

Canadian Mine Openings, Closings, Expansions, Extensions and New Mine Developments

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OVERVIEW

In 1997, Canadian mining was hit hard by the current metal downturn that began with a dramatic drop in the price of gold. However, despite a larger-than-expected number of mine closings, the year ended with 21 mine openings (11 new mines and 10 re-openings) and 20 mine closings (9 suspensions and 11 closures) (Tables 1 and 2). The 11 new mine openings consisted of 5 gold mines, 4 base-metal mines, 1 gold and base-metal mine, and 1 wollastonite mine. The re-openings included 4 gold mines, 5 base-metal mines and 1 salt mine. The 20 mine closings included the temporary suspension of production at 8 gold mines and 1 gold-copper mine, and the permanent closure of 4 gold mines, 1 gold-copper mine, 4 base-metal mines, 1 potash mine and 1 asbestos mine. Four of the mine openings (2 new mines and 2 re-openings) and 5 of the mine closures were Canadian and foreign joint ventures or were foreign-controlled operations. In addition, 5 Canadian junior companies joined the rank of producer in Canada in 1997.

The new mines opened in 1997 were: the Nugget Pond gold mine and the Beaver Brook antimony mine in Newfoundland; the Restigouche zinc-lead-silver-gold mine in New Brunswick; the Troilus gold mine, the Raglan nickel-copper-cobalt-precious metal mine, and the St. Onge wollastonite mine in Quebec; the Glimmer, Edwards and Musselwhite gold mines in Ontario; and the Huckleberry copper-molybdenum-gold-silver mine and the Mount Polley gold-copper mine in British Columbia. The re-opened mines included the Caribou zinc-lead-silver-gold mine in New Brunswick; the Gallen zinc-silver-gold mine, the Langlois zinc-copper-silver mine and the Îles-de-la-Madeleine salt mine in Quebec; the Madsen gold mine in Ontario; the Bissett (formerly San Antonio) gold mine in Manitoba; the Golden Bear and Hannandor gold mines in British Columbia; and the

Grum and Vangorda zinc-lead-silver mines in the Yukon.

The most important new mines in 1997, in terms of value of expected production and employment, were the Troilus gold mine and the Raglan base-metal mine in Quebec, the Musselwhite gold mine in Ontario, and the Huckleberry base-metal mine and the Mount Polley gold-copper mine in British Columbia. The most important re-openings were the Caribou base-metal mine in New Brunswick, the Langlois (formerly Grevet) base-metal mine and the Îles-de-la-Madeleine salt mine in Quebec, the Bissett gold mine in Manitoba, and the Grum base-metal mine in the Yukon. However, the importance of the re-opening of the Bissett and Grum mines was minimized when Bissett was closed six months later as a result of the filing for bankruptcy by the owner, Rea Gold Corporation. As well, production was suspended at Grum in January 1998 after only three months of operation.

Four significant mine closures took place during 1997. In Newfoundland, the Hope Brook gold mine, which first came into production in 1987, closed in August because of ore depletion. In New Brunswick, the Potacan potash mine closed in October because of irreparable damage from severe flooding. The mine was brought on stream in July 1985. In Quebec, the British Canadian asbestos mine, which first began production in 1885, closed in November as a result of worsening market demand that rendered its remaining ore reserves uneconomical. The Île Dieu and Norita East zinc-copper-lead mines, operated since 1989 and 1992, respectively, closed in November due to ore depletion. The Ajax-Afton copper-gold mine near Kamloops, British Columbia, was mined out in July, and the Colomac gold mine in the Northwest Territories closed in December because its pit ore was exhausted. In addition, the Rambler gold tailings and the Stog'er Tight/Ming gold-copper operations in Newfoundland, the Casa Berardi Est and Ouest gold mines and the Copper Rand gold-copper mine in Quebec, the Bissett gold mine in Manitoba, the Komis gold mine in Saskatchewan, and the Ptarmigan and Tom gold mines in the Northwest Territories suspended operations during the year.

Besides the production suspensions and mine closures, numerous production cutbacks and project postponements took place in 1997 in response to

persistently depressed commodity prices, creating substantial employment losses in the year. Estimated job losses through production cutbacks amounted to at least 500 in 1997, the largest such losses since the 1991-92 period when 65 mines were closed.

In addition to mine openings, there were at least 20 significant mine expansion and mine extension projects across Canada in 1997 (Table 2). Although most of these projects marked the continuation of existing programs that began in 1995, several were new or further expansions or extensions. The more important of these existing programs have been the Copper Rand 5000 project, and the Doyon, Joe Mann and LaRonde gold mines in Quebec, the Campbell and Red Lake gold mines and the McCreedy East nickel-copper mine in Ontario, and the Elkview coal mine project in British Columbia. The most significant new expansion and extension programs announced in 1997 include: the Kienna, Sigma and Mouska gold mines in Quebec; Hudson Bay Mining and Smelting Co., Limited's Flin Flon Division zinc-copper mines in Manitoba; and the Eskay Creek gold-silver mine and the Greenhills coal mine in British Columbia.

The total capital cost (excluding acquisition costs) for new and re-opened mines in 1997 is estimated to be over \$1.5 billion, which is \$1 billion higher than for those opened in 1996. At least another \$250 million is estimated to have been spent on mine expansions and extensions, which is 25% higher than in 1996. However, lingering weak metal prices have resulted in the postponement of many mine development projects, especially gold projects. Had it not been for the drastic decline in the price of gold throughout 1997 and the equally dramatic weakening of base-metal prices in the second half of the year, capital expenditures for mine developments, including mine openings, expansions and extensions, would have been much higher. While capital spending will likely be lower in 1998 and 1999, it is expected to rise considerably in the year 2000.

REGIONAL PERSPECTIVE

During 1997, seven provinces and both territories were affected by mine openings or closings. Most occurred in Newfoundland, Quebec, Ontario and British Columbia. Of the 21 mine openings in the year, 6 occurred in Quebec, 4 in each of Ontario and British Columbia, 2 in each of Newfoundland, New Brunswick and the Yukon, and 1 in Manitoba. Of the 20 mine closings, 8 occurred in Quebec, 3 in each of Newfoundland and the Northwest Territories, 2 in Manitoba, and 1 in each of New Brunswick, Ontario, Saskatchewan and British Columbia. However, because the opening or closure of a larger mine will have more effect on production and employment than that of a smaller mine, the impact of mine openings and closings varied considerably from province to

province. Overall, Ontario and British Columbia benefitted the most from mine openings, while Newfoundland, New Brunswick, Quebec and the Northwest Territories were the hardest hit by production suspensions or mine closures at relatively large mines in these regions.

In Newfoundland, the small but relatively high-grade Nugget Pond gold mine near Baie Verte was opened in April by Richmond Mines Inc., and the Beaver Brook mine, which is Canada's only primary antimony operation (since New Brunswick's Lake George antimony mine suspended production in December 1996), was brought on stream in November by Roycefield Resources Ltd. The mine is expected to contribute, at full production, some 5% of the world's antimony production for 20 years. However, the Rambler gold tailings and the Stog'er Tight/Ming gold mine, both near Baie Verte, suspended operations in January as a result of the low gold price. As well, the Hope Brook mine near Couteau Bay in southern Newfoundland, the province's largest gold producer, closed in August as the persistently weak gold price accelerated the depletion of economic ore reserves. As a result, Newfoundland incurred a net loss of some 3700 t of daily ore capacity and some 200 direct mining jobs.

In New Brunswick, two mines opened in the north and one closed in the southeast. The 3000-t/d Caribou zinc-lead-silver-gold mine near Bathurst re-opened in August, along with the nearby Restigouche mine, a new mine of a similar type. The Caribou mine has been dormant since October 1990, soon after the present owner, Breakwater Resources Ltd., acquired the mine from East West Caribou Mining Limited. After several months of intense efforts failed to save the Potacan potash mine at Clover Hill (near Sussex) from a devastating flood, the 10 500-t/d mine closed in October due to irreversible water damage. On March 3, 1998, Potash Corporation of Saskatchewan Inc., the world's largest potash company in terms of capacity, acquired Potash Company of Canada Limited and its ownership of the mine and mill, and changed the name "Potash Company of Canada" to PCS Cassidy Lake Limited. The company plans to use the mill to upgrade standard-grade potash from Saskatchewan to granular product for shipment to eastern Canada and the United States. There is now a possibility that the mine could be re-opened using solution mining. Overall, New Brunswick suffered heavy net losses of 7500 t/d of daily ore capacity and some 270 mining jobs as a result of its two mine openings and one closure in 1997.

In Quebec in 1997, three new mines came on stream and three mines re-opened, compared with three production suspensions and five mine closures. The 10 000-t/d Troilus gold-copper mine north of Chibougamau was brought on stream in January. At full production, the mine, which employs 225 workers, is expected to produce some 138 000 oz of gold annually for more than 13 years. The 2400-t/d Raglan nickel-copper mine northwest of Ungava

came into production at a capital cost of \$486 million in December. The high-grade nickel producer, employing a work force of 350, has been the province's sole primary nickel producer since 1975. Once full production is attained, the mine is expected to produce some 21 000 t of nickel, 5200 t of copper and 300 t of cobalt annually, as well as precious metals. Despite the current weak metal prices, Falconbridge Limited plans to rapidly expand the mine's production capacity to 30 000 t/y of nickel. The St. Onge mine at Lac St-Jean, Canada's first wollastonite mine, opened in November. Although the mine plan calls for 35 years of production at 550 t/d, the deposit contains over 100 years of wollastonite supply. Its annual production is estimated at 50 000 t of 99.3%-pure wollastonite. In addition, the 2350-t/d Gallen zinc-silver-gold mine near Rouyn-Noranda, which had been dormant since December 1985, was redeveloped for production in October. The 2500-t/d Langlois zinc-copper-silver mine near Lebel-sur-Quévillon was reactivated in July as planned, after some six months of suspended production, in an effort to change the mining method. As well, the mine's ore reserves were re-estimated (Tables 2 and 4). In the Îles-de-la-Madeleine region, the 7500-t/d Îles-de-la-Madeleine salt mine re-opened in July. Operations at the mine were suspended in 1995 following the cave-in of the production shaft as a result of flooding in April that year. At an estimated production rate of 1.5 Mt/y of salt, there are sufficient ore reserves to support 1000 years of production.

During 1997, the Casa Berardi Est and Ouest gold mines suspended production in February. Aurizon Mines Ltd. of Vancouver is currently acquiring the mines for re-opening. Although production was suspended at the Copper Rand gold-copper mine near Chibougamau in November because of low metal prices, owner MSV Resources Inc. is proceeding with the Copper Rand 5000 project (a deep ore development project) for possible production in 1999. While the Silidor gold mine at Rouyn-Noranda, the Portage gold-copper mine at Chibougamau, and the Isle Dieu and Norita East zinc-copper-lead mines at Matagami Lake closed because of ore depletion, the British Canadian asbestos mine at Black Lake in the Eastern Townships closed as a result of declining asbestos demand rendering its remaining ore reserves uneconomical. Overall, because of the lower-than-expected mine openings and higher-than-expected mine closings, Quebec incurred net losses of some 34 800 t/d of productive mine capacity and 100 direct mining jobs in 1997, a setback from 1996 when the province benefited from net gains of some 13 000 t/d of productive mine capacity and 645 new mining jobs.

In Ontario in 1997, four mines opened and one closed. These included three new gold mines: the Glimmer mine (600 t/d) near Matheson, the Edwards mine (about 250 t/d) near Wawa, and the Musselwhite mine near Opapimiskan Lake. With an ore production capacity of 3300 t/d, an annual gold output of 200 000 oz and a mine life of at least 16 years, the

Musselwhite mine was Canada's largest new gold mine opening in 1997. In June, the Madsen gold mine near Red Lake re-opened after having been dormant for 21 years. At full capacity, the mine could produce 50 000 oz of gold annually. In February 1998, Claude Resources Inc. of Saskatoon, owner of the successful Seabee gold mine in Saskatchewan, acquired the Madsen mine, which has since been put on care and maintenance. Claude Resources intends to further explore the high-grade No. 8 Zone at Madsen and to re-open the mine for production in 1998. The only mine closure in Ontario in 1997 occurred in March when the small (400-t/d) Golden Patricia gold mine at Pickle Lake was mined out after 19 years of production. Consequently, the province of Ontario incurred net gains of some 4200 t/d of mine production capacity and some 300 mining jobs from mine openings and closings.

One mine opened and two closed, and there were no new mines in Manitoba in 1997. The 900-t/d Bissett (formerly San Antonio) gold mine northeast of Winnipeg was reactivated for production in July. However, due to the depressed gold price, production was suspended six months later. The small but relatively high-grade Westarm zinc-copper mine near Flin Flon was mined out in January after two years of production. In all, Manitoba incurred a small net loss of 500 t/d of productive mine capacity and some 50 mining jobs in 1997.

The 400-t/d Komis gold mine near La Ronge, Saskatchewan, suspended production in April. The mine began production in August 1996, but has since been plagued by lower-than-expected reserves due to lower and erratic ore grades. The problem was further compounded by the lingering weak gold price. With no new mines or re-openings in 1997, Saskatchewan suffered a net loss of 400 t/d of mine production capacity and some 75 mining jobs from mine closings during the year.

With four mine openings and one mine closure, British Columbia fared well among the provinces in 1997 compared with 1996. Of the four openings, two were new mines and two were re-openings. The Mount Polley gold-copper mine near Williams Lake began production in July. With an 18 000-t/d ore capacity, the mine is the largest new gold and base-metal mine to come on stream in the province in at least two decades. The mine, a joint venture between Imperial Metals Corporation (55%) of Canada and Sumitomo Corporation (45%) of Japan, was developed at a capital cost of \$123.5 million. Its mine life was estimated at 12 years. The 16 500-t/d Huckleberry copper-molybdenum-gold-silver mine near Houston opened on October 1. It is a joint venture between Canada's Princeton Mining Corporation (60%) and a consortium of Japanese investors (40%) led by Mitsubishi Materials Corporation. The other owners of the consortium include Marubeni Corporation, Dow Mining Co. Ltd. and Furukawa Co. Ltd. The Huckleberry mine was developed at an estimated cost

of \$137 million. Its mine life was estimated at about 16 years. In February 1998, Princeton Mining and Imperial Metals agreed to merge by May 15, 1998, with Imperial Metals Corporation to be the surviving entity. The merger will result in production at both Huckleberry and Mount Polley mines being drastically reduced with the possibility of suspending production at Mount Polley. The companies hope the merger will enable the two mines to weather the current low metal cycle and to take better advantage of the up-cycle when it comes. Overall, British Columbia fared well in 1997 with net gains of 28 600 t/d in ore production capacity and some 320 new mining jobs, nearly a 100% turnaround from 1996.

In the Yukon, the Grum and Vangorda zinc-lead-silver mines at Faro re-opened in October after Cominco Ltd. acquired a 28% interest in majority owner Anvil Range Mining Corporation and provided funds for restarting the operation. On January 16, 1998, after only three months of shaky operation, production was once again suspended when Anvil Range announced plans to defer the interest payment on the loan and to file for court protection from creditors. While the Vangorda pit was mined out in early 1998, about six years of ore reserves remain at Grum. As a result, although the Yukon incurred net gains of 12 500 t/d of ore capacity along with some 400 mining jobs in 1997, the gains were short-lived.

MINE EXPANSIONS AND EXTENSIONS

Despite low metal prices, at least 20 significant mine expansion and extension projects were initiated or undertaken in 1997 (Table 2). These included 9 in Quebec, 4 in Ontario, at least 1 in Manitoba, 1 in Saskatchewan, 4 in British Columbia, and 1 in the Yukon. Although most projects occurred in Quebec, the largest took place in British Columbia. While the majority of these projects involved existing programs, six were new. Three of the new projects were in Quebec, one was in Manitoba, and two were in British Columbia. In addition, at least three existing programs have been further extended, including two (Doyon and LaRonde) in Quebec and one (Red Lake) in Ontario. Previously announced significant expansion or extension projects that were completed during 1997 include the Bouchard-Hebert zinc-copper-gold-silver mine and the Francoeur gold mine in Quebec, the Hoyle Pond gold mine in Ontario, and the Seabee gold mine in Saskatchewan. During 1997, the most significant new expansions began at the LaRonde gold-copper mine in Quebec, and at the Eskay Creek gold-silver mine and the Greenhills coal mine in British Columbia. In addition, significant new ore was found at the Mouska gold mine near Rouyn-Noranda, Quebec, extending the mine life for at least another two years. The mine was initially scheduled to close in 1997 due to ore depletion. At LaRonde, while a previously announced capital program to expand gold production continued in 1997, a new program to develop the mine's zinc orebody for produc-

tion in 1998 was launched. Agnico-Eagle Mines Limited successfully raised \$56 million in April 1997 to fund the mine expansion and to add a new zinc circuit. The circuit is expected to produce 5000 t of zinc in concentrate in 1998, reaching 52 000 t/y at full production in the year 2000. At the Eskay Creek mine, some 630 000 oz of new gold and equivalent were added to the mine reserves in 1997, boosting the total gold and silver reserves of the mine to 2.5 million oz of gold and 117 million oz of silver at the beginning of 1998, which is more than it had when the mine began production three full years ago. Its production in 1997 is expected to exceed 500 000 oz of gold and equivalent, compared with some 275 000 oz in 1996. This could propel Eskay Creek to the top rank among gold producers in Canada in terms of gold and equivalent production. At the Greenhills mine, a capital program that began in April 1997 (originally estimated at \$100 million) to expand coal production at the Cougar pit was completed in February 1998. Coal production from the mine has already been increased to the new capacity level of 4.5 Mt/y. As well, exploration success has added some 483 000 oz of gold resources to the geological oxide resources at the Brewery Creek gold mine near Dawson Creek in western Yukon. The Brewery Creek open-pit mine, which came on stream in November 1996, is the largest lode gold mining operation in the Yukon.

In addition, significant existing mine expansions and extensions continued in 1997 at the Bouchard-Hebert, Copper Rand, Doyon, Francoeur, and Joe Mann mines in Quebec, at the Campbell, Hoyle Pond, McCreeley East and Red Lake mines in Ontario, at the Seabee mine in Saskatchewan, and at the Elkview and Quinsam mines in British Columbia. The largest of these was the \$100 million extension program at the Elkview mine, which involved the pit extension and the construction of the huge Bodie Dump for waste rock disposal. The Quinsam coal mine, after a series of production expansions since 1992, finally completed its long-term goal of a \$14 million, 1.2-Mt/y capacity expansion at the end of 1997.

The large number of significant mine expansions and extensions in Canada during 1997 and the accompanying capital investment have continued to reinforce the upward trend that began in 1992.

IMPACT

Mine openings in Canada outnumbered mine closings in 1997, albeit marginally, for the fourth consecutive year. Although the total number of jobs gained from mine openings was almost completely offset by the number of jobs lost from mine closings during the year, there was a substantial net gain in production capacity due to the opening of the 10 000-t/d Troilus gold-copper mine in Quebec, the 16 500-t/d Huckleberry copper-molybdenum mine and the 18 000-t/d Mount Polley gold-copper mine in British Columbia,

and the re-opening of the 12 500-t/d Grum and Vangorda zinc-lead-silver mines in the Yukon. New mine openings and re-openings resulted in gross gains of some 84 430 t of daily ore production capacity and 3225 jobs, but about 52 945 t of daily capacity and 3200 jobs were lost because of mine closures and suspensions. Overall, Canadian mines incurred a substantial net gain of some 31 485 t of daily ore production capacity and some 25 mining jobs in 1997 through mine openings and closings. On the other hand, mine expansions and extensions have created few new jobs at Canadian mines in 1997. But job losses due to production cutbacks by mines, especially at gold and base-metal mines in the fourth quarter of 1997 due to persistently weak metal prices, amounted to over 500, making 1997 a relatively negative year for Canadian mining compared to recent years.

Mine openings in 1997 are expected to contribute significantly to Canada's total minerals and metals production. At full capacity, production from new and re-opened mines in 1997 is expected to be some 22 t (710 000 oz) of gold, 85.6 t (2.75 million oz) of silver, 53 000 t of copper, 21 000 t of nickel, 132 000 t of zinc, 35 000 t of lead, 4000 t of antimony, 670 t of molybdenum, 330 t of cobalt, 50 000 t of wollastonite and 1.5 Mt of salt annually (Table 3), considerably higher than from those opened in 1996. While most of the new gold production (62%) comes from two gold mines (Troilus and Musselwhite) and one gold-copper mine (Mount Polley), a large majority of the new silver production (94%) comes from two base-metal mines (Huckleberry and Caribou). Had the Grum mine not suspended production in January 1998, it would be the largest silver producer (at full production) among the mines that came on stream in 1997. More than 75% of the new copper production comes from Huckleberry and Mount Polley. The Caribou, Gallen, Langlois, Grum and Vangorda mines contributed all of the new zinc and lead production in 1997, while all of the new nickel production comes from the Raglan mine. At full production, the Beaver Brook mine is expected to contribute approximately 5% of the world's antimony production for 20 years. All of this new production is essential for offsetting production losses from mine closings and for maintaining Canada's production levels from existing mines. Most of the new mines are expected to produce into the next century.

Table 4 shows that new and re-opened mines in 1997 have also added over 287 t, or 9.2 million oz, of gold reserves; 1236 t, or 39.7 million oz, of silver reserves; 953 000 t of copper reserves; 423 000 t of nickel reserves; 1.1 Mt of zinc reserves; 241 000 t of lead reserves; 105 800 t of antimony reserves; and 12 700 t of molybdenum reserves to Canada's total reserves of these metals. In addition, some 9.5 Mt of wollastonite and 1.35 billion t of salt reserves were also added. Although most of the gold came from gold mines, most of the silver came from base-metal mines, as has been the case in Canada in the past.

While two mines (Caribou and Langlois) contributed the majority of the new zinc reserves, most new copper reserves came from the Huckleberry and Mount Polley mines in British Columbia, and all of the nickel came from the Raglan mine in Quebec. All new reserves, which are substantially higher than those from mines that came on stream in 1996, are essential for replenishing depleted reserves due to production and for sustaining Canada's minerals and metals production capability.

NEW DEVELOPMENTS EXPECTED TO BECOME MINES IN 1998

The dramatic decline in metal prices in 1997 has considerably dampened an upward trend in mine openings from robust new mine developments in Canada in recent years. Many mining projects that were previously scheduled to come on stream in 1997 and 1998 were postponed during 1997 to later years. Preliminary estimates at the beginning of 1998 indicate that some 12 mines could come on stream during the year. Among the most promising new mines are the Island Pond (peat) and Keels (slate) mines in Newfoundland; Tusket (gypsum) in Nova Scotia; Werner Lake (cobalt) in Ontario; McClean Lake (uranium) and Konuto Lake (copper) in Saskatchewan; Kemess South (gold and copper) and McGillivray (coal) in British Columbia; and Panda (diamond) in the Northwest Territories.

Several mining operations that had previously suspended production could re-open in 1998. These include the St. Lawrence Fluorspar (fluorspar) operation in Newfoundland; Madsen (gold) in Ontario; and Bellekeno and Silver King (silver-lead-zinc-gold) in the Yukon. In addition, several of the existing mine expansions and extensions, as well as new ones that were initiated in 1997, are expected to continue in 1998 and other new ones will likely be announced during the year. These expansions and extensions, together with new mine developments, are central to sustaining mining production in Canada.

OUTLOOK

During 1997, many mine openings and mine developments were postponed as the metal down-cycle hit nearly all of the major metals. Gold projects were the most severely affected. This is because the gold price began its decline early in the year as a result of such factors as gold sales by central banks and the Bre-X incident. The price decline was further deepened by the Asian currency crisis, which triggered a downward slide in base-metal prices in the fall, casting serious doubt on the market's ability to recover in the foreseeable future. Under such a gloomy scenario, companies responded by closing high-cost mines, cutting back on production to keep marginal operations afloat, and postponing mine openings and

developments. Such a trend is expected to continue for at least the first half of 1998. Preliminary estimates indicate that some 12 mines are likely to open and 20 are likely to close in 1998 with considerable net loss in employment. As the gold price is likely to remain weak, few gold mines are expected to open in 1998. However, because several sizeable new mines are expected to come on stream in 1998, including the McClean Lake uranium mine in Saskatchewan, the Kemess South gold-copper mine in British Columbia and the Panda diamond mine (the Ekati mine project, Canada's first diamond mine) in the Northwest Territories, capital investment for mine openings in the year could still exceed \$1.5 billion, similar to that for the mines that came on stream in 1997.

Because the U.S. and European economies are strong, the negative effect of the Bre-X incident is tapering off, and the core effect of the Asian crisis is expected to be short term, demand for metals is expected to recover in 1999. In addition, because a

large number of mines that were to open in 1997 and 1998 have been postponed to 1999 and 2000, forecast mine openings in 1999 and 2000 are 21 and 30 respectively, with respective capital investments of \$0.8 billion and \$2 billion. With only about half as many mines expected to close during those two years, the Canadian mining industry can expect considerable net gains in both production capacity and new jobs. The net gains from mine openings should contribute significantly to tax revenues and spin-off social and economic benefits for Canadians. As the number of significant new industrial mineral, coal, uranium and diamond mine openings is expected to rise, Canadian mining is heading towards the new millennium well prepared and more diversified than ever.

Note: Information in this review was current as of March 10, 1998.

TABLE 1. MINE OPENINGS AND CLOSINGS IN CANADA, 1997

Province/ Territory	New Mines			Mines Re-Opened			Mines Suspended			Mines Closed		
	Precious Metals	Base Metals	Other Minerals	Precious Metals	Base Metals	Other Minerals	Precious Metals	Base Metals	Other Minerals	Precious Metals	Base Metals	Other Minerals
Newfoundland	1	1	-	-	-	-	2	-	-	1	-	-
New Brunswick	-	1	-	-	1	-	-	-	-	-	-	1
Quebec	1	1	1	-	2	1	2	1	-	2	2	1
Ontario	3	-	-	1	-	-	-	-	-	1	-	-
Manitoba	-	-	-	1	-	-	1	-	-	-	1	-
Saskatchewan	-	-	-	-	-	-	1	-	-	-	-	-
British Columbia	1	1	-	2	-	-	-	-	-	-	1	-
Yukon	-	-	-	-	2	-	-	-	-	-	-	-
Northwest Territories	-	-	-	-	-	-	2	-	-	1	-	-
Canada, total by commodity group	6	4	1	4	5	1	8	1	-	5	4	2
Total Canada		11			10			9			11	

Source: Natural Resources Canada, based on company reports.
- Nil.

TABLE 2. MINE OPENINGS, RE-OPENINGS, EXPANSIONS, EXTENSIONS, SUSPENSIONS AND CLOSURES IN CANADA IN 1997

Mining Project	Location	Province/Territory	Ore Capacity (tonnes/day)	Employment ¹	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
NEW OPERATIONS									
Precious Metals									
Nugget Pond	Baie Verte	Nfld.	400	90	April 1	U/G	Gold	Richmont Mines Inc.	Richmont Mines Inc. became 100% owner of the mine in January 1996 by acquiring the remaining 40% interest from partner Noveder Inc. Construction began in June 1996 and was completed six months later in December. Commercial production began on April 1, 1997. The mine is expected to produce 33 000 oz of gold in 1997 and 48 000 oz annually from 1998 onwards. Its expected mine life is about four years.
Troilus	175 km N of Chibougamau	Que.	10 000	225	January	O/P	Gold, copper	Inmet Mining Corporation	The mine began commercial production in January 1997. Production is planned at 138 000 oz of gold annually. At the beginning of 1997, ore reserves at the mine were sufficient to support 13.5 years of production. In October, Inmet Mining Corporation entered into an agreement with Homestake Canada Inc. and Prime Resources Group Inc. to sell its 100% interest in the Troilus gold-copper mine; however, the deal did not go through.
Glimmer	Matheson	Ont.	600	98	April 15	U/G	Gold	Exall Resources Limited and Glimmer Resources Inc.	The mine began production in April 1997. Ore was custom-milled at St. Andrew Goldfields Ltd.'s Stock mill. The mine produced 15 592 oz of gold in the September 1997 quarter, 30% more than predicted, and is on its way to reach its production target of 65 000 oz/y. Its mineable ore reserves were recently estimated at 731 169 t grading 12.9 g/t gold. The deposit remains open at depth and along strike. Exall Resources Limited, the current operator of the mine, holds a 65.35% interest in the mine, and the remaining 34.65% is held by Glimmer Resources Inc. However, the partners are in dispute over ownership and operatorship. Their respective equity in the Glimmer mine is expected to be determined by an Ontario court.
Edwards	Wawa	Ont.	250*	24	August 27	U/G	Gold	VenCan Corporation and River Gold Mines Ltd.	The mine is 100% owned by VenCan Gold Corporation, but is operated by River Gold Mines Ltd. Production began in August 1997. Ore was treated at the River Gold mill (formerly Magnacon mill). The mine produced 30 412 oz of gold and 3678 oz of silver in 1997. Its planned annual production is 40 000 oz of gold. At the beginning of 1998, ore reserves stood at 393 000 t grading 16.5 g/t gold. Currently, underground work is advancing on the higher-grade Shaynee Zone, which is sub-parallel to the Carbonate and Porphyry zones, and the New North and Edwards zones. Some samples from the New North II Zone have assayed up to 50 g/t gold.

TABLE 2 (cont'd)

Mining Project	Location	Province/Territory	Ore Capacity (tonnes/day)	Employment ¹	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
NEW OPERATIONS (cont'd)									
Precious Metals (cont'd)									
Musselwhite	Opapimiskan Lake	Ont.	3 300	280	March 10	O/P (U/G later)	Gold	Placer Dome Inc. and TVX Gold Inc.	The Musselwhite mine is a joint venture between Placer Dome Inc. and TVX Gold Inc. in which Placer Dome has a 68% interest and is the project operator. The project currently holds 569 contiguous mining claims encompassing four major gold deposits: the T Antiform, PQ, OP and West Anticline zones, with the T Antiform being the largest and most significant. Current mining operations include an open pit on the OP Zone and underground on the T Antiform Zone. Production from the open pit began in March 1997, followed by underground mining in May. While the overall mill capacity was designed at 3300 t/d, production from the underground operation reached 2700 t/d in the second quarter of 1997. Capital costs were estimated at US\$190 million. At full production, the mine is expected to produce 200 000 oz of gold annually. Its life is estimated to be about 16 years.
Base Metals									
Beaver Brook	Glenwood	Nfld.	600	80	November	U/G	Antimony	Roycefield Resources Ltd.	Underground mining began in July 1997 and milling commenced in November. Initial shipments of antimony sulphide concentrates were made in 1997. In 1998, the company intends to ship 4000 t of concentrates. At full production, the mine is expected to produce approximately 5% of the world's antimony for about 20 years. The capital cost to production was estimated at \$14.6 million. Current production comes from mining of the East and Central zones. At the start of mining in mid-1997, ore reserves in the East Zone were 2.39 Mt grading 4.08% antimony, and in the Central Zone were slightly over 159 600 t grading 5.28% antimony. A demonstration plant was built in 1997 and successfully tested the conversion of antimony sulphide into antimony trioxide. The company intends to build a commercial antimony trioxide plant at the mine site. The Beaver Brook antimony deposit was discovered in 1989.

Restigouche	Bathurst	N.B.	Incl. in Caribou	Incl. in Caribou	August	O/P	Zinc, lead, silver, gold	Breakwater Resources Ltd.	In 1995, Breakwater Resources Ltd. acquired the Restigouche base-metal deposit from Marshall Minerals Corporation. The mine, situated 30 km west of the company's Caribou mine, was developed into a new open-pit mine along with the re-opening of Caribou in August 1997. Ore is trucked to the central mill at the Caribou mine site. The capital cost of developing Restigouche into production was estimated at \$9.1 million, which is included in the total capital cost of \$54.4 million for re-development of the Caribou mine and mill complex as well as for the mill conversion and expansion (see Caribou re-opening below). Approximately 65 people are employed by the contractor operating the Restigouche open pit.
Raglan	Ungava	Que.	2 400	350	December	O/P	Nickel, copper, cobalt, precious metals	Falconbridge Limited	The mine began concentrate production in December 1997, almost three months ahead of schedule. The first shipment of concentrate via Deception Bay and Québec City to Falconbridge Limited's smelter in Sudbury was scheduled to take place in early March 1998. At full production, the mine is expected to produce 21 000 t of nickel, 5200 t of copper and 300 t of cobalt annually. In 1998, production is expected to be 16 000 t of nickel, increasing to 21 000 t/y, despite the current low nickel price. The company also plans to rapidly expand the mine's production capacity from the current 20 000 t/y to 30 000 t/y of nickel. This expansion was previously planned for the year 2003. Although the capital cost for bringing the mine into production was estimated at \$486 million, the company has spent a total of \$540 million to date on the Raglan project, including pre-development expenses.
Huckleberry	Kemano (near Houston)	B.C.	16 500	170	October 1	O/P	Copper, molybdenum, gold, silver	Princeton Mining Corporation, Mitsubishi Materials Corp., Marubeni Corp., Dowa Mining Co. Ltd., and Furukawa Co. Ltd.	The mine, a joint venture between Vancouver-based Princeton Mining Corporation (60%) and a consortium of four Japanese companies (40%), is operated by Huckleberry Mines Ltd. Ore production began in September 1997 from the higher-grade East pit, which has sufficient ore for two years of production. Copper concentrate production began on October 1. From the second to the seventh year, mining will be focused on the Main pit and, in year seven, will revert back to the East pit. A molybdenum circuit was installed in December 1997 and the first shipment of molybdenite concentrate was expected to take place in early 1998. Initial production followed the original designed mill capacity of 16 500 t/d. This capacity is expected to be upgraded to 18 000 t/d in 1998. At full production, the mine is expected to produce 37 000 t of copper, 670 t of molybdenum, 380 000 oz of silver and 7000 oz of gold annually. The capital cost of bringing the mine into production was estimated at \$137 million. The expected mine life is 16 years. The mine directly employs 170 workers and another 40 indirectly under full-time contracts. In February 1998, Princeton Mining agreed to merge with Imperial Metals Corporation, which owns and operates the Mount Polley gold-copper mine near Williams Lake, B.C. (see Mount Polley below). The companies hope the merger will enable the two mines to weather the current low metal cycle and to take better advantage of the up-cycle when it comes.

TABLE 2 (cont'd)

Mining Project	Location	Province/ Territory	Ore Capacity (tonnes/day)	Employment ¹	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
NEW OPERATIONS (cont'd)									
Base Metals (cont'd)									
Mount Polley	Williams Lake	B.C.	18 000	165	July	O/P	Gold, copper	Imperial Metals Corporation and Sumitomo Corporation	The open-pit mine is a joint venture between Imperial Metals Corporation (55%) and Sumitomo Corporation (45%) of Japan, with Imperial Metals being the operator. The mine, which began production in July 1997, was developed on schedule and within the anticipated capital cost of \$123.5 million. The operation uses a conventional flotation mill with a designed capacity of 18 000 t/d. At full capacity, the mine is expected to produce 100 000 oz of gold and 10 886 t of copper annually. The current mine plan consists of production from three pits, the Central, Bell and Springer, which have a total mineable reserve of 82 Mt grading 0.3% copper and 0.42 g/t gold. Because gold grades decrease and copper grades increase with depth, current operations will focus on gold mining, at least for the first four years, with a copper production increase planned for the remaining years of the mine's life, which is estimated at 12 years. In February 1998, a plan to merge Imperial Metals with Princeton Mining Corporation, which owns and operates the Huckleberry copper-molybdenum mine near Houston, B.C. (see Huckleberry above), was accepted by both companies. The closing of the merger transaction was expected to take place between April 9 and May 15, 1998.
Other Minerals									
St. Onge	Lac St-Jean	Que.	550	75	November	O/P	Wollastonite	Orleans Resources Inc.	The St. Onge open-pit mine, 600 km north of Montréal, is Canada's first wollastonite mine. Although the mine plan calls for 35 years of operation, the deposit contains over 100 years of wollastonite supply. The project received a positive feasibility study in November 1994. Construction began in August 1996 and the mine was brought into production in November 1997. Its production in 1997 was expected to be about 5000 t of wollastonite. Its annual production is estimated at 50 000 t averaging 99.3% wollastonite. The capital cost to production was estimated at \$32 million. In addition to the 75 mine workers, about 100 temporary jobs were created during construction of the mine.

RE-OPENINGS

Precious Metals

Madsen	Red Lake	Ont.	450	74	June 14	U/G	Gold	Madsen Gold Corp.	The Madsen mine produced over 3.4 million oz of gold between 1938 and 1976. The mine was reactivated for production in June 1997 at a capital cost of \$15 million. The mine and mill facilities were purchased from the Dona Lake gold mine, which was closed in April 1994 due to ore depletion. The c.i.p. mill has a capacity of 600 t/d. At full production, the mine could produce 50 000 oz of gold annually. At the Madsen mine, exploration and mining has historically been focused on the Austin Tuff Horizon. Recent exploration success west of the shaft has discovered new orebodies elsewhere on the property. Ore reserves from the expanded Austin, South Austin, and the high-grade No. 8 Zone, as well as from the newly discovered McVeigh Tuff orebody (West and Shaft zones) now total over 327 000 oz. In late February 1998, Claude Resources Inc. of Saskatoon proceeded to acquire Madsen Gold Corp., the mine's owner. The transaction was expected to close by the end of March 1998. Claude Resources intends to further explore the high-grade No. 8 Zone.
Bissett (San Antonio)	170 km NE of Winnipeg	Man.	900	240	July 30	U/G	Gold	Rea Gold Corporation	The Bissett (formerly San Antonio) gold mine, about 95 km west of Ontario's Campbell Red Lake gold district, was redeveloped between 1995 and 1997 at a capital cost of \$42 million. At its full capacity of 900 t/d, the mine was expected to produce 80 000 oz of gold annually. On December 16, 1997, production at the mine was once again suspended as owner Rea Gold Corporation and operator Bissett Gold Mining Company Ltd. (which is wholly owned by Rea Gold) filed for bankruptcy. The mine produced 1.36 million oz of gold from 4.43 Mt of ore from 1932 to 1968.
Golden Bear	Telegraph Creek	B.C.	360	120	July	O/P & U/G & HL	Gold	North American Metals Corp.	Production was suspended in late 1994 due to ore depletion at the Main Bear deposit. The mine was reactivated in July 1997 as a heap leach mining operation. Mining will focus on three zones: the Kodiak A and Ursa zones by open pit, and the Kodiak B Zone by underground methods. In 1997, production was expected to be 25 000 oz, increasing to 51 000 oz annually at full production. At the beginning of 1997, gold reserves exceeded 250 000 oz, with a mine life estimated at over five years. The smaller but higher-grade Kodiak B Zone has excellent potential to expand. The zone's gold reserves, which stood at 76 900 oz at the start of 1997, were expected to increase by 19% by the end of the year. Overall, the mine will be operated as a seasonal producer.
Hannandor	Quesnel	B.C.	2 270	15*	Summer	O/P	Gold	Gallery Resources Ltd. and Hannandor Gold Ltd.	The mine began production in 1990 as a seasonal placer gold producer from May to November. Its production plan was revamped in 1996 with the installation of new production facilities, and the mining of an on-site hard-rock deposit began in 1997. Its planned production rate for 1997 was 2500 t/d.

TABLE 2 (cont'd)

Mining Project	Location	Province/ Territory	Ore Capacity (tonnes/day)	Employment ¹	Date of Opening, Re-Opening, Expansion, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
RE-OPENINGS (cont'd)									
Base Metals									
Caribou	Bathurst	N.B.	3 000	280	August	U/G	Zinc, lead, silver, gold	Breakwater Resources Ltd.	Breakwater Resources Ltd. acquired the Caribou mine in 1990 from East-West Caribou Mining Limited and suspended operations in October due to poor metallurgical recovery and low metal prices. In 1995, the company acquired the nearby Restigouche deposit and developed it into a new mine in 1997, along with the re-opening of the Caribou mine, at a capital cost of \$54.4 million. The original mill was expanded from 2000 t/d to 3000 t/d. Annual production from the two zinc-lead-silver mines is expected to be 150 million lb of zinc, 78 million lb of lead, 2.2 million oz of silver and 6000 oz of gold. The mine life, based on the combined current ore reserves of Caribou and Restigouche, is estimated to exceed six years.
Gallen	Rouyn-Noranda	Que.	2 350	150*	Oct. 1	U/G	Zinc, silver, gold	Noranda Mining Exploration Inc.	The mine was redeveloped in 1996 and 1997 at a capital cost of \$9 million. Its production will be approximately 54 600 t/y of zinc concentrates. The mine's life is estimated at about 2.5 years. It first began production in November 1981. Operations were suspended in July 1982. It was reactivated in 1984, but production was again suspended in December 1985.
Langlois	Lebel-sur- Quévillon	Que.	2 500	200	July 1	U/G	Zinc, copper, silver	Cambior inc.	The mine (formerly Grevet) was first brought on stream in January 1996 at a capital cost of \$80 million. Operations were suspended in December due to high dilution problems encountered on the lower mining horizon and weak metal prices. The company spent US\$5 million in the first half of 1997 to develop a new mining method, recalculate ore reserves, and re-open the mine for production on July 1. As of April 30, 1997, ore reserves were re-estimated at 7.3 Mt averaging 8.5% zinc, 0.5% copper, 38 g/t silver and 0.1 g/t gold.

Grum and Vangorda	Faro	Yukon	12 500	400	Oct. 21	O/P	Zinc, lead, silver	Anvil Range Mining Corporation, Cominco Ltd. and Hyundai Corporation	The mines last suspended production in December 1996. Production resumed in October 1997 after Cominco Ltd. acquired a 28% interest in Anvil Range Mining Corporation in February 1997 and provided funds for restarting the mine. Hyundai Corporation, who previously owned a 22% interest in Anvil Range, now holds about 20%. While Vangorda was mined out in early 1998, about six years of ore reserves remain at Grum. Ore was processed at the Faro concentrator on site. Mining operations ceased on January 16, 1998, when Anvil Range announced that it planned to defer the interest payment on the loan and file for court protection from creditors.
Other Minerals									
Îles-de-la-Madeleine	Îles-de-la-Madeleine	Que.	7 500	188	July	U/G	Salt	Seleine Mines Inc.	Operations were suspended in 1995 following a cave-in of the production shaft due to flooding in April that year. The mine was brought back into production in July 1997 at a capital cost of \$50 million. Its estimated production is about 1.5 Mt/y of salt. At this rate of production, its current ore reserves could support 1000 years of production.
EXPANSIONS AND EXTENSIONS									
Precious Metals									
Copper Rand	Chibougamau	Que.	3 000	300	1997-99	U/G	Gold, copper	MSV Resources Inc.	Continued successes in outlining new ore reserves since the company acquired the mine in 1993 have extended the mine's life in recent years. However, ore reserves in the developed parts of the mine were expected to be exhausted by the end of 1997. Due to weak metal prices and the need to develop sufficient ore feed for the mill, production was suspended in November 1997. In April 1997, resources of 3.6 Mt grading 1.5% copper and 3.08 g/t gold between the 4000 and 5000 levels were outlined. Named Copper Rand 5000, the company expects to spend \$20 million to develop this deep ore project for production in 1999.
Doyon	Cadillac	Que.	3 500	453	1994-2001	U/G	Gold	Cambior inc. and Barrick Gold Corporation	The mine began a major capital program in 1994 to expand the mill and ore reserves. The program continued in 1997. For 1996/97, the total planned capital expenditure for completing the shaft deepening and for underground development was estimated at US\$20 million. At the end of 1997, gold reserves at the mine were increased to 2.2 million oz, compared to 1.6 million oz at the end of 1996. On January 19, 1998, Cambior inc. agreed to purchase the 50% interest in the Doyon mine held by Barrick Gold Corporation, co-owner and operator of the mine, for US\$95 million, raising its interest to 100%. For 1998, production at Doyon is planned at 176 000 oz at a cash cost of US\$245/oz. Cambior plans to increase the level of production to 260 000 oz/y of gold by 2001 at a cash cost of US\$200/oz, compared with the current production rate of 208 000 oz/y at US\$228/oz. The mill capacity will be further expanded to 3800 t/d from the current 3500 t/d to allow for the planned increase in production. The Cambior-Barrick Gold deal will also enable Cambior to consolidate operations at the nearby Mouska mine by redirecting ore from Mouska to the Doyon mill for processing instead of to Vezina mill.

TABLE 2 (cont'd)

Mining Project	Location	Province/ Territory	Ore Capacity (tonnes/day)	Employment ¹	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
EXPANSIONS AND EXTENSIONS (cont'd)									
Precious Metals (cont'd)									
Francoeur	Rouyn-Noranda	Que.	1 225	125	1996-97	U/G	Gold	Richmont Mines Inc.	During 1997, a significant new ore zone dubbed the No. 7 Zone was discovered from underground drilling. The zone, a steeply dipping structure that cuts across the main east-west trending Cadillac Break, has a resource of 258 500 t grading 7.54 g/t gold. The zone is open downward and in both directions along strike. This steeply dipping zone is sufficiently wide with strong wallrock, and will enable the company to use inexpensive longhole stoping as the mining method. In 1996, the West Zone was discovered, adding some 131 500 t of ore grading 5.83 g/t gold to the mine's resource base. Both new ore zones are believed to be faulted extensions of the main Francoeur-Wasa structure, which has provided most of the mine's gold mineralization. The mine has a larger ore reserve base than when it started production in October 1991. As of early October 1997, ore reserves stood at 1 Mt grading 6.86 g/t gold.
Joe Mann	Chibougamau	Que.	1 045	257	1996-98	U/G	Gold, copper	Campbell Resources Inc.	In addition to the development of new ore reserves from below the current levels, a \$13.5 million 18-month capital program was launched in early 1997 to develop a newly discovered deep ore zone that is expected to extend the mine life for more than five years. The 300-m deepening of the main production shaft is expected to be completed in the first half of 1998, which will allow six new levels to enter production. The newly discovered West Zone, which is yet to be developed, is targeted for start-up in 1998. The zone may lead to an incremental increase in mine production once it is fully delineated.
Kiena	Val-d'Or	Que.	1 700	195	1998-99	U/G	Gold	McWatters Mining Inc.	The Kiena and Sigma gold mines were purchased by McWatters Mining Inc. from Placer Dome Inc. in September 1997 for US\$55 million. In February 1998, the new owner announced a US\$23 million program to extend the mine life of both operations to more than 10 years and to increase underground production at Sigma (see Sigma below). Production from Kiena from the date of acquisition to the end of 1997 was 27 290 oz of gold at a cash operating cost of US\$200/oz. Its total cost was US\$239/oz. The mine is expected to produce 90 000 oz of gold in 1998 at a budgeted cash cost of US\$220/oz.

LaRonde	Val-d'Or	Que.	1 800	295	1997-2000	U/G	Gold	Agnico-Eagle Mines Limited	Aggressive exploration and development work by the company has resulted in many new ore discoveries and continued production expansions and mine life extensions in recent years. Agnico - Eagle Mines Limited is developing new ore zones at LaRonde that should boost the mine's annual production. The mine is expected to produce 160 000 oz of gold in 1997. Although their production profile is expected to remain relatively flat during 1998/99 due to weak gold prices and the need to focus on new ore zones, development of these new ore zones is expected to boost the mine's production to more than 225 000 oz/ly of gold within four years. The new ore zones contain substantial amounts of zinc which, combined with copper credits from its currently producing ore zones, should bring cash operating costs at the mine down to below US\$100/oz of gold. In 1997, cash costs at LaRonde averaged US\$214/oz. The company successfully raised \$56 million in April 1997 to fund the mine expansion and to add processing enhancements and a new zinc circuit. The circuit is expected to produce some 5000 t of zinc in concentrates in 1998, 15 000 t in 1999, and to reach full production of 52 000 t/y in 2000.
Mouska	Rouyn-Noranda	Que.	400	88	1997-98	U/G	Gold	Cambior inc.	The mine was to close in 1997 in anticipation of ore depletion. However, the discovery of Zones 50 and 60 will likely extend the mine life by at least two years. The mine began production in July 1991. In 1996, it produced 26 000 oz of gold.
Sigma	Val-d'Or	Que.	1 000	300*	1997-98	U/G	Gold	McWatters Mining Inc.	The mine was acquired by the company, along with the Kiena mine, from Placer Dome Inc. in September 1997 (see Kiena above). In February 1998, the company announced a US\$23 million investment program to extend the mine life of both operations and to increase production at Sigma to 1000 t/d from 700 t/d by July 1998, and to 1500 t/d by the year 2000. Production from the mine from the date of the acquisition to the end of the year was 23 701 oz of gold. The company expects to produce 93 000 oz of gold from the Sigma mine in 1998 at a budgeted cash cost of US\$295/oz.
Campbell	Balmertown	Ont.	1 585	380	1995-98	U/G	Gold	Placer Dome Inc.	A series of capital programs that began in June 1995 to expand the mine and mill and to improve mill recovery continued in 1997. In addition to the US\$51 million (about \$70 million) main expansion program to expand the mill capacity to 1585 t/d from 1365 t/d and to develop the deep ore zones, mill recoveries were improved to the 96% level from the historical average of 94% at a capital cost of US\$3 million. A new 1870-m circular shaft ("Reid shaft") from the surface to access ore below the bottom level of the current workings and to provide a second, more efficient access to the current workings is scheduled for completion in 1998. A significant portion of the mine property remains to be explored and a number of existing zones have potential for extension.

TABLE 2 (cont'd)

Mining Project	Location	Province/Territory	Ore Capacity (tonnes/day)	Employment ¹	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
EXPANSIONS AND EXTENSIONS (cont'd)									
Precious Metals (cont'd)									
Hoyle Pond	Schumacher	Ont.	2 000	210	1995-97	U/G	Gold	Kinross Gold Corporation	The \$35 million capital program launched in 1995 to sink a new shaft and to expand the mine's existing mill (Bell Creek Mill) to accommodate production from the newly discovered 1060 Zone was completed in 1997. Its mill capacity was increased to 2000 t/d from 1500 t/d. Gold production in 1996 was 161 669 oz. As a result of the capacity expansion and ore extension, the mine produced over 174 000 oz of gold at a cash operating cost of US\$184/oz in 1997. In addition, increased exploration and development in 1997 have expanded resources at the 1060 Zone, the 7 Vein and the Owl Creek East deposits. This will enable the development of new ore reserves in 1998.
Red Lake	Balmertown	Ont.	770	250	1996-99	U/G	Gold	Goldcorp Inc.	Underground exploration successes at the Red Lake mine in recent years continued in 1997. Several pipe-shaped structures in known high-grade zones with new mineralization were discovered near the mine's western boundary, adjacent to Placer Dome Inc.'s Campbell mine. The company also continued to find mineralization outside the pipe structures. As well, some of the previously discovered structures are now believed to extend to depths of 580-759 m. A prefeasibility study by consulting firm Dynatech concurred with the company's previous estimates that the Red Lake mine could produce 200 000 oz/y of gold from newly discovered high-grade zones at a cost of about US\$180/oz. Dynatech estimated that the capital cost of mine expansion, which includes the sinking of a new 2300-m shaft and construction of an 1135-t/d mill, would be US\$115 million. A \$10 million expansion program at the mine that began in 1995 was completed in 1997. Operations have been suspended at the mine since June 23, 1996, due to a labour dispute.
Hudson Bay	Flin Flon	Man.	—	—	1998	U/G	Zinc, copper	Hudson Bay Mining and Smelting Co., Limited	The company announced that it has discovered new ore reserves near Flin Flon. This and the recently introduced cost-cutting measures could extend the mine life well beyond the previously expected closure date of 2004. There has been a high level of exploration in the Flin Flon and Snow Lake areas in recent years but, until now, no significant expansion in ore reserves has been achieved. As of January 1, 1997, ore reserves of the company's mines in Manitoba (including Trout Lake, Callinan, Photo Lake and Rutlan) were 24.1 Mt grading 1.45% copper and 3.21% zinc, plus measured, indicated and inferred resources of 16.9 Mt grading 1.6% copper and 5.1% zinc.

Seabee	La Ronge	Sask.	600	150	1996-97	U/G	Gold	Claude Resources Inc.	Since 1996, the company was successful in delineating new ore reserves and increasing production. During 1997, a number of high-grade new ore zones to the west, southwest and east of the 2 mine portal were discovered, extending the 2, 2c and 10 vein systems. The 10 vein, which was discovered in early 1997, has a strike length of thousands of metres and it stretches completely across the Seabee property onto the adjacent Currie Rose claims. Both the 10 and 2c veins are open along strike and at depth. As a result of these discoveries, the mine life of Seabee has been extended by five years. The ore reserves currently stand at over 960 000 t grading 9.86 g/t gold. An additional 95 000 t of lower-grade material has been stockpiled for blending at the mill. The capacity of the mill was expanded to 600 t/d in 1996 from 400 t/d in 1995. The company plans to further increase the capacity to 700 t/d in 1997. In early 1997, Claude Resources announced the installation of a \$3.5 million 395-m shaft and hoist at the mine to recover potential ore reserves as deep as 725 m and to lower the cost of production. The mine produced 60 000 oz of gold in 1997, which is the new annual rate of production, up from the 36 709 oz produced in 1996. The cash cost of production was US\$210/oz in 1997.
Eskay Creek	Stewart	B.C.	300	100	1997-98	U/G	Gold, silver	Prime Resources Group Inc.	As the result of an aggressive exploration program, about 630 000 oz of gold and equivalent were added to the mine reserves at the Eskay Creek gold-silver mine in 1997, representing a 15% increase in proven and probable reserves compared to 1996. Production in 1997 is expected to exceed 500 000 oz of gold and equivalent. As of January 1, 1998, ore reserves stood at 1.36 Mt grading 57.94 g/t (1.69 oz/st) gold and 2684.57 g/t (78.3 oz/st) silver. This amounts to some 2.5 million oz of gold and 117 million oz of silver, which is more than it had when the mine began production three full years ago.
Brewery Creek	Dawson Creek	Yukon	6 850	80	1998	O/P & HL	Gold	Viceroy Resources Corporation	The mine began production in November 1996 at an estimated capital cost of \$36.9 million. It is the largest lode gold mining operation in the Yukon. The open-pit heap-leach operation has a pad ore capacity of 17 Mt/y and a solution plant capacity of 13 000 t/d. The overall ore solution capacity is estimated at 6850 t/d operating at about 360 days per year. In 1997, the mine produced some 72 000 oz of gold at US\$184/oz. Despite current weak gold prices, production is expected to increase to 77 500 oz in 1998 at a cash cost of US\$200/oz. In 1997, exploration success fully added 483 000 oz of gold to the geologic resources at the Lucky Bohemian, Classic and North Slope zones. The company plans to expand the oxide resources and conduct further testing on the sulphide potential of the mine property in 1998.

TABLE 2 (cont'd)

Mining Project	Location	Province/Territory	Ore Capacity (tonnes/day)	Employment ¹	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
EXPANSIONS AND EXTENSIONS (cont'd)									
Base Metals									
Bouchard-Hébert	Rouyn-Noranda	Que.	2 600	145	1996-97	U/G	Zinc, copper, gold, silver	Cambior inc.	Mining operations have continued to improve since the mine came on stream in January 1995. Following a US\$4 million capital program to expand the mill capacity to 2600 t/d from 2000 t/d, along with further mine and infrastructure developments in 1996, mill recoveries were improved and production increased substantially. In 1997, one of the main focuses was to explore and develop mineralization in the eastern part of the deposit at depth. A US\$6 million capital expenditure was budgeted to expand the tailings pond in 1997.
McCreedy East	Sudbury	Ont.	1 800	180	1996-2000	U/G	Nickel, copper, cobalt, precious metals	Inco Limited	Since production started in April 1996 at a rate of 550 t/d, the capacity of the mine has increased steadily, reaching the designed rate of 1800 t/d at the end of 1997. By 1999, the mine is expected to produce 14 500 t (32 million lb) of nickel annually, and Inco Limited would have spent a total of \$194 million to fully develop the mine into the lowest-cost nickel-copper producer in the company's Ontario Division. Despite current weak nickel and copper prices, the capital program to expand mine production to 2700 t/d by the year 2000 will continue. The mine includes the 153 orebody, which is a high-grade copper orebody associated with the main nickel-rich orebody. Copper ore throughput from this orebody also increased to 330 t/d in 1997 from 90 t/d in 1996, is expected to reach 1000 t/d by the end of 1998, and is expected to attain the design capacity of 1100 t/d by the year 2000. Employment at the mine also rose to 180 in 1997 from 170 in 1996 as planned.
Other Minerals									
Elkview	Sparwood	B.C.	30 000	500	1996-98	O/P	Coal	Elkview Coal Corporation	Teck Corporation acquired the mine (formerly the Balmer mine) from Westar Mining Ltd. in December 1992 and re-opened it for production in May 1993. Mining has since been progressing towards the lower levels and westward along the main coal seam (the No. 10 seam). Since February 1996, focus has been on the capital program for the development of the lower western flank of the coal deposit, which includes the construction of the Bodie Dump for waste rock disposal. The total capital cost for the mine extension program and dump construction was estimated at \$100 million. In addition to the 50 operating jobs required, about 100 construction jobs would also be created.

Greenhills	Elkford	B.C.	10 000*	360	1997-98	O/P	Coal	Fording Coal Ltd. and Pohang Steel Canada Ltd.	A \$100 million capital program to expand production from the Cougar pit that began in April 1997 was completed in February 1998. Its production capacity was increased to 4.5 Mt/y from 3.5 Mt/y. Actual coal production had already reached the capacity of 4.5 Mt/y in 1997. The development of the Cougar Main and South pits will extend the life of the mine by about 15 years to 2020.
Quinsam	Campbell River	B.C.	3 300*	225	1995-97	U/G	Coal	Hillsborough Resources Limited and Marubeni Corporation	After a series of production expansions since 1992, the mine finally achieved its long-term goal of expanding its capacity to 1.2 Mt/y at the end of 1997.
SUSPENSIONS									
Rambler Tailings	Baie Verte	Nfld.	450	15	January	Surface	Gold	Raymo Processing Limited	Mining was suspended in January 1997 due to the low gold price.
Stog'er Tight/Ming	Baie Verte	Nfld.	750	75	January	O/P	Gold	Ming Minerals Inc.	Mining was suspended in January 1997 due to the low gold price.
Casa Berardi Est & Ouest	Casa Berardi	Que.	2 200	196	February	U/G	Gold	TVX Gold Inc. and Golden Knights Resources Inc.	In January 1997, the joint-venture partners announced plans to suspend production due to continued operating losses and the need to develop existing resources. Mining was suspended in February following unexpected geotechnical problems in the Est mine. On November 4, 1997, Aurizon Mines Ltd. of Vancouver signed a letter of intent to purchase the mines from the partners.
Copper Rand	Chibougamau	Que.	2 500	360	November	U/G	Gold, copper	MSV Resources Inc.	Mining was suspended in November 1997 due to low metal prices. However, the Copper Rand 5000 project for developing mine ore at depth will continue (see Expansions and Extensions).
Bissett (San Antonio)	170 km NE of Winnipeg	Man.	900	240	December 16	U/G	Gold	Rea Gold Corporation	Operations were suspended on December 16, 1997, as a result of Rea Gold Corporation filing for bankruptcy. The mine was in production between 1932 and 1968 and was re-opened in July 1997 for about six months.
Komis	La Ronge	Sask.	400	80	April	U/G	Gold	Golden Rule Resources Limited	Operations were suspended in April 1997 due to the weak gold price and lower-than-expected ore reserves in terms of both tonnage and grade.
Ptarmigan and Tom	Yellowknife	NWT	250	41	August	U/G	Gold	Tremenco Resources Ltd.	Production was suspended in August 1997 due to the low gold price.
CLOSURES									
Hope Brook	Couteau Bay	Nfld.	3 495	280	August	U/G	Gold	Royal Oak Mines Inc.	The mine closed in August 1997 due to ore depletion. The mine was operated by previous owners from August 1987 to May 1991 and was re-opened by Royal Oak Mines Inc. in June 1992.
Potacan	Sussex	N.B.	10 500	550	October 30	U/G	Potash	Potacan Mining Company	The mine closed in October 1997 due to the collapse of the production shaft and irreparable damage to the underground workings as a result of severe flooding. It began production in July 1985.

TABLE 2 (cont'd)

Mining Project	Location	Province/ Territory	Ore Capacity (tonnes/day)	Employment ¹	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
CLOSURES (cont'd)									
British Canadian	Black Lake	Que.	9 300	400	November 1	O/P	Asbestos	Asbestos Corporation	Mining ceased on November 30, 1997, due to the remaining ore reserves being uneconomical. The mine began production in 1885. Operations were suspended in May 1995. Production restarted in July 1996 until its recent closure.
Isle Dieu and Norita East	Matagami Lake	Que.	2 700	280	November 30	U/G	Zinc, copper, lead	Noranda Mining and Exploration Inc.	The mines closed in November 1997 due to ore depletion. Production at Isle Dieu began in January 1989, and at Norita East in August 1992.
Portage	Chibougamau	Que.	Incl. in Copper Rand		September	U/G	Gold, copper	MSV Resources Inc.	The mine was closed in September 1997 due to ore depletion. It began production in 1960.
Silidor	Rouyn-Noranda	Que.	1 100	118	July 25	U/G	Gold	Battle Mountain Gold Company and Cambior inc.	The mine was closed in July 1997 due to ore depletion. It began production in April 1990.
Golden Patricia	Pickle Lake	Ont.	400	180	March	U/G	Gold	Barrick Gold Corporation	The mine was closed in March 1997 due to ore depletion. The mine site is to close by the fourth quarter of 1998. It began production in 1988.
Westarm	Flin Flon	Man.	500	60	January 20	U/G	Zinc, copper	Hudson Bay Mining and Smelting Co., Limited	The mine was closed in January 1997 due to ore depletion. It began production in January 1995.
Afton-Ajax	Kamloops	B.C.	8 500	150	July	O/P	Copper, gold	Teck Corporation	The mine was closed in July 1997 due to ore depletion. The Ajax mine began production in September 1994. Ore was processed at the nearby Afton mill. The original Afton mine, which produced from the Afton orebody, was mined out in September 1988.
Colomac	Indin Lake	NWT	9 000	240	December	O/P	Gold	Royal Oak Mines Inc.	The mine was closed in December 1997 due to ore depletion. It began production in August 1990.

Source: Natural Resources Canada, based on company reports and communications with companies.

O/P open-pit; U/G underground; HL heap leach; SX-EW solvent extraction-electrowinning.

• Estimated.

¹ Employment refers to workers on the company's payroll and to contract workers at an operation, or at an operation prior to its closure.

Note: A mine that closed and re-opened in the same year is shown under both categories.

TABLE 3. NEW PRODUCTION FROM MINE OPENINGS IN CANADA IN 1997

Mining Project	Main Commodities	Estimated Annual Production ¹								
		Gold	Gold	Silver	Silver	Copper	Nickel	Zinc	Lead	Other Minerals
		(g)	(oz)	(g)	(oz)	(t)	(t)	(t)	(t)	(t)
NEW OPERATIONS										
Precious Metals										
Nugget Pond	Gold	1 430 760	46 000	—	—	—	—	—	—	—
Troilus	Gold, copper	4 292 280	138 000	—	—	—	—	—	—	—
Edwards	Gold	1 244 140	40 000	—	—	—	—	—	—	—
Glimmer	Gold	2 021 720	65 000	—	—	—	—	—	—	—
Musselwhite	Gold	6 220 700	200 000	—	—	—	—	—	—	—
Base Metals										
Beaver Brook	Antimony	—	—	—	—	—	—	—	—	4 000 t antimony
Restigouche (see Caribou)	Zinc, lead, silver, gold	—	—	—	—	—	—	—	—	—
Raglan	Nickel, copper, cobalt, precious metals	—	—	—	—	5 200	20 800	—	—	330 t cobalt
Huckleberry ²	Copper, molybdenum, gold, silver	217 720	7 000	11 819 320	380 000	37 000	—	—	—	670 t molybdenum
Mount Polley ²	Gold, copper	3 110 350	100 000	—	—	11 000	—	—	—	—
Other Minerals										
Îles-de-la-Madeleine	Salt	—	—	—	—	—	—	—	—	1.5 Mt salt
St. Onge	Wollastonite	—	—	—	—	—	—	—	—	50 000 t wollastonite
RE-OPENINGS										
Precious Metals										
Madsen	Gold	1 555 170	50 000	—	—	—	—	—	—	—
Bissett (San Antonio) ³	Gold	2 488 280	80 000	—	—	—	—	—	—	—
Golden Bear	Gold	1 586 280	51 000	—	—	—	—	—	—	—
Hannandor	Gold	155 520	5 000	—	—	—	—	—	—	—
Base Metals										
Caribou	Zinc, lead, silver, gold	186 620	6 000	68 427 650	2 200 000	—	—	68 000	35 360	—
Gallen	Zinc, silver, gold	75 000 ^e	2 400 ^e	1 875 000 ^e	60 000 ^e	—	—	28 000	—	—
Langlois	Zinc, copper, silver	—	—	3 500 000 ^e	112 500 ^e	—	—	36 000	—	—
Grum and Vangorda ³	Zinc, lead, silver	671 830	21 600	121 303 560	3 900 000	—	—	131 500	95 200	—
Planned total		25 256 370	812 000	206 925 530	6 652 500	53 200	20 800	263 500	130 560	—
Adjusted total (excludes Bissett, Grum and Vangorda)		22 096 260	710 400	85 621 970	2 752 500	53 200	20 800	132 000	35 360	—

Source: Natural Resources Canada, based on company reports and communications with companies.

^e Estimated; — Nil.

¹ Estimated annual production at full capacity. ² Planned production cutbacks at the Mount Polley gold-copper and the Huckleberry copper-molybdenum mines due to a recent merger agreement between Imperial Metals Corporation and Princeton Mining Corporation are considered to be a short-term arrangement and, therefore, do not affect the longer-term production capability of these two mines as reflected in the above table. ³ Operations were suspended at the Bissett gold mine in December 1997 after six months of production, and at the Grum and Vangorda zinc-lead-silver mines in January 1998 after only three months of production, during which time the Vangorda mine ore was depleted.

TABLE 4. NEW ORE RESERVES FROM MINE OPENINGS IN CANADA IN 1997

Mining Project	Main Commodities	Proven-Probable Ore Reserves ¹		In-Situ Metal Reserves								
		Tonnage	Grade	Gold	Gold	Silver	Silver	Copper	Nickel	Zinc	Lead	Other Minerals
		(tonnes)		(g)	(oz)	(g)	(oz)	(t)	(t)	(t)	(t)	(t)
NEW OPERATIONS												
Precious Metals												
Nugget Pond	Gold	488 000	12.24 g/t gold	5 973 100	174 200	-	-	-	-	-	-	-
Troilus	Gold, copper	50 000 000	1.38 g/t gold 0.12% copper 1.37 g/t silver	69 000 000	2 218 400	68 500 000	2 202 300	60 000	-	-	-	-
Edwards	Gold	393 700	16.52 g/t gold	6 503 900	209 100	-	-	-	-	-	-	-
Glimmer	Gold	1 200 000	9.9 g/t gold	11 880 000	381 950	-	-	-	-	-	-	-
Musselwhite	Gold	11 025 000	9 g/t gold	99 225 000	3 190 150	-	-	-	-	-	-	-
Base Metals												
Beaver Brook	Antimony	2 547 747	4.16% antimony	-	-	-	-	-	-	-	-	105 850 t antimony
Restigouche	Zinc, lead, silver, gold	1 589 000	6.8% zinc 5.4% lead 0.3% copper 1.1 g/t gold 108 g/t silver	1 747 900	56 190	171 612 000	5 517 450	4 760	-	108 050	85 800	-
Raglan	Nickel, copper, cobalt, precious metals	13 322 000	3.18% nickel 0.87% copper	-	-	-	-	115 900	423 600	-	-	-
Huckleberry	Copper, molybdenum, gold, silver	91 000 000	0.517% copper 0.014% molybdenum 0.064 g/t gold 2.78 g/t silver	5 824 000	187 240	252 980 000	8 133 500	470 470	-	-	-	12 740 t molybdenum
Mount Polley	Gold, copper	82 300 000	0.417 g/t gold 0.3% copper	34 319 100	1 103 380	-	-	246 900	-	-	-	-
Other Minerals												
Îles de la Madeleine	Salt	1 500 000 000	90% NaCl	-	-	-	-	-	-	-	-	1 350 000 000 t salt
St. Onge	Wollastonite	25 600 000	37% wollastonite	-	-	-	-	-	-	-	-	9 472 000 t wollastonite
RE-OPENINGS												
Precious Metals												
Madsen	Gold	1 088 620	9.26 g/t gold	10 080 620	324 100	-	-	-	-	-	-	-
Bissett (San Antonio) ²	Gold	2 900 000	8.64 g/t gold	25 056 000	805 570	-	-	-	-	-	-	-
Golden Bear	Gold	824 000	3.3 g/t gold	8 887 700	279 300	-	-	-	-	-	-	-
Hannandor	Gold	400 000	0.9 g/t gold	360 000	11 570	-	-	-	-	-	-	-
Base Metals												
Caribou	Zinc, lead, silver, gold	4 571 000	7.4% zinc 3.4% lead 0.38% copper 93 g/t silver 1.4 g/t gold	6 399 400	205 740	425 103 000	13 667 380	17 370	-	338 250	155 400	-
Gallen	Zinc, silver, gold	1 400 000	6.4% zinc 0.1% copper 29 g/t silver 1.37 g/t gold	1 918 000	61 660	40 600 000	1 305 320	1 400	-	89 600	-	-
Langlois	Zinc, copper, silver	7 300 000	8.5% zinc 0.5% copper 38 g/t silver 0.1 g/t gold	730 000	23 470	277 400 000	8 918 600	36 500	-	620 500	-	-
Grum and Vangorda ²	Zinc, lead, silver	20 767 000	4.28% zinc 2.61% lead 43.5 g/t silver 0.47 g/t gold	15 367 580	494 000	903 364 500	29 043 800	-	-	888 800	542 000	-
Total				303 072 300	9 726 020	2 139 559 500	68 788 350	953 300	423 600	2 045 200	783 200	-
Adjusted total (excludes Bissett, Grum and Vangorda)				287 704 720	9 232 020	1 236 195 000	39 744 550	953 300	423 600	1 156 400	241 200	-

Source: Natural Resources Canada, based on company reports and communications with companies.

- Nil; * Estimated.

1 Ore reserves as of January 1, 1997. 2 Operations at the Bissett gold mine were suspended in December 1997 after six months of production, and at the Grum and Vangorda zinc-lead-silver mines in January 1998 after only three months of production, during which time ore reserves at Vangorda were depleted.