

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

# Australian Mineral Industry

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VOLUME 29 No. 2

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**Part 1—Quarterly Review.** *Information to September 1976*  
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**Part 1—  
Quarterly  
Review**

## **Australian Mineral Industry**

**VOLUME 29 No. 2 1977**

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DEPARTMENT OF NATIONAL RESOURCES

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Information of interest to the mineral industry, corrections to published data, and suggestions will be welcomed.

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## Commodity Review

### FUELS

**Black coal.** The rate of production and exports of black coal decreased during the September quarter 1976. However, production and sales in the first 9 months were substantially above those of the same period in 1975.

Production of raw black coal in Queensland and New South Wales decreased by 9 percent to 15.5 million tonnes in the three months ended 2 October 1976 compared with the preceding three months. Production in Queensland fell by 23 percent to 5.4 million tonnes, reflecting reduced output from open-cut mines in the central and northern Bowen Basin.

Production of black coal in New South Wales and Queensland in the 40 weeks ended 2 October 1976 increased by 15 percent to 52.7 million compared with the first three quarters of 1975. Production in New South Wales increased by 11 percent to 32.7 million tonnes and production in Queensland increased by 24 percent to 20.1 million tonnes. The substantial increase in production in the first three quarters of 1976 mainly reflects reduced output from May to September 1975 when production in both States was adversely affected by widespread industrial disputes.

Production of black coal in South Australia, Western Australia and Tasmania for the first three quarters of 1976 totalled 2.9 million tonnes, 5 percent less than in the corresponding period of 1975.

Consumption of black coal in New South Wales and Queensland during the 3 months ended 2 October 1976 increased by 2 percent compared with the preceding 3 months reflecting increased purchases for electricity generation. Consumption in Queensland and New South Wales during the 40 weeks to 2 October 1976 increased by 4 percent to 19.7 million tonnes compared with the corresponding period of 1975. Despite increased consumption in 1976 coal stocks remain high. Stocks in New South Wales increased slightly to 8.48 million tonnes at 2 October from 8.46 million tonnes at 10 July.

Statistics published by the Joint Coal Board and the Queensland Coal Board show that exports of black coal from Australia in the 3 months ended 2 October 1976 decreased by 11 percent to 7.3 million tonnes compared with the preceding 3 months. In the 40 weeks ended 2 October 1976 exports from Australia increased by 11 percent to 25.4 million tonnes compared with the corresponding period of 1975. Exports from Queensland increased by 26 percent to 14.6 million tonnes, offsetting a 5-percent decrease in exports from New South Wales to 10.8 million tonnes.

Australian Mutual Provident Society and Utah Mining Australia Ltd announced in July that they were to become direct participants in Central Queensland Coal Associates (CQCA), their respective shares being 7.75 percent and 4 percent. The arrangement will take effect when a decision is made to proceed with coal mining at Norwich Park. Utah Development Company which currently holds an 85-percent share in CQCA and Mitsubishi Development Pty Ltd which holds a 15-percent share in CQCA are to have respective shareholdings of 76.25 percent and 12 percent under the new agreement. Utah Development Company is owned by Utah International Inc. (89.2 percent) and Utah Mining Australia Ltd (10.8 percent).

As announced in September, British Petroleum Company Ltd is to purchase a 50-percent share in the New South Wales coal mining operations of Clutha Development Pty Ltd. The agreement is subject to an investigation of Clutha's coal mines and coal reserves by British Petroleum as well as to the approval of the Australian Government.

In the 1976/77 Budget the Government announced its intention to phase out the coal export duty over three years. As a first step the Government introduced legislation (Customs Tariff (Coal Export Duty) Proposals (1976)) which would from 17 August exempt non-coking coal from duty and reduce duty on high quality coking coal from \$6/tonne to \$4.50/tonne and on other coking coal from \$2/tonne to \$1.50/tonne.

R. PRATT

## METALS

**Aluminium.** Production of primary aluminium in Australia increased steadily during the nine months January-September 1976 with progressive reactivation of smelting capacity rendered idle in 1975 as a result of the world recession in the industry at that time. Output during the period was 172 501 tonnes, compared with 160 909 tonnes in the corresponding period of 1975. In the September quarter of 1976, production of primary aluminium was 59 428 tonnes, indicating a return to full capacity production by Alcan at Kurri Kurri, NSW, and Comalco at Bell Bay, Tas. The Point Henry, Vic., smelter of Alcoa had been operating at full capacity throughout 1975 and early 1976.

Exports of primary aluminium during the nine months to 30 September 1976 totalled 42 296 tonnes, valued at \$29 042 000, compared with 51 783, valued at \$30 595 000, during the equivalent period of 1975. Imports remained at a low level—219 tonnes during the nine months—so that apparent consumption for the period was 130 420 tonnes.

No precise data are available on stocks held by smelters and fabricating plants. According to statistics published by the International Primary Aluminium Institute, London, inventories at smelters and fabricating plants in Oceania (Australia and New Zealand) decreased by a total of 2000 tonnes between 1 January and 30 September 1976. It might therefore be reasonable to assume that actual consumption was fairly close to the apparent consumption figure quoted above, and that consumption for the calendar year might be of the order of 176 000 tonnes, about 11 percent higher than the 158 228 tonnes consumed in 1975 as estimated by the Aluminium Development Council.

Production of alumina during the period January-September was 4 575 684 tonnes, indicating a total output for 1976 of about 6 million tonnes, 17 percent higher than the 5.13 million tonnes produced in 1975. Apart from increased output by Queensland Alumina Ltd at Gladstone, Qld, and Nabalco Pty Ltd at Gove, NT, the main factor contributing to the higher 1976 production was continuing expansion at the Pinjarra, WA, refinery of Alcoa. Completion of an additional unit at this refinery by late 1976 will lift its capacity to 2 million tonnes/year, and Alcoa's total refining capacity in Australia to 3.4 million tonnes/year.

On 29 September, Conzinc Riotinto of Australia Ltd (CRA) and Comalco Ltd announced that CRA was selling to Comalco its 12.5-percent interest in Queensland Alumina Ltd. Comalco would also acquire an additional 4 percent equity in the project from the purchase of portion of the interest of Kaiser Aluminium and Chemical Corporation. As a result, Comalco's equity would be increased from 13.8 percent to 30.3 percent. A correspondingly increased share in the alumina output of the refinery would make Comalco self-sufficient in alumina requirements for the Bell Bay and Bluff (NZ) smelters, and leave it with an exportable surplus of about 200 000 tonnes/year, which may in part provide an alumina source in the future for Comalco's proposed smelter at Gladstone.

A. J. GOURLAY

**Copper.** Preliminary statistics for the three months to September 1976 indicate that domestic mine production (copper in all concentrates produced) was 54 128 tonnes, 4 percent above the previous quarter but 3 percent less than in the same period in 1975. Production for the first nine months of 1976, at 163 206 tonnes is 2 percent below the corresponding output for 1975 and it is estimated that the total for the calendar year will reach 215 500 tonnes.

Total blister production (primary and secondary) fell in the third quarter by 5 percent to 41 815 tonnes. Refined copper production (primary and secondary) increased to 46 681 tonnes because of higher output at Townsville.

Peko Wallsend Ltd continued its research into extracting bismuth from copper matte produced at Tennant Creek in 1974 and 1975. Testing of Pierce-Smith convertors has been completed at Mount Morgan and the company announced its intention to substitute these at Tennant Creek in place of the previously installed Kaldo convertors.

In September, Western Selcast Pty Ltd and MIM Holdings Limited announced the discovery of copper-zinc mineralization at their Teutonic Bore prospect 80 km southeast of Agnew, WA. The companies reported in October that diamond drilling intersected mineralization at a depth of 120 m, over a strike length of about 250 m. Assay results range from 1.5 to 5.2 percent copper, 8.6 to 20.7 percent zinc and 121 to 289 g/tonne silver. Drilling indicates that mineralization continues down dip but further information is required before true widths of the mineralization can be determined.

The Mount Isa Mines Limited copper price rose to \$1340/tonne in mid-July, continuing the upward trend of the previous quarter, but declined appreciably in the following months to close at \$1040/tonne at the end of September.

Following a public enquiry in June 1976 the Prices Justification Tribunal (PJT) concluded in August that it should not impose an artificial ceiling price on copper in the present circumstances and agreed to exempt Mount Isa Mines Ltd from the obligation to notify increases in copper prices where the increases reflect changes in LME prices. The PJT added that, if in future it considered it appropriate in the public interest, it would designate a price as a point of review prior to immediate consideration of whether a ceiling should be placed at that or some other level. The PJT also suggested that domestic copper producers discuss with the fabricating industry trading arrangements, including terms of settlement, ordering procedures in Australia, and the possibility of extending the time base of the LME moving average.

Comex (Commodity Exchange) stocks rose appreciably in July and August and LME stocks closed the third quarter 3.7 percent above the total at the end of the previous quarter at 559 000 tonnes. After firming in early July, LME prices declined because of rising stocks and poor consumer demand. The US producer price for copper was increased from 70 cents/lb to 74 cents/lb early in July.

B. G. ELLIOTT

**Gold.** Industrial disputes have interrupted development at the Telfer Project in the Paterson Ranges in Western Australia but following settlement of the disputes work has now resumed and the mine is expected to be in production by the end of February 1977.

Kia Ora Gold Corporation NL has been developing the old Marvel Loch gold mine near Southern Cross, WA. The newly erected concentrator started operating in June 1976 but with the decrease in the price of gold the mine became uneconomic and in September it was placed on care and maintenance.

On 31 August Kalgoolie Mining Associates announced that it would suspend its Mount Charlotte operation and put the mine and associated facilities on care and maintenance until the economics of gold mining permitted the mine to be

re-opened. Production will cease about mid-December 1976 after all readily available broken ore is treated.

In August 1976 the Australian Government announced that it had accepted the main recommendation of the Industries Assistance Commission Report on the Gold Mining Industry that the taxation exemption applying to profits from the mining of gold should be phased out and cease by the 1980-81 financial year.

Following representations from both the Premier of Western Australia and a delegation of gold mining interests and others associated with the industry, the Government decided in August 1976 to refer the question of assistance for the production of gold in Australia, including the question of tax exemption, back to the Industries Assistance Commission, which is required to report to the Government by 31 March 1977.

The Commission has been asked whether, in the light of developments in the situation of the gold mining industry since the Commission's report of 6 June 1975 on production of gold, any changes are necessary in the assistance accorded the production of gold, including assistance by way of taxation treatment, in order to sustain economic production in Australia.

The Gold Producers' Association Ltd (GPA) price of gold to Australian industrial users was \$99.52/fine ounce on 1 July and apart from minor short-lived increases the price continued to fall. On 25 August the GPA price was \$83.19, the lowest price since January 1974. Prices then started to increase and by 30 September had reached \$94.05.

G. HILLIER

**Iron and Steel.** Following indications of a recovery in world demand for steel in early 1976, demand in major non-Communist world countries slowed in the September quarter. Despite this, Australian exports of steel products continued to expand in 1976, offsetting a relatively low level of domestic demand.

Production of raw steel by The Broken Hill Proprietary Co Ltd during the September quarter of 1976 decreased by 4 percent, to 1 961 000 tonnes, compared with the preceding June quarter of 1976. An 8-percent reduction in output at Port Kembla to 1 135 000 tonnes, which mainly reflected the effects of industrial disputes, and a 3-percent reduction in output at Whyalla to 763 000 tonnes were partially offset by a 6-percent increase in output at Newcastle to 553 000 tonnes.

Production of pig iron and steel by BHP during the 9 months to September 1976 increased by 0.4 percent and 0.5 percent to 5 699 000 tonnes and 5 962 000 tonnes respectively, compared with 1975.

The value of exports of iron and steel products during the quarter ended September 1976 increased to \$100.1 million, 20 percent above exports in the preceding June quarter 1976. The value of imports increased to \$42.9 million, 12 percent more than imports in the preceding June quarter.

The Minister for Industry and Commerce and the Minister for Business and Consumer Affairs announced on 16 September that the Federal Government had decided to lift the temporary tariff quotas on imports of uncoated cold rolled iron and steel sheet as from 1 October 1976. The quotas were introduced on 9 June 1976 and were previously effective from 1 April 1976 until March 1977.

The Minister for Business and Consumer Affairs announced on 30 September 1976 that the Federal Government would extend the tariff quotas on stainless steel flat products that were due to be terminated on that date. Tariff quotas have applied since 1 November 1975 and involved an additional duty of 15 percent (General and Preferential) on quantities imported above a quota. The tariff quotas were extended in June 1976 until 30 September to enable the Government to

consider an interim report from the Industries Assistance Commission on assistance to manufacturers of high-alloy steels; the interim report had been prepared pending completion of the IAC's inquiry into the entire iron and steel industry.

R. PRATT

**Iron ore.** With a slowing in the improvement of world demand for steel and a levelling out of steel output in Japan, optimism for a recovery in demand for iron ore lessened during the September quarter 1976. However, both Australian production and exports increased compared with the preceding June quarter.

Production of iron ore and concentrates during the September quarter 1976 increased by 15 percent to 25.1 million tonnes compared with the preceding quarter, mainly because of increased output at Mount Whaleback. Production of iron ore during the 9 months ending September 1976 decreased by 7 percent to 69.3 million tonnes compared with the corresponding period of 1975. The decrease reflects reduced demand combined with reduced production due to industrial disputes and tropical cyclones.

Exports of iron ore and iron ore pellets in the September quarter 1976 increased by 8 percent above the preceding June quarter to 22.1 million tonnes. Shipments to Japan decreased by 1 percent to 16.2 million tonnes. Exports of iron ore and iron ore pellets in the 9 months to September 1976 increased by 2 percent to 61.6 million tonnes compared with exports in the same period of 1975.

Japanese steel industry representatives announced in September their intention to purchase additional iron ore from Australia. Contracts were reportedly arranged for the purchase of an additional 6 million tonnes/year from Hamersley Iron Pty Ltd in addition to an extension of existing contracts. Reportedly Cliffs Robe River Iron Associates is to deliver an additional 700 000 tonnes of iron ore fines to Japan in the Japanese fiscal year 1977, 3 million tonnes/year from 1978 (including options) and 3.5 million tonnes from 1981 (including options). Japanese steel mills are also considering the purchase of a further 3 million tonnes/year in and after 1979 from the Mount Newman Joint Venturers, though contract details are yet to be finalized.

To meet its commitments Hamersley Iron Pty Ltd announced that it intends to expand production capacity to 46 million tonnes/year of saleable iron ore. The expansion will allow the treatment, including concentration, of 13.5 million tonnes/year of low-grade iron ore at Mount Tom Price. The new concentrator and associated facilities will cost about \$250 million. It will satisfy part of Hamersley's processing commitments to the Western Australian Government and will increase net capacity for high grade ore by 7.7 million tonnes/year.

Expansion of facilities by Cliffs Robe River Iron Associates to supply additional iron ore fines to Japan will reportedly cost about \$70 million.

The iron ore production and shipment capacity of the Mount Newman Joint Venturers increased from 35 million tonnes/year to 40 million tonnes/year with the opening of No. 2 ore handling plant at Port Hedland in September. The Mount Newman Joint Venturers plan to further expand capacity by a reported 5 million tonnes, to 45 million tonnes/year, to supply at least part of the additional ore to Japan from 1979.

The Boards of Consolidated Gold Fields Australia Ltd (CGFA) and M.I.M. Holdings Ltd (MIM) announced in September that agreement had been reached in principle for the purchase by MIM of a 20-percent share in the Mount Goldsworthy Joint Venture. The share will be provided by the sale by each of CGFA and Cyprus Mines Corporation to MIM of a 10-percent interest in the venture. When the agreement is finalized ownership in the Mount Goldsworthy Joint Venture will be CGFA (23-1/3 percent), Cyprus Mines Corporation (23-1/3 percent), Utah Development Co. (33-1/3 percent), and MIM (20 percent). It was later reported by the press that both CGFA and Cyprus Mines Corp. intended

to sell their respective 23-1/3-percent shares to Consolidated Gold Fields Ltd of the UK after arrangements for purchase of the 20-percent interest in the Venture by MIM have been finalized.

Nippon Steel Corporation announced in September that it would purchase a 3-percent share in Cliffs Robe River Iron Associates from Mount Enid Iron Co. Ltd. Ownership of the venture will now be Cliffs Western Australian Mining Co. Pty Ltd 30 percent, Mitsui Iron Ore Development Pty Ltd 30 percent, Robe River Ltd 35 percent, Nippon Steel Corp. 3 percent, and Mount Enid Iron Co. Pty Ltd 2 percent.

R. PRATT

**Lead and Zinc.** Preliminary Australian estimates for 1976 indicate a 3-percent decrease in domestic mine production of lead and a 7-percent fall in zinc production to about 383 000 tonnes and 435 000 tonnes respectively. Several producers who stockpiled unsold concentrates rather than reduce mine output in 1975 were forced to cut back production in the first half of 1976 because of continuing poor demand both in Australia and overseas. Mine output increased in the second half of the year, but failed to offset the earlier cutbacks in production.

Smelters and refineries increased output in the second half of the year in response to a general improvement in demand and higher prices. Data obtained by the BMR indicate refined lead output will increase by about 14 percent to 220 000 tonnes and refined zinc output will rise by 26 percent from the very low levels recorded in 1975 to about 252 000 tonnes. Domestic lead consumption is likely to increase by 4 percent to 75 000 tonnes and zinc consumption by 6 percent to 87 000 tonnes.

The price of domestic refined zinc was unchanged at \$651/tonne in the third quarter of 1976. The refined lead price was increased on 31 July from \$355/tonne to \$400 and remained unchanged for the remainder of the quarter.

In July, Australian Mining and Smelting Ltd announced that it had reached agreement with Jododex Australia Pty Ltd to develop jointly the Woodlawn orebody. Detailed engineering, feasibility and environmental impact studies have been completed and the group expects mine production to commence in about two years.

On 17 September, Asarco Incorporated and MIM Holdings Limited announced that the two companies had agreed not to proceed further with the proposed acquisition by MIM of a 13.7-percent interest in Asarco Inc. at a cost of about \$A70 million. The decision in principle between the two companies to participate in a joint study of the Kentucky zinc project was not affected.

In September, the General Services Administration of the United States announced new stockpile objectives, effective from 1 October 1976, for the full range of strategic materials. The new lead objective of 865 000 short tons is greater than the total existing inventory (601 619 short tons), indicating future acquisitions will be required. Similarly the new zinc objective of 1 313 000 short tons is substantially larger than the total existing inventory of 374 830 short tons. GSA have stated that these goals will be achieved over a period of years.

At Broken Hill, North Broken Hill Ltd obtained further encouraging results from drilling in the new zone of lead-zinc mineralization (Fitzpatrick Area) reported in previous issues of the *Quarterly Review*. Hole 2104 intersected 17.1 m assaying 5% Pb, 12.9% Zn and 344 g/t Ag. The gangue minerals associated with this mineralization suggest the occurrence of zinc-rich lode material similar to that occurring at the southern end of the Broken Hill lode which was previously unrecorded from the northern end of the lode.

Underground operations at the South Mine at Broken Hill, operated by Minerals Mining and Metallurgy Ltd, ceased on 20 August; operations are now confined to the treatment of residue tailings dumps and the mining of oxidized ore and remnant sulphide ore in the Blackwood Open Cut.

Work continued on the decline adit at the Que River prospect. Problems associated with poor roof conditions have largely been overcome and the first drift in ore has been commenced, to provide bulk ore samples for metallurgical testing.

K. PATTERSON

**Nickel.** Australian mine production of nickel in the third quarter of 1976 was up by about 7 percent on output for the previous quarter. All mining centres except Scotia in Western Australia reported increased production.

The production of nickel oxide at Yabulu in Queensland was less than in the previous quarter despite an increase in ore railed to the refinery. The reduced output resulted from plant modifications which were about 50 percent complete at the end of the quarter.

The Kwinana nickel refinery operated normally throughout the period but production at the Kalgoorlie nickel smelter was interrupted for five weeks for routine maintenance.

Progress of the decline at the Agnew nickel project was interrupted for about five weeks during the quarter as a result of a collapse at the beginning of August. The decline is being constructed for the Agnew Nickel Co. Pty Ltd (60% Western Selcast Pty Ltd and 40% Mount Isa Mines Ltd) by Thyssen Mining and Construction Pty Ltd and had advanced about 112 m from the portal at the time of the collapse.

Agnew Nickel announced in July that it had let a contract to Thyssen Mining and Construction to sink a 910-m shaft at the project. This shaft will have a diameter of 7.5 m and will take about three years to complete. The partners were advised in August by the Australian Government that proceeding with the project on the present equity participation basis would not be inconsistent with the Government's foreign investment policy. The announcement by the company indicated that the Government had noted the partners' intention to increase the level of Australian equity in the future and that they were required to report back to the Foreign Investment Review Board within five years on the efforts made to achieve this.

New intersections of nickel sulphides were reported by Geometals NL from the Beautiful Sunday Prospect at Forrestania. Amax Inc. and Geometals are joint venture partners in this project which is managed by Amax. The results were from diamond drill hole BSD6 which intersected 1.29 m averaging 1.5% Ni at the basal contact of an ultrabasic unit.

Western Mining Corporation Ltd, Australia's largest producer of nickel, released the company's preliminary results for 1975-76 during the quarter. WMC's nickel stocks increased in value from \$19.1 million to \$45.8 million during the year, reflecting the oversupply situation which existed throughout the period. The company indicated that the nickel market was still slow although they see signs of an improvement compared with earlier 1976 and hope for an acceleration in demand in 1977 as the major industrialized nations consolidate recent economic recoveries.

The Japanese Ministry of International Trade and Industry (MITI) has revised its estimates of Japan's demand for nickel metal in fiscal 1976 from 28 200 tonnes to 34 900 tonnes. MITI stated that the estimated increase was the result of increased demand from the electrical and automotive industries. The two major producers of nickel metal in Japan, Sumitomo Metal and Mining Co. Ltd and Shimura Chemical Company Ltd, also announced that they were producing at full capacity in early August, following increased demand from the nickel plating and stainless steel sectors of industry.

Falconbridge Nickel Mines Ltd announced in early September a 15-percent rise effective from the beginning of October. However, they rescinded this proposal later in September in line with other major producers, who announced in mid-September an increase of 9.6 percent to US\$2.41/lb effective from 1 October 1976. Because most nickel is sold under long-term contracts which now afford

90 days' protection from increases, the new prices will not become effective until January 1977. Producers still have large nickel stocks and it seems most likely that the practice of discounting prices for forward commitments, which has occurred during the last year, is likely to continue into 1977.

L. C. RANFORD

**Tin.** The export quotas which the International Tin Council had introduced in April 1975 were not continued beyond 30 June 1976, and Australian tin producers returned to normal production rates in the September quarter. Australian mine production of tin-in-concentrates was 2 745 tonnes, 24 percent more than in the September quarter of 1975. Production of primary refined tin was 1 668 tonnes, 18 percent more than in the corresponding quarter of 1975.

Domestic consumption in the quarter was about 990 tonnes, compared with 845 tonnes in the September quarter of 1975 and about 900 tonnes in the June 1976 quarter.

Exports of tin-in-concentrates increased substantially in the third quarter of 1976 because of the increased mine production; the total, 1054 tonnes, was 20 percent more than the total in the September 1975 quarter and 35 percent more than in the June 1976 quarter. Exports of tin metal, 623 tonnes, were up 29 percent on the preceding quarter and 4 percent down on the September 1975 quarter.

Renison Limited announced that it was studying the feasibility of a leaching process to remove iron carbonate from tin concentrates. The result, after removal of sulphide minerals by flotation, would be a single concentrate capable of being smelted in conventional smelters. At present the company produces a high-grade concentrate which can be treated by the Australian smelter (Associated Tin Smelters Pty Ltd, Alexandria, NSW), and a low-grade concentrate which must be exported because it requires special treatment. The company was also studying the feasibility of establishing a tin smelter, expected to cost at least \$3.5 million.

The Penang tin price, which had been M\$1187/pikul (1 pikul = 60.48 kg) on 30 June, when the International Tin Council suspended buffer stock operations, rose to M\$1230 on 1 July. On 6 July, the ITC authorized the Buffer Stock Manager to operate at his discretion with a view to achieving the objectives of the Fifth International Tin Agreement. The price reached a peak of M\$1320/pikul on 8 July and then, with some easing of physical demand and market uncertainty about the state of national economies around the world and the possibility of disposals from the United States stockpile, it gradually decreased, falling below the upper limit of the buffer-stock price range (M\$1200) on 10 August, to fluctuate, mostly in the range M\$1170-1190, for the remainder of the quarter.

The LME cash price reached a peak of £4905/tonne on 9 July, then fell rather erratically during the rest of July; a sudden fall in early August brought it to the £4500 level, where it fluctuated until, with the rapid fall in the value of sterling in late September, it rose to close the quarter at £4747/tonne. The Australian price generally followed the Penang price, reaching a peak of \$7534 on 9 July then trending downwards, with a reversal of this trend emerging at the end of the quarter and continuing into the next quarter.

The United States Senate on 15 September agreed to the treaty authorizing United States participation in the Fifth Tin Agreement.

I. R. McLEOD

**Tungsten.** In the first three quarters of 1976 Australia produced 1779 tonnes of tungstic oxide ( $WO_3$ ) in concentrates, 29 percent more than in the corresponding period of 1975. A small decrease in the quantity of contained tungstic oxide produced by Aberfoyle NL was more than countered by increased output by King Island Scheelite Pty Ltd, a subsidiary of Peko Wallsend Ltd, and RB Mining Pty Ltd.

King Island Scheelite Pty Ltd has announced that the company will erect a plant to produce artificial scheelite on the mine site at Grassy on King Island in Bass Strait. The scheelite concentrates at present produced at King Island attract a penalty because of their molybdenite content. The plant, which is to be commissioned in 1978, will produce a product free from molybdenite and other impurities.

RB Mining Pty Ltd, which operates an open-cut mine at Mount Carbine near Mareeba in northern Queensland, expects that the installation of photometric ore sorters at its concentrator will be completed in mid-1977. The company, which holds proved ore reserves containing 23 000 tonnes of tungstic oxide, has announced that it has long-term contracts to supply 1080 tonnes/year of tungstic oxide to European purchasers.

Complete statistics on the quantity of tungsten released by the General Services Administration (GSA) from its stockpile during the quarter are not available, but reports indicate that the prices at which material was released were about US\$3/mtu below the *London Metal Bulletin* (LMB) quotation at the time of the releases.

On 1 July the average LMB quotation for standard-grade wolfram concentrates was £63.25/mtu. The price increased steadily during the quarter and at the end of September the average quotation was £76.00/mtu, an increase of 20 percent. Quotations in United States dollars over the same period increased by 12 percent. The 8-percent difference represents the depreciation of sterling against United States currency. Because of this difference and also because of the uncertainty regarding the future stability of sterling, an increasing body of opinion believes that LMB quotations for tungsten should be expressed in United States currency.

G. HILLIER

## NON-METALS

**Phosphate.** Queensland Phosphate Limited reported production of 107 250 wet tonnes of marketable rock (average grade about 13.7 percent P) from the company's interim crushing, washing and screening plant, for the period 27 June to 18 September; rail consignments to Townsville in the same period totalled 71 235 dry tonnes. Construction of new plant for crushing, washing and screening and desliming phosphate rock is virtually complete and the company's rate of production is scheduled to increase to 1 million tonnes/year during the next quarter with commissioning of the new plant and delivery of a fourth unit train.

Imports of phosphate rock during the quarter ended 30 September are estimated at 275 000 tonnes. Superphosphate production statistics for the quarter are incomplete but are estimated at 448 000 tonnes of single superphosphate equivalent which is equivalent to 275 000 tonnes rock. The level of rock stocks would therefore appear to have remained static at an estimated 1.79 million tonnes.

In response to the recommendation by the Industries Assistance Commission in its interim report of 1975, the Government restored the \$11.81/tonne bounty on single superphosphate (or its equivalent in terms of P content). The Commission's *Draft Report on Assistance for the Consumption of Phosphatic Fertilizers* was released in July 1976. In summary, the Commission recommended bounty payments on consumption of superphosphates, ammonium phosphates and phosphate rock prepared for direct application, at a rate of \$170/tonne contained P for superphosphates and ammonium phosphates, equivalent to about \$16.30/tonne of single superphosphate equivalent and about \$4.50 more than the present rate of bounty. However, this rate was recommended subject to removal of the indirect subsidy which it considered inherent in pricing of Christmas Island rock at cost and should this recommendation regarding removal of the indirect subsidy not be accepted, the Commission recommended a bounty rate of \$130/tonne contained P for phosphate fertilizers; bounty payments were recommended for a period of five years commencing 1 July 1977 and to be reviewed before the end of that period.

A. DRIESSEN

**Asbestos.** Production of asbestos in the three months ending September 1976 was 14 781 tonnes of fibre, 4 percent below the previous quarter and 1 percent below the output for the same period in 1975.

The productive capacity of the Chrysotile Corporation of Australia Pty Ltd asbestos operation at Woodsreef, NSW, was increased by 33 percent to 105 000 tonnes/year of asbestos fibre when two new rock lines were commissioned at the end of September 1976. Improvements in the recovery rate of the Woodsreef mill and the exclusive use of ore from the North Pit have enabled Chrysotile Corporation to produce a higher-grade fibre which, combined with the high world demand for asbestos, has increased sales revenue per tonne of fibre by more than 30 percent. Consequently, the company made a net operating profit for the nine months ended 31 July, the first since operations began in 1972.

Chrysotile Corporation became Australia's only producer of asbestos on 20 September 1976 following its purchase of Asbestos Mines Pty Ltd's small mining operation at Baryulgil, NSW. The acquisition of the mining leases will allow Chrysotile Corporation to consolidate its interests in the Baryulgil district and to continue with its exploration program in the area.

The Asbestos Association of Australia, an association to facilitate the exchange of information on medical, scientific, and technical aspects of asbestos, was formed in July 1976 by six companies including both miners and consumers of asbestos.

R. J. HUGHES

#### MINERAL SANDS

During the first half of 1976, domestic mineral sand producers confined output to 1975 levels, and this, combined with an encouraging increase in exports, brought production and shipments of mineral sands into better balance. Some producers have been able to reduce the high level of stocks of concentrates accumulated during 1975.

**Ilmenite.** During the six months January-June 1976, domestic production of ilmenite concentrates (including leucoxene) was reduced to an annual rate of about 900 000 tonnes, about 10 percent lower than in 1975. However, considerable production capacity in Western Australia remains unused and output could be expected to increase in the latter part of the year if demand warrants. Exports of concentrates (including leucoxene) for the six months to 30 June 1976 totalled 373 000 tonnes (545 000 tonnes for the whole of 1975). Higher prices written on forward contracts are reflected in improved unit values of shipments—\$16.9/tonne for exports in the first half of 1976 compared with a unit value of \$14.8/tonne in 1975.

Overseas, much of the production capacity for  $\text{TiO}_2$  pigments put on a care-and-maintenance basis in 1975 has now been reactivated, although a substantial proportion of titaniferous feed requirements for this capacity is being met from accumulated stocks. Demand has improved for higher  $\text{TiO}_2$  concentrates (60%  $\text{TiO}_2$  or better) for upgrading or direct chlorination, but the market for standard-grade ilmenite remains highly competitive; demand for standard-grade ilmenite has weakened because of pollution problems connected with the sulphate process, and stricter anti-pollution controls imposed on users of the sulphate process, particularly in Europe.

**Rutile.** Domestic production of rutile concentrates in the first half of 1976 increased to an annual rate of 370 000 tonnes (344 000 tonnes in 1975) because of increased output from new projects in the Eneabba area of Western Australia. Demand has been well maintained and exports of 186 000 tonnes of rutile concentrates (unit value \$202/tonne f.o.b.) were recorded during the six months January-June 1976, compared with 319 000 tonnes (unit value \$188/tonne) for the calendar year 1975.

**Zircon.** Domestic production of zircon concentrates is running at an annual rate of about 380 000 tonnes, little changed from 1975. However, exports of concentrates in the early half of 1976 have shown some recovery to 168 000 tonnes, an annual rate about 11 percent higher than the depressed level of exports in 1975. Nevertheless, producer stocks continue to accumulate and the sluggish market is reflected in lower unit values of exports—\$167/tonne f.o.b. for the first six months of 1976 compared with \$190/tonne in 1975.

In early November 1976, the Acting Minister for National Resources announced that the special export control arrangements for zircon, introduced in late 1975, would be continued in 1977. However, because of the adverse market situation the minimum export prices for 1977 would be set at \$115/tonne f.o.b. bulk basis for zircon containing 0.1% or more iron oxide, and \$125/tonne f.o.b. bulk basis for zircon containing less than 0.1% iron oxide, \$25/tonne below the 1976 floor prices. These minimum prices will apply to new export contracts for standard grades of zircon, with differentials for premium-grade material. Exporters will be allowed more flexibility in drawing up new export contracts for zircon and other mineral sands. Pricing in an alternative currency to Australian dollars, for example United States dollars, and pricing for up to three years (if satisfactory provision is made for escalation beyond 1977) will now be accepted. Exporters will continue to be required to consult with the Department of National Resources before new contracts for export are finalized.

J. WARD

## Mineral exploration in Australia 1965 to 1973

P. J. ROBERTS

Before the second World War, mineral exploration in Australia was at a low ebb; prospecting was largely restricted to the examination of known deposits by established local mining companies. In 1949 the discovery of small but rich uranium deposits at Rum Jungle in the Northern Territory prompted fresh interest in Australia's mineral potential and resulted in a considerable increase in activity by both local and overseas mining companies.

In the 1950s and early 1960s major discoveries of bauxite, manganese, lead, zinc, and iron ore led an upsurge in exploration which reached a peak in 1970-71. This article attempts to analyse some of the results of this upsurge. Because statistics on exploration in Australia are not available for the years before 1965, the analysis is restricted to the search for minerals from January 1965 to June 1973, which was in fact the important period. Statistics collected in the annual mineral exploration census conducted by the Australian Bureau of Statistics have been drawn on extensively. Petroleum is not included in this study.

Australia experienced an unprecedented increase in exploration activity from 1965 to 1971. Total annual expenditure on exploration for minerals other than petroleum rose from \$25.6 million in 1965 to a peak of \$168.4 million in the fiscal year 1970-71, an increase of \$142.8 million. By contrast, in Canada, which also witnessed a strong upturn in exploration activity, total expenditure rose by only Can\$84.7 from Can\$54.0 million in 1965 to Can\$138.7 million in 1971.

Exploration for minerals declined noticeably in most Free World countries, with the possible exceptions of South Africa, Brazil and the Philippines, between 1970 and 1973. In Australia exploration expenditure dropped sharply from the 1970-71 peak of \$168.4 million to \$109.1 million in 1972-73.

The upsurge in exploration activity in Australia followed the successful development of a series of very large mining projects, including manganese at Groote Eylandt, bauxite at Gove and Weipa, coal in the Bowen Basin, and iron ore in Western Australia. The success of these early ventures and the political and economic stability of Australia attracted the attention of both Australian and foreign explorers and support was provided by a series of new discoveries. Prominent among these were the 1966 discoveries of the Kambalda nickel province in Western Australia and the large phosphate reserves at Duchess and Lady Annie in Queensland. Exploration interest was sustained and heightened by later base metal discoveries, including the Lady Loretta silver-lead-zinc deposit in Queensland, the Woodlawn copper-lead-zinc deposit in New South Wales, continued exploration success in the nickel belts of Western Australia, and the discovery of important major uranium deposits in the Northern Territory and Western Australia.

In 1964-65 mining stocks constituted 20 percent of the total equity shares traded on the Sydney Stock Exchange; in 1969-70 over 70 percent. In the three years to 1968 a total of 51 new mining and exploration companies were admitted to exchange lists compared with less than 26 industrial companies. Published Australian Bureau of Statistics figures (ABS 1971-1973; CBCS 1965 to 1970-71, 1971-72) show that the total number of enterprises engaged in exploration in

Australia increased from 438 in 1968-69 to 848 in 1970-71 while in the same period the number of enterprises spending more than \$1 million annually on exploration increased from 16 to 41. By 1970 virtually all the major world mining companies were actively exploring for metals in Australia.

Data compiled principally from company reports indicate that at least 70 percent of the companies spending more than \$500 000/year on exploration between 1969 and 1972 were directly foreign owned according to the Australian Bureau of Statistics definition of direct foreign company ownership.

In 1971, expenditure fell sharply. The sharp downturn in activity indicated by the 1971-72 expenditure figures coincided with a weakness in world metal markets, induced by economic recession in most industrialized countries, and a fall-off in the discovery rate in Australia. However, the fall in the level of effective exploration between 1970-71 and 1971-72 was probably much less than the figures suggest, as a proportion of the funds expended on exploration in Australia at the height of the boom in 1970-71 was unwisely spent, and in some instances wasted.

In the period between 1965 and 1971 the most important source of exploration funds was re-invested mining profits of established miners. As metal prices declined and profits were squeezed, most mining companies in Australia and elsewhere tended to cut back the areas of corporate activity including exploration, where no immediate return on funds was being obtained. In most cases this meant reduced exploration budgets.

Public confidence in mineral explorers was severely damaged by the collapse of the Vam Ltd and Mineral Securities Ltd mining groups, the severe downgrading of uranium reserves at the Nabarlek uranium deposit (which had commanded world attention when its discovery was first announced), and the Tasminex and Leopold affairs in Western Australia. As a consequence funds for speculative mining ventures were greatly reduced. Published ABS figures show that the number of small explorers (i.e. those spending less than \$500 000 a year) declined from 539 at the height of the boom in 1970-71 to 395 in 1971-72 and 337 in 1972-73. The total number of explorers active in Australia also fell sharply from a peak of 848 in 1970-71 to 553 in 1972-73.

Throughout this paper no attempt has been made to measure the effects of changes in Australian government policies, which may have affected explorers' investment decisions, for two main reasons. First, it is extremely difficult to quantify the effect of policy changes affecting exploration; and second, they cannot be considered in isolation, given the international character of the search for minerals. Changing political and investment climates in other countries and recognition of the mineral potential of newly developing regions exert considerable influence on exploration decisions which may outweigh or counteract the effect of changes in domestic policies.

All expenditure data are in unadjusted 'current' dollars. Ideally allowance should be made for erosion in the purchasing power of the dollar when comparing expenditure on a yearly basis over the period examined. However, it appears likely that in this period the introduction of new technology and exploration methods would have considerably modified inflationary effects and helped maintain a 'constant' exploration dollar.

The statistics presented in Tables 1 and Figures 1 and 2 illustrate the important private sector contribution to exploration in the period examined. Private expenditure increased from 87 percent of the total expenditure in 1965 to 91 percent in 1972-73.

Government exploration expenditure by the Commonwealth Government (Bureau of Mineral Resources, Joint Coal Board) and State Mines Departments almost trebled in amount but decreased as a percentage of the total from 12.6 percent to 8.6 percent between 1965 and 1972-73.

The most volatile and probably the most important single category of exploration has been private expenditure outside production leases. By definition this category

**TABLE 1. MINERAL EXPLORATION EXPENDITURE IN AUSTRALIA 1965-73 (\$'000)**

	Total	Total private expenditure	Total Government expenditure	Total private expenditure minus private expenditure on production leases
1965	25 582	22 360	3 223	13 971
1966	31 687	28 115	3 572	18 674
1967	39 393	34 822	4 571	25 496
1968	58 321	52 463	5 858	44 818
1968-69 (a) (six months only)	39 546	36 281	3 265	31 192
1969-70	124 818	118 115	6 704	97 024
1970-71	168 377	161 063	7 314	133 511
1971-72	125 396	117 061	8 334	95 882
1972-73	109 140	99 738	9 402	86 035
<b>TOTAL</b>	<b>722 260</b>	<b>670 018</b>	<b>52 243</b>	<b>546 603</b>

(a) Before 1968-69 the annual mineral exploration census was based on the calendar year. For 1968-69 the reporting period was changed to the fiscal year ending 30 June. Thus data for the 6 months to 31.12.1968 are included in both the 1968 and 1968-69 returns. Expenditure for the 6 months to 30 June 1969 has been estimated here by halving total expenditure for the year to 30 June 1969.

Note: Before 1968 the scope of the ABS census was limited to private exploration on lease or licence areas, and all Government exploration. From 1968 the scope of private exploration was broadened to take in general exploration work not directly attributable to lease or licence areas. To this extent the annual figures for 1965, 1966, 1967 and the total expenditure are understated.

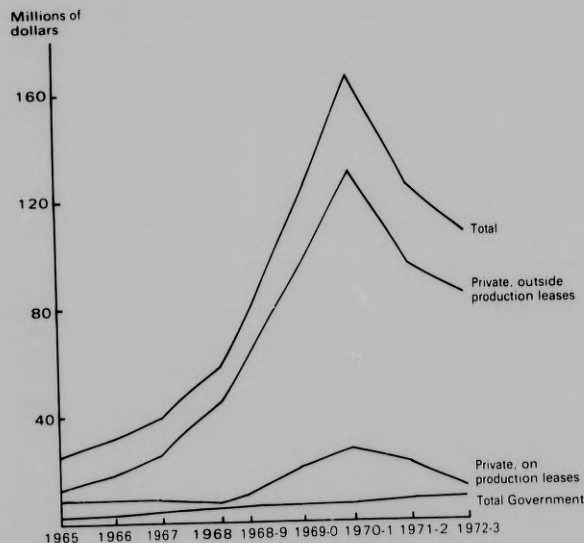


Fig. 1 Trends in exploration expenditure, excluding petroleum.

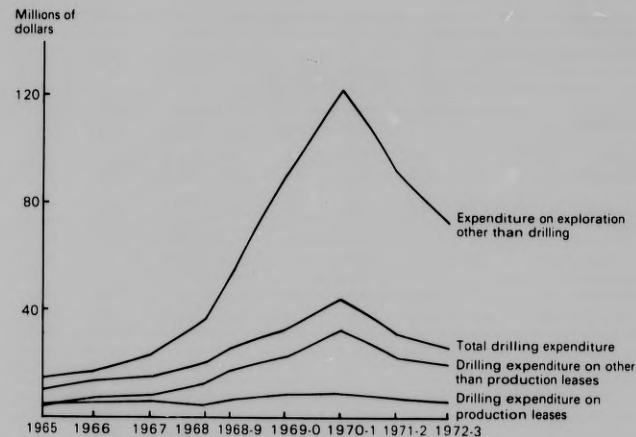


Fig. 2 Trends in exploration expenditure, excluding petroleum—drilling and other.

includes all work carried out by the private sector on areas covered by licences and authorities issued by the State Governments and Territorial Administrations for exploration for minerals, but excludes exploration on production leases currently producing or under development for production of minerals. Private expenditure on exploration outside production leases has been most directly responsible for new mineral discoveries in Australia in recent years. Investigations by Governments have of course been an important contributing factor. These have been directed principally towards providing data basic to the search for minerals, but have also been directly responsible for several discoveries in the past, for example, the Gove bauxite deposit, the Groote Eylandt manganese deposit, and the Woodcutters base metal deposit in the Northern Territory.

Private exploration expenditure outside production leases was an increasingly important component of total expenditure in the period, rising from about 55 percent in 1965 to 79 percent in 1972-73. In absolute terms this category of private expenditure declined substantially from the peak level reached in 1970-71, but it did not fall as rapidly as private exploration expenditure on production leases, indicating a shift in emphasis by explorers to more 'grass-roots' exploration. It is suggested that this switch resulted from two factors. First, declining demand for most metals led to generally falling prices in 1971 and lower company profits, thus reducing the exploration budgets of producing miners in particular, with a consequent effect on the level of exploration on production leases. Second, in the boom years leading up to 1970-71 almost all explorers were involved in land acquisition programs in prospective areas, in some instances to the detriment of active exploration on areas already held. Most areas acquired were subject to minimum work conditions and as land stocks of individual explorers were built up to satisfactory levels, exploration of these areas began, at the expense of work on production leases, to satisfy work requirements and to ensure that areas were adequately explored before relinquishment or reduction.

In Table 2 private exploration expenditure is tabulated by region for the eight-and-a-half years under review. Clearly the most actively prospected regions, New South Wales, Queensland, and Western Australia, were also the States in which activity declined most in 1971-72 and again in 1972-73. Little real change is

**TABLE 2. GEOGRAPHIC DISTRIBUTION OF TOTAL PRIVATE EXPLORATION IN AUSTRALIA (\$'000 000)**

	1965	1966	1967	1968	1968-69(a) (six months only)	1969-70	1970-71	1971-72	1972-73	Total 1965 - 1972-73
<b>New South Wales</b>	4.5	4.9	4.6	5.6	3.6	16.6	21.2	15.1	12.7	88.7
<b>Victoria</b>	1.0	1.2	1.5	1.5	0.8	2.4	1.9	1.3	1.9	13.4
<b>Queensland</b>	4.4	8.3	11.7	13.3	9.0	25.0	32.7	22.1	15.5	142.0
<b>South Australia</b>	1.1	1.4	1.2	2.7	1.5	5.8	6.2	4.1	5.3	29.0
<b>Western Australia</b>	3.9	6.5	10.2	23.1	17.7	59.8	86.1	62.8	51.1	321.4
<b>Tasmania</b>	5.1	2.8	2.2	2.1	1.2	3.3	4.4	3.5	3.4	28.0
<b>Northern Territory</b>	2.4	2.9	3.5	4.2	2.4	5.2	8.6	8.2	9.9	47.4
<b>Total</b>	22.4	28.1	34.8	52.5	36.3	118.1	161.1	117.1	99.7	670.0

(a) Before 1968-69 the annual mineral exploration census was based on the calendar year. For 1968-69 the reporting period was changed to the fiscal year ending 30 June. Thus data for the 6 months to 31 December 1968 are included in both the 1968 and 1968-69 returns. Expenditure for the 6 months to 30 June 1969 has been estimated here by halving total expenditure for the year to 30 June 1969.

Note: Any discrepancies between totals and sums of components in tables are due to rounding.

**TABLE 3. TOTAL PRIVATE EXPLORATION EXPENDITURE IN DOLLARS/km<sup>2</sup>**

	1965	1966	1967	1968	1968-69(a) (six months only)	1969-70	1970-71	1971-72	1972-73	Total 1965 - 1972-73
<b>New South Wales</b>	5.6	6.1	5.7	7.0	4.5	20.7	26.4	18.8	15.8	110.6
<b>Victoria</b>	4.4	5.3	6.6	6.5	3.5	10.6	8.4	5.7	8.4	59.0
<b>Queensland</b>	2.6	4.8	6.8	7.7	5.2	14.5	18.9	12.8	9.0	82.2
<b>South Australia</b>	1.1	1.4	1.2	2.7	1.5	5.9	6.3	4.2	5.4	29.5
<b>Western Australia</b>	1.5	2.6	4.0	9.1	7.0	23.7	34.0	24.9	20.2	127.2
<b>Tasmania</b>	75.0	41.2	32.4	30.9	17.7	48.5	64.7	51.5	50.0	411.8
<b>Northern Territory</b>	1.8	2.2	2.6	3.1	1.8	3.9	6.4	6.1	7.4	25.2
<b>Total</b>	2.9	3.7	4.5	6.8	4.7	15.4	21.0	15.2	13.0	87.2

(a) See Table 2 footnote above.

evident in Victoria and Tasmania, but exploration has tended to increase in South Australia, although here again a downturn is clearly evident in 1971-72. In marked contrast to the major States, exploration in the Northern Territory has increased in every year except 1971-72. This is best explained by the interest and exploration activity sparked off by the 1970 discovery of the very rich Nabarlek uranium deposit. Companies attracted to the Northern Territory included a number of explorers new to Australia and the metal exploration subsidiaries of several major oil companies whose exploration budgets were largely unaffected by the 1971 downturn in world metal prices.

Table 3 shows the level of expenditure as a function of the surface area of each region. It provides an indication of the industry's assessment of the exploration potential of each region. For example, the high level of expenditure/km<sup>2</sup> in Tasmania over the past eight-and-a-half years reflects the high ranking given to Tasmania by explorers and justified by the existing high concentration of economic mineral deposits in a region which represents only 0.9 percent of Australia's total area. Differences in the costs of identical programs in different areas also contributed to the observed variations.

The mineral potential of a given area is a function of its geological environment and the decision to undertake exploration depends on a wide range of factors such as type and grade of mineralization which can reasonably be expected, location, access, availability of title, etc. However, the sheer size of the regions listed in Table 3 should reduce the effect of these variables. The Northern Territory and South Australia appear to have received less attention from explorers than would appear merited from a study of the data in Table 3.

## EMPLOYMENT

Almost all employment trends in Figure 3 closely follow the overall expenditure patterns of which they form a part. However, the trend for professionals engaged in private exploration diverges significantly and contrasts strongly with that for non-professionals, mainly reflecting the change in the direction of exploration after 1971. As companies switched to assessment work on prospective areas they had delineated, their requirement for geoscientists capable of carrying out this type of work increased relative to demand for non-professional support staff who were mainly employed to assist in the early, broad-ranging reconnaissance phases of exploration.

However, this trend probably also represents a reluctance on the part of management to terminate highly qualified professional staff together with the early release of non-professional staff; many companies were forced to use non-professional support staff for professional work in the years immediately preceding 1970-71, because a severe shortage of suitably qualified exploration personnel had by then developed in Australia.

## DRILLING

Drilling trends in Figure 4 closely parallel general expenditure patterns. The rate of increase in non-core drilling footage relative to core drilling up to 1970-71 is largely due to the concentration on reconnaissance-type exploration up to that date.

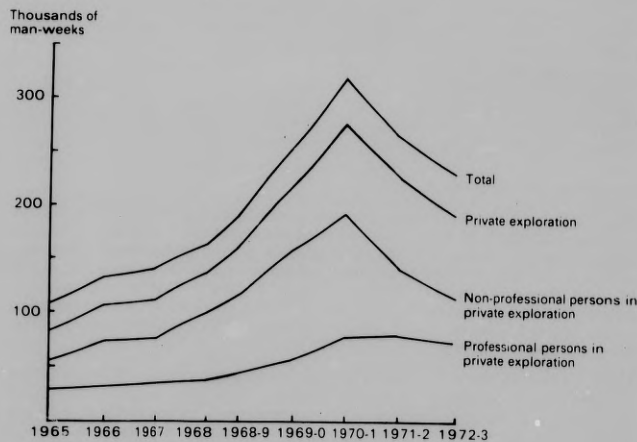


Fig. 3 Employment trends

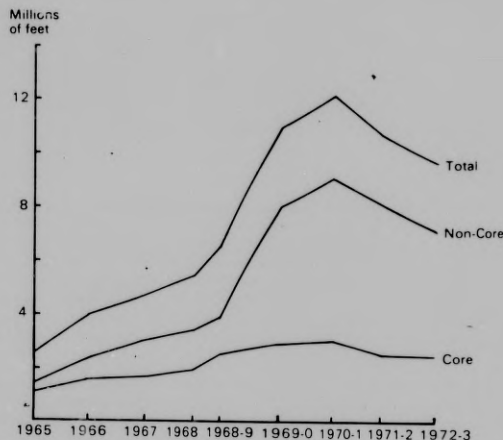


Fig. 4 Trends in drilling activity

The small decrease in core drilling footage in 1971-72 and again in 1972-73 contrasts strongly with the sharp downturn in non-core drilling and again indicates a switch in emphasis by most explorers to more detailed evaluation of prospective areas outlined in the earlier reconnaissance phase.

However, this interpretation is subject to some reservations. The smaller and more speculative explorers, who proliferated before 1970-71, showed a marked tendency to use non-core drilling methods in their initial property evaluations. Non-core drilling had the twin advantages of speed and relative cheapness, both important factors to companies with a limited budget and no cash flow. Costs in Australia in 1972 were about \$2-\$5/foot for non-core and \$10-\$12/foot for core drilling, although costs varied widely depending on location, hole depth, footage drilled, and other variables. Also although no statistics on the number and type of drilling rigs are available, it appears probable that the very large increase in drilling activity resulted in a shortage of core drilling capacity, thus forcing some explorers to use second preference non-core drilling methods.

#### SOURCES OF FUNDS

The major explorers, here defined as enterprises spending more than \$500 000/year on exploration in Australia, were the most important source of exploration funds from 1968-69 to 1972-73. They remained a relatively constant proportion (8%) of the total number of explorers but accounted for more than 61 percent of total expenditure in each of the five years. Figure 5 illustrates this relationship for 1971-72; for example, 13 percent of exploration enterprises were spending 75 percent of the funds. The number of explorers in this category declined from 68 at the height of the boom to 45 in 1972-73.

Up to the Second World War prospectors played an important role in the discovery of new mineral deposits in Australia. However, their importance as ore finders has declined in the past 20 to 30 years and this trend appears likely to continue as orebodies become progressively more difficult to find and search techniques increase in cost and sophistication. King (1973) estimated that only 10 out of a total of 87 discoveries made in Australia, Papua New Guinea, and the British

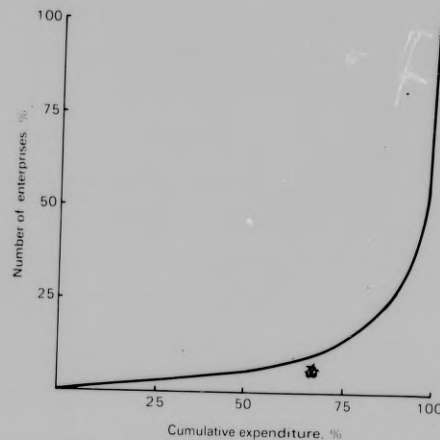


Fig. 5 Private exploration expenditure, 1971-72

Solomon Islands between 1955 and 1972 were attributable to the activities of prospectors, including residents and landowners; all the others were found by companies.

The major explorers are most important principally because they investigate the greatest number of prospects and are thus most likely to discover and/or develop new resources. In addition they are responsible for most of the long-term expenditure, research, and new technology. On the basis of a number of case studies, Morgan (1969) suggested that a minimum desirable annual rate of spending on exploration by a single explorer is \$1-\$1.5 million a year to achieve a better than 50 percent chance of finding a medium to large ore deposit within 6 to 10 years.

Information from company reports and other sources indicates that directly foreign-owned exploration companies were responsible for at least 70 percent of total expenditure by major explorers between 1968-69 and 1972-73. The foreign explorers outnumbered major Australian explorers by 3 to 1 and their average expenditure in 1971-72 was about \$1.7 million a year compared with about \$1.4 million for the major domestic mineral explorers.

The majority of foreign companies directly involved in exploration in Australia operated on a large scale with budgets in excess of \$500 000; hence on the figures above, it appears probable that they contributed around 50 percent, or \$303 million of the total exploration funds expended in Australia in the five years to June 1973.

The level of Australian equity in new reserves discovered between 1965 and 1972-73 is calculated as: 59 percent in copper, 37 percent in lead, 33 percent in zinc, 52 percent in nickel, 75 percent in uranium, 58 percent in coal, 40 percent in iron ore, and 27 percent in bauxite. Overall Australian equity in new reserves adjusted on a weighted ex-mine value basis is 47 percent which is comparable with the estimated proportion of total exploration expenditure by Australian companies during the same period. Thus a good correlation is apparent between the total amounts expended on exploration and the equity ownership in new reserves discovered. In fact this result is somewhat surprising when it is recognized that at least 20 percent of the total Australian company expenditure was

attributable to a very large number of small companies who were unable to enjoy the economies of scale or technical and research facilities available to most of the overseas explorers operating in Australia. Inclusion of other minerals such as the large phosphate rock discovery of B.H. South Ltd in Northern Queensland would raise the Australian equity share in new reserves to well over 50 percent.

### THE COST OF DISCOVERY

In 1973 the Australian Mining Industry Council estimated that \$600 million had been expended on exploration and assessment work in Australia in a ten-year period between 1962 and 1972. Of the 67 significant discoveries made, 29 were either being mined or were under development; development of the remaining 38 deposits awaited changed conditions for viability. Because of the interest foregone on money spent on these 38 discoveries their actual discovery cost should be increased by adding the appropriate interest charge up to the date of their actual development. Assuming an average ten-year delay before development of the remaining deposits the average discovery cost of a viable orebody is increased to about \$20 million. These figures are in close accord with unpublished estimates prepared in the Mineral Resources Branch of the Bureau of Mineral Resources, which indicated that in the period from 1965 to June 1971 \$488 million was spent on mineral exploration and 50 significant discoveries were made; however, only about half of these discoveries were immediately viable.

Ore discovery costs in Canada were the subject of an important paper by Cranstone & Martin (1973) and their general findings are considered applicable to Australia with one important proviso. Canada has been the subject of more intensive and extensive exploration than Australia except in very recent years. In general, discovery costs increase with time and the amount of total exploration effort as the more obvious deposits are found. Thus Australian discovery costs could reasonably be expected to lag behind Canada, assuming similar geological environments and comparable exploration efficiency.

Cranstone & Martin show that the cost of a discovery in Canada (regardless of size) in constant 1971 Canadian dollars increased from about Can\$2 million in 1946-55 to Can\$6 million on 1956-65, to Can\$14-15 million in 1966-70, and to Can\$27 million in 1971. However, in Canada the general size of new discoveries increased significantly between 1946 and 1971, which largely compensated for the increase in the cost of an individual discovery. Thus, while the cost of a single discovery increased by a factor of about 13 between 1946 and 1971, the real cost of discovery per tonne of metal only doubled. It is estimated that discovery costs per tonne of metal have increased in Australia by a similar factor.

A measure of the beneficial results of the recorded exploration expenditure over the eight-and-a-half year period between 1965 and 30 June 1973, has been attempted by calculating the proved reserves discovered for a group of eight important minerals: copper, lead, zinc, nickel, uranium, black coal, iron ore and bauxite (Tables 4 and 5). This particular group of minerals was chosen because of the amount of published information available and because of their relative importance. In 1972 they represented about 57 percent of the total ex-mine value of Australian mineral production and accounted for 83 percent of the total value of Australian exports of primary mineral products.

Only deposits discovered between 1965 and 1973 have been included here, and the reserve figures used were in most cases the published proved reserves as at June 1973. Additional reserves located at deposits already known to exist by 1965 have been excluded as they are considered to result mainly from normal development activities rather than exploration. Obviously the discovery dates of some reserves are subject to argument so wherever possible the date of the first significant intersection of ore, which led to the recognition of an orebody within a relatively short time span, was chosen. The reserve figures are understated, as

TABLE 4. MINE PRODUCTION AND NET RESERVES OF SELECTED MINERALS DISCOVERED, 1965-73 ('000 tonnes)

Commodity	Mine production	New reserves discovered (a)	Net reserves discovered (b)	Annual production rate (1973)	Net reserves discovered: current production (c) (years)
Copper	1 273	702	- 571	214.3	- 2.7
Lead	3 598	3 862	+ 264	404.1	+ 0.7
Zinc	3 977	6 298	+ 2 321	460.9	+ 5.0
Nickel	169	1 825	+ 1 656	41.3	+ 40.0
Uranium	—	198	+ 198	—	—
Coal	406 590	8 000 000	+ 7 593 410	60 700	+ 125
Iron ore	368 406	11 000 000	+ 10 631 594	84 000	+ 127
Bauxite	65 559	1 679 000	+ 1 613 441	19 000	+ 85

(a) New reserves are here defined as all those contained in new discoveries since 1 January 1965 plus reserves subsequently proved at deposits located prior to 1 January 1965 but which contained no proved reserves at that date. Reserves arising from extensions to pre-existing orebodies are specifically excluded.

(b) Net reserves discovered are here defined as new reserves discovered minus mine production in the period covered.

(c) The ratio of net reserves discovered to production is a measure of the life of the net reserves at the current annual production rate. A negative sign implies a decrease in reserve life.

published ore reserves are normally conservative and additional ore reserves have been found by later exploration work in most instances.

Several reservations apply to the discoveries included in this report. Firstly a new discovery is normally the result of cumulative exploration effort and expenditure over a long period of time. Thus some deposits included as discoveries may have resulted primarily from expenditure incurred in earlier years. However, total exploration expenditure in Australia in the five years to January 1965 was certainly less than \$60 million. Given that discovery is a function of expenditure, the number of new discoveries announced after 1965 which were the result of pre-1965 expenditure would appear to be minimal. The great increase in funds outlay on exploration in later years suggests that we can expect a number of new discoveries in the immediate future which will be largely attributable to expenditure in the January 1965 to June 1973 period.\*

The new-reserves figures published here can therefore be considered as conservative because published reserves are typically conservative, and future discoveries will be made as a direct result of past expenditure.

Net reserves discovered are here defined as new-reserves-discovered minus mine production, and in Table 4 they are compared with the rates of mine production in 1973.

Obviously exploration for coal and iron ore has been tremendously successful. The results for nickel, uranium, and bauxite are also impressive and suggest that for those four commodities currently produced Australia is sufficiently well endowed to permit substantial increases in the current production rates.

However, the results for lead, zinc, and particularly copper are in sharp contrast. Between 1965 and June 1973 more copper was mined in Australia than was discovered in new reserves, while net reserves of zinc and lead show only a slight increase. Although no detailed breakdown is available for expenditure on the search for these particular minerals, company reports and mineral lease and exploration authority applications show that all three were high on the priority list of most explorers. The results can only be regarded as disappointing and they suggest that Australia might not be as well endowed with copper, lead, and zinc

\* Several important new discoveries have been announced since this paper was prepared.

TABLE 5. NEW RESERVES AND THEIR VALUE, 1965-1973

Commodity	New reserves '000 tonnes	Ex-mine value \$/tonne (1972)	Ex-mine value of new reserves \$'000 000
Copper	702	683.37	480
Lead (a)	3 862	191.33	739
Zinc	6 298	134.28	846
Nickel	1 825	1 500.00 (b)	2 738
Uranium	198	13 000.00 (b)	2 574
Coal	8 000 000	6.42	51 360
Iron ore	11 000 000	5.88	64 680
Bauxite	1 679 000	5.00 (b)	8 395
Total			131 812

(a) Ex-mine value of lead used here for valuation purposes includes silver content.

(b) Estimate.

as commonly thought; statistics on the number of operating mines support this conclusion. For instance in 1973 there were at least 73 Canadian mines producing copper compared with about 21 significant producers in Australia.

Although exploration from 1965 to 1973 failed to add significantly to Australia's reserves of copper and lead-zinc, reserves of these metals in deposits discovered before 1965 are sufficient for about 20 and 30 years respectively at projected production rates.

In Table 5 the ex-mine value (1972) of new reserves discovered in Australia between 1965 and June 1973 is tabulated as an indication of gross value. Although it is realized that ore in the ground has no real value until its economic recovery and sale is assured, reserves are valued in this exercise to provide some measurements of the potential benefits of exploration. The ex-mine value is defined as the value of the mineral at the mine or at the associated treatment works in the locality of the mine. Internal BMR studies and work elsewhere have shown that in the long term the selling prices of most major metals have remained fairly stable or increased in constant dollar terms with time. Table 5 therefore provides a measure of the potential gross value to Australia of exploration carried out in the eight and a half year to June 1973. Expressed in dollar terms, expenditure on exploration for minerals other than petroleum in Australia of slightly over \$722 million (Table 1) has resulted in the discovery of new proved reserves of lead, zinc, nickel, uranium, bauxite, iron, and black coal, which, if valued on a 1972 ex-mine basis, would be worth \$131 812 million; or, alternatively, an average of \$182 worth of these ores has been found for each \$1 spent on the search for minerals other than petroleum. The ultimate value of ore discovered is dependent on the location and characteristics of the individual deposits and the economic conditions which prevail at the time of their exploitation. The majority of these reserves can be attributed to private expenditure outside production leases, which totalled \$546.6 million.

These figures do not represent the real gross return for exploration carried out. First, only eight minerals have been considered. Important new reserves of phosphate, mineral sands, gemstones, and numerous other minerals have also been discovered. Second, mineral deposits have been discovered which, although presently uneconomic, constitute important future resources. Examples include the huge Mount Keith nickel deposit in Western Australia and numerous low-grade porphyry copper deposits in Queensland. Third, even exploration programs which fail to locate new deposits yield valuable information which can contribute to later discoveries.

Logically the benefits accruing to Australia should be compared with the returns available in alternative avenues of investment. However, this presupposes that exploration funds would be available for re-direction and it is pertinent to note

here that the search for minerals is international in character. The explorer's decision to invest high-risk capital in any particular region is based on the potential rewards which can reasonably be expected from development of a mineral discovery.

It seems probable that any attempt to re-direct exploration funds would have resulted in the diversion of some of the high-risk capital from exploration in Australia to other countries and, given that discovery is a function of expenditure, this would have reduced the economic benefits which have accrued to Australia in the form of new mineral reserves. The bulk of the funds expended were available only for mineral exploration.

Discoveries in the period discussed have added greatly to Australia's mineral reserves and Noakes (1974) has shown that with the important exception of petroleum, Australia is fairly well endowed with minerals and has a reasonable lead time in which to discover new reserves to replace those which are mined.

However, most of the more prospective areas of the continent have now been explored on at least a 'first pass' basis and probably nearly all the outcropping and easily recognized deposits have been found. The next phase of exploration must concentrate on locating deposits for which surface evidence is either subtle or entirely lacking. The discovery of new orebodies will require the use of increasingly sophisticated search techniques and will involve greater risks and expenditure than were incurred in the past.

The discovery rate of significant new deposits decreased markedly between 1970 and 1973. This is well illustrated in King (1973) who presented a detailed list of 'exploratory discoveries' of which 2 were made in 1964, 6 in 1966, 12 in 1968, 15 in 1970, and only 2 in 1972. Although the criteria used by King to define a discovery differ from those detailed elsewhere in this paper the downturn in discovery rate is clearly evident whichever criteria are used.

It is not possible to predict accurately the level of exploration expenditure required in the future to replenish known reserves now being mined. However, the sharp decrease in the rate of discovery since 1970 should be viewed with concern if it persists at what is still, currently, an historically high annual rate of expenditure. The downturn in discovery rate may well signify the end of an extremely successful period of exploration in Australia and herald the advent of a new and more costly phase characterized by concept-orientated programs with an emphasis on the search for partially obscured or blind orebodies and totally new deposits in new environments.

#### ACKNOWLEDGMENT

The writer acknowledges with gratitude the assistance provided by colleagues in the Mineral Economics Section in preparation of this paper, and in particular the advice and encouragement of L. C. Noakes, Director of the Bureau of Mineral Resources.

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## Metal and Mineral Prices

Compiled by W. H. COULSON

### MONTHLY AVERAGE BASE METAL PRICES

	Copper	Tin	Zinc	Lead
Australia (\$/tonne)—				
July	1322.72	7253.45	651.00	375.00
August	1284.00	6927.00	651.00	400.00
September	1217.27	6759.36	651.00	400.00
UK (LME £/tonne)—				
July	922.13	4755.63	433.65	282.77
August	862.23	4534.59	414.61	269.94
September	844.92	4598.86	411.86	277.65
USA (US cents/lb)—				
July	73.91	389.48	37.00	24.28
August	74.00	372.13	38.57	24.75
September	74.00	361.68	39.50	24.77

### MAXIMUM AND MINIMUM BASE METAL PRICES 1 JULY 1976 TO 30 SEPTEMBER 1976

	Copper	Tin	Zinc	Lead
Australia (\$/tonne)—				
Maximum	1340.00	7534.00	651.00	400.00
Minimum	1180.00	6659.00	651.00	375.00
UK (LME £/tonne)—				
Maximum	936.25	4905.00	440.50	293.50
Minimum	824.25	4407.00	402.50	248.50
USA (US cents/lb)—				
Maximum	74.00	405.00	40.00	26.00
Minimum	70.00	326.00	37.00	23.00

### METAL PRICES AS AT THE END OF SEPTEMBER 1976\*

(Prices shown are for the last trading day of the month)

Metal	Australia	Europe	United States
Aluminium	(1) \$/tonne 787 (1/5/76)	(2) £/tonne 579 (10/9/76)	(3) c/lb 45-46.50
Antimony	(4) \$/tonne 3700 (14/7/76)	(5) £/tonne 2175 (19/7/76)	(33) c/lb 165-170
Bismuth	(6) \$/kg 16.00 (19/7/76)	(40) \$/lb 6.08-6.15 (30/9/76)	(34) \$/lb del'd 7.50
Cadmium	(7) \$/kg 5.29 (8/9/76)	(8) £/kg 3.84-3.92 (1/10/76)	(9) \$/lb 2.75-2.85
Cobalt	(10) \$/kg 6.38 (3/2/75)	(11) \$/lb 4.90 (13/9/76)	(35) \$/lb 4.90
Copper	(11) \$/tonne 1180	(12) £/tonne 837-837.50 (LME)	(13) c/lb 74.00
Gold	(14) \$/troy oz 94.05, \$/g 3.02	(15) \$US/troy oz 116.10	(15) \$/troy oz 116.55
Lead	(16) \$/tonne 400 (31/7/76)	(17) £/tonne 277.25-277.75 (LME)	(17) c/lb 24.5-26.0
Mercury	nominal	(18) \$US/flask 93.97	(36) \$/flask 129-133
Nickel	(39) \$/lb 1.94 \$/kg 4.27	(19) \$US/lb 2.09-2.20 (23/9/76)	(20) \$/lb 2.41
Pig iron	(21) \$/tonne 105.0 (8/3/76)	(22) £/tonne 96.00 (4/7/76)	(23) 180.00
Platinum	nominal	(24) £/troy oz 106.00	(37) \$/troy oz 170-190
Silver	(25) \$/kg 113.33 (1/10/76)	London spot	np/troy oz 259.50
Tin	(26) \$/tonne 6811	(27) £/tonne 4745-4750 (LME)	(28) c/lb 357-367
Zinc	(29) \$/tonne 651 (16/6/76)	(30) £/tonne 410.50-410.75	(31) c/lb 39-40
		(32) \$US/tonne 795 (16/10/75)	

Penang tin price \$M pikul 1178.50 ex-smelter.

\* Where prices are not set daily the date of latest change is shown in brackets.

- |   |  |
|---|--|
| (1) domestic ingots 99.5% cif capital cities, lots of 10 000 kg or more | (20) major producer cathode, fob Port Colbourne                            |
| (2) del'd UK ports  | (21) foundry pig iron, cif State capital city ports                        |
| (3) <i>Metals Week</i> US Market, estimated US market price             | (22) foundry pig iron (phosphorous 0.3-1.0%, ex-basing points UK)          |
| (4) 1-tonne lots, del'd capital cities                                  | (23) fob, \$/net ton of 2000 pounds, Midwest No. 2 Foundry                 |
| (5) UK, 99.6%, 5 tonnes, del'd  | (24) UK & Empire refined, del'd  |
| (6) min. lots 12.5-50 kg  | (25) min. lots 320 kg, fob, fob Port Pirie                                 |
| (7) min. 1-tonne lot, del'd Melbourne                                   | (26) spot, min. 2 tonne, ex-smelter  |
| (8) European reference price, cif ex-works 99.5% sticks, 1-tonne lots   | (27) LME, standard, cash midday  |
| (9) 99.95%, min. 1-ton lots, del'd                                      | (28) US producer, New York   |
| (10) oxide, del'd Melbourne   | (29) gob. delivered buyers works, capital cities                           |
| (11) Mount Isa Mines Limited copper price                               | (30) LME cash midday   |
| (12) LME cash midday  | (31) Prime Western, del'd  |
| (13) del'd wirebars   | (32) gob. producer basis   |
| (14) Australian Gold Producers' Association price: min. 400 oz. bars    | (33) NY dealer, 99.5-99.6% metal, cif port                                 |
| (15) Handy & Harman sellers' price, 400-oz bars, 99.95%                 | (34) major producer, 99.99% 1-ton lots                                     |
| (16) fob, for, fob, Port Pirie  | (35) shot/cathode/250 kg   |
| (17) LME cash midday  | (36) <i>Metals Week</i> New York, 20-plus flasks                           |
| (18) min. 99.99%, cif main European ports                               | (37) major producer, fob refinery  |
| (19) free market, cif Europe, refined                                   | (38) Handy and Harman bullion quotations 999 min.                          |
|   | (39) Australian currency equivalent of US price, last trading day of month |
|   | (40) European free market, ton lots cif                                    |

**ORE AND CONCENTRATE PRICES AS AT END OF SEPTEMBER 1976\***

(Prices shown are for the last trading day of the month)

Ore or Concentrate	Australia nominal	Europe nominal	United States nominal
Antimony	(1) \$/mtu 22.50-25.00	(2) \$/mtu 25.90-27.55 (9/9/76)	(4) \$/mtu 40-42
Beryl	(3) \$/stu 28-31	(5) nominal	(6) nominal
Bismuth	(4) nominal	(6) \$/S/tonne 150-170	(8) c/lb 2.40-2.70
Chromite	(5) nominal	(7) \$/S 2.90-3.25	(10) c/lb 147-153
Columbium	(6) nominal	(8) \$/S 1.45-1.50	(12) \$/lb 3.20
Manganese	(7) nominal	(9) \$/S lb 3.20	(13) nominal
Molybdenum	(8) nominal	(10) SA tonne 170-185	(15) \$/lb 16.00-17.25 (18/6/76)
Monazite	(9) nominal	(11) \$/mtu 57.10	(17) nominal, 70-75% Sn (deduction of 1 unit) 205-250, 30-64% Sn (including deduction) 220-260, 20-30% Sn (including deduction)
Tantalum	(10) nominal	(12) \$/mtu 100.55-103.38	(19) 111.94 \$/stu WO <sub>3</sub> (3/9/76)
Tin (cassiterite)	(11) nominal	(13) nominal	(20) 113.14 \$/stu WO <sub>3</sub>
Tungsten concs—wolfram	(12) nominal	(14) \$/mtu 74.25-77.75	(21) \$/long ton 55 (28/6/74)
scheelite	(13) nominal	(15) nominal	(26) \$/short ton 510
Titanium concs—ilmenite	(14) nominal	(16) SA tonne 15-18	(27) \$/lb 40-41 (1/9/76)
rutile	(15) nominal	(17) SA tonne 290-330	(29) \$/short ton 560
Uranium—oxide	(16) nominal	(18) \$/S lb 20-30	
hexafluoride	(17) nominal	(19) \$/S lb 22-32	
Zircon	(18) nominal	(20) SA tonne 140-160	
	(19) nominal	(21) SA tonne 160-190	

\* Where prices are not set daily the date of latest change is shown in brackets.

- (1) Lump sulphide ore, 60% Sb cif
  - (2) NY dealer ore, lump 60% Sb
  - (3) Cobbed lump, min. 10% BeO, cif
  - (4) 10-12% Be, imported cif Philadelphia
  - (5) Conc. oxide min. 60% Bi, cif
  - (6) Russian lumpy min. 48% Cr<sub>2</sub>O<sub>3</sub>; 3.5:1 cif
  - (7) Columbite min. 65% Cb<sub>2</sub>O<sub>5</sub> + Ta<sub>2</sub>O<sub>5</sub>, 10:1, cif \$/lb pentoxide content
  - (8) 10:1 ratio Cb<sub>2</sub>O<sub>5</sub>:Ta<sub>2</sub>O<sub>5</sub>. Dealer and producer quotation price on basis of combined pentoxide content, cif US ports
  - (9) Metallurgical mtu, min. 48-50% Mn, max 0.1% P, cif
  - (10) Producer selling agents and dealer quotation cif US ports, min. 48% Mn
  - (11) Mo in MoS<sub>2</sub> conc, fob Climax, min. 85%
  - (12) 95% MoS<sub>2</sub>, considered nominal, cost of container extra
  - (13) Conc. min 60% REO + Thoria fob, fid Australia
  - (14) Ore min 60% Ta<sub>2</sub>O<sub>5</sub>, cif
  - (15) dealer quotation—about 60% combined Cb<sub>2</sub>O<sub>5</sub> and Ta<sub>2</sub>O<sub>5</sub>, depending on grade and size of lot
  - (16) conc, 70%, delivered Sydney
  - (17) Returning charge tonne
  - (18) Based on LME price, min 65%
  - (19) GSA domestic wolfram and scheelite concs, excluding 54 stu WO<sub>3</sub> pre-paid duty
  - (20) GSA export wolfram and scheelite concs
  - (21) fob Bunbury
  - (22) Ilmenite bulk conc., min. 54% TiO<sub>2</sub>, fob Australia
  - (23) 54% TiO<sub>2</sub>, imported fob Atlantic ports, ship-load quantities
  - (24) Bagged fob
  - (25) Rutile conc., 96-97% TiO<sub>2</sub>, bagged fob fid Australia
  - (26) 96% TiO<sub>2</sub>, fob cars, Atlantic & Great Lakes ports
  - (27) Bagged, min. 65% ZrO<sub>2</sub>, max. 0.3% TiO<sub>2</sub>
  - (28) Sand, 66-67% ZrO<sub>2</sub>, std, fob, fid
  - (29) Ore Australia, 65% ZrO<sub>2</sub>, bulk cif Atlantic ports
  - (30) bagged, min. 66% ZrO<sub>2</sub>, max. 0.1% TiO<sub>2</sub>, fob, fid, Australia
  - (31) Premium, max. 0.1% TiO<sub>2</sub>, fob, fid
  - (32) conc, contract basis, fob mine
  - (33) Metals Week US spot oxide
- Some ore and concentrate prices are nominal, the prices being subject to negotiation between the producer and purchaser. The ore and concentrate prices quoted will also vary according to grade and possible impurities and in many cases with the size of the ore parcel.
- All European prices, and US prices for copper, tin and zinc, are obtained from the London *Metal Bulletin*; the remaining US prices are obtained from *Metals Week* and *American Metal Market*. Australian prices are obtained from various sources.

**Copper Ore—**

Australia: The price paid for ores is related to the market price of copper, less charges listed below. The basis of price determination is variable: details are obtainable from individual smelters.

Company	Metal deduction or copper content	Receiving, sampling, assaying, smelting, charge/tonne	Converting, refining, realizing charge/unit of copper paid for	Gold refining charge/gram of gold paid for	Silver refining charge/gram of silver paid for
ERS (a)	1.3 units of copper/tonne of ore (b)	\$ 25.00 (material natural state)	\$ 2.00	cents 5.0 (c)	cents 1.50 (c)
Mount Isa (d)	1.3 units of copper/dry tonne of ore	\$ 11.30 (dry ore)	\$ 1.70	cents 5.0 (e)	cents 1.45 (f)

- (a) The Electrolytic Refining and Smelting Company of Australia Pty Ltd, Port Kembla, New South Wales.
- (b) Payment at 96 percent of the ERS refined copper price after metal deduction.
- (c) ERS gold deduction: 0.002 kg gold/dry tonne material and 2.5 percent of the balance of gold metal contained in material; ERS silver deduction: 0.03 kg silver/tonne material and 8 percent of the balance of silver metal contained in material.
- (d) Mount Isa Mines Ltd, Mount Isa, Queensland.
- (e) Mount Isa gold deduction: from the gold content of each parcel of ore delivered 2 g gold/tonne of ore will be deducted. Payment for 97.5 percent of the excess is based on the Australian Gold Producers' monthly average price.
- (f) Mount Isa silver deduction: from the silver content of each parcel of ore delivered, 60 g silver/tonne of ore will be deducted. Payment for excess is based on average London Bullion Brokers cash price for silver.

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**Part 2—  
Quarterly  
Statistics**

## **Australian Mineral Industry**

**VOLUME 29 No. 2 QUARTER ENDED 30 JUNE 1976**

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*Prepared under instructions from the Rt Honourable the Treasurer  
by D. V. Youngman, Acting Australian Statistician*

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AUSTRALIAN BUREAU OF STATISTICS  
CANBERRA, AUSTRALIA

## Preface

Statistics included in this Part relate to Australian production of and overseas trade in minerals and mineral products. In the main, the data relating to mineral production consist of official statistics of Mines Departments of the several States and the Department of the Northern Territory Mines Branch. These statistics have been supplemented as necessary by data obtained from the Petroleum Branch of the Department of National Resources and the Bureau of Mineral Resources, including information collected by that Bureau from mines and treatment plants.

The presentation of data in this Part is arranged to assemble under the one heading all statistics in respect of each particular mineral. Summary tables showing production of selected major minerals and metals are shown on page 23, and include details where available for the September quarter 1976.

The fundamental concept of Australian mineral production statistics is that quantities and values of individual minerals are reported in terms of the products in the form in which they are despatched from the locality of each mine. This involves the inclusion in the mining industry of ore-dressing and certain elementary smelting of metallic minerals (e.g. in the case of gold) and miscellaneous treatment of non-metallic minerals where these operations are carried out in an associated plant at or near the mine. For example, in the case of a metal mine, the output is recorded as ore when no treatment is undertaken at the mine or as a concentrate where ore-dressing operations are carried out in an associated plant in the locality of the mine.

The particulars of quantities of minerals produced have been compiled on this basis as far as practicable. This has involved some re-arrangement of official statistics published by Mines Departments for certain States. Actual output of the mineral product (as defined in the preceding paragraph) has generally been reported, but in some cases it has been necessary to include despatches from the mine (or reported sales) as distinct from production in deriving the total for Australia. In addition to the basic quantity data, particulars of contents of metallic minerals are shown and in general represent total contents (as determined by assay) for each metal which is a 'pay metal' or 'refiners' prize' when present in the particular mineral.

The data exclude construction materials (sand, gravel, building stone, etc.) and some particulars for non-metallic minerals which are not at present available.

Quarterly value of output statistics are not available because of delays in realization of values of several important minerals. Statistics of the value of output of individual minerals are published in the annual statistical bulletin, 'Mineral Production'—Reference 10.51. In that bulletin figures relate to fiscal years.

All tables in this publication omit particulars relating to uranium-bearing minerals.

I extend my thanks to State Departments of Mines, Statisticians of the several States, and the Department of National Resources who have supplied information used in the preparation of this Bulletin.

D. V. YOUNGMAN  
Acting Australian Statistician

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**Summary Tables: Production of Principal Minerals and Smelter and Refinery Production of Principal Metals**

23

Details of metric units and conversion factors used are shown below.

<i>Imperial Unit</i>	<i>Metric Unit</i>	<i>Conversion factors</i>	
		<i>Imperial to Metric: multiply by</i>	<i>Metric to Imperial: multiply by</i>
<b>Mass</b>			
troy (fine) ounce	kilogram	0.0311035	32.1507
pound	kilogram	0.453592	2.20462
short ton	tonne	0.907185	1.10231
long ton	tonne	1.01605	0.984207
long ton unit	metric ton unit	1.01605	0.984207
<b>Volume</b>			
cubic foot	cubic metre	0.0283168	35.3147
barrel	cubic metre	0.158987	6.28981

The following terms and symbols, where shown in tables, mean:

—: nil	—: less than half the unit shown
tonne: metric ton (2 204.6 lb)	n.a.: not available
unit: metric ton unit (22.046 lb)	n.a.p.: not available for publication
*: subject to revision	n.e.l.: not elsewhere included
	n.y.a.: not yet available

Statistics of smelter and refinery production exclude secondary metal (i.e. metal recovered from scrap) unless otherwise specified.  
All import and export values are expressed in Australian currency and are generally f.o.b. port of shipment. A more detailed description of the method of valuation is quoted in the *Overseas Trade Bulletin* Reference No. B.11.  
Any discrepancies between totals and sums of components in the tables are due to rounding.

# ALUMINIUM

Other publications of the Australian Bureau of Statistics relating to the Australian mineral industry

Reference Title, Frequency and Price

- 10.19 Minerals and Mineral Products, **Monthly, Free**
- 10.41 Mineral Exploration, **Annually, Free**
- 10.42 Foreign Ownership and Control of the Mining Industry, 1972-73, **Free**
- 10.51 Mineral Production, **Annually, Free**
- 10.60 Mining Establishments (Details of Operations), **Annually, Free**
- 10.72 Mining Establishments (Summary of Operations, Australia) (Preliminary), **Annually, Free**
- 10.75 Mineral Exploration (other than for petroleum): Expenditure by Principal Enterprises, **Quarterly, Free**
- 10.76 Petroleum Exploration, **Quarterly, Free**

Enquiries regarding these publications should be made to:  
Australian Bureau of Statistics  
P.O. Box 10  
Belconnen, A.C.T. 2616

Note. Enquiries concerning the mineral statistics contained in this Part may be made by telephoning Mr I. Haine, Canberra 49 9556.

	1974	1975*		1976*		
		September	December	March	June	
<b>PRODUCTION</b>						
<b>Mine production</b>						
<b>Minerals produced</b>						
Bauxite .....	19 994 300	20 957 927	5 387 321	4 596 940	5 606 065	5 984 084
Alumina (Al <sub>2</sub> O <sub>3</sub> ) content ..	10 474 474	11 006 358	2 793 048	2 406 132	2 927 378	3 080 805
<b>Production: States (Al<sub>2</sub>O<sub>3</sub> content)</b>						
New South Wales .....	3 449	4 015	1 049	988	1 009	717
Victoria .....	2 819	—	—	—	1 211	—
Queensland .....	5 468 065	5 671 382	1 343 588	1 018 275	1 533 917	1 439 975
Western Australia .....	3 185 185	3 327 762	911 388	911 313	975 719	1 135 934
Northern Territory .....	1 814 956	2 003 199	537 023	475 556	415 522	504 179
<b>Total contained alumina</b> .....	<b>10 474 474</b>	<b>11 006 358</b>	<b>2 793 048</b>	<b>2 406 132</b>	<b>2 927 378</b>	<b>3 080 805</b>
<b>Smelter and refinery production</b>						
Alumina .....	4 899 489	5 127 162	1 301 816	1 400 562	1 350 292	1 566 731
Refined aluminium .....	219 089	214 191	53 672	53 282	55 362	57 711
<b>IMPORTS</b>						
Bauxite .....	96	16 694	3 303	7 002	4 557	608
Value .....	\$'000	7	1 613	205	873	455
Alumina .....	2 748	2 555	705	366	504	710
Value .....	\$'000	649	757	167	130	193
<b>Aluminium and aluminium base alloys</b>						
Unworked shapes .....	tonne	9 473	369	66	122	14
Canada .....	"	5 949	—	—	—	—
U.K. .....	"	181	316	64	122	13
U.S.A. .....	"	782	3	2	—	—
Other .....	"	2 559	50	—	—	12
Value .....	\$'000	6 684	449	102	84	16
Plates, sheets, strips and circles .....	tonne	6 877	1 732	271	248	306
Value .....	\$'000	6 516	2 627	519	414	485
Pipes and tubes .....	tonne	53	25	6	6	7
Value .....	\$'000	96	69	17	19	16
Bars, rods and angles .....	tonne	1 616	726	165	57	112
Value .....	\$'000	1 811	1 171	221	121	149
Foil .....	tonne	1 235	1 654	289	411	598
Value .....	\$'000	1 959	3 543	646	743	1 090
Powder .....	tonne	164	296	32	85	48
Value .....	\$'000	199	350	38	113	52
Wire, single strand, uncovered .....	tonne	125	83	23	27	22
Value .....	\$'000	229	174	58	45	42
Scrap (including re-melt) .....	tonne	2 589	1 154	508	465	198
Value .....	\$'000	1 216	613	243	280	119
<b>EXPORTS (a)</b>						
Alumina (b) .....	'000 tonne	4 705	4 514	1 262	1 206	1 362
Value .....	\$'000	250 985	343 804	96 171	94 298	120 351
<b>Aluminium and aluminium base alloys</b>						
Unworked shapes (c) .....	tonne	52 731	76 661	16 944	24 878	11 538
Hong Kong .....	"	n.a.p.	1 659	39	663	170
Japan .....	"	n.a.p.	64 258	14 988	16 783	9 390
Philippines .....	"	n.a.p.	1 608	505	640	1 165
Thailand .....	"	n.a.p.	755	—	754	—
Other .....	"	n.a.p.	8 381	1 412	8 018	813
Value .....	\$'000	27 774	46 213	10 270	15 218	7 754
Plates, sheets, strips and circles .....	tonne	1 538	338	136	33	14
Value .....	\$'000	1 529	437	152	68	34
Pipes and tubes .....	tonne	343	82	17	15	11
Value .....	\$'000	548	153	40	38	24
Bars, rods and angles .....	tonne	1 311	1 008	32	40	27
Value .....	\$'000	1 201	1 077	77	98	66
Foil .....	tonne	3 324	1 153	172	261	134
Value .....	\$'000	2 811	1 322	203	287	185
Powder .....	tonne	12	10	—	—	1
Value .....	\$'000	12	11	—	—	1
Wire, single strand, uncovered .....	tonne	6	27	3	1	8
Value .....	\$'000	15	57	9	3	20
Scrap (including re-melt) .....	tonne	1 171	2 720	623	885	1 061
Value .....	\$'000	389	733	191	259	297

(a) Details of exports of bauxite are not available for publication. (b) Country details not available for publication. (c) Country details not available for publication prior to 1975.

# ANTIMONY

		1975*		1976*			
		1974	1975*	September	December	March	June
<b>PRODUCTION</b>							
<b>Mine production</b>							
Minerals produced							
Antimony ore	tonne	408	3 627	800	532	—	—
Antimony content	"	43	381	84	56	—	—
Antimony concentrate	"	1 211	1 385	473	318	433	354
Antimony content	"	778	895	308	207	288	228
Antimony content of minerals produced							
Antimony ore	tonne	43	381	84	56	—	—
Antimony concentrate	"	776	895	308	207	288	228
Lead concentrate	"	576	639	181	156	123	159
Lead-zinc middlings	"	11	8	2	2	2	3
New South Wales	"	1 363	1 542	491	365	413	390
Victoria	"	43	381	84	56	—	—
Queensland	"	—	—	—	—	—	—
Total contained antimony	"	1 408	1 923	575	421	413	390
<b>IMPORTS</b>							
Antimony metal	tonne	10	11	—	—	—	—
Value	\$'000	27	37	—	—	—	—
<b>EXPORTS</b>							
Antimony ores and cons	tonne	838	1 428	113	497	367	339
Value	\$'000	1 017	2 118	139	887	567	451

# ASBESTOS

		1975*		1976*			
		1974	1975*	September	December	March	June
<b>PRODUCTION</b>							
<b>Mine production</b>							
Chrysotile	tonne	30 863	47 911	14 995	14 929	11 957	15 361
New South Wales	"	30 863	47 911	14 995	14 929	11 957	15 361
<b>IMPORTS</b>							
Chrysotile	tonne	34 891	29 008	6 484	7 784	10 119	11 086
Canada	"	33 845	28 107	6 172	7 327	9 639	11 037
Others	"	1 748	2 901	311	457	480	49
Value	\$'000	5 716	8 414	2 035	2 593	3 442	3 205
Amosite	tonne	7 608	12 961	4 913	2 535	1 659	2 413
South Africa	"	7 608	12 754	4 865	2 407	1 627	2 397
Others	"	—	208	48	128	32	16
Value	\$'000	1 234	3 758	1 515	762	646	907
Other types	tonne	12 292	6 763	1 007	2 300	1 627	3 228
Value	\$'000	1 983	2 036	605	583	589	970
<b>EXPORTS</b>							
All types and grades	tonne	20 819	24 524	9 499	8 279	10 182	10 972
Value	\$'000	2 650	6 923	2 945	2 580	2 783	3 484

# CADMIUM

		1975*		1976*			
		1974	1975*	September	December	March	June
<b>PRODUCTION</b>							
<b>Mine production</b>							
Cadmium content of minerals produced							
Lead concentrate	tonne	45	50	16	12	9	11
Lead-zinc middlings	"	24	16	3	4	6	8
Zinc concentrate	"	1 374	1 543	419	386	318	369
New South Wales	"	895	996	283	241	188	243
Queensland	"	401	442	110	112	106	106
Tasmania	"	147	171	45	49	39	39
Total contained cadmium	"	1 443	1 609	438	402	333	388
Refinery production							
Refined cadmium	"	720	552	126	137	97	157
<b>EXPORTS</b>							
Cadmium and cadmium alloys—							
Unwrought	tonne	124	358	149	129	115	88
Value	\$'000	577	1 412	617	507	435	385
Worked shapes and sections	tonne	450	114	62	25	10	1
Value	\$'000	2 660	464	236	99	31	2
Waste and scrap etc.	tonne	2	47	4	15	5	2
Value	\$'000	16	181	24	43	19	7

# COAL

		1975*		1976*			
		1974	1975*	September	December	March	June
<b>PRODUCTION</b>							
<b>Mine production</b>							
<b>Black coal</b>							
Semi-anthracite	'000 tonnes	—	—	—	—	—	—
Bituminous	"	59 058	62 034	11 189	17 928	16 146	18 132
Sub-bituminous	"	3 975	4 905	1 332	1 260	1 305	1 432
New South Wales	"	38 783	40 152	8 344	11 311	10 395	10 834
Queensland (a)	"	21 085	22 760	3 668	6 935	6 012	7 701
South Australia	"	1 071	1 751	521	375	478	447
Western Australia	"	1 446	2 114	572	519	527	538
Tasmania	"	127	182	45	48	40	44
Underground	"	34 356	35 032	7 234	9 740	9 377	9 773
Open cut	"	28 677	31 908	5 917	9 448	8 075	9 790
Total	"	83 033	86 939	13 151	19 188	17 451	19 564
Brown coal (lignite)	"	27 383	28 177	7 544	6 756	7 187	7 743
Victoria	"	27 303	28 177	7 544	6 756	7 167	7 743
Coal products							
Metallurgical coke	"	5 114	5 239	1 182	1 316	1 362	1 393
Brown coal briquettes	"	1 155	1 030	311	198	194	243
<b>IMPORTS</b>							
Coal	tonne	15 480	6 078	285	299	411	394
Value	\$'000	294	244	46	58	80	63
Coke (incl. petroleum coke)	tonne	127 872	103 266	29 033	27 092	25 188	18 352
Value	\$'000	5 445	6 851	2 024	1 922	1 923	1 522
<b>EXPORTS</b>							
Black coal	'000 tonnes	29 440	30 245	6 049	7 730	7 098	8 206
Japan	"	23 132	22 973	4 715	6 298	5 497	6 050
Other	"	6 309	7 272	1 333	1 433	1 601	2 153
Value	\$'000	489 518	755 502	147 292	260 247	248 236	291 741
Brown coal (lignite)	tonnes	234	231	2	2	2	1
Japan	"	—	1	—	—	—	—
Other	"	—	233	—	—	—	—
Value	\$'000	5	14	—	13	—	1
Coke	tonne	241 436	234 329	17 107	45 897	66 776	52 083
Value	\$'000	4 049	5 637	444	1 001	1 929	1 228

(a) Saleable coal; excludes washery rejects.

# COPPER

	1974	1975*		1976*		
		1975*	September	December	March	June
<b>PRODUCTION</b>						
<b>Mine production</b>						
Minerals produced						
Copper ore (a)	tonne	21 690	5 199	813	548	—
Copper content	tonne	1 279	298	52	40	—
Silver content	kilogram	20	—	—	33	—
Copper concentrate	tonne	946 823	813 073	209 618	190 937	210 519
Bismuth content	tonne	778 700	826 400	227 100	102 100	190 644
Copper content	kilogram	238 298	206 378	52 746	49 374	53 993
Gold content	tonne	3 476	2 504	642	611	49 282
Silver content	tonne	39 950	34 822	7 899	8 638	607
Lead content	tonne	639	740	289	8 328	8 403
Zinc content	tonne	1 838	1 795	457	357	119
Copper precipitate	tonne	145	45	30	—	421
Copper content	tonne	97	35	26	—	3
Copper content of minerals produced	tonne	—	—	—	—	2
<b>Smelter and refinery production</b>						
Copper ore (a)	tonne	359	170	50	23	18
Copper concentrate	tonne	1 279	298	52	40	33
Copper precipitate	tonne	238 298	206 378	52 746	49 374	53 993
Copper-lead concentrate	tonne	97	35	26	—	49 282
Lead concentrate	tonne	554	570	147	—	10
Lead-copper concentrate	tonne	2 999	2 776	725	166	172
Lead-zinc middlings	tonne	2 741	2 485	530	742	548
Nickel concentrate	tonne	140	97	20	22	33
Zinc concentrate	tonne	3 639	4 688	1 176	1 147	1 113
	tonne	1 234	1 186	329	299	268
<b>New South Wales</b>						
Queensland	tonne	12 800	13 433	3 167	3 074	2 693
South Australia	tonne	182 621	153 776	41 218	36 250	42 392
Western Australia	tonne	9 454	17 683	4 235	4 683	3 899
Tasmania	tonne	3 639	4 688	5 541	341	4 212
Northern Territory	tonne	29 106	26 460	1 176	1 147	1 113
Total contained copper	tonne	13 720	2 643	464	341	6 015
Smelter and refinery production	tonne	251 340	218 683	55 801	52 533	56 949
Blister copper (b)	tonne	196 129	179 942	46 020	43 394	42 086
Refined copper	tonne	162 461	165 341	40 181	40 487	44 982

## IMPORTS

	1974	1975*	1975*	1976*	1976*	1976*
			September	December	March	June
<b>Copper—</b>						
Unrefined copper	tonne	373	4	—	4	—
Value	\$'000	349	5	—	4	—
Refinery shapes	tonne	130	—	—	5	—
U.S.A.	tonne	30	—	—	—	—
Others	tonne	100	—	—	—	—
Value	\$'000	235	—	—	—	—
Bars, rods, angles and tees	tonne	4	—	—	—	—
Value	\$'000	25	—	—	—	—
Plates, sheets and strips	tonne	158	5	—	—	—
Value	\$'000	239	42	23	3	1
Pipes and tubes	tonne	362	147	35	7	9
Value	\$'000	834	287	61	50	66
Wire	tonne	15	11	5	83	123
Value	\$'000	58	59	21	3	2
Powder	tonne	395	149	26	31	10
Value	\$'000	749	329	55	60	84
Scrap	tonne	720	587	144	146	150
Value	\$'000	461	337	91	63	75
<b>Copper-base alloys—</b>						
Pigs, ingots and blocks	tonne	73	52	24	10	3
Value	\$'000	137	75	27	13	7

# COPPER

	1974	1975*		1976*		
		1975*	September	December	March	June
<b>IMPORTS (continued)</b>						
<b>Copper-base alloys—continued</b>						
Rolled, drawn and extruded shapes	tonne	4 973	1 562	452	597	1 069
Value	\$'000	5 874	2 351	384	1 009	1 665
Wire	tonne	325	107	8	15	68
Value	\$'000	554	304	23	43	129
Scrap	tonne	687	582	185	210	80
Value	\$'000	401	226	77	57	28

## EXPORTS

	1974	1975*	1975*	1976*	1976*	1976*
			September	December	March	June
<b>Copper—</b>						
Copper concentrate	tonne	178 198	152 857	33 319	52 152	26 192
Japan	tonne	172 600	142 171	31 263	49 922	25 004
Other	tonne	5 598	10 686	2 056	2 230	1 188
Value	\$'000	60 647	37 588	8 488	13 771	6 947
Copper matte	tonne	5 919	5 508	501	1 215	1 980
Belgium-Luxembourg	tonne	3 557	5 508	501	1 215	1 980
Other	tonne	2 362	—	—	—	—
Value	\$'000	2 761	1 597	147	364	441
Copper-lead dross	tonne	1 137	4 996	1 063	730	896
Value	\$'000	370	1 589	279	290	192
Slags and residues	tonne	1 418	24 251	6 704	10 869	—
Value	\$'000	169	307	48	101	—
Blister copper	tonne	12 464	12 641	658	3 933	2 625
Japan	tonne	12 464	12 641	658	3 933	2 625
Other	tonne	—	—	—	—	1 300
Value	\$'000	23 978	16 364	908	5 282	3 596
Refinery shapes	tonne	70 536	86 608	22 068	17 300	16 260
E.E.C. (c)	tonne	42 079	53 281	14 406	7 633	10 937
U.K.	tonne	15 282	21 135	5 110	6 012	4 506
Other	tonne	13 175	12 192	2 552	3 455	817
Value	\$'000	89 969	79 215	20 118	15 786	15 232
Bars and rods	tonne	13 136	10 401	2 362	3 210	3 497
Value	\$'000	19 723	11 029	2 433	3 355	6 587
Angles, shapes and sections	tonne	731	5 072	3 811	1 104	2 202
Value	\$'000	929	4 605	3 414	1 034	2 140
Plates, sheets and strips	tonne	1 183	844	287	250	177
Value	\$'000	2 555	1 377	467	300	510
Tubes and pipes	tonne	2 012	1 344	327	300	288
Value	\$'000	4 765	2 386	566	512	399
Wire	tonne	1 683	400	9	5	17
Value	\$'000	2 862	410	12	19	32
Scrap	tonne	19	17	—	17	—
Value	\$'000	9	13	—	13	—
<b>Copper-base alloys—</b>						
Refinery shapes	tonne	6	40	2	36	5
Value	\$'000	18	33	3	21	7
Bars and rods	tonne	2 453	1 401	371	451	239
Value	\$'000	3 725	1 614	416	526	262
Angles, shapes and sections	tonne	230	187	54	47	45
Value	\$'000	333	269	65	65	84
Plates, sheets and strips	tonne	444	198	38	62	40
Value	\$'000	975	387	80	112	86
Tubes and pipes	tonne	153	56	10	10	16
Value	\$'000	382	141	24	22	31
Wire	tonne	184	140	51	31	39
Value	\$'000	338	229	85	45	65
Scrap	tonne	377	558	196	71	91
Value	\$'000	412	417	143	61	70
<b>Copper and copper-base alloys—</b>						
Foil	tonne	6	44	7	—	2
Value	\$'000	17	150	26	—	7
Powders and flakes	tonne	1	11	1	10	—
Value	\$'000	16	17	3	14	—
Copper content of concentrates, matte, etc. exported (d)	tonne	51 101	51 540	11 487	17 317	9 876

(a) Includes cuprous ore for fertilizer. (b) Total production for refining in Australia and overseas. (c) Excludes U.K. (d) Excludes copper in blister.

# GEMS

	1974	1975*			1976*	
		September	December	March	June	
<b>PRODUCTION</b>						
Opals	\$'000	25 521				
New South Wales	"	2 902				
Queensland	"	602				
South Australia	"	22 000				
Western Australia	"	17				
Sapphires	"	14 001				
New South Wales	"	4 001				
Queensland	"	10 000				
Other gems	"	99	n.y.a.	n.a.	n.a.	n.a.
New South Wales	"	24				
Queensland	"	46				
South Australia	"	11				
Western Australia	"	15				
Tasmania	"	—				

<b>IMPORTS</b>							
Diamonds, gem	metric carat	77 646	98 601	20 976	23 417	27 092	18 061
Value	\$'000	15 011	15 011	3 816	3 807	5 771	3 577

<b>EXPORTS</b>						
Opals—	\$'000					
Rough, not cut or polished	5 952	6 885	1 456	1 861	1 482	2 751
Cut and polished (a)	6 700	6 716	1 240	1 985	2 417	3 004
Sapphires—						
Rough, not cut or polished	1 635	2 138	698	905	309	585
Other	993	873	165	292	236	324

(a) Includes black opals.

# GOLD

	1974	1975*			1976*	
		September	December	March	June	
<b>PRODUCTION</b>						
<b>Mine production</b>						
Minerals produced						
Gold ore	tonne	161	n.a.	n.a.	n.a.	n.a.
Gold content	kilogram	2	2	—	1	5
Gold bullion (a)	"	13 319	n.a.	n.a.	n.a.	n.a.
Gold content	"	10 090	11 728	3 106	3 841	3 279
Silver content	"	2 090	2 014	502	667	526
Gold content of minerals produced						
Bismuth concentrate	"	955	536	203	97	45
Copper concentrate	"	3 476	2 504	642	611	607
Gold ore	"	2	2	—	1	5
Gold bullion (a)	"	10 090	11 728	3 106	3 841	3 279
Lead concentrate	"	244	258	66	77	44
Lead-copper concentrate	"	906	1 017	252	313	198
Lead-zinc middlings	"	30	21	4	5	7
Nickel concentrate	"	61	28	5	7	12
Silver-gold ore	"	4	45	19	23	2
Zinc concentrate	"	176	190	56	43	47
New South Wales	"	282	364	106	118	138
Victoria	"	126	209	51	37	10
Queensland	"	1 984	1 486	306	393	364
South Australia	"	67	42	—	23	—
Western Australia	"	6 584	7 126	1 805	2 541	1 778
Tasmania	"	1 585	1 668	400	489	346
Northern Territory	"	5 316	5 434	1 686	1 430	1 629
Total contained gold	"	15 944	16 928	4 353	5 031	4 241
Refinery production						
Newly-won gold						
Australian origin	"	10 190	12 057	3 418	3 254	n.y.a.
Overseas origin	"	2 745	2 925	732	779	n.y.a.
Scrap	"					
Australian origin	"	792	732	209	171	n.y.a.
Overseas origin	"	97	62	21	14	n.y.a.
Total	"	13 825	15 776	4 380	4 218	n.y.a.

# GOLD

	1974	1975*			1976*	
		September	December	March	June	
<b>IMPORTS</b>						
<b>Gold</b>						
Refined forms (excl. specie, leaf and foil)	kilogram	30	1	—	8	4
Value	\$'000	158	5	—	31	13
Unrefined bullion (gold content)	kilogram	2 494	2 881	732	623	838
Fiji	"	1 835	2 065	544	494	630
Papua New Guinea	"	625	792	182	129	301
Other	"	34	24	6	3	8
Value	\$'000	7 439	9 752	2 363	2 203	2 236

<b>EXPORTS</b>						
Refined forms (excl. specie, leaf and foil)	kilogram	5 641	3 180	1 188	1 185	2 491
Hong Kong	"	1 723	1 036	57	935	1 505
Japan	"	280	—	—	—	497
Singapore	"	—	—	—	82	12
New Zealand	"	4	102	6	—	—
U.K.	"	3 634	437	—	—	—
Other	"	—	1 607	1 125	168	477
Value	\$'000	18 688	12 152	4 368	4 134	9 121
Gold content of concentrates, blister copper, etc. exported	kilogram	4 476	4 983	423	1 241	1 137

## SUPPLIES AND DISPOSALS OF GOLD BULLION

	1974	1975*			1976*	
		September	December	March	June	
<b>Supplies</b>						
Refinery production (b)	kilogram	11 079	12 851	3 648	3 439	n.a.
Imports	"	2 524	2 882	733	623	847
Total supplies	"	13 603	15 733	4 381	4 062	n.a.
<b>Disposals</b>						
Exports	"	5 641	3 180	1 188	1 185	2 491
Net industrial consumption	"	7 856	8 577	1 952	2 532	n.a.
Total disposals	"	13 497	11 757	3 140	3 717	n.a.
Apparent change in stocks held in Australia (c)	"	+106	+3 976	+1 241	+345	n.a.

(a) Mine bullion, alluvial, retorted gold, etc. Includes production from auriferous pyrites. (b) Refinery production from newly-won gold of Australian origin and scrap of domestic and overseas origin. (c) Apparent change in stocks calculated as the difference between supplies and disposals; includes changes in holdings in Australia by Official and Banking Institutions both on their own behalf and that of non-residents.

# GYPSUM

	1974	1975*			1976*	
		September	December	March	June	
<b>PRODUCTION</b>						
<b>Mine production</b>						
New South Wales	tonne	1 068 852	949 203	192 414	250 858	235 784
Victoria	"	42 561	33 541	8 860	5 020	5 740
South Australia	"	43 045	54 298	17 673	7 793	21 847
Western Australia	"	789 708	759 266	153 219	201 690	189 373
Other	"	213 478	102 098	12 662	36 353	18 804
Total	"	2 137 644	1 898 406	466 385	541 561	471 548
<b>EXPORTS</b>						
<b>Gypsum and anhydrite</b>						
Indonesia	tonne	303 167	215 776	43 138	58 755	53 820
Japan	"	30 623	15 559	5 179	—	16 652
Malaysia	"	42 852	—	—	—	—
New Zealand	"	666	549	119	168	118
Singapore	"	173 062	151 737	31 852	43 822	26 999
Taiwan	"	14 915	27 271	5 897	6 357	10 047
Other	"	16 484	—	—	—	—
Value	\$'000	22 565	20 860	91	8 408	4
Total	"	1 858	1 539	320	444	243

# IRON

	1974	1975*		1976*			
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
<b>Mine production</b>							
<b>Minerals produced</b>							
Iron ore and concentrate (a)	'000 tonnes	96 950	97 653	25 438	23 008	22 431	21 804
Iron content		61 276	61 746	16 079	14 574	14 125	13 721
Production: States, iron content							
South Australia		3 441	3 342	781	729	667	659
Western Australia		55 883	56 973	14 953	13 431	13 065	12 752
Tasmania		1 514	1 431	345	414	393	311
Northern Territory		438	—	—	—	—	—
Total contained iron		61 276	61 746	16 079	14 574	14 125	13 721
<b>Iron and steel</b>							
Iron ore pellets		10 066	9 469	2 598	2 243	2 586	2 412
Pig iron		7 250	7 476	1 881	1 751	1 928	1 960
Raw steel (b)		7 755	7 845	2 024	1 913	1 961	2 039
Blooms and slabs		6 479	5 648	1 455	1 363	1 431	1 314
Tinplate		341	266	72	63	66	81

## IMPORTS

<b>Iron</b>							
Iron ore	tonne	28 140	16 759	9 159	—	22 124	12 700
Canada		20 279	15 159	9 159	—	22 124	12 700
Philippines		7 418	1 600	—	—	—	—
Other		443	—	—	—	—	—
Value	\$'000	459	206	98	—	318	185
<b>Iron and steel</b>							
<b>Ferroalloys (excl. powders)</b>							
Ferromanganese	tonne	13 816	4 964	346	795	2 888	276
Value	\$'000	5 283	3 654	227	562	1 593	164
Ferromanganese	tonne	10 426	4 263	107	1 189	1 532	70
Value	\$'000	2 516	1 773	54	516	680	36
Ferromolybdenum	tonne	620	149	44	23	24	19
Value	\$'000	1 480	555	177	83	90	134
Ferronickel	tonne	1 506	1 207	—	434	—	—
Value	\$'000	931	980	—	355	—	—
Ferrosilicon	tonne	17 618	17 161	774	4 961	7 685	819
Value	\$'000	5 200	7 270	327	1 721	2 923	278
Other	tonne	3 313	2 502	380	381	323	864
Value	\$'000	2 057	1 326	380	844	754	1 187
Tinplate (c)	tonne	74 977	6 718	314	606	552	1 047
Value	\$'000	16 962	2 739	88	185	175	343

## EXPORTS

<b>Iron</b>							
Iron ore and pellets	'000 tonnes	83 591	80 363	19 431	19 855	19 054	20 409
Japan		85 890	61 604	15 474	15 933	14 603	16 375
Other		17 731	18 759	3 957	3 923	4 451	4 034
Value	\$'000	588 193	748 805	185 306	192 925	186 883	204 818
<b>Iron and steel</b>							
Pig iron	tonne	735 111	519 942	159 530	144 543	142 893	145 942
China		363 787	426 597	145 964	127 649	59 541	86 510
Czechoslovakia		3 824	3 906	—	1 163	1 678	—
Italy		1 405	365	—	—	10 058	5 157
Japan		274 468	41 580	10 475	—	4 417	—
New Zealand		6 001	3 512	866	—	19	1 855
Romania		—	—	—	—	—	36 305
Taiwan		7 755	—	—	—	—	—
U.S.A.		—	20 882	—	10 215	—	—
Other		76 049	23 100	2 225	5 516	30 881	30 832
Value	\$'000	67 130	46 589	11 456	10 017	9 395	9 593
Ingot, blooms and slabs	tonne	767 458	1 615 331	462 411	424 358	351 926	267 751
Value	\$'000	85 593	190 588	50 639	41 170	36 591	29 329
Scrap	tonne	811 901	577 401	156 111	122 367	268 370	165 971
Value	\$'000	55 618	47 156	12 789	11 829	11 724	10 713
Tinplate	tonne	49 010	49 574	2 778	2 950	2 876	3 624
Value	\$'000	11 343	14 579	2 778	2 950	2 876	3 624
Iron content of iron ore and pellets exported	'000 tonnes	52 494	50 720	12 391	12 475	12 055	12 818

(a) Iron oxide for metal extraction. (b) Includes recovery from scrap. (c) Includes tinplate.

# LEAD

	1974	1975*		1976*			
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
<b>Mine production</b>							
<b>Minerals produced</b>							
Lead ore (a)	tonne	44 877	50 627	28 687	—	—	—
Lead content		2 477	2 788	1 578	—	—	—
Silver content	kilogram	2 860	2 168	803	—	—	—
Lead concentrate	tonne	551 385	591 175	158 142	143 696	130 200	147 516
Lead content		348 967	380 105	102 216	92 716	80 831	93 016
Silver content	kilogram	497 360	563 846	148 262	140 816	130 665	137 935
Antimony content	tonne	576	639	181	156	123	159
Cadmium content	tonne	45	60	16	12	9	11
Copper content	tonne	2 999	2 776	725	720	546	687
Gold content	kilogram	244	258	66	77	44	54
Zinc content	tonne	27 335	29 913	7 223	7 447	7 255	8 481
Sulphur content	tonne	43 895	48 801	13 444	11 645	9 056	11 751
Lead-copper concentrate	tonne	22 257	18 226	4 028	5 287	5 498	4 667
Lead content	tonne	5 219	4 135	979	1 226	1 290	1 328
Copper content	tonne	2 741	2 485	530	742	769	615
Gold content	kilogram	50 157	43 992	10 595	12 279	9 981	9 925
Zinc content	tonne	906	1 017	252	313	198	223
Sulphur content	tonne	2 795	2 096	485	533	482	442
Lead-zinc middlings (b)	tonne	6 622	5 259	1 113	1 535	1 550	1 329
Lead content	tonne	12 023	8 023	1 663	1 800	2 782	3 939
Zinc content	tonne	2 759	1 985	447	446	712	468
Silver content	kilogram	3 716	2 711	580	548	946	1 662
Antimony content	tonne	16 468	15 351	3 614	3 041	4 337	5 379
Cadmium content	tonne	11	8	2	2	4	3
Copper content	tonne	24	16	3	4	6	8
Gold content	kilogram	140	97	20	22	33	47
Sulphur content	tonne	30	21	4	5	7	11
Lead content of minerals produced	tonne	3 442	2 286	474	513	793	1 123
Copper concentrate	tonne	639	740	289	85	119	147
Lead ore (a)		2 477	2 788	1 578	—	—	—
Lead concentrate		348 967	380 105	102 216	92 716	80 831	93 016
Lead-copper concentrate		5 219	4 135	979	1 226	1 290	1 328
Lead-zinc middlings		2 759	1 985	447	446	712	468
Zinc ore		512	—	—	—	—	257
Zinc concentrate		14 731	17 416	4 532	4 666	3 914	3 880
<b>New South Wales</b>							
Queensland		227 558	244 872	67 309	57 417	45 648	57 925
Western Australia		128 210	142 513	37 690	35 941	36 904	36 339
South Australia		516	10	—	2	—	263
Tasmania		—	—	—	—	—	—
Northern Territory		19 017	19 552	4 908	5 751	4 314	4 569
Total contained lead		375 304	407 169	110 041	99 139	86 886	99 096
<b>Smelter and refinery production</b>							
Refined lead (c)	tonne	192 757	159 793	40 729	43 150	39 841	44 463
Lead content of lead bullion for export	tonne	144 203	151 520	38 607	35 589	36 937	41 166

## EXPORTS

Lead concentrate	tonne	62 840	65 085	15 865	36 611	18 090	13 672
Japan		8 770	8 121	4 145	3 976	—	—
U.K.		18 772	—	—	—	—	5
U.S.A.		35 298	28 882	6 517	9 556	12 600	4 452
Other		—	28 262	5 203	23 079	5 490	9 215
Value	\$'000	19 259	15 822	3 751	7 264	4 739	2 984

Continued over page

# LEAD (continued)

	1974	1975*			1976*		
		1975*	September	December	March	June	
<b>EXPORTS (continued)</b>							
Lead bullion .....	tonne	149 460	143 785	37 756	27 830	56 308	29 758
Germany, F.R. ....	"	8 566	8 401	1 813	—	493	—
Netherlands .....	"	14 366	11 658	3 217	5 235	2 651	3 761
U.K. ....	"	124 128	120 739	32 682	22 595	53 164	23 750
Other .....	"	2 400	2 987	50	—	—	2 247
Value .....	\$'000	84 420	72 621	17 527	12 504	25 400	15 570
Refined lead, unworked .....	tonne	132 962	117 237	29 027	31 646	37 819	39 372
India .....	"	34 482	19 232	9 710	6 078	9 380	7 139
Italy .....	"	10 651	8 802	1 264	1 423	4 493	7 410
Netherlands .....	"	653	5 404	501	—	1 501	—
New Zealand .....	"	6 421	5 538	1 582	1 285	1 582	1 634
Philippines .....	"	2 853	3 439	1 154	1 264	1 276	—
U.K. ....	"	40 935	44 644	5 567	10 990	12 735	10 996
U.S.A. ....	"	3 001	—	—	—	—	—
Other .....	"	33 956	30 378	9 149	7 993	8 652	11 489
Value .....	\$'000	51 012	37 095	7 993	8 246	9 723	12 577
Rolled and extruded shapes .....	tonne	469	1 951	1 437	177	164	68
Value .....	\$'000	259	1 586	1 297	96	77	49
Antimonial lead .....	tonne	5 402	4 783	1 495	1 126	1 000	1 674
Value .....	\$'000	2 441	1 893	498	392	343	640
Scrap .....	tonne	786	1 162	903	194	122	202
Value .....	\$'000	188	183	107	49	24	58
Slags and residues .....	tonne	28 256	25 932	5 859	8 850	3 435	1 196
Value .....	\$'000	5 379	2 310	411	685	206	242
Lead content of concentrates, residues, etc., exported .....	tonne	45 599	59 946	14 057	29 890	12 684	9 239
Lead content of lead bullion exported .....	tonne	148 302	142 414	37 530	27 658	55 966	29 577

(a) Includes lead-silver ores. (b) Product of dump re-treatment. (c) Includes lead content of lead alloys from primary sources.

# LIMESTONE

	1974	1975*			1976*		
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
Mine production (a) (b) .....	'000 tonnes	9 889	9 549	2 359	2 250	1 895	2 313
New South Wales .....	"	3 779	3 301	724	789	555	795
Victoria .....	"	2 192	2 255	595	587	424	555
Queensland .....	"	1 758	1 940	459	459	364	369
South Australia .....	"	1 562	1 508	417	313	395	470
Western Australia .....	"	n.a.p.	n.a.p.	n.a.p.	n.a.p.	n.a.p.	n.a.p.
Tasmania .....	"	599	545	164	102	158	124
Cement, Portland .....	"	5 204	5 017	1 318	1 281	1 109	1 299
<b>IMPORTS</b>							
Limestone and calcareous stone .....	tonne	1 432 468	1 489 706	264 860	303 276	490 519	367 812
Japan .....	"	1 432 468	1 449 190	264 820	262 800	490 519	367 800
Other .....	"	—	40 516	40	40 476	—	12
Value .....	\$'000	2 572	3 775	716	868	1 325	1 050
Calcium carbide .....	tonne	15 346	5 232	1 523	926	1 742	2 736
Norway .....	"	3 796	1 400	649	—	—	—
Poland .....	"	5 941	—	—	—	—	—
Other .....	"	5 609	3 832	874	926	1 742	2 736
Value .....	\$'000	1 966	914	274	175	317	546
Cement, Portland grey .....	"	843	1 108	285	547	638	453
Cement, Portland white .....	tonne	42 891	17 538	5 155	4 674	5 987	4 699
Denmark .....	"	2 745	1 804	403	393	488	—
Japan .....	"	24 019	13 704	4 158	4 154	4 753	3 944
U.K. ....	"	1 543	678	338	37	249	299
Other .....	"	14 584	1 352	90	256	90	497
Value .....	\$'000	1 366	769	228	200	272	215
Cement, Portland, other .....	tonne	1 631	274	274	—	54	54
Value .....	\$'000	145	30	30	—	8	7

	1974	1975*			1976*		
		1975*	September	December	March	June	
<b>EXPORTS</b>							
Cement, constructional .....	tonne	139 426	114 988	17 941	21 852	17 600	14 921
Value .....	\$'000	2 653	2 841	583	631	884	504

(a) Including shell and coral. (b) Excludes W.A.

# MAGNESITE

	1974	1975*			1976*		
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
Mine production .....	tonne	19 300	16 208	4 142	4 245	2 876	4 156
New South Wales .....	"	18 835	15 859	3 913	4 208	2 876	4 156
South Australia .....	"	465	349	229	37	—	—
<b>IMPORTS</b>							
Magnesite calcined, deadburned .....	tonne	623	54	11	—	71	2 501
Value .....	\$'000	50	7	2	—	16	272
Magnesite calcined, other .....	tonne	130	11	1	5	—	15
Value .....	\$'000	50	5	1	2	—	7
Magnesite, other .....	tonne	5	—	—	—	—	—
Value .....	\$'000	3	—	—	—	—	—
Magnesium oxide (a) — Electrically fused .....	tonne	884	1 210	54	1 047	97	104
Value .....	\$'000	504	263	33	164	82	84
Other .....	tonne	15 753	15 069	1 089	31	3 035	71
Value .....	\$'000	1 734	1 710	162	19	353	42
<b>EXPORTS</b>							
Magnesite .....	tonne	959	16 280	15 635	—	13 450	—
Value .....	\$'000	114	400	346	—	261	—

(a) Predominantly seawater magnesite and seawater deadburned magnesite.

# MANGANESE

	1974	1975*			1976*		
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
Mine production .....	tonne	1 521 989	1 554 909	475 676	305 053	467 255	613 164
Minerals produced .....	"	724 103	744 367	228 820	144 861	222 955	301 526
Metallurgical grade .....	tonne	—	—	—	—	—	—
Manganese content .....	"	—	—	—	—	—	—
Manganese content of minerals .....	"	—	—	—	—	—	—
produced .....	"	724 103	744 367	228 820	144 861	222 955	301 526
Zinc concentrate .....	"	5 486	6 012	1 582	1 503	1 183	1 469
Total contained manganese .....	"	729 589	750 379	230 402	146 364	224 138	302 995
Production, States: metallurgical grade ore: .....	"	—	—	—	—	—	—
Northern Territory .....	"	1 521 989	1 554 909	475 676	305 053	467 255	613 164
Total .....	"	1 521 989	1 554 909	475 676	305 053	467 255	613 164
<b>IMPORTS (a) (b)</b>							
Battery grade ore .....	tonne	2 881	—	—	—	—	1 007
Value .....	\$'000	178	—	—	—	—	98
Other grade ore .....	tonne	499	179	71	71	35	7
Value .....	\$'000	35	32	13	13	6	1
Metal and powder .....	tonne	973	778	135	128	459	138
Value .....	\$'000	407	516	95	108	310	92

(a) Imports of ferromanganese are shown on page 8. (b) Details of exports of manganese ore are not available for publication.

# MONAZITE

		1975*				1976*	
		1974	1975*	September	December	March	June
<b>PRODUCTION</b>							
Mine production							
Monazite concentrate	tonne	3 577	4 267	887	1 988	1 129	616
Monazite content		3 270	3 842	800	1 789	1 016	556
Production: States, monazite content:							
New South Wales (a)		903	688	—	452	203	113
Queensland		16	—	—	—	—	—
Western Australia		2 351	3 154	800	1 337	813	443
<b>Total contained monazite</b>		<b>3 270</b>	<b>3 842</b>	<b>800</b>	<b>1 789</b>	<b>1 016</b>	<b>556</b>

<b>EXPORTS</b>							
		1974	1975*	September	December	March	June
Monazite concentrate	tonne	3 808	2 528	595	454	656	737
France		1 584	1 151	126	108	436	737
U.K.		724	1 085	469	108	—	—
Other		1 500	292	—	238	220	—
Value	\$'000	541	428	100	70	118	123

(a) Despatches.

# NICKEL

		1975*				1976*	
		1974	1975*	September	December	March	June
<b>PRODUCTION</b>							
Mine production							
Nickel ore	tonne	228 768	1 627 438	420 801	393 000	470 400	471 200
Nickel content		2 745	20 440	5 285	4 936	7 385	7 398
Cobalt content		201	1 432	370	346	517	565
Nickel concentrate		350 258	459 248	120 682	123 052	109 728	100 800
Nickel content		43 236	25 354	14 621	15 029	13 418	12 753
Cobalt content		777	1 057	280	286	256	234
Copper content		3 639	4 688	1 176	1 147	1 113	1 014
<b>Total contained nickel</b>		<b>45 981</b>	<b>75 794</b>	<b>19 906</b>	<b>19 965</b>	<b>20 803</b>	<b>20 151</b>

**IMPORTS (a)**

		1974	1975*	September	December	March	June
Pigs, ingots and blocks	tonne	995	511	169	221	182	310
Value	\$'000	2 541	1 861	570	856	703	1 228
Pellets, shot granulated	tonne	350	215	80	—	—	—
Value	\$'000	904	738	271	—	—	—
Electroplating anodes	tonne	83	26	6	3	5	16
Value	\$'000	276	102	26	13	17	77
Bars, rods, angles, shapes and sections	tonne	15	—	—	—	—	5
Value	\$'000	48	5	3	1	1	20
Plates, sheets and strips	tonne	10	11	—	—	—	1
Value	\$'000	54	55	1	4	9	7
Pipes and tubes	tonne	4	14	7	4	2	1
Value	\$'000	19	17	1	2	1	4
Wire	tonne	75	108	6	26	1	7
Value	\$'000	17	8	5	2	1	4
Powder	tonne	41	27	18	5	1	16
Value	\$'000	905	543	17	73	55	40
<b>Nickel-base alloys—</b>							
Unworked shapes	tonne	1 909	1 538	56	275	234	159
Value	\$'000	378	295	27	35	22	54
Bars, rods, angles, shapes and sections	tonne	1 011	1 121	168	202	132	322
Value	\$'000	553	402	62	69	253	109
Plates, sheets and strips	tonne	1 822	1 956	395	384	892	457
Value	\$'000	23	38	5	12	9	6
Pipes and tubes	tonne	149	296	56	76	67	46
Value	\$'000	225	259	37	27	45	53
Wire	tonne	814	831	152	152	242	337
Value	\$'000	81	53	4	9	3	3
Powder	tonne	512	432	69	128	74	56
Value	\$'000						

**EXPORTS (b)**

		1974	1975*	September	December	March	June
Nickel—							
Concentrate	\$'000	14 218	10 598	3 162	2 649	2 920	2 10
Metal, unwrought							
Value	\$'000	36 946	51 484	10 594	11 860	8 011	6 581
Matte and speiss							
Value	\$'000	29 878	58 691	12 067	18 516	36 256	35 4
Powder							
Value	\$'000	14 909	53 562	19 207	17 733	8 655	15 8

(a) Imports of ferronickel are shown on page 8. (b) Details of the quantities exported of nickel concentrate, nickel metal unwrought, nickel matte and speiss and nickel powder are not available for publication.

# PETROLEUM

		1975*				1976*	
		1974	1975*	September	December	March	June

**PRODUCTION** (Source: Petroleum Branch, Department of National Resources)

		1974	1975*	September	December	March	June
<b>Petroleum production</b>							
Crude oil	'000 cu. metres	22 403	23 829	5 680	6 101	5 942	6 108
Natural gas	mil. cu. metres	4 512	5 026	1 417	1 246	1 183	1 541
<b>Refinery operations</b>							
Input of feedstock	'000 cu. metres	32 842	33 257	8 285	8 302	8 252	8 704
<b>Products</b>							
Refinery gas (a) (b) (c)		126	118	28	25	41	27
Liquefied petroleum gas		623	649	173	171	169	159
Aviation gasoline		70	40	9	9	14	6
Motor spirit		12 128	12 435	3 215	2 860	3 213	3 213
Power kerosene		54	53	7	5	7	9
Aviation turbine fuel		2 058	2 148	489	550	569	480
Lighting kerosene		217	196	42	28	56	84
Heating oil		696	787	295	137	91	209
Automotive distillate		5 146	5 591	1 494	1 547	1 492	1 453
Industrial diesel fuel		1 413	1 258	352	343	307	428
Furnace fuel (b)		5 253	4 741	1 215	1 171	1 071	1 218
Solvents		290	200	40	58	55	57
Lubricating oil base stock		430	388	80	93	111	147
Bitumen		461	450	92	128	117	126
Other marketable products		1 358	1 380	384	339	291	349
<b>Refinery fuel—</b>							
Liquid		794	655	180	153	148	157
Gas and coke (a)		1 877	1 836	449	441	506	534

**IMPORTS**

		1974	1975*	September	December	March	June
Natural crude	'000 cu. metres	7 143	6 161	1 500	1 704	1 334	912
Value	\$'000	299 186	344 497	80 751	104 219	82 012	62 538
Enriched crude and other refinery stock	'000 cu. metres	2 876	2 757	662	680	909	1 027
Value	\$'000	121 102	145 224	33 954	38 778	53 988	60 123
Gasoline, solvents and other petroleum spirits	'000 cu. metres	1 154	745	168	292	322	301
Value	\$'000	63 745	56 996	12 514	23 634	28 407	29 416
Kerosene and aviation turbine fuel	'000 cu. metres	120	128	66	17	16	31
Value	\$'000	7 479	9 152	4 693	1 321	1 573	557
Automotive distillate, industrial and marine diesel fuels and heavy distillates, n.e.i.	'000 cu. metres	549	579	96	159	169	115
Value	\$'000	29 386	33 629	6 375	11 833	15 134	8 860
Residual oils	'000 cu. metres	2 801	2 273	608	585	532	527
Value	\$'000	104 750	113 099	30 356	30 911	28 975	28 491
Lubricating oil	'000 cu. metres	71	79	28	3	8	16
Value	\$'000	7 830	11 931	4 182	583	1 470	2 530

**EXPORTS**

		1974	1975*	September	December	March	June
Natural crude	'000 cu. metres	—	—	—	—	—	—
Value	\$'000	—	—	—	—	—	—
Partly refined petroleum	'000 cu. metres	216	224	72	21	58	93
Value	\$'000	10 977	15 371	4 343	1 456	3 944	6 499
Gasolines, solvents and other petroleum spirits	'000 cu. metres	367	378	59	55	31	84
Value	\$'000	22 021	32 602	4 949	5 269	3 079	8 424
Kerosene and aviation turbine fuel	'000 cu. metres	413	449	70	52	91	123
Value	\$'000	23 136	34 569	4 947	4 550	9 077	10 732
Automotive distillate, industrial and marine diesel fuels and heavy distillates, n.e.i.	'000 cu. metres	488	454	32	125	130	133
Value	\$'000	25 284	30 745	2 154	8 501	10 417	10 584
Residual oils	'000 cu. metres	438	749	276	193	161	169
Value	\$'000	24 357	38 789	13 931	9 385	8 969	9 234
Lubricating oils	'000 cu. metres	105	104	28	19	16	39
Value	\$'000	12 367	16 432	4 118	3 267	2 584	6 972

(a) Fuel oil equivalent. (b) Excludes refinery fuel. (c) For sale as fuel.

# PHOSPHATE

	1974	1975*		1976*			
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
Mine production							
Phosphate rock .....	tonne	1 484	139 821	54 000	48 805	42 851	44 780
Queensland .....	"	—	138 907	54 000	47 422	42 851	43 370
South Australia .....	"	1 484	2 914	—	1 383	—	1 410
Production of superphosphate (a) .....	'000 tonnes	5 352	1 593	191	468	835	684
<b>IMPORTS</b>							
Phosphate rock .....	'000 tonnes	3 056	1 981	406	458	345	296
Christmas Island (Indian Ocean) .....	"	1 041	681	114	176	130	84
Newru .....	"	1 611	968	198	209	150	130
Other .....	"	403	332	94	73	66	83
Value .....	'\$000	53 620	67 451	14 708	14 354	12 998	11 152

(a) Includes double and triple superphosphate and ammonium phosphate expressed in terms of single superphosphate, i.e. 22% P<sub>2</sub>O<sub>5</sub> equivalent.

# SALT

	1974	1975*		1976*			
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
Mine production .....	'000 tonnes	(a) 4 935	n.y.s.	n.s.	n.s.	n.s.	n.s.
Victoria .....	"	n.s.p.	n.s.p.	n.s.p.	n.s.p.	n.s.p.	n.s.p.
Queensland .....	"	82	n.s.	n.s.	n.s.	n.s.	n.s.
South Australia .....	"	730	n.s.	n.s.	n.s.	n.s.	n.s.
Western Australia .....	"	4 123	3 982	884	1 165	1 095	1 497
<b>IMPORTS</b>							
Salt, common .....	tonne	8 321	13 304	2 069	9 108	2 281	17 786
Value .....	'\$000	143	200	46	106	60	190
<b>EXPORTS</b>							
Salt .....	'000 tonnes	4 210	3 651	907	944	1 304	1 166
Value .....	'\$000	15 298	17 302	4 172	4 923	7 841	6 035

(a) Excludes Victoria.

# SILLIMANITE (a)

	1974	1975*		1976*			
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
Mine production .....	tonne	751	688	155	97	151	16
South Australia .....	"	751	688	155	97	151	16

(a) Imports not available separately—included under clays.

# SILVER

	1974	1975*		1976*			
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
<b>Mine production</b>							
Silver content of minerals produced							
Bismuth concentrate .....	kilogram	257	268	69	29	25	44
Copper ore .....	"	20	—	—	—	—	—
Copper concentrate .....	"	39 950	34 822	7 899	8 838	8 328	8 403
Gold bullion .....	"	2 090	2 014	502	667	526	435
Lead ore (a) .....	"	2 860	2 168	803	—	—	—
Lead concentrate .....	"	497 360	563 846	148 262	140 816	130 665	137 935
Lead-copper concentrate .....	"	50 157	43 992	10 595	12 279	9 981	9 925
Nickel concentrate .....	"	18 458	15 351	3 614	3 041	4 337	5 379
Silver-gold ore .....	"	316	1 694	843	735	69	37
Zinc concentrate .....	"	58 372	65 195	16 285	18 213	14 814	13 770
New South Wales .....	"	—	—	—	—	—	—
Victoria .....	"	264 735	286 103	78 572	66 843	53 371	65 633
Queensland .....	"	—	—	—	—	—	—
South Australia .....	"	319 107	362 171	90 803	93 368	97 057	92 834
Western Australia .....	"	1 700	1 670	—	1 219	—	560
Tasmania .....	"	1 653	1 998	500	658	491	382
Northern Territory .....	"	80 179	76 403	18 699	22 435	17 757	18 624
Total contained silver .....	"	2 580	1 005	296	94	69	96
Refinery production .....	"	669 954	729 350	188 872	184 618	168 745	175 929
Refined silver .....	"	256 475	267 548	62 735	61 145	51 026	51 303
<b>IMPORTS</b>							
<b>Silver</b>							
Silver and alloys .....	kilogram	2 838	804	195	236	244	353
Fiji .....	"	703	743	170	220	235	264
Hong Kong .....	"	1 324	—	—	—	—	—
New Zealand .....	"	129	1	—	1	—	—
U.K. .....	"	91	47	21	16	7	57
U.S.A. .....	"	521	13	3	—	1	1
Other .....	"	70	—	—	—	—	—
Value .....	'\$000	203	73	24	19	23	29
<b>EXPORTS</b>							
<b>Silver, refined</b>							
Mint bullion .....	kilogram	104 525	126 991	24 917	14 840	21 545	25 091
Value .....	'\$000	9 620	13 353	2 739	1 443	2 014	2 892
Refined, other .....	kilogram	7 696	7 504	3 455	1 061	818	1 667
Value .....	'\$000	405	449	195	103	97	194
Silver content of concentrate, matte, etc. exported .....	kilogram	152 846	133 714	26 720	54 533	38 530	41 394
Silver content of lead bullion exported .....	"	293 264	306 589	80 860	58 441	125 077	61 732

(a) Includes lead-silver ores.

# SULPHUR

	1974	1975*		1976*			
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
<b>Mine production</b>							
Pyrite concentrate (a)	tonne	224 928	224 423	49 411	60 928	49 404	53 188
Sulphur content	"	107 554	105 876	23 124	28 810	23 675	25 547
Sulphur content of minerals produced							
Lead concentrate	"	43 895	48 801	13 444	11 645	9 056	11 751
Lead-copper concentrate	"	6 622	5 299	1 113	1 535	1 550	1 329
Lead-zinc middlings	"	3 442	2 286	474	513	793	1 123
Pyrite concentrate	"	107 554	105 876	23 124	28 810	23 675	25 547
Zinc concentrate	"	249 875	275 769	73 828	69 638	56 833	66 288
New South Wales	"	193 957	214 337	59 185	51 698	39 984	52 283
Queensland	"	63 664	70 810	17 678	17 961	16 924	17 039
South Australia	"	—	—	—	—	—	—
Tasmania	"	—	—	—	—	—	—
Total contained sulphur	"	153 767	152 884	35 120	42 482	34 999	36 736
Sulphuric acid production	'000 tonnes	2 431	1 151	212	295	417	370
<b>IMPORTS</b>							
Sulphur, elemental	tonne	685 282	282 036	92 610	2 816	38 695	22 571
Canada	"	434 426	281 529	92 596	2 461	26 615	22 506
Iran	"	—	—	—	—	12 021	—
Mexico	"	54 041	—	—	—	—	—
U.S.A.	"	196 677	—	—	—	18	18
Other	"	137	507	14	355	41	45
Value	'000	14 451	7 534	2 052	88	1 459	937

(a) Gold content not recorded separately; included in gold content of gold bullion.

# TALC (a)

	1974	1975*		1976*			
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
<b>Mine production</b>							
New South Wales	tonne	79 837	81 354	20 525	22 783	24 408	28 853
South Australia	"	16 275	14 392	4 266	2 886	3 929	4 947
Western Australia	"	12 773	12 975	1 519	3 098	1 243	5 248
Other	"	50 789	53 987	14 740	16 799	19 236	18 658
<b>IMPORTS</b>							
Talc	tonne	1 606	947	284	52	138	94
China	"	1 051	651	251	—	101	—
India	"	55	—	—	—	—	—
U.S.A.	"	355	244	43	48	34	61
Other	"	145	53	—	5	4	32
Value	'000	101	72	26	9	12	19
<b>EXPORTS</b>							
Talc	tonne	56 334	45 457	7 370	15 500	17 491	18 592
Japan	"	35 898	28 529	4 036	9 433	10 300	13 790
Netherlands	"	18 703	12 163	3 000	2 665	5 029	3 897
Other	"	1 733	4 965	334	3 402	2 162	805
Value	'000	1 488	1 527	242	534	620	714

(a) Includes steatite, chlorite and pyrophyllite.

# TIN

	1974	1975*		1976*			
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
<b>Mine production</b>							
Minerals produced							
Copper-tin concentrate	tonne	2 670	2 728	722	709	768	677
Copper content	"	554	570	147	166	172	143
Tin content	"	71	75	21	15	21	19
Tin concentrate	"	20 074	17 359	3 989	3 809	4 304	6 630
Tin content	"	10 410	9 039	2 189	2 130	2 157	2 771
Production: States, tin content							
New South Wales	"	2 227	1 621	413	375	320	331
Victoria	"	5	—	—	—	—	—
Queensland	"	1 606	1 287	319	330	378	317
Western Australia	"	691	695	178	158	139	180
Tasmania	"	5 950	5 494	1 292	1 278	1 341	1 959
Northern Territory	"	2	17	8	4	—	3
Total contained tin	"	10 481	9 114	2 210	2 145	2 178	2 790
Smelter and refinery production							
Refined tin	"	6 714	5 254	1 414	1 389	1 187	1 396
<b>IMPORTS (a)</b>							
Refined tin	tonne	56	28	—	12	12	10
Value	'000	320	146	—	62	61	59
<b>EXPORTS (a)</b>							
Tin concentrate	tonne	9 619	11 370	1 879	1 716	1 754	2 012
Value	'000	21 145	19 767	3 980	3 603	2 886	3 800
Tin, unworked—							
Refined	tonne	2 342	2 438	647	572	646	483
Value	'000	8 829	12 173	3 303	2 857	3 188	2 771
Alloys	tonne	177	32	9	8	4	8
Value	'000	516	102	31	23	12	34
Tin content of all concentrates, slags, residues, etc. exported	tonne	4 413	4 539	819	964	747	782

(a) Production and overseas trade details for tinplate are shown on page 8.

# TITANIUM

	1974	1975*		1976*			
		1975*	September	December	March	June	
<b>PRODUCTION</b>							
<b>Mine production</b>							
Minerals produced							
Ilmenite concentrate	tonne	816 746	1 013 100	266 500	250 256	225 061	216 441
Titanium dioxide content	"	456 879	557 492	148 236	136 958	125 504	119 857
Leucocoxene concentrate	"	14 782	16 900	3 277	4 947	3 596	4 240
Titanium dioxide content	"	13 101	14 843	2 878	4 340	3 146	3 747
Rutile concentrate	"	318 702	344 035	84 254	93 019	86 620	96 292
Titanium dioxide content	"	305 675	330 166	80 946	89 284	83 220	92 487
Titanium dioxide content of minerals produced							
Titanium dioxide contained in:							
Ilmenite concentrate	"	456 879	557 492	148 236	136 958	125 504	119 857
Leucocoxene concentrate	"	13 101	14 843	2 878	4 340	3 146	3 747
Rutile concentrate	"	305 675	330 166	80 946	89 284	83 220	92 487
Total contained titanium dioxide	"	775 655	992 501	232 060	230 582	211 870	216 091
Production: States (titanium dioxide content)							
Ilmenite concentrate (a)	"	—	—	—	—	—	—
New South Wales	"	4 859	6 188	1 077	1 396	1 465	1 855
Queensland	"	23 590	15 915	640	9 228	5 046	7 663
South Australia	"	151	45	—	27	—	62
Western Australia	"	441 380	550 187	149 397	130 647	122 139	114 024
Total	"	469 860	572 335	151 114	141 298	128 650	123 604
Rutile concentrate							
New South Wales	"	159 463	165 890	40 035	44 933	33 522	41 866
Queensland	"	131 278	120 970	28 119	31 430	30 127	31 031
South Australia	"	311	85	—	—	—	34
Western Australia	"	10 484	37 561	11 272	11 150	17 489	18 219
Tasmania	"	4 139	5 670	1 520	1 771	2 082	1 337
Total	"	305 675	330 166	80 946	89 284	83 220	92 487

Continued over page

# TITANIUM (continued)

	1975*				1976*	
	1974	1975*	September	December	March	June
<b>IMPORTS</b>						
Titanium oxide—						
Anatase .....	tonne	21	28	8	—	18
Value .....	\$'000	18	25	9	1	14
Rutile .....	tonne	145	145	29	108	44
Value .....	\$'000	171	103	22	74	33
Titanium white pigment .....	tonne	558	76	21	6	11
Value .....	\$'000	393	91	22	10	13

	1975*						1976*	
	1974	1975*	September	December	March	June	1975*	1976*
<b>EXPORTS</b>								
Ilmenite concentrate (a) .....								
Brazil .....	tonne	750 091	545 031	145 772	129 009	165 775	206 902	—
France .....	tonne	35 880	27 619	—	13 869	—	14 033	—
Japan .....	tonne	141 628	117 082	42 034	22 482	15 418	48 028	—
U.K. ....	tonne	133 891	109 524	20 634	33 205	39 680	28 525	—
Other .....	tonne	198 765	133 545	53 971	39 610	42 371	28 679	—
U.S.A. ....	tonne	104 055	71 792	6 283	—	44 085	63 757	—
Value .....	\$'000	135 872	85 569	22 850	19 863	24 221	25 880	—
Rutile concentrate .....	tonne	10 078	8 053	1 922	1 695	3 042	3 244	—
Canada .....	tonne	344 539	319 301	75 688	77 587	92 995	93 072	—
Japan .....	tonne	3 414	1 007	108	71	180	120	—
Netherlands .....	tonne	23 851	20 300	3 349	8 803	613	3 497	—
U.K. ....	tonne	28 889	19 134	6 006	5 905	10 142	11 192	—
U.S.A. ....	tonne	56 694	44 794	1 090	10 782	23 388	20 638	—
Other .....	tonne	157 183	167 395	53 198	34 028	34 254	42 148	—
Value .....	\$'000	74 708	66 671	11 937	20 008	24 308	15 477	—
Value .....	\$'000	48 239	60 136	12 650	15 535	17 184	20 379	—

(a) Includes leucosene concentrate

# TUNGSTEN

	1975*				1976*	
	1974	1975*	September	December	March	June
<b>PRODUCTION</b>						
Mine production						
Minerals produced						
Scheelite concentrate .....	tonne	1 588	2 121	500	618	562
Tungstic oxide (WO <sub>3</sub> ) content .....	unit	114 400	154 713	36 686	45 145	40 626
Wolfram concentrate .....	tonne	399	538	141	143	148
Tungstic oxide (WO <sub>3</sub> ) content .....	unit	27 478	38 561	10 099	10 154	10 496
Tungstic oxide (WO <sub>3</sub> ) content of minerals produced .....	unit	—	—	—	—	—
Scheelite concentrate .....	unit	—	—	—	—	—
Tasmania .....	unit	114 400	154 713	36 686	45 145	40 626
Total contained in scheelite .....	unit	114 400	154 713	36 686	45 145	40 626
Wolfram concentrate .....	unit	—	—	—	—	—
New South Wales .....	unit	147	—	—	—	—
Queensland .....	unit	11 295	16 672	3 829	5 610	5 731
Tasmania .....	unit	16 000	21 889	6 270	4 344	4 765
Northern Territory .....	unit	36	—	—	—	—
Total contained in wolfram .....	unit	27 478	38 561	10 099	10 154	10 496
Total contained in tungsten minerals .....	unit	141 878	193 274	46 785	55 299	51 122

## EXPORTS

Scheelite concentrate .....	tonne	1 538	2 201	652	527	582
Value .....	\$'000	4 663	11 768	3 390	2 942	3 062
Wolfram concentrate .....	tonne	863	575	198	133	44
Value .....	\$'000	1 218	2 641	856	609	194
Tungstic oxide (WO <sub>3</sub> ) content of concentrates exported .....	unit	130 234	196 181	59 815	46 524	41 347
In scheelite concentrate .....	unit	106 676	155 090	45 702	37 108	38 554
In wolfram concentrate .....	unit	23 558	41 091	14 113	9 416	2 793

# ZINC

	1975*				1976*	
	1974	1975*	September	December	March	June
<b>PRODUCTION</b>						
Mine production						
Minerals produced						
Zinc ore(a) .....	tonne	25 603	36 184	—	9 979	—
Zinc content .....	tonne	9 217	14 305	—	3 892	—
Lead content .....	tonne	512	—	—	—	—
Zinc concentrate .....	tonne	793 118	870 270	231 971	217 121	177 003
Zinc content .....	tonne	412 157	451 810	120 182	115 187	91 371
Lead content .....	tonne	14 731	17 416	4 532	4 866	3 914
Silver content .....	tonne	58 372	65 195	16 265	18 213	14 814
Gold content .....	tonne	176	190	56	58	43
Cadmium content .....	tonne	1 374	1 543	419	386	318
Cobalt content .....	tonne	100	111	32	27	20
Copper content .....	tonne	1 234	1 188	329	299	268
Manganese content .....	tonne	5 486	6 012	1 582	1 503	1 163
Sulphur content .....	tonne	249 875	275 789	73 828	69 638	56 833
Zinc content of minerals produced .....	tonne	1 838	1 795	457	357	420
Copper concentrate .....	tonne	27 335	29 913	7 223	7 447	7 255
Lead concentrate .....	tonne	2 796	2 096	485	533	442
Lead-zinc middlings .....	tonne	3 716	2 711	580	546	986
Zinc ore .....	tonne	9 217	14 305	—	3 892	—
Zinc concentrate .....	tonne	412 157	451 810	120 182	115 187	91 371
New South Wales .....	tonne	263 249	288 109	77 859	68 623	52 965
Queensland .....	tonne	119 282	132 740	33 288	36 154	32 445
South Australia .....	tonne	9 217	14 305	—	3 892	—
Tasmania .....	tonne	63 311	67 476	17 780	19 285	15 064
Total contained zinc .....	tonne	457 059	502 630	128 927	127 784	100 474
Smelter and refinery production						
Refined zinc .....	tonne	276 831	193 335	46 557	52 196	49 443

## EXPORTS

Zinc concentrate .....	tonne	413 452	341 715	69 467	113 187	135 509
Belgium-Luxembourg .....	tonne	54 918	31 833	13 753	—	50 804
Japan .....	tonne	222 650	155 515	31 466	69 095	14 095
Netherlands .....	tonne	40 195	119 588	24 221	34 270	52 975
Norway .....	tonne	12 588	9 729	—	—	—
U.K. ....	tonne	55 861	14 681	—	14	126
Value .....	\$'000	27 240	10 369	27	79	17 509
Other .....	\$'000	54 678	51 423	10 386	16 809	19 243
Refinery-type shapes .....	tonne	161 560	117 693	27 631	35 647	28 112
India .....	tonne	22 308	7 082	3 039	41	2 032
Indonesia .....	tonne	12 785	15 461	4 635	5 420	4 305
New Zealand .....	tonne	18 800	14 761	740	4 178	4 829
Taiwan .....	tonne	11 219	8 555	1 332	2 204	2 046
Thailand .....	tonne	15 157	11 619	3 997	4 135	3 010
U.K. ....	tonne	14 099	18 232	3 838	2 912	3 680
U.S.A. ....	tonne	38 290	19 021	3 666	5 230	7 605
Other .....	tonne	27 922	23 082	6 382	9 629	5 249
Value .....	\$'000	84 814	65 550	15 378	19 701	17 574
Plates, circles and strips .....	tonne	576	441	112	79	36
Value .....	\$'000	388	459	161	119	51
Slags and residues .....	tonne	5 483	5 552	1 633	1 240	1 062
Value .....	\$'000	1 850	1 565	441	356	289
Zinc content of ores and concentrates, slags, residues, etc. exported .....	tonne	224 642	189 301	39 063	62 876	72 383

(a) Data available only on a six-monthly basis.

# ZIRCONIUM

	1974	1975*		1976*		
		September	December	March	June	
<b>PRODUCTION</b>						
<b>Mine production</b>						
Minerals produced						
Zircon concentrate	367 772	382 190	95 351	98 665	90 499	100 188
Zircon content	362 143	376 493	93 887	97 316	89 273	97 972
Production: States, zircon content						
New South Wales	163 192	174 014	42 515	43 954	36 450	40 640
Queensland	121 368	102 095	20 411	28 520	23 634	26 456
South Australia	140	57	—	19	—	25
Western Australia	72 039	92 061	28 497	22 901	27 416	29 173
Tasmania	5 404	8 266	2 464	1 922	1 773	1 678
<b>Total contained zircon</b>	<b>362 143</b>	<b>376 493</b>	<b>93 887</b>	<b>97 316</b>	<b>89 273</b>	<b>97 972</b>

	1974	1975*		1976*		
		September	December	March	June	
<b>EXPORTS</b>						
Zircon concentrate	388 533	302 057	49 796	70 938	74 572	93 806
Belgium-Luxembourg	5 692	4 627	70	3 799	3 273	36
Canada	2 323	445	30	—	462	1 675
France	32 225	41 215	5 682	19 526	767	3 586
Italy	37 584	30 880	6 099	4 626	8 437	11 990
Japan	157 061	99 833	15 357	19 794	23 181	29 671
Netherlands	28 511	16 383	2 174	2 547	6 307	7 701
U.K.	26 728	23 550	1 301	8 215	4 959	667
U.S.A.	47 594	40 616	12 632	1 819	7 008	25 778
Other	50 815	44 308	6 451	10 613	20 178	12 702
Value	\$ 32 566	\$ 57 252	\$ 9 748	\$ 12 402	\$ 12 688	\$ 15 415

# MINOR MINERALS

	1974	1975*		1976*		
		September	December	March	June	
<b>BARITE</b>						
Mine production	7 466	7 475	2 786	1 259	709	6 573
Imports (including wilherite)	5 270	947	100	105	305	105
Value	\$ 271	\$ 50	\$ 5	\$ 6	\$ 15	\$ 7
Exports	1 808	13 957	2 148	10 162	2 347	1 238
Value	\$ 129	\$ 721	\$ 127	\$ 492	\$ 81	\$ 79

	1974	1975*		1976*		
		September	December	March	June	
<b>BERYLLIUM</b>						
Mine production	79	—	—	—	—	—
BeO content	931	—	—	—	—	—
Exports	260	—	—	—	—	—
Value	\$ 65	—	—	—	—	—

	1974	1975*		1976*		
		September	December	March	June	
<b>BISMUTH</b>						
<b>Mine production</b>						
Bismuth concentrate	2 671	1 678	499	205	161	291
Bismuth content	391 000	218 300	56 400	25 000	20 100	43 500
Gold content	955	536	203	97	45	121
Copper content	359	170	50	23	18	35
Selenium content	3 000	—	—	—	—	—
Silver content	257	268	69	29	25	44
Bismuth content of minerals produced	391 000	218 300	56 400	25 000	20 100	43 500
Bismuth concentrate	778 700	626 400	227 100	102 100	190 200	195 500
Copper concentrate	—	9 000	—	—	—	—
Lead concentrate	—	—	—	9 000	—	—
<b>Total contained bismuth</b>	<b>1 169 700</b>	<b>853 700</b>	<b>283 500</b>	<b>136 100</b>	<b>210 300</b>	<b>239 000</b>
<b>Imports</b>						
Bismuth metal	21 605	4 948	1	1 422	1 000	3 275
Value	\$ 487	\$ 68	\$ —	\$ 15	\$ 10	\$ 36

# MINOR MINERALS

	1974	1975*		1976*		
		September	December	March	June	
<b>CLAYS</b>						
<b>Mine production</b>						
Brick clay and shale	8 727	7 302	1 951	2 055	1 797	2 124
<b>Imports</b>						
Andalucite, Mullite, Dinas Earth, Kyanite and Sillimanite	(a)	1 612	86	110	1 030	42
Bentonite and bentonitic clay	85 363	54 736	40 260	10 986	1 009	11 477
Value	\$ 1 649	\$ 1 142	\$ 682	\$ 280	\$ 59	\$ 295
Clay, ball	1 041	3 297	2 752	109	2 651	107
Value	\$ 43	\$ 140	\$ 110	\$ 6	\$ 105	\$ 5
Clays and earths, activated	2 948	2 208	345	383	742	832
Value	\$ 381	\$ 215	\$ 36	\$ 38	\$ 78	\$ 100
Clay, white	25 162	—	—	—	—	—
Value	\$ 502	—	—	—	—	—
China clay, incl. kaolin	11 333	2 275	556	1 223	176	3 542
Value	\$ 483	\$ 247	\$ 92	\$ 127	\$ 14	\$ 168
Fireclay	4 860	4 375	3 072	43	2 138	41
Value	\$ 106	\$ 160	\$ 116	\$ 4	\$ 86	\$ 4
Clays, n.e.i.	25 616	25 042	4 689	2 987	5 646	3 269
Value	\$ 1 207	\$ 1 140	\$ 231	\$ 202	\$ 321	\$ 200
<b>Exports</b>						
Clays (except activated)	6 247	6 849	1 765	1 504	1 257	1 336
Value	\$ 278	\$ 294	\$ 70	\$ 79	\$ 58	\$ 58

	1974	1975*		1976*		
		September	December	March	June	
<b>COBALT</b>						
<b>Mine production</b>						
Cobalt content of minerals produced						
Nickel ore	201	1 432	370	346	517	565
Nickel concentrate	777	1 057	280	286	256	234
Zinc concentrate	100	111	32	27	20	27
<b>Total contained cobalt</b>	<b>1 078</b>	<b>2 600</b>	<b>682</b>	<b>659</b>	<b>793</b>	<b>826</b>
<b>Imports</b>						
Cobalt oxide and hydroxide	94	6	—	—	11	10
Value	\$ 500	\$ 40	\$ 1	\$ 2	\$ 82	\$ 66
Cobalt and cobalt base metal alloys (excl. powder)	26	5	1	2	6	4
Value	\$ 140	\$ 40	\$ 9	\$ 14	\$ 46	\$ —

	1974	1975*		1976*		
		September	December	March	June	
<b>CRYOLITE, NATURAL</b>						
Imports (including chiolite)	270	134	47	31	64	42
Value	\$ 76	\$ 50	\$ 22	\$ 11	\$ 23	\$ 14

	1974	1975*		1976*		
		September	December	March	June	
<b>DIAMONDS, INDUSTRIAL</b>						
Imports	1 199 805	619 315	218 517	157 044	155 183	78 053
Value	\$ 4 285	\$ 3 403	\$ 1 058	\$ 788	\$ 548	\$ 459
Exports (b)	209 766	178 159	38 502	46 394	48 783	41 851
Value	\$ 1 037	\$ 998	\$ 220	\$ 244	\$ 244	\$ 295

	1974	1975*		1976*		
		September	December	March	June	
<b>DIATOMITE</b>						
Mine production	7 438	4 806	266	156	268	397
Imports	13 316	8 468	1 793	2 074	1 844	2 476
Value	\$ 1 130	\$ 849	\$ 203	\$ 217	\$ 180	\$ 251

	1974	1975*		1976*		
		September	December	March	June	
<b>DOLOMITE</b>						
Mine production	409 206	438 330	90 516	140 216	103 245	169 660

(a) Not available. (b) Excludes powder and dust

# MINOR MINERALS

	1974	1975*		1976*			
		1974	1975*	September	December	March	June
<b>FELSPAR</b>							
Mine production .....	tonne	4 145	3 029	453	977	187	2 485
<b>FLUORSPAR</b>							
Mine production .....	tonne	238	—	—	—	—	—
Imports .....	tonne	29 076	20 042	250	9 157	7 233	8 234
Value .....	\$'000	1 327	901	25	418	267	499
<b>LITHIUM</b>							
Mine production .....	tonne	1	—	—	—	—	—
Lithium ore .....	tonne	1	—	—	—	—	—
Li <sub>2</sub> O content .....	unit	420	—	—	—	—	—
<b>MERCURY</b>							
Refinery production .....	kilogram	71	210	65	127	110	30
Imports .....	tonne	47 702	55 616	16 759	19 032	12 093	13 155
Algeria .....	tonne	3 450	—	—	—	—	—
China .....	tonne	16 218	18 458	5 175	—	7 248	12 075
Mexico .....	tonne	2 720	—	—	—	—	—
Philippines .....	tonne	8 624	—	—	—	—	—
Spain .....	tonne	8 969	23 204	1 573	16 387	345	—
U.S.A. .....	tonne	3	1	—	—	—	—
U.S.S.R. ....	tonne	7 590	8 267	5 000	2 587	4 485	1 070
Other .....	tonne	130	5 686	5 011	57	17	10
Value .....	\$'000	260	192	47	50	31	28

<b>MICA</b>							
<b>Imports</b>							
Slab, block or sheet .....	tonne	7	5	—	1	—	—
Value .....	\$'000	32	21	2	8	2	4
Splittings (not cut or stamped) .....	tonne	53	92	24	23	—	14
Value .....	\$'000	48	49	14	13	—	10
Ground or pulverised .....	tonne	453	340	44	11	8	6
Value .....	\$'000	64	—	—	—	—	—
Other .....	tonne	588	135	50	50	88	72
Value .....	\$'000	39	18	6	8	16	8

<b>PEAT</b>							
Mine production .....	tonne	2 240	2 671	221	748	208	360
Imports .....	tonne	4 856	6 709	3 653	953	1 358	2 325
Value .....	\$'000	272	410	125	101	108	107

## PLATINUM and PLATINUM GROUP METALS

<b>Imports</b>							
Ingot, blocks, plgs, etc. ....	kilogram	1 302	1 256	787	120	188	245
Value .....	\$'000	2 112	1 751	542	495	596	719
Powder .....	kilogram	17	75	41	27	11	—
Value .....	\$'000	133	34	7	27	42	3
Wire .....	kilogram	120	80	7	10	21	16
Value .....	\$'000	329	270	31	34	94	74

## POTASSIUM

<b>Imports</b>							
Potassium chloride (fertilizer grade) .....	tonne	172 433	177 980	37 332	32 148	12 301	18 761
Value .....	\$'000	5 750	9 546	2 360	2 007	704	1 031
Potassium sulphate (fertilizer grade) .....	tonne	8 618	9 594	2 610	494	5 553	772
Value .....	\$'000	480	935	303	53	622	153

## TANTALUM AND COLUMBIUM (a)

<b>Exports</b>							
Tantalite-columbite concentrate .....	tonne	128	132	46	26	49	14
Value .....	\$'000	853	1 035	421	191	567	179

(a) Details of mine production are not available for publication.

# Summary Tables

## MINE PRODUCTION OF PRINCIPAL MINERALS: AUSTRALIA

Mineral	Unit of Quantity	1974	1975*		1976*		
			December	March	June	September	
Bauxite .....	'000 tonnes	19 994	20 958	4 597	5 606	5 984	6 246
Black coal .....	tonne	63 033	66 939	19 188	17 451	19 564	18 674
Brown coal .....	tonne	27 303	28 177	6 756	7 167	7 743	8 554
Copper (a) .....	tonne	251 340	218 683	52 533	56 949	52 129	54 277
Gold (a) .....	kilogram	15 944	16 328	5 031	4 241	3 767	4 049
Iron ore and concentrate (b) .....	'000 tonnes	96 950	97 853	23 008	22 431	21 604	25 051
Lead (a) .....	tonne	375 304	407 169	99 139	86 866	99 096	113 542
Manganese ore, metallurgical .....	tonne	1 521 989	1 554 909	305 053	467 255	613 164	494 995
Nickel (a) .....	tonne	45 981	75 794	19 965	20 803	20 151	22 149
Petroleum—							
Crude oil .....	'000 cu. metres	22 403	23 829	6 101	5 942	6 108	6 532
Natural gas .....	'000 cu. metres	4 512	5 026	1 246	1 183	1 541	1 728
Silver (a) .....	kilogram	669 954	729 350	184 618	168 745	175 929	228 519
Tin (a) .....	tonne	10 481	9 114	2 145	2 178	2 790	2 745
Titanium—							
Ilmenite concentrate (c) .....	tonne	816 746	1 013 100	250 256	225 061	216 441	274 001
Rutile concentrate .....	tonne	318 702	344 035	93 019	86 620	96 292	89 550
Tungstic concentrate (d) .....	unit	141 878	193 274	55 299	51 122	64 361	62 464
Zinc (a) .....	tonne	457 059	502 630	127 764	100 474	123 367	126 050
Zircon concentrate .....	tonne	367 772	382 190	88 665	90 499	100 188	115 842

(a) Total metallic content of minerals produced. (b) Excludes iron oxide not intended for metal extraction. (c) Excludes leucoxene. (d) Tungstic oxide content.

## SMELTER AND REFINERY PRODUCTION OF PRINCIPAL METALS: AUSTRALIA

Mineral	Unit of Quantity	1974	1975*		1976*		
			December	March	June	September	
Alumina .....	tonne	4 899 489	5 127 162	1 403 562	1 350 292	1 566 731	1 658 861
Aluminium (refined) .....	tonne	219 089	214 191	53 282	55 362	57 711	59 428
Cadmium (refined) .....	tonne	720	552	137	97	157	203
Copper (blister) (a) .....	tonne	196 129	179 942	43 394	42 086	42 740	41 191
Copper (refined) .....	tonne	162 461	165 341	40 487	44 982	38 629	41 829
Gold (refined) (b)—							
Australian origin .....	kilogram	10 190	12 057	3 254	n.a.	n.a.	n.a.
Total .....	tonne	12 935	14 982	4 033	n.a.	n.a.	n.a.
Lead—							
Refined (c) .....	tonne	192 757	159 793	43 150	39 841	44 463	51 403
Lead content of lead bullion for export .....	tonne	144 203	151 520	35 589	36 937	41 166	45 184
Pig iron .....	'000 tonnes	7 250	7 476	1 751	1 928	1 960	1 910
Raw steel (d) .....	tonne	7 755	7 845	1 913	1 961	2 039	1 960
Silver (refined) .....	kilogram	256 475	267 548	61 145	51 026	51 303	64 482
Tin (refined) .....	tonne	6 714	5 254	1 389	1 167	1 398	1 668
Zinc (refined) .....	tonne	276 831	193 335	52 196	49 443	57 338	70 614

(a) Total production for refining in Australia and overseas. (b) Newly-won gold. (c) Includes lead content of lead alloys from primary sources. (d) Includes recovery from scrap.

Note: Particulates of crude oil and natural gas were collected by Petroleum Branch, Department of National Resources and refined aluminium, cadmium, copper, lead, nickel, silver, tin and zinc were collected by the Bureau of Mineral Resources.