

# Canadian Reserves of Selected Major Metals, and Recent Production Decisions

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## RESERVES OF SELECTED MAJOR METALS

Canadian reserves of copper, molybdenum, lead, nickel, silver and gold decreased significantly during 1999. Only zinc reserves were maintained at the same level as at the end of 1998 (Table 1).

Declining metal prices during 1999 caused many mining companies to make their ore reserve calculations at year-end based upon lower metal prices than they had used at the end of 1998. This resulted in reductions in ore reserves at most producing mines and a number of mine closures.

In Canada during 1999, there were only two announcements of new production decisions for the seven metals reviewed in this chapter. Given that metal prices were generally depressed during 2000, it is probable that Canadian ore reserve levels for the major metals will continue to decline in the immediate future. The Voisey's Bay nickel-copper-cobalt deposit in Labrador is not presently included in Canadian reserves because there are major issues to be resolved before production can begin. When a production decision is made, it will result in significant increases in the reserves of nickel and copper.

### Reserves Policy

Canadian reserves are estimated from information contained in annual and other corporate reports, and from the responses of mining companies to the annual Federal-Provincial Survey of Mines and Concentrators.

Reserves reported here include only metal contained in material that is classified by companies as "proven" or "probable" (or their equivalents) at pro-

ducing mines and in deposits that are firmly committed to production (Table 2). Metal contained in mineral resources classified by companies as "possible" (or its equivalents) is not included in national totals, nor is metal contained in deposits that have not advanced beyond the deposit appraisal phase (Figure 1). When available, only metal contained in mineable ore is included in Canadian totals to exclude losses inherent in the mining process. Every effort is made to achieve, from year to year, consistency in the reserves reported here; however, consistency ultimately depends on industry practice, which has evolved over the years. Imperial units reported by companies have been converted to metric units and the results have been rounded to the appropriate number of significant digits.

### Reserves by Commodity

#### Gold

There were 1326 t of gold contained in Canadian mine reserves in December 1999. This represents a decrease of 7% (89 t) compared to revised totals for December 1998. The major components of this decrease were the closure of Royal Oak Ontario Division as a result of the bankruptcy of Royal Oak Mines Inc. and the depletion of reserves without replacement at the Doyon mine (-15 t) and the Troilus mine (-12 t) in Quebec, at the Golden Giant mine (-12 t) in Ontario, and at the Kemess South (-12 t) and Highland Valley mine (-12 t) in British Columbia. Notable increases in gold reserves were reported at the LaRonde mine (+66 t) and the Sigma #1 mine (+19 t) in Quebec, at the Musselwhite (+19 t) and Red Lake mines (+13 t) in Ontario, and at the 777 mine (+22 t) in Manitoba.

#### Silver

There were 15 368 t of silver contained in Canadian mine reserves in December 1999. This represents a decrease of 2% (370 t) compared to revised totals for December 1998. The major components of this decrease were the depletion without replacement of reserves at the Highland Valley (-471 t) and Eskay Creek mines (-198 t) in British Columbia. The only silver-producing mines to significantly increase their reserves during 1999 were the LaRonde mine (+843 t) in Quebec and the 777 mine (+310 t) in Manitoba.

**Figure 1**  
**Generalized Model of the Mineral Resource Development and Mining Process**

PHASE	MINERAL RESOURCE ASSESSMENT	MINERAL EXPLORATION					MINERAL DEPOSIT APPRAISAL				MINE COMPLEX DEVELOPMENT	MINE PRODUCTION	ENVIRONMENTAL RESTORATION
		GRASSROOTS EXPLORATION					DA-1	DA-2	DA-3	DA-4			
STAGE	MRA	EX-1	EX-2	EX-3	EX-4	EX-5					DA-1	DA-2	DA-3
	Various surveys, research and synthesis.	Exploration planning.	Regional reconnaissance and surveys.	Prospecting and ground surveys of anomalies.	Verification of anomalies and showings.	Discovery and delimitation of a mineral deposit.	Mineral deposit definition.	Project engineering.	Project economics.	Feasibility study, production decision.	Mine development, construction of processing plant and infrastructure.	Production, marketing and renewal of reserves.	Mine complex closure and decommissioning, site restoration.
OBJECTIVES	Supply information and tools required to develop the mineral potential of the nation for economic benefit, in the perspective of sustainable development.	Select target commodities. Establish exploration objectives and strategies. Select target areas and sites. Acquire claims or permits if appropriate.	Seek anomalies of interest over wide areas by various survey methods. Select the more promising targets. Acquire claims or permits.	Confirm the presence, exact location and characteristics of anomalies. Acquire claims, leases and properties.	Investigate the cause of anomalies. Find mineral showings. Acquire additional claims, leases and properties.	Discover, delimit and interpret grade quality and tonnage of a new mineral deposit. Determine if it constitutes a mineral resource of "potential economic interest", to justify more intensive and detailed work.	Define the limits, controls and internal distribution of grades, mineralogy and mineral processing characteristics of the deposit. Acquire all data required for project engineering and cost estimation.	Determine, in an iterative fashion, the design, plans, schedules, capital cost and operating cost estimates for all aspects of the project. Establish technical evaluation of the project.	Obtain all the information required and determine, based on corporate objectives, parameters for the economic, financial and social-political evaluation of the project.	Diligently validate and integrate project data, interpretations, estimates, plans and evaluations to achieve MCD and production objectives. Decide on whether to undertake the mining project. Obtain permits and financing.	Complete mine development and construction on schedule and within budgets and specifications. Ensure efficient and timely mine complex start-up according to schedule, specifications and cash flow forecasts.	Achieve commercial production on schedule and meet cash flow forecasts and quality specifications. Achieve mine profitability and company survival in the perspective of sustainable development.	Restore mine site, outside plant and infrastructure to environmentally acceptable condition. Ensure the future quality of the environment.
EVALUATION METHODS	Geoscientific, mineral and economic surveys, research, compilations and synthesis by governments, research institutes, universities and industry.	Metal and mineral market research. Review of geological and ore deposit information and of the legal, fiscal and socio-political context in various areas.	Remote sensing, aerial photography and airborne geophysics. Prospecting, geology and geochemistry. Appraisal, rating and selection of anomalies.	Ground, geological, geochemical and geophysical prospecting and surveys. Compilation, appraisal and selection of significant anomalies.	Geological mapping and other surveys. Trenching, drilling and sampling. Appraisal of results, recommendations for further work, and selection of new targets.	Stripping, trenching, mapping, sampling, drilling and down-hole geophysics. Initial mineral processing tests. Environmental and site surveys. Mineral resource estimation and inventory.	Detailed mapping, sampling and drilling on surface or from underground. Systematic mineralogy and mineral processing tests. Detailed environmental and site surveys. Pre-feasibility studies.	Pilot tests, engineering design and planning. Capital and operating costs for mining, mineral processing, infrastructure, environmental protection and restoration. Technical risk analysis. Pre-feasibility studies.	Market, prices, product development and financial studies. Environmental, economic, financial, and socio-political risk analysis. Pre-feasibility studies.	Exhaustive due diligence review of all data, interpretations, plans and estimates. Evaluation of profitability, given the geological, technical, financial and qualitative risks, and the up-side factors.	Project management methods in a quality assurance perspective. Training program for personnel and detailed start-up plan to meet the requirements of this demanding period.	Production management methods to ensure continuous quality and efficiency improvements. Exploration, deposit appraisal and development of new zones or deposits on-mine-site and off-mine-site.	Mine closure and decommissioning. Environmental restoration and monitoring.
RESULTS	Maps, data bases, tools and models.	Exploration projects.	Regional anomalies.	Local anomalies.	Mineral showings.	Mineral deposit.	Deposit appraisal project.			Mining project.	Mining complex.	Mineral production.	Restored site.
MINERAL INVENTORY	UNDISCOVERED MINERAL POTENTIAL					INFERRED RESOURCE	DELIMITED MINERAL RESOURCE				MINERAL RESERVE		
	SPECULATIVE		HYPOTHETICAL				INDICATED	INDICATED AND MEASURED			PROVEN AND PROBABLE		
ESTIMATION ERROR (targeted margin of error of tonnage/grade estimates at the 90% confidence level)						± 100%	± 50%	Indicated: ± 50 to ± 30% Measured: ± 20 to ± 10% (often several sample grid dimensions are used in each category)			Proven (feasibility: ± 10%; mining: ± 5%)		Full compliance
INVESTMENTS	Moderate	Low, but increasing multiple investments.				Larger and increasing multiple investments.				Very large industrial investment.			
RISK LEVEL	Low	Very high, but decreasing risk of failure and financial loss.				High, but decreasing risk of failure.				Moderate to low industrial risk.			

Sources: Modified by D.A. Cranstone, A. Lemieux and M. Vallée, February 25, 1994, from M. Vallée, 1992, *Guide to the Evaluation of Gold Deposits*, CIM Special Volume 45, p. 4, and *SOQUEM Annual Report*, 1976-77, pp. 4 and 5. Revised by M. Vallée and G. Bouchard, January 2001.

## Zinc

During 1999, Canadian reserves of zinc remained essentially unchanged at about 10.2 Mt. Zinc reserves decreased at the Brunswick No. 12 mine (-260 000 t) in New Brunswick, at the Sullivan mine (-109 000 t) in British Columbia, and at the Polaris mine (-94 000 t) in Nunavut. The only major increases in zinc ore reserves during 1999 were at the LaRonde mine (+378 000 t) in Quebec and at the 777 mine (+414 000 t) in Manitoba.

## Lead

Canadian reserves of lead decreased by approximately 14% during 1999 to 1 586 000 t. This was largely because of the production without replacement of ore at the Brunswick No. 12 mine (-120 000 t) in New Brunswick, at the Sullivan mine (-74 000 t) in British Columbia, and at the Polaris mine (-22 000 t) in Nunavut.

## Copper

In December 1999, Canadian reserves of copper were estimated at about 7.8 Mt, or down by about 7% (-594 000 t) from a year earlier. Copper reserves were reduced at Inco Limited's Ontario Division (-380 000 t) and at the Highland Valley mine (-126 000 t) in British Columbia. Copper reserves were increased at the LaRonde mine (+65 000 t) in Quebec and at the 777 mine (+263 000 t) in Manitoba.

## Molybdenum

Canadian reserves of molybdenum stood at 119 000 t in December 1999, or about 2% lower than in the previous year. This decrease was due to the depletion without replacement of the reserves at the Endako (-3000 t) and Huckleberry (-1000 t) mines, which were only partially offset by the increase at the Highland Valley mine (+2000 t). All of these mines are in British Columbia.

## Nickel

In December 1999, there were some 5.0 Mt of nickel contained in Canadian mine reserves, down by approximately 12% from 1998 levels. This decrease is due largely to reduced reserves at Inco's Ontario Division (-661 000 t) and at Falconbridge Limited's Sudbury operations (-68 000 t), also in Ontario.

Inco had some 4.1 Mt of nickel in Canadian reserves at the end of 1999, or about 82% of the national total. It is expected that development of the copper-nickel-cobalt deposits at Voisey's Bay in Labrador will make major additions to Canada's mineable reserves of these metals in the near future.

## Canadian Reserves by Province and Territory

Four provinces (Ontario, British Columbia, New Brunswick and Quebec) held dominant positions in terms of Canada's proven and probable mineable reserves of major metals in December 1999 (Table 4).

Ontario had 68% of the nickel, 48% of the gold and 49% of the copper, plus 19% of the silver and 17% of the zinc.

British Columbia had 100% of the molybdenum, 33% of the copper and 28% of the silver, plus 10% of the lead, 8% of the zinc and 17% of the gold.

New Brunswick had 80% of the lead, 32% of the zinc and 25% of the silver, plus 2% of the copper and 2% of the gold.

Quebec had 29% of the zinc, 24% of the gold, 9% of the copper, 11% of the nickel and 24% of the silver.

Manitoba had 21% of the nickel, 9% of the zinc and 5% of the gold, plus 7% of the copper and 4% of the silver.

The Yukon had less than 1% of the gold and less than 1% of the silver.

The Northwest Territories had 1% of the gold.

Nunavut had 5% of the lead, 5% of the zinc, 1% of the gold and 1% of the silver.

## Canadian Reserves by Industry

Canadian mines are, to a large extent, polymetallic, a complexity that the Standard Industrial Classification (SIC) tends to oversimplify (Table 5).

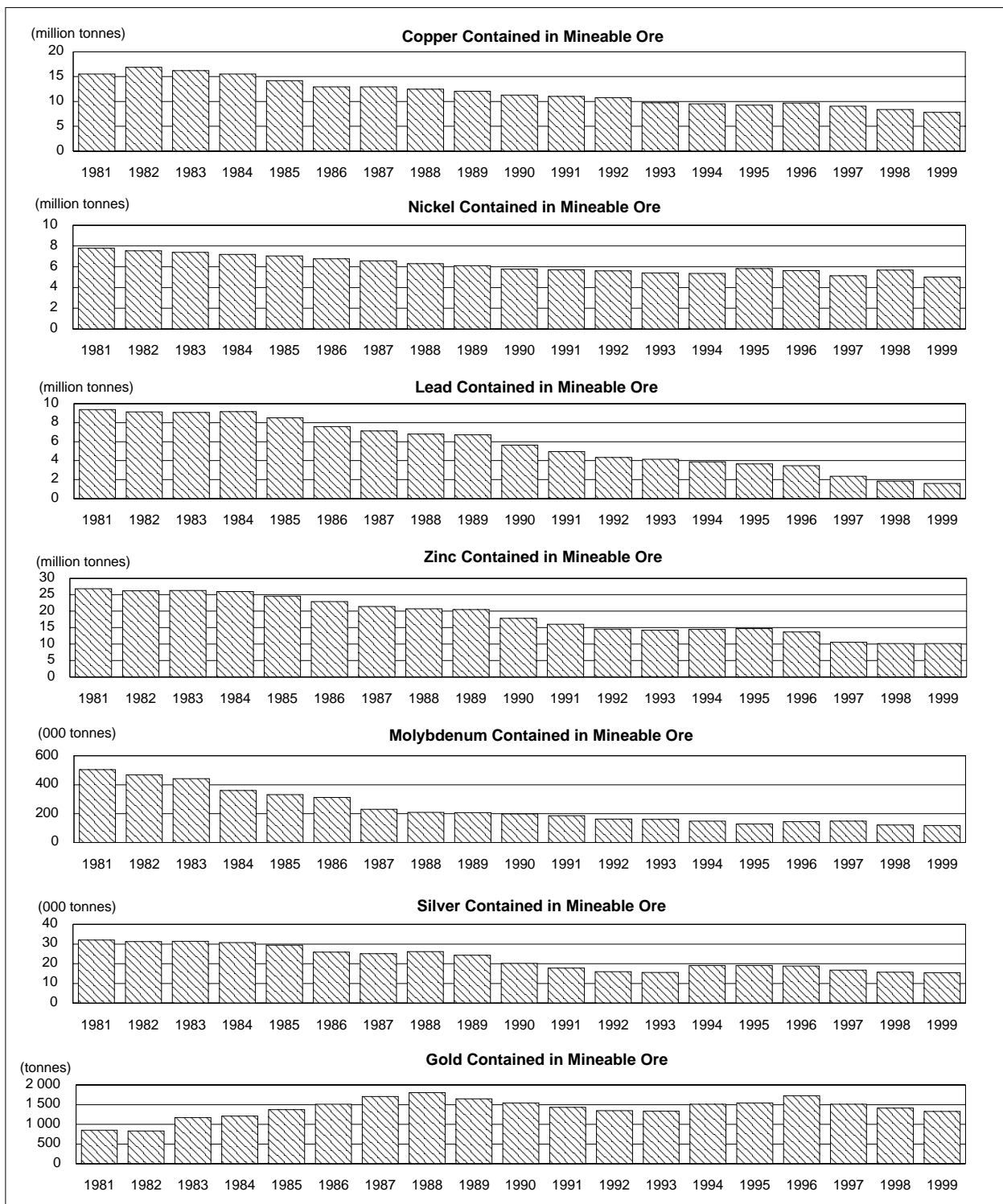
Current mine reserves of gold in Canada are distributed through the various SIC classes as follows: gold mines, 79%; copper and copper-zinc mines, 15%; nickel-copper mines, 3%; and zinc-lead-silver mines, 2%.

Current mine reserves of silver in Canada are distributed through the various SIC classes as follows: gold mines, 39%; copper and copper-zinc mines, 27%; nickel-copper mines, 3%; and zinc-lead-silver mines, 27%.

Current mine reserves of copper in Canada are distributed through the various SIC classes as follows: gold mines, 2%; copper and copper-zinc mines, 53%; nickel-copper mines, 42%; and zinc-lead-silver mines, 2%.

Current mine reserves of molybdenum in Canada are contained in the SIC classes as follows: copper and copper-zinc mines, 36%; and molybdenum mines, 64%.

**Figure 2**  
**Canadian Reserves of Selected Major Metals, 1981-99**  
 Metal Contained in Proven and Probable Mineable Ore in Operating Mines and Deposits Committed to Production, as at December 31 of Each Year



Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.  
 Note: This series was revised during 1996.

Current mine reserves of nickel in Canada are contained 99% in the SIC class of nickel-copper mines and 1% in the SIC class of miscellaneous metal mines.

Current mine reserves of lead in Canada are contained in the SIC classes as follows: copper and copper-zinc mines, 5%; and zinc-lead-silver mines, 95%.

Current mine reserves of zinc in Canada are contained in the SIC classes as follows: gold mines, 13%; copper and copper-zinc mines, 45%; and zinc-lead-silver mines, 42%.

### Apparent Life of Canadian Reserves

The apparent life (life index) of mine reserves is usually calculated by dividing the total amount of metals remaining in mine reserves at the end of a given year by the corresponding amount of metals contained in the ores produced during that year. Similar calculations are often applied at the national level.

At the national level, life indices are but a very rough measure of the expected life of aggregate mine reserves and they are often misleading unless abnormal situations are recognized. Life indices based on proven and probable reserves do not make allowances for inferred extensions to reserves at current mines, gross additions that will accrue to current reserves from the likely development, in the foreseeable future, of known orebodies for which a production decision has yet to be made, or expected changes in production rates. Furthermore, life indices tend to overstate the apparent life of reserves when, for example, annual production is abnormally low due to strikes, cutbacks or suspensions at large establishments, or when significant increases in capacity resulting from new production decisions will be coming on stream, but only several years hence.

The apparent life indices for the major metals in Canada at the end of 1999 were 22 years for nickel, 11 years for copper, 11 years for silver, 9 years for zinc, 9 years for molybdenum, 8 years for gold and 8 years for lead.

### Reserve Trends

Figure 2 and Table 6 show how Canadian reserves of copper, nickel, lead, zinc, molybdenum and silver have declined steadily since the early 1980s. In contrast, gold reserves increased substantially until 1988 before starting a gradual decline. At the end of 1999, Canadian reserves of copper, lead, zinc and molybdenum were lower than at any time since Natural Resources Canada began keeping records (1977), and reserves of nickel, silver and gold were only slightly higher than the recent historic lows that occurred in 1993 and 1994.

The annual aggregate change in Canadian reserves is the net result of three main factors affecting individual mines (Figure 3): additions to reserves, deletions to reserves, and production. Additions to reserves are the result of new discoveries; of new geological, metallurgical, production or other information; of a decrease in production costs; or of a rise in commodity prices, all of which increase the quantity of mineral resources that are profitable to mine. Deletions to reserves are the result of new geological, metallurgical, production or other information; of increases in costs; or of decreases in commodity prices, all of which reduce the quantity of mineral resources previously counted in mine reserves that are now expected to be mined at a profit. Production is normally the main factor reducing the reserves at individual mines but, in 1999, declining metal prices were a significant factor in the reduction of ore reserves at producing mines.

### RECENT PRODUCTION DECISIONS

Several criteria need to be met for a project to be considered here to have reached the production decision stage. In general, there needs to have been a positive production feasibility study, all of the necessary permits must have been obtained, financing must have been arranged, and directors must have approved construction.

During 1999, Hudson Bay Mining and Smelting Co., Limited announced plans to bring the 777 deposit at Flin Flon, Manitoba, and the Chisel North deposit at Snow Lake, Manitoba, into production. The 777 deposit has reserves of 13.4 Mt containing 3.32% copper, 5.78% zinc, 2.7 g/t gold and 38 g/t silver. The Chisel North deposit has reserves of 2.4 Mt containing 10.8% zinc. Also during 1999, St. Andrew Goldfields Ltd. announced plans to begin production from a small open-pit mine on the Hislop West zone near Matheson, Ontario.

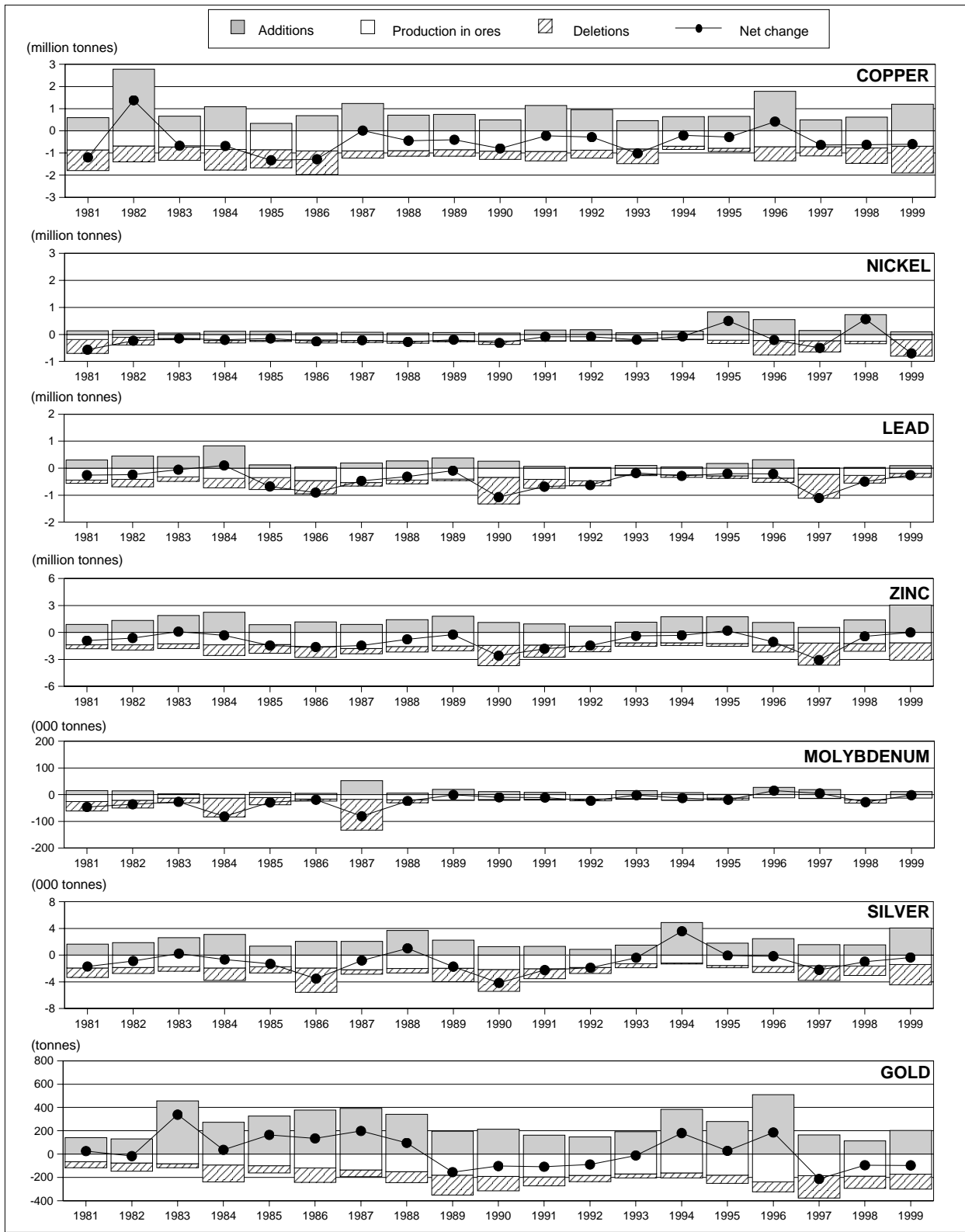
During 2000, there were no new production decisions.

Inco Limited's Voisey's Bay deposit in Labrador is poised for a production decision, but it is not included as a 2000 production decision because not all of the necessary permits and agreements were in place at that time.

### OUTLOOK

Given that there were no new production decisions, and prices of most of the metals covered in this chapter were depressed during 2000, it is probable that mine reserves of precious metals and base metals will decline further during 2000.

**Figure 3**  
**Main Components of Change in Canadian Reserves of Selected Major Metals, 1981-99**



Source: Natural Resources Canada.

At the Voisey's Bay nickel-copper-cobalt deposit, Inco had established proven reserves of 32 Mt grading 2.83% nickel, 1.68% copper and 0.12% cobalt at the end of 1999. If these figures are confirmed, Voisey's Bay will increase Canada's nickel reserves by about 18% and its copper reserves by about 7%.

*Notes: (1) Information in this review was current as of February 11, 2001. (2) This and other reviews, including previous editions, are available on the Internet at [http://www.nrcan.gc.ca/mms/cmty/index\\_e.html](http://www.nrcan.gc.ca/mms/cmty/index_e.html).*

### NOTE TO READERS

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**TABLE 1. MAIN COMPONENTS OF CHANGE DURING 1999 IN CANADIAN RESERVES OF SELECTED MAJOR METALS**

Metal	Units	Revised Opening Metal Balance, January 1999	Metal in Ore Mined During 1999	Metal Apparently Written Off During 1999	Metal in New Reserves Found During 1999	Net Change During 1999	Closing Metal Balance, December 1999	% Change During 1999
Copper	000 t	8 402	-704	-1164	1 222	-594	7 763	-7
Nickel	000 t	5 683	-225	-565	91	-699	4 983	-12
Lead	000 t	1 845	1 586	-154	94	-261	1 586	-14
Zinc	000 t	10 159	10 210	-1 944	3 038	50	10 210	0
Molybdenum	000 t	121	-13	-	11	-2	119	-2
Silver	t	15 738	1 424	-3033	4 075	-355	15 368	-2
Gold	t	1 415	-172	-127	202	-97	1 326	-7

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.

Note: May not balance due to rounding.

- Nil.

**TABLE 2. TONNAGES AND GRADES OF OPERATIONS INCLUDED IN CANADIAN RESERVES OF SELECTED MAJOR METALS, AS AT JANUARY 1, 2000**

Tonnages classified by companies as "possible" are not included where they are reported separately from proven and probable tonnages, nor are tonnages for deposits for which there is no firm production decision. Data reported in imperial units were converted to metric units and rounded to the corresponding number of significant digits. Confidential data have been suppressed from the details of this report.

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
<b>NEWFOUNDLAND</b>								
Nugget Pond Richmont Mines Inc. Proven and probable	249 476							10.97
<b>NEW BRUNSWICK</b>								
Brunswick No. 12 Underground Noranda Inc. Proven	33 226 000	0.39		3.39	8.64		103.30	..
Probable	4 200 000	0.27		3.48	8.60		94.90	..
<b>QUEBEC</b>								
Beaufor Aurizon Mines Ltd. Louvem Mines Inc. Proven	314 387						..	7.32
Probable	732 020						..	7.64
Bell Allard Noranda Inc. Proven	2 770 000	1.21		0.12	13.16		36.70	0.70
Probable	576 000	1.54		0.13	12.77		47.30	0.70
Bouchard-Hébert Cambior inc. Proven and probable	5 274 000	0.70			4.70		38.00	1.20
Bousquet No. 2 Barrick Gold Corporation Mineable	2 540 117	0.29					..	6.31
Doyon Barrick Gold Corporation Cambior inc. Proven and probable	10 600 000						..	6.30
Francoeur Richmont Mines Inc. Proven and probable	398 254						..	7.54
Gallen Noranda Metallurgy Inc. Probable	465 000	0.16			4.58		29.90	1.00
Joe Mann Campbell Resources Inc. Proven	163 224	..					..	9.22
Probable	110 627	..					..	10.11
Kiena McWatters Mining Inc. Proven	1 724 000						..	4.08
Probable	926 000						..	4.20
Langlois (Grevet) Cambior inc. Proven and probable	5 610 000	0.60			9.40		43.00	0.10
LaRonde Agnico-Eagle Mines Limited Proven and probable	28 618 050	0.33			4.78		79.89	3.43
Louvicourt Aur Resources Inc. Novicourt Inc. Teck Corporation Proven	5 288 000	3.66			1.67		28.30	0.90
Probable	2 185 000	2.52			1.99		27.30	0.80
Raglan Falconbridge Limited Proven	7 407 000	0.78	2.97					
Probable	12 291 000	0.76	2.73					



TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
<b>QUEBEC (cont'd)</b>								
Selbaie A1 Open Pit								
Billiton Metals Canada Inc. (Gencor Ltd.)								
Proven and probable	13 775 000	0.37		..	1.35		25	0.32
Sigma No. 1								
McWatters Mining Inc.								
Proven and probable	16 263 000						..	3.02
Sleeping Giant								
Aurizon Mines Ltd.								
Cambior inc.								
Proven	232 000						..	12.00
Probable	385 000						..	10.00
Troilus (Lac Frotet)								
INMET Mining Corporation								
Proven and probable	38 299 000	0.09					..	0.96
<b>ONTARIO</b>								
Campbell								
Placer Dome North America								
Proven and probable	4 044 000						..	14.50
David Bell								
Homestake Canada Inc.								
Teck Corporation								
Reserves	3 900 000						..	11.00
Dome (including Paymaster)								
Placer Dome North America								
Proven and probable	29 974 000						..	1.80
Eagle River								
River Gold Mines Ltd.								
Proven and probable	1 500 000						..	10.78
Edwards								
River Gold Mines Ltd.								
VenCan Gold Corporation								
Proven	85 900						..	12.10
Probable	90 600						..	14.46
Falconbridge Sudbury Integrated Nickel								
Operations								
Falconbridge Limited								
Proven	10 403 000	1.31	1.60					
Probable	9 099 000	1.39	1.44					
Glimmer								
Exall Resources Limited								
Glimmer Resources Inc.								
Mineable	1 137 000							8.31
Golden Giant								
Battle Mountain Gold Company								
Reserves	5 585 537						..	9.63
Holloway								
Battle Mountain Gold Company								
Teddy Bear Valley Mines, Limited								
Reserves	4 329 086						..	6.51
Holt-McDermott								
Barrick Gold Corporation								
Proven and probable	2 177 244						0.34	6.99
Hoyle Pond								
Kinross Gold Corporation								
Proven and probable	2 879 000						..	4.69
Inco Ontario Division								
Inco Limited								
Proven	157 000 000	1.16	1.26				..	..
Probable	71 000 000	1.37	1.53				..	0.19
Kidd Creek								
Falconbridge Limited								
Proven	19 213 000	2.29		..	5.57		66.00	
Probable	10 311 000	2.26		..	6.94		54.00	

TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
<b>ONTARIO (cont'd)</b>								
Lac des Îles (palladium-platinum)								
North American Palladium Ltd.								
Proven	10 525 000	0.07	0.06					0.14
Probable	62 683 000	0.06	0.05					0.14
Musselwhite								
Placer Dome Inc.								
TVX Gold Inc.								
Proven and probable	13 838 235							5.80
Red Lake (Arthur W. White)								
Goldcorp Inc.								
Proven and probable	2 985 545						..	30.17
Williams								
Homestake Canada Inc.								
Teck Corporation								
Reserves	25 400 000						..	5.00
<b>MANITOBA</b>								
777								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	9 400 000	2.80			4.40		..	..
Bissett (San Antonio)								
Harmony Gold Mining Company Limited								
Mineable	2 100 000							6.67
Callinan								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	3 100 000	1.30			5.00		..	2.00
Inco Manitoba Division								
Inco Limited								
Proven	24 000 000	0.16	2.39				..	..
Probable	21 000 000	0.13	2.15				..	..
Keystone								
Black Hawk Mining Inc.								
Stockpiles	126 500						..	2.24
New Britannia (Nor Acme/Snow Lake)								
High River Gold Mines Ltd.								
TVX Gold Inc.								
Reserves	2 843 000						..	6.72
Ruttan								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	8 200 000	1.00			1.60		..	..
Trout Lake								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	4 100 000	1.40			4.70		..	..
<b>SASKATCHEWAN</b>								
Konuto Lake								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	900 000	4.30			1.40		..	..
Seabee								
Claude Resources Inc.								
Proven and probable	507 206						0.30	8.89
<b>BRITISH COLUMBIA</b>								
Endako								
Nissho Iwai Corporation								
Thompson Creek Mining Limited								
Mineable	..						..	
Eskay Creek								
Prime Resources Group Inc.								
Reserves	1 460 567						2 341.71	51.29

TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
<b>BRITISH COLUMBIA (cont'd)</b>								
Golden Bear								
North American Metals Corp.								
Proven	494 416							..
Highland Valley								
Cominco Ltd.								
Highmont Mining Company								
Rio Algom Limited								
Teck Corporation								
Proven and probable	387 000 000	0.42				0.01	..	..
Huckleberry								
Mitsubishi Corporation, Dowa Mining								
Co., Ltd., Furukawa Co. Ltd., Marubeni								
Corporation								
Imperial Metals Corporation								
Proven and probable	61 762 000	0.50				0.01	2.76	0.06
Kemess South								
Royal Oak Mines Inc.								
Proven and probable	165 000 000	0.23						0.66
Mount Polley								
Imperial Metals Corporation								
Sumitomo Corporation								
Proven and probable	..	..						..
Myra Falls								
Westmin Resources Limited								
Proven	6 056 000	1.50				8.00	39.00	1.40
Probable	1 664 000	1.10				4.60	37.00	1.50
Sullivan								
Cominco Ltd.								
Proven	4 600 000			3.30	6.40		18.00	
<b>YUKON TERRITORY</b>								
Brewery Creek (Heap Leach)								
Viceroy Resource Corporation								
Reserves	3 053 000						..	1.59
<b>NORTHWEST TERRITORIES</b>								
Con								
Miramar Mining Corporation								
Proven	312 706						..	11.66
Probable	797 450						..	11.66
Giant Open Pit-Giant Underground								
Miramar Mining Corporation								
Proven and probable	207 518						1.37	12.41
<b>NUNAVUT</b>								
Lupin								
Echo Bay Mines Ltd.								
Proven	1 319 954						..	9.43
Probable	431 820						..	8.54
Nanisivik								
Nanisivik Mines Ltd.								
Proven and probable	3 222 000			0.40	7.40		31.00	
Polaris								
Cominco Ltd.								
Pine Point Mines Limited								
Reserves	2 100 000			3.50	13.20			

Source: Natural Resources Canada, based on published company reports.

.. Not available in published reports or estimated by author.

Notes: One tonne (t) = 1.1023113 short tons. One gram per tonne (g/t) = 0.02916668 troy ounces per short ton.

**TABLE 3. PRODUCTION DECISIONS ADDED TO CANADIAN RESERVE TOTALS AS AT DECEMBER 31, 1999**

Project	Operators and Major Partners	Province	Metals
777	Hudson Bay Mining and Smelting Co., Limited	Manitoba	Copper, zinc, silver, gold
Chisel North	Hudson Bay Mining and Smelting Co., Limited	Manitoba	Zinc

Source: Natural Resources Canada, based on company reports.

**TABLE 4. CANADIAN RESERVES OF SELECTED MAJOR METALS BY PROVINCE AND TERRITORY, AS AT DECEMBER 31, 1999**

Metal Contained in Proven and Probable Mineable Ore<sup>1</sup> in Operating Mines<sup>2</sup> and Deposits Committed to Production

Metal	Units <sup>3</sup>	Nfld.	N.B.	Que.	Ont.	Man.	Sask.	B.C.	Yukon	N.W.T.	Nunavut	Canada <sup>5</sup>
Copper	000 t	–	141	704	3 777	509	39	2 594	–	–	–	7 763
Nickel	000 t	–	–	556	3 402	1 025	–	–	–	–	–	4 983
Lead	000 t	–	1 273	13	62	–	–	152	–	–	86	1 586
Zinc	000 t	–	3 232	2 916	1 786	893	13	855	–	–	516	10 210
Molybdenum	000 t	–	–	–	–	–	–	119	–	–	–	119
Silver	t	–	3 831	3 622	2 861	579	9	4 358	2	3	102	15 368
Gold <sup>4</sup>	t	3	26	318	639	72	7	225	5	16	16	1 326

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.

– Nil or less than one unit.

<sup>1</sup> No allowance is made for losses in milling, smelting and refining. Excludes material classified as "possible." Includes "geological reserves" for some mines that do not report mineable ore. <sup>2</sup> Includes metal in mines where production has been suspended temporarily. <sup>3</sup> One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces. <sup>4</sup> Excludes metal in placer deposits because reserves data are generally unavailable. <sup>5</sup> May not balance due to rounding at the provincial level.

**TABLE 5. CANADIAN RESERVES OF SELECTED MAJOR METALS BY INDUSTRY, AS AT DECEMBER 31, 1999**

Metal Contained in Proven and Probable Mineable Ore<sup>1</sup> in Operating Mines<sup>2</sup> and Deposits Committed to Production

SIC no. <sup>5</sup>		Gold Mines	Copper, Copper-Zinc Mines	Nickel-Copper Mines	Zinc-Lead-Silver Mines	Molybdenum Mines	Miscellaneous Metal Mines	Canada <sup>6</sup>
		0611	0612	0613	0614	0615	0619	
	(Units <sup>3</sup> )							
Copper	000 t	138	4 126	3 274	178	–	48	7 761
Nickel	000 t	–	–	4 943	–	–	40	4 983
Lead	000 t	–	75	–	1 511	–	–	1 586
Zinc	000 t	1 368	4 552	–	4 290	–	–	10 210
Molybdenum	000 t	–	43	–	–	75	–	119
Silver	t	5 947	4 206	1 001	4 214	–	–	15 368
Gold <sup>4</sup>	t	1 045	199	39	32	–	10	1 326

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.

– Nil or less than one unit.

<sup>1</sup> No allowance is made for losses in milling, smelting and refining. Excludes material classified as "possible." Includes "geological reserves" for some mines that do not report mineable ore. <sup>2</sup> Includes metal in mines where production has been suspended temporarily. <sup>3</sup> One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces.

<sup>4</sup> Excludes metal in placer deposits because reserves data are generally unavailable. <sup>5</sup> SIC Standard Industrial Classification. <sup>6</sup> May not balance due to rounding at the SIC level.

**TABLE 6. CANADIAN RESERVES OF SELECTED MAJOR METALS AS AT DECEMBER 31 OF EACH YEAR, 1977-99**Metal Contained in Proven and Probable Mineable Ore<sup>1</sup> in Operating Mines<sup>2</sup> and Deposits Committed to Production

Year	Copper	Nickel	Lead	Zinc	Molybdenum	Silver	Gold <sup>3</sup>
	(000 t)	(000 t)	(000 t)	(000 t)	(000 t)	(t)	(t)
1977	16 914	7 749	8 954	26 953	369	30 991	493
1978	16 184	7 843	8 930	26 721	464	30 995	505
1979	16 721	7 947	8 992	26 581	549	32 124	575
1980	16 714	8 348	9 637	27 742	551	33 804	826
1981	15 511	7 781	9 380	26 833	505	32 092	851
1982	16 889	7 546	9 139	26 216	469	31 204	833
1983	16 214	7 393	9 081	26 313	442	31 425	1 172
1984	15 530	7 191	9 180	26 000	361	30 757	1 208
1985	14 201	7 041	8 503	24 553	331	29 442	1 373
1986	12 918	6 780	7 599	22 936	312	25 914	1 507
1987	12 927	6 562	7 129	21 471	231	25 103	1 705
1988	12 485	6 286	6 811	20 710	208	26 122	1 801
1989	12 082	6 092	6 717	20 479	207	24 393	1 645
1990	11 261	5 776	5 643	17 847	198	20 102	1 542
1991	11 040	5 691	4 957	16 038	186	17 859	1 433
1992	10 755	5 605	4 328	14 584	163	15 974	1 345
1993	9 740	5 409	4 149	14 206	161	15 576	1 333
1994	9 533	5 334	3 861	14 514	148	19 146	1 513
1995	9 250	5 832	3 660	14 712	129	19 073	1 540
1996	9 667	5 623	3 450	13 660	144	18 911	1 724
1997	9 032	5 122	2 344	10 588	149	16 697	1 510
1998	8 402	5 683	1 845	10 159	121	15 738	1 415
1999	7 761	4 983	1 586	10 210	119	15 368	1 326

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.

<sup>1</sup> No allowance is made for losses in milling, smelting and refining. Excludes material classified as "possible." Includes "geological reserves" for some mines that do not report mineable ore. <sup>2</sup> Includes metal in mines where production has been suspended temporarily. <sup>3</sup> Excludes metal in placer deposits because reserves data are generally unavailable.

Note: One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces.