

Gillian Cobban

Highmont - 92I/7W
 - 92I/SE-13
 - 04830

Highland Valley-92I/7W

Afton - 92I/10E
 - 92I/NE-23,113
 - 01850, 01969

Gibraltar - 93B/10
 - 00541

Copper

Canadian operators on the move — ahead

After several years of depressed prices, prospects for the copper industry in Canada are on the upward trend. Copper consumption reached record levels in 1978 and as worldwide copper inventories declined, prices improved steadily.

The forecast by several major copper producers is for continued improvement.

'Demand for most metals, including copper, was much stronger than expected in the first four months of 1979'.

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'In the case of copper, the serious and continuing production problems in Zaire have caused a shortfall in world supply for most of 1978 and to the present'.

In addition, Canadian copper production was sharply reduced through a combination of production cutbacks and strikes at the Inco and Gaspé mines. Copper production amounted to an estimated 657,000 tons, a 13.4% drop from 749,000 tons in 1977.

Mr McIntyre adds that 'the combined effects of a healthy demand in USA, Japan and Europe, and the supply problems, resulted in a drop in world surplus stocks of some 485,000 tons in 1978, and an estimated further drop of 17,000 tons week through to at least June 1979. Without these stimuli, prices finally broke out of their rather lethargic performance last year'.

The US equivalent of the LME copper price rose from 71¢ at the end of 1977 to the 98¢ to \$1.00 range by early April 1979, and the US producer price also moved in the same period from 71¢ to the 98¢ to \$1.00 range.

'Assuming a slow-down in the economy later this year, the supply situation in Africa will continue to be the fundamentals and copper prices are expected to remain at least in the \$1.00 range in 1979', Mr McIntyre predicts.

At the same time as copper prices are

improving, recent expansion and development decisions by several major producers have reinforced the sense of well-being in the industry.

Teck Corporation has announced it will spend \$150-million to develop a new copper-molybdenum mine in the Highland Valley of BC. 92I/7W

Designed to handle 25,000 tons/day, the annual output will be approximately 50,000,000 lb of copper and 4,500,000 lb molybdenum, with higher molybdenum output in the initial years. The molybdenum will be sold to Metallgesellschaft, of Germany, and arrangements for the sale of copper concentrate on world markets are being finalized.

Construction is scheduled to begin in spring 1979 and will take about 18 months to complete. Over 400 new jobs will be created by the project. 92I/7W.

The Highmont project is owned 70% by Highmont Mining Corporation and 30% by Teck. For Teck, which also owns 53% of Highmont, this will be its fourth new mine in the last five years. 92I/10E.

Its third mine, the Afton mine and smelter near Kamloops, BC, was officially opened 27 April 1978. During the five months of operation in the fiscal year ended 30 Sept 1978, net earnings were \$2,951,000. Production during the five month period was 21,372,000 lb of copper and 20,733 oz of gold.

The concentrator began tune up operations in December 1977 and throughput to 30 Sept 1978, was 2,113,000 tons with an average recovery rate of 85.2%. A total of 34,780,000 lb copper and 27,973 oz of gold was produced in concentrate.

For the five months to the end of February 1978, a total of 1,228,000 tons grading 0.97% copper was milled. Copper production for the five month period was 20,642,000 lb, gold was 22,352 oz, and silver totalled 106,849 oz.

R E Hallbauer, president of Afton Mines projects that 'the price of copper will probably stay somewhere around its

present level for 1979 but will head for an improvement after that'.

Echoing Mr Hallbauer's comments, R P Taylor, president of Zapata Granby predicts a continued improvement in prices.

He adds that 'given the long lead times for planning, financing and developing new mines, the probability of substantial supply shortages in the next five years is greatly increased'.

'The consumption of copper will exceed supply resulting in significant shortages developing in the early 1980s. Production will increase slowly over the next few years which could possibly lead to another situation of over-supply and a resulting downward cycle in the mid-1980s', Mr Taylor claims.

A different outlook, particularly for the second half of 1979, is expressed by Donn Morgan, marketing manager for Placer Development.

The seasonal pattern of consumption (being 5% greater in the first half of the year), combined with inflation and a resulting drop in investment, will cause the demand for copper to go down in the last half of 1979, says Mr Morgan.

At the same time, supply will increase because improved prices encourage expansion and new mine development as well as a response from the scrap copper market.

He predicts that 'prices are going to drop to the 72¢ to 80¢ range by full this year. This will be followed by a gradual strengthening to a new stabilization point around 75¢ to 80¢ by 1981, and rising to the \$1.10 to \$1.50 range by 1982-83, in order to justify new investment. Refined production will be approximately 6.9-million tons with consumption around 7.2-million tons in 1979'. 93B/10.

Gibraltar Mines Limited, owned 71.9% by Placer, had a disappointing year in 1978 because of a labour dispute which halted operations from 26 May through to 6 Feb 1979. The company had

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a net loss of \$2,381,000, compared to a loss of \$142,000 the previous year. For the first quarter of 1979 it incurred a loss of \$593,000.

Copper inventories in 1978 were also affected by a strike at Noranda Mines' Gaspé operation in Québec. The strike began 16 Oct 1978 and was not settled at end-April 1979.

With projections for improved copper prospects, Noranda has recently announced a \$19-million expansion project at its Bell Copper Division near Granisle, B.C. The expansion will increase the daily ore throughput from 1500 tons/day to 1700 tons/day by 1981.

About \$12-million will be spent on mining equipment to expand the pit operation where mining of ore and waste rock will increase from the current rate of 27,000 tons/day to 55,000 tons/day.

The Bell Copper Division was facing closure by 1982, but this expansion project will extend the life of the mine until 1988. The current number of 280 people employed will increase to about 330.

An agreement reached last year to sell the Bell Copper Division to Zapata Granby broke down in March after Noranda refused to grant a third extension to the agreement.

Another boost to development in western Canada came with the announcement by Esso Minerals Canada that it will re-open the Granduc copper property near Stewart, B.C.

The mine, which was closed in June 1978, will resume operations in mid-1980. Rehabilitation work is scheduled to begin this summer at an estimated cost of \$20-million.

Esso is purchasing mining and mill machinery owned by Newmont Mining Corporation and used in the Granduc operation.

Newmont Mines has also begun work to expand its Similkameen Division by developing the Copper Mountain orebodies east of the Similkameen River and across from the Ingerbelle pit and concentrator.

The project, estimated to cost \$23,400,000, includes a new primary crusher and a conveyor system to transport crushed ore from the new mine area to the present concentrator via a new suspension bridge. It is scheduled for completion in early 1981.

'Anyone who predicts copper prices is usually wrong', comments J Harvey Parliament, president of Newmont. He adds that 'with the demand having overtaken production, the current prices in the 90c range are very realistic. However, with the high costs of producing copper, it is still below the price needed to bring new mines into production'.

He admits to feeling quite bullish and optimistic for the mining industry in Canada and adds that, with a continued high demand, there could possibly be some shortages in the next few years.

In view of the much improved outlook for both copper and molybdenum, expansion options for Lornex mine in the Highland Valley are now under detailed study. An earlier uncompleted expansion feasibility study has been reactivated and should be finished during 1979.

'The orebody could support an expansion of up to 50%, which would include a third mill line, and still have a remaining life of over 20 years', reports R D Armstrong, chairman and chief executive officer.

Earnings for Lornex for the first three months of 1979 rose to \$8,487,000 from \$2,252,000 in 1978. The improvement was primarily due to increased copper prices and the lower value of the Canadian dollar.

Also in the Highland Valley area is Bethlehem Copper. Exploration work is continuing to expand ore reserves at the mine site, and Ryan J Reynolds, president, states that although there are no specific plans for expansion at this time, if the exploration continues to be suc-

cessful, mine expansion would be considered.

'Prices are going to be stronger over the next few years primarily as a result of a tightening of supply and because of the time period involved in bringing new copper into production', says Mr Reynolds.

Adjoining the Bethlehem mine is the large Highland Valley copper property owned 80% by Valley Copper Mines (Valley Copper is owned 81.35% by Cominco, with Bethlehem holding another 5.1%).

The largest known deposit in BC, it is estimated to contain 800-million tons averaging 0.45% copper. Due to the earlier depressed prices of copper, it was decided that development was not feasible. In spring 1977, it was calculated that a copper price of 85c would be necessary to support the investment needed to bring the project into production.

In Eastern Canada, Hudson Bay Mining and Smelting Company Ltd forecast an improved outlook for 1979.

'Disruptions of copper supplies and a sustained strong demand has reduced stocks overhanging the market. This, together with a lack of availability of good-grade cathode and wire-bars should give rise to a firm base for copper in 1979', the annual report states.

Major projects undertaken by the company include the construction of a \$26-million concentrator near Snow Lake, Manitoba. The 3800-ton concentrator has two separate treatment circuits to produce zinc and copper concentrates. The concentrates will be railed to the metallurgical plants at Flin Flon.

The Westarm mine in the Flin Flon area was brought into production 3 Jan 1978, and production improved steadily throughout the year. In the same area, the White Lake mine resumed operations in 1978 after being out of production for shaft deepening and redevelopment. Construction of the new Spruce Point mine on the north shore of Reed Lake was started in August 1978.

In the Snow Lake area, the Stall Lake mine continued deepening its No 1 production shaft. Work on the proposed open pit site at the Chisel Lake mine continued and, following development of the Lost Lake ore zones, production is scheduled from the Ghost Lake mine in 1979.

Proven reserves of copper-zinc ore in the company's mines in the Flin Flon-Snow Lake area at the end of 1978 totalled 17,016,000 tons assaying 2.76% copper, 2.7% zinc, 0.40 oz/ton silver and 0.037 oz/ton of gold.

Production of refined copper from all sources in 1978 amounted to 137,402,585 lb, compared to 135,363,453 lb in 1977.

In the Sudbury area of Ontario, Falconbridge Nickel Mines Limited reduced its operating rate, and copper production also dropped, primarily because of the

Noranda Mines Limited

Granduc - 104B/1W
 104B/21
 08408
 Copper Mt. - 92H/7E
 - 92H/5E-5
 - 01268
 Lornex - 92I/6E
 - 92I/SW-45
 - 03771
 Bethl. Copper - 92I/7W
 - 92I/5E-1
 - 04819

J. B. KNAPP

Noranda Mines Limited announces the appointment of J.B. Knapp as General Manager of its Bell Copper Division, which is located in Granisle, B.C. Mr. Knapp is also Vice President and General Manager — Mining Operations of Brenda Mines Ltd., a subsidiary of Noranda Mines Limited, in Peachland, B.C. This appointment is effective April 1, 1979.

92I/7W

92H/7E

92I/6E

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depressed world nickel markets. Only two mines, the Falconbridge and Stratcona operated for the full year. The Lockerby and North mines were closed and a seven-week vacation shutdown of the entire operation began on 1 July 1978.

A new labour agreement was negotiated in the last quarter of 1978, for the mine, mill and smelter workers, enabling a continuation of the company's copper and nickel production in the Sudbury area.

A strike at the Inco mine in Sudbury curtailed that company's copper production severely. Production of copper by Inco in Canada was 197-million lb in 1978, compared to 328-million lb produced in 1977.

In the first quarter of 1979, earnings of Inco Limited dropped to \$0.5-million from \$34.9-million for the first quarter in 1978. Factors contributing to the decline include costs of \$41-million attributable to the Sudbury strike, lower nickel prices, and costs related to the Guatemalan and Indonesian projects.

The Sudbury strike, which began 16 Sept 1978 had not been settled at end-April 1979 although negotiations were currently in progress.

At Texasgulf's Kidd Creek mine in Timmins, Ontario, construction of a new copper refinery and smelter is underway, with completion scheduled for 1981. The expansion project is expected to increase copper output at the mine by more than 50%. A fourth circuit at the Kidd Creek concentrator was in operation by May 1978 and maintenance work was carried out on the other circuits.

During 1978 a major underground development project was begun at the Ruttan mine of Sherritt Gordon Mines Limited. This year, the transition from the open pit to underground mining commences and the operation will be combined until the pit is mined out in 1981. After 1981, a 2,500,000-ton ore production rate is expected to be maintained from underground.

The improved outlook has also been evident in Québec, where financial agreements between the Québec government and Campbell Chibougamau Mines Limited and Orchan Mines Limited have averted closures of both mines. Mine development has been carried out by both companies.

Madeline Mines Limited also intends to reopen its copper mine in Gaspé area of Québec by July 1979. The mine closed in 1976 because of weak copper prices and will reopen with an initial extraction rate of 2000 tons/day for a five-day week.

The reopening decision was based on the rising prices of copper, declining world inventories and projections showing consumption exceeding production.

These projections are the basis for a much brighter outlook for copper in Canada in the years ahead. WM

W. MINER
MAY 1979

Mineral exploration in British Columbia: molybdenum, tungsten, uranium, tin are attractive

Depressed prices for traditional British Columbia mineral commodities, principally copper, resulted in a re-direction of mineral exploration effort throughout the Province in 1978. Attractive mineral commodities included molybdenum, uranium, tungsten, and tin, and a review of the geological settings for the occurrence of these elements in British Columbia will be the main theme of this paper.

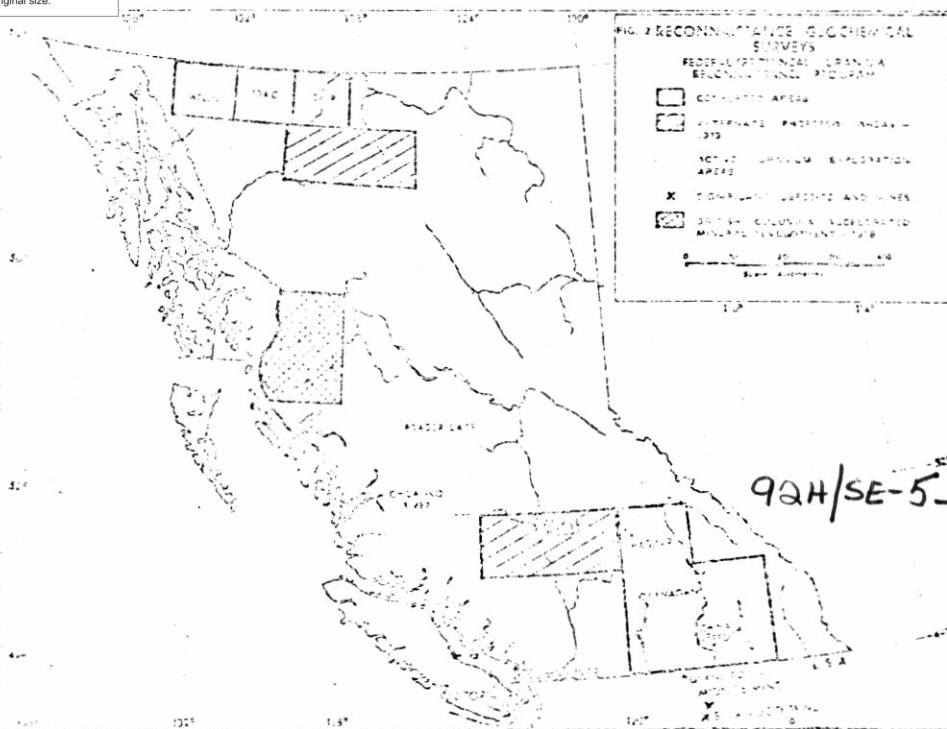
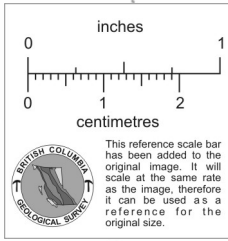
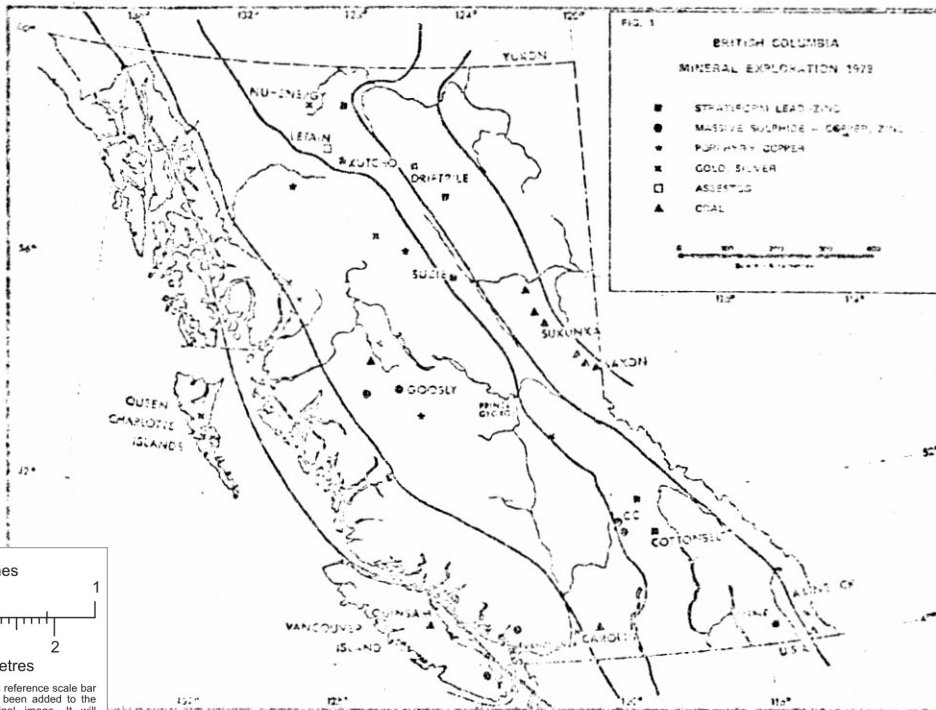
The emphasis on these four elements does not imply that there was no interest in other minerals in 1978, and a summary of exploration and development follows.

GENERAL REVIEW

Mineral exploration expenditures in British Columbia during 1978 are expected to show an increase over last year due to a greater number of drilling programs. The number of mineral claim units recorded to the end of December were in the order of 33,800 or a little more than 2000 units short of the number recorded by the end of 1977.

The value of mineral production, excluding petroleum and natural gas, is estimated at \$1.59-billion, or a 12 percent increase over the actual 1977 value, due in large part to a positive effect of the current exchange rates whereby British Columbia coal and most base metal producers have contracts based on US dollars. This factor is expected to maintain copper as the leading commodity by value in spite of decreased production caused by an ongoing strike at Gibraltar and the closures of Granduc and Phoenix. The value of coal production will be nearly that of copper, and molybdenum remains a solid third.

In addition to the previously mentioned copper producers which suspended operations, Cominco's HB lead-zinc mine at Selma also closed in 1978. Diminishing the effects of mine closures was the first full year of production from the Alton copper mine and similar at Kamloops, the announcement of Newmont's intentions to mine Similkameen Mining's Copper Mountain ore-body adjacent to Logatchew, and the production resumption by Cimmax Molybdenum of British Columbia Limited regarding the former British Columbia Molybdenum mine at Alice Arm. Production was started by year-end from Nu Energy's underground gold property near Cassiar.



Gibraltar - 93B/10; 00541
 Granduc 104B/10; 08408
 Phoenix - 82E/2E; 1383
 H.B. - 82F/3E; 00931

Alton - 92I/0E; 1850
 Copper Men - 92H/7E
 - 01268
 Alice - 103R/10; 5101
 (Nu Energy) Erickson Cl

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EXPLORATION REVIEW

The most active metal exploration areas in the Province included, from north to south: the Adam-Jennings River area (uranium, tungsten-tin), Keechikan-Gataga Rivers (stratiform lead-zinc), Fraser Lake-Vanderhoof and central interior (uranium), and the southeast Okanagan (uranium). A notable feature of the 1978 exploration scene was the relatively low level of porphyry copper exploration, a reflection of depressed world copper prices over the past three years.

In contrast, exploration for massive sulphide deposits containing copper, zinc, and byproduct gold-silver increased over 1977. The Geosil copper-silver deposit south of Smithers (see Fig 1) was optioned from Equity Mining-Kearney by Canex Miner in mid-year. Additional development drilling and metallurgical studies are underway pending a production decision. Esso Minerals continued drilling the significant Kutchin massive sulphide deposit in northwest British Columbia, part of which is held by Saratono who have reported at least 10-million tons of good grade copper-zinc mineralization. Nearby is the Letaia asbestos deposit (Fig 1), on which Cassia Asbestos conducted 15,000 feet of diamond drilling.

Other massive sulphide prospects explored in 1978 included two in the Coast Range — the Nitty near Bella Coola, drilled by Pan Ocean, and Margie Mines property near Hosco south north of Vancouver, drilled by Canex Place. Regional exploration was conducted in the Omineca area northwest of Pike George and near Barren Lakes north of Karluops, where several prospects Paleontic, Eagle, Lay-Framed, Hornet rocks were drilled. One of these programs disclosed interesting copper mineralization in acid volcanic rocks on the CC property, owned by the Vester group of companies and under option to Craigmont.

Lead-zinc deposits explored in southeast British Columbia included the Vine deposit at Mowat Lake, drilled by Cominco and the Cotton Shuswap-type deposit drilled by Metallgesellschaft.

Significant lead-zinc-barite deposits in Upper Devonian-Mississippian black shale sequences in the Keechikan River area of northeast British Columbia attracted considerable attention. Gataga Joint Venture conducted a major drilling program at Driftpile Creek and Cyprus Anvil drilled a similar deposit to the southeast. Also in northern British Columbia, exploration drilling continued on the Sunco property where galena and sphalerite occur in dolomitized limestone.

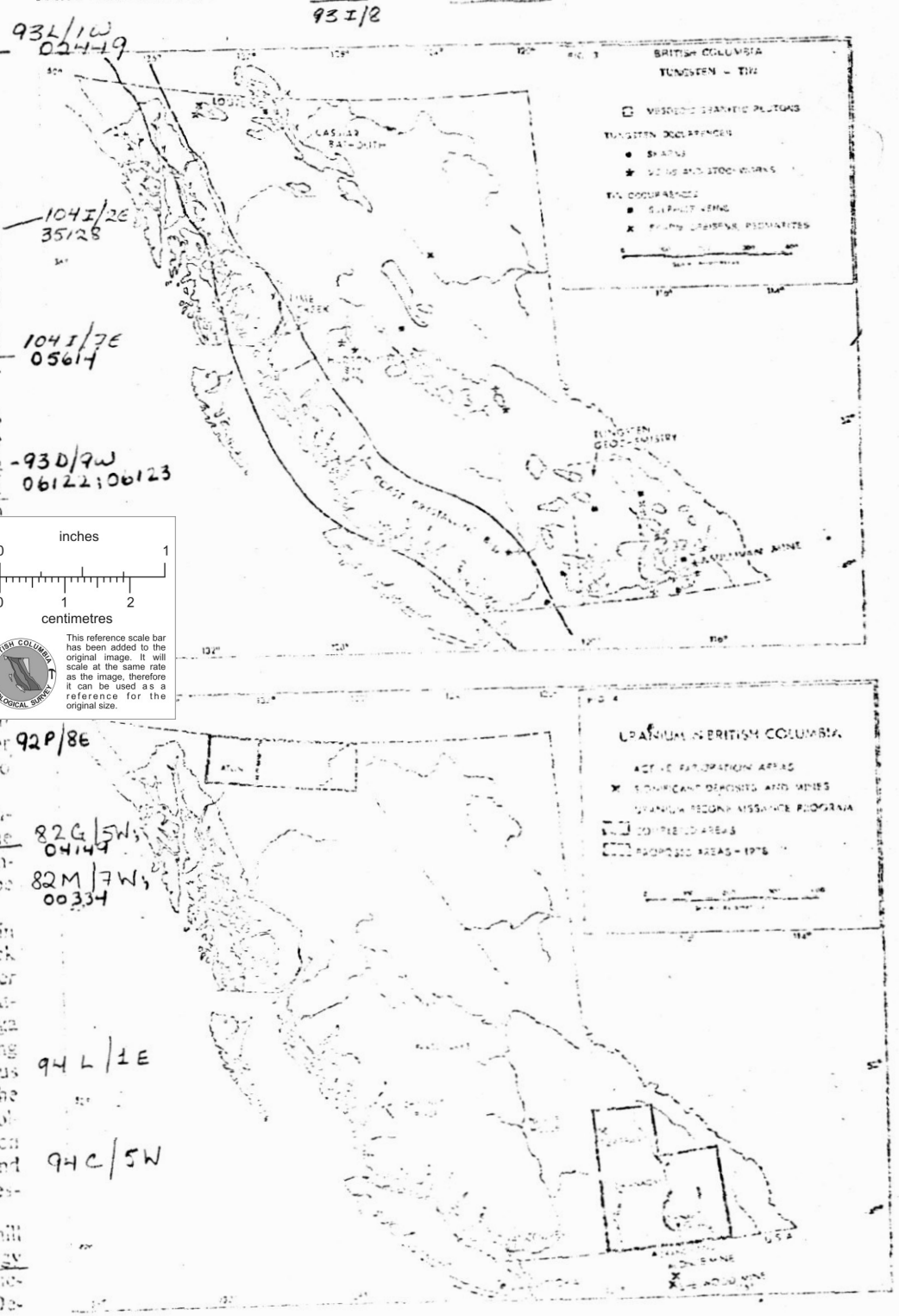
Underground development and mill construction went on at the No-Entry gold deposit near Cassiar where production and mill tune-up started in De-

cember 1978. Feasibility studies continued at the Carolin gold property near Hope. Exploration programs for gold and silver included Tonnigan Mining's drilling and underground work at Big-Mis-ouni north of Stewart, and projects by several companies on gold mineralization on Porcher and Banks Island south of Prince Rupert and on the Queen Charlotte Islands.

The moratorium on the issuance of new coal licences was lifted in February and this had the effect of doubling the number of valid licences. In the Peace River Coalfield, significant drilling programs were carried out on the Saxon and

Belcourt properties of Denison Coal, on the Pacific Petroleum-Canadian Superior-McIntyre Wapiti River property, and on Ranger Oil's Mount Spieker property. Underground development and drilling on the Sukunka property was continued by BP Coal, and Brameda explored the Burnt River thermal coal deposit. Various companies began preliminary exploration of new licence areas.

Crowsnest Resources continued development of the Line Creek thermal coal property in southeast British Columbia and also drilled their Corbin and Sage Creek properties.



82F/10
 Thermal coal deposits explored elsewhere in the Province included drilling programs by Luscar-Weldwood at Quinsam on Vancouver Island and by Cyprus Anvil at Tulameen and Telkwa. 82F/10

9247E
GOVERNMENT PROGRAMS TO ENCOURAGE EXPLORATION

Ongoing geological programs include regional mapping in areas of mineral potential and studies directed to the better understanding of ore deposits. Related programs include reconnaissance geochemical surveys in selected areas (Fig 2), principally through the

three-year Federal-Provincial Uranium Reconnaissance Program (URP) which was completed in 1978. This program involved the collection of stream sediments and waters at a sample site density of one per 5 square miles. Waters are analysed for fluorine and uranium and sediments for uranium and up to 11 other elements. To date results for six 1:250,000 map sheets have been published, including five in southeastern British Columbia (Fig 2) and the Atlin sheet in the northwestern part of the Province. The 1978 sampling program included the Jennings River-McDame

map-area east of Atlin, and survey results will be made available in the spring of 1979.

The 1978 Accelerated Mineral Development Program, funded by \$5-million made available through Bill 5, Revenue Surplus of 1976/77 Appropriation Act, 1978, included an Accelerated Geochemical Survey of two map-areas in west-central British Columbia (Fig 2). This program is modelled after the Uranium Reconnaissance Program except that sample site density was one per three square miles. Data from this program are to be released in April of 1979.

The Accelerated Mineral Development Program also expanded existing Ministry programs including Prospectors' Assistance, funds for mineral roads, and mine site reclamation. In addition, funds were made available to assist with labour costs for underground mine development and property exploration, and for the Mineral Exploration Incentive Program which reimburses junior mining companies and prospectors for one-third of field expenditures up to a maximum of \$50,000.

MOLYBDENUM, URANIUM, TUNGSTEN, TIN EXPLORATION

These four elements occur together in a number of areas in British Columbia, particularly in the Omineca Belt, noted for its diversity of elements. A significant correlation between the four has been noted in northwest British Columbia, specifically in the Atlin area where URP geochemistry has shown the Late Cretaceous Surprise Lake batholith to be anomalous not only in these four elements but also in lead and zinc and to a lesser degree copper and nickel.

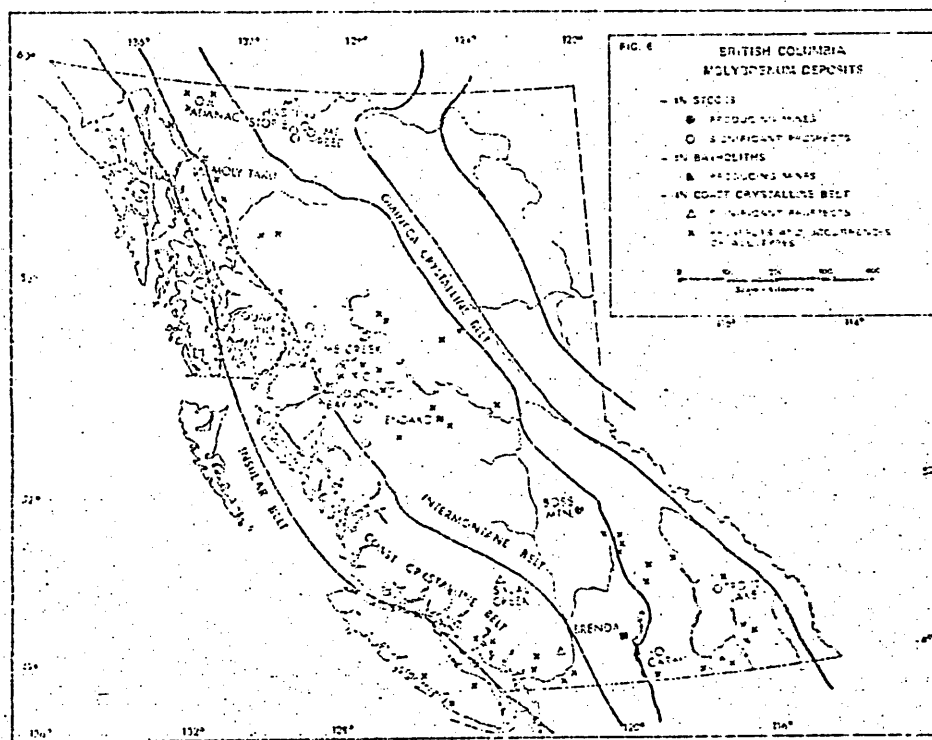
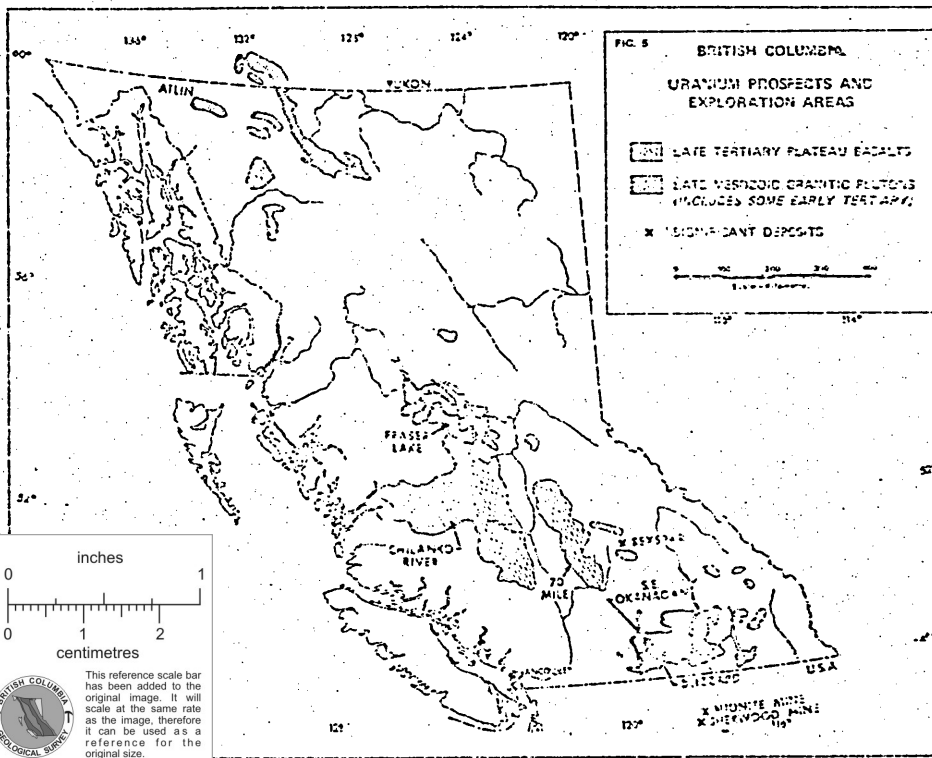
Tungsten-Tin

Tungsten and tin minerals occur together in the northwest and southeast parts of the Omineca Belt (Fig 3), commonly within Mesozoic and younger granite plutons and adjacent late Precambrian and Early Paleozoic miogeoclinal sedimentary rocks.

At present there is no tungsten production in British Columbia. Tin is produced as a byproduct (187 478 kilograms, 1977) from the Sullivan mine where cassiterite occurs throughout the lead-zinc deposit but is mainly concentrated just above the footwall of the orebody, and in tourmalinized fractures in the footwall. The origin of this tin mineralization is not clear but it may be related in part to tourmaline-beryl-bearing granitic stocks of Precambrian age which are known south of the mine.

Numerous tin occurrences are known throughout the Kootenays where many lead-zinc veins contain stannite and some tungsten. At the former Emerald tungsten mine near Salmon, scheelite occurs in skarns developed in Cambrian

Emerald - 82F/3E;
 - 01195



limestones adjacent to Cretaceous intrusions.

As shown on Figure 3, tungsten analyses of 700 stream sediment samples from the 1976 Uranium Reconnaissance Program survey area were released in August 1978. Anomalous values were obtained from several areas, principally in the southwest corner of the area adjacent to the US border.

One of the most active exploration areas in the Province was in the Atlin-Jennings River-Cassiar area where considerable effort was directed to the search for tungsten and tin. Three types of tin occurrences are known in this part of northwest British Columbia and adjacent Yukon. Cassiterite occurs in the gold placer creeks east of Atlin which drain the Surprise Lake batholith which hosts quartz-wolframite veins with tin as a minor constituent. Minor tin is associated with scheelite at the Adanac molybdenum property, and in skarns in the general area.

Geochemistry indicates higher than average trace amounts of tin in the polymetallic multiphase Surprise Lake batholith. Further east, the Seagull, Klinkut, and Glundebery batholiths underwent considerable exploration for tungsten and tin. Principal rock types are miarolytic biotite quartz monzonites with muscovite granite and aplite phases. Tin-tungsten mineralization with beryl-

limum and molybdenum is associated with fluorite and boron minerals (tourmaline, axinite) in skarns developed marginal to these plutons. At Ash Mountain, tin occurs in an andradite garnet skarn while at the Blue Lite property cassiterite and scheelite are contained in magnetite-pyrite veins. In the Cassiar area tin is a minor constituent of lead-zinc sulphide veins marginal to the Cassiar batholith.

Logtong, on the British Columbia-Yukon border (Fig 3), is a significant stockwork tungsten-molybdenum property on which a major drilling program was continued by Amax. Scheelite and molybdenite occur in a quartz veinlet stockwork in porphyritic alaskites, quartz monzonites, and contact-hornfels and skarn. The skarns also contain beryl, minor wolframite, and tin, fluorite, and tourmaline. Published drill-indicated reserves are 200-million tons of 0.12% WO_3 and 0.06% MoS_2 .

Tungsten analyses of stream sediments collected in the Atlin area by the URP survey were released earlier in 1978 and tungsten will be analysed along with 11 other elements in samples collected from the Jennings River-McDane map-area in 1978.

Uranium

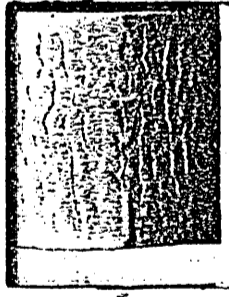
1978 was the third year in which intense exploration activity took place for uranium. It is probable that 60 percent of

the mineral claim units recorded to date were located principally for uranium. Areas of significant claim staking activity were the Okanagan, the south-central interior, south of Fraser Lake, and Atlin (Fig 4).

Two potentially economic types of uranium deposit have been identified in British Columbia. Rexspar is a volcanogenic deposit in which uranium minerals and fluorite occur in trachytic volcanic rocks which are part of Paleozoic pile of schistose acid fragmental volcanic rocks. The Blizzard, southeast of Kelowna, is a basal or paleo-stream channel deposit in which secondary uranium minerals are contained in poorly consolidated Tertiary sediments preserved beneath a Pliocene basalt cap. Continued drilling of this deposit, owned by Lacana and under option to Norcen, has indicated the presence of 2.1-million tons averaging 5 pounds per ton U_3O_8 .

Primary and secondary uranium minerals are also known to occur in pegmatite swarms in Monashee gneisses at China Creek near Castlegar and north of Grand Forks (Fig 4). Drilling programs on both of these properties were carried out during the year.

Exploration drilling for basal Tertiary-type deposits continued in the southeast Okanagan, at Chilanko River and 70 Mile House in the south-central



interior and south of Fraser Lake-M Vanderhoof.

Result, from the URP geochemical program have indicated a number of Late Mesozoic granitic plutons with anomalous uranium values in southeastern and northwestern British Columbia. These may represent potential source rocks for basal-type deposits or may contain primary deposits within or adjacent to them. The distribution of some of these relative to Late Tertiary volcanic rocks is shown on Figure 5 and these include the Surprise Lake batholith near Atlin, and the Jay Creek, Babin, and Nakusp batholiths and Hugaboo and Herschler Creek stocks in southeast British Columbia. URP data have shown anomalous uranium values in stream sediments and waters from drainages underlain by Eocene volcanic sequences along the west side of Okanagan Lake.

Molybdenum

Molybdenum production in British Columbia in 1977 was 34-million pounds, or about 20% of free world production, second only to the United States. The Province's prominent position in molybdenum production was attained in 1955 with the start-up of the Endako and Boss Mountain mines. Molybdenite is the principal commodity at present price levels at Brenda, and byproduct molybdenite is recovered at four porphyry copper mines — Bethlehem, Lornex, Gibraltar, and Island Copper. Climax Molybdenum of British Columbia Limited have announced a 1982 production date for the former British Columbia molybdenum mine on Lime Creek near Alice Arm. The deposit will produce 10 million pounds of molybdenum per year over a 25-year life.

At the end of 1974, molybdenum reserves of producing mines and significant undeveloped molybdenum-bearing deposits was estimated to be 1340-million tonnes of contained Mo, making British Columbia one of the world's truly great molybdenum metallogenic provinces.

A great number of significant molybdenite deposits and prospects are known throughout the Province (Fig 6) and, while the greatest known concentration is in the Intermontane Belt, they are distributed throughout all tectonic belts with the exception of the Eastern Margin Belt. The majority of deposits are stockwork and are associated with composite quartz monzonite stocks of Late Cretaceous-Early Tertiary age which intrude older layered rocks or acidic batholiths, as at Adanac and Boss Mountain. 93A-2W

Molybdenite mineralization at Endako and Brenda is related to late stage intrusive phases of the Francois Lake and Pennack batholiths, both of Late Jurassic age.

Significant molybdenum deposits have

been identified in the Omineca Belt and, like the majority of those in the Intermontane Belt, are related to small stocks of Late Cretaceous and Early Tertiary age. These include the clustering of deposits near Cassiar where the Mount Haskins and Mount Reed deposits are associated with small Eocene quartz monzonite stocks, while the Storie and Cassiar Moly deposits are hosted by acidic intrusive phases of a Late Cretaceous stock on the eastern margin of the older Cassiar batholith.

At Trout Lake in southeast British Columbia (Fig 6), molybdenum mineralization is related to a buried Late Cretaceous quartz monzonite stock which intrudes a highly deformed Lower Paleozoic sedimentary sequence. Drilling of this significant discovery by Newmont and Esso Minerals is continuing to further define a reported 900-foot intersection of 0.40% MoS₂. An underground exploration program is under consideration for 1979.

The significance of molybdenite mineralization in the Coast Crystalline Belt was recognized by the discovery of the US Borax Quartz Hill deposit east of Ketchikan in southeast Alaska. Molybdenite mineralization in quartz vein stockworks is associated with a multiple phase Oligocene intrusion which cuts older plutonic and metamorphic rocks. Similar young intrusions host molybdenite mineralization at the Salal and Gem properties in southwest British Columbia. The Moly Taku prospect, east of the International Boundary in northwest British Columbia (Fig 6) and being explored by Omni Resources, may be of a similar type.

The great clustering of molybdenum deposits in the Alice Arm-Terrace area (Fig 6) includes the Lime Creek and other stockwork deposits marginal to the Coast Plutonic Complex as well as a number of occurrences within Coast granitic rocks. A significant feature of these deposits is their coincidence with the distribution of Quaternary basalt flows.

The discovery of significant molybde-

nite deposits in the Coast and Omineca Belts effectively renders two-thirds of British Columbia attractive for molybdenum exploration, particularly in areas that have heretofore received only limited attention.

SYNTHESIS

Exploration for a variety of mineral commodities increased throughout the Province in 1978. 'Glamour' commodities were molybdenum, uranium, tungsten, and tin, and molybdenum exploration is expected to continue at a good pace while the levels of activity for uranium, tungsten, and tin will depend on the success of exploration ventures currently underway. Lead-zinc exploration is expected to increase, particularly in northeast British Columbia, and at present price levels increased effort will be directed to the search for gold and silver. Coal exploration should show a noticeable increase in response to work requirements on new licence areas. Finally, strengthening world copper markets will further encourage exploration for massive sulphide deposits and may in turn predicate a return to significant porphyry exploration.

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Endako - 93 K/3E; 93K-6; 04782
 Mt. Haskin - 104 P/6W; 104P-38; 04492
 Storie - 104 P/5W; 04491
 Cassiar - 104P/4W; 104P-35; 04489
 Trout Lake - 82K/12E; 82K/NW-3, 4, 87
 Salal - 92J/14W; 92J/W-5; 00119
 Gem - 92J/9E
 Moly Taku - 104K/6W

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Island Copper - 92 L/11W; 5984
 Adanac { Ruby Creek } - 104N/11W; 104N-51; 1619
 Boss Mtn. - 93A/2W; 93A-1; 00477

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AUGUST 28, 1978

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92H/7E

WESTERN CANADIAN INVESTMENTS

NEWMONT MINES LIMITED

property over file

COPPER MOUNTAIN ORE PRODUCTION - EXTENDS MINE LIFE TO 1997 - At an estimated cost of \$23,400,000, the **Copper Mountain** ore bodies of Newmont Mining Corporation's wholly-owned Newmont Mines Limited across the Similkameen River from their current Ingerbelle copper mining operation near Princeton, B.C., are to be brought to production. First ore delivery is scheduled for early 1981. Based on currently known ore reserves, the company's Similkameen mining operation will thereby be able to continue through 1997, i.e. the mine's life would extend at least 19 years from 1978.

J. Harvey Parliament, president of Newmont Mines, reports that mining of the Copper Mountain orebodies will be phased in with the present mining operations to provide feed for the existing 22,000 tons per day concentrator. Ore from Copper Mountain will be mined from three separate open pits, and the project will include installation of a new primary crusher and conveyor system to transport crushed ore across the Similkameen River canyon via a new suspension bridge to the concentrator.

Mr. Parliament says a re-evaluation of the orebodies and open pit design indicates a total of 154,000,000 tons of ore averaging 0.41% copper at the Similkameen Division.

A \$23.4 million project

N-MINER 31-AUG-78

92H/7E

Newmont to develop Copper Mountain

By RICHARD ROBERTS
Assistant Editor

VANCOUVER - A \$23.4-million project is planned by Newmont Mines, wholly-owned subsidiary of Newmont Mining Corp., to bring into production the Copper Mountain orebodies at its Similkameen Division, about 10 miles south of Princeton, B.C.

The production decision follows more than two years of engineering studies of open pit design and a re-

evaluation of the orebodies. As a result of these studies, there has been placed into the minable category over 100 million tons of material previously not included in ore reserves.

Mining of the Copper Mountain orebodies will be phased in with the present mining operations to provide feed for the existing concentrator now treating ore from the Ingerbelle deposit. This means that there will be no expansion in milling

capacity but that the life of the operation will be extended for many years.

The Similkameen mill, treating ore from the Ingerbelle open pit, was placed into operation at a rate of 15,000 tons per day in September, 1972. The milling capacity was expanded to 22,000 tons per day in 1975. Ore reserves at Dec. 31, 1977, were reported at 49,892,000 tons of 0.54% copper.

The re-evaluation of the orebodies now indicates a total of 154 million tons of ore averaging 0.41% copper with the low stripping ratio of 0.7 ton of waste to each ton of ore. These reserves are sufficient to maintain milling operations for over 19 years, which, in effect, adds more than 11 years to the life of the operation.

The Ingerbelle orebody was developed by Newmont. In 1967 Newmont purchased from Granby Mining the Copper Mountain property (a copper producer from 1925-57) which is across Similkameen Canyon about a mile east of Ingerbelle.

Ore from Copper Mountain, J. Harvey Parliament, President, Newmont Mines, told The Northern
See Page 2

Copper Mountain

Continued from Page 1

Miner, will be mined from three separate open pits with the first ore delivery scheduled for early 1981. The project will involve the installation of a new primary crusher, a conveyor system to transport the crushed ore across the Similkameen Canyon by way of a new 1,300 ft. long suspension bridge, about 500 ft. above the river, to the concentrator. The conveyor belt will be 42 inches wide and in two sections. One section, 4,250 ft. long, will move the ore from the crushing plant to the bridge and the other section will transport the crushed ore across the bridge to the mill. The four power shovels and three heavy rotary drills presently at Ingerbelle will be moved one or two at a time to Copper Mountain. A great deal of the ore to be mined by open pit at Copper Mountain is in the underground workings of the old Granby mine.

The Similkameen operation employs 310 persons, and no increase in permanent employment is anticipated as a result of Copper Mountain production. However, the project will provide employment for more than 100 on construction work for two years.

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092MSE REGIONAL FILE

PART II

SUNDAY CREEK PROPERTY

SUMMARY

Copper Plate Mines Ltd. (NPL) acquired 12 contiguous claims in the Similkameen Mining Division, B. C.

Significant copper mineralization is not known to exist on the property; however, the possible existence of favourable geologic conditions for the deposition of copper mineralization similar to those at Copper Mountain some 6 miles due north, indicate an exploration programme is warranted.

It is recommended that an exploration programme be initiated to include geological mapping and geochemical and magnetometer surveys.

INTRODUCTION

On August 20, 1971, an examination was made of the Sunday Creek property consisting of 12 contiguous claims located in the Similkameen Mining Division, B. C. Initial difficulty was encountered in locating the subject claims; however, ample time was provided to examine rock outcrops and become basically familiar with the geological setting.

Claim particulars are as follows:

<u>Claim Name</u>	<u>Record Number</u>	<u>Expiry Date</u>
G 43 - 54	30374B - 30385B	Feb. 18, 1972

LOCATION AND ACCESS

The claim group is situated 1 mile east of Highway No. 3, 19 miles south of Princeton, B. C. The claim group, 2 claims wide in a north-south direction and 6 claims long in an east-west direction, is immediately south of Sunday Creek with the eastern boundary 1/4 mile west of the Similkameen River. Coordinates of the property are 49° 15' N. Latitude and 120° 33' W. Longitude.

Access to the property is by an old log haulage road which intersects Highway No. 3 at a gravel pit 18 miles south of Princeton, B. C. Numerous logging roads and skid trails provide access to all portions of the property.

TOPOGRAPHY, WATER, TIMBER, POWER

The claim group occupies the north slope of an elongated north-south trending ridge. Relief is gentle to moderate on the western portion of the group but increases sharply on the east toward the Similkameen River. Elevations vary from 4,200' on the west to 3,400' on the east. Several small intermittent creeks drain the property to Sunday Creek which flows northeast into the Similkameen River. All water required for mining purposes would have to be pumped from the Similkameen River. Timber for mining purposes is available on the property or can be purchased from several local sawmills in the area. A power transmission line, presently under construction, terminates at Similkameen Mining Co. Ltd. 6 miles due north.

GEOLOGY

The property is underlain by an assemblage of Princeton Group sediments and possibly volcanics on the western half of the claim group, and interbedded Nicola Group sediments and volcanic flows on the east. Bedrock exposures are extremely limited on the west, occurring only as isolated weathered exposures in old logging road cuts. It is with some uncertainty that the Princeton-Nicola contact has been assumed to pass through the approximate centre of the claim group and in fact could be farther to the west.

The Princeton Group sequence consists of course-grained sandstones to fine-grained shales. The common colour is light buff with quartz, feldspar and argillaceous material being the principal constituents. In other locals the Princeton sedimentary beds are commonly underlain by Princeton volcanic rocks. This situation could exist on the claim group. Exposures of green porphyritic lava located immediately south of the property might well pass through an area of overburden on Claims G 47 and G 48.

A more or less continuous band of Nicola Group fine-grained tuffs and argillaceous tuffs mixed with volcanics extends from Copper Mountain south along the Similkameen River to Pasayten River. This band passes through the Sunday Creek property. The most westerly Nicola rock exposures on the claim group occur on Claims G 49 and G 50. Locally the Nicola rocks consist essentially of mixed, fine-grained light grey-blue tuffs and argillaceous tuffs mixed with volcanic flows. Two flow types observed consist of a dark green amygdaloidal lava, the vesicles filled with calcite, possibly representing a flow-top structure and a dark green andesite porphyry with disseminated specks of pyrite and occasional specks of chalcopyrite.

ECONOMIC GEOLOGY

The Princeton Group volcanics and sediments are not considered geologically favourable for the deposition

of either base or precious metals; therefore, when considering economic possibilities of the claim group, attention must be directed to the Nicola volcanics and sediments on the east.

The close proximity of the property to Copper Mountain warrants a few comments here. Basically, the copper ores of Copper Mountain are closely related to two intrusive bodies; the Copper Mountain and Voight stocks, which have intruded and metamorphosed the Nicola rocks. Mineralizing solutions might have entered the Nicola rocks through channels provided by three major faults which are recognized north of Copper Mountain and might converge at, or south of, Copper Mountain as undetermined by the presence of large areas of drift and Princeton Group rocks to the south. It is not inferred here that a similar geologic environment might exist on the Sunday Creek property; however, the possibility cannot be dismissed that copper mineralization is present on the claim group. No significant mineralization is known to exist on the group; however, occasional specks of chalcopyrite were observed in Nicola volcanic rocks.

CONCLUSIONS AND RECOMMENDATIONS

Significant copper mineralization is not known to exist on the claim group; however, the existence of favourable geologic conditions; namely, the presence of Nicola

rocks in close proximity to a plug of the Copper Mountain stock 1-1/2 miles NE of the property and the undetermined southern terminus of the major fault system believed related to mineralization at Copper Mountain indicate that an initial limited exploration programme is warranted.

It is, therefore, recommended that the following exploration programme be initiated:

1. Geologically map the G 49 - 54 claims on a scale of 1" = 400'. The geologist should be accompanied by an experienced prospector for exploration purposes.
2. Geochemical soil survey -- samples should be taken at 100' intervals on EW grid lines 400' apart, and tested for copper
3. Magnetometer survey -- this will provide structural information not obtainable solely from mapping.

It is estimated that a sum of \$4,000.00 will be required based on a period of 14 days after line cutting has been completed.

- | | | |
|----|-----------------------|-----------|
| 1. | Contract line-cutting | \$ 900.00 |
| 2. | Geological mapping | 1,000.00 |

3.	Prospecting, geochemical survey magnetometer survey	\$ 800.00
4.	Assaying	500.00
5.	Room, board, vehicle and supplies	500.00
6.	Contingencies	300.00
		<hr/>
		\$ 4,000.00
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