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THE CANADIAN MINERAL INDUSTRY

MONTHLY REPORT

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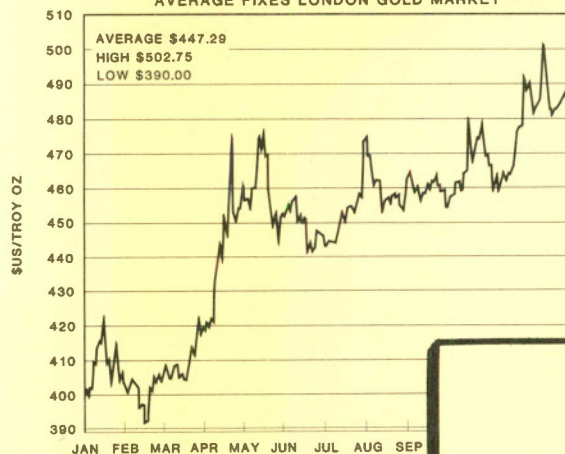
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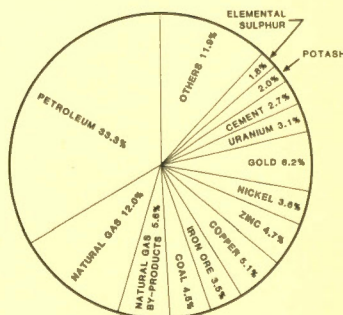
ANNUAL FIELD EXPENDITURES ON
 OFF- AND ON-PROPERTY MINERAL EXPLORATION
 IN CANADA



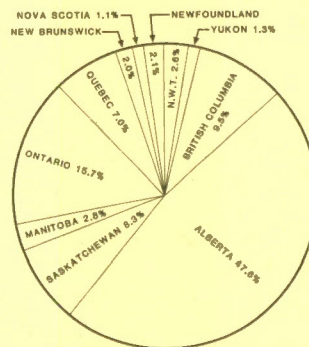
DAILY GOLD PRICES 1987
 AVERAGE FIXES LONDON GOLD MARKET



CANADA, MINERAL PRODUCTION, 1987



% OF TOTAL BY COMMODITY



% OF TOTAL BY PROVINCE

Canada

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ISSN 0229-1908

THE CANADIAN MINERAL INDUSTRY

MONTHLY REPORT



**Energy, Mines and
Resources Canada**

**Énergie, Mines et
Ressources Canada**

PREFACE

This publication is prepared in the Mineral Policy Sector of the Department of Energy, Mines and Resources. It is compiled from many sources using the best information available to us. This report is intended to be a general review of the more important current developments that affect, or may affect the Canadian mineral industry. It should not be considered an authority for exact quotation or an expression of the official views of the Government of Canada.

Mineral Policy Sector
Department of Energy, Mines and Resources
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Ottawa, Ontario K1A 0E4

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THE CANADIAN MINERAL INDUSTRY FOR DECEMBER

The following constitutes a brief summary of the Canadian mineral industry based on information that became available in December.

ECONOMIC TRENDS

Table 1 provides a comparison of the volume of production of Canada's leading minerals for the months of September and October 1988, the corresponding months last year, as well as the year-to-date totals.

In the metals group: copper, gold, iron ore, nickel, silver, zinc and molybdenum showed gains in production during the first ten months of 1988 compared to last year. Lead and uranium experienced decreases in production on a year-to-date basis.

In the nonmetals group: asbestos, potash and lime showed gains in production for the first ten months of 1988 compared to last year. Clay products, gypsum and cement experienced decreases on a year-to-date basis.

Table 2 provides information on Canada's Gross Domestic Product at factor cost by industry at 1981 prices. The data is also annualized and seasonally adjusted.

The annual rate shown for any given month is calculated by multiplying the figure for that month by twelve. It is important to note, however, that if a particular month has been influenced by special factors such as a strike, the annualized data will reflect this bias.

Factor cost refers to output which is valued exclusive of excise taxes and duties, and provincial and municipal sales tax. Factor cost does, however, include subsidies and other taxes which are not a function of the level of output or sale.

Seasonally adjusted data represent time-series data from which the effects of repetitive and clearly defined seasonal fluctuations have been removed. Such a practice permits the isolation of trends in the economy which might otherwise be obscured. Seasonal factors include such items as climate, trade practices and social institutions such as Christmas and Easter.

The GDP data are subject to ongoing revision.

GDP at Factor Cost at 1981 prices increased by 0.1% in October, following a 0.3% gain in September and a 0.6% gain in August. In October, the GDP stood 3.1% above the level of the corresponding month last year. Services producing industries advanced by 0.3% in October, while the output of goods producing industries declined by 0.2%.

Table 3 shows the prices of selected metals for September and October 1988.

TABLE 1. CANADA, PRODUCTION OF LEADING MINERALS ('000 TONNES EXCEPT WHERE NOTED)

		1987			1988			Percentage Changes		
		September	October	Total 10 Months	September	October	Total 10 Months	October 1988 October 1987	October 1988 September 1988	1st 10 months 1988 1987
Metals										
Copper		63.8	62.8 ^r	611.4	56.0	66.0	625.4	5.1	17.9	2.3
Gold	kg	10 906.0	10 860.4	93 486.7	11 084.4	11 554.1	106 422.0	6.4	4.2	13.8
Iron ore		3 403.0	3 802.0 ^r	29 735.7	3 376.9	3 851.7	32 230.3	1.3	14.1	8.4
Lead		53.6	29.2	326.6	39.4	32.6	303.6	11.6	-17.3	-7.0
Molybdenum	t	881.5	744.3 ^r	10 117.5	1 032.6	1 033.2	10 764.7	38.8	0.1	6.4
Nickel		17.8	19.1	157.4	17.8	20.0	160.1	4.7	12.4	1.7
Silver	t	131.1	121.1 ^r	1 022.1	114.2	116.5	1 153.0	-3.8	2.0	12.8
Uranium ¹	t	922.6	1 479.9	10 634.2	1 137.9	1 209.3	10 233.8	-18.3	6.3	-3.8
Zinc		131.1	123.3	1 039.7	151.4	112.0	1 114.0	-9.2	-26.0	7.1
Nonmetals										
Asbestos		56.0	60.7	546.6	60.9	64.6	590.9	6.4	6.1	8.1
Clay products	\$000	18 507.3	21 049.1	177 982.9	18 359.3	22 275.3	160 584.5	5.8	21.3	-9.8
Gypsum		929.0	1 034.1	7 914.5	845.9	872.6	7 410.3	-15.6	3.2	-6.4
Potash K ₂ O		617.8	628.2	6 255.6	638.6	639.4	6 815.3	1.8	0.1	8.9
Cement		1 307.7	1 417.8	10 908.2	1 307.0	1 209.0	10 401.1	-14.7	-7.5	-4.6
Lime		189.2	201.4	1 897.4	215.7	202.4	2 062.0	0.5	-6.2	8.7
Salt		826.0	1 046.0	7 936.2	868.7	1 037.5	8 558.9	-0.8	19.4	7.8
Fuels										
Coal		5 479.2	5 822.4 ^r	49 494.6	5 623.9	..	..	..	..	..
Natural gas	million m ³	7 182.0	9 009.0 ^r	78 200.0	8 416.0	..	..	..	..	..
Crude oil and equivalent	000 m ³	7 835.0	8 263.0 ^r	78 489.0	8 538.0	..	..	..	..	..

¹ Tonnes uranium (1 tonne U = 1.2999 short tons U₃O₈).^r Revised; .. Not available.

**TABLE 2. CANADA, REAL GROSS DOMESTIC PRODUCT AT FACTOR COST BY INDUSTRY, IN 1981 PRICES, MONTHLY
(SEASONALLY ADJUSTED AT ANNUAL RATES)**

Industry Sector	1987	1988			Percentage Change October 1988 October 1987
	October	August	September	October	
	(\$ million)				
Total Economy	387 584.5	389 047.4	399 197.5	399 670.1	3.1
Primary Industries					
Agriculture	11 572.2	9 968.6	10 054.3	10 039.8	-13.2
Forestry	3 038.4	2 741.2	2 627.2	2 707.3	-10.9
Fishing and Trapping	596.1	620.6	667.4	646.3	8.4
Mines, Quarries and Oil Wells	22 773.1	24 029.2	23 893.0	23 648.6	3.8
Mining Industries	8 234.2	8 502.4	8 194.8	8 266.1	0.4
Gold Mines	1 498.4	1 444.2	1 432.2	1 505.7	0.5
Iron Mines	612.8	678.9	635.7	653.7	6.7
Other Metal Mines	4 046.0	4 055.6	3 809.2	3 915.0	-3.2
Nonmetal Mines	783.1	886.0	923.2	872.9	11.5
Asbestos Mines	157.5	170.4	174.0	172.8	9.7
Mineral Fuels					
Coal Mines	1 033.2	1 136.5	1 099.3	1 030.8	-0.2
Crude Petroleum and Natural Gas	12 705.8	13 821.6	13 935.6	13 868.4	9.2
Secondary Industries					
Manufacturing	75 821.2	78 854.8	79 179.3	78 904.2	4.1
Non-durable Manufacturing	32 830.1	33 381.3	33 365.7	33 374.2	1.7
Durable Manufacturing	42 991.1	45 473.5	45 813.6	45 530.0	5.9
Primary Metal Industries	6 235.4	6 477.5	6 324.7	6 259.7	0.4
Primary Steel Industries	2 494.0	2 556.3	2 517.9	2 489.2	-0.2
Steel, Pipe and Tube Industry	362.0	366.7	373.8	303.8	-16.1
Iron Foundries	348.3	348.0	330.0	360.0	3.4
Smelting and Refining	2 301.8	2 455.8	2 334.3	2 369.2	2.9
Nonmetallic Mineral Products	2 416.0	2 424.1	2 475.7	2 398.9	-0.7
Clay Products Industry	85.1	79.2	84.0	81.6	-4.1
Cement Industry	325.0	322.8	319.2	307.2	-5.5
Ready-mix Concrete Industry	462.1	447.7	475.3	446.5	-3.4
Construction Industry	27 257.9	27 814.8	28 544.4	28 449.6	4.4
Transportation and Storage	17 828.3	18 652.8	18 597.6	18 637.2	4.5
Communications	11 189.8	12 082.8	12 121.2	12 247.2	9.4
Other Utilities	11 376.4	11 546.4	11 334.0	11 550.0	1.5
Wholesale Trade	21 787.0	22 657.2	22 560.0	22 546.8	3.5
Retail Trade	25 180.0	25 659.7	25 912.2	26 108.2	3.7
Finance, Insurance and Real Estate	56 591.9	58 731.6	59 005.2	59 079.8	4.4
Community, Business and Personal Service	39 029.4	40 310.2	40 260.6	40 516.3	3.8

TABLE 3. METAL PRICES - 1988

	September	October
Copper		
Electrolytic, U.S. producer f.o.b. refinery, cents (U.S.)	114.720	136.648
Electrolytic, COMEX, 1st pos. plus 5¢, cents (C.)	142.567	166.904
Electrolytic, Standard, LME cash, cents (U.S.)	105.127	127.646
Lead		
New York, cents (U.S.)	38.000	38.375
Montreal, cents (C.)	47.000	47.000
LME cash, cents (U.S.)	27.629	29.683
Silver		
New York, cents (U.S.) per troy oz.	636.481	627.762
Toronto, cents (C.) per troy oz.	809.614	784.995
LME cash, cents (U.S.) per troy oz.	633.545	625.536
Zinc		
St. Louis, H.G., cents (U.S.)	68.255	69.466
Montreal, Electrolytic, cents (C.)	85.000	87.000
LME cash, cents (U.S.)	60.298	68.851
Tin		
New York, dealers, cents (U.S.)	344.906	339.056
Metals Week, composite, cents (U.S.)	463.050	454.324
Gold		
London, p.m., US\$ per troy oz.	413.473	406.750
Average, (Sharps Pixley) US\$ per troy oz.	413.447	406.586
High, (Sharps Pixley) US\$ per troy oz.	430.400	413.000
Low, (Sharps Pixley) US\$ per troy oz.	395.300	395.450
Mercury		
New York, dealers, US\$ per flask	333.571	297.000
Nickel		
New York, dealers, cathode (U.S.)	5.207	5.125
LME cash, US\$	5.389	5.242
Antimony		
New York, dealers, cents (U.S.)	105.000	105.000
Platinum		
New York, refined, US\$ per troy oz.	600.000	600.000
Cadmium		
New York, dealers, US\$	6.974	5.925
Aluminum		
LME cash, cents (C.)	132.804	126.258
LME cash, cents (U.S.)	108.278	104.757
Cobalt		
Shot/cathode/250 kg., US\$	7.500	7.500
U.S. spot cathode, US\$	7.025	7.038
Tungsten		
LMB ore, low, US\$/MTU	52.750	53.875
Molybdenum		
M.W. dealer oxide, US\$	3.495	3.473
Uranium		
Nuexco, US\$ U ₃ O ₈	14.150	13.750

Average U.S. Exchange Rate for September = 1.22651, October 1.20525.

Note: Prices are per pound unless otherwise stated.

SPECIAL ITEMS

Advanced Industrial Materials
A. Werner (613) 992-7613

Advanced Industrial Materials Research Activities at the National Research Council of Canada's Industrial Materials Research Institute (IMRI), Boucherville, Quebec, 1987.

The latest annual report of activities published by IMRI indicates active interest in the Institute on the part of companies in the mineral industry.

Among the Institute's "Research Partners" are: Alcan International Limited; The Algoma Steel Corporation, Limited; Almax Industries (1980) Limited; Cominco Ltd.; Quebec Cartier Mining Company (QCM); Esso Resources Canada Limited; Noranda Inc.'s Research Centre; Reynolds Aluminum Company of Canada Ltd.; Sherritt Gordon Limited; Sidbec-Dosco Inc.; and Stelco Inc.

Examples of projects of interest to the mineral industry are:

- a computer-integrated system for predicting the behaviour of alloys in die-casting;
- the use of ultrasound velocities to measure the formability and texture of sheet metal;
- development of titanium-boride (TiB_2) - based materials resistant to wear;
- a simulation model to predict drilling speed in diamond drilling for mineral exploration; and
- the development of high-temperature superconductor wires.

For copies of the report, contact:

Industrial Materials Research Institute
National Research Council of Canada
75 De Mortagne Blvd.
Boucherville, Quebec
J4B 6Y4
(814) 641-2280.

Metal Mining and Exploration – What the Latest Statistics Tell Us

André Lemieux (613) 992-2709

and

Donald A. Cranstone (613) 992-4666

Mining

For the third year in a row, gold production in 1988 (128 t) surpassed the 100 t mark last achieved 20 years ago. Gold reserves were up more than 15% from 1987. Since 1979, they have more than quadrupled. Commitments made since the beginning of 1988 show that, of at least 25 metal-bearing deposits to be developed into mines, 17 are gold deposits. Gold reserves and gold production will both keep rising in 1988 and 1989.

Mine site investments in gold rose more than three-fold from \$260 million (in 1987 dollars) in 1981 to more than \$800 million in 1987, as many new gold discoveries were put into production and as production capacity at some existing mines was upgraded. In 1988, they may reach \$1 billion. As a result of concerted efforts in gold exploration and development, the production of gold may well, in the near future, surpass the all-time production record of 166 t set in 1941.

Even though many base-metal operations were trimmed during the difficult years, 1982-86, Canada's 1987 production levels for zinc and lead were the highest ever, copper output was the highest since 1974, and nickel output the highest since 1977. This maintenance of production levels is a remarkable achievement, possible only through the mining industry's major improvements in efficiency and productivity. With gold constantly in the limelight, it is easy to overlook that the major base metals produced (copper, zinc, nickel, and lead) together were still worth about 2.3 times the value of gold produced in Canada in 1987 (gold \$2.2 billion, copper \$1.8 billion, zinc \$1.7 billion, nickel \$1.3 billion, and lead \$0.4 billion).

Attention to gold tends to obscure the deteriorating outlook for production of copper, zinc and lead beyond the mid-1990s. From 1981 to 1988, reserves of all the major metals declined significantly: copper by 23%, nickel by 20%, zinc by 30%, lead by 34%, and molybdenum by 60% (Figure 1). These reserves have dropped because of the closure of uneconomic mines, downward reassessment of former reserves in light of expectations of lower prices than were initially assumed, mine exhaustion, and delay in delineating additional reserves to replace mined-out ore in some producing mines. Mine site investments in base metals dropped significantly from 1980 to 1983, and, except for a slight rise in 1984-85, have (in constant dollars) remained close to the 1983 level.¹

Exploration

During 1987, Canadian mineral exploration was at an all-time high, fuelled by increased activity by junior mining companies. Sales of flow-through shares issued for companies listed on Canadian stock exchanges surged to almost \$1.2 billion, the largest volume in one year, up spectacularly from \$34 million in 1983. Sales of flow-through shares during 1988 are estimated at approximately \$1 billion.

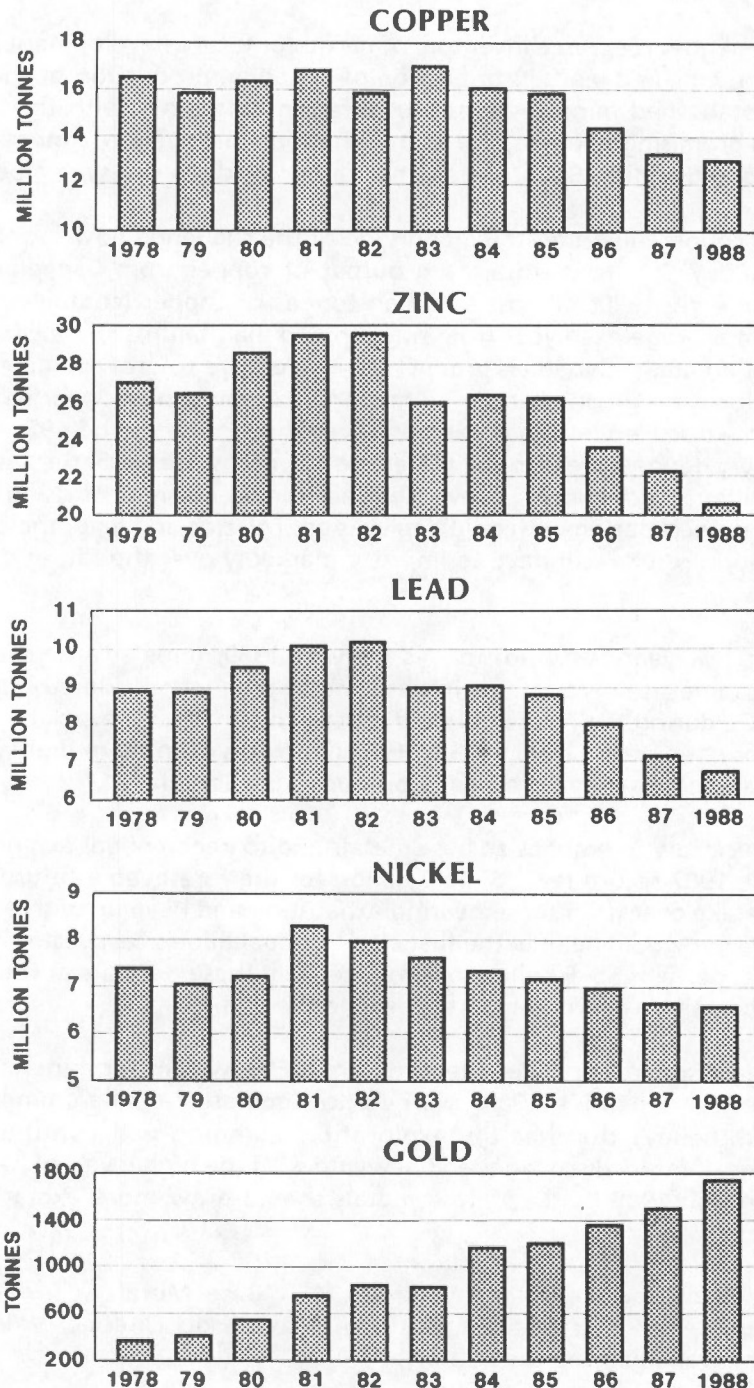
¹ For more details about mine production, reserves, development, promising deposits, exploration and discoveries see, for example, Lemieux, A.; Jen, L.S.; Bouchard, G. and Cranstone, D.A.; "Canadian Mines: Perspective from 1988" Mineral Bulletin MR 221, Energy, Mines and Resources Canada, in press.

Figure 1

LEVELS OF RESERVES

QUANTITIES OF METALS CONTAINED IN
RESERVES OF MINEABLE ORE IN OPERATING CANADIAN MINES AND
DEPOSITS COMMITTED FOR PRODUCTION AS AT JANUARY 1 OF EACH YEAR

(Note that most vertical scales do not start at zero)



A record number of metallic mineral deposits were discovered during 1987, with the count (still in progress) already totalling more than 60 discoveries and likely to climb significantly higher. This surpasses the previous record of 50 discoveries in 1981, the previous record year for expenditures on mineral exploration. More than 80% of exploration expenditures in Canada in 1987 was directed towards precious metals; not surprisingly, seven out of eight of the metallic mineral deposits discovered in 1987 are gold deposits. Since 1980, more than 250 new gold deposits have been discovered in Canada. Ten years ago, only one in ten discoveries promising enough to lead to mine development was a gold deposit; now, nine in ten are gold deposits.

Discussion

Whereas the known resource inventory of nickel for future development is sizeable, this is not the case for copper, zinc and lead. A projection of Canadian production of these metals, on the basis of currently established mine reserves plus inferred extensions with the addition of an optimistic mix of known promising deposits, shows their national production cannot be maintained at the current levels beyond the mid-1990s unless some major new discoveries are made soon.²

The case of copper illustrates the magnitude of the challenge now facing the Canadian mineral exploration industry. Just to maintain the output of copper from Canadian mines at the current level beyond the early 1990s, almost a million tonnes of copper (contained in ore) would have to be discovered on average each year from now on. To maintain its share of a world copper market growing at 1.5% annually, Canadian production would have to grow commensurately, and, to support such production growth, an average 1.3 million t/y of mineable copper would have to be found. Historically, such a discovery rate has been achieved only in the period 1956-75, when most known Canadian porphyry deposits were found. Over the 12 years since 1975, the average discovery rate was less than 0.2 million t/y of copper, a level that has shown no signs of rising in recent years with the overwhelming preoccupation with gold exploration. For zinc and lead, the challenge is less formidable, but exploration results will have to improve markedly over the rather dismal record of the 1980s.

In the next few years, and possibly as early as 1989, mine site investments in gold production may surpass mine site investments in base-metal production, something that probably last occurred in the 1930s, during the heyday of gold mining in Canada. The lack of growth in total mine site investments for base metals from 1983 to 1987 illustrates even more dramatically the new investment needed in base metals to maintain their production in Canada.

It will be necessary to emphasize base metals and to keep annual exploration spending in Canada at least at the 1987 record level of \$1.3 billion for the foreseeable future if Canada is to find enough deposits to take over from those nearing exhaustion and keep up with expected growth in mineral demand. But that would be only the first step. Annual mine site investments may have to be some 4 times as large, perhaps \$5-6 billion, to produce from these deposits at the levels required for Canada to hold on to its share of world markets beyond the mid-1990s.

The Canadian Exploration Incentives Program (CEIP), which (for minerals other than oil and gas) came into effect on January 1, 1989, will help to stimulate Canadian mineral exploration. There is every reason to believe that healthy exploration spending will continue to lead to a significant number of new mineral discoveries and new mines. If the high levels of base-metal prices that have prevailed through 1988 hold up, base metals should draw more exploration attention again in Canada.

² See, for example, Cranstone, D.A., and Lemieux, A.; "Base Metals - Today's Exploration Challenge", Congrès annuel de l'Association des prospecteurs du Québec, Val-d'Or, Québec, Sept. 14-16, 1988 (copies available from the authors).

**Principal Canadian Nonferrous and Precious Metal Mine
Production in 1987**
Lo-Sun Jen (613) 992-0658

In 1987, principal Canadian nonferrous and precious metal mines producing copper, nickel, lead, zinc, silver and gold milled 167 Mt of ore, yielding record amounts of metal-in-concentrate or mine bullion since 1978. These included 821 000 t copper, 197 000 t nickel, 463 000 t lead, 1 572 000 t zinc, 1 450 t silver and 114 t gold. As a result of an upswing in metal prices in 1987, copper, lead, zinc, silver and gold production reached its highest points in the past ten years. All metals were up in 1987 compared with 1986: copper 2%, nickel 9%, lead 18%, zinc 16%, silver 5% and gold 11%.

Table 1 provides a concentrator by concentrator account of the principal nonferrous and precious metal mine production in 1987. The table essentially provides basic information on the milling capacity, tonnage and grades of ore milled, and amounts of metals contained in all concentrates produced. Due to the lack of information for metallurgical balances by early September, at least 15 concentrators, mostly small new gold operations or operations with small production in 1987, are not included in the table (see footnote in table).

The table also provides a quantitative estimate on the type of ore milled for each of the metals produced. An article specifically dealing with the determination, classification of ore type and ranking of mines and deposits by ore type, will be presented in a later issue of this monthly report.

TABLE 1. PRINCIPAL CANADIAN NONFERROUS AND PRECIOUS METAL MINE PRODUCTION IN 1987

Company and Mine/Mill	Capacity (tonnes per day)	Grades of Ore Milled						Ore	Metal Contained in All Concentrates Produced					
		Cu %	Ni %	Pb %	Zn %	Ag (g/tonne)	Au	Milled (tonnes)	Copper	Nickel	Lead (tonnes)	Zinc	Silver (kilograms)	Gold
NEWFOUNDLAND														
Teck-Amax Joint Venture Newfoundland Zinc Mill	1 451	0	0	0	6.63	0	0	140 456	0	0	0	9 135	0	0
Total	1 451	0	0	0	6.63	0	0	140 456	0	0	0	9 135	0	0
By Ore Type														
Cu		0						0						
Ni			0					0						
Pb				0				0						
Zn					6.63			140 456						
Ag						0		0						
Au							0	0						
NEW BRUNSWICK														
Brunswick Mining and Smelting Corporation Limited Brunswick Mill	10 251	0.37	0	3.5	8.85	103.89	0.6	3 446 922	9 952	0	89 468	258 110	250 259	103
Gordex Minerals Limited Cape Spencer Heap Leach	635	0	0	0	0	0.1	1.47	61 748	0	0	0	0	4	64
Total	10 886	0.36	0	3.44	8.69	102.06	0.62	3 508 669	9 952	0	89 468	258 110	250 264	167
By Ore Type														
Cu		0.37						3 446 922						
Ni			0					0						
Pb				3.5				3 446 922						
Zn					8.85			3 446 922						
Ag						102.06		3 508 669						
Au							0.62	3 508 669						
QUEBEC														
Agnico-Eagle Mines Limited (Gold Division) Eagle Mill	1 633	0	0	0	0	2.4	5.69	451 897	0	0	0	0	543	2 327

Cambior inc. Yvan Vezina Mill	998	0	0	0	0	1.41	3.09	325 714	0	0	0	0	409	1 057
American Barrick Resources Corporation (Camflo Division) Camflo Mill	1 179	0	0	0	0	0.17	3.05	440 721	0	0	0	0	73	1 291
Bachelor Lake Gold Mines Inc. (Quebec Sturgeon River Mines Limited) Bachelor Lake Mill	454	0	0	0	0	0.27	4.7	28 712	0	0	0	0	7	124
Belmoral Mines Ltd. Ferderber Mill	1 361	0	0	0	0	0.58	5.04	351 106	0	0	0	0	190	1 624
BP Resources Canada Limited Selbaie Mill ("A" Ore Circuit)	7 013	1.15	0	0	2.21	67.54	0.41	2 352 860	26 157	0	0	45 349	47 746	895
Campbell Resources Inc. (Metals & Minerals Group) Camchib Mill (Flotation Circuit)	3 266	0.54	0	0	0	5.52	4.83	371 154	1 946	0	0	0	1 807	2 603
Kiena Gold Mines Limited Kiema Mill	1 250	0	0	0	0	0.69	4.56	478 752	0	0	0	0	307	2 087
Lac Minerals-SOQUEM Joint Venture Doyon Mill	1 361	0	0	0	0	0.72	8.47	466 810	0	0	0	0	308	3 470
Lac Minerals Ltd. (Est- Malartic Division) Est-Malartic Mill	1 996	0	0	0	0	0.62	5.38	698 786	0	0	0	0	399	2 891
Lac Minerals Ltd. (Terrains Aurifères Divison) Terrains Aurifères Mill (Malartic Goldfields Mill)	1 588	0	0	0	0	1.2	5.52	531 943	0	0	0	0	584	2 692
Minnova Inc. (Lake Dufault Division) Lake Dufault Mill (Norbec)	1 542	0.99	0	0	2.2	30.03	2.26	240 668	1 855	0	0	4 299	2 074	254
Minnova Inc. (Lac Shortt Division) Lac Shortt Mill	1 089	0	0	0	0	0.21	4.59	395 748	0	0	0	0	73	1 696
Minnova Inc. (Opemiska Division) Opemiska Mill	2 540	1.36	0	0	0	10.29	2.13	407 229	5 401	0	0	0	3 559	719

TABLE 1. PRINCIPAL CANADIAN NONFERROUS AND PRECIOUS METAL MINE PRODUCTION IN 1987 (cont'd)

Company and Mine/Mill	Capacity (tonnes per day)	Grades of Ore Milled						Ore Milled (tonnes)	Metal Contained in All Concentrates Produced					
		Cu %	Ni %	Pb %	Zn %	Ag (g/tonne)	Au		Copper	Nickel	Lead (tonnes)	Zinc	Silver (kilograms)	Gold
Muscocho Explorations Ltd. Montauban Mill	399	0	0	0	0	50.67	3.31	120 967	0	0	0	0	3 349	346
Noranda Inc. (Horne Division) Horne Mill (Chadbourne Circuit)	3 447	0	0	0	0	4.49	4.97	24 324	0	0	0	0	103	114
Noranda Inc. (Horne Division) Horne Mill (Copper Circuit) - See Chadbourne Circuit	0	5.73	0	0	0	0.08	0.05	374 734	18 581	0	0	0	26	17
Noranda Inc. (Matagami Division) Matagami Lake Mill (Matagami Circuit)	3 946	0.99	0	0	5.17	24.51	0.39	976 767	8 535	0	0	44 244	4 940	85
Noranda Inc. (Matagami Division) Matagami Lake Mill (Isle- Dieu Circuit) See Matagami Circuit	0	1.01	0	0	16.55	107.66	0.31	4 804	45	0	0	751	376	1
Noranda Inc. (Mines Gaspé Division) Gaspé No. 1 Mill (No. 2 Circuit)	10 002	2	0	0	0	5.9	0.07	341 311	6 426	0	0	0	1 509	6
Northgate Mines Inc. Copper Rand Mill	3 084	1.46	0	0	0	8.67	4.66	498 338	7 125	0	0	0	2 922	2 087
Sigma Mines (Quebec) Ltd. Sigma Mill	1 270	0	0	0	0	0.86	4.7	440 138	0	0	0	0	364	1 998
Société québécoise d'exploration minière (SOQUEM) Manitou Mill (Cyanide Circuit-Custom Ore)	900	0	0	0	0	0.52	6.54	165 767	0	0	0	0	84	963

Total	50 317	0.78	0	0	1.04	20.36	3.06	10 489 250	76 070	0	0	94 643	71 752	29 348
By Ore Type														
Cu		1.48						5 567 864						
Ni			0					0						
Pb				0				0						
Zn					3.04			3 575 099						
Ag						20.36		10 489 250						
Au							3.06	10 489 250						
ONTARIO														
Agnico-Eagle Mines Limited (Silver Division) Penn Mill	260	0	0	0	0	764.57	0	25 953	0	0	0	0	18 992	0
Ateba Mines Inc. Ateba Mill	181	0	0	0	0	0.45	7.37	1 216	0	0	0	0	0	8
Canamax Resources Inc. Bell Creek Mill	350	0	0	0	0	0.51	7.3	29 564	0	0	0	0	14	197
Dickenson Mines Limited Arthur White Mill	907	0	0	0	0	1.37	10.17	219 666	0	0	0	0	241	1 982
Falconbridge Limited (Sudbury Operations) Falconbridge Mill	2 722	0.73	1.24	0	0	6.86	0.14	492 802	3 419	5 173	0	0	1 688	34
Falconbridge Limited (Sudbury Operations) Strathcona Mill	9 072	1.33	1.48	0	0	5.01	0.1	1 896 016	23 850	24 198	0	0	8 194	158
Falconbridge Limited (Timmins Operations) Kidd Creek Mill ("A" Ore Circuit)	13 499	3.45	0	0.11	5.22	50.78	0	3 484 646	116 227	0	2 832	159 471	181 433	0
Falconbridge Limited (Timmins Operations) Kidd Creek Mill ("C" Ore Circuit) - See "A" Ore Circuit	0	1.26	0	0.78	8.02	201.26	0	760 823	8 404	0	4 818	52 907	117 656	0
Falconbridge Limited (Timmins Operations) Kidd Creek Gold Mill	408	0	0	0	0	6	11.38	207 584	0	0	0	0	1 143	2 168
Giant Yellowknife Mines Limited (Timmins Div) No. 1 Mine Concentrator (Pamour No. 1 Mill)	2 631	0	0	0	0	1.51	2.47	884 873	0	0	0	0	317	1 963

TABLE 1. PRINCIPAL CANADIAN NONFERROUS AND PRECIOUS METAL MINE PRODUCTION IN 1987 (cont'd)

Company and Mine/Mill	Capacity (tonnes per day)	Grades of Ore Milled						Ore Milled (tonnes)	Metal Contained in All Concentrates Produced					
		Cu %	Ni %	Pb %	Zn %	Ag (g/tonne)	Au		Copper	Nickel	Lead (tonnes)	Zinc	Silver (kilograms)	Gold
Giant Yellowknife Mines Limited (Timmins Div) Schumacher Mill	2 585	0.03	0.01	0.01	0.04	2.57	2.54	901 291	148	0	0	0	1 327	1 896
Golden Shield Resources Ltd. (Kerr Mine Division) Kerr Addison Mill	1 225	0	0	0	0	0.17	3.43	343 259	0	0	0	0	57	1 147
Hemlo Gold Mines Inc. Golden Giant Mill	3 000	0	0	0	0	5.14	13.51	884 979	0	0	0	0	425	11 369
INCO Limited (Ontario Division) Sudbury District Mills	56 245	1.15	1.21	0	0	5.9	0.38	10 461 316	114 152	106 005	0	0	48 211	2 491
Lac Minerals Ltd. (Hemlo Division) Page-Williams Mill	4 050	0	0	0	0	0.87	7.17	1 223 518	0	0	0	0	1 007	8 285
Lac Minerals Ltd. (Macassa Division) Macassa Mill	454	0	0	0	0	2.57	15.63	145 521	0	0	0	0	355	2 134
Lake Asbestos of Quebec, Ltd. Aquarius Mill	272	0	0	0	0	3.02	6.27	66 065	0	0	0	0	185	386
Noranda Inc. (Geco Division) Geco Mill	3 629	1.7	0	0.23	4.81	59.66	0.14	1 278 891	20 691	0	2 194	58 439	58 572	85
Noranda Inc. (Mattabi Division) Mattabi Mill	2 788	0.52	0	0.99	9.9	101.49	0.34	844 789	4 001	0	7 131	77 864	73 394	216
Orofino Resources Limited Scadding Mill (Scadding Circuit)	141	0	0	0	0	0	4.29	12 226	0	0	0	0	0	44
Orofino Resources Limited Scadding Mill (Norstar Circuit) - See Scadding Circuit	0	0.89	0	0	0	0	7.06	29 457	232	0	0	0	0	171

Placer Dome Inc. Campbell Mill	1 066	0	0	0	0	1.99	21.67	355 273	0	0	0	0	668	7 291
Placer Dome Inc. - Amoco Joint Venture Detour Lake Mill	2 230	0	0	0	0	0.86	2.78	748 511	0	0	0	0	605	1 953
Placer Dome Inc. Dome Mill	2 722	0	0	0	0	0.79	4.32	986 201	0	0	0	0	745	4 106
Royex Gold Mining Corporation now Corona Corporation - American Barrick Resources Renabie Mill	594	0	0	0	0	1.65	6.41	200 259	0	0	0	0	255	1 190
Teck-International Corona Joint Venture Teck-Corona Mill	998	0	0	0	0	0.55	13.23	364 730	0	0	0	0	198	4 643
Total	112 028	1.14	0.6	0.08	1.45	22.37	2.2	26 849 428	291 125	135 376	16 974	348 681	515 683	53 916
By Ore Type														
Cu		1.52						20 150 032						
Ni			1.17					13 751 425						
Pb				0.29				7 270 441						
Zn					5.34			7 270 441						
Ag						22.4		26 807 745						
Au							2.61	22 578 006						
MANITOBA														
Granges Exploration Ltd.- Abermin Corporation Tartan Mill	476	0	0	0	0	0.96	8.57	27 216	0	0	0	0	16	156
Hudson Bay Mining and Smelting Co., Limited (Flin Flon Group) Flin Flon Mill	7 076	1.67	0	0	4.16	16.05	1.65	1 062 205	16 121	0	0	36 103	11 733	1 148
Hudson Bay Mining and Smelting Co., Limited (Snow Lake Group) Snow Lake Mill	3 447	3.11	0	0.15	3.4	20.23	1.37	804 175	24 288	0	1 065	24 103	10 302	644
Hudson Bay Mining and Smelting Co., Limited Ruttan Mill	6 700	1.54	0	0	1.01	11.02	0.79	1 850 307	26 585	0	0	15 987	14 215	488

TABLE 1. PRINCIPAL CANADIAN NONFERROUS AND PRECIOUS METAL MINE PRODUCTION IN 1987 (cont'd)

Company and Mine/Mill	Capacity (tonnes per day)	Grades of Ore Milled						Ore Milled (tonnes)	Metal Contained in All Concentrates Produced					
		Cu %	Ni %	Pb %	Zn %	Ag (g/tonne)	Au		Copper	Nickel	Lead (tonnes)	Zinc	Silver (kilograms)	Gold
INCO Limited (Manitoba Division) Thompson Mill	13 608	0.19	2.76	0	0	5.14	0.1	2 432 337	4 313	61 650	0	0	9 756	152
SherrGold Inc. (now LynnGold Resources Inc.) MacLellan Mill	1 089	0	0	0	0	15.98	5.45	264 236	0	0	0	0	2 004	1 270
Total	32 396	1.18	1.04	0.02	1.4	10.94	0.97	6 440 476	71 307	61 650	1 065	76 193	48 026	3 857
By Ore Type														
Cu		1.23						6 149 024						
Ni			2.76					2 432 337						
Pb				0.15				804 175						
Zn					2.43			3 716 687						
Ag						10.94		6 440 476						
Au							0.97	6 440 476						
SASKATCHEWAN														
Saskatchewan Mining Development Corporation Star Lake Mill	181	0	0	0	0	2.4	15.77	71 629	0	0	0	0	138	1 053
Total	181	0	0	0	0	2.4	15.77	71 629	0	0	0	0	138	1 053
By Ore Type														
Cu		0						0						
Ni			0					0						
Pb				0				0						
Zn					0			0						
Ag						2.4		71 629						
Au							15.77	71 629						
BRITISH COLUMBIA														
Blackdome Mining Corporation Blackdome Mountain Mill (Clinton Project)	181	0	0	0	0	74.74	21.26	74 000	0	0	0	0	3 759	1 387
Brenda Mines Ltd. (Noranda) Brenda Mill	29 937	0.19	0	0	0	1.75	0.03	10 291 394	17 728	0	0	0	8 949	135

Broken Hill Proprietary Company Limited, The (Utah Division) Island Copper Mill	46 502	0.42	0	0	0	1.65	0.18	17 089 030	60 864	0	0	0	13 914	1 529
Cominco Ltd. Sullivan Mill	9 072	0	0	6.3	6.05	67.2	0	1 264 303	0	0	72 770	70 040	75 424	0
Cominco Ltd.-Lornex Mining Corporation Ltd. Lornex-Bethlehem Mills	120 021	0.44	0	0	0	1.37	0.01	41 999 932	160 962	0	0	0	28 263	119
Dickenson Mines Limited (Silvana Division) Carnegie Mill	109	0	0	9.41	5.9	612.34	0	25 653	0	0	2 340	1 434	15 244	0
Mascot Gold Mines Limited (amalg. into Corona Corporation) Nickel Plate Mill	2 449	0	0	0	0	2.23	4.04	481 454	0	0	0	0	832	1 512
Mosquito Consolidated Gold Mines Limited Mosquito Creek Mill	100	0	0	0	0	3.98	12	4 672	0	0	0	0	17	50
Newmont Mines Limited (Similkameen Division) Similkameen Mill	19 051	0.44	0	0	0	3.43	0.13	6 842 429	23 352	0	0	0	11 730	10
Noranda Inc. (Babine Division) Bell Mill	15 422	0.45	0	0	0	1.3	0.17	5 409 542	21 940	0	0	0	3 545	889
Placer Dome Inc. Endako Mill	29 937	0	0	0	0	0	0	4 716 453	0	0	0	0	0	0
Placer Dome Inc. Equity Silver Mill	9 888	0.26	0	0	0	78.89	0.85	3 610 049	6 149	0	0	0	159 959	1 273
Placer Dome Inc. Gibraltar Mill	37 195	0.35	0	0	0	1.03	0.01	12 575 395	33 529	0	0	0	7 487	50
Taurus Resources Ltd. (now International Taurus Resources Inc.) Taurus Mill	163	0	0	0	0	1.44	3.74	33 941	0	0	0	0	27	70
Teck Corporation Afton Mill	6 804	0.82	0	0	0	4.42	0.65	2 931 565	19 805	0	0	0	8 305	1 527
Teck Corporation (Beaverdell Division) Beaverdell Mill	101	0	0	0.42	0.48	328.11	0	36 533	0	0	135	153	10 573	0

TABLE 1. PRINCIPAL CANADIAN NONFERROUS AND PRECIOUS METAL MINE PRODUCTION IN 1987 (cont'd)

Company and Mine/Mill	Capacity (tonnes per day)	Grades of Ore Milled						Ore Milled (tonnes)	Metal Contained in All Concentrates Produced					
		Cu %	Ni %	Pb %	Zn %	Ag (g/tonne)	Au		Copper	Nickel	Lead (tonnes)	Zinc	Silver (kilograms)	Gold
Total Erickson Resources Ltd. Erickson Mill	181	0	0	0	0	6.86	14.4	86 345	0	0	0	0	536	1 154
Westmin Resources Limited (Brascan) Myra Falls Mill	3 500	2.46	0	0.36	4.91	40.11	1.99	1 089 805	25 137	0	3 374	47 579	33 197	1 320
Total	330 613	0.4	0	0.08	0.12	5.61	0.16	108 562 496	369 465	0	78 619	119 206	381 763	11 026
By Ore Type														
Cu		0.43						101 839 140						
Ni			0					0						
Pb				3.57				2 416 295						
Zn					5.45			2 416 295						
Ag						5.86		103 846 042						
Au							0.17	102 519 552						
YUKON TERRITORY														
Curragh Resources Corporation (now 630902 Ontario Inc.) Faro Mill	13 500	0.15	0	3.31	4.93	39.5	0.11	4 539 394	2 975	0	121 539	184 727	109 211	1 448
Total Erickson Resources Ltd. Mount Skukum Mill	272	0	0	0	0	13.03	15.39	97 032	0	0	0	0	1 068	1 380
United Keno Hill Mines Limited Elsa Mill	454	0	0	2.32	0	781.71	0	78 834	0	0	1 315	0	48 130	0
Total	14 226	0.14	0	3.23	4.75	51.36	0.43	4 715 260	2 975	0	122 854	184 727	158 409	2 828
By Ore Type														
Cu		0.15						4 539 394						
Ni			0					0						
Pb				3.29				4 618 228						
Zn					4.93			4 539 394						
Ag						51.36		4 715 260						
Au							0.43	4 636 425						

NORTHWEST TERRITORIES

Cominco Ltd. (Pine Point Operations) Pine Point Mill	9 979	0	0	3.9	9.6	0	0	3 187 847	0	0	121 471	293 626	0	0
Cominco Ltd. Polaris Mill	3 348	0	0	3	13.6	0	0	983 755	0	0	28 158	129 456	0	0
Echo Bay Mines Ltd. Lupin Mill	1 678	0	0	0	0	1.68	10.29	612 576	0	0	0	0	984	6 006
Giant Yellowknife Mines Limited (Yellowknife Division) Giant Mill	1 134	0	0	0	0	2.06	8.16	349 841	0	0	0	0	623	2 472
Giant Yellowknife Mines Limited (Salmita Division) Tundra Mill	159	0	0	0	0	5.14	26.23	21 155	0	0	0	0	107	545
Nanisivik Mines Ltd. (Mineral Resources International Limited) Nanisivik Mill	1 996	0	0	0.6	8.9	39.81	0	688 000	0	0	3 896	58 267	21 315	0
NERCO Minerals Company Con Mill	680	0	0	0	0	1.71	13.71	198 773	0	0	0	0	316	2 492
Total	18 974	0	0	2.61	8.29	4.9	2.06	6 041 947	0	0	153 526	481 349	23 345	11 516
By Ore Type														
Cu		0												0
Ni			0											0
Pb				3.25										4 859 602
Zn					10.31									4 859 602
Ag						15.82								1 870 346
Au							10.52							1 182 346

CANADIAN

Total	571 073	0.55	0.14	0.32	1.05	12.73	0.79	166 819 610	820 894	197 026	462 505	1 572 044	1 449 380	113 709
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TABLE 1. PRINCIPAL CANADIAN NONFERROUS AND PRECIOUS METAL MINE PRODUCTION IN 1987 (cont'd)

Company and Mine/Mill	Capacity (tonnes per day)	Grades of Ore Milled					Ore	Metal Contained in All Concentrates Produced						
		Cu	Ni	Pb	Zn	Ag	Au	Milled	Copper	Nickel	Lead	Zinc	Silver	Gold
		%	%	%	%	(g/tonne)		(tonnes)	(tonnes)			(kilograms)		
By Ore Type														
Cu		0.65						141 692 376						
Ni			1.41					16 283 762						
Pb				2.3				23 415 662						
Zn					5.87			29 964 894						
Ag						13.46		157 749 416						
Au							0.88	151 426 352						

Note: At least 15 more mills/concentrators were in production in 1987 but were not included in the above table. These are: (1) Hope Brook heap leaching pad of Hope Brook Gold Inc. in Newfoundland; (2) East Kemptville Tin Corporation mill (owned and operated by a banking group in 1987 and re-acquired by Rio Algom Limited in March 1988, which produces copper and zinc as by-products of tin) in Nova Scotia; (3) Beacon mill of d'Or Val Mines Ltd. and (4) Gaspé oxide leach plant of Noranda Inc. in Quebec; (5) Eastmaque mill of Eastmaque Gold Mines Ltd., (6) Golden-Rose mill of Emerald Lake Resources Inc. and Place Resources Corporation, (7) Hellens-Eplett mill (a small silver operation owned by Silverside Resources Inc. and International Platinum Corporation), (8) Timmins heap leaching plant of Giant Yellowknife Mines Limited, (9) Tyrant mill of Tyrant Gold Inc. and Mill City Gold Inc., (10) Upper Canada mill of Golden Shield Resources Ltd. which closed after only one year of operation in 1987, and (11) Winston Lake mill (a zinc operation) of Minnova Inc. in Ontario; (12) Puffy Lake mill of Pioneer Metals Corporation in Manitoba and, (13) Dankoe mill (a small silver operation) of Skylark Resources Ltd. and Viscount Resources Ltd., (14) Gibraltar solvent extraction - electrowinning (SX-EW) plant (leached waste rock for copper) of Placer Dome Inc. and (15) Union heap leach pad of Sumac Ventures Inc. in British Columbia. Estimated total production from these 15 mills/concentrators amounts to less than 3% of the total Canadian production of gold and silver, about 1% of total production of copper and less than 1% of total production of zinc.

