

# Copper

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### RECENT WORLD COPPER DATA

	2003	2004 (p)
	(million tonnes)	
Mine production	13.676	14.529
Primary refined production	13.460	13.804
Secondary refined production	1.774	1.980
Total refined production	15.234	15.784
Usage (consumption)	15.62	16.499
Refined stocks at year-end	1.78	0.923

Source: International Copper Study Group (ICSG), *Copper Bulletin*, May 2004.  
(p) Preliminary.

### LME COPPER PRICES

	2002	2003	2004
	(US\$/t)		
Cash	1 560	1 779	2 846
3 months	1 579	1 787	2 752
15 months	1 634	1 799	2 436
27 months	1 668	1 802	2 271

Source: Bloomsbury Minerals Economics Ltd.

### RECENT CANADIAN DATA

	2003	2004 (p)
	(tonnes)	
Copper mine production (1)	557 082	557 323
Reported copper mine production (2)	554 000	533 000
Copper refined production	454 900	527 000
Copper domestic shipments	235 600	314 900
Copper refined imports	21 700	53 500
Apparent copper usage (3)	257 300	368 400

Source: Natural Resources Canada.

(1) Recoverable metal in concentrates shipped based on NRCan surveys. (2) Reported copper mine production is taken from company reports and is a mixture of copper in concentrates produced and payable copper in concentrates, depending upon the company. (3) usage = domestic shipments + refined imports.  
Notes: NRCan data are rounded to the nearest 100 t except for reported copper mine production, which is rounded to nearest 1000 t.

## CANADIAN PRODUCTION SUMMARY

The locations of Canadian mines and metallurgical operations that produced copper in 2004 are shown in Figure 1.

Canadian production of copper in concentrates (recoverable metal in concentrates shipped) was 557 300 t, virtually unchanged from 2003 output of 557 100 t. Refined production increased to 527 000 t from 455 000 t in 2003. Refined output was lower in 2003 due to strike activity at Noranda's Horne smelter and Inco's Sudbury complex. Domestic shipments of refined copper increased to 314 000 t from 236 000 t in 2003. The reader can obtain monthly data for 2004 and 2003 by referring to the publication *Production of Canada's Leading Minerals*, Table 3, at [http://mmsd1.mms.nrcan.gc.ca/mmsd/data/default\\_e.asp](http://mmsd1.mms.nrcan.gc.ca/mmsd/data/default_e.asp).

The most significant new mine development is Voisey's Bay, a nickel-copper-cobalt deposit in Newfoundland and Labrador owned by Inco limited. This project is scheduled to commence shipping concentrate in late 2005. A second smaller-scale new development is the Duck Pond copper-zinc-silver-gold-lead deposit, also in Newfoundland and Labrador. The mine, which is wholly owned by Toronto-based Aur Resources Inc., will begin production in late 2006.

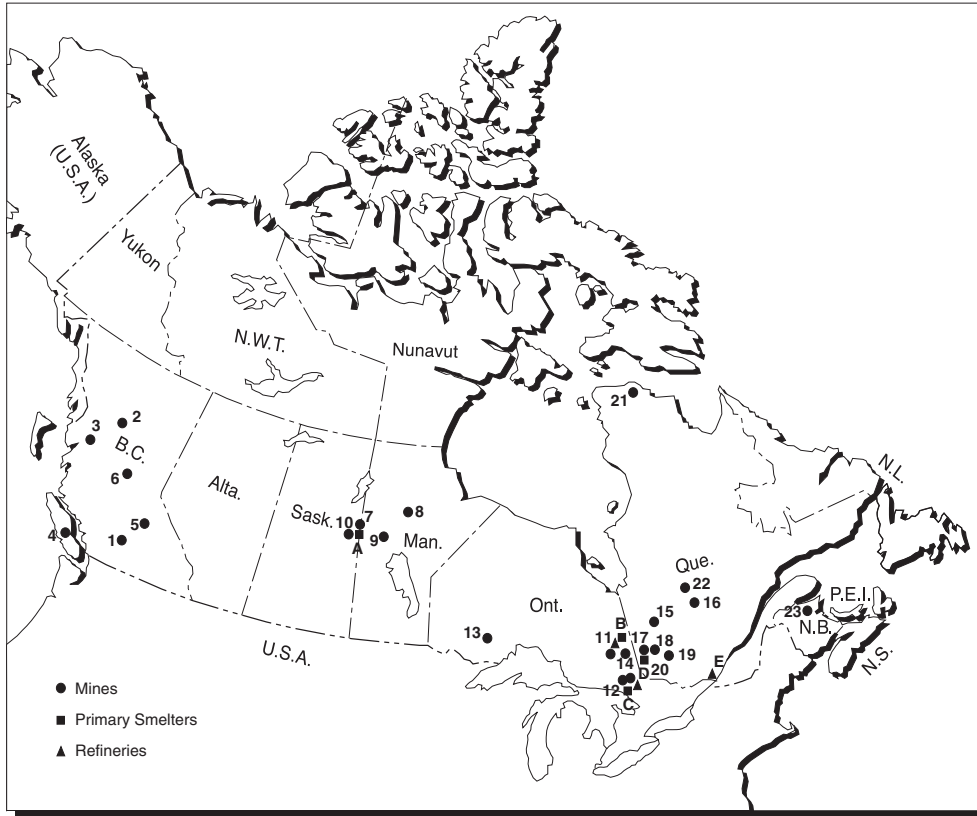
The price recovery in 2004 led to decisions to restart operations at Copper Rand in Quebec and at Mt. Polley and Gibraltar in British Columbia.

Two mines closed during 2004 due to the depletion of reserves: the Selbaie mine and the Bell Allard mine, both in northern Quebec. The Bouchard-Hébert mine and the Louvicourt mine, also located in Quebec, are expected to cease operations in 2005 due to the depletion of reserves.

## A Note on Statistics Based on Production vs. Shipments

Canadian statistics include a report of "mine production" (which is actually mill or concentrator production) and is the total amount of copper produced in concentrates by Canadian mines. However, Canadian statistics also include a "primary production" figure, which is actually

**Figure 1**  
**Copper Producers in Canada, 2004**



Numbers and letters refer to locations on map above.

**MINES**

**BRITISH COLUMBIA**

1. Highland Valley Copper Partnership (1)
2. Northgate Minerals Corporation (Kemess mine)
3. Huckleberry Mines Ltd. (Huckleberry mine)
4. Breakwater Resources Ltd. (Myra Falls mine)
5. Imperial Metals Corporation (Mount Polley mine) (production suspended until 2005)
6. Taseko Mines Limited (Gibraltar mine)

**SASKATCHEWAN**

7. Hudson Bay Mining and Smelting Co., Limited (Konuto Lake mine)

**MANITOBA**

8. Inco Limited (Thompson mine)
9. Hudson Bay Mining and Smelting Co., Limited (Chisel Lake North mine)
10. Hudson Bay Mining and Smelting Co., Limited (Trout Lake mine, 777 project)

**ONTARIO**

11. Falconbridge Limited (Kidd Creek Division)
12. Falconbridge Limited (Sudbury Division)  
Inco Limited (Ontario Mines)
13. North American Palladium Ltd. (Lac des Iles mine)
14. Falconbridge Limited (Montcalm mine)

**QUEBEC**

15. BHP Billiton Base Metals (Selbaie mine)
16. Noranda Inc. (Bell Allard mine)
17. Campbell Resources Inc. (Joe Mann mine)
18. Breakwater Resources Ltd. (Bouchard-Hébert mine)
19. Agnico-Eagle Mines Limited (LaRonde mine)
20. Aur Resources, Inc., Novicourt Inc., Teck Cominco Limited (Louvicourt mine)
21. Falconbridge Limited (Raglan mine)
22. Inmet Mining Corporation (Troilus mine)

**NEW BRUNSWICK**

23. Noranda Inc. (Brunswick mine)

**PRIMARY SMELTERS**

- A. Hudson Bay Mining and Smelting Co., Limited (Flin Flon)
- B. Falconbridge Limited (Kidd Creek)
- C. Inco Limited (Copper Cliff)  
Falconbridge Limited (Falconbridge)
- D. Noranda Inc. (Horne)

**REFINERIES**

- B. Falconbridge Limited (Kidd Creek)
- C. Inco Limited (Copper Cliff)
- E. Noranda Inc. (CCR Division)

(1) Highland Valley Copper is a partnership of Teck Cominco Limited and Highmont Mining.

the total amount of copper contained in concentrates that is shipped from the mine site in a year. This measure of production is less widely used and is not consistent with the definitions used by the International Copper Study Group (ICSG); Canadian “mine production” data are consistent with the ICSG definition.

The reader needs to be careful to verify which definition is being used in Canadian statistics when viewing a particular table. For example, the record of “Mineral Production of Canada, by Province” presented at <http://mmsd1.mms.nrcan.gc.ca/mmsd/production/2004/2004p.pdf> actually shows preliminary **shipment** data for 2004 and not the production of copper in concentrate.

Preliminary shipment data are estimated prior to the end of the year in question. Mine production data (noted above) are reported by producers after the month of production. Hence, at the time of writing, the 2004 production data are more accurate than the estimated preliminary shipment data. Revisions to both the shipment data and the mine production data are completed in the subsequent year. Historically, Canadian statistical series show mine shipment data. Such data are useful to show the relative copper output between provinces.

The preliminary estimate for 2004 shipments of copper in concentrates was 542 000 t, which is less than the over 557 000 t of copper in concentrates reported as being produced in 2004. The production data are usually higher than shipments as production relates to the total content of copper in concentrates produced whereas the shipment data relate to the estimated recoverable copper in concentrates shipped. In certain instances, material produced at the end of one year may not be shipped until the next year, causing a further difference between the data series.

Companies may show production data that report the total amount of copper contained in the concentrates produced in a year or the “payable production” may be shown. The latter reflects the amount of copper for which the mine is paid by the custom smelter. The deduction reflects the inability of the smelters to achieve 100% recoverability of the copper in the feed material. For some operations that report payable production, it is possible to calculate the production of copper contained if one knows the tonnage of ore processed, the copper grade of the material processed, and the recovery factor at the mill.

Using the shipment data, the largest producing provinces are British Columbia, with 44% of total copper shipments, and Ontario, with 33%. The majority of the B.C. output is from copper mines that also produce other by-products such as gold and molybdenum. The Ontario copper production comes in the form of by-product copper from the Sudbury Basin nickel operations and from the Kidd copper-zinc operations at Timmins (see Figure 1).

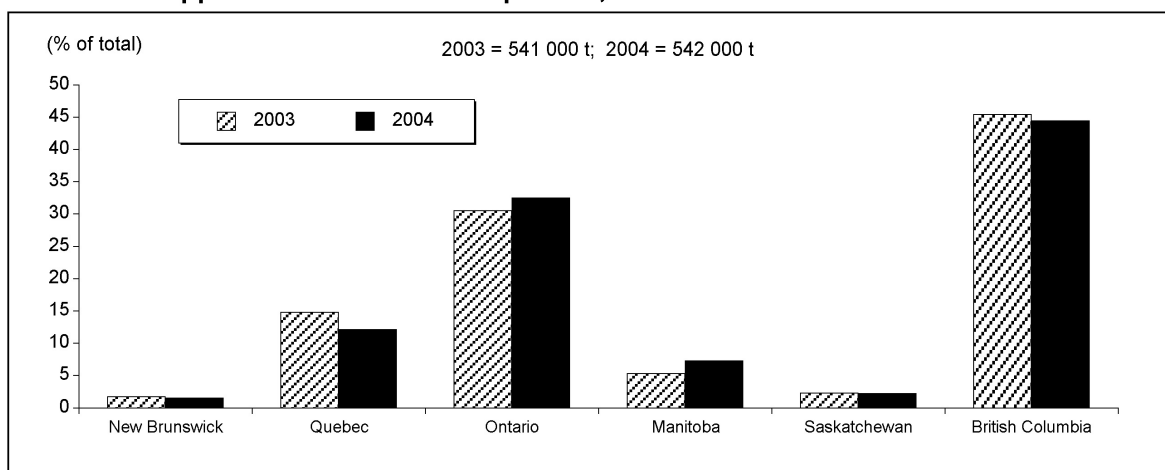
## CANADIAN PRODUCTION FACILITIES

This section describes production facilities in Canada, all of which are majority owned or operated by Canadian companies. Mine production data for 2003 and 2004 from the producers profiled below are summarized in Table 3.

The web sites for copper producers and for companies that are prospective producers are shown in Table 4.

**Agnico-Eagle Mines Limited** owns and operates the LaRonde mine near Val-d’Or, Quebec. LaRonde is a gold

**Figure 2**  
Canadian Copper in Concentrates Shipments, 2003 and 2004



Source: Natural Resources Canada.

operation that produces by-product silver, zinc and copper. The mine has been expanded several times since it began operations in 1972. Currently all production comes from the Penna shaft, which was extended to a depth of 7380 feet in 2000 and is considered by the company to be the deepest single lift shaft in the Western Hemisphere. The company budgeted \$55 million for mine expansion, exploration and development in 2004. Ore reserves are sufficient for 14 years of production at current rates and exploration results indicate the potential to continue to expand reserves. Agnico-Eagle began developing the nearby Lapa property in 2004 and will develop the Goldex property in 2005.

**Aur Resources Inc.** is the operator of the Louvicourt mine, a joint venture between Aur Resources (30%), Novicourt Inc. (45%) and Teck Cominco Limited (25%). The Louvicourt mine is located 24 km east of Val-d'Or, Quebec; it began production in 1994. The mine produces zinc and copper concentrates containing silver and gold. It is expected to be depleted in mid-2005. Aur Resources is bringing the Duck Pond operation located in Newfoundland and Labrador into production in 2006 and this output will partially offset the loss of production from the closure of the Louvicourt mine (refer to the section entitled "Canadian Projects" for details on Duck Pond).

The Selbaie copper-zinc mine, owned by **BHP Billiton plc**, ceased production in March 2004 after 23 years of operation due to the depletion of ore reserves.

**Breakwater Resources Ltd.** has two zinc-copper mines in Quebec, the Langlois mine and the Bouchard-Hébert mine, as well as the Myra Falls copper zinc mine on Vancouver Island. The Langlois mine did not operate in 2004; further details on this mine can be found in the "Canadian Projects and Mines on Standby in 2004" section of this chapter.

Breakwater's Bouchard-Hébert underground zinc mine (formerly known as the Mobrún mine) is located about 30 km from Rouyn-Noranda (where Noranda's Horne copper smelter is located). As well as zinc, the mine produces by-product gold, copper and silver. The Bouchard-Hébert mine ceased operations during February 2005 due to the exhaustion of known reserves. Exploration work in the area resulted in several targets being outlined, but failed to locate any areas with economic potential. Breakwater plans to continue exploration in the area of the mine but has commenced closure activities.

Breakwater acquired the Langlois mine in 2000 from Cambior Inc. The Langlois mine produced mainly zinc concentrate, as well as some copper concentrate containing silver and gold. As of December 31, 2004, the Langlois mine contained proven reserves totalling 497 000 t grading 9.3% zinc, 0.5% copper, 0.1 g/t gold and 36 g/t silver. When the mine was producing, the mill operated at a rate of 1500 t/d but has a design capacity of 2500 t/d.

The mine has been on temporary care and maintenance since November 2000 pending an improvement in the zinc price. In addition, serious problems had been encountered with the ore pass system being used at the time the mine was in operation, and a feasibility study was commissioned in 2003 in part to address this issue. The report estimated that \$38.2 million in capital is required over the life of the mine, of which approximately \$16.4 million must be spent prior to the start of production. Breakwater announced in early 2005 that it is updating the price assumptions in the 2003 feasibility study and will make a decision regarding restarting operations at Langlois by mid-2005.

Breakwater acquired the Myra Falls mine from Boliden Westmin (Canada) Limited in July 2004. The Myra Falls operation consists of two underground mines and a mill; the H-W mine is located at a depth of 300-600 m and the Battle/Gap mine, with its higher zinc grade, is located about 2 km horizontally away from the shaft at a depth of 700-900 m. The ore from the two mines is hoisted in a 715-m shaft. The 1.4-Mt/y mill utilizes rod and ball mills and flotation to produce a zinc concentrate and a copper-gold concentrate, as well as a separate gold concentrate. The concentrates are trucked 90 km to the port at Campbell River for shipping to smelters, principally in Japan. Zinc concentrates are sent to South Korea and Japan with some sales elsewhere.

Since acquiring the mine, Breakwater has been making various mine plan and metallurgical improvements, including enhancing gold recovery and carrying out test work to produce a lead concentrate, which would result in lower levels of lead reporting to the copper concentrate.

**Campbell Resources Inc.** operates the Joe Mann mine, an underground gold-copper mine, through its wholly owned subsidiary, **Meston Resources Inc.** Located about 65 km from Chibougamau, Quebec, operations at the mine had been suspended due to a combination of ground control problems, dilution and low prices; the suspensions were from October 1999 to April 2000 and again from November 2001 to April 1, 2002. The plan that brought the mine back into production was based upon an operating rate of 945 t/d, five days a week, to produce 2 t/y of gold, about 685 kg/y of silver and 558 t/y of copper (either in concentrates or as payable copper). Ore is trucked to the Campbell mill located about 65 km from the Joe Mann mine. The 3175-t/d mill has three circuits for metals recovery – gravity, flotation and cyanide are all used. Some of the gold is contained in the copper concentrate, which is railed to Noranda's Horne smelter.

Campbell also owns the Copper Rand mine through its wholly owned subsidiary MSV Resources Inc.; it began operations in March 2005. The mine was brought into production originally in 1959 and was mined in the 1990s by Westminer. Campbell Resources Inc. became involved

in a project to rehabilitate the mine in 2000 with other partners and acquired a 100% interest in late 2004 through an exchange of shares. The development plan involved gaining access to deeper levels of the orebody. Start-up was delayed by five months because of ground conditions and delays in completing construction and rehabilitation work. The company plans to mine at a rate of 1200 t/d of ore by mid-2005. Proven and probable ore reserves as of December 2004 totalled 1.5 Mt grading 1.84% copper and 0.84 oz/t gold.

**Noranda Inc.** is the most significant copper producer in Canada. Its copper-producing assets in 2004 included a majority ownership (59.5%) of Falconbridge Limited (as of December 31, 2004), a company that produces a large amount of copper as a by-product of nickel from the company's Sudbury operations and as copper from the company's Kidd operations in Timmins, Ontario. The majority of Noranda's Canadian copper operations are reported under Noranda's Canadian Copper and Recycling business unit, which consists of:

- the Kidd Creek mining operations at Timmins, Ontario;
- the Horne smelter at Rouyn-Noranda, Quebec;
- the Gaspé smelter (now permanently closed);
- the Kidd metallurgical complex, consisting of a copper smelter and copper refinery (as well as a zinc refinery, acid plant and recovery facilities for minor metals); and
- the CCR refinery in Montréal-East.

Noranda Inc. also holds a 62% interest in Novicourt Inc., which in turn holds a 45% interest in the Louvicourt mine. For a description of this mine, please refer to the paragraph on Aur Resources Inc. in this section. Copper is also produced as a by-product from Noranda's wholly owned Brunswick and Bell Allard mines, and from the Falconbridge-owned Raglan nickel mine. Refer to Figure 1 for the locations of Canadian operations controlled by Noranda Inc.

In addition, Noranda has significant copper production facilities in foreign countries, including the Antamina mine in Peru and the Altonorte smelter in Chile.

The details of Noranda's non-Falconbridge operations are described later in this section.

**Falconbridge Limited's** smelter in Sudbury, Ontario, takes concentrate produced from the company's four Sudbury area mines, the Montcalm mine near Timmins (see Projects section), and the Raglan mine in northern Quebec, plus material that is recovered from recyclables. With the exception of Montcalm, whose concentrate is milled at the Kidd Creek metallurgical site, the mines ship their ore to a central mill at Strathcona where most of the ore is processed into a bulk nickel-copper-cobalt concentrate. In addition, however, some high-grade copper material is recovered separately as copper concentrate and is shipped to Falconbridge's Kidd operations for recovery (see

below). The bulk nickel-copper-cobalt concentrate from the Sudbury mines is sent to the company's smelter located at Falconbridge, Ontario, about 85 km from the Strathcona mill. This concentrate is smelted to a nickel-copper-cobalt matte and shipped to the Nikkelverk refinery in Kristiansand, Norway, for final refining.

Falconbridge has permission from the Province of Ontario to export nickel-copper matte from Canada with a recoverable content of 100 million lb (or about 45 360 t) of refined nickel annually; this permission lasts until December 31, 2009. The permission has been renewed a number of times in the past and can be renewed again in the future.

In addition to copper production from the nickel operations located in Canada, Falconbridge also produces refined copper at its plant in Norway. The Falconbridge Nikkelverk Aktieselskap A/S operation is located in Kristiansand in southern Norway. There Falconbridge recovers nickel, cobalt, gold, silver, platinum group metals and sulphuric acid by treating the matte with a chlorine leach and electrowinning. Nikkelverk supplements the feed from the Sudbury smelter by tolling, principally from BCL Limited in Botswana. Finally, Nikkelverk can process certain recyclable materials as well. The capacity of Nikkelverk is 40 000 t/y of copper, 85 000 t/y of nickel, and 4500 t/y of cobalt. This could be increased, if market conditions and feed supply warrant, to 60 000 t/y of copper, 100 000 t/y of nickel and 5000 t/y of cobalt.

The Kidd operations of Falconbridge Limited consist of two independent divisions: the Kidd Mining Division, site of the company's underground mines producing copper, zinc and silver; and the Kidd Metallurgical Division, located about 25 km southwest of the mine, where the company mills the ore, smelts the copper concentrate, refines the anode copper, and refines the zinc concentrate. It also produces by-product cadmium, indium and sulphuric acid. Silver and other by-products contained in the electro-refinery tank house slimes are sent to Noranda's CCR Division for recovery.

Ore is produced from three mines at the Kidd mining site, namely the No. 1, No. 2 and No. 3 mines. These mines divide the orebody up into three horizontal slices like thick layers of a cake. Mine No. 1 extends from surface to 790 m, Mine No. 2 extends from 790 m to 1400 m, and Mine No. 3 extends from 1400 m to 2070 m. In 2000, the company approved the development of Mine D, the depth extension of the Kidd Creek orebody beyond the limits of the No. 3 mine to a depth of 10 200 feet (3100 m). Production from Mine D began in the second half of 2004 and is expected to reach 550 000 t in 2005 with ramp-up continuing into 2005 and 2006.

The copper concentrate is smelted at the Kidd metallurgical site in a Mitsubishi continuous smelter with a capacity of 150 000 t/y of blister copper (copper in anodes), along with the copper concentrate produced at the separate

circuit in the Strathcona mill (see above) and the custom concentrates, which include imported copper in concentrate.

In addition, the smelter processes copper concentrates from Falconbridge's Collahuasi mine in Chile and other imported concentrate.

The Kidd refinery also sends anode slimes containing substantial quantities of silver to Noranda's CCR refinery and to third-party refineries. Refined output for 2004 was 115 578 t of copper and 121 560 t of zinc.

**Highland Valley Copper** is owned 97.5% by Teck Cominco Limited and 2.5% by Highmont Mining Company. In 2004, Teck Cominco increased its share in the mine by exercising its right of first refusal with respect to BHP Billiton's 33.57% interest. The open-pit mine is located about 80 km southwest of Kamloops, British Columbia. The 136 000-t/d concentrator produces a copper concentrate and a molybdenum concentrate using SAG mills and conventional flotation technology.

The operations consist of the Lornex mine and mill, the Valley Copper orebody and the Highmont mill. At current rates of production, the mine is expected to remain in production until 2009. Teck Cominco will decide in 2006 whether to go ahead with an expansion that would extend the mine life a further four years to 2013. The company has stated the decision will depend on the resolution of some geotechnical issues and on the outlook for copper prices.

At the end of 2004, **Hudson Bay Mining and Smelting Co., Limited** (HBMS), wholly owned by HudBay Minerals Inc. (HudBay), consisted of five mines, two mills, a copper smelter, and a zinc pressure leach refinery. In October 2004, HudBay entered into an agreement to purchase the mining and smelting complex from Anglo American plc for \$325 million. The main operations are centred on the Manitoba/Saskatchewan border. The principal mines are Konuto, Chisel North (a zinc mine), Callinan, Trout Lake, and the new 777 mine. All facilities are in Manitoba except for the Konuto and Callinan mines, which are located in Saskatchewan close to the border with Manitoba.

In 2004, HBMS completed the development of the 777 project at a cost of \$435 million. The project consists of the development of the 777 mine in Flin Flon and the Chisel North mine in Snow Lake, as well as the expansion of the Flin Flon concentrator and the Flin Flon zinc plant. The 777 mine should extend the life of the operations to 2016. The mineable reserves and resources of the 777 orebody were estimated at 14.2 Mt grading 2.53% copper and 5.09% zinc.

The copper smelter processes approximately 80 000 t/y of anode that is shipped to the White Pine refinery in Michi-

gan for processing into copper cathodes. In 2004, approximately 56% of the concentrate feed to the smelter was from HBMS mines and the balance was sourced from purchased concentrate.

**Imperial Metals Corporation's** mining assets include a 50% interest in the Huckleberry mine (see below), an open-pit copper-molybdenum mine, and the wholly owned Mount Polley mine, which is an open-pit copper-gold operation that was put on care and maintenance from September 2001 until March 2005 due to low metal prices.

**Huckleberry Mines Ltd.**, owned 50% by Imperial Metals Corporation and 50% by the "Japan Group," is the operator of the Huckleberry mine, an open-pit operation that produces copper and molybdenum. The Japan Group consists of Mitsubishi Materials Corporation, Dowa Mining Co., Ltd., Furukawa Co. Ltd., and Marubeni Corporation. At the end of 2004, Huckleberry's estimated mine life was approximately three years. In early 2005, a reserve recalculation was undertaken to determine how much additional copper could be produced at higher copper prices. As a result, the mine life was extended to late 2007. Exploration efforts continue in order to discover additional reserves that could extend the mine life.

The Mount Polley mine restarted operations in March 2005 on the strength of positive drilling results at the recently discovered Northeast zone and improved metal prices. During 2004, Imperial Metals updated the reserve estimate for the Northeast, Bell and Springer zones and obtained a permit amendment to include mining of the Northeast zone. Total proven and probable reserves in the Wight, Bell and Springer open pits are 44 Mt grading 0.45% copper and 0.30 g/t gold, which contain approximately 438 million lb of copper and 433 000 oz of gold. The mine life as of February 2005 is 6.75 years.

Imperial Metals is conducting research into applying leaching techniques to copper oxide ores found near surface at the Mount Polley mine.

**Inco Limited** operates mines, mills, smelters and refineries in Sudbury, Ontario; Port Colborne, Ontario; and Thompson, Manitoba. The company produces copper as a by-product of its nickel operations. In addition, cobalt, gold, silver, platinum group metals, selenium, tellurium, sulphuric acid and liquid SO<sub>2</sub> are also produced at Inco's Canadian facilities. The majority of the copper produced in Inco's Canadian facilities is from the Sudbury mines. Ninety-two percent (92%) of the total copper output in 2004 came from Sudbury ores while only 2% came from Thompson ores. The remaining 6% of the copper produced may have come from recyclable materials, likely also containing nickel. Inco no longer smelts copper concentrate from Thompson ores in Thompson, but sends the concentrate to Sudbury for smelting.

A bulk nickel-copper concentrate is produced in Sudbury at the Clarabelle mill in Copper Cliff, Ontario. The concentrate is sent to two flash smelters and then to converters; the Bessemer matte is slowly cooled over a period of days to allow the copper and nickel to separate. The cooled matte is then crushed and ground and, through both magnetic and conventional separation, the copper concentrate is removed and sent to Inco's MK Converter. The copper concentrate is then smelted in a series of stages; the copper is cast into anodes and refined at Inco's copper refinery in Copper Cliff. Production of refined copper was 124 456 t in 2004, compared to 91 134 t in 2003 when production was below normal levels due to a three-month strike at the company's Ontario operations and subsequent ramp-up problems.

**Inmet Mining Corporation** operates its wholly owned open-pit gold-copper Troilus mine 175 km north of Chibougamau, Quebec. Troilus is principally a gold mine that also produces copper concentrates containing gold. Since January 1, 2004, all copper concentrate production from Troilus has been sold under a three-year agreement with an international metals merchant. A mill expansion involving the installation of a larger secondary crusher and a new ball mill circuit was completed in December 2004 at a cost of \$16.5 million. The expansion is expected to result in a 15% increase in mill capacity and a 2% increase in gold recoveries. The average mill throughput rate in 2004 was 16 600 t/d. Inmet expects Troilus to continue to operate through 2009.

The Louvicourt mine is a copper mine producing by-product zinc, silver and gold that is owned jointly by Novicourt Inc. (45%), Aur Resources Inc. (30%) and Teck Cominco Limited (25%). **Noranda Inc.** had a beneficial interest of 62.1% in Novicourt in 2004. There are no full-time employees of Novicourt; Noranda supplies the administrative, accounting and other corporate services under an agreement between the two companies. Novicourt is represented on the management board of Louvicourt by Noranda appointees. Louvicourt is expected to close in July 2005 following the exhaustion of economic reserves.

Noranda Inc., as noted above, owns a majority share in Falconbridge Limited, whose operations were noted above. The copper operations of the non-Falconbridge facilities are detailed below.

In 2004, Noranda's copper was derived from:

- two wholly owned zinc operations, the Brunswick and Bell-Allard mines and mills, which produce by-product copper (Brunswick also produces refined lead at its smelter);
- two copper-zinc producers, the Louvicourt mine and mill (detailed above, in which Noranda is a part owner through a Noranda subsidiary), and the Kidd operations

of Falconbridge Limited (detailed above), consisting of a mine complex, a mill, a copper smelter and refinery, an acid plant, and minor metal recovery facilities;

- the nickel-copper operations (six mines, two mills, a smelter, and an acid plant) of Falconbridge in Sudbury and in northern Quebec (detailed above), which produce by-product copper;
- the Horne smelter; and
- the CCR refinery.

The Bell-Allard zinc mine is located 10 km from the town of Matagami, Quebec. Bell-Allard began operation in 2000 with five years of reserves, using the Matagami mill, located 2 km from the mine, to process ore. The conventional flotation mill produces a zinc concentrate and a copper concentrate that are sent to the CEZ refinery and the Horne smelter, respectively. The Bell-Allard mine closed in October 2004 due to depleted reserves.

The Brunswick mine is located about 25 km from Bathurst, New Brunswick. This zinc mine also produces lead and by-product copper and silver. Copper concentrate from Brunswick is sent to the Horne smelter. Problems were encountered at the Brunswick mine with underground ore passes during 2004 and, as a result, the mine production was reduced to an average of 9405 t/d compared to 9889 t/d in 2003. At planned operating rates, the Brunswick mine has an estimated life of five years.

The metallurgical processing plants of Noranda's Canadian Copper and Recycling business unit, which are not part of Falconbridge (see above), consist of the Horne smelter at Rouyn-Noranda, Quebec, and the CCR refinery in Montréal-Est.

The Horne smelter processes copper concentrate and copper- and precious metal-bearing recyclable material into copper anodes that are further processed into refined copper cathodes at Noranda's CCR refinery in Montréal-Est, Quebec. Most of the copper concentrate produced in northern Quebec is processed at the Horne smelter. The smelter also treats a significant quantity of imported copper concentrates. In 2004, recycled materials comprised about 12% of the total volumes processed at the smelter. In October 2003, Noranda Inc. announced that it would reduce its processing rate from 840 000 to 630 000 t/y at the Horne smelter effective June 2004 in order to reduce its reliance on low-margin offshore concentrates. The anode production rate dropped from 186 000 to 130 000 t/y.

The CCR copper refinery is located in Montréal-Est, Quebec. This refinery received the full production of copper anode from the Horne smelter as well as anode from Noranda Inc.'s Altonorte smelter in Chile and other unrefined copper and precious metals from Noranda and third-party sources. CCR is a major refiner of gold and silver.

**North American Palladium Ltd.** operates the Lac des Iles open-pit palladium mine 85 km north of Thunder Bay, Ontario. The concentrate also contains important amounts of by-product platinum, gold, copper and nickel. The concentrate is sent to Inco and Falconbridge in Sudbury for smelting and refining. Production of payable copper in 2004 was 3554 t. In late 2003, the company commissioned a full feasibility study in response to scoping studies and a pre-feasibility study that indicated a higher-grade sub-vertical orebody located directly beneath the open pit was viable as an underground mine. The study confirmed that an underground operation was economically viable operating concurrently with the open pit to provide a blended higher-grade mill feed. Development began in the second quarter of 2004 and is progressing towards full production in 2006. In 2004, total tonnes mined amounted to 16.9 Mt, or 46 038 t/d, containing 4.6 Mt of ore grading 2.60 g/t palladium.

**Northgate Minerals Corporation** owns 100% of **Kemess Mines Ltd.**, which owns and operates the Kemess South mine in British Columbia. Kemess produced 35 500 t of copper and 303 500 oz of gold in 2004. Mill throughput and recoveries have increased steadily as Northgate has made operational improvements since acquiring the mine in 2000. Kemess South has sufficient reserves at current operating rates until 2009. Northgate is carrying out permitting and development work on the Kemess North deposit, which it may bring into production concurrently with the Kemess South operation (see Projects section). This would extend the mine life of Kemess to 2019.

The Selbaie copper-zinc mine, owned by **BHP Billiton plc**, ceased production in March 2004 after 23 years of operation due to the depletion of ore reserves

## CANADIAN PROJECTS AND MINES ON STANDBY IN 2004

Space and time preclude a review of all projects, mines on standby, and exploration programs in Canada. The selection of the following mines and projects does not imply that those discussed below are more or less advanced than others not included in this chapter on copper.

### Mines on Standby

Breakwater Resources Ltd.'s **Langlois** mine spent 2004 on care and maintenance. The mine was closed after problems in an ore pass in November 2000 and low zinc prices. Breakwater is updating the feasibility study for the mine and expects to make a decision on the project by mid-2005.

Imperial Metals re-opened the **Mount Polley** open-pit copper-gold mine in March 2005 on the strength of positive drilling results at the recently discovered Northeast

Zone and improved metal prices. Operations were suspended in 2001 due to low prices. During 2004, Imperial Metals updated the reserve estimate for the Northeast, Bell and Springer zones and obtained a permit amendment to include mining of the Wight pit in the Northeast Zone. Drilling results at the Northeast Zone, which was discovered in 2003, have indicated that the resource could support an underground operation. The current reserve and resource estimate based on drilling to December 15, 2004, is 44 Mt proven and probable grading 0.45% copper and 0.30 g/t gold in the Wight, Bell and Springer open pits. The operation has a processing capacity of 20 000 t/d.

Imperial Metals plans to produce 11 800 t of copper and 33 000 oz of gold in concentrate in 2005. In 2006, based on a plan to mine 40% of ore coming from the Wight pit, output is forecast at 31 800 t of copper and 50 000 oz of gold.

Production resumed in October 2004 at the **Gibraltar** mine near Williams Lake, British Columbia. The open-pit operation ran from 1972 to 1998 when it was closed due to low prices and placed on care and maintenance. Taseko Mines Limited purchased Gibraltar from Boliden Westmin (Canada) Limited in 1999. The mine is operated by Ledcor Mining Ltd. under a joint-venture agreement with Taseko. Taseko has a 12-year mine plan to produce an average of 32 000 t of copper and 980 000 lb of molybdenum annually from 148 Mt of sulphide. There are also 14 million lb of oxide ore outlined that could be processed in the on-site solvent extraction electrowinning plant to produce up to 4500 t/y of copper.

In 2001, Gibraltar Mines Limited, Gibraltar Engineering Services Limited Partnership (GESL), and Cominco Engineering Services Ltd. (CESL) concluded a memorandum of understanding to jointly evaluate the potential for a hydrometallurgical copper refinery at the Gibraltar mine.

During the latter half of the 2001 fiscal year, Bateman Engineering Pty of Australia was engaged to conduct an engineering feasibility-level cost study for the construction and operation of a copper refinery utilizing CESL technology at the Gibraltar mine. The study involved engineering and design work sufficient to determine the capital and operating costs for a refinery capable of processing 130 000 t of 24% copper concentrate to produce 30 000 t of LME-grade copper cathode annually. The study estimated the refinery capital cost to be \$109.5 million and the annual operating cost to be \$16.3 million, or US\$0.147/lb of copper produced. The results of the study indicated that development of the refinery could reduce the operating costs of the mine in the range of US\$0.20/lb of copper produced. Due to a favourable concentrate market at the time, Taseko decided to restart the mine as a conventional concentrate producer. The company has stated on its web site that it is reconsidering the opportunity to develop the copper refinery.



## Projects

Aur Resources Inc. announced it would develop its **Duck Pond** copper-zinc deposit in Newfoundland and Labrador on a fast-track basis with production expected to begin in late 2006. Aur expects to produce over a seven-year period about 18 600 t/y of copper contained in concentrates plus by-products of about 34 000 t/y of zinc, 536 000 oz/y of silver and 4100 oz/y of gold.

New Gold Inc. (formerly DRC Resources Corporation) continues to advance the **Afton** copper-gold project to final feasibility. The company is spending \$18 million on a program to upgrade the Afton mineral resource to the reserve category. As of October 2004, DRC had outlined a measured and indicated resource of 68.7 Mt grading 1.08% copper, 0.85 g/t gold, 2.63 g/t silver and 0.12 g/t palladium. The resource is adjacent to the previously mined Afton open pit, 10 km west of Kamloops. An advanced scoping study completed in February 2004 indicates that a 51.5-Mt resource could be mined at a rate of 9000 t/d to produce an average 34 000 t of copper and 2.5 t of gold per year.

Yukon Zinc Corporation (formerly Expatriate Resources Ltd.) continues to develop several deposits in the **Finlayson** Massive Sulphide District, located in southern Yukon, containing zinc, copper, lead, silver and gold. The district includes the high-grade Wolverine deposit, discovered in 1995 by Westmin Resources Limited, the Logan 3 deposit, the Ice deposit, and the Kudz Ze Kayah deposit owned by Teck Cominco (Yukon Zinc had purchased Cominco's interest in the Kudz Ze Kayah deposit in 2000 but subsequently relinquished its claim following failure to make a scheduled payment in 2001). Yukon Zinc now owns 100% of the Wolverine deposit following the purchase of Atna Resources Ltd.'s 39.4% interest in 2004. Yukon Zinc owns 100% of the Ice 2 deposit and 60% of the Logan 3 deposit.

Yukon Zinc plans to spend \$10 million to further define reserves at the **Wolverine** deposit and to complete a bankable feasibility study by the end of 2005. The company intends to make a production decision in early 2006 with start-up planned in late 2007. A pre-feasibility study conducted by Hatch Associates in 2000 outlined probable reserves at the Wolverine deposit of 4 941 000 t grading 12.43% zinc, 1.44% lead, 1.37% copper, 337 g/t silver and 1.59 g/t gold. Metallurgical test work done in the 1990s indicated high levels of selenium were present in the concentrate that would be produced at Wolverine, which could have an impact on their marketability. In its 2004 Annual Report, Yukon Zinc states that recent dramatic increases in selenium prices (from \$4.00/lb to US\$50/lb) have led to increased interest in Wolverine concentrates from potential buyers and this was a factor in the company's decision to progress to a bankable feasibility study.

The **Ice** property hosts copper-gold-silver-zinc-cobalt-massive sulphide mineralization within volcanic strata. Diamond drilling at the Ice property has defined an indicated mineral resource of 4 561 863 t grading 1.48% copper.

Falconbridge Limited brought the **Montcalm** nickel-copper mine into production in 2004. It is located 100 km east of the Kidd metallurgical site in Montcalm Township, Ontario. The Montcalm project reached its designed production capacity of 750 000 t/y during the fourth quarter of 2004. Montcalm ores are processed at the Kidd Creek Metallurgical Complex. Two concentrates are produced: a copper concentrate that is treated at the Kidd smelter and a nickel concentrate that is transported to Falconbridge's smelter in Sudbury. During 2004, the Montcalm mine produced 214 392 t of ore grading 1.32% nickel and 0.68% copper.

Falconbridge Limited launched an underground definition program at the **Nickel Rim South** deposit in the Sudbury area. Nickel Rim South is an inferred resource containing 13.4 Mt of ore grading 1.8% nickel, 3.3% copper, and significant platinum and palladium. Falconbridge expects to convert a significant portion of this inferred resource to the reserve category. This should extend the life of the Sudbury mining operations to 2021.

The first shipments of concentrate from Inco Limited's **Voisey's Bay** mine are expected in November 2005, six months ahead of the original timeline. Production from the mine is expected to average 50 000 t/y of nickel, 2300 t/y of cobalt and 6800 t/y of copper from the concentrate to be smelted at Inco's Ontario and Manitoba plants; in addition, about 32 000 t/y of copper in copper concentrate will be sold to third parties for processing.

The initial phase of the Voisey's Bay project consists of: (i) the mine/concentrator project and related infrastructure; (ii) a research and development program covering hydrometallurgical processing technologies (the "Hydromet R&D Program") for the treatment of the Voisey's Bay nickel- and cobalt-containing concentrates to be produced into finished nickel and cobalt product, including a demonstration plant to be constructed in Argenta, Newfoundland; (iii) concentrate-handling facilities to be constructed at its Canadian operations for the nickel- and cobalt-containing concentrates to be processed over the 2006-11 period once the mine/concentrator project is completed; and (iv) an exploration program. As of the end of 2004, Inco had spent \$620 million of the total \$920 million cost of the initial phase of the project. Should the demonstration plant prove that the hydrometallurgical process is technically and economically successful, a commercial hydrometallurgical processing plant will be built as part of the second phase of the project between 2009 and 2011.

Inmet owns 100% of the **Izok Lake** zinc-copper property in Nunavut. Izok's indicated resources are 16.5 Mt grading 2.2% copper, 11.4% zinc and 60 g/t silver. A feasibility study of the project was completed in 1994. The project requires infrastructure in order for the concentrates to be shipped to markets. The Bathurst Inlet Port and Road (BIPR) project, estimated to cost about \$215 million, envisaged a 210-km all-weather road connecting a port on Bathurst Inlet with the eastern shore of Contwoyto Lake; an 80-km road would then proceed from the other shore of Contwoyto Lake to the Izok Lake project site, with the two road sections being connected by an ice road in the winter and by barges in the summer. The feasibility study concerning the road and port was completed prior to the end of the first quarter of 2002 and a project description was filed with the regulatory authorities, triggering the permitting process. The Nunavut Impact Review Board (NIRB) subsequently recommended that the project be sent for environmental review under Part 5 of Article 12 of the Nunavut Land Claims Agreement. This recommendation was approved by the Canadian Minister of Indian Affairs and Northern Development in mid-2004 and guidelines for the completion of an Environmental Impact Assessment report were issued by the NIRB in November 2004.

Minto Exploration Ltd. holds 100% of the **Minto** project, located about 250 km northwest of Whitehorse, Yukon, on the west side of the Yukon River. The deposit consists of in-situ geologic reserves of 8.8 Mt grading 1.73% copper, 0.48 g/t gold and 7.5 g/t silver. A 1995 feasibility study called for open pitting of 6.5 Mt grading 2.13% copper, 0.62 g/t gold and 9.3 g/t silver over an initial life of 12 years. A review of the project in 2000 increased the planned throughput to 1723 t/d and reduced the mine life to 11 years. The capital cost was adjusted to \$22.2 million. A substantial amount of infrastructure has already been put in place, including a 28.8-km access road and bridge, mill foundations, and a SAG and ball mill. ASARCO Incorporated, now a wholly owned subsidiary of Grupo Mexico, holds a 57.5% stake in the Minto project. ASARCO started to develop the project in the 1990s but suspended work in 1999 due to low prices. In the fall of 2004, Minto Explorations and ASARCO agreed to sell their interest in the project. In April 2005, Vancouver-based Sherwood Mining announced its intention to bid for Minto Explorations. Upon completion of the purchase, Sherwood intends to update the feasibility study and permitting required to put the mine in operation.

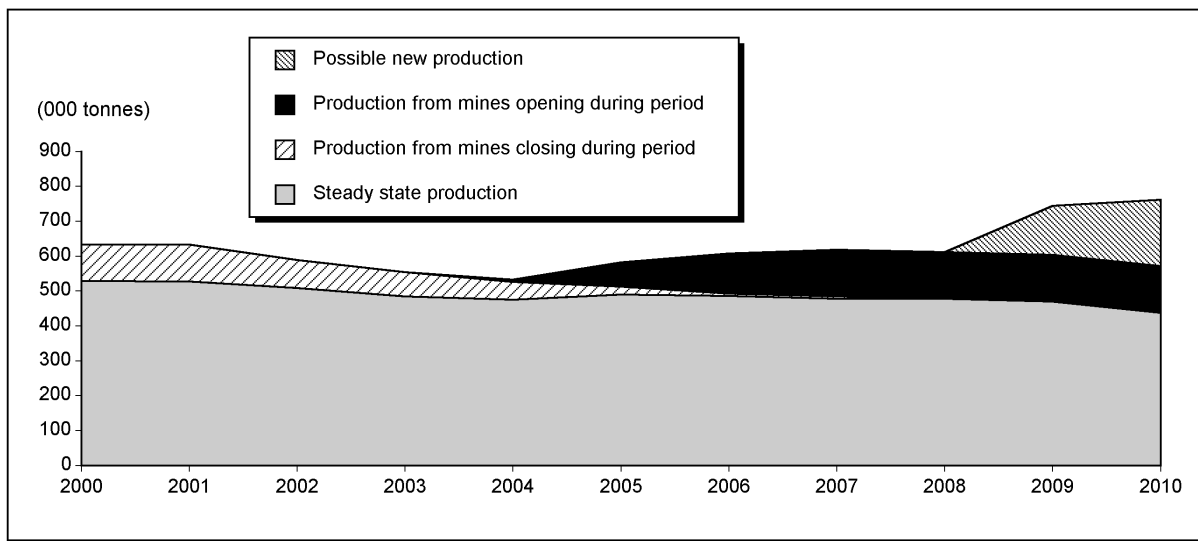
Noranda Inc.'s **Perseverance** property is located very close to Noranda's Bell-Allard mine near Matagami, Quebec. A feasibility study of the Perseverance property has been completed. Noranda owns a 90% interest and Société de développement de la Baie James owns the remaining 10%. The deposit consists of three high-grade zinc zones: Perseverance, Equinox and Perseverance West, which also contain an average of 1.24% copper. As

of June 2005, Noranda had not yet taken a decision on developing the deposit.

Northgate Minerals Corporation completed a feasibility study on the development of the **Kemess North** project. The development scenario has ore production from the Kemess North pit commencing in late 2006 at an annual rate of 250 000 oz of gold and 51 256 t of copper. The plan would include increasing mill capacity from 86 000 to 96 000 t/d. Kemess North ore would be processed with ore from the existing Kemess South deposit from 2007 until Kemess South reserves are exhausted in 2012. The total capital investment required is US\$190 million. Should the project proceed, the mine life of the Kemess operation would be extended from 2012 to 2019. If Northgate does not proceed with the project, reserves at the Kemess South mine will be exhausted by 2009. Northgate is continuing with the permitting process and is looking at various alternatives for financing the project. Northgate will make a decision on whether to proceed with the project only after development permits are granted. The granting of permits will be based on the results of a joint environmental review of the Kemess North project between the federal government, led by the Department of Fisheries and Oceans (DFO), and the Government of British Columbia, led by the British Columbia Environmental Assessment Office under the *Canadian Environmental Assessment Act* (CEAA). The review process began in March 2005.

Redcorp Ventures Ltd.'s subsidiary, Redfern Resources Ltd., owns the **Tulsequah** project in northwestern British Columbia, located 100 km from Atlin, British Columbia, and 65 km northeast of Juneau, Alaska. The claims are located adjacent to the Canada-U.S. boundary. The deposit contains measured and indicated resources totalling 5 380 000 t with grades of 1.42% copper, 1.32% lead, 6.73% zinc, 2.73 g/t gold and 100.8 g/t silver. The project requires major new infrastructure, including a 162-km access road and underground gravity and grinding circuits due to the lack of level ground at the deposit. Redcorp received a provincial Certificate of Authorization to proceed in November 2004. In December 2004, DFO released a supplemental screening report required under the CEAA process advising that the project is not likely to cause significant adverse environmental effects. As of February 2005, DFO was evaluating public comments on the report prior to reaching a final decision. Redcorp had been updating the feasibility study on the project but, in May 2005, the company announced it would curtail this work as the results to date were indicating that, due to the combination of increased capital and operating cost estimates and a reduced resource estimate, additional work would be required in order to develop a financeable project. All work on the project has been put on hold while the company considers options to expand the resource base or reduce capital and operating costs in order to improve the economic performance of the project.

**Figure 3**  
**Canada, Mine Production of Copper, 2000-2010**



Source: Natural Resources Canada, author's calculations based on company reports.

## CANADIAN PRODUCTION OUTLOOK

Existing and future Canadian copper production is affected by both copper prices and by the prices of other co-product and by-product metals. Low prices of copper and other associated metals during the period 1999 to 2003 led to cutbacks and suspensions at producing mines and dampened exploration activity. Despite a recovery in copper prices in 2004, leading to several restarts and new projects, Canadian copper mine output at the end of the decade is projected to be lower than in 2000 as output from new mines will not sufficiently replace output from mines that are expected to exhaust their reserves by the end of the decade. This forecast could change should the world copper price remain strong over an extended period of time.

## USE OF COPPER IN CANADA

Canadian copper use is not surveyed on an annual basis. Apparent use can be calculated by adding the imports of refined copper to the reported domestic shipments of copper producers. For 2004, as noted in the third table on the first page of this chapter, these data were: 53 500 t of refined imports plus 314 900 t of producers' domestic shipments (21 700 t and 235 600 t, respectively, in 2003).

## OTHER CANADIAN INFORMATION SOURCES

The **Canadian Copper & Brass Development Association (CCBDA)** assists copper and copper alloy users on many matters, including technical information. Its web site contains technical information that can be ordered on-line for such topics as alloy castings, tubing, forgings, etc. Technical assistance and library services are also available. The membership consists of both users and producers of copper. Companies making wire, tubes, rod, plumbing fixtures, castings and forgings are among those that are members of the CCBDA. The association's web site can be found at [www.ccbda.org](http://www.ccbda.org).

The CCBDA web site also provides links to other copper development associations. There is information:

- in French at [www.cuivre.org](http://www.cuivre.org) and at [www.copperbenelux.org](http://www.copperbenelux.org); and
- in English at [www.copper.org](http://www.copper.org) (United States), [www.copperinfo.com](http://www.copperinfo.com) (international), [www.copper.org.sg](http://www.copper.org.sg) (South-East Asia), [www.procobreperu.org/home.htm](http://www.procobreperu.org/home.htm) (Peru), [www.indiancopper.org](http://www.indiancopper.org) (India), and [www.asia.copper.org/japan](http://www.asia.copper.org/japan) (Japan).

Information is also available in other languages, including Finnish, Danish, Dutch, German, Greek, Italian, Japanese, Norwegian, Portuguese, Spanish and Swedish through links shown at [www.copperinfo.com/professionals/index.html#CRIF](http://www.copperinfo.com/professionals/index.html#CRIF).

The **Canadian Association of Recycling Industries** is the national organization of recycling industries, of which metal recycling, and copper recycling in particular, is an important component. The Association represents companies through the entire chain of recycling from scrap collection to processing and utilization ([www.cari-acir.org](http://www.cari-acir.org)).

The **Canadian Foundry Association (CFA)** is the national association of foundries in Canada, formed in 1975. Its members include brass and bronze foundries. Its site contains a membership list with links to the members' web sites (click on "Member Profiles"). The CFA web site is located at [www.foundryassociation.ca](http://www.foundryassociation.ca).

The **Canadian Die Casters Association** represents companies in Canada engaged in pressure die casting. Its site contains information about members and links to web sites (click on "Member Profiles" in left frame). Companies seem to publicize their use of aluminum, zinc and magnesium rather than that of copper. The CDCA web site is located at [www.diecasters.ca](http://www.diecasters.ca).

**Industry Canada** maintains a web site that allows searches for companies engaged in the semi-fabrication of metals and fabrication metals, including copper and copper alloys. The Canadian Company Capabilities (CCC) data base can be searched using terms such as "copper," "brass" or "bronze." The site is located at <http://strategis.ic.gc.ca/app/ccc/search/cccBasicSearch.do;jsessionid=0000R4i65mG2JdZSc4SneNRTQ7F:100uhnevb?portal=1&language=eng>.

## WORLD COPPER REVIEW

Copper is the third-ranking metal produced and used in the world, behind aluminum and steel. Total refined copper production in 2004 was reported at 15.8 Mt, of which about 12.5%, or 1.98 Mt, was produced from recycled sources (see also World Copper Data on page 1 of this chapter). In comparison, world crude steel production in 2004 was 1057 Mt, derived from primary and recycled feed materials. Aluminum is the second most produced metal with primary refined production reported by the International Aluminium Institute (IAI) at over 22.6 Mt in 2004, with an estimated further 2.7 Mt produced from purchased or tolled scrap.

In 2004, refined copper demand outpaced supply and, by the end of the year, the refined copper production deficit had grown to 706 000 t from 386 000 t at the end of 2003. World refined usage of copper in 2004 increased by 5.6%, compared to growth in refined production of 3.6%. Mine production growth in 2004 was 5.6% (source: ICSG preliminary data for the year 2004, press release issued March 9, 2005).

The strongest growth in demand came from the United States (5.5%), Japan (6.4%) and China (3.6%). It must be

noted, however, that the growth rate for China may be understated due to unreported stock changes.

In August 2005, the International Copper Study Group released its 2005 Yearbook, which highlights some interesting trends in world copper supply and demand over the 10-year period 1995-2005. The data confirm that production and usage in the United States is declining and that the strongest growth in production and usage came from Asia and South America. For example, Chile and China's output nearly doubled over the 10-year period and their shares of total refined production rose to 18% and 13%, respectively. U.S. production fell by nearly 1 Mt and its production share fell to 8%. South Korea nearly doubled its production over the period and India became a major producer of copper. Significant increases also occurred in Australia, Kazakhstan, Peru and Russia. Indonesia, Myanmar and Thailand became new producers of refined copper. The major trend in Canadian copper output for this 10-year period was a decline in Canada's share of world mined copper production from 7.3% to 3.9%.

Refined copper usage increased by 37% during the 10-year period. In 2002, China became the leading world copper consumer, its usage increasing by nearly 2 Mt (181%) and its share of total world usage increasing to 19% in 2004 from only 9% in 1994. Usage within the 15 European Union states increased by 14%. (The 15 states include Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom.) Russian use increased by 238% and India, Indonesia and Mexico doubled their usage. In contrast, U.S. and Japanese usage fell by 5% and 9%, respectively. A press release with a summary of the data is available at [www.icsg.org](http://www.icsg.org) under the "press releases" section.

The following is a brief overview of major world developments during 2004:

### Chile

In May, the owners of the Escondida mine (BHP Billiton, Rio Tinto and minor interests) approved the US\$870 million Escondida sulphide leach project, which involves the bio-assisted leaching of low-grade run-of-mine (ROM) sulphide ore from the Escondida pit and low-grade ROM sulphide and oxide ore from the Escondida Norte pit. The project is expected to produce 180 000 t/y of cathode and is scheduled to begin during the second half of 2006. Total ore reserves are estimated at 1.134 billion t of sulphide ore grading 0.52% copper. Outokumpu will design the solvent extraction plant using its Vertical Smooth Flow technology.

In October, BHP announced plans to develop its Spence SX-EW project in northern Chile at a cost of US\$990 million. Planned annual production is 200 000 t of cathode

over a 19-year mine life. First cathode production is scheduled for the fourth quarter of 2006.

Codelco may begin developing a full-scale bio-leaching plant at its Mansa Mina in 2005. Targeted production is 100 000-200 000 t/y of copper by 2008. Codelco has invested US\$60 million in a pilot plant since 2000. Codelco released an environmental impact statement on its smelting/refining project at Mejillones in Chile; the US\$1.25 billion operation would produce 1.4 Mt/y of cathode.

## Peru

Xstrata was selected as the winning bidder by the Government of Peru for the Las Bambas project. Las Bambas comprises four known deposits with proven reserves of 40.5 Mt grading around 2% copper and an indicated resource of 500 Mt containing copper grades of over 1% plus gold. Xstrata will have a period of up to six years to complete exploration and feasibility work.

In October, Phelps Dodge announced it would expand the capacity of the Cerro Verde SX/EW operation from 90 000 to 180 000 t/y. The expansion will be completed by mid-2007.

## China

Jianxi Copper is to increase cathode production by 31% to 450 000 t/y in 2005, compared to 343 000 t/y in 2003. The expansion will be financed from internal cash flows.

Yunnan Copper Industry is planning to spend US\$60 million per year over the next six years on the exploration and development of copper and zinc projects.

## United States

In January, Phelps Dodge announced restarts and ramp-ups at operations that had been idled due to low prices. In Arizona, production at the Bagdad and Sierrita mines and at the Miami smelter ramped back up to full capacity. In New Mexico, the Chino concentrator and the Cobre mine were restarted.

In March, Asarco announced plans to return output from its Ray and Mission mines in Arizona to full capacity.

Newmont announced it has started development of its Phoenix gold-copper project in Nevada. Planned annual production is 12-14 t of gold and 8000-9000 t of copper over 15 years starting in 2006.

Production at Quadra Mining Ltd.'s Robinson mine began in September. Robinson is expected to produce 75 000 t/y of copper over 10 years.

## Zambia

First Quantum Minerals' Kansanshi copper-gold project was commissioned in late 2004 and commercial production is expected in early 2005.

Equinox Resources is developing the Lumwana mine. Production of 140 000 t/y of copper is expected by 2006.

Vedanta Resources has acquired a 51% stake in Konkola Copper Mines (KCM) in Zambia for US\$48.2 million. The complex consists of the Konkola and Nchanga copper mines and Nchanga tailings leach plant, and the 180 000-t/y Nkana copper smelter and refinery. Vedanta's subsidiary, Sterlite Industries, will operate KCM. Sterlite will focus on improving operations at KCM's Nkana smelting and refining complex and plans to increase output to the 225 000- to 250 000-t/y level. Production in 2003 was 188 000 t of copper.

Mopani Copper Mines, a subsidiary of Glencore, announced it will install a new ISASMELT furnace at the Mufilira smelter. Capacity will increase to 300 000 t/y from 180 000 t/y by early 2006.

## Democratic Republic of Congo

The Democratic Republic of Congo has granted conditional approval to American Mineral Fields' subsidiary Congolese Mineral Developments to develop the Kolwezi copper-cobalt tailings project. Planned production is 42 000 t/y of copper and 7000 t/y of cobalt over a 38-year mine life starting in the fourth quarter of 2006 (112.8 Mt of oxide tailings grading 1.49% copper and 0.32% cobalt). AMF owns 82.5%, Gecamines owns 12.5% and the government owns 5%.

## Thailand

Thai Copper Industries started up its Rayong smelter and refinery in mid-June. The facility is expected to reach full capacity of 165 000 t/y by May 2005.

## Indonesia

Normal milling rates resumed in June at Freeport McMoran's Grasberg mine following a major pit wall slippage in October 2004 that had a severe impact on production for several months. Copper output totalled 517 000 t in 2004, down 28% from 716 000 t in 2003.

## APPLICATIONS

Copper is used in many applications. Due to its high electrical conductivity, a prime application of copper is wire and cable used to carry power and signals. The high

conductivity means good efficiency, and good corrosion resistance means that copper is a very good electrical conductor. High conductivity means a smaller cross-section for wires relative to other metals, which is important for small motors, hand tools, and crowded conduit spaces. However, in long-distance transmission lines, the heavier density of copper relative to conductivity means that aluminum is preferred to copper as the current-carrying metal for such lines.

Copper also has a high thermal conductivity that makes it a leading competitor for heat exchangers, such as automotive radiators, and for solar heating. More information about the applications of copper can be found on the web sites of various copper development organizations. An extensive review of applications is available at [www.copperinfo.com/cproducts/index.html](http://www.copperinfo.com/cproducts/index.html).

Copper use is generally measured at the semi-fabrication stage. If copper products are made into wires, tubes, etc., that are principally copper and copper alloys, these imports and exports can be tracked. But once incorporated into fabricated items such as electronics, ships, aerospace goods, transformers, motors, etc., then it is difficult to track the ultimate destination of copper. Imagine a customs broker being asked to declare the copper content of imported motor vehicles or of imported CD players. Therefore, a calculation showing the "consumption per capita" ignores the ultimate user/consumer of the metals in question by focusing on the available data collected at the semi-fabrication stage.

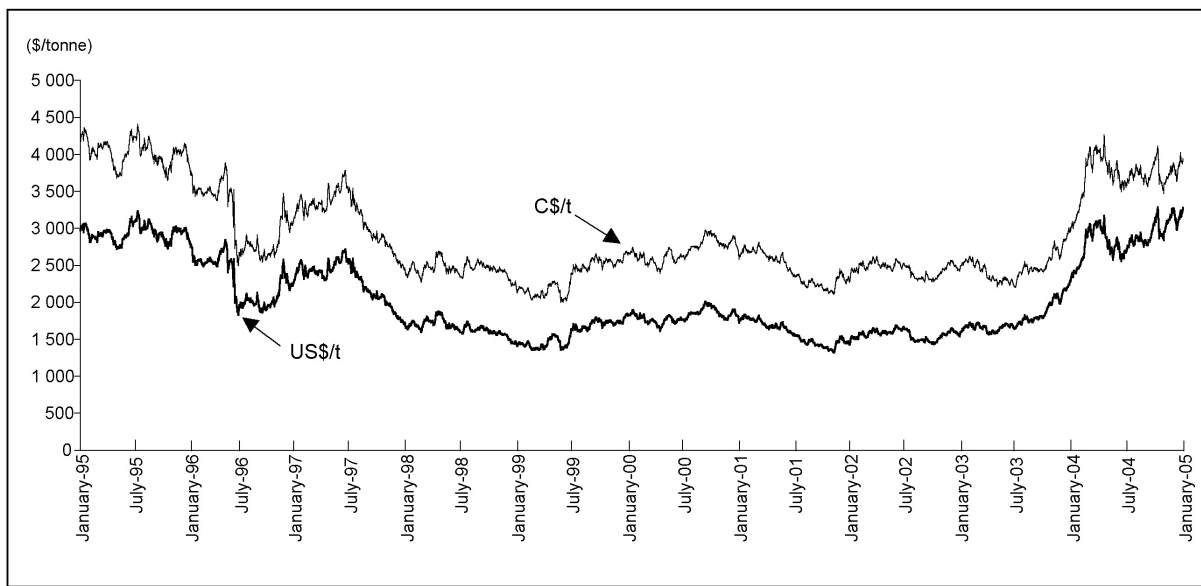
## PRICES

As noted on page 1 of this chapter, the London Metal Exchange (LME) cash settlement price for copper averaged US\$2846/t, or US\$1.29/lb, for Grade A copper in 2004. Copper inventories on the LME decreased dramatically from just under 431 000 t at the end of 2003 to just 49 000 t at the end of 2004. Total copper stocks, or the sum of the exchange stocks on the LME, the Commodity Metal Exchange (COMEX), New York, and Shanghai Futures Exchange (SHFE), as well as producer, merchant and government stocks, decreased from a total of over 1.79 Mt at the end of 2003 to 923 000 t at the end of 2004.

Figure 4 shows daily LME cash settlement copper prices valued in both U.S. and Canadian dollars for the period 1994 to 2004. Figure 5 plots the monthly average copper price in U.S. dollars, as well as monthly exchange stocks of copper, for the period 1998 to 2004. Figure 6 shows the monthly average Canadian to U.S. dollar exchange rates for 1995 to 2004. During 2003 and 2004, copper prices rose dramatically on the strength of declining stocks and a recovery in global demand growth. The increase in the average annual copper price in 2004 compared to 2003 was 60.0% when expressed in U.S. dollars and 48.9% when expressed in Canadian dollars. The same year-on-year increase for 2003 over 2002 was 14.1% in the U.S. dollar price and 1.4% in the Canadian dollar price.

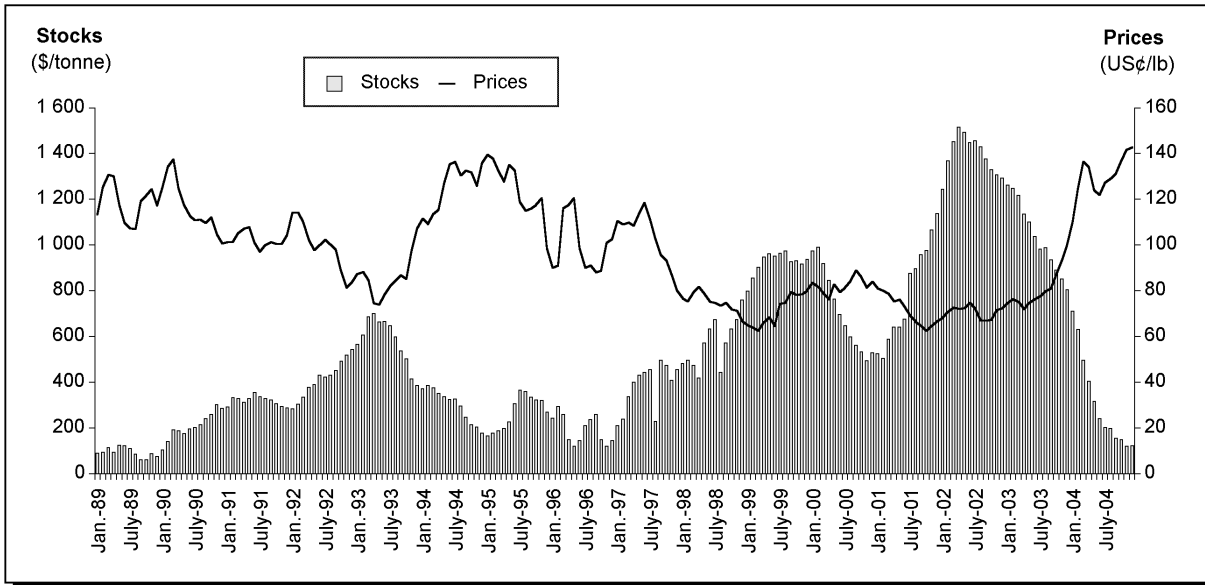
The rise in copper prices over 2003/04 is very positive for the copper industry. However, as Figure 6 illustrates, the

**Figure 4**  
**Copper, LME Official Settlement Prices, 1994-2004**



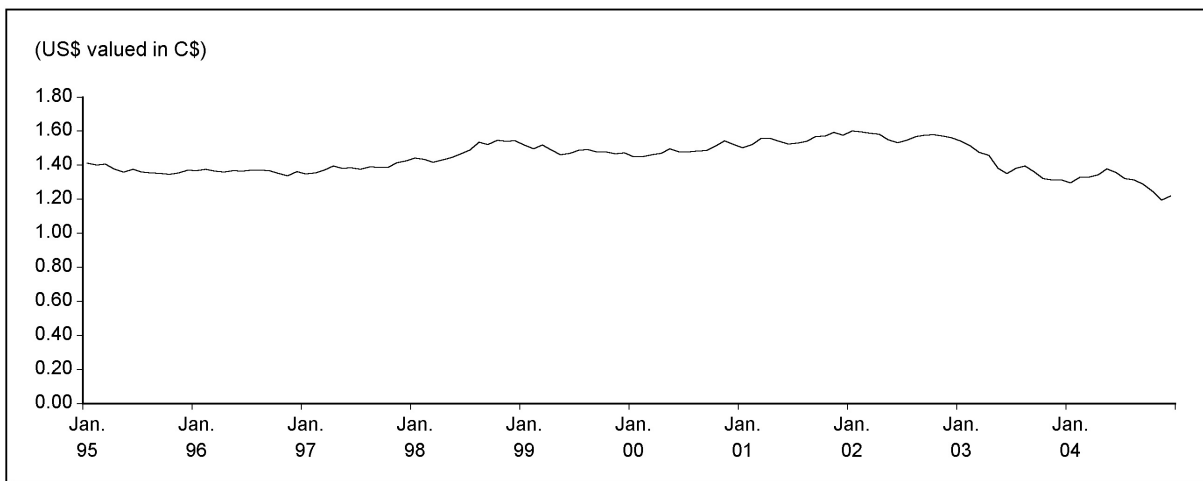
Sources: London Metal Exchange; Bank of Canada noon rates.

**Figure 5**  
**Copper, Exchange Stocks and LME Cash Settlement Prices, 1989-2004**



Sources: London Metal Exchange; International Copper Study Group.

**Figure 6**  
**Monthly Average Exchange Rates, 1995-2004**



Source: Bank of Canada.

Canadian dollar has appreciated significantly over roughly the same period. The U.S. value of the Canadian dollar declined by 10.7% in 2003 over 2002, and by a further 7.2% in 2004 over 2003. From the perspective of Canadian-based copper operations that sell metal and thus earn revenue based mainly in U.S. dollars but incur operating expenses for the most part based in Canadian dollars, this change in the U.S./Canada exchange rate represents a decline in the competitive advantage that Canadian operators have enjoyed for the past several years. Thus far, the rise in copper and other metal prices has more than compensated for the strengthening Canadian dollar. A future scenario of a strengthening Canadian dollar and falling metal prices would be negative for Canadian-based mining companies.

### Concentrate Treatment and Refining Charges

The long decline in treatment and refining charges (TC/RCs, or the price charged to smelt copper concentrates and to produce refined copper) that began in early 2001 came to an abrupt end in the second quarter of 2004 thanks to an improved concentrate supply situation. Declining copper prices from mid-2000 to late 2002 led to mine cutbacks and closures, pushing the supply/demand balance for concentrate (difference between production and consumption of concentrates) into a deficit from 2001 through 2003 in the range of 100 000-250 000 t of copper in concentrate. Average annual spot treatment and refining charges declined from a level of US\$62.50/t and US\$6.25¢/lb in 2001 to US\$17.30/t and US\$1.73¢/lb in 2003 (c.i.f. Shanghai delivery terms). In 2004, the concentrate balance moved to a surplus of around 400 000 t. Spot TC/RCs bottomed out at below US\$15/t and 5¢/lb during the first quarter and then rose to the US\$130/t and US\$13¢/lb level by third quarter (c.i.f. Shanghai). Annual treatment and refining charges (terms agreed to by mines and smelters under long-term concentrate supply agreements) are settling at the US\$85/t and US\$8.5¢/lb level for 2004, compared to US\$46/t and US\$4¢/lb in 2003 (c.i.f. Japan).

### Price Outlook

Copper prices could rise above levels seen in 2004 due to several factors. Global demand growth in 2005 is forecasted in the 4-5% range, which, although down from the 5.7% level estimated for 2004, is nonetheless very strong. In addition, it will take time for increased smelter and refinery production to translate into increased cathode output; therefore, cathode stocks will remain extremely tight in the first half of 2005. However, global industrial production (IP) growth seems to have peaked in the second quarter of 2004 and, should demand for copper slow, prices could start to decline in the latter part of 2005 and into 2006. Nonetheless, given the strong demand trend in the Asia-Pacific region, many analysts are currently pre-

dicting prices to remain above the US\$1.00/lb level for the next five years.

## OTHER SOURCES OF COPPER INFORMATION

Much more information is available about copper supply, demand and uses, as well as the health and environmental aspects of copper. Good sources of information for production are the web sites of those companies that produce copper. The list of web sites of companies with Canadian mines and projects is shown in Table 4. Securities information is available from SEDAR, the System for Electronic Document Analysis and Retrieval (see [www.sedar.com](http://www.sedar.com)).

For copper production outside of Canada, Table 4 shows the countries and web sites of major producers.

Production, trade and capacity data are published by the ICSG, a group consisting of 25 countries serviced by a secretariat in Lisbon, Portugal. Various publications are sold. The ICSG *Copper Bulletin* is a monthly publication. Yearly subscriptions are available. In addition, the Group sells a *Directory of Copper Mines and Plants* spanning a five-year period. Details of these and other publications are available at [www.icsg.org](http://www.icsg.org) in the "Publications" section.

Long-term data are available from the World Bureau of Metal Statistics (WBMS). The WBMS is a private company that holds the copyright for *METALLSTATISTIK*, the renowned data series formerly published by Metallgesellschaft AG. This publication series contains production data back to 1900, as well as trade and price data. The WBMS also publishes *World Metal Statistics* monthly, quarterly and yearly. The WBMS web site is located at [www.world-bureau.com](http://www.world-bureau.com).

The **International Copper Association (ICA)** maintains a web site with information about:

- **copper products** - building products, consumer and electronic items, transportation, agriculture, industrial applications, and machinery and future applications;
- **energy efficiency** - air conditioners and refrigerators, copper bus bars, motors, power cables, solar energy, transformers, and case studies;
- **health and nutrition** - aquatic life, biological importance, copper deficiency, copper research, information flow project, drinking water, good health with copper, how much do we need (?), plant and animal health, pregnancy and infants, public health benefits, quick facts, ICA research;
- **environment** - climate change mitigation, copper research information flow project, energy conservation, natural presence, recycling, sustainability, ICA research; and



- **about copper** - copper alloys, copper exchanges, copper markets, copper mining, copper products.

The web site for the International Copper Association is located at [www.copperinfo.com](http://www.copperinfo.com).

One of the more interesting destinations from the ICA site is an on-line history of copper. This site provides material of interest to students and others seeking an overview of the history of copper. This can be found at <http://60centuries.copper.org>.

The **International Copper Study Group (ICSG)** based in Lisbon sells detailed statistics on world copper production, use and trade. Details are available on its web site at [www.icsg.org](http://www.icsg.org).

The **U.S. Geological Survey (USGS)** is another source of detailed information about the world copper industry. The copper information available includes yearly reviews, monthly articles, and an annual summary. The copper portal for the USGS is located at <http://minerals.usgs.gov/minerals/pubs/commodity/copper>.

Information about copper use is available from the **International Wrought Copper Council (IWCC)**. The site has links to member companies and organizations. The IWCC site is located at [www.coppercouncil.org](http://www.coppercouncil.org).

Web sites other than those of Natural Resources Canada (NRCAN) are maintained and owned by other parties who are responsible for the material displayed therein; questions about the suitability and accuracy of such information should be directed to the owners of the web sites. Reference to an external web site does not imply in any way that the material contained therein is accurate or will be maintained in the future; such external references are provided only for the convenience of the reader.

*Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 64. (2) Information in this review was current as of May 2005. (3) Various Internet sites have been identified in this article. Please note that Natural Resources Canada has no control over the content of the web sites of other organizations, which may be modified, updated or deleted at any time. (4) This and other reviews, including previous editions, are available on the Internet at [www.nrcan.gc.ca/mms/cmy/com\\_e.html](http://www.nrcan.gc.ca/mms/cmy/com_e.html).*

## NOTE TO READERS

**The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.**

## TARIFFS

Item No.	Description	Canada			United States	EU	Japan
		MFN	GPT	USA	Canada	Conventional Rate (1)	WTO (2)
2603.00	Copper ores and concentrates						
2603.00.00.10	Copper content	Free	Free	Free	Free	Free	Free
2825.50	Copper oxides and hydroxides	Free	Free	Free	Free	3.2%	4.8%
28.33	Sulphates; alums; peroxosulphates (persulphates)						
	Other sulphates:						
	Of copper						
2833.25	Cupric sulphate	Free	Free	Free	Free	3.2%	3.9%
2833.25.10							
2833.25.90	Other copper sulphates	5.5%	Free	Free	Free	3.2%	3.9%
74.01	Copper mattes; cement copper (precipitated copper)						
7401.10	Copper mattes	Free	Free	Free	Free	Free	Free
7401.20	Cement copper (precipitated copper)	Free	Free	Free	Free	Free	Free
7402.00	Unrefined copper; copper anodes for electrolytic refining	Free	Free	Free	Free	Free	Free-3%
74.03	Refined copper and copper alloys, unwrought						
	Refined copper:						
7403.11	Cathodes and sections of cathodes	Free	Free	Free	Free	Free	Free-3%
7403.12	Wire bars	Free	Free	Free	Free	Free	Free-3%
7403.13	Billets	Free	Free	Free	Free	Free	Free-3%
7403.19	Other	Free	Free	Free	Free	Free	Free-3%
	Copper alloys:						
7403.21	Copper-zinc base alloys (brass)	Free	Free	Free	Free	Free	Free
7403.22	Copper-tin base alloys (bronze)	Free	Free	Free	Free	Free	Free-3%
7403.23	Copper-nickel base alloys (cupro-nickel) or copper-nickel-zinc base alloys (nickel-silver)	Free	Free	Free	Free	Free	Free-3%
7403.29	Other copper alloys (other than master alloys of heading no. 74.05)	Free	Free	Free	Free	Free	Free-3%
7404.00	Copper waste and scrap	Free	Free	Free	Free	Free	Free
7405.00	Master alloys of copper	Free	Free	Free	Free	Free	3%
74.06	Copper powders and flakes	Free	Free	Free	Free	Free	3%
74.07	Copper bars, rods and profiles	Free-3%	Free	Free	Free	4.8%	3%
74.08	Copper wire	Free-3%	Free	Free	Free	4.8%	3%
74.09	Copper plates, sheets and strip of a thickness exceeding 0.15 mm	Free	Free	Free	Free	4.8%	3%
74.10	Copper foil (whether or not printed or backed with paper, paperboard, plastics or similar backing materials) of a thickness (excluding any backing) not exceeding 0.15 mm	Free	Free	Free	Free	5.2%	3%
74.11	Copper tubes and pipes	2-2.5%	Free	Free	Free	4.8%	3%
74.12	Copper tube or pipe fittings (for example, couplings, elbows, sleeves)	3%	Free	Free	Free	5.2%	Free
7413.00	Stranded wire, cables, plaited bands and the like, of copper, not electrically insulated	3%	Free	Free	Free	Free-5.2%	3%
74.14	Cloth (including endless bands), grill and netting, of copper wire; expanded metal of copper	3%	Free	Free	Free	4.3%	Free
74.15	Nails, tacks, drawing pins, staples (other than those of heading no. 83.05) and similar articles, of copper or of iron or steel with heads of copper; screws, bolts, nuts, screw hooks, rivets, cotters, cotter-pins, washers (including spring washers) and similar articles, of copper	Free-3%	Free	Free	Free	3-4%	Free
7416.00	Copper springs	3%	Free	Free	Free	4%	Free
7417.00	Cooking or heating apparatus of a kind used for domestic purposes, non-electric and parts thereof, of copper	3%	Free	Free	Free	4%	Free
74.18	Table, kitchen or other household articles and parts thereof, of copper; pot scourers and scouring or polishing pads, gloves and the like, of copper; sanitary ware and parts thereof, of copper	3%	Free	Free	Free	3%	Free
74.19	Other articles of copper	Free-9.5%	Free-5%	Free	Free	3%	Free

Sources: Canadian Customs Tariff, effective January 2005, Canada Border Services Agency; Harmonized Tariff Schedule of the United States, 2005; Official Journal of the European Union (October 30, 2004 Edition); Customs Tariff Schedules of Japan, 2004.

(1) The customs duties applicable to imported goods originating in countries that are Contracting Parties to the General Agreement on Tariffs and Trade or with which the European Community has concluded agreements containing the most-favoured-nation tariff clause shall be the conventional duties shown in column 3 of the Schedule of Duties. (2) WTO rate is shown; lower tariff rates may apply circumstantially.

TABLE 1. CANADA, COPPER PRODUCTION AND TRADE, 2002-04

Item No.	2002		2003		2004 (p)	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>MINE PRODUCTION (1)</b>	603 498	–	557 082	–	566 491	–
<b>SHIPMENTS (2)</b>						
New Brunswick	9 035	22 271	9 294	22 335	7 862	29 467
Quebec	87 418	215 485	80 149	192 598	65 774	246 521
Ontario	190 391	469 313	164 961	396 402	176 137	660 160
Manitoba	38 949	96 009	28 906	69 460	39 487	147 999
Saskatchewan	10 080	24 847	12 180	29 268	11 758	44 068
British Columbia	248 322	612 114	245 508	589 955	240 779	902 437
Total	584 195	1 440 039	540 998	1 300 017	541 797	2 030 652
Refinery output	494 521	..	454 866	..	526 967	..
<b>EXPORTS</b>						
2603.00.10						
Copper ores and concentrates						
Copper content						
Japan	173 345	202 833	118 570	285 743	93 478	341 997
South Korea	23 197	46 145	10 735	25 141	32 364	108 949
China	59 307	63 098	19 294	44 185	15 407	51 580
Philippines	7 858	15 669	14 663	39 390	19 265	48 798
India	16 281	32 171	7 497	19 256	4 057	13 790
United States	8 348	12 901	86	208	516	1 135
Other countries	–	–	3	13	–	–
Total	288 336	372 817	170 848	413 936	165 087	566 249
2604.00.00.10, 2607.00.00.10, 2608.00.00.10, 2616.10.00.10						
Silver ores and concentrates						
Copper content	–	–	–	–	...	...
2620.30						
Copper ash and residues						
United States	64	155	187	478	96	430
Germany	20	34	–	–	3	4
Total	84	189	187	478	99	434
2833.25						
Copper sulphates						
United States	5 939	7 799	8 551	10 322	8 604	11 308
Thailand	–	–	–	–	...	3
India	–	–	–	–	1	1
Total	5 939	7 799	8 551	10 322	8 605	11 312
7401.10						
Copper mattes						
Norway	20 146	40 271	16 886	36 373	21 839	73 850
Peru	–	–	30	151	126	670
Russia	–	–	–	–	4	19
United States	–	–	–	–	3	19
Total	20 146	40 271	16 916	36 524	21 972	74 558
7401.20						
Copper mattes; cement copper (precipitated copper)						
Japan	3 438	322	–	–	–	–
United States	...	4	–	–	–	–
South Korea	–	–	8 774	137	–	–
Total	3 438	326	8 774	137	–	–
7402.00						
Copper anodes						
United States	84 118	387 596	84 076	345 451	75 951	289 516
Azerbaijan	–	–	–	–	1	4
United Arab Emirates	–	–	–	–	1	4
Chile	–	–	97	2 234	–	–
New Zealand	–	–	1	7	–	–
Total	84 118	387 596	84 174	347 692	75 953	289 524

TABLE 1 (cont'd)

Item No.	2002		2003		2004 (p)		
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)	
<b>EXPORTS (cont'd)</b>							
7403.11 to 7403.19	Refined copper and copper alloys, unwrought						
	Refined copper						
	United States	234 538	594 156	217 520	549 058	277 647	861 698
	China	—	—	1 571	4 113	5 523	20 257
	Colombia	2 747	13 195	2 455	10 337	3 333	13 143
	Italy	—	—	—	—	1 275	5 021
	United Kingdom	702	1 916	...	8	498	1 944
	Indonesia	—	—	—	—	303	1 218
	Singapore	—	—	—	—	119	479
	Hong Kong	—	—	3	11	98	417
	Japan	—	—	—	—	39	175
	Dominican Republic	98	479	—	—	39	159
	Brazil	—	—	—	—	20	79
	Bermuda	—	—	—	—	20	77
	India	—	—	—	—	11	34
	New Zealand	—	—	—	—	1	4
	South Africa	13	95	—	—	—	—
	Trinidad and Tobago	20	96	—	—	—	—
	Chile	—	—	13	11	—	—
	Germany	—	—	12	111	—	—
	Thailand	—	—	2	8	—	—
	<b>Total</b>	<b>238 118</b>	<b>609 937</b>	<b>221 576</b>	<b>563 657</b>	<b>288 926</b>	<b>904 705</b>
7403.21 to 7403.29	Refined copper and copper alloys, unwrought; other copper alloys						
	United States	3 059	10 065	2 545	7 614	3 397	12 524
	France	—	—	—	—	99	905
	Spain	2	6	7	18	2	19
	Hong Kong	—	—	—	—	1	3
	Algeria	—	—	—	—	...	2
	United Kingdom	4	10	...	...	...	...
	Chile	...	...	2	9	—	—
	Brazil	—	—	1	10	—	—
	China	—	—	17	115	—	—
	<b>Total</b>	<b>3 065</b>	<b>10 081</b>	<b>2 572</b>	<b>7 766</b>	<b>3 499</b>	<b>13 453</b>
7404.00	Copper waste and scrap						
	United States	52 621	113 670	41 392	81 429	50 981	135 189
	China	13 771	17 533	24 118	26 258	25 894	33 536
	South Korea	556	1 133	168	161	833	2 216
	Germany	1 052	1 635	351	380	510	1 306
	Taiwan	477	988	779	1 404	376	1 096
	Italy	83	150	—	—	298	1 028
	India	1 016	1 479	699	904	589	1 010
	Belgium	—	—	790	524	400	479
	North Korea	—	—	—	—	106	353
	Japan	63	67	243	474	121	334
	Hong Kong	411	607	384	357	277	266
	Other countries	1 148	1 280	485	599	400	511
	<b>Total</b>	<b>71 198</b>	<b>138 542</b>	<b>69 409</b>	<b>112 490</b>	<b>80 785</b>	<b>177 324</b>
7405.00	Master alloys of copper						
	France	—	—	—	—	3	16
	United States	—	—	10	34	—	—
	<b>Total</b>	<b>—</b>	<b>—</b>	<b>10</b>	<b>34</b>	<b>3</b>	<b>16</b>
7406.10 to 7406.20	Copper powders and flakes						
	United States	282	678	25	181	33	194
	Hong Kong	2	17	11	97	8	71
	Taiwan	23	232	20	180	5	52
	United Kingdom	—	—	43	307	1	8
	Thailand	8	67	7	46	3	20
	Other countries	15	155	49	303	17	144
	<b>Total</b>	<b>330</b>	<b>1 149</b>	<b>155</b>	<b>1 114</b>	<b>67</b>	<b>489</b>

TABLE 1 (cont'd)

Item No.	2002		2003		2004 (p)	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>EXPORTS (cont'd)</b>						
7407.10 to 7407.29	Copper bars, rods and profiles of refined copper and copper alloys					
	5 539	24 562	5 598	23 459	8 524	43 277
United States						
Chile	129	590	487	1 803	687	3 957
Italy	-	-	-	-	164	654
Thailand	3	10	57	227	66	216
Other countries	26	142	91	544	77	319
Total	5 697	25 304	6 233	26 033	9 518	48 423
7408.11 to 7408.29	Copper wire of refined copper and of copper alloys					
	131 632	369 048	113 440	303 959	142 925	549 298
United States						
China	-	-	155	384	8 565	33 335
Colombia	-	-	-	-	2 443	9 636
Trinidad and Tobago	-	-	-	-	1 579	6 214
Indonesia	-	-	-	-	631	2 477
Dominican Republic	-	-	-	-	514	1 943
Singapore	-	-	-	-	276	1 087
Other countries	107	500	75	472	303	1 340
Total	131 739	369 548	113 670	304 815	157 236	605 330
7409.11 to 7410.22	Copper and copper alloy plates, sheets, strip and foil					
	4 695	19 830	1 419	7 080	1 856	11 662
United States						
Taiwan	203	779	77	322	414	1 933
China	-	-	3	11	169	967
Hong Kong	77	432	331	1 663	48	258
Other countries	442	1 586	56	209	208	999
Total	5 417	22 627	1 886	9 285	2 695	15 819
7411.10 to 7411.29	Copper and copper alloys tubes and pipes					
	18 852	115 929	19 678	108 709	20 229	131 208
United States						
Netherlands	38	253	117	773	157	1 229
Singapore	45	307	69	568	109	878
Australia	28	200	47	376	89	497
Other countries	174	1 021	255	1 895	358	1 651
Total	19 137	117 710	20 166	112 321	20 942	135 463
7412.10 to 7412.20	Copper and copper alloys tubes and pipes					
	..	36 561	..	29 315	..	33 563
United States						
Dominican Republic	-	-	-	-	..	458
France	..	483	..	301	..	144
Australia	..	..	..	24	..	123
Other countries	..	1579	-	554	..	456
Total	..	38 623	..	30 194	..	34 744
7413.00	Stranded wire, cables, plaited bands and the like, of copper, not electrically insulated					
	722	5 900	1 844	7 090	1 247	5 336
United States						
China	2	9	55	135	152	422
Germany	1	5	-	-	21	63
Other countries	38	395	19	112	29	186
Total	763	6 309	1 918	7 337	1 449	6 007
7414, 7415, 7416, 7419	Other items of copper					
	..	34 026	..	33 280	..	33 178
United States						
Other countries	..	1473650	..	1240526	..	2080408
Total	..	36 942	..	36 472	..	35 189
Total exports	..	2 185 770	..	2 020 607	..	2 919 039

TABLE 1 (cont'd)

Item No.	2002		2003		2004 (p)		
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)	
<b>IMPORTS (3)</b>							
2603.00.00.10	Copper ores and concentrates						
	Copper content						
	Chile	51 600	105 019	38 776	75 676	36 408	121 385
	United States	16 510	47 417	6 741	20 230	13 775	43 831
	Peru	22 414	41 981	10 213	17 885	9 160	27 491
	Bulgaria	1 488	2 609	3 683	6 789	2 383	7 273
	Mexico	5 651	9 908	118	406	2 488	6 578
	Spain	85	204	451	810	871	2 774
	Saudi Arabia	—	—	3 345	10 613	550	1 921
	Germany	632	1 662	775	1 971	355	1 000
	Argentina	6 813	13 519	6 562	12 898	—	—
	Other countries	24 662	52 758	3 136	8 321	51	64
	<b>Total</b>	<b>129 855</b>	<b>275 077</b>	<b>73 800</b>	<b>155 599</b>	<b>66 041</b>	<b>212 317</b>
2604.00.00.10, 2607.00.00.10, 2608.00.00.10, 2616.10.00.10	Silver ores and concentrates						
	Copper content						
	South Africa	—	—	276	605	1 000	2 991
	United States	192	313	184	417	325	744
	<b>Total</b>	<b>192</b>	<b>313</b>	<b>460</b>	<b>1 022</b>	<b>1 325</b>	<b>3 735</b>
2620.30	Copper ash and residues						
	United States	2 686	4 586	7 715	12 733	31 677	28 596
	Sweden	557	1 552	1 046	2 970	2 804	5 643
	Spain	19	286	30	324	7 700	504
	Canada	—	—	1	9	20	37
	United Kingdom	—	—	—	—	15	24
	Panama	—	—	—	—	20	20
	Chile	441	266	—	—	—	—
	Germany	85	58	—	—	—	—
	<b>Total</b>	<b>3 788</b>	<b>6 748</b>	<b>8 792</b>	<b>16 036</b>	<b>42 236</b>	<b>34 824</b>
2825.50	Copper oxides and hydroxides						
	United States	679	1 953	437	1 282	706	2 856
	Australia	605	1 765	327	1 037	40	164
	Germany	...	...	...	...	...	1
	United Kingdom	...	2	1	5	...	...
	Japan	—	—	3	3	—	—
	Netherlands	—	—	10	30	—	—
	<b>Total</b>	<b>1 284</b>	<b>3 720</b>	<b>778</b>	<b>2 357</b>	<b>746</b>	<b>3 021</b>
2833.25	Copper sulphates						
	Taiwan	5 747	4 888	2 548	2 561	7 168	6 321
	China	3 493	2 905	5 935	4 744	3 689	3 545
	Russia	337	283	221	177	2 722	2 633
	France	864	1 114	872	898	1 285	1 455
	United States	1 353	1 730	1 578	1 812	855	1 224
	Chile	2 393	1 874	2 660	2 518	1 020	983
	Netherlands	776	745	50	48	495	500
	Peru	1 059	1 076	439	427	360	462
	Other countries	2 853	2 464	1 906	1 845	550	522
	<b>Total</b>	<b>18 875</b>	<b>17 079</b>	<b>16 209</b>	<b>15 030</b>	<b>18 144</b>	<b>17 645</b>
2836.99.10.20	Copper carbonates						
	United Kingdom	..	7	..	3	..	5
	United States	..	1	..	4	—	—
	<b>Total</b>	<b>..</b>	<b>8</b>	<b>..</b>	<b>7</b>	<b>..</b>	<b>5</b>
2836.99.90.10	Other copper carbonates						
	United States	5	11	5	10	4	9
	France	2	4	—	—	2	4
	United Kingdom	—	—	3	7	...	1
	China	—	—	—	—	...	...
	Finland	1	2	—	—	—	—
	India	1	2	1	2	—	—
	<b>Total</b>	<b>9</b>	<b>19</b>	<b>9</b>	<b>19</b>	<b>6</b>	<b>14</b>

TABLE 1 (cont'd)

Item No.		2002		2003		2004 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>IMPORTS (cont'd)</b>							
2837.19.00.10	Copper cyanides						
	United States	24	150	23	130	24	144
	South Korea	10	55	6	35	7	41
	Germany	—	—	—	—	1	4
	France	1	3	3	16	1	3
	Japan	...	1	—	—	...	...
	Switzerland	...	1	—	—	—	—
	Total	35	210	32	181	33	192
3212.90.90.12	Pigments based on copper or copper alloy powders and flakes						
	United States	6	55	14	126	20	219
	Germany	3	54	7	126	5	92
	Netherlands	—	—	...	1	...	6
	Total	9	109	21	253	25	317
7401.10	Copper mattes						
	Botswana	—	—	888	2 098	389	1 500
	United States	100	367	...	2	...	...
	Total	100	367	888	2 100	389	1 500
7401.20	Copper mattes; cement copper (precipitated copper)						
	Germany	114	328	280	680	422	872
	United States	34	91	148	374	87	259
	United Kingdom	6	17	13	35	2	7
	Netherlands	23	113	—	—	—	—
	Norway	—	—	738	2 003	—	—
	Total	177	549	1 179	3 092	511	1 138
7402.00	Copper anodes						
	Chile	40 687	97 513	104 509	250 285	123 820	447 943
	United States	17 799	31 747	17 007	29 468	19 525	51 019
	Spain	—	—	—	—	5 031	25 121
	Mexico	—	—	5 597	19 721	—	—
	Other countries	1	3	239	850	—	—
	Total	58 487	129 263	127 352	300 324	148 376	524 083
7403.11 to 7403.19	Refined copper and copper alloys, unwrought						
	Refined copper						
	Chile	6 283	15 130	12 265	31 500	41 817	161 230
	Peru	—	—	4 584	11 505	5 994	23 238
	Germany	162	490	880	2 654	2 517	9 067
	United States	3 199	8 933	2 130	6 016	2 247	7 614
	Japan	2 034	6 839	1 344	4 143	853	3 398
	Austria	—	—	11	43	37	165
	Other countries	14	52	486	1 148	1	7
	Total	11 692	31 444	21 700	57 009	53 466	204 719
7403.21 to 7403.29	Refined copper and copper alloys, unwrought						
	Copper alloys						
	United States	7 086	26 405	6 303	22 388	14 161	53 372
	China	7	32	4	18	51	272
	Portugal	—	—	9	39	45	235
	Mexico	...	...	...	1	15	124
	Germany	12	56	113	564	19	76
	Other countries	156	582	97	394	43	191
	Total	7 261	27 075	6 526	23 404	14 334	54 270
7404.00	Copper waste and scrap						
	United States	39 402	68 373	35 460	57 592	53 251	87 934
	Cuba	1 257	1 823	983	1 417	1 032	1 904
	United Kingdom	290	1 099	319	1 234	222	825
	Other countries	581	1 228	412	751	811	1 724
	Total	41 530	72 523	37 174	60 994	55 316	92 387

TABLE 1 (cont'd)

Item No.		2002		2003		2004 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>IMPORTS (cont'd)</b>							
7405.00	Master alloys of copper						
	United States	298	1 340	446	1 728	460	1 991
	China	100	391	82	303	109	431
	Other countries	87	303	3	18	5	28
	Total	485	2 034	531	2 049	574	2 450
7406.10 to 7406.20	Copper powders and flakes						
	United States	1 988	9 447	1 589	7 316	2 091	11 257
	China	6	34	62	340	155	978
	United Kingdom	26	346	14	155	81	535
	Germany	29	414	26	343	45	346
	France	90	392	114	438	61	323
	Italy	17	82	18	78	18	84
	Other countries	23	115	40	237	19	90
	Total	2 162	10 748	1 845	8 829	2 452	13 529
7407.10 to 7407.29	Copper bars, rods and profiles of refined copper and copper alloys						
	United States	32 740	103 970	31 338	98 326	35 066	139 075
	Brazil	18	114	49	194	7 503	30 274
	France	116	502	227	1 050	467	2 490
	Poland	1 325	2 975	429	1 325	482	1 839
	South Korea	953	1 304	1 954	2 152	515	1 661
	Turkey	600	854	52	177	454	1 402
	Germany	111	650	146	741	230	1 292
	New Zealand	248	920	166	769	163	864
	Australia	64	282	150	565	166	667
	Russia	2	10	13	81	152	658
	Italy	109	400	210	759	119	586
	China	14	88	69	294	95	566
	United Kingdom	135	718	176	847	68	446
	Mexico	1	4	18	79	48	307
	Finland	10	62	27	161	51	301
	Bulgaria	145	429	231	459	59	274
	Other countries	238	908	609	2 011	192	1 048
	Total	36 829	114 190	35 864	109 990	45 830	183 750
7408.11 to 7408.29	Copper wire of refined copper and of copper alloys						
	United States	18 908	62 144	13 922	44 114	18 451	61 274
	Brazil	—	—	38	114	1 542	5 259
	Germany	536	2 347	537	2 135	754	2 901
	South Korea	176	931	266	1 210	265	1 434
	Other countries	2 915	10 492	1 735	6 948	1 640	8 405
	Total	22 535	75 914	16 498	54 521	22 652	79 273
7409.11 to 7410.22	Copper and copper alloy plates, sheets, strip and foil						
	United States	18 285	124 226	17 479	107 901	17 253	123 489
	Germany	2 300	11 861	1 785	8 732	5 038	24 638
	Netherlands	2 795	11 935	2 676	11 200	2 278	11 306
	China	614	4 407	668	4 049	918	6 208
	Sweden	1 375	6 195	1 154	5 178	1 062	6 047
	Greece	321	1 303	503	2 155	714	4 047
	Taiwan	492	4 210	173	1 211	456	3 327
	Japan	159	1 654	248	2 883	229	2 804
	Luxembourg	70	240	100	397	351	2 555
	Poland	458	1 584	190	641	311	1 315
	India	76	321	228	784	220	931
	Other countries	888	4 361	875	3 831	789	4 279
	Total	27 833	172 297	26 079	148 962	29 619	190 946
7411.10	Pipes and tubes, refined copper						
	United States	7 801	35 992	7 996	34 420	8 512	48 072
	China	460	1 749	613	2 089	2 018	9 575
	South Korea	1 319	4 881	764	2 853	1 022	5 036
	Chile	—	—	—	—	948	4 205
	Other countries	411	1 876	559	2 295	225	1 163
	Total	9 991	44 498	9 932	41 657	12 725	68 051



TABLE 1 (cont'd)

Item No.		2002		2003		2004 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>IMPORTS (cont'd)</b>							
7411.21	Pipes and tubes, copper-zinc base alloys						
	China	1 188	6 732	832	4 391	1 076	7 050
	United States	1 485	9 523	1 168	7 521	823	6 486
	Germany	663	3 519	771	3 975	737	4 222
	Chile	24	90	47	162	554	2 167
	Mexico	139	862	243	1 603	136	1 107
	Serbia and Montenegro	836	2 278	867	2 324	41	184
	Other countries	371	1 798	245	1 199	145	1 271
	Total	4 706	24 802	4 173	21 175	3 512	22 487
7411.22	Pipes and tubes, copper-nickel base alloys or copper-nickel-zinc base alloys						
	United States	275	1 863	318	1 934	337	2 247
	United Kingdom	1	11	2	12	45	279
	Mexico	6	50	5	44	23	176
	Germany	...	...	6	44	14	100
	Canada	9	76	16	125	7	45
	China	-	-	26	97	4	31
	Netherlands	22	165	60	432	4	25
	India	11	80	5	38	1	13
	South Korea	...	1	54	415	...	3
	Russia	77	574	121	867	-	-
	Other countries	4	34	2	14	2	11
	Total	405	2 854	615	4 022	437	2 930
7411.29	Plates and tubes, copper alloys, n.e.s.						
	United States	690	4 044	712	3 887	790	4 930
	China	103	441	56	299	146	705
	Other countries	58	400	69	427	131	712
	Total	851	4 885	837	4 613	1 067	6 347
7412.10	Fittings, pipe or tube, of refined copper						
	United States	797	10 564	889	10 200	1 171	10 547
	South Korea	352	3 051	497	2 901	1 417	8 403
	China	49	454	95	700	276	2 081
	Germany	9	293	12	341	27	651
	Other countries	132	870	92	1 041	83	707
	Total	1 273	15 232	1 585	15 183	2 974	22 389
7412.20	Fittings, pipe or tube, copper alloys						
	United States	4 067	56 251	3 901	47 814	7 243	49 884
	China	606	6 107	747	5 834	1 262	7 027
	Taiwan	1 075	8 035	1 643	11 035	2 488	12 489
	South Korea	255	2 050	319	2 607	677	3 532
	Germany	58	980	56	1 182	120	1 545
	Other countries	505	6 004	716	7 332	723	5 428
	Total	6 566	79 427	7 382	75 804	12 513	79 905
7413.00	Stranded wire, cables, plaited bands and the like, of copper, not electrically insulated						
	United States	6 258	23 988	6 513	24 786	7 422	34 365
	Canada	2 289	7 365	814	2 917	1 106	5 095
	Germany	39	185	44	219	55	352
	Other countries	55	260	224	714	129	783
	Total	8 641	31 798	7 595	28 636	8 712	40 595
7414.20	Endless bands of copper wire for machinery						
	United States	..	145	..	117	..	120
	United Kingdom	..	32	-	-	..	79
	Germany	..	9	..	8	..	35
	Other countries	-	35	..	43	..	30
	Total	..	221	..	168	..	264
7414.90	Cloth, grill and netting of copper wire and expanded metal of copper						
	United States	155	736	73	392	90	750
	Other countries	25	116	15	90	8	55
	Total	180	852	88	482	98	805

TABLE 1 (cont'd)

Item No.		2002		2003		2004 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>IMPORTS (cont'd)</b>							
7415.10	Nails, tacks, drawing pins, staples and similar articles of copper or of iron or steel with copper heads						
	United States	76	425	48	294	40	308
	Taiwan	34	210	35	197	31	190
	China	5	27	19	101	15	182
	Germany	10	54	9	55	17	76
	Other countries	50	320	39	242	33	220
	Total	165	982	141	834	119	900
7415.21	Copper washers, including spring						
	United States	299	2 088	357	2 229	300	1 413
	Canada	1	4	2	11	63	872
	Mexico	..	1	19	117	65	567
	United Kingdom	52	421	68	470	48	423
	China	44	291	46	327	51	306
	Other countries	35	213	34	214	265	257
	Total	431	3 018	526	3 368	792	3 838
7415.29	Articles of copper, not threaded, n.e.s., similar to those of headings 7415.10 and 7415.21						
	United States	669	3 469	577	3 029	494	2 802
	China	15	89	31	159	235	239
	New Zealand	16	88	8	49	17	140
	Germany	16	87	20	98	12	118
	Other countries	206	1 175	79	467	63	429
	Total	922	4 908	715	3 802	821	3 728
7415.33 (4)	Screws, bolts and nuts of copper, excluding wood screws						
	United States	788	3 699	560	2 660	491	3 055
	Taiwan	430	1 312	382	1 104	262	1 291
	China	167	889	255	1 176	277	1 234
	Germany	8	40	56	246	57	311
	Other countries	63	351	79	453	66	541
	Total	1 456	6 291	1 332	5 639	1 153	6 432
7415.39	Articles of copper, threaded, n.e.s., similar to bolts, nuts and screws						
	United States	634	3 360	722	3 701	619	3 605
	China	15	85	30	146	47	413
	Taiwan	76	451	71	348	34	308
	Germany	6	30	13	64	25	240
	Other countries	171	640	79	407	125	654
	Total	896	4 536	902	4 602	825	4 980
7416.00	Copper springs						
	Germany	..	511	..	615	..	451
	United States	..	293	..	241	..	240
	Taiwan	..	100	..	75	..	49
	Other countries	-	31	..	11	-	26
	Total	..	935	..	942	..	766
7419.10	Chain and parts thereof of copper						
	United States	43	308	35	236	79	1 735
	Other countries	15	120	23	173	15	95
	Total	58	428	58	409	94	1 830
7419.91	Articles of copper, not further worked than cast, moulded, stamped or forged						
	United States	3 664	24 179	1 720	15 923	2 557	21 238
	Other countries	266	1 917	192	1 741	232	1 605
	Total	3 930	26 096	1 912	17 664	2 789	22 843

TABLE 1 (cont'd)

Item No.	2002		2003		2004 (p)	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>IMPORTS (cont'd)</b>						
7419.99	Articles of copper, n.e.s.					
	United States	.. 25 294	.. 22 241	.. 22 241	.. 22 564	.. 22 564
	China	.. 5 854	.. 6 875	.. 6 875	.. 5 835	.. 5 835
	Germany	.. 3 696	.. 2 403	.. 2 403	.. 3 834	.. 3 834
	Other countries	- 13 686	.. 12 749	.. 12 749	- 11 894	- 11 894
	Total	.. 48 530	.. 44 268	.. 44 268	.. 44 127	.. 44 127
	Total imports	.. 1 239 980	.. 1 235 046	.. 1 235 046	.. 1 953 332	.. 1 953 332

Sources: Natural Resources Canada; Statistics Canada.

- Nil; .. Not available or not applicable; . . . Amount too small to be expressed; n.e.s. Not elsewhere specified; (p) Preliminary.

(a) Data believed to be tonnage of concentrates and not tonnes of copper in concentrate. (b) Tonnage of concentrates adjusted by unit value and may not reflect tonnes of copper in concentrates.

(1) Copper contained in concentrates produced. (2) Anode copper recovered in Canada from domestic concentrates plus exports of payable copper in concentrate and matte. (3) Imports from "other countries" may include re-imports from Canada. (4) HS code changed from 7415.32 to 7415.33 as of 2002.

Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, COPPER PRODUCTION, TRADE (1) AND USE, 1988-2004

	Production		Exports			Imports Refined (6)	Use (3) Refined
	Shipments (2)	Refinery Output	Concentrates and Matte (4)	Refined (5)	Total		
	(tonnes)						
1988	758 477	528 722	348 404	268 680	617 083	4 660	236 281
1989	704 431	515 215	348 811	321 689	670 500	4 408	213 045
1990	771 433	515 834	374 875	335 940	710 815	2 611	180 605
1991	780 361	538 338	348 080	377 984	726 064	2 321	159 170
1992	761 693	539 301	346 841	385 761	732 602	8 916	156 132
1993	709 650	561 579	319 840	408 364	728 204	21 155	185 565
1994	590 783	549 868	237 552	388 568	626 120	19 594	199 350
1995	700 842	572 616	274 492	434 690	709 182	24 176	189 550
1996	652 498	559 200	409 577	384 336	793 914	28 700	218 280
1997	647 779	560 582	515 547	381 475	897 022	22 602	224 776
1998	690 761	562 261	433 685	355 825	789 510	18 685	246 212
1999	581 582	548 563	355 839	294 106	649 945	16 475	266 504
2000	621 888	551 393	426 007	288 334	714 340	11 875	272 076
2001	614 311	567 720	359 633	308 897	668 531	7 994	265 210
2002	584 194	494 521	311 919	238 116	550 036	11 692	274 132
2003	540 998	454 866	196 538	221 577	418 115	21 700	257 325
2004 (p)	541 796	526 967	187 058	288 926	475 985	53 466	..

Sources: Natural Resources Canada; Statistics Canada.

.. Not available; (p) Preliminary.

(1) Beginning in 1988, exports and imports are based on the new Harmonized System and may not be in complete accordance with previous method of reporting. (2) From 1975 to 1988, anode copper recovered in Canada from domestic concentrate plus exports of payable copper in concentrates and matte. Starting in 1989 to date, recoverable copper in concentrate shipped. (3) Producer's domestic shipments of refined copper plus imports of refined shapes. (4) Data include HS Codes 2603.00.10, 2604.00.00.10, 2607.00.00.10, 2608.00.00.10, 2616.10.00.10, 7401.10 and 7401.20. (5) Data include HS Codes 7403.11 to 7403.19. (6) Data include HS Codes 7403.11 to 7403.19.

**TABLE 3. CANADIAN MINES PRODUCING COPPER IN CONCENTRATE, 2003 AND 2004**

Mine	Operator	2003	2004
		(tonnes)	
Bouchard-Hébert	Breakwater Resources Limited	3 674	5 200
Brunswick	Noranda Inc.	8 688	6 195
Gibraltar	Ledcor Mining Ltd.	–	6 160
Highland Valley	Highland Valley Mine Partnership	170 400	164 267
Huckleberry	Imperial Metals Corp.	32 781	27 841
Hudson Bay Complex	Hudson Bay Mining and Smelting Company Limited	46 000	45 500
Kemess South	Kemess Mines Limited	35 150	34 000
Kidd Creek	Falconbridge Limited	46 409	41 029
Montcalm	Falconbridge Limited	–	1 188
LaRonde	Agnico-Eagle Mines Limited	9 800	10 251
Louvicourt	Aur Resources Inc.	40 000	33 112
Matagami/Bell-Allard	Noranda Inc.	7 829	5 993
Myra Falls	Breakwater Resources Limited	10 687	12 600
Raglan	Falconbridge Limited	6 628	6 867
Selbaie	Les Mines Selbaie	9 600	800
Sudbury	Inco Limited	91 134	105 000
Sudbury Division	Falconbridge Limited	29 161	22 602
Troilus	Inmet Mining Corporation	5 800	4 800
Total		553 741	533 405

Source: Natural Resources Canada, author's calculations based on company reports.

– Nil.

TABLE 4. COPPER PRODUCERS

Country	Company	Web Site Address
Australia	M.I.M. Holdings Limited	www.mim.com.au
	WMC Resources Ltd.	www.wmc.com
Belgium	Umicore (Olen refinery/Pirdop smelter)	www.um.be
Brazil	Companhia Vale do Rio Doce (CVRD)	www.vale.com.br
Canada	Agnico Eagles Mines Limited	www.agnico-eagle.com
	Aur Resources Inc.	www.aurreources.com
	Barrick Gold Corporation	www.barrick.com
	Billiton Metals Canada Inc. (see BHP Billiton Plc)	www.bhpbilliton.com/bb/home/home.jsp
	Breakwater Resources Ltd.	www.breakwater.ca
	Callinan Mines Limited	www.callinan.com
	Campbell Resources Inc.	www.ressourcescampbell.com/en/index.html
	DRC Resources Corporation	www.drcresources.com/s/Home.asp
	Expatriate Resources Ltd.	www.expatriateresources.com/start.htm
	Falconbridge Limited	www.falconbridge.com
	Getty Copper Corporation	www.gettycopper.com
	Highland Valley Copper (see Teck Cominco Limited)	www.teckcominco.com
	Hudson Bay Mining and Smelting Co., Ltd. (see Ontzinc Corporation)	www.ontzinc.ca
	Imperial Metals Corporation	www.imperialmetals.com/s/Home.asp
	Inco Limited	www.inco.com
	Inmet Mining Corporation	www.inmetmining.com
	Noranda Inc.	www.noranda.com
	North America Palladium Ltd.	www.napalladium.com
	Northgate Exploration Ltd.	www.northgateexploration.ca
	Placer Dome Inc.	www.placerdome.com/index.jsp
	Redcorp Ventures Ltd.	www.redcorp-ventures.com
	Taseko Mines Limited	www.tasekomines.com/tko/Home.asp
	Teck Cominco Limited	www.teckcominco.com
	Voiseys Bay Nickel Company Limited	www.vbnc.com and www.inco.com
Chile	Chile Antofagasta Holdings	www.aminerals.cl
	Corporación Nacional del Cobre de Chile	www.codelco.com
	Compañía Minera Doña Inés de Collahuasi	www.collahuasi.cl
	Empresa Nacional de Minería (ENAMI)	www.enami.cl
	Minera Escondida Limitada	www.escondida.cl
China	Jiangxi Copper Company Limited	www.jxcc.com/english/engfgs/enindex.htm
	Jinchuan Group Limited	www.jnmc.com/default.asp
	Yunnan Copper Industrial Corp. Ltd.	www.yunnan-copper.com/ehtml/copper.html
	India Birla Copper	www.birlacopper.com
	Hindustan Copper Ltd. (HCL)	www.hindustancopper.com
Indonesia	Freeport-McMoRan Copper & Gold Inc.	www.fcx.com
Japan	Dowa Mining Co., Ltd.	www.dowa.co.jp
	Furukawa Electric Co., Ltd.	www.furukawa.co.jp/english/index.htm
	Mitsubishi Materials Corporation	www.mmc.co.jp/english/top_e.html
	Mitsubishi Group	www.mitsubishi.or.jp/e/contents/contents_2.html
	Mitsui & Co., Ltd.	www.mitsui.co.jp/tkabz/english/index.html
	Nippon Mining & Metals Co., Ltd.	www.nikko-metal.co.jp
	Nittetsu Mining Co., Ltd.	www.nittetsukou.co.jp
	Onahama Smelting and Refining Co., Ltd.	www.group.mmc.co.jp/osr/eng
	Dowa Mining Co., Ltd.	www.dowa.co.jp/english/index.htm
	Sumitomo Metal Mining Co., Ltd.	www.smm.co.jp/index_E.html
Korea	LG-Nikko Copper Inc.	www.lgnikko.com/eng/#
Mexico	Grupo México S.A. de C.V.	www.gmexico.com
Peru	Centromin Peru S.A.	www.centromin.com.pe
	Southern Peru Copper Corporation	www.southernperu.com/pages/home.htm
Papua New Guinea	Ok Tedi Mining Limited	www.oktedi.com
Phillipines	Phillipine Associated Smelting & Refining Corp.	www.pasar.net.ph
Poland	KGHM Polska Miedz S.A.	www.kghm.pl/en/index.php
Russia	MMC Norilsk Nickel	www.nornik.ru/en/
United Kingdom	Anglo American plc	www.angloamerican.co.uk
	BHP Billiton Plc	www.bhpbilliton.com
	Rio Tinto plc	www.riotinto.com
United States	ASARCO Incorporated	www.asarco.com
	Kennecott Utah Copper Corporation	www.kennecott.com
	Phelps Dodge Corporation	www.phelpsdodge.com

Source: Natural Resources Canada.