Tungsten

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CANADIAN DEVELOPMENTS

Until 1986, Canada was a major producer of tungsten ore and concentrate. Annual production reached a high of 3715 t of tungsten content (8% of world) production in 1984, after which prices collapsed as a result of increased exports from the People's Republic of China. The low-priced material from China eventually forced the closure of the Canadian operations at the Cantung and Mount Pleasant mines in the Northwest Territories and New Brunswick, respectively.

The Cantung mine operated by Canada Tungsten Mining Corporation Limited (Cantung), Canada's leading tungsten company, was recognized as the largest producer of tungsten concentrate in the Western World. Located in the Northwest Territories, the Cantung mine was in operation between 1962 and 1986 at a rate of about 4450 t/y of tungsten trioxide (WO_3). Higher-grade concentrates were marketed directly while lower-grade concentrates were sent to the Fort Madison, Iowa, plant for conversion to ammonium paratungstate (APT).

North American Tungsten Corporation Ltd. re-opened the mine in 2001 when prices increased; however, the company announced in December 2003 that it was forced to close the mine due to the termination of loans and purchasing agreements for the concentrate produced at the mine. At that time, prices had again fallen and the company sought legal protection under the *Companies' Creditors Arrangement Act*.

During 2004 and early 2005, the company was restructured and funds were raised to re-open the mine. Kaska Minerals Corporation, a First Nations corporation based in the Yukon, became the largest single shareholder in North American Tungsten and consultation was under way on the feasibility of establishing an APT plant in southeastern Yukon and the development of the Mactung property. The company expected to resume operations at the Cantung mine in 2005.

North American Tungsten indicates that current mineable reserves at the Cantung mine are 771 000 t at an average grade of 1.75% WO_3, with additional potential for underground and open-pit resources. At the Mactung deposit, the largest deposit of tungsten in the world, the company indicated reserves and resources of 30 Mt at an average grade of 0.96% WO_3. Additional information is available on the Internet at www.northamericantungsten.com.

EXPLORATION ACTIVITY

Companies with Canadian exploration projects with potential for tungsten include[1]:

- Buchans River Ltd., Granite Lake, Newfoundland and Labrador (www.newlab.nf.ca);
- Copper Ridge Explorations Inc., Kalzas, Yukon (www.copper-ridge.com);
- Freeport Resources Inc., Omineca, British Columbia, former producer;
- Geodex Minerals Ltd., Beech Hill and Sisson Brook/Nashwaak properties, New Brunswick (optioned from Champlain Resources Inc.);
- J.A.G. Mines Ltd., Beauce, Quebec (www.mines-jag.com/JAGenglish/Jag.html);
- Noront Resources Ltd., Burnt Hill, New Brunswick, former producer (www.norontresources.com);
- Orphan Boy Resources Inc., Revelstoke, British Columbia (www.orphanboy.com);
- Strategic Metals Ltd., various properties in Yukon and northern British Columbia (www.strategicmetalsltd.com); and
- Sultan Minerals Inc., Salmo, British Columbia, former producer (www.sultanminerals.com).

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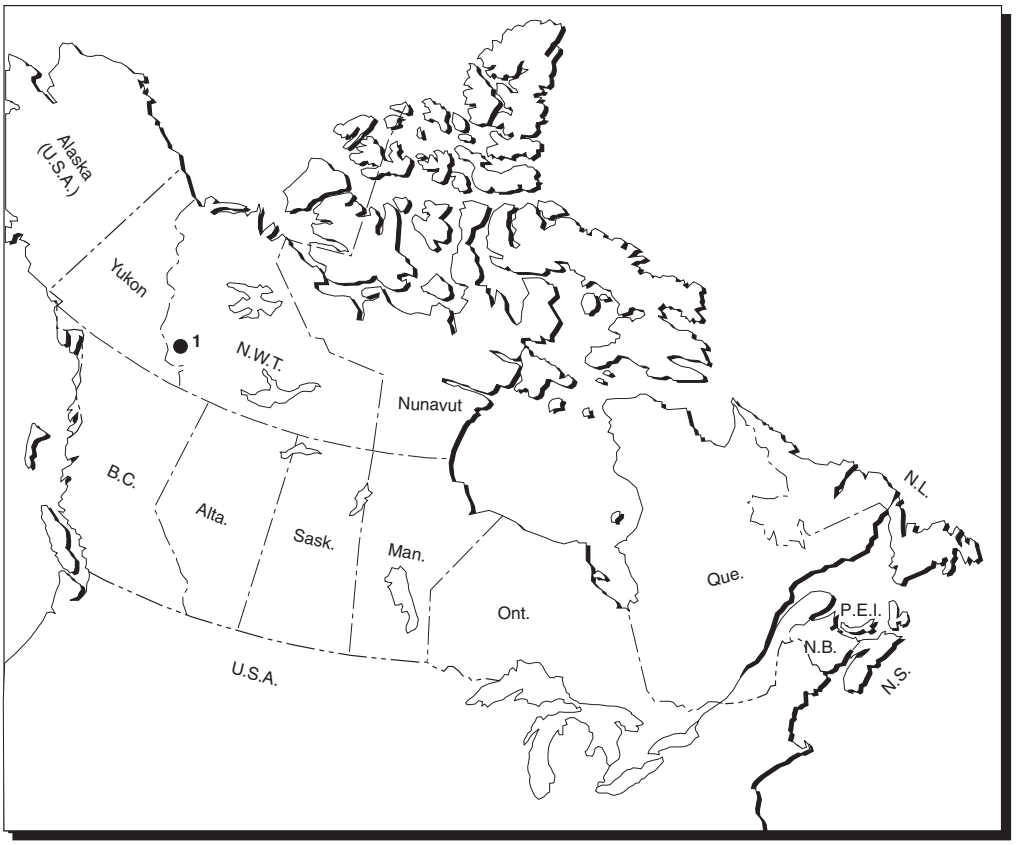
[1] If your company has a tungsten property that you would like to have included, contact the Minerals and Metals Sector with details.

Figure 1
Location of Cantung Mine, Northwest Territories



1. Cantung mine, North American Tungsten Corporation Ltd.

Other Canadian-based companies with international interests include:

- Rome Resources Ltd., with various properties in Mexico (www.romermr.com);
- Primary Metals Inc., who owns 100% of Beralt Tin and Wolfram (Portugal) S.A.; the latter owns and operates the Panasqueira tungsten mine in Portugal, one of the world's largest producers of tungsten concentrates outside of China (www.primarymetals.ca);
- Tiberon Minerals Ltd., a tungsten-fluorspar deposit at Nui Phao in Vietnam (www.tiberon.com); and
- Verena Minerals Corporation, a gold-tungsten property in the state of Rio Grande do Norte, Brazil (www.verena.com).

USE AND PROPERTIES

Canada's use data for tungsten are confidential due to the low number of users.

Tungsten's properties include a very high density, the highest melting point of any metal at 3410°C, a low coefficient of thermal expansion, high tensile strength at elevated temperatures, high corrosion resistance, good thermal and electrical conductivity, and its hardness. Tungsten metal is the hardest of the refractory metals and tungsten carbide is one of the hardest substances.

About 60% of tungsten concentrate is used for tungsten cemented carbide products such as tools and wear parts. Steel and metal products, including wire, electrical contacts and welding equipment, each account for 15%, nonferrous alloys and pigments/catalysts account for 5%, and other uses account for 5%.

Ammonium paratungstate (APT) is the most important intermediate in the production of tungsten metal powder and tungsten carbide, and for some chemical uses of tungsten. It is used to produce tungsten trioxide ("yellow oxide" and "blue oxide"), which can be converted into tungsten powder for use in the manufacture of cemented carbides and lightbulb filaments, as well as other uses.

Due to its hardness, tungsten carbide has widespread application where intense wear and abrasion are encountered. This product is the preferred metal-working material for the cutting edges of machine tools and as a metal surface in forming and shaping dies. It is produced by the chemical combination of tungsten metal powder and finely divided carbon. Tungsten carbide is compacted to the desired form, using cobalt as a binder, and sintered to produce cemented tungsten carbide. Other uses of tungsten carbide include: tire studs, spikes for golf shoes, armour-piercing projectiles, and welding electrodes. Tungsten can also replace lead in ammunition to produce "green" ammunition.

As an alloy constituent, tungsten is used primarily in the production of high-speed steels and tool and die steels. Tungsten-bearing steels are used for the same applications as carbides, especially where lower operating temperatures are encountered.

Tungsten is also used in superalloys and nonferrous alloys. Tungsten-containing superalloys are being used increasingly in high-temperature applications and in highly corrosive environments because of their high-temperature strength and oxidation resistance.

Tungsten wire is used for filaments in incandescent lamps and for heating elements in both fluorescent lamps and vacuum tubes. Minor amounts of tungsten are also used to make chemicals and compounds for non-metallurgical applications. Some of the end uses include dyes, chemical reagents, catalysts, lubricants, paints and varnishes.

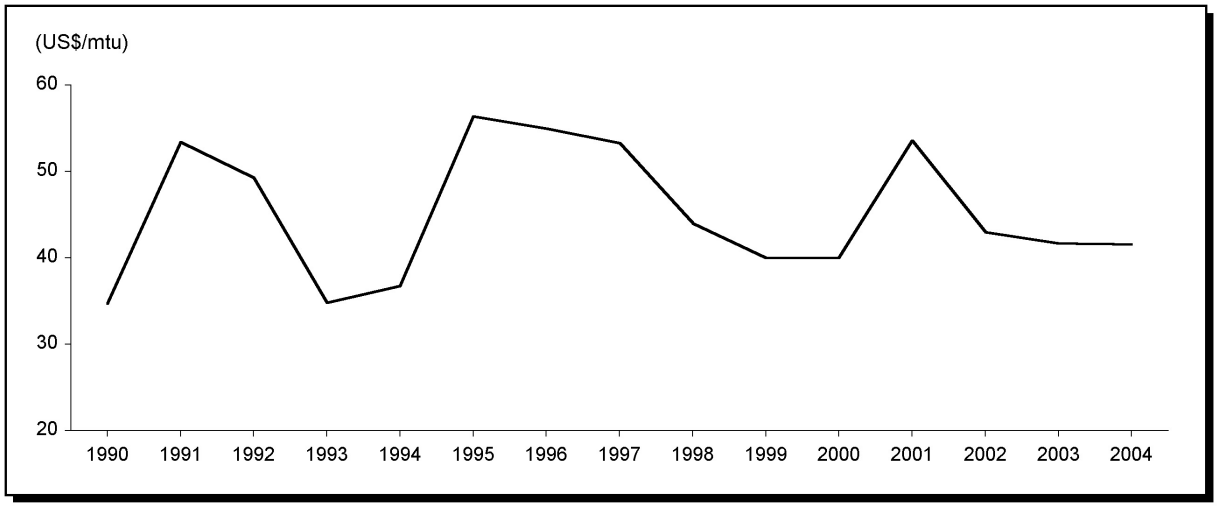
PRICES

Various tungsten prices can be found in journals such as *Platts Metals Week* and *Metal Bulletin*. Most are given in metric tonne units (mtu), which is 1% of one metric tonne or 10 kg of contained metal.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 64. (2) Most information in this review was current as of March 31, 2005. (3) Although HS codes are often not specific enough to identify individual tungsten-containing compounds, if you feel that publication of additional trade statistics would assist you or your company, please contact the Minerals and Mining Statistics Division by telephone at 1-800-267-0452 or by e-mail at info-mms@nrcan.gc.ca. (4) This and other reviews, including previous editions, are available on www.nrcan.gc.ca/mms/cmy/com_e.html.

NOTE TO READER

Figure 2
Tungsten Ore, U.S. Spot Prices, 1990-2004



Source: *Platts Metals Week*, annual average of weekly prices.
mtu Metric tonne unit.

TARIFFS

Item No.	Description	Canada			United States	EU	Japan
		MFN	GPT	USA	Canada	Conventional Rate (1)	WTO (2)
2611.00	Tungsten ores and concentrates	Free	Free	Free	Free	Free	Free
2841.80	Tungstates (wolframates)	5.5%	3%	Free	Free	5.6%	3.3%
2849.90.10	Tungsten carbide	Free	Free	Free	Free	5.5%	2.5%
7202.80	Ferro-tungsten and ferro-silico-tungsten	Free	Free	Free	Free	Free	2%
81.01	Tungsten (wolfram) and articles thereof, including waste and scrap						
8101.10.10	Powder, not alloyed	Free	Free	Free	Free	5%	Free
8101.10.20	Powder, alloyed	Free	Free	Free	Free	5%	Free
8101.94.10	Other: Unwrought tungsten, including bars and rods obtained simply by sintering; sintered bars and rods, not alloyed	Free	Free	Free	Free	5%	Free
8101.94.91	Other: Unwrought tungsten, including bars and rods obtained simply by sintering; Other: Unwrought tungsten, not alloyed	Free	Free	Free	Free	5%	Free
8101.94.92	Other: Unwrought tungsten, including bars and rods obtained simply by sintering: Other: Unwrought tungsten, alloyed	Free	Free	Free	Free	5%	Free
8101.95.10	Other: Bars and rods, other than those obtained simply by sintering; profiles, plates, sheets, strip and foil; bars and rods, not alloyed	Free	Free	Free	Free	6%	Free
8101.95.21	Other: Bars and rods, other than those obtained simply by sintering; profiles, plates, sheets, strip and foil; bars and rods, alloyed; profiles, plates, sheets, strip and foil, not alloyed	Free	Free	Free	Free	6%	Free
8101.95.22	Other: Bars and rods, other than those obtained simply by sintering; profiles, plates, sheets, strip and foil; bars and rods, alloyed; profiles, plates, sheets, strip and foil, alloyed	Free	Free	Free	Free	6%	Free
8101.96.10	Other: Wire, not alloyed	Free	Free	Free	Free	6%	Free
8101.96.21	Other: Wire, alloyed, not coated or covered	Free	Free	Free	Free	6%	Free
8101.96.22	Other: Wire, alloyed, coated or	Free	Free	Free	Free	6%	Free
8101.97	Other: Waste and scrap	Free	Free	Free	Free	Free	Free
8101.99.10	Other: Other; for use in Canadian manufactures	Free	Free	Free	Free	7%	Free
8101.99.90	Other: Other, other	3%	Free	Free	Free	7%	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, TUNGSTEN TRADE, 2002-04

Item No.		2002		2003		2004 (p)	
		(kilograms)	($000)	(kilograms)	($000)	(kilograms)	($000)
EXPORTS							
2611.00	Tungsten ores and concentrates	3 620 143	22 702	5 332 049	24 657	2 816 789	5 156
8101.10	Tungsten (wolfram) powders	28 313	976	344 777	3 171	341 803	6 382
8101.99	Tungsten (wolfram) and articles thereof, n.e.s.	–	–	77	17	481	35
	Total exports	3 648 456	23 678	5 676 903	27 845	3 159 043	11 553
IMPORTS							
2611.00	Tungsten ores and concentrates	3	. . .	1 272	20	3 809	40
2841.80	Tungstates (wolframates)	10 205	35	38 399	118	98 597	308
2849.90.00.10	Tungsten carbide	168 170	5 811	155 004	5 440	190 311	6 431
7202.80	Ferrotungsten and ferro-silico-tungsten	70 364	591	3 134	26	9 590	105
8101.10.00.10	Tungsten powders, not alloyed	34 640	1 316	61 180	1 656	110 181	3 377
8101.10.00.20	Tungsten powders, alloyed	29 730	1 337	24 377	1 294	24 403	1 209
8101.94.00.10	Unwrought tungsten, sintered bars and rods, not alloyed	10 935	650	6 289	387	4 444	250
8101.94.00.91	Unwrought tungsten, not alloyed	3 624	93	3 541	73	1 419	33
8101.94.00.92	Unwrought tungsten, alloyed	9 760	383	3 360	135	2 747	112
8101.95.00.10	Tungsten not alloyed, other than that obtained simply by sintering	2 172	95	3 719	218	2 418	138
8101.95.00.21	Tungsten bars and rods, not alloyed; profiles, plates, sheets, strip and foil	3 579	259	4 643	248	5 915	270
8101.95.00.22	Tungsten bars and rods, alloyed, other than that obtained simply by sintering; profiles, plates, sheets, strip and foil	19 259	1 445	15 903	1 080	14 199	950
8101.96.00.10	Tungsten wire, not alloyed	4 458	243	5 656	296	4 757	284
8101.96.00.21	Tungsten wire, alloyed, not coated or covered	292	23	170	11	5 749	333
8101.96.00.22	Tungsten wire, alloyed, coated and covered	41 224	2 111	40 584	1 865	7 630	351
8101.97	Unwrought tungsten, waste and scrap	1 885	79	2 134	94	5 588	274
8101.99.10	Tungsten (wolfram) and articles, thereof, n.e.s.	5 154	296	11 181	604	18 054	1 165
8101.99.90	Tungsten, other	21 573	1 192	16 315	858	24 869	1 564
	Total imports	437 018	15 959	394 861	14 423	534 680	17 194

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . . Amount too small to be expressed; n.e.s. Not elsewhere specified; (p) Preliminary.
Note: Numbers may not add to totals due to rounding.