THE MINERAL INDUSTRY OF

CANADA

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In 1994, minerals and metals contributed more than 4% to Canada's gross domestic product (GDP), and accounted for about 2.5% of national employment and more than 15% of Canada's total domestic exports. The mineral industry, defined to encompass mining and concentrating, smelting, and refining, as well as the minerals and metals-based semi-fabricating and fabricating industries, recovered in 1994 as prices for most base metals slowly increased as the year progressed.

According to preliminary estimates by Natural Resources Canada, the total value of production of all mineral commodities, including mineral fuels, rose from $28.2 billion in 1993 to $29.2 billion in 1994, an increase of 3.5%.[3] However, the increase in the value, expressed in terms of the Canadian dollar, was much higher—about 9%—reflecting the continued devaluation of the Canadian currency against the U.S. dollar. The value of mineral production excluding mineral fuels increased from $10.3 billion in 1993 to $10.6 billion in 1994. The Province of Ontario accounted for about 33% of this latter value, followed by Québec, 19%; British Columbia, 12%; Saskatchewan, 11%; and Newfoundland, 6%. It is estimated that about $440 million was spent on nonpetroleum mineral exploration in Canada in 1994.[4]

Environmental concerns continued to influence mineral exploration and development activity in Canada as some companies continued to look elsewhere for projects. Increasingly, Canadian mining companies looked toward Latin America in terms of exploration and development because mining and foreign mine ownership, with reasonable controls, has been newly welcomed there. Canada, meanwhile, mounted a strong effort to define the permissible versus the impermissible in terms acceptable to both the mineral industries and the concerns of environmental conservation and preservation.

Government Policies and Programs

Provincial Governments have jurisdiction over mineral resources in Canada. The main exception is in the Yukon and the Northwest Territories, where the Federal Government is in the process of conveying resource management responsibilities to territorial Governments.

Federal and Provincial policies are generally stable and have traditionally been favorable to mineral research and information services in the mining industry. It also has negotiated multiyear Mineral Development Agreements with Provincial Governments. These agreements funded various initiatives intended to strengthen the mining industry in each region. The Federal Government has established a Canadian Geoscience Information Center to provide centralized access to the Government's technical information on Canada's geology.

There are some unsettled Federal-Provincial jurisdictional issues in the area of environmental policy, and the Federal Government has been slow to produce regulations implementing new environmental assessment legislation passed in 1992. In its February 1994 budget, the Federal Government proposed to allow tax deductions for funds set aside for eventual cleanup of closed mine sites. This measure would bring Federal tax law into harmony with Provincial reclamation requirements.

Some industry representatives have used the recent shift of international mining investment away from Canada to press for changes to Canadian regulatory and tax regimes affecting the mining industry. The industry has been critical of the regulatory process for approving new mines in the Province of British Columbia, where mining has traditionally been a major activity. In response, the Province has promised to speed up the mine approval process. In its 1994 budget, the Province also announced a variety of measures to boost the industry. These included a tax incentive for capital spending on mines, and a 3-year exploration grant program.

Production

In 1994, gold production dropped by 4.5% to 146,000 metric tons (mt). Copper, nickel, and zinc mine production registered a 15%, 20%, and 2% drop, respectively. However, generally higher commodity prices in 1994 resulted in improvement in overall production value.

The value of production for the metals group overall, $6.9 billion, remained the same as in 1993. The overall value of production for nonmetallic group and structural minerals rose from $3.5 billion in 1993 to $3.7 billion in 1994.[5]

Based on value of production, the top nonfuel commodities in 1994 were gold ($1.8 billion), copper ($1.3 billion), zinc ($950 million), nickel ($880 million), and iron ore ($770 million). Coal contributed a further $1.3 billion to the total value of production. *(See table 1.)*

Trade

The value of exports of nonfuel minerals and coal was estimated at $16.5 billion for the first 9 months of 1994, an increase of 10% from the corresponding period in 1993. These exports, representing about 15% of Canada's total exports, included crude minerals, smelted and refined outputs, semifabricated and fabricated products, as well as waste and scrap for recycling. The United States was the main destination for 68% of Canada's exports of nonfuel minerals and coal, while the European Union (EU) and Japan received 10% and 8%, respectively.

Imports of nonfuel minerals and coal for the first 9 months of the year were estimated at nearly $10.3 billion, or 9.6% of total Canadian imports, resulting in a trade surplus for nonfuel minerals and coal of about $6.2 billion for the first three-quarters of the year. The trade surplus for the year was expected to exceed $8 billion.

Canada's main nonfuel mineral exports were crude materials, including iron ore, potash, and sulfur to the United States; copper concentrates to Japan; iron ore and zinc concentrates to the EU; smelted and refined metals, including aluminum, copper, gold, iron and steel, nickel, silver, and zinc to the United States; aluminum and gold to Japan; and copper and nickel to the EU. Coal exports went mostly to Japan.

Total trade between the United States and Canada exceeded that of any other two countries in the world, amounting to more than $235 billion in 1994, up 15% from 1993. Mainly as a result of the Canadian dollar's continued weakness against the U.S. dollar, Canada's trade surplus with the United States increased in 1994 to more than $35 billion from about $29 billion in 1993.[6]

Structure of the Mineral Industry

The Canadian mineral industry during 1993-94 comprised as many as 3,000 domestic and perhaps 150 foreign companies. Companies whose corporate voting rights were at least 50% non-Canadian were considered foreign, although other distinctions could apply in some large companies. About 320 mine sites were active, including coal but excluding sand, gravel, and other construction materials. At least 40 smelters were in operation, as well as other processing companies were subject to all of the same taxes as domestic companies, but repatriation of earnings was unimpeded. Predominantly, the Canadian mineral industry was privately owned, with the exception of some Government participation in potash and petroleum, but even these were largely in transition to private ownership. Some companies, such as Potash Corp. of Saskatchewan Inc. and Saskatchewan Oil and Gas Corp., were owned partially by the Province of Saskatchewan. Moreover, the Province of Alberta owned part of Alberta Energy Co. Ltd. Although the proportion of Government ownership was changeable, the trend was toward privatization. Petro-Canada was owned partly by Federal and partly by Provincial Governments, but was expected to become completely privatized. A large proportion of the total number of mining and petroleum companies were partly publicly owned, with shares trading on various exchanges in Canada and, in many cases, the United States.

Overall, the mineral industry in Canada consisted of underground mines, open pits, leaching operations, concentrators, smelters, and refineries, as well as drilling and production operations characteristic of the petroleum industry. Table 2 depicts the structure of the mineral industry for sectors of the major mineral commodities.

Employment in the mining and mineral manufacturing industries has stabilized after a decline that began in 1989, when the number of jobs in those industries peaked at 422,000. Preliminary employment estimates by Statistics Canada for 1994 indicated that total employment in mining and mineral manufacturing, including coal, was about 329,000, up 1% from that of 1993. The mining, smelting, and refining sectors showed a small net decline as the significant increase in production values caused by improving commodity prices had not translated into employment increases in these sectors. The total number of employees in metal mining, nonmetal mining, quarrying and coal mining was estimated by Statistics Canada at 57,000, about the same as in 1993. Employment in nonferrous smelting and refining was estimated at 61,000, down slightly from 1993. This effect has, however, been more than offset by a rebound in employment in the mineral manufacturing industries. The number of jobs in these industries grew from 206,000 in 1993 to an estimated 214,000 in 1994. About 9,500 people were also employed in diamond drilling and other services incidental to mining operations.[7]

Commodity Review

Metals

Aluminum.—Canadian production of primary aluminum in 1994 decreased to 2.25 million metric tons (Mmt) from 2.31 Mmt in 1993. In January 1994, Alcan Aluminum Ltd. (Alcan) announced temporary production cuts of 156,000 metric tons per year (mt/a) of primary aluminum production capacity from its worldwide operations, in addition to the 102,000 mt/a closed in 1991 and 1992. Together the closures, totaling 258,000 mt/a, reduced Alcan's operating rate to 85% of its world capacity. Reductions included 30,000 mt/a at the Kitimat smelter in British Columbia and 40,000 mt/a at various locations in Alcan's Québec smelter system. Alcan reported a profit of $96 million for 1994, compared to a loss of about $100 million in 1993.

Pechiney cut 10,000 mt/a from its 25% share of production at the 360,000-mt/a Aluminerie de Bécancour Inc. (ABI) smelter in Québec. The three other partners in the ABI consortium, Canadian Reynolds Metals, Alumax, and Société Générale de Financement du Québec (SGF), maintained full production from its share of the operation.

Hoogovens Group cut 5,000 mt/a from its 20% share in the 215,000-mt/a Aluminerie Alouette smelter at Sept-Iles, Québec. Another 5,000 mt/a was cut by a second member of the consortium, Germany's Aluminium-Werke. The other members of the consortium, Austria's Metall, SGF, Italy's Marubeni, and Japan's Kobe Steel, maintained full production from their share of the operation.

In January 1995, British Columbia's Government announced its intention to cancel Alcan's half-built Kemano Completion project near Kitimat. The decision was made following the public release of the British Columbia Utilities Commission's review of the project. The $1.4 billion project was the second phase of Alcan's hydroelectric development of the Nechako River system and was scheduled to add 540 megawatts to Alcan's Kemano generating station.[8]

Copper.—Copper mine output from Canadian mines in 1994 declined to 626,000 mt from 734,000 mt in 1993. During 1994, refined copper production decreased to an estimated 550,000 mt from 562,000 mt in 1993. The significant reduction of mine output of copper resulted from a number of temporary mine closures, resulting from weak metal prices, in British Columbia.

In August 1994, Princeton Mining resumed operations at its Similco Mine near Princeton, British Columbia. The operation had been closed since November 1993, due to depressed prices and high operating costs. The company also announced increased reserves at its Ingerbelle deposit. Gibraltar Mines resumed operations at its McLeese Lake Mine in July and reached full production at the end of September. Equity Silver Mines ceased operations at its mine near Houston, British Columbia in January 1994, due to depletion of ore reserves.

In November, Hudson Bay Mining and Smelting (HBMS) announced the discovery of a copper-rich deposit near Snow Lake, Manitoba. Earlier in the year, the company closed its Stall Lake and Chisel Lake mines at Snow Lake due to the exhaustion of reserves.

Further underground exploration by Falconbridge at its Kidd Creek Mine in Timmins, Ontario, confirmed the extension of the main ore body to at least the 3,000- meter (m)-level. While exploration is continuing, it is expected that the discovery of additional reserves will significantly extend the mine life.

Cambior approved development of its Grevet zinc-copper deposit near Lebel-sur-Quévillion. The mine, which was expected to begin production in the first quarter of 1996, would produce about 72,000 mt/a of contained zinc and 3,300 mt/a of contained copper. Metall Mining's feasibility study of its Troilus gold-copper project was promising. The project, located north of Chibougamau, Québec, received the necessary environmental approvals. Production is expected to start in the third quarter of 1996 at a rate of 4,800 kilograms (kg) of gold per year and 3,500 mt/a of copper. Other advanced copper projects include MSV Resources' Inner Block property near Chibougamau, Québec, and Diamond Fields Resources' Voisey Bay nickel-copper project in Labrador.

Gold.—After a decade of rapid growth, Canada's gold production decreased for the third consecutive year to 146 mt in 1994 from 153 mt in 1993 and a record 177 mt in 1991. Canada was the fourth largest gold producer behind South Africa, the United States, and Australia.

There were about 50 primary gold mines in Canada at the end of 1994, which accounted for 91% of the gold produced, with the remainder coming from base-metal mines (6.5%) and placer operations (2.5%). Six mines closed, while five opened during the year. Total employment in primary gold mines totaled 8,800 in 1993. Employment figures in the gold industry have been declining steadily from the 1988 peak of 12,600.

British Columbia's gold production decreased to 12.1 mt in 1994 from 13.9 mt in 1993. The Eskay Creek gold mine in northwestern British Columbia was expected to start production in January 1995 at a rate of 7 mt/a of gold. The mine was one of the highest-grade precious metal deposits in the world, according to the company, with reserves of 1.1 Mmt, grading 66 grams per metric tons (g/mt) of gold and 2,930 g/mt of silver. The ore also contained 5.6% zinc and 0.77% copper. Cusac Industries announced the startup of a mill with a capacity of 270 metric tons per day (mt/d) at the Table Mountain Mine.

Gold production in the Northwest Territories decreased slightly to 13.1 mt in 1994. Royal Oak Mines resumed production at the Colomac Mine. Full production was expected by January 1995 at a rate of 5 mt/a of gold. Current reserves were reportedly sufficient for 7 years of production. Yukon's 3.2 mt of gold production in 1994 was exclusively derived from placer deposits.

Ontario's gold production totaled 68.5 mt in 1994, down from 72.4 mt in 1993. Ross-Finlay Ltd. ceased production at the Dona Lake Mine, and Saint Andrew Goldfields suspended production at the Stock Township Mine due to exhaustion of reserves.

Québec's gold production decreased slightly to 40.9 mt in 1994. MSV Resources brought the Eastmain Mine on-stream. Reserves at the Eastmain Mine are reportedly 900,000 mt of ore grading 10 g/mt of gold. Initial production for 1995 was expected to be 1 mt and should reach 1.7 mt in 1996. Orco Resources started preproduction at the Donalda Mine, while Louvem Mines and Aurizon Mines began pre-production at the Beaufort Mine. The Ferderber and Dumont Mines of Aur Resources Ltd. closed in December 1994.

Iron Ore.—Canadian production of iron ore increased sharply from 30.5 Mmt in 1993 to 36.6 Mmt in 1994. This total was composed of concentrates, pellets, and sinter from hematite and siderite ores. Major iron ore producing companies included Québec Cartier Mining (QCM), Iron Ore

Company of Canada (IOC), Wabush Mines, and the Algoma Ore Division (AOD) of Algoma Steel Ltd.

QCM produced 16 Mmt of ore in 1994, 3.2 Mmt more than 1993. The increased production was achieved through elimination of shutdown periods and introduction of a quality management process throughout the operation. QCM shipped 16.4 Mmt of ore, of which 8.2 Mmt was concentrate destined mainly for Europe. IOC's production was about 15.9 Mmt compared with 13.5 Mmt in 1993. Wabush shipped 4.8 Mmt of pellets and 368,000 mt of concentrate.

Canadian iron ore exports increased 15% to 30 Mmt in 1994. Nearly all the increase was in iron ore pellets, of which the United States imported 2 Mmt more than in 1993. Belgium, Germany, the Netherlands, and the United Kingdom also increased their imports of Canadian pellets by more than 500,000 mt each.

Lead and Zinc.—Canada was the world's largest mine producer of zinc and the fifth largest producer of lead in 1994 with a total of 984,000 mt of zinc and 172,000 mt of lead in concentrates, in both cases a decline for the second consecutive year. The decline in lead and zinc production was primarily due to the closure of the Faro Mine in the Yukon in April 1993. The Faro Mine was purchased by Anvil Range, which completed the necessary financing to reopen the mine. Stripping the Grum deposit at Faro began late in 1994, and commercial production was expected to begin in the latter part of 1995.

Cominco Ltd. announced the discovery of a polymetallic base-metal deposit northwest of Watson Lake. Cominco was moving ahead to develop the ore body, which contained an inferred geological reserve, according to the company, of 13 Mmt grading 5.5% zinc, 1% copper, 1.3% lead, 125 g/mt silver, and 1.2 g/mt gold.

Aur Resources Ltd.'s Louvicourt copper-zinc mine began milling in July 1994. At full capacity, the mine was expected to produce 50,000 mt/a of contained copper and 27,000 mt/a of contained zinc. In April 1994, Aur Resources announced a downward revision of ore reserves, reducing the mine life from 17 to 12 years. Exploration drilling was ongoing in conjunction with mining, in an attempt to increase reserves.

Brunswick Mining and Smelting (BM&S) reopened its Heath Steele zinc-lead mine near Newcastle. The mine had been closed for 16 months due to worldwide concentrate surpluses and low metal prices. Heath Steele has a capacity of 11,000 mt/a of lead and 40,000 mt/a of zinc in concentrate. BM&S also restarted production at its 72,000-mt/a Belledune lead smelter in January 1994. The smelter had been closed for 6 weeks due to insufficient concentrate supply. In June 1994, the facility was again temporarily closed for 6 weeks for maintenance.

Exploration continued on several advanced projects, including San Andreas Resources' Prairie Cree, Redfern Resources' Tulsequah Chief, Noranda's Bell Allard, and Metall's Pick Lake deposits.

Nickel.—Canadian nickel mine production decreased sharply in 1994 to an estimated 150,000 mt from 188,000 mt in 1992, primarily due to production cuts by Inco Ltd. during the first quarter of the year. Inco signed a new 3-year labor contract at its Ontario Division. The contract called for increased pension benefits. Environmental permits were obtained for a $53 million development program at Inco's new Victor deposit near Sudbury. The project, which included a 1,768 m exploration shaft, was scheduled to be completed by 1998. Inco also started development work at the McCreedy East Mine near Sudbury. The mine was expected to produce 10,000 mt/a of contained nickel and 35,000 mt/a of contained copper by 1999.

Falconbridge Ltd. sold 77 million shares to the public, for about $1 billion, in June 1994. Following Inco's model, Falconbridge signed a 3-year labor contract at its Sudbury operations. The contract called for higher pension benefits and the recall of 37 laid-off miners. The company announced plans to develop its Raglan property in northern Québec, pending completion of negotiations with the Inuit Nation and the Québec Government. The $350 million operation is to produce about 20,000 mt/a of nickel in concentrate by mid-1998.

Sherritt Inc. signed a basic contract with Cuba to set up an enterprise to mine, refine, and market nickel and cobalt internationally. Sherritt's Fort Saskatchewan refinery in Alberta and Cuba's Moa Bay nickel and cobalt concentration plants were included in the joint-venture agreement.

Industrial Minerals

Asbestos.—In 1994, Canadian asbestos mines operated at an average of 94% of capacity while average prices increased by 4%. Canadian employment in asbestos mining and milling remained fairly stable.

Export volumes for 1994 were estimated to be about 519,000 mt, a 2% increase from 1993. Exports from January to September 1994 totaled about 380,000 mt, valued at $163 million, compared with 358,000 mt, valued at $162 million, for the same period in the previous year. The decline in exports of Canadian asbestos to Europe moderated, with exports to certain countries displaying significant increases. Asia remained an important market, accounting for 58% of exports. The U.S. Bureau of Mines estimated that Canadian asbestos imports into the United States in 1994 were about 27,000 mt compared with 30,700 mt in 1993.

At Cassiar, British Columbia, a joint-venture group comprising Minpro Pty. Ltd., Cliff Resources Corp., and Black Hill Minerals Ltd., invested $1.8 million in preparatory work for the construction of a wet milling pilot plant. At JM Asbestos Inc., mine workers invested $2 million in their company, and the Government of Québec guaranteed a $25 million loan for its development phase. At LAB Chrysotile, the largest Canadian asbestos producer, workers at the Black Lake operation signed a 5-year contract.

At the company's Bell Mine, a drilling program was underway to evaluate reserves. In Newfoundland, Cliff Resources Inc. exercised its option to purchase the remaining 50% of Princeton Mining Corp.'s interest in Teranov Mining Corp., a tailings reprocessing operation co-owned by Cliff Resources and Black Hill Minerals.

Diamond.—In 1994, more than 500 companies were involved in diamond exploration in Canada, especially in the Northwest Territories, but also in Saskatchewan, Québec, Alberta, Ontario, British Columbia, Manitoba, and Labrador. Total diamond exploration expenditures in 1994 were estimated at about $67 million.

Broken Hill Pty. (BHP) Diamonds Inc. of Australia reported that the diamond recovered to date from five kimberlite pipes at its Lac de Gras property, about 300 kilometers (km) northeast of Yellowknife, compared favorably with those at other diamond mines in the world. The company stated that, at current prices for rough diamond, the project to develop the pipes was economically feasible. Capital investment was expected to be in excess of $360 million. The five pipes were located under lakes bearing the same names: Panda, Misery, Koala, Fox, and Leslie. The pipes would be mined during a 30-year period. Preliminary results on two pipes were as follows: Koala, containing 0.75 carat per mt, at an average of $110 per carat, resulting in an ore value of $82 per mt; and Panda, 1.18 carat per mt at $127 per carat, resulting in an ore value of $150 per mt. The planned processing plant was to receive 9,000 mt/d of ore during the first 9 years of operation and 18,000 mt/d thereafter. The cut-off grade would be 0.01 carat. Processing was expected to involve mainly crushing, scrubbing, and dense media separation, plus high-intensity magnetic separation, X-ray concentration, and sorting. The work force during the construction phase was projected to reach 1,000 at its peak. Approximately 650 workers would be employed during production.

Potash.—In 1994, Canadian potash production rose by about 18%. Increases in output were mostly registered in Saskatchewan. New Brunswick's potash production accounted for 12% of total output. In 1944, Canadian potash was shipped mostly to the United States (57%) and Asia (29%), with the remainder going to Latin America (8%), Oceania (3%), and Western Europe (3%). Exports to the United States rose by about 15%.

In 1994, the producer-members of Canpotex Limited, the export arm of the Saskatchewan potash industry, entered into a partnership with Kap Resources to invest in a potassium nitrate project in Chile. IMC Canada continued to manage its recurring water inflows and pursued its evaluation of long-term options for its potash mines, including various mining methods. Vigoro Corp., Kalium Canada's Chicago-based parent company, acquired the Central Potash Canada operation of Noranda Minerals. The transaction, completed in early January 1995, involved a disbursement of $89 million, plus $12 million in working capital.

In early March 1994, the International Trade Administration of the U.S. Department of Commerce extended for another year the suspension agreement between the United States and Canadian potash producers, which was due for termination. During the year, investigation continued into allegations of price-fixing in North America by several U.S. and Canadian potash exporters. The investigations were related to class-action lawsuits consolidated in St. Paul, Minnesota, and a U.S. grand jury investigation.

Mineral Fuels

Coal.—The year 1994 was better for the Canadian coal industry than 1993. Total coal production for 1994 was 72.8 Mmt, valued at $1.3 billion, compared with 69 Mmt in 1993. The increase in production reflected the return to full-year production following the resolution of problems at three mines in southeastern British Columbia.

Canadian coal consumption in 1994 was forecast to be about 51 Mmt, 2 Mmt greater than 1993. The increase was attributable to increased coal-fired power generation, which accounted for about 44 Mmt of coal. Consumption by the steel industry and the industrial sector in 1994 was expected to be similar to the previous year, at about 5 Mmt and 2 Mmt, respectively.

Canada maintained its position as the world's fourth largest coal exporter, with 1994 exports of about 31 Mmt to 23 countries. Traditionally, more than 80% of Canada's coal exports has been coking coal, sold mostly to Japan, and about 70% of Canadian steam coal exports were to Japan and South Korea. Exports in 1994 were expected to conform to this pattern. Coal imports for 1994 were estimated to be slightly more than 8 Mmt, same as in 1993.

Natural Gas.—Canada ranked third in the world, after Russia and the United States, in output of natural gas. Once again, the production of natural gas played a major role in the mineral economy of Canada. In 1994, production rose to a gross output of 183 billion cubic meters (m^3), up from 171 billion m^3 in 1993, and production of marketable gas was 139 billion m^3. Marketable gas is gross (total) production minus reinjected gas and producer consumption.

Canada exported about 70 billion m^3 (2.5 trillion cubic feet) of natural gas to the United States during 1994, which was about 10% of the U.S. supply. Gas exports to the United States were expected to increase to about 100 billion m^3 by 2006, anticipating the increasing inability of U.S. domestic production to meet demand.

Opposition to natural gas exploration, production, and transmission has grown in recent years. Environmental groups are opposing construction of a proposed 1,000-km, 20-million-m^3-per-day natural gas pipeline to Wyoming. In addition, the Rocky Mountain Ecosystem Coalition was

attempting to slow the expansion of natural gas exploration and production activities in northern Alberta. Environmentalists have also tried, with some success, to block Amoco Canada, Ltd. from drilling in the ecologically sensitive "Whaleback" region, about 120 km southwest of Calgary. On September 8, 1994, Alberta's Energy Resources Conservation Board ruled against Amoco, marking a major victory for environmental groups and local ranchers opposed to Amoco's plans.[9]

Petroleum Crude.—Production of crude reached an alltime high of 636 million barrels (Mbbl) in 1994, about 4% higher than 1993 and 12% higher than 1990. Besides successes in cost cutting, the recovery in Canada's oil industry resulted largely from improvements in exploration, drilling, and production technology. In addition, drilling activity more than doubled, from about 2,000 wells drilled in 1990 to more than 4,200 in 1993.

The Athabasca oilsands north of Fort McMurray, Alberta, played an increasingly important role in Canadian oil production. Output in 1994 was about 90 Mbbl of light "sweet" (nonsulfur-containing) crude, or about 14% of the Nation's total for the year. Technological development and increased operating efficiencies have steadily reduced production costs by the two major operators, Suncor Inc. and Syncrude Canada Ltd., at its two sites in Alberta and northern Saskatchewan. Suncor's operating costs at the Suncor oil sands plant in Alberta dropped from $15 per barrel (bbl) in 1992 to $12 per bbl in 1993, and a projected $9 per bbl in 1997. The National Energy Board predicted that the oilsands could contribute 50% of national production by 2010. Athabasca, Peace River, and other bitumen and heavy oil deposits in Alberta amount to 2.5 trillion bbl of oil in place, about 40% of the world's known bitumen.

Improved technology has also opened up offshore oil areas to development. The Hibernia Field, offshore Newfoundland in 75 m of water, for instance, contains 615 Mbbl of light, waxy oil. The field is being developed in a $6.5 billion project by a consortium of U.S.-based companies, including Mobil, Chevron, and Murphy, plus large subsidies from the Canadian Government. Production is scheduled to begin in 1997, with peak production estimated at 125,000 barrels per day (bbl/d).

Canada exported 925,000 bbl/d of crude oil in 1993, including 529,000 bbl/d of light crude and about 397,000 bbl/d of blended heavy crude. Alberta alone accounted for about three-quarters of total Canadian oil exports in 1993. Canadian refineries were able to process 1.9 Mbbl per day of crude oil. Nearly two-thirds of this capacity is concentrated in three Provinces—Ontario, 535,400 bbl/d; Alberta, 389,800 bbl/d; and Québec, 347,400 bbl/d—with the remainder distributed across Canada's other six Provinces.[10]

Reserves

Three Provinces dominated Canada's nonfuel mineral reserves position: New Brunswick had 52% of the lead, 38% of the zinc, and 40% of the silver; Ontario had 74% of the nickel, 55% of the gold, and 46% of the copper; and British Columbia had all of the molybdenum and 34% of the copper. Based on the current mix of precious-metal and base-metal deposits, the expected aggregate recovery in concentrates of Canadian gold reserves was about 85%; it was roughly 90% for both copper and zinc, 85% for nickel, 80% for lead, 70% for silver, and 65% for molybdenum.

Reserves of major metals have been falling for more than a decade, except for those of gold, which grew yearly from the late-1970's until early 1989. At current production rates, the apparent life of current reserves was about 24 years for nickel, 12 for copper, 10 for zinc and molybdenum, 9 for lead and silver, and 8 for gold. These estimates did not take into account inferred extensions to reserves at current mines or gross additions that would accrue to current reserves from the likely development, in the foreseeable future, of known ore bodies for which a production decision has yet to be made.

Several projects, not yet counted in Canadian reserves, were expected to improve Canada's current reserves position. With respect to gold, Placer Dome announced in January 1994 that it would expand, at a cost of $150 million, the open pit at its Dome operations in Timmins, Ontario; that pit has estimated reserves of 53 mt of gold (1.7 million troy ounces), comparable to those of the present underground operation. In the case of zinc, deep underground exploration was conducted by Falconbridge Ltd., resulting in the discovery of an extension to its Kidd Creek ore body equivalent to 3 to 4 years of output at current production rates.

Inco Ltd. was expected to add nickel reserves from McCreedy East, which is not yet fully developed. Inco also was planning a $60 million program for the deep Victor, Ontario, deposit where about 36 Mmt of rich nickel-copper-platinum-group mineralization was indicated. In January 1994, Falconbridge intersected, at its Nickel Rim property, an exceptionally rich horizon containing copper, nickel, platinum, and palladium, which may be the downdip extension of the Victor deposit. *(See table 3.)*

Infrastructure

With a total land area of about 9,221,000 square kilometers, slightly larger than the United States, Canada had networks of highly developed infrastructure as well as other vast areas of trackless wilderness. The country had 884,272 km of roads, comprising 250,023 km of paved highway, 462,913 km of gravel or other loose surface, and 171,336 km of earth-surface roads, the latter not graded or drained in many places. Bulldozed temporary roads have been

established for mining exploration in many out-of-the-way places, but these deteriorated quickly where not maintained.

A total of 93,544 km of railroads included two main systems, the Canadian National and the Canadian Pacific. The country also had about 3,000 km of inland waterways, including the St. Lawrence Seaway, one of the busiest in the world. Principal ports were Halifax, Montreal, Québec, St. John (New Brunswick), St. John's (Newfoundland), Toronto, and Vancouver. Canada's merchant marine was made up of approximately 75 ships of 1,000 or more gross registered tons.

The country had 1,416 airports, 1,168 of them usable. Of these, 455 had permanent-surface runways; 4 with runways longer than 3,659 m; 30 with runways 2,440 to 3,659 m long; and 338 with runways 1,220 to 2,439 m in length. Civil aviation included about 636 major transport aircraft, with Air Canada as the major carrier.

Canada generated electrical power from coal, natural gas, and nuclear fuels as well as massive hydroelectric facilities. Total capacity was approximately 108 gigawatts. About 511 million megawatt hours (MW•h), or 18 MW•h per capita, was produced in 1993, the last year for which complete data were available. More than 62% of Canada's electricity was generated by hydroelectric plants, about 17% by nuclear, 15% by coal, and 5% by oil and gas. Québec and Ontario produced the most electricity, 154 MW•h and 141 MW•h, respectively. Nearly 97% of Québec's electricity generation came from hydro plants, with the remaining 3% produced mainly by nuclear facilities. In contrast, about 56% of Ontario's electric power derived from nuclear, 29% from hydro, and 14% from coal-fired plants. The majority of Canada's electricity exports originated in the eastern Provinces of Québec, Ontario, and New Brunswick and were sold to consumers in New England and New York. The western Provinces of British Columbia and Manitoba also exported large amounts of electricity, mainly to Washington State, Minnesota, California, and Oregon. Except for Alberta, all Canadian Provinces bordering the United States had transmission links to neighboring U.S. systems. Canadian electricity exports to the United States surged in late 1993 and early 1994, due largely to favorable hydrological conditions. In November 1994, Québec announced cancellation of the controversial $10 billion Great Whale hydroelectric power project. Under discussion since the mid-1970's, Great Whale was dealt a severe setback when New York's Power Authority, a major Hydro-Québec customer, announced cancellation of a $5 billion power contract, citing environmental concerns and decreased power needs.

An extensive system of pipelines connected oil producing—mostly western Canada—and consuming areas—mostly central and eastern Canada and the United States. This system was dominated by two major pipelines: the Interprovincial Pipe Line (IPL), which delivered oil from Edmonton east to Montreal, Québec, and the U.S. Great Lakes region; and the Trans Mountain Pipe Line (TMPL), which delivered oil mainly from Alberta west to refineries and terminals in the Vancouver area, as well as to the Puget Sound area of Washington State. Canadian natural gas was transported largely by TransCanada PipeLines Ltd. of Calgary, which owned 13,600 km of mainline gas pipelines in Canada, along with 56 compressor stations, linking western Canadian gas producers with eastern Canadian and U.S. consumers. In 1993, the TransCanada system shipped a record 60 billion m^3 of natural gas, up from 40 billion m^3 in 1989, including 25 billion m^3 to the United States. Total Canadian pipeline network included about 25,000 km for crude oil and refined products and 75,000 km for transmission of natural gas. Alberta's network represents the greatest length for any Province.[11]

Outlook

The Canadian mineral industry should experience better times in 1995 as base-metal prices continue their upward trend. The price increases should be sustained as a result of the increased demand expected from Europe and part of the Far East, including Japan. The outlook for the industrial minerals sector is also positive. Although this sector is expecting continuing pressures from China and other competitors, Canada is well positioned in terms of its own industrial mineral resource base and in terms of its access to the United States and other markets. Canada's mineral industry is primarily export-oriented with as much as 90% of the production of some commodities being exported. In this regard, the industry's export capability is enhanced significantly by a lower exchange rate for the Canadian dollar. The United States should continue to be a major market for Canada's metals and minerals, although there were expectations that a slowdown in the U.S. economy was likely in 1995 as a result of efforts by the Federal Reserve to subdue inflation.

The issues facing Canada's mineral industry as the turn of the century approaches remain complex. Many of them are international in nature and may lie beyond Canada's sphere of influence. Canada cannot escape the realities of growing international competition, especially from mineral-rich developing countries that have liberalized economic and political systems in order to attract foreign investment. Despite the increased level of exploration activity that occurred in 1994, the ongoing depletion of Canadian mineral reserves remains a subject of concern.

The industry's improved productivity and financial performance in 1994 bodes well for the future. A sustained period of low prices between 1989 and 1994 has forced Canadian producers to cut costs and, at the same time, to increase productivity. In 1994, for example, Canadian zinc producers were among the lowest-cost producers in the world. The trend to improved profitability is expected to continue in 1995.

[1]Text prepared July 1995.

[2]For more detailed information on the mineral industry of Canada, see the Canadian Mineral Yearbooks for 1993 and 1994, prepared by the Mining Sector, Natural Resources Canada, Ottawa, Canada, which were used extensively as source material for this report. The U.S. Department of the Interior, Bureau of Mines, has arranged to have these Canadian publications placed in selected depository libraries of the 50 States and Puerto Rico. Please note that any datum or statistic in the text not referenced elsewhere may be assumed to be from either the Yearbook or the related series of separate, preliminary, topical periodicals containing information compiled by Statistics Canada and issued by Natural Resources Canada.

[3]Where necessary, values have been converted from Canadian dollars (CAN$) to U.S. dollars at an average rate of CAN$1.3659=US$1.00 for 1994 and CAN$1.2944=US$1.00 for 1993. All values in this report are expressed in U.S. dollars.

[4]Mining Annual Review, 1995. London, United Kingdom.

[5]Work cited in footnote 4.

[6]United Nations, Statistical Division. Commodity trade statistics issued in microfiche format, 1995.

[7]Work cited in footnote 4.

[8]Work cited in footnote 4.

[9]U.S. Department of Energy, Energy Information Administration. Canada Country Analysis Briefs: 1994.

[10]Work cited in footnote 9.

[11]Work cited in footnote 9.

Major Sources of Information

Natural Resources Canada
580 Booth Street
Ottawa, Ontario K1A OE4
Canada

Mining Sector
Geological Survey of Canada
Surveys, Mapping, and Remote Sensing Sector
Canada Centre for Mineral and Energy Technology (CANMET)

Statistics Canada
Tunney's Pasture
Ottawa, Ontario
Canada

Department of Indian Affairs and Northern Development
Les Terrasses de la Chaudière,
Ottawa, Ontario K1A 0H4
Canada

Environment Canada
Les Terrasses de la Chaudière
27th Floor
10 Wellington St.
Ottawa, Ontario K1A 0H3
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Ministry of Energy, Mines and Petroleum Resources
Parliament Buildings
Victoria, British Columbia V8V 1X4
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Department of Energy
Petroleum Plaza, North Tower, 9945 108 St.
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Room 306, Legislative Building
Regina, Saskatchewan S4S 0B3
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Administration of Mining Lands
Toronto-Dominion Bank Building
1914 Hamilton St.
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Department of Energy and Mines
Room 301, Legislative Building
Winnipeg, Manitoba R3C 0V8
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Ministry of Northern Development and Mines
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Northeastern Region
Northwestern Region

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Newfoundland Department of Mines and Energy
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British Columbia and Yukon Chamber of Mines
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Vancouver, British Columbia V6C 1C8
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Chamber of Mines of Eastern British Columbia
215 Hall Street
Nelson, British Columbia V1L 5X4
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Mining Association of British Columbia
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Alberta Chamber of Resources
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Saskatchewan Mining Association Inc.
1740 Avord Tower
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The Mining Association of Manitoba
700-305 Broadway
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Ontario Mining Association
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Toronto, Ontario M5H 2G4
Canada
Québec Asbestos Mining Association
410-1140 Sherbrooke Street West,
Montreal, Québec H3A 2M8
Canada
Québec Mining Association Inc.
942-2635 Boulevard.
Hochelaga, Ste. Foy
Québec G1V 4W2
Canada
The New Brunswick Mining Association
Suite 312-236 St. George St.
Moncton, New Brunswick E1C 1W1
Canada
Chamber of Mineral Resources of Nova Scotia
202-5525 Artillery Place
Halifax, Nova Scotia NS B3J 1J2
Canada

Major Publications

Canadian Geoscience Council, annual report.
Canadian Institute of Mining and Metallurgy, monthly.
Canadian Mineral Analysts, monthly.
Canadian Mining Journal, Canada's Top Mining Companies, monthly.
Natural Resources, Canada:
Canadian Minerals Yearbook, annual.
Canadian Mineral Industry Reports, monthly.
Canadian Mines: Perspective for 1990, Production, Reserves, Development, and Exploration, annual.
Mineral Policy Sector, Canadian Minerals, annual.
Mining and Mineral Processing Operations in Canada, Annual Mineral Bulletin.
Production of Canada's Leading Minerals, monthly.
Geological Association of Canada, Geoscience Canada, quarterly.
Indian and Northern Affairs Canada, Mines and Mineral Activities, annual.
Industrial Minerals of London, World of Minerals, monthly.
International Mining of London, Canadian Mining, monthly.
The Journal of Commerce (U.S.) newspaper, weekdays.
Maclean Hunter Publication, Rock Products Register, annual.
Metal Industry, Trends and Outlook, monthly.
Mining Journal Ltd., London, Mineral Markets and Mining Finance, monthly.
Mining Journal Ltd., London, Mining Journal, weekly.
Northern Miner Press Inc.:
Canadian Mines Handbook 1990-91, annual.
Canadian Oil & Gas Handbook, 1990-91, annual.
The Northern Miner, weekly.
Penn Well Publishing Co.:
Worldwide Natural Gas Industry Directory, annual.
Oil and Gas Journal, Worldwide Report, monthly.
International Petroleum Encyclopedia, 1990.
Prospectors and Developers Association of Canada, monthly.
Québec Prospectors Association, monthly.
Répertoire des Etablissements Menant des Opérations Minières Au Québec, annual.
Statistics Canada:
Coal and Coke Statistics, monthly.
Crude Petroleum and Natural Gas Production, monthly.
International Trade Division, Imports by Commodity, yearly; Exports: Trade Merchandise, yearly.
U.S. Embassy, Ottawa:
Periodic Economic and Industrial Outlook reporting.
United Nations, Energy Statistics Yearbook, annual.
The Wall Street Journal, newspaper, daily.
Information Respecting Securities Laws
Corporate Annual Reports of individual mining companies.

TABLE 1
CANADA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1990	1991	1992	1993	1994
METALS						
Aluminum:						
Alumina, gross weight	thousand tons	1,090	1,130	1,100	1,180	1,170
Metal:						
Primary		1,570,000	1,820,000	1,970,000	2,310,000	2,250,000
Secondary		82,500 r/	74,100 r/	88,600 r/	97,200 r/	100,000 e/
Antimony 3/		658	469	948	673 r/	750
Arsenic trioxide e/		485 4/	236 4/	250	250	250
Bismuth 3/		87	65	224	144 r/	131
Cadmium:						
Mine output, Cd content 3/		1,530	1,790	1,630	1,340 r/	1,650
Metal, refined		1,470	1,830	1,960	1,890	2,130
Calcium	kilograms	W	W	W	W	W
Cobalt:						
Mine output, Co content 3/		5,470	5,270	5,100	5,110 r/	4,330
Metal:						
Shipments 5/		2,180	2,170	2,220	2,150 r/	1,920
Refined, including oxide		2,060	2,250	2,210	2,700	2,950
Columbium and tantalum:						
Pyrochlore concentrate:						
Gross weight		5,270	5,230	5,100	5,320	5,130
Cb content		2,370	2,350	2,300	2,390	2,310
Tantalite concentrate: e/						
Gross weight		350	380	200	100 r/	120
Ta content		86	93	48	25 r/	28
Cb content		14	15	8	5	6
Copper:						
Mine output, Cu content 3/		794,000	811,000	769,000	734,000	626,000
Metal:						
Smelter:						
Primary, blister		476,000	505,000	515,000	518,000 r/	515,000
Secondary and scrap		47,400	26,800	37,400	44,100 r/	45,000
Total		523,000	532,000	552,000	562,000 r/	560,000
Refined:						
Primary		468,000	504,000	508,000	520,000	505,000
Secondary		47,400	34,500	31,100	41,600	45,000
Total		516,000	538,000	539,000	562,000	550,000
Gold, mine ouput	kilograms	169,000	177,000	161,000	153,000	146,000
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand tons	34,900	36,400	32,700	30,500 r/	36,600
Fe content	do.	22,000	22,900	21,500	20,000 e/	23,000 e/
Metal:						
Pig iron	do.	7,350	8,270	8,620	8,630	8,150
Direct reduced iron	do.	730	553	639	758	770
Ferroalloys, electric arc furnace: e/						
Ferromanganese and silicomanganese	do.	185 4/	45	--	--	--
Ferrosilicon	do.	95	75	55	55	55
Silicon metal	do.	20	20	20	20	20
Ferrovanadium	do.	2	2	2	2	2
Total	do.	302	142	77	77	77
Crude steel	do.	12,300	13,000	13,900	14,400 r/	13,900
Lead:						
Mine output, Pb content		241,000	276,000 r/	344,000	183,000 r/	172,000
Metal, refined:						
Primary		87,200	106,000	151,000	151,000	145,000
Secondary		96,500	106,000	102,000	69,100	97,800
Total		184,000	212,000	253,000	220,000	243,000
Lithium: Spodumene e/		12,000	12,000	18,500	18,900 r/	20,000
Magnesium metal, primary e/		25,300 r/ 4/	35,500 4/	25,800 r/	23,000 r/	28,900
Molybdenum, mine output, Mo content		12,000	11,300	9,410	9,700 r/	9,540
Nickel:						
Mine output, Ni content 3/		196,000	192,000	186,000	188,000	150,000
Refined 6/		135,000	132,000	135,000	123,000	105,000
Platinum-group metals, mine output	kilograms	11,700	11,700	11,900	12,400 r/	15,000
Selenium, refined 7/	do.	342,000	207,000	294,000	500,000 r/ e/	600,000 e/
Silver:						
Mine output, Ag content	kilograms	1,500,000	1,340,000	1,220,000	896,000 r/	758,000
Refined	do.	941,000	1,000,000	1,030,000	1,010,000	1,000,000 e/
Tellurium, refined 7/	do.	9,860	12,400	21,800	24,000 r/	30,000
Tin:						
Mine output, Sn content		2,830	4,460	--	--	-- e/
Metal, smelter, secondary e/		200	200	200	200	200
Titanium: Sorel slag 8/		1,050,000	701,000	753,000	653,000 r/	764,000
Uranium oxide (U_3O_8)		10,300	9,620	11,000	10,800 r/	11,500
Zinc:						
Mine output, Zn content		1,200,000	1,160,000	1,320,000	1,000,000 r/	984,000
Metal, refined, primary		592,000	661,000	672,000	660,000 r/	689,000

See footnotes at end of table.

TABLE 1--Continued
CANADA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1990	1991	1992	1993	1994
INDUSTRIAL MINERALS						
Asbestos		725,000	639,000	591,000	517,000 r/	518,000
Barite		41,000	50,000	37,000	59,000	55,000
Cement, hydraulic 9/	thousand tons	11,700	9,370 r/	8,590 r/	9,390 r/	10,500
Clay and clay products 10/	value, thousands	$136,000 r/	$120,000	$117,000	$120,000 e/	$120,000 e/
Diatomite e/		4,100	8,000	10,000	10,000	10,000
Fluorspar		21,400	--	--	--	-- e/
Gemstones, amethyst and jade		455	542	1,340	3,680 r/	467
Graphite (exports)		10,200	6,200	17,400	18,800 r/	15,800
Gypsum and anhydrite	thousand tons	8,790	6,830	7,570	7,880 r/	8,500
Lime 9/	do.	2,340	2,380	2,380 r/	2,380 r/	2,390
Magnesite, dolomite, brucite e/		150,000 4/	180,000	180,000	180,000	180,000
Mica, scrap and flake e/		16,000	17,000	17,500	17,500	17,500
Nepheline syenite		535,000	484,000	554,000	550,000 r/	544,000
Nitrogen: N content of ammonia		3,050,000	3,020,000	3,100,000	3,410,000 r/	3,470,000
Potash, K_2O equivalent	thousand tons	6,990	7,410	7,270	6,840	8,040
Pyrite and pyrrhotite, gross weight e/		5,000	5,000	5,000	5,000	5,000
Salt	thousand tons	11,300	12,000	11,200	10,900 r/	11,700
Sand and gravel	do.	243,000	214,000	238,000	237,000 r/	237,000
Silica (quartz) 11/	do.	2,080	1,500	1,750	1,600 e/	1,600 e/
Sodium compounds, n.e.s.:						
Sodium carbonate (soda ash) e/	do.	315	310	305	305	300
Sodium sulfate, natural 12/	do.	345	332	282	320 r/	312
Stone 13/	do.	128,000	103,000	105,000	106,000 r/	105,000
Sulfur: Elemental byproduct:						
Metallurgy	do.	899	872	931	897 r/	990
Natural gas	do.	5,180	5,490	5,770	6,500 e/	7,000 e/
Petroleum e/	do.	207 4/	230	235	350 r/	400
Tar sands	do.	503	540	552	700 r/	750 e/
Total	do.	6,790	7,130	7,490	8,450	9,140
Talc, soapstone, pyrophyllite	do.	148	123	104	108 r/	130
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		178,000	157,000	161,000	161,000 e/	160,000 e/
Coal:						
Bituminous and subbituminous	thousand tons	58,900	62,100	55,600 r/	59,000 r/	62,700
Lignite	do.	9,410	9,000 r/	10,000	10,000	10,100
Total	do.	68,300	71,100	65,600	69,000	72,800
Coke, high-temperature	do.	3,710	3,620 r/	3,710	3,660 r/	3,680
Gas, natural:						
Gross	million cubic meters	138,000	145,000	158,000	171,000 r/	183,000
Marketed	do.	98,800	105,000	117,000 r/	129,000 r/	139,000
Natural gas liquids:						
Ethane	thousand 42-gallon barrels	44,700	47,400	46,000	45,000 r/ e/	45,000 e/
Propane	do.	42,400	42,400	45,300	45,000 e/	45,000 e/
Butane	do.	21,600	23,600	24,900	25,000 e/	25,000 e/
Pentanes plus	do.	41,600	43,400	48,100	50,500 r/	55,900
Condensate	do.	976	1,220	1,400	1,430 r/	1,730
Total	do.	151,000	158,000	166,000	167,000 r/ e/	173,000 e/
Peat		716,000	856,000	740,000	801,000 r/	1,020,000
Crude 14/	thousand 42-gallon barrels	567,000	564,000	585,000	610,000 r/	636,000
Refinery products:						
Liquefied petroleum gas, propane, butane, and naphtha	do.	17,200	16,500	17,300	15,800 r/	14,900
Gasoline:						
Aviation	do.	813	759	706	824 r/	835
Other	do.	232,000	230,000	229,000	234,000 r/	239,000
Petrochemical feedstocks	do.	31,300	31,900	30,700	29,400 r/	28,200
Jet fuel	do.	33,300	28,600	24,700	26,600 r/	26,800
Kerosene	do.	2,790	3,490	2,020	3,670 r/	2,690
Distillate fuel oil, diesel and light	do.	175,000	169,000	163,000	178,000 r/	186,000
Lubricants including grease	do.	6,550	6,180	5,360	5,360 r/	6,250
Residual fuel oil, heavy	do.	56,700	54,100	50,100	48,500 r/	44,200
Asphalt	do.	16,900	15,900	15,200	17,800 r/	20,400
Petroleum coke	do.	5,400	5,690	6,310	7,220 r/	6,660
Unspecified	do.	33,700	30,800	30,300	28,900 r/	28,100
Refinery fuel and losses 15/	do.	26,500	24,700	29,100	24,800 r/	25,100
Total	do.	637,000	618,000	604,000	621,000 r/	629,000

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data.

1/ 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/ Table includes data available through July 1995.

3/ Metal content of concentrates produced.

4/ Reported figure.

5/ Cobalt content of all products derived from ores of Canadian origin, including cobalt oxide shipped to the United Kingdom for further processing and nickel-copper-cobalt matte shipped to Norway for refining.

6/ Nickel contained in products of smelters and refineries in forms which are ready for use by consumers. Natural Resources Canada has revised all nickel refined figures to conform with International Nickel Study Group guidelines.

7/ From all sources, including imports and secondary sources. Excludes intermediate products exported for refining.

8/ Refined sorel slag contained 80% TiO_2 in 1990. TiO_2 content in 1991-94 is not reported.

9/ Producers' shipments and quantities used by producers.

10/ Includes bentonite products from common clay, fire, stoneware clay, and other clays. Values are in current Canadian dollars.

TABLE 1--Continued
CANADA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

11/ Producers' shipments of quartz.
12/ Excludes byproduct production from chemical plants.
13/ Crushed, building, ornamental, paving, and similar stone.
14/ Including synthetic crude (from oil shale and/or tar sands).
15/ Refinery fuel represents total reported production of still gas, including a small amount sold.

TABLE 2
CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Alcan Aluminum Ltd.	Smelter, Laterriere, Quebec	204.
Do.	do.	Smelter, Isle-Maligne, Quebec	73.
Do.	do.	Smelter, Beauharnois, Quebec	48.
Do.	do.	Smelter, Shawinigan, Quebec	84.
Do.	do.	Smelter, Grande-Baie, Quebec	180.
Do.	do.	Smelter, Arvida, Quebec	232.
Do.	do.	Smelter, Kitimat, British Columbia	272.
Do.	Aluminiere de Becancour Inc. (Pechiney Corp., 25%; Quebec Government, 24.95%)	Smelter, Beacancour, Quebec	360.
Do.	Canadian Reynolds Metals Co. Ltd. (Reynolds Metals Co., 100%)	Smelter, Baie-Comeau, Quebec	400.
Do.	Aluminerie Alouette Inc. (Vereinigte Aluminium-Werke AG, Germany, 20%; Hoogovens Groep BP, Netherlands, 20%; Metall Aktiengesellshaft, Austria, 20%; SGF, Alunor, 20%; Marubeni, Italy, 16.3% Kobe Steel, Japan, 3.7%)	Smelter, Sept-Iles, Quebec	215.
Do.	Aluminerie Lauralco Inc. (Alumax Inc. of the U. S.)	Deschambault, Quebec	215.
Asbestos	Lac d'Amiante du Quebec, Ltee (LAQ) (Jean Dupere, President of LAB Chrysotile, Inc.; Connell Bros. Co. Ltd. of the U. S.)	Black Lake, Quebec	160 (fiber).
Do.	Asbestos Corp. Ltd. (Mazarin Mining Exploration Inc.)	British Canadian Mine, Black Lake, Quebec	70 (fiber)
Do.	Bell Asbestos Mines, Ltd. (Mazarin Mining Exploration Inc.)	Thetford Mines, Quebec	70 (fiber)
Do.	JM Asbestos Inc.	Jeffrey Mines, Asbestos, Quebec	250 (fiber).
Do.	Teranov Mining Corp. (Black Hill Minerals Ltd., 50%; Cliff Resources, 50%)	Baie Verte, Newfoundland	20 (fiber).
Cement	Lafarge Canada Inc.	Bath, Ontario	1,045 (dry-process).
Do.	do.	Exshaw, Alberta	1,029 (dry-process).
Do.	do.	Kamloops, British Columbia	194 (dry-process).
Do.	do.	Richmond, British Columbia	474 (wet-process).
Do.	do.	St. Constant, Quebec	991 (dry-process).
Do.	do.	Brookfield, Nova Scotia	527 (dry-process).
Do.	St. Lawrence Cement Inc. (Independent Cement Inc.)	Joliette, Quebec	991 (dry-process).
Do.	do.	Mississauga, Ontario	1,876 (wet and dry).
Do.	do.	Beauport, Quebec	611 (wet-process).
Do.	ESSROC Canada Inc.	Picton, Ontario	1,124 (dry-process).
Do.	North Star cement Ltd.	Corner Brook, Newfoundland	152 (dry-process).
Do.	Ciment Quebec Inc.	St. Basile, Quebec	1,074 (wet and dry).
Do.	Federal White Cement Ltd.	Woodstock, Ontario	170 (dry-process).
Do.	St. Marys Cement Co.	Bowmanville, Ontario	1,550 (dry-process).
Do.	do.	St. Marys, Ontario	645 (dry-process).
Do.	Inland Cement Ltd. (S.A. Cimenteries CBR)	Edmonton, Alberta	726 (dry-process).
	Tilbury cement Ltd. (S.A. Cimenteries CBR)	Delta, British Columbia	1,040 (dry-process).
Coal	Brinco Coal Corp. (Consolidated Brinco Ltd., 100%)	Quinsam Coal Mine, Campbell River, British Columbia	14,400 (open pit and underground).
Do.	Cape Breton Development Corp. (Government of Canada, 100%)	Sydney, Nova Scotia	22,000 (longwall).
Do.	Luscar, Ltd.	Obed Mountain Mine, Hinton, Alberta	3,500.
Do.	Manalta Coal Ltd.	Gregg River Mine, Hinton, Alberta	3,960 (open pit).
Do.	do.	Higvale Mine, Seba Beach, Alberta	11,610 (open pit).
Do.	do.	Utility Mine, Estevan, Saskatchewan	3,600 (open pit).
Do.	Smoky River Coal Ltd. (Smoky River Holdings Ltd., 100%)	Grande Cache, Alberta	3,600 (open pit and underground).
Copper	Brenda Mines Ltd. (Noranda Inc., 69%)	Peachland, British Columbia	10,800.
Do.	Broken Hill Proprietary Co. Ltd. (BHP Holdings Inc., 100%)	Island Copper Mine, Port Hardy, British Columbia	16,200.
Do.	Cassiar Mining Corp. (Princeton Mining Corp., 100%)	Similco Mine, Princeton, British Columbia	9,000.
Do.	Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	Subdury Operations, Sudbury, Ontario	4,250.

See footnotes at end of the table.

TABLE 2--Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper--Continued	Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	Strathcona and Timmins operations, Timmins, Ontario	4,860.
Do.	do.	Smelter, Timmins, Ontario	440.
Do.	Gibraltar Mines Ltd. (placer Dome Inc., 68.14%)	McLease Lake, British Columbia	13,070.
Do.	Highland Valley Copper (Cominco, 50%; Rio Alom Ltd., 33.5%; Teck Corp., 11.5%; and Highmont Mining Co., 5%)	Logan Lake, British Columbia	4,500.
Do.	Inco Ltd.	Sudbury and Shebandowan, Ontario Thompson District, Manitoba	20,250 (mine).
Do.	do.	Smelter, Sudbury, Ontario	500.
Do.	do.	Refinery, Subdury, Ontario	170.
Do.	Noranda Inc.	Bell Copper Mine, Babine Lake, British Columbia	5,550 (mine).
Do.	do.	Smelter Horne, Noranda, Quebec	770.
Gold	Agnico-Eagle Mines Ltd.	Joutel, Quebec	590 (ore).
Do.	American Barrick Resources Corp. (The Horsham Group, 21.1%)	Camflo Div., Val d'Or, Quebec	436 (ore).
Do.	Cassiar Mining Corp. (Acquired by Princeton)	Similco Mine, Princeton, British Columbia	450 (kg metal).
Do.	Eastmaque Gold Mines Ltd.	Kirkland Lake, Ontario	949 (ore).
Do.	Echo Bay Mines Ltd.	Lupin Mine, Contwoyo Lake; Northwest Territories	612.
Do.	Royal Oak Mines Inc.	Giant Mine, Yellowknife, Northwest Territories	407 (ore).
Do.	do.	Gaint Mill-tailings, Yellowknife, Northwest Territories	3,265 (ore).
Do.	do.	Pamour, Ontario	945 (ore).
Do.	do.	Schumacher, Ontario	931 (ore).
Do.	Hemlo Gold Mines Inc. (Noranda, Inc., 50.8%)	Golden Giant Mine, Marathon, Ontario	1,080 (ore).
Do.	Hope Brook Gold Inc. (BP Canadian Holdings Ltd., 75.7%)	Hope Brook Mine, Conteau Bay, Newfoundland	1,090 (ore).
Do.	LAC Minerals Ltd.	Page Williams Mie, Hemio, Ontario	2,100 (ore).
Do.	Hudson Bay Mining and Smelting Co. (Inspiration Resources Corp., 100%)	Flin Flon and Snow Lake, Manitoba	2,600 (kg metal).
Do.	do.	Rutan Mine, Leaf Rapids, Manitoba	2,412 (ore)
Do.	Placer Dome Inc.	Campbell Mine, Red Lake, Ontario	400 (ore).
Do.	do.	Detour Lake Mine, Northeast Ontario	900 (ore).
Do.	do.	Dome Mine, South Porcupine, Ontario	1,300 (ore).
Do.	do.	Sigma Mine, Val d'Or, Quebec	500 (ore).
Do.	do.	Kiena Mine, Val d'Or, Quebec	500 (ore).
Do.	do.	Equity Silver Mine, Houston, British Columbia	3,500 (ore).
Do.	Teck-Corona Corp. (Teck Corp., 100%)	David Bell Mine, Hemlo, Ontario	456 (ore).
Gypsum	Domtar Inc.	Flat Bay, Newfoundland	1,300.
Do.	Georgia-Pacific Corp.	River Denys, Sugar Camp, Nova Scotia	1,460.
Do.	Little Narrows Gypsum Co. Ltd. (USG Corp., 100%)	Little Narrows, Nova Scotia	1,640.
Do.	National Gypsum (Canada) Ltd. (Aancor Holdings Corp., 100%)	Milford, Nova Scotia	3,300.
Do.	Westroc Industries Ltd.	Windermere, British Columbia	1,170.
Iron and Steel	Iron Ore Co. of Canada	Carol Lake, Labrador	8,800 (concentrate), 10,300 (pellets).
Do.	Quebec Cartier Mining Co. (Dofasco Inc., 50%)	Mount Wright, Quebec	16,950 (concentrate), 7,500 (acid pellets).
Do.	The Algoma Steel Corp. Ltd. (Dofasco Inc., 100%)	Sault Ste. Marie, Ontario	2,478 (pig iron), 3,135 (crude steel), 657 (sinter).
Do.	Dofasco Inc.	Hamilton, Ontario	3,642 (pig iron), 4,500 (crude steel).
Do.	Stelco, Inc.	do.	2,733 (pig iron), 7,990 7,990 (crude steel), 560 (sinter).

See footnotes at end of the table.

TABLE 2--Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron and Steel--Continued		Wabush Mines Ltd. (Inland Steel Industries, 18%; LTV Corp., 26.9%; IRI Italy, 11.4%)	Wabush, Labrador, and Pointe Noire, Quebec	6,200 (concentrate).
Lead		Brunswick Mining and Smelting Corp. Ltd. (Noranda Inc., 64.8%)	No. 12 Mine, Bathurst and smelter in Belledune, New Brunswick	72 (Pb contained).
Do.		Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	Strathcona, Timmins, Ontario	212 (Pb-Zn contained).
Do.		Hudson Bay Mining and Smelting Co., Ltd. (Inspiration Resources Corp., 100%)	Flin Flon and Snow Lake, Manitoba	60 (Pb-Zn contained).
Do.		Cominco Ltd.	Trail, British Columbia	135 (refined lead).
Do.		Curragh Resources Inc. (Banco Espanol de Credito, S.A., 100%)	Faro Mine, Yukon Territory	184 (Pb-Zn contained).
Limestone		Lafarge Canada Inc.	Steep Rock, Manitoba	906 (quarry limestone).
Do.		Scotia Limestone Ltd.	Iris Cove, Sydney, Nova Scotia	720 (limestone).
Do.		Inland Cement Ltd. (CBR Materials Corp. of Canada, 100%)	Mafeking, Manitoba	720 (limestone).
Do.		do.	Cadomin, Alberta	2,160 (quarry limestone).
Do.		Havelock Ltd. (Kickenson Mines, Ltd. 100%)	Havelock, New Brunswick	864 (limestone).
Do.		Continental Lime Ltd.	Faulkner, Manitoba	1,440 (320/R-1 crushed 'stone).
Nickel		Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	East, Fraser, Lockerby, Onaping, Strathcona, and Craig in Sudbury	30 (metal contained).
Do.		do.	Smelter, Falconbridge	45 (rated capacity).
Do.		Inco Ltd.	Sudbury district mines: Frood, Stobie, Little Stobie, Creighton, Copper Cliff North and South, Garson-Offsets, Levack, McCreedy East and West, Shebandowan, Clarabell, Coleman, Crean Hill, Murray, and Totten in Sudbury area, Ontario	106 (metal contained).
Do.		do.	Smelter, Sudbury, Ontario	110 (metal contained).
Do.		do.	Refinery, Sudbury, Ontario	57 (metal contained).
Do.		do.	Refinery, Port Colborne, Ontario	30 (metal contained).
Do.		do.	Thompson, Pipe, Birchtree mines in Manitoba	62 (metal contained).
Do.		do.	Smelter, Thompson, Manitoba	82 (metal contained).
Do.		Sherritt Gordon Ltd.	Refinery, Fort Saskachewan, Alberta	24 (metal contained).
Petroleum 1/				
Gas	billion cuabic meters	Bow Valley Industries Ltd. (British Gas Canada Ltd., 100%)	Edgerton, etc.	1.8.
Crude	million 42-gallon barrels	do.	do.	12.4.
Gas	million cuabic meters	BP Canada Inc. (The British Petroleum Co. PLC London, 100%)	Noel Area, North Alberta; Chauvin, Sibbald, North Pembina, Alberta	47.
Crude	million 43-gallon barrels	do.	do.	12.
Do.	do.	Gulf Canada Corp. (Olympia & York Developments, 80%; Gulf, 20%)	Fenn-Big Valley, Swan Hills, Goose River, Peerless, and Sene, Alberta	18.
Do.	do.	Home Oil Co. Ltd. (Interhome Energy Inc. 100%)	Red Earth, Garrington, Cherhill, Medicine River, and Swan Hills, Alberta	11.5.
Gas	billion cubic meters	do.	do.	1.8.
Crude	thousand 42-gallon barrels	Imperial Oil Ltd. (Exxon Corp., USA, 70%; others, 30%)	Judy Creek, Cold Lake, Alberta, Mackenzie Delta, Beaufort Sea, Yukon and Northwest Territories	670.
Gas	million cubic meters	do.	do.	36.4.
Crude	million 42-gallon barrels	Mobil Oil Canada Ltd. (Mobil Corp., United States, 100%)	Hibernia, Grand Banks, Southeast of Newfoundland and Sable Island, Nova Scotia, and others in Alberta	26.1.
Gas	billion cubic meters	do.	do.	3.0.
Crude	million 42-gallon barrels	Norcen Energy Resources Ltd. (Hollinger Inc., 59%; Hees International, 41%)	Pembina, Bodo, Majorville, Alberta	12.1.
Do.	do.	Oakwood Petrooleums Ltd. (Sceptre Resources Ltd., 100%)	Grantham, Hays Ronalane, Peace River, Normandville, Randell, Alberta, and Grizzly Valley, British Columbia	24.6.

See footnotes at end of the table.

TABLE 2--Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Crude million 42-gallon barrels	PanCanadian Petroleum Ltd. (Canadian Pacific Enterprises, 87%; Others, 13%)	Rycroft, Wembley, Elk Point, Rio Bravo, Alberta	19.7.
Gas billion cubic meters	do.	do.	3.53.
Crude million 42-gallon barrels	Shell Canada Ltd. (Shell Investments, 79%; Others, 21%)	Dimsdale, Little Smoky Lake, Sousa, Alberta, Midale, Benson, Saskatchewan	22.2.
Gas billion cubic meters	do.	do.	6.53.
Crude million 42-gallon barrels	Suncor Inc. (Sun Co. Inc., United States, 75%; Ontario Energy Resources, 25%)	Kidney, Zama Lake, Cosway, Albersun Prevo, and Medicine River, Alberta, and Leitchville, Unwin, Saskatchewan	4.1.
Crude thousand 42-gallon barrels	Texaco Canada Petroleum Inc. (Texaco Inc., United States, 78%; Others, 22%)	Eaglesham, Virgo, Alberta, and Desan, British Columbia	158.
Gas million cubic meters	do.	do.	67.3.
Crude million 42-gallon barrels	UNOCAL Canada Ltd. (UNOCAL Corp., United States, 100%)	Calgary, Alberta	14.7.
Potash (K_2O equivalent):	Potash Corp. of Saskatchewan Inc. (Private, 37%; Provincial government, 63%)	Lanigan, near Lanigan Saskatchewan	3,400 (KCl).
Do.	do.	Rocanville, southeast Saskatchewan	1,750 (KCl).
Do.	International Minerals & Chemical Corp. (Canada) Ltd. (IMC Fertilizer Corp., 100%)	Esterhazy, southeast Saskatchewan	1,814 (KCl).
Do.	Kalium Chemicals (Kalium Canada Ltd., 100%)	Potash Mine, 40 km west of Regina, Moose Jaw, Saskatchewan	2,040 (KCl).
Salt and brine operations	The Canadian Salt Co.	Pugwash, Nova Scotia	1,400 (rock salt and brine salt).
Do.	do.	Iles-de-la-Madeleine, Quebec	1,625 (rock salt).
Do.	do.	Ojibway, Ontario	2,600 (rock salt).
Silver	Cambior, Inc.	Quebec	396 (mill feed).
Do.	International Corona Corp. (Dundee Bancorp, 30%)	Nickel Plate Mine, Hedley, British Columbia	1,320 (mill feed).
Do.	Equity Silver Mines Ltd. (Placer Dome Inc., 58.8%)	Houston, British Columbia	2,970 (Ag-Au-Cu concentrate).
Do.	LAC Minerals Ltd.	Macassa Mine, Ontario	165 (mill feed).
Do.	do.	Bousquet Mine, Quebec	580 (mill feed).
Do.	Similco Mines Ltd.	Princeton, British Columbia	8,250 (Ag-Au-Cu concentrate).
Do.	United Keno Hill Mines Ltd.	Elsa, Yukon Territory	132 (mill feed).
Sodium chlorate production using salt	Dow Chemical Canada Inc. (The Dow Chemical Co. Michigan, United States, 100%)	Fort Saskatchewan, Alberta	524 (caustic soda).
Do.	do.	do.	476 (chlorine).
Do.	do.	Sarnia, Ontario	350 (caustic soda).
Do.	General Chemical Canada Ltd.	Amherstburg, Ontario	363 (sodium carbonate).
Sulfur:			
Petroleum refinery capacities	Consumer's Cooperative Refineries Ltd. (Federated Cooperatives Ltd., 100%)	Regina, Saskatchewan	54.
Do.	Esso Petroleum Canada	Sarnia, Ontario	50.
Do.	Sulconam Inc. (Petro Canada, 7.6%)	Montreal, Quebec	108.
Main sulfur extraction plants (sour gas and oil sands)	Amoco Canada Petroleum Co., Ltd. (Amoco Corp. USA, 100%)	East Crossfield-Elkton, Alberta	650.
Do.	Canadian Occidental Petroleum, Ltd.	East Calgany-Crossfield, Alberta	610.
Do.	Chevron Canada Resources Ltd. (Chevron Corp. USA, 100%	Kaybob South III, Alberta	1,281.
Do.	Husky Oil Ltd.	Ram River, Ricinus, Alberta	1,646.
Do.	Shell Canada Ltd.	Waterton, Alberta	1,120.
Principal SO_2 and H_2SO_2 production capacities	Canadian Electro Zinc Ltd. (CEZ) (Noranda Inc., 90.17%)	Valleyfield, Quebec	430 (H2SO4).
Do.	INCO Ltd.	Copper Cliff, Ontario	950 (H2SO4).
Do.	Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	Kidd Creek, Ontario	690 (H2SO4).
Do.	ESSO Chemical Canada (Imperial Oil, Ltd., 100%)	Redwater, Alberta	910 (H2SO4).
Uranium	Denison Mines Ltd.	Elliot Lake, Ontario	1,319 (metal).
Do.	Cameo Corp. (Province of Saskatchewan, 61.5%; Government of Canada, 38.5)	Key Lake, Saskatchewan	4,976 (metal).

See footnotes at end of the table.

TABLE 2--Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Zinc	Brunswick Mining and Smelting Corp. Ltd. (Noranda Inc., 64.3%)	Bathurst, New Brunswick	232 (Zn in concentrate).
Do.	Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	Timmins Operations, Ontario	212 (Pb-Zn contained).
Do.	do.	Smelter	133 (slab zinc).
Do.	Hudson Bay Mining and Smelting Co., Ltd. (Inspiration Resources Corp., 100%)	Snow Lake concentrator, Manitoba	1,125 (Pb-Zn ore).
Do.	do.	Flin Flon mine and smelter	85 (slab zinc).
Do.	Cominco Ltd. (Cominco, 55%; Pine Point Mines Ltd., 45%)	Sullivan Mine, Kimbreley, British Columbia	70 (Pb-Zn contained).
Do.	do.	Smelter, Trail, British Columbia	300 (slab zinc).
Do.	Curragh Resources Inc. (Banco Espanol de Credito, S.A., 100%)	Faro Mine, Yukon Territory	184 (Pb-Zn contained).

1/ Projections of annual capacity involve matching decline curves against new discoveries and are extrapolations only, based on data in Canadian Oil & Gas Handbook 1991, Northern Miner Press, Inc.

TABLE 3

CANADA: RESERVES OF MAJOR MINERALS FOR 1994

(Thousand metric tons unless otherwise specified) 1/ 2/

Commodity		Reserves	
Abestos, fiber		39,000	e/
Coal, all types		6,370,000	e/
Copper, metal content		9,780	
Gold, metal	metric tons	1,340	3/
Gypsum		500,000	e/ 4/
Iron ore, iron content		1,310,000	e/
Lead, metal content		4,150	
Molybdenum, metal content		161	
Natural gas	billion cubic meters	2,060	5/
Nickel, metal content		5,410	
Petroleum crude	million barrels	6,770	5/
Potash, K_2O equivalent	million tons	14,000	e/
Salt		314,000	4/
Silver, metal	metric tons	15,700	
Sodium sulfate		92,000	4/
Sulfur		140,000	e/
Uranium		275	6/
Zinc, metal content		14,200	

e/ Estimated.

1/ Data are rounded by the U.S. Bureau of Mines to three significant digits.

2/ 1994 and 1993 Canadian Minerals Yearbook, Natural Resources Canada, unless noted.

3/ Excludes metal in placer deposits.

4/ Data in thousand short tons.

5/ Extrapolated from 1991 Canadian Oil and Gas Handbook, The Northern Mines Press Ltd.

6/ Recoverable at prices of $100 per kilogram of U, or less.