FEASIBILITY STUDY

FOR

2000 TPD COPPER ORE MINE
CONCENTRATOR PLANT AND RELATED SERVICES

NEW IMPERIAL MINES LTD.
WHITEHORSE, Y.T.

BY

WRIGHT ENGINEERS LIMITED

J.A.C. ROSS AND ASSOCIATES, LTD.
Mining Consultants

DR. A.C. SKERL, P.ENG.
Consulting Mining Geologist

PROJECT NO. 402

NOVEMBER, 1965.

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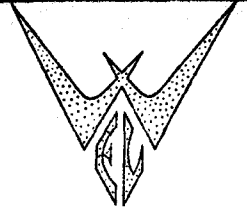


ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

We wish to acknowledge the co-operation and help received in developing this report during the various meetings and in correspondence with the following:-

New Imperial Mines Limited

Mr. Arnold Pitt, President
Mr. E. Lambert, Director
Mr. E.B. Gillanders, Director
Mr. R.W. Kenway, Mine Manager
Mr. D. Maxey, Manager Vancouver Office

The assistance given us and the interest shown by the representatives and staff of the Sumitomo Metal Mining Company Limited and C. Itoh and Company was also much appreciated.

We acknowledge the metallurgical testwork carried out by the Britton Research Laboratories, Vancouver, the Sumitomo Metal Mining Company Limited, Tokyo, and the Department of Mines and Technical Surveys, Ottawa.

Authors

The feasibility study and ensuing report has been written by:-

Dr. A.C. Skerl, P.Eng. as author of Section 1B.
J.A.C. Ross, P.Eng) of J.A.C. Ross and Associates Limited,
T. Swanson, P. Eng) Section II Mining.

Wright Engineers Limited personnel were responsible for the remainder of the report and the overall co-ordination.

BIBLIOGRAPHY

Metallurgical Test Reports by Britton Research Laboratories, Vancouver
by Sumitomo Metal Mining Company, Tokyo
by Dept. of Mines & Technical Surveys, Ottawa.
as listed in Section III.

Wright Engineers Limited Reports

1. Feasibility Study for 1000 TPD Iron-Copper Ore Mining and Concentrating Plant and Related Services with Expansion to 2000 tons per day - June 16th, 1964.

2. Memorandum on Preliminary Estimates of Cash Flow on Yukon Orebodies when Mined at Rate 2000 TPD - March 31st, 1965.

TERMS OF REFERENCE

The terms of reference for this study were developed through a series of meetings and correspondence between New Imperial Mines and Wright Engineers Limited starting in January, 1965 and ending in August, 1965.

In a letter dated January 22nd, 1965 from Mr. A. Pitt, President of New Imperial Mines, Wright Engineers were asked to update the previous report of June 16th, 1964.

On request Wright Engineers submitted on March 31st, 1965, a report entitled "Memorandum on Preliminary Estimates of Cash Flow on Yukon Orebodies when mined at the rate of 2000 TPD."

On May 21st, 1965 Wright Engineers Limited were instructed to commence gathering material for a new feasibility report and the terms of reference were discussed on June 25th, 1965, in a meeting in Vancouver between L.F. Wright and R. Kenway and a tentative target date was set for the report of September 30th, 1965. At this meeting the format of the report was outlined and the arrangements for splitting the responsibility for the report between Dr. A.C. Skerl, J.A.C. Ross and Associates and Wright Engineers Limited were outlined. At a further meeting in Vancouver on July 13th with J.A.C. Ross, T. Swanson, Dr. Gillanders, Mr. D. Maxey, Mr. R. Kenway and L.F. Wright the details of these arrangements were confirmed.

After preliminary estimates by J.A.C. Ross and Associates and Wright Engineers Limited, it was established that 2000 tons per day was a practical mining tonnage rate and would produce the best economic return. The tonnage rate was confirmed in a letter from Mr. R. Kenway dated August 5th, 1965.

SECTION 0
SUMMARY AND CONCLUSIONS

Summary and Conclusions

The total capital investment required to construct the surface plant and related facilities and to provide the necessary equipment to mine and mill at the rate of 2,000 tons per day from the Little Chief ore body is estimated to be about $7,250,000. An additional $2,160,000 will be required over a six year period to bring the remaining pits into operation and to expand the concentrator for molybdenite recovery from the Cowley Park ore. It is assumed that this expenditure will be paid from operating revenue.

The following table summarizes the value, operating cost, and revenue per ton of ore based on a copper price of 38.5¢ Canadian per pound.

	Value $/Ton	Operating Cost $/Ton	Revenue $/Ton
Initial (Little Chief)	8.09	4.05	4.04
Maximum	9.37	4.13	5.34
Minimum	6.20	3.64	2.53
Weighted average	7.54	3.88	3.66

The financial summary of the operation at a copper price of 38.5¢ Can./lb. is therefore estimated as follows:

Total value of 5,022,730 ton open pit ore reserve	$ 37,871,400	
Less total operating cost		$ 19,488,200
Less initial capital investment		7,253,900
Less additional expenditure		2,156,100
Plus return of working capital	721,800	
Plus return of housing loan	36,000	
	$ 38,629,200	$ 28,898,200

. . Total profit before financing charges, head office expenses, interest payments and taxation = $ 9,731,000

A financial analysis has been prepared by McDonald Currie and Co., based on the estimates in this report and their estimate of $212,800 for interest during the construction period is included in the capital cost summary.

Summary and Conclusions - Cont'd.

The concentrator is designed to treat 2,000 tons per day of Little Chief ore, but the capacity for treatment of other ores will range from 1,900 to 2,200 tons per day because of differences in grinding characteristics of the other ores. On testwork to date a detailed analysis of the exact tonnage rates for each ore body and mixtures of ores from more than one pit is not justified.

A preliminary analysis to determine the optimum tonnage rate showed that the total profit from a 3,000 tons per day operation is about the same as for 2,000 tons per day. The increase in capital investment of about 2 to 2-1/2 million dollars cannot therefore be justified unless taxation considerations permit a faster return of this capital. The previous feasibility report in June 1964 showed that total profit from a 2,000 tons per day operation was higher than a 1,000 tons per day operation, and since then there has been a substantial increase in proven ore reserves.

The mining schedule shows the sequence in which the ore bodies must be mined to return the greatest profit in the shortest time. The mining estimates are based on the company carrying out its own mining operations.

Winter conditions are not expected to affect output, but provision has been made for insulating the water pipeline from the Yukon River, screening fines from the ore before stockpiling, and drying the concentrate to 3 to 4% moisture during winter months to prevent freezing.

It is assumed that housing for company personnel will be available in Whitehorse and that company assistance will be confined to a loan for initial equity payment for married personnel and relocation expenses for single personnel.

Scope of the Report

The summarized capital costs cover all the direct investment needed to develop the mine and construct the various sections of the plant as described in the report.

The report does not include the cost of financing, interest charges, taxation and head office expenses. A financial analysis by McDonald Currie and Co., has been prepared to cover these items.

The construction and installation costs are based on an orderly progression of work by small contractors at expected 1966 labour rates and at current costs for equipment and materials. No allowance has been made for further labour rate escalation or price increases. Should the construction rate be accelerated then an increase in labour costs by up to 40% could be expected.

All equipment costs are based on new equipment, F.O.B. Vancouver. The freight cost to site is included at $80/ton.

The Yukon Territory has no Provincial Tax, but Federal Tax at a rate of 11% is included.

All operating costs are based on wage rates as we believe they will be in 1966 without taking further escalation into account. The operating costs shown in the individual sections are calculated on basic labour rates without including cost of fringe benefits. Fringe benefits are summarized in the administration section and have not been pro-rated to other sections. Operating costs are estimated as straight costs with no allowance for depreciation or replacement of equipment.

A contingency of 10% has been included in all mining costs to allow for remote location and winter conditions. An allowance of $0.10 per ton has been included for molybdenite recovery when treating the Cowley Park ore.

It has been assumed that the concentrates are dried to an average of 6% moisture for freight rate calculations.

The economic analysis has been calculated based on four copper prices: 28.5 and 30.0 U.S. ¢/lb. as requested by the Sumitomo Metal Mining Co. Ltd., and 38.5 and 45.0 ¢ Can./lb. as requested by New Imperial Mines Ltd.

Short tons (2,000 lbs.) Imperial Gallons and Canadian Dollars are used throughout the report except where otherwise stated.

Ore Reserves

	PROVED			AS MINED		
Ore Body	Tons	Grade %Cu	Ass.Min. $/Ton *	Tons	Grade %Cu	Ass.Min. $/Ton *
Little Chief	1,780,000	1.40	1.07	1,518,610	1.21	1.07
Arctic Chief	400,000	1.32	1.67	420,750	1.27	1.67
War Eagle)	1,080,000	1.33	0.73	926,530	1.24	0.73
War Eagle S)				215,330	0.96	0.73
Cowley Park	780,000	0.84	1.47	1,265,050	0.86	1.47
Keewenaw	380,000	1.10	0.96	485,180	1.05	0.96
Best Chance	200,000	1.00	0.26	191,280	0.98	0.26
	4,620,000	1.23	1.07	5,022,730	1.10	1.13

* Recoverable gold, silver and molybdenite.
Probable reserves are listed under Section IB.

Mining Schedule

Year	Ore Body	Tons	
1.	Little Chief	650,000	
			650,000
2.	Little Chief	599,010	
	Arctic Chief	120,990	
			720,000
3.	Little Chief	269,600	
	Arctic Chief	299,760	
	War Eagle	150,640	
			720,000
4.	War Eagle	613,650	
	War Eagle South	106,350	
			720,000
5.	War Eagle	162,240	
	War Eagle South	108,980	
	Cowley Park	448,780	
			720,000
6.	Cowley Park	570,000	
	Keewenaw	150,000	
			720,000
7.	Cowley Park	246,270	
	Keewenaw	335,180	
	Best Chance	138,550	
			720,000
8.	Best Chance	52,730	
			52,730
	Total		5,022,730 Tons

Capital Cost Summary

Section		Equipment	Construction & Installation	Totals
II	Mining	$ 1,283,240	$ -	$ 1,283,240
	Preproduction Mining		464,480	464,480
IV	Access Road		54,000	54,000
V	Ancillary Buildings	38,500	188,900	227,400
VI	Power	50,390	35,300	85,690
VII	Crushing Plant & Coarse Ore Storage	382,100	470,600	852,700
	Concentrator & Fine Ore Storage	583,100	1,118,900	1,702,000
VIII	Water Supply & Fire Protection	93,200	198,300	291,500
	Tailings Disposal	9,190	77,600	86,790
IX	Administration & General Costs	432,100	-	432,100
	Sub Total -	$ 2,871,820	$ 2,608,080	$ 5,479,900
	Contingencies @ 10% on $4,196,660			419,700
	Engineering, Construction Supervision and Company Administration @ 10% on $4,196,660			419,700
	Interest from beginning of construction to first revenue payment			212,800
	Working Capital for first 100 days operation			721,800
	Total Capital Investment Required -			$ 7,253,900

SUMMARY OF OPERATING COSTS

Yr.	Pit	Mining $/Ton	Milling $/Ton	Freight $/Ton	Ad. & Serv. $/Ton	Explor. $/Ton	Total Operating Cost $/Ton
1	Little Chief	1.516	1.419	0.352	0.616	0.150	4.053
2	Little Chief	1.464	1.281	0.305	0.556	"	3.756
	Arctic Chief	"	"	0.369	"	"	3.820
3	Little Chief	1.373	"	0.403	"	"	3.763
	Arctic Chief	"	"	0.369	"	"	3.729
	War Eagle	"	"	0.359	"	"	3.719
4	War Eagle	1.637	"	0.396	"	"	4.020
	War Eagle S	"	"	0.305	"	"	3.929
5	War Eagle	1.715	"	0.433	"	"	4.135
	War Eagle S	"	"	0.305	"	"	4.007
	Cowley Park	"	1.381	0.270	"	"	4.072
6	Cowley Park	1.521	1.381	0.270	"	"	3.878
	Keewenaw	"	1.281	0.271	"	"	3.779
7	Cowley Park	1.378	1.381	0.270	"	"	3.735
	Keewenaw	"	1.281	0.271	"	"	3.636
	Best Chance	"	"	0.298	"	"	3.663
8	Best Chance	1.378	"	0.298	"	"	3.663

Copper Valuation

Let copper price be X U.S. ¢/lb.

Assume concentrate grade of 35% Cu.

Then value per lb. Cu contained in concentrates

$$= \frac{2204.6 \times \frac{(35-1)}{100} \times \left(\frac{X}{100} - 0.005\right)}{\frac{2204.6 \times 35}{100}}$$

$$= \frac{34}{35}\left(\frac{X}{100} - 0.005\right)$$

U.S. $ = 0.009714X - 0.004857
U.S. ¢ = 0.9714X - 0.4857

Smelter charge and sea freight

= U.S. $22.50/Metric Ton Dry Concs.

∴ Cost/Lb. Cu Metal $\frac{22.50 \times 100}{35 \quad 2204.6}$ = U.S. $ 0.0292 = U.S. ¢ 2.92

∴ Net value U.S. ¢/Lb = 0.9714X - 0.4857 - 2.92
= 0.9714X - 3.406

Copper Price U.S. ¢/Lb.	28.50	30.0	35.81	41.86
Copper in Conc. U.S. ¢/Lb.	24.28	25.74	31.38	37.26
Copper in Conc. Can. ¢/Lb. (x1.075)	26.10	27.67	33.74	40.05

Au, Ag, & MoS_2 Valuation

Deposit	Arctic Chief		Best Chance		Little Chief		War Eagle		Keewenaw		Cowley Park	
Brittons Sample assay % Cu.	0.88		0.85		1.20		1.25		1.31		0.92	
Pit Design assay % Cu.	1.27		0.98		1.21		1.24		1.05		0.86	
	Au.	Ag.	Au.	Ag.	Au.	Ag.	Au.	Ag.	Au.	Ag.	Au.	Ag.
Brittons sample oz./ton	0.03	0.22	0.003	0.17	0.023	0.30	0.01	0.46	0.03	0.27	0.004	0.15
Pit Design reduced value oz./ton	0.043	0.317	0.003	0.196	0.023	0.302	0.010	0.456	0.024	0.216	0.004	0.140
Recovery	78	76	30	90	84	80	65	88	82	69	55	70
Recoverable value oz./ton	0.034	0.241	0.001	0.176	0.019	0.241	0.006	0.401	0.019	0.149	0.002	0.098
Au. 95% price basis oz./ton	0.032	-	0.00.	-	0.018	-	0.006	-	0.018	-	0.002	-
Price ($5 bonus above 10 gms/ton) (1) 34.9125 (2) 39.9125	(2)	-	(1)	-	(2)	-	(1)	-	(2)	-	(1)	-
Ag. 90% price basis oz./ton		0.217		0.158		0.217		0.361		0.134		0.088
Price U.S. $1.293												
Value U.S. $/ton	1.277	0.281	0.035	0.204	0.718	0.281	0.209	0.467	0.718	0.173	0.069	0.114
Value Can. $/ton	1.373	0.302	0.038	0.219	0.772	0.302	0.225	0.502	0.772	0.186	0.074	0.123
Total Value Can. $/ton	1.67		0.26		1.07		0.73		0.96		0.20	
% MoS_2	-		-		-		-		-		0.091	
Estimated recovery 65%											0.059	
Lbs/Sh Ton MoS_2											1.18	
U.S.$/ton MoS_2 ($ U.S. 1.00/lb)											1.18	
Can.$/ton MoS_2											1.27	
Total Associated Minerals	1.67		0.26		1.07		0.73		0.96		1.47	

VALUATION OF ORE BODIES

Yr.	Pit	Cu Price U.S. ¢/LB	Cu Price Can. ¢/LB	Cu Value In Conc. Can ¢/LB	% Cu	Rec %	Rec % Cu	Cu LB/Ton	Cu $/Ton Ore	* Ass. Min. $/Ton Ore	Total $/Ton Ore	Oper. Cost $/Ton	Revenue $/Ton
1	Little Chief	28.5	30.64	26.10	1.25	83.3	1.04	20.8	5.43	1.07	6.50	4.05	2.45
		30.0	32.25	27.67	"	"	"	"	5.76	"	6.83	"	2.78
		35.81	38.5	33.74	"	"	"	"	7.02	"	8.09	"	4.04
		41.86	45.0	40.05	"	"	"	"	8.33	"	9.40	"	5.35
2	Little Chief	28.5	30.64	26.10	1.08	83.3	0.90	18.0	4.70	"	5.77	3.76	2.01
		30.0	32.25	27.67	"	"	"	"	4.98	"	6.05	"	2.29
		35.81	38.5	33.74	"	"	"	"	6.07	"	7.14	"	3.38
		41.86	45.0	40.05	"	"	"	"	7.21	"	8.28	"	4.52
	Arctic Chief	28.5	30.64	26.10	1.27	86	1.09	21.8	5.69	1.67	7.36	3.82	3.54
		30.0	32.25	27.67	"	"	"	"	6.03	"	7.70	"	3.88
		35.81	38.5	33.74	"	"	"	"	7.36	"	9.03	"	5.21
		41.86	45.0	40.05	"	"	"	"	8.73	"	10.40	"	6.58
3	Little Chief	28.5	30.64	26.10	1.43	83.3	1.19	23.8	6.21	1.07	7.28	3.76	3.52
		30.0	32.25	27.67	"	"	"	"	6.59	"	7.66	"	3.90
		35.81	38.5	33.74	"	"	"	"	8.03	"	9.10	"	5.34
		41.86	45.0	40.05	"	"	"	"	9.53	"	10.60	"	6.84
	Arctic Chief	28.5	30.64	26.10	1.27	86	1.09	21.8	5.69	1.67	7.36	3.73	3.63
		30.0	32.25	27.67	"	"	"	"	6.03	"	7.70	"	3.97
		35.81	38.5	33.74	"	"	"	"	7.36	"	9.03	"	5.30
		41.86	45.0	40.05	"	"	"	"	8.73	"	10.40	"	6.67
	War Eagle	28.5	30.64	26.10	1.13	94	1.06	21.2	5.53	0.73	6.26	3.72	2.54
		30.0	32.25	27.67	"	"	"	"	5.87	"	6.60	"	2.88
		35.81	38.5	33.74	"	"	"	"	7.15	"	7.88	"	4.16
		41.86	45.0	40.05	"	"	"	"	8.49	"	9.22	"	5.50

* Au. Ag. and MoS_2

VALUATION OF ORE BODIES (Cont'd)

Yr.	Pit	Cu Price U.S. ¢/LB	Cu Price Can. ¢/LB	Cu Value In Conc. Can. ¢/LB	% Cu	Rec %	Rec % Cu	Cu LB/Ton	Cu $/Ton Ore	* Ass. Min. $/Ton Ore	Total $/Ton Ore	Oper. Cost $/Ton	Revenue $/Ton
4	War Eagle	28.5	30.64	26.10	1.25	94	1.17	23.4	6.11	0.73	6.84	4.02	2.82
		30.0	32.25	27.67	"	"	"	"	6.47	"	7.20	"	3.18
		35.81	38.5	33.74	"	"	"	"	7.90	"	8.63	"	4.61
		41.86	45.0	40.05	"	"	"	"	9.37	"	10.10	"	6.08
	War Eagle S	28.5	30.64	26.10	0.96	94	0.90	18.0	4.70	"	5.43	3.93	1.50
		30.0	32.25	27.67	"	"	"	"	4.98	"	5.71	"	1.78
		35.81	38.5	33.74	"	"	"	"	6.07	"	6.80	"	2.87
		41.86	45.0	40.05	"	"	"	"	7.21	"	7.94	"	4.01
5	War Eagle	28.5	30.64	26.10	1.35	94	1.27	25.4	6.63	"	7.36	4.13	3.23
		30.0	32.25	27.67	"	"	"	"	7.03	"	7.76	"	3.63
		35.81	38.5	33.74	"	"	"	"	8.57	"	9.30	"	5.17
		41.86	45.0	40.05	"	"	"	"	10.17	"	10.90	"	6.77
	War Eagle S	28.5	30.64	26.10	0.96	94	0.90	18.0	4.70	"	5.43	4.01	1.42
		30.0	32.25	27.67	"	"	"	"	4.98	"	5.71	"	1.70
		35.81	38.5	33.74	"	"	"	"	6.07	"	6.80	"	2.79
		41.86	45.0	40.05	"	"	"	"	7.21	"	7.94	"	3.93
	Cowley Park	28.5	30.64	26.10	0.86	88	0.76	15.2	3.97	1.47	5.44	4.07	1.37
		30.0	32.25	27.67	"	"	"	"	4.21	"	5.68	"	1.61
		35.81	38.5	33.74	"	"	"	"	5.13	"	6.60	"	2.53
		41.86	45.0	40.05	"	"	"	"	6.09	"	7.56	"	3.49
6	Cowley Park	28.5	30.64	26.10	0.86	88	0.76	15.2	3.97	"	5.44	3.88	1.56
		30.0	32.25	27.67	"	"	"	"	4.21	"	5.68	"	1.80
		35.81	38.5	33.74	"	"	"	"	5.13	"	6.60	"	2.72
		41.86	45.0	40.05	"	"	"	"	6.09	"	7.56	"	3.68

* Au. Ag. and MoS_2

VALUATION OF ORE BODIES (Cont'd)

Yr.	Pit	Cu Price U.S. ¢/LB	Cu Price Can. ¢/LB	Cu Value In Conc. Can. ¢/LB	% Cu	Rec %	Rec % Cu	Cu LB/Ton	Cu $/Ton Ore	* Ass. Min. $/Ton Ore	Total $/Ton Ore	Oper. Cost $/Ton	Revenue $/Ton
6	Keewenaw	28.5	30.64	26.10	1.05	76	0.80	16.0	4.18	0.96	5.14	3.78	1.36
		30.0	32.25	27.67	"	"	"	"	4.42	"	5.38	"	1.60
		35.81	38.5	33.74	"	"	"	"	5.40	"	6.36	"	2.58
		41.86	45.0	40.05	"	"	"	"	6.41	"	7.37	"	3.59
7	Cowley Park	28.5	30.64	26.10	0.86	88	0.76	15.2	3.97	1.47	5.44	3.73	1.71
		30.0	32.25	27.67	"	"	"	"	4.21	"	5.68	"	1.95
		35.81	38.5	33.74	"	"	"	"	5.13	"	6.60	"	2.87
		41.86	45.0	40.05	"	"	"	"	6.09	"	7.56	"	3.83
	Keewenaw	28.5	30.64	26.10	1.05	76	0.80	16.0	4.18	0.96	5.14	3.64	1.50
		30.0	32.25	27.67	"	"	"	"	4.42	"	5.38	"	1.74
		35.81	38.5	33.74	"	"	"	"	5.40	"	6.36	"	2.72
		41.86	45.0	40.05	"	"	"	"	6.41	"	7.37	"	3.73
	Best Chance	28.5	30.64	26.10	0.98	90	0.88	17.6	4.59	0.26	4.85	3.66	1.19
		30.0	32.25	27.67	"	"	"	"	4.87	"	5.13	"	1.47
		35.81	38.5	33.74	"	"	"	"	5.94	"	6.20	"	2.54
		41.86	45.0	40.05	"	"	"	"	7.05	"	7.31	"	3.65
8	Best Chance	28.5	30.64	26.10	0.98	90	0.88	17.6	4.59	0.26	4.85	3.66	1.19
		30.0	32.25	27.67	"	"	"	"	4.87	"	5.13	"	1.47
		35.81	38.5	33.74	"	"	"	"	5.94	"	6.20	"	2.54
		41.86	45.0	40.05	"	"	"	"	7.05	"	7.31	"	3.65

* Au. Ag. & MoS_2

OPERATING INCOME

Yr.	Pit	Tons	COPPER PRICE U.S. ¢/LB. 28.5	30.0	35.81	41.86
			COPPER PRICE CAN. ¢/LB. 30.64	32.25	38.5	45.0
1	Little Chief	650,000	1,592,500	1,807,000	2,626,000	3,477,500
	Total	650,000	$ 1,592,500	1,807,000	2,626,000	3,477,500
2	Little Chief	599,010	1,204,000	1,371,700	2,024,700	2,707,500
	Arctic Chief	120,990	428,300	469,400	630,400	796,100
		720,000	1,632,300	1,841,100	2,655,100	3,503,600
	Less Addn. Mine Equip.		22,200	22,200	22,200	22,200
	Less Arctic Chief Preprod.		179,700	179,700	179,700	179,700
			$ 1,430,400	1,639,200	2,453,200	3,301,700
3	Little Chief	269,600	949,000	1,051,400	1,439,700	1,844,100
	Arctic Chief	299,760	1,088,100	1,190,000	1,588,700	1,999,400
	War Eagle	150,640	382,600	433,800	626,700	828,500
		720,000	2,419,700	2,675,200	3,655,100	4,672,000
	Less Addn. Mine Equip.		100,800	100,800	100,800	100,800
	Less War Eagle Preprod.		590,600	590,600	590,600	590,600
			$ 1,728,300	1,983,800	2,963,700	3,980,600
4	War Eagle	613,650	1,730,500	1,951,400	2,828,900	3,731,000
	War Eagle South	106,350	159,500	189,300	305,200	426,500
		720,000	1,890,000	2,140,700	3,134,100	4,157,500
	Less Addn. Mine Equip.		283,200	283,200	283,200	283,200
	Less Cowley Pk. Preprod.		593,000	593,000	593,000	593,000
	Less Cost MoS_2 Circuit		200,000	200,000	200,000	200,000
			$ 813,800	1,064,500	2,057,900	2,981,300
5	War Eagle	162,240	524,000	588,900	838,800	1,098,400
	War Eagle South	108,980	154,800	185,300	304,100	428,300
	Cowley Park	448,780	614,800	722,500	1,135,400	1,566,200
		720,000	1,293,600	1,496,700	2,278,300	3,092,900
	Less Keewenaw Preprod.		102,700	102,700	102,700	102,700
			$ 1,190,900	1,394,000	2,175,600	2,990,200
6	Cowley Park	570,000	889,200	1,026,000	1,550,400	2,097,600
	Keewenaw	150,000	204,000	240,000	387,000	538,500
		720,000	1,093,200	1,266,000	1,937,400	2,636,100
	Less Best Chance Preprod.		83,900	83,900	83,900	83,900
			$ 1,009,300	1,182,100	1,853,500	2,552,200
7	Cowley Park	246,270	421,100	480,200	706,800	943,200
	Keewenaw	335,180	502,800	583,200	911,700	1,250,200
	Best Chance	138,550	164,900	203,700	351,900	505,700
		720,000	$ 1,088,800	1,267,100	1,970,400	2,699,100
8	Best Chance	52,730	62,700	77,500	133,900	192,500
		52,730	$ 62,700	77,500	133,900	192,500

SECTION 1A
GENERAL INFORMATION

GENERAL INFORMATION

Location

The claims of New Imperial Mines Limited are situated along the Whitehorse "copper belt" shown on map 49-1962 "Geology Whitehorse Copper Belt" published by the Geological Survey of Canada. The company holds 286 staked claims and one crown granted claim and has options on 88 staked claims and 21 crown granted claims.

The six orebodies planned for mining extend over 16 miles in a N.W.-S.E. line approximately parallel and 1-3/4 miles to the west of the Alaska Highway. The mill is situated midway along of this line, 5-1/2 miles due south of Whitehorse and 1,200 ft. from the Little Chief pit. The railhead at MacRae is 2-1/2 miles east of the mill.

History

The important showings along the Whitehorse Copper Belt were all staked in 1898 and 1899. Until 1909 not more than 4000 tons of ore had been shipped. Then the construction of a spur of the Whitepass and Yukon Railway for ten miles along the belt enabled a number of the properties to ship crude ore to the smelter at Anyox, British Columbia.

The main production was during the first world war after which all activity ceased apart from drilling in the boom years of 1926 to 1929.

In 1947 and 1948 Noranda Mines did extensive geological mapping, geophysical surveying, trenching and diamond drilling.

In 1955 Imperial Mines and Metals acquired by staking, purchase, or option numerous claims along the copper belt. In the following year the company did 2191 feet of diamond drilling on the Best Chance ore-body as well as geological and magnetometer surveys both around this deposit and in the Arctic Chief areas.

In 1963 the company was reorganized as New Imperial Mines and immediately proceeded on a development plant to investigate the other important properties by means of diamond drilling and geophysical surveys.

It is now considered that sufficient ore has been found to warrant planning for production.

Topography

Whitehorse lies only 80 miles north of the Lynn Canal, the nearest area of the Pacific Ocean. South of Whitehorse lies the Coast Range with peaks to 8,000 feet. The main pass to the south is White Pass of elevation 2,915 feet. The St. Elias Range with elevation up to near 20,000 feet lies to the southwest and west. The ground to the east and north of Whitehorse is of lower rough highland with progressively lower elevations to the north. The valley configuration throughout is northwesterly.

The main physical feature of the Whitehorse district is the large valley of the Lewes River which is approximately four miles wide opposite the town of Whitehorse. The central part of what was a preglacial valley is now filled with silts and boulder clays through which the present Lewes River has cut a narrow, winding secondary valley about 200 feet deep. Many canyon-like tributary valleys enter it from both sides.

Away from the valleys, the terrain is quite rough with rock ridges and hummocks of glacial material.

Climate

Although MacRae lies only 75 miles from the Pacific Ocean, the climate must be classed as continental. The two main mountain ranges act as a rain barrier. While cloud shields from the frequent storms in the Gulf of Alaska will spread rapidly into the area, generally only light precipitation occurs. Heaviest precipitation occurs with a northerly circulation which with the higher elevations to the south give an upslope circulation. Summer precipitation is mainly of a shower nature. Thunderstorms are infrequent in the valley but are more common along the adjacent mountains. Summer precipitation averages 5.49 inches of rain and the average yearly snowfall is 45.6 inches.

The temperature range is also continental with a mean temperature of 30.8 degrees F. A summer maximum of 80 can be expected most years although the maximums are generally near 65° to 70°. The highest temperature reported is 91.1°F. Winters are cold but the proximity of the ocean allows frequent mild spells uncommon in other parts of the Yukon. Thawing temperatures have occurred in every winter month and at some time in every winter. On the other hand, 40° below can be expected most winters and a reading of 50° below, one out of every three winters. The coldest temperature reported is -61.6°F.

The prevailing wind direction is southwest and to a lesser degree north-west. Wind speeds of 20-40 MPH are common from the southeast particularly during the winter months.

INSURANCE CONSIDERATIONS

Apart from the insurance coverage needed during the construction period we are here primarily concerned with fire-insurance, coupled with clauses regarding business interruption.

The rates quoted can vary considerably depending on the provisions made for fighting fire and it has been our experience that the insurance underwriters should be given the opportunity to examine the plans and make suggestions for improvement of the system.

Because of the rate structure the chosen system will depend on the life expectancy of the mine for instance in the past the cost of sprinkler systems can not be balanced off against reduced insurance costs in less than five to seven years.

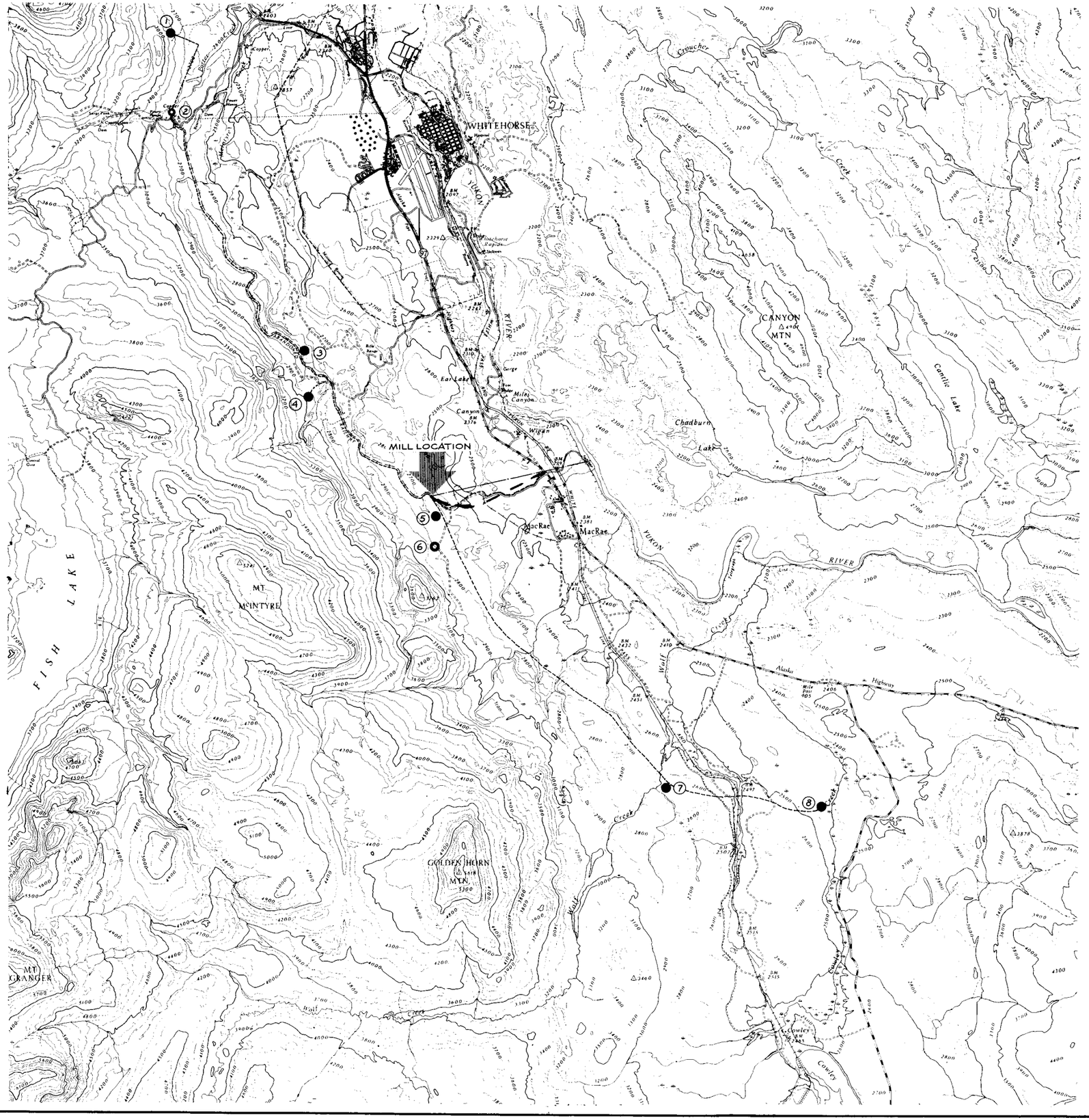
Each plant must be evaluated through co-operation between engineers and underwriters at an early stage of the design to obtain an optimum economic solution.

The estimate include allowances for both chemical fire extinguishers in the electrical control rooms and sprinkler systems in the main building areas. Buildings will have an outer cladding of metal to reduce hazards from brush fires and independent fire pumps will be installed in the Little Chief reservoir, one of which will be diesel powered.

LOCATION MAP.

NEW IMPERIAL MINES, LIMITED · WHITEHORSE, YUKON

WRIGHT ENGINEERS LIMITED VANCOUVER ——— CANADA	DRAWN BY NH DATE NOV 65	DRAWING No. 402 | 021 | 001



LEGEND

- ● ORE DEPOSITS
- ○ TENTATIVE ORE DEPOSITS
- (1) WAR EAGLE
- (2) PUEBLO
- (3) BEST CHANCE
- (4) ARCTIC CHIEF
- (5) LITTLE CHIEF
- (6) VALERIE
- (7) KEEWENAW
- (8) COWLEY PARK
- PROPOSED MINE ROAD ----------
- PROPOSED WATER PIPE LINE —·—·—

1 ½ 0 1 2 Miles

SCALE:

DESCRIPTION OF REVISION	ISSUED FOR	APPR.	FINAL CHECK	DESIGN CHECK	DIM. CHECK	DRAWN	DESIGN	APP. DATE
	REPORT					LM		1965

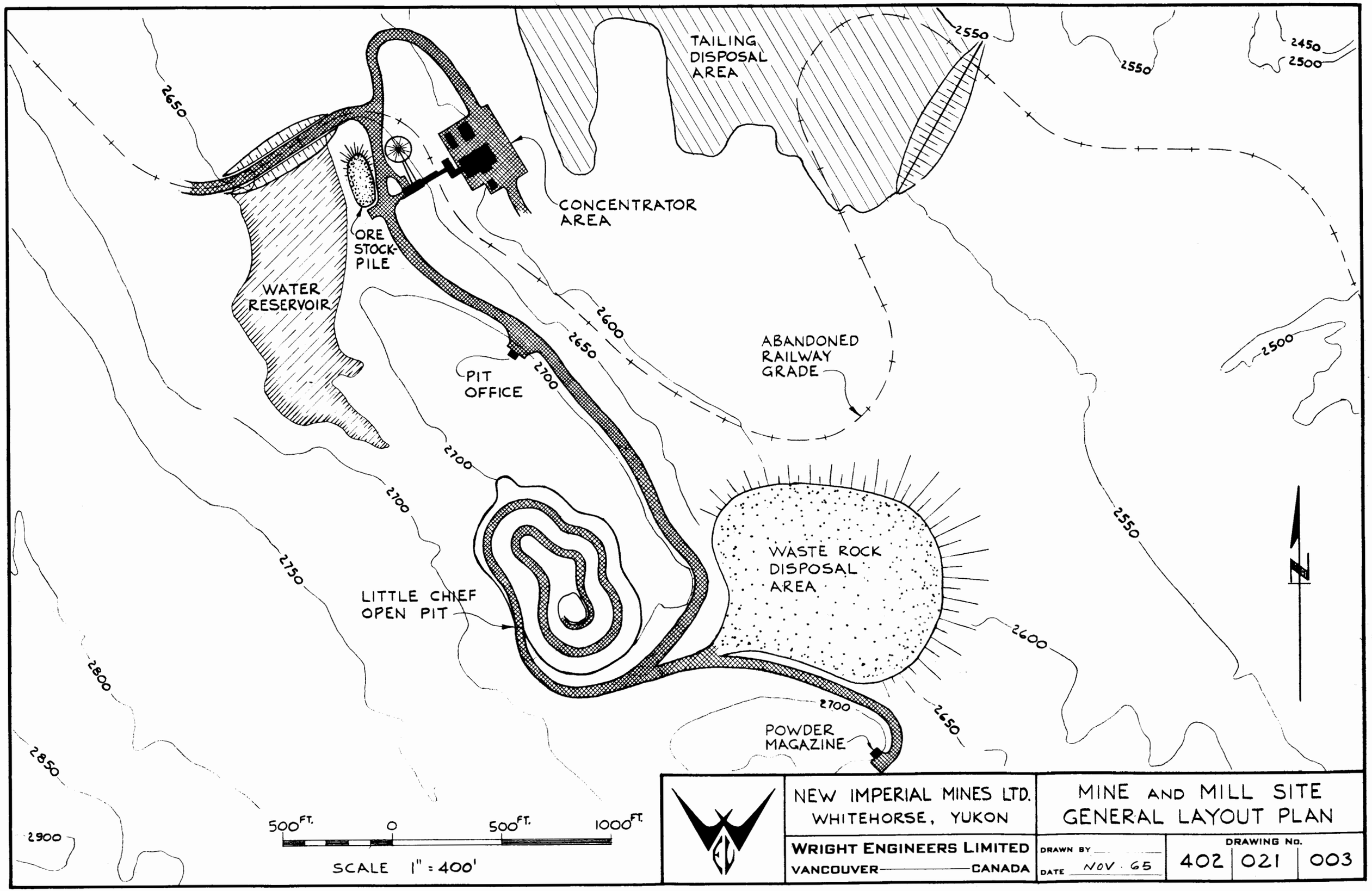
REFERENCE | DWG. No.

LOCATION MAP
WHITEHORSE AREA

NEW IMPERIAL MINES LTD.
WHITEHORSE YUKON

DWG. No. 402 021 002

WRIGHT ENGINEERS LIMITED
VANCOUVER —— CANADA



NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON

MINE AND MILL SITE GENERAL LAYOUT PLAN

WRIGHT ENGINEERS LIMITED
VANCOUVER——CANADA

DRAWN BY

DATE NOV. 65

DRAWING No. 402 021 003

LEGEND

1. PIT STOCKPILE AREA
2. CRUSHING & SCREENING PLANT
3. COARSE ORE STOCKPILE
4. FINE ORE BINS.
5. CONCENTRATOR.
6. MINE OFFICE & DRY
7. SERVICES BLDG. & COLD WAREHOUSE
8. ASSAY OFFICE
9. ADMINISTRATION OFFICES & WARM WAREHOUSE.

2600
2575
2625
2650
TO TAILING DISPOSAL AREA
TO WHITEHORSE
N
PIT ROAD
PIT ROAD
ABANDONED RLWY.
2600
2625
2625

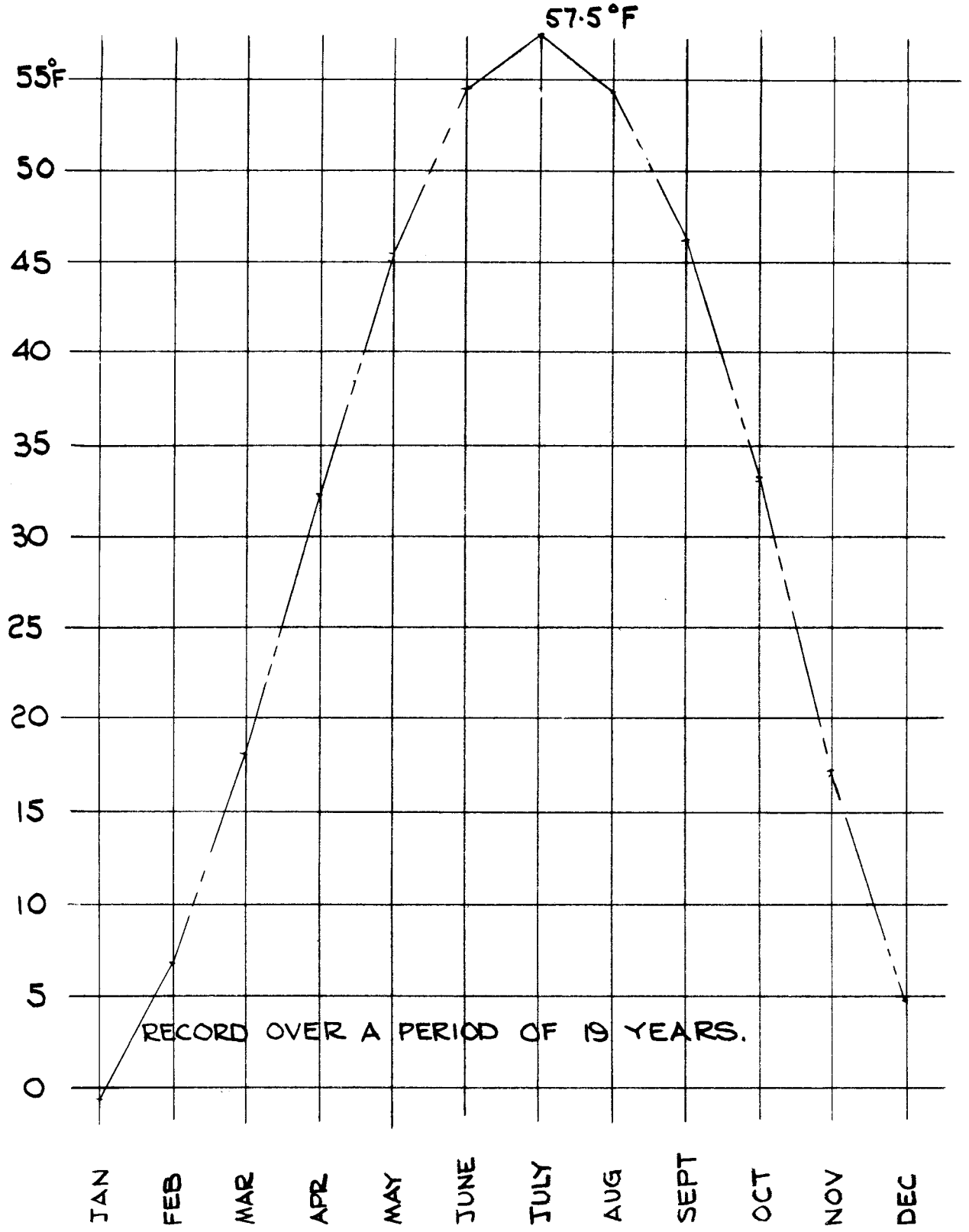
NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON.

WRIGHT ENGINEERS LIMITED
VANCOUVER——CANADA

MILL SITE

DRAWN BY J. E.
DATE NOV 1965

DRAWING No. 402 021 004



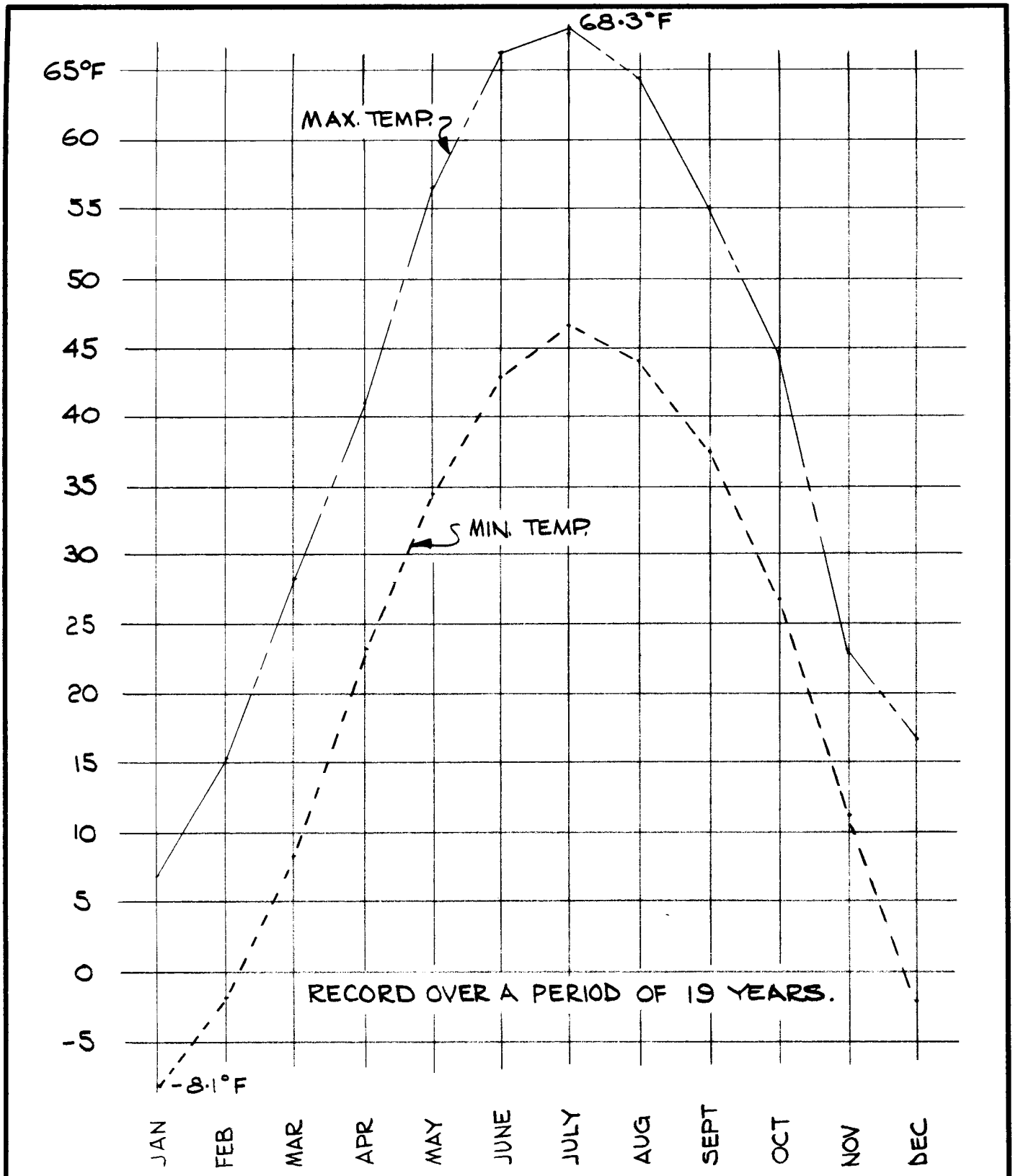
AVERAGE MONTHLY TEMPERATURE FOR WHITEHORSE AIRPORT

NEW IMPERIAL MINES LIMITED - WHITEHORSE, YUKON.

WRIGHT ENGINEERS LIMITED
VANCOUVER —— CANADA

DRAWN BY S.A. FOX
DATE NOV 65

DRAWING No. 402 | 021 | 005



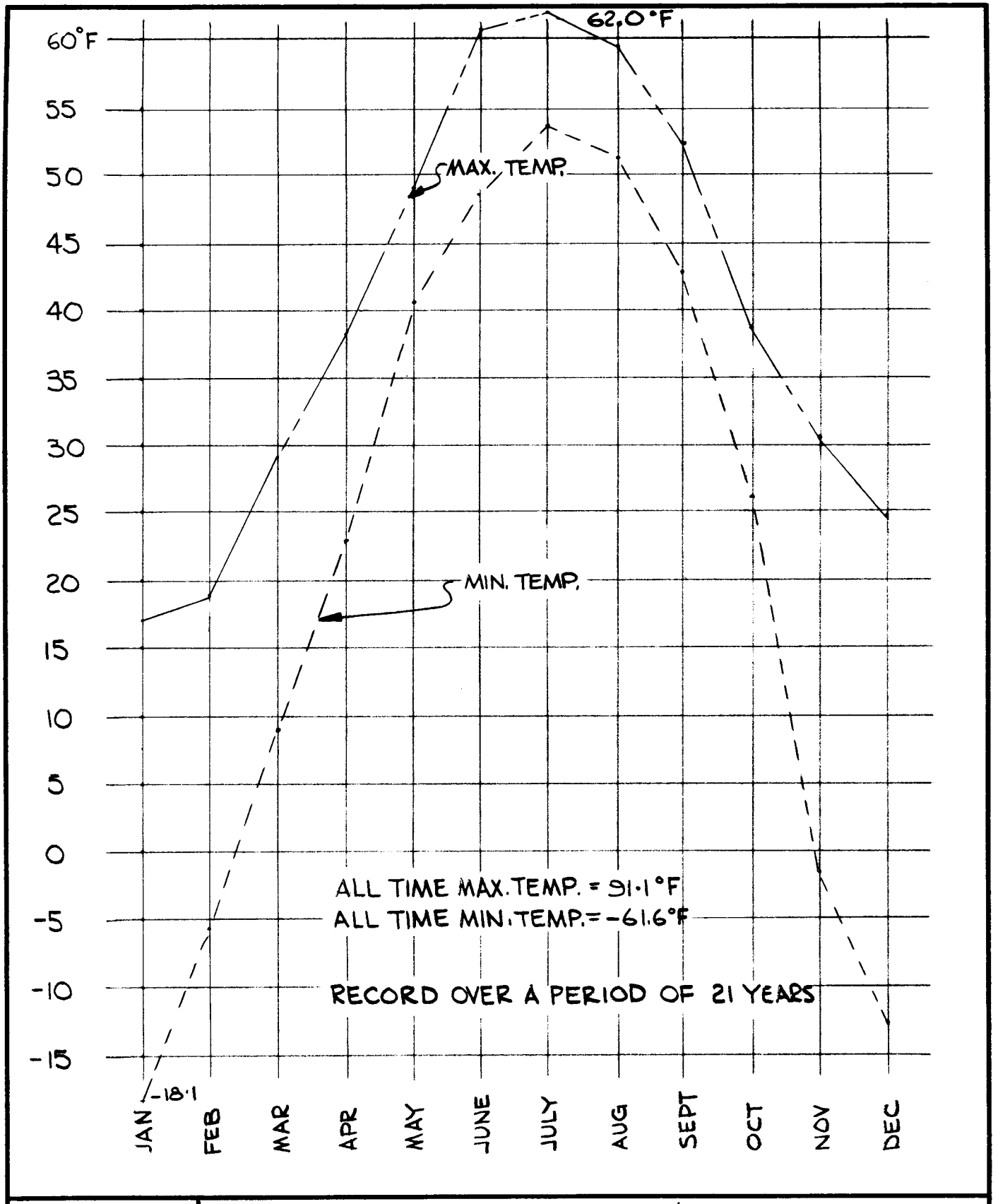
AVERAGE MONTHLY MAX. & MIN. TEMPERATURE FOR WHITEHORSE AIRPORT.

NEW IMPERIAL MINES LIMITED, WHITEHORSE YUKON.

WRIGHT ENGINEERS LIMITED
VANCOUVER — CANADA

DRAWN BY S.A. Fox
DATE NOV 65

DRAWING NO. 402|021|006



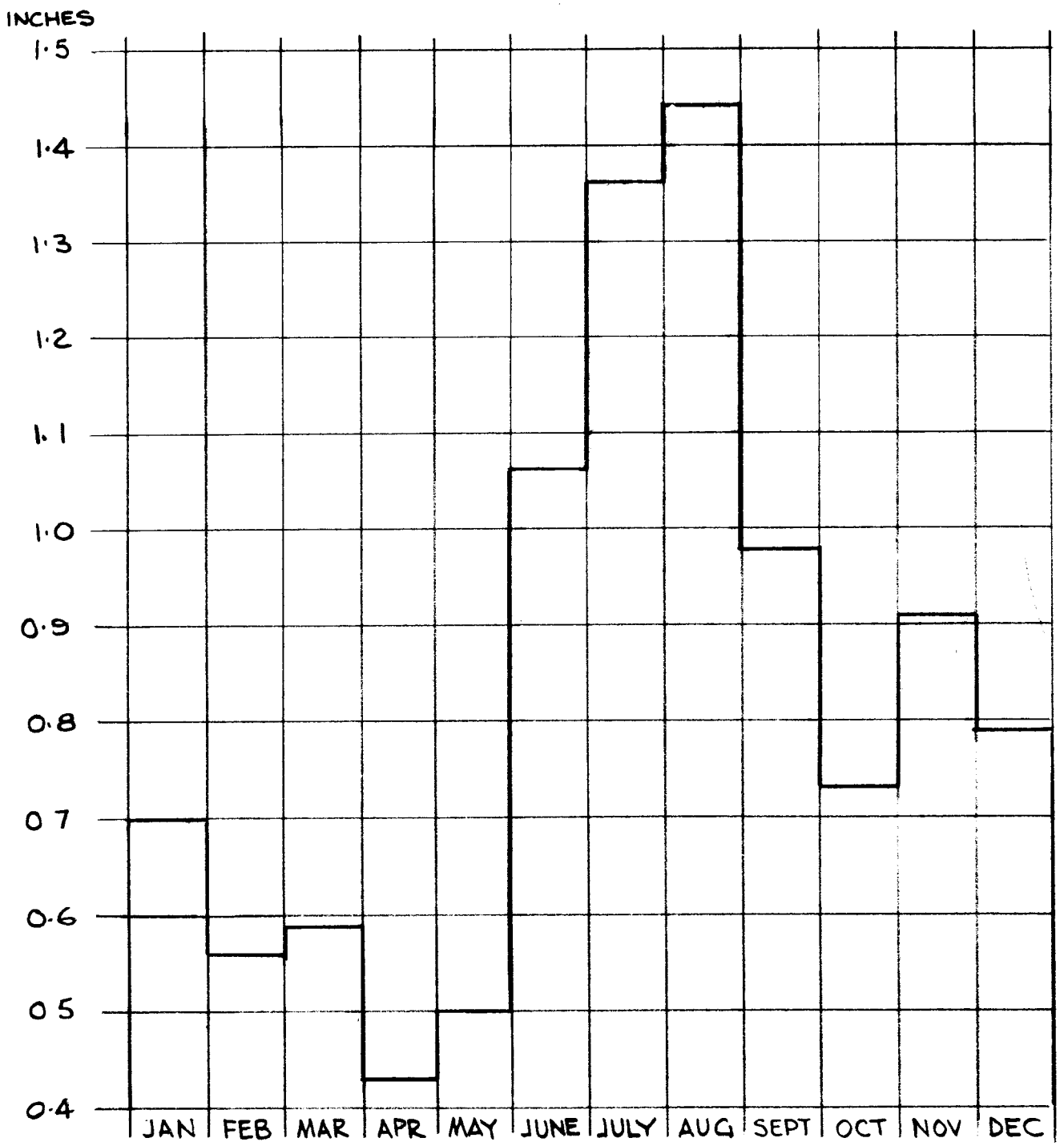
AVERAGE EXTREME MAX. & MIN. TEMPERATURE FOR WHITEHORSE AIRPORT.

NEW IMPERIAL MINES LIMITED, WHITEHORSE YUKON.

WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

DRAWN BY S.A.Fox
DATE NOV 65

DRAWING No. 402 | 021 | 007



TOTAL ANNUAL PRECIPITATION = 10·05"
RECORD OVER A PERIOD OF 19 YEARS

AVERAGE MONTHLY PRECIPITATION FOR WHITEHORSE AIRPORT.

NEW IMPERIAL MINES LIMITED - WHITEHORSE, YUKON.

WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

DRAWN BY S.A.FOK
DATE NOV 65

DRAWING No.
E402 | 021 | 008

SECTION 1B
GEOLOGY AND ORE RESERVES

GEOLOGY AND ORE RESERVES

GENERAL GEOLOGY

The recently issued geological map of the Whitehorse Copper Belt by the Canadian Geological Survey shows predominant granitic intrusives containing an elongated zone of limestone and associated sediments with a north-northwesterly strike and a width of up to two miles.

The granitic intrusions gave rise to widespread masses of skarn that have replaced the limestone and consist of varying amounts of garnet, epidote, tremolite, calcite, augite, etc. Magnetite is a common constituent of the skarn and sometimes predominates within the central four miles of the copper belt.

The Pueblo mine was unusual in that hematite was the principal mineral of its large orebody.

All the deposits that have been drilled to date are associated with both major and minor faults which probably were significant during mineralization.

The so-called acid dykes are another invariable associate. They range in composition from granitic to dioritic and frequently are classed as feldspar porphyry. They appear to have been post-skarn formation but to have immediately preceeded mineralization.

Basic dykes of post-ore age are also present in all deposits.

MINERALIZATION

The copper sulphides, bornite and chalcopyrite and their common oxidation products malachite, azurite, cuprite, malaconite, chrysocolla and native copper are found associated with skarn minerals at intervals throughout the contact zones. Late in 1963 the rare copper sulphide valleriite was recognized in the drill core at the Little Chief deposit.

Molybdenite is of economic importance in at least one deposit. Pyrite and pyrrhotite are sometimes present although not in the ore-bodies developed to date.

Both gold and silver are found by assay in appreciable amounts associated with the copper minerals in all the deposits.

ORE DEPOSITS

These usually consist of skarn with a sufficient concentration of copper minerals to form orebodies.

Although small amounts of high grade ore ranging from 10% to 25% Copper have been shipped in the past, large scale mining under present conditions will depend on orebodies ranging from 1% - 2% Copper.

Usually precious metals values are present and so far have averaged as much as 0.05 oz Gold and 0.50 oz Silver per ton in the orebodies tested.

ORE DEPOSITS Cont'd.

New Imperial Mines controls important claims in four separate areas along the copper belt. From south to north they are:

1. Cowley Park - Keevenaw
2. Valerie - Little Chief - Big Chief Group
3. Arctic Chief - Best Chance Group.
4. Pueblo - War Eagle - Copper King Group.

It is roughly 5 miles between the first two areas, 1½ miles between the second and third and 4 miles between the third and fourth.

The second and third areas contain all the deposits in the Copper Belt that are noteworthy for their high content of magnetite. The recently published aeromagnetic map for the Whitehorse area clearly indicated both the Arctic Chief deposits and the Valerie - Little Chief group.

A strong anomaly in the drift-covered area between the Pueblo and Best Chance deposits was found to be due to Quaternary Basalt buried under 200 feet of glacial materials.

In the following pages the salient features of the various mineral occurrences will be described.

Typical plans and sections, which illustrate the geology of the various ore-bodies that have been drilled, accompany this report. They are based on the complete sets of detailed plans and sections to a scale of 1 inch equals 20 feet that have been prepared by the geologists at the mine.

VALERIE - LITTLE CHIEF - BIG CHIEF GROUP

In this area two sets of claims named Oro and Geno have been staked over the old Valerie Mine and the three deposits known as Little, Middle and Big Chiefs that were explored by Noranda Mines in 1947.

The geology of this section is quite significant when studied on the map. A ' finger ' of granite 3000 feet long striking north-northwest has intruded the limestone. On the east side at the base of the finger is the important Little Chief deposit. Immediately north of it is the Middle Chief whilst the tip of the finger is capped by the 'V' shaped Big Chief. On the west side at the base of the finger is the old Valerie Mine. The 3000 feet between it and the Big Chief is covered by overburden, but Noranda Mines detected four anomalies with a dip needle survey that could be due to valuable mineralization. Both magnetometer and self potential surveys conducted in the summer of 1963 confirmed these anomalies. Further confirmation was obtained by an induced polarization survey in 1964.

The drilling in this group of deposits has shown that there is a continuous zone of serpentine between the siliceous skarns and the limestone. This serpentine zone is of great importance since it is usually the host for the mineralization. Originally this serpentine may have been a dolomitic limestone or alternatively a basic lava flow on the sea floor.

VALERIE

The original Valerie Mine is at an embayment in the contact of the granite and the limestone. The outcrops of the ore are now covered by the extensive dumps.

The two shafts are now flooded and no plans exist of the underground workings. The description of the mine by McConnell (1909) applies to the earlier work only.

The old mine itself gives a geophysical anomaly that is 450 feet long and to the north there are four more anomalies totalling 1200 feet in a distance of 2800 feet.

In 1963 and 1964 these five anomalies were tested by 16 diamond drill holes totalling 4,062 feet. Interesting copper-magnetite mineralization was found in each anomaly but nothing of ore grade. A detailed study of the results may justify further drilling.

LITTLE CHIEF

So far this deposit is the largest proven on the Copper Belt as demonstrated by 71 diamond drill holes totalling 28,497 feet, on sections spaced 50 feet apart.

It has a length of 700 feet and horizontal widths up to 180 feet. Until recently the deepest ore known there extended 400 feet below the surface but now the ore at the south end has been found to extend to 750 feet below the surface.

In detail the ore boundaries are highly irregular and are probably the result of the numerous faults that have been noted in the drill core.

Most of the ore is associated with magnetite which in turn is associated with serpentine that it has partly replaced.

The ore minerals are bornite, chalcocite, chalcopyrite and valleriite. Any one of these may predominate in a given section.

The deposit is divided into two by a prominent dyke on which there appears to have been a vertical displacement of the ore body for 80 feet with the south end moved down.

The north end has been cut off by a steep fault with a displacement of 300 feet to the west to the Middle Chief deposit.

The south end of the Little Chief appears to have been dropped on another fault for at least 100 feet vertically.

The south limit is formed by dioritic rocks but these may have been brought into this position by still another fault so detailed investigation is being done in the hope of finding another segment of the deposit.

LITTLE CHIEF Cont'd.

At present the ore reserve at the Little Chief is calculated at:

1,910,000 tons averaging 1.40% Cu.
of which 435,000 tons averaging 1.63% Cu. is in a block below the 600 elevation (about 440 feet below the surface). There are good indications that further drilling could increase this figure to one million tons.

MIDDLE CHIEF

This mineralized zone that is 700 feet long is separated from the Little Chief by an easterly striking fault with a throw of 300 feet and from the Big Chief by a northerly striking fault zone that separates the two by 350 feet. In addition there appears to be another easterly striking fault dividing the Middle Chief into two sections with an offset of 80 feet.

The south segment of the zone appears to be essentially vertical with an average width of 70 feet and a length of 250 feet. For a depth of 100 feet it contains 200,000 tons with an average grade of only 0.54% Cu.

The north segment is almost 400 feet long, 100 feet wide and apparently dips 70^{o} NE. The copper minerals appear to be in four layers of which those on the footwall side which is close to the granite have an appreciable content of magnetite. On the hangingwall side molybdenite is present sporadically. The large amount of included waste results in an average grade of only 0.28% Cu. for this area.

It should be possible to selectively mine on a salvage basis say 100,000 tons of medium grade ore from the Middle Chief. Further drilling of shallow holes in selected areas would be needed to determine the location of selective mining.

BIG CHIEF

Here there is a mineralized contact zone about 50 feet wide in a 'V' shape with the limbs 450 feet long. The principal mineral is magnetite with copper sulphides that have been oxidized on the surface. Noranda's sampling of their trenches gave values of 0.65% Cu to 1.46% Cu over widths of 25 - 70 feet.

The drilling in 1964 showed that the fault zone between the Middle and Big Chiefs was 100 feet wide with a segment of the mineralized zone caught within it.

Two holes in the east limb both gave average assays of 0.50% Cu. A hole in the west limb gave an average of only 0.34% Cu with poor recoveries due to broken ground.

The drilling in the Middle Chief amounted to 14 holes totalling 4,228 feet and in the Big Chief 6 holes totalling 1,480 feet.

ARCTIC CHIEF

In 1954 Mr. P.R. Wilson made geological maps, a magnetometer survey and sampled the underground workings in this area.

The original deposit of the Arctic Chief consists of an irregular lens of massive magnetite that appears to be steep near the surface and then flattens to a dip of 40° to the west beneath a mass of skarn that is up to 400 feet wide and bounded on the west by granite. The footwall of the ore is limestone.

An old tunnel that was driven prior to 1916 follows the ore by means of a drift and three irregularly spaced cross-cuts that indicate a length of 200 feet and an average width of 35 feet. The workings beyond are rendered inaccessible by a bad cave on a fault that dips 30° S.

In 1956 Mr. Wilson obtained an average for his samples in the three crosscuts of 2.9% Cu, 0.10 oz Au, 0.80 oz. Ag.

The 240 feet crosscut adit on the bottom level 60 feet below the upper level has very limited workings on the orebody.

No stoping has been done on the Arctic Chief orebody but there is evidence of hand sorting at the upper portal so that the ore from development was probably shipped. A profit of $4,164 attributed to this mine presumably was obtained in this way.

Diamond drilling in 1963 and recent 'dry drilling', on sections 50 feet apart has shown that there are 155,000 tons in this orebody averaging 1.70% Cu and 28% Fe. Across the dyke that forms the south boundary there is another 18,000 tons averaging 1% Cu. and 9% Fe. The drilling in this area totalled 2,953 feet in 13 holes.

EAST ARCTIC

Here the magnetometer survey carried out by Mr. Wilson confirmed the old survey made in 1947. Further confirmation was obtained in 1962 when lines were run on a different bearing for drilling purposes.

The area was completely masked by overburden where two strong anomalies were obtained separated by a 100 ft. gap in which the projections of an acid and a basic porphry dyke met.

The anomalies appear to indicate a north striking zone of magnetite but the northern section has a prong striking west.

Noranda tested the northern anomaly with a vertical hole and an inclined hole obtaining 1.0% Cu over 99 feet in the first and 1.50% Cu. in the second but recoveries were poor in the first half of each intersection.

EAST ARCTIC Cont'd.

This was the first ore body to be drilled in 1963. An analysis of the results shows that 158,000 tons are present averaging 1.10% Cu and 20% Fe. There is a minor body at 80 feet to the east that contains 17,000 tons averaging 0.7% Cu and 21% Fe. The drilling in this area totalled 2,924 feet in 13 holes on sections 50 feet apart.

The anomaly to the south proved to be due to an ore body amounting to 65,000 tons averaging 1.10% Cu. and 36% Fe, as shown by 9 drill holes totalling 2,390 feet also on sections 50 feet apart.

BEST CHANCE

Here, there is an impressive outcrop of magnetite and skarn over a maximum length of 420 feet in a northerly direction and widths up to 80 feet with patches and disseminations of copper minerals. It is bounded by limestone on the west and granite on the east.

In the past, it was partially explored by two shafts, 35 and 16 feet deep respectively, several pits and at least four vertical shot drill holes for which there are no known records.

The ore consists of chalcopyrite and bornite in scattered patches of the garnet-magnetite skarn with some sections of massive magnetite.

In 1956, Mr. Wilson made a geological map of the immediate area and then magnetometer survey which indicated that the ore extended beneath an area of limestone on the southwest side. This survey also showed that a second ore body was present immediately to the south in an area concealed by overburden and beyond a gap of only 80 feet that the geological mapping indicates is a dyke of granite.

In 1956, a series of -45° holes on 50 feet centres was drilled from the west side of the exposed deposit on six sections of which four had two holes. In 1963 a similar series of holes was drilled on the next six sections to the south but from the east side.

Section 0 shows that the ore body extends under the limestone for a maximum width of 180 feet. Adjacent sections also indicate that granite is present on the west side of the limestone.

Reconstruction of the geology of the sections suggests that the deposit had a highly irregular roof of limestone that is only partially removed. The major part of the copper mineralization is concentrated near the roof or around a large unreplaced lens of limestone within the skarn. Frequently, the copper values are in massive magnetite.

A series of six steep faults that strike northeast are also postulated from the evidence obtained by drilling.

The 21 holes totalled 5,690 feet and the ore reserve calculated from the results obtained amounts to 200,000 tons averaging 1.0% Cu and 20% Fe to a depth of 150 feet.

PUEBLO

McConnell described the ore body exposed by stripping here in 1908 as an irregularly shaped mass 300 feet in length and up to 170 feet wide with an area of 33,000 square feet. It is entirely surrounded by crystalline limestone but is not more than 300 feet from a granite contact.

The ore is essentially cupriferous hematite but for the first 100 feet of depth known in 1909 the copper was in the form of oxide minerals with an average grade of 4% Cu.

In 1926 C.B. White described how the ore had been mined to the 60 feet level by means of open cuts and glory holes. Then a main shaft was sunk to 500 feet and stoping was carried out on levels at 200,300 and 400 feet until March 21st, 1917 when a disastrous cave-in closed the mine. The production to that date had been 140,000 tons.

At the time of this cave-in diamond drilling was being done on the 500 level with considerable success according to the figures of Mr. White. Thus the current flat hole (514) returned 44 feet of 9.6% Cu. at 60 feet depth which would be 240 feet N N W of the shaft. Hole 512 gave 65 feet of 13.8% Cu and 513 gave 11 feet of 3.6% Cu at 40 feet further north showing that the main ore body was still present.

The 514 hole was regarded as discovering a new ore body so that Mr. White recommended drilling from the surface in 1926. As a result three holes cut ore about 200 feet above the 500 feet level intersection and whilst widths of 23 and 24 feet were reported the true width was probably 5 to 6 feet with an average grade of 4%. Mr. White interpreted the results as indicating two ore bodies about 35 feet apart and recommended further drilling.

Mr. E.R. Wilcox in his report on the Arctic Chief dated June 1917 mentions that the'Pueblo mine has been closed down since last March after a bad cave between the second and fourth levels, but is just now commencing operations again to prepare for further production. Previous to the shut-down the mine was producing 200 tons per day.'

Also he wrote ' I have been informed that ore with less than 3.5% copper content was not considered a shipping grade from this mine'.

In 1948 Noranda Mines drilled two inconclusive holes from the surface in an attempt to test the original ore-body at depth on either side of the shaft. They also tried to check an occurrence reported by White on the east side of the creek about 800 feet north of the mine but again obtained poor results.

It is interesting to note that in 1926 Mr. T. Kerruish found from the old records that the Pueblo Mine had made a net profit during the operation of $576,532.

WAR EAGLE

This old mine is about three miles east of Whitehorse and near the Alaska Highway.

WAR EAGLE Cont'd.

McConnell described this property when it had been operating for only two years. The orebody that he saw consisted of an irregularly shaped area, 65 feet across, in which the sulphides were associated with bands of tremolite. He reported an average of 2.71% Cu over a width of 45 feet in an open cut. At 23 feet below the surface a tunnel showed 44 feet of ore consisting of two well mineralized bands 14 and 10 feet wide with lower grade material between. I was able to crawl into this working last year and confirm this description.

A later account was found in the records of the Lowe Estate from which the following was taken:

On the surface there were two lenses of ore each 250 feet long, 6 feet wide and 30 feet apart. They were developed by a shaft 100 feet deep. In the early days production was from open cuts that were 20 feet deep, and amounted to 2000 tons averaging 7% Cu and $2. in gold and silver.

In 1916 and 1917 another 2245 tons were shipped with a recovered value of 5.7% Cu, 0.03 oz Au, and 2.0 oz Ag per ton. This ore came from the shaft and from an open cut 40 feet long and 200 feet to the south.

There is another shaft about 500 feet north of the first which is also 100 feet deep but it produced very little shipping ore. The dump now contains a few tons of massive hematite-magnetite with about 1½ % Cu.

In 1926 and 1929 some drilling was done for which there is only a sketchy record.

In 1939 A.A. McKinnon certified that he had worked on the War Eagle in 1916 when a thirty foot pocket of bornite ore was mined leaving underneath molybdenum ore that was 20 feet long and 10 feet wide.

It is reported that this property produced a net profit of $43,379. for its owners.

During the past twelve months diamond drilling has been successful in outlining an important ore body beneath an area of overburden a few hundred feet north of the old main shaft as described below.

The ore occurs in a metamorphosed succession of limestones, cherts and quartzites that have been explored by diamond drilling over a width of 500 feet and a length of 1600 feet. For half of this drilling the section lines were 50 feet apart and for the rest 100 feet apart.

89 holes were diamond drilled for a total of 25,851 feet and in addition 50 dry percussion holes that totalled 5215 feet.

The sediments strike at N 20° W at the south end of the explored area and at N 30° W toward the north end. They dip from 65° at the south end to about 45° W toward the north end.

Near the north end of the area the sediments have been invaded by a swarm of dykes from 5 to 20 and more feet wide and apparently striking W N W. They are feldspar porphyry dykes with from 2 - 50% hornblende. They appear to pinch out rapidly in the southeast direction apart from one dyke which passes to the east side of the zone and widens from 5 feet at the north to 30 feet at the south end.

WAR EAGLE Cont'd.

There are also a number of fine grained basic dykes, usually less than 5 feet thick, that appear to be interbbeded with the sediments.

The sediments have been replaced by various types of skarn in an apparently irregular manner and then mineralized with bornite, chalcopyrite, chalcocite and sporadically with molybdenite. In some places the feldspar porphyry dykes have been mineralized as well - especially with molybdenite.

In a length of 600 feet and a width from 40 to 120 feet in the centre of the area a body of ore has been demonstrated by the drilling to contain 900,000 tons averaging 1.40% Cu over a vertical range of 250 feet below the surface. On six of the drill sections in this ore body the vertical range has not been fully explored at the bottom so that there is a possibility of developing another 130,000 tons averaging 1.20% Cu.

At its north end this ore body fades out in the swarm of dykes and a possible northeast striking fault. From 250-450 feet further north some preliminary drilling has indicated a body of low grade mineralization that is 100 feet wide and averages about 0.5% Cu. There is also a parallel zone at 80 feet to the east that is 40 feet wide and of a similar grade. Further drilling will be needed here to trace the zone northward in the hope of finding a better grade.

At its south end the main ore body passes into a low grade zone for 300 feet although this includes the old main shaft where good ore was extracted in the past.

Next there is a length of 250 feet indicated by drilling to average about 1% Cu over 35 feet for a depth of 100 feet. Similar parallel bodies were also found at 50 feet and 250 feet respectively to the west and still another at 150 feet to the east.

These four small deposits are together estimated to contain 330,000 tons averaging 1.0% Cu.

This south section of the area is characterized by the lack of limestone which is presumably represented by skarn.

Exploration should be continued along the zone to the south.

COPPER KING

This mine is in an isolated mass of limestone surrounded by granitic rocks. The limestone is largely converted to silicates which are accompanied by copper sulphides especially near the unaltered cores of limestone. The ore sections are characterized by tremolite. In 1900 McConnell reported that the main deposit dipped at 46° towards the granite contact. It had been followed down dip for 130 feet (91 feet vertically). Above the 63 foot level an excavation 15 - 30 feet long and up to 10 feet wide showed the size of an original lens of high grade ore.

About 200 feet north of this is a wide garnet-limestone band with copper mineralization which was followed in a steeply inclined shaft for 65 feet. The first 20 feet followed a small high grade lens of bornite ore but the rest of the workings, including short drifts from the bottom, are in unworkable material.

COPPER KING Cont'd.

At 200 feet south of the main shaft another one was sunk for 40 feet on a lens of ore.

Over 500 tons averaging 15% Cu had been shipped by 1908 and in 1917 Mr. Wilcox stated that the property was shipping 300 tons a month. In 1918 good ore was encountered on the 100 foot level.

Between 1915 and 1920 shipments totalled 3288 tons averaging 10% Cu which netted a profit of $88,073. according to the old records.

A geological map of this area and a later induced polarisation survey suggest the possibility of a medium sized low grade ore-body.

Drilling was started in August 1964 with a light exploration machine. Four holes were drilled of which the most interesting returned 64 feet that averaged 1.30% Cu. Further drilling here is warranted.

COWLEY PARK

This is the most southerly of all the known mineral occurrences on the Copper Belt. It is in an easterly striking metamorphosed remnant of sediments consisting mostly of limestone, at least 3000 feet long and 700 feet wide, at the south end of the main granitic intrusive.

Much of the limestone has been converted to skarn consisting of garnet, tremolite, wollastonite, epidote, etc with some areas mineralized by bornite, chalcopyrite, molybdenite, pyrite and magnetite.

In the main area investigated to date there are two old, shallow shafts and some bulldozed cuts.

A length of 600 feet has been drilled with sections at 100 feet intervals plus another section at 200 feet further to the west.

The granitic rock was found to have a bowl shape with altered hybrid rock between it and the skarn. The ore is restricted to a part of this skarn.

Major faulting is present but its relationship to the ore, if any, has not been determined.

The grades of copper and molybdenite vary widely from hole to hole.

At present the ore reserve amounts to:

1,370,000 tons averaging 0.87% Cu, 0.08% MoS_2.

A total of 13,449 feet was drilled in 45 holes.

KEEWENAW

This deposit is on the east side of Wolfe Creek, 2½ miles west of the Cowley Park deposit, in an altered, dioritic phase of the main intrusion at its contact with limestone.

It is cut by a swarm of intermediate and basic dykes that make the interpretation of the ore shapes difficult. Faulting is also present that adds further complications.

Most of the mineralization consists of bornite scattered through the dioritic rock. Deep oxidation is present in some parts of the deposit with the copper in the form of chrysocolla.

The deposit was trenched, mapped, sampled and diamond drilled with 5 holes by Noranda Mines in 1947.

During the past winter a series of 29 holes on 50 ft. centres totalling 8625 feet were drilled by New Imperial.

A recent interpretation of this drilling shows that near the surface the mineralized ground occupies a roughly circular area about 300 feet across. At 100 feet lower it is 250 feet across and at another 100 feet lower it is not more than 120 feet in diameter.

A core of non-mineralized feldspar porphyry dyke rock strikes northwest across the ore-body for 350 feet with a maximum width of 60 feet at the centre and pinching out to nothing at each end. It is cut off on its northeast side however by a vertical fault striking N 30° W. On the other side of this fault to the north there is a similar mass of the same rock. It could originally have been part of the other mass and have been moved 300 feet horizontally along the fault.

The east side of the second feldspar porphyry is also limited by a fault which dips at 45° S W and cuts the vertical fault.

At depth the southern porphyry dyke rapidly diminishes in length to become pipelike.

I have estimated that the sulphide ore here amounts to 380,000 tons averaging 1.10% Cu. The stripping ratio will be about 0.75 cu yards of waste to 1 ton of ore.

ORE RESERVES

The reasonably assured reserve at each deposit has been calculated under two categories:

1. Proved ore is within 25 feet of a drill hole.
2. Probable ore is from 25 to 50 feet from a drill hole.

In both cases the ore is geologically reasonable.

In most holes the drill core recoveries have been better than 95% but where more than 20% of the core is missing from a sample the missing portion is assumed to be barren in the calculations.

ORE RESERVES Cont'd.

The recoverable values of gold and silver are based on the assays for these metals in the copper concentrates obtained during the mill test work by Mr. J.W. Britton, P. Eng., Consulting Metallurgist.

The value for the molybdenite is based on a 65% recovery from the Cowley Park ore in preliminary work although a better performance is expected with further tests.

The figures for the iron content of the ore-bodies have been deleted because the high cost of transportation and handling the magnetite concentrates would leave no profit. A production of 150,000 tons per year of magnetite concentrates for a period of at least four years was contemplated with a value at Skagway of $1,400,000 per year.

The tabulation of the reserves for the various ore-bodies is as follows:

	PROVED				PROBABLE			
DEPOSIT	Tons	Cu %	Au,Ag $	MoS_2	Tons	Cu %	Au,Ag $	MoS_2
Little Chief	1,780,000	1.40	1.07		130,000	1.60	1.05	
Arctic Chief	400,000	1.32	1.67					
War Eagle	1,080,000	1.33	0.73		150,000	1.00	0.50	
Cowley Park	780,000	0.84	0.20	0.091	590,000	0.92	0.25	0.087
Keewenaw	380,000	1.10	0.96					
Best Chance	200,000	1.00	0.26					
Totals	4,620,000	1.23	0.85	0.015	870,000	1.03	0.41	0.059
Total Reserve	5,490,000	1.20	0.78	0.022 or $1.00 recoverable per ton as Au,Ag & MoS_2.				

Ross and Associates found that in their designs for the open pits the following tonnages and grades would be available from the various ore-bodies after allowing for a suitable dilution in each case. For comparison the corresponding ore reserve figures are given alongside.

	AS MINED				ORE RESERVE			
	Tons	Cu %	Au,Ag	MoS_2	Tons	Cu %	Au,Ag	MoS_2
Little Chief above 600'	1,518,610	1.21	1.07		1,475,000	1.33	1.05	
Arctic Chief	420,750	1.27	1.67		400,000	1.32	1.10	
War Eagle-Main	926,530	1.24	0.73		900,000	1.40	0.75	
-South	215,330	0.96			330,000	1.00	0.50	
Cowley Park	1,265,050	0.86	0.20	0.091	1,370,000	0.88	0.25	0.080
Keewenaw	485,180	1.05	0.96		380,000	1.10	1.05	
Best Chance	191,280	0.98	0.26		200,000	1.09	0.25	
Total	5,022,730	1.10	$ 0.85	$ 0.2	5,055,000	1.13	$ 0.71	$ 0.26

ORE RESERVES Cont'd.

The differences are due to the mining dilution in most cases.

In the War Eagle and Cowley Park some ore was found to be uneconomic to mine.

Because the oxide copper at the Keewenaw is not recoverable, about 100,000 tons was deleted from the ore reserve but since it was present in the test sample it was included in the mining calculations. Further checking and testing will be necessary to clarify the picture here.

FUTURE EXPLORATION

In addition to the possible extensions of the developed ore-bodies there are a number of occurences that should be drilled in future:

1. COPPER KING
   Only a start has been made on the diamond drilling here.

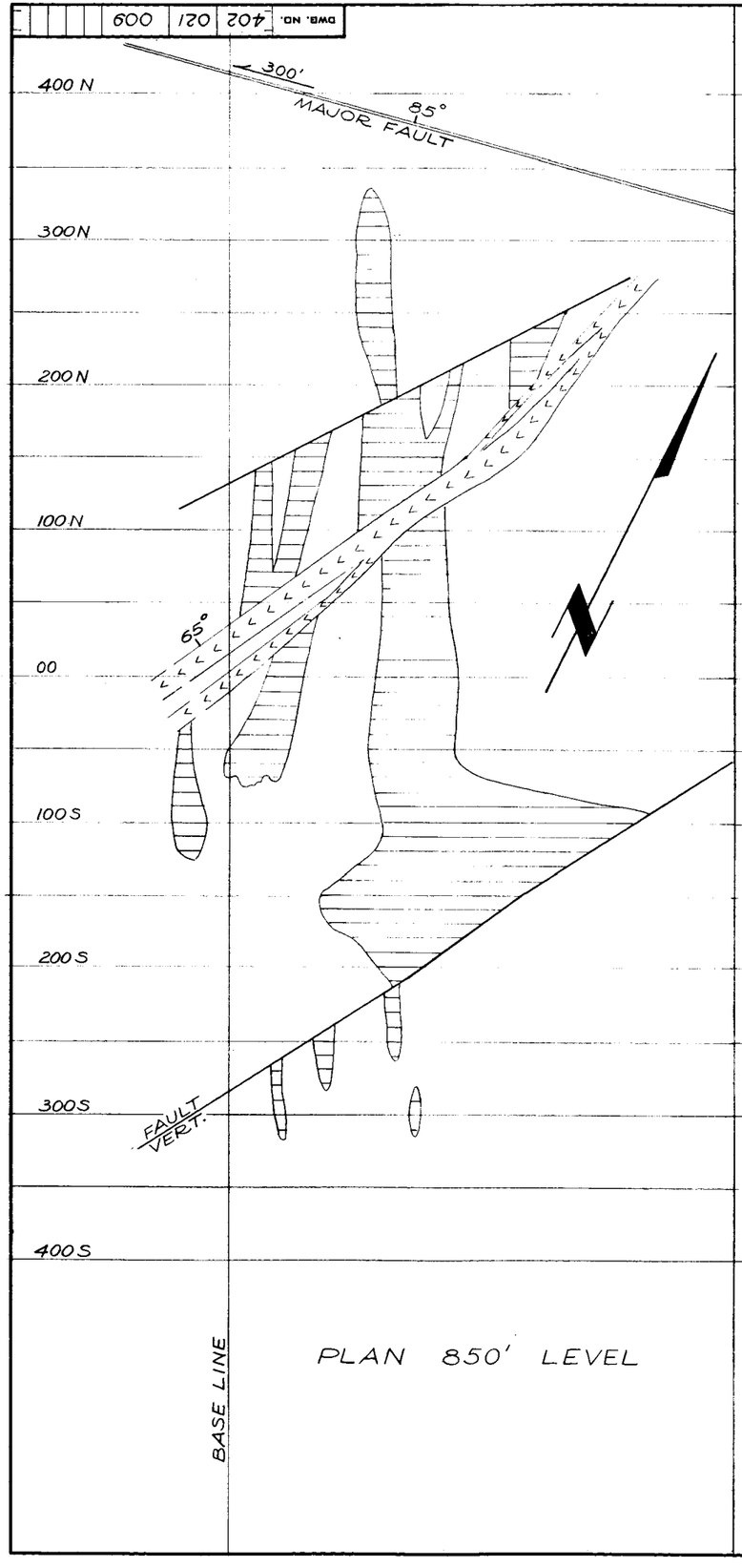
2. PUEBLO
   It should be possible to check the reported high grade ore on the 500 level with a vertical drill hole about 600 feet long from the surface. A possible mineralized area to the northeast of the mine was indicated by the I.P. Survey in 1964. A bulldoze cut failed to penetrate the deep overburden although some mineralized material was found. Dry drilling is proposed to test this ground.

3. ANACONDA AND RABBITT'S FOOT
   These old prospects are near the Alaska Highway on the road to the War Eagle. They should be mapped geologically and then tested with the O. B. machine.

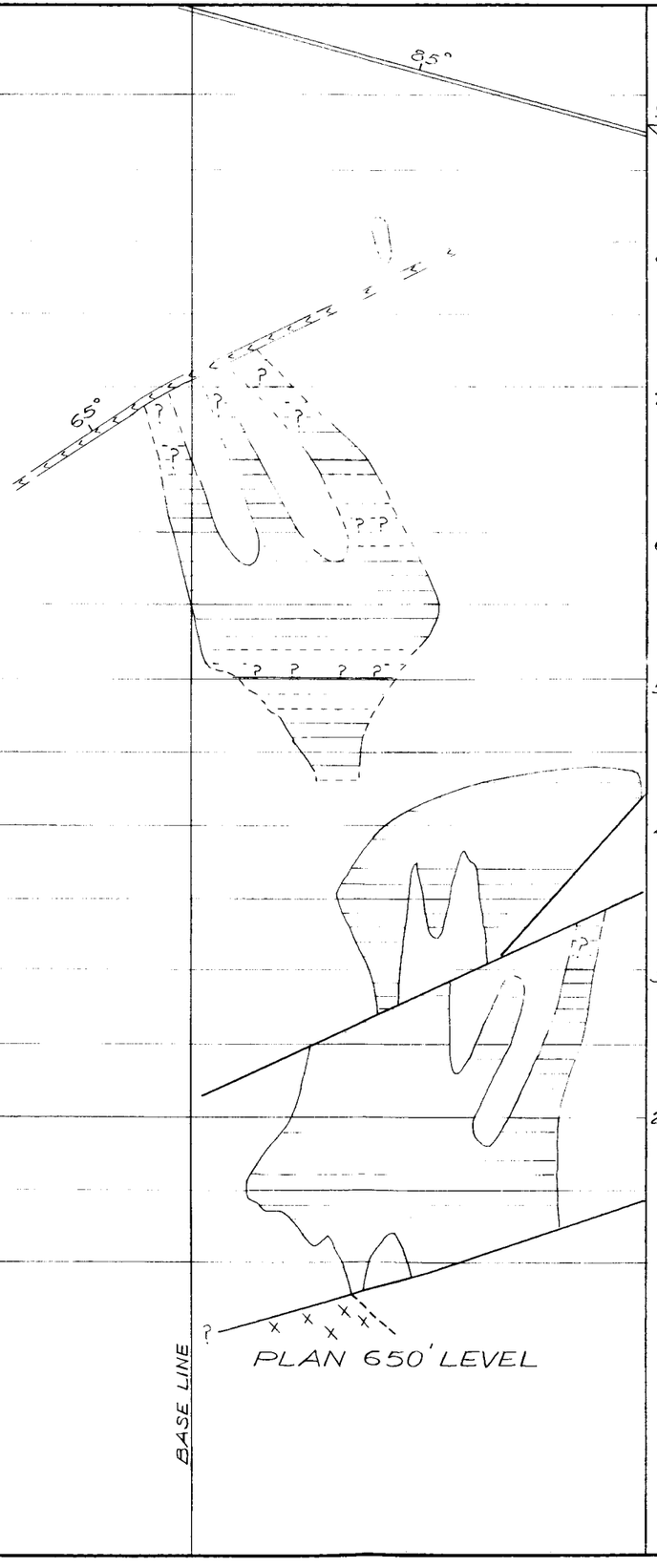
4. KEEWENAW AREA
   At about 500 feet to the northeast of the Keewenaw depost similar mineralization has been found by drilling to be associated with an I. P. anomaly. No ore grade has been located but further work is justified.

   An old trench was found about 2000 feet to the east-southeast of the main Keewenaw deposit. It is 60 feet long and extensively mineralized with malachite and some chalcopyrite in a silicate skarn. Attempts to reach bedrock in parallel and cross trenches apparently failed. This occurrence certainly warrants drilling.

DWG. NO. 402 021 009



PLAN 850' LEVEL



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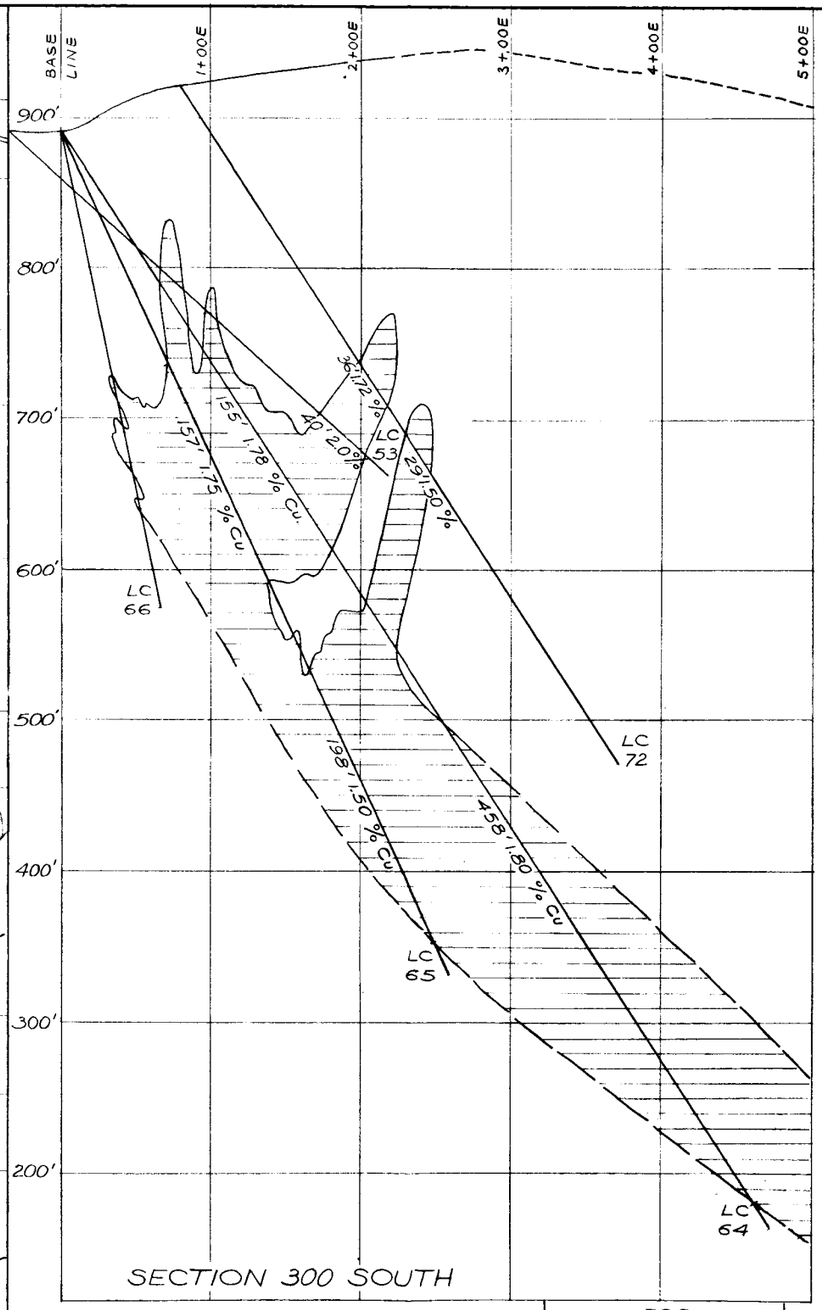

SECTION 300 SOUTH

FOR
DR. A.C. SKERL
SEPT. 1965

REFERENCE	DWG. NO.

LITTLE CHIEF LEVEL PLANS & SECTION

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON.

SCALE:

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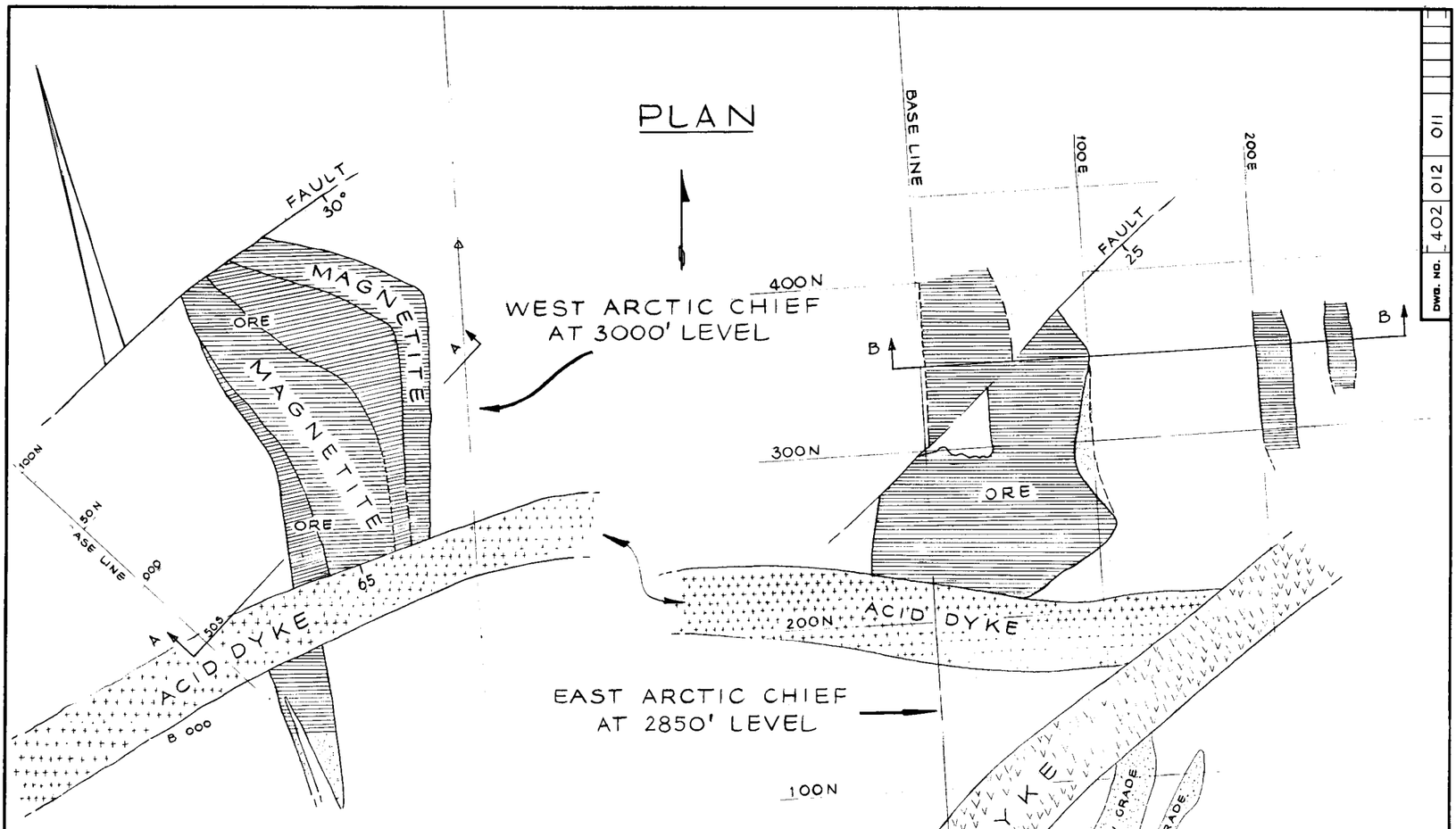
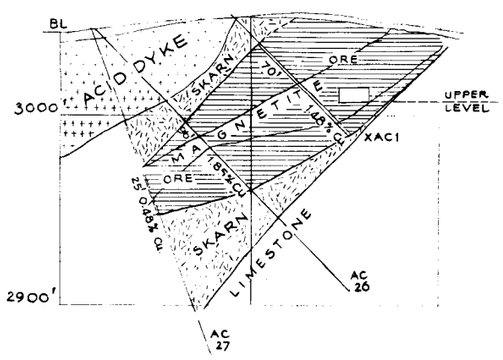
ISSUED FOR REPORT.					

DWG. No. 402 021 009

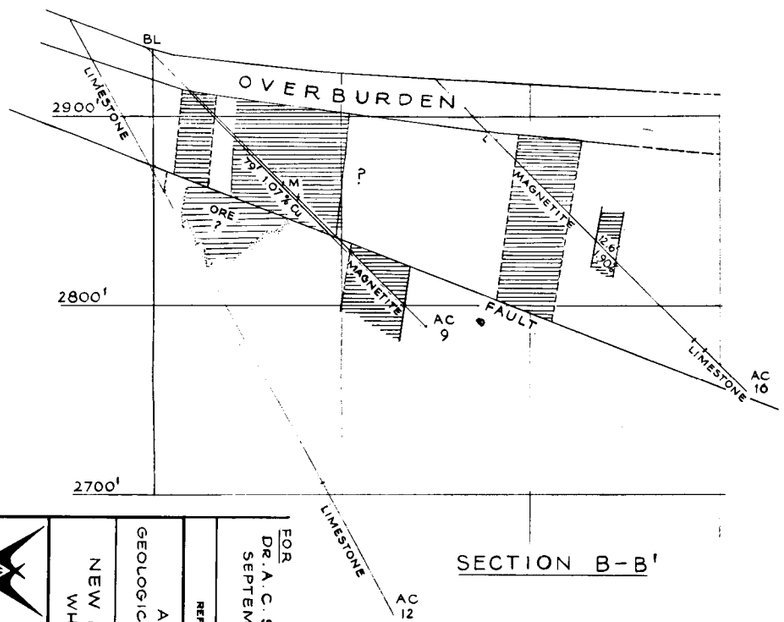
WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

PLAN





SECTION A-A'



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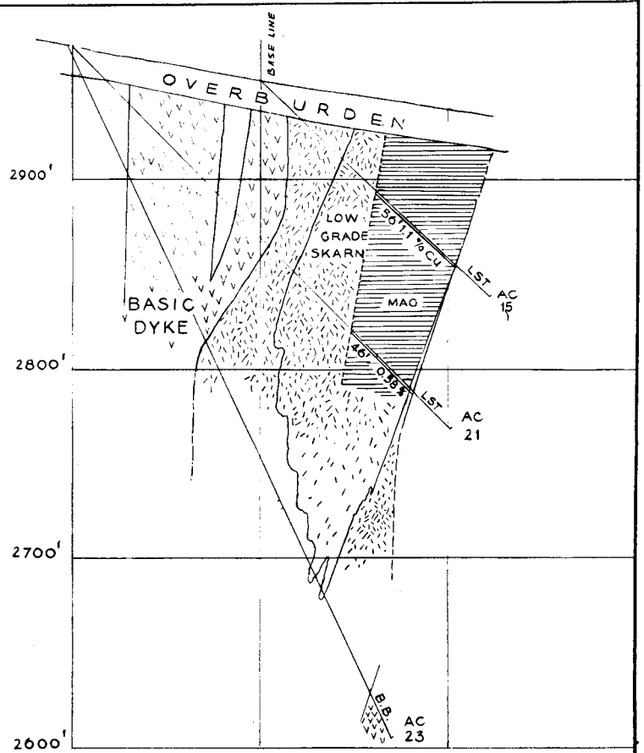

SECTION C-C'

LEGEND

- DIORITE
- ACID DYKE
- BASIC DYKE
- LIMESTONE
- SKARN
- MINERALIZATION
- ORE

DWG. NO.	402 012 011
DWG. NO.	402 021 011
NEW IMPERIAL MINES WHITEHORSE YT	
ARCTIC CHIEF GEOLOGICAL PLAN & SECTIONS	
REFERENCE	
DWG. NO.	
FOR DR. A.C. SKERL SEPTEMBER 1965	
WRIGHT ENGINEERS LIMITED VANCOUVER — CANADA	
SCALE:	

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							REPORT.	

DWG. NO. 402 021 012

BASE LINE

000

50W

100W

150W

200W

250W

300W

200N

150N

100N

50N

000

50S

100S

150S

200S

300S

350S

400S

FOR
DR. A.C. SKERL
SEPT. 1965

LEGEND

GRANITE

LIMESTONE

SKARN

MINERALIZATION

REFERENCE	DWG. No.

BEST CHANCE
GEOLOGY 625' LEVEL

NEW IMPERIAL
MINES LTD.
WHITEHORSE, YUKON

DWG. No. 402 021 012

WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

APP.	DATE	DESIGN	DRAWN	DES. CHECK	DESIGN CHECK	FINAL CHECK	APPR.	DESCRIPTION OF REVISION
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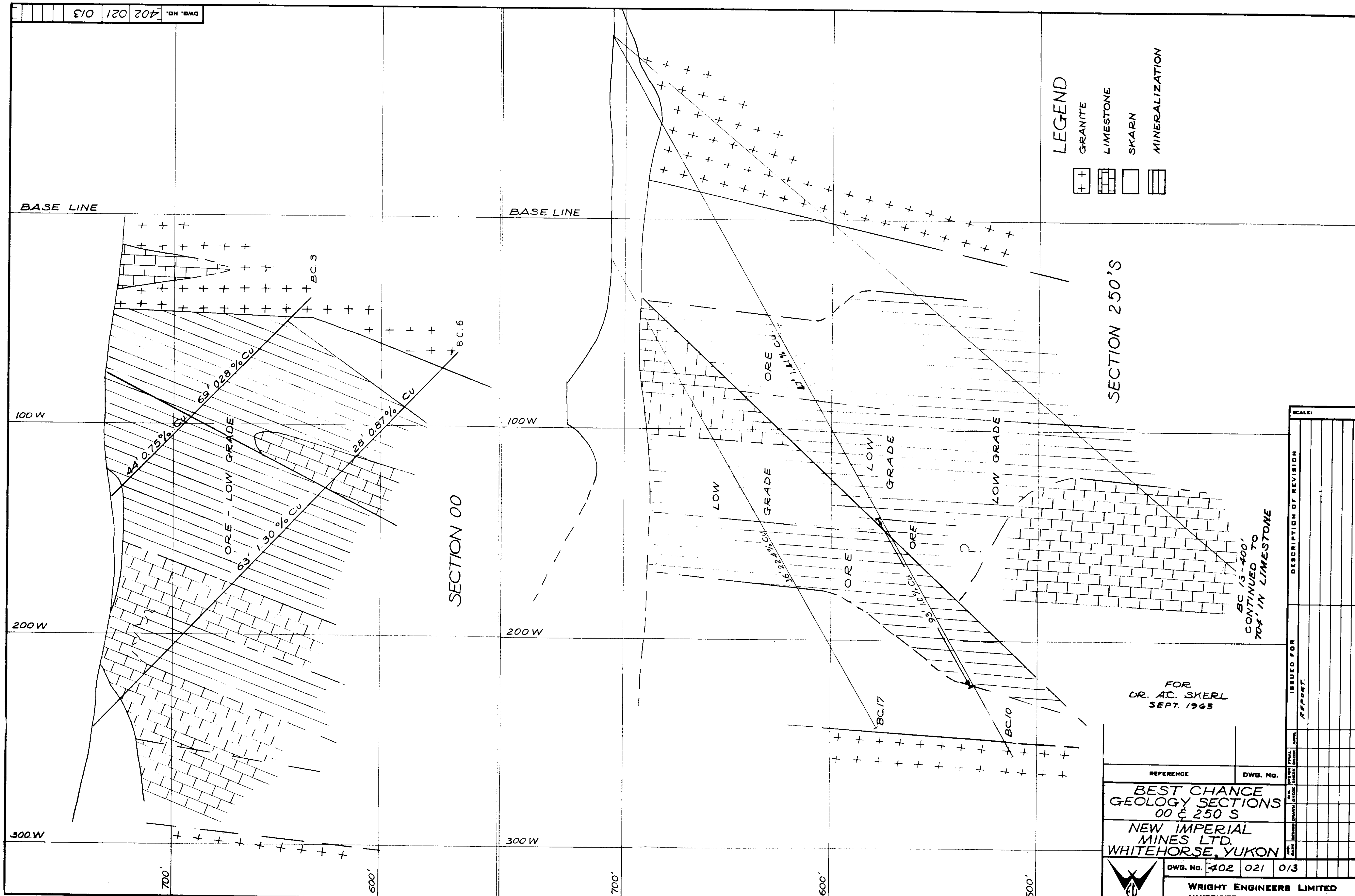

DWG. NO. 402 021 013
BASE LINE
100 W
200 W
300 W
700'
600'
500'
B.C.3
B.C.6
69' 0.28 % Cu
44' 0.75 % Cu
28' 0.87 % Cu
63' 1.30 % Cu
ORE - LOW GRADE
SECTION 00
47' 1.41 % Cu
ORE
LOW GRADE
36' 2.24 % Cu
93' 1.0 % Cu
BC.17
BC.10
?
SECTION 250'S
BC 13 - 400' CONTINUED TO 70± IN LIMESTONE
LEGEND
GRANITE
LIMESTONE
SKARN
MINERALIZATION
FOR DR. A.C. SKERL SEPT. 1965
SCALE:
DESCRIPTION OF REVISION
ISSUED FOR
REPORT
REFERENCE
DWG. No.
BEST CHANCE GEOLOGY SECTIONS 00 & 250 S
NEW IMPERIAL MINES LTD. WHITEHORSE, YUKON
DWG. No. 402 021 013
WRIGHT ENGINEERS LIMITED
VANCOUVER — CANADA

DWG. NO. 402 021 014

600W

500W

400W

300W

200W

100W

BASE LINE

100E

300N 400N 500N 600N 700N 800N 900N 1000N 1100N 1200N 1300N

?F

No 1 SHAFT

No 2 SHAFT

?

FOR
DR. A.C. SKERL
SEPT. 1965

LEGEND

- LIMESTONE
- SKARN & QUARTZITE
- ACID DYKE
- ORE

1400N 1500N

REFERENCE DWG. No.

WAR EAGLE
GEOLOGY 600' LEVEL

NEW IMPERIAL
MINES LTD.
WHITEHORSE, YUKON

DWG. No. 402 021 014

WRIGHT ENGINEERS LIMITED
VANCOUVER —— CANADA

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APP. DATE	DESIGN	DRAWN	DIR. CHECK	DESIGN CHECK	FINAL CHECK	APPR.	DESCRIPTION OF REVISION
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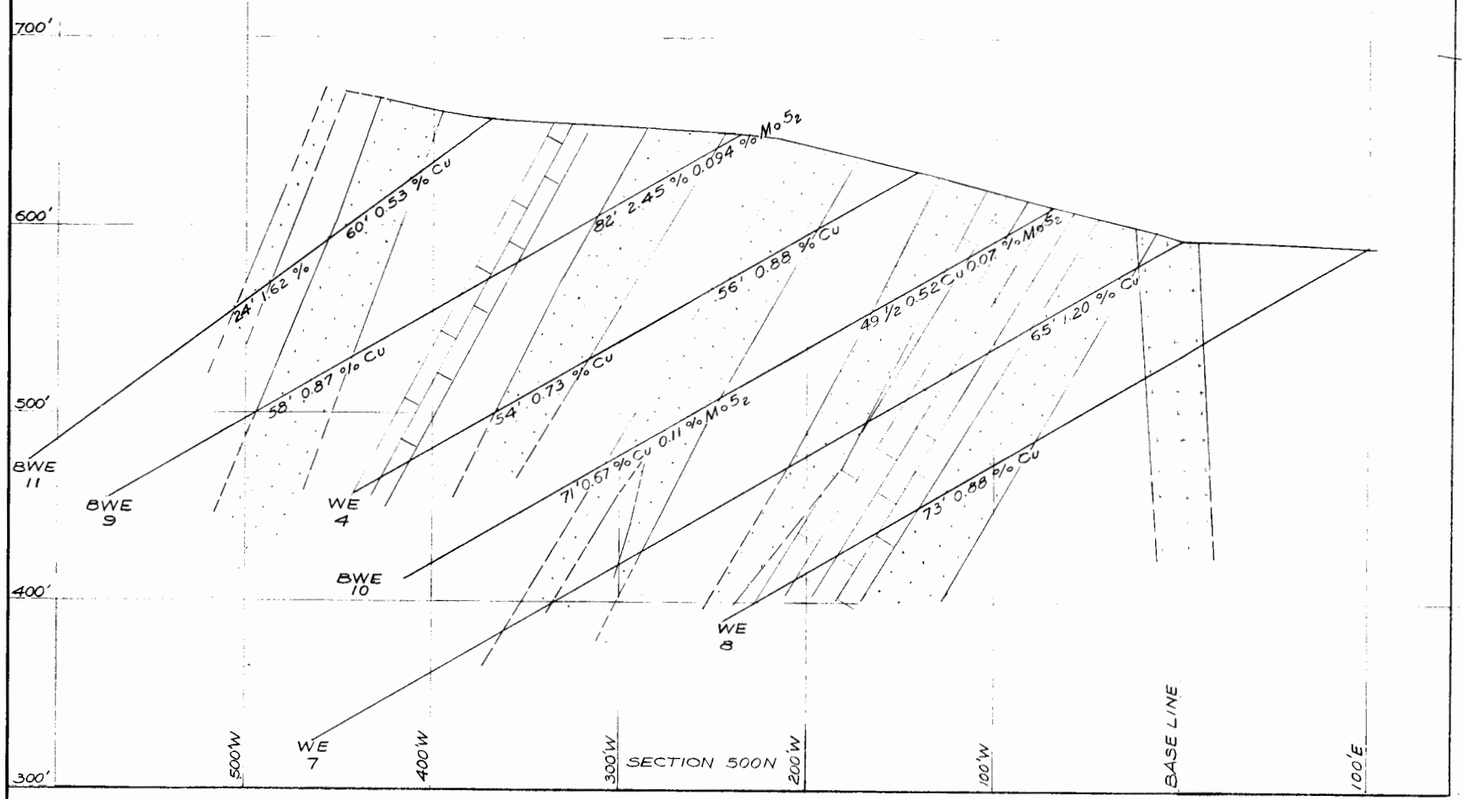
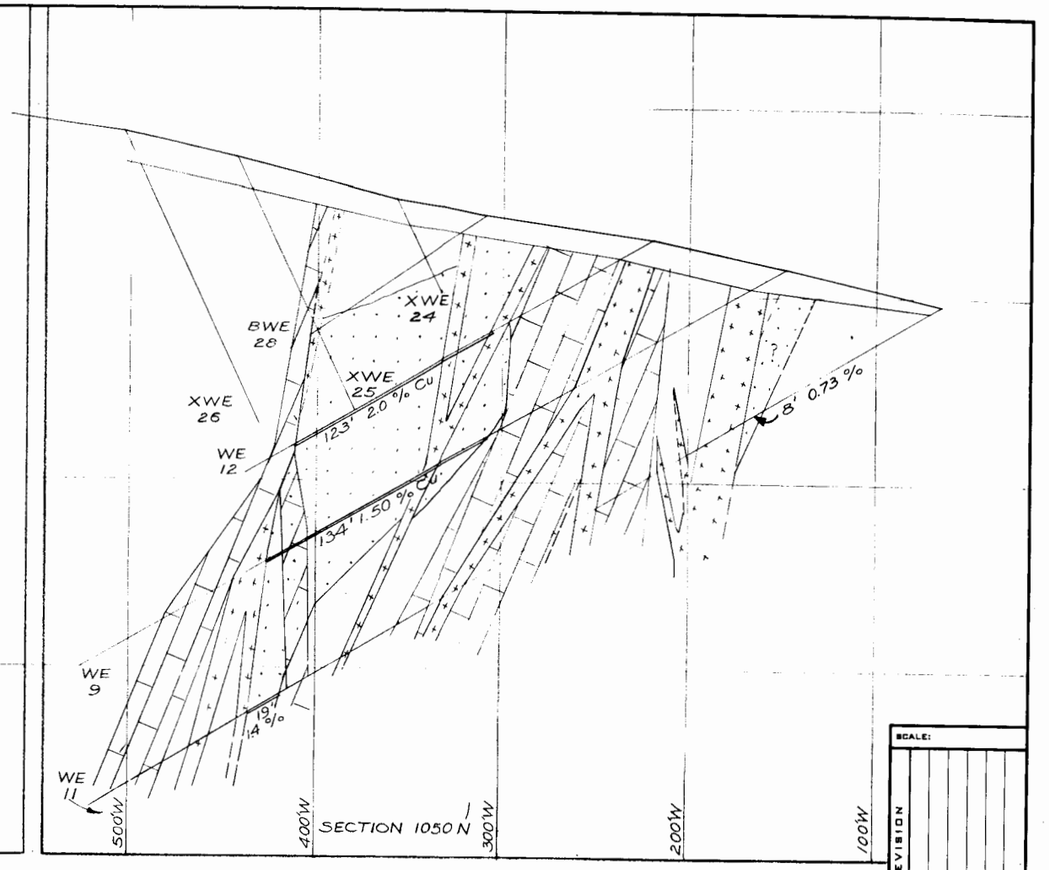
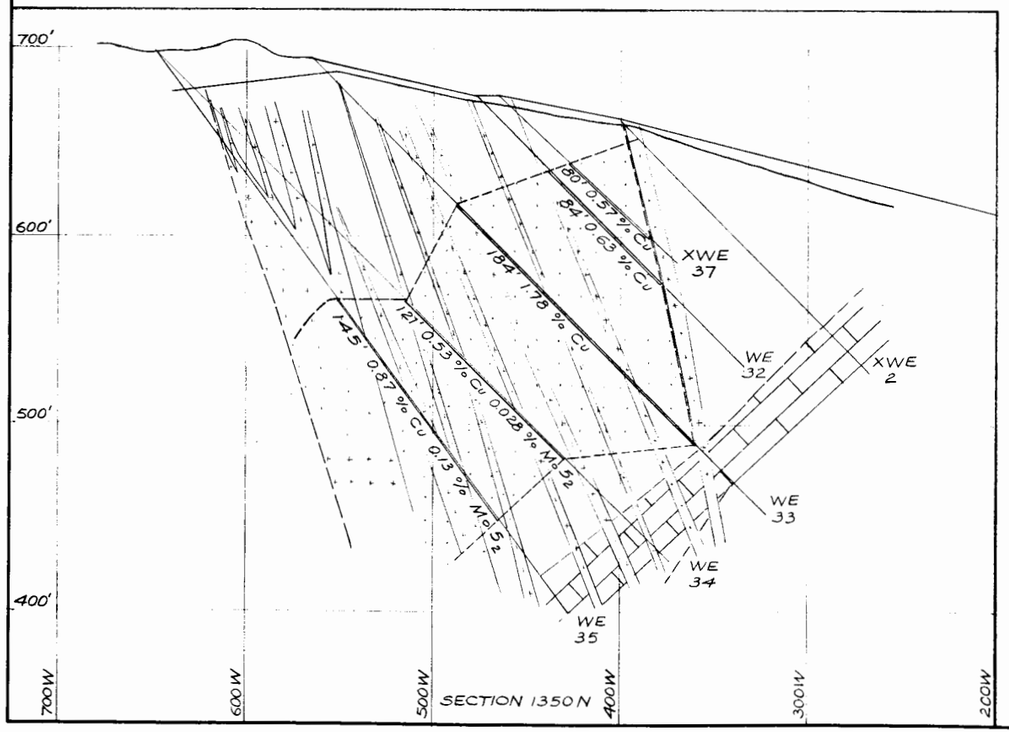
DWG. NO. 402 021 015







FOR
DR. A.C. SKERL
SEPT 1965.

LEGEND

- LIMESTONE
- SKARN & QUARTZITE
- ACID DYKE
- ORE

DESCRIPTION OF REVISION	DESIGN	DRAWN	DES. CHECK	DRAFT CHECK	APPR.
ISSUED FOR REPORT.					

SCALE:

REFERENCE | DWG. No.

WAR EAGLE GEOLOGY SECTIONS

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON

DWG. No. 402 021 015

WRIGHT ENGINEERS LIMITED
VANCOUVER —— CANADA

DWG. NO. 402 021 016

700'

600'

500'

BASE LINE

SECTION 125+00 E

1+00 N

3+00 N

C.P.21

C.P.24

C.P.26

C.P.28

C.P.30

135' 0.50% Cu, 0.116% MoS2

130' 1.40% Cu, 1.14% MoS2

137' 0.83% Cu, 0.125% MoS2

126' 1.27% Cu, 0.196% MoS2

121' 0.61% Cu, 0.092% MoS2

SECTION 123

EASE LINE

1+00 N

2+00 N

3+00 N

136' 0.87% Cu, 0.098% MoS2

137' 0.53% Cu, 0.058% MoS2

145' 0.86% Cu, 0.045% MoS2

C.P.34

C.P.36

C.P.39

TO 500' C.P.41

C.P.33

200 N

100 N

BASE LINE

100 S

11,900 12,000 12,100 12,200 12,300 12,400 12,500 12,600 12,700 12,800

LEGEND.

- DIORITE
- ALTERED DIORITE
- LIMESTONE
- SKARN
- BASIC DYKE
- ORE

FOR DR. A.C. SKERL SEPT. 1965

REPORT.

ISSUED FOR

DESCRIPTION OF REVISION

SCALE:

APP. DATE | DESIGN | DRAWN | CHECK | DES. CHECK | FINAL CHECK | APPR.

REFERENCE | DWG. No.

GEOLOGY AT 650' ELEVATION
SECTIONS 123+00E & 125+00E
COWLEY PARK

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON

DWG. No. 402 021 016

WRIGHT ENGINEERS LIMITED
VANCOUVER —— CANADA

DWG. NO. 402 | 021 | 017

LEGEND

- GRANITE
- DIORITE
- ACID DYKE
- BASIC DYKE
- MINERALIZATION

800E

700E

600E

500E

500 CONTOUR AT BEDROCK

500 CONTOUR AT SURFACE

45°

FAULT

FAULT

VERT.

BASE LINE

200 S

300 S

400 S

SCALE:

DESCRIPTION OF REVISION	ISSUED FOR	APPR.	CHKD.	DESIGN	FINAL CHECK	DIM. CHECK	DRAWN	DESIGN	APP. DATE
	REPORT.								

FOR
DR. A.C. SKERL
SEPT. 1955

REFERENCE	DWG. No.

KEEWENAW
GEOLOGY AT 500 ELEVATION.

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON.

DWG. No. 402 | 021 | 017

WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

DWG. NO. 402 021 018

500'

400'

300'

200'

F

962

0.41% Cu

153' 1.21% Cu

77' 2.32% Cu

130' 1.86% Cu

96' 0.62% Cu

K30

K20

K4

K8

K19

K25

FAULT

BASE LINE

100'S

300'S

500'S

LEGEND

- GRANITE
- ACID DYKE
- BASIC DYKE
- MINERALIZATION
- ORE
- DIORITE

FOR
DR. A.C. SKERL
SEPT. 1965

SCALE:

DESCRIPTION OF REVISION	APPR.	DESIGN	DRAWN	CHKD.	DATE
ISSUED FOR REPORT.					

REFERENCE	DWG. No.

KEEWENAW - GEOLOGY
SECTION 650 E.

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON.

DWG. No. 402 021 018

WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

SECTION II
MINING

DEVELOPMENT OF SITE, ROADWORK AND MINE PREPRODUCTION EXPENSES

The work estimated in this section includes the roadwork necessary to gain permanent access to the Little Chief mine site, the internal road system for haulage of ore and waste, the clearing and levelling of the mine sites, the removal of overburden and lake bottom silt prior to production.

The clearing and rough grading of the access roads must be completed prior to the commencement of pit preproduction work but it is proposed to gravel as few miles of roads as possible until the installation of the crushing plant provides a cheap source of crushed waste rock which can be used for this purpose. Wherever practical, it is proposed to use waste rock from the pits to build all roads on the property.

The exact sequence in which the clearing, roadwork and grading work should proceed will depend on the overall construction schedules. The costs have been estimated on the assumption that the company completes the work using its own mining equipment for a major part of the work outlined in this section.

During the first year of operation, it is proposed to mine only from the Little Chief ore zone. As a result, the initial preproduction preparation work is limited to the work required to bring this zone into production.

CAPITAL COST ESTIMATES

Preproduction - Little Chief Zone

Main ore and waste haulage roads, 50 feet wide, gravel surface	$ 14,000	
Access road, 30 feet wide, from millsite to Little Chief, gravel surface	3,000	
Preproduction Expenses - Mine		
Little Chief only		
Clearing 12 acres @ $200.00 per acre	2,400	
Draining lake and silt removal, 56,350 cu. yds. @ $0.80	45,080	
Overburden removal, 141,000 cu. yds. @ $0.50	70,500	
Waste rock removal, 275,000 cu. yds.	284,000	
Ore broken and stockpiled 70,000 tons	36,000	
Miscellaneous roads to powder magazines	4,500	
Preparation of coarse ore stockpile area	5,000	
Total Mine Preproduction Capital Cost		$ 464,480

In addition to the foregoing, the following work must be completed prior to commencement of production from the remaining pits. The expenditures required for this work are tabulated below in the year during which the work must be completed. The following costs do not include miscellaneous mine expense or general overhead as these items are adequately included elsewhere in the operating costs.

Second Year - Arctic Chief Zone

Road construction from millsite to Arctic Chief Zone, 3.54 miles	$ 71,540	
Clearing mine site 8 acres @ $200.00 per acre	1,600	
Overburden removal 132,800 cu. yds. @ $0.50	66,400	
Waste Rock removal 16,850 cu. yds.	23,780	
Total		$ 163,320
Contingency @ 10%		16,330
Total Second Year		$ 179,650

Third Year - War Eagle Zones

Road construction from Arctic Chief to War Eagle zones, 7.56 miles	$ 154,000	
McIntyre Creek bridge	18,000	
Clearing mine sites 10 acres @ $200.00 per acre	2,000	
Overburden removal 194,600 cu. yds. @ $0.50	97,300	
Waste rock removal 297,800 cu. yds.	265,600	
Total		$ 536,900
Contingency @ 10%		53,690
Total Third Year		$ 590,590

Fourth Year - Cowley Park Zone

New road construction from millsite to the Cowley Park zone, 9.02 miles	$ 197,700	
Wolfe Creek bridge	20,000	
Clearing mine site 10 acres @ $200.00 per acre	2,000	
Overburden removal 42,000 cu. yds. @ $0.50	21,000	
Waste rock removal 329,670 cu. yds.	298,400	
Total		$ 539,100
Contingency @ 10%		53,910
Total Fourth Year		$ 593,010

Fifth Year - Keewenaw Zone

New road construction to the Keewenaw zone, 0.23 miles	$ 5,100	
Clearing mine site 4.0 acres @ $200.00 per acre	800	
Overburden removal 39,200 cu. yds. @ $0.50	19,600	
River diversion 75,000 cu. yds.	67,900	
Total		$ 93,400
Contingency @ 10%		9,340
Total Fifth Year		$ 102,740

SUMMARY OF ORE RESERVES AND PIT DATA

Ore Zone	Little Chief	Arctic Chief	War Eagle	War Eagle South	Cowley Park	Keewenaw	Best Chance	Totals & Averages
Ore tons	1,343,900	377,300	812,750	188,890	1,193,440	433,200	169,280	4,518,760
Grade % Cu.	1.36	1.41	1.41	1.08	0.90	1.17	1.09	1.21
Dilution tons	174,710	43,450	113,780	26,440	71,610	51,980	22,000	503,970
grade % Cu	0.10	0.05	0.07	0.07	0.10	0.08	0.06	0.08
%	13.0	11.4	14.0	14.0	6.0	12.0	13.0	11.1
Total Ore tons	1,518,610	420,750	926,530	215,330	1,265,050	485,180	191,280	5,022,730
Grade % Cu.	1.21	1.27	1.24	0.96	0.86	1.05	0.98	1.10
% MoS_2					0.091			
Recoverable Gold & Silver $/ton	$1.07	$1.67	$0.73	$0.73	$0.20	$0.96	$0.26	$0.78
Waste rock cu. yds. Preproduction	275,000	16,850	233,800	64,000	329,670	75,000	50,000	1,044,320
After preproduction	1,674,800	164,610	616,550	254,530	449,750	200,090	119,250	3,479,580
Total waste rock cu. yds.	1,949,800	181,460	850,350	318,530	779,420	275,090	169,250	4,523,900
Waste/Ore Ratio cu.yds./ton	1.284	0.431	0.918	1.479	0.616	0.567	0.885	0.901
Overburden Cu. Yds.	141,000	132,800	145,700	48,900	42,000	39,200	61,900	611,500
Lake silt Cu. Yds.	56,350							56,350
Area to be cleared acres	12	8	12	3	10	4	4	53

MINING OPERATIONS

1. Pit Design

Studies have been made of each pit including such pertinent geological features as faults, types of rock, shape of ore bodies, etc. Such factors have been considered in preparing the various designs. This has resulted in different overall wall slopes, widths of berms and other design features so that all pits are not designed to a uniform set of conditions.

In general the rock conditions are very competent, which factor, coupled with the relatively small zones should permit mining at pit slopes steeper than normally considered in open pit operations.

A total of nine pits have been designed in varying degrees of detail. The Little Chief, War Eagle, Cowley Park and Keewenaw have been designed complete with berms, roads, etc. as these operations contain a major portion of the ore reserves. The other pits have been designed with overall slopes considered feasible for deposits of these types.

Additional design work may be successful in retrieving more ore but it is doubtful if the stripping ratios can be lowered significantly.

2. Production Requirements

During the preproduction period it will be necessary to mine 275,000 tons of waste rock to permit mining to continue at an adequate rate thereafter. It is estimated that prior to commencement of production 70,000 tons of ore will also be broken and available to supplement production during the first few months of operation.

Estimates have been based on the assumption that, during the first year of operation, 650,000 tons of ore will be milled and 720,000 annually thereafter. The following table schedules production from the various pits in accordance with the mining sequence previously outlined.

ORE AND WASTE PRODUCTION SCHEDULE

Year	Ore Zone	Ore Tons	Grade % Cu.	Grade MoS_2	Waste Rock Cu. Yds.	Waste/Ore Ratio Cu.Yds./Ton
Preproduction						
	Little Chief	70,000 *	1.25	-	275,000	3.929
1.	Little Chief	580,000	1.25	-	814,810	1.405
2.	Preproduction					
	Arctic Chief	-			16,850	-
	Little Chief	599,010	1.08	-	706,670	1.180
	Arctic Chief	120,990	1.27	-	76,480	0.632
	Totals & Averages	720,000	1.11	-	800,000	1.111
3.	Preproduction					
	War Eagle	-			233,800	-
	War Eagle South	-			64,000	-
	Little Chief	269,600	1.43	-	153,320	0.569
	Arctic Chief	299,760	1.27	-	88,130	0.294
	War Eagle	150,640	1.13	-	260,750	1.731
	Totals & Averages	720,000	1.30	-	800,000	1.111
4.	Preproduction					
	Cowley Park	-			329,670	-
	War Eagle	613,650	1.25	-	265,800	0.433
	War Eagle South	106,350	0.96		204,530	0.192
	Totals & Averages	720,000	1.20	-	800,000	1.111
5.	Preproduction					
	Keewenaw	-			75,000	-
	War Eagle	162,240	1.35	-	90,000	0.555
	War Eagle South	108,980	0.96	-	50,000	0.459
	Cowley Park	448,780	0.86	0.091	300,000	0.668
	Totals & Averages	720,000	0.99	0.057	515,000	0.715
6.	Preproduction					
	Best Chance	-			50,000	-
	Cowley Park	570,000	0.86	0.091	100,000	0.175
	Keewenaw	150,000	1.05	-	125,000	0.833
	Totals & Averages	720,000	0.90	0.072	275,000	0.382
7.	Cowley Park	246,270	0.86	0.091	49,750	0.202
	Keewenaw	335,180	1.05	-	75,090	0.224
	Best Chance	138,550	0.98	-	100,000	0.722
	Totals & Averages	720,000	0.97	0.031	224,840	0.312
Ore remaining after seventh year						
	Best Chance	52,730	0.98		19,250	0.365

* It is assumed the 70,000 tons of ore mined from the Little Chief during preproduction will be milled during the first year.

MINING OPERATIONS Cont'd.

3. Mining Methods

During the first year, mining must be concentrated in the north end of the Little Chief pit where the ore outcrops at the surface over a substantial area. At the south end the ore is overlain by a substantial thickness of waste rock and can only be mined after much of this material has been removed.

The stripping ratios allocated in this report are such as to maintain fairly uniform productions of ore and waste. The recommended schedule has the effect of extending production from the Little Chief zone into the third year as the ore at, and below, the 600 level can only be mined after practically all the waste rock has been removed. Unfortunately the highest grade ore lies in this lower region and can only be extracted during the last stages of production from this zone. The following data include recommendations and conditions applying to the proposed mining operation.

Production Data

Ore production - per year		720,000 tons
- per day		2,880 tons
- shifts per day		2
Working days per year		250
Working hours per week		40
Operation shifts worked	Per Day	
2 - primary drills	1.5	
2 - 2½ cu. yd. shovels	3	
Hauling	3	
General pit maintenance	1 & 2	
Other	1	

It is proposed to mine at 25 foot bench intervals leaving berms every third bench. Berm widths vary between 20 and 25 feet depending upon the competency of the rock.

Diesel powered 2½ cubic yard shovels, each operating on a three shift basis are proposed, each unit producing 2,000 tons per shift. Larger units would meet production requirements but because of the varying haul lengths and necessity of moving long distances, from pit to pit, it is recommended 2½ cubic yard units be used with the 35 ton hauling units. The following advantages favor the choice of the smaller shovel size.

(1) Lower initial capital expenditure
(2) Flexibility of operation
(3) Standardization - smaller inventory requirement
(4) Expense in moving larger than 2½ cubic yard shovel
(5) One small unit required in any case.

A rubber-mounted front-end loader is included to clean up scatter rock in the pits and waste dumps. This machine is much faster than a bulldozer for this work and is also capable of substituting for a shovel in the event of a prolonged breakdown. A spare loading unit is necessary as the shovels are programmed close to full capacity.

MINING OPERATIONS Cont'd.

Limited test work has indicated primary drilling might be done effectively with rotary machines. In the absence of conclusive data, however, these estimates are based on using "down-the-hole" percussion machines which will undoubtedly perform the work.

Two Drillmaster type rigs and one crawler mounted drill are required and will have ample capacity to maintain production. There will be numerous moves of equipment made during the mining operations and these machines have reasonable flexibility and can be moved with a low-boy trailer unit that can be rented locally.

Although 35 ton dump trucks are proposed throughout, consideration should be given to the acquisition of larger units considering the long ore hauls necessary after the first year of operations. Some reduction in the hauling costs can be expected with larger units. The units recommended are equipped with exhaust heated bodies.

MINE CAPITAL EXPENDITURES

The capital equipment required at the start of production is listed below. Additional equipment that will be needed is listed during the year in which the expenditure must be made.

Capital expenditures for shifters' offices, powder and fuse magazines are provided under the Ancillary Buildings section. Provision therein has been made for temporary buildings at each pit to serve as field offices, lunch and waiting rooms and for emergency repair work. An allowance has also been made in the section on Power for electrical installations to the Little Chief pit from the mill site. At the other pits it is proposed to provide a small diesel generator to supply lighting and power for miscellaneous uses that might be required.

Number Required	Description	Tons	Total
2	I.R. Drillmasters	39.0	$ 224,756
1	Crawler mounted drill complete	2.2	23,471
2	Jackleg rock drills complete	0.1	2,340
2	2.5 cubic yard shovels	145.0	253,352
1	Front end loader size #988	30.8	101,930
1	Size D-7-E bulldozer	25.5	57,015
5	35 ton trucks	128.5	439,260
1	600 cfm portable compressor	4.0	25,361
1	Road grader	12.5	28,866
1	Workmans bus	-	8,000
1	Service truck	-	7,500
4	Pick-up trucks	-	12,000
1	15 H.P. pump	0.1	1,235
	Small tools and miscellaneous	0.4	6,000
	Totals	388.1	$ 1,191,086

MINE CAPITAL EXPENDITURES Cont'd.

Number Required	Description	Tons	Total
	Brought forward	388.1	$ 1,191,086
	Freight 388.1 tons @ $80.00/ton		31,048
	Total F.O.B. Minesite		1,222,134
	Contingency and Engineering @ 5%		61,107
	TOTAL MINE EQUIPMENT - First Year		$ 1,283,241

ADDITIONAL EQUIPMENT REQUIRED

Number Required	Description	Tons	Total
	SECOND YEAR		
1	Service truck	-	$ 7,500
1	Pick-up truck	-	3,000
1	30 KW Diesel generator	1.5	5,947
1	set of 6 radio installations for trucks	0.25	4,595
	Totals	1.75	$ 21,042
	Freight 1.75 tons @ $80.00/ton		140
	Total F.O.B. Minesite		21,182
	Contingency and Engineering @ 5%		1,059
	TOTAL - SECOND YEAR		$ 22,241
	THIRD YEAR		
1	35 ton truck	25.7	$ 87,852
1	30 K.W. generator	1.5	5,947
	Totals	27.2	$ 93,799
	Freight 27.2 tons @ $80.00/ton		2,176
	Total F.O.B. Minesite		$ 95,975
	Contingency & Engineering @ 5%		4,799
	TOTAL THIRD YEAR		$ 100,774
	FOURTH YEAR		
3	35 ton trucks	77.1	$ 263,556
	Freight 77.1 tons @ $80.00/ton		6,168
	Total F.O.B. Minesite		$ 269,724
	Contingency & Engineering @ 5%		13,486
	TOTAL FOURTH YEAR		$ 283,210

MINE OPERATING COSTS

Following is a summary of the estimated mine operating costs.

SUMMARY OF ESTIMATED MINE OPERATING COSTS

Cost Per Ton Milled

Year	First	Second	Third	Fourth	Fifth	Sixth	Seventh
Primary Drilling	$0.140	$0.130	$0.102	$0.104	$0.100	$0.078	$0.077
Primary Blasting	0.323	0.292	0.220	0.220	0.208	0.151	0.150
Secondary & Misc. Breaking	0.074	0.067	0.067	0.067	0.067	0.067	0.067
Shovel Loading	0.298	0.275	0.203	0.195	0.187	0.132	0.132
Hauling	0.383	0.391	0.457	0.727	0.829	0.769	0.628
Mine Maintenance	0.110	0.100	0.100	0.100	0.100	0.100	0.100
Miscellaneous Mine Expense	0.126	0.153	0.168	0.168	0.168	0.168	0.168
Ore Stockpile to Crusher	0.062	0.056	0.056	0.056	0.056	0.056	0.056
Totals per Ton Milled	$1.516	$1.464	$1.373	$1.637	$1.715	$1.521	$1.378

Explanatory Notes:

1. These Costs do not include replacement of equipment nor depreciation allowances.

2. The first year is computed on the basis of milling 650,000 tons, subsequent years at 720,000 tons.

3. Costs for each year vary with the individual pits and their locations.

4. A contingency of 10% has been included on all costs to allow for remote location and severe winter conditions.

5. Costs have been based on present day prices for material and labour rates expected to apply in 1966. No allowance has been made for escalation in costs nor for slightly lower costs during the early years when the maintenance will be lower.

MINE OPERATING COSTS Cont'd.

PRIMARY DRILLING

Data

	Ore	Waste
Drill Pattern - Burden - feet	12	15
Spacing - feet	14	16
Height of Bench - feet	25	25
Sub-drilling in %	20	20
Net Cubic Yards per Hole	156	222
Drilling Speed - feet per hour	25	25

Year	Production Requirements Tons/Day		Drilling Requirements Hours/Day	Drill Shifts Required Per Day
	Ore	Waste		
1	2880	7985	25.8	3.2
2	2880	7840	25.5	3.2
3	2880	7840	25.5	3.2
4	2880	7840	25.5	3.2
5	2880	5047	19.3	2.2
6	2880	2695	14.2	1.8
7	2880	2203	12.9	1.6

Operating Costs

	Costs per Hour
Fuel 6 gal/hr. @ $0.27	$ 1.62
Lubricants	0.55
Maintenance	4.00
Bits and rods	5.50
Labour	3.95
	$15.62
Contingency @ 10%	1.56
Total	$17.18

MINE OPERATING COSTS Cont'd.

PRIMARY DRILLING Cont'd.

Operating Costs Cont'd.

Zone	Net tons per hour Ore	Cost per ton Ore	Cost per ton Waste
Little Chief	352	$0.049	$0.032
Arctic Chief	381	0.045	0.032
War Eagle	316	0.054	0.032
Cowley Park	324	0.053	0.032
Keewenaw	288	0.057	0.032
Best Chance	377	0.046	0.032

Summary of Primary Drilling Costs

Year	Cost per Year	Cost per ton milled
First	$ 91,160	$0.140
Second	93,800	0.130
Third	73,500	0.102
Fourth	75,090	0.104
Fifth	73,310	0.100
Sixth	56,080	0.078
Seventh	55,840	0.077

PRIMARY BLASTING

Data

	Ore	Waste
Pounds of explosive per net cu. yd.	1.0	1.0
Pounds of explosive per hole		
Hydromex	40	55
AN-FO	116	167
Pounds of explosive per hole blasted	156	222

MINE OPERATING COSTS Cont'd.

PRIMARY BLASTING Cont'd.

Operating Costs

	Ore	Waste
Materials per hole		
40 lbs. of Hydromex @ 28.89/cwt.	$11.56	
116 lbs. of AN-FO @ $0.089/lb.	10.32	
55 lbs. of Hydromex @ $28.89/cwt.		$15.89
167 lbs. of AN-FO @ $0.089/lb.		14.86
Primer, fuse, liner, cap and wire	6.08	6.08
	27.96	36.83
Contingency @ 10%	2.80	3.68
Total material per hole	$30.76	$40.51

Labour	
Cost per day	$ 84.48
Cost per ton broken	0.008

Zone	Net tons per hole		Cost per ton	
	Ore	Waste	Ore	Waste
Little Chief	441	544	$0.078	$0.082
Arctic Chief	478	544	0.072	0.082
War Eagle	396	544	0.086	0.082
Cowley Park	407	544	0.084	0.082
Keewenaw	362	544	0.093	0.082
Best Chance	472	544	0.073	0.082

Summary of Primary Blasting Costs

Year	Cost per year	Cost per ton milled
First	$209,930	$0.323
Second	210,230	0.292
Third	157,010	0.220
Fourth	156,930	0.220
Fifth	149,900	0.208
Sixth	108,420	0.151
Seventh	107,880	0.150

MINE OPERATING COSTS Cont'd.

SECONDARY & MISCELLANEOUS BREAKING

		Per Hour		Per Year
Materials				
Crawler mounted drill				
Rods, bits, hoses, etc.				
Cost per foot drilled	$0.20			
Cost at 25 feet per hour		$5.00		
Repairs		1.32	6.32	
Compressor operation				
Fuel - 6 gal./hr. @ $0.27		1.62		
Lubricant and repairs		.43	2.05	
Explosives				
Assume 0/75#/ton				
(includes fuse, caps & miscellaneous blasting)				
@ $0.34 per lb. for 94 lbs./hr.			23.97	
Total material for 1000 hrs./yr.			$32.34	$32,340
Labour				11,480
Total				$43,820
Contingency @ 10%				4,382
Total Secondary and Miscellaneous Breaking				$48,202
Cost per ton milled - first year				$0.074
- subsequent years				0.067

SHOVEL LOADING

Data

Two 2½ cubic yard diesel powered shovels	
Production per 8 hour shift	2,000 tons
Production per day on 2 shifts per machine	4,000 tons
Production per day on 3 shifts	5,400 tons
Total available capacity per day	10,800 tons
Total available capacity per year	2,700,000 tons

MINE OPERATING COSTS Cont'd.

SHOVEL LOADING Cont'd.

Operating Cost

	Per Hour	Per Year
Fuel 6.25 gallons per hour @ $0.27	$1.69	
Oil and grease	0.60	
Shovel teeth	1.13	
Wire rope and miscellaneous	2.31	
Maintenance	3.06	
	$8.79	
Contingency @ 10%	.88	
	$9.67	
Total for six shifts @ 6.67 hours per shift		$96,748
Labour		$95,687
Total Shovel Loading		$192,435
Cost per ton loaded		$0.075

Summary of Shovel Operating Costs

Year	Daily Production Required Tons		Daily Machine Shifts	Daily Shovel Capacity		Cost Per Ton Milled
	Ore	Waste		Ore	Waste	
First	2880	7985	6	2880	7920	$0.298
Second	2880	7840	6	2880	7920	0.275
Third	2880	7840	6	2880	7920	0.203
Fourth	2880	7840	6	2880	7920	0.195
Fifth	2880	5047	4	2880	5120	0.187
Sixth	2880	2695	* 2	2880	1120	0.132
Seventh	2880	2203	** 2	2880	1120	0.132

* 6th year - third shift required for 9.5 months
** 7th year - third shift required for 6.5 months

MINE OPERATING COSTS Cont'd.

HAULING

Data

First Year
- Recommend 35 ton rear dump trucks
- Average load - 35 tons
- Three shift operation to service shovel units

Number of trucks required	4
Spare truck required	1
Total required, years 1 & 2	5

- Additional requirements shown in table on page 2-10
- Truck requirements based on 50 minute hour and 85% truck/shovel efficiency
- For years 2 to 7, number of trucks include requirements for pre-production work but operating costs for this work are included under Preproduction Expenses

Operating Cost per Hour per Truck

	Per Hour
Materials & Supplies	
Fuel 8 gallons per hour @ $0.27	$2.16
Tire replacement	3.60
Tire repairs	0.54
Repairs materials	3.15
Lubricants	0.25
Total Materials	$9.70
Labour	$4.75
	$14.45
Contingency @ 10%	1.445
Total Hauling	$15.895

Summary of Hauling Operating Costs

Year	Truck Hours Per Year	Number of Trucks Required	Cost per Year	Cost/ton Milled
First	15,683	5	249,280	$0.383
Second	17,710	5	281,500	0.391
Third	20,699	6	329,010	0.457
Fourth	32,943	9	523,630	0.727
Fifth	37,589	9	597,470	0.829
Sixth	34,833	8	553,670	0.769
Seventh	28,450	7	452,210	0.628

MINE OPERATING COSTS Cont'd.

MINE MAINTENANCE

	Per Year	
Bulldozer		
Fuel and material @ $5.24 per hour for 1 shift operation @ 6.67 hours per shift	$ 8,736	
Labour	9,620	
Total Bulldozer		$ 18,356
Grader		
Fuel and material @ $2.57 per hour for 1 shift operation @ 6.67 hours per shift	$ 4,285	
Labour	6,500	
Total Grader		$ 10,785
Front End Loader		
Fuel and material @ $8.93 per hour for 1 shift operation @ 6.67 hours per shift	$ 14,891	
Labour	15,820	
Total Front End Loader		$ 30,711
Scaling and miscellaneous		$ 5,400
Total		$ 65,252
Contingency @ 10%		6,525
Total Mine Maintenance		$ 71,777
Cost per ton milled - first year		$0.110
- subsequent years		$0.100

MINE OPERATING COSTS Cont'd.

MISCELLANEOUS MINE EXPENSE

	Per Year	
Service Truck		
Fuel and materials	$ 3,035	
Labour	6,870	
Total Service Truck		$ 9,905
Pick-up Truck		
Fuel and materials	$ 1,784	
Labour	4,400	
Total Pick-up Truck		$ 6,184
Transportation - Men and Equipment		
Fuel and materials	$ 1,625	
Labour - included elsewhere	-	
Total Transportation		$ 1,625
Pumping and Miscellaneous		$ 2,500
Supervision		
Material	$ 2,500	
2 pick-up trucks	5,352	
Labour	37,200	
Total Supervision		$ 45,052
Miscellaneous Garage and Services		
Material	$ 4,400	
Labour	4,800	
Total Miscellaneous Garage and Services		$ 9,200
Total		$ 74,466
Contingency @ 10%		7,447
Total Miscellaneous Mine Expense		$ 81,913
Cost per ton milled - first year		$0.126
- second year		$0.153
- subsequent years		$0.168

POSSIBLE UNDERGROUND DEVELOPMENT

Little Chief Ore Zone

Deep drilling in the Little Chief Ore Zone on Sections 2+50S, 3+00S, and 4+00S indicate that the ore zone below the pit floor could be of a size and grade to consider an underground mining operation in this area. On Section 3+00S good values persist in diamond drill holes number 64 and 65 to 200 feet, or 400 feet below the pit floor.

In the geological section of this report, Dr. Skerl has illustrated the results obtained on the drawing the 3+00S section.

More diamond drilling will have to be done to delineate the ore and to determine tons and grade before serious consideration can be given to mining underground.

To serve as a rough guide for this possibility, the following estimate of the cost of equipment, development and preparation work to sustain an underground mining operation, is included. In addition an estimated mining cost, based on what could be a comparable situation, is shown.

The mining costs used are direct underground costs and include only the cost of placing the ore in the ore bin at the shaft. No overhead or administration costs are included.

Mining

Means of Entry

It is reasonable to consider sinking a shaft from the pit floor. The best ore is in Sections 3+00S and 3+50S and there is not enough room on the pit floor to sink too close to these two sections. The remaining pit floor climbs 50 feet to the 650 foot elevation. Future work may make this approach impracticable because of ore extensions, however for the time being, the shaft will be considered as located at 1+50S and 2+00E with the collar at 650 foot elevation.

Size of Shaft

As the economics of the underground mining will depend on the grade of ore and the tonnage hoisted, the shaft should be large enough to hoist 1000 to 1800 tons of ore per day and to service the mine. Minimum requirements would probably be a three compartment shaft with compartments 6 feet by 5 feet 6 inches. This would mean an overall size outside of timber of 20 feet 6 inches by 9 feet 6 inches.

Three levels would be driven at the 450 foot, 300 foot and 150 foot horizons. To allow for a loading pocket, spill pocket and sumps the minimum length of the shaft would be 675 feet.

POSSIBLE UNDERGROUND DEVELOPMENT Cont'd.

Mine Development

If Section 3+00S were taken as the center of the ore and the shaft is located at 1+50S, drifts along the ore zone would be 300 feet long. Cross cuts from the drifts to the ore zone would be probably 75 feet in length.

A study of Section 3+00S with the suggested width and the flat dip, suggests that the ore could be stoped transversely leaving a number of buttress pillars against the hanging wall - particularly from the 500 foot horizon down the dip.

Preparation

Scram drifts could be driven above the haulage levels and the ore scraped to one chute located near the footwall side. Mining would retreat from the hanging wall toward the footwall.

Sub drifts driven off raises at 45 feet above the level would serve as sill drifts and drilling could be done from this sub and from one placed 60 feet above the sill.

Stoping

Breaking could be done by long hole machines drilling from the sill elevation and the sub level 60 feet above. Stopes widths with two walls in ore, could be 50 feet and pillars between stopes 30 feet wide. Combined with the loss in sill pillars and scram drifts the overall extraction would not be more than 65% of the ore.

Because of the irregularities in the Little Chief Ore Zone shown to date, transverse stoping would retard dilution. The final decision as to choice of mining method will have to wait for the results of detailed drill assessment.

The cost of an underground mining plan such as the above would probably be as follows:

Summary of Pre-production Costs

Equipment	$807,153
Shaft including head frame, pockets, stations, etc.	303,750
Development	312,750
Preparation	639,750
Underground Excavations	65,572
Underground Installations	95,160
Miscellaneous Mine Expense	132,780
Services	276,336
Total	$2,633,251
Contingency @ 10%	263,325
Total all Pre-production Costs	$2,896,576
Estimated Mining Costs Per Ton	$2.70

DWG. NO. 402 022 001

2 +00 N | BASE LINE | 2 +00 S | 4 +00 S | 6 +00 S

A — 40' ROAD — A

B — ROCK SURFACE — B

20' BERMS

875 BERM

25' BERM

800 BERM

725 BERM

650 BERM

ROAD - 12% GRADE

TO CRUSHING PLANT

TO WASTE DUMP

50' ROAD

PIT FLOOR
EL. 650

PIT FLOOR
EL. 600

ROAD - 8% GRADE

4 +00 E

2 +00 E

BASE LINE

2 +00 W

825 | 800 | 775 | 750 | 725 | 700 | 675 | 650 | 625 | 600 | 850 | 875

50 FT. 0 50 FT. 100 FT.

ORIGINAL SCALE 1" = 40'

NO.	DESCRIPTION OF REVISION	APP'D
	ISSUED FOR REPORT.	

DESIGNED BY
J.A.C. ROSS & ASSOCIATES LTD.

REFERENCE | DWG. NO.

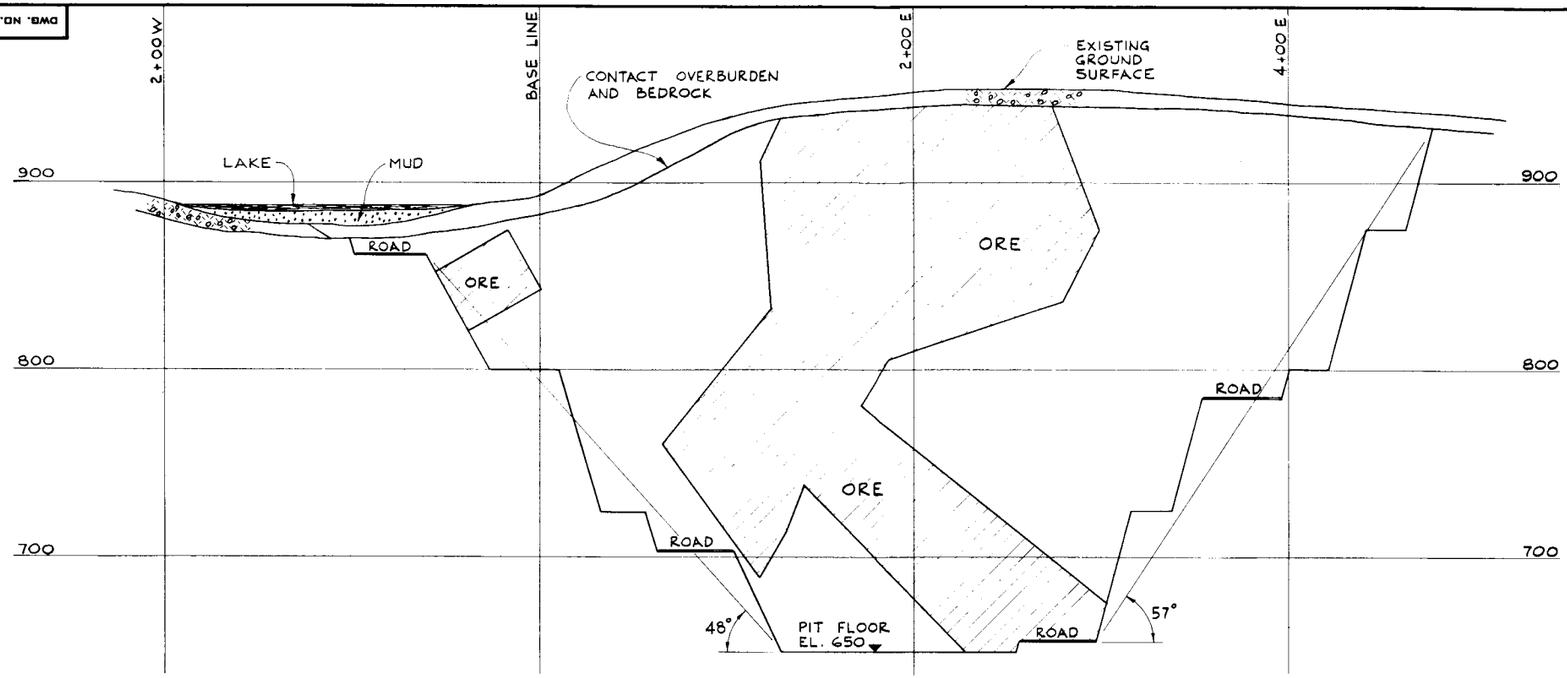
LITTLE CHIEF ZONE
OPEN PIT PLAN

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON

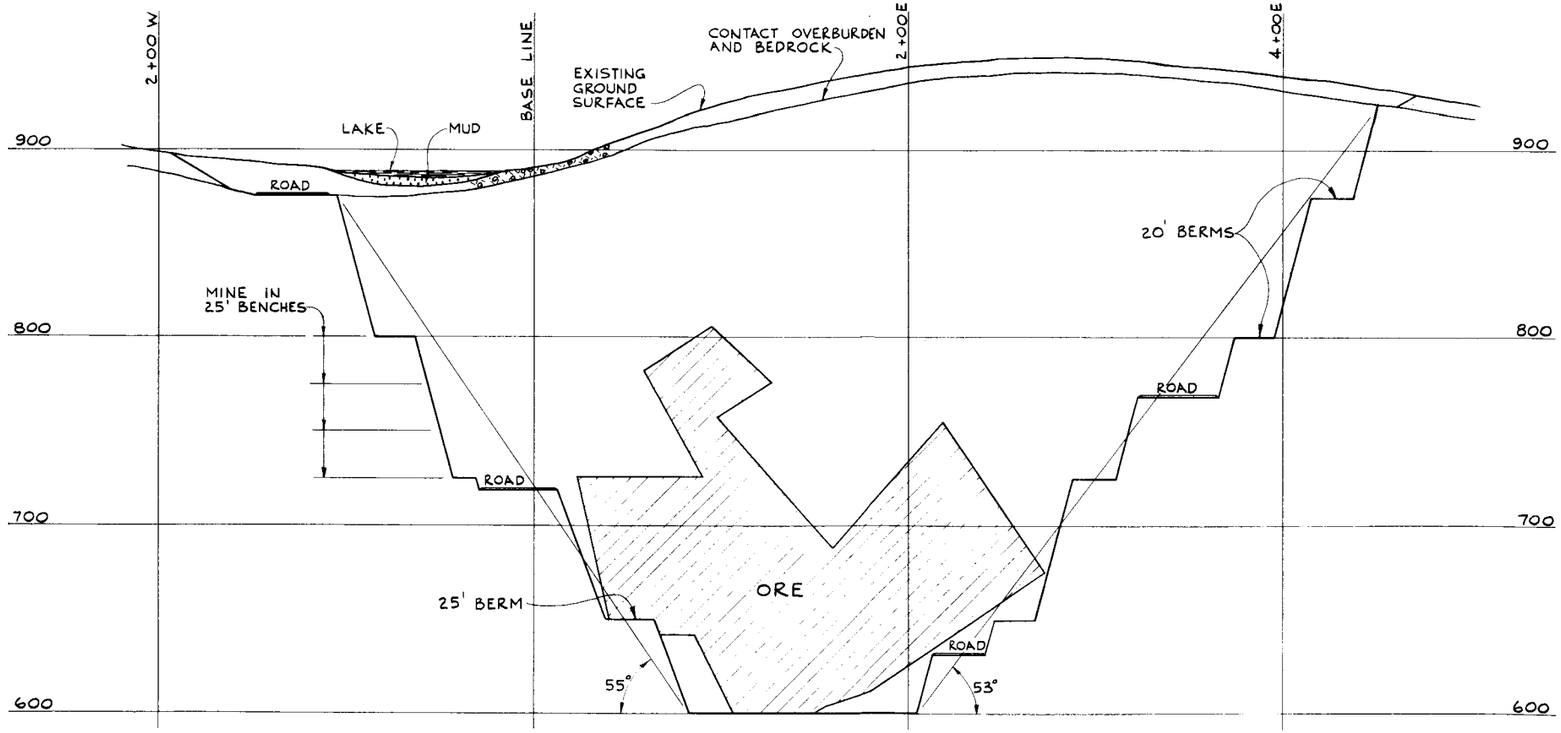
DWG. NO. 402 022 001

WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

DWG. NO. 402 022 002



SECTION A-A



SECTION B-B

ORIGINAL SCALE: 1" = 40'

NO.	DESCRIPTION OF REVISION	ISSUED FOR	APP'D	FINAL CHECK
		REPORT		

50FT. 0 50FT. 100FT

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REFERENCE | DWG. No.

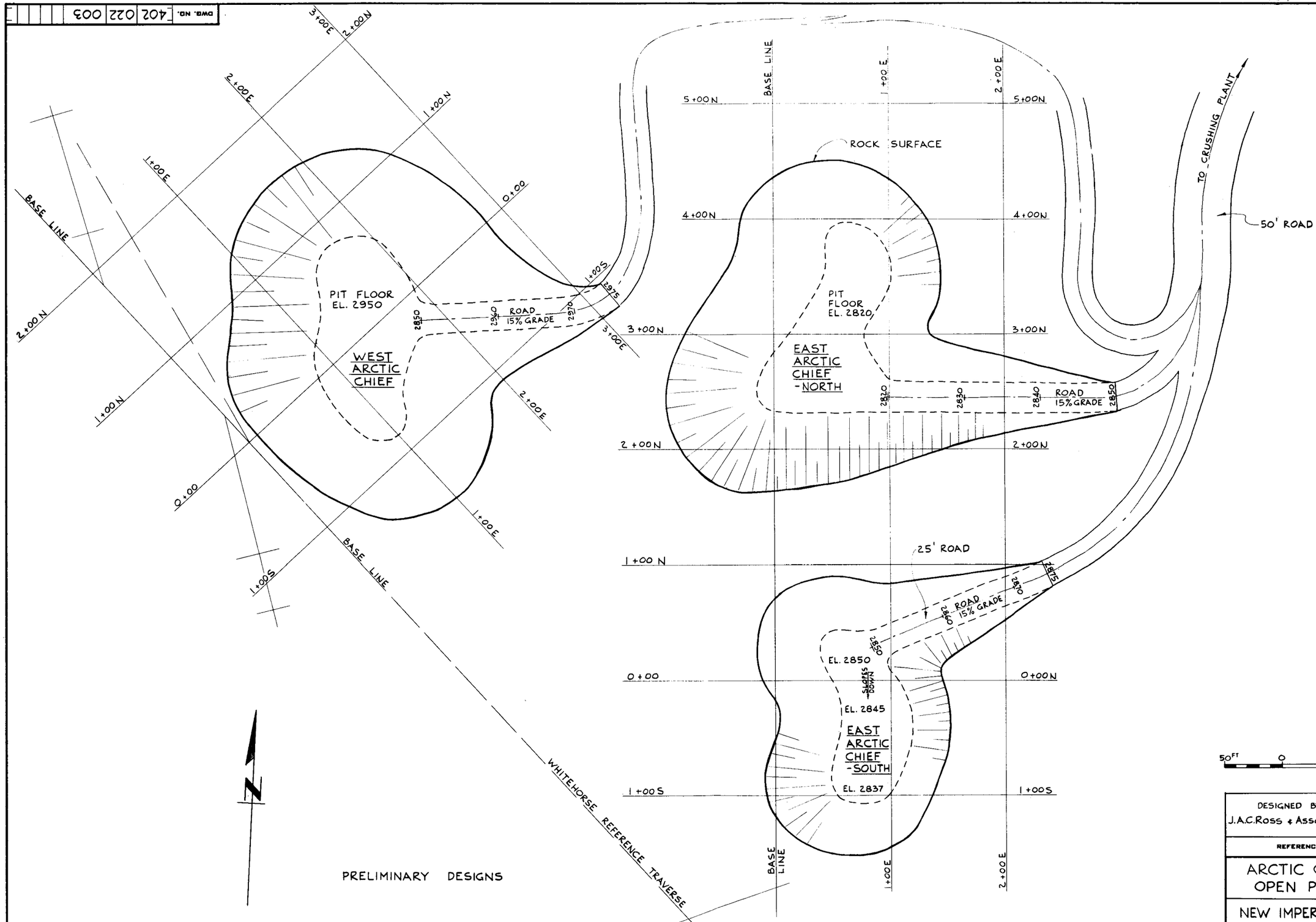
LITTLE CHIEF ZONE
OPEN PIT SECTIONS

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON

DWG. No. 402 022 002

WRIGHT ENGINEERS LIMITED
VANCOUVER —— CANADA

DWG. NO. 402 022 003



ORIGINAL SCALE: 1" = 40'

DESCRIPTION OF REVISION	DATE	DESIGN	DRAWN	CHKD.	APPD.
ISSUED FOR REPORT.	MAY 1965		DJH		

DESIGNED BY
J.A.C. ROSS & ASSOCIATES LTD.

REFERENCE	DWG. No.

ARCTIC CHIEF ZONE OPEN PIT PLANS

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON

DWG. No. 402 022 003

WRIGHT ENGINEERS LIMITED
VANCOUVER —— CANADA

DWG. NO. 402 022 005

120+00E | 122+00E | 124+00E | 40' ROAD | 126+00E | ROCK SURFACE | 128+00E | 130+00E

4+00N

25' BERMS

750 | 675 | 650 | 625 | 600 | 575 | 550 | 725 | 700

PIT FLOOR EL. 600

PIT FLOOR EL. 550

675 BERM

750 BERM

2+00N

BASE LINE

2+00S

TO CRUSHING PLANT

50' ROAD

ROAD - 8% GRADE

760

50FT 0 50FT 100FT.

ORIGINAL SCALE: 1" = 40'

DESCRIPTION OF REVISION

ISSUED FOR REPORT

APPR. | FINAL CHECK | DESIGN CHECK | DRAWN | DETAIL CHECK | APPR. | DESIGN

DESIGNED BY
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REFERENCE | DWG. No.

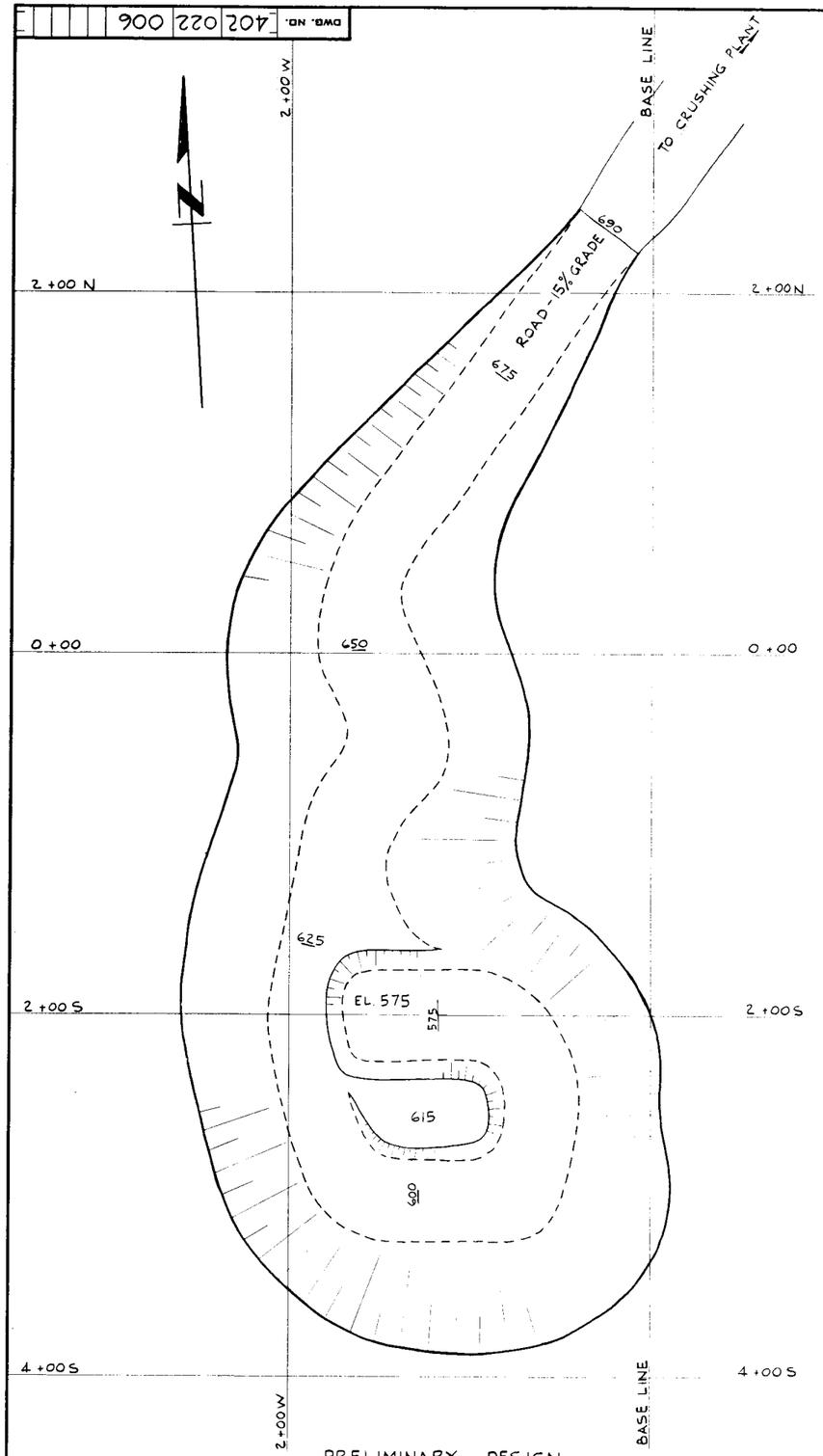
COWLEY PARK ZONE OPEN PIT PLAN

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON

DWG. No. 402 022 005

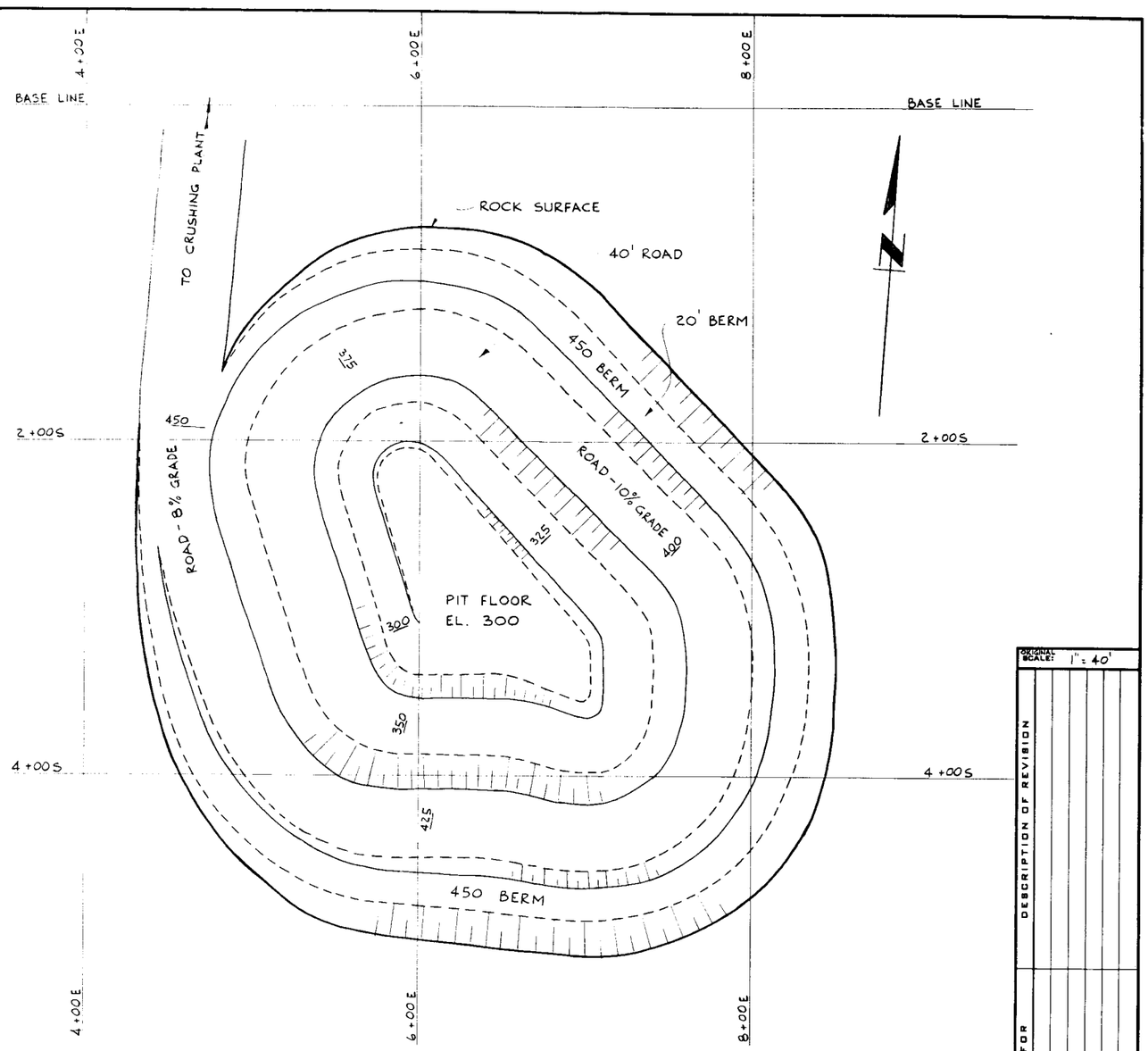
WRIGHT ENGINEERS LIMITED
VANCOUVER — CANADA

DWG. NO. 402 022 006



PRELIMINARY DESIGN

BEST CHANCE



PRELIMINARY DESIGN

KEEWENAW

50FT. 0 50FT. 100FT.

ORIGINAL SCALE: 1" = 40'

DESCRIPTION OF REVISION	ISSUED FOR	APP.	FINAL CHECK	DESIGN CHECK	DIR. CHECK	DRAWN	DESIGN	APP. DATE	ENGR. DATE
	REPORT								

DESIGNED BY
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REFERENCE | DWG. No.

BEST CHANCE AND KEEWENAW ZONES OPEN PIT PLANS

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON

DWG. No. 402 022 006

WRIGHT ENGINEERS LIMITED
VANCOUVER — CANADA

SECTION III
METALLURGY

METALLURGY

Introduction

The metallurgical flowsheet was developed from testwork carried out on drill core composite samples from each of the six ore bodies. This testwork is reported from the laboratories concerned as follows:-

(1) Britton Research Laboratories, Vancouver.

(a) Concentration Tests on Samples of Copper-Iron Ore (Arctic Chief) (24/10/63).

(b) Tests on Composite Sample from Best Chance Ore body (2/1/64).

(c) Indicated Results from Treating Ore from the Little Chief Ore body (15/5/65).

(d) Progress Report No. 5, War Eagle (16/7/65).

(e) Progress Report No. 6, Keewenaw, (16/7/65).

(f) Progress Report No. 7, Cowley Park, (20/9/65).

(2) Sumitomo Metal Mining Co. Ltd., Tokyo.

(a) Testwork on Little Chief, Arctic Chief and Best Chance, (5/12/65).

(b) Testwork on War Eagle and Cowley Park, (5/12/64).

(c) Testwork on Keewenaw, (5/12/64).

(3) Department of Mines and Technical Surveys, Ottawa.

(a) Letter 26/5/65 - Little Chief Testwork.

(b) Letter 27/11/65- Little Chief Testwork.

The previous feasibility report was concerned with the recovery of copper, iron and associated gold and silver values from the Arctic Chief, Little Chief and Best Chance ore bodies. The terms of reference for the present report exclude the recovery of iron but the previous testwork for recovery of copper values is still valid. No testwork for iron recovery was carried out on the Cowley Park, Keewenaw and War Eagle ore bodies. Preliminary testwork has been performed on the concentration of molybdenite which is expected to be economically recoverable from the Cowley Park ore body.

Conclusions

The ore from the six deposits has similar grinding and metallurgical characteristics and the copper, gold and silver values can be readily concentrated by flotation of the copper sulphides. The grade of the copper concentrate produced is mainly dependent on the bornite content of the ore being treated but is expected to average about 35% copper at an average recovery of 85%. The grade will probably range between 28 and 45% copper at recoveries between 76% and 95%. Gold recoveries will range between 30 and 85% although this is difficult to predict from testwork due to the small concentrations present. Silver recoveries will range between 69 and 90%.

The copper is mineralized as the sulphides, chalcopyrite, bornite and chalcocite and major oxidation has occurred only in the Keewenaw ore body where chrysocolla and a little malachite account for 20% of the total copper. Attempts to float the oxides were unsuccessful.

Preliminary molybdenite flotation tests on the Cowley Park ore indicated that 65% of the MoS_2 can be recovered in a concentrate grading 90% MoS_2. Further testwork is required to develop a flowsheet.

Testwork indicates a power requirement for the primary grinding varying between 10.3 and 11.7 kwh/ton. Although the work index varies between 12.0 and 15.0, this variation is compensated by the differing mesh of grinds required (50 to 70% - 200 mesh). Variations in the work index of up to 1.0 kwh/ton were recorded from separate composite samples from the same ore body within the range 12.0 to 15.0, and it is thought that in actual plant practice adjustments to the mill operation, such as alteration of rod and ball load, will allow sufficient grinding control.

The proposed smelter schedule as expected, confirms the advantage of aiming for a high grade concentrate consistent with recovery. Testwork, particularly by Sumitomo, on the Little Chief ore body (Tests LCN4 and LCN5) indicates that regrinding of the copper rougher concentrates to 90% - 200 mesh in conjunction with a gangue depressant will increase the grade of the concentrates by up to 10% copper.

Testwork by Sumitomo and the Department of Mines checked the use of a gangue depressant particularly on the Little Chief ore where talc is present. Little success was reported with sodium silicate or Aero 610 but significant improvements in grade were recorded with the use of quartec. It is expected in plant practice that quartec additions will be confined to the cleaning sections due to the relatively high cost of the reagent.

The proposed method of treatment is as follows:-

(1) Crushing to 5/8"

(2) Rod milling to approximately 10 mesh.

(3) Ball milling to approximately 65% - 200 mesh.

(4) Flotation of a copper-gold-silver rougher concentrate.

(5) Flotation of a copper scavenger concentrate which will be recirculated to the primary ball mill.

(6) Regrinding and double cleaning of the copper-gold-silver rougher concentrate. (Flotation of a MoS_2 Concentrate.)

(7) Recirculation of the cleaner tailing to the primary ball mill.

(8) Recirculation of the recleaner tailing to the cleaner circuit.

(9) Thickening, filtering and drying of the copper-gold-silver concentrate.

Test Results

Metallurgical results from the laboratories concerned are summarized in Tables 1 and 2. Detailed flotation results from The Britton Research Laboratories on the three main ore bodies, Little Chief, War Eagle and Cowley Park, are shown in Tables 3, 4, and 5. Grinding characteristics are compared in Table 6.

TABLE I - Summary of Test Results - Copper.

ORE BODY	BRITTON RESEARCH					SUMITOMO					DEPT. OF MINES				
	GRADE % CU		CU REC %	SIZE FLOT FEED %-200	SIZE FINAL CONC. %-325	GRADE % CU		CU REC %	SIZE FLOT FEED %-200	SIZE FINAL CONC. %-325	GRADE % CU		CU REC %	SIZE FLOT FEED %-200	SIZE FINAL CONC. %-325
	FEED	CONC.				FEED	CONC.				FEED	CONC.			
Arctic Chief	0.88	28	83	70	-	0.79	36	89	60	-					
Best Chance	0.85	25	90	61	-	0.61	45	83	57	-					
Little Chief	1.20	25	83	65	70	1.37	45	80	62	98	1.29	30 to 34	86 to 88	75	-
War Eagle	1.25	35	94	50	-	N) 1.41 S) 0.78	42 35	95 81	70 68	- -					
Keewenaw	1.31	28	76	55	-	1.38	55	79	50	85					
Cowley Park	0.92	36	80	59	93	0.80	37	86	65	77					

TABLE 2 - Summary of Test Results - Associated Minerals

Ore Body	BRITTON RESEARCH						SUMITOMO						DEPT. OF MINES					
	Au		Ag		MoS_2		Au		Ag		MoS_2		Au		Ag		MoS_2	
	Feed Oz/Ton	Rec %	Feed Oz/Ton	Rec %	Feed %MoS_2	Rec %	Feed Oz/Ton	Rec %	Feed Oz/Ton	Rec %	Feed % MoS_2	Rec %	Feed Oz/Ton	Rec %	Feed Oz/Ton	Rec %	Feed MoS_2	Rec %
Arctic Chief	0.03	78	0.22	76	-	-	0.023	-	0.26	-	-	-	-	-	-	-	-	-
Best Chance	0.003	30	0.17	90	-	-	0.003	-	0.22	-	-	-	-	-	-	-	-	-
Little Chief	0.023	84	0.30	80	-	-	0.029	-	0.45	-	-	-	0.045	82 to 87	0.55	80 to 90	-	-
War Eagle	0.01	65	0.46	88	0.03	-	N) 0.006	-	0.51	-	0.005	-	-	-	-	-	-	-
							S) 0.006	-	0.23	-	0.041	-	-	-	-	-	-	-
Keewenaw	0.03	82	0.27	69	-	-	0.039	-	0.32	-	0.002	-	-	-	-	-	-	-
Cowley Park	0.004	55	0.15	70	0.11	65	0.003	-	0.12	-	0.097	-	-	-	-	-	-	-

TABLE 3 - BRITTON RESEARCH LABORATORIES

LITTLE CHIEF ORE (Second Composite)

Flotation Results
(Derived from Test L.C.7)

No.	Product	Weight %	Assays Au Oz/Ton	Assays Ag Oz/Ton	Assays Cu %	Distribution % Au	Distribution % Ag	Distribution % Cu
1	1st Cu Concentrate	4.13	0.38	5.90	25.28	75.3	71.5	77.2
2	2nd Cu Concentrate	0.60)	0.03	0.84	4.22)	2.2	3.7	1.8
3	2nd Cu Cleaner Tail	0.92)			1.60)			1.1
4	1st Cu Cleaner Tail	4.64	0.03	0.43	1.35	6.7	5.9	4.7
5	Scav. Cu Concentrate	3.51	0.02	0.36	1.11	3.4	3.7	2.8
6	Final Tails	86.20	0.003	0.06	0.19	12.4	15.2	12.4
7.	Head (calculated)	100.00	0.021	0.34	1.35	100.0	100.0	100.0
	Head (direct assays)		0.026	0.31	1.35			
	Calculated Results							
1 + 2	Combined Cu Concentrates	4.73	-	-	22.61	-	-	79.0
2 + 3	2nd Cu Conc. & 2nd Cleaner Tail	1.52	0.03	0.84	2.63	2.2	3.7	2.9
1 to 3	Cu Conc. after 1 cleaning	5.65	0.29	4.54	19.19	77.5	75.2	80.1
1 to 4	Cu rougher Concentrate	10.29	0.17	2.69	11.14	84.2	81.1	84.8
1 to 5	Cu rougher & Scav.Concentrate	13.80	0.13	2.09	8.59	87.6	84.8	87.6

TABLE 4 - BRITTON RESEARCH LABORATORIES

WAR EAGLE ORE

Flotation Results
Test W.E. 5

No.	Product	Weight %	Assays Oz. per Ton Au	Assays Oz. per Ton Ag	Assays % Cu	Assays % MoS_2	Distribution % Au	Distribution % Ag	Distribution % Cu	Distribution % MoS_2
1	Final Concentrate	3.16	0.20	11.90	35.91	0.27	46.2	83.7	91.5	47.9
2	2nd Cleaner Tailing	0.95)			2.91)				2.3)	
3	1st Cleaner Tailing	2.14)	0.12	0.70	0.82)	0.17	33.4	5.9	1.4)	36.4
4	Scavenger Concentrate	0.72)			1.20)				0.7)	
5	Scavenger Tailing	93.03	0.003	0.05	0.055	0.003	20.4	10.4	4.1	15.7
6	Head (calculated)	100.00	0.014	0.45	1.24	0.018	100.0	100.0	100.0	100.0
	Calculated Results									
1 + 2	Conc. after 1 cleaning	4.11			28.28				93.8	
1 to 3	Rougher Concentrate	6.25			18.88				95.2	
1 to 4	Rougher & scav. concs.	6.97	0.16	5.80	17.05	0.22	79.6	89.6	95.9	84.3
2 to 4	Middlings	3.81	0.12	0.70	1.41	0.17	33.4	5.9	4.4	36.4

Additional assays on final concentrate: Fe 19.58%, SiO_2 9.72%, CaO 3.77%, MgO 1.23%, Al_2O_3 1.70%, S 27.32%.

TABLE 5 - BRITTON RESEARCH LABORATORIES

COWLEY PARK ORE

Flotation Results
Test C.P. 3

No.	Product	Weight		Assays				Distribution %			
		Grams	%	Oz. per Ton Au	Oz. per Ton Ag	% Cu	% MoS_2	Au	Ag	Cu	MoS_2
1	MoS_2 Concentrate	1.46	0.037			0.47%	95.53			-	30.4
2	" Middling	1.18	0.030)			2.84%	81.45)			0.1	21.1
3	2nd Cu Concentrate	4.09	0.102)	0.10	4.9	25.93%	13.03)	51.7	67.7	3.0	11.4
4	1st Cu Concentrate	78.6	1.967			37.59	0.48			80.5	8.2
5	3rd Cleaner Tailing	13.2	0.330)			6.00%	0.85)			2.1	2.4
6	2nd Cleaner Tailing	24.8	0.621)			2.57%	0.35)			1.7	1.8
7	1st Cleaner Tailing	230.0	5.756)	0.002*	0.05*	0.86%	0.07)	48.3*	32.3*	5.4	3.5
8	Rougher tailing	3642.6	91.157)			0.07%	0.027)			6.9	21.2
9	Cu in solution	-	-			0.12%	-			0.3	-
10	Head (calculated)	3995.93	100.000			0.92%	0.116	100.0	100.0	100.0	100.0

*Including MoS_2 Concentrate

Calculated Results

1 + 2	MoS_2 Conc. & Middling	2.64	0.067			1.55	89.24			0.1	51.5
3 + 4	Combined Cu Concs.	82.69	2.069			37.02	1.10			83.5	19.6
1 to 7 + 9	Rougher Concentrate	353.33	8.843			9.67	1.04			93.1	78.8

TABLE 6

Comparison of Grinding Characteristics and Power Requirements

	Arctic Chief	Best Chance	Little Chief	War Eagle	Keewenaw	Cowley Park
M.O.G. % - 200 Mesh	70	61	65	50	55	59
Rod Mill						
Wi	12.1	13.4	12.0	15.0	14.0	13.0
Fu	9,400	9,400	9,400	9,400	9,400	9,400
Pu	455	455	455	455	455	455
W Kwh/Ton	4.43	4.90	4.39	5.49	5.12	4.75
HP for 2000 TPD	494.5	547.7	490.4	613.1	572.2	531.3
Mill Size	10' x 12'	10' x 12'	10' x 12'	10' x 14'	10' x 14'	10' x 12'
Ball Mill						
Wi (allow 1.25 increase)	13.35	14.65	13.25	16.25	15.25	14.25
Fu	455	455	455	455	455	455
Pu	100	115	100	170	140	120
W Kwh/Ton	7.09	6.80	7.03	4.84	5.73	6.32
HP for 2000 TPD	792.3	759.5	786.4	541.2	640.3	706.3
Mill Size	10' x 14'	10' x 14'	10' x 14'	10' x 10'	10' x 10'	10' x 10'
Total HP	1286.8	1307.2	1276.8	1154.3	1212.5	1237.6
Total W Kwh/Ton	11.52	11.70	11.42	10.33	10.85	11.07
TPD to M.O.G. on L.C. HP	1983	1952	2000	2211	2105	2063

Design Data

Most of the design data are based on results of testwork from the Little Chief ore body. This is the largest ore body of the six and will be the first pit mined. Grinding power requirements are close to the weighted average for the six ore bodies and flotation conditions require the maximum cell volume.

Assumed Assay of Ore

Copper	1.2%
Gold	0.023 oz/ton
Silver	0.3 oz/ton

Estimated Grinding Power

Primary rod and ball milling (Feed size 5/8 in.)	11.4
Copper concentrate regrinding	1.5
Total	12.9 KWH/ton

Work index of ore: - Wi = 12 KWH/ton

Specific gravity of ore: - 3.4

Screen Analyses (Percent passing)

Product	Mesh Size (Tyler) 28	48	100	200	325
Primary ball mill feed	48%	32%	18%	10%	6%
Primary flotation feed	100%	100%	94%	65%	45%
Final copper concentrate	100%	100%	100%	95%	80%

80% Passing Sizes	Microns
Primary ball mill feed	455
Primary flotation feed	100
Final copper concentrate	40

Weights of Concentrates (Percent of mill feed)

Rougher concentrate	10%
Cleaner concentrate	6%
Final concentrate	4%
Scavenger concentrate	4½%
Cleaner tails	6%
Recleaner tails	1½%

Assay of Concentrates - (From Britton Research Laboratories Test L.C. 7)

Chemical Analysis

Copper (Cu)	25.%
Gold (Au)	0.46 oz/ton
Silver (Ag)	5.9 oz/ton
Iron (total) (Fe)	12.%
Iron (acid sol.) (Fe)	11.%
Sulphur (S)	12.%
Silica (SiO_2)	22.%
Moisture (H_2O)	12.%

Assay of Concentrates - Cont'd.

Spectrographic Analysis

Alumina (Al_2O_3)	0.5%
Antimony (Sb)	Nil
Arsenic (As)	Nil
Barium (Ba)	Trace
Beryllium (Be)	Nil
Bismuth (Bi)	Nil
Boron (B)	0.002%
Cadmium (Cd)	Nil
Calciumoxide (CaO)	5%
Chromium (Cr)	Trace
Cobalt (Co)	0.003%
Gallium (Ga)	Nil
Lead (Pb)	0.04%
Magnesiumoxide (MgO)	15%
Manganese (Mn)	0.1%
Molybdenite (MoS_2)	0.03%
Niobium (Nb)	Nil
Nickel (Ni)	0.01%
Strontium (Sr)	Trace
Tantalum (Ta)	Nil
Tin (Sn)	Trace
Titaniumoxide (TiO_2)	0.3%
Tungsten (W)	Nil
Vanadium (V)	0.02%
Zinc (Zn)	0.1%
Zirconium (Zr)	Nil

Conditioning and Flotation Contact Periods and Percent Solids

	Retention Time Minutes	Percent Solids (approx.)
Conditioner (before rougher flotation)	5	33
Rougher flotation	10	33
Scavenger flotation	4	32
Cleaner flotation	6	11
Recleaner flotation	4	8

Assumed Recoveries

Copper	83.3%
Gold	80%
Silver	78.7%

Reagent Consumption

Potassium amyl xanthate	0.18 Lbs./Ton
Pine oil	0.16 Lbs./Ton
Quartec	0.05 Lbs./Ton

In practice, it is probable that less reagents will be required.

Grinding and Flotation Circuits
Metallurgical and Water Balances

The determination of grinding power requirements is shown in Table 7. A work index of 19 and a product size of 40 microns has been assumed for the regrinding of the rougher concentrates. Testwork indicates that the Little Chief ore will require the greatest amount of regrinding due to the close mineral association with magnetite and gangue and it is probable that power requirements will be reduced on the other ores.

The determination of pulp volumes and flotation cell sizes are shown in Table 8 and the metallurgical balance in Table 9. The water balance is shown in Table 10.

TABLE 7

Grinding Data and Power

	80% passing Size Microns		Approx. Work Index (Rel.)	Work Input Kwh/Ton of		Mill Size		% of Critical
	Feed	Product	Kwh/Ton	Mill Feed	of 2000 TPD	Ft	Motor HP	Speed
Rod Mill	9,400	455	12.0	4.4	4.4	10 x 12	500	65
Primary Ball Mill	455	100	13.25	7.0	7.0	10 x 14	800	65
Regrind Ball Mill	140	40	19.0	13.9	1.5	7 x 7	200	
Total					12.9		1,500	

TABLE 8

Flotation Circuit

	Feed					
	Dry Solids TPD	Pulp I GPM	% Solids	Contact Time Min.	Pulp Volume Cu.Ft.	Cells installed No. and Cu. ft.
Rougher Flotation	2210	703	33.3	10	1127	24-50 cu.ft.
Scavenger Flotation	1990	646	32.7	4	416	8-50 cu.ft.
Cleaner Flotation	250	290	11.0	6	280	12-24 cu.ft.
Recleaner Flotation	130	151	11.0	4	97	4-24 cu.ft.
Total cells installed			32 cells, 50 cu.ft. each 16 cells, 24 cu.ft. each			

TABLE 9

Assumed Metallurgy in the Flotation Circuit

(From Britton Research Laboratories Test L.C. 7)

	Weight %	Cu %	Au Oz/Ton	Ag Oz/Ton	Distribution % Cu	Au	Ag
Head Feed	100.0	1.20	0.023	0.30	100.0	100.0	100.0
Rougher Concs.	10.0	10.75	0.20	2.55	89.5	87	85
Final Concs.	4.0	25.00	0.46	5.90	83.3	80	78.7
Final Tails	96.0	0.21	0.005	0.07	16.7	20	21.3

TABLE 10

Total Water Introduced into the Mill Circuit

Point of Addition	I GPM
Rod Mill	119.0
Primary Ball Mill	217.3
Regrind Mill	25.4
Cleaner Cells	80.8
Recleaner Cells	123.8
Total	566.3

Total Water Losses without Water Reclamation

Final Copper concentrate	17.0
Final Tails	549.3
	566.3

Molybdenite Flotation

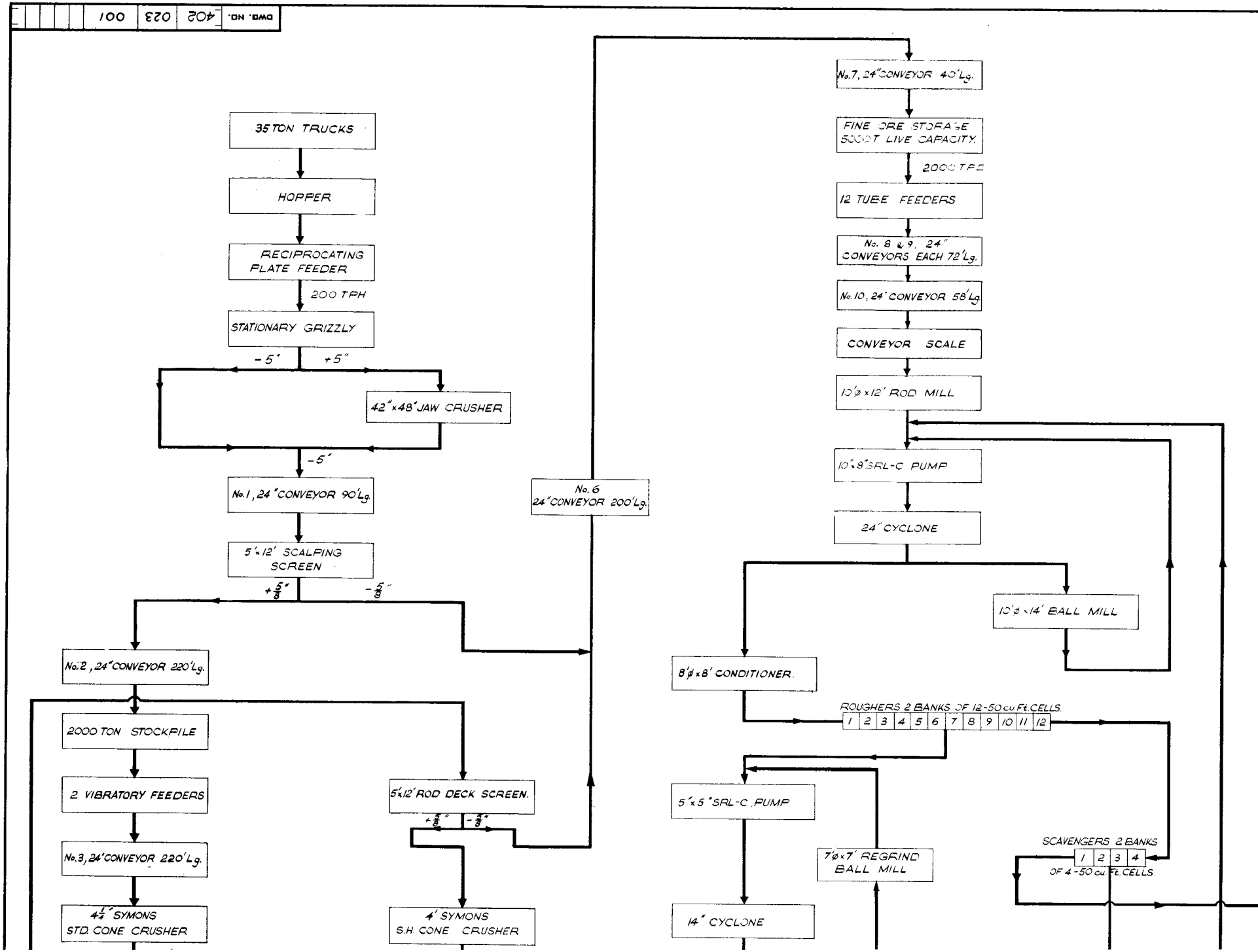
Preliminary tests have indicated that a 90% MoS_2 concentrate containing less than 1% copper can be obtained at a 65% recovery, but further testwork is required to determine optimum conditions and reduce reagent consumption. Detailed results are as follows:

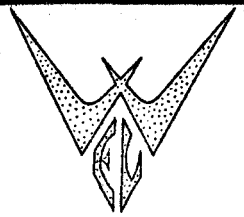
MoS_2 Concentrate

Test	Wt. %	Assay % MoS_2	Assay % Cu	Rec %	%-325 Mesh	Reagent Addns. Lbs./Ton orig.ore NaCN	NaHS	K4(Fe(CN6)	NaCLO
Britton									
CP1	0.079	89.6	0.92	65.2	48	0.60			
CP2	0.090	94.9	0.47	77.7	94	0.95			
CP3)	0.037	95.5	0.47	30.4	93	0.20	0.10		
)Midd.	0.030	81.4	2.84	21.1					
Sumitomo									
	0.06	96.2	0.20	47.6	77	0.69		0.03	0.04
(Midd.)	0.11	29.5	15.60	26.8					

It is not expected that regrinding of the copper cleaner concentrates will be required and a saleable grade concentrate will probably be produced by flotation of a rougher molybdenite concentrate followed by four to five stages of cleaning.

DWG. NO. 402 023 001





SECTION IV
SITE DEVELOPMENT, ROADS AND CONCENTRATE MOVEMENT

SITE DEVELOPMENT

All clearing, grubbing and rough excavation costs are included in Section VII except for the pits which are included in Section II.

ROADS

Mine road costs are included in Section II. The roads in the millsite complex are included in Section VII. The 2-1/4 mile access road from MacRae to millsite is costed in this section.

CONCENTRATE MOVEMENT

It is expected that the Whitepass and Yukon Route will transport the copper concentrate from the concentrator to shipboard in Skagway. A preliminary survey by the Whitepass and Yukon Route, reported in a letter to New Imperial Mines Limited, dated 13th October, 1965, estimates the freight rate at $11.85 per short ton. Although this rate is not firm, it is used in this report. The freight rate includes truck transportation in containers from the concentrator to the rail siding at McRae, rail transportation to Skagway, handling, storage at Skagway and loading to ship.

Of the two sizes of collapsible containers available it is proposed to use the smaller size (12' x 4' x 3') for ease of handling. This container has a maximum capacity of 10 tons. It may be necessary to line the containers with paper to prevent the concentrates sticking under freezing conditions. It may also be necessary to cover the containers with plastic sheeting to prevent wind losses in transportation. No allowance has been made for the lining and sheeting in the operating cost.

The preliminary survey does not indicate where the concentrates are to be weighed but it is presumed that the Whitepass and Yukon Route will provide such a facility.

A preliminary concentrate production rate of 80 tons per day was reported to the Whitepass and Yukon Route for estimating purposes. It is now apparent that the average rate will be closer to 60 tons per day and will range between 43 and 73 tons per day at an assumed concentrate grade of 35% copper.

Construction & Installation	Quantity	@$	Cost $
Access Road MacRae to Millsite	2-1/4 miles	$24,000	$54,000

SECTION V
ANCILLARY BUILDINGS

ANCILLARY BUILDINGS

General

General comments regarding Ancillary Buildings made in the initial report still stand. However there has been a steep upward trend in tendered prices lately which cannot be justified solely by known increases in labour rates and prices of materials. The buildings therefore have been re-estimated at current unit prices for the same class of work in districts of similar location.

The mill site is close enough to Whitehorse that no provision need be made for housing at the site.

The repair shops of the White Pass and Yukon Route in Whitehorse may be relied on as a base for major equipment repairs. For this reason, an elaborately equipped machine shop is not considered necessary.

The few necessary buildings have been designed with a maximum economy of space and material in mind.

Office and Warm Warehouse

This building is designed as a conventional timber framed structure on concrete footings with a concrete slab forming the warehouse floor. The multiplicity of partitions renders a standard steel building unsuitable for this purpose. The offices are placed on the upper floor which enables a comprehensive view of the whole plant to be obtained from the Manager's office. The vault is placed over the furnace room and is accessible to both engineering and office staff. The furnace room and vault enclosure is constructed of concrete blocks. In the event of fire destroying the building, the vault should remain standing with records remaining intact. Combining the warehouse and office accommodation allows maximum economy in excavation and footings.

Mine Office and Dry

The mine office and dry is located at the plant site where it shares water, sewer, lighting and fire protection services with other plant buildings. A conventional timber framed building with pitched roof and concrete footings is recommended. A total of 60 lockers has been provided to allow service and surface personnel as well as the mine personnel to use the changehouse facilities.

Machine Shop and Cold Warehouse

The increased number of vehicles proposed in the present report has required an increase in the size of the maintenance area. A standard steel building with an overhead crane 40 ft. wide, similar to the previous scheme, has been proposed. An additional bay, approximately 25 ft. wide for the length of the building, has been added and the tool room, electrical shop, office and washroom have been relocated in this area, leaving the area travelled by the crane entirely clear.

The building is fully insulated and has an inner lining of galvanized sheet up to 8 feet for protection of the vapour barrier and insulation material. Heating is by unit heaters or infra red heaters. The crane hoist would be hand operated but the beam travel would be powered by electric motor. Washroom facilities are included within the building to provide for inclement weather and for time saving. The roof slope is extended on one side to provide cold warehousing requirements and a wire mesh enclosure is all that is required. Any racking required in this area should be provided by staff on site and no allowance has been made for this. A separate enclosed oil storage has been added under this roof slope.

Pit Shack, Pit Garages, Powder Magazine & Cap & Fuse Shed

A pit shack 12 ft. x 20 ft. mounted on skids provides a lunch room, one end of which is partitioned off for a washroom and toilet facilities. This can be moved from pit to pit as necessary. Four pit garages each 20 ft. wide, 30 ft. long and 14 ft. high are provided.

A powder magazine and cap and fuse shed complete with the necessary earthworks as illustrated are provided but the core shed and nitrate storage shed are omitted from the present scheme.

Sewage Disposal

Washroom facilities in both the general plant area and the pit area require two separate sewage systems. The plant site sewage system would consist of a septic tank and a leaching cesspit. At the pit shack, a simple septic tank discharging to surface drainage should suffice because this building will be relocated after three years.

SUMMARY OF CAPITAL ESTIMATE

	Building Construction	Equipment	Freight	Total
(a) Office & Warm Warehouse	$ 43,200.00	$10,000.00	$ 4,000.00	$ 57,200.00
(b) Maintenance Building & Open Storage	60,000.00	22,000.00	4,000.00	86,000.00
(c) Mine Office & Dry	30,500.00	6,500.00	5,200.00	42,200.00
(d) Miscellaneous Small Buildings, Sewage, Etc.	40,000.00	-	2,000.00	42,000.00
	$173,700.00	$38,500.00	$15,200.00	$227,400.00

ANCILLARY BUILDINGS

Office & Warm Warehouse - 2,700 sq.ft.

Building at$16.00 per sq.ft. including heating & lighting.	=	$ 43,200.00	$ 43,200.00

Equipment

Desks & Chairs		
Drafting Tables		
Typewriters & Machines		
Filing Cabinets	6,300.00	
Warehouse racks etc.	3,700.00	
		10,000.00

Freight

50 Tons @ $80.00	4,000.00	4,000.00
Total To Summary		$ 57,200.00

MAINTENANCE BUILDING & OPEN STORAGE

Prefab. Building - Delivered & Erected	$ 32,000.00	
Foundations, Partitions, Services, Etc.	$ 28,000.00	
		$ 60,000.00

Equipment

Office	700.00	
5 Ton Crane	13,000.00	
1 Electric Welder		
1 Set Acelylene torches		
1 Bench Table		
1 Bench Hacksaw		
1 Set pipe dies		
Small Tools	8,300.00	
		22,000.00

Freight

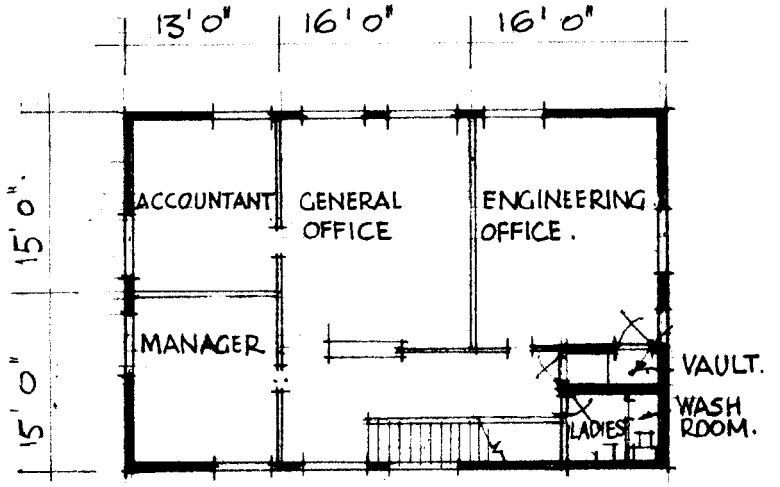
50 Tons @ $80.00	4,000.00	4,000.00
Total To Summary		$ 86,000.00

MINE OFFICE, SMALL PARTS STORE & DRY - 1,680 sq.ft.

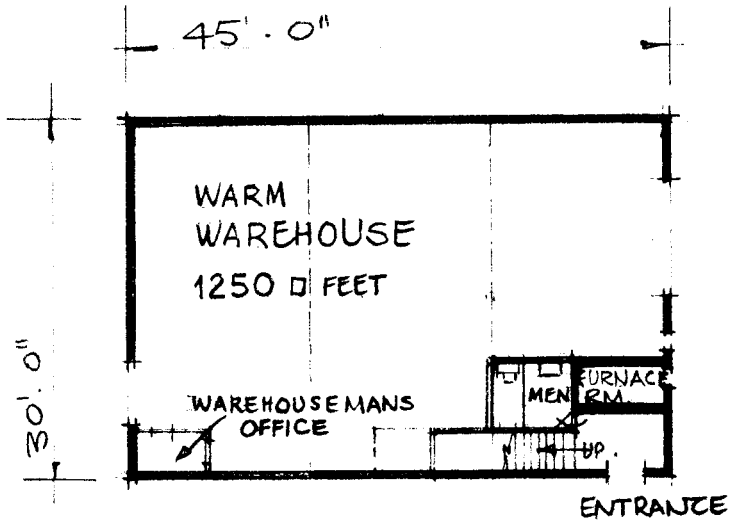
Building at $18.00 per sq.ft. including heating & lighting	=	$ 30,500.00	
Equipment			
Desks & Chairs Drafting Tables & Stools Filing Cabinets Typewriter Storage racks Lockers		6,500.00	
Freight			
67.5 Tons @ $80.00		5,200.00	
Total To Summary			$ 42,200.00

MISCELLANEOUS SMALL BUILDINGS, Etc.

Powder Magazine and Cap and Fuse Shed	$ 12,600.00	
Pit Shack on skids	2,400.00	
4 Pit Garages @ $5,000. each	20,000.00	
Sewage Disposal allowed	5,000.00	
		$ 40,000.00
Freight		
25 Tons @ $80.00	2,000.00	2,000.00
Total To Summary		$ 42,000.00



SECOND FLOOR - OFFICES



MAIN FLOOR - WAREHOUSE.

TWO STOREY BUILDING.
2700 SQ.FT. TOTAL.

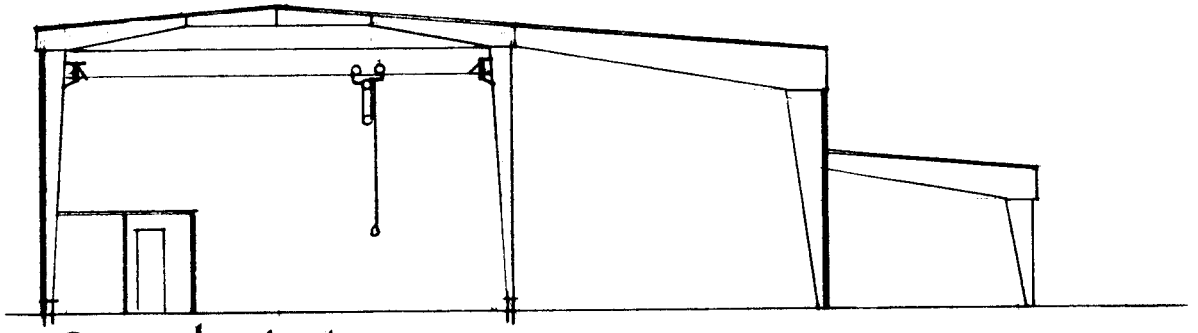
ADMIN. OFFICES & WARM WAREHOUSE

NEW IMPERIAL MINES LIMITED, WHITEHORSE, YUKON.

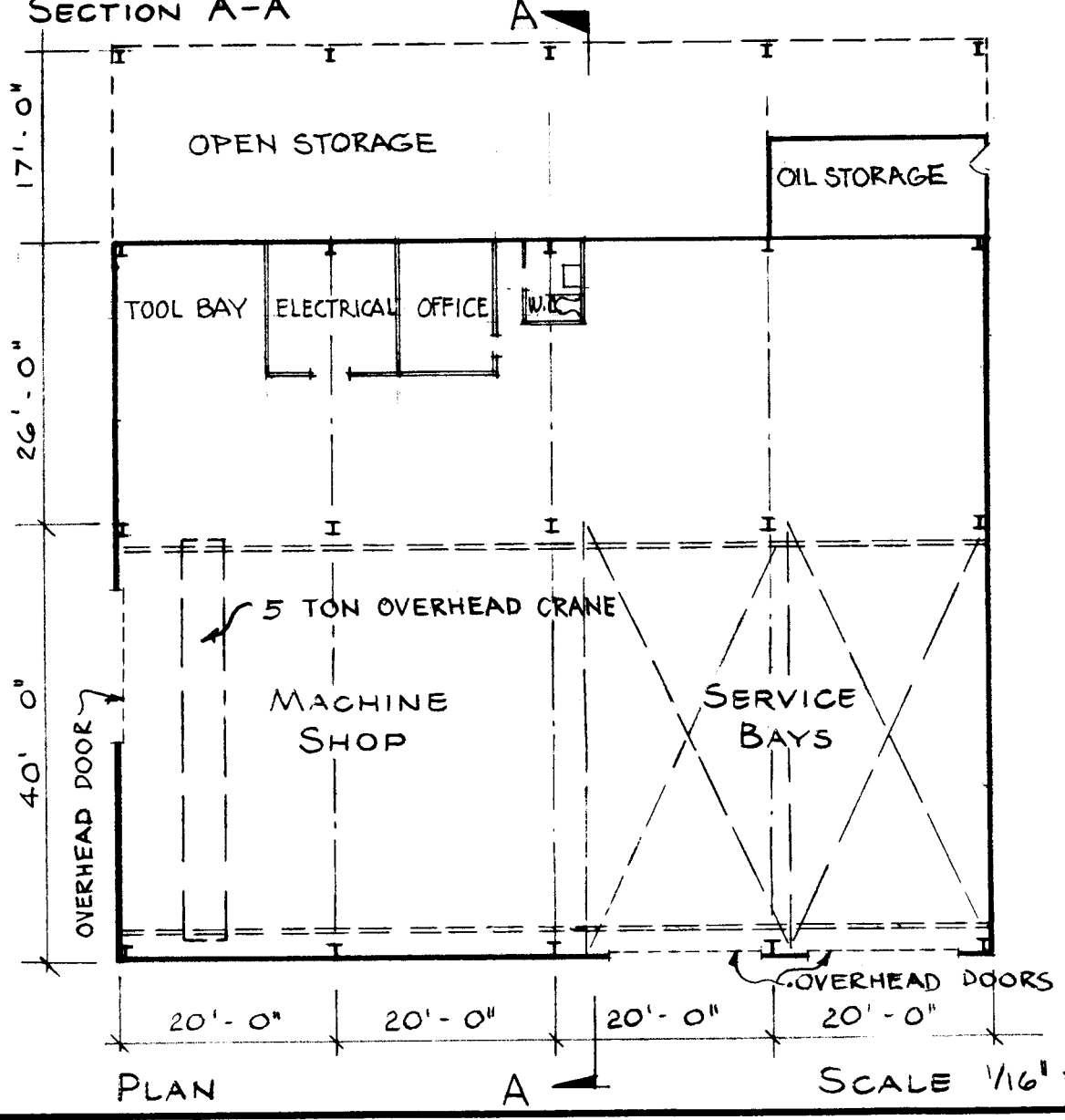
WRIGHT ENGINEERS LIMITED
VANCOUVER —— CANADA

DRAWN BY RC
DATE NOV 1965

DRAWING NO. 402 | 025 | 001



SECTION A-A



PLAN

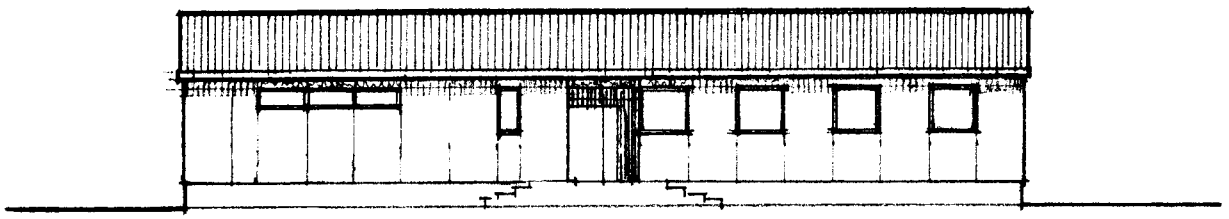
SCALE 1/16" = 1'-0"

MAINTENANCE BUILDING & COLD WAREHOUSE
NEW IMPERIAL MINES, LIMITED. WHITEHORSE, YUKON

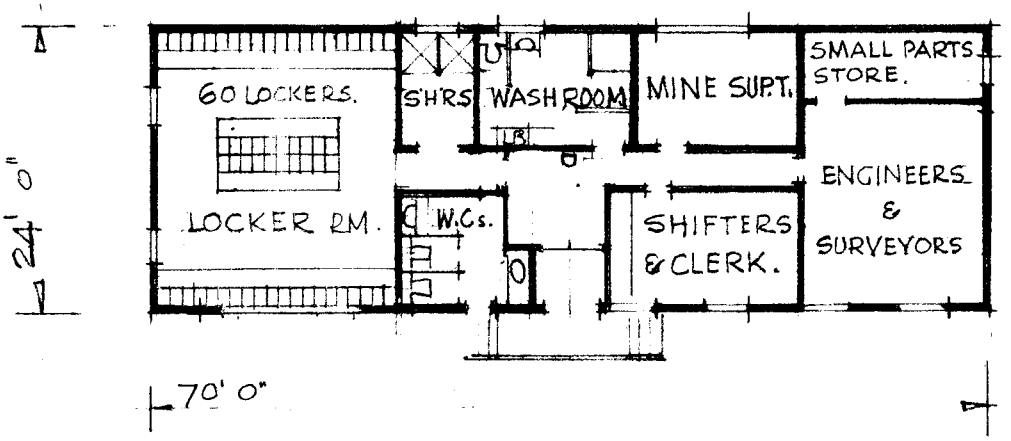
WRIGHT ENGINEERS LIMITED
VANCOUVER — CANADA

DRAWN BY
DATE NOV 65

DRAWING NO. 403 025 002



ELEVATION.



1680 SQ.FT.

ACCOMMODATION FOR MINE SUPERINTENDENT.
2 SHIFTERS
CLERK.
2 ENGINEERS
SURVEYOR & HELPER
60 OPERATIVES.
SMALL PARTS & SURVEY EQUIP.T.

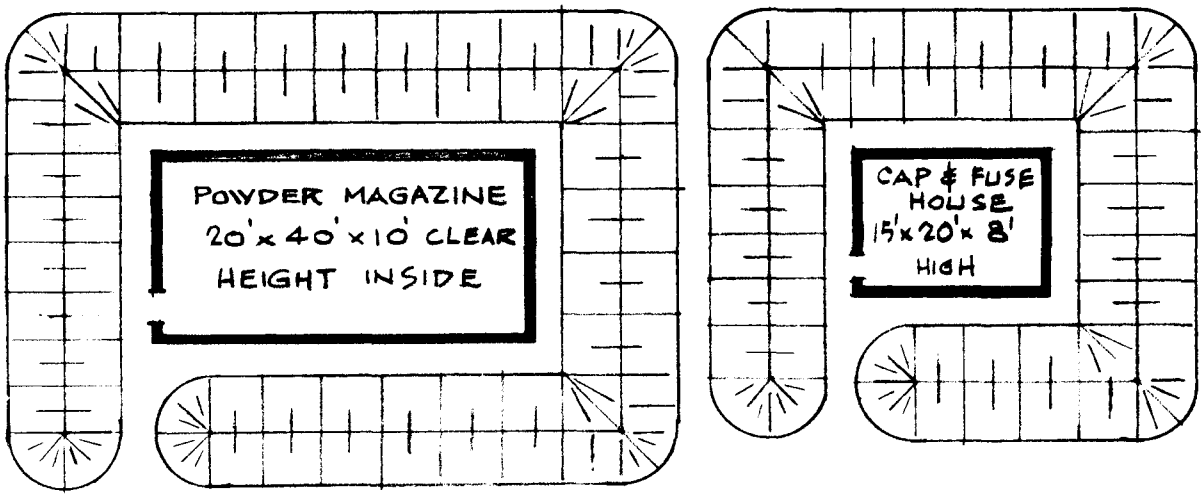
MINE OFFICE DRY & SMALL PARTS STORE

NEW IMPERIAL MINES, LIMITED. WHITEHORSE, YUKON.

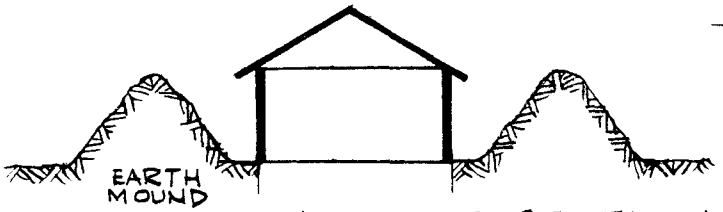
WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

DRAWN BY RG
DATE NOV 1965

DRAWING NO.
402 | 025 | 003



PLAN



TYPICAL CROSS SECTION

NOTE:-

WALLS & ROOF MUST BE BULLET PROOF. BUILDINGS IN SEPARATE LOCATIONS.

SCALE:- 1" = 20'-0"

POWDER MAGAZINE & CAP & FUSE HOUSE

NEW IMPERIAL MINES, LIMITED. WHITEHORSE, YUKON

WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

DRAWN BY F.J.P
DATE NOV - 65.

DRAWING NO. 402 025 004

SECTION VI
POWER

ELECTRIC POWER

The estimated total electrical load demand for the mine, milling, water supply, crushing plant and auxiliary service operations is estimated to be approximately 2200 KVA for a production rate of 2000 TPD.

The overall load factor for the operation of the mill is estimated at 79%. The monthly energy consumption for 2000 TPD operation amounts to 1,240,000 KWH.

Power will be supplied from a 34KV transmission line from the Whitehorse Rapids plant to a location near the mill site. The Yukon Electrical Company Ltd., has agreed to provide a substation having a capacity of 2500 KVA, three phase, 60 cycle to deliver 2300/4160 volts. Metering will be installed on the secondary side of the transformer preferably in the main metalclad switchboard.

The billing demand offered by the Yukon Electrical Company Ltd., states that the monthly billing demand upon which the bill in any month or billing period is computed, will be the maximum demand established in the current month or any previous month of the preceding eleven months. This clause could be expensive as applied to the customer. For example, let us say that the ordinary maximum demand as estimated is 2200 KVA, but during a winter month the plant peak demand reached 2500 KVA. The normal monthly billing, based on 2200 KVA demand (assuming .85 power factor) is estimated at $18,898. However, the minimum monthly billing for all of the eleven months subsequent to this peak month would be based on 2500 KVA of peak demand and would never be less including relative excessive charges than $19,250 regardless of the actual demand or energy consumption during these months.

POWER SUMMARY

Plant Section	HP Connected	Demand Factor in %	HP Consumed	KW	Remarks
Crushing	630	80	504	377	2shifts/day-5days/W
Concentrator	1,917.25	90	1,720	1,282	3shifts/day-7days/W
Mining	30	70	21	15.6	3shifts/day-5days/W
Water Supply	200	90	180	134	3shifts/day-7days/W
Lighting(PFO.9)	175 KVA	65		156.8	3shifts/day-7days/W
Total KW				1,965.4	

Assuming Diversity Factor 1.05

Estimated Peak Demand $\frac{1,965}{1.05} = 1,870$ KW

Assuming Plant Power factor at .85

Estimated Peak Demand $\frac{1,871}{.85} = 2,200$ KVA

The estimates for overhead power lines are based on standard wood pole construction and allowances have been made for clearing of right-of-way of suitable width for the voltage class of power line concerned.

POWER CONSUMPTION

Plant Section	KW Consumed	Operating Hrs/Week	KWH/Week
Crushing	377	80	30,160
Concentrator	1,282	168	215,200
Mining	15.6	120	1,872
Water Supply	134	168	22,510
Lighting	156.8	168	26,400
Total			296,142

POWER COST

Re: The Yukon Electrical Company Ltd's. letter to New Imperial Mines Ltd., dated July 26, 1965.

Demand Charge - $7.5 KVA of billing demand to include 500 KWH per KVA of peak demand per month.

Excess Emergency Charge - All KWH's used in excess of 500 KWH'S/KVA/Month at 1.38¢.

Demand Charge - Max. demand (KVA) x 7.50 2200 x 7.50 = $16,570.

KWH Allowance - 2200 x 500 = 1,100,000 KWH/Month.

Excess energy charge with regard to days in Month.

$\frac{\text{Total KWH/Week}}{\text{7 Days}} = \frac{296,142}{7} =$ 42,306 KWH Daily.

1 Month of 28 Days	42,306x28-1,100,000 = 84,068x1 @ 1.38¢ =	$1,160
4 Months of 30 Days	42,306x30-1,100,000 =168,680x4 @ 1.38¢ =	$9,311
6 Months of 31 Days	42,306x31-1,100,000 =210,986x6 @ 1.38¢ =	$17,469
1 Month/2 Weeks Vacation	No Surplus Charge Yearly Cost:	$27,940

Average/Month: $\frac{27,940}{12} =$ $ 2,328

Demand Charge: 16,570

$18,898

DESCRIPTION

1. Metalclad switchgear made up of a total of 7 cells and including the following:

Metalclad switchgear shall be rated for 5KV 150 MVA with a bus work rated for 1000 amp.

Cell # 1

One 1200A 5 KV 60 cycles 150 MVA power circuit breaker removable element type complete with one ammeter and 3 phase ammeter transfer switch, three current transformers, two relays inst. and time overcurrent and one relay, ground censor.

Cell # 2

Metering unit with provision for current and potential transformers and meters.

Cells 3 to 7

5 fused load interrupters, quick make, quick break 3 pole group operated, front operated handle mechanism, switch rated 600 amper continuous 600 amperes interrupting 40,000 RMS amps, complete with 3 power fuse holders, with mufflers.

6. 2 - 750 KVA 3 phase, 60 cycles 2400/600 V power transformers ONS type (oil immersed, air cooled) complete with tap changer.

7. 2 - Air circuit breakers stationary type 50 KA interrupting capacity at 600 volt, 800 amp, 3 spst manually operated with adjustable inverse time and short time delay trips.

8. 2 - Motor control centres shall consist of fused combination starters ranging from CEMA size 1 to CEMA size 5, main bus work shall be rated for 1000 A 600 volt.

9. One synchronous motor starter 5 KV 600 HP, 8 pf with current limiting fuses and contactor complete with all auxiliary relays as inst. overcurrent, inst. (ground sensor) field removal, incomplete sequence inst. undervoltage and ammeter wattmeter and varmeter.

10. One synchronous motor starter 5 KV 1000 HP .8pf same as described under (9).

16. Grounding shall consist of bare stranded soft annealed copper conductors and cadweld connectors.

17 & 18. 2 - operator control consoles consist of push buttons and pilot lights.

19. 2.4 KV overhead line using #4 bare stranded copper wire poles spaced @ 80 ft complete with all auxiliary equipment required for distribution.

DESCRIPTION Cont'd.

Lighting; Mercury vapour hi-bay low bay lamp fittings for 600 volt.

Lamp Fittings; Fluorescent and incandescent industrial types.

Cables

Thermoplastic insultated 0-600 volts.

Single conductor, #10 and smaller shall be solid while #8 and larger shall be stranded annealed. Copper wire general purpose, moisture resistant and flame retarding building wire to be suitable for open wiring, flexible or rigid conduit wiring or metal troughs and for dry and wet locations.

Current ratings to be supplied based on ambient temperature 30°C (86°F).

No. 3 Armoured Cable 0 - 3000 volts

Multi-conductor, standard stranded tinned copper conductors insulated with heat, moisture and ozone resistant rubber. The conductors cabled together with rubber fillers which completely fill the cable interior. Neoprane jacketed with interlocking aluminum sheath and P.V.C. sheath overall.

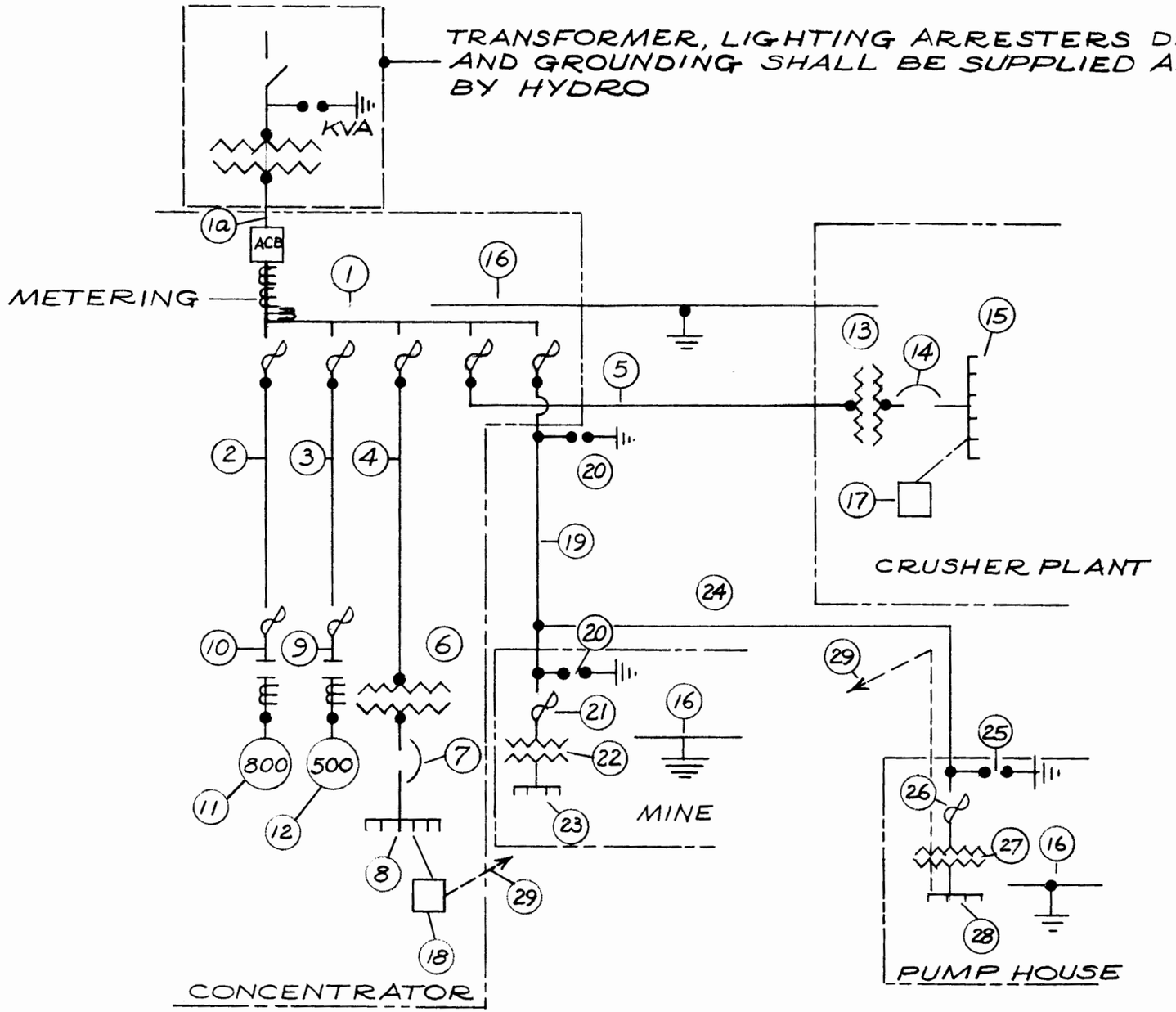
Ground conductor to be included with line conductors.

To be used for control, lighting and power circuits in wet locations and to be suitable for direct earth burial.

Current ratings to be supplied based on ambient temperature of 30°C. (86°F).

Item No.	Concentrator	Weight lbs.	Material $	Labour $
2	100' 4/0 Teck Cable 3KV 3 cond.	400	600	450
3	100' 1/0 Teck Cable 3KV 3 cond.	240	450	300
4	60' 3/0 Teck Cable 3KV 3 cond.	200	325	250
6	750 KVA 2400/600 V 3 phase ONS Transformer	8,500	6,200	1,500
7	A.C.B. Stationary Type 50 ka i.c./600V 3 phase	900	1,600	400
8	Motor control centre complete wired to individual motors 6 Vertical Section	5,400	20,100	20,100
9	2500 V Synchrs. Motor starter limit amp 150 MVA 600 HP	4,000	5,000	500
10	2500 V Synchrs. Motor starter limit amp 150 MVA 1000 HP	4,000	5,500	500
11	800 HP Synchrs. Motor all auxiliaries incl. & wired to starter		20,000	15,000
12	500 HP Synchrs. Motor all auxiliaries incl. & wired to starter.		10,200	10,000
18	Operator Control Console Concentrator Plant	600	1,200	1,200
		24,240	71,175	50,200
	Freight 12 tons @ $80		960	
	Tax @ 11% on $71,175		7,830	
			79,965	50,200
	Sub-Total to Section VII			$ 130,200
	Crusher Plant			
5	240' 3/0 Teck Cable 3 KV 3 cond.	780	1,300	1,000
13	750 KVA 2400/600V 3 phase ONS Transformer	8,500	6,200	1,500
14	A.C.B. Stationary Type 50 KA I.C./600V 3 phase	900	1,600	400
15	Motor Control Centre Complete wired to individual motor 5 Vertical Sections	4,500	17,500	17,500
17	Operator Control Console Crusher Plant	600	1,200	1,200
		15,280	27,800	21,600
	Freight 8 tons @ $80		640	
	Tax @ 11% on $27,800		3,058	
			31,498	21,600
	Sub-Total to Section VII			$ 53,100

Item No.	Water Supply	Weight lbs.	Material $	Labour $
24	2.4KV overhead line complete instal. 136 poles appr. 13,500' @ $1.42/ft. 40,500 ft. wire	127,665	8,200	11,000
25) 26) 27) 28) 29)	Lightning arrestors, cutouts, 3 single phase transformers mounted on a platform 50KVA 2400/600V distribution equip. incl. starters & aux. equip. wired to individual motors. C Control cable with guide wire	2,140	8,500	8,500
		129,805	16,700	19,500
	Freight 65 tons @ $80		5,200	
	Tax @ 11% on $16,700		1,840	
			23,740	19,500
	Sub-Total to Section VIII			$ 43,200
	Mine & General			
1	Main 2,400 V metalclad switchboard 7 cells	15,000	11,900	3,000
1A	100' 350 MCM Teck Cable 3 cond. 3 KV	560	1,050	800
16	Grounding system mill, crusher plant, Pump station and Mine		800	1,400
19	2.4 KV Overhead Line Approx. 1000' 11 poles 3000'wire	10,290	800	800
20) 21) 22) 23)	Lightning arrestors, cut outs, 3 phase transformer 45 KVA, 2400/600 V. Distribution equip. incl. starters. disc. switches wired to individual motors	820	3,600	3,000
	Indoor lighting mill and crusher plant, pump house.		15,000	15,000
	Electrical heating mill and crusher plant, pump house.		4,500	4,500
	Outdoor lighting including mine.		6,800	6,800
		26,670	44,450	35,300
	Freight 13 tons @ $80		1,040	
	Tax @ 11% on $44,450		4,900	
	Sub-Totals to Summary Sheet		$50,390	$ 35,300



	NEW IMPERIAL MINES WHITEHORSE, YUKON	ELECTRICAL DISTRIBUTION SYSTEM	
	WRIGHT ENGINEERS LIMITED VANCOUVER——CANADA	DRAWN BY LMC DATE NOV. 65	DRAWING NO. 402 026 001

SECTION VII
CRUSHING AND CONCENTRATING PLANT

CRUSHING PLANT

The proposed crushing plant is sized to crush 200 ton/hour, 14 hours/day, 5 days/week. The plant, for ease of operating and due to site conditions, encloses in one building the primary, secondary, and tertiary crushers. The primary crusher circuit operates as part of the open pit, and comprises a truck dump, hopper, feeder, jaw crusher (with 5" setting), screen (5/8" opening), and a coarse ore stock pile. The secondary, tertiary circuit reclaims 5" material from the stock pile, and reduces it to 1 1/2" in a standard cone crusher in open circuit, and to 5/8" in a short-head cone crusher, in closed circuit with a single rod deck screen. The-5/8" ore is screened out after each stage of crushing, and by-passed to the fine ore bins.

The coarse ore pile has a live capacity of 2,000 tons, which is adequate for surge storage ahead of the secondary crusher. Moreover it has a total storage of approximately 14,500 tons of-5" material, which can be reclaimed if inclement weather interrupts mining. It is not considered necessary to cover the pile inasmuch as, precipitation and snowfall is low, the roof structure is expensive and becomes a hazard if bull-dozing of the pile is required. Excavation and foundation costs assume that foundations are laid on bed rock and that over burden is about one foot on the average.

The magnetite in the ore and non magnetic steel from the open pit operation makes a suspended magnet unsuitable for removal of tramp iron, consequently a metal detector is allowed for in the capital cost estimate.

CONCENTRATOR

The concentrator is designed to treat 2000 TPD of feed on a continuous basis to produce daily a maximum of 80 dry short tons of copper concentrate containing 35% copper. The concentrator is situated at elevation 2605 ft. and some 200 ft. to the northeast of, and 55 ft. below the crusher building. The site consists of gravel flats which have a light soil cover with some erratic boulders. After the trees are cleared and stumped little levelling and excavation will be required.

Several alternative schemes for fine ore storage were considered. The drill cores indicate that copper values will be fairly erratic (also the molybdenite in the Cowley Park ore) and blending of the ores is desirable to obtain an even grade of feed to the concentrator. Blending is also desirable when treating a mixture of ores from several pits having slightly different grinding characteristics. A single rectangular bin with multiple draw off points and fed by shuttle conveyor would blend the mixed ore better than the two circular 2,500 ton capacity bins proposed, but the higher capital cost of the rectangular bin cannot be justified. The two circular bins will blend the mixed ore better than a single circular bin at a small increase in capital cost.

Fine ore is drawn from the bins through tube feeders (6 per bin) on to two variable speed conveyor belts. A single conveyor collects the fine ore and transfers it to the 10'ø x 12' rod mill. The feed rate is measured and controlled by a weightometer on the rod mill feed belt. The rod mill discharge is pumped to a cyclone in closed circuit with a 10'ø x 14' ball mill. The cyclone overflow drains to an 8'ø x 8' conditioning tank ahead of rougher flotation. The rougher concentrate is pumped to a cyclone in closed circuit with a 7'ø x 7' regrind ball mill and the cyclone overflow is fed to the cleaner and recleaner cells. The tailing from the cleaner cells is combined with the scavenger concentrate and returned to the primary grinding circuit. The tailing from the recleaner cells is recirculated to the cleaner cells.

After the final copper concentrate is thickened it is stored in a 10'ø x 10' stock tank from which it is pumped to a 6'ø x 6 disc filter. The filtered product is dried in a 4'ø x 28' oil fired rotary drier from which it is transported via a conveyor to concentrate storage. Concentrate is reclaimed from the 300 ton stockpile by a front end loader and loaded into containers supplied by the Whitepass and Yukon Railway.

Storage is provided in the building for 12 - 12' x 4' x 3'containers stacked three deep. A 10 ton crane is installed to service the concentrator and will be used to move the containers to filling, storage and loading on to trucks.

The concentrate will be dried to 8% or 9% moisture during the summer months but during freezing conditions in the winter the moisture will be reduced to between 3% and 4%.

It is not possible at present to design the molybdenite circuit for the Cowley Park ore. It is expected however that a rougher molybdenite concentrate will be floated from the copper recleaner concentrates and can be raised to marketable grade with four or five stages of cleaning. An extra thickener, filter, and drier will be required. It is not expected that extra regrinding will be necessary.

CRUSHING PLANT

Equipment	Weight lbs.	H.P.	Cost $
Reciprocating Plate Feeder	20,000	25 HP	$ 11,000
Stationary Grizzly c/w Chute	37,000		22,000
Jaw Crusher 42" x 48"	145,000	150 HP	82,400
Discharge Chute	3,000		1,800
Screen Feed Box	2,000		1,200
Scalping Screen 5'x12' Single Deck	10,000	15 HP	7,500
Vibratory Feeders (2)	10,600	6 HP	9,000
Crusher Feed Box	3,000		1,800
4 1/4' Std. Cone Crusher	50,000	150 HP	44,200
Discharge Chute	4,000		2,400
Transfer Chute	6,000		3,600
Screen Feed Box	3,000		1,800
5'x12' Rod Deck Screen	17,500	10 HP	13,500
Screen Discharge Chute	10,000		6,000
Crusher Feed Box	3,000		1,800
4' Short-Head Cone Crusher	47,400	150 HP	46,000
Discharge Chute	3,000		1,800
Metal Detector	500		5,200
Dust Control System	12,000	15 HP	18,500
10 Ton Travelling Crane	20,000	5 HP	15,000
Conveyor No. 1 90' long	8,300	10 HP	9,000
No. 2 220' long	18,600	20 HP	17,000
No. 3 220' long	18,400	15 HP	16,800
No. 4 140' long	12,800	15 HP	13,500
No. 5 100' long	10,000	15 HP	11,000
No. 6 200' long	17,000	20 HP	14,700
Transfer Chute	6,000		3,600
SUB-TOTAL -- To Summary Sheet			$ 382,100

CRUSHER BUILDING

Construction and Installation	Quantity	@ $	Cost $
Excavation			
Rock	4,000 cu.yd.	3.5	14,000
Footings	150 cu.yd.	20	3,000
Back Fill Tamped	220 cu.yd.	2.5	550
Concrete Slab	80 cu.yd.	130	10,200
Walls	250 cu.yd.	140	35,000
Foundations	170 cu.yd.	130	22,000
Steel Columns	36,000 lb..	.40	14,400
Beams & Trusses	25,000 lb.	.40	10,000
Purlins	25,000 lb.	.40	10,000
Cladding	11,000 sq.ft.	1.10	12,100
Miscellaneous Items			
Platforms, stairs & handrails	2,500 sq.ft.	8	20,000
Conveyor Galleries	450 ft.	100	45,000
Towers and Cantilever	Allowance		20,000
Switch Room	500 sq.ft.	7	3,500
Wash Room	120 sq.ft.	20	2,400
Fire Protection	4,000 sq.ft.	.30	1,200
Windows & Doors	Allowance		5,000
Coarse ore Stock Pile			
Excavation	500 cu.yd.	3.5	1,750
Concrete Tunnel	140 cu.yd.	140	19,600
Freight and Handling	220 tons	80	17,600
Equip. installation excluding electrical	$382,100 @	25%	95,500
Federal Tax - Equipment	$382,100 @	11%	42,000
- Construction	$230,400 @	5 1/2%	12,700
Electrical Equipment and Installation including freight and tax (From Section VI) (excluding lighting and heating)			53,100
SUB-TOTAL -- To Summary Sheet			$ 470,600

CRUSHER & CONCENTRATOR OPERATING COSTS

Supplies & Power

Primary Crushing	Cost/Yr. $	
Liners @ 0.04 lb./ton @ 42¢/lb.	12,100	
Misc. material @ .4¢/ton	2,880	
Power 0.63 KWH @ 1.5¢/KWH	6,800	
		21,780
Secondary Crushing		
Liners @ 0.05 lb./ton @ 52¢/lb.	18,700	
Misc. maintenance @ 1.0¢/ton	7,200	
Screening, feeders, chutes, etc. @ 1.0¢/ton	7,200	
Conveyors @ 1.0¢/ton	7,200	
Motors, lubrication, dust collection, etc., @ .5¢/ton	3,600	
Power 1.47 KWH @ 1.5¢/KWH	15,850	
		59,750
Primary Grinding		
Rods 0.75 lb/ton @ 12¢/lb.	64,800	
Liners & Material @ .05 lb/ton @ 24¢	8,640	
Balls 1.0 lb./ton @ 13¢	93,400	
Liners & maint. @ .09 lb./ton @ 20¢	12,960	
Conveyors, chutes, general @ 1.0¢/ton	7,200	
Pumps, cyclones, etc. @ 0.5¢/ton	3,600	
Power 11.19 KWH/ton @ 1.5¢/KWH	120,860	
		311,460
Flotation & Regrind		
Reagents @ 20¢/ton	144,000	
Cell repair & Pumps, etc. @ 1.5¢/ton	10,800	
Regrind, liners, maint. etc. @ .10 lb. @ 20¢	1,600	
Balls .5 lb. @ 14¢ on 79,000 tons	5,500	
Power 3.51 KWH/ton @ 1.5¢/KWH	37,930	
		199,830
Filtering & Drying		
Filter maint. @ 4¢/ton on 30,000 tons	1,200	
Fuel 2.5 gal./ton @ 27¢/gal.	20,200	
Dryer maint. @ 4¢/ton	1,200	
Power 0.83 KWH/ton @ 1.5¢/KWH	9,000	
		31,600

CRUSHER BUILDING

Construction and Installation	Quantity	@ $	Cost $
Excavation			
Rock	4,000 cu.yd.	3.5	14,000
Footings	150 cu.yd.	20	3,000
Back Fill Tamped	220 cu.yd.	2.5	550
Concrete Slab	80 cu.yd.	130	10,200
Walls	250 cu.yd.	140	35,000
Foundations	170 cu.yd.	130	22,000
Steel Columns	36,000 lb..	.40	14,400
Beams & Trusses	25,000 lb.	.40	10,000
Purlins	25,000 lb.	.40	10,000
Cladding	11,000 sq.ft.	1.10	12,100
Miscellaneous Items			
Platforms, stairs & handrails	2,500 sq.ft.	8	20,000
Conveyor Galleries	450 ft.	100	45,000
Towers and Cantilever	Allowance		20,000
Switch Room	500 sq.ft.	7	3,500
Wash Room	120 sq.ft.	20	2,400
Fire Protection	4,000 sq.ft.	.30	1,200
Windows & Doors	Allowance		5,000
Coarse ore Stock Pile			
Excavation	500 cu.yd.	3.5	1,750
Concrete Tunnel	140 cu.yd.	140	19,600
Freight and Handling	220 tons	80	17,600
Equip. installation excluding electrical	$382,100 @	25%	95,500
Federal Tax - Equipment	$382,100 @	11%	42,000
- Construction	$230,400 @	5 1/2%	12,700
Electrical Equipment and Installation including freight and tax (From Section VI) (excluding lighting and heating)			53,100
SUB-TOTAL -- To Summary Sheet			$ 470,600

FINE ORE BINS AND CONCENTRATOR

Equipment	Weight lbs.	H.P.	Cost $
Conveyor No. 7 40' long	5,400	5	6,000
12 Tube Feeders	6,000		4,800
12 Chutes	7,200		4,500
Conveyor No. 8 72' long	7,500	5	8,700
Conveyor No. 9 72' long	7,500	5	8,700
2 Transfer Chutes	6,000		3,600
Conveyor No. 10 58' long	6,800	5	6,800
Weightometer			5,000
10'ø x 12' Rod Mill including charge	285,000	500	113,900
10'ø x 14' Ball Mill including charge	315,000	800	124,700
7'ø x 7' Ball Mill including charge	116,000	200	54,400
Rod Mill feed chute	1,200		600
Rod Mill pump box	7,000		2,000
Rod Charger			3,500
2 - 10" x 8" SRL-C Pumps	11,000	50	10,300
2 - 24"ø Cyclones incl. piping	2,500		7,000
Cyclone underflow box	1,200		2,000
8'ø x 8' Conditioner	4,000	5	1,900
2 - 16 cell # 24 Flotation Machines	102,400	160	53,400
Blower	1,500	5	2,100
2 - 8 Cell # 18s Flotation Machines	30,100	40	17,400
Distributor	800		400
14" Cyclone including piping	1,500		3,000
Launders	4,000		5,000
2 - 5" x 5" SRL Pumps	3,000	20	4,000
4 Pump boxes	4,000		3,000
2 - 2" x 2" SRL Pumps	1,400	10	1,600
28'ø Concentrate Thickener	38,000	1 1/2	12,000
10'ø x 10' Stock Tank	2,000	7 1/2	2,900
6'ø x 6 Disc Filter (incl. vac. equip.)	11,000	48	13,900
4'ø x 28' Rotary Dryer	25,000	30	28,000
Refractories			1,000
Fuel Storage Tank	2,000		1,000
Reagent Distribution (allowance)			6,000
Conveyor No. 11 34' long	5,000	5	3,000
2 Automatic Samplers	1,000		2,500
Sump Pump	1,000	3	1,500
10/2 ton Crane 86' span	45,000		20,000
General Piping (allowance)	10,000		30,000
Welding set and tools (allowance)			3,000
SUB-TOTAL -- To Summary Sheet			$583,100

FINE ORE BINS AND CONCENTRATOR

Construction and Installation	Quantity	@ $	Cost $
Site Roads (allowance)			20,000
Clearing and Grubbing	9 acres	1,500	13,500
Rough Excavation and Backfilling (allowance)			20,000
Fine Ore Bins:-			
Excavating footings	100 cu.yds	20.	2,000
Concrete:			
Structural slab	180 cu.yds	130	23,400
Columns and Foundations	130 cu.yds	140	18,200
Base slab	40 cu.yds	130	5,200
Steel:-			
Roof and supports	65,000 lbs.	40¢	34,500
Bins	242,000 lbs.	40¢	96,800
Roof Cladding	4,200 sq.ft	1.10	4,600
Wall Cladding (allowance)			5,000
Concentrator:			
Excavating Foundations (allowance)			5,000
Concrete:-			
10'ø x 12' Rod Mill Foundations	190 cu.yds	130	24,700
10'ø x 14' Ball Mill Foundations	210 cu.yds	130	27,300
7'ø x 7' Ball Mill Foundations	80 cu.yds	130	10,400
Walls	130 cu.yds	140	18,200
Flooring	230 cu.yds	130	29,900
Concentrate Retaining Walls	110 cu.yds	130	14,300
Crane Columns			2,000
Steel:-			
Main building structural frame	431,200 cu.ft	40¢	172,500
Cladding (allowance)			30,000
Office, assay laboratory building	660 sq.ft	14	9,200
Office, dry, assay laboratory equipment (allowance)			20,000
Sprinkler system	12,300 sq.ft	30¢	3,700
Electrical Control Room (allowance)			2,500
Handrails, stairs and platforms	8,800 sq.ft	10	88,000
Freight and Handling	539 tons	80	43,100
Equipment Installation	$538,100 @	25%	145,800
Federal Tax- Equipment	$583,100 @	11%	64,100
- Construction	$633,200 @	5 1/2%	34,800
Electrical Equipment and Installation including freight and tax (from Section VI) (excluding lighting and heating).			130,200
SUB-TOTAL -- To Summary Sheet.			$1,118,900

CRUSHER & CONCENTRATOR OPERATING COSTS - Cont'd.

Supplies & Power

Miscellaneous	Cost/Yr. $	
Assay supplies	4,800	
Tailing disposal @ 1¢/ton	7,200	
Mill general @ 9.0¢/ton	64,800	
Light, heat @ 1.5 KWH @ 1.5¢/KWH	16,200	
Power for water supply 1.63 KWH @ 1.5¢/KWH	17,640	
		110,640
Total Supplies & Power		735,060
Total Labour & Supervision		187,600
Total Cost/Year		$ 922,660

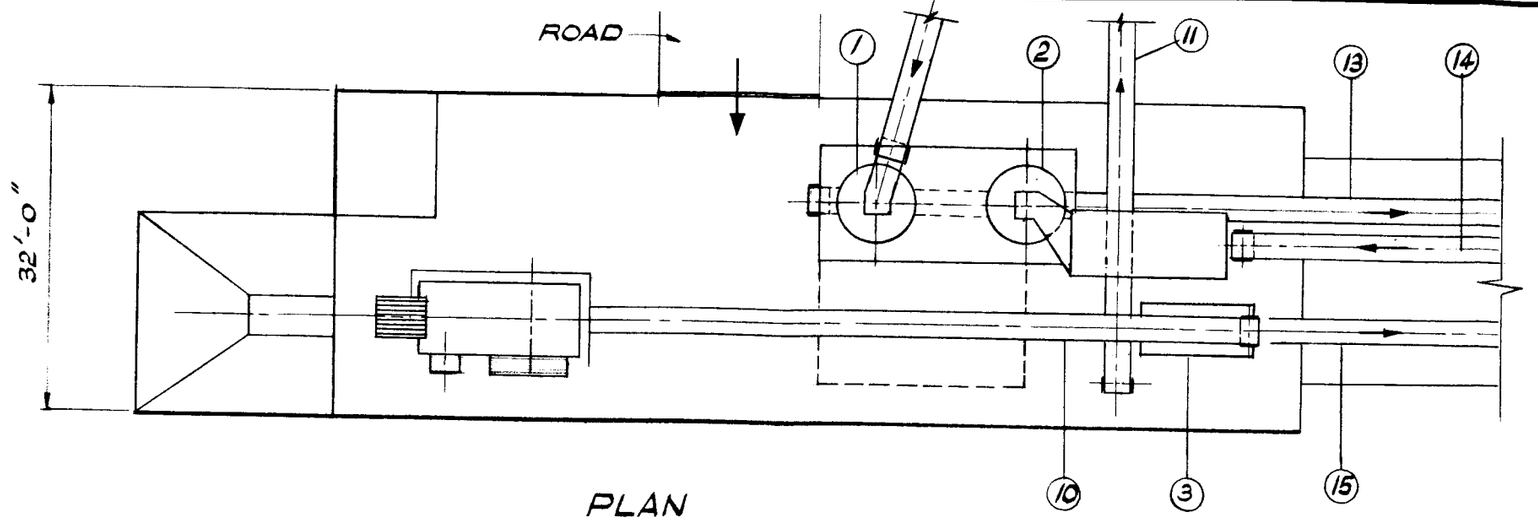
Total Operating Cost/Ton $\frac{922,660}{720,000}$ = $ 1.281/Ton @ 720,000 Tons/Yr.

$\frac{922,660}{650,000}$ = $ 1.419/Ton @ 650,000 Tons/Yr. (1st. Yr.)

CRUSHER & CONCENTRATOR LABOUR REQUIREMENTS

	No. Men	Shifts /Day	Men /Day	Days /Year	Rate $/Day	Cost $/Year
Crushing Plant						
Operator	1	2	2	260	18.88	9,820
Helper	1	2	2	260	18.32	9,530
Mill						
Grinding	1	3	3	360	18.88	20,390
Flotation	1	3	3	360	21.04	22,720
Filter & dryer handled by Shift Boss						
Loading	2	1/2	1	260	18.32	4,760
Reagents & Balls	2	1/2	1	260	18.32	4,760
Maintenance 1st	2	1	2	260	22.08	11,480
Maintenance 2nd	2	1	2	260	20.32	10,570
Labour	4	1	4	260	17.28	17,970
Supervision						
Superintendent	1	1	1	Salary	1,000	12,000
Foreman	1	1	1	"	700	8,400
Shift Bosses	1	3	4	"	600	28,800
Metallurgist	1	1	1	"	700	8,400
Chief Chemist	1	1	1	"	600	7,200
Chemist	1	1	1	"	500	6,000
Helper	1	1	1	"	400	4,800
Total working direct labour			30 Men			$ 187,600

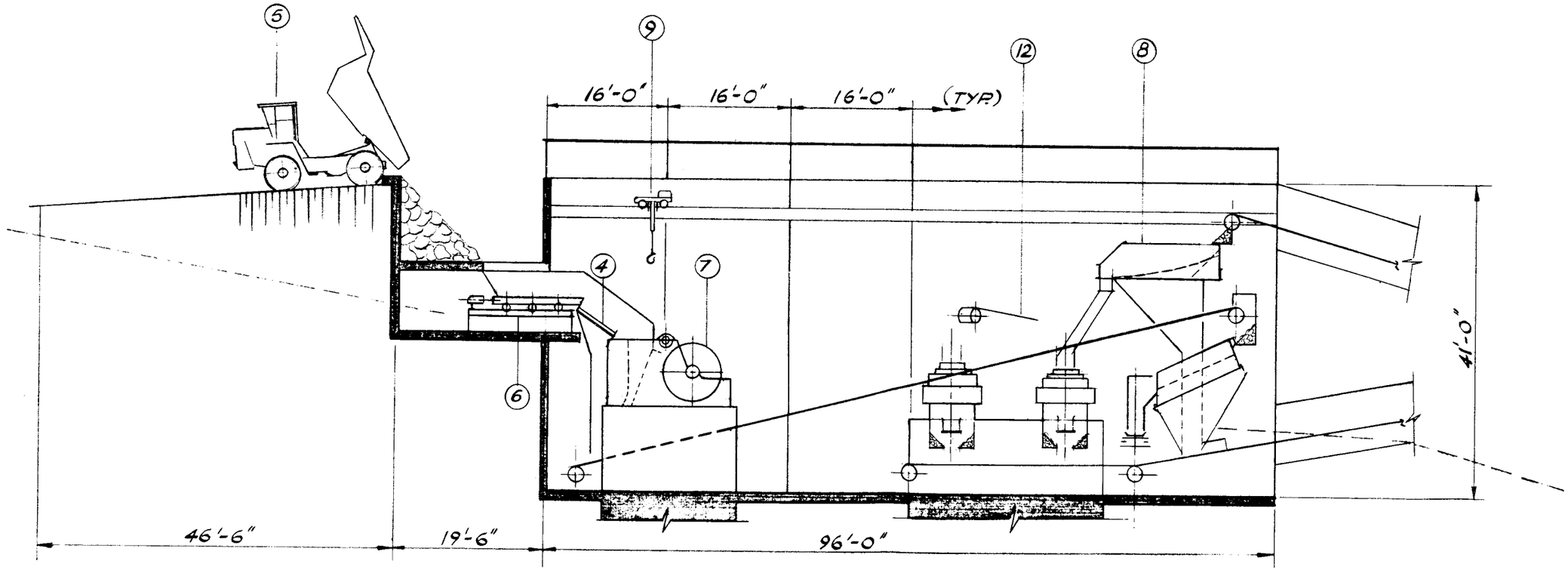
$ 0.289/Ton milled @ 650,000 Tons/Yr.
$ 0.261/Ton milled @ 720,000 Tons/Yr.



PLAN

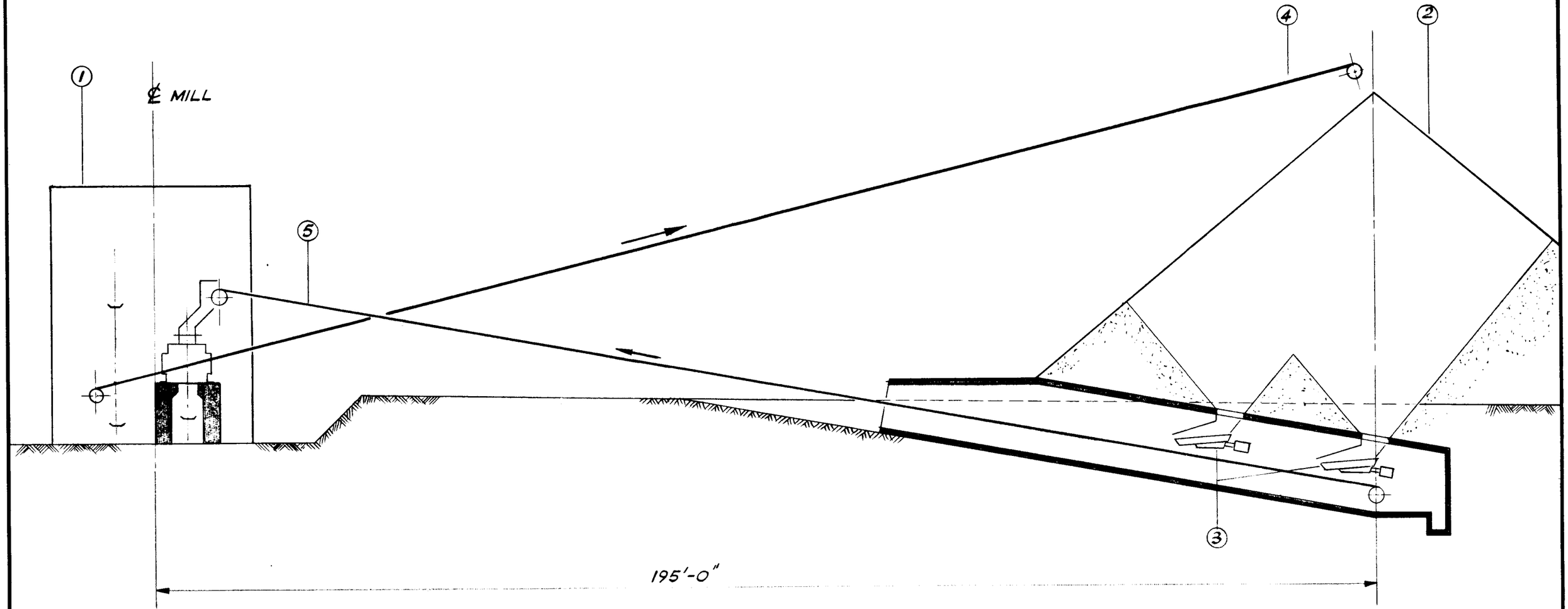
LEGEND.

1. 4¼ Ft SYMONS STD. CONE CRUSHER.
2. 4Ft. SYMONS S.H. CONE CRUSHER.
3. 5×12 SINGLE DECK SCREEN
4. STATIONARY GRIZZLY
5. 35T. TRUCK
6. RECIPROCATING PLATE FEEDER.
7. 42"×48" JAW CRUSHER.
8. 5'×12' ROD DECK SCREEN.
9. 10 TON CRANE.
10. CONVEYOR No. 1
11. CONVEYOR No. 2
12. CONVEYOR No. 3
13. CONVEYOR No. 4
14. CONVEYOR No. 5
15. CONVEYOR No. 6



SCALE : 1/16" = 1'-0"

	NEW IMPERIAL MINES LTD. WHITEHORSE, YUKON.	CRUSHING & SCREENING PLANT.
	WRIGHT ENGINEERS LIMITED VANCOUVER——CANADA	DRAWN BY C.Mc. DATE Nov. 1965
		DRAWING No. 402 027 001



LEGEND.

1. CRUSHING & SCREENING PLANT
2. COARSE ORE STOCKPILE
3. VIBRATORY FEEDERS
4. CONVEYOR No. 2
5. CONVEYOR No. 3

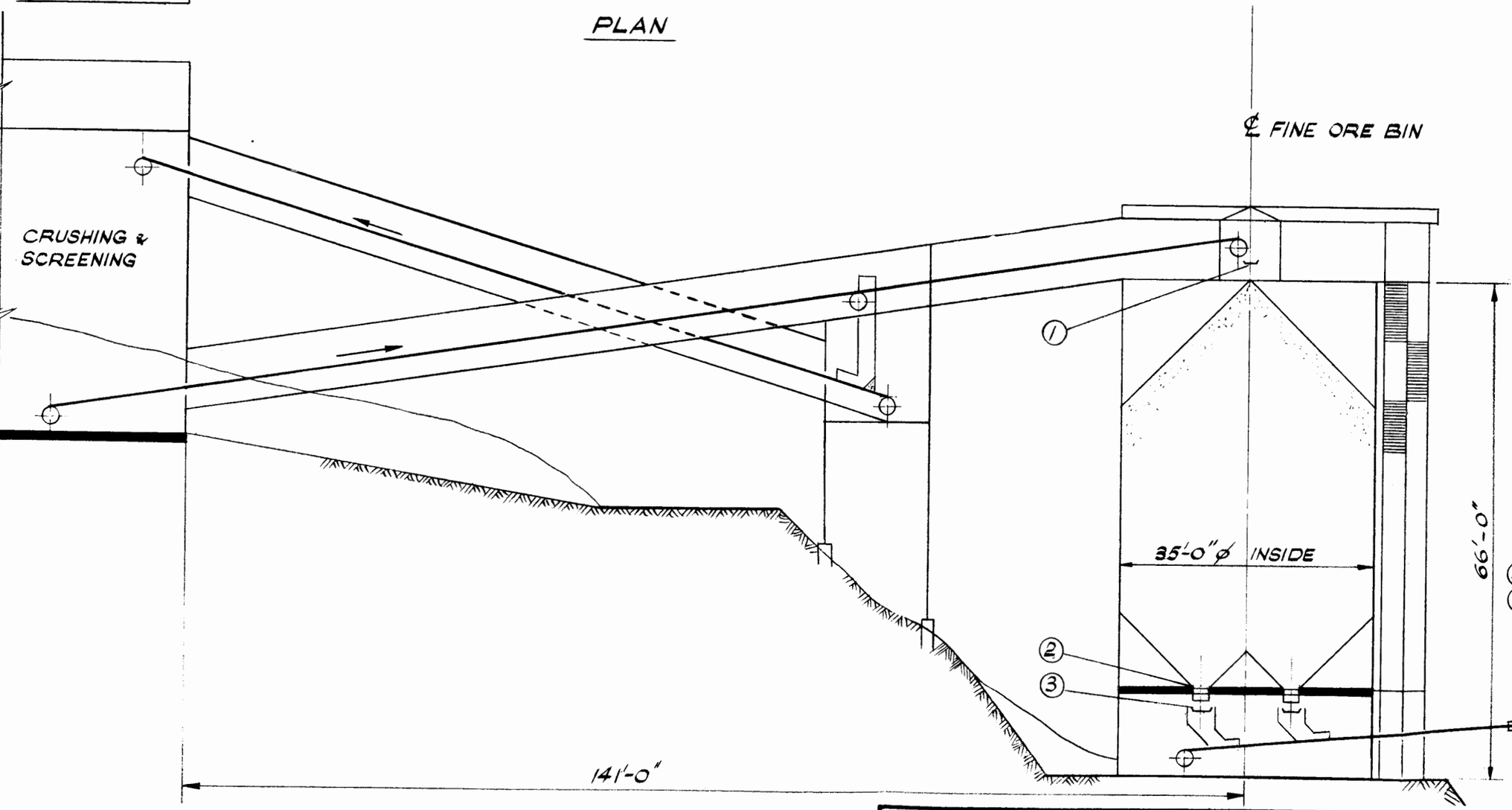
SCALE : 1/16" = 1'-0"

	NEW IMPERIAL MINES LTD. WHITEHORSE, YUKON.	SECTION SHOWING COARSE ORE STOCKPILE.
WRIGHT ENGINEERS LIMITED VANCOUVER——CANADA	DRAWN BY C. Mc. DATE Nov. 1965	DRAWING NO. 402 027 002

LEGEND

1. CONVEYOR No.7 (REVERSIBLE)
2. TUBE FEEDER
3. CONVEYOR No. 8 & No. 9
4. CONVEYOR No. 10
5. WEIGHTOMETER

PLAN



SCALE: 1/16" = 1'-0"

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON.

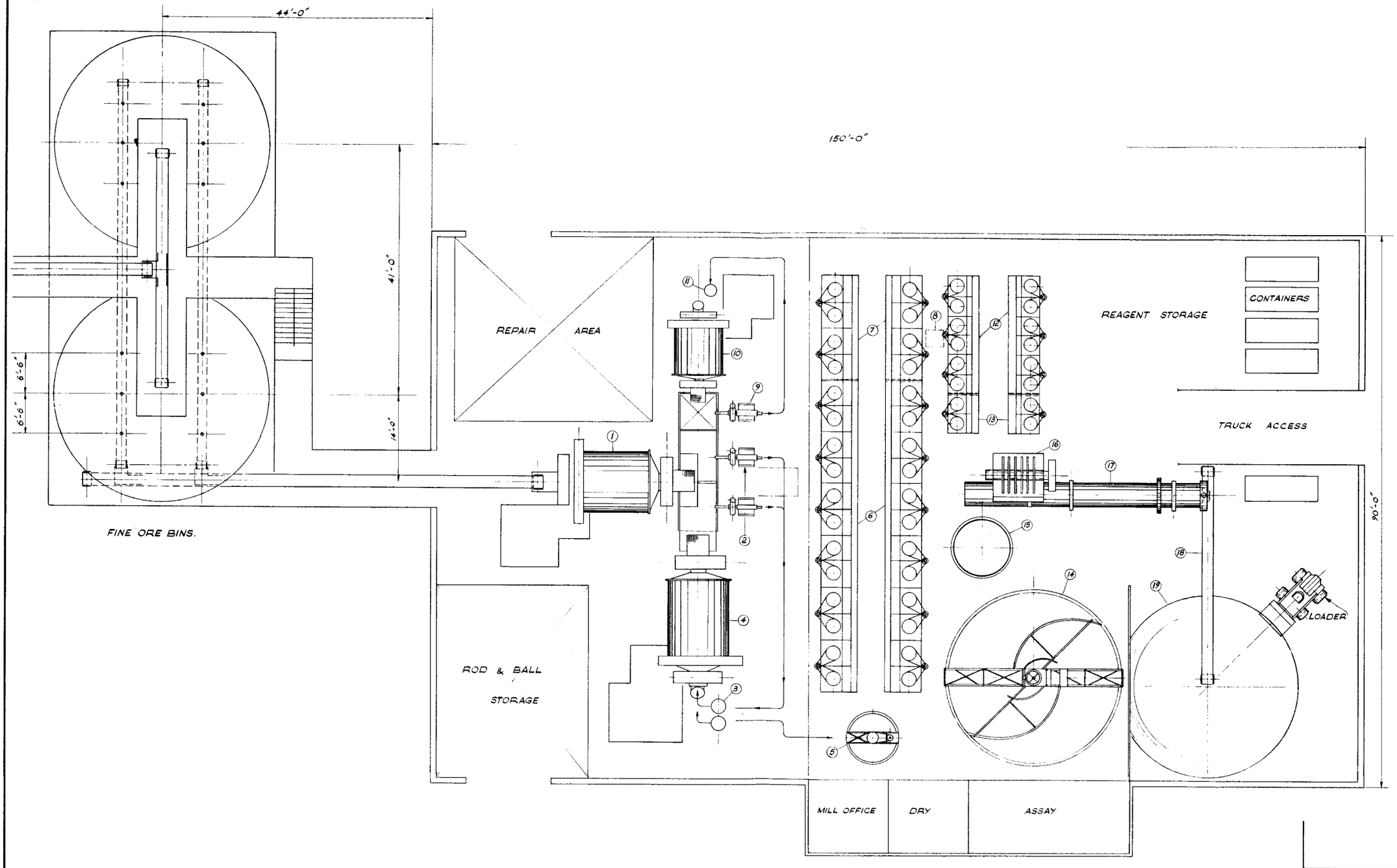
SECTION
TRANSFER HOUSE & F.O. BIN.

WRIGHT ENGINEERS LIMITED
VANCOUVER——————CANADA

DRAWN BY C. Mc.
DATE Nov. 1965

DRAWING NO. 402 027 003

DWG. NO. 402 027 004



LEGEND.

1. 10'ø x 12' ROD MILL
2. 10"x 8" S.R.L. C-PUMP
3. 24' CYCLONE
4. 10'ø x 14' BALL MILL
5. 8'ø x 8' CONDITIONER
6. ROUGHERS 2 BANKS OF 12-50 cu Ft. CELLS.
7. SCAVENGERS 2 BANKS OF 4-50 cu Ft. CELLS.
8. 5"x 5" S.R.L. C-PUMP
9. 5"x 5" S.R.L. C-PUMP
10. 7'ø x 7' REGRIND BALL MILL.
11. 14" CYCLONE
12. CLEANERS 2 BANKS OF 6-24 cu Ft. CELLS.
13. RECLEANERS 2 BANKS OF 2-24 cu Ft. CELLS.
14. 28'ø CONC. THICKENER.
15. 10'ø x 10' STOCK TANK.
16. 6'ø x 6 DISC. FILTER.
17. 4'ø 28' ROTARY DRYER
18. CONVEYOR # 11 , 18'
19. 300 TON STOCKPILE.

SCALE: 1/16" = 1'-0"

DESCRIPTION OF REVISION	ISSUED FOR	APPR.	DESIGN FINAL CHECK	DIM. CHECK	DRAWN	DESIGN	APP.
	REPORT.				C.M.		NOV 1968

REFERENCE	DWG. No.

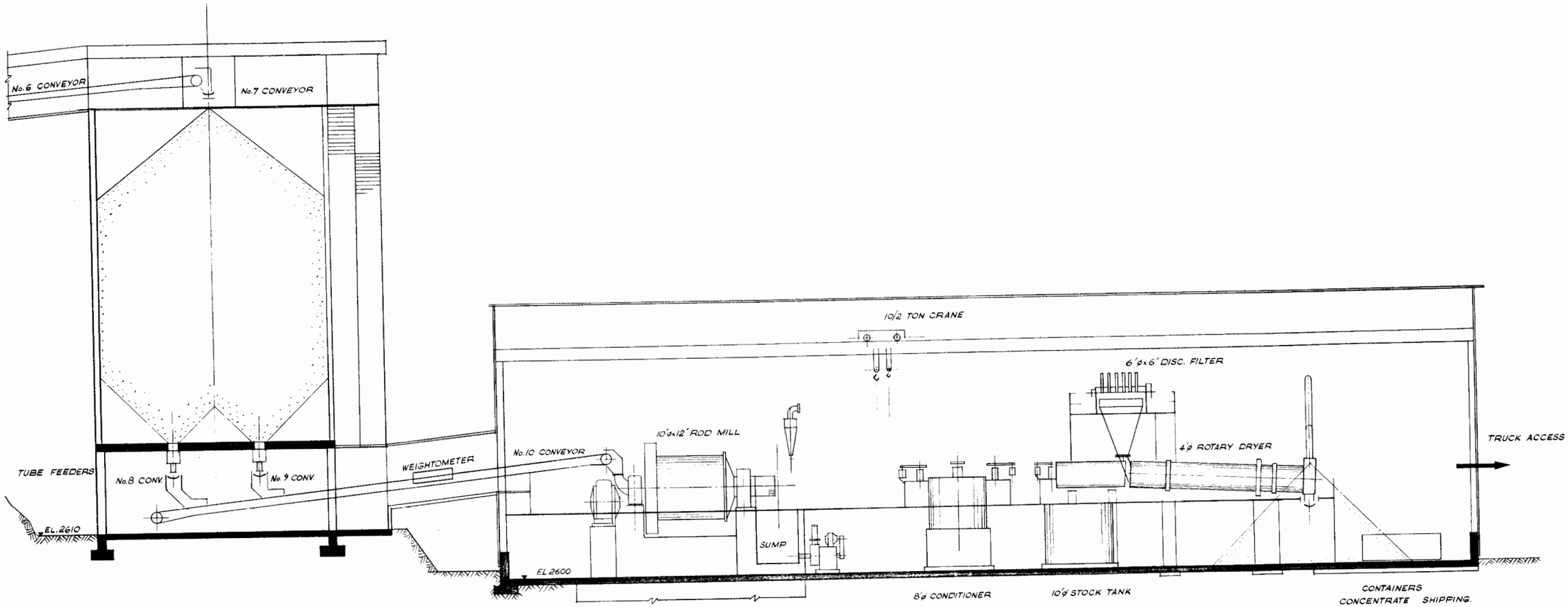
CONCENTRATOR
GENERAL ARRANGEMENT.

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON.

DWG. No. 402 027 004

WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

DWG. NO. 402 027 005



FINE ORE BINS.

SCALE: 1/8" = 1'-0"

NO.	DESCRIPTION OF REVISION	APPR.	DATE
	ISSUED FOR REPORT.		

APP.			
DATE			
DESIGN			
DRAWN	JE		
DIM. CHECK			
DESIGN CHECK			
FINAL CHECK			
APPR.			

REFERENCE | DWG. No.

SECTION
FINE ORE BINS & CONCENTRATOR.

NEW IMPERIAL MINES LTD.
WHITEHORSE, YUKON.

DWG. No. 402 027 005

WRIGHT ENGINEERS LIMITED
VANCOUVER ——— CANADA

SECTION VIII
WATER SUPPLY AND TAILINGS DISPOSAL

WATER SUPPLY

An accurate economic comparison of alternative sources of water for the plant water supply is difficult due to the lack of long term records of stream run off in the vicinity of the plant site. Because of this lack of data and the lack of assurance that plant water requirements can be obtained from nearby sources of water, the proposed water supply system is based on a year round pumped supply from the Yukon River supplemented by water drained from Parker Lake for 9 months of the year. An assured year round supply of water could also be obtained either from McIntyre Creek or Wolf Creek but development of an assured water supply from these creeks would be more costly than from the Yukon River.

The proposed Yukon River system would require three pumps to deliver 900 gallons per minute through 13,500 feet of 10" pipe to a 10,000 gallon mill head tank situated uphill from the mill. During the period from May to December, one or two of these pumps could be shut down and process and domestic water requirements could be supplemented by water pumped from the Little Chief reservoir which would be filled from Parker Lake through a diversion ditch. A diesel fire pump drawing from the Little Chief reservoir would be installed as fire protection for the plant.

Because the cost of pumping process water from the Yukon River would be high, alternative sources of water have been studied. Field investigation and stream measurements will be necessary before any of these sources can be considered as either replacing or supplementing the Yukon River system.

Although the annual rainfall at Whitehorse is only ten inches, the reduced transpiration and evaporation in this area may result in useful sources of water from small streams or groundwater. Small streams do not flow between January and April and a water supply drawn from these streams must be combined with a reservoir of sufficient storage to supply the plant requirements for a four month period. It is proposed to build a road over fill across the north end of Little Chief Lake to provide access to the pits to the north west of the plant. This earth fill dam will form a reservoir in the Little Chief Lake which could supply the plant for 30 days at a rate of 900 g.p.m.

This Little Chief reservoir could be filled from the Parker Lake system by a diversion ditch from Mill Feed Lake but the supply of water from Parker Lake would be inadequate to meet the total plant requirements throughout the year. This reservoir could serve as a supplementary supply of water to the Yukon River system or to an alternative ground water system.

Drainage to Parker Lake could be increased by diverting the creek 3 miles south of the plant site but until stream flow measurements of these creeks are made during the winter months, it is not known whether this system could provide for all the plant requirements on a year round basis.

Because Mill Feed Lake is at a higher elevation than the plant, pumping from the Parker Lake system would not be necessary, operating costs would be low, and matching of supply to a fluctuating demand would be simple. If winter stream flow measurements indicate that this system could supply all the plant requirements on a year round basis, a pipeline from Mill Feed Lake would be preferable to a diversion ditch, because the pressure head available from Mill Feed Lake would be adequate for fire protection as well as the mill water pressure requirements. In this case it would be necessary to size the pipeline from Mill Feed Lake to meet the maximum fire demand plus the process water demand.

There are indications that groundwater may be available near the plant site but it is not certain whether the groundwater aquifer has sufficient storage to supply all the plant requirements on a year round basis. Because development of an adequate groundwater supply would provide the least costly year round supply of water for the plant, drilling tests for groundwater should be conducted as soon as possible. If, however, sufficient groundwater supplies cannot be developed, it would be necessary to revert to the Yukon River as a dependable year round source of water. It is recommended that not more than $20,000 be spent in field investigations of ground water supplies, because unless an adequate source of ground water can be developed to replace the Yukon River supply, costly investigation of ground water supplies will not be warranted.

WATER SUPPLY AND FIRE PROTECTION

Equipment	Weight lbs.	Cost $
3 - 350 IGPM 75 H.P. Vertical Pumps	12,000	$ 10,500
13,500 ft. 10" Ductile Iron Pipe	428,000	53,500
1 - 50 H.P. Diesel Fire Pump	12,000	7,500
1 - 50 H.P. Electric Fire Pump	4,000	3,000
2 - 10 H.P. Vertical Pumps Jockey & Mill	4,000	1,800
10,000 gallon Mill Tank	5,000	2,400
1000 ft. 8" Ductile Iron Pipe	23,000	3,000
Valves, hydrants and fittings (allowance)	27,000	11,500
Sub-Total -- To Summary Sheet	515,000	$ 93,200

Construction & Installation	Quantity	@ $	Cost $
Yukon River Pumphouse			$13,000
Installation of Insulated Pipeline from Yukon River	13,500 ft.	5	67,500
Reservoir Pumphouse			11,000
Mill Tank Installation and piping			12,500
Mill Feed Lake Diversion Ditch			15,000
Freight and Handling	258 tons	80	20,600
Federal Tax - Equipment	$93,200	11%	10,300
- Construction	$104,000	5 1/2%	5,200
Electrical Equipment and Installation including freight and tax (from Section VI) (excluding lighting and heating)			43,200
Sub-Total -- To Summary Sheet			$198,300

TAILINGS DISPOSAL

It is proposed to store tailings in the shallow valley just east of the plant by constructing dams to a crest elevation of 2550 feet from overburden stripped from the Little Chief orebody. This tailings basin would be adequate to store tailings for about five years at the production rate of 1950 tons per day. An additional five years of storage could be attained by building up the dams to an elevation of 2570 feet. It is assumed that these dams will be raised either with classified sands from the tailings or with locally available fill. Because the cost of raising the dams will be an operating cost which will be incurred several years after the start of production, these costs are not included in the initial capital cost estimate.

Two alternative areas for tailings storage were studied. The canyon 4000 feet east of the plant site would require a dam at least 85 feet high to attain 5-1/2 years of storage. The canyon 5000 feet north east of the plant site would require a dam 60 feet high to attain 6 years of storage. In both these areas, the volume of fill required to build the dams, and the distance required to transport the fill available from stripping the Little Chief orebody made these areas less desirable for tailings disposal than the shallow valley east of the plant. If it becomes feasible in the future to reclaim the tailings for iron recovery,or to reclaim the tailings water, the shallow valley east of the plant would be much more desirable for tailings storage than the canyons because of the shorter pumping distance and the lower pumping pressure required.

The initial development of the proposed tailings area in the shallow valley would not be costly because the tailings pipeline would be short, and because the additional haulage distance required to haul the overburden from the Little Chief orebody to the dams would not appreciably increase haulage costs. The attached cost estimate for building the dams from pit overburden includes only the extra costs of hauling, spreading, and compacting overburden at the dams instead of dumping the pit overburden in the most suitable area adjacent to the pit. A soil study should be made along the site of the proposed dams to ascertain the suitability of the subsoil for dam construction. Because of the relatively low dam heights required for the initial tailings area, it is not expected that suitable subsoil conditions will be difficult to attain in the general area of the dams.

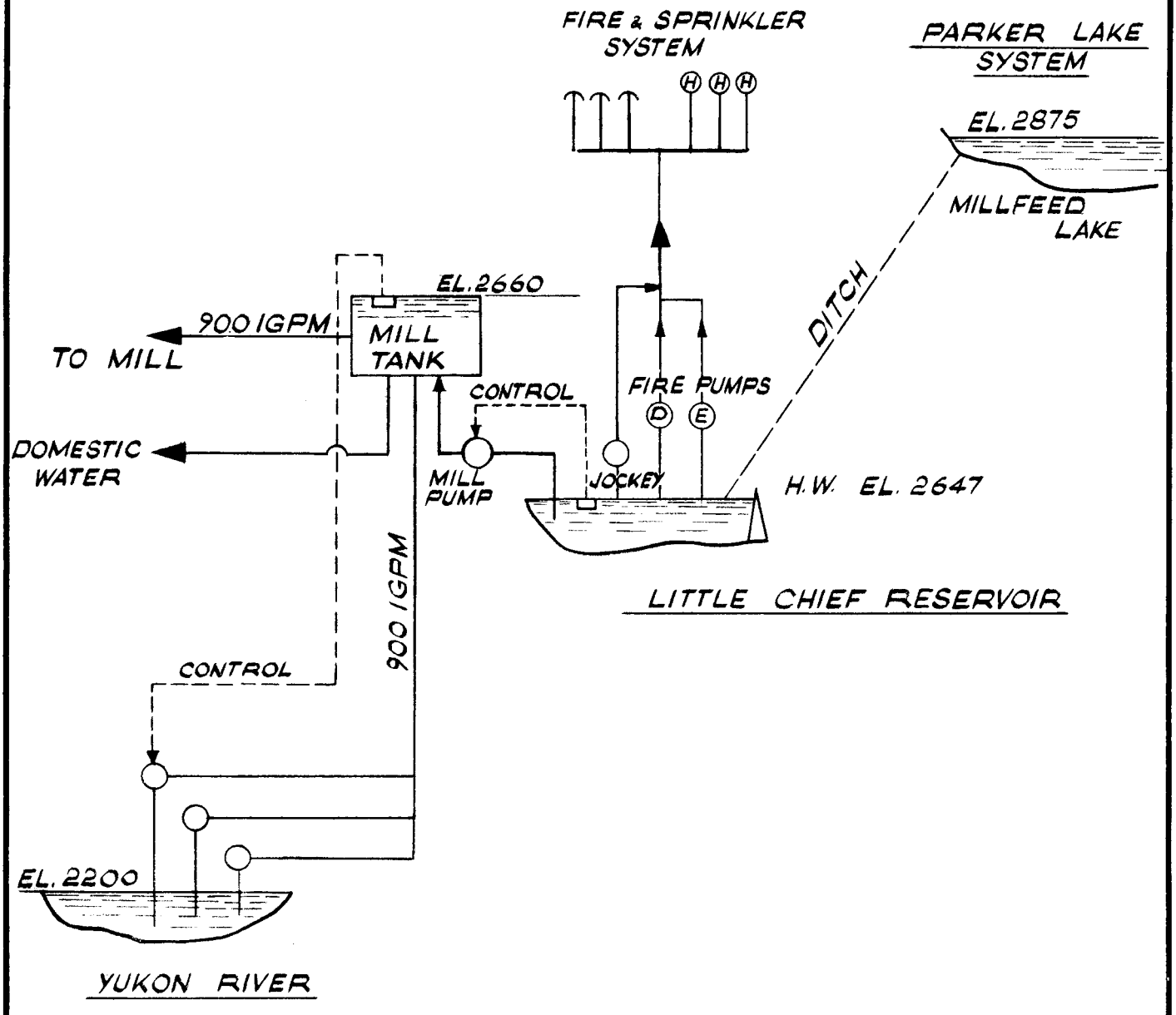
The ground slope east of the mill site is suitable for gravity drainage of tailings through trestle supported wood stave pipe. Water in the tailings pond would be decanted through concrete decantation towers to a 16 inch reinforced concrete pipe laid on the valley floor. This concrete pipe would decant the tailings water through the base of the dam and discharge it into the canyon north of the tailings area. Any fine solids that might be carried into the decant pipe would settle out in the canyon where they would be inoffensive.

TAILINGS DISPOSAL PHASE (1)

Materials	Quantity	@ $	Cost $
12" dia. Wood Stave Pipe	1000 ft.	$ 3.02	$3,020
Reinforced Concrete Pipe 16"ø	800 ft.	$ 2.20	1,760
Concrete Pipe 20"ø	100 ft.	$ 3.70	370
Add Federal Tax			600
Add Freight	45 tons	$80.00	3,440
Sub-Total - to Summary Sheet			$9,190

Construction & Installation

Clearing	3.2 acres	$1000.00	$3,200
Concrete Decantation Tower	15 cu.yds	$ 110.00	1,650
Trestling allowance			8,000
Laying Wood Stave Pipe	1000 ft.	$ 2.60	2,600
Laying Concrete Pipe	800 ft.	$ 4.00	3,200
Decantation Tower Boxes	14 MBF	$ 1.50	2,100
Stripping and Scraping	3500 cu.yds	.50	1,750
Transporting Fill	180,000 tons	0.19	32,500
Spreading and Compacting Fill	180,000 tons	.12	21,600
Tax Allowance			1,000
Sub-Total - To Summary Sheet			$77,600



	NEW IMPERIAL MINES LTD. WHITEHORSE, YUKON.	WATER SUPPLY SYSTEM. SCHEME No. 1
	WRIGHT ENGINEERS LIMITED VANCOUVER —— CANADA	DRAWN BY C.Mc. DATE Nov. 1965
		DRAWING NO. 402 028 001

DWG. NO. 402 028 002

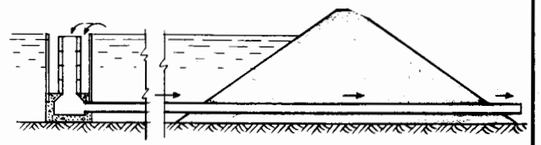


DIAGRAM SHOWING
DECANT TOWER & DAM

2400
2450
2500
2550
2600

3 FUTURE TAILING AREA (6 YEARS)

DECANT TOWERS

1 TAILING AREA (3 TO 5 YEARS)

2 FUTURE TAILING AREA (4 YEARS)

WHITEHORSE

MINE PLANT

N

0 400 800
FEET

DESCRIPTION OF REVISION	APPR.	DESIGN	DRAWN	CHECK	FINAL CHECK
ISSUED FOR REPORT					

SCALE:

REFERENCE | DWG. No.

LOCATION OF
PROBABLE TAILING AREAS

NEW IMPERIAL MINES,
WHITEHORSE, YUKON

DWG. No. 402 028 002

WRIGHT ENGINEERS LIMITED
VANCOUVER —— CANADA

SECTION IX
ADMINISTRATION AND GENERAL COSTS

ADMINISTRATION AND GENERAL

SUMMARY OF ORGANIZATION AND PERSONNEL

ADMINISTRATION	MINE	CONCENTRATING	MAINTENANCE
Accounting	Pit Operation	Primary Crushing	Maintenance Shop
Warehousing	Waste Removal	Secondary Crushing	Electrical Shop
	Engineering	Coarse Ore Storage	
		Fine Ore Storage	
		Grinding	
		Flotation	
		Concentrate Loading	
		Tailing Disposal	
		Assaying	
		Water Supply	

SALARIED STAFF

Manager	Mine Superintend.	Superintendent	Plant Superintend.
Accountant	Chief Geologist	Metallurgist	Foreman
Asst. Accountant	Geologist	Foreman	Chief Electrician
Timekeeper	Pit Engineer	Shift Bosses (4)	
Warehouseman	Surveyor	Chief Chemist	
Clerk	Shift Bosses (3)	Chemist	
Stenographer	Survey Helpers(2)		
Janitor	Sorters (2)		
First-Aid & Personnel	Samplers (2)		
Total - 9.	Total - 14.	Total - 9.	Total - 3.

Total Salaried Staff - 35.

HOURLY PAID PERSONNEL

MINE		CONCENTRATING		MAINTENANCE	
Shovel Operator	6	Crusher Operators	2	Machinist	1
Shovel Oilers	6	Crusher Helpers	2	Welder	1
Blaster Scaler	2	Mill Operators	4	Electrician 1st Class	1
Drill Operators	5	Flotation Operators	4	Electrician 2nd Class	1
Air Truck Operators	1	Concentrate Handlers)	4	Mechanic 1st Class	1
Truck Drivers	12	Reagent & Cells)		Mechanic 2nd Class	1
Service Truck Driver	2	Filter & Dryer Handling		Truck Driver	1
Grader Operator	2	Shift Bosses		Helper	1
Front-End Loader Op.	3	Maintenance 1st Class	2	Loader Operator	1
Helpers	9	Maintenance 2nd Class	2	Labourer	3
Mechanics 1st Class	3	Labourers	4		
2nd Class	1				
3rd Class	1				
Welder 1st Class	1				
Total	54	Total	24	Total	12

Total Personnel

Salaried	35
Hourly Paid	90
Total	125

CAPITAL COST ESTIMATE

The estimate includes equipment that cannot be allocated to a particular section of the operation, an allowance for spare parts and warehouse inventory and an allowance for assistance to personnel for housing. Office, garage and machine shop equipment is costed in Section V.

The spare parts and warehouse inventory cannot be costed accurately and the allowance is based on published figures for similar operations. It includes $100,000 for mine requirements. Small items will be available from Whitehorse at short notice and large stocks need not be carried.

The costs include construction of three houses for senior personnel and an advancement for the initial mortgage payment for married personnel. Allowance has been made in the operating cost for relocation of single personnel.

The front end loader is intended mainly for loading concentrate into containers but would be available for general work around the mill complex.

	Cost $
Warehouse inventory and spare parts (allowance)	300,000
Company houses 3 @ $20,000	60,000
Housing loan to married personnel 40 @ $900	36,000
Pick up truck	4,300
Jeep	2,800
5 Ton Truck	7,200
1 cu.yd. Front End Loader	21,800
Total (to summary)	$ 432,100

OPERATING COST ESTIMATE

The estimate includes the personnel costs of administrative and general maintenance services that cannot be allocated to a particular section of the operation. General maintenance and service supplies are also included.

No cost is included for head office expenses and it is assumed that the Vancouver office will be closed on start up of operations.

Compensation and silicosis are handled by the employers liability insurance and rates similar to Canada Tungsten in 1964 are assumed.

It is assumed that some assistance in relocation expenses will be given to single personnel to attract suitable men.

Power and heat costs are for the general office, garage, maintenance building, and mine office.

Summary

		$/Yr
Administration and General Office		106,150
Fringe Benefits		108,000
General Maintenance and Services		127,860
Engineering		58,200
Total.		400,210
Cost per ton milled on 720,000 tons	=	55.6¢ton
Cost per ton milled on 650,000 tons (1st yr.)	=	61.6¢ton

ADMINISTRATION

	Cost/Month $	Cost/Year $	
1 Manager	1,500	17,000	
1 Chief Accountant	775	9,300	

GENERAL OFFICE

1 Assistant Accountant	600	7,200	
1 Warehouse Man	500	6,000	
1 Timekeeper	450	5,400	
1 Clerk	325	4,000	
1 First-Aid & Personnel	550	6,600	
1 Stenographer	300	3,600	
1 Janitor	300	3,600	
Sub Total			$62,700

OFFICE & ADMINISTRATION EXPENSES

	Cost/Year $	
Stationery and Office Supplies	6,000	
Jeep	1,250	
Telephone & Telegraph	7,200	
Permits, Licences & Fees	3,500	
Property Taxes	3,500	
Insurance	14,000	
Travelling Expenses	5,000	
Legal & Audit	3,000	
Sub Total		$ 43,450
Total to Summary Sheet		$106,150

FRINGE BENEFITS

	$	
Holidays 4% wage payroll	19,000	
Statutory Holidays 3.2%	15,200	
Overtime 10% Mechanical & Electrical Payroll	10,300	
Shift Differential	6,000	
Group Insurance	2,500	
Medical Scheme Contributions	5,000	
Hospitalization Scheme	5,000	
Unemployment Insurance	4,200	
Safety & First-Aid Supplies	1,500	
Silicosis Assessment) 4.15% of total pay-	29,300	
Workmens Compensation) roll		
Relocation Allowance for single personnel	10,000	
Total to Summary Sheet		$ 108,000

ENGINEERING STAFF

	Cost/Month $	Cost/Year $
1 Chief Geologist	800	9,600
1 Geologist	700	8,400
1 Pit Engineer	700	8,400
1 Surveyor	550	6,600
2 Helpers	700	8,400
2 Sorters	700	8,400
2 Samplers	700	8,400
Total to Summary Sheet		$58,200

GENERAL MAINTENANCE AND SERVICE

	Cost/Month $	Cost/Year $
1 Plant Superintendent	1,000	12,000
1 Foreman	700	8,400
1 Chief Electrician	700	8,400
1 Machinist	@ 2.92 $/Hr.	5,840
1 Welder	@ 2.92. $/Hr.	5,840
1 Electrician 1st Class	@ 3.10 $/Hr.	6,200
1 Mechanic 1st Class	@ 2.92 $/Hr.	5,840
1 Mechanic 2nd Class	@ 2.54 $/Hr.	5,080
1 Electrician 2nd Class	@ 2.54 $/Hr.	5,080
1 Truck Driver	@ 2.63 $/Hr.	5,260
1 Helper	@ 2.20 $/Hr.	4,400
1 Loader Driver	@ 2.76 $/Hr.	5,520
3 Labourers	@ 2.20 $/Hr.	13,200
Sub-Total		$91,060

GENERAL MAINTENANCE AND SERVICE SUPPLIES

	Cost/Year $	
Mechanical Supplies	14,700	
Pick-Up Truck	1,400	
5 Ton Truck	2,000	
Tractor	2,500	
Electrical Supplies	8,200	
Power and Heat	5,000	
Engineering Supplies	3,000	
Sub-Total		$36,800
Total to Summary Sheet		$127,860

Project No. 402

By:

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WRIGHT ENGINEERS LIMITED,

M.I. CALLOW.

T.A. O'HARA, P. Eng.

Vancouver, British Columbia,
November 17, 1965.