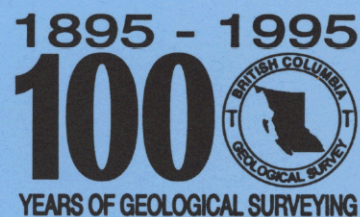




Ministry of Energy, Mines and Petroleum Resources  
Mineral Resources Division  
Hon. Anne Edwards, Minister



# BRITISH COLUMBIA MINERAL EXPLORATION REVIEW 1994

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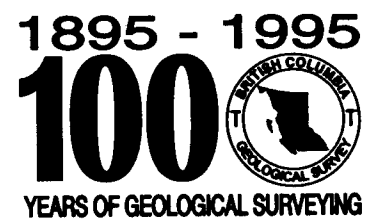
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*Information Circular 1995-1*



1895 - 1995  
**100**



YEARS OF GEOLOGICAL SURVEYING

1995 is the 100th anniversary of the British Columbia Bureau of Mines, the predecessor to the present Mineral Resources Division. The Bureau brought together into one Department all government offices that dealt wholly with mining, including the Gold Commissioners, the Government Assay office, the Inspector of Mines and the newly created Provincial Mineralogist.

The Provincial Mineralogist, later known as the Chief Geologist, was charged with the collection of information on the geology and various mining projects in the Province, for the publication of such information to make the mineral wealth of the Province more widely known, and also for promoting the development of the mining industry. These are the origins of the British Columbia Geological Survey Branch.

In 1995 we celebrate 100 years of geological surveying; dedication and progress.

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## BRITISH COLUMBIA MINING, DEVELOPMENT AND EXPLORATION 1994 HIGHLIGHTS

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### INTRODUCTION

Buoyed in part by the increase in the copper price to the US\$1.15-\$1.20 per pound range, and the gold price, which approached the US\$400 per ounce mark in late September and fell back in the US\$390 range, three mines re-opened in the fall of 1994: **Similco**, **Gibraltar**, and **Afton/Ajax**. The **Myra Falls** mine also re-opened following resolution of a long labour dispute. Exploration and development programs at most mining operations in the province have been successful in adding reserves which will result in increased mine lives. Construction of the **Eskay Creek** high-grade silver-gold mine was completed by September; direct shipping ore is scheduled to be transported by road to rail and ship load-outs in January 1995. Eskay Creek will be the first new metal mine to open in western Canada in several years. The **QR** (Quesnel River) gold project is under construction with production scheduled for April 1995. At the **Golden Bear** gold mine, the focus has turned to the potential for heap leaching of lower grade material. Significant new discoveries of both refractory and oxide ore have been made recently.

Despite the intense global competition for exploration dollars, several companies and individuals continued to conduct small to medium-sized programs, primarily in areas having a good database, known resources in the ground, and higher probability of development and production. Total exploration expenditures in 1994 are estimated to be approximately \$100 million, a 30% increase over 1993. Targets included many of the classic mineral deposit types for which British Columbia is known. For example **Eskay Creek**, **Red Mountain**, **Huckleberry**, **Akie**, and properties in the Interior Plateau region and the **Aiken-Johanson Lakes** areas. The estimate for the number of claim units recorded in 1994 indicates about a 10% increase from 1993. The rally in the price of gold may enable small, high-grade gold operations to start up; several bulk sampling projects were carried out. A number of advanced projects have entered the Mine Development Assessment Process, with many in the feasibility stage. Some projects (e.g., **Cirque**, **Mount Milligan** and **Mount Polley**) have received Mine Development Certificates and await production decisions.

Coal production for 1994 is expected to be back to pre-1992 levels. Industrial minerals are receiving increasing

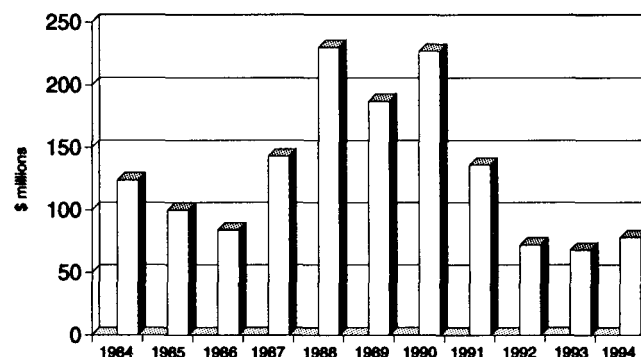
attention with 1994 exploration expenditures estimated at \$4.5 million, up from \$2 million in 1993.

In 1994 the British Columbia government initiated the three-year \$13.5 million **Explore B.C.** program. It is designed to assist and promote private sector mineral exploration, to extend the economic lives of existing mines and contribute to community stability in existing mining regions. This program has had positive and encouraging results from those projects supported in 1994.

### REGIONAL PERSPECTIVES AND TRENDS

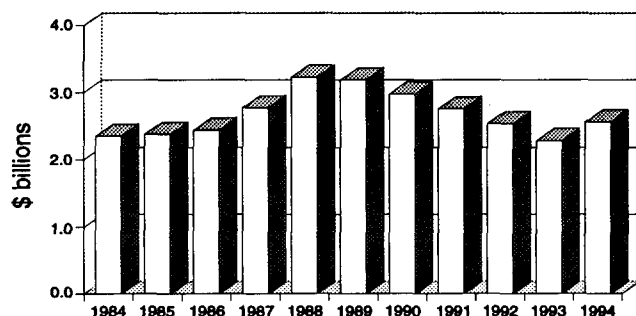
Preliminary estimates (November 1994) indicate that total on the ground expenditures on mineral exploration and development projects in British Columbia during 1994 will be approximately \$100 million (all Canadian \$ unless otherwise stated), a 30% increase in expenditures from 1993. Like 1993, it is estimated that more than half of this total will be spent in the northwest part of the province. This figure is compiled from estimates made on a project-by-project basis throughout the province, primarily from published sources, and is an estimate of the actual dollars spent on the ground. The official Mineral Statistics Survey, compiled in April 1994 and including non-property costs, forecasts a total of \$78 million.

Figure 1 illustrates the wide fluctuation of exploration expenditures over the past decade. The peak year 1988, with expenditures of \$225 million, coincided with the height of flow-through funding. Following the record ex-



Source: MEMPR, Land Management and Policy Branch

Figure 1. Mineral exploration expenditures in British Columbia: 1984 to 1994.



Source: MEMPR, Land Management and Policy Branch

Figure 2. Solid mineral production value in British Columbia: 1984 to 1994.

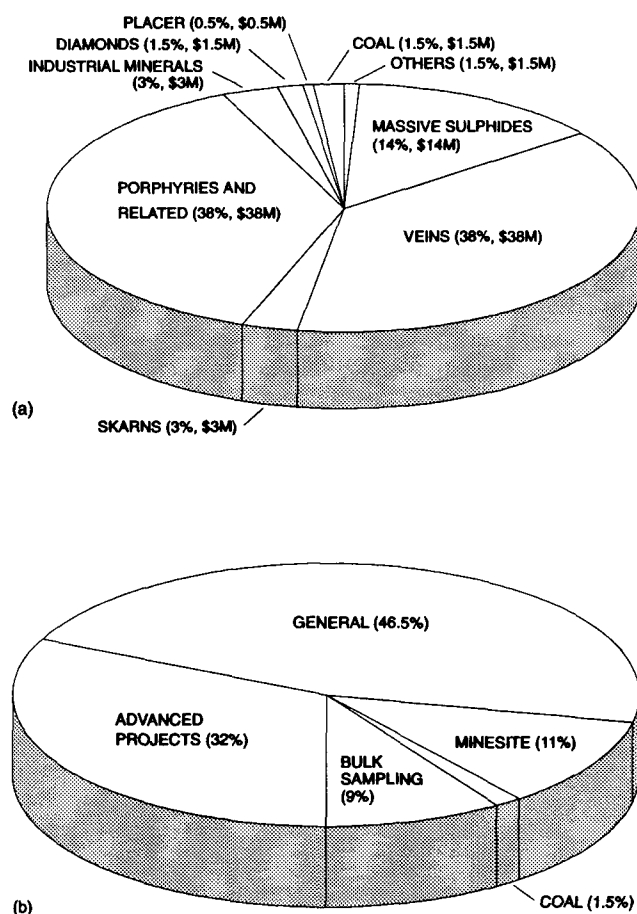


Figure 3. Exploration targets - 1994 (a) by deposit type (% expenditures); (b) by level or category of program.

penditures in 1988, expenditures have shown a steady decline to a low of \$68 million in 1993. For the same ten-year period, the pattern of exploration spending is similar to changes in the total value of solid mineral production including an increase in 1994 values (Figure 2).

Exploration targets are varied and include: veins, volcanogenic, sedimentary and seafloor hydrothermal massive sulphides, porphyries and related deposits, skarns, industrial minerals (including diamonds), coal, placer deposits and others (Figure 3a).

Approximately 11% of exploration expenditures were at minesites, 9% on bulk sampling projects, and 32% on 'advanced' projects, including environmental studies and reclamation programs. Almost half (46.5%) was spent on less-advanced and grassroots ('general') exploration programs (Figure 3b). In total, there were approximately 225 projects with budgets in excess of \$100 000, up from the 100 projects in 1993. Figures 4a and 4b show the number of projects with expenditures in excess of this figure. As in 1993, by far the largest exploration/development program in the province was by Lac Minerals Limited on the **Red Mountain** gold project near Stewart, estimated around \$15 million. In the early fall American Barrick Resources Ltd. gained control of Lac Minerals Ltd. and put the property up for sale.

Grassroots programs were carried out in north-central British Columbia in the Babine and Ha Ha Creek areas for porphyries, in southeastern and northeastern parts of the province for sedex deposits, in the Interior Plateau region of south-central British Columbia for bonanza and bulk-mineable epithermal gold, in the Stewart Camp in the northwest for porphyry-related Red Mountain-type and Snip-type gold, and in the Rocky Mountains for diamonds. Exploration expenditures for industrial minerals increased by 45%, but decreased by 50% for coal.

Similar positive trends are apparent in the levels of new mineral titles recorded (Figure 5) and in the number of Free Miner Certificates issued. The estimate for claim staking indicates a 10% increase from 1993. The number for Free Miner Certificates is expected to be about 5750, approximately 3% above the 1993 figure.

## HIGHLIGHTS AT OPERATING MINES

### PRODUCTION LEVELS

The locations of operating mines in British Columbia in 1994 are shown in Figure 6. No new mines were opened in 1994; however, four mines (**Similco**, **Gibraltar**, **Afton-Ajax** and **Myra Falls**) re-opened. Three operations were closed down either permanently (**Equity Silver**) or indefinitely (**Silvana** and **Johnny Mountain**) due to exhausted ore reserves, low metal prices, or the inability to raise financing (*see Operations*). However, several small high-grade projects (*i.e.* **Elk**, **Iron Colt**, **Brett**, **Porcher Is-**

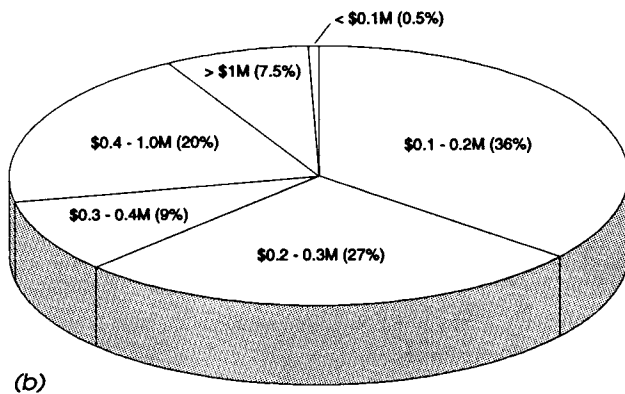
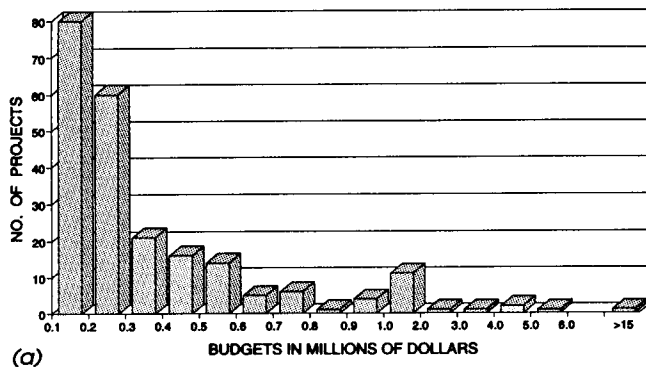
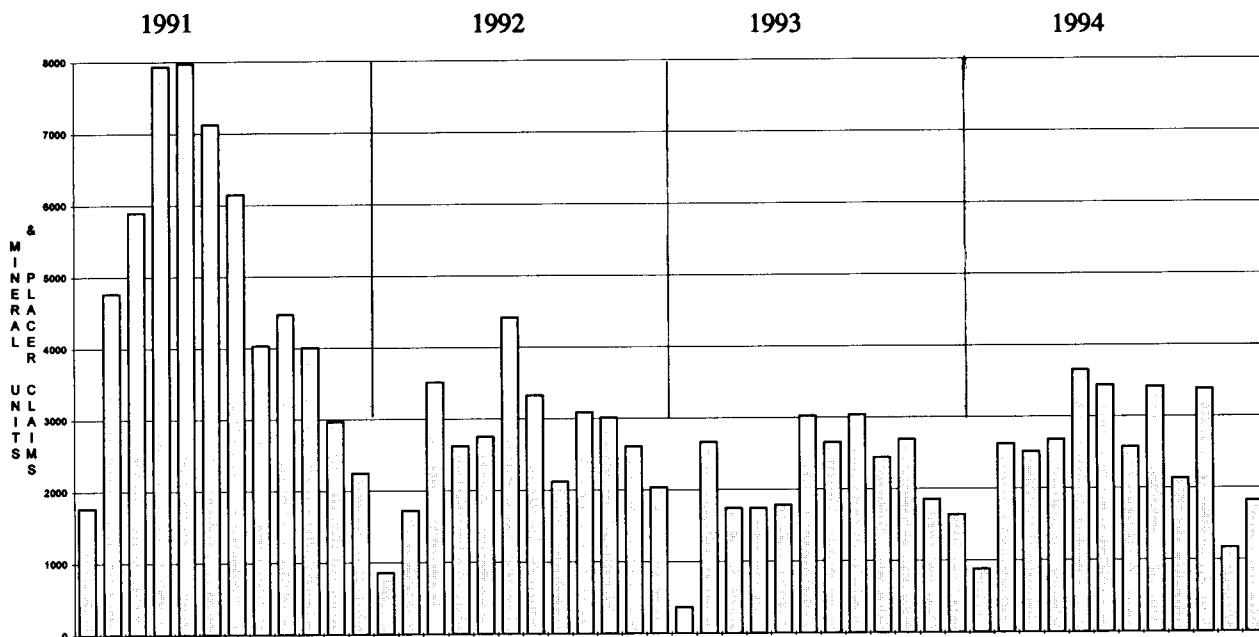


Figure 4. Estimated number of major projects (>100 000) (a) by incremental \$0.1M; (b) by percentage of total.

land, Bonaparte and SB) have continued to produce, or plan to produce, using custom milling arrangements (Table 2) (see Operations). The Table Mountain gold mine reopened on a limited basis. The Golden Bear gold mine ceased underground mining and milling of refractory ore from the Bear Main zone; development for heap leaching of the oxide ore from the Kodiak zones planned for mid-1995 continues, as does development of the refractory ore from the underground Grizzly zone, also for production in late 1995.

The forecast value of solid mineral production for 1994 in British Columbia is \$2.56 billion, a 10% increase from 1993 (Table 1). Copper represents 31% of the total, at a projected value of approximately \$792 million. Coal represents 36%, at a projected value of approximately \$900 million. The production of gold is forecast to be 12.8 million grams (411 500 oz) valued at \$218 million, down from 13.3 million grams (428 800 oz) last year, primarily due to decreases from the Myra Falls, Equity Silver and Similco operations. Silver output is forecast at 125 million grams (4 million oz) valued at \$30 million, down significantly due to reduced production at the Myra Falls operation and closure of the Equity Silver mine. Zinc production in 1994 is forecast to be 90 million kilograms worth \$124 million, lead output is forecast to be 45 million kilograms valued at \$31 million. Value of production of industrial minerals is forecast to be \$50 million; structural materials are expected to account for another \$325 million.



Source: MEMPR, Mineral Titles Branch

Figure 5. All mineral tenure recorded by month; January 1991 to January 1995.





Figure 6. operating mines in British Columbia - 1994.

## OPERATIONS

### METAL MINES

The **Snip** gold mine, owned and operated by Cominco Ltd. (60%) and Prime Resources Group Inc. (40%), produced 4.65 million grams (149 475 oz) of gold in 1993 at a cost of US\$152 per ounce. The 15 000 kilogram (500 000 oz) production milestone was achieved in the early fall of 1994. Current milling is at 470 tonnes per day; recoveries are approximately 35% by gravity-circuit and 56% by flotation, for an overall 91% recovery. The very clean concentrate typically grades 320 g/t Au and 150 g/t Ag. Production for 1994 is forecast to be about 20% less than that for 1993 due to a lower ore grade. Cash costs per ounce are estimated at US \$170. Mining is currently being conducted between the 180-metre and 470-metre levels; extensions are planned upwards to the 580 and 600-metre levels over the next two years. An active underground exploration drilling program (15 000 to 20 000 m) continues to add tonnage to reserves. Development drilling has resulted in confirming mineable reserves estimated by the company at 811 000 tonnes grading 26.4 g/t Au at January 1, 1994. Exploration is currently focused on the east part of the vein system, above and below the 180-metre level. Snip is the largest producer of gold in the province; it continues to be an extremely profitable low-cost operation. Cominco and Prime are confident of extending the operating life of the mine past the current four-year projection. The first shipment of concentrate to a B.C. mill was in 1994 to the Premier mill near Stewart.

The **Highland Valley Copper** mine, a partnership among Cominco Ltd. (50%), Rio Algom Limited (33.6%), Teck Corporation (13.9%) and Highmont Mining Company (2.5%) milled 44 473 000 tonnes during 1993 at an average daily throughput of 121 800 tonnes. Production totalled 156 800 tonnes of copper contained in concentrate, 59 100 kilograms (1.9 million oz) of silver, 398 kilograms (12 800 oz) of gold and 1.7 million kilograms of molybdenum. With published reserves at January 1, 1994 of 627 million tonnes averaging 0.426% Cu and 0.0072% Mo, the mine life is estimated to be about fifteen more years. The mine is one of the largest operations in the world and employs about 1160 people.

The **Island Copper** mine produced 57 900 tonnes of copper, 1.34 million kilograms of molybdenum, 1823 kilograms (58 615 oz) of gold, and 16 000 kilograms (514 400 oz) of silver in 1993. Daily throughput averaged 51 100 tonnes at a head grade of approximately 0.36% Cu. Between 1971 and 1994 the mine has produced 1.2 million tonnes of copper, 27 300 tonnes of molybdenum, 32 700 kilograms (1 050 000 oz) of gold, 336 000 kilograms (10 800 000 oz) of silver, and 23 600 kilograms of rhenium. BHP Minerals Canada Ltd. continues to implement its closure plan for the mine; the mill is expected close in late 1995. Mining in the pit will end in June 1995 and from the beach dump in September 1995. Reserves reported at January 1, 1994 were estimated at 59.9 million tonnes grading 0.36% Cu and 0.017% Mo. Structural problems associated with the south wall of the pit may preclude mining of some reserves.

TABLE 1  
1994 FORECAST VALUE OF MINERAL PRODUCTION IN B.C.

Commodity	Quantity (millions)	\$ Value (millions)	Percent of Total Value
Copper	248 kg	792	31%
Gold	12.8 g	218	9%
Zinc	90 kg	124	5%
Lead	45 kg	31	1%
Molybdenum	8.1 kg	82	3%
Silver	125 g	30	1%
Other		6	
<b>Total Metals</b>		<b>1 283</b>	<b>50%</b>
Structural Materials		325	13%
Industrial Minerals		50	2%
Metallurgical Coal	19.95 t	858	34%
Thermal Coal	1.83 t	44	2%
<b>Total Solid Minerals</b>		<b>2 560</b>	<b>100%</b>

Source: MEMPR, Land Management and Policy Branch

TABLE 2  
ACTIVE AND POTENTIAL CUSTOM MILLING PROJECTS

Mill or Smelter/ Location	Project Name (Potential)	Commodity	Operator
Asarco/Helena, Montana	*Elk	Au	Fairfield Minerals Ltd.
Bolivar/Vananda, B.C.	*Texada Is.	Au	Metals Research Corp. Ltd.
Greenwood, B.C.	(Brett)	Au	Liquid Gold Res. Inc./Huntington Res. Ltd.
Island Copper, Port Hardy, B.C.	(Hushamu)	Cu, Au, Mo	BHP Minerals Canada Ltd./Jordex Res. Ltd.
Kettle/Republic, Washington	*Iron Colt	Au	Pacific Vangold Res. Inc./ Int'l Silver Ridge Res. Inc.
Premier/Stewart, B.C.	(Debbie)	Au	White Hawk Ventures Inc.
Premier	(Greens Creek, Alaska)	Au, Cu, Ag, Pb, Zn	Kennecott Corp./Hecla Mining Co./ CSX Energy Corp./Exalas Res.
Premier	(Johnson River)	Au, Cu, Ag, Pb, Zn	Westmin Res. Ltd.
Premier	(Jualin)	Au	Coeur d'Alene Mines Ltd.
Premier	(Porcher Island)	Au	Westmin Res. Ltd.
Premier	(Red Mtn.)	Au, Ag	American Barrick Res. Ltd.
Premier	(Skinner)	Au	Ottarasko Mines Ltd.
Premier	Snip	Au	Cominco Ltd./Prime Resource Group Inc.
Premier	(SB)	Au	Tenajon Res. Ltd./Westmin Res. Ltd.
Trail	*Bonaparte	Au	Claimstaker Res. Ltd.
?	(Engineer)	Au	Ampex Mining
?	(Valentine Mtn.)	Au	Beau Pre Explorations Ltd.

\* = Active

Production at the Westmin Resources Limited **Myra Falls** mine resumed in September, 1994 after a 16-month mining hiatus due to a labour dispute. During 1993 the mine operated at 1200 tonnes per day and produced 6760 tonnes of copper, 7928 tonnes of zinc, 274 kilograms (8800 oz) of gold and 3814 kilograms (122 600 oz) of silver. Reserves at January 1, 1994 were estimated by the company at 12.5 million tonnes grading 1.9% Cu, 0.5% Pb, 6.3% Zn, 45.6 g/t Ag and 2.1 g/t Au. Proven and probable reserves in the Battle zone are estimated at 2.9 million tonnes grading 2.0% Cu, 0.4% Pb, 10.3% Zn, 0.9 g/t Au and 20 g/t Ag. The nearby Gap zone contains additional proven and probable reserves of 714 000 tonnes grading 1.5% Cu, 0.9% Pb, 10.6% Zn, 2.5 g/t Au and 121.2 g/t Ag. Westmin has begun development of the Battle/Gap zone with production scheduled for spring 1995. The Zn-Au-Ag-rich Battle ore will be blended with copper-rich ore from the H-W zone. Over the next five years Westmin plans to mine approximately 6.5 million tonnes of ore grading 1.7% Cu, 6.1% Zn, 1.7 g/t Au and 39 g/t Ag. The company estimates that less than 40% of the property has been 'properly' explored. Over the next five years it plans to spend \$2.7 million annually on exploration, especially testing the Trumpeter zone located at the eastern end of the Myra Falls mining operations. Drilling late in 1994 extended the zone at least 75 metres to the northwest of previously known mineralization. In addition drilling also encountered two well mineralized zones above the Trumpeter zone; felsic fragmental hostrocks are very similar in nature to the Block 43 ore in the H-W mine approximately 1-kilometre to the west. If this upper zone turns out to be an extension of Block 43, it has significant tonnage implications for the eastern end of the H-W mine. The company plans to continue the drilling program to test the western extensions of the Trumpeter zone.

At the Gibraltar Mines Limited **Gibraltar** (McLeese Lake) mine, mining and milling resumed in September 1994. Operations had been suspended on December 1, 1993 due to low copper prices. Full production, with 277 employees, and shipping of concentrate will begin by year end. Production at a daily milling rate of 38 900 tonnes in 1993 totalled 22 492 tonnes of copper. The company estimated reserves at January 1, 1994 at 170.1 million tonnes grading 0.301% Cu and 0.0095% Mo. The improved price of copper, the lower value of the Canadian dollar, cost reductions, together with the cooperation and contributions from the B.C. Job Protection Commissioner, the B.C. Ministry of Energy, Mines and Petroleum Resources, B.C. Hydro and the Cariboo Regional District, led to the decision for resumption of operations. The mill will process about 44 000 tonnes of ore a day, producing about 27 million kilograms of copper annually. Gibraltar has acquired the GM claims on the east (Pollyanna) side of the property and diamond drilling is expanding the reserves in this area.

At the **Equity Silver** mine, Equity Silver Mines Ltd. ceased milling in January 1994, after thirteen years of open-pit and underground production. Production totalled approximately 2 million kilograms (66.7 million oz) of silver, 15 900 kilograms (511 296 oz) of gold and 81 million kilograms (178.2 million pounds) of copper, from over 32 million tonnes mined at an average grade of 0.34% Cu, 101 g/t Ag and 1.1 g/t Au. Approximately 25 employees remain on site to carry out closure and reclamation, with costs estimated at \$47.5 million. Equity Silver drill tested the adjacent SG claims on its eastern boundary in an inconclusive search for the source of ore-grade float boulders. An auction was held in August and most of the mine's assets were sold.

In 1993 the Homestake Canada Ltd. **Nickel Plate** open-pit mine produced 2 300 kilograms (73 900 oz) of gold and 855 kilograms (27 481 oz) of silver from 1 280 724 tonnes of ore at a daily mill throughput of 3500 tonnes. Reserves at January 1, 1994 were estimated by the company at 4 375 000 tonnes grading 2.64 g/t Au.

Cominco Ltd. production at the **Sullivan** mine in 1993 was 28 000 kilograms (900 000 oz) of silver, 42 000 tonnes of lead and 87 000 tonnes of zinc from 1 364 300 tonnes at a daily rate of 7000 tonnes. The mine was shut down for an eleven-week period over the summer and one week in December. Published reserves as of January 1, 1994 were 14.8 million tonnes grading 26 g/t Ag, 4.7% Pb and 8% Zn.

Production from the **Golden Bear** mine in 1993, now owned by Wheaton River Minerals Ltd., was 1628 kilograms (52 357 oz) of gold and 417 kilograms (13 409 oz) of silver. From start-up in 1990 to the end of June, 1994 production totalled about 419 000 tonnes averaging 15.4 g/t Au. Mill recovery averaged 89%, netting a total of 5743 kilograms (184 640 oz) of gold. Lower grade surface material in the pit area, was the last ore run through the mill in September. Reserves at January 1, 1994 were estimated by the operator at 98 703 tonnes grading 20.4 g/t Au. Gold production during 1994 to the end of September (*i.e.* closure) totalled (29 726 ounces), recovered from 88 920 tonnes grading 11.5 g/t Au. Production was slowed by a two-week shutdown in February.

In June 1994, Wheaton and North American Metals Ltd. announced a revised production plan and received a Mine Development Certificate from the provincial government in early August. The new plan, which involves heap-leach technology, predicts present rates of gold production to continue for up to five more years from currently known lode gold and stockpiles. Estimated total contained gold in the Kodiak A, B, and C zones, and the low-grade stockpile is 967 320 grams (311 000 oz) in approximately 3 350 000 tonnes grading between 1.5 and 8.2 g/t Au and averaging 2.9 g/t Au. The original mining plan called for approximately 325 000 tonnes of ore grading 4.6 g/t Au from the Kodiak A zone to be mined (open pit), crushed and

stacked during August to November, at which time heap leaching was to have begun. Production costs were expected to be US\$224 per ounce. Drilling during the summer increased the contained ounces by 18% bringing the total mining reserve to 473 000 tonnes. Column tests indicate a recovery of greater than 93% of the gold by heap leaching. Unfortunately, heavy rains during the latter part of September and early October washed out two bridges on the mine access road and damaged the airstrip. Consequently, the company has deferred installation of the liner on the leach bed until June 1995. Gold production is expected by September.

During the past summer and fall two new zones of gold mineralization were discovered on the Kodiak North (Ursa deposit) zone, 800 metres to the north of the Kodiak A open pit. The host rock is a strongly hematized limestone breccia, similar to Kodiak ore, indicating good potential for heap leaching. Twelve holes drilled on the Ursa deposit have outlined a deposit along a strike length in excess of 100 metres and to a depth of up to 75 metres. The deepest hole returned an intersection grading 12.2 g/t Au across 27.2 metres. A second phase of drilling is planned for 1995.

Also in the fall of 1994, a new zone of high-grade gold mineralization was discovered during the advance of the Grizzly zone decline being driven to test previous ore-grade drill intersections. A fault structure (Cub zone) grading 27.0 g/t Au across a true width of 3.9 metres was intersected 500 metres down the decline. This zone, east of the Footwall fault, is separate from the Grizzly zone and opens up another new exploration area on the property. The Cub zone mineralization is refractory and may be related to the Main Bear fault, which hosted most of the gold mineralization in the previously mined Main Bear zone, 400 metres above it. A nine-hole, 6500-metre drilling program will test this new zone. Overall, Wheaton River's exploration of the various deposits associated with the 22-kilometre-long Ophir Break during 1994 is estimated to have cost \$5.5 million.

During 1993 the Princeton Mining Corporation's **Similco** mine produced 23 580 tonnes of copper, 441 kilograms (14 200 oz) of gold and 11 512 kilograms (370 130 oz) of silver from 6 727 000 tonnes of ore at a daily milling rate of 22 700 tonnes. The mine closed in November 1993, due in part to reduced copper prices. During 1994 the company was restructured and on August 18th the mine re-opened. The planned operating rate of 22 675 tonnes per day was achieved by the end of September. The first concentrate shipment to Japan was scheduled for mid-October. Mitsubishi Materials Corporation provided Princeton with a US\$3.6 million advance credit against the production and delivery of concentrate. The Similco mine is projected to produce 5 million kilograms of copper and 249 kilograms (8000 oz) of gold in 1994. In 1995, the operation is forecast to yield 21.3 million kilograms of copper and 995.3 kilograms (32 000 oz) of gold. Company reserve estimates at

January 1, 1994 were 94.8 million tonnes grading 0.399% Cu plus gold credits. During the year Princeton completed a definition drilling program at the Ingerbelle East deposit, 1200 metres from the mill. Results of the twenty-one hole, 4170-metre drilling program show that the mineralization is continuous. An evaluation of drill results has led the company to announce an initial plan to conduct mining in two phases: phase 1 containing 13 million tonnes grading 0.32% Cu and 0.24 g/t Au, and phase 2 containing 38.4 million tonnes grading 0.33% Cu and 0.24 g/t Au. Similco intends to begin mining the phase 1 pit in the latter part of the first quarter of 1995. Also during 1994, Princeton completed a phase 1 diamond drilling program totalling 4909 metres in 29 holes on the Alabama zone. A preliminary inventory of 20 million tonnes grading 0.31% Cu and 0.16 g/t Au is indicated. A phase 2, 4600-metre diamond drilling program commenced in November on the Alabama deposit, with the goal of defining a reserve base for a final pit design.

During 1993 the Westmin Resources Limited **Premier** gold mine produced 637 kilograms (20 475 oz) of gold and 4333 kilograms (139 300 oz) of silver from 159 172 tonnes of ore at a daily throughput of 750 tonnes. Custom milling of 3000 tonnes from six different sources yielded an additional 20 kilograms (645 oz) of gold and 38.4 kilograms (1235 oz) of silver. 1993 was the first full year that Premier operated as an underground mine, with about 50 000 tonnes of stockpiled ore from the earlier open pit also being treated. Mining was from two main areas, the Northern Light and the Glory Hole zones; proven and probable reserves as of January 1, 1994 were estimated by the company at 151 200 tonnes grading 7.54 g/t Au and 55.20 g/t Ag. 1994 production of 4-level and 450-sublevel ore through the 6-level portal at approximately 180 tonnes per day is expected to continue at least through 1995. An additional 450 tonnes of mill feed per day is from other areas in the mine. During 1994 Westmin carried out an exploration drilling program to test for a northerly extension of mineralization in the **Lesley Creek** area.

During 1993 the **Goldstream** mine, operated on a 50-50 basis by Goldneve Resources Inc. and Bethlehem Resources Corporation, produced 16 790 tonnes of copper, 1617 tonnes of zinc, and 5190 kilograms (166 866 oz) of silver from 425 130 tonnes of ore at a daily throughput of 1150 tonnes. The mill was closed down from March 15 to April 15, 1994; mine development continued. Reserves as of January 1, 1994 were reported to be approximately 1 million tonnes grading 4.31% Cu, 2.94% Zn and 12 g/t Ag. Exploration in the mine area in 1994 centred on a six-hole, 2330-metre definition drilling program on the down-plunge extension of the orebody. Preliminary results are very encouraging; an additional six holes will further test the zone between the 0 (surface) and 250-metre elevations. Exploration was also carried out on the C-1 zone approximately 10 kilometres west of the mine.

In the last half of 1993, International Skyline Gold Corporation re-opened the **Johnny Mountain** gold mine and produced 247 kilograms (7940 oz) of gold and 482 kilograms (15 500 oz) of silver from 21 850 tonnes of ore at an average daily throughput of 350 tonnes. The mine did not re-open in 1994. Reserves estimated by the company as of January 1, 1994 were 24 000 tonnes grading 11.3 g/t Au, 22 g/t Ag, and 0.23% Cu. Exploration by Skyline in 1994 was concentrated on the Bronson Slope porphyry area to the northwest of the mine. In September, Foremost Industries Inc. signed a letter of agreement with International Skyline whereby Foremost will own the mining and milling equipment and will become a participant in a joint venture to explore, develop and process ore from Skyline's mineral properties and other adjacent claims, on a custom milling basis.

At the **Endako** molybdenum mine, Placer Dome Inc. produced 6.64 million kilograms of molybdenum from 9.6 million tonnes of ore at a daily throughput of 28 200 tonnes. Published reserves as of January 1, 1994 were 128.2 million tonnes grading 0.077% Mo. In 1994 Placer carried out an eight-hole, 914-metre diamond drilling program to delineate ore in the Endako Southeast pit. Additional exploration was planned for later in the year.

At the **Ajax** copper-gold mine, Afton Operating Corporation resumed production in September after a three-year suspension in operations because of depressed metal prices. Reported reserves at January 1, 1993 were 14.1 million tonnes grading 0.46% Cu and 0.34 g/t Au. Mill capacity at the nearby Afton plant is 8500 tonnes per day.

At the **Table Mountain** gold mine, Cusac Industries Ltd. re-opened the mine in late 1993. Development and mining centred on the Bain vein. Based on a published mineable reserve of 32 650 tonnes grading approximately 23.6 g/t Au, production in 1994, using the existing 275 tonne per day mill, was forecast to total 715 380 grams (23 000 oz) of gold at a cost of less than US\$200 per ounce. Mining on the West Bain vein started in March, 1994. Milling started in mid-April from 18 140 tonnes of ore grading 23.3 g/t Au stockpiled at the decline portal. In October, Cusac began to develop the Michelle high-grade zone (22 675 tonnes grading 35.0 g/t Au) from the old Eileen vein workings by driving an additional 200 metres to intercept the vein. In late October the mill was shutdown due to a decrease in grades down-dip on the West Bain vein. To the end of September the company mined and milled about 30 000 tonnes grading 14.1 g/t Au at an estimated cash operating cost of US\$177 per ounce gold.

The **Silvana** mine closed indefinitely in April, 1993. In October, 1994, Amcorp Industries Ltd. signed an agreement to buy the Silvana mine and mill at Sandon from Tremanco Resources Ltd. A review of the Silvana and Hinckley mines' ore reserves by Amcorp indicated that about 54 400 tonnes of ore remain in the developed areas of

the mines with potential to develop additional reserves. Amcorp expects to resume production in early 1995.

## COAL MINES

Coal production in 1994 is expected to be back to pre-1992 levels. In the Kootenay coalfields, Fording Coal Limited plans to expand production at its **Greenhills** mine by 50% to meet the stronger demand for metallurgical coal on world markets. Output will increase to 4.5 million tonnes in 1995 from 3 million tonnes this year. At its **Fording River** mine, Fording is also boosting production from 6.5 million tonnes to about 7 million. In October, Fording signed an agreement to buy the coal mining assets (**Byron Creek Collieries**) of Corbin Creek Resources Limited. Byron Creek will produce about 300 000 tonnes of thermal and weak coking coal this year, well below the 2 million tonne capacity of its washing and drying plant. Fording will produce about 13 million tonnes of coal in 1994 from its three southeast British Columbia operations. In a major breakthrough, coal from Fording Coal and Smoky River, Alberta operations is now being used as the primary product in coking coal blends. Initial results from a shipment to Croatia are very encouraging with all blast furnace coke-quality requirements being met. The owners are hopeful that new markets will open up. Production at Teck's Elkview mine was in the 2.5 million to 3 million tonne range.

In the Peace River coalfields, Japanese steel mills are taking contract tonnage from the Quintette (Quintette Coal Limited) and Bullmoose mines (Teck Corporation, 60.9%, Rio Algom Limited, 29.1%, and Nissho Iwai Coal Development (Canada) Ltd., 10%). Annual production at Quintette and Bullmoose is estimated at 4.2 million tonnes and 2 million tonnes respectively.

At the **Quinsam** mine on Vancouver Island, Quinsam Coal Corporation has finished open-pit production and is now dependent on coal from underground sources.

## INDUSTRIAL MINERALS MINES

British Columbia is well endowed with a variety of industrial minerals. There are nine major mines and more than twenty-five smaller quarries. These operations are mainly located in the southern half of the province close to tidewater or major transportation routes. The most economically significant minerals are sulphur, magnesite, gypsum, silica, barite, limestone and construction materials with lesser production of jade, diatomite, magnetite, dolomite, dimension stone, clay and fuller's earth. Sand and gravel pits are located throughout the province. In 1993 there was reported production of twelve industrial mineral commodities with a total value of \$48.3 million; structural materials accounted for another \$320 million.

**Sulphur**, derived from natural gas, is produced at five extraction plants in the northeastern part of the province. Production in 1993 totalled approximately 710 000 tonnes;



up 20% from 1992. The new sulphur-recovery operation near Chetwynd started production in October 1994.

In the Rockies, Westroc Industries Limited is planning to sustain **gypsum** production at 450 000 tonnes per year by opening the **Elkhorn II** deposit which is an extension of the existing pit on Windermere Creek. The company has developed an excellent grade-control program and is able to ship a blended gypsum product with constant amounts of soluble salts and clay and limestone impurities.

Domtar Gypsum is being restructured into a public company called North American Gyprock Company. It opened a new pit between Swan Lake Provincial Park and Coyote Creek at its **Canal Flats** operation and continues to ship approximately 100 000 tonnes per year. Two wallboard plants in the Vancouver area are supplied by gypsum from the Kootenays.

In operation since 1982, Baymag Mines Company Limited continues to mine **magnesite** at **Mount Brussilof** at a rate of approximately 175 000 tonnes annually. The magnesite is shipped to a processing plant at Exshaw, Alberta to produce high-quality calcined and fused magnesia. The company is considering plans to increase production levels.

The **Mount Moberley** and **Nicholson** silica mines in the Golden area account for all of British Columbia's silica production. Mountain Minerals Ltd. is producing approximately 80 000 tonnes annually from the Moberley quarry and Bert Miller Contracting is producing approximately 50 000 tonnes annually from the Nicholson mine.

**Limestone** quarries at Gillies Bay and Blubber Bay on **Texada Island** ship some 5 million tonnes annually to pulp and paper mills, cement plants and lime producers along the coast from Alaska to northern California. White limestone for filler applications is produced from deposits at **Benson Lake**, two quarries on Texada Island and the **Lost Creek** mine near Creston. Imasco Minerals Inc. is developing new resources in the upper part of the Lost Creek deposit. Limestone is processed by three cement plants and two lime production centres near Kamloops and Lillooet and in the Lower Mainland. White limestone is used as a filler in paints and plastics produced in Surrey and Creston. The majority of pulp and paper mills produce their own lime from nearby limestone quarries.

Mountain Minerals Ltd. operates the **Parson** mine, British Columbia's only **barite** producer. With the current mine reserves sufficient for only four years, the company has acquired the Muncho Lake barite occurrences close to the Alaska Highway west of Fort Nelson and is preparing a major drilling program.

**Granite** and **marble** are being produced by a number of companies, including Fox Island Granite Co. Ltd., B.C. Granite Ltd., Matrix Marble Corp., North West Granite Co.

Ltd., and Quarry Pacific Industries Ltd. Stone-processing plants are being operated by Margranite Industries Ltd. in Surrey, Matrix Marble in Duncan and Westcoast Granite manufacturing Inc. in Delta. Revelstoke Flagstone Quarries and Begbie Flagstone Ltd. are together producing approximately 4000 tonnes of **mica schist flagstone**. Kootenay Stone Centre in Salmo is producing about 4000 tonnes of **quartzite flagstone**.

Clayburn Industries Ltd. of Vancouver is mining relatively small amounts of **fireclay**, **diatomite** and **pyrophyllite** at three different sites. Western Clay Products Ltd. in Kamloops rebuilt its plant last year, quadrupling its capacity. The production has doubled since last year; at present the company supplies approximately half of the kitty litter market in western Canada. The company is planning to undertake research and development for higher value products (catalyst carriers) using clay (**fuller's earth**) from its quarry near Kamloops. Production in 1994 is expected to reach 40 000 tonnes.

Near Sechelt, Tri-Sil Minerals Ltd. was briefly shipping from its **wollastonite** quarry, however, the only sales to date have been to cement plants.

**Dolomite** quarried in the Creston and Rock Creek areas is used for soil conditioning, as a component in stucco and roofing materials, and as white, ornamental aggregate rock.

## TAILINGS

Candorado Operating Company Limited operated the **Hedley** tailings project at a designed rate of 36 000 tonnes per month and the target production for 1994 is 200 000 tonnes grading 1.34 g/t Au. Craigmont Mines Ltd. and M-7 Industries Ltd. continued to recover magnetite from the Craigmont mine tailings.

## ADVANCED EXPLORATION AND DEVELOPMENT PROJECTS

### METALS

A number of exploration projects advanced in 1994 to development or bulk sampling stages. The projects described in this section are shown on Figure 7 and listed with reserves in Table 3.

Proven and probable reserves for the 21B zone at the Prime Resources Group Inc. **Eskay Creek** property are estimated at 1.09 million tonnes grading 65.14 g/t Au, 2949 g/t Ag, 5.6% Zn and 0.77% Cu for a total *in situ* inventory of 71 000 kilograms (2 300 000 oz) of gold and 3172 tonnes (102 000 000 oz) of silver.

During 1994 the access road to the mine area was completed and all production facilities were commissioned and made fully operational. Production mining commenced in November and initial shipments of crushed ore have been trucked to the transshipment facilities in preparation for de-

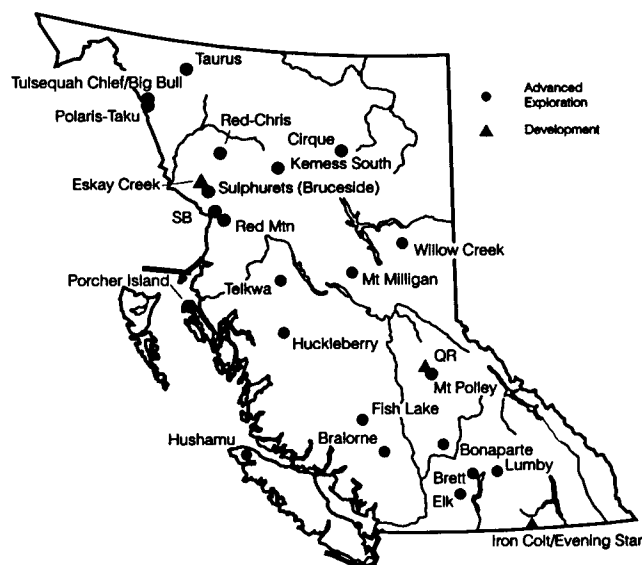


Figure 7. Advanced exploration and development projects in British Columbia - 1994.

livery to smelters in January 1995. The mine will come into production only two years after application to the provincial government for a Mine Development Certificate. The direct shipping ore is being crushed and blended at the mine and then moved by rail from Kitwanga to Noranda's Horne smelter in Quebec, and by sea from Stewart to Dowa Mining's smelter in Japan. At a daily mining rate of 300 tonnes, annual production is estimated at 6530 kilograms (210 000 oz) of gold and 290 000 kilograms (9.3 million oz) of silver together with copper and zinc. The operating cost is forecast to be US\$187 per ounce gold equivalent. Eskay Creek will become the fourth largest silver producer in the world. Zinc will be recovered using the solvent extraction - electrowinning method.

During excavation for a rock quarry to provide aggregate for road construction, a 0.4-metre sulphide bed was discovered approximately 150 metres stratigraphically above the favourable contact mudstone unit. Six deep drill-holes tested the 'Eskay horizon' north and east of the deposit, on the IKS and GNC claim groups. New zones of gold mineralization were located during underground development. Prime has entered into agreements to acquire the remaining 50% interest in the IKS 1 mineral claim which is estimated to contain approximately 4975 kilograms (160 000 ounces) of gold equivalent, as part of the 21B zone orebody. The potential to increase reserves is considered very good.

In 1994 Lac Minerals Ltd. which has now been taken over by American Barrick Resources Corporation, carried out the largest exploration/development program in the province, with expenditures estimated in excess of \$15 million on the **Red Mountain** project. The company previously reported the resource in the Marc and AV zones

was 2 539 000 tonnes grading 12.8 g/t Au and 38.1 g/t Ag at a cut-off grade of 3 g/t Au. During 1994 22 742 metres of surface drilling was completed in 63 holes and 16 390 metres of underground drilling in 66 holes. Five hundred and forty metres of underground development were completed in the decline for diamond-drill stations in the hangingwall and in the AV zone. The proposed development/production portal (1750-metre level) and decline was advanced for 12 metres of an estimated 1.3 kilometres to reach the Marc, AV and JW zones.

Surface exploration included mapping, soil sampling, trenching and down-hole geophysics. This year's focus was on the AV and 141 zones, and the south-southeastern part of the property.

The **Tulsequah Chief** and **Big Bull** projects, located 75 kilometres northeast of Juneau, Alaska were explored by Redfern Resources Ltd. with expenditures estimated at \$900 000 on each. Underground drilling (4240 m) and surface drilling (1700 m) were completed on the Tulsequah Chief deposit. Underground drilling was mainly targeted on the northeast extensions of the H and G lenses which comprise most of the present reserve estimated by the company at 8 489 885 tonnes grading 1.41% Cu, 1.23% Pb, 6.65% Zn, 2.56 g/t Au and 103.4 g/t Ag. In-fill drilling on the H lens intersected a thick and high-grade zone (Hole TCU94-065, 13 m grading 2.92% Cu, 1.15% Pb, 11.65% Zn, 3.1 g/t Au, and 159 g/t Ag) which is expected to substantially improve the existing reserve in an area of low drilling density. Surface drilling confirmed the western extension of the host stratigraphy and alteration associated with the main deposit approximately 300 metres down-dip from its previously known limit. A Pre-application for a Mine Development Certificate has been filed with the Government of British Columbia.

At the **Big Bull** deposit, 8 kilometres south of the Tulsequah Chief, a surface diamond drilling program consisting of 5528 metres in fifteen holes was successful in expanding the size of the massive sulphide deposit mined by Cominco in the 1950s. The ore appears to be disrupted by faulting, and a distinct stratiform body has yet to be recognized. Drilling also confirmed the large size of the **Big Bull** alteration system, which has a minimum strike length of 1000 metres, and a minimum dip extent of 600 metres. A recently discovered and significant thickness (up to 40 m) of massive manganese oxide and jasper is interpreted by the company to be an exhalative deposit which is distal to the main vent area.

On the **Sulphurets (Bruceside)** project, owned 60% by Newhawk Gold Mines Ltd. and 40% by Granduc Mining Corporation, an estimated \$1.5 million was spent on of 7350 metres of drilling concentrated in three areas. Deep drilling (300 to 500-m holes) tested the Gossan Hill/Tommyknocker zones; areas with open intersections of mineralization in the West and Shore zones; and the up-dip extension of the R8 structure of the West zone at its eastern

TABLE 3  
NEW MINES, RE-OPENINGS, CLOSURES, DEVELOPMENT  
AND ADVANCED EXPLORATION PROJECTS

Company Name	Project Name	Commodity	Estimated Tonnes (000s)	Estimated Grade	Reference	Estimated Employment
<b>Re-Openings/Development</b>						
Prime Res. Group Inc.	Eskay Creek/ 21B Zone	Au, Ag	1019	65.14 g/t Au, 2949 g/t Ag, 5.6% Zn, 0.77% Cu	Homestake, MDC (prod. Spring '95)	125
Cusac Ind. Ltd.	Table Mtn. Bain zone Michelle zone	Au	32.7 22.7	23.6 g/t Au 35.0 g/t Au	Cusac, 1994	
Teck Corp.	Afton/Ajax	Au, Cu	14 100	0.46% Cu, 0.34 g/t Au	Teck Ann. Rpt., 1991	150
Westmin Res. Ltd.	Myra Falls	Cu, Pb, Zn, Ag, Au	12 500	1.9% Cu, 0.5% Pb, 6.3% Zn, 45.6 g/t Ag, 2.1 g/t Au	Westmin, 1994 (prod. of Battle z. Spring '95)	350
Princeton Mining Corp.	Similco	Cu, Au	94 800	0.399% Cu	Princeton, 1994	250
Gibraltar Mines Ltd.	Gibraltar (expansion)	Cu	170 100	0.3% Cu, 0.0095% Mo	Gibraltar, 1994	275
Kinross Gold Corp.	QR	Au	1300	4.77 g/t Au	Kinross, MDC 1994 (prod. Spring '95)	75
North American Metals Ltd./ Wheaton River Minerals Ltd.	Golden Bear (Kodiak)	Au	473	4.6 g/t Au	Wheaton, MDAP 1994	75
Bethlehem Res. Corp./ Goldnev Res. Inc.	Goldstream	Cu, Ag, Zn	1000	4.3% Cu, 2.94% Zn, 12 g/t Ag	Bethlehem, 1994	130
<b>Closures (Indefinite)</b>						
International Skyline Gold Corp.	(Johnny Mtn)	Au, Ag, Cu	24	11.3 g/t Au, 22 g/t Ag, 0.23% Cu	Skyline, 1994	
Amcorp Ind. Ltd.	(Silvana)	Pb, Zn, Ag	54	3.4% Pb, 4.7% Zn, 290 g/t Ag	SW, Oct. 13/94	
Equity Silver Mines Ltd.	Equity Silver	Ag, Au, Cu				
North American Metals Ltd. Wheaton River Minerals Ltd.	Golden Bear (Bear Main)	Au				
<b>Advanced Exploration</b>						
<b>Coal and Industrial Mineral Deposits</b>						
Manalta Coal Ltd.	Telkwa	coal	38 670	thermal		
Globaltex Industries Ltd.	Willow Creek	coal		thermal		

Table 3 continued

Quinto Mining Corp. Ltd.	Lumby	graphite, sericite	27 000		Quinto, 1994	
<b>Porphyry (and related) Deposits</b>						
Imperial Metals Corp.	Mt. Polley	Cu, Au	49 000	0.38% Cu, 0.55 g/t Au	Imperial Metals MDC, 1993	200
Taseko Mines Ltd.	Fish Lake	Cu, Au	675 000	0.236% Cu, 0.435 g/t Au	Taseko Mines, 1994	300+
El Condor Res. Ltd./ St. Philips Res. Ltd.	Kemess South	Cu, Au	200 400	0.22% Cu, 0.63 g/t Au	El Condor, MDAP, 1992	300+
Jordex Res. Ltd.	Hushamu (Expo)	Cu, Au, Mo	173 237	0.27% Cu, 0.34 g/t Au, 0.01% Mo	Jordex, 1992	
New Canamin Res. Ltd.	Huckleberry Main Zone	Cu	30 900	0.48% Cu, 0.07 g/t Au, 2.17 g/t Ag, 0.013% Mo	New Canamin,	160
	East Zone		60 275	0.54% Cu, 0.06 g/t Au, 3.1 g/t Ag, 0.014% Mo	MDAP, 1994	
Placer Dome Inc.	Mount Milligan	Cu, Au	298 400	0.22% Cu, 0.45 g/t Au	Placer Dome, MDC, 1993	
American Bullion Minerals Ltd.	Red Chris	Cu, Au	41 000	0.56% Cu, 0.34 g/t Au	Amer. Bull., 1994	
Princeton Mining	Similco - Ingerbelle East Alabama	Cu, Au	51 400 20 000	0.33% Cu, 0.24 g/t Au 0.31% Cu, 0.16 g/t Au	GCNL, Nov. 30, 1994	250
Gibraltar Mines Ltd.	Gibraltar	Cu	5+	est. 0.3% Cu	Gibraltar, 1994	275
American Barrick Res. Corp./ Lac Minerals Ltd.	Red Mountain	Au, Ag	2540	12.8 g/t Au 38.1 g/t Ag	Lac Minerals MDAP, 1993	
<b>Massive Sulphide Deposits</b>						
Teck Corp./Cominco Ltd./ Samsung/Korea Zinc	Cirque	Pb, Zn, Ag	24 700	2.3% Pb, 8.5 % Zn, 50.8 g/t Ag	Curragh MDC, 1991	300+
Redfern Res. Ltd.	Tulsequah Chief/ Big Bull	Cu, Pb, Zn, Au, Ag	8490	1.41% Cu, 1.23% Pb 6.65% Zn, 2.56 g/t Au, 103.4 g/t Ag	Redfern, MDAP, 1994	
<b>Vein Deposits</b>						
Bralorne-Pioneer Gold Mines Ltd./ Avino Mines and Res. Ltd.	Bralorne Above 1000 level Below 1000 level	Au, Ag	292 673	12 g/t Au 8.2 g/t Au	Avino MDAP, 1992	50
Liquid Gold Res. Inc./ Huntington Res. Ltd.	Brett Bonanza Zone	Au	2300	100 to 120 g/t Au	Huntington, 1993	

Table 3 continued

Liquid Gold Res. Inc./ Huntington Res. Ltd.	Brett Bonanza Zone	Au	2300	100 to 120 g/t Au	Huntington, 1993
Canarc Res. Corp.	Polaris-Taku	Au	2200	14.7 g/t Au	Canarc, 1994
Newhawk Gold Mines Ltd./ Granduc Mining Corp.	Sulphurets (Bruce side) West Zone	Au, Ag	750	15.43 g/t Au, 647.2 g/t Ag	Newhawk MDAP, 50 - 60 1993
Fairfield Minerals Ltd.	Elk (Siwash North)	Au	122.5	54.5 g/t Au, 24.68 g/t Ag	Fairfield, 1994
Tenajon Res. Ltd./ Westmin Resources Ltd.	SB	Au, Ag	313	3.07 g/t Au	Tenajon, 1994
Westmin Res. Ltd.	Porcher Island	Au, Ag	82	13.7 g/t Au	Westmin, 1994
Pacific Vangold Res. Inc./ Int'l Silver Ridge Res. Inc.	Iron Colt Evening Star	Au, Ag	90.7	11.3 g/t Au	SW Oct. 13/94
Hera Res. Inc./ Int'l Taurus Res. Ltd.	Taurus	Au, Ag	436	7.2 g/t Au	Hera, 1994
Claimstaker Res. Ltd.	Bonaparte	Au, Ag	6.4	25.4 g/t Au	SW, May 2/94

Note: MDC = Mine Development Certificate; MDAP = Mine Development Review Process; Sw = Stockwatch.

end. Exploration to date has identified over forty zones of gold-silver mineralization including the West zone, where geological reserves are estimated by the company at approximately 750 000 tonnes grading 15.43 g/t Au and 647 g/t Ag. Drilling at the western end of the West zone intersected a wide, low-grade halo, with higher grades within it, that provides some potential for additional reserves.

On the **Huckleberry** project, New Canamin Resources Ltd. completed 19 807 metres of drilling, including in-fill drilling (38 holes totalling 4585 m) on the Main zone; definition drilling (fifty holes totalling 13 181 m) on the East zone; and 2041 metres of condemnation drilling. Two short holes tested the Far East zone. At a cut off grade of 0.30% Cu, the company reported total mineable reserves at 91.2 million tonnes grading 0.52% Cu, 0.014% Mo, 0.06 g/t Au and 2.8 g/t Ag. Reserves for the Main and East zones are reported to be 30.9 million tonnes grading 0.48% Cu, 0.066 g/t Au, 2.17 g/t Ag and 0.013% Mo; and 60.3 million tonnes grading 0.536% Cu, 0.063 g/t Au, 3.1 g/t Ag, and 0.014% Mo, respectively. The mining plan outlines two open pits, starting with the higher grade East zone, that would be developed sequentially over a mine life of 18 years at a daily production rate of 13 500 tonnes. The approximate annual production is estimated to be 23 800 kilograms of copper, 1674 kilograms of molybdenum, 9950 kilograms (320 000 oz) of silver, and 158.6 kilograms (5100 oz) of gold. New Canamin submitted a revised pre-application for a Mine Development Certificate in September and intends to submit an application in early 1995.

At the **Fish Lake** deposit, in excess of 96 000 metres was drilled in 305 holes over the period 1962 to 1993, outlining an open-pit reserve of 675 million tonnes grading 0.236% Cu and 0.435 g/t Au. Taseko Mines Ltd., has acquired the exclusive right to all of Cominco's residual interest in the property. The reserve is sufficient for a 30-year mine life at a milling rate of 60 000 tonnes per day. The initial capital cost estimate reported in a recently completed prefeasibility study is \$460 million. An Application for a Mine Development Certificate will be submitted to the provincial government.

At the **Kemess South** project, El Condor Resources Ltd. (60%) and St. Philips Resources Inc. (40%) submitted an Application for a Mine Development Certificate in December 1993. Mineable reserves are estimated by the company at 45.4 million tonnes grading 0.20% Cu and 0.75 g/t Au (supergene) and 155 million tonnes grading 0.23% Cu and 0.59 g/t Au (hypogene) for an overall reserve of 200.4 million tonnes grading 0.22% Cu and 0.63 g/t Au. Mill throughput is proposed at 40 000 tonnes per day, providing a mine life in excess of 15 years. In May, 1994, after an extensive due diligence program including a nine-hole confirmation diamond drilling program, Pegasus Gold Inc. decided not to proceed with its proposed acquisition of El Condor's outstanding shares. The results of the Pegasus program compare favourably with the pre-feasibility mine model completed by Kilborn Engineering Ltd. in July, 1993.



Placer Dome Inc.'s **Mount Milligan** project received a combined Mine Development and Energy Project Certificate in late November 1993. Reserves are estimated by the company at 298.4 million tonnes grading 0.22% Cu and 0.45 g/t Au. Capital costs were projected in the \$500 to \$600 million range. There was no significant activity in 1994.

In March 1994, Imperial Metals Corp. signed an agreement with Gibraltar Mines Ltd. for the formation of a 50/50 joint venture to develop Imperial's wholly-owned **Mount Polley** copper-gold deposit. Gibraltar undertook an extensive due diligence study over a 15-month period to confirm tonnage, grade and metallurgy, as estimated by Wright Engineers Ltd. in its feasibility study of June 1990. Reserves estimated by Imperial Metals are 49 million tonnes grading 0.38% Cu and 0.55 g/t Au. Capital costs were estimated at \$150 million. A Mine Development Certificate was issued in October, 1993. In 1994 the joint venture parties hoped to establish the feasibility of linking the proposed Mount Polley mine to the Gibraltar concentrator by conveyor or other means of surface transport, allowing the milling of Mount Polley ore at Gibraltar. Gibraltar completed seven drill holes totalling 1220 metres within the proposed open-pit area to confirm ore grade and thickness. The company also conducted additional metallurgical tests on five bulk samples, essentially confirming previous recovery estimates of 76.6% for copper and 81.2% for gold. In early September, 1994 Gibraltar gave notice that it will not proceed with Phase II of its program. In November, Imperial Metals Corporation and Bethlehem Resources Corporation agreed to merge. The primary focus of the new company will be the financing and development of the Mount Polley project.

In February 1993, Kinross Gold Corporation's request to increase production levels from 500 to 800 tonnes per day for the proposed **QR** (Quesnel River) gold project was granted, and in March 1993 a Mine Development Certificate was issued. The mineable reserve is estimated by the company at 1.3 million tonnes grading 4.77 g/t Au. Expected mine life is about five years. When fully operational, the mine will produce about 1244 kilograms (40 000 oz) of gold annually. The mine will begin as an open-pit operation, supplemented by reserves from two underground areas. During 1994 purchasing of equipment and hiring of people continued, with production scheduled for the spring of 1995.

The **Polaris-Taku** gold project lies directly across the Tulsequah River from the Tulsequah Chief site. Geological reserves are estimated by Canarc Resource Corporation at 2.2 million tonnes grading 14.7 g/t Au. Surface work in 1994 has identified a 1525-metre northerly strike extension of the property's three main vein systems. The discovery is more than 520 metres higher than the area of existing gold reserves and past production, affording significant depth potential. To the end of October, a total of twenty-nine drill

holes were completed including eight holes in the C vein, five holes in the Y vein and sixteen holes in the new North zone.

No work was carried out on the **Cirque** project, owned 25% by each of Teck Corporation and Cominco Ltd., and Korea Zinc and Samsung. Reserves in the North orebody are estimated at 24.7 million tonnes grading 2.3% Pb, 8.5% Zn and 50.8 g/t Ag. A Mine Development Certificate was issued in December 1992. However, the surrounding Gataga belt was actively explored in 1994 (*see Exploration Highlights*).

Jordex Resources Ltd. conducted a modest diamond drilling program in the spring of 1994 on its **Hushamu (Expo)** property located approximately 25 kilometres west of the Island Copper mine. Proven and probable reserves are estimated by the company at 173 237 000 tonnes grading 0.27% Cu, 0.009% Mo and 0.34 g/t Au. After Jordex completed its 45% earn-in with BHP Minerals Canada Ltd. in the spring of 1994, BHP became manager of the project. A seven-hole diamond drilling program was completed to test a zone of advanced argillic alteration located 12 kilometres northwest of the Hushamu deposit.

Westmin Resources Limited in 1994 acquired an option to earn 50% of the **Porcher Island** property, owned by Cathedral Gold Corporation, by completing a mine evaluation, a feasibility study and by giving notice by December 31, 1994 of its intention to place the property into production. Proven and probable reserves are estimated by the company at 300 000 tonnes grading 7.8 g/t Au; possible reserves are estimated at 190 000 tonnes grading 7.8 g/t Au; and further possible deep reserves are estimated at 800 000 tonnes grading 6.9 g/t Au. Included in these reserves are 82 000 tonnes of direct-shipping ore grading 13.7 g/t Au, all accessible above the existing mine levels. Westmin is exploring the possibility of mining the Porcher Island ore, crushing it on site and transporting the crushed ore by barge 240 kilometres north to its Premier mill near Stewart. Westmin completed metallurgical tests, preliminary concentrate-marketing studies, detailed capital and transportation cost estimates and has held public meetings in connection with permitting the mine. Work continues on the final feasibility study.

American Bullion Minerals Ltd. (80%) and Teck Corp. (20%) conducted a fifty-eight-hole diamond drilling program totalling approximately 21 400 metres on the **Red-Chris** property, designed to expand a higher grade core within the deposit, which is estimated by the company to contain 30 million tonnes grading 0.73% Cu and 0.48 g/t Au. Previous work outlined a drill-indicated inventory of 41 million tonnes grading 0.56% Cu and 0.34 g/t Au available for open-pit mining to a depth of about 275 metres. Deeper drilling (below 300 m) is testing the higher grade stockwork zone. The Red-Chris deposit is currently defined over a 1100 metre length, widths ranging from 150 to 500 metres,

and to depths greater than 300 metres. An I.P. survey was conducted to define the edges of a 4 kilometre by 1 kilometre anomaly over the Red stock. A new reserve estimate is expected by year end.

Tenajon Resources Corporation, together with its 50/50 joint venture partner Westmin Resources Limited, conducted underground development drifting, bulk sampling and diamond drilling on the Kansas/West Kansas zones of the SB property, north of Stewart. Work in 1993 resulted in the definition of a bulk mineable reserve of 312 700 tonnes grading 3.07 g/t Au based on development drifting and diamond drilling of a 50-metre strike length of the ore zone. Prior wide-spaced surface drilling indicates there is potential to increase this reserve to several million tonnes at a similar grade. A further 140 metres of strike length within the mineralized zone was tested by 150 metres of exploration drifting in 1994. A total of 2860 metres of underground diamond drilling is testing the newly accessible strike length at 20-metre intervals. Early indications are that the mineralized silicified zone has a strike length of more than 280 metres. Ore would be custom milled at Westmin's nearby Premier mill facility.

Bralorne-Pioneer Gold Mines Ltd, in a joint venture with Avino Mines and Resources Ltd., is conducting a minimum 1525-metre diamond drilling program on the Peter vein and the newly discovered, parallel Big Solly vein on the Bralorne mine (King mine) property. The program will test the downward extensions of two veins on the northeast side of the Ferguson fault. In July, 1994 Avino submitted an Application for a Mine Development Certificate. Proven and probable reserves are estimated by the company at 292 000 tonnes grading 12 g/t Au above the 1000 level, and an additional 673 000 tonnes grading 8.2 g/t Au below the 1000 level. Also, two veins on the Loco prospect are estimated to contain 362 800 tonnes grading 17.2 g/t Au.

At the Taurus project in the Cassiar camp, Hera Resources Inc. and International Taurus Resources Ltd. spent over \$1.5 million on exploration in 1994. Work included approximately 300 metres of underground exploration and development, approximately 3700 metres of surface drilling, 1850 metres of trenching, 40 kilometres of induced polarization surveying and cleaning up the 135 tonne per day mill. Three phases of underground development from the Sable (Hopeful) decline were carried out to further define the previously reported geological resource of 436 000 tonnes grading 7.2 g/t Au. A higher grade vein, with reserves of 29 000 tonnes grading 17 g/t Au, has been identified within this resource. A trenching and surface drilling program on the 88-1 zone to the west of the Sable decline extended the known vein system an additional 290 metres along strike and 120 metres in width. Trenching on the eastern portion of this 88-1 zone has also returned good values. Recent drilling on I.P. anomalies has encountered a new broad zone of low-grade quartz stockwork and altered

volcanic rocks. If this lower grade material is leachable, there is potential for several million tonnes of leach ore. Recent drilling on the Taurus West zone has resulted in a loss of potential reserves previously reported; however, this loss has been offset with the addition of potential reserves in the new (B.M.) and 88-1 zones. The camp facilities have been expanded for a winter program, and mine permitting is in progress.

Huntington Resources Ltd. (50%) and Liquid Gold Resources Inc. (50%) received approval for the removal of an 8000-tonne bulk sample from their Brett property. Between mid-1993 and mid-1994 Liquid Gold has spent approximately \$325 000 on surface drilling, engineering and feasibility studies, and completion of the haulage road. The drilling confirmed earlier grade estimates of 68 to 108 g/t Au on the Bonanza zone and average grades of 41.1 g/t Au on the R.W. vein which is accessible for surface mining. Liquid Gold is driving an adit from the portal site approximately 180 metres to the Bonanza zone. Ore will be processed at the Greenwood mill in which the company recently acquired a 49% interest.

In 1993 Fairfield Minerals Ltd. recovered 404 kilograms (13 000 oz) of gold and 498 kilograms (16 000 oz) of silver from 3850 tonnes of ore treated at the Asarco smelter at Helena, Montana, from its bulk sampling program on the Siwash North vein on the Elk property. Total cost of production was US\$170 per ounce of gold. Reserves at January 1, 1994 were estimated by the company at 122 500 tonnes grading 54.5 g/t Au and 24.68 g/t Ag. Total 1994 sales from open pit production and underground test mining and 1993 stockpiles are estimated to exceed 715 kilograms (23 000 oz) of gold. Stockpiles containing approximately 373 kilograms (12 000 oz) of gold remain on hand for future sales. Since late 1993, 1540 tonnes of ore averaging 77.14 g/t Au, test mined from underground, have yielded 118 kilograms (3800 oz) of gold from drifts, raises and a stope located below the open pit. This high-grade ore was mined over an average width of 0.55 metre. Eighty-three drill holes, totaling 2410 metres, drilled from underground stations to intersect the vein, expanded and further defined ore shoots. Underground exploration, development and test mining, with a \$1.5 million budget, resumed in October following completion of open-pit operations. Fairfield expects to produce 776 kilograms (25 000 oz) of gold from 9070 tonnes of ore from the pit operation. The resumed underground program will include 400 metres of additional decline to accommodate future mining and further diamond drilling. Since mid-1992 the Siwash (Elk) mine has produced over 1555 kilograms (50 000 oz) of gold from ore averaging 95.7 g/t Au. This production exceeded drill-indicated estimates by a factor of two. Fairfield is also exploring two nearby gold properties, the Crest and the Oka.

In the Rossland camp, International Silver Ridge Resources Inc. and Pacific Vangold Mines Ltd. have been

conducting underground development work on the Iron Colt and Evening Star projects. On the Iron Colt, the companies have a bulk sampling permit allowing the mining and testing of 10 000 tonnes of ore. Underground exploration and development is being facilitated by a 40-metre drift, four box holes that test the upward extension of the vein, and a crosscut which has been driven to test the width of the main vein. The first 450 tonnes of material stockpiled graded approximately 51.4 g/t Au. The companies signed a letter of intent with Echo Bay Mines Ltd. in September, under which Echo Bay has agreed to treat ore supplied by the Iron Colt joint venture in the Kettle River mill in Republic, Washington. The first shipment of 635 tonnes, estimated by the company to grade in excess of 34 g/t Au, commenced November 15, 1994. Continuous production is planned at a daily mining rate of 55 tonnes. Estimated production costs are US\$162 per ounce gold. By early October, drifting had progressed approximately 110 metres on the Evening Star and approximately 45 metres more drifting is required to reach the 90 700-tonne reserve grading 11.3 g/t Au. Pacific Vangold plans extensive underground drilling to test the western extension of this orebody. Elsewhere in the Rossland district, Pacific Vangold Mines Ltd. is conducting an extensive diamond drilling program on the Gertrude claim adjacent to the War Eagle mine and the Georgia claim, where the company theorizes that the LeRoi and North veins converge.

Claimstaker Resources Ltd., under an option agreement with Beaton Engineering Ltd. and Cleveland Capital Company Ltd., began shipping ore to the Trail smelter at a daily rate of 75 tonnes from the Bonaparte gold property located north of Kamloops. The reported assays from the first shipment averaged 27.8 g/t Au. The company has a permit to remove a 2700-tonne bulk sample of ore and shipments continued to the end of October. The company expected to receive payment for approximately 93 kilograms (3000 oz) of gold. The sample results will be used to confirm the average grade and general mineability of the ore. A diamond drilling program also explored strike and dip extensions of other mineralized zones on the property.

## INDUSTRIAL MINERALS

Exploration and market interest in industrial minerals continues to increase. In 1993, exploration expenditures reached at least \$2 million, with approximately half that amount spent on the search for diamonds in the southeastern part of the province. In 1994, exploration expenditures are estimated at \$4.5 million, including \$1.5 million for diamonds.

B.C. Chrysotile Limited did not complete the assembly of its pilot plant to process the asbestos tailings at Cassiar and because of advancing winter weather, decided to postpone its completion until next spring. The pilot plant will be used to produce sample material to supply to potential customers.

Cassiar Coal Company Ltd. initiated a feasibility study on its Stitt Creek placer garnet deposit, north of Revelstoke in the Goldstream mine area. The company estimates that the deposit contains substantial reserves of almandine garnet; mine life is estimated at ten years.

Zeolite beds have been identified in seven areas throughout the interior of British Columbia. Trial production by Mountain Minerals Ltd. in 1992-1993 tested the market. Potential buyers on the Prairies responded positively to the variety of agricultural uses. IMPACT Minerals Inc. has entered into a letter of intent to acquire the Allenby and Bromley Vale (Sunday Creek) zeolite properties near Princeton from Princeton Zeolite Products Inc. and the Princeton Industrial Mineral Joint Venture. The company plans a bulk sampling program to obtain material for product testing and market development. Surface sampling has identified the zeolite as a high quality clinoptilolite variety.

Gemstones are attracting more interest in British Columbia as new discoveries are made. In addition to the sapphire from the Blu Starr claims, there are two new finds in the Slocan valley. In the Airey Creek area prospectors have found gem quality aquamarine in pegmatite dikes. High quality black and smoky grey quartz crystals are also common. The Klinker fire opal locality near Vernon continues to attract attention, although there has been no significant development to date.

Canada Pumice Corporation is developing a market for scoria from the Nazko cinder cone, located west of Quesnel. Black scoria in the deposit is used mostly as light-weight aggregate, antiskid highway sand and barbecue rock. The company is finding buyers for the extensive red cinder used mainly in landscaping and other ornamental aggregate applications, including golf course sand traps.

A bulk sample was collected at the Lumby feldspar deposit in 1993. The material is being tested by Lakefield Laboratories for use in the glass plant in Lavington.

Highland Talc Ltd. has been conducting marketing studies and product development on its talc property, jointly with the Finnish owners of proprietary technology.

Lang Bay Resources Ltd. is planning a large bulk sample and is seeking financing for its kaolin property near Sechelt. The feasibility of underground mining is an unresolved issue. The B.C. pulp and paper industry has recently identified an emerging market for precipitated and ground calcium carbonate and kaolin as fillers in paper making, to add value to its products.

In 1993 New Global Resources Ltd. shipped a 9000-tonne bulk sample of pyrophyllite-silica (geyserite) from its Monteith Bay (Easy Inlet) property on the west coast of Vancouver Island to the Tilbury portland cement plant in Delta. The cement plant found the product acceptable. The project is in the Mine Development Assessment Process.

Consolidated Ramrod Corporation Ltd. spent over \$0.5 million exploring for **diamonds** on its large **Ice** property which includes the Crossing Creek kimberlite near Elkford. Grassroots exploration was also carried out elsewhere in the Rocky Mountains, the Horsethief - Toby Creek area, and near Midway and south of Grand Forks.

Quadra Stone opened a new **granite** quarry at **Grano Creek** in Christina Valley, as well as two new sites in the **Beaverdell** area. Quarry Pacific Industries Ltd. opened two new **granite** quarries at **Idabel Lake**, east of Kelowna.

Franz Capital Corporation Ltd. is working on development of its **Kingfisher** white marble property east of Vernon. The property also has a very attractive white pegmatitic granite 250 metres east of the marble zone that may be another development target. The company estimates a geological potential of at least 5.5 million tonnes of marble. Permitting has been applied for block sampling and ASTM testing.

In 1994 Jade West Resources Ltd. purchased the remaining Mohawk Oil **jade** properties in the Kutcho Creek area and concentrated production there. The Ogden Mountain area has been left idle. The jade is processed at Jade West's South Surrey site.

Quinto Mining Corporation Ltd. is developing its 27 million tonne **Lumby** (Chaput) **graphite** and **sericite** deposit 37 kilometres east of Vernon. The microcrystalline graphite is intergrown with mica and cannot be upgraded to a marketable graphite concentrate. However, the company is examining the possibility of marketing a muscovite-graphite product for special filler applications. USIG Inc. of California has earned a 30% interest in the property. Work during 1994 included underground bulk sampling and construction of a test lab and pilot flotation plant.

## COAL

1994 saw a decrease of about 50% in coal exploration in four areas of the province: the Kootenays, Telkwa, Peace River and Vancouver Island. Total estimated expenditures for coal exploration are \$1.5 million of which \$1.0 million was spent on the investigation of thermal coal potential, principally at the Telkwa, Tsolum Creek and Willow Creek coalfields.

In the Kootenay coalfields, Fording Coal Limited conducted exploration programs at its **Fording River** and **Greenhills** operations. A total of 76 holes were drilled for coal sampling and down-hole geophysics, and one test pit was excavated. At the **Line Creek** and adjacent properties, Manalta Coal Ltd. drilled 15 rotary holes. The total exploration expenditure in the Kootenay coalfields in 1994 is estimated at \$500 000. On Vancouver Island, Canadian Occidental Petroleum Ltd. conducted a modest drilling program, consisting of approximately 2000 metres in six holes on the **Tsolum River** property, at an estimated cost of

\$150 000. On the **Quinsam** property, Quinsam Coal Ltd. drilled three PQ holes to test the down-dip depth and continuity of the main coal seams north of the 2N/3N mine block. Results were encouraging. The company also drilled seven PQ holes between the 2N and 3N blocks, to confirm thickness, quality and local structure in an area not adequately tested prior to open-pit production. Total expenditures are estimated at \$150 000.

At the **Telkwa** thermal coal project, Manalta Coal Ltd.'s focus in 1994 was reconnaissance drilling (500 m spacing) of the large property, as well as in-fill drilling on the Tenas deposit. A total of 8550 metres was completed in 57 rotary-drill holes. Geological reserves on the main deposit are estimated to be 38.7 million tonnes contained within four pit areas. The application to the Mine Development Assessment Process, originally filed in 1990, is currently under review.

In the Peace River area, Globaltex Coal Corporation drilled 101 rotary-drill holes totalling 5000 metres at an estimated cost of \$300 000 on three coal licenses on the **Willow Creek** thermal coal property. Bulk samples from each of the four major seams were taken for detailed testing, product development, and initial customer samples. Preliminary results indicate the seams have excellent cleaning characteristics. The company is planning for production of coking and thermal/industrial coals. Detailed design engineering and environmental studies continue. Mine start-up is planned for 1995 at an initial production rate of 500 000 tonnes per year.

There was no exploration at either **Quintette** or **Bull-moose** coal mines.

## HIGHLIGHTS OF EXPLORATION PROJECTS

Gold-enriched porphyry copper deposits, polymetallic massive sulphide deposits (volcanogenic, seafloor hydrothermal and sedex), and veins and porphyry-related to transitional deposits accounted for approximately 90% of 1994 exploration expenditures in British Columbia. The remainder were directed to coal, industrial minerals, skarn, diamonds and less traditional targets such as sedimentary copper. Of the total estimated \$100 million exploration expenditures, approximately 45% fits into the less advanced to grassroots category addressed in this section. Although most of the programs were focused in and around areas with mines or known showings and existing infrastructure, several new, relatively low budget, regional programs were conducted throughout the province. These keyed on: sedex deposits in the southeast (especially in the Purcell Supergroup) and northeast (e.g., **Cirque-Driftpile** area); diamonds in the Rocky Mountains; gold deposits in the Interior Plateau of south-central British Columbia; porphyry deposits in the Babine Lake area and epithermal precious

metal veins and porphyry-related deposits in the Stewart camp in the northwest. Some of these projects have advanced very quickly and are mentioned in the previous section (*i.e.*, **Huckleberry**, **Red Mountain**). The diversity of targets, their large size (some world class, such as **Highland Valley Copper** and **Sullivan**), and the profitability of smaller, higher grade deposits such as **Snip**, continue to make British Columbia a good place to explore. The properties mentioned below are shown on Figure 8 and listed in Table 4, with estimated preliminary reserves, where available.

### PORPHYRY AND PORPHYRY-RELATED COPPER-GOLD DEPOSITS

At the **Hearne Hill** deposit, located close to the recently closed **Bell Copper** mine in the Babine Lake area, **Booker Gold Explorations Ltd.** completed extensive ground magnetometer and EM surveys to delineate more breccia pipe targets, and follow-up percussion and diamond drilling. A total of seven new magnetic anomalies, all larger than the **Chapman** breccia pipe anomaly, were identified within or peripheral to an extensive porphyry copper system. The focus of a proposed 1500-metre diamond drilling program is a new breccia zone located approximately 160 metres northeast of the **Chapman** zone. Elsewhere in the

**Babine** region, **Hera Resources Inc.** recently acquired the **Nak** prospect and planned a large I.P. survey during the fall.

**Lysander Gold Corporation** reached an agreement in principal with **Kennecott Canada Inc.** to acquire an option to purchase a 100% interest in the **Lorraine** property. Previous work outlined geological reserves of 10 million tonnes grading 0.67% Cu and 0.34 g/t Au in the **Main** zone deposits. Three other anomalous zones have been identified, including the **Extension (Bishop)** zone. Drilling of 1216 metres in ten holes in 1994 concentrated on the **Extension** zone (seven holes) and, to a lesser extent, the **Main** zone (three holes). Intersections well mineralized with chalcopyrite and bornite have been reported, including hole **L94-8** which assayed 1.48% Cu and 0.65 g/t Au over 92 metres, in the upper **Main** zone.

**International Skyline Gold Corporation** drilled 870 metres on the **Bronson Slope** property in late 1993 and calculated a mineral inventory of 100 million tonnes grading 0.65 g/t Au, 0.14% Cu, 3.4 g/t Ag, and 0.01% Mo. A drill-indicated probable and possible mineral resource of 20 million tonnes grading 0.25% Cu, 0.71 g/t Au and 2.65 g/t Ag is contained within the larger resource. The company is preparing a revised mineral resource estimate. A second phase of drilling was suspended due to severe winter conditions after completion of 610 metres in two holes to test

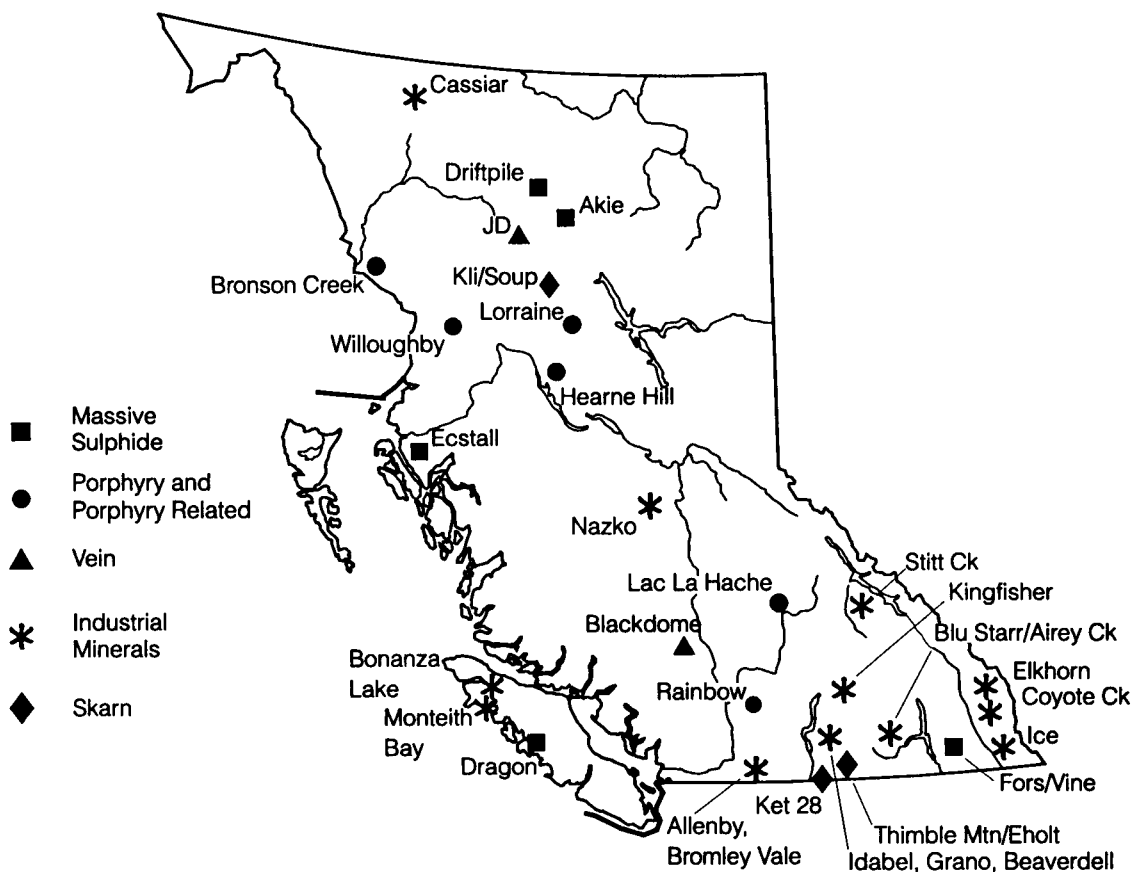


Figure 8. Exploration highlights projects in British Columbia - 1994.



TABLE 4  
1994 EXPLORATION HIGHLIGHTS

Company Name	Project Name	Commodity	Estimated Tonnes (000s)	Estimated Grade	Reference
<b>Massive Sulphide Deposits</b>					
Ecstall Mining Corp./ Metall Mining Corp.	Akie	Pb,Zn,Ag			GCNL Oct. 5/94
Teck Corp.	Driftpile	Pb,Zn,Ag	20 000	2.4% Pb + Zn	NM, Oct. 18/93
Consolidated Ramrod Gold Corp.	Fors/Vine	Pb,Zn,Ag			
Ecstall Mining Corp./ Ama Res. Ltd.	Ecstall Red Gulch	Cu,Zn,Ag	6350	0.6% Cu, 2.5% Zn, 0.5 g/t Au, 20 g/t Ag	Atna, 1994
<b>Porphyry (and related) Deposits</b>					
International Skyline Gold Corp.	Bronson Creek	Cu,Au,Ag,Mo	100 000	0.14% Cu, 0.65 g/t Au, 3.4 g/t Ag, 0.01% MoS <sub>2</sub>	Skyline, 1994
Brooker Gold Explorations Ltd.	Hearne Hill	Cu,Au	180	1.7% Cu	Prospectus MDAP, 1992
Camnor Res. Ltd./ Gold Giant Minerals Inc.	Willoughby	Au, Ag			NM, Oct. 10/94
Lysander Gold Corp./ Kennecott Canada Inc.	Lorraine	Cu,Au	10 000	0.67% Cu, 0.34 g/t Au	Kennecott, 1993
Getchell Res. Inc./ Teck Corp. Ltd.	Rainbow No. 2 zone	Cu,Au	3000	0.7% Cu	Getchell, 1994
<b>Skarn Deposits</b>					
GWR Resources Inc./ Regional Resources Ltd.	Lac La Hache (Nemrude)	Cu,Au	544	1.8% Cu, 0.17 g/t Au, 49% Fe	SW, Mar. 4/93
Orvana Minerals Corp.	Eholt/Thimble Mtn.	Cu,Au			SW, Aug. 8/94
Hemlo Gold Mines Inc./ Athlone Res. Ltd./ Kennecott Canada Inc./ Vital Pacific Res. Ltd.	Kli	Cu,Au	2300	0.31% Cu, 1.3 g/t Au, 6.9 g/t Ag	SW, Feb. 2/93
Gold City Res. Inc./ Sway Res. Inc./ Phoenix Gold Res. Ltd.	Ket 28	Au	-	-	-
<b>Vein Deposits</b>					
AGC Americas Gold Corp.	JD	Au	-	-	SW, Oct. 20/94
<b>Industrial Minerals</b>					
B.C. Chrysotile Ltd.	Cassiar	asbestos	-	-	-

Table 4 continued

Canada Pumice Corp.	Nazko	red cinder	-	-	-
Cassiar Coal Co. Ltd.	Stitt Creek	placer garnet	-	-	-
Quadra Stone	Grano Creek/ Beaverdell	granite	-	-	-
Quarry Pacific Ind. Ltd.	Idabel	granite	-	-	-
Franz Capital Corp. Ltd.	Kingfisher	marble, pegmatite	-	-	-
IMPACT Minerals Inc.	Allenby/ Bromely Vale (Princeton)	zeolite	-	-	-
Trueman/Currie	Lumby	feldspar	-	-	-
Westroc Ind.	Elkhorn	gypsum	-	-	-
Northamerican Gyprock Co.	Coyote Creek	gypsum	-	-	-
Consolidated Ramrod Gold Corp.	Ice (Cross)	diamond	-	-	-
Luchansky/Demers Barkley	Blu Starr, Airey Creek	sapphire, aquamarine	-	-	-
Leo D'Or Marble	Bonanza Lake (Leo D'Or)	limestone	-	-	-
Blue Emerald Res. Ltd. B. Yorke - Hardy/ G. Grywachski	Klinker	fire opal	-	-	-
New Global Res. Ltd.	Monteith Bay (Easy Inlet)	pyrophyllite - silica	-	-	-

Note: SW = Stockwatch; NM = Northern Miner; MDAP = Mine Development Review Process; GCNL = George Cross News Letter.

down to the 200-metre elevation. The company considers this drilling successfully confirmed results from previous drilling in higher grade zones and traced these previously defined zones to a greater depth.

On the **Lac La Hache** property, Regional Resources Ltd. and GWR Resources Inc. conducted I.P. surveys over six target areas outlined during the 1993 season. Regional conducted a further I.P. survey on claims and adjoining the Nemrude bornite skarn zone and planned to conduct a winter drilling program on the Nemrude zone where the company previously estimated reserves of 544 200 tonnes grading 1.8% Cu, 49% Fe and 0.17 g/t Au.

In the area between the Afton and Ajax deposits, Teck Corporation, under an option agreement with Getchell Resources Inc., drill-tested the **Rainbow** property. Previous operators had outlined three zones of copper-gold mineralization. Teck's phase I program in 1994 included ground magnetic and I.P. surveys, detailed lithologic and alteration mapping, trenching and approximately 2600 metres of diamond drilling in sixteen holes. Targeted areas included extensions of known mineralization, previously untested intrusive contact areas and possible fault intersections as interpreted from data acquired from airborne surveys. Fol-

lowing encouraging results from the phase I program, Teck entered a second phase consisting of at least 1500 metres of drilling in seven core holes designed to follow-up an intersection of 0.7% Cu and 0.1 g/t Au across 62 metres in hole 94-14. Hole 94-17 returned a 176-metre interval which averaged 0.61% Cu. Drilling tested on-strike and down-dip extensions of this new zone which has been intersected over an east-west width of 100 to 150 metres, a north-south strike length of 200 to 250 metres, and to depths of 250 metres. The company suggests that this mineralization may relate to the No. 2 zone in which the company has estimated a reserve of 3 million tonnes grading 0.76% Cu. A third phase of drilling totalling approximately 1830 metres in eight holes, tested the up-dip extent of the mineralized intrusion. Getchell also controls the **Galaxy** property 1.5 kilometres to the north of Teck's Ajax mine. The company reports that property hosts an estimated 3.2 million tonnes grading 0.65% Cu and 0.34 g/t Au.

Camnor Resources Ltd., under an option agreement with Gold Giant Minerals Inc., drilled 1775 metres in seventeen holes on the **Willoughby** property, 6 kilometres east of Lac Minerals' Red Mountain project. The property is geologically similar to the Red Mountain deposit. Drilling (hole NZ89.06) on the North zone of the Willoughby prop-

erty by Bond Gold Canada in 1989 returned 20.1 metres grading 25 g/t Au and 171.4 g/t Ag. At least nine surface showings have been identified to date in or near the Wiloughby nunatak. Four of the showings were drill tested. The North zone is a mineralized vein stockwork in an altered porphyry in a structure 30 metres long and 65 metres deep. Mineralized intercepts include 6 metres grading 712 g/t Ag and 18.2 g/t Au in hole 94-26. Based on the results, Camnor is considering a small underground exploration program for 1995. The Wilby zone, defined by six holes 425 metres southeast of the North zone, is 55 metres long, 35 metres deep and 26 metres wide. Mineralization occurs as a replacement body of semimassive sulphides in altered, bedded tuff. Hole 94.22 returned 2.7 metres grading 15.8 g/t Au.

### **POLYMETALLIC MASSIVE SULPHIDE DEPOSITS**

Both base metal rich (sedex and volcanogenic) and precious metal rich ("Eskay Creek" or seafloor hydrothermal type) massive sulphide deposits were very important targets in 1994. The success of projects at Myra Falls (Battle/Gap zones), Tulsequah Chief/Big Bull, Eskay Creek, Fors/Vine, Goldstream and Akie/Driftpile over the past few years bears good testimony to the exploration potential of these deposit types.

In the **Gataga** district, where the Cirque deposit has been delineated, Metall Mining Corporation under an option agreement with Ecstall Mining Corporation, reported a new discovery (Cardiac Creek zone) on the Akie sedex property. The discovery drill hole (A-94-5) intersected 31.9 metres of bedded pyrite, sphalerite and massive barite within which 13.1 metres assayed 3.56% Zn, 0.61% Pb, and 5.05 g/t Ag. Further drilling has intersected sulphides along a strike length in excess of 1.4 kilometres and a dip length of 300 metres. Hole A-94-12 intersected 40.4 metres of mineralized sedimentary rocks, including a 9.3-metre interval grading 8.42% Zn and 1.61% Pb, adding 150 metres to the previously tested dip length. Results from drill holes A-94-11 and A-94-12 indicate the grade of the deposit is increasing at depth. The program was suspended following the completion of drill hole A-94-12 due to deteriorating weather. Drilling will resume in the spring of 1995.

On the **Driftpile Creek** property, Teck Exploration Ltd. drilled twenty-six holes totalling 4377 metres in 1994. The drilling tested five mineralized targets beyond the Main zone drilled in 1993. Twenty-one of the twenty-six holes intersected sulphide-barite mineralization. Best results included 7.93% Zn over 2.0 metres and 17.5% Zn over 1.0 metre, both in drill hole 94-88 on the East zone. Significant ore grade intercepts were not encountered. Improved understanding of the structure and stratigraphy indicates that mineralization in the East zone may represent a stratigraphically higher and more weakly mineralized horizon than high-grade intersections recorded in 1993. The poten-

tial for a deeper high-grade mineralized horizon, similar to that tested in the Main zone in 1993, is indicated. Conodont dating by the Geological Survey of Canada should confirm the stratigraphic position of the East zone mineralization. Additional work is planned for 1995. Teck also completed drilling on the **Bear** sedex property, located approximately 10 kilometres to the southeast.

In the Purcell Mountains, Consolidated Ramrod Gold Corporation drilled three deep holes on the **Fors** sedex prospect in the search for a Sullivan-type deposit. A modest drilling program on the **Vine** prospect was planned for late in 1994. Drilling in 1993 identified an extensive vent complex with widespread alteration and mineralization in the vicinity of the "Sullivan horizon".

On the **Dragon** polymetallic prospect located near Gold River, Westmin Resources Limited exercised a right of first refusal with Doromin Resources Ltd. The property is underlain by Paleozoic stratigraphy, similar to that at the nearby Myra Falls mine, over a strike length in excess of 8 kilometres. Noranda Exploration Company, Limited drilled the Falls and North showings in 1993, but did not renew its option agreement with Doromin.

Exploration by Atna Resources Ltd. on the **Ecstall** volcanogenic massive sulphide deposits focused on the Thirteen Creek and Red Gulch areas. The Ecstall deposit in the Red Gulch area has a reserve estimated by the company at 6.35 million tonnes grading 0.6% Cu, 2.5% Zn, 0.5 g/t Au and 20 g/t Ag. In the Thirteen Creek area disseminated and vein-type copper mineralization was discovered along a zone 2 kilometres long. Drilling was planned for later in the year.

### **PRECIOUS METAL BEARING VEIN AND BULK-MINEABLE DEPOSITS**

Exploration targets in this category cover a broad spectrum of hydrothermal, epigenetic mineral deposits. They include high-level epithermal and deeper level mesothermal deposits.

In the northern Toadogone district, AGC Americas Gold Corporation drilled thirty-two holes on the **JD** property. Geochemical, geophysical and geological surveys were carried out over a gold-bearing structure 2.5 kilometres long. Drilling tested the Gumbo-Finn zone which has large-tonnage open-pit potential, and the JD West-Schmitt zone of high-grade vein mineralization. Drilling on the Finn zone returned an intersection of 13.2 g/t Au over 8.84 metres in 'discovery' hole 94-18. Further drilling along strike and down-dip indicates that the shallow dipping mineralized structure has potential to host a significant tonnage.

In the **Interior Plateau** region in the central part of the province, numerous projects were carried out in the search for epithermal bonanza and bulk-mineable (heap leachable) deposits: **Wolf** (Metall Mining Corporation), **Baez** (Phelps Dodge Corporation of Canada Ltd.), **Blackwater-David-**

son (Granges Inc.), Cutoff, Holy Cross and Yellow Moose (Cogema Resources Inc.), Loon (Hudson Bay Mining and Smelting), Uduk Lake (Pioneer Metals Corporation), Fawn/Buck (Western Keltic Mines Inc.), Tsacha (Teck Exploration Ltd.), Bent (Kennecott Canada Inc.) and Greg (Cominco Ltd.)

On the Blackdome epithermal gold property, Claim-staker Resources Limited completed in excess of 2000 metres of drilling in 20 diamond-drill holes testing the No. 11 and No. 18 vein systems. Results indicate an additional mineable resource may be outlined by further drilling. Prior to 1994 exploration, an in-mine resource of approximately 73 000 tonnes grading 14 g/t Au had been estimated. The property includes a 200 tonne per day mill and a permitted tailings pond. Production is planned for 1995.

### SKARN DEPOSITS

In north-central B.C., Hemlo Gold Mines Inc. worked on the Soup property (see Figure 8) under an option agreement with Vital Pacific Resources Ltd. (75%) and Athlone Resources Ltd. (25%). Strongly anomalous gold-copper geochemical values extend over an area greater than 1 square kilometre. These correlate with ground and airborne magnetic anomalies in areas of diorite and magnetite skarn in andesitic flows. In 1994, Hemlo discovered magnetite-silica-sulphide mineralization identified by an airborne magnetic and coincident gold-copper geochemical anomaly over an area 90 to 275 metres wide and 1200 metres long. A 1989 drill hole completed in the target zone averaged 5.4 g/t Au and 0.1% Cu over 40 metres.

On the Kli property, Hemlo, under an option agreement with Athlone Resources Ltd. (25%), Kennecott Canada Inc. (45%) and Vital Pacific Resources Ltd. (30%), completed ten diamond-drill holes totalling 1120 metres testing auriferous and cupriferous magnetite-silica replacement zones within altered and fractured andesitic, dioritic and monzonitic rocks. Previous drilling had outlined about 2.3 million tonnes grading 0.45% Cu, 1.3 g/t Au and 6.9 g/t Ag. Elsewhere in the area, Hemlo has optioned Major General Resources Ltd.'s Joh and Darb claims which adjoin the Kli property to the north. The target is gold-copper skarn associated with porphyry-style mineralization. Several new claims have been staked in the area.

In the Rock Creek area, Gold City Resources Inc., Sway Resources Inc. and Phoenix Gold Resources Ltd. announced a drill-hole intersection assaying 52.1 g/t Au across 3.35 metres within 10 metres of surface on their Ket 28 claim. The gold zone is associated with a pyritic matrix-supported breccia, in chloritized, epidotized and silicified greenstone. The Ket 28 property, located 12 kilometres northwest of Battle Mountain Gold Company's 56 000 kilogram (1.8 million oz) Crown Jewel gold skarn deposit, lies along the 18-kilometre Rock Creek - Jolly Creek structural trend.

To the east, in the Greenwood camp, Orvana Minerals Corporation drilled the Thimble Mountain and Eholt gold-copper skarn targets.

### OTHER TARGETS

Both property-scale and regional exploration programs were conducted for sedimentary copper-cobalt-silver deposits in the southeast (e.g., Junction/Delta properties) and northeast (e.g., Tuchodi Lakes area) of the province.

### NEW INITIATIVES IN BRITISH COLUMBIA

Several new government programs that will influence future mineral resource planning, exploration and development in British Columbia were initiated in 1994.

- A five-year \$100 million program to provide significant tax reductions and exploration incentives to assist and promote private sector mineral exploration in British Columbia was announced in April.

Explore B.C., a part of this program, is a three-year \$13.5 million program designed to provide part of the risk capital required by mineral exploration companies to finance their programs, to extend the economic lives of existing mines and contribute to community stability in existing mining regions. The program has two components:

- (1) **Mineral Exploration Incentive Program** - (MEIP) provides grants to eligible exploration companies or individuals, to cover up to one-third of eligible exploration expenses on properties with identified economic potential. Maximum assistance is \$150 000 per project. In July, 56 exploration and mining companies were awarded grants totalling \$2.4 million under the MEIP program. This figure includes grants totalling \$0.2 million to ten industrial mineral targets.
  - (2) **Accelerated Mine Exploration Program** - (AMEP) provides grants to mining companies to cover up to one-third of eligible exploration expenses at existing mines for the purpose of discovering additional reserves. Maximum assistance is \$150 000 per project. Under the AMEP program, grants totalling approximately \$1 million were awarded to eleven projects.
- The **Prospectors' Assistance Grant Program** is designed to promote grassroots prospecting for new mineral deposits in British Columbia. It will contribute up to 75% of eligible costs of an approved project to a maximum of \$10 000. Sixty-nine grants, totalling approximately \$500 000, were awarded in 1994.
  - The 1994 Budget amended the **Mineral Tax Act** to allow companies with more than one operating mine

in the province to pool exploration expenditures, providing new flexibility for mining companies in using exploration deductions.

- Effective January 1, 1995 a five-year program will begin whereby the allowable deduction for capital costs for a new mine or major expansion will be increased by one-third for the calculation of Mineral Tax.
- British Columbia will also spend **\$1.6 million** in 1994/95 on the **Federal/Provincial Mineral Development Agreement**. This program runs to 1995/1996 and coordinates the efforts of Canada and British Columbia to strengthen and diversify the province's mineral industry. Activities sponsored under the agreement include the funding of geological, market and technology studies. New value-added opportunities will also be examined.
- The new **Environmental Assessment Act** has passed third reading in the Legislative Assembly of British Columbia and will be proclaimed in 1995, following completion of drafting the regulations. The Act builds on the strengths of the existing Mine Development Assessment Act in establishing a process through which the potential effects of projects are identified and means of preventing or mitigating adverse impacts are developed and evaluated.
- A provincial initiative which includes a **partnership with B.C. Trade Development Corporation** to promote the marketing of industrial minerals in the province, Pacific Rim countries and Europe.
- Creation of the **Premier's Forum** on mining, involving cooperation and consultation between government and industry at the highest levels to develop concrete solutions to the industry's competitive position.
- The **Geological Survey Branch's** multidisciplinary programs continue to be focused on regions where existing mines are forecast to close in the next few years (northern Vancouver Island, East Kootenays and northern Selkirks) and in areas with significant identified potential (Interior Plateau, Tulsequah, Gataga, and Tatogga). Results of these programs are expected to encourage base and precious metal exploration in these areas and elsewhere.
- The **Mineral Potential Mapping Initiative** will see completion of 1:250 000-scale mineral potential maps for the province in 1996. These data are being used in many land-use decisions, principally those by the Commission on Resources and Environment (CORE).

- Initiation of a multi-year project to develop an inventory of sand and gravel resources in the province.
- Initiation of a pilot program to produce an earthquake microzonation map of part of the Fraser Valley.
- Development of a **joint strategic plan** of selected geoscience needs for British Columbia between the British Columbia Geological Survey Branch and the Geological Survey of Canada. The "Geoscience Cooperation for British Columbia" plan is intended to guide both organizations in planning operations for the next five years.
- Completion of part of the Geological Survey Branch's "**Mineral Deposit Profiles**" project to describe the types of mineral deposits found around the world, with special emphasis on examples and deposit characteristics relating to British Columbia.
- After two years of consultation between the mining industry, government officials, the labour unions, environmentalists and First Nations groups, the **Whitehorse Mining Initiative Leadership Accord** was signed in September 1994. The mining industry is committed to establishing guidelines for protecting the environment during all mining activities and to improving training and human resource development in the industry. In return, the industry hopes that governments will encourage Canadian and international mining companies to explore and invest in new mines by, amongst other things, providing greater exploration incentives and revising tax policies on mine reclamation.
- Discussions continued with the **First Nations**, spearheaded through the Treaty Commission in British Columbia, designed to provide them with a more equitable role in mineral exploration and development decision making within their traditional territories.
- In March 1994 an agreement signed between the provincial government and Cominco Ltd. will see a new lead smelter constructed at Trail at a cost of approximately \$145 million and a zinc plant expansion costing approximately \$25 million.

### ***SUMMARY AND OUTLOOK FOR 1995***

Many signs indicate an upswing in the mining industry in British Columbia. Exploration expenditures in 1994 are forecast to be approximately \$100 million, a 30% increase from 1993; claim staking is forecast to be up 10%; the number of valid Free Miners Certificates is up, four metal mines have recently re-opened, production from southeastern coal mines is expected to reach pre-1992 levels with a strong demand for metallurgical coal, and the general increased level of grassroots activity are all key factors.



Several advanced projects will receive further work in anticipation of improved metal markets and favourable resolution of uncertainties in land-use policies. Several smaller, high-grade gold projects have and will continue to take advantage of the custom milling facilities available in the province by obtaining the necessary permitting for bulk sampling.

The many copper and gold-bearing porphyry deposits discovered during the 1960s and 1970s (*e.g.*, **Red-Chris, Lorraine, Huckleberry**) will continue to attract attention. Sedex (*e.g.*, **Akie, Driftpile**) and volcanogenic polymetallic sulphide (*e.g.* **Ecstall, Tulsequah Chief**) deposits offer small to medium tonnage and high-grade potential, particularly those enriched in precious metals. The stratiform, gold-enriched (seafloor hydrothermal) Eskay Creek-type deposits are examples of low-tonnage, but potentially extremely profitable, high-grade targets. The transitional setting which includes vein and skarn deposits related to porphyry systems (*e.g.*, **Red Mountain, Willoughby, Snip**), offers similar small to medium tonnage and high-grade potential.

The potential for bulk-mineable (heap leachable) gold deposits will continue to be examined. Current exploration and future development at the Golden Bear mine will focus on the heap leaching characteristics of recently discovered "no seeum" mineralization associated with silicified limestones. In the Interior Plateau region bonanza and bulk-mineable targets (*e.g.*, **Wolf, Baez, Uduk Lake, Loon**) are being recognized.

The completion of the access road into the Eskay Creek property and impending production in January, 1995 will provide improved infrastructure for future exploration pro-

grams in this area. The increase in exploration expenditures on industrial minerals is forecast to continue, with new discoveries and new markets being developed. In general, the long-term outlook for markets for minerals, and mineral products is very good throughout the Pacific Rim; British Columbia is well positioned to compete in the international market.

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