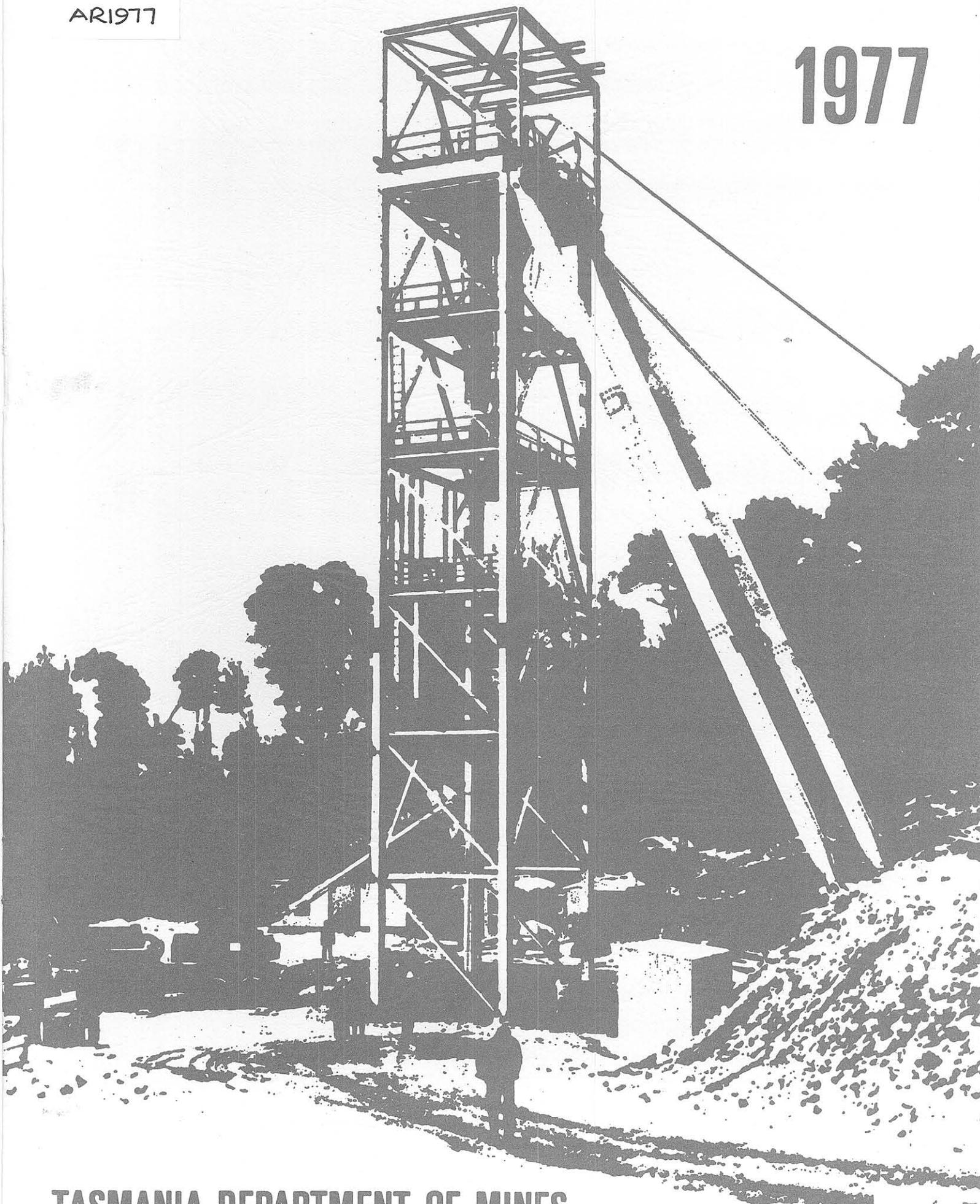


# REPORT OF THE DIRECTOR OF MINES

AR1977

# 1977



TASMANIA DEPARTMENT OF MINES

726



1978

PARLIAMENT OF TASMANIA

# DIRECTOR OF MINES

## REPORT FOR THE YEAR ENDED 31 DECEMBER 1977

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

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By Authority:

T. J. HUGHES, Government Printer, Tasmania



Construction work at the Que River Mine (Abminco N.L.) by Thyssen Mining Construction of Australia Pty Ltd (See page 49)

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# REPORT OF THE DIRECTOR OF MINES

Department of Mines,  
Hobart, 1 July 1978

THE MINISTER FOR MINES

SIR,

I present my report on the mining industry for the year ended 31 December 1977.

The value of metals and minerals produced from Tasmanian ores, based on average Australian metal prices was \$298 006 591. This represents an increase of over 30 per cent on the figure of \$228 466 800 for 1976.

In addition metallurgical production from ores and concentrates imported into the State was \$208 169 966 compared with \$169 915 967 for the previous year, an increase of over 22 per cent.

The production of cadmium, gold, lead, silver, tungstic oxide and zinc recorded increases but there was reduced output of copper, iron ore pellets, rutile, tin and zircon than in 1976.

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

|   | 1976            |              | 1977            |              |
|---|-----------------|--------------|-----------------|--------------|
|   | <i>Quantity</i> | <i>Value</i> | <i>Quantity</i> | <i>Value</i> |
|   |                 | \$           |                 | \$           |
| Copper (tonnes) ....                        | 24 566          | 28 507 660   | 21 089          | 24 801 960   |
| Gold (kilograms) ....                       | 1 314           | 4 246 862    | 1 616           | 6 976 251    |
| Iron ore pellets (tonnes) ....              | 2 221 805       | 40 616 387   | 2 119 430       | 44 807 178   |
| Lead (tonnes) ....                          | 12 070          | 4 415 664    | 16 027          | 8 523 445    |
| Silver (kilograms) ....                     | 54 421          | 6 341 438    | 65 830          | 8 904 050    |
| Tin (tonnes) ....                           | 6 853           | 46 834 677   | 6 634           | 69 105 352   |
| Tungsten as tungstic oxide<br>(tonnes) .... | 2 204           | 20 768 806   | 2 533           | 41 093 047   |
| Zinc (tonnes) ....                          | 49 697          | 34 683 132   | 63 070          | 42 745 279   |

## DEVELOPMENTS

Work has continued on the zinc-lead ore deposits at Que River approximately eighty kilometres south of Burnie. Surface facilities have now been established at the shaft site. These include a power station workshop and office buildings. By the end of the year the shaft had been sunk to a depth of 87 metres.

An acid leaching plant was commissioned by Renison Ltd in October. This has allowed a single grade of concentrate to be produced containing about 50 per cent tin. The company had investigated the possibility of building its own smelting plant with a view to improving tin recovery by smelting a lower grade concentrate than was acceptable by the Australian or Malaysian smelters. However, this plan is now in abeyance as new smelting contracts have been signed.

Financial assistance was provided to Northern Chromite Pty Ltd by the Department of Planning and Development to enable the company to overcome initial development problems.

Tasminex commenced construction of a small concentrating plant at their Kara mine near Hampshire.

Treatment of ore from an open pit started in August and by the end of the year production of scheelite concentrate had reached two tonnes per week.

Depressed prices for copper led to the introduction of a modified mining plan by the Mt Lyell Mining and Railway Co. Ltd in early January. This plan which was known as the Prince Lyell Plan Extended was designed to reduce the cost of copper production through a combination of higher productivity, improved operating efficiency, higher grades and better recovery. The plan provided for a 30 per cent reduction in the number of employees.

It was intended that operations would be confined to the Prince Lyell area. However, to ensure sufficient flexibility in mining operations the Cape Horn was kept in production.

The bulk mining approach was replaced by a more accurate definition of the stope boundaries. This avoided the processing of much waste and low grade material.

Milling operations were reduced to a five-day week but development was continued on the basis of an on-going mine.

In August the Federal and State Governments agreed to fund the company's cash shortfall with a dollar for dollar loan. This assistance commenced on 15 August and continued until 8 November. From the 9 November the Federal Government agreed to accept full responsibility for the cash shortfall and the State Government waived payment of pay-roll tax. This agreement is to operate until 30 June 1978 by which time the Industries Assistance Commission's report should be made public. The Commission held part of its enquiry in Queenstown on 5 and 6 September.

The new agreement includes provision for capital expenditure of \$632 000 necessary to maintain the current level of production at the mine.

Development of the main declines at the Bold Head and the Dolphin Mines on King Island continued during the year. However, much of the major capital expenditure was on the artificial scheelite plant. It is hoped this will be in operation early in 1978 and will provide a product acceptable to a greater number of users.

Production of zinc at Rosebery showed a marked improvement. The total of 63 070 tonnes was the highest figure recorded since 1972 being an increase of almost 27 per cent over the 1976 output of 49 697 tonnes. Prices have been affected by the large world stockpile of zinc and a drop in demand caused by the present financial climate.

The \$40 million dollar expansion at Temco's plant at Bell Bay was completed early in the year. This will enable production of ferro manganese and silico-manganese to be greatly increased and almost double the work force.

Construction of a new furnace at the calcium carbide works at Electrona has commenced. It is expected that commercial production will begin about mid 1978. Enquiries for both calcium carbide and carbon black have been received from potential customers throughout South-East Asia. The new furnace will aid more efficient production of both commodities.

The State Government provided a guarantee for the \$3 500 000 loan made by Barclays Bank International for the reconstruction work.

The possibility of an energy crisis and the likelihood of higher oil prices have caused several companies to consider the use of coal. Assistance of \$500 000 is to be provided by the State Government for re-equipment of the Duncan Colliery at Fingal and preliminary expenditure on the new Cornwall Mine at St Marys.

Potential markets are being examined including test work now proceeding at the Port Latta plant of Savage River Mines.

## PRODUCTION

### *Copper*

Despite introduction of the modified mining plan at Queenstown, the Mt Lyell Mining and Railway Co. Ltd continued to be the major producer of copper in the State. Production also came from the Cleveland Mine at Luina and the Electrolytic Zinc Co. of Australasia Ltd at Rosebery.

The Mount Lyell Company treated 1.5 million tonnes of ore for the production of 67 056 tonnes of copper concentrate containing 17 690 tonnes of copper, 2 621 kilograms of silver and 380 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 amounting to 86 672 tonnes were processed by North-West Acid Pty Ltd at Burnie for the manufacture of sulphuric acid.

The continued decline in copper prices caused the company to seek financial assistance from the State and the Commonwealth. An initial agreement provided for the State and the Commonwealth to each meet half of the cash shortfall from the 15 August to the 8 November 1977. This shortfall was the difference

between the cost of operations and the price Mt Lyell received for its copper concentrate. An Amending Agreement took effect from the 9 November 1977 and will apply until 30 June 1978. Under this agreement the Commonwealth meets the total cost of the subsidy less the pay-roll tax payable by the Company which the State Government has agreed to waive.

The Electrolytic Zinc Co. at Rosebery produced 2 966 tonnes of copper from the treatment of its zinc-lead ores and 433 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 2 119 430 tonnes compared with 2 221 805 tonnes for the previous year. Shipment of pellets to Japan from Port Latta continued under contract.

The holder of the exploration licence covering the Savage River ore deposits outside the leases being mined by Savage River Mines has continued with active investigations with the object of establishing a further industry.

### *Tin*

Total production was 6 633 tonnes. The principal producers were Renison Limited at Renison Bell, Cleveland Tin N.L. at Luina, Aberfoyle Tin Ltd at Rossarden and Minops Pty Ltd at the Razorback Mine, Dundas.

Production by Renison Ltd totalled 4 872 tonnes of tin from the mining of 588 724 tonnes of ore. The overall recovery of tin metal in concentrates was 66.81 per cent compared with 64.8 per cent last year.

A concentrator leaching plant to upgrade and remove impurities from the blend of high and low grade concentrates was commissioned in August. The company has decided to expand its tin concentrator facilities, and to defer plans for a early start on the construction of a tin smelter. Proved and probable ore reserves increased by 2 045 000 tonnes but the grade dropped to 1.19 per cent tin.

The company has maintained an active program of exploration outside its leases and is also engaged in a drilling program in the Blue Tier area near St Helens.

At the Cleveland Mine at Luina, production consisted of 1 465 tonnes of tin and 433 tonnes of copper from the treatment of 382 181 tonnes of ore. Indicated ore has been increased to 2.1 million tonnes averaging 0.71 per cent tin and 0.28 per cent copper. This adjustment was made following a reassessment of the 'B' South mineralisation. The type of ore mined at Cleveland makes a high metallurgical recovery difficult to achieve. However, there is hope for improvement in the recovery of tin achieved in recent years.

A considerable effort is being made at the present time both in metallurgical research and in plant improvement aimed at a better recovery.

At the Storeys Creek and Aberfoyle mines operated by Aberfoyle Tin Ltd 41 164 tonnes of ore were treated for the recovery of 127 tonnes of tin and 135 tonnes of wolfram concentrate. The company has shown renewed interest in the Lutwyche deposit which was first discovered in the late 1950's. Attention is being directed to the problem of de-watering the development area.

Minops Pty Ltd produced 64 tonnes of tin from the treatment of 42 623 tonnes of ore. However the company continued to experience problems of poor recovery of tin in its milling operations.

Ringarooma Mining Pty Ltd which ceased operations at Waratah at the end of 1976 had a final clean-up which yielded 13 tonnes of tin from the treatment of 22 251 tonnes of ore.

Tin mining continues to make an important contribution to the economy of north-eastern Tasmania. Five of the larger operators in this area produced a total of 52 tonnes of tin. The principal producer was again the B.M.I. Mining Co. with an output of 32 tonnes from its operations at the West Endurance Mine.

### *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. has been operating an open cut at their Kara mine and producing scheelite. There has also been development work at the All Nations Mine at Moina and exploration work at the River Forth.

The King Island Scheelite mine treated 345 199 tonnes of ore for the production of 2 379 tonnes of tungstic oxide. Ore from the Storeys Creek and Aberfoyle mines is treated at the Aberfoyle mill. This year 41 164 tonnes of ore were processed for the recovery of 135 tonnes of tungstic oxide and 127 tonnes of tin. In addition there was production of 18 tonnes of tungstic oxide from Tasminex scheelite mine at Kara.

Favourable prices have been maintained throughout the year. Development of the main declines at the King Island mines has continued and the capacity of the plant has been increased to 400 000 tonnes a year. Construction of the artificial scheelite plant is almost completed and it is hoped it will be in operation early in 1978.

### *Rutile-Zircon*

As mentioned in the report for 1976 the fall in the price of zircon limited the profitability of Kibuka Mines Pty Ltd's operations. The mine eventually closed in the March quarter. Since that time the company has continued to expand its interests in tin mining in Tasmania, principally in the north-east of the State.

### *Zinc*

The Electrolytic Zinc Company at Rosebery treated 659 364 tonnes of ore principally from the Rosebery mine, for the recovery of 141 628 tonnes of zinc concentrates, 23 596 tonnes of copper concentrates and 18 148 tonnes of lead concentrates. Total production consisted of 63 070 tonnes of zinc, 16 027 tonnes of lead, 2 966 tonnes of copper, 63 209 kilograms of silver and 1 235 kilograms of gold. Pyrite aggregating 233 146 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 1977 was 104 093 tonnes compared with 98 311 for the previous year.

## METAL PRICES

The following table shows the average Australian metal prices:—

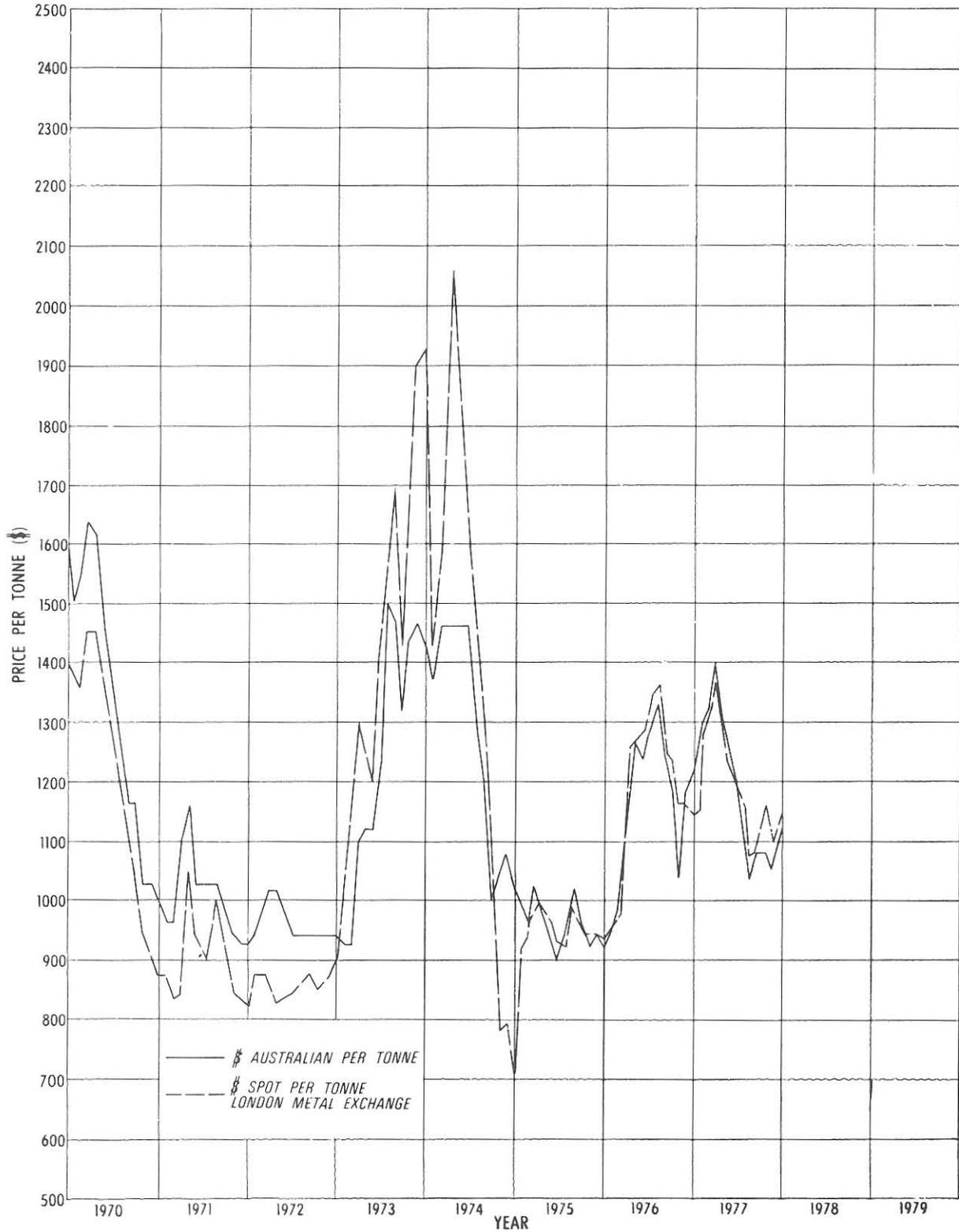
| <i>Commodity</i>    |      | <i>Unit</i> | 1975     | 1976     | 1977      |
|---------------------|------|-------------|----------|----------|-----------|
|                     |      |             | \$       | \$       | \$        |
| Copper              | .... | tonne       | 958.25   | 1 166.67 | 1 188.34  |
| Gold                | .... | kilogram    | 3 949.55 | 3 245.78 | 4 306.86  |
| Lead                | .... | tonne       | 317.50   | 364.17   | 532.09    |
| Rutile concentrates | .... | tonne       | 290.00   | 290.00   | 211.58    |
| Silver              | .... | kilogram    | 109.56   | 116.25   | 135.24    |
| Tungsten oxide      | .... | unit        | 68.47    | 93.81    | 158.79    |
| Tin                 | .... | tonne       | 5 475.92 | 6 778.84 | 10 400.00 |
| Zircon concentrates | .... | tonne       | 242.50   | 140.00   | 98.75     |
| Zinc                | .... | tonne       | 660.58   | 699.00   | 680.08    |

### *Copper*

The Australian price of copper commenced the year at \$1 220 per tonne. As in the previous twelve months the price improved steadily during January. It then remained constant at \$1 320 for the next five weeks. A temporary slump in the second week of March was followed by a rise to \$1 400 per tonne at the end of the month. This was the top price for the year but only lasted for a brief period. From the middle of April the price fell each month until by the end of August, it had reached \$1 060, its lowest price for the year.

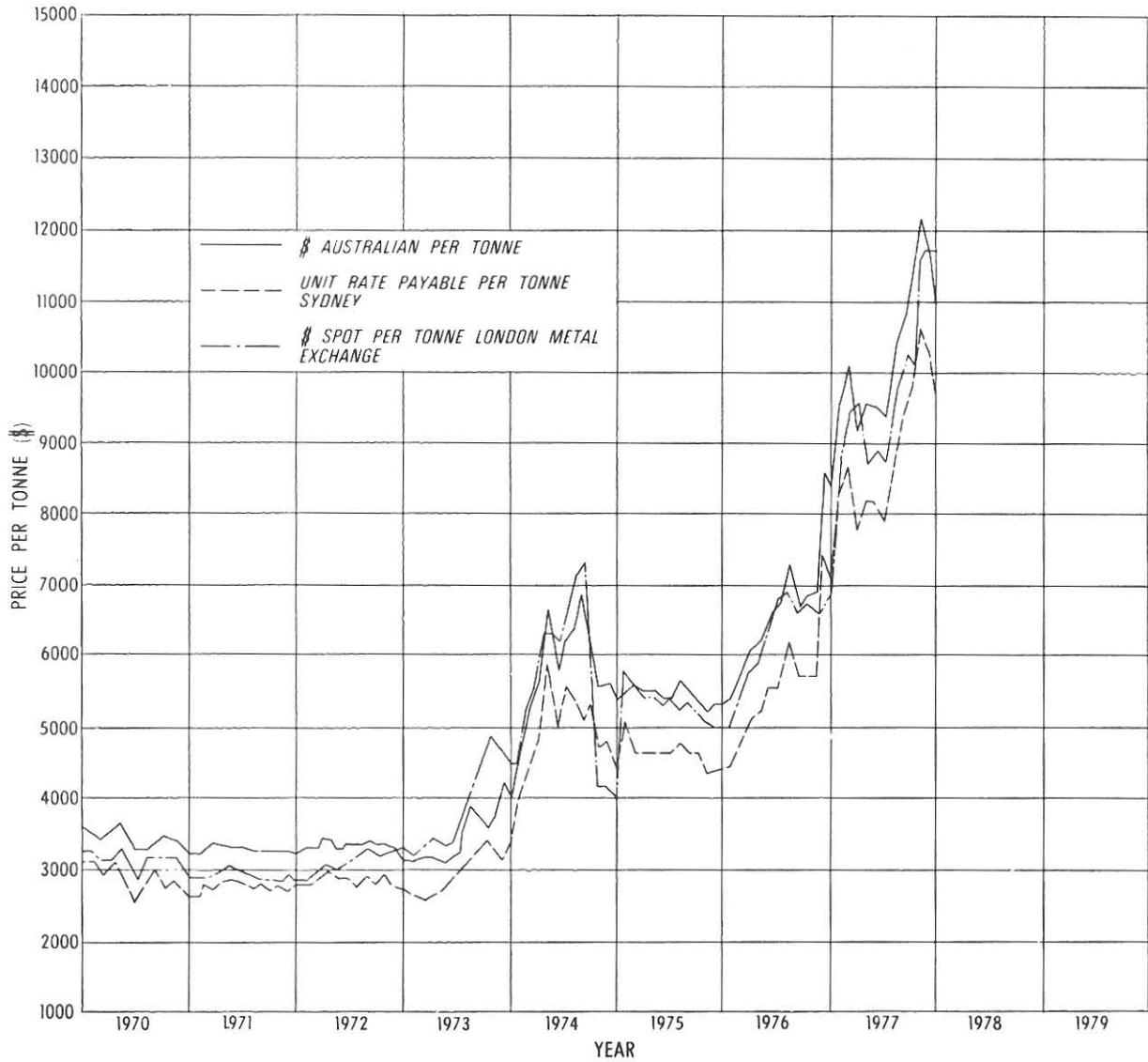
There was a slight improvement to \$1 080 in the second week of September. The price held at this figure until November when it again fell to \$1 060. There was no further alteration until mid-December when there was an increase to \$1 100. This was the quoted price at the end of the year. Fluctuation in prices having ranged from a high of \$1 400 to a low of \$1 060 finishing in the middle price bracket.

COPPER PRICES  
MONTHLY AVERAGES, 1970-1977



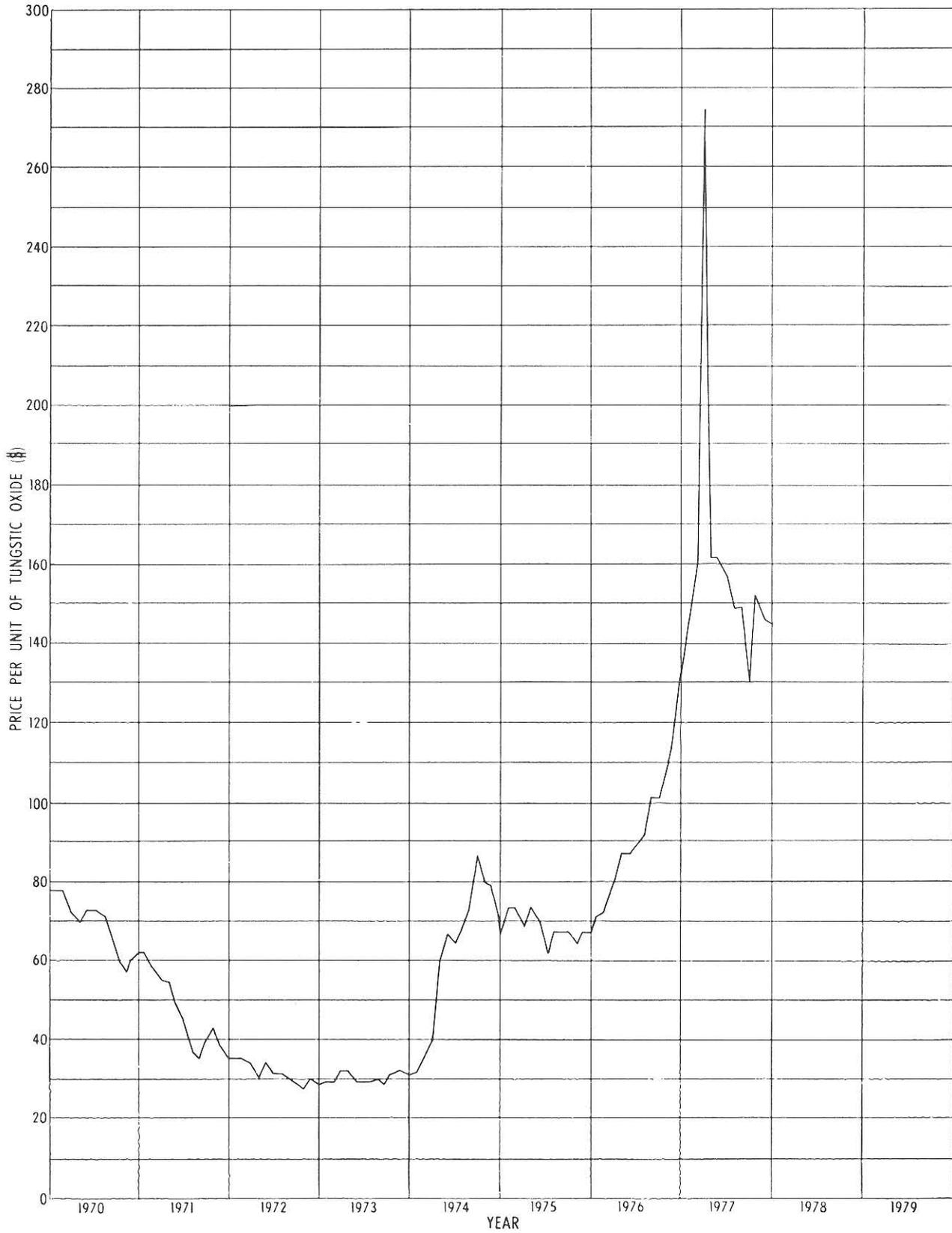
5 cm

TIN PRICES  
MONTHLY AVERAGES, 1970-1977



5 cm

TUNGSTEN PRICES  
MONTHLY AVERAGES, 1970-1977



5 cm

On the London Metal Exchange the price at the beginning of 1977 was £778 per tonne. This improved in the first three months of the year reaching a high of £900 per tonne in the third week of March. There was a bad slump in April when the gains in the previous quarter were almost all lost. The decline in price continued until the beginning of September when copper was quoted at £686 per tonne. This was an increase of £31 per tonne on the closing quote for August. The downward trend continued in October but this loss was recovered in the final months of the year. The London Metal Exchange's price was then £683. This was £44 above the bottom price of £639 quoted at the end of October.

The reduced demand for copper because of the decline in overall economic activity together with the massive stocks overhanging the world market have continued to depress prices during the year. Market forecasts do not suggest any improvement in the near future.

### *Tin*

There was a big jump in tin prices at the beginning of the year. The upward move in price started after Christmas 1976, extended into January and continued in February. It was accelerated by exhaustion of the buffer stocks held by the International Tin Council on 13 January. In February tin prices reached new highs on the four international markets. The prices being the highest since records were kept. There were moves in the United States Congress to release 30 000 long tons held in the national stockpile. At the end of September a bill was introduced calling for the sale of 30 000 tons of stockpile tin and the use of the resulting revenue to buy 250 000 tons of copper.

The London Metal Exchange price, which was £5 265 per tonne at the beginning of the year rose sharply to £5 735 by the end of January. There were upward and downward movements during the year but the price never fell below £5 635. In the last quarter prices again jumped and reached a high of £7 010 at the end of November.

The price quoted at the end of the year was £6 355.

The market is controlled by the Buffer Stock Manager's price ranges which were fixed on the 9 December 1976 as follows. The price at which he must buy is \$M1 075 Straits dollars per picul (1 picul = 133 lb). The price at which he must sell is \$M1 325. Under the price control scheme the Manager sells when the price is at or above the 'must sell' price. He may or may not sell in the middle range but when the price reaches the lower limit of \$M1 075 then he must buy. This has the effect of maintaining the price within reasonable limits.

Due to the continuing imbalance between production and consumption and the fact that the United States Government had not released any of its stockpile tin in August the market fell into the hands of the speculators.

At the International Tin Council's meeting in London in March it was announced that all members had decided to accept the Fifth International Tin Agreement. This agreement will not expire until 30 June 1981. At meetings held at the end of the year there were moves for higher prices for buffer stock operating levels.

### *Tungsten*

The price of tungstic oxide, which determines the value of scheelite from the King Island Scheelite mines and of wolfram from the Storeys Creek mines, continued to be quoted at very much higher prices than the previous year. The price on which the London Metal Exchange opened was £146 per unit and it closed on £169 per unit at the end of December. Prices in excess of £169 were maintained from February to almost the end of July. These rates compare most favourably with the prices for 1976 which ranged from £44 per unit to £146. A surprising feature was the fact that the higher prices continued despite lower demands for this product from Western countries. This appears to have been due to a heavier demand from Eastern Europe and sales restraint by both China and the U.S.A. It was not considered likely that prices would be maintained at the current high levels for such an extended period.

**Zinc**

The price of zinc on the London Metal Exchange declined steadily throughout the year. There was a short-lived recovery in the month of February and March when a top price of £436 was quoted. Following this the price continued to drop from £385 at the beginning of the year to £287 by the end of December.

During the same period the Australian domestic price fell from \$768 to \$568 per tonne. The lift in price resulting from devaluation of the Australian dollar on 29 November 1976 was lost in the subsequent revaluations combined with the fall in the price of zinc in May. Although consumption of zinc has increased there has been an even greater increase in world production. This has resulted in a massive build-up of stocks and a consequential downward pressure on prices.

In October, E.Z. Industries Ltd cut its European price for zinc from \$US700 a tonne to \$US630. The equivalent fall on the Australian market was \$671 a tonne to \$568. The present world zinc stockpile is calculated to be in excess of one million tonnes. This represents at least four month's consumption. Unless there is a worldwide economic recovery with an improved demand for zinc there is unlikely to be a sustained improvement in prices.

**EXPLORATION**

Exploration activity was stimulated by the continuing high level of tin prices. Concern at the possibility of a future energy crisis and increasing costs of fuel oil were factors which also encouraged the further investigation of the coal resources of the State. In addition local companies continued their exploration programs on their leases and adjoining areas to increase their knowledge of mineral reserves.

At the end of the year there were 83 exploration and special prospector's licences in force. The majority of these licences was in the western and north-western parts of the State. However, two large areas were also held on the east coast for coal exploration and further areas had been marked out in the north-east to look for tin prospects.

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 advice 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 Prospecting Licences during 1977 was as follows:—

|                |      |      |      |      |      |             |
|----------------|------|------|------|------|------|-------------|
|                |      |      |      |      |      | \$          |
| March 1977     | .... | .... | .... | .... | .... | 753 502     |
| June 1977      | .... | .... | .... | .... | .... | 834 265     |
| September 1977 | .... | .... | .... | .... | .... | 585 275     |
| December 1977  | .... | .... | .... | .... | .... | 815 183     |
|                |      |      |      |      |      | <hr/>       |
|                |      |      |      |      |      | \$2 988 225 |
|                |      |      |      |      |      | <hr/>       |

**COAL**

The Duncan mine at Fingal operated by the Cornwall Coal Company was the only producing coal mine. Output was increased by 9 477 tonnes to a total of 198 966 tonnes, compared with 189 489 tonnes in 1976.

Difficult mining conditions continued to affect production and hinder development work. In February, a serious accident occurred underground causing three fatalities and other serious injuries.

Upgrading of the Duncan mine made it necessary to curtail development of the proposed new mine at Cornwall. Anticipated increases in oil prices together with the threatened energy crisis have renewed interest in the coal deposits of the State. The company is at present awaiting the results of test work now proceeding at Savage River Mines Port Latta plant. If successful it could mean a significant increase in orders.

### OIL

The following licences continue to be held in Bass Strait:—

| <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            |

Permit T/4P was relinquished by the licence-holder towards the end of the year. The request to relinquish the forty-two blocks was referred to the Department of National Development for their approval. On completion of the necessary formalities for relinquishment it is proposed to invite applications for the surrendered blocks.

A short seismic survey was made in December of Permit T/3P and around the Pelican structure in Permits T/5P and T/6P using the seismic vessel M.V. 'Eugene McDermott II'.

### LEGISLATION

There were no amendments to the various Acts administered by the Department but the following regulations were made.

Mines Inspection Amendment Regulations 1977 (S.R. 1977 No. 12).

These amendments arose from the adoption by the Conference of Chief Inspectors of Mines of a new set of electrical rules. At the same time the opportunity was taken to make provisions covering the use of asbestos, particularly in asbestos-cement manufacture.

### MINING AND THE ENVIRONMENT

This title in itself summarizes the conflict between the demand for minerals and the desire to preserve the environment. Many fail to appreciate that the standard of living which we enjoy today is highly dependent on the use of mineral resources.

Until society gives more thought and devotes more research to the need for wise conservation of minerals once they are processed and made into consumer goods, the demand for minerals will continue to grow. However, mining of necessity, is an exploitation of the earth's resources. Even in the initial exploration of an area, certain disturbance of the environment is inevitable. This is the point at which the community must determine, as wisely as possible, how land is to be used.

It is only in recent years that attention has been given to the effect of mining operations on the environment. In the past miners were given rights which would not be acceptable by today's standards. A vastly different situation now exists. All applicants for exploration licences or mining leases are required to complete environmental impact studies. Copies of these studies are forwarded to the Department of the Environment for perusal and comment. Standard conditions have been incorporated in all lease and licence documents. These ensure that mining operations are conducted with the minimum disturbance of the environment. Special conditions are included, when warranted, to allow for unusual conditions in an area.

The problems associated with mining and the environment have been intensified because of the greatly increased quantities of mineral products our society demands. Economics require that mining is carried out on an ever increasing scale, moving greater tonnages, opening up larger areas and generating larger quantities of waste.

The mining industry is facing up to these new challenges of meeting the greater demands for its products and, at the same time, complying with the accepted environmental standards. However, I still feel there is too much emphasis on what has been done in the past and not enough recognition given to what the industry is now achieving.

### THE FUTURE OF MINING

The future of mining in Tasmania should be considered in the context of its contribution to the mining industry of Australia and that of the Western World. Tasmania is an important element in the mining industry of Australia particularly with respect to the production of such important strategic minerals as tin and tungsten of which we supply the bulk of Australia's production and make important contributions to the Western World.

Although the short term outlook for copper and zinc are not as healthy as we might wish it is apparent to the far-sighted members of the industry that these products will be required in increasing quantities in the decades ahead if we are to maintain our present standard of living.

The mining industry is structured to accept the long lead times necessary to discover and bring on stream new mineral deposits. The industry therefore takes a longer term view of prices and availability of products than other industries and plans exploration programs well in advance in order to anticipate shortages which can be perceived for the future.

Of importance and concern to the industry are political events which have occurred or which may occur in certain nations which produce significant quantities of certain of the Western World's strategic minerals. These facts are recognised by the industry; and exploration in more politically stable countries, or those countries considered not to be under threat of political instability, is being intensified in order to locate supplies of these commodities.

With these facts in mind the Tasmanian mining industry can look forward to a healthy and productive future. There can be no doubt that we will be seeking new commodities. At the same time we will be seeking additional reserves of those strategic metals such as tin and tungsten in order to meet the world shortfall in production. In the longer term we need to add to our known reserves of copper, lead and zinc. It is important to recognise that mineral exploration in Tasmania has not been seriously affected by the present economic downturn and that new developments in a variety of mineral commodities are likely in the not distant future.

Tasmania has such an important history of mining and mineral production together with the demonstrable ability to produce a wide range of mineral products that it is natural that the mineral exploration companies will turn to this State in the quest for new and diversified mineral deposits. This will bring with it a challenge which the State must meet.

The whole history of mineral exploration shows that we must continue to re-explore our known mineral bearing geological environments and at the same time seek to encourage exploration in new geological environments. In order to do this the industry needs access to areas for exploration and to alienate these areas by the creation of widespread State Reserves is not in the best interests of the State.

Exploration and development must be conducted with proper respect to the environment. The industry is aware of these requirements and will conduct its operations in a responsible and sensitive manner. I feel sure that the future of the mining industry in Tasmania is assured but at the same time repeat my previously expressed view that if we are to reap the rewards this industry can bring, then we must take steps to safeguard the rights of exploration and development of mineral deposits on the remaining areas of unalienated Crown Land within the State.

### AUSTRALIAN MINERALS AND ENERGY COUNCIL

Two meetings of the Council were held during the year, the first being in Canberra in March and the other in Adelaide in August.

A small Secretariat of three officers from the Department of National Resources has been established in Canberra. This Secretariat will be concerned with servicing meetings and the co-ordination of action flowing from Council and Advisory Committee decisions. The cost is to be borne by the Department of National Resources.

A high-level committee has been established to advise the Federal Government on energy matters and assist in the formulation and development of a national energy policy for Australia. This committee will be known as the National Energy Advisory Committee and will act as a link between the Federal Government and all bodies working in the energy field. These would include State Government Departments and Authorities, private companies, university research workers, learned societies and the like.

## REVENUE

### REVENUE COLLECTED DURING THE YEAR ENDED 31 DECEMBER 1977

| <i>Heads of Revenue</i>                       | \$        |
|---|-----------|
| Mines Department (Drilling) .... ..           | 105 490   |
| Rent and Fees of Auriferous and Mineral Lands | 150 686   |
| Royalty on Iron Ore Pellets .... ..           | 333 567   |
| Mineral Royalties .... ..                     | 1 627 969 |
| Survey Fees .... ..                           | 3 029     |
| Fees under the Dangerous Goods Act .... ..    | 42 372    |
|   | 2 263 113 |

### COMPARATIVE STATEMENT OF REVENUE FROM MINES BEING RENTS, FEES, STORAGE OR EXPLOSIVES, ETC., PAID TO THE TREASURY DURING THE YEARS 1972 TO 1977

| <i>Year</i>  | \$      | <i>Year</i>  | \$        |
|--------------|---------|--------------|-----------|
| 1972 .... .. | 563 816 | 1975 .... .. | 602 259   |
| 1973 .... .. | 641 380 | 1976 .... .. | 1 202 560 |
| 1974 .... .. | 649 029 | 1977 .... .. | 2 263 163 |

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

### *Royalties*

In accordance with the provisions of Mining Amendment Regulations proclaimed in 1975 the rate of royalty on sand and gravel is 30 cents per cubic metre and 2 per cent of the proceeds from the sale of mining products or 5 per cent of net profits, whichever is the less. The amount of royalty collected in 1977 was \$1 962 270 consisting of \$40 519 from the mining of gravel and sand and \$1 921 751 from mining operations. Three companies elected to pay royalty on profits and three chose to pay on proceeds.

## LEASES AND LICENCES

### NUMBER AND AREA OF NEW LEASES AND LICENCES ISSUED DURING THE YEAR ENDED 31 DECEMBER 1977

| <i>Leases and Licences</i> | <i>Number</i> | <i>Area (ha)</i> |
|----------------------------|---------------|------------------|
| Gold .... ..               | 1             | 21               |
| Minerals .... ..           | 12            | 157              |
| Rutile and zircon .... ..  | 4             | 36               |
| Sand .... ..               | 1             | 2                |
| Stone .... ..              | 15            | 750              |
| Tin .... ..                | 19            | 784              |
|                            | 52            | 1 750            |

## TOTAL NUMBER OF LEASES AND LICENCES IN FORCE ON 31 DECEMBER 1977

|                         | <i>Leases and Licences</i> | <i>Number</i> | <i>Area (ha)</i> | <i>Sluiceheads</i> |
|-------------------------|----------------------------|---------------|------------------|--------------------|
| Antimony                | ....                       | 2             | 65               | ....               |
| Bauxite                 | ....                       | 5             | 184              | ....               |
| Clay                    | ....                       | 28            | 1 144            | ....               |
| Coal                    | ....                       | 11            | 1 844            | ....               |
| Copper                  | ....                       | 4             | 4 991            | ....               |
| Dolomite                | ....                       | 4             | 129              | ....               |
| Gemstones               | ....                       | 3             | 22               | ....               |
| Gold                    | ....                       | 53            | 979              | ....               |
| Granite                 | ....                       | 3             | 110              | ....               |
| Iron ore                | ....                       | 18            | 2 251            | ....               |
| Kaolin                  | ....                       | 2             | 360              | ....               |
| Limestone               | ....                       | 10            | 636              | ....               |
| Marble                  | ....                       | 2             | 32               | ....               |
| Minerals                | ....                       | 57            | 7 651            | ....               |
| Osmiridium and chromite | ....                       | 7             | 398              | ....               |
| Peat                    | ....                       | 2             | 92               | ....               |
| Rutile                  | ....                       | 5             | 1 016            | ....               |
| Sand and gravel         | ....                       | 66            | 5 045            | ....               |
| Silica                  | ....                       | 17            | 1 338            | ....               |
| Slate                   | ....                       | 3             | 51               | ....               |
| Stone                   | ....                       | 92            | 5 085            | ....               |
| Silver lead and zinc    | ....                       | 15            | 756              | ....               |
| Tin                     | ....                       | 309           | 11 077           | ....               |
| Uranium                 | ....                       | 1             | 81               | ....               |
| Wolfram and tin         | ....                       | 19            | 2 817            | ....               |
| Water licences          | ....                       | 102           | ....             | 888                |
| Easements               | ....                       | 47            | 1 344            | ....               |
| TOTAL                   | ....                       | 887           | 49 498           | 888                |

NUMBER AND AREA OF LEASES AND LICENCES APPLIED FOR DURING THE YEAR ENDED  
31 DECEMBER 1977

|                     | <i>Leases and Licences</i> | <i>Number</i> | <i>Area (ha)</i> | <i>Sluiceheads</i> |
|---------------------|----------------------------|---------------|------------------|--------------------|
| Coal                | ....                       | 1             | 82               | ....               |
| Gold                | ....                       | 9             | 233              | ....               |
| Gravel and sand     | ....                       | 22            | 471              | ....               |
| Limestone           | ....                       | 1             | 150              | ....               |
| Minerals            | ....                       | 16            | 1 137            | ....               |
| Silica              | ....                       | 3             | 151              | ....               |
| Silver-lead         | ....                       | 4             | 128              | ....               |
| Stone               | ....                       | 7             | 902              | ....               |
| Tin                 | ....                       | 72            | 4 957            | ....               |
| Wolfram             | ....                       | 1             | 25               | ....               |
| Zinc                | ....                       | 1             | 100              | ....               |
| Water and easements | ....                       | 10            | 32               | 63                 |
| TOTAL               | ....                       | 147           | 8 368            | 63                 |

## TOTAL NUMBER OF ALL TYPES OF PROSPECTING RIGHTS HELD AS AT 31 DECEMBER 1977

| <i>Mining Tenement</i>   | <i>Number</i> | <i>Area</i>  |
|--|---------------|--|
| Permits to enter and search on private land, including owners' consents ....     | 3             | 3 219 ha   |
| Exploration licences ....  | 71            | 14 237 km <sup>2</sup>                             |
| Special Prospector's licences ....   | 7             | 298 km <sup>2</sup>                                |
| Miners Rights ....   | 119           | 29 ha  |
| Prospecting licences ....  | 204           | 5 100 ha   |
| Authorities to prospect under the Aid to Mining Act, 1927 ....                   | ....          | ....   |
| Permits to explore for petroleum under the petroleum (Submerged Lands) Act, 1967 | 4             | 256 graticuler blocks<br>(16 128 km <sup>2</sup> ) |

## MINES DRAFTING SECTION

*Senior Draftsman G. A. Thomas reports:—*

During 1977 six mineral topographic charts were produced. One of these (Tomahawk 2 South) is a scale 1:15 840 and the remainder (Sphinx Bluff, Fingal, Mangana, Mt Durham and St Marys) are all at scale 1:20 000.

Further charts at proof copy stage (Balfour, Mt Lyell and Cassiterite Creek) should be in use in the first half of 1978.

There are 460 working plans and transparencies in use which are kept up-to-date with all mining tenement information. Exempt areas, State forests, National Parks and other reserves affecting the Mining Act are recorded as daily procedure.

Dyelines for office use and sale to the public totalled 1 400.

Applications for mineral leases on Crown land totalled 108, with a further 29 applications over private lands. Numerous prospecting claims and miner's rights were recorded.

There were 104 survey diagrams drawn subject-to-survey, 27 diagrams prepared from surveys and 5 plans drawn. Transparencies from all diagrams were prepared for lease documentation.

Twenty-two exploration and special prospecting licences were recorded and described.

It is of interest to note, that the introduction of posted notice surveys has greatly simplified survey procedures, reduced costs, and provided adequate information for location on existing charts and in the preparation of new series maps.

## WARDENS' COURT

*B. D. Bellette v. R. F. and M. E. Buckingham.* Forfeiture of lease 852P/M. No decision has been given yet.

*L. W. Morris v. P. M. Voss.* Objection to granting of lease 24M/77. This was withdrawn by the plaintiff.

*J. B. Veasey v. Qintex Limited.* Application for forfeiture of lease 61M/74. This was withdrawn by the plaintiff.

*H. N. Thomas v. J. M. Dwyer.* Application for forfeiture of lease 100M/68. Warden of Mines, Launceston, dismissed the application.

## MINE MANAGERS' CERTIFICATES

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

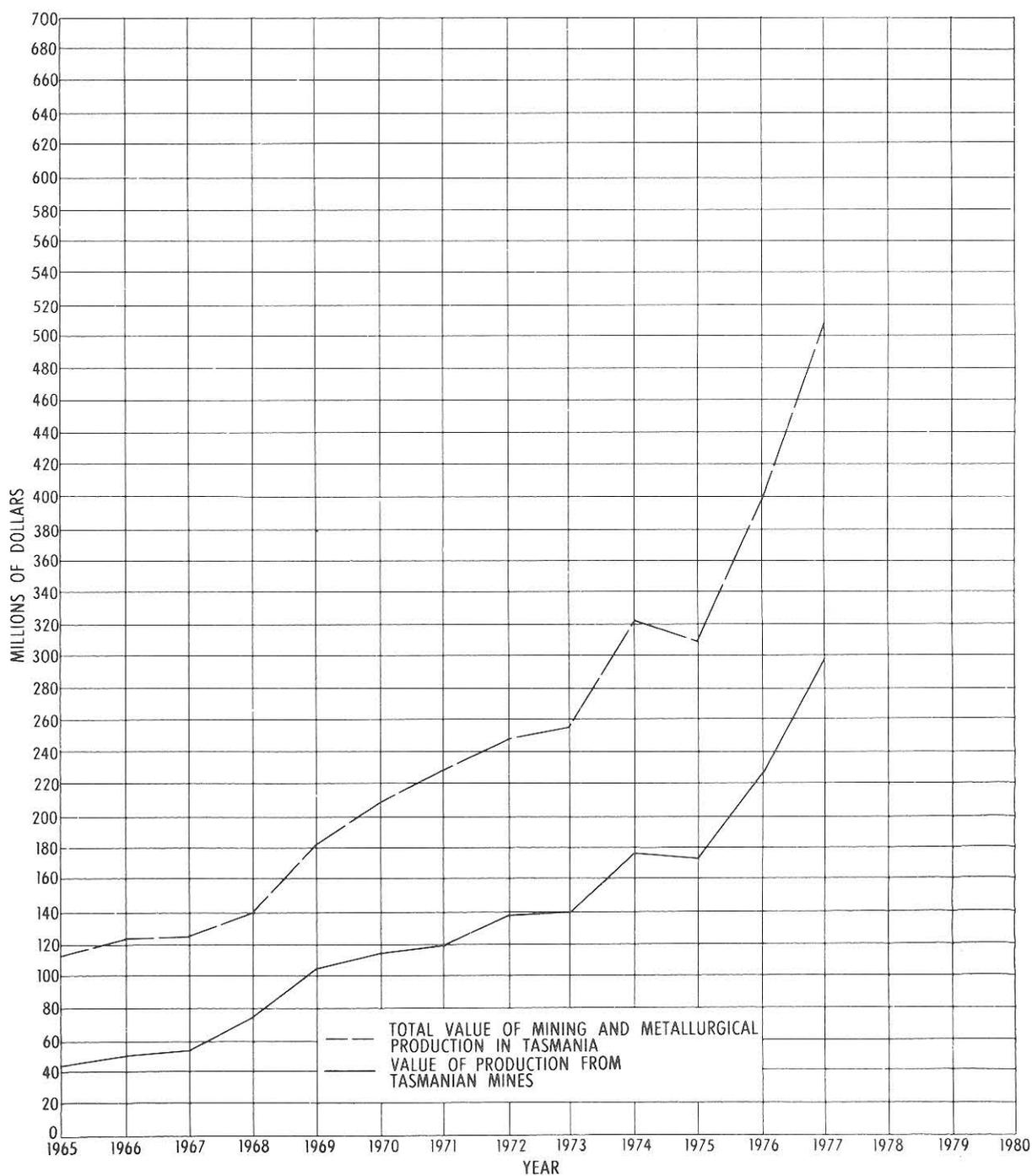
*By examination viva voce—*

| <i>Certificate No.</i> |                      |        |                       |
|------------------------|----------------------|--------|-----------------------|
| 248/77                 | Pieter Willem Greef. | 251/77 | Michael William Ayre. |
| 249/77                 | Ian Leslie Price.    | 252/77 | Peter Thomas Isles.   |
| 250/77                 | Warwick Lloyd Davis. |        |                       |

VALUE OF TASMANIAN MINERALS IN RECENT YEARS WITH AUSTRALIAN METAL PRICES

| Year |      | \$          | Year | \$          |
|------|------|-------------|------|-------------|
| 1968 | .... | 71 919 344  | 1973 | 139 557 052 |
| 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 |

VALUE OF MINING AND METALLURGICAL PRODUCTION, 1965-1977



**MINERAL PRODUCTION SINCE 1880**  
**QUANTITY AND VALUE OF PRODUCTION AS AT 31 DECEMBER 1977**

| <i>Mineral</i>   | <i>Unit</i>           | <i>Total<br/>Quantity</i> | <i>Value</i> |
|--|-----------------------|---------------------------|--------------|
|  |                       |                           | \$           |
| <b>METALLIC MINERALS</b>                                     |                       |                           |              |
| Antimony   | (tonne)               | 3                         | 2 034        |
| Bismuth  | (kilogram)            | 110 080                   | 503 385      |
| Cadmium  | (tonne)               | 2 793                     | 10 565 346   |
| Cobalt oxide   | (tonne)               | 127 23                    | 733 367      |
| 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                    | 1 155 746    |
| Copper (from 1919)   | (tonne)               | 725 337                   | 453 676 174  |
| Crocoite   | (specimens only)      | ....                      | 34 244       |
| Gold   | (kilogram)            | 98 833                    | 68 183 980   |
| Ilmenite   | (tonne)               | 558                       | 2 512        |
| Iron ore pellets   | (tonne)               | 20 235 208                | 277 395 010  |
| Iron oxide (including hematite, limonite and magnetite)      | (tonne)               | 238 830                   | 1 108 242    |
| Lead (from 1919)   | (tonne)               | 528 472                   | 93 704 368   |
| Manganese  | (tonne)               | 1                         | 6            |
| Manganese dioxide (from 1957)                                | (tonne)               | 11 061                    | 407 297      |
| Mercury  | (kilogram)            | 7 697                     | 90 251       |
| Monazite   | (tonne)               | 34                        | 1 214        |
| Nickel   | (tonne)               | 237                       | 81 036       |
| Osmiridium   | (kilogram)            | 881                       | 1 418 771    |
| Pyrite (to 1971)   | (tonne)               | 2 124 070                 | 10 239 957   |
| Pyrite (from 1972)   | (tonne)               | 1 342 707                 | ....         |
| Rutile   | (tonne)               | 1                         | 36           |
| Rutile (concentrates)  | (tonne)               | 40 027                    | 8 270 047    |
| Scheelite  | (tonne)               | 42 781                    | 149 041 839  |
| Silica for silicon alloy production                          | (tonne)               | 132 733                   | 22 102 424   |
| Silicon as silicon alloy                                     | (tonne)               | 229 997                   | 36 730 324   |
| Silver-lead ore to 1918 (now shown under Silver and Lead)    | (tonne)               | 1 101 295                 | 12 858 582   |
| Silver (from 1919)   | (kilogram)            | 2 081 523                 | 74 986 171   |
| Sulphur as sulphuric acid (from 1957)                        | (mono tonne)          | 3 568 986                 | 61 197 896   |
| Tin  | (tonne)               | 211 672                   | 371 692 916  |
| Wolfram  | (tonne)               | 21 554                    | 41 431 365   |
| Zinc   | (tonne)               | 1 393 267                 | 384 655 165  |
| Zinc sulphate (from 1957)                                    | (tonne)               | 3 251                     | 324 177      |
| Zircon (concentrates)  | (tonne)               | 39 001                    | 5 039 899    |
| <b>NON-METALLIC MINERALS</b>                                 |                       |                           |              |
| Asbestos   | (tonne)               | 4 044                     | 34 284       |
| Baryte   | (tonne)               | 2 240                     | 16 478       |
| Clay (from 1958)—  |                       |                           |              |
| Brick  | (metre <sup>3</sup> ) | 1 525 180                 | 4 066 864    |
| Tile   | (metre <sup>3</sup> ) | 63 814                    | 151 856      |
| Other  | (metre <sup>3</sup> ) | 503 897                   | 1 933 016    |
| Dolomite   | (tonne)               | 82 386                    | 581 618      |
| Graphite   | (tonne)               | 41                        | 214          |
| Kaolin   | (tonne)               | 135 491                   | 2 935 971    |
| Limestone—   |                       |                           |              |
| Agricultural and other                                       | (tonne)               | 1 189 327                 | 3 274 243    |
| Carbide  | (tonne)               | 979 801                   | 4 410 569    |
| Cement   | (tonne)               | 9 703 683                 | 16 879 066   |
| Chemical and metallurgical                                   | (tonne)               | 4 830 145                 | 8 472 561    |
| Ochre  | (tonne)               | 2 949                     | 23 483       |
| Pebbles (from 1957)  | (tonne)               | 20 931                    | 378 343      |
| Sand (moulding)  | (tonne)               | 864                       | 9 550        |
| Silica   | (tonne)               | 406 913                   | 1 074 737    |
| Talc   | (tonne)               | 338                       | 2 154        |

MINERAL PRODUCTION SINCE 1880—*cont.*  
 QUANTITY AND VALUE OF PRODUCTION AS AT 31 DECEMBER 1977—*cont.*

| <i>Mineral</i>                        | <i>Unit</i>           | <i>Total<br/>Quantity</i> | <i>Value</i>  |
|---------------------------------------|-----------------------|---------------------------|---------------|
|                                       |                       |                           | \$            |
| <b>FUEL MINERALS</b>                  |                       |                           |               |
| Coal ....                             | (tonne)               | 11 023 519                | 33 337 288    |
| Shale ....                            | (tonne)               | 42 239                    | 62 462        |
| Peat ....                             | (tonne)               | 5 946                     | 226 183       |
| <b>CONSTRUCTION MATERIALS</b>         |                       |                           |               |
| Building stone—                       |                       |                           |               |
| Freestone ....                        | (metre <sup>3</sup> ) | 13 971                    | 706 313       |
| Granite ....                          | (metre <sup>3</sup> ) | 4 642                     | 90 858        |
| Other ....                            | (metre <sup>3</sup> ) | 13 468                    | 117 926       |
| Crushed and broken stone (from 1958)— |                       |                           |               |
| Basalt ....                           | (metre <sup>3</sup> ) | 3 443 697                 | 17 154 373    |
| Dolerite ....                         | (metre <sup>3</sup> ) | 9 365 644                 | 43 572 386    |
| Limestone ....                        | (metre <sup>3</sup> ) | 370 201                   | 1 516 421     |
| Sandstone ....                        | (metre <sup>3</sup> ) | 36 275                    | 88 620        |
| Other ....                            | (metre <sup>3</sup> ) | 500 111                   | 13 100 790    |
| Gravel (from 1958) ....               | (metre <sup>3</sup> ) | 21 032 292                | 45 762 694    |
| Sand (from 1958) ....                 | (metre <sup>3</sup> ) | 2 455 300                 | 7 243 606     |
| Other road making material ....       | (metre <sup>3</sup> ) | 357 699                   | 6 919 273     |
|                                       |                       |                           | 2 309 653 507 |

## STATISTICS RELATING TO THE MINERAL INDUSTRY

| Mineral   | Year Ended 31 December<br>1976 |                      | Year Ended 31 December<br>1977 |                      |
|---|--------------------------------|----------------------|--------------------------------|----------------------|
|   | Total<br>Quantity              | Value \$A            | Total<br>Quantity              | Value \$A            |
| <b>METALLIC MINERALS</b>                              |                                |                      |                                |                      |
| Bismuth .... (kilogram)                               | ....                           | ....                 | ....                           | ....                 |
| Cadmium .... (tonne)                                  | 118                            | 554 810              | 149                            | 731 250              |
| Cobalt oxide .... (tonne)                             | 25-64                          | 185 496              | 21-33                          | 214 613              |
| Copper .... (tonne)                                   | 24 566                         | 28 507 660           | 21 089                         | 24 801 960           |
| Crocoite .... (specimens only)                        | ....                           | 5 057                | ....                           | 4 216                |
| Gold .... (kilogram)                                  | 1 314                          | 4 246 862            | 1 616                          | 6 976 251            |
| Iron ore pellets .... (tonne)                         | 2 221 805                      | 40 616 387           | 2 119 430                      | 44 807 178           |
| Iron oxide .... (tonne)                               | 13 529                         | 134 550              | 12 793                         | 102 200              |
| Lead .... (tonne)                                     | 12 070                         | 4 415 664            | 16 027                         | 8 523 445            |
| Manganese dioxide .... (tonne)                        | 232                            | 6 106                | 427                            | 12 104               |
| Mercury .... (kilogram)                               | 140                            | 363                  | 21                             | 107                  |
| Rutile (concentrates) .... (tonne)                    | 6 685                          | 1 938 650            | 770                            | 187 345              |
| Silicon for silicon alloy production .... (tonne)     | 16 837                         | 420 925              | 38 071                         | 951 775              |
| Silicon as silicon alloys .... (tonne)                | 23 162                         | 6 017 896            | 41 647                         | 11 666 003           |
| Silver .... (kilogram)                                | 54 421                         | 6 341 438            | 5 830                          | 8 904 050            |
| Sulphur—  |                                |                      |                                |                      |
| Pyrites .... (tonne)                                  | 202 370                        | ....                 | 225 270                        | ....                 |
| Sulphuric acid from pyrites .... (mono tonne)         | 299 293                        | 7 220 562            | 322 710                        | 7 754 789            |
| Sulphuric acid from zinc concentrates .. (mono tonne) | 91 182                         | 1 937 278            | 70 051                         | 1 582 435            |
| Tin .... (tonne)                                      | 6 853                          | 46 834 677           | 6 634                          | 69 105 352           |
| Tungsten as tungstic oxide .... (tonne)               | 2 204                          | 20 768 806           | 2 533                          | 41 093 047           |
| Zinc .... (tonne)                                     | 49 697                         | 34 683 132           | 63 070                         | 42 745 279           |
| Zircon (concentrates) .... (tonne)                    | 6 313                          | 883 820              | 923                            | 113 882              |
| <i>Value of Metallic Minerals ....</i>                | ....                           | <u>\$205 720 139</u> | ....                           | <u>\$270 277 281</u> |
| <b>NON-METALLIC MINERALS</b>                          |                                |                      |                                |                      |
| Clay—   |                                |                      |                                |                      |
| Brick .... (metre <sup>3</sup> )                      | 81 387                         | 244 161              | 71 513                         | 214 539              |
| Tile .... (metre <sup>3</sup> )                       | 3 513                          | 10 539               | 3 311                          | 13 244               |
| Other .... (metre <sup>3</sup> )                      | 16 026                         | 80 130               | 13 107                         | 57 127               |
| Dolomite .... (tonne)                                 | 10 335                         | 96 392               | 8 617                          | 97 489               |
| Kaolin .... (tonne)                                   | 9 527                          | 857 170              | 11 039                         | 1 028 645            |
| Limestone—  |                                |                      |                                |                      |
| Agricultural .... (tonne)                             | 37 191                         | 198 319              | 46 577                         | 282 674              |
| Carbide .... (tonne)                                  | 20 696                         | 310 440              | 20 308                         | 304 620              |
| Cement .... (tonne)                                   | 488 441                        | 1 465 323            | 490 514                        | 1 471 542            |
| Chemical and metallurgical .... (tonne)               | 75 154                         | 704 308              | 82 131                         | 812 499              |
| Other .... (tonne)                                    | 15 299                         | 58 797               | 18 975                         | 65 858               |
| Ochre .... (tonne)                                    | ....                           | ....                 | ....                           | ....                 |
| Pebbles .... (tonne)                                  | 1 716                          | 33 366               | 1 189                          | 30 399               |
| Silica .... (tonne)                                   | 20 479                         | 66 630               | 13 453                         | 81 930               |
| <i>Value of Non-Metallic Minerals ....</i>            | ....                           | <u>4 125 575</u>     | ....                           | <u>4 460 566</u>     |
| <b>FUEL MINERALS</b>                                  |                                |                      |                                |                      |
| Coal .... (tonne)                                     | 189 489                        | 1 689 878            | 198 966                        | 2 152 381            |
| Peat .... (tonne)                                     | 3 779                          | 58 974               | 330                            | 45 788               |
| <i>Value of Fuel Minerals ....</i>                    | ....                           | <u>1 748 852</u>     | ....                           | <u>2 198 169</u>     |

STATISTICS RELATING TO THE MINERAL INDUSTRY—*cont.*

| <i>Mineral</i>   | <i>Year Ended 31 December</i><br>1976 |                  | <i>Year Ended 31 December</i><br>1977 |                  |             |
|--|---------------------------------------|------------------|---------------------------------------|------------------|-------------|
|  | <i>Total</i><br><i>Quantity</i>       | <i>Value \$A</i> | <i>Total</i><br><i>Quantity</i>       | <i>Value \$A</i> |             |
| <b>CONSTRUCTION MATERIALS</b>                                  |                                       |                  |                                       |                  |             |
| Building stone—  |                                       |                  |                                       |                  |             |
| Freestone .....  | (metre <sup>3</sup> )                 | 920              | 97 334                                | 1 049            | 145 814     |
| Other .....  | (metre <sup>3</sup> )                 | 269              | 29 171                                | 223              | 10 150      |
| Crushed and broken stone—                                      |                                       |                  |                                       |                  |             |
| Basaly .....   | (metre <sup>3</sup> )                 | 317 398          | 2 616 506                             | 372 473          | 3 311 468   |
| Dolerite .....   | (metre <sup>3</sup> )                 | 467 988          | 3 741 657                             | 488 278          | 4 538 431   |
| Limestone .....  | (metre <sup>3</sup> )                 | 19 038           | 133 266                               | 14 389           | 100 723     |
| Sandstone .....  | (metre <sup>3</sup> )                 | ....             | ....                                  | ....             | ....        |
| Other .....  | (metre <sup>3</sup> )                 | 97 391           | 681 804                               | 402 720          | 2 819 115   |
| Gravel .....   | (metre <sup>3</sup> )                 | 1 408 346        | 7 074 740                             | 1 521 793        | 7 813 152   |
| Sand .....   | (metre <sup>3</sup> )                 | 292 409          | 1 554 236                             | 262 867          | 1 478 405   |
| Other road making material .....                               | (metre <sup>3</sup> )                 | 188 633          | 943 520                               | 169 066          | 853 317     |
| <i>Value of Construction Materials</i> .....                   |                                       | ....             | 16 872 234                            | ....             | 21 070 575  |
| <i>Total Value with Australian Metal Prices</i> .....          |                                       | ....             | 228 466 800                           | ....             | 298 006 591 |
| <b>METALLURGICAL PRODUCTION FROM OTHER THAN TASMANIAN ORES</b> |                                       |                  |                                       |                  |             |
| Alumina .....  | .....                                 | }                | 169 915 967                           | }                | 208 169 966 |
| Aluminium .....  | .....                                 |                  |                                       |                  |             |
| Aluminium hydrates .....                                       | .....                                 |                  |                                       |                  |             |
| Aluminium sulphates .....                                      | .....                                 |                  |                                       |                  |             |
| Cadmium .....  | .....                                 |                  |                                       |                  |             |
| Cobalt oxide .....   | .....                                 |                  |                                       |                  |             |
| Ferro-manganese .....  | .....                                 |                  |                                       |                  |             |
| Titanium dioxide .....   | .....                                 |                  |                                       |                  |             |
| Zinc .....   | .....                                 | ....             | ....                                  | ....             | ....        |
| <i>Value of Mining and Metallurgical Production</i> .....      |                                       | ....             | 398 382 767                           | ....             | 506 176 557 |
| Average number of Employees .....                              | .....                                 | 9 345            | 9 326                                 | .....            | .....       |

**AID TO MINING**

Two parties were granted financial assistance for the purchase of items of plant. This was required in connection with alluvial tin mining operations at Gladstone and Port Davey. The 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. Interest at 7½ per cent per annum is charged.

Repayments of royalty received from various assisted parties totalled \$32 906. This is credited to the Mining Trust Fund and used to assist other parties.

In October the Department was successful in selling a bulldozer which had been seized for a breach of the covenants of the mortgage deed. This helped to reduce the outstanding debt of a company which had ceased operations.

*Mt Bischoff Tin Mine*

The only existing Authority to Prospect (7AP/AM) was discontinued in June and made part of Exploration Licence 5/63 which is held by Comstaff Pty Ltd.

*Mining Plant*

The Cobra rock drill and a compressor were hired for tin mining operations in the North-East and a sludge pump was used on a wolfram prospect at Dove River. This plant is available for hire to small parties to test mineral prospects from shafts or other forms of underground mining.

STATEMENT OF RECEIPTS AND PAYMENTS OF THE MINING TRUST FUND FOR THE YEAR  
ENDED 31 DECEMBER 1977

| <i>Receipts</i>           | \$          | <i>Payments</i>         | \$          |
|---------------------------|-------------|-------------------------|-------------|
| Balance at 1 January 1977 | 3 573.92    | Assistance              | 15 400.00   |
| Repayment of loans        | 32 906.50   | Balance to next Account | 23 184.97   |
| Interest on loans         | 1 923.16    |                         |             |
| Tribute royalty           | ....        |                         |             |
| Hire of mining plant      | 181.39      |                         |             |
| Authorities to prospect   | ....        |                         |             |
|                           | \$38 584.97 |                         | \$38 584.97 |

STAFF

The following staff changes occurred during the year:—

| <i>Name</i>                              | <i>Position</i>                      | <i>Remarks</i> |          |
|--|--------------------------------------|----------------|----------|
| Andrews, T. M.                           | Technical Assistant                  | Appointed      | 10.3.77  |
| Booth, C. J.                             | Technical Assistant                  | Appointed      | 12.8.77  |
| Bourke, W. B.                            | Technical Assistant                  | Appointed      | 21.7.77  |
| Briggs, W. E. (Miss)                     | Clerk                                | Promoted       | 15.9.77  |
| Byrne, R.                                | Clerk                                | Resigned       | 3.6.77   |
| Castleden, R. H.                         | Geologist                            | Appointed      | 4.1.77   |
| Clark, T. L.                             | Inspector of Explosives              | Retired        | 23.11.77 |
| Cobern, G. S.                            | Clerk                                | Appointed      | 15.8.77  |
| Corby, I. E.                             | Administrative Officer               | Retired        | 30.5.77  |
| Coulston, J. S.                          | Chemist                              | Retired        | 18.1.77  |
| Egan, M. A. (Miss) (Karimalis,<br>(Mrs)) | Clerk                                | Appointed      | 12.10.77 |
| Everard, G. B.                           | Mineralogist and Petrol-<br>ogist    | Retired        | 16.4.77  |
| Forster, J. C. H.                        | Clerk                                | Retired        | 18.5.77  |
| Geeves, M.                               | Executive Officer                    | Appointed      | 10.11.77 |
| Hawkey, R. M. (Mrs)                      | Typist                               | Resigned       | 21.12.77 |
| Hodge, G. R.                             | Technical Assistant                  | Resigned       | 28.1.77  |
| Johnstone, P. M.                         | Deputy State Mining En-<br>gineer    | Retired        | 25.1.77  |
| Lethborg, J. R.                          | Chemist                              | Appointed      | 30.5.77  |
| Leyland, E. C.                           | Senior Mining Engineer               | Promoted       | 21.7.77  |
| Lockwood, M. J. (Mrs)                    | Typist                               | Appointed      | 8.9.77   |
| MacDonald, J. A. P.                      | Administrative Officer               | Promoted       | 4.8.77   |
| McManus, S. F.                           | Clerk                                | Appointed      | 7.7.77   |
| Munro, R. A. A.                          | Technical Assistant                  | Resigned       | 20.5.77  |
| Murchie, H.                              | Deputy State Mining En-<br>gineer    | Promoted       | 26.1.77  |
| Pickering, M. W.                         | Chemist                              | Appointed      | 4.7.77   |
| Saunders, C. D.                          | Technical Assistant                  | Resigned       | 29.4.77  |
| Singline, R. N.                          | Chemist                              | Resigned       | 1.2.77   |
| Smith, S. K. (Miss)                      | Records Clerk                        | Resigned       | 8.3.77   |
| Smythe, J.                               | Office Assistant                     | Appointed      | 26.9.77  |
| Stewart, N. C.                           | Clerk                                | Appointed      | 6.4.77   |
| Thomas, R. C.                            | Senior Mining Engineer               | Promoted       | 27.1.77  |
| Tomlin, M. (Mrs)                         | Records Clerk                        | Appointed      | 2.6.77   |
| Watson, G. W.                            | Clerk                                | Resigned       | 25.3.77  |
| West, A. K.                              | Laboratory Technician As-<br>sistant | Appointed      | 13.4.77  |
| Wichmann, P. M. (Mrs)                    | Records Clerk                        | Appointed      | 21.2.77  |

### OBITUARY

Ian Eugene Corby, DIP.COM., F.A.S.A., J.P.

During this year the department witnessed the departure of its longest serving officer.

Ian Corby joined the Mines Department as a Junior Clerk on 20 July 1934. During the next 43 years he occupied various positions in the Administration Branch. He was appointed Acting Accountant in May 1940 and Acting Chief Clerk and Accountant twelve months later. On different occasions he also acted as Secretary for Mines in the absence of the Head of the Department.

As officer in charge of the Administration Branch for over 30 years he helped guide the department through some of its busiest and most interesting periods. 'Corb' came from the mining area of the West Coast of Tasmania. His knowledge of the mining industry in this State was always freely available to all who sought his help.

He planned to retire in August 1977 but unfortunately this date had to be brought forward because of serious illness. He died on 24 June a few weeks after his retirement.

The department pays tribute to an exemplary officer, one whose contribution to the work of the department and to the State it would be difficult to gauge. His courteous and pleasant manner will long be remembered by all who had the pleasure of working with him.

### SCHOLARSHIPS

Miss C. A. Bacon (second year) and Mr J. L. Everard (third year) continued with their studies.

Mr C. R. Calver 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 attended the Symposium on Landslides and Mass Movements of the International Association of Engineering Geology in Prague, Czechoslovakia in September.

### CONCLUSION

Appreciation is recorded of the services rendered by officers of the Department, including officers of the Mines Draughting Section, Wardens of mines and Registrar of Mines in the several 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 |      |      | \$   |       |            |
|-----------|--------|------|------|-------|-----------|--|-------|--------|------|------|------|-------|------------|
| 1927-1972 | ....   | .... | .... | 2 067 | 6 708 816 |  | 1975  | ....   | .... | .... | .... | 155   | 784 240    |
| 1973      | ....   | .... | .... | 178   | 1 026 000 |  | 1976  | ....   | .... | .... | .... | 118   | 554 810    |
| 1974      | ....   | .... | .... | 126   | 760 230   |  | 1977  | ....   | .... | .... | .... | 149   | 731 250    |
|           |        |      |      |       |           |  | Total | ....   | .... | .... | .... | 2 793 | 10 565 346 |

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

### COBALT OXIDE

The source of the 21.325 tonnes of cobalt oxide of value \$214 613 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      | \$      |             |
| 1919-1972 | ....          | 3 832 | 4 120 145           | 23 965 | 18 839 863        | 501 143 | 208 564 870      | 71 274  | 76 221 115  | 600 214 | 307 745 993 |
| 1973      | ....          | 750   | 941 501             | 1 746  | 2 256 020         | ....    | ....             | 22 833  | 28 979 109  | 25 329  | 32 176 630  |
| 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  |
| TOTAL     | ....          | 6 729 | 7 515 219           | 36 115 | 33 103 033        | 501 143 | 208 564 870      | 181 350 | 204 493 052 | 725 337 | 453 676 174 |

#### The Mount Lyell Mining and Railway Company Limited, Queenstown

##### Mining—

##### Ore mined—

|                      | Tonnes  |
|----------------------|---------|
| Prince Lyell         | 945 665 |
| West Lyell stockpile | 31 237  |
| Crown Lyell          | 173 665 |
| Cape Horn            | 184 691 |
| Crown Three open cut | 67 940  |
| 'A' Lens             | 149 707 |

1 552 905

|   |            |
|---|------------|
| Copper concentrate produced containing— | 67 056     |
| Copper (tonnes)                         | 17 690     |
| Silver (grams)                          | 2 621 582  |
| Gold (grams)                            | 379 895    |
| Pyrite concentrate produced             | 93 224     |
| Total value of production               | 22 732 720 |

The average number of persons employed was 278 underground and 444 on the surface.

Metal production from the inception of the company to 31 December 1977 was:—

|        |      |      |      |      |      |                   |
|--------|------|------|------|------|------|-------------------|
| Copper | .... | .... | .... | .... | .... | 844 675 tonnes    |
| Silver | .... | .... | .... | .... | .... | 542 513 922 grams |
| Gold   | .... | .... | .... | .... | .... | 23 761 853 grams  |

E. C. Leyland, Mining Engineer, Burnie, reports:—

#### MINE DEVELOPMENT

| <i>Mine area</i> | <i>Driving</i> | <i>Rising</i> | <i>Diamond<br/>Drilling</i> |
|------------------|----------------|---------------|-----------------------------|
|                  | (m)            | (m)           | (m)                         |
| Prince Lyell     | 2 739          | 355           | 1 157                       |
| 'A' Lens         | 839            | 78            | ....                        |
| Main Decline     | 547            | 170           | ....                        |
| Cape Horn        | 298            | 104           | 370                         |
| Crown Lyell      | 143            | ....          | ....                        |
| Exploration      | ....           | ....          | 2 990                       |
|                  | 4 566          | 707           | 4 517                       |

#### *No. 1 Shaft, Prince Lyell*

The poor copper price, the necessity to conserve capital for development associated with current production, and the requirement to concentrate the reduced labour force, caused the cessation of all new capital work on this project. Some repair work to the damaged section of the shaft equipment (i.e. buntons and brattice wall) was carried out in the vicinity of 17 Level. In the future, if this shaft is to fulfil its planned role, then considerable expenditure will be necessary to stabilise ground problems in that section of the shaft between 15 and 18 levels.

Further continuous movement of ground in a section of the main haulage drive on 17 level, in a faulted zone, has resulted in self-caving blocking the access to the 'moled' section. Ventilation is being drawn from the shaft along 14 level and through a raise-bored rise to supplement the main air intake to the 92 m level, the present main production level. The shaft pumping system is being maintained and the water level in the shaft sump controlled.

#### *Prince Lyell Mine*

Development in this mine was concentrated upon the current '20' series stopes, namely the block between the 92 m level and the 195 m level. The Main Decline (5.5 m wide  $\times$  4.7 m high) driven at a grade of 1 in 9 has reached the north-western end of the Prince Lyell ore zone at the base of the '30' series stoping lift, about 20 m above 14 level. When the necessary modifications to the surface tip area at No. 4 crusher are completed, it is proposed to transport ore from the stoping blocks in large haulage units direct to the surface. Modifications, to the drilling system and draw-point arrangements for the '20' series stopes, have necessitated extra development for these blocks, with the result that stope development is only marginally ahead of production stopes. The pipelines, pumps, and agitation equipment have been installed in the main pump station at the 92 m level and the system is now in full operation.

Production from this mine failed to reach the budget target for tonnes, however the grade was higher than anticipated. Stope 27 and 26 were mined out and in August the crown pillar above stope 27 was blasted, thus, after the ore extraction, bring the 'cave' down to the 92 m level. Production from the '10' series stopes above the 195 m level was progressively decreased, with the only ore remaining to be won at the end of the year being contained in the old draw-point apexes. 'E' lens was completely mined above the 195 m with the grade of ore recovered being below budget.

Development of 'A' lens, the sub-level cave project above the 195 m level, and in the footwall of the main Prince lenses, was accelerated. The top level was completed, the slot cut through to the floor of the open-cut, and production was commenced. Since ore from this ore body can be tipped into a pass and loaded on to a train at rail level, any production from this lens will ease the load on the Prince decline truck haulage system. The grade of the ore won to date has maintained ore reserve grade. Development of the Intermediate lens, close to 'A' lens, is behind schedule and, since both lenses share a common access, it is essential that the development and drilling of each level of the Intermediate lens precedes the retreat of the 'A' lens 'cave' on that level to its hanging wall limit.

#### *Cape Horn Mine*

Development of the 170 m level was curtailed for the majority of the year. In September development of the Northern stopes on this level recommenced.

Production exceeded budget targets in tonnes and grade. Remnant ore from the open stope block (223-323 m) was extracted from pillar 1-2 to complete the mining of all recoverable ore above the 223 m level. On the 170 m level extraction from stope 9 was completed and the slot for stope 8 was cut. In November the crown pillar above stope 9 and below stope 5 was fired bringing the 'cave' fill to the 170 m level after the pillar ore had been loaded. Production was curtailed for two weeks to handle the 'mud-slurry' run which followed the blast. Ore from the 170 m level is trucked up the decline to the ore pass on the 223 m level and then loaded on to the 195 m rail haulage system. A small labour force has been allocated to this mine and in 1978 it is planned that Prince Lyell Mine and Cape Horn Mine will be the two producing mines in the group.

#### *Crown Mine*

Little development was carried out during the year; the foot-wall draw-points on No. 4 level were completed. Production of the remnant pillar ore above 4 level was carried out using two yard diesel L.H.D. vehicles. As the weather improved later in the year and the decision had been made not to drill any more of the stope pillars, contractors extracted a small tonnage of high grade ore from the open cut above stope pillars 2-3 and 3-4.

### GENERAL

Underground mines provided over 90 per cent of the ore treated for the year. The recovered grade of this production showed a considerable improvement on the previous year's figure, being 80 per cent of the ore reserve grade. Ore production and treatment were planned to have been at a rate of 120 000 tonnes per four-weekly period, the actual production failed to achieve this target by 1 000 tonnes per period. The truck haulage of the lower Prince ore achieved the planned capacity towards the end of the year and, indeed, indicated that greater tonnages were possible, if the loading cycle could be improved. Half the slot and stoping holes of stope 25 were bored out using a down-the-hole hammer drilling 165 mm holes. It is expected that this type of drilling will be extended and may become the standard in 1978. The continued use of molanite has permitted greater flexibility in the charging up of major blasts by allowing holes to be partially charged, without priming, for some days before initiation. Ventilation throughout the mines has been upgraded with beneficial effects to all personnel and mobile equipment.

Following the Company's decision to defer the Prince Lyell shaft development, the ore reserve statement was amended accordingly. This has resulted in a major reduction in proved ore and an equivalent increase in probable ore. The proved ore category now, only includes ore for which there are immediate plans for mining.

## ORE RESERVES AT 30 JUNE 1977

| <i>Mine</i>                           | <i>Tonnes</i> | <i>Copper</i> | <i>Silver</i> | <i>Gold</i> |
|---------------------------------------|---------------|---------------|---------------|-------------|
|                                       |               | (%)           | (g/t)         | (g/t)       |
| PROVED ORE—                           |               |               |               |             |
| Prince Lyell ....                     | 4 885 000     | 1.45          | 3.00          | 0.40        |
| Cape Horn ....                        | 422 000       | 1.73          | 4.28          | 1.22        |
| 'A' Lens ....                         | 330 000       | 1.63          | 1.58          | 0.33        |
| Intermediate Lens ....                | 148 000       | 1.19          | 1.53          | 0.24        |
| Crown Three ....                      | 40 000        | 1.59          | 3.98          | 0.37        |
| TOTAL ....                            | 5 825 000     | 1.47          | 2.98          | 0.45        |
| PROBABLE ORE—                         |               |               |               |             |
| Prince Lyell ....                     | 20 284 000    | 1.45          | 3.00          | 0.40        |
| Cape Horn ....                        | 1 380 000     | 1.87          | 3.06          | 0.31        |
| 'A' Lens ....                         | 2 855 000     | 1.33          | 1.53          | 0.24        |
| Royal Tharsis ....                    | 1 878 000     | 1.46          | 1.53          | 0.24        |
| TOTAL ....                            | 26 397 000    | 1.46          | 2.74          | 0.37        |
| POSSIBLE ORE ( <i>not reserves</i> )— |               |               |               |             |
| Twelve West ....                      | 29 000        | 9.50          | 30.61         | 0.15        |
| Cape Horn ....                        | 1 128 000     | 1.55          | 3.06          | 0.31        |
| 'A' Lens ....                         | 1 418 000     | 1.25          | 1.53          | 0.24        |
| Prince Lyell ....                     | 3 000 000     | 1.30          | 3.00          | 0.40        |
| Crown Three ....                      | 1 295 000     | 1.73          | 3.98          | 0.37        |
| TOTAL ....                            | 6 870 000     | 1.45          | 3.00          | 0.34        |

## MILLING

Recovery of copper improved over the latter half of the year to a high of 92 per cent. Modifications to milling practice which are considered to have achieved this result are—

- (a) The addition of 15-25 per cent water to the grinding circuits. This resulted in higher mill circulating loads and a finer product to flotation.
- (b) Limited reclamation of the flotation circuit spillage, limiting tailings salting.
- (c) The reduction of the throughput from 270 to 260 tonnes per hour to conform with the mine's five day week.

| <i>Concentrate</i> | <i>Copper</i> | <i>Sulphur</i> |
|--------------------|---------------|----------------|
|                    | (%)           | (%)            |
| Copper ....        | 26.38         | ....           |
| Pyrite ....        | 0.24          | 49.20          |

## RESEARCH PROJECTS

*Low Grade Re grind*

The screen oversize from the scalping of the coarse fractions of the copper tailings was reground in one of the secondary ball mills and returned to the scavenger flotation circuit. Simulation by computer of the results obtained in the tests should indicate potential economic benefits.

*Gold Recovery*

The gold recovery figure has been improved, by ensuring that the fine gold entrapped in the wood pulp and plastic remnants in the flotation cell launders, was returned to the circuit.

*Slime Pyrite*

The advent of the five day milling week, for the reduced mine output, precluded the fulfilment of pyrite contractual obligations. An investigation commenced into the recovery of pyrite from the slime fraction of copper tailings. Results did not prove economic.

The sampling and assay of lease streams for a number of elements was continued with the results being forwarded to the Department of the Environment. The rehabilitation of disused refuse dumps was commenced.

## SAFETY

|                      |      |      |      |      |      |           |
|----------------------|------|------|------|------|------|-----------|
| Man hours exposure   | .... | .... | .... | .... | .... | 1 356 986 |
| Frequency rate       | .... | .... | .... | .... | .... | 94.3      |
| Severity rate        | .... | .... | .... | .... | .... | 1 975.7   |
| Mean duration (days) | .... | .... | .... | .... | .... | 15.0      |

These 1977 statistics show little variation from the figures for 1976 which, in view of the reduced scale of operation and the decrease in manpower is disappointing. Of the 128 lost time accidents 11 were designated as serious and 117 as minor. It is a pleasant duty to report that the dedication and training of the rescue squads has been well rewarded. In two separate accidents potentially fatal injuries to two victims resulted in merely serious injuries due to the prompt efficient, and humane care given by members of the squads.

## CAPITAL EXPENDITURE

No major items of equipment were purchased during the year.

**Cleveland Tin N.L., Luina**

This company, reviewed under Tin, produced 2 151 tonnes of copper concentrates containing 433 tonnes of copper valued at \$519 836.

**Electrolytic Zinc Company of Australasia Limited, Rosebery**

This company, reviewed under Zinc, produced 23 596 tonnes of copper concentrates containing 2 709 tonnes of copper valued at \$3 509 792.

## GOLD

## QUANTITY AND VALUE OF PRODUCTION

| <i>Year</i>   | <i>Kilograms</i> | <i>Value</i> | <i>Year</i> | <i>Kilograms</i> | <i>Value</i> |
|---------------|------------------|--------------|-------------|------------------|--------------|
|               |                  | \$           |             |                  | \$           |
| Prior to 1973 | 91 746           | 43 151 669   | 1975        | ....             | 1 453        |
| 1973          | ....             | 2 987 891    | 1976        | ....             | 1 314        |
| 1974          | ....             | 5 118 359    | 1977        | ....             | 1 616        |
|               |                  |              | TOTAL       | ....             | 98 833       |
|               |                  |              |             |                  | 68 193 980   |

**The Mount Lyell Mining and Railway Company Limited, Queenstown**

This company recovered 380 kilograms, valued at \$1 647 942 from sludge in the electrolytic copper refinery.

**Electrolytic Zinc Company of Australasia Limited, Rosebery**

Concentrates produced by this company contained 1 235 kilograms, valued at \$5 324 470.

**BMI Mining Pty Ltd, South Mount Cameron**

Concentrates produced by this company contained one kilogram of gold valued at \$3 839.

## IRON ORE (PELLETS)

## Savage River Mines, Savage River and Port Latta

| Savage River—                       |         | <i>Tonnes</i> |
|-------------------------------------|---------|---------------|
| Overburden removed                  | .... .. | 9 360 462     |
| Ore mined                           | .... .. | 5 049 311     |
| Concentrate to Port Latta (dry)     | .... .. | 2 045 551     |
| Port Latta—                         |         |               |
| Pellets produced (dry)              | .... .. | 2 119 430     |
| Value of Production                 | .... .. | \$44 807 178  |
| Average number of persons employed— |         |               |
| Mining                              | .... .. | 156           |
| Other                               | .... .. | 533           |
| TOTAL                               |         | 689           |

R. C. Thomas, Mining Engineer, Hobart reports that at Savage River the pit bottom had reached 16 level at the end of the year from the northern access road.

Work continued on improving the pit stability by drilling drain holes down to 10 level and placing rock bolts down to 8 level on the east face of the pit. On the western face of the pit 1 275 800 tonnes of overburden was removed from the western knob as the first phase of the bank stability program and this work was completed in June 1977.

In the concentrator the grind control study was completed, a new ring gear installed on No. 1 autogenous mill together with the replacement of the external stiffener ring on the trannion. The shell of No. 2 ball mill was also repaired. The main tailings dam wall was developed to give a  $\frac{1}{2}^\circ$  slope over the length of the wall and so allow the removal of the booster pump to a higher location.

At Port Latta, thirty shipments of pellets averaging 72 478 tonnes per vessel, and six oil tankers, discharging 38 670 tonnes of fuel oil were handled through the port during the year. In the plant, testing of Fingal coal as a partial substitute for fuel oil in the furnances was completed. Modifications to control method and parameters were introduced to reduce the usage of bentonite.

## CAPITAL EXPENDITURE

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

Rebuilding of a 33/11 haulage truck which was extensively damaged by fire in 1976 and the purchase of another 33/11 haulage truck.

Purchase and installation of prototype main air blower oil bath filters and Kelly and Lewis G.I.W cyclone pumps.

Purchase of a spare raw water pump motor and a replacement plant air compressor.

Installation of a concentrate de-aeration system and associated sodium sulphite addition equipment to minimise internal corrosion of the pipeline.

Provision of adequate locker facilities.

Continuation of diamond drilling for bank stability investigation and ore reserve determination.

Removal of overburden from the western knob.

Contract painting of the offshore facility as Phase II of a three-phase corrosion rectification program.

Modification of No. 1 furnace to accept coal as a partial fuel substitute for extended testing.

## EXPLORATION AND RESERVES

There has been no exploration during the year. Re-estimation of ore reserves has confirmed reserves close to original estimates.

## ACCIDENTS

One hundred and nineteen reportable accidents occurred during the year, thirty three of these at Port Latta, an increase of 43 per cent, and eighty-six at Savage River, an increase of 84 per cent.

|              | <i>Accidents</i> | <i>Days Lost</i> | <i>Man Hours Exposure</i> | <i>Frequency Rate</i> | <i>Incidence Rate</i> | <i>Mean Duration</i> |
|--------------|------------------|------------------|---------------------------|-----------------------|-----------------------|----------------------|
| Savage River | 86               | 816              | 834 649                   | 103                   | 0.206                 | 9.49                 |
| Port Latta   | 33               | 409              | 491 420                   | 67                    | 0.127                 | 12.39                |
| Combined     | 119              | 1 225            | 1 326 069                 | 90                    | 0.176                 | 10.29                |

## 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 1972 | 178 511       | 623 137      | 1975        | 10 699        | 92 769       |
| 1973          | 12 293        | 82 394       | 1976        | 13 529        | 134 550      |
| 1974          | 11 005        | 73 192       | 1977        | 12 793        | 102 200      |
|               |               |              | TOTAL       | 238 830       | \$1 108 242  |

**Iron Cliffs Mine, Penguin**

A. Pearson continued to work the secondary ore at the Iron Cliffs mine and supplied a cement works with 12 793 tonnes of hematite valued at \$102 200. Employment averaged six men.

## LEAD

## QUANTITY AND VALUE OF PRODUCTION

| <i>Year</i>  | <i>Tonnes</i> | <i>Value</i> | <i>Year</i> | <i>Tonnes</i> | <i>Value</i> |
|--------------|---------------|--------------|-------------|---------------|--------------|
|              |               | \$           |             |               | \$           |
| 1919 to 1972 | 461 996       | 68 100 995   | 1975        | 11 380        | 3 524 700    |
| 1973         | 14 362        | 4 091 160    | 1976        | 12 070        | 4 415 664    |
| 1974         | 12 637        | 5 048 404    | 1977        | 16 027        | 8 523 445    |
|              |               |              | TOTAL       | 528 472       | \$93 704 368 |

**Electrolytic Zinc Company of Australasia Limited, Rosebery**

This company, reviewed under zinc, produced 18 148 tonnes of lead concentrate and the total content of lead in the lead, zinc and copper concentrates was 16 027 tonnes valued at \$8 523 445.

**South Comet Mine, Dundas**

No production was recorded from this mine. The partners are still considering installing their own treatment plant, and have made some purchases of equipment to achieve this aim.

## SPECIMENS OF LEAD MINERALS

**Adelaide Mine, Dundas**

Production of mineral samples of crocoite for the year realised \$4 767. Development was confined to 10 m of rising and 10 m of driving. The original rise, which was covered over during the open-cut operations of the previous lease-holder, has been re-opened, a sub-level drive advanced and two break-throughs made to the stope from this drive, in order to dispose of mullock. Some further stoping was undertaken in the southern stope for lead and cerussite samples. The average employment was two men.

**Red Lead P. A., Dundas**

Production of mineral samples realised \$1 449. No underground development was undertaken. Stopping in the top sub-level yielded good colour specimens but poor bonding of the crystals to the host rock resulted in low yields at the washing and clean-up stage. In an attempt to trace the lode-gossan outcrop a back-hoe was used to cut six costeans of 3×3 metres. These trenches were progressively backfilled after sampling. The access road to the mine required considerable work to clear minor slips and to drain several sections, about fifty cubic metres of metal were spread on soft sections of the access road.

**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 427 tonnes was valued at \$12 104.

**MERCURY****QUANTITY AND VALUE OF PRODUCTION**

| <i>Year</i>  | <i>Kilograms</i> | <i>Value</i> | <i>Year</i> | <i>Kilograms</i> | <i>Value</i> |
|--------------|------------------|--------------|-------------|------------------|--------------|
|              |                  | \$           |             |                  | \$           |
| 1967 to 1972 | 6 711            | 84 394       | 1975        | 210              | 1 200        |
| 1973         | 544              | 3 265        | 1976        | 140              | 363          |
| 1974         | 71               | 922          | 1977        | 21               | 107          |
|              |                  |              | TOTAL       | 7 697            | 90 251       |

This is recovered at the Risdon Works of the Electrolytic Zinc Company of Australasia Limited from the roaster gases in the calcining of zinc concentrates. The ore containing the mercury is mined at the company's mine on the West Coast. Recovery was first made early in 1967. Production for the year was 21 kilograms, valued at \$107.

**OSMIRIDIUM**

Total production to date is 881 kilograms, valued at \$1 418 771.

**PYRITE****QUANTITY PRODUCED**

| <i>Year</i>  | <i>Tonnes</i> | <i>Year</i> | <i>Tonnes</i> |
|--------------|---------------|-------------|---------------|
| 1915 to 1972 | 2 345 665     | 1975        | 224 423       |
| 1973         | 244 798       | 1976        | 202 370       |
| 1974         | 224 251       | 1977        | 225 270       |
|              |               | TOTAL       | 3 466 777     |

Since 1969 pyrite concentrates produced by the Mount Lyell Mining and Railway Company Limited, Queenstown and the Electrolytic Zinc Company of Australasia have been sent to the North-West Acid Pty Ltd treatment plant at Wivenhoe.

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

**SILICA FOR SILICON ALLOY PRODUCTION****The Broken Hill Proprietary Company Limited, Beaconsfield**

This company mined and supplied to the Tasmanian Electro-Metallurgical Company 38 071 tonnes of silica valued at \$951 775. A local contracting firm carried out the work.

## SILICON

## Tasmanian Electro-Metallurgical Company Proprietary Limited, Bell Bay

In the production of silicon as silico-manganese this company smelted 42 852 tonnes of local Beaconsfield quartzite combined with slag from ferro-manganese production for a yield of 41 647 tonnes of silico-manganese valued at \$11 666 003. The average number of persons employed is shown under Ferro-Manganese.

## SILVER

Silver is nowhere mined for itself but is a valuable by-product from copper, lead and zinc ores.

## PRODUCERS, SOURCE, QUANTITY AND VALUE OF PRODUCTION, 1977

| <i>Producer</i>           | <i>Source</i>                      | <i>Kilograms</i> | <i>\$</i> |
|---------------------------|------------------------------------|------------------|-----------|
| EZ Co. of A/asia Ltd .... | Copper, lead and zinc concentrates | 63 209           | 8 549 536 |
| Mt Lyell M. & R. Co. Ltd  | Refinery sludge                    | 2 621            | 345 514   |

## SOURCE, QUANTITY AND VALUE OF PRODUCTION

| <i>Year</i>    | <i>From tin and other ores</i> |           | <i>From silver-lead ore</i> |           | <i>From copper ore</i> |           | <i>From lead-zinc ore</i> |            | <i>Total</i>     |            |
|----------------|--------------------------------|-----------|-----------------------------|-----------|------------------------|-----------|---------------------------|------------|------------------|------------|
|                | <i>Kilograms</i>               | <i>\$</i> | <i>Kilograms</i>            | <i>\$</i> | <i>Kilograms</i>       | <i>\$</i> | <i>Kilograms</i>          | <i>\$</i>  | <i>Kilograms</i> | <i>\$</i>  |
| 1919-1972 .... | 6 360                          | 225 486   | 550 239                     | 5 749 634 | 137 220                | 2 501 149 | 1 089 427                 | 34 430 975 | 1 783 246        | 42 907 244 |
| 1973 ....      | 663                            | 38 686    | ....                        | ....      | 3 944                  | 231 726   | 55 473                    | 3 283 151  | 60 080           | 3 553 563  |
| 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  | 56 271           | 6 172 855  |
| 1976 ....      | 282                            | 32 783    | ....                        | ....      | 3 916                  | 455 822   | 50 087                    | 5 822 916  | 54 285           | 6 311 521  |
| 1977 ....      | 373                            | 50 461    | ....                        | ....      | 2 621                  | 354 514   | 63 209                    | 8 549 536  | 66 203           | 8 954 511  |
| TOTAL ....     | 8 541                          | 461 389   | 550 248                     | 5 750 679 | 157 320                | 4 624 431 | 136 609                   | 64 232 916 | 2 082 178        | 75 069 415 |

## 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

| <i>Year</i>    | <i>From zinc concentrates</i> |            | <i>From pyrite concentrates</i> |             |            | <i>Total</i>       |            |
|----------------|-------------------------------|------------|---------------------------------|-------------|------------|--------------------|------------|
|                | <i>Mono tonnes</i>            | <i>\$</i>  | <i>Pyrite</i>                   | <i>Acid</i> | <i>\$</i>  | <i>Mono tonnes</i> | <i>\$</i>  |
| 1957-1972 .... | 815 645                       | 9 894 437  | 503 238                         | 799 933     | 11 879 681 | 1 615 578          | 21 774 118 |
| 1973 ....      | 61 895                        | 827 631    | 242 618                         | 331 090     | 5 183 827  | 392 985            | 6 011 458  |
| 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  |
| TOTAL ....     | 1 181 335                     | 16 782 685 | 1 661 030                       | 2 387 651   | 44 415 211 | 3 568 986          | 61 197 896 |

**North-West Acid Pty Ltd, Wivenhoe**

Production for the year was 322 710 tonnes of acid expressed as 100 per cent. No new development was undertaken during the year; however, the shortfall in pyrite received from Mt Lyell due to their decreased production, was balanced by the successful roasting of pyrrhotite from the Rension tin mining operation. A total of 12 961 tonnes of pyrrhotite being treated in the last quarter of the year.

Demand exceeded production for the year, but losses of 30 000 tonnes due to industrial action and 25 000 tonnes through a shut-down necessitated by a leak in the inter-pass tank system, caused this supply deficit.

The number of employees averaged 106, but considerable employment of contractors contributed to the total man hours exposure. These contractors were, in the main, employed on maintenance engineering. There were thirty-two lost time accidents, of which three were classified as serious.

Work injury statistics were:—

Man hours exposure—245 586.

Frequency rate—130.3.

Severity rate—2 202.9.

Mean duration (days)—16.9.

**TIN**  
**QUANTITY AND VALUE OF PRODUCTION**

| <i>Year</i>  | <i>Tonnes</i> | <i>Value</i> | <i>Year</i> | <i>Tonnes</i> | <i>Value</i>  |
|--------------|---------------|--------------|-------------|---------------|---------------|
|              |               | \$           |             |               | \$            |
| 1873 to 1972 | 181 066       | 148 776 800  | 1975        | ....          | 5 494         |
| 1973         | ....          | 5 674        | 20 221 559  | 1976          | ....          |
| 1974         | ....          | 5 951        | 34 221 518  | 1977          | ....          |
|              |               |              |             | TOTAL         | 211 672       |
|              |               |              |             |               | \$371 692 916 |

**Aberfoyle Ltd, Rossarden****PRODUCTION**

|                | <i>Ore Milled</i> | <i>Cassiterite concentrates</i> | <i>Tin in concentrates</i> | <i>Value</i> | <i>Wolfram concentrates</i> | <i>WO<sub>3</sub> in concentrates</i> | <i>Value</i> |
|----------------|-------------------|---------------------------------|----------------------------|--------------|-----------------------------|---------------------------------------|--------------|
|                | (Tonnes)          | (Tonnes)                        | (Tonnes)                   | \$           | (Tonnes)                    | (Tonnes)                              | \$           |
| Aberfoyle      | ....              | ....                            | ....                       | 28 594       | 174                         | 127                                   | 1 345 129    |
| Storeys Creek  | ....              | ....                            | ....                       | ....         | ....                        | ....                                  | ....         |
| Aberfoyle Mill | ....              | ....                            | ....                       | 28 594       | 174                         | 127                                   | 1 345 129    |
|                |                   |                                 |                            |              | 185                         | 136                                   | 2 213 709    |

**EMPLOYMENT AND DEVELOPMENT**

| <i>Mine</i>   | <i>Average Number of Men</i> |                | <i>Driving and Cross-cutting</i> | <i>Diamond drilling</i> |
|---------------|------------------------------|----------------|----------------------------------|-------------------------|
|               | <i>Underground</i>           | <i>Surface</i> |                                  |                         |
| Aberfoyle     | ....                         | ....           | (Metres)                         | (Metres)                |
| Storeys Creek | ....                         | ....           | { 362                            | 92                      |
|               |                              |                | { 217                            | 297                     |

R. A. A. Seymour, Mining Engineer, Launceston reports operations at the Aberfoyle and Storeys Creek mines were helped by the improved price of tin. All ore from Storeys Creek was treated at the Aberfoyle mill, which was again only operated for part of each week. Underground work at Aberfoyle concentrated on developing and stoping blocks of ore between 2 level and the surface, and on rehabilitating the long drive to the Lutwyche working on 13 level. Drainage and ventilation were restored and some development and

diamond drilling done to confirm ore reserves in this area. However, heavy water flows under pressure are still a problem. At Storeys Creek, the footwall vein, in the winze below 11 level was blocked out and partly stopped. The sub-level from the winze was extended north to the aplite dome. Other stoping was mainly in small remnants left by previous operations. Some changes and improvements were made in the milling circuit, and an investigation was started into the possible retreatment of the slime dams.

#### EXPENDITURE

Major expenditure was as follows:—

|                                |      |      |      |      |      |      |      |      |          |
|--------------------------------|------|------|------|------|------|------|------|------|----------|
| Vehicles                       | .... | .... | .... | .... | .... | .... | .... | .... | \$15 300 |
| Pumps                          | .... | .... | .... | .... | .... | .... | .... | .... | \$10 300 |
| Tailings and settling dams     | .... | .... | .... | .... | .... | .... | .... | .... | \$10 600 |
| Other capital items            | .... | .... | .... | .... | .... | .... | .... | .... | \$ 9 300 |
| Slime flotation investigation  | .... | .... | .... | .... | .... | .... | .... | .... | \$60 000 |
| Chemical treatment of effluent | .... | .... | .... | .... | .... | .... | .... | .... | \$15 600 |

#### BMI Mining Pty Ltd, South Mount Cameron

Sluicing operations fed by scraper and dozer continued in the Endurance and Post Office areas. Two jig plants were also set up. One using H.E.C. power was installed north of the Blue Lake on a lead running down from Mount Cameron. After initial trials with a loader, this plant was fed with a nozzle and gravel pump. The other jig plant was a small unit with its own diesel-electric supply, and was used to retreat old coarse Endurance tails on the south side of the Blue Lake.

A total of 198 278 cubic metres was treated during the year for a yield of 44·954 tonnes of concentrates containing 31·784 tonnes of tin valued at \$336 869. Employment averaged fifteen men.

#### Cleveland Tin N.L., Luina

E. C. Leyland, Mining Engineer, Burnie, reports that a total of 393 275 tonnes with a head grade of 0·66 per cent Sn (as cassiterite) and 0·22 per cent Cu was processed. Recoveries for 1977 were as follows:—

|                    |      |      |      |      |      |      |      | <i>Tonnes</i> |
|--------------------|------|------|------|------|------|------|------|---------------|
| Tin concentrate    | .... | .... | .... | .... | .... | .... | .... | 2 489         |
| Tin content        | .... | .... | .... | .... | .... | .... | .... | 1 465         |
| Copper concentrate | .... | .... | .... | .... | .... | .... | .... | 2 151         |
| Copper content     | .... | .... | .... | .... | .... | .... | .... | 433           |
| Tin content        | .... | .... | .... | .... | .... | .... | .... | 79            |

#### DEVELOPMENT

|                                 |      |      |      |      |       | <i>Ore</i> | <i>Mullock</i> |
|---------------------------------|------|------|------|------|-------|------------|----------------|
|                                 |      |      |      |      |       | (m)        | (m)            |
| Decline                         | .... | .... | .... | .... | ....  | ....       | 479            |
| Driving and cross-cutting       | .... | .... | .... | .... | ....  | 631        | 247            |
| Slot rising                     | .... | .... | .... | .... | ....  | 144        | ....           |
| Mullock rising                  | .... | .... | .... | .... | ....  | ....       | 84             |
| Diamond drilling (under-ground) | .... | .... | .... | .... | 2 146 | ....       | ....           |
| <b>TOTAL</b>                    | .... | .... | .... | .... | 2 146 | 775        | 810            |

This development advanced the main decline to the 18 level horizon, i.e. R.L. 114 m A.S.L., completed the development of available ore on 15 level, 'C' lens, 'B' lens, and 'A' lens; completed the development of lenses 'B' and 'C' on 16 level; provided access to a remnant block on 10 level in the 'B' south-west branch and provided access to the floor horizon of the Khaki lens at 11 level.

In vivid contrast to previous years, ore production from development was at the low figure of 10 per cent of total ore production. It has been decided to expedite development below 16 level to sea level. Hall's lenses are intersected by the Nadir reverse fault at 16 level, the accelerated advance of the main decline will permit a diamond drill program to be conducted to test the existing known mineralisation below the fault down to R.L. 0. The results of this program will permit the calculation of 'indicated' reserves and provide the information for level interval and development.

#### PRODUCTION

The concentrator treated 393 275 tonnes in 1977.

The head grades were:—

|                        |                  |
|------------------------|------------------|
|                        | %                |
| Tin (cassiterite) .... | 0.66             |
| Copper ....            | 0.22             |
| Recoveries were:—      |                  |
| Tin—gravity ....       | 50.3             |
| Tin—flotation ....     | 3.2              |
| Tin—total ....         | <u>53.5</u>      |
| Copper ....            | <u>48.7</u>      |
| Metal production was:— |                  |
|                        | <i>M.T.U.</i>    |
| Tin—gravity ....       | 130 339.4        |
| Tin—flotation ....     | 8 231.7          |
| Tin—total ....         | <u>138 571.1</u> |
| Copper ....            | <u>41 982.0</u>  |

#### MINING

The mine continued to operate on two shifts only throughout 1977. Head grades of the ore being mined at 0.66 per cent tin as cassiterite and 0.22 per cent copper were below ore reserve grade. A large fall in Khaki lens north of the rib pillar caused dilution of the broken ore and curtailed production from this lens. The mullock from the hanging wall had to be hauled to surface before the mining cycle could proceed. Haulage figures for the year were:—

|                   |                |
|-------------------|----------------|
| Ore—              | <i>Tonnes</i>  |
| Hall's ....       | 80 092         |
| Khaki ....        | 281 067        |
| 'B' South ....    | 9 632          |
| Henry's ....      | 1 424          |
| TOTAL ....        | <u>372 215</u> |
| Mullock ....      | 95 158         |
| TOTAL HAULED .... | <u>467 373</u> |

81 757 metres were drilled, 305 261 tonnes fired and at the end of the year 222 798 tonnes were drilled, with approximately 30 per cent of this total ready for current production. Due to the shortfall in development ore production of ore from stoping increased by 45 per cent. Production for 1978 will be considerably influenced by the draw-recovery from the firing of the Khaki rib pillar.

Underground diamond drilling to assist level development and stope design was maintained throughout the year. No deep drilling from the surface was carried out, although a pattern of holes to test Khaki and 'B' south mineralisation at depth, is planned to commence in January 1978. Stratigraphic drilling is also planned to the north of the mine.

## RESERVES

Total diluted mineable—

|                  |      |      |           | % Cassiterite | % Copper |
|------------------|------|------|-----------|---------------|----------|
| Reserves—Tonnes— |      |      |           |               |          |
| 1976             | .... | .... | 1 722 000 | 0.79          | 0.30     |
| 1977             | .... | .... | 2 070 000 | 0.71          | 0.28     |

The increase on reserves of 348 000 tonnes is due to a reassessment of 'B' south mineralisation between 11 and 16 levels.

## MILLING

The mill operated on a seven day continuous shift operation for the full year. The ore treated increased by 30 000 tonnes when compared to 1976, however, the throughput rate was reduced due to the difficulty of maintaining constant ore supplies from the mine. Khaki ore constituted 78 per cent of the ore treated, and with the lower mine head grade, tin recovery declined to 53.5 per cent and copper to 48.7 per cent. Copper recovery was affected by the effort to maintain a saleable copper grade in concentrates in the difficult copper market.

The major modification to the plant for the year, was to increase the table tail regrind circuit screening area by the installation of 'A' frame screens superseding the 'Rapperfine' type. In addition, four spiral classifiers were installed in the circuit immediately prior to screening, in an effort to upgrade screen feed and produce a tailing from the spirals. This was not successful and the spiral classifiers were removed from the circuit.

Copper concentrates were shipped from the mine site in 18 tonne containers from August, this replaced the former mode of transport, namely 44 gallon drums. Following an investigation into the feasibility of treating vanner tails by cassiterite flotation during the year, additional capacity for the flotation plant will be installed in 1978.

## CAPITAL EXPENDITURE

The following items were purchased or installed in 1977:—

|  | \$        |
|--|-----------|
| Mobile equipment (2 Cat. 980s, 1 Wig-truck, 1 drilling jumbo) .... | 606 000   |
| Housing ....   | 269 600   |
| Mill circuit ....  | 29 000    |
| Sundries ....  | 4 000     |
|  | \$908 600 |

## SAFETY

The average employment for the year was 252, including 50 underground personnel. Of the 57 lost time accidents three were designated as serious, with the remainder categorised as minor.

Work injury statistics were:—

|                           |           |
|---------------------------|-----------|
| Man hours exposure ....   | 444 034.0 |
| Frequency rate ....       | 128.4     |
| Severity rate ....        | 2 866.0   |
| Mean duration (days) .... | 15.9      |

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

The company continued to operate the open pit at this mine and to treat the low grade ore in a gravity concentrator on the lease at Dundas.

## PRODUCTION

|                      |      |      |      |      |      |      |      | <i>Tonnes</i> |
|----------------------|------|------|------|------|------|------|------|---------------|
| Waste mined          | .... | .... | .... | .... | .... | .... | .... | 194 400.0     |
| Ore mined            | .... | .... | .... | .... | .... | .... | .... | 42 523.0      |
| Concentrate produced |      |      | .... | .... | .... | .... | .... | 125.3         |
| Contained tin metal  | .... | .... | .... | .... | .... | .... | .... | 63.5          |

A contractor was employed to carry out the mining of the oxidised ore in the open pit. Due to the steep nature of the terrain it was necessary to push all waste by bulldozers to the dumps. Both waste and ore material was mainly ripped by bulldozers but some gossan required boring and firing. The ore was pushed by bulldozer to, and over, a vertical face where it was then loaded by a front-end loader onto a truck, for transport to the stockpile at the concentrator.

The original study of the available sampling and drilling data indicated that the ore was continuous in strike, and averaged a grade of 0.67 per cent. In fact, during the mining it was found that there was a north and south lens with a large waste section separating the two. The planned ratio waste to ore was 2:1 for the year but, due to this strike discontinuity, the actual ratio mined was 5:1. The grade of ore delivered to the mill, once this separation in the pit was effected, was considerably enhanced. However, the effect on oxidised ore reserves was to halve the possible potential.

The concentrator yielded poor recoveries throughout the year, the main problems being, the fineness of the tin, the comminution circuit, the higher turnover in mill labour and the consequent inexperience of gravity separation equipment of the mill employees.

The installation of a 20-inch gyratory crusher, to replace the 14-inch gyratory crusher at the beginning of this year, did not improve the crushing efficiency. Even with the pre-screening of the crusher feed the new installation proved to be too small. Other modifications or additions made or planned to the concentrator include:—

- (1) The commissioning of a regrind mill.
- (2) The installation of additional fine cyclones.
- (3) Provisions for more vanners to attempt to recover a greater percentage of the fine cassiterite.
- (4) The use of finer screens in the primary grinding section. The present screens are 250 micron aperture compared with the 550 micron formerly in use.
- (5) The 42-inch spiral classifier to be removed from the circuit.

## RESERVES

Possible ore was estimated at 86 700 tonnes.

## EXPLORATION

A low key and intermittent exploration program was conducted over Lewis Ridge, south of the main open pit workings. The program entailed bulldozer costeaning followed by channel sampling. Sampling results indicated the presence of tin associated with the Razorback Shear. Although no ore can be added to the ore reserve figure results are sufficiently encouraging to continue further investigation.

## SAFETY

The average number of employees including staff was thirty. There were thirty-four new employees with thirty-five employees terminating their employment. Lost time accidents numbered fifteen but were all designated in the minor category. Accident statistics are:—

|                      |      |      |      |      |      |          |
|----------------------|------|------|------|------|------|----------|
| Man hours exposure   | .... | .... | .... | .... | .... | 77 751.0 |
| Frequency rate       | .... | .... | .... | .... | .... | 192.9    |
| Severity rate        | .... | .... | .... | .... | .... | 630.2    |
| Mean duration (days) | .... | .... | .... | .... | .... | 2.3      |

**Renison Limited, Renison Bell**

Ore hauled to the surface stockpile or delivered direct to the crusher totalled 587 615 tonnes. The sources of this production were as follows:—

|                           |      |      |      |      |      |               |
|---------------------------|------|------|------|------|------|---------------|
|                           |      |      |      |      |      | <i>Tonnes</i> |
| Bassett-Federal structure | .... | .... | .... | .... | .... | 14 553        |
| Stebbins lode             | .... | .... | .... | .... | .... | 146 962       |
| Dreadnought lode          | .... | .... | .... | .... | .... | 54 226        |
| Murchison lode            | .... | .... | .... | .... | .... | 135 310       |
| Colebrook lode            | .... | .... | .... | .... | .... | 103 205       |
| Penzance lode             | .... | .... | .... | .... | .... | 130 542       |
| Howard lode               | .... | .... | .... | .... | .... | 2 817         |
| Concentrator plant—       |      |      |      |      |      |               |
| Ore treated               | .... | .... | .... | .... | .... | 588 615       |
| Assay (per cent Sn)       | .... | .... | .... | .... | .... | 1.30          |

Tin concentrates produced—

|                        |      |      |      |      |      |               |             |                             |
|------------------------|------|------|------|------|------|---------------|-------------|-----------------------------|
|                        |      |      |      |      |      | <i>Tonnes</i> | <i>% Sn</i> | <i>Metallic tin content</i> |
|                        |      |      |      |      |      |               |             | (tonnes)                    |
| High grade             | .... | .... | .... | .... | .... | 10216.1       | 44.9        | 4 583.654                   |
| Low grade              | .... | .... | .... | .... | .... | 1 467.4       | 19.6        | 288.011                     |
| Overall metal recovery | .... | .... | .... | .... | .... | ....          | 66.81       | ....                        |

R. C. Thomas, Senior Mining Engineer, Hobart, reports that the Renison decline advanced 187.8 metres to 4 640.4 metres from, and 510 metres below the portal. In addition 2 866.8 metres of driving and cross-cutting and 321.2 metres of rising were completed. A start has been made on cutting the 1700 pump chamber off the main decline. The No. 4 portal was completed, this will eventually be linked, by a road bridge over the main highway, with the stockpile area.

Ore treated in the concentrator amounted to 588 615 tonnes at 1.30 per cent Sn compared with 515 287 tonnes at 1.36 per cent treated in 1976. During the year there were no restrictions on production by the International Tin Council and high tin prices prevailed through the year. In July the vanner section of the mill was closed down and at the end of August the new leach plant was commissioned to treat the combined gravity and flotation concentrates and produce only one grade of concentrate for sale.

On the consolidated mining lease exploration was directed towards the search for extension of strata-bound ore zones up-dip from the current mining operations. Significant tonnages, particularly in the No. 3 horizon, have been delineated as a result of this work. Further drilling of this nature will continue during 1978 in addition to wider spaced stratigraphic drilling further south on the mining lease.

A 17-hole diamond drilling program at the Sweeney's mine near Trial Harbour succeeded in defining a small tonnage of complex stanniferous sulphides. Further geophysical and geological work is planned in this general area prior to further drilling.

At Mount Lindsay, a six-hole diamond drilling program, designed to further test skarn zones in this area, was completed. Results were generally disappointing, but were sufficient to justify a similar programme in 1978.

In the Argent Dam area, a combined geological, geophysical-geochemical survey succeeded in defining several anomalous areas which warrant drilling in 1978.

On the East Coast, an eleven hole diamond drilling program was completed in the Blue Tier area near St Helens. Results both in the Anchor Mine and Poimena zones were sufficiently encouraging to warrant further drilling there in the near future.

One hundred and eighteen diamond drill holes, totalling 10 486 metres, were drilled in the consolidated mining lease and thirty-five diamond drill holes, totalling 7 283 metres were drilled elsewhere.

After allowing for depletion by mining, the combined proved and probable ore reserved increased by 2 045 000 tonnes but the grade dropped from 1.24 per cent Sn to 1.19 per cent Sn. The main reason for the large increase in reserve tonnage is that the reserves have now been calculated to R.L. 1800 instead of to R.L. 1900 as in previous years. This increased depth is considered to be within economic trucking distance using the new larger haulage equipment which has been added to the mine fleet. The drop in reserve grade is due to the rather low average grade (1.10 per cent Sn) of additions to reserves and the higher than average grade of ore mined during the year.

Ore reserves at July 1977 were as follows:—

| <i>Ore body</i> | <i>Proved</i>    |             | <i>Probable</i>  |             | <i>Possible<br/>(not reserves)</i> |             |
|-----------------|------------------|-------------|------------------|-------------|------------------------------------|-------------|
|                 | Tonnes           | % Sn        | Tonnes           | % Sn        | Tonnes                             | % Sn        |
| Bassett-Federal | 2 400 000        | 0.87        | 2 850 000        | 1.02        | 9 000 000                          | 1.06        |
| No. 2 horizon   | 1 705 000        | 1.25        | 1 710 000        | 1.10        | 750 000                            | 1.10        |
| No. 3 horizon   | 1 735 000        | 1.68        | 740 000          | 1.63        | 1 000 000                          | 0.80        |
| Other           | 200 000          | 1.45        | 600 000          | 1.30        | 250 000                            | 1.75        |
| <b>TOTAL</b>    | <b>6 040 000</b> | <b>1.23</b> | <b>5 900 000</b> | <b>1.14</b> | <b>11 000 000</b>                  | <b>1.05</b> |

Capital expenditure for the year was as follows:—

|                               |                    |
|-------------------------------|--------------------|
| Mine development              | 769 000            |
| Mobile equipment and vehicles | 689 000            |
| Fixed plant                   | 2 364 000          |
| Housing and welfare           | 68 000             |
| <b>TOTAL</b>                  | <b>\$3 891 000</b> |

#### SAFETY

Eighty lost time accidents occurred during the year compared with ninety-eight accidents in 1976. Again there were no fatal accidents.

Accidents statistics for the year were:—

|                      |         |
|----------------------|---------|
| Man hours—exposure   | 839 649 |
| Frequency rate       | 95.3    |
| Incidence rate       | 0.185   |
| Duration rate (days) | 8.36    |

At the end of the year the number of employees was 455 comprising of 136 staff and 319 award employees.

#### Ringarooma Mining Pty Ltd

This company produced 13 tonnes of tin from 22 251 cubic metres of gravel. This production was actually in the quarter ending 31 December 1976. The company ceased operations on 21 October 1976.

**V. Wood, Pioneer Mine, Pioneer**

Production was 16 tonnes of concentrates containing 11·8 tonnes of tin valued at \$119 737. An average of seven men was employed.

**K. Kerrison, Ringarooma River Beaches**

Mr Kerrison continued operations with a front-end loader and jig, to produce 2·3 tonnes of concentrates containing 1·5 tonnes of tin valued at \$16 305.

**Mount Cameron Tin Syndicate, Gladstone**

This syndicate operated in the Garfield area to produce 12 tonnes of concentrates containing 8·5 tonnes of tin valued at \$88 151 from 27 500 m<sup>3</sup> of gravel.

**L. J. Groves, Gladstone**

Mr Groves produced 4·5 tonnes of concentrates containing 3·3 tonnes of tin valued at \$35 075.

**Northern Developments, Ringarooma River**

This Company produced 18·1 tonnes of concentrates containing 11·3 tonnes of tin valued at \$112 368.

**M. L. Watt, Gladstone**

Mr Watt produced 9·5 tonnes of concentrates containing 6·9 tonnes of tin valued at \$74 871.

**R. C. Lawry, Gladstone**

Mr Lawry continued work in the Garfield area to obtain 2·8 tonnes of concentrates containing 1·9 tonnes of tin valued at \$20 651.

**C. D. King, Port Davey**

Mr King produced 1·6 tonnes of concentrates containing 1·2 tonnes of tin valued at \$12 849 from the Melaleuca mine.

**EAST COAST**

*Miscellaneous.* Messrs D. B. Dwyer, T. H. Fitzallen, A. Holloway, L. McRae and B. E. Pitchford produced individually 0·340 tonne of tin concentrates containing 0·226 tonne of tin valued at \$2 338.

**BRANXHOLM-DERBY**

*L. M. Barnett, Star of Peace Mine, Branxholm,* produced 0·923 tonne of tin concentrates containing 0·607 tonne of tin valued at \$6 778.

*R. Hyde, Moorina,* produced 0·513 tonne of tin concentrates containing 0·349 tonne of tin valued at \$3 910.

*Johnson N. C. & V. A., Star of Peace,* produced 1·938 tonne of tin concentrates containing 1·227 tonne of tin valued at \$12 608.

*Jones E., Derby,* produced 2·560 tonne of tin concentrates containing 1·828 tonne of tin valued at \$18 604.

*D. L. & W. J. Mullins, Branxholm,* produced 0·956 tonne of tin concentrates containing 0·715 tonne of tin valued at \$7 500.

*P. Price, Derby,* produced 1·238 tonne of tin concentrates containing 0·766 tonne of tin valued at \$8 237.

*Miscellaneous.* Messrs K. Banks and Hodgetts, P. W. Kerrison, V. Lockwood and J. C. Mott individually produced 0·507 tonne of tin concentrate containing 0·330 tonne of tin valued at \$3 569.

## PIONEER—SOUTH MOUNT CAMERON—GLADSTONE

*R. J. Moore, Gladstone*, produced 1.451 tonne of tin concentrates containing 1.035 tonne of tin valued at \$10 665.

*K. M. Richardson, Swain Creek*, produced 0.794 tonne of tin concentrates containing 0.573 tonne of tin valued at \$5 921.

*Miscellaneous.* Messrs D. Daw, J. Groves, V. Moore, G. Selby and H. Standage produced individually 0.308 tonne of tin concentrates containing 0.206 tonne of tin valued at \$2 181.

## WARATAH AND WEST COAST

*M. Laan, Balfour*, produced 0.429 tonne of tin concentrates containing 0.279 tonne of tin valued at \$2 713.

*R. Laffler, Heemskirk*, produced 2.276 tonnes of tin concentrates containing 1.291 tonne of tin valued at \$13 666.

*P. R. P. Wilson, Melaleuca*, produced 1.497 tonne of tin concentrates containing 1.14 tonne of tin valued at \$11 869.

*Miscellaneous.* Messrs E. J. Bayley, D. Kenworthy, M. W. McKendrick and H. Moses produced individually 0.832 tonne of tin concentrates containing 0.439 tonne of tin valued at \$4 739.

## 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 to 1972 | 18 729        | 3 113 480    | 1975        | .... 5 279    | 1 579 311    |
| 1973         | .... 2 846    | 388 288      | 1976        | .... 6 379    | 1 938 650    |
| 1974         | .... 4 139    | 1 062 973    | 1977        | .... 732      | 187 345      |
|              |               |              | TOTAL       | 38 104        | \$8 270 047  |

## Kibuka Mines Pty Ltd, Naracoopa, King Island

The collapse of the zircon and rutile market led to the closure of this mine in the first quarter of the year. All stocks of rutile and zircon on hand at the mine were then ground to flour in the ball mill to produce a more marketable product. Restoration of the worked out areas is proceeding.

Some 139 000 tonnes of sand were treated to produce 770 tonnes of rutile concentrates and 923 tonnes of zircon concentrates.

## TUNGSTEN (SCHEELITE)

## TUNGSTIC OXIDE: QUANTITY AND VALUE OF PRODUCTION

| <i>Year</i>  | <i>Tonnes</i>  |                    | <i>Value</i> |
|--------------|----------------|--------------------|--------------|
|              | (Concentrates) | (WO <sub>3</sub> ) | \$           |
| 1917 to 1972 | .... 31 455    | 3 297              | 70 287 337   |
| 1973         | .... 1 682     | 1 244              | 3 663 649    |
| 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   |
| TOTAL        | .... 42 781    |                    | 149 041 839  |

**King Island Scheelite Limited, Grassy***Production statistics—*

|                                      |      |      |      |      |      |      |         |
|--------------------------------------|------|------|------|------|------|------|---------|
| Ore mined (tonnes)—                  |      |      |      |      |      |      |         |
| Bold Head                            | .... | .... | .... | .... | .... | .... | 112 291 |
| Dolphin                              | .... | .... | .... | .... | .... | .... | 221 248 |
| Mill throughput (tonnes)             | .... | .... | .... | .... | .... | .... | 345 199 |
| Concentrate produced (tonnes)        |      |      |      | .... | .... | .... | 3 276   |
| Concentrate grade (WO <sub>3</sub> ) |      |      | .... | .... | .... | .... | 72.47%  |
| Average number of persons employed—  |      |      |      |      |      |      |         |
| Underground                          | .... | .... | .... | .... | .... | .... | 101     |
| Other surface                        | .... | .... | .... | .... | .... | .... | 350     |
|                                      |      |      |      |      |      |      | <hr/>   |
|                                      |      |      |      |      |      |      | 451     |
|                                      |      |      |      |      |      |      | <hr/>   |

## MINING

*Bold Head Mine*

Development of the main decline was hampered by a large rock fall which resulted in extensive steel setting and timbering, and only 162 m were achieved. Cross cuts and stope development driving amounted to 575.4 m. Hand rising for manways, ore passes and ventilation amounted to 215.5 m, and one 61.7 m ventilation rise was bored with the boring machine.

Stoping in the 'A' Lens was by cut and fill using a Cavo loader and in 'B' Lens Main ore body by an open slot method using scraper winches. In the Boundary Fault areas stoping was by small cut and fill methods using airlegs and Cavos and in larger stopes using jumbos and 980B front end loader.

*Dolphin Mine*

The main decline advanced 379.8 m and at the end of the year was 238 m below sea level. Development was through poor ground conditions and extensive use of steel sets and timber was required. Driving for stope development, ventilation and diamond drilling amounted to 697.1 m. Main access ramps for the Pit and Wedge stopes were driven 251.1 m and rising by hand and machine for ventilation was 196 m.

The Dolphin Pumping Scheme was advanced to the -160 m level with three rises being bored for a total of 344.8 m and the sumps were completed with an advance of 15.3 m. One rise was equipped to surface as an escapeway with platforms and ladders as well as the installation of air and water pipes. The second rise has been equipped with a 60 litre/s Ritz submersible pump and a 200 mm rising main. All surface works for this pumping scheme, except for the final electrical connections were completed.

Stoping was carried out in three areas, Wedge, Central and Pit, and the stoping method was post pillar with hydraulic fill. The sand fill plants operated well during the year and filling progressed closely after mining. All post pillars were rock bolted on a regular pattern with additional bolts used as required.

The rock mechanics program continued with the assistance of the C.S.I.R.O. Levelling traverses to monitor subsidence along 17 Bench and -75 m level were carried out on a regular basis. Twenty-two rod and magnetic extensometer stations monitored movement above the three stoping areas. The largest deformation has occurred in the Wedge stope adjacent to the Wedge Fault. Traverse monitoring units have been installed horizontally across three post pillars to measure horizontal dilation.

Continuing small dilations beneath the fill have been recorded. Four boreholes are equipped with inclinometers to measure any relative tilt. Stress levels were measured using the overcoring technique in five post pillars, the Wedge stope regional pillar and five places in the Wedge stope hanging wall.



## TUNGSTEN (WOLFRAM)

## TUNGSTIC OXIDE: QUANTITY AND VALUE OF PRODUCTION

| <i>Year</i>  |      | <i>Tonnes</i>                     | <i>Tonnes</i> | <i>Value</i>      |
|--------------|------|-----------------------------------|---------------|-------------------|
|              |      | (Concentrates) (WO <sub>3</sub> ) |               | \$                |
| 1899 to 1972 | .... | 20 227                            | 1 602         | 34 045 113        |
| 1973         | .... | 375                               | 278           | 828 102           |
| 1974         | .... | 216                               | 159           | 1 075 850         |
| 1975         | .... | 303                               | 225           | 1 543 378         |
| 1976         | .... | 248                               | 186           | 1 724 433         |
| 1977         | .... | 185                               | 136           | 2 214 489         |
| <b>TOTAL</b> | .... | <b>21 554</b>                     |               | <b>41 431 365</b> |

## Aberfoyle Ltd, Rossarden

Production by this company, reviewed under Tin, was as follows:—

| <i>Mine</i>   |      | <i>Tonnes</i>                     | <i>Tonnes</i> | <i>Value</i> |
|---------------|------|-----------------------------------|---------------|--------------|
|               |      | (Concentrates) (WO <sub>3</sub> ) |               | \$           |
| Aberfoyle     | .... | 53                                | 40            | 634 374      |
| Storeys Creek | .... | 132                               | 96            | 1 579 335    |

## All Nations Mine, Moina

Full details are not available but the lessees have shipped away three tonnes of concentrates of an average grade of 60 per cent WO<sub>3</sub>. Twenty metres of driving and cross-cutting were advanced for the year. In excess of 300 tonnes of stoping was carried out, in an area in between the old workings from No. 2 tunnel. A low angle reverse fault has curtailed any further work in this area, and drilling is required to locate the veins below this fault.

Two men were employed on the lease throughout the year.

## Mt Pelion Joint Venture, Kibuka Mines Pty Ltd

The lease-holders employed contractors to mine bulk samples in six sections of the exposed lode in the main tunnel. Following assaying, a program of diamond drilling to delineate potential extensions of the lode in strike and depth has been arranged for early 1978.

Considerable work on the main access road to the mine was carried out with the co-operation and assistance of a timber firm, who have the timber rights in the area north of the mine.

## ZINC

## QUANTITY AND VALUE OF PRODUCTION

| <i>Year</i>  | <i>Tonnes</i> | <i>Value</i> | <i>Year</i>  | <i>Tonnes</i>    | <i>Value</i>         |
|--------------|---------------|--------------|--------------|------------------|----------------------|
|              |               | \$           |              |                  | \$                   |
| 1919 to 1972 | 1 120 222     | 217 929 322  | 1975         | ....             | 54 326               |
| 1973         | ....          | 22 451 078   | 1976         | ....             | 49 697               |
| 1974         | ....          | 30 973 172   | 1977         | ....             | 63 070               |
|              |               |              | <b>TOTAL</b> | <b>1 393 267</b> | <b>\$384 655 165</b> |

## Electrolytic Zinc Company of Australasia Limited

## EXTRACTION FROM CONCENTRATES: RISDON

|                                |      | <i>Tonnes</i> |
|--------------------------------|------|---------------|
| From other than Tasmanian ore— |      |               |
| Zinc                           | .... | 104 093       |
| Cadmium                        | .... | 300           |
| Cobalt oxide                   | .... | 3 915         |
| Superphosphate                 | .... | 49 324        |
| From Tasmanian ore—            |      |               |
| Zinc                           | .... | 54 679        |
| Cadmium                        | .... | 131           |
| Cobalt oxide                   | .... | 21 325        |
| Manufactured products—         |      |               |
| Aluminium sulphate             | .... | 3 766         |
| Ammonium sulphate              | .... | 5 005         |

The average number of men employed was 1 973.

## WEST COAST DIVISION

Ore mined—

| <i>Mine</i>               | <i>Tonnes</i> | <i>Pb</i> | <i>Zn</i> | <i>Cu</i> | <i>Ag</i>  | <i>Au</i>  | <i>Fe</i> |
|---------------------------|---------------|-----------|-----------|-----------|------------|------------|-----------|
|                           |               | <i>%</i>  | <i>%</i>  | <i>%</i>  | <i>g/t</i> | <i>g/t</i> | <i>%</i>  |
| Rosebery<br>(underground) | 466 340       | 4.4       | 14.8      | 0.85      | 167        | 3.4        | 15.7      |
| Rosebery (open cut)       | 77 534        | 2.1       | 5.9       | 0.19      | 43         | 1.0        | 7.6       |
| Hercules                  | 61 368        | 3.5       | 8.7       | 0.26      | 98         | 2.5        | 8.0       |
| Dumps                     | 3 687         | 1.5       | 6.6       | 0.06      | 179        | 0.2        | 15.9      |
| TOTAL                     | 608 929       | 4.0       | 13.1      | 0.70      | 145        | 3.0        | 13.9      |

Concentrate Produced—

|                    |      | <i>Tonnes</i> |
|--------------------|------|---------------|
| Zinc concentrate   | .... | 141 628       |
| Lead concentrate   | .... | 18 148        |
| Copper concentrate | .... | 23 596        |
| Pyrite concentrate | .... | 132 046       |

Recoverable quantity in ore mined—

|                   |      | <i>Tonnes</i> | <i>Kilograms</i> |
|-------------------|------|---------------|------------------|
| Zinc              | .... | 63 070        | ....             |
| Lead              | .... | 16 017        | ....             |
| Copper            | .... | 2 966         | ....             |
| Cadmium           | .... | 149           | ....             |
| Silver            | .... | ....          | 63 209           |
| Gold              | .... | ....          | 1 235            |
| Cobalt oxide      | .... | 21            | ....             |
| Manganese dioxide | .... | 427           | ....             |
| Mercury           | .... | ....          | 21               |

Total value of production \$69 610 596.

Average number of persons employed—

|                |      | <i>Surface</i> | <i>Under-ground</i> | <i>Total</i> |
|----------------|------|----------------|---------------------|--------------|
| Hercules Mines | .... | 4              | 33                  | 37           |
| Rosebery Mine  | .... | 466            | 628                 | 1 094        |
| TOTALS         | .... | 470            | 661                 | 1 131        |

R. C. Thomas, Senior Mining Engineer, Hobart reports that operations were again confined to the Rosebery and Hercules mines and the Farrell mine at Tullah has remained on a care and maintenance basis.

#### *Development*

The majority of development work was at the Rosebery mine and was mainly concentrated on the 15, 16 and 17 levels preparing long hole and sub-level long hole blocks for production.

Other development included work on improving the overall mine ventilation system prior to the introduction of underground diesel units, which are to be employed on mine development below the 17 level in the near future. Some 3 791 metres of driving and cross-cutting and 1 279 metres of rising were completed during the year at the Rosebery mine. At the Hercules mine 65 metres of driving were completed.

Total diamond drilling underground amounted to 7 286 metres comprising 7 253 metres at the Rosebery mine and 33 metres at the Hercules mine.

#### *Production*

Ore mined from all sources increased by 5 438 tonnes to 608 929 tonnes. At the Rosebery mine the underground production was approximately equally divided between conventional cut and fill stoping and bulk stoping (long hole and sub-level stoping). Cable bolting of conventional areas was introduced. Ore reserves at all mines at 31 December 1977 amounted to 8 320 489 tonnes.

#### *Safety*

The number of lost time accidents increased from 497 to 533 which has reversed the trend of recent years. There was also one fatal accident.

|                               |      |      |      |           |
|-------------------------------|------|------|------|-----------|
| Number of lost time accidents | .... | .... | .... | 533       |
| Lost time (working shifts)    | .... | .... | .... | 5 606     |
| Man hours exposure            | .... | .... | .... | 1 782 469 |
| Frequency rate                | .... | .... | .... | 299       |
| Incidence rate                | .... | .... | .... | 0.474     |
| Duration rate (days)          | .... | .... | .... | 10.52     |

#### *Capital expenditure*

Major capital expenditure during 1977 included the commencement, continuation or completion of the following projects:—

##### Purchase of mining equipment—

- 41 rock drills.
- 5 scrapers.
- 8 winches.
- 13 impact wrenches.
- 2 Cavo 320 loaders.
- 3 Cavo 310 loaders.
- 2 Eimco 21 loaders.
- 14 gable trucks (for 15 level drive north).
- 17 Granby trucks (110 cu. ft).
- 4 Gemco locomotives (5 tonnes).

##### Purchase of mines rescue equipment—

- 9 Draeger B.G. 174 S.C.B.A. sets.
- 1 Draeger U300 D.S. oxygen booster pump.

##### Purchase of surface equipment—

- 2 Front end loaders.

Installation of additional ball mill.

Ventilation upgrading project—

- Installation of  $4 \times 100$  h.p. fans/completed at 8 level northern upcast.
- Preparation for installation of  $3 \times 100$  h.p. fans at the southern upcast.
- Ventilation raise ( $3 \text{ m} \times 3 \text{ m}$ ) from 8 level to surface commenced.

### RISDON WORKS

R. Billingham, Mining Engineer, Hobart, reports that major developments included:—

- Completion of pilot plants for research into plant operations and treatment of residues.
- Continuation of the jarosite filtering installation designed to reduce metal content in plant residues.
- Continuation of investigation and design of the water management project to collect, treat and recycle plant effluents and drainages.
- Initial investigation and design of plant for the mechanical stripping of cathodes.
- Improvement to roasting, acid, leaching, electrolytic, casting and zinc products divisions, mainly in process equipment, drainage and piping circuits.
- Improvements and modifications to fluid roasters and associated services.
- Improved facilities and amenities in crib-rest rooms and offices.
- Improved fire alarms and sprinkler systems.

### Abminco N.L., Mackintosh Joint Venture

#### DEVELOPMENT

Clearing and excavation for the shaft site was completed in March. The contractors Thyssen Mining Construction of Australia Pty Ltd moved on site and established the surface facilities. The headframe, winders, power station, workshop, office and other buildings were completed at the shaft site. The pre-sink of the  $5 \times 2.5$  metres rectangular shaft was effected with a hired crane, mucking being carried out with a cactus grab. The stage winder was installed and the two deck stage, with the grab mounted on running rails below the bottom deck, was hoisted into the shaft. Sinking for the year reached a depth of 87 metres below the surface at R.L. 610. Continuous concrete lining was installed to 36 m below the surface, with one metre high reinforced concrete bands around the periphery of the shaft, being placed at five metre centres in the remainder. Future possible sub-level flats were developed to roughly ten metres from the shaft wall at R.L.'s 670, 640 and 610.

It is proposed, to cross-out to the 'P' South ore lens on R.L. 610 and develop the lens with a  $2.5 \times 2$  metres wide drive for a length in excess of 200 metres. It is further planned, that cross-cuts will be driven the full width of the ore at regular intervals, to permit diamond drilling for the other lenses and to provide the maximum information on ore grades and wall characteristics.

#### EXPLORATION

One HQ size diamond drill hole was drilled as a pilot hole for the shaft to ascertain ground conditions and possible water flows at the selected site. Two diamond drill holes were drilled on lease 3M/75 to test for possible base metal mineralisation beneath a strong soil geochemical anomaly. The zone is strongly anomalous in lead but with weaker coincident anomalies in both copper and zinc. The anomaly had previously been tested by one hole which, whilst not intersecting mineralisation, did intersect a zone of fragmented rocks containing fragments of base metal sulphides. This was interpreted as a possible indicator of the proximity of a massive sulphide horizon. Neither of the two holes intersected mineralisation, although both are considered to have adequately tested the prospective stratigraphic horizon.

Total drilling was three holes for 940 metres.

## RESERVES

| Category               | Lens    | Tonnes    | % Cu | % Pb | % Zn  | Ag (g/t) | Au (g/t) |
|------------------------|---------|-----------|------|------|-------|----------|----------|
| Indicated              | P South | 2 322 791 | 0.33 | 6.42 | 11.84 | 130.96   | 3.15     |
|                        | Q       | 1 168 039 | 0.25 | 4.60 | 7.31  | 88.63    | 1.76     |
|                        | S       | 870 711   | 1.05 | 1.89 | 3.86  | 41.66    | ....     |
|                        | Total   | 4 361 541 | 0.45 | 5.03 | 9.03  | 101.8    | 2.15     |
| Inferred               | P West  | 748 833   | 0.20 | 3.86 | 6.97  | 52.10    | 0.94     |
|                        | P North | 633 160   | 0.23 | 3.50 | 6.77  | 60.70    | 1.21     |
|                        | N       | 421 290   | 0.18 | 2.68 | 5.43  | 54.51    | 0.76     |
|                        | Total   | 1 803 283 | 0.21 | 3.46 | 6.54  | 55.68    | 0.99     |
| Indicated and Inferred | Total   | 6 164 824 | 0.38 | 4.57 | 8.30  | 88.31    | 1.81     |

These reserves are referred to as 'geological' since the diamond drill intersections, defined to mining criteria of width and grade, have been cut to approximate mining conditions but no allowance has been made for mining recovery. Studies have been conducted to ascertain what part of the above geological resource might be classified as 'ore' but to date no decision has been reached.

## CAPITAL EXPENDITURE

Total expenditure on the joint venture was \$2 022 195, including site establishment, shaft sinking, diamond drilling, associated geological studies and further feasibility studies.

## SAFETY

The average number of employees on this project for the year was 13. This figure included all contractors. There were 11 lost time accidents one of which was designated as serious with the remainder being minor. Work injury statistics were:—

|                      |      |      |      |      |      |         |
|----------------------|------|------|------|------|------|---------|
| Man hours exposed    | .... | .... | .... | .... | .... | 46 198  |
| Frequency rate       | .... | .... | .... | .... | .... | 238.1   |
| Severity rate        | .... | .... | .... | .... | .... | 3 969.9 |
| Mean duration (days) | .... | .... | .... | .... | .... | 11.9    |

## ZIRCON

## ZIRCONIUM DIOXIDE: QUANTITY AND VALUE OF PRODUCTION

| Year         | Tonnes | Value     | Year  | Tonnes | Value       |
|--------------|--------|-----------|-------|--------|-------------|
|              |        | \$        |       |        | \$          |
| 1969 to 1972 | 12 562 | 890 965   | 1975  | ....   | 5 818       |
| 1973         | ....   | 817       | 1976  | ....   | 4 163       |
| 1974         | ....   | 3 627     | 1977  | ....   | 609         |
|              |        | 1 145 030 | TOTAL | 27 596 | \$5 039 899 |

## Kibuka Mines Pty Ltd, Naracoopa

This company, reviewed under Titanium, produced 923 tonnes of zircon concentrates.

## 2.—Non-Metallic Minerals

### CLAY

#### QUANTITY AND VALUE OF PRODUCTION

| Year      |      | Value          |           | Year  |      | Value          |           |
|-----------|------|----------------|-----------|-------|------|----------------|-----------|
|           |      | m <sup>3</sup> | \$        |       |      | m <sup>3</sup> | \$        |
| 1958-1972 | .... | 1 567 392      | 4 348 020 | 1975  | .... | 112 287        | 572 230   |
| 1973      | .... | 113 896        | 393 815   | 1976  | .... | 100 926        | 334 830   |
| 1974      | .... | 111 487        | 388 096   | 1977  | .... | 87 931         | 284 910   |
|           |      |                |           | TOTAL | .... | 2 093 919      | 6 321 874 |

#### DETAILS OF PRODUCTION

| Company                             | Clay           | Value  | No. of men | Product |
|-------------------------------------|----------------|--------|------------|---------|
|                                     | m <sup>3</sup> | \$     |            |         |
| Agripipe Pottery Pty Ltd            | ....           | ....   | 4          | Pipes   |
| Clifton Brick (Tas.) Pty Ltd        | 31 276         | 93 828 | 40         | Bricks  |
| Goliath Portland Cement Co. Railton | 12 233         | 52 757 | *          | Cement  |
| Grierson, M.A., Dodges Ferry†       | 9 737          | 29 211 | 1          | Bricks  |
| Hazell Bros, Kingston†              | 9 373          | 28 119 | 1          | Bricks  |
| Hobart Brick Co., Granton           | 9 982          | 29 946 | 28         | Bricks  |
| Hobart Brick Co., Kingston          | 3 721          | 11 163 | 1          | Bricks  |
| Humes Ltd, Hamilton                 | 874            | 4 370  | 9          | Pipes   |
| Wunderlich Ltd                      | 3 311          | 13 244 | 21         | Tiles   |
| Zolati & Son Pty Ltd                | 7 424          | 22 272 | 20         | Bricks  |
|                                     |                | 87 931 | 284 910    | 125     |

\*See Limestone.

†Supplies to Hobart Brick Company.

### DOLOMITE

#### QUANTITY AND VALUE OF PRODUCTION

| Year          | Tonnes | Value   | Year | Tonnes | Value     |
|---------------|--------|---------|------|--------|-----------|
|               |        | \$      |      |        | \$        |
| Prior to 1972 | 46 793 | 270 110 | 1975 | ....   | 5 042     |
| 1973          | 5 165  | 29 640  | 1976 | ....   | 10 335    |
| 1974          | 6 434  | 47 444  | 1977 | ....   | 8 617     |
|               |        |         |      | TOTAL  | 82 386    |
|               |        |         |      |        | \$581 618 |

#### Circular Head Dolomite and Trading Co. Pty Ltd, Smithton

This company, the sole producer, employed an average of five men and produced 8 617 tonnes, a decrease of 1 718 tonnes. The stone is milled for 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  | 028 645   |
| <b>TOTAL</b> | .... | .... | .... | .... | .... | .... | 135 491 | 2 938 971 |

**A.P.P.M. Ltd, Tonganah**

The company continued to mine decomposed granite to produce kaolin filler clay for their paper mills.

**LIMESTONE**  
QUANTITY, VALUE OF PRODUCTION AND USAGE

| Year          | Manufacture of cement |                   | Manufacture of carbide |                  | Chemical and metallurgical |                  | Agriculture and other |                  | Totals            |                   |
|---------------|-----------------------|-------------------|------------------------|------------------|----------------------------|------------------|-----------------------|------------------|-------------------|-------------------|
|               | Tonnes                | \$                | Tonnes                 | \$               | Tonnes                     | \$               | Tonnes                | \$               | Tonnes            | \$                |
| 1919-72       | 7 397 095             | 11 384 828        | 874 062                | 3 037 825        | 4 488 380                  | 5 879 163        | 869 018               | 2 058 190        | 13 628 555        | 22 360 006        |
| 1973          | 488 873               | 948 180           | 23 383                 | 2 176 649        | 65 599                     | 343 547          | 56 069                | 179 712          | 633 924           | 1 689 088         |
| 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         |
| <b>TOTALS</b> | <b>9 703 683</b>      | <b>16 897 066</b> | <b>979 801</b>         | <b>4 410 569</b> | <b>4 830 145</b>           | <b>8 472 561</b> | <b>1 189 327</b>      | <b>3 274 303</b> | <b>16 702 956</b> | <b>33 054 439</b> |

**Tasmanian Carbide Products, Ida Bay and Electrona**

This company quarried 54 272 tonnes of limestone at Ida Bay valued at \$802 268. Of this, 20 308 tonnes were used in the production of calcium carbide at the Electrona works and 31 531 tonnes were supplied to the E. Z. Company at Risdon for metallurgical purposes.

Work was commenced at Electrona in rebuilding the entire works and installation of a new Demag furnace. This will allow increased and more efficient production of carbide and carbon black.

Calcium carbide production was 9 737 tonnes valued at \$2 777 769 and acetylene black production was 498 tonnes valued at \$706 885. The average number of persons employed was 195.

**A. R. Beams, Flowery Gully**

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

|   | Tonnes       | \$            |
|---|--------------|---------------|
| Agricultural limestone                            | 1 475        | 14 690        |
| Limestone for chemical and metallurgical purposes | 3 140        | 37 995        |
| Burnt lime for various purposes                   | 5            | 25            |
| <b>TOTAL</b>                                      | <b>4 621</b> | <b>52 710</b> |

Six men were employed.

**Goliath Portland Cement Co. Ltd, Railton**

Studies were undertaken during the year to investigate increasing the capacity of the existing kiln in use. In the quarry, stripping of clay overburden was carried out in the area formerly occupied by the railway line to enable the quarry to be extended in this direction.

A total of 490 514 tonnes of limestone with a cost value of \$1 471 542 was quarried and used in the manufacture of cement. An average of sixteen men was employed in the quarry, for this production.

In addition to the above, 30 877 tonnes of limestone, valued at \$106 784 was produced for sale.

Production of fine cement amounted to 338 342 tonnes valued at \$5 995 419. An average of 275 men was employed.

#### Mole Creek Limestone Ltd, Mole Creek

Quarry benches have now been established to the top of the hill and overburden removal is being pushed forward. This will enable the quarry to be opened up to give more working room. Trees planted around the plant and kiln area are progressing satisfactorily.

Production was 46 990 tonnes of limestone for chemical and metallurgical purposes and 10 951 tonnes for agricultural and other purposes, of total value \$349 076. Average employment was fifteen men.

#### Railton Lime Works, Railton

Two men were employed at this works to crush and mill 9 647 tonnes of limestone, valued at \$28 941 supplied by the Goliath Company.

#### Wright Stephenson Pty Ltd, Pulbeena

This company produced 19 810 tonnes of lime sand, valued at \$151 493 compared with 14 530 tonnes in the previous year. Average employment was three men.

#### R. K. Sulzberger, Flowery Gully

Using a mobile crushing plant Mr Sulzberger crushed a total of 220 tonnes valued at \$1 320.

### 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 to 1972 | 2 849         | 21 852       | 1975        | ....          | ....         |
| 1973         | ....          | 62           | 1976        | ....          | ....         |
| 1974         | ....          | 38           | 1977        | ....          | ....         |
|              |               |              | TOTAL       | 2 949         | \$23 483     |

### PEBBLES

#### QUANTITY AND VALUE OF PRODUCTION

| <i>Year</i>  | <i>Tonnes</i> | <i>Value</i> | <i>Year</i> | <i>Tonnes</i> | <i>Value</i> |
|--------------|---------------|--------------|-------------|---------------|--------------|
|              |               | \$           |             |               | \$           |
| 1957 to 1972 | 14 917        | 245 349      | 1975        | ....          | 859          |
| 1973         | ....          | 824          | 1976        | ....          | 1 716        |
| 1974         | ....          | 1 426        | 1977        | ....          | 1 189        |
|              |               |              | TOTAL       | 20 931        | \$378 343    |

#### Mineral Supplies, Ulverstone

The collection of pebbles for grinding was continued on the beaches around Ulverstone. The output was 563 tonnes, value at \$26 800. An average of six men was employed.

#### G. R. Wise, Youngtown

Production was 45 tonnes of pebbles valued at \$270.

## SILICA

## QUANTITY AND VALUE OF PRODUCTION

| <i>Year</i>  | <i>Tonnes</i> | <i>Value</i> | <i>Year</i> | <i>Tonnes</i> | <i>Value</i> |
|--------------|---------------|--------------|-------------|---------------|--------------|
|              |               | \$           |             |               | \$           |
| 1936 to 1972 | 302 897       | 703 413      | 1975        | .... 27 573   | 95 257       |
| 1973         | .... 17 101   | 52 679       | 1976        | .... 20 479   | 66 630       |
| 1974         | .... 25 410   | 74 828       | 1977        | .... 13 453   | 81 930       |
|              |               |              | TOTAL       | 406 913       | \$1 074 737  |

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

A total of 12 205 tonnes of silica sand, valued at \$54 995 was produced for the manufacture of glass.

**Industrial Sands Pty Ltd, Eagle Point**

This company continued to refine silica sands for various industrial purposes, producing 856 tonnes of sands in various grades and sizings valued at \$23 185. An average of five men was employed.

**Mineral Supplies, Ulverstone**

This firm produced 64 tonnes valued at \$2 000.

### 3.—Construction Materials

#### BUILDING STONE

##### PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

| <i>Stone</i> | <i>Producer</i>     | <i>m<sup>3</sup></i> | <i>Value (\$)</i> | <i>No. of men</i> |
|--------------|---------------------|----------------------|-------------------|-------------------|
| Freestone    | Etna Stone Pty Ltd  | 698                  | 136 728           | 13                |
|              | Kingston Quarries   | 57                   | 2 050             | 1                 |
|              | Pontville Freestone | 294                  | 7 036             | 1                 |
|              |                     | 1 049                | \$145 814         | 15                |

#### CRUSHED AND BROKEN STONE

##### Basalt

##### PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

| <i>Quarry</i>                        | <i>Men</i> | <i>m<sup>3</sup></i> | <i>Value (\$)</i> |
|--------------------------------------|------------|----------------------|-------------------|
| Associated Forest Holdings Pty Ltd   | 4          | 6 905                | 48 335            |
| Australian Newsprint Mills           | 4          | 12 967               | 90 769            |
| Brambles                             | 8          | 34 716               | 277 724           |
| Devon Metal Supplies                 | *          | 2 404                | 19 232            |
| Hobart Quarries Pty Ltd, Bridgewater | 16         | 165 521              | 1 789 250         |
| Holloway, L. G., Round Hill          | 1          | 10 000               | 70 000            |
| Merseylea Quarries                   | 1          | 553                  | 3 406             |
| Sulzberger, R. K., Lilydale          | 2          | 1 730                | 13 610            |
| Talisker Blue Metals, Evandale       | 6          | 45 326               | 352 685           |
| Woodfield & French                   | †          | 92 351               | 646 457           |
| TOTALS                               | 42         | 372 473              | \$3 311 468       |

\*See crushed and broken stone (Dolerite). †See Gravel.

##### Dolerite

##### PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

| <i>Quarry</i>                     | <i>Men</i> | <i>m<sup>3</sup></i> | <i>Value (\$)</i> |
|-----------------------------------|------------|----------------------|-------------------|
| Brighton Council                  | *          | 2 645                | 18 515            |
| Devon Metal Supplies, Devonport   | 8          | 23 022               | 174 766           |
| E. Z. Co. of Australasia, Risdon  | †          | 3 000                | 21 000            |
| Forestry Commission               | *          | 49 491               | 346 437           |
| Glenorchy Quarries                | 11         | 35 776               | 254 962           |
| Hobart Quarries, Lenah Valley     | 30         | 157 277              | 1 492 142         |
| Holloway, L. G.                   | ‡          | 35 510               | 248 570           |
| Huon Municipal Council            | ....       | 625                  | 4 375             |
| Johnson, C. A.                    | *          | 25 269               | 176 883           |
| Launceston Quarries               | 13         | 64 790               | 880 960           |
| Pioneer Quarries, Flagstaff Gully | 18         | 85 873               | 884 821           |
| Stone, A. J., Ulverstone          | 1          | 5 000                | 35 000            |
|                                   | 81         | 488 278              | \$4 538 431       |

\*See Gravel. †See Zinc. ‡See crushed and Broken Stone (Basalt).

##### Limestone

##### PRODUCER, QUANTITY AND VALUE OF PRODUCTION

| <i>Quarry</i>          | <i>Men</i> | <i>m<sup>3</sup></i> | <i>Value (\$)</i> |
|------------------------|------------|----------------------|-------------------|
| G. J. Weily, Glenorchy | 7          | 14 389               | 100 723           |

**Other Stone**  
**PRODUCERS, QUANTITY AND VALUE OF PRODUCTION**

| <i>Quarry</i>                          | <i>Men</i> | <i>m<sup>3</sup></i> | <i>Value (\$)</i> |
|--|------------|----------------------|-------------------|
| A.P.P.M., Diddleum Plains              | 1          | 3 341                | 23 387            |
| Circular Head Dolomite & Trading Co.   | *          | 2 314                | 17 420            |
| Forestry Commission                    | †          | 65 324               | 457 268           |
| H.E.C., Scotts Peak                    | 5          | 5 258                | 36 806            |
| H.E.C., Pieman River                   | 28         | 318 000              | 2 226 000         |
| Department of Housing and Construction | †          | 5 971                | 40 615            |
| Shields Quarries, Rokeby Road          | 1          | 2 477                | 17 339            |
| Other                                  | ....       | 35                   | 280               |
| TOTALS                                 | 35         | 402 720              | \$2 819 115       |

\*See Dolomite. †See Gravel.

**GRAVEL**  
**PRODUCERS, QUANTITY AND VALUE OF PRODUCTION**

| <i>Pit</i>                                       | <i>Men</i> | <i>m<sup>3</sup></i> | <i>Value (\$)</i> |
|--|------------|----------------------|-------------------|
| Associated Forest Holdings Pty Ltd, Surrey Hills | 4          | 30 553               | 152 765           |
| Beaconsfield Council                             | 2          | 12 840               | 64 200            |
| Brambles Limited                                 | *          | 18 364               | 102 670           |
| Broken Hill Proprietary Co. Ltd                  | †          | 56 548               | 282 740           |
| Campbell Town Council                            | 1          | 17 803               | 89 015            |
| Circular Head Municipal Council                  | 3          | 31 494               | 157 470           |
| Deloraine Council                                | 1          | 23 610               | 118 050           |
| Devonport Council                                | 2          | 41 742               | 208 710           |
| Fingal Council                                   | 1          | 10 016               | 50 080            |
| Flinders Council                                 | 1          | 16 194               | 80 970            |
| Forestry Commission                              | 22         | 149 695              | 748 475           |
| George Town Council                              | 3          | 27 311               | 136 555           |
| Gerke, G.  | 2          | 11 079               | 55 395            |
| Glamorgan Council                                | 2          | 18 649               | 93 245            |
| Green Ponds Council                              | 1          | 12 846               | 64 230            |
| Hamilton Council                                 | 2          | 14 255               | 71 275            |
| Johnson, C. R.                                   | 10         | 18 072               | 90 360            |
| Kentish Council                                  | 4          | 10 809               | 54 045            |
| King, L. Pty Ltd                                 | 17         | 16 007               | 92 826            |
| Latrobe Council                                  | 5          | 14 328               | 71 640            |
| Lilydale Council                                 | 1          | 23 698               | 118 490           |
| Longford Council                                 | 1          | 21 907               | 109 535           |
| Port Cygnet Council                              | 1          | 10 511               | 52 555            |
| Portland Municipal Council                       | 1          | 18 914               | 94 570            |
| Department of Main Roads (P.W.D.)                | 100        | 565 779              | 2 828 896         |
| Richmond Council                                 | 1          | 14 311               | 71 555            |
| Ringarooma Council                               | 2          | 21 919               | 109 595           |
| Scottsdale Council                               | 2          | 13 617               | 68 085            |
| Ulverstone Council                               | 2          | 20 612               | 103 060           |
| Westbury, M. C.                                  | 1          | 18 224               | 67 760            |
| Woodfield and French                             | 54         | 70 756               | 537 507           |
| Wynyard Council                                  | 1          | 38 771               | 193 855           |
| Others   | 46         | 131 279              | 672 973           |
| TOTALS   | 296        | 1 521 793            | \$7 813 152       |

\*See Gravel. †See crushed and broken Stone (Other).

## SAND

## PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

| <i>Pit</i>                         | <i>Men</i> | <i>m<sup>3</sup></i> | <i>Value (\$)</i>  |
|------------------------------------|------------|----------------------|--------------------|
| A. A. Ashbolt, New Norfolk         | 1          | 10 913               | 54 565             |
| Besser Tas. Pty Ltd, Calder        | 6          | 40 319               | 254 051            |
| Calvert, P. and A., Sandford       | 1          | 3 940                | 19 700             |
| Cambridge Washed Sands, Sorell     | 6          | 15 295               | 76 475             |
| Gerke, G., Scottsdale              | ....       | 4 228                | 21 140             |
| Groombridge Sand Supplies          | 1          | 4 485                | 38 181             |
| Hobart Quarries, South Arm         | 1          | 52 237               | 261 185            |
| L. King Pty Ltd, Devonport         | *          | 6 545                | 33 409             |
| Lazenby, F. R. and C. M., Sandford | 3          | 5 155                | 25 775             |
| Males, G. L., South Arm            | 3          | 12 573               | 68 655             |
| May, P. L. and P.                  | ....       | 19 592               | 97 960             |
| Millhouse, K. J., Bellerive        | 1          | 4 011                | 20 055             |
| Pinnington, W. G., Beauty Point    | 3          | 6 704                | 61 908             |
| Stubbs Sand and Gravel             | 3          | 17 475               | 113 484            |
| Swain, L. A., Perth                | 1          | 15 736               | 78 680             |
| Woodfield and French, West Tamar   | *          | 12 910               | 92 856             |
| Others                             | 6          | 30 749               | 160 326            |
| <b>TOTALS</b>                      | <b>36</b>  | <b>262 867</b>       | <b>\$1 478 405</b> |

\*See Gravel.

## OTHER ROAD MAKING MATERIAL

## PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

| <i>Pit</i>                              | <i>Men</i> | <i>m<sup>3</sup></i> | <i>Value (\$)</i> |
|---|------------|----------------------|-------------------|
| Abminco N.L.                            | *          | 70 550               | 352 750           |
| Barnett, J. S.                          | 2          | 4 136                | 20 680            |
| Beams, A. R.                            | †          | 2 925                | 21 451            |
| Hydro-Electric Commission, Pieman River | ‡          | 26 800               | 134 000           |
| Hydro-Electric Commission, Strathgordon | ‡          | 7 453                | 37 265            |
| Mt Lyell Mining and Railway Co. Ltd     | 2          | 10 580               | 53 966            |
| Department of Main Roads (P.W.D.)       | §          | 4 147                | 20 735            |
| Portland Council                        | §          | 1 225                | 6 125             |
| Shaw Contracting Pty Ltd                | ....       | 4 500                | 22 500            |
| Spring Bay Municipal Council            | §          | 4 626                | 23 130            |
| Warman International, King Island       | ¶          | 6 537                | 32 685            |
| Woodfield and French, Launceston        | §          | 24 075               | 120 375           |
| Zeehan Municipal Council                | §          | 1 038                | 5 190             |
| Other                                   | ....       | 474                  | 2 465             |
| <b>TOTALS</b>                           | <b>4</b>   | <b>169 066</b>       | <b>\$853 317</b>  |

\*See Tin.

†See Limestone (Agricultural).

‡See crushed and broken stone (Other).

§See Gravel.

¶See Tungsten (Scheelite).

## 4.—Fuel Materials

### 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 1972 | 10 231 094    | 27 312 998   | 1975        | .... 161 922  | 972 491      |
| 1973          | .... 114 588  | 530 875      | 1976        | .... 189 489  | 1 689 878    |
| 1974          | .... 127 460  | 678 665      | 1977        | .... 198 966  | 2 152 381    |
| TOTALS        |               |              |             | 11 023 519    | \$33 337 288 |

H. Murchie, Deputy State Mining Engineer, Hobart, reports that there has been an increase in production of 9 477 tonnes. The number of employees increased from eighty-two to eighty-eight, of whom forty-six were employed underground. The production per man year increased from 4 211 to 4 325 tonnes for underground employees, but decreased from 2 311 to 2 261 overall.

#### Duncan Coal Mine, Fingal

Production increased by 9 477 tonnes and the number of men employed by six.

## 5.—Foreign Ores

The total value of the metallurgical products of four large works treating foreign ores imported into Tasmania was approximately \$208 169 966.

### ALUMINIUM

#### Comalco Aluminium (Bell Bay) Ltd, Bell Bay

In the production of 101 289 tonnes of aluminium 197 217 tonnes of imported alumina were processed.

Average employment was 1 179 men.

The No. 4 potline was completed and commissioned. Total capacity is now about 114 000 tonnes of aluminium per year. Investigation of the recovery of cryolite from fume, etc., was started and a trial cryolite recovery plant installed for the No. 4 potline.

### FERRO-MANGANESE, FERRO-SILICON AND SILICO-MANGANESE

#### Tasmanian Electro-Metallurgical Co. Pty Ltd, Bell Bay

During the year 15 103 tonnes of manganese ore from Groote Eylant were smelted to produce 112 924 tonnes of manganese alloys for the steel industry.

The alloys were 71 277 tonnes of high carbon ferro-manganese and 41 647 tonnes of silico-manganese reported under Silicon.

Production of various alloys for the steel-making industry continued. Owing to the poor market world-wide, towards the end of the year, the older No. 1 and No. 2 furnaces were temporarily shut down, and production restricted to the No. 3 and No. 5 furnaces.

## TITANIUM DIOXIDE

### Tioxide Australia Pty Ltd, Heybridge

Production of titanium dioxide from Western Australia ilmenite was comparable to that of last year.

Capital expenditure for the year amounted to \$1 228 224 and was spent on:—

- Reagent preparation area.
- Environmental projects (gas scrubbers).
- Additional water treatment capacity.
- Additional vacuum pump.
- Other items for improving plant efficiency.

The number of persons employed in Tasmania dropped from 461 to 437 and the turnover rate decreased from 11·9 per cent to 11·6 per cent.

#### *Accident statistics*

|                               |      |      |      |      |         |
|-------------------------------|------|------|------|------|---------|
| Number of lost time accidents | .... | .... | .... | .... | 12      |
| Days charged                  | .... | .... | .... | .... | 84      |
| Man hours exposure            | .... | .... | .... | .... | 823 063 |
| Frequency rate                | .... | .... | .... | .... | 14      |
| Incidence rate                | .... | .... | .... | .... | 0·026   |
| Duration rate (days)          | .... | .... | .... | .... | 7       |

## ZINC, CADMIUM, COBALT OXIDE AND SUPERPHOSPHATE

### Electrolytic Zinc Company of Australasia Limited, Risdon

This company, described 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 the Chief Geologist, I. B. Jennings, B.Sc. (Hons), A.M.Aust.I.M.M.

The Geological Survey Branch continued to provide an expanding range of services during the year. The increasing complexity of various geological investigations require that officers of the Branch must continue to specialise in new techniques and keep abreast of the increasingly complicated instrumental methods of data gathering along with the concomitant complexity in the interpretation of such data. In a relatively small organisation such as exists in Tasmania this creates greater demands upon individual officers than is the case in the larger States. However, we are fortunate in having built up a staff which has proved capable of keeping the Branch abreast of new developments in all the fields of geology in which it is engaged.

During the year further progress was made in the systematic assessment of the groundwater resources of the State as well as continuing to meet the demands from the public for advice on groundwater problems. Problems resulting from unstable slopes in both soils and rocks have continued to make demands upon the Engineering Geology Section reflecting the accumulating problems resulting from the spread of urban development into fragile areas.

The Regional systematic mapping program has continued with the completion of mapping of five, 1:50 000 sheets and mapping is continuing of a further nine sheets. Explanatory notes to accompany the maps published have also been prepared for publication.

Regional exploration for coal resources in the area south of the Fingal Valley by means of a gravity survey was continued and by the end of the year most of the field data had been collected. However, the processing of this data will present a formidable problem during next year.

At the same time details geological mapping of the potential coal bearing areas and the outlining of reserves by diamond drilling continued. This project is regarded as being of prime importance in order to ensure that the State's coal requirements can be met from indigenous sources.

The Branch has been engaged on a study of the role of humic acids in the transport of metals in solution for some years. The initial research program has now been completed and plans are being formulated to carry out additional research into using this material for practical purposes, leaching of low grade ore deposits, possibly assisting in pollution control from ore deposits, waste heaps and slimes dams appear to be useful avenues of research for the future.

Archival and information services to Departmental officers, representatives of exploration companies and the public were expanded in order to provide basic data to assist in the continuing active minerals and petroleum exploration programs being conducted within the State and on the surrounding continental shelves.

In several areas the Branch continued to provide assistance in the field of geological education where required.

Mr G. B. Everard, Mineralogist and Petrologist, retired on 16 April 1977 after nearly 28 years service with the Branch. I would like to express my appreciation of his contributions to the work of the Department.

Reports of the various heads of Sections follow and set out the activities of the Branch in more detail.

## REGIONAL GEOLOGY

### Supervising Geologist E. Williams reports—

P. Lennox joined the Department in December 1976, and R. Castleden joined in January 1977.

1:250 000 Map Series—

Port Davey has been published. King Island—Flinders Island Sheet is being drafted for publication.

1:50 000 Map Series—

Strahan and Ringarooma Sheets have been published.

Kingborough is being drafted for publication.

Huntley Sheet: Geologists M. P. McClenaghan, A. V. Brown, N. J. Turner, P. W. Baillie and P.

Lennox completed the field mapping, and this sheet is being drafted for publication.

- Boobyalla Sheet: Geologists P. W. Baillie and N. J. Turner completed the field mapping, and this sheet is being drafted for publication.
- Davey Sheet: Geologist P. R. Williams completed the field mapping, and this sheet is 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: Geologists M. P. McClenaghan and P. R. Williams continued mapping.
- Pedder Sheet: Geologists M. P. McClenaghan and N. J. Turner continued mapping.
- Smithton Sheet: Geologists P. Lennox continued mapping.
- Eddystone Sheet: Geologists P. W. Baillie and P. R. Williams commenced mapping.
- St Marys Sheet: Geologist R. Castleden commenced mapping.
- Corinna Sheet: Geologist A. V. Brown commenced mapping.
- St Valentines Sheet: Geologists P. W. Baillie, G. R. Green and P. R. Williams commenced mapping.
- Davey Explanatory Notes (1:250 000) has been published. Explanatory Notes of 1:250 000 Hobart and Oatlands Sheets are being prepared. Explanatory Notes for the 1-mile Burnie Sheet and 1:50 000 Brighton Sheet have been published. Notes for the 1-mile Sheffield Sheet have been prepared. Reports for 1-mile Mackintosh and Frankford Sheets, and 1:50 000 Strahan, Oatlands, Kingborough, and Ringarooma-Boobyalla 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 two geologists until November, Geologist P. L. F. Collins returned to duty at this time after completing Ph.D. residential requirements at the University of Tasmania.

The following activities were carried out:—

#### METALLICS

- (1) Continuation of investigation of detrital tin deposits in the north-east generally including:—
  - (a) completion of an 18-hole drilling program in the Arba-Black Creek area, Branxholm.
  - (b) resumption of exploratory drilling in the Herrick-Pioneer area.
  - (c) commencement of exploratory drilling in the Cybele Creek area, east of Gladstone.
- (2) Continuation of diamond drilling program on the Great Pyramid tin prospect, Upper Scamander.
- (3) Completion of surface investigation at the Big Ben prospect, Zeehan district and completion of one diamond drill exploratory hole.
- (4) Examination of mineral prospects and small mines throughout the State. Examination of mineral potential of areas under application to purchase from the Crown. Advice to prospectors and the general public.

#### FUEL MINERALS

- (1) Continuation of explanatory 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) Commencement 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.

## NON-METALLICS

- (1) Continuation of construction materials survey and register from government, local government and private industry records.
- (2) Commencement 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) Representative to the Australian Road Research Board Workshop on Geology of Quarries.

## GENERAL

- (1) Continuation of studies of the Cambrian succession of the Mt Darwin-Rosebery-Pieman River mineralised belt and mineral relationships.
- (2) Commencement of mineral appraisal of the regional geology of the Cleveland mine area and south and the St Valentines map sheet in association with the Regional Mapping Section.
- (3) Supervision of Tasmania section of the Australian Development Assistance Bureau course on mineral exploration.
- (4) Presentation of paper on isotope studies/mineral exploration at Geological Society of Australia Symposium, Queenstown.
- (5) Representation at the International Geological Correlation Project, Victoria, N.S.W. and South Australia.
- (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 consisted of a Supervising Geologist, two Senior Geologists and four Geologists. Geologist Carolyn J. Knights resigned in December.

## GROUNDWATER

Arising from investigation work done in previous years, interest in the use of groundwater is rising. A major investigation based on water in coastal sands has been conducted at Greens Beach, in the Tamar and investigations resulting in yielding bores have been made at Badger Head, Stony Head for the Army, Gladstone, Maria Island, Winnaleah, Cape Portland, Carlton and Lady Barron. Sites have been examined and recommended for drilling at Devonport, Tasman, Koonya, Stonor, George Town, New Norfolk, Deloraine, Oatlands, Oyster Cove, Melton Mowbray, Huonville for the High School, Lilydale and Pawleena.

The North-East Regional Groundwater survey has been completed and has resulted in much local interest, and the departmental drilling machines have been occupied with contract work, in default of a service by contractors. Mapping of wells, bores, and springs has been conducted in the Oatlands region and regional investigation will begin soon. The Department sponsored a two year project on groundwater in coastal aquifers in conjunction with the Geography Department of the University of Tasmania.

## SLOPE STABILITY

The instability of soft rock slopes continues to generate a great deal of work. House sites, and subdivisions small and large have required advice, mainly in the Tamar and on the North-West Coast, but requests have appeared from new areas such as South Hobart and Lilydale, indicating a rising awareness of this geological hazard on the part of councils, subdividers and landowners. Major studies have been made at Beauty Point, Bell Bay and Taroona and others of some substance at Kingborough, Kelceys Tier, Evandale, Dysart and near Western Junction on the Launceston-Western Junction line.

The section has put into use a trailer mounted auger drill and this had enabled more detailed investigations. A greater amount of soil testing and the development of better analytical methods has raised the level of stability assessments. Necessary fundamental work has been done on X-ray mineralogy of clays, on piezometer behaviour over long periods, on the expansive properties of clays and on zoning methods. As part of these studies, the Lawrence Vale Landslip has been re-examined.

Supervising Geologists P. C. Stevenson attended and gave a paper at the Symposium on Landslides and Mass Movements of the International Association of Engineering Geology in Prague, Czechoslovakia in September and was able to make a tour of that State to examine landslides and rock faces.

#### ROCK FACE STABILITY

Recent years have seen the world-wide development of analytical methods for the determination of stability in rock faces. These methods have been used in several old quarry faces at Burnie and in road cuts at Cam River. A watching brief is being maintained on several high road cuts in rock in the Hobart area by the technique of annual sets of stereophotographs, and a detailed study of cliff erosion was made at Lindisfarne.

#### FOUNDATION STUDIES

Studies of rock conditions have been made at Brighton for additions to the treatment plant, in Hobart for extensions to the Telecom building, for a gas storage tank at Bell Bay and for a proposed marina in Prince of Wales Bay. Preliminary studies of sites for dams were made on several East Coast rivers and detailed investigations made for small storage dams at Ulverstone and Wynyard.

#### ROUTE STUDIES

Advice was given on the geology and hazards of a road route from Latrobe to Devonport and a pipeline in the same region for consulting engineers.

#### GENERAL GEOLOGY

The specialised knowledge of the section assisted in the clarification of problems of regional geology in the Precambrian rocks of the North-West and in the depositional environment of Tertiary rocks in the North-East.

#### FURTHER TRAINING

Three section members who had not previously attended, passed St John's Ambulance First Aid Course.

The section organised and attended a week long seminar on Geophysical methods in Engineering Geology, by Dr D. E. Leaman.

Senior Geologists W. R. Moore attended a course on Engineering Geology Investigations organised by Amdel in Adelaide in March.

#### GEOPHYSICS

##### **Geophysicist D. E. Leaman reports—**

During 1977 only those survey requests with priority or capable of ready treatment were handled and the need for further geophysical staff was emphasized. A recommendation for an appointment of an assistant was made in December. Improved public service computing facilities are also an urgent need.

#### ORE DEPOSITS

No surveys were undertaken during the year. The file of maps with index of all geophysical work done in Tasmania was revised. This index is mostly used by commercial exploration companies operating in Western Tasmania. It is intended that the assistant geophysicist will spend about half his time in evaluation and research into method usage and interpretations in local conditions so that the quality of exploration work can be improved.

### OTHER DEPOSITS

Some evaluation of quarry sites for rock condition or environmental impact continues to be requested; quarries at Carlton, Sandfly, Pontville and Flagstaff Gully were inspected.

The principal endeavour in 1977 was the continuing data collection and reduction related to the coal resources evaluation in central east Tasmania. The gravity survey is nearing completion although some difficult areas remain. The seismic reflection equipment acquired in 1976 finally entered service after a long series of teething problems. About one-third of the test program designed to assess the equipment, its use in local conditions and a data-rock reference file has been completed. No computer processing has yet been undertaken but seems certain to be required in complex geological situations. Some additional hardware must be purchased before this is possible. The seismic reflection method has never been used in any major or coherent way in Tasmania. Most previous use has been oil exploration offshore and much has to be learnt about the signature of local conditions before the coal program receives full impact from this technique.

### REGIONAL PROJECTS

The Bureau of Mineral Resources in Canberra has made statewide, including offshore, gravity data available and this has been collated and read for structural interpretation. An assessment of granite boundaries in the North-East has been completed.

### 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 matters are referred. Assistance was provided with surveys at South Hobart, Mt Nelson and Prince of Wales Bay. Considerable time was spent aiding assessment of data derived from pump tests at Greens Beach.

### GENERAL AND DEVELOPMENT

Gravity gradient methods have been evaluated since these offer better structural resolution in regional and coal survey problems.

A series of geophysics seminars was organised during March to provide staff in the department up to date information on methods, their value and local usage.

No equipment or developmental research was possible during the year due to time and financial restriction. Technician time was almost wholly engaged in equipment repair and maintenance.

### CARTOGRAPHIC DRAUGHTING

#### Senior Draughtsman D. M. Hardy reports—

The following progress was made on colour map productions.

#### The 1:250 000 Series

Port Davey SK 55-7: printed in 18 colours. This now leaves only King and Flinders Islands to complete the series. These will be produced as one sheet.

#### The 1:50 000 Series

Oatlands Sheet No. 68: printed in 8 colours.

Ringarooma Sheet No. 32: printed in 11 colours.

Strahan Sheet No. 57: printed in 12 colours.

Davey Sheet No. 91: fair drawing proceeding.

Boobyalla Sheet No. 24: fair drawing proceeding.

The balance of time was used in producing 90 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) Surveying and levelling of a landslip investigation area at Lawrence Vale, Launceston.
- (d) All departmental drill holes at Oliver Hill (Sheffield) tied in to the H.E.C. Trig. Stn on Tin Spur.
- (e) Further work carried out at Herrick on bore hole locations; also a similar survey at Derby.
- (f) The Devon Mine, Cradle Mountain area.
- (g) Greens Beach, northern Tasmania.
- (h) A survey for a seismic survey at Prince of Wales Bay, Hobart.
- (i) Levelling of a gravity survey at Fingal.
- (j) A survey of a proposed quarry at Leslie Road, Kingston.
- (k) A survey of Carlton House quarry, Sorell area, Hobart.
- (l) Further survey work at Etna Stone Quarry, Pontville.
- (m) A survey of Coles Bay Granite Pty Ltd quarry.
- (n) Plans were produced of all surveys.

## GEOCHEMISTRY

## Geochemist W. E. Baker reports—

A total of some 2 500 analyses were carried out for aluminium, antimony, barium, calcium, cobalt, copper, gold, iron, lead, magnesium, manganese, molybdenum, nickel, silicon, silver, tin, tungsten, vanadium and zinc in a variety of samples which included minerals, rocks, stream sediments, soils, vegetation, water and humic materials.

Statistical evaluation of the analytical results for samples from the Mt Roland area indicate that only one anomaly is of sufficient interest to warrant further investigation. Geochemical studies are unlikely to be of use in locating the source of the anomaly since it appears to be under deep scree, well up on the slopes of the mountain. Geologically, it seems likely that the source lies in the unconformity between Cambrian volcanics and Ordovician sediments.

Progress with investigations in the Lisle goldfield has been very slow due largely to the inadequate laboratory facilities. Attempts will be made to relate gold analysed in soils and vegetation to recoverable gold in the underlying drift.

Studies of humic substances to date have been compiled in a thesis and submitted to the University of Tasmania. Further investigations are planned which will involve the use of large quantities of humic substances in various field trials which are aimed at developing an environmentally acceptable means of treating mine dumps. It may be possible to use natural materials to reduce contamination of river systems by metals present in mine dumps and also eventually produce metal enriched materials which may be worth subjecting to recovery processes.

The X-ray diffraction equipment has been used extensively during the year, largely in the study of various clay samples. A variety of other minerals, which are difficult to identify by other means, have also been processed through this equipment.

Projects which are under way continue to be frustrated by the conditions in the area used for geochemical laboratories. Other projects have had to be deferred since they involve procedures which would be dangerous under conditions other than those to be found in well designed chemical laboratories.

## PALAEOLOGY

The period January-April was spent on long service leave. At the close of this interval, whilst in London, I took the opportunity to spend two weeks at the British Museum (Natural History) to study the type collections of several important Tasmanian Permian brachiopods which were collected early in the nineteenth century. Probably the most significant result of these studies was the establishment of the original provenance of the spiriferid brachiopod *Trigonotreta stokesi* Koenig, 1825. This is the type species of *Trigonotreta*. Consequently, the species, and hence the genus, can now be placed on a sound basis. The name *Trigonotreta* clearly predates the more commonly used, but incorrect, term *Neospirifer* Fredericks, 1924. The establishment of *Trigonotreta* is not only of scientific importance, but is also of historical interest since it is the first described Australian fossil taxon. The results of this work have been submitted to the *American Journal of Paleontology* for publication.

Biostratigraphic studies of the Permian faunas of the St Marys area have been commenced. Similar studies are in progress in conjunction with the Kingborough Quadrangle stratigraphic drilling program.

Dr R. B. Rickards (University of Cambridge) has greatly assisted with critical graptolite determinations. Graptolites are the most exact of all Early Palaeozoic age indicators, and an important fossiliferous sequence of graptolite-trilobite-brachiopod faunas spanning the Ordovician-Silurian boundary has now been established in the Huntley Quadrangle. There is little doubt that this will prove to be the best reference section anywhere in Australia. Dr E. M. Truswell (B.M.R.) continues her studies of Tasmanian Permo-Carboniferous palynofloras. Her interim report on studies so far has been published. Dr J. B. Jago (South Australia) continues his studies of Tasmanian Cambrian trilobite faunas. He is currently working on new discoveries in the St Valentines and Huntley Quadrangles.

Various collections of fossil specimens have been identified for Hobart Matriculation College, various schools and other members of the general public.

## PUBLICATIONS

## Publications Officer E. L. Martin reports—

The following publications were printed during the year:—

Geological Survey Bulletin 55. The Blue Tier Batholith, by D. E. Groves, J. D. Cocker and D. J. Jennings.

Geological Survey Bulletin 5. Gunns Plains, Alma and other Mining Fields, North-West Coast, by W. H. Twelvetrees (reprint).

Geological Survey Explanatory Report 1-mile Series. Sheet 28 (8015N) Burnie, by R. D. Gee, with contributions by A. B. Gulline, A. P. Bravo, N. J. Clarke, G. R. Green and V. M. Threader.

Geological Survey Explanatory Report 1:50 000 Series. Sheet 75 (8312N) Brighton, by D. E. Leaman, with contributions by F. L. Sutherland, E. A. Colhoun and V. M. Threader.

Technical Reports No. 20 (for 1975).

Occurrences of gemstone minerals in Tasmania (4th edition).

Notes of procedures for the occupation of land for mining purposes (8th edition).

Geological Survey Bulletin 56 (Palynology of the Permo-Carboniferous in Tasmania: an interim report, by Elizabeth M. Truswell) was in press at the end of the year.

Fifty-three unpublished reports were edited and issued during the year and subject indexes to the 1976 reports were prepared.

Over 500 photographs were added to the Department's collection during the year. The Assistant Publication Officer took a series of photographs of the landslips on the railway line near Western Junction, and of temporary excavations in Hobart. In addition to routine graphic arts work 100 microfiche copies were produced to accompany the Burnie Explanatory Report. A set of prints with accompanying descriptions were produced and bound for all R-series photographs.

## LIST OF UNPUBLISHED REPORTS, 1977

| <i>No.</i> | <i>Title</i>   | <i>Author</i>                     | <i>Date</i> |
|------------|--|-----------------------------------|-------------|
| 1977/1     | The boundary relationship of the Concert Schist and the Oonah Quartzite and Slate correlate at Dundas.                   | N. J. Turner                      | 5.1.77      |
| 1977/2     | Groundwater and site investigations near Koonya.   | W. C. Cromer                      | 13.1.77     |
| 1977/3     | Seismic survey, Surrey Lagoon area, Herrick.   | W. R. Moore                       | 13.1.77     |
| 1977/4     | Groundwater investigations near Pawleena.  | W. C. Cromer                      | 18.1.77     |
| 1977/5     | Seismic survey at Swain Creek, north-east Tasmania.  | W. R. Moore                       | 21.1.77     |
| 1977/6     | Groundwater investigations at Badger Head.   | D. J. Sloane<br>W. C. Cromer      | 3.2.77      |
| 1977/8     | Cliff stability investigation of a property at Lindisfarne.  | W. R. Moore                       | 11.2.77     |
| 1977/9     | A assessment of the cutting failure at kilometre 15, Launceston to Western Junction line, Tasmanian Government Railways. | P. C. Stevenson<br>I. B. Jennings | 1.3.77      |
| 1977/10    | Site stability investigation for a proposed storage tank at Bell Bay.  | W. C. Cromer<br>D. J. Sloane      | 3.3.77      |
| 1977/11    | Groundwater prospects at the Stony Head Artillery Range.   | W. R. Moore                       | 4.3.77      |
| 1977/12    | Results from test pits on R. French's property at Spreyton.  | W. L. Matthews                    | 24.3.77     |
| 1977/13    | Slope stability at Liverpool Crescent, West Hobart.  | P. C. Stevenson                   | 4.4.77      |
| 1977/14    | Site investigation at the Bridgewater sewerage treatment plant.  | W. C. Cromer<br>R. C. Donaldson   | 14.4.77     |
| 1977/15    | Evaluation of proposed rural-residential subdivision, Brighton Municipality.   | R. C. Donaldson                   | 20.4.77     |
| 1977/16    | Groundwater prospects near Reedy Marsh Road, Deloraine.  | W. L. Matthews                    | 19.4.77     |
| 1977/17    | Examination of a proposed dam site on Camp Creek, Wynyard.   | W. L. Matthews                    | 5.5.77      |
| 1977/18    | Investigation of possible highway routes between Latrobe and Devonport.  | W. L. Matthews                    | 19.5.77     |
| 1977/19    | Further comments on Early Palaeozoic (Late Ordovician-Early Silurian) Graptolites in the Huntley Quadrangle.             | P. W. Baillie                     | 20.5.77     |
| 1977/20    | Damage to a house at Punchbowl Road, Launceston.   | C. J. Knights                     | 1.6.77      |
| 1977/21    | Geological map of the North-West Bay area.   | N. Farmer                         | 7.6.77      |
| 1977/23    | Review of literature on expansive soils.   | C. J. Knights                     | 9.6.77      |
| 1977/24    | Foundation investigation for telephone exchange, Davey Street, Hobart.   | R. C. Donaldson                   | 29.6.77     |
| 1977/25    | Preliminary report on age dating of basalt samples from the Ringarooma 1:50 000 Sheet.                                   | A. V. Brown                       | 30.6.77     |
| 1977/26    | Gravity survey of north-eastern Tasmania. Analysis of pluton margins.  | D. E. Leaman                      | 15.9.77     |
| 1977/27    | Gravity survey of north-eastern Tasmania. Re-interpretation of the Gladstone section.                                    | D. E. Leaman                      | 29.8.77     |
| 1977/28    | Groundwater prospects, Lisdillon, Little Swanport.   | D. J. Sloane                      | 4.7.77      |
| 1977/29    | Investigation of land proposed for subdivision. Leith-Forth area.  | R. C. Donaldson                   | 6.7.77      |
| 1977/30    | Investigation of proposed marina site, Prince of Wales Bay.  | D. E. Leaman<br>W. R. Moore       | 13.7.77     |
| 1977/31    | Inspection of two alternative reservoir sites, Ulverstone.   | R. C. Donaldson                   | 14.7.77     |
| 1977/32    | Seismic survey on Bridgewater causeway.  | D. E. Leaman                      | 14.7.77     |
| 1977/33    | Palynology of a Triassic carbonaceous sequence at South Cape Bay.  | S. M. Forsyth                     | 15.8.77     |
| 1977/34    | Inspection of a proposed subdivision below Bonnet Hill.  | R. C. Donaldson                   | 17.8.77     |
| 1977/35    | House damage in the Tarooma area.  | C. J. Knights                     | 25.8.77     |
| 1977/36    | Road foundation failures, Channel Highway Tarooma.   | R. C. Donaldson                   | 6.9.77      |
| 1977/37    | Piezometric measurements in Tertiary lacustrine sediments in the Tamar Valley.   | C. J. Knights                     | 13.9.77     |
| 1977/38    | Seismic survey, Sandfly quarry site.   | D. E. Leaman                      | 31.8.77     |
| 1977/39    | Investigation of the stability of land at Legana Beach Road, Legana.   | C. J. Knights                     | 1.9.77      |
| 1977/40    | Investigation of road movement at Strickland Avenue.   | C. J. Knights                     | 1.9.77      |
| 1977/41    | Foreshore instability near Tarooma High School.  | R. C. Donaldson                   | 13.9.77     |

LIST OF UNPUBLISHED REPORTS, 1977 — *cont.*

| <i>No.</i> | <i>Title</i>  | <i>Author</i>                    | <i>Date</i> |
|------------|---|----------------------------------|-------------|
| 1977/42    | Reserves of dolerite gravel at Sugarloaf Road quarry, Carlton.                                  | V. M. Threader                   | 20.9.77     |
| 1977/43    | Stability of a proposed subdivision, Everton Lane area, Evandale.                               | W. L. Matthews                   | 23.9.77     |
| 1977/44    | Notes on groundwater and dam sites, south-eastern coastal streams area.                         | D. J. Sloane                     | 30.9.77     |
| 1977/45    | Test pits on Chugg's property, Evandale.  | W. L. Mathews                    | 10.10.77    |
| 1977/46    | Preliminary reconnaissance seismic survey, potential quarry site, Cascades Road, Burnie.        | W. R. Moore                      | 11.10.77    |
| 1977/47    | A landslip investigation on the tow area of an old landslip at McEwans Road, West Tamar.        | C. J. Knights                    | 14.10.77    |
| 1977/48    | Groundwater possibilities at the Trebilcock Rest Home, Carlton.                                 | W. C. Cromer                     | 13.10.77    |
| 1977/49    | Test pits on Crowden's property at Kelcey Tier, Devonport.                                      | W. L. Matthews                   | 25.10.77    |
| 1977/50    | Seismic survey to establish the rippability of rock at Holloway's quarry at Round Hill, Burnie. | W. R. Moore                      | 26.10.77    |
| 1977/51    | Preliminary report on an alternative groundwater scheme for the town supply at Gladstone.       | W. R. Moore                      | 28.10.77    |
| 1977/52    | Groundwater investigation, Chinamans Bay, Maria Island.   | W. C. Cromer                     | 15.11.77    |
| 1977/53    | Investigation of the Lawrence Vale landslip.  | C. J. Knights                    | 28.11.77    |
| 1977/54    | Slope stability in the Bell Bay port area.  | R. C. Donaldson<br>C. J. Knights | 1.12.77     |
| 1977/55    | Investigation of proposed pipeline route, Devonport and Latrobe.                                | R. C. Donaldson                  | 15.12.77    |

# 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.

There was a small increase in the number of samples registered over last year but a decrease in the number of determinations made, the number of determinations per sample, 2.0, being lower than for the last few years but close to the previous normal level.

The number of water analyses increased again, particularly complete analyses which although recorded as single determinations above involve ten or more individual measurements. Tin assays were again the main determination with a small increase over the previous two years. Tungsten assays reached a record level.

The capacity for analytical work during the year was reduced by vacancies and long service leave.

Metallurgical activity particularly in the pilot plant increased due to Abminco N.L. and Renison Ltd both employing their own staff on projects in out pilot plant. Renison worked on one project to recover tin from a calcined sulphide concentrate while Abminco staff were employed on a number of projects covering the Cleveland operation and to a lesser extent the Aberfoyle mine.

## TYPE AND NUMBER OF TESTS

| <i>Type of Test</i>        | <i>Number</i> | <i>Type of Test</i>         | <i>Number</i> |
|----------------------------|---------------|-----------------------------|---------------|
| <b>I. QUANTITATIVE—</b>    |               |                             |               |
| Elements—                  |               |                             |               |
| Aluminium ....             | 46            | Strontium ....              | 18            |
| Antimony ....              | 78            | Sulphur ....                | 97            |
| Arsenic ....               | 122           | Tin ....                    | 970           |
| Barium ....                | 18            | Tellurium ....              | 7             |
| Bismuth ....               | 114           | Titanium ....               | 63            |
| Boron ....                 | 1             | Tungsten ....               | 695           |
| Cadmium ....               | 6             | Vanadium ....               | 47            |
| Calcium ....               | 62            | Yttrium ....                | 18            |
| Carbon and CO <sub>2</sub> | 217           | Zinc ....                   | 162           |
| Chromium ....              | 111           | Zirconium ....              | 30            |
| Cobalt ....                | 19            |                             | 4 262         |
| Copper ....                | 147           | Water Etc.—                 |               |
| Fluorine ....              | 43            | Complete analysis           | 521           |
| Germanium ....             | 2             | Partial analysis            | 183           |
| Gold ....                  | 204           | Deposit Gauges              | 51            |
| Iron (ferric) ....         | 300           |                             | 755           |
| Iron (ferrous)             | 72            | Miscellaneous—              |               |
| Lead ....                  | 100           | Ash ....                    | 191           |
| Lithium ....               | 18            | Base exchange capacity      | 2             |
| Magnesium ....             | 38            | Calorific value             | 71            |
| Manganese ....             | 50            | Cation exchange capacity    | 7             |
| Mercury ....               | 5             | Combined water              | 18            |
| Molybdenum ....            | 7             | Insoluble ....              | 6             |
| Nickel ....                | 29            | Loss of ignition            | 7             |
| Niobium ....               | 18            | Moisture ....               | 195           |
| Nitrogen ....              | 4             | Phase analysis-lead         | 1             |
| Phosphorus ....            | 48            | Soluble salts in bricks     | 18            |
| Potassium ....             | 31            | Volatiles ....              | 176           |
| Rubidium ....              | 18            |                             | 692           |
| Selenium ....              | 2             | <b>II. QUALITATIVE</b> .... |               |
| Silicon ....               | 90            |                             | 18            |
| Silver ....                | 102           |                             |               |
| Sodium ....                | 33            |                             |               |

TYPE AND NUMBER OF TESTS—*cont.*

| <i>Type of Test</i>   | <i>Number</i> | <i>Type of Test</i>                  | <i>Number</i> |
|-----------------------|---------------|--------------------------------------|---------------|
| III. CERAMIC—         |               | Gold (alluvial by count) ....        | 43            |
| Sand determinations   | 48            | Heavy liquid separation              | 4             |
| Specimen bricks ....  | 6             | Magnetic separation                  | 12            |
| Fusion points ....    | 5             | Pan concentration ....               | 1             |
|                       | — 59          | Settling ....                        | 8             |
| IV. METALLURGICAL—    |               | Sizing (including cyclo-sizing) .... | 1 038         |
| Crushing and grinding | 21            | Tabling ....                         | 3             |
| Density ....          | 2             | Tank testing ....                    | 16            |
| Examination ....      | 10            |                                      | — 1 159       |
| Flotation ....        | 1             |                                      | 6 945         |

## RESEARCH INVESTIGATIONS

|                  |   |                     |    |
|------------------|---|---------------------|----|
| Tin ....         | 6 | Mica ....           | 1  |
| Tungsten ....    | 7 | Grinding balls .... | 1  |
| Chromite ....    | 1 | Ceramics ....       | 1  |
| Iron ....        | 1 | Polution ....       | 1  |
| Beach sands .... | 1 |                     | —  |
|                  |   | TOTAL ....          | 20 |

## SUMMARY OF INVESTIGATIONS

## Tin

R.730—Abminco N.L., occurrence of cassiterite in black microschist in Khaki lode, Cleveland mine.

A mineralogical examination showed the material was a microschist containing fine-grained magnetite.

As the cassiterite grain size showed 92 per cent of the tin occurred in fractions readily recovered by gravity methods no problem should be found in recovering the tin from this material.

R.748—Nothorn Development Pty Ltd, North Valley mill, Waratah

A number of mill products were submitted for examination. As a result of this work it was recommended that—

- (1) the jig feed be screened to produce a higher grade jig concentrate,
- (2) the +250  $\mu$  m jig concentrate should be ground,
- (3) froth floatation should be used to remove sulphides, followed by,
- (4) screening and the tabling of the screen products to produce final concentrates.

R.749—Renison Ltd, Renison Bell

The first report on this project covers work done by Mr C. A. Brown of Renison Ltd at this laboratory and at Amdel in Adelaide.

Early bench scale work on the calcining of pyrrhotite concentrate from Renison was done in Adelaide. Subsequently pyrrhotite concentrate was roasted in North-West Acid's fluid bed roasters to produce a calcine which was concentrated in the pilot plant of this laboratory. Using magnetic separation and gravity concentration 40 per cent of the tin in the calcine was recovered in a concentrate assaying 40 per cent Sn.

The second report covers work done at the request of Renison Ltd to produce a quantity of magnetics from this calcine for grinding studies at CSIRO. The non-magnetics thus produced were concentrated after hydro-separation to yield a table feed, and after hydraulic cycloning of the separator overflow to produce a vanner feed. A recovery of 50 per cent of the tin was achieved in a concentrate assaying 41 per cent Sn. By grinding further tin could be recovered from the middlings which contained 8.5 per cent of the total tin.

**R.750**—Minops Pty Ltd: Razorback mill products

A number of mill products, mostly tailings, were submitted for examination of the cassiterite therein.

Little free cassiterite was found in the spiral tailings. The vanner tailings show too great a size range and the necessity for good desliming in the vanner feeds.

**R.751**—Abminco N.L., investigation of mill products using magnetic separation.

This project was conducted by Mr J. V. Kazis of Abminco in this laboratory. The results showed that for each of the products tested the Jones magnetic separator would remove half as a magnetic product that could not be discarded without further treatment to recover the tin it contained.

**R.745**—H. Betts, Interview River

A sample of tin concentrate was submitted to determine the impurities and how best to remove them. As the sample assayed 74 per cent Sn further concentration was unnecessary although some up-grading was possible by screening on a 250  $\mu$  m screen.

### Tungsten

**R.711**—Tasminex N.L., Kara oxidised ore

A composite, which assayed 0.92 per cent  $WO_3$ , was made from three bore hole samples from the oxidised zone.

Crushing to pass a 4 mm screen then desliming (at 38  $\mu$  m) recovered two-thirds of the tungsten in the slime which assayed 1.46 per cent  $WO_3$ . Magnetic separation of the +38  $\mu$  m fraction recovered three quarters of the magnetite in a high grade product.

Further grinding of the tungsten and magnetite products did not enhance grade or the recovery of either.

Only minor amounts of scheelite were observed.

**R.737**—Tasminex N.L., Kara ore

A blended 700 kg sample assaying 1.1 per cent  $WO_3$ , 59.1 per cent T.Fe and 11.7 per cent  $Fe^{++}$  was submitted for magnetic separation. The parcel sized all passing 10 mm with half retained on 1.18 mm.

While the magnetic separation recovered all the magnetite in the magnetics the tungsten was evenly distributed between the magnetics and non-magnetics. The magnetite produced had a low ferrous iron content compared with unoxidised magnetite.

**R.738**—Tasminex N.L., examination of R737 products

The magnetite contains interstitial tungsten which precludes its recovery from the iron product by ore dressing.

The scheelite in the non-magnetic fraction can be concentrated with a 40 per cent overall tungsten recovery in the scheelite concentrate.

**R.739**—Kibuka Mines Pty Ltd, examination of Mt Pelion mine products from R616

The wolfram concentrate produced in R616 was ground then subjected to flotation to remove the sulphides. The sulphur and arsenic were considerably reduced in the final concentrate which assayed 69.6 per cent  $WO_3$ , 0.07 per cent S, 0.09 per cent As and 0.14 per cent Bi.

**R.746**—Tasminex N.L., Kara ore

Composite samples were made up according to directions from Tasminex to represent areas they proposed to mine.

Magnetic separation after crushing to pass 1 mm showed the three composites differed in tungsten and magnetic contents.

On gravity concentrating one of the composites 32 per cent of the tungsten was shown to be recovered in a 65 per cent  $WO_3$  concentrate.

**R.747—D. I. Hyland, All Nations Mine, Moina**

Samples of mill products were submitted for the production of tungsten and bismuth concentrates as difficulty was being experienced in producing a low-bismuth tungsten concentrate.

After close sizing, magnetic separation of the sized fractions and gravity concentration of the non magnetics a 73 per cent  $WO_3$  wolfram concentrate and a 70 per cent Bi bismuth concentrate were made from a 65.0 per cent  $WO_3$ , 7.1 per cent Bi concentrate supplied. A similar separation was made from a sample assaying 5.5 per cent  $WO_3$  and 0.59 per cent Bi.

**R.762—Tasminex N.L., survey of Kara mill**

The Kara mill was sampled during a four hour run. The feed during this period assayed one per cent  $WO_3$  and 70 per cent magnetics.

The magnetic separators removed almost all the magnetite and with it about a quarter of the tungsten in the feed.

The jigs were operating as desliming units rather than as scheelite concentrators.

About half the scheelite was being recovered as a table concentrate assaying 70 per cent  $WO_3$ . No cleaning stage was being used to achieve this grade. About a quarter of the tungsten in the mill feed was being recycled as table middling assaying 15 to 20 per cent  $WO_3$ .

The solids in the tailing dam overflow assayed one per cent  $WO_3$  which could be settled into this dam by flocculation with lime.

### Chromite

**R.753—Northern Chromite Pty Ltd, Barnes Hill**

Three flotation reagents were compared using a composite sample of ore and tailings assaying four per cent  $Cr_2O_3$ . Reagent 845 was the preferred collector.

Settling tests were done on the flotation slime tailings. The addition of a flocculant was found necessary.

### Iron

**R.734—Industrial and Mining Investigations Pty Ltd, Tenth Legion**

Samples were supplied from the outcrop and spoil at an adit portal.

After preliminary examination by Davis tube and assay a selection was made for larger scale testing employing an Eriez drum magnetic separator.

The specification for coal washery media magnetite was not achieved even after further desliming and magnetic separation.

### Beach Sands

**R.741—C. Blacklow, Musselroe Bay**

A sample from a heavy mineral band on Musselroe Bay beach was submitted for examination. By tabling an magnetic separation tin and zircon concentrates were made. The recovered head grades of the economic minerals were 0.25 per cent Sn, 1.9 per cent zircon and 0.16 per cent rutile. As the ilmenite present contains 0.65 per cent  $Cr_2O_3$  it has no commercial value.

### Grinding Balls

**R.742—Savage River Mines, Savage River**

Tests were made to ascertain if the loss of metal from the grinding balls due to corrosion could be reduced.

While deliberately corrosive conditions enhanced corrosion little effect was found using a reducing gas atmosphere or by using reagents to inhibit corrosion.

It was concluded that present grinding conditions at pH 9 in the ball mill produced the minimum ball loss due to corrosion.

**Pollution**

**R.680**—Department of Mines, oxidation of mine wastes

Results after three years of testing were issued to participating companies. Some extensions to the project have been made.

**Mica**

**R.736**—C. K. Wright: Poolta, King Island

Cycloning followed by froth flotation produced a high grade mica concentrate with a good recovery of mica from a decomposed mica schist.

**Ceramics**

**R.743**—Department of Mines

The annual survey of brick production was made in December 1976.

# 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.

Mr P. M. Johnstone retired in January 1977 after 21 years of service as Deputy State Mining Engineer. The officers of the Branch record their appreciation for his leadership and guidance and wish him a long and happy retirement.

## *The Mines Inspection Act 1968*

### EMPLOYMENT

The average number of persons employed in the mining, metallurgical and quarrying industry during the year was 8 745, a decrease of 600 or 6.4 per cent. While approximately half the overall decrease resulted from a continuing reduction in the work force at Mount Lyell, the remainder reflects the rationalisation being forced upon the industry by the continuing upward spiral in labour costs and the necessity to trim these costs where possible. Except where the reduction is the result of the ending of particular contracts the major effect appears to result from a reduction in the replacement normally associated with actual wastage.

### ACCIDENTS

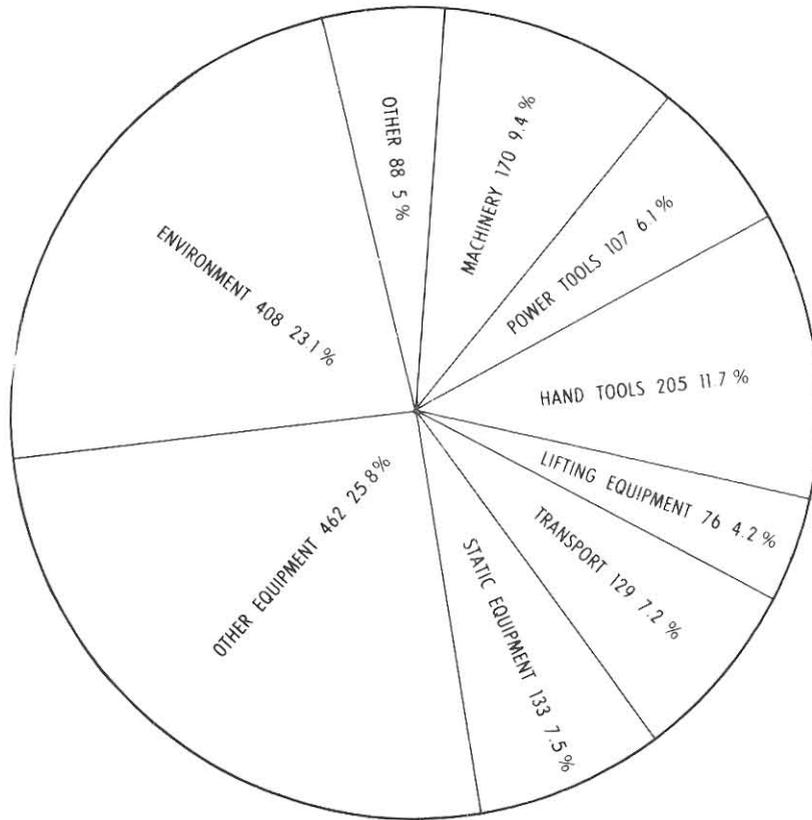
Accidents were reported and recorded in accordance with Australian Standards AS 1885 Recording and Measuring Work Injury Experience which has resulted in slight alterations to our previous recording system which was in line with the now replaced AS CZ6

All disabling injuries resulting in the loss of one shift or more are recorded as in the past but fatalities are now recorded separately.

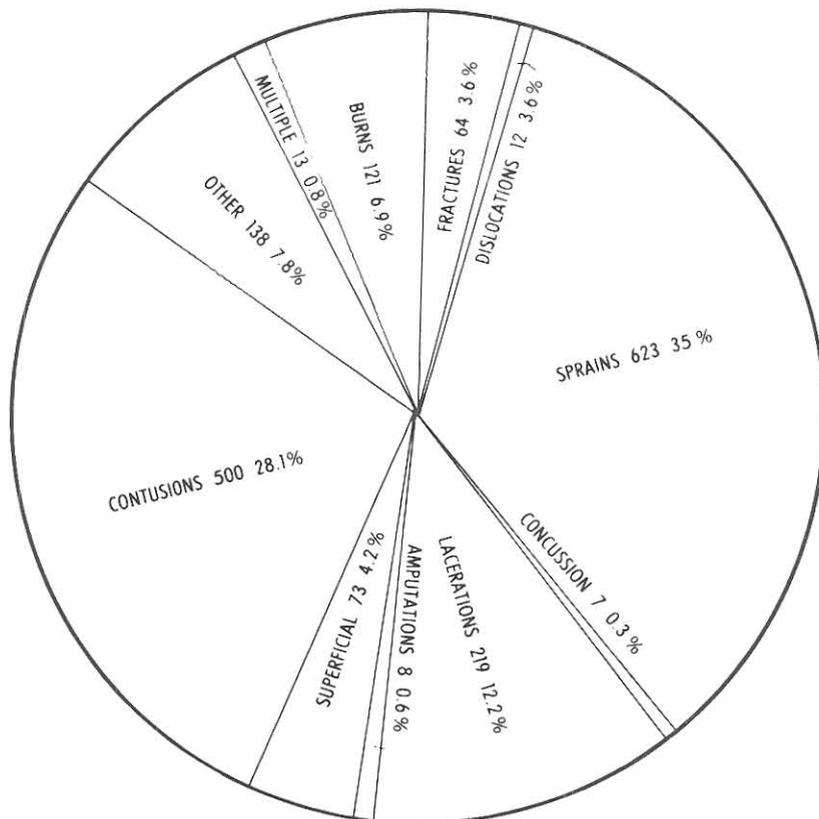
### ACCIDENT STATISTICS (AS 1885)

| Employer               | Man hours exposure | No. of injuries | Frequency rate | Days lost | Incidence rate (%) | Mean duration (days) |
|------------------------|--------------------|-----------------|----------------|-----------|--------------------|----------------------|
| Aberfoyle              | 292 514            | 53              | 181.2          | 716       | 32                 | 14                   |
| Abminco                | 444 034            | 57              | 128.4          | 909       | 23                 | 16                   |
| BMI                    | 29 036             | 2               | 68.9           | 24        | 14                 | 12                   |
| EZ, Rosebery           | 1 782 469          | 533             | 299.0          | 5 606     | 47                 | 11                   |
| Kibuka (K.I.)          | 16 533             | 1               | 60.5           | 3         | 14                 | 3                    |
| Kibuka (Pioneer)       | 48 672             | 5               | 102.7          | 39        | 21                 | 8                    |
| King Island Scheelite  | 807 434            | 140             | 173.4          | 1 033     | 31                 | 7                    |
| Minops                 | 77 751             | 15              | 192.9          | 49        | 50                 | 3                    |
| Mt Lyell               | 1 356 986          | 128             | 94.3           | 2 681     | 18                 | 21                   |
| Que River              | 46 198             | 11              | 238.1          | 131       | 85                 | 12                   |
| Renison                | 839 649            | 80              | 95.3           | 669       | 18                 | 8                    |
| Savage River           | 834 868            | 86              | 103.0          | 816       | 21                 | 10                   |
| All mines              | 6 576 144          | 1 111           | 168.9          | 12 676    | 30                 | 11                   |
| APPM                   | 34 707             | 5               | 144.1          | 39        | 22                 | 8                    |
| Comalco                | 2 464 079          | 132             | 53.6           | 2 336     | 11                 | 18                   |
| Electrona Carbide Ind. | 229 990            | 76              | 330.4          | 771       | 50                 | 10                   |
| EZ, Risdon             | 3 424 084          | 288             | 84.1           | 5 434     | 15                 | 19                   |
| Goliath Cement         | 557 626            | 15              | 26.9           | 187       | 5                  | 13                   |
| Mole Creek             | 31 168             | 6               | 192.5          | 80        | 35                 | 13                   |
| NW Acid                | 245 586            | 32              | 130.3          | 541       | 30                 | 17                   |
| Port Latta             | 491 420            | 33              | 67.1           | 409       | 13                 | 12                   |
| Temco                  | 759 313            | 11              | 14.5           | 575       | 3                  | 52                   |
| Tioxide Aust.          | 823 063            | 12              | 14.5           | 84        | 3                  | 7                    |
| Ceramic                | 243 212            | 13              | 53.5           | 31        | 11                 | 2                    |
| All works              | 8 481 185          | 623             | 73.4           | 10 487    | 13                 | 17                   |
| Collieries             | 151 773            | 26              | 171.3          | 705       | 30                 | 27                   |
| Quarries               | 243 306            | 18              | 74.0           | 203       | 27                 | 11                   |
| Totals                 | 15 452 408         | 1 778           | 115.1          | 24 071    | 20                 | 14                   |

75

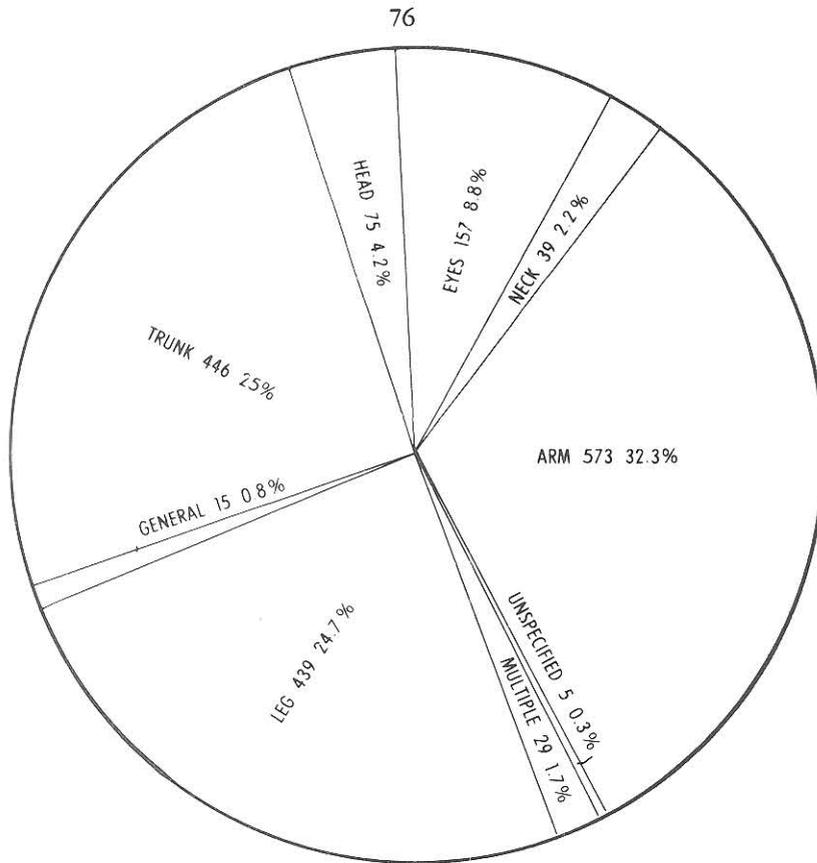


Agency of injury

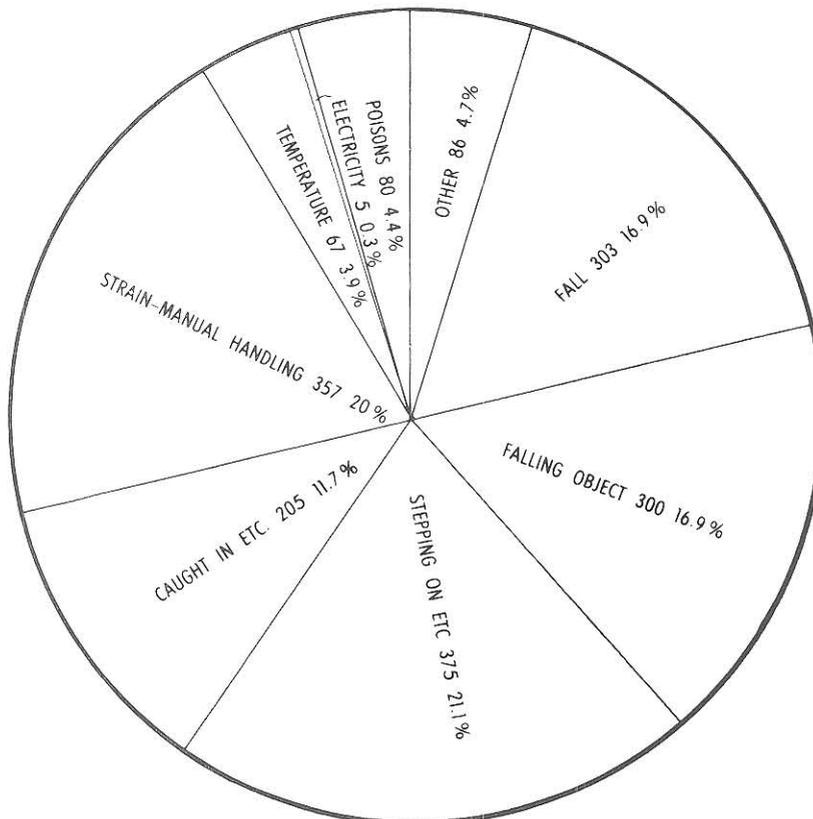


Nature of injury

5 cm



*Part of body injured*



*Type of incident*

5 cm

## DESCRIPTION OF FATAL AND SERIOUS ACCIDENTS

*Fatal*

- G. D. Scales, Duncan Colliery: Accidental ignition of methane.
- A. W. Targett, Dur. an Colliery: Accidental ignition of methane.
- D. D. Vincent, Duncan Colliery: Accidental ignition of methane.
- P. Trevor, E.Z. Rosebery: Struck by fall of rock.

*Serious*

- B. E. Nailer, Duncan Colliery: Methane ignition; burns to body.
- T. Underwood, Duncan Colliery: Fall of coal; neck and shoulder injuries.
- P. J. Campbell, Mount Lyell: Struck hand with hammer, fractured hand.
- E. Brewer, Mount Lyell: Repairing trolley wire, thrown off loco; fractured wrist.
- B. J. McNear, Mount Lyell: Using docking saw; amputated left hand fingers.
- M. Rahn, Mount Lyell: Rock fall; fractured ankle.
- B. Smith, Mount Lyell: Barring down; fractured thumb.
- G. E. Farrow, Mount Lyell: Foot slipped into shotcrete mixer bowl; fractured and crushed leg.
- D. W. Frerk, Mount Lyell: Burst air main; perforated ear drums.
- C. W. Price, Mount Lyell: Bowled over by blow pipe; fractured clavicle and shoulder.
- E. Bricknell, Mount Lyell: Slipped when barring chute; head injuries and fractured clavicle.
- A. W. Davis, Mount Lyell: Pinned by haulage vehicle tyre; crushed foot.
- B. Culibrk, E.Z. Rosebery: Fell down manway; fractured leg, ribs and spine.
- E. F. Hunt, E.Z. Rosebery: Uncoupling grouting hose; loss of eye.
- K. Phillips, E.Z. Rosebery: Timber load shifted; fractured leg.
- S. W. Gallagher, E.Z. Rosebery: Fell in back of dump truck; fractured wrist.
- R. C. Powderham, E.Z. Rosebery: Ore fell from bucket; fractured metatarsal.
- P. M. Fisher, E.Z. Rosebery: Foot slipped off brake pedal and jammed by vehicle; amputated toe.
- A. W. Burrows, E.Z. Rosebery: Foot jammed in chute door; amputated toe.
- B. Duhig, E.Z. Rosebery: Slipped on wet duckboards; fractured ribs.
- P. S. O'Toole, Abminco: Lifted large rock; displaced disk.
- K. J. Davis, Abminco: Rock fall; fractured leg.
- R. J. Lomas, N.W. Acid: Cleaning moving conveyor; torn arm.
- R. M. Flint, N.W. Acid: Stepped in hot calcine; severe burns lower leg.
- J. E. Orme, N.W. Acid: Fell off conveyor; fractured foot.
- A. Hopfenzitz, Que River: Jammed between bogger and kibble; fractured leg.
- T. Flanagan, Electrona Carbide Products: Motor vehicle collision; fractured leg.
- N. Dance, Electrona Carbide Products: Drum of carbide exploded; fractured thumb.
- K. Turner, King Island Scheelite: Fell through roof; internal injuries.
- J. Nicholson, King Island Scheelite: Struck by fall of rock; fingers amputated.
- J. Rosbergen, King Island Scheelite: Loader bucket fell on foot; fractured toes.
- R. Cain, King Island Scheelite: Foot caught in shotcrete machine; amputated foot.
- A. McLeod, King Island Scheelite: Struck by fall of rock; fractured legs.

**Duncan Coal Mine, Fingal**

On 7 February 1977 at approximately 9.02 a.m. an ignition of methane occurred at the Duncan Colliery which resulted in the deaths of three men. The ignition was due to a build up of methane gas above the explosive limit and exposure to a naked light.

The following steps have been taken to ensure the safe working of the mine:—

1. The return airway has been relocated to bypass a fall of ground which restricted air flow in the mine.
2. An additional surface fan has been installed to increase the air flow at the working faces.
3. The use of auxiliary fans underground has ceased.

4. Regular searches are made to ensure matches and smoking material are not taken into the mine.
5. Brick stoppings are built as close to face workings as possible to maintain positive air flow and prevent gas accumulation.
6. Air velocity at the face is checked at two hourly intervals by the shift deputy.
7. All underground personnel carry self-rescuers.
8. All dusty areas are treated with stone dust.

Coal mining has been carried out for almost 100 years in the Fingal valley. This is the first time an explosion of methane gas has been recorded. The loss of life has been a tragedy for the local community, the company and the industry.

### DANGEROUS GOODS

#### *The Dangerous Goods Act 1976*

The following explosives were authorised during the year:—

Nobel:—

Trunkline 910.

Flexicord.

Du-Pont Explosives:—

Tovex 100, 200, 500, 650, 700, 800.

Tovex PX.

Detaprime.

All fibre-bound cases are now marked in accordance with the IMCO classification as required by the Dangerous Goods Regulations introduced in December 1976.

#### IMPORTS OF EXPLOSIVES

|   | <i>Hobart</i> | <i>King Island</i> | <i>Burnie</i> | <i>Strahan</i> | <i>Total</i> |
|---|---------------|--------------------|---------------|----------------|--------------|
| Nitro-compounds (kg) ....                                       | 144 874       | 92 450             | 356 300       | 247 475        | 84 100       |
| Detonators ....   | 176 100       | 169 000            | 515 200       | 151 175        | 1 011 475    |
| Explosive shipments (no.) ....                                  | 4             | 4                  | 4             | 4              | 16           |
| Ammonium nitrate imported for use as an explosive (tonnes) .... | ....          | ....               | ....          | ....           | 3 021        |

#### 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 ....                         | 3 750           | ....          | ....             | 400           | 4 150        |
| Kerosene—                                      |                 |               |                  |               |              |
| Aviation ....                                  | 5 081           | ....          | ....             | 14 045        | 19 126       |
| Lighting ....                                  | ....            | ....          | 2 650            | 4 158         | 6 808        |
| Power ....                                     | 8 395           | ....          | ....             | ....          | 8 395        |
| Motor Spirit—                                  |                 |               |                  |               |              |
| Premium ....                                   | 74 610          | 26 291        | 55 339           | 122 035       | 278 275      |
| Regular ....                                   | 8 961           | 4 049         | 9 376            | 19 244        | 41 630       |
| LP Gas ....                                    | 2 512           | ....          | ....             | 2 567         | 5 079        |
| Total ....                                     | 103 309         | 30 340        | 67 365           | 162 449       | 363 463      |
| Tankerships (no.) ....                         | 36              | 11            | 16               | 29            | 92           |

|                    |      |      |       |                     |      |      |      |     |
|--------------------|------|------|-------|---------------------|------|------|------|-----|
| Exemptions granted | .... | .... | 16    | Other licences      | .... | .... | .... | 257 |
| Licences to keep   | .... | .... | 2 350 | Import licences     | .... | .... | .... | 19  |
| Plans approved     | .... | .... | 423   | Shot firers permits | .... | .... | .... | 44  |
| Magazine licences  | .... | .... | 116   |                     |      |      |      |     |

During the year the Hobart Gas Co. began to phase out the reticulated gas supply this in turn generated increased inspection activity with regard to LP gas installations by both commercial and domestic users.

### SPECIAL INVESTIGATIONS

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

#### DIESEL ENGINES UNDERGROUND

The downturn in the introduction of new diesel equipment reported in the previous year continued throughout 1977 and indications are it will continue for some time.

The water-cooled engine continues to gain in popularity with only one air-cooled Deutz F12L 413 being approved in a compressor while ten water-cooled engines were approved. Engine approvals were:—

- Caterpillar 1693 in an Eimco 920C temporarily approved then withdrawn.
- Caterpillar 3408 in an Eimco 960 temporarily approved.
- Caterpillar 3304 in a Cat. 950 FEL approved.
- Caterpillar 3304 in a Cat. 920 modified as a scaling carriage approved.
- Caterpillar 3306 in a Kiruna K250 approved.
- Caterpillar 3208 (V8) in a concrete pumping unit approved.
- Caterpillar 343 in a Cat. 988 approved.
- Hino EC 100 approved.
- Toyota H approved.
- Perkins A4-212 in a Domino PET (flame-proofed) approved.
- Deutz F12L 413 in a compressor approved.

#### INVESTIGATIONS

Investigations into possible damage, causes, effects and prevention continue to increase in number. This years investigations covered the following:—

- Hobart City Council—High frequency vibrating roller, Elizabeth Street, Hobart.
- Transport Commission—Andover Railway bridge.
- Department of Public Works (now Main Roads)—Condition of property, West Tamar, Road, Launceston.
- Department of Public Works—Effects of road vibration, Main Road, Geeveston.
- Department of Public Works—Effects of road vibration, By-pass, Ulverstone.
- Insurance Co.—Cause of property damage, Mt Stuart, Hobart.
- National Trust—Condition of cottages, Napoleon Street, Battery Point.
- National Trust—Condition of Guard House, Spring Hill.
- Readymix—Environmental impact of noise and vibrations, Mt Nassau Limestone.
- Launceston Environment Centre—Cause of damage to miscellaneous properties, Launceston.
- Launceston City Council—Effects of traffic flow, Cypress Street, Launceston.

Our vibration equipment continues to give good service but the treatment to which it is subjected in its present configuration in two wooden cases is proving to be a maintenance problem, the only solution to which is its permanent mounting in a mobile trailer. It is hoped this will soon become available and, without loss of mobility, reduce the maintenance time on the equipment with a corresponding increase in availability.

### BLASTING OPERATIONS

The ability of the section to give advice with blasting is becoming widely appreciated and made use of by contractors and others with unusual problems to solve.

Three shot-firing courses were operated during the year in co-operation with the Department of Main Roads for both new and experienced shot-firers. Some ninety people attended the courses which were held in the three main centres at Hobart, Launceston and the North-West Coast.

A number of lectures were delivered at the Tasmania Police Academy, Rokeby to trainee police officers, in-service police officers and to civilians attending special 'recognition' courses run by the Police.

### ATMOSPHERIC INVESTIGATIONS

As a result of unfounded statements by an environmental group in George Town a concentrated investigation was carried out into both dust and fume emission within the Comalco and Temco plants in the area, but no serious condition was found.

Information received from overseas led to an investigation into the possibility of the concentration of radio-active material in the treatment process employed by Tioxide Australia Pty Ltd at their Heybridge plant. In co-operation with the Tasmanian Department of Public Health and staff from the physical chemistry department of the University of Melbourne, a complete investigation was carried out to determine the extent if any, of the problem. Radio-activity was found to a minor extent concentrated and totally contained in one small unit of the plant where a problem could exist during infrequent maintenance periods. It was firmly established that the problem was minor, that no radio-active material reached the final product but left in the solid and liquid effluents and that no danger from external radiation existed within the plant. Tests on the solid effluent proved it did not constitute a radiation hazard while the radiation material in the liquid effluent is massively diluted and dispersed so as again to constitute no hazard.

### MECHANICAL INSPECTION

#### W. C. Hodgson, M.I.E.Aust., Hobart

Plant and machinery inspections continued throughout the year to monitor compliance with Parts V and VII of the Mines Inspection Regulations. All mines and works were inspected at least once.

New plant designs examined for approval included—

Comalco No. 4 Potline—46 tonne cranes.

Tasmanian Carbide Products—new furnace building and associated mechanical handling equipment.

King Island Scheelite—Dolphin mine de-watering pump and servicing equipment. Dolphin mine egress shaft equipment. Artificial scheelite plant.

Readymix Bridgewater—Crushing and screening equipment and associated mechanical handling equipment.

Launceston Gas Company—conversion from coal gas to LP gas.

Mobil Australia—vehicular tanks for the transport of inflammable liquids.

New works completed and site examined included—

Mackintosh Joint Venture—the Que River hoist, headframe, and shaft sinking equipment started operating with commendably few problems.

#### *Electrolytic Zinc Co., Risdon*

Improvements have been made to the foreshore gas scrubbing equipment to reduce leaks and restore structural strength due to corrosion. More work has yet to be done.

#### *Commonwealth Industrial Gases*

Two new road tankers were examined for approval.

#### *Renison Limited*

Acid leaching plant cranes examined for approval.

*Temco*

Mechanical inspection and testing of lifts and cranes in new furnace buildings.

*Clifton Brick*

New oil fired furnaces, mechanical handling, equipment and brickmaking machinery.

*Certificate of competency*

Sixty-three candidates were examined for certification under the Act to operate machinery.

**ELECTRICAL INSPECTION****E. J. Bartkus, M.I.E.Aust., Hobart**

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

Generally improvements were noticed in the upgrading and modernisation of existing plants and in many instances electronically controlled equipment is already replacing manual operations

*Accidents*

Four minor electrical accidents were investigated during 1977.

Investigations of the Cornwall Coal mine methane explosion, disclosed that it was very unlikely to be due to electrical equipment situated in the explosion area.

The following proposed electrical plant and equipment and details were investigated and approved:—

C.I.G.: hydrogen compressing facility at E.Z. Risdon.

King Island Scheelite: Dolphin mine pumping scheme and synthetic scheelite plant.

Shell, Devonport: cathodic protection of ships discharge lines.

Cleveland mine: 22KV substation and 6.6KV underground reticulation.

Mobil Oil, Burnie: C.B.P. new load centre.

Tioxide Burnie, nuclear plant.

Readymix, Bridgewater Quarries plant.

New electrical plant inspected and approved on completion—

Renison mine: leaching plant and No. 5 and No. 6 H.V. ventilation fans.

Temco: No. 3 FeMn furnace.

Que River: Shaft winder and diesel generating station.

Comalco: No. 4 pot lines.

Clifton Bricks: Longford plant.

Kibuka Mines, Pioneer: treatment plant.

Northern Chromite, Beaconsfield: treatment plant.

**DRILLING****R. Billingham, B.Sc., A.R.S.M., A.M.Aust.I.M.M., Hobart**

The major projects through the year were the continuation of coal exploration in the Fingal area, and site investigation drilling for a second Derwent River crossing.

At Fingal, the new Longyear 38 diamond drill was introduced and drilling productivity was increased dramatically. The Joy 30HD was withdrawn for overhaul.

In conjunction with the Materials and Research Section of the Department of Main Roads and consultants, Maunsell and Partners Pty Limited, 24 holes were drilled over water in the Derwent River using the Mayhew 1000 as both a diamond and rotary drill. Further holes over water were drilled for new Bruny Island ferry terminals.

The Keystone 55 drill continued tin exploration drilling in the north-east of Tasmania.

Major purchases of equipment during the year were a Longyear 38 diamond drill, a triplex pump, drill rods and other equipment for the new drill.

The improved productivity of the section has been largely due to the knowledge and expertise of the Drilling Superintendent, Mr D. Murray.

## DRILLING DETAILS 1977

| <i>Location</i>           |      | <i>Purpose</i> |                       |      |      | <i>Drill</i> | <i>No. of Holes</i> | <i>Total Depth (m)</i> |
|---------------------------|------|----------------|-----------------------|------|------|--------------|---------------------|------------------------|
| <i>Diamond—</i>           |      |                |                       |      |      |              |                     |                        |
| Northdown                 | .... | ....           | Stratigraphic         | .... | .... | F20C         | 1                   | 120.15                 |
| Longford                  | .... | ....           | Site investigation    | .... | .... | Gemco 210    | 1                   | 24.00                  |
| Launceston                | .... | ....           | Site investigation    | .... | .... | Gemco 210    | 2                   | 38.50                  |
| Sassafras                 | .... | ....           | Stratigraphic         | .... | .... | F20C         | 1                   | 101.50                 |
| Jetsonville               | .... | ....           | Water investigation   | .... | .... | F20C         | 1                   | 149.80                 |
| Boobyalla                 | .... | ....           | Water investigation   | .... | .... | Joy 12B      | 1                   | 252.70                 |
| Zeehan                    | .... | ....           | Mineral investigation | .... | .... | F20C         | 1                   | 164.83                 |
| Scamander                 | .... | ....           | Mineral investigation | .... | .... | F20C         | 4                   | 376.30                 |
| Margate                   | .... | ....           | Stratigraphic         | .... | .... | F20C         | 2                   | 182.65                 |
| Fingal                    | .... | ....           | Coal investigation    | .... | .... | Longyear 38  | 4                   | 1 120.51               |
| Fingal                    | .... | ....           | Coal investigation    | .... | .... | Edeco 36     | 3                   | 1 262.83               |
| Derwent River             | .... | ....           | Bridge foundation     | .... | .... | F20C         | 6                   | 90.95                  |
| TOTAL                     |      |                |                       |      |      |              | 27                  | 3 884.72               |
| <i>Diamond/Auger—</i>     |      |                |                       |      |      |              |                     |                        |
|                           |      |                | Bridge Foundation     | .... | .... |              |                     |                        |
| Longford                  | .... | ....           |                       |      |      | Gemco 210    | 2                   | 13.99                  |
| Ulverstone                | .... | ....           | Bridge Foundation     | .... | .... | Gemco 210    | 13                  | 264.12                 |
| Greens Beach              | .... | ....           | Water investigation   | .... | .... | Gemco 210    | 3                   | 76.35                  |
| Hobart                    | .... | ....           | Site investigation    | .... | .... | Gemco 210    | 6                   | 46.42                  |
| Scamander                 | .... | ....           | Bridge Foundation     | .... | .... | Gemco 210    | 3                   | 36.56                  |
| Spring Hill               | .... | ....           | Road investigation    | .... | .... | Gemco 210    | 3                   | 33.65                  |
| Dunalley                  | .... | ....           | Stratigraphic         | .... | .... | Gemco 210    | 6                   | 76.54                  |
| New Town                  | .... | ....           | Site investigation    | .... | .... | Gemco 210    | 2                   | 13.72                  |
| Spring Hill               | .... | ....           | Stratigraphic         | .... | .... | Gemco 210    | 3                   | 66.11                  |
| TOTAL                     |      |                |                       |      |      |              | 41                  | 627.46                 |
| <i>Rotary/Diamond—</i>    |      |                |                       |      |      |              |                     |                        |
|                           |      |                | Bridge Foundation     | .... | .... |              |                     |                        |
| Derwent River             | .... | ....           |                       |      |      | Mayhew 1000  | 32                  | 775.07                 |
| Campbell Street           | .... | ....           | Site investigation    | .... | .... | Mayhew 1000  | 2                   | 30.47                  |
| George Town               | .... | ....           | Water investigation   | .... | .... | Mayhew 1000  | 1                   | 20.00                  |
| Kettering                 | .... | ....           | Site investigation    | .... | .... | Mayhew 1000  | 4                   | 82.92                  |
| Roberts Point             | .... | ....           | Site investigation    | .... | .... | Mayhew 1000  | 2                   | 38.71                  |
| TOTAL                     |      |                |                       |      |      |              | 41                  | 947.17                 |
| <i>Rotary/Percussion—</i> |      |                |                       |      |      |              |                     |                        |
|                           |      |                | Water investigation   | .... | .... |              |                     |                        |
| Ringarooma                | .... | ....           |                       |      |      | Failing WW1  | 1                   | 46.9                   |
| Nabowla                   | .... | ....           | Water investigation   | .... | .... | Failing WW1  | 2                   | 92.88                  |
| Letina                    | .... | ....           | Water investigation   | .... | .... | Failing WW1  | 1                   | 25.90                  |
| Pipers River              | .... | ....           | Water investigation   | .... | .... | Failing WW1  | 1                   | 41.12                  |
| Greens Beach              | .... | ....           | Water investigation   | .... | .... | Failing WW1  | 4                   | 90.22                  |
| Stoney Head               | .... | ....           | Water investigation   | .... | .... | Failing WW1  | 2                   | 61.60                  |
| Cape Portland             | .... | ....           | Water investigation   | .... | .... | Failing WW1  | 2                   | 97.49                  |
| Scottsdale                | .... | ....           | Water investigation   | .... | .... | Failing WW1  | 2                   | 153.68                 |
| Winnaleah                 | .... | ....           | Water investigation   | .... | .... | Failing WW1  | 1                   | 65.44                  |
| Lilydale                  | .... | ....           | Water investigation   | .... | .... | Failing WW1  | 3                   | 132.46                 |
| TOTAL                     |      |                |                       |      |      |              | 19                  | 807.69                 |

DRILLING DETAILS 1977—*cont.*

| <i>Location</i> | <i>Purpose</i>      | <i>Drill</i> | <i>No. of Holes</i> | <i>Total Depth (m)</i> |
|-----------------|---------------------|--------------|---------------------|------------------------|
| <i>Churn—</i>   |                     |              |                     |                        |
| Longford        | Site investigation  | Keystone 55  | 1                   | 24.00                  |
| Ulverstone      | Bridge Foundation   | Keystone 55  | 3                   | 58.50                  |
| Branxholm       | Tin investigation   | Keystone 55  | 3                   | 55.00                  |
| Telita          | Water investigation | Keystone 55  | 1                   | 19.50                  |
| Herrick         | Tin investigation   | Keystone 55  | 22                  | 292.50                 |
| Gladstone       | Tin investigation   | Keystone 55  | 46                  | 963.00                 |
| TOTAL           |                     |              | 76                  | 1 412.50               |

## SUMMARY OF DRILLING

| <i>Drill Type</i> | <i>No. of drills operating</i> | <i>Depth drilled (m)</i> |
|-------------------|--------------------------------|--------------------------|
| Diamond           | 5                              | 3 884.72                 |
| Diamond/Auger     | 1                              | 627.46                   |
| Rotary/Diamond    | 1                              | 947.17                   |
| Rotary/Percussion | 1                              | 807.69                   |
| Churn             | 1                              | 1 412.50                 |
| TOTAL             | 9                              | 7 679.54                 |

## NORTH WESTERN DISTRICT

W. R. Tindal, A.W.A.S.M., M.Aust.I.M.M.,  
 R. C. Thomas, A.C.S.M., M.I.M.M., M.Aust.I.M.M.,  
 E. C. Leyland, A.W.A.S.M., A.M.Aust.I.M.M., Burnie

## EXPLORATION

*Electrolytic Zinc Company of Australasia Ltd*

During 1977 the major exploration activity was north of Rosebery, mainly on the Bulgobac Joint Venture (E.L. 12/72).

E.L. 1/62, Mt Black. A gradient array IP survey and some ground magnetics were conducted in the Cutty Sark area. An access track into this area from the Bastyan Dam power transmission line was commenced and stopped after approximately one kilometre of track was completed.

A diamond drill hole was drilled at Koonya (KP 210) to a depth of 360 metres. This hole tested the southern extension of mineralisation intersected in KP 205. It intersected only minor pyrite and trace chalcopyrite.

E.L. 12/72, Bulgobac. Exploration was continued under joint venture with Getty Oil Development. Three diamond drill holes were completed in the Boco area. No significant mineralisation was intersected.

Reconnaissance gradient array IP was carried out on western extensions to the Boco grid. Four spreads of dipole-dipole IP were also undertaken over selected gradient array anomalies.

A cut line grid was prepared in the northern area. A test survey (Schlumberger EIP depth expander and a single line of gradient-array) was carried out in the vicinity of the most significant Barringer input anomaly (CS-27A). This survey indicated a thick 'low resistivity' layer of overburden (at least 90-120 metres).

Detailed mapping of all access is in progress.

S.P.L. 3. The Tullah lease was extended to include an additional 4 km<sup>2</sup> at the north-west corner.

E.L. 2/76, Loongana. This area is held jointly with Geopeko. Follow-up geological and soil geochemical surveys were conducted over three selected areas. No significant results were obtained.

Regional mapping continued in the vicinity of E.L. 12/72.

*The Mount Lyell Mining and Railway Co. Ltd*

Mine lease. Following the suspension of diamond drilling on the lease in December 1976, drilling was resumed in July 1977. Two drilling crews were employed. The primary objective of the continuing drilling program has been to improve the definition of ore outlines in the Prince Lyell 20 series stope block (12 holes: 1 157 metres drilled) and the Cape Horn 170 m level stope block (7 holes: 370 metres drilled), in order to optimise production grades.

Exploration tenements. Exploration programs for volcanogenic base metal sulphide deposits continued on E.L. 9/66, 10/69, 41/71 and 21/76, and for hydrothermal replacement tin deposits on S.P.L. 129.

E.L. 9/66, Mt Tyndall Area. Eight diamond drill holes (3 078 m) were completed in the Red Hills-Gooseneck zone to test the potential of the felsic pyroclastics—black shale sequence flanking the massive felsic lava mass on Red Hills. The zone was tested over a strike length of 1 500 metres, but only low grade disseminated sphalerite with trace to minor amounts of galena and chalcopyrite was encountered.

Track cutting, involving some 18 km of traverse lines on the Red Hills North grid, completed the reconnaissance grid coverage between Red Hills and the northern licence boundary, and a further 29 km of traverse lines were established in the White Spur area. Reconnaissance geological mapping, geochemical soil sampling, EP gradient array and controlled ground magnetometer surveys were conducted on both grids. In the White Spur area, numerous coincident anomalous responses were obtained, and work has commenced towards the detailed evaluation of the area.

E.L. 10/69, Dora-Huxley Area. A combined gradient array EIP controlled ground magnetometer and geological mapping program was conducted over 38 line kilometres on the Beatrice grid (northern slopes of the Comstock Valley). Six anomalous areas were located and a further eight small anomalous zones indicated. The further evaluation of these geophysically anomalous zones, using geochemical soil and rock sampling will aid in the selection of drilling targets.

E.L. 41/71, Henty-Yolande Area. Two diamond drill holes (576 m) were completed to test coincident geophysical and geochemically anomalous zones on the West Sedgwick grid, but failed to intersect significant mineralisation. Reconnaissance IP and geochemical surveys (with detailed follow-up in selected areas) were conducted on the latter grid and the Basin Lake grid and indicated several extensive anomalous zones. Diamond drilling will commence on the eastern section of the Basin Lake grid in February 1978.

E.L. 21/76, Jukes-Darwin Area. The initial exploration program has concentrated on the pyroclastics-black shale sequence in the Clark-Garfield-Thomas-Currie River Valleys, which appear to present a geological setting similar to that of the Red Hills-Gooseneck Zone in the Mt Tyndall area.

Following a preliminary geological appraisal of the area, a broad reconnaissance grid (20 line kilometres) was established in the Clark Valley, in readiness for a program of EIP gradient array, ground magnetometer, geochemical soil and rock sampling, and geological mapping to be conducted in early 1978.

In the Garfield-Currie area, a network of access tracks (20 km) was established to facilitate a geological appraisal of the area prior to selecting localities for detailed evaluation.

S.P.L. 129, Trial Harbour Area. Exploration for replacement tin deposits in the sedimentary sequence adjacent to the Heemskirk Granite continued. One drill hole (512 m) was completed to test the strike extension of the magnetite-pyrrhotite mineralisation intersected in the previous hole in the area, but no significant mineralisation was encountered. A reconnaissance EIP gradient array-ground magnetometer-geochemical survey of the East Heemskirk grid was commenced.



The police requested assistance at two trench 'cave-ins' in the Burnie area. One man was injured and in the second collapse a man was killed. Heavy rain in the area, poor ground conditions, and the absence of shuttering caused both failures.

The lease holders of the Kapi mine called in the Zeehan Police to investigate the theft of mineral samples from the mine. The thieves were not content with stealing but sealed off the main entrance to the stoping area by firing down the portal. To assist the police, an assessment was made of the quantity of explosives used and unexploded cartridges were collected, and disposed of by burning.

A semi-trailer tanker carrying 5 000 gallons of distillate over-turned at Elliott spilling about 1 000 gallons. The failure was assessed to be fatigue of the fifth wheel.

Exceptional winds in the Gormanston-Linda Valley area for twelve hours, lifted the high tension wires causing them to collide and cut power to the main fans of the Mount Lyell Mining and Railway Co. Ltd. This freak happening occurred six times in the day. Reducing the wire spans by the addition of more power poles has been effected.

#### GENERAL

During the year a talk was given to a working seminar, conducted by the Australian Trade Union Training Authority at Queenstown, on legislation administered by the Tasmanian Department of Mines and its effect on working conditions in mines.

The first underground operators conference held by the Broken Hill Branch of the Australasian Institute of Mining and Metallurgy at Broken Hill was attended in October. The variety and complexity of the practical mining problems encountered by mines throughout Australia, together with the solutions adopted, were well presented in the many papers.

#### NORTH-EASTERN DISTRICT

**R. A. A. Seymour, B.Sc., M.I.M.M., A.M.Aust.I.M.M., Launceston**

Main developments were the completion and commissioning of the No. 4 pot line at Comalco, and the Clifton Brick (Tas.) Pty Ltd new brickworks at Longford.

The high price of tin maintained interest in alluvial tin areas throughout the north-east, and a large number of lease applications were inspected and processed.

Indirect complaints were received of manganese and fluorine from Temco and Comalco at Bell Bay leading to the poisoning of employees and local residents. The matter was investigated with the Special Duties Inspector and emissions monitored. No evidence was found of poisoning, nor was it possible to obtain from the complainants the names of persons alleged to be affected.

#### SOUTHERN DISTRICT

**R. Billingham, B.Sc., A.R.S.M., A.M.Aust., I.M.M., Hobart**

##### STRATHGORDON

Pearson Bridge Pty Ltd completed the tail-race tunnel at the Gordon River dam site and handed it over to the Hydro-Electric Commission. The invert was concrete lined, but complete lining was only carried out in areas of potentially unstable ground.

#### GENERAL

Investigations were made into several minor blasting nuisances following complaints from the public. Inspections were made of numerous quarries and works in the district.

## EXPLORATION

*Geopeko Limited*

Field exploration on King Island was concentrated around the Grassy granite contact aureole within E.L. 15/66. Work involved mainly deep diamond drilling and detailed geological analysis as a follow up to the auger drilling, jacro drilling, geophysical surveys (gravity and magnetics) and photogeological interpretation carried out in the previous year. A total of 1 277.5 m of diamond drilling was completed in five holes.

Field exploration continued on mainland Tasmania under E.L. 2/76 and E.L. 10/74 (Northern Tasmania), and E.L. 9/74 and E.L. 27/76 (South-Western Tasmanian). Exploration activities consisted of detailed geological mapping and photointerpretation, ground magnetics, I.P., S.P., stream and soil geochemistry, auger drilling and jacro drilling. A total of 651.2 m of auger drilling and 1 253.1 m of jacro drilling were completed.

On the production leases, diamond drilling by contractors to block out underground ore continued routinely with 4 853.3 m being completed at Dolphin Mine and 3 114.2 m at Bold Head Mine. A further 443.5 m at Bold Head and 26.0 m at Dolphin Mine were completed by the Company's own drill, and surface drilling of 243.3 m at Bold Head and 47.0 m at Dolphin aided ore definition.



# Report of the Ringarooma and Cascade Water Board for the year ended 31 December 1977

## THE MINISTER FOR MINES

We submit the report of the Ringarooma and Cascade Water Race Board for the year ended 31 December 1977.

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.

J. G. SYMONS, Chairman  
H. K. TURNER, Member  
N. P. EDWARDS, Member

## RINGAROOMA AND CASCADE (WATER) SUSPENSE ACCOUNT

### STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 DECEMBER 1977

| <i>Receipts</i>                  |         | \$                | <i>Payments</i>   |         | \$                |
|----------------------------------|---------|-------------------|-------------------|---------|-------------------|
| Balance (being accumulated loss) | .... .. | 1 513-33          | Interest payments | .... .. | 1 363-33          |
|                                  |         |                   | Inspection fees   | .... .. | 150-00            |
|                                  |         | <u>\$1 513-33</u> |                   |         | <u>\$1 513-33</u> |