

Mount Nansen Mines Limited

MINABLE ORE RESERVES

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In an earlier report by the author (April 24, 1969) the total ore reserves for Mount Nansen Mines Limited, as for December 31, 1968, were reported as follows:

Proven ore:	80,763 t @ 0.347 oz.Au/t and	13,626 oz.Ag/t
Probable ore:	<u>136,804 t @ 0.314</u>	<u>12,637</u>
Subtotal:	217,567 t @ 0.3265	13.00
Possible ore:	<u>97,195 t @ (0.3217)</u>	<u>(13.900)</u>
TOTAL:	314,762 t @ 0.325 oz.Au/t and	13.31 oz.Ag/t

Since that time the ore reserves did not change significantly. If on one hand the very limited exploration and development work performed underground during 1969 added some ore tonnage (ore shoot 585 in the Huestis 4100 level), on the other hand the ore stoped out from both the Huestis levels during the short milling operation compensated the total balance. The purpose of this report is not to up-date the given total ore reserves, but to indicate that part of the total ore reserves, which are minable profitably.

MINABLE ORE RESERVES are defined as portions of the mineralisations which meet the following requirements or criteria:

- A. Only ore above the deepest present level of the two mines, the Webber 4260 level and the Huestis 4100 level, is included in this computation. This criterion eliminates a large portion of the total reserves; (approximately 1/3) for instance, all ore in the Webber mine between the 4260 level and the initiated 4100 level (see Fig.4 in report dated April 24, 1969 and the ore below the Huestis 4100 level (see Fig.5, same report). In other words, this ore is present (some of it even under the proven category), but it is not accessible. It will become accessible only by developing a deeper level (Webber 4100, Huestis 3900, the former being proposed for the next development stage).
- B. For the same reason as item A., all ore which is not developed by drifting must be excluded from the minable reserves. This eliminates ore only exposed at the surface (Cabin Creek vein) and probable and possible ore indicated by drilling (for instance 13 Vein in both Huestis levels), or approximately 1/6 of the total reserves. This ore will also become minable by means of drifting. (Proposed development includes only 13 Vein; Cabin Creek would be considered only in a second stage).

C. From the total ore reserves a third class of mineralisation has to be eliminated in order to obtain realistic minable reserves, namely such portions which cannot be mined profitably, or approximately 1/6 of the total reserves. Several factors determine the profitability limit; the cardinal being cut-off grade, milling recovery, and metal prices. For the present computation the following figures are used:

- (i) Cut - off grade. During the past operation (Sept.68 / April 69), the total mining, milling, transportation and smelting costs were about \$43.50/ton; it is obvious and proved that these costs were by far too high and resulted from poor management and control. The present estimation of the total costs, as compiled by our mining engineer, R.C. McCombe, indicates \$38.00/ton ore at a production rate of 150 tpd, \$35.00/ton ore at a production rate of 200 tpd, and \$31.70/ton ore at a rate of 300 tpd. It must be noted that these cost estimations imply several assumptions; for instance, a concentration ratio ore: concentrate of 15:1. Obviously a better concentration ratio, as the result of a more efficient milling operation, would lower considerably the transportation costs, the smelter penalties etc., thus lowering the total costs and the cut-off grade. The present ore reserves do not allow a larger rate than 200 tpd, so one must assume a present cut-off grade of \$35.00/ton.
- (ii) Milling recovery. This factor has not yet been determined reliably. Accurate figures should be obtained with the next metallurgical testing. From the past laboratory work it seems feasible to reach optimum recoveries of 90% gold and silver and a concentration ratio of 10:1 or more. Cut-off price and recoveries combined lead to the conclusion, that **only** ore having a gross value of \$39.00/ton should be mined. However, some ore having a gross value of less than \$39.00/ton has been included in the present computation. This for two reasons. The first one is of geological nature: since the grade (and consequently the gross value of an ore shoot is not constant in the vertical direction some portions of lower grade have to be included in order to mine out higher grade sections which lie between low-grade sections. The second reason is of more "philosophical" nature and was one of the battlefields during the conflicts with Chapman's people. If one considers only ore having a gross value of more than the cut-off grade, the resulting tonnage of ore will have an average grade much higher than the cut-off grade itself,

and the resulting tonnage will be very low. The low tonnage would imply a lower rate of production and the lower rate of production would increase the cut-off grade, and so require a further high-grading. These considerations have already been exposed in all details in earlier reports and correspondence (Memo from F.B. - R.S. - R.Mc. to Mr.H.Willi, Nov.7, 1969, letter from F.B. - R.S. to Chapman, Wood and Griswold Ltd., Dec.4, 1969). As a conclusion of the above explained it was felt to be a correct procedure to take into account also some ore which has a gross value lower than the cut-off grade.

- (iii) Metal prices. The third factor which must be considered in the computation of the minable reserves is the price of gold and silver. The importance of this factor is obvious. An increase of the metal prices will result in an increase of the gross value of the ore (and thus of the profit); on the other hand, this would also mean that ore below cut-off grade at current metal prices would become minable at increased metal prices. For the present computation the following prices were used:
Can.\$37.50 oz.Au and Can.\$2.00 oz.Au.

CONCLUSIONS. After elimination of the above mentioned three categories of ore and mineralisation the resulting total minable reserves are:

108,855 tons @ 0.386 oz.Au/t and 15.45 oz.Ag/t,

44,855 tons grading 0.338 oz.Au/t and 20.28 oz.Ag/t from the Webber Mine and 64,000 tons grading 0.42 oz.Au/t and 12.06 oz.Ag/t from the Huestis Mine.

The location of the ore is given in detail in tables 1 and 2. For plans and sections refer to the author's report dated April 24, 1969.

Profit. At 200 tpd these reserves would last for 500 days, or approximately 1 1/2 years. The profit of mining these reserves is estimated to be as follows:

- (i) @ can.\$37.50/oz.Au and \$2.00/oz.Ag, and 90% recovery of gold and silver:
- | | |
|---------------|---------------------|
| Gross Value | \$45.38/ton |
| Recovered | \$40.84/ton |
| - Costs | <u>\$35.00/ton</u> |
| Net Profit | \$ 5.84/ton |
| Total Profit: | <u>\$635,888.00</u> |

(ii) @ can.\$40.00 oz.Au and \$2.50 oz.Ag, and 90% recovery of gold and silver:

Gross Value	\$54.07/ton
Recovered	\$48.66/ton
- Costs	<u>\$35.00/ton</u>
Net Profit	\$13.66/ton
<u>Total Profit</u>	<u>\$1,487,369.00</u>

Table 1. WEBBER MINE - MINABLE RESERVES (March 11, 1970)

PROVEN ORE

<u>Ore Shoot</u>	<u>tons</u>	<u>Grade</u>	<u>Gold</u> (oz/t)	<u>Silver</u> (oz/t)
105	436		0.42	54.00
107	5,614		0.44	36.40
119	1,036		0.38	8.32
	1,000		0.16	9.00
121	1,181		0.47	19.70
	545		0.27	29.30
130	1,900		0.37	30.50
136	1,000		0.30	4.30
	1,400		0.54	41.50
139	200		0.18	17.30
157	1,745		0.31	13.80

TOTAL: 16,057 tons @ 0.39 oz.Au/t 26.05 oz.Ag/t

Gross Value: Can.\$66.725/ton @ Can.\$37.50/oz.Au and
Can.\$2.00/oz.Ag.

PROBABLE ORE

<u>Ore Shoot</u>	<u>tons</u>	<u>Grade</u>	<u>Gold</u> (oz/t)	<u>Silver</u> (oz/t)
105	490		0.27	13.30
119	4,144		0.27	8.66
121	2,589		0.37	24.50
130	880		0.06	15.00
	5,200		0.21	22.70
136	3,800		0.42	27.90
139	200		0.18	17.30
154	880		0.17	12.10
	3,490		0.48	16.50
157	1,745		0.31	13.80

TOTAL: 23,418 tons @ 0.314 oz.Au/t 17.82 oz.Ag/t

Gross Value: Can.\$47.40/t @ Can.\$37.50/oz.Au and
Can.\$2.00/oz.Ag.

POSSIBLE ORE

Ore Shoot 157

Total: 5,380 tons (@ 0.31 oz.Au/t and 13.80 oz.Ag/t)

Gross Value: (Can.\$39.20/t) @ Can.\$37.50/oz.Au and Can.\$2.00/oz.Ag.

TOTAL WEBBER

44,855 tons @ 0.338 oz.Au/t and 20.28 oz.Ag/t

Gross Value: Can.\$53.20/t @ Can.\$37.50/oz.Au and Can.\$2.00/oz.Ag.

Table 2: HUESTIS MINE - MINABLE RESERVES (March 11, 1970)

PROVEN ORE

<u>Ore Shoot</u>	<u>tons</u>	<u>Grade</u>	<u>Gold</u> (oz/t)	<u>Silver</u> (oz/t)
585	3,200		0.73	12.5
	2,800		0.32	10.8
588	2,540		0.17	4.66
	800		0.43	8.8
590	480		0.35	4.6
591	600		0.36	10.0
594	2,000		0.58	19.2
595	550		0.23	14.0
TOTAL:	<u>12,970</u> tons @	<u>0.437</u> oz.Au/t	<u>11.06</u> oz.Ag/t	

Gross Value: can.\$38.50/t @ can.\$37.50/oz.Au and can.\$2.00/oz.Ag.

PROBABLE ORE

<u>Ore Shoot</u>	<u>tons</u>	<u>Grade</u>	<u>Gold</u> (oz/t)	<u>Silver</u> (oz/t)
585	2,830		0.32	10.8
	13,700		0.52	11.6
588	1,090		0.91	48.3
	1,090		0.17	4.6
	5,870		0.31	6.7
590	1,360		0.30	10.1
	1,360		0.35	4.6
591	600		0.36	10.0
594	8,600		0.44	13.7
595	900		0.23	14.0

Total: 37,400 tons @ 0.431 oz.Au/t and 11.84 oz.Ag/t

Gross Value: Can.\$39.80/t @ Can.\$37.50/oz.Au and Can.\$2.00/oz.Ag.

POSSIBLE ORE

<u>Ore Shoot</u>	<u>tons</u>	<u>Grade</u>	<u>Gold</u> (oz/t)	<u>Silver</u> (oz/t)
585	8,030		(0.32)	(10.8)
588	2,900		(0.55)	(26.5)
590	1,800		(0.32)	(7.4)
591	900		(0.36)	(10.0)

Total: 13,630 tons (@ 0.371 oz.Au/t and 13.64 oz.Ag/t)

Gross Value: (Can.\$41.20/t) @ Can.\$37.50/oz.Au and Can.\$2.00/oz.Ag/

TOTAL HUESTIS

64,000 tons @ 0.42 oz.Au/t and 12.06 oz.Ag/t

Gross Value: Can.\$39.85/t @ Can.\$37.50/oz.Au and Can.\$2.00/oz.Ag.

POSSIBILITIES OF INCREASING THE MINABLE RESERVES.

There are several possibilities which can increase the minable reserves:

- A. The most obvious possibility is to explore for new veins and to develop drill-indicated, already known veins. Some proposals in this regard are indicated in the report dated Oct.17, 1969, by F.B. - R.S. - R.Mc.:" Preliminary Budget and Comments, Period Oct.1, 1969 to April 30, 1970", where the authors outline a minimum exploration and development program. This program should convert drill-indicated ore into minable ore (Huestis 4300 level, 13 Vein; possibly 20,000 tons), convert possible ore below level into minable ore (drifting of Webber 4100 level, 2 Vein, 20,000 tons plus, depending on how much drifting), and finally should find new ore in both drifts, (Huestis 4100 and 4300 levels, continuation of 12 Vein to the west), and drillings, (15 and 17 Veins on the Huestis 4300 level, 12 and 13 Veins in the Huestis 4100 level, 1 and 2 Veins in the Webber 4260 level).
- B. Another possibility of increasing the tonnage of the minable reserves is a lower cut-off grade. This can be the result of the following factors:
- (i) An increased production rate, which reduces mining, milling and overhead costs. Here we have a vicious circle, since in order to increase the production rate one has to increase the ore reserves; the ore reserves can be increased by a lower cut-off grade; and in turn, the cut-off grade can be reduced by increasing the production rate. In the case of Mount Nansen the egg is definitely the ore, the chicken being the production rate; in other words: more minable ore has to be added to the present reserves by exploration and development work. This additional ore would then permit an increased production rate; this would reduce the cut-off grade, and finally, the reduced cut-off grade would convert lower grade ore into minable one.
 - (ii) A more efficient metallurgy. Better recoveries and/or better concentration ratio than anticipated would reduce the total costs and/or increase the profit margin. This is equal to say that the cut-off grade would be lower.

(iii) An increase in metal prices. An increase in metal prices would also add tonnage to the minable reserves. This applies especially for silver, as explained in this example. Assume a mineralisation grading 15 oz. Ag/t. At can.\$2.00/oz.Ag the gross value would be \$30.00/ton, also not minable. At can.\$3.00/oz.Ag the gross value would increase to can.\$45.00/ton, making this ore minable.

C. Another important factor is represented by the mining technique used for the extraction of the ore. Not enough attention and time were spent on this problem, previously and to date. The method used at Mount Nansen during the past was a simple shrinkage stoping. The experienced average mining width was by far too high (5.46 feet). Since the calculated ore reserves were based on a assumed mining width of 4 feet, the experienced mining width of 5.46 feet represented 36.5% additional dilution of the ore grade. This was one of the main reasons for the failure of the operation.

Our mining engineer, Robert McCombe, made some suggestions on the mining procedures (report "Preliminary Budget and Comments, Oct. 17, 1969) and he stated: "In summation, it is believed certain that, if proper mining procedures are followed, stope widths of four feet or less can easily be achieved". If stoping width of less than four feet can really be achieved, this would imply an increase of the grade of the ore mined. This would make lower grade ore minable, thus further increasing the total reserves. Some investigations should take place on the feasibility of stoping very narrow veins (not minable at four feet stoping width), by means of resuing or cut-and-fill techniques.

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Vancouver, March 11, 1970

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