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*Province -*  
**Green light likely today**  
*Oct 2/75*  
*921 NE023*  
**for Afton copper project**

By BOB McMURRAY  
Province Business Editor

It is likely a go-ahead will be announced today on the development of the Afton copper property at Kamloops — and perhaps a smelter to handle its concentrates.

The Province learned Monday night that the Teck Mining Group Ltd., of Vancouver, holder of the Kamloops copper claims, has scheduled a press conference in the Interior city for 11:30 a.m. today.

Norman Keevil Jr., Teck executive vice-president, and Robert Halbauer, company managing director, are flying to Kamloops to take part in the press conference. Keevil declined Monday night to give any advance information.

The copper property, proven for a number of years but left dormant because of NDP mining policy and bad copper markets, has 34 million tons of proven one-per-cent copper ore. The ore has some gold and silver values also.

Estimates of putting the property into production at 7,000 tons of ore per day are \$50 million. At that output the property would have a life of 17 years on present proven ore tonnage.

The Teck Group has recently been holding discussions with the government about the copper property and a copper smelter,

See Page 12 — GOV'T

## Gov't may help Afton project

FROM PAGE ONE

which has long been wanted by the NDP. The company said it has plans for a 28,000-ton-per-year smelter but has given no estimate of construction costs.

The Afton property is located eight miles west of Kamloops city centre.

The government has been reassessing its mining policy, particularly since the recent appointment of Gary Lauk as mines minister to succeed Leo Nimsick. Lauk said 10 days ago he had talked to many mining executives about development and smelters.

It is speculated that Lauk could make some announcement today of a change in government legislation which would help the Teck development, although no subsidy is expected. He has a press conference scheduled for 11 a.m. today in Victoria.

After the 1972 election of the NDP gov-

ernment, mining development in B.C. dropped off. No major new mines have been announced since.

In 1974 the government passed the Mineral Royalties Act and the Mineral Land Tax Act which imposed levies on minerals mined. In addition, changes in the mining act gave the government discretionary power in granting mine development permits.

In 1974 the government collected \$13.8 million under the two acts.

The royalties act provides for a small rebate to any firm doing additional processing of minerals in B.C. but companies have said it is not enough to make such ventures economic.

There has been considerable speculation that the government would introduce amendments to the two acts at a fall session of the legislature.

In addition to Teck, a four-firm consortium and Cominco Ltd. have considered copper smelters in the past.

PROPERTY FILE



PROPERTY FILE 92/NE023

## Afton Smelter Project Termed Not Enough

OSOYOOS (CP) — The British Columbia government's special deal with Teck Corp. to bring its Afton mine at Kamloops into production and build a copper smelter will do little to help other mining companies in the province, says the managing director of the Mining Association of B.C.

P. R. Matthew told the Osoyoos Chamber of Commerce that "the sooner the minister talks about a new deal for all, the better.

"While copper is still the leading revenue producer among all minerals, other minerals are produced in abundance," said Matthew.

"A change in policy should apply to all types of mining, and to all mining companies, if there is to be effective development of the industry for the benefit of all.

"The development of one mine and a small smelter is a step forward, but it does not produce a policy that will maximise the development of

the potential mineral resource that is here, in B.C."

Matthews said he hopes new mines and petroleum minister, Gary Lauk, opens his doors for a full and frank discussion of mining problems in the province.

Lauk announced Oct. 21 that the government would pro-

pose new legislation to encourage private investors to develop copper smelters in B.C.

The legislation would obligate the government to pay two cents for each pound of smelted copper during the first four years of operation, he said.

## Energy Pricing 'Stumbling Block'

VANCOUVER (CP) — A tendency to place new forms of energy in the same price range as oil and gas is a stumbling block to new energy sources replacing those that are being depleted, David Cass-Beggs, former chairman of B.C. Hydro, said Friday.

"The acceptance of the price of oil as the value of alternative energy forms, rather than their intrinsic costs, is seen in the tendency to price coal at its energy equivalent to oil (after allowing for conversion costs) rather than at the cost of min-

ing it," he told the Vancouver Electric Club.

"This opens up the energy market to exploitation by entrepreneurs and robs the public of the benefits they could have had from using the lower-cost energy resource.

He also asked why society should tie its price structure to the inevitably escalating price of a diminishing and soon-to-be abandoned energy resource.

"It would be far better to base prices on the most abundant resource — coal or nuclear power — which presumably will have more stable costs," he said.

The principle and purpose of the publicly-owned power systems is being threatened by acceptance of the oil philosophy and applying the oil pricing approach to other energy forms, he added.

Times Oct 22/75

PROPERTY FILE

# Smelter Help Good —But 'Not Enough'

92/NE023

Mines Minister Gary Lauk's announcement Tuesday of a subsidy for a copper smelter is the first sign of a thaw between the government and the mining industry — but there is a long way to go, says P. R. Matthew, secretary-manager of the Mining Association of B.C.

He said the Afton orebody near Kamloops, where the new mine and smelter will be developed, is a special situation that might not be duplicated elsewhere in the province.

"It remains to be seen whether the new government policies will assist other companies to explore and develop new mines in British Columbia," Matthew said.

On the good side, he said, is the indication the government is recognizing that the mining industry needs a better tax-

ation climate in order to develop. He said he would await with hope but not a great deal of optimism the government's planned revisions in the mining royalty legislation.

On the negative side, he said, are the following factors:

—The provincial government is taking an option on five per cent ownership of the smelter, "which the mining industry views as a bad trend."

—Unless there are significant reductions in provincial royalty rates there will be no exploration and development of mines other than the Afton property.

—While a 2-cent-a-pound subsidy might be enough to help Afton, a subsidy of 10 or 12 cents a pound might be needed for other companies to put up a smelter, because their ore is of a lower grade than the Afton holdings.

"I think it is important to realize that special circumstances have made this project feasible at Afton and I doubt very much that the circumstances will be duplicated any place else in the province," Matthew said.

"As a result, this smelter may be the only one constructed under this program."

He said the special circumstances involve the nature of the ore, which is of very high-grade copper. The high grade means the smelter will be very efficient compared to operations involving low-grade copper.

In addition, the Afton ore has a very low sulphur content and the pollution problems are mild compared with what they would be elsewhere in the province.

He said the five per cent ownership by the government is not high but the principle was opposed by the mining industry in general.

Matthew said it was hardly fair that private enterprise should take all the risks and then have the government come in and take part of the profit without also sharing the risks.

After the mine and smelter are developed the province has the option of buying five per cent of the equity in the venture by paying five per cent of the start-up costs. The company has estimated the

total capital cost at \$80 million.

The provincial government, if it buys five per cent of the equity, would have one representative on the board of management of the smelter.

Rick Higgs, manager of the B.C. and Yukon Chamber of Mines, said the changes were disappointing because they don't affect mining.

"Very simply, you can't have copper smelters unless you have copper mines," Higgs said, adding he is waiting for legislation to encourage mining.

Robert D. Armstrong, president of Lornex Mining Corp. and chairman and chief executive officer of Rio Algom, which controls and operates Lornex, said his organization has been discussing plans for a copper smelter and refinery and "we expect further conversations."

Brian Reynolds, executive vice president of Bethlehem Copper Corp., said the two-cents-a-pound subsidy "doesn't sound like much." He said his company is keeping touch with other companies.

Gerald H. D. Hobbs, president of Cominco Ltd., said he was watching the situation.

"We are waiting to hear if there is to be any change in mining taxes. We hope the conflict between the B.C. and federal governments will be resolved so we can get into business."

Ross Duthie, president of Placer Development Ltd., said he was concerned the two-cents-a-pound subsidy for smelted copper might be a benefit, but is not enough.

"The way mining development is not going ahead in this province, I don't know where you would get the feed for a smelter," Duthie said.

## Belt Law Unwanted, Lea Claims

VANCOUVER (CP) — B.C. Highways Minister Graham Lea said Tuesday compulsory seat-belt legislation could be brought in by any government with "the guts" to do it but it would probably get voted out of office.

Speaking to the Canada Safety Council convention, Lea said politicians think the public does not want hard enforcement of laws relating to driving.

"Why don't governments enforce drinking and driving laws?" He asked. "Because the public doesn't really want them to."

"So politicians think that if they enforce laws about drinking and driving there will only be about 10 per cent of the population available to vote for them."

Lea said he understood that Nova Scotia had brought in mandatory seat-belt legislation but had yet to proclaim the law.

"I understand that only the NDP members voted against it — I don't even understand our own NDP members sometimes," he said.

SEE OPRANE C13 FOR:

SPECIAL REPORT ON GRASSHOPPER MTH.,  
BY W.S. HENLEY, 1937















## Moratorium urged on controls

Financial Times

MONTREAL — The federal government was right to impose wage and price controls, says one of Canada's leading economists. But it has gone about it in the wrong way.

Carl E. Beigle, director of the C. D. Howe Research Institute, an independent economic research centre in Montreal, says controls were needed because without them, "the risks were too high that ... government policies would shift toward restraining the necessary recovery of economic activity."

Speaking Tuesday to the industrial relations section of the Canadian Pulp and Paper Association, Beigle said traditional policies of restraint, aimed at curbing inflation, would, in fact, "prolong the journey out of inflation," as well as creating unacceptably high inflation.

Therefore, he said, controls were "the least unattractive of a number of very unpleasant options." And he said that the "general approach" of Ottawa's program is sound: It is flexible, it is aimed at the sectors which have the power to distort the process of restoring price stability, and it has "the kind of teeth needed to make it stick."

"Having said this," Beigle continued, "I want to register my growing uneasiness that the Canadian program may already be in serious trouble."

He thinks the risk of trouble ahead is so great that he believes Ottawa should announce a "moratorium" until the beginning of January, 1976. During this time, he would freeze all contracts, leases and so on under existing terms with provisions for retroactive adjustments back to Oct. 14, when controls were imposed. And he would subject price increases to rollbacks, or, where necessary, tax penalties.

The reason for a moratorium — in effect, a 2½-month freeze on wages and prices — would be to give Ottawa a chance to set its house in order.

Beigle said the existing programs basic policy context is not clear. "The government has left serious independent analysis with the impression that it does not really have a clear view of what the driving forces of inflation are in this country," he said.

"In the absence of a clear view, I simply cannot see the government being fully successful, or even reasonably consistent, in the manner in which it implements the controls program."

### CALGARY LIVESTOCK

CALGARY (CP) — Receipts to 11 a.m. at the Calgary public stock yards totalled 1,960 head, mostly steers and cows. Trade was active, meeting good local and Eastern demand.

Slaughter steers sold \$1 higher. Butlers were scarce, selling fully steady. Cows were mostly in the lower grades but all grades sold steady. Unfinished bulls were sold to establish quotations.

Steers, A1, A2: 45-50-60 lb. A3: 45-50.

Heifers, A1, A2: 41-45.50, A3: 35-40.

Cows, D1, D2: 19-19.50, D3: 15-16.50, D4: 16-17.

Insufficient feeders steers, butlers or stock calves were sold early. Feeder cows traded steady at 19-21, with odd sales to 22.50.

Butcher calves: 27-30.50.

No hogs were sold to 11 a.m.

### DIVIDENDS

Bank of Montreal, 24 cents, Dec. 15, 1975.

Bank of Nova Scotia, 15 cents, Dec. 15, 1975.

Bank of the North, 15 cents, Dec. 15, 1975.

Bank of Victoria, 15 cents, Dec. 15, 1975.

Bank of Western, 15 cents, Dec. 15, 1975.

Bank of Commerce, 15 cents, Dec. 15, 1975.

Bank of Montreal, 24 cents, Dec. 15, 1975.

Bank of Nova Scotia, 15 cents, Dec. 15, 1975.

Bank of the North, 15 cents, Dec. 15, 1975.

Bank of Victoria, 15 cents, Dec. 15, 1975.

Bank of Western, 15 cents, Dec. 15, 1975.

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## BUSINESS

# Trouble from the east

## Labor

by ASHLEY FORD



COLA clause, based on the same formula workers enjoyed here in their last contract of 1 cent an hour for every .35 increase in the consumer price index. They have picked up an additional 57 cents an hour for a grand base rate total of \$9.28 an hour.

One really must feel a little sympathy for the pulp workers, a much-maligned group of late, when one looks at the latest pulp settlement out of the East.

Workers at the Irving Pulp and Paper Ltd. in Saint John have just won a new one-year pact that will give them a 21 per cent increase in pay. And apart from the wages, they have also picked up some nice little fringe benefits as well.

When this settlement has been used to upset the traditional lead west coast pulp workers have enjoyed in wages. When traditions are upset, someone invariably gets a little hot under the collar. That heat will no doubt be given a reasonable venting at the bargaining table when the two sides decide to start talking again.

The wage figures tell the story.

Under the recommendations of special mediator Mr. Justice Henry Hutchinson, pulp workers here would in the first year of a two-year contract receive 10 cents an hour increase, plus a folding-in of a 24-cent hourly increase they are already receiving into the base rate of \$5.10 for a total base of \$5.14.

The Irving workers were receiving a base rate of \$4.87 an hour, plus the same 24-cent hourly COLA payment. Under their contract they receive a folding-in of 16 cents of that 24 cents to the base rate and picked up wage increase increments of 53 cents an hour retroactive to May 1 and another 35 cents on Sept. 1 to bring the new base to \$5.91 an hour.

However, the workers also retain their

The industry will resist knowing full well the trouble it would bring down upon itself from the woods section should it accede to the demands. The industry has made itself quite clear that it is going to treat each side in the industry equally.

The pulp unions have been resisting this approach all along, maintaining they are different from woodworkers. The Irving settlement will obviously give them new ammunition to take to the bargaining table.

It will certainly strengthen the pulp unions' contention that they should have a COLA in the first year of their agreement. Hutcheon only recommends a COLA in the second year of the pact and it is not the same as the old plan.

However, industry and unions may have the whole thing taken out of their hands. The new federal anti-inflation board will have to review the Irving settlement since it exceeds the government's wage controls.

The board may well determine just how much pulp workers are going to get in new contracts.

## Guyana quits pound

GEORGETOWN (Reuter) — Guyana has broken with the British pound and has announced a fixed exchange rate for its currency with the strengthening U.S. dollar. Finance Minister Frank Hope told a news conference the traditional link between the Guyana dollar and the British pound could not be maintained under present circumstances.

## ROYAL BANK APPOINTMENTS



A. M. CHANNELL

The Royal Bank of Canada announces two senior appointments in its British Columbia district. A. M. Channell, currently a Manager, Corporate Lending, British Columbia, and J. G. Macpherson, at present Manager, Winnipeg Main Branch, are both appointed Assistant General Managers, Corporate Banking, British Columbia. Mr. Channell and Mr. Macpherson take up their new posts in Vancouver in late October.

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J. G. MACPHERSON

The estimate includes various Arctic and northern gas pipeline projects and plans for extracting oil from Alberta's Athabasca oil sands, he said.

## \$100 billion needed for energy expansion

LONDON, Ont. (CP) — An official of the Royal Bank of Canada said the cost of underwriting Canadian energy and utility projects during the next 10 years is expected to be between \$65 and \$100 billion.

William B. Anderson of the bank's Calgary branch told delegates to the Ontario Petroleum Institute conference that this estimate does not include "indirect costs which in the long run may prove to be the most worrisome."

The estimate includes various Arctic and northern gas pipeline projects and plans for extracting oil from Alberta's Athabasca oil sands, he said.

## ANNOUNCEMENT

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# MID-WEEK REPORT

Wednesday, October 22, 1975

BOB McMURRAY, Business Editor

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# Afton plans first B.C. copper smelter

By BOB McMURRAY

Construction of B.C. first copper smelter will begin soon at Afton Mines Ltd.'s Kamloops property — pushed the final step by a new incentive announced on Tuesday by Mines Minister Gary Laik.

Afton will spend at least \$80 million for the smelter and the development of its open-pit mining operation at a location eight miles from Kamloops city centre. About \$25 million will be for the smelter.

Under an agreement with the government, to be covered by subsequent new legislation, Afton will receive about \$43 million in subsidies over a four-year period and about a further \$4 million in re-

bates on copper royalties as provided under the Mineral Royalties Act.

"The incentive," as Laik calls it, will be two cents for every pound of blister copper produced at the smelter in the first four years of production.

The mine and smelter are expected to provide 350 permanent jobs and be in operation by December, 1977.

Here are other highlights of Tuesday's developments:

• Laik says the Mineral Royalties Act and the Mineral Land Tax Act will "not be interfered with" by the legislature while both are being challenged in the Supreme Court, by mineral companies. (See further details on Page 19).

• The minister is trying to build a position to fight the federal government over the rules it uses in resource taxation.

• He contends the new "incentives" are not a subsidy.

• The mining industry, while welcoming the government's new approach, says that the incentive to Afton may not mean too much to other companies because the Afton pollution problem is much less difficult. (See separate story below.)

• Afton will sell 25,000 tons annually of blister copper under a 10-year contract to the U.K. firms of BICC Ltd., the parent firm of Phillips Cabot Ltd. of Canada, and The Delta Metal Co. Ltd.

• These two firms will provide a \$15 million line of credit to cover contingencies. This sum will back up a \$75 million term loan being provided by two unidentified Canadian banks.

• The B.C. government will have the right for one year after start of production to purchase a five per cent equity position in the smelter for \$12.5 million.

• Other mining companies are examining the prospects of other copper smelters in B.C. (See separate story below.)

• Afton Mines is 64 per cent controlled by Teck Mining Ltd. of Vancouver directly and through Iso Mines Ltd., which is 49.7 per cent controlled by Teck. The property at Kamloops has lain dormant since the 1972 election of the NDP government

which brought mining development almost to a halt in B.C.

Announcement of the Afton project is the first major mining development since 1972.

In Vancouver, Norman B. Keevil Sr., president of Teck and chairman of Afton, said at a press conference that Afton had been hoping to go ahead, but it needed some incentives. "We wouldn't have gone ahead without it," he said, in reference to the two-cent government payment.

In Victoria, Laik said the payment could be provided in cash or subtracted from sums which the company may owe the provincial government. He expects that

a special bill will be introduced to the Legislature to authorize the payments.

After its election, the NDP repealed the Copper Bounty Act which would have provided a payment of one cent per pound for blister or refined copper, up to \$25,000 per year or a total payment of \$2.5 million to any one company.

Keevil released an exchange of letters between his son, Dr. N. B. Keevil Jr., executive vice-president of Teck, and Laik in which the minister says planned incentives do not prevent Afton from taking advantage of any benefits under existing legislation.

See Page 18 — AFTON

# More smelters ahead

By BOB SHAW

Other mining companies, besides Teck and Afton, are moving ahead with copper smelter plans — some with more enthusiasm and vigor than others.

Lornex Mining Corp., in particular, is holding discussions with the B.C. government for a "world scale" smelting and refining plant in the general Highland Valley area.

Noranda Mines Ltd. has also held recent discussions with the government, made an effort to revive a four-company consortium that presented a smelter proposal to the Social Credit government in 1972, and is understood to have contacted producers.

Members of the 1972 consortium — Bell-Ishen Copper Corp., Newmont Mining Corp., Place Development Ltd. and Noranda — are still interested but hardly enthusiastic.

The other major mining company that had a copper smelter proposal in 1971 and 1972, Cominco Ltd., is silent, or almost. Gerald H. D. Hobbs, president, said Tuesday, "We are waiting to hear if there is to be any change in mining taxes. We hope the conflict between the B.C. and federal governments will be resolved so we can get into business."

Mining people agreed the present subsidy of two cents a pound for smelted copper might be a benefit or an encourage-



DR. NORMAN B. KEEVIL JR.

ment in some circumstances, but there were other problems.

"The way mining development is not going ahead in this province, I don't know where you would get the feed for a smelter," said Ross Duthie, president of Placer.

There was even some speculation that Teck must have a "deal" on taxation, to encourage it to make its move. The speculation seemed to spring from recent financial reports of producing companies, some of which showed combined provincial and federal taxation as exceeding profits.

However, Norman B. Keevil Jr., executive vice-president of Teck and president of Afton, said, "We do not have any assurance directly that there will be, or will not be any changes in legislation beyond the smelter incentive. What we do have is some degree of optimism because of the minister's statements."

He said Mines Minister Gary Laik had said legislation is under review because was introduced before the federal resource taxation rules were changed and before the decline in the copper markets.

Robert D. Armstrong, president of Lornex and chairman and chief executive officer of Rio Algom, which controls and operates Lornex, said his organization has been discussing plans for a copper smelter and refinery in B.C. "and we expect further conversations."

Telephone in Toronto, he said Lornex made comprehensive smelter studies in 1968, and then started a more thorough study in 1973, which ended in late 1974, "having regard to the fact that Lornex had paid off its debt."

He said Lornex had a number of detailed conversations with the government, its advisers and the Copper Task Force.

See Page 18 — SMELTER

# 'A brief but tender funeral'

It would take a Joseph Conrad or an Alan Villiers to do full justice to the sad saga of the good ship Supply Venture, the latest addition to the harbor fleet of the Port of Vancouver.

Purchased six months ago in Halifax by the National Harbors Board for \$75,000 for use as a personnel vessel in Vancouver harbor, she is now hauled up on stilts at Centennial Pier. Her appraised value is now only \$10,000, and she is presently being surveyed to find out if it is worth while to bring her up to Canadian Steamship Inspection (CSI) requirements.

It was intended to bring the 57-foot vessel from Halifax by rail, but it was found she was a foot too wide for the railway car, and so she had to be freighted on deck via the Panama Canal aboard the Norwegian MS Belstar, which added several thousand dollars to her cost.

When the ship was unloaded here, old waterfront hands rubbed their eyes at her rusty and dishevelled state, and some irreverent, well-chilled SS Sausage on her hull.

It was the intention of the National Harbors Board to rename the vessel Buntly, in honor of Miss Buntly Lees, secretary to the port manager, but soon Miss Lees, wise in the ways of the waterfront, was dismayed when she saw her namesake.

The steel-hulled vessel was built at New Orleans in 1965 as the Cardinal for use as a personnel boat in the Gulf of



Norman Hacking

Mexico offshore oil industry. She accommodates 15 passengers, and is powered by twin GM diesels, which in her palmy days were reputed to give a speed of 20 knots.

Last year she was purchased in New Orleans for a reputed \$25,000 by a Halifax man. Renamed Supply Venture she was registered under the ownership of Halifax Fishing Ventures Ltd. Duty of 10 per cent, instead of the normal 25 per cent was paid, and she was given a temporary certificate of seaworthiness by CSI. The ship sailed under her own power to Halifax last year, via the Mississippi River, Great Lakes and Gulf of St. Lawrence.

Her voyage up the river to the St. Lawrence system is not recorded, but the log book of the final leg of her voyage to Halifax is a classic of its kind. A few excerpts will give an indication of its fine flavor.

• Aug. 17, 1974. Tied up at Rimouski for a brief rest. Minor engine repairs and preventive maintenance.

• Aug. 19, 0600. Starboard engine quiet. Would not restart. 0645. Made Bathurst on one engine and docked safely. Thank God!

• Aug. 20. Docked Tormentine. No en-

gines. Heaving without going into gear.

• Aug. 23. Dan Norman departs for Hamilton with no backward glances. Mel Price departs for Halifax.

• Aug. 27. At Borden, P.E.I. Skipper leaves because of no balance. Mate leaves his senses. 1900. New crew aboard. 1930. Starboard engine will not start.

• Aug. 28. Attempt to remedy starboard engine's trouble. Navigating system taken to Dartmouth to resolve problems.

• Aug. 29, 1500. New master aboard: 2200. New master on ferry headed for Chester, N.S. Felt too many things wrong with boat.

• Sept. 3. New skipper fails to show.

• Sept. 5. New skipper ??? due from Summerside.

• Sept. 11, 1600. Dark cloud appears in form of CSI man who is rather ominous about no bilge pump. Survey crew down. Decide not to go out because of Nova Scotia confusion: 1709. Electrician finds faulty switch and puts temporary one in. Offered up prayer of a cure: 2345. Out of water.



# Afton Mines drills better grade zone

On the copper discovery of Afton Mines Ltd., 10 miles west of Kamloops, drilling is expanding to the better grade zone west of the lake on the property and has indicated that grades improve with depth in the southeast section.

Additional assay results have been received from diamond drill hole 72-3 also located to the west of the previously drilled area. The new section is from 130 to 390 feet and grades 1.21 per cent copper. The previously reported section of 30 to 130 feet assayed 2.24 per cent copper. Average for the section of 360 feet (from 30 to 390 feet) is 1.50 per cent copper.

Chester F. Millar, president, reports that, as indicated by recent induced polarization work, the westerly zone may extend on the Afton claims further to the west than the area drilled to date.

A percussion drill capable of drilling 300 feet deep and a rotary drill capable of drilling 1,000 feet deep are in use. Afton intends also to resume diamond drilling with a pro-

gram for which tenders will shortly be called. Financing for this continued work is under negotiation.

Assays from various percussion holes have recently been received. They are listed below. Q162 is in the western zone. The others are in the southeast section of the drilled area.

Assays are awaited from a rotary drill hole put down in the southeast section beside percussion hole Q 110, which, as previously reported, returned 0.99 per cent copper from 130 to 300 feet. Millar reports that better results are apparently below 300 feet in that rotary drill hole.

Hole No.	Interval	Copper
		%
Q 139	30-250	0.27
142	270-300	0.26
143	200-300	0.69
148	200-300	0.25
149	120-300	0.42
158	150-190	0.70
162	90-300	1.66

# Afton reports extended body

Assay results from eight recently drilled holes on the Afton Mines Ltd. property, 10 miles west of Kamloops, have added to the northwest extension of the ore body as well as providing good grade in a number of fill-in holes, the company reports.

Diamond drill hole 72-7, the new step-out hole to the southwest of the ore body, proved continuity in that direction.

The recent assay results are as follows:

Hole No.	Interval	Footage	Copper%
72-6 (previously reported)	0 - 62 ft.	62 ft.	waste
	62 - 620 ft.	558 ft.	1.18
	620 - 670 ft.	50 ft.	0.43
	670 - 797 ft. bottom of hole	127 ft.	waste
72-7	0 - 250 ft.	250 ft.	waste
	250 - 480 ft.	230 ft.	0.63
	480 - 640 ft.	160 ft.	2.93
	640 - 877 ft. bottom of hole	237 ft.	waste
72-8	0 - 150 ft.	150 ft.	waste
	150 - 470 ft.	320 ft.	0.29
	470 - 610 ft.	140 ft.	waste
	610 - 1080 ft.	470 ft.	1.30
	1080 - 1107 ft. bottom of hole	27 ft.	waste
R-11	0 - 470 ft. bottom of hole	470 ft.	waste
R-12	0 - 100 ft.	100 ft.	waste
	100 - 140 ft.	40 ft.	0.82
	140 - 290 ft.	150 ft.	waste
	290 - 300 ft.	10 ft.	1.59
	300 - 520 ft.	220 ft.	waste
	520 - 1380 ft.	860 ft.	1.53
	including 530 - 670 ft.	140 ft.	4.19
	including 960 - 1070 ft.	110 ft.	2.33
Further assays are awaited to the bottom of the hole at 1500 feet.			
R-13	0 - 910 ft.	910 ft.	waste
	including 650 - 910 ft.	260 ft.	0.22
R-14	This hole has not yet been drilled.		
R-15	0 - 870 ft.	870 ft.	waste
R-16	0 - 50 ft.	50 ft.	waste
	50 - 440 ft.	390 ft.	1.75
	including 230 - 410 ft.	180 ft.	2.74
	440 - 810 ft. bottom of hole		waste

Chester F. Millar, president of Afton, reported that the company has seven drilling machines on the property, several on a temporary basis. Three diamond drill holes are being drilled, two fill-in holes and one a step-out hole to the west.

The two 4¼-inch rotary machines are drilling fill-in holes, in and near the lake. The seven-inch rotary machine has been doing test drilling to prove its effectiveness on the property. These holes have been within the grid drilled area toward the eastern side of the known ore body.

A percussion drill machine has been doing limited testing in a possible mill site location for foundation information. Studies are continuing on metallurgical data and concentrate sales potential which will form part of the feasibility study on the property.

# Drilling by Afton still paying off

Afton Mines Ltd. reports that drilling on the western extension of its mineralized zone shows grades of copper continuing better than the average which is 0.67 per cent. The property is 10 miles west of Kamloops.

Rotary drill hole R3 is not assayed, but shows better grades below the 300-foot depth, so percussion drilling has been suspended to allow use of equipment capable of greater depths.

Rotary hole R2 interval 140-570 feet, length 430 feet, assayed 1.22 per cent copper.

Percussion holes on the north, south and east indicate that copper mineralization either ceases or plunges below the 300-foot depth. The possibility of the latter will be checked by deeper drilling on

these boundaries.

Tenders have been received for 10,000 feet of diamond drilling and it is expected that a contract will be let and the program started in a few days.

Following are results of 12 percussion holes which, along with R2, are west of the lake and are over an east-west distance of 400 feet and north-south 700 feet on a 100-foot grid.

Hole Q159, interval 70-300, length 230, grade .67 per cent; Q160, 120-300, 180, 1.72; Q161, 90-240, 150, 3.82; Q162, 90-300, 210, 1.66; Q163, waste to 300; Q164, 210-290, 80, .86; Q165, waste to 300; Q166, 45-300, 255, 2.55; A167, 240-270, 30, .27; A176, 70-300, 230, 2.66; Q177, 90-300, 210, .30; Q178, 140-300, 160, 2.80.



FOR THE RECORD

Pacific Western Airlines Ltd. has reported that after less than one week of negotiations, the Canadian Air Line Pilots Association and Pacific Western Airlines reached substantial agreement on a new 15 month contract, subject to ratification of the membership.

The accord was reached six weeks prior to the termination of the present contract. The settlement will cover salaries, hours of service and general working conditions.

Falcon Explorations Limited, by 17Apr72 agt., has bought 20 claims in Kamloops mining division from Keith McKay for \$8,000 and 100,000 shs. to be issued forthwith.

Flagstone Mines Ltd. has had 100,000 shs. taken down at 25¢ each by Hemsworth, Turton & Co. being the balance of an option due 16May72 pursuant to a 9Feb72 agt. The subsequent option on 200,000 shs. at 31¢ each remains due 14Aug72.

Hanna Gold Mines Ltd. has been renamed Dorchester Resources Ltd. with no change in capitalization pursuant to approvals of shareholders (GCNL 28(72)) and Registrar of Companies 14Feb72. On 17May72 Hanna shs. will be removed by Vancouver Stock Exchange and Dorchester shs. will be listed on interim section, symbol DRL.

Great Pacific Industries Ltd. shareholders' offering of 536,205 previously issued shs. has been qualified for sale through Vancouver Stock Exchange for one year from 3May72 being 19,665 by H.B.Dunbar, 17,100 by Wm. J.Sleeman and 499,440 by Jim Pattison Enterprises Ltd.(controlled by Jas. A.Pattison).

Lone Creek Mines Ltd. shares were listed 16May72 on the mining section of Vancouver Stock Exchange, symbol LCM. Of 4,000,000 shs. without par value authorized, 1,355,468 are issued including 675,000 in escrow. Transfer agent is Guaranty Trust.

Hallmac Mines Ltd. offering of 250,000 shs. at 20¢ each by 9May72 prospectus was registered 12May72 with B.C.Sec.Comm. Solicitor is Roger D.Walker at 1710-1177 W. Hastings St., Vancouver.

WINDERMERE EXPLORATIONS LTD.

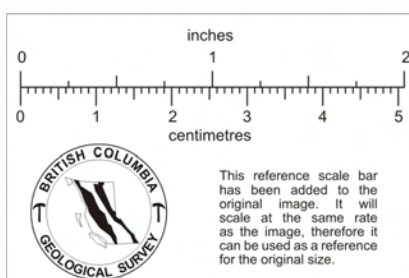
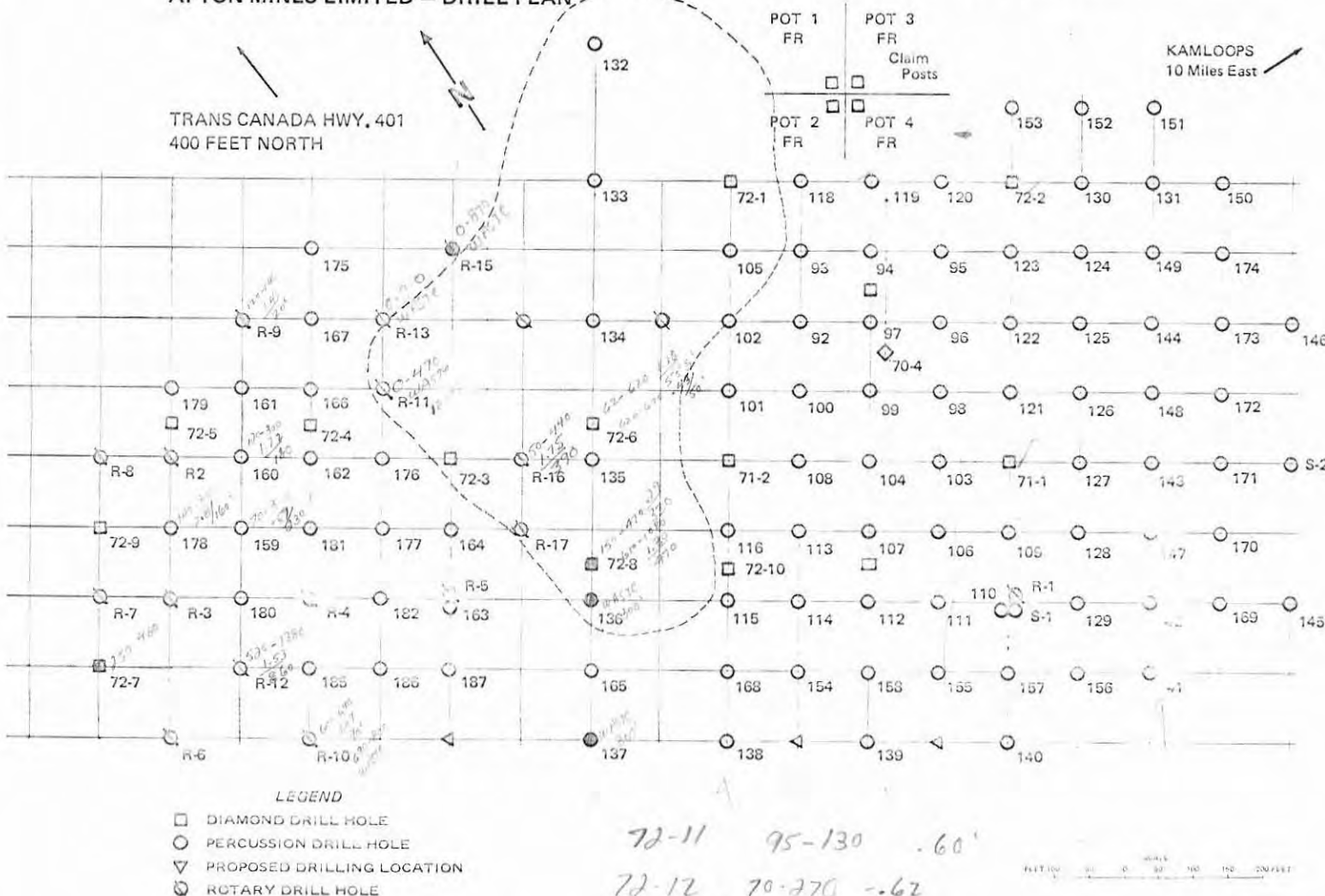
MEETING APPROVES MERGER PROPOSALS - The shareholders of Windermere Explorations Ltd. at the meeting 15May72, in Vancouver approved the amalgamation with Peregrine Explorations Ltd. under a new name Barrier Reef Resources Ltd. Under the agreement each two shares of Windermere will be exchanged for one share of Barrier Reef Resources Ltd. (At the current market of \$1.50 per share on Windermere, the Barrier Reef shares will trade in the \$3.00 per share range.) On 16May72, A.F.Reeve, president of Windermere and Barrier Reef, reported that Court approval of the amalgamation had been sought and obtained and that the other required regulatory authority approvals will be received in the near future.

Crews have been dispatched to the lead-zinc property, located 120 miles northwest of Fort St.John, B.C., to establish camp and it is anticipated that the first drill holes in the 1972 season will start to test a number of known showings about mid-June with first public results perhaps available in early July.

See GCNL No.85, page two, 3May72, for further details.

PROPERTY FILE

AFTON MINES LIMITED - DRILL PLAN





## George Cross News Letter

"Reliable Reporting"

NO.56(1972)  
MARCH 21,1972

### WESTERN CANADIAN INVESTMENTS

#### FINNING TRACTOR & EQUIPMENT COMPANY LIMITED

NEW DIRECTOR ADDS FURTHER STRENGTH TO BOARD - W.M.Young, president of Finning Tractor & COMPANY GROWTH THROUGH CATERPILLAR NEW Equipment Company Limited, made a special point PRODUCTS AND NEW EQUIPMENT LINES at the annual meeting to welcome to the board of directors newly-elected John C.Gilmer, F.C.A., who is president and chief executive officer of CP Air.

Mr. Young explained that, in the annual report of the company, a forecast of a 15% increase in revenue for the current year was made together with a statement that it will be difficult to substantially improve upon the net profit margin. Increased labour costs made the drive to increase profit margins difficult but the effort is being made and will continue to be made. The net profit last year was 3.7% of sales and it is the company's intention to increase this percentage, but labour cost increases make this difficult.

A number of new lines of products were added to those offered by the company in the past year and all are part of a plan and to a pattern. These new products are not in any way to detract from the potential growth within the Caterpillar product line now offered or from the new products now offered or shortly to be offered by Caterpillar. One new product recently introduced by Caterpillar is a rubber tired logging skidder which opens an entirely new and very large market for the company.

Since the first of the company's year, Jan.1,1972, the company's operations have been right on forecasts and present indications are that 1972 should be another good year. The president stated that he was hopeful that the current year would not see a repeat of the extensive labour disruption of 1970. Mr. Young stated that he was relatively optimistic with regard to labour for the year.

As to capital expenditures, the meeting was told that directors have approved a \$1,000,000 expenditure for additional tools and equipment and that directors are still considering a capital expenditure of \$1,300,000 for new buildings. A decision on these new buildings will be made in the near future.

All other routine matters were approved at the meeting.

#### FOR THE RECORD

Bullion Mountain Mining Ltd. annual meeting 20Mar72 approved the resolution noted in GCNL 54(72) confirming the directors' authority to enter an agreement regarding its Yukon Territory claims with another company. Proposed terms of the agreement with Kerr Addison are given in NO.54.

Reference was made at the meeting to Bullion Mountain's Mexican mining interests. Concerning these, an auditor's note to 30Sep71 statements says that Bullion Mountain has breached the pertinent contract and has received a 30-day notice to that effect in that, as at 3Feb72 \$15,000 due had not been paid.

#### AFTON MINES LTD.

WESTERLY EXPANSION OF - On the copper discovery of Afton Mines Ltd. 10 miles west of BETTER GRADE ZONE REPORTED Kamloops, B.C., drilling is currently expanding the better grade zone west of the lake and has indicated grades improve with depth in the southeast section. Additional assay results have been received from diamond drill hole 72-3. The new section is from 130 to 390 feet and grades 1.21% copper. The previously reported section of 30 to 130 feet assayed 2.24% copper. Average for the section of 360 ft.30 to 390 feet is 1.50% copper.

Chester F.Millar,P.Eng., president, reports that, as indicated by recent induced polarization work, the westerly zone may extend on the Afton claims much further to the west than the area drilled to date.

A percussion drill capable of drilling 300 ft. deep and a rotary drill capable of drilling 1000 ft. deep are in use. Afton intends also to start an extensive diamond drilling program for which tenders will shortly be called. Financing for this continued work is currently under negotiation and is expected to be completed soon, says Mr.Millar.

Assays from various percussion holes have recently been received. They are listed below. Q 162 is in the western zone. The others are in the SE section of the drilled area. Assays are awaited from a rotary drill hole put down in the SE section beside percussion hole Q 110, which, as previously reported, returned 0.99% copper from 130 to 300 ft. Mr.Millar reports that even better results are apparent below 300 ft. in that rotary drill hole.

Hole No.	Interval	Footage	Copper %
DD 72-3	30-130	100 ft.	2.24%
	130-390	260 ft.	1.21
	30-390	360 ft.	1.50
Q 139	30-250	220 ft.	0.27
	270-300	30 ft.	0.26
	200-300	100 ft.	0.69
	200-300	100 ft.	0.25
	120-300	180 ft.	0.42
	150-190	40 ft.	0.70
	90-300	210 ft.	1.66

(See Page 4 of this GCNL for table of assay results and property drill plan).

MARCH 8,1972

AFTON MINES LTD.FURTHER GOOD GRADE ASSAYS  
EXTEND ZONE TO THE WEST

- Assay results from a series of percussion and diamond drill holes have recently been received from the Afton Mines Ltd. property, located 10 miles west of Kamloops, B.C. The most

recent results are as follows:

Hole No.	Interval	Footage	Copper %
Three holes Drilled to The West Of the Blocked Out Ore			
DD 72-3	30 - 130	100	2.24%
Q 161	90 - 240	150	3.82
Q 159	60 - 300	240	0.65
Three Holes Drilled to The East Of the Blocked Out Ore			
Q 148	270 - 300	30	0.42
Q 147	80 - 300	220	0.53
	(Including 250 - 300	50	1.21)
Q 144	80 - 300	220	0.76
	(Including 250 - 300	50	1.82%)
One Hole Drilled to the North of the Blocked Out Ore			
DD 72-2	Drilled in a Fault Zone-Minor Mineralization		

Percussion drill hole Q-161 is of particular significance since it was drilled from a location 700 feet west and 100 feet north of DD 71-2 which is on the west boundary of the blocked ore. DD 71-2 has been previously reported as having intersected from 15 feet to 700 feet, an interval of 685 feet, copper with an average grade of 0.67%.

The holes drilled on lines 200 feet to the north and south of the originally blocked out ore were outside the zone and confirmed the boundaries in both these directions.

As seen in the above assay results, very favourable grades have been obtained in the holes drilled to the west. The zone is open to considerable extensions to the west.

The holes drilled to the east have been intersecting favourable mineralization at greater depths. Drill holes to the east of the ore zone must be drilled further to the east and to greater depths since the mineralization is still open to extension in this direction and depth.

A high speed rotary drill capable of reaching greater depth is being moved to the property from Alberta and should be in operation 7Mar72. This machine will be used to continue the 100 foot grid of holes in an effort to establish boundaries to the mineralized zone.

With regard to a major company participation, officials of Afton Mines have had preliminary discussions with major companies and have received one written offer which would involve sale of treasury shares at a price well in excess of the high market price of Afton shares. The objectives of the company are that if control of the property is sold to a major company then the percentage to be purchased by the major would be dependent upon the eventual size of the mill constructed. In this regard, it is important that the largest tonnage be established prior to firm negotiations. The long-term benefit for shareholders of the larger mill is obvious and negotiations for larger tonnages for the mill are progressing to an anticipated early completion.

With the interest shown by two major companies it is very feasible for the company to put the property into production without losing majority stock control.

ACKLANDS LIMITED

**EARNINGS IMPROVE** - A preliminary report by H.Bessin, president of Acklands Limited, shows that, in the year ended 30Nov71, sales were down to \$123,811,117 from \$129,362,581 in 1970, but net earnings, after income taxes (reduced by prior years' losses) and minority shareholder interest, rose to \$2,013,824 against a net loss of \$3,310,190 for the preceding year. Calculated on the number of common and third preference shares outstanding, and after providing for first and second preference share dividends, net 1971 earnings were 67¢ per share. Shareholders' equity in fiscal 1971 rose by \$1.3 million to \$23,909,695 with equity per share (combined common and third preference) increasing from \$6.36 in 1970 to \$7.15 for 1971.

Sales and earnings for the first quarter of the current fiscal year continued to show an upward trend, Mr. Bessin said.

CHAPPARAL MINES LTD.

**MEDICIN HAT GAS TESTS CONTINUE** - Elmer B.Baker, president of Chapparral Mines Ltd. has reported that testing of the Second White Spec Sand formation in ENG Chapparral Med Hat 10-21M-18-2W4 was undertaken over the last weekend. The well was perforated and sand fractured to produce a 'good' gas flow. The well is being cleaned now and will be flow tested in the next week.

Since the completion of this well took substantially longer than anticipated the other formations in the twin well were not tested but current plans are to complete and test the twin well in the next few days.

An agreement has been made to production test the ENG Maynard-Med Hat-11-36-12-1W4 well for a 60 day period with SasPower taking the gas and paying a net well head of 14¢ per thousand cubic feet. This is a Bow Island formation producer.

NO.47(MARCH 8,1972) + GEORGE CROSS NEWS LETTER LTD. + TWENTY-FIFTH YEAR OF PUBLICATION +



# George Cross News Letter

"Reliable Reporting"

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MAY 9, 1972

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\$160.00 per year  
NO.89(1972)  
MAY 9, 1972

## WESTERN CANADIAN INVESTMENTS

### WILEY OILFIELD HAULING LTD.

92 IN 023 (106)

SIX MOS. ENDED MAR 31	1972	1971
Revenue	\$4,221,076	\$2,528,455
Op. & Admin. Exps.	2,529,869	1,653,568
Depreciation	178,302	140,140
Interest Expense	58,323	98,382
Provs. Inc. Tax Current	644,300	263,100
Deferred	81,100	48,900
NET INCOME	\$ 729,112	\$ 324,365
Earnings P/Share	*84.1¢	41.9¢

\*Weighted average shares issued.

Wiley Oilfield Hauling Ltd. president V.N. Osadchuk has reported that all phases of the company's operations contributed to the strong growth in earnings in the six months. During the second quarter of this year the company completed stringing of the 1971 winter pipeline construction program in Northern Ontario and stringing of the pipeline from Beaver River in Northern B.C. to Pointed Mountain in the N.W.T. Support services for oil and gas exploration continued throughout the second quarter with crews

working in the Yukon Territory, the N.W.T. and the Province of Quebec.

Work has commenced on the Westcoast Transmission Company Limited summer looping program with completion scheduled during the fourth quarter. Pinestringing work in Northern Ontario presently under contract is scheduled to start during the latter part of the third quarter. Support services in the Yukon Territory and the N.W.T. should be suspended about the middle of the third quarter while the company's support service crews are expected to work throughout the summer in Quebec. The heavy hauling part of operations should experience normal summer activity.

### AFTON MINES LTD.

TWO DIAMOND DRILL RIGS-TWO ROTARY INCH RIGS - Current drilling on the Afton Mines Ltd., AND ONE NEW & INCH ROTARY MACHINE NOW WORKING property, 10 miles west of Kamloops, B.C., is directed to confirming drill results

obtained in the percussion holes and to extending the results from these holes to greater depth, as well as testing the southern and western extension of the orebody. Currently there are two diamond drills, two standard rotary drill rigs and one large seven inch rotary rig working on the property. The next key hole is 72-7 which is a 100-foot stepout to the southwest of the orebody. This hole has been completed and assays are expected shortly. Hole No. 72-9 is also an important hole since it is a stepout 100 feet to the west.

Hole No.	Interval Ft.	Footage Ft.	Copper %
72-4	95 - 240	145	2.56
	240 - 400	160 Waste	
	400 - 820	420	0.50
	further assays awaited from this hole		
72-5	0 - 190 Waste		
	190 - 290	100	2.10
	290 - 350	60 Waste	
	350 - 610	260	0.33
	610 - 680	70 Waste	
	680 - 877 bottom of hole	197	0.46
	(including 870 - 877	7	0.52)
72-6	0 - 62	62 Waste	
	62 - 620	558	1.18
	(including 220 - 470	250	1.63)
	further assays awaited from this hole		
R-9	0 - 120 Waste		
	120 - 140	20	1.40
	140 - 490 Waste to bottom of hole at 490 feet		
R-10	0 - 600 Waste		
	600 - 690	90	1.07
	690 - 800 Waste to bottom of the hole at 800 Feet		
R-11	0 - 120 Waste		
	120 - 170	50	2.67
	170 - 470 Waste		
	further assays awaited from this hole		

### FOR THE RECORD

Teck Corporation Limited will pay a quarterly dividend of 7½¢ p/Class "A" and "B" share on 1Jun72, record date 15May72.

Western Mines Ltd. will pay a semi-annual dividend of 10¢ p/comm. share on 15Jun72, record date 31May72.

International Visual Systems Ltd. shares are no longer in primary distribution.

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## TOO LITTLE, TOO LATE

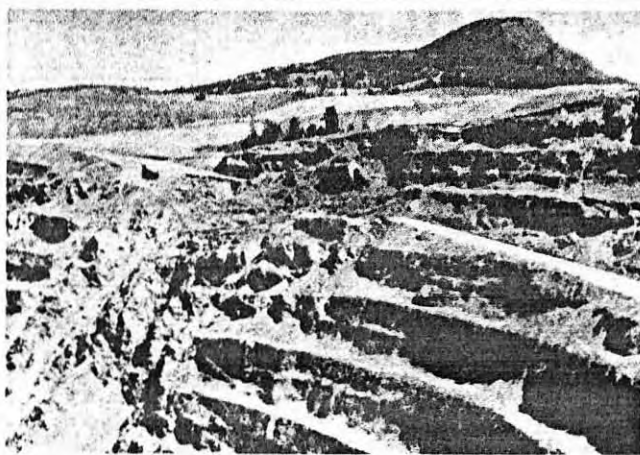
Last year the south face of the Afton open pit mine, near Kamloops, B.C., experienced what is known to mine engineers as a "severe toppling failure."

In other words some 7.3 million tons of rock broke loose from the upper part of the wall and slid into the open pit, covering the mine's access ramp.

Catastrophic as this may sound, the event didn't come as a complete surprise to the mine's operators and no one was injured. Cracks began forming in the wall two years ago and the company installed a number of extensometers to monitor the wall's movement.

What they found was a period of constant movement of 0.24 inches per day, lasting for several months, followed by a phase of acceleration to velocities of 2.4 inches per day.

At this point, according to G. Reid, a geological engineer for Afton, the company believed a significant failure was imminent. On May 27, miners were



Seven-million-ton toppling failure on the south wall of the copper-gold Afton mine, near Kamloops, B.C.

notified and the haulage road was blocked off. But work continued on the pit floor until quitting time on June 5. On June 2, company engineers predicted a major failure would occur sometime between June 6 and 8.

As engineers continued to take measurements, the failure "window" was narrowed down to a matter of hours — between 12:00 and 4:00 a.m. on June 6.

"By 2:30 a.m.," Reid says, "the noise of almost continuous spalling was such that we felt disinclined to approach an extensometer

located directly beneath the slide."

The failure occurred at 3:00 and lasted about 45 minutes. It occurred despite the fact that the company drilled some 10,000 ft of horizontal holes to drain groundwater and relieve pore water pressures from the rock wall.

Suffice it to say that the amount of drilling was insufficient to prevent failure — and the old maxim of "too little, too late" probably applies here.

Mining is continuing at the Afton under a new, revised mine plan.

## ZINC WAFER

Zinc oxide wafers are not the latest diet craze, unless you happen to have a yen for low-voltage current. But General Electric is pressing the compound into a cookie-shaped form to prevent electrical utility line surges from destroying delicate electronic equipment.

The company claims its new line of low-voltage zinc oxide arresters extends the threshold of protection as much as 70% lower than earlier devices. Among the improvements:

- enhancement of the formulation of the zinc oxide compound that forms the core of the units; and

- development of a technique to produce geometrically true zinc oxide wafers.

## DRAWING POWER

Magnets made of neodymium, iron and boron are about to penetrate the \$1-billion world market for permanent magnets.

Because of their high strength, low weight and low cost, Nd-Fe-B magnets could capture half of the world market, according to a study by Gorham International.

## OUTLANDISH

One has to wonder how Thomas Budnick is going to carry out his assessment work. The Massachusetts resident recently had mining claims on the planet Mars accepted by the county auditor's office in Spokane, Wash. Maybe he should consider hiring Orson (War of the Worlds) Welles as his promoter. □

## GOLDEN GIRLS

The next time you tell your wife she looks like a million bucks, it doesn't have to be a lie. A new line of elitist cosmetics can leave her literally glowing.

If you're planning a business trip in Europe, why not bring her back a bottle of *Fluid Gold* — a mica-filled lotion guaranteed to give her a shimmer? (Sounds like something invented by Goldfinger, one of James Bond's arch-enemies).

Or how about *L'Air D'Or*,

a perfume which squirts actual gold onto the skin of your loved one. This small token of your affection costs



David Flett

only \$95 for a quarter of an ounce — almost as much as the yellow stuff itself.

Not unlike gold, these new products are said to have a powerful psychological effect on women. "It energizes a woman, makes her feel alluring and precious," says Marilyn Miglin, creator of Fluid Gold, in a *New York Times* article. "She stands up straighter, she feels better." Miglin insists.

Who knows? Maybe demand will drive up even higher the price for the yellow metal.

# A free-wheeling Teck has successful record

by David Duval

**VANCOUVER** — Like beauty, mines are often in the eyes of the beholder, a point best illustrated by a wall poster at Teck Corporation's Bullmoose coal project during the construction phase: "A diamond is just a piece of coal that made good under pressure."

Recognizing a diamond in the rough has long been a trademark of Teck and its entrepreneurial management and staff. For, despite soft markets and pressure from Japan for lower prices, Bullmoose has proven to be a moneymaker, and a recent court decision involving the Williams property at Hemlo will dramatically increase Teck's gold production there along with profitability for the division, a gem if there ever was one.

Teck was unflinching in its support of International Corona during the prolonged court case, particularly its president, Norman B. Keevil, Jr., who never once doubted the validity of Corona's position. The company has a habit of turning successful beginnings into successful outcomes and the reason for this starts right at the top.

In wide-ranging interviews with senior executives at Teck, The Northern Miner was given a rare glimpse into the company and its entrepreneurial management style — something that is truly unique in the Canadian mining industry.

Style without substance doesn't go far in the mining business and Teck appears to have an abundance of both. Emphasis is placed on the individual who is given a free hand in the decision-making process and

is allowed to develop his or her area of expertise. Self-starters are encouraged and Teck's free-wheeling attitude has made it a favorite among junior sector companies which correctly perceive it to be a tough but fair dealer, laying all its cards on the table.

Much of Teck's growth has been related to mergers with these smaller companies including Afton Mines, where initial control was purchased on the open market. Dr Norman Keevil, Sr., the company's chairman, muses that Teck has been responsible for taking 21 listed companies off the Toronto Stock

Exchange through mergers "a record number for such a large Canadian mining company."

Not all of them were friendly, however. In the case of Afton, Teck was refused board representation

even though it had had a 50% equity in the company, which precipitated a lawsuit. This time the judge ruled against Teck and Dr Keevil contacted Placer Development which had a small shareholding in Afton and the right of first refusal on financing. A lunch with then Placer Chairman T. H. McClelland, brought Placer onside and Teck bought out several major shareholders in Afton and later merged with it.

Dr Keevil says Teck has always had a first-rate exploration team and great spirit within the organization. Noting the company's ability to take advantage of opportunities as they come along, he recalls having dinner one night with a U.B.C. professor in Hawaii and discussing an innovative rechargeable lithium battery which represented the first breakthrough in 40 years. Within two weeks, Teck had made the decision to fund Moly Energy which now is developing a \$43-million manufacturing facility near Vancouver that will produce 33 million cells per year at planned capacity.

Overseeing the day-to-day business of Teck is Mr Keevil, Jr., who credits the company's debt reduction program in 1982 for Teck's much improved financial results and outlook today. Teck made \$16.1 million in 1985 and if first-half results of \$11 million are representative, 1986 will be even better. The company has also been paying dividends and with 10¢ payable on Class A and B shares June 30, the total this fiscal year will reach 17.5¢.

## Solid financial position

High interest rates four years ago signalled a shift in emphasis to debt reduction and about \$300 million in assets were sold over a 2-year period. Most of these assets were not contributing to earnings and the subsequent reduction in interest costs left Teck in a solid financial position.

David A. Thompson, vice-president finance, was the main architect of the program which improved Teck's working capital from a negative \$6 million in March, 1982, to a positive \$64.7 million a year later.

Discussing the company's holdings on a project-by-project basis, Mr Keevil confirms that Bullmoose is living right up to expectations. Claiming the operation has a firm coal price until April, 1989, he says the price is set according to a formula and it can only go up. The Japanese are back to their original contract terms and will take 1.7 million tonnes of coal per year plus or minus 5% at their option.

Teck's direct 51% interest in Bullmoose returned net earnings of \$6.6 million last year. Outlining the reasons for its success, he states that the property is a manageable size, the geology is simple and the coal deposit is located on a dip slope, so mining is relatively easy.

Mr Keevil reflects that Teck knew there was plenty of coal in the region and sent out William Bergey (now a senior consulting geologist) to scout for a flat-lying seam using aerial photographs. He found one such deposit and Teck later dealt off its Sukunka coal deposit and part of another for a cool \$30 million to a major oil company. The underground project was never developed by British Petroleum.

According to Robert E. Hallbauer, senior vice-president, Teck is receiving \$105 per tonne for its Bullmoose metallurgical coal and he confirms the Japanese have asked for a price review. But any change to the present agreement would probably involve Japanese consumers taking more coal at a lower price similar to what happened previously.

B.C. Rail has been approached for lower freight rates which would make Teck's coal more competitive with the rate reduction premised on higher tonnages. But he admits "we haven't been able to convince them that it would be to their advantage," adding that Teck is not going to take all the burden itself.



Teck spent a fair bit of money on its Burnt River coal prospect last year and sent a trial shipment to Korea. But it is still unsure whether there is a market for the coal. It would also be difficult to compete internationally, given the fact that freight rates would be approximately \$26 per tonne to tidewater. The company is only selling small amounts of thermal coal into the market to establish itself, he points out.

### Highmont dispute

The company's Highmont operation has been closed since October, 1984, although recently it has become the subject of a dispute with Lornex Mining in which Teck holds a 21.7% interest. According to Mr Keevil, Teck and Lornex had agreed previously that neither would sign a deal in the Highland Valley without including the other. Earlier this year Lornex and Cominco announced plans to develop jointly Cominco's Valley Copper deposit utilizing their existing mills but not the dormant Highmont facility.

He says the deal was concluded before Teck got wind of it, adding "we are hopeful it will be resolved but time is running out." Noting the companies are still good friends, he concedes that Lornex has been a good asset and expresses the hope the matter will be resolved to their mutual satisfaction. He emphasized that Teck's quarrel is not with Cominco, which has the oldest mill of the three, but rather with Lornex.

Highmont could process 45,000 tonnes of Valley ore but the existing moly circuit would have to be converted to copper. Mr Keevil argues it should be an engineering decision whether to modernize the Bethlehem (Cominco) mill or use Highmont in conjunction with Lornex. A conveyor system would have to be built between these two properties and the estimated cost of production would be about 50¢ per lb, compared to 47¢ for the combined Cominco/Lornex project.

Still in the development stage but producing gold, the Teck/Corona project at Hemlo has been the most significant project for Teck this decade. Better than anything, Teck's participation in the venture underscores its understanding of junior sector companies and how they operate.

Mining promoter Murray Pezim tells The Northern Miner that Teck offered Corona the best deal of any

company at the time, citing the fact that his company needed money and also the expertise to develop the deposit. He says the deal was

sealed with a handshake with no lawyers present and the legal details worked out later. The 55/45 deal was certainly a great deal more fair than the 80/20 deals that had been offered by majors until then, he adds.

An area of interest was agreed upon and that included the Williams property which was recently won by Corona in a court case. Teck offered strong moral support to Corona in the legal action and Mr Pezim believes Teck will cover a portion of the court costs since Teck will receive a 50% interest in the Williams property, assuming the appeal by Lac Minerals is unsuccessful. "I feel Teck is a great organization and the biggest friend of junior mining companies," Mr Pezim says.

Mr Hallbauer says a joint operating company will handle both properties at Hemlo and some savings will be realized by combining the two operations, particularly in the tailings area. It is still uncertain whether they will follow Lac's mining plan and he adds the Williams property will double Teck's gold production at Hemlo.

Stoping is under way on the first three levels at Teck-Corona where widths are often quite narrow. The lower levels, where widths are thicker, will be more mechanized.



Photo by The Northern Miner  
Murray Pezim shovels overburden from shaft collar at Teck-Corona mine in September, 1983.

especially towards the Noranda ground. Noranda's operation will connect with Teck's seventh level because of the previous agreement on the quarter claim and also for ventilation purposes.

Mr Keevil says the combined mining operations will produce more than 600,000 oz gold by the

end of the decade. And he adds the recent agreement whereby Corona bought an additional 5% interest in the Teck-Corona operation was a "good deal because it made sense to have the ownership the same from the management point of view."

He confirms that Lac Minerals' appeal over the Williams property decision will be heard Nov 12 and the court has set aside two weeks for the hearing. He doesn't see any change to the original decision, adding there have been no discussions with Lac on the matter.

### Casa Berardi area

Teck has a 30% equity interest in Golden Knight which has a major interest in a gold discovery in the Casa Berardi area made by Inco. Admitting it was "a bit of a gamble," Mr Keevil says Teck would like to increase its equity position in Golden Knight but probably not immediately.

He says that underground work is in progress at Golden Knight in order to assess mining conditions and provide bulk samples for metallurgical purposes.

Commenting on the nearby Estrades discovery, he says at this point the discovery will probably make a small mine, adding that Teck is sending people to Japan to study similar deposits there. Geological reserves at Estrades are estimated to be 2.4 million tonnes grading 0.14 oz gold, 3.5 oz silver, 0.84% copper and 7.7% zinc.

John May, president of Teck Explorations, agrees that Hemlo was the major exploration success of the decade for Teck with Estrades (in Quebec's Casa Berardi area) a close second. An acknowledged expert on junior sector companies, he says Teck understands the needs of such companies, adding that communications are essential to maintaining good relations. Other major companies are reluctant to divulge information on exploration programs involving juniors which is one major advantage Teck has. Junior companies need to promote to raise money and Teck affords them the opportunity, albeit with guidelines.

He confirms that more drilling is planned for the Estrades discovery before a reserve calculation is made and the program will begin shortly. Drilling is planned to depth and along strike on the Estrades, Boulder Mountain and Casa Berardi trends.

"It has been repetitive from what we've seen so far and there is no reason to believe it won't be in the future," he predicts. The budget for the remainder of the year will

probably be around \$3 million on top of the \$2 million that has already been spent.

Mr May confirms the company has a number of options to pursue at the idle Lamaque mine near Val d'Or, Que. He says they have had a fair amount of success there with **Golden Pond Resources** finding new reserves. More drilling is required, however, and Teck is hopeful it will be able to announce something more positive in the coming months.

Mr Hallbauer estimates gold prices would have to be above \$400(US) per oz for the mine to reopen and that includes custom milling as well. Teck is in a Catch-22 situation — gold prices "are too low for potential custom millers and it's too low for us," he claims.

905/100  
012 INE  
023

The **Afton** mine at Kamloops has a few years left before open pit reserves are exhausted and underground mining would have to be considered. Mr Keevil feels the underground will be economic some day but there could be a hiatus before it is developed. The underground grades about 3% copper equivalent, which at today's prices is simply not high enough.

The open pit operation is generating a profit, however, and about 4,000 oz gold per month. Efforts are being made to sell the dormant

**Afton** smelter which is designed for processing ore containing native copper.

Mr Keevil can see the Newfoundland zinc operation reopening when there is a "price window" for the metal. The mine produces as much zinc as Placer Development's Gibraltar mine does copper, but zinc is a smaller market and they will have to be careful how they phase it in. Pointing out that he didn't roll over his copper futures "for the first time this spring," he argues that the fundamentals for copper are pretty good. He adds that many companies are doing things to survive that will cost production in the future.

Teck has a policy of "networking," which gives it exposure to a wide range of situations in Canada and abroad. Metallgesellschaft Ag is the company's largest shareholder, with 16%, and Mt. Isa Mines has 3%. "They are major shareholders and a real plus for Teck," he states, adding that the companies give Teck an international perspective on things. "They look for deals for us," he says. And deals are what Teck is really all about.

GCNL #104 30 MAY 1985

NO. 104(1985)  
MAY 30, 1985

TECK CORPORATION (TEK.A-T,M,V)

**SIX MONTHS REPORT** - Teck Corporation stated in the report for the quarter ended March 31, 1985 that the Bullmoose coal mine operated for the full six months in this year, whereas, it began commercial production only at the start of the second quarter in the last fiscal year. The operation continues to run smoothly, producing 1,100,000 tonnes of clean coal during the period. (SEE GCNL NO.88, PAGE 1 FOR FINANCIAL RESULTS).

Results from the Afton mine continued to improve, with grade averaging 0.92% copper in the second quarter, after two difficult years of a scheduled low grade cycle. Newfoundland Zinc and Niobec performed well, while precious metals remained marginal because of low gold and silver prices. The fundamentals of metals like copper and zinc are strong, with rising consumption and low inventories.

Lornex returned to a net profit in the second quarter, with profits from its copper, molybdenum mine as well as Bullmoose. As a result, equity accounted earnings of associated companies increased to \$900,000 in the current quarter as compared with a loss of \$400,000 in the first quarter, and a loss of \$1,500,000 in the first 6 months last year.

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Base metals are once again playing a prominent role in Teck's earnings. The Afton mine near Kamloops, B.C., has come out of a low grade cycle and millheads averaged 0.98% copper or 45% higher than the previous year. The mine also produces significant amounts of gold as a byproduct — last year some 48,559 oz. — representing a 64% increase from before. Teck's 73% share in the mine earned it \$4.9 million versus a loss of \$3.2 million the previous year.

**AFTON MINE** 921NE023

The Afton mine continues to perform well and profitably at current copper prices. R E Hallbauer, senior vice president of Teck Corp, emphasized

the stability and uniformity of the Afton mine and mill operations. Neither of these cost centres has required substantial modifications since start-up.

The reserves of the presently producing open pit will last two years. Thereafter a smaller open pit orebody can be mined to supply mill feed for another year.

Unless the copper price improves, the underground mine will not be brought into production, and thus the Afton mill will close in approximately three years.

CMJ Sept 86 "BC Copper  
Stands Tall & Slim" by T. Cieski

NMINER  
21 FEB 1985

The Northern Miner February 21, 1985

## Teck has first quarter profit after a two-year drought

VANCOUVER — After two years of losses, things are starting to turn around for **Teck Corp.**, which despite lower metal prices had earnings of \$1.6 million during fiscal 1985's first quarter ended Dec. 31 compared to a loss of \$4.2 million a year earlier.

At the annual meeting, Norman Keevil Jr., president and chief executive officer, said there were three mitigating factors in the improvement: production from the new **Bullmoose** coal mine; increased grade at the **Afton** mine which found itself in a low grade cycle as the recession began, and the shutdown of the **Highmont** copper-molybdenum mine in the Highland Valley of B.C.

Mr. Keevil said results from oil and gas, niobium and zinc operations were virtually unchanged, adding the **Beaverdell** silver mine operated at near break-even. The loss attributed to its 22% interest in **Lornex Mining** was lower due, in part to earnings from that company's 39% interest in **Bullmoose**. Falling gold prices precipitated a loss at the **Lamaque** mine in northwestern Quebec and a decision was made to close that operation this March.

Teck's over-all mine operating profit was almost six times higher for the quarter at \$12.6 million while petroleum was unchanged at \$2.1 million, bringing the combined operating profit to \$14.7 million, more than three times better. Earnings per common share (after deducting preferred share dividends) totalled 1¢ against an 11¢ loss a year ago.

Under pressure from Japanese consumers, Teck reduced its **Bullmoose** coal price last year by \$10 per tonne but the Japanese agreed to take more coal to compensate. Robert Hallbauer, senior vice-president, told *The Northern Miner* that Teck is now supplying more than two million tonnes per year, a 300,000-tonne increase over its previous commitment.

Claiming the recovery in North America has been delayed by strong U.S. and Canadian dollars, Mr. Keevil argued that a lower dollar would mean better prices for metals meaning, as he put it, "we could begin to re-employ some of those people who unfortunately lost jobs due to the shutdown of mines throughout the country." Mr. Keevil declined to say how to effect a lower dollar, suggesting that was something the government would have to decide.

Citing discussions on various issues he and other senior mining executives have had with the federal government, Mr. Keevil said the Conservative administration is reacting much more positively to the industry's point of view, unlike the previous Liberal government which approached important issues in a confrontational manner.

The Hemlo project will come on stream as scheduled and Teck noted that more than \$50 million had been spent or committed to December, 1984. Two mining methods are being considered: sub-level stoping and mechanized cut and fill for the upper levels where mining will begin. All major equipment procurement has been completed, the company added.

The president of Teck Exploration, John May, said an attempt is being made to find replacement ore for the **Lamaque** mine from the **United Siscoe** property several miles away. Drilling has been suspended but he is optimistic the program will be resumed in the near future. A number of targets are being tested and some of these are close to old workings. Teck drilled about 15 holes last year from a land-based location but additional work would also involve drilling from the ice. The **United Siscoe** shaft is located on an island so any new reserves would probably be under the lake.

In the Hemlo region, Teck has ground east of the **Lytton Minerals** discovery and efforts are under way to consolidate a larger land position in the area. He also said **Inco Ltd.** is planning additional drilling on **Golden Knight Resource's** Casa Berardi prospect in northwestern Quebec. Teck has a 7% interest in **Golden Knight** and the right to acquire another 6%. Its equity could be expanded even further in the event the property sees production and Teck provides **Golden Knight's** share of project financing.

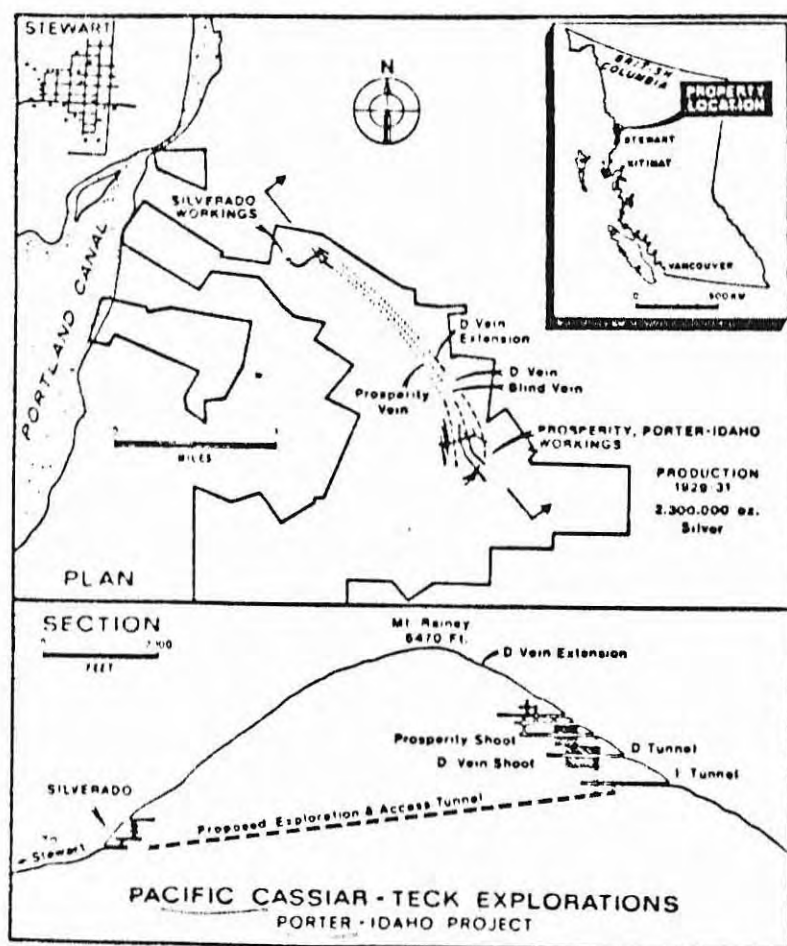
The property is roughly on strike with **Agnico Eagle**, some 30 miles to the east, and the mineralization occurs in the same general rock type. The **Golden Pond** zone, the first discovery, is reported to have geological reserves of three million tons grading 0.217 oz. gold over 1,600 ft. of strike length. And it has been speculated that the **Golden Pond East** zone has slightly more reserves at marginally lower grade. Some deep drilling is planned for that zone this year.

A major exploration program is scheduled for the company's **Porter-Idaho** silver property near **Stewart, B.C.**, under a joint venture agreement with **Pacific Casiar**. At least \$1 million could be spent there this year. Exploration for lithium in the western U.S. will get under way this year.



## Teck predicts 1985 profit even at present prices

The Northern Miner January 24, 1985



Map above shows the location and section plan at the Porter-Idaho project joint venture where Pacific Cassiar and Teck Explorations expect to commence a major exploration program (N.M. Jan. 17/85).

103P/13W  
(03P 031)

VANCOUVER — Even at present metal prices Teck Corp. is predicting a profitable year, following a 1984 fiscal net loss before extraordinary items of \$2 million — about one-third the previous year's.

Norman B. Keevil Jr., president and chief executive officer, says the primary reason for the over-all corporate loss was the Highmont mine which closed last October. The copper-molybdenum producer contributed a loss of \$10.4 million and resulted in Teck taking a \$15.9-million writedown from 1984 earnings.

Teck made a special provision for an extraordinary after-tax writedown in the fourth quarter of \$23 million which also includes frontier lands off the Labrador coast; so the total net loss for the year was actually \$25.1 million or 96¢ per share. Mine operating profit was four times higher at \$36.5 million, reflecting coal production from the Bullmoose mine.

Referring to the reorganization started in 1981, where assets were sold and partners taken to lessen its exposure on certain capital projects, Mr. Keevil says in the annual report "there are no plans for further divestments." He adds that the company will concentrate on mining, mineral exploration and new mine development, expanding as the situation warrants.

Earnings should be strengthened with a full year's production from the Bullmoose coal mine in northeastern B.C. and improved results from Afion which is out of a low grade cycle. The Highmont closure will reduce losses there.

Bullmoose is running efficiently and approximately 2.2 million tons of raw coal were delivered to the treatment plant in 1984 resulting in nearly 1.6 million tons of clean coal or a yield of 73%. Based on the company's 51% share in the operation, net earnings attributable to Teck were \$5 million.

The company's Hemlo operation will come on stream at mid-year and Teck's share of production should average about 100,000 oz. per year.

Head grades at the Lamaque gold mine dropped to 0.113 oz. from 0.148 oz. which is more in line with historical experience, says Teck. The mine produced 32,414 oz. gold during the year, slightly lower than the year before. The mine lost a month's production when the main shaft hoist broke down, which precluded

work in the No. 7 shaft area until the problem was fixed. Lamaque has a custom milling agreement with Kiena Gold Mines which is due to expire in January. The mine will close this spring because of low gold prices.

At the Newfoundland Zinc mine in which Teck has a 6.3% interest and Amax Lead and Zinc, 37%, the new T zone is providing half the mill throughput. The zinc grade has risen to 8.5% and testing of the down dip potential 2,000 ft. to the west of the L and T zones has indicated additional ore. A high grade surface zone has also been discovered. Teck's shares of net earnings from this operation was \$4 million for the year.

Recoveries were lower at the 50% owned Niobec mine near Chicoutimi, Que., because of the refractory nature of the mineralization. Despite the 60% recovery rate, the mine contributed \$1.5 million to net earnings about four times that in 1983. Full production resumed in late November after a one-month strike.

The Beaverdell mine near Kelowna, B.C. produced 375,709 oz silver, slightly higher than the previous year. But net earnings were more than halved to \$344,000.

Oil and gas production was lower because Teck sold its U.S. petroleum interests and also properties representing about one-third of its Canadian production to Trilogy Resource Corp. Operating profit from this sector was \$9.3 million compared to \$15.5 million the previous year.

751/102  
(002INL023)



MINER 20 SEPT 84

## Teck will suspend Highmont operations

92I/TW  
(09245 EOB)  
Teck Corporation says operations at its 50%-owned Highmont mine in the Highland Valley district of British Columbia, will be suspended effective Oct. 19.

Highmont is a 27,000 ton-per-day copper-molybdenum mine owned 50% by Teck, 30% by Redclay Holdings, and 20% by an affiliate of Metallgesellschaft.

Robert E. Hallbauer, Teck's senior vice president mining, said that copper and molybdenum prices remain depressed, particularly in terms of the strong U.S. and Canadian dollars, and that the suspension was necessary in order to stem the continuing net losses produced by this operation.

He said that the plant and equipment will be maintained in condition to re-open when economic conditions warrant.

92I/OE  
(09245 EOB)  
He added that Teck's Aston copper-gold mine, which was closed for nine months two years ago, would remain in operation.

GCL #98 22MAY84

## TECK CORPORATION (TEK-V,T,V)

921/10E (692TNR023)

## SIX MONTHS ENDED MARCH 31

	1984	1983
Mining Revenue	\$74,142,000	\$45,905,000
Petroleum Revenue	7,166,000	10,927,000
Other Income	573,000	1,631,000
Total Revenue	\$81,881,000	\$58,463,000
Mining Expense	60,962,000	40,155,000
Petroleum Expense	2,347,000	2,725,000
Admin. Expense	1,830,000	1,646,000
Depl'n, Deprec'n, Amortiz'n	10,966,000	8,287,000
Exploration Expense	684,000	2,415,000
Interest Expense	7,209,000	5,660,000
Income & Mine Taxes, Current	683,000	550,000
Deferred, (Recovery)	(1,228,000)	(1,125,000)
Equity in Associates' Loss *	\$ 1,508,000	\$ 1,264,000
Loss Bef. Extra Items	3,080,000	3,114,000
Investments Sale Gain	-	180,000
Net Loss	3,080,000	2,934,000
Loss Per Share	15¢	14¢
Cash Flow	\$ 8,400,000	\$ 6,900,000

\* Notable associate is Lornex Mining Corp.

TURN TO NET PROFIT  
ACHIEVED IN MARCH

The new Bullmoose metallurgical coal mine in NE B.C. was placed on production status as of 1Jan84. A total of 406,000 tonnes of coal was shipped from the new coal port at Ridley Island during the ensuing quarter and the project has made a positive contribution to earnings of Teck Corporation from the start, says president N.B. Keevil, Jr.

In Teck's fiscal year's first half ended 31Mar84, the petroleum division produced 272,000 barrels of oil and 723,000 mcf of natural gas, compared with 371,000 barrels and 1,669,000 mcf in the first half last year, which included a number of properties later sold to Trilogy Resources. Teck's share of metal production from Teck-operated mines was 18,300,000 pounds of copper (8,300,000 last year), 26,377 ounces of gold (18,396), 258,000 ounces of silver (507,000), 28,500,000 pounds of zinc (29,900,000), 1,700,000 pounds of niobium oxide (1,600,000) and 790,000 pounds of molybdenite (958,000).

Combined operating profit for the 6 months was

\$18,000,000, up from \$14,000,000 a year earlier. All divisions operated profitably, except copper in which the 2 copper mines had a total operating loss of \$1,600,000.

Mr. Keevil comments, "Inventories of copper have been declining since January, and most observers predict increased prices as the year progresses, although estimates vary widely as to the extent of this. Regardless, we anticipate higher grades of gold and copper at the Afton mine as the planned low-grade cycle ends, resulting in lower unit costs and an improved contribution to earnings.

"Net earnings including provision for equity in Lornex were positive in the month of March and our present expectation is for a modest profit in the second half of the fiscal year.

"Construction of the mill at the Teck-Corona gold property near Hemlo, Ontario began during the quarter. The headframe has been completed and shaft sinking is underway, with the first ore scheduled to be processed in mid-1985. Also in gold, Teck entered into a financing arrangement with Golden Knight Resources which is exploring a gold property in the Abitibi region of Quebec, jointly with Inco."

NUMBER  
26 JAN 84

## Teck posts \$6m. loss in 1983 looks to copper price increase

VANCOUVER — Teck Corp. says its copper producing operations were responsible for the net loss of \$6 million posted in fiscal 1983, noting an improvement in the price of copper from its recent record lows "will be the most important factor in a return to corporate profitability." Excluding losses attributed to copper, the company would have earned a profit of \$8 million.

Despite the downturn in the base metal sector, Teck still managed to bring another mine into production last year "on schedule and under budget," according to Norman Keevil Jr., president, who notes in the annual report that the first train-load of coal left the Bullmoose coal mine Nov. 1, 1983, just 18 months after construction began. The company's Hemlo operation, which is scheduled to come on stream in 1985, will be the seventh mine for Teck in a 10-year period.

The Bullmoose project, a joint venture between Teck (51%), Iornex Mining (39%) and Nicsho-lani Canada (10%), involved a budget of \$300 million including pre-production interest and working capital, says Mr. Keevil, who adds it appears that the final capital cost will be below budget.

The process plant has a production capacity of 2.3 million tonnes per year and Teck has a sales contract with nine Japanese steel mills to purchase 1.7 million tonnes of coking coal per year for a 15-year period. There is also provision in the contract for a 5-year extension beyond that point.

With the exception of Afton and Highmont, all divisions reported an operating profit this year, he states. The oil and gas division produced an operating profit before exploration of \$15.5 million, up from \$10.6 million in 1982. Precious metals operations also contributed strong operating profits including the Lamaque mine which earned \$6.2 million, Silverfields \$2.3 million, Beaverdell \$1.5 million and the Granville placer mine in the Yukon \$2.4 million. The company's Newfoundland Zinc mine had an operating profit of \$9.8 million while the Niobec mine in Quebec reported a "modest profit" after being closed

for five months in 1983 to reduce inventories. The operating loss at Afton for Teck was \$2.3 million and for Highmont \$6 million.

The company says combined cash flow from operations was \$9.2 million compared to a deficiency of \$12.1 million last year, and the operating loss of \$6 million or 28¢ per share before extraordinary items was much better than the \$17.7 million or 76¢ per share loss in 1982. Long-term debt increased from \$132 million to \$165 million because of the Bullmoose project but the level of recourse indebtedness was reduced from \$124 million to \$53 million, says Teck.

73-7 (73-2632)

TECK CORP. 1983

GENL #182 20 SEPT 84

TECK CORPORATION (TEK.A, TEK.B-T, M, V)

OPERATIONS SUSPENDED AT HIGHMONT - Teck Corporation suspended operations of the Highmont mine in the Highland Valley district of B.C., effective Oct 19/84. Highmont is a 27,000 tons per day copper-molybdenum mine owned 50% by Teck Corporation, 30% by Redclay Holdings Limited and 20% by an affiliate of Metallgesellschaft.

In announcing this, Robert E. Hallbauer, Teck's senior vice president mining, says copper and molybdenum prices remain depressed, particularly in terms of the strong U.S. and Canadian dollars and that the suspension was necessary in order to stem the continuing net losses produced by this operation. The plant and equipment will be maintained in condition to re-open when economic conditions warrant.

Mr. Hallbauer also said that Teck's Afton copper-gold mine, which was closed for nine months two years ago, would remain in operation.

(78)

GCNL #14 20 JAN 84

(0921NE023)  
921/10E

10.14(1984)  
JANUARY 20, 1984

721/7W  
(0921NE013)

TECK CORPORATION

FINANCIAL CONDITION STRENGTHENED. HEMLO GOLD - DEVELOPMENT AND COAL PRODUCTION STARTED

In his annual report for the year ended 30 Sep 83, Norman B. Keevil, Jr., president, says this has been a year of progress for

Teck Corporation in a number of areas. The financial restructuring program initiated in early 1981 was completed with a further \$20,000,000 raised through the sale of some of Teck's oil and gas properties and the private placement of common and convertible preferred shares. The total raised over this period amounts to just over \$300,000,000. As a result, Teck ended the year in stronger financial condition than when the recession began. Although long term debt shown on the balance sheet rose from \$132 to \$165 million over the year, this included \$92,000,000 in project financing, for the new Bullmoose coal mine in N.E. B.C., which is non-recourse to Teck. Long term debt with recourse to Teck was down from \$124,000,000 in 1982 to \$53,000,000, or 11% of total assets, at the end of fiscal 1983. Working capital at year end was unchanged at \$28,000,000.

Construction at the Bullmoose coal mine was completed shortly after the fiscal year end, on schedule and under budget. The first trainload of coal left the loading station near Tumbler Ridge on 1 Nov 83, 18 months after construction began.

Ore reserves on the Corona gold property near Hemlo, Ontario were expanded sevenfold over the tonnage reported a year ago. Site preparation for shaft-sinking is underway; when completed in 1985, this will be Teck's seventh new mine built in 10 years.

Dr. Keevil notes that an operating profit was achieved this year by all divisions of Teck except their 2 copper mines, Afton and Highmont in south central B.C. The oil and gas division had an operating profit before exploration of \$15,500,000 up from \$10,600,000 in 1982. Approximately one third of Teck's petroleum production was sold to Trilogy Resource Corporation effective 1 June 83, and operating profit in fiscal 1984 from the retained properties is forecast to be just over \$9,000,000.

The Lamaque gold mine in Quebec produced an operating profit of \$6,200,000, up from \$3,000,000 a year earlier because of higher grade and better gold prices. The Silverfields silver mine in Ontario had an operating profit of \$2,300,000 up from \$1,400,000 a year ago. The mine was closed in June, its ore reserves exhausted after producing 18,500,000 ounces of silver since starting production in 1964. The Beaverdell silver mine in B.C. had an operating profit of \$1,500,000 up from \$1,300,000 in 1982.

A 60% interest in the Granville placer gold mine in Yukon Territory was acquired by merger in August with Copperfields Mining Corporation. This seasonal mine produced 7600 ounces of gold last summer for an operating profit of \$2,400,000.

The Newfoundland Zinc mine (Teck 63%) produced an operating profit of \$9,800,000, up from \$6,200,000 the previous year. In Quebec, Niobec niobium mine (Teck 50%) was shut down for 5 months to work off inventories of niobium concentrate, reopening on August 22, and reported a modest profit.

The Afton copper-gold mine (Teck 73%) re-opened on May 2 after a 10-month shutdown. Results were affected by continued low copper prices and a scheduled low grade cycle in the open pit. Teck's share of the operating loss since re-opening was \$2,300,000 vs a loss of \$5,000,000 in 9 months production the previous year. The smelter was shut down on July 20. Future production will be sold as copper concentrate, at a considerable improvement in the net smelter return per pound of copper produced.

Teck's 50% share of the Highmont copper-molybdenum mine had an operating loss based on market prices of \$6,000,000, but, after crediting support prices paid by the metal customers as non-recourse, project loans, Teck's share of operating cash flow was \$3,400,000.

Dr. Keevil says, "Teck's 21.7% share interest in Lornex Mining Corporation continues to be one of our most important holdings, but the Lornex mine was also affected by low copper and molybdenum prices and reported a modest net loss during the year."

Although fiscal 1983's administrative, exploration and interest costs were all reduced considerably from 1982's, the operating losses and depreciation charges from the 2 copper mines resulted in a net loss before extraordinary items for the year of \$6,000,000 or 28¢ a share, down from \$17,700,000 or 76¢ a share in 1982. Combined cash flow from operations was up \$21,300,000 from a deficiency of \$12,100,000 last year to \$9,200,000 or 34¢ a share.



GCNL #240 12 DEC 83 TECK CORPORATION

YEAR ENDED 30 SEPTEMBER	1983	1982
Revenue	\$126,200,000	\$128,000,000
Cash Flow	9,200,000	(12,100,000)
Cash Flow Per Share	34¢	(48¢)
Net Loss Bef. Extra Items	6,000,000	\$ 17,700,000
-Per Share	28¢	76¢
Extra. Write Down	\$ 11,000,000	- -
Total Loss	\$ 17,000,000	31,900,000
-Per Share	68¢	\$1.32

Teck Corporation chief financial officer David A. Thompson, vice president has reported a \$21.3 million improvement in cash flow for the year ended 30 Sep 83. Earnings continued to be affected by low copper prices for the company's two copper mines, with all other divisions producing gold, silver, zinc, niobium, oil and gas operating at a profit. Extraordinary items, primarily a

writedown of the Afton Smelter because of the decision to sell future production as concentrate, amounted to \$11,000,000.

min can earn a 70% interest in the Big Missouri property. In conjunction with that program, Westmin is also doing exploratory work on **British Silbak Premier Mines** 87-claim property 15 miles north of Stewart. By the end of August, Westmin had spent \$675,000 on the ground which included extensive trenching and diamond drilling. The majority of that drilling (75%) was done on the central part of the property and 16 mineralized intercepts were encountered in 12 drill holes completed immediately north of the glory hole. But further drilling will be required to determine the significance of those preliminary results.

Although Westmin's **Buttle Lake** property on Vancouver Island is not a primary gold producer, a tripling of the production rate there to 3,000 tons per day will move the company into the forefront of B.C. gold producers. Development of the H-W mine which, including the mill expansion and related facilities, will constitute a \$225 million capital expenditure, is currently under way with start-up projected for the last quarter of 1984. In 1982, the operation produced 20,000 oz. gold (at a 930 ton-per-day mill rate) and 759,000 oz. silver.

But the gold grade for the H-W deposit (0.07 oz.) will be 0.01 oz. higher than that previously mined, improving gold output even further. But silver values will be less than half that encountered previously in the underground operation.

**Teck Corp.**'s **Afton** mine is also a significant producer of precious metals although last year a strike and later a recession-related shut-down, affected production dramatically. The last full year of production was 1981 when 41,024 oz. gold was produced along with 246,150 oz. silver. It has a mill capacity of 7,500 tons per day.

Afton reopened in May but the company's future is tenuous with gold and copper prices currently below profitable levels. Compounding the problem, the mine is still in a low grade cycle.

Despite its small mill capacity of 120 tons per day, **Teck's Beaverdell** mine is a real money maker. With a head of grade of 12.9 oz., the mine produced 467,433 oz. silver in 1982 and a profit for Teck of approximately \$1.3 million to Sept. 30, 1982.

#### Resumes production

In the Yukon, **United Keno Hill Mines'** silver operation near Elsa has restarted production after being shut down for over a year. The mine had been producing at 8,100 tons per month but the new rate was scheduled to be 5,500 tons per month which would yield about 115,000 oz.

silver per month from this high-grade operation. The company's concentrate is sent to Cominco's Trail smelter. A recent labor contract which ends in June 1985 should allow the company a period of labor stability, with known costs, enabling the operation to get back on its feet again.

Although not a primary silver producer, **Cyprus Anvil Mining** ranks on a par with **United Keno** (when in full production) as far as silver output is concerned. Closed in June, 1982, because of poor metal prices for lead, zinc and silver, the federal government has granted Cyprus Anvil a \$19.6 million interest-free loan which will allow waste stripping at the mine located near Faro, Yukon. In its last full year of production (1981), the mine accounted for

1.7 million oz. of Yukon silver production. Only a significant increase in lead-zinc prices will allow this high-cost operation to produce as it has in the past.

#### Potential producer

One of the more interesting "potential silver producers" in the Yukon is **Regional Resources** Midway property. Actually, the main discovery is just over the B.C. border but the huge property encompasses considerable ground with good potential in the Yukon as well. At the end of last year's program, **Regional** announced reserves of 3.5 million tons grading 12 oz. silver and 18% combined zinc-lead. A major exploration program this year costing approximately \$2.3 million should improve the reserve picture even more. **Canamax Resources** is expected to take over as operator next year.

Of all the placer mining operations in the Yukon, **Queenstake Resources** probably draws the most interest. It operates a placer dredge on Clear Creek and expects 1983 will be a record year as far as gold production is concerned from its Yukon operations. Weather problems delayed start-up last year but conditions were excellent at the onset this season which prompted the company to forecast gold production of 6,000 oz. in 1983. **Queenstake** which is 45% owned by **Canada Tungsten Mining**, has a number of excellent gold properties both in Canada and the U.S. With a strong mineral portfolio, that company expects to be a major precious metal producer in the future.

#### Finds new zone

**Mosquito Creek Gold Mining** operates a small gold mine near Wells, B.C. which, although producing at a rate of 80 tons per day, is technically still in the exploration stage. Recently the company

reported it has discovered a new ore zone on ground it holds under option from **Wharf Resources**. **Mosquito Creek** feels the discovery could be the largest found on the property since the inception of production in 1980. At the moment, the company is trying to ensure an adequate stockpile is on hand to allow maximum production through the winter months.

**Blackdome Exploration's** Clinton gold prospect under option to **Heath**

**Steele Mines**, a wholly-owned Noranda subsidiary, is currently the subject of a detailed exploration program by **Heath**. By meeting its option commitments, **Heath** eventually could own a 55% interest in **Blackdome**. Assuming this year's results live up to expectations, the company could be in a position to make a production decision early in 1984. At the end of last year the property had drill-indicated reserves of 455,000 tons grading 0.32 oz. gold and 2.7 oz. silver.

**Mascot Gold Mines** has been exploring its **Hedley** gold property for years. The old **Nickel Plate** mine was a major producer in the past with a historic grade in the range of 0.2-0.3 oz. At the annual meeting earlier this year **Mascot** said a reserve of at least 500,000 tons would be needed to warrant a production decision which most observers feel it has now. **Campbell Resources** took over **GM Resources** this year which held a 73% interest in **Mascot** but it's still uncertain whether **Campbell's** entry is a positive development or not as far as the mine ever achieving production again.

#### Outstanding successes

A number of Vancouver-based companies have chalked up some outstanding successes in the U.S. including **Pegasus Gold** which operates a gold-silver heap-leaching prospect near **Landusky, Mont.** The company expects gold production from the property will be over 70,000 oz. this year. In the three months ended June 30 the seasonal mining operation generated a net profit of \$2.04 million for **Pegasus**.

**Inca Resources** **Rich Gulch** gold property in California is in the feasibility stage and a production decision will probably be based on a 3,000 ton-per-day mining rate with a grade of 0.12 oz. gold.

# B.C. financing flows to Ontario

By David Duval

Considering that B.C. hosts one of the greatest risk-capital markets in the world (the Vancouver Stock Exchange) it's ironic that most of the money raised in the province goes elsewhere. Although the province is endowed with a wealth of natural resources, exploitation of these resources is generally more difficult and expensive than in other parts of the country.

The mountainous terrain, high labor costs and low productivity — all contribute to making the province a high-cost area for new mining developments.

Predictably, where costs are lower and the logistics better that's where companies will be heading. And this is particularly the case in Eastern Canada where B.C.-financed companies have already precipitated several discoveries the best known of which is undoubtedly Hemlo. A substantial portion of those exploration dollars is also going to the U.S.

Ontario's mineral incentive program has provided further stimulus to explore in the province, significantly reducing capital requirements for such work. But there seems little chance a similar program will be initiated in B.C. because of the provincial government's current restraint program.

While exploration in B.C. last year ended on a high note (with several intriguing gold discoveries announced) follow-up work on these properties, although encouraging, did not live up to earlier expectations. Precious metals exploration, it seems, is considerably more difficult than people ever imagined — especially for gold where the erratic nature of the metal usually requires a great deal of close-spaced drilling to block out a minable reserve.

Even though 0.3 oz. gold by industry standards today represents a decent grade underground reserve, that often "non-homogeneous" one-third ounce occurs in one ton of rock — not the easiest thing to find. There is also a marked trend towards reactivating old producers and many companies are finding old data from these mines are not nearly as accurate as was thought. Also that they are simply inheriting someone else's problem.

## Hurdles

The past few years have been devastating for B.C.'s mining industry and the precious metals sector didn't escape the onslaught of high interest rates and low metal prices. In most cases, existing gold producers in the province are struggling to make ends meet, including **Carroll Mines** near Hope, B.C. and **Scottie**

**Gold Mines** near Stewart. Although Scottie recently received an equity infusion from **Goldcorp Investment**, a Toronto-based holding company which could pump as much as \$3.5 million into its treasury. Already, the first instalment of that financing has allowed Scottie to step up exploration at its Summit Lake gold mine both underground and on surface, and early in the program the results are very encouraging, it says. Prior to the Goldcorp transaction, **Northair Mines** had a 21% equity in Scottie but it was required to convert \$1.6 million in Scottie debt into shares (272,593) increasing that equity further. Northair's gold mine near Squamish remains closed and will probably be until gold reaches at least \$US500.

At last report, Carolin was seeking a further equity infusion to keep its Ladner Creek operation afloat but the company is heavily in debt, with a relatively small reserve inventory, and a complicated recovery process. The recent drop in gold prices will only aggravate an already difficult situation.

## Bright spot

About the only real bright spot on the horizon is **Erickson Gold Mines** small (180 ton per day) but profitable gold operation near Cassiar, B.C. The mine has the earmarks of becoming a major gold producer in the next few years, possibly the largest in the province. Erickson has consolidated the biggest land position of any gold mining company in

the area and recently concluded a \$3.1 million agreement with the trustee of **Plaza Mining Corp.** to buy that company's 150 ton-per-day Cassiar gold mill and even more important its mineral claims adjoining and adjacent to the Erickson mine.

Shortly after that deal was announced the company acquired control (94.7%) of **Table Mountain Mines** which also has extensive holdings in the area near Erickson. The shares (1,166,552) representing an additional 44.1% equity in Table Mountain, were acquired from **United Hearne Resources** in a sharp swap. Hearne ended up with 225,000 Erickson shares in the exchange. Hearne's gold operation at Cassiar is now being run by **Taurus Resources**.

## A real success

**Equity Silver**, a 70%-owned Placer Development subsidiary, is proving to be an outstanding success, despite a large cost overrun in the leach plant which is still operating below design capacity.

Even though silver prices tend to follow gold downward the industrial applications for the metal are much greater, suggesting that operation's continuing success is almost certain. Operating at approximately 5,700 tonnes per day, as of Dec. 31, 1982, Equity had 23.6 million tonnes of reserves grading 98.2 g silver (3.2 oz.) and 0.884 g gold (0.028 oz.). The mine is a world-class producer and a highly profitable one for Placer and its subsidiary. In the first half, Equity reported net earnings of \$8.3 million because of higher metal prices and lower interest charges. Equity is repaying its outstanding debt quickly and recently announced plans for a prospectus offering involving cumulative, redeemable, preferred shares. No doubt some of these funds will be used to reduce that debt further.

Earlier this year, Allen Born, Equity president, who is also chairman of Placer, predicted that precious metals would be the largest contributor to Placer's earnings this year. Augmenting those earnings will be the company's 100%-owned **Golden Sunlight** mine in Montana which is operating at approximately 5,000 tons per day. A major gold producer, the open pit operation should put out over 72,000 oz. gold this year based on a mine grade of 0.05 oz. gold per ton. The carefully conceived mining operation came on stream 31% under the proposed \$U73 million budget and should be a major profit centre after payback.

In Mexico, Placer has a 34% interest in the **Real de Angeles** silver mine which should produce approximately 7.0 million oz. annually with associated lead, zinc and cadmium. Very definitely, Placer Development represents a major force in precious metals. Production from that sector this year should total approximately 6.5 million oz. silver and 140,000 oz. gold. This compares with silver output of 170,000 and 25,000 oz. gold in 1976.

**Westmin Resources** has extensive interest in the Stewart area of B.C. and earlier this year reported 1.9 million tons of reserves grading 0.1 oz. gold equivalent on property it holds under option from **Tournigan Mining Explorations**. Through share purchases and for completing a feasibility study by June 1, 1985, West-

104P/4E  
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ERICKSON

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# Structural geology and geostatistical parameters of the Afton copper-gold mine, Kamloops, B.C.

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## ABSTRACT

Afton Mines Ltd. (N.P.L.) operates an 8500-tpd open-pit copper-gold mine near Kamloops, B.C. The pit is currently 480 feet deep and will reach an ultimate depth of 800 feet.

The east, south and west walls of the pit are composed of Triassic andesites (Nicola Volcanic Formation) and contemporaneous sub-volcanic intrusions of micro-syenite, micro-diorite, diorite and picrite-basalt (Iron Mask Pluton). The north wall of the pit consists of Tertiary sandstones, shales and mudstones (Tranquille Formation) and dacitic dykes, sills, flows and tuffs (Kamloops Volcanic Formation).

The Afton copper-gold orebody (30 million tons of open-pit ore with a grade of 1.0 per cent copper, 0.016 oz/ton gold and 0.12 oz/ton silver) occurs within the Triassic Iron Mask Pluton adjacent to its faulted contact with Tertiary rocks. The Triassic-Tertiary contact is a complex fault system dipping 65 degrees southward and causing the Triassic rocks to overlie the Tertiary rocks. The detailed trace of this contact is very intricate due to the mutual interference of three principal fault systems.

The dominant geological structures in both Triassic and Tertiary rocks are faults striking WNW and dipping 65 degrees southward, i.e. sub-parallel to the orebody (strike faults). Cross faults and oblique faults are abundant and highly significant in some sectors of the pit. The Tertiary sedimentary rocks show an early series of northwesterly plunging folds deformed by a later series of northeasterly striking folds. Major lithological and structural boundaries divide the pit into 8 structural domains within which the pitwall slope stability is controlled by the local geological structures and lithology.

Assay data from production blasthole samples and exploration diamond drillhole samples show a log-normal frequency distribution, with a fairly low relative variance. Variograms

computed from production blasthole samples show good continuity with elliptical horizontal zones of influence which are truncated by the major faults that bound the ore zone.

Deep diamond drillholes in the west part of the orebody show a rhythmically banded distribution of mineralization, with copper, gold and silver decreasing generally westward, while sulphur gradually increases westward. Experimental semivariograms computed from diamond drillhole samples show excellent continuity that can be modelled by nested spherical structures.

## Introduction

The Afton copper-gold mine is located in the southern interior of British Columbia, 10 miles west of Kamloops and 160 miles northeast of Vancouver. Open-pit mining began in 1977, and the current production rate is 8500 tons of ore per day with an average grade of 1.0 per cent copper, 0.016 oz/ton gold and 0.12 oz/ton of silver. The waste-to-ore ratio is 7:1, and the open pit is now 480 feet deep. Open-pit ore reserves are sufficient to maintain mill production until 1988.

## Regional Geology

The geological setting of the Afton orebody is described by Carr and Reed (1976). Rocks of the Paleozoic, Mesozoic and Cenozoic eras outcrop in the vicinity of Kamloops (Fig. 1), but the unit with the greatest economic significance is the Upper Triassic Nicola Volcanic Group and its sub-volcanic dioritic intrusion, the Iron Mask Pluton. The Afton orebody occurs at the northwestern extremity of the Iron Mask Pluton immediately south of a deep graben structure that developed in post-Triassic time (Coast Mountains orogeny) and which was the focus of vigorous sedimentation and volcanism in Tertiary times.

The Iron Mask Pluton is a lenticular composite intrusion approximately 9 miles in length in a northwesterly direction. The petrography of the Iron Mask Pluton ranges from picrite and serpentinite to latite porphyry. Outcrops of individual petrographic units are generally elongate in a northwesterly direction parallel to the axis of the pluton. The Iron Mask Pluton represents the moderately-slowly cooled core of an oceanic fissure volcano which built up an island flanked by shallow-water sediments including reef knolls, and which, during its later stages, intruded its own volcanic pile (Northcote, 1974).

## Mine Geology

The position of the Afton orebody within the Cherry Creek unit of the Iron Mask Pluton and its relationship to the later sediment-filled grabens is shown in Figures 2 and 3. The orebody occupies the northwestern tip of a zone of abundant magnetite veining developed along the longitudinal axis of the



Alan Reed

Alan Reed is head of the Economic Geology Division of D.R. Piteau and Associates. He was educated at the University of Leeds (U.K.), has worked on geological and mining projects in Britain, Sweden, Jamaica, Canada and the United States, and was recently appointed to the faculty of the

Department of Mining and Mineral Process Engineering at the University of British Columbia.

**Keywords:** Economic geology, Structural geology, Geostatistics, Afton Mine, Mineralization, Open-pit mining, Gold, Silver, Copper, Slope stability.

\*Formerly Chief Engineer, Afton Mines Ltd., Kamloops, B.C.

GNL #135 14 JULY 1983

TECK CORPORATION

COPPERFIELDS MINING CORPORATION

MERGER APPROVED - Teck Corporation and Copperfields Mining Corporation shareholders have approved a proposal to merge the companies. Copperfields shareholders will receive 5 Class B shares of Teck Corporation for each 4 Copperfields shares now held.

Dr. Norman B. Keevil Jr., Teck president, says final details of the merger should be completed early in August, at which time Copperfields shareholders will be able to exchange their share certificates for Teck share certificates.

AFTON SMELTER WILL CLOSE - Robert E. Hallbauer, president of Afton Operating Corporation, announces that the Afton copper smelter near Kamloops, B.C., will be shut down in late July and that negotiations with Afton's blister copper customers, Delta Metal Company Limited and BICC Limited, have resulted in termination of sales agreements. He says the Afton mining and milling operations will not be affected and future copper production will be sold as concentrate.

Mr. Hallbauer notes that the smelter would have been phased out in several years when the nature of the Afton orebody changed from native copper to sulphides in the lower levels of the open pit and underground, but it has been decided to close sooner because both the cost of operating the smelter and refining charges had escalated far more rapidly than the price of copper and custom smelting charges. The changeover will have a positive impact on the economic viability of the mining and milling operation.

The Afton operation as a whole currently employs 355 people, and this will be reduced by 34 people to 321 as a result of the smelter shutdown.

The Afton mine is owned 73% by Teck Corporation, and 27% by an affiliate of Metallgesellschaft (Canada) Limited.

MINER 21 JULY 1983

### Afton closing smelting plant

Afton Mines is closing down its copper smelting operations near Kamloops, B.C., later this month. The company's mining and milling operations, however, will not be affected and Afton's future copper production will be sold as concentrates.

President Robert E. Hallbauer reports that negotiations with its blister copper customers have resulted in termination of sales agreements.

Mr. Hallbauer says that the smelter would have been phased out in several years when the nature of the Afton orebody changed from native copper to sulphides in the lower levels of the open pit and underground, but that the decision to close sooner had been taken because both the cost of operating the smelter and refining charges had escalated far more rapidly than the price of copper and custom smelting charges.

The changeover will have a positive impact on the economic viability of the mining and milling operation, he says.

The Afton operation as a whole currently employs 355 people, and this will be reduced by 34 people to 321 as a result of the shutdown of the smelter.

The Afton mine is owned 73% by Teck Corp., and 27% by an affiliate of Metallgesellschaft (Canada) Ltd.

925/10E (0707 N1133)

72F/10E  
MAY 1983

# Teck reopens Afton Mine

Teck Corporation's Afton Mine resumed pre-startup work in early May, after a 10-month closure.

As a result of agreements reached with the Federal Government under Section 38 of the Unemployment Insurance Act and the BC Government's Community Recovery Program, funding to assist Afton during the first three months of operation has been provided. This

funding was important to the re-opening decision because it will be some months until initial revenue from blister copper sales is received, the company reports.

Once the terms of the funding programs were settled, Afton met with the United Steelworkers of America who represent Afton employees, to work out modifications to the Collective Agreement. Afton employees agreed to return to work at the rates of pay in effect at the time of shutdown with a 6% increase in November of this year. The 30 April, 1984 expiry date of the agreement remains unchanged.

GCL #106

2 JUNE 1983

## TECK CORPORATION

72F/10E (092FNE023)

SIX MONTHS ENDED MARCH 31	1983	1982
Mining Revenue	\$45,905,000	\$45,071,000
Petroleum Revenue	10,927,000	7,076,000
Other Income	1,631,000	2,855,000
Total Revenue	\$58,463,000	\$55,002,000
Cash Flow (Out)	6,301,000	(6,586,000)
Less Bel. Extra Items	3,114,000	8,492,000
Investment Sale Gain (Loss)	180,000	(147,000)
Net Loss	2,934,000	8,739,000
Loss Per Share	14¢	58¢
Working Capital (Deficit)	\$64,724,000	\$(6,013,000)

Although the U.S. and Canadian economies have begun to recover from recession, this has not yet resulted in healthy metal markets, and the improvement in Teck Corporation's first half is due mainly to last year's divestment and cost control programs.

President Norman B. Keevil, Jr., says a further cash infusion of \$26,000,000 is anticipated in the third quarter from the sale of part

of Teck's oil and gas interests to Trilogy Resource Corporation. In addition, Teck would receive a present value of \$4,000,000 in retractable preferred shares of Trilogy and about 34% of Trilogy's issued common shares, making Teck the largest shareholder of Trilogy. Teck would retain directly its producing oil properties in Saskatchewan and certain Alberta and B.C. gas properties, that account for two thirds of the current cash flow from petroleum.

Petroleum operating profits in the fiscal year's first half ended 31Mar83 rose from \$4,000,000 to \$8,200,000. Oil production increased from 303,000 to 403,000 barrels and gas production from 1.43 to 1.64 billion cubic feet.

Mine operating profits rose from \$3,100,000 to \$5,700,000 with losses from copper and molybdenum offset by profits from gold, silver, niobium and zinc. The Afton copper-gold mine remained closed throughout the period, but is now re-opening. Lamaque gold mine resumed production in mid-May following a 3-month strike. The new Bullmoose coal mine in NE B.C. should be in production on schedule by 31Dec83.

Deep drilling on the Corona gold property at Hemlo, Ontario successfully traced the zone from its previous limit of 1,300 feet to a depth of 2,700 feet, with indications of a second, similar zone on some of the deeper holes. Also, deep drilling 2,400 feet to the west encountered what appears to be an extension of the Noranda-Goliath-Golden Sceptre probably onto the Teck-Corona property. Possibly these two deposits join at depth.



GCL #86

4 MAY 1983

TECK CORPORATION

92I/10E (092TNE023)

AFTON TO REOPEN AS A - R.E. Hallbauer, senior vice president of Teck Corporation, has announced that the Afton Mine, near Kamloops B.C., will resume production in the next few weeks. The first employees started work on May 2nd preparing equipment for start-up.

As a result of agreements reached with the Federal Government under Section 38 of the Unemployment Insurance Act and the Provincial Government's Community Recovery Program, funding to assist Afton during the first three months of operation has been provided.

The Afton smelter previously received assistance under the Provincial Government's "Copper Smelter and Refining Act" but the initial term of the agreement expired on 1 Apr 83. The Cabinet approved the extension of the agreement for an additional five years.

Under the terms of the modified collective agreement the Afton employees will return to work at the rates of pay in effect at the time of shutdown with a 6% increase in November of this year. The 30 Apr 84 expiry date of the agreement remains unchanged.

Mr. Hallbauer said that all four parties have made a contribution to the re-opening, the company, the union, the Provincial and the Federal Government.

NMINER 5 MAY 1983

## Teck's Afton mine back on stream

By David Duval

VANCOUVER — The news is getting better and better in the base metals sector — at least for copper. The Afton mine of Teck Corp. near Kamloops, B.C., resumed production May 2, although only a limited number of employees were recalled to prepare equipment for start-up. Everything should be running by May 20.

According to Robert E. Hallbauer, senior vice-president of Teck, funding from both the federal and provincial governments was "important to the reopening decision because it will be some months until initial revenue from blister copper sales is received." The federal part of the package involves about \$670,000 and the provincial some \$440,000 over a 3-month period.

Mr. Hallbauer explains to The Northern Miner that the money "doesn't change the economics of Afton," it will just help the company make it until fall when metal prices are expected to improve.

The agreement with the federal government, which falls under the Unemployment Insurance Act, will see Afton employees on layoff receive their regular \$240 per week in unemployment insurance benefits with the company making up the difference between that and their regular wages. Assistance from the provincial government falls under its Community Recovery Program and also lasts three months.

Afton previously received assis-

tance under the provincial government's "Copper Smelter and Refining Act" which lasts 10 years but is renegotiable after five. This has now been extended for another 5 years. It is "particularly important" during the period of low copper prices which could last so long, he says. The program pays

per kilogram of copper produced (up to \$500,000 per year) for the term of the agreement.

Modification to the existing collective agreement by the United Steelworkers of America, which represents Afton employees, will see union members return to work at pay rates in existence at the time of the shutdown. But a 6% increase will be awarded this November. The April 30, 1984, expiry date for the contract remains unchanged.

Mr. Hallbauer says Afton will be in a low grade cycle for about another year after which the copper grade will rise to approximately 1%. This was a big factor in the shutdown although recent strength in gold has tended to offset this somewhat.

Regarding the possibility of an NDP victory in the coming election, he predicts "in the short term it doesn't make any difference since we won't be making enough money," although it could effect exploration.

92I/10E

(092TNE023)



GCNL #45 07MARI983

## TECK CORPORATION

72I/10E (092INE023)

## 3 MONTHS ENDED 31 DECEMBER

	1982	1981
Mining Revenue	\$24,906,000	\$20,414,000
Petroleum Revenue	4,514,000	3,052,000
Investment, Other Income	833,000	1,441,000
Total Revenue	30,253,000	24,907,000
Mining Expense	20,676,000	16,752,000
Petroleum Expense	1,205,000	821,000
Admin., General Exp.	592,000	1,326,000
Depl'n. Deprec'n. Amortiz'n.	4,040,000	2,772,000
Exploration Exp.	1,060,000	2,626,000
Interest Expense	2,920,000	1,223,000
Income & Mine Taxes: Current	410,000	780,000
Deferred (Recover)	(444,000)	(626,000)
Loss Bef. Following	206,000	767,000
Equity in Lornex' Profit(Loss)	(1,161,000)	418,000
Net Loss	1,367,000	349,000
Loss Per Share	7¢	2¢

In their fiscal year's first quarter ended 31Dec82, Teck Corporation's mine operating profit was \$4,200,000 compared with \$3,600,000 a year before. The president, Norman B. Keevil, Jr., reports that the Afton mine remained shut down and the Highmont mine incurred an operating loss when calculated before support price payments under the sales contracts, while the Newfoundland Zinc, Niobec, Lamaque, Beaverdell and Silverfields mines all showed a profit.

Petroleum operating profit was \$3,300,000, up from \$2,200,000 in the first quarter last year.

Oil production of 197,500 barrels was up from 155,000 barrels last year and gas production was up slightly from 632,000,000 cubic feet. to 660,000 mcf

At the Bullmoose coking coal mine and washing plant in NE B.C. the project is about one third completed, on schedule and within budget.

Reviewing the company's chief interests in the Hemlo area of NW Ontario, Dr. Keevil says Teck have the right to earn 55% interest in International Corona's gold discovery by placing it into production. Since 31Dec82 Teck and Corona entered an agreement with Noranda Mines Limited who are developing a gold orebody on an adjoining property; Noranda will provide up to 1,000 tons per day of custom-milling capacity. This will eliminate the need for two separate mills and will improve the economics of the Teck-Corona deposit. Deep drilling is now underway to explore beneath the presently established Corona orebody. Teck recently issued 2,500,000 Class B shares in a private placement which netted \$26,300,000, further reducing their bank debt and broadening their equity base.

GCNL #82 28APR1983

## TECK CORPORATION

72I/10E (092INE023)

AFTON MINE RESUMES - R.E. Hallbauer, senior vice president at Teck Corporation, announces PRODUCTION SHORTLY that their Afton Mine at Kamloops, B.C., will resume production in the next few weeks.

The federal government under Section 38 of the Unemployment Insurance Act and with the provincial government under their Community Recovery Program, have provided funds to assist Afton during the first 3 months of operation. Mr. Hallbauer says this funding is important because some months will pass before initial revenue from blister copper sales is received. The Afton smelter previously received assistance under the provincial Government's Copper Smelter and Refining Act. The initial term of that agreement expired 1Apr83 but the Cabinet has re-established it for 5 more years.

Afton and the United Steelworkers of American have modified the collective agreement so that employees will return to work at rates of pay in effect at shutdown with a 6% increase in November this year. The 30Apr84 expiry date of the agreement remains unchanged.

INT. &amp; PROS. &amp; DEV.

## TECK CORPORATION (TEK)

MAR/APR 1983

72I/10E (092INE023)

R.E. Hallbauer, Senior Vice-President, announced today that the Afton Mine will resume production in the next few weeks. The 1st employees will start work on May 2nd preparing equipment for start-up.

As a result of agreements with the Federal Government under Section 38 of the Unemployment Insurance Act and the Provincial Government's Community Recovery Program, funding to assist Afton during the 1st 3 months of operation has been provided. Hallbauer said this funding was important to the re-opening decision because it will be some months until initial revenue from blister copper sales is received.

The Afton smelter previously received assistance under the Provincial Government's "Copper Smelter and Refining Act" but the initial term of the agreement expired on Apr.1/83. Through the efforts of local M.L.A. Claude Richmond and Brian Smith, Minister of Energy, Mines and Petroleum Resources, the Cabinet approved the extension of the agreement for an additional 5 years. Hallbauer said that this assistance is particularly important to Afton during the period of low copper prices which could last for some time yet.

Once the terms of the funding programs were settled with the Provincial and Federal Governments, Afton met with the United Steelworkers of America who represent Afton employees, to work out modifications to the Collective Agreement. Under the terms of the modified agreement the Afton employees will return to work at the rates of pay in effect at the time of shutdown with a 6% increase in Nov. of this year. The Apr.30/84 expiry date of the agreement remains unchanged.

Mr. Hallbauer said that all 4 parties have made a contribution to the re-opening, the company, the union, the Provincial and the Federal Governments and it is hoped that by the time funding programs end, metal prices will have stabilized at levels that will permit sustained operation of Afton.

## Fourth quarter results check 1982 loss slide by Teck Corp.

THE NORTHERN MINER January 20, 1983

Teck Corp. ended up fiscal 1982 on a slightly better note than the one on which it started, but operations for the year were nevertheless heavily in the red. The company incurred a loss of \$17,705,000 or 76¢ per share before extraordinary items, compared with earnings of \$11,259,000 or 43¢ per share for the year ended Sept. 30, 1981.

Extraordinary writedowns, mainly as a result of the sale of a 30% interest in the Highmont mine, brought final net loss to \$31,851,000 or \$1.32 per share, whereas there was a bottom-line profit of \$51,910,000 or \$2.03 per share in fiscal 1981.

Total revenues decreased to \$127,956,000 from \$154,088,000 previously. Main items were \$105,242,000 from mining (\$134,588,000 in 1981), and \$16,647,000 from oil and gas sales (\$14,224,000).

Commenting on the results in the annual report, President Norman B. Keevil, Jr., notes that five of the company's seven mines recorded operating profits despite lower metal prices. The loss, which occurred primarily in the second and third quarters, was largely due to the two copper mines, Afton and Highmont.

Suspension of operations at Afton and sale of 30% of Highmont (reducing Teck's interest in Highmont to 50%), both effective in June - as well as other cost control measures - had the effect of stemming the losses. In fact, fourth quarter operations actually showed a modest profit of \$1 million before extraordinary items.

"While the company is now in a positive cash flow position, some continuing losses must be antici-

pated until the prices of base metals begin to recover," Dr. Keevil says.

Teck's wholly-owned Beaverdell mine near Kelowna, B.C., produced 476,400 oz. silver in fiscal 1982, its highest output in the last nine years. Mill throughput was 40,200 tons, comparable with 1981, but grade improved to 12.9 oz. from 8.6 oz. per ton.

Production at the Lamaque mine (100%) at Val d'Or, Que., was 36,744 oz. gold on mill throughput of 318,000 tons grading 0.123 oz. per ton. In addition to ore from the Lamaque mine, 255,700 tons of ore from the nearby Kiena mine were treated on a custom basis, for a combined mill throughput averaging 1,720 tons per day.

There was an increase in Lamaque's ore reserves at year-end to 447,440 tons grading 0.152 oz. (from 293,000 tons of 0.109 oz.), primarily due to the addition of a pillar not previously included in reserves.

### Silverfields to close

After yielding production of some 18 million oz. silver since going into production in 1964, the wholly-owned Silverfields mine at Cobalt, Ont., is almost out of ore and is slated to be closed down sometime in early 1983. It is planned to maintain the concentrator in condition for custom milling of other properties that may be developed in the area.

Construction on the new Bull-moose coking coal mine in north-eastern British Columbia is scheduled for completion by the end of 1983. This is a joint venture managed by Teck, with a 51% interest with associate **Lornex Mining Corp.** holding a 39% interest and Nissho-Iwai Canada 10%.

The capital cost of the mine is expected to be \$300 million. After taking into account financial arrangements with the two partners, Teck's share of the capital cost is expected to be \$135 million, for which project financing has been arranged with a consortium of Canadian, German and Japanese banks.

Teck's balance sheet at Sept. 30, 1982, showed current assets of \$83,731,000 versus current liabilities of \$56,662,000, indicating a working capital of \$27,069,000. The company also held investments with a quoted market value of \$86,729,000. Long-term debt at that date amounted to \$132,497,000.

Teck Corporation has entered into an agreement with Gordon Securities for a private placement of 2,500,000 Class B shares of the company at a price of \$10.75 per share.

The placement, which the company says is a firm commitment, is due to close on Feb. 4, 1983.

93J/10E (512T-NL023)  
92J/1W (512T-SLO13)

(68)



GCNL #171

7 SEPT 82

## TECK CORPORATION

NO.171(1982)

SEPTEMBER 7, 1982

## 9 MONTHS ENDED 30 JUNE

## Operating Profits:

	1982	1981
-Concentrates & Metals	\$2,404,000	\$39,252,000
-Oil/Gas, Net of Royalties,	7,204,000	8,513,000
Investments, Other Income	4,097,000	2,824,000
Profit Bef. Following	13,705,000	50,589,000
Admin. & General Expense	4,197,000	4,555,000
Depl'n, Deprec'n, Amortiz'n.	15,971,000	10,665,000
Oil/Gas, Mine Exploration	6,525,000	8,866,000
Interest Expense	17,262,000	10,899,000
Foreign Exchange Adjustment	1,895,000	2,518,000
Income & Mining Tax: Current	1,091,000	2,672,000
-Deferred (Recovery)	(15,246,000)	3,385,000
Equity in Associates' Profits	(805,000)	6,633,000
Minority Interest	-	(1,924,000)
Net Bef. Extra. Item	(\$18,795,000)	\$11,738,000
-Per Share, Diluted	(67¢)	43¢
Assets Sale Gain	\$8,434,000	\$41,383,000
Net Earnings (Loss)	(\$10,361,000)	\$53,121,000
-Per Share, Basic	(45¢)	\$2.03
-Diluted	(38¢)	\$1.99
Working Capital (Deficit)	(\$310,000)	\$36,448,000

rates, the most important task for any company in our business is careful attention to its financial position, including debt carrying costs and discretionary expenditures. In this respect, Teck is continuing with the program which in the last fiscal year saw a reduction in exposure to floating debt by \$143,000,000. In the third quarter of the current fiscal year Teck: sold its interest in the Wayne-Rosedale oil field in Alberta for \$11,200,000; completed the sale of 10% interest in the Bullmoose coal project to Nissho-Iwai of Japan for \$8,000,000; arranged for Lornex Mines Limited to acquire 39% interest in Bullmoose - Teck continue to hold 51% interest and management of the project; reduced discretionary expenditures on research, exploration and administration; and initiated negotiations on the further disposition or reorganization of other assets....

"Construction at the new Bullmoose coal mine made good progress during the third quarter.... Financing for our share of the \$300,000,000 capital cost of this project was arranged with a consortium of Canadian, American, Japanese and German banks...."

In presenting comparative results of Teck Corporation in their fiscal year's first 9 months ended 30 Jun 82, president Norman B. Keevil says, in part, "Although mining company earnings continue to be affected by recessionary metal prices, it is encouraging to note that our 5 zinc, gold, silver and niobium mines produced operating profits... as did the petroleum division. 921/10E 0921NE023

"The price of copper is still at its lowest in real terms in over 30 years and our 2 copper mines, Afton and Highmont, recorded operating losses. Because of this, the participants in the Afton partnership decided to suspend mining operations temporarily on June 22, pending recovery of the price of copper.... 921/10E 0921SEW030

"In these difficult times of low metal prices and excessive interest rates, the most important task for any company in our business is careful attention to its financial position, including debt carrying costs and discretionary expenditures. In this respect, Teck is continuing with the program which in the last fiscal year saw a reduction in exposure to floating debt by \$143,000,000. In the third quarter of the current fiscal year Teck: sold its interest in the Wayne-Rosedale oil field in Alberta for \$11,200,000; completed the sale of 10% interest in the Bullmoose coal project to Nissho-Iwai of Japan for \$8,000,000; arranged for Lornex Mines Limited to acquire 39% interest in Bullmoose - Teck continue to hold 51% interest and management of the project; reduced discretionary expenditures on research, exploration and administration; and initiated negotiations on the further disposition or reorganization of other assets....

from the sale of a 30% interest in Highmont.

Dr. Keevil points out that five of the company's seven mines reported operating profits despite lower metal prices than the previous year, and that the petroleum division was profitable. He says the loss, which occurred primarily in the second and third quarters, was largely due to the two copper mines, Afton and Highmont. The suspension of operations at Afton and sale of 30% of Highmont (reducing Teck's interest in Highmont to 50%) both effective in June, together with other cost control measures, had the effect of stemming the losses. Fourth quarter operations actually showed a modest profit of \$1,000,000 before extraordinary items. 921/10E 0921NE023

GCNL #9 14 JAN 1983

## TECK CORPORATION

## YEAR ENDED 30 SEPTEMBER

	1982	1981-Restated
Net Profit (Loss) Bef. Extra. Item	(\$17,700,000)	11,300,000
-Per Share	(76¢)	43¢
Extraordinary Items		
Net Profit (Loss)	(31,900,000)	51,900,000
-Per Share	(\$1.32)	\$2.03

In presenting comparative results of Teck Corporation for the year ended 30 Sep 82 that show a loss, Dr. Norman B. Keevil, Jr., president, notes that the extraordinary items in 1982 mainly reflect writedowns resulting



6 MONTHS ENDED 31MARCH	1982	1981
Operating Profits:		
-Concentrates & Metals	\$3,118,000	\$29,639,000
-Oil/Gas, Net of Royalties	4,875,000	6,217,000
Other Income	2,855,000	1,440,000
Total Revenue, Net	10,848,000	37,296,000
Cash Flow (Out)	(6,586,000)	19,354,000
Net Bef. Extra. Item	(8,492,000)	10,529,000
-Per Share (Diluted)	(31¢)	39¢
Investments Sale Gain(Loss)	(247,000)	14,738,000
Net Earnings (Loss)	(\$8,739,000)	\$25,337,000
-Per Share, Basic	(38¢)	99¢
-Diluted	(32¢)	92¢
Working Capital Deficit	\$6,013,000	\$3,730,000
Long Term Debt	\$4,326,000	\$34,311,000

LOSS INCURRED. LORNEX WILL BE  
39% PARTNER IN A COAL PROJECT

Teck Corporation experienced the first half-yearly loss in their history in their fiscal year's first half ended 31Mar82. President Norman B. Keevil, Jr., attributes this to the depressed metal prices and high interest rates which have affected most mining companies.

Concerning coal, Dr. Keevil reports that arrangements have been made with Lornex Mines Limited, in which Teck hold 21.6% share interest, to participate as a 39% joint venture partner in the development of the Bullmoose coal mine in

NE B.C. Lornex will put up 39% of the capital costs plus an additional contribution. With prior arrangements for Nissho-Iwai of Japan to participate as to 10%, Teck will retain 51% interest in the project and be the operator. Project financing for Teck's share of the \$300,000,000 construction cost has been arranged with a consortium of banks. The project itself and the townsite, rail and port infrastructure programs are all on schedule. Upon completion of the Bullmoose mine, coal will be one of Teck's largest single sources of revenue and will provide a stable earnings base to level out cyclical extremes in the metals side of the business.

In their fiscal year's first half, Newfoundland Zinc, Niobec and Teck's 3 precious metal mines all produced modest operating profits, while the copper mines, Highmont and Afton, recorded operating losses.

Concerning oil and gas operating profits, Dr. Keevil points out that the 2 new federal royalties, the Petroleum and Gas Revenue Tax and Incremental Oil Revenue Tax, cost \$900,000. Oil production was down from 460,000 to 270,000 barrels, primarily due to reduced production in the Steelman field in Saskatchewan, with eastern Canadian refineries option for imported oil. Gas production was down from 1.9 to 1.4 billion cubic feet due to lower demand. Off-setting these, Alberta's royalties were reduced by \$600,000 and U.S. production revenue was up by \$450,000

Consolidated financial statements of Copperfields Mining Corporation, whose chief asset is 50.48% of Teck's A & B common shares, recorded a net loss of \$2,313,000 in the 6 months ended 31Mar82 vs net earnings of \$4,621,000 the year before.

WINNER JULY 82

### Afton mine closes for three months

Teck Corporation's Afton mine, near Kamloops BC, suspended operations on 22 June 1982. The shut down, a result of depressed metal prices, will be for approximately three months and will affect 390 employees. The price of copper has fallen to levels below the cost of production at Afton, and virtually all other copper mines.



92I/10E 092INE023

MINER 3JUNE82

## Teck has heavy loss in first six months

Low metal prices and high interest rates have been the major villains in a reported loss of \$8.5 million, or 37¢ a share, for the first six months of Teck Corporation's current fiscal year, compared with a profit of \$10.6 million for the same period last year.

Teck President Dr. Norman B. Keevil Jr., says that while the company's zinc, niobium and three precious metal mines all had an operating profit, totalling \$8.3 million during the period, losses were recorded at Teck's copper mines, Afton and Highmont, for the reasons already cited.

Also contributing to the loss, Mr. Keevil said, was the fact that the Afton mine is in the midst of a planned low grade, higher stripping ratio cycle as the pit walls are pushed back to the ultimate open pit design.

The Teck president noted that the Highmont mine is "operating well," with mill throughput averaging about 28,000 tons per day, compared with design capacity of 25,000 tons per day. He said the mine, with customer price support payments, is producing a positive cash flow before interest payments.

NO.106(1982)  
JUNE 3, 1982

GCNL #106 3JUNE82 TECK CORPORATION

92I/10E

092INE023

AFTON MINE TO SHUT DOWN FOR THREE MONTHS - Robert E. Hallbauer, senior vice president of Teck Corporation has reported that the Afton copper mine near Kamloops, B.C. will suspend operations on June 22, 1982.

It is anticipated that the shut-down will be for a period of three months, but this will depend upon metal prices and the situation will be under constant review.

Mr. Hallbauer said that the price of copper has fallen to levels below the cost of production at Afton, and virtually all other copper mines. With current high interest rates, he said, it is not practical to continue financing operating losses.

WMTNER MAY82

**Teck Corporation notes  
loss from Afton strike**

Teck Corporation, at its 12 Feb annual meeting, announced a net loss before extraordinary items of \$0.35-million for the first quarter of Fiscal 1982, ended 31 December 1981.

Dr Norman B Keevil Jr, President, said that all established divisions operated

profitably except for the Afton mine, which has been on strike since 20 November and produced an operating loss of \$1.7-million in the quarter.

Dr Keevil said that the new Highmont mine has been tuned up to the point where it has reached rated milling capacity on a monthly basis, processing an average of 25,020 tons a day during the month of January 1982. Accordingly, it has been placed on production on an accounting basis as of 1 January.

Although the mine is producing a positive cash flow before financing costs, it will have a negative impact on earnings until the price of copper improves. Dr Keevil said that the same would apply to any new mine if placed into production at today's prices, including most if not all of the world's established copper mines.

92I/10E  
092INE023

92I/7W  
092ISE013

NO.104(1982)  
JUNE 1, 1982

GCNL #104 13JUNE82 TECK CORPORATION

**SIX MONTHS LOSS REPORTED** - Teck Corporation reported a loss of \$8,500,000 or 37¢ a share for the six months ended 30Apr82 compared with a profit of \$10,600,000 for the same period last year.

Dr.Norman B.Keevil,Jr., president, said that Teck's zinc, niobium and 3 precious metal mines all produced an operating profit, totalling \$8,300,000, during the period, but that its copper mines, Afton and Highmont, recorded losses because of low metal prices and high interest rates.

In addition, the Afton mine is in the midst of a planned low grade, higher stripping ratio cycle as the pit walls are pushed back to the ultimate open pit design, which is contributing along with the low copper price to an operating loss.

Highmont mine is operating well, with mill throughput averaging about 28,000 tons per day, compared with design capacity of 25,000 tons per day. With customer price support payments, the Highmont mine is producing a positive cash flow before interest payments.

92I/7W 092ISE013

NO.105(1982)  
JUNE 2, 1982

GCNL #105 23JUNE82 EAGLET MINES LIMITED

**FURTHER DIAMOND DRILL TESTING OF THE HIGHGRADE FLUORSPAR ZONE NOW UNDERWAY** - Andrew Robertson, president of Eaglet Mines Limited, has reported that the ice has now gone out of Quesnel Lake, B.C. and that as a result diamond drilling has resumed on the company's fluorspar property near the lake. The first hole in the 1982 program of 10,000 feet, No.82-50, has been completed and the second hole, No.82-51, was drilling ahead in an effort to extend the high grade zone partially tested in last year's program. The 1981 program showed an enriched zone adjacent to the footwall or lower contact of the mineralized granite gneiss. (See GCNL No.77, 22Apr82, page two, for results of 1981 work.)

93A/10W 093A 046

4



GCNL #43 3MAR82

TECK CORPORATION

92I10E 092INE023

3 MONTHS ENDED DECEMBER 31,	1981	1980
Concentrates & Metals	\$3,562,000	\$13,349,000
Oil & Gas, Net of Royalties	2,231,000	2,628,000
Investment & Other Income	1,441,000	1,175,000
Total Revenue	\$7,334,000	\$17,152,000
Cash Flow	1,378,000	7,934,000
Net Bef. Extraord. Items	(349,000)	5,856,000
Per Share	(2¢)	23¢
Investments Sale Gain	-	2,753,000
Net Earnings (Loss)	\$ (349,000)	\$ 8,609,000
Per Share, Basic	(2¢)	34¢
Diluted	(1¢)	32¢

LOSS RECORDED. GROWTH CONTINUES

In common with most mining companies, earnings of Teck Corporation have been down substantially since mid-1981, says president Norman B. Keevil, Jr., in a report of results in their fiscal year's first quarter ended 31Dec81. The same high interest rates that led management to mount a major debt-reduction program a year ago have resulted in a sharp recession and a drop in prices of most metals to marginal levels.

Tune-up of new Highmont mine & concentrator to design capacity was essentially completed during the quarter. In Jan., throughput

aver. 25,020 tons/day with recoveries improved to 84.7% for copper & 74.6% for molybdenum. In the first 3 weeks of Feb., throughput aver. 27,400 tons/day with recoveries of 85.5% & 71.1% respectively. The project was placed on operational status for accounting purposes as of 1Jan82.

The petroleum division and all established mines produced an operating profit in the first quarter, save for Afton, which has been on strike since Nov.20 and showed an operating loss of \$1,700,000.

After deducting interest exploration, administration and non-cash charges to earnings, Teck's net loss of \$349,000 before extraordinary items compares with a profit of \$120,000 in the preceding quarter and \$5,900,000 in the first quarter last year.

Highmont produced a positive cash flow before financing costs in January, despite weak metal prices. Operating costs per pound of copper, net of by-product credits, are below the average for North American producers.

However, the project will contribute negative earnings, after deducting interest and amortization costs, until the price of copper improves. Dr. Keevil adds, "To put this in perspective, the same negative earnings situation would apply to most if not all existing copper mines in the world if they had just been placed into production, and had to cover financing as well as operating costs."

The price of copper, being below the operating cost of many mines, has resulted in a number of recent mine closures and cutbacks. This has tended to keep supply and demand in balance and has set the stage for a significant recovery as the recession draws to a close.

Most of the remaining contracts necessary for the Northeast B.C. coal development were resolved during the quarter and plans are to begin construction of the \$300,000,000 Bullmoose coking and thermal coal mine this Spring with completion scheduled for December, 1983.

# Teck first quarter loss tied to "lousy" copper price

Teck Corporation reports it had a net loss before extraordinary items of \$350,000 in the first quarter of fiscal 1982, ended Dec. 31. The company had earlier reported a decline in ordinary earnings in fiscal 1981 to \$11.9 million or 45¢ a share from \$31.8 million or \$1.24 a share in the previous year, and extraordinary gains in fiscal 1981 which added \$40.6 million for total earnings of \$52.5 million, or \$2.05 a share.

President Norman B. Keevil, Jr., told the annual meeting that all established operating divisions showed an operating profit in the first quarter of the current year, with the exception of Afton Mines, which has been on strike since November 20 and produced a loss of \$1.7 million.

Mr. Keevil said despite the beneficial impact of a number of actions taken in 1981 to improve the company's liquidity position, including sale of Coseka Resources, transfer of a 20% interest in the new B.C. Highmont mine to Metallgesellschaft for \$22 million, and a reorganization of Afton Mines which netted Teck another \$12 million, ordinary earnings were still essentially flat for the past six months. There was a modest profit before extraordinary items of \$120,000 in the last quarter of fiscal 1981, and the above-reported \$350,000 loss in the first quarter this year.

Reviewing current developments, he said tuneup at the new Highmont copper mine in the Highland Valley district of southern B.C., recently completed at a cost of \$150 million, "has progressed to the point where

the mill achieved its rated milling capacity of 25,000 tons per day in January, 1982." The operation has been placed on production on an accounting basis as of Jan. 1, Mr. Keevil said.

The Teck president cautioned shareholders that the Highmont project cannot be expected to make a positive earnings contribution, after financing costs, at the current price of copper.

"To put this in perspective", he said, "I know of no significant copper mine in the world, existing or on the drawing boards, that could show a profit if it were built today."

He instanced the original Lornex mine which he said if built in 1981 would have cost close to \$400 million instead of the \$165 million invested in 1972. "It would be in a net loss position today and yet it is one of the better copper mines in North America."

Comparing average operating costs at Highmont with U.S. producer costs — estimated by Chase Econometrics of New York to have been US93¢ per lb. of copper in 1981 and with average operating costs in Canada "probably somewhat lower, in the 85¢ range," Mr. Keevil said he expected Highmont costs in the next fiscal year to be under US70¢ per lb., in current dollars.

"The mine produced a positive cash flow in January before interest costs. Thus, it is competitive with established producers," he said.

Keith E. Steeves, Teck vice-president marketing, told shareholders he could give them the bad news on copper in one sentence: "the present price is lousy."

He said though that there are some positive features in the present situation. He offered an emphatic "no" to a shareholder who asked if copper prices would sink even lower in 1982.

Commenting on the company's new Bullmoose coking and thermal coal project in northern B.C., Mr. Keevil noted that prices of these commodities tend to have a steady growth pattern, related to energy, rather than a cyclical one. Construction on the Bullmoose is due to start this spring, with completion by the end of 1983 at a cost of \$300 million. Output will be 2.3 million tonnes per year, and of this, 1.7 million tonnes of coking coal is under long-term contracts with Japanese steel mills.

"Like the Alsands, Bullmoose is part of a megaproject, involving a total capital investment of \$2 billion including the Bullmoose, Denison's nearby Quintette mine, a 135-km rail line, CN rail line upgrading to handle additional tonnages of coal and grain, and a new coal port at Prince Rupert," he said.

Turning to the company's frontier oil and gas activities, resulting from last summer's farm-in agreement with Aquitaine, Mr. Keevil said the most important well at North Bjarni off Labrador, will be re-entered for testing this summer. The well encountered 177 m of apparent pay as determined by electric logs, he said, and has a "good chance of being a discovery, probably gas."

He said Teck has also exercised an option to participate with Aquitaine (now known as Canterra) on a farmout from Mobil, in the Beaufort Sea. The well will test the sands which contained oil in the earlier Tarsuit discovery well, six kilometres away, as well as deeper horizons.

Outside the meeting room, representatives of the Local Union 8637, United Steelworkers of America, bargaining unit at Teck's strike-bound Afton mine, circulated a pamphlet charging Afton management over the past two years with use of tactics designed to break the cycle of "leapfrog" bargaining prevalent in B.C. "Logical," the pamphlet said, "except that we (the union) are not trying to 'leap' over anyone."

Robert Halibauer, Teck senior vice-president, denied that management philosophy and practice had changed and hardened at Afton. "We set out there to establish a good management-labor climate, and we did," he said.

92I/10E

092INE023

NO. 31(1982  
FEBRUARY 15, 1982

GNL #31 15 FEB 82

TECK CORPORATION

92I/10E

092INE023

LOSS REPORTED - Dr. N.B. Keevil, Jr., president, reports that Teck Corporation, incurred a net loss before extraordinary items of

\$350,000 in their fiscal year's first quarter ended 31Dec81. He says all established divisions operated profitably except for the Afton mine, which has been on strike since November 20 and produced an operating loss of \$1,700,000 in the quarter. 92I/10E 092ISE013

The new Highmont mine has been tuned up to the point where it has reached rated milling capacity on a monthly basis, processing an average of 25,020 tons a day during January. Accordingly, it has been placed on production on an accounting basis as of January 1. Dr. Keevil notes that, while the mine is producing a positive cash flow before financing costs, it will have a negative impact on earnings until the price of copper improves. He also said that the same would apply to any new mine if placed into production at today's prices, including most if not all of the world's established copper mines.



Company	Purpose of expenditure	\$000s to be spent			
		1981	1982	1983	Beyond 1983
<b>Scottie Gold Mines</b> 104B/1E 104B 074	The company's gold-silver mine was recently placed in production. <b>Total: \$7.5 million</b>	7,500			
<b>Teck Corp</b>	Construction is slated to begin on the Bullmoose coking coal mine in northeast BC in the spring of 1982. It is designed to supply 1.7 million tons of coal annually, beginning in late-1983. <b>Total: \$220 million</b>		110,000	110,000	
<b>Westmin Resources</b> 92F/12E 072F 071 072	The shaft is being sunk for development of the Creek zone copper-lead-zinc deposit near the Myra and Lynx mines at Buttle Lake, BC. Production is expected by 1983 and ore will be milled at the existing concentrator. <b>Total: \$15 million</b>	5,000	5,000	5,000	

Company	Purpose of expenditure	\$000s to be spent			
		1981	1982	1983	Beyond 1983
Equity Silver (continued)	Regional exploration		100		111
	Replace mill equipment	155	<del>6</del>		6
	Buy on-stream analyzer	200			
	Additions to flotation	200			
	Mill expansion				2,500
	Replace plant equipment	121	300	70	280
	Move carpenter shop	55			
	Replace misc. equipment	41	177	39	363
	New warehouse storage	50			
	Buy computer facilities		75	75	
	Replace telephone system	20			
Total: \$11.64 million					
Esso Minerals Canada	Having just bought the Byron Creek colliery in southeastern BC, Esso plans to expand it.	35,000	35,000		
Total: \$70 million					
Fording Coal Ltd	The \$115 million coal mine expansion at Elkford is well under way.	38,000	26,000	20,000	
Total: \$84 million					
Lornex Mining Corp Ltd 92I/7W 092ISE008	The \$160 million expansion of the copper mine at Logan Lake, BC, is complete. Project included upping the milling rate to 80,000 tpd and purchasing additional pit equipment.	78,300			
Total: \$78.3 million HIGHLAND VALLEY					
Noranda Mines Ltd 82M/9W 082M 141	The Goldstream copper-zinc mine near Revelstoke is scheduled to be in production late in 1982 at a rate of 1350 tpd. Total cost of the project is estimated at \$62 million.	27,600	16,300		
	Studies have started on modifications to the ore handling and processing systems at the Granisle mine.	300	300		
	Total: \$44.5 million				
Norco Resources	A hydraulic and longwall coal mine is planned at Bowron River, near Prince George, BC. Output will be sold to Taiwan Power Co.	40,000	41,000		
Total: \$81 million					
Placer Development Limited 93K/3E 093K 006	The bulk of spending at the Endako moly mine will be for upgrading the mill.				
	Replace mobile equipment	50	1,291	1,511	
	Upgrade and replace process equipment	536	1,815	1,040	
	Complete flotation expansion	185			
	Complete roaster expansion	1,697			
Total: \$8.125 million					
Ruth Vermont Mine Limited 82K/15W 082KNE009	This silver-lead-zinc producer was reopened this summer in southeastern BC.	4,000			
Total: \$4 million					

Company	Purpose of expenditure	\$000s to be spent			
		1981	1982	1983	Beyond 1983
BP Canada	Plans are being made for the Sukunka coal mine development near Chetwynd, BC. Total: \$400 million			400,000	
Carolyn Mines Ltd 92H/11W 092HNW003	The Ladner Creek gold mine development was completed this year. Total: \$10 million	10,000			
Cominco Ltd 82F/19E 082FNE052	The modernization and associated metallurgical projects at the Trail smelter will receive the bulk of spending — \$355 million. Trail modernization Sullivan mine and mill Minor projects Total: \$443 million	85,000 7,000 12,000	105,000 10,000 12,000	160,000 40,000 12,000	
Crows Nest Resources Ltd	The Line Creek coal mine at Sparwood is nearing production set for next year. Total: \$120 million	70,000	50,000		
Dankoe Mines Ltd 82E/4E 082ESW002	Spending is modest at the silver mine near Keremeos, BC Total: \$750,000	250	250	250	
Denison Mines Ltd	With the promise of a rail line to northeastern BC, development of the Quintette coal deposit is planned by 1985. Total: \$700 million		100,000	100,000	500,000
Dickenson Mines Limited 82F/14W 082FNW050	The silver-lead-zinc mine near New Denver, BC is receiving several improvements. Conversion to central diesel plant for mine and mill plus upgrading and increasing hydro plant Replacing mill equipment and upgrading capacity 60 per cent to 200 tpd Total: \$550,000	100	300	150	
Dimac Resource Corporation 82M/13E 082M 136	This small tungsten mine was recently placed in production near Clearwater, BC Total: \$2.5 million	2,500			
DuPont Canada Inc 94E/16E 094E 026	The Baker gold mine at Chappelle, BC, is in production. Total: \$6 million	6,000			
Equity Silver Mines Ltd 93L/11W 093L 001	This newly-opened silver mine is planning expenditures of about \$7 million for mining and \$3 million for milling. Replace pit equipment	477	695	4,673	855



# MINING JOURNAL

92I/10E

## CMJ Capital Spending Report

**BRITISH COLUMBIA**

**\$2.996 billion**

Company	Purpose of expenditure	\$000s to be spent			
		1981	1982	1983	Beyond 1983
Afton Operating Corporation 92I/10E 092INE003	Mobile equipment for open pit copper mine	3,500	3,500		
	Systems improvements at mill	750	750		
	Systems improvements at smelter	750	750		
	<b>Total: \$5 million</b>				
BC Coal Ltd	The \$278 million Greenhills coal mine is expected to begin production in mid-1983 at a rate of 1.8 million tonnes/year.	63,000	100,000	60,000	
	Expenditures at Sparwood include \$17.6 million for pit equipment, \$13 million for land acquisition and residential construction and \$1.6 million for a new lab.	53,000	46,000	28,000	10,000
	Construction at the Harmer mine includes a new dry and office and maintenance shop extension.	9,458	7,635		
	Cost of increasing the throughput of Westshore terminals and upkeep.	43,000	74,000	38,000	
	<b>Total: \$472.093 million</b>				
BC Hydro	The price tag of the Hat Creek coal mine and generating plant due to come on stream in 1988 has risen to \$5 billion, with roughly 45 per cent of the cost being for the mine.	32,000	32,000	32,000	129,000
	<b>Total: \$2.25 billion</b>				
Bethlehem Copper Corporation 92I/7W 092ISE001	Spending at this open pit copper mine has nearly doubled this year over last.				
	Replace mining equipment	4,554	2,117	1,468	
	Construct tailings dam	7,316	2,376		
	<b>Total: \$17.831 million</b>				
Brenda Mines Ltd 92H/16E 092HNE047	A new mining shovel and mill equipment were added at this copper-moly producer.				
	New mining shovel	2,000			
	Classifying and flotation equipment	4,250			
	Normal equipment replacement	3,500	4,000		
	<b>Total: \$13.75 million</b>				

Mr. Nickel says Afton has a calcium silicate slag system whereas most other smelters have an iron silicate system. Iron plays a secondary role at the operation. He also mentioned, with a justifiable amount of pride, that copper grade in the slag runs below 4%, of which, 65% is recovered on shaking tables in the mill.

A Teck operation

# Imposing financial success is shown by Afton mine

92I/10E  
092INE023

By David Duval

**KAMLOOPS, B.C. (Staff) —** Fitting in is one of the nice things about Teck's Afton mine near Kamloops, B.C. Its well-designed and visually pleasing mine-mill-smelter complex fits into the surrounding environment, almost as if it were a few odd-shaped pieces of tumbleweed. The smelter stack, which brings to mind an unconventionally long rotary drill mast, puffs smoke rather than belches it.

Imposing though, is the operation's financial success. Officially opened in the spring of 1978, Afton earned over \$14.4 million in its first fiscal year, and bettered that one year later with net earnings of \$21.1 million. Reflecting lower metal prices and higher operating costs Afton's six-month earnings for 1981 were \$6.6 million — still a healthy profit.

Afton mine Manager, Mike Lipkewich, told The Northern Miner that copper accounted for 70% of its revenue, the balance came from gold and silver contained in blister copper. While he doesn't see copper doubling in price during the next six months, Mr. Lipkewich feels a 10%-15% increase is likely.

Any increase in price though will probably be offset by plans to mine lower grade ore in the pit. This is necessitated by the changeover to stage two mining, which will see the pit grade drop to 0.60% copper in fiscal 1981-82, which compares with a 1.07% copper average for fiscal 1980. During that period the Afton mill averaged 8,560 tons per day.

## Important sweeteners

Gold and silver are important sweeteners since the pit averages 0.016 oz. gold per ton and 0.12 oz. silver, and Mr. Lipkewich states these values are increasing with depth. Gold values mined by an underground operation would be three times those obtained at present, he said, while silver (at 0.12 oz.) would be almost twice that of the open pit.

Studies, which are under way to determine the economics of going underground, should be completed by year-end. According to Doug Stewart, Afton's chief mine engineer, the orebody widens and deepens westward, which is where any under-



Photo by The Northern Miner

Afton's smelter superintendent, Wolfgang Nickel, stands beside copper ingots produced at the operation.

ground production would come from. As reported earlier, the underground has reserves of 6.5 million tons, averaging 1.55% copper with higher gold values.

Tapping this portion of the orebody would require a shaft and likely a highly mechanized cost-effective mining method. The Northern Miner gathers. Production personnel would also have to adapt to a new mining environment.

In a drive around the pit, Mr. Stewart said that the stage one pit was completed in July and most of the ore was coming from the eastern portion. It will be some time before they get to the western section, he noted. A great deal of stripping is being done and the stripping ratio presently runs about 7.5 to one.

The current mining operation goes down to the 1,650 ft elevation and the stage two pit will bottom at 1,350 ft or about 900 ft. in depth.

## Two pit slopes

Two pit slopes are being used, 40° in the north, where the ground is heavily jointed, and 45° in the south. Some wedge failures have occurred in bad ground, he remarked, but none has caused any loss of production.

In the engineering department, Mr. Stewart explained the orebody is divided into eight structural domains. His department looks at the rock fabric in each to establish the desirable pit slope and the chance of wedge failures.

Afton's rock is fairly soft and it fragments easily. Straight Anfo is

used for blasting with a powder factor of 0.25 lb. per ton, he said, most shots are choke blasted, meaning they don't blast to a free face. The production blast is initiated first, then the — holes are blasted. The — or no problem digging the broken rock even though it seems hardly to have moved at all.

CIL supplies the explosives and provides technical expertise for blasting at the mine.

The company's smelter superintendent, W.P. Nickel, said Afton produces two kinds of concentrate, one metallic, the other flotation. Pointing to a concentrate stockpile in front of the smelter, he said it ran over 50% copper, high by industry standards for a float concentrate.

Mr. Nickel reports that Afton is fine tuning its scrubber system, adding that the company will have to look into expanding the regeneration capacity in that system.

The smelter utilizes a top blown rotary converter, which produces blister copper from a mixture of sulphide flotation concentrate and anode copper concentrate. He told The Northern Miner the converter runs 100 heats before the lining has to be replaced (about every three months). The cycle time averages 13 hours which is twice the original design. This is the result of lower charging rates and grade, he said.

## Smelter capacity

The smelter has a 25-30,000 tons annual capacity for blister copper but this will be effected by grade which is coming down because of stage two mining in the pit.

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GCNL #43 4 MARCH 81 AFTON MINES LTD. 92110E 092INE023

3 MONTHS ENDED DECEMBER 31,	1980	1979	3 MONTHS TO 31DEC.	1980	1979
Revenue	\$14,877,000	\$24,085,000	OPERATING STATISTICS:		
Concentrate & Blister Prod.Costs	6,922,000	7,563,000	Tons Milled	659,693	773,240
Interest Expense	1,843,000	3,892,000	Grade (%)	0.89	1.01
Currency Translation Adjustments	618,000	2,046,000	Tons Milled/		
Deprec'n, Depl'n, Amortiz'n.	996,000	1,323,000	Calendar Day	7,200	8,400
Income & Mine Taxes, Current	500,000	-	Copper Recover Lb.10,197,118	13,789,670	
-Deferred	1,253,000	3,863,000	Copper Recovery(%)	87.2	88.2
Net Earnings	\$2,745,000	\$5,398,000	Gold Recovery, Oz.	7,987	11,010
-Per Share	72¢	\$1.43	Silver Recovery, Oz.	53,409	71,820
Working Capital	\$4,262,000	\$12,800,000	Blister Copper Produced,		
			Tons	4,150	5,675

R.E.Hallbauer, president of Afton Mines Ltd., reports that at their mine, mill and smelter at Kamloops, B.C., average daily throughput in their fiscal year's first quarter ended 31Dec80 was 7,170 tons and ore grade was 0.89% copper. Throughput was lower as a result of treating harder than normal ore from the upper benches of the Stage II pit. As a result of a 38-day shut-down of the smelter for maintenance, copper concentrate inventory increased by 2,000 tons. It is valued at cost.

On 31Dec80, the final repayment of the \$75,000,000 U.S. term bank loan was made. This loan was drawn in 1976 and 1977 to finance mine development. The \$15,000,000 customer loans were repaid and re-financed by the Bank of Montreal at a rate of LIBOR + 0.75%. Afton's total debt including working capital bank debt amounted to \$42,600,000 Cdn. on 31Dec80.

For detail of the planned merger of Afton and Teck Corporation, see GCNL 22(81).

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## Depletion of surface ore reserves may send Afton Mines underground

VANCOUVER — Afton Mines' shareholders were told at the annual meeting a decision to go underground at its Kamloops B.C. operation will probably have to be made in the next two years. Company president R. E. Hallbauer said there was little or no chance for expanding reserves on surface which currently are about 21 million tons grading 0.93% copper.

Last year a diamond drilling program disclosed the orebody appeared to be narrowing and shortening along strike. However, the zone was still open at depth which may lead to additional drilling this year. Careful study will be given to

such a program since each deep hole cost close to \$80,000, said Mr. Hallbauer.

Based on five holes drilled in 1980, and two others in 1973, underground reserves now stand at approximately 6.5 million tons averaging 1.55% copper, 0.047 oz. gold and 0.20 oz. silver. Precious metals are a key factor in Afton's profitability and last year 45,333 oz. of the yellow metal together with 307,790 oz. silver were produced.

Afton managed to improve its throughput to 8,300 tons per day during January with copper averaging 0.97% per ton. Gold production for the month was 5,500 oz., the company reports. Because the Afton pit is so small, a period of lower grade ore production will be necessary during the transition from the initial to the final pit. This transition will occur during 1981-82 and will see the copper grade dropping to 0.60%, said Mr. Hallbauer.

For the first quarter of Afton's fiscal year (which ended Dec. 30) the company had net earnings of \$2,745,000 or 72¢ per share. The mining of lower grade material and the need for smelter maintenance, which necessitated a shut-down during November and December for 38 days, contributed to the reduced earnings. Stockpiled concentrate for this period will be processed in the next few months, he noted.

The meeting was told that Afton's directors had approved the merger with Teck Corp. (N.M., Feb. 5/81) although Mr. Hallbauer admitted it would take some time to complete the technical details and to obtain the necessary tax rulings and regulatory approvals.

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GCNL #170 03-09-80

AFTON MINES LTD.

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NINE MONTHS ENDED 30 JUNE

	1980	1979
Concentrates & Blister Revenue	\$78,553,000	\$43,166,000
Production Expense	27,752,000	20,753,000
Interest Expense	10,837,000	10,810,000
Currency Adjustments	5,671,000	636,000
Deprec'n, Depl'n, Amortiz'n.	5,070,000	4,055,000
Deferred Income & Mining Tax	12,402,000	2,189,000
Net Earnings	\$16,821,000	\$4,723,000
-Per Share	\$4.44	\$1.25
Working Capital	\$4,034,000	\$8,059,000

OPERATING STATISTICS:

Tons Milled	2,389,000	2,305,000
Copper Grade, %	1.05%	1.04%
Gold Recovered, Ounces	34,347	44,817
Silver Recovered, Ounces	229,500	213,600
Blister Copper Produced, Tons	18,600	14,700

Afton Mines Ltd. president R.E.Hallbauer has reported that, in the 9 months ended 30Jun80, the outstanding debt was reduced by \$43,500,000 U.S. to \$40,500,000 U.S.

Operations were normal during the third quarter with mill throughput averaging 9,330 tons per calendar day with average grade of 1.07% copper.

During the last quarter five deep drill holes were put down to test continuity of the ore zone beneath the open pit. Geological interpretation has indicated that the orebody changes direction at the west end and that earlier

diamond drill holes No.73-32 and 73-47 on Section 18 had intersected the zone parallel to the strike rather than at right angles to the strike. This theory was tested by the recent drilling and it has been determined that the orebody has turned from an east-west strike to a north-south strike, plunging steeply to the south. As a result of the five holes recently completed and the two holes drilled in 1973, underground reserves have been calculated at 6,500,000 tons containing 1.55% copper and 0.047 oz.gold and 0.20 oz.silver/ton. The deepest hole penetrated the zone at 2,000 feet below the surface or 1,100 feet below the final pit. The ore zone is open but appears to be narrowing and shortening along the strike. The drilling program has accomplished its objective and has been completed.

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AFTON MINES LTD.

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Year Ended Sept.30,

	1980	1979
Copper Concentrate & Blister Sales	\$97,745,000	\$72,823,000
Production Costs	36,666,000	31,116,000
Interest Expenses	12,394,000	14,457,000
Currency Translation Costs	6,751,000	1,044,000
Depletion, Depreciation & Amortiz.	6,336,000	6,119,000
Income & Mining Taxes: Current	400,000	-
Deferred	14,100,000	5,690,000
Net Earnings	\$21,098,000	\$14,397,000
Earnings Per Share	\$5.57	\$3.80
Working Capital	\$716,000	\$16,805,000
Shares Issued	3,789,672	3,787,172

PROFIT ROSE 47%

In his full annual report for the year ended Sept.30,1980 that confirms the results given in the preliminary report in GCNL No.229(80), R.E.Hallbauer, president of Afton Mines Ltd., notes that the outstanding debt was reduced by \$53,500,000 U.S. to \$30,500,000 U.S. by Sept.30, 1980. He states that a total of 22,800,000 tons of ore and waste were mined in the open pit during

the year. Of this 3,100,000 tons of ore were sent to the mill and 288,000 tons to the low grade stockpile. The stripping ratio averaged 6.36 tons of waste per one ton of ore. The grade of ore mined averaged 1.07% copper. Open pit reserves at year end were 21,385,000 tons at 0.93% copper.

Five deep diamond drill holes tested the continuity of the ore zone beneath the open pit. Underground reserves have been calculated at 6,500,000 tons grading 1.55% copper, 0.047 oz.gold/t, 0.20 oz.silver/t.

The concentrator treated 3,100,000 tons of ore grading 1.07% copper and 0.019 oz. gold/t. A total of 59,106,000 pounds of copper, 45,300 oz.gold and 308,000 oz.silver were recovered in concentrate. Average daily throughput was 8,560 tons per calendar day and recovery averaged 87.8%. Smelter performance continued to improve and 48,196,000 pounds of copper were recovered as blister copper. Markets for both blister and concentrate were strong most of the year.



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## **AFTON'S PROFITS CONTINUE TO GROW**

Moving into its second year of operations, Afton Mines Limited reports excellent progress at its copper mine-mill-smelter complex near Kamloops, BC.

Net income for the fiscal year ended 30 Sept 1979 was \$14.3-million or \$3.80/share. First quarter earnings were \$5.4-million or \$1.43/share. During this period the outstanding debt was reduced by \$19-million and now stands at \$71-million (US).

During the fiscal year the concentrator treated 3,068,000 tons grading 1.07% copper, for an average of 8406 tons/day. A total of 57,266,000 lb of copper were recovered as concentrate, along with 57,608 oz gold and 295,000 oz silver. The smelter produced 39,769,000 lb of blister copper, containing 38,585 oz gold and 200,000 oz silver.

In the four months to the end of January 1980, 1,050,000 tons grading 0.99% copper were milled, an average of 8540 tons/day. Copper production was 18,429,070 lb, along with 15,900 oz gold and 101,620 oz silver. The smelter produced 15,311,380 lb of copper.

Ore reserves mineable by open pit at year end were 24,500,000 tons grading 0.94%. This does not include reserves that may eventually be mined by underground methods.

## **ALGOMA STEEL SUSTAINS HIGH LEVEL OF OPERATIONS**

Production and profits of The Algoma Steel Corporation reached record levels in 1979. Net earnings of \$119.9-million or \$8.65/share were well above earnings of \$69.6-million or \$5.15/share recorded in 1978.

Capital expenditures for the year amounted to \$89.3-million, up from \$39.2-million in 1978. Projects included the new continuous slab caster, Stage IV mine development at the George W MacLeod mine in Wawa and the new heat treat facilities at the Tube Division. Construction is progressing on new facilities for heat treating plate which are expected to be in operation by early 1981. Work is on schedule to increase rail and structural mill capacity and has commenced on the third slab rehear furnace and coil box for the wide strip mill.

Capital expenditures for 1980 are planned at approximately \$140-million.

Work will begin in 1980 on a new coke oven battery estimated to cost \$120-million. The new battery, which will be completed in 1983, will replace an old battery to be removed from service in 1981 and will provide increased coke production capacity.

The company plans to reline the No 5 blast furnace in the first quarter of 1980 and the No 6 blast furnace will be relined later in the year. Arrangements have been made to purchase semi-finished steel during the reline periods.

## **FEASIBILITY WORK PLANNED BY ANGLO-BOMARC IN IDAHO**

Anglo-Bomarc Mines Limited plans a feasibility study on its Hercules silver property north of Boise, Idaho.

The \$1-million study will examine the Hercules high grade deposit, where a reserve of 1.7-million tons grading 3.3 oz/tons silver has been indicated. Joint venture partners are being sought to evaluate the lower grade Hercules Rhyolite deposits on which the company reports potential reserves of 200-million tons grading 0.65 oz/ton silver.

## **BELMORAL EXPANDS OPERATIONS IN VAL D'OR AREA OF QUÉBEC**

Since start-up in August 1979, Belmoral Mines Limited has been working to expand operations at its Ferderber gold-silver mine in the Val d'Or area of Québec.

Milling is currently being done by Societe Minière Louvem Inc, whose nearby mill is processing at a rate of 10,000 tons/month.

Present plans call for production to begin at the Bras d'Or George H Dumont mine by the end of March 1980. Belmoral is making progress on assembling its 1500-ton mill on the Ferderber property, which will eventually treat ore from both the Ferderber and Bras d'Or operations.

At the end, 4100 oz gold and 1341 oz silver had been sold, for a net value after refining costs of \$1,995,678.

## **CAMFLO PARTICIPATING IN ONTARIO GOLD VENTURE**

An expanded exploration and development program will be carried out by Camflo Mines Limited on the Wilanour and adjacent Wilmar properties, two former gold producers in the Red Lake camp of northwestern Ontario.

Subject to regulatory body approval,

an agreement between Camflo, Wilanour Resources Limited and Neomar Resources Limited provides for Camflo to spend \$2-million in 1980 and, depending on results, a further \$3.5-million in 1981.

On the Wilanour property, owned by Wilanour Resources (the former Cochenour-Willans Gold Mines Ltd), existing mine workings will be pumped out and the surface plant will be restored. Surface and underground work will be carried out on this and on the Wilmar property, which is owned by Wilmar Mines Limited. (Wilmar Mines is owned 65% by Wilanour and 35% by Neomar).

If both phases of the work are completed, Camflo's interest in Wilanour will increase from 26% to 51%. In addition, if the company completes earlier announced expenditures on Neomar's oil and gas prospects, its interest in Neomar will increase from 25% to about 55% by 1981.

## **ONTARIO GOVERNMENT REVIEWS CALAND PIT CLOSURE**

The closure of the Caland Ore Company's iron ore mines at Atikokan in northern Ontario is subject of a review by the Mineral Resources Group of the Ontario Ministry of Natural Resources.

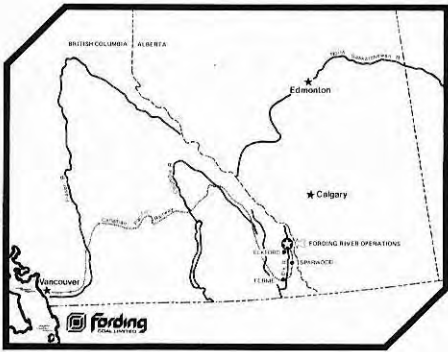
In releasing the review, Natural Resources Minister James Auld explained that the 1979 closure was an economic necessity because ore reserves could not be mined profitably.

'What was ore in the ground in 1973 or even three years ago may no longer be ore today, due to changing conditions such as costs, demand for steel, or even unexpected rock conditions', said Mr Auld.

He added that the closure had been anticipated for several years. The Ontario government had studied the possibility of bringing Bending Lake near Atikokan, into production to coincide with the closings at Caland and Steep Rock, but the study only emphasized that such a project was not economically sound, even with proposed government assistance.

## **CONTRACTS AWARDED FOR COMINCO'S POLARIS PROJECT**

Cominco Ltd has awarded Pamo Inc of Québec a \$9.7-million contract to provide residences and offices at its lead-zinc Polaris project in the Canadian



is preparing its Alberta thermal coal properties to meet local and export demands of the future.

Environmental and socio-economic studies are currently under way on three potential thermal coal mines in Alberta. The properties being examined are Heatburg, 26 miles east of Red Deer; Bow City-Kitsim, 10 miles southwest of Brooks; and Shaughnessy, 12 miles north of Lethbridge. The three locations have combined recoverable steam coal reserves of 635-million tons of bituminous and sub-bituminous rank.

The studies are designed to meet requirements for a preliminary disclosure to the Alberta government, the first step in a series of pre-licencing requirements.

It is understood that preliminary disclosure proceedings for the proposed surface mine near Red Deer will begin in the second quarter of 1980. Fording plans a \$50-million underground mine at Lethbridge and is expected to make disclosure to government this fall, followed by the proposed surface mine at Brooks, on which disclosure is expected to be made early in 1981. WM

#### COMCOL LTD

Net earnings for 1979 rose to \$203.7-million of \$11.52/share, from \$67.4-million or \$3.59/share in 1978. Sales were \$1,273.9-million. The record earnings and revenues are attributed to improved base and precious metal prices and favourable exchange rate of the Canadian dollar.

#### CRAIGMONT MINES LTD

Profit for the three months ended 31 Jan 1980 was \$3.4-million or 67¢/share, including an extraordinary gain of \$1.5-million. This compares to \$4.2-million or 82¢/share in the same period of 1979. The decline is attributed to a reduction in the average grade of ore milled and higher than usual shipments in the 1979 first quarter.

#### VESTGRO MINES LTD

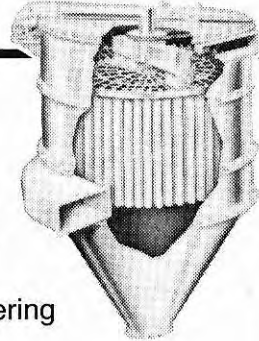
Profit for 1979 was \$27.7-million or \$6.55/share, compared to \$3.7-million or 86¢/share in 1978. Sales were \$89.3-million, up from \$45.9-million. Higher earnings are attributed to a reduction in zinc concentrate inventory and improved prices for lead and silver. Concentrate sales totalled 182,300 tons zinc and 41,300 tons lead.

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## Canada-wide recent activity in the mining world

Pamela Bottomley

### PCS to buy Allan potash mine

The Potash Corporation of Saskatchewan has reached an agreement in principle to buy 60% of the Allan potash mine for \$85.8-million. The closing date of the sale is expected to be 15 March 1978. The province would then own 40% of the Saskatchewan potash industry.

The agreement has been reached with two owners of the Allan mine — US Borax and Chemical Corporation and Swift Canadian Company Limited. The other owner is Texas Gulf Potash Company.

Under the terms of the agreement, the Potash Corporation will pay \$85.8-million

and the two companies will pay provincial taxes owing. The corporation and Swift has also agreed to a long-term marketing arrangement.

The crown corporation has also reached agreement in principle with Amax Potash Ltd, a subsidiary of Amax Inc, for the purchase of its potash interests for \$85-million.

These include potash ore reserves and a long-term service contract with International Minerals and Chemicals Corp (Canada) Ltd (IMC) to mine and process the reserves.

Under an Amax-IMC agreement signed in 1971, IMC has the right of first refusal to re-acquire the reserves on the same terms and conditions offered to Amax by any third party. Therefore, in order to complete the sale to the Potash Corporation, IMC must waive this right.

## Company activity

□**ADANAC MINING:** Placer Development Limited has offered to participate in joint venture development of Adanac Mining and Exploration Ltd's Ruby Creek molybdenum property at Atlin, British Columbia. Under the terms of the proposal, Placer can acquire 70% undivided interest in the property. If Placer decides to proceed it will spend \$300,000 on exploration and development by February 1979.

□**AFTON MINES LTD:** Tuneup of Afton's mine and concentrator near Kamloops, BC, is proceeding smoothly. As of mid-January, no major mechanical or metallurgical problems had been encountered. The 7000 tons/day concentrator reached and exceeded rated capacity after startup on 9 Dec 1977.

During December 1977, 134,856 tons grading 0.76% copper were treated to

produce 988 tons flotation concentrate grading 53%, and 210 tons gravity concentrate grading 75.3%.

During 2-9 Jan 1978, throughput averaged 7400 tons/day. A total of 59,200 tons grading 0.91% copper produced 682 tons flotation concentrate averaging 47% copper and 145 gravity concentrate grading 72%. Recovery during January was below the target levels but was expected to improve as the mining of top benches was completed.

□**CASSIAR ASBESTOS CORP:** The company has decided to use BC's most northerly port, Stewart, for shipping asbestos fibre to Vancouver for onwards movement. At present, Cassiar moves most of its production from its mine at Cassiar, BC, and entire output from its Clinton Creek, Yukon, operation through Skagway, Alaska. The first shipment is expected to reach Stewart in July. North Arm Transportation Ltd of Vancouver will move the fibre to Vancouver on covered barges. Loading and storage facilities will be built at Stewart if clearance for the project is granted by federal fisheries management.

□**CONS MORRISON EXPLORATIONS:** The company continued work on a number of mineral exploration projects in 1977. Diamond drilling on the Flin Flon project totalled 9000ft but no economic mineralization was found. However, work is continuing.

Exploration in the Urex project consisted of prospecting, geological mapping and diamond drilling, a total of 6788ft. A promising zone of uranium oxide is still being evaluated.

A small program was conducted in the Bathurst area, New Brunswick. An anomaly will be further explored in 1978.

The Great Burnt Lake project, another regional base metal exploration

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program, is under operation and financing of Rio Tinto Canadian exploration Ltd. Drilling will continue in 1978.

In 1977, Consolidated Morrison decided to enter the oil and gas exploration and development field. It is looking for

suitable acquisitions and is involved in three joint venture programs.

**□CRAIGMONT MINES LIMITED:** Fewer shipments of copper concentrate was the main factor contributing to

reduced earnings in fiscal 1977. For the year ended 31 Oct 1977, net earnings were \$2,359,000, or 46¢/share, compared to \$3,919,000, or 77¢/share, in 1976.

Copper production declined as a result of a reduction in the average grade of ore milled. In 1977, the mine produced 45,315,000 lb copper from 2,050,000 tons grading 1.17% copper.

A final on-property program was begun in July 1977 which is expected to cost \$1,600,000 by the time it is completed in 1978. The company's off-property program consisted of soil sampling, geophysical surveys and diamond drilling on a number of anomalies shown by an airborne survey in the Shuswap area, BC. Seven other prospects were examined and two optioned for further work. The 1977 program cost \$432,000 and the 1978 program is estimated at \$250,000.

It is estimated that there are sufficient ore reserves to continue the mining operation until early 1979.

An oil and gas exploration program with Canex Placer begun in 1976 was terminated in May 1977. Present interests in oil and gas will be maintained, and a budget of \$650,000 has been approved for exploration and development in 1978.

**□GRANDUC MINES LIMITED:** The board of directors of the company have decided to write down its mining properties to a nominal value of \$1 and to write off the unamortized balance of mine development and pre-production expenditure. This action resulted in a reduction of asset values in excess of \$15,000,000. The decision was made because of the continuing low price of copper and its effect on the viability of the Granduc Mine. The lessees, Newmont Mining Corporation and ASARCO Inc, have written off their investments in the Granduc mine.

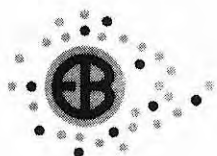
**■GRANBY MINING CORP:** Poor copper prices and higher operating costs were largely responsible for the company remaining in a loss position in fiscal 1977. For the year ended 30 Sept 1977, Granby had a consolidated net loss of \$2,626,558, or \$1.82/share, compared to a net loss of \$663,112, or 46¢/share, in fiscal 1976.

Capital expenditures in 1977 totalled \$1,794,391, practically all at the Granisle mine. A 100-ton haulage truck was bought for \$520,000 to enable the mine to handle increased waste tonnage. The remainder was used to replace mining equipment.

Capital commitments at year-end totalled about \$1,500,000, mainly for the purchase of a 10-yard electric shovel at Granisle. The mining program for 1978 calls for a further increase in the stripping ratio.

In 1977, the tonnage of ore milled was

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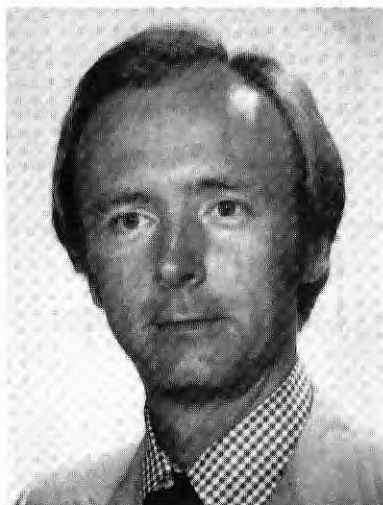


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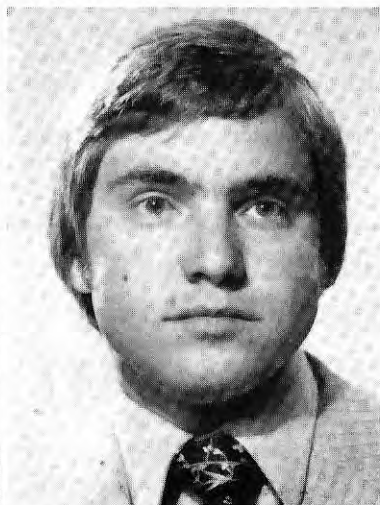
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P.Eng.



RICHARD W. THOMPSON,

CONNORS DRILLING is pleased to announce the appointments of PHILIP T. S. EDWARDS to the position of CONTRACTS MANAGER (Canada). Mr. Edwards was formerly Assistant Division Manager (Western Canada).

RICHARD W. THOMPSON, formerly Branch Manager (Yellowknife, N.W.T.), has been appointed Operations' Manager (Canada). Both Mr. Edwards and Mr. Thompson assume their new positions with several years' background in the Diamond Drilling Industry. These new appointments are in keeping with Connors Drilling expansion plans.

15% higher than in 1976 at 3,266,664. This results mainly from continuous plant operations and the treatment of easier grinding ore. The combined effect of higher throughput, better grades and improved metallurgical performance increased copper production by 23% to 37,780,917 lb.

As of 30 Sept 1977, Granisle ore reserves were estimated at 52,883,000 tons averaging 0.42% copper. At year-end, there was a small stockpile of about five-million tons of low-grade material. A total of 4,997,000 tons of ore were mined during the year.

During 1977, total mill feed at Phoenix mine came from the low-grade stockpiles which contained an estimated 260,000 tons averaging 0.37% at year-end.

Mill throughput of 934,600 tons was 12% below the 1976 performance due to a planned summer vacation shutdown in July and difficult loading and crushing conditions during handling of stockpile ores. The decline in tonnage milled and ore grade resulted in a 29% reduction in copper production from 9,195,433 to 6,561,224 lb.

The Lone Star, Washington, project was suspended during winter months and mining began in May 1977. The 12-mile haul road from Phoenix to the Lone Star property was constructed and all plantsite services and pre-production work was completed. Milling of the Lone Star ore is scheduled for 1978.

Granby's exploration expenditures in fiscal 1977 were \$817,669 compared to \$759,410 in 1976. Of the total, \$132,187 was spent on the Lone Star project.

Exploration activities were concentrated in western Canada mainly on lead, zinc, and molybdenum. Two helicopter-supported programs were carried out, both of which found mineralization. A total of 144 claim units were staked.

No work was done on the Huckleberry copper deposit under option from Kennco Explorations (Western) Limited. The option on the Lorraine copper deposit was surrendered. The Richmond copper prospect adjacent to the road between Phoenix and Lone Star was optioned and 3000ft of percussion drilling was carried out but this showed only sub-economic mineralization and the option was dropped.

Exploration activities of Granby's subsidiary, Granex (Pty) Ltd in South Africa, were terminated at year end.

The company completed negotiations with Equity Mining Corporation whereby Granby can acquire an interest in the Sam Goosly silver-copper property near Houston, BC, about 50 miles from Granisle.

□**HUDSON BAY MINING:** The Westarm Mine near Flin Flon, Manitoba, was officially brought into production on 3 Jan 1978. The mine, discovered in 1973 and named because it is on the west arm

of Schist Lake, is a copper-zinc producer. Proven reserves to the 510-metre level total one-million tons grading 3.85% copper and 0.9% zinc. The orebody is open at depth. Ore is trucked to the company's metallurgical complex at Flin Flon for processing.

Its wholly-owned subsidiary, Hudson Bay Exploration and Development Company Limited, has acquired a 32,000-acre mineral property, 60 miles from Flin Flon, formerly held by Freeport Canadian Exploration Company in a joint venture with Beth-Canada Mining Company. The property contains the Spruce Point copper-zinc de-

posit at the south shore of Reed Lake and several other indications of mineralization which have not been fully tested. Further surface drilling is not feasible and underground testing will be required.

□**PRESTON MINES LIMITED:** The company has signed a contract with Ontario Hydro for the delivery to the utility of about 72-million lb uranium oxide beginning in 1984 and continuing for more than 30 years. Production will come from the company's currently dormant Stanleigh mine and mill at Elliot Lake, Ontario. Reactivation is expected



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to create about 1000 new jobs at the site.

The contract is subject to approval by the Ontario government.

The Stanleigh property has been idle since the end of mining in 1960 and the closing of the mill in 1961. It is planned that work will commence on the property toward the end of 1978 with production scheduled to begin in 1984. The design average milling rate is about 5000 tons/day.

Under the contract terms, Ontario Hydro will advance funds needed for the development which will be repaid as uranium oxide is delivered.

The reactivation of the Stanleigh property and its subsequent operation will be carried out under a management contract by Rio Algom Limited which is affiliated with Preston.

□**TECK CORPORATION:** Teck has announced it will purchase \$4.7-million of convertible notes of Conventures Limited of Calgary as part of an \$8-million total refinancing of the firm. The remaining \$3.3-million has been placed privately by Conventures. Conventures will acquire certain producing oil and gas properties now held by Teck.

□**TERRA MINING:** Silver production during the third quarter ended 30 Sept 1977 improved to 375,052 oz from the

relatively poor production level of 181,908 oz in the second quarter from its Camsell River area, Northwest Territories, Silver Bear mine.

Total production for the nine months of 986,787 oz remained well below the comparable 1976 level of 1,484,602 oz and resulted in net income of \$880,610, or 26.7¢/share, down from \$1,801,894, or 54.6¢/share, in 1976.

During November 1977, the first full-scale production run of ore from the first level stope on the Graham vein at the adjacent Norex property (which Terra and Norex Resources Limited own 50-50) yielded 237,291 oz silver from 3002 tons of mill feed. From the beginning of trial production in July 1977 to the end of the third quarter, 446,579 oz silver has been produced from the Norex mine. The second level of the Graham vein is being readied for production and follow-up exploration continues on other targets indicated by diamond drilling.

Early in the fourth quarter an exploratory drift was completed from the 600ft level of the Silver Bear mine to the north sulphide zone indicated by earlier surface drilling. A strong vein structure was encountered. Underground diamond drilling has been planned to establish and evaluate ore reserves on this new vein.

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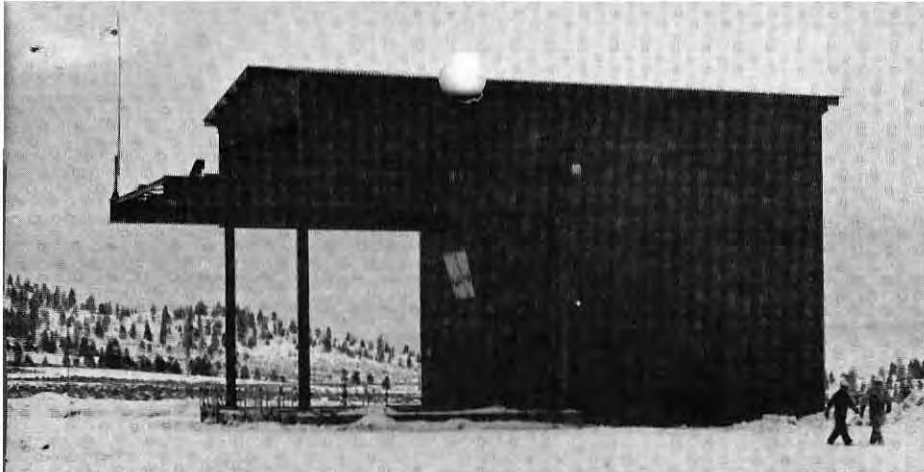
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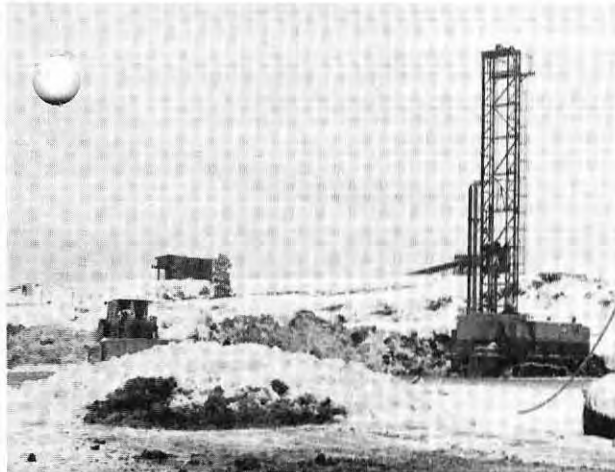
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**AFTON:** Primary crusher building at the mine site



**AFTON:** The new copper mine-mill-smelter complex near Kamloops has two of these Bucyrus Erie 40R drills at work in the open pit

# The Afton Mines project

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**Pamela Bottomley**

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Afton Mines is the only substantial new base metal mine to come into production in BC in recent years and was the only major base metal mine under construction in the entire country in 1977. The climax of many years' hard work, millions of dollars spent, not to mention a few prayers, will come when blister copper is poured at the smelter, probably at the end of February.

It happened to be a big day for Afton when Western Miner visited the site near Kamloops in early December 1977: for the first time, the huge semi-autogenous mill rolled over. There were a lot of smiles in the plant that day. A few days later, ore from a healthy stockpile was churning through the mill.

### HISTORY

The potential of the Afton area was suspected as long ago as 1898 although the discovery of the copper deposit did not occur until late 1971.

An English company sank a shaft 330ft deep in 1898, known as the Pothook, in addition to many pits and trenches.

Much later work focussed on this area.

There were only a couple of mines in the Kamloops area that had been worked to any degree — the Iron Mask to the east of Afton and the Copper King to the northwest. The Iron Mask ran periodically between 1903 and 1927.

In 1949, a prospector named Axel Bergland staked eight claims over the Pothook workings and called them Afton. Kennecott Copper optioned them and drilled 12 holes near the shaft in 1952.

The next option was taken by Graham-Bousquet, which staked additional claims and performed geochemical and geophysical work in 1956-67. A number of anomalies were found but the option was dropped after a few of them were drilled.

Noranda optioned the area in 1958 and drilled the Afton claims. An induced polarization survey was conducted over the area in 1960 by New Jersey Zinc which encountered an anomaly over the Pothook shaft but this was not followed up.

Chester Millar, who usually gets credit for the discovery of the Afton deposit, became interested in the claims in 1964 at a time when he was working on a nearby property as a drilling contractor.

He persuaded Colonial Mines to begin percussion drilling around the Pothook shaft but this was stopped after 11 holes.

Mr Millar then formed a private syndicate in 1965 to continue work and staked more claims adjacent to the Trans Canada Highway. Another 30 holes were drilled and an induced polarization survey was conducted.

The drill program revealed an east-west trending zone of copper mineralization extending beyond the drilling area to the west and below the bottom of the drill holes. The IP survey showed a large anomaly trending in the same direction centred several hundred feet south of the Pothook shaft.

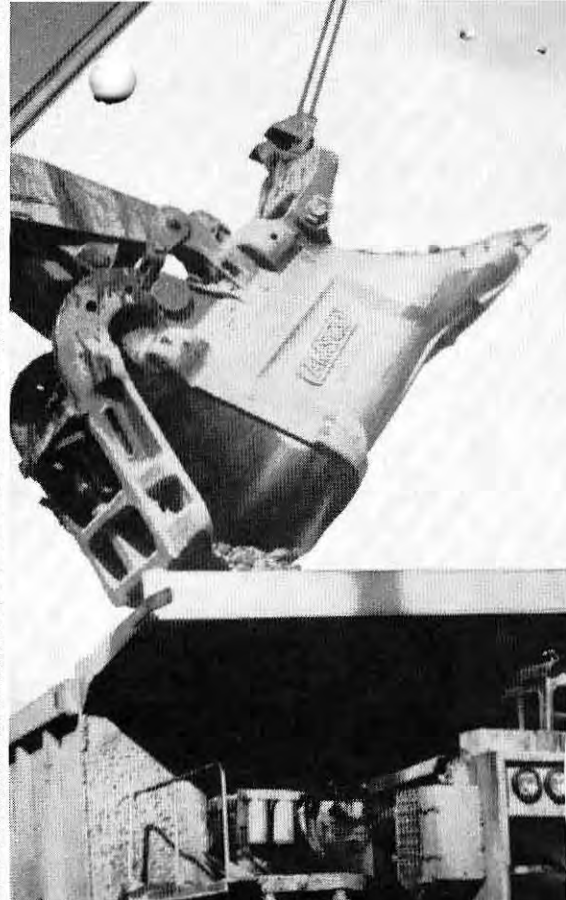
A consulting geological firm was hired to prepare a report on the property with the idea of attracting public financing. This was received in 1967, and an underwriting was completed in 1969.

The report had recommended drilling nine diamond drill holes, in several weak IP anomalies, and five of these were completed in 1970.

The results showed that the IP anomaly passing south of the Pothook copper zone was caused by pyrite disseminated in the intrusive rocks. One hole intersected 170ft of 0.4% copper in a zone of massive magnetite veining. This hole was one recommended by the consultants, and was located on the weak IP anomaly that was later found to be present over the Afton orebody.

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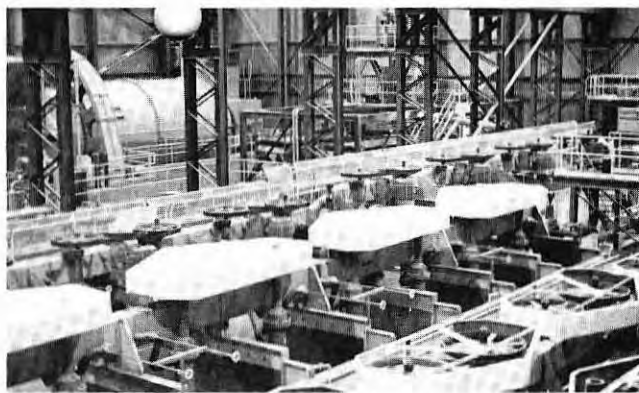
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**AFTON:** Mine Manager John Anderson is seen near the mill control panel



**AFTON:** Banks of flotation cells in the mill. Two types of concentrate — flotation and gravity — are produced for mixing as feed for the Top Blown Rotary Converter

report, Duval Corporation was given the first rights of refusal. The report recommended further diamond drilling.

An option was taken on the property in 1970-71 by Quintana Minerals. Seventeen percussion drill holes were put down but nothing was found and the option expired on 31 August 1971.

At this time Afton Mines, which still had \$70,000 in its treasury, decided to proceed with percussion drilling on areas showing copper mineralization. This began in September with Mr Millar drilling the first hole with a homemade drill.

During that month, 17 vertical percussion holes were drilled on 100ft centres and 300ft deep filling in an area of about 400 feet-square beside the diamond drill hole which intersected copper. Most bottomed in ore and drilling stopped to arrange further financing. Drilling resumed in November 1971, coincident with an underwriting.

A new IP survey showed anomalous conditions to extend further west than expected. This discrepancy was explained by drilling to the west which showed an increasingly thick cover of tertiary sediments covering the ore zone in addition to a rise in topography. The percussion drill had difficulty getting through this cover as it moved to the west but rotary drilling proved to be more successful.

Development of the property was suspended for a time pending clarification of an agreement signed on May 1972 between Canex Placer Limited and Afton Mines.

Settlement was reached in May 1973 which called for Teck Corporation and Iso Mines to pay Canex Placer \$4-million to relinquish its interest in the Afton property.

The original agreement had specified that Canex Placer would put up money for exploration and development work in return for an interest in the property.

Teck and Iso (Teck-controlled) disputed the agreement, arguing that they had bought control of Afton on the open market in 1972 and did not approve of the

deal which would eventually have reduced their 51% ownership position.

Work resumed on the property after settlement was reached. From late 1970 until late 1973, more than 29 miles of drilling were completed on the Afton property.

#### **GEOLOGY**

The Afton deposit is located at the western end of the Ironmask batholith, an intrusive comprised of a coarse-grained granodiorite phase and a fine-grained microdiorite-micromonzonite phase.

The batholith is associated with two intrusives — the Cherry Creek and the Sugarloaf, both of which are porphyritic and of later age than the Ironmask. The mineralization is mainly associated with the Sugarloaf and Cherry Creek intrusives and occurs as veins, stock works and disseminations.

The Lake Zone of the Afton deposits appears to be localized at the junction of two major fault systems. One system comprises a set of enechelon faults, trending east to northeast with a dip of 60° to 70°. These faults are probably an important ore control, according to mine manager John Anderson. The main fault is a major part of this system and there is also a second series of faults running generally north-south.

The mineralization is distinctive. Copper minerals include native copper, chalcocite, bornite and chalcopyrite.

#### **FINANCING**

Teck Corporation controls Afton Mines through a 50% direct ownership and through its 65% ownership of Iso Mines which holds 23% of Afton. This gives Teck a 65% equity in Afton which is a Canadian company with more than 99% of the issued shares held by Canadians.

At presstime, plans had been announced to convert \$80-million of the financing of the estimated cost of \$85-million of the Afton project to income debentures. This will have the effect of lowering Afton's interest rate by about 4% resulting in a cost saving of \$3.2-

million in the first full year of operation, equivalent to about 84¢ per share or 6¢ per pound of copper produced.

The company's bankers, the Bank of Montreal and the Canadian Imperial Bank of Commerce, have agreed in principle to this arrangement. However, the banks must be provided with further security and this will be achieved by a financial restructuring of the Afton project. It will become an operating joint venture between Afton and Teck Corporation with Teck's interest, formerly being a 50% shareholding in Afton, becoming instead an equal direct participation in the project.

There will be no change in the operation of the mine, which will function as a joint venture under the same management, and the equity of other shareholders of Afton in the orebody and plant will remain unchanged.

Issuance of the income debenture is subject to approval of the department of national revenue, and the financial restructuring will proceed only if the income debenture is obtained. All arrangements are subject to shareholders' approval.

#### **DEVELOPMENT**

The decision to go ahead with the Afton project was made in October 1975 and site preparation began in March 1976. It is somewhat ironic that the development of BC's first smelter in modern times, as part of the \$85-million copper mine-mill complex, occurred in a period of depressed copper prices. The reason the project has attracted so much attention is that it is the only development of its size in the country. At a time when the industry as a whole seems to be waiting for things to improve, Afton is steaming ahead.

Management foresees a turnaround for copper prices in the long term. The operation will have the advantages of good grade ore and relatively low operating costs. Ore reserves amenable to open pit mining are 34-million tons of 1% copper with \$2 per ton gold and silver values.



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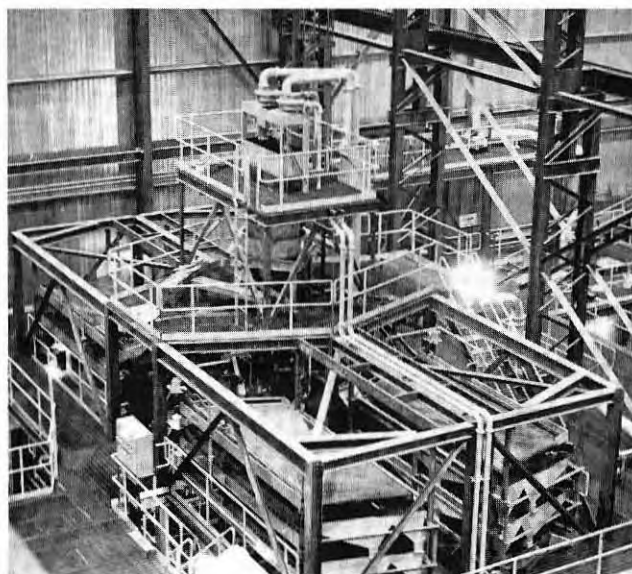
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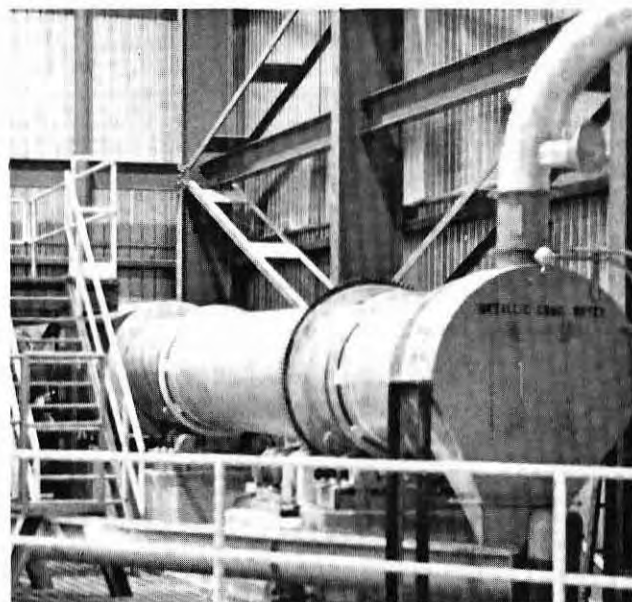


**AFTON:** There are a lot of special people at work at the mine complex. A few of them are John Bell, plant superintendent, (from Left), Charlie Lighthall, construction superintendent for Teck Corporation, and John Anderson, mine manager



**AFTON:** Tables in mill for producing gravity concentrate (metallic)

**AFTON:** High grade gravity concentrate, produced from native copper in ore, is dried in metallic concentrate drier



Because of its higher grade ore, Afton's cost to produce a pound of copper, it is estimated, will be one of the lowest in Canada.

But low copper prices aren't being ignored. Afton's President Norman B Keevil Jr has said that with current copper prices being depressed, it is important that everything practical be done to reduce operating costs. And that's why Teck hopes to restructure the financing of the project as mentioned above. The potential reduction in interest represents the single biggest cost saving available to the company and should add to its profitability, said Dr Keevil.

The smelter qualifies for benefits under the BC Copper Smelting and Refining Incentive Act which provides for

payments of up to 2.27¢ per pound of blister and refined copper produced in a smelter or refinery in the province. The payments are limited to 10 years and to a maximum of \$500,000 a year.

Mr Keevil has explained in the past that the reason the Afton project has moved ahead at this time is that Teck believes the worst is over.

Two British companies — British Insulated Callendars Cables Ltd and Delta Metals Ltd — have contracted to buy half (each) of Afton's yearly output of blister copper. The contracts are for eight years and the price will be in accordance with London Metal Exchange fluctuations.

Development included relocating about 2.8 miles of the Trans Canada Highway which formerly ran through one side of the property at a cost to Afton Mines of \$1-million. Unusually heavy rains in the summer of 1976 delayed some of this work. A 6000ft segment of the Inland Natural Gas 12in main line was moved, and the Trans Mountain oil pipeline has been relocated at the east and west ends of the intersections with the new highway. The 138kV hydro main line had to be raised to provide adequate clearance for the highway. Necessary relocations cost a total of \$1.4-million.

In a demonstration of the practical applications of multiple land use theories, Afton operates a ranching subsidiary adjacent to the mine — Sugarloaf ranches Ltd.

Over the past four years, Afton has acquired some 2300 acres of fee simple land and 4900 acres of Crown grazing leases and has operated through its subsidiary a 200-head cow-half operation since 1975.

The major contractor for the Afton project was Commonwealth Construction. Other companies involved in the

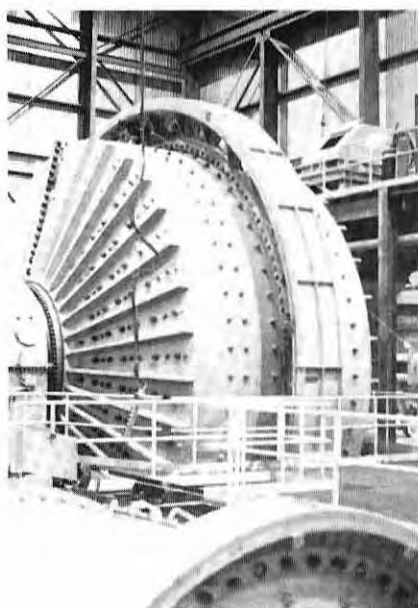
development of the new mine include: Wright Engineers, concentrator, plant and electrical design; Ker Priestman, water system; Kohn Leonoff Consultants, geotechnical work, tailings dam design; Pooley Bros, site preparation, overburden removal; Gould Electric, power transmission lines. There were, of course, many other firms involved in a project of this size.

Applications were made for five Pollution Control Board permits for construction camp sewage, refuse, concentrator air emissions, concentrator tailings, and smelter air emissions. All permits were issued in April 1976 with appeal hearings held in July and appeals subsequently dismissed in August of that year when the board ruled that the operation of the proposed copper mine, mill and smelter complex did not constitute a threat to the environment of the Kamloops area and that it felt it was in the public interest that the permits be issued.

A 25,000ft fresh water pipeline from Kamloops Lake to the plant site was begun in September 1976 and completed just before Christmas that year. The total cost of the system was about \$2.3-million.

A province-wide construction industry strike-lockout from June to August 1976 resulted in the loss of 25 working days on the project. Structural steel for the main shop was in place by mid-August 1976 and foundation work was begun on the concentrator and smelter.

Months of red tape and wrangles with various levels of government resulted from overlapping jurisdictions. The rezoning of the plant site from agricultural-forestry to heavy industrial took five months. The problem apparently arose from Afton's close proximity to the Kamloops town limits, in spite of the fact

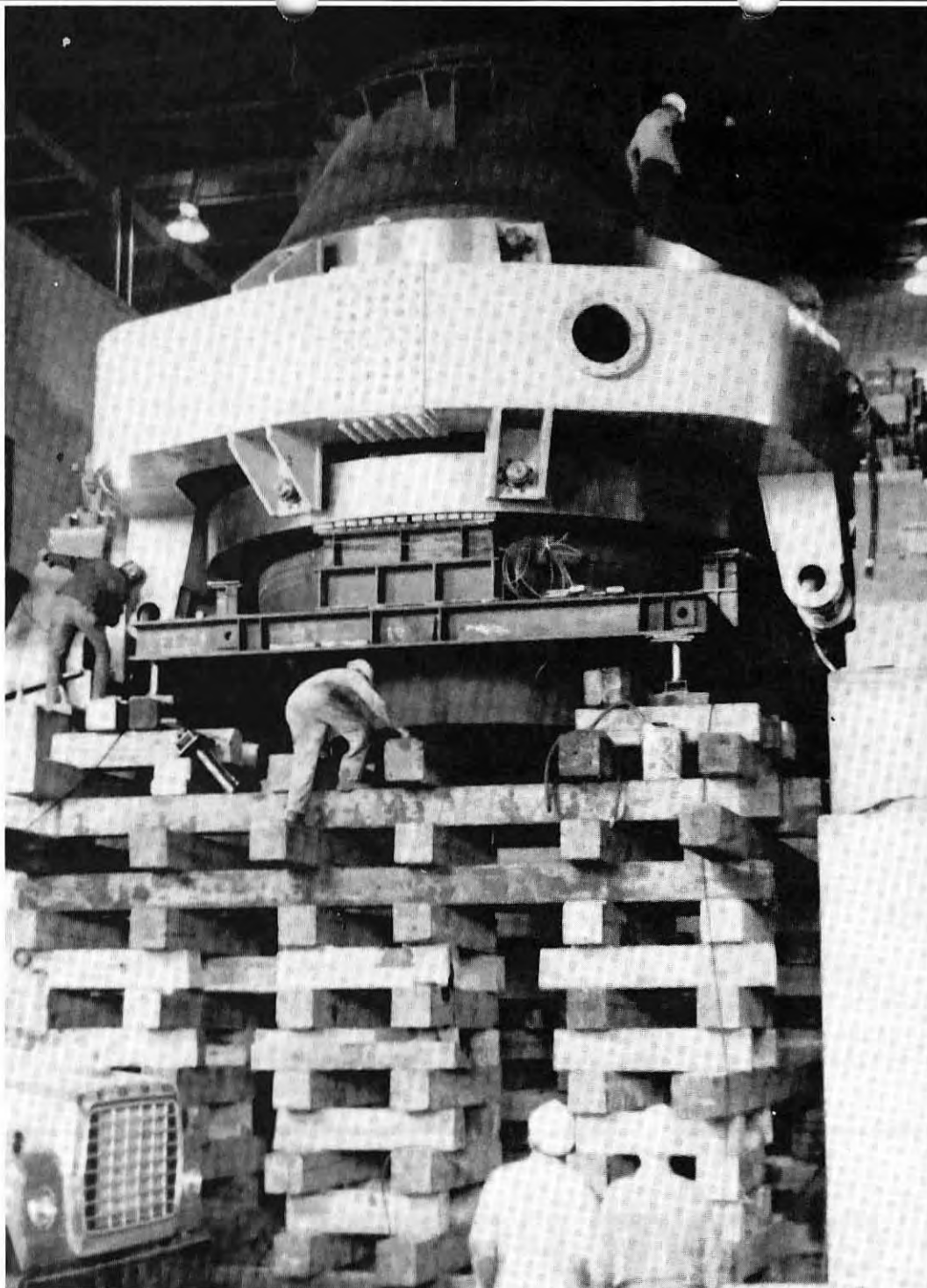


**AFTON:** Semi-autogenous mill in plant with regrind mill in foreground

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INSTALLATION OF TOP BLOWN ROTARY CONVERTER

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that the actual population centre is eight miles away.

On-going surveys of mineral content in soil, vegetation and cattle were initiated in addition to regular meteorological studies.

The Top Blown Rotary Converter, built by Krupps, West Germany, arrived on site in May 1977. The primary crusher, supplied by Allis Chalmers, was put into operation in August, and the concentrator was being tuned up in December. A delay in mill startup occurred when a transformer malfunctioned and a replacement had to be brought from San Francisco.

The shop, warehouse and changehouse complex, a \$2-million building, was occupied in April 1977 as was the administration office building constructed at a cost of \$320,000. The assay and research laboratory, valued at \$400,000 (equipped) has been in service since June 1977.

#### CURRENT OPERATIONS

At the time of Western Miner's visit to the mine, most of the construction work still underway was in the smelter building. The bulk of this was electrical and instrumentation installation. Mine manager John Anderson said half the Commonwealth Construction employees on site were electricians.

Although Afton was aiming for the end of 1977 as the goal for beginning copper production, it now appears that the end of February 1978 is more realistic (partly because of a labour dispute).

Mr Anderson said the company hoped to wind up work by sub-trades by Christmas and the main construction force was not due to return to the site until the first week of January.

Afton states that its smelter will be the cleanest in North America.

Testing of the Top Blown Rotary Converter, built under licence from Inco and Dravo at a total cost of \$2-million, had been underway under supervision of Fritz Hesse a representative of Krupps, West Germany, builders of the converter. The hot metal crane was due to be tested under load. Afton will be the first commercial copper smelter designed by Dravo to use the TBRC oxygen-oriented technology. Previous applications have been in the nickel industry.

Because of the high native copper content of the Afton ore, the TBRC process was chosen as the most economical and efficient.

When compared to the electric furnace method, the TBRC smelter offered greater flexibility for processing varying grades of concentrate and also permitted appreciable savings in capital costs.

Mr Anderson said, however, that although it would be possible to convert the smelter to enable it to handle concentrates from other operations, he doubted if this would be undertaken. Only Afton ore will be treated. Evidently a different

sulphur treatment system would have to be incorporated to handle conventional concentrates which are normally 25% sulphur. The Afton concentrates combined as smelter feed have a low sulphur content — 3% to 5%. The smelter, however, would be ideal for treating scrap or cement copper, he said.

In comparison with hydrometallurgical leaching, the TBRC offers greater flexibility for the recovery of precious metals.

The single furnace TBRC smelter at Afton has a diameter of 14ft and a length of 21ft and is designed to produce 28,000 tons of blister copper annually in 1200-lb billet form (assaying 99%) for shipment by truck and rail. The converter's daily capacity is up to 300 tons of copper concentrate.

Gravity concentrate (from native copper in the ore) will contain more than 90% metallic copper and will be trucked up to the smelter building from the concen-

trator below while flotation concentrate, containing 55% copper, will be pumped to the smelter. The two concentrates will be mixed to give a smelter feed of 65% copper.

In the smelting cycle, the desired oxygen-natural gas flame is set for the lance while the flotation concentrate and a lime flux are charged to the furnace. After initial meltdown is achieved, the furnace returns to the operating position and smelting resumes until all the flotation concentrate has been charged.

The metallic concentrate is charged later in the blowing cycle and the slagging operation is repeated. If slags need cleaning, they are kept in refractory-lined ladles for return to the smelter.

Copper is poured into ladles and taken to the casting area. Process exhaust gases are diluted by controlling the leakage of ambient air into the mouth of the exhaust hood. A water spray chamber reduces their temperature from the

### **Congratulations to Afton Mines**

in bringing their mine, mill smelter complex to fruition. Denver Equipment is proud to have been associated in supplying reliable and economical Flotation Equipment for this important B.C. mining operation.

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1400°F to 1500°F range to about 650°F. Dust in the gases is removed by an electrostatic precipitator and the sulphur dioxide gas by a dual-alkali scrubber. The gas treatment system was built at a cost of \$4-million. Cleaned converter gases are emitted through a 300ft stack at a point 1500ft above Kamloops.

#### RECENT OPERATIONS

In early December 1977, the third group of smelter staff from Afton was in Sudbury where Inco staff was showing them proper operation of the TBRC converter.

Mining was proceeding in the open pit five days a week, three shifts per day and

producing 75,000 tons per day using two P&H AL shovels (there is a third shovel on standby), eleven 100-ton Unit Rig trucks, and two Bucyrus Erie 40R drills. By the end of November 1977, nine-million tons of material had been moved. The operation is running 12,500 tons per shovel shift, 2800 tons per truck shift, and 630ft per drill shift. Pit dimensions in December 1977 were 1500ft by 2300ft and 100ft deep. It will grow to 2700ft by 2800ft and 900ft deep.

A new crushing and screening plant, purchased for \$500,000, had been in operation for 10 days, producing material for the tailings dam and roads from waste from the pit.

Mine ore is crushed to minus eight inches in a 42in by 65in gyratory crusher and conveyed to a 25,000-tons live load stockpile. The material is fed by two reclaim conveyors, with three Nico 550H feeders on each, to the 28ft by 12ft 5300hp semi-autogenous mill. The concentrator also includes a 16½ft by 29ft 4800hp ball mill and a 9½ft regrind mill. All mills are supplied by Koppers.

Total mill power requirements are 26,000hp, and overall recovery will average 87%. The two concentrate products are dried and stored in bins above the TBRC prior to charging the converter. Other products stored are the lime flux, briquetted electrostatic precipitator dust and coke.

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#### PEOPLE

Key staff at the mine, in addition to Mr Anderson, include: Earl McManus, construction superintendent (Commonwealth Construction); Charlie Lighthall, construction superintendent (Teck); John Lovering, mill superintendent; Joe McDonald, smelter superintendent; Mike Lipkewich, pit superintendent; John Bell, plant superintendent (mechanical, electrical and maintenance); Terry Duggan, chief accountant; Gerry Bell, superintendent employee relations; and Peter Atkinson, chief engineer.

Sugarloaf Ranches is run by Max Leavens, a retired mine manager for Copperfields at Temagami, and Sam Strande.

Mr Anderson said that at the end of October 1977, of the 228 people on staff, the average age was 32 years, 27% had been on unemployment insurance immediately prior to working at Afton, 49% were residents of the Kamloops area, 69% were married, and 11% were women. Of union employees, 43% had been on unemployment insurance before coming to the mine.

Employee relations is an important facet of the operation and there is a training fund for shop stewards regarding interpretation of the collective agreement.

The operation will employ an estimated 325 people when in full production.

#### References:

The Afton Discovery by Chester Millar  
WM Feb'73 p33

Afton Dispute Settled WM May'73 p47

Afton Mines Go Ahead WM Nov'76 p16

Afton Mines photo review WM Sept'76 p16

Afton; An Update on Progress at BC's newest Mine by JM Anderson PEng, Afton mine manager, *The BC Professional Engineer* Nov'77 p10.

TBRC smelter process for Copper, brochure by Dravo Corporation WM



JANUARY 2, 1980

TECK CORPORATION

GCNL #1  
02-01-80  
CONTINUED FROM PAGE ONE - Newfoundland zinc mine, 64%-owned, produced 98,235,000 pounds of zinc compared with 98,636,000 pounds in fiscal 1978. Teck's share of operating profit was \$7,357,000 based on an average European Producers' price for zinc of 40¢ a pound, compared to \$5,374,000 at an average price of 32¢ a year ago.

Silverfields, wholly-owned, produced 725,722 ounces of silver during the year, compared with 848,920 in fiscal 1978. At the previous year end, 336,834 ounces of silver were stock-piled as concentrate and carried in the books at cost. This material was sold in the 1979 fiscal year. Operating profit on normal production was \$2,760,000 based on an average silver price received of \$9.71 an ounce. Sale of the concentrate inventory added \$1,486,000 at \$10.58 an ounce for total operating profit of \$4,246,000, compared with \$761,000 a year ago.

Lornex, owned 21%, produced 139,760,000 pounds of copper and 3,895,000 pounds of molybdenum during Teck's fiscal year ended 30Sep79. Earnings were \$46,629,000 with Teck's share being \$8,502,000 or 90¢ a Teck share, after amortizing acquisition costs. Lornex' plans to expand production by 68% at a capital cost of \$160,000,000, financed out of cash flow, will make it Canada's largest metal mine with a milling rate of some 70,000 tons per day.

Teck produced 997,000 barrels of oil and 3.5 billion cubic feet of natural gas in 1979, for a record operating profit after provincial and state royalties of \$8.8 million, compared with \$8.2 million a year ago. Proven and probable reserves at the fiscal year end were 9,954,000 barrels of oil and 81.1 billion cubic feet of natural gas, compared with 9,875,000 barrels of oil and 77.3 billion cubic feet of gas at the end of 1978. After the fiscal 1979 year end, Teck acquired a 25% share interest in Coseka Resources Limited, with natural gas production in the U.S. and Canada and reserves at the end of 1978 of 4 million barrels of oil and condensate and 402 billion cubic feet of natural gas.

GCNL #47 06-03-80		AFTON MINES LTD. 92I/10E 092INE023	
3 MONTHS ENDED DECEMBER 31,	1979	1978	3 MONTHS ENDED DECEMBER 31, 1979
Concentr. & Blister Revenue	\$24,085,000	\$12,330,000	Tons Milled 773,240
Production Costs	7,563,000	6,665,000	Copper Grade,% 1.01
Interest Expense	3,892,000	3,600,000	Tons Milled/Calendar Day 8,400
Currency Exchange Loss	2,046,000	166,000	Copper Recovered, Pounds 13,789,670
Deprec'n, Depl'n, Amortiz'n.	1,323,000	1,300,000	Copper Recovery,% 88.2
Deferred Inc. & Mining Taxes	3,863,000	222,000	Gold Recovered, Ounces 11,010
Net Earnings	\$5,398,000	\$2,920,000	Silver Recovered, Ounces 71,820
Per Share	\$1.43	10¢	Blister Copper Produced, Tons 5,675.5

EARNINGS ROSE SHARPLY - In presenting results of Afton Mines Ltd. for their fiscal year's first quarter ended 31Dec79, president R.E.Hallbauer reports that concentrate inventory increased by 2,700 tons and this material has been valued at cost. With this inventory valued at market, earnings would be increased by \$2,170,000 or 57¢ per share.

During the period the outstanding debt was reduced by \$13,000,000 U.S. to \$71,000,000 U.S.

GCNL #107 03-06-80		AFTON MINES LTD. 92I/10E 092INE023	
6 MONTHS ENDED 31MARCH	1980	1979	6 MOS. ENDED 31MARCH 1980
Concentrate & Blister Rev.	\$47,417,000	\$25,680,000	Tons Milled 1,538,880
Production Expenses	15,435,000	13,069,000	Copper Grade % 1.04
Interest Expense	7,520,000	7,231,000	Tons Milled/Calendar Day 8,410
Currency Translat. Adjust.	2,859,000	138,000	Copper Recovered, Lbs. 28,304,320
Deprec'n, Depl'n, Amortiz'n.	2,781,000	2,432,000	Copper Recovered,% 88.2
Income & Mining Taxes	7,552,000	855,000	Gold Recovered, Oz. 21,578
Net Earnings	\$11,270,000	\$1,955,000	Silver Recovered, Oz. 149,070
-Per Share	\$2.98	52¢	Blister Copper Prod, Tons 11,830

EARNINGS PER SHARE - In presenting results of Afton Mines Ltd. for their fiscal year's first half ended 31Mar80, president R.E.Hallbauer notes that the concentrate inventory increased by 4,100 tons and this material has been valued at cost. Operations were normal except for a seven day illegal strike which caused a minor loss of ore production.

Mr.Hallbauer reports that Afton's outstanding debt was reduced by \$22,500,000 U.S. to \$61,500,000 U.S. during the period.

## TECK CORPORATION

YEAR ENDED SEPTEMBER 30,	1979	1978
Metal Concentrate Revenue	\$127,209,000	\$64,366,000
Oil/Gas Revenue, After Royalty	11,596,000	10,630,000
Investment & Other Income	2,961,000	2,173,000
Technical Services Revenue	194,000	26,000
Total Revenue	141,960,000	77,195,000
Metal, Concen. Production Cost	68,709,000	42,270,000
Petroleum Well Operating Cost	2,786,000	2,432,000
Administration, General Expense	2,467,000	1,919,000
Depletion, Deprec'n., Amortiz'n.	12,682,000	7,408,000
Exploration, Research Expenses	4,810,000	3,580,000
Interest Expenses	20,056,000	9,510,000
Income, Mining Taxes: Current	3,171,000	2,031,000
-Deferred	8,463,000	3,668,000
Equity In Associates' Profits	9,740,000	969,000
Minority Interests	(5,865,000)	(1,054,000)
Net Bef. Extra. Items	\$22,691,000	\$4,292,000
-Per Common Share, Basic	\$2.40	62¢
Extraordinary Items	5,723,000	316,000
Net Earnings	\$28,414,000	\$4,608,000
-Per Common Share, Basic	\$3.01	66¢
Working Capital	\$41,485,000	\$29,848,000
Shares Outstanding	10,853,178	7,422,103

## SUBSTANTIAL GROWTH ACHIEVED

In presenting the 16th annual report of Teck Corporation, covering a year with record earnings, two successful mergers and the start of construction on another new mine, Norman B. Keevil, president, lists the highlights of the fiscal year ended 30 Sep 79 as follows: Net earnings before extraordinary gains reached a record level of \$22,700,000 or \$2.40 per common share. Ordinary earnings, before a non-cash charge for deferred taxes, rose to \$31,200,000 or \$3.30 per share. A full year of production at Afton, near Kamloops, B.C., was recorded and all Teck obligations under the completion guarantee were satisfied. A decision was made to develop the Highmont mine - a \$150,000,000 copper-molybdenum project in the Highland Valley, B.C. Decision to expand output at Niobec in Quebec by 30% at a cost of \$10,000,000. A 70% interest was acquired in the Schaft Creek copper-molybdenum-gold project in northern B.C. Oil and natural gas reserves were increased. Brameda and Yukon Consolidated merged with Teck, consolidating the company's interests in Lornex and in the Bullmoose coking coal project, both in B.C. Highmont Mining Corporation and Iso Mines Limited merged with Teck. \$25,000,000 were raised by issue of shares and a convertible debenture to Metallgesellschaft. Teck Research Inc. was formed to pursue research and development opportunities.

Dr. Keevil comments, "The result of our program in recent years has been to develop a company with a solid earnings base and considerable opportunity for continued growth. On the mining side alone, several projects are on hand for development after the Highmont mine is placed into production, so that the company should continue to be Canada's leading builder of new mines for some years to come."

Dr. Keevil points out that Teck's "expansion, while rapid, has been financed conservatively. This has been accomplished through a combination of project financing, private placement of shares and timely acquisition of solid investment positions such as Lornex. We have thus been able to maintain an acceptable debt to equity ratio."

Included in the annual report are several graphs and tables that illustrate the substantial financial growth of Teck over the past 6 years. For instance, shareholders' equity has increased from \$35 to \$169 million since 1974, net ordinary earnings have climbed from \$4.2 to \$22.7 million and cash flow from operations has risen from \$5,321,000 to \$39,962,000 in the 1979 fiscal year.

The new Afton mine and smelter owned as to 65% by Teck, completed their first full year of production in fiscal 1979, producing 57,266,000 pounds of copper and 57,600 ounces of gold. Operating profit was \$41,714,000, based on average copper and gold prices of 97¢ a pound and \$350 an ounce respectively. Afton contributed \$8.2 million or 87¢ a share to Teck's earnings in 1979, after deducting amortization, deferred taxes and interest costs.

Lamaque Gold, wholly owned, produced 46,372 ounces of gold during the year, compared with 57,364 ounces in fiscal 1978. Operating profit in 1979 was \$1,064,000, based upon an average gold price received of \$254 an ounce compared with \$2,506,000 at a price of \$211 a year ago.

The Niobec mine, 50% owned, produced 5,445,000 pounds of niobium oxide during the year, compared with 5,707,000 pounds in fiscal 1978. Markets for niobium continue strong, and a 30% increase in production is planned. Niobec contributed \$946,000 or 10¢ a share to Teck's earnings in 1979, compared with \$969,000 or 14¢ a share the previous year.

Beaverdell, wholly-owned, produced 341,126 ounces of silver during the year, compared with 373,190 ounces in fiscal 1978. Underground exploration and development are being considered to open up deeper parts of the mine where there are indications of gold values as well as silver. Operating profit was \$1,576,000 based on an average silver price received of \$11.30 an ounce, compared with \$460,000 at an average price of \$5.78 an ounce in 1978.

- Continued On Page Two -



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NO. 142(1979)  
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WESTERN CANADIAN INVESTMENTS

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NINE MONTHS ENDED 31MAY	1979	1978	CHANGE
Gross Revenue	\$5,180,306	\$3,872,625	+33.8%
Net Income	\$766,100	\$397,496	+92.7%
Earnings Per Share	\$1.80	93¢	

GCNL #142 24-07-79

AFTON MINES LTD. 92I/10E 01850 092INE023

PROFIT ROSE SHARPLY - Afton Mines Limited announce their fiscal third quarter earnings amounted to \$2,768,000 or 73¢ per share. Earnings for the full nine months ended 30Jun79 were \$1.23 a share. If concentrate inventory on hand at 30June had been valued at market, earnings would have been 69¢ a share higher. These results show a sharp improvement over the results in the 6 months ended 31Mar79 during which earnings were 52¢ per share (GCNL 105(79) refers).

Third quarter production amounted to 16,699,000 pounds of copper, 19,742 ounces of gold and 83,000 ounces of silver. Mill throughput was 821,000 tons (9,022 tons per day) grading 1.16% copper, and recovery was 87.4%. The average prices received for copper and gold, in Canadian funds, were 90¢ a pound and \$302 an ounce, respectively.

Blister copper production for the quarter was 7,004 tons, and the smelter operated at capacity during the period.

GCNL #231 30-11-79

TECK CORPORATION

92I/10E 092INE023

YEAR ENDED 30SEPT.	1979	1978	
Net Bef.Extra.Items	\$22,700,000	\$4,532,000	Dr.N.B.Keevil, president of Teck Corporation,
-Per Share	\$2.40	65¢	said that the increase in earnings in the year
Extraordinary Profits	\$5,700,000	\$316,000	ended 30Sep79 resulted from a full year of
Net Earnings	\$28,400,000	\$4,828,000	production at Teck's new Afton Mine, the in-
-Per Share	\$3.00	70¢	itial earnings contribution from Teck's invest-
			ment in Lornex, and improvement in metal prices.

D.L.Hiebert, vice president finance, said that earnings before extraordinary items and deferred taxes, a more realistic measure of resource company performance and one recently adopted by the U.K. Institute of Chartered Accountants, were \$31,200,000 or \$3.32 a share.

A semi-annual dividend of 15¢ a share (up from previous rate of 12.5¢) was declared payable 14Dec79, record 6Dec79.

owned subsidiary, Fahramet Limited.

The initial phase, to cost \$4-million, will add 43,000ft<sup>2</sup> of manufacturing space to the Plant 3 foundry, to house new sand-casting foundry facilities for production of medium-sized steel castings. Startup is scheduled for spring of 1980.

When approved, the second \$3-million phase would modernize the original foundry Plant 1 for production of heavier steel castings. If business is favourable, it is planned to carry out this phase in 1981 and to start production early 1982.

About 400 people are employed in the four plants at Orillia.

was 87% and mill throughput averaged 8154 tons/day compared to design capacity of 7000 tons/day. Of the 25,300,000 lb of copper produced, 15,580 lb was converted to blister and sold under long term contract and 5,537,000 lb was sold as concentrate on the spot market. Production of gold totalled 25,075 oz and 130,500 oz of silver was produced.

**CAMFLO MINES LIMITED:** Consolidated net profit for the quarter ended 31 March, 1979 was \$195,058 or 6¢/share, compared to \$1,155,028 or 33¢/share in 1978.

The decline is attributed to a loss incurred by the company's subsidiary, La Luz Mines caused by severe weather and flooding at the Ohio coal mines in the first two months of 1979.

**COPPERFIELDS MINING CORP:** Consolidated net earnings for the six months ended 31 March, 1979 climbed to \$3,335,000 or 76¢/share, from \$55,000 or 1¢/share of the year before. Earnings before extraordinary items were \$1,215,000 or 28¢ share, compared to a loss of \$165,000 or 4¢/share in the first half of 1978.

The company's 52%-owned subsidiary, Teck Corporation, currently has no debt obligations other than project financing loans related to specific mine development projects.

**ISO MINES LIMITED:** For the six months ended 31 March, 1979, net earnings rose to \$194,945 or \$4.57/share, compared to \$37,902 or 88¢/share for the same period in 1978. Earnings before extraordinary items were \$62,462 or \$1.46/share, compared to a loss of \$79,604 or \$1.86/share the year before.

**NORTH AIR MINES LTD:** The rising price of gold and silver contributed to an increase in net income for the year ended 28 Feb 1979. Profits rose to \$1,874,996 or 35¢/share, from \$295,858 or 10¢/share in fiscal 1977. Revenue increased to \$9,584,137 compared to \$8,254,455 in 1977.

The mill handled 103,218 tons of ore grading 0.35 oz/ton gold, 1.97 oz/ton silver, 1.22% lead and 1.88% zinc. This compares to 103,510 tons grading 0.42 oz/ton gold, 3.54 oz/ton silver, 1.58% and 2.11% zinc in 1977.

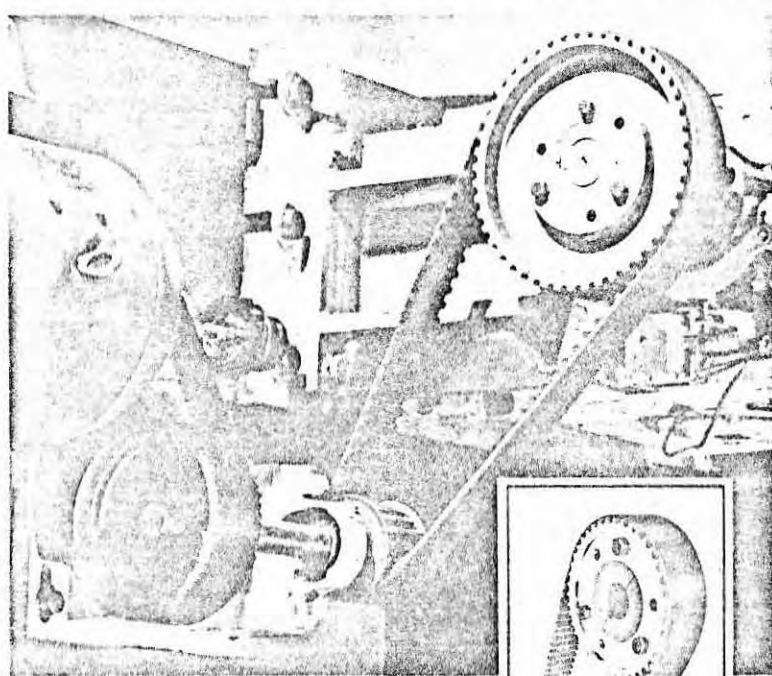
Major changes in the mill included the addition of a second bank of zinc cleaner cells, a second cleaner jig, and an alkaline-chlorination system for the treatment of tailings pond supernatant.

Recent work has developed sufficient ore above the 2800ft level for 2½ years operation and currently there are three diamond drilling machines working to expand ore reserves. At 30 April 1979, total diluted ore reserves were calculated at 215,000 tons grading 0.35 oz/ton gold,

## Company activity

**AFTON MINES LIMITED:** Production at Afton has progressed smoothly, with the project generating an operating profit of \$12.6-million for the six months ended 31 March, 1979. Net earnings amounted to \$1,955,000 or 52¢/share. If concentrate inventory at the end of the period was valued at market rather than cost, net earnings would have been \$4,036,000, or \$1.06/share.

The concentrator treated 1,484,000 tons grading 0.98% copper. Recovery



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WESTF

July 1979

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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 Orchem Mines Limited have averted closures of both mines. Mine development has been carried out by both companies.

Madelaine 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 250 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

a net loss of \$7,381,000, compared to a loss of \$142,000 the previous year. For the first quarter of 1979 it incurred a loss of \$893,000.

Copper inventories in 1978 were also affected by a strike at Noranda Mines' Gaspé operation in Québec. The strike began 14 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 90¢ 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 Bryan 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 5.17%).

The largest known deposit in B.C. 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 85¢ 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 bailed to the metallurgical plants at Flin Flon.

The Western 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 276¢ copper, 27¢ zinc, 0.40 oz ton silver and 0.037 oz ton gold.

Production of refined copper from all sources in 1978 amounted to 137,162,586 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/SE-5  
- 01268

Lornex - 92I/6E  
- 92I/SW-45  
- 03771

Bethl. Copper - 92I/7W  
- 92I/SE-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/7E

46



Gillian Cobban

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

Highland Valley - 92 I/7 W

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

Gibraltar - 93 B/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. Don McIntyre of Noranda Sales Division.

In the case of copper, the serious and continuing production problems in Zaire 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 760,000 tons in 1977.

McIntyre adds that 'the combined effects of a healthy demand in USA, Japan and Europe, and the supply problem resulted in a drop in world surplus stocks of some 485,000 tons in 1978, and a projected further drop of 17,000 tons through to at least June 1979. These stimuli, prices finally broke through their rather lethargic performance of the year'.

The US equivalent of the LME price rose from 71¢ at the end of 1977 to the 98¢ to \$1.00 range by early 1979, and the US producer price moved in the same period from 72¢ 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 is 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. 92 I/7 W

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. 92 I/7 W

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. 92 I/11 E

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 20,735 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 86.2%. 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'. 93 B/10

Gibraltar Mines Limited, owned 71.97% 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

GCNL #105 31-057692INE023

AFTON MINES LTD. 92I/10E 01850

6 MONTHS ENDED 31MARCH		1979	6 MONTHS ENDED 31MARCH		1979
Concentrate & Blister Revenue	\$25,680,000		Tons Milled		1,484,000
Concent., Blister Production Exp.	13,069,000		Tons Milled/Calendar Day		8,154
Interest Expense	7,369,000		Copper Grade %		0.98%
Depreciation, Depletion, Amortiz'n.	2,432,000		Copper Recovered, Lbs.	25,334,000	
Income, Mining Taxes, Deferred	855,000		Copper Recovery %		87.6%
Net Earnings	\$1,955,000		Gold Recovered, Oz.	25,075	
-Per Share	52¢		Silver Recovered, Oz.	130,500	
Working Capital	\$5,726,000		Blister Copper Produced, Tons	7,856	

MINE & MILL OPERATIONS EXCEED - In presenting results of operations of Afton Mines Ltd. DESIGN CAPACITY. REVENUE MOUNTS in the 6 months ended 31Mar79, that show net earnings of \$1,955,000, being 52¢ per share, president R.E. Hallbauer notes that, if revenue had been calculated on the basis that all concentrate production was sold at market value, net earnings for the period would have been \$4,036,000, or \$1.06 a share.

Mr. Hallbauer reports that the concentrator treated 1,484,000 tons grading 0.98% copper. Recovery was 87.6%, slightly in excess of plan, and mill throughput averaged 8,154 tons per day, compared to design capacity of 7,000 tons per day. Of the 25,300,000 pounds of copper produced by the concentrator, 15,580,000 pounds were converted to blister copper. One shipment of 4,700 metric tons of flotation concentrate was sold on the spot market at favourable terms.

Operations in the mine and concentrator continued to exceed design capacity, says Mr. Hallbauer. Operations in the smelter are gradually improving. He expects the smelter will be operating near capacity in the last half of the fiscal year. Meanwhile, the market for concentrate remains strong and sales of excess concentrate will be made from time to time. The average price received for copper during the period was 93¢ per pound. A new labor agreement will result in a 22% increase in labor costs over the 2 years ending 5Apr81.

## Company activity

ALCAN ALUMINUM LTD: Consolidated net income for the first quarter of 1979 rose to \$98-million, or \$2.47 share, compared to \$60-million or \$1.48 share in 1978. Gains in earnings were recorded in several geographical areas of the international business, with improvements in Canadian and United States fabricating operations particularly significant.

Aluminium Company of Canada Limited, had a net profit of \$69.8-million for the quarter, compared to \$32.4-million for the same period in 1978.

92I/10E  
AFTON MINES LIMITED: For the first quarter ending 31 Dec 1978, net earnings amounted to \$377,043, or 10¢ share. - 92I/10E (01619)  
- 92I/NE-23, 113  
WESTERN MINER May 1979 59



□COPPERFIELD'S MINING: The past year for Copperfields and its subsidiary, Teck Corporation was highlighted by completion of the Afton copper-gold mine and smelter near Kamloops, B.C.

Copperfield's earnings before extraordinary items for fiscal 1978 were \$370,000, or 8¢/share, down from \$650,000 or 15¢/share in 1977. The main reason is a \$470,000 non-cash writedown recorded as a result of issuance by Teck Corporation of 444,444 shares when it acquired an interest in the Yukon Consolidated Gold Corporation.

For the first quarter ended 31 Dec 1978, consolidated earnings before ex-

AFTON - 92 I/10E  
01890 - 23

traordinary items were \$333,000, or 8¢/share, compared to a loss of \$86,000, or 2¢/share for the same period last year. This includes consolidated earnings of Teck Corporation which were \$1,490,000, or 20¢/share, up from 4¢/share in the first quarter of 1978.

Exploration was carried out in fiscal 1978 on the St Honoré prospect adjoining the Niobec mine. Geochemical sampling and trenching was carried out on the Ecuador gold prospect and further work is required to fully evaluate this prospect.

(See W.M. February 1979 for a review of 1978 activities of Teck Corporation.)

92 I/2W

92 I/2W  
92 I/5C-34  
04849  
□ECKRAMONT MINES LIMITED: The earnings improvement for the quarter ended 31 Jan 1979 was primarily due to improved copper prices, above average sales volume and the low value of the Canadian dollar.

Net earnings for the three months were \$4,165,000 or 82¢/share, compared to \$588,000 or 12¢/share in the same period in 1978.

A one-year collective agreement effective to 28 Jan 1980 was signed with Local 6523 of the United Steelworkers of America.

92 I/1+E

06678  
□DENISON MINES LIMITED: The company has acquired the major potash and salt property near Salt Springs, New Brunswick, from International Minerals and Chemical Corporation.

It plans to begin sinking a mining shaft at Salt Springs and underground exploration and development phases will be carried out in 1979 and 1980. Development and construction work is scheduled for 1981-1982 at an estimated cost of \$150-million.

W MINER APRIL 1979.

## Halibauer praises labor force

# Past year important for Afton Mines

By Pamela Bottomley

VANCOUVER — The 1978 fiscal year was an important one for Afton Mines, with the official commissioning in April of its copper mine and smelter near Kamloops, B.C.

The project was completed at a cost of \$US85 million, within 9% of planned expenditure, despite inflation, a province-wide construction industry work stoppage and labor union jurisdictional disputes, President R. E. Halibauer states in

the annual report. "This was achieved because of hard work by a lot of people", he said, praising the efforts of the labor force, consultants, suppliers, contractors, management and staff.

Operating profit for the five months of operation in the fiscal year ended Sept. 30, 1978, was \$12,995,000, which resulted in net earnings of \$2,951,000, or 78¢ a share. Production during this period was 21,372,000 lb. copper and

20,733 oz. gold.

During the five-month fiscal period, production from the open pit mine was 1,197,000 tons ore, 5,843,000 tons waste and 371,000 tons low-grade ore, which were stockpiled.

The concentrator began tune up operations in December 1977 and has operated continuously since. Throughput to Sept. 30, 1978, was 2,113,000 tons, an average of 7,162 tons a day. Recovery during the full period averaged 86.2% with production of 34,780,000 lb. copper and 32,973 oz. gold in concentrate.

Production from the flotation circuit during the full period was 22,800 tons with an average concentrate grade of 53% copper. Production from the gravity circuit was 6,300 tons grading 84% copper.

The Top Blown Rotary Converter smelter began tune up operations in March 1978 and produced to Sept. 30 10,700,000 lb. copper in blister form grading 99% copper. The

See Page 15

THE NORTHERN MINER March 15, 1979 15

## Past year important for Afton

Continued from Page 1  
mental control sections. These are now operating smoothly and the remaining key area for attention is in improved brick life to increase the number of heats between relining cycles."

Sales from the start of operations have consisted of 5,317 tons of blister copper and 20,020 tons concentrate, the gold content of which was 9,927 and 20,536 oz. respectively.

During the period May to Sept. 30, 1978, 14,662 tons of concentrate were sold containing 8,123 tons copper and 16,998 oz. gold and 4,911 tons blister copper were sold containing 8,317 oz. gold. The blister copper was sold under long term contract to BICC and Delta Metals of the United Kingdom and the concentrate was sold to several different smelters. Sales revenues were \$25,817,000.

As of Sept. 30, the company's debt position stood at \$95,574,000. No repayments of principal were made during the period with operating profit being used to establish working capital, which stood at \$5,366,000 at year end, compared to a working capital deficit of \$4,889,000 at the end of fiscal 1977.

converting \$US80 million to income debentures. However, this could not be completed by Revenue Canada's deadline of Sept. 30 and now the federal government has eliminated this form of financing.

Afton Mines will continue to press for reinstatement of this

method of financing, said Mr. Halibauer.

At year end, the Afton project employed 325 people. Relations with the hourly-rated employees and their union, the United Steelworkers of America, have been excellent, he added.



□COPPERFIELDS MINING: The past year for Copperfields and its subsidiary, Teck Corporation was highlighted by completion of the Afton copper-gold mine and smelter near Kamloops, B.C.

Copperfield's earnings before extraordinary items for fiscal 1978 were \$370,000, or 8¢/share, down from \$650,000 or 15¢/share in 1977. The main reason is a \$470,000 non-cash writedown recorded as a result of issuance by Teck Corporation of 444,444 shares when it acquired an interest in the Yukon Consolidated Gold Corporation.

For the first quarter ended 31 Dec 1978, consolidated earnings before ex-

AFTON - 922/10E  
922/NE-23  
01850

traordinary items were \$333,000, or 8¢ share, compared to a loss of \$86,000, or 2¢ share for the same period last year. This includes consolidated earnings of Teck Corporation which were \$1,490,000, or 20¢/share, up from 4¢ share in the first quarter of 1978.

Exploration was carried out in fiscal 1978 on the St Honoré prospect adjoining the Niobec mine. Geochemical sampling and trenching was carried out on the Ecuador gold prospect and further work is required to fully evaluate this prospect.

(See WML February 1979 for a review of 1978 activities of Teck Corporation.)

GCNL #52 14-03-79

AFTON MINES LTD. 922/10E 01850 092INE023

FIVE MONTHS ENDED 30 SEPT.

	1978	
Concentrates & Blister Revenue	\$25,817,000	Confirming the preliminary results in GCNL
Conc. & Blister Production Cost	12,822,000	220 (78) of the results of Afton Mines Ltd.'s
Interest Expense	5,190,000	operations in the 5 months ended 30 Sep 78, pres-
Deprec'n., Deple'n., Amortiz'n.	2,814,000	ident R.E. Hallbauer in his annual report points
Income, Mining Taxes, Deferred	1,932,000	out that, with copper having averaged 66¢(U.S.)
Net Bef. Extra. Item	\$3,059,000	per pound and gold \$203 (U.S.) per ounce and
-Per Share	81¢	after assigning gold revenue and costs to cop-
Refinancing Costs	\$108,000	per, the average sales revenue per pound of
Net Earnings	\$2,951,000	copper was \$1.00, and the average operating
Per Share	78¢	cost 50¢ per pound.
Working Capital	\$5,566,000	The annual interest cost on the \$95,574,000
Long Term Debt	\$88,467,000	long term debt, including the current portion
Shares Outstanding	3,787,172	due, amounts to \$14,681,625, says Mr. Hall-
		bauer. During the year, an attempt was made

to income debentures. This would have enabled a cash saving of some \$4,400,000 a year at current interest rates. Unfortunately, this arrangement could not be completed by Revenue Canada's deadline of 30 Sep 78 and the federal government has now eliminated this method of financing, as well as the similar use of term preferred shares. Management believe this method of financing should be reinstated, at least for capital investment in new plant and equipment, because it represented the only remaining source of low cost capital with which to create new production and new jobs.

Production during this period was 21,372,000 pounds of copper and 20,733 ounces of gold. Average daily mill throughput was 7,485 tons grading 0.97% copper and 0.02 ounces of gold per ton.

Preparation of the open pit began in April 1977. By the end of September 1977, 5,650,000 tons of waste and 441,000 tons of ore had been mined. During the five month fiscal period, production from the mine consisted of 1,197,000 tons of ore, 5,843,000 tons of waste and 371,000 tons of low grade ore which were stockpiled.

The smelter began tune-up operations on 23 Mar 78. Production to September 30 was 10,700,000 pounds of copper in blister grading 99% copper.

The environmental control equipment has operated satisfactorily in that all conditions of the pollution control permits have been met.

The president also said, "Tune-up of a new process like this is a gradual task. Although the furnace has operated well from the start, the smelter experienced considerable down time in the early stages in order to correct relatively minor but critical mechanical problems in both the casting and environmental control sections. These are now operating smoothly, and the remaining key area for attention is in improved brick life to increase the number of heats between relining cycles."

Afton Mines' annual meeting will be held on 30 Mar 79 at 2 p.m. in the Victoria Room at the Holiday Inn, 1133 W. Hastings St., Vancouver.

interior and south of Fraser Lake-M Vanderhoof.

Results from the URP geochemical program have identified 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 Adlin and the Jay Creek, Lacey, and Nakea batholiths and Highton and Harschell 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 by-product molybdenite is recovered at four porphyry copper mines — Bethshem, Lorne, Glenora, 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 tons of contained Mo, making British Columbia one of the world's truly great molybdenum metallurgical 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, in the batholiths, as at Adanac and Boss Mountain (Fig. 2A-2C).

Molybdenite mineralization at Endako and Brenda is related to late-stage intrusive phases of the Franciscan Lake and Frank Lake 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 Storrie 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% MoS<sub>5</sub>. 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 Sald 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.

#### REFERENCES

- Christopher P. A. and Kalnins T. (1977): Exploration for Basalt Type Uranium Deposits in British Columbia, *Western Miner*, April 1977.
- Mulligan R. (1975): Geology of Canadian Tin Occurrences. *Geol. Surv. Canada, Economic Geology Report No. 28*.
- Sinclair A. J., Wynne Edwards, H. R., Sutherland Brown A. (1978): An Analysis of Distribution of Mineral Occurrences in British Columbia, *BC Ministry of Mines & Pet. Res. Bull. 68*.
- Soregaroli A. E. and Sutherland Brown A. (1976): Characteristics of Canadian Cordilleran Molybdenum Deposits; in *Porphyry Deposits of the Canadian Cordillera, CIM, Special Vol. 15*, p. 417-431.
- Sutherland Brown A., Cathro R. J., Panteljevich A., and Ney C. S. (1971): Metallurgy of the Canadian Cordillera. *CIM, Trans.*, Vol. 74, p. 121-145. W&J

Endako - 93 N/3E; 93K-6; 00752  
Mc. Haskins - 104 P/10W; 104P-38; 04492  
Storrie - 104 P/5N; 04491  
Cassiar - 104 P/4W; 104P-35; 04489  
Trout Lake - 82 N/2E; 82N/4N-3, 4, 8, 7  
Sald - 92J/4W; 92J/W-5; 00419  
Gem - 92J/9E  
Moly Taku - 104 K/6W

Diamond and Porphyry Drilling Specialists

Head Office: 1215 W. 7th Avenue, Vancouver, B.C. V6H 1B7

Kamloops 374-1132

733-2361

Island Copper - 92 L/11W; 5984

Adanac & Ruby Creek - 104 N/11W; 104N-51; 1619  
Boss Mtn. - 93A/2W; 93A-1; 00477

Bethshem - 92 I/7W; 04819  
Lorne - 92 I/6E; 03711  
Glenora - 93 B/10; 00541



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. Anonymous 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 Glendeberry batholiths underwent considerable exploration for tungsten and tin. Principal rock types are microlytic biotite quartz monzonites with muscovite granite and aplite phases. Tin-tungsten mineralization with beryl-

Fum 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.

Liquidag, 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 alkalis, 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<sub>3</sub> and 0.06% MoS<sub>2</sub>.

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-McDome map-area in 1978.

#### Uranium

1978 was the third year in which intense exploration activity took place for uranium. It is probable that 60 per cent 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 Norcan, has indicated the presence of 2.1-million tons averaging 5 pounds per ton U<sub>3</sub>O<sub>8</sub>.

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



P. 17

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 fluoride 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-McDane

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.

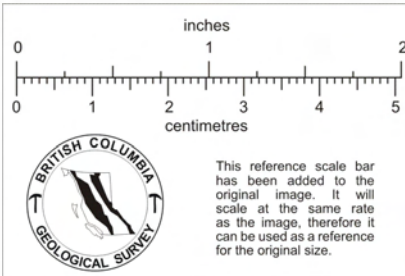
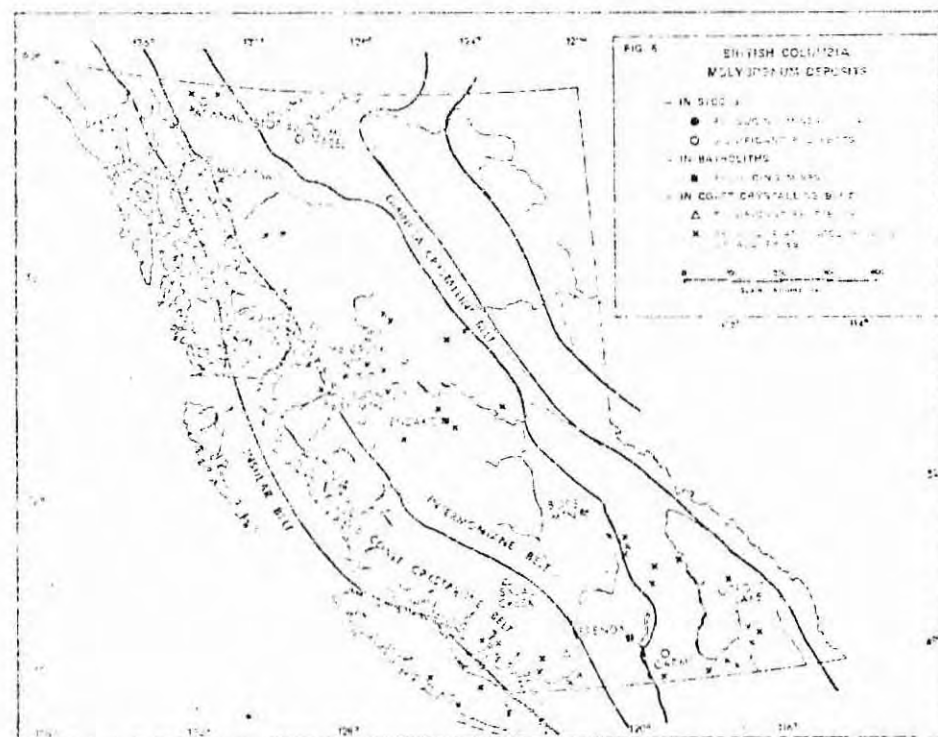
These four elements occur together in a number of areas in British Columbia, particularly in the Omineca Belt, noted for its diversity of elements. A significant correlation between the four has been noted in northwest British Columbia, specifically in the Atlin area where URP geochemistry has shown 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-Din**  
Tungsten and tin minerals occur together in the northwest and southeast parts of the Oninzei 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 Enterline tungsten mine near Salmon, scheelite occurs in skarns developed in Cambrian

Emerald - 82F/3E;  
- 01195





## EXPLORATION REVIEW

The most active metal exploration areas in the Province included, from north to south, the Athabasca River area (uranium, tungsten-tin), Kechikan-Quinta Rivers (sedimentary 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 by-product gold-silver increased over 1977. The Gossy copper-silver deposit south of Smithers (see Fig. 1) was optioned from Equity Mining-Kennecott by Canex Pincer in mid-year. Additional development drilling and metallurgical studies are underway pending a production decision. Esso Minerals continued drilling the significant Kuroko massive sulphide deposit in northwest British Columbia, part of which is held by Sonitomo who have reported at least 10-million tons of good grade copper-zinc mineralization. Nearby is the Letah asbestos deposit (Fig. 1), on which Cassin Asbestos conducted 15,000 feet of diamond drilling.

Other massive sulphide prospects explored in 1978 included two in the Coast Range -- the Nelly near Reilly Creek, drilled by the Oceanic, and the Mangle Mines property near Howe Sound north of Vancouver, drilled by Canex Pincer. Regional exploration was conducted in the Okanagan area northwest of Prince George and the northern Lakes area, north of Kamloops, where several prospects in Paleozoic, High Level Formation rocks were drilled. One of these programs disclosed interesting copper mineralization in acid volcanic rocks on the CC property, owned by the Master group of companies and under option to Cragmont.

Lead-zinc deposits explored in southeastern British Columbia included the Vase deposit at Myle Lake, drilled by Comstar and the Cottonhill Shinarump-type deposit drilled by Metallgesellschaft.

Significant lead-zinc-barite deposits in Upper Devonian-Mississippian black shale sequences in the Kechikan River area of northeast British Columbia attracted considerable attention. Centega John Venter conducted a major drilling program at Driftville Creek and Cyprus Area drilled a similar deposit to the southeast. Also in northern British Columbia, exploration drilling continued on the Seale property where galena and sphalerite occur in dolomitized limestone.

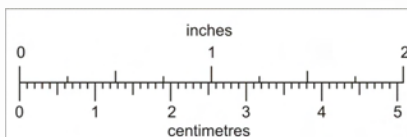
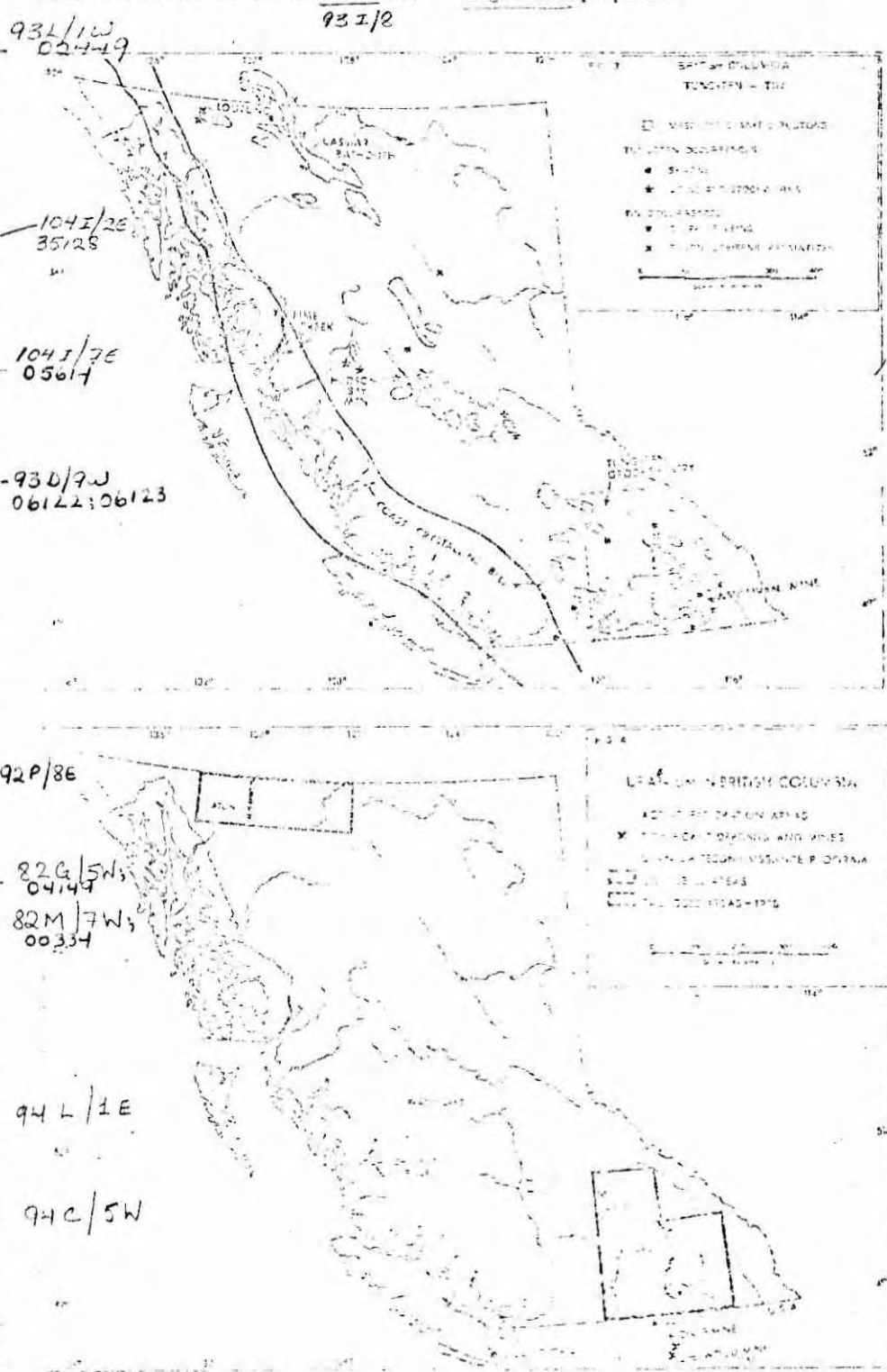
Underground development and mill construction went on at the Nu-Enagy pit-type deposit at Cassiar where production and mill tune-up started in December 1978. Feasibility studies continued at the Carolin gold property near

Hoyle. Exploration programs for gold and silver included Tominigan Mining's drilling and underground work at Big Mist and 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 Wasli River property, and on Ranger Oil's Mount Spieker property. Underground development and drilling on the Sabunka property was continued by BP Coal, and Brumet 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 Cortlin and Sage Creek properties.

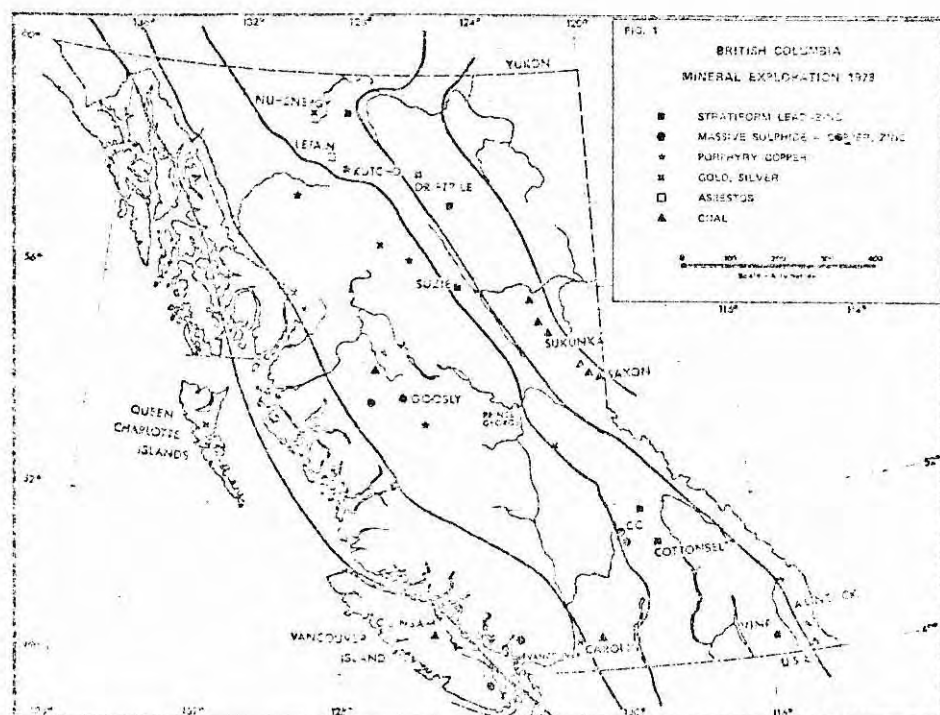


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# Mineral exploration in British Columbia: molybdenum, tungsten, uranium, tin are attractive



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.

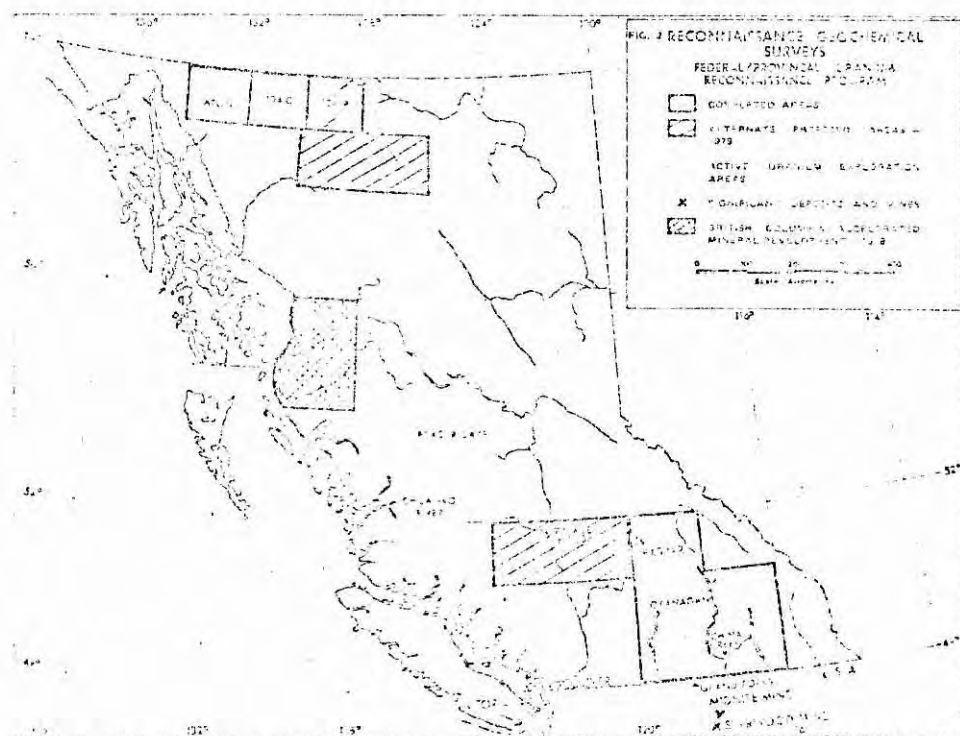
The emphasis on these four elements does not imply that there was no interest in other minerals in 1978, and a summary of exploration and development follows.

## 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 33,900 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 \$1.56-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 Grandue and Phoenix. The value of coal production will be nearly that of copper, and molybdenum remains a solid third.

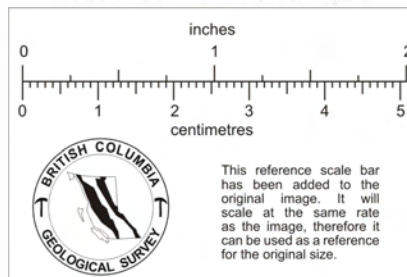
In addition to the previously mentioned copper producers which suspended operations, Cominco's H.B. Leach mine at Sault also closed in 1978. Diminishing the effects of mine closures was the first full year of production from the Affon copper mine and similar at Kamloops, the announcement of Newmont's intentions to mine Similkameen Mining's Copper Mountain orebody adjacent to Hazelton, and the production of British Columbia Molybdenum of British Columbia Molybdenum mine at Alice Arm. Production was started by year-end from Nu Energy's underground gold property near Cassiar.



12 WESTERN MINER February 1979

Gibraltar - 93B/10; 00541  
Grandue 104B/10; 08408  
Phoenix - 82E/2E; 1383  
H.B. - 82F/3E; 00981

Affon - 924/0E; 1850  
Copper Mountain - 924/7E  
Alice - 103P/10; 5101  
(Nu Energy) - 924/0E; 5101



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AFTON EARNED 13¢ PER  
SHARE IN FIRST 2 MONTHS

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GCNL #172 8-Sept-78

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PRELIMINARY FIVE MONTHS RESULTS -

Earnings before extraordinary items were \$3,059,000 or 81¢ a share. The operative prices of copper and gold during the period were 74¢ Canadian a pound and \$230 Canadian an ounce, respectively. Total revenue, including gold and silver, was equivalent to \$1.00

The mill processed an average of 7,485 tons a day, with grade running 0.966% copper and with a recovery of 89%. Sales amounted to 26,068,000 pounds of copper, 25,000 ounces of gold and 145,000 ounces of silver.

N. Miner  
Jan. 4/79

**VANCOUVER** — The past year has been one of continued achievement for Teck Corp. as it brought its third new mine in four years into production and cash flow and earnings reached record levels.

Net earnings before extraordinary items for the year ended Sept. 30, 1978, were \$4,532,000, or 65¢ a share, up from last year's \$4,083,000, or 59¢ a share. Extraordinary profits in fiscal 1977 raised earnings to \$14,684,000, or \$2.11 a share. After extraordinary items in 1978, earnings were \$4,848,000, or 70¢ a share.

Second half earnings in the past year were substantially better than those in the first half due to improved zinc prices and the first contribution from the Afton mine. N. B. Keevil, president, said in the annual report 921106 921106.

Tech is building its inventory of products and capabilities in the areas of software, hardware, systems integration, consulting and training. Tech has ample opportunities for continued growth.

Included in this inventory is the low grade Highmont copper-molybdenum deposit adjoining the Lornex mine in the Highland Valley. Teck has an interest in Lornex through The Yukon Consolidated Gold Corp.

Another prospect is the Bullmoose coking coal property in northeastern B.C. held jointly by Teck and Brameda. Teck also has a 37% interest in the Montcalm nickel-copper deposit and recently acquired the majority interest in the Schaft Creek copper-molybdenum deposit in northwestern B.C. Mr. Keevil said the company currently intends to develop this property in the 1980s, after the other three orebodies.

The report states that given reasonable metal prices, the outlook is for further improvement in earn-

ings as a result of the company's expanded production base.

In the past five years, Teck has brought three new mines and a smelter into production at a cost of \$130 million and has increased natural gas production 10 times.

Total assets have more than quadrupled during this period to \$287 million. Operating profit from both mining and petroleum increased for the fourth consecutive year to \$8.2 million and \$22.1 million respectively.

092100-01850 (092100-01850)

## Move to prevent Afton refinancing

Afton Mines reports a group led by D. L. Price has indicated it will try to frustrate and prevent the refinancing approved by a majority of Afton shareholders earlier this month (N.M., June 15, 1978).

Arrangements involve refinancing of Afton's copper mine and smelter which would result in substantially lower interest costs, with an immediate cash saving of about \$10,000 a day. In order to achieve this, shareholders approved a restructuring of the Afton project, with Afton to acquire 50% of its

N.M. MINER 21 JUNE 78

presently-issued shares from Teck Corp. in exchange for Teck taking on 50% of Afton's assets and liabilities directly. This would provide the project's bankers with sufficient additional security to support the conversion to income debentures, bearing the lower interest rate.

N. B. Keevil Jr., Afton's president, said that, subject to the rulings of the court, every effort will be made to close as soon after the scheduled June 30 date as possible. "The importance of the refinancing to Afton and the large cost of delay, amounting to \$300,000 a month, make this imperative," he said.

Mr. Price was an officer and director of Afton several years ago when Teck and an associate bought a majority interest in Afton Mines on the open market without his approval.

GCNL HIST 16 AUG 78 092100-01850 (092100-01850)

### AFTON MINES LTD.

TECK WITHDRAWS FROM - Afton Mines Ltd. president N.B. Keevil, Jr., reports that it appears REFINANCING PROGRAM it will be impractical to complete the refinancing program approved by shareholders on June 13 as outlined in GCNL 98(78). Although 98 shareholders voted in favor of the income debenture refinancing program, a group of 5 shareholders has instituted legal proceedings to block completion until final trial and appeal court verdicts have been rendered. Because of the potential long delays and uncertainty as to the manner of financing, Teck Corporation has indicated that, in view of its own other financial plans, it must exercise its right to withdraw from the program. Meanwhile, Afton management have been attempting to ascertain the objectives of the dissident shareholders, and have been discussing alternative proposals with bankers.

N.M. MINER 17 AUG 78 (092100-01850) (092100-01850)

## Teck drops refinancing program until legal problems are cleared

VANCOUVER — It appears that it will be impractical for Afton Mines to complete the refinancing program approved by shareholders on June 13, N. B. Keevil, Jr., president, reports.

A group of five shareholders has instituted legal proceedings to block completion until final trial and appeal court verdicts have been rendered. In the opinion of Afton's counsel, the group's petition should eventually be dismissed and directors are unanimous in wishing to proceed with the program, Mr. Keevil stated.

However, he continued, the result would be potential long delays and there would be intervening uncertainty as to the manner and steps of financing. Because of this, Teck Corp. has indicated that, in view of

its own other financial plans, it must exercise its right to withdraw from its additional financial commitments which were necessary for completion of the refinancing program.

Afton has made, without success, several proposals in an attempt to reach a compromise with this group of shareholders. The only proposal from the group which would have removed the obstacle to completion was one which the company was not in a position to consider.

The company is pursuing discussions with its bankers as to alternative proposals and with Revenue Canada as to an extension of the Sept. 30 deadline for this kind of refinancing. However, unless an early compromise can be worked out with the shareholder group in question, or some alternative arrangements are soon forthcoming, Afton will be forced to abandon its intention to convert its financing to income debentures, which will mean continued higher interest costs.

"We do not wish to leave anyone with the impression that Afton will be in serious difficulty because the refinancing cannot be completed," Mr. Keevil said. As long as the company can keep other costs in line and the price of copper behaves, Afton should be able to cover interest payments and make some contribution to reduction of capital costs, he concludes.

However, interest costs will amount to \$300,000 a month more than they would have been under the income debenture plan.



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AFTON MINES LTD.

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SHAREHOLDERS MEETING APPROVE -  
CONVERSION OF DEBT TO INCOME  
DEBENTURE AND SHARE INTEREST  
TO DIRECT PROPERTY INTEREST

The shareholders meeting of Afton Mines Ltd. held June 13, 1978 approved a debt financing change and alteration in the mine ownership so that Afton Mines Ltd. will own 50% of the mine, which is located close to Kamloops, B.C., and Teck Corporation will own 50% of the mine direct. The bank debt of Afton Mines

Ltd. of \$80,000,000 is to be converted into income debentures at an interest rate which will save Afton approximately \$10,000 interest expenses per day, about \$3,900,000 in one year or about 7.7¢ per pound of copper produced in one year. This savings in interest expense represents the equivalent of approximately \$1.00 per Afton share in improved cash flow. The interest is not deductible for income tax purposes by Afton but passes to the Bank tax free. In order for the bank to accept the lower interest rate and an increased risk it has required greater security. This greater security has been provided by making \$40,000,000 of the debt a direct obligation of Teck and conveying 50% of the Afton Mine to Teck in return for cancellation of its 50% share holdings in the company. The 50% direct mine interest held by Teck is also pledged direct to the bank as security for \$40,000,000 of Afton income debentures. The resolution required 75% of the 3,387,965 shares present at the meeting to vote in favour in order for it to pass. In favour 2,925,288 shares or 86.6% voted.

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## Restructure debt of Afton Mines to trim costs

VANCOUVER — Shareholders of Afton mines, controlled by Teck Corp., have approved restructuring of the company's undertaking to enable switching bank financing to income debentures (N.M., June 1, 1978).

The effect of this measure, N. B. Keevil, Jr., president, explains, will be to reduce interest costs by about \$10,000 a day.

A minority group, including C. F. Millar and D. L. Price, two former directors, and said to own in excess of 10% of Afton's issued shares, are opposed.

In a prepared statement Mr. Price said the minority group is of the view that restructuring is harmful to the minority shareholders and detrimental to the operation of the com-

See Page A7

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THE NORTHERN MINER June 15, 1978

A7

## Afton trims costs

Continued from Page A1

pany. It is the opinion of this dissident group that this refinancing arrangement will have an adverse effect on the tax position of Afton and will create a strong conflict of interest between Teck and Afton.

Mr. Keevil says the arrangement is a first class deal for all Afton shareholders, pointing out that each shareholder's percentage equity in Afton assets would remain unchanged.

The Afton mill has been producing consistently at, or ahead of, design specifications, Mr. Keevil says. In May mill throughput averaged 8,810 tons per day with grade of 1.27% copper. Recovery was 90.5% with 6.3 million lb. of copper, 5,232 oz. of gold and 34,388 oz. of silver recovered in concentrate. The smelter is still in the tune-up stage but approaching full scale production. In May, 775 tons of blister copper were produced.

To meet its financing obligations, Afton, he said, needs a copper price that will cover 35¢ a lb. in operating costs, 17¢ in interest and 28¢ in principal payments, for a total of 80¢ a lb. This excluded 3¢ a lb. interest on customer loans for a total breakeven cost of 83¢ a lb.

The copper price today is 68.7¢ a lb. (Canadian). Obviously, he declared, some form of refinancing is

necessary.

As a result of an arrangement negotiated with bankers, Afton's obligations for principal and interest over the next fiscal year will be reduced from \$22.7 million to \$9.1 million, or from 44.8¢ a lb. of copper to 17.9¢. Adding operating costs, the effect will be to reduce the required price of copper from about 80¢ to 53¢ a lb.

deepens westward with an average width of 300 ft. The ultimate pit depth will be 900 ft. However, the orebody has been indicated to a depth of at least 1,800 ft.

The western part of the orebody is still open down dip. In 1973 a hole, 73-32, on the western extension of the orebody, cut 630 ft. of core from 1070-1700 ft. which assayed 2.50% copper. Another hole, 73-47, in the same section, intersected 590 ft. which ran 1.52% copper.

The management expects significant tonnage at depth, and an underground mine will be developed to feed the concentrator when the open pit ore is exhausted. An extensive exploration program is planned to develop the ore beneath the open pit, but it is unlikely that such a program will get under way for a couple of years.

About 10,000 tons of ore a day are being produced from the pit, which is operating round the clock five days a week. The schedule is to be stepped up to continuous operations seven days a week in September. One rig for drilling 9-in. blastholes, two 11 cu. yd. shovels and eight 100-ton trucks are being employed in this operation. In order to maintain this production, allowing for mechanical availabilities, the open pit equipment includes, among other items, two rotary drills for blastholes, three 11 cu. yd. shovels and 11 100-ton trucks. Three 120-ton trucks are on order.

The open pit, called the Dominion pit, is approximately 2,400 ft. by 1,700 ft. and at depth of 120 ft. The ultimate pit will be 2,800 ft. by 2,800 ft. by 900 ft. deep. The pit slopes, which may be modified as experience is gained, have been designed from 35° in the heavily faulted zones in the west wall to 40° in Tertiary sediments and volcanics in the north wall to 45° in the more competent diorite and Nicola volcanics. The operating bench height is 30 ft. with two benches being combined to create a berm every 60 ft. Safety berms will vary from 38 ft. to 65 ft., depending on wall slope.

#### **First application**

The ore from the pit is transported by 100-ton trucks to the primary crusher, a distance of 2,400 ft. After being crushed the ore is conveyed to the coarse ore stockpile from where it is fed into the primary mill. This is a 28-ft. by 12-ft. semi-autogenous mill driven by a 5,300 hp. dc motor with variable speed drive. It is the first application of a dc motor to a large grinding mill drive, which provides for greater flexibility.

The crushing and milling facilities are designed to process approximately 7,000 tons of ore a day. Since the start of milling on Dec. 9, 1977, the average daily milling rate, including tuneup period, is 6,800 tons. The mill has been operated at a daily rate as high as 10,000 tons and, currently, is 7,000 tons, which is the planned daily rate. Operations in the mill are continuous, seven days a week.

Two concentrates are produced, a gravity concentrate consisting mainly of coarse metallic copper and a flotation concentrate of fine metallic copper and chalcocite. About 30 tons of gravity concentrate, assaying 80% copper, and approximately 100 tons of flotation concentrate, assaying 46% copper, are produced daily.

The two concentrates are fed to the smelter which produces blister copper in the form of copper cakes each weighing 1,100-1,200 lb. and about 44 in. by 27 in. by 6 in. in dimension. Smelter capacity is 50-tons of blister copper in an eight-hour period. The first heat was on Mar. 23, 1978, and copper production for the fiscal year ending Sept. 30, 1978, is expected to approximate 40 million lb. Planned annual production rate is 50 million lb.

Working on site with Mine Manager John Anderson is a top team of operators, including Michael Lipkewich, pit superintendent; John Lovering, mill superintendent; Joe McDonald, smelter superintendent; John Bell, plant superintendent, Terry Duggan, chief accountant, and the already mentioned Gerry Bell.

Afton is Teck's third new mine in three and a half years. The question is posed where will their fourth new mine be? Some are guessing Ontario, the Montcalm nickel-copper deposit near Timmins, a joint venture of Teck, Metallgesellschaft of Germany and Domik Exploration of Japan.



# Afton performs well in mine, mill, smelter

By **RICHARD J. ROBERTS**  
Assistant Editor

KAMLOOPS — Teck Corp., in placing into production the copper mine, mill and smelter of Afton Mines, 10 miles west of here and 180 air miles east-northeast of Vancouver, exemplifies the good corporate citizen.

It is stimulating the economy of the area and working towards maintaining friendly labor relations. It also considers the environment.

All of these things were obvious to The Northern Miner at the recent official opening of the Afton mine. The management is pleased by the satisfactory operations in the mine, mill and smelter. "Everything is run-

## The Teck Corp. Story: Part 5

*Exploration work in the Afton area dates back to 1898 when a 330-ft. shaft was sunk 2,000 ft. south of the orebody now being mined. Afton Mines acquired the key claims in 1964 and, under the guidance of Chester Millar, discovered the Afton orebody in 1970. Since that time, over 150,000 ft. of exploration and definition drilling have been completed.*

*In 1972 Teck Corp. and an affiliate, Iso Mines, purchased an interest in Afton, and proceeded with feasibility studies. Teck has direct and indirect interest of 65%. The decision to proceed with construction was made in October, 1975, and construction started in the following March. Open pit stripping began in April, 1977. The first concentrate was produced on Dec. 10, 1977, and the first blister copper from the smelter on Mar. 23, 1978.*

*Capital cost of the project is \$US85 million. The operation employs 300 persons and by year end the staff is expected to be enlarged to about 325. Annual payroll will approximate \$6 million.*

ning at least as well as we expected," commented Robert E. Hallbauer, Afton managing director and soon to be president of the company.

The concentrator had a very smooth startup and is performing well. Since the commencement of milling on Dec. 9, 1977, to date, mill recovery has averaged 81.3% copper and is expected to be up to the feasibility study level of 85% soon.

The smelter tune up, started in March, is progressing "pretty well as expected". It is a new process, Mr. Hallbauer noted, so that time is required to train personnel and to learn about the equipment. At the time of the official opening, blister copper production from the smelter was approximating 50 tons a day on a one-shift-a-day basis. Although currently being operated two shifts a day, the smelter is still in the tuneup period. When it is at

full capacity on a regular basis, it will produce blister copper at a daily rate of 75-100 tons.

Afton's smelter, the first copper smelter to utilize a top blown rotary converter (TBRC), produces blister copper from a mixture of sulphide flotation concentrate and native copper concentrate. Incorporating \$4.5 million of pollution control equipment, it is described as the cleanest smelter on this continent. "There will never be any smell in Kamloops from the Afton smelter," Mr. Hallbauer declared.

### Considers environment

Outside of the spanking new facilities, we were impressed by Afton's tidy roadsides, clear of tree branches and stumps, pieces of machinery and other debris, and by the pleasing manner in which the metro brown buildings blend into the landscape.

The company was guided on the aesthetic aspects of the plant layout by internationally renowned architect Arthur Erickson. They are only a short distance from a town of 60,000 on the Trans Canada Highway and expect a great number of visitors. John Anderson, mine manager, pointed out. "We are trying to make the Afton operation a show place," he added. "We have set out to achieve this and we are not finished yet. We want this to be a mining operation of which the company, the community and the industry will be proud."

Recognizing the area's rural life, Afton formed Sugarloaf Ranches, which, under Max Leavens, manager, operates a 200-head Hereford cow/calf ranch south of and adjacent to the mine site. The ranch covers 2,300 acres of fee simple land and 4,900 acres of Crown grazing leases. In this area about 35 acres are required to sustain one cow.

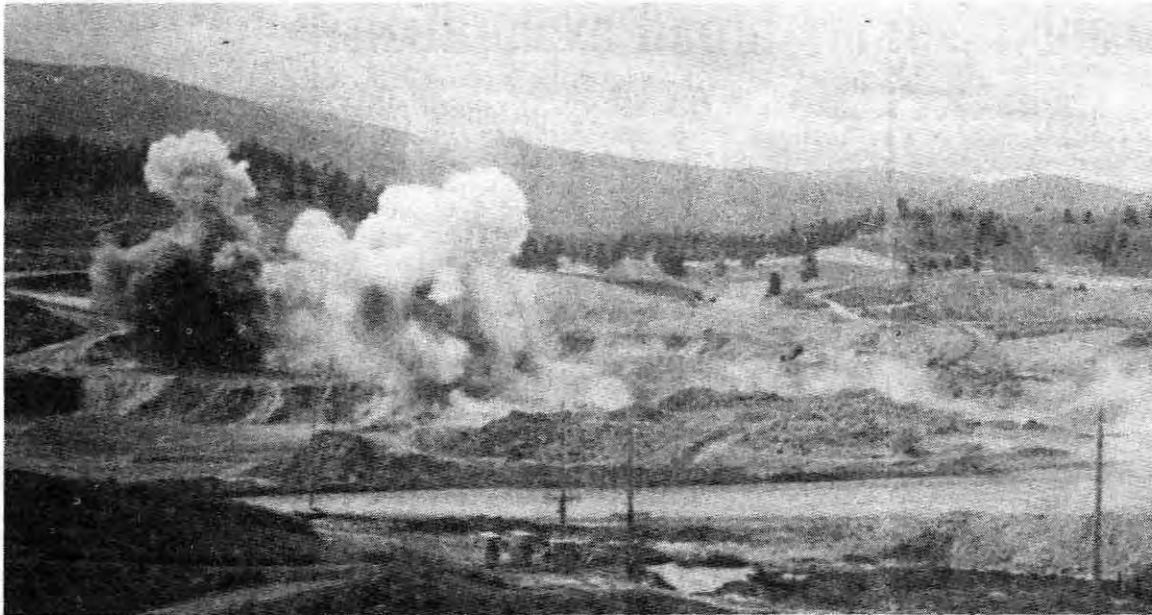
Approximately 65% of the 300 employees were hired locally. Morale is extremely high, commented Gerry Bell, employee relations superintendent. There is no magic to this, he said. "It is just mutual trust and respect between labor and management, and common sense."

The Afton deposit is at the northwest end of the Iron Mask Pluton close to the pluton's intrusive contact with volcanic rocks of the Nicola Group. It outcrops in a valley adjacent to the Trans Canada Highway three miles of which had to be moved in the final project development. The orebody contains substantial native copper in the upper horizons and the copper minerals chalcocite, bornite and chalcopyrite. The mine site is at an elevation of about 2,231 ft.

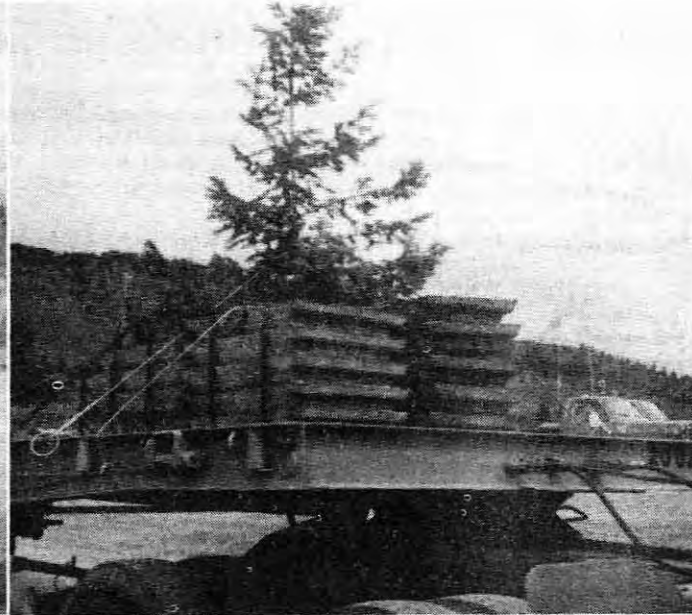
On the basis of percussion, rotary and diamond drilling, ore reserves minable by open pit methods are estimated at 32 million tons, grading approximately 1.00% copper at a cut off grade of 0.25% copper, and 0.016 oz. gold and 0.12 oz. silver per ton. These open pit reserves are sufficient for 12 years' operation at a daily milling rate of 7,000 tons.

The copper deposit is 1,700 ft. long and tabular with a strike of about N. 70°W and a dip of 55° S. It widens and

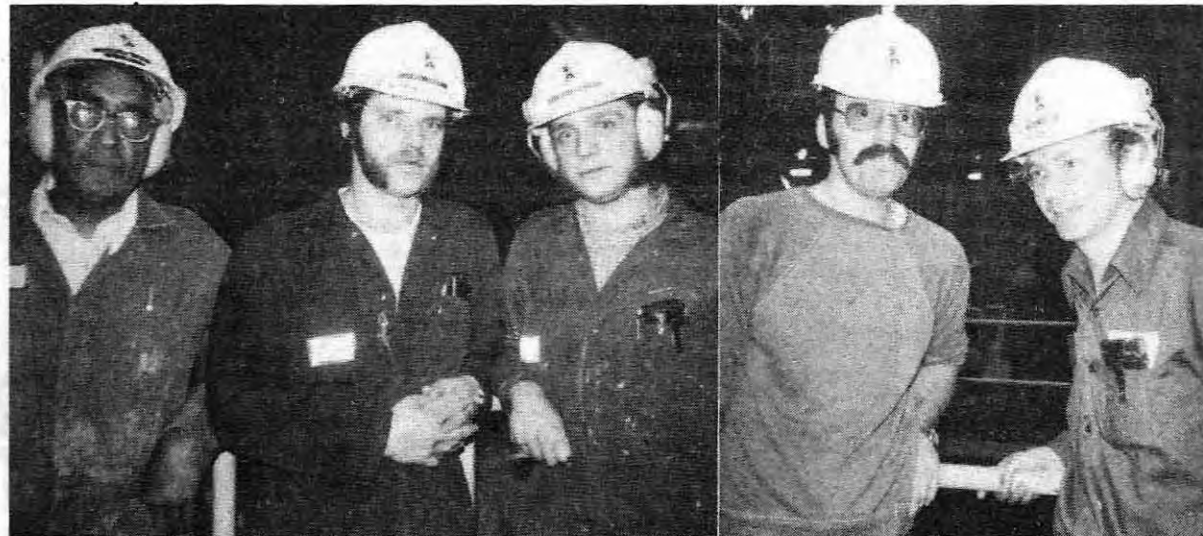
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*OPENING WITH A BANG! Our picture on the left shows the inaugural explosion in Afton Mines' open pit. It was detonated by B.C. Mines Minister James Chabot and Teck*



*Corp. Chairman Rt. Honorable Roland Michener. On the right is Afton's first truckload of blister copper topped by the evergreen tree, a symbol of good luck.*



*Afton's millworkers in the picture on the left are A. Dhaliwal, Donald Power and Danny Perkins. On the ex-*

*treme right is Donald Robb, mill shift foreman, with H. Mahler, gravity operator.*



Large cash flow saving

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## Afton meet to discuss financing plan

VANCOUVER — Shareholders of Afton Mines will be asked at a meeting on June 13 to vote on new financing arrangements, which in the next year alone would mean a cash flow saving of about \$3.9 million in interest.

The basic tax rulings covering conversion of the majority of the company's financing to income debentures has been obtained so the company can proceed with the conversion and related reorganization, Norman B. Keevil, Jr., president, reports. Plans are to have the conversion completed by June 30.

The new arrangement involves

the issuance of \$US80 million in income debentures to replace and extend existing bank loans of \$US75 million. The effect will be to reduce Afton's interest rate on its bank loans by a current 4.35%.

It is anticipated that Afton will exchange 50% of its assets and liabilities to Teck Corp. for 50% of the presently outstanding Afton shares now held by Teck. This will provide Afton's bankers with a stronger direct security, so that they will accept the conversion to income debentures.

Each shareholder's percentage equity in the Afton assets would remain unchanged, Mr. Keevil said.

It is hoped, he said, that the necessary approvals can be obtained and the arrangements closed as soon as possible since the immediate saving on interest is approximately \$10,000 a day.

Afton has retained McLeod, Young Weir as advisors on the transaction. Their conclusion is that it is in the best interest of Afton shareholders to approve the proposed refinancing, provided that Teck undertakes, as they suggest, a \$5 million deficiency guarantee to the new arrangements. Teck has agreed to do this, provided there is no adverse effect on the tax rulings which have been obtained.

Lower first half

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## Teck counts on Afton for better days ahead

In the six months ended Mar. 31, 1978, Teck Corp. had earnings of \$723,000 or 10.4¢ per common share compared with \$1,836,000 or 26.4¢ in the comparable year-ago period. After extraordinary items (gain on sale of investments) earnings came to \$1,265,000 or 18.1¢ in the latest period compared with \$3,680,000 or 52.9¢ a year earlier.

As of Mar. 31, 1978, working capital stood at \$5,273,000 versus \$6,088,000 a year ago.

President N. B. Keevil notes that there is "some cause for optimism" in both zinc and copper as production cutbacks have brought supply and demand more closely into line. "Afton (see separate story), which will enter commercial production on an accounting basis in June or July, after the smelter has been tuned up to capacity, will have a major effect on earnings from that point on," continues Dr. Keevil.

It's anticipated that Afton's total operating cost, including transportation and refining, and after gold and silver credits, will be about 35¢ Canadian per lb. of copper. Production to Mar. 31, 1978, amounted to 11,400,000 lb. copper; 11,100 oz. gold and 64,800 oz. silver from milling of 765,995 tons of ore which averaged 0.91% copper.

Operating profits from precious metal mines were up from \$1,401,000 last year to \$1,801,000, as a result of improved prices for gold and silver. The Niobec columbium mine, accounted for on an equity basis, continued to perform well and contributed \$495,000 after taxes, up from \$24,000 in the first half last year.

Overall mining profits, excluding Niobec, were down from \$4,412,000 to \$2,445,000 as a result of low zinc prices, which reduced Teck's share of operating profits from Newfoundland Zinc from \$3,011,000 to \$644,000 in the first six months. "There has been some recent evidence of firming in the European zinc market and it is hoped that the price will improve later in the year," adds Dr. Keevil.

Operating profit from oil and natural gas was \$7,164,000 before royalties for the first six months, compared with \$5,567,000 in the comparable period last year. After royalties, but before provision for income taxes, operating profits were

up from \$3,190,000 last year to \$4,011,000.

Teck continued to be active in direct oil and gas exploration in western Canada, and augmented its activities through the purchase of \$4,700,000 of convertible notes of Conventures Limited, which is currently active in the Elsworth-Grizzly Valley gas play.

## Afton Mines now officially in production

By R. J. ROBERTS  
Assistant Editor

KAMLOOPS (B.C.) — After a stirring ceremony attended by 600 mining men, industrialists, government officials, newsmen and employees, the \$85-million copper mine and smelter complex of Afton Mines, a subsidiary of Teck Corp., near Kamloops is now officially in production.

Rt. Hon. Roland Michener, chairman of Teck and former governor general, and B.C. Mines Minister James Chabot detonated an inaugural explosion in the open pit. The two VIPs then cut the ribbon, allowing to move the first truckload of Afton-produced blister copper.

It was a proud and exciting moment for Teck and the Keevils who built the Teck organization. Norman B. Keevil is president of Teck and chairman of Afton, and his son, Norman, executive vice-president of Teck and president of Afton. It is the third new Canadian mine Teck has brought into production in 3½ years.

In attendance were visitors from England, Germany, New York, and Washington, as well as from across Canada.

Among those on the speaker's platform were Axel Berglund of Prince George, the prospector who staked the Afton claims, and Chester Millar who discovered the orebody.

A number of Canada's mine finders and mine makers attended. These included J. D. Simpson, Karl Springer, Egil Lorntzen, Robert Falkins, Joe Rankin, Bernie

See Page 11

## Afton Mines opened

Continued from Page 1

Brynnelsen, Gordon Davis, Bill Dunn and Andy Robertson.

One has to wonder, Norman Keevil Jr. said in his remarks, how many men like these, some of Canada's best mine makers, are out there looking today with that same "frontier-busting" urge.

"It is harder now to raise money to prospect, and harder to finance those junior companies which have been responsible for so many of Canada's mines," he said.

"Too often, governments and pundits seem to get bemused by the idea that manufacturing is somehow the Holy Grail, and that we miners are just hewers of wood and drawers of water . . . and yet it's people like this, and mines like this, that have provided Canada with the solid economic foundation it has. They need and deserve more encouragement.

"I think this is beginning to be realized better, and I think we can look forward to a revitalized resources industry in coming years. I

believe the ministers of government who took time to be with us today share that view, and are doing what they can to make it happen."

Robert E. Hallbauer, vice-president, mining operations, Teck, managing director of Afton and soon to become president of that company, said that the copper smelter is a unique type known as top blown rotary conversion developed by Inco. It is the first copper smelter in modern times in British Columbia and the cleanest on the continent. Mr. Hallbauer, noting that a good wind was blowing, pointed out that there was no smell.

B.C. Corporate and Consumer Affairs Minister Rafe Mair described the mine opening as a great day for Kamloops.

Since tune-up operations started last December, mine and mill have produced concentrate containing over 13 million lb. of copper, 11,000 oz. of gold and 65,000 oz. of silver. Over 500 tons of blister copper have been produced.

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TAX RULING RECEIVED DEBT  
RESTRUCTURING NOW PROCEEDING

AFTON MINES LTD.

Afton Mines Ltd. has received the basic tax rulings covering conversion of the majority of its financing to income debentures so that the debt reorganization can now proceed. A meeting of shareholders has been called for June 13 to consider the matter, and plans are to have the conversion completed by June 30, 1978. The plans involve the issuance of \$80,000,000 U.S. in income debentures to replace and extend existing bank loans of \$75,000,000 U.S. The effect will be to reduce Afton's interest rate on its bank loans by a current 4.35%, a cash flow saving for the operation of approximately \$3,900,000 in interest in the next year, equivalent to about 7.7¢ per pound of copper scheduled for production.

As part of the arrangement, it is anticipated that Afton will exchange 50% of its assets and liabilities to Teck Corp. in return for 50% of the presently outstanding Afton shares, which are now held by Teck.



## Blister copper this month at Afton

Continued from Page 1

Granduc and one major mine in the U.S. It has resulted in operating losses or only marginal returns for many other mines.

"In fact," Mr. Keevil noted, "if it wasn't for the decline in value of the Canadian dollar, many Canadian mines would be in serious trouble."

Surplus inventory of the metal built up in the last few years is the cause of the low price. Unfortunately, he said, too much of

the world's copper productive capacity is in the hands of Third World governments and their tendency — faced with lower prices — has been to increase production in order to maintain their foreign exchange income. This tends to worsen the situation.

In the longer term, into the 1980s, it is reasonable to expect copper to sell at much higher levels, he said. There are few new mines in the world that can be justified, on a

commercial basis, at current prices of less than \$1 a lb. If a normal new supply is to be brought into production in the coming years, prices are going to have to increase to this level or beyond, he said.

Meanwhile, he said, it is important that copper producers do all they can to keep costs to a minimum. This is why, he pointed out, that the company is working on a plan to convert \$80 million of financing to income debentures, which conversion means a saving of \$3 million in interest a year, the equivalent of about 6¢ per lb. of copper (N.M., Dec. 15, 1977). Details are being worked out and will be discussed at a later meeting.

Afton has made a concerted effort to hire as many local residents as possible, Mr. Anderson said. Total payroll numbers 270. Kamloops residents account for 57% of the company's bargaining unit employees. Based on the January payroll, the annual payroll will exceed \$5 million in 1978, excluding employee benefits program.

The company has been working hard at Kamloops to foster a better understanding of the industry by co-operating with educational institutions and participating in school science fairs, career nights, school tours of the property, and talks to service clubs. The local Chamber of Commerce is including mine tours in its list of "sights to see" in the Kamloops area.

Mill Production  
Dec. 10, 1977, to Feb. 28, 1978

	Dec.	Jan.	Feb.	Total to Feb. 28
Tons milled .....	134,857	222,822	217,261	574,940
Tons/calendar day .....	6.130	7.188	7.759	7.098
Head grade .....	0.76%	0.90%	0.94%	0.88%
Lb. Cu. recovered .....	1,361,777	3,311,373	3,539,060	8,212,210
Recovery .....	67%	82%	87%	81%
<b>GOLD</b>				
Heads .....	0.013	0.022	0.016	0.0176
Oz. recovered .....	1.299	3.564	2.594	7.456
<b>SILVER</b>				
Heads .....	0.114	0.145	0.13	0.132
Oz. recovered .....	7.371	19.129	20.255	46.751

GCN/L #82 28-april-78

### AFTON MINES LTD.

MINE AND SMELTER OFFICIALLY OPENED - Afton mine and smelter near Kamloops, was opened officially April 27, 1978. The Rt. Hon. Roland

Michener, chairman of Afton's parent company, Teck Corporation, and The Hon. James Chabot, B.C.'s Minister of Mines, jointly set off an inaugural blast in the open pit and cut the ribbon sending off the first truckload of blister copper.

Afton Mines Limited is a subsidiary of Teck Corporation, the company which arranged the \$85,000,000 (U.S.) financing required to build the mine and smelter, and managed the construction project. Afton is the third new Canadian mine Teck has built in the last 3½ years.

Robert E. Hallbauer, vice president of mining operations for Teck Corporation, said that Afton has a capacity of 50-60 million pounds of copper annually.

The copper smelter is the first in modern times west of Manitoba, and employs a new process known as Top Blown Rotary Conversion, developed in Canada by Inco Ltd. The blister copper output is being developed in Canada by Inco Ltd. The blister copper output is being sold under a long term contract to two consumers in the United Kingdom.

Mr. Hallbauer said that the operation employs 275 people presently, and that this will increase to 300 by year end.

Since tune-up operations in the mine and mill began last December, the mine and mill have produced concentrate containing over 13,000,000 pounds of copper, 11,000 ounces of gold, and 65,000 ounces of silver. Over 500 tons of blister copper has now been produced.

Now milling 7,400 tons per day

## Iso Mines holds big stake in Afton mine

Afton is the second major new Canadian mine in which Iso Mines has been involved, the first being the Mattagami mine in Quebec. N. B. Keevil Jr., president, points out in the annual report.

Iso is the second largest Afton shareholder, holding 876,968 shares or 23%. Teck Corp., in turn, holds 2,774,529 shares or 65% of Iso.

The concentrator has now been completed and has been operating on a tune-up basis since Dec. 9, 1977. A total of 137,856 tons of ore grading 0.76% copper was milled in December. Production was 988 tons

of flotation concentrate grading 53% copper and 210 tons of gravity concentrate grading 75%, with recovery of 67%. Recovered gold and silver amounted to \$1.96 per ton of ore milled.

Production in January averaged 7,400 tons per day for a total of 222,282 tons grading 0.90% copper. This resulted in 3,250 tons of flotation concentrate grading 40.5% copper and 451 tons of gravity concentrate grading 74.9%. Recovery had improved to 82.3%. Rated plant capacity and recovery are 7,000 tons per day and 87%, respectively.

The smelter is in the final stages of construction and is expected to start up about the end of March. Concentrate produced in the meantime is being stockpiled.

The only outside exploration carried out by Iso in 1977 was work required to keep properties in good standing. This includes its copper properties in Arizona, the Twin Bridges project in Montana, in which it has a 50% working interest, and a Nevada fluorite prospect. The Copper Canyon prospect in Nevada was optioned during the year to Cities Service Co. which may acquire outright ownership for a cash payment of \$3,000,000.

Since year end the company disposed of its shareholding in Dumagami Mines for \$191,000.

Iso's balance sheet as of Sept. 30, 1977, shows current assets of \$119,681 against current liabilities of \$1,610,045 (\$1,594,000 being a secured bank loan) for a working capital deficiency of \$1,490,364.



Phoenix Geophysics

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Wins safety award

## Afton Mines' first blister copper this month

By R. J. ROBERTS  
Assistant Editor

VANCOUVER — If all proceeds on schedule, Afton Mines should produce its first blister copper this month. John Anderson, mine manager, told the annual meeting.

In the first eight days of March the mill averaged 8,600 tons of ore per day. Open pit operations on the basis of three shifts a day, five days

a week, and employing two of three shovels are keeping pace with the mill.

He also revealed that the company will be awarded the B.C. mines dept. Open Pit Safety Award for 1977. The operation had only one lost time accident in 277,000 man hours worked, the best record for open pit mines in the province in 1977.

The Afton mine, mill and smelter complex built at a cost of about \$85 million is located near Kamloops, B.C. Tune-up operations in the mill began on Dec. 9, 1977. Construction of the smelter was delayed somewhat as a result of jurisdictional disputes between trade unions, but now has been essentially completed. In the meantime, the company sold to a custom smelter 5,100 metric tons of copper concentrate valued at \$3 million.

President Norman Keevil, Jr., described the annual meeting as a particularly satisfying one. Many of the shareholders have been with the company from the early days when the property was just a raw prospect, he said. You can be proud of having been part of an important discovery, and now of one of Canada's few significant new mines in recent years, he told the shareholders.

During February, he reported, the mill was operated at an average daily rate of 7,750 tons, or 11% above rated capacity of 7,000 tons per day. Grade treated in February averaged 0.94% copper. Recovery for the month was 86.7%, up from 82.3% in January and close to the planned rate of 87%.

The situation in the copper mar-

26



**AFTON MINES LTD.**

**EARLY PRODUCTION RESULTS REPORTED** - In the annual report of Afton Mines Ltd., N.B. Keevil, Jr., president, provides the following statistics on early production results. "A total of 134,856 tons of ore grading 0.76% copper was milled between December 9 and 31. This resulted in production of 988 tons of flotation concentrate grading 53% copper and 210 tons of gravity concentrate grading 75% copper, with recovery of 67%. Recovered gold and silver amounted to \$1.96 per ton of ore milled.

"Production in January averaged 7,400 tons per day for a total of 222,822 tons grading 0.90% copper. This resulted in 3,250 tons of flotation concentrate grading 40.5% copper and 451 tons of gravity concentrate grading 74.9% copper, and recovery had improved to 82.3%."

**INADEQUATE PROCEDURE TO SETTLE JURISDICTIONAL LABOUR DISPUTES COST COMPANY MILLIONS EXTRA** - Dr. Keevil pointed out in the report that while relations have been good with the United Steelworkers of America union there was a jurisdictional dispute which caused a several million dollar delay over \$50,000 worth of work. The International Brotherhood of Electrical Workers, responsible to the Afton contractor for electrical work on the property, chose to dispute the allocation of certain work to other unions. This resulted in a delay of at least one month in completion of the concentrator and two months in completion of the smelter.

"It is a serious problem for B.C. when this kind of jurisdictional dispute can cause such costly delays. Jurisdictional disputes will come up, but if a mechanism cannot be found to resolve them more quickly, then future investors will have no alternative but to build provision for unnecessary overruns into their planning. If this means projects are cancelled or curtailed, it will add to costs, lower productivity, contribute further to inflation, and affect the well-being of all British Columbians including members of the labour unions.

"The dispute was finally resolved after many months when the Minister of Labour appointed a special officer who upheld the original allocation of work and persuaded the union involved to get on with the job. What the Province needs is a mechanism to settle such disputes quickly, without resorting to costly illegal strikes or slowdowns. It would be constructive if union leaders would take the initiative in achieving such a mechanism."

The company is negotiating to increase its bank loan from \$75,000,000 to \$80,000,000 U.S. and to convert the total to income debentures. Additional financing of up to \$15,000,000 U.S. continues to be available from the British customers. The effect of the conversion will be to lower Afton's interest cost by approximately 4%. The saving of some \$3,200,000 in the first year of operation is equivalent to about 6¢ per pound of copper to be produced, and will represent an important saving.

The annual meeting will be held at 11:00 a.m., March 10, 1978, in the Georgia Hotel, Vancouver, B.C.

**Construction costs to reach \$85 million**

**Union disputes raise Afton development costs**

VANCOUVER - Afton Mines was Western Canada's first new copper producer in five years and the only significant new mine in Canada in 1977.

In the company's annual report, President N. B. Keevil, Jr., pays tribute to the people behind the discovery and development of the Afton deposit near Kamloops, B.C.

Open pit preparation by Afton crews and equipment began in April, 1977, after initial work by a contractor. By the end of the fiscal year, Sept. 30, 1977, 6,095,000 tons of material had been removed from the pit area and the mine was capable of supplying ore to the mill.

Construction of the project proceeded well except for delays caused by labor disputes. In addition to an eight-week loss in 1976 due to a province-wide construction shutdown, further delays in late 1977 were the result of union jurisdictional disputes.

Mr. Keevil explained that the In-

ternational Brotherhood of Electrical Workers disputed the allocation of certain work to other unions and a delay of at least a month in completion of the concentrator and two months in completion of the smelter resulted. He said that, although the work in question was worth only about \$50,000, the delays added several million dollars to the cost of the project.

The province of B.C. needs a mechanism to settle such disputes quickly, without resorting to illegal strikes or slowdowns, he said. Without such a mechanism, "future investors will have no alternative but to build provisions of unnecessary overruns into their planning.

"If this means projects are cancelled or curtailed, it will add to costs, lower productivity, contribute further to inflation and affect the well-being of all British Columbians including members of labor unions."

The Afton concentrator has been

operating since Dec. 9, 1977, and the smelter is expected to start up at the end of March (N.M., Jan. 19, 1978). Production in January averaged 7,400 tons of ore per day for a total of 222,822 tons grading 0.90% copper. This resulted in 3,250 tons of flotation concentrate grading 40.50% copper and 451 tons of gravity concentrate grading 74.90% copper. Recovery was about 82.30%.

By the end of the fiscal year, a total of \$73,000,000 had been spent and \$2,400,000 had been committed on equipment purchases. Construction costs to completion, excluding working capital, are expected to be \$85,000,000. There was a working capital deficit at year end of \$4,889,349.

Arrangements are under negotiation to increase bank loans for the Afton project from \$75 million to \$80 million and to convert the total to income debentures.

The annual meeting will be held March 10 in Vancouver.

Northern Miner - Feb. 23/78

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Excavation for pumphouse foundations at Kamloops Lake



Installation of groundwater monitoring wells

of 20 to 200 ft. Water samples are taken regularly by Afton Mines and analyzed. Water levels are recorded weekly in conjunction with the piezometer readings and assessed with regard to possible changes in the groundwater regime.

#### HIGHWAY RELOCATION


The Afton pit necessitated the relocation of about 3 miles of the Trans-Canada Highway. The new highway curves in an arc around the north side of the pit. Klohn Leonoff were responsible for investigation, design, preparation of contract specifications and construction supervision of the highway. Construction began in May 1976, and was completed by September 1976. View Construction Ltd., of Kamloops, was the prime contractor. Construction problems were minimal, with the weather posing the largest problem. Groundwater seepage in one section required construction of about 1000 feet of filter and drain to dewater and stabilize the highway. Inspection services by Klohn Leonoff involved nuclear density testing for compaction control, lab testing on site and quality control of construction.

#### FOUNDATIONS

The geotechnical assignment included design and inspection of foundations for mill and smelter structures and the pumphouse on Kamloops Lake. Site investigations for the proposed mill smelter structures started in 1975 with drilling and soil testing. The structures are primarily founded on an irregular rock surface at a shallow depth below glacial till. Structures with lower footing requirements are placed on the dense glacial till. High footing requirements for the primary crusher, ball mill, Top Blown Rotary Converter, and emission stack required mass reinforced concrete footings on bedrock. Site investigations by Klohn Leonoff on the pumphouse were carried out in 1976 by drilling from their raft with a penetrometer type drill and obtaining soil samples and profile. The pumphouse foundation is on rock and required excavation of surface silts by a dragline in the water and a front-end loader on the lakeshore.

#### GROUNDWATER

Groundwater investigations by Klohn Leonoff began in 1975-76 and consisted of a regional review of the groundwater regime and assessment of the impact mining operations would have on the groundwater. The work involved field mapping of groundwater recharge and discharge zones, pump tests in an abandoned shaft to help estimate rock permeability and tailings dam seepage estimates. As outlined in the section on tailings dams, groundwater monitoring wells have been installed downstream from the tailings pond, to determine any possible effect on groundwater. WM



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24



The work involved drilling, soil sampling, field permeability tests and installation of pneumatic piezometers in the foundation deposits. The piezometers are continuously monitored and measure pore pressures in the deposits.

Later in the spring, Pooley Construction Ltd. returned to the site and completed excavation for the cutoff key, and backfilled the cutoff with compacted glacial till to the original ground elevation. Other work involved construction of the seepage recovery dam and complete excavation of soft silt deposits under the east dam. Both operations required dewatering and excavation simultaneously. Filter gravels were supplied by Dawson Construction Ltd., as field investigations by Kohn Leonoff indicated no significant clean sand and gravel deposits on site. Future filter gravels will be produced on site from open pit rock after crushing and screening.

During the spring of 1977 Afton Mines had started opening up their pit with 11-yd<sup>3</sup> P&H shovels and 100-ton Lectra Haul trucks. Glacial till overburden from the pit was hauled to the dams for construction of the starter dams which consist entirely of compacted glacial till. Construction was on a 24 hour day with about 18,000yd<sup>3</sup> placed each day. The material was hauled to the site by 4 to 6 haul trucks and spread into 9 inch lifts by D-8 dozers. The material was then watered and mixed with a Rome disc until it was at optimum moisture content. The layer was then packed by 5 passes with a 45-ton (total dynamic force) Ingersoll Rand smooth drum vibratory compactor to average density of 100% Standard Proctor. The compactor was purchased by Afton Mines, and was chosen over

the conventional sheepfoot roller because it is also to be used for compaction of the rockfill zones and haul roads. The smooth surface produced by packing the glacial till was then scarified by the Rome disc to provide a good bond between layers. The starter dams were completed by November 1977, and will provide storage for about 1 year of milling operations. Construction on the dams will continue on an annual basis and rise approximately 25 feet each year.

**Monitoring and Instrumentation:** Monitoring of the dams will be done on a continual basis to confirm original design assumptions and construction procedures. Instrumentation for the dams is provided by EPIC Pneumatic Industries Ltd., of Vancouver. Pneumatic piezometers installed in the foundation soils at the west dam are collected in a readout station downstream of the dam. These are read weekly by Afton personnel and reviewed continually. The piezometers measure the pore pressure in the soils. Gauges will be installed in the rockfill portions of the dam to monitor settlement. Potential settlement is important as uncontrolled settlement could lead to cracking of the upstream impervious membrane. The relatively long construction period of the dams will aid in reducing post construction settlement.

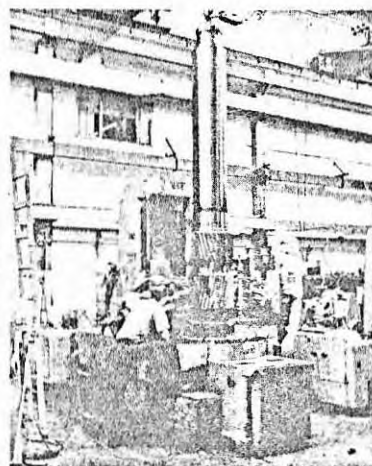
Groundwater monitoring wells to provide samples for environmental analysis were installed by Kohn Leonoff in 1976. There are 9 wells located downstream of the west dam and 2 downstream of the seepage recovery dam. The wells consist of a 3-in diameter plastic pipe with a sealed slotted section at depth. The wells were drilled to depths

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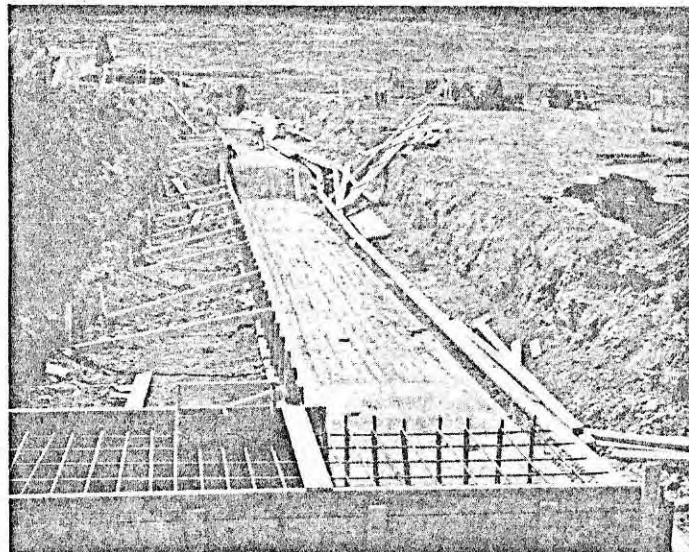


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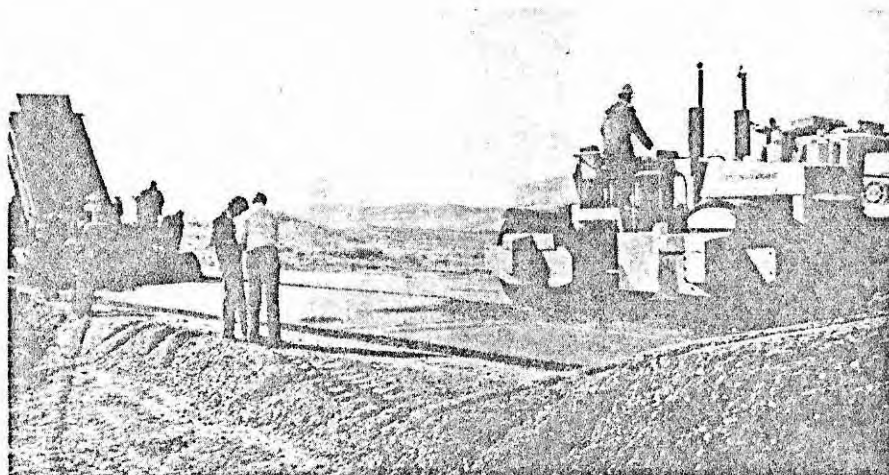
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Placement of fill material by mine haulage trucks



Footing construction for shops and warehouse structures



Trans-Canada Highway relocation — paving of final section

front-end loaders, 1 D-9, 3 D-8s, 2 D-7s, 2 D-6s, 2 compactors, and other ancillary equipment. The work in 1976 included the construction of the south dam, a 50-foot high diversion dam for Alkali Creek which otherwise would flow into the tailings pond. Heavy rains in August severely hampered construction as the glacial till used in the dam is impossible to work with when wet.

During construction it was only possible to work 6 days out of 18 to complete the dam. In addition to the south dam, work on the two main dams was started. Stripping of the subsurface deposits down to glacial till was started in the cutoff key areas. This work involved digging dewatering ditches and installing pumps to lower the groundwater table. Scrapers and dozers were used initially for excavation but later had to be replaced by front-end loaders and scrapers because of the wet and soft condition of some of the subsoils.

Klohn Leonoff Consultants had a project engineer on site supervising construction, inspecting foundations and construction, doing material searches for dam construction and test pit investigations for foundations and materials. Initial portions of the east starter dam were constructed using glacial till from borrow areas adjacent to the dam. Quality control testing was done in a lab on site. Construction on the west starter dam was halted pending a more detailed soil investigation of the pro-glacial pervious deposits which were exposed within the glacial till in the area of the west dam cutoff key.

Construction 1977: Detailed subsurface investigations were carried out by Klohn Leonoff Consultants Ltd in the spring of 1977 in the area of the west starter dam.

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West starter dam prior to tailings discharge

## Afton Mines project geotechnical engineering

Klohn Leonoff Consultants Ltd has been involved with the Afton Project since 1974 and has been working with Afton Mines on various geotechnical assignments. This work includes: the investigation, design, and construction supervision of all work related to earthwork, foundations, and groundwater; tailings disposal dams; relocation of the Trans-Canada Highway around the open pit; foundations of the mill and smelter structures and the pumphouse on Kamloops Lake; and the monitoring of groundwater downstream from the tailings disposal system. This article outlines the various geotechnical aspects of the Afton Project to date.

### TAILINGS DAMS

The site of the Afton Mines tailings pond is in the valley containing Hughes Lake,

approximately 3 miles south of Kamloops Lake and 9 miles west of Kamloops on Highway 1. The tailings pond is about 1 mile west of the mill site and ½ mile west of the open pit. The tailings pond will initially be enclosed by two large dams, one at each end of Hughes Lake, joining the high ridge on the north with the rising ground to the south. Two smaller dams will be built to an ultimate crest elevation of 2400 feet, roughly 285 feet above the present level of Hughes Lake. The dams will provide storage for approximately 95-million cubic yards.

**Subsoils:** The dam foundations are mainly composed of a dense, well-graded silt-sand-gravel mixture (glacial till) of varying depth lying directly on bedrock. The glacial till was deposited in several stages and has pro-glacial sands, silts and

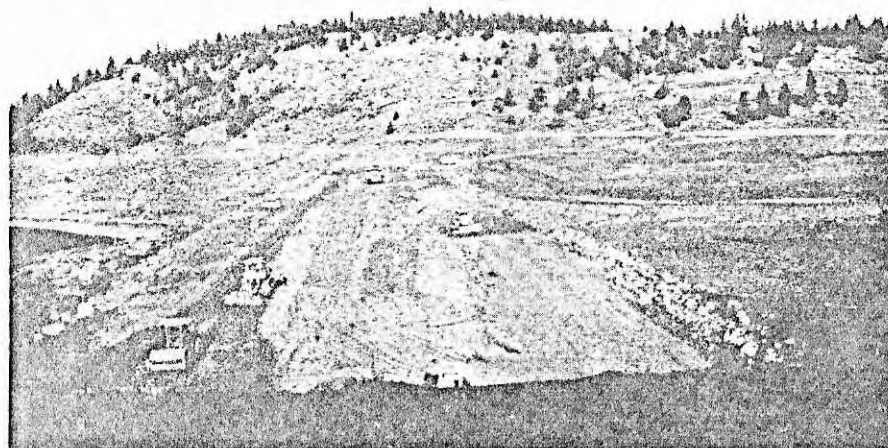
gravels dispersed irregularly within. More recent silt, sand, and gravel deposits occur in the Hughes Lake channel up to 35 feet deep. The softer sediments under the dam were excavated and in both dams a cutoff key was excavated through the recent deposits and into glacial till.

**Design:** The tailings dams are designed with a triangular section of waste rock sealed by an impervious upstream membrane of compacted glacial till. Two filter zones of carefully selected granular materials will separate the impervious membrane and rockfill and provide protection against piping and cracking, as well as internal drainage. The filter zones will extend beneath the rockfill zone to provide protection against upward piping of foundation soils.

The tailings material is expected to be a very fine slurry with a high slimes content. The very fine fraction is similar to Bentonite clay. The fine fraction of the tailings solids is not expected to settle rapidly. Hence a larger storage volume will be required initially to impound process water along with the tailings solids until water reclamation commences. The dams are not typical tailings dams in that a high head of water is in contact with the dam face. In this regard the dams are similar to water retention dams and are designed as such.

**Construction 1976:** Construction of the dams started in the summer of 1976. Pooley Construction Co Ltd, of Merritt, were the contractors responsible for earth-moving operations. Their equipment fleet consisted of up to 9 scrapers, 2

East starter dam construction 1977



an overflow to adjacent natural drainage and is 28 ft in diameter and 36 ft in height constructed on a reinforced concrete base.

#### TAILING DISPOSAL

Tailing is pumped some 10,000 feet from the concentrator to an impoundment area located in the valley of Hughes Lake south west of the open pit. This valley was selected as the only feasible location both from the topographic and areal standpoints. Estimated pond life has been determined on the basis that no reclaim water will be available from the pond due to the low settleability of the fine fraction of the tailing pulp. All mill process water must therefore be supplied by the fresh water system from Kamloops Lake. As the use of reclaim water from the pond could greatly extend the life of the pond and reduce pumping costs, Afton will be researching the use of flocculants to increase tailing settleability and thereby permit the installation of a reclaim system and a reduction in the input to the pond of fresh water from Kamloops Lake.

#### Tailing dams

To obtain the necessary storage capacity for the Afton tailing pond, it proved necessary to construct two major dams across the Hughes Lake valley and to impound the tailing between the two dams. Both will have an ultimate crest elevation of 2400 ft, rise 300 ft above the valley floor at its lowest point, and will be constructed with till and rock removed from the open pit. The dams will have a rock core and an impervious blanket on the upstream side. The rock and till will be separated by filter zones to prevent migration of fine materials. Both the

western and eastern dams will be free-standing with benched downstream faces at slopes of 1.5 to 1 and with upstream slopes of 2 to 1. The waste rock dump will be integrated with the downstream slope of the Eastern Dam. Together the dams will impound some 95-million cubic yards of tailing production and will themselves require 20-million cubic yards of waste rock fill.

Starter dams 100-ft high constructed of glacial till from the open pit and founded mainly on dense glacial tills are incorporated with the design. Embankment slopes are 2 to 1 and the fill is placed and compacted in 9-inch lifts.

In all, nine different tailing pond configurations were examined in the valley of Hughes Lake before final selection was made.

#### Stream diversions

In order to prevent natural drainage courses from entering the tailing pond area, and thus affecting downstream water rights, stream diversions were constructed at the South fork of Alkali Creek to the south of Hughes Lake and on East Creek at Moose Lake and Pot Hook Lake. As well, the diversion of creek flows at Moose Lake with the resulting control of inflows into downstream Pot Hook Lake was designed as a wildfowl habitat improvement project to provide controlled storage levels on the two lakes for wildfowl nesting when annual spring runoff permits.

#### Recovery systems

Provision has been made in the design of the tailing disposal system for the staged construction of seepage recovery systems for the west dam of the Hughes

Lake tailing pond.

The primary system, located 1800 ft downstream of the starter dam, consists of a 20-ft high earthfill dam with crest length of 250 ft constructed of compacted glacial till with 2½:1 embankment slopes. If required, a recovery pump house will be installed to recycle seepage water back to the tailing pond.

Similarly, a secondary system, located 3200 ft to the south of the primary system, may be required and would consist of a 20-ft high earthfill dam of similar construction to the primary system dam but with a crest length of 620 ft. A small pumping plant may be required to direct this flow to the primary system.

#### SEWAGE TREATMENT FACILITIES

Sewage treatment facilities designed for the mine consist of a 0.2-acre aerated lagoon with influent comminution and effluent chlorination. After chlorination, effluent is pumped 115 ft vertically to the concentrator tailing sump and from there it is conveyed with the tailing to the Afton tailing pond. During mill construction the lagoon was used in conjunction with a 1-acre evaporation lagoon to treat effluent from a peak period work force in excess of 570 men and women. The evaporation lagoon is retained as an emergency effluent holding basin in the event of sewage pump failure, and also may be used as a source of water for sprinkler irrigation of forage crops.

#### PERMITS

Approvals required for the implementation of this project included a number of water licences, Pollution Control Branch permits (both for liquid effluent and concentrator air emissions), and Mines Department approvals, together with Crown Land rights-of-way, navigable waters permit for the Lake pumping plant, and oil, gas, telephone, power, railway and highway crossings.


Pollution Control Branch requirements were particularly demanding and in this respect considerable attention was given to ensure full conformity with the regulations.

#### CONSTRUCTION AND DESIGN

Commonwealth Construction was responsible as main contractor for all the project items described, as well as the concentrator construction.


Teck Corporation headed the design group for the entire project, and Ker. Priestman & Associates Ltd were prime consultants for the water supply, recovery and tailing disposal systems. Geotechnical design of the tailing dam impoundments was provided by Klobn Leonoff Consultants Ltd. Tailing dam construction was also carried out under the supervision of Klobn Leonoff personnel. Wright Engineers Ltd were responsible for electrical design work on the water supply system.

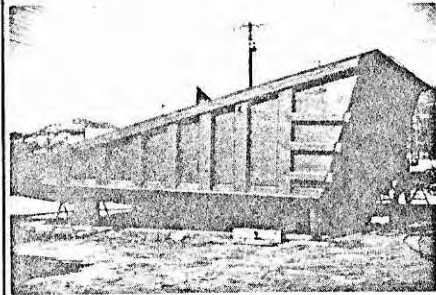
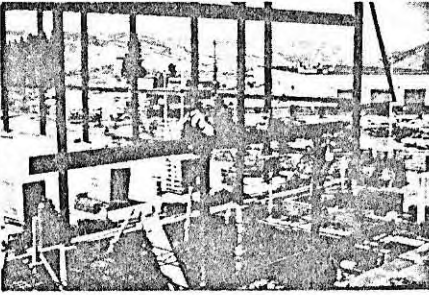
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pumphouse through two 24-inch diameter valved inlets which receive their supply by gravity from a submerged intake located at the end of 225 feet of 36-inch diameter pipe at a depth of 30 feet below low-water-level. Intake depth is selected to discourage algae growth on the intake screens due to the low level of light penetration at a depth of 30 feet or more. The intake box consists of 16x0.028 inch dia mesh intake screens each 10 ft<sup>2</sup> in area, designed for easy removal and replacement during cleaning. Flow velocity through the screens does not exceed 0.1 ft/sec required by fishery regulations. The intake structure was designed to be prefabricated off-site, transported and submerged in one piece to facilitate field installation.

Due to the 28 feet range of lake levels for Kamloops Lake, the pumping plant is designed with a 34-ft deep reinforced concrete sump which provides a normal minimum of 4ft of water from which the vertical turbine pumps installed therein draw suction. The pump motors and discharge pipework are located directly above the sump on the ground floor of the building and the electrical controls are situated on a mezzanine level 7 ft above floor level to minimize pumphouse space requirements.

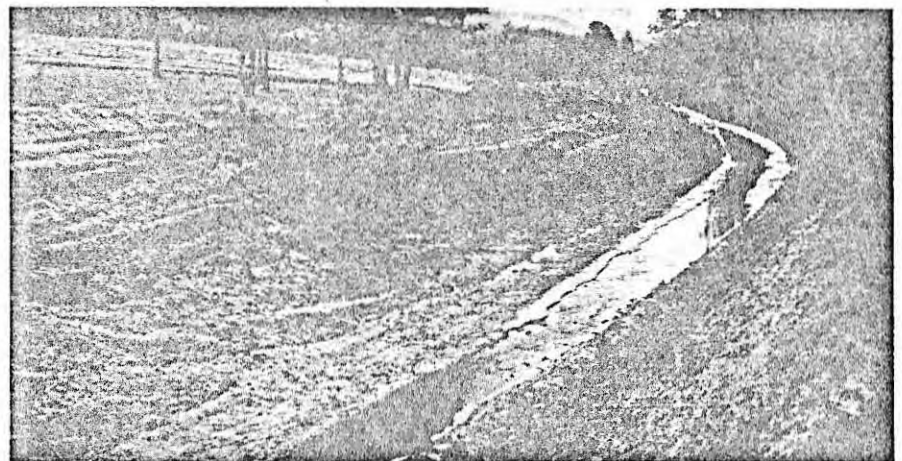
The 300-horsepower vertical turbine pumps installed in the pumping plant each deliver 1100 USgal/min in parallel against a total head of 790 ft to the sump of a Booster Pumping Plant 3600 ft along the pipeline route. Motors are 1775rev/min 4160V with power supplied by overhead powerlines from a transformer station located at the booster plant, and operation is fully automatic with a telemetry connection to the mill control centre. Start-stop surges are relieved by automatic valving manifolded to the pumphouse sump, and pipeline surge relief is provided for by an electrically controlled double acting relief valve, which also serves as a blow-off. Design pressure for the plant pipework and valves is 500 lb/in<sup>2</sup> which allows adequate safeguard for pipeline pressure surging over and above the normal operating pressure of 340 lb/in<sup>2</sup>.

A pre-fabricated metal building houses the plant mechanical and electrical equipment. Access is provided across the Canadian Pacific Railroad tracks which skirt the south shore of Kamloops Lake.

#### Booster pumping plant and pipeline

Water is pumped a vertical distance of 1400 ft to the mill site in two separate pumping lifts, using one booster station on the pipeline at a location selected to balance the pumping head at each station. The booster delivers directly to the mill head tank lifting against a total design head of 685 ft.

The booster pumping plant consists of



Water: Alkali Creek diversion in 8 in cut

a reinforced concrete sump to receive the incoming flow and provide some storage for pump control purposes, and a pre-fabricated metal superstructure housing the mechanical and electrical equipment. The sump has a capacity of 40,000 US gallons between normal high and low water levels. The four vertical turbine pumps in the station are similar to those at the Lake Pumping Plant, so that in all, a total of eight 300-horsepower pumping units with either 7 or 8 stages each are installed on the fresh water delivery pipeline. The normal operating pressure at the Booster is 290 lb/in<sup>2</sup> and the design pressure is 450 lb/in<sup>2</sup>. Automatic control employing float switches for start-stop sequencing, and conventional alarm and protective devices are integrated between both pumping plants and the mill, so that the system is fully automated under normal operating conditions.

Electrical supply to the booster station is by overhead 12kV line and is trans-

formed to 4.16kV at the substation located at the booster site.

The water pipeline is 24 inch OD steel pipe to AWWA specification, yellow-jacket coated externally and butt welded throughout. Overall length is 25,000 feet, of which the majority is 0.250 inch wall. Where pipeline ascent slopes are steep and pressures are high, wall thickness is increased to 0.281 inch. Design capacity of the line is 4400 USgal/min. Protection against freezing was provided for by burying the line full length with a nominal cover of 4 ft, housing air valves in insulated pits and taking special precaution at the pumping plants.

Completed sections of the installation were air tested at 50 lb/in<sup>2</sup> followed by a leakage test at 500 lb/in<sup>2</sup> maximum.

A 160,000 US gallon storage reservoir was constructed on high ground at elevation 2470 ft adjacent to the smelter site and is the terminal point on the fresh water pipeline. The tank is provided with

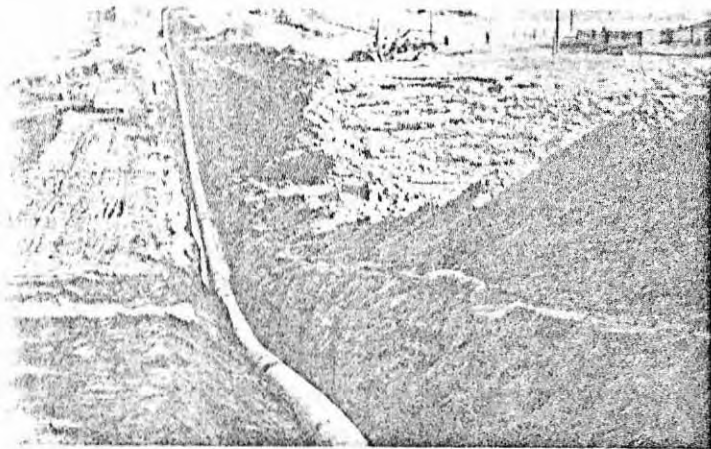


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#### Water Supply and Tailings Disposal Pollution Control — Townsite Development

"We were pleased to provide expertise in regard to water supply, tailings disposal and pollution control permit applications for the Afton Project, and extend best wishes for a successful future."

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**Water:** General view of the Afton water pipeline construction



**Water:** Kamloops Lake near the Afton pumping plant site; leading edge of the Thompson River delta is in middle background

## Afton Mines

# Water supply and tailing disposal



**N I Guild PEng**  
Ker, Priestman & Associates Ltd

The Afton complex is a copper mine-mill-smelter development located ten miles west of the city of Kamloops, BC, at an elevation of 2300 feet.

Minimum plant design capacity is 7200 tons/day, with the expectation that greater throughputs might be realistically achieved.

This paper outlines feasibility studies initially carried out for fresh water supply purposes, final design of the fresh water and recovery water systems, tailing disposal considerations, and the procurement of required permits from the Governmental agencies concerned.

### FRESH WATER SUPPLY SYSTEM

Fresh water demand was established for design purposes at 4400 USgal/min which provided 3300USgal/min for mil-

ling purposes and 1100USgal/min for land reclamation and irrigation in and around the mine site during the summer months.

At the feasibility stage, all of the available sources in the area were investigated as follows: (1) Kamloops Lake. (2) Thompson River entering Kamloops Lake. (3) Upland surface waters. (4) Groundwater.

The evaluation studies were completed in August 1973, and towards the end of the year a decision was made to utilize Kamloops Lake as the water supply source offering the best operational security for the continuous demand of a modern ore milling complex.

It is of interest that the Thompson River System supports runs of coho, chinook, sockeye, and pink salmon, the majority of which pass through Kamloops Lake to spawn in the Adams and Shuswap Lake Systems of the South Thompson River. Runs of sockeye greater than 1,000,000 spawners have been recorded in the Adams River Area. In view of the importance of the Kamloops Lake fishery, early discussions were held with the Fisheries and Marine Branch of Environment Canada to enable an intake design to be developed that would meet all the technical requirements of that agency.

The final plan adopted for the fresh water system consists of a 25,000-foot pressure pipeline delivering 4400 USgal/min from a pumphouse constructed on Kamloops Lake to the mill site storage tank, some 1400ft higher in

elevation. The following main components are described.

### Kamloops Lake pumping plant

Kamloops Lake is a body of fresh water 16 miles in length, 233ft in mean depth, and with a volume of  $3 \times 10^6$  acre-feet. At the east end of the Lake is the Thompson River Delta, a steep unstable slope where sedimentation is occurring at the very rapid forward rate of 80 feet per annum in the shallower depths. Studies by Environment Canada have determined that the rate of sedimentation decreases as the distance from the delta increases and that sediment distribution in the Lake is notably coarser along the North side of the Lake up to 5 miles downstream of the delta, reflecting the extension and confinement of river-induced flow along the north side of the Lake.

Taking into account the aforementioned features of Kamloops Lake limnology, the location of the Lake Pumping Plant was chosen to provide an accessible southshore site, sufficiently downstream from the Thompson River Delta to be free from the advancing delta sediments and to be capable of supplying Afton with water low in suspended solids and free from river debris. The pumphouse structure is founded on rock in the lakeshore and, due to an impervious layer of blue clay above the rock, construction of the foundations was able to proceed some 9 feet below the lake water level without the need for a cofferdam.

Water enters the deep sump of the



## PROJECT DESIGN DATA

### CAPACITIES OF FRESH WATER SUPPLY SYSTEM

#### LAKE PUMPING PLANT

4/VTP, 8 STAGE, 300 HP UNITS, 1100 US gpm AT 790 FT. TDH.

#### FRESH WATER BOOSTER PUMPING PLANT

4/VTP, 7 STAGE, 300 HP UNITS, 1100 US gpm AT 885 FT. TDH.

#### 24 IN DIA. FRESH WATER PIPELINE

CAPACITY - 4400 US gpm

#### FRESH WATER STORAGE

FRESH WATER TANK - 150,000 US GALLONS. T.W.L. ELEV. AT 2506 FT.

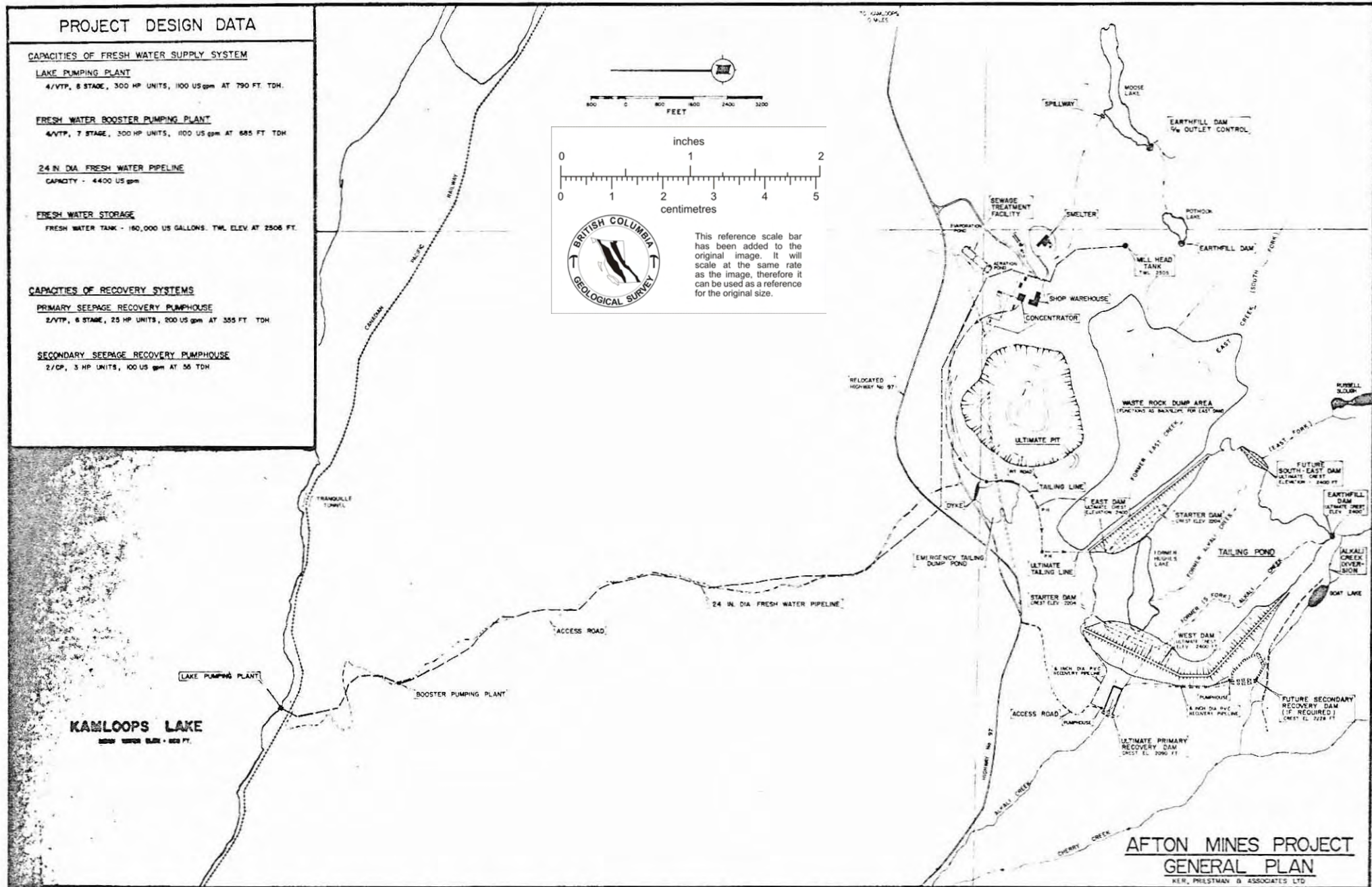
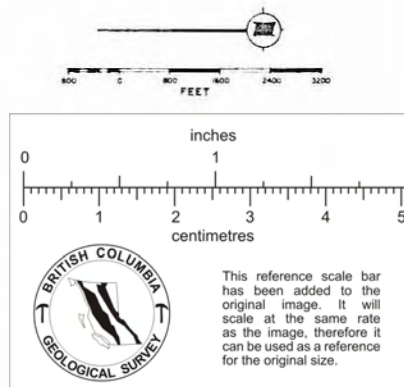
### CAPACITIES OF RECOVERY SYSTEMS

#### PRIMARY SEEPAGE RECOVERY PUMPHOUSE

2/VTP, 6 STAGE, 25 HP UNITS, 200 US gpm AT 355 FT. TDH.

#### SECONDARY SEEPAGE RECOVERY PUMPHOUSE

2/CP, 3 HP UNITS, 100 US gpm AT 56 TDH.



**AFTON MINES PROJECT**  
**GENERAL PLAN**  
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1400°F to 1500°F range to about 650°F. Dust in the gases is removed by an electrostatic precipitator and the sulphur dioxide gas by a dual-alkali scrubber. The gas treatment system was built at a cost of \$4-million. Cleaned converter gases are emitted through a 300ft stack at a point 1500ft above Kamloops.

#### RECENT OPERATIONS

In early December 1977, the third group of smelter staff from Afton was in Sudbury where Inco staff was showing them proper operation of the TBRC converter.

Mining was proceeding in the open pit five days a week, three shifts per day and

producing 75,000 tons per day using two P&H AL shovels (there is a third shovel on standby), eleven 100-ton Unit Rig trucks, and two Bucyrus Erie 40R drills. By the end of November 1977, nine-million tons of material had been moved. The operation is running 12,500 tons per shovel shift, 2800 tons per truck shift, and 630ft per drill shift. Pit dimensions in December 1977 were 1500ft by 2300ft and 100ft deep. It will grow to 2700ft by 2800ft and 900ft deep.

A new crushing and screening plant, purchased for \$500,000, had been in operation for 10 days, producing material for the tailings dam and roads from waste from the pit.

Mine ore is crushed to minus eight inches in a 42in by 65in gyratory crusher and conveyed to a 25,000-tons live load stockpile. The material is fed by two reclaim conveyors, with three Nico 550H feeders on each, to the 28ft by 12ft 5300hp semi-autogenous mill. The concentrator also includes a 16½ft by 29ft 4800hp ball mill and a 9½ft regrind mill. All mills are supplied by Koppers.

Total mill power requirements are 26,000hp, and overall recovery will average 87%. The two concentrate products are dried and stored in bins above the TBRC prior to charging the converter. Other products stored are the lime flux, briquetted electrostatic precipitator dust and coke.

#### PEOPLE

Key staff at the mine, in addition to Mr Anderson, include: Earl McManus, construction superintendent (Commonwealth Construction); Charlie Lighthall, construction superintendent (Teck); John Lovering, mill superintendent; Joe McDonald, smelter superintendent; Mike Lipkewich, pit superintendent; John Bell, plant superintendent (mechanical, electrical and maintenance); Terry Duggan, chief accountant; Gerry Bell, superintendent employee relations; and Peter Atkinson, chief engineer.

Sugarloaf Ranches is run by Max Leavens, a retired mine manager for Copperfields at Temagami, and Sam Strande.

Mr Anderson said that at the end of October 1977, of the 228 people on staff, the average age was 32 years, 27% had been on unemployment insurance immediately prior to working at Afton, 49% were residents of the Kamloops area, 69% were married, and 11% were women. Of union employees, 43% had been on unemployment insurance before coming to the mine.

Employee relations is an important facet of the operation and there is a training fund for shop stewards regarding interpretation of the collective agreement.

The operation will employ an estimated 325 people when in full production.

#### References:

The Afton Discovery by Chester Millar WM Feb'73 p33

Afton Dispute Settled WM May'73 p47

Afton Mines Go Ahead WM Nov'76 p16

Afton Mines photo review WM Sept'76 p16

Afton; An Update on Progress at BC's newest Mine by JM Anderson PEng,

Afton mine manager, *The BC Professional Engineer* Nov'77 p10.

TBRC smelter process for Copper, brochure by Dravo Corporation WM

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that the actual population centre is eight miles away.

On-going surveys of mineral content in soil, vegetation and cattle were initiated in addition to regular meteorological studies.

The Top Blown Rotary Converter, built by Krupps, West Germany, arrived on site in May 1977. The primary crusher, supplied by Allis Chalmers, was put into operation in August, and the concentrator was being tuned up in December. A delay in mill startup occurred when a transformer malfunctioned and a replacement had to be brought from San Francisco.

The shop, warehouse and changehouse complex, a \$2-million building, was occupied in April 1977 as was the administration office building constructed at a cost of \$320,000. The assay and research laboratory, valued at \$400,000 (equipped) has been in service since June 1977.

#### CURRENT OPERATIONS

At the time of Western Miner's visit to the mine, most of the construction work still underway was in the smelter building. The bulk of this was electrical and instrumentation installation. Mine manager John Anderson said half the Commonwealth Construction employees on site were electricians.

Although Afton was aiming for the end of 1977 as the goal for beginning copper production, it now appears that the end of February 1978 is more realistic (partly because of a labour dispute).

Mr Anderson said the company hoped to wind up work by sub-trades by Christmas and the main construction force was not due to return to the site until the first week of January.

Afton states that its smelter will be the cleanest in North America.

Testing of the Top Blown Rotary Converter, built under licence from Inco and Dravo at a total cost of \$2-million, had been underway under supervision of Fritz Hesse a representative of Krupps, West Germany, builders of the converter. The hot metal crane was due to be tested under load. Afton will be the first commercial copper smelter designed by Dravo to use the TBRC oxygen-oriented technology. Previous applications have been in the nickel industry.

Because of the high native copper content of the Afton ore, the TBRC process was chosen as the most economical and efficient.

When compared to the electric furnace method, the TBRC smelter offered greater flexibility for processing varying grades of concentrate and also permitted appreciable savings in capital costs.

Mr Anderson said, however, that although it would be possible to convert the smelter to enable it to handle concentrates from other operations, he doubted if this would be undertaken. Only Afton ore will be treated. Evidently a different

sulphur treatment system would have to be incorporated to handle conventional concentrates which are normally 25% sulphur. The Afton concentrates combined as smelter feed have a low sulphur content — 3% to 5%. The smelter, however, would be ideal for treating scrap or cement copper, he said.

In comparison with hydrometallurgical leaching, the TBRC offers greater flexibility for the recovery of precious metals.

The single furnace TBRC smelter at Afton has a diameter of 14ft and a length of 21ft and is designed to produce 28,000 tons of blister copper annually in 1200-lb billet form (assaying 99%) for shipment by truck and rail. The converter's daily capacity is up to 300 tons of copper concentrate.

Gravity concentrate (from native copper in the ore) will contain more than 90% metallic copper and will be trucked up to the smelter building from the concen-

trator below while flotation concentrate, containing 55% copper, will be pumped to the smelter. The two concentrates will be mixed to give a smelter feed of 65% copper.

In the smelting cycle, the desired oxygen-natural gas flame is set for the lance while the flotation concentrate and a lime flux are charged to the furnace. After initial meltdown is achieved, the furnace returns to the operating position and smelting resumes until all the flotation concentrate has been charged.

The metallic concentrate is charged later in the blowing cycle and the slagging operation is repeated. If slags need cleaning, they are kept in refractory-lined ladles for return to the smelter.

Copper is poured into ladles and taken to the casting area. Process exhaust gases are diluted by controlling the leakage of ambient air into the mouth of the exhaust hood. A water spray chamber reduces their temperature from the

#### Congratulations to Afton Mines

in bringing their mine, mill smelter complex to fruition. Denver Equipment is proud to have been associated in supplying reliable and economical Flotation Equipment for this important B.C. mining operation.

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Because of its higher grade ore, Afton's cost to produce a pound of copper, it is estimated, will be one of the lowest in Canada.

But low copper prices aren't being ignored. Afton's President Norman B. Keevil Jr. has said that with current copper prices being depressed, it is important that everything practical be done to reduce operating costs. And that's why Teck hopes to restructure the financing of the project as mentioned above. The potential reduction in interest represents the single biggest cost saving available to the company and should add to its profitability, said Dr. Keevil.

The smelter qualifies for benefits under the BC Copper Smelting and Refining Incentive Act which provides for

payments of up to 2.27¢ per pound for blister and refined copper produced in a smelter or refinery in the province. The payments are limited to 10 years and to a maximum of \$500,000 a year.

Mr. Keevil has explained in the past that the reason the Afton project has moved ahead at this time is that Teck believes the worst is over.

Two British companies — British Insulated Callendars Cables Ltd and Delta Metals Ltd — have contracted to buy half (each) of Afton's yearly output of blister copper. The contracts are for eight years and the price will be in accordance with London Metal Exchange fluctuations.

Development included relocating about 2.8 miles of the Trans Canada Highway which formerly ran through one side of the property at a cost to Afton Mines of \$1-million. Unusually heavy rains in the summer of 1976 delayed some of this work. A 6000ft segment of the Inland Natural Gas 12in main line was moved, and the Trans Mountain oil pipeline has been relocated at the east and west ends of the intersections with the new highway. The 138kV hydro main line had to be raised to provide adequate clearance for the highway. Necessary relocations cost a total of \$1.4-million.

In a demonstration of the practical applications of multiple land use theories, Afton operates a ranching subsidiary adjacent to the mine — Sugarloaf ranches Ltd.

Over the past four years, Afton has acquired some 2300 acres of fee simple land and 4900 acres of Crown grazing leases and has operated through its subsidiary a 200-head cow-half operation since 1975.

The major contractor for the Afton project was Commonwealth Construction. Other companies involved in the

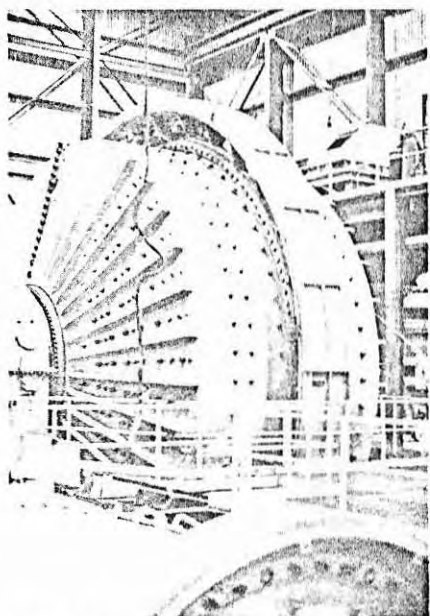
development of the new mine include: Wright Engineers, concentrator, plant and electrical design; Ker Priestman, water system; Klohn Leonoff Consultants, geotechnical work, tailings dam design; Pooley Bros, site preparation, overburden removal; Gould Electric, power transmission lines. There were, of course, many other firms involved in a project of this size.

Applications were made for five Pollution Control Board permits for construction camp sewage, refuse, concentrator air emissions, concentrator tailings, and smelter air emissions. All permits were issued in April 1976 with appeal hearings held in July and appeals subsequently dismissed in August of that year when the board ruled that the operation of the proposed copper mine, mill and smelter complex did not constitute a threat to the environment of the Kamloops area and that it felt it was in the public interest that the permits be issued.

A 25,000ft fresh water pipeline from Kamloops Lake to the plant site was begun in September 1976 and completed just before Christmas that year. The total cost of the system was about \$2.3-million.

A province-wide construction industry strike-lockout from June to August 1976 resulted in the loss of 25 working days on the project. Structural steel for the main shop was in place by mid-August 1976 and foundation work was begun on the concentrator and smelter.

Months of red tape and wrangles with various levels of government resulted from overlapping jurisdictions. The rezoning of the plant site from agricultural-forestry to heavy industrial took five months. The problem apparently arose from Afton's close proximity to the Kamloops town limits, in spite of the fact



**AFTON:** Semi-autogenous mill in plant with regrind mill in foreground

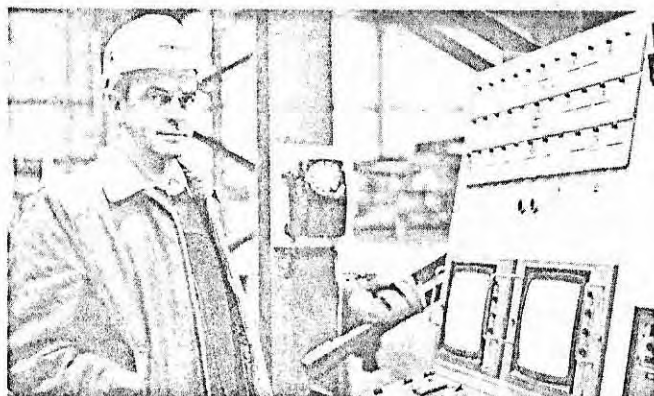
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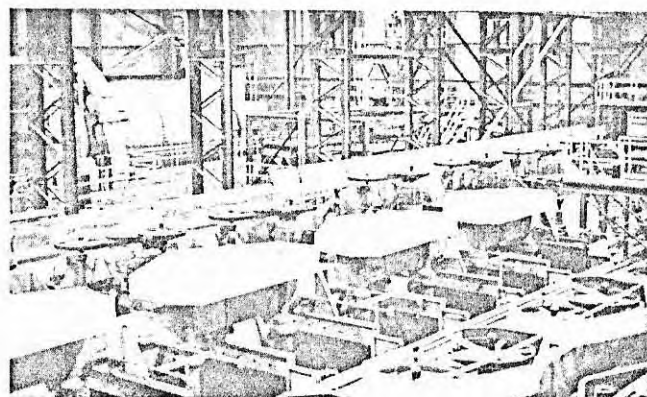
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14





**AFTON:** Mine Manager John Anderson is seen near the mill control panel



**AFTON:** Banks of flotation cells in the mill. Two types of concentrate — flotation and gravity — are produced for mixing as feed for the Top Blown Rotary Converter

report, Duval Corporation was given the first rights of refusal. The report recommended further diamond drilling.

An option was taken on the property in 1970-71 by Quintana Minerals. Seventeen percussion drill holes were put down but nothing was found and the option expired on 31 August 1971.

At this time Afton Mines, which still had \$70,000 in its treasury, decided to proceed with percussion drilling on areas showing copper mineralization. This began in September with Mr Millar drilling the first hole with a homemade drill.

During that month, 17 vertical percussion holes were drilled on 100ft centres and 300ft deep filling in an area of about 400 feet-square beside the diamond drill hole which intersected copper. Most bottomed in ore and drilling stopped to arrange further financing. Drilling resumed in November 1971, coincident with an underwriting.

A new IP survey showed anomalous conditions to extend further west than expected. This discrepancy was explained by drilling to the west which showed an increasingly thick cover of tertiary sediments covering the ore zone in addition to a rise in topography. The percussion drill had difficulty getting through this cover as it moved to the west but rotary drilling proved to be more successful.

Development of the property was suspended for a time pending clarification of an agreement signed on May 1972 between Canex Placer Limited and Afton Mines.

Settlement was reached in May 1973 which called for Teck Corporation and Iso Mines to pay Canex Placer \$4-million to relinquish its interest in the Afton property.

The original agreement had specified that Canex Placer would put up money for exploration and development work in return for an interest in the property.

Teck and Iso (Teck-controlled) disputed the agreement, arguing that they had bought control of Afton on the open market in 1972 and did not approve of the

deal which would eventually have reduced their 51% ownership position.

Work resumed on the property after settlement was reached. From late 1970 until late 1973, more than 29 miles of drilling were completed on the Afton property.

#### **GEOLOGY**

The Afton deposit is located at the western end of the Ironmask batholith, an intrusive comprised of a coarse-grained granodiorite phase and a fine-grained microdiorite-micromonzonite phase.

The batholith is associated with two intrusives — the Cherry Creek and the Sugarloaf, both of which are porphyritic and of later age than the Ironmask. The mineralization is mainly associated with the Sugarloaf and Cherry Creek intrusives and occurs as veins, stock works and disseminations.

The Lake Zone of the Afton deposits appears to be localized at the junction of two major fault systems. One system comprises a set of enechelon faults, trending east to northeast with a dip of 60° to 70°. These faults are probably an important ore control, according to mine manager John Anderson. The main fault is a major part of this system and there is also a second series of faults running generally north-south.

The mineralization is distinctive. Copper minerals include native copper, chalcocite, bornite and chalcopyrite.

#### **FINANCING**

Teck Corporation controls Afton Mines through a 50% direct ownership and through its 65% ownership of Iso Mines which holds 23% of Afton. This gives Teck a 65% equity in Afton which is a Canadian company with more than 99% of the issued shares held by Canadians.

At presstime, plans had been announced to convert \$80-million of the financing of the estimated cost of \$85-million of the Afton project to income debentures. This will have the effect of lowering Afton's interest rate by about 4% resulting in a cost saving of \$3.2-

million in the first full year of operation, equivalent to about 84¢ per share or 6¢ per pound of copper produced.

The company's bankers, the Bank of Montreal and the Canadian Imperial Bank of Commerce, have agreed in principle to this arrangement. However, the banks must be provided with further security and this will be achieved by a financial restructuring of the Afton project. It will become an operating joint venture between Afton and Teck Corporation with Teck's interest, formerly being a 50% shareholding in Afton, becoming instead an equal direct participation in the project.

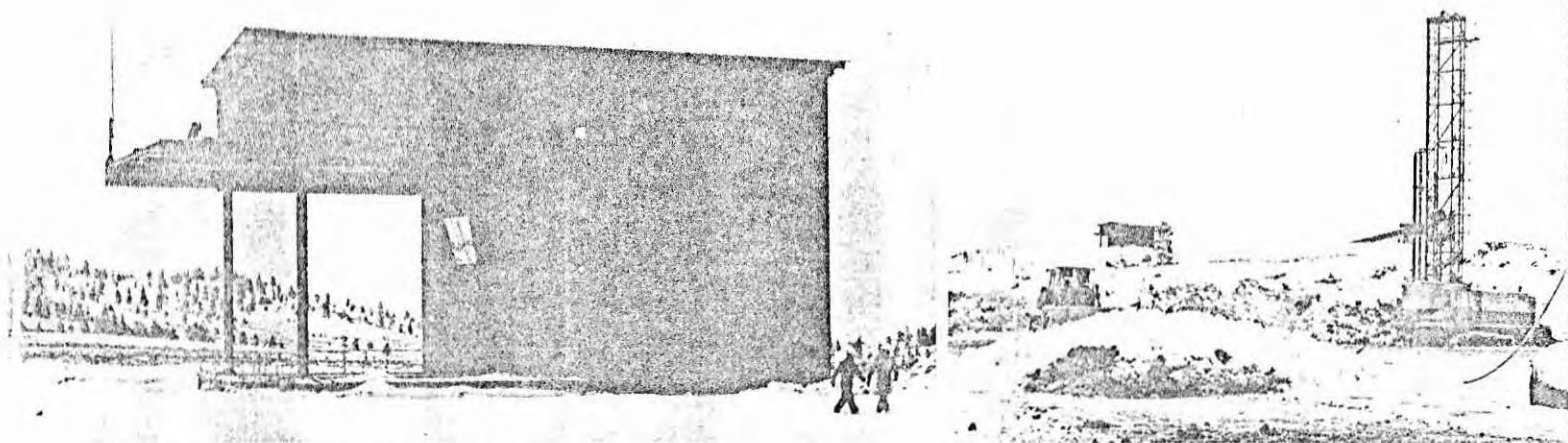
There will be no change in the operation of the mine, which will function as a joint venture under the same management, and the equity of other shareholders of Afton in the orebody and plant will remain unchanged.

Issuance of the income debenture is subject to approval of the department of national revenue, and the financial restructuring will proceed only if the income debenture is obtained. All arrangements are subject to shareholders' approval.

#### **DEVELOPMENT**

The decision to go ahead with the Afton project was made in October 1975 and site preparation began in March 1976. It is somewhat ironic that the development of BC's first smelter in modern times, as part of the \$85-million copper mine-mill complex, occurred in a period of depressed copper prices. The reason the project has attracted so much attention is that it is the only development of its size in the country. At a time when the industry as a whole seems to be waiting for things to improve, Afton is steaming ahead.

Management foresees a turnaround for copper prices in the long term. The operation will have the advantages of good grade ore and relatively low operating costs. Ore reserves amenable to open pit mining are 34-million tons of 1% copper with \$2 per ton gold and silver values.



AFTON: Primary crusher building at the mine site

AFTON: The new copper mine-mill-smelter complex near Kamloops has two of these Bucyrus Erie 40R drills at work in the open pit

## The Afton Mines project

# Flowing along sweet and gentle

Pamela Bottomley

A lot of people have been excited by the word Afton for a long time. And now that the dream is nearing fruition — copper concentrate is being prepared for the innovative Top Blown Rotary Converter — excitement is running higher yet.

Afton Mines is the only substantial new base metal mine to come into production in BC in recent years and was the only major base metal mine under construction in the entire country in 1977. The climax of many years' hard work, millions of dollars spent, not to mention a few prayers, will come when blister copper is poured at the smelter, probably at the end of February.

It happened to be a big day for Afton when Western Miner visited the site near Kamloops in early December 1977: for the first time, the huge semi-autogenous mill rolled over. There were a lot of smiles in the plant that day. A few days later, ore from a healthy stockpile was churning through the mill.

### HISTORY

The potential of the Afton area was suspected as long ago as 1898 although the discovery of the copper deposit did not occur until late 1971.

An English company sank a shaft 330ft deep in 1898, known as the Pothook, in addition to many pits and trenches.

Much later work focussed on this area.

There were only a couple of mines in the Kamloops area that had been worked to any degree — the Iron Mask to the east of Afton and the Copper King to the northwest. The Iron Mask ran periodically between 1903 and 1927.

In 1949, a prospector named Axel Bergland staked eight claims over the Pothook workings and called them Afton. Kennecott Copper optioned them and drilled 12 holes near the shaft in 1952.

The next option was taken by Graham-Bousquet, which staked additional claims and performed geochemical and geophysical work in 1956-67. A number of anomalies were found but the option was dropped after a few of them were drilled.

Noranda optioned the area in 1958 and drilled the Afton claims. An induced polarization survey was conducted over the area in 1960 by New Jersey Zinc which encountered an anomaly over the Pothook shaft but this was not followed up.

Chester Millar, who usually gets credit for the discovery of the Afton deposit, became interested in the claims in 1964 at a time when he was working on a nearby property as a drilling contractor.

He persuaded Colonial Mines to begin percussion drilling around the Pothook shaft but this was stopped after 11 holes.

Mr Millar then formed a private syndicate in 1965 to continue work and staked more claims adjacent to the Trans Canada Highway. Another 30 holes were drilled and an induced polarization survey was conducted.

The drill program revealed an east-west trending zone of copper mineralization extending beyond the drilling area to the west and below the bottom of the drill holes. The IP survey showed a large anomaly trending in the same direction centred several hundred feet south of the Pothook shaft.

A consulting geological firm was hired to prepare a report on the property with the idea of attracting public financing. This was received in 1967, and an underwriting was completed in 1969.

The report had recommended drilling nine diamond drill holes, in several weak IP anomalies, and five of these were completed in 1970.

The results showed that the IP anomaly passing south of the Pothook copper zone was caused by pyrite disseminated in the intrusive rocks. One hole intersected 170ft of 0.4% copper in a zone of massive magnetite veining. This hole was one recommended by the consultants, and was located on the weak IP anomaly that was later found to be present over the Afton orebody.

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## Congratulations Teck

This month we extend congratulations to Teck Corp for placing in production the Afton copper mine, an \$85-million project, about eight miles west of Kamloops, BC.

The first ore was fed to the mill on 9 Dec, and the smelter, with a capacity to produce 50- to 60-million pounds of copper a year, should be ready to start operation by the end of February 1978. It is the third mine that Teck has brought into production in three years, a remarkable achievement, especially in a period when the country's political climate for mining is disappointing.

Production at Afton is commencing at a time of low copper prices, but, also, at a time when copper prices are beginning to strengthen. At reasonable copper prices, the mine, which will be one of the lowest-cost copper mines in North America, will make a substantial contribution to Teck earnings.

More important is the economic benefit of Afton's mining, milling, and smelting complex to Kamloops and the surrounding area. The people of Kamloops should indeed be proud of this splendid operation and happy with its contribution to their well being. With unemployment across Canada at the highest level since the dreadful depression of the 1930s, this new mine, we hope Ottawa notes, is playing a significant role in providing permanent employment to at least 300 persons in the area.

Afton's annual payroll will be in the neighborhood of \$5-million to \$6-million. In addition to these millions of dollars, the company will be spending substantial amounts for local services and supplies. All of these millions will course through the economic veins of the Kamloops area in the form of purchases of accommodation, food, clothing, appliances and so forth to the benefit of wholesale and retail business, large and small.

In this mining industry, there is always to be expected some complaint from a vociferous minority group of environmentalists who, choosing to ignore the fact that metals are essential to modern life, are against mine openings.

Great pains have been taken to scar the environment as little as possible in developing the Afton mine and constructing the mill and smelter. The idea is to minimize adverse environmental impact and to improve existing conditions wherever possible. In keeping with the local scenery, Afton is operating a cattle range on its property. The most advanced technology is being employed. The smelter, the first copper smelter in British Columbia in modern times, is expected to be the cleanest on this Continent. Undoubtedly, the mine will be a showpiece for the industry.

Teck is to be commended. It has done a fine job.

# Western Miner

COVERING THE CANADIAN MINING SCENE FROM COAST TO COAST

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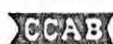
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**NEXT MONTH:** Exploration is the general theme, with special reports on uranium, British Columbia, the Yukon, diamond drilling, and some of the statistical techniques that aid exploration

(10)



AFTON MINES LTD.

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SIX MONTHS REPORT - In the six months ended March 31,1976, Afton Mines Ltd. received \$5,892,600 from term bank loans and ended the period with a working capital of \$766,697 after having spent \$2,488,788 on construction in progress, \$102,471 for land and grazing leases, \$35,000 on mortgage payments and \$21,096 on deferred costs.

N.B.Keevil,Jr., president of Afton,states that site preparation is nearly complete and foundations for the concentrator building have been started. Work is well underway on relocation of the nearby oil and gas pipelines and the highway. A construction camp capable of housing 80 men has been completed and will be occupied by May 29.

It was necessary to apply for rezoning by the Thompson Nicola Regional District in order to proceed with construction of the converter, and the requisite by-law was passed on May 7.

The Pollution Control Branch of the Government of B.C. issued all permits covering the operation on April 13. These contain stringent environmental protection requirements which Afton had already accommodated in its engineering design. To be more specific, the standards are such that the emissions from this facility will be cleaner than any other smelter in North America. Some environmental groups and others have chosen to appeal the Pollution Control Permits. A hearing to consider the appeal has been called by the Pollution Control Branch for July 5,1976.

PROD AFTON MINES LTD  
N.B.Keevil, president of Teck Corporation Limited,states in the annual report that during the year the Niobec mine was opened officially on June 7, adding columbium to the list of products. Construction on the Afton copper mine and smelter began in May, and is proceeding on schedule for completion late in 1977.

## Regional district okays Afton mine and smelter

KAMLOOPS (CP)—The Thompson-Nicola Regional District board of directors Friday approved third reading of a rezoning application by Afton Mines Ltd. for its planned \$80 million copper mine and smelter just west of here.

The board defeated a motion, by Mayor Al Thompson of Kamloops, that would have blocked construction of the smelter in a 9 to 8 vote with several board members expressing concern about possible air pollution problems.

Directors approved a motion to establish a regional pollution control body to monitor air pollution in the area of the planned mine. The motion still must be approved by the provincial government.

Afton Mines' rezoning application now goes before the provincial government and, if approved, returns to the regional district board for fourth and final reading requiring a two-thirds-majority vote.

Thompson's defeated motion would have removed wording from the rezoning bylaw allowing construction of the copper smelter.

Afton Mines' application asks that the land in question be rezoned from agriculture-forestry to heavy industrial to allow open-pit mining and copper smelter operations.

Dr. Norman Keevil Jr., president of Afton Mines, said Friday he was pleased with the directors' decision but "the major hurdle is yet to come."

Dr. Keevil said the mine cannot go

ahead without the smelter because Afton Mines' contract with Japanese buyers calls for blister copper. He said putting the smelter elsewhere, as some district board directors have suggested, is out of the question because of the work schedule at the mine site and the signed financing agreement.

On-site preparation for the project began last month.

Dr. Keevil has said that 350 permanent jobs would be created by the mining and smelter project and annual supply and payroll payments would be about \$15 million.

The project was part of an incentive program worked out with the former NDP provincial government.

Thompson said that although he is concerned about the city's economy, the smelter should be taken out of the bylaw at this stage "until we know much more about it."

Kamloops director Paul Bianco said he disagreed with "the hysteria that has been caused by some of the medical profession" regarding toxic emissions from the smelter.

Bianco said medical opinion was not unanimous about pollution hazards and he said he was confident the Pollution Control Branch would be a good watch dog.

Another director, Kamloops alderman Donald Couch, said the branch has not responded to repeated requests to hold public hearings on the copper development.

### Progress at Afton is reported good

VANCOUVER — Progress in developing the mine, mill and copper conversion facilities of Afton Mines near Kamloops, B.C., accelerated in the past few months, N. B. Keevil, Jr., president, states in an interim report. Financing and sales contracts were signed in March. Site preparation is nearly complete and foundations for the concentrator building have been started. Work is under way on the relocation of nearby oil and gas pipelines and the highway. A construction camp capable of housing 80 men has been completed and is occupied.

The B.C. government pollution control branch issued, on April 13, all permits covering the operation. The standards, Mr. Keevil stated, are such that the emissions from this facility will be cleaner than any other smelter in North America.

In spite of this, he said, some environmental groups and others have chosen to appeal the permits and a hearing to consider the appeal has been called by the pollution control board for July 5, 1976.



## Afton Mines to produce by end of '77

VANCOUVER — Barring unforeseen circumstances, the Kamloops area copper property of Afton Mines should be in production by the end of 1977.

The project, to cost an estimated \$80,000,000, provided inflation stays within reasonable limits and there are no significant delays in equipment delivery, includes developing the mine to production, a 7,000 ton per day capacity concentrator and a smelter to produce 25,000 tons of copper a year.

Contracts for detailed engineering and for key items of equipment with the longest delivery schedule were let immediately after the decision to proceed was announced. Assuming that all necessary permits have been obtained, or are progressing expeditiously, it is anticipated that construction will begin this month.

Each of the mining, milling and smelting units has been designed to meet provincial and federal environmental standards. Despite the low sulphur content of concentrate, Afton will devote \$3-\$4 million to air emission control. The smelter is

See Page 15

expected to be the cleanest in North America.

Arthur Erickson, internationally renowned architect, has been retained to advise on aesthetic aspects of the plant layout as well as on the viewing facilities for students and general public.

An important stimulative effect on the economy of Kamloops and B.C. is expected from the project. Afton's annual expenditure on payroll and supplies will approximate \$15 million.

The annual meeting will be held on Mar. 25, 1976, in Vancouver.

Afton is owned 43% by the Teck Corp. and 23% by Iso Mines, which in turn, is owned 46.4% by Teck.

The second group is a copper prospect about eight miles west of the Afton Mines property, near Kamloops. Mapping and surface work in preparation for drilling are planned for this property, which has geophysical similarities to the Afton property.

Directors were re-elected.

N. Mines, April 14, 1976

Afton Mines Ltd.'s decision to place their mining property at Kamloops, B.C., in production and to build a mill and smelter complex on the property, the cost of which is estimated to be \$80,000,000, resulted in various agreements to finance and manage the project. By a 14Nov75 agt. between Afton, Teck Corporation Limited, Iso Mines Limited and the Bank of Montreal, the bank agreed to lend up to \$75,000,000 for the development and construction of the mine, mill and smelter complex and Teck and Iso have agreed to either lend funds to Afton to complete the project, or repay the bank the amount of advances if Afton should default in payments, and in addition, have agreed to provide up to \$25,000,000 for repayment of such advances if cash flow is insufficient to meet scheduled repayments to the bank. As security, Afton issued to the bank, a demand debenture for \$75,000,000 which creates a specific mortgage and charge over certain assets, and a floating charge over all of the assets of Afton.

By two 1Nov75 agreements, Afton agreed to sell to each of two British companies, BICC Limited and Delta Metal Company Limited, blister copper produced from the project. BICC and Delta have severally agreed to provide secondary financing up to \$7,500,000 each if funds advanced by the bank are not enough to complete the project. As security, Afton will issue 2 junior debentures dated as of 14Nov75 to the buyers, each for \$7,500,000 charging certain assets of Afton. The debentures are secondary and will be postponed to the debenture created in favour of the bank.

Afton Mines have entered into a management agreement with Teck, Iso and Teck Mining Group Limited, where TMG has agreed to provide management and administrative services and management personnel.

## Canada

BRITISH COLUMBIA

### Afton to develop new mine and copper smelter near Kamloops

Afton Mines Limited has announced that it intends to place its copper mine near Kamloops into production. The

company will also build western Canada's first modern copper smelter on an adjacent site. The capital cost of the combined facilities will be approximately \$80,000,000.

The project has been under active planning by the company and its two sponsors, **Teck Corporation** and **Iso Mines Ltd.**, for some time. The decision to proceed followed completion of extensive discussions with the government of British Columbia. These discussions involved consideration of various methods to encourage construction of one or more new copper smelters in the province, as recommended by the "Copper Task Force."

The resulting incentive program, to be of general application to any new copper smelters, will provide them with a payment of \$0.02 per pound of copper produced over the first four years of operation. This would be of assistance during the early years of operation when the smelter's funded debt position would be highest. The government will have the option to purchase, at cost, a 5.0 percent equity in the smelter. If this is exercised, the smelter unit would be operated as a joint venture, with Afton Mines holding 95 percent.

Open pit reserves are estimated at 34,000,000 tons assaying 1.0 percent copper. Additional mineralization has

been indicated at depth which will have to be mined by underground methods.

The mining and milling operation has been designed to process 7,000 tons of ore per day, and to produce concentrate containing over 25,000 tons of copper annually. The smelter will employ the TBRC (Top Blown Rotary Converter process) developed by the International Nickel Company of Canada, Limited. This process is said to have lower fuel use, controlled atmosphere, higher operating temperatures, and lower maintenance.

Arrangements have been made, subject to the approval of the Bank of England, to sell the copper to two large companies in the United Kingdom, BICC Limited, and The Delta Metal Company Limited, for refining and consumption in the United Kingdom.

Financing arrangements consist of a \$75,000,000 term loan to be provided by two Canadian banks, and a \$15,000,000 line of credit from the customers to cover contingencies. Financing was arranged by Teck and Iso Mines, substantial shareholders of Afton. Teck and Iso have undertaken to complete the project and have provided certain other financial guarantees.

Dravo Corporation of Pittsburgh, Pennsylvania, has been authorized by Afton Mines to proceed with design, engineering, procurement, and construction liaison services for the smelter.

GEORGE CROSS NEWS LETTER LTD. NO. 42(1976)

(Page Two)

MARCH 2, 1976

#### AFTON MINES LTD.

MINE, MILL, SMELTER CONSTRUCTION IS TO START THIS MONTH and smelter of Afton Mines Ltd., 8 miles SW of Kamloops, B.C. and, barring unforeseen circumstances, the project should be in operation by the end of 1977. This is stated by president N.B. Keevil, Jr. in his annual report for the shareholders' meeting to be held on 25 Mar 76 at 2 p.m. in Holiday Inn Harbourside, Vancouver.

Of the 3,777,171 shares of Afton outstanding, Teck Corporation Limited own 42.54%, being 1,606,848 shares and Iso Mines Ltd., controlled by Teck, own 22.91%, being 865,311 shares. Thus, Teck and Iso together own 65.45% of Afton's issued shares. Management nominees for election as Afton directors are, besides Dr. Keevil, Jr., owning 3,000 shares, Dr. N.B. Keevil, chairman, owning 5,000 shares; D.L. Hiebert, v. pres., treasurer, 500 shs.; R.E. Hallbauer, managing director, 500; Dr. A.P. Fawley, 5,800; E.P. Chapman, Jr., 1,000; Dr. J.D. Leishman, 500; and L.G. White, nil.

By agreement, Teck and Iso are exclusively responsible for development and management of Afton's mining property and it was they who made the production decision. Summarized in GCNL 202(75) dated Oct. 22/75 was much of the detail of the project that was published at that time and repeated now in the annual meeting material.

Basic details of the project are as follows: Proven ore reserves of 34,000,000 tons grading 1% copper will be mined by open pit methods. Additional mineralization indicated at depth, it is contemplated, would eventually be mined by underground methods. The mine and mill operation is designed to process 7,000 tons of ore per day from which 25,000 tons of 99% pure copper in blister form, with some values in gold and silver, would be produced by the on-site smelter employing the Top Blown Rotary Converter process. The product, in 1,200-pound billets, will be shipped under long term contracts to two of the largest copper consumers in the U.K., BICC Ltd. and Delta Metal Co. Afton will receive the London Metal Exchange price less a refining charge. Capital cost is estimated at \$80,000,000. The financing includes \$75,000,000 bank loans from two Canadian banks, a \$15,000,000 line of credit from the British customers. Teck and Iso have provided completion and deficiency guarantees. The B.C. government will pay Afton 2¢ per pound of copper produced by the smelter during the first four years of its operation.

As at fiscal year end 30 Sep 75, Afton had a working capital deficit of \$2,478,548 and a 6% mortgage loan in the amount of \$35,000.



AFTON MINES LTD.

NTS 92 T/SW

PRODUCTION DECISION ANNOUNCED - Afton Mines Ltd. has announced that the mine with proven ore reserve of 34,000,000 tons of 1% copper will be placed in production at a capital cost of \$80,000,000, including smelter costs, in about two years, at a rate of 7,000 tons per day. The mine is located 8 miles southwest of Kamloops, B.C. The new plant will employ 450 persons during construction and will employ 350 when in operation. The operation is to include a smelter with sufficient capacity to process the concentrate produced by the 7,000 ton per day concentrator and will utilize the new 'Top Blown Rotary Converter' (TBRC) process. The smelter will produce 99% pure blister copper and have a production capacity of 58,000,000 pounds of copper per year, equal to the mine production. The smelter with the TBRC process will be designed to process the Afton native copper and will be converted to sulphide ores in later years as the Afton orebody grades to chalcopyrite at depth. Dr. N.B. Keevil, Sr., said that the smelter is not planned to have any custom smelting capacity or capability in its initial years.

Relocation of the Trans-Canada highway in the area of the mine is expected to start in the Spring of 1976 at about the time that mine site, concentrator foundation and smelter site on the ground work begins in March 1976. Between now and March soil testing, engineering and design work will continue.

In making the announcement, Dr. N.B. Keevil Jr., president of Afton, said that the decision to proceed to production was made after extensive discussions with the Government of B.C. Financing for the \$80,000,000 capital cost facility has been arranged by Teck Corp. and Iso Mines, substantial shareholders of Afton. The financing has been arranged as to \$75,000,000 by term loans from two Canadian banks and a \$15,000,000 line of credit from customers to cover contingencies. The copper produced is to be sold to BICC, parent company of Phillips Cables Limited, and The Delta Metal Company Limited.

In conjunction with the announcement of production at Afton the B.C. Government announced legislation where under the Government will pay a 2¢ per pound of copper produced incentive to any smelting operation in B.C. In addition the B.C. Government is to have an option to buy at cost a 5% equity in the smelter at any time until the end of the first year of operation of the smelter. The 2¢ per pound incentive is to be paid for only the first four years of production.

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FOR THE RECORD

Afton Mines Ltd.'s decision to place their mining property at Kamloops, B.C., in production and to build a mill and smelter complex on the property, the cost of which is estimated to be \$80,000,000, resulted in various agreements to finance and manage the project. By a 14Nov75 agt. between Afton, Teck Corporation Limited, Iso Mines Limited and the Bank of Montreal, the bank agreed to lend up to \$75,000,000 for the development and construction of the mine, mill and smelter complex and Teck and Iso have agreed to either lend funds to Afton to complete the project, or repay the bank the amount of advances if Afton should default in payments, and in addition, have agreed to provide up to \$25,000,000 for repayment of such advances if cash flow is insufficient to meet scheduled repayments to the bank. As security, Afton issued to the bank, a demand debenture for \$75,000,000 which creates a specific mortgage and charge over certain assets, and a floating charge over all of the assets of Afton.

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Afton Mines have entered into a management agreement with Teck, Iso and Teck Mining Group Limited, where TMG has agreed to provide management and administrative services and management personnel.

TABLE 11

STATEMENT OF ESTIMATED EARNINGS FOR  
AFTON

(Per Ton Ore)

	Copper =	<u>58¢</u>	<u>70¢</u>	<u>90¢</u>
Gross Revenue		9.86	11.90	16.30
Less: Allowable Costs -				
Smelting and Refining	2.55			
Concentrate Transportation	<u>0.12</u>			
		(2.67)	(2.67)	(2.67)
Net Value		7.19	9.23	12.63
Basic Royalty, 5% of "Net Value"		(0.36)	(0.46)	(0.63)
Net Value, Less Royalty		6.83	8.77	12.00
Operating Cost (Per Table 5)		(4.05)	(4.05)	(4.05)
Capital Cost Write-off		(2.94)	(2.94)	(2.94)
Interest at 10% on half the Capital		(1.47)	(1.47)	(1.47)
Net Return		<u>(1.63)</u>	<u>0.31</u>	<u>3.54</u>



#### 2.4 Teck Corporation - Cariboo Bell Mines Ltd.

The Cariboo-Bell property is located 50 miles northeast of Williams Lake. Copper mineralization with gold values is contained in three zones amenable to open pit mining. The orebody has not been adequately explored to warrant a feasibility study, but 10,000 tons per day is a hypothetical milling rate that might be reasonable. Further exploration has added unspecified reserves to those quoted in Table 4 (8).

The Statement of Estimated Earnings is given in Table 10. In comparison with the properties already examined, the Gross Revenues here reflect the difference that a small amount of precious metal content can make. While it could not pay off its loan at current copper prices, it would probably be satisfactory with copper at 90 cents per pound. Royalties could affect a production decision at marginal copper prices. The major constraint preventing production at the moment is the proving in detail of sufficient ore to permit a feasibility study to be done. An increased copper price would encourage the company to complete this phase as quickly as possible.

The estimated service and supply requirements and annual tonnage of concentrate produced are given in Table 6. This property is sufficiently remote that a townsite would need to be constructed. A substantial road and power line would be required.

#### 2.5 Teck Corporation - Afton Mines Ltd.

The Afton property is a relatively high grade copper deposit suitable for open pit mining. It is located adjacent to the Trans-Canada Highway 8 miles southeast of Kamloops. The orebody has been delineated and a 1974 feasibility study recommended the establishment of a 7,000 tons per day mill at the site.


The Statement of Estimated Earnings is given in Table 11. Gross Revenues were based on a copper content of 1%. It is known that there is some gold and silver content, but the grades have not been published. These would increase the Gross Revenues if they were accounted for. This project would be attractive at 70 cents copper. Teck decided not to put the property into production on completion of the feasibility study because of the uncertain taxation and royalty situation (8).

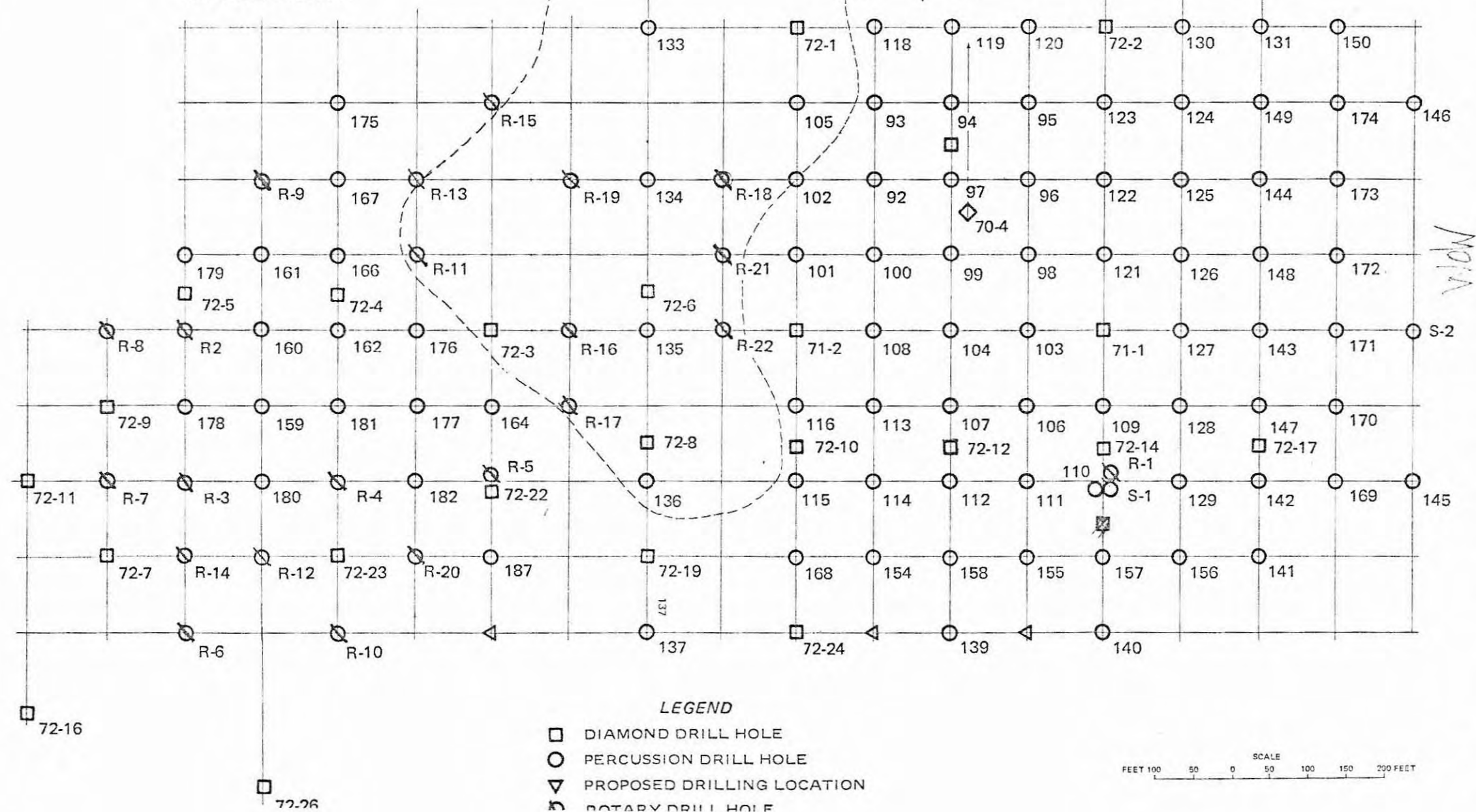
The estimated service and supply requirements are given in Table 6. Employees would live in nearby Kamloops. Little road construction is required due to the proximity of the Trans-Canada Highway. Power will be purchased from a B.C. Hydro and water will be pumped from Kamloops Lake. Concentrate would possibly be trucked to a rail terminal most likely on the CPR.

*Source: Wright Engineers Report, March 1975  
Central Region, Forecast of Development in the Mineral Sector*

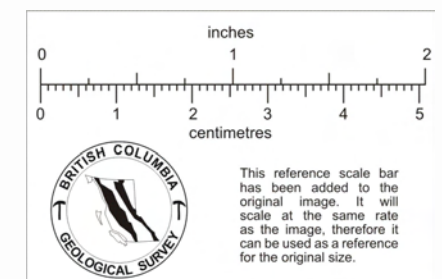
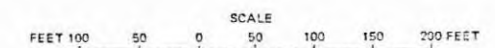
TRANS CANADA HWY. 401  
400 FEET NORTH

POT 3  
FR  
Claim  
Posts

KAMLOOPS  
10 Miles East 



NO. 126 (JUNE 30, 1972) + GEORGE CROSS NEWS LETTER LTD. + TWENTY FIFTH YEAR OF PUBLICATION +





GCNL #106 30 JUNE 1972 AFTON MINES LTD.

DRILL RESULTS CONFIRM AND EXTEND - Assay results from 11 diamond drill holes and seven  
OREBODY - GOOD COPPER GRADE AT DEPTH rotary drill holes on the Afton Mines Ltd. property,  
located 10 miles west of Kamloops, B.C., have been re-  
ported by C.F. Millar, P. Eng., president. The holes add to reserves by, confirming internal  
reserves, as to grade; adding to depth and by stepout holes to the southwest. See the map  
on page two for hole locations. (For earlier drill results, see GCNL 100, 94, 89, 62 and 56).  
There are further Court hearings set for 5 Jul 72, to determine extent of work programs pending  
final trials set to start 21 Aug 72, (see GCNL 123, page one) whereby Teck Corporation will  
seek permanent injunction to prevent the Placer Development agreement with Afton from be-  
coming effective. It is understood that the shareholders meeting called for 4 Jul 72 will be  
adjourned till after the 5<sup>th</sup> July Court hearing.

The new assay results are as follows:

Hole No.	Interval Ft.	Footage Ft.	Copper Grade %
Diamond Drill Holes			
72-13	12 - 410	398	0.61%
14	25 - 340	315	0.58
	560 - 590	30	0.41
15	50 - 230	180	0.55
	350 - 400	50	0.31
	810 - 890	80	0.31
16	Incomplete		
17	180 - 290	110	0.59
	350 - 390	40	0.42
	460 - 570	110	0.48
18	0 - 160	160	0.48
19	340 - 460	120	0.72
20	60 - 310	250	0.48
21	Not available		
22	350 - 430	80	0.32
	590 - 1040	450	1.61
23	200 - 450	250	0.61
Rotary Drill Holes			
R-14	270 - 1100	830	1.62
17	40 - 180	140	0.25
	250 - 560	310	0.71
	650 - 910	260	1.40
18	90 - 520	430	0.86
19	40 - 160	120	0.51
20	560 - 700	140	1.32
	830 - 1200	370	0.47
21	20 - 710	690	1.10
	(last 10 ft. 0.41%)		
22	40 - 800	760	1.26