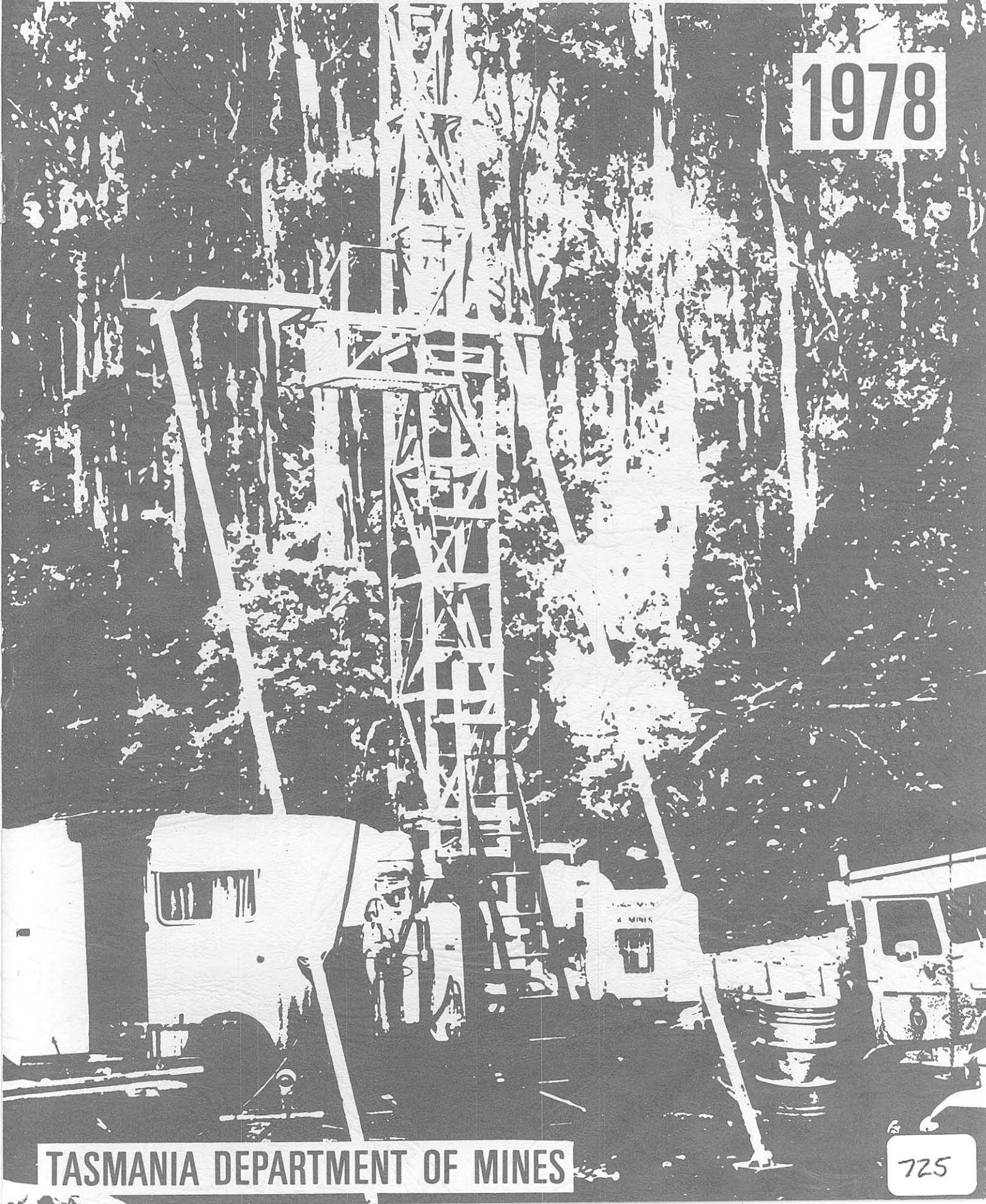


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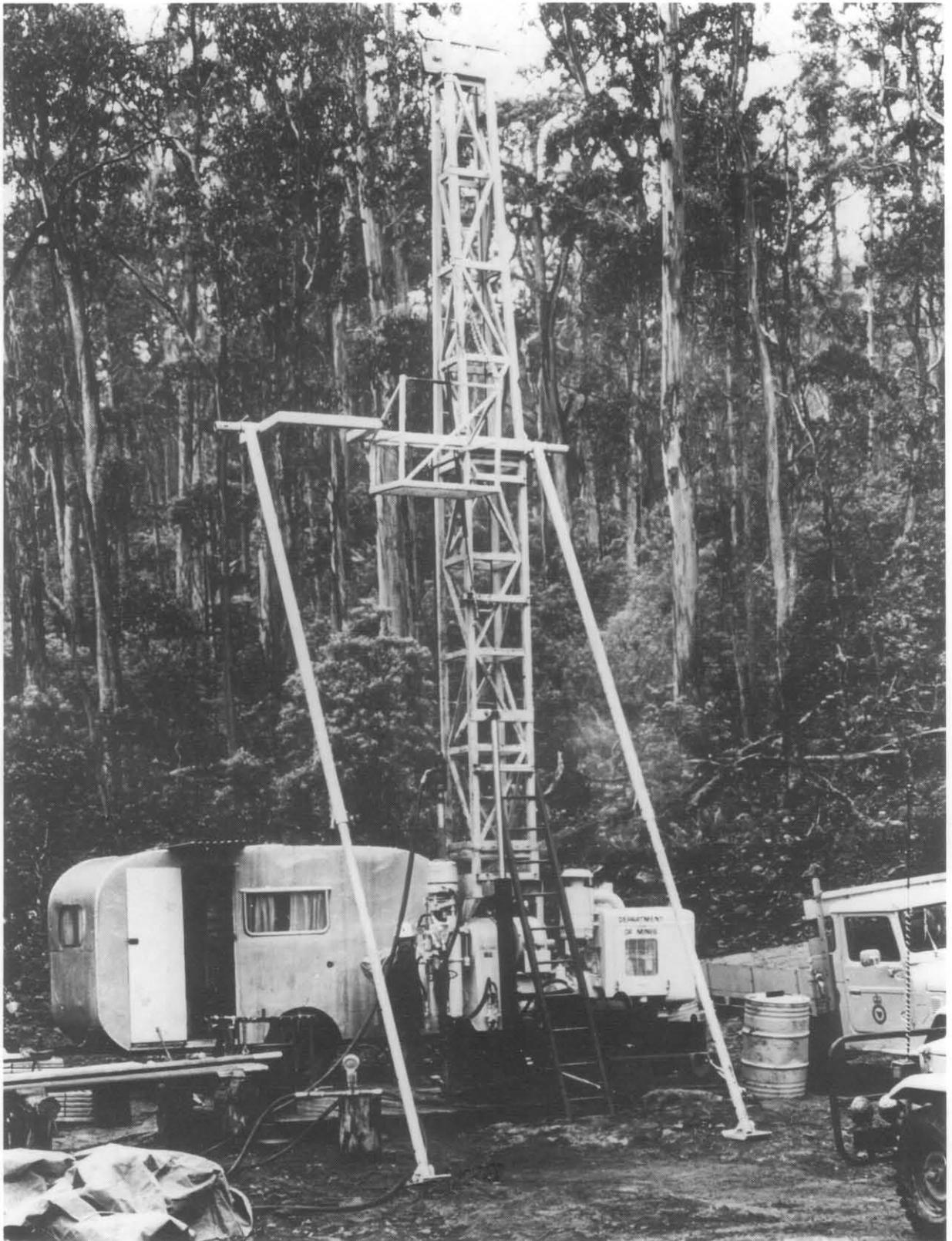
REPORT OF THE DIRECTOR OF MINES

1978



TASMANIA DEPARTMENT OF MINES

725



Longyear 44 drilling rig, one of several rigs being used for the evaluation of coal reserves in the Fingal Tier area



1979

PARLIAMENT OF TASMANIA

DIRECTOR OF MINES

REPORT FOR THE YEAR ENDED 31 DECEMBER 1978

Presented to both Houses of Parliament by His Excellency's Command

By Authority:

T. J. HUGHES, Government Printer, Tasmania

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REPORT OF THE DIRECTOR OF MINES

Department of Mines,
Hobart, 8 November 1979

THE MINISTER FOR MINES

SIR,

I present my report on the mining industry for the year ended 31 December 1978.

The value of metals and minerals produced from Tasmanian ores, based on average Australian metal prices was \$300 884 758. This represents an increase of 1 per cent on the figure of \$298 006 591 for 1977.

In addition metallurgical production from ores and concentrates imported into the State was \$230 923 877 compared with \$208 169 966 for the previous year. This was an increase of 11 per cent.

There was increased production of all the principal minerals except iron ore pellets, tungsten as tungstic oxide and zinc. The increase in tin concentrates produced was specially significant due to expanded operations at Renison Bell.

Details of production and value of all mining products are shown elsewhere in this report but particulars of the principal minerals are summarised below: —

	1977		1978	
	Quantity	Value \$ million	Quantity	Value \$ million
Copper (tonnes)	21 089	24.8	22 067	26.7
Gold (kilograms)	1 616	6.9	1 618	8.8
Iron ore pellets (tonnes)	2 119 430	44.8	2 108 027	43.0
Lead (tonnes)	16 027	8.5	16 907	9.6
Silver (kilograms)	65 830	8.9	68 456	10.5
Tin (tonnes)	6 634	69.1	7 271	84.5
Tungsten as tungstic oxide (tonnes)	2 533	41.1	2 630	31.8
Zinc (tonnes)	63 070	42.7	61 753	35.1
Coal (tonnes)	198 966	2.2	223 957	2.5

DEVELOPMENTS

Renison Limited announced in September that a \$20 million expansion project would proceed in two stages. Stage one provides for the construction of a new rod mill. This is to be followed by a new ball mill and purchase of further mining equipment.

This expenditure will increase the capacity for ore treatment from the present 630 000 tonnes to 850 000 tonnes per year. Plans for a smelter will await completion of the proposed development.

There have been extensive remodifications to the main ore feeder crusher bin at Mt Lyell. This work was necessary to cater for the four huge 50 tonne diesel trucks which will be used to haul copper ore from the mine. The present rail system is no longer viable as mining has now reached a point too deep for the rail trucks to operate. The rail stock is to be sold as soon as the trucks arrive. Estimated cost of the trucks is \$1.5 million.

Following completion of the \$4 million development project by King Island Scheelite earlier this year, the first batch of artificial scheelite was produced in June. This contains 80-90 per cent tungstic oxide compared with the previous 72 per cent and should provide a more competitive product to consumers. This mine is one of the biggest producers of scheelite in the western world.

The exploratory program of the Mackintosh joint venture at Que River, about 80 kilometres south of Burnie was completed in September. Work has included the sinking of a vertical shaft to a depth of 170 metres with some lateral development to explore the silver-lead-zinc ore body. Cost of this development has been about \$6 million. During the exploration 7 000 tonnes of ore was sent to Rosebery for treatment at the Electrolytic Zinc Company's plant. A decision by Aberfoyle, which holds a 90 per cent interest in the project, will not be made until another feasibility study is carried out and an assessment made of the results from previous exploration. Part of this study will assist in deciding whether the company should sell its ore to the Electrolytic Zinc Company for treatment or set up a full mining and treatment operation costing upwards of \$50 million.

A consortium of French and Australian mining interests has entered into a joint venture to develop an old wolframite mine located near Sheffield. The new project is called the Oakleigh Creek Mine and is to be operated by Central Tasmanian Tungsten Pty Ltd. The companies in the consortium are Buka Minerals N.L., Triako Mines N.L. and the French firm Serem (Aust.) Pty Ltd.

It is hoped to commence operations in the first half of 1979 and to employ about 25 men. Capital cost of the project is expected to be \$1.5 to \$2 million. On current reserves the mine will have a life of five years. As the area is close to a National Park the mining operation has been designed to minimise disturbance to the area. Mine work will be confined underground and the only visual impact will be the underground entrances.

Problems are still being experienced with the installation of the new electronic furnace at Electrona. The Department of Planning and Development extended its original guarantee of \$500 000 until 30 June 1979.

The threatened energy crisis and increased oil prices have encouraged the use of coal. The Cornwall Coal Co. has expanded over \$400 000 in the purchase of a second hand continuous miner, conveyors, power supply and washery modifications. Test work for Savage River Mines pelletising plant has proved coal to be a technically feasible fuel.

Continued significant losses and technical problems have placed the future of the North-West Acid Pty Ltd company in jeopardy. Present contracts run out in June 1980.

PRODUCTION

Copper

The major producer is the Mount Lyell Mining and Railway Company Ltd at Queenstown but significant quantities also result from the processing of zinc-lead ores by the Electrolytic Zinc Company at Rosebery and as a product of tin mining operations by Cleveland Tin N.L. at Luina.

The Mount Lyell Company treated 1.6 million tonnes of ore for the production of 74 315 tonnes of copper concentrate containing 19 454 tonnes of copper, 2 644 kilograms of silver and 433 kilograms of gold. The copper concentrates are transported by road to Melba Siding and then by rail to Burnie for shipment to Port Kembla and Japan. Pyrite concentrates of 72 305 tonnes were produced for processing by North-West Acid Pty Ltd at Burnie for the manufacture of sulphuric acid.

The Amending Agreement, under which the Commonwealth met the total cost of the subsidy, less the pay-roll tax payable by the Company, which the State Government agreed to waive, expired on 30 June 1978. Under this Amending Agreement the Commonwealth accepted that certain approved capital costs could be included in Mt Lyell's subsidy claims.

A second Amending Agreement was approved by the Federal Government to cover the period 1 July to 30 September 1978. This made provision for the assistance to continue to Mount Lyell under the same basis as the previous Amending Agreement. Finally on 23 August it was announced that the Federal and State Governments would share, dollar for dollar, in meeting Mount Lyell's losses for 21 months from 30 September

1978 when the current agreement was due to expire. The subsidy will be given as an interest-free loan repayable when the company's operations become profitable. This further assistance was agreed to despite the fact that the Industries Assistance Commission had recommended that no further aid should be given. Thanks to improved prices for copper, tighter operating controls and the success of the modified mining plan the company has been able to operate without financial assistance for the last quarter of the year.

The Electrolytic Zinc Company at Rosebery produced 2 163 tonnes of copper from the treatment of its zinc-lead ores and 451 tonnes were produced by Cleveland Tin N.L. at Luina as part of its tin mining operations.

Iron Ore

Pellets produced from iron ore mined at Savage River totalled 2 108 027 tonnes compared with 2 119 430 tonnes for the previous year. Twenty-eight shipments of pellets were made from Port Latta to Japan under the existing contract. A four per cent cut in the price for iron ore pellets added to the problems experienced by this company due to continual industrial disputes.

In December it was announced that Savage River Mines and Industrial and Mining Investigations Pty Ltd had reached agreement for transfer of an area known as the Northern Lease to Savage River Mines. Until this time the area had been held as part of an exploration licence by Industrial and Mining Investigations Pty Ltd. The area covers about ten square kilometers and it is hoped to develop a new open cut working which will be operated concurrently with the present mine. It is anticipated that this will extend the life of the mine for another twenty-five years.

Tin

Total production was 7 271 tonnes. This was an increase of almost ten per cent over the total of 6 633 tonnes for the previous year. The principal producers were Renison Limited at Renison Bell, Cleveland Tin N.L. at Luina, Aberfoyle Tin Ltd at Rossarden and the Pioneer Tin Mine which is operated by Kibuka Mines Pty Ltd.

Tasmania continues to be the leading State in production of this mineral, contributing about 60 per cent of the Australian total.

Production by Renison Ltd totalled 5 761 tonnes of tin from the mining of 611 649 tonnes of ore. The overall recovery of tin metal in concentrates was 68.8 per cent compared with 66.81 per cent last year.

The commissioning of the leaching plant in August 1977 permitted the closure of the vanner section of the gravity plant and tin formerly recovered in that section is now recovered by flotation.

Proved and probable reserves increased by 1.7 million tonnes but the grade dropped from 1.19 per cent to 1.14 per cent tin. No decision has yet been made regarding the possibility of the company constructing its own smelter.

The company has continued an active exploration program at Renison Bell, Mt Lindsay, Trial Harbour and Wilson River. In addition it has engaged in a drilling program in the Blue Tier area near St Helens.

At the Cleveland mine at Luina, production consisted of 1 242 tonnes of tin and 451 tonnes of copper from the treatment of 378 029 tonnes of ore. The main decline to depth has continued and mine development has accelerated principally due to an increase, from two to three in the daily shifts.

As a result of the efforts made, both in metallurgical research and capital expenditure on plant, there has been an improvement in ore recovery. The flotation circuit capacity has been doubled and a cyclone circuit auxiliary to the heavy media section has been installed.

At the Storeys Creek and Aberfoyle mines operated by Aberfoyle Tin Ltd 36 761 tonnes of ore were treated for the recovery of 105 tonnes of tin and 140 tonnes of wolfram concentrate. Drilling of a 1.2 meter ventilation shaft commenced in October. Completion of this work will enable development to advance more quickly.

Minops Pty Ltd produced 12 tonnes of tin from the treatment of 7 756 tonnes of ore in the first quarter of the year from the Razorback mine. However, the company decided to cease mining operations on 15 February.

Amdex Mining Ltd took over the operations at the Endurance Mine from Blue Metal Industries, in April. During the year a total of 179 890 cubic metres was treated for the recovery of 53 tonnes of concentrate containing 38 tonnes of tin.

Amdex also produced 49 tonnes of concentrate containing 35 tonnes of tin from the treatment of 160 000 cubic metres at the Pioneer Tin Mine.

Several of the smaller operators have been encouraged to return to tin mining in the north-east as a result of the better price being received for this product.

Tungsten

The principal producers are King Island Scheelite, who mine scheelite at their Bold Head and Dolphin mines on King Island and the Storeys Creek and Aberfoyle mines, who produce wolfram concentrates from the mining of wolfram-tin ores in the vicinity of Rossarden. In addition Tasminex N.L. operates an open-cut mine at Kara near Hampshire, south of Burnie.

Development work has continued at a wolframite mine near Sheffield to be known as the Oakleigh Creek mine. This work is being done by a consortium of French and Australian mining interests. Work has also proceeded at the All Nations mine at Moina.

The King Island Scheelite mine treated a total of 392 050 tonnes of ore for the production of 2 377 tonnes of tungstic oxide. This figure showed little variation from the 1977 total. Ore from the Storeys Creek and Aberfoyle mines is treated at the Aberfoyle mill. This year 36 761 tonnes of ore were processed for the recovery of 140 tonnes of tungstic oxide and 105 tonnes of tin.

In addition there was production of 122 tonnes of tungstic oxide from Tasminex scheelite mine at Kara. This was the company's first full year of production. The concentrate is taken by road to Burnie where it is dried and packed. From there it is shipped to West Germany via the United Kingdom. McIntyre Mines has continued its detailed investigation of this area under the option agreement entered into in 1977.

Rutile-zircon

Prices of these minerals showed no improvement until November when rutile gained a little. Kibuka Mines continued rehabilitation work at their former mine on King Island.

Zinc

The Electrolytic Zinc Company at Rosebery treated 701 264 tonnes of ore, principally from the Rosebery mine, for the recovery of 138 858 tonnes of zinc concentrates, 27 812 tonnes of copper concentrates and 17 365 tonnes of lead concentrates. Total production consisted of 61 753 tonnes of zinc, 16 907 tonnes of lead, 2 163 tonnes of copper, 65 812 kilograms of silver and 1 185 kilograms of gold. Pyrite aggregating 201 419 tonnes was treated by North-West Acid Pty Ltd for the production of sulphuric acid.

The zinc concentrate from the Rosebery mine and concentrates from the Broken Hill mines are treated at the Electrolytic Zinc Company's plant at Risdon. The production for 1978 was 114 340 tonnes compared with 104 093 for the previous year.

METAL PRICES

The following table shows the average Australian metal prices: —

Commodity	Unit	1976	1977	1978
		\$	\$	\$
Copper	tonne	1 166.67	1 188.34	1 201.67
Gold	kilogram	3 245.78	4 306.86	5 426.70
Lead	tonne	364.17	532.09	570.83
Rutile concentrates	tonne	290.00	211.58	188.25
Silver	kilogram	116.25	135.24	153.37
Tungsten oxide	unit	93.81	158.79	120.95
Tin	tonne	6 778.84	10 400.00	11 649.17
Zircon concentrates	tonne	140.00	98.75	65.00
Zinc	tonne	699.00	680.08	569.75

Copper

After opening the year at \$1 120 per tonne the price fell in February to \$1 080 but recovered again at the end of March reflecting higher prices overseas. This improvement continued during March and April.

As a result of the conflict in Shaba province of Zaire and transport problems associated with copper consignments from Zambia, the price reached \$1 180 in May. There was a slight drop to \$1 160 in June but this was regained the following month.

The remainder of the year saw prices climbing steadily with a top price of \$1 340 being received in December. This general improvement was contrary to the predictions of market analysts who had forecast a renewed setback for prices towards the end of the year because of record stockpiles and failure of the proposed cuts in production.

On the London Metal Exchange the price at the beginning of 1978 was £664 per tonne. It remained firm until late January when it fell to £616 per tonne. Prices rose briefly in mid-February following discussions by Zambia, Zaire and Peru to reduce production by 15 per cent. Prices then strengthened in mid-March following agreement for the production cuts between the three countries. London Metal Exchange stocks declined appreciably during the first half of the year and from July prices showed a steady improvement reaching a high of £780 in mid-December. Closing price for 1978 was £773 an increase of £109 over the January figure.

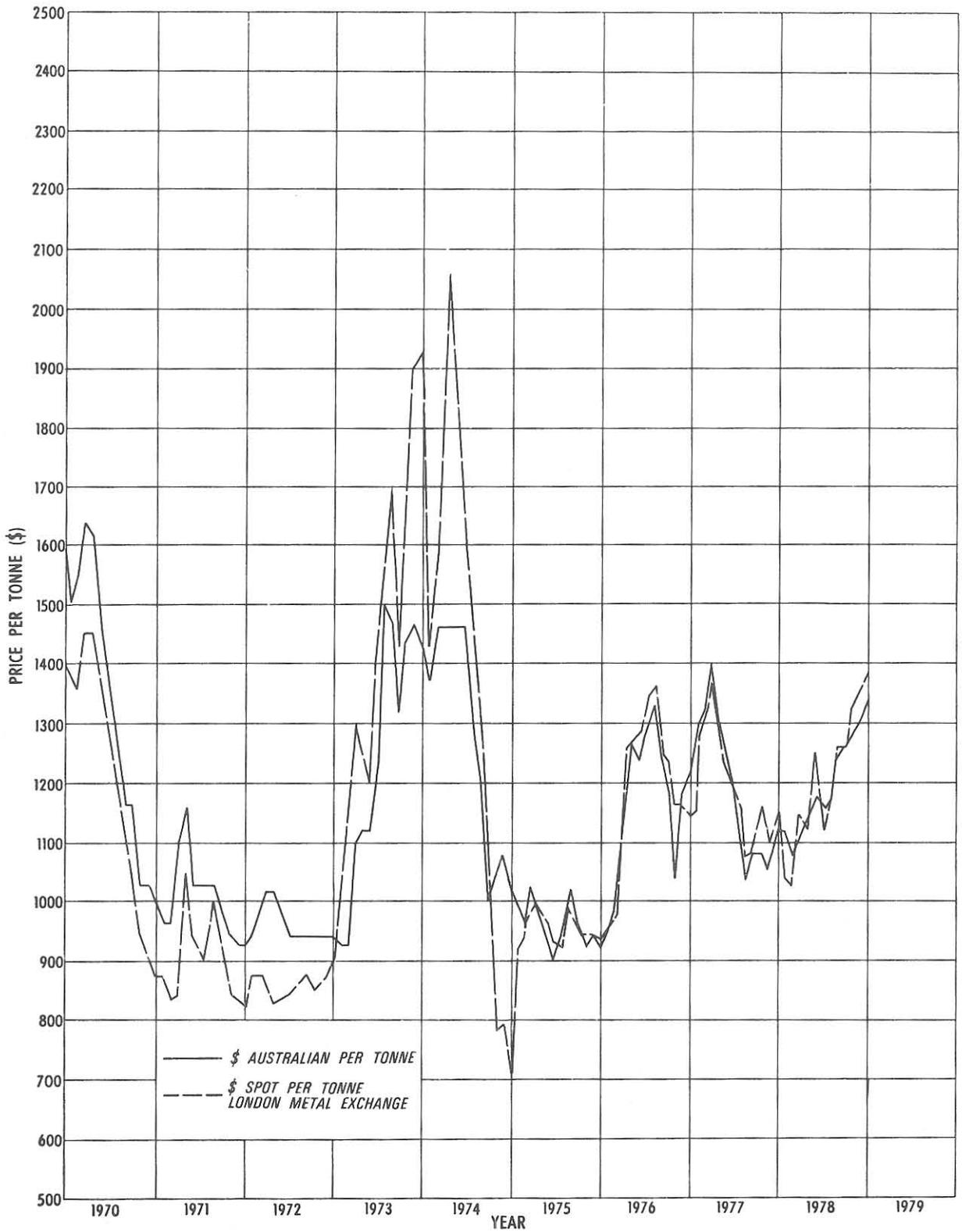
The prospect of real improvements in copper prices is thought good in many informed quarters. This is partly due to the fact that L.M.E. stocks of copper at their lowest level for about three years.

Tin

Proposed legislation in the U.S. Congress affecting the U.S. strategic stockpile, had more effect on tin markets than any other factor, on either the producer or consumer side of the equation. Another item contributing to price levels was the introduction of export control towards the end of the Fourth Tin Agreement. Larger quantities of tin in the buffer stock would have enabled the buffer stock manager to be more effective in controlling prices.

The introduction of legislation in both Houses of the U.S. Congress on 9 March considerably dislocated tin prices. The legislation involved the proposed sale of 45 000 long tons of tin and the purchase of certain other items including 225 000 tons of copper.

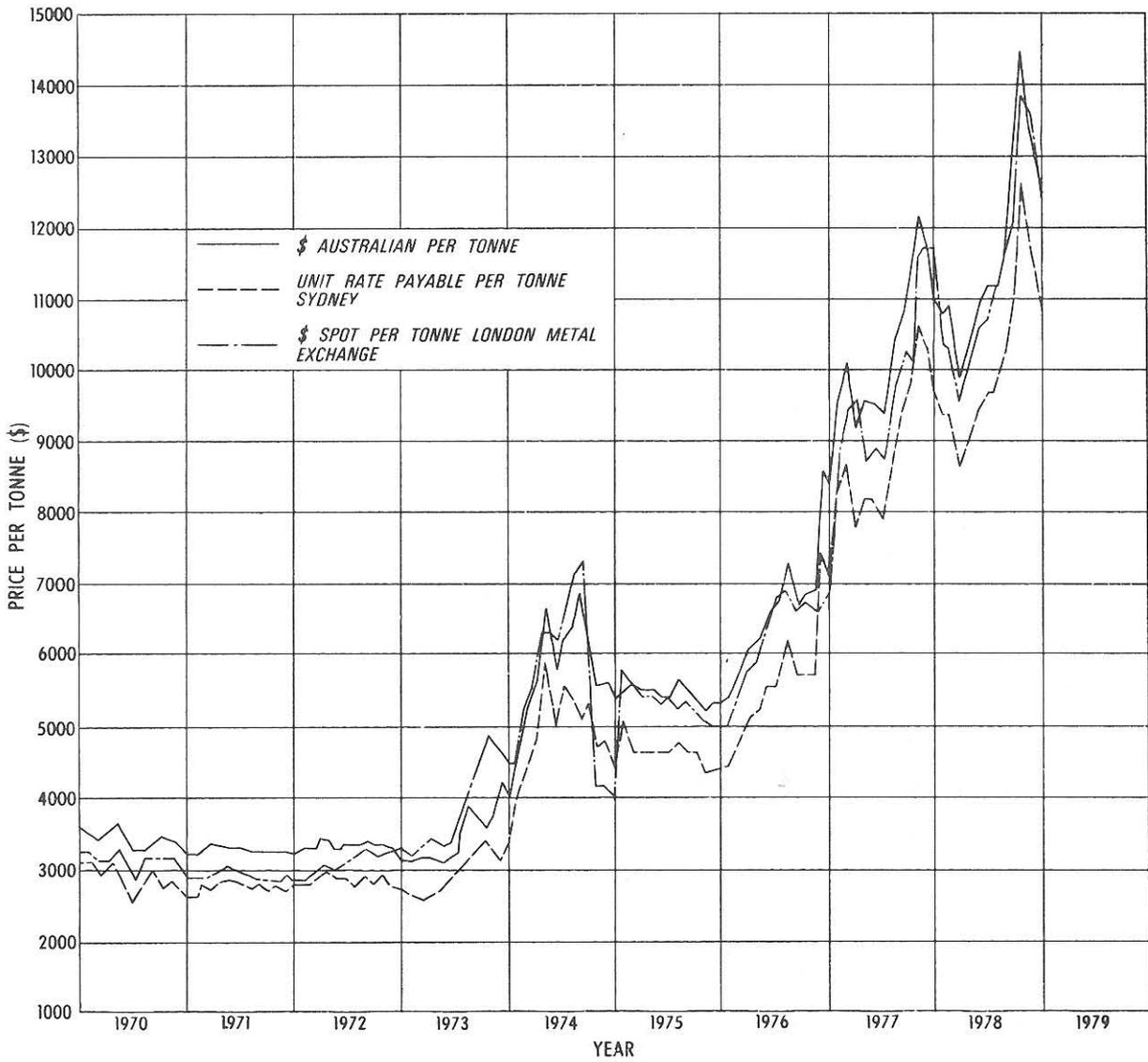
COPPER PRICES
MONTHLY AVERAGES, 1970-78



5 cm

TIN PRICES

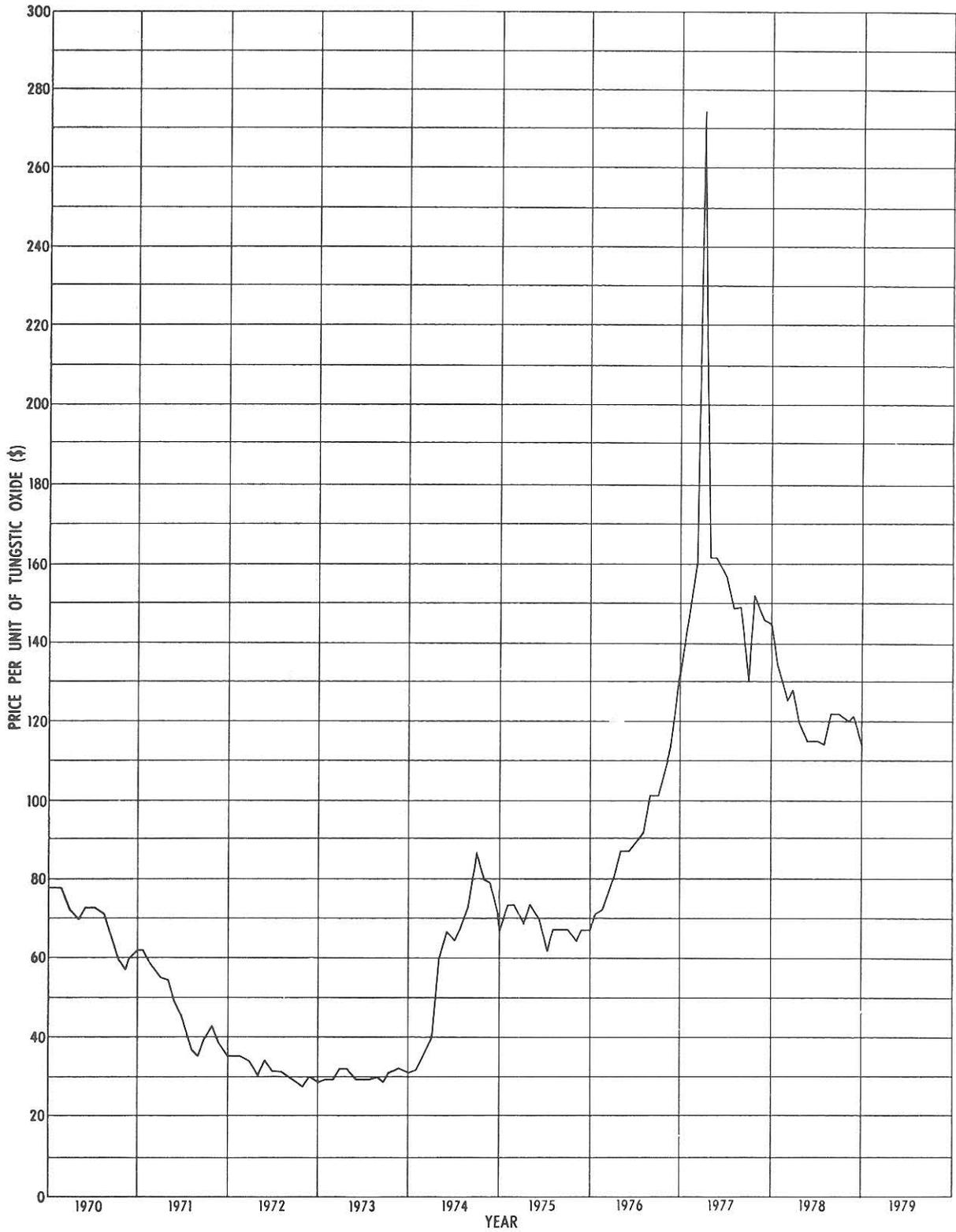
MONTHLY AVERAGE, 1970-1978



5 cm

TUNGSTEN PRICES

MONTHLY AVERAGES, 1970-1978



5 cm

In October a sugar bill was passed to the U.S. Senate with amendments to transfer up to 5 000 tons of tin to the buffer stock and authority for the sale of 30 000 tons of tin. This was eventually defeated. Any future action will require new legislation in 1979. The only real advance which has been made in this matter is that both Houses of the U.S. Congress have indicated approval of the concept of a transfer of tin to the buffer stock.

The price on the London Metal Exchange at the beginning of the year was £6 240. There were no sudden fluctuations until April when it was thought there might be a sale of tin from the U.S. strategic stockpile. From May to November the price showed a steady but definite increase, moving from £6 140 to £7 975. In October there was a reaction to the defeat of the legislation in the United States which caused the price to fluctuate by £950 in a two day period. The price quoted at the end of the year was £7 575.

The instability of tin prices can largely be attributed to the factor of the U.S. stockpile, of legislation involving it and of speculation about that legislation.

The International Tin Council is due to meet in London in January 1979.

The Current Buffer stock price range of \$9 070-\$11 420 a tonne was agreed at the Tenth Tin Council Session in July 1978 and will be reviewed in July 1979.

The Tin Council has established a Preparatory Committee to undertake work towards the negotiation of a Sixth International Tin Agreement as the current Agreement expires on 30 June 1981.

Tungsten

Over the years this metal has been subject to major price fluctuations, perhaps more than any other. In April 1978 the Primary Tungsten Association announced the introduction of a new price index to be known as the International Tungsten Indicator (I.T.I.). This system relies on reported transactions between producers and consumers. It is hoped this will lead to greater market stability.

Prices eased during 1978, having commenced at £145 per unit and finished the year at £114. There was a slight improvement during August to November but this was lost by December.

Reasons for the lower price included reduced purchases by Communist-block buyers, the entry of new producers following good prices in 1977 and the release of almost 3 000 tonnes of tungsten oxide by the General Services Administration of the United States.

Zinc

The reduced demand for zinc experienced in 1977 continued well into 1978. Overseas producers announced plans to cut back production in an attempt to reduce the oversupply. However, there was an improvement in August, apparently due to increased demand for zinc in South-east Asia and a run down in metal stocks.

On the London Metal Exchange prices commenced at £283 and closed at the end of the year on £347. The highest price for the twelve months being £375. The Australian domestic price opened at \$536 and fell to \$489 by July. There was a steady improvement from August to close the year at a high of \$632 per tonne. The improved sales in Australia contrasted sharply with weak markets in U.S.A. and Europe in the first half of the year.

EXPLORATION

Improved prices for most commodities and continued concern at the possibility of a future energy crisis both contributed to active exploration programs on shore. In addition, applications were received for offshore areas in Bass Strait and off the West Coast near Macquarie Harbour. There was also further investigation by local companies of areas adjoining their leases to extend known reserves.

At the end of the year there were 77 Exploration and Special Prospectors' Licences in force. The majority of these licences were in the western and north-western parts of the State. However, with tin maintaining a good price, companies such as Broken Hill Co. Pty Ltd, Renison Ltd, Mineral Holdings Australia Pty Ltd and Geopeko have shown interest in exploring for tin in the north-east of the State. Large areas are also held for coal investigation by different companies and the Department, too, has continued its work in determining the reserves of this fuel in the Fingal Valley.

The Department has maintained its established program of regional geological mapping, economic geology, groundwater investigations and engineering geology. Maps and reports are issued regularly and professional staff are always available to assist and advise those engaged in the mining industry. Reports and other information lodged by former exploration licence holders are placed on 'open file' when licences are relinquished or cancelled. These, with departmental publications and maps, form the basis upon which further work is planned by other explorers.

The Department's drilling plants are engaged in testing mineral and coal deposits and in the investigation and measurement of underground water in selected areas. The results of all departmental work are published and are available to assist interested parties.

Expenditure on Exploration Licences and Special Prospectors' Licences during 1978 was as follows: —

<i>Quarter ended</i>	<i>\$</i>
31 March 1978	845 773
30 June 1978	1 028 025
30 September 1978	1 121 991
31 December 1978	1 255 278
	4 251 067

There were 29 applications received for Exploration Licences and 6 for Special Prospectors' Licences during the year.

COAL

The Duncan mine at Fingal operated by the Cornwall Coal Company was the only coal mine in production during the year. Output increased by 24 991 tonnes to a total of 223 957 tonnes compared with 198 966 tonnes in 1977.

Mining conditions were again generally difficult due to a variety of geological problems. These affected productivity and caused a higher proportion of reject from the washery. The company's principal objective is to open a larger area of easily mineable coal to allow more flexibility in operations when seam disturbances are encountered.

Test work in 1977 for Savage River Mines pelletising plant has proved coal to be a technically feasible fuel. The number of employees increased from 88 in 1977 to 105 in 1978, twelve of the additional employees being underground workers.

Further anticipated increases in fuel oil prices are making coal a more attractive alternative.

OIL

The following licences are held in Bass Strait under the Petroleum (Submerged Lands) Act 1967: —

<i>Title</i>	<i>Holder</i>	<i>Blocks</i>	<i>Expiry Date</i>
T/3P	Hematite Petroleum Pty Ltd	85	16.7.79
T/5P	Hematite Petroleum Pty Ltd	65	16.7.79
T/6P	Hematite Petroleum Pty Ltd	64	16.7.79

The search for oil and gas in Australia during 1978 stepped up to proportions approaching the level of activity in the early years of this decade. This extended to Tasmanian waters. An application was received from Terra Marine Pacific for 60 blocks off Macquarie Harbour. In addition an application was received from Otter Exploration N.L. for 224 blocks extending from north of Flinders Island to the vicinity of Eddystone Point on the north-east coast of Tasmania. Terra Marine Pacific is based in the United States of America and Otter Exploration N.L. is an Australian company.

As oil prices continue to rise, there is renewed interest in re-examining areas previously held under offshore permit, with improved and more accurate seismic techniques.

LEGISLATION

The only amendment made to the various Acts administered by the Department was to the Regulations under the Mining Act 1929.

As from 22 November 1978 the rates of royalty payable by the lessee in respect of mining products taken under a lease are as follows:—

- (a) Sand and gravel — 30 cents/m³
- (b) Mining products (including a concentrate) other than sand, gravel, coal, oil, pyrite, silica, dolomite, limestone, limesand, ochre, kaolin and stone.
 - (i) where annual profits do not exceed \$10 000 000 — 2½ per cent of proceeds in any year from sale of the mining product or 5 per cent of profits (as determined by the Minister) from sales in that year of the mining product, whichever is the less.
 - (ii) where annual profits exceed \$10 000 000 but do not exceed \$15 000 000 — 3 per cent of proceeds in any year from sale of the mining product or 6 per cent of profits (as determined by the Minister) from sales in that year of the mining product, whichever is the less.
 - (iii) where annual profits exceed \$15 000 000 — 3½ per cent of proceeds in any year from sale of the mining product or 7 per cent of profits (as determined by the Minister) from sales in that year of the mining product, whichever is the less.

Notes:

1. No royalty is payable in a quarter for the above materials if the proceeds of the sales in that quarter do not exceed \$50 000. The royalty on oil as stated in the Mining Act is 10 per cent of the gross value at the well head, but in the event of any actual production in the State a confirming Regulation would be necessary.
2. Where a mining product is treated in the State for the recovery of a metal the royalty is reduced by 20 per cent for that period.
3. No royalty is payable on coal, pyrite, silica, dolomite, limestone, limesand, ochre, kaolin and stone.
4. Definitions: 'Proceeds' means the amount received for the sale of the product reduced by deducting the cost of transport, handling and selling.

MINING AND THE ENVIRONMENT

In keeping with the public's growing awareness of the necessity to protect the environment, there has been a developing sense of responsibility on the part of the mining industry. However, the problems facing the industry are twofold. First of all it has to overcome its inheritance from the past, when operations were conducted in a manner which would not be acceptable by today's standards. Secondly, it has to combat the image which extremists of the conservation movement have fostered and encouraged, that mining is synonymous with destruction.

There is an urgent need for the public to appreciate that the performance of the past will not be repeated in the future. The many abandoned and derelict workings of past decades can serve as a spur for better rehabilitation on completion of mining operations. This means there must be predevelopment planning to prevent unnecessary impact on the environment and to ensure that the adverse effects of mineral extraction can be reduced to acceptable levels.

It is generally accepted that our present way of life is highly dependent on minerals and energy products. We must therefore have the mines and quarries to produce them. However, the distribution of mineral deposits is fixed by past geological events. Mines cannot therefore be planned and located in the same manner as residential, commercial and manufacturing industries. It must be realised, too, that mining is not a final use of the land. Although it is a consumer of part of the land, there are many examples of successful restoration and rehabilitation which have followed mining operations.

As the mining industry does not determine the location of mineral deposits, any restriction on the land area available for exploration, places a severe limitation on potential discoveries. Any land use allocation system, should therefore be sufficiently flexible to provide for the exploration and working of mineral deposits in areas where another use has been established. In this way the industry will not be denied access to large areas in which the ore-bodies of the future may be found.

It is therefore essential that the companies undertaking exploration conduct their activities so as to minimise any adverse effect on the environment. In particular there must be strict control on vehicular access tracks. These not only have a physical impact on the surface but can open formerly inaccessible areas to possible damage from hunters, tourists and others.

The aim of both the mining industry and the environmentalists should be to ensure that the proper balance is struck between development and conservation. We must use and develop the resources with which our State has been endowed but this must not be done in a careless or wasteful manner.

THE FUTURE OF MINING

It has been said that the development of civilisation is related to man's ability to obtain minerals. The more we advance, the more we depend on minerals to keep us where we are and to assist us in moving forward. Without our minerals we are stripped of most of the essentials and virtually all the comforts of modern living. Therefore, mineral development, like it or not, must be the cornerstone of the Tasmanian economy.

Unless planning for future development is allowed to progress in a rational manner, then our continued prosperity will be greatly endangered. Mineral development has made a significant contribution to our national income and, accordingly, has also made a valuable contribution to general community welfare. However, intervention by outside regulatory bodies is tending to restrict the production of minerals and deny the industry access to large areas.

If mining is to take place, exploration companies need to be assured that when economic ore bodies are found, they will be allowed to develop them. The conditions, however, must be reasonable from both the company and social viewpoints.

Mining companies must have security of tenure. They must be assured that if huge sums of money are invested in exploration, they will have the certainty of leases. A balance must be struck between development and the environment. With careful planning, mineral activity can co-exist with a protected environment.

The forecast increase in world population will cause a greater demand for minerals. Although certain factors such as advanced technology, higher prices and improved transport facilities will change present uneconomic deposits into economic operations, it is essential that mineral exploration continues. We cannot utilise our resources if we do not know what they are and where they are. It is necessary to maintain a rate of discovery and a rate of development that enables us to be sure of the mines we need up to ten years and more ahead. Together with this exploration is a need for more research into the recycling of minerals produced, so that they are utilised to the greatest advantage.

Firm guidelines must be introduced to manage exploration and mineral production activities. More care must be taken in preventing unnecessary impact on the environment. This can be achieved by properly designed access tracks, use of the most suitable equipment and careful siting of excavation work. Reclamation work should proceed progressively and not left to the conclusion of operations.

By consideration of environmental and amenity factors it can be demonstrated that mining is an acceptable as well as an essential use of our land resources.

AUSTRALIAN MINERALS AND ENERGY COUNCIL

This Council is composed of Commonwealth and State Ministers responsible for minerals and energy matters. AMEC was established in 1976 with the following terms of reference: —

To promote the general welfare and progressive development of the Australian mining and mineral industry and to consult on the nation's energy needs, resources and policies.

During the year two meetings of the Council were held, in Hobart (March) and Darwin (August). Meetings of the Advisory Committee which consists of officials drawn from the departments supporting the Council Ministers were held in Melbourne (February), Adelaide and Hobart (March), Darwin (August) and Broken Hill (November).

Important matters discussed have included: —

- (i) the international and Australian oil supply outlook
- (ii) energy conservation
- (iii) export controls
- (iv) offshore legislation
- (v) petroleum exploration
- (vi) raw materials processing

REVENUE

REVENUE COLLECTED DURING THE YEAR ENDED 31 DECEMBER 1978	
<i>Heads of Revenue</i>	\$
Mines Department (Drilling)	89 532
Rent and Fees of Auriferous and Mineral Lands	197 720
Royalty on Iron Ore Pellets	298 713
Mineral Royalties	1 748 279
Survey Fees	2 185
Fees under the Dangerous Goods Act	44 161
	2 380 590

COMPARATIVE STATEMENT OF REVENUE FROM MINES BEING RENTS, FEES, STORAGE OF EXPLOSIVES, ETC., PAID TO THE TREASURY DURING THE YEARS 1973 TO 1978

<i>Year</i>	\$	<i>Year</i>	\$
1973	641 380	1976	1 202 560
1974	649 029	1977	2 263 163
1975	602 259	1978	2 380 590

The above statement does not include Stamp Duties upon Transfer of Leases.

Royalties

As stated in the section under 'Legislation' the Regulations under the Mining Act 1929 were amended in November 1978. The royalty on sand and gravel is unchanged but a three tier system now applies to other minerals.

The amount of royalty collected in 1978 was \$2 046 259 consisting of \$38 868 from the mining of sand and gravel and \$2 007 391 from other mining operations.

Three companies elected to pay royalty on proceeds and one chose to pay on profits.

LEASES AND LICENCES

NUMBER AND AREA OF NEW LEASES AND LICENCES ISSUED DURING THE YEAR ENDED 31 DECEMBER 1978

<i>Leases and Licences</i>	<i>Number</i>	<i>Area (ha)</i>	<i>Sluiceways</i>
Coal	4	724	....
Copper	1	16	....
Stone	23	1 398	....
Minerals	2	24	....
Sand	1	6	....
Tin	63	1 736	....
Water Licences	6	16	67
	100	3 920	67

TOTAL NUMBER OF LEASES AND LICENCES IN FORCE ON 31 DECEMBER 1978

<i>Leases and Licences</i>	<i>Number</i>	<i>Area (ha)</i>	<i>Sluiceways</i>
Antimony	2	65	....
Bauxite	6	184	....
Clay	20	387	....
Coal	21	3 307	....
Copper	5	4 996	....
Dolomite	6	145	....
Gemstones	3	22	....
Gold	46	1 165	....
Granite	3	10	....
Iron ore	20	1 743	....
Kaolin	2	362	....
Limestone	11	945	....
Marble	2	32	....
Minerals	38	6 524	....
Osmiridium and chromite	3	209	....
Peat	2	92	....
Rutile	2	884	....
Sand and Gravel	93	5 402	....
Silica	14	1 143	....
Slate	3	51	....
Stone	102	4 685	....
Silver lead and zinc	36	1 604	....
Tin	335	12 343	....
Uranium	1	81	....
Wolfram and tin	15	2 719	....
Water licences	121	....	1 006
Easements	64	1 445	....
Total	976	50 010	1 006

NUMBER AND AREA OF LEASES AND LICENCES APPLIED
FOR DURING THE YEAR ENDED 31 DECEMBER 1978

<i>Leases and Licences</i>	<i>Number</i>	<i>Area (ha)</i>	<i>Sluiceways</i>
Coal	9	1 308	...
Gold	4	117	...
Gravel and sand	12	548	...
Limestone	2	228	...
Minerals	15	774	...
Tin	33	987	...
Wolfram	1	32	...
Water licences	10	60	30
Total	86	4 054	30

TOTAL NUMBER OF ALL TYPES OF PROSPECTING RIGHTS HELD
AS AT 31 DECEMBER 1978

<i>Mining Tenement</i>	<i>Number</i>	<i>Area</i>
Permits to enter and search on private land, including owners' consents	8	4 959 ha
Exploration licences	84	21 018 km ²
Special Prospectors' licences	4	80 km ²
Miners' Rights	122	30 ha
Prospectors' licences	222	5 525 ha
Authorities to prospect under the aid to Mining Act 1927	1	709 ha
Permits to explore for petroleum under the Petroleum (Submerged Lands) Act 1967	3	214 graticular blocks (13 482 km ²)

MINES DRAFTING SECTION

Senior Draftsman G. A. Thomas reports: —

1978 saw the production of three mineral topographic charts at scale 1:20 000. Those printed included: Balfour, Mt Lyell and Cassiterite Creek, with Mathinna at proof copy stage. On Program for 1979 are: Mt Blackboy, Yolande River, Calder, Brilliant Creek, Waratah, Lynchford and Mt Owen.

Recordings of mineral leases on Crown Land totalled 71 with a further 14 applications over private lands. Numerous prospecting claims and miners' rights were recorded.

There were 86 diagrams described and drawn subject-to-survey with 12 diagrams and 8 plans prepared from surveys. Transparencies of all diagrams were prepared for lease documentation.

A total of 470 working plans and transparencies are in use and kept up-to-date with all mining tenement information. There was also daily recording of exempt areas. State forests and Forest Reserves, National Parks and other reserves effecting the Mining Act.

Thirty-three Exploration and Special Prospectors' Licences were charted and described for issue of licences. Two applications for Petroleum Licences were recorded in the Bass Strait and West Coast areas.

Dyelines for office use and sale to the public totalled 1 300.

WARDENS' COURT

M. T. Ellis v. Woodhouse and Singleton. Forfeiture of lease 7M/72. Warden of Mines, Burnie, upheld the application and the plaintiff has applied for the area.

B.M.I. Mining Pty Ltd v. V. Wood. Forfeiture of lease 169M/69. This was withdrawn by the plaintiff.

D. L. Nichols v. Freycinet Tin Mining Co. Pty Ltd. Forfeiture of leases 86M/64, 87M/64, 38M/65, 103M/66 and 16M/67. These were withdrawn by the plaintiff.

C. T. Wallis v. Mt Lyell Mining and Railway Co. Ltd. Objection to an application for an exploration licence on the north-west of Tasmania. This was withdrawn by the plaintiff.

Tasmanian Conservation Trust v. Marathon Petroleum Australia Ltd. Objection to an application for an exploration licence — Lune River. Warden of Mines, Hobart, dismissed the application.

Australian Conservation Trust v. Marathon Petroleum Australia Ltd. Objection to an application for an exploration licence — Lune River. Warden of Mines, Hobart, dismissed the application.

Tasmanian Wilderness Society v. Marathon Petroleum Australia Ltd. Objection for an application for exploration licence — Lune River. Warden of Mines, Hobart, dismissed the application.

M. L. Reynolds v. V. Wood. Forfeiture of lease 169M/69. Warden of Mines, Launceston, dismissed the application.

Tasmanian Conservation Trust Inc. and Australian Conservation Foundation v. B.H.P. Co. Limited. Objection to an application for an exploration licence — Adamsfield. Warden of Mines, Hobart, dismissed the application.

Tasmanian Conservation Trust Inc. v. B.H.P. Co. Limited. Objection to an application for an exploration licence — Maydena. Warden of Mines, Hobart, dismissed the application.

MINE MANAGERS' CERTIFICATES

Metalliferous Mine Managers' Certificates of Competency were issued by the Board of Examiners under the Mines Inspection Act, 1968, as follows: —

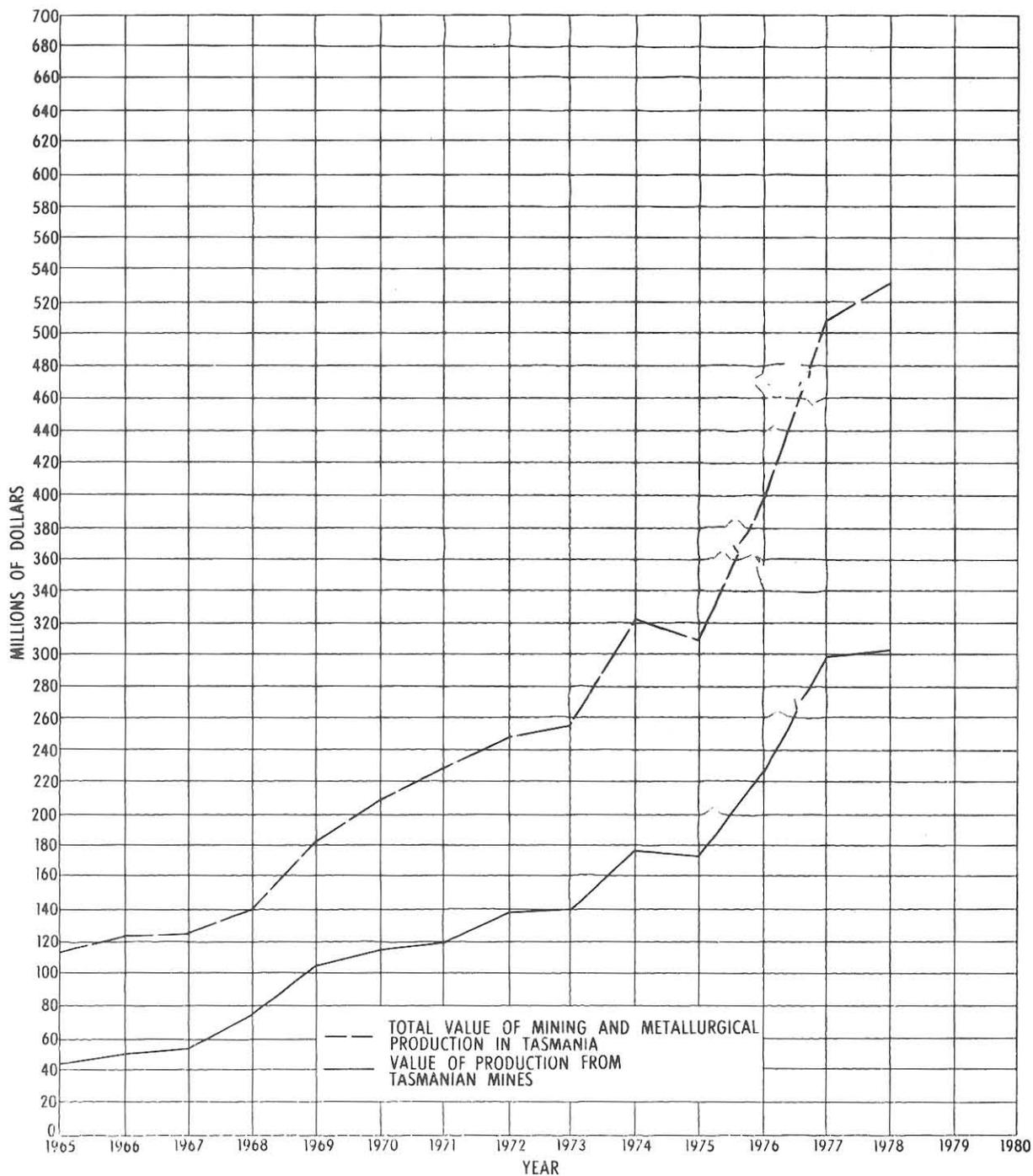
By examination viva voce —

Certificate No.	
253/78	Roland Wai-Kue Lee
254/78	David Roland Nicholls
255/78	Thomas Eastwood Evans
256/78	John Warwick Dempster
257/78	Michael Anthony Christie
258/78	John Shipp
259/78	Vere Lance Brown
260/78	Edwin Charles Leyland
261/78	Jack Gilroy Symons
262/78	Walter Ross Cannings
263/78	Rodney John Hanson

VALUE OF TASMANIAN MINERALS IN RECENT YEARS WITH AUSTRALIAN METAL PRICES

Year	\$	Year	\$
1969	104 150 500	1974	177 327 923
1970	115 469 042	1975	173 317 865
1971	119 998 652	1976	228 466 800
1972	136 847 182	1977	298 006 591
1973	139 557 052	1978	300 884 758

VALUE OF MINING AND METALLURGICAL PRODUCTION, 1965-1978



5 cm

MINERAL PRODUCTION SINCE 1880

QUANTITY AND VALUE OF PRODUCTION AS AT 31 DECEMBER 1978

<i>Mineral</i>	<i>Unit</i>	<i>Total Quantity</i>	<i>Value \$</i>
METALLIC MINERALS			
Antimony	(tonne)	3	2 034
Bismuth	(kilogram)	110 080	503 385
Cadmium	(tonne)	2 938	11 159 846
Chromite	(tonne)	684	61 312
Cobalt oxide	(tonne)	130 042	786 157
Copper (blister) to 1918 (now shown under Silver and Copper)	(tonne)	169 273	27 577 054
Copper matte	(tonne)	6 326	267 472
Copper ore to 1918 (now shown under Copper)	(tonne)	42 439	1 155 476
Copper (from 1919)	(tonne)	747 404	480 407 079
Crocoite	(specimens only)	....	44 740
Gold	(kilogram)	100 451	76 962 812
Ilmenite	(tonne)	558	2 512
Iron ore pellets	(tonne)	22 343 235	320 385 938
Iron oxide (including hematite, limonite and masnetite)	(tonne)	253 155	1 214 042
Lead (from 1919)	(tonne)	545 379	103 277 418
Manganese	(tonne)	1	6
Manganese dioxide (from 1957)	(tonne)	11 581	422 733
Mercury	(kilogram)	7 697	90 251
Monazite	(tonne)	34	1 214
Nickel	(tonne)	237	81 036
Osmiridium	(kilogram)	967	1 418 771
Pyrite (to 1971)	(tonne)	2 124 070	10 239 957
Pyrite (from 1972)	(tonne)	1 483 957	....
Rutile	(tonne)	1	36
Rutile (concentrates)	(tonne)	40 027	8 270 047
Scheelite (concentrates)	(tonne)	46 210	179 100 797
Silica for silicon alloy production	(tonne)	177 455	3 220 474
Silicon as silicon alloys	(tonne)	255 458	45 038 892
Silver-lead ore to 1918 (now shown under Silver and Lead)	(tonne)	1 101 295	12 858 582
Silver (from 1919)	(tonne)	2 149 979	85 461 813
Sulphur as sulphuric acid	(mono tonne)	3 921 050	70 512 380
Tin	(tonne)	218 942	456 214 272
Wolfram (concentrates)	(tonne)	21 694	43 123 146
Zinc	(tonne)	1 455 020	419 733 281
Zinc sulphate (from 1957)	(tonne)	3 251	324 177
Zircon (concentrates)	(tonne)	39 001	5 039 899
NON-METALLIC MINERALS			
Asbestos	(tonne)	4 044	34 284
Barite	(tonne)	2 240	16 478
Clay (from 1958) —			
Brick	(metre ³)	1 588 581	4 257 535
Tile	(metre ³)	71 310	182 009
Other	(metre ³)	519 195	2 174 729
Dolomite	(tonne)	92 670	701 056
Graphite	(tonne)	41	214
Kaolin	(tonne)	148 772	4 113 734
Limestone —			
Agricultural and other	(tonne)	1 271 175	3 742 736
Carbide	(tonne)	1 009 677	4 858 709
Cement	(tonne)	10 219 400	18 444 217
Chemical and metallurgical	(tonne)	4 919 720	9 385 961
Ochre	(tonne)	2 949	23 483
Pebbles (from 1957)	(tonne)	22 417	426 438
Sand (moulding)	(tonne)	864	9 550
Silica	(tonne)	415 279	1 118 728
Talc	(tonne)	338	2 154

MINERAL PRODUCTION SINCE 1880 — *continued*
 QUANTITY AND VALUE OF PRODUCTION AS AT 31 DECEMBER 1978 — *continued*

<i>Mineral</i>	<i>Unit</i>	<i>Total Quantity</i>	<i>Value \$</i>
FUEL MINERALS			
Coal	(tonne)	11 247 476	35 864 321
Shale	(tonne)	42 239	62 462
Peat	(tonne)	9 044	291 353
CONSTRUCTION MATERIALS			
Building stone —			
Freestone	(metre ³)	14 753	866 236
Granite	(metre ³)	5 347	205 274
Other stone	(metre ³)	13 503	119 326
Crushed and broken stone (from 1958) —			
Basalt	(metre ³)	3 824 643	20 631 348
Dolorite	(metre ³)	9 781 423	47 257 952
Limestone	(metre ³)	411 950	1 808 542
Sandstone	(metre ³)	39 332	110 019
Other	(metre ³)	3 950 714	18 957 417
Gravel (from 1958)	(metre ³)	22 616 487	53 769 927
Sand (from 1958)	(metre ³)	2 659 647	8 455 018
Other road-making material	(metre ³)	3 489 003	7 857 882
			2 610 538 265

STATISTICS RELATING TO THE MINERAL INDUSTRY

Mineral	Unit	Year ended 31 December 1977		Year ended 31 December 1978	
		Total Quantity	Value \$	Total Quantity	Value \$
METALLIC MINERALS					
Cadmium	(tonne)	149	731 250	145	594 500
Chromite	(tonne)	....	....	684	61 312
Cobalt oxide	(tonne)	21 33	214 613	2 82	52 790
Copper	(tonne)	21 089	24 801 960	22 067	26 730 905
Crocoite	(specimens only)	....	4 216	....	10 496
Gold	(kilogram)	1 616	6 976 251	1 618	8 768 832
Iron ore pellets	(tonne)	2 119 430	44 807 178	2 108 027	42 990 928
Iron oxide	(tonne)	12 793	102 200	14 325	105 800
Lead	(tonne)	16 027	8 523 445	16 907	9 573 050
Manganese dioxide	(tonne)	427	12 104	520	15 436
Mercury	(kilogram)	21	107	....	....
Rutile (concentrates)	(tonne)	770	187 345	....	....
Silica for silicon alloy production	(tonne)	38 071	951 775	44 722	1 118 050
Silicon as silicon alloys	(tonne)	41 647	11 666 003	25 461	8 308 568
Silver	(tonne)	5 830	8 904 050	68 456	10 475 642
Sulphur —					
Pyrite	(tonne)	225 270	....	141 250	....
Sulphuric acid from pyrite	(mono tonne)	322 710	7 754 789	242 438	6 723 816
Sulphuric acid from zinc concentrates	(mono tonnes)	70 051	1 582 435	109 626	2 590 668
Tin	(tonne)	6 634	69 105 352	7 271	84 521 356
Tungsten as tungstic oxide	(tonne)	2 533	41 093 047	2 630	31 750 739
Zinc	(tonne)	63 070	42 745 279	61 753	35 078 116
Zircon (concentrates)	(tonne)	923	113 882	....	....
VALUE OF METALLIC MINERALS		....	270 277 281	....	269 471 004
NON-METALLIC MINERALS					
Clay —					
Brick	(metre ³)	71 513	214 539	63 401	190 671
Tile	(metre ³)	3 311	13 244	7 496	30 153
Other	(metre ³)	13 107	57 127	14 270	71 575
Dolomite	(tonne)	8 617	97 489	10 284	119 438
Kaolin	(tonne)	11 039	1 028 645	13 281	1 174 763
Limestone —					
Agricultural	(tonne)	46 577	282 674	67 485	412 296
Carbide	(tonne)	20 308	304 620	29 876	448 140
Cement	(tonne)	490 514	1 471 542	515 717	1 547 151
Chemical and metallurgical	(tonne)	82 131	812 499	89 575	913 400
Other	(tonne)	18 975	65 858	14 363	56 197
Pebbles	(tonne)	1 189	30 399	1 486	48 095
Silica	(tonne)	13 453	81 930	8 366	43 991
VALUE OF NON-METALLIC MINERALS		....	4 460 566	....	5 055 870
FUEL MINERALS					
Coal	(tonne)	198 966	2 152 381	223 957	2 527 033
Peat	(tonne)	330	45 788	3 098	65 170
VALUE OF FUEL MINERALS		....	2 198 169	....	2 592 203
CONSTRUCTION MATERIALS					
Building stone —					
Freestone	(metre ³)	1 049	145 814	937	159 923
Granite	(metre ³)	....	....	705	114 416
Other stone	(metre ³)	223	10 150	35	1 400

STATISTICS RELATING TO THE MINERAL INDUSTRY — *continued*

Mineral	Unit	Year ended 31 December 1977		Year ended 31 December 1978	
		Total Quantity	Value \$	Total Quantity	Value \$
Crushed and broken stone —					
Basalt	(metre ³)	372 473	3 311 468	380 946	3 476 975
Dolerite	(metre ³)	488 278	4 538 431	415 779	3 685 566
Limestone	(metre ³)	14 389	100 723	41 743	292 121
Sandstone	(metre ³)	....	....	3 057	21 399
Other	(metre ³)	402 720	2 819 115	836 632	5 856 627
Gravel*	(metre ³)	1 521 793	7 813 152	1 584 195	8 007 233
Sand	(metre ³)	262 867	1 478 405	204 347	1 211 412
Other road-making material	(metre ³)	169 066	853 317	187 255	938 609
Value of Construction Materials	....	....	21 070 575	....	23 765 681
TOTAL VALUE WITH AUSTRALIAN METAL PRICES	....	....	298 006 591	....	300 884 758
METALLURGICAL PRODUCTION FROM OTHER THAN TASMANIAN ORES					
Alumina	....	....	....	....	....
Aluminium	....	....	....	....	....
Aluminium hydrates	....	....	....	....	....
Aluminium sulphate	....	....	....	....	....
Cadmium	....	....	208 169 966	....	230 923 877
Cobalt oxide	....	....	....	....	....
Ferro-manganese	....	....	....	....	....
Titanium dioxide	....	....	....	....	....
Zinc	....	....	....	....	....
Value of Mining and Metallurgical Production	....	....	506 176 557	....	531 808 635
Average Number of Employees	....	9 326	....	9 425	....

*1978 figures include late returns.

AID TO MINING

Under the provisions of the Aid to Mining Act, 1927, financial assistance may be made available to companies or single operators who hold mineral leases. Loans are secured by a registered mortgage deed and repayments are required at the rate of 7½ per cent of the proceeds of minerals produced and sold.

Repayments of royalty from assisted parties are credited to the Mining Trust Fund and are then available to other applicants.

During 1978 assistance totalling \$36 460 was made to assist in the purchase of bulldozer and backhoe, gravel pumps and galvanised pipes.

Mining Plant

Certain items of plant are available for hire to small parties to test mineral prospects from shafts or other forms of underground mining. During the year the Atlas Copco rock drill and a pump were hired by different parties for short periods.

STAFF MOVEMENTS

Andrews, T. M.	....	....	....	Field Assistant	Resigned	22.12.78
Bennett, S. G. (Miss)	....	....	....	Records Clerk	Appointed	31.8.78
Booth, C. J.	....	....	....	Field Assistant	Transferred	20.4.78
Bourke, W. B.	....	....	....	Field Assistant	Transferred	6.4.78
Calver, C.	....	....	....	Geologist	Appointed	3.1.78
Curtain, M. E.	....	....	....	Industrial Chemist	Appointed	6.4.78
Davis, H. J. (Miss)	....	....	....	Clerk	Appointed	19.1.78
Dempster, J. W.	....	....	....	Mining Engineer	Appointed	23.1.78
Evans, T. E.	....	....	....	Mining Engineer	Appointed	8.2.78
Goodluck, L. (Miss)	....	....	....	Typist	Appointed	5.1.78
Green, D. C.	....	....	....	Mineralogist & Petrologist	Appointed	1.2.78
Grieve, M. (Mrs)	....	....	....	Typist	Appointed	22.6.78
Harris, C. C.	....	....	....	Field Assistant	Appointed	20.11.78
Humphries, C. B. (Mrs)	....	....	....	Secretarial Assistant	Appointed	4.9.78
Lister, J. R.	....	....	....	Field Assistant	Appointed	24.4.78
Munro, R. A. A.	....	....	....	Field Assistant	Appointed	17.7.78
Murzecki, P. R. P.	....	....	....	Clerk	Transferred	20.11.78
Perry, C. C.	....	....	....	Draftsman	Appointed	2.11.78
Pickett, R. A.	....	....	....	Inspector of Explosives	Appointed	31.1.78
Purdon, D. P. (Mrs)	....	....	....	Typist	Appointed	23.2.78
Richardson, R. G.	....	....	....	Assistant Geophysicist	Appointed	29.3.78
Ross, M. L.	....	....	....	Draftsman	Transferred	27.7.78
Seymour, R. A. A.	....	....	....	Mining Engineer	Resigned	6.8.78
Slater, C. M. (Mrs)	....	....	....	Typist	Resigned	18.1.78
Springer, P. J. (Mrs)	....	....	....	Records Clerk	Appointed	18.5.78
Summons, T. G.	....	....	....	Geologist	Appointed	10.4.78
Tomlin, M (Mrs)	....	....	....	Records Clerk	Transferred	16.2.78
Walters, B. M.	....	....	....	Secretarial Assistant	Resigned	2.8.78
Warren, R. A.	....	....	....	Field Assistant	Resigned	5.1.78
White, E. L. (Miss)	....	....	....	Clerk	Resigned	20.1.78
Wichmann, P. M. (Mrs)	....	....	....	Records Clerk	Transferred	6.7.78
Woolley, R. N.	....	....	....	Field Assistant	Appointed	31.1.78

SCHOLARSHIPS

Scholarships were awarded to P. B. Ketelaar and D. Polya. Both students will study at the University of Tasmania for the degree of Bachelor of Science. Miss C. A. Bacon (3rd year) continued with her studies.

J. L. Everard was granted an extension of his scholarship to enable him to study for an honours degree.

OVERSEAS VISIT

P. C. Stevenson, Supervising Geologist, Engineering Geology Section, presented a working paper to a meeting of the International Association of Engineering Geology Commission on Landslips in Madrid in September.

CONCLUSION

Appreciation is recorded of the services rendered by officers of the Department, Wardens of Mines and Registrar of Mines in the various mining districts.

A detailed review of operations and production, and the reports of the Geological Survey Branch, the Chemical and Metallurgical Branch, the Mines and Explosives Branch, the Mount Cameron Water Race Board and the Ringarooma and Cascade Water Board follow.

J. G. SYMONS, Director of Mines.

OPERATIONS AND PRODUCTION

1. METALLIC MINERALS

CADMIUM

QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	\$	Year	Tonnes	\$
1927-1973	2 245	7 734 816	1976	118	554 810
1974	126	760 230	1977	149	731 250
1975	155	784 240	1978	145	594 500
			Total	2 938	11 159 846

This is a by-product obtained by the Electrolytic Zinc Company of Australasia Limited at its Risdon Works from zinc concentrates produced from the Rosebery and Williamsford mines.

CHROMITE

Northern Chromite Pty Ltd, Beaconsfield.

This company started producing chromite during the last quarter of 1977 total production and value at the 31 December 1978 amounted to 684 tonnes of chromite valued at \$61 312. During the year modifications were carried out to the treatment plant which included installing spirals in the circuit and the completion of the fine chromite recovery section which was commissioned in October. The average number of persons employed was twelve.

COBALT OXIDE

The source of the 2.822 tonnes of cobalt oxide of value \$52 790 was the same as that of cadmium.

COPPER

SOURCE QUANTITY AND VALUE OF PRODUCTION

Year	From tin ores		From lead-zinc ores		In blister copper		From copper ores		Total	
	Tonnes	\$	Tonnes	\$	Tonnes	\$	Tonnes	\$	Tonnes	\$
1919-1973	4 582	5 061 646	25 711	21 095 883	501 143	208 564 870	94 107	105 200 224	625 543	339 922 623
1974	533	678 871	2 555	3 263 125	....	....	25 353	31 895 420	28 441	35 837 416
1975	570	545 487	2 174	2 080 831	....	....	22 954	21 980 197	25 698	24 606 515
1976	611	709 379	2 709	3 153 402	....	....	21 246	24 644 879	24 566	28 507 660
1977	433	519 836	2 966	3 509 792	....	....	17 690	20 772 332	21 089	24 801 960
1978	450	547 864	2 163	2 596 818	....	....	19 454	23 586 223	22 067	26 730 905
Total	7 179	8 063 083	38 278	35 699 851	501 143	208 564 870	200 804	228 079 275	747 404	480 407 079

The Mount Lyell Mining and Railway Company Limited, Queenstown.

Mining	Tonnes
Ore mined—	
Prince Lyell	1 014 004
'A' Lens	343 843
Cape Horn	203 043
Crown Three open cut	18 607
Crown Lyell	15 611
Main Decline	9 736
West Lyell Stockpile	1 503
Total	1 606 347
Tonnage milled	1 607 865
Copper concentrate produced	74 315
Containing—	
Copper (tonnes)	19 454
Silver (grams)	2 644 944
Gold (grams)	432 659
Pyrite concentrate produced	73 315
Total value of production	\$29 520 010

The average number of persons employed was 287 underground and 414 on the surface.

Metal production from the inception of the company to 31 December 1978 was: —

Copper	....	....	....	....	....	....	....	....	....	864 129 tonnes
Silver	....	....	....	....	....	....	....	....	....	545 158 866 grams
Gold	....	....	....	....	....	....	....	....	....	24 194 512 grams

T. E. Evans, Mining Engineer, Burnie, reports: —

General

This was another very difficult year for Mount Lyell from a financial point of view. Copper prices continued to be depressed until near the year's end and the company was consequently forced into seeking and accepting financial aid from the Commonwealth and State Governments in order to survive. On the other hand, operating results were achieved which were a great improvement on those of the year before and steps were taken which were aimed at making even better results attainable in the future.

Included among the operating results, that showed an improvement, was the grade of the ore despatched to the concentrator. In this, the improvement was quite considerable and was affected by utilising new provisions that were made for keeping the bulk of the waste-rock produced by development separate from broken ore during their handling. These provisions on surface comprised the tip and bin formerly associated with the standby Ruwolt gyratory crusher, which, with the crusher removed, formed a means of receiving waste being hauled out of the mine by rail for subsequent transportation to dump.

Included in the steps taken towards improving operating efficiency was the installation of a truck-loading feeder at the 80-metre level in the Prince Lyell Decline. This installation was made in July and was of an experimental nature. It obviates direct loading of trucks by loader vehicles and has proved such a success that the installation of another five is now on plan. These new feeders will be situated on 14 level and will in conjunction with the Main Decline serve Prince Lyell and 'A' Lens.

In addition, further concentration of the mining operations was affected in June when the Crown Lyell Mine and the Crown Three Open Cut were closed down. Mining during the second half of the year was thus carried out entirely underground.

Also closed down, were the workshops on surface at the Cape Horn Mine. The personnel from these were transferred to new workshops situated near the Tunnel Office.

Stoping

Open stoping followed by hangingwall caving was the method employed in all the stoping areas except in 'A' Lens, where the sublevel-caving method was employed, and at Crown Lyell, where, although open stoping was employed, pillars were left standing to prevent subsequent caving.

In the Prince Lyell orebody, mining took place in the usual incremental manner in the 24 and 23 stopes of the 20 Series between the 92-metre and the 195-metre levels and the 26/27 and 25/26 pillars of the same series were mass fired. A mid-stope pillar was left in the 24 stope supporting the adjacent rib pillars where they are traversed by a major fault system. This pillar will be fired and broken in conjunction with the 24/25 pillar sometime around mid 1979.

Both of the mass firings were successful. The firing of the 25/26 pillar in fact was the largest one so far undertaken at Mount Lyell. It comprised 106 tonnes of explosives, and was initiated by 3 370 detonators and broke 406 000 tonnes of ore.

The drilling of 6 ½ inch diameter blast holes, which was begun on an experimental basis in the 25 Stope of the 20 Series, continued and has become standard practice in the Prince Lyell Mine. Layouts based on sub-level open stoping by means of blast holes of this size have been finalised for the 30 Series of stopes at both Prince Lyell and 'A' Lens.

At Cape Horn, mining took place in the usual incremented manner of the 8 and 7 stopes between the 170-metre and the 223-metre levels and the 8/9 rib pillar was mass fired.

When the 8/9 pillar was fired, the lower part of the pillar did not break and so a bridge was formed. A later attempt to wreck this bridge by redrilling and firing was not successful.

The 8 crown pillar was not fired as it was planned to recover the drawpoint buttress pillar above the 223-metre level by sublevel caving. However, this crown collapsed soon after the 8/9 rib was fired and the area became inaccessible as a result.

In the 'A' Lens, stoping was carried out and completed over the full length of the orebody between the 230-metre and 244-metre levels and to about midway along the length of the orebody between the 216-metre and 230-metre levels. Weak ground conditions were encountered in the south-east portion of the stoping area on the 230-metre level and to overcome the problems these conditions presented, the stope fans drilled, there, were mass fired.

Mine Development

A summary of the mine development achieved during the year is as follows:

<i>Mine Area</i>	<i>Drives and Crosscuts (metres)</i>	<i>Rise (metres)</i>	<i>Total (metres)</i>
Prince Lyell	2 149	475	2 624
Main Decline	882	19	901
'A' Lens	1 310	99	1 409
Cape Horn	903	135	1 038
Total Mount Lyell	5 244	728	5 972

In the Prince Lyell Mine, the development associated with the 20 Series of Stopes was completed on the 92-metre level (the extraction level) and all but completed on the levels above. Diagonal crosscutting commenced on the 92-metre level to the position of the Southern Exhaust Airway.

In 'A' Lens, development of the 207-metre level, which is to be the bottom sublevel-cave level, was near completion at year end and development associated with the open stopes that are to be mined below the sublevel caving had commenced.

Access development from the Main Decline to the 30 Series of Stopes at both Prince Lyell and 'A' Lens has begun and development of the main Decline and the incline which will link it to the Prince Lyell Decline were continued.

Development of the Cape Horn Decline below the 170-metre level recommenced during the year.

Diamond Drilling

Diamond drilling on the mining lease amounted to 4 843 metres and had as its objective the definition of ore outlines, as follows:

- (a) at Prince Lyell in the 20 Series and 30 Series stope blocks;
- (b) at 'A' Lens in the 20 Series stope block; and
- (c) at Cape Horn in the western lens.

ORE RESERVES AT 30 JUNE 1978

	<i>Ore</i> (tonnes)	<i>Copper</i> (%)	<i>Silver</i> (g/tonne)	<i>Gold</i> (g/tonne)
PROVED RESERVES				
Prince Lyell	3 909 000	1.43	3.0	0.4
Cape Horn	402 000	2.00	4.3	1.2
'A' Lens	139 000	1.36	1.6	0.3
Intermediate Lens	122 000	1.19	1.5	0.2
	4 572 000	1.47	3.03	0.46
PROBABLE RESERVES				
Prince Lyell	20 284 000	1.45	3.0	0.4
Cape Horn	1 119 000	1.74	3.1	0.3
'A' Lens	2 855 000	1.33	1.5	0.2
Royal Tharsis	1 878 000	1.46	1.5	0.2
	26 136 000	1.45	2.73	0.36
POSSIBLE ORE (NOT RESERVES)				
Twelve West	29 000	9.50	30.6	0.2
Cape Horn	1 128 000	1.55	3.1	0.3
'A' Lens	1 418 000	1.25	1.5	0.2
Prince Lyell	3 000 000	1.30	3.0	0.4
Crown Three	1 187 000	1.67	4.0	0.4
	6 762 000	1.43	3.0	0.3

Manpower and Safety

Including contractors' employees, the average number of persons employed was 706.

One hundred and eight lost-time accidents occurred, of which nine were classified as serious. This shows an improvement on the previous year's statistics.

The work injury statistics are as follows—

Manhours exposure	1 347 509
Frequency Rate	80.1
Severity Rate	1 594
Mean Duration Rate	14.2

Incidents

At 07.45 hours on 10 July 1978 the main fan on surface at Prince Lyell No.1 Shaft broke down as a result of movement in its foundations. Major damage was done to its blades. It was sent to the manufacturers for repair and was not back operating until January 1979. In the meantime, two 40-inch fans were installed and operated on the 14 level, making up the ventilation deficiency.

On 21 September 1978 a fire broke out in the old West Lyell workshops, which were in process of being dismantled, burning out all flammable material in the central section but causing no injury to anyone. The cause of the outbreak was not ascertained.

Cleveland Tin N.L., Luina

This company, reviewed under Tin, produced 1 893 tonnes of copper concentrates containing 450 tonnes of copper valued at \$547 864.

Electrolytic Zinc Company of Australasia Limited, Rosebery

This company, reviewed under Zinc, produced 27 812 tonnes of copper concentrates containing 2 163 tonnes of copper valued at \$2 596 818.

GOLD

QUANTITY AND VALUE OF PRODUCTION

Year	Kilograms	Value \$	Year	Kilograms	Value \$
Prior to 1974	93 065	46 139 560	1976	1 314	4 246 862
1974	1 385	5 118 359	1977	1 616	6 976 251
1975	1 453	5 712 948	1978	1 618	8 768 832
			Total	100 451	76 962 812

The Mount Lyell Mining and Railway Company Limited, Queenstown

This company recovered 433 kilograms, valued at \$2 379 854 from sludge in the electrolytic copper refinery.

Electrolytic Zinc Company of Australasia Limited, Rosebery

Concentrates produced by this company contained 1 185 kilograms valued at \$6 384 910.

Amdex Mining Limited, South Mount Cameron

Concentrates produced by this company contained 0.824 kilograms of gold valued at \$4 068.

IRON ORE (PELLETS)

Savage River Mines, Savage River and Port Latta

	<i>Tonnes</i>
Savage River	
All material handled	13 354 970
Rock to waste	8 470 390
Crude ore	4 884 580
Concentrate to Port Latta (dry)	2 092 654
Port Latta	
Pellets produced (dry)	2 108 027
Value of production	\$42 990 928
Average number of persons employed —	
Mining	157
Other	515
Total	672

Mr E. C. Leyland, Senior Mining Engineer, Burnie, reports that in the open pit the north haulage road was developed down to the commencement of bench No. 17. The crusher gully road, an uphill haul road only, has effected a saving of 650m in the haul distance of the northern route to the crusher, giving a reduction in the cycle time of 109 seconds per cycle. The saddle between A and B dumps was lowered down to R.L. 322m to cut down the haul costs of future dumping in the Main Creek area. The study of the geology and stability of the east bank of the pit continued, with rock bolting and dewatering holes being completed on the seventh bench. It is considered that on the east wall the final pit design slope down to the 8th bench has been achieved, but monitoring of the fault blocks will be maintained. The method of choke blasting, introduced in 1977, has proved most successful and maintains a broken stock in the pit of up to half a million tonnes of ore and two million tonnes of waste. The problem of back break along the east wall in the vicinity of faults and bedding changes has not been completely overcome, but modifications to the firing pattern in the vicinity of these areas are being introduced. Truck availability has stabilised at seventy-eight per cent, with a performance rate of 150 tonnes per hour having been achieved. Lighting has been installed on the major dumps.

Milling

Ancillary computer equipment for a minicomputer was purchased to provide an improved metallurgical control system and plant monitoring. The techniques adopted in the relining of furnaces were critically analysed, and the modifications made following this study have resulted in a considerable saving in 'downtime'. The bulk handling of soda ash was introduced in 1978. A spare autogenous mill trunion was purchased from the Griffith mine and is now on site at Savage River. The corrosion rectification program at Port Latta was continued.

Pellets were shipped on 28 vessels averaging 73 974 tonnes per vessel. Five shipments of fuel oil totalling 43 701 tonnes were received.

Exploration and Reserves

There was no exploration during the year, some diamond drilling will be undertaken in 1979 from the lower benches to confirm ore projections. Ratification of the remaining reserves with the original estimates is being continually monitored.

Capital Expenditure

The main areas of capital expenditure for the year have been: —

- (1) Townsite — repairs, painting and modification to the houses and shopping complex at Savage River. Purchase of replacement ambulance.
- (2) Construction of office and computer facilities at Wynyard.
- (3) Construction of a lubricant storage and truck service shed at Savage River.
- (4) Purchase of Cat. 922 loader.
- (5) Purchase of two Wild T2 theodolites.

Safety

The work injury statistics for the year were: —

	<i>Savage River</i>	<i>Port Latta</i>
No. of accidents	92	17
Days lost	1 006	396
Man hours exposure	800 890	504 747
Frequency rate	114.9	33.7
Incidence rate	22.0	6.7
Mean duration	10.9	23.3
Average number of employees	418	254

Of the 109 accidents reported two were classified as serious, one at Port Latta and the other at Savage River. The remaining 107 lost time accidents were classified as minor.

General

At the end of the year the administrative section of the Company moved from Port Latta into an office in Wynyard where the computer will be installed. The improvements and extensions to the washroom and locker facilities at the pellet plant, Port Latta, have achieved a desirable standard.

IRON OXIDE
QUANTITY AND VALUE OF PRODUCTION

<i>Year</i>	<i>Tonnes</i>	<i>Value \$</i>	<i>Year</i>	<i>Tonnes</i>	<i>Value \$</i>
Prior to 1974	190 084	705 531	1976	13 529	134 550
1974	11 005	73 192	1977	12 793	102 200
1975	10 699	92 769	1978	14 325	105 800
			Total	253 155	1 214 042

Iron Cliffs Mine, Penguin

A person continued to mine hematite at the Iron Cliffs Mine and supplied a cement works with 14 325 tonnes of hematite valued at \$105 800. Employment averaged six men.

LEAD

QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
Prior to 1974	476 358	72 192 155	1976	12 070	4 415 664
1974	12 637	5 048 404	1977	16 027	8 523 445
1975	11 380	3 524 700	1978	16 907	9 573 050
			Total	545 379	103 277 418

Electrolytic Zinc Company of Australasia Limited, Rosebery

This company, reviewed under Zinc, produced 17 365 tonnes of lead concentrates and the total content of lead in the lead, zinc and copper concentrates was 16 907 tonnes valued at \$9 573 050.

SPECIMENS OF LEAD MINERALS

Adelaide Mine, Dundas

Production of mineral samples realised \$3 325. Stopping was continued in the area off No. 1 adit through to the old open cut. Intermediate driving was advanced from the stope face to leave a pillar and the rise to form the pillar commenced. Demand for quality specimens remain high with prices at their best to date. One man worked on the leases throughout the year.

Red Lead P.A., Dundas

Production of mineral samples realised \$7 171. A trench was excavated with a back-hoe, between the two adits, good specimen was found in three veins and excavated. The lease was sold at the end of September with the new owner working alone until the end of the year. When the lease-holder has amassed sufficient equipment he intends to extend the underground development.

MANGANESE DIOXIDE

This is recovered as a sludge in the electrolysis of zinc sulphate at the Risdon Works of the Electrolytic Zinc Company of Australasia Limited, the original source being the ore in its West Coast mines. The production of 520 tonnes was valued at \$15 436.

MERCURY

QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
Prior to 1974	7 255	87 660	1976	140	363
1974	71	922	1977	21	107
1975	210	1 200	1978	Nil	Nil
			Total	7 697	90 251

No production of mercury was reported for 1978.

OSMIRIDIUM

Total production to date is 967.34 kilograms valued at \$1 418 771.

PYRITE
QUANTITY PRODUCED

Year	Tonnes	Year	Tonnes
Prior to 1974	2 590 463	1976	202 370
1974	224 251	1977	225 270
1975	224 423	1978	141 250
		Total	3 608 027

Pyrite concentrates produced by the Mt Lyell Mining and Railway Company Limited, Queenstown and the Electrolytic Zinc Company of Australasia have been sent to the North-West Acid Pty Limited plant at Wivenhoe for the manufacture of sulphuric acid.

No value is reported for pyrites as this is included in the value reported for sulphur as sulphuric acid.

SILICA FOR SILICON ALLOY PRODUCTION

The Broken Hill Pty Company Limited, Beaconsfield

This company mined and supplied to the Tasmanian Electro-Metallurgical Company 44 722 tonnes of silica valued at \$1 118 050. A local contracting firm carried out the operation of quarrying and crushing.

SILICON

Tasmanian Electro-Metallurgical Company Pty Limited, Bell Bay

In the production of silicon as silico-manganese this company smelted 32 851 tonnes of local Beaconsfield quartzite combined with slag from ferro-manganese production for a yield of 25 461 tonnes of silico-manganese valued at \$8 308 568. The average number of persons employed is shown under Ferro-Manganese.

SILVER

Silver is produced solely as a by-product from the treatment of copper, lead and zinc ores.

PRODUCERS, SOURCE, QUANTITY AND VALUE OF PRODUCTION, 1978

Producer	Source	Kilograms	\$
EZ Co. of A/asia Ltd, Rosebery	Copper, lead and zinc concentrates.	65 812	10 066 391
Mt Lyell M. & R. Co. Ltd, Queenstown	Refinery sludge	2 644	409 251

SOURCE QUANTITY AND VALUE OF PRODUCTION

Year	From tin and other ores		From silver-lead ores		From copper ore		From lead-zinc ores		Total	
	Kilograms	Value \$	Kilograms	Value \$	Kilograms	Value \$	Kilograms	Value \$	Kilograms	Value \$
1919-1973	7 023	264 172	550 239	5 749 634	141 164	2 732 875	1 144 900	37 714 126	1 843 326	46 460 807
1974	445	51 273	9	1 045	5 217	602 181	56 422	6 515 222	62 093	7 169 721
1975	418	62 700	...	...	4 402	479 039	51 451	5 631 116	55 853	6 172 855
1976	282	32 783	...	...	3 916	455 822	50 087	5 822 916	54 421	6 311 521
1977	373	50 461	...	...	2 621	354 514	63 209	8 549 536	65 830	8 954 511
1978	...	...	...	...	2 644	409 251	65 812	10 066 391	68 456	10 475 642
Total	8 541	461 389	550 248	5 750 679	259 964	5 033 682	1 431 881	74 299 307	2 149 979	85 545 057

SULPHUR

Sulphuric Acid is produced in the roasting at Risdon of the zinc concentrates from the West Coast mines of the Electrolytic Zinc Company of Australasia Limited, and from the treatment by North-West Acid Pty Ltd of pyrite concentrates produced by the Electrolytic Zinc Company and by the Mount Lyell Mining and Railway Company Limited.

SULPHUR AS SULPHURIC ACID: SOURCE, QUANTITY AND VALUE OF PRODUCTION

Year	From zinc concentrates		From pyrite concentrates				Total	
	Acid		Pyrite	Acid		Acid		
	Mono tonnes	\$	Tonnes	Mono tonnes	\$	Mono tonnes	\$	
1957-1973	877 540	9 894 437	745 856	1 131 023	17 063 508	2 008 563	27 785 576	
1974	79 200	1 300 706	232 763	301 872	5 452 341	381 072	6 753 047	
1975	63 362	1 240 198	222 626	332 753	6 924 011	396 115	8 164 209	
1976	91 182	1 937 278	226 639	299 293	7 220 562	390 475	9 157 840	
1977	70 051	1 582 435	233 146	322 710	7 754 789	392 761	9 337 224	
1978	109 626	2 590 668	201 419	242 438	6 723 816	352 064	9 314 484	
Totals	1 290 961	19 373 353	1 862 449	2 630 089	51 139 027	3 921 050	70 512 380	

North-West Acid Proprietary Limited, Wivenhoe

T. E. Evans, Mining Engineer, Burnie reports that: Production, which amounted to 242 438 mono tonnes of sulphuric acid, was well below the usual level as a result of disruptions caused by technical difficulties, plant breakdowns and an industrial dispute. There was no lack of demand for the acid.

No new developments were undertaken during the year.

A planned shut-down for the purpose of maintenance took place in July, during which a new weak-acid cooler was installed as a replacement. This item of plant together with its installation cost \$104 000 and was the most significant charged against capital during the year.

The average number of persons employed was 119, including contractors' employees.

TIN

QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
1873-1973	186 740	168 998 359	1976	6 853	46 834 677
1974	5 951	34 221 518	1977	6 634	69 105 352
1975	5 494	30 093 128	1978	7 271	84 521 356
			Total	218 943	456 214 272

Aberfoyle Ltd, Rossarden

PRODUCTION

	Ore milled	Cassiterite concentrates	Tin in concentrates	Value	Wolfram concentrates	W ₂ O ₃ in concentrates	Value
	(Tonnes)	(Tonnes)	(Tonnes)	(\$)	(Tonnes)	(Tonnes)	(\$)
Aberfoyle	22 616	144.9	105.4	1 249 696	94.0	66.6	796 200
Storeys Creek	14 145	Nil	Nil	Nil	101.0	73.6	894 115
Total at Aberfoyle Mill	36 761	144.9	105.4	1 249 696	195.0	140.2	1 690 315

Mining

R. C. Thomas, Senior Mining Engineer, Hobart, reports that operations at the Storeys Creek Mine continued to contract and that the majority of production was obtained from remnants and pillar reclaiming. Total mine development for the year amounted to 78 metres of rising, driving and cross-cutting. At the Aberfoyle Mine stoping operations were concentrated on the upper tin-rich levels but the majority of the development was concentrated in the Lutwyche section, total development amounted to 317 metres of rising, driving and cross-cutting. A raise bore hole was started from surface with a pilot hole which had reached a depth of 210 metres below collar at the year end. The object of this raise bore hole is to improve the ventilation on 13 level and so increase the rate of exploration and development of the Lutwyche project.

A start has been made to upgrade the pumping facilities at the Aberfoyle Mine, with improvements in the power supply to the main pumping station.

Capital Expenditure

The following expenditure was incurred in capital works: —

Mining	\$
Double deck cage	3 500
3½ tonne battery locomotive	8 100
4 Granby trucks	3 000
Improved auxiliary 11 KV power supply	3 200
Milling	
Close circuit regrind mill	14 700
Re-wiring of tin dressing section	2 300
New pump to replace elevator	4 700
Slimes Flotation Project	52 600
General	30 100

Milling

A test on the retreatment of slimes from the tailings dams was conducted during May and June and the report on this test is not yet available.

The rod-mill continued milling for sand-fill and a total of 11 165 tonnes of fill was placed underground at the Aberfoyle mine.

Diamond Drilling

A total of 1 131 metres of diamond drilling was completed during the year, 719 metres of which was completed at the Aberfoyle mine, mainly in the Lutwyche section. The drilling at Storeys Creek was mainly for extensions of known quartz lodes.

Employment

The average number of persons employed was 179, of which 100 persons were employed underground. However, at the end of the year there were some vacancies for underground workers and the opportunities for job-seekers are expected to increase with the proposed developments in the Lutwyche section on completion of the raise bore hole.

Amdex Mining Ltd, Pioneer*Endurance Mine, South Mount Cameron*

Ownership changed from Blue Metal Industries to Amdex Mining Ltd, on the 1 April 1978.

The mine treated 179 890 cubic metres of gravel for a recovery of 52.94 tonnes SNO₂ valued at \$422 014. The work force increased from sixteen men to twenty-three men during the year. Production was obtained from three units operating scrapers with sluice boxes and two units operating jigs.

Pioneer Mine, Pioneer

The mining operation has been extensively altered during the year. The main feature being that the top 10 metres of gravel overburden is removed by scrapers run by a contractor. The lower richer gravels are now pumped direct to the concentrating plant. A Warman 12/10 gravel pump was purchased at a cost of \$25 000 and this replaces the old 14/12 Malaysian gravel pump.

A total of 160 000 cubic metres of gravel was treated for a recovery of 49.34 tonnes SNO₂ valued at \$562 759.

The number of persons employed including contractors was twenty-six at the year's end.

Cleveland Tin Limited, Luina

T. E. Evans, Mining Engineer, Burnie reports that during the year, 368 712 tonnes of ore were hauled from the mine and 378 029 tonnes of ore were treated at the concentrator. From this treatment, concentrates were produced containing 1 241.80 tonnes tin valued at \$14 431 560 and 450 tonnes of copper valued at \$547 864.

Float material from past heavy-media-separation operations was taken from stockpile and added to the run-of-mine ore fed to the concentrator to boost the tonnage treated.

The ore hauled from the mine was obtained from the following sources:

	<i>tonnes</i>
Hall's lenses	160 726
'B' South lens	78 673
Khaki lenses	75 387
Henry's lenses	53 926

It contained development material to the extent of 22 per cent. The remainder of the tonnage originated from stoping.

The average grade of the ore treated, at 0.53 per cent tin in the form of cassiterite and 0.18 per cent copper, was much lower than for previous years. This was due in part to the high development-tonnage content of the ore, which ran at rather a low grade, and more particularly to the considerable dilution by waste rock that occurred in some of the stopes. Hall's and 'B' South lenses were the chief sources of this dilution and intense faulting was the principal cause of it.

Stoping

During the year, 94 760 metres of blast holes were drilled and 207 950 tonnes of ore were broken in stopes. Drilled reserves were thus increased from 222 800 tonnes at the beginning of the year to 318 600 tonnes at the end. Nearly half of these reserves however lie in a Khaki rib-pillar between the 3 and 10 levels which might not be fired in its entirety for a long time to come.

Mine Development

Progress in mine development was as follows:

<i>Development Type</i>	<i>Metres Advanced</i>
Decline	560
Drives and crosscuts	2 091
Slot rises	413
Other rises	97
Total	3 161

Activity was intensified, chiefly by increasing the shifts worked per day from two to three, and as a result progress was almost double that for 1977.

Top priority was given to developing the decline, which advanced 560 metres down to the elevation of 57 metres above sea level, ventilation openings associated with the decline and drives opening up the Khaki and 'B' South orebodies on 11 level. The drives on the Khaki were complete at year end.

Diamond Drilling

Diamond drilling was carried out underground to define ore reserves and to provide information for development-layout and stope design and from surface for the purpose of exploration. To define ore reserves, 6 369 metres of holes were drilled covering a zone of mineralisation approximately 260 metres long lying between the underside of the Nadir Fault and sea level and to provide information for designwork, 3 233 metres were drilled. For the purpose of exploration, six holes were drilled totalling 3 669 metres.

Of these six holes, four explored the potential of the 'B' South orebody at depth and added indicated ore to the reserves. The other two intersected stratigraphy believed to be an extension of the Hall's lenses and confirmed the exploration potential of an area at depth up to three kilometers north of the mine.

Reserves

Mineable ore reserves now stand at 1 312 000 tonnes at a grade of 0.69 per cent tin and 0.24 per cent copper.

When calculating these, appreciable adjustment downwards was made to allow for the effect on recovery of the heavily faulted condition of some of the ore to be mined.

Milling

Because of the employment of shorter periods for scheduled maintenance, the number of concentrator-operating days increased from 355½ for 1977 to 362. Metal recoveries also improved in comparison to 1977 by 11 per cent for tin and 34 per cent for copper. This is believed to have been due to a more amenable blend of ore types making up the mill feeding to the metallurgical developments carried out during the year.

These developments comprised the installation and commissioning of a Mark IV Mitchell Colts heavy-media cyclone in August and the expansion of the cassiterite flotation section. The cyclone is designed to upgrade particles previously too fine for treatment in the heavy-media-cone unit and so bring about an improvement in the overall heavy-media-separation efficiency and a reduction in the work index of the feed to the grinding circuit. The expansion of the cassiterite flotation section permits flotation scavenging to take place of vanner tails and the minus 106-microns fraction of the table tails.

Capital Expenditure

Capital expenditure for the year was as follows:

<i>Items</i>	<i>£</i>
H.T. — power extension underground	208 000
Cassiterite-flotation section expansion	304 000
Heavy-media cyclone	321 000
Sundry items of a productive nature	174 000
Housing and single accommodation	105 000
Laboratory extensions	115 000
Sewage plant	67 000
Sundry items of a welfare/safety nature	143 000
XRF spectrometer	108 000
Sundry replacements	17 000
Total	1 562 000

Manpower and Safety

The average number of persons employed by Cleveland Tin Limited was as follows:

Staff								
all departments	...	...	...	...	...	...	...	55
Award								
mining	...	...	...	...	...	...	...	50
milling	...	...	...	...	...	...	...	59
engineering	...	...	...	...	...	...	...	85
other	...	...	...	...	...	...	...	20
Total	...	...	...	...	...	...	...	269

Contractors were also employed and their employees raised the average number of persons employed at the mine to 292.

Minops Pty Ltd, Dundas*Razorback Mine**Production*

Production was as follows:

								<i>tonnes</i>
Overburden removed	...	...	...	...	...	...	...	3 000
Ore mined	...	...	...	...	...	...	...	7 756
Concentrate produced	...	...	...	...	...	...	...	26.8
Tin contained in concentrate produced	...	...	...	...	...	...	...	12.8

It was limited by closure of the mine early in the year.

In spite of the measures taken in 1977 aimed at improving the performance of the concentrator, very poor tin recovery continued to be a feature of its operations into 1978 and the venture consequently continued to generate a financial loss. Procedures leading to mine closure were therefore undertaken, commencing on 14 February 1978 when the bulk of the labour force was retrenched. Clean-up milling followed, together with some work on the open cut faces and tailings dam walls aimed at making them more stable. These tasks were completed on 30 May. All operations of a mining nature then ceased and the leases were placed under care and maintenance. Sale of the concentrator and ancillary equipment took place during the next month at public auction.

Exploration

Exploration however continued to be carried out on the leases. A diamond drilling program of seven holes costing \$85 000 was undertaken testing the occurrence of mineralisation beneath the open cut. A computer generated model of the mineralisation at Razorback was employed to design the program.

Manpower

The average numbers employed at Razorback, including contractors' employees, were as follows:

- from 1 January to 14 February — 31
- from 15 February to 30 May — 5
- from 31 May to 31 December — 2

Renison Limited, Renison Bell

Mr E. C. Leyland, Senior Mining Engineer, Burnie, reports that ore hauled to the surface stockpile, or delivered direct to the crusher, totalled 608 810 tonnes. The sources of this production were:—

	<i>tonnes</i>
No. 1 Horizon	3 824
North Stebbins	55 896
North Bassett	12 165
South Stebbins	22 806
Murchison	132 580
Dreadnought	58 664
Colebrook	154 700
Penzance	123 143
Howard	32 296
Sligo	6 765
2.5 Horizon (Melba)	5 971
	608 810

CONCENTRATOR PLANT

Tonnes treated	611 649	tonnes
Ore grade	1.31	% Sn
Tonnes (concentrate)	12 475	net dry tonnes
Grade (concentrate)	46.18	Sn
Tin metal in concentrate	5 761.46	tonnes
Overall metal recovery	71.9	%

MINING*Development*

The Renison decline advanced 16.3 m from 4 640.4 to 4 656.7, and is now at a depth of 514 m below the Portal.

<i>Driving and cross-cutting</i>	<i>Ore (m)</i>	<i>Waste (m)</i>	<i>Total (m)</i>
Renison mine	....	512.1	512.1
North Bassett	157.2	488.9	646.1
South Bassett	....	315.0	315.0
Services	2.5	539.7	542.2
No. 5 adit	104.3	224.2	328.5
Federal	....	8.3	8.3
North Stebbins	130.8	64.6	195.4
Colebrook	17.5	....	17.5
Penzance	214.2	136.1	350.3
Howard	315.1	188.4	503.5
South Stebbins	110.6	314.5	425.1
Murchison	....	20.8	20.8
Dreadnought	5.2	47.5	52.7
2.5 Horizon	3.6	....	3.6
	1 061.0	2 860.1	3 921.1
<i>Rising</i>	9.9	154.2	164.1
Total development	1 070.9	3 014.3	4 085.2

No deep development program was carried out during the year. The main emphasis was directed towards extensions North and South on the main Bassett-Federal structure, and up dip into Renison Bell Hill on the No. 2 and No. 3 sill ore bodies. Exploratory development of the steeply dipping North Bassett structure consisted of declines and inclines to provide future diamond drilling sites. High water inflows have been encountered in this area and exploratory work is scheduled to continue in 1979 after dewatering of the ground ahead. The South Stebbins ore zone below the 2 000 level steepened markedly and junctions with the South Bassett structure. Further exploratory declining is planned to the south in 1979.

Number 5 adit, a new exploratory adit was commenced to provide access to the extensions of No. 3 ore body up dip. The Sligo ore body was intersected and driven upon for a 100 m, grade of the ore was relatively low. The development from the Upper Dreadnought section towards the Ring ore body was well advanced at the end of the year, and development in ore should commence in 1979. The Ring ore body is thicker and of higher grade than the Sligo ore body. The bulk of the development undertaken was in the vicinity of current working areas and was either to extend or open known stope blocks.

Stoping

Extraction was concentrated solely on mining ores from the No. 2 and No. 3 sill horizons away from the Federal-Bassett structure. The change to flat back stope drilling, in preference to angled up holes, continued in the cut and fill stopes. This has improved 'backs' control but has resulted in some decrease in production and an increase in unit movements. All stope fill consisted of waste rock derived from development with the addition of waste from the heavy media plant, when required. The continuing policy of production from a number of separate sources allowed the head grade to be finely attuned to the budget figure. The stoping method, particularly for the narrower No. 3 horizon ore bodies is under review. The demand in 1979 for increased production will result in more stope horizons being developed to give greater flexibility. The effect on ground conditions developing several ore horizons in the one ore body to be worked continuously, will be closely monitored by a rock mechanics program to commence early in 1979. A new underground pumping station was cut at the 1 700 m horizon and will be equipped in 1979.

MILLING

A record tonnage at 611 649 tonnes of ore, grade 1.31 per cent tin, was treated at an average rate of 75.84 tonnes per hour. Overall concentrator recovery at 71.9 per cent also was the highest yearly average to date. Total declared tin metal in concentrates was 5 761.46 tonnes, an all time record for this concentrator. The acid leaching plant for beneficiation of blended gravity and flotation concentrates, which was commissioned last year, continued to perform satisfactorily, and generally in accordance with design parameters. Post leaching flotation operations for the removal of iron and arsenic sulphides were discontinued due to the high tin loss incurred in the process, with the cost of the operation exceeding the penalties imposed by smelters for their presence in the concentrates.

Crushing plant operations were satisfactory in the main, with a secondary tertiary crusher to operate in parallel with the existing Allis-Chalmers 5 foot hydrocone being commissioned in mid-year. This has resulted in a finer product being delivered to the ore storage bin, and improved overall concentrator throughput by relieving bottlenecks at the H.M.S. crusher and rolls crusher.

Heavy media separation operations improved markedly in the year with 95 per cent of the total ore now being processed through the H.M.S. compared with 80 per cent in 1977. This improvement has been effected by the use of polyurethane for fine screening, improved fines rejection in the H.M.S. feed preparation, by operating screens at a lower angle, and the introduction of the secondary tertiary crusher. The primary grinding circuit's automatic control system continued to give high availability and to maintain mill feed conditions. Test work with 50 inch chrome-moly cast steel shells in the rolls crusher demonstrated substantial cost savings and the use of 48 inch shells will be phased out.

Sodium ethyl xanthate continued to be used for most sulphide operations. Influx of talcose ores occurred sporadically throughout the year, and various brands and grades of carboxy-methyl cellulose were tried to depress this mineral. Hoechst CR 1 500 gave the best results from these trials. The fine screens were removed from the sulphide regrind circuit and cyclones reintroduced for this classification.

Prior to leach plant start-up, vanner feed was diverted to cassiterite flotation. Response to flotation has been checked for some years, and the upgrading facility afforded by leaching allowed the change to be implemented. Cassiterite flotation performance has continued to be satisfactory since the change, with the closure of the vanner plant releasing prime space for the future expansion.

Several plant trials in the cassiterite flotation section were carried out with the objective of finding alternate collectors to the expensive organoarsenious compound currently being used. The most satisfactory reagent in terms of metallurgical and operational performance was styrene-phosphonic acid used in conjunction with a gangue depressant sodium-silico flouride. Change to S.P.A. will be introduced when supplies arrive from an English manufacturer in 1979.

A two-stage Amberger Kaoloinwerke 40 millimetre polyurethane cyclone system was commissioned to remove a fraction, amenable to cassiterite flotation, from the slime tailings. Since the introduction of this cyclone system tin losses have been halved at this point with cassiterite down to 3 microns in size being recovered.

Amdel-Phillips on-stream analysis probes continued to be used to aid manual control of concentrate streams in the sulphide circuit, and two further probes were installed to monitor a concentrate and final tailing stream in the cassiterite flotation plant. This latter installation has significantly improved control of the circuit. The original stokes single-spigot hydrosizers, installed twelve years ago, have been replaced with a Hukki cone classifier developed in Finland, and manufactured by Larox Oy. Metallurgical and operational benefits resulted, since the stokes hydrosizers were being subjected to a greater than design feed due to increased throughput and flowsheet changes.

In any future expansion the extra number of shaking tables required would not be materially influenced by the small holding of spares for the existing Holman units. Accordingly, a Wilfley unit was installed for test purposes. Results favour the retention of the Holman tables and their future selection with the main observed difference being in the action of the head motion rather than the deck material or the riffle pattern.

Plant tailings continue to be discharged into the two main dams A and B. The construction of dam C is well advanced and will be available for use in 1980. The capacity of dam C is to be greater than that of dams A and B combined and will permit discharge of plant tailings until 1991, on present production forecasts. Requirements of effluent quality, as required by the licence conditions to operate the Renison mine and concentrator issued by the Department of the Environment were met to the satisfaction of the Environmental Officers.

The addition to the mill building to house, the engineering and metallurgical staff, the plant control assay equipment and to provide lunch rooms and toilet facilities was completed in mid-year. These modern facilities have greatly improved operating communication and working environment, with the removal of the cold amenities providing a greater workshop area and room for expansion.

A new X-ray fluorescence analyser (Phillips P. W. 1600) has replaced the A.F.-50 auto-assay unit for mill control assaying. The new unit is computerised so that matrix effects due to ore changes can be compensated for automatically.

EXPLORATION AND RESERVES

During 1978, Renison Limited expended \$1.5 million on exploration for tin deposits in Tasmania. The majority of this expenditure was outlaid on the consolidated mining lease at Renison Bell. This program resulted in the geological ore reserves being increased by 13 660 tonnes of contained tin. Significant extensions of the carbonate replacement style of massive sulphide mineralisations were defined in the No. 2 and No. 3 carbonate beds both at depth in the mine, and to the west of the current mining operations. Exploration of these ore zones will continue at a similar level during 1979.

Elsewhere in Tasmania, substantial exploratory programs were undertaken on the Heemskirk Granite, in the Mount Lindsay area and on the Blue Tier granites. On the Heemskirk Granite, detailed drilling of the Sweeney Mine defined a small tonnage of tin (cassiterite and stannite) — Sphalerite — silver mineralisation within a strong sulphide zone in the granite. Elsewhere on the granite, geophysical and mapping programs delineated several areas near the old Federation Mine worthy of future drilling.

In the Mount Lindsay area, diamond drilling of several major stanniferous skarn zones continued. Five holes were completed in the summer. They succeeded in providing more information on this area, where to date six major skarns have been located. Unfortunately tin and tungsten mineralisation appears patchy and generally low grade, but further drilling and regional exploratory work is planned.

In the Blue Tier region of north-eastern Tasmania, exploration was commenced by Renison in 1978, in search of large low grade cassiterite deposits. Work to date has been confined to the Anchor mine area and the Poimena Plateau. Diamond drilling at the Anchor has succeeded in defining several million tonnes of low grade cassiterite mineralisation to the north-east of the old open cut. Further diamond drilling, percussive drilling and regional geological geochemical surveys are planned for this region in 1979.

Details of present ore reserves are contained in the following table with the addition that there is 11.5 million tonnes of possible ore at a grade of 1.07 per cent Sn. Of this tonnage 9 million tonnes is contained within the Federal-Bassett Structure.

Ore Zone	Proved		Probable		Total	
	Tonnes 000's	Grade % Sn	Tonnes 000's	Grade % Sn	Tonnes 000's	Grade % Sn
NO. 1 HORIZON	....	....	95	1.00	95	1.00
NO. 2 HORIZON						
Murchison	670	1.36	157	1.10	827	1.31
Dreadnought	140	1.20	500	1.00	640	1.00
North Stebbins	420	1.32	400	1.30	820	1.31
South Stebbins	200	0.95	690	1.03	890	1.01
Total	1 430	1.25	1 747	1.08	3 177	1.16
NO. 2.5 HORIZON	190	1.35	600	1.35	790	1.35
NO. 3 HORIZON						
Penzance	975	1.48	200	1.85	1 175	1.54
Penzance South	....	....	50	2.00	50	2.00
Colebrook	700	1.74	....	....	700	1.74
Howard	....	....	355	1.45	355	1.47
Sub-total	1 675	1.59	605	1.63	2 280	1.60
RENISON BELL HILL						
Ring	....	....	1 100	1.07	1 100	1.07
Sligo	....	....	300	0.70	300	0.70
Argent	....	....	670	1.16	670	1.16
Upper Argent	....	....	100	1.40	100	1.40
Sub-total	1 675	1.59	2 170	1.06	2 170	1.06
Total	1 675	1.59	2 775	1.18	4 450	1.33
NORTH BASSETT	....	....	1 250	1.04	1 250	1.04
TOTAL SILL ORE	3 295	1.44	6 467	1.13	9 762	1.23
FEDERAL-BASSETT	2 400	0.87	1 500	0.98	3 900	0.91
ORE RESERVES	5 695	1.20	7 967	1.10	13 662	1.14

CAPITAL EXPENDITURE

The major items of the capital expenditure, totalling \$3.17 m, for 1978 were: —

- (a) Sewage Plant. The replacement of the Imhof plant by a larger and more efficient unit.
- (b) General Office additions. The replacement of Wowic temporary units with permanent office facilities for Administration, Geology and Industrial Personnel staff.
- (c) Mill Office Block. The resiting of office accommodation for mill engineering and metallurgical staff with a modern amenities block, has provided additional space for mill extensions.
- (d) Highway Overpass. Access for all traffic from the mine to No. 4 adit and the southern sections of the lease, without travelling on the Murchison Highway.
- (e) X.R.F. Analyser. A replacement for the aged existing unit.
- (f) Waste L.H.D. Machine (Eimco 920C). A trial replacement of the smaller waste handling units.
- (g) Secondary Tertiary Crusher. Installed to provide for future increased production and to relieve existing bottlenecks.

SAFETY

At December 1978 the labour complement was: —

Mining	86
Milling	123
Engineering	143
Administration	37
Geology	11
Industrial	20
Total	420

During the year there was a minor downward movement in personnel but operations surpassed budget predictions. Labour turnover was 34 per cent with 146 separations, however, stability in the underground work force was notable. Recruitment of skilled tradesmen presented the only real problem during the year making interstate advertising necessary.

SMALL PRODUCERS

With the continuing high price of tin, small producers were active in all the known alluvial tin fields and their production is summarised as follows: —

BRANXHOLM — DERBY AREA

Name of Producer	Tin Concentrates	Contained Tin Metal	Value \$
Barnett and Jones	2.582	1.761	22 408
Kerrison, K.	2.58	1.70	19 644
Barnett, L. M.	6.050	4.145	47 184
Hyde, R.	2.186	1.509	17 583
Johnson, N. C. and V. A.	2.913	1.916	23 317
Price, P.	0.222	0.131	1 380
Kerrison, M.	0.158	0.114	1 370
Jones, E.	2.860	1.957	23 317
Yaxley, T.	0.328	0.213	2 864
Rainbow, R.	0.058	0.043	507
Rainbow, W.	1.176	0.810	9 738
N.S.W. Mining Co.	0.908	0.598	6 335

PIONEER — SOUTH MT CAMERON — GLADSTONE AREA

<i>Name of Producer</i>	<i>Tin Concentrates</i>	<i>Contained Tin Metal</i>	<i>Value \$</i>
Moore, R. J.	0.586	0.414	4 518
Richardson, K. M.	0.994	0.703	9 118
M.S.H. Mining	4.688	3.285	39 406
Mount Cameron Tin Syndicate	7.40	5.40	57 630
Groves, L. J.	10.18	7.65	92 443
Watt, M. L.	8.10	6.80	64 088
Lawry, R. C.	4.20	2.56	30 468
Moore, N. B.	4.108	3.043	37 388
Mott, J. C.	0.046	0.032	430
Blackberry, D.	0.223	0.103	1 259
Salter, G.	0.040	0.028	376
Galbraith and Wood	1.167	0.866	10 202
Groves, J.	0.051	0.035	369
Standage, H.	0.018	0.012	126
Holloway, R.	0.039	0.028	376
Reynolds, M.	2.004	1.433	17 216

EAST COAST AREA

<i>Name of Producer</i>	<i>Tin Concentrates</i>	<i>Contained Tin Metal</i>	<i>Value \$</i>
Lewis, D.	0.835	0.510	6 425
Gillies	0.051	0.032	430
Reynolds, J.	0.101	0.073	427
Dwyer, D. B.			
Fitzallen, T. H.	0.255	0.178	2 263
Pitchford, B. E.			

BALFOUR — WARATAH — ZEEHAN — PORT DAVEY AREA

<i>Name of Producer</i>	<i>Tin Concentrates</i>	<i>Contained Tin Metal</i>	<i>Value \$</i>
Laan, M.	4.845	2.027	25 358
Bayley, E. J.	0.186	0.116	1 560
Kenworthy, D.	0.097	0.057	610
Glozier, M.	0.090	0.051	645
Smith, A. R.	0.647	0.398	5 161
Jessup, K.	0.185	0.121	1 286
Machen, G.	0.214	0.153	2 057
Laffier, R.	7.044	4.379	50 383
Ralph and Guy	2.638	1.932	22 619
Wilson, P. R. P.	3.117	2.337	28 380

TITANIUM

TITANIUM DIOXIDE: QUANTITY AND VALUE OF PRODUCTION

<i>Year</i>	<i>Tonnes</i>	<i>Value \$</i>	<i>Year</i>	<i>Tonnes</i>	<i>Value \$</i>
1969-1973	21 575	3 501 768	1976	6 379	1 938 650
1974	4 139	1 062 973	1977	732	187 345
1975	5 279	1 579 311	1978	Nil	Nil
				38 104	8 270 047

Kibuka Mines Pty Ltd, Naracoopa, King Island

The mine remained closed due to the low rutile and zircon prices and it is doubtful whether it will re-open in the near future. The rehabilitation of the mined areas is continuing with a program of marram grass planting.

Mobile equipment has been removed and some of the fixed plant removed for use in company projects elsewhere.

TUNGSTEN (SCHEELITE)
QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes (Concentrates)	Tonnes (WO ₃)	Value \$
1917 to 1973	33 137	4 541	73 950 986
1974	1 588	1 143	6 800 473
1975	2 082	1 519	10 367 449
1976	2 698	2 019	19 044 373
1977	3 276	2 397	38 878 558
1978	3 429	2 490	30 058 958
Total	46 210	14 109	179 100 797

King Island Scheelite Limited, Grassy*Production statistics —*

Ore mined — (tonnes)		
Bold Head		139 855
Dolphin		252 195
Total		392 050
Ore treated in concentrator		395 664
Concentrates produced (tonnes)		3 429
Concentrate grade (% WO ₃)		72.71%
Value of production		\$28 700 404
Average number of persons employed —		
Underground		112
Other surface		360
Total		372

Dolphin Mine

Mr R. Billingham, Mining Engineer, Hobart, reports that the main decline advanced only 172 m during the year to reach 255 m below sea level. Extensive steel setting in heavy ground caused delays. Level drives and ramps were advanced to open up the three main ore bodies and lower dag orebody and for ventilation and diamond drilling. Total level driving was 502 m, and ramping was 116 m. Hand rising, mainly to establish the emergency egress from 200 m R L amounted to 53 m, and ventilation raise boring to 151 m. Ore production was obtained from the Wedge, Pit and Central stopes above the — 150 m R L, and from development. Stope ore amounted to 205 576 tonnes and development ore to 46 619 tonnes.

The extensive rock mechanics program was continued with the assistance of the C.S.I.R.O. Rod extensometer deformation measurements continued to indicate vertical compression at the base of the post pillars and separation along the major faults. This is consistent with the theory of back stability using the post-pillar method of mining. Stress meters installed in 25 m high pillars in the central stope suggested that good back support was being obtained. Precise levelling and transverse monitoring showed slight movement in the stopes and pillars. Water inflow from diamond drill holes and faults showed no major changes or trends.

Bold Head Mine

The main decline advanced 205 m to 100 m below sea level and ground conditions were good. Level headings in waste were developed 359 m for access into the ore blocks and for the main ventilation return airway. Stope development, amounting to 801 m in the form of levels and ramps to open up the various ore bodies, was the major source of ore sent to the mill. Some 257 m of hand rising was completed, mainly for the extension of manways and ventilation systems. The raise bore machine cut 76.3 m of ventilation rise. Ore production was obtained from several sources using different stoping methods including cut and fill with cavos, slot stoping with scraper winches and cut and fill stopes with jumbos and F.E.L's. Some 54 000 tonnes of ore were mined in the stopes and 86 000 tonnes in stope development.

Milling

The mill operated for 363 days with a throughput of 396 000 tonnes at a head grade of 0.73 per cent WO_3 . Further upgrading in the plant was completed and the new Artificial Scheelite Plant was commissioned in June.

The new steel fine ore mine operated satisfactorily when steel cored belts were installed on the 10 feeders and the belt and drive motor loading was reduced. No major alterations were made to the grinding circuit. In the gravity concentration section, re-tabling of middling tails enabled scalping of additional free scheelite. A new scrubbing system was installed on the gravity concentrate roasters.

The flotation circuit was altered from a highly selective float producing a 60 per cent WO_3 concentrate to a non-selective float producing a 15 per cent WO_3 concentrate. The low grade concentrate is dewatered from 25 per cent to 50 per cent solids using cyclones and lamella thickeners to provide feed for chemical digestion in the Artificial Scheelite Plant.

The Artificial Scheelite Plant was installed to treat the flotation concentrate to produce a high purity chemically precipitated calcium tungstate. The major impurity in the natural flotation concentrate was molybdenum, which is now produced in small quantities as a by-product. Flotation concentrate is dosed with sodium carbonate and fed into autoclaves where W and Mo are digested into the liquor. Leached pulp from autoclaves is thickened and the carbonate liquor removed. Liquor is filtered and sulphuric acid and sodium hydrosulphide added. This precipitates the molybdenum as a tri-sulphide which is filtered off. The H_2S generated is ducted to absorption and scrubbing towers. The filtrate is oxidised by air-blowing, made alkaline with sodium hydroxide, and precipitated by the addition of calcium chloride. The calcium tungstate is dried in centrifuges, filters and a thermal disc-dryer and then packed in steel drums for sale.

Use of chemical treatment has necessitated the installation of bulk handling facilities for the various reagents. Extensive instrumentation and automation in the plant allows close control of operations, and an automatic start emergency generating set has been installed to pick up essential drives.

Capital Expenditure

Major capital expenditure was for the Artificial Scheelite Plant, surface and underground vehicle purchases, installation of a new K8 Mirlees generator, extensions to workshops and a new administration block.

Capital expenditure was as follows: —

	<i>tonnes</i>
Mining	830 181
Concentrator	3 678 838
Engineering	534 301
Administration	406 383
Agricultural	54 406
Total	5 504 109

Tasminex N.L., Kara mine, Hampshire

Mr Leyland, Senior Mining Engineer, Burnie reports that: the concentrator treated 38 100 tonnes of ore and recovered 158.14 tonnes of scheelite concentrates valued at \$1 358 554. Some 28 000 tonnes of magnetite were stockpiled.

At the beginning of the year the open pit and mill were worked on day shift only and employed ten men. To increase mill throughput, which averaged 12 tonnes per hour, a second shift in the mill was commenced in March, to be quickly followed, in April, by a three shift operation for a five day week. The all day shift operation in the open pit was able to mine this increased tonnage, however, the initial section of good grade scheelite was mined out by the end of June. The average number of persons employed rose to twenty-one for the year.

Two bulldozers, equipped with rippers, move both ore and waste. The ore is heaped, then loaded by a front-end loader into a truck, for cartage to the mill stock-pile. Some drilling and blasting of the magnetite-rich areas is necessary. During December the TD 20 bulldozer was replaced by a TD 25 to facilitate removal of overburden and to improve ripping capability. The front-end loader is used to load ore from the stock-pile directly into the jaw crusher on the two shifts each day that the pit is not working.

No major changes were made in the mill during the year but operating experience did indicate that finer reduction of the feed to the jigs and concentrating tables, would improve scheelite recovery. Accordingly, it was decided to replace the two rolls crushers by a grinding mill, to install an additional magnetic drum separator, and to execute this work during the planned two weeks shut-down at Christmas time.

Exploration

During the year a program of exploration, which included an airborne magnetometer survey and stream sediment and soil sampling was completed over the major portion of E.L. 17/68. In the diamond drilling program undertaken, 65 holes of an average depth of 50 metres were drilled with the majority of these holes being sited within the mining lease. Scheelite mineralisation was encountered in most of these holes. Assessment of the diamond drilling results was in progress at the end of the year, with metallurgical research being conducted on samples from the cores. Work has commenced on the feasibility study which will determine whether McIntyre Mines will enter into a new joint mining agreement with Tasminex. No new figures for ore reserves have been finalised. The last published figures were provided by Anzeco in 1975 and were given as 1.2 million tonnes of inferred ore at 0.4 per cent W.

Capital Expenditure

The total capital expenditure for 1978 was \$173 900. Major items purchased were: —

1 Bulldozer; 1 Front-end-loader; 1 portable compressor and air track drill.

These units had previously been on hire to the Company.

About 70 per cent of the work force is now housed by the Company and this fact, together with the current unemployment in the State, is the main factor in the improved stability of the present employment figures.

TUNGSTEN (WOLFRAM)
TUNGSTIC OXIDE: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes (Concentrates)	Tonnes (WO ₃)	Value \$
1899-1973	20 602	1 880	34 873 215
1974	216	159	1 075 850
1975	303	225	1 543 378
1976	248	186	1 724 433
1977	185	136	2 214 489
1978	196	140	1 691 781
Total	21 750	2 726	43 123 146

Aberfoyle Ltd, Rossarden

This company, reviewed under Tin, produced 94 tonnes of Wolfram Concentrates valued at \$796 200 at the Aberfoyle mine and 102 tonnes of Wolfram Concentrates valued at \$794 115 at the Storeys Creek mine.

All Nations Mine, Moina

The partners produced 2.8 tonnes of concentrate valued at \$26 650.

Stoping and development in the east-end of the mine was terminated by a flat dipping fault zone. A cross-cut was driven ten metres south under the fault but did not locate any ore. The partners, unable to pursue a diamond drill program, transferred their activities to the west-end of the mine. An intermediate drive was started at a horizon of 20 metres below the collar of the winze on a vein containing good Wolfram value. A section of this development was leading stoped for about 20 metres and the ore from this work is to be treated in 1979.

Lease 66M/78, Moina

At Pochins adit preparations involved the clearing of the area, establishment of a camp, dump site and services area. A track from All Nations Mine was cut to provide all year round access.

A portal was established at the adit and rails layed to the face. The partners intend to advance the adit face on two small quartz veins in 1979.

Lease 17M/60, Moina — Lawkenlaw Mine

The lease holder recovered 300 kg of concentrate valued at \$1 466.

A small winze was sunk for eight metres on fine stringers of quartz/wolfram ore in the hanging wall of the main vein system. The old dumps were picked over and further development is to be carried out when a compressor becomes available.

Oakleigh Creek Mine — Central Tasmanian Tungsten Pty Ltd

Serem (Australia) Pty Ltd, are conducting operations on leases 60M/69, 60M/71 and 59M/71. The option over these leases (formerly held by Scamander Mining Corporation N.L. and Louisa Mining Corporation N.L.) was exercised by Kibuka Mines, acting on behalf of Triako Mines N.L., Buka N.L. and Serem in July 1978.

Exploration

Access to the leases is via a sealed road from the township of Sheffield to the Lemonthyne Power Station, thence via an old track 26.6 km to the old workings. The first 13.6 km of this track had been maintained and upgraded by a local timber company, who have the timber rights in the area, and was in reasonable condition. Serem expended \$30 000 in employing contractors to clear and form the last 13 km of the track. Four diamond drill holes were bored to outline vein extensions to the south and below the existing opening. Following geological mapping, a review of previous geological reports, and the results of the drilled holes, it was decided to extend the existing adit to obtain an increased strike length. The first 155.6 m of this adit (designated 240 m level) was stripped to 2.4 m high by 2.7 m wide and the drive then advanced 114 m at these dimensions. Minor faulting was encountered but the veins being developed remained strong. A new adit was commenced at the 280 m level and advanced from the portal 128 m. To facilitate the handling of the ore from the upper level development a rise from the 240 m level was advanced 37 m to a break-through on the 280 m level near to the portal. Boggging of both exploration headings was effected with an Eimco 911B L.H.D. Transport of the material broken was by an Eimco 964 truck to a surface stockpile, which was formed at the portal of the 240 m adit by the previous leaseholders. Exploration development was continuing at the end of the year on both levels, in order to delineate sufficient reserves to justify the introduction of a small mining operation. Inferred reserves have been assessed as 50 000 tonnes at a grade of 1.2 per cent WO₃.

Metallurgical tests have been carried out on bulk parcels by both Amdel and the Department of Mines. The sampling of the veins has been by the point counting technique at one metre intervals. Bulk samples were taken from all the stripping and the new development, but assays were not available to permit a comparison and adjustment, if necessary. Further exploration is being conducted on the leases and exploration licence to seek other veins and areas of interest. It is planned to carry out further diamond drilling in 1979, especially from the available underground openings, to test for parallel veins. A feasibility study is being prepared with the major options under review being, the site, size and stage of concentration of a potential mill to treat the mine product.

Capital Expenditure

Capital expenditure in the area amounted to \$500 000 major items included in this were:

1 Eimco 911B L.H.D. 1 m³; 1 Eimco 964 truck 3 m³; 1 Compressor A/C PR700; 2 Motor vehicles.

ZINC QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
1919-73	1 172 371	240 380 400	1976	49 697	34 683 132
1974	53 803	30 973 172	1977	63 070	42 745 279
1975	54 326	35 873 182	1978	61 753	35 078 116
			Total	1 455 020	419 733 281

Electrolytic Zinc Company of Australasia Limited

EXTRACTION FROM CONCENTRATES: RISDON

	Tonnes
From other than Tasmanian ore: —	
Zinc	114 340
Cadmium	334
Cobalt oxide	21 968
Superphosphate	66 161
From Tasmanian ore: —	
Zinc	73 469
Cadmium	164
Cobalt oxide	2 822
Manufactured products: —	
Aluminium sulphate	3 416
Ammonium sulphate	4 103
The average number of men employed was 1 900	

WEST COAST DIVISION

	Tonnes	Kilograms
Concentrate produced: —		
Zinc concentrate	138 858	
Lead concentrate	17 365	
Copper concentrate	27 812	
Pyrite concentrate	107 302	
Recoverable quantity in ore mined: —		
Zinc	61 753	
Lead	16 907	
Copper	2 163	
Cadmium	145	
Silver		68 812
Gold		1 185
Cobalt oxide	2.8	
Manganese dioxide	520	
Mercury		Nil
Total value of production — \$64 362 011		

	<i>Surface</i>	<i>Under ground</i>	<i>Total</i>
Average number of persons employed: —			
Hercules mine	12	36	48
Rosebery mine	495	570	1 065
Total	507	606	1 113

Mr J. Dempster, Mining Engineer, Launceston reports that operations during the year were again confined to the Rosebery and Hercules mines. The Farrell mine at Tullah was kept on a care and maintenance basis throughout the year.

Production

Ore mined from all sources increased by 47 929 tonnes to 656 8568 tonnes. An increase of nearly 8 per cent for the year. The Que River project submitted some parcels of ore for testing and treatment and these are included in the tonnage figures. Ore reserves at all mines at 31 December 1978 amounted to 8 456 085 tonnes.

Development

Most of the development work was at the Rosebery mine and was mainly concentrated on the 15, 16 and 17 levels in developing the transverse longhole stopes and the longitudinal stopes for production. The 17 level was also being prepared for the development of the decline below 17 level and the program of ventilation raises in readiness for the introduction of diesel powered equipment was continued as well as the drive north on 15 level which had reached the northern ore zone at the end of the year. A total of 4 732 metres of driving and cross-cutting and 1 526 metres of raising was achieved during the year.

At the Hercules mine, development work started on the No. 7 adit system and a total of 146 metres of driving was achieved. A total diamond drilling underground amounted to 7 966 metres comprising 7 834 metres at the Rosebery mine and 132 metres at the Hercules mine.

Safety

The number of lost time accidents increased from 533 to 576 but there were no fatal accidents.

The development of mines rescue training and competitions on the West Coast was largely due to the initiative of the company, its staff and members of the rescue teams. Two mines rescue competitions were organised during the year and besides winning both competitions the E.Z. Company (Aust.) Ltd, team came second in the National Mines Rescue competition held at Tennant Creek, N.T. during the year.

Capital Expenditure

Major capital expenditure during 1978 included the commencement, continuation or completion of the following projects: —

1. Purchase of mining equipment —
 - 2 M10 diamond drills
 - 3 Cavo 310 autoloading
 - 2 Air Trac drills
 - 7 Light rock drills
 - 2 MHB-41 air winches
 - 2 BBC-120F drifters
 - 2 Flygt pumps
 - 1 Tellurometer
 - 1 Down-the-hole
 - 1 5-tonne locomotive.

2. Purchase of construction of surface and mill equipment and plant: —

- Surface explosives magazines
- Forklift truck
- Vehicles
- Crusher hoist

RISDON WORKS

Mr R. Billingham, Mining Engineer, Hobart reports that: —

Major developments include: —

Completion of the jarosite filtering installation designed to reduce metal values in plant residues.

Completion of a residue drying gas scrubbing installation to replace an unserviceable system and ensure compliance with the Environmental Protection (Atmospheric Pollution) Act 1974.

Detailed investigation and design of plant for the mechanical stripping of cathode zinc.

Continuation of investigation and design of the Water Management Project to collect, treat and recycle plant effluents and drainage.

Construction of plant to treat ore from Beltana.

Provision of cleaning ports in the fluid bed roaster.

Installation of acid-proof linings in residue from vats to facilitate acid filtration.

Provision of equipment for automatic logging of data in the power control centre.

Improved facilities in various crib, rest and control rooms.

Replacement and purchase of workshop equipment, mobile units and motor vehicles.

Aberfoyle Limited, Mackintosh Joint Venture

Mr E. C. Leyland, Senior Mining Engineer, Burnie reports that: development continued on the project during the year with 76 metres of shaft sinking, 247 metres of cross-cutting (114 metres of which was in ore) and 349 metres of driving, all of which was ore.

(a) *Shaft* — was advanced to R.L. 533.5 for a total dept of 163.5 m below collar. Ground conditions in the shaft remained good with very little inflow of water. Stations were developed at three positions R.L. 610, R.L. 580 and R.L. 550.

(b) *Levels* — The two exploration levels R.L.'s 610 and 550 were developed over the majority of P South lens by drives 2.5 m high and 2 m wide. At 50 m intervals along these drives cross-cuts were advanced to expose the full width of the ore, thus permitting chip as well as bulk samples to be taken. The ore and waste from this development was tipped into a small ore pass at the plat and loaded into the kibble through a pocket 7 m below the level. Support was necessary over a 50 m section of the 'P' South lens drive on the 610 m level. The ore in this section was narrow and confined between poor walls.

Production

<i>Source</i>	<i>Estimated tonnes</i>	<i>Estimated Grade</i>
R.L. 610 ore	1 900	+20% PbZn
R.L. 610 ore	1 900	20% PbZn
R.L. 550 ore	3 400	+30% PbZn

The ore produced from the development in 'P' South lens was stock-piled in a prepared area approximately 300 m from the shaft. Parcels of this ore were despatched for metallurgical testing overseas. Waste rock was used to form the roads and to consolidate the ground in the camp site and shaft areas. Total expenditure of capital for the year was \$1 831 381. This outlay covered —

- (a) Shaft sinking
- (b) Exploration development on the levels
- (c) Wall test drilling
- (d) Geological and feasibility studies.

Exploration

All underground openings were mapped as development advanced. Continuous chip samples were taken along each cross-cut, and at each drill section to provide a complete sample across the ore body, and to correlate with both the assays of the bulk samples and those taken from diamond drill cores. All drill core was logged and zones containing significant sulphides were sampled. Eight hundred and fifty samples were prepared and assays made for: copper, lead, zinc, silver, gold, iron and specific gravity. The ore type and ground conditions encountered in the development, confirmed the predictions made from observations of the surface drilling cores. No change was made to the ore reserves published in the last annual report, however, a new reserve for 'P' South lens will be calculated when all information from the exploration development program has been assessed.

General

The Hydro-Electric Commission of Tasmania completed the clearing for the construction of a 220 kV power transmission line from Tullah to Sheffield. The line passes through the mining leases and power will be available from this source in January 1980. At the end of the year the shaft was manned by a skeleton crew to keep the mine dewatered and to maintain existing equipment. The present quantity of water being pumped is averaging 500 l/min with a pH of 6.0.

ZIRCON

ZIRCONIUM DIOXIDE: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
1969-73	13 379	963 755	1976	4 163	883 820
1974	3 627	1 145 030	1977	609	113 882
1975	5 818	1 933 412	1978	Nil	Nil
			Total	27 596	5 039 899

2. NON-METALLIC MINERALS

CLAY

QUANTITY AND VALUE OF PRODUCTION

Year	m ³	Value \$	Year	m ³	Value \$
1958-73	1 681 288	4 741 835	1976	100 926	334 830
1974	111 487	388 069	1977	87 931	284 910
1975	112 287	572 230	1978	85 167	292 399
			Total	2 179 086	6 614 273

DETAILS OF PRODUCTION

Company	Clay m ³	Value \$	No of men	Product
Agrippe Pottery Pty Ltd, Relbia	.....	.....	4	Pipes and Pors
Clifton Brick (Tas) Pty Ltd, Kings Meadows	29 657	88 971	31	Bricks
Goliath Portland Cement Co, Railton	13 875	69 375	*	Cement
Grierson, M.A., Dodges Ferry†	6 069	18 201	1	Bricks
Hazell Bros, Kingston†	9 746	29 238	2	Bricks
Hobart Brick Co. Granton	6 938	20 814	27	Bricks
Hobart Brick Co. Kingston	2 628	7 824	1	Bricks
Humes Ltd, Hamilton	395	2 200	6	Pipes
G. R. Wise, Youngtown	393	1 659	2	.....
Wunderlich Ltd	7 469	30 153	21	Tiles
Zolati and Sons Pty Ltd	7 988	23 964	20	Bricks

* Reported under Limestone (Cement). † Suppliers to Hobart Brick Company.

Clifton Brick (Tas) Pty Ltd, Launceston

The old brickworks at Machens Road was closed down and all bricks are now produced at the new plant at Longford.

Wunderlich Ltd, Launceston

The operations of this company ceased during the year.

DOLOMITE

QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
Prior to 1973	51 958	299 750	1976	10 335	96 392
1974	6 434	47 444	1977	8 617	97 489
1975	5 042	40 543	1978	10 284	119 438
			Total	92 670	701 056

Circular Head Dolomite and Trading Co. Pty Ltd, Smithton

This company, the sole producer, employed an average of six men and produced 10 284 tonnes of crushed and milled dolomite primarily as a top-dressing in agriculture.

KAOLIN

QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$
1940-1962	112 869	883 018
1975	2 056	170 138
1976	9 527	857 170
1977	11 039	1 028 645
1978	13 281	1 174 763
Total	148 772	4 113 734

A.P.P.M. Ltd, Tonganah

The company continued to mine decomposed granite to produce Kaolin filler clay for their paper mills at Burnie.

Contractors completed the stripping of the No. 2 mine area early in the year and by the end of the year all production was being obtained from this mine. No. 1 mine is now being filled ready for rehabilitation. Grasses were sown on several tailings dumps in the spring and 1 500 trees were planted within the lease area.

LIMESTONE

QUANTITY, VALUE OF PRODUCTION AND USAGE

Year	Manufacturer of cement		Manufacturer of carbide		Chemical and metallurgical		Agricultural and other		Totals	
	Tonnes	\$	Tonnes	\$	Tonnes	\$	Tonnes	\$	Tonnes	\$
1919-73	7 885 968	12 333 008	897 445	3 255 474	4 553 979	6 222 710	925 087	2 237 902	14 262 479	24 049 094
1974	421 145	817 020	22 487	270 331	64 333	392 620	91 746	244 924	599 711	1 724 895
1975	417 615	810 173	18 865	269 704	54 548	340 424	54 452	185 769	545 480	1 606 070
1976	488 441	1 465 323	20 696	310 440	75 154	704 308	52 490	257 116	636 781	2 737 187
1977	490 514	1 471 542	20 308	304 620	82 131	812 499	65 552	348 532	658 505	2 937 193
1978	515 717	1 547 151	29 876	448 140	89 575	913 400	81 845	468 493	717 016	3 377 184
Totals	10 219 400	18 444 217	1 009 677	4 858 709	4 919 720	9 385 961	1 271 175	3 742 736	17 419 972	36 431 623

Electrona Carbide Industries, Ida Bay and Electrona

During the year 66 996 tonnes of limestone were quarried at Ida Bay. Of this 29 876 tonnes were used for carbide production at Electrona and 37 129 tonnes for metallurgical purposes at E.Z. works at Risdon.

Work continued in rebuilding the carbide plant at Electrona. Erection of buildings for the furnace and carbide handling was completed, the new acetylene black plant was commissioned and one of the lime kilns was reconstructed.

Calcium carbide production was 15 127 tonnes valued at \$4 112 273 and acetylene black production was 648 tonnes valued at \$717 921. The average number of persons employed was 188.

A. R. Beams, Flowery Gully

From this quarry, crushing plant and lime kiln, Mr Beams produced: —

	<i>Tonnes</i>	<i>\$</i>
Agricultural limestone	3 229	35 519
Limestone for chemicals and metallurgical purposes	3 296	38 784
Total	6 525	74 303

A total of six persons were employed during the year.

Goliath Portland Cement Co. Ltd, Railton

A total of 515 717 tonnes of limestone with a cost value of \$1 547 151 was quarried and used mainly in the manufacturer of cement. An average of 15 persons were employed in the quarry. In addition 21 984 tonnes of limestone was produced for outside sales.

The plant produced 407 300 tonnes of fine cement at a value of \$7 299 000. An average of 288 men was employed in the plant.

The installation of a Humbolt hammer mill to increase the milling section capacity at a cost of \$1 500 000 was one of the major items of capital expenditure. A new clinker conveyor was also installed at a cost of \$100 000.

Mole Creek Limestone Ltd, Mole Creek

The quarry produced 48 559 tonnes of limestone for chemical and metallurgical purposes and 11 949 tonnes for agricultural and other purposes at a total value of \$381 102. The average number of persons employed was eighteen.

In the quarry the rate of removal of overburden was increased by the use of bulldozers in clearing and ripping instead of the old practice of drilling and blasting.

A new fines stockpile conveyor, a new double deck scalping screen with feeder were added to the plant during the year. With the increase in the use of lime mainly in the metallurgical field it was necessary to erect another 600 tonne Lime Storage Bin.

Railton Lime Pty Ltd, Railton

Two men were employed at this works to crush and mill 5 340 tonnes of limestone valued at \$16 020, supplied by the Goliath Cement Company for use in the agricultural industry.

OCHRE QUANTITY AND VALUE OF PRODUCTION

<i>Year</i>	<i>Tonnes</i>	<i>Value \$</i>	<i>Year</i>	<i>Tonnes</i>	<i>Value \$</i>
1918-1973	2 911	22 862	1976	Nil	Nil
1974	38	621	1977	Nil	Nil
1975	Nil	Nil	1978	Nil	Nil
			Total	2 949	23 483

PEBBLES
QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
1957-1973	15 741	263 437	1976	1 716	33 366
1974	1 426	35 519	1977	1 189	30 399
1975	859	15 622	1978	1 486	48 095
Total				22 417	426 438

Mineral Supplies, Ulverstone

The collection of pebbles for grinding was continued on the beaches in the Ulverstone area. The output was 807 tonnes, valued at \$44 700. An average of seven men were employed.

SILICA
QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
1936-1973	319 998	756 092	1976	20 479	66 630
1974	25 410	74 828	1977	13 453	81 930
1975	27 573	95 257	1978	8 366	43 991
Total				415 279	1 118 728

F. R. and C. M. Lazenby, South Arm

A total of 7 518 tonnes of silica sand, valued at \$37 590 was produced for the manufacturer of glass.

Industrial Sands Pty Ltd, Eagle Point

This company produced 385 tonnes of silica sands in various grades and sizings for various industrial purposes. An average of five persons were employed.

A total of \$9 000 was spent on improving ablution and crib room facilities for the employees and also for the installation of a dry products screen.

Mineral Supplies, Ulverstone

This firm produced 62 tonnes valued at \$1 721.

3. CONSTRUCTION MATERIALS

BUILDING STONE

PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

Stone	Producer	m ³	Value \$	No. of men
Freestone	Etna Stone Pty Ltd, Pontville	575	147 778	10
	Pontville Freestone, Molesworth	262	6 145	1
	Rizzolo Stone and Cement, New Norfolk	100	6 000	1
Total		937	159 923	12

Coles Bay Granite Proprietary Limited

This company began producing red granite for construction purposes in late 1977. Production during the first half of the year was reduced because the company were awaiting delivery of equipment from overseas. A total of 705 cubic metres was produced for the year with a total value of \$114 416. The average number of men employed during the year was five. This is the first production of red granite in any quantity greater than 100 cubic metres since 1947.

CRUSHED AND BROKEN STONE

BASALT

Producers, Quantity and Value of Production

<i>Quarry</i>	<i>Men</i>	<i>m³</i>	<i>Value \$</i>
Associated Forest Holdings Pty Ltd	6	3 881	27 167
Australian Newsprint Mills	1	9 094	63 658
Brambles	10	34 130	233 089
Richardson G. L.	2	7 839	54 873
Hobart Quarries Pty Ltd, Bridgewater	19	228 511	2 288 553
Merseylea Quarries	1	4 336	34 459
Sulzberger R. K., Lilydale	2	1 000	6 500
Talisker Blue Metals, Evandale	6	48 165	428 226
Woodfield and French	*	36 941	261 107
E. M. Hale	1	210	1 470
Readymix — Calder Pit	1	6 839	47 873
Totals		380 946	3 476 975

Hobart Quarries Pty Ltd, Bridgewater

Mr R. Billingham, Mining Engineer, Hobart reports that: the new 1 000 000 tonnes per annum quarry plant was commissioned at a capital cost of about \$3 250 000. This is the first modern crushing and screening plant to be erected in Tasmania.

Plant feed is hauled from the quarry face in 35 tonne Wabco Haulpack trucks and dumped in the 760 mm × 1 060 mm jaw crusher hopper. From the primary jaw crusher the products are screened and fed to 900 mm and 1 500 mm hydrocone secondary crushers. The products then pass to the tertiary impact crusher house and then to the final screening house where they are distributed into a series of 300 tonne capacity hoppers for use as required.

The crushing and screening operations are controlled from a central sound and dust proof room linked by closed circuit television to strategic locations throughout the plant. Crushing and screening operations are as near totally enclosed as is practicable and a detergent dust suppression system has been installed.

A total of 21 men operate the quarry and plant.

DOLERITE

Producers, Quantity and Value of Production

<i>Quarry</i>	<i>Men</i>	<i>m³</i>	<i>Value \$</i>
Brighton Council, Brighton	1	8 073	56 561
Devon Metal Supplies, Devonport	7	17 925	143 384
Forestry Commission	....	30 009	210 063
Glenorchy Quarries	10	38 791	286 774
Hobart Quarries, Lenah Valley	9	76 582	680 509
Huon Municipal Council	....	1 875	13 125
Johnson C. A.	*	59 865	419 055
Launceston Quarries	14	76 793	880 090
Pioneer Quarries, Flagstaff Gully	19	105 768	995 305
Department of Main Roads	....	100	700
Total		415 779	3 685 566

* See Gravel.

LIMESTONE
Producers, Quantity and Value of Production

<i>Quarry</i>	<i>Men</i>	<i>m³</i>	<i>Value \$</i>
G. J. Weily, Glenorchy	5	40 043	280 301
Rathbone Bros.	....	1 700	11 900
Totals	....	41 743	292 201

OTHER STONE
Producers, Quantity and Value of Production

<i>Quarry</i>	<i>Men</i>	<i>m³</i>	<i>Value \$</i>
A.P.P.M., Diddleum Plains	2	8 465	59 255
Circular Head Dolomite and Trading Co.	*	1 809	14 374
Forestry Commission	†	71 046	597 322
H.E.C., Strathgordon	1	100	700
H.E.C., Pieman River	24	742 300	5 196 100
Department of Main Roads	....	8 574	60 010
Shields Quarries, Rokeby Road	2	3 150	22 050
Shaw Contracting	....	688	4 816
D. J. Worsely	....	500	2 000
Totals	....	836 632	5 856 627

* See Dolomite.

† See Gravel.

GRAVEL
Producers, Quantity and Value of Production

<i>Pit</i>	<i>Men</i>	<i>m³</i>	<i>Value \$</i>
Associated Forest Holdings	*	51 661	258 305
Beaconsfield Council	2	11 185	55 925
Broken Hill Pty Co. Ltd, Beaconsfield	†	40 516	202 580
Campbell Town Council	1	12 857	64 285
Circular Head Council	3	37 954	189 770
Deloraine Council	1	12 870	64 350
Devonport Council	1	32 985	164 925
Fingal Council	1	18 361	11 805
Flinders Council	1	22 320	111 600
Forestry Commission	22	94 143	470 715
George Town Council	3	24 444	122 220
Hamilton Council	2	23 734	118 670
C. R. Johnson	10	15 622	78 410
Kentish Council	1	17 026	85 130
L. King Pty Ltd, Devonport	16	10 686	65 758
Lands Department	4	10 592	52 960
Latrobe Council	5	13 111	65 555
Lilydale Council	1	18 248	91 240
Longford Council	2	25 836	129 180
New Norfolk Council	1	11 241	56 205
Portland Council	1	20 745	103 725
Department of Main Roads	100	733 449	3 667 245
Reardon B. & K.	1	12 243	61 215
Richmond Council	1	13 472	67 360
Ringarooma Council	2	21 095	105 475
Scottsdale Council	2	12 335	61 675
Ulverstone Council	2	23 080	115 400
Woodfield and French	50	59 727	318 675
Wynyard Council	2	48 210	241 050
Others	53	136 076	725 825
Total	291	1 585 824	8 007 233

* See C. & B. (Basalt)

† See Woodfield and French (Gravel)

SAND
Producers, Quantity and Value of Production

<i>Quarry</i>	<i>Men</i>	<i>m³</i>	<i>Value \$</i>
A.C.I. Operations	1	3 622	18 110
A. A. Ashbolt, New Norfolk	1	5 545	27 725
Besser (Tasmania) Pty Ltd, Calder	7	64 101	394 022
Cambridge Washed Sands, Cambridge	5	14 736	69 325
Groombridge Sand Suppliers	1	13 466	122 765
Hobart Quarries, South Arm	1	19 665	98 325
L. King Pty Ltd, Devonport	*	8 103	43 483
Lands Department	*	4 552	22 760
Lazenby F. R. & C. M.	4	4 854	24 270
Moy P. and P.	1	8 401	42 005
Pinnington W. G.	2	4 375	40 250
Stubbs Sand and Gravel, Devonport	3	13 923	104 422
Woodfield and French, West Tamar	*	7 301	41 173
Others	12	31 703	162 777
Total	38	204 347	1 211 412

* See Gravel

OTHER ROAD MAKING MATERIALS
Producers, Quantity and Value of Production

<i>Quarry</i>	<i>Men</i>	<i>m³</i>	<i>Value \$</i>
Abminco N. L., Luina	*	98 193	490 965
A. R. Beams	†	836	6 014
V. S. Clark	‡	216	1 080
George Town Council	‡	201	1 005
H.E.C. Pieman	P	17 200	86 000
H.E.C. Strathgordon	P	4 200	1 000
M. Jones	‡	1 000	5 000
D. C. Kenny	‡	1 680	8 400
Department of Main Roads	‡	6 059	30 295
Mt Lyell Mining Railway Co.	4	24 280	121 400
Port Cygnet Council	....	1 600	8 000
Portland Council	‡	7 000	35 000
St Leonards Council	....	856	4 280
Warman International, King Island	C	6 645	33 225
A. P. Watson	1	550	2 750
G. R. Wise	....	348	2 240
Mersylea Pastoral	S	391	1 955
Totals	5	187 255	938 609

* See Tin

† See Limestone (Agricultural)

‡ See Gravel

P See Crushed and Broken Stone (other)

C See Scheelite

S See Sand

P See Tungsten (Scheelite)

4. FUEL MINERALS

COAL

QUANTITY AND VALUE OF PRODUCTION

<i>Year</i>	<i>Tonnes</i>	<i>Value \$</i>	<i>Year</i>	<i>Tonnes</i>	<i>Value \$</i>
Prior to 1974	10 345 682	27 843 873	1976	189 489	1 689 878
1974	127 460	678 665	1977	198 966	2 152 381
1975	161 922	972 491	1978	223 957	2 527 033
Total	....	....	....	11 247 476	35 864 321

Cornwall Coal Company N.L., Duncan Colliery, Fingal

Mr P. Allan, Mining Engineer, Hobart reports that total production of coal for the year was 223 957 tonnes mainly from heading and pillar development while employment had risen to 107 men by the end of the year.

Underground equipment increased during the year by the addition of a reconditioned Lee-Norse 38H continuous miner, two Atlas Copco roof bolters in association with a 250 cfm compressor, an additional Domino 'Pet' men and materials carrier, two new 125 hp conveyor drive heads, one new 250 kVA transformer and approximately 700 m of 36 inch conveyor structure and belt.

On the surface a new combined facility of bath-house, pit head office, lamp cabin and first-aid room was completed, a centrifuge in the washery was replaced and considerable progress made in upgrading and refurbishing the surface plant to bring it to a reliable state of availability.

While the working seam at the Duncan Colliery is a fairly consistent 2 m thick, varying roof conditions, minor faulting and mudstone intrusions constantly interfere with production schedules and quite seriously limit the effectiveness of forward planning. This is reflected in the number of conveyors and transfer points forced upon the haulage system as ground conditions dictate the direction of development.

A large amount of re-alignment of belt roads is now in progress to rationalise the existing system and greatly reduce the number of transfer points.

Timber support of workings is gradually being phased out and replaced by roof bolting plating using Du Pont rapid setting chemical grout. This is proving highly successful and timber is now only for emergency support and for brattice installation.

Accident figures for the year are disappointing with 40 injuries and a high accident rate of 38.1% reflecting the increase in production and employment. It is hoped these figures will improve as new entrants to the industry gain in experience.

PEAT**QUANTITY AND VALUE OF PRODUCTION**

<i>Year</i>	<i>Tonnes</i>	<i>Value \$</i>	<i>Year</i>	<i>Tonnes</i>	<i>Value \$</i>
Prior to 1974	1 144	64 548	1976	3 779	58 974
1974	318	27 000	1977	330	45 783
1975	375	29 873	1978	3 098	65 170
			Total	9 044	291 353

Collins Development Pty Ltd

This company produced and processed 3 098 tonnes of peat valued at \$65 170. The average number of persons employed was three.

5. FOREIGN ORES

The total value of the metallurgical products of four large works treating foreign ores imported into Tasmania was \$230 923 877.

ALUMINIUM**Comalco Aluminium (Bell Bay) Ltd, Bell Bay**

221 497 tonnes of Alumina were imported during the year producing 113 625 tonnes of aluminium. Average employment was 1 254 persons which was an increase of 75 persons from the previous year.

Capital expenditure totalled over \$1.9 million and included alterations to the old alumina plant for cryolite and Sodium Sulphate production and additions to the fume towers.

FERRO-MANGANESE, FERRO-SILICON AND SILICO-MANGANESE

Tasmanian Electro-Metallurgical Co. Pty Ltd, Bell Bay

During the year 131 318 tonnes of manganese ore from Groote Eylandt were smelted to produce 131 571 tonnes of manganese alloys for the steel industry.

The alloys were 106 110 tonnes of high carbon ferro-manganese and 25 461 tonnes of silico manganese which has been reported under Silicon.

The number of persons employed rose from 333 persons at the beginning of the year to 408 persons on the 31 December 1978. This rise in employment was due to improved export market conditions which resulted in No. 1 and No. 2 furnaces being re-commissioned and the plant being placed on a seven day per week operating cycle from the 27 July 1978.

TITANIUM DIOXIDE

Tioxide Australia Pty Ltd, Heybridge

Production of titanium dioxide from Western Australian ilmenite was comparable to that of last year despite depressed market conditions and increased costs.

Capital Expenditure for the year amounted to \$827 000 and covered the following items: —

- (1) Environmental projects
- (2) Reagent preparation and supply
- (3) Dust elimination projects
- (4) Automation of some operations.

Employment during the year decreased from 445 persons in January to 394 persons in December.

ZINC, CADMIUM, COBALT OXIDE AND SUPERPHOSPHATE

Electrolytic Zinc Company of Australasia Limited, Risdon

This company, reviewed under Zinc, produced zinc from Broken Hill concentrates together with small quantities of cadmium and cobalt oxide as by-products. The Sulphuric Acid derived from roasting the concentrates was used in making superphosphate fertilisers from phosphate rock imported from Nauru, Ocean and Christmas Islands.

GEOLOGICAL SURVEY BRANCH

Report of Chief Geologist, I. B. Jennings, B.Sc.(Hons), A.M.Aust.I.M.M.

During 1978 the Geological Survey Branch continued to carry out a program of systematic geological mapping of the State, assessment of various mineral resources including groundwater, and at the same time provided geological advice on a diverse range of matters including engineering and conservation. The library services of the Branch were upgraded and continued to provide information to the staff, public and to companies, whilst the drawing office and publications staff continued the production of maps, reports and other publications.

With the appointment of Dr D. C. Green as petrologist and mineralogist the opportunity was taken to expand the petrological services of the Branch. A mass spectrometer, to determine the ratios of light stable isotopes has been set up, in conjunction with the University of Tasmania. This has demonstrated that the method has important research applications in such fields as ore genesis, engineering geology and groundwater studies. The collaboration between this Department and the University of Tasmania in fields such as this, where expensive equipment and specialised operator techniques are necessary, is regarded as an important step forward in the proper rationalisation of resources.

The high prices for some metals, particularly tin and tungsten, have led to sustained interest in the exploration for these commodities which has been directed particularly toward Tasmania as we are the nation's major source of these metals. The main areas of interest have been in the north-east of the state where widespread alluvial tin deposits have been worked for over a century and the West Coast where many important lode deposits occur. An important aspect of these investigations has been the search for scheelite deposits in skarn rocks adjacent to granites in north-western Tasmania and the search for large low grade disseminated tin deposits in granites in both western and north-eastern Tasmania.

The possibility of producing the State's next major block of power by means of coal fired thermal station has brought with it the necessity to expand exploration in order to delineate the required coal resources. Additional drilling capacity is required to complete the work in the time required and the indications are that this will become available during 1979. At the same time geological mapping and various geophysical methods will be used where possible.

In common with the rest of Australia and indeed the world, the search for all possible energy sources is intensifying. The expanded coal exploration has been mentioned above. Some interest has been shown in exploration for uranium deposits in the State but the results to date have been disappointing and it must be conceded that the likelihood of discovering significant deposits in the State are not high in the light of present knowledge. The exploration for oil and gas in offshore areas around the State has so far not been very encouraging. However, it is expected that another well will be drilled on the Pelican potential gas field during the coming year. Renewed interest is also being shown in other areas of Bass Strait where blocks had been relinquished by earlier operations. The long term outlook for renewed oil exploration in Bass Strait is therefore good but it will be a few years before the present interest results in new wildcat drilling.

Reports of the heads of sections which give the activities of the Branch in more detail are given below:—

REGIONAL GEOLOGY

Supervising Geologist E. Williams reports—

C. Calver joined the Department in December 1977.

1:250 000 Map Series—

King Island — Flinders Island Sheet is in press.

1:50 000 Map Series—

Davey Sheet has been published.

Boobyalla Sheet is in press.

Kingborough and Huntley Sheets are being drafted for publication.

Sorell Sheet: Senior Geologist A. B. Gulline continued work in this area.

Dover Sheet: Senior Geologist N. Farmer continued mapping.

Interlaken Sheet: Geologist S. Forsyth continued mapping.

Blue Tier Sheet: Geologist M. P. McClenaghan and P. R. Williams continued mapping.

Pedder Sheet: Geologists M. P. McClenaghan, N. J. Turner and C. Calver continued mapping.

St Marys Sheet: Geologist N. J. Turner, R. Castleden and C. Calver continued mapping.

Corinna Sheet: Geologist A. V. Brown continued mapping.

St Valentines Peak Sheet: Geologists P. W. Baillie, G. R. Green, P. R. Williams and P. Lennox continued mapping.

Maria Island Sheet: Palaeontologist M. J. Clarke commenced mapping.

Smithton Sheet: Geologist P. Lennox continued mapping.

The Explanatory Report for the 1:250 000 Launceston Sheet has been published. The Report for the 1:250 000 Oatlands Sheet is in press, and that for the 1:250 000 Hobart Sheet is being prepared. The Reports for the 1:63 360 Sheffield Sheet and for the 1:50 000 Ringarooma-Boobyalla Sheets have been prepared. Reports for the 1:63 360 Mackintosh and Frankford Sheets, and 1:50 000 Strahan, Oatlands and Kingborough Sheets are being prepared.

ECONOMIC GEOLOGY

Supervising Geologist, A. J. Noldart reports—

The Staff of the section comprised a supervising geologist, two senior geologists and three geologists until augmented by geologists T. G. Summons in April and R. H. Castleden in May.

The following activities were carried out—

- (1) Continuation of investigation of detrital tin in the north-east generally including—
 - (a) Completion of exploratory drilling in the Herrick — Pioneer area, Musselroe flats and Elizabeth mine area.
- (2) Completion of diamond drill programme at the Pyramid mine, Upper Scamander.
- (3) Examination of mineral prospects and small mines throughout the State and examination of mineral potential of areas under application to purchase from the Crown.
- (4) Advice to prospectors in general.

Fuel Minerals

- (1) Continuation of exploratory diamond drilling in the north-east coal fields.
- (2) Continuation of mapping and studies of the Duncan coal mine, Fingal.
- (3) Continuation of compilation of an interim report on the coal resources of the Fingal area.
- (4) Continuation of detailed field mapping of the north-east coal fields in association with the Regional Mapping Section.
- (5) Close liaison was maintained with private interests investigating fuel deposits throughout the State.
- (6) Representative to Extension Course in Coal Exploration, Mining and Beneficiation, Sydney, N.S.W.

Non-Metallics

- (1) Continuation of construction materials survey and register from government, local government and private industry records.
- (2) Continuation of quarry sampling data tabulation for construction materials report
- (3) Compilation of above data to assist various planning authorities and municipal bodies.
- (4) Appraisals of potential or proposed quarry sites in various localities.
- (5) Advice to governmental and semi-governmental bodies, and private industries.

General

- (1) Continuation of studies of the Cambrian succession of the Mt Darwin-Rosebery-Pieman River mineralised belt and mineral relationships.
- (2) Continuation of mineral appraisal of the regional geology of the Cleveland mine area and southwards, and the St Valentines map sheet in association with the Regional Mapping Section.
- (3) Representation at the International Geological Correlation Project No. 7, Canberra.
- (4) Preparation of Ore Minerals Catalogue.
- (5) Commencement of Sheffield map sheet economic appendix.
- (6) Liaison was maintained with mineral exploration companies throughout Tasmania and works in progress in association with industry staff.

ENGINEERING GEOLOGY

Supervising Geologist P. C. Stevenson reports —

The section staff comprised a Supervising Geologist, two Senior Geologists and three Geologists. There has been one vacancy throughout the year.

The major services have as usual been provided in the fields of groundwater and slope stability.

Regional groundwater studies in the north-east of the State have moved into a phase of contract drilling for landowners necessitated by the failure of contractors to provide the service. This has afforded the Department additional data, but at the cost of postponing definitive exploration work in other areas. The data accumulated over some years work in the north and east and in the Longford area are being prepared for publication.

General studies on coastal sand aquifers have continued, and have greatly assisted detailed studies at King Island, Flinders Island, and Greens Beach on the West Tamar. In all these areas, town supplies have been developed. The Greens Beech installation for the Rivers and Water Supply Commission, a multi-spear bore array, has been of great theoretical interest and the results of the study will be of use in other areas. The Flinders Island work has also resulted in a report on atmospheric corrections to pump tests.

Routine bore hole siting has continued at a low level, at Coningham, Coles Bay, Swanwick, White Beach, New Norfolk, Binalong Bay, Pontville, North Bruny and New River. Specialised studies have been made at Kimberley on the warm spring, and on the water flows into the Lutwyche workings of Rossarden Mine. The Supervising Geologist attended the Alice Springs meeting of the Technical Committee on Underground Water, but shortage of funds prevented attendance of geologists at the fourth Groundwater School in Adelaide.

Slope stability work has continued to be the major occupation of the section. The landslide phenomenon is becoming better understood and the local examples are being dealt with increasing confidence. This arises from the increasing use of soil mechanics and sub-surface investigations, and stronger contacts with international activity in the field. Professor David Price of Delft University was a visitor in February and gave a lecture on his work on rock faces. He also commented in the field on several localities within the section's purview, including the problems of the Mt Wellington face. Supervising Geologist P. C. Stevenson has been

appointed to the Commission on Landslides and Mass Movements of the International Association of Engineering Geology, and UNESCO sponsored his visit to the Commission's meeting at Madrid in September. The zoning of landslide areas was discussed in detail and a report is being produced.

Regional studies are being made on the north-west coast, in Hobart city, at Fingal and at St Helens, a revised zone map has been issued for Beauty Point, and detailed subsurface studies have been made at Swan Bay, Leith, Underwood, Penguin and Riverside. Subdivision or house site work has been done extensively in the Tamar Valley, on the north-west coast, and Hadspen, Spreyton, Dysart and Sheffield. Some remedial work was done with the Rivers and Water Supply Commission on a slip endangering the West Tamar Pipeline.

The section has concerned itself increasingly with the investigation of sites for dams. This was a major activity some ten years ago and is slowly reappearing. Sites at Wynyard, and Bradys Lookout were examined and consultants work on tailings dams at West Coast mines reviewed. Preliminary studies have been made of several sites in the south-east.

Foundation studies for structures, mainly water tanks and treatment plants have been made at Rocherlea, Forth, Gawler, Scottsdale, Barrington, Legana and Georgetown, and pipelines routes have been examined at Latrobe.

Two deep boreholes to examine lithology and stratigraphy of water bearing and slip prone materials are in progress at Rowella and Boobyalla and some significant results have been obtained.

GEOPHYSICS

Geophysicist, D. E. Leaman reports —

An assistant geophysicist (R. G. Richardson) was appointed early in the year in order to cope with increased work loads and to allow complete diversification into the field of ore mineral exploration geophysics. However, the department's two staff geophysicists spent most of the year in evaluation, research and testing of coal exploration procedures and on coal surveys.

Ore Deposits

No surveys were undertaken during the year but an evaluation of survey effectiveness was completed. This showed that the quality of work by private consultants and contractors remains very poor. There was no improvement noted since the previous assessment in 1973.

Other Deposits

A preliminary survey was undertaken in the Huon Estuary in order to locate gravel deposits. The results are to be compared with test drilling and sampling before complete assessment.

The principal endeavour during 1978 was the coal resources evaluation in Central East Tasmania. The gravity survey begun in 1973 has been completed and a preliminary interpretation prepared which indicates that the region which can be actively explored for coal is smaller than anticipated. The survey has also located problem structures and established drilling targets. Some additional drilling was undertaken during 1978 in order to provide interpretive control. Considerable research has now been undertaken in the use of seismic reflection methods in the difficult geology and topography of the region and only test processing remains before a conclusion can be reached. There are grounds for optimism. Use of this powerful, direct method is central to any rapid evaluation of coal resources. However, processing is expensive and presently beyond available resources. The lack of adequate computing facilities for either preprocessing or independent processing compounds these problems.

Regional Projects

An interpretation of the gravity map of Tasmania was begun and work is proceeding as funds become available. A small-scale assessment of the Nut at Stanley has also been made.

Engineering and Groundwater

Most geophysical surveys related to foundation engineering or groundwater projects continue to be undertaken by the Engineering Geology section and only specialist projects are referred. In particular, assistance was provided for bridge site surveys at Mathinna and Beauty Flats and pump test data from Greens Beach.

Computing

An evaluation of the computing needs of the department was completed and some recommendations made. Lack of internal or Public Service facilities and funding curtails many projects. However, several gravity, coal reduction and regional procedures have been prepared for the Burroughs machine at the University of Tasmania. In addition work has begun on a system for the Tasmanian rock catalogue.

General and Developmental

Most developmental work during 1978 was related to a consideration of field and process methods for gravity and seismic reflection observations in coal-bearing areas.

In addition initial surveys were made at Bowen Park in an attempt to better define the settlement prior to excavation.

Apart from preparatory work on an induced polarization transmitter console most technician time was spent on repair and maintenance of aging equipment.

CARTOGRAPHIC DRAUGHTING**Senior Draughtsman D. M. Hardy reports —**

The Chief Draftsmans Conference in Adelaide was attended early in the year, with much discussion on computer applications in geological and geophysical drafting, and development in study courses.

The first half of the year saw very little progress made on some of our multi-coloured maps, due to the shortage of finance for processing and printing.

The following progress was made on colour map productions.

1:250 000 Series

King and Flinders Islands, produced as one map — near completion, should be printed early in 1979.

1:50 000 Series

Davey Sheet No. 91: printed in 11 colours.

Boobyalla Sheet No. 24: near completion, should be printed early in 1979.

Kingborough Sheet No. 88: fair drawing proceeding.

Work on two multi-coloured maps at 1:100 000 of the Longford Basin Area made good progress. One map shows the geology, the other the hydrology and associated information. A seven colour map of the Mt Read Volcanics and associated rocks was produced at a scale of 1:15 840, and will be printed early in 1979.

The balance of time was used in producing 140 geophysical, geological, palaeontological and engineering plans and diagrams for Technical Reports, Geological Survey Bulletins and normal field services.

SURVEYING

Surveyor G. Benn reports —

The following surveys were carried out during the year: —

- (a) Continuation of surveying and levelling of diamond drill holes at Fingal.
- (b) Continuation of levelling in the Duncan Coal Mine, Fingal.
- (c) Continuation of surveying of the Flowerdale gravel quarries at Wynyard.
- (d) A survey of bore holes put down at Garfield Creek, Gladstone.
- (e) A survey of landslips at Penguin (Grooms slip) and at Fort Street, Launceston.
- (f) A survey of bore holes around Stanley and 2 profiles were also surveyed.
- (g) A survey of bore holes put down at Upper Scamander, at the Great Pyramid workings.
- (h) A survey of bore holes and seismic lines at Northern Chromite, Beaconsfield.
- (i) A survey of the old quarry at Royal George.
- (j) A survey of seismic lines and bore holes at Rocherlea reservoir, West Tamar, Launceston.
- (k) A survey at Bowen Park, Hobart.
- (l) Plans were produced of all surveys.

GEOCHEMISTRY

Geochemist W. E. Baker reports —

Approximately 3 000 element analyses were carried out on soils, plants and humic substances for a wide range of elements.

Studies undertaken in the Lisle goldfield were handicapped by the lack of suitable working areas and equipment to handle the problem to trace gold analysis in soils. An attempt will be made to make use of vegetation sampling to study the gold distribution in this area.

Investigations of the role of humic acids in the geochemical cycle continued throughout the year and a successful doctoral thesis was submitted to the University of Tasmania.

A range of faults with both atomic absorption and X-ray diffraction units caused considerable delays in processing of samples.

Laboratory facilities and working conditions at the Derwent Park location remain extremely unsatisfactory.

MINERALOGY AND PETROLOGY

Mineralogist and Petrologist D. C. Green, reports —

This year has seen the introduction of additional petrological techniques to the range of services available to the Department. An assistant, Mr R. Woolley, has begun training to handle many of the routine instrumental techniques now available. The electron microprobe and stable isotope facilities available at the University have been used to reinforce classical mineralogical investigations and to allow projects formerly carried out on the Mainland or New Zealand to be done in Tasmania.

Over 100 rock and mineral specimens, ores and concentrates were examined for prospectors, mineral collectors and officers of the Department.

A small mineral separating laboratory has been established at Derwent Park. This has facilitated the assessment of over 1 500 alluvial tin samples from the drilling program in north-eastern Tasmania supervised by Senior Geologist, I. D. Jennings.

The Departmental collections of registered minerals and rocks are being catalogued prior to incorporation into a computer based data file. A public display of Tasmanian rocks and minerals was arranged in the Lands Department building during September.

Mineral separations of hornblende from porphyries intruding the Mt Read Volcanics near Queenstown have been made for age determination at the Australian National University on these economically important rocks.

Mineralogical investigations included samples from the Interview River area, Storeys Creek, and Greenbushes (W.A.).

A small asphalt occurrence in Lower Triassic sandstone, west of Bagdad, was investigated.

A field examination of granites on the Ringarooma 1:50 000 map sheet was made in conjunction with staff from the Regional Mapping section.

Assistance was given in the organisation of a Geological Society of Australia regional and field conference held in Burnie. A paper was prepared on the radiometric dating and trace element geochemistry of the post Tabberabberan granites of Tasmania.

A stable isotope laboratory for oxygen, carbon, sulphur and hydrogen isotopes has been established at the University as a joint Department of Mines — University of Tasmania facility. The first project, a survey of *Eurydesma* specimens for palaeotemperature determinations, is to be extended to brachiopods in order to eliminate the possibility of slight oxygen isotope exchange with groundwaters. Equipment for measurement of oxygen isotopes in environmental and groundwater samples has been constructed. This facility will be available in 1979. Calibration of the sulphur isotope extraction line for work on sulphide deposits is in progress.

PALAEONTOLOGY

Palaeontologist M. J. Clarke reports —

Much of the years work has consisted of the detailed regional geological mapping and biostratigraphic studies on Maria Island. Maria Island displays what is probably the finest development of the Late Palaeozoic cold-water *Eurydesma* fauna anywhere in the world. It is intended that part of the section on Maria Island will serve as the reference stratotype for the Bernacchian Stage. On the basis of collecting so far it is evident that the biostratigraphic sequence through the late Bernacchian — early Lymingtonian interval is rather more complex than previously thought.

Investigations into Late Palaeozoic palaeotemperatures and climates continue. Whereas analyses of taxonomic diversities through time provide a broad qualitative framework, it is to be hoped that oxygen isotope studies recently commenced by Dr D. C. Green will provide more exact quantitative results.

Work has again progressed well in several other areas. The occurrence of *Pseudagnostus* indicates an early Late Cambrian age for volcanic sequences in the St Valentines Quadrangle, and the occurrence of anomocarids indicates a probable Middle Cambrian age for sequences previously thought to be of Precambrian age in the Pedder Quadrangle. A locality at Cateena Point (Devonport Quadrangle) has been re-collected for re-evaluation.

Early Devonian faunas are present in the St Valentine Quadrangle. These faunas are very rich and well preserved and they may be slightly younger than any previously known faunas from the Eldon Group. A new Eldon Group fauna rich in *Leptostrophia*, *Rostricellula* and *Cornulites* has been located in the Huskisson River area (Corinna Quadrangle).

Dr P. M. Sheehan (USA) in collaboration with P. W. Baillie is writing up for publication the occurrence of *Eospirifer* in the Tiger Range area (Huntley Quadrangle). The Tasmanian occurrence is noteworthy as being the oldest known record of any true strophic spiriferid anywhere in the world.

The assistance of several outside experts is again gratefully acknowledged. Dr J. B. Jago (South Australia) has continued his identifications and age assessments of Tasmanian Cambrian trilobite faunas, and Dr E. M. Truswell (Bureau of Mineral Resources, Canberra) has continued her palynological investigations of Tasmanian Late Palaeozoic microfloras. Her preliminary results have been published as Geological Survey Bulletin 56.

PUBLICATIONS

Publications Officer E. L. Martin reports —

The following publication was printed: —

Geological Survey Bulletin 56. Palynology of the Permo-Carboniferous in Tasmania: an interim report, by E. M. Truswell.

The following unpublished material was prepared: —

Geological Survey Paper 3. Whitewater Creek dam sites, Kingston and the Tertiary channels of the Kingston — Margate area, by W. R. Moore.

Geophysics Special Report 7. DHR1632 seismic system. Use of the reflection method in Tasmania. Part 1: Equipment, techniques, problems, by D. E. Leaman.

In addition forty-three Unpublished Reports were issued and are listed separately.

The following publications were in preparation at the end of the year: —

Geological Survey Bulletin 57. Groundwater from coastal sands at Greens Beach, northern Tasmania.

Geological Survey Explanatory Report. Beaconsfield 1:63360 (second edition).

Geological Survey Explanatory Report. Sheffield, 1:63369.

Geological Survey Explanatory Report. Oatlands, 1 250 000.

Tasman fold belt system in Tasmania (revised edition).

Photographic work included the taking of oblique aerial photographs from a Cessna 206 using hand-held cameras; areas covered included landslips at Stieglitz, near St Helens, landslip areas of the North-West Coast from Devonport to Boat Harbour and West Coast mines.

Photographs were also taken of drill rigs, geophysical equipment, geophysical work at Bowens Historic Site, Risdon and of a landslip in West Hobart.

Computer programs were written for the calculation of coal reserves and for the production of graphic logs of coal sections. A study of text editing systems using an LSI-11 computer was also made.

The Publications Officer attended the AESIS Seminar at the Australian Mineral Foundation, Adelaide, in October.

List of Unpublished Reports, 1978

<i>No.</i>	<i>Title</i>	<i>Author</i>	<i>Date</i>
1978/1	Stability investigation of a proposed subdivision at Swan Bay	D. J. Sloane	24.1.78
1978/2	Guidelines for the planning of soil investigations in relation to slope stability and swelling soils	P. C. Stevenson	23.1.78
1978/3	Site investigations at the Camp Creek dam-site, Wynyard	W. L. Matthews	10.2.78
1978/4	Investigation of proposed sites for a treatment plant in the Gawler area	P. C. Stevenson	27.1.78
1978/5	Recommendations for future drilling at the Etna Stone quarry, Pontville	V. M. Threader	13.2.78
1978/6	Geological notes on proposed Central East Coast dam-sites	W. C. Cromer	16.2.78
1978/7	Tertiary lead and basin — Winnaleah Map Sheet	A. V. Brown	21.3.78
1978/8	Groundwater at Lady Barron, Flinders Island	W. L. Matthews	20.3.78
1978/9	The evolution of a risk-zoning system for landslide areas	P. C. Stevenson	23.8.78
1978/10	Drilling for water at Currie, King Island	W. L. Matthews	6.4.78
1978/11	Site investigation for the proposed Lower Forth Treatment Plant	R. C. Donaldson	10.4.78
1978/12	Thermal spring at Kimberley	W. L. Matthews	17.4.78
1978/13	Pump tests at Currie, King Island	W. L. Matthews	20.4.78
1978/14	Proposed diamond drilling program, All nations mine, Moina	P. L. F. Collins	26.4.78
1978/15	Groundwater investigations near Coles Bay	W. C. Cromer	1.5.78
1978/16	An estimate of the coal resources of the Fingal area	V. M. Threader	3.5.78
1978/17	Gravity survey at Stanley	P. W. Baillie D. E. Leaman	12.6.78
1978/18	Mineralogy of 'micaceous material' in samples of pelitic Proterozoic and Lower Palaeozoic rocks in Tasmania	P. R. Williams P. G. Lennox	27.6.78
1978/19	Subsurface investigation and slope stability of Haack's subdivision at Underwood, Lilydale Municipality	W. R. Moore	26.6.78
1978/20	Seismic survey at a proposed reservoir site near Barrington	D. J. Sloane	7.7.78
1978/21	Mineral geophysics in Tasmania	R. G. Richardson	18.7.78
1978/22	Drilling for groundwater at Lennonville, North Bruny Island	W. R. Moore	24.7.78
1978/23	Geological map of the Kingborough Quadrangle	N. Farmer	3.8.78
1978/24	Extended definitions of the five landslide risk zones	P. C. Stevenson	17.8.78
1978/25	Investigation of timber mill sites near Scottsdale	W. R. Moore	15.8.78
1978/26	Bibliography of Tasmanian tin	J. D. Berry	9.8.78
1978/27	Bowen's Landing Historic Site, Risdon. Geology, building materials, survey factors and recommendations for geophysical work	D. E. Leaman	22.8.78
1978/28	Investigation of proposed pipeline route, Latrobe to Port Sorell	W. C. Cromer	22.8.78
1978/29	Pump testing an unconfined coastal aquifer, Currie, King Island	W. C. Cromer	23.8.78
1978/30	Some thoughts on dolerite intrusions with particular reference to marginal features	D. E. Leaman	7.9.78
1978/31	Seismic surveys for bridge site investigations, Mathinna Secondary Road	D. E. Leaman	13.9.78
1978/32	Further report on the stability of a proposed subdivision near Lilydale	W. R. Moore	26.9.78
1978/33	Correcting drawdowns for atmospheric pressure changes: an example from a semi-confined aquifer on Flinders Island	W. C. Cromer	29.9.78
1978/34	Pump testing a confined coastal aquifer near Lady Barron, Flinders Island	W. C. Cromer	10.10.78
1978/35	Investigation of a proposed reservoir site at George Town North	D. J. Sloane	17.10.78
1978/36	Test pits on Harris' property at Kelcey Tier, Spreyton	W. L. Matthews	18.10.78
1978/37	Seismic refraction survey Randalls Bay Garden Island. Feasibility study	D. E. Leaman	30.10.78
1978/38	Bowens Landing Historic Site, Risdon: Geophysical survey	D. E. Leaman	24.11.78
1978/39	East Coast coal project gravity survey. Preliminary report. Part 1. Survey details and qualitative interpretation	D. E. Leaman	13.12.78
1978/40	Seismic survey at Oakleigh Creek (formerly Mt Pelion wolfram) mine	P. C. Stevenson P. L. F. Collins	20.12.78
1978/41	Slope stability in the Mt Punter area, eastern Tasmania	D. J. Sloane	14.12.78
1978/42	Foundation conditions at a proposed industrial estate at Legana	D. J. Sloane	22.12.78
1978/43	Groundwater investigations at Lime Bay and Plunkett Point, Tasman Peninsula	W. C. Cromer	22.12.78

NON DEPARTMENTAL PUBLICATIONS

The following articles by (or co-authored by) members of the Geological Survey Staff were published during the year:—

- BAILLIE, P. W.; BANKS, M. R.; RICKARDS, R. B. 1978. Early Silurian graptolites from Tasmania and their significance. *Search* 9:46-47.
- BAILLIE, P.; BROWN, A. V. 1978. Excursion 3. A section across the Dial Range Trough and its margins, in GREEN, D. C.; WILLIAMS, P. R. (ed). *Geology and mineralisation of N.W. Tasmania*: 39-42. Geological Society of Australia, Tasmanian Division: Hobart.
- COLLINS, P. L. F. 1978. The geology and mineralisation of north-west Tasmania, in GREEN, D. C.; WILLIAMS, P. R. (ed). *Geology and mineralisation of N.W. Tasmania*: 2-8. Geological Society of Australia, Tasmanian Division: Hobart.
- COLLINS, P. L. F. 1978. An alteration halo to the sulphide-cassiterite mineralisation at the Cleveland mine as a possible exploration guide, in GREEN, D. C.; WILLIAMS, P. R. (ed). *Geology and mineralisation of N.W. Tasmania*: 11-12. Geological Society of Australia, Tasmanian Division: Hobart.
- GREEN, D. C. 1978. The geochronology and some observations on the geochemistry of Tabberabberan granites in Tasmania, in GREEN, D. C.; WILLIAMS, P. R. (ed). *Geology and mineralisation of N.W. Tasmania*: 13. Geological Society of Australia, Tasmania Division: Hobart.
- GREEN, D. C.; HULSTON, J. R.; CRICK, I. H. 1978. Stable isotope and chemical studies of volcanic exhalations and thermal waters, Rabaul caldera, New Britain, Papua New Guinea. *BMR J.Geol.Geophys.* 3:233-239.
- SUTHERLAND, F. L.; STUBBS, D.; GREEN, D. C. 1978. K-Ar ages of Cainozoic volcanic suites, Bowen-St Lawrence hinterland, north Queensland (with some implications for petrological models). *J.geol.Soc.Aust.* 24:447-460.
- VARNE, R.; BROWN, A. V. 1978. The geology and petrology of the Adamsfield ultramafic complex, Tasmania. *Contrib.Mineral.Petrology* 67:195-207.
- WILLIAMS, E. 1978. Tasman fold belt system in Tasmania, in: The Phanerozoic structure of Australia and variations in tectonic style. *Tectonophysics* 48:159-205.

LIBRARY

Librarian J. Berry reports —

There was no library report for 1977. During late 1977 it was discovered that the main library, as well as three other library rooms, were overloaded. The main library was worst affected with a section of the floor subsiding 20 mm in the three months prior to the floor being unloaded. In January 1978 part of the library collection was moved out of the main room into an adjacent room so as to avoid an imminent disaster. Some new library shelving arrived on 20 June enabling a large room on the ground floor to be used to take the excess weight from the overloaded rooms on the first floor. The library collection now occupies eleven rooms, one in the basement, three on the ground floor and seven on the first floor.

Staff

The present staff comprises a librarian, a temporary clerical assistant, and a part-time clerical assistant. Mr M. Bennett resigned as librarian on 13 October 1977. Mrs W. Grubb, previously a student librarian with the Department of Mines, was employed as acting librarian from 24 October 1977 until 1 February 1978. Mr J. Berry (B.Sc. (Hons), Dip. Lib., A.L.A.A.) commenced work as librarian on 2 February. Mrs B. Crocker, who was clerical assistant from January 1977, was succeeded by Mrs D. Auld from 6 July 1978. Miss V. Webster, who was the student librarian, resigned on 19 May and was succeeded by Mr H. Ware, a temporary clerical assistant, who commenced work on 1 June.

Collection

Additions to the collection during 1978 were 123 monographs and 816 serials. Of the 816 serial titles held only 544 are currently received, 88 are by subscription, 382 are via exchange and 74 are donations. (This number only includes those titles for which entries have been sent to the CSIRO, to be included in *Scientific Serials in Australian Libraries*).

Reference and Information

The accession list has been continued with fifteen lists being issued in 1978. The format has been modified so that all books are catalogued before being included on the accession list. In addition, new open file reports are also listed.

During 1978, 321 inter-library loan requests were received from staff, while 646 items (in addition to the 560 journals circulated every month) were issued on loan. In addition, 382 open file reports were studied by company representatives and members of the public, in the library. A total of 699 reference queries were received by the library and these 670 were readily answerable queries while the other 29 required extensive searches to be carried out and in some cases bibliographies to be prepared.

CHEMICAL AND METALLURGICAL BRANCH

Report of the Chief Chemist and Metallurgist, H. K. Wellington, B.E., F.S.A.S.M., A.M.Aust.I.M.M.

The number of samples registered showed a small increase over last year but the number of determinations increased markedly-in part a reflection of the 81 complete rock analyses done with up to 32 determinations on a single rock sample.

The total number of determinations made was the largest since 1974. The number of tin determinations increased markedly to the highest number since 1973. Arsenic determinations increased greatly over recent levels to a record number. Alluvial gold determinations (673) reached a high, most being from one drilling program in Papua.

More metallurgical effort was devoted to individual determinations hence the research projects were fewer although a second continuing project on Moina wiggilite occupied considerable time.

TYPE AND NUMBER OF TESTS

<i>Type of Test</i>	<i>Number</i>	<i>Type of Test</i>	<i>Number</i>
I. QUANTITATIVE —		Waters, Etc —	
Elements —		Complete analysis	263
Aluminium	89	Partial analysis	295
Antimony	295	Deposit Gauges	30
Arsenic	372		588
Barium	80	Miscellaneous	
Beryllium	10	Ash	75
Bismuth	318	Calorific Value	16
Boron	5	Combined Water	81
Cadmium	2	Cyanide	2
Calcium	111	Ignition loss	12
Carbon (including CO ₂	137	Insoluble	9
Chromium	278	Moisture	139
Cobalt	71	Soluble salts in bricks	15
Copper	423	Volatiles	58
Fluorine	92		407
Gold	123	II. QUALITATIVE	
Iron (ferric)	349	III. CERAMIC	
Iron (ferrous)	81	Sand determinations	10
Lead	115	Fusion points	5
Lithium	71	Miscellaneous	8
Magnesium	93		23
Manganese	176	IV. METALLURGICAL	
Mercury	1	Checking masses	1
Molybdenum	17	Crushing and grinding	6
Nickel	204	Density	47
Niobium	75	Gold (alluvial by count)	673
Nitrogen	1	Heavy liquid separation	4
Phosphorus	91	Magnetic separation	15
Potassium	82	Pan concentration	7
Rubidium	90	Sizing	732
Scandium	75	Tank testing	1
Silicon	115	Work index	2
Silver	193		1 488
Sodium	96		9 874
Strontium	90		
Sulphur	234		
Tantalum	27		
Tin	1 521		
Titanium	101		
Tungsten	394		
Uranium	1		
Vanadium	98		
Yttrium	70		
Zinc	385		
Zirconium	98		

RESEARCH INVESTIGATIONS

Tin	....	....	....	....	5	Miscellaneous	....	....	....	3
Tin/Tantalum	....	....	....	....	1	Ceramic	....	....	....	1
Tungsten	....	....	....	....	2	Pollution	....	....	....	1
Gold	....	....	....	....	1					
						Total	....	....	....	14

SUMMARY OF INVESTIGATIONS

Tin

R.740-Minops Pty Ltd, Razorback sulphide ore

Two chip samples were taken by Minops from an adit in the sulphide zone. The two samples assayed quite differently:

	770 126	770 127
	%	%
Fe	33.8	16.1
Cu	0.6	0.04
S	18.8	7.9
C.Sn	6.0	0.08
S.Sn	0.48	0.05
As	5.8	0.2

In 770 126 92 per cent of the cassiterite was in the +C/S 2 fractions.

Test work was done on an equal mass composite of each. Talc and sulphides were removed by flotation after grinding initially to pass 300 μ m. Subsequent gravity concentration removed 80 per cent of the cassiterite in a concentrate assaying 64 per cent Sn.

R.757-Minops Pty Ltd, lead in Razorback tin concentrates

The concentrate sample assayed 51 per cent Sn, 8 per cent Pb, 3 per cent Mn, 5.5 per cent Fe, and 1 per cent As. The lead occurs as anglesite/cerussite 36 per cent, pyromorphite 33 per cent, galena 27 per cent and the remainder as magneto-plumbite or plumbiferite.

Magnetic separation and flotation will remove only minor amounts of lead from this concentrate.

R.760-Minops Pty Ltd, examination of low grade concentrate, from Razorback mine

A concentrate assaying 15 per cent Sn was submitted. The tin in this mainly sulphide material was associated with talc which must be removed by flotation before the sulphides to get a low tin sulphide concentrate.

A 66 per cent tin recovery in a 53 per cent Sn concentrate was obtained by subsequent gravity concentration.

R.761-BMI Mining Pty Ltd, South Mount Cameron dressing shed middlings examination

The middling submitted assayed 47 per cent Sn, 6.7 per cent TiO_2 and 2.4 per cent Zr. The magnetic minerals present were ilmenite, monazite, and ferro-magnesian minerals while the non-magnetic were cassiterite, zircon and rutile.

By combined sizing, magnetic separation and gravity concentration 86 per cent of the tin was recovered in a concentrate assaying 73 per cent Sn.

Magnetic separation of the unsized middling recovered 95 per cent of the tin in a 69 per cent Sn concentrate.

R.773-R. Lawry: Fly-by-Night mine, Gladstone

Face samples assayed 200 to 400 g/t Sn. Sizing analyses showed about half the tin was under 300 μm . Jigging tests showed that a jig was unlikely to achieve a sufficiently high recovery of tin.

The dressing shed middling contained about 40 per cent cassiterite with spinel the main impurity. If the middling were screen sized a satisfactory tin concentrate is possible.

Tin/Tantalum*R.765-Greenbushes Tin N.L.: Scavenger Spinel concentrate*

A sample of the above product from the mill at Greenbushes, W.A. was submitted for tin/tantalum concentration tests. The sample assayed 0.2 per cent Sn, 0.05 per cent Ta and sized 95 per cent passing 600 μm , 10 per cent passing 150 μm .

By screening on 170 μm and concentrating the undersize 60 per cent of the tantalum and 33 per cent of the tin can be recovered. By grinding all the material to pass 300 μm about 80 per cent of the tin can be recovered.

Magnetic separation failed to separate tantalite, cassiterite and tourmaline.

Tungsten*R.745-Comalco Ltd, Moina wriggilite*

This project extends the work done in R731 using the same head sample which assayed 0.25 per cent Sn, 0.15 per cent WO_3 , 8.5 per cent F, and 22 per cent S.Fe.

Tabling and flotation resulted in 33 per cent of the tungsten being contained in a concentrate assaying 22 per cent WO_3 and 7 per cent Sn. Magnetic separation on this concentrate recovered a non-magnetic fraction containing 9 per cent of the tungsten and assaying 31 per cent WO_3 and 21 per cent Sn.

A magnetic concentrate from magnetic separation contained 82 per cent of the magnetics and 30 per cent of the total mass. This magnetic product also contained 15 per cent of the tungsten, 19 per cent of the tin, 10 per cent of the fluorine and 75 per cent of the acid soluble iron.

The final -53 μm gravity tailing the main fluorite product contained 86 per cent of the fluorine and assayed 11.1 per cent F a slight increase on the head value. The fineness of the tin and tungsten in the gravity tailing is shown by the following: —

- (1) The gravity tailing contains 53 per cent of the tin in the head sample finer than 16 μm and
- (2) The same tailing contains 40 per cent of the tungsten finer than 16 μm .

A further test program to process about a ton of ore is underway to produce sufficient material for an investigation to upgrade the gravity concentrates.

R.772-Tasminex N.L., second survey of Kara mill

The results of this survey are similar to those of R.762 with the main differences being —

- (1) A lower head grade (about 0.5 per cent WO_3) and
- (2) The recovered concentrate assayed 60 per cent WO_3 (70 per cent formerly)

The main problem to be resolved is the need to size the gravity feed.

Gold*R.763-B.M.I. Mining Pty Ltd, Middle Arm residues, Beaconsfield*

This project extends the work previously done in R.697 and R.717 using the head samples of those projects.

Sizing analyses show that the gold and sulphur are closely associated. Grinding of the residues is essential for further gold recovery.

From R.697 material flotation recovered three quarters of the gold in a sulphide concentrate but only just over half of this gold could be extracted by cyanidation from this concentrate hence the overall gold recovery was just under 40 per cent. The corresponding recoveries with R.717 material were each lower, overall only a quarter of the gold was recovered.

Miscellaneous

R.764-Director of Mines, sampling suspended solids in a stream

Samples of north-eastern stream sediments were used in a closed circuit to study sampling methods from a launder. During the sampling program the circulating stream was sampled using an automatic sampler. Methods of sampling used on the launder were a traversing nozzle, dipping in a beaker, immersing a bottle and cutting a falling stream.

An indication of the accuracy would be ± 10 per cent of the amount present with widening limits as the amount present decreases. For a single sample the variation could be up to 25 per cent of the amount present.

R.768-Comalco Aluminium Ltd, grinding aluminium cell waste

Grinding tests were requested on material from discarded aluminium electrolysis cells to determine the best way to reduce this heterogenous material. Of the methods tried the hammer mill was best but in using this machine the following points should be noted —

- (1) The material must be dry.
- (2) Aluminium metal could be a problem and
- (3) Wear will be considerable on the hammers.

R.770-Bryce-Watson Pty Ltd, removal of iron from foundry sand

It was desired to reduce the iron content of a beach sand from near Hobart to make it suitable for foundry purposes.

High intensity magnetic separation only reduced the iron content from 0.56 per cent to 0.41 per cent Fe because most of the iron appeared to be as encrustations on the sand grains. There were some free magnetite grains.

Ceramics

R.767-Department of Mines

The annual survey of brick production was made in December 1977.

Pollution

R.680-Department of Mines: oxidation of mine wastes

Results of four years of testing were issued to participating companies.

MINES AND EXPLOSIVES BRANCH

Report of the Deputy State Mining Engineer and Deputy Chief Inspector of Mines and Explosives,
H. Murchie, B.Sc., D.R.T.C. M.Aust.I.M.M.

The Mines Inspection Act 1968

Employment

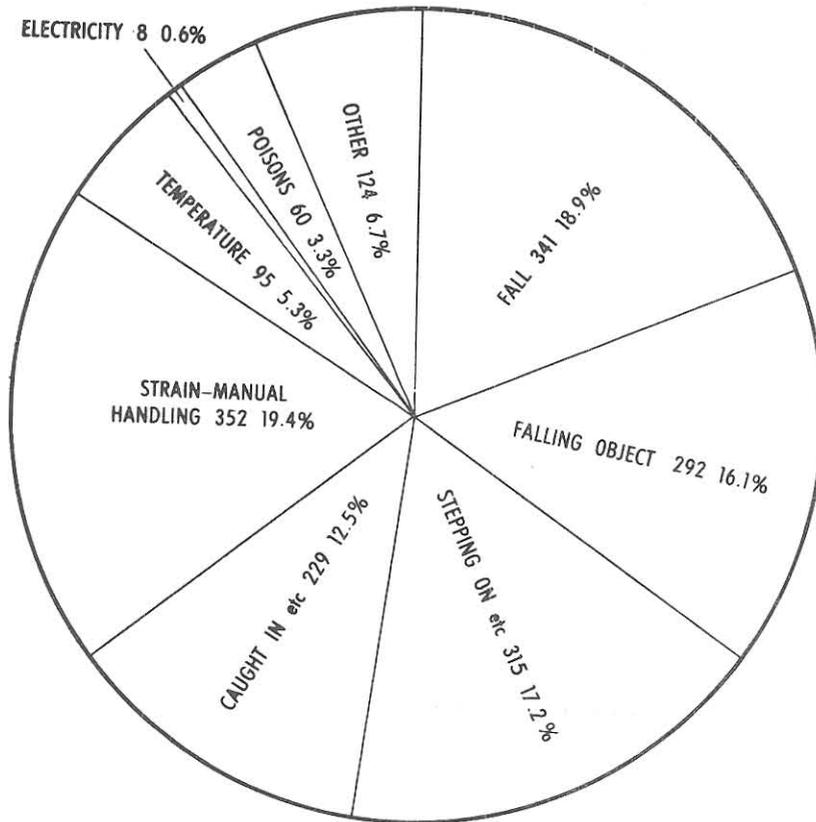
The average number of people employed in the mining, metallurgical and quarrying industry during the year was 9 425 which is within 1 per cent of last year's figure indicating the work force has stabilised following the previous reduction.

Accidents

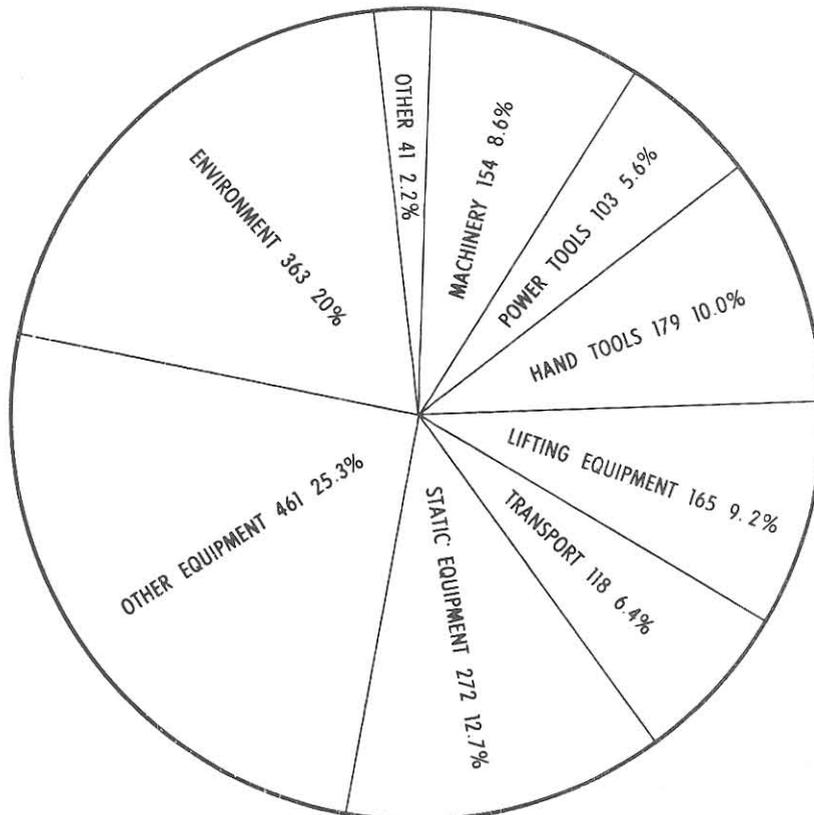
Accidents are again reported and recorded in accordance with Australian Standard AS 1885 'Recording and Measuring Work Injury Experience' and some comparison can now be made with previous figures. Frequency and Incidence rates have either remained stable or improved with areas of concern clearly highlighted. As this is only the second year recording has been under the new Standard it is still too early to determine trends and there remains some resistance to the introduction of incidence rates in place of the former severity rate. The removal of the fixed allocation for fatalities allows for a more rational comparison in the overall pattern of the general accident scene and a clearer indication of the precise areas of concern.

ACCIDENT STATISTICS (AS 1885)

<i>Employer</i>	<i>Man hours exposure</i>	<i>No. of injuries</i>	<i>Frequency rate</i>	<i>Days lost</i>	<i>Incidence Rate (%)</i>	<i>Mean Duration Rate (days)</i>	<i>Employee</i>
Aberfoyle	287 695	44	153	465	24.6	10.57	179
Abminco	615 925	72	116.9	712	24.7	10.8	292
Amdex Endurance	36 299	Nil	Nil	Nil	Nil	Nil	19
Amdex Pioneer	58 583	5	85.4	117	20.0	23.4	25
EZ, Rosebery	1 730 499	576	332.9	5 822	51.6	10.1	1 117
King Island Scheelite	924 114	93	100.6	644	20.4	6.9	455
Mt Lyell	1 347 509	108	80.1	2 148	15.3	14.2	7.6
Mt Pelion	9 024	Nil	Nil	Nil	Nil	Nil	5
Northern Chromite	26 788	13	186.7	107	92.9	8.2	14
Que River	68 885	9	130.7	120	32.1	13.3	28
Renison	855 229	97	113.4	961	22.2	9.9	434
Savage River	800 890	92	114.9	1 006	22.0	10.9	418
Tasminex	38 927	5	128.4	197	21.8	39.4	23
All mines	6 800 367	1 114	163.81	12 299	29.99	11.04	3 715
APPM	30 905	3	97.1	46	15.8	15.3	19
Comalco	2 573 548	184	71.5	1 539	15.0	8.4	1 234
Electrona Carbide Works	319 472	132	413.2	1 345	82.5	10.2	160
EZ, Risdon	3 442 283	294	85.4	3 578	15.4	12.2	1 904
Goliath Cement	545 966	19	34.8	128	6.6	6.7	288
Mole Creek	30 036	4	133.2	128	22.2	32.0	18
NW Acid	246 966	11	44.5	176	9.2	16.0	119
Port Latta	504 747	17	33.7	396	6.7	23.3	254
Temco	778 087	20	25.7	272	5.5	13.6	362
Tioxide Aust.	749 763	9	12.0	37	2.1	9.3	424
Ceramic	160 032	10	62.5	158	11.8	15.8	85
All works	9 381 805	703	76.2	7 803	14.7	10.9	4 867
Collieries	172 928	40	231.3	669	38.1	16.98	105
Quarries	182 561	20	109.6	269	22.73	13.45	88
Totals	16 537 661	1 889	114.2	21 040	21.5	8.5	8 775

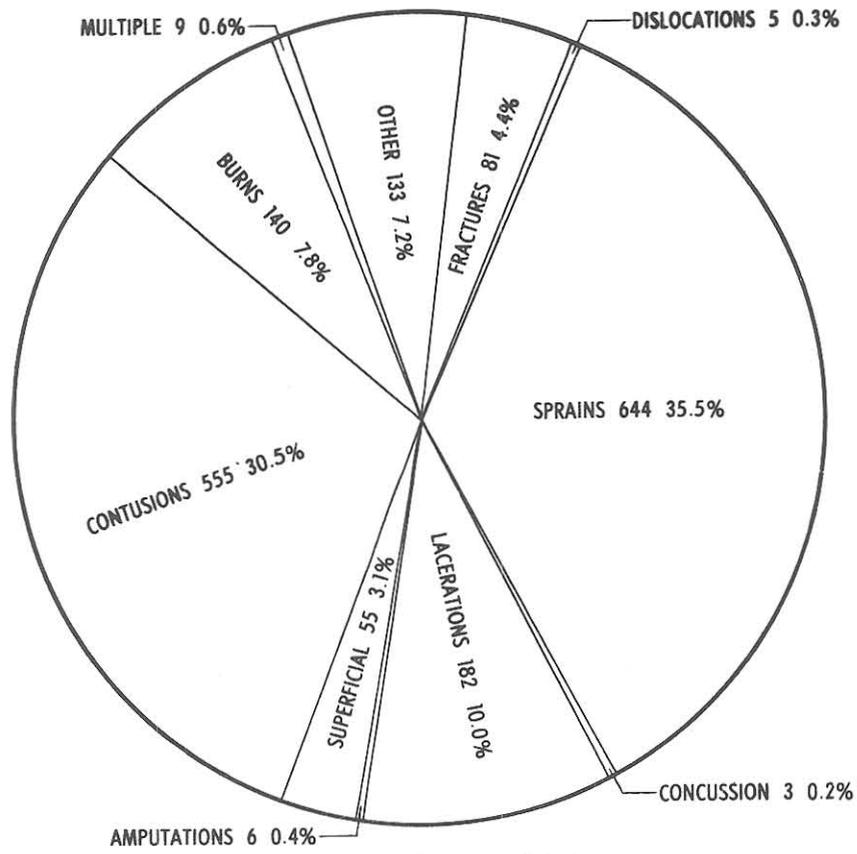


Accidents : Type of incident

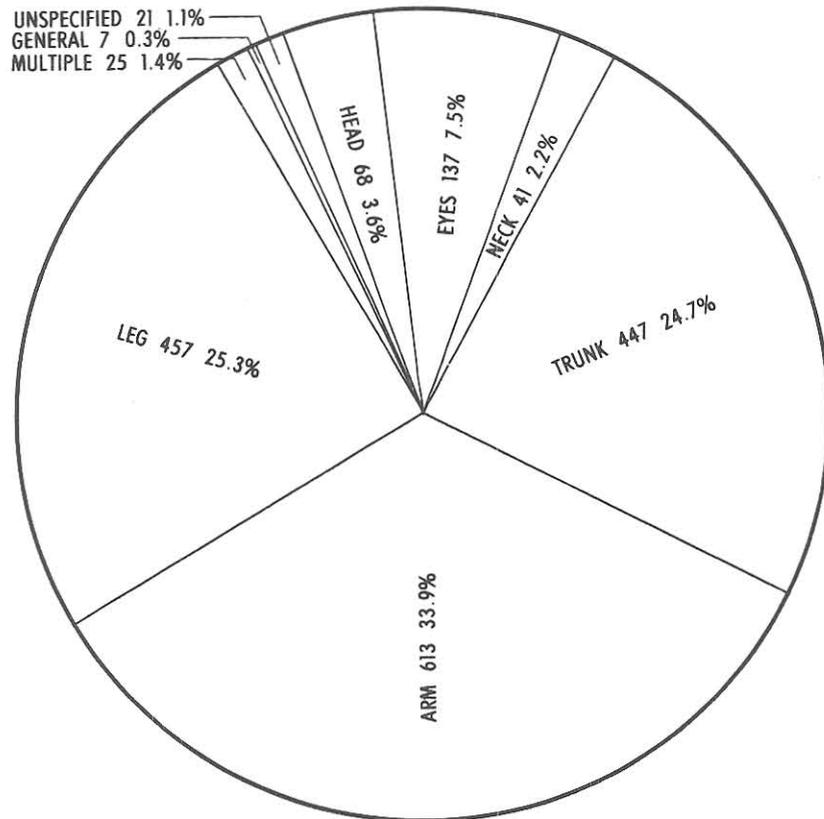


Accidents : Agency

5 cm



Accidents : Nature of injury



Accidents : Location of injury

5 cm

DESCRIPTION OF FATAL AND SERIOUS ACCIDENTS

Fatal

- B. C. Grumitt, King Island Scheelite: Struck by fall of rock from the stope back.
- J. S. Reilly, King Island Scheelite: Struck by fall of rock from the stope back.
- R. T. Houghton, Renison Ltd: Ore carrier driver struck by front-end loader during loading operations.

Serious

- M. Thomas, E. Z. Company, Risdon: Struck by wheel falling from front-end loader; fractured leg.
- W. Petryk, E.Z. Company, Risdon: Fell when ladder slipped; fractured wrist.
- R. Sayer, E.Z. Company, Risdon: Slipped on wet floor; fractured wrist.
- S. Garth, E.Z. Company, Risdon: Caught in form rolling machine; crushed hand.
- D. J. Fox, E.Z. Company, Rosebery: Fell from manway ladder; fractures to ribs, jaw and lower lumbar vertebrae.
- K. Flint, E.Z. Company, Rosebery: Struck from manway ladder by falling kibble; fractured ankle, lacerations and bruises.
- M. W. Evans, E.Z. Company, Rosebery: Struck by flying sheave block when anchor sling snapped under load; compound fracture of the leg.
- R. Brown, E.Z. Company: Rosebery: struck by falling rock while drilling; tip of index finger amputated.
- J. DeSouza, Abminco (Luina): Hand caught in moving vee-belt; thumb amputated.
- P. Kelly, Abminco: Lifted a full 205 litre drum; inguinal hernia.
- L. G. Foster, Abminco: While freeing hang-up in primary crusher, struck by rolling rock; finger amputated.
- P. Blair, N.W. Acid: sudden emission of hot calcine; severe burns to arms and hips.
- M. S. Keltie, Mount Lyell: Caught in surface ore-car tipper; leg amputated.
- K. E. Ebert, Mount Lyell: Rock fell from raised loader bucket; foot fractured.
- L. Gurr, Mount Lyell: Piece of timber fell from shuttering; finger fractured.
- I. A. Waddle, Mount Lyell: Rock fell from back while drilling; fractured hand.
- P. J. Breen, Mount Lyell: Slipped on railway line; injured ribs.
- P. J. Wells, Mount Lyell: Trapped between two vehicles; fractured foot.
- G. L. Newson, Mount Lyell: Pipe rolled during loading of vehicle; finger fractured.
- L. G. Stebbings, Mount Lyell: thrown by sudden emission of compressed air while pipe fittings; fractured spine.
- J. F. Halton, Mount Lyell: Chock ejected from beneath jacked up loader; jaw fractured.
- T. J. McDonald, Renison Limited: Trapped between automatic doors after entering filter hopper; head injuries.
- B. Holmes, Savage River: Fell, striking head on valve; head injuries.
- B. Lennox, King Island Scheelite: Slipped in scraper way; leg fractured.
- C. Kostrynski, Electrona Carbide: Slipped handling drum; arm fractured.
- E. Basso, Coles Bay Granite Quarry: Caught between granite blocks; crushed hand.
- M. Moore, Amdex, Pioneer: Falling pump unit; fractured finger.
- T. McConnon, Clifton Brickworks: Fell while dismantling kiln wall; fractured foot.
- M. L. Dennis, Comalco: Trapped by dislodged lifting frame; lacerated scalp, fractured leg and clavicle.

DANGEROUS GOODS

The Dangerous Goods Act 1976

Mr M. E. Curtain: Assistant Chief Inspector of Explosives

Mr G. Jobson: Senior Inspector of Explosives

Southern District: —

Mr R. A. Pickett: Inspector of Explosives

Mr G. Goodrick: Magazine Keeper

Northern District: —

Mr D. Bonham: Inspector of Explosives

Mr S. Smith: Magazine Keeper.

North-West District: —

Mr H. E. T. Medwin Inspector of Explosives

Mr M. E. Curtain reports that the activities of the Section increased in number and scope during the year. Besides routine duties of plan approvals, issue of permits and inspections the Department was involved as a whole in discussions with other government departments and industry at all levels in relation to the importation transportation and keeping of dangerous goods.

The main areas of investigation and action being: —

The Storage, Transport and Installation of L.P. Gas

There was a rapid growth in the use of L.P. Gas during 1978, which was partly due to the phasing out of the Hobart Gas Company's reticulated town gas supply and also to the increasing acceptance by the public and industry of L.P. Gas as an alternative fuel throughout the State.

L.P. Gas Safety Committee

In response to the interest of sections of the L.P. gas industry a L.P. Gas Safety Committee was formed in September, 1978. The Committee is comprised of ten members representing a cross-section of the industry and is chaired by an officer of the Mines Department. The objectives of the Committee are to discuss L.P. Gas Safety and to keep abreast of current developments, locally and internationally, and to advise the Mines Department of the views of the industry accordingly.

One recommendation of the committee was the proposal for a 'Start Work Notice', 'Certificate of Test' and 'Gas Supplier's Endorsement' to apply to new, alteration or repair of installations.

The proposal is planned to be implemented in 1979 and it is expected that a closer control over the standard of gasfitting work will be achieved and it is hoped that these measures will encourage the industry to self regulate with regard to basic safety measures.

Transport of Dangerous Goods

Preliminary discussions were held with the Transport Commission regarding the transport of dangerous goods by road.

It was proposed that: —

- (1) An annual inspection of vehicles to be conducted and a permit issued to convey certain classes of dangerous goods by road.
- (2) Drivers be examined and their licences certified for them to drive permitted vehicles.

Research into the type of procedures to be adopted in connection with the proposals is being investigated by the section in conjunction with the Department's and the Transport Commission's Mechanical Engineers.

Containerisation of Explosives

The first shipment of containerised explosives ex. Point Wilson, Victoria was received at Burnie in February and the ease of landing and distribution by road and rail to all parts of the State has ensured that this method of transport of bulk explosives will remain as standard practice.

Dangerous Chemicals

It was brought to the attention of industry the need to follow correct practice in the storage of chemicals as routine inspection had shown that some potentially hazardous conditions existed. This also applied to some minor storage in other sections of the community including one high school. A quantity of dangerous chemicals and explosives from various sources were destroyed or disposed of during the year.

Occupational Health

The section assisted investigations into occupational health hazards during the year a number of firms and government departments were advised on precautions required when handling dangerous chemicals. In addition lectures were given to interested organisations on the subject of occupational health relating to dangerous goods.

Committees

In addition to the committees mentioned above, the section represented the department on the Hazchem Committee, Disposal of Hazardous Chemicals Committee, A.T.A.C. advisory Committee on the Transport of Dangerous Goods and Standards Association of Australia — CH/9 Committee [Safe Handling of Chemicals].

General

The following explosives were authorised during the year — Geospeke Shaped Charges and Amex. Definitions for the following explosives were amended — Aquaflex Cordtex, Tuffcord, Geoflex, Ribard, Flexcord, Silvercord, Anzimex Booster, Anzite Blue and Quariquel.

IMPORTS OF EXPLOSIVES

	<i>Burnie</i>	<i>Wynyard</i>	<i>King Island</i>	<i>Total</i>
Nitro-compounds (kg)	709 375	1 908	17 850	729 133
Detonators	1 256 798	....	109 300	1 366 098
Explosives shipments (No.)	4	5	6	15
Ammonium nitrate imported for use as an explosive (tonnes) ....	....	....	....	2 750

Note: Burnie became the sole port serving ship-borne Explosives for 1978.

IMPORTS OF INFLAMMABLE LIQUIDS

	<i>Bell Bay</i>	<i>Burnie</i>	<i>Devonport</i>	<i>Hobart</i>	<i>Total</i>
Inflammable liquids imported in bulk (tonnes)					
Aviation gasoline	9 846	....	....	6 110	15 956
Kerosene —					
Aviation	5 781	....	....	3 200	8 981
Lighting	706	....	2 306	3 050	6 062
Motor Spirit —					
Premium	54 564	23 126	56 091	111 016	244 797
Regular	21 231	7 538	7 957	15 585	52 311
L.P. Gas	5 778	....	....	3 455	9 233
Totals	97 906	30 664	66 354	142 416	337 340

SPECIAL INVESTIGATIONS

P. Allan, Mining Engineer, Hobart*Diesel Engines Underground*

The downturn in the introduction of new diesel equipment, which first became obvious in late 1976, has continued through the two succeeding years.

Temporary approvals were issued for: —

- Deutz F4L 921W in an Eimco 964
- Deutz F4L 912W in an Eimco 911B
- Ford 2712E in a modified Ford F100
- Lister SR4 in an underground diamond drill

Full approvals were issued for: —

- Hino EC100 KLB 300 personnel carrier
- Toyota B in a Toyota Landcruiser
- Caterpillar 3408T in an Eimco 920C
- Caterpillar 3306T in a Caterpillar D 6D bulldozer
- Caterpillar 3304NA in a Caterpillar 920 F.E.L.

A prolonged field test of a catalytic exhaust conditioner was inaugurated early in the year in co-operation with the ventilation and engineering departments of the Mt Lyell Mining and Railway Co. to determine the credibility of the manufacturer's claims and to assess the long term operation of the device. Tests to date indicate that the unit lives up to expectations in treating the carbon monoxide content in exhaust fumes and with 800 working hours under test to date is showing favourably in terms of continuing maintenance free operation.

The tests will continue over into the following year under full working conditions and after approximately 1 800 hours it is hoped to be in a position to judge not only the effectiveness of the device but what conditions may require to be placed on its use.

Investigations

VIBRATIONS

Our vibration equipment is now mounted in a miniature caravan type trailer, where it is subject to much less wear and tear as well as being more comfortable to operate during inclement weather.

This year's investigations covered the following: —

- Department of Main Roads — Pile driving, Ulverstone Bypass
- Department of Main Roads — Possibility of building damage from 54" and 72" vibratory rollers
- Department of Main Roads — Effects of vibrating roller on Huon Highway, Geeveston
- Department of Main Roads — Effects of vibrating roller on Midland Highway, Kempton

BLASTING—

- Administrator of Road Transport — Traffic effects on property, Launceston
- Department of Main Roads — Effects on Historic Barn — Midland Highway
- Department of Main Roads — Protection of house, Geeveston Main Road
- Department of Main Roads — Control of pre-split, Hobart Eastern Outlet
- Port of Launceston Authority — Control of blasting, Low Head marina
- Seafood Pty Ltd — Control of blasting, Margate marina

BUILDING FAILURE

National Trust — Condition of 'Chegworth' St Leonards
 Hobart City Council — Condition of 32 Broadwater Parade Sandy Bay
 Department of Main Roads — Conditions of property Moore and Lytton Streets, Launceston
 Launceston City Council — Condition of Tasmanian Fibre Containers Pty Ltd
 Launceston City Council — Condition of properties in Vermont Road Mowbray
 Insurance — Condition of properties in Vermont Road Mowbray
 Insurance — Condition of 93 Karoola Road, Lindisfarne

NOISE

Prolonged noise level surveys were carried out at the Mt Nassau Limestone Quarry and the Remount Road, Launceston quarries of Readymix Limited to supply basic data on environmental impact.

QUARRY PLANNING

Assistance was given to Readymix Limited in planning layout and firing patterns for the Mt Nassau Limestone Quarry.

A total re-development scheme was planned for the Lune River Limestone quarry operated by Benders Spreading Services and the main source of supply for the Electrona Carbide works.

MISCELLANEOUS

Assistance was given to the Tasmanian Police with the re-writing of their Standing Orders referring to the handling of explosives.

Acting on a report from the St Marys Police regarding the injury sustained by some children at Scamander the old Scamander (Gold) Mine was inspected.

The mine which pre-dates the Mining Act is on private property and still in an excellent state of repair. The children apparently attempted to 'blow it up' using petrol and, while they carefully left their matches outside, they worked in the adit by the light of a candle. After spending some time in hospital, the three appear to be fully recovered from the burns they received in the accident.

MECHANICAL INSPECTION

W. C. Hodgson, M.I.E. (Aust.), Hobart

Routine plant and machinery inspections continued as usual throughout the year, and all mines and works were visited at least once.

New designs and plant examined for approval included: —

Tasmanian Carbide Products

The new furnace building, furnace, and machinery were well advanced by the end of the year although substantially behind commencement schedule.

The lime kilns were re-bricked, increased in height and modernised.

Comalco

The No. 4 Potline was completed and commissioned.

Initial problems with heavy wear and structural cracks encountered on rails and wheels and associated steelwork of the No. 4 potline cranes now seems to have been solved by using double flanged wheels.

E.Z. Risdon

Restoration and structural renewal work on the foreshore gas scrubbing plant was completed during the year.

E.Z. Rosebery

No. 1 Shaft

The mancage and both skips have been completely renovated.

No. 2 Shaft

A shaft mishap resulting from the skip tailropes becoming twisted together and nearly severing highlighted the need for a tripping device at the tail loops.

The original tripping device had apparently become unserviceable and was removed sometime previously.

Preliminary steps have been taken towards restoring the auxiliary hoist following last years broken rope mishap. The use of a cage arresting device of Mines Department design is being investigated.

King Island Scheelite

The Dolphin Mine de-watering pump plant was completed.

The new artificial scheelite plant was well advanced by the end of the year if somewhat behind schedule.

Several fixed cranes were design approved, and a new Grove RT 65 crane was purchased to replace the two Steelweld cranes — which had been found to be inadequate to service the Dolphin de-watering pump equipment.

Goliath Portland Cement

The new raw mill commenced operation.

Savage River Mines

The 33.11 Terex trucks have been further modified to reduce fire hazard. This includes alteration to the exhaust system, and re-routing of oil carrying pipelines away from hot spots.

The Lease Afex extinguisher system, in spite of perseverance and extensive modification has not proved reliable. The company is now considering a simpler approach.

Cleveland Tin N.L.

Mechanical maintenance of fixed plant still falls short of the ideal but is slowly improving.

Mobile equipment is better maintained than in previous years.

Que River Mine

Shaft sinking was well advanced by the end of the year and all mechanical equipment proving substantially trouble free.

Storeys Creek Mine

For the second time on record the hoist rope on the winding engine was found to be partly cut apparently with a hacksaw. The matter was reported to the police by the Mine Manager and the damaged section of rope removed.

The winding engine was scheduled to be re-conditioned over the Xmas period. A short extension of time was granted at the companies request.

Aberfoyle

The Spiers shaft winder has now been extensively re-conditioned.

Readymix

The new crushing and screening complex at Bridgewater was completed and commenced operating.

Launceston Gas Company

The conversion to L.P.G. was completed.

DANGEROUS GOODS

An accident to a petrol tank semi-trailer in Victoria was found to be due to fatigue cracking at the 5th wheel connection.

A systematic inspection of these was carried out in Tasmania.

A tightening of inspection and operating procedures on these and other dangerous goods vehicles will be initiated.

Two L.P.G. tank vehicles were inspected for approval at C.I.G. and one for the Launceston Gas Company.

Certificates of Competency

Seventy one candidates were examined for certificates as crane drivers, winding engine drivers, and I.C. engine drivers.

ELECTRICAL INSPECTION

E. J. Bartkus, M.I.E.(Aust.), Hobart

Inspection of electrical installations and equipment continued throughout all mines and works.

Upgrading of old electrical installations and equipment, to comply with latest regulation standards, continued throughout the industry.

Three minor electrical accidents were investigated during 1978.

The following electrical installations and equipment were investigated and approved: —

Coles Bay Granite Quarries, electrical installations:

Electrona Carbide Industries, new arc furnace and auxiliaries, carbon block plant and high voltage sub-stations:

Que River Project, underground electrical installations:

King Island Scheelite, Dolphin mine ventilating fans:

Hazell Brothers Quarries, electrical installations:

Goliath Portland Cement, new hammer mill and auxiliaries:

Pioneer Concrete, Lindisfarne, new electrical installations.

New electrical plants inspected and approved on completion: —

King Island Scheelite: Dolphin mine pumping scheme,
Dolphin mine ventilating fans and the synthetic scheelite plant.
Cleveland mine: 22 KV substation and 6.6 KV underground reticulation.
Tioxide, Burnie: nuclei plant.
Readymix, Bridgewater: new crushing and screening plant.
Jeffries Quarries, Mornington: new plant.
E.Z., Risdon: jarosite plant.
Que River Project: underground reticulation.
Launceston Gas Company: L.P.G. Conversion plant.
Goliath Portland Cement: new hammer mill and auxiliaries and C.I.G., Selfs Point: L.P.G. installations.

The following investigations were completed during 1978 period: —

Static electricity effect on safety fuses and 28.5 MHz radio transmitter radiation effect on electric detonators.

DRILLING

R. Billingham, Mining Engineer, Hobart

Diamond Drilling

The major projects through the year were the continuation of coal exploration in the Fingal region and the North-East water investigation program.

The total depth drilled in coal exploration increased although severe problems were encountered in penetrating the dolerite scree on the side of the Fingal Tiers. Three holes were completed on the Tiers and one was abandoned. Other holes were drilled at Mt Nicholas and Bicheno.

Several shallow diamond drill holes were put down in the North-East to determine the extent of the aquifers. Numerous water bores were drilled in the area under contract to local landowners using the Failing rig.

The Materials and Research Section of the Department of Main Roads were assisted by the use of the Gemco 210 for site investigation, drilling for bridge foundations and road cutting.

DRILLING DETAILS 1978

<i>Location</i>	<i>Purpose</i>	<i>Drill</i>	<i>No. of holes</i>	<i>Total depth (m)</i>
<i>Diamond —</i>				
Fingal	Coal investigation	Longyear 38	4	637.22
Fingal	Coal investigation	Edeco	1	575.98
Bicheno	Coal investigation	Edeco	3	906.24
Fingal	Coal investigation	F20C	1	65.32
Mt Nicholas	Coal investigation	F20C	2	332.82
Scamander	Coal investigation	F20C	1	154.57
Turners Marsh	Water investigation	Joy 12B	2	185.90
Lilydale	Water investigation	Joy 12B	4	203.80
Seawood	Water investigation	Joy 12B	1	48.10
Boobyalla	Water investigation	Joy 30HD	1	113.00
Rowella	Stratigraphic	Joy 30HD	1	152.00
Snug	Stratigraphic	F20C	3	387.62
Margate	Stratigraphic	F20C	2	507.82
Launceston	Site investigation	F20C	6	75.34
Spring Hill	Site investigation	F20C	2	25.71
Kempton	Sandstone investigation	Gemco 210	2	9.08
Dunalley	Stratigraphic	Gemco 210	2	51.18
Total			38	4 431.70
<i>Churn</i>				
Beaconsfield	Mineral investigation	Keystone 55	9	163.00
Gladstone	Tin investigation	Keystone 55	86	922.50
Gladstone	Water investigation	Keystone 55	4	60.00
Binalong Bay	Water investigation	Keystone 55	5	116.00
New River	Water investigation	Keystone 55	2	52.50
Branxholm	Water investigation	Keystone 55	1	60.00
Winnaleah	Water investigation	Keystone 55	1	26.00
Lilydale	Water investigation	Keystone 55	4	89.20
Total			112	1 489.20
<i>Diamond/Auger</i>				
Launceston	Site investigation	Gemco 210	3	26.05
Claremont	Bridge foundation	Gemco 210	4	96.00
Zeehan	Bridge foundation	Gemco 210	6	83.40
Glen Huon	Site investigation	Gemco 210	2	49.00
Scottsdale	Site investigation	Gemco 210	1	10.00
Winnaleah	Water investigation	Gemco 210	12	122.89
Geeveston	Site investigation	Gemco 210	1	16.00
Kempton	Site investigation	Gemco 210	2	12.01
Ulverstone	Site investigation	Gemco 210	4	52.92
Total			35	468.27
<i>Rotary/Percussion</i>				
Lilydale	Water investigation	Failing WW1	9	378.11
Karoola	Water investigation	Failing WW1	13	278.76
Lalla	Water investigation	Failing WW1	8	217.78
Winnaleah	Water investigation	Failing WW1	8	207.18
Lebrina	Water investigation	Failing WW1	8	261.97
Pipers River	Water investigation	Failing WW1	2	91.36
Turners Marsh	Water investigation	Failing WW1	1	45.68
Tonganah	Water investigation	Failing WW1	1	113.28
New River	Water investigation	Failing WW1	1	7.62
Weymouth	Water investigation	Failing WW1	1	45.68
Tunnel	Water investigation	Failing WW1	1	24.38
Scottsdale	Water investigation	Failing WW1	1	42.64
Waterhouse	Water investigation	Failing WW1	2	57.04
Bridport	Water investigation	Failing WW1	1	36.56
Melton Mowbray	Water investigation	Failing WW1	1	86.72
Rowella	Stratigraphic	Failing WW1	1	83.00
Total			59	1 977.76

SUMMARY OF DRILLING

<i>Drill Type</i>	<i>No. of drills operating</i>	<i>Depth drilled (m)</i>
Diamond	5	4 431.70
Diamond/Auger	1	468.27
Rotary/Percussion	1	1 977.76
Churn	1	1 489.20
	8	8 366.93

NORTH-WESTERN DISTRICT

E. C. Leyland, A.W.A.S.M., M.Aust, I.M.M.

T. E. Evans, B.Sc., A.R.S.M., F.I.M.M., Burnie

EXPLORATION

The Mount Lyell Mining and Railway Co. Ltd

Exploration programs continued to be undertaken for deposits of volcanogenic base-metal sulphides on exploration-licence area E.L. 9/66, E.L. 10/69, E.L. 41/71 and E.L. 21/76 and for deposits of hydrothermal-replacement tin on special-prospectors-licence area S.P.L. 129. The amounts expended on the 1978 activities in these areas were as follows: —

<i>Licence Area</i>	<i>Expenditure \$</i>
E.L. 9/66	190 071
E.L. 10/69	45 962
E.L. 41/71	107 725
E.L. 21/76	129 277
S.P.L. 129	68 829

On 4 December 1978 four exploration-licence areas referred to above were amalgamated into E.L. 9/66.

E.L. 9/66 — MOUNT TYNDALL AREA

A program of diamond drilling was completed early in 1978 which tested the potential of the felsic pyroclastics/black shale sequence flanking the felsic-lava mass on Red Hills. This program covered a strike length of 1 500 metres but only encountered low-grade disseminated sphalerite with trace/minor quantities of galena and chalcopyrite. The follow-up work in the form of electrical geophysics and costean digging that was carried out in the vicinity of the sole drill-hole intersection of significance failed to indicate the presence of any sizeable deposit.

In the White Spur area, further traverse lines were established. Detailed gradient array E.I.P. and controlled magnetic surveys were carried out, as were follow-up soil sampling and geological mapping. In addition, two costeans were excavated but these failed in their purpose to explain the reason for the occurrence of two coincident E.I.P. and soil geochemical anomalies in the area.

In the Henty River gorge, three old adits were located and sampled. To the north and south of the adits, a total of 15 kilometres of traverse lines were established and surveyed with detailed gradient array E.I.P. Then, controlled ground magnetics were carried out along with geological mapping and soil and stream-sediment sampling. Soil sampling and geological mapping were also carried out in the adjoining West Tyndall area as part of the evaluation of this lead-zinc prospect.

A low level aeromagnetic survey was flown over the north-western portion of the licence area.

E.L. 10/69 — DORA-HUXLEY AREA

Exploration activity was concentrated on the Beatrice grid, where soil and chip sampling undertaken in the vicinities of the E.I.P. anomalies found by a survey carried out last year gave very-strong indication of the presence of a Cu-Pb-Zn-Ag anomaly with a strike length of about 1 000 metres. In addition, 2.4 kilometres of road were constructed and this undertaking exposed a major zone of altered and Pb-Zn mineralised tuffs. One drill hole was put down and this intersected two minor zones of disseminated sphalerite-galean-pyrite-chalcopyrite mineralisation.

An additional 4.1 kilometres of traverse lines were cut in the north-west part of the grid-area and surveyed with gradient array E.I.P. geophysics.

E.L. 41/71 — HENTY-YOLANDE AREA

In the south-east and north-east portions of the Basin Lake grid, 3.7 kilometres of intermediate traverse lines were established and a soil-sampling program was carried out along with a gradient array E.I.P. survey. Two holes were drilled in the south-east portion but both failed to intersect significant mineralisation. A costean was excavated in the north-east portion exposing pyritic black shale and tuff but these again carried no mineralisation of economic significance.

Access tracks were cut to the Langdon and Henty rivers to enable reconnaissance geological mapping and geochemical sampling to be undertaken in the areas.

E.L. 21/76 — JUKES-DARWIN AREA

Three helicopter-supported camps were established to enable a reconnaissance program to be carried out at each of two places in the licence area.

At the one of these in the Clark River Valley, a grid of 23.5 kilometres was cut and programs of geological mapping, soil sampling, gradient array E.I.P. surveys and total-field magnetics surveys were undertaken and completed. Three major zones of interest were located in consequence, each having coincident E.I.P. and soil geochemical anomalies and featuring black-shale horizons.

At the other in the Garfield River area, a broad reconnaissance program was undertaken and completed in which 28.5 kilometres of access tracks were cut and geological mapping, soil sampling and stream-sediment sampling were carried out. This located three areas of interest, each containing black shale.

S.P.L. 129 — TRIAL HARBOUR AREA

On the East Heemskirk grid, pole-dipole E.I.P. and ground magnetics surveys started last year were completed. In addition, geological-mapping and soil-sampling programs were carried out and extensions to the grid were covered by a ground magnetometer survey.

A diamond drill hole put down in the vicinity of the old workings of Kelvin and Mayne intersected a variably altered and metasomatised tuffaceous sequence with trace amounts of magnetite, pyrite, pyrrhotite, chalcopyrite and cassiterite occurring in veins.

Minops Pty Ltd

LEASES 102M/66, 23M/52 AND 29M/51 (GRAND PRIZE), NORTH DUNDAS

Reconnaissance mapping and some sampling were carried out during the year.

Minops Pty Ltd, is in process of negotiating a joint-venture agreement for the purpose of continuing to explore for tin deposits in the vicinity of the Grand Prize zone of shearing within these leases.

LEASE 35M/72 (OONAH), WEST ZEEHAN

A limited program of exploratory work, including sampling and reconnaissance mapping, was undertaken during the year.

A farm-out agreement has been reached with another company for the carrying out of further exploration on this lease. A program including geophysical work and deep diamond drilling is being formulated for starting on in 1979.

LEASE 62M/75 (GODKIN), NORTH-EAST DUNDAS

Some basic exploratory work was carried out during the year, including reconnaissance mapping and the re-logging of diamond-drill core.

Another farm out agreement has been negotiated in respect to this lease. A program comprising grid cutting, costean excavating, mapping, geophysical work and diamond drilling is in process of being designed.

INCIDENTS AND OCCURRENCES

The investigation of an explosion at a domestic dwelling in Ulverstone reinforced the view that, in spite of Departmental advice, little heed is given to the dangers of having containers of inflammable liquid on the premises. The re-filling of non-returnable containers with a higher grade petroleum product is also a questionable practice.

Mr R. Maxfield was fatally injured when the hand-piece of a Compak Sovereign arc welding set made contact with an inflammable liquid container. It is considered that the container held a very small quantity of flammable liquid of the petrol type.

An explosion, which occurred at a scrap-yard in the Wivenhoe area was investigated. No personnel were injured, and the majority of the shrapnel, resulting from the explosion, was confined to the yard area. However, one piece was blown a distance of 170 metres and landed in the garden of a domestic dwelling. The cause of the explosion was the heating of scrap metal surrounding a void which contained either sulphuric acid, grease, or water.

A schoolboy received serious injuries to the thumb and two fingers of one hand, when he attempted to open one detonator of several he found in an unoccupied dwelling. The practice of souveniring detonators and explosives from mining, quarrying and construction sites is still widespread, and, following information received from the police or public, explosives have been recovered from schools, rivers and private dwellings.

The export pipeline of North-West Acid leaked during pumping operations with acid entering the drains from the property of A.P.P.M. The damage to the pipe was the result of external corrosion from a previous leak. The damaged section was replaced, the line tested and pumping recommenced ten days later.

NORTH-EASTERN DISTRICT**J. W. Dempster, A.C.S.M., F.I.M.M., M.Aust.I.M., F.I.Q. Launceston**

The continuing high price of tin maintained interest in the alluvial tin areas throughout the North-East and a considerable number of lease applications were inspected and processed. Also inspections and reports were completed on certain leases which applied for assistance under the Mining Act.

A pleasing aspect of the upturn in the economy was that for the last four months of the year all furnaces at TEMCO, including the Sinter plant, were operated on a seven day per week basis.

Complaints were received from the public regarding noise and house damage from blasting operations. All complaints were investigated and when necessary modifications made to blasting practice.

On Flinders Island, in October, there was a serious accident involving two young boys, who suffered severe burns to the lower parts of their bodies, when a quantity of gun powder stored in a shed on a rural property ignited.

The boys were flown to Launceston General Hospital and admitted to the intensive care unit. One of the boys was found to be in a very serious condition and it will some time before he will be fit enough to leave hospital.

It is not clear how the accident occurred but it appears that the boys could have been playing with matches in the shed.

Assistance was given to the Police in the recovery of explosives.

SOUTHERN DISTRICT

R. C. Thomas, A.C.S.M., M.I.M.M., M.Aust.I.M.M.

P. A. Allan, B.Sc., A.H.W.C., M.I.E. (Aust), F.I.Q., M.Aust.I.M.M.

R. Billingham, B.Sc., A.R.S.M., M.I.Q., A.M.Aust.I.M.M.

General

Amongst developments in the district during the year the two most significant were the installation of a new carbide furnace and acetylene black plant at the Carbide plant at Electrona and the new Crushing and Screening plant installed at the Readymix quarry at Bridgewater and the subsequent closure of operations at the Giblin Street quarry.

Incidents

During the year there was a release into the atmosphere of a pollutant from the Electrolytic Zinc Co. (Australasia) Ltd plant at Risdon. The situation was contained very quickly and nobody was injured. The incident arose when an inspection glass broke as a result of an error in the closing down procedure in the Acid section. The company has now made changes to procedure to ensure that the incident does not re-occur.

Investigations were made into complaints of blasting nuisances and where necessary procedures were changed.

**REPORT OF THE MOUNT CAMERON WATER RACE BOARD
FOR THE YEAR ENDED 31 DECEMBER 1978**

THE MINISTER FOR MINES

We submit the report of the Mount Cameron Water Race Board for the year ended 31 December 1978.

The loss of \$22 104 incurred in this year's operations showed an increase over the previous year (\$19 681). This was attributed to two factors. Firstly, to the higher operating costs mainly due to National Wage adjustments and, secondly, to the reduced demand for water requirements by companies who were seeking savings in water costs.

A new scale of charges was approved at a Board meeting on 3 May 1978, effective from that day. Details are as follows: —

12 months contract: \$8.00 per sluichead per week (Payment to be made in advance).

Short term contracts: 1 week minimum, \$20.00 per sluichead per week (Payment to be made in advance).

During 1978 one channel-keeper was employed full-time and a second channel-keeper was employed for about ten months of the year.

The Manager, Mr N. Petrie, reported that the race system was in good order and that water, well in excess of demand, was flowing through the race. Installation of the concrete pipes at the Chum Creek dam has eliminated the leakage. Spraying of weeds in the channels has continued during the year and most sections of the race are now clear of weed.

Mr H. K. Turner, a board member of long standing, submitted his resignation from the Board in May. This was accepted by the Chairman who expressed the Board's appreciation for Mr Turner's long and valuable service. Arrangements are to be made to appoint a member in Mr Turner's place.

J. G. SYMONS, Chairman

V. WOOD, Member

S. EVERETT, Member

MOUNT CAMERON WATER RACE SUSPENSE ACCOUNT

Statement of Receipts and Payments for the Year Ended 31 December 1978

<i>Receipts</i>	\$	<i>Payments</i>	\$
Proceeds from sale of water: —			
Fixed rate	4 502.00	Wages and Pay-roll Tax	26 224.91
Domestic rate	248.00	Maintenance	329.35
Balance (Loss)	22 104.26	Car allowance	300.00
	\$26 854.26		\$26 854.26

MOUNT CAMERON WATER RACE

Statistics for the Year Ended 31 December 1978

<i>Registered Rainfall</i>		<i>Production</i>	<i>Tonnes</i>
Great Musselroe	1 265.4 mm	Tin oxide produced —	
Little Musselroe	1 358.3 mm	Fixed scale	17.93
		Royalty scale	—
		<i>Employment</i>	
		Average per week —	
		Fixed scale	5
		Royalty scale	—
			5
			—
	373		

REPORT OF THE RINGAROOMA AND CASCADE WATER BOARD

For the Year Ended 31 December 1978

THE MINISTER FOR MINES

We submit the report of the Ringarooma and Cascade Water Race Board for the year ended 31 December 1978.

The Board has maintained the Cascade dam and retained ownership of the Mt Paris dam which is kept empty. There have been no applications for water for use in re-establishing tin mining operations at the old Briseis Mine.

The Board has no revenue. The cost of caretaking the Cascade dam and the interest charges on the capital cost of the water system is reimbursed from Consolidated Revenue.

A letter was received during the year from the Ringarooma Municipal Council regarding dead wood around the spillway of the Cascade dam. This has been investigated and appropriate action taken.

J. G. SYMONS, Chairman

S. EVERETT, Member

N. P. EDWARDS, Member

RINGAROOMA AND CASCADE (WATER) SUSPENSE ACCOUNT

Statement of Receipts and Payments for the Year Ended 31 December 1978

	<i>Receipts</i>	\$		<i>Payments</i>	\$
Balance (loss)	1 579-91	Interest on capital cost	.....	1 429-91
			Inspection fees	.....	150-00
		\$1 579-91			\$1 579-91