



1974

PARLIAMENT OF TASMANIA

DIRECTOR OF MINES

REPORT FOR THE YEAR ENDED 31 DECEMBER 1973

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

By Authority:

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REPORT OF THE DIRECTOR OF MINES

Department of Mines,
Hobart, 1 July 1974

THE MINISTER FOR MINES, THE HONOURABLE E. E. REECE

I present my Report on the mining industry for the year ended 31 December 1973.

The value of metals and minerals produced from Tasmanian ores was \$139 557 052 as compared with \$136 847 182 for 1972, representing an increase of almost 2%. In addition metallurgical production from imported ores and concentrates was \$114 645 092 compared with \$107 310 085 for 1972, an increase of over 12%. The total value of the industry of \$254 202 144 surpasses the 1972 record by \$10 044 877.

The recorded production of copper, gold, lead, silver, tin, tungsten and zinc declined but the output of iron ore pellets showed a small increase. The production of rutile and zircon concentrates at King Island was re-commenced during the year.

Details of production and value of all mineral products are shown elsewhere in this Report; those for minerals are summarised below:—

<i>Mineral</i>	1972		1973	
	<i>Quantity</i>	<i>Value</i>	<i>Quantity</i>	<i>Value</i>
		\$		\$
Copper (tonnes)	27 806	26 226 228	25 329	32 176 630
Gold (kilograms)	1 781	2 873 567	1 319	2 987 891
Iron ore pellets (tonnes)	2 373 047	27 527 624	2 413 781	27 656 607
Lead (tonnes)	20 303	4 951 450	14 372	4 091 160
Silver (kilograms)	79 222	2 547 037	60 080	3 553 503
Tin (tonnes)	6 825	22 439 882	5 674	20 221 559
Tungsten as tungstic oxide (tonnes) ..	1 921	5 927 063	1 502	4 491 751
Zinc (tonnes)	66 811	24 869 254	52 149	22 451 078

It will be noted that metric units have been used throughout this Report. Collection of production statistics in metric units commenced in the March quarter and the change has been readily made by the larger producers. It is hoped that as metric units become more commonly used in industry all producers will report in these units. The changeover from imperial units was commenced by the Commonwealth Statistician for the September quarter to fit in with his reporting in financial year periods.

DEVELOPMENTS

In 1973 the industry has been characterised by a period of consolidation following the completion of large capital expansion programmes which commenced in 1968. Production in 1972 reflected the results of this expansion and in 1973 these levels were generally maintained although some mines were out of production for several weeks because of local industrial action.

The principal mining companies have been active in exploration and have added to ore reserves. Expansion of the tin mining industry was retarded by the quota on exports and by the depressed market price, but Renison Ltd, which is Australia's chief producer, increased recoveries and maintained production levels although throughput was seriously affected by strike action. The company has been responsible for development of a heavy media separation process which, when installed, will considerably increase the capacity of the existing mill.

The decision of the Tin Council to impose an export quota, which was maintained from January to the end of September 1973, resulted in at least two potential developments not being proceeded with because of discouragement of investors.

The low price offering for wolfram and scheelite concentrates has resulted in the Storeys Creek Tin Mining Co. ceasing full-scale operations at its wolfram-tin mine at Storeys Creek and the mine has been worked on little more than a maintenance basis.

Expansion of operations by King Island Scheelite Ltd at King Island have proceeded slowly pending improvement in the metal price.

Studies are continuing on the commercial development of a large silica deposit discovered by Comalco at Cape Sorell on the West Coast. The possibilities of the establishment of a steel industry based on the Savage River iron ore deposits are still under active investigation by the holder of the exploration licence. A feasibility study in the production of pig iron is being made. There have been no developments in the prospect of using clay deposits in the north-east in paper making by APPM but the company is continuing research into the suitability of the clay for this purpose. Production of rutile concentrates was recommenced at King Island.

The expected reopening of the former Endurance Tin Mine at South Mount Cameron by its present owners BMI Mining Pty Ltd did not eventuate. Because of operating conditions the company was obliged to suspend operations at its Monarch Mine and has moved its dragline equipment to its leases along the Ringarooma River.

The Electrolytic Zinc Co. at Risdon is planning to phase out its existing four flash roasters and has begun the installation of a new concentrate fluid-bed roaster. This will improve recoveries and add to the production of zinc.

The production of alumina from imported bauxite is to be discontinued by Comalco at Bell Bay for economic reasons but aluminium production will not be affected. Alumina will be brought from the company's plant at Gladstone in Queensland. The company proposes to double its capacity to produce aluminium powder and paste during 1974.

PRODUCTION

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

The Mt Lyell Co. treated 2.2 million tonnes of ore averaging 1.185% copper for the production of 90 102 tonnes of copper concentrates containing 22 833 tonnes of copper, 440 kilograms of gold and 3 944 kilograms of silver. The copper concentrates were shipped to Japan and Port Kembla. Pyrite concentrate produced amounted to 138 344 tonnes which was railed to North-West Acid Pty Ltd, a subsidiary owned jointly with the Electrolytic Zinc Co., for the manufacture of sulphuric acid. The change from surface to underground operations was completed successfully: the West Lyell open-cut which was the main source of ore for so many years was closed in September 1972.

Exploration drilling was continued on the company's leases and as a result there has been a reassessment of reserves. Proved ore reserves were calculated at 32 million tonnes assaying 1.47% copper and probable ore was increased by 3.6 million tonnes to 9.6 million tonnes averaging 1.39% copper. Figures for possible ore were also increased and are now assessed at 2.5 million tonnes having a grade of 1.22% copper.

The expansion programme commenced in 1968 has continued according to plan and is largely complete. It is proposed to continue with development from No. 1 shaft which became operational during the year so that production of ore from the lower levels can commence on schedule in 1975.

The company has reported that depressed copper prices during the first half of the year, combined with currency revaluations, resulted in only marginal profits being earned for the first three quarters of the year. The rise in prices since April 1973 improved profitability. The company continued its policy of taking forward selling positions on the London Metal Exchange to obtain a fixed selling price for some of its production and to reduce price uncertainties.

The Electrolytic Zinc Co. at Rosebery produced 1 746 tonnes of copper from its treatment of zinc-lead ores and 750 tonnes of copper resulted from tin mining operations at Luina by Cleveland Tin N.L.

Iron ore pellets produced totalled 2 413 781 tonnes as compared with 2 335 561 tonnes for the previous year. Shipments to Japan were continued under the original contract. A revision in the contract price was negotiated following currency revaluation in December 1972. This and other measures taken by the operators has, it is understood, reversed the previously unprofitable operations.

Total tin production was 5 674 tonnes, the principal producers being Renison Ltd and Cleveland Tin N.L., which are the two leading tin mines in Australia.

At the mine operated by Renison Ltd, at Renison Bell the throughput of ore declined from 448 000 tonnes to 319 000 tonnes but as a result of the higher grade of ore which contained 1.49% tin as compared to 1.30% last year and the significant increase in recovery of tin metal in concentrates from 65.7% to 71.2% the final outcome was 3 481 tonnes of tin as compared with last year's record output of 4 008 tonnes. The fall in ore production resulted from local industrial unrest which had the effect of offsetting the adverse reaction which could have followed the application of a quota restriction. The quota was lifted as from 1 October 1973.

Exploration by means of diamond drilling was maintained at a high level. Proved ore reserves were increased by 1 689 million tonnes to 4 955 million tonnes averaging 1.45% tin which is an improvement on the average of 1.33% last year. Probable ore has been assessed at 3 100 million tonnes averaging 1.16% tin and possible ore has been estimated at 8 000 million tonnes having a grade of 1.12% tin.

A comprehensive investigation into the use of heavy media separation for the treatment of ore at a relatively coarse sizing has been successfully completed. Installation of a heavy media separation plant should enable the capacity of the existing mill to be increased to 700 000 tonnes per annum without any major modifications whilst still retaining the present percentage recovery of tin in concentrates.

Surface and underground testing within the company's leases has disclosed further areas to be tested and in addition the company is carrying out exploration in three areas on the West Coast outside the leases.

At the Cleveland mine at Luina 316 825 tonnes of ore were milled for a recovery of 1 774 tonnes of tin and 750 tonnes of copper. Deep drilling to investigate depth extensions of the mine began in October 1972 and is continuing. Ore reserves at March 1973 were assessed at 2.9 million tonnes averaging 0.87% tin and 0.31% copper.

At the Storeys Creek and Aberfoyle mines operated by Aberfoyle Ltd, 50 000 tonnes of ore were treated for a recovery of 215 tonnes of tin and wolfram concentrates containing 128 tonnes of tungstic oxide. The continued low price level for the wolfram concentrates and the depressed price of tin taken in conjunction with higher operating costs resulted in the Storeys Creek mine which produces mainly wolfram being reduced to practically a standstill pending more favourable metal prices. The Aberfoyle mine which produces mainly tin ore is to remain in operation but the economic viability of the mine has been seriously affected by low prices and rising costs.

Tin mining continues to be an important factor in the economy of the North-East. BMI Mining Pty Ltd produced 60 tonnes of tin from operations at the Monarch mine and 27 tonnes from the Western Endurance mine and have now moved to a site along the Ringarooma River. The company is still continuing investigations at the old Endurance mine and has undertaken extensive boring operations on the Scotia Lead to determine whether there are reserves of tin-bearing ground of sufficient grade to establish profitable mining. Productive operations have been maintained at the old Pioneer mine at Pioneer and in addition there are a number of smaller operators whose production of alluvial tin is of value to the industry.

The only producers of tungstic oxide were King Island Scheelite Ltd, who mine scheelite on King Island and the Storeys Creek and Aberfoyle mines which produce wolfram concentrate from the mining of wolfram-tin ores in the vicinity of Rossarden.

At the King Island Scheelite mine 306 522 tonnes of ore were treated for the production of 1 224 tonnes of tungstic oxide whilst the treatment plant which processes the ore from the Storeys Creek and Aberfoyle mines produced 128 tonnes of tungstic oxide and 215 tonnes of tin.

The market price of tungsten which has shown a downward trend since early in 1970 has been the principal factor in retarding the development of new orebodies by King Island Scheelite Ltd. There has been progress with development of the Bold Head deposit about 5 km east of the present mine and on the decline at the Dolphin mine beside the present open-cut. The open-cut has an estimated life of two years.

It is estimated that production from the open-cut will be phased out over the next eighteen months after which production will be entirely from underground mining at the Bold Head and Dolphin mines. The first ore is planned to be mined from the Dolphin mine early in 1974 and at Bold Head ore extraction is expected to commence later in the year. The work of developing the new orebodies and plans for

new treatment plant will be continued but the rate of capital expenditure will be geared to the market price for tungsten which is dependent on improvement in the world demand for scheelite. The minimum capital expenditure will be \$1.5 to \$2 million a year.

The company has engaged in continuous exploration both on its leases and in other areas of King Island and holds exploration licences covering a total area of 520 km². Exploration is slow and costly because of lack of exposures for geological examination and it is necessary to drill large numbers of prospecting bores to determine the nature of the underlying rock strata.

The Electrolytic Zinc Co. at Rosebery which operates the Rosebery, Hercules and Farrell mines treated 516 272 tonnes of ore for the recovery of 52 149 tonnes of zinc, 14 362 tonnes of lead, 1 746 tonnes of copper, 55 473 kilograms of silver and 876 kilograms of gold. A total of 106 454 tonnes of pyrite was produced for use in the manufacture of sulphuric acid at Burnie by North-West Acid Pty Ltd, jointly owned by the Electrolytic Zinc Co. and the Mount Lyell Co.

Ore reserves were assessed at 9 million tonnes at the Rosebery mine, 280 000 tonnes at the Hercules mine and 75 000 tonnes at the Farrell mine. The total of 9.36 million tonnes is 260 000 tonnes less than for 1972.

Output of zinc at the company's Risdon plant was 142 553 tonnes. The installation of a new roaster is planned which will result in increased efficiency and production.

METAL PRICES

Tin

An export quota system was imposed by the International Tin Council to prevent a decline in the price of tin below the lower price of £1 729-£1 878 Sterling per ton fixed by the Council. This remained in force from January until the end of September 1973 when the buffer stock of tin held by the Council's Buffer Stock Manager had been largely disposed of and the statistical position showed a shortfall in production against consumption. When the quota system was imposed it appeared that the rapid expansion in productive activities by Renison Ltd and Cleveland Tin N.L. would have to be curtailed. However, because of industrial unrest there was a fall in ore production by Renison Ltd which had the effect of reducing the output of tin which largely offset the expected adverse effect of the quota restriction. It resulted in a deferment of proposals to develop productive activities by at least one potential producer, but generally the impact on our tin mining industry was not serious.

The average Australian price of tin for 1973 was \$3 532. The price ranged from a low of \$3 107 in April to a high of \$4 253 in November.

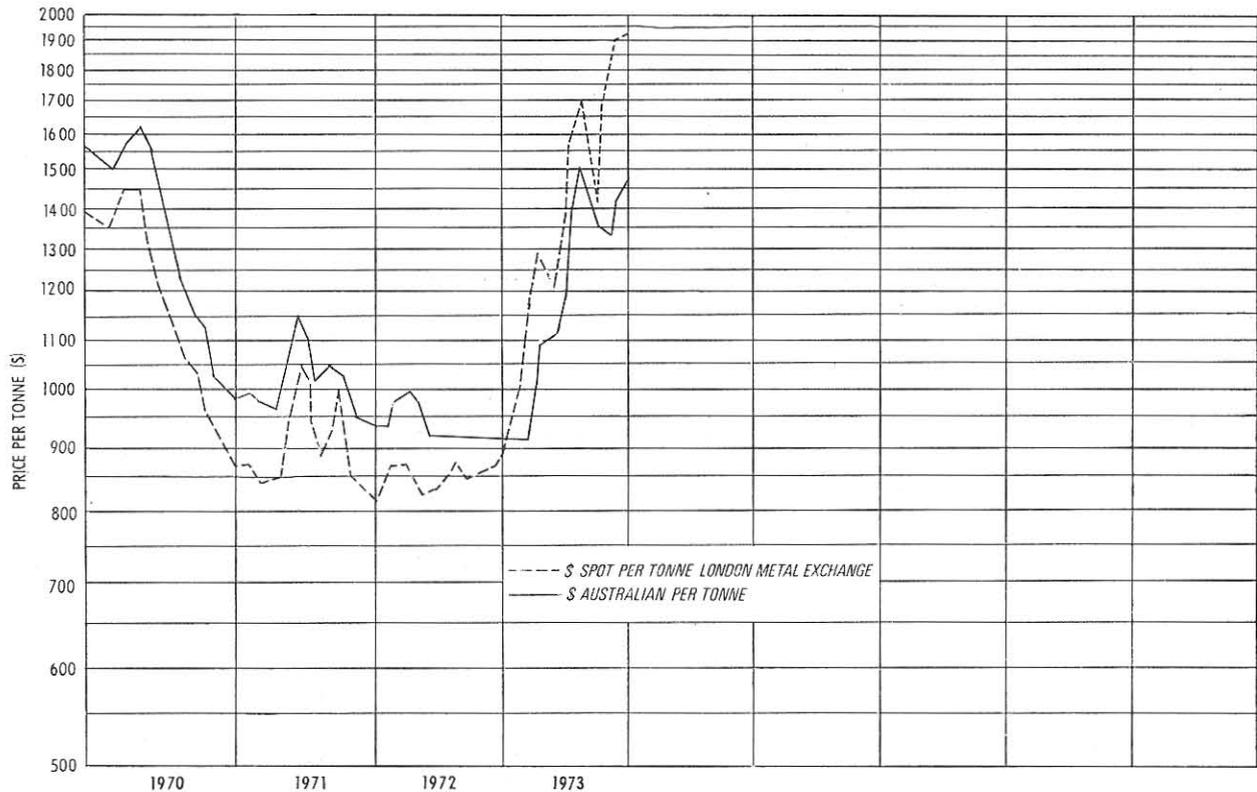
The Australian price of tin is based on the Malaysian tin price and concentrates are purchased by the Australian smelter on this price less a deduction for smelting and other charges. It is quoted daily per metric ton unit for 70% concentrates and represents the price received for tin concentrates produced. It is of more significance to most producers that the LME or Australian price per ton which is the figure normally published. The unit rate was \$26.41 at the beginning of January 1973 and with some variations remained in the vicinity of this amount until May when it reached a high of \$27.41. It continued an upward trend and was quoted at \$29.34 per unit at the end of June and \$33.21 per unit at the end of July. It had fallen to \$31.57 per unit at the end of August and was \$31.36 per unit when the Australian dollar was revalued on 7 September 1973. There was an immediate fall to \$29.82 per unit and it was not until mid-October that the price was restored to its pre-revaluation level. It had reached \$32.09 by the end of the month and continued to rise reaching a high of \$43.86 per unit on 11 December 1973. A rapid decline was then recorded and the price received by producers at the end of December was \$33.81 per unit.

AVERAGE AUSTRALIAN PRICES, 1972-1973 (\$A)

Commodity	Unit	1972	1973
		\$	\$
Copper	tonne	944.43	1 252.66
Gold	kilogram	1 589.21	2 247.00
Lead	tonne	243.59	280.50
Silver	kilogram	42.76	58.35
Tin	tonne	3 285.27	3 532.00
Tungsten	tonne	30.62	30.17
Zinc	tonne	372.19	425.50

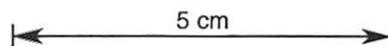
Tungsten

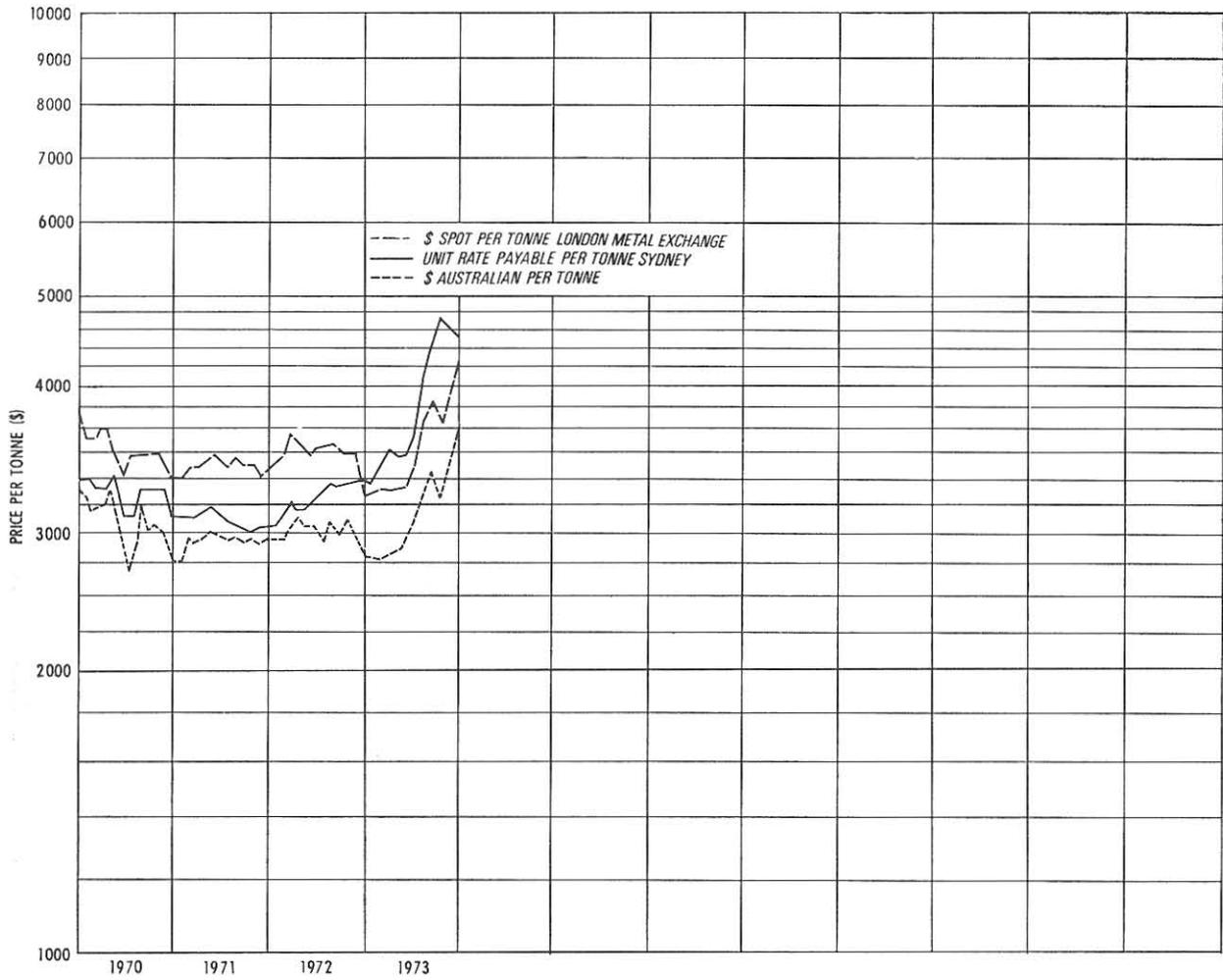
Scheelite (calcium tungstate) from the operations of the King Island Scheelite mine and wolfram (iron tungstate) from the Storeys Creek and Aberfoyle mines are the sources from which the bulk of Australia's production of tungsten is produced. Only minor amounts are consumed domestically and production in the form of tungstic oxide concentrates is sold overseas mostly under forward contracts. The market has remained depressed and the value is quoted nominally at £22.25 per unit of contained tungstic oxide on the London Metal Exchange. The effect on mining operations is referred to under 'Production'. Revenue from sales has also depreciated because of upwards revaluation of the \$A against the £Sterling.



COPPER PRICES

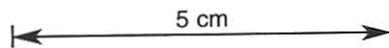
MONTHLY AVERAGES, 1970-1973

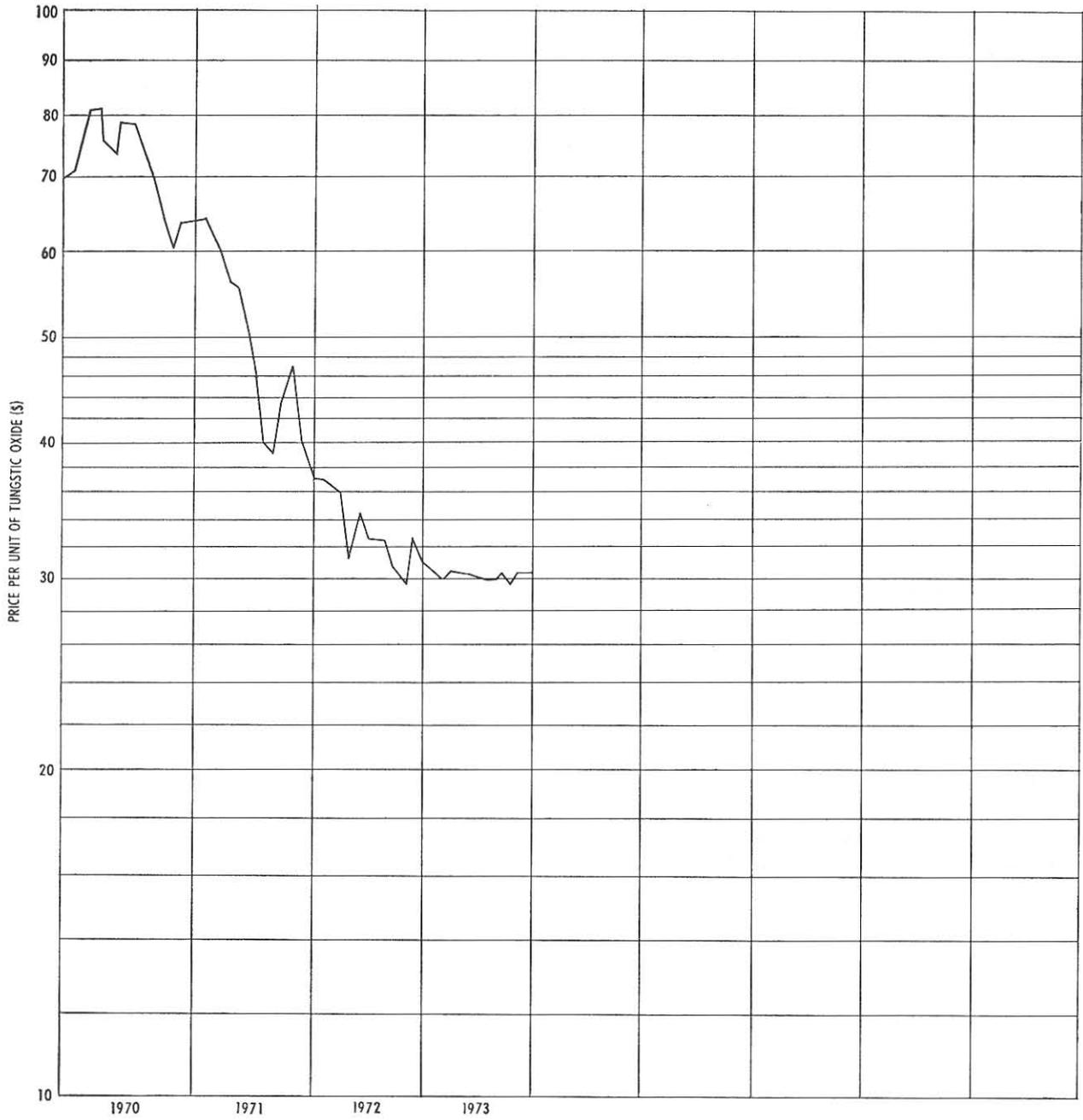




TIN PRICES

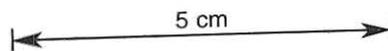
MONTHLY AVERAGES, 1970-1973





TUNGSTEN PRICES

MONTHLY AVERAGES, 1970-1973



Revaluation of the Currency

Producers have always had to contend with fluctuations in the prices for metals sold overseas except in cases where firm contracts could be arranged and where forward trading was possible. During the past year currency revaluations have been a significant factor in determining the amount received in Australian dollars from sales of mineral products which are sold in £Sterling or \$US. There was an upwards revaluation of the \$A of 7.05% on 23 December 1972 and of 5% on 9 September 1973 and this in association with devaluation of the \$US and a gradual decline in Sterling has had a significant effect on the mining industry in Australia. Even where favourable sales conditions have applied currency movements eroded much of the benefit of the higher world prices but where increased prices have been obtained it has reduced the impact on the industry of the revaluations. However, currency fluctuations are expected to continue as a feature of world metal trading.

Two sections of the mining industry in this State most affected by currency revaluation are the tungsten producers, notably King Island Scheelite Ltd and the small-scale tin producers in the north-east.

A case was submitted to the Australian Government by King Island Scheelite for compensation for losses arising from the revaluation of the \$A and this is under consideration. Representations were made to the Deputy Prime Minister on 17 February 1973 by small tin miners in the north-east for compensation for loss in value of tin produced resulting from the revaluation of the \$A on 23 December 1972 the unit price having fallen from \$27.48 per unit on 23 December to \$25.81 per unit on 27 December 1972. The unit price remained below the pre-revaluation level until 12 June 1973 when it moved to \$27.00 per unit which was above the price of \$27.48 at 23 December 1972. No compensation was granted.

On 9 September 1973 there was a further revaluation of the \$A against all currencies of 5% and the unit rate declined from \$31.36 per unit on 7 September 1973 to \$29.82 on 10 September 1973. A deputation of the small miners again met the Deputy Prime Minister on 12 October 1973 seeking compensation for losses due to the revaluation. After a close investigation the Commonwealth Government considered that there was no case for revaluation adjustment assistance, the \$A price per unit of tin in concentrates having been restored to the pre-revaluation level by 9 October 1973 when it was quoted at \$31.45 per unit. The price has since remained above this level and was \$A33.81 per unit at the end of the year.

EXPLORATION

Active programmes of investigation of areas of potential value for the occurrence of minerals were maintained by well established companies. There has been limited demand for new licences, but during the year two major companies which had not previously operated in Tasmania were granted licences and have commenced activities in assessing the areas covered by those licences.

The Department has continued its policy of requiring holders of the larger areas to relinquish part after the holders have had an opportunity to determine areas of particular interest. This has resulted in more intensive exploration, and has freed areas for which other exploration companies can apply. Where areas are not being investigated licences are cancelled and deposits held as security for compliance with the conditions of licences which have been forfeited.

At the end of the year fifty-nine exploration licences and thirteen special prospector's licences were held. In addition, six permits to explore for petroleum in Bass Strait remained current.

The Department has continued its programme of regional geological mapping, economic geology, groundwater investigations and engineering geology. Maps and reports are published regularly and professional staff are always available to assist and advise the mining industry. Departmental publications and information by former exploration licence holders when released for Open File, are in constant demand by mining companies and other holders of exploration licences.

The Department's drilling plants are employed in testing mineral deposits on areas reserved for official purposes and in the investigation and measurement of underground water resources in selected areas. At the end of the year, in addition to groundwater studies, the Department was testing coal measures on the East Coast, another plant was on hire to test a tin deposit at Weldborough and stratigraphic boring was being undertaken at Cygnet for departmental geological purposes.

OIL

Geophysical surveys and drilling were continued on the exploration permit areas in Bass Strait. Four bores were drilled in permit areas held by Hematite Petroleum Pty Ltd, but discoveries of commercial significance did not result. Further investigations, including drilling, are planned for 1974.

Details of the bores put down are as under:—

<i>Name of Bore</i>	<i>Location</i>	<i>Period of Drilling</i>	<i>Final Depth (m)</i>	<i>Result</i>
Konkon	Lat. 39° 12' 19" S Long. 145° 03' 39" E	11.5.73 to 29.5.73	1 537	Unsuccessful—abandoned
Dondu	Lat. 39° 59' 12" S Long. 146° 13' 02" E	29.5.73 to 1.7.73	2 927	Unsuccessful
Yurongi-1	Lat. 39° 55' 31" S Long. 146° 15' 57" E	2.7.73 to 14.7.73	2 438	Unsuccessful
Narimba No. 1	Lat. 40° 16' 16" S Long. 145° 43' 53" E	31.8.73 to 4.10.73	3 354	Unsuccessful

Shell Development (Australia) Pty Ltd were granted a Scientific Investigation Authority under the provisions of the Petroleum (Submerged Lands) Act to carry out a seismic survey programme for the purposes of investigating the sedimentary thickness and structural development below deeper waters in the area adjacent to Tasmania as part of a survey of deeper waters off the Australian continent. The period of the Authority was for three months from 1 April 1973. A report and other data have been lodged with the Department.

The following exploration permits issued under the Petroleum (Submerged Lands) Act 1967 remained in force during the year:—

<i>Title</i>	<i>Title Holder</i>	<i>Blocks</i>	<i>Location</i>	<i>Expiry Date</i>
T/1P	Magellan Petroleum Aust. Ltd	41	Bass Strait	4.7.74
T/3P	Hematite Petroleum Pty Ltd	342	Bass Strait	16.7.74
T/4P	Hematite Petroleum Pty Ltd	394	Bass Strait	16.7.74
T/5P	Hematite Petroleum Pty Ltd	317	Bass Strait	16.7.74
T/6P	Hematite Petroleum Pty Ltd	400	Bass Strait	16.7.74
T/9P	Magellan Petroleum Aust. Ltd	4	Bass Strait	11.4.75

Permits are issued for periods of six years and under the legislation one-half of the blocks covered by the permits must be surrendered if application is made for a renewal. It will be noted that five of the permits expire in July 1974. The holders have accumulated considerable data as a result of geophysical surveys and drilling of wells and decisions as to blocks which must be relinquished will be difficult. Provision is made for applications to be invited for surrendered blocks and applicants are required to indicate the amount which will be paid for a permit in addition to the prescribed fees.

LEGISLATION

Mining Act 1929

Provision was made in the Statute Law Revision (Environment Protection) Act 1973 which was passed in conjunction with the Environment Protection Act 1973, for amendments to sections 46, 64, 89 and 90 of the Mining Act 1929. The amendments provide that in granting leases and water and easement licences regard shall be had to the recommendations of the Director of Environmental Control as to conditions considered necessary or desirable to prevent or lessen pollution or to restore the environment which may be affected by mining operations. They also provide that the recommendations of the Director of Environmental Control shall receive consideration in any action being taken by the Department of Mines to prevent mine tailings dumps being carried into a river or stream. The Director of Environmental Control is being given legislative authority to object if he considers that any proposal to proclaim a stream as a sludge channel could conflict with the purposes of the Environmental Control Act.

Under the provisions of the Metric Conversion Act 1973 the areas and measurements contained in the Mining Act 1929 were converted from imperial to metric units. The amendments were in most cases a direct conversion but opportunity was taken to alter the maximum areas of some mining tenements. A

mineral lease may now be granted for 100 hectares (previously 80 acres), a stone lease for 100 hectares (previously 320 acres) and a coal lease 200 hectares (previously 640 acres). The maximum area of a special prospector's licence was increased from 25 square miles to 100 km². There were no increases in fees. The amendments became effective on 1 January 1974.

The Mining Regulations were also amended by Statutory Rules 1973, No. 156, to convert areas and measurements in the Regulations to metric units and to provide for a new lease form. The area of an ordinary prospecting claim was increased from 50 acres for minerals and 100 acres for coal to 25 hectares and 50 hectares respectively and the area which may be occupied under a miners right claim was also slightly increased from one-half of an acre to one-quarter of a hectare. The basis of measurement of a sluichead of water has been 150 gallons of water per minute which was unique to Tasmania. This has been amended to 10 litres of water per second which is the metric equivalent of the previous measurement. Two new types of gauge boxes have been prescribed for use according to the number of sluicheads of water granted under a water licence.

Inflammable Liquids Act 1929

The regulations were amended by Statutory Rules 1973, No. 158 to convert imperial measurements to metric units. Other amendments were consequential upon the formulation of the Model Code for Road Transport, the Model Code for Road Tank Vehicles and amendments to the Model Code for Handling of Dangerous Goods.

Explosives Act 1916, Mount Read and Rosebery Mines Ltd Leases Act 1916, Underground Water Act 1966

Under the provisions of the Metric Conversion Act 1973, the abovementioned Acts were amended to convert imperial measurements to metric units.

Mines Inspection Act 1968

The references to imperial measurements in the Act were converted to metric units by the Mines Inspection Act 1973 (No. 4 of 1973) and at the same time the qualifications of an Inspector of Mines were clarified to specify clearly that he is required to hold a full certificate of competency as manager of any class of mine.

Local Government Act (No. 2) 1973

In 1971, section 431A was inserted in the Local Government Act 1962 to provide that the Governor upon the recommendation of the Director of Mines may declare areas to be subject to the danger of movement by reason of their inherent instability. On these landslip areas, building was prohibited other than an addition to a dwelling or a shed or other insubstantial building on a farm. Under this legislation, areas at Freshwater Point and St Helens were proclaimed as landslip areas. Geologists of the Department have undertaken landslip investigations in various parts of the State particularly in the Tamar Valley and on the North-West Coast.

As a result of the experience gained in administration of the 1970 legislation it became clear that some classification of landslip areas was necessary since some areas, although potentially unstable, are less liable to slip than others. In such areas everyone concerned with the administration of the legislation has been concerned that landowners were being caused unnecessary loss and inconvenience by a total prohibition on building.

The 1973 amending Act continues the system of proclamation of areas as landslip areas but provides that landslips may be divided into *A* areas where buildings will not be permitted except under licence and *B* areas where buildings will be subject to special construction requirements. Landslip areas will be recorded on the land titles concerned so that persons considering the purchase of land can readily ascertain whether or not it is in a landslip area. The Act also provides that the Government will not pay compensation for damage to buildings erected after an area has been declared to be a landslip area. Immediate steps have been taken by the Government to set up an expert committee to advise on the special constructional provisions to be included in the Building Regulations. This Department proposes to make an immediate review of the areas proclaimed as landslips under the 1970 Act with the object of classifying the more stable areas as *B* areas to which the new Building Regulations will apply. It is also proposed during 1974 to recom-

mend the proclamation of other landslip areas under the *B* classification which have been investigated by geologists of the Department. This will apply particularly to subdivisions in the Tamar Valley where there are several areas of inherent instability.

Gas Franchises Act 1973

As a result of representations made by the Hobart Gas Company and the Launceston Gas Company the Government introduced legislation to grant the companies a franchise to supply gas, which includes town gas and liquefied petroleum gas, in the Hobart and Launceston areas in which they operate at present. The franchise confers an exclusive right to the supply of gas by reticulation but applies only to the sale of gas in a cylinder or cylinders that contain more than 27 kilograms of gas. The legislation also provides that any person may supply gas in the franchise area which is used as a fuel for motor vehicles, as a raw material for a chemical manufacturing process, for filling cylinders or for transshipment out of the franchise area, gas used for metal working and gas used for processing into industrial gases.

The Act, therefore, limits the franchise granted to the two gas companies to the supply of gas in cylinders containing over 27 kilograms of gas for heating and domestic purposes only. Other retailers of gas can operate freely outside the franchise areas at Hobart and Launceston but are restricted to the supply of gas in cylinders in the franchise areas for heating and domestic purposes to a cylinder or cylinders containing 27 kilograms of gas or less.

MINING AND THE ENVIRONMENT

Environmental control measures have been given constant attention by our Mining Engineers during the course of their inspections and it is pleasing to record the co-operation received both from the larger mining companies and by small operators in undertaking works and conducting operations so as to cause minimum disturbance of the environment. A significant part of the work by the Chemical Section of our Laboratories has been concerned with analyses of samples from localities which are being monitored as an anti-pollution measure.

The Department has adopted the practice of having all areas applied for as mining leases examined by one of the Mining Engineers and special conditions are included in leases according to the circumstances in each case to safeguard the area against pollution and environmental damage, consistent with mining operations.

It cannot be denied that past mining operations in Tasmania were conducted with little regard to the environment, which was the practice followed throughout the world with mining and other activities. With the growing awareness of people for the need to practice conservation it is of importance to note the ready acceptance of the principles by the mining industry and the voluntary efforts which have and are being made to prevent and overcome damage to the environment. This is not always understood and appreciated by some ardent conservationists but it is a fact that significant advances have been made in preventing pollution and that there is a considerable expenditure of resources and finance within the industry to conduct operations with a real concern for the environment. It must be understood that there cannot be development of our natural resources for mining or any other purpose without some change in the environment. The object must be to adopt a balanced approach first of all to the use of the land and, the particular resource, and then to ensure that any development is controlled so that an acceptable level of environmental quality is maintained both during and after mining or other development.

The Environmental Protection Act was passed during the year to make better provision for protecting the environment of the people of the State. The Act includes provision for the establishment of a Council to advise the Minister and to make recommendations to the Minister or the Director of Environmental Control on matters affecting the purposes or administration of the Act. The Council consists of representatives of Government departments and instrumentalities, local government, the Tasmanian Conservation Trust, the Tasmanian Industry Association for Environmental Control, the Tasmanian Trades and Labour Council and farmers organisations; there is power to co-opt additional members for special purposes. The Director of Mines is a member of the Council and the Chief Chemist and Metallurgist serves on an expert committee which is examining certain aspects of pollution.

It is Government policy that all future activities within the State involving major changes in transportation, urban development or land use, the large-scale use of indigenous natural resources or the disposal of significant quantities of waste materials must be the subject of an impact study at the earliest stage of

planning. This policy is a further provision to ensure that there has been a study of all aspects of the likely environmental effects of any future significant development before any decision is made to allow the project to proceed.

As from 1 January 1974 all new mining projects will also be subject to the licensing provisions of the Environmental Protection Act 1973, and existing operations will require to be licensed after 31 December 1974.

There has been a considerable advance both in the field of legislation and in the growth of conservation practices in the industry during 1973. There will be further developments in future years in prescribing procedures and standards to be observed by industry, but it is clear that there has been general acceptance of the principles of environmental control and that this aspect will be a normal part of mining activities in future and will be an important factor in planning for expansion within the industry.

AUSTRALIAN MINERALS COUNCIL

The Council was formed on 8 November 1968 for the purposes of promoting the general welfare and progressive development of the Australian mining and mineral industry. It consists of the Ministers for Mines of all the States and the Commonwealth Ministers of National Development, Interior and External Territories.

The Council, and its Advisory Committee comprises the Heads of the Departments of Mines of the States and representatives of the Commonwealth Departments of National Development, Interior and External Territories, which has met on numerous occasions since 1968 did not meet during the year and there was no opportunity to confer on many matters of vital significance to the mining industry. The meetings of the Council have served a very useful purpose in the administration of the mining industry and although there have been changes in the structure of the Commonwealth departments concerned the continued existence of an Australian Minerals Council is regarded as a necessary part of the administrative structure of mining in Australia. It is hoped that during 1974 the functioning of the Council will be revived.

REVENUE

REVENUE COLLECTED DURING THE YEAR ENDED 31 DECEMBER 1973

<i>Heads of Revenue</i>	\$
Public Works and Services—Mines Department	60 173
Rent and Fees of Auriferous and Mineral Lands	151 570
Royalty on Iron Ore Pellets	383 483
Survey Fees	3 426
Fees under the Explosives and Inflammable Liquids Act	42 728
TOTAL	641 380

COMPARATIVE STATEMENT OF REVENUE FROM MINES, BEING RENTS, FEES, STORAGE OF EXPLOSIVES, ETC., PAID TO THE TREASURY DURING THE YEARS 1968 TO 1973

<i>Year</i>	\$	<i>Year</i>	\$
1968	205 941	1971	597 937
1969	445 712	1972	563 816
1970	528 666	1973	641 380

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

LEASES AND LICENCES

NUMBER AND AREA OF NEW LEASES AND LICENCES ISSUED DURING THE YEAR ENDED
31 DECEMBER 1973

<i>Leases and Licences</i>	<i>Number</i>	<i>Area (ha)</i>	<i>Sluiceheads</i>
Gold	9	76	....
Gravel and sand	6	191	....
Ilmenite and rutile	1	4	....
Iron ore	1	20	....
Minerals	1	16	....
Silver-lead and antimony	4	61	....
Stone	3	36	....
Tin	20	188	....
Water licences	1	....	2
Wolfram and tin	3	67	....
TOTAL	49	659	2

TOTAL NUMBER OF LEASES AND LICENCES IN FORCE ON 31 DECEMBER 1973

<i>Leases and Licences</i>	<i>Number</i>	<i>Area (ha)</i>	<i>Sluiceheads</i>
Antimony	3	97	....
Bauxite	6	192	....
Barytes	2	32	....
Clay	18	216	....
Coal	15	1 675	....
Copper	5	4 880	....
Dolomite	3	125	....
Easements	70	669	....
Feldspar	2	6	....
Gold	35	542	....
Granite	2	8	....
Iron ore	16	1 828	....
Kaolin	2	53	....
Limestone	11	451	....
Marble	2	32	....
Minerals	39	3 850	....
Ochre	2	3	....
Osmiridium and chromite	23	526	....
Nickel	1	32	....
Sand and gravel	42	1 659	....
Scheelite	1	2 689	....
Silica	24	1 078	....
Silver-lead	19	625	....
Stone	67	4 727	....
Tin	346	6 116	....
Wolfram and tin	53	3 243	....
Water licences	129	397	1 651
TOTAL	938	35 753	1 651

NUMBER AND AREA OF LEASES AND LICENCES APPLIED FOR DURING THE YEAR ENDED
31 DECEMBER 1973

<i>Leases and Licences</i>	<i>Number</i>	<i>Area (ha)</i>	<i>Sluiceways</i>
Clay	1	75	....
Copper	1	6	....
Easements	2	38	....
Gold	13	181	....
Minerals	23	630	....
Sand	7	1 225	....
Silica	2	44	....
Silver-lead	5	37	....
Stone	23	1 238	....
Tin	25	375	....
Tin and wolfram	11	356	....
Water	4	49	10
TOTAL	117	4 254	10

TOTAL NUMBER OF ALL TYPES OF PROSPECTING RIGHTS HELD AS AT
31 DECEMBER 1973

<i>Mining Tenement</i>	<i>Number</i>	<i>Area</i>
Permits to enter and search on private land, including owners' consents	10	442 km ²
Exploration licences	51	13 377 km ²
Special Prospector's licences	13	145 km ²
Miners Rights	89	18 ha
Prospectors licences	129	26 km ²
Authorities to prospect under the Aid to Mining Act 1927	1	23 km ²
Permits to explore for petroleum under the Petroleum (Submerged Lands) Act 1967	6	1 498 graticular blocks (95 700 km ²)

Exemptions

Exemption from the labour covenant of leases is granted only in circumstances where compliance is beyond the control of the lessee.

Northern Chromite Pty Ltd the holder of lease 67M/72 at Beaconsfield was granted an exemption from 1 July to 31 December 1973 and John Bennetto, the holder of leases 37M/73, 39M/73, 40M/73 and 41M/73, was granted an exemption from 1 July 1973 to 30 September 1973.

WARDENS COURT

Tasmanian Conservation Trust, Hobart and Launceston Branches; South-West Committee; Society for Growing Australian Plants; Launceston Walking Club; Launceston Field Naturalists' Club and R. A. Wyatt v. Mineral Holdings Australia Pty Ltd. Objections to an application for a Special Prospector's Licence in the vicinity of Milford Creek and New River Lagoon.

As I reported in my last Report this case was heard by the Warden of Mines, Devonport on 4 and 5 December 1972. The Warden upheld the objections but his finding was reversed by Mr Justice Nettlefold on appeal to the Supreme Court. A further appeal has been made to the Full Court but this had not been set down for hearing at the end of the year.

Objections by landowners to the granting of an Exploration Licence applied for by Investment Trust Ltd.

It is now over four years since the application was first lodged but the appeal from the Warden's finding that the application was invalid has not been prosecuted in the Supreme Court by the parties.

F. P. C. Ralph v. Rockford Pty Ltd. Objection to applications for leases at Wombat Flat; *L. G. Szabo v. Kibuka Mines Pty Ltd.* Objection to application for an Exploration Licence at King Island.

Both these applications were withdrawn by the objectors and a determination by the Warden of Mines was not necessary.

Allstate (Tas.) Pty Ltd v. Estate late H. D. Windred. Application for forfeiture of lease 1517/G, Beaconsfield.

This application was heard by the Warden of Mines at Launceston and was adjourned *sine die* because of certain legal technicalities. A second application was subsequently lodged and forwarded to the Warden but no determination has yet been made.

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—

Cert. No.

222/73	Henry John Head
223/73	Mehmet Umit Safak
224/73	George Robert Wakenshaw
225/73	Timothy Bertram Cawdry
226/73	Darrold John Cox
227/73	Francis Robin Campbell
228/73	Terence Anthony Lee
229/73	Alan Francis Brecknell
230/73	Trevor Wren Muller
231/73	Malcolm George Dorricott
232/73	Richard Moore Patterson
233/73	Robert John Lloyd

Certificate Issued Upon Presentation of a Certificate

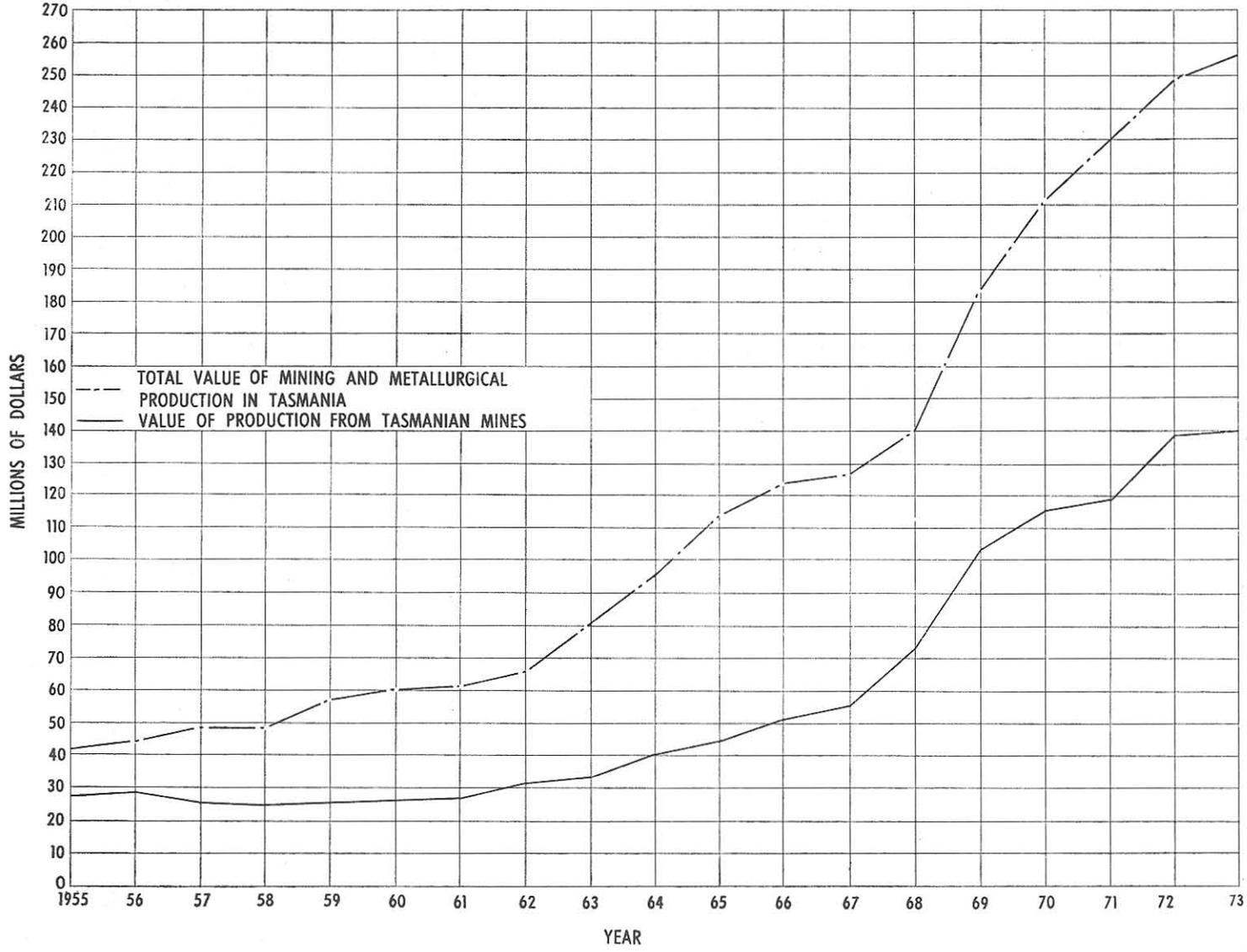
Issued by a Recognised Authority—

Cert. No.

221/73	Colin Edward James
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VALUE OF TASMANIAN MINERALS IN RECENT YEARS WITH AUSTRALIAN METAL PRICES

<i>Year</i>	\$	<i>Year</i>	\$
1964	40 013 378	1969	104 150 500
1965	43 755 904	1970	115 469 042
1966	51 180 693	1971	119 998 652
1967	55 252 710	1972	136 847 182
1968	71 919 344	1973	139 557 057



VALUE OF MINING AND METALLURGICAL PRODUCTION, 1955-73.



MINERAL PRODUCTION SINCE 1880
 QUANTITY AND VALUE OF MINERAL PRODUCTION AS AT 31 DECEMBER 1973

<i>Mineral</i>	<i>Unit</i>	<i>Total Quantity</i>	<i>Value \$</i>
METALLIC MINERALS			
Antimony	(tonne)	3	2 034
Bismuth	(kilogram)	110 080	503 385
Cadmium	(tonne)	2 245	7 734 816
Cobalt oxide	(tonne)	42	121 244
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)	625 543	339 922 623
Crocoite	(specimens only)	....	13 652
Gold	(kilogram)	93 065	46 139 560
Ilmenite	(tonne)	558	2 512
Iron ore pellets	(tonne)	11 609 254	139 666 450
Iron oxide (including hematite, limonite and magnetite)	(tonne)	190 804	705 531
Lead (from 1919)	(tonne)	476 358	72 192 155
Manganese	(tonne)	1	6
Manganese dioxide (from 1957)	(tonne)	8 702	308 997
Mercury	(kilogram)	7 255	87 659
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)	466 393	....
Rutile	(tonne)	1	36
Rutile (concentrates)	(tonne)	22 746	3 501 768
Scheelite	(tonne)	33 137	73 950 986
Silica for silicon alloy production	(tonne)	68 633	637 804
Silicon as silicon alloys	(tonne)	131 305	14 289 187
Silver-lead ore to 1918 (now shown under Silver and Lead)	(tonne)	1 101 295	12 858 582
Silver (from 1919)	(kilogram)	1 843 326	46 460 807
Sulphur as sulphuric acid (from 1957)	(mono tonne)	2 008 563	27 785 576
Tin	(tonne)	186 740	191 438 241
Wolfram	(tonne)	20 602	34 873 215
Zinc	(tonne)	1 172 371	240 380 400
Zinc sulphate (from 1957)	(tonne)	3 251	324 177
Zircon (concentrates)	(tonne)	17 435	963 755
NON-METALLIC MINERALS			
Asbestos	(tonne)	4 044	34 284
Baryte	(tonne)	2 240	16 478
Clay (from 1958)—			
Brick	(metre ³)	1 229 468	3 138 748
Tile	(metre ³)	44 714	90 870
Other	(metre ³)	407 106	1 512 217
Dolomite	(tonne)	51 958	299 750
Graphite	(tonne)	41	214
Kaolin	(tonne)	112 869	883 018

<i>Mineral</i>	<i>Unit</i>	<i>Total Quantity</i>	<i>Value \$</i>
Limestone—			
Agricultural and other	(tonne)	925 087	2 237 902
Carbide	(tonne)	897 445	3 255 474
Cement	(tonne)	7 885 968	12 333 008
Chemical and metallurgical	(tonne)	4 553 979	6 222 710
Ochre	(tonne)	2 911	22 862
Pebbles (from 1957)	(tonne)	15 741	263 437
Sand (moulding)	(tonne)	864	9 550
Silica	(tonne)	319 998	756 092
Talc	(tonne)	338	2 154
FUEL MINERALS			
Coal	(tonne)	10 345 682	27 843 873
Shale	(tonne)	42 239	62 462
Peat	(tonne)	1 144	64 548
CONSTRUCTION MATERIALS			
Building stone—			
Freestone	(metre ³)	10 225	283 732
Granite	(metre ³)	4 638	89 778
Other	(metre ³)	12 011	55 555
Crushed and broken stone (from 1958)—			
Basalt	(metre ³)	2 105 737	7 401 106
Dolerite	(metre ³)	7 567 860	30 347 257
Limestone	(metre ³)	304 078	1 097 272
Sandstone	(metre ³)	36 260	88 296
Other	(metre ³)	2 428 517	8 506 838
Gravel (from 1958)	(metre ³)	15 189 638	22 746 097
Sand (from 1958)	(metre ³)	1 627 915	3 078 002
Other road materials	(metre ³)	2 667 091	4 184 336
			\$1 432 534 328

STATISTICS RELATING TO THE MINERAL INDUSTRY

<i>Mineral</i>	<i>Year Ended 31 December 1972</i>		<i>Year Ended 31 December 1973</i>	
	<i>Total Quantity</i>	<i>Value \$A</i>	<i>Total Quantity</i>	<i>Value \$A</i>
METALLIC MINERALS				
Bismuth (kilogram)	20 000	372 724	5 080	71 373
Cadmium (tonne)	138	658 560	178	1 026 000
Cobalt oxide (tonne)	4·56	17 656	10·28	42 190
Copper (tonne)	27 806	26 226 228	25 329	32 176 630
Crocoite (specimens only)	....	1 500	....	750
Gold (kilogram)	1 781	2 873 567	1 319	2 987 891
Iron ore pellets (tonne)	2 373 047	27 527 624	2 413 781	27 656 607
Iron oxide (tonne)	9 783	61 956	12 293	82 394
Lead (tonne)	20 303	4 951 450	14 362	4 091 160
Manganese dioxide (tonne)	2 205	79 443	2 400	97 047
Mercury (kilogram)	593	2 986	544	3 265
Rutile (concentrates) (tonne)	Nil	Nil	2 965	388 288
Silica for silicon alloy production (tonne)	3 851	37 900	11 021	110 210
Silicon as silicon alloys (tonne)	16 603	1 786 770	24 854	2 749 818
Silver (kilogram)	79 222	3 666 297	60 080	3 553 563
Sulphurs—				
Pyrites (tonne)	221 595	....	244 798	....
Sulphuric acid from pyrites (mono tonne)	357 528	5 258 779	331 090	5 183 827
Sulphuric acid from zinc concentrates (mono tonne)	96 210	1 217 939	61 895	827 631
Tin (tonne)	6 825	22 439 882	5 674	20 221 559
Tungsten as tungstic oxide (tonne)	1 921	5 927 063	1 502	4 491 751
Zinc (tonne)	66 811	24 869 254	52 149	22 451 078
Zircon (concentrates) (tonne)	Nil	Nil	1 238	72 790
<i>Value of Metallic Minerals</i> .. .. .	....	127 977 578	....	128 285 822

Mineral	Year Ended 31 December 1972		Year Ended 31 December 1973		
	Total Quantity	Value \$A	Total Quantity	Value \$A	
NON-METALLIC MINERALS					
Clay—					
Brick	(metre ³)	70 596	183 710	68 760	200 103
Tile	(metre ³)	6 135	16 038	2 883	7 553
Other	(metre ³)	58 187	246 288	42 253	186 159
Dolomite	(tonne)	4 630	26 815	5 165	29 640
Limestone—					
Agricultural	(tonne)	28 247	96 037	33 789	123 154
Carbide	(tonne)	25 225	258 058	23 383	217 649
Cement	(tonne)	471 393	913 975	488 873	948 180
Chemical and metallurgical	(tonne)	53 265	286 151	65 599	343 547
Other	(tonne)	11 335	6 773	22 280	56 558
Ochre	(tonne)	48	721	62	1 010
Pebbles	(tonne)	1 716	28 714	824	18 088
Silica	(tonne)	16 261	45 317	17 101	52 679
<i>Value of Non-Metallic Minerals</i> .....		....	2 108 597	....	2 184 320
FUEL MINERALS					
Coal	(tonne)	132 242	589 015	114 588	530 875
Peat	(tonne)	308	17 328	184	10 512
<i>Value of Fuel Minerals</i> .....		....	606 343	....	541 387
CONSTRUCTION MATERIALS					
Building stone—					
Freestone	(metre ³)	2 083	36 930	1 033	97 018
Granite	(metre ³)	Nil	Nil	Nil	Nil
Granite (red)	(metre ³)	Nil	Nil	22	4 025
Other	(metre ³)	1 219	4 779	3 552	23 310
Crushed and broken stone—					
Basalt	(metre ³)	239 869	940 662	252 235	1 269 485
Dolerite	(metre ³)	494 389	1 958 765	516 708	2 588 449
Limestone	(metre ³)	18 708	73 365	22 145	110 725
Sandstone	(metre ³)	46	180	1 507	7 535
Other	(metre ³)	370 430	1 452 595	188 319	939 858
Gravel	(metre ³)	1 005 421	1 545 362	1 306 839	2 770 342
Sand	(metre ³)	124 855	256 794	137 713	357 952
Other road material	(metre ³)	144 814	257 789	164 390	376 824
<i>Value of Construction Materials</i> .....		....	6 527 221	....	8 545 523
<i>Total Value with Australian Metal Prices</i> .....		....	137 219 739	....	139 557 052
METALLURGICAL PRODUCTION FROM OTHER THAN TASMANIAN ORES					
Alumina .....	}	....	107 310 085	....	114 645 092
Aluminium					
Aluminium hydrates					
Aluminium sulphates					
Cadmium					
Cobalt oxide					
Ferro-manganese					
Titanium dioxide					
Zinc .....	}	....	244 529 824	....	254 202 144
<i>Value of Mining and Metallurgical Production</i>					
Average number of Employees		10 345	10 073		

AID TO MINING

During the past few years assistance has been provided to many of the smaller producers of alluvial tin to purchase pumping equipment and in some cases earth moving equipment to improve both output and recovery of tin concentrates. Applications for further assistance of this nature were not received during the year. However, repayments were received on previous loans either by royalty on the proceeds of mineral products sold or from the proceeds of sale of the mine to a company. This resulted in the balance in the Mining Trust Fund being accumulated. Towards the end of the year one of the larger producers who had to cease productive mining temporarily in order to move operations to another part of the leases sought assistance to meet instalments due on the purchase of a hydro-electric power station from which the major supply of water used in sluicing is obtained.

A loan was arranged which is secured by a registered mortgage over the assets at the mine. Repayment is to be made by royalty on the proceeds from the sale of tin produced when operations are re-established and interest is being charged half-yearly.

Mt Bischoff Mine. The reservation around the old mine which has been held under an Authority to Prospect under the Aid to Mining Act 1927, by Comstaff Pty Ltd continued in force. The company is also engaged in intensive investigation of the mineral potential of adjoining areas occupied as exploration licences under the Mining Act 1929, and any immediate developments at the Mt Bischoff mine are dependent upon commercial discoveries being made on the adjoining licences.

There was little interest by tribute parties and only four tributaries were held during the year. The treatment plant which had been maintained by the Department for the benefit of tributors has not been used and is in an advanced state of deterioration and rehabilitation cannot be justified. In such circumstances consideration is being given to discontinuing the tribute system in favour of granting small leases under the Mining Act 1929 which will not interfere with any developments which may accrue from the investigations by Comstaff Pty Ltd to which reference has been made.

Mining Plant. There was no demand for use of the items of mining plant purchased some years ago for hire to small parties to test mineral prospects from shafts or other below-surface mining.

STAFF

The following staff movements occurred during the year:—

Name	Position	Remarks
Byers, G. M. (Miss)	Typist	Appointed 17.5.73
Collins, P. L. F.	Geologist	Appointed 2.1.73
Corbett, E. B. (Mrs)	Geologist	Resigned 26.1.73
Galbraith, A. S. T.	Geologist	Resigned 2.3.73
Geard, L. A.	Laboratory Assistant	Appointed 12.2.73
Hewitt, C. G. (Miss)	Typist	Resigned 26.4.73
Kennaugh, A. D.	Clerk	Transferred 3.5.73
Morrison, C. J.	Clerk	Appointed 19.3.73
Saunders, C. D. (Miss) ..	Laboratory Technician	Appointed 28.7.73
Webb, C. S.	Clerk	Appointed 19.7.73

SCHOLARSHIPS

Two geological scholarships were awarded. One to C. Calver who commenced first year studies and the other to D. J. Sloane who was in his third year.

S. F. Cox was granted an extension of his scholarship to enable him to study for an Honours Degree.

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 detail 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.

J. G. SYMONS, Director of Mines

OPERATIONS AND PRODUCTION

1. — Metallic Minerals

CADMIUM

CADMIUM: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes		\$		Year	Tonnes		\$	
1924-68	1 776		5 247 286		1971	75		272 563	
1969	40		255 267		1972	138		658 560	
1970	38		275 140		1973	178		1 026 000	
					Total	2 245		7 734 816	

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

COBALT OXIDE

The source of the 10.28 tonnes of cobalt oxide of value \$42 190 was the same as that of cadmium.

COPPER

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	\$
1919-1968	516	421 795	17 183	11 350 574	488 139	191 065 283	410	21 162	506 248	202 858 814
1969	578	787 851	1 359	1 837 597	13 004	17 499 587	2 636	3 546 678	17 577	23 671 713
1970	775	1 011 242	1 276	1 680 941	....	....	21 334	27 493 602	23 385	30 185 785
1971	925	917 843	1 669	1 629 093	....	....	22 604	22 256 517	25 198	24 803 453
1972	1 038	981 414	2 478	2 341 658	....	....	24 290	22 903 156	27 806	26 226 228
1973	750	941 501	1 746	2 256 020	....	....	22 833	28 979 109	25 329	32 176 630
Total	4 582	5 061 646	25 711	21 095 883	501 143	208 564 870	94 107	105 200 224	625 543	339 922 623

The Mount Lyell Mining and Railway Company Limited, Queenstown

	Tonnes
Mining—	
Overburden removed from Crown Three mine	567 188
Ore mined—	
Prince Lyell	1 107 659
West Lyell	91 783
Crown Lyell	222 338
Cape Horn	376 663
Lyell Tharsis	75 891
Royal Tharsis	12 677
Crown Three open cut	316 521
	2 203 532
Copper concentrate produced	90 102
Containing—	
Copper (tonnes)	22 834
Silver (grams)	3 944 036
Gold (grams)	440 489
Pyrite concentrate produced	99 633
Total value of production	\$29 064 944

The average number of persons employed was 438 underground and 929 on the surface.

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

Mine	MINE DEVELOPMENT			
	Driving and Cross-cutting (m)	Rising (m)	Diamond Drilling (m)	Core Recovery (m)
Prince Lyell	1 944.2	155.5	489	440
Cape Horn	2 797.7	706.8	4 526	4 029
Crown ..	425.5	175.9	400	325
Lyell Tharsis	122.0	34.0	....	....
Royal Tharsis	236.9	322.7	729	556
'A' Lens	278.8	73.0	858	757
No. 1 Shaft	528.2	51.5	360	218
Total	6 333.3	1 479.4	7 362	6 325

No. 1 Shaft, Prince Lyell

Equipping—

Shaft steelwork	330 metres
Brattice wall	340 metres

Equipping of the Prince Lyell shaft was completed by Roberts-Holland early in June, the failure to conform to schedule being occasioned by delays in design. A temporary signalling system was installed permitting manual operation of the cage winder, so that off-shaft development could commence in July, all development mullock being hoisted in Cavos in the main cage.

Prince Lyell Mine

Horizontal development from the Prince Lyell No. 1 shaft has progressed with the main emphasis being directed to the establishment of a mullock pass. The mullock pass rise from the 18 level to the 17 level was completed and 14 level was driven to a position for the introduction of the raise borer to excavate the section from 14 level to 17 level. When this rise is completed skip hoisting of mullock should permit an accelerated rate of development.

Roberts-Holland contracted to strip the Southern Exhaust Airway from the original Alimak rise diameter of 2.1 metres to a finished diameter of 5.5 metres from the 11 level horizon to the surface. The stripping was completed at the end of the year.

Development of the second block of sub-level open stoping has proceeded with the main decline advancing to beyond the cross-cut for the 120 m level, the lower drill level. The stoping block will be 75 metres in height leaving a crown pillar of 25 metres below the first block. At this stage planning dictates that the mining method, after completion of the second block of open stoping, be changed to sub-level caving.

The production of 1 107 659 tonnes of ore from this mine represented 50% of the company's tonnage mined. The introduction of larger capacity loading units considerably decreased the train loading time at the low level loading points. The failure of the upper sections of the pillars between stopes 2-3 and 3-4 has resulted in more attention being devoted to the major shearing pattern and the sequence of stope firings.

Ventilation of the extraction level (195 m) remained a problem due to the frequent and numerous variations in stope contents.

The portal of the main decline situated at the Tunnel Yard was fully established and this decline will provide the permanent vehicular access into the lower sections.

Cape Horn Mine

The decline from the 323 m level (surface adit) was advanced to 220 metres beyond the Cape Horn Haulage level (203 m) with a connection, for access, being made to the 203 m level. The controls for No. 1 and No. 2 ore passes were installed, and the utilisation of these passes towards the latter half of the year contributed to a reduction in costs, by eliminating an extra handling of the broken ore.

The sub-level cave block was mined out during the year and in the sub-level open stope block production commenced from stope 2 and stope 3. Deterioration of the pillar between stopes 3 and 4 has necessitated curtailing the mining of stope 3 until stopes 4 and 5 have been mined. The excavations for underground workshop and re-fuelling station have been started.

Crown Mine

No new development was carried out during the year but the programme of diamond drilling to delineate the ore outline of the upper 12 West orebody was completed. A mining method has now been planned and production from this high grade block should commence during 1974.

Crown Three Open-cut

Ground movement, necessitating handling extra waste, not only limited ore production from this open-cut but also affected the Crown mine's production, since the stope pillars in the Crown mine cannot be mined until the open-cut is finished.

Lyell Tharsis Mine

Ground conditions continue to give trouble in this orebody, and it has not been practicable, due to self caving, to retreat with the firing of successive rings.

Royal Tharsis 'A' Lens

The raise borer completed a 250 m ventilation rise for this area during the year. Stope development continued on a limited shift basis.

GENERAL

Underground mines provided 80% of the ore treated for the year, an increase of 25% over the figures for 1972. The installation of the centralised traffic control system for the rail transport on the 195 m level was completed. Full automatic control of points and signals in the tunnel yard area with radio communication to locomotive drivers is now effective from a manned mimic panel. The extension to cover the underground tracks to the loading points is now dependent upon improved radio effectiveness.

ORE RESERVES AT 30 JUNE 1973				
<i>Mine</i>	<i>Tonnes</i>	<i>Copper</i>	<i>Silver</i>	<i>Gold</i>
		(%)	(g/t)	(g/t)
PROVED ORE—				
Prince Lyell	26 577 000	1.43	1.40	0.223
Crown 2	21 000	2.99	22.32	0.279
Crown 3	2 215 000	1.48	3.63	0.335
12 West ..	38 000	8.39	27.90	0.140
Lyell Tharsis ..	601 000	1.22	1.40	0.223
Cape Horn	2 521 000	1.80	3.91	1.116
Crown 3 Open-cut	501 000	1.46	3.63	0.335
Total	32 474 000	1.47	1.81	0.307
PROBABLE ORE—				
'A' Lens West Lyell	3 645 000	1.30	1.39	0.223
Royal Tharsis	2 529 000	1.36	1.39	0.223
Cape Horn	1 361 000	1.70	2.79	0.279
Prince Lyell ..	2 223 000	1.38	1.39	....
Total	9 758 000	1.39	1.59	0.223
POSSIBLE ORE (not reserves)—				
Cape Horn	1 608 000	1.26	2.79	0.279
'A' Lens ..	902 000	1.16	1.39	0.223
Total	2 510 000	1.22	2.23	0.251

MILLING

Crushing

The Intermediate Ore Storage and secondary crushing complex was fully commissioned during January. This facility, in providing storage for a 'live' load of 15 000 tonnes before the tertiary crushing section, has been of great benefit, and has permitted some control of ore grade and moisture content.

Concentrate

	<i>Tonnes</i>	<i>Copper (%)</i>	<i>Sulphur (%)</i>
Copper	90 102	25·34	....
Pyrite	99 633	0·35	48·64

General

An on-stream analysis system was installed and commissioned during the year with the aim of improving the process control during copper flotation.

A continuous 'read out' was available for copper, iron, and density, of both the flotation head feed and the final tail. This permitted the transfer of four assayers to other duties. The mill operated for 359 days.

Metal production from the inception of the company to 31 December 1973 was:—

Copper	757 432 tonnes
Silver	526 355 kilograms
Gold	21 994 kilograms

ACCIDENTS

Man hours exposure	2 773 087
Frequency rate	57·7
Severity rate	8 635·5
Mean duration (days)	12·5

An increase in the number of accidents and their severity, illustrates the poor safety record achieved by the company for the year under review. Three fatal accidents occurred in 1973, all on the surface. Two of these accidents involved the driving of vehicles on the lease, both vehicles, when examined after the accident, being found to be mechanically unsound. The third fatal accident was caused by the failure of a mechanical lifting arrangement on the headframe of the Prince Lyell shaft.

CAPITAL EXPENDITURE

During the year the following capital items were purchased:—

- Subterranean 007 raise borer
- Three Hagglund shuttle cars
- Two 10-ton battery locomotives
- Two ST8 load-haul-dump units
- One 3-boom rail mounted drill jumbo
- One D5 bulldozer
- Six mine cars
- Intermediate ore storage and secondary crushing plant
- On-stream analysis equipment.

Cleveland Tin N.L., Luina

This company, reviewed under Tin, produced 3 575 tonnes of copper concentrates containing 750 tonnes of copper valued at \$941 501.

Electrolytic Zinc Company of Australasia Limited, Rosebery

This company, reviewed under Zinc, produced, 15 372 tonnes of copper concentrates containing 1 746 tonnes of copper valued at \$2 256 020.

GOLD

GOLD: QUANTITY AND VALUE OF PRODUCTION

Year	Kilograms	Value	Year	Kilograms	Value
		\$			\$
Prior to 1969	85 938	35 738 946	1971	1 660	1 933 457
1969	1 142	1 338 817	1972	1 781	2 873 567
1970	1 225	1 266 882	1973	1 319	2 987 891
				Total	93 065
					46 139 560

The Mount Lyell Mining and Railway Company Limited, Queenstown

This company recovered 441 kilograms, valued at \$984 134, from sludge in the electrolytic copper refinery.

Electrolytic Zinc Company of Australasia Limited, Rosebery

Concentrates produced by this company contained 876 kilograms, valued at \$1 999 019.

Aberfoyle Limited (Dorset Tin Division), Gladstone

Re-treated tailings gave a recovery of 2 kilograms valued at \$4 738.

LISLE GOLDFIELD

Two small workers, Messrs A. Graham and M. Holman, recovered several grams of gold but no sales were made.

IRON ORE (PELLETS)

Savage River Mines, Savage River and Port Latta

P. Allan, Mining Engineer, Burnie, reports as follows:—

Savage River—	<i>Tonnes</i>
Overburden removed	6 873 359
Ore mined	4 778 216
Concentrate to Port Latta (dry)	2 415 466
Port Latta—	
Pellets produced (dry)	2 413 781
Value of production	\$27 656 607
Average number of persons employed—	
Mining	118
Other	518
Total	636

A total of thirty-eight shipments averaging 62 909 tonnes per vessel and seven oil tankers discharging a total of 40 852 tonnes of fuel oil passed through Port Latta. Some 6 000 tonnes of concentrates were despatched for heavy media separation in coal washing.

At Savage River the open-cut has remained at the eleventh lift throughout the year while work has continued in opening up the southern end. Considerable effort is being put into pit bank stability analyses. With the development of the eleventh lift it has become apparent that fault intersections are introducing areas of instability. By careful control of the mining programme it has been possible to maintain production schedules. All potential slip areas are now fully monitored while geological and geomechanical studies are in progress.

Work is well advanced on the development of a northern access road outside the projected pit limits. This road when completed will reduce the haul distance to the crusher and future road construction requirements.

A rock sizing grizzly has been constructed and a crushing and screening plant is being rehabilitated for the handling of road material. It is intended to augment and partially replace the present fleet of Terex R45 and Euclid R50 haulage vehicles with Terex 33-11 (80-tonne) vehicles. The availability of the present fleet has been 80% for the year.

Work has been completed in the main tailings dam and the wall is now raised continuously, a 30-inch cyclone mounted on the wall itself giving close size control to meet the specifications suggested by the Hydro-Electric Commission. The northern slot of the same effluent control area has been raised 6 metres and includes a series of graded filter beds in conjunction with a flow-through dam.

Other capital expenditure was involved in the replacement purchase of five utility trucks, enlarged crib and sanitary facilities in the mill, the start to constructing a mill concentrate crossover feed system to provide an additional means of blending feed and improving concentrate consistency, a start to study to develop an automatic autogenous mill grinding system, additions to the fire protection systems at both Savage River concentrator and the Port Latta pelletising plant.

A total of forty-eight reportable accidents occurred during the year, six of these being at Port Latta which recorded eight separate accident-free months. One-third of all reportable accidents involved back strain.

Accident statistics for the year are:—

	Accidents	Days Lost		Man Hours	Frequency Rate	Severity Rate	Mean Duration
		Working	Calendar				
Savage River	42	284	360	858 633	48.91	419.2	6.7
Port Latta	6	33	37	408 177	14.70	90.65	5.5
Combined	48	317	397	1 266 810	37.89	313.4	6.6

IRON OXIDE

IRON OXIDE: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value		Year	Tonnes	Value	
		\$				\$	
Prior to 1969	137 100	363 197		1971	10 724	65 526	
1969	11 295	71 791		1972	9 783	61 956	
1970	9 609	60 667		1973	12 293	82 394	
				Total	190 804	705 531	

Iron Cliffs Mine, Penguin

A. Pearson continued to work the secondary ore at the Iron Cliffs mine and supplied a cement works with 12 293 tonnes of hematite valued at \$82 394. Employment averaged eight men.

LEAD

LEAD: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value		Year	Tonnes	Value	
		\$				\$	
1919 to 1968	406 596	54 160 977		1971	12 452	2 926 075	
1969	11 918	3 081 475		1972	20 303	4 951 450	
1970	10 727	2 981 018		1973	14 362	4 091 160	
				Total	476 358	72 192 155	

Electrolytic Zinc Company of Australasia Limited, Rosebery

This company, reviewed under Zinc, produced 19 020 tonnes of lead concentrate and the total content of lead in the lead, zinc and copper concentrates was 14 362 tonnes valued at \$4 091 160.

South Comet Mine, Dundas

During the year no production was recorded from this lease, however, the lease-holders Texin Development Pty Ltd concentrated on the area of their exploration licence which surrounds the leases in an attempt to prove additional ore reserves.

Adelaide Mine, Dundas

Two men were employed during the year with specimen crocoite sold yielding in excess of \$10 000. Stopping was continued at No. 1 sub-level horizon until the patch was worked out at the surface. Some fine specimen dundasite was found during 1.5 m of driving in the main adit area but the valuable mineral pinched out in the face. Improvements were made to the access road during the year.

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 2 400 tonnes was valued at \$97 047.

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

Year	Value		Year	Value	
	Kilograms	\$		Kilograms	\$
1967 to 1968	2 881	39 051	1971	302	2 484
1969	1 645	23 707	1972	593	2 986
1970	1 290	16 166	1973	544	3 265
			Total	7 255	87 659

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 544 kilograms, valued at \$3 265.

OSMIRIDIUM

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

PYRITE**PYRITE: QUANTITY PRODUCED**

Year	Tonnes	Year	Tonnes
1915 to 1968	1 836 119	1971	182 411
1969	28 993	1972	221 595
1970	76 547	1973	244 798
		Total	2 590 463

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 11 021 tonnes of silica valued at \$110 210. 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 9 726 tonnes of local Beaconsfield quartzite combined with slag from ferro-manganese production for a yield of 24 854 tonnes of silico-manganese valued at \$2 749 818. 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.

SILVER: PRODUCERS, SOURCE, QUANTITY AND VALUE OF PRODUCTION, 1973

<i>Producer</i>	<i>Source</i>	<i>Kilograms</i>	<i>\$</i>
Cleveland Tin N.L.	Tin and copper concentrates	663	38 686
EZ Co. of A/asia Ltd	Copper, lead and zinc concentrates	55 473	3 283 151
Mt Lyell M. & R. Co. Ltd	Refinery sludge	3 944	231 726

SILVER: 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>
1919-1968 ..	3 788	101 764	550 239	5 749 634	123 487	1 852 629	885 209	24 780 099	1 562 723	32 484 126
1969 .. ....	....	....	....	....	2 365	123 116	42 914	2 223 832	45 279	2 346 948
1970 .. ....	....	....	....	....	3 521	177 458	40 574	2 060 012	44 095	2 237 470
1971 .. ....	....	....	....	....	3 673	156 351	48 254	2 016 052	51 927	2 172 403
1972	2 572	123 722	....	....	4 174	191 595	72 456	3 350 980	79 222	3 666 297
1973	663	38 686	....	....	3 944	231 726	55 473	3 283 151	60 080	3 553 563
Totals	7 023	264 172	550 239	5 749 634	141 164	2 732 875	1 144 900	37 714 126	1 843 326	46 460 807

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>Pyrite</i>	<i>Acid</i>			
	<i>Mono tonnes</i>	<i>\$</i>	<i>Tonnes</i>	<i>Mono tonnes</i>	<i>\$</i>	<i>Mono tonnes</i>	<i>\$</i>
1957-1968	553 786	5 999 944	....	....	....	553 786	5 999 944
1969	54 619	1 158 662	....	....	....	54 619	1 158 662
1970	59 389	889 263	76 547	88 778	1 415 482	148 167	2 304 745
1971	51 642	628 629	182 410	353 627	5 205 420	405 269	5 834 049
1972	96 209	1 217 939	244 281	357 528	5 258 779	453 737	6,476 718
1973	61 895	827 631	242 618	331 090	5 183 827	392 985	6 011 458
Totals	877 540	10 722 068	745 856	1 131 023	17 063 508	2 008 563	27 785 576

North-West Acid Proprietary Limited, Wivenhoe

This company continued to treat pyrite concentrates produced by the Electrolytic Zinc Company, Rosebery and the Mount Lyell Mining and Railway Company, Queenstown. Production for the year was 331 090 mono tonnes of acid.

Capital Expenditure

A capital expenditure of \$300 000 was incurred as follows:—

- Additional weak acid cooler
- Interpass booster blower system
- Cross flow stripper fan
- Additional carbate bundle and shell
- Third treated liquor tank
- Safety requirements including coverguards, platforms and catwalks
- Additional catalyst.

Production

Production for the year achieved budget tonnage but remained below plant design capacity. Failures in the carbate cooler section during the year resulted in the installation of a lead cooler which appears to be performing satisfactorily. An inspection of the stack was made during the year and indicated that little corrosion had taken place.

General

The M.V. 'Emu Bay' the barge transporting the calcine, was fitted with hatch sideboards to prevent spillage, and chains were fitted to the doors to preclude the possibility of their opening in the event of the failure of the hydraulics system.

Extensive feasibility studies have been made for the processing of calcine residues. Pilot processes have been investigated in Sweden and Italy but major technical problems remain to be solved.

Safety

The number of employees during the year averaged 109 and there was a turnover of 15%. Eight lost-time accidents occurred during 1973, one of which was classified as a serious accident.

Work injury statistics were:—

Man hours exposure	273 991
Frequency rate	29·2
Severity rate	339·4
Mean duration rate (days)	11·6

TIN

TIN: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value		Year	Tonnes	Value	
		\$				\$	
1873 to 1968	158 202	96 177 236		1971	6 168	19 854 601	
1969	4 853	15 817 361		1972	6 825	22 439 882	
1970	5 018	16 927 602		1973	5 674	20 221 559	
				Total	186 740	191 438 241	

Aberfoyle Ltd, Rossarden

PRODUCTION

Mine	Ore milled (Tonnes)	Tin in concentrates (Tonnes)	Value (\$)	WO ₃ in concentrates (Tonnes)	Value (\$)	Hydraulic fill (Tonnes)
Storeys Creek	26 176	25	87 785	184	544 684	11 200
Aberfoyle Mill	56 439	215	758 622	278	828 102	31 706

EMPLOYMENT AND DEVELOPMENT

Mine	Average Number of Men		Driving and cross-cutting (Metres)	Rising (Metres)
	Underground	Surface		
Aberfoyle	62	64	....	59
Storeys Creek	62	4	127	84

Mr R. C. Thomas, Mining Engineer, Hobart, reports:—

Aberfoyle Mine

During the year, due to depressed metal prices and rising costs, the labour force at the Aberfoyle mine was reduced from 191 employees at the beginning of the year to 109 employees at the end. This was accomplished in three stages:—

- (1) Aberfoyle mine placed on a one-shift basis in March 1973.
- (2) Further cut-back and reorganisation in June 1973.
- (3) Aberfoyle mill placed on a one-shift basis in August 1973.

Every effort was made to find work for as many of the employees as possible in the mining industry elsewhere in the State and to minimise the effect of the retrenchments on the Rossarden community.

The following expenditure was incurred on capital works:—

	\$
Mill modifications	16 235
New assay office	7 500
Enlarging slimes dam	7 750
Waste sorting facilities	1 272
	<hr/>
	32 757
	<hr/>

A further amount of \$4 500 was spent on the chemical treatment of mill effluent.

A custom ore bin was built to receive Storeys Creek ore. The new hydrosizer was installed in the tabling section of the mill and a new Rapid magnetic separator replaced one of the older units. The Pan-Am jig from Storeys Creek was also installed in the circuit.

Ore reserves, as published at 30 November 1973 were as follows:—

	<i>Tonnes</i>
Indicated ore	312 400
Inferred ore	64 850
	<hr/>
Total	377 250
	<hr/>

Storeys Creek Mine

Due to low metal prices and rising costs the mine was placed on a care and maintenance basis at the end of August but later in the year some limited stoping was resumed in areas above 3 level, which contained significant amounts of tin, and other men were employed on sand filling. The labour force was reduced from eighty-nine persons at the beginning of the year to seven at the end of the year. A total of \$5 500 was spent on the chemical treatment of mine drainage water. The ore reserves as published on 30 November 1973 are:—

	<i>Tonnes</i>
Indicated ore	217 250
Inferred ore	27 250
	<hr/>
Total	244 500
	<hr/>

BMI Mining Pty Ltd, South Mount Cameron

Monarch Mine: Operations were temporarily suspended.

Endurance Surface Area: This was worked for six months; eight men were employed.

Endurance South: The area was operated during the last four months of the year; an average of eight men was employed. A 10-inch gravel pump was installed to stack the tailings; the water was recirculated.

Ringarooma River Leases: A start was made on preparations for the mining of the Ringarooma River gravels above Moorina. Using the Bucyrus Eyrie dragline a river diversion cut was put through a bend in the river thereby enabling the river bed to be mined. Installation of pumps and jigs was in progress at the end of the year.

A total of 233 849 cubic metres was treated during the year for a yield of 78·726 tonnes of concentrates containing 59·616 tonnes of tin valued at \$191 691. Employment averaged thirteen men.

Cleveland Tin N.L., Luina

E. C. Leyland, Mining Engineer, Burnie, reports that there has been a decrease this year in the tonnage treated; 316 825 tonnes containing 0·845% Sn and 0·392% Cu, were treated. Recoveries were as follows:—

	<i>Tonnes</i>
Tin concentrate	3 084
Tin content	1 675
Copper concentrate	3 575
Copper content	750
Tin content	99

DEVELOPMENT

	<i>Ore (m)</i>	<i>Mullock (m)</i>
Driving and cross-cutting	1 642·2	582·6
Decline advance .....	....	259·6
Rising	38·7	110·8
	<hr/> 1 680·9	<hr/> 953·0

PRODUCTION

Mine production was 304 179 tonnes.

Of the 323 605 tonnes of ore broken over 60% came from development and silling. Difficulties were experienced with the treatment of ore from the 'Khaki' orebody, which had been developed to provide the bulk of the ore from 1973. In view of this problem the lower development of Hall's lenses was accelerated to permit metallurgical testing of the 'Khaki' lens. Ventilation of the development headings and equipment availability for the long haul of both mullock and ore pose increasing problems with depth for the mining method in use.

CAPITAL EXPENDITURE

During the year the following capital items were purchased:—

- A spare 115 h.p. motor and switchgear
- Mine decline traffic lights
- 1 500 KVA sub-station and cable
- FTT tables
- Concentrate weighbridge
- Caterpillar 12 grader
- Two B7FD Euclid trucks
- Three utilities.

MILLING

Gravity Concentrator

Three additional Holman shaking tables were installed in the final tin treatment section to reduce the overloading on the existing six tables. The grade of final concentrates improved from 57% Sn to 61% after these tables were commissioned, with a marginal improvement in recovery.

Cassiterite Flotation Plant

The Jones high intensity wet magnetic separator was not installed until late 1972, and its operation was plagued with mechanical problems until late 1973. Since then its operation has been continuous, the grade of the cassiterite flotation plant concentrate has improved from 27% Sn to 48% Sn. The Jones separator treats the final flotation concentrate, the magnetics being sent back to the six No. 36 Agitair scavenger flotation cells.

EXPLORATION

The surface exploration programme initiated in 1972 is continuing. A deep drilling programme based on a re-interpretation of the mine structure is presently in progress. The new interpretation suggests that ore lenses are displaced to the east by low angle faulting.

ORE RESERVES

The reserves were assessed in November 1973 and are given as 'indicated ore' 2.62 million tonnes containing 0.87% tin and 0.40% copper.

SAFETY

The following is the work injury record for the year:—

Man hours exposure	367 332
Frequency rate	130.7
Severity rate	2 180.0
Mean duration (days)	16.6

Employment figures for the year gave an average figure of 227 employees of whom fifty-seven were underground workers.

Renison Limited, Renison Bell

Ore mined—	<i>Tonnes</i>
Federal	38 666
Lower North Stebbins	50 889
Upper North Stebbins	43 822
Lower Dreadnought	4 080
Upper Dreadnought	60 940
Colebrook	72 520
Penzance	20 188
Howard	995
Murchison	455
Bassett	32 266
Mineralised shales	361
South Stebbins	3 122
	<hr/>
	328 304
	<hr/>
Tin concentrates produced—	
High grade	5 900
Low grade	2 186
	<hr/>
	8 086
	<hr/>
Tin content	3 573
Overall recovery	71%

P. Allan, Mining Engineer, Burnie, reports that the Renison decline advanced 377 metres to 3 511 metres from, and 379 metres below, the portal. In addition 2 561 metres of driving and cross-cutting, and 316 metres of rising were completed.

Of the 328 304 tonnes mined, 319 136 tonnes at a grade of 1.58% Sn were treated. There was a fall in production of 26% compared with 1972.

Production was increased from the No. 3 horizon orebodies, especially the Colebrook, resulting in a higher head grade which with improved recovery gave a production only 16% below the previous year.

Ore treatment continues to improve and indicates that periodically changing personnel may perhaps be advantageous, each superintendent subscribing his quota of improvement before moving on. The fine ore bin has always proved difficult in maintaining mass flow due in part to outlet design but mainly to the oxidising nature of the ore. Each of the ten feeder outlets has now been fitted with a stainless steel cone substantially achieving a constant mass flow and reducing bin clean-outs. Modification to the mill is a continuous process, wedge wire screens currently in use in the primary grinding circuit are to be replaced with polyurethane sieve panels and Reichert spirals will shortly replace tables on coarse rougher duty. A nest of 40 mm polyurethane cyclones will be installed to recover $-6 \mu\text{m} + 2 \mu\text{m}$ cassiterite from the slime tail (vanner) for flotation. On-stream XRF probes have been successfully tested for continuous analysis of pulp in the sulphide flotation circuit. A comprehensive investigation into the use of heavy media separation for the treatment of ore at relatively coarse sizing ($-12 \text{ mm} + 5 \text{ mm}$) indicated that the process could be successfully applied to increase the mill capacity to 700 000 tonnes per annum without any adverse effect on recovery.

The company drilled 5 265 metres in eighteen surface holes and 8 284 metres in ninety-one underground holes all designed to delineate known lodes. After allowing for depletion, the ore reserves increased by approximately 1.7 million tonnes, with an increase in grade resulting in the main from the No. 3 horizon orebodies.

Ore reserves at September 1973 stood as follows:—

Orebody	Probable		Proved		Possible	
	(Tonnes)	%	(Tonnes)	%	(Tonnes)	%
Federal	1 250 000	0.95	950 000	0.90	800 000	0.80
Bassett	960 000	1.30	710 000	1.55	7 000 000	1.15
No. 2 Horizon	490 000	1.25	945 000	1.30	200 000	1.30
No. 3 Horizon	....	....	2 350 000	1.70	....	....
Other lodes	400 000	1.40	....	....	....	....
Total	3 100 000	1.16	4 955 000	1.45	8 000 000	1.12

Capital expenditure for the year was as follows:—

	\$
Housing and amenities	61 000
Mine site buildings	89 000
Mine plant and equipment	585 000
Concentrator	306 000
Maintenance equipment and sundries	120 000
Exploration	11 000
Mine development	653 000
	<hr/>
	1 825 000

Eighty-three accidents occurred during the year, one of which was fatal; some 359 persons were employed.

In the fatal accident Mr J. B. Ramsay lost control of a tractor service vehicle on the 1 in 9 decline and was catapulted from the tractor.

Accident statistics for the year were:—

Man hours exposure	656 545
Frequency rate	126.4
Severity rate	10 971
Mean duration (days)	14.7

Ringarooma Mining Pty Ltd, Waratah

This company produced 174 tonnes of tin concentrates containing 114 tonnes of tin from approximately 110 000 cubic metres of gravel. An average of eighteen men were employed.

The harsh bouldery nature of the deposit has resulted in many operating problems, several of which were overcome when a screening plant was built as an adjunct to the mobile grizzly unit. This resulted in a reduction of the size of the gravel pumped to the concentrating plant to -19 mm. Two parallel bull jigs, specially designed for the scavenging section of the plant have been effective in recovering $+19$ mm nuggets of cassiterite. In a further major change, a new bin with apron feeder is being erected close to the concentrating plant to receive gravel mined by dragline and front-end loader into heavy off-highway trucks. The gravel will be fed into the existing grizzly/screening/scavenging plant, which will become a fixed unit under the new arrangement.

The new feed preparation complex will also enable the evaluation of large bulk samples excavated with a dragline. A programme of sampling in a small area to a depth of 3 metres with a back-hoe resulted in gravel reserves being extended by some 75 000 cubic metres.

Additional tailing capacity has been provided by the construction of a dam downstream from the concentrating plant. Experimental work on flocculating the suspended solids in the tailings was without success, but this work will continue.

Accidents

Man hours exposure	33 293
Number of accidents	7
Days charged	71
Frequency	210
Severity rate	2 140
Mean duration (days)	10

V. Wood, Pioneer Mine, Pioneer

Mr Wood sluiced 760 m³/h of overburden on the top face and pumped 60 m³/h of gravel in the bottom face. The gravel pump and jigs were moved twice during the year. Production from $113\,300$ m³ of gravel treated was 16.6 tonnes of tin in concentrates valued at \$58 593. An average of seven men were employed.

K. Kerrison, Ringarooma River Beaches

Mr Kerrison continued operations with a front-end loader and a jig, to produce 5.6 tonnes of tin in concentrates valued at \$19 902 from $12\,570$ m³ of gravel.

Black Creek Tin Mining Syndicate, Branhholm

The production of 5 tonnes of concentrates from $13\,640$ m³ was unprofitable and operations ceased.

Mount Cameron Tin Syndicate, South Mount Cameron

Gravel reserves on this syndicate's leases were exhausted and the mine closed down. Production from $31\,730$ m³ was 12.7 tonnes of tin in concentrates valued at \$44 232.

T. G. Rainbow, Banca Mine, Winnaleah

Mr Rainbow, successor to R. L. Rainbow & Son sluiced $13\,445$ m³ to recover concentrates containing 4.2 tonnes of tin valued at \$15 489. A new tailing dam was constructed.

Allied Mining Enterprises Pty Ltd, South Mount Cameron

This company continued to mine shallow ground by bulldozing up to a monitor. The sluicing of $36\,450$ m³ of gravel yielded concentrates containing 12 tonnes of tin valued at \$43 938.

NSW Mining Co. Pty Ltd, Derby

Late in the year this company acquired the leases of Mr J. Maumill in the Ringarooma River below the Mutual Bridge. A jig and grizzly were set up and a dragline and front-end loader moved in. No clean-up was made.

R. Hyde and B. Trevena, Ringarooma River, Moorina

This partnership sold out after producing concentrates containing 2.2 tonnes of tin valued at \$7 376.

R. C. Lawry, Gladstone

Mr Lawry continued work in the Garfield area to obtain concentrates containing 2·7 tonnes of tin valued at \$8 644.

C. D. King, Port Davey

Mr King produced concentrates containing 2·238 tonnes of tin, valued at \$7 657, from the Melaleuca mine.

Aberfoyle Ltd (Dorset Tin Division), Gladstone

Re-treating tailings at the old tin dressing sheds at South Mount Cameron, this company, formerly Storeys Creek Tin Mining Company N.L., recovered 2·99 tonnes of concentrates containing 2·141 tonnes of tin valued at \$7 160. An average of two men were employed.

Minops Pty Ltd, Dundas and Zeehan

The programme of bulk sampling of the Razorback mine was continued; 126 samples being put through the small mill. The surface and, following the cleaning out of the main adits and the dewatering of No. 3 adit, all underground exposures were mapped. To test the continuity of mineralisation in and about the main orebody the auger drilling of twenty-four holes for a total run of 140 metres was carried out with only partial success. Following this geological work the company have suggested a structural interpretation of the orebody different to that held by previous occupiers of this lease.

The power line has been erected to the mine and the access road and bridge have been upgraded. The design for the tailings dams was completed and some bulldozing at both the dam and mill sites has cleared the timber and scrub. Four employees were occupied on the leases during the year.

A study of the core obtained from previous diamond drilling at the Oonah mine was undertaken, but apart from some metallurgical research, further work was deferred until the setting up of milling facilities at the Razorback mine.

Gippsland Mineral N.L., Zeehan

In the Queen Hill area Cocinco-Gippsland have continued mapping and have been concerned with the distribution of volcanic rocks within quartzite. A Turair (airborne electro-magnetic) survey was conducted over the licence area. Two men were employed for the year. Metallurgical research on the ore is being undertaken in London.

R. S. Laffer, North Heemskirk

Cominco have taken an option over the St Dizier mine and have increased the work force to six men. Geophysical and geochemical programmes following a survey of the exploration licence have commenced and it is expected that diamond drilling will be undertaken.

Production by Small Workers

Many miners and prospectors throughout the State produce small quantities of concentrates by reason of either small-scale or part-time working. Their work is described under the headings of various districts.

EAST COAST

L. D. McRae, Coles Bay, produced concentrates containing 0·232 tonne of tin valued at \$731.

T. H. Fitzallen produced concentrates containing 0·038 tonne of tin valued at \$152.

BRANXHOLM-DERBY

J. Maumill, Ringarooma River Beaches, Mutual Area. Before selling out to the New South Wales Mining Co. Pty Ltd, Mr Maumill mined 1 100 m³ of river gravels to obtain concentrates containing 0·998 tonne of tin valued at \$3 402.

L. M. Barnett, Star of Peace Mine, Branxholm. Mr Barnett's concentrates contained 1·598 tonnes of tin valued at \$5 944.

S. T. Kerrison, Derby, produced concentrates containing 0·204 tonne of tin valued at \$659.

PIONEER-SOUTH MOUNT CAMERON-GLADSTONE

L. J. Groves, Eastern Lead, South Mount Cameron. Mr Groves, using earth-moving equipment, mined 5 825 m³ of gravel for sluicing. Concentrates produced contained 1·205 tonnes of tin valued at \$3 867.

Miscellaneous. Messrs T. Bishop, D. Dawe, H. A. Fenton, M. F. Fenton, J. M. Groves, J. Kerrison, G. Machen and E. Hayes, N. B. Moore, R. Moore, A. K. and F. Richardson, K. M. Richardson and H. Standage produced individually concentrates containing 2·831 tonnes of tin valued at \$10 795.

MOORINA-WELDBOROUGH

Messrs P. Dickson, A. Holloway and J. Lambert produced individually concentrates containing 0·205 tonne of tin valued at \$705.

WARATAH AND WEST COAST

W. J. Hodge, Razorback Mine, Dundas. Mr Hodge sold concentrates containing 0·089 tonne of tin valued at \$192.

Ludbrooks Ltd, Port Davey. Using earth-moving equipment and jigs this company produced concentrates containing 1·317 tonnes of tin valued at \$4 291 from leases granted near Melaleuca Inlet.

J. Housego, Happy Valley. Mr Housego set up a new operation in Happy Valley Creek. Production was 0·969 tonne of tin in concentrates valued at \$3 305.

Miscellaneous. Messrs E. Bailey, M. Glozier, C. Housego and D. Kenworthy produced individually concentrates containing 0·431 tonne of tin valued at \$1 607.

TITANIUM

TITANIUM DIOXIDE: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
1969	5 009	775 086	1972 .. .. .	.....	.....
1970	7 136	1 216 274	1973	2 846	388 288
1971	6 584	1 222 120			
			Total	21 575	3 501 768

Kibuka Mines Pty Ltd, Naracoopa

This company continued with upgrading the treatment plant and started producing rutile and zircon for sale. Kibuka Mines Pty Ltd took over the management from McSweeney & Partners in July. Alterations in the treatment plant included rebuilding the secondary wet concentration section, upgrading the wet magnetic separation section and installing extra fibreglass spirals. A trommel screen was installed in the primary wet plant section. The pinch sluices were refurbished and pulp density and feed controls installed. Provision was made for stockpile areas between sections of the plant to smooth out production flows. Chemical attrition has not proved successful and has been replaced by straight water attrition. In the latter half of the year the operation of the pit was altered from dredging to dry operation by installing, at a cost of \$20 000, a buried loader unit consisting of covered conveyor tunnel with a grizzly feed onto the conveyor which discharges to a trommel, the undersize being pumped to the primary wet plant. A new International TD20C dozer was purchased at a cost of \$50 000, to feed the ore to the buried loader. Pumping arrangements have been improved in the plant and the pumps in the pit have been changed over to diesel power. A new water supply from the Fraser River has been installed.

Four houses for married personnel were completed and the single men's accommodation increased by twelve units.

Auger drilling on the lease comprised 1 671 metres.

Rehabilitation of the old tailing area continued and approximately 1·5 ha have been grassed, although the mineral content may justify reworking part of this area.

From the treatment of 203 540 m³ of sands 2 965 tonnes of rutile concentrates were produced, together with 1 238 tonnes of zircon concentrates. An average of fifty-five men was employed.

TUNGSTEN (SCHEELITE)

TUNGSTIC OXIDE: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes (Concentrates)	Tonnes (WO ₃)	Value \$
1917-1968	25 336	1 054	50 623 914
1969	1 555	1 092	5 084 758
1970	1 087	761	5 253 996
1971	1 610	1 133	5 130 809
1972	1 837	1 335	4 193 860
1973	1 682	1 224	3 663 649
Total	33 137		73 950 986

King Island Scheelite Limited, Grassy

Production statistics—

Overburden removed (tonnes)	978 741
Ore mined—Open-cut (tonnes)	343 716
Mill throughput (tonnes)	305 227
Derived mill head (WO ₃)	0·522%
Concentrate produced (tonnes)	1 682
Concentrate grade (WO ₃)	72·50%
Average number of persons employed—	
Open-cut ..	36
Underground ..	19
Other surface ..	313
	368

Open-cut

The rate of overburden removal was decreased to an average of 2·85 tonnes to one tonne of ore. Production from the open-cut was reduced from two shifts a day to one shift as the bottom of the orebody was reached. Production from the open-cut will cease in approximately seven months.

Bold Head Mine

The main decline has advanced 179 metres at a grade of 1 in 10 through poor volcanic rock where steel sets had to be used. At a distance of 246 metres from the portal the decline was steepened to 1 in 7 and turned westerly to intersect the orebody. This decline advanced 160 metres in ground conditions good enough for rock bolting.

At the end of December the decline entered the faulted contact between volcanics and the Mine Series rocks. This contact zone was very broken and necessitated grouting, diamond drilling ahead of the face being carried out.

Dolphin Mine

The Dolphin decline was commenced in March using equipment as it was available from the Bold Head mine. The decline was driven on a grade of 1 in 7 and had advanced 255 metres at the end of the year. Ground conditions were good and rock bolting was used as required. During December a cross-cut was turned off at the -75 metre level to intersect the 'C' lens orebody. This cross-cut advanced 17·3 metres. Diamond and percussion drilling ahead of the decline was carried out regularly. Diamond drilling at regular intervals was also carried out to delineate the orebody more closely.

Capital Expenditure

Capital investment for the year amounted to \$601 076 for the underground mines and \$266 678 on the surface.

Major items were:—

Kiruna trucks
Front-end loader
Drill jumbo
Mine buildings
Power house.

TUNGSTEN (WOLFRAM)

TUNGSTIC OXIDE: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes (Concentrates)	Tonnes (WO ₃)	Value \$
1899-1968	17 121	708	23 152 853
1969	612	444	2 034 886
1970	910	659	4 428 708
1971	813	592	2 695 463
1972	771	566	1 733 203
1973	375	278	828 102
Total	20 602		34 873 215

Aberfoyle Ltd, Rossarden

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

Mine	Concentrates (Tonnes)	WO ₃ content (Tonnes)	Value \$
Aberfoyle	127	94	283 418
Storeys Creek	248	184	544 684

ZINC

ZINC: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
1919-1968	931 458	153 099 194	1971	41 844	14 829 575
1969	41 781	12 795 905	1972	66 811	24 869 254
1970	38 328	12 335 394	1973	52 149	22 451 078
			Total	1 172 371	240 380 400

Electrolytic Zinc Company of Australasia Limited

EXTRACTION FROM CONCENTRATES: RISDON

	Tonnes
From other than Tasmanian ore—	
Zinc	142 553
Cadmium	275
Cobalt oxide	26
Superphosphate	141 238
From Tasmanian ore—	
Zinc	47 561
Cadmium	155
Cobalt oxide	10·28
Manufactured products—	
Aluminium sulphate	2 890
Ammonium sulphate	25 736

The average number of men employed was 2 458.

WEST COAST DIVISION

Ore mined—

Mine	Tonnes	Pb %	Zn %	Cu %	Ag g/t	Au g/t	Fe %	S %
Rosebery	396 063	5.05	15.66	0.63	185	3.79	14.65	22.62
Hercules	53 525	4.30	12.91	0.48	113	1.93	6.67	12.88
Farrell	16 576	11.23	4.80	0.22	402	....	9.81	10.67
Dumps	19 249	1.24	7.72	0.41	176	1.29	11.21	14.03
Total ..	485 413	4.97	14.67	0.59	184	3.36	13.47	20.80

Concentrate produced—

	Tonnes
Zinc concentrate	110 506
Lead concentrate	19 020
Copper concentrate	15 372
Pyrite concentrate	106 454

Recoverable quantity in ore mined—

Zinc	52 149 tonnes
Lead	14 362 tonnes
Copper	1 746 tonnes
Cadmium	178 tonnes
Silver	55 473 kilograms
Gold	876 kilograms
Cobalt oxide	10 tonnes
Manganese dioxide	2 400 tonnes
Mercury	544 kilograms

Total value of production—\$28 497 346.

Average number of persons employed—

	Surface	Underground	Total
Hercules Mine	12	38	50
Rosebery Mine	468	551	1 019
Farrell Mine	7	22	29
Total	487	611	1 098

P. Allan, Mining Engineer, Burnie, reports:—

Rosebery Mine

Some 1 986 metres of driving and cross-cutting, which included 684 metres in connection with the long hole stopes, and 225 metres of rising, including 103 metres for the long hole stopes, were completed during the year.

The long hole and sub-level long hole stoping methods were introduced on the 15 level during the year. In the long hole method the ore is worked between two levels. Drilling cross-cuts and draw points are developed on the lower level with a sub-level and drilling cross-cut also being developed 12 metres below the upper level. Fan pattern drilling from both top and bottom drill cross-cuts have the patterns 1.5 metres apart, one row at the top being fired simultaneously with the corresponding row from the bottom, between them breaking some 2 000 tonnes of ore. The broken ore is picked up by auto-loaders, the final clean-up being carried out under remote control.

In the sub-level long hole method the division of the ore into blocks by sub-levels and pillars, has reduced the drilling lengths and by cutting a slot in the middle of each block, fan drilling and firing to the slot, many of the original difficulties have been overcome.

At present sand-fill is used in all cut and fill stopes but to aid pillar recovery and as an essential adjunct to the long hole method, it is proposed to fill all long hole stopes with a 1 : 30 cement sand fill. A capping of 1 : 10 cement sand is introduced into the sub-level long hole stopes and the footwall slices in the cut and fill stopes.

In No. 1 underlay shaft full timber sets are steadily being replaced with RSJ on timber legs, to improve the overall condition of the shaft. Both 11 level and 12 level plats are in need of renewal and this work should be completed early in the following year.

Due to an unplanned drainage and pumping problem in conjunction with excessive loading station spillage after commissioning, the sump of No. 2 shaft below the 18 level was filled with slimes, water and material so that the tail ropes ran for a period in water. The main cause was the collapse of the brattice between the skip compartment and the shaft. Slimes pumps have so far prevented a worsening of the situation and plans are afoot to deal with the accumulated material and to regain access to the 19 level plat.

In the latter part of the year a question was raised regarding the adequacy of the brakes installed on the Mary Ann winder but within days and before any action could be taken, the conveyance dropped to the bottom of the shaft, without causing injury or serious damage.

The incident was caused by a failure in the brake engine system when a screwed connecting rod in the two-stage hydraulic activator became disconnected, preventing automatic (but not manual) application by giving rise to a hydraulic lock.

All three shaft winders now require modification to the brake engines to cover the apparent weakness in the existing single line hydraulic brake controls and a second brake system has to be installed on the Mary Ann.

Hercules Mine

An increase in tonnage of 40% with a slightly reduced grade was obtained mainly from the open-cut and an increased stoping rate.

To counteract labour shortages, new stopes are being developed for the shrinkage method and consideration is being given to convert suitable cut and fill stopes to that method.

Environmental Work

Considerable progress was made in the construction of a new residue dam at Bobadil, between Rosebery and the Pieman River, which will have an initial capacity of 2 million tonnes of residue. All mill and mine effluents will be collected and after treatment, pumped at 500 l/s to a holding tank on the hillside behind the mill. The combined effluents will then flow by open flume to the Bobadil dam. The dam has been established in an area traversed by the Emu Bay Railway and a short detour was made.

Ore Reserves

At the end of the year, the ore reserves for Rosebery, Hercules and Farrell amounted to 9 205 000 tonnes.

Safety

Despite a vigorous accident prevention programme the general situation continues to deteriorate with a record 79% increase in accidents. Two miners were fatally injured by falls of rock in stopes.

Accident Statistics

Number of accidents	..	....	....	....	....	....	....	....	....	785
Lost days—working	..	....	....	....	....	....	....	....	....	7 370
Total	..	....	....	....	....	....	....	....	....	10 240
Man hours exposure	..	....	....	....	....	....	....	....	....	2 366 972
Frequency rate	..	....	....	....	....	....	....	....	....	332
Severity rate	....	....	....	....	....	....	....	....	....	7 622
Mean duration (days)	....	....	....	....	....	....	....	....	....	9·41

RISDON WORKS

R. C. Thomas, Mining Engineer, Hobart, reports that the major development work involving capital expenditure included:—

Improvements to the leaching and residue treatment plants, the electrolytic plant, the zinc stacking and strapping lines, and equipment for the contact acid plant.

Provision of facilities for the disposal of jarosite beyond the continental shelf including the purchase of M.V. 'Anson'.

Commencement of construction of a second fluid bed zinc concentrate roaster complex.

Installation of equipment for the control and treatment of effluents.

ZIRCON

ZIRCONIUM DIOXIDE: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value	Year	Tonnes	Value
		\$			\$
1969	6 061	340 535	1972	....	....
1970	4 012	333 052	1973	817	72 790
1971	2 489	217 378			
			Total	13 379	963 755

Kibuka Mines Pty Ltd, Naracoopa

This company, reviewed under Titanium, produced 1 238 tonnes of zircon concentrates.

2. - Non-Metallic Minerals

CLAY

CLAY: QUANTITY AND VALUE OF PRODUCTION

Year	m ³	Value	Year	m ³	Value
		\$			\$
1958-1968	1 094 920	2 800 505	1971	112 792	384 447
1969	120 963	366 537	1972	134 918	446 036
1970	104 642	350 495	1973	113 896	393 815
			Total	1 682 131	4 741 835

CLAY: DETAILS OF PRODUCTION

Company	Clay m ³	Value \$	No. of men	Product
Agrippe Pottery Pty Ltd, Relbia	....	....	2	Pipes
Campbell, John Pty Ltd, Launceston	727	950	10	Pipes
Goliath Portland Cement Co., Railton	37 341	165 794	....	Cement
Grierson, Dodges Ferry*	5 218	16 365	1	Bricks
Hazell Bros, Margate*	13 020	41 698	4	Bricks
Hobart Brick Co., Granton	7 050	18 434	48	Bricks
Hobart Brick Co., Kingston	3 117	9 781	1	Bricks
Humes Ltd, Granton	3 225	15 591	22	Pipes
Humes Ltd, Prospect Vale	960	3 824	15	Pipes
Huttons Bricks, Launceston	17 428	54 655	21	Bricks
Machens Bricks Pty Ltd, Kings Meadows	15 850	41 485	22	Bricks
Wunderlich Ltd, Launceston	2 883	7 553	2	Tiles
Zolati and Son, Dulverton	7 077	17 685	22	Bricks
Totals	113 896	393 815	170	

* Suppliers to Hobart Brick Company

DOLOMITE

DOLOMITE: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value	Year	Tonnes	Value
		\$			\$
Prior to 1969	34 671	184 670	1971	2 558	14 406
1969	1 539	9 104	1972	4 630	26 815
1970	3 395	20 045	1973	5 165	29 640
			Total	51 958	299 750

Circular Head Dolomite and Trading Co. Pty Ltd, Smithton

This company, the sole producer, employed an average of one man and produced 5 165 tonnes, an increase of 608 tonnes. The stone is milled for top-dressing in agriculture.

KAOLIN

There has been no production since 1962. The total quantity produced since 1940 is 112 869 tonnes, valued at \$883 018.

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

Year	Manufacture of cement		Manufacture of carbide		Chemical and metallurgical		Agricultural and other		Totals	
	Tonnes	\$	Tonnes	\$	Tonnes	\$	Tonnes	\$	Tonnes	\$
1919-1968	5 665 551	8 027 571	770 529	2 127 176	4 320 631	5 145 658	720 516	1 703 932	11 477 227	17 004 337
1969	455 839	883 816	23 047	163 282	38 091	136 500	41 926	88 804	558 903	1 272 402
1970	420 604	815 496	29 120	232 029	36 668	134 035	30 976	63 425	517 365	1 244 985
1971	383 711	743 970	26 141	257 280	39 726	176 819	36 069	99 219	485 647	1 277 288
1972	471 393	913 975	25 225	258 058	53 265	286 151	39 582	102 810	589 465	1 560 994
1973	488 873	948 180	23 383	217 649	65 599	343 547	33 789	123 154	611 644	1 632 530
Totals ..	7 885 968	12 333 008	897 445	3 255 474	4 553 980	6 222 710	902 858	2 181 344	14 240 251	23 992 536

Australian Commonwealth Carbide Company Ltd, Ida Bay and Electrona

This company quarried 42 773 tonnes of limestone valued at \$402 131 at Ida Bay. Of this 23 383 tonnes was used in the production of calcium carbide at the Electrona works and 19 390 tonnes was supplied to the Electrolytic Zinc Company at Risdon for metallurgical purposes.

Calcium carbide production was 9 584 tonnes valued at \$1 590 415 and acetylene black production was 164 tonnes valued at \$108 566. The average number of persons employed was 187 of whom twenty-five were employed at the quarry.

Australian Newsprint Mills Ltd, Maydena

This company quarried 1 516 tonnes of limestone valued at \$10 966. The limestone was burnt at their Boyer mill and used in newsprint production. The quarry was closed down in March; limestone being obtained from other sources.

A. R. Beams, Flowery Gully

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

	Tonnes	\$
Agricultural limestone ..	3 523	9 116
Limestone for chemical and metallurgical purposes	12 111	33 647
Burnt lime for various purposes	55	1 815
Total	15 689	44 578

Six men were employed.

Goliath Portland Cement Co. Ltd, Railton

A total of 488 873 tonnes of limestone with a cost value of \$948 180 was quarried and used in the manufacture of cement. An average of twenty-two men was employed in the quarry, for this production.

In addition to the above 6 424 tonnes of limestone, valued at \$3 470 was produced for sale.

Production amounted to 369 403 tonnes of fine cement valued at \$6 484 564. An average of 318 men was employed.

There were no lost time injuries sustained by employees in the quarry which was a creditable performance.

A second air track drill was put into operation to keep up with increased limestone demand. Increased sales of clinker and cement outside Tasmania necessitated wet process plant operation for the first time for four years, in addition to the dry process plant. At present the company is undertaking a feasibility study towards the installation of a 1 000 tonne/day cement clinker plant.

During the year the company installed an NCR Century computer replacing a smaller unit. In the laboratory a Siemens multi-channel X-ray spectrophotometer with a digital computer was installed representing an investment of \$100 000.

Mole Creek Limestone Ltd, Mole Creek

Mole Creek Limestone successfully commissioned the \$100 000 extensions to their stone crushing plant including plant for the production of agricultural ground limestone and chicken grit. The extremely high quality limestone is being worked on five benches with 12 metre faces whence a new 17-tonne Terex truck is being used to haul to the crusher. David Mitchell Estate Ltd is operating the lime kiln continuously in excess of 60 tonne/day. Work has commenced on the construction of a large settling pond for storage purposes. Production was 32 438 tonnes of limestone for chemical and metallurgical purposes and 15 801 tonnes for other purposes, of total value \$164 485.

Railton Lime Works, Railton

Two men were employed at this works to crush and mill 6 424 tonnes of limestone, valued at \$3 470 supplied by the Goliath Company.

Wright Stephenson Pty Ltd, Pulbeena

This company produced 9 649 tonnes of lime sand, valued at \$66 161, compared with 12 024 tonnes in the previous year. Average employment was two men.

Addison & Coates, King Island

Production was 1 982 tonnes valued at \$6 800 in the first half of the year.

R. K. Sulzberger, Flowery Gully

Using a mobile crushing plant Mr Sulzberger crushed a total of 144 tonnes valued at \$1 240.

OCHRE

OCHRE: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
1918-1968	2 608	18 363	1971	71	982
1969	80	1 191	1972	48	721
1970	42	595	1973	62	1 010
			Total	2 911	22 862

Mineral Supplies, Spalford and Deep Creek

Production of red and yellow ochre from these pits was 62 tonnes, valued at \$1 010.

PEBBLES

PEBBLES: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value \$	Year	Tonnes	Value \$
1957-1968	8 983	136 410	1971	1 510	29 246
1969	1 039	19 036	1972	1 716	28 714
1970	1 668	31 943	1973	824	18 088
			Total	15 740	263 437

Mineral Supplies, Ulverstone

The collection of pebbles for grinding was continued on the beaches around Ulverstone. The output was 778 tonnes, valued at \$17 848. An average of seven men was employed.

G. R. Wise, Youngtown

Production was 46 tonnes of pebbles valued at \$240.

SILICA

SILICA: QUANTITY AND VALUE OF PRODUCTION

Year	Tonnes	Value		Year	Tonnes	Value	
		\$				\$	
1936-1968	200 196	311 633		1971	28 454	95 976	
1969	22 356	93 181		1972	16 261	43 317	
1970	35 629	157 306		1973	17 101	52 679	
				Total	319 997	754 092	

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

A total of 8 488 tonnes of silica sand, valued at \$16 976, 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 8 242 tonnes of sands in various grades and sizings valued at \$33 719. An average of four men was employed.

L. and E. Radford, Beaconsfield

A total of 196 tonnes, valued at \$334, was produced.

Mineral Supplies, Ulverstone

This firm produced 101 tonnes valued at \$1 492.

G. R. Wise, Youngtown

A total of 74 tonnes, valued at \$158, was produced.

3. — Construction Materials**BUILDING STONE**

BUILDING STONE: QUANTITY AND VALUE OF PRODUCTION

Stone	Producer	<i>m</i> ³	Value (\$)	No. of men
Freestone	Etna Stone Pty Ltd, Pontville	577	72 911	8
	Kingston Quarries	72	1 000	2
	Pontville Freestone, Molesworth	294	4 522	1
Other		90	18 585	1
	Total	1 033	97 018	12

CRUSHED AND BROKEN STONE

Basalt

BASALT: PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

Quarry	Men	m ³	Value (\$)
AFH, Surrey Hills	....	1 329	6 645
ANM, Maydena	4	12 923	64 615
APPM, Diddleum Plains	4	14 348	71 740
Bonney Bros, Cooece	3	9 868	49 340
Brambles, Calder	11	22 956	114 780
Forestry Commission	....	7 856	39 280
Hobart Quarries, Bridgewater	6	72 424	370 430
L. G. Holloway, Round Hill	2	4 401	22 005
St Leonards Council, Launceston	1	4 360	21 800
Talisker Blue Metals, Relbia	8	54 230	271 150
Woodfield and French, Relbia	....*	47 334	236 670
Others ..	....	206	1 030
Totals ..	39	252 235	1 269 485

* See Gravel

Dolerite

DOLERITE: PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

Quarry	Men	m ³	Value (\$)
Bruny Island Council, Alonnah	....	1 876	9 380
Devon Metal Supplies, Devonport	23	11 845	59 225
Ensign Quarries, Rocherlea	1	4 004	20 020
Electrolytic Zinc Co., Risdon	....*	16 566	82 830
Forestry Commission	11	42 675	213 375
Glenorchy Quarries, Glenorchy	7	50 456	252 280
Hobart Quarries, New Town	40	203 457	1 022 194
Huon Council, Huonville	1	1 415	7 075
Launceston Quarries, Mowbray	15	69 065	345 325
Pioneer Quarries, Flagstaff Gully	11	133 554	567 770
R. K. Sulzberger, Launceston	1	1 795	8 975
Totals ..	110	516 708	2 588 449

* See Zinc

Hobart Quarries Pty Ltd, New Town

A total of 203 457 m³, valued at \$1 022 194 was produced at the Giblin Street quarry. The average number of persons employed in the quarry was forty.

Capital expenditure at the quarry was:—

	\$
50-ton weighbridge ..	24 000
Rolls single-deck screen and conveyor	6 500
Caterpillar 930 loader	28 815
Komatsu loader ..	25 460
Total ..	\$84 775

Limestone

LIMESTONE: : PRODUCER, QUANTITY AND VALUE OF PRODUCTION

Quarry	Men	m ³	Value (\$)
Mole Creek Limestone Pty Ltd, Mole Creek	....	3 667	18 335
G. J. Weily, Glenorchy	7	18 478	92 390
Totals ..	7	221 145	110 725

Sandstone

SANDSTONE: PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

<i>Quarry</i>	<i>m³</i>	<i>Value (\$)</i>
L. G. Holloway, Burnie	84	420
St Leonards Council	1 423	7 115
Totals	1 507	7 535

Other Stone

OTHER STONE: PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

<i>Quarry</i>	<i>Men</i>	<i>m³</i>	<i>Value (\$)</i>
APPM, Patersonia	2	14 798	73 990
Forestry Commission	NR*	31 564	157 820
Hydro-Electric Commission, Scotts Peak	4	13 770	68 850
Hydro-Electric Commission, Strathgordon	44	82 873	414 365
C. R. Johnson	1	32 765	163 825
Readymix, Merseylea	1	4 220	21 100
Transport Commission, Launceston	1	1 761	7 068
Others	1	6 568	32 840
Totals	54	188 319	939 858

* See Dolerite

GRAVEL

GRAVEL: PRODUCERS, QUANTITY AND VALUE OF PRODUCTION

<i>Pit</i>	<i>Men</i>	<i>m³</i>	<i>Value (\$)</i>
AFH, Surrey Hills	6	79 902	185 116
Beaconsfield Council	2	11 201	22 402
Bonney Bros, Cooe	NR*	10 371	27 114
Brambles, Burnie	NR*	28 477	69 176
Broken Hill Pty Co. Ltd, Beaconsfield	NR†	29 674	59 348
Circular Head Council	2	14 656	29 312
Deloraine Council	1	34 501	69 002
Devonport Council	2	44 355	88 710
Fingal Council	1	19 129	38 258
Flinders Island Council	3	14 852	29 704
Forestry Commission	NR‡	63 041	126 082
George Town Council	3	19 909	39 818
Green Ponds Council	1	15 801	31 602
Hamilton Council	2	15 400	30 800
C. R. Johnson	1	15 471	30 942
Kentish Council	2	25 913	51 826
Latrobe Council	5	16 595	33 190
Lilydale Council	2	10 509	25 554
Longford Council	1	10 103	20 206
New Norfolk Council	2	17 730	35 460
Northern Chromite, Beaconsfield	1	14 193	28 386
Penguin Council	2	20 548	41 096
Portland Council	6	32 995	65 990
Public Works Department	100	452 703	905 406
Ringarooma Council	2	20 902	41 804
Scottsdale Council	2	12 622	33 000
Ulverstone Council	2	25 403	50 806
Westbury Council	1	12 904	25 808
Woodfield and French	43	69 372	208 795
Others	43	147 607	325 629
Totals	238	1 306 839	2 770 342

* See Basalt

† See Woodfield and French

‡ See Dolerite

SAND**SAND: PRODUCERS, QUANTITY AND VALUE OF PRODUCTION**

<i>Pit</i>	<i>Men</i>	<i>m³</i>	<i>Value (\$)</i>
A. G. Atkinson, Moonah .. .. .	....	3 106	6 212
Devon Metal Supplies, Devonport	NR*	3 086	6 172
Flinders Island Council	NR†	3 792	7 584
G. Gerke, Scottsdale	NR†	2 754	7 200
Hobart Quarries, South Arm	NR*	26 432	52 864
Hydro-Electric Commission, Strathgordon	NR‡	20 605	41 210
C. R. Johnson, Cambridge	NR†	1 961	3 922
L. King Pty Ltd, Devonport	NR†	4 664	14 035
C. A. Long, South Arm	3	25 270	58 860
G. L. Males, South Arm	4	12 599	74 927
Scottsdale Council	NR†	1 530	4 000
L. A. Swain, Perth	1	10 137	20 274
C. G. Turmine	1	1 170	2 486
Woodfield and French, West Tamar	NR†	6 875	23 116
Others	8	13 732	35 090
Totals	17	137 713	357 952

* See Crushed and Broken Stone (Dolerite)

† See Gravel

‡ See Crushed and Broken Stone (Other)

OTHER ROAD MAKING MATERIAL**OTHER ROAD MAKING MATERIAL: PRODUCERS, QUANTITY AND VALUE OF PRODUCTION**

<i>Pit</i>	<i>Men</i>	<i>m³</i>	<i>Value (\$)</i>
Cleveland Tin, Luina	NR*	2 210	4 420
Devon Metal Supplies, Devonport	NR†	1 181	2 562
Devonport Council	1	13 364	26 728
C. R. Johnson	1	60 469	120 938
Mt Lyell Mining and Railway Co. Ltd, Queenstown	4	34 760	107 105
Savage River Mines	NR‡	10 481	25 532
St Leonards Council	NR§	1 124	2 248
Sorell Council	3	2 957	11 051
Woodfield and French	NR§	28 427	56 854
Zeehan Council	NR§	5 292	10 584
Others .. .. .	....	4 125	8 802
Totals	9	164 390	376 824

* See Tin

† See Crushed and Broken Stone (Dolerite)

‡ See Iron Ore

§ See Gravel

4. — Fuel Materials**COAL****COAL: QUANTITY AND VALUE OF PRODUCTION**

<i>Year</i>	<i>Tonnes</i>	<i>Value</i> <i>\$</i>	<i>Year</i>	<i>Tonnes</i>	<i>Value</i> <i>\$</i>
Prior to 1969	9 730 639	24 986 905	1971	123 922	600 140
1969	117 794	519 373	1972	132 242	589 015
1970	126 497	617 565	1973	114 588	530 875
			Total	10 345 682	27 843 873

W. R. Tindal, Mining Engineer, Hobart, reports that there has been a decrease in production of 17 654 tonnes. The number of employees decreased from fifty-one to forty-nine, of whom twenty-eight were employed underground. The production per man year decreased from 4 722 to 4 092 tonnes for underground employees, and from 2 593 to 2 339 overall.

Duncan Coal Mine, Fingal

Production has been obtained from an area in the original lease of the Duncan mine, skirting along the old worked area. The main heading has been further advanced a distance of 100 metres. Production was 110 020 tonnes, a decrease of 8 764 tonnes, with a complement of forty-five employees, giving a decrease in overall production per man year from 2 700 to 2 445 tonnes.

New Stanhope Coal Mine

This mine was closed down in May due to the exhaustion of extractable pillars. Production was 4 568 tonnes over a period of four months. The average number of men was seven.

5. — Foreign Ores

The total value of the metallurgical products of four large works treating foreign ores imported into Tasmania was approximately \$114 645 092.

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

In the production of 78 489 tonnes of aluminium, 144 361 tonnes of Weipa bauxite and 100 243 tonnes of imported alumina were processed.

Other products were: 8 295 tonnes of aluminium hydrates and 4 540 tonnes of alumina. Average employment was 1 177 men.

FERRO-MANGANESE**Tasmanian Electro-Metallurgical Co. Pty Ltd, Bell Bay**

During the year 72 513 tonnes of manganese ore from Groote Eylandt was smelted to produce 64 490 tonnes of manganese alloys for the steel industry.

The alloys were 39 636 tonnes of high carbon ferro-manganese and 24 854 tonnes of silicon-manganese reported under Silicon.

Accidents

Average number of employees	.....	141
Man hours exposure	.....	287 435
Frequency rate	.....	3.48
Severity rate	.....	153.08
Number of accidents	.....	44

TITANIUM DIOXIDE**Tioxide Australia Pty Ltd, Heybridge**

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

Capital expenditure more than doubled to \$883 439 and included the extension of the 6-inch effluent pipeline to a total length of 2 286 metres, extensions to the main building, a start on the digester, a computer and improvements to several sections of plant.

The company's excellent safety record has been marred by fourteen accidents. One serious accident occurred when two men employed by a fibreglass contractor introduced a half bucket of acetone and a non-flameproof disc sander into a tank 3 metres in diameter by 3.3 metres deep. The ensuing explosion resulted in the hospitalisation of both men. Examination of the equipment established that ignition took place in the sander motor.

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

Good progress has been made throughout the year in all fields of geological study with which the Branch is engaged. This has been made possible by a full staff of geologists supported by the various specialist services. However, this geological programme has placed considerable strain on the resources of supporting services such as publications, drafting and library services. The creation of new positions for an Assistant Publications Officer, Electronics Technician, Draughtsman and Student Librarian will ease this situation in the coming year. Applications have been received for these positions and it is expected that the appointees should take up their positions early in 1974.

In spite of the progress made, as set out in the following reports of the various officers there is no cause for complacency for the future of the Branch. The increasing complexity of modern geological investigations and the ever-increasing fields of specialisation will require a continual up-grading of the quality and specialisation of incoming staff, together with the essential supporting services in order to keep ahead of the demands which will be made upon the Branch. In particular our information and data storage and retrieval systems need to be modernised and expanded. A large backlog of work has built up in these areas.

Severe restrictions are imposed upon the Branch by the present poor accommodation but it is hoped that present negotiations for a new building with modern facilities will eventually solve this problem. However, no relief from this pressing problem can be seen for the next few years. In the meantime every effort will be made to maintain, and where possible expand, the range and quality of services offered. It is planned to commence palynological work in the Branch in the coming year. This important field of study should assist considerably in helping to solve mapping problems in the difficult Triassic sequences throughout the State, which include our major coal resources.

Officers of the Branch are aware of the changing and demanding requirements of a geological survey in a modern society. The problems of changing attitudes to the environment, pollution and conservation together with the increasing demands for all mining products, particularly energy sources, are challenges which must be met and indeed anticipated in advance, so that the public and the government can be properly informed on such matters without delay.

In anticipation of the demands by planning authorities and in response to various requests the Branch has pursued its programme of investigation of landslips in urban areas and in areas which are likely to become urbanised in the next decade. Particular attention has been given to the Tamar Valley region where the problem is most acute. Preliminary landslip zone maps for this area have been drawn up and suitable legislation to deal with the problem has now been enacted. Although much remains to be discovered regarding the mechanism and factors of safety of landslips and slip-prone areas it is believed that sufficient information is available in order to initiate proceedings to protect those concerned in the development of urban centres in such areas. Data is also available to deal with other landslip areas in the vicinity of Burnie, Penguin, Boat Harbour and St Helens. As soon as possible the surveys will be extended to Devonport and any other areas where it is considered that landslips may affect urban development. At the same time a programme of research into the properties of the materials involved in landslips has been commenced as a long-term project.

Investigations to determine the ultimate usable reserves of coal in the Fingal Valley have been in progress for some years. Initially a geological study of the area was made but the usefulness of this work was inhibited by the lack of suitable accurately contoured base maps. New topographic maps of the district have recently become available through the Lands Department and these will assist future explorations considerably. At the same time a drilling programme has been initiated in the area. The drilling is severely hampered by a thick cover of dolerite, often broken, which results in difficult drilling conditions. In addition to this the coal bearing rocks dip gently south so that the coal seams in the areas from which future reserves may be expected lie at greater and greater depths as the investigations proceed to the south-east, away from the existing collieries. These problems have resulted in the abandonment of some holes due to the difficulties of drilling and inadequate plant capacity. An amended drilling programme has been initiated to deal with these problems whilst at the same time a gravity survey of the area has been commenced. The gravity survey should provide considerable general basic data as to the geological structure of the area and thus guide future investigations in the district.

Scholarship holder Stephen Cox graduated with first class Honours in geology at the end of the year and has now taken up duties with the Regional Section.

Mrs W. Marriott, Departmental Librarian resigned toward the end of the year. It is desired to place on record an appreciation of the very valuable contribution she made to the Department during her term of office. In spite of considerable difficulties, Mrs Marriott reorganised the library onto a proper footing and laid the foundations for the development of a series of information services. Her services to the Department will be sorely missed.

REGIONAL GEOLOGY

Supervising Geologist E. Williams reports

Late in the year Dr K. D. Corbett was transferred to the Economic Geology Section. Mr P. R. Williams was transferred to the University in November to study the Bathurst Harbour region.

Progress during the year in regional geological mapping was as follows:—

1 : 250 000 Map Series

Burnie Sheet has been published and the Explanatory Notes are in press. Launceston Sheet and Queenstown Sheet are being drafted for publication. Oatlands, Port Davey and Hobart Sheets have been compiled and are awaiting final drafting for publication. King Island and Flinders Island Sheets are being compiled.

Explanatory Notes for the Launceston and Queenstown Sheets are in preparation.

1 : 500 000 Map of Tasmania

This Sheet has been compiled and awaits final drafting for publication.

1 : 50 000 Map Series

Hobart and Frankford Sheets have been published.

Brighton Sheet and Lake River Sheet are being drafted for publication.

Scottsdale Sheet: Geologists A. V. Brown, M. McClenaghan, J. McClenaghan, N. J. Turner and P. R. Williams continued mapping the region.

Kingborough Sheet: Senior Geologist N. Farmer continued mapping in this area.

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

Oatlands Sheet: Geologist S. M. Forsyth continued the mapping of the region.

Strahan Sheet: Geologists K. D. Corbett and P. W. Baillie continued work in this area.

Smithton Sheet: Geologists K. D. Corbett and P. W. Baillie continued the mapping of this region.

Huntley Sheet: Geologists M. McClenaghan, J. McClenaghan, A. V. Brown and N. J. Turner continued studies of the geology of the Lake Gordon region.

Explanatory Notes have been published for the 1-mile Quamby Sheet. Notes are being edited for publication for the 1-mile Beaconsfield, Burnie and Sheffield Sheets, and for the 1 : 50 000 Brighton Sheet. Reports for 1-mile Mackintosh, Frankford and Pieman Heads Sheets are being prepared.

ECONOMIC GEOLOGY

Supervising Geologist A. J. Noldart reports—

The following activities were carried out during the year:—

METALLIC MINERALS

- (a) Continued investigation of detrital tin deposits in the north-eastern districts.
- (b) Continued investigation of granitic rocks and associated mineralisation in the eastern and north-eastern districts.
- (c) Continuation of investigations on the distribution and geochemistry of granitic rocks on Cape Barren Island and associated detrital deposits.
- (d) Commencement of compilation of a Bulletin and maps of the north-eastern district.
- (e) Completion of exploratory diamond drilling at the Salisbury goldfield, Moina district and Lefroy. Commencement of drilling at Cambria mine, Blue Tier.
- (f) Commencement of carbonate alteration studies from Moina drill core for potential mineralisation guides.
- (g) General advice to prospectors and examination of the mineral potential of areas under application for purchase from the Crown.

FUEL MINERALS

- (a) Continuation of exploratory diamond drilling for coal in the Fingal area and commencement of exploratory drilling in the Merrywood-Mt St John area.
- (b) Continuation of studies at the New Stanhope (now closed) and Duncan coal mines.

NON-METALLIC MINERALS

- (a) Continuation of construction materials survey of Tasmania from records of Government Departments, Municipal Council and private industry.
- (b) Field investigations to complement the above records.
- (c) Commencement of field investigations and sampling of the Flowerdale-Calder River gravel deposits.
- (d) Commencement of proline auger drilling of clay deposits in north-east Tasmania, and processing of samples obtained.
- (e) Compilation of report on (d) above.
- (f) Continuation of studies of clay resources of Launceston and Hobart.
- (g) Miscellaneous investigations on behalf of governmental and semi-government organisations.
- (h) General advice as requested to the extractive industry throughout Tasmania.

GENERAL

- (a) Completion of field work on shoreline sections in the Tomahawk area and compilation of report.
- (b) Completion of economic appendix for the Beaconsfield quadrangle explanatory notes.
- (c) Completion of reports on sundry mineralisation and non-metallic commodities for inclusion in the 3rd edition 'Economic Geology of Australia and Papua New Guinea'.
- (d) Commencement of detailed studies of the Cambrian succession in the Rosebery-Mt Lyell district.
- (e) Commencement of studies of dolerites of Cambrian? age and relationship to intruded granites.
- (f) Commencement of production of map and notes on Hunter Island for 1 : 500 000 map compilation.
- (g) Continuation of field work on the Mackintosh, Sheffield and Hobart quadrangles.
- (h) Liaison was maintained with mineral exploration companies throughout Tasmania and investigations of works in progress carried out in association with company staff.

ENGINEERING GEOLOGY

Supervising Geologist P. C. Stevenson reports—

The Section has consisted of a Supervising Geologist, two Senior Geologists and two Geologists. No staff changes have occurred in the past year.

GROUNDWATER

Regional groundwater surveys are in progress in the Longford Basin, Scottsdale-Bridport and at Devonport-Port Sorell.

The Longford survey is in the last stages of writing up; drilling and other field work is complete at Scottsdale, and Devonport is at the drilling stage.

Preliminary work has been done on a survey at Mole Creek and the regional mapping is well advanced at Oatlands.

Coastal and aquifers have been examined both regionally and in response to special requests, at Seven Mile Beach, South Arm, Cape Sorell, King Island, Clifton and Carlton and at several properties on the East Coast. A short paper on this subject was published in the 'Tasmanian Journal of Agriculture'.

Routine groundwater requests have resulted in reports on work at Montana, Wiltshire, Copping, Kettering and Ross.

A meeting of Extension Officers of the Agriculture Department was addressed on groundwater topics.

The Burnie 1 : 250 000 geological map was used as a base for a groundwater map and similar compilations are intended for later sheets.

Groundwater seepage was examined and preventive measures suggested at Grays Road, Fern Tree.

Two geologists attended the 4th Groundwater School at Adelaide sponsored by the Australian Water Resources Council.

ENGINEERING

Reports have been prepared on cutting stability on the Southern and Eastern Outlet Roads.

Small dam sites were examined at Bridport and Pawleena.

Foundations were logged and reported on at New Town for the K-Mart, at Victoria Street, Hobart and a site for sewage lagoons was examined at Richmond.

LANDSLIPS

A great number of subdivision proposals have been examined so that opinions on stability could be expressed, mostly in the Tamar Valley but also at Ulverstone, Spreyton, Ambleside, Parklands, Devonport and Leith, sometimes including examinations of trial pits.

Subsurface investigations of slips at St Leonards and at Wanstead Farm have been pursued in detail, involving drilling, installation of piezometers and deformation gauges, the taking of samples and testing of soil mechanics properties. Geophysical measurements on these slips have revealed additional subsurface information.

A further examination of the Boat Harbour area was made in preparation for a possible landslide proclamation.

Much work has been done on the legislative basis of landslide activities and this has resulted in an amendment to the Local Government Act.

CATCHMENT MAPPING

Geological maps to aid in the hydrological studies of catchments as part of the Representative Basin Project were prepared for Sandfly Creek, Birralee Creek, Meredith River and Flowerdale River.

GEOPHYSICS

The Section has assisted in numerous geophysical observations. Marine seismic operations were carried out in North-West Bay and some magnetic work in the Derwent. Seismic work in aid of regional and catchment mapping was done at Scotts Peak and Sandfly Creek, and in aid of economic studies at Great Northern Plains and the Endurance area. A major detailed gravity survey was carried out in the Rossarden-Storys Creek area, and some detailed work on ground vibrations was also done.

LECTURES

Lectures on Engineering Geology have been given by various officers of the University, the TCAE, the Hobart Technical College and to schools.

GEOPHYSICS

Geophysicist D. E. Leaman reports—

During the year there was a consolidation in the range of geophysical equipment available and in the use of techniques still under development. Most activity was directed at problems related directly or indirectly to ores or other economic prospects.

ORE DEPOSITS

A gravity survey was completed at the Beulah barites deposit and another survey completed to interpretation stage at Rossarden-Storys Creek.

OTHER DEPOSITS

A gravity survey with mapping and drilling was also begun south of Fingal-St Marys as parts of a project to evaluate coal reserves. Gravel deposits were evaluated at Bothwell, Cairns Bay and Merseylea. Tin leads were examined at St Helens and Mt Cameron.

REGIONAL PROJECTS

The gravity survey of north-eastern Tasmania was completed and marine seismic surveys were undertaken in North-West Bay to evaluate the bay floor. The major magnetic anomalies in Storm Bay near Betsey Island were located and the hydrographic service given details of position and compass deflection.

CONFERENCES

Three symposia were attended during the year; International Conference on Geophysics of Earth and Oceans (Sydney), January; National Water Well Association Symposium (Sydney), November; International Symposium on Development of Groundwater Resources (Madras), November. Assistance was provided by UNESCO for the latter and several submissions were prepared for the two last mentioned symposia.

ENGINEERING

Seismic and magnetic surveys were undertaken in the region of Bedlam Walls as part of an alternative bridge site appraisal. Road cuts along the Southern Outlet in Hobart were examined in some detail.

GENERAL AND DEVELOPMENTAL

Work continued throughout the year in evaluation of vibration methods and quarry blasting complaints. Piezoelectric and orientation resistivity methods were also further developed.

MAPPING AND ENGINEERING DRAUGHTING

Senior Draughtsman D. M. Hardy reports—

The following progress was made on colour map productions.

Frankford Sheet No. 38

This was printed in eleven colours and was the last of the 1-mile series.

The 1 : 50 000 Series

Hobart Sheet No. 82: Printed in eight colours.

Brighton Sheet No. 75: Fair drawing proceeding.

Lake River Sheet No. 54: Fair drawing proceeding.

The 1 : 250 000 Series

Burnie SK55-3: Printed in eighteen colours; fifty copies were printed with an overlay showing groundwater distribution.

Launceston SK55-4: Fair drawing proceeding.

Queenstown SK55-5: Fair drawing proceeding.

The proline drilling sections of the Longford Basin were printed in ten colours.

Once again work on the map of the Geology of the Blue Tier Batholith was interrupted, but it is now finished and will go to the printers early in 1974.

The Mt Williams-Eddystone Point map and two smaller maps around the St Helens area, showing bed-rock geology and cainozoic sediments are completed and should be printed early in 1974.

Four two-colour maps of the Tamar Gravity Survey were printed.

The Tamar Landslip Area maps, at a scale of 1 inch to 1 mile were completed, but would only be available in dyeline form.

The balance of time was used in drawing sixty-four 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 and Merrywood areas.
- (b) Continuation of surveying and levelling in the Duncan mine and at the New Stanhope mine.
- (c) Survey and levelling of landslips in the St Leonards district.
- (d) Survey and levelling carried out at the Salisbury mine, Beaconsfield.
- (e) Survey and levelling to drill holes at Lefroy.
- (f) Survey and levelling to drill holes and surrounding area at Waterhouse.
- (g) Levelling carried out to the old Cornwall adits at Fingal, Mt Nicholas area.
- (h) Surveying and levelling of diamond drill holes at Moina.

- (i) Survey to diamond drill holes at Anderson Creek.
- (j) Survey for a grid layout at Mt Roland, Sheffield area.
- (k) Survey and levels taken at Aberfoyle mine, Rossarden.
- (l) Survey and levelling for a gravity survey at the Nut, Stanley.
- (m) Plans prepared of all surveys.

MINERALOGY AND PETROLOGY

Mineralogist and Petrologist G. Everard reports—

Suites of rocks collected by departmental geologists at Mt Anne, Pieman Heads, Currie and from an area north of Oatlands were examined in thin section and the specimens added to the departmental collection. Clays and weathered sandstone from Launceston were examined microscopically. Limestones from Railton were examined microscopically with regard to their crushing characteristics.

Core from holes 1, 2 and 3 put down by Ludbrooks Ltd in alluvial ground at Cox Bight was examined and estimates of tin and other detrital mineral made for various depths.

DDH core from holes 1 and 2 Fingal were examined and the densities of various portions determined.

Samples from Kara tungsten prospect were examined spectroscopically.

Material from Taroona Beach reported in the press as an oil slick was examined but found to be only a stratum of black sand laid bare by erosion.

Some field work was carried out in the valley of the Weld River and samples of thermally metamorphosed limestone were obtained for petrological examination.

About fifty samples and specimens of rocks, minerals, ores, sands, concentrates, clays and slags were determined for prospectors and others. More than fifty minerals were identified in collections submitted by mineral collectors.

Enquiries of a technical nature were attended to, and several collections of rocks and minerals prepared for scientific and educational purposes.

GEOCHEMISTRY

Geochemist W. E. Baker reports—

Approximately 5 000 element analyses were made during the year for such elements as aluminium, antimony, barium, beryllium, bismuth, calcium, cobalt, copper, gold, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, silicon, silver, sodium, tin and zinc. Samples included rocks, minerals, stream sediment, soil, water, vegetation and humic materials.

A carbon rod device was added to the atomic absorption spectrophotometer during the year. This will enable far lower levels of detection of many elements. Preliminary studies of the usefulness of this device in geochemical prospecting for gold are in progress.

A soil sampling programme to follow up the stream sediment anomalies detected in the vicinity of Mt Roland is well advanced. One of the anomalies is obviously due to the presence of a mineralised shear zone and more detailed sampling will be undertaken in an attempt to establish a drilling target.

Studies of the activity of humic acids have continued and a report on these was accepted for publication by the Geochemical Society.

After strong representations to the manufacturers the problems with the X-ray diffraction equipment were solved. The plant is now operating satisfactorily and providing a useful service to the survey staff.

With the undertaking of a wider range of projects the laboratory facilities have proved totally inadequate. The efficient operation of the Geochemical Section and provision of services to the survey will not become fact until the planned departmental buildings become a reality.

Non-official Publication

BAKER, W. E. 1973. The role of humic acids from Tasmanian podzolic soils in mineral degradation and metal mobilization. *Geochim. cosmochim. Acta.* 37: 269-281.

PALAEOLOGY

Palaeontologist M. J. Clarke reports—

Much of the year's work has again involved the collection, preparation and identification of Permian fossils from sections in the Kingborough, Sorell, Oatlands, Lake River and St Clair quadrangles. New faunas from Lake River and St Clair demonstrate the presence of the important hiatus first recognised at Cygnet and in the Fisher River area, and which is now proving to be widespread. Notable discoveries include a virtually complete specimen of the unusual crinoid *Camptocrinus* from Lake River, and well-preserved specimens of the brachiopod genera *Cleiothyridina* and *Plekonella* from Oatlands and Kingborough respectively. This constitutes the first definitive record of these brachiopod genera from the Tasmanian Permian. Both are now known throughout eastern Australia. Broad faunal distributions now support other lines of evidence relating to palaeolatitude positions.

Co-leadership of Field Excursion No. 1, 1-10 August, together with attendance and participation in the 3rd International Gondwana Congress, Canberra, 20-25 August, is recorded. Possibly the most significant outcome of the Canberra Congress was the establishment of an active working group under the aegis of the International Gondwana Subcommission to investigate the practicability of setting up a separate time-scale for the Permo-Carboniferous parts of the stratigraphic column for the southern hemisphere continents. There is no doubt that Tasmanian sequences of rocks and fossils will figure prominently in this scheme.

Dr P. R. Evans, Esso (Australia) Pty Ltd, Dr R. J. Helby, Geological Survey of New South Wales, and Dr E. M. Kemp, Bureau of Mineral Resources, have kindly provided important palynological information about Tasmanian Permo-Carboniferous material. Their results are in strong agreement with the macrofaunal evidence and assist with the correlation of eastern Australian sequences in general.

Collections of fossils from the Strahan and Huntley quadrangles have been identified and commented on as necessary for the regional mapping programme. Possibly the most significant discovery is the presence of well-preserved Upper Cambrian (probably Franconian) faunas with trilobites and brachiopods (including *Billingsella*) at several localities in sequences in the Huntley quadrangle. The nature and distribution of Siluro-Devonian faunas in the Strahan quadrangle indicate large scale structural complications.

Representative sequences of Tasmanian Permian rocks and fossils were shown to Professor D. Hill, Queensland, Professor W. R. Danner, Canada, and Professor M. Waterlot, France.

As in previous years considerable time has been allocated to the preparation of material for publication. Papers completed and now in press include:—

- (1) The Stratigraphy of the lower (Permo-Carboniferous) rocks of the Parmeener Super-Group, Tasmania (with M. R. Banks). *Proc. 3rd Int. Gondwana Symp.*, A.N.U. Press, Canberra.
- (2) Status and subdivision of the Parmeener Super-Group (with S. M. Forsyth; N. Farmer; A. B. Gulline; M. R. Banks, E. Williams). *Pap. Proc. R. Soc. Tasm.*
- (3) Carboniferous System, Tasmania (with M. R. Banks and A. B. Gulline). *Int. Strat. Lexicon*. Vol. VIII, UNESCO, Paris.
- (4) Certain misconceptions regarding Late Palaeozoic rocks in Tasmania. *Geological Magazine*, Cambridge, UK.
- (5) Andersons Creek boreholes. Appendix Beaconsfield Explan. Notes.

Non-official Publications

CLARKE, M. J.; FARMER, N.; GULLINE, A. B. 1973. Parmeener Super-Group (lower part), Poatina, in BANKS, M. R. (ed.) *The Lake Country of Tasmania*: 35-41. Royal Society of Tasmania, Hobart.

BANKS, M. R.; CLARKE, M. J.; LUDBROOK, N. H.; THOMAS, G. A. 1973. Upper Carboniferous to Triassic rocks in south-eastern Australia. *Excursion Guide 3rd Gondwana Symp.* 1. Canberra.

LIBRARY

Librarian Mrs B. W. Marriott reports—

The reorganisation of the Library and information services continued throughout the year. Many new serials and monographs were added to the collection in line with the policy to upgrade and modernise the library holdings within the limits imposed by the funds available. Full and proper development of library

services will remain impossible due to the present inadequate and unsuitable space available. Indeed, it is difficult to see how the library will be able to house existing collections over the next few years unless additional space is made available.

Plans were formulated for updated data storage and retrieval systems for certain data systems but the backlog in this area is so large that with the existing staff and facilities the provision of a complete and up to date system for all data must, of necessity, be regarded as a long-term project.

The departmental collection contains a very significant proportion of unique documents. As this collection is housed in a building of very doubtful security and lacking adequate fireproof storage, the microfilming of many essential records is regarded as an urgent necessity. Although some facilities are available they appear to be inadequate to provide the cover required in the immediate future.

PUBLICATIONS

Publications Officer E. L. Martin reports—

The following publications were printed during the year:—

- Geological Survey Bulletin No. 54. A century of tin mining at Mount Bischoff, 1871-1971, by D. I. Groves, E. L. Martin, H. Murchie and H. K. Wellington.
- Geological Survey Explanatory Report—Quamby, by G. P. Pike, with contributions by V. M. Threader and W. R. Moore.
- Geological Survey Paper No. 1. Gravity survey of the Tamar region, northern Tasmania, by D. E. Leaman, P. A. Symonds and J. E. Shirley.
- Tasmania: Mineral resources and mining industry (1973 ed.).
- Technical Reports No. 15 (for 1970).
- Technical Reports No. 16 (for 1971).

Typescript reports have previously been edited at the end of each year and have been collectively issued as Technical Reports. During 1973 each report has been edited as it has been produced and typed in a form suitable for direct reproduction. Ninety-five of these serially numbered Unpublished Reports were produced during the year. A trial microfiche of Unpublished Reports 1973/41-1973/47 was produced in anticipation of the possible future use of this form of publication. Selected Unpublished Reports may be printed in a limited edition of Technical Reports.

Geological Survey Paper No. 1 is the first in a new series of publications intended for limited distribution within Australasia. All other Geological Survey serial publications, with the exception of Geological Survey Bulletins and Explanatory Reports which are intended for international distribution, will be discontinued.

Computer programmes for map grid reference conversion and for the plotting of distribution maps from grid references were developed.

An outline of the Australian map grid reference systems was given in Unpublished Report 1973/49 and grid overlays for 1 : 50 000 and 1 : 63 360 geological sheets were issued with Unpublished Report 1973/57.

About 135 monochrome negatives and a number of colour transparencies were added to the collection of geological photographs.

The increasing volume of material for publication has resulted in a considerable backlog of papers awaiting editing. It is hoped to overcome this by the appointment of an Assistant Publications Officer early in 1974.

Non-official Publication

- MARTIN, E. L. 1973. Geological maps, in WOOD, D. N. (ed.) *Use of earth sciences literature*. Butterworth: London (pp. 122-150).

CHEMICAL AND METALLURGICAL BRANCH

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

The number of samples handled and determinations made again exceeded those of any previous year. The low ratio of determinations to samples registered, namely 1.58, again indicates the high proportion of time spent in sample preparation.

Noteworthy was the number of gold determinations which exceeded the previous maximum by three fold and was about six times the yearly average.

TYPE AND NUMBER OF TESTS

<i>Type of Test</i>	<i>Number</i>	<i>Type of Test</i>	<i>Number</i>
I. QUANTITATIVE—		Zinc	95
Solids—		Zirconium	11
Aluminium	138	Waters—	
Antimony	7	Complete analysis	138
Arsenic	73	Partial analysis	262
Barium	1	Deposit gauges	159
Bismuth	50	Miscellaneous—	
Cadmium	38	Ash (coal)	47
Calcium	238	Calorific value	5
Carbon (including CO ₂)	41	Ignition loss	127
Chlorine	15	Insoluble	10
Chromium	45	Moisture	13
Cobalt	2	Soluble salts in bricks ..	13
Copper	170	Volatiles (coal)	3
Fluorine	45		10 415
Gold	677	II. QUALITATIVE	
Iron	381	III. CERAMIC—	
Lead	109	Clay determination	108
Lithium	12	Fusion point	2
Magnesium	149	Moisture	15
Manganese	125	Brick test	28
Mercury	21		153
Molybdenum	55	IV. METALLURGICAL—	
Nickel	44	Amalgamation	1
Nitrogen	9	Crushing and grinding ..	7
Phosphorus	148	Density	2
Platinum	3	Flotation	3
Potassium	118	Heavy liquid separation	17
Rubidium	12	Jigging	1
Silicon	155	Leaching	6
Silver	55	Magnetic separation ..	2
Sodium	144	Planning	3
Strontium	12	pH	16
Sulphur	258	Settling	10
Tin	5 850	Sizing	1 205
Thorium	1	Tabling	1
Titanium	154		1 274
Tungsten	127	Total	
Uranium	5		11 870
Vanadium	45		

RESEARCH INVESTIGATIONS

Tin	9	Coal	2
Gold	2	Miscellaneous	3
Tungsten	2	Ceramic	2
			—
		Total	20
			—

SUMMARY OF INVESTIGATIONS

Tin

R.653—Minops Pty Ltd, Razorback Mine, Dundas

Two samples, A and B, from the oxidised zone were used in these tests.

Sample A was a composite made from twenty-two bulk samples taken by Minops for milling tests at Dundas. During these tests a head sample was taken. Sample B was coarse material for autogenous grinding tests.

Tests on sample A (head assay 0.78% Sn) and B (head assay 0.66% Sn) showed:—

Test No.	Sample	Size of Grind (μm)	Concentrate Assay (%Sn)	Tin Recovery in Concentrate (%)
N1	A	—150	42.3	71.3
N2	A	—300	32.5	76.9
N4	B	—590	53.7	55.1

Sliming occurred during all handling operations with this ore.

R.659—Aberfoyle Management Pty Ltd, Queen Hill Mine, Zeehan

In R.643 poor recovery of tin was achieved from this ore. This investigation was to study the tin recovery by floating the sulphides differently firstly to get a high sulphur concentrate then to scavenge the remaining sulphides. Test N2 was typical of the results obtained:—

Product	Mass (%)	Assay (%)		Distribution (%)	
		Sn	S	Sn	S
Sulphide concentrate	28.0	0.33	50.7	4.1	52.2
Scavenger concentrate	34.2	2.04	36.7	32.6	46.1
Tailing	37.8	3.59	1.2	63.3	1.7

Regrinding the scavenger concentrate to pass 30 μm failed to liberate the contained tin.

R.660—Minops Pty Ltd, Razorback Mine, Dundas

Following a mineragraphic investigation by Minops on the tin concentrates produced in R.649, flotation tests were done to examine the elimination of arsenic, iron, lead and sulphur.

These tests showed 70% of the arsenic, 50% of the iron, 60% of the lead and 75% of the sulphur could be eliminated with a 99% recovery of the tin in a concentrate assaying more than 70% Sn.

R.662—Ringarooma Mining Pty Ltd, North Valley Plant, Waratah

The company requested a metallurgical appraisal of its plant with a view to assessing its performance and reducing tin losses.

Losses were found to occur in the —150 μm cassiterite fed to the jig along with all other cassiterite sizes.

It was recommended that the jig feed be sized.

R.668—Minops Pty Ltd, Razorback Mine, Dundas

Using material from R.653, this investigation studied the effect of attritioning noted in that investigation

Attritioning did not effect a liberation of a substantial amount of tin.

R.669—Minops Pty Ltd, Razorback Mine, Dundas

Various machines were used in an endeavour to liberate tin by attrition at a range of pulp densities but without success.

R.670—Minops Pty Ltd, Razorback Mine, Dundas

Further attritioning was tried on the sample of ore used in R.608, but without success.

R.672—Cleveland Tin N.L., Luina

A grab sample of Khaki Lode ore was supplied for cassiterite grain size determination and preliminary fluorite recovery tests. Some mill samples were also submitted.

The cassiterite grain size showed a 65% recovery of tin should be possible although the amount of siderite present could cause problems.

A low grade fluorite concentrate can be made from material from this lode. Some mill products were shown to have an above head grade fluorite content and would provide a better head sample for any future test work.

R.673—Minops Pty Ltd, Razorback Mine, Zeehan

Magnetic separation tests were done on sized fractions of the head sample of R.649 by Rapid Magnetic Ltd in England. The products were assayed here.

The test work was inconclusive due to the low head grades of the samples.

Gold**R.655**—BMI Mining Pty Ltd, Beaconsfield dumps

Part 1. Unpublished reports, R1, R2, R41, R50, R51, R77, R128 and R130 are reviewed and conclusions made on possible extraction methods.

Part 2. Four drill samples were submitted by BMI. The sulphides were separated by flotation then roasted and cyanided. The flotation tailing was ground to 10% + 106 μ m then cyanided. Gold recovery was 67.4% or 2.5 g/t.

R.666—Dwyer & Taylor, Mathinna dumps

A large sample stated to be similar to that of R.567 was submitted for amalgamation testing. The sample assayed only 1.8 g/t. Recovery by amalgamation was 8.9%. The head assay was much lower than expected.

Tungsten**R.657**—Tasminex N.L., Kara Tungsten Prospect, Hampshire

ANZEC submitted forty-six drill core and sludge samples on behalf of Tasminex for scheelite concentration tests. The samples were grouped by ANZEC into three groups which assayed:—

Group	Assay (%)			Remarks
	WO ₃	S.Fe	S	
A	0.59	58.6	0.8	Weathered, little scheelite
B	0.58	63.9	Tr.	Some scheelite, weathered
C	0.36	44.8	Nil	Minor weathering, the tungsten mineral is scheelite

Magnetic separation of the ground ore is an initial approach to concentration. Only in Group C is scheelite flotation a possibility. Gravity concentration has not been effective due to the fine scheelite grain size.

Leaching of the non-magnetic fractions at room temperature with caustic soda was not effective.

R.664—Minefields Exploration N.L., Mt Mulgine Prospect, W.A.

A composite of drill core assay rejects was submitted for scheelite concentration tests. It assayed 0.5% WO₃.

Heavy liquid, magnetic separation, table and flotation testing were used in the investigation.

A scheelite concentrate assaying 59% WO₃ and containing 76% of the tungsten was made by tabling and magnetic separation.

Coal**R.665**—Cornwall Coal Co. N.L., Fingal washery

Laboratory centrifuge batch tests at varying pH were made on the washery effluent.

These tests showed that clean water can be recovered for recirculation in the plant.

R.667—Cornwall Coal Co. N.L., Fingal washery

A continuous centrifuge was installed in the washery for test work similar to that of R.665 only on a continuous basis.

Although working at less than optimum speed the tests showed centrifuging would produce a satisfactory water for circulation.

Miscellaneous**R.641—Minops Pty Ltd, Extraction of Metals from Calcine**

Minops supplied a sample of North West Acid Pty Ltd calcine which assayed:—

	%		%		g/t
Cu	0.40	Ca	0.45	Ag	34
Pb	0.83	As	0.26		
Zn	3.1	S	1.2		

Solvents tried were sodium cyanide, ammonium chloride and EDTA.

Sodium cyanide dissolved 40% of the copper and 18% of the zinc. EDTA dissolved 40% of the copper, 25% of the zinc and 50% of the lead.

Ball mill grinding increased the metal yield.

R.663—Johns Phoenix Pty Ltd, Regeneration of Moulding Sand

The foundry requested test work to regenerate moulding sand. The sodium carbonate content of the used sand was extracted using autogenous grinding, intense agitation or percolation.

A regenerated sand was tested in the foundry and found satisfactory.

R.671—Electrolytic Zinc Company, Rosebery, Mill Effluents

Samples of mine water-mill effluent and tailing dam overflows were collected and assayed for trace elements. The use of lime addition and aeration were studied with a view to reducing these metals to levels required by environmental regulations.

CERAMICS**R.652—Hobart Brick Company, Light-weight Bricks**

Tests were made incorporating coal waste and sawdust with clays and firing at 1 000° C for six hours.

Sawdust additions were limited to 20% by the laboratory equipment. At this addition the normal brick mass was down to about two-thirds while the compressive strength was down to under a tenth of an all clay brick.

With coal waste a 50% addition reduced the mass to about 50% and the compressive strength was comparable with 20% sawdust.

R.658—Department of Mines, Annual Survey of Bricks

Survey of brick production in the State.

MINES AND EXPLOSIVES BRANCH

Report of the Deputy State Mining Engineer and Deputy Chief Inspector of Mines and Explosives,

P. M. Johnstone, B.E., M.Aust.I.M.M.

The Mines Inspection Act 1968

EMPLOYMENT

The average number of persons employed in the mining, metallurgical and quarrying industry was 10 073, a decrease of 272. The number of men employed underground fell by 4% to 1 378. This decrease was evenly spread over mining operations as distinct from works.

ACCIDENTS

Accidents were reported and recorded in accordance with Australian Standard CZ6, Recording and Measuring Work Injury Experience. By this practice all disabling injuries causing the loss of one shift or more are recorded. In calculating the rates, 111 employees in the total of 10 073 were disregarded because their employers do not submit accident reports.

The number of accidents was 1 786 in which 1 781 men were injured and six killed.

ACCIDENT STATISTICS (A.S. CZ6)

<i>Employer</i>	<i>Man-hours exposure</i>	<i>No. of injuries</i>	<i>Frequency rate</i>	<i>Days charged</i>	<i>Severity rate</i>	<i>Mean duration (days)</i>
Aberfoyle	346 324	63	181.9	817	2 359	13
BMI	72 368	3	41.5	7	97	2
Cleveland	367 332	48	130.7	572	1 557	17
EZ	2 366 972	785	331.6	18 040	7 622	9
Kibuka	134 001	3	22.4	13	97	4
King Island	793 312	88	110.9	1 808	2 279	20
Mt Lyell	2 773 087	160	57.7	23 947	8 636	12
Renison	656 545	83	126.4	7 651	11 653	15
Ringarooma	33 293	7	210.3	71	2 133	10
Savage River	858 633	42	48.9	360	419	7
All mines	8 401 867	1 282	152.6	53 286	6 342	15
Carbide	287 218	41	142.7	412	1 434	10
Comalco	2 209 185	16	7.2	210	95	13
EZ	4 458 480	340	76.3	1 667	374	5
Goliath	632 662	2	3.2	138	218	68
Mole Creek	35 243	1	28.4	1	28	1
NW Acid	273 991	8	29.2	93	339	12
Savage River	408 177	6	14.7	37	91	6
Temco	287 435	1	3.5	57	198	57
Tioxide	876 193	14	16.0	425	485	18
Ceramic	413 777	43	103.9	306	740	7
All works	9 882 361	472	47.8	3 346	339	7
Collieries	75 946	9	118.5	169	2 225	19
Quarries	153 028	24	156.8	550	3 594	23
Total	18 513 202	1 787	96.5	57 351	3 098	12

DESCRIPTION OF FATAL AND SERIOUS ACCIDENTS

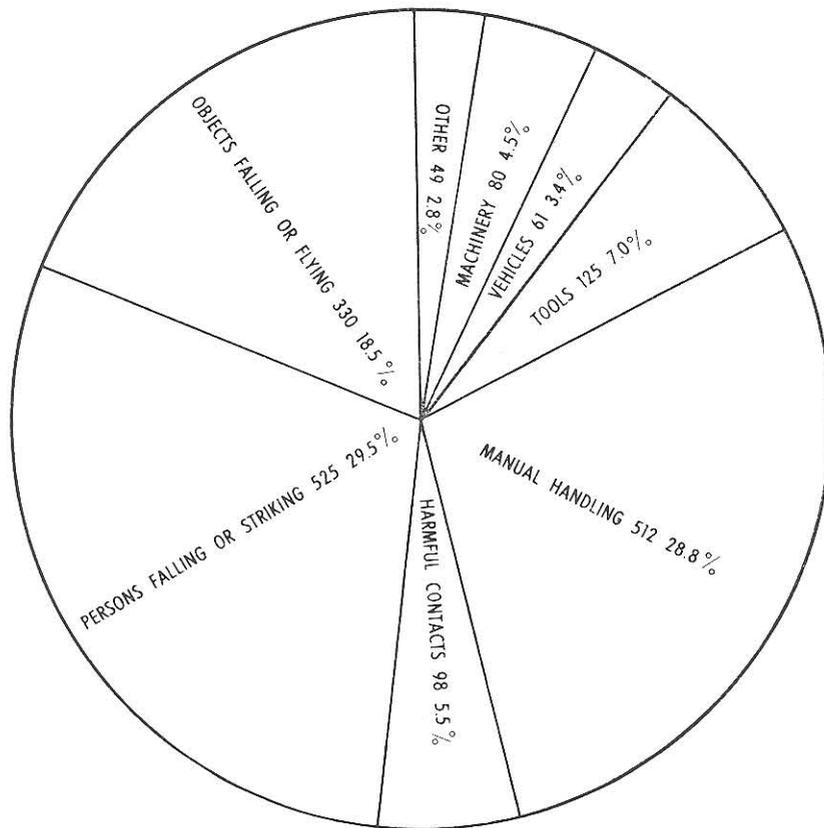
Fatal

- R. Thorpe, EZ Co., Rosebery: Struck by fall of ground in stope.
 R. J. Butters, EZ Co., Rosebery: Struck by fall of ground in stope.
 J. B. Ramsay, Renison: Driving tractor which overturned descending a decline.
 P. Halliday, Mount Lyell: Fell from Prince Lyell headframe.
 M. Rozsnyai, Mount Lyell: Thrown from and run over by LHD unit running downhill out of control.
 G. T. Ryall, Mount Lyell: Pinned beneath tractor when it overturned.

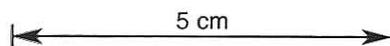
Serious

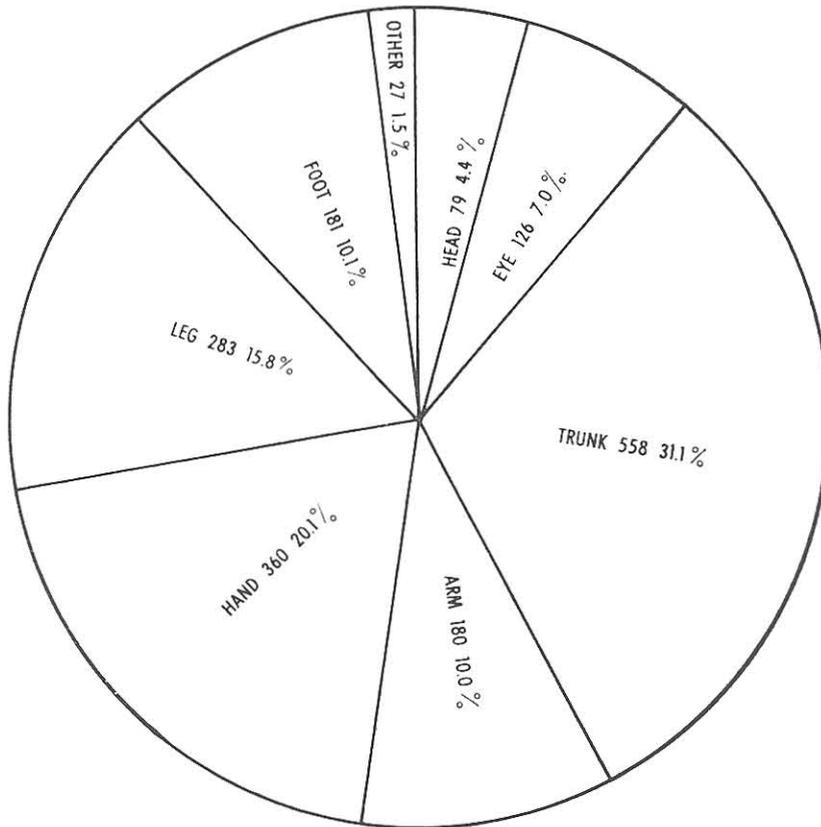
- L. Webster, Cleveland Tin: Tripped and fell down ore pass; injured head.
 A. J. Thomas, North West Acid: Steel plate fell on foot; broken ankle.
 J. Batik, Renison: Struck on hand by machine; broken fingers.
 L. Heazlewood, Renison: Knocked over by a machine; broken ankle.
 M. Noone, Ringarooma: Fell off pigsty; broken pelvis.
 R. Shannon, Ringarooma: Unloading a pipe which fell on foot; broken ankle.
 B. Johnson, Tioxide: Finger caught between girders; amputated.
 E. Dean, D. Bassett, Tioxide: Explosion of acetone vapour by spark from electric drill; burns to face and hands.
 H. Butters, EZ Co., Rosebery: Struck by fall of ground; broken ribs.
 R. Fischer, EZ Co., Rosebery: Fell against truck; broken ribs.
 M. Nicholson, EZ Co., Rosebery: Barring chute, struck by bar; broken bones in face.
 M. Eastley, EZ Co., Rosebery: Struck by falling rock; broken foot.
 L. Maresz, EZ Co., Rosebery: Fell on level; broken arm.
 D. Keynes, EZ Co., Rosebery: Fell on stairs; broken hand.
 M. Trickett, EZ Co., Rosebery: Fell on piece of timber; broken ribs.
 G. Thorne, EZ Co., Rosebery: Struck by piece of timber while slushing; broken sternum.
 L. J. Gardiner, EZ Co., Rosebery: Fell down embankment; broken wrist.

- P. Brodie, Mount Lyell: Piece of steel fell from sling; broken foot.
- W. H. Eaves, Mount Lyell: Struck by fall of ground; broken ankle.
- N. K. Watson, Mount Lyell: Spanner contacted 500-volt contactors; burnt hand.
- R. J. Parks, Mount Lyell: Hair of scalp caught in mechanism of drill; partly scalped.
- D. Easter, Mount Lyell: Struck by flying valve cover; broken leg.
- B. O. Farrow, Mount Lyell: Knocked over by bucket of LHD unit; chipped bone in spine and broken arm.
- J. Chaisty, Comalco: Removing key strongback; fell and fractured left foot.
- A. Zeleznik, Comalco: Metal dripped on foot; broken.
- J. Cousins, Launceston Quarries: Fell over; broken wrist.
- D. P. Smith, Goliath: Spanner across terminals; electrical burns.
- K. Porter, Comalco: Fell while straightening breaker bar which broke; broken ankle.
- A. R. Freeman, Temco: Collided with telfer; broken ankle.
- T. Wilson, Machens: Dropped machine part; broken ribs.
- J. Keating, EZ Co., Risdon: Fell against board; broken ribs.
- A. Ford, EZ Co., Risdon: Hand caught in machinery; three fingers amputated.
- C. V. Webb, Carbide: Explosion when tapping furnace; burns to back and arms.
- R. Brunsdon, KIS: Struck by fall of ground; lacerations to head, arms and legs.
- M. Barrett, Pioneer: Hand caught in conveyor; broken wrist.

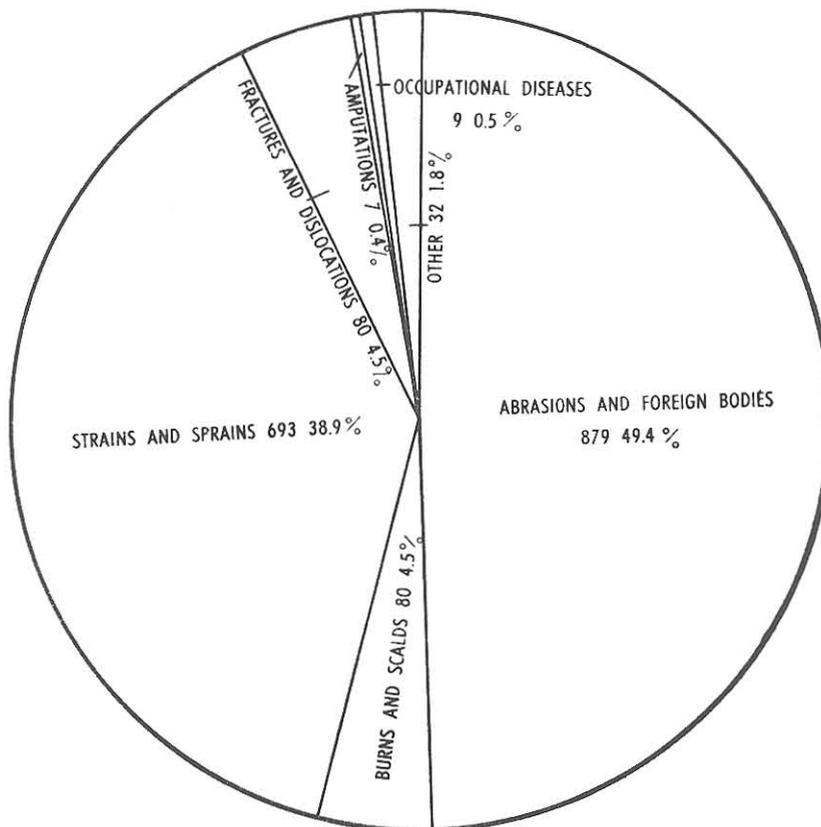


Accident Factor

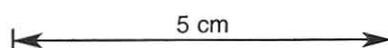




Accidents : Location of Injury



Accidents : Nature of Injury



DANGEROUS GOODS
The Explosives and Inflammable Liquids Acts
IMPORTS OF EXPLOSIVES

	<i>Hobart</i>	<i>Launceston</i>	<i>King Island</i>	<i>Stanley</i>	<i>Strahan</i>	<i>Total</i>
Nitro-compounds (kg)	171 392	121 315	63 277	138 756	527 514	1 022 254
Detonators	188 000	836 170	48 000	446 150	284 088	1 802 408
Explosives shipments (No.)	4	6	4	4	5	23
Ammonium nitrate imported for use as an explosive (tonnes) ....	....	....	....	....	....	1 924

The number of licences and permits issued were: Magazine Licences, 111; Other Licences, 370; Shot Firer's Permits, 63.

IMPORTS OF INFLAMMABLE LIQUIDS

	<i>Bell Bay</i>	<i>Burnie</i>	<i>Devonport</i>	<i>Hobart</i>	<i>Naracoopa</i>	<i>Total</i>
Inflammable liquids imported in bulk (tonnes)—						
Aviation gasoline	993	....	....	406	....	1 399
Kerosene—						
Aviation	2 821	....	....	13 807	....	16 628
Lighting ....	....	....	3 034	2 733	....	5 767
Power .. ....	....	....	507	403	....	910
Motor spirit—						
Premium	58 824	25 877	41 618	95 188	400	221 907
Regular	14 473	5 165	11 224	30 187	....	61 049
LP gas	877	....	....	987	....	1 864
Total	77 988	31 042	56 383	143 711	400	309 524
Tankships (No.)	17	8	12	21	1	59

Licences to keep, 2 158; Plans approved, 484; Exemptions granted, 20; Permits to import, 22.

Prosecution

The case against Mobil Oil Australia Limited for oil spillage was finalised on 20 September 1973 after three sittings; negligence was proved and a small fine imposed.

Accidents

A tanker caught fire at the Hellyer Gorge, due to a fractured oil line. The fire was extinguished by the driver with little damage to the vehicle.

A vehicle slipped on a greasy road and turned on its side, tipping off a small tank; there was no spillage.

Outrage

On 6 March 1973 an explosives outrage took place at the Electrolytic Zinc Company's property at Rosebery when a company electrical sub-station was damaged by a charge of explosives. Safety fuse was used to set off the charge and if anyone had been in the vicinity at the time of the explosion there could have been fatal results. The Tasmanian Police conducted an investigation.

MECHANICAL INSPECTION

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

Plant inspections were carried out at mines and works including Mt Lyell, Rosebery, Mt Farrell, Hercules, Renison, Cleveland, Savage River, Ringarooma, Port Latta, Tioxide, N.W. Acid, Mole Creek, Goliath, Comalco, Aberfoyle, Storeys Creek, EZ (Risdon) and King Island Scheelite.

Inspection for Approval

Mt Lyell. The Prince Lyell cage winder was performance tested for initial use. Southern exhaust air-way sinking equipment.

Tioxide. Gas scrubbing plant construction and equipment.

North West Acid. Stack climbing and servicing equipment.

Comalco. Modifications to oil pipelines. Silo and conveyor extension. Upgrading of conveyor safety.

EZ, Risdon. Bulk loading conveyors.

Hercules. Haulage equipment modifications.

Certification

Seventy-three persons qualified for certificates of competency.

General

Maintenance and inspection standards show a continued improvement, with isolated exceptions. Statutory inspection of winding and hoisting equipment and the recording of such is becoming more uniform.

DRILLING

J. B. Braithwaite, B.C.E., B.M.E., M.Aust.I.M.M., M.I.E.Aust.

DIAMOND DRILLING

The five diamond and one combination auger-diamond drills continued to operate throughout the year. The increased cost per shift reflects the general increases in wages, payment of service allowances and the increased cost of diamonds.

Cost per metre in general reflected the increased cost per shift but a few very expensive holes in difficult situations caused an abnormal increase in the average.

Coal

One hole was successfully completed at 505 metres, the top 310 metres being extremely hard dolerite. The other plant was engaged for most of the year in an attempt to prevent the complete loss of a hole in friable mudstone below 260 metres of hard dolerite. The plant was later moved to a site near the old Merrywood coal mine but again found difficult drilling in dolerite scree.

Mineral Investigation

The last hole of the Salisbury programme was completed at 216 metres and difficulty was experienced in withdrawing the casing. The Lefroy and Moina programmes were completed and a hole was started at the Cambria mine near Weldborough under the Aid to Mining Act.

Four holes, mostly horizontal, were drilled from a very steep hillside into limestone at Mole Creek.

The Gemco started work at Railton towards the end of the year to delineate the extent of the limestone deposits held by Goliath Portland Cement Co. Ltd.

Foundation Testing

This work was mainly for the Public Works Department in conjunction with their Materials and Research Section. Both the Gemco and diamond drills were used in Hobart, Launceston, Devonport and Burnie. Work was also done for the Hobart City Council, the Hobart Brick Co. and Maunsell & Partners acting for the Tasmanian Government Railways. The latter work proved most expensive as holes had to be drilled through a newly placed embankment of freshly blasted dolerite.

Stratigraphic Drilling

The Gemco was used in the Snug and Bothwell areas to auger through the overburden and then core the basement rock. An attempt was made to deepen the hole at Cygnet but had to be abandoned when it entered a fault zone. A diamond drill hole was started in the Wesley Vale area and was near the capacity of the drill at 345 metres at the end of the year.

A large number of auger holes was drilled in the Cressy area to enable the Rivers and Water Supply Commission to monitor the water table.

ROTARY DRILLING

Water Investigation

Work in the Scottsdale area is nearing completion. The cost per metre is no indication of the actual drilling cost as more time was spent in development of wells and full scale pumping tests than in drilling.

Mineral Investigation

A hole was drilled at Beaconsfield to allow a diamond drilling contractor to start in solid ground for further evaluation of the gold lode below the workings of the Tasmania mine.

CHURN DRILLING

Water investigation was continued in the Scottsdale area and as with the rotary plant more time was spent on development and pump testing than in drilling.

A start was made on the Port Sorell area programme and one hole was completed at 142 metres but has not yet been tested.

A small amount of work was done for the Hydro-Electric Commission on a slip area at the Fisher dam but the plant was quite unsuitable for the type of ground.

One plant was shut down towards the end of the year as two shifts were worked on the rotary plant at Beaconsfield. It was not restarted as one foreman went on long service leave and a new Mayhew 1000 plant is expected to be ready for operation on his return.

DRILLING DETAILS

<i>Location</i>	<i>Purpose</i>	<i>No. of holes</i>	<i>Total depth (metres)</i>	
<i>Diamond—</i>				
Fingal	Coal investigation	(Edeco)* 1	505.29	
Fingal	Coal investigation	(12B, 30HD)* ...	...
Royal George	Coal investigation	(30HD)* 1	20.85	
Moina	Mineral investigation	(30HD)* 1	45.24	
Moina	Mineral investigation	(12B)* 2	196.40	
Devonport	Site investigation	(12B)* 25	206.95	
Burnie	Site investigation	(12B)* 8	121.72	
Cygnets	Stratigraphic Investigation	(12B)* 1	15.63	
Salisbury ..	Mineral investigation	(F20C1)* 1	17.35	
Mole Creek	Limestone investigation	(F20C1)* 4	259.10	
Hobart	Site investigation	(F20C1)* 8	82.96	
Hobart	Site investigation	(F20C1)* 8	76.68	
Hobart	Site investigation	(F20C1)* 6	69.42	
Weldborough ..	Tin investigation	(F20C1)* 1	95.48	
Lefroy	Gold investigation	(F20C2)* 2	241.56	
Wesley Vale	Stratigraphic investigation	(F20C2)* 1	340.46	
		70	2 295.09	
<i>Diamond/Auger—</i>				
Hobart	Material investigation	8	24.05	(24.04)†
Snug ..	Stratigraphic investigation	14	123.46	(105.34)†
Oatlands ..	Stratigraphic investigation	17	84.40	(43.83)†
Hobart	Site investigation	12	73.91	(46.41)†
Hobart	Site investigation	1	23.47	(23.47)†
Hobart	Site investigation	4	46.65	(7.22)†
Cressy	Water table determination	29	132.53	(132.53)†
Launceston	Site investigation	3	77.26	(1.22)†
Bothwell ..	Stratigraphic investigation	3	34.74	(7.01)†
Launceston	Site investigation	5	74.35	
Launceston	Site investigation	6	104.81	
Bothwell ..	Stratigraphic investigation	8	84.98	(15.22)†
Railton	Limestone evaluation	10	235.91	(202.43)†
		123	1 177.62	(608.73)†

Location		Purpose		No. of holes	Total depth (metres)
<i>Churn—</i>					
Scottsdale	....	Water investigation	(Keystone No. 2)*	2	90.50
Port Sorell	....	Water investigation	(Keystone No. 2)*	1	142.00
Fisher Dam	....	Landslip investigation	(Keystone No. 2)*	3	34.00
Scottsdale	....	Water investigation	(Keystone No. 1)*	10	299.03
				16	565.53
<i>Rotary—</i>					
Scottsdale	....	Water investigation		15	618.04
Beaconsfield	....	Gold investigation		2	514.52
				17	1 132.56

* Drill type † Auger only

SUMMARY OF DRILLING

Drill type	No. of drills operating	Metres drilled	Total cost (\$)	Cost per metre (\$)	Cost per shift (\$)
Diamond	5	2 295.09	98 823	43.05	89.59
Diamond/Auger	1	1 177.62	19 144	16.25	87.81
Churn	2	565.53	32 627	57.69	92.95
Rotary	1	1 132.56	24 488	21.63	92.06
	9	5 170.60	175 082	33.85	90.34

NORTH-WESTERN DISTRICT

H. Murchie, B.Sc., D.R.T.C., M.Aust.I.M.M.

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

P. Allan, B.Sc., A.H.-W.C., AM.I.M.M., Burnie

ENVIRONMENTAL CONTROL

This aspect assumed a major role and some of the tasks undertaken were as follows:—

- (1) Supervising progress of the Bobadil tailings dam at the Electrolytic Zinc Company's lease at Rosebery and checking monitoring of effluents at the mine and collating sampling results.
- (2) Flying over the Arthur River system from Waratah to Dunns Plain to check reports of discoloration and pollution of the river from mining operations at Waratah. Accompanied by the Regional Forester and the District Agricultural Officer, the South Arthur forests, Roger River, Waratah, Hellyer and Oonah areas were inspected for possible sources of pollution of the Arthur River.
- (3) The Director of Environmental Control was taken on an inspection of the mining operations of the Ringarooma Mining Company at Waratah.
- (4) A Residual Disposal Conference at the Renison mine was attended by representatives of the mining companies in the district who were able to share their experience in waste disposal problems.
- (5) Inspection of prospecting operations in the Balfour area with M. MacIntyre of ACI Minerals Pty Ltd. We flew over the area and were able to get a 'birds-eye view' of the effect the work is having on the environment. Costeaning and drill site clearing has left some scars on the landscape, but not to the extent of other land clearing projects.
- (6) With the Director of the North-West Master Planning Authority an inspection of quarrying and gravel pit operations was made in the Burnie and Wynyard areas.

- (7) The Director of Environmental Control together with his Water Control, Waste Control and Air Control Officers were taken on a tour of the West Coast mines. The following properties were visited and environmental matters discussed with management: Savage River, Cleveland, Ringarooma Mining, Electrolytic Zinc, Renison and Mount Lyell.
- (8) Seminar in Burnie on Environmental Impact Studies.
- (9) B. Healey and B. Struck of the Department of the Environment were taken on an inspection of the Duncan colliery at Fingal.

Co-operation between Government departments and industry is essential to achieve satisfactory results in environmental control and the work listed above has succeeded in achieving such co-operation.

Area Development Consultative Committee (Arthur to Pieman Rivers)

Mr Murchie attended the quarterly meetings and found the Committee to be useful in communicating with other Government departments and the local authority. At a seminar held in Smithton Mr Murchie presented a paper on 'Mining—Past, Present and Future'. The seminar was well attended and it was found that generally the public has little knowledge of mining developments and the value of the industry to the community. Discussion at the seminar was valuable and the press coverage favourable; so that contact with interests outside the mining industry has been established and can be maintained.

EXPLORATION

Mt Lyell Mining and Railway Co. Ltd

E.L. 10/69. Exploration continued to be concentrated on the area south of Queenstown where a geophysical grid consisting of 42 line kilometres with a line spacing of 180 metres, was established between Whip Spur and the Lyell Highway. A gradient array induced polarisation survey over the grid outlined several interesting anomalous zones. Detailed mapping and proton magnetometer surveys are still in progress. Further geophysical investigations were conducted on the eastern end of Mt Lyell in an attempt to determine the depth to the base of the Jukes Conglomerate. No reliable readings were obtained, but mapping was continued in the area in order to outline the unconformable contact between the Jukes Conglomerate and the underlying volcanic rocks.

E.L. 41/71. The reconnaissance geological mapping of the licence area was completed and a geophysical grid consisting of 38 line kilometres of cut traverse line, at 180 metre intervals, established between the Comstock Valley and the Lake Margaret township. Detailed geological mapping was conducted over the grid in conjunction with a gradient array induced polarisation survey which outlined two main areas of anomalous response.

E.L. 9/66. Exploration activities continued through the licence area with emphasis on the Selina, Henty fault zone and Basin Lake-Howard's anomaly areas.

In the Selina area, a diamond drill hole was completed at a depth of 410 metres after intersecting 20 metres of pyrite mineralisation (10% FeS₂) adjacent to the Owen Conglomerate, which was intersected at 390 metres. A Turair survey was conducted over the Selina area in order to assess the potential of the method in the search for Mt Lyell type disseminated sulphide bodies. The results were very poor and indicated that the currently used ground induced polarisation techniques are still the most effective tool available. The geochemical project investigating the variations in trace element content of the sulphides continued, but it is too early to draw significant conclusions.

A gradient array induced polarisation survey was conducted over 48 line kilometres of the Henty fault zone grid and detailed mapping and ground magnetometer surveys were also completed. Numerous strong anomaly responses were obtained and subsequently soil sampled. Several costeans have been excavated and extensive road construction and site preparation undertaken in preparation for diamond drilling. Two of the anomalies were tested by three drill holes for a total advance of 620 metres. Only minor disseminated sulphide mineralisation (predominantly pyrite with traces of chalcopyrite, galena and sphalerite) was intersected in acid tuffs and tuffaceous siltstones.

The area south of Howard's Anomaly was re-mapped and several previously outlined induced polarisation anomalies in the area were re-checked for position using gradient array. Tests were also conducted using a mercury vapour soil gas analyser, however the results confirmed that the system was unsuitable as an aid to locating sulphide bodies in the waterlogged soils of the area. The construction of a new access road between the Henty Camp and the White Spur was commenced.

OIL EXPLORATION

The drilling rig 'Glomar Conception' was inspected whilst operating in Tasmanian waters.

GENERAL

In February a mission from the Department of Overseas Trade was taken on a conducted tour of the West Coast mines, including the Mount Lyell Company, Renison Limited, Electrolytic Zinc Company, Savage River mines, Cleveland Tin and the Port Latta pellet plant.

A supervisors' safety training course was conducted by the National Safety Council at the Electrolytic Zinc Company's mine. The course was well presented and stimulated enthusiasm at the time, however the accident record of the company indicates that not sufficient follow-up has been done.

NORTH-EASTERN DISTRICT

L. F. Egan, A.M.Aust.I.M.M., Launceston

Expanding operations by woodchip companies necessitated the searching out of road making materials, and quarries were developed on the East Tamar Highway, Patersonia, Camden and Mathinna Plains in rocks ranging from dolerite to slate and sandstone.

Of interest was the incursion by a large tin mining company into the mining and treatment of tailings and gravels in the Ringarooma River. This involved the transporting of a 6 cubic yard dragline from the Vicary Creek flats to the company's leases about 1.5 kilometres above Moorina. The project involved the construction of roads, a power line and installation of hoppers, pumps, hydrocyclone and jigs. Construction was nearing completion at the end of the year.

Throughout the year all lease applications were examined to ascertain if any special conditions were to be incorporated in the lease covenants. This was in line with the policy of the Department of the Environment to protect the natural ecology of such areas.

EXPLORATION

Allstates Exploration N.L.

E.L. 17/73. Diamond drilling on the old Tasmania gold mine line of reef was resumed, the first 300 metres being accomplished by the Department. Drilling was still proceeding at the end of the year by the company.

BMI Mining Pty Ltd

E.L. 19/70. This area was reduced from 495 km² to 240 km² as mapping and sampling proceeded. These operations entailed the employment of one geologist and two field assistants.

E.L. 21/72. Beaconsfield area. The drilling and sampling phase was completed and an overall evaluation is proceeding.

E.L. 24/70 (166 km²). Geological mapping (one geologist and one field assistant) was carried out in the Banca area. Two men worked with a churn drill.

Texins Development Pty Ltd

E.L. 6/68. The examination and appraisal of the tin mining potential of this licence was completed at the end of 1973. Operations followed the pattern of previous years: geological investigations and drilling. Six men were employed.

Tenneco Aust. Inc.

E.L. 16/72. Investigations by this company were completed during the year and the licence abandoned.

M. L. Watt

S.P.L. 92. Mr Watt continued to prospect this area single handed.

APPM

E.L. 20/70 Tonganah area (80 km²) and E.L. 21/70 South Mount Cameron (202 km²). Work on E.L. 20/70 was confined mainly to evaluating collated data, while prospecting and drilling on E.L. 21/70 was intensified.

N. B. Brown

S.P.L. 107 Mt Victoria area. Prospecting was engaged in by the licensee and another. A bulldozer was used part time.

Mole Creek Limestone

E.L. 19/69 (21 km²). Prospecting and sampling continued throughout the year.

SOUTHERN DISTRICT

J. B. Braithwaite, B.C.E., B.M.E., M.Aust.I.M.M., M.I.E.Aust.

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

Assistance and technical advice were given to other departments, contractors and shotfirers in connection with blasting operations and excavations on building sites, including lectures on the use of explosives and blasting procedures to potential shotfirers from Commonwealth and other State departments and local councils.

Complaints from the public regarding nuisances from blasting operations were dealt with and where necessary technical advice given to minimise these nuisances.

The process of bringing under mining leases the winning of sand, clay, gravel and other construction materials on private land continued and the conditions of mining leases were enforced.

EXPLORATION*Geopeko Ltd*

Exploration continued during the year on seven exploration licences covering nearly two-thirds of King Island and 2 484 metres of auger drilling were completed on fifteen prospects.

Intensive rotary-percussion and diamond drilling programmes were undertaken around the Grassy granite contact zone to the west of the orebodies at Grassy; 4 018 metres of rotary-percussion drilling were completed in the scout drilling programme, including more detailed drilling of five prospects. Four areas of scheelite-molybdenum mineralisation were located. A total of 1 841 metres of pre-collaring for diamond drill holes using the percussion drill rig were completed on the four scheelite-molybdenum prospects, and 2 180 metres of diamond drilling were carried out on the four prospects and deep scout holes in other areas along the granite contact zone.

Report of the Mount Cameron Water Race Board for the year ended 31 December 1973

THE MINISTER FOR MINES, THE HONOURABLE E. E. REECE

We submit the Report of the Mount Cameron Water Race Board for the year ended 31 December 1973.

The Board is concerned at the continuing lack of revenue from the sale of water for mining purposes. There are areas of potential tin bearing ground which, if developed, would require water from the race but although interested parties have undertaken some investigations there has been no increase in mining activities.

The race system is generally in good order and considerable maintenance was possible as a result of the employment of additional labour when relief funds became available to alleviate the unemployment position in rural areas. A total of \$878 was expended from these funds. The Chum dam is in good condition and is full to capacity but work at the entrance to the Cybele syphon is necessary and considerable repairs to the Little Musselroe syphon will be required if more water has to be supplied from that source. Because of the mounting operational loss the Board is limiting expenditure to works which are essential to prevent serious deterioration of the race system.

Revenue from sale of water for tin mining purposes was \$2 105 which was slightly less than for 1972. There was only one consumer and requirements ranged between five and fifteen sluiceways per week. No water on the royalty scale of payment was consumed. Expenditure rose by \$850 which was due to necessary increase in rates of pay to the three permanent employees of the Board. The overall operational loss was \$9 276.

The proposal to re-draft the existing regulations and to provide for further increases in water charges was deferred until future consumption of water for mining and other purposes has been clarified.

The Board has reduced operational costs to a minimum consistent with keeping the system functional but because of inevitable increases in wages and materials it must be expected that the annual loss will grow unless consumption of water can be increased. This lies with the development of potential tin deposits or the growth of irrigation schemes which can be supplied from the race system.

J. G. SYMONS, Chairman
H. K. TURNER, Member
V. WOOD, Member

MOUNT CAMERON WATER RACE SUSPENSE ACCOUNT

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 DECEMBER 1973

<i>Receipts</i>	\$	<i>Payments</i>	\$
Sale of Water—		Salaries and wages, including pay-roll tax	10 916·30
Fixed on cash sale	2 105·30	Insurance ..	526·96
Royalty scale ....	....	Car allowance	150·00
Domestic use	248·00	Maintenance material	36·40
Balance (loss) ..	9 276·36		
	\$11 629·66		\$11 629·66

MOUNT CAMERON WATER RACE

STATISTICS FOR THE YEAR ENDED 31 DECEMBER 1973

<i>Registered Rainfall</i>		<i>Production</i>		<i>Tonnes</i>
Great Musselroe	1 040 mm	Tin oxide produced—		
Little Musselroe	927 mm	Fixed scale	.....	4·521
		Royalty scale	.....	.....
<i>Water Services</i>		<i>Employment</i>		
Average number of claims supplied per week	1	Average per week—		
Greatest number of claims supplied in any one week	1	Fixed scale	.....	2
Sluiceheads supplied—		Royalty scale	.....	.....
Fixed scale	578			—
Royalty Scale	.....			2
	578			—

Report of the Ringarooma and Cascade Water Board for the year ended 31 December 1973

THE MINISTER FOR MINES, THE HONOURABLE E. E. REECE

We submit the Report of the Ringarooma and Cascade Water Board for the year ended 31 December 1973.

There have been no firm proposals made to the Board as to the re-opening of the Briseis tin mine at Derby or as to an irrigation system for the Winnaleah district. The Cascade dam is in good order and is full and the Mount Paris dam has been kept empty. The dams will be the source of water if the proposals referred to should develop.

The loss of \$1 183·50 represents interest on the capital cost of the purchase of the Ringarooma and Cascade water system in 1947 and the cost of caretaking the Cascade dam.

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 1973

<i>Receipts</i>	\$	<i>Payments</i>	\$
Balance (loss)	1 183·50	Interest on capital cost	1 033·50
		Caretaking	150·00
	<u>1 183·50</u>		<u>1 183·50</u>