# SOUTH AFRICA

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South Africa in 1994 was one of the world's major mining and mineral processing nations. Apart from having by far the largest production of gold. South Africa was the largest or among the dominant producers of many other mineral commodities. World-class output of metallic minerals included ores and/or smelted products of antimony, chromium, iron, manganese, platinum-group metals (PGM), titanium, uranium, vanadium, and zirconium. Important output of industrial minerals included andalusite, asbestos, diamond, dimension stone, fluorspar, phosphate rock, and vermiculite. South Africa was a major producer and the world's third largest exporter of coal. It was also the largest producer of liquid fuels and petrochemicals derived from coal. South Africa's well-developed railing and port infrastructure served both the domestic minerals industry and those in neighboring countries.

As with virtually all other facets of the economy, South Africa's mineral production and trade has long been affected by the Government's Apartheid policies. Progressive elimination of these racial policies in recent years culminated in the country holding its first all-race elections in April 1994. As expected, a majority in Parliament went to the hitherto opposition African National Congress (ANC) party. An interim Government was formed, dominated by the ANC, but which included representation by the former ruling National Party. The National Party retained the portfolio of the Ministry of Mineral and Energy Affairs. Enacted changes to mining and related economic policies were relatively few during the year, but a number of major policy changes were proposed and debated, some of which had the potential to profoundly change the minerals industry.

Enhanced political and economic expectations led to a large amount of labor unrest during the year, which affected a number of mines and processing facilities. Removal of economic sanctions against South Africa led to improved trade relations with a number of countries.

Mineral commodities continued to be the cornerstone of the South African economy. Total sales of crude or primary minerals in 1994, as reported by the South African Minerals Bureau, amounted to about \$15.1 billion.<sup>2</sup> Exports accounted for almost \$12.1 billion of this, including gold worth \$7.0 billion. South Africa also had important production of a number of secondary or processed mineral commodities, notably ferroalloys and steel, cement, manufactured fertilizers, and refined petroleum products (from both coal and crude petroleum). Data were incomplete on the total value of these products, but it was estimated that such totaled about \$10.5 billion, including exports of about \$5 billion. Almost 90% of South Africa's electricity was generated from coal and about 6% from uranium; electricity sales in 1994 amounted to \$4.3 billion. By comparison, South Africa's gross domestic product in 1994 was \$122 billion, and total exports were \$25 billion.

The South African minerals industry was unusual in that the bulk of production is controlled by five mining houses. These houses also had major holdings in most other sectors of the South African economy. The legal and regulatory framework that favored this arrangement was expected to be reevaluated by the new Government. In late 1993, proposals for a Reconstruction and Development Program were drafted by the ANC and its mining component was sent to the major mining companies and other industrial concerns for their comments. Further drafts were issued late in 1994. Perhaps in anticipation of political and economic changes to come, some of the major mining houses were divesting themselves of their nonmining subsidiaries-a process referred to as "unbundling" by the local press. They also were expanding their activities overseas—a process greatly aided by the rapid removal of economic sanctions against South Africa. An example of this was Gencor Ltd., which purchased the mining assets of Billiton Ltd., a subsidiary of Royal Dutch/Shell. Anglo American Corp. of South Africa proposed divesting itself of much of Johannesburg Consolidated Investments Co. Ltd.

### **Government Policies and Programs**

The Ministry of Mineral and Energy Affairs' Department of Mineral and Energy Affairs (DMEA) was the primary Government entity responsible for oversight of the country's mineral industry. Within DMEA were the Mineral Rights and Management Services Chief Directorate, which was responsible for liaison and information and the registration of mining titles; the Minerals Bureau Directorate, which was responsible for collecting, classifying, and analyzing mineral data; and the Energy Chief Directorate, which promoted the optimum utilization of energy resources. The Government Mining Engineer and the Mining Branch were responsible for mine health and safety issues. Nine newly created Regional Directorates issued prospecting permits, inspected mineral operations and mine rehabilitation sites, and ensured compliance with environmental regulations. A Mine Environment Control and Rehabilitation Chief Directorate was to be established in 1994.

The Council for Mineral Technology (Mintek) and the Council for Scientific and Industrial Research (CSIR) conducted minerals, mineral processing, and environmental research. The former Chamber of Mines Research Organization (COMRO) was incorporated as the Mining Technology arm of the CSIR. The ANC's Minerals and Energy Policy Centre (MEPC) continued to act as an advisory think tank to the Government, but its long-term future was uncertain.

Notwithstanding major political changes in the country, the South African mineral industry operated under substantially the same laws in 1994 as in 1993. These include the Mining Titles Registration Act, 1967; Mining Rights Act, 1967; Central Energy Fund Act, 1977; Petroleum Products Act, 1977; Nuclear Energy Act, 1982; Diamonds Act, 1986; Electricity Act, 1987; Mineral Technology Act, 1989; Minerals Act, 1991; and Minerals Amendment Act, 1993. The Liquid Fuels and Oil Act, 1947, was repealed in February by the Liquid Fuels and Oil Repeal Act, 1993. Revisions to the Nuclear Energy Act, 1982, as amended in the Nuclear Energy Act, 1993, were to come into effect during 1994. A number of these laws were expected to be subject to review.

Under the new Minerals Act, all mines had to reapply for mining permits by January 1994. Corporate tax rates were reduced to 35% to encourage investment, but the mining industry was assessed a one-time Transition Levy of 5%, related to the elections. In July, the so-called Leon Commission opened hearings on issues of mine safety, health, and compensation to study existing regulations. The Commission's report was expected by yearend.

Historically, the energy crises of the 1970's and the effect of international sanctions on South Africa's supply of imported crude oil had resulted in Government involvement in most aspects of the oil and gas industry, particularly in efforts to achieve energy self-sufficiency. Oil companies were obliged to buy all of Sasol Mining (Pty.) Ltd.'s (SASOL) synthetic fuel (synfuels) production, and prices of fuels and some petroleum products were controlled. Deregulation of the industry was being considered by the Government in 1993. Of particular concern was the disposition of the synfuels production of SASOL and the Mossel Bay Gas Project (Mossgas), and the Atomic Energy Corp.'s (AEC) Zplant at Pelindaba. SASOL and Mossgass were being mooted for privatization. The Z-plant was planned to be closed.

### **Environmental Issues**

Reclamation plans and environmental impact statements were required for existing and proposed mineral operations. Emissions were being reduced at the country's smelters. One company developed a bio-oxidation process to reduce arsenic emissions at a small gold mine; the process has subsequently been adopted by some other mines overseas. A number of gold mines' tailings piles were being reprocessed and/or rehabilitated. Feasibility studies were underway to install scrubbers at the country's many large coal-fired powerplants, although the cost of such retrofits was expected to be prohibitive. New mining projects were under increased environmental scrutiny. Underground development was being considered for the Gamsburg zinc deposit that could more economically be mined as an open pit. An independent committee recommended against the issuance of a mining permit for the St. Lucia titaniferous sands project in an environmentally sensitive part of the northern Natal coastline, although the Government still had to render a final decision. A proposed new steel plant for Saldanha Bay was being opposed on environmental grounds.

### Production

South Africa in 1994 was one of the largest and most diverse minerals producers in the world. As shown in table 1, output levels in 1994 were mixed. Most notably, production of gold fell dramatically, largely because of a large number of wildcat strikes, but also, in some mines, due to declining grades. Strikes also hurt output of PGM, and of titanium and zirconium ores. Output of chromite, manganese and vanadium ores, and derived ferroalloys and chemicals, increased significantly, driven by strong export demand. Steel production, in contrast, was constrained by poor domestic market conditions.

Among industrial minerals, asbestos output continued to decline in step with an ever diminishing world market. Cement output increased modestly, partly in anticipation of major growth in domestic housing starts and because of demand from some major construction projects in the metals sector. A relatively strong world market in the first half of the year allowed a modest increase in diamond output, although overall production by the major company was still administratively constrained. Fluorspar production fell, reflecting the cessation of production late in 1993 of a major mine and its formal closure in early 1994. Strong domestic and very strong export demand for steam coal led to a large increase in coal production during the year; output of anthracite, however, fell.

#### Trade

Complete trade data for South Africa were unavailable for 1994 and official trade tables for 1993 were for the Southern African Customs Union, which included Botswana, Lesotho, Namibia, and Swaziland. South Africa likely accounted for more than 90% of the trade reported. Customs Union data excluded trade among the members, and data for certain key mineral commodities were either excluded or aggregated into general totals in the tables. However, export data for most crude or primary minerals (and a few processed products) were available from the South African Minerals Bureau.

Exports accounted for 80% of total primary minerals sales revenues of \$15.1 billion in 1994, and about 48% of total

estimated secondary or processed mineral sales of about \$10.5 billion. Mineral commodities accounted for almost 70% of South Africa's total exports for the year.

It appeared that mineral export revenues benefitted from generally much improved world prices in 1994. However, for some commodities, improved prices were offset by production decreases. The most notable offset was in gold, where a 6% decline in output more than countered the 6.4% increase in average gold price for the year; exports in 1994 were worth \$7.03 billion. Gold constrained the total growth of crude mineral exports to 3%; it would have been almost 8% had gold output been at 1993 levels.

After gold, the most valuable crude mineral exports were PGM (\$1.62 billion) and coal (\$1.38 billion). Iron ore exports were worth almost \$300 million. Although individual data were officially withheld, exports of diamond, and titanium and zirconium minerals accounted for most of the \$1.12 billion reported by the Minerals Bureau for "miscellaneous" mineral exports. In the value-added sector, exports of steel and ferroalloys were major components, at an estimated \$2 billion and \$1 billion, respectively. Although details were unavailable, liquid mineral fuel exports were estimated at about \$1.6 billion.

Data for exports of South African mineral commodities to the United States were incomplete and excluded trade via third countries. The bulk of the imports in terms of value was in various ferrous metals ores and ferroalloys, diamond, uranium, and, possibly, gold.

Removal of economic sanctions was the main reason South Africa's total imports increased 19% to \$23.4 billion. Detailed data for 1994 were unavailable but much of this increase appeared to have been in consumer goods. In 1993, mineral commodity imports were reported at about \$1 billion, but the data appeared incomplete. It was likely that mineral fuel imports, especially crude petroleum, in 1994 significantly exceeded the \$74 million reported for 1993. Imports of primary steel increased by 51% by mass in 1994 and were worth about \$220 million. It was estimated that imports of most other mineral commodities were at levels comparable to those in 1993.

South Africa was the largest export market for U.S. products and services in sub-Saharan Africa. In 1993, reported direct U.S. mineral exports to South Africa were about \$210 million, primarily steel and steel scrap, refined petroleum products, and coking coal. The United States also had significant sales to South Africa of mining and milling machinery.

#### Structure of the Mineral Industry

The South African mining industry continued to be dominated by five major mining investment groups: Anglo American Corp. (AAC); Anglovaal Ltd.; Gencor; Gold Fields of South Africa Ltd. (GFSA); Johannesburg Consolidated Investment Co. Ltd. (JCI); and Rand Mines Ltd. (*See table 2.*) The groups, often referred to as mining houses, were members of the Chamber of Mines of South Africa.

Other Chamber of Mines members included the majority of remaining gold and coal mines and a number of producers of other mineral commodities. The Chamber of Mines was responsible for a variety of advisory and service functions. One of the main activities of the Chamber was the annual wage negotiations between member mines and the National Union of Mineworkers (NUM). The Rand Refinery, the largest gold refinery in the world, was affiliated with the Chamber.

The South African mineral industry was dynamic, marked by numerous changes in corporate ownership and joint ventures and active trading on the Johannesburg Stock Exchange. Gencor unbundled its consumer products, energy, forest products, and investment divisions. AAC proposed to divest its 39.7% interest in JCI after appropriate tax law changes, anticipated by late 1994. JCI would be split into three entities: one would control the nonmining industrial assets. Another (JCI Ltd.) would control all of the mining assets save platinum and diamonds. The third was to comprise JCI's platinum and diamond assets and would be retained by AAC. A management restructuring occurred at Randgold.

The largest foreign-owned mining group operating in South Africa was Rio Tinto Zinc Corp. Plc. of the United Kingdom, which jointly owned, with AAC, the Palabora copper mine in northeastern Transvaal, one of the largest copper mines in the world. RTZ was also a 50% shareholder in Richards Bay Minerals Ltd. (RBM), a major world producer of mineral sands, with operations in the coastal areas of Natal Province.

According to the Chamber of Mines, the overall South African mining industry employed an average of 610,026 in 1994—about 1% fewer than in 1993 and about 20% fewer than in the mid-1980's. For Chamber member companies only, an average of 346,648 workers were employed by the gold mines in 1994; 54,662 by the coal mines; and 110,883 at other mines. Overall, this was a 3.7% increase from Chamber staffing levels in 1993 and the first overall increase since 1988. Wages in 1994 for Chamber member employees totaled about \$2.32 billion. The Employment Bureau of Africa (TEBA) continued to recruit unskilled and semiskilled workers throughout southern Africa for members of the Chamber of Mines. In 1994, the Chamber of Mines reported that approximately 166,000 mineworkers were from outside South Africa, including about 87,000 from Lesotho and 51,000 from Mozambique. Wages repatriated by or on behalf of these workers were major sources of foreign exchange for these countries.

### **Commodity Review**

### Metals

Aluminum.—Primary aluminum production continued to be entirely by Aluminum South Africa (Pty.) Ltd. (Alusaf) from its Bayside smelter at Richards Bay. Output fell slightly during the year. Alusaf made rapid progress with construction of the new 466,000 metric ton per year (mt/a) Hillside smelter, also at Richards Bay. Construction had started in mid-1993 with first metal production scheduled for late 1995, but by yearend 1994, the startup date had been advanced to mid-1995. Gencor, the controlling owner, had signed long-term contracts with Alcoa of Australia Ltd. and Billiton to supply 500,000 mt/a and 400,000 mt/a alumina, respectively. In turn, Alcoa and Billiton be major consumers of the smelter's output. Despite the purchase of Billiton by Gencor, no plans were announced to alter the alumina supply arrangements.

The Hillside smelter construction project reportedly would require 100,000 metric tons (mt) of steel and 280,000 cubic meters (m<sup>3</sup>) of concrete and thus was a significant boost to the South African steel and cement sector. Shiploading and unloading facilities at Richards Bay were upgraded in anticipation of an eventual influx of 1.2 million metric tons per year (Mmt/a) of alumina and 200,000 mt/a petroleum coke, compared with existing imports of 340,000 mt/a and 30,000 mt/a, respectively.

Prior to commencing construction at Hillside, Alusaf had signed an emissions agreement with the Government, which limited emissions (particularly of fluorides) for the company to then-current levels at the old Bayside smelter. This limit also would apply to the combined Bayside and Hillside smelter output. The Hillside smelter was being constructed with state-of-the-art technology and emissions control systems. Nevertheless, to meet the limit for the combined smelters, it was necessary to reduce emissions at Bayside. Work on this was ongoing for one of the three potlines at Bayside and was being studied for the other two. Also under consideration was a modest increase in capacity, by about 35,000 mt/a combined, for the Bayside smelter.

Antimony.-Consolidated Murchison Ltd., South Africa's only producer of antimony (as stibnite concentrate), had in recent years concentrated its mining efforts in relatively goldrich, but antimony-poor, ores in response to low antimony prices. The company was only marginally successful in returning to the better antimony ores when a shortage of Chinese material on the world market led to higher prices in late 1993. Prices increased significantly in 1994 but. reportedly, equipment problems at the mine constrained ore output increases. Nevertheless, an improvement in head grades and plant recoveries was reported, and output of stibnite concentrates for the year increased modestly. Murchison's sales for the year included material from stockpiles. In recent years, most or all of Murchison's concentrates have been sold to the adjacent Antimony Products (Pty) Ltd. plant for conversion to antimony oxide.

**Chromite.**—A stronger international market for stainless steel, particularly from midyear, and reduced availability of ferrochromium from countries of the former Soviet Union, led to a significant increase in South Africa's chromite production in 1994 compared with the lackluster performance the previous year. Much of the increased ore output, however, was absorbed by domestic ferroalloys production. Exports of chromite actually fell 9% to 892,071 mt.

Samancor Ltd. continued to be the largest chromite producer in the country, with an ore output capacity at midyear reported at 2.6 Mmt/a. However, the company had a number of mines, totaling about 1 Mmt/a capacity, on mothball status that were being brought back into production to meet current and anticipated demand from its ferrochromium smelters.

Copper.-The Palabora Mine was by far the largest copper producer in the country. Output or ore from the 100,000 mt (80,000 mt ore) per day (mt/d) mine complex increased slightly and mill output for the year was 127,600 mt of copper-in-concentrate. Both smelter and refinery performance improved, the latter by 5% to 115,500 mt of cathode. The mine also produced baddeleyite, nickel sulfate, uranium, phosphate concentrates, and vermiculite, as well as modest amounts of precious metals contained in refinery tankhouse slimes. Remaining open pit reserves were claimed adequate for mining through 2002. Thereafter, it was proposed to carry on mining underground. A 2-year feasibility study on this was concluded in 1994, based on the assumption of an underground mining rate of 60,000 mt/d. The conclusion was negative but, at yearend, additional studies were being done on the feasibility of underground mining at a smaller scale.

Apart from two other copper companies, the metal was produced in small amounts by the country's PGM mines.

Gold.—Although South Africa's gold industry in 1994 remained the largest by far in the world, it had its worst production year since 1958. Total gold output fell 6% from that in 1993. A major reason was lost production time. A number of unscheduled holidays were related to the general elections in April, and later in the year the new Government mandated that 12 holidays per year be given the mine workers (hitherto the allotment was 4). The industry considered the extra holidays, in and of themselves, as a nuisance. The major problem, according to the industry, was that the extra holidays were being imposed while the mines were still restricted to a 6-day working week. Sunday mining (blasting) was still forbidden, except for a few marginal mines. The industry argued that Sunday mining would give them a large net increase in working days, and hence gold production. Further, it would lead to the mines hiring more workers. This issue remained unresolved as of yearend. A further aggravation to the holiday situation was a large number of wildcat strikes and work slowdowns that plagued the industry during the year.

The other major contribution to the fall in gold output was declining ore grades. For members of the Chamber of Mines (these accounted for almost 95% of total South African gold output, mostly from about 30 mines on the Witwatersrand), the average grade of ore milled in 1994 was 5.40 grams per

mt (g/mt) gold. This was a 2.9% drop from the previous year and, except for minor perturbations, continued a general grade decline totaling about 60% from the late 1960's.

For Chamber members, working costs (in rands) in 1994 rose almost 13% per mt of ore milled and 16% per kilogram (kg) of gold recovered. The increases reflected generally high inflation levels (including higher wages) and, notwithstanding labor-intensive mining methods, the great technical difficulties of mining at extreme depths. Continuing to mitigate cost increases was the fact that costs were denominated in rands and gold sales were in dollars. In 1994, the industry thus received a double benefit from the 6.5% higher (dollar) gold price and the 8.5% devaluation of the rand. Nevertheless, the net effect (since 1985) has been a steady rise in the average grade pay limits and a narrowing of the gap between pay limit and recovery grade. Traditionally, at times of low gold prices, South African producers have concentrated on mining their higher grade reserves and exploiting lower grade material when prices improved. With relatively stagnant and/or low gold prices since the mid-1980's, there has been rapid depletion of relatively highgrade ores at most mines. This has led to actual, and fears of, "sterilizing" (rendering permanently uneconomic) the remaining low-grade resources. Particularly vulnerable were very deep resources and those very distant to the ore-hoisting shafts-the latter problem sometimes has been overcome by merging adjacent mines.

The Witwatersrand gold mines varied greatly in size and grade. The largest continued to be AAC's Free State Consolidated, which milled 23.6 million metric tons (Mmt) of ore in 1994 to recover 102,139 kg of gold. Apart for some tailings reprocessing operations, the smallest production on the Witwatersrand was from Gengold (Gencor)'s Oryx mine, which milled 148,000 mt of ore and produced 283 kg of gold. The highest average grade operation was GFSA's Kloof Mine, at 14.17 g/mt; the lowest was Gengold's Stilfontein Mine, at 1.05 g/mt.

A number of mines were considered marginal. At the Oryx Mine, production stoping had ceased in late 1993, owing to lower and more variable grades than expected. The problem was that the mine had started as a uranium operation and was redesigned for gold when uranium prices plummeted. The existing shaft, however, was not well-situated for the best gold ore. The parent company, Gencor, was underwriting the cost of at least 2,000 meters (m) of development needed to access and sample higher grade, but distant, reserves. At yearend, Gengold was nearly finished with closure of the Stilfontein Mine, but was continuing to pump water from one shaft to reduce influx to the adjacent Hartebeestfontein Mine, owned by Anglovaal. Gengold was considering merging its Kinross and Winkelhaak Mines, to make more economic the combined reserves. Gengold's Buffelsfontein Mine had only 2 years of underground reserves remaining, but was expected to continue producing gold from reprocessed tailings for a decade. GFSA's Doornfontein Mine was not profitable at current gold prices.

The planned closure of Randgold's Durban Roodepoort

Deep (Durban Deep) Mine, announced in July, was opposed by both NUM and the new Government, and the latter was considering subsidies to help the ailing operation. Following a management change at Randgold in August, it was announced that the mine would not be closed after all; toward yearend it was announced that Durban Deep instead would be merged with the adjacent Rand Leases Mine.

A number of major development projects were ongoing. AAC continued development work on the Moab Mine project to access large high grade reserves adjacent to AAC's Vaal Reefs Mine. To reduce costs, development was being done via Vaal Reefs No. 11 shaft. This shaft's hoisting capacity was increased by 30,000 mt/month to advance by 1 year the startup of ore production from Moab. Startup was expected in 1997. A new company, Eastvaal Gold Holdings Ltd., was formed through which to attract further financing for the project. At AAC's Free State Consolidated Mine, sinking operations were commenced on the new Freddies No. 4 shaft.

Anglovaal continued underground development work from its Loraine Mine to reach large, deep, resources to the north—the so-called Target component of the Sun project. The company expected to reach the Target area in mid-1995, whereupon it would commence underground drilling to delineate reserves.

JCI announced the merger of its Western Areas Mine with South Deeps Exploration Co. Ltd.—the company formed to develop the South Deep project adjacent to Western Areas. It was claimed that South Deep had the largest, as yet unmined, reserves on the Witwatersrand, on the order of 120 Mmt grading 10 g/mt gold. Mining of the shaft pillar reserves commenced during the year.

*Iron and Steel.*— Iron Ore.—Strong export demand spurred a significant increase in iron ore production in 1994. Exports rose 3% to 19.6 Mmt, worth about \$300 million.

Iscor Ltd. was by far the largest iron ore producer--its two iron mines, Sishen and Thabazimbi, accounted for 78% of the country's total output. Railroad capacity from Sishen to the export terminal at Saldanha Bay was upgraded by 2.5 Mmt/a to 23.4 Mmt/a.

Steel.-Iscor accounted for 83% of total South African steel production and remained the largest steelmaker in Africa. The company at yearend announced that it would go ahead with plans to build a 650,000 mt/a Corex steel plant at Saldanha Bay. The plant would use iron ore (pellets) instead of scrap and, while initial feed would be imported, the plant eventually would be supplied from the Sishen Mine. The plant project faced significant opposition on environmental grounds; Saldanha Bay had a burgeoning tourist industry. Iscor also announced plans to convert, by 1996, its Pretoria steel plant to stainless steel output. Planned capacity was given as 480,000 mt/a of stainless slab. The plant was expected to have a production cost advantage by using ore feed, rather than scrap. Iscor also was planning to convert its Durban plant, idled in 1993, to the production of about 100,000 mt/a stainless steel long products.

The Columbus Stainless Steel expansion project was about 85% completed at yearend. The project, a joint venture among Samancor, Highveld, and the IDC (33.3% each), would have a capacity of 500,000 mt/a. Capacity at the existing plant was about 150,000 mt/a and the final, combined plant would have a capacity of 600,000 mt/a. Initial production from the new facilities was expected by mid-1995 with total output for the year from the expanded plant of about 250,000 mt. Some disruptions to production and coil deliveries from the existing plant were experienced late in 1994 as a result of the expansion project; this was inevitable given that the construction work was intertwined with the existing production facilities. The expansion project would make Columbus the largest single-site stainless producer in the world. Significant production cost savings were to be achieved through the plant's taking hot metal from the adjacent Middelburg ferrochromium smelter.

Given the planned coming on-stream between Iscor and Columbus of more than 1 Mmt/a of new stainless capacity, concerns were raised as to the source of the required nickel. Columbus anticipated using 40,000 to 50,000 mt/a nickel and it was expected that Iscor would need a similar amount; the total requirement was well in excess of South Africa's nickel production capacity. Gencor, in its purchase of Billiton, acquired substantial nickel capacity overseas, but it was unclear if this material would be diverted to Columbus.

*Ferroalloys.*— Ferrochrome.—Substantially improved world ferrochromium prices led to a major increase in output in 1994. Because of poor market conditions in 1993, Samancor had converted some of its ferrochromium furnaces at its Ferrometals plant in Witbank and Palmiet plant in Krugersdorp to the production of ferromanganese and silicomanganese. As ferrochrome demand picked up in the second half of the year, and in anticipation of commissioning the expanded Columbus stainless steel plant in 1995, Samancor reconverted the Palmiet furnaces in October 1994, and planned to have the Ferrometals units reconverted by April 1995.

Samancor continued to establish production links with major customers. In 1993, it had formed a 50-50 joint venture with Japan's Nippon Denko Corp. (NDC) to supply NDC's customers with the dedicated production of the No. 5 furnace at Samancor's Tubatse smelter. A similar plan, involving low-carbon ferrochromium capacity at the Middelburg smelter, was being negotiated in 1994 with another Japanese company.

Samancor was constructing a ferrochromium-from-slag plant at the Ferrometals smelter, which it planned to commission in 1995. It was considering similar units at Tubatse and Middelburg.

JCI's Consolidated Metallurgical Industries (CMI) had idled about 50% of its ferrochromium capacity at Lydenburg in 1993, but restored most of the capacity in 1994 and expected to be at full capacity again in early 1995.

Chromecorp Technology (Pty.) Ltd. was installing a fourth

ferrochromium furnace at Rustenburg; commissioning was planned for early 1995. With the new furnace, the company's capacity would be 260,000 mt/a.

**Ferromanganese.**—South Africa's production of high and medium carbon ferromanganese increased again in 1994, largely because of the use, by Samancor, of five of its ferrochromium furnaces for manganese alloys. Samancor was considering installing an additional ferromanganese furnace, of 120,000 mt/a capacity, at its Metalloys smelter complex at Meyerton. A plant was being constructed there to recover entrained ferromanganese from slag. It was estimated that there was about 10 Mmt of this slag available onsite.

Nickel.-South Africa's nickel output is mostly a byproduct of PGM production, with some byproduct production from the Palabora copper mine. Output was significantly unchanged in 1994. With the anticipated growth in demand from stainless steel producers in South Africa and worldwide. Anglovaal speeded its evaluation of its Slaaihoek nickel-cobalt-copper-PGM project. The deposit is hosted by the Uitkomst mafic complex near Barberton in the Eastern Transvaal. Drilling was expected to be completed by yearend 1994 and a geostatistical reserve evaluation was planned for early 1995, to be followed by a full feasibility study. Toward the latter, an exploration shaft was sunk late in 1994 to a depth of 390 m and construction of a pilot plant was started. AAC did not report any plans to restart its adjacent Uitkomst nickel-copper project, but was monitoring the nickel market in this regard.

**Platinum-Group Metals (PGM).**—South Africa continued to be the world's largest primary producer of PGM and had almost 90% of world reserves. Combined PGM production declined in 1994, in part owing to labor disruptions and an increased number of holidays. Also, some bottlenecks were reported at Rustenburg associated with the modernization of the smelter complex, and one shaft was enclosed at Impala. However, the decline was offset by improved prices; sales revenues increased slightly to \$1.62 billion—all reported as exports.

The corporate structure of platinum mining was set to change significantly. The platinum holdings of JCI were to be transferred to AAC as part of AAC's unbundling of JCI. These holdings, combined with others held by AAC, were to be combined under a new company, Anglo American Platinum Corp. (Amplats). It was planned to float the new company in early 1995. A possible merger of Impala with Lonrho's Eastern and Western Platinum mines was being discussed.

Technical and grade-control problems continued to plague the Northam platinum mine, the deepest and highest temperature platinum mine in the world. Output was well below that forecasted. An assessment of the operation conducted during the year concluded that it would not be possible to produce the targeted rate of 150,000 mt/month of ore, but a rate of 110,000 mt/month would be attainable. Rates close to this were attained by yearend and improved geological modeling of the mine's so-called pothole structures allowed better grade control.

**Titanium and Zirconium.**—Richard Bay Minerals' Tisand (Pty.) Ltd. (RBM) produced ilmenite, rutile, and zircon from beach sands north of Richards Bay. A sister company, Richards Bay Iron and Titanium (Pty.) Ltd. produced an 85% titanium dioxide slag from ilmenite concentrates at the Richards Bay smelter, as well as lowmanganese pig iron. RBM overwhelmingly was the largest titanium mineral producer in the country. Titaniferous magnetite also was recovered at the Phalaborwa carbonatite as a byproduct of copper and phosphate rock production, and titaniferous slag was produced from magnetite ores by the Highveld steel plant.

No decision by the Government had been announced at yearend as to whether RBM would be allowed to mine large titaniferous sands resources at St. Lucia. A recommendation to deny a mining permit, on environmental grounds, had been made by an independent panel at yearend 1993.

Mining commenced in 1994 at AAC's Namakwa Sands project commissioned in September, although the titanium slag and pig iron smelters were still under construction. Initial mining was at a rate of 4 Mmt/a of combined heavy minerals, and was expected to reach capacity level, following the construction of additional concentrator units, of 12 Mmt/a by about 1999. At full production, the mine and smelter was expected to produce about 370,000 mt/a of ilmenite (to be converted to 196,000 mt/a titania slag); 36,000 mt/a rutile; 123,000 mt/a zircon; and 119,000 mt/a pig iron.

Iscor announced that it had purchased 100% of Natal Mineral Sands (Pty.) Ltd., which held titaniferous sand reserves near Richards Bay. A feasibility study was being conducted on smelting the material, with first production anticipated by 2000. Iscor itself would be the likely customer for the pig iron coproduct.

**Uranium.**—Uranium production, largely a coproduct of a three Witwatersrand gold mines, fell in 1994 in line with reduced gold output. A small amount (approximately 100 mt) of uranium oxide

was produced by the Palabora copper mine.

**Vanadium.**—Vanadium was produced from titaniferous magnetite mined from the Bushveld Complex. Output of vanadium increased modestly during in 1994.

The largest producer was Highveld Steel and Vanadium Corp. Highveld completed its purchase of Transvaal Alloys Pty. Ltd. at the beginning of the year. Highveld's main products were vanadium slag and vanadium pentoxide flake, although modest amounts of vanadium trioxide also was produced, as was a small amount of ferrovanadium.

Rhombus Vanadium Holdings Ltd. (Rhovan)

commissioned a 6,000 mt/a (contained) vanadium pentoxide plant toward yearend, but the plant's economics initially were being threatened by low pentoxide prices. A ferrovanadium smelter for the plant was being considered.

Low prices earlier in the year led to an announcement of the cessation of mining by Vametco Minerals Corp. Instead, the company was buying slag from Highveld.

### **Industrial Minerals**

**Cement.**—Cement was produced by Pretoria Portland Cement Co. Ltd. (PPC), Anglo Alpha Cement, and Blue Circle Cement (Pty.) Ltd. The three companies had equal interest in Natal Portland Cement Co. (Pty.) Ltd. (NPC), which served much of the Natal market. These companies comprised a cartel, the South African Cement Producers Association. Following a 2-year investigation of the cartel's pricing and supply practices, the South African Competition Board recommended that the cartel be disbanded. It was unclear what the effect of disbanding would be, but the producers were planning to increase output capacity in anticipation of major housing projects sponsored by the new Government.

**Diamond.**—South Africa's rough diamond production increased significantly in 1994, reflecting relatively strong prices in the first half of the year. As in years past, De Beers dominated the sector with about 95% of total production. Total production by De Beers was 10.23 million carats, up 4%. Much of the increase was from the Finsch, Kimberley, and Namaqualand Mines. Output at Venetia, which had increased in 1993, fell in 1994 owing to the processing of lower grade ore. Production increased at the Premier Mine due to increased reprocessing of dumps. Reserves were exhausted and mining ceased above the gabbro sill at Premier early in the year.

Apart from De Beers, there were several other companies with diamond operations in South Africa and several others obtained exploration permits. Most of these were relatively small alluvial workings, either onshore or offshore the Atlantic coast north of Saldanha Bay, but particularly near the Namibian border around Alexander Bay and along the Orange River. One of the larger of these companies was Trans Hex Group Ltd. Apart from its coastal alluvial operations, the company was recovering diamonds through retreatment of kimberlite mine tailings from three former mines near Kimberley.

A Canadian company, Diamond Field Resources Inc., was planning to expand production at the Frank Smith and Loxton Dal kimberlites near Kimberley.

**Fluorspar.**—The Buffalo fluorspar mine was officially closed in February 1994. It had ceased production the previous November.

### **Mineral Fuels**

Except for a minor amount of gas condensate, South Africa produced no crude oil during the year, and only a limited amount of natural gas. Most of the country's primary energy needs were supplied by coal; most electricity was generated by coal-fired power stations, and coal was also the basic raw material for South Africa's production of synthetic fuels.

The Southern Oil Exploration Co. (Soekor), the stateowned petroleum exploration company, controlled all offshore oil and gas prospects. During 1994, Soekor invited international bids on several small offshore blocks near Cape Town.

**Coal.**—South Africa was the sixth largest coal-producing country in the world and the third largest coal exporter. Bituminous coal accounted for more than 98% of South African production. Four companies, Anglo American Coal Corp. Ltd. (Amcoal), Trans-Natal Coal Corp. Ltd., Randcoal, and Sasol Mining (Pty.) Ltd., continued to account for more than 80% of the country's coal production. Other producers included Iscor Ltd., which mined coal for its own use; GFSA; and numerous independent medium to small coal companies. Although the 76 coal operations within the 19 coalfields of South Africa were spread over an area of 300,000 square kilometers, the main coal-producing area was the Witbank Basin, which accounted for approximately 42% of the country's output. About 65% of the coal was produced from underground mining operations, with the remainder coming from open pit mines. Most open pit mines were less than 70 m deep.

The corporate structure of the coal industry changed dramatically in late 1994 with the purchase of Randcoal by Trans Natal Coal to form Ingwe Coal Corp., one of the largest coal companies in the world. One of the reasons given for the merger was that Trans-Natal wanted to reverse its declining sales to Eskom, by far the largest coal consumer in South Africa. Randcoal's sales to Eskom had been increasing. The merger also gave Ingwe a controlling stake (41.3%) in the Richards Bay Coal terminal (RBCT).

The RBCT in 1994 had approximately 60 Mmt/a shipping capacity, although it was originally designed to be expanded to 100 Mmt/a. The terminal was owned by several coal companies, who restricted access to it. A rival coalition, led by SASOL, had planned to build a smaller coal terminal at Richards Bay—the so-called South Dunes Coal Export Terminal (COALEX). The COALEX project received a severe setback when SASOL, toward yearend, purchased a 5.2% interest in RBCT and the rights to export 3 Mmt/a of coal from it.

The largest domestic consumer of coal continued to be Eskom, followed by SASOL. Eskom used slightly less than 40% of the coal produced in South Africa for power generation. SASOL's oil-from-coal plants consumed about 21% of the country's coal production. Other significant domestic users were Iscor's metallurgical plants, the cement industry, and large municipalities. **Synfuels.**—The Government was considering plans to privatise the Mossgas oil-from-gas project, and SASOL's plants producing oil and petrochemicals from coal. These companies' fuel production was considered too expensive in light of the ready access to imported fuels occasioned by the removal of economic sanctions against South Africa.

### Reserves

South Africa's mineral reserves are large and diverse and reflect the country's complex geology. A detailed account of the geology of many of South Africa's ore deposits is available from the Geological Society of South Africa<sup>3</sup> and a useful background geologic summary is given in Mining Magazine.<sup>4</sup> The bulk of South Africa's mineral production is from the northern half of the country.

Table 3 gives the reserve base for a number of South Africa's major minerals; diamond reserve data are unavailable. Although data are incomplete for the world, for many of the minerals shown South Africa's reserves appear to rank among the top five countries and would rank first in the world for andalusite, chromite, gold, manganese, PGM, and vanadium.

### Infrastructure

The country had a well-developed and extensive road and railroad infrastructure, serving not only South Africa but also southern Africa. A number of ports handled minerals, notably Cape Town, Durban, Richards Bay, Port Elizabeth, Mossel Bay, East London, and Saldanha Bay.

Richards Bay handled the greatest volume of cargo among African ports. The RBCT had a coal export capacity of about 60 Mmt/a. Coal exports through Durban were only a fraction of those through RBCT. Durban's port facilities were designed mainly for small consignments of high-quality-sized bituminous coal and anthracite that cannot be accommodated at Richards Bay and have a coal export capacity of 3.5 Mmt/a. An upgrading program, which would increase capacity to 5 Mmt/a, was in progress.

In addition to fulfilling the requirements of South Africa itself, the country's ports also served as outlets for landlocked countries such as Botswana, Lesotho, Swaziland, Zaire, Zambia, and Zimbabwe. Walvis Bay was transferred to Namibian sovereignty in early 1994. South Africa was also a regional supplier of electricity and petroleum products, two of a number of examples of the dependence of neighboring countries on South Africa's infrastructure and transportation networks.

Eskom, one of the largest utilities in the world with a nominal capacity of 39,746 megawatts (MW) (31,585 MW in active plants), generated 160,293 gigawatt-hours of electricity in 1994—almost 96% of the country's total electricity. Coal-fired powerplants accounted for 92% of Eskom's total output. Eskom's Koeberg nuclear powerplant supplied 6% of the total. The mining industry consumed 20% of Eskom's electricity in 1994.

### Outlook

It was too soon to fully evaluate the impact of the dramatic political changes that occurred in South Africa in 1994. Potentially, significant changes could be anticipated in labor issues, such as housing of migrant workers, wages, job training, and work schedules. It was likely that mine safety issues would assume greater political importance, with trade unions demanding a greater say in mining practices. The frequency of wildcat strikes and other labor disturbances had not diminished at yearend 1994 and disruptions were expected to continue well into 1995. The resulting loss of work days, coupled with the unresolved matter of balancing new holidays with the requested elimination of the ban on Sunday mining, were expected to lead to even lower gold output for 1995. Rapidly escalating crime, particularly in urban areas, had the potential of discouraging foreign investment in the country.

Increased attention was expected to be given to environmental issues, which also would be factors in projects requiring financing from international lending institutions.

The major mining houses will likely continue to increase their holdings and activities overseas, including the forming of strategic alliances with major overseas customers. Government proposals to maximize prices received for South African goods, and to guard against transfer pricing, were seen as potentially damaging to South Africa's export competitiveness.

South Africa appeared to be entering a phase of rapid expansion of mineral processing capacity, especially for metals. In this regard, if labor and energy costs remained low and world markets remained buoyant, South Africa had the potential to greatly increase its market share for many commodities.

<sup>4</sup>Mining Magazine, May 1995, The SA Mineral Industry: 1—The Geological Background: Mining Magazine, v. 172 No. 5, (special section) pp. 6-9.

#### **Major Sources of Information**

Chamber of Mines of South Africa P.O. Box 61809 2107 Marshallton South Africa

Telephone: (27) 11 838-8211 Fax: (27) 11 834-1884 Council for Geosciences (Geological Survey) Private Bag X112 0001 Pretoria South Africa Telephone: (27) 12 841-1911 Fax: (27) 12 841-1203 Council for Mineral Technology (Mintek) Private Bag X3015 2125 Randburg South Africa Telephone: (27) 11 709-4111 Fax: (27) 11 793-2413 Department of Mineral and Energy Affairs **Government Mining Engineer** Private Bag X59 0001 Pretoria South Africa Telephone: (27) 12 322-8561 Fax: (27) 12 322-3416 Department of Trade and Industry Private Bag X84 0001 Pretoria South Africa Telephone: (27) 12 310-9791 Fax: (27) 12 322-0298 Embassy of South Africa Minerals and Energy Liason 3051 Massachusetts Ave., NW Washington, DC 20008 Telephone: (202) 232-4400 Fax: (202) 232-3402 Eskom P.O. Box 1091 2000 Johannesburg South Africa Telephone: (27) 11 800-8111 Fax: (27) 11 800-4299 Industrial Development Corp. of South Africa Ltd. P.O. Box 784055 2146 Sandton South Africa Telephone: (27) 11 883-1600 Fax: (27) 11 883-1655 Minerals Bureau Private Bag X4 2017 Braamfontein

South Africa Telephone: (27) 11 339-4414

Fax: (27) 11 403-2061

<sup>&</sup>lt;sup>1</sup>Unless otherwise specified, reference to South Africa includes Bophuthatswana, Ciskei, Transkei, and Venda, as well as the 10 tribd homelands, all within the boundary of South Africa, and all of which were reincorporated into South Africa following the 1994 general elections. Walvis Bay was transferred to Namibian sovereignty in early 1994.

<sup>&</sup>lt;sup>2</sup>Where necessary, values have been converted from South African rands (R) to U.S. dollars at the rate of R3.55=US\$1.00 for 1994 and R3.27=US\$1.00 for 1993.

<sup>&</sup>lt;sup>3</sup>Anhaeusser, C.R., and Maske, S., eds., 1986: Mineral Deposits of Southern Africa, Vols. I and II: The Geological Society of South Africa, 2355 p.

## TABLE 1 SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/

### (Thousand metric tons unless otherwise specified)

Commodity METALS		1990	1991	1992	1993	1994
Aluminum metal primary		159	169	173	175	172
Antimony concentrate 2/:		157	109	175	175	172
Gross weight	tons	8.110	7.530	6.470	7.180	7.500 e/
Sh content	do.	4.820	4,490	3.380	4,110	4.300 e/
Cadmium. Cd content of cadmium cake	<u>do.</u>	57	103	60	70 r/ e/	65 e/
Chromite, gross weight:						
More than 48% chromic oxide		47	70	18	4	
44% to 48% chromic oxide		2,380	2,670	1,900	1,810	1,570
Less than 44% chromic oxide		2,190	2,370	1,440	1,010	2,030
Total		4,620	5,110	3,360	2,830	3,600
Cobalt:		,	,	,	*	,
Mine output, Co content e/	tons	350	350 r/	350	350 r/	350
Refinery output:						
Metal, powder e/	do.	70	60	65	48	72
Sulfate, contained cobalt e/	do.	180	150	170	124	186
Total	do.	249	209	234	172	258
Columbite-tantalite, concentrates:						
Gross weight	kilograms	6	14	31		
Cb content e/	do.	2	5	11		
Ta content e/	do.	2	4	9		
Copper:						
Mine (company output), Cu content		179	185	176	166	165
Metal:						
Smelter		176	165	159 r/	157 r/	166
Refined, primary		133	127	120	128	132
Gold, primary	tons	605	601	614	619	580
Iron and steel:						
Ore and concentrate:						
Gross weight		30,300	29,100 r/	28,200	29,400	32,300
Fe content e/		19,700	18,900 r/	18,300	19,100	20,700
Metal:						
Pig iron		6,260	6,970	6,500	6,110	6,050
Direct-reduced iron		882	863	854	833	980
Ferroalloys, electric arc furnace:						
Chromium ferroalloys		1,020	1,150	771	834	1,100
Ferromanganese		404	260	270	393	582
Silicomanganese		269	270	267	268	290
Ferrosilicon		78	68	64	99	95
Silicon metal		36	40	35	38	36
Ferrovanadium e/		1	1	1	1	1
Crude steel		8,620	9,360	9,060	8,730	8,320
Lead:		60, 100	<b>5</b> < <b>3</b> 00		100.000	05.000
Concentrate, Pb content	tons	69,400	76,300	75,800	100,000	95,800
Smelter, secondary	<u>do.</u> :	31,200	32,200	29,000	31,800	31,800
Manganese:						
Ore and concentrate, gross weight:						
More then 48% manageness		2 100	1 640	1 220	1.240	1 520
$\frac{1}{45\%}$ More than 48% manganese		2,100	1,040	1,550	1,240	1,550
45% to 48% manganese		610	181	219	237	0/
40% to 45% manganese		009	653	273	299	1 010
Total metallurgical		4 320	3 100	2 380	2 440	2 800
		4,520	5,100	2,380	2,440	2,800
More than 65% manganese dioxide		6	1	16		
35% to 65% manganese dioxide		69	1	10		50
Less than 35% manganese dioxide		09	45	15	07	50
Total chemical		81		80	67	50
Grand total		4 400	3 150	2 460	2 510	2 850
Metal electrolytic e/		35 3/	3,130	2,400	2,510	2,050
Nickel		55 51	55	55	55	55
Mine output, concentrate, nickel content	tops	29 000	27 700	28 400	30.000 e/	31.000 e/
Metal electrolytic	do	28,200	26,900	27,600	29,900	30,100
Platinum-group metals	do	142	143	153	176	165
			1.0		1.0	100

## TABLE 1--Continued SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/

### (Thousand metric tons unless otherwise specified)

Commodity		1990	1991	1992	1993	1994
METALSContinued		1770	1)))1	1772	1775	17771
Silver	do.	161	171	183	192	196
Thorium, monazite concentrate, gross weight e/	do.	1,320 3/	400 r/	400 r/	400 r/	400
Tin:						
Cassiterite concentrate:						
Gross weight e/	do.	2,800	2,600	1,500	1,200	115
Sn content	do.	1,140	1,040	582	452	43
Metal:						
Primary 4/	do.	1,140	1,040	592	452 r/	43
Secondary e/	do.	70	70	60	50	50
Titanium: e/						
Rutile concentrate		64 3/	77 r/	85 r/	86 r/	78
Titaniferous slag 5/		717 r/	853 r/	929 r/	937 r/	819
Uranium oxide	tons	2,880	2,040	2,220	2,010	1,910
Vanadium:						
Vanadiferous slag, gross weight e/	<u>do.</u>	70	60	55	60	60
Vanadium content:						
Of vanadiferous slag e/	<u>do.</u>	10,000	8,460	7,730	8,400	9,600
Of vanadium pentoxide and other products e/	do.	7,100	6,500	6,300	6,650	6,060
Total e/	do.	17,100	15,000	14,000	15,100	15,700
Zinc:						
Concentrate:						
Gross weight e/		139 3/	127	134 3/	140	140
Zn content		75	64	72	77	76
Metal, smelter		92	92	83	96	94
Zirconium concentrate (baddeleyite and zircon) e/		152	230	243 r/	243 r/	226
INDUSTRIAL MINERALS						
Aluminosilicates:		201	210	220	100	200
Andalusite		284	210	230	188	208
Sillimanite	tons	256	422	632	569	525
Asbestos:	1	26,600	27 200	5 120		
Amosite Characterile	<u>do.</u>	26,600	27,300	5,130		
	<u>do.</u>	103,000	102,000	104,000	92,400	85,900
Tratal	<u> </u>	15,800	19,600	24,500	104.000	0,270
 Derite	<u> </u>	2,400	149,000	155,000	2 000	92,200
Darile Daril concentrate (110/ to 120/ DeO)	1::10 groups	2,490	4,790	5,570	2,000	1,950
Calaita	Kilograms	1,000	2 5 6 0	12 800		
Cament hydraulic	tons	7 810	2,300	7.030	7 360	7 910
Clave		7,010	7,450	7,050	7,500	7,910
Attanulgite	tons	7 630	8 1 1 0	8 240	7.030	10 100
Bentonite	do	66 100	64 600	44,000	50,400	71 800
Fire clay	<u>uo.</u>	232	133	86	92	109
Flint clay, raw and calcined		130	124	124	89	132
Kaolin		130	134	132	147	132
Brick clay local sales		2 060	1 260	1 070	1.030	1 240
Corundum natural	tons	2,000 2 e/				
Diamond natural	tons	2 0/				
Gem e/ t	housand carats	3,900	3.800	4.600	4.600	4,900
Industrial e/	do.	4.810	4.630	5.560	5.720	5,900
Total	do.	8.710	8.430	10.200	10,300	10.800
Diatomite	tons	2.800	2.350	576		
Feldspar	do.	56,100	70,300	49,400	56,800	38,400
Fluorspar:				- <i>1</i>	/	/
Acid-grade e/		262	240	231	195	167 3/
Ceramic-grade e/		8	6	6	4	
Metallurgical-grade e/		42	24	23	19	7
Total 3/4/		311	270	260	218	174
Gemstones, semiprecious:						
Rose quartz	kilograms	17,800	41,200	101,000	85,500	
Tiger's eye	tons	550	467	621	548	531
Gypsum, crude		391	420	334	284	308
Industrial or glass sand (quartz)		1,990	2,070	1,750	1,740	1,920
Lime 4/		1,830	1,770	1,690	1,600	2,890

### TABLE 1--Continued SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/

#### (Thousand metric tons unless otherwise specified)

INDUSTRIAL MINERALS-Contined terms         1990         1991         1992         1993         1994           Magnesite, crude         terms         114,000         92,600         60,100         67,400         71,800           Magnesite, crude         terms         12,800         2,108         1,200 <td< th=""><th></th><th></th><th>1000</th><th>1001</th><th>1002</th><th>1002</th><th>1004</th></td<>			1000	1001	1002	1002	1004
Integratie crude         Integratie crude <thintegratie crude<="" th=""> <thintegratie <="" crude<="" td=""><td></td><td>Continued</td><td>1990</td><td>1991</td><td>1992</td><td>1993</td><td>1994</td></thintegratie></thintegratie>		Continued	1990	1991	1992	1993	1994
imput number		-Continueu	114 000	92 600	60 100	67 400	71 800
Jacka Skop and ground         John Sk	Miagneshe, crude		1 14,000	92,000	2 080	1,000	1,000
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Nitrogen: N content of ammonia	<u>uo.</u>	1,770	1,000	2,080	1,990 607 o/	1,970 610 o/
reme         1005 $2100$ $41$ $97$ $2.60$ $91a$ Gross weight $3.090$ $3.170$ $r'$ $3.080$ $r'$ $2.470$ $r'$ $2.545$ Pussphurs perioxide content e' $1.200$ $r'$ $3.090$ $r'$ $3.080$ $r'$ $2.470$ $r'$ $2.545$ Pussphurs perioxide content e' $1.200$ $r'$ $3.090$ $r'$ $3.090$ $r'$ $2.470$ $r'$ $2.470$ $r'$ $2.470$ $r'$ $2.710$ $r'$ $2.900$ $2.2700$ $2.600$ $2.2700$ $3.6400$ $44.500$ $500$ $723$ $665$ $7022$ $613$ $3380$ $3.600$ $44.500$ $72.700$ $36.400$ $44.500$ $990$ $r'$ $77.7200$ $36.400$ $44.500$ $990$ $r'$ $77.7200$ $36.400$ $44.500$ $22.000$ $22.2000$ $22.2000$ $22.2000$ $22.2000$ $22.2000$ $22.2000$ $22.2000$ $22.2000$ $22.2000$ $22.200$	Dealite	tons	430	437	07	007 e/	010 e/
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Phoenhata roak:	tons	200	41	97	528	914
Lines weight Phosphorus pentoxide content $e'$ 1200 t'         2,100 t'         2,200 t'<	Gross weight		2 000 */	2 170 r/	2 0 9 0 */	2 470 r/	2 5 4 5
Prospondus perindus perindical perindus perindus perindical perindus perindus perindus	Dhosphorus pontovido content o/		5,090 I/	5,170 I/	5,080 I/	2,470 1/	2,343
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Phosphorus penioxide content e/		1,200 1/	1,230 1/	1,200 1/	902 1/	995
Outlets         100s         2,10 e         999         800         1,180         2,280           Total         do.         2010         1,120         1,110         1,190         12,700           Salt         723         665         702         613         338           Solten suffae, natural         do.         200 e'         -	Pigments, mineral, natural:		2 710 -/	000	800	1 1 9 0	2 820
Dates         Date         <		tons	2,710 e/	999	890	1,180	2,820
Total         201         1.120         1.110		do	200 e/	123	1 110	1 1 1 0 0	9,850
Sait         1/28         005 $1/24$ 006 $1/240$ 006 $1/240$ 006 $1/240$ 006 $1/240$ 006 $1/240$ 006 $1/240$ 006 $1/2400$ $1/2400$ $1/2400$ <		d0.	2,910	1,120	1,110	1,190	12,700
Sincree 4/         Intervention           Solum sulfae, natural $do_{c}$ Stome, ne.s. $20 e'$ Dimension: $66400$ Gramite and norite 4/ $699 r'$ Mardle 6'         tons           State 4/ $do_{c}$ Crushed and broken: $699 r'$ Limestone and dolomite $699 r'$ Limestone and dolomite $21,800 r'$ Nepheline syenite $100 r'$ Quartite 4/ $320 r'$ Store, nex.s. $21,800 r'$ Quartite 4/ $3310 r'$ Other 4/ $3310 r'$ Total $3310 r'$ Scontent of pyrite $3310 r'$ Scontent of pyrite $452 293 296 r'$ Petroleum $700 r'$ Mittalityry e' $452 293 296 r'$ 21 f' 68 r' 56 r' $82 r'$ Scontent of pyrite $51 r'$ Petroleum $700 r'$ Mittale materials: $71 r'$ Tale         toms           Mittale materials: $71 r'$ Tale </td <td>Salt</td> <td></td> <td>728</td> <td>665</td> <td>/02</td> <td>613</td> <td>358</td>	Salt		728	665	/02	613	358
Sodum sultate, natural         doi: $51,200$ $50,400$ $44,300$ Dimension:	Silcrete 4/	tons	1,240				
Store, no.s.:           Granite and norite 4/           Marble 6'           State 4'           Crushed and broken:           Limestone and dolomite           Limestone and dolomite           Crushed and broken:           Limestone and dolomite           Core core and dolomite           Very Core core and dolomite           Station:           Sconten of pyrite           Byproduct:           Metallargy e/           Petroleum           Tale           Anthracite           Mintracite           Mintracite           Mintracite           Dimensions           Trial           Coore core on for pyrite           Sconten of pyrite           Coore core on for pyrite           Tale and reliated materials:           Tale <t< td=""><td>Sodium sulfate, natural</td><td>do.</td><td>20 e/</td><td></td><td>37,200</td><td>36,400</td><td>44,500</td></t<>	Sodium sulfate, natural	do.	20 e/		37,200	36,400	44,500
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Stone, n.e.s.:						
Grante and norie 4/         6099 $p'$ 613 p'         513 p'         523         659           Marble 6'         tons         609 $p'$ 613 p'         513 p'         523         659           Crushed and broken:         609 $p'$ 613 p'         613 p'         513 p'         523         659           Crushed and broken:         609 $p'$ $613 p'$ $613 p'$ $623 p''$ $623 p''$ $623 p''$ $623 p'''$ $623 p''''$ $623 p''''''''''''''''''''''''''''''''''''$	Dimension:		c00 /	(72)	575 I	500	(2)
Mardie $e^{i}$ tots           Slate $4'$ do.           Crushed and broken:         13,100 $r'$ 12,100 $r'$ 22,300         22,000 <td>Granite and norite 4/</td> <td></td> <td>699 f/</td> <td>6/3 ľ/</td> <td>5/5 f/</td> <td>528</td> <td>636</td>	Granite and norite 4/		699 f/	6/3 ľ/	5/5 f/	528	636
Site 4/         do. $29,400$ $26,400$ $7$ $26,300$ $22,0$	Marble 6/	tons	13,100 r/	12,100	17,200	20,600	30,200
Crushed and broken:           Limestone and dolomite         21,500 r/         21,500 r/         19,800         18,200         19,800           Nepheline syenite         tors         21,00 r/         8,160 r/         8,220 r/         8,200           Shale:         -         -         -         -         -           Other 4/         386         391         301         331         371           Other 4/         3,370         3,570         3,250         2,770         2,160           Scontent of pyrite         Syrodott:         -         -         -           Byproduct:         -         -         -         -           Metallurgy e/         21,800 r/         21,900 r/         19,500 r/         15,800 r/         4,400           Scontent of pyrite         -         -         -         -         -           Byproduct:         -         -         -         -         -           Tale and related materials:         -         -         -         -         -           Tale         tons         -         -         -         -         -           Anthracite         -         -         -         -	Slate 4/	do.	29,400	26,400 r/	26,300	22,000	22,500
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Crushed and broken:						
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Limestone and dolomite		21,800 r/	21,500 r/	19,800	18,200	19,800
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Nepheline syenite	tons	210 r/ e/	21,000	175,000		
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Quartzite 4/		11,200 r/	8,320 r/	8,160 r/	8,220 r/	8,290
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Shale:						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	For cement		386	391	301	331	371
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Other 4/		3,310	3,570	3,250	2,770	2,160
Aggregate and sand, n.e.s. $24,600 r'$ $21,900 r'$ $19,500 r'$ $15,800 r'$ $14,400$ Sulfur:       Scontent of pyrite $452$ $293$ $296 r'$ $323$ $252$ Byproduct: $452$ $293$ $296 r'$ $323$ $252$ Petroleum $210 r' e'$ $166 r'$ $171 r'$ $190$ Tata $10 r' e'$ $166 r'$ $171 r'$ $190$ Pyrophyllite (wonderstone) $do_{c}$ $2,760$ $4,450$ $3,050$ $4,290$ $5,510$ Vermiculite $220$ $215$ $170$ $211$ $223$ MINERAL FUELS AND RELATED MATERIALS $3,620$ $2,690$ $3,350$ $3,250$ $2,280$ Bituminous $171,000$ $176,000$ $171,000$ $179,000$ $196,000$ Total       Petroleum refinery products: $1,510$ $1,540$ $1,540$ $2,460$ $2,500 e'$ Liquefied petroleum gases       thousand $42$ -gallon barrels $51,600$ $54,600$ $54,500$ $57,500$ $58,000 e'$ Liquefied petroleum gases       thousand $42$ -gallon barrels	Total		3,700	3,960	3,550	3,100	2,530
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Aggregate and sand, n.e.s.		24,600 r/	21,900 r/	19,500 r/	15,800 r/	14,400
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Sulfur:						
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	S content of pyrite		452	293	296 r/	323	252
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Byproduct:						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Metallurgy e/		23 r/	68 r/	56 r/	82 r/	82
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Petroleum		210 r/ e/	160 r/ e/	166 r/	171 r/	190
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Total		683	521 r/	518 r/	575 r/	524
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Talc and related materials:						
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Talc	tons	11,200	8,240	13,900	8,800	8,200
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Pyrophyllite (wonderstone)	do.	2,760	4,450	3,050	4,290	5,510
MINERAL FUELS AND RELATED MATERIALS           Coal (salable product):           Anthracite         3,620         2,690         3,350         3,250         2,280           Bituminous         171,000         176,000         171,000         179,000         194,000           Total         175,000         174,000         182,000         196,000           Petroleum refinery products:         1,510         1,540         2,460         2,500 e/           Gasoline         do.         51,600         54,600         54,500         57,500         58,000 e/           Jet fuel         do.         5,580         5,600         6,480         6,350         6,000 e/           Distillate fuel oil         do.         35,500         34,400         33,900         31,100         31,500 e/           Residual fuel oil         do.         13,300         13,600         15,900         16,000 e/         16,000 e/           Lubricants (including greases)         do.         2,390         2,310         2,240         2,500 e/         2,500 e/           Bitumen         do.         1,960         1,670         1,740         1,780         1,800 e/           Other 7/         do.         819         812	Vermiculite		220	215	170	211	223
$\begin{array}{c ccccc} \hline Coal (salable product): \\ \hline Anthracite \\ \hline Bituminous \\ \hline Total \\ \hline Petroleum refinery products: \\ \hline Liquefied petroleum gases thousand 42-gallon barrels \\ \hline Gasoline \\ \hline do. \\ Jet fuel \\ \hline do. \\ \hline State fuel oil \\ \hline Bistultate fuel oil \\ \hline Cosene \\ \hline do. \\ \hline State fuel oil \\ \hline Cosene \\ \hline do. \\ \hline State fuel oil \\ \hline Cosene \\ \hline do. \\ \hline State fuel oil \\ \hline Cosene \\ \hline do. \\ \hline State fuel oil \\ \hline Cosene \\ \hline do. \\ \hline State fuel oil \\ \hline Cosene \\ \hline do. \\ \hline State fuel oil \\ \hline Cosene \\ \hline do. \\ \hline State fuel oil \\ \hline Cosene \\ \hline do. \\ \hline Cosene \\ \hline Cosene \\ \hline do. \\ \hline Cosene \\ \hline Cosene \\ \hline Cosene \\ \hline do. \\ \hline Cosene \\ \hline Cosene \\ \hline do. \\ \hline Cosene \\ \hline Cosene \\ \hline do. \\ \hline Cosene \\ \hline Cosene \\ \hline do. \\ \hline do. \\ \hline Cosene \\ \hline do. \\ \hline do. \\ \hline Cosene \\ \hline do. \\ \hline do. \\ \hline Cosene \\ \hline do. \\ \hline do. \\ \hline Cosene \\ \hline do. \\ \hline do. \\ \hline Cosene \\ \hline do. \\ \hline do$	MINERAL FUELS AND RELATE	ED MATERIALS					
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Coal (salable product):						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Anthracite		3,620	2,690	3,350	3,250	2,280
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Bituminous		171,000	176,000	171,000	179,000	194,000
Petroleum refinery products:         1,510         1,540         1,540         2,460         2,500         e/           Gasoline         do.         51,600         54,600         54,500         57,500         58,000         e/           Jet fuel         do.         5,580         5,600         6,480         6,350         6,500         e/           Distillate fuel oil         do.         3880         3,810         3,910         4,680         5,000         e/           Lubricants (including greases)         do.         13,300         13,600         15,900         16,000         e/         16,000         e/           Bitumen         do.         1,960         1,670         1,740         1,780         1,800         e/           Other 7/         do.         819         812         686         700         e/         700         e/           Total 8/         do.         117,000         117,000         119,000         121,000         e/         122,000         e/	Total		175,000	178,000	174,000	182,000	196,000
Liquefied petroleum gases         thousand 42-gallon barrels         1,510         1,540         1,540         2,460         2,500         e/           Gasoline         do.         51,600         54,600         54,500         57,500         58,000         e/           Jet fuel         do.         5,580         5,600         6,480         6,350         6,500         e/           Distillate fuel oil         do.         3880         3,810         3,910         4,680         5,000         e/           Residual fuel oil         do.         13,300         13,600         15,900         16,000         e/         16,000         e/           Lubricants (including greases)         do.         2,390         2,310         2,240         2,500         2,500         e/           Other 7/         do.         1,960         1,670         1,740         1,780         1,800         e/           Total 8/         do.         117,000         117,000         119,000         121,000         e/         122,000         e/	Petroleum refinery products:						
Gasoline         do.         51,600         54,600         54,500         57,500         58,000 e/           Jet fuel         do.         5,580         5,600         6,480         6,350         6,500 e/           Kerosene         do.         3,880         3,810         3,910         4,680         5,000 e/           Distillate fuel oil         do.         35,500         34,400         33,900         31,100         31,500 e/           Residual fuel oil         do.         13,300         13,600         15,900         16,000 e/         16,000 e/           Lubricants (including greases)         do.         2,390         2,310         2,240         2,500         2,500 e/           Bitumen         do.         1,960         1,670         1,740         1,780         1,800 e/           Other 7/         do.         819         812         686         700 e/         700 e/           Total 8/         do.         117,000         117,000         119,000         121,000 e/         122,000 e/	Liquefied petroleum gases the	ousand 42-gallon barrels	1,510	1,540	1,540	2,460	2,500 e/
Jet fuel         do.         5,580         5,600         6,480         6,350         6,500 e/           Kerosene         do.         3,880         3,810         3,910         4,680         5,000 e/           Distillate fuel oil         do.         35,500         34,400         33,900         31,100         31,500 e/           Residual fuel oil         do.         13,300         13,600         15,900         16,000 e/         16,000 e/           Lubricants (including greases)         do.         2,390         2,310         2,240         2,500         2,500 e/           Bitumen         do.         1,960         1,670         1,740         1,780         1,800 e/           Other 7/         do.         819         812         686         700 e/         700 e/           Total 8/         do.         117,000         117,000         121,000 e/         122,000 e/	Gasoline	do.	51,600	54,600	54,500	57,500	58,000 e/
Kerosene         do.         3,880         3,810         3,910         4,680         5,000 e/           Distillate fuel oil         do.         35,500         34,400         33,900         31,100         31,500 e/           Residual fuel oil         do.         13,300         13,600         15,900         16,000 e/         16,000 e/           Lubricants (including greases)         do.         2,390         2,310         2,240         2,500         2,500 e/           Bitumen         do.         1,960         1,670         1,740         1,780         1,800 e/           Other 7/         do.         819         812         686         700 e/         700 e/           Total 8/         do.         117,000         117,000         119,000         121,000 e/         122,000 e/	Jet fuel	do.	5,580	5,600	6,480	6,350	6,500 e/
Distillate fuel oil         do.         35,500         34,400         33,900         31,100         31,500 e/           Residual fuel oil         do.         13,300         13,600         15,900         16,000 e/         18,00 e/         18,00 e/         18,00 e/         18,00 e/         18,00 e/         12,000 e/         120,000 e/         122,000 e/         122,000 e/         122,000 e/         122,000 e/         122,000 e/         122,000 e/	Kerosene	do.	3.880	3.810	3.910	4.680	5.000 e/
Residual fuel oil         do.         13,300         13,600         15,900         16,000 e/         16,000 e/           Lubricants (including greases)         do.         2,390         2,310         2,240         2,500         2,500 e/           Bitumen         do.         1,960         1,670         1,740         1,780         1,800 e/           Other 7/         do.         819         812         686         700 e/         700 e/           Total 8/         do.         117,000         117,000         121,000 e/         122,000 e/	Distillate fuel oil	do.	35.500	34,400	33,900	31.100	31.500 e/
Lubricants (including greases)         do.         2,390         2,310         2,240         2,500         2,500         e/           Bitumen         do.         1,960         1,670         1,740         1,780         1,800         e/           Other 7/         do.         819         812         686         700         e/         700         e/           Total 8/         do.         117,000         117,000         119,000         121,000         e/         122,000         e/	Residual fuel oil	do.	13.300	13.600	15,900	16.000 e/	16.000 e/
Bitumen         do.         1,960         1,670         1,740         1,780         1,800 e/           Other 7/         do.         819         812         686         700 e/         700 e/         12,000 e/         122,000 e	Lubricants (including greases)	do	2.390	2.310	2.240	2.500	2,500 e/
Other 7/         do.         819         812         686         700 e/         700 e/           Total 8/         do.         117,000         117,000         119,000         121.000 e/         122.000 e/	Bitumen	do.	1,960	1.670	1.740	1.780	1.800 e/
Total 8/         do.         117,000         117,000         119,000         121.000 e/         122.000 e/	Other 7/	do.	819	812	686	700 e/	700 e/
	Total 8/		117.000	117.000	119,000	121.000 e/	122,000 e/

e/ Estimated. r/ Revised.

1/ Table includes data available through Sept. 29, 1995. Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Data are for the year ending June 30 of that stated.

3/ Reported figure.

4/ Domestic sales plus exports.

5/ Except for about 45,000 mt/a slag derived from titaniferous magnetite by Highveld Steel, titaniferous slag is all from the smelting of ilmenite and likely represents most of that mineral's production, for which data are unavailable. In 1994, there was an estimated 50,000 mt of ilmenite produced but not smelted by the Namakwa Sands mining project.

6/ Converted from reported cubic meters using 1 cubic meter=2.7 tons.

### TABLE 1--Continued SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/

7/ Includes naphthas, paraffin wax, petroleum coke, petrochemical feedstocks, unfinished oils, white spirits, and blending components.
 8/ Excludes refinery fuel and losses, amounting to an estimated 7 to 8 million 42-gallon barrels per year.

## TABLE 2 SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Major commodities	Major operating companies and major equity owners 1/	Location of main facilities	Annual capacity
Aluminum	Aluminium South Africa (Pty.) Ltd. (Gencor 48%: IDC 34%: other 18%)	Bayside smelter at Richards Bay	170 hot metal. 2/
Andalusite	Rhino Andalusite Mines (Pty.) Ltd. (Anglovaal Ltd., 77%)	Timeball Mine, near Thabazimbi	120.
Do.	Damrec of France (private, 100%)	Annesley Mine at Penge, 50 kilometers north of Steelpoort	75.
Do.	do.	Andafrax Mine at Groot Marico, 60 kilometers west of Rustenburg	12.
Do.	Cullinan Minerals Ltd. (South African Mutual Life Insurance, 44%; Fermain Nom Ltd. 8%: AAC)	Krugerspost Mine, near Lydenburg	50.
Do.	Verref Mining (Pty.) Ltd. (AAC)	Havercroft Mine at Penge, 50 kilometers north of Steelpoort	36.
Do.	Hoogenoeg Andalusite (Pty.) Ltd.	Hoogenoeg Mine, 60 kilometers northeast of Potgietersrus	15.
Antimony	Consolidated Murchison Ltd. (JCI, 24.1%; Middle Witwatersrand, 5.5%; Anglovaal Ltd., 2.4%)	50 kilometers west of Phalaborwa	9.5 Sb concentrate.
Asbestos	Gencor Ltd. (Gencor Beherend Bpk, 54.8%; AAC, 0.9%)	Penge Mine, 50 kilometers north of Steelpoort	48 (amosite).
Do.	do.	Klipfontein Mine, near Sishen	NA (crocidolite).
Do.	Anglo Dutch Exploration & Mining Co. (Ptv.) Ltd.	Stella Mine, 25 kilometers east of Barberton	NA (chrysotile).
Cement	Anglo Alpha Ltd. (AAL)	Dudfield plant near Lichtenburg	1.830.
Do.	do.	Ulco plant 60 kilometers northwest of Kimberley	1,241
Do.	Blue Circle Cement (Ptv.) Ltd. (BCC)	Plant at Lichtenburg	2.000.
Do.	Natal Portland Cement Co. (Pty.) Ltd. (AAL, 33.3%; BCC, 33.3%; Pretoria Portland Cement, 33.3%)	Simumu plant, 125 kilometers southwest of Durban	580.
Do.	Pretoria Portland Cement Co. Ltd. (Barlow Rand Group, 60.3%)	De Hoek, Herculese, Jupiter, Slurry, Riebeeck West, and Port Elizabeth	4.59 Mmt (combined), clinker.
Chromite	Samancor Ltd. (Gencor, 41%; Delauney Ltd., 24.9%; De Beers, 8.7%)	Winterveld and Tweefontein Mines at Steelpoort	960 ore.
Do.	do.	Montrose Mine, near Lydenburg	360 ore.
Do.	do.	Mooinooi Mine, 30 kilometers west of Brits	580 ore.
Do.	do.	Millsell Mine, 8 kilometers east of Rustenburg	300 ore.
Do.	do.	Elandsdrift Mine, near Brits	420 ore.
Do.	Consolidated Metallurgical Industries (Pty.) Ltd. (JCI, 49.9%; AAC, 26.4%)	Purity Mine, near Rustenburg	360 ore; 252 concentrate.
Do.	Lavino South Africa (Pty.) Ltd. (Anglovaal Ltd., 51%; Middle Witwatersrand, 49%)	Grootboom Mine, near Lydenburg	500 ore.
Do.	Dilokong Chrome Mine (Pty.) Ltd. (Mining Corp. Ltd., 100%)	Dilokong Mine, near Lydenburg	480 ore.
Do.	Chromecorp Technology (Pty.) Ltd. (CI Chromeinvest AG, Germany, 50%; Investinox AG, Germany, 50%)	Chroombronne Mine, near Rustenburg	576 ore; 432 concentrate.
Coal	Anglo American Coal Corp. Ltd. (AAC, 51.4%; ASA Ltd., 2.2%)	13 collieries in the eastern Transvaal and Natal	46,000 anthracite and bituminous.
Do.	Ingwe Coal Corp. (Trans-Natal Corp. Ltd.; 49.1%; Rand Mines Ltd., 45.9%; other, 5%)	12 collieries in the eastern Transvaal and Natal	59,000 anthracite and bituminous.
Do.	Duvha Opencast Services (Pty.) Ltd. (Rand Mines Ltd., 71%)	Duvha Colliery, 18 kilometers southeast of Witbank	11,000 bituminous.
Do.	Sasol Mining (Pty.) Ltd.	Sigma Mine, 75 kilometers south of Johannesburg	7,000 bituminous.
Do.	do.	Secunda Collieries, 75 kilometers south of Witbank	31,000 bituminous.
Do.	Iscor Ltd. (De Beers, 3.4%; AAC, 0.7%)	Grootegeluk Mine, 120 kilometers north of Thabazimbi	6,300 bituminous; 1,700 coking coal.
Do.	do.	Durnacol Mine at Dannhauser, 40 kilometers south of Newcastle	1,200 coking coal.

## TABLE 2--Continued SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Major	commodities	Major operating companies and major equity owners 1/	Location of main facilities	Annual capacity
CoalContinu	ied	do.	Hlobane Mine, 100 kilometers east of Newcastle	700 coking coal.
Do.		do.	Tshikondeni Mine in Venda, about 100 kilometers southeast of Messina	200 coking coal.
Copper		Palabora Mining Co. Ltd. (Rio Tinto Zinc Corp. plc, 38.9%; AAC, 19.1%; De Beers, 9.5%)	Palabora Mine and plant at Phalaborwa	130 metal.
Do.		O'Okiep Copper Co. Ltd. (GFSA, 82%; Mellon Securities Trust Co., 18%)	O'Okiep copper mine, 20 kilometers north of Okiep	40.
Do.		Black Mountain Mineral Development Co. (Pty.) Ltd. (GFSA, 55.4%; Phelps Dodge Corp., 44.6%)	Black Mountain Mine, 100 kilometers northwest of Okiep	2.5 Cu in concentrate.
Diamond, mill	lion carats	De Beers (Anglo American Investment Trust Ltd., 25.8%; AAC, 6.9%)	Finsch Mine, 100 kilometers west of Kimberley	3.5. e/
Do.	do.	do.	Kimberley Mines, Kimberley	0.8. e/
Do.	do.	do.	Koffiefontein Mine, 70 kilometers south of Kimberley	0.25. e/
Do.	do.	do.	Namaqualand Mines, 50 kilometers north of Port Nolloth	1.0. e/
Do.	do.	do.	Premier Mine, 70 kilometers	1.7. e/
Do.	do.	do.	Venetia Mine, 150 kilometers	5. e/
Fluorspar		Vergenoeg Mining Corp. (Pty.) Ltd. (Bayer AG, Germany, 100%)	Vergenoeg Mine, 90 kilometers east of Pretoria	200 acid- and metallurgical-grade fluorspar. e/
Do.		Phelps Dodge Mining (Pty.) Ltd. (Phelps Dodge Corp., U.S., 100%)	Witkop Mine, 130 kilometers west of Johannesburg	75 acid-grade fluorspar. e/
Do.		Van Den Heever Vloeispaat Werke	Van Den Heever Mine, 120 kilometers	50.e/
Gold:	tons	AAC (De Beers, 38.7%; ASA Ltd., 0.1%)	Freegold near Welkom, Vaal Reefs near Klerksdorp, Western Deep Levels, 70 kilometers southwest	260 Au.
Do.	do.	GFSA (GFSA Holdings Ltd., 43%; Anglo American Gold Investment Co., 10.8%; AAC, 8.9%; De Beers, 1.3%)	East Driefontein and West Driefontein, 65 kilometers southwest of Johannesburg; Kloof, 55 kilometers southwest of Johannesburg; and others	125 Au.
Do.	do.	Gencor (Gencor Beherend Bpk, 54.8%; AAC, 0.9%)	Buffelsfontein near Klerksdorp; Beatrix, 35 kilometers southeast of Welkom; Winkelhaak, 120 kilometers southeast of Johannesburg; others	90 Au.
Do.	do.	Rand Mines Ltd.	Harmony Mine, 20 kilometers southeast of Welkom and others	55 Au.
Do.	do.	Anglovaal Ltd. (Anglovaal Holdings Ltd., 49.7%;, South African Mutual Life Insurance, 10.7%)	Hartebeestfontein Mine near Klerksdorp and others	45 Au.
Do.	do.	JCI (AAC, 39.8%; South African Mutual Life Insurance, 8.9%; De Beers, 8.4%)	Randfontein Mine, 20 kilometers west of Johannesburg; Western Areas Mine, 30 kilometers southwest of Johannesburg; and others	41 Au.
Iron and steel:			<u> </u>	
Iron ore		Iscor Ltd. (De Beers, 3.4%; AAC, 0.7%)	Sishen Mine at Sishen	21,500 ore.
Do.		do.	Thabazimbi Mine at Thabazimbi	2,500 ore.
Do.		Highveid Steel and Vanadium Corp. Ltd. (Anglo American Industrial Corp. Ltd. 51.8%)	Mapochs Mine at Roossenekal, 60 kilometers west of Lydenburg	3,000 titaniferous and vanadiferous magnetite
Ferroalloys		Ferrometals Ltd. (Samancor Ltd., 100%)	Witbank	320 ferrochromium.
Do.		Tubatse Ferrochrome (Pty.) Ltd. (Samancor Ltd., 100%)	Steelpoort	300 ferrochromium.
Do.		Batlhako Ferrochrome (Pty.) Ltd. (Samancor Ltd., 100%)	Ruighoek Mine site, 80 kilometers southwest of Thabazimbi	20 ferrochromium.
Do.		Samancor Ltd. (100%)	Middelburg	234 ferrochromium.
Do.		do.	Krugersdorp, 30 kilometers west of Johannesburg	120 ferrochromium.

### TABLE 2--Continued SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Major commodities	Major operating companies and major equity owners 1/	Location of main facilities	Annual capacity
FerroalloysContinued	Consolidated Metallurgical Industries (Pty.) Ltd. (JCI, 49.9%; AAC, 26.4%)	Lydenburg	210 ferrochromium.
Do.	do.	Purity, at Rustenburg	120 ferrochromium.
Do.	Chromecorp Technology (Pty.) Ltd. (CI Chromeinvest AG, Germany, 50%; Investinox AG, Germany, 50%)	Rustenburg	200 ferrochromium.
Do.	Feralloys Ltd. (Associated Manganese Mines of South Africa Ltd., 100%)	Machadadorp, 80 kilometers east of Middelburg	110 ferrochromium.
Do.	do.	Cato Ridge, 75 kilometers west of Durban	130 high-carbon ferromanganese.
Do.	Metalloys Ltd. (Samancor Ltd., 100%)	Meyerton plant, 50 kilometers south of Johannesburg	532 high-carbon ferromanganese; 200 silicomanganese.
Do.	Manganese Metal Co. (Pty) Ltd. (Samancor Ltd., 45.9%)	Plants at Krugersdorp and Nelspruit	38 electrolytic manganese (total).
Do.	Transvaal Alloys Pty. Ltd., (Highveld Steel and Vanadium Corp., 100%)	Witbank	20 low-carbon ferromanganese; 175 silicomanganese.
Steel	Iscor Ltd. (De Beers, 3.4%; AAC, 0.7%)	Plant at Vanderbijlpark	4,300.
Do.	do.	Newcastle plant	2,000.
Do.	do.	Pretoria plant	800.
Do.	do.	Cisco plant near Cape Town	150.
Do.	do.	Corex plant in Pretoria	300.
Do.	do.	Ex-Usko plant in Vereeniging	450. e/
Do.	Highveld Steel and Vanadium Corp. Ltd. (Anglo American Industrial Corp. Ltd., 51.8%; De Beers, 3.8%)	Witbank	1,000.
Do.	Columbus Stainless, Ltd. (AAC and De Beers, 33.3%; Gencor, 33.3%; IDC, 33.3%)	Stainless steel plant at Middelburg	150. e/ 3/
Manganese	Associated Manganese Mines of South Africa Ltd. (Associated Ore and Metal Corp. Ltd., 45%; Anglovaal Ltd., 44%)	Blackrock, Gloria, N'Chwaning Mines near Hotazel, 70 kilometers north of Sishen	1,500 ore.
Do.	Samancor Ltd. (100%)	Mamatwan and Wessels Mines near Hotazel	3,000 ore.
Petroleum products			
million 42-gallon barrels	Shell and British Petroleum South Africa Petroleum Refineries Pty. Ltd. (Shell South Africa, 50%; British Petroleum Co., 50%)	Sanref refinery in Durban	73 crude.
Do.	Caltex Oil SA Pty. Ltd. (private, 100%)	Refinery in Cape Town	33 crude.
Do.	National Petroleum Refiners of South Africa Pty. Ltd. (SASOL, 100%)	Refinery in Secunda, 100 kilometers southeast of Johannesburg	28 crude.
_Do.	Genref (Engen Ltd., 62%)	Refinery in Durban	24 crude.
Phosphate	Phosphate Development Corp. Ltd. (Foskor Ltd.) (IDC, 100%)	Foskor mine and plant at Phalaborwa	3,800. e/ 4/
Platinum-group metals			
tons	Rustenburg Platinum Mines Ltd. (JCI, 32.6%; AAC, 23.9%; Lydenburg Platinum Ltd., 8.3%; ASA Ltd., 0.8%)	Rustenburg Mine near Rustenburg, Union and Amandelbult Mines about 50 kilometers south of Thabazimbi	70 PGM. e/
Do. do.	Lebowa Platinum Mines Ltd. (Rustenburg Platinum Holdings, 21.5%; JCI, 20.1%; Lydenburg Platinum Ltd., 20.1%; AAC, 14.4%)	Atok Mine, 70 kilometers east of Potgietersrus	10 PGM. e/
Do. do.	Potgietersrust Platinums Ltd. (JCI, 30.23%; AAC, 22.65%)	Open pit mine near Potgietersrus	10 PGM (in concentrates.)
Do. do.	Impala Platinum Ltd. (Gencor, 40.7%; Genbel Investments Corp. Ltd., 10.8%)	Bafokeng North, Bafokeng South, Wildebeestfontein North, and Wildebeestfontein South Mines, 20 kilometers north of Rustenburg	35 PGM. e/
Do. do.	Eastern Platinum Ltd. (Lonrho Plc., 73%; Impala Platinum Holdings Ltd., 27%)	40 kilometers northeast of Rustenburg	3 PGM. e/
Do. do.	Western Platinum Ltd. (Lonrho Plc., 73%; Impala Platinum Holdings Ltd., 27%)	20 kilometers east of Rustenburg	10 PGM. e/

#### TABLE 2--Continued SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Major commodities		Major operating companies and major equity owners 1/	Location of main facilities	Annual capacity
Platinum-group	metalsContinued	do.	Karee Mine, 25 kilometers northeast of Rustenburg	5 PGM. e/
Do.	do.	Barplats Investments Ltd. (Impala Platinum Holdings Ltd., 38%; Rand Mines Ltd., 30.6%; Vansa Vanadium, 3.2%)	Crocodile River Mine near Brits	10 PGM.
Do.	do.	Northam Platinum Ltd. (GFSA, 63%; New Wits Ltd., 3.1%)	Northeast of Northam, 20 kilometers south of Thabazimbi	10 PGM. e/
Pyrophyllite		Wonderstone 1937 Ltd. (Associated Ore and Metal Co. Ltd., 100%)	Gestoptefontein Quarry near Ottosdal, 70 kilometers west of Klerksdorp	4. e/
Titanium:				
Mineral conc	entrates	Tisand (Pty.) Ltd./Richards Bay Minerals (Rio Tinto Zinc Corp. Plc., 50%; Gencor, 50%)	Opencast operations near Richards Bay	125 rutile concentrate; e/ 1,280 ilmenite concentrate. e/
Do.		Namakwa Sands project (AAC, 80%; De Beers, 20%)	Opencast mine near Vredendal, 300 kilometers north of Cape Town	16 rutile concentrate; 220 ilmenite concentrate.
Titanium slag		Richards Bay Iron and Titanium Corp./ Richards Bay Minerals (Rio Tinto Zinc Corp. plc, 50%; Gencor, 50%)	Smelter at Richards Bay	1,000 slag.
Do.		Highveld Steel and Vanadium Corp. Ltd.	Steel plant at Witbank	48 slag. e/
Uranium	tons	Vaal Reefs Exploration and Mining Co. Ltd. (Anglo American Gold Investment Co., 16.8%; AAC, 10.8%; ASA Ltd., 3.1%)	Mine and plant near Klerksdorp	2,000 uranium oxide. e/
Do.	do.	Hartebeestfontein Gold Mining Co. Ltd. (Zandpan Gold Mining Co. Ltd., 19.6%; Anglo American Gold Investment Co., 15.5%; AAC, 7.5%; Anglovaal Ltd., 4.6%)	Mine and plant, 5 kilometers southeast of Klerksdorp	400 uranium oxide. e/
Do.	do.	Western Areas Gold Mining Co. Ltd. (Elsburg Gold Mining Co. Ltd., 48.7%; JCI, 6.5%)	Western Areas Mine, 30 kilometers southwest of Johannesburg	500 uranium oxide. e/
Do.	do.	Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	200 uranium oxide. e/
Vanadium	do.	Highveld Steel and Vanadium Corp. Ltd.	Mapochs Mine near Lydenburg	25,000 vanadium pentoxide. e/
Do.	do.	do.	Highveld slag plant in Witbank	17,000 vanadium pentoxide
Do.	do.	do.	Highveld Vantra plant in Witbank	8,000 vanadium pentoxide.
Do.	do.	Vametco Minerals Corp. (Strategic Metals Corp., USA, 100%)	Krokodilkraal Mine and plant near Brits	5,000 vanadium pentoxide. e/
Do.	do.	Transvaal Alloys Pty. Ltd., (Highveld Steel and Vanadium Corp., 100%)	Wapadskloof Mine and plant, 60 kilometers northeast of Middelburg	2,250 vanadium pentoxide. e/
Do.	do.	Vanadium Technology Ltd. (Chromecorp Technology (Pty.) Ltd., 100%)	Kennedy's Vale (ex-Vansa Vanadium) Mine and plant, near Lydenburg	3,600 vanadium pentoxide.
Do.	do.	Rhombus Vanadium Holdings Ltd. (Rhombus Exploration Ltd., 50%; Usko Ltd., 50%)	Ba-Mogopa Mine and Usko plant near Brits	13,500 vanadium pentoxide. e/
Vermiculite		Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	230. e/
Zinc		Zinc Corp. of South Africa Ltd. (GFSA, 56%; Iscor Ltd., 35%)	Struisbult Springs Works in Springs, southeast of Johannesburg	90 Zn.
Do.		Black Mountain Mineral Development Co. (Pty.) Ltd.	Black Mountain Mine near Aggeneys, 100 kilometers northeast of Okiep	26 Zn (in concentrate).
Zirconium		Tisand (Pty.) Ltd./Richards Bay Minerals	Opencast mines near Richards Bay	300 zircon concentrate.
Do.		Namakwa Sands project (AAC, 80%; De Beers, 20%)	Opencast mine along coast about 300 kilometers north of Cape Town	60 zircon concentrate.
Do.		Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	13.2 baddelevite. e/
Do.		Phosphate Development Corp. Ltd.	Plant at Phalaborwa	12.5 baddeleyite. e/

e/ Estimated.

1/ Abbreviations of company names used are as follows: Anglo American Corp. of South Africa Ltd. (AAC); De Beers Consolidated Mines Ltd. (De Beers); General Mining, Metals and Minerals Ltd. (Gencor); Gold Fields of South Africa Ltd. (GFSA); Investment Development

Corp. of South Africa (IDC); and Johannesburg Consolidated Investment Co. Ltd. (JCI).

2/ Alusaf's new Hillside smelter at Richards Bay was nearing completion (expected mid-1995); design capacity was 466,000 mt/a .
3/ Columbus was nearing the completion (expected mid-1995) of an expansion project to 600,000 mt/a capacity.

4/ Most of Foskor's phosphate output is from phosphate concentrates supplied by the neighboring Palabora copper mine.

### TABLE 3

### SOUTH AFRICA: RESERVE BASE OF MAJOR MINERALS FOR 1994

### (Million metric tons unless otherwise specified)

Commodity		Reserve base 1/
Andalusite 2/		51
Antimony	thousand tons	250
Asbestos, fiber		8.2
Chromium, ore		3,200
Coal, recoverable		55,300
Cobalt	thousand tons	15
Copper		13
Fluorspar		36
Gold 3/	thousand tons	18
Iron ore		5,900
Lead		5
Manganese		3,992
Nickel		11.8
Phosphate rock, concentrates		2,310
Platinum-group metals	thousand tons	58.9
Silver	do.	10
Titanium		45
Uranium 4/	thousand tons	179.1
Vanadium		12.5
Vermiculite		80
Zinc		15
Zirconium		15.3

1/ Metallic minerals are contained metal.

2/ Includes sillimanite.

3/ Mine leases only. The Economic Geology Research Unit of the University of the Witwatersrand estimates a reserve base, including that of undeveloped fields, of 40,000 tons of gold. 4/ Recoverable at a cost of less than \$80 per kilogram.

Source: Chamber of Mines, 1994 and Minerals Bureau, 1994