

THE MINERAL INDUSTRY OF

AUSTRALIA

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Australia was estimated to be the third largest producer of minerals and metals, excluding coal and petroleum, in the world, and its minerals industry was a leading catalyst in promoting the growth of the economy. The country's 1999 gross domestic product (GDP) was \$390 billion (Bureau of East Asian Affairs, October 2000, Australia—Background notes, accessed November 2, 2000, at URL http://www.state.gov/www/background_notes/australia_0010_b_gn.html). The minerals industry, which included exploration, mining, and mineral processing, represented about 6.6% of the Australian economy (Resource Information Unit, 2000, p. 4). The real growth rate of the GDP for 1999 was 3.9% (U.S. Energy Information Administration, April 2000, Australia, accessed November 1, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/australi.html>).

In 1999, Australia was the world's leading producer of alumina, bauxite, chrysoprase, diamond, ilmenite, mined lead, monazite, opal, rutile, sapphire, mined zinc, and zircon; the second largest producer of uranium; the third largest producer of gold, iron ore, and nickel ore; the fourth largest producer of copper and silver; and the fifth largest producer of aluminum and coal. Australia was the premier exporter of alumina, coal, ilmenite, iron ore, refined lead, rutile, and zircon. The country's mineral wealth was so extraordinary that it was virtually self-sufficient in most mineral commodities. The only significant mineral resource in which Australia was not self-sufficient was petroleum. Australia nevertheless produced 80% to 85% of its annual crude oil requirements. The country also was endowed with abundant resources of other mineral fuels, which included coal, natural gas, and uranium, and continued to be one of the few market economy countries that was a net exporter of mineral fuels in 1999.

Expenditures for mineral exploration programs continued to decline in 1999, the last quarter of which represented the 10th consecutive quarterly decline, with only about \$112.2 million spent for mineral exploration. This was the lowest expenditure since the second quarter of 1993. Total exploration spending in 1999 was \$481.1 million. This was down a formidable 23% from that of 1998 (Resource Information Unit, 2000, p. 18). By yearend 1999, 172 of the 250 recognized mineral exploration companies operating in mid-1998 had closed down (Mining Annual Review, 2000).

Government Policies and Programs

Australia has not had a retail sales tax, although the Commonwealth [Federal] Government has, instead, levied a wholesale tax at either the manufacturer or wholesaler level

that was passed along to the consumer as part of the retail price. In 1999, the Commonwealth Government passed new legislation for a goods and services tax (GST) of 10% to replace the wholesale sales tax effective July 1, 2000. The GST will be levied at 10% of the value added at each point in the production and distribution chain for all goods and services including imports, with some exceptions (U.S. Department of State, July 1999, FY 2000 country commercial guide: Australia, p. 87, accessed November 1, 2000, at URL http://www.state.gov/www/about_state/business/com_guides/2000/eap/australia_CCG2000.pdf).

Environmental Issues

Although less than 0.02% of Australia's land surface has been affected by mining activities, care and maintenance of the environment was a prominent and recurrent concern of the Commonwealth and state governments. Mining companies must provide a program for care and management of the environment, which includes subsequent rehabilitation, prior to being granted permission to mine (Journal of Mines, Metals, and Fuels, 1997).

In energy commodities, coal, natural gas, and petroleum were a major source of export earnings in Australia, and development of these resources in a sustainable manner was a primary policy goal of the country's leadership. The Government also realizes what the cost-effectiveness of reducing the environmental impacts of the energy sector and improving end-use efficiency in the various economic sectors remains a key element in Australia's sustainable energy policy, as does the use of renewable energy sources (U.S. Energy Information Administration, April 2000, Australia, accessed November 1, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/australi.html>).

Production

Of the approximate \$26.4 billion in mineral and energy production in 1999, metallic minerals contributed an estimated 40%; petroleum and natural gas, 30%; coal and peat, 25%; and industrial minerals, 5%. Australian mine production statistics for various commodities from 1995 through 1999 are presented in table 1.

In 1999, mining, refining, and smelting produced more than 48,400, 14,500, and 1,700 metric tons (t) of bauxite, alumina, and primary aluminum, respectively. Australia's mine production of contained copper in 1999 was 735,000 t, with the 21% increase compared with that of 1998 mainly attributable to

the rise in production from WMC Ltd.'s Olympic Dam Mine at Roxby Downs Station, 80 kilometers (km) north of Woomera, South Australia. Gold production in 1999 decreased by slightly less than 3% to 301 t. Western Australia remained the dominant producer with about 71% (213 t) of Australia's output, which was the same percentage as that of 1998, although total production was about 9% lower. Iron ore production was 154.3 million metric tons (Mt) in 1999 compared with 155.7 Mt in 1998. Of total production, 96.0% was from Western Australia's Pilbara region. Australian production of manganese ore, predominantly from Groote Eylandt in the Northern Territory, was about 1.9 Mt, with a manganese content of about 47.4%. Australia produced about 2.0 Mt of ilmenite, 190,000 t of rutile, and 375,000 t of zirconium concentrates from its mineral sands mining operations. In 1999, Western Australia produced all Australia's mined nickel, 126,000 t contained in about 700,000 t of nickel concentrates. Sons of Gwalia Ltd., which was the world's largest producer of tantalum in the form of tantalum concentrates and controlled the world's largest stock of tantalum resources, produced 336 t of tantalum oxide (Ta_2O_5) from its Greenbushes operation and a further 85 t from its Wodgina Mine, both in Western Australia. In 1999, Production of uranium oxide (U_3O_8) reached a record-high 7,055 t, which was 5,983 t of uranium at 0.848 t of uranium per metric ton of U_3O_8 . All uranium oxide production was from from the Ranger Mine in the Alligator Rivers region of the Northern Territory and the Olympic Dam Mine in South Australia. In 1999, mine production of lead, silver, and zinc was 68,000 t, 1,700 t, and 1.16 Mt, respectively. Production was mainly from mines at Cannington, Century, George Fisher, Hilton, and Mount Isa in Queensland; McArthur River in the Northern Territory; Broken Hill and Elura in New South Wales; Hellyer and Rosebery in Tasmania; and the Gossan Hill, Lennard Shelf, and Scuddles deposits in Western Australia. Australia's gold mines also continued to be a significant contributor of silver to total production (Australian Geological Survey Organization, 2000a, p. 10, 14, 17, 20-21, 25, 28, 31, 33, 39).

Production of diamond in 1999 (gem, near gem, and industrial) was about 30.8 million carats, which was a decrease of 10 million carats compared with that of 1998. The decrease was attributed to the increased waste-to-ore ratio associated with expansion of the Argyle open pit in Western Australia. Sons of Gwalia's Greenbushes Mine was the world's largest producer of lithium minerals, predominantly spodumene used in the production of specialty glasses, ceramics, ceramic glazes, and glass bottles and as feedstock for the production of lithium carbonate for the chemical industry.

Production of spodumene concentrate in 1999 (75,800 t) was about 20% higher compared with that of 1998, but sales decreased by about 21% owing to a significant oversupply in world markets. Although magnesite deposits occur throughout Australia, it was mined substantially only at Queensland's Kunwarara Mine. About 2.4 Mt of crude magnesite ore was mined and beneficiated to produce 280,500 t of magnesite. This was, in turn, was used to produce 89,900 t of deadburned magnesia, 37,200 t of calcined magnesia, and 19,900 t of

electrofused magnesia for use in manufacturing high-quality refractory bricks for lining heat-containment vessels in the cement, chemical, nonferrous metals, and steel industries.

Australia's commercial resources of phosphate were at Phosphate Hill, which is 150 km south of Mount Isa, Queensland. The phosphate rock was first mined in late 1999 to produce diammonium phosphate fertilizer. About 5,000 t of phosphate rock was mined from small deposits in South Australia in 1999, but owing to its high aluminum and iron content, it was suitable only as a direct-application fertilizer or for making organic fertilizer for horticultural applications (Australian Geological Survey Organization, 2000a, p. 15, 22-24, 29-30).

In 1999, Australia produced 294 Mt of raw black coal, which was a 3% increase compared with that of 1998, and yielded 231 Mt of salable coal compared with 225 Mt in 1998. More than 70% of the country's black coal production was from open cut mines, predominantly in Queensland and New South Wales. Brown coal production also increased by about 3% in 1999 compared with that of 1998; the La Trobe Valley in South Australia produced about 98.5% of the total (Australian Geological Survey Organization, 2000a, p. 12-13). Production of crude petroleum in 1999 increased to 621,000 barrels per day (bbl/d) from 619,000 bbl/d in 1998 (Energy Information Administration, April 2000, Australia, accessed November 1, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/australi.html>).

Trade

To bolster economic growth, Australia continued to rely heavily on the export of the majority of its mineral production. Most of the mineral export value, however, was concentrated in just four commodity groups, coal, gold, iron ore, and alumina-aluminum-bauxite in descending order. The mineral industry remained Australia's largest commodity export earner, accounting for an estimated 60% of the total. An estimated 80% of Australia's mineral production was exported. Australia remained the premier exporter of alumina, bauxite, coal, diamond (gem, near gem, and natural industrial), ilmenite, iron ore, refined lead, rutile, and zircon.

Structure of the Mineral Industry

The Australian mineral industry included nearly the entire breadth of economic minerals—major industrial minerals (ilmenite, rutile, and zircon), base metals (copper, lead, and zinc), ferrous metals (iron ore, manganese, and nickel), nonferrous metals (aluminum and tin), precious metals (gold and silver), fuel minerals (coal, petroleum, and uranium), and gemstones (diamond, opal, and sapphire). Australia was one of the world's principal producers and suppliers of ores, concentrates, and refined metals. It was estimated to rank third in the world in the value of nonfuel mineral production and eighth in the value of mineral production including fuels.

The Australian mining industry was based on a system of free enterprise in which private companies were involved in exploration, mine development, production, mineral processing, and marketing. A number of companies in

Australian mineral ventures were affiliates or subsidiaries of U.S. companies. Foreign companies controlled a large part of the mining, smelting, and refining sectors and a significant portion of the petroleum and natural gas sectors.

Many of the mineral industries were fully integrated and produced ores, concentrates, or other intermediate products (e.g., alumina) and refined metal or other end products (e.g., cut and polished gem diamond). In 1999, Australia had six alumina refineries and six aluminum smelters; three principal copper smelters and three principal refineries; one principal gold refinery; four principal lead-zinc smelters and/or refineries; one manganese ferroalloy plant; one nickel smelter and two nickel refineries; three principal crude steel plants; one primary tin smelter, one tin refinery, and two secondary tin refineries; two silver refineries; and nine petroleum refineries.

Ownership of the mineral rights in Australia generally was vested in the Crown (i.e., the government of the relevant State or Territory) or the Commonwealth Government for Commonwealth lands and waters, regardless of ownership or tenure of the surface (Journal of Mines, Metals, and Fuels, 1997). Mineral ownership was divided between State ownership in State onshore areas and Commonwealth ownership in Territories and in offshore areas beyond Australia's 4.8-km (3-mile) territorial limit. The Commonwealth's responsibility for minerals, except for uranium, in the Northern Territory was, however, transferred to the government of the Northern Territory. Thus, the individual States and Territories administered the mineral industries within their own borders, which included registering land titles; issuing exploration and development permits; overseeing mining operations, which included administration of inspections; assuring compliance with health, safety, and environmental regulations; and levying royalties and taxes.

The Commonwealth may restrict mineral exports for the good of the country and, therefore, has de facto control over most mineral production (table 1).

Commodity Review

Metals

Bauxite, Alumina, and Aluminum.—For the 29th consecutive year, Australia was the world's dominant bauxite producer. In 1999, production was from the open cut operations at Weipa-Andoom on the western flank of the Cape York Peninsula in the far north of Queensland; the Gove open cut, which included the nearby aboriginal-owned Rocky Bay ore body, across the Gulf of Carpentaria in northeastern Arnhem Land, Northern Territory; and the surface mines in the Darling Range south of Perth, Western Australia, which included Huntly, Willowdale, and Worsley. Substantial bauxite deposits also border Admiralty Gulf at Cape Bougainville and are in the nearby Mitchell Plateau area of the Kimberley region of northern Western Australia, but their remoteness from energy supplies and infrastructure has prevented their development. Australia was dominant in alumina production in 1999, with output coming from six refineries, four in Western Australia and one each in the Northern Territory and

Queensland. In 1999, Australia accounted for one-third of the global alumina and bauxite production. Ranking third in the world in 1999, Australia also was a significant producer of aluminum. Only about 20% of the alumina manufactured in the country was smelted into aluminum metal. Aluminum was produced at six smelters, two each in New South Wales and Victoria and one each in Queensland and Tasmania.

In midyear 1999, Alcoa World Alumina Australia, which was the trading name of the unlisted public company Alcoa of Australia Ltd., completed the 440,000-t expansion of its Wagerup alumina refinery in Western Australia. The \$170 million expansion increased the refinery's capacity to 2.19 million metric tons per year (Mt/yr) (Resource Information Unit, 2000, p. 47).

At yearend, the \$528 million expansion from 1.7 Mt/yr to 3.1 Mt/yr of the Worsley alumina refinery managed by Worsley Alumina Pty. Ltd. that began in late 1997 was well advanced and was expected to be completed by mid-2000 (Resource Information Unit, 2000, p. 47).

Cobalt.—Australia's biggest cobalt producers were Preston Resources Ltd. (Bulong nickel-cobalt mine), Centaur Mining and Exploration Ltd. (Cawse nickel-cobalt mine), and Anaconda Nickel Ltd. (Murrin Murrin nickel-cobalt mine). In May, Preston Resources produced its first cobalt metal from Bulong, 30 km east of Kalgoorlie in Western Australia. Peak cobalt production, scheduled to be achieved in 2002, was to be 900 metric tons per year (t/yr) of high-grade cobalt metal (Resource Information Unit, 2000, p. 349). Treatment was by pressure acid leaching and solvent extraction/electrowinning techniques, more commonly associated with the copper industry.

Copper.—In 1999, Australia ranked as the fourth largest producer of mined copper in the world following Chile, the United States, and Indonesia (World Bureau of Metal Statistics, 2000, p. 37). Copper in Australia was produced from several major copper mines and a considerable number of smaller mines, some of which were gold-copper operations.

The largest copper mine was WMC's Olympic Dam Mine with a production capacity in excess of 200,000 t/yr. This was followed in size by MIM Holdings Ltd.'s Mount Isa and Ernest Henry Mines in Queensland with capacities of 180,000 t/yr and 95,000 t/yr, respectively. Other noteworthy copper mines included Western Metals Ltd.'s Mount Gordon Mine (50,000-t/yr capacity) and Placer Pacific Ltd.'s Osborne Mine (40,000 t/yr) in Queensland and North Ltd.'s Northparkes Mine (55,000 t/yr) in New South Wales.

Major copper refineries included WMC's Olympic Dam (200,000 t/yr), MIM's Townsville (270,000 t/yr), the refurbished Port Kembla facility owned by a consortium of Japanese companies (120,000 t/yr), and Western Metals' Mount Gordon plant (50,000 t/yr).

The Cobar Mine in New South Wales, which was owned by Glencore International AG of Switzerland, recommenced production in May following a feasibility study based on a 550,000-t/yr, 5-year mine life completed in February. The mine had been closed since August 1997.

In late 1999, a massive air blast that reverberated through the underground workings at the Northparkes Mine claimed four lives. Following the accident, the mill continued to treat stockpile open pit sulfide ore. Although structural damage to the operation was minimal, the underground mine remained closed until late January 2000 (Resource Information Unit, 2000, p. 83).

MIM's Mount Isa mining and processing complex, which included the Enterprise and the George Fisher ore bodies, was Australia's largest areal underground mine. The underground copper mine, which is adjacent to the original lead-zinc-silver mine, has been operating for more than 60 years. George Fisher was to be a replacement ore source for the Mount Isa lead-zinc-silver ore body, which was expected to be depleted around 2000. Development at George Fisher began in 1998, and the first mine stope began producing in December 1999 (Resource Information Unit, 2000, p. 91).

MIM's Townsville copper refinery was expanded, its capacity increasing to 270,000 t/yr from 260,000 t/yr, and modernized to match the increased anode output from the Mount Isa copper smelter.

Site works for the Olympic Dam underground mine, processing plant, and smelter expansions that began in January 1997 were completed in 1999. The expansion included an automated electric rail haulage system, a new crusher station, a new 275-kilovolt powerline from Port Augusta to Roxby Downs, a new semiautogenous grinding (SAG) mill, a new smelter, an enlarged hydrometallurgical plant, and a third haulage shaft. The smelter was completed in March ahead of schedule. An explosion in the new acid plant, however, delayed commissioning until midyear. Further disruptions followed in December from a spillage in the anode furnace and a fire in the copper solvent extraction plant. Repairs to the plant were not expected to be completed until midyear 2000, and until then, electrowon copper production, which represented about 10% of the total output, would be restricted to about one-half the normal rate. WMC had planned to produce about 206,000 t of copper in 2000, but this was revised downward to 200,000 t (Resource Information Unit, 2004, p. 95).

Copper Mines of Tasmania Pty. Ltd., which was a subsidiary of India's Sterlite Industries Ltd. and owner of India's largest non-Government copper smelter (about 100,000 t/yr of concentrate feed), purchased the Mount Lyell copper-gold mine in March and planned to invest about \$6 million to resume underground development and deep drilling and to establish a tailings dam. The Indian subsidiary was planning to source about 35% of its smelter's feed from the Mount Lyell Mine (Resource Information Unit, 2004, p. 96).

Gold.—Australia remained the world's third largest gold producer after South Africa and the United States, with gold mined in all six States and the Northern Territory. Western Australia remained the premier gold mining State in Australia, producing just over 70% of the country's output (Australian Bureau of Agricultural and Resource Economics, 2000, p. 15). Gold was the second largest export earner after coal.

Depressed gold prices during a sustained period, however,

continued to take its toll on gold exploration programs in Australia. The U.S. dollar gold price fell in the June 1999 quarter to an average of \$274 per troy ounce [0.0311035 kilogram (kg)]; this was the lowest quarterly nominal gold price since December 1972. Prices continued to fall in the September quarter before stabilizing late in 1999, when the price hovered at about \$300 per ounce (Resource Information Unit, 2000, p. 40).

Australia's largest gold mine remained the Super Pit operation in Kalgoorlie, Western Australia, with production in 1999 being 28,530 kg of gold. It was managed by Kalgoorlie Consolidated Gold Mines Pty. Ltd., which was jointly owned by the Homestake Mining Co. of the United States subsidiary Homestake Gold of Australia and Normandy Mining Ltd. When fully developed, the pit was expected to be 4.5 km long, 1.5 km wide, and 530 meters (m) deep (Resource Information Unit, 2000, p. 278). Granny Smith, which was the country's second largest gold mine, produced 24,211 kg of gold for the year and its 3-millionth ounce (93,310 kg) of gold in December. Production started in February 1990. Throughout most of the 1990's, the company worked three discontinuous deposits (Goanna, Granny, and Windich) around a central flotation/carbon-in-pulp (CIP)/carbon-in-leach (CIL) treatment plant and four satellite deposits (Childe Harold, Keringal, Phoenix, and Sunrise). During 1999, the Sunrise satellite deposit was the only active pit, although millfeed was supplemented from stockpiled ore (Resource Information Unit, 2000, p. 218).

Great Central Mines Ltd. merged its Jundee and Nimary Mines in 1998, and the resulting mine, which produced 17,593 kg of gold, became Australia's third largest gold mine in 1999. The combined milling capacity of the open cut/underground operations was 3.2 Mt/yr. Ore was treated in a CIP plant (Resource Information Unit, 2000, p. 226). The fourth and fifth largest Australian gold mines in 1999 were the Telfer open cut/underground mine, which is at Telfer, Western Australia (15,569 kg of gold), and the Saint Ives Mine, which is 75 km south-southeast of Kalgoorlie, Western Australia (12,719 kg of gold), respectively. The Telfer Mine was owned by Newcrest Mining Ltd., and Saint Ives was owned by WMC Ltd. Production at Saint Ives was down by 3.3% from that of 1998 owing to the shift from underground mining to lower cost, lower grade open cut resources. Ore treatment was accomplished by dump leach-CIL at Telfer and by gravity-CIP at Saint Ives (Resource Information Unit, 2000, p. 271, 281).

New England Antimony Mines NL, which was a subsidiary of Hillgrove Gold NL, anticipated producing 3,110 kg (100,000 ounces) of gold and 7% of the world's antimony trioxide in 1999. The company made investments in three specific processes for improving production: a pressure oxidation process for recovering gold combined in arsenopyrite concentrates, a process for converting antimony sulfide concentrates to antimony trioxide, and the expansion of throughput at the Hillgrove Mine, which is 25 km east of Armidale, New South Wales. December 1999 was the first full month of operation of the pressure oxidation circuit with an overall throughput of 90% of design capacity and gold recovery from the oxidized product that exceeded 90% (Resource

Information Unit, 2000, p. 122).

Ross Mining NL closed its Yandan Mine, which was 350 km south of Townsville, Queensland, in April 1999 when the ore was depleted. Ross returned the CIP plant to its Wirralie Mine, which is 270 km north of Mackay, where it was first installed and operated from 1987 to 1993. The Wirralie Mine began production again in July 1999 (Resource Information Unit, 2000, p. 158-159).

Production at Normandy Mining's Big Bell consolidated open cut/underground mine in Western Australia, which is 30 km northwest of Cue, was adversely affected in early 1999 by extended crusher maintenance, a SAG mill reline, and interruptions to open cut ore haulage caused by strong cyclonic rains. In the second quarter, production was affected by a major failure of the ball millgirth gear. In May, Normandy Mining rationalized the Big Bell operation to focus on the underground mine with all open cut mining suspended. The CIP treatment plant throughput was to be limited to about 2 Mt/yr, thus allowing the circuit to be reconfigured to introduce a preoxygenation stage to improve gold recovery and to reduce reagent consumption. Gold production of about 150,000 ounces per year (4,665 kilograms per year) was expected under this plan. In October, New Hampton Goldfields Ltd. (NHG) acquired the Big Bell consolidated mine for 50 million shares and \$7.2 million within 2 years. NHG improved metallurgical recoveries and undertook testing for the addition of a gravity circuit, which was expected to increase recovery to 92%. The gravity plant was to be built offsite and installed during the second quarter of 2000 (Resource Information Unit, 2000, p. 189).

In May, the Bronzewing underground mine, which is 65 km northeast of Leinster in Western Australia, produced its 1-millionth ounce (31,104 kg) of gold. Development of the underground portion of the mine began in February 1995, which was 9 months after the open cut mining operation (Resource Information Unit, 2000, p. 195).

Iron Ore and Steel.—Iron ore production in Australia totaled 154.3 Mt in 1999 and represented 14% of world production; the country ranked third after China and Brazil. About 90% of Australia's iron ore was exported and accounted for about 37% of world iron ore exports; Brazil, which was the world leader, accounted for just more than 38% (Resource Information Unit, 2000, p. 304).

Three major iron ore producers operated in the Hamersley Range of the Pilbara region of Western Australia—BHP Iron Ore Pty. Ltd., Hamersley Iron Pty. Ltd., and Robe River Iron Associates. Portman Resources NL and Goldamere Pty. Ltd. (operating under the trading name Australian Bulk Minerals), which were smaller producers, operated in Western Australia (Koolyanobbing Mine) and Tasmania (Savage River Mine), respectively. Through BHP Steel Pty. Ltd., BHP also operated the Middleback Ranges mines, which are about 270 km northwest of Adelaide, South Australia; these included Iron Duchess, Iron Duke, Iron Knight, and Iron Knob.

Hamersley started mining operations at Mount Tom Price in 1966 after the Federal Government lifted the iron ore export embargo in 1960 following the realization of the huge potential

of iron ore in the Pilbara area in the late 1950's. Hamersley's mines included the Brockman, the Marandoo, the Mount Tom Price, the Nammuldi, the Paraburdoo, and the Yandicoogina.

BHP continued to recover iron ore from stockpiles from earlier mining at the Cockatoo Island Mine, which is 130 km north-northeast of Derby in northern Western Australia. Although BHP owned 100% of some leases on the island, Nugold Hill Mines NL owned the remainder and received a \$0.60 royalty per ton of ore shipped. Shipping of beneficiated ore began in 1995 mainly to steel mills in China and was to be completed in 2000.

Portman Resources NL, which was a wholly owned subsidiary of Portman Ltd., completed a feasibility study into mining the remaining high-grade (more than 69% iron) resources in BHP's lease area. An agreement with BHP was reached to mine this material in 2000 (Resource Information Unit, 2000, p. 306).

Lead, Silver, and Zinc.—Australia's lead, silver, and zinc mines were predominantly based on zinc-rich ore bodies with zinc as the major component and lead and silver as coproducts. An exception was BHP's Cannington Mine, which is 200 km southeast of Mount Isa, Queensland; it is based on a lead-silver ore body with zinc as a coproduct.

In 1999, Australia accounted for 21% of the world's lead mine production and 14% of zinc mine production, which made it the world's largest producer of mined lead and second largest producer, after China, of mined zinc (World Bureau of Metal Statistics, 2000, p. 80, 128).

Australia's largest zinc-lead operation was Pasminco Century Mine Ltd.'s Century Mine, which is 250 km northwest of Mount Isa, Queensland. The mine will have an eventual production capacity of 520,000 t/yr zinc-in-concentrates, which was scheduled for 2001 or 2002. The Century Mine treated its first ore in October 1999, and by December, all major items of plant and equipment were commissioned. The concentrate was pumped in slurry form by way of a 300-km underground pipeline to Port Karumba on the Gulf of Carpentaria where it was dewatered and stockpiled prior to export. The first 10,000-t shipment of zinc concentrate to Pasminco's Budel Smelter in the Netherlands was shipped in December. At full capacity, Century will produce 780,000 t/yr of zinc and silver concentrate and 70,000 t/yr of lead concentrate (Resource Information Unit, 2000, p. 317-318).

Other major mines with contained zinc production in excess of 100,000 t/yr were Pasminco's Broken Hill Mine in New South Wales, MIM's Mount Isa Mine in Queensland and the McArthur River Mine in the Northern Territory, Western Metals's Lennard Shelf operations in Western Australia and Hellyer in Tasmania, and Normandy Mining's Golden Grove Mine in Western Australia. Another significant contributor will be MIM's George Fisher Mine in Queensland, which was due to come on-stream by midyear 2000. BHP's Cannington Mine had a production capacity of 175,000 t/yr of lead-in-concentrate and 800 t/yr of silver, which made it the world's largest silver mine.

In 1999, Australia had four processing facilities that produced refined zinc—the Risdon Refinery in Tasmania, the

Cockle Creek Refinery-Smelter in New South Wales, and the Port Pirie Refinery-Smelter in South Australia, which were all owned by Pasminco, and Townsville in Queensland, which was owned by Sun Metal; Sun Metal was a subsidiary of Korea Zinc Co. Ltd. of the Republic of Korea. The Sun Metal Refinery, which was developed at a cost of \$390 million and began operations in 1999, was the world's first new Greenfield zinc refinery in more than 20 years. It was expected to source the bulk of its concentrates from Australian mines, and as a result, Australian refined zinc production was projected to increase by almost 40% in 2000 and a further 11% in 2001 to reach 500,000 t/yr (Resource Information Unit, 2000, p. 312).

Australia was the fourth largest silver miner in the world, following Mexico, Peru, and the United States (Hilliard, 2000).

Manganese.—Groote Eylandt Mining Co. Pty. Ltd. (GEMCO), which was a wholly owned subsidiary of London-based Billiton Plc., mined about 10% of the world's manganese at its 2.4-Mt capacity, 84-square kilometer Groote Eylandt open cut operations on the northwestern portion of Groote Eylandt, which is off the far north coast of Australia in the west of the Gulf of Carpentaria, Northern Territory. The operations at Groote Eylandt used excavators and 145-t end-dump trucks for removal of overburden and ore mining. The on-site concentrator produced clean lump and fine ore products that were trucked to Milner Port Bay for shipment. GEMCO shipped about 25% per year of its concentrate to the ferromanganese plant operated at Bell Bay near Launceston, Tasmania, by Tasmanian Electro Metallurgical Co. Pty. Ltd., which was another wholly owned Billiton subsidiary. A smaller percentage was used in an electrolytic manganese dioxide plant at Newcastle, New South Wales, by Australian Manganese Co. Pty. Ltd., which also was wholly owned by Billiton. The plant produced high-grade material used in long-life batteries. Other GEMCO customers were ferroalloy and steel makers in Australia, Canada, China, Europe, Japan, Mexico, Norway, the Republic of Korea, and the United States.

In May, after an almost 2-year hiatus, mining operations restarted at Pilbara Manganese Pty. Ltd.'s Woodie Woodie Mine, which is 400 km southeast of Port Hedland, Western Australia. In August, the first shipment of manganese was shipped from Port Hedland. Mining was done by a 100-t hydraulic excavator loading 50-t dump trucks.

In July, Consolidated Minerals Ltd., which was Pilbara Manganese's parent company, purchased the two adjacent Bell mining leases from Boral Contracting Pty. Ltd., thus consolidating all the prospective manganese ground in the area under the control of one company. Ore from the Bell open cut mines was to be processed through Woodie Woodie's production facilities (Resource Information Unit, 2000, p. 333).

Mineral Sands.—Australia's mineral sands industry comprised the mining and processing of high concentrations of such titanium minerals as ilmenite, leucoxene, and rutile; monazite (a rare-earth phosphate containing a variety of rare-earth oxides, especially cerium); thorium oxide; and zircon (an ore of zirconium also used in the ceramics-refractories industry). Monazite, however, was not recovered during 1999

owing to lack of demand throughout the year and was returned to the tailings. The Australian mineral sands industry provided about 50% of the world's rutile, 40% of the zircon, and 25% of the world's ilmenite.

In February, BHP closed its Beenup Mine, which is 20 km north of Augusta, Western Australia, following a comprehensive study into technical problems caused by the high clay content of the ore body that adversely impacted production levels and tailings management (Resource Information Unit, 2000, p. 340).

In March, mining of rutile and zircon ceased at Pacific Mining Ltd.'s Tomago Mine in the Hunter Valley of New South Wales (Resource Information Unit, 2000, p. 337).

Nickel.—Australian nickel companies began to revolutionize the industry during 1999 by using a commercial application of leaching processes for nickel laterite ores. Three operations in Western Australia were the only ones to attempt this since the original development of the process at the Moa Bay nickel facility in Cuba in the 1950's. In early 1999, the new producers began operations by using pressure acid leach technology to process laterite ores directly into London Metal Exchange-grade nickel metal for export. Anaconda Nickel Ltd.'s and Glencore International AG's 60-40 Murrin Murrin joint-venture project had a design capacity of 45,000 t/yr nickel metal, and Preston Resources Ltd.'s Bulong and Centaur Mining and Exploration Ltd.'s Cawse projects were each designed to produce about 9,000 t/yr of nickel metal. Although these operations had not demonstrated by yearend complete success of the technology at the scale required to produce at design capacity, their achievements thus far had encouraged proposals for similar projects in Australia and abroad.

The largest Australian nickel producer at yearend still was WMC from its mines at Kambalda, Leinster, and Mount Keith in Western Australia.

In August, the ore at Outokumpu Mining Australia Pty. Ltd.'s Forrestania underground mine, which is 360 km southeast of Perth, was depleted. The company planned to relocate the processing plant to its Black Swan underground mine near Kalgoorlie.

In early 1999, QNI Ltd. was taken over by Billiton, thus resulting in Billiton's controlling the 300,000-t/yr Yabulu nickel refinery in Townsville. The refinery's principal output was nickel metal rondelles produced from laterite ores imported from Indonesia, New Caledonia, and the Philippines.

Platinum-Group Metals.—No Australian mines were primary producers of platinum-group metals (PGM's), although minor production continued in Western Australia's Eastern Goldfields at Kalgoorlie-Boulder and Kambalda as a byproduct of nickel operations. PGM's, which are mainly platinum and palladium, were recovered at the Port Kembla refinery-smelter complex from byproduct copper sulfide residues produced at the Kwinana nickel refinery. PGM's also were contained in nickel matte produced for export at the Kalgoorlie smelter.

Tungsten.—Tasmania Mines Ltd. and Itochu Corp., with equal interest, produced a small quantity of low- and high-

grade scheelite concentrates from the Kara No. 1 pit, which is 30 km south of Burnie, Tasmania, for use in the specialty steel industry. The Kara Mine also produced magnetite for use in coal washeries. A limited amount of magnetite also was produced for the Tasmanian market (Resource Information Unit, 1998, p. 304).

Vanadium.—At yearend, commissioning of the estimated \$70 million Windimurra vanadium project, which is 80 km southeast of Mount Magnet, Western Australia, continued. The mine and processing plant would produce 7,170 t/yr of vanadium pentoxide, which would represent about 12% of world production. The first marketable production was scheduled for January 2000. The joint-venture project was owned by Swiss-based Xstrata AG (60%) and Precious Metals Australia Ltd. (40%) (Resource Information Unit, 2000, p. 385).

Industrial Minerals

Cement.—Five industrial conglomerates accounted for most of the country's cement capacity by holding large share percentages of a multitude of plants around the country. Adelaide Brighton Cement Ltd. held the most with about 2.1 Mt/yr of capacity, or a 29% share; Blue Circle Southern Cement Ltd., approximately 2 Mt/yr, or 28%; Australian Cement Holdings Ltd., about 1.4 Mt/yr, or 20%; Queensland Cement Ltd., about 1.3 Mt/yr, or 19%; and Cockburn Cement Ltd., 300,000 t, or about 4%.

Garnet.—During 1999, GMA Garnet Pty. Ltd.'s garnet sand separation plants near Port Gregory, Western Australia, processed garnet for use as an abrasive in industrial cleaning and maintenance and as a high-pressure cutting agent. The product was sold domestically and exported through the ports of Fremantle and Geraldton, Western Australia.

The Staurolite Ridge open cut mine near Broken Hill, New South Wales, supplied about 15,000 t/yr of garnet feed to owner Minerals Corp. Ltd.'s Triple Chance plant, which is about 65 km away by road. The ore body was a garnet schist that was relatively easy to crush and process into high-quality product for the abrasive and water filtration markets. Regular production of garnet began in March 1999, although mining had begun in 1997. Processing problems delayed consistent production (Resource Information Unit, 2000, p. 296-297).

Gemstones.—Australia, which was the leading producer of precious opal, accounted for a large percentage of world production. About one-half of Australia's annual production was mined in South Australia's three major fields at Andamooka, Coober Pedy, and Mintabie, as well as many smaller fields that stretch from Andamooka to the Northern Territory border along the southwestern margin of the Great Artesian Basin. Most opal was hand mined either from open cuts or underground drifts, and all grades, from milky pinfire through crystal up to high-grade black, were produced (Mines and Energy South Australia, 1997). Lambina, which was a newer field, increased its production at the expense of Coober

Pedy, although Coober Pedy still produced, in terms of value, almost three times that of Lambina (Primary Industries and Resources South Australia, 2000, p. 19). Opal in New South Wales was mined at Lightning Ridge, which was the world's major source of the highly prized and valuable black opal. A small quantity of opal also was produced in western Queensland.

Australia also continued to be a leading producer of natural sapphire. Commercial sapphire production was mined from alluvial deposits in the Inverell-Glen Innes (New England) region of northern New South Wales and the Rubyvale-Anakie region of central Queensland. Australia supplied as much as 30%, by volume, of the world's rough sapphire output. Most of the uncut gems were exported to Thailand, which was the recognized world leader for cutting and marketing.

Jade was discovered in the form of nephrite, which is one of the two recognized jade minerals (the other being jadeite), near Cowell on the Eyre Peninsula, South Australia. These deposits were the world's largest known resource of nephrite jade. In 1999, Gemstone Corp. was restricting its operations to minimal mining and selling unprocessed jade and to receiving royalty payments (Resource Information Unit, 2000, p. 113). Australia produced most of the world's chrysoprase, which is known as Australian jade outside of Australia.

Australia produced such other gemstones as agate, amethyst, chialstolite, emerald (aquamarine), garnet, rhodonite, topaz, tourmaline, turquoise, and zircon.

Lithium and Tantalum.—Gwalia Consolidated Ltd. was the world's largest producer of lithium minerals (spodumene). They were mined from the southern end of the Greenbushes Mine, which is 300 km south of Perth. This was the world's largest, highest grade spodumene resource. Gwalia Consolidated, which also was the world's largest producer of tantalum, has supplied an estimated 25% per year of the world's tantalum requirements. Both commodities were extracted from two separate open cuts that are spaced about 300 m apart within the Greenbushes pegmatite ore body, which was one of the largest zoned rare metal pegmatites in the world. Additionally, Gwalia Consolidated produced tantalum from the Mount Cassiterite ore body at its Wodgina Mine, which is 100 km south of Port Hedland.

Mineral Fuels

Coal.—In 1999, Australia again was the world's largest exporter of coal, as it has been since 1984, and thus marking its 15th consecutive year. Coal exports during this period have more than doubled to 167 Mt from 78.9 Mt. In 1999, more than one-half of Australia's coal was exported with about 70% shipped to Japan and the remainder, to other Asian markets (Energy Information Administration, April 2000, Australia, accessed November 1, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/australi.html>). Virtually all production for export was based on the mining of black (bituminous and subbituminous) coal in New South Wales and Queensland. Coal exports were shipped from 11 terminals at 7 ports along the country's eastern coast (International Bulk Journal, 1999).

Petroleum and Natural Gas.—In 1999, Australia produced from 80% to 85% of its crude oil requirements. About 44% of the crude oil and condensate was produced in Bass Strait between Tasmania and Victoria, and about 41% of the production was from the Carnarvon Basin off the northwestern coast of Western Australia, which was the next largest deposit. The Gippsland Basin in Victoria led the way as Australia's largest source of natural gas (a 33% share) and liquefied petroleum gas (69%), and the North West Shelf Development Project was the source of Australia's liquefied natural gas (LNG) production. The North West Shelf project on the Continental Shelf, which is about 140 km offshore Dampier, Western Australia, was the source of Australia's LNG production (Australian Institute of Petroleum Ltd., 1999, Frequently asked questions, accessed November 29, 2000, at URL <http://www.aip.com.au/education/faq/index.html>).

Areas of active Australian oil exploration and development were located within and adjacent to the zone of cooperation area (ZOCA) in the Timor Sea; the ZOCA was established in 1989 by the Timor Gap Treaty between Australia and Indonesia. It was divided into three regions, one controlled by each country and a third jointly administered. Four major investors were operating in the Timor Gap; namely, Phillips Petroleum Co., BHP Petroleum Pty. Ltd., Santos Ltd., and The Shell Co. of Australia Ltd. Woodside Petroleum Ltd. began production from the Laminaria-Corallina Oilfields in November. These oilfields were in the Timor Sea and were about 550 km northwest of Darwin and 160 km south of the Island of Timor. Development of the fields was the first in this part of the Timor Sea, and the floating production, storage, and offloading facility was anticipated to become the primary infrastructure for other projects in the area. The nearest production facility was that of BHP Petroleum in the Jabiru area, which is 175 km southwest of Laminaria. In Bass Strait, BHP Petroleum and joint-venture partner Esso Australia Ltd., which was the operator, produced about 200,000 bbl/d of oil and 15.6 million cubic meters per day (550 million cubic feet per day) of natural gas from the offshore Gippsland Basin. In 1999, in the North West Shelf, U.S.-based Apache Energy Ltd., which was the operator of the joint venture, drilled a successful test well at North Gypsy-1 that produced almost 6,000 bbl/d, which made it more likely that the Gypsy/Rose/Lee complex, which is just 16 km north of Apache's oil and gas processing-export facilities on Varanus Island, would be developed. In December 1999, production from the BHP Petroleum-operated Buffalo Oilfield, also offshore Western Australia, began (Energy Information Administration, April 2000, Australia, accessed November 1, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/australi.html>).

Australia has nine crude oil refineries with a total production capacity of 812,350 bbl/d. The largest facility was BP Amoco Refinery (Kwinana) Pty. Ltd.'s 138,000-bbl/d Kwinana Refinery. Restructuring of Australia's refining industry has been becoming more necessary as a result of increased competition from Asian refineries with excess capacity. Additionally, environmental standards will require new investment to stay in business. Since 1980, the number of refiners and marketers in Australia has fallen by more than

50%; two refineries have closed (Energy Information Administration, April 2000, Australia, accessed November 1, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/australi.html>).

Australia's major oilfields in 1999 were, in alphabetical order, Bass Strait, Corallina, Laminaria, Roller, Skate, and Wanea-Cossack. The major gasfields included, in alphabetical order, Bass Strait, Cooper Basin, Goodwyn, Gorgon, and North Rankin.

The total number of petroleum exploration and development wells drilled during 1999 (176) was 87 fewer than that of 1998 (263, revised). The number of onshore exploration wells drilled in 1999 (44) was 51 fewer than that of 1998 (95, revised). During 1999, the number of offshore exploration wells drilled decreased to 51 compared with that of 1998 when 73 (revised) wells were drilled. The total number of exploration wells drilled in 1999 (95) decreased by 43% from the number drilled in 1998 (168). The total number of development wells drilled (81) was 14 fewer than that of 1998 (95, revised); 40 wells were drilled onshore, which was a decrease of 55 wells compared with that of 1998; and 41 were drilled offshore compared with 40 (revised) wells drilled in 1998. In 1999, the total meters drilled for exploration and development wells (417,411 m) was 34% less than that drilled in 1998 (630,301 m, revised). The 237,775 line kilometers of seismic survey activity during 1999 was about 76% less than that recorded in 1998, which was the record year with 972,059 line kilometers surveyed (Australian Geological Survey Organisation, 2000b). A total of 22 oilfields and gasfields were discovered in 1999, 11 in each realm (Australian Geological Survey Organization, 2000b). Significant offshore discoveries were made in the Carnarvon Basin, with five gasfields and five oilfields established (Ministry of Industry, Science, and Resources, 2000).

Uranium.—The existence of uranium in Australia has been known since the 1890's. In the 1930's, ores were mined at Mount Painter and Radium Hill in South Australia to recover minute amounts of radium for medical purposes. Additionally, a few hundred kilograms of uranium also were produced and used as a bright-yellow pigment in glass and ceramics. Uranium ores as such were mined and treated in Australia from the mid- 1950's until 1971. The Mary Kathleen Mine in Queensland and the Radium Hill and Rum Jungle mines in the Northern Territory were the largest producers of uranium (as yellowcake, or ammonium diuranate). The uranium material was intended primarily for export to the United Kingdom and the United States for use in their weapons programs of the period, but much also was used in nuclear powerplants for the generation of electricity. Uranium mining resumed in 1979 at the Nabarlek Mine in the Northern Territory, and treatment of its stockpiled ore began in 1980. Since 1981, Australia's uranium oxide concentrates have been sold strictly for electrical power generation. The Commonwealth Government has had appropriate safeguards in place to ensure that Australia-originated uranium material complied with this policy. Australia's uranium reserves were the world's largest accounting for about 40% of the West's and about 25% of the world's total reserves (Uranium Information Center Ltd.,

1999a).

In Australia, U_3O_8 was produced at two mining-milling operations during 1999—the Ranger Mine in the Northern Territory and the huge polymetallic (copper-gold-silver-uranium) Olympic Dam Mine in South Australia.

Energy Resources of Australia Ltd. (ERA) had begun full-scale production at the Ranger No. 3 ore body in mid-1997 by using the mined-out No. 1 open pit, which originally had been opened in 1980, about 1 km to the south as a repository for the mill tailings. ERA accounted for about 12% of the world's uranium production. Sales of uranium oxide concentrate in 1999 were to electric utilities in France, Germany, Japan, the Republic of Korea, Spain, Sweden, the United Kingdom, and the United States. All were under the auspices of international and bilateral safeguards regulations (Uranium Information Center Ltd., 1999c).

WMC's Olympic Dam Mine is 560 km north of Adelaide, South Australia's capital city; the massive ore deposit, which is the largest known uranium ore body in the world, is 350 to 700 m below the surface. Although the mine was primarily a copper producer, the associated uranium generated about 20% of the mine's revenue.

During 1999, the \$750 million expansion project at Olympic Dam that began in late 1996 was completed. The expansion, which included an automated electric rail haulage system and a new gyratory crusher station underground, a new SAG mill incorporating the latest grinding technology, a new smelter, an enlarged hydrometallurgical plant, and a third haulage shaft, increased production capacity to 3,700 t/yr of U_3O_8 . Cost of the expansion program, which was expedited to bring the increased capacity on-line in early 1999, escalated to \$1.2 billion; the U_3O_8 capacity increased to 4,600 t/yr from 1,700 t/yr. In 1999, U_3O_8 concentrate was sold to electric utilities in Belgium, Canada, Finland, France, the Republic of Korea, Japan, Sweden, the United Kingdom, and the United States under long-term contracts (Uranium Information Center Ltd., 1999b).

Reserves

Australia has a significant resource base of a diverse range of minerals and was self-sufficient in most minerals of economic importance. The country, however, still appeared to be deficient (import reliant) in asbestos, chromium, fluorine, mercury, mica, molybdenum, PGM's, petroleum, and sulfur.

According to the Australian Geological Survey Organization, Australia's demonstrated bauxite resources of 9.1 billion metric tons (Gt) ranked first in the world followed by those of Guinea, Brazil, India, Jamaica, and China. Australia had the third largest economic demonstrated resources (EDR) of copper (6%) after Chile (25%) and the United States (13%). Australia dropped one place in the EDR of gold in 1999, ranking fourth after South Africa (38%), the United States (11%), and Uzbekistan (just under 11%). Despite dropping to fourth place, however, Australia maintained its share of the world's EDR for gold at 10%. Western Australia has 99.5% of Australia's EDR of 15.5 Gt of iron ore, with most in the Hamersley Basin of the Pilbara region. Australia ranked fourth with 11% of world EDR of iron ore after China (18%), Ukraine (16%), and Russia

(15%). Australia ranked fourth with 7% of the world's EDR for manganese ore following South Africa (46%), Ukraine (24%), and China (11%). In 1999, Australia held the world's largest EDR of ilmenite, rutile, and zircon, the principal components of mineral sands, with 29%, 42%, and 39%, respectively. Other significant rankings were South Africa (19%) and Norway (11%) for ilmenite; South Africa (19%) and India (15%) for rutile; and South Africa (35%) and Ukraine (10%) for zircon. Australia ranked first in the world for the EDR of nickel, by holding more than a 22% share followed by Russia (14%) and Cuba (12%). The country also had the largest EDR of lead (23%), second largest of zinc (17%) after China, and fourth largest of silver (11%) after Mexico, Canada, and the United States.

Australia's EDR of industrial diamond are the world's third largest (15%), after the Republic of Congo and Botswana. The country's EDR of lithium were in Sons of Gwalia Ltd.'s Greenbushes deposit in the southwest of Western Australia. Australia ranked third in the world's lithium resources (just under 5%) after Chile (88%) and Canada (just over 5%). Australia held about 2% of the world's EDR of magnesite with China, North Korea, and Russia together accounting for more than 70%.

In 1999, Australia, which accounted for about 6% of the world's recoverable EDR of black coal, ranked sixth after the United States (28%), Russia (12%), China (12%), India (9%), and South Africa (9%). It held about 20% of the world's recoverable EDR of brown coal to rank second behind Germany (22%). Australia had the world's largest EDR (26%) of uranium followed by Kazakhstan (20%), Canada (15%), South Africa (10%), Namibia (7%), and Brazil (7%) (table 3; Australian Geological Survey Organisation, 2000a, p. 10-11, 13-15, 17, 21-25, 27-28, 33, 39).

Infrastructure

The transportation infrastructure of Australia was well developed. Of the 913,000 km of roads, 353,331 km were paved, which included 13,630 km of expressways, and 559,669 km were unpaved. Inland waterways, of which 8,368 km was usable mainly by small, shallow-draft craft, were of little importance to the transportation industry.

The public sector railway system consisted of 33,819 km of track, of which 15,422 km was standard (1.435-m) gauge, 14,506 km was narrow (1.067-m) gauge, 3,719 km was broad (1.600-m) gauge, and 172 km was dual gauge. There were 2,540 km of electrified rail. A few hundred kilometers of rail were privately owned, most of this served the iron ore industry in Western Australia. Of the 408 airports, 265 were principal with permanent-surface runways. International shipping ports included Adelaide, Brisbane, Cairns, Darwin, Devonport (Tasmania), Esperance, Fremantle, Geelong, Hobart (Tasmania), Launceston (Tasmania), Mackay, Melbourne, Sydney, and Townsville. The merchant marine fleet included 8 petroleum-oil-lubricant tankers, 4 chemical tankers, 4 liquefied natural gas tankers, and 39 bulk roll-on-off cargo-container freighters, and 2 passenger vessels.

Pipelines included 5,600 km for natural gas, 2,500 km for

crude oil, and 500 km for refined petroleum products (U.S. Central Intelligence Agency, 2000, Australia, accessed November 1, 2000, at URL <http://www.odci.gov/cia/publications/factbook/geos/as.html>). Electric generating capacity was 38.5 gigawatts, 82% of which was thermal (mostly coal) and 18% of which was hydroelectric power (U.S. Energy Information Administration, April 2000, Australia, accessed November 1, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/australi.html>).

Outlook

The Australian economy came through the major financial collapse in Southeast Asia much stronger than initially expected, although some of its resource sectors (e.g., coal, copper, gold, and iron ore) have been adversely affected since the event. The dominant dependency on Japan caused major reductions in price and supply contracts, especially for coal and iron ore. Most other Asian countries also imported, which resulted in additional declines in exports from the Australian minerals sector. Although the Asian financial and economic crisis that manifested itself in 1997 did not have as much of an effect on Australia's economy as elsewhere in Asia in 1998 or 1999 (the economy grew by 4.7% and 3.9%, respectively) the annual growth rate of the economy has diminished; this was predominantly due to diminished production, and thus exports, in the minerals sector.

Australia, however, should remain among the leaders in world mineral supply, particularly in those mineral commodities in which it is abundantly endowed, such as bauxite, coal, copper, diamond, gold, iron ore, lead, manganese, mineral sands, natural gas, and zinc.

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Major Publications

Australian Bureau of Agricultural and Resource Economics,
Canberra: Quarterly Mineral Statistics, quarterly.
Australian Bureau of Statistics, Belconnen: Mineral Production,
Australia, annual.
Australian Bureau of Statistics, Belconnen: Production
Statistics, Preliminary, monthly.

TABLE 1
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1995	1996	1997	1998	1999 e/
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	42,655	43,063	44,465	44,553	48,416 2/
Alumina	do.	13,147	13,348	13,385	13,853	14,532 2/
Metal, refined:						
Primary	do.	1,297	1,372	1,495	1,627	1,718 2/
Secondary		55,000	95,500 r/	101,100 r/	104,000 r/	108,400 2/
Antimony, Sb content of ores and concentrates		900	1,800	1,900	1,800	2,300 2/
Cadmium:						
Mine output, Cd content e/		1,900	1,900	1,900	1,900	1,900
Metal, smelter (refined)		838	639	632	585 r/	462 2/
Cobalt:						
Mine output, Co content e/		1,300	1,400	1,600	1,269 r/ 2/	1,700 2/
Metal, refined		-- r/	-- r/	617 r/	1,395 r/	1,622 2/
Columbium-tantalum concentrate, gross weight		900	920	1,010	1,150	1,230 2/
Copper:						
Mine output, Cu content	thousand tons	398 r/	547 r/	558 r/	607	735 2/
Metal:						
Smelter:						
Primary	do.	233 r/	261 r/	208	236	334 2/
Secondary		-- r/	-- r/	-- r/	-- r/	-- 2/
Refined:						
Primary	thousand tons	248 r/	311 r/	271	285	419 2/
Secondary e/	do.	18	24	21	22	36
Gold:						
Mine output, Au content	kilograms	253,504	289,530	314,500	310,070	301,000 2/
Metal:						
Refined:						
Primary	do.	289,004	329,000	332,700	282,000 r/	310,000 2/
Secondary	do.	8,747	3,620	900	127,000	66,000 2/
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	142,936	147,100	157,766	155,731 r/	154,268 2/
Fe content	do.	88,653	93,000	97,901	99,418 r/	95,223 2/
Metal:						
Pig iron	do.	7,476	7,774	7,884	7,724	7,159 2/
Ferroalloys: e/						
Ferromanganese		110,000	110,000	95,000	110,000	95,000
Silicomanganese		100,000	95,000	95,000	105,000	105,000
Total		210,000	205,000	190,000	215,000	200,000
Steel, crude	thousand tons	8,447	8,415	8,769	8,886 r/	8,158 2/
Semimanufactures e/		4,000	4,000	5,000	5,000	5,000
Lead:						
Mine output, Pb content	thousand tons	455	522	531	619 r/	681 2/
Metal:						
Primary:						
Bullion	do.	164	191	178	164	152 2/
Refined	do.	215	204	204	173	239 2/
Total	do.	379	395	382	337	391 2/
Secondary excluding remelt	do.	26 r/	24 r/	34 r/	28 r/	31 2/
Manganese ore (metallurgical):						
Gross weight	do.	2,176	2,109	2,136	1,500	1,892 2/
Mn content	do.	1,066	1,023	1,024	729	897 2/
Nickel:						
Mine output, Ni content	do.	98	113	123	144	126 2/
Metal, smelter (refined Ni and Ni content of oxide)	do.	77	74	74	81	85 2/
Platinum-group metals: e/						
Palladium, Pd content	kilograms	400	400	400	400	400
Platinum, Pt content	do.	100	100	100	100	100
Total	do.	500	500	500	500	500
Rare-earth metals, monazite concentrate: e/						
Gross weight		200	--	--	--	--
Monazite content		110	--	--	--	--
Silver:						
Mine output, Ag content		939	1,013	1,106	1,474	1,720 2/
Metal, refined		346	356	280	319	472 2/

See footnotes at end of table.

TABLE 1--Continued
 AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1995	1996	1997	1998	1999 e/
METALS--Continued					
Tin:					
Mine output, Sn content	8,656	8,828	10,168	10,174 r/	10,029 2/
Metal, refined:					
Primary	570	460	605	655 r/	585 2/
Secondary e/	300	300	300	300 r/	300
Titanium concentrates, gross weight:					
Ilmenite thousand tons	1,980	2,028	2,233	2,425 r/	1,989 2/
Leucoxene	31,000	33,000	32,000	31,000 r/	31,000 2/
Rutile	195,000	180,000	214,000	243,000 r/	190,000 2/
Zinc:					
Mine output, Zn content thousand tons	937	1,071	1,035	1,066 r/	1,163 2/
Metal, smelter:					
Primary do.	320	326	307 r/	311 r/	338 2/
Secondary e/	4,500	4,500	11,000	10,000 r/ 2/	10,000 2/
Zirconium concentrates, gross weight thousand tons	518	502	416	369 r/	375 2/
INDUSTRIAL MINERALS					
Abrasives, natural: e/					
Beach pebble	2,000	2,000	2,000	2,000	2,000
Garnet	25,000	25,000	25,000	25,000	25,000
Barite e/	11,729 2/	12,000	15,000	13,000 r/	12,000
Cement, hydraulic e/ thousand tons	6,500	6,500	6,500	6,500 r/	6,500
Clays: e/					
Bentonite and bentonitic clay	35,000	35,000	35,000	35,000	35,000
Brick clay and shale thousand tons	8,000	8,000	8,000	8,000	8,000
Cement clay and shale do.	500	500	500	500	500
Damourite clay	100	100	100	100	100
Fire clay	25,000	25,000	25,000	25,000	25,000
Fuller's earth (attapulgitite)	15,000	15,000	15,000	15,000	15,000
Kaolin and ball clay	210,000	210,000	220,000	220,000	220,000
Other thousand tons	1,000	1,000	1,000	1,000	1,000
Diamond:					
Gem thousand carats	18,312	18,897	18,079	18,379	16,930 2/
Industrial do.	22,381	23,096	22,096	22,464	13,855 2/
Total do.	40,693	41,993	40,175	40,843	30,785 2/
Diatomite e/	11,000	11,000	11,000	20,000 r/	20,000
Feldspar including nepheline syenite e/	16,000	17,000	20,000	20,000	20,000
Gemstones, other than diamond: e/					
Opal value, thousands	\$100,000	\$100,000	\$110,000	\$126,000	\$150,000
Sapphire do.	\$50,000	\$50,000	\$60,000	\$40,000	\$50,000
Other do.	\$1,500	\$1,500	\$12,000	\$14,000	\$15,000
Total do.	\$151,500	\$151,500	\$182,000	\$180,000	\$215,000
Gypsum e/ thousand tons	2,000	2,000	2,100	2,100	2,100
Kyanite e/	800	800	800	800	1,000
Lime e/	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Magnesite	263,249	237,707	245,192	360,115 r/	280,505 2/
Nitrogen, N content of ammonia	432,900	446,400	432,400	434,500 r/	430,900 2/
Perlite, crude e/	5,000	5,000	5,000	5,000	5,000
Phosphate rock e/	4,600 r/	600 r/	1,000 r/	1,000 r/	1,000
Salt thousand tons	8,148	7,905	8,801	9,033 r/	10,003 2/
Sillimanite e/ 3/	100	100	100	100	100
Spodumene, concentrate	81,841	117,094	88,399	63,190 r/	75,824 2/
Stone, sand and gravel: e/					
Construction sand thousand tons	30,000	30,000	30,000	30,000	30,000
Gravel do.	15,000	15,000	15,000	15,000	15,000
Dolomite do.	10,000	10,000	10,000	10,000	10,000
Limestone:					
For cement do.	6,000	6,000	6,000	6,000	6,000
For other uses do.	6,000	6,000	6,000	6,000	6,000
Silica in the form of quartz, quartzite, glass sand do.	2,500	2,500	2,500	2,500	2,500
Other:					
Crushed and broken stone do.	65,000	65,000	65,000	65,000	65,000
Dimension stone do.	100	100	100	100	100
Unspecified do.	30,000	30,000	30,000	30,000	30,000
Sulfur, byproduct:					
Metallurgy do.	263	327	474	507	500
Petroleum e/ do.	35	35	35	35	34 2/
Total e/ do.	298	362	509	542	534

See footnotes at end of table.

TABLE 1--Continued
 AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1995	1996	1997	1998	1999 e/	
INDUSTRIAL MINERALS--Continued						
Talc, chlorite, pyrophyllite, steatite e/	215,000	215,000	215,000	215,000	215,000	
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous and subbituminous	thousand tons	193,500	199,800	216,490	285,000 r/	294,000 2/
Lignite	do.	50,700	53,600	60,100	63,900 r/	65,800 2/
Total	do.	244,200	253,400	276,590	348,900 r/	359,800 2/
Coke, metallurgical e/	do.	322	325	325	325	325
Fuel briquets e/	do.	750	750	750	750	750
Gas, natural, marketed	million cubic meters	29,717	29,798	29,950	30,364	30,500
Natural gas liquids	thousand 42-gallon barrels	21,560	23,379	25,896	26,116	26,000
Peat e/		15,000	15,000	20,000	20,000	20,000
Petroleum:						
Crude	thousand 42-gallon barrels	184,813	198,620	206,965	225,935 r/	226,665 2/
Refinery products:						
Gasoline:						
Aviation	do.	940	980	900	1,072	1,100
Motor	do.	113,099	114,534	116,220	115,159	115,000
Jet fuel	do.	29,495	31,673	34,082	33,277	33,500
Kerosene	do.	496	1,882	534	510	500
Distillate fuel oil	do.	75,480	80,471	84,847	82,947	83,000
Residual fuel oil	do.	15,588	10,572	11,324	10,362	10,500
Lubricants	do.	4,883	4,807	5,321	4,386	4,500
Liquefied petroleum gas	do.	8,084	9,689	10,332	9,456	9,500
Bitumen	do.	3,825	3,932	4,342	4,053	4,000
Unspecified	do.	7,142	6,445	6,512	5,976	6,000
Total 4/	do.	259,032	264,985	274,414	267,198	267,600
Uranium, mine output, U content		3,712	4,945	5,489	4,901	5,983 2/

e/ Estimated. r/ Revised. -- Zero.

1/ Includes data available through November 30, 2000.

2/ Reported figure.

3/ In addition, about 7,000 metric tons per year of sillimanite clay, also known as kaolinized sillimanite, containing 40% to 48% aluminum oxide, is produced.

4/ Excludes refinery fuel and losses

TABLE 2
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities 1/	Annual capacity e/
Alumina	Queensland Alumina Ltd., operator [Comalco Ltd., 30.3%; Kaiser Aluminum and Chemical Corp. (Australia) Ltd., 28.3%; Alcan South Pacific Pty. Ltd., 21.4%; and Pechiney Australia Pty. Ltd., 20%]	Gladstone Refinery, QLD	3,000
Do.	Nabalco Pty. Ltd., operator, 70%, and Gove Aluminium Ltd., 30%	Gove Refinery, NT	1,600
Do.	Alcoa World Alumina Australia, 100%	Kwinana Refinery, WA	1,900
Do.	do.	Pinjarra Refinery, WA	3,200
Do.	Alcoa World Alumina Australia, 60%, and Western Mining Corp., 40%	Wagerup Refinery near Waroona, WA	2,190
Do.	Worsley Alumina Pty. Ltd., manager [Reynolds Australia Alumina Ltd., 56%; Billiton Plc, 30%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; and Nissho Iwai Alumina Pty. Ltd., 4.0%]	Worsley Refinery, 20 kilometers northwest of Collie, WA	3,100
Aluminium	Comalco Aluminium (Bell Bay) Ltd., 100%	Bell Bay Smelter, TAS	142
Do.	Boyne Island Smelters Ltd., operator (Comalco Ltd., 54%; Sumitomo Light Metal Industries Ltd., 17%; Ryowa Development Pty. Ltd., 12%; Kobe Steel Ltd., 5%; and Sumitomo Chemical Co. Ltd., 2%)	Boyne Island Smelter, QLD	490
Do.	Capral Aluminium Ltd., 100%	Kurri Kurri Smelter, NSW	160
Do.	Alcoa World Alumina Australia, 60%, and Western Mining Corp., 40%	Point Henry Smelter, VIC	180
Do.	Alcoa World Alumina Australia, 45% and manager; China International Trust Investment Co., 22.5%, a People's Republic of China Government Agency; Marubeni Australia Pty. Ltd., 22.5%; and Eastern Aluminium Ltd., 10%	Portland Smelter, VIC	345
Do.	Tomago Aluminium Co. Pty. Ltd., operator (Gove Aluminium Finance Ltd., 36%; Pechiney Australia Pty. Ltd., 36%; Australian Mutual Provident Society, 16%; and VAW Australia Pty. Ltd., 12%)	Tomago Smelter, NSW	440
Antimony	Hillgrove Gold Ltd., 100%	Hillgrove open cut/underground mine, NSW	4
Bauxite	Nabalco Pty. Ltd., operator, 70%, and Gove Aluminium Ltd., 30%	Gove surface mine, NT	7,000
Do.	Alcoa World Alumina Australia, 100%	Huntly open cut mine, 80 kilometers south of Perth, WA	19,000
Do.	do.	Willowdale open cut mine, 130 kilometers south of Perth, WA	7,400
Do.	Worsley Alumina Pty. Ltd., manager [Reynolds Australia Alumina Ltd., 56%; Billiton Plc., 30%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; and Nissho Iwai Alumina Pty. Ltd., 4.0%]	Worsley open cut mine, 50 kilometers northeast of Collie, WA	11,000
Do.	Comalco Ltd., 100%	Weipa-Andoom open cut mine, Weipa, QLD	12,000
Cement	Blue Circle Southern Cement Ltd., 100%	Berrima Plant, NSW	1,200
Do.	Adelaide Brighton Cement Ltd., 100%	Birkenhead Plant, SA	1,000
Do.	Queensland Cement Ltd., 100%	Darra Plant, QLD	700
Do.	Adelaide Brighton Cement Ltd., 100%	Geelong Plant, VIC	800
Do.	Goliath Cement Holdings Ltd., 100%	Railton Plant, TAS	1,000
Do.	Cockburn Cement Ltd., 100%	South Coogee Plant, WA	1,000
Coal, black	Powercoal Pty. Ltd., 100%	Angus Place underground mine, NSW	2,000
Do.	BHP Steel (AIS) Pty. Ltd., 100%	Appin underground mine, NSW	2,400
Do.	Coalex Pty. Ltd., 95% and manager; and Sumisho Coal Development Pty. Ltd., 5%	Baal Bone underground mine, NSW	3,500
Do.	Coal Operations Australia Ltd., 78.3% and manager; Nippon Oil (Australia) Pty. Ltd., 8.7%; Nippon Steel Australia Pty. Ltd., 8%; and KEPSCO Resources Australia Pty. Ltd., 5%	Bayswater No. 3 open cut mine, NSW	4,800
Do.	Central Queensland Coal Associates, 100% (BHP Coal Pty. Ltd., 52.1%; QCT Resources Ltd., 32.37%; and Mitsubishi Development Pty. Ltd., 15.53%)	Blackwater open cut mine, QLD	5,000
Do.	Queensland Coal Pty. Ltd., 57.195% and manager; Coney Investments Pty. Ltd., 31.416%; EPDC (Australia) Pty. Ltd., 7.973%; and Japan Coal Development Co. Ltd., 3.416%	Blair Athol open cut mine, QLD	11,000
Do.	Bloomfield Collieries Pty. Ltd., 100%	Bloomfield open cut mine, NSW	2,000
Do.	Shell Coal (Callide) Pty. Ltd., 66.7% and manager, and AMP Life Ltd., 33.3%	Boundary Hill open cut mine, QLD	3,500

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities 1/	Annual capacity e/
Coal, black--Continued:	Bulga Coal Management Pty. Ltd., 90% and manager, and Nippon Steel Australia Pty. Ltd., 10%	Bulga open cut/underground mine, NSW (formerly Saxonvale-Bulga mine)	9,000
Do.	Thiess Contractors Pty. Ltd., 5% and operator, and Portman Mining Ltd., 95%	Burton open cut mine, QLD	4,000
Do.	Shell Coal (Callide) Pty. Ltd., 66.7% and manager, and AMP Life Ltd., 33.3%	Callide open cut mine, QLD	4,500
Do.	Camberwell Coal Pty. Ltd., manager. [Navidale Pty. Ltd., 50%; Toyota Tsusho Mining (Australia) Pty. Ltd., 40%; and Dia Coal Mining (Australia) Pty. Ltd., 10%]	Camberwell open cut mine, NSW	4,000
Do.	Centennial Coal Co. Ltd., 90% and manager, and SK Corp., 10%	Clarence underground mine, NSW	2,200
Do.	Collinsville Coal Co. Pty. Ltd., 75% and manager, and Itochu Coal Resources of Australia Pty. Ltd., 25%	Collinsville open cut mine, QLD	1,750
Do.	Powercoal Pty. Ltd., 100%	Cooranbong underground mine, NSW	1,600
Do.	BHP Steel (AIS) Pty. Ltd., 100%	Cordeaux underground mine, NSW	2,800
Do.	BHP Minerals Pty. Ltd., 64.14% and manager; QCT Resources Ltd., 32.37%; and Mitsubishi Development Pty. Ltd., 3.49%	Crinum longwall mine, QLD	4,000
Do.	Cumnock No. 1 Colliery Pty. Ltd., 100%	Cumnock No. 1 open cut/underground mine, NSW	2,750
Do.	ARCO Coal Australia Inc., 87% and manager, and Mitsui Coal Development Australia Pty. Ltd., 13%	Curragh open cut mine, QLD	6,600
Do.	Dartbrook Coal Pty. Ltd., manager [A and B Coal Co. Pty. Ltd., 75%; Marubeni Thermal Coal Pty. Ltd., 15%; Ssangyong Resources Pty. Ltd., 7%; and Showa Coal (NSW) Pty. Ltd., 3%]	Dartbrook longwall mine, NSW	3,200
Do.	Shell Coal (Drayton) Pty. Ltd., 74.8% and manager; AMP Life Ltd., 13.4%; Mitsui Coal Development Australia Pty. Ltd., 3.8%; Mitsui Mining (Australia) Pty. Ltd., 3%; Daesung Australia Pty. Ltd., 2.5%; and Hyundai (Aust) Pty. Ltd., 2.5%	Drayton open cut mine, NSW	4,500
Do.	Ebenezer Mining Co., 100%	Ebenezer open cut mine, QLD	3,000
Do.	BHP Steel (AIS) Pty. Ltd., 100%	Elouera underground mine, NSW	2,500
Do.	Capricorn Coal Management Pty. Ltd., 100% [Shell Coal Holdings (Australia) Ltd., 46.75% of German Creek and 59.47% of German Creek East; Ticor Energy Pty. Ltd., 26.06% of German Creek and 31.14% of German Creek East; Ruhrkohle Australia Pty. Ltd., 27.19% of German Creek; and Marubeni Coal Pty. Ltd., 9.39% of German Creek East]	German Creek and German Creek East open cut/underground mines, QLD	7,000
Do.	BHP Coal Pty. Ltd., manager, and 52.1% of Goonyella and 80% of Riverside; QCT Resources Ltd., 32.37% of Goonyella; Mitsubishi Development Pty. Ltd., 15.53% of Goonyella; and Mitsui and Co. (Australia) Ltd., 20% of Riverside	Goonyella Riverside open cut mine, QLD	7,500
Do.	BHP Minerals Pty. Ltd., 64.14% and manager; QCT Resources Ltd., 32.37%; and Mitsubishi Development Pty. Ltd., 3.49%	Gregory open cut mine, QLD	4,500
Do.	Novacoal Australia Pty. Ltd., 60% and manager, and Mitsubishi Coal Development Pty. Ltd., 40%	Howick open cut mine, NSW	5,000
Do.	Coal and Allied Industries Ltd., 100%	Hunter Valley No. 1 open cut mine, NSW	6,300
Do.	Optima Energy, 100%	Leigh Creek open cut mine, SA	3,000
Do.	Lemington Coal Mines Ltd., 100%	Lemington open cut mine, NSW	3,500
Do.	Liddell Coal Operations Pty. Ltd., manager (Pasminco Ltd., 67.5%; and Mitsui Matsushima Australia Pty. Ltd., 32.5%)	Liddell open cut mine, NSW	4,000
Do.	Moranbah North Coal (Management) Pty. Ltd., manager. (Moranbah North Coal Pty. Ltd., 88%; and Japanese private interests, 7%)	Moranbah longwall mine, QLD	5,000
Do.	Rio Tinto Coal (NSW) Pty. Ltd., manager. (Coal and Allied Industries Ltd., 80%, and Pohang Steel Australia Pty. Ltd., 20%)	Mount Thorley open cut mine, NSW	6,500
Do.	BHP Ltd., 80%, and Mitsui and Co. (Australia) Ltd., 20%	Moura open cut mine, QLD	5,000
Do.	Muswellbrook Coal Co. Ltd., 100%	Muswellbrook No. 2 open cut mine, NSW	1,850
Do.	The Griffin Coal Mining Co. Pty. Ltd., 100%	Muja open cut mine, WA	2,000
Do.	Powercoal Pty. Ltd., 100%	Myuna underground mine, NSW	3,000
Do.	Newlands Coal Pty. Ltd., 75% and manager, and Itochu Coal Resources of Australia Pty. Ltd., 25%	Newlands open cut/underground mine, QLD	7,000
Do.	Powercoal Pty. Ltd., 100%	Newstan underground mine, NSW	2,500
Do.	Sumisho Coal Development Pty. Ltd., 100%	North Goonyella longwall mine, QLD	5,000
Do.	BHP Coal Pty. Ltd., 52.1% and manager; QCT Resources Ltd., 32.37%; and Mitsubishi Development Pty. Ltd., 15.53%	Norwich Park open cut mine, QLD	5,200

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities 1/	Annual capacity e/
Coal, black--Continued:	Oaky Creek Coal Pty. Ltd., 75%, operator and manager; Sumitomo Coal Australia Pty. Ltd., 15%; and Itochu Coal Resources of Australia Pty. Ltd., 10%	Oaky Creek open cut/underground mine, QLD	6,000
Do.	BHP Coal Pty. Ltd., 52.1% and manager; QCT Resources Ltd., 32.37%; and Mitsubishi Development Pty. Ltd., 15.53%	Peak Downs open cut mine, QLD	7,000
Do.	Wesfarmers Coal Ltd., 100%	Premier open cut mine, WA	3,000
Do.	Peabody Resources Ltd., 100% at Ravensworth and 50% at Narama. Iluka Resources Ltd., 50% at Narama	Ravensworth-Narama open cut mine, NSW	6,200
Do.	BHP Coal Pty. Ltd., 52.1% and manager; QCT Resources Ltd., 32.37%; and Mitsubishi Development Pty. Ltd., 15.53%	Saraji open cut mine, QLD	5,500
Do.	South Blackwater Coal Ltd., 100%	South Blackwater open cut/longwall and bord pillar mine, QLD	4,500
Do.	Cyprus Springvale Ltd., 50% and manager, and Samsung Development (Australia) Pty. Ltd., 50%	Springvale underground mine, NSW	2,000
Do.	Austral Coal Ltd., 100%	Tahmoor underground mine, NSW	2,000
Do.	Queensland Coal Pty. Ltd., 100%	Tarong-Meandu open cut mine, QLD	5,500
Do.	Oceanic Coal Australia Ltd., 80% and manager; Marubeni Australia Ltd., 17%; and Kokan Kogyo (Australia) Pty. Ltd., 3%	Teralba underground mine, NSW	1,700
Do.	BHP Steel (AIS) Pty. Ltd., 100%	Tower underground mine, NSW	2,000
Do.	Ulan Coal Mines Ltd., manager (Mitsubishi Development Pty. Ltd., 49%; Exxon Coal Australia Ltd., 36%; and Morgan Grenfell, 15%)	Ulan open cut-underground mine, NSW	5,500
Do.	Wambo Mining Corp. Pty. Ltd., 100%	Wambo underground mine, NSW	3,000
Do.	Peabody Resources Ltd., 28.75% and manager; (Mitsubishi Coal Development Pty. Ltd., 22.75%; Tigor Energy Pty. Ltd., 20%; Peabody Australia Pty. Ltd., 15%; Nippon Steel Australia Pty. Ltd., 7.5%; and Mitsubishi Materials (Australia) Pty. Ltd., 6%	Warkworth open cut mine, NSW	5,000
Do.	BHP Steel (AIS) Pty. Ltd., 100%	West Cliff longwall mine, NSW	3,000
Do.	Oceanic Coal Australia Ltd., 80% and manager, and Marubeni (Australia) Pty. Ltd., 3%	West Wallsend underground mine, NSW	2,400
Do.	Powercoal Pty. Ltd., 100%	Wye underground mine, NSW	1,800
Coal, brown	Alcoa World Alumina Australia, 100%	Anglesea open cut mine, VIC	1,100
Do.	Hazelwood Power Corp., 100%	Hazelwood open cut mine, VIC	13,000
Do.	Loy Yang Power Ltd., 100%	Loy Yang open cut mine, VIC	30,700
Do.	Yallourn Energy Pty. Ltd., manager (Powergen International, 49.9%; AMP Life Ltd., 26%; Itochu Australia Ltd., 10.4%; Morgan Grenfell, 8%; and Hastings Fund Management, 5.7%)	Yallourn open cut mine, VIC	18,500
Cobalt	Preston Resources Ltd., 100%	Bulong open cut mine, WA 2/	1
Do.	Centaur Mining and Exploration Ltd., 100%	Cawse open cut mine, WA 2/	2
Do.	Anaconda Nickel Ltd., 60%, and Glencore International AG, 40%	Murrin Murrin open cut mine, WA 2/	3
Do.	Billiton (Australia) Pty. Ltd., 100%	Yabulu Refinery, QLD	1
Copper	Newcrest Mining Ltd., 100%	Cadia Hill open cut mine, NSW	23
Do.	Glencore International AG, 100%	Cobar underground mine, NSW	18
Do.	Ernest Henry Mining Pty. Ltd., operator and manager (MIM Holdings Ltd., 51%, and Savage Resources Ltd., 49%)	Ernest Henry open cut mine, QLD	95
Do.	Girilambone Copper Co. Pty. Ltd., manager (Straits Resources Ltd., 60%; and Nord Pacific Ltd., 40%)	Girilambone open cut mine, NSW	18
Do.	Murchison Zinc Co. Pty. Ltd., 100%	Golden Grove (includes Gossan Hill and Scuddles) underground mine, WA	16
Do.	Western Metals Ltd., 100%	Hellyer underground mine, TAS	4
Do.	MIM Holdings Ltd., 100%	Hilton underground mine, QLD	180
Do.	Murchison United NL, 60% and manager; and Brancote Australia NL, 40%	Mount Cuthbert open cut mine, QLD	8
Do.	Western Metals Ltd., 100%	Mount Gordon open cut mine, QLD	50
Do.	MIM Holdings Ltd., 100%	Mount Isa underground mine, QLD	180
Do.	do.	Mount Isa Smelter, QLD	255
Do.	Copper Mines of Tasmania Pty. Ltd., 100%	Mount Lyell underground mine, TAS	25
Do.	Straits (Nifty) Pty. Ltd., 100%	Nifty open cut mine, WA	10
Do.	North Ltd., 80% and operator; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; and SC Mineral Resources Pty. Ltd., 6.7%	Northparkes open cut/underground mine, NSW	55

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities 1/	Annual capacity e/
Copper--Continued:		Olympic Dam Operations Pty. Ltd., manager (WMC Ltd., 100%)	Olympic Dam underground mine, SA	200
Do.		do.	Olympic Dam Smelter, SA	70
Do.		Placer Pacific Ltd., 100%	Osborne underground mine, QLD	40
Do.		Peak Gold Mines Pty. Ltd., 100%	Peak underground mine, NSW	3
Do.		Furukawa Co. Ltd., 52.5%; Nittetsu Mining Co., 20%; Nissho Iwai Corp., 17.5%; Itochu Corp., 10%	Port Kembla Refinery, NSW	120
Do.		do.	Port Kembla Smelter, NSW	120
Do.		RGC Thalanga Pty. Ltd., 68.85 and manager; and BML Holdings Pty. Ltd., 31.15%	Reward open cut mine, QLD	170
Do.		Pasminco Ltd., 100%	Rosebery underground mine, TAS	4
Do.		Australian Resources Ltd., 100%	Selwyn open cut/underground mine, QLD	16
Do.		Normandy Gold Ltd., 100%	Tennant Creek open cut/underground mines, NT	17
Do.		Copper Refineries Pty. Ltd., operator. (MIM Holdings Ltd., 100%)	Townsville Refinery, QLD	270
Diamond	thousand carats	Argyle Diamond, manager (Rio Tinto Ltd., 57%; Ashton Mining Ltd., 38%; and Western Australian Diamond Trust, 5%)	Argyle Mine (AK-1 lamproite pipe and alluvial deposits), WA	42,000
Gas, condensate	thousand 42-gallon barrels per day	Woodside Petroleum Pty. Ltd., manager [BHP Petroleum Pty. Ltd.; BP Australia Holdings Ltd.; Chevron Asiatic Ltd.; Japan Australia LNG (MIMI) Pty. Ltd.; Shell Development (Australia) Pty. Ltd.; and Woodside Petroleum Ltd., 16.67% each]	North West Shelf operations, 130 kilometers offshore from Dampier, WA	60
Gas, natural	million cubic meters per day	do.	North West Shelf operations, 130 kilometers offshore from Dampier, WA	20
Gas, liquefied natural	million tons per year	do.	Three-train liquefaction plant, Burrup Peninsula, WA	8
Gold	kilograms	WMC Ltd., 100%	Agnew open cut-underground mine, WA	4,000
Do.	do.	New Hampton Goldfields Ltd., 100%	Big Bell Consolidated (includes former Golden Crown) open cut/underground mine, WA	7,000
Do.	do.	Saint Barbara Mines Ltd., 100%	Bluebird open cut mine, WA	4,000
Do.	do.	Worsley Alumina Pty. Ltd., manager (Normandy Gold Ltd., 44.45%; Acacia Resources Ltd., 33.33%; and Newcrest Mining Ltd., 22.22%)	Boddington open cut/underground mine, WA	12,000
Do.	do.	Great Central Mines Ltd., 100%	Bronzewing open cut/underground mine, WA	6,200
Do.	do.	Newcrest Mining Ltd., 100%	Cadia Hill open cut mine, NSW	9,000
Do.	do.	Herald Resources Ltd., 100%	Coolgardie open cut/underground operations, WA	4,000
Do.		Ernest Henry Mining Pty. Ltd., operator and manager (MIM Holdings Ltd., 51%, and Savage Resources Ltd., 49%)	Ernest Henry open cut mine, QLD	4,000
Do.	do.	Normandy NFM Ltd., 100%	Granites-Dead Bullock Soak open cut/underground mines, NT	7,000
Do.	do.	Placer (Granny Smith) Pty. Ltd., manager (Placer Pacific Ltd., 60%; and Delta Gold NL, 40%)	Granny Smith open cut mine, WA	4,800
Do.	do.	Alcoa of Australia Ltd., 100%	Hedges open cut mine, WA	4,900
Do.	do.	Goldfields Ltd., 100%	Henty underground mine, TAS	2,800
Do.	do.	Hill 50 Gold NL, 100%	Hill 50 open cut/underground mine, WA	4,000
Do.	do.	Great Central Mines Ltd., 100%	Jundee open cut mine, WA	6,600
Do.	do.	Australian Gold Refineries, 100% (State of WA agency)	Kalgoorlie Refinery, WA	46,000
Do.	do.	North Ltd., manager, 50%; and Delta Gold NL, 50%	Kanowna Belle open cut/underground mine, WA	5,300
Do.	do.	Kidston Gold Mines Ltd., 100%	Kidston open cut mine, QLD	6,500
Do.	do.	Sons of Gwalia Ltd., 100%	Marvel Loch-Southern Cross open cut/underground mines, WA	3,000
Do.	do.	Kalgoorlie Consolidated Gold Mines Pty. Ltd., manager (Homestake Gold of Australia Ltd., 50%; and Gold Mines of Kalgoorlie Ltd., 50%)	Mount Charlotte underground mine, WA	4,300
Do.	do.	Normandy Mount Leyshon Ltd., 100%	Mount Leyshon open cut mine, QLD	7,500
Do.	do.	Australian Resources Ltd., 100%	Mount McClure open cut/underground mine, WA	3,100
Do.	do.	Central Norseman Gold Corp. Ltd., 100%	Norseman open cut/underground mine, WA	3,700

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities 1/	Annual capacity e/
Gold--Continued:	kilograms	North Ltd., 80% and operator; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; and SC Mineral Resources Pty. Ltd., 6.7%	Northparkes open cut/underground mine, NSW	3,500
Do.	do.	Olympic Dam Operations Pty. Ltd., manager (WMC Ltd., 100%)	Olympic Dam underground mine, SA	1,500
Do.	do.	MIM Holdings Ltd., 100%	Pacific precious metals refinery, NSW	1,900
Do.	do.	Goldfields Kalgoorlie Ltd., 100% and manager	Paddington open cut mine, WA	4,100
Do.	do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground mine, NSW	4,700
Do.	do.	Australian Gold Refineries, 100% (State of WA agency)	Perth Refinery (Newburn), WA	95,000
Do.	do.	Homestake Mining Co., 100%	Plutonic open cut/underground mine, WA	5,800
Do.	do.	Carpentaria Gold Pty. Ltd., 50.1% and manager; and Haoma Mining NL, 49.9%	Ravenswood open cut mine, QLD	3,800
Do.	do.	WMC Ltd., 100%	Saint Ives open cut/underground mine, WA	7,500
Do.	do.	Sons of Gwalia Ltd., 100%	Sons of Gwalia open cut mine, WA	4,000
Do.	do.	MPI Gold Pty. Ltd., 50% and Pittston Mineral Ventures of Pty. Australia Pty. Ltd., 50%	Stawell underground mine, VIC	2,700
Do.	do.	Kalgoorlie Consolidated Gold Mines Pty. Ltd., manager (Homestake Gold of Australia Ltd., 50%; and Gold Mines of Kalgoorlie Ltd., 50%)	Super Pit (includes Fimiston) operation, WA	22,000
Do.	do.	Otter Gold Mines Ltd., 60% and manager; and Acacia Resources Ltd., 40%	Tanami open cut mine, NT	4,000
Do.	do.	Newcrest Mining Ltd., 100%	Telfer open cut/underground mine, WA	12,000
Do.	do.	Normandy Gold Ltd., 100%	Tennant Creek open cut/underground mines, NT	4,000
Do.	do.	Wiluna Mines Ltd., 100%	Wiluna open cut/underground mine, WA	3,300
Do.	do.	Sons of Gwalia Ltd., 70% and manager; Coeur D'Alene Mines Corp. 25%; and Gemini Mining Pty. Ltd., 5%	Yilgarn Star open cut/underground mine, WA	3,400
Ilmenite		Tiwest Joint Venture, operator (KMCC Western Australia Pty. Ltd., 50%, and Ticor Resources Pty. Ltd., 50%)	Cooljarloo Dredge, WA	480
Do.		Iluka Resources Ltd., 100%	Eneabba Dredge and open cut mine, WA	600
Do.		Mineral Deposits Ltd., 100%	Hawks Nest (Fullerton and Viney Creek) Dredges, NSW	10
Do.		Cable Sands (WA) Pty. Ltd., 100%	Jangardup Dredge, WA	100
Do.		Consolidated Rutile Ltd., 100%	North Stradbroke Island (Gordon) Dredge, QLD	200
Do.		Cable Sands (WA) Pty. Ltd., 100%	Sandalwood Dredge, WA	50
Do.		Iluka Resources Ltd., 100%	South Capel Dredge, WA	450
Do.		do.	Yoganup open cut mine, WA	300
Iron ore		Commercial Minerals Ltd., 100%	Biggenden underground mine, QLD	25
Do.		Hamersley Iron Pty. Ltd., 100%	Brockman No. 2 Detrital (includes Nammuldi) open cut mine, WA	4,000
Do.		Hamersley Iron Pty. Ltd., 60% and manager, and China Iron and Steel Industry and Trade Group Corp., 40%, a People's Republic of China Government Agency	Channar open cut mine, WA	10,000
Do.		Koolyanobbing Iron Pty. Ltd., manager. (Nugold Hill Mines NL, 100%)	Cockatoo Island iron ore stockpile, WA	750
Do.		BHP Iron Ore Pty. Ltd., 85% and manager; CI Minerals Australia Pty. Ltd., 8%; and Mitsui Iron Ore Corp. Pty. Ltd., 7%	Goldsworthy open cut mines (includes Nimingarra, Shay Gap, and Yarrarie) WA	8,000
Do.		BHP Iron Ore Pty. Ltd., 100%	Jimblebar open cut mine, WA	6,000
Do.		Koolyanobbing Iron Pty. Ltd., manager (Portman Resources NL, 60%, and Angang Australia Pty. Ltd., 40%)	Koolyanobbing open cut mine, WA	3,000
Do.		Hamersley Iron Pty. Ltd., 100%	Marandoo open cut mine, WA	12,000
Do.		BHP Steel Pty. Ltd., 100%	Middleback Range open cut mine, SA	2,000
Do.		Saint Barbara Mines Ltd., 100%	Mount Gould open cut mine, WA	6,000
Do.		BHP Iron Ore Pty. Ltd., 85% and manager; Mitsui Itochu Iron Pty. Ltd., 10%; and CI Minerals Australia Pty. Ltd., 5%	Mount Newman (includes Whaleback, Orebody 23-25, and Orebody 29) open cut mine, WA	35,000
Do.		Hamersley Iron Pty. Ltd., 100%	Mount Tom Price open cut mine, WA	28,000
Do.		Robe River Iron Associates, operator (Robe River Mining Co. Pty. Ltd., 53%; Mitsui Iron Ore Development Pty. Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; and Sumitomo Metal Australia Pty. Ltd., 3.5%)	Pannawonica-Deepdale (includes Mesa J) open cut mine, WA	31,000
Do.		Hamersley Iron Pty. Ltd., 100%	Paraburdoo open cut mine, WA	50,000

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities 1/	Annual capacity e/	
Iron ore--Continued:	Goldamere Pty. Ltd., 100%	Savage River open cut mine, TAS	1,500	
Do.	Commercial Minerals Ltd., 100%	Tallawang open cut mine, NSW	50	
Do.	BHP Iron Ore Pty. Ltd., manager (BHP Minerals Pty. Ltd., 55%; Pilbara Iron Pty. Ltd., 30%; CI Minerals Australia Pty. Ltd., 8%; and Mitsui Iron Ore Corp. Pty. Ltd., 7%)	Yandi open cut mine, WA	25,000	
Do.	Hamersley Iron Pty. Ltd., 100%	Yandicoogina open cut mine, WA	15,000	
Lead	Pasminco Broken Hill Mine Pty. Ltd., 100%	Broken Hill open cut/underground (South) mine, NSW	82	
Do.	Western Metals Ltd., 100%	Pillara underground mine, WA	35	
Do.	BHP Minerals Pty. Ltd., 100%	Cannington underground mine, QLD	140	
Do.	Pasminco Century Mine Ltd., 100%	Century open cut mine, QLD	70	
Do.	do.	Cockle Creek Smelter, NSW	30	
Do.	do.	Elura underground mine, NSW	45	
Do.	Western Metals Ltd., 100%	Hellyer underground mine, TAS	50	
Do.	MIM Holdings Ltd., 100%	Hilton underground mine, QLD	80	
Do.	McArthur River Mining Pty. Ltd., operator (Mount Isa Mines Ltd., 70%; and ANT Minerals Pty. Ltd., 30%)	McArthur River underground mine, NT	26	
Do.	Mount Isa Mines Ltd., 100%	Mount Isa underground mine, QLD	150	
Do.	do.	Mount Isa Smelter, QLD	240	
Do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground mine, NSW	4	
Do.	Pasminco Ltd., 100%	Port Pirie Refinery-Smelter, SA	250	
Do.	do.	Rosebery underground mine, TAS	15	
Do.	Normandy Metals Ltd., 100%	Woodcutters underground mine, NT	10	
Leucocoxene	Tiwest Joint Venture, operator (KMCC Western Australia Pty. Ltd., 50%, and Tigor Resources Pty. Ltd., 50%)	Cooljarloo Dredge, WA	10	
Magnesite	Queensland Metals Corp. Ltd., 100%	Kunwarara open cut mine, QLD	2,500	
Manganese	Groote Eylandt Mining Co. Pty. Ltd., 100%	Groote Eylandt open cut mine, NT	2,400	
Do.	Consolidated Minerals Ltd., 100%	Woodie Woodie open cut mine, WA	170	
Manganese alloys	Tasmanian Electro Metallurgical Co. Pty. Ltd., 100%	Bell Bay Smelter, TAS	260	
Nickel	Preston Resources Ltd., 100%	Bulong open cut mine, WA 2/	9	
Do.	Centaur Mining and Exploration Ltd., 100%	Cawse open cut mine, WA 2/	9	
Do.	Outokumpu Mining Australia Pty. Ltd., 100%	Forrestania underground mines (2), WA	9	
Do.	WMC Resources Ltd., 100%	Kalgoorlie Smelter, WA	100	
Do.	do.	Kambalda Nickel Operations, WA	35	
Do.	do.	Kwinana Refinery, WA	42	
Do.	do.	Leinster Nickel Operations, WA	44	
Do.	do.	Mount Keith Mine, WA	42	
Do.	Anaconda Nickel Ltd., 60%, and Glencore International AG, 40%	Murrin Murrin open cut mine, WA 2/	45	
Do.	Titan Resources NL, 100%	Radio Hill underground mine, WA	4	
Do.	Outokumpu Exploration Ventures Ltd., 100%	Silver Swan underground mine, WA	12	
Do.	Billiton (Australia) Pty. Ltd., 100%	Yabulu Refinery, QLD	30	
Opal	Many small producers	Andamooka and Coober Pedy areas, SA; Lightning Ridge area, NSW	NA	
Petroleum thousand 42-gallon barrels per day	Mobile Refining Australia Pty. Ltd., 100%	Altona Refinery, VIC	120	
Do.	do.	Bulwer Island Refinery, QLD	69	
Do.	do.	Shell Refining (Australia) Pty. Ltd., 100%	Clyde Refinery, NSW	85
Do.	do.	do.	Geelong Refinery, VIC	110
Do.	do.	Caltex Refineries (NSW) Ltd., 100%	Kurnell Refinery, NSW	114
Do.	do.	BP Amoco Refinery (Kwinana) Pty. Ltd., 100%	Kwinana Refinery, WA	138
Do.	do.	Caltex Refineries (QLD) Ltd., 100%	Lytton Refinery, QLD	106
Do.	do.	Mobile Refining Australia Pty. Ltd., 100%	Port Stanvac Refinery, SA	69
Phosphate	WMC Ltd., 100%	Phosphate Hill, QLD	2,200	
Rutile	Tiwest Joint Venture, operator (KMCC Western Australia Pty. Ltd., 50%, and Tigor Resources Pty. Ltd., 50%)	Cooljarloo Dredge, WA	35	
Do.	Iluka Resources Ltd., 100%	Eneabba Dredge and open cut mine, WA	120	
Do.	Mineral Deposits Ltd., 100%	Hawks Nest (Fullerton and Viney Creek) Dredges, NSW	35	
Do.	Cable Sands (WA) Pty. Ltd., 100%	Jangardup Dredge, WA	100	
Do.	Consolidated Rutile Ltd., 100%	North Stradbroke Island (Gordon) Dredge, QLD	80	
Do.	Cable Sands (WA) Pty. Ltd., 100%	Sandalwood Dredge, WA	50	
Do.	Iluka Resources Ltd., 100%	South Capel Dredge, WA	120	
Do.	Pacific Mining Ltd., 100%	Tomago Dredge, NSW	18	

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities 1/	Annual capacity e/
Salt		Dampier Salt Ltd., 100%	Dampier and Lake Macleod salt fields, WA	4,500
Do.		Cargill Salt, 100%	Leslie Salt operations, WA	2,750
Silver	kilograms	Pasminco Broken Hill Mine Pty. Ltd., 100%	Broken Hill open cut/underground (South) mine, NSW	52,000
Do.	do.	BHP Minerals Ltd., 100%	Cannington underground mine, QLD	750,000
Do.	do.	Pasminco Ltd., 100%	Century open cut mine, QLD	3,000
Do.	do.	Glencore International AG, 100%	Cobar underground mine, NSW	3,000
Do.	do.	Pasminco Ltd., 100%	Elura underground mine, NSW	35,000
Do.	do.	McArthur River Mining Pty. Ltd., operator (Mount Isa Mines Ltd., 70%; and ANT Minerals Pty. Ltd. holding the combined Japanese interests of Nippon Mining and Metals Co. Ltd., 15%; Mitsubishi Materials Corp., 5%; Mitsui & Co. Ltd., 5%; and Marubeni Corp., 5%)	McArthur River underground mine, NT	28,000
Do.	do.	Mount Isa Mines Ltd., 100%	Mount Isa underground mine, QLD	375,000
Do.	do.	Olympic Dam Operations Pty. Ltd., manager (WMC Ltd., 100%)	Olympic Dam underground mine, SA	12,900
Do.	do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground mine, NSW	20,000
Do.	do.	Pasminco Ltd., 100%	Rosebery underground mine, TAS	20,000
Spodumene	do.	Gwalia Consolidated. Ltd., 100%	Greenbushes open cut mine, WA	100
Steel		BHP Steel (AIS) Pty. Ltd., 100%	Newcastle steelworks, NSW	1,800
Do.		do.	Port Kembla steelworks, NSW	4,000
Do.		do.	Sydney (Rooty Hill) minimill, NSW	250
Do.		do.	Whyalla steelworks, SA	1,200
Talc		Three Springs Talc Pty. Ltd., 100%	Three Springs open cut mine, WA	200
Tantalite (Ta ₂ O ₅)	pounds	Gwalia Consolidated Ltd., 100%	Greenbushes open cut mine, WA	600,000
Do.	do.	do.	Wodgina open cut mine, WA	500,000
Tin		do.	Greenbushes open cut mine, WA	1
Do.		do.	Greenbushes Smelter, WA	1
Do.		Murchison United NL, 100%	Renison Bell underground mine, TAS	6
Uranium (U ₃ O ₈)	tons	Olympic Dam Operations Pty. Ltd., manager (WMC Ltd., 100%)	Olympic Dam underground mine, SA	1,500
Do.	do.	Energy Resources of Australia Ltd., 100%	Ranger open cut mine, NT	4,500
Zinc		Pasminco Broken Hill Mine Pty. Ltd., 100%	Broken Hill open cut/underground (South) mine, NSW	350
Do.		Western Metals Ltd., 100%	Pillara underground mine, WA	165
Do.		BHP Minerals Ltd., 100%	Cannington underground mine, QLD	40
Do.		Pasminco Ltd., 100%	Century open cut mine, QLD	500
Do.		do.	Cockle Creek Refinery-Smelter, NSW	85
Do.		do.	Elura underground mine, NSW	125
Do.		Western Metals Ltd., 100%	Hellyer underground mine, TAS	250
Do.		MIM Holdings Ltd., 100%	Hilton underground mine, QLD	82
Do.		McArthur River Mining Pty. Ltd., operator (Mount Isa Mines Ltd., 70%; and ANT Minerals Pty. Ltd., 30%)	McArthur River underground mine, NT	95
Do.		Mount Isa Mines Ltd., 100%	Mount Isa underground mine, QLD	250
Do.		Western Metals Ltd., 100%	Pillara underground mine, WA	165
Do.		Pasminco Ltd., 100%	Port Pirie Refinery-Smelter, SA	45
Do.		do.	Ridson Refinery, TAS	220
Do.		do.	Rosebery underground mine, TAS	45
Do.		Normandy Mining Ltd., manager (Murchison Zinc Co. Pty. Ltd., 100%)	Scuddles (includes Golden Grove and Gossan Hill) underground mine	150
Do.		Normandy Metals Ltd., 100%	Woodcutters underground mine, NT	54
Zircon		Iluka Resources Ltd., 100%	Capel South Dredge, WA	300
Do.		Tiwest Joint Venture, operator (Kerr-McGee Chemical Corp. Western Australia Pty. Ltd., 50%, and Ticor Resources Pty. Ltd., 50%)	Cooljarloo Dredge, WA	67
Do.		Iluka Resources Ltd., 100%	Eneabba Dredge and open cut mine, WA	300
Do.		Mineral Deposits Ltd., 100%	Hawks Nest (Fullerton and Viney Creek) Dredges, NSW	25
Do.		Consolidated Rutile Ltd., 100%	North Stradbroke Island (Gordon) Dredge, QLD	50
Do.		Pacific Mining Ltd., 100%	Tomago Dredge, NSW	15
Do.		Iluka Resources Ltd., 100%	Yoganup open cut mine, WA	60

e/ Estimated. NA Not available.

1/ NSW New South Wales; NT Northern Territory; QLD Queensland; SA South Australia; TAS Tasmania; VIC Victoria; WA Western Australia.

2/ Scheduled to come on-stream in early 1999.

TABLE 3
AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES IN 1999

Commodity	Reserves
Antimony	thousand metric tons 78.5
Bauxite	million metric tons 3,764.0
Black coal:	
In situ	billion metric tons 64.9
Recoverable	do. 44.4
Brown coal:	
In situ	do. 41.9
Recoverable	do. 37.7
Cadmium	thousand metric tons 108.8
Cobalt	do. 878.0
Columbium (niobium)	do. 16.1
Copper	million metric tons 22.2
Diamond:	
Gem and near gem	million carats 82.4
Industrial	do. 85.5
Gold	metric tons 5,018.0
Iron ore	billion metric tons 15.5
Lead	million metric tons 14.6
Lithium	thousand metric tons 156.0
Magnesite (MgCO ₃)	million metric tons 245.9
Manganese ore	do. 134.3
Mineral sands:	
Ilmenite	do. 180.9
Rutile	do. 19.8
Zircon	do. 26.3
Nickel	do. 10.6
Petroleum, recoverable:	
Condensate	billion liters 192.0
Crude	do. 266.0
Liquefied petroleum gas	do. 184.0
Natural gas	billion cubic meters 1,494.0
Platinum-group metals (Pd, Pt)	metric tons 36.1
Rare earths (REO plus Y ₂ O ₃) 1/	million metric tons 0.8
Silver	thousand metric tons 31.2
Tantalum	do. 24.7
Tin	do. 100.9
Tungsten	do. 1.0
Uranium, recoverable	do. 571.0
Vanadium	do. 180.0
Zinc	million metric tons 32.0

1/ REO--Rare-earth oxides.

Source: Australian Geological Survey Organisation, 2000, Australia's Identified Mineral Resources 2000: Canberra, Australian Geological Survey Organisation, p. 7.