

NSW DEPT PRIMARY INDUSTRIES



AA051994

New South Wales Industrial Minerals Mine Dossier



DEPARTMENT OF MINERALS AND ENERGY
NEW SOUTH WALES

AAOS 1994

NEW SOUTH WALES INDUSTRIAL MINERALS MINE DOSSIER

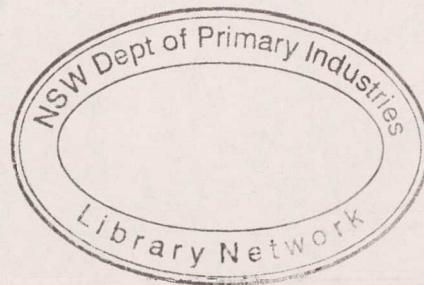
Compiled by
R. G. Hirst



Information current
at 30th April, 1988

*Shelved
NSUGS
Notes available*

Department of Minerals and Energy



A MESSAGE FROM THE MINISTER FOR MINERALS AND ENERGY

I am pleased to commend to the mining industry this first ever documentation of the industrial mineral mines of New South Wales.

The commodities covered by the term "industrial mineral" are diverse, both in their nature and their application. Although, in terms of the recognition of their importance, they have historically taken second place to the better known metallic minerals such as copper, gold, lead and zinc, industrial minerals nevertheless make a significant contribution to the State's economy. The value of annual production for the 100 mines listed in this publication, in the year ended June 1987, amounted to \$88 million.

Significant opportunities exist to explore for industrial minerals in New South Wales. There is also considerable scope for investment in development and further processing of such minerals particularly gemstones, silica, mineral sands, topaz, dimension stone, diatomite, bentonite and natural zeolites.

Some of these opportunities are unique to this State.

A handwritten signature in cursive script that reads "Neil Pickard".

The Hon Neil Pickard M P
Minister for Minerals and Energy

FOREWORD

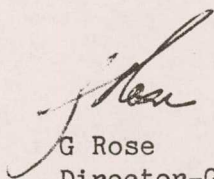
This publication provides a listing, accompanied by summary geological, mining, and marketing information, of the State's operating industrial mineral mines. Information on an imminent industrial mineral mine development (the Torrington Industrial Topaz Project) is also included.

The ore reserve/resource classification terminology used in this publication (proved/probable reserves, measured/indicated/inferred resources) complies with the code recommended by the Joint Committee of the Australasian Institute of Mining and Metallurgy (AusIMM) and the Australian Mining Industry Council (AMIC) in their June 1988 report on mineral resources and ore reserves. Tonneages, and where applicable grades/specifications, quoted in the publication have been supplied by the mine owners.

Materials used in the construction industry have not been included in this publication. Specifically, clay and silica sand mines producing construction materials (brick, pipe, and terra-cotta clays; construction sand) have not been listed. For a listing of these mines the inquirer is referred to the "List of all operating mines in New South Wales" produced by the Department's Mines Inspection Branch, and the statistical records compiled by the Statistical Section.

The information contained in the data sheets was current at 30th April, 1988. Any further questions regarding the mining operations can be directed to the Mineral Economics and Marketing Section of the Department of Minerals and Energy, 8-18 Bent Street, Sydney, phone (02) 231 0922.

This publication serves as a companion volume to the earlier published "New South Wales Metallic Minerals Mine Dossier". It is hoped that the information presented in these two publications will assist the further development and utilization of the State's mineral resources. Periodic updates of both Dossiers are planned.



G Rose
Director-General
Department of Minerals and Energy

INDUSTRIAL MINERAL MINES OF NEW SOUTH WALES

Operating mines, mines in abeyance, and significant mine developments.

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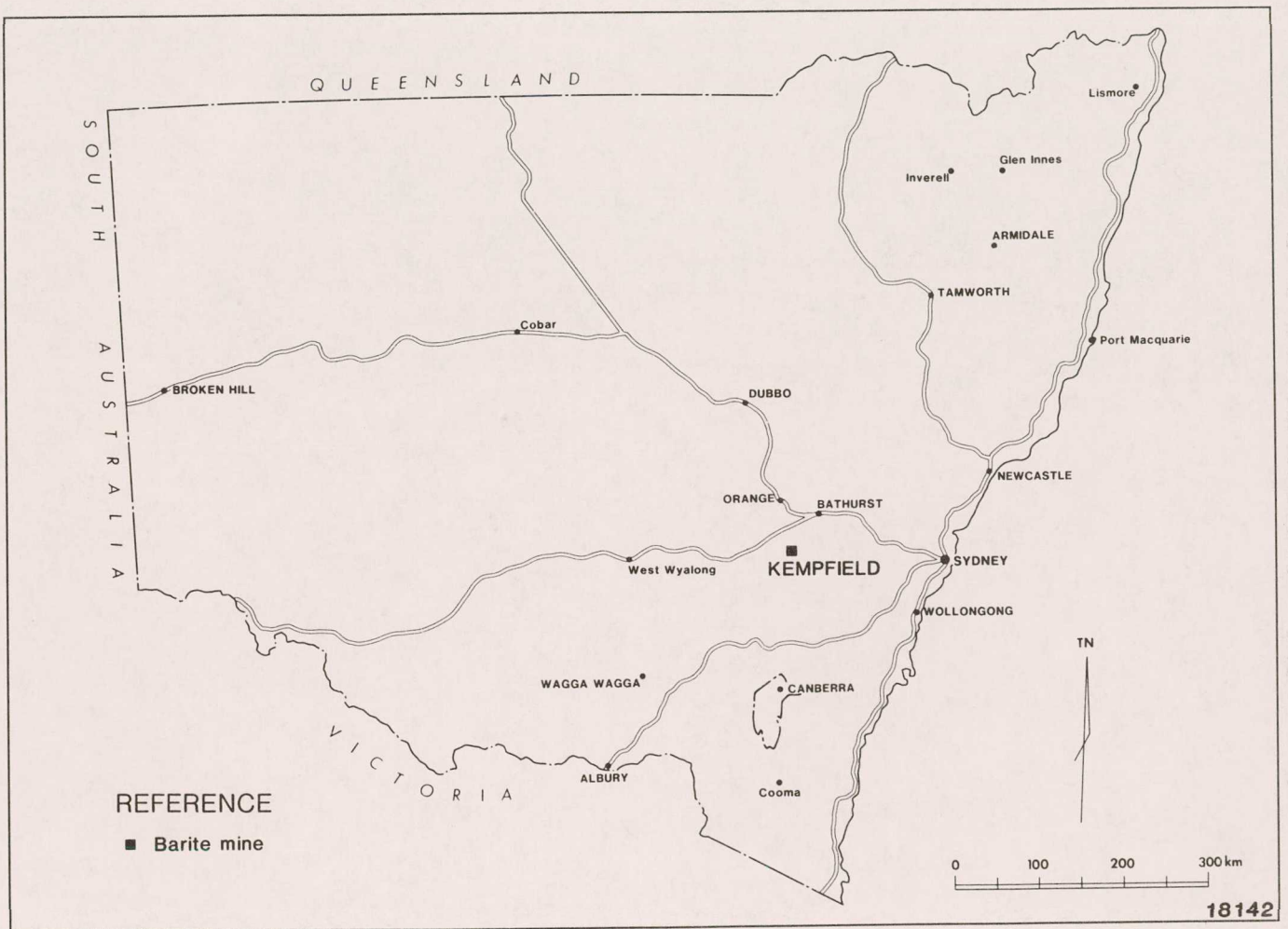
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BARITE MINES



KEMPFIELD MINE

Commodity: Barite.

Location: Trunkey Creek, 28 km south of Blayney.

Owner/Operator: C Henry, Trunkey Creek, NSW 2795. Ph (063) 68 8788.

Geology: Barite occurs as lenticular, bedded units consisting of fine-grained barite with minor sulphides and lenses of chert. Host rocks are altered Silurian sediments and acid volcanics.

Mineralization: Greyish barite with minor amounts of galena, sphalerite, pyrite, tetrahedrite and chalcopyrite.

Reserves: April 1988 Proved - 50 000 t.

Mining Method: Open cut.

Treatment: No on-site treatment.

Production Capacity: 1 200 tpa.

Commencement: Mine first worked in 1918. Current operations - 1939.

Production: 1986/87 Crude barite mined and despatched for treatment - 984 t.

Product Specification: Not available.

Market: 1986/87 Commercial Minerals Ltd, Sydney.

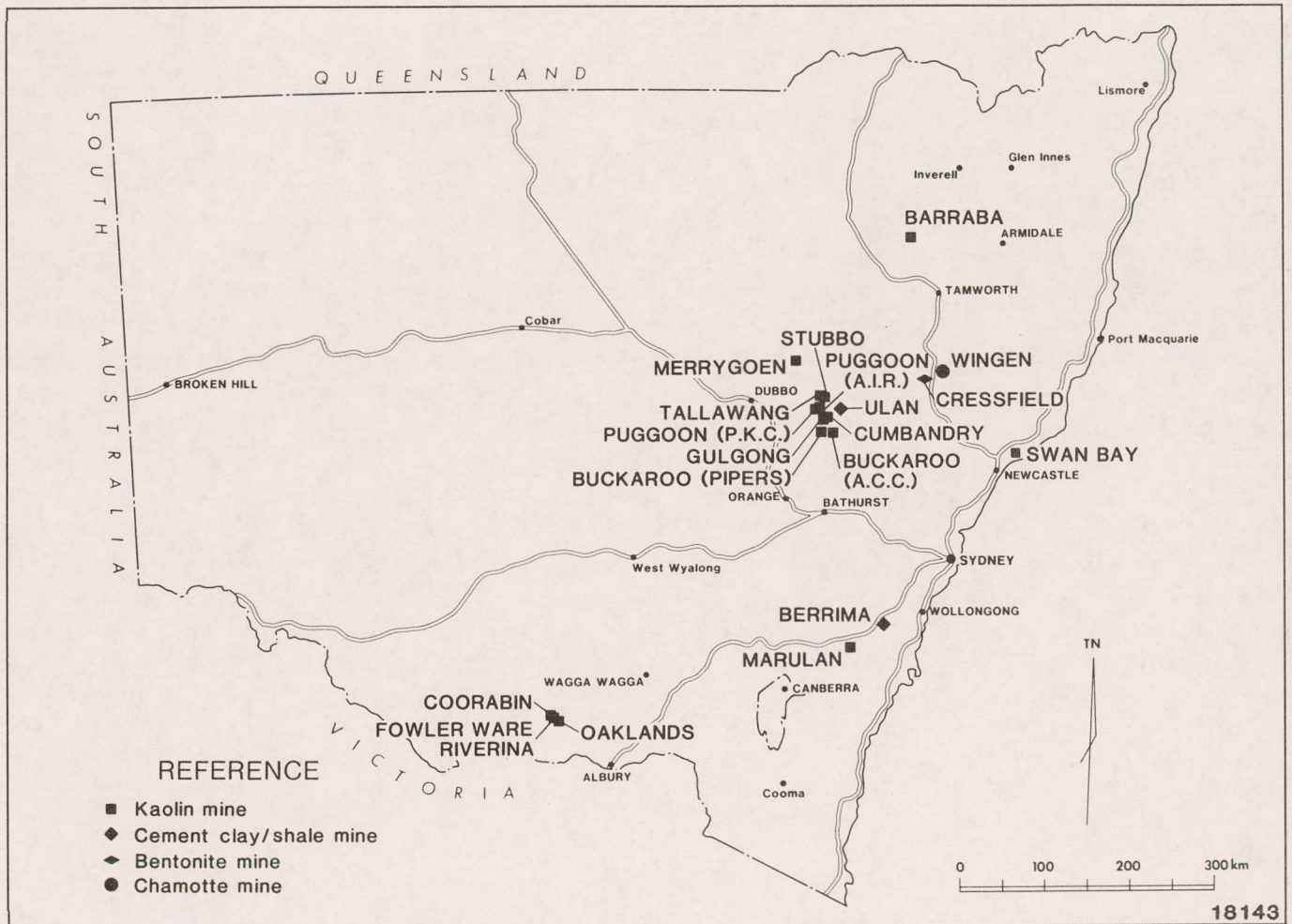
Transport: Road to Sydney.

Employees: June 1987 - 3 (intermittent working).

Historic Production: Total recorded production from Kempfield barite deposits from 1918 to June 1987 - 51 700 t.

Comments: Ownership of mine transferred to owner's sons, T, H & G Henry in January 1988.

CLAY MINES



BARRABA PIT

Commodity: Kaolin.

Location: Black Springs Rail Siding, 10 km south of Barraba.

Owner: The Broken Hill Proprietary Co Ltd, GPO Box 86A, Melbourne, VIC 3001. Ph (03) 609 3333. Telex AA30408. Fax (03) 609 3015.

Operator: Australian Industrial Refractories Ltd, PO Box 154, Mayfield, NSW 2304. Phone (049) 68 0477. Telex AA28111. Fax (049) 67 2287.

Geology: Elijah Hill (Mount Elijah) clay deposit which consists of transported kaolin of Tertiary age, derived mainly from altered trachytic tuffs.

Mineralization: Approximate theoretical - Kaolinite 75%, illite 9%, montmorillonite 9%, quartz 4%.

Reserves: May 1987 Proved - 64 000 t.

Mining Method: Open cut.

Treatment: No on-site processing.

Production Capacity: -

Commencement: 1960.

Production: 1986/87 Refractory clay - 5 266 t. Brick clay - 4 005 t.

Product Specification: Al₂O₃ - average 26%, minimum 24%.

Market: 1986/87 Refractory clay - forwarded to Company's plants at Thirroul (Wollongong) (52%) and Mayfield (Newcastle) (20%), and to Commercial Minerals Ltd plant at Gulgong for milling for A.I.R. (27%).
Brick Clay - Rogers Brickworks, Tamworth.

Transport: Road to Newcastle, Wollongong, Gulgong, and Tamworth.

Employees: June 87 - 1 (Contractor).

Historic Production: From 1960 to June 1987 - Refractory clay 169 756 t, brick clay 8 961 t.

Comments:

Commodity: Clay and shale.

Location: New Berrima, 6 km southeast of Moss Vale.

Owner/Operator: Blue Circle Southern Cement Ltd, GPO Box 1571, Sydney, NSW 2001. Ph (02) 929 0200. Telex AA22466. Fax (02) 929 4520. Mine - PBS No 4, Moss Vale, NSW 2577. Phone (048) 77 1305. Telex AA20887. Fax (048) 77 1231.

Geology: Grey to black shale of the Ashfield Shale, the basal formation of the Triassic Wianamatta Group.

Reserves: Not determined.

Mining Method: Open cut.

Treatment: No on-site treatment.

Production Capacity: 250 000 tpa.

Commencement: 1978.

Production: 1986/87 Cement clay and shale - 125 238 t.

Market: 1986/87 Berrima Cement Works, New Berrima, adjacent to pit.

Employees: June 1987 - 4.

Historic Production: From 1978 to June 1987 - not available.

Comments: Production is used entirely for cement manufacture at the Company's Berrima Works.

BUCKAROO (A C C) PIT**Commodity:** Kaolin.**Location:** Mt Buckaroo, 8 km northeast of Mudgee.**Owner/Operator:** Australian China Clays Ltd, Barneys Reef Road, Gulgong, NSW 2852. Ph (063) 75 9241. Fax (063) 75 9244.**Geology:** Residual kaolin deposit derived from highly weathered slates, of the Devonian Boogledie Formation.**Mineralization:** White micaceous kaolin with 20%-30% coarse, clean white quartz.**Reserves:** June 1985 Proved - 40 000 t Probable - 60 000 t.**Mining Method:** Open cut.**Treatment:** Wet processing plant at Company's Tallawang lease, 40 km to the north.**Commencement:** Underground mining began in 1930's. Open cut mining began in 1973.**Production:** No production since 1983.**Product Specification:**)**Market:**) See Tallawang Pit data sheet**Transport:**)**Employees:** 3 when operating.**Historic Production:** From 1973 to 1983 - 30 000 t.**Comments:**

BUCKAROO (PIPERS) PIT

Commodity: Kaolin.

Location: Buckaroo, 5 km northeast of Mudgee.

Owners/Operators: W M and A M H Piper, "Woodlands" PO Box 113, Mudgee, NSW 2850. Ph (063) 73 3820.

Geology: Weathered shale of Devonian Boogledie Formation.

Mineralization: Potash mica 72%, kaolinite 17%, quartz 7%, feldspar <5%.

Reserves: Not known.

Mining Method: Open cut.

Treatment: No on-site treatment.

Production Capacity: Not determined.

Commencement: 1984.

Production: 1985/86 Refractory clay - 500 t.

Product Specification: Not available.

Market: 1986/87 Milling of clay at Gulgong (69%) and Mudgee (31%).

Transport: Road to points of further treatment.

Employees: June 1987 - 2 (Contractors).

Historic Production: From 1984 to June 1987 - 640 t.

Comments:

COORABIN PIT**Commodity:** Kaolin.**Location:** Coorabin near Oaklands, 47 km east of Jerilderie.**Owner/Operator:** Coorabin Clay Mines Pty Ltd, c/- Price Waterhouse, PO Box 675J, Newcastle, NSW 2300. Ph (049) 26 1655. Telex AA28457. Fax (049) 26 4372.**Geology:** Transported kaolin of Tertiary age. Two lenses of clay occur at depths of about 10 m and 20 m.**Mineralization:** Mainly kaolinite with quartz and mica.**Reserves:** April 1988 Proved - 1 mt.**Mining Method:** Open cut from 1979. Previously underground 1954 to 1980.**Treatment:** No on-site treatment.**Production Capacity:** 20 000 tpa.**Commencement:** Current operations - 1954.**Production:** 1986/87 Ceramicware clay - 6 000 t.**Product Specification:**

	<u>Chemical analysis (%)</u>
SiO ₂	56.1
TiO ₂	1.35
Al ₂ O ₃	30.1
Fe ₂ O ₃	0.72
CaO	0.09
MgO	0.44
K ₂ O	2.23
Na ₂ O	0.16
LOI	8.83

Market: 1986/87 Ceramicware manufacturers in Sydney and Melbourne.**Transport:** Road to Sydney and Melbourne.**Employees:** June 1987 - 2.**Historic Production:** From July 1979 to June 1987 - 42 859 t.**Comments:**

CRESSFIELD MINE**Commodity:** Bentonite.**Location:** "Cressfield" near Parkville, 12 km north of Scone.**Owner/Operator:** Commercial Minerals Ltd, Old Maitland Road, Sandgate, NSW 2304. Ph (049) 67 1222. Telex AA28201. Fax (049) 60 1105.**Geology/Mineralization:** The Cressfield deposit occurs as a sequence of calcium montmorillonite seams intercalated with carbonaceous shales and clay shales. Eight principal seams comprise the deposit, giving a total thickness of up to 11 metres of bentonite. Accessory minerals include quartz, mica and magnesite.**Reserves:** October 1985 Detailed core drilling delineated (proved and probable) 250 000 tonnes of bentonite in an area of only 120 m x 120 m adjacent to the present pit. Total bentonite reserves under lease are unestimated but are substantial.**Mining Method:** Open cut. Overburden is removed by bulldozer and scraper until the topmost seam is exposed. The seam is extracted by hydraulic excavator and a bench established. Interseam sediments are then removed and a bench established within the next seam.**Treatment:** Raw bentonite is transferred from stockpiles to drying strips for activation or upgrading by soda ash additions as necessary for some foundry and civil engineering grades. This is followed by rotary kiln drying. Dried material is housed under cover prior to despatch to the Company's Sandgate and Granville plants for milling and packaging.**Production Capacity:** 20 000 tpa.**Commencement:** 1974.**Production:** 1986/87 - 2 190 t.**Product Specification:** The major use for Cressfield bentonite is in the foundry industry. It is supplied either in a pure form (after soda ash treatment) or blended with high quality Hunter Valley coal dust. Typical chemical and physical properties of standard grades of foundry bentonite are:Chemical Analyses (%)

	<u>P1</u>	<u>SM23</u>
SiO ₂	61.0	64.0
Al ₂ O ₃	18.0	17.0
Fe ₂ O ₃	5.5	4.0
CaO	1.7	0.6
MgO	1.6	2.1
Na ₂ O	3.0	2.8
LOI	7.0	7.7
H ₂ O (110°C)	10.0	10.0

Physical Properties

	<u>P1</u>	<u>SM23</u>
Cation exchange capacity	75	75 meq/100 g
Swelling volume	33	30 ml/2g
pH	10	10
Bulk density		
- loose	600	600 kg/m ³
- compacted	1 200	1 200 kg/m ³

Specialized grades of bentonite are also produced for a wide range of industrial applications including use as an aid to pelletising stock feed, engineering, oil drilling, and dam sealing applications.

Typical chemical and physical properties of CE grade bentonite used for civil engineering applications and drilling muds are:

Chemical Analysis (%)

SiO ₂	58.0
Al ₂ O ₃	19.0
Fe ₂ O ₃	5.9
CaO	0.9
MgO	2.8
Na ₂ O	2.6
K ₂ O	0.1
LOI	7.5
H ₂ O (110°C)	10-15

Physical Properties

Cation exchange capacity	75 meq/100 g
Swelling volume	35 ml/2g
Gel strength	
- 10 sec	1 710 g/m ²
- 10 min	1 910 g/m ²
Barrell yield	16 m ³ /1 000 kg
pH	10
Bulk density - loose	600 kg/m ³

Market: 1986/87 Mainly local with small overseas market serviced from the Company's Sandgate and Granville operations.

Transport: Road to Newcastle (150 km).

Employees: June 1987 - 3.

Historic Production: 1974 to July 1987 - 75 706 t.

Comments:

CUMBANDRY PIT**Commodity:** Kaolin.**Location:** Home Rule, 8 km south of Gulgong.**Owner/Operator:** Australian China Clays Ltd, Barneys Reef Road, Gulgong, NSW 2852. Ph (063) 75 9241. Fax (063) 75 9244.**Geology:** Home Rule kaolin deposit, consisting of transported kaolin of Tertiary age derived from the Carboniferous Gulgong Granite.**Mineralization:** White to grey-white kaolin (plastic ball clay) intercalated with, and underlain by a kaolin with a high grit content (marketed as a brick clay).**Reserves:** June 1985 Proved - 10 100 t. Probable - 13 600 t.**Mining Method:** Open cut.**Treatment:** Wet processing plant at company's Tallawang lease, 21 km to the north.**Commencement:** Current operations - 1982.**Production:** 1986/87 - No production.**Product Specification:**)**Market:**) See Tallawang Pit data sheet.**Transport:**)**Employees:** 3 when operating.**Historic Production:** 5 000 t.**Comments:** Periodically worked as market demands.

FOWLER WARE RIVERINA MINE

Commodity: Kaolin.

Location: Coorabin near Oaklands, 47 km east of Jerilderie.

Owner: James Hardie Industries Ltd, GPO Box 3935, Sydney, NSW 2001.
Ph (02) 290 5333. Telex AA22467. Fax (02) 290 2215.

Operator: Fowler Ware - A unit of James Hardie Bathroom Products Pty Ltd, PO Box 218, Smithfield, NSW 2164. Ph (02) 604 7666.
Telex AA74601. Fax (02) 604 9447.

Geology/Mineralization: Transported clay deposit of Tertiary age consisting of kaolin with sandy loam and sandy clay.

Reserves: April 1988 Not known. (Drilling programme in progress.)

Mining Method: Underground room and pillar to 1985. Open cut when mine re-opens.

Treatment: No on-site treatment.

Production Capacity: -

Commencement: First workings - c1958 to 1973. Current operations - 1977.

Production: 1984/85 Pottery clay - 207 t. 1985/86 and 1986/87 - No production.

Product Specification: Kaolin is used in the manufacture of sanitary ware.

Market: 1986/87 Used by Company at Sydney and Melbourne plants.

Transport: Road to Sydney and Melbourne.

Employees: June 1987 - 1.

Historic Production: 1977 to June 1987 - 9 293 t.

Comments: Company has been awaiting granting of a new mining lease before carrying out further mining. This lease was granted at the end of January 1988. Mine was formerly known as McDonalds Mine.

Commodity: Kaolin.

Location: One pit at Home Rule 10 km southeast of Gulgong. Three pits at Stubbo 7 km north of Gulgong.

Owner/Operator: Commercial Minerals Ltd, Old Maitland Road, Sandgate, NSW 2304. Ph (049) 67 1222. Telex AA28201. Fax (049) 60 1105.

Geology: All of the quarries extract transported kaolin which occurs as discontinuous lens-shaped bodies within poorly consolidated sandstone. Tertiary basalts underlie the clay-bearing sequence in the Stubbo locality, while at Home Rule the clay sequence is much thicker and directly overlies the Carboniferous Gulgong Granite. The kaolin is believed to be derived primarily from decomposition of the granite.

Mineralization: The clays are essentially pure kaolinite with minor quartz and mica. Carbonaceous plant material may be present in some horizons while ironstaining may be seen as patches or mottles.

Reserves: April 1988 Home Rule Pit reserves are almost exhausted. Stubbo locality has 3 producing pits containing a probable total of approx 30 000 t. Reserves of deposits delineated by recent drilling yet to be assessed.

Mining Method: Open cut. Clay is selectively mined by front-end loader and stockpiled on site.

Treatment: Clay from various pits is taken to the Gulgong plant for blending and dry processing (milling) or wet processing (slurry production).

Production Capacity: 200 t per day.

Commencement: Underground - 1927. Open cut - 1943.

Production: 1986/87 Refractory clay - 2 181 t. Clay for fillers - 3 074 t. Cement clay - 1 837 t.

Product Specification: Typical specification for BBR (ceramic grade) and HRI (filler grade) kaolin as follows:

	<u>Chemical Analysis (%)</u>		<u>Physical Properties</u>	
	HRI	BBR		
SiO ₂	49.6	55.1	pH	8.2
Al ₂ O ₃	34.3	30.0	Refractive Index	1.56
Fe ₂ O ₃	1.11	0.53	Specific Gravity	2.67
TiO ₂	1.12	0.92	Oil Absorption	45
MgO	0.40	0.50	(mls/100 g)	
K ₂ O	0.11	0.48	Bulk density	0.77
Na ₂ O	0.18	0.32	(compacted) gm/cc	
CaO	0.40	0.07	Reflectance (457 mu)	73
LOI	12.8	11.50		

Market: 1986/87 Local 90% Export 10%.

Transport: Road distribution.

Employees: June 1987 - 3.

Historic Production: Not available.

Comments:

MARULAN PIT

Commodity: Kaolin.

Location: Marulan, 25 km east of Goulburn.

Owner: The Broken Hill Proprietary Co Ltd, GPO Box 86A, Melbourne, VIC 3001. Ph (03) 609 3333. Telex AA30408. Fax (03) 609 3015.

Operator: Australian Industrial Refractories Ltd, PO Box 154, Mayfield, NSW 2304. Ph (049) 68 0477. Telex AA28111. Fax (049) 67 2287.

Geology: Deposit of transported sandy kaolin of Tertiary age, at least 10 m thick.

Mineralization: Details not available.

Reserves: May 1987 Proved - 15 100 t. Inferred resource - 250 000 t.

Mining Method: Open cut.

Treatment: No on-site processing. Clay transported to refractory plants at Mayfield (Newcastle) and Thirroul (Wollongong).

Production Capacity: -

Commencement: 1960.

Production: 1986/87 Refractory clay - 2 650 t.

Product Specification: Al₂O₃ - average 26%, minimum 24%.

Market: 1986/87 Refractory clay distributed to Mayfield (Newcastle) (44%) and Thirroul (Wollongong) (56%).

Transport: Road to Newcastle and Wollongong.

Employees: June 1987 - 1 (Contractor only - intermittent working).

Historic Production: From 1960 to June 1987 - 30 757 t.

Comments:

MERRYGOEN PIT

Commodity: Kaolin.

Location: Merrygoen, 55 km east of Gilgandra.

Owner: The Broken Hill Proprietary Co Ltd, GPO Box 86A, Melbourne, VIC 3001. Ph (03) 609 3333. Telex AA30408. Fax (03) 609 3015.

Operator: Australian Industrial Refractories Ltd, PO Box 154, Mayfield, NSW 2304. Ph (049) 68 0477. Telex AA28111. Fax (049) 67 2287.

Geology: Merrygoen clay deposit - a transported clay deposit consisting of beds of flint clay (dense kaolinitic clay) within the Jurassic Ukebung Formation which extend over a large area. Lower quality beds have considerable carbonaceous content, necessitating selective extraction.

Mineralization: Kaolinite 95%, quartz 5%.

Reserves: May 1987 Proved - 18 400 t Probable - 1 300 000 t. Inferred resource - 160 000 t.

Mining Method: Open cut.

Treatment: Clay transported to refractory plant at Thirroul (Wollongong).

Production Capacity: -

Commencement: Early 1950's.

Production: 1986/87 Refractory clay - 3 725 t.

Product Specification: Al₂O₃ - average 35%, minimum 33%.

Market: 1986/87 Refractory products distributed from Thirroul.

Transport: Road to Thirroul.

Employees: June 1987 - 2 (Contractors only - intermittent working).

Historic Production: From 1955 to June 1987 - 257 150 t.

Comments:

OAKLANDS PIT

Commodity: Kaolin.

Location: Coorabin near Oaklands, 47 km east of Jerilderie.

Owner: The Broken Hill Proprietary Co Ltd, GPO Box 86A, Melbourne, VIC 3001. Ph (03) 609 3333. Telex AA30408. Fax (03) 609 3015.

Operator: Australian Industrial Refractories Ltd, PO Box 154, Mayfield, NSW 2304. Ph (049) 68 0477. Telex AA28111. Fax (049) 67 2287.

Geology: Deposit consists of two lenses of transported kaolin of Tertiary age, 8 m and 15 m below the surface.

Mineralization: Upper lens contains in parts up to 90% kaolin (40% Al_2O_3). Lower lens contains a lower grade clay (grey shale) with 32% to 38% Al_2O_3 .

Reserves: May 1987 Proved - 15 000 t. Probable - 480 000 t. Inferred resource - 160 000 t.

Mining Method: Underground to 1973. Open cut since 1973.

Treatment: Bulk of clay is transported to Company's refractory plant at Thirroul (Wollongong).

Production Capacity: -

Commencement: 1947.

Production: 1986/87 Refractory clay - 4 224 t.

Product Specification: Al_2O_3 - average 35%, minimum 32%.

Market: 1986/87 Company's refractory plant, Thirroul (89%). Refractory plants in Melbourne (6%), Granville (Sydney) (2.5%) and Beverley, SA (2%).

Transport: Road to Thirroul.

Employees: June 1987 - 3 (Contractor only - intermittent working).

Historic Production: Refractory clay produced between 1947 and June 1987 - 176 287 t.

Comments:

PUGGOON (A I R) PIT**Commodity:** Kaolin.**Location:** Puggoon Rail Siding, 11 km northwest of Gulgong.**Owner:** The Broken Hill Proprietary Co Ltd, GPO Box 86A, Melbourne, VIC 3001. Ph (03) 609 3333. Telex AA30408. Fax (03) 609 3015.**Operator:** Australian Industrial Refractories Ltd, PO Box 154, Mayfield, NSW 2304. Ph (049) 68 0477. Telex AA28111. Fax (049) 67 2287.**Geology:** Deposit is one of Puggoon kaolin deposits consisting of transported kaolin of Tertiary age, derived from the Carboniferous Gulgong Granite.**Mineralization:** Details not available.**Reserves:** May 1987 Proved - 65 000 t. Probable 189 000.**Mining Method:** Open cut.**Treatment:** Clay is transported to Company's refractory plant at Mayfield (Newcastle).**Production Capacity:** -**Commencement:** c1931.**Production:** 1986/87 Refractory clay - High grade 406 t, Low grade 260 t.**Product Specification:** Al_2O_3 - average 31%, minimum 26%.**Market:** 1986/87 Company's refractory plant, Mayfield (Newcastle).**Transport:** Road to Newcastle.**Employees:** June 1987 - 1 (Contractor - intermittent working).**Historic Production:** High grade kaolin produced between 1957 and June 1988 - 14 716 t. Grey shale - 75 622 t.**Comments:**

PUGGOON (P K C) PIT**Commodity:** Kaolin.**Location:** Puggoon Rail Siding, 10 km north of Gulgong.**Owner/Operator:** Puggoon Kaolin Co, PO Box 89, Gulgong, NSW 2852.
Ph (063) 75 9611.**Geology:** Deposit is one of Puggoon kaolin deposits consisting of transported kaolin of Tertiary age derived from the Carboniferous Gulgong Granite.**Mineralization:** Details not available.**Reserves:** April 1988 Proved - 100 000 t.**Mining Method:** Open cut.**Treatment:** Clay transported to manufacturing plants in Gulgong, Sydney, and Unanderra.**Production Capacity:** 7 000 tpa.**Commencement:** Original workings - 1944. Current operations 1969.**Production:** 1986/87 Ceramicware clay - 4 500 t.**Product Specification:** Not available.**Market:** 1986/87 Ceramicware plants in Gulgong (Commercial Minerals Ltd) - 60%, Sydney (Caroma Industries Ltd) - 20%, and Unanderra (Heat Containment Industries Ltd) - 25%.**Transport:** Road to Gulgong and Sydney.**Employees:** June 1987 - 1.**Historic Production:** From 1969 to June 1987 - Approximately 70 000 t.**Comments:**

STUBBO PIT**Commodity:** Kaolin.**Location:** 15 km north of Gulgong.**Owner/Operator:** Australian China Clays Ltd, Barneys Reef Road, Gulgong, NSW 2852. Ph (063) 75 9241. Fax (063) 75 9244.**Geology:** Stubbo kaolin deposit, consisting of transported kaolin of Tertiary age, derived from the Gulgong Granite.**Mineralization:** Smooth, white to grey hard china clay containing in parts, a proportion of carbonaceous material, and in other parts, both carbonaceous material and ironstaining. A white, hard siliceous kaolin also occurs, as well as small pockets of a smooth plastic ball clay.**Reserves:** June 1985 - Proved - 55 700 t. Probable - 35 500 t.**Mining Method:** Open cut.**Treatment:** Wet processing plant at company's Tallawang lease, 1 km northwest of the pit.**Commencement:** Original underground workings - 1930's. Current operations - mid 1970's.**Production:**)

)

Product Specification:)

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Market:) See Tallawang Pit data sheet

)

Transport:)

)

Employees:)

)

Historic Production: To June 1987 - 50 000 t.**Comments:**

SWAN BAY PIT**Commodity:** Kaolin.**Location:** Swan Bay off Port Stephens, 20 km northeast of Raymond Terrace.**Owner/Operator:** Commercial Minerals Ltd, Old Maitland Road, Sandgate, NSW 2304. Ph (049) 67 1222. Telex AA28201. Fax (049) 60 1105.**Geology/Mineralization:** Deposit is part of Port Stephens (Swan Bay) kaolin deposit which consists of transported kaolin of possible Tertiary age and probably derived from Carboniferous volcanics. The clay deposits are lenticular within sedimentary units characterised by sands and gravels. At Swan Bay soft white kaolin with minor ironstained patches and mottle grades laterally into grey sands and pebble conglomerates.**Reserves:** November 1985 Proved - 340 000 t.**Mining Method:** Open cut. Selective mining by front-end loader onto dump truck for haulage to drying strips.**Treatment:** On-site air drying of clay. Clay is then transported to the Company's Sandgate plant for milling and packaging.**Production Capacity:** Not applicable - weather dependent.**Commencement:** 1959. Pit has been owned by Commercial Minerals Ltd since 1978.**Production:** 1986/87 Refractory clay - 3 402 t.**Product Specification:** Kaolin clay with high plasticity, dry strength and refractory properties.Chemical Analysis (%)

SiO ₂	75.0	
Al ₂ O ₃	15.0	
TiO ₂	0.7	Dry shrinkage
Fe ₂ O ₃	2.0	(from 35% H ₂ O) 3%
CaO	0.01	Refractoriness 1 580°C
MgO	0.10	
Na ₂ O	0.05	Residue on 150 µm 2%
K ₂ O	0.15	
LOI	7.5	
H ₂ O (110°C)	3.0	

Market: Refractory/mortar clay 100% local.**Transport:** Road to Newcastle.**Employees:** June 1987 - 1 (Contractor).**Historic Production:** From June 1975 to June 1987 - 62 624 t.**Comments:**

TALLAWANG PIT**Commodity:** Kaolin.**Location:** 16 km north of Gulgong.**Owner/Operator:** Australian China Clays Ltd, Barneys Reef Road, Gulgong, NSW 2852. Ph (063) 75 9241. Fax (063) 75 9244.**Geology:** Slapdash Creek kaolin deposit, consisting of transported kaolin of Tertiary age, derived from the Carboniferous Gulgong Granite.**Mineralization:** A dark grey plastic ball clay occurring with or without grit, and in part, ironstained.**Reserves:** June 1985 Proved - 38 000 t. Probable - 327 000 t.**Mining Method:** Open cut.**Treatment:** On-site wet processing plant producing four types of refined clay. Material is also supplied from the Company's Stubbo, Cumbandry and Buckaroo Pits in the Gulgong - Mudgee area.**Production Capacity:** 3 000 to 5 000 tpa. Capacity can be phased up to 25 000 tpa as markets develop.**Commencement:** Original workings - post war. Current operations - 1987.**Production:** 1986/87 Ceramicware clay - 24 364 t (including Stubbo Pit).**Product Specifications:** Four clay products are produced for the ceramic industry:**CRESTAVIT:** A mid particle size non-plastic clay containing 60% kaolinite, 30% mica and 10% fine silica.**CRESTAPLAS:** A plastic ball clay containing 92% kaolinite, 5% quartz and 3% mica.**CRESTACAST:** A medium particle size moderately plastic clay containing 94% kaolinite/halloysite, 3% mica and 3% quartz.**CRESTA ULTRAFINE:** A fine particle size plastic clay containing 98% kaolinite/halloysite and only 1% of mica and quartz.**Market:** 1986/87 Local and overseas ceramic industry markets.**Transport:** Road.**Employees:** June 1987 Tallawang Pit - 3.**Historic Production:** From commencement of operations to June 1987 - >100 000 t.**Comments:**

ULAN CLAY/SHALE PITS

Commodity: Clay and shale.

Location: Ulan, 25 km and 26 km northeast of Gulgong (two pits, 3 km apart).

Owner/Operator: Blue Circle Southern Cement Ltd, Box 1571 GPO, Sydney, NSW 2001. Ph (02) 929 0200. Telex AA22466. Fax (02) 929 4520.
Mine - PO Box 57, Portland, NSW 2847. Ph (063) 55 5000. Telex AA22728. Fax (063) 55 5796.

Geology/Mineralization: Weathered kaolinitic shale within Permian Illawarra Coal Measures underlying Triassic sandstone.

Reserves: April 1988 Proved - 210 000 t (Two locations - 30 000 t and 180 000 t).

Mining Method: Open cut.

Treatment: No on-site treatment.

Production Capacity: 8 000 tpa.

Commencement: Current operations - 1979.

Production: 1986/87 Cement clay and shale - 8 714 t.

Product Specification: < 1% Fe₂O₃.

Market: Portland Cement Works.

Transport: Road to Portland.

Employees: June 1986/87 - 1 (Contractor - intermittent working).

Historic Production: From 1979 to June 1987 - not available.

Comments:

WINGEN MINE

Commodity: Chamotte (Calcined flint clay).

Location: Near Burning Mountain near Wingen, 14 km southeast of Murrurundi.

Owner/Operator: Commercial Minerals Ltd, Old Maitland Road, Sandgate, NSW 2304. Ph (049) 67 1222. Telex AA28201. Fax (049) 60 1105.

Geology/Mineralization: Kaolinite clayrocks (flintclays) of the Permian Koogah Formation have been calcined to form a natural chamotte by heat from the subsurface combustion of a coal seam. Mullite, cristobalite and tridymite are the major minerals of the calcined rock.

Reserves: 1987 - Proved 101 000 t.

Mining Method: Open cut. Both overburden and ore removal conducted by hydraulic excavator and two off-road dump trucks.

Treatment: Chamotte is hauled from quarries to on-site treatment plant for screening, hand sorting and crushing to -50 mm. Crushed product is transported to the Company's Sandgate plant for further crushing to numerous sizings. Specialized sizings also available.

Production Capacity: Not available.

Commencement: 1967.

Production: 1986/87 Refractory clay - 9 240 t.

Product Specification:

		<u>Typical Chemical Analysis (%)</u>			
SiO ₂		50 - 52			
Al ₂ O ₃		41 - 43			
Fe ₂ O ₃		2 - 3		Grades:	
TiO ₂		2 - 3		Bulk	50 mm
CaO		0.2		(95% passing)	20 mm
MgO		0.2			6 mm
Na ₂ O		0.1			2.8 mm
K ₂ O		0.1			2.4 mm
MnO		0.01		Bagged	
BaO		0.06		(95% passing)	2.8 mm
SO ₃		0.01			2.4 mm
LOI		0.05 - 1.5			1.0 mm
H ₂ O (110°C)		1 - 4			150 mm
					75 mm

Refractoriness 1 750°C, Volume change (1 350°C/2hrs) +1.1%.
Bulk density 2.47 g/ml.

Market: 1986/87 55% of production to Newcastle refractory plants. 45% of production to refractory brick and tile plants in Wollongong, Sydney and other States.

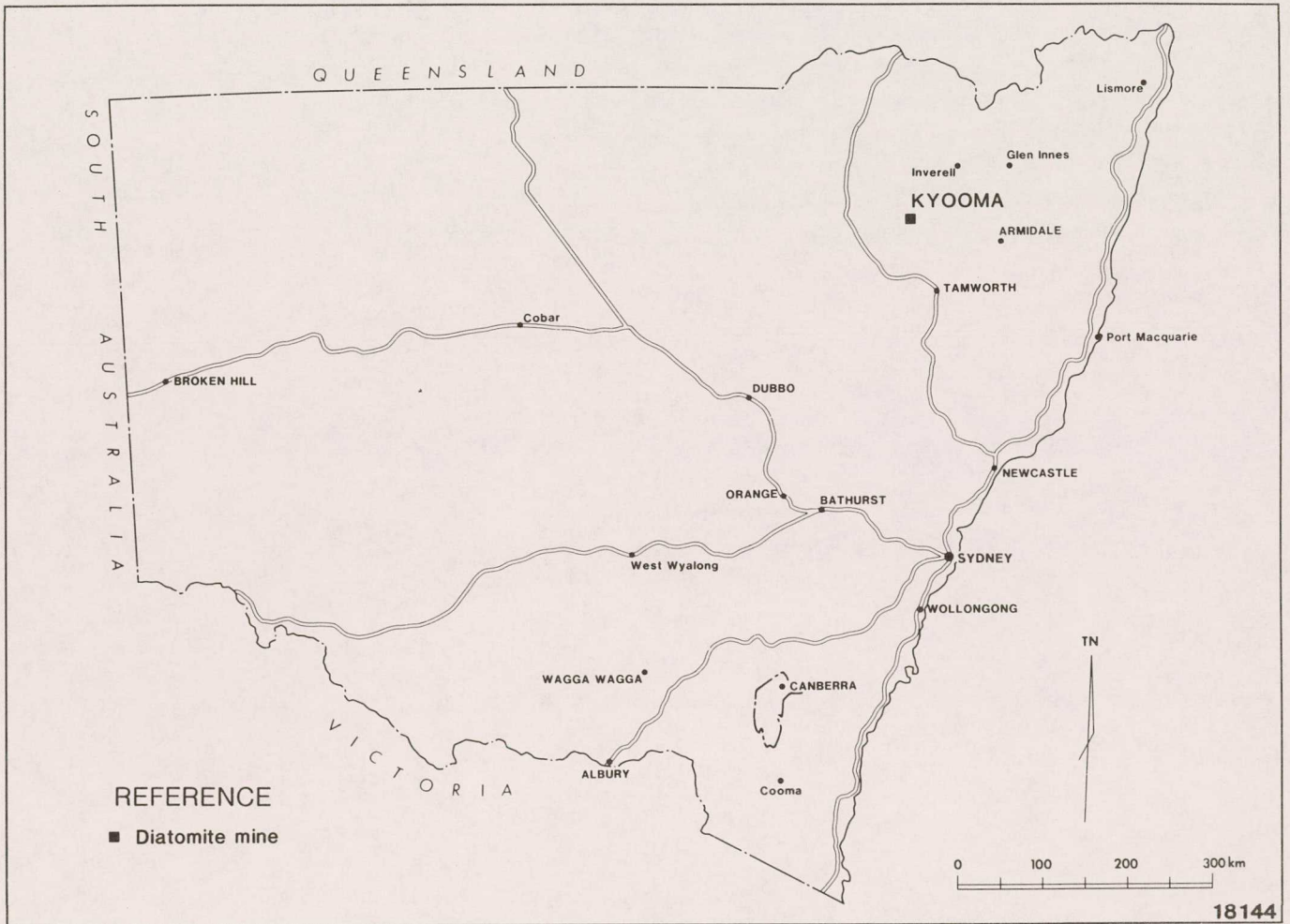
Transport: Road to and from Sandgate.

Employees: June 1987 - 5.

Historic Production: From June 1974 to June 1987 - 139 299 t.

Comments:

DIATOMITE MINES



KYOOMA MINE**Commodity:** Diatomite.**Location:** Bells Mountain on "Kyooma" Station, 10 km north of Barraba.**Owner:** Westralian Sands Ltd, PO Box 96, Capel WA 6271.
Ph (097) 27 2002, Telex AA93905, Fax (097) 27 2353.**Operator:** Australian Diatomite Mining Pty Ltd, Suite 44, 2 O'Connell Street, Parramatta NSW 2150. Ph (02) 633 9844, Telex AA75350, Fax (02) 633 9776.**Geology:** Mining leases cover two parts of a diatomite deposit now separated by erosion. These two parts are termed "Kyooma West" and "Kyooma East". The deposit is freshwater lacustrine in origin and is associated with Miocene volcanics. It is up to 10 m thick and is interbedded with tuff bands. Basalt covers most of the deposit.**Mineralization:** Fairly pure diatomite composed largely of the diatom Melosira granulata.**Reserves:** June 1986 Kyooma West (open cut): Proved - 300 000 t.
Kyooma East: Resources in excess of 1.3 mt have been measured but are currently uneconomic due to inferior quality, and large thickness of basalt capping.**Mining Method:** Originally underground. Current operations (Kyooma West) - open cut. Diatomite is extracted by face shovel, front-end loaders, bulldozers, and trucks.**Treatment:** Nearby coal-fired rotary calcining kiln plant at Kyooma East.**Production Capacity:** 20 000 tpa of calcined diatomite.**Commencement:** First worked 1917. Current operations - September 1982.**Production:** 1986/87 Diatomite mined - 50 018 m³. Diatomite treated - 38 340 m³. Calcined diatomite produced - 7 358 t.**Product Specification:** Calcined diatomite -

	<u>Chemical Composition (%)</u>		
	<u>Minimum</u>		<u>Maximum</u>
SiO ₂	65		80
Al ₂ O ₃	14		18
Fe ₂ O ₃	3.0	to	4.0
TiO ₂	0.65	to	0.85
P ₂ O ₅	0.04	to	0.08
MnO	0.04	to	0.06
CaO	1.6	to	2.2
K ₂ O	0.9	to	1.2

Physical Properties

Apparent density	0.40 to 0.50 g/ml
Water Absorption	50 to 130% (by weight)
Oil Absorption	65 to 100% (by weight)

Market: 1986/87 New South Wales and interstate - mainly pet litter and industrial absorbents. New Zealand - pet litter and industrial absorbents only.

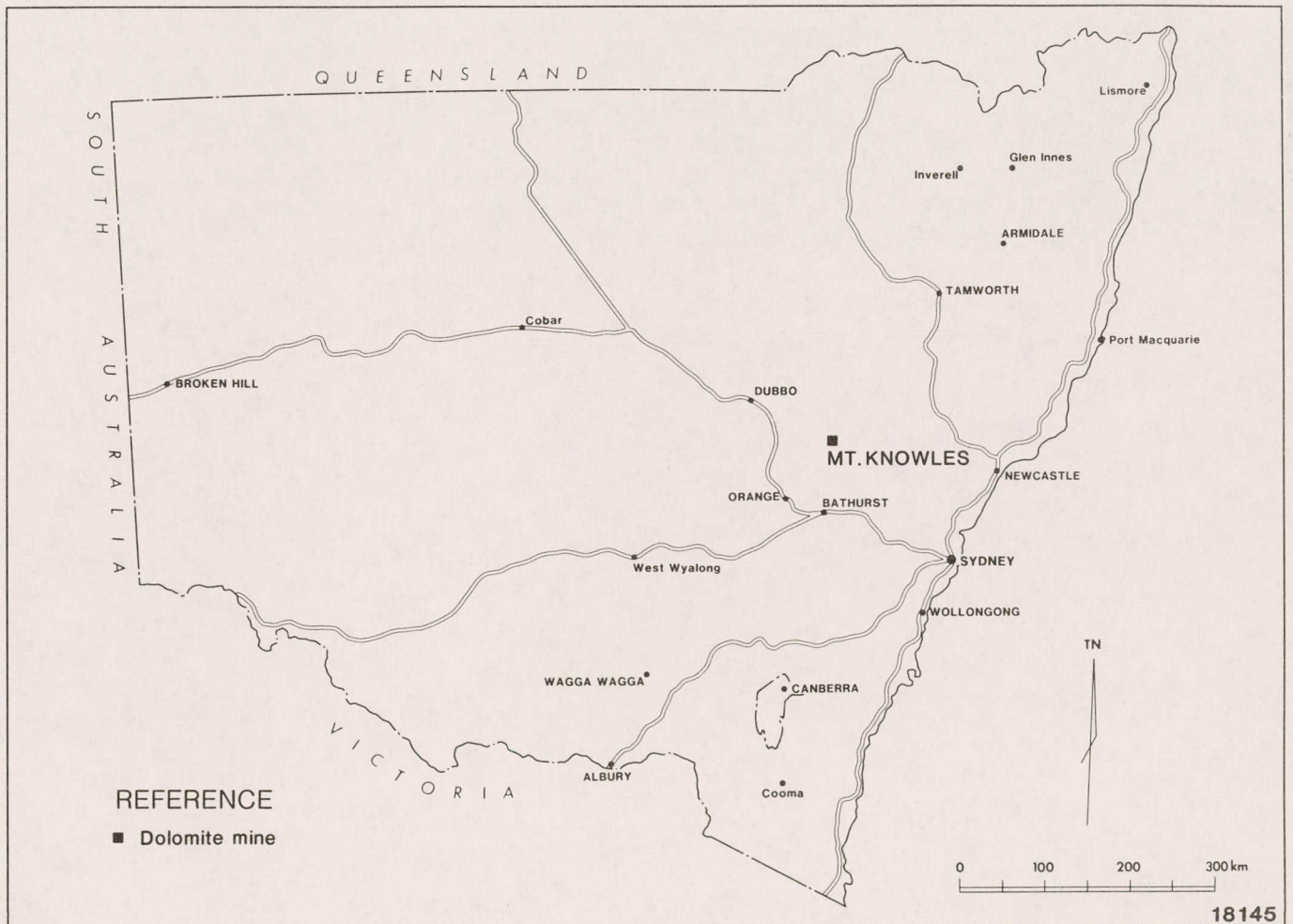
Transport: Road.

Employees: June 1987 - 25.

Historic Production: Previous operations since 1917 - over 50 000 t of diatomite extracted. Current operations from September, 1982 to June, 1987 - 120 000 t.

Comments: The company is exploring for additional reserves in an area within the Nandewar Range west of the current mine. Additional significant diatomite resources have been identified and some of the higher purity material may have potential for use in filtration applications.

DOLOMITE MINES



MT KNOWLES QUARRY

Commodities: Dolomite
(minor Limestone).

Location: Mt Knowles, 10 km east of Mudgee.

Owner/Operator: W J Murdock & Co Pty Ltd, 31 Horatio Street, Mudgee, NSW 2850. Ph (063) 72 2466.

Geology: Small deposit (50 m x 500 m) of dolomite with occasional beds of limestone occurring within the Mt Knowles Limestone Member of a Devonian sedimentary sequence (Boogledie Formation).

Mineralization: Dolomite is dark grey with brownish patches and is finely crystalline.

Reserves: April 1988 Dolomite - 1 mt. Limestone - 50 000 t.

Mining Method: Open cut.

Treatment: On-site crushing and milling plant.

Production Capacity: 20 000 t (Plant updated May 1987).

Commencement: First worked - 1951. Current operator - 1974.

Production: 1986/87 Dolomite mined - 2 707 t.

Production Specification: Analyses of samples taken from each end of deposit:

	<u>Percentage</u>	
	<u>Southern end</u>	<u>Northern end</u>
CaCO ₃	50.9	55.3
MgCO ₃	39.9	37.8
MnCO ₃	0.5	0.5
Fe ₂ O ₃ and Al ₂ O ₃	0.9	1.1

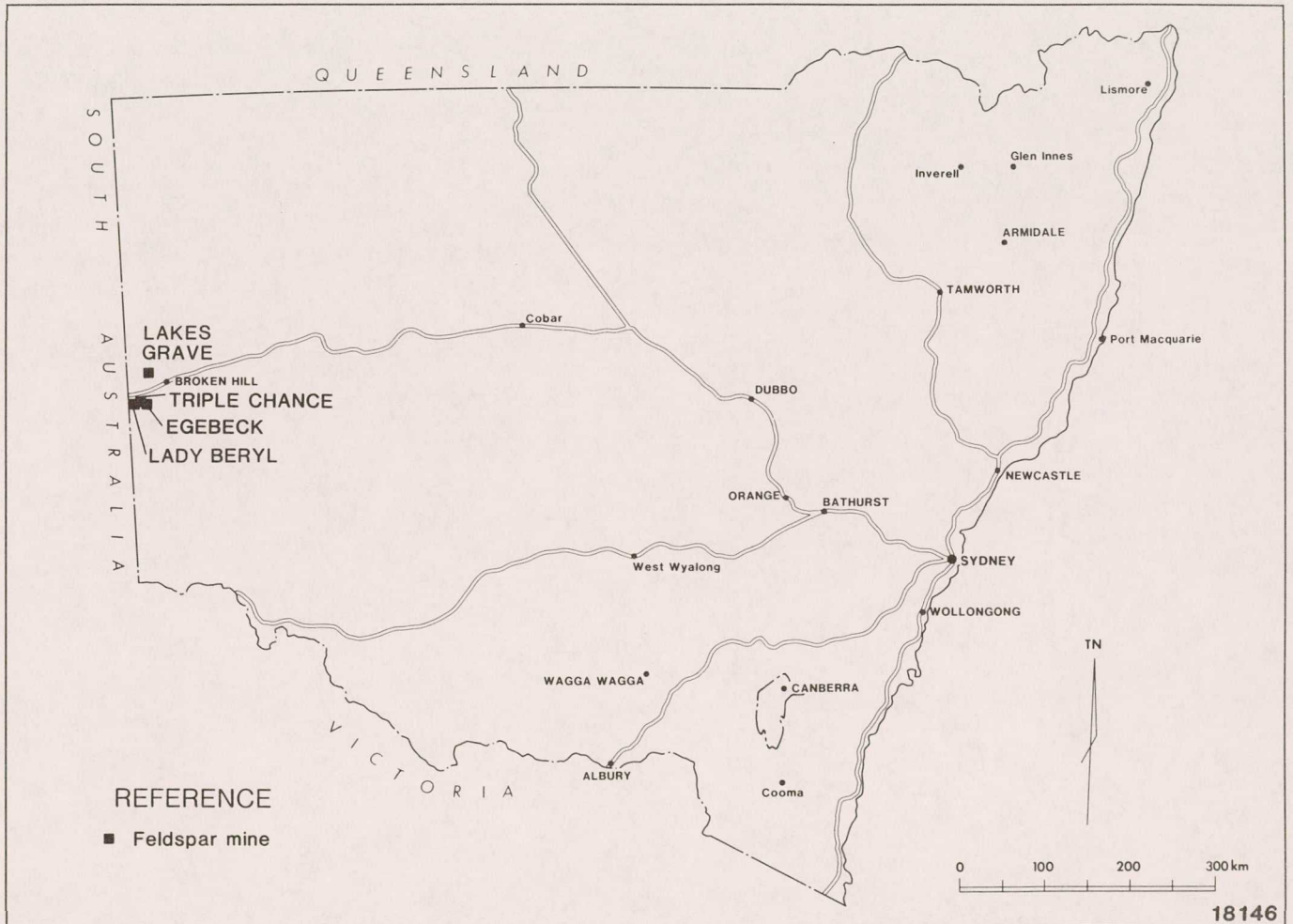
Market: 1986/87 Local agricultural use.

Employees: June 1987 - 2.

Historic Production: From 1951 to June 1988 - not available.

Comments:

FELDSPAR MINES



EGBECK QUARRY

Commodity: Feldspar.

Location: Cockburn, 38 km southwest of Broken Hill.

Owner/Operator: Commercial Minerals Ltd, Private Bag 11, Camberwell, VIC 3124. Ph (03) 822 8614. Telex AA32581. Fax (03) 20 1682.

Geology: A pegmatite body, over 200 m long and 50 m wide, intrudes amphibolite, gneiss, and schist of the Proterozoic Willyama Supergroup.

Mineralization: Dominantly microcline-albite perthite and quartz. A 2 m border zone consists of albite-oligoclase with quartz and mica.

Reserves: Not known (Reserves drilling to be undertaken in 1989).

Mining Method: Open cut.

Treatment: No on-site treatment.

Production Capacity: 400 tpa (with 2 men).

Commencement: Deposit first worked in 1941. Current operations - 1985.

Production: 1986/87 Potash feldspar mined and treated - 444 t.

Product Specification: "Premium" grade - 11% total alkalis.

Market: Feldspar is milled at Company's plant at Allendale, Victoria, and Granville, NSW, for sale to ceramicware manufacturers, Melbourne and Sydney.

Transport: Road to Allendale, Victoria and Granville, New South Wales.

Employees: June 1987 - 2 (Contractors).

Historic Production: From 1941 to 1966 - 57 349 t. From 1985 to June 1987 - 495 t.

Comments: Mine was purchased from Forner Mining Pty Ltd in March, 1986. The Egebeck Mine has been the largest producer of feldspar in New South Wales.

Commodity: Feldspar.
(minor Beryl, Mica, Quartz).

Location: Cockburn, 40 km southwest of Broken Hill.

Owner/Operator: Consolidated Feldspar Ltd, 1 Booth Street, Annandale, NSW 2038. Ph (02) 552 1236. Fax (02) 552 1963.

Geology: A pegmatite body, at least 750 m long and up to 100 m wide, intrudes schist, gneiss, amphibolite, and aplite of the Proterozoic Willyama Supergroup.

Mineralization: Dominantly microcline-albite perthite accompanied by quartz and beryl. Replacement bodies composed of plagioclase, quartz, and muscovite also occur within the pegmatite.

Reserves: April 1988 Proved - 2.25 mt of pegmatite.

Mining Method: Open cut.

Treatment: Feldspar is treated at Triple Chance Mine plant, 4 km to the north.

Commencement: Deposit was first worked for beryl in 1944 and for feldspar in 1947. Current operations - full production commenced with commissioning of Triple Chance Mine plant in April 1988.

Production: 1986/87 (from April 1987) Potassium feldspar mined and treated - 26 t.

Product Specification:

Chemical Analysis (%)

SiO ₂	65.8
Al ₂ O ₃	18.0
Fe ₂ O ₃	0.18
CaO	0.04
MgO	<0.01
Na ₂ O	3.63
K ₂ O	11.7
TiO ₂	0.06
LOI	0.38

Market: 1986/87 Ceramics industry, Melbourne.

Transport: Road and rail to Sydney. Road to Melbourne.

Employees: June 87 - 2 (intermittent working).

Historic Production: Feldspar From 1947 to 1959 - 3 794 t. Beryl From 1944 to 1959 - 16.5 t.

Comments: A high grade potassium feldspar suitable for use in the glass and ceramic manufacturing process will be mined at this deposit and transported to the Triple Chance Processing Plant for processing to customer requirements.

LAKES GRAVE MINE**Commodity:** Feldspar.**Location:** Lakes Grave Creek near Silverton, 19 km northwest of Broken Hill.**Owner/Operator:** Commercial Minerals Ltd, Private Bag 11, Camberwell, VIC 3124. Ph (03) 822 8614. Telex AA32581. Fax (03) 20 1682.**Geology:** A number of dyke-like bodies of albite pegmatite are associated with banded albite-rich rocks and intrude quartz-mica-feldspar gneiss and schist of the Proterozoic Willyama Supergroup.**Mineralization:** Pegmatite consists mostly of albite (up to 90%) with minor amounts of quartz and muscovite.**Reserves:** January 1988 Proved - 1 500 t. Inferred resource - 1 000 t.**Mining Method:** Open cut.**Treatment:** No on-site treatment. Hand-sorted quality control.**Production Capacity:** Dependent on demand - currently 30 t per week.**Commencement:** First worked between 1962 and 1964. Current operations - 1975.**Production:** 1986/87 Soda-feldspar mined - 667 t.**Product Specification:**

	<u>Chemical analysis (%)</u>
Al ₂ O ₃	20.00
Na ₂ O	10.90
K ₂ O	0.41
Fe ₂ O ₃	0.20

Market: 1986/87 Feldspar is milled at Company's plant at Allendale, Victoria, and Granville, NSW, for sale to ceramicware manufacturers in Melbourne and Sydney.**Transport:** Road to Allendale, Victoria and Granville, New South Wales..**Employees:** June 1987 - 3 (Contractors).**Historic Production:** From 1962 to 1964 - 416 t. Current operations from 1975 to June 1987 - approximately 1 620 t.**Comments:** Commercial Minerals Ltd purchased mine from Broken Hill Feldspar Milling Pty Ltd in March, 1987. Mine was originally known as the Acacia Vale Feldspar Mine. Estimated mine life on current known reserves is 18 months on present production (from January 1988).

TRIPLE CHANCE MINE

Commodities: Feldspar
(minor Beryl, Mica).

Location: Cockburn, 37 km southwest of Broken Hill.

Owner/Operator: Consolidated Feldspar Ltd, 1 Booth Street, Annandale, NSW 2038. Ph (02) 552 1236. Fax (02) 552 1963.

Geology: An elongate body of pegmatite (145 m x 15 m) intrudes gneiss and amphibolite of the Proterozoic Willyama Supergroup. The pegmatite varies in composition within the deposit (with 4 zones recognized) and contains both soda- and potash-feldspar.

Mineralization: Soda-feldspar occurs in the 1 metre wide border zone as soda-plagioclase associated with muscovite and quartz. Potash-feldspar occurs in the intermediate and core zones as microcline-albite perthite associated with quartz and muscovite. Beryl also occurs in the deposit.

Reserves: June 1987 Proved - 85 000 t of 40% feldspar on dumps available for retreatment. Reserves on nearby leases over the Lady Beryl, Spar Ridge and Bakers ML39 deposits have been evaluated and total approximately 2.5 mt of proved pegmatite.

Mining Method: Open cut. Mining from main open cut is currently not viable. Drilling in the next twelve months to define three other potential bodies on the leases. 85 000 tonnes of 40% feldspar dump material available to be treated.

Treatment: A crushing and milling circuit was completed in April, 1988 and has the ability to produce material suitable to glass and ceramic manufacturers' requirements.

Production Capacity: 45 000 tpa.

Commencement: First worked - 1944. Present quarry commenced in 1946.

Production: 1986/87 Soda-feldspar mined - 60 t.

Product Specification:

	<u>Chemical Analyses (%)</u>	
	<u>Soda-feldspar</u>	<u>Potash-feldspar</u>
SiO ₂	67.1	65.7
Al ₂ O ₃	20.2	19.0
Na ₂ O	10.9	2.93
K ₂ O	0.13	11.9
CaO	1.27	0.08
MgO	0.06	0.02
Fe ₂ O ₃	0.06	0.13
TiO ₂	0.01	0.01
LOI	0.22	0.30

Market: 1986/87 Ceramics industry, Melbourne and Sydney. A 30 000 t potential exists for export to Taiwan, Singapore, Indonesia, New Zealand, and USA.

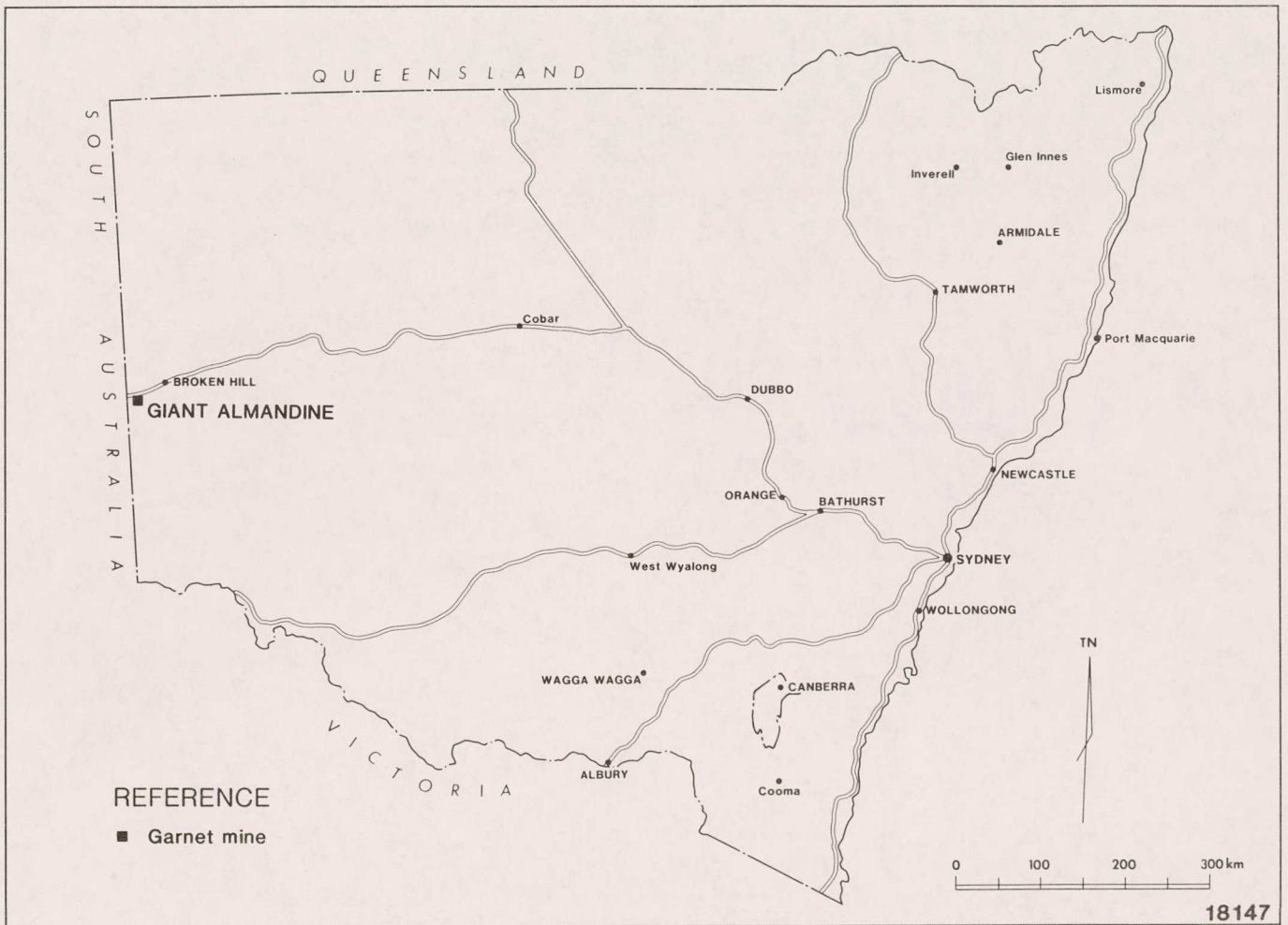
Transport: Road and rail to Sydney and road to Melbourne.

Employees: June 87 - 5.

Historic Production: From 1944 to June 1987 - 36 000 t of feldspar, 333 t of beryl and 3 025 t of quartz.

Comments: Triple Chance Mine has been the second largest feldspar producer (after the nearby Egebek Mine) and the largest beryl producer in New South Wales. Mine was purchased by Consolidated Feldspar Ltd from the late Mrs T Alfonzi in June, 1984.

GARNET MINES



GIANT ALMANDINE MINE

Commodity: Garnet.

Location: General Gordons Tank near Cockburn, 25 km southwest of Broken Hill.

Owner: A J Ireland, 148 Sulphide Street, Broken Hill, NSW 2880. No phone.

Operators: J & P Ireland (address as above).

Geology: Garnet crystals occur in chlorite schist associated with mica schist and amphibolite of the Proterozoic Willyama Supergroup.

Mineralization: Brown, almost opaque, almandine garnet crystals averaging 20 mm in diameter. Pyrope garnet and black magnetite crystals also occur.

Reserves: Not known.

Mining Method: Small open pit.

Treatment: Hand sorting.

Commencement: Mid 1950's.

Production: 1986/87 Material mined and treated - 20 t, providing approximately 150 specimens.

Product Specification: Saleable garnet crystals generally greater than 100 mm in diameter.

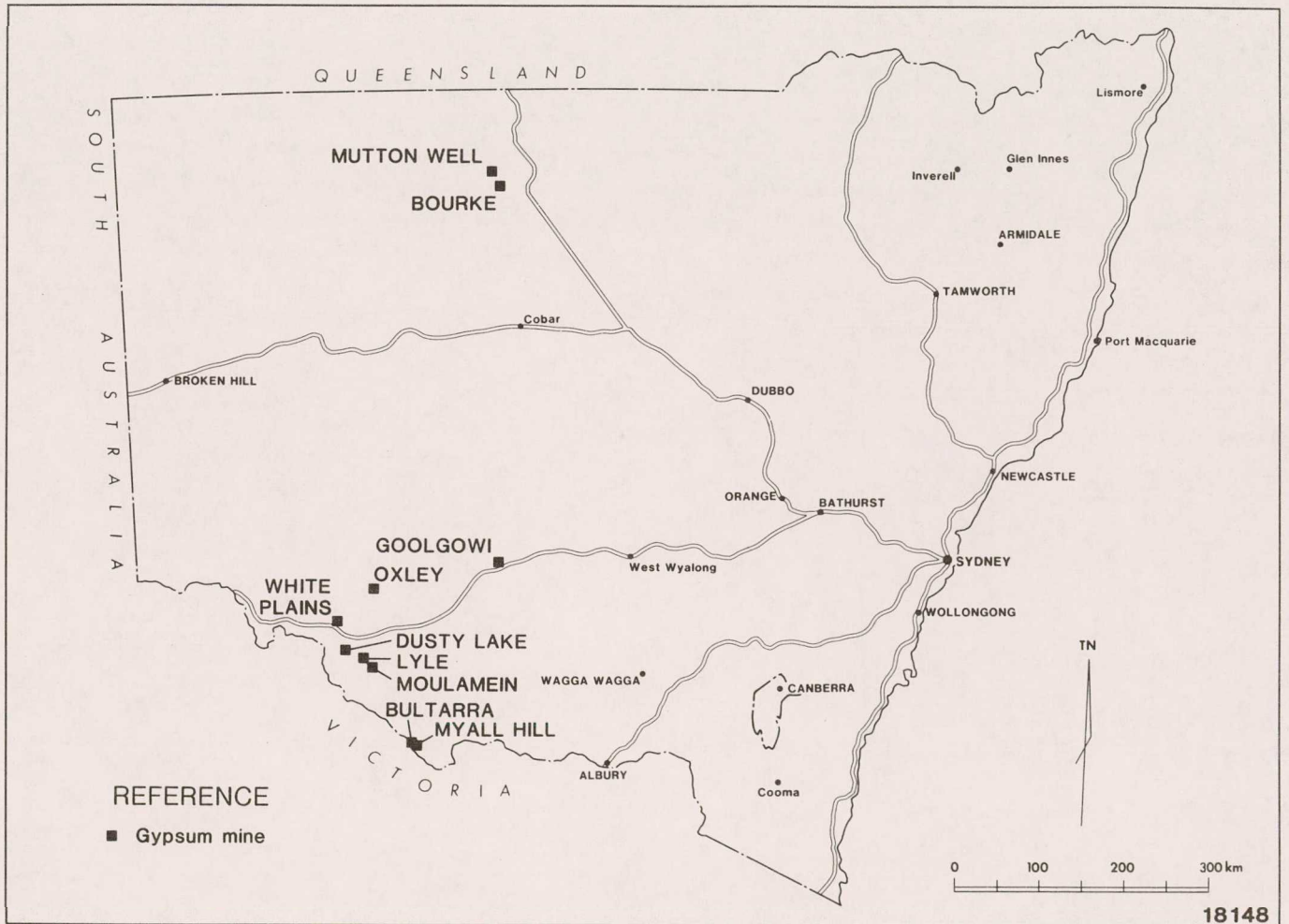
Market: Tourists and mineral collectors. Undersized crystals sold to local Arts and Craft centre.

Employees: June 1987 - 2.

Historic Production: From commencement of operations to June 1987 - not available.

Comments: Mine also known as Irelands Garnet Mine.

GYPSUM MINES



BOURKE GYPSUM MINE

Commodity: Gypsum.

Location: Paka Tank, Bourke - Wanaaring Road, 27 km west of Bourke.

Owner/Operator: CSR Ltd (Building Materials Division), PO Box 58, Rosewater East, SA 5013. Ph (08) 348 1400. Fax (08) 348 1423.

Geology/Mineralization: Gypsum occurs in a swampy depression and in a large dune on its eastern margin. In the depression gypsum occurs as selenite in a sandy bed up to 1.5 m in thickness, under an overburden of sand ranging from 0.3 m to 1.5 m in thickness. The gypsum content of this bed is variable but averages 45% crystalline gypsum. The dune consists of an upper layer of cemented aeolian gypsum ranging in thickness from 0.2 m to 0.75 m underlain by layers of gypsum (80% to 90% gypsum), and selenite in sand and clay (50 to 75% gypsum).

Reserves: April 1988 Probable - 150 000 t of washed gypsum.

Mining Method: Surface mining.

Treatment: On-site washing plant.

Production Capacity: 25 000 to 30 000 tpa of washed gypsum.

Commencement: Deposit first worked in 1925 but not worked again until 1949, whence mining continued until 1959. Current operations - 1970.

Production: 1986/87 Crude gypsum mined - 65 745 t. Crude gypsum washed - 63 075 t. Washed gypsum - 25 921 t of 92-94% gypsum.

Market: 1986/87 Cement manufacture, Kandos (78%); local agricultural use (22%).

Transport: Rail to Kandos.

Employees: June 1987 - 6.

Historic Production: 1925 - 280 t of gypsum mined. From 1949 to 1959 - approximately 74 000 t of gypsum produced (none of material washed, however some beneficiated by dry screening). Current operations from 1970 to June 1987 - not available.

Comments: Mining and washing of gypsum carried out by contractor.

BULTARRA MINE

Commodity: Gypsum.

Location: "Bultarra" Property near Bunnaloo, 51 km southwest of Deniliquin.

Owner/Operator: R C Meares, "Bultarra" Wamboona, NSW 2731.
Ph (054) 89 7257.

Geology/Mineralization: Gypsum occurs in several dunes in and near an old watercourse (Green Gully). A thin layer of clay overlies approximately 60 cm of earthy gypsum (gypsite). Below this the gypsum becomes crystalline and clay impurities increase with depth.

Reserves: 1949 Inferred resource estimate of deposit - 78 000 t.

Mining Method: Surface mining.

Treatment: None.

Commencement: Current operations - 1981.

Production: 1986/1987 Crude gypsum mined - 500 t of 72% gypsum.

Market: Local agricultural use (50% owner's property).

Employees: June 1987 - 1 (Contractor - intermittent working).

Historic Production: From 1981 to June 1987 - 8 280 t averaging 70%.

Comments:

DUSTY LAKE MINE

Commodity: Gypsum.

Location: Dusty Lake, "Yanga" Property, 22 km south-southeast of Balranald.

Owners/Operators: G V & W E Dalton, PO Box 101, Balranald, NSW 2715, Ph (050) 38 8267.

Geology/Mineralization: A 1.8 m thick gypsum bed (approximately 80%-90% gypsum) is overlain by a 0.5 m overburden.

Reserves: At commencement of operations (February 1986) - Inferred resource based on a volume of 12 ha of 1.8 m depth.

Mining Method: Surface mining. Overburden pushed off; gypsum excavated down to about 0.3 m; rotary hoe used to break up. Gypsum is then pushed into a stockpile and placed on truck by front-end loader.

Treatment: None.

Commencement: 1986.

Production: 1986/87 Crude gypsum mined - 500 t of 80% gypsum.

Market: Agricultural use on owner's property.

Employees: June 1987 - 1 (intermittent working).

Historic Production: From 1986 to June 1987 - 2 100 t of 80% gypsum.

Comments:

GOOLGOWI MINE

Commodity: Gypsum.

Location: Doolitty Swamp near Goolgowi, 74 km south of Hillston.

Owners: J W & J E Parsons, Goolgowi, NSW 2652, W J Bennett and estate of R W Bennett, Kerang, VIC 3579.

Operator: Northern Gypsum, PO Box 322, Kerang, VIC 3579. Ph (054) 52 2211. Fax (054) 52 2011.

Geology/Mineralization: A deposit of earthy gypsum (gypsite) occurs at the base of a swamp (Doolitty Swamp) and in a 1 km by 20 m windblown dune near the eastern and southern edges of the swamp. The gypsite on the dune forms a 60 cm thick layer and is underlain by a bed of clay containing selenite crystals. The grade of the gypsum in the deposit is extremely variable, ranging from 30% to 80%.

Reserves: Not available.

Mining Method: Surface mining.

Treatment: None.

Commencement: First worked - 1924. Current operations - 1981.

Production: 1986/87 Crude gypsum mined - 1 177 t of approximately 60% gypsum.

Market: Local agricultural use.

Employees: June 1987 - 3 (intermittent working).

Historic Production: 1924 - 681 t. From 1947 to 1952 - 2 465 t. Current operations from 1981 to June 1987 - 7 198 t.

LYLE MINE

Commodity: Gypsum.

Location: "Lyle" Property near Moulamein, 46 km southeast of Balranald.

Owner: Keri Keri Pastoral Co Pty Ltd, Keri Keri, Moulamin, NSW 2739.
Ph (050) 34 0541.

Operator: Cumco Pty Ltd (to June 1987). No current operator (April 1988).

Geology/Mineralization: Gypsum deposit within Pleistocene lake bed.

Reserves: April 1988 Inferred resource, estimated to be between 0.5 and 1.0 mt.

Mining Method: Surface mining.

Treatment: None.

Commencement: 1984.

Production: 1986/87 Crude gypsum mined - 5 961 t of 80% gypsum.

Market: Local agricultural use.

Employees: June 1987 - 1 (intermittent working).

Historic Production: From 1984 to June 1987 - 20 768 t of 80% gypsum.

Comments:

MOULAMEIN MINE

Commodity: Gypsum.

Location: Moulamein, 53 km southeast of Balranald.

Owners: W J Bennett and K F Rahill, Kerang, VIC 3579.

Operator: Northern Gypsum, PO Box 322, Kerang, VIC 3579.
Ph (054) 52 221. Fax (054) 52 2011.

Geology/Mineralization: Gypsum deposit within Pleistocene lake bed.

Reserves: Not available.

Mining Method: Surface mining.

Treatment: None.

Commencement: 1975.

Production: 1986/87 Crude gypsum mined - 1 258 t.

Market: Local agricultural use - New South Wales and northern Victoria.

Employees: June 87 - 3 (intermittent working).

Historic Production: From 1975 to June 1987 - 15 000 t.

Comments: Lease transfer pending (April 1988).

MUTTON WELL MINE

Commodity: Gypsum.

Location: Mutton Well, "Waverley" Station, 43 km northwest of Bourke.

Owner/Operator: Far Western Stone Quarries Pty Ltd, PO Box 40, Bourke, NSW 2840. Ph (068) 72 2064.

Geology/Mineralization: In the area near Mutton Well, deposits of gypsum are associated with a series of dry lakes approximately 120 hectares in extent. On the eastern edge of the main depression, dunes of earthy gypsum (gypsite) and cellular gypsum are developed. Gypsite, cellular gypsum, and selenite also crop out on the surface of the depression between areas of sand and clay. Approximately 1 m of crystalline gypsum underlies the surface.

Reserves: April 1988 Inferred resource estimate of deposit - 0.5 mt.

Mining Method: Surface mining.

Treatment: On-site screening plant.

Commencement: 1975.

Production: 1986/87 Crude gypsum mined and treated - 151 t of 75% gypsum. Screened gypsum produced - approximately 126 tonnes of 90% gypsum.

Market: 1986/87 Local agricultural use.

Employees: June 87 - 3 (intermittent working).

Historic Production: From 1980 to June 1987 - approximately 1 200 t.

Comments: Production figures also include gypsum mined on "Ningawalla" Station, 6 km west of the Mutton Well operation.

MYALL HILL MINE

Commodity: Gypsum.

Location: Green Gully Lagoon, "Myall Hill" Property near Bunnaloo, 47 km southwest of Deniliquin.

Owners/Operators: M C & E J Robinson to April 1988. Operation now owned by Ryle Bate Pty Ltd, "Myall Hill", Wamboona, NSW 2739.

Geology/Mineralization: Gypsum occurs in several dunes near an old watercourse (Green Gully Lagoon). A thin layer of clay overlies a 60 cm layer of earthy gypsum (gypsite) (73% gypsum) below which is a 2 m layer of clay and crystalline gypsum grading downwards from 60% to 40% gypsum.

Reserves: 1949 Inferred resource estimate of deposit - 49 000 t.

Mining: Surface mining.

Treatment: None.

Commencement: Not known. First recorded production - 1984.

Production: 1985/86 - 1 000 t of 70% gypsum. 1986/87 - No production.

Market: 1985/86 Agricultural use on owner's property.

Employees: June 1986 - 1 (intermittent working).

Historic Production: 11 000 t of 70% gypsum produced between 1984 and June 1986.

Comments:

OXLEY GYPSUM MINE

Commodity: Gypsum.

Location: Oxley, 69 km northeast of Balranald.

Owner/Operator: T P O'Connor, Box 557, Swan Hill, Vic 3585.
Ph (050) 34 5206.

Geology/Mineralization: Gypsum deposit within Pleistocene lake bed.

Reserves: April 1988 Inferred resource estimate of deposit - 50 000 t.

Mining Method: Surface mining using backhoe. Two open cuts approximately 50 m apart.

Treatment: None.

Commencement: January 1985.

Production: 1986/87 Crude gypsum mined - 561 t of 70 to 79% gypsum.

Market: 1986/87 Agricultural use in Hay district.

Employees: June 87 - 1 (Contractor only - intermittent working).

Historic Production: 1985 to June 1987 - 5 028 t.

Comments:

WHITE PLAINS MINE

Commodity: Gypsum.

Location: "White Plains" Property, 12 km north of Balranald.

Owners/Operators: K R & J E Dalton, PO Box 20, Balranald, NSW 2715. Ph (050) 20 1741.

Geology/Mineralization: Gypsum crops out in isolated patches in a 1.5 km by 2.5 km depression (The White Plain). A layer of approximately 0.7 m thickness of earthy gypsum (gypsite) (up to 80% gypsum) overlies a 1 m or more layer of seed gypsum with clay content increasing with depth (approximately 65%-80% gypsum).

Reserves: Not known but inferred resource estimate taken at commencement of operations (July 1984) could be based on a volume of 20 ha at 1 m depth.

Mining Method: Surface mining. Front-end loader into truck.

Treatment: None.

Commencement: July 1984.

Production: 1986/87 Crude gypsum mined - 3 025 t of 85% gypsum.

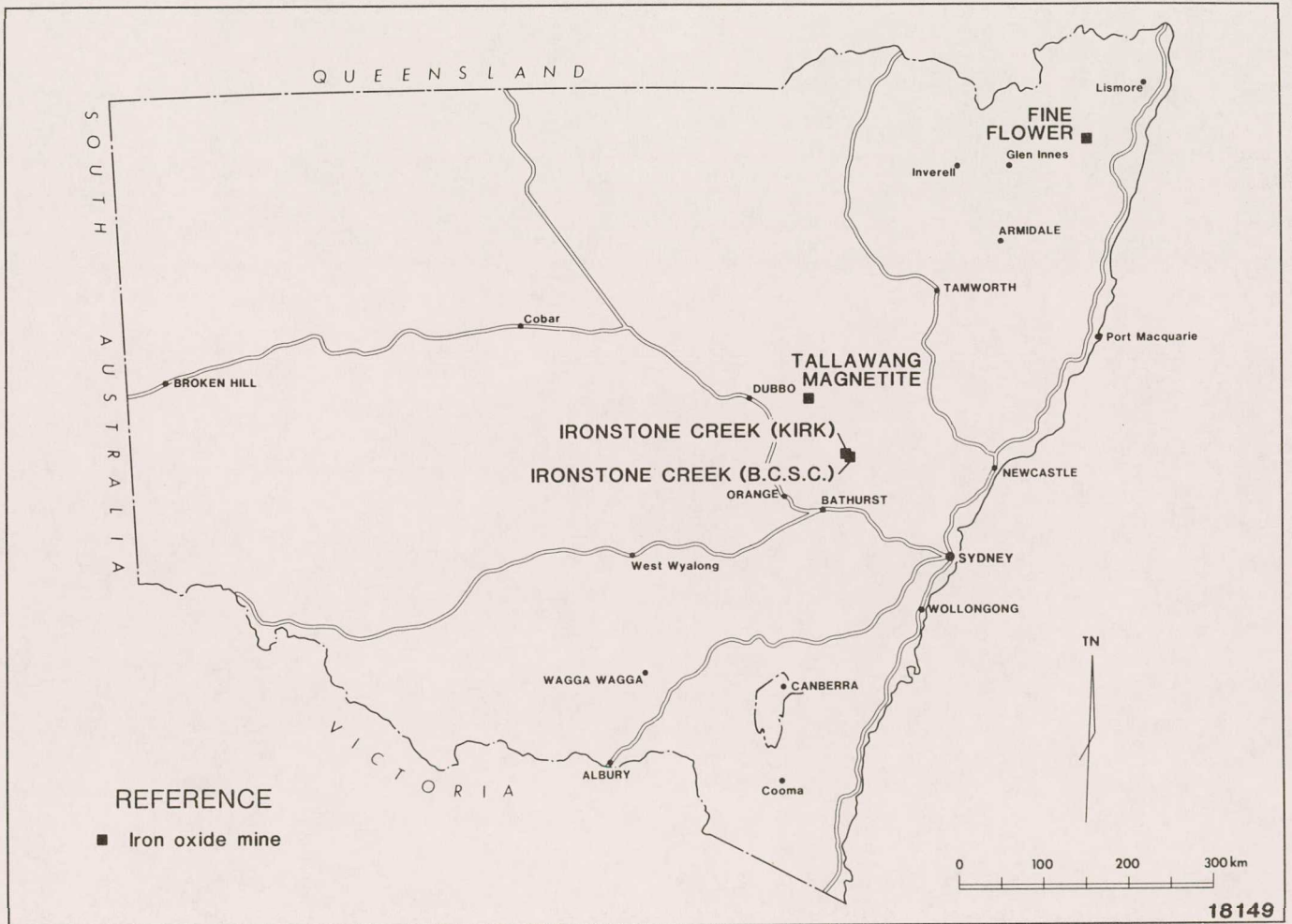
Market: Local agricultural use (including owners property).

Employees: June 1987 - 2 (intermittent working).

Historic Production: From 1984 to June, 1987 - 7 581 t of 84% gypsum.

Comments:

IRON OXIDE MINES



FINE FLOWER MINE

Commodity: Iron oxide.

Location: Fine Flower Creek near Copmanhurst, 45 km northwest of Grafton.

Owner/Operator: Central Plant Hire Pty Ltd, PO Box 554, Coffs Harbour, NSW 2450. Ph (066) 52 3505.

Geology/Mineralization: The Fine Flower iron deposit is composed of three distinct orebodies. The largest (120 m x 30 m) is 700 m north of two smaller (50 m x 30 m) orebodies only 30 m apart. All orebodies are composed mainly of magnetite with minor amounts of haematite, and are located along and near the contact of a diorite phase of the Permian Towgon Grange Granodiorite and a sequence of metavolcanics and sediments. The magnetite probably represents a late magmatic phase of the diorite intrusion.

Reserves: Inferred resource estimated in 1961 to be 0.7 mt to a depth of 18 m.

Mining Method: Open cut. Excavator and front-end loader.

Treatment: On-site crushing and screening plant.

Production Capacity: 50 tonnes per day.

Commencement: Early mining prior to 1905. First recorded production - 1960. Current operations - 1984.

Production: 1986/87 Ore mined and treated - 2 311 t of 90% Fe₂O₃.

Market: Cement manufacture, Brisbane.

Transport: Road to Brisbane.

Employees: June 1987 - 2 (intermittent working).

Historic Production: From 1984 to June 1987 - 8 492 t.

Comments:

IRONSTONE CREEK (B C S C) MINE

Commodity: Iron oxide.

Location: Ironstone Creek near Cudgegong, 13 km west of Rylstone.

Owner/Operator: Blue Circle Southern Cement Ltd, Box 1571 GPO, Sydney, NSW 2001. Ph (02) 929 0200. Telex AA22466. Fax (02) 929 4520. Mine-PO Box 57, Portland, NSW 2847. Ph (063) 55 5000. Telex AA22728. Fax (063) 55 5796.

Geology: Lease is situated at the southern section of an iron oxide deposit which crops out discontinuously over a strike length of approximately 1 km and a width of up to 20 m.

Mineralization: Limonite, goethite, haematite, and manganese oxides.

Reserves: Not known. Reserves of higher grade material are limited.

Mining Method: Open cut.

Treatment: No on-site treatment.

Production Capacity: 5 000 tpa.

Commencement: 1961.

Production: 1986/87 Ore mined - 4 768 t of >68% Fe₂O₃.

Market: 1986/87 Cement manufacture at Company's Portland plant.

Transport: Road to Portland.

Employees: June 1987 - 1 (Contractors C & J Kirk).

Historic Production: From commencement of current operations to June 1987 - not available.

Comments:

IRONSTONE CREEK (KIRK) MINE

Commodity: Iron oxide.

Location: Ironstone Creek near Cudgegong, 13 km west of Rylstone.

Owners/Operators: C & J Kirk, "Weenoona" Rylstone, NSW 2849. Ph (063) 79 6260.

Geology: Lease is situated at the northern section of an iron oxide deposit which crops out discontinuously over a strike length of approximately 1 km and a width of up to 20 m.

Mineralization: Limonite, goethite, haematite, and manganese oxides.

Reserves: April 1988 Inferred resource estimated to be greater than 50 000 t.

Mining Method: Open cut.

Treatment: No on-site treatment.

Production Capacity: Approximately 10 000 tpa.

Commencement: 1960.

Production: 1986/87 Ore mined - 2 917 t of >64% Fe₂O₃.

Market: 1986/87 Cement manufacture - Australian Cement Ltd, Kandos.

Transport: 17 km by road to Kandos.

Employees: June 1987 - 2 (intermittent working).

Historic Production: From 1960 to June 1987 - not available.

Comments:

TALLAWANG MAGNETITE MINE

Commodity: Iron oxide (Magnetite).

Location: Tallawang Rail Siding, 15 km northwest of Gulgong.

Owner: Eagle Corporation Ltd, PO Box 7415, Cloisters Square, Perth, WA 6000. Ph (09) 324 1880. Telex AA95112. Fax (09) 481 3639.

Operator: Australian Magnetite Pty Ltd (address as above).

Geology/Mineralization: Magnetite occurs as near vertical tabular bodies varying in width from 2 to 11 m within a hornblende - biotite - magnetite metasomatic deposit close to the contact between the Carboniferous Gulgong Granite and metamorphosed sedimentary and volcanic rocks of the Devonian Tucklan Beds. The mineralized area is approximately 1.2 km long by 11 m wide.

Reserves: 1984 Proved and probable - 1.5 mt (open cut - 880 000 t, underground - 665 000 t).

Mining Method: Currently open cut. Drilling and blasting using conventional benched quarry methods. Ore removed by front-end loader and dump trucks. Underground mining will be carried out following completion of the open cut operations.

Treatment: On-site - crushing, grinding and magnetic separation to produce ground magnetite.

Production Capacity: 50 000 tpa of ore treated.

Commencement: Main periods of previous operation were from 1901 to 1927 and from 1951 to 1955. Current operations began July, 1987.

Production: July to December 1987 Ore mined - 127 646 t. Ore treated - 12 319 t. Ground magnetite produced - Fine grade 286 t. Superfine grade 2 402 t. Ultrafine - 1 448 t.

Product Specifications: Three different sized grades of ground magnetite are produced:

Fine	85 to 90% less than 53 microns.
Ultra fine	92 to 95% less than 53 microns.
Super fine	94 to 97% less than 53 microns.

Market: Magnetite will be used as a dense medium for coal washing purposes on New South Wales coalfields.

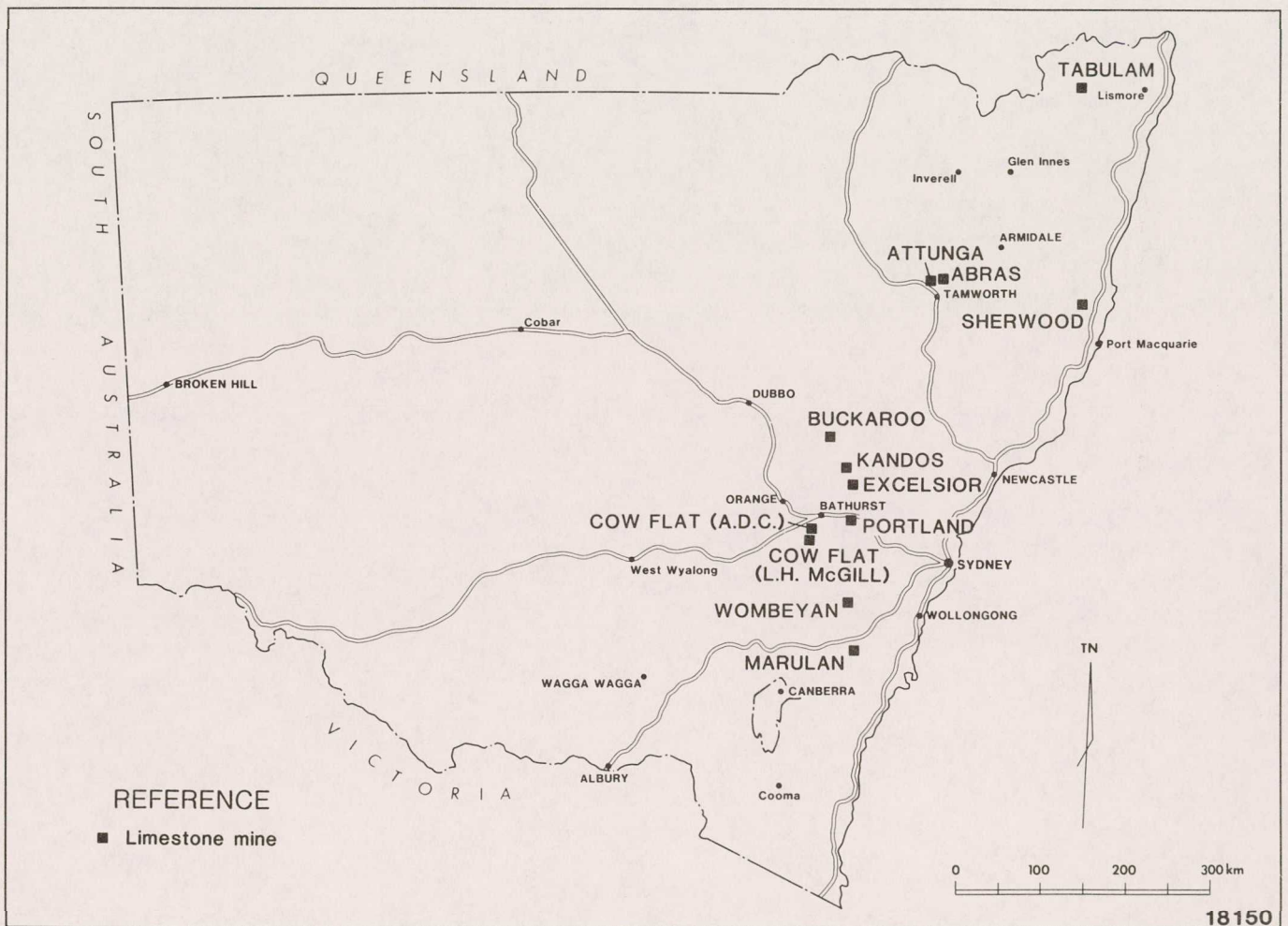
Transport: Road to coal mines.

Employees: June 87 - 10 (including 7 contractors).

Historic Production: From 1901 to 1955 - approximately 525 000 t of ore.

Comments: Total mine life is anticipated to be approximately 20 years (open cut - 12 years, underground - 8 years).

LIMESTONE MINES



ABRAS MARBLE QUARRY**Commodity:** Limestone (Marble).**Location:** Attunga, 21 km north of Tamworth.**Owner:** E L Abra, Attunga Street, Attunga, NSW 2345. Ph (067) 69 5611.**Operator:** P L Neal (trading as Sanphil Agricultural Ground Lime),
10 Neal Lane, Attunga, NSW 2345. Ph (067) 69 5579.**Geology/Mineralization:** Fine-grained, white, recrystallized, massive limestone of the Willow Tree Creek deposits within the Devonian Tamworth Group.**Reserves:** Not known. Lease area covers 32 hectares.**Mining Method:** Open cut.**Treatment:** On-site primary crusher and hammer mill.**Production Capacity:** 64 tonnes per day of finished product.**Commencement:** 1979.**Production:** 1986/87 Limestone mined for agricultural use - 146 t, for building stone (terrazzo) use - 310 t.**Product Specification:** Calcium carbonate - 98.4%.Chemical Analysis (%)

Al ₂ O ₃	0.20
SiO ₂	0.50
Fe ₂ O ₃	0.14
CaO	52.50
MgO	0.23
LOI	44.80

Market: Local use - poultry feed and pH control in soil.**Employees:** June 1987 - 2 (intermittent working).**Historic Production:** 1979 to June 1987 - 1 766 t.**Comments:** Mine product (white and black marble) is one of easiest polishing marbles in New South Wales. Product is also suitable for use in glass lime manufacturing, coal mine stone dust and sand blasting.

ATTUNGA LIME PLANT

Commodity: Limestone.

Location: Attunga, 20 km northwest of Tamworth.

Owners: David Mitchell Ltd (50%), PO Box 486, Lilydale, VIC 3140. Ph (03) 735 0644. Telex AA35660. Fax (03) 735 4574, and Melcann Holdings Ltd (50%), PO Box 236, Footscray West, VIC 3012. Ph (03) 689 2444. Telex AA31169. Fax (03) 689 3620.

Operator: David Mitchell - Melcann Pty Ltd, PO Box 486 Lilydale, VIC 3140. Ph (03) 735 0644. Telex AA35660. Fax (03) 735 4574. Sales, Orders and Works - PO Box 468, Tamworth, NSW 2340. Ph (067) 69 5501, Telex AA63352. Fax (067) 69 5707.

Geology/Mineralization: Deposit consists of a massive grey and pink, largely coralline, limestone which is part of the Nemingha Limestone Member of the Devonian Tamworth Group.

Reserves: April 1988 Proved - 14 mt of high-grade extractable limestone.

Mining Method: Open cut.

Treatment: On-site vertical shaft kilns for calcining. Hydration plant. Crushing plant producing ground limestone.

Production Capacity: 250 000 tpa crushed.

Commencement: 1967.

Production: 1986/87 Limestone mined - 108 660 t.

Product Specification: Not available.

Market: 1986/87 Aggregate for roadmaking (37%), hydrated lime for water treatment plants and road stabilization (28%), ground limestone for neutralization in mineral processing (17%), agricultural limestone (10%), quicklime for road stabilization (8%).

Transport: Road.

Employees: June 1987 - 23.

Historic Production: From 1967 to June 1987 - not available.

Comments:

BUCKAROO QUARRY

Commodity: Limestone
(minor Dolomite).

Location: Mt Buckaroo, 8 km northeast of Mudgee.

Owner/Operator: Industrial Minerals Aust Pty Ltd, Level 4, 154 Pacific Highway, North Sydney, NSW 2060. Ph (02) 959 5788. Telex AA74369. Fax (02) 959 5801.

Geology/Mineralization: Compact to finely crystalline limestone of the Archer limestone deposit, a disconnected series of limestone deposits over a distance of 1 200 m with a maximum width of 160 m, which is part of the Devonian Boogledie Formation.

Reserves: Not calculated but resources are considerable.

Mining Method: Open cut.

Treatment: Plant for crushing and grinding located at Buckaroo.

Production Capacity: Moderate scale - dependant on market requirements.

Commencement: 1984.

Production: 1986/87 Limestone mined - 7 017 t. Dolomite mined - 229 t.

Product Specifications:LIMESTONE

Used in agriculture industry
as a soil additive

pH 9.5

CaCO₃ content 95%

Neutralising value of 96%

DOLOMITE

Used in agriculture industry
as a soil additive

pH 9.0

CaCO₃ content 63%

MgCO₃ content 35%

Neutralising value of 98%

Market: 1986/87 Limestone Colliery stonedust (44%), agricultural (29%), roadmaking (26%). Dolomite Agricultural.

Transport: Road.

Employees: June 1987 - 7.

Historic Production: From 1984 to June 1987 - 4 464 t.

Comments:

COW FLAT (A D C) QUARRY

Commodity: Limestone (Marble).

Location: Cow Flat, 18 km south of Bathurst.

Owner: Morrison Quarries Pty Ltd, PO Box 3, Wilberforce, NSW 2756.
Ph (045) 75 1918. Fax (045) 79 9497.

Operator: Australian Dolomite Co Pty Ltd (address as above).

Geology/Mineralization: Fine to coarse white marble of Cow Flat limestone deposits within Silurian metasediments of the Kildrummie Formation.

Reserves: April 1988 Proved reserves greater than 700 000 t.

Mining Method: Open cut.

Treatment: No on-site treatment. Limestone transported to Georges Plains for crushing.

Production Capacity: 5 000 tpa.

Commencement: 1961.

Production: 1986/87 Marble mined - 1 580 t.

Product Specification: High-grade limestone 97-98% CaCO₃.

Market: 1986/87 Exposed aggregate use in Melbourne (65%), Sydney (34%), and Canberra (1%).

Transport: Road.

Employees: June 1987 - 5.

Historic Production: From 1961 to June 1987 - not available.

Comments: April 1988 - Material is suitable for sophisticated filler, coating, and glass manufacturing markets. Operator is currently investigating production of white slab marble. Evidence of dolomite exists within leases; however further exploration drilling is required to quantify grades and reserves.

COW FLAT (L H MCGILL) QUARRY**Commodity:** Limestone (Marble).**Location:** Cow Flat, 20 km south of Bathurst.**Owners:** Omya Southern Pty Ltd, 6th Floor, Prudential Building, 53 Walker Street, North Sydney, NSW 2060. Ph (02) 959 4077. Telex AA26398. Fax (02) 929 0736, and L H McGill Pty Ltd, 4 McGill Street, Lewisham, NSW 2049. Ph (02) 569 1514.**Operator:** L H McGill Pty Ltd (address as above).**Geology/Mineralization:** Fine to coarse white marble of Cow Flat deposits within the Silurian Kildrummie Formation.**Reserves:** April 1988 Probable - 4 mt.**Mining Method:** Open cut. Conventional benching system by drilling and blasting.**Treatment:** No on-site treatment. Limestone is transported 24 km to Omya Southern Pty Ltd's plant at Bathurst, for crushing and milling.**Production Capacity:** 100 000 tpa.**Commencement:** 1981.**Production:** 1986/87 Marble mined - 91 520 t.**Product Specification:** Typical chemical analysis:

	<u>Percentage</u>
CaCO ₃	96.00
SiO ₂	0.70
Al ₂ O ₃	0.07
Fe ₂ O ₃	0.10

Market: Three major groups of products are produced at the Bathurst plant: (1) Limestone for industrial uses, including use as a filler or extender in the plastics, paint, rubber and paper industries and as a flux and filler in the glass industry (63%), (2) Limestone for agricultural purposes (35%). (3) Marble chips used for landscaping and the production of Terazzo surfaces (3%).**Transport:** Mainly road, also rail.**Employees:** June 1987 - 33.**Historic Production:** From 1981 to June 1987 - not available.**Comments:**

EXCELSIOR QUARRY**Commodity:** Limestone.**Location:** Excelsior Siding near Capertee, 49 km northwest of Lithgow.**Owner:** Hartley Pastoral Co Pty Ltd, PO Box 75, Chatswood, NSW 2067.
Ph (02) 412 2100.**Operator:** Hyrock Pty Ltd, PO Box 75, Cullen Bullen, NSW 2790.
Ph (063) 59 0180.**Geology/Mineralization:** Light to grey massive crystalline limestone of the Excelsior limestone deposit within a Devonian sequence of shale, limestone, calcareous sediments and volcanics.**Reserves:** 1985 Probable - 40 mt.**Mining Method:** Open cut.**Treatment:** On-site crushing plant.**Production Capacity:** 1 000 t per day.**Commencement:** 1981.**Production:** 1986/87 Limestone mined - 63 177 t.**Product Specification:** Road base to Department of Main Roads specifications. Colliery stone dust to Coal Mine Regulations Act standards. Agricultural lime to Department of Agriculture standards.Chemical Analysis (%)

CaO	54.6
MgO	0.52
Fe ₂ O ₃	0.3
Al ₂ O ₃	0.25
SiO ₂	0.5
Na ₂ O	0.05
K ₂ O	0.03
MnO	0.05
P ₂ O ₅	0.02
TiO ₂	0.02
LOI	43.6

Market: 1986/87 Roadmaking (48%), colliery stonedust - Western Coalfield (20%), agricultural (6%), concrete aggregate (3%), various uses - crushed rock (23%).**Transport:** Road to various destinations. Quarry adjoins railway.**Employees:** June 1987 - 8.**Historic Production:** From 1981 to June 1987 - not available.**Comments:** Mine life is unlimited at current production rates.

KANDOS QUARRY

Commodity: Limestone.

Location: Kandos, 43 km southeast of Mudgee.

Owner: Australian & Kandos Cement Holdings Ltd (a fully owned subsidiary of Cement Industries Pty Ltd), Kandos, NSW 2848. Ph (063) 79 4007. Fax (063) 79 4029.

Operator: Australian Cement Ltd (address as above).

Geology/Mineralization: Partly recrystallized and dolomitized limestone of the Cardwell Creek limestone deposit within the Devonian Kandos Formation. The deposit contains considerable interbedded sandstone and calcareous shales.

Reserves: April 1988 Proved - 24 mt.

Mining Method: Open cut.

Treatment: On-site crushing plant.

Production Capacity: 600 000 tpa.

Commencement: 1916.

Production: 1986/87 Limestone mined - 606 132 t.

Product Specification: Feed cement plant maintained at approximately 80% CaCO₃.

Market: Cement manufacture at Company's plant at Kandos.

Transport: 6.5 km ropeway from quarry to cement works at Kandos.

Employees: June 1987 - 22.

Historic Production: From 1916 to June 1987 - approximately 20 mt.

Comments: Second largest limestone quarry in New South Wales after Marulan Quarry. Supplies raw material for about 40% of State's cement production.

MARULAN WORKS

Commodity: Limestone.

Location: Marulan South, 28 km east of Goulburn.

Owner/Operator: Blue Circle Southern Cement Ltd, Box 1571 GPO, Sydney, NSW 2001. Ph (02) 929 0200. Telex AA22466. Fax (02) 929 4520. Mine-PO Marulan South, NSW 2579. Ph (048) 41 1645. Telex AA62487. Fax (048) 41 1617.

Geology/Mineralization: Lease areas cover the "Eastern Limestone Member" of the Silurian Bungonia Limestone. The limestone varies from being relatively fine grained in the area of the southern leases to being coarsely recrystallized in the area of the northern leases.

Reserves: Recoverable resources were estimated in 1979 to be between approximately 200 mt and 340 mt depending on such factors as future cement prices, changes in operating costs, and environmental constraints.

Mining Method: Open cut.

Treatment: On-site plant for crushing, grinding and calcining (for lime production).

Production Capacity: 2.5 mtpa.

Commencement: Deposit first worked for lime production in 1875. Current operations - 1929.

Production: 1986/87 Limestone mined - 2.49 mt.

Product Specification: Predominantly a high-grade limestone containing more than 95% CaCO₃.

Market: 1986/87 Cement manufacture at company's plant, Berrima (63%), iron & steel manufacture, Port Kembla (29%), lime manufacture at company's plant, Marulan South (8%).

Transport: Rail to Berrima cement plant (57 km). Rail to Port Kembla.

Employees: June 1987 - 165.

Historic Production: From July 1975 to June 1987 (current quarry configuration) - 28.5 mt.

Comments: Marulan Quarry is the largest quarry of its type in Australia and is the most important source of limestone for cement in New South Wales, as well as being an important source of limestone for steel making at Port Kembla.

PORTLAND WORKS

Commodity: Limestone.

Location: Portland, 22 km northwest of Lithgow.

Owner/Operator: Blue Circle Southern Cement Ltd, Box 1571 GPO, Sydney, NSW 2001. Ph (02) 929 0200. Telex AA22466. Fax (02) 929 4520. Mine - PO Box 57, Portland, NSW 2847. Ph (063) 55 5000. Telex AA22728. Fax (063) 55 5796.

Geology/Mineralization: Largely grey, massive, and finely crystalline limestone of the Portland limestone deposit within a sequence of quartzite, mudstone and conglomerate of probable Silurian age.

Reserves: 1981 Indicated resource - 15 mt.

Mining Method: Open cut.

Treatment: On-site crushing and grinding.

Production Capacity: 90 000 tpa.

Commencement: First worked in 1898. Current operations - 1902.

Production: 1986/87 Limestone mined - 106 062 t.

Product Specification: Predominantly a high-grade limestone containing more than 85% CaCO₃.

Market: 1986/87 Cement manufacture - Portland cement works. Aggregate - Sydney (<1%).

Employees: June 1987 - 8.

Historic Production: From 1902 to June 1987 - not available.

Comments: First limestone deposit quarried on a large scale in Australia.

SHERWOOD LIME PLANT (YESSABAH LIMESTONE QUARRY)

Commodity: Limestone.

Location: Sherwood, 15 km west of Kempsey.

Owners: David Mitchell Ltd (50%), PO Box 486, Lilydale, VIC 3140.
Ph (03) 735 0644. Telex AA35660. Fax (03) 735 4574, and Melcann Holdings Ltd (50%), PO Box 236, Footscray West, VIC 3012.
Ph (03) 689 2444. Telex AA31169. Fax (03) 689 3620.

Operator: David Mitchell - Melcann Pty Ltd, PO Box 486, Lilydale, VIC 3140. Ph (03) 735 0644. Telex AA35660. Fax (03) 735 4574. Sales, Orders and Works - PO Box 468, Tamworth, NSW 2340. Ph (067) 69 5501. Telex AA63352. Fax (067) 69 5707.

Geology/Mineralization: Massive pink or white, mainly crinoidal limestone of the Early Permian Yessabah Limestone.

Reserves: April 1988 Proved - 7.5 mt of high-grade extractable limestone.

Mining Method: Open cut.

Treatment: On-site crushing plant.

Production Capacity: 100 000 tpa.

Commencement: 1927.

Production: 1986/87 Limestone mined - 15 576 t.

Product Specification: CaCO₃ - approx 95%
MgCO₃ - approx 2%

Market: 1986/87 Agricultural (88%), roadmaking (8%), lead-zinc smelter flux (4%).

Transport: Road.

Employees: June 1987 - 3.

Historic Production: From 1927 to June 1987 - not available.

Comments:

TABULAM LIME PLANT

Commodity: Limestone.

Location: Tabulam, 55 km west of Casino.

Owners: David Mitchell Ltd (50%), PO Box 486, Lilydale, VIC 3140. Ph (03) 735 0644. Telex AA35660. Fax (03) 735 4574, and Melcann Holdings Ltd (50%), PO Box 236, Footscray West, VIC 3012. Ph (03) 689 2444. Telex AA31169. Fax (03) 689 3620.

Operator: David Mitchell - Melcann Pty Ltd, PO Box 486, Lilydale, VIC 3140. Ph (03) 735 0644. Telex AA35660. Fax (03) 735 4574. Sales, Orders and Works - PO Box 468, Tamworth, NSW 2340. Ph (067) 69 5501. Telex AA63352. Fax (067) 69 5707.

Geology/Mineralization: Lease area is located within the central deposit of the Tabulam limestone deposit, a series of early Permian limestone lenses within the Permo-Carboniferous Emu Creek Formation. The limestone within this central deposit varies from a coarsely crystalline compact white marble to a finely crystalline grey limestone.

Reserves: Not available.

Mining Method: Open cut.

Treatment: On-site crushing plant.

Production Capacity: Not available.

Commencement: 1952.

Production: 1986/87 Limestone mined - 1 812 t.

Product Specification: Not available.

Market: 1986/87 Local agriculture.

Employees: June 1987 - 1.

Historic Production: 1927 to June 1987 - not available.

Comments:

WOMBEGAN QUARRY

Commodity: Limestone.

Location: Wombeyan Caves, 17 km northeast of Taralga.

Owner/Operator: Omya Southern Pty Ltd, 6th Floor, Prudential Building, 53 Walker Street, North Sydney, NSW 2060. Ph (02) 959 4077. Telex AA26398. Fax (02) 929 0736. Mine - PO Box 9, Moss Vale, NSW 2577. Ph (048) 68 1666. Telex AA72836. Fax (048) 68 3413.

Geology/Mineralization: Largely grey to white marble of the Wombeyan Limestone which is probably a lower unit of the Silurian Taralga Group.

Reserves: April 1988 Proved - 11 mt. Probable - 30 mt.

Mining Method: Open cut.

Treatment: On-site crushing and screening plant. Milling plant at Moss Vale.

Production Capacity: 120 000 tpa.

Commencement: 1937.

Production: 1986/87 Limestone mined - 51 026 t.

Product Specification: CaCO₃ > 98%
Fe₂O₃ < 0.1%
Silica < 0.3%

Market: 1986/87 Building products (mortars, tiles etc) 30%, Paper industry 24%, Plastics industry 20%, Surface coatings (mainly paint) 16%, Glass manufacture 10%.

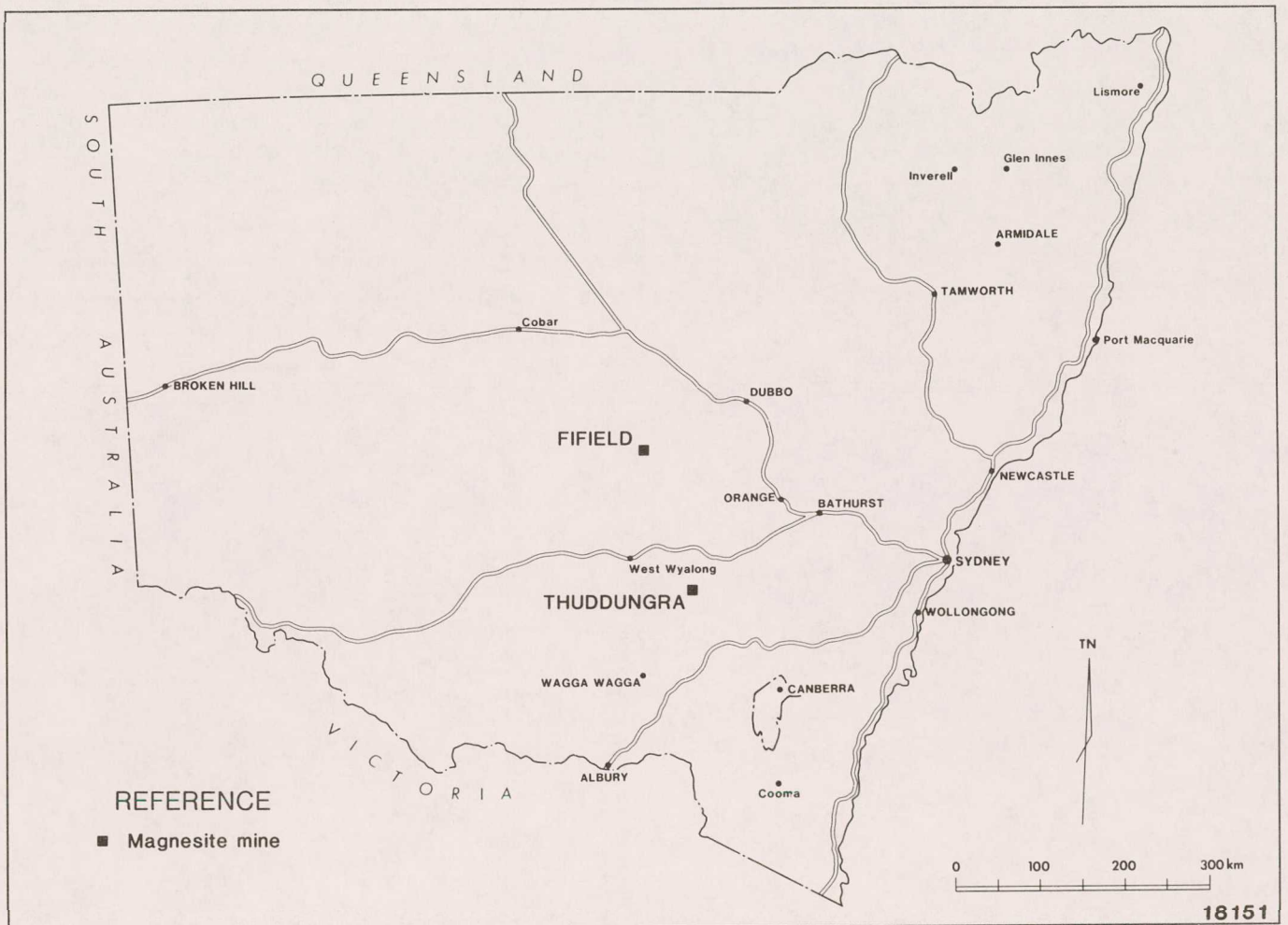
Transport: 80 km by road to Moss Vale plant.

Employees: June 1987 - 8.

Historic Production: From 1937 to June 1987 - not available.

Comments:

MAGNESITE MINES



FIFIELD MINE

Commodity: Magnesite.

Location: Fifield, 46 km northeast of Condobolin.

Owner: Devex Ltd (trading as Causmag International), PO Box 438, Young, NSW 2594. Ph (063) 82 1177. Telex AA62627. Fax (063) 82 4176.

Operator: Young Mining Co Pty Ltd (address as above).

Geology/Mineralization: Magnesite in the Fifield area occurs in nodular and concretionary form as pockets of boulders, nodules, or veins in a decomposed ultrabasic rock. Generally it occurs under overburden of 1 m to 3 m and extends to a depth of not more than 10 m.

Reserves: September 1987 An inferred resource of approximately 400 000 t of high-silica, high-lime magnesite ore. Additional magnesite believed to be present. Resource generally not suited for current production.

Mining Method: Open cut, using three 20 t payload earth movers.

Treatment: On-site vertical shaft kiln producing dead-burned magnesite. Ore is hand sorted prior to calcining.

Production Capacity: 10 000 tpa of dead-burned magnesite.

Commencement: Fifield magnesite deposits were first worked in 1907. Current operations began in 1977.

Production: 1986/87 Magnesite mined - 4 229 t. Magnesite processed - 4 132 t. Processed magnesite produced for calcining - 2 130 t.

Product Specification: Various grades of dead-burned magnesite are produced.

Market: 1986/87 Local refractory manufacturers and Japan.

Transport: Road.

Employees: May 1987 Mine - 3 (intermittent working), kiln - 24.

Historic Production: From 1907 to 1987 over 1 million tonnes of magnesite have been mined. Current operations from 1977 to June 1987 - not available.

Comments: Mine was purchased from Heat Containment Industries Pty Ltd in December, 1985. On-site kiln also used to calcine processed magnesite from company's Thuddungra Mine (14 078 t forwarded in 1986/87).

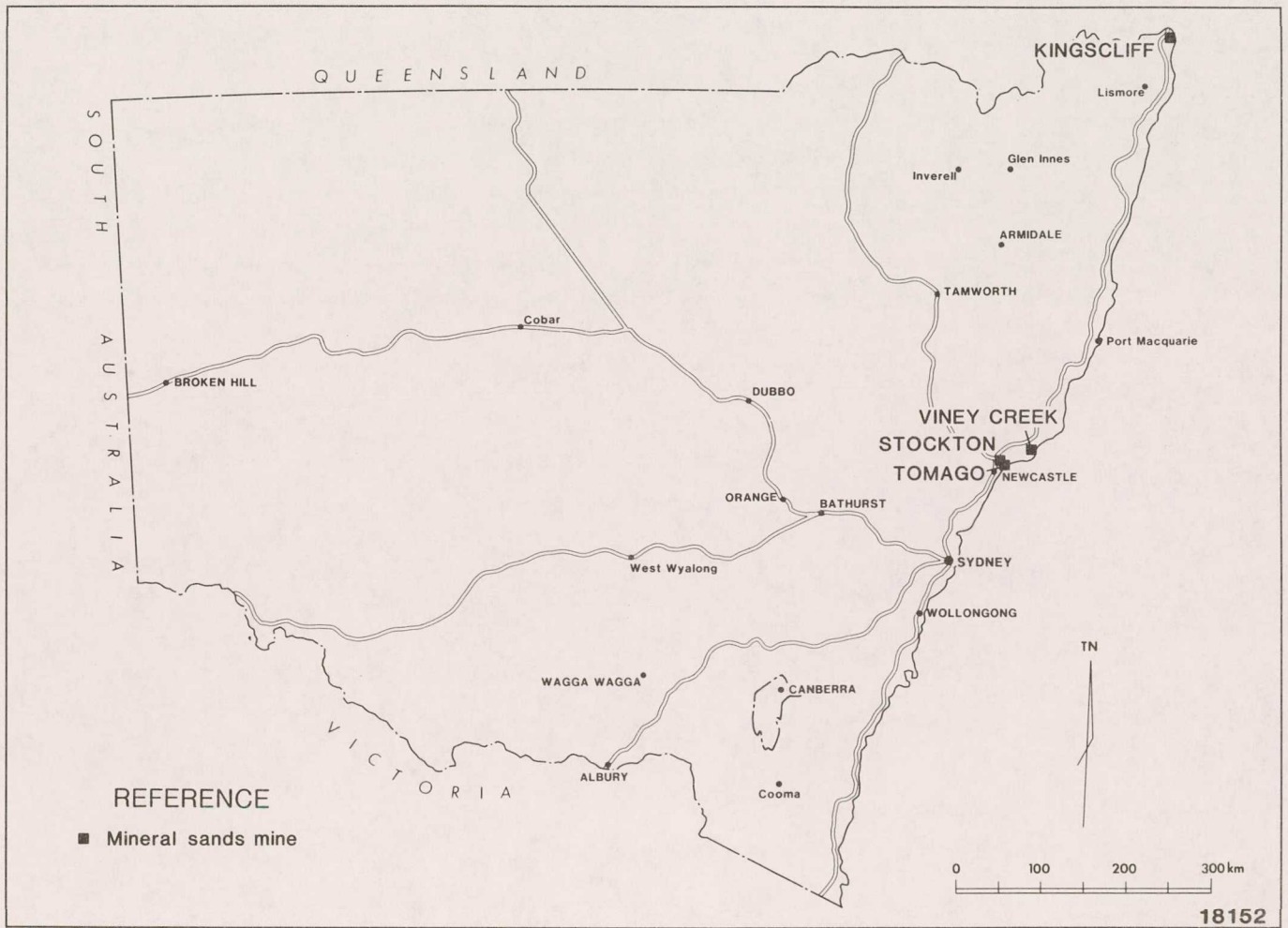
THUDDUNGRA MINE**Commodity:** Magnesite.**Location:** Thuddungra, 28 km northwest of Young.**Owner:** Devex Ltd (trading as Causmag International), PO Box 438, Young, NSW 2594. Ph (063) 82 1177. Telex AA62627. Fax (063) 82 4176.**Operator:** Young Mining Co Pty Ltd (address as above).**Geology/Mineralization:** An isolated mass of serpentinite, metagabbro and amphibolite has been extensively altered to veins and nodules of magnesite. The mineable horizon varies from 2 m to 10 m in thickness and contains 30% to 60% magnesite. It is buried by 12 m of soil and alluvium.**Reserves:** January 1986 Proved - 5.9 mt averaging 55% magnesite, equivalent to 1.8 mt of MgO.**Mining Method:** Open cut.**Treatment:** On-site screening, sorting, and crushing producing several grades of magnesite. Ore is transported by truck to the company's milling and calcining plants at Young and Fifield.**Production Capacity:** Young calcining plant - 11 000 tpa of caustic-calcined magnesite.**Commencement:** First workings - 1935. Current operations by founder of Company (V Guiliano) commenced in 1949.**Production:** 1986/87 Magnesite mined - 42 454 t. Magnesite processed - 38 932 t. Processed magnesite produced for calcining - 26 393 t (12 315 t despatched to Young plant, 14 078 t to Fifield plant).**Product Specification:** The characteristics of the caustic-calcined magnesite used for industrial and agricultural purposes include:

- * very high MgO content with correspondingly low impurity levels.
- * consistent chemical and physical properties.
- * high chemical reactivity.
- * high bulk density.

The product is available in a range of particle sizes to suit customer requirements.

Market: 1986/87 Caustic-calcined magnesite is used for agricultural and industrial purposes in Australia and is exported to New Zealand and Southeast Asia.**Transport:** Road to Young plant. Rail and road to markets.**Employees:** April 1988 Mine - 31, kiln and office - 32.**Historic Production:** From 1935 to June 1987 - not available.**Comments:** A second kiln is on order for Young which will allow production to be increased by 40%.

MINERAL SANDS MINES



KINGSCLIFF CONCENTRATION PLANT

Commodity: Rutile, Zircon, Ilmenite, Monazite.

Location: Sutherland Point near Kingscliff, 11 km south of Tweed Heads.

Owner/Operator: Currumbin Minerals Pty Ltd, PO Box 31, Currumbin, QLD 4223. Ph (075) 34 7255. Telex AA40451. Fax (075) 34 7591.

Geology/Mineralization: Heavy mineral concentrations occur within Holocene marine and aeolian sands.

Reserves: 1983 Inferred resource - 30 000 t of combined rutile and zircon.

Mining Method: Cutter-suction floating dredge delivers sand and water slurry to floating gravity concentration plant.

Treatment: Crude mixed concentrate is trucked 20 km north to the Company's dry separation plant at Currumbin, Queensland.

Production Capacity: Concentration plant throughput capacity - 200 tph.

Commencement: Site first worked in 1947. Current operations - 1979.

Production: 1986/87 - Crude mixed concentrate produced and treated in dry separation plant - 4 178 t.

Product Specifications: Currumbin plant produces rutile and zircon as both sand and flour in both standard and premium grades.

Market: Zircon Local 9%, Export 91%. Rutile Local 2%, Export 98%. Ilmenite Local. Monazite No sales. Zircon and rutile export markets include New Zealand and twenty-two countries in Asia, North America, South America and Europe.

Transport: Exports shipped through Brisbane and Sydney.

Employees: June 1987 - 8.

Historic Production: From 1979 to June 1987 - not available.

Comments:

STOCKTON CONCENTRATION PLANT

Commodities: Rutile, Zircon, Ilmenite, Monazite.

Location: Stockton, 14 km northeast of Newcastle.

Owner: The Broken Hill Proprietary Co Ltd, GPO Box 86A, Melbourne, VIC 3001. Ph (03) 609 3333. Telex AA30408. Fax (03) 609 3015.

Operator: Mineral Deposits Ltd, PO Box 5044, Gold Coast Mail Exchange, QLD 4215. Ph (075) 39 9055. Telex AA40438. Fax (075) 39 9863.

Geology/Mineralization: Holocene marine and aeolian sands with heavy mineral content varying from 0.3% to 0.8%.

Reserves: April 1988 Sufficient reserves in the overall deposit for in excess of 10 years production.

Mining Method: Cutter-suction floating dredge delivering sand and water slurry to floating gravity concentration plant.

Treatment: Concentrate is forwarded to separation plant at Hawks Nest, 50 km northeast of Newcastle.

Production Capacity: Stockton Concentration plant - 550 tonnes per hour.

Commencement: Production commenced in 1985. Full production was achieved in 1987/88.

Production: 1986/87 Crude mixed concentrate produced by Stockton and Viney Creek concentration plants - 38 601 t. Crude mixed concentrate treated at Hawks Nest separation plant - not available. Concentrates produced - Rutile concentrate 13 648 t (95% rutile), Zircon concentrate 12 186 t (99% zircon), Ilmenite concentrate 9 895 t (45% ilmenite), Monazite concentrate 300 t (90% monazite).

Product Specifications: Zircon - Two grades are produced - Premium grade 66% ZrO₂ (max Fe₂O₃ 0.05%) and standard grade 65% ZrO₂ (max Fe₂O₃ 0.3%). Rutile - Minimum 95% TiO₂ and maximum 1.0% ZrO₂ and 0.05% Fe₂O₃.

Market: 1986/87 Zircon Sydney 41%, Newcastle 6%, Melbourne 3%, Japan 23%, United Kingdom 23%. Rutile Sydney 70%, Melbourne 5%, Thailand 9%, Japan 6%, Pakistan 5%, Taiwan 5%. Ilmenite - Newcastle and local. Monazite - France.

Transport: Road to dry mill at Hawks Nest. Road to Newcastle for export.

Employees: June 1987 - 150 (including Viney Creek and Hawks Nest operations).

Historic Production: From 1985 to June 1987 (including Viney Creek concentration plant) - 63 552 t of crude mixed concentrate.

Comments:

TOMAGO CONCENTRATION PLANTS

Commodity: Rutile, Zircon, Ilmenite, Monazite.

Location: Tomago, 15 km north of Newcastle.

Owners: Peko-Wallsend Ltd (50%), PO Box R211 Royal Exchange, NSW 2000. Ph (02) 250 1100. Telex AA121107. Fax (02) 251 1558, and Coffs Harbour Rutile NL (50%), 8th Floor, FCA House, 50 Margaret Street, Sydney, NSW 2000. Ph (02) 29 2521. Telex AA121340. Fax (02) 290 2287.

Operator: R Z Mines (Newcastle) Pty Ltd, Private Bag 32, Newcastle Mail Exchange, NSW 2301. Ph (049) 64 8081. Telex AA28318. Fax (02) 66 5492.

Geology/Mineralization: Heavy mineral concentrations occur both as stratiform beach leads and as low-grade uniformly distributed mineralization within aeolian dunes composing the Pleistocene Tomago sand beds.

Reserves: Not available.

Mining Method: Hydraulic suction dredges deliver sand and water slurry to four gravity concentration plants (one floating, three land based) which extract the heavy minerals by means of slurries and spiral concentrators.

Treatment: Crude mixed concentrate from the four concentrating plants is trucked approximately 20 km to the Company's dry separation plant at Tomago.

Production Capacity: Throughput capacities of concentrating plants - two at 300 tph, one at 400 tph and one at 250 tph.

Commencement: 1967.

Production: 1986/87 Crude mixed concentrates produced - 100 636 t. Crude mixed concentrates treated in dry separation plant - 99 381. Concentrates produced - Rutile concentrate 36 021 t (96% rutile), Zircon concentrate 35 867 t (66% ZrO₂), Ilmenite concentrate 9 182 t (47% ilmenite), Monazite concentrate 246 t (90% monazite).

Product Specification: Rutile - sand and flour, premium grade only. Zircon - sand and flour, two premium grades. Premium A grade 66% ZrO₂ (max Fe₂O₃ 0.05%). Premium B grade 66% ZrO₂ (max Fe₂O₃ 0.3%).

Market: 1986/87

	<u>Australia</u>	<u>Europe</u>	<u>Asia</u>	<u>Americas</u>	<u>Middle East</u>
Rutile	10%	30%	13%	40%	7%
Zircon	29%	26%	40%	3%	2%
Monazite		100%			
Ilmenite	90%	10%			

Transport: Exports through Ports of Newcastle and Sydney.

Employees: June 1987 - 251.

Historic Production: From 1967 to June 1987 - Rutile 782 000 t, Zircon 900 000 t.

Comments: A fifth concentration plant at Failford, south of Taree, is now in production producing approximately 5/6 000 tpa of crude mixed concentrate which is trucked to the Company's Tomago dry separation plant.

VINEY CREEK CONCENTRATION PLANT

Commodities: Rutile, Zircon, Ilmenite, Monazite.

Location: Deposit extends 4 to 14 km northeast of Tea Gardens.

Owner: The Broken Hill Proprietary Co Ltd, GPO Box 86A, Melbourne, VIC 3001. Ph (03) 609 3333. Telex AA30408. Fax (03) 609 3015.

Operator: Mineral Deposits Ltd, Box 5044, Gold Coast Mail Exchange, QLD 4215. Ph (075) 39 9055. Telex AA40438. Fax (075) 39 9863. Plant - Private Mail Bag No 1, Tea Gardens, NSW 2324. Ph (049) 97 0288. Telex AA28145. Fax (049) 97 0786.

Geology/Mineralization: Pleistocene marine and aeolian sands. Essentially the orebody as defined by exploration consists of two linear mineralized zones connected at the northern end by a further zone of mineralization. The eastern zone is up to 800 m wide and 10 km long and the western zone up to 400 m wide and at least 6 km long.

Reserves: April 1988 Sufficient reserves in the deposit for 8-10 years of mining.

Mining Method: Cutter-suction floating dredge delivering sand and water slurry to floating gravity concentration plant which extracts the heavy minerals by means of slurries, cones, and spirals.

Treatment: Crude mixed concentrate is forwarded to separation plant at Hawks Nest, 4 km south of the lease area.

Production Capacity: 1 700 tonnes per hour.

Commencement: Area first worked in 1960's. Current operations - December 1986.

Production: 1986/87 See Stockton Concentration Plant data sheet for combined production figures. Separate figures for Viney Creek crude mixed production unavailable.

Product Specifications:)

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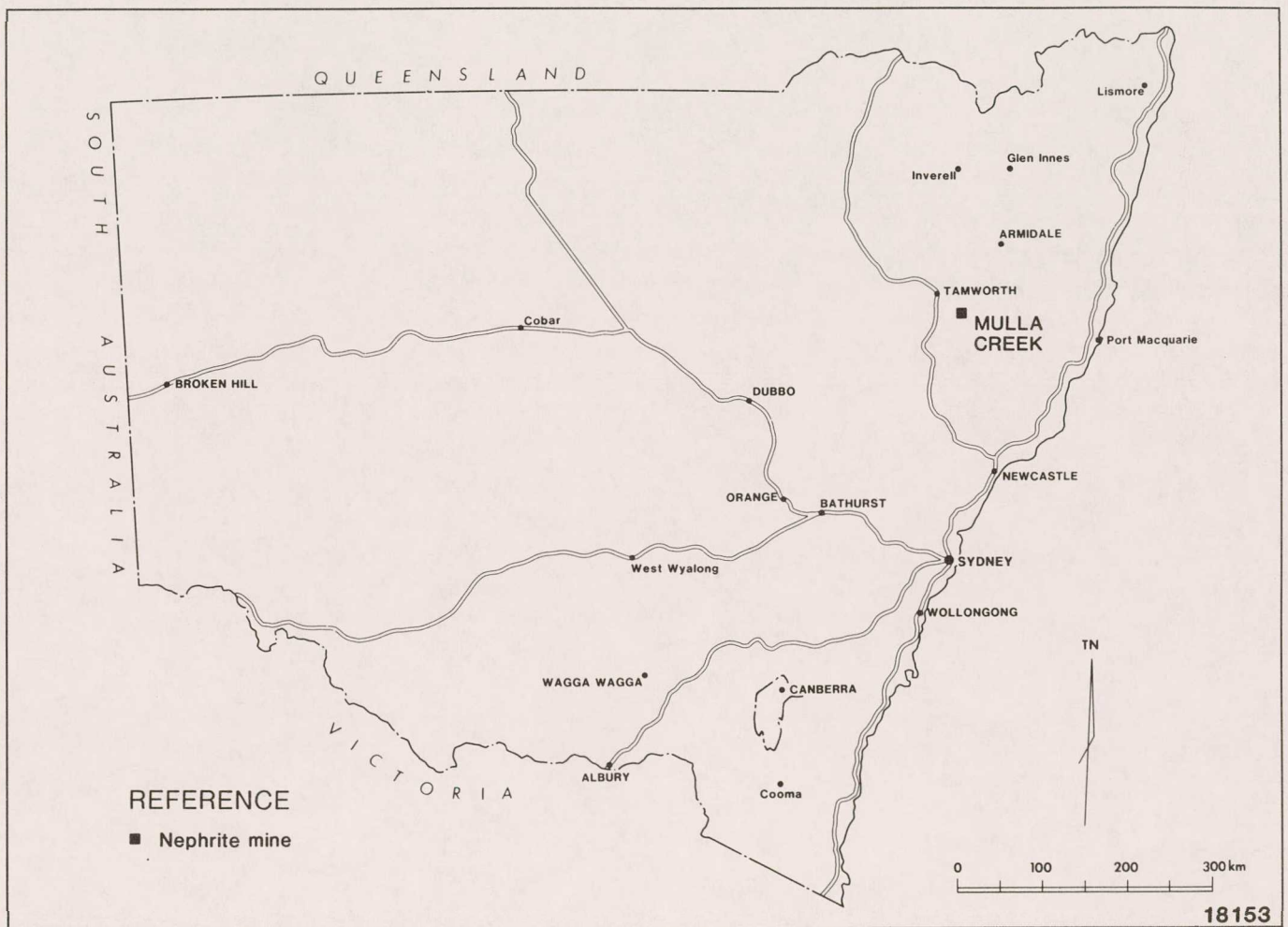
Market:) See Stockton Concentration Plant

)

Employees:)

Comments: A 200 tph concentration plant operated for 5 months in the first half of 1988 on a small ore body, "The Baskets" at Hawks Nest, prior to being re-located to Viney Creek where it is now operating in support to the 1 700 tph plant.

NEPHRITE MINES



MULLA CREEK MINE

Commodity: Nephrite (Jade).

Location: Mulla Creek near Dungowan, 34 km southeast of Tamworth.

Owner: H R & L B Pitt, "Rywang", Kootingal, NSW 2352.
Ph (067) 69 2342.

Operator: Tamworth Nephrite Jade Co, "Ulallie", Dungowan, NSW 2340.
Ph (067) 69 2333.

Geology: Nephrite occurs as steeply dipping elongate pods, approximately 0.3 m in thickness, associated with a sheared contact between serpentine and Devonian-Carboniferous chert.

Mineralization: Nephrite varies in colour from a very pale to a deep spinach-green.

Reserves: April 1988 Inferred resource - several tonnes.

Mining Method: Small open cut.

Treatment: Material cut to size with diamond saws.

Production Capacity: Up to 150 kg per annum.

Commencement: 1976.

Production: 1986/87 Nephrite won - 10 kg.

Product Specification: Carving and gem grades.

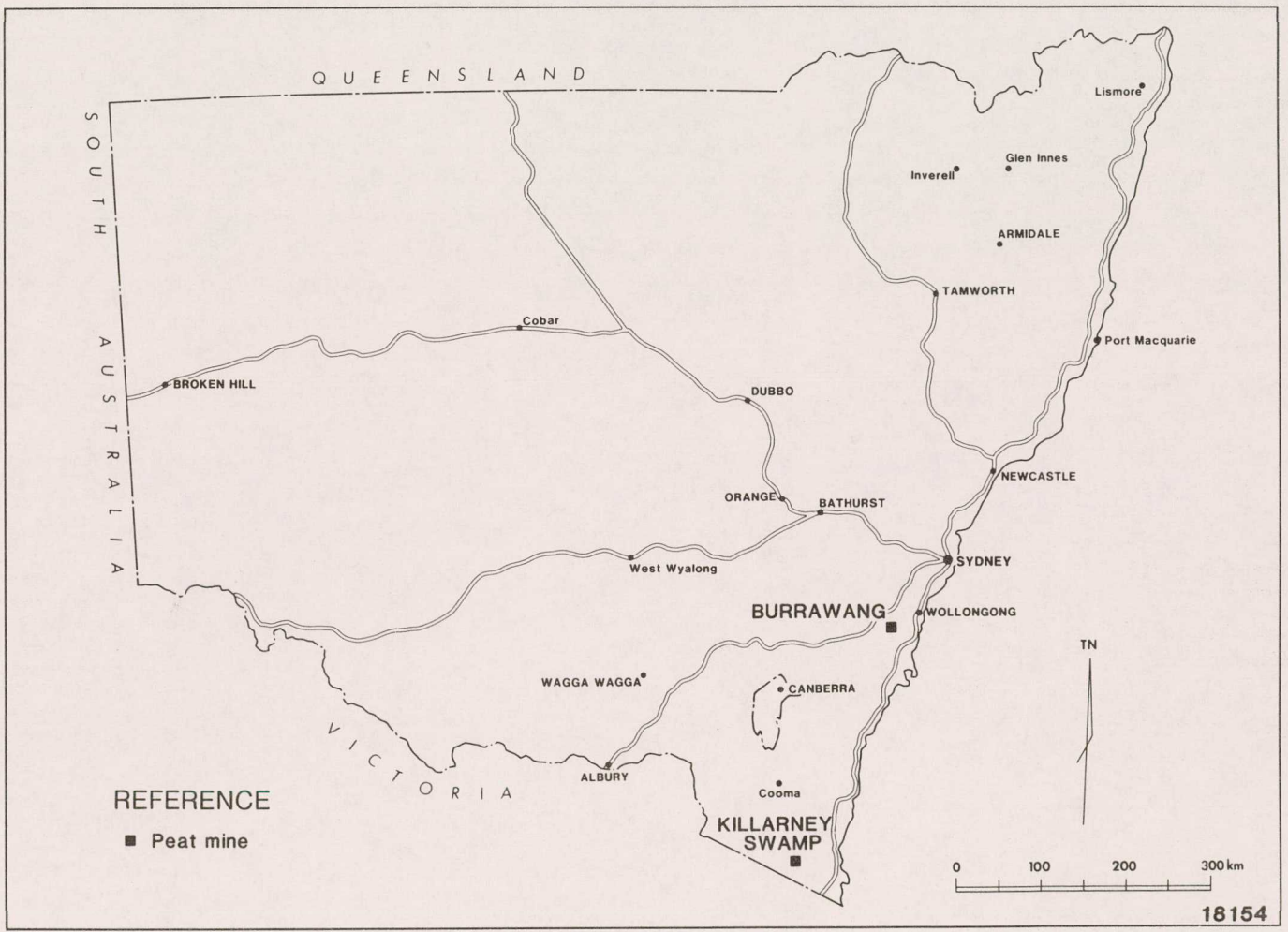
Market: 1986/87 Individual buyers.

Employees: June 1987 - 3 (intermittent working).

Historic Production: From 1976 to June 1987 - 400 kg.

Comments:

PEAT MINES



BURRAWANG (WINGECARRIBEE SWAMP) DEPOSIT**Commodity:** Peat.**Location:** Wingecarribee Swamp near Burrawang, 14 km east of Moss Vale.**Owner:** Arthur Yates & Co Pty Ltd (a fully owned subsidiary of Cheetham Ltd), PO Box 72, Revesby, NSW 2212. Ph (02) 771 2911. Telex AA121223. Fax (02) 774 5659.**Operator:** Burrawang Enterprises Pty Ltd (address as above).**Geology:** Holocene deposit of reed-sedge peat in Wingecarribee Swamp which measures approximately 8 km by 1 km and contains peat to a depth of over 6 m. Quality of the peat within the swamp varies from moderate (some fibre present, often silty or clayey) to very good (very high fibre content, negligible sediment).**Reserves:** April 1988 Proved - 19 million m³ (equivalent to approximately 8.4 mt).**Mining Method:** Dragline.**Treatment:** Peat is treated on a belt filter to remove water prior to being laid out for air drying.**Production Capacity:** 20 000 m³ per annum (equivalent to 8 860 tpa).**Commencement:** 1971.**Production:** 1986/87 Peat mined and milled - 3 472 t.**Product Specification:**

pH	5.0
Total Soluble Salts (ppm)	Nil
Biopsy	Good
Moisture content by weight	82%
Waterholding capacity (by volume)	54%
Aeration porosity (by volume)	27%

Market: 1986/87 Australian nursery garden industry.**Transport:** Road.**Employees:** June 1987 - 5.**Historic Production:** From 1971 to June 1987 - not available.**Comments:**

KILLARNEY SWAMP DEPOSIT**Commodity:** Peat.**Location:** Killarney Swamp, 15 km southeast of Bombala.**Owner/Operator:** Killarney Peat Pty Ltd, 358 Castlereagh Road, Castlereagh, NSW 2750. Ph (047) 29 0596. Fax (047) 29 0634. Mine - PO Box 21, Bega, NSW 2550. Ph (064) 92 1477. Fax (064) 92 1062.**Geology:** Holocene deposit of reed-sedge peat in Killarney Swamp which measures 4 km in length and up to 1 km in width. Maximum depth of the peat is in excess of 4.5 m. Quality of the peat within the swamp varies from moderate (some fibre present, often silty or clayey) to very good (very high fibre content, negligible sediment).**Reserves:** Very large resources - sufficient to support Australian market needs for at least the next 50 years.**Mining Method:** Peat is dug from the deposit by a dredge utilizing a 30 cm cutter which delivers a peat slurry to the treatment plant.**Treatment:** On-site plant for water removal and milling of the peat to reduce the fibre length to the desired range. Water removal is initially by belt filter. Part of the peat is then placed in a dryer, utilizing continuous microwave emission.**Production Capacity:** 16 000 m³ per annum (equivalent to 4 800 tpa).**Commencement:** 1983.**Production:** 1986/87 Peat mined - 990 t. Peat milled - 905 t.**Product Specification:** High fibre peat:Chemical Analysis (Parts per million)

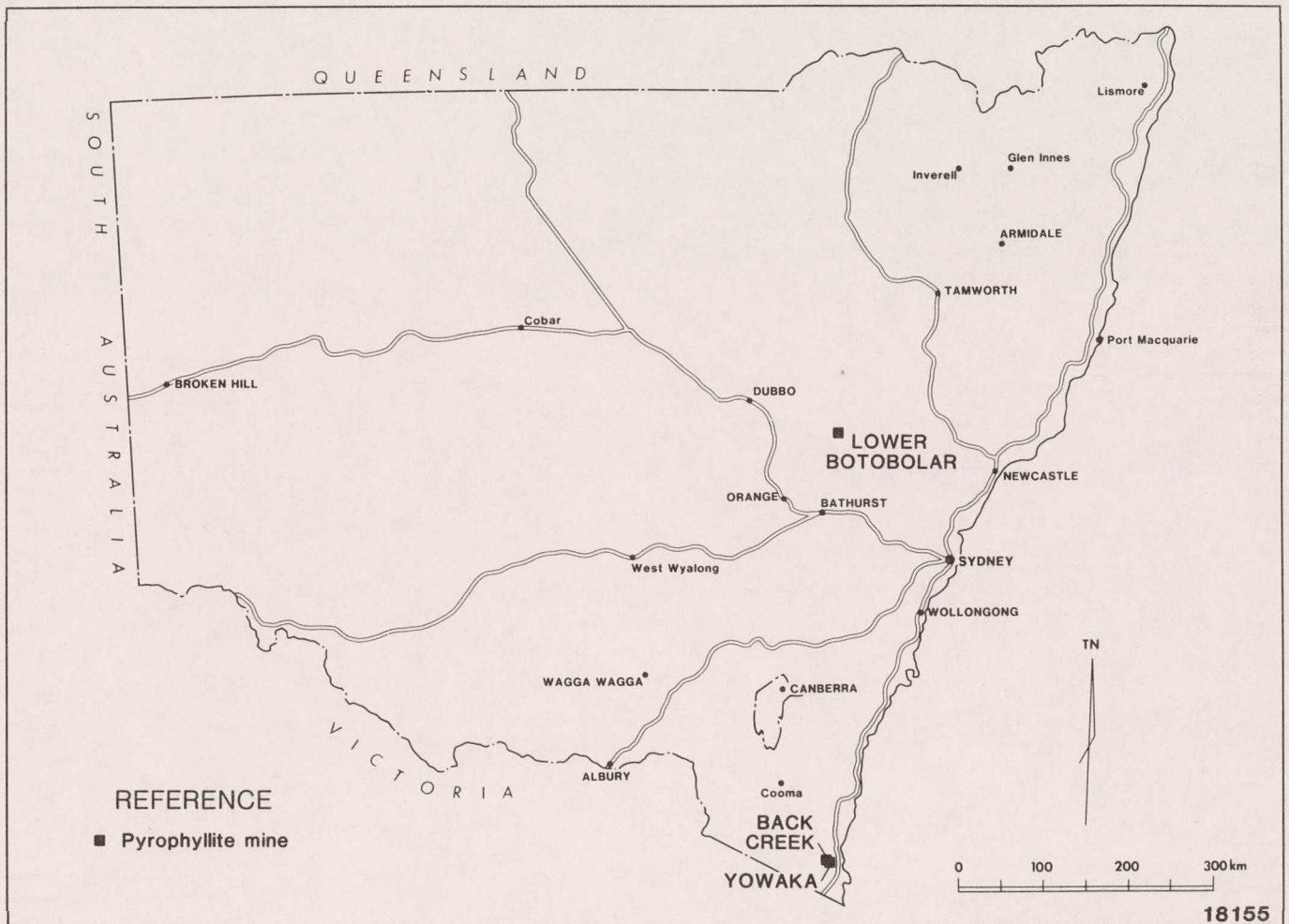
Na	69	(Soluble - 37)	N as NH ₄	23
K	109	(Soluble - 16)	N as NO ₃	6
Ca	3 760	(Soluble - 67)	S	105
Mg	464	(Soluble - 20)	Fe	52
Chlorides	12		Zinc	7
P	32			

Physical Analysis (%)

Moisture content	57.3	Organic matter	33.8
Ash content	8.4	Fibre content	82.1

Market: 1986/87 Most of the milled peat is marketed through an associated company - AMG Horticulture Pty Ltd, Castlereagh, and is available in bulk or bales.**Transport:** Road to Castlereagh (near Sydney).**Employees:** June 1987 - 6.**Historic Production:** From 1983 to June 1987 - 2 753 t of peat mined.**Comments:**

PYROPHYLLITE MINES



BACK CREEK MINE**Commodity:** Pyrophyllite.**Location:** Lochiel, 10 km southwest of Pambula.**Owner:** Commercial Minerals Ltd, PO Box 173, Granville, NSW 2142.
Ph (02) 637 7444. Telex AA26226. Fax (02) 682 3626.**Operator:** Pyrophyllite Corporation Pty Ltd (address as above).**Geology:** The Back Creek pyrophyllite deposit occurs as a lenticular, elongate and near-vertical body within a rhyolitic breccia which forms part of the Devonian Boyd Volcanic Complex. It was formed by hydrothermal alteration.**Mineralization:** The pattern of alteration appears zoned with a central core of chloritic pyrophyllite surrounded by imperfectly segregated zones of chalcedonic pyrophyllite and sericitic pyrophyllite which grade into unaltered host rock.**Reserves:** 1976 - Proved - 8 mt of variable grades, including 200 000 t of high-grade pyrophyllite suitable for use as mineral filler. Inferred resource - 18 mt.**Mining Method:** Open cut. The steep nature of the terrain necessitates a considerable amount of benching.**Treatment:** On-site plant for crushing, screening and blending ore from three quarry sites within the lease area.**Production Capacity:** 25 000 tpa.**Commencement:** First workings - 1941. Current operations - 1972.**Production:** 1986/87 Pyrophyllite mined and treated - 11 749 t.**Product Specifications:**

<u>Raw Material</u>	<u>Typical Grade</u>	<u>Product Code</u>	<u>Application</u>
Chloritic pyrophyllite	Al ₂ O ₃ 15%	PPRG	Mineral fillers
Chalcedonic pyrophyllite	Al ₂ O ₃ 11.4%	PPR-L	Contact refractories

Market: 1986/87 Contact refractory use, Newcastle, 50%. Aggregate 46%.**Transport:** Road to markets within New South Wales and interstate.**Employees:** June 1987 - 2.**Historic Production:** From 1972 to June 1987 - not available.**Comments:**

LOWER BOTOBOLAR MINE

Commodities: Pyrophyllite, Sericite (mica).

Location: Lower Botobolar, 17 km northeast of Mudgee.

Owner/Operator: Industrial Minerals Aust Pty Ltd, Level 4, 154 Pacific Highway, North Sydney, NSW 2060. Ph (02) 959 5788. Telex AA74369. Fax (02) 959 5801.

Geology: The Lower Botobolar pyrophyllite deposit occurs within an area of sheared Ordovician sediments and volcanics.

Mineralization: Pyrophyllite with varying amounts of quartz and sericite. In many parts of the deposit the material is composed mainly of sericite and quartz, with little or no pyrophyllite present.

Reserves: Undefined.

Mining Method: Open cut. Deposit was originally worked from shafts.

Treatment: No on-site treatment. Crushing and milling is at company's multi-purpose plant at Buckaroo, near Mudgee.

Production Capacity: Small-scale production dependent on market requirements.

Commencement: Original workings - 1941. Current operations - 1978.

Production: 1986/87 Ore mined and milled - 185 t.

Product Specification: Free silica - maximum 5%.

Market: 1986/87 Sydney - primarily used as a filler.

Transport: Road to Sydney.

Employees: June 1987 - 2 (intermittent working).

Historic Production: From 1978 to June 1987 - Approx 20 000 t.

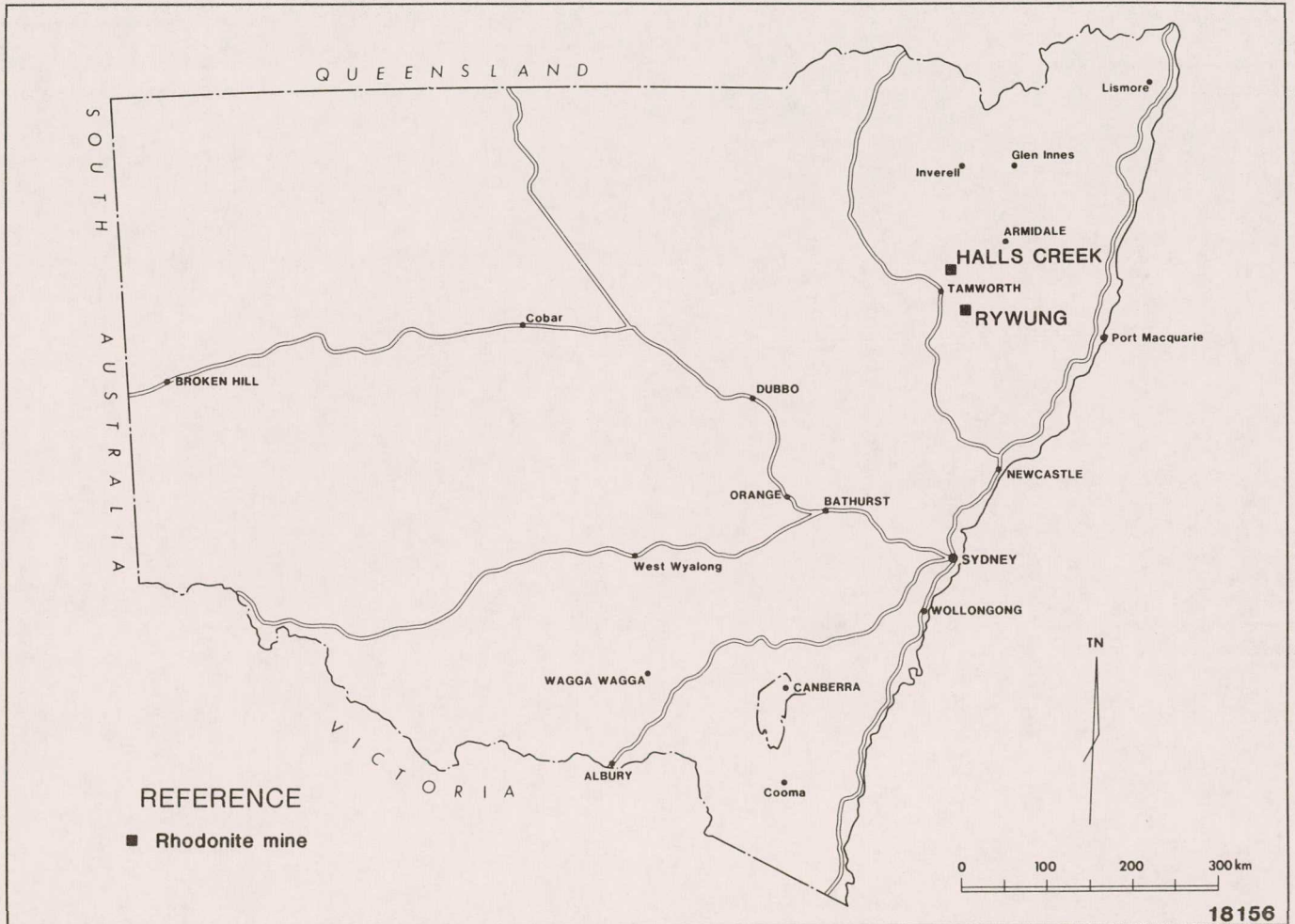
Comments:

YOWAKA MINE**Commodity:** Pyrophyllite.**Location:** Greigs Flat, 7 km southwest of Pambula.**Owner:** Cudgen R Z Ltd, 4th Floor, 484 Queen Street, Brisbane, QLD 4000.
Ph (07) 832 2299. Telex AA145019. Fax (07) 832 1167.**Operator:** No current operator. Operator prior to June, 1987 - Heat Containment Industries Pty Ltd.**Geology:** The Yowaka pyrophyllite deposit occurs as irregular lenticular masses up to 40 m long and 5 m wide formed by hydrothermal alteration along shears in rhyolite of the Devonian Boyd Volcanic Complex.**Mineralization:** The pyrophyllite bodies are contaminated by varying amounts of mica, quartz, chlorite, kaolinite, and diaspore.**Reserves:** Not determined.**Mining Method:** Open cut.**Treatment:** No on-site treatment. Ore previously crushed at HCL's plant at Unanderra.**Production Capacity:** No current production.**Commencement:** Intermittent small-scale mining in 1941, 1943, and 1946. Current operations - intermittent mining since 1963.**Production:** 1985/86 Pyrophyllite mined - 1 200 t. 1986/87 No production.**Product Specification:** A typical chemical analysis of the pyrophyllite is:

	<u>Percentage</u>
Al ₂ O ₃	18.8
SiO ₂	76.3
TiO ₂	0.13
Fe ₂ O ₃	0.56
CaO	<0.01
MgO	<0.01
Alkalies	0.85
L O I	3.42

Market: 1986/87 After crushing at Unanderra, the pyrophyllite is sent to HCL's plant at Beverley, South Australia, for the manufacture of refractories.**Transport:** Road.**Employees:** March 1986 - 2 (intermittent working).**Historic Production:** From 1963 to June 1986 - not available.**Comments:** No current mining.

RHODONITE MINES



HALLS CREEK MINE

Commodity: Rhodonite.

Location: Halls Creek, 28 km east of Manilla.

Owner/Operator: S R Leaver (trading as Australian Rhodonite Company),
9 Cambridge Street, Tamworth, NSW 2340. Ph (067) 65 5597.

Geology/Mineralization: Rhodonite occurs as a series of lenses in Palaeozoic metasediments close to their contact with the Glenclair Adamellite.

Reserves: July 1987 Proved - 50 t. Probable - 2 000 t.

Mining Method: Open cut. Hydraulic excavator, bulldozer, drilling/blasting equipment.

Treatment: Hand sorting - breakout out of the rhodonite from manganese oxides and separation of grades.

Production Capacity: 100 tpa.

Commencement: August 1986.

Production: 1986/87 (from August 1986) Rhodonite won - 36 t.

Product Specification: Several grades of rhodonite - various pinks, reds, etc.

Market: 1986/87 Hong Kong.

Transport: Road to Tamworth. Then road or rail to export port.

Employees: June 1987 - 2.

Historic Production: As above.

Comments: Company supplies rough rhodonite only (not finished products).

RYWUNG RHODONITE MINE

Commodity: Rhodonite.

Location: "Rywung" Station near Dungowan, 35 km southeast of Tamworth.

Owners/Operators: A C Taggart and H R Pitt, 8 Mills Street, Tamworth, NSW 2340. Ph (067) 65 7480.

Geology/Mineralization: Lens of rhodonite in Palaeozoic metasediments.

Reserves: Not known.

Mining Method: Small open cut.

Treatment: Breaking by hand hammers.

Production Capacity: Small-scale operation only.

Commencement: 1982.

Production: 1986/87 Rhodonite won - 6 t.

Product Specification: Not available.

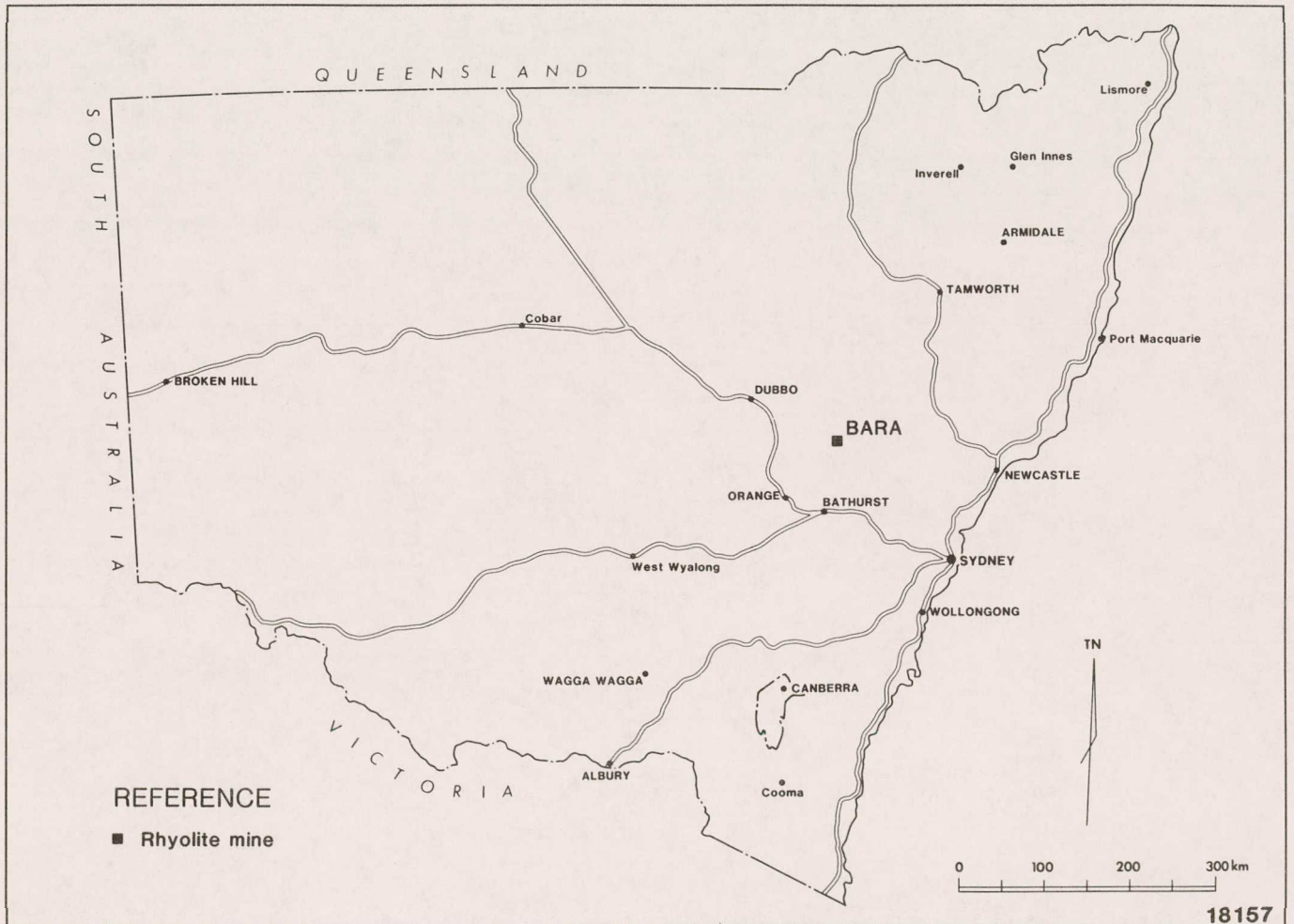
Market: 1986/87 Gem merchants, Melbourne and Brisbane.

Employees: June 1987 - 2 (intermittent working).

Historic Production: From 1982 to June 1987 - 48 t.

Comments:

RHYOLITE MINES

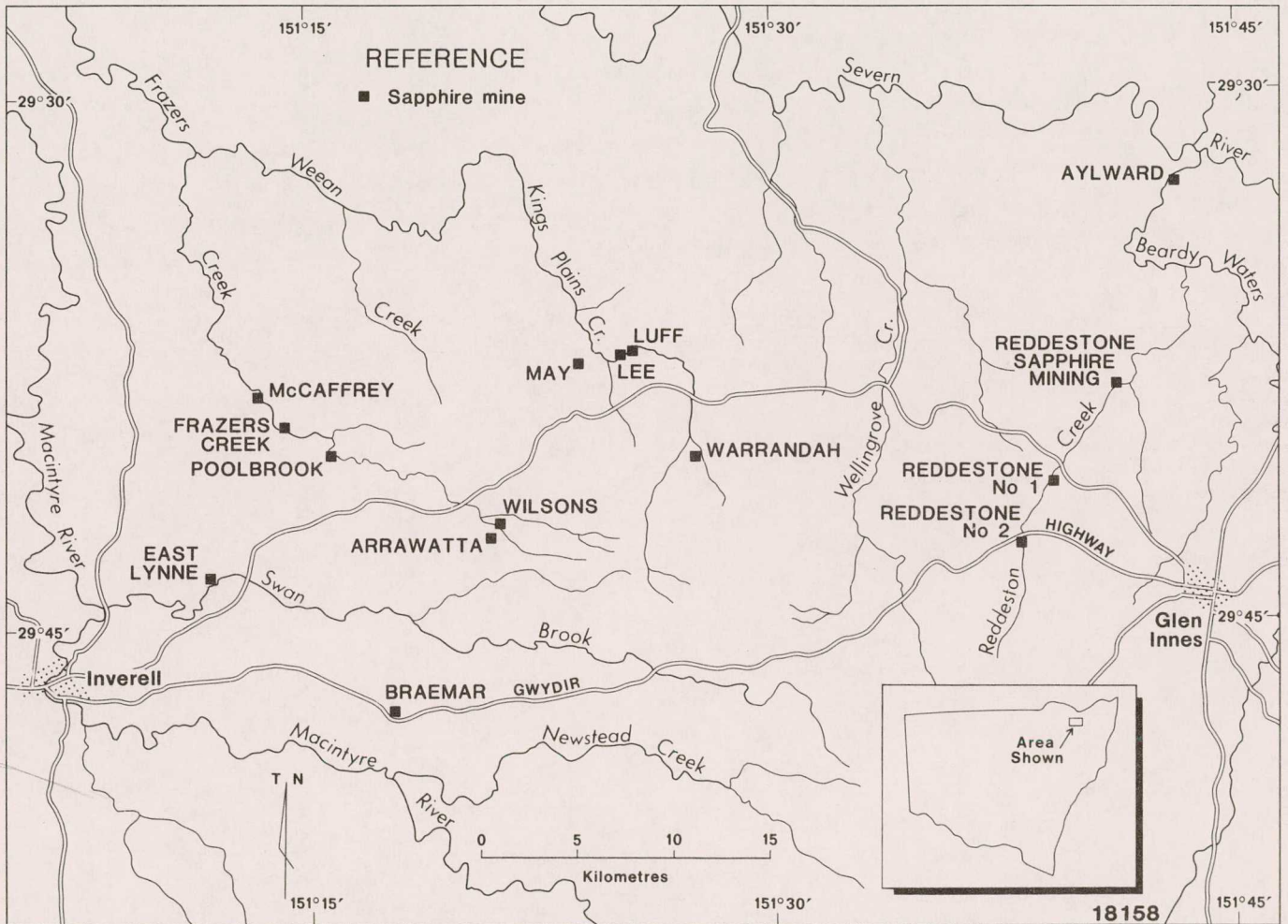


BARA QUARRY**Commodity:** Rhyolite.**Location:** Lue, 21 km east of Mudgee.**Owner/Operator:** Industrial Minerals Aust Pty Ltd (trading as Mudgee Marble and Granite), Level 4, 154 Pacific Highway, North Sydney, NSW 2060. Ph (02) 959 5788. Telex AA74369. Fax (02) 959 5801.**Geology/Mineralization:** Lease area is within Rylstone Tuff (of possible Carboniferous age) composed of hydrothermally altered rhyolite and dacite tuff.**Reserves:** Undefined.**Mining Method:** Open cut.**Treatment:** On-site crushing and screening.**Production Capacity:** Small-scale production dependent on market.**Commencement:** 1969.**Production:** 1986/87 Rhyolite mined, and crushed and screened to chip size - 1 562 t.**Product Specification:** "First grade"-

	<u>Chemical Analysis (%)</u>
SiO ₂	69.10
Al ₂ O ₃	15.30
Fe ₂ O ₃	1.32
CaO	0.11
MgO	0.88
Na ₂ O	0.13
K ₂ O	0.62
TiO ₂	0.22
MnO	<0.01
SO ₃	<0.01
P ₂ O ₅	0.024
LOI	0.20

Market: 1986/87 Sydney manufacturer of porcelain (for sanitary ware, insulators and electric jugs) and baked enamel finishes.**Transport:** Road to Sydney.**Employees:** June 1987 - 7.**Historic Production:** From 1969 to June 1987 - not available.**Comments:** The Mudgee Marble and Granite business was purchased by Industrial Minerals Aust Pty Ltd from Mr D.M. Mills in May, 1987.

SAPPHIRE MINES



ARRAWATTA MINE

Commodity: Sapphire.

Location: Horse Gully, 24 km east of Inverell.

Owner: Darrell James Ltd, 69-73 Pitt Street, Sydney, NSW 2000. Ph (02) 27 7158. Telex AA 70201. Fax (02) 27 7745.

Operators: N R & D R Burnham (tributors), 11 Short Street, Inverell, NSW 2360. Phone (067) 22 2256.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: April 1988 Inferred resource sufficient for approximately 3 years mining.

Mining Method: Open cut using conventional back-hoe and truck.

Treatment: On-site gravity plant with screening and pulsator jigs.

Production Capacity: 24 000 tpa.

Commencement: First worked about 1970. Tributors commenced operations in January, 1987.

Production: 1986/87 Washdirt raised and treated - 9 774 t. Sapphire won - 7.7 kg.

Market: 1986/87 Thailand.

Employees: June 1987 - 2.

Historic Production: From c1970 to June 1987 - not available.

Comments:

AYLWARD SAPPHIRE MINE

Commodity: Sapphire.

Location: Beardy Waters near "Rangers Valley" Station, 22 km north of Glen Innes.

Owner/Operator: K J Aylward, 1 Durang Place, Reedy Creek, QLD 4228.
Ph (075) 93 4423.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: April 1988 Inferred resource sufficient for 2 to 3 years mining depending on price available.

Mining Method: Open cut.

Treatment: Alluvial on-site pulsators and screens.

Production Capacity: 100 000 tpa.

Commencement: December 1986.

Production: 1986/87 Washdirt raised and treated - 57 000 t. Sapphire won - 140 kg.

Market: 1986/87 Local 5%, Thailand 95%.

Employees: June 1987 - 9.

Historic Production: From December 1986 to June 1987 - as above.

Comments:

BRAEMAR MINE

Commodity: Sapphire.

Location: Elsmore, 18 km east of Inverell.

Owner: D C & J D Rynne, Glen Innes Road, Elsmore, NSW 2370. Ph (067) 2304 - Elsmore 22.

Operator: Modjewel Pty Ltd to 23 July 1987.

Geology/Mineralization: Tertiary deposit of weathered volcanoclastic rocks containing gem corundum (sapphire).

Reserves: Not known.

Mining Method: Open cut using back-hoe and trucks.

Treatment: On-site standard gravity circuit with screens and jigs.

Production Capacity: 100 t per day.

Commencement: 1982.

Production: 1986/87 Washdirt raised - 22 000 t. Washdirt treated - 20 000 t. Sapphire won - 78.5 kg.

Market: 1986/87 Thailand.

Employees: June 1987 - 2.

Historic Production: From 1982 to June 1988 - 132 kg of sapphire.

Comments:

EAST LYNNE MINE

Commodity: Sapphire.

Location: Swan Brook, 10 km east of Inverell.

Owner/Operator: C R Colley, "East Lynne" Swanbrook Road, Inverell, NSW 2360. Ph (067) 25 1587.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: Not known.

Mining Method: Open cut.

Treatment: On-site treatment with jigs.

Production Capacity: 20 m³ per day.

Commencement: Current operations - 1985.

Production: 1986/87 Washdirt raised - 4 000 t. Washdirt treated - 1 000 t. Sapphire won - 0.3 kg.

Market: 1986/87 Thailand.

Employees: June 1987 - 3.

Historic Production: From 1985 to June 1987 - 0.9 kg.

Comments:

FRAZERS CREEK MINE

Commodity: Sapphire.

Location: Frazers Creek near Nullamanna, 18 km northeast of Inverell.

Owner: Estate of A C Brown, "Atholton" Nullamanna, NSW 2360. Ph (067) 25 1596.

Operator: P Brown (address as above).

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: April 1988 Inferred resource sufficient for 7 years mining.

Mining Method: Open cut using excavator and trucks.

Treatment: On-site treatment with standard gravity circuit. Sapphire recovered on pulsating jigs.

Production Capacity: 700 tpa.

Commencement: 1984.

Production: 1986/87 Washdirt raised - 1 250 t. Washdirt treated - 600 t. Sapphire won - 1.2 kg.

Market: 1986/87 Local 45%, Thailand 55%.

Employees: June 1987 - 2 (intermittent working).

Historic Production: From 1984 to June 1987 - 2.9 kg of sapphire obtained from 3 300 t of washdirt treated.

Comments:

LEE SAPPHIRE MINE

Commodity: Sapphire.

Location: Kings Plains Creek, 33 km northwest of Glen Innes.

Owner/Operator: R R Lee, 149 Glen Innes Road, Inverell, NSW 2360.
Ph (067) 22 1809.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: April 1988 Inferred resource sufficient for approximately 5 years mining at present production rate.

Mining Method: Open cut using excavator and truck.

Treatment: On-site gravity separation plant with pulsator jigs.

Production Capacity: 6 m³ per hour.

Commencement: July 1984.

Production: 1986/87 Washdirt and treated - 5 860 t. Sapphire won - 37 kg.

Market: 1986/87 Thailand.

Employees: June 1987 - 3.

Historic Production: From 1984 to June 1987 - 64.3 kg.

Comments:

LUFF SAPPHIRE MINE

Commodity: Sapphire.

Location: Kings Plains Creek, 32 km northwest of Glen Innes.

Owner/Operator: B B Luff, RMB 2494, Collins Lane, Kulnura, NSW 2250.
Ph (043) 76 1316.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: Not known.

Mining Method: Open cut.

Treatment: On-site wet processing plant.

Production Capacity: Small-scale operation.

Commencement: First worked - 1975. Current operator - 1984.

Production: 1986/87 Washdirt raised - 110 t. Washdirt treated - 90 t.
Sapphire won - 1.4 kg.

Market: 1986/87 No sales.

Employees: June 1987 - 1 (intermittent working).

Historic Production: From 1984 to June 1987 - 17.1 kg of sapphire from
1 630 t of washdirt treated.

Comments: Mine operations in process of being transferred to R Lee,
Inverell (April 1988).

MAY SAPPHIRE MINE

Commodity: Sapphire.

Location: Kings Plains Creek, 32 km northeast of Inverell.

Owner/Operator: C W May, 17 Leonard Street, Inverell, NSW 2360.
Ph (067) 22 2961.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics. Sapphire-bearing layer is relatively thin, ranging from 0.6 to 2.4 m.

Reserves: April 1988 Inferred resource of approximately 3.5 hectares of unworked marginal ground.

Mining Method: Hand mining. Open cut by small back hoe.

Treatment: On-site hand sieving.

Production Capacity: 150 to 250 tpa.

Commencement: 1969.

Production: 1986/87 Washdirt raised and treated - 150 t. Sapphire won - 1.0 kg.

Market: 1986/87 Thailand.

Employees: June 1987 - 1 (intermittent working).

Historic Production: From 1969 to June 1987 - Approximately 54 kg.

Comments: Sapphires are mainly small - few are cuttable stones.

McCAFFREY SAPPHIRE MINE

Commodity: Sapphire.

Location: Frazers Creek near Nullamanna, 19 km northeast of Inverell.

Owner/Operator: D M McCaffrey, 29 Clive Street, Inverell, NSW 2360.
No phone.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: Not known.

Mining Method: Open cut. Washdirt raised by excavator.

Treatment: On-site pulsator type plant.

Production Capacity: 1 000 tpa.

Commencement: Current operations - 1981.

Production: 1986/87 Washdirt raised - 70 t. Washdirt treated - 60 t.
Sapphire won - 60 g.

Market: 1986/87 No sales.

Employees: June 1987 - 1 (intermittent working).

Historic Production: From 1981 to June 1987 - 914 g.

Comments: Current operations are reworking previous mined areas.

POOLBROOK MINE

Commodity: Sapphire.

Location: "Poolbrook" property, Frazers Creek near Nullamanna, 19 km northeast of Inverell.

Owner/Operator: R K Schieb, "Poolbrook", Nullamanna, NSW 2360. Ph (067) 25 1518.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: Not known.

Mining Method: Open cut.

Treatment: On-site wet processing plant.

Production Capacity: 60 m³ per day.

Commencement: 1968. Mining ceased in 1983 and recommenced in May 1987.

Production: 1986/87 (from May 1987) Washdirt raised - 600 t. Washdirt treated - 150 t. Sapphire won - 0.5 kg.

Market: 1986/87 Thailand.

Employees: June 1987 - 1.

Historic Production: From 1968 to June 1987 - not available.

Comments:

REDDESTONE NO 1 MINE

Commodity: Sapphire.

Location: Reddestone Creek, 10 km northwest of Glen Innes.

Owner/Operator: T J & P V Nunan Pty Ltd, PO Box 653, Inverell, NSW 2360. Ph (067) 22 3484. Fax (067) 22 5220.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: April 1988 Proved - 907 000 m³ at 8 g/m³.

Mining Method: Open cut using excavator and trucks.

Treatment: On-site gravity separation plant with wet screening and pulsator jigs.

Production Capacity: 1 000 m³ per day.

Commencement: November 1984.

Production: 1986/87 Washdirt raised and treated - 243 172 t.
Corundum/sapphire won - 1 237 kg.

Market: 1986/87 Mainly Thailand.

Employees: June 1987 - 31.

Historic Production: From 1984 to June 1987: Washdirt raised and treated - 518 417 t. Corundum/sapphire won - 2 288 kg.

Comments:

REDDESTONE NO 2 MINE

Commodity: Sapphire.

Location: Reddestone Creek, 10 km west of Glen Innes.

Owner/Operator: T J & P V Nunan Pty Ltd, PO Box 653, Inverell, NSW 2360. Ph (067) 22 3484. Fax (067) 22 5220.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: April 1988 Proved - 390 000 m³ at 9.5 g/m³. Probable - 323 000 m³ of similar grade.

Mining Method: Open cut using excavator and trucks.

Treatment: On-site gravity separation plant with wet screening and jigs.

Production Capacity: 300 m³ per day.

Commencement: September 1986.

Production: 1986/87 (from September 1986) Washdirt raised and treated - 50 527 t. Corundum/sapphire won - 496 kg.

Market: 1986/87 Mainly Thailand.

Employees: June 1987 - 11.

Historic Production: As above.

Comments:

REDDESTONE SAPPHIRE MINING MINE

Commodity: Sapphire.

Location: Reddestone Creek, 12 km northwest of Glen Innes.

Owner/Operator: Reddestone Sapphire Mining Pty Ltd, 22 Veness Street, Glen Innes, NSW 2370. Ph (067) 32 1342.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: April 1988. Inferred resource sufficient for approximately 2 years mining.

Mining Method: Open cut.

Treatment: On-site plant - trommel and jigs.

Production Capacity: 250 000 tpa.

Commencement: 1964.

Production: 1986/87 Washdirt raised and treated - 60 000 t. Sapphire won - 110 kg.

Market: 1986/87 Thailand.

Employees: June 1987 - 13.

Historic Production: From 1964 to June 1987 - not available.

Comments:

WARRANDAH MINE

Commodity: Sapphire.

Location: Kings Plains Creek, 27 km west of Glen Innes.

Owner/Operator: T J & P V Nunan Pty Ltd, PO Box 653, Inverell, NSW 2360. Ph (067) 22 3484. Fax (067) 22 5220.

Geology/Mineralization: Tertiary deposit of weathered volcanoclastic rocks containing gem corundum (sapphire).

Reserves: April 1988 Proved - 147 000 m³ at 35 g/m³. Probable - 300 000 m³ of similar grade.

Mining Method: Open cut using excavator and trucks.

Treatment: On-site gravity separation plant with screens and jigs.

Production Capacity: 600 m³ per day.

Commencement: 1980.

Production: 1986/87 Washdirt raised and treated - 68 880 t.
Corundum/sapphire won - 4 309 kg.

Market: 1986/87 Mainly Thailand.

Employees: June 1987 - 10.

Historic Production: From 1980 to June 1987: Washdirt raised and treated - 429 409 t. Sapphire/corundum won - 3 483 kg.

Comments:

WILSONS SAPPHIRE MINE

Commodity: Sapphire.

Location: Horse Gully near Sapphire, 24 km east of Inverell.

Owner/Operator: D B & K F Wilson, "Rockleigh", Inverell, NSW 2360.
Ph (067) 25 1573.

Geology/Mineralization: Holocene alluvial deposit containing gem corundum (sapphire) probably derived from the weathering and erosion of Tertiary volcanoclastics.

Reserves: April 1988 Inferred resource sufficient for approximately 5 years mining.

Mining Method: Open cut using excavator and trucks.

Treatment: On-site gravity separation plant with wet screens and jigs.

Production Capacity: 15 m³ per hour.

Commencement: 1969.

Production: 1986/87 Washdirt and treated - 4 980 t. Sapphire won - 11.7 kg.

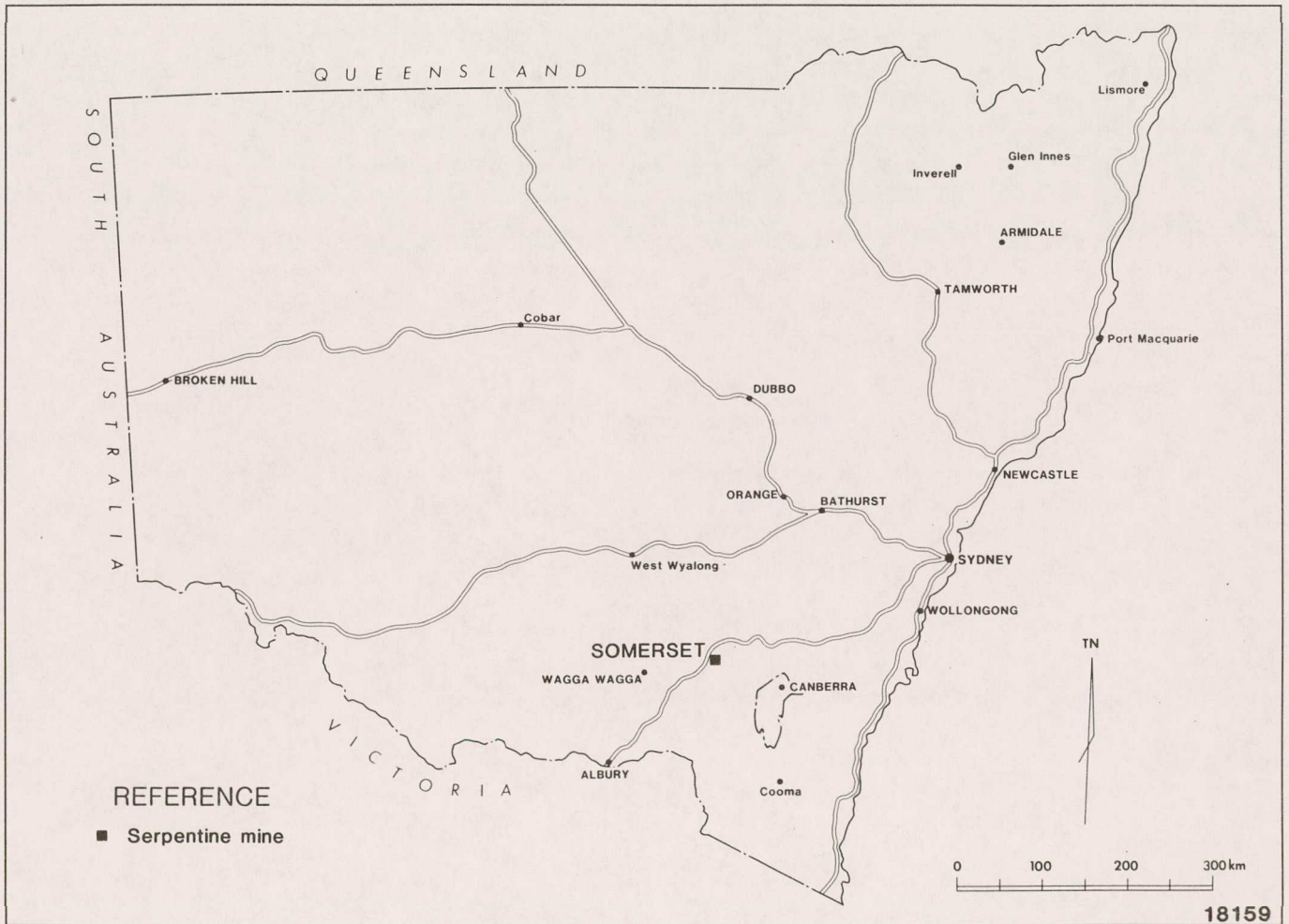
Market: 1986/87 Thailand.

Employees: June 1987 - 2 (intermittent working).

Historic Production: From 1969 to June 1987 - not available.

Comments:

SERPENTINE MINES



SOMERSET MINE

Commodity: Serpentine.

Location: "Somerset" Property near Coolac, 22 km northeast of Gundagai.

Owner/Operator: Somerset Mining Pty Ltd, PO Box 41, Watsons Bay, NSW 2030. Ph (02) 223 5200. Fax (02) 235 3424.

Geology/Mineralization: Coolac Serpentinite.

Reserves: April 1988 Probable - 200 000 t.

Mining Method: Open cut.

Treatment: On-site crushing and screening plant.

Production Capacity: 100 000 tpa.

Commencement: July 1984.

Production: 1986/87 Serpentine mined and treated - 58 506 t. Crushed and screened serpentine produced - 58 452 t.

Market: 1986/87 Steel making, Port Kembla.

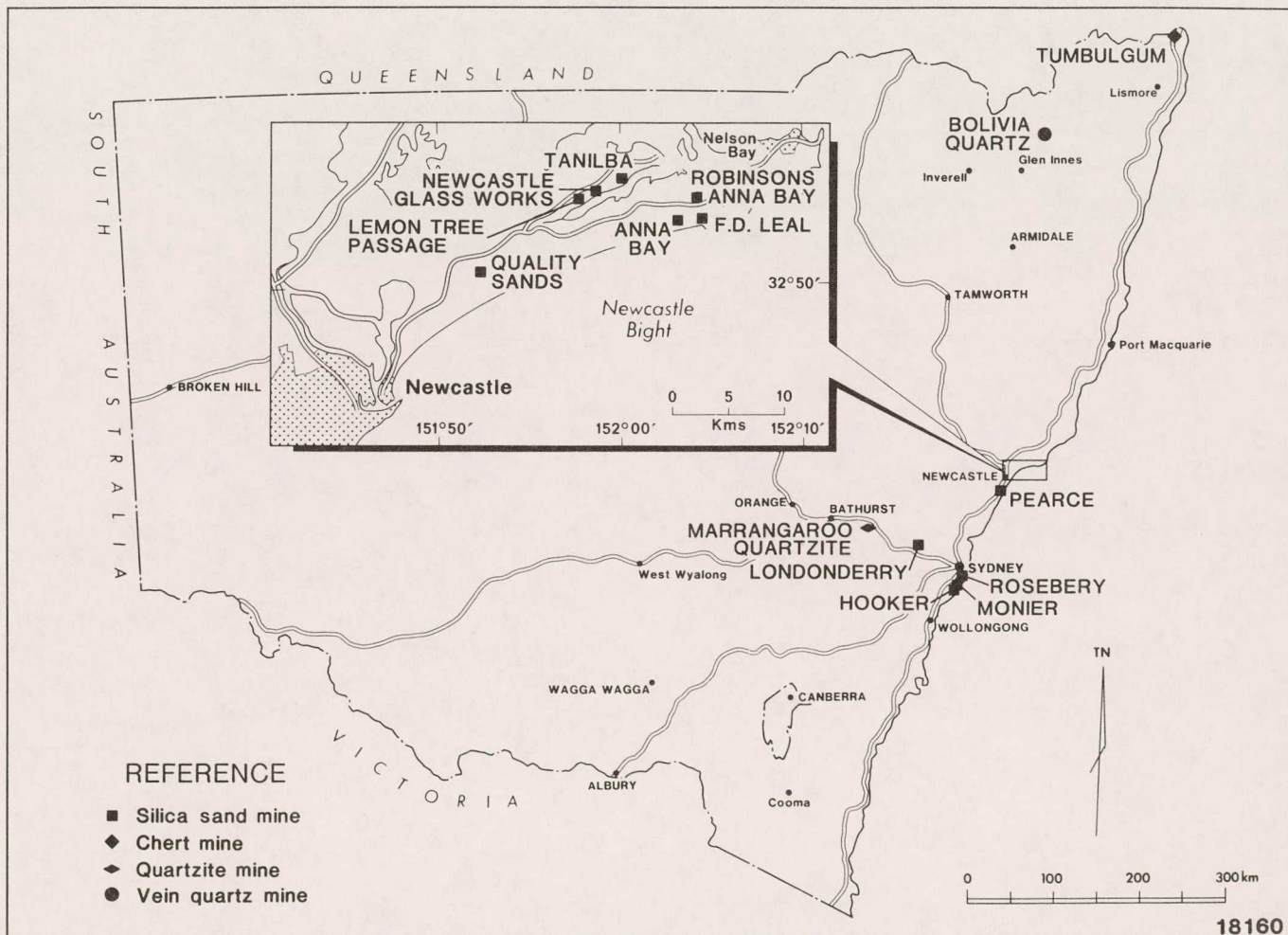
Transport: Road to Port Kembla.

Employees: June 1987 - 3.

Historic Production: 1984 to June 1987 - 126 220 t of crushed serpentine produced.

Comments: Mining in abeyance from December, 1987. Mine was purchased from Hooker Corporation Ltd on 9th February 1988. Production recommenced on this date with an expected annual rate of 40 000 tpa.

SILICA MINES



ANNA BAY PIT**Commodity:** Silica sand.**Location:** Anna Bay, 11 km southwest of Nelson Bay.**Owner:** Hooker Corporation Ltd, GPO Box 2724, Sydney, NSW 2001.
Ph (02) 239 2222. Telex AA22894. Fax (02) 239 2600.**Operator:** Hooker Town Developments Pty Ltd (trading as Hooker Industrial Sands), PO Box 170, North Cronulla, NSW 2230.
Ph (02) 523 6266. Telex AA22894. Fax (02) 527 4867.**Geology/Mineralization:** Deposit consists of fine, even-grained silica sand, low in shell material, located at the back of the mobile dunes fronting Newcastle Bight.**Reserves:** April 1988 Inferred resource sufficient for approximately 12 years mining (until approximately 2000).**Mining Method:** Surface mining. Direct extraction by front-end loader.**Treatment:** No on-site treatment.**Production Capacity:** 500 t per month.**Commencement:** 1978.**Production:** 1986/87 Unprocessed sand produced - 40 232 t.**Product Specification:** Foundry sand -Chemical Analyses (%)

<u>AB2 Silica Sand</u> (for medium to light steel and iron castings)		<u>WT2 Silica Sand</u> (for medium to heavy steel and iron castings)	
SiO ₂	97.90	SiO ₂	99.20
Fe ₂ O ₃	0.22	Fe ₂ O ₃	0.12
Al ₂ O ₃	0.69	Al ₂ O ₃	0.32
TiO ₂	0.08	TiO ₂	0.043
Cr ₂ O ₃	<0.001	Cr ₂ O ₃	<0.001
CaO	0.25	CaO	<0.01
MgO	0.03	MgO	<0.01
Na ₂ O	0.05	Na ₂ O	0.012
K ₂ O	0.29	K ₂ O	0.10

Market: 1986/87 Japan (foundry use).**Transport:** Road to Newcastle for export.**Employees:** June 1987 - 4 (Contractors).**Historic Production:** From to June 1987 - not available.**Comments:**

BOLIVIA QUARTZ MINE

Commodity: Silica (Vein quartz).

Location: Bolivia, 29 km south of Tenterfield.

Owner/Operator: Darryl McCarthy Constructions Pty Ltd, PO Box 246, Tenterfield, NSW 2372. Ph (067) 36 1988. Fax (067) 36 1385.

Geology/Mineralization: White quartz occurs as a massive pipelike hydrothermal deposit within the Mt Jonblee Leucoadamellite.

Reserves: April 1988 Inferred resource of a minimum of 50 000 t of quartz readily available to open cut mining.

Mining Method: Open cut.

Treatment: Washing and crushing plant at site approximately 10 km north of Tenterfield.

Production Capacity: Approximately 1 000 t per month.

Commencement: First worked - 1974. Current operations - 1980.

Production: 1986/87 Quartz mined - 5 075 t (first grade) and 600 t (second grade). Washed and crushed silica produced - 3 675 t (first grade). No second grade silica produced.

Product Specifications: 1st grade silica - 99.95% SiO₂
2nd grade silica - Not known.

Market: 1986/87 Japan (semi-conductor, casting, and ceramic industries) 64%, Local and interstate exposed aggregate and landscaping market 36%.

Transport: Road local and interstate markets. Rail to port for export (mainly Japan).

Employees: May 1987 - 2 (intermittent working).

Historic Production: From 1974 to June 1987 - not available.

Comments: Company is developing pit and market for expansion of operation. Material from this deposit is of a high purity, rendering it potentially suitable for use in special applications such as feedstock for silicon metal production and special glasses.

F D LEAL SAND PIT

Commodity: Silica sand.

Location: Anna Bay, 9 km southwest of Nelson Bay.

Owner/Operator: F D Leal Pty Ltd, Racecourse Road, Clarendon, NSW 2756.
Ph (045) 77 3514.

Geology/Operator: Deposit consists of fine, even-grained silica sand, low in shell material, located at the back of the mobile dunes fronting Newcastle Bight.

Reserves: Not known.

Mining Method: Surface mining using front-end loaders.

Treatment: No on-site treatment.

Production Capacity: 5 000 tpa.

Commencement: 1966.

Production: 1986/87 Foundry sand produced - 2 000 t.

Product Specification: Not available.

Market: 1986/87 Foundry industry - Newcastle area.

Transport: Road to Newcastle.

Employees: June 87 - 1 (intermittent working).

Historic Production: From 1966 to June 1987 - not available.

Comments:

HOOKER SAND PIT**Commodity:** Silica sand.**Location:** Kurnell Peninsula, 2 km north of Cronulla.**Owner:** Hooker Corporation Ltd, GPO Box 2724, Sydney, NSW 2001.
Ph (02) 239 2222. Telex AA22894. Fax (02) 239 2600.**Operator:** Hooker Town Developments Pty Ltd (trading as Hooker Industrial Sands), PO Box 170, North Cronulla, NSW 2230.
Ph (02) 523 6266. Telex AA22894. Fax (02) 527 4867.**Geology/Mineralization:** Deposit is part of a Holocene to late Pleistocene dune of medium-grained silica sand low in shell content.**Reserves:** April 1988 Inferred resource sufficient for 4 years mining (until 1992).**Mining Method:** Surface mining. Direct extraction by front-end loader and dredge.**Treatment:** On-site processing plant.**Production Capacity:** 300 t per week (new plant).**Commencement:** 1968.**Production:** 1986/87 Foundry sand produced - 33 473 t. Construction sand produced - 424 137 t.**Product Specification:** Foundry sand-

<u>Chemical Analysis (%)</u>	
SiO ₂	98.70
Fe ₂ O ₃	0.13
Al ₂ O ₃	0.59
TiO ₂	0.11
CaO	0.03
MgO	0.03
Na ₂ O	0.04
K ₂ O	0.22
LOI	0.13

Market: 1986/87 Local foundry industry.**Transport:** Road to markets.**Employees:** June 1987 - 4.**Historic Production:** From 1968 to June 1987 - not available.**Comments:**

LEMON TREE PASSAGE PIT**Commodity:** Silica sand.**Location:** Tanilba near Lemon Tree Passage, 17 km west of Nelson Bay.**Owner/Operator:** P B White Minerals Pty Ltd, 6 West Street, Pymble, NSW 2073. Ph (02) 498 5852. Fax (02) 498 7791.**Geology/Mineralization:** Deposit is part of a Pleistocene dune of fine to medium well-sorted sand located 6 km from the present coastline. White sand occurs to a depth of 2 to 3 m and is underlain by a core of ferruginous mottled orange-brown sand ("coffee rock").**Reserves:** April 1988 Proved - approximately 400 000 t.**Mining Method:** Front-end loaders.**Treatment:** On-site processing plant - washing, screening and spiralling facilities.**Production Capacity:** 75 000 tpa.**Commencement:** 1976.**Production:** 1986/87 Sand raised and treated - 36 635 t. Glass sand produced (for colourless glass products) - 34 803 t.**Product Specification:**

<u>Glass and Foundry Sand (%)</u>	
SiO ₂	99.76
Fe ₂ O ₃	0.13
Al ₂ O ₃	0.06

Market: 1986/87 Glass Containers Ltd, Penrith and Newcastle Glassworks Pty Ltd, Newcastle (for glass bulbs and tubing for incandescent and fluorescent lamps).**Transport:** Road to Newcastle and Sydney.**Employees:** June 1987 - 2.**Historic Production:** From 1976 to June 1987 - approximately 500 000 t.**Comments:**

LONDONDERRY QUARRY

Commodity: Silica sand.

Location: Agnes Banks near Londonderry, 6 km southwest of Richmond.

Owner: Pacific Mining Ltd, 6 West Street, Pymble, NSW 2073.
Ph (02) 498 5852. Fax 498 7791.

Operator: P B White Minerals Pty Ltd (address as above).

Geology/Mineralization: Quarry is located in the Agnes Banks Sand, a Pleistocene deposit of fine to medium sand up to 7 m thick and covering an area of 9 km². The unit consist of a white quartz sand, 1 to 5 m thick that grades down into a yellow-brown quartz sand containing a higher proportion of iron oxide, clay, and clay-sized quartz. The clay content of the deposit is variable but averages 10%. At the PB White Minerals site only the top 1 m of white sand is suitable for the manufacture of colourless glass (flint grade), while the underlying 3 m of fine-grained, cream-yellow sand is suitable for the manufacture of amber and green glass (amber grade).

Reserves: April 1988 Proved - 1.2 mt.

Mining Method: Front-end loader.

Treatment: On-site processing plant - washing, screening and attritioning of sand to produce flint grade and amber grade sand.

Production Capacity: 175 000 tpa.

Commencement: 1972.

Production: 1986/87 Sand raised and treated 106 882 t. Glass grade sand produced - 79 295 t. Industrial sand produced - 8 349 t.

Product Specifications: Amber grade (for amber and green glass) -
SiO₂ 98.4%, Fe₂O₃ 0.13%, Al₂O₃ 0.65%.

Market: 1986/87 Glass sand - Glass Containers Ltd, Penrith. Industrial sand - local users.

Transport: Road to Penrith.

Employees: June 1987 - 11.

Historic Production: From 1972 to June 1987 - 1 630 000 t.

Comments:

MARRANGAROO QUARTZITE QUARRY**Commodity:** Quartzite.**Location:** Marrangaroo, 7 km northwest of Lithgow.**Owner:** Hooker Corporation Ltd, GPO Box 2724, Sydney, NSW 2001.
Ph (02) 239 2222. Telex AA22894. Fax (02) 239 2600.**Operator:** Marrangaroo Aggregates Pty Ltd, PO Box 228, Lithgow, NSW 2790. Ph (063) 51 4209. Telex AA22894. Fax (02) 239 2600.**Geology/Mineralization:** Quarry is located on a belt of quartzite which is part of a sequence of quartzites and silicified slates within the Devonian Lambie Group. The quartzite is variably contaminated by accessory minerals such as mica and clay, together with zircon, tourmaline and rutile.**Reserves:** April 1988 Inferred resource sufficient for 5 to 8 years mining.**Mining Method:** Open cut.**Treatment:** On-site crushing and screening.**Production Capacity:** 125 000 tpa.**Commencement:** 1974.**Production:** 1986/87 Quartzite and claystone produced for construction industry (including road making and railway ballast use) - 118 938 t. Quartzite produced for use as steelmaking flux - 19 243 t.**Product Specification:** For steelmaking flux use (40 mm aggregate) -Chemical Analysis (%)

SiO ₂	97.07
Al ₂ O ₃	1.50
Fe ₂ O ₃	0.20
TiO ₂	0.10
MgO	0.05
CaO	0.11
Na ₂ O	0.01
K ₂ O	0.37
P ₂ O ₅	0.04
LOI	0.55

Market: 1986/87 Steelmaking flux use - Australian Iron and Steel Pty Ltd, Port Kembla.**Transport:** Road to Port Kembla.**Employees:** June 1987 - 9.**Historic Production:** From 1974 to June 1987 - not available.**Comments:**

MONIER PIT

Commodity: Silica sand.

Location: Kurnell Peninsula, 4 km northeast of Cronulla.

Owner/Operator: Monier Ltd, 72 Orchardleigh Street, Guildford, NSW 2161. Ph (02) 632 0122. Fax (02) 632 7471.

Geology/Mineralization: Deposit is part of a Holocene dune of medium grained silica sand, low in shell content.

Reserves: April 1988 Probable - 300 000 t.

Mining Method: Surface mining using front-end loaders, dozer and excavator.

Treatment: On-site kiln drying and screening. Dredges and wet screens.

Production Capacity: 300 000 tpa.

Commencement: First worked - 1951. Current ownership - June 1985.

Production: 1986/87 Construction sand produced - 782 000 t. Foundry sand produced - 11 500 t.

Product Specification: Foundry sand - Silica 98.1%, shell content between 0.2% and 1%. Material finer than 600 μm .

Market: 1986/87 Foundry industry - Sydney area.

Transport: Road.

Employees: June 1987 - 12.

Historic Production: From 1951 to June 1987 - not available.

Comments: Operations purchased from Processed Sand Pty Ltd in June, 1985. During 1987/88 sand processed through plant at nearby Hooker Sand Pit.

NEWCASTLE GLASS WORKS SAND PIT

Commodity: Silica Sand.

Location: Tanilba Bay, 16 km west of Nelson Bay.

Owner: Electric Lamp Manufacturers Aust Pty Ltd, PO Box 170, Hamilton, NSW 2303. Ph (049) 61 0481. Telex AA28147. Fax (049) 62 1928.

Operator: Newcastle Glass Works Pty Ltd, Suite 2, 6 West Street, Pymble, NSW 2073. Ph (02) 498 5852. Fax (02) 498 7791.

Geology/Mineralization: Deposit is part of a Pleistocene dune of fine to medium well-sorted sand located 6 km from present coastline. White sand occurs to a depth of 2 to 3 m and is underlain by a core of ferruginous mottled orange-brown sand ("coffee rock").

Reserves: April 1988 - 200 000 t.

Mining Method: Dry mining with front-end loader.

Treatment: No on-site processing. Sand treated at adjacent Lemon Tree Passage Pit by P B White Minerals Pty Ltd.

Production Capacity: Not known but sufficient for demand.

Commencement: 1980.

Production: 1986/87 Glass sand produced - 4 430 t.

Product Specification: Glass grade sand.

Market: All glass sand produced is used by company's lamp factory at Hamilton, Newcastle for production of glass bulbs and tubing for incandescent and fluorescent lamps. Tubing for the production of pharmaceutical vials is also produced.

Employees: June 1987 - 2.

Historic Production: From 1980 to June 1987 - 40 000 t.

Comments:

PEARCE SAND PIT

Commodity: Silica sand.

Location: Redhead, 13 km southwest of Newcastle.

Owner/Operator: Pearce Sand Processing Pty Ltd, 62 Kalaroo Road, Redhead, NSW 2290. Ph (049) 49 7366.

Geology/Mineralization: Holocene marine and aeolian sands.

Reserves: April 1988 Inferred resource sufficient for 10-15 years mining.

Mining Method: Dredge and front-end loader.

Treatment: On-site processing plant.

Production Capacity: Dredge - 60 tph.

Commencement: 1979.

Production: 1986/87 Construction sand produced - 102 257 t. Foundry sand produced - 28 344 t.

Market: 1986/87 Foundry sand - Port Kembla and Sydney.

Transport: Road.

Employees: June 1987 - 8.

Historic Production: From 1979 to June 1988 - not available.

Comments:

QUALITY SANDS PIT

Commodity: Silica sand.

Location: Williamtown, 15 km northeast of Newcastle.

Owner/Operator: Quality Sand and Ceramics Pty Ltd, Lavis Lane, Williamtown, NSW 2301. Ph (049) 65 1429. Fax (043) 34 1288.

Geology/Mineralization: Holocene marine and aeolian sands.

Reserves: April 1988 Proved - 3 mt.

Mining Method: Open cut extraction.

Treatment: On-site washing and drying plant.

Production Capacity: Washing - 100 t per hour. Drying - 20 t per hour.

Commencement: 1978.

Production: 1986/87 Foundry sand produced - 13 780 t. Ceramic sand produced - 5 906 t. Construction sand produced - 25 192 t.

Product Specifications: Foundry sand and ceramic sand - SiO₂ approx 98%, Fe₂O₃ between 0.16% and 0.18%.

Market: 1986/87 Foundry sand and ceramic sand - Newcastle and Sydney.

Transport: Road to Newcastle and Sydney.

Employees: June 1987 - 3.

Historic Production: Foundry sand from 1985 to June 1987 - 37 662 t.

Comments:

ROBINSONS ANNA BAY SAND PIT

Commodity: Silica sand.

Location: Anna Bay, 9 km southwest of Nelson Bay.

Owner/Operator: Robinsons Anna Bay Sand Pty Ltd, 69 Gan Gan Road, Anna Bay, NSW 2301. Ph (049) 82 1177.

Geology/Mineralization: Deposit consists of fine, even-grained silica sand, low in shell material, located at the back of the mobile dunes fronting Newcastle Bight.

Reserves: April 1988 Inferred resource sufficient for 10 years mining.

Mining Method: Front-end loader loading directly onto trucks.

Treatment: No on-site treatment.

Production Capacity: -

Commencement: 1954.

Production: 1986/87 Foundry sand produced - 8 280 t. Construction and filling sand produced - 7 518 t.

Product Specification: Foundry sand - not available.

Market: 1986/87 Foundry sand - Newcastle and Sydney areas.
Construction and filling sand - local and Newcastle.

Transport: Road to markets in Newcastle and Sydney.

Employees: June 1987 - 7.

Historic Production: From 1954 to June 1987 - not available.

Comments:

ROSEBERY SAND PIT

Commodity: Silica sand.

Location: Rosebery, 5 km south of city of Sydney.

Owner: ACI International Ltd, GPO Box 5094BB, Melbourne, VIC 3001.
Ph (03) 605 8555. Fax 605 8711.

Operator: ACI Resources Ltd, PO Box 208, Hawthorn, VIC 3122.
Ph (03) 810 2211. Fax 819 5200.

Geology/Mineralization: Pleistocene sand deposit within Botany Basin.

Reserves: April 1988 Probable reserve sufficient for 12 months mining.

Mining Method: Open cut. Front-end loading and stripping.

Treatment: On-site plant for gravity separation and screening.

Production Capacity: 109 000 tpa.

Commencement: 1985.

Production: 1986/87 Sand gathered and treated - 86 750 t. Glass grade sand produced - 82 434 t (amber glass grade).

Product Specification: Glass sand - Fe₂O₃ 0.09%.

Market: 1986/87 Australian Glass Manufacturers Co, Waterloo (Sydney).

Transport: Road - 3 km to glassworks.

Employees: June 1987 - 2.

Historic Production: From 1985 to June 1987 - 189 311 t of sand gathered and treated producing 172 596 t of glass grade sand.

Comments:

TANILBA SAND PIT**Commodity:** Silica sand.**Location:** Tanilba Bay, 14 km west of Nelson Bay.**Owner:** NSW Glass and Ceramic Silica Sand Users Association Ltd, Private Bag 938, North Sydney, NSW 2060. Ph (02) 957 5792. Telex AA22050. Fax (02) 923 1166.**Operator:** ACI Resources Ltd, PO Box 208, Hawthorn, VIC 3122. Ph (03) 310 2211. Fax (03) 819 5200.**Geology/Mineralization:** Deposit is part of a Pleistocene dune of fine to medium well-sorted sand located 6 km from present coastline. White sand occurs to a depth of 2 to 3 m and is underlain by a core of ferruginous mottled orange-brown sand ("coffee rock").**Reserves:** March 1988 Proved - 100 000 t.**Mining Method:** Open cut. Stripping with dozer and front-end loader.**Treatment:** On-site processing plant - washing, screening, and heavy mineral separation (wet magnets for Crown-Corning Ltd production).**Production Capacity:** 94 000 tpa.**Commencement:** 1980.**Production:** 1986/87 Sand gathered - 88 700 t. Sand treated 83 900 t. Glass sand produced (for colourless glass products) - 78 000 t.**Product Specification:** Typical chemical analysis of glass sand:

	<u>Percentage</u>
SiO ₂	99.8
Fe ₂ O ₃	0.010 to 0.018
Al ₂ O ₃	0.06
TiO ₂	0.5 to 0.8
Cr ₂ O ₃	< 0.001

Market: 1986/87 Glass manufacture - Australian Glass Manufacturers Co and Crown-Corning Ltd (both located at Waterloo, Sydney). Ceramicware manufacture - ICI Australia Ltd (Matraville, Sydney).**Transport:** Road.**Employees:** June 1987 - 7.**Historic Production:** From 1980 to June 1987 - not available.**Comments:** Expected life on present lease area is 12 months (from April 1988).

TUMBULGUM MINE

Commodity: Silica (chert).

Location: Tumbulgum, 7 km northeast of Murwillumbah.

Owner/Operator: Besser (Qld) Ltd, PO Box 342, Burleigh Heads, QLD 4220.
Ph (075) 35 2244.

Geology/Mineralization: Chert in undifferentiated early Palaeozoic sediments.

Reserves: April 1988 Proved - 20 000 t.

Mining Method: Open cut quarry.

Treatment: Material transported to Burleigh Heads for processing.

Production Capacity: -

Commencement: 1976.

Production: 1986/87 Quartz mined and crushed - 1 080 t. Crushed quartz produced - 1 060 t.

Product Specification: Not available.

Market: All product is used by company as a filler in concrete bricks.

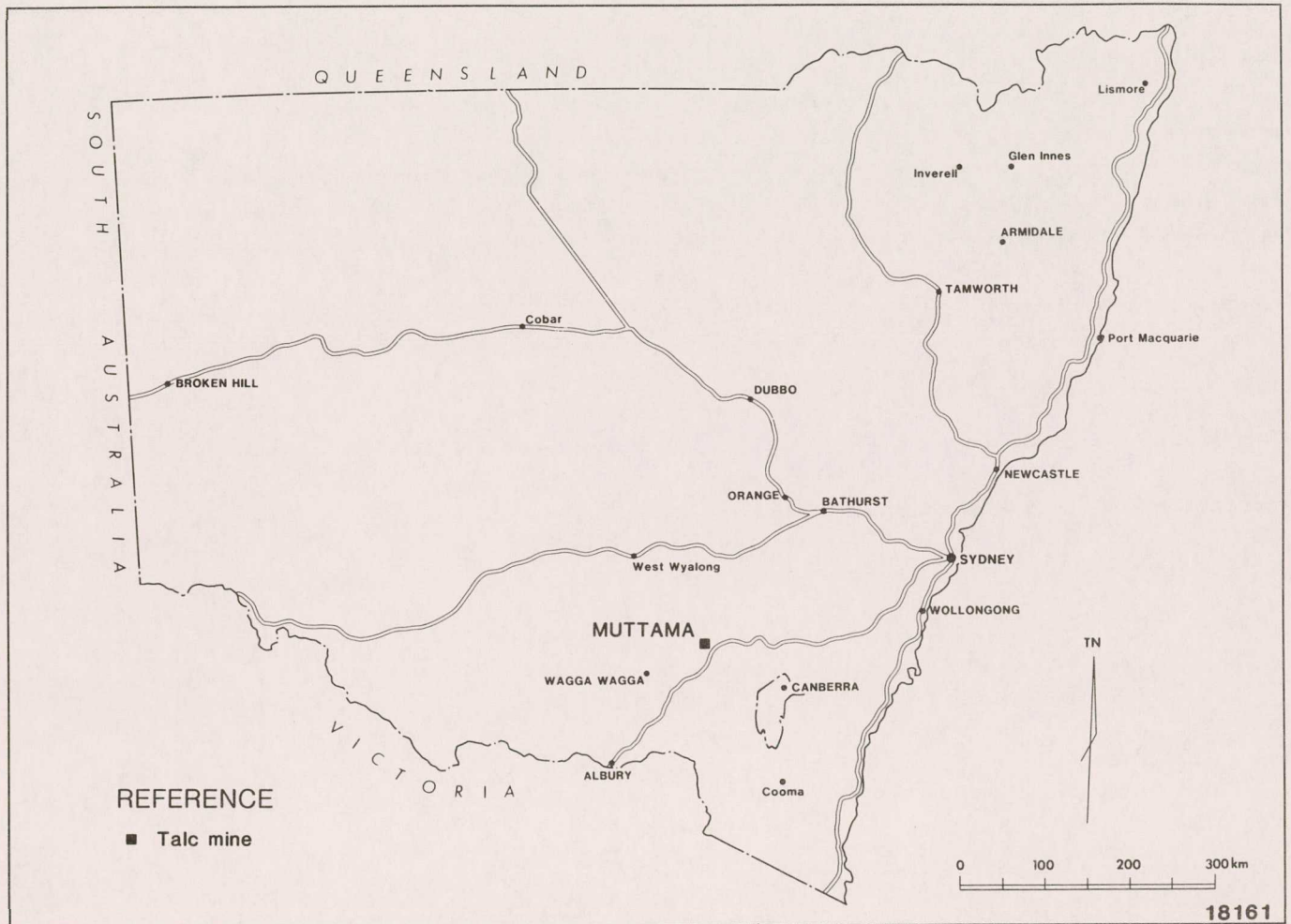
Transport: Road to Burleigh Heads.

Employees: June 1987 - 3 (intermittent working).

Historic Production: From 1976 to June 1987 - not available.

Comments:

TALC MINES



MUTTAMA MINE

Commodity: Talc.

Location: Muttama, 17 km southeast of Cootamundra.

Owner: James Cumming & Sons, 319 Parramatta Road, Auburn, NSW 2144.
Ph (02) 648 2309. Fax (02) 648 4887.

Operator: H C Briggs, "Yolanda", Muttama, NSW 2722. Ph (069) 43 6238.

Geology/Mineralization: The Muttama talc deposit consists of a number of small lenses of talc-schist within the early Palaeozoic Wambidgee Serpentinite which are composed essentially of talc and chlorite, sometimes with accessory actinolite and magnesite. Some limonite staining is present.

Reserves: Not known, but small.

Mining Method: Open cut.

Treatment: No on-site treatment. Crude ore is transported to the Auburn (Sydney) milling works where it is ground for use in the foundry industry.

Production Capacity: 50 t per week.

Commencement: 1954.

Production: 1986/87 Crude talc mined and treated - 90 t.

Market: 1986/87 Foundry industry - Sydney area.

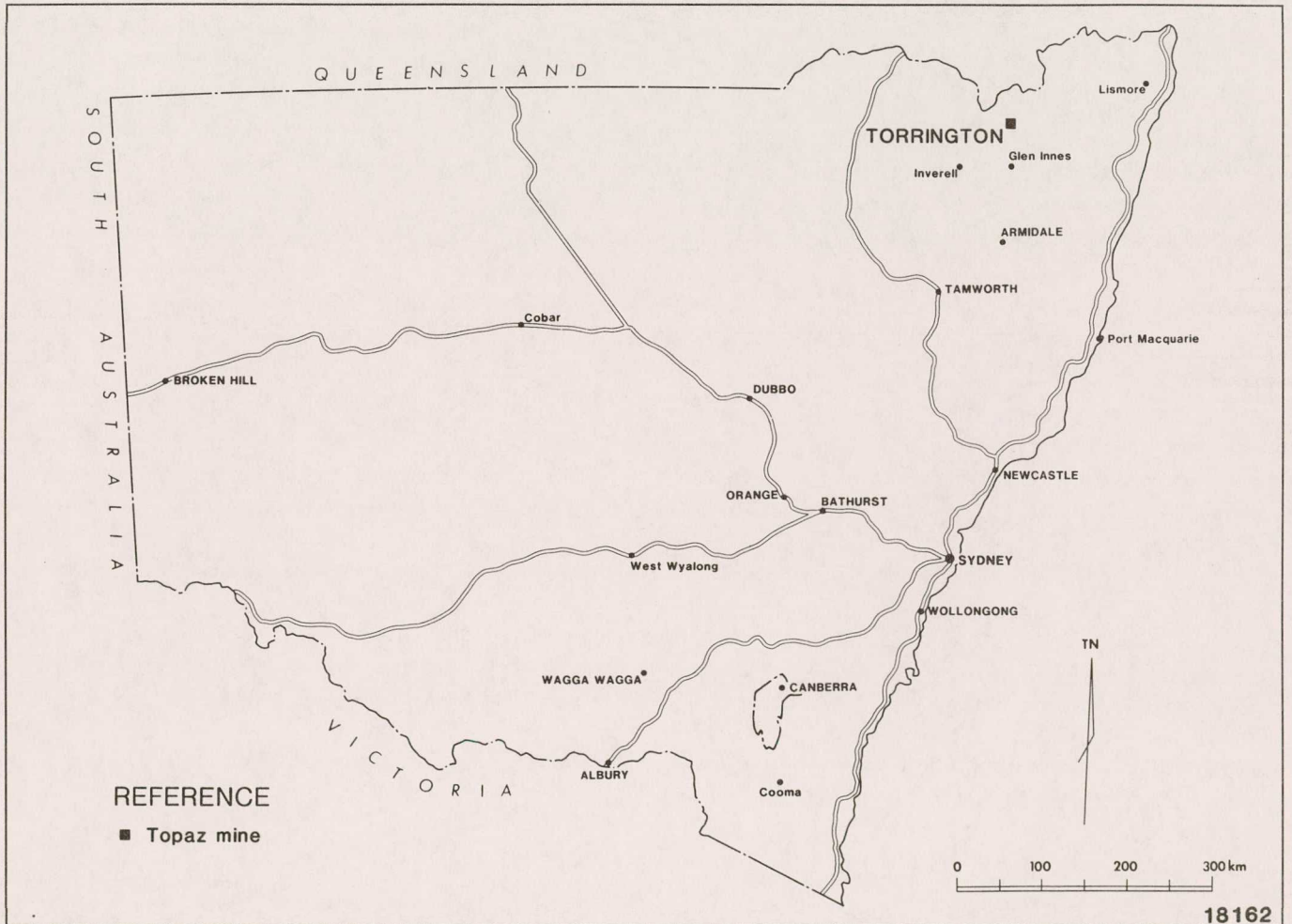
Transport: Road to Sydney.

Employees: June 87 - 2 (intermittent working).

Historic Production: From 1954 to June 1987 - Approximately 3 300 t.

Comments:

TOPAZ MINES



TORRINGTON INDUSTRIAL TOPAZ PROJECT

Commodity: Industrial Topaz
(minor - Tungsten, Bismuth).

Location: Torrington, 52 km north of Glen Innes.

Owner: Joint venture between Pacific Copper Ltd (51%), Level 4, 255 Pitt Street, Sydney, NSW 2000. Ph (02) 264 5055. Telex AA178188. Fax (02) 261 4183, Topalite Resources Pty Ltd (24.5%), Phoenix Oil & Gas NL (12.25%) and Mincorp Petroleum NL (12.25%).

Operator: Topalite Resources Pty Ltd, 3rd Floor, 468 St Kilda Road, Melbourne, VIC 3004. Ph (03) 820 1933. Telex AA152454. Fax (03) 820 0383.

Geology: A number of irregular bodies of a quartz-topaz rock (variously described as "silexite" or "greisen") occur within metamorphosed and altered early Permian sediments, pegmatites, and microgranites in the Torrington Pendant, a large roof pendant surrounded by the late Permian Mole Granite.

Mineralization: Quartz and topaz (approximately 20%) with minor amounts of wolfram and native bismuth.

Reserves: April 1985 - An inferred resource aggregating 1.5 mt of greisen containing 250 000 t of topaz from 24 orebodies outlined. Continuing exploration is expected to increase the total resource to 2.0 mt of greisen with about 340 000 t of topaz from approximately 30 orebodies.

Mining Method: Open cut. As most of the deposits outcrop as small hills, mining will involve the excavation and removal of the tops of these hills by conventional open cut earthmoving/quarrying - type methods.

Treatment: On-site plant - crushing to reduce ore to sand-size particles, and separation by gravitational, magnetic, and electrostatic methods to produce several grades of topaz concentrates. Wolfram, and probably bismuth, concentrates will also be recovered.

Production Capacity: Initially 75 000 tpa of ore treated, increasing to 150 000 tpa.

Commencement: Deposits were first worked for wolfram in 1903. Topaz production is expected to commence in 1990.

Production: Ore mined -
Ore treated -
Concentrates -

Product Specifications: Not available.

Market: Topaz concentrate will be forwarded to a processing plant to be established by the Joint Venture possibly at Glen Innes (or in the Newcastle area) where it will be calcined to yield a refractory aluminosilicate ceramic (mullite) which will be used (because of its capability to withstand high temperatures) to manufacture a range of refractory products. By-product fluorine compounds will be used in the fluorochemical and aluminium smelting industries.

Transport: Road to proposed refractory plant possibly at Glen Innes (or Newcastle area).

Employees: Mine - approximately 30 with full production. Processing plant - approximately 25.

Historic Production: Recorded production from the Carters Cut mine area (the largest of the earlier workings on the lease areas) - 270 t of tungsten concentrates from 40 000 t of ore mined.

Comments: The Torrington quartz-topaz deposits represent the largest known resource of industrial topaz in the world. The Joint Venture announced in May, 1987 the establishment of a two year, \$1 million, development programme to demonstrate the feasibility of a refractories and chemicals industry based on the deposit. The programme includes mineral processing at Torrington and the establishment of a pilot calcination, gas scrubbing, fluoride chemicals and refractory processing facility in Sydney.

The Joint Venture also plans to treat 80 000 t of tailings (battery sands), grading 15-20% topaz over the first two years of the mining operation.