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823847

MEMO TO: G.E. Cooper
FROM: M. Power
SUBJECT: Harper Creek

Summary

Break Even

Re-evaluation of the Harper Creek copper - molybdenum property indicates that a copper price of about \$1.50 Canadian per pound in today's dollars is required to yield a project rate of return of 15.0%. Molybdenum is assumed at \$10.00 Canadian per pound.

Assumptions

The assumptions to the evaluation are:

1. Mineable Reserves:

Mineable reserves total 84 million tons grading 0.39% Cu, 0.016% Mo and are based on a cutoff of 0.35% Cu. Gold and silver content of the ore is estimated to be 0.002 oz. Au/ton and 0.07 oz. Ag/ton respectively. The reserves were calculated by Noranda's General Pit System programme assuming 45° wall slopes. Overall stripping ratio is 1.68 to 1 (Waste/Ore).

Reserves are contained within two pits about 1/2 a mile apart. The grade of molybdenum is based on assays from two drill hole composite samples. Preproduction stripping is assumed to be 4.5 million tons. The average stripping ratio during production is 1.6 to 1. The production schedule which has been

derived by computer is as shown on the cash flow attached to this memo.

2. Production:

Production is assumed at 15,500 tpd or 5.7 million tons per year. Mine life is 15 years. Production startup is assumed to be on January 1, 1983.

3. Metallurgy:

Metallurgical recoveries and concentrate grades are based on very limited test work on core samples by Noranda Mines in 1971 ("Preliminary Flotation Test Work on Harper Creek Property Ore Samples" dated April 27, 1971).

Estimated copper recovery is 85% and estimated concentrate grade is 26% Cu, 0.09 oz. Au/S.T. and 2.85 oz. Ag/S.T. Gold and silver recoveries are assumed to be 40%. Molybdenum recovery is 30%.

4. Metal Prices and Net Smelter Returns:

Assumed metal prices:

Copper = \$1.50 per lb.
Gold = \$300.00 per oz.
Silver = \$8.50 per oz.
1979 Canadian Dollars

	<u>\$ CAN./SDT</u>
Payable copper = (26.0 - 1.3) x 20 x \$1.50	= \$741.00
Payable gold = (0.09 - 0.02) x \$300.00	= 21.00
Payable silver = (2.85 - 1.00) x \$8.50	= <u>15.72</u>
Total payable content	= \$777.72

Charges:

Smelting		\$ 80.00	
Refining	11.2¢	55.33	
Freight		55.00	
Metal to Market	2.5¢	12.35	
Ins/Rep		1.00	
Losses		<u>2.87</u>	
		\$206.55	\$206.55
N.S.R./SDT Concentrate			\$571.17
N.S.R./lb. Cu Contained			\$1.10
N.S.R./lb. Cu Contained excluding Au & Ag			\$1.03

Summary:

Price Copper	\$1.50
Deductions	(0.47)
Gold, Silver	<u>0.07</u>
Net/lb. Cu	\$1.10

5. Operating Costs:

Operating costs are based on current costs experienced at a similar sized operation in British Columbia.

\$ Canadian 1979

Mining	\$0.60
Milling	\$1.60
General and Administrative	\$0.55

Based on the average stripping ratio of 1.6 to 1 the average operating cost is \$3.71 per ton milled.

6. Capital Costs:

Capital costs are based on the previous estimates updated to current dollars. The construction period is assumed to be 3 years starting in 1980.

The total capital cost to production is assumed to be \$108 million in 1979 Canadian dollars. This is about \$7,000 per ton of daily capacity. The capital expenditure schedule in 1979 Canadian dollars is as follows:

<u>YEAR</u>	<u>(1979 CAN. DOLLARS X MILLION)</u>			
	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>TOTAL</u>
Preproduction Develop.	\$ 3.6	\$ 3.6	\$ 3.8	\$ 11.0
Mining & Services	4.0	14.0	16.8	34.8
Processing & Services	3.0	16.0	33.2	52.2
Working Capital	<u>-</u>	<u>-</u>	<u>10.0</u>	<u>10.0</u>
	\$10.6	\$33.6	\$63.8	\$108.0

Infrastructure costs of \$7.0 million are included in mining and services. The property is 60 miles north of Kamloops, B.C. The nearest railhead is about 15 miles north west of the property at Clearwater.

Ongoing replacement capital is assumed to be \$1 million per year.

7. Taxes:

Current taxes applying to a mining operation in B.C. are used. The federal investment tax credit is 7% of equipment and fixed assets and is assumed to extend over the mine life. The maximum marginal tax rate in B.C. is 56.9% and applies only when the earned depletion bank is exhausted.

Comments

1. The current copper price is about \$1.00 Canadian per pound. Harper Creek requires a copper price of \$1.50 Canadian in current dollars. The difference is substantial.
2. Comparing Harper Creek to other open pit projects is of interest.
 - (a) Comparing estimated capital costs:

	<u>Capacity Short Tons Per Day</u>	<u>Capital Cost Millions of Canadian Dollars</u>	<u>Capital Co Per Ton Of Capac</u>
Harper Creek	15,500	\$108.00	\$7,000
Highmont	25,000	\$150.00	\$6,000
Andacollo	44,000	\$291.00	\$6,600

(b) Comparing net smelter returns per ton of ore milled:

	<u>Harper Creek</u>	<u>Highmont</u>	<u>Andacoll</u>
Head grades			
% Cu	0.39	0.27	0.64
% Mo	0.016	0.03	Nil
Mill Recoveries			
Cu	85%	85%	82.5
Mo	30%	80%	Nil
N.S.R./lb. Metal			
Cu	\$ 1.10	\$ 1.10	\$ 1.1
Mo	\$10.00	\$10.00	\$10.0
N.S.R./Ton Milled			
Cu	\$ 7.29	\$ 5.05	\$11.6
Mo	<u>0.96</u>	<u>4.80</u>	<u>-</u>
Total	\$ 8.25	\$ 9.85	\$11.6
% Cu Equivalent	0.44% Cu eq.	0.53% Cu eq.	0.64 Cu

(c) Comparing estimated operating costs in 1979 Canadian dollars:

	<u>Stripping Ratio</u>	<u>Operating Cost \$ Can/Ton Mille</u>
Harper Creek	1.6:1	\$3.71
Highmont	1.3:1	\$3.50
Andacollo	1.0:1	\$3.60

Harper Creek has the highest capital cost per ton of daily capacity, the highest operating cost and the lowest net smelter return per ton of ore milled.

There are 130 million tons of ore at Highmont and 220 million tons of ore at Andacollo. Harper Creek has 84 million tons. The molybdenum grade of 0.016% Mo at Harper Creek is based on two assays. Clearly this grade would need to be verified.

The indicated molybdenum recovery is 30%. Assuming that this could be improved to 70%, then the required copper price for a 15% rate of return is \$1.30 Canadian per pound in current dollars.

MEP:sk
Att.



Michael Power