



# BARITE IN SOUTH AUSTRALIA



MINERAL INFORMATION SERIES

# INTRODUCTION

The mining of barite in South Australia began in 1910, when 60 tons were produced at Williamstown. With the development of the petroleum industry in Australia in the 1960's and consequent expansion of drilling activity offshore the production of barite, although small compared to other mining operations, has risen rapidly in South Australia to supply the bulk of Australian needs and for export overseas.

## WHAT IS BARITE?

Barite (barium sulphate) is a heavy non-metallic mineral with the chemical composition  $\text{BaSO}_4$ . The name is derived from the Greek "barys" meaning heavy as it has a specific gravity 4.5. It is known as barytes, heavy spar, tiff or cawk.

When pure, it is a colourless, white or grey mineral. Impurities which may include silica, quartz, iron oxides, calcite, shale, pyrite or alumina, may result in black, yellow, brown, red, green or blue colours. Barite is frequently brown in colour due to iron-staining. The streak is white, lustre is vitreous to resinous or pearly, and it may be transparent to opaque. Its hardness varies from 2.5 to 3.5 on Moh's scale. Commercially, the terms "hard" and "soft" are used to refer to the ease of grinding. Barite has three cleavages, two of which are at right angles, and the fracture is uneven. It is insoluble in water and in most acids and can therefore be used as a chemically inert material. It is, however, soluble in concentrated sulphuric acid.

Barite may be found in tabular orthorhombic crystals, or it may appear granular or earthy. Crystals have been found in many places, e.g. at Pernatty Lagoon, and in the Mitcham quartzite quarries. Concretionary masses of barite, known as "buns" which occur in Cretaceous rocks of the Great Artesian Basin are thought to represent worm casts that have been replaced by barite in solution. At Hallett Cove, rosettes of platy barite which crystallised around sand grains may be found in Tertiary sediments.

## USES

Three-quarters of the barite consumed in the world today is used in petroleum drilling operations, the balance being used in chemical, paint and rubber industries. It is generally marketed in the ground form.

The main uses are as follows:-

- (1) — Finely ground barite is used as a weighting agent in well-drilling muds because of its high specific gravity, low abrasiveness, chemical stability and lack of magnetic and toxic effects. All the low grade barite is used for this purpose. Specifications for drilling mud usage require a minimum S.G. of 4.2  
A large quantity of South Australian barite was used in drilling mud to control the Marlin Well blowout in Bass Strait, early in 1969. Up to 3,000 tonnes of barite may be consumed in the drilling of a single well, as was the case for a gas well in the Norwegian sector of the North Sea.
- (2) — South Australian barite is also used as a filler or extender in paints, inks, oilcloth, linoleum, rubber, etc., and in the glass industry.



An application formerly of great importance was the white paint pigment, lithopone, but titanium oxide has largely replaced barite for this purpose.

The American Society for Testing Material Specification D602-42 requires barite for use in pigments to be white and to contain:

- at least 94%  $\text{BaSO}_4$
- not more than 0.05%  $\text{Fe}_2\text{O}_3$
- not more than 0.2% soluble salts
- not more than 0.5% moisture and volatiles
- not more than 2% quartz, clays and foreign materials

- (3) — Barite may be used as a source of barium chemicals but there is limited application for this purpose in Australia at the present time.

*Barium sulphate* when precipitated is known as *blanc fixe* and is used as a paint extender and filler in paper, rubber and linoleum. Because of the large absorption of X-rays by barium, the sulphate is used to coat the alimentary tract for X-ray photographs to increase the contrast.

*Barium chloride* is used in leather and cloth manufacture.

*Barium carbonate* is a component of ceramic glazes and enamels.

*Barium hydroxide* is used to recover sugar from molasses.

*Barium oxide* is used in glass.

*Barium nitrate* is used as an ingredient of signal flares and detonators.

- (4) — In the future, large quantities of barite may be required as an aggregate in concrete shields for nuclear reactors.

## PRODUCTION

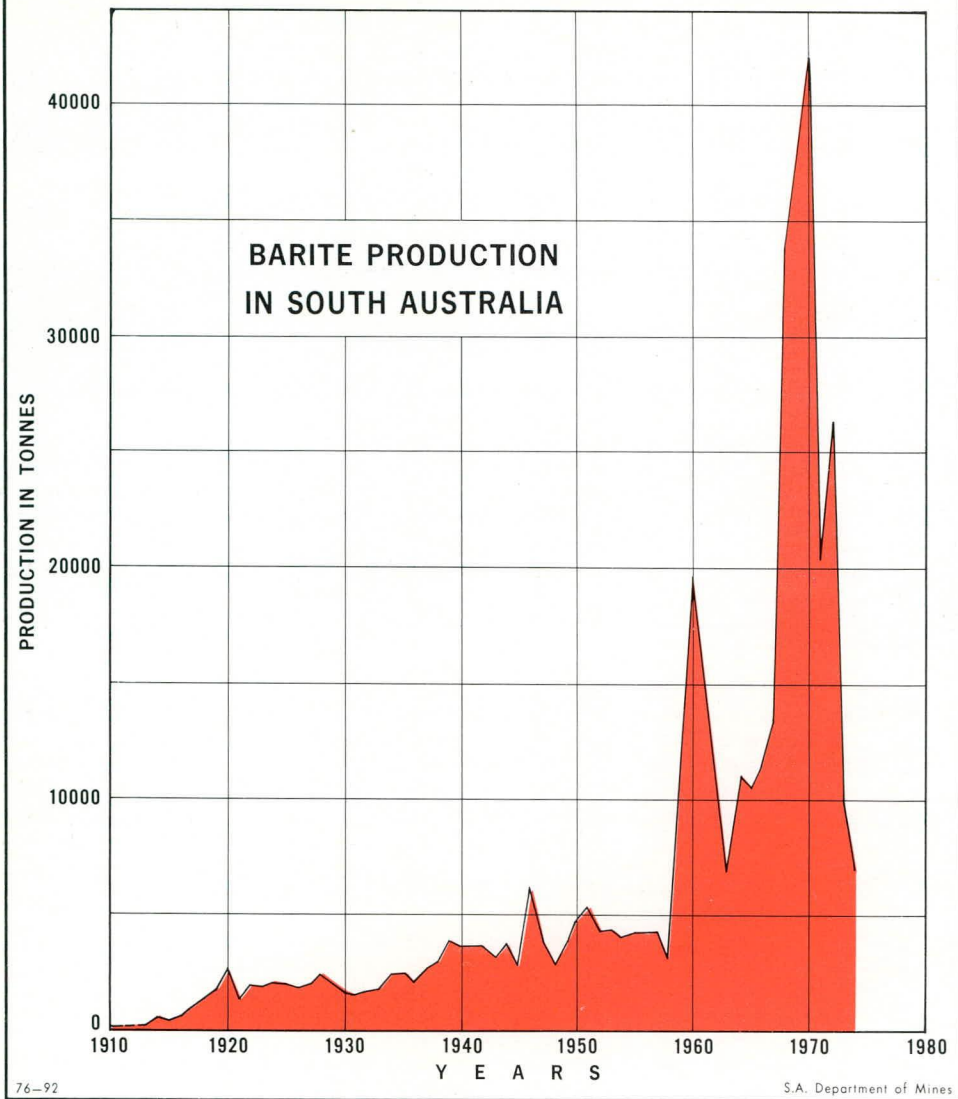
Production in South Australia during the period 1910 to 1974 totalled 336,628 tonnes, valued at \$4,327,933. The year of greatest output was 1970 when 41,347 tons were produced, valued at \$490,000. Expanded output was due to heavy demands from the petroleum drilling industry.

A comparison between total Australian production and South Australian production during the period 1964 to 1974 is given in the following table (in tons to 1970, tonnes from 1971).

YEAR	SOUTH AUSTRALIA	AUSTRALIA	EXPORTS FROM AUSTRALIA
1964	10 831	12 302	6 209
1965	10 349	11 976	2 183
1966	11 281	13 724	4 797
1967	13 104	15 666	4 174
1968	32 839	39 155	19 564
1969	36 061	39 562	22 060
1970	41 347	44 067	29 705
1971	20 261	53 811	16 262
1972	25 803	26 288	13 217
1973	9 755	10 028	518
1974	6 811	7 466	1 808

Compared with world production (4 million tonnes in 1974) Australia is a small producer.

Barite from Australia is exported to Papua, New Zealand, Malaysia, Phillipines, Borneo and Africa.



## BUYERS AND SELLERS

Because of stringent specifications, barite is not generally sold directly on the open market. The following companies in South Australia are producers of ground barite and purchasers of crude ore, delivered to their works; after processing barite is sold to interested buyers. Prices are negotiated according to grade and amount required.

South Australian Barytes Ltd., Treatment plant at Quorn.  
 Manager:- Fell and Starkey,  
 170 Greenhill Road,  
 Parkside.  
 Minerals Ltd., (formerly Jarvis Minerals) Crushing mill at Beverley.  
 Toogood Avenue,  
 Beverley.  
 Steetley Australasia Pty. Ltd., Crushing mill at Gillman.  
 100 Eastern Parade,  
 Gillman.

## OCCURRENCE

Barite deposits are widely distributed throughout the world. The most important Australian deposits are located in the Flinders Ranges in South Australia.

Barite is formed by the precipitation of barium sulphate from hot aqueous solutions under moderate to high pressure. The barium may have originated from a magma or have been redissolved from pre-existing rocks by circulating groundwater. In the Adelaide Geosyncline of the Mount Lofty and Flinders Ranges purple slates, shales and siltstones of Marinoan age, and in particular the Brachina Formation have abnormally high barium content. As these shales contain numerous veins of barite, not associated with igneous rocks, the barite is considered to have been leached from the sediments and redeposited by circulating groundwater.

Barite deposits can be classified into four principal types:-  
 vein and cavity filling  
 bedded replacement  
 residual  
 sedimentary

*Vein and cavity filling deposits* comprise barite deposition in openings within faults, joints, bedding planes, breccia zones or solution channels. The most common type in the Flinders and Mount Lofty Ranges is the fissure vein, a steep tabular sheet-like body commonly associated with quartz and hematite. Barite may comprise a gangue mineral in veins containing metallic ores, e.g. with galena in the Mount Malvern lead mine.

*Replacement bedded deposits* are those in which barium sulphate in aqueous solution has replaced the host rocks. The barite-rich beds generally form lenticular orebodies that may pinch out abruptly both horizontally and vertically. Deposits in this form tend to be large in extent, but are generally of low grade because of incomplete replacement of the host.

*Residual deposits* are those in which barite is redeposited in unconsolidated material from the weathering of pre-existing deposits e.g. infilling of karstic Cambrian limestone at Ediacara.

*Sedimentary deposits* are those in which barite was precipitated from a barium-rich solution before sediment compaction. The original sedimentary features can be recognised; the most important characteristics are those of lateral continuity and conformity. The deposits of the Olary Province appear to be of this type.





Mt. Frome Barite deposit, Flinders Ranges.

## EXPLORATION AND MINING METHODS

Methods of exploration vary depending on the type of deposit and its geological setting. Vein and bedded types of deposits can be explored by drilling sinking test pits and exploratory shafts or by driving. Since barite has a higher specific gravity than most sedimentary rocks, it might be possible to locate concealed deposits by means of microgravity survey; this method has been used to define residual deposits in Missouri, U.S.A.

In evaluating deposits, three factors must be considered:

*Grade* - Mining of extensive deposits of lower grade barite of requisite S.G. occasioned by petroleum exploration; this has been at a low ebb in Australia since 1972.

*Geographic locality* - Because of its weight, barite can become expensive to transport over long distances. Consequently, the choice of a deposit may depend more on the geographic locality than geology. Before 1948, most barite deposits in South Australia were mined in the Mount Lofty Ranges, within a radius of less than 80 km from Adelaide.

*Mining methods* - Most of the South Australian deposits have been worked by open-cut methods. Where extension of lode permitted shafts and drives were extended underground e.g. in the Crittendon Mine, the barite was worked by shafts, drives and stoping to a depth of 85 m; first grade barite was generally sorted from the low grade by hand, on the basis of colour. At the Oraparinna Mine, workings extend to a depth of 150 m. Many barite deposits were not exhausted in the past for the following reasons:-

Where ore was hauled to the surface by hand operated windlass, workings were seldom extended below a depth of 50 m.

As there was a premium for first grade barite and little demand for second grade material containing in excess of 4% iron, only selected parts of the veins were mined.

Tributers selectively mined the better grade material and left the discoloured barite as filling.

# BARITE DEPOSITS IN SOUTH AUSTRALIA

Barite deposits are located in four main regions:

- Flinders Ranges
- Mount Lofty Ranges
- Olary Province
- Eyre Peninsula

Production has been recorded for 60 deposits although a number of others are known.

## Flinders Ranges

Nearly all barite deposits which are being worked are located in the Flinders Ranges.

The largest and most important source of high grade barite is the *Oraparinna Mine* 77 km northeast of Hawker in the Bunker Range. This deposit was first worked in 1940, but little progress was made until 1946 when South Australian Barytes Ltd. was formed.

Following development of the principal lodes, the company with the backing of the South Australian Government, built a treatment plant at Quorn capable of producing up to 30 000 tons per year.

In 1975 capacity was greatly increased with the installation of a Bradley Mill. From Quorn, the finely ground barite is transported to Port Pirie for shipment to other parts of Australia and overseas. Total production to 1974 was 224 251 tonnes.

Barite occurs in veins which occupy steeply dipping fractures in purple-grey slate, shales and siltstones within the Brachina Formation of Marinoan age. Workings are on four levels, and there are several open cuts. The lodes range up to 5 m width and have been worked over a length of 400 m; indicated geological reserves are in excess of 80 000 tonnes.

Other smaller barite deposits which are being worked include:-

- Appealinna, 8 km southeast of Oraparinna H.S.
- Artipena, 80 km northeast of Hawker
- Carey Hill, 8 km east of Blinman
- Martin's Well, 37 km southeast of Oraparinna Mine
- Mt. John, 48 km east of Blinman
- Mt. Coffin, 10 km east of Leigh Creek
- Mt. James, 30 km northwest of Beltana

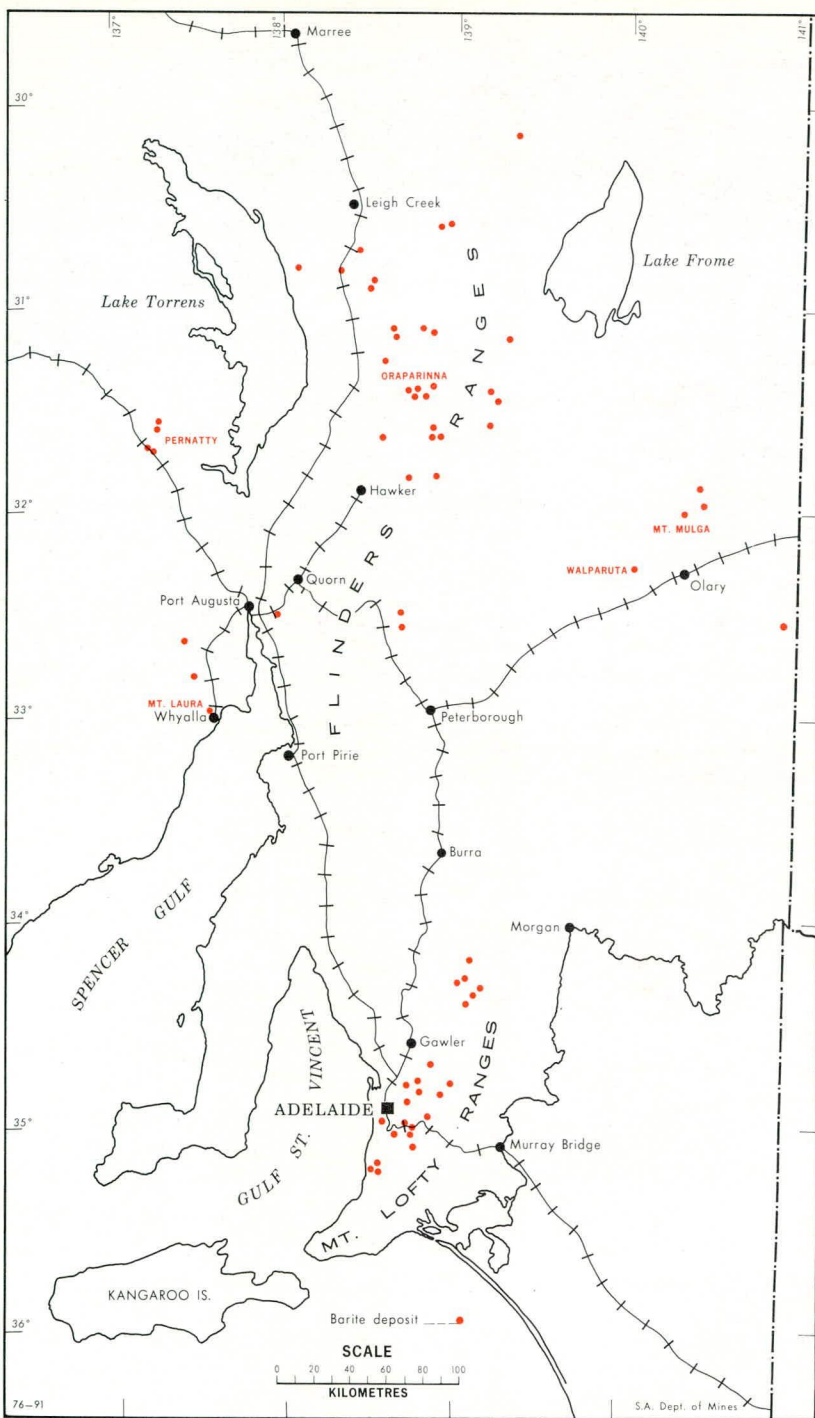
Deposits which have potential for development include:-

- Mt. Faulkland, 16 km east of Parachilna; high grade
- Mt. Frome, 50 km east of Blinman; large deposit with silica impurities
- Mt. Serle, 45 km east of Copley
- Moralana, 33 km north of Hawker, drilling mud grade
- Nilpena, 20 km north of Parachilna, drilling mud grade
- Yanyarrie, 8 km north of Carrieton, large, possibly of drilling mud grade
- Many other small deposits occur, but they are possibly too small or too low grade to be economic.

## Mount Lofty Ranges

Most of the mines have been abandoned, and the areas converted to farm land or to reserves. The most recently worked area is at Julia Creek, 72 km northeast of Adelaide where total of 10 513 tonnes were produced from 1925 to 1974, from a number of small mines in the region.





BARITE DEPOSITS IN SOUTH AUSTRALIA





Matthews Barite deposit, Flinders Ranges.

The largest deposits were located in an area of about 260 hectares, three km south of Noarlunga where the main workings were Crittendon, Noarlunga Barytes Ltd., Elliot's and Sutter's. *Crittendon* was the largest, having produced 38 840 tons between 1918 and 1952. The barite was principally first grade with some iron-stained second grade. Seven diamond drill holes bored in 1942, revealed no appreciable barite at depth, hence the mine is regarded as having been worked out.

From the workings of *Noarlunga Barytes Ltd.* a total of 18 441 tons were produced from 1918 to 1961. Because of poor mining methods, much of the barite was left and is now buried by fill.

One of the earliest barite mines was at Aldgate, 16 km southeast of Adelaide, which was worked from 1913 to 1921. The barite was ground in porcelain-flint lined mills, but with the exhaustion of the more easily won barite, the plant was removed and re-erected near Adelaide.

Other barite mines which have been worked out or abandoned because of the low grade include:

*Torrens Barite Mine*, 6 km northeast of Athelstone

*Uraidla*, 5 km north of Bridgewater

*Mt. Barite Mine*, 3 km north of Birdwood

*Prairie Mine*, 19 km east-northeast of Adelaide

*Williamstown Barite Mine*, 5 km southwest of Williamstown - the oldest barite mine in South Australia.



Moralana Barite deposit, Flinders Ranges.

## Olary Province

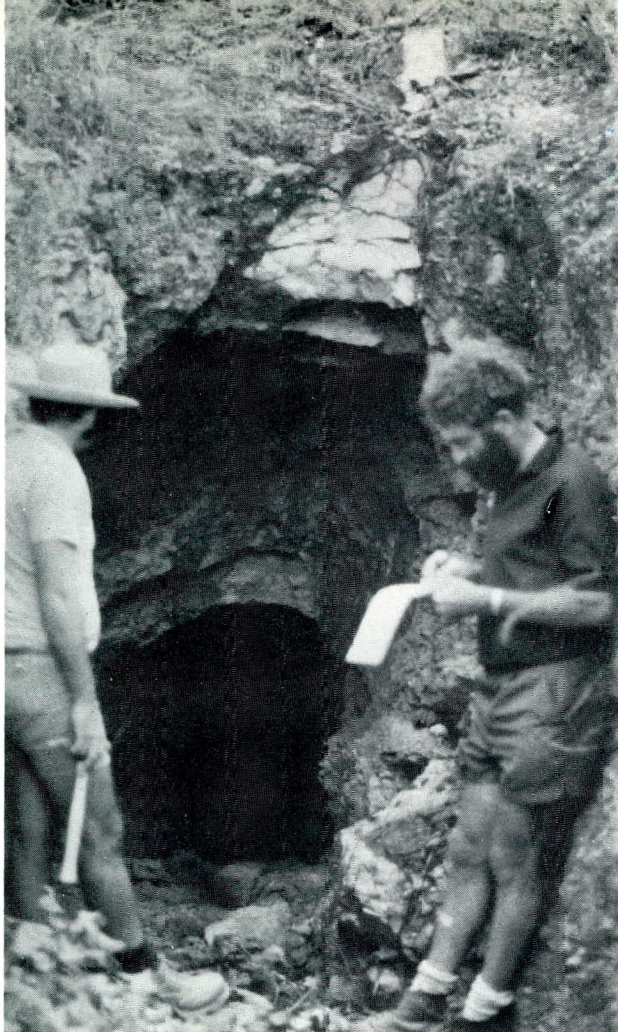
Several large, low grade deposits of barite are known in the Olary district. They occur at the same stratigraphic level within a banded iron formation in the older basement rocks. The deposits are conformable with the bedding of the metamorphic country rock and in places retain the original bedding structures. They are therefore considered to be of the sedimentary type. As the deposits are largely contaminated with silica and iron oxide, they appear to be suitable only for drilling mud.

The largest deposit at Walparuta, 11 km northeast of Weekeroo Station, contains reserves of over one million tonnes; the grade is not known.

*Mt. Mulga Barite Mine*, 5 km southeast of the old Boolcoomata Homestead is currently being worked on a small scale.

Other similar deposits are at Dome Rock, 46 km northeast of Olary, Waukaloo, 13 km northeast of Kalabity Homestead, and Ameroo Hill, 20 km north of Olary.





Mt. John Barite deposit, Flinders Ranges,  
showing lens shape of deposit.

## Eyre Peninsula

*Mt. Whyalla Barite Mine*, 24 km northwest of Whyalla, was selectively worked from a series of vertical lenses over a distance of one km. Similar veins occur at Mt. Laura, overlooking Whyalla and at Corunna 15 km from Iron Knob. Of the barite produced, approximately 50 per cent first grade material was obtained by hand picking; the remainder was discarded as waste.

A deposit of high grade barite occurs on the floor of Pernatty Lagoon, 8 km north of Wocalla, adjacent to the manganese deposits near the Western shore. It forms a rise elevated 30 cm above the general lake level over an area 6 to 12 metres wide, and is traceable as a succession of patches forming a long narrow lode for a distance of 500 metres. The continuity and vertical extent are unknown.

*Mt. Laura*, 2 km northwest of Whyalla, was worked for a short period and produced a small amount of high grade barite.

*Corunna*, 15 km northwest of Iron Knob, quartz-barite veins intrude the Burkitt Granite; the barite is of oil drilling grade.





Mt. Whyalla Barite Mine, Eyre Peninsula,  
showing narrow vein deposit.

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COVER PHOTO:

Top left - Crystalline Barite from Pernatty Lagoon;

Top right - Botryoidal Barite from Noarlunga;

Bottom - More common occurrences from the Flinders Ranges.

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**S.A. DEPARTMENT OF MINES**  
**191 GREENHILL ROAD, PARKSIDE 5063**

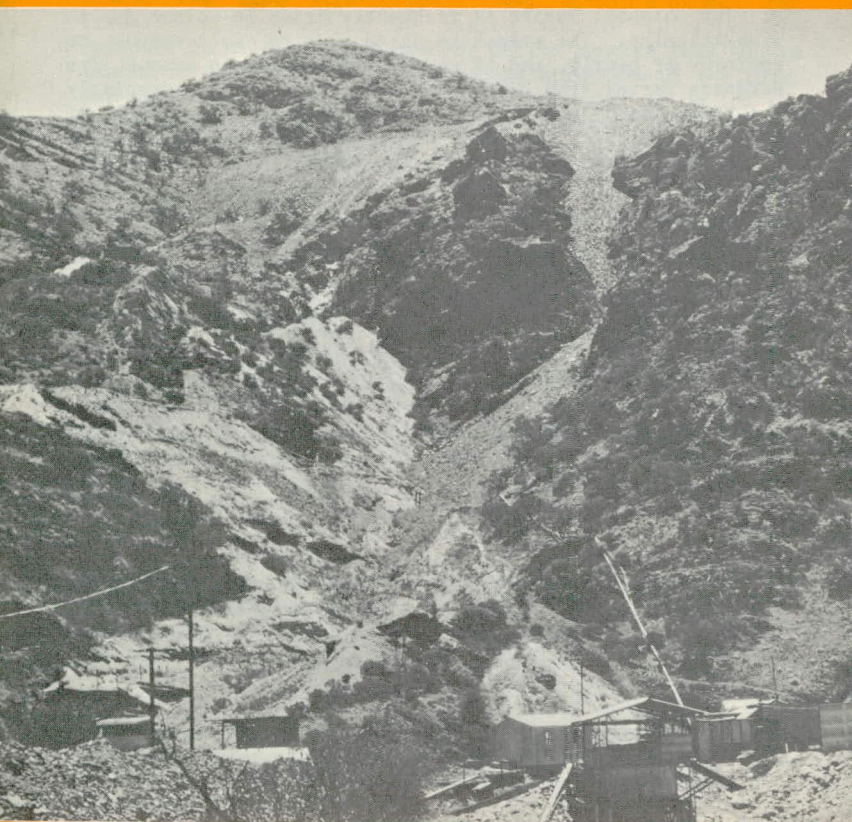
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# BARITE in South Australia

S.A. Department of Mines and Geological Survey



MINERAL INFORMATION SERIES

**The mining of barite** in South Australia began in 1910, when 60 tons was produced at Williamstown. With the development of the petroleum industry in Australia in the 1960's, and in particular with offshore drilling of oil and gas wells, the production of barite, although small compared to other mining operations, has risen rapidly in South Australia, supplying the bulk of Australian needs, and also exporting to neighbouring countries.

### *What is barite?*

Barite is a heavy non-metallic mineral with the chemical composition of barium sulphate ( $\text{BaSO}_4$ ). Another less common barium mineral is witherite, its chemical composition being barium carbonate.

The term "barite" is derived from the Greek word "barys" meaning heavy, as its specific gravity is 4.5 when pure. It is also known as barytes, heavy spar, tiff or cawk.

When pure it is colourless, white or grey. Impurities e.g. silica, quartz, iron oxides, calcite, shale, pyrite, alumina etc., may result in black, yellow, brown, red, green or blue colours. Barite is frequently brown in colour due to iron-staining. The streak is white, lustre is vitreous to resinous or pearly, and it may be transparent to opaque. Its hardness varies from 2.5 to 3.5 on Moh's scale. Commercially the terms "hard" and "soft" are used to refer to the ease of grinding. Barite has three cleavages, two of which are at right angles, and the fracture is uneven. It is insoluble in water and in most acids and can therefore be used as a chemically inert material. It is however soluble in concentrated sulphuric acid.

Barite may be found in tabular orthorhombic crystals, or it may appear granular or earthy. Crystals have been found in many places, e.g. at Pernatty Lagoon, and Mitcham quartzite quarries, near Adelaide. Concretionary masses of barite, known as "buns" have been found in Cretaceous rocks of the Great Artesian Basin. They are thought to have been worm casts which have been replaced by barite in solution. At Hallett Cove, south of Adelaide, rosettes in which platy barite has crystallised around sand grains have been found in Tertiary sediments.

### *Uses*

Although three-quarters of the barite consumed in the world today is used for oil and gas well drilling, the barite mining industry originally supplied the requirements of the chemical, paint and rubber industries. The main uses are as follows:-

- (1) In oil and gas well drilling, finely ground barite is used as a weighting agent in well-drilling muds because of its high specific gravity. The majority of barite now produced in South Australia and all the low grade barite is used in the petroleum industry. A large tonnage of South Australian barite was used in drilling mud to control the Marlin Well blowout in Bass Strait, early in 1969.



- (2) The second most important use of South Australian barite is that of a filler or extender in paints, inks, oilcloth, linoleum, rubber etc., and in the glass industry. An application formerly of great importance was the white paint pigment, lithophone. Titanium oxide has largely replaced barite for this purpose.
- (3) Overseas, barite is used as a source of barium chemicals. This use has only a limited application in Australia at present. The various chemical compounds of barium are used as follows:-
- a) *Barium sulphate* when precipitated is known as *blanc fixe* and is used as a paint extender and filler in paper, rubber and linoleum. Because of the large absorption of x-rays by barium, the sulphate is also used to coat the alimentary tract for x-ray photographs to increase the contrast.
  - b) Barium chloride is used in leather and cloth manufacture.
  - c) Barium carbonate is a component of ceramic glazes and enamels.
  - d) Barium hydroxide is used to recover sugar from molasses.
  - e) Barium oxide is used in glass.
  - f) Barium nitrate is used as an ingredient of signal flares and detonators.
- (4) In the future, large tonnages of barite may be required as an aggregate in concrete shields for nuclear reactors. At present, barite from South Australia is being used to construct a biological shield at Lucas Heights, a project of the Australian Atomic Energy Commission.

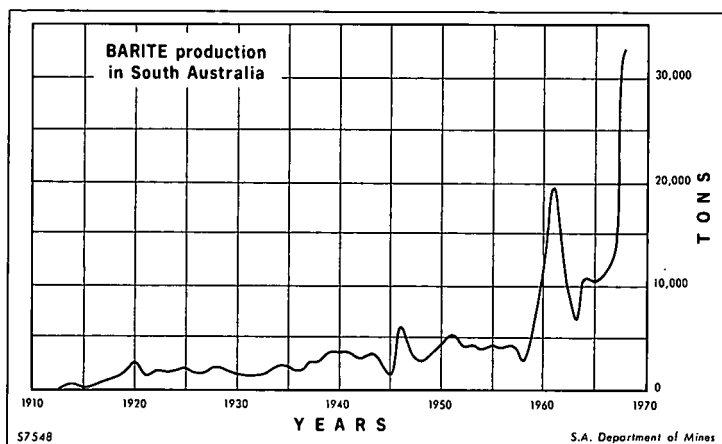
### Production

Total production in South Australia from 1910 to June 1969, was 253,919 tons valued at \$2,706,579. The year 1968 saw the greatest production in South Australia with 32,839 tons produced, valued at \$358,494. This increase was due to heavier demands in the petroleum industry, including the Marlin gas blow-out.

A comparison between total Australian production and South Australian production from 1964-1968 is given in the following table (in tons):

Year	South Australia	Australia	Exports from Australia	Imports	
				Barium Chemicals	Crushed Barite
1964	10,831	12,302	6,209	2,289	1,195
1965	10,349	11,976	2,183	2,217	2,119
1966	11,281	13,724	4,797	2,498	1,133
1967	13,104	15,666	4,174	3,753	1,345
1968	32,839	39,155	19,564	4,175	1,544

Compared with world production (4,000,000 tons in 1967) Australia is still a small producer. However, barite from Australia is exported to Papua, New Zealand, Malaysia, Phillipines, Borneo and Africa.



### Buyers and Sellers

Due to the stringent specifications, barite is not generally sold directly on the open market. The following companies in South Australia are producers of ground barite and will also buy barite as crude ore from smaller operating mines delivered to their works. After processing, they sell barite to interested buyers.

South Australian Barytes Ltd.,  
Grenfell Street,  
ADELAIDE, S.A.

- Treatment plant is  
at Quorn

Minerals (S.A.) Pty. Ltd., )  
Arqona Road, )  
KILKENNY, S.A. )

S.N. Rodda & Co., )  
100 Eastern Parade, )  
GLENMORE, S.A. )

Jarvis Industries Ltd., )  
Military Road, )  
TAPEROO, S.A. )

- These companies  
all have crushing  
mills in Adelaide  
at the addresses  
shown.

### OCCURRENCE

Barite deposits are widely distributed in the world. In Australia, the most important deposits occur in the Flinders - Mount Lofty Ranges of South Australia.

Barite is formed by the precipitation of barium sulphate from hot aqueous solutions under moderate to high pressure. The barium may have originated from a magma or have been redissolved from pre-existing rocks by circulating groundwater. In the Adelaide Geosyncline of the Mount Lofty - Flinders Ranges, an unusually high content of barium is present in purple slates and shales of Marinoan age. As these shales contain numerous veins of barite, not associated with igneous rocks, the barite is thought to have been

redeposited by circulating groundwater; whereas in Victoria barite deposits are found associated with igneous rocks.

Most barite deposits can be classified into three types:

- (1) Vein and cavity filling deposits.
- (2) Replacement bedded deposits.
- (3) Residual deposits.

- (1) *Vein and cavity filling deposits* occur where barite has filled in spaces in the rocks such as along faults, joints, bedding planes, breccia zones or solutions channels. The most common type found in the Flinders - Mount Lofty Ranges is the fissure vein as a tabular sheet-like body, and commonly associated with quartz and hematite. Barite may also form a gangue mineral in veins containing metallic ores, such as galena in the Mount Malvern lead mine.
- (2) *Replacement bedded deposits* are those in which aqueous solutions containing barium sulphate have replaced the host rocks. The barite-rich beds generally form lenticular shaped orebodies that may pinch out abruptly both horizontally and vertically. Deposits in this form tend to be large in extent, but are generally of low grade due to contamination by the presence of inclusions of the replaced country rock. The barite deposits in the Olary Province are of this type.
- (3) *Residual deposits* are those in which barite is redeposited in unconsolidated material from the weathering of pre-existing deposits e.g. barite occurs in Tertiary sediments at Hallet Cove, South Australia, but no commercial deposits are known.

## EXPLORATION AND MINING METHODS

Methods of exploration vary depending on the type of deposit and its geologic setting. Vein and bedded types of deposits can be explored by drilling, sinking test pits and exploratory shafts or driving adits. Since barite has a higher specific gravity than most sedimentary rocks it should be possible to locate underground deposits by means of micro-gravity surveys. This method has been used over residual deposits in Missouri, U.S.A.

In evaluating deposits, three factors must be considered:

- (1) *Grade* - Extensive deposits of low grade barite occur in South Australia. Until there is an increased demand from oil drilling companies, mining of these deposits is not economic.
- (2) *Geographic locality* - Because of its weight, barite can become expensive to transport over long distances. Consequently, the choice of a deposit may depend more on the geographic locality than geology. Before 1948, most barite deposits in South Australia were mined in the Mount Lofty Ranges, where distances were not far from the principal users in Adelaide.
- (3) *Mining methods* - Unless the deposit is very large, or of high grade, mining methods must be relatively simple to be economic. Most barite mines in South Australia have been worked by open-cut methods. As



these areas were worked out, shafts and drives were extended from the open-cut e.g. in the Crittendon Mine, the barite was worked by shafts, drives and stoping to a depth of 280 feet. First grade barite was generally sorted from the low grade by hand, on the basis of colour.

Many of the barite mines were not thoroughly worked in the past for the following reasons:

- (a) Barite was hauled to the surface by hand operated windlass; it was therefore difficult to work below 40-50 feet in depth.
- (b) As there was a high premium for first grade barite and very little market for second grade barite, operations ceased when the material became too heavily iron-stained (4% iron was considered uneconomic).
- (c) A considerable amount of mining in the Mount Lofty Ranges was carried out on a tributer basis. The tributers followed the better grade material, leaving the discoloured barite as filling. Consequently many of the old mines were only partially exploited; recovery of the barite would now require development and more expensive mining methods.

Producers therefore, have problems of heavy dependence on a single market, of locating economically mineable deposits near major consuming markets, of keeping costs down and of maintaining a satisfactory reserve position.

## BARITE DEPOSITS IN SOUTH AUSTRALIA

Barite deposits in South Australia occur in four main areas:

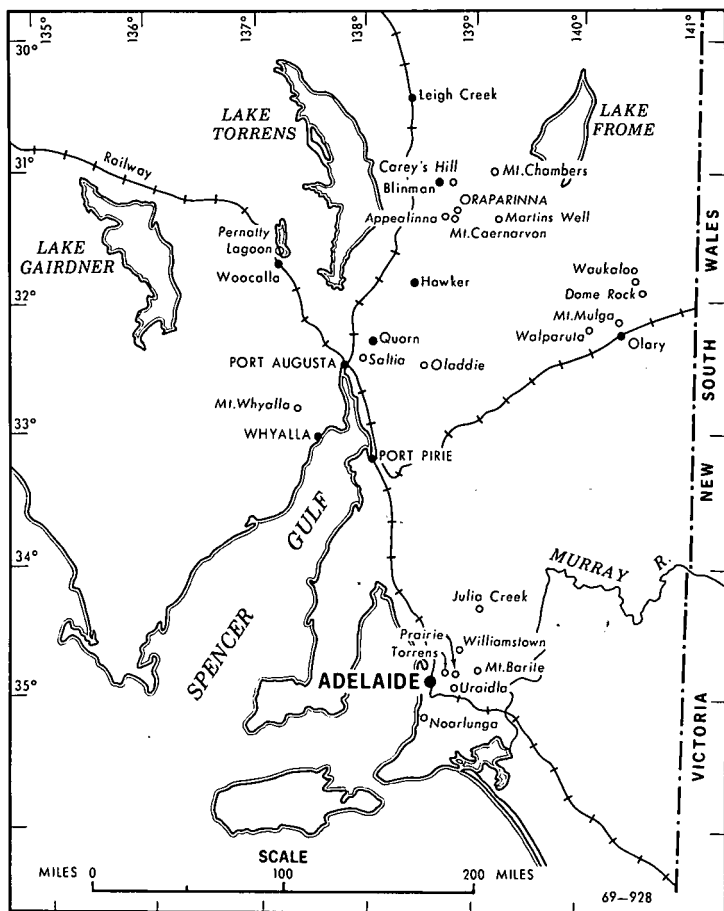
- (1) Flinders Ranges
- (2) Mt. Lofty Ranges
- (3) Olary Province
- (4) Mt. Whyalla and Pernatty Lagoon.

In these areas, a total of 73 deposits have been recorded, of which 50 have some recorded production and 22 have production of over 1,000 tons. Many of these deposits are small, of low grade or with reserves exhausted.

### (1) FLINDERS RANGES

Nearly all barite deposits now being worked are in the Flinders Ranges.

The largest and most important source of high grade barite in Australia is the *Oraparinna Mine*, 48 miles north-east of Hawker in the Bunker Range. This deposit was first worked in 1940, but little progress was made until 1946 when South Australian Barytes Ltd. was formed. Following the development of the principal lodes, the company with the backing of the South Australian Government, built a treatment plant at Quorn capable of producing up to 30,000 tons per year. In 1968-69, the plant was improved and a new Bradley Mill was installed, increasing the capacity three-fold. From Quorn, the barite is transported by rail to



Principal BARITE deposits in South Australia

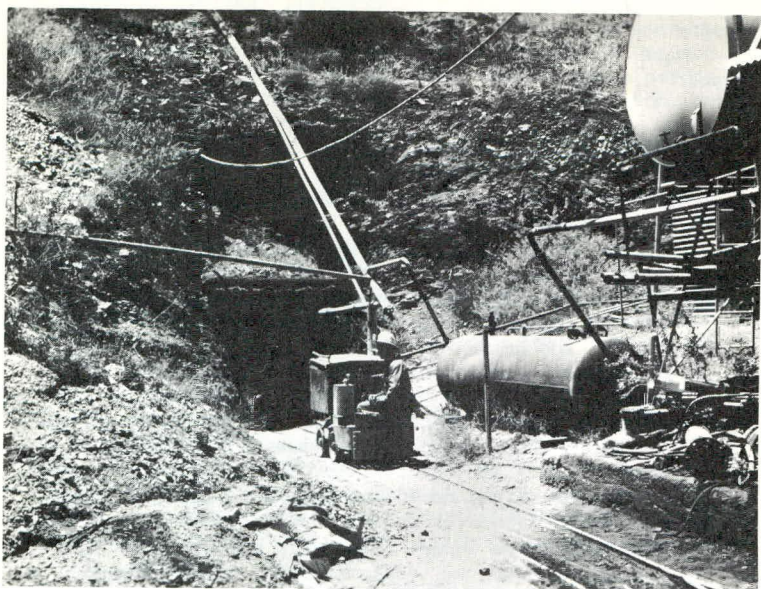
Port Pirie where it is shipped to other parts of Australia and to neighbouring countries.

The barite at Oraparinna occurs in veins occupying steeply dipping fractures in purple-grey slates and shales in the Wilpena Group of Marinoan age. Workings are on three levels, and there are several open cuts at various places. Available reserves are believed to be large; total production to 1968 was 144,523 tons.

Other smaller barite mines in the Oraparinna area are being worked four to five miles southeast of Oraparinna homestead, near the old Appealinna Copper Mine. Although large reserves have been estimated, the grade is low and without treatment is suitably only for oil drilling mud. Total production from 1962-1968 is 10,790 tons.

Other deposits currently being worked in the Flinders Ranges are:

Mt. Caernarvon, six miles southwest of Oraparinna Mine.  
 Martin's Well, 23 miles southeast of Oraparinna Mine.  
 Mt. Chambers, 30 miles north of Martin's Well.  
 Carey's Hill, six miles east of Blinman.



Main adit, No.3 Level, S.A. Barytes, Oraparinna

Some of the oldest mines in the Flinders Ranges were worked at Saltia, 12 miles east-northeast of Port Augusta and Oladdie, eight and a half miles southeast of Carrieton. At Oladdie, a mill was erected in 1925, but was closed down in the same year, as a market could not be found for the ground product.

Many other small deposits occur in the Flinders Ranges, but in general they are too small or of too low grade to be economic.

## (2) MT. LOFTY RANGES

Due to high transport costs, the early barite mines were largely restricted to the Mt. Lofty Ranges. Today, most of the mines have been abandoned, and the areas converted to farm land or to reserves. The only area currently being worked on a very small scale is at Julia Creek, 45 miles northeast of Adelaide. A total of 10,347 tons was produced from 1925 to 1968, from various mines in this area.

The largest deposits in the Mt. Lofty Ranges were in an area of about one square mile, two miles south of Noarlunga in the hundred of Willunga. The main workings were Crittenden, Noarlunga Barytes Ltd., Elliotts and Sutters.

Of these mines *Crittenden* was the largest, having produced 38,840 tons between 1918 and 1952. The barite was principally first grade with some ironstained second grade. Seven diamond drill holes bored in 1942, revealed no appreciable barite at depth, hence the mine is regarded as worked out.

Barite from the workings of *Noarlunga Barytes Ltd.* produced a total of 18,441 tons from 1918 to 1961. Because of poor mining methods, much of the barite was left and is now buried by the fill. Considerable quantities of second grade barite are thought to remain.



One of the earliest barite mines worked was at Aldgate, ten miles southeast of Adelaide, which was mined from 1913 to 1921. The barite was ground in porcelain-flint lined mills, but with the exhaustion of the more easily won barite, the plant was removed and re-erected near Adelaide.

Other barite mines in the Mt. Lofty Ranges which have been worked out or abandoned due to the low grade include:

*Torrens Barite Mine*, four miles northeast of Athelstone.

*Uraidla*, three miles north of Bridgewater.

*Mt. Barite Mine*, two miles north of Birdwood.

*Prairie Mine*, 12 miles east-northeast of Adelaide.

*Williamstown Barite Mine*, three miles southwest of Williamstown - the oldest barite mine in South Australia.

### (3) OLARY PROVINCE

Several large but low grade deposits of barite are known in the Olary district.

In the older basement rocks, the barite deposits are all at the same stratigraphic level within a banded iron formation. The shape of the barite deposit is generally oriented parallel to the bedding of the country rock and in places retains the original bedding structure of the rock. For this reason, the deposits are believed to be of the bedded replacement type. As the deposits are largely contaminated with silica and iron oxide, they are low grade, and without beneficiation are suitable only for oil drilling.

The largest deposit is at Walparuta, seven miles northeast of Weekeroo Station. Reserves by open-cut methods have been estimated at 40,000 tons, beyond which mining costs would rise steeply.

*Mt. Mulga Barite Mine*, three miles southwest of the old Boolcoomata Homestead is currently being worked on a small scale. It consists of six large and irregular shaped bodies, the largest of which covers an area of 15,000 square feet, of massive but impure barite.

Other deposits are at Dome Rock, 29 miles northeast of Olary, and Waukaloo, eight miles northeast of Kalabity Homestead.

### (4) MT. WHYALLA AND PERNATTY LAGOON

*Mt. Whyalla Barite Mine*, 15 miles northwest of Whyalla, was selectively worked from a series of horizontal lenses over a distance of half a mile. Of the barite produced, approximately 50 percent first grade material was obtained by hand picking; the remainder was discarded as waste.

A deposit of high grade barite occurs on the western edge of Pernatty Lagoon, five miles north of Woocalla. The barite is closely associated with manganese and dolomite. It forms a rise elevated one foot above the general lake level over an area 20 to 40 feet wide, and is traceable as a succession of patches forming a long narrow lode for a distance of a quarter of a mile. Total reserves are not known. (December, 1969).



Bulldozer stripping hanging wall of Barite seam,  
S.A. Barytes, Oraparinna

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COVER PHOTO: S.A. Barytes Mines, Oraparinna

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**Address:** *Department of Mines*  
*169 Rundle Street, Adelaide, South Australia. 5000.*

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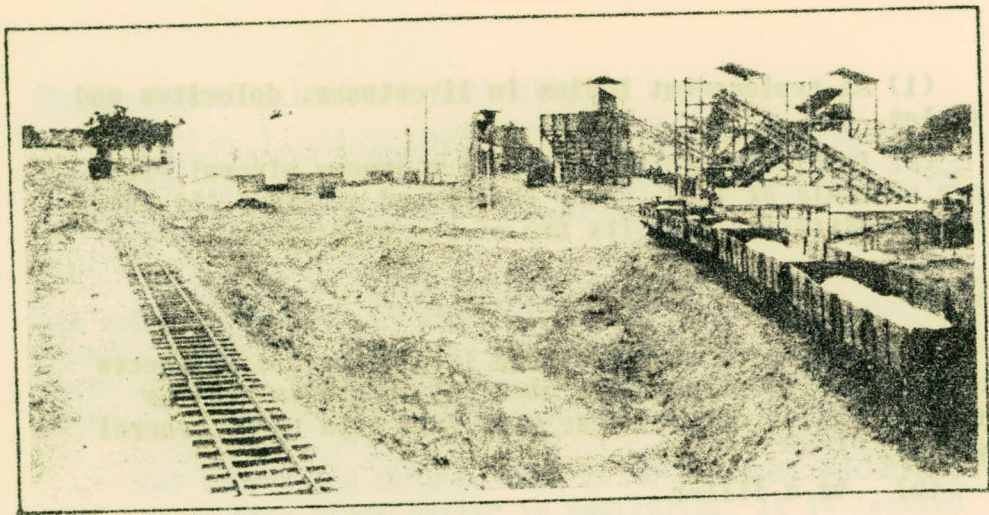
Prepared for lithography by the Drafting Branch  
S.A. Department of Mines

Printed by H. J. Wall,  
Government Photolithographer, Adelaide.

S.A. Department of Mines and Geological Survey

**BARITE**  
**(Barytes)**  
**in**  
**South Australia**





S.A. Barytes Ltd. mill at Quorn.

### B A R I T E

in South Australia

Barite, or barium sulphate ( $\text{BaSO}_4$ ) is also known as Barytes, and "heavy spar". It consists of the metal barium, with combined sulphur and oxygen. Commercial forms of barytes contain impurities such as silica or quartz, iron oxides, calcite (limestone) dolomite, shale and so on. The content of barium sulphate may for some uses, be as low as 93%.

When pure, the mineral is white, but because of impurities present may be grey, blue, yellow, brown or nearly black. In the pure form it may be transparent or translucent, but is usually opaque. It is noticeably heavy, with a specific gravity of 4.3 to 4.6 (quartz is 2.7). It is found crystalline, but may be granular or earthy in appearance. The lustre is vitreous to pearly or resinous on cleavage faces. There are two perfect cleavages, at right angles, and a third, indistinct. The crystal form is orthorhombic.

Barite deposits are of two types -

(1) As replacement bodies in limestones, dolomites and shales, and

(2) in mineral veins, often as a gangue mineral with ore minerals of lead, zinc, copper and others. All known South Australian deposits are of the vein type.

### Uses

The uses of barite depend largely on its whiteness when pure, its weight, its chemical inertness and its relatively low cost. These uses fall into three general groups.

- (a) as a filler
- (b) as pigment materials lithopone and blanc fixe
- (c) barium chemicals.

There is no manufacture of lithopone (a mixture of barium sulphate and zinc sulphide) or of blanc fixe (chemically precipitated barium sulphate) in Australia, all domestic requirements being imported.

Similarly, most barium chemicals are imported, though there is some small manufacture of certain barium compounds in the eastern states.

In Australia, barite is used almost exclusively in the ground form as a filler. Preparation of the crude ore requires only grinding to the required degree of fineness. In South Australia the ground product is also up graded by simple gravity methods to remove the lighter impurities. Though low grade barite may be bleached to improve its colour, no bleaching is practised in Australia at present.

Uses of ground barite include:-

Paint manufacture (principally in fillers and flat enamels)

Moulded rubber products

Plastics

High density bricks for X-ray rooms  
Aggregate for high density concrete in Atomic  
Energy Establishments  
In preparation of barium meals for X-ray  
screening  
Oil Well drilling muds  
Miscellaneous minor uses.

The greatest world usage of barite is in oil well drilling, and about 75% of all barytes produced in the free world is used in this industry. The purpose of the barytes as an additive to the bentonitic drilling mud is to increase its weight, and so render it more effective in controlling oil and gas pressures in the bore.

Other important overseas uses include plate glass manufacture (all Australian requirements are imported), superfine papers, ceramic glazes, and linoleum.

### Specifications

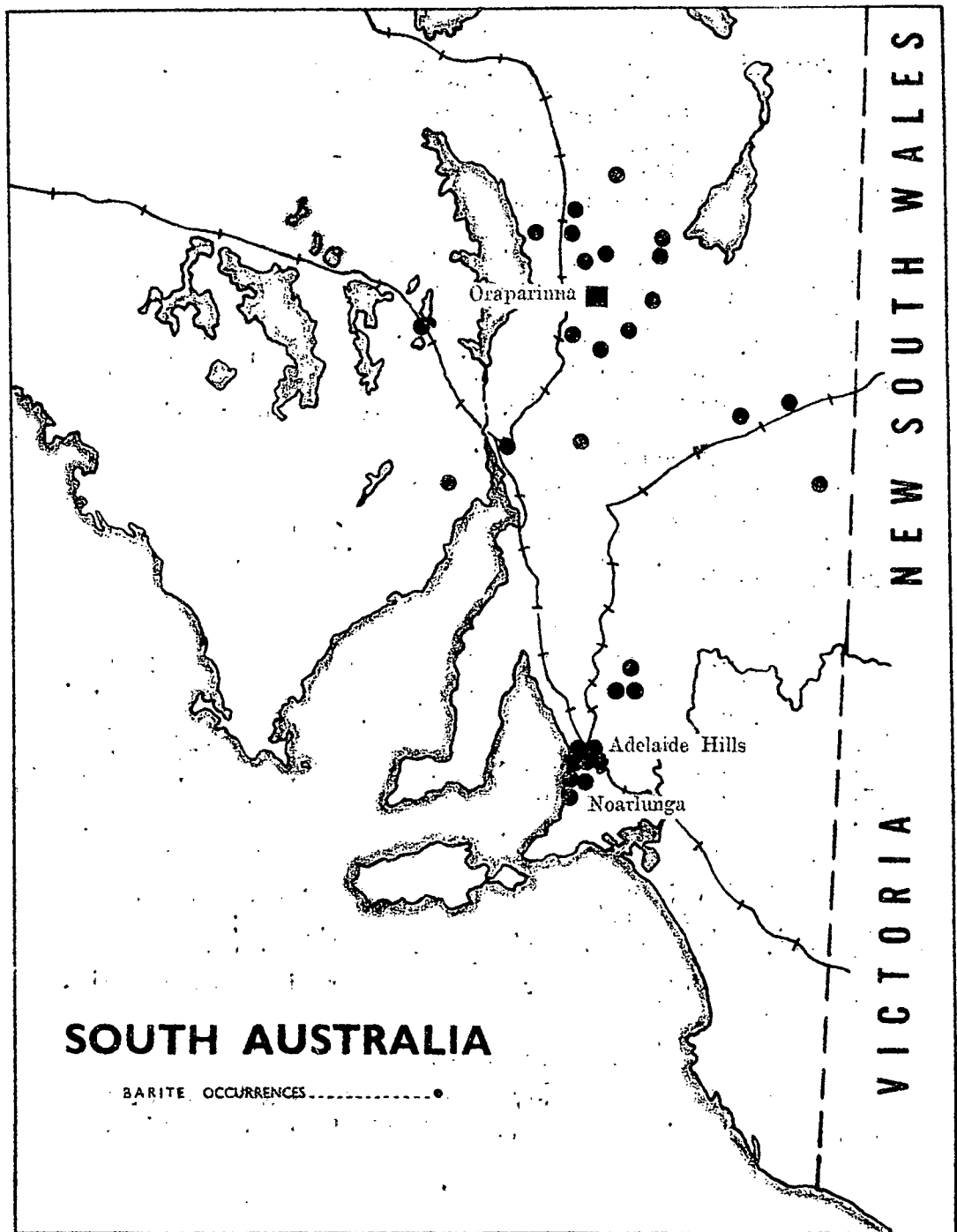
There is no generally accepted standard specification or test in use either for crude or ground barite. Commercial crude barite should contain not less than 93% barium sulphate; the better grades 95-98% barium sulphate and a minimum of 1-3% silica. Under present conditions there is a ready sale for the highest grade crude barite but there is little demand for low grade off white barite.

Ground barite is marketed in several grades, dependent on colour and fineness. Demand for off white grades for use in oil well drilling may improve in the future, depending on the results of current oil exploration in Australia.

### Buyers and Prices

The only buyer of crude barytes in South Australia at present is Minerals Ltd., 17 Currie Street, Adelaide.





# DEPARTMENT OF MINES

## BARITE

OCCURRENCE

USES

COMMONLY KNOWN AS BARYTES

BARITE OR BARIUM SULPHATE IS A HEAVY WHITE TRANSLUCENT CRYSTALLINE MATERIAL ALSO KNOWN AS BARYTES, BARYTA OR HEAVY SPAR. IT IS FOUND IN MINERAL VEINS, AS REPLACEMENTS IN BEDDED DEPOSITS AND, AS RESIDUAL

DEPOSITS. ALL SOUTH AUSTRALIAN DEPOSITS ARE OF THE VEIN TYPE. THE USES OF THIS LOW PRICED INDUSTRIAL MINERAL DEPEND MAINLY ON ITS CHEMICAL STABILITY, WHITE COLOUR AND WEIGHT.

BARITE IS USED IN THE MANUFACTURE OF GLASS, PAPER, CEMENT, AND IN THE TREATMENT OF OILS. IT IS ALSO USED IN THE MANUFACTURE OF RADIUM. IN AUSTRALIAN APPLICATIONS, BARITE IS USED IN THE MANUFACTURE OF RADIUM, AND IN THE TREATMENT OF OILS. IT IS ALSO USED IN THE MANUFACTURE OF RADIUM, AND IN THE TREATMENT OF OILS.



Prices, delivered to the Kilkenny works, are -

per ton

Top grade (snow white, 98% minimum barium sulphate)	£17. 0. 0.
Medium grade	£13. 0. 0.
Second grade	£6. 15. 0.

There is little demand for second grade material.

Ground barite is produced both by South Australian Barytes Ltd. at its Quorn mill, and by Minerals Ltd. at Kilkenny.

Prices for ground barite, as quoted by S.A. Barytes Ltd., range from £12 to £44 per ton, depending on purity and fineness of grind.

#### Production

Australian production is small compared with world standards, but a significant proportion is obtained in South Australia.

	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>
Sth. Aust.	4210	3828	4168	4040	4223	2811	6145
Australia	5667	6872	6264	6009	9778	6802	n.a.

South Australian production of barite since about 1913 totals 126,716 tons, valued at £602,513.

Estimated production of barite throughout the free world in 1957, amounted to 2,300,000 tons, of which the United States contributed over one million tons. Of this world production, about 75 per cent, or 1½ million tons, was processed as weighting material in oil well drilling.

Should oil in commercial quantities be discovered in Australia, the probability will be for a large increase in demand for ground barite for this purpose.



## Barite deposits in South Australia

Departmental records include about 50 deposits of barite in the state. Many of these deposits are small, of low grade, or with reserves exhausted.

The principal South Australian producer since 1949 has been the Oraparinna Mine of S.A. Barytes Ltd. near Blinman. Prior to the development of the Oraparinna Mine about 1945, the principal producers of barite were Noarlunga group of mines, about two miles south of the township.

The Oraparinna Barytes mine is the largest potential producer of high grade barite in Australia. It is located in County Taunton, in the northern division of the state, or about 66 miles north east of Hawker. The deposit was first worked in 1940, but little progress was made until the organisation of the present company, South Australian Barytes, in 1946. Following development of the principal lodes by means of adits, the Company with the backing of the South Australian Government, built a treatment plant at Quorn. This plant is capable of milling 10,000 tons of crude ore annually, and currently produces about 3,000 tons of high grade ground barite.

There are seven groups of lodes on the company's leases totalling 73 lodes and branches, of which 53 are considered of workable width. The present workings are confined on the No. 1 group of lodes, located on the steep southern slope of a prominent ridge known as the Bunker. The lodes occupy a complex set of fractures in a series of sandy slates and minor interbedded quartzites and are persistent over a known vertical depth of 400 feet. Steep easterly dips are dominant in the lode system, but there are reversals to a westerly dip. The vein width is very variable, being nearly 30 feet in one of the early open cuts.

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While the Craparinna Mine produces the bulk of Australian requirements of high grade barite, there are a number of smaller deposits being worked intermittently, producing small tonnages for disposal through mineral earth milling companies in Adelaide.

The locality of all known deposits of barite is shown on the enclosed plan.

(29/8/60)





SOUTH AUSTRALIAN DEPARTMENT  
OF MINES & GEOLOGICAL SURVEY.

11 DEC 1958

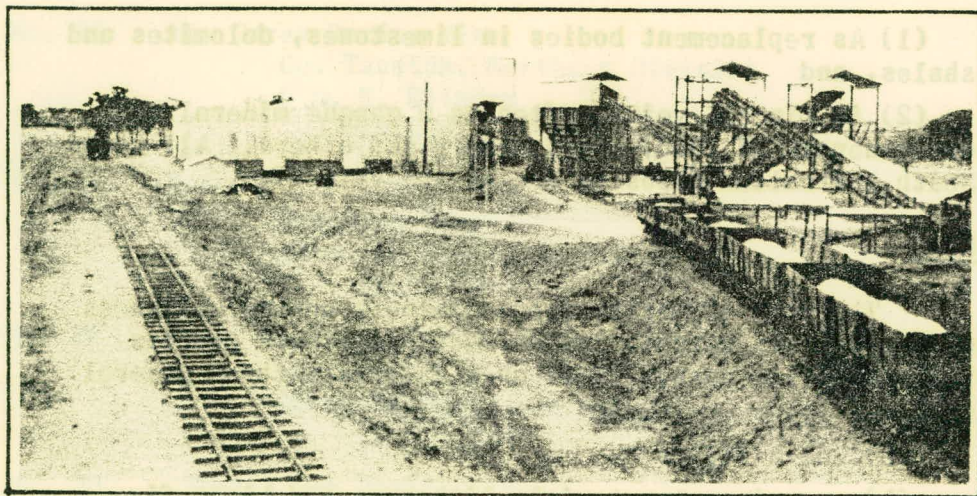
# BARITE

in

South Australia

Mineral Information Series

No. 2.



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### Barite deposits in South Australia

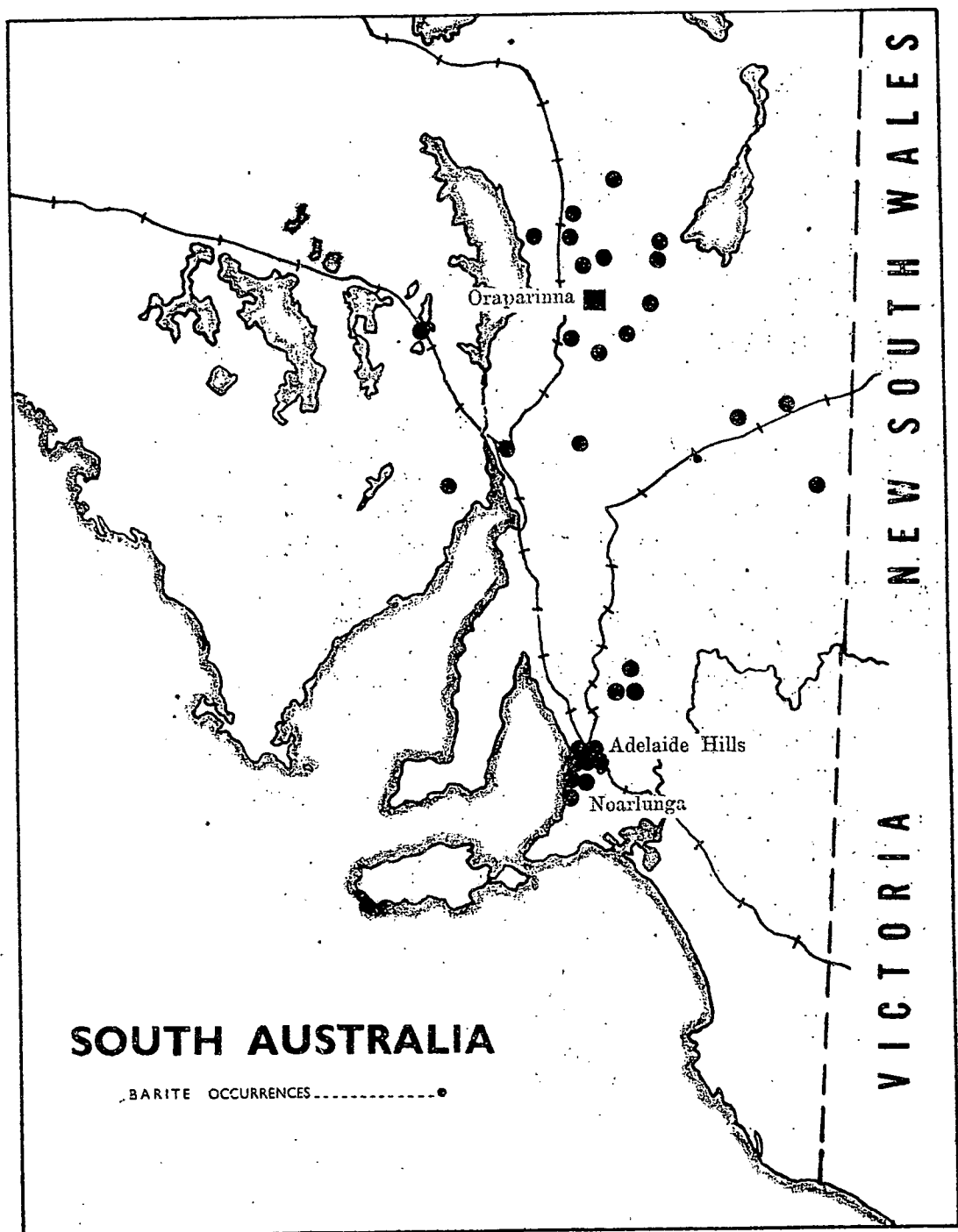
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While the Oraparinna Mine produces the bulk of Australian requirements of high grade barite, there are a number of smaller deposits being worked intermittently, producing small tonnages for disposal through mineral earth milling companies in Adelaide.

The table below shows all recorded barite deposits in South Australia, those being worked at present being noted. The locality of these deposits is shown on the enclosed plan. (5/12/58)

BARITE MINES

in South Australia

Which have been described in Mines Department reports

- No. 1      Mt. Barytes Mine  
                     Sec. 6396, Hd. Talunga  
                     2 m. North Birdwood  
                     (Minerals alienated)
- No. 2      Birdwood Barite Mine  
                     Sec. 6394, Hd. Talunga  
                     2 m. North Birdwood  
                     (Minerals alienated)
- No. 3      Prairrie Barite Mine  
                     Sec. 6088, Hd. Talunga  
                     16 m. NE Adelaide  
                     (Minerals alienated)
- No. 4      Crystal Barite Mine  
                     Sec. 379, Hd. Kuitpo  
                     4 m. West of Echunga  
                     (On Waterworks reserve)
- No. 5      Torrens Barytes Mine  
                     Sec. 5539, Block 331, Hd. Onkaparinga  
                     4 m. E. Athelstone  
                     (M.C. 2155)
- No. 6      Southern Barytes Mine  
                     Sec. 1154, Hd. Onkaparinga  
                     near Uraidla  
                     (Minerals alienated)
- No. 7      Hermitage Barite Mine  
                     Secs. 5530, 5563, Hd. Para Wirra  
                     (Minerals alienated)

- No. 8      Mount Crystal Barite Mine  
              Secs. 575, 576, 577, Hd. Para Wirra  
              ½ mile from Paracombe
- No. 9      Williamstown Barite Mine  
              Sec. 285, Hd. Para Wirra  
              3 m. SW Williamstown  
              (Forest Reserve)
- No. 10     Aldgate Barite Mine,  
              Rec. Res., Hd. Noarlunga, adjoining Sec. 92  
              1 m. SE Aldgate
- No. 11     Noarlunga Barytes Mine  
              Secs. 110, 111, 101, Hd. Willunga  
              2 m. S. Noarlunga.  
              (Minerals alienated)
- No. 12     Adelaide Barytes Synd.  
              Secs. 92, 93, Hd. Willunga  
              2 m. S. Noarlunga  
              (Minerals alienated)
- No. 13     Elliotts Barite Mine  
              Sec. 119, Hd. Willunga,  
              2 m. S. Noarlunga  
              (Minerals alienated)
- No. 14     Snowflake Barite Mine  
              Secs. 82, 102, 109, 120, Hd. Willunga  
              2 m. S. Noarlunga  
              (Minerals alienated)
- No. 15     Barite Mine  
              Secs. 89, 90, Hd. Willunga,  
              2 m. S. Noarlunga  
              (Minerals alienated)
- No. 16     Willunga Barytes Mine,  
              Sec. 122, Hd. Willunga  
              2 m. S. Noarlunga  
              (Minerals alienated)

- No. 17      Truro Barytes Mine,  
               Sec. 153, Hd. Belvidere  
               3 m. NW Truro  
               (Minerals alienated)
- No. 18      Truro Barytes Mine,  
               Sec. 142, Hd. Belvidere  
               3½ m. W. Truro  
               (Minerals alienated)
- No. 19      Julia Creek Barite Mine  
               Secs. 197 & 220, Hd. Julia Creek  
               7 m. SE Eudunda  
               (Minerals alienated)
- No. 20      Saltia Barytes Mine  
               Secs. 79, 81, 218, Hd. Woolundunga  
               12 m. NNE Port Augusta  
               (M.C. 2473)
- No. 21      Oladdie Barytes Mine  
               Secs. 80, 90, 91, Hd. Oladdie  
               ½ m. SE Oladdie  
               (M.C. 2403, 2404, 2406)
- No. 22      Moralana Barite Mine  
               Sec. 16, Hd. Moralana  
               22 m. N. Hawker  
               (M.L. 2991, 2992)
- No. 23      Mt. Whyalla Barite Mine,  
               Bl. 808, Co. Manchester  
               2 m. NNW Mt. Whyalla  
               (M.C. 2361, 2362, 2363)
- No. 24      Nilpena Barite Mine  
               Northern Division  
               5 m. NE Nilpena  
               (M.C. 758, 791)



- No. 25     Mt. Carey Barite Mine  
              Co. Taunton, Northern Division  
              6 m. E. Blinman  
              (M.C. 2287/8, 677, 708/9, 2377)
- No. 26     Mount Frome Barite Mine  
              Northern Division  
              18 m. E. Wirrealpa H.S.  
              (M.C. 770)
- No. 27     Mount Chambers Barite Mine  
              Northern Division  
              20 m. NE Wirrealpa H.S.  
              (M.C. 1807)
- No. 28     Tooths Nob Barite Mine  
              Northern Division  
              45 m. E Edeowie R.S.  
              (M.L. 2990)
- No. 29     Artipena Barytes Mine  
              Co. Hansen  
              45 m. NE Hawker  
              (M.C. 725)
- No. 30     Mt. Caernarvon  
              Co. Taunton  
              near Mt. Caernarvon  
              (M.C. 2309)
- No. 31     Appealina Barite Mine  
              Co. Taunton  
              40 m. NE Hawker
- No. 32     Oraparinna Mine  
              Co. Taunton  
              66 m. NE Hawker R.S.  
              (M.L. 2933, 2934, 2935, 2936, 2996)  
              (S.A. Barytes Ltd.)
- No. 33     Angorichina Barytes Mine  
              Sec. 4, Hd. Oratunga  
              9 m. E Farachilna

- No. 34      Constitution Hill Barite Mine  
                  Northern Division  
                  28 m. E Copley  
                  (M.C. 2429, 1656, M.L. 2932)
- No. 35      Beltana Barytes Mine  
                  Northern Division  
                  1½ m. N Beltana
- No. 36      Boolcoomatta Barytes Mine  
                  12 m. NE Olary
- No. 37      Dutton Barytes Mine  
                  Secs. 16, 17, 18, Hd. Dutton  
                  6 m. NE Truro
- No. 38      Belvidere Barite Mine  
                  Secs. 301, 302, 303, Hd. Belvidere  
                  2 m. NW Dutton  
                  (Minerals alienated)
- No. 39      Wyacca Creek Barite Mine,  
                  Sec. 27, Hd. Warcowie  
                  21 m. NE Hawker
- No. 40      Walparuta Barite Mine  
                  16 m. NNE Mannahill  
                  (M.C. 1775)
- No. 41      Campbells Bald Hill Barytes  
                  Northern Division  
                  3 m. SE Constitution Hill
- No. 42      Mt. James Barytes Mine  
                  Northern Division  
                  17 m. NW Beltana  
                  (M.C. 2285, 2294)  
                  Special Mining Lease No. 28

- No. 43      Pernatty Lagoon Barite Mine  
                  Northern Division  
                  4 m. NE Woocalla
- No. 44      Mt. Hayward Barytes Mine  
                  Co. Taunton  
                  4 m. NE Mt. Hayward
- No. 45      New Spring Barytes Mine  
                  Northern Division  
                  9 m. SE Beltana
- No. 46      Mt. Serle Barytes Mine  
                  Northern Division  
                  4 m. SE Mt. Serle H.S.
- No. 47      Puttapa Gap Barite Mine  
                  Northern Division  
                  6 m. N Beltana
- No. 48      Moolooloo Barite Mine  
                  Northern Division  
                  12 m. NE Beltana  
                  (M.C. 2375)
- No. 49      Mutooroo Barite Mine  
                  Northern Division  
                  5 m. S Mutooroo H.S.  
                  (M.C. 1871/2)
- No. 50      Mona Lena Barite Mine  
                  Northern Division  
                  Near Woocalla
- No. 51      Sec. 106, Hd. Eurelia  
                  (Minerals alienated  
                  M.C. 2297/8).