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PRELIMINARY FEASIBILITY REPORT
DEVELOPMENT AND MINING OPERATIONS
AT THE
MOUNT NANSEN PROPERTIES
OF
MOUNT NANSEN MINES LIMITED

Toronto, Ontario
November 25, 1966

Watts, Griffis and McQuat Limited

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SUMMARY AND CONCLUSIONS

A preliminary feasibility study on development of the Mount Nansen gold-silver ores has been carried out.

Surface and underground work completed to-date has indicated a reserve of 130,630 tons, grading 0.53 oz. gold per ton, and 17.70 oz. silver per ton on the Mount Nansen property. An additional 66,200 tons, grading 0.72 oz. of gold and 3.84 oz. of silver per ton, is indicated on the adjoining property of Brown-McDade Mines Limited, an associated company.

Apart from the excellent grade, there are additional reasons for recommending further work on the deposits. Two drill holes on the Huestis zone of the Mount Nansen property indicate ore grade well below the present workings, and there are promising indications on surface that deserve further follow-up. Furthermore, the presently known zones have not been fully developed and consequently, there is good reason to expect that ore along these zones can be extended both laterally and to depth.

World demand for silver has exceeded production for some years now and there is a widespread consensus that the price will be increased in the next year or so. Due to the high silver content of the ores, any increase in the price of silver would very favourably affect the profitability of the Mount Nansen ores.

The net recoverable value of the Mount Nansen ores is \$35.90 per ton, based on presently estimated recoveries. The total costs for mining and processing are estimated at \$26.64 per ton, at 250 tons per day. Our estimate of capital costs for a 250-ton plant, including working capital is \$3,300,000.00, in two stages as set forth below.

The indicated profitability on the present reserves, including possible ore, is \$1,852,000 and in order to ensure a return on capital investment, it is necessary to check and increase the total reserves. This can be done by developing drill-indicated ore, and by an additional adit on the Huestis vein zone below the present level. At the same time, metallurgical test work should be continued to confirm the process and, if possible, to improve gold and silver recovery. We also recommend that the continuing program of development at Mount Nansen should include provision for completion of an all-weather road to Carmacks, and for engineering of the production plant. This interim program will cost \$550,000.00.

On the assumption that developments from the above program are favourable, it should be possible to begin plant construction in August of 1967 and have the property in production on or before March, 1968, at an additional cost of \$2,750,000.00.

With an indicated reserve of 350,000 tons, all capital costs would be repaid over a four-year period.

RECOMMENDATIONS

1. The program of metallurgical test work should be continued to verify and improve on predicted recoveries of gold and silver.
2. A program involving 10,000 feet of drifting and raising and 10,000 feet of diamond drilling is required to increase ore reserves, and to prove reserves presently shown as indicated and possible.
3. An all-weather road to the property should be completed during the period, while items (1) and (2) are in progress.
4. Plant design should be in progress during this interval, and will commence as soon as metallurgical testing has advanced far enough to confirm the mill flow sheet.

These four items are considered to require a period of six months. On completion of this program, the following schedule is recommended, contingent on confirmation of grade and tonnage:

5. Mill construction for a plant capacity of 250 tons per day.
6. A small program of mine continuing development.
7. Townsite and surface plant construction.
8. Installation of a water-line from Victoria Lake.

An additional six months will be required for this second phase, contingent on equipment deliveries.

In summary, it is estimated that these recommendations, 1 to 4 inclusive, of the above program will require an investment of \$550,000.00 and that phases 5 to 8 inclusive will require an additional amount of \$2,750,000.00. Details of these estimates are set out in the report.

Respectfully submitted,

WATTS, GRIFFIS AND McOUAT LIMITED



James A. Bates, B.Sc., P.Eng.

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INTRODUCTION

This report is submitted at the request of Mr. Paul Berliz, a director of Mount Nansen Mines Limited, and is a preliminary study of the feasibility of developing the silver-gold orebodies opened up to-date on the properties of the company in the Mount Nansen area, Yukon Territory.

Records of exploration and development work to-date are detailed and rather complete, and have been of critical value in making up this report. Although metallurgical testing is still incomplete, the data on which this report is based is from reports by Britton Research Laboratories, Vancouver, B.C. Flow sheet design is based on the results of test work and has been done by Mr. John Britton and Wright Engineers Limited, Vancouver, B.C. Wright Engineers Limited has also been responsible for the capital and operating costs of ore concentration.

The study is based on an examination by us of all open mine workings at Mount Nansen, careful examination and checking of company records and our estimates of cost, both for capital and operating, except for the estimates on ore concentration as submitted by Wright Engineers Limited.

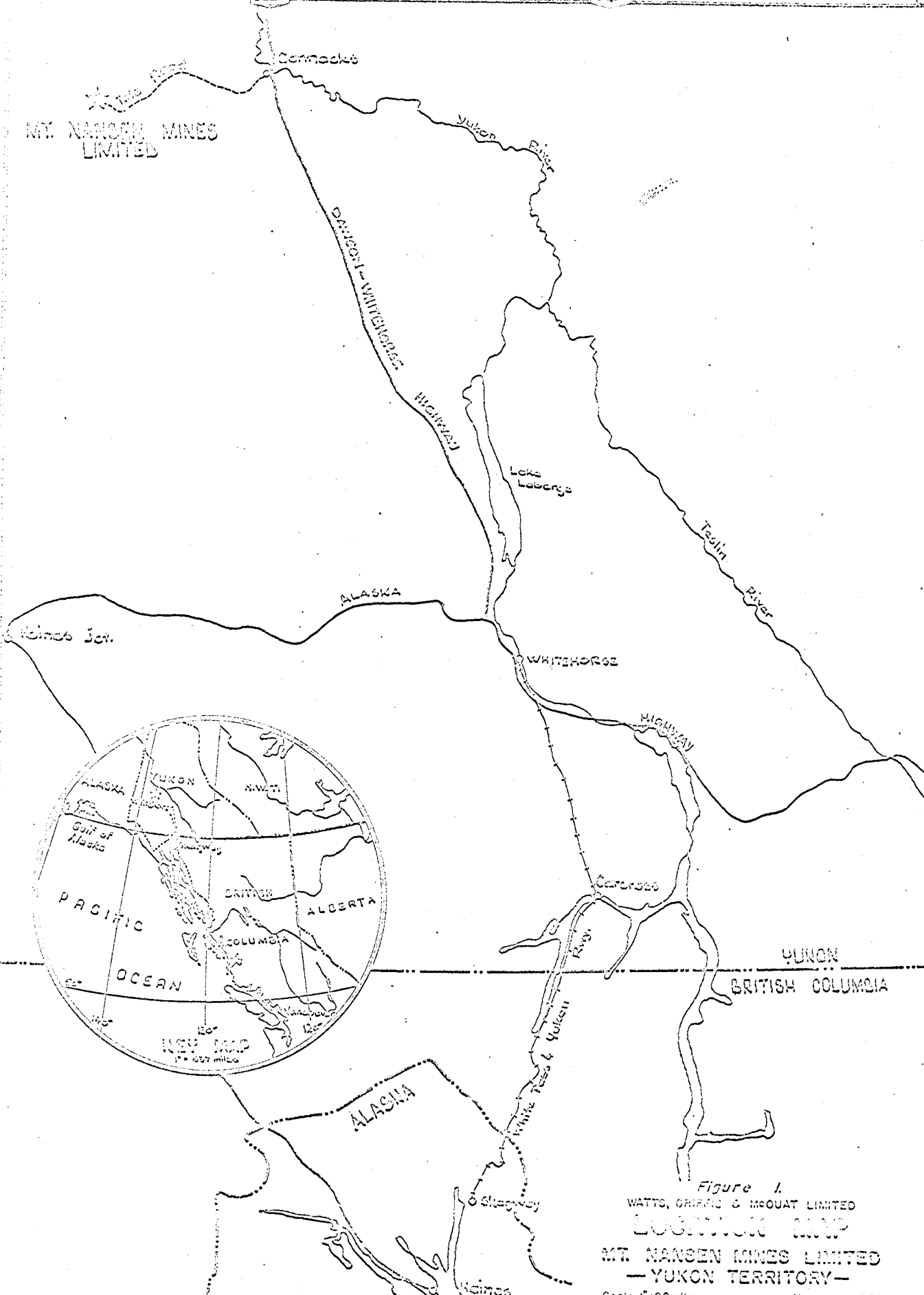
COMPANY

Mount Nansen Mines Limited was incorporated under the laws of the Province of Ontario in 1963, with a share capitalization of 10,000,000. There are 5,646,009 shares issued and outstanding, and 810,000 shares are subject to escrow.

The company is controlled by Peso Silver Mines Limited, which in turn is controlled by Charter Oil & Gas Company Limited.

Officers and directors of the company are:

Avery Stone	Vice-President and Director
A. E. Proznick	Secretary-Treasurer
Paul O. Berliz	Director
C. S. Walker	Director
J. A. Bates	Director
B. S. Imrie	Director
S. J. Dumaresq	Director
A. T. Griffis	Director



MT. NANSEN MINES LIMITED

Figure 1.

WATTS, GRIFFIN & McQUAT LIMITED
LOCATION MAP
 MT. NANSEN MINES LIMITED
 — YUKON TERRITORY —

Scale: 1"=20 miles

November 1933

LOCATION

The Mount Nansen area is at latitude 62° 03' north, longitude 137° 08' west, Yukon Territory. The general location is shown in Figure 1 of this report.

PROPERTY

Mount Nansen Mines Limited holds two groups totalling 269 claims or approximately 21 square miles, the principal workings being located on the southern group. These are shown, in part, on Figure 2 of this report.

Brown McDade Mines Limited owns one block of 70 claims totalling 1.65 square miles, adjoining Mount Nansen Mines on the east. Since there is an important gold-silver vein partially opened up on this ground, with a good possibility of additional ore on strike, and at depth, and since it is proposed that Mount Nansen Mines Limited acquire control (82 1/2%) of Brown McDade Mines Limited, the property outlines are also shown in Figure 2.

ACCESS

The property is located 40 miles west of Carmacks, Yukon Territory, a village on the Dawson Highway, 115 miles north of the town of Whitehorse, the capital of the Yukon Territory.

A winter tote road has been put through to the property from Carmacks. It is proposed to complete this road for year-round delivery from and communication with Carmacks.

A small 3,000-foot runway has been cleared about four miles from the mine workings. This can easily be improved for reliable access by light planes.

TOPOGRAPHY

The area lies within the Dawson Range of the Rocky Mountains and the relief is moderate. The mean elevation of valley floors is about 3,500 feet and the highest peak in the area (Mount Victoria) rises to 6,136 feet.

Valley walls rise gently toward the peaks to an elevation of about 4,400 feet from which a few sharp eroded peaks rise abruptly and precipitously.

POWER, WATER AND TIMBER

Power

There are no developed sources of energy or power in the region. Although small quantities of sub-bituminous coal are mined at Carmacks, the requirements at Mount Nansen do not apparently justify its use.

For this report, diesel power has been used as the source of power for all necessary uses. Diesel fuel is available at 37¢ per imperial gallon delivered on site.

Water

The nearest reliable source of water for year-round use is at Victoria Lake, three miles from the proposed mill-site (see Figure 2). It would therefore be necessary to run a pipeline from Victoria Lake to the site, and this has been included in the estimates.

Timber

The mine, at an elevation of 4,300 feet, is almost at the timber line. However, some of the valleys are well wooded and could supply some timber for mining purposes. It is concluded that all construction timber would be brought in from Whitehorse by truck transport.

DEVELOPMENT TO-DATE

The history of the area has been described by Campbell in his report⁽¹⁾ of November, 1965, and will not be reviewed here.

Surface exploration and trenching started on the Brown, McDade claims in 1943, and a syndicate headed by Conwest Explorations, carried out the first work on what is now Mount Nansen ground, in 1946.

(1) Reference reports are listed at the end of this report.

Mount Nansen Mines Limited

Extensive surface trenching has disclosed three vein structures on the Mount Nansen ground: the Webber Veins, Huestis Veins and the Cabin Vein. (See Figure 2)

Webber Veins - Surface trenching over a length of 1,300 feet has disclosed ore grade silver-gold values in several shoots totalling 740 feet. An adit has been driven under the surface showings totalling 2,960 feet of crosscutting and drifting, at 160 to 200 feet below the surface showings. In addition, 70 non-coring holes recovering sludge, were put down to shallow depths under the surface exposures, and a total of 2,680 feet of diamond core drilling has been completed.

Huestis Veins - Surface trenching, along a length of 1,300 feet, disclosed ore grade values in every trench. This was followed up, as at the Webber location, with an adit driven under the surface showings, at 100 to 200 feet below the showings. The total footage to-date of drifting-cross-cutting in the Huestis adit is 3,000 feet, with 4,625 feet of diamond core drilling from underground.

Cabin Vein - This showing is located 1,200 feet southwest of the Webber and surface work, carried out in 1963 over a strike length of 300 feet, indicated a 100-foot section of ore grade at the southeast end, open on strike. No underground work has been carried out on this vein.

GEOLOGY

The geology of the region has been reported by Bostock. The geology of the mine area has been described by Campbell and will not be reviewed in detail.

The oldest rocks of the area are schists and gneisses of the Yukon Group, believed to be late Precambrian or Cambrian in age. These are unconformably overlain by basic flow rocks and fragmentals of the Mount Nansen Group, and considered to be Jurassic in age. Both of the older series are intruded by granodiorite, considered to be Cretaceous in age, and by porphyritic granite of Tertiary age.

All of the rocks of the area have been complexly deformed by folding and faulting.

The gold-silver veins are later in age than all of the above-described rocks, and show a characteristic branching pattern. They, in turn, are cut by a series of later cross faults.

Both in the Webber and the Huestis mine workings, veins have been found to branch, with a northwest-trending vein joined by stringers or veins from the west-northwest, resulting in a characteristic "Y" pattern. This is considered by us as indicating an original shear origin for the ore-bearing veins, with a relaxing and opening of shears along certain favourable directions at the time of ore deposition.

Campbell has noted that the width is significantly controlled by the enclosing rocks. In the granodiorite, and the basic volcanics, the veins are narrow and they widen when they pass out into Yukon gneiss or the later granite. The veins are relatively narrow, though persistent in length. Mineralization may be concentrated in a narrow stringer one to two inches wide, with tiny parallel stringers in the walls, or disseminated sulphides giving appreciable gold-silver values over one to five feet in total width. They strike generally N 30° W. The Webber Veins dip steeply southwest as does the Brown, McDade zone, while the Huestis Veins dip steeply to the northeast.

ORE MINERALOGY

The rocks of the area have been extensively fractured and weathered. Consequently, the ores have been partially oxidized to depths of 60 to 160 feet below surface.

(3)
A mineralogical investigation carried out by the Mineral Resources Division of the Mines Branch in Ottawa describes the ore as being composed chiefly of siliceous rock and breccia with sulphides and minute quantities of silver-bearing minerals. These are freieslebenite, acanthite and native silver. Arsenopyrite and pyrite are the commonest of the sulphides with lesser amounts of galena, sphalerite, chalcopyrite, bornite, pyrrotite, covellite and arsenobismite. Gold is almost certainly intimately associated with the arsenopyrite.

It is quite apparent that the ore is complex and consequently the recovery of gold and silver cannot be easily and efficiently accomplished.

(3) Reference reports listed at the end of this report.

ORE RESERVES

The ore reserve estimates are based on records of surface and underground development, as supplied to us by the company. Since this work was carefully supervised by the company and was regularly reviewed by Campbell, the consulting geologist, we accept the records.

1. Material used for calculations includes company assay plans and surface plans where available and Dr. Campbell's reports of November, 1965 and May 1966 where company information lacking.

2. Dilution of the Webber and Huestis ore reserves has been on the following basis:

- (a) calculated width less than 1.0' - dilute to 2.0'
- (b) calculated width 1.0' - 5.0' - dilute by 12 inches.
- (c) calculated width greater than 5.0' - dilute by 20%.

3. Vertical dimension of the ore shoots has been established as follows:

- (a) - where surface and drift data correlate, vein is carried through and blocks calculated using one-half vertical distance, adit to surface.
- (b) - veins are extended one-half their length below surface or above or below drift to a maximum of 75 feet when there is no correlation between surface and adit.
- (c) - veins intersected by one drill only are considered to extend 50 feet in each direction.
- (d) - veins intersected by more than one drill hole are considered to extend on strike one-half the drill hole interval.

4. The results of the overburden drilling on the Webber have not been used in the calculations except to assist in defining the extent of the vein.

5. Ore has been categorized as follows:

- (a) Proven - drifted and raised
- (b) Indicated - drifted with or without surface and drill hole correlation.
- (c) Drill-indicated - vein intersected by more than one drill hole correlated with surface and/or drift exposure.
- (d) Possible - surface exposure without drift or drill hole correlation, or one isolated drill hole only.

Sampling and Average Grades

We have used the sampling records of the company, or as recorded in the reports by Campbell.

SUMMARY OF ORE RESERVES
(including dilution)

Watts, Griffis and McOuat Limited
November, 1966

		<u>Tons</u>	<u>Oz. Au</u>	<u>Oz. Ag</u>
<u>Webber</u>	Proven	5,420	0.38	22.7
	Indicated	48,160	0.42	23.1
	Possible	5,580	<u>0.57</u>	<u>15.5</u>
		\$5,180		
	Sub-Total	<u>59,160</u>	<u>0.43</u>	<u>22.4</u>
Huestis	Indicated	13,000	0.67	21.6
	Possible	30,000	0.64	19.7
	Drill-indicated	28,470	<u>0.58</u>	<u>4.0</u>
		\$8,035		
	Sub-Total	<u>71,470</u>	<u>0.62</u>	<u>13.8</u>
<u>Webber and Huestis Total</u>		<u>130,630</u>	<u>0.53</u>	<u>17.7</u>
<u>Brown, McDade-</u>	Indicated	38,640	0.48	4.6
	Possible	10,800	2.00	2.5
	Drill-indicated	13,200	<u>0.42</u>	<u>4.6</u>
		110,000		
	Sub-Total	<u>62,640</u>	<u>0.73</u>	<u>4.2</u>
	Overall Total	<u><u>193,270</u></u>	<u><u>0.60</u></u>	<u><u>15.2</u></u>

Note: See details and exploration in Appendix I to IV.

In drilling it was found that core recovery was very poor. Because of the friable nature of the ore, the samples from drilling may be low where core assays were used.

On the other hand, channel sampling of faces and backs in the mine, no matter how carefully done, may show a bias in the high side.

In the estimates of tonnage and grade, about equal tonnages have been indicated by drilling and in mine workings. We have concluded that the overall average of reserves may have little bias and should be reliable.

Comparison with Earlier Estimates

Although we have lacked a small amount of information, we do not believe that our estimate would be materially affected by such information.

Our estimate of ore, including all classes, is less than that estimated by Campbell. We list below, for comparison, the summary of Campbell's detailed estimates.

Campbell's Estimates of Reserves

Huestis	88,035 tons	at .63 oz. Au	15.88 oz. Ag/ton
Webber	85,280 tons	at .40	21.5
Brown McDade	110,000 tons	at .61	5.4
	<u>283,315</u>		

METALLURGICAL TESTING

Preliminary metallurgical testing for the recovery of gold and silver have been carried out by Britton⁽⁴⁾ and at the Mines Branch^(5, 6) in Ottawa.

The ores opened up to-date on the Webber and the Brown McDade are partially oxidized and the test work indicates a moderate recovery of both gold and silver by fine grinding and cyanidation. It may be that additional test work will indicate the feasibility of recovering a low-grade concentrate from cyanide tailings, to be roasted and re-cyanided.

The Huestis ores are complex sulphides with relatively little oxidation and are probably typical of ores below the zone of weathering.

Test work on these ores has not yet firmly established the best method of precious metal recovery. The process recommended at this stage is to make a high-grade silver-lead concentrate to be sold as such, followed by double-roasting and cyanidation of a bulk pyrite-arsenopyrite concentrate. The firm recommendation of both Britton and Wright is that a more exhaustive recovery research program be undertaken as soon as possible.

The metal recoveries used in this report are those given us by Britton and Wright as sufficiently well established for use in a preliminary feasibility study. They believe these recoveries may be improved and that estimated treatment costs may be lowered as a result of further detailed investigation.

Value of the Ore

Gold is valued at \$37.80 per troy ounce and silver at \$1.40 per troy ounce in this report. Since world consumption of silver exceeds present production by a considerable margin, there is an extremely good chance that silver will be re-valued upward in the next year or so, with little or no chance that it will decrease in value. An increase in the price of silver would greatly enhance the attractiveness of the Mount Nansen ores.

Since the ores are different, the proposed treatment and recoveries are different. Each ore is therefore evaluated in the light of the test work to-date.

(a) Webber Ore

Grade	Overall Recovery	\$ Value/Ton	
0.43 oz. Au/ton	73%	11.85	12.60
22.39 oz. Ag/ton	84% 92%	26.30	28.00
		38.15	<u>41.60</u>

Recovery will eventually be same as Huestis since both are same ore

(b) Huestis Ore -

The Huestis ore is to be valued on the recovery of gold-silver and lead in a concentrate and gold and silver in a double-roasted and cyanided bulk concentrate.

Huestis Ore - silver-lead concentrate

This concentrate has been valued on the basis of a possible contract given to us by American Smelting & Refining Company, November 21, 1966.

(b) Huestis Ore - silver-lead concentrate

<u>Grade</u>	<u>Overall Recovery</u>	<u>\$ Value/Ton</u>
.61 oz. Au./ton	79%	18.14
13.6 oz. Ag./ton	92%	17.50
Less: net cost of marketing concentrate		<u>1.44</u>
	Total	34.20

(c) Brown McDade Ore -

<u>Grade</u>	<u>Overall Recovery</u>	<u>\$ Value/Ton</u>
.72 oz. Au./ton	84%	22.85
3.84 oz. Ag./ton	71%	<u>3.80</u>
	Total	26.65

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PROPOSED MINING METHODS

Operating costs are based on mining all widths less than 3.5 feet on the resuing method. Stope widths in excess of 3.5 feet will be by shrinkage. In all cases, draw-down will be through timbered chutes on the adit levels. Level timber will be supported on wall pins.

Oxidized ore near surface will stand up well as long as the permafrost remains in it. Stopes in the oxidized zones will have to be mined as rapidly as possible and break-through to surface will be done in the summer months. The upper adit level should be preserved as an escape exit and a means of controlling ventilation and a haulage-way for providing fill, if required, for the stopes below. It is planned to backfill the shrinkage stopes with surface rubble, bulldozed in before freeze-up. Permafrost should penetrate during the winter months and eventually provide a permanent, stable, backfill material.

Access to the Webber Vein system will be through an adit driven from the 4,100-foot level at the Huestis. Men and supplies will be serviced from the existing adit to the mine from 4,265 feet to surface.

All ore will be trammed to an ore pass between the 4,000-foot of 4,100-foot level of the Huestis, where sufficient adit will be driven to make room for mine car loading. This would necessitate a one-mile haul to a proposed mill site location.

Mining costs are based on a 250 ton per day operation, seven days a week. Twenty tons of this would be supplied by development muck, and the balance from stoping. Mine development costs, at \$3.50 per ton on the ore outlined, are included in preproduction expenses and the cost of mining this ore is reduced accordingly.

Ore below the 4,000-foot level would be mined by means of an internal shaft, sunk from an adit at this elevation.

METALLURGY

The ore is divided into two types metallurgically. The Webber ore is oxidized from the 4,265-foot adit to surface and to an unknown depth below this level. Oxidized ore in the Huestis occurs in surface trenching, but does not appear to continue to depth, and veins on the 4,300-foot adit are in sulphides. No

Of the ore reserves blocked out, 50 percent are considered in the oxidized category and 50 percent sulphides, so that 125 tons of each will be milled daily.

Not correct

Test work performed by Britton Laboratories in Vancouver indicates recoveries of 84 percent of silver and 73 percent of the gold from the oxide ore by direct cyanidation. The sulphide ore will require flotation followed by double roasting and cyanidation, to give an indicated recovery of 92 percent of the silver and 79 percent of the gold.

A lead-silver-gold concentrate, representing 5.5 percent of the sulphide ore will be produced. This will be a salable concentrate at either Trail, B.C. or at East Helena, Montana. The cost of shipping and smelting this concentrate is applied against the gross value of the ore.

SUMMARY OF ALL OPERATING COSTS

Mining Operating Costs (direct)	\$ 6.95	
Raising and Drifting	3.00	
Diamond Drilling	0.40	
Milling Operating Costs	6.84	3.00
Surface Plant Operating Costs	5.31	
Mine to Mill Haulage	0.35	
Direct Mine Overhead	1.52	
Indirect Mine Overhead	<u>1.50</u>	
	\$25.87	
Add: Contingency of 3%	<u>0.77</u>	
TOTAL OPERATING COSTS		<u><u>\$26.64</u></u>

	<u>Total</u>	costs / ton.
Carlton	\$ 26.26	
Cochran W.	21.59	
McKenzie R.L.	11.12	
Discovery	<u>26.72</u>	Absolute total @ 200 t/d.

$200 \text{ t/day} = \# 30 / \text{day DD.}$

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MINING OPERATING COSTS
* * * * *

MINING COST ESTIMATE

MINING OPERATING COST SUMMARY

Breaking	\$4.95
Chute Pulling	0.89
Miscellaneous Labour and Sampling	1.16
Stope Backfilling	0.10
Supervision	0.44
	<u>\$7.54</u>
Less: development ore at no charge	<u>.59 (credit)</u>
 NET COST/TON	 <u>\$6.95</u>

DRIFTING COSTS (Direct)

Labour - 2 miners to break 6.5, of 7' x 8' drift-muck out, and lay their own track and pipe.	
Wages - 2 miners at 3.00/hr. x 8 hrs.	\$48.00
Bonus - 2 men at 10.00	20.00
Non-wage benefits at 20%	13.60
Board allowance at 2.00/man/day	<u>4.00</u>
	\$85.60
 Cost/foot on 6.5' = \$13.20	
 Rail	\$ 1.00
Ties	0.35
Pipe	2.50
Vent Pipe	1.50
Drill Steel	1.10
Explosives	3.30
Rock Drill Repairs	1.00
Small Tools	0.25
Rock Bolting and Timber Support	0.75
Trammer Repairs	0.15
Mine-car Repairs	0.15
Mucking Machine Repairs	<u>0.30</u>
	\$12.35
 Drift - servicing and tramming	 4.45
 Total Direct Costs = \$90.00/foot	

RAISING COSTS (Direct)

Labour - 2 man crew as for drifting = \$85.60
Average advance at 6'/shift = 14.25/foot
Mucking- 1 man 4 hrs. at 42.80/shift = 21.40 or 3.57/foot

Total Direct Labour = \$17.82/foot

Pipe	\$ 1.50	
Timber	3.00	
Drill steel	1.00	
Explosives	3.30	
Rock drill repairs	1.00	
Small tools	0.25	
Mucking machine repairs	0.30	
Mine-car and trammer repairs	0.30	
Servicing	<u>1.53</u>	<u>12.13</u>

Total Direct Cost Raising = \$30.00/foot

RESUING STOPING COSTS - 3.5' and less in width (58% of total)

Drilling

Use uppers with average of 3 holes for 2 1/2 feet strike length and 7 foot of hole to break 6 1/2 feet - average width broken - 3 feet.

$$\text{Tons/foot of strike} = \frac{3 \times 1 \times 6.5}{11.5} = 1.7$$

$$\text{Footage drilled for 1.7 tons broken} = 21' / 2.5 = 8.4$$

$$\text{Footage drilled/ton} = \frac{8.4}{1.7} = 5' \text{ at } 10\text{¢} = 50\text{¢/ton}$$

Explosives

$$\begin{aligned} 0.75 \text{ lbs./ton at } 25\text{¢} &= 19\text{¢/ton} \\ \text{Caps- 3 at } 35\text{¢} &= \frac{\$1.05}{2.5} \text{ on } 1.7 \text{ tons} = 25\text{¢/ton} \end{aligned}$$

Total Explosive Cost/Ton = 44¢

RESUING STOPING COSTS (continued)

Labour

One man to muck-out, drill and blast 18 holes for 25 tons
Labour/man shift = 42.75

Cost/Ton = \$1.71

Mucking

Cable and Repairs = 10¢/Ton

Timber Cribbed Manways

2 per stope on average length of 90 feet or 1 every 45 feet

Cost/vertical foot - material	\$ 5.60
Labour	<u>5.00</u>
	\$10.60

Average tons/foot of manway = $\frac{45 \times 3}{11.5} = 10.7$

Cost/Ton Manway = \$1.00

Chutes and Timber Sets at Level

Allow 125' interval chutes at 25' centres.

1 Chute installed = \$700.00
Timber pin sets - material = \$3.00/foot
Labour at 2 men, 3 sets/shift = 15' for \$85.50 or 5.70/foot

Total Cost/Foot of drift = \$8.70 + 28.00 = \$36.70/foot

Cost/Ton on 150' x 3' x 1 at 11.5 cu. ft./ton = $\frac{36.70}{11.5} = \$0.94$

RESUING STOPING COSTS (continued)

Backfilling of Stopes

2 man crew to drill, blast and muck sufficient backfill for four shifts on equivalent - 40 x 3 = 120 tons
Using 3 x 3 spacing and long-holing at 9 cu. ft. /ft. of hole = 0.84 tons/foot drilled

Required footage drilled = $\frac{6.3}{0.84}$ = 150 feet at 10¢ \$15.00

Explosives/ ton = 25¢ x 120 \$30.00

Slusher Maintenance & Cable at 5¢/ton \$ 7.50

Timber - flooring and temporary support \$20.00

\$72.50

Labour 85.60

120 tons for \$158.10

Cost/Ton = \$1.32

Summary of Resuing Stopping Costs

Labour - \$1.71/ ton

Explosives - 0.44

Cribbed manways - 1.00

Drilling - 0.50

Level timber & chutes 0.94

Backfilling 1.32

Direct Mining Costs \$5.91/ton

Tons/day required on ratio of 3 tons to 1 ton shrinkage =

135 tons at 200 tons/day

17 tons/man-shift = 8 men required for 135 tons

Add: 2 timbermen - 10 men for 135 tons

Drilling

Average stope width - 6.5 feet
8 feet of break for 9' hole - 4 holes/breast for $52 \times 2.5 =$
125 cu. ft. for 10.8 tons
36' of hole to break 10.8 tons = 3.3'/ton

Drilling Cost at 10¢/foot = 33¢/ton

Explosives

At 0.3 lbs. at 30¢/lb. = 18¢
Caps, fuse, misc. = 30¢
Total explosive cost = 48¢

Labour

1 man to drill and blast 12 holes for $\frac{7 \times 8 \times 6.5'}{11.5} = 31$ tons

Cost/Ton at \$42.75/shift = \$1.38
No. of miners required = 6, allowing for 1/3 draw-down

Timbering & Chutes (on the level)

Allow 125-foot interval for levels and chute every 25' at	
750.00 =	\$28.00/foot of strike
Labour - timber installation	6.00/foot of strike
Timber material	<u>6.00/foot of strike</u>
Total Cost	\$40.00/foot of strike

No. of tons = $\frac{6.5 \times 1 \times 125}{11.5} = 70.5$

Cost/Ton = $\frac{40.00}{70.5} = 0.57¢$

Cribbed Manways

At same cost/vertical ft. as for raising = \$10.60

Cost/Ton on 70.5 ton/vertical foot = 15¢

SHRINKAGE STOPING (continued)

Summary of Shrinkage Stopping Costs

Labour -	\$1.38
Drilling -	0.33
Explosives -	0.48
Level timbering -	0.57
Cribbed manways -	<u>0.15</u>
Total breaking costs	\$2.91

No. of Men required for 65 ton per day = $2 \times 3 = 6$ (draw-down = 1/3)

PULLING CHUTES AND TRAMMING

Same costs for both types of mining.
200 tons/day production and 80 tons/2 man crew
= $\frac{200}{80} \times 2 = 5$ miners

Labour - 5 x 8 x 2.75/hr.	\$110.00
Bonus/shift at 6.00 x 5	30.00
Board allowance at 2.00 ea.	10.00
Non-wage benefits at 20%	<u>30.00</u>
Total Cost	\$180.00

Cost/Ton on 200 tons per day = 89¢/ton

MISCELLANEOUS UNDERGROUND LABOUR

2 samplers at 2.90/hr.	\$ 46.40
1 powder man & cleanup at 2.60	20.80
2 pipe fitters at 2.95	47.20
2 timbermen (included in stoping costs)	
3 labourers at 2.60/hr.	<u>62.40</u>
10	\$176.80
Non-wage at 20% of these	35.40
Board at 2.00 each	<u>20.00</u>
	\$232.20

Miscellaneous Labour Cost/ton \$1.16

Resuing and Shrinkage Stopping (Combined Costs)

Breaking - 135 tons/day resuing at 5.91/ton = 800.00
- 65 tons/day shrinkage at 2.91/ton = 190.00
990.00

Average Break Cost/Ton \$4.95
Chute Pulling 0.89
Miscellaneous labour & sampling 1.16
Stope Backfilling 0.10
\$7.10/ton

Add: supervision - 3 shift bosses at \$800/mo. \$2,400.00
non-wage at 20% 480.00
board allowance 30 x 2.00 x 3 180.00
\$3,060.00

Supervision Cost/Ton on 6,900 tons = \$0.44

Cost/Ton at the mine is \$7.54

On the basis of milling 250 tons/day:

230 tons mined at \$7.54/ton \$1,734.00
20 tons development muck at N/C -

AVERAGE COST/ TON ON 250 TONS/DAY
PRODUCTION = $\frac{\$173.20}{250}$ = \$6.95

RAISING AND DRIFTING

10,000 feet for 100,000 tons of ore = 10 tons/foot of development at \$30/foot

Cost/Ton of Ore = \$3.00

DIAMOND DRILLING

10,000 feet for 100,000 tons = 10 tons/foot at \$4.00 direct cost

Cost/Ton of Ore = \$0.40

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MILLING OPERATING COSTS
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SURFACE PLANT OPERATING

COSTS

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SURFACE PLANT OPERATING COST
SUMMARY

Surface Labour	\$2.10
Expediting	0.20
Assaying (included under milling)	-
Fuel Costs	2.78
Vehicle Cost of Operation	<u>0.23</u>
 TOTAL COST/TON	 <u><u>\$5.31</u></u>

SURFACE PLANT COST ESTIMATE

Surface Labour

1	Rock Drill Mechanic - at \$ 2.85 x 8	\$ 22.80
1	Diesel Mechanic - at \$ 2.85 x 8	22.80
1	Welder - at \$ 3.25 x 8	26.00
1	Electrician - at \$ 3.25 x 8	26.00
1	Automotive Mechanic - at \$ 2.90 x 8	23.20
1	Driver - \$ 2.50 x 8	20.00
1	Timekeeper - \$ 2.50 x 8	20.00
1	Stenographer - \$ 2.25 x 8	18.00
2	Road Maintenance and Yard - \$ 2.60 x 8	41.60
1	Dryman - \$ 2.50 x 8	20.00
3	Diesel & Boiler Operators - \$ 3.10 x 8	74.40
1	Machinist - \$ 3.25 x 8	26.00
2	General Labourers - \$ 2.50/hr. x 8	40.00
1	Pipe Fitter - \$ 3.25/hr. x 8	<u>26.00</u>
18		\$ 406.80
	Add 20% Non-Wage Labour	<u>81.00</u>
		\$ 487.80
	Board Allowance - 18 at \$ 2.00	<u>36.00</u>
		\$ 523.80

Cost per ton on 250 tons per day = \$ 2.10

Expediting

1	Man in Vancouver and 1 Man in Whitehorse each with their own vehicle on a mileage basis.	
2	men at \$ 600.00 per month each	\$ 1,200.00
	Non-Wage at 15%	180.00
	Vehicle Mileage 40/day x 30 x 10¢	<u>120.00</u> /mo.
		\$ 1,500.00

Cost per month on 250 tons per day = \$ 0.20

Assaying

Included under milling.

Central Heating Plant

120 people at 150 sq. ft. /person at 100 B. T. U. /sq. ft. /hr.
= 1,800,000 B. T. U. /hr.
Private Homes at 100,000 B. T. U. /hr. x 10 = 1,000,000
Total Heat Required for Homes = 2,800,000
Allow 10% heat loss on transmission = 280,000

Total B. T. U. /hour = 4,080,000

Heating efficiency at 75% on boiler to give total
requirement of $\frac{100 \times 4,080,000}{75} = 5,450,000$ B. T. U. /hour

Fuel required at 180,000 B. T. U. /Imp. Gal. = 30 gals. /hr. =
720 gal. /day maximum

Use average at 2/3 of maximum = 470 gals. /day.

Mine Ventilation Heating

Use direct fired oil heaters at each portal.
Fuel consumption for both portals = 50 gal. /day
Heat from compressors will augment this.

Water-Line Pumping

200 U.S. gals. /minute over 16,000 feet of 4" pipe
Static head - from elevation 3,400 to elevation 3,800 = 400 feet
Friction head - 16,000 feet at 4.29'/100 = 690 feet

Total Head = 1,100 feet

H. P. Required = $\frac{200 \times 1,100 \times 1}{3,960 \times 0.65} = 86$ H. P.

Use 100 H. P. for generator design and fuel consumption.

Diesel Plant

Mill - included in mill costs

Compressors - diesel driven

1,200 c.f.m. at each portal = 400 H.P. at 3/4 use factor = 300 H.P.

Electric fans - 50 H.P.

Misc. Motors, shop, etc. - 50 H.P.

Townsite - 1 k.w./person x 160 = 160 k.v.a. = 160 H.P.

Water-Line Heating - 300 k.v.a. = 300 H.P.

Lake Pump = 100 H.P.

Mine Water Supply Pump = 25 H.P.

Fuel consumption on 885 H.P. at 0.5 lb./H.P./hr.

= $885 \times 0.5 \times 24 = 1,220$ gals./day

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Summary of Fuel Costs

Townsite Heating	470 gals./day
Adit Heating	50
Power	1,220
	<u>1,740 gals./day at 37¢ = \$645.00/day</u>

Cost/Ton on 250 tons/day = \$2.54

Maintenance & Lubs on diesel & heating plant \$60/day or 24¢/ton

Total Cost/Ton (mill excluded) = \$2.78

Vehicle Cost of Operation

1	One-ton - 4 wheel drive - general purpose	
1	One-ton - 4 wheel drive - general purpose	
1	Five-ton - snow plow	
1	Jeep (manager)	
<u>1</u>	<u>Three-ton service vehicle</u>	
5 vehicles	- fuel, 15, 10, 10, 10, 5 = 55 gals./day at 50¢	\$27.50
	lubs	3.00
	repairs	<u>16.00</u>
		\$46.50
1	Dozer (for emergency only)	<u>10.00</u>
	Vehicle Operation Cost/Ton = 23¢	\$56.50

INDIRECT MINE OVERHEAD

Head Office

\$1.50

CAPITAL COST ESTIMATE

SUMMARY OF CAPITAL COSTS

Recommended Metallurgical Research and Development Costs (Interim Program)	\$ 550,000.00
<u>Costs of Production Facility</u>	
Pre-production Mining Costs	\$ 62,000.00
Mining Equipment Costs	246,800.00
Mill Plant Costs	1,088,000.00
Townsite & Surface Buildings Costs	460,000.00
Power & Heating Plant Costs	190,000.00
Water-line Costs	<u>136,000.00</u>
	\$2,732,800.00
Contingency	<u>267,200.00</u>
Total Capital Costs	\$3,000,000.00
Working Capital	<u>300,000.00</u>
 TOTAL CAPITAL REQUIRED	 <u><u>\$3,300,000.00</u></u>

Note: It is considered that a saving of \$100,000.00 on the purchase of used mining and milling equipment is possible.

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RECOMMENDED PROGRAM OF METALLURGICAL
RESEARCH AND MINE DEVELOPMENT

Our ore estimates, including possible ore, do not indicate sufficient present reserve to repay the capital costs of development. We are confident that the ores extend to depth and recommend a program of metallurgical research and ore development to increase the indicated profitability of the venture. We estimate this program of work will require six months to complete.

An important part of this program is metallurgical testing to prove and improve recoveries and to further test roasting characteristics of the ore. At the same time we would expect the consulting metallurgists to firm up plant design and establish more accurate cost estimates, both for operating and capital.

The road from Carmacks to the mine should be improved for year-round service. Half of the cost of the road should be paid by the Federal Government under the Roads to Resources Plan.

Work in the mine would open up a new adit under the existing Huestis adit and drifting would confirm and extend ore, now classed as "possible ore".

As the program proceeds, allowance is made for design engineering.

1. Metallurgical Research

Bench scale testing and roasting tests on 500 lbs. of bulk concentrate from Huestis ore	<u>\$25,000.00</u>
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2. Mine Development

Diamond Drilling	10,000 feet
Drifting	Huestis - 4,300 level - 700 feet 4,150 level - 3,300 feet Webber - 4,265 level - 700 feet on vein
Raising	400 feet

Total Development = 4,700 feet required drifting plus 400 feet raising.

Line Drive to Webber on 4,100' level = 4,800 feet
Drifting to north end No. 1 vein 2,000
 6,800 feet

Total Drive = 6,800 feet at 540 feet/month = 12.6 months

If we eliminate driving to the Webber during this interval, the drive on the Huestis will be 2,800 feet at 540 feet/month for 5.2 months.

Diamond drilling cross-cuts would have to be cut en route and diamond drilling could be done concurrently with the long drive.

Minimum time required for diamond drilling and drifting would be six months.

Drifting at 30.00/foot x 4,700 feet	\$141,000.00
Raising at 30.00/foot x 400 feet	12,000.00
Diamond drilling at 4.00/foot x 10,000 feet	<u>40,000.00</u>
	\$193,000.00

3. Surface Plant Operation

Fuel - compressors 450 gal./day at 37¢ =	\$166.00
lubs and maintenance =	\$ 30.00/day
Mobile Equipment - 1 dozer 80 gal.	
2 - 4 wheel drive 20 gal.	
1 - jeep 10 gal.	
1 - muskeg tractor 10 gal.	
<u>120 gal.</u>	
80 gal. at 37¢	\$ 32.00
40 gal. at 55¢	22.00
Lubs & maintenance on above vehicles	<u>44.00</u>
Total	\$294.00/day
Cost for 6 months at \$294.00/day =	\$ 53,000.00

3. Surface Plant Operation (continued)

Assaying

Assayer - 6 months at 700.00	\$4,200.00	
Non-wage labour at 15%	630.00	
	<u>\$4,830.00</u>	
Chemicals & fuel-500./mo. x 6	3,000.00	\$ 7,830.00

Camp Fuel

200 gals. /day at 37¢	\$37.00	
Cost for 180 days =		\$ 6,860.00

Surface Crew

1 Dozer operator at 3.00/hr.	\$24.00	
3 Compressor operators at 2.75/hr.	66.00	
1 Bombardier operator at 2.80/hr.	22.40	
1 Truck Driver at 2.75/hr.	22.00	
2 Labourers at 2.65/hr.	21.20	
1 Rock-drill mechanic at 3.00/hr.	24.00	
1 Welder mechanic at 3.00/hr.	24.00	
	<u>203.60</u>	
Non-wage labour at 15%	30.50	
	<u>\$234.10</u>	
Cost for 6 months at \$234.10/day		\$ 42,150.00

Staff

1 Mine manager at \$1,100/mo.	\$1,100.00	
2 Shift bosses at \$700/mo.	1,400.00	
1 Geologist at \$900/mo.	900.00	
1 Sampler at \$550/mo.	550.00	
1 Master mechanic at \$800/mo.	800.00	
	<u>\$4,750.00</u>	
Non-wage labour at 20%	950.00	
	<u>\$5,700.00</u>	
Cost for 6 months at \$5,700.00/mo.		\$ 34,200.00

3. Surface Plant Operation (continued)

Board Loss

35 men at 4.00/day/man = \$140.00/day

180 days at \$140.00 =

\$ 15,200.00

Total Mine Development

\$352,240.00

4. Road Work

15 miles at \$5,500/mile =

\$82,500.00

Bridge

6,500.00

\$89,000.00

At 1/2 cost

\$ 44,500.00

5. Engineering Design

Total

\$ 50,000.00

6. Miscellaneous Charges

Transportation of Crews

50 return trips at \$200.00

\$10,000.00

Expediting

\$800.00/month x 6 months

4,800.00

Telephone, Telegraph & Communications

\$800.00/month for 6 months

4,800.00

Stationery, Office Supplies

\$250.00/month for 6 months

1,500.00

Cost for 6 months

\$ 21,100.00

7. Head Office and Consulting Engineers

\$4,000.00/month for 6 months

\$ 24,000.00

8. Contingency Allowance \$ 33,160.00

SUMMARY OF INTERIM COSTS

Metallurgical Research	\$ 25,000.00
Mine Development	352,240.00
Road Work	44,500.00
Engineering Design	50,000.00
Miscellaneous Charges	21,100.00
Head Office and Consulting Engineers	24,000.00
Contingency Allowance	<u>33,160.00</u>
 Total Interim Costs	 <u>\$550,000.00</u>

PRE-PRODUCTION MINING COSTS

500 feet of drifting at \$40.00	\$20,000
450 feet of raising at \$40.00	18,000
Chute Installations	4,000
Miscellaneous Stope Preparation	<u>20,000</u>
Total Pre-Production Mining Costs	\$ 62,000.00

MINING EQUIPMENT COSTS

Mine cars - 20 at \$700	\$14,000
Trammers - 6 at \$6,000	36,000
Charging Sets - 6 at \$1,200	7,200
Trammer Batteries - 12 at \$1,200	14,400
Mill Haulage - track & equipment	20,000
Rock Drills - 12 at \$1,100	13,200
Slushers - 15 at \$3,500	52,500
Tuggers - 15 at \$2,000	30,000
Car Switchers - 2 at \$2,000	4,000
Compressors - 1 at \$22,000	22,000
Vent Fans - 7 at \$500	3,500
Air Heaters - 3 at \$2,000	6,000
Air Cylinders & Chutes	5,000
Small Tools	6,000
Mine Shop Equipment	6,000
Lathe	5,000
Miners' Lamps - 40 at \$50	<u>2,000</u>
	\$ 246,800.00

Less: proposed saving on used
equipment - \$70,000

Capital Required = \$176,800.00

MILL PLANT COST SUMMARY

	<u>Equipment</u>	<u>Construction & Installation</u>	<u>Sub-Total</u>
Crushing Plant	\$ 76,600	\$ 102,700	\$ 179,300
Concentrator	305,900	353,370	659,270
Roasting Plant	<u>200,000</u>	<u>50,000</u>	<u>250,000</u>
Sub-Totals	582,500	506,070	1,088,570
Contingencies 20% Including Engineering			<u>217,710</u>
Total Plant Cost at Start Up			<u>\$ 1,306,280</u>

Crushing Plant Equipment

<u>Equipment, Construction & Install.</u>	<u>H.P.</u>	<u>Cost</u>
36" x 42" Vibr. Feeders (2)	2	\$ 7,000
Conv. No. 1 - 24" x 60' x 20' Rise	5	2,700
Tuning Fork Grizzly		2,000
18" x 32" Jaw Crusher	60	16,000
Conv. No. 2 - 24" x 60' x 20' Rise	5	2,700
3' x 8' D. D. Screen	2	3,800
3' Std. Cone Crusher	75	30,000
Conv. No. 3 - 18" x 120' x 40' Rise	5	4,200
Dust Cyclone & Fan	10	2,500
3 Ton Hoist & Monorail	1	1,200
Chutes & Skirting		3,500
Dust Collecting Piping		<u>1,000</u>
Total Crushing Plant Equipment	<u>165</u>	<u>\$ 76,600</u>

Crushing Plant Construction & Installation

<u>Equipment, Construction & Installation</u>	<u>H. P.</u>	<u>Cost</u>
Excavation, Backfill - 1,000 cu. yds.		\$ 3,000
Buildings Foundations included		
C. O. Bin & Slab		20,000
Super Structure Including Platforms		25,000
Conv. Gallery No. 1 - \$ 35/ft.		500
Conv. Gallery No. 3 - \$ 35/ft.		3,800
Equipment Installation - \$ 76,600 - 30%		22,980
Electrical Equipment & Installation	165	5,000
Heating, Piping Allowance		10,000
Freight at \$ 100 per ton - 40 tons		4,000
Federal Tax 11% on Equipment		8,420
Total Crushing Plant Construction & Installation	165	\$ 102,700

Concentrator Equipment

12" x 36" Vibr. Feeders (4)	2	5,000
Conv. No. 4 - 18" x 50' x 10'	2	1,800
Conv. No. 5 - 18" x 50' x 10'	2	1,800
6' x 5' Ball Mills (2)	250	100,000
2" x 2" SRL Pumps (2)	10	1,300
10" Cyclones (2)		1,600
24" Avt. Samplers (2)		1,600
8 Cell No. 18 SP Flot. Machine (2)	16	16,600
1 1/2" Pumps (2)	4	1,400
6' x 6' Conditioner Tank	2	1,500
12' x 8' Thickeners (2)	2	6,000
2" Diaphragm Pumps (2)	1	2,200
4' x 2' Disc Filter	1	4,200
	292	\$ 145,000

Concentrator Equipment (Cont'd)

<u>Equipment, Construction & Installation</u>	<u>H. P.</u>	<u>Cost</u>
Balances Forward	292	\$ 145,000
Filtrate Receiver & Pump	1	1,000
30' x 10' Thickener	1 1/2	9,000
No. 3 DSM Pump	3	1,200
18' x 20' Agitators (4)	8	24,000
8' x 10' Drum Filters (2)	8	28,000
24" Repulpers (2)	4	7,000
24" x 36" Filtrate Receivers (2)		
2" x 2" Filtrate Pumps (2)	10	
24" x 36" Moisture Trap		6,000
Vacuum Pump 850 CFM	25	
2" Pumps (2)	4	1,000
14' x 18' Solution Tanks (2)		2,000
Clarifier 20 Leaf, Vacuum Tank		5,000
Deaerating Tower		1,000
1 1/2" Filtrate Pump	7 1/2	700
6' x 6' Belt Feeder	1	500
Emulsifier Cone		500
Moisture Trap		300
Vacuum Pump	10	2,000
3' x 3' Regrind Mill	15	7,000
2" x 2" Pump	2	800
Filter Presses (2)		8,000
Refinery Equipment including Furnace	5	6,500
Chutes & Pump Boxes, Launderers, etc.		5,000
Piping - Supply		5,000
Tailing Pipe - 2,500'		4,000
Water Tank, Piping, etc.		12,000
Initial Ball Charge		5,400
Initial Reagents		7,000
Reagent Feeding System		6,000
Min. Essential Spare Parts		5,000
Total Concentrator Equipment	397	\$ 305,900

Concentrator Construction & Installation

<u>Equipment, Construction & Installation</u>	<u>H. P.</u>	<u>Cost</u>
Excavation & Backfill - 3,000 cu. yds.		15,000
F.O.B. Foundations - 100 cu. yds - \$ 100		10,000
F.O.B. Superstructure & Roof		8,000
Conc. Bldg. Foundations including Slab		35,000
Ball & Regrind Mill Foundation		10,000
Mill Bldg. Structure Including Platforms		80,000
Refinery Bldg.		4,000
Office Allowance		6,000
Assay Allowance		3,000
Heating Allowance		10,000
Cold Warehouse Lean-To		6,000
Equipment Installation - \$ 305,900 - 30%		90,270
Electrical Equipment & Installation	397	25,000
Freight at \$ 100 per ton - 180 tons		18,000
Federal Tax 11% on equipment		33,100
Total Concentrator Construction & Installation	397	\$ 353,370

TOWNSITE AND SURFACE BUILDINGS COSTS

10 Houses at \$16, 000 (serviced)	\$160, 000	
Single Quarters-130 at \$1, 500/ person (serviced)	195, 000	
Garage	20, 000	
Recreation Building	20, 000	
Cookhouse and Facilities	20, 000	
Mine Dry	15, 000	
Warehouse	20, 000	
Powerhouse and Boiler Room	20, 000	
Office	20, 000	
	<u>\$490, 000</u>	
Less: credit on existing structures	<u>30, 000</u>	
Total Cost		\$ 460, 000.00

POWER AND HEATING PLANT COSTS

900 k. v. a. -	\$ 80, 000	
Heating Plant	20, 000	
Electric Distribution Panel	10, 000	
Sewage Disposal (included in townsite cost) -		
Boiler and Powerhouse Installations	20, 000	
Stand-by Equipment	50, 000	
Electrical Services	<u>10, 000</u>	
Total Cost		\$ 190, 000.00

WATER-LINE COSTS

3 miles of 4" line (16, 000') required		
4" Pipe at 2. 00 (including fittings)	\$ 32, 000	
Power & Heater cable at 2. 80/ft.		
x 16, 000	44, 800	
Miscellaneous Attachments at \$3, 000	3, 000	
Insulation at 25¢/ft.	4, 000	
Waterproof Jacket or Box at 75¢/ft.	12, 000	
Pipe-laying at \$1/ft. x 16, 000 feet:	<u>16, 000</u>	
	\$111, 800	
Cost/Mile = \$37, 300. 00		
Add: 1/5 mile to Huestis portal	<u>7, 500</u>	
Cost of Water-line		\$119, 300

WATER-LINE COSTS (continued)

Pumps	\$ 8,000	
Pumphouse	4,000	
Miscellaneous Electric, etc.	5,000	
	<u>\$ 17,000</u>	
Total Cost of Water-line Installation		\$ 136,000.00
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		\$ 2,732,800.00
Contingency at 10%		<u>276,200.00</u>
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Total Capital Costs		\$ 3,000,000.00
Working Capital (2 months)		<u>300,000.00</u>
		<hr/>
TOTAL CAPITAL REQUIRED		<u><u>\$ 3,300,000.00</u></u>

FEASIBILITY

It is not yet possible to recommend development to production at Mount Nansen. Nevertheless, the property has an excellent chance of becoming a producing mine when ore has been checked out sufficient to warrant mill construction.

Operating costs are estimated at \$26.64, allowing for normal costs of exploration, \$3.50 per ton. These costs have already been paid for on a part of the ore included in the estimates.

The operating costs at the Brown, McDade property should be less than average, since it is anticipated that shrinkage stoping can be applied to all the ores estimated on this property. For the purpose of this report, it has been suggested that 82 1/2 percent of profits from Brown, McDade would accrue to Mount Nansen Mines Limited.

On the basis of the total existing reserve then, an operation would show the credits set out below.

Operating Profit - 250-ton Operation

Huestis Zone -	72,120 tons x (\$34.20-26.64) =	\$ 545,000
	Credit for development work-to-date	
	12,900 x \$3.50 =	45,000
Webber Zone -	59,160 tons x (\$38.15-26.64) =	682,000
	Credit for development work-to-date	
	53,600 x \$3.50 =	187,000
Brown-McDade Zone-	62,200 tons x (26.65-23.14) =	218,000
	Credit for development work-to-date	
	50,000 x \$3.50 =	<u>175,000</u>
	Total Operating Profit existing reserve	<u><u>\$1,852,000</u></u>

Ore Reserves Required

The company's consulting metallurgist and consulting metallurgical engineers believe that the recoveries of gold and silver can be improved by continued test work and that the estimated mill operating costs may also be lowered. Although these possible credits cannot yet be evaluated, we can conclude that the venture would repay all costs of further development with a minimum total reserve of 350,000 tons, and that four years would be required for payback.

REPORTS AND REFERENCES

1. Review Report on the Geology and Ore Reserves of the Peso Silver Mines Limited Properties, Yukon Territory by D. D. Campbell, November 10, 1965.
2. Addendum to Report on Peso Silver Mines Limited Properties, Yukon Territory by D. D. Campbell, May 10, 1966.
3. Mineralogical Investigations of Ore Samples for Mount Nansen Mines, Yukon Territory by W. Patrick, October 19, 1965.
4. Britton Research Laboratories:
 1. Metallurgical Test Work on Webber Veins - August 2, 1965
 2. Metallurgical Test Work on Huestis Veins - February 23, 1966
 3. Test Results on Huestis Ore - March, 1966
 4. Summary and Interpretation of Test Results, November 23, 1966
5. Progress Report on Ore from Brown, McDade Property, Ottawa July 12, 1947.
6. Mines Branch Metallurgical Test Report by T. F. Berry.
7. Geological Survey of Canada Memoir 189 - Carmacks District, Yukon, by H. S. Bostock, 1941.
8. Geological Map of Yukon Territories No. 1048A by Department of Mines and Technical Surveys, 1957.
9. Preliminary Concentrator Layout with Estimated Product Recoveries, Operating Costs and Capital Costs by Wright Engineers Limited, Vancouver, B.C., November 19, 1966.
10. Various plans and sections from Mount Nansen files.

APPENDIX I (a)

DETAILS OF WEBBER ORE RESERVES - SURFACE ELEVATION

<u>Location</u> <u>No. 1 Vein</u>	<u>Length</u>	<u>Width</u>	<u>Height</u>	<u>Tons</u>	<u>Au</u> <u>oz. /ton</u>	<u>Ag</u> <u>oz. /ton</u>	<u>Category</u>	<u>Remarks</u>
105	34.0	4.8	50.0	710	0.37	46.6	Indicated	Trench & overburden holes-adit correlation
107	70.0	6.2	70.0	2,640	0.45	31.0	Proven	Avg. of trench & raise -adit correlation
121	82.0	4.7	85.0	2,850	0.46	19.9	Indicated	Trench-adit correlation
119	85.0	4.0	94.0	2,780	0.38	8.3	Indicated	Trench-adit correlation
120	70.0	3.5	95.0	2,020	0.40	11.8	Indicated	" " "
122N	130.0	3.0	95.0	3,220	0.50	13.4	Indicated	" " "
122S	30.0	3.0	95.0	740	0.39	10.0	Indicated	" " "
A ✓	135.0	2.5	67.5	1,980	0.27	11.9	Possible	Trench-no adit infor- mation
B	30.0	3.0	15.0	120	0.46	4.2	Possible	" "
C ✓	55.0	3.5	80.0	1,340	0.52	5.6	Indicated	" "
D ✓	40.0	4.0	80.0	1,110	0.33	20.0	Indicated	" "
E ✓	80.0	4.5	80.0	2,500	0.32	9.2	Indicated	" "
<u>No. 2 Vein</u>								
130-131 ✓	180.0	4.6	86.0	6,190	0.37	30.5	Indicated	" "
140 ✓	70.0	3.3	85.0	1,710	0.43	16.0	Indicated	" "

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APPENDIX I (b)

DETAILS OF WEBBER ORE RESERVES - ADIT ELEVATION

<u>Location</u> <u>No. 1 Vein</u>	<u>Length</u>	<u>Width</u>	<u>Height</u>	<u>Tons</u>	<u>Au</u> <u>oz./ton</u>	<u>Ag</u> <u>oz./ton</u>	<u>Category</u>	<u>Remarks</u>
107A	76.0	6.0	70.0	2,780	0.32	14.9	Proven	Avg. of drift & raise
107B	76.0	5.0	38.0	1,260	0.23	13.0	Indicated	drift
121	52.0	3.5	111.0	1,760	0.31	38.2	Indicated	drift surface correlation
119	52.0	3.6	120.0	1,950	0.27	15.2	Indicated	" " " "
120	33.0	2.0	111.0	640	0.21	10.8	Not ore	" " " "
122	34.0	2.1	112.0	700	0.21	16.1	Not Ore	" " " "
128	28.0	2.4	109.0	640	0.50	7.9	Not Ore	" " " "
136	130.0	5.0	145.0	8,200	0.67	43.5	Not Ore ?	drift & test holes- surface correlation
<u>No. 2 Vein</u>								
131 ✓	48.0	3.3	114.0	1,570	0.22	13.4	Indicated	drift surface correlation
134 ✓	38.0	2.8	109.0	1,010	0.23	12.0	Indicated	" " " "
139 ✓	15.0	3.8	93.0	460	0.33	26.1	Indicated	" " " "
143 ✓	67.0	4.5	183.0	4,800	0.36	25.0	Indicated	X-cuts, test holes & overburden holes, no surface information
152	100.0	4.0	100.0	3,480	0.75	18.0	Possible	1 drill hole only-AD-2
Totals				5,420	0.38	22.7	Proven	
				48,160	0.42	23.1	Indicated	
				<u>5,580</u>	0.57	15.5	Possible	
				59,160	0.43	22.4	Overall	

Note: Campbell's 129 and 130 ore blocks not included at this elevation because of inadequate information.

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APPENDIX II

DETAILS OF HUESTIS ORE RESERVES

<u>Location</u> <u>No. 12 Vein</u>	<u>Length</u>	<u>Width</u>	<u>Height</u>	<u>Tons</u>	<u>Au</u> <u>oz. /ton</u>	<u>Ag</u> <u>oz. /ton</u>	<u>Category</u>	<u>Remarks</u>
608	51	3.4	50	750	0.49	7.0	Indicated	Drift
609	55	5.1	55	1,340	0.39	5.3	Possible	1 sample in X-cut
610	76	2.0	76	1,000	0.84	23.6	Possible	" " " "
612	60	3.1	80	1,290	0.64	19.6	Indicated	drift & extension
615	99	3.8	150	4,910	0.88	37.4	Indicated	drift
617	103	3.0	150	4,030	0.63	10.7	Indicated	drift
616A	100	3.6	65	2,060	0.74	17.0	Drill-Indicated	615, 617, H-9 comb.
616B	100	3.6	280	8,760	0.71	15.6	Possible	616A & H-22 comb.
12N-W br	450	4.5	150	26,410	0.57	3.0	Drill-indicated	H-20, 16, 21, 13
12N-W br	100	5.6	100	4,870	0.51	19.5	Possible	surface trench 202
12N-E br	275	3.2	80	6,120	0.90	44.3	Possible	" 204, 205 & 206
<u>No. 13 Vein</u>								
13N-1	65	5.5	65	2,020	0.30	11.4	Indicated	drift
13N-3	100	3.3	100	2,870	0.27	9.8	Possible	DDH H-15 only
13N-0	60	2.2	60	690	0.37	16.8	Possible	DDH H-12 only
<u>No. 14 Vein</u>								
14N-0	100	5.0	100	4,350	0.56	4.0	Possible	DDH H-12 only
Totals				13,000	0.67	21.6	Indicated	
				28,470	0.58	4.0	Drill-indicated	
				30,000	0.64	19.7	Possible	
				71,470	0.62	13.8	Overall	
				88,035				

APPENDIX III

DETAILS OF BROWN, McDADE ORE RESERVE

<u>Location</u>	<u>Length</u>	<u>Width</u>	<u>Height</u>	<u>Tons</u>	<u>Au oz. /ton</u>	<u>Ag oz. /ton</u>	<u>Category</u>	<u>Remarks</u>
Trench 1	150	15.0	50	11,200	0.29	3.4	Indicated	Surface
Trench 2	100	9.0	50	4,500	1.02	16.4	Indicated	Surface
Trench 3	110	9.0	50	4,900	0.90	6.3	Indicated	Surface
Trench 4	80	6.0	50	2,400	0.73	1.2	Indicated	Surface
Trench 8	100	18.0	50	9,000	2.40	3.0	Possible	Surface
Adit Xcut	140	5.4	75	5,700	0.50	3.6	Indicated	Drift
Adit drift	35	3.6	75	900	0.39	1.2	Indicated	Drift
Adit drift	110	4.8	50	2,600	0.40	3.9	Indicated	Drift
DDH below adit	100	11.0	100	11,000	0.50	5.5	Drill-indicated	DDH below drift
Undiluted Totals				32,200	0.57	5.5	Indicated	
				11,000	0.50	5.5	Drill-indicated	
				9,000	2.40	3.0	Possible	
Diluted (20%) Totals				38,640	0.48	4.6	Indicated	
				13,200	0.42	4.6	Drill-indicated	
				10,800	2.00	2.5	Possible	
				62,640	0.73	4.2	Overall	
				77,945				

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APPENDIX IV

AMERICAN SMELTING AND REFINING COMPANY
ORE DEPARTMENT

120 BROADWAY, NEW YORK, N.Y. 10005

ALLEN L. HATCH
MANAGER

November 21, 1966

JAMES G. COX
ASSISTANT MANAGER

VIA AIR MAIL

Watts, Griffiths & McQuat, Ltd.
Suite 911
159 Bay Street
Toronto 1, Canada

Attention: Mr. Jim Bates

MOUNT NANSEN MINES, LTD.
MAYO DISTRICT Y.T., CANADA

Dear Sir:

This will refer to your conversations with Mr. A. L. Hatch request-
ing purchase terms for the proposed silver-lead concentrate and arsenical
concentrate production of the Mount Nansen Mines, Ltd. in the Mayo District,
Y.T., Canada.

We would be pleased to offer the following tentative schedule for purchase
of the silver-lead concentrates.

PRODUCT, Approximately 100 tons per month of silver-lead concentrates produced
TONNAGE & from properties owned or controlled by Seller in the Mayo District,
ANALYSES: Y.T., Canada, said to analyze substantially as follows:

Au	2 ounces per ton	Zn	3%
Ag	400 ounces per ton	As	5%
Pb	36%	Sb	7%

DELIVERY: In bond, f.o.b. cars at unloading bins at Buyer's plant at East Helena,
Montana.

PAYMENTS

GOLD: Pay for \$6.75% at the net price per ounce paid by United States Mints
for gold recovered from imported gold-bearing materials on the 30th
day following date of delivery of product at plant of Buyer, subject
to the applicable United States Governmental regulations pertaining
to transactions in gold. The quantity of gold not paid for shall
equal a minimum of 0.015 troy ounces per dry ton.

Watts, Griffis & McQuat

-2-

November 21, 1966

SILVER:

If over one troy ounce per short dry ton and less than 175 troy ounces, pay for 95%; if 175 ounces and less than 275 ounces, pay for 96%; if 275 ounces and less than 375 ounces, pay for 96.5%; if 375 ounces or over, pay for 97%, at the Handy & Harman New York quotation for silver adjusted to the basis applicable to silver contained in unrefined silver-bearing material, as published in the Engineering and Mining Journal, averaged for the calendar month following date of delivery of product at plant of Buyer, less a deduction of 1¢ per troy ounce of silver paid for. The quantity of silver not paid for shall equal a minimum of one troy ounce per dry ton.

LEAD:

Deduct from the wet lead assay 1.5 units and pay for 95% of the remaining lead at the average of the quotations for common domestic lead for delivery in New York City, as published in the Engineering and Mining Journal, averaged for the calendar month following the date of delivery of product at plant of Buyer, less a deduction of 2.5¢ per pound of lead paid for. The quantity of lead not paid for shall equal a minimum of 2.5 units per dry ton.

No payment will be made for any metal or content except as above specified.

From the total of the above, make the following

DEDUCTIONS

RISE \$15.00 per net dry ton of 2,000 pounds.
CHARGE:

ARSENIC: 1% free; charge for excess at 75¢ per unit, fractions in proportion.
ANTIMONY: 1% free; charge for excess at 75¢ per unit, fractions in proportion.
WAX: 0.05% free; charge for excess at 50¢ per pound, fractions in proportion.
HANDLING Small Lots: For lots containing less than 20 tons dry weight, charge \$15.00
CHARGE: per lot.
Sacks and Drums: For product shipped in sacks or drums, charge \$2.50 per net dry ton of product.

November 21, 1966

LABOR:

This contract is based on an average hourly labor cost of \$3.49 at Buyer's East Helena, Montana plant, based on the wage rates, shift differentials, holiday, vacation, and overtime payments and payroll taxes paid to or on behalf of the employees, excluding foremen and other salaried employees and men on construction work, at said plant. Any increase or decrease in said average hourly labor cost in effect for the calendar month prior to the date of delivery of product shall be for Seller's account and to adjust, charge 6¢ per dry ton for each 1¢ per hour that the average hourly labor cost shall be in excess of \$3.49, and credit 6¢ per dry ton for each 1¢ per hour that the average hourly labor cost shall be less than \$3.49, fractions in proportion.

DUTIES & TAXES:

All United States customs duties applicable to product and also taxes and other governmental charges on product shall be for account of Seller.

OTHER TERMS:

Usual.

We would also be pleased to purchase the arsenical ores or concentrates on the basis of the following terms and conditions:

PRODUCT, TONNAGE & ANALYSIS:

Approximately 1,000 tons per month of arsenical prude ores or 600 tons per month of arsenical concentrates produced from properties owned or controlled by Seller in the Mayo District, Y.T., Canada, said to analyze substantially as follows:

Au	2 - 3 ounces per ton	Fe	38%
Ag	5 - 7 ounces per ton	Zn	1 - 6%
Pb	.3%	S	37%
SiO ₂	8%	As	13 - 18%
		Sb	.5%

DELIVERY:

In bond, f.o.b. cars at unloading bins of Buyer's plant at Tacoma, Washington.

GOLD:

Pay for 96.75% at the net price per ounce paid by United States Mints for gold recovered from imported gold-bearing materials on the 30th day following date of delivery of product at plant of Buyer, subject to applicable United States Governmental regulations pertaining to transactions in gold. The quantity of gold not paid for shall equal a minimum of 0.015 troy ounces per dry ton.

SILVER:

Pay for 95% of the silver content at the Handy & Harman New York quotation for refined silver adjusted to the basis applicable to silver contained in unrefined silver-bearing material, as published in the Engineering and Mining Journal, averaged for the calendar month following date of delivery of product at plant of Buyer, less a deduction of 1.5¢ per troy ounce of silver paid for. The quantity of silver not paid for shall equal a minimum of 0.5 troy ounces per dry ton.