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REPORT

on

ALWIN MINING COMPANY LTD.

HIGHLAND VALLEY, B.C.

by

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Vancouver, B.C. April 24th, 1969.

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BACON AND CROWHURST
CONSULTING ENGINEERS

April 24th, 1969.

Nippon Mining Co. Ltd.,
475 Howe St.,
Vancouver, 1, B.C.

Attention: Mr. M. Nakamura,
Vice-President

Dear Sir:

We are pleased to submit herewith a report concerning a preliminary feasibility study of the Highland Valley, B.C., Alwin Mining Company Ltd. property.

We trust that this report will provide you with the data you required to make a preliminary assessment of the economic possibilities concerning placing the property into production.

Yours very truly,

BACON & CROWHURST LTD.

J J Crowhurst

J.J. Crowhurst, P.Eng.

JJC/ic

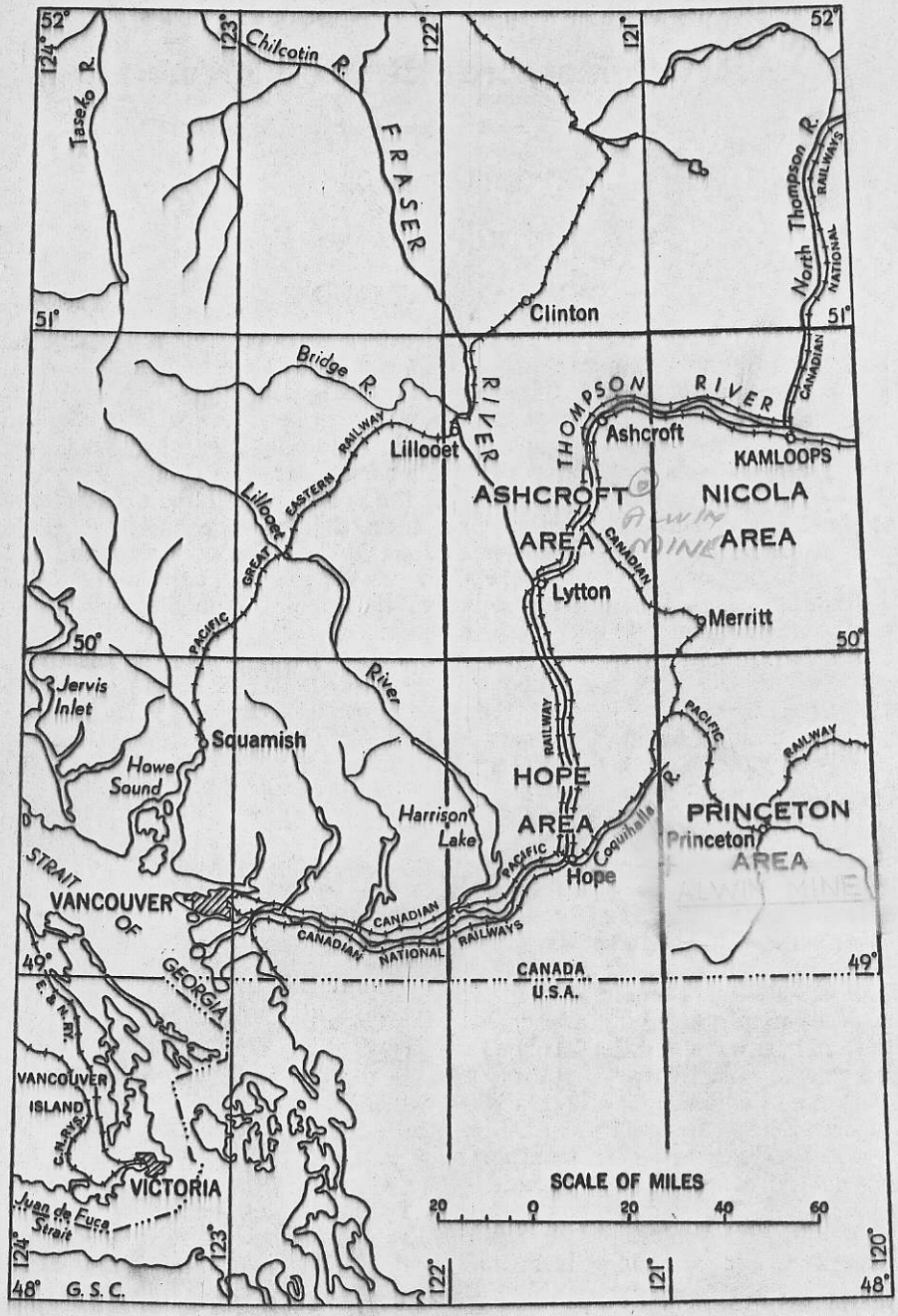
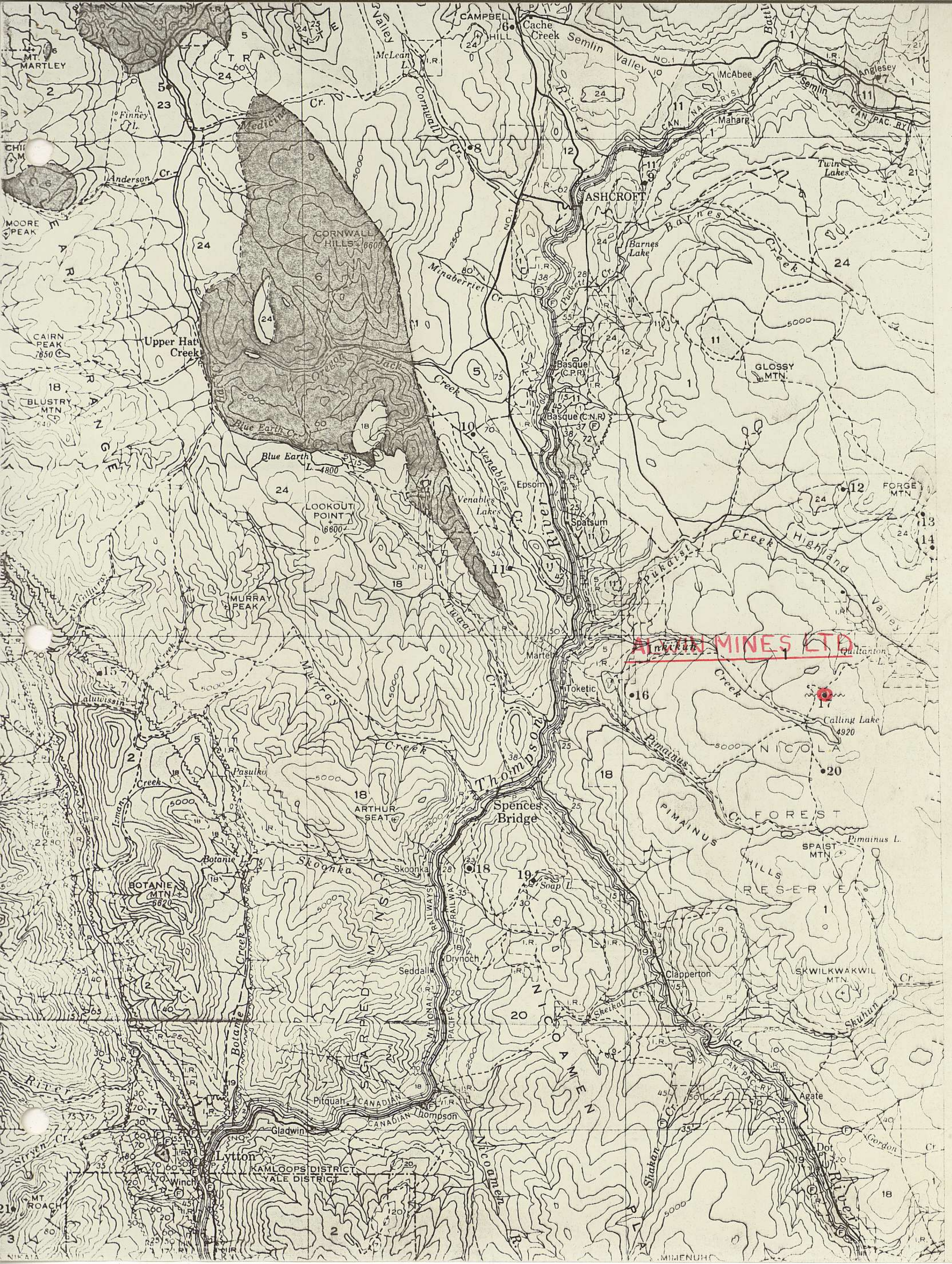


Figure 1. Key map, southwestern British Columbia, showing position of Ashcroft, Nicola, Hope, and Princeton map-areas.



AIWIN MINES LTD
MT. MARTLEY
CAMPBELL HILL
Cache Creek
Semlin Valley
McAbee
Semlin
Anglesey
Maharg
Twin Lakes
ASHCROFT
Barnes Lake
Barnes Creek
CORNWALL HILLS 6600
Cornwall Cr.
McLean L.
Finney L.
Anderson Cr.
MOORE PEAK
CAIRN PEAK 7650
BLUSTRY MTN 7640
Upper Hat Creek
Oregon Jack Creek
Blue Earth Cr.
Blue Earth L. 4800
LOOKOUT POINT 6600
Minaberriet Cr.
Basque (C.P.R.)
Basque (C.N.R.)
GLOSSY MTN.
Venables Cr.
Venables Lakes
Epsom
Spatsum
FORGE MTN.
Highland Valley
Pukaist Creek
MURRAY PEAK
Murray Creek
Twaal Cr.
Martel
Toketic
Quiltanton L.
Calling Lake 4920
Pimainus Cr.
NICOLA FOREST RESERVE
PIMAINUS HILLS
SPAIST MTN.
Pimainus L.
Thompson River
Spences Bridge
ARTHUR SEAT
Laluwissin Cr.
Pasulko L.
Botanie L.
BOTANIE MTN 6820
Botanie Creek
Skoonka Cr.
Skoonka
Soap L.
Drynoch
Seddall
SKWILKWAKWIL MTN
Skuhun Cr.
Clapperton
Shelkat Cr.
NICOAMEN
Nicoamen R.
Shakan Cr.
Pitquah
Thompson
Gladwin
Lytton
KAMLOOPS DISTRICT
YALE DISTRICT
Winch
MT ROACH
Agate
Gordon Cr.
Dot
Nicola River
CANADIAN NATIONAL RAILWAY
CANADIAN PACIFIC RAILWAY

TERMS OF REFERENCE

At a meeting between Mr. M. Nakamura, Vice-President, Mr. N. Hakari, Chief Geologist, Nippon Mining Co. Ltd., and Mr. J.J. Crowhurst of Bacon & Crowhurst Ltd., held in Vancouver on April 18th, 1969, the scope and terms of reference of this report were discussed.

It was understood that, because the time for preparation of information and making cost estimates would be very short, several assumptions, considered to be attainable or reasonable, would of necessity be made.

Some of the more important ones that have formed the basis for the report are as follows:

(1) Rate of Production - 1000 short tons of ore per calendar day - to be extracted from the mineralized zones situated on the O.K. and I.O.U. Crown grant mineral claims.

(2) Metallurgical Performance - as per the recent test work results submitted by the Department of Energy, Mines and Resources, Ottawa.

(3) Metal Prices - Copper @ 44¢ and @ 48¢, both U.S. per lb.

Silver - $1.86 U.S. per ounce.

(4) Adequate Water Supply for a concentrating plant and camp requirements - available from nearby lakes or a similar source such as supply to neighbouring proposed mining operations.

(5) Power - requirements to be supplied by B.C. Hydro and Power Authority from nearby transmission lines.

(6) Mining Methods - cut & fill stoping using small trackless equipment for stopes over 11' wide, and shrinkage stoping for ore zones under 11' wide - actual mining considerations have not been determined to date.

(7) Mine Access - vertical shaft from surface to 3900 elevation with six levels at 150' intervals. It should be noted that the alternative of driving an inclined ramp system, with accompanying trackless and/or conveyor belt haulage, should be investigated in detail before a final decision is made.

(8) Camp - Alwin will construct bunkhouse and cookhouse accommodation for 100 men and provide housing for an additional 50. The other men required will commute from nearby towns and villages.

SCOPE OF THE REPORT Delete

The scope of the report is intended to cover ore reserve estimate calculations, proposed mining methods including mine development procedures, proposed milling methods, concentrate deliveries to Vancouver, B.C., wharf handling facilities, plant & townsite construction, manpower requirements, power considerations, cost estimates concerning capital (preproduction) costs including warehouse inventory and working capital, operating costs, net smelter returns and operating profit. (delete - 15 Oct 69 - JJe)

It is to be noted that Bacon & Crowhurst Ltd. have not investigated, and this report does not cover, the following:

(a) Ownership of the mineral claims.

(b) Financing arrangements and related costs.

(c) Dominion, Provincial or local taxation.

(d) Royalty payments to Royal Canadian Ventures.

(e) Cash flow (other than operating profit) and/or present value of shares.

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CHAPTER I
SUMMARY & FINANCIAL

SUMMARY

Ore reserves as of April 20th, 1969, are estimated at 1,391,448 tons assaying 1.994% copper and 0.30 ounces of silver per ton after allowing for mining dilution. A further 870,000 tons of similar material may be anticipated.

It is estimated that a total investment of $7,964,000 will be required to complete the necessary exploration, to prepare the underground workings for production and to construct a concentrator with related facilities capable of processing 1000 tons of ore per day (348,000 tons of ore per year).

The present ore reserves will suffice for 4 years operation at this rate, with a further 2½ years anticipated.

The sum of $75,000 representing inventory of supplies and the sum of $671,000 representing three months operating costs for working capital is included in the $7,964,000 total.

Operating costs are estimated at $7.71 per ton milled for the first 1½ years and $8.95 per ton milled thereafter.

Operating profit, before writeoffs for depletion or depreciation, financing charges, royalties, or taxation, is estimated as follows (in 000's $ Canadian funds):

	Price of Copper	
	44¢ U.S.	48¢ U.S.
Year 1	$3,144	$3,737
2	2,520	3,072
3	1,895	2,406
4	1,895	2,406
Sub-Total	9,454	11,621
5	2,202	2,743
6	2,202	2,744
7	1,100	1,371
Total	14,958	18,479

ESTIMATED OPERATING PROFIT - CAN. FUNDS

PRICE OF COPPER - 44¢ U.S.

Year	1	2	3	4	Sub-total	5	6	7*	Totals
Tons milled - 000's	348	348	348	348	1,392	348	348	174	2,262
Tons Concentrate	21,661	20,144	18,626	18,626	79,057	19,765	19,765	9,882	128,469
Net smelter returns 000's Can. @ $269.00/ton of Conc.	5,827	5,419	5,010	5,010	21,266	5,317	5,317	2,658	34,558
N.S.R. per ton of ore milled	$16.74	$15.57	14.40	14.40	15.28	15.28	15.28	15.28	15.28
Operating Cost - 000's $ Can. ($7.71 & $8.95 per ton)	2,683	2,899	3,115	3,115	11,812	3,115	3,115	1,558	19,600
Operating Profit	3,144	2,520	1,895	1,895	9,454	2,202	2,202	1,100	14,958

PRICE OF COPPER - 48¢ U.S.

Net Smelter returns 000's Can. @ $296.41/ton	6,420	5,971	5,521	5,521	23,433	5,858	5,859	2,929	38,079
N.S.R. per ton ore milled	18.45	17.16	15.86	15.86	16.83	16.83	16.83	16.83	16.83
Operating Cost - 000's $ Can.	2,683	2,899	3,115	3,115	11,812	3,115	3,115	1,558	19,600
Operating Profit	3,737	3,072	2,406	2,406	11,621	2,743	2,744	1,371	18,479

* ½ year

50 ¢
55 ¢
60 ¢

ESTIMATED NET SMELTER RETURNS

Assumptions

Grade of copper concentrate - 33.0% Cu + 5.45 ozs.Ag/ton + 0.004 ozs. Au/ton.
Moisture content - 8%.
Price of copper per lb. (a) 44¢ U.S. (b) 48¢ U.S.
Price of silver - U.S. equivalent - $1.86- 1-1/8% or $1.84 approx.

(a) PRICE OF COPPER - 44¢ U.S./lb.

	Per Short Ton of Concentrate
Gross Value	
Copper contained - 660#.	
Copper paid for - 660#-24# = 636#.	
Value of copper - 636 x (44¢-1¢) =	$273.48 U.S.
Value of silver - 5.45 ozs. x 1.84 x 90% =	9.03 U.S.
Value of gold since content less than 1 gr./metric ton	-
	$282.51 U.S.
Deductions	
(1) Treatment charge - 24.50/dry metric ton (25.00)	
or $\frac{24.50 \times 2000}{2204.6}$ per dry short ton =	22.23 U.S.
Net	$260.28 U.S.
Plus Am.-Can. exchange @ 7-3/4%	20.17
	$280.45 Can.

(2) Concentrate handling & freight -

	Per ton of Concentrate	
Loading (4¢)	0.45	
Trucking (9¢ x 250 m.) to Vancouver	7.50	
Sampling, warehousing, shiploading	3.50	11.45 Can.
Net value per short ton of concentrate		$269.00 Can.
Net value per lb. of copper contained - $\frac{269.00}{660}$ =		40.76¢ Can.

8 ¢

		Per short ton of concentrate
(b) PRICE OF COPPER - 48¢ U.S./lb.		
Gross Value		
Copper contained - 660#		
Copper paid for - 660#-24# = 636#		
Value of copper - 636 x (48¢-1¢) =		$298.92 U.S.
Value of silver - as above		9.03 U.S.
		$307.95 U.S.
Deductions		
(1) Treatment charge - as above		22.23 U.S.
	Net	$285.72 U.S.
Plus Am.-Can. exchange @ 7-3/4%		22.14
		$307.86 Can.
(2) Concentrate handling & freight		
As above		11.45 Can.
Net value per short ton of concentrate		$296.41 Can.
Net value per lb. of copper contained - $\frac{296.41}{660}$ =		44.91¢ Can.

ESTIMATED CAPITAL COSTS

Exploration	$480,000
Mining	
Preproduction development	1,463,000
Equipment	772,000
Crushing plant & concentrator	1,905,000
Water supply	100,000
Power (transmission line & transformers)	100,000
Plant services	260,000
Camp buildings & housing	930,000
Administration & head office costs	
12 months @ $20,000/month	240,000
Sub-Total	$6,250,000
Contingencies @ 10%	625,000
	$6,875,000
Engineering @ 5%	343,000
Sub-Total	$7,218,000
Inventory of supplies	75,000
Working capital - 3 months operating costs or	
3 x $29,000 x $7.71	671,000
Total	$7,964,000

ESTIMATED OPERATING COST - 348,000 TONS/YR.

	First 1½ Years		Next 5 years	
	Amt./yr. 000's $	Per Ton Milled	Amt./yr. 000's $	Per Ton Milled
Mining	1830.5	5.26	2262.0	6.50
Milling	435.0	1.25	435.0	1.25
Plant services & townsite	174.0	0.50	174.0	0.50
Mine adminstration & head office	243.6	0.70	243.6	0.70
Total	2683.1	7.71	3114.6	8.95

It is reasonable to expect that, if sufficient funds are expended for exploration, enough additional ore will be found to support the operation for a further 2 to 2½ years. Total anticipated life for the purposes of this report has, therefore, been assumed to be 6½ years.

EXPLORATION

In order to explore the presently known zones in more detail, to search for extensions and to look for additional ore, it is suggested two more exploration stages will be required.

The estimated cost is as follows:

Stage 1	-	$230,000
Stage 2	-	250,000
Total	-	$480,000

During the second stage, a detailed feasibility study can be prepared.

CHAPTER II
GENERAL INFORMATION

CHAPTER III
GEOLOGY, MINERALIZATION,
ORE RESERVES & EXPLORATION

CHAPTER IV
MINING

GENERAL

It is proposed to sink a 700' three compartment vertical shaft from the 4680 level elevation to the 3980 elevation. This shaft will then be connected through to the surface by raising a distance of approximately 300' and a production type hoist installed at the collar. Levels will be cut at 150' intervals or at the 4830 elevation (No. 1), the 4530 elevation (No. 3), the 4380 elevation (No. 4), the 4230 elevation (No. 5), and the 3980 elevation (No. 6). The 4680 level is referred to in this report as No. 2 level.

The widest (11'-30'-average 20') stoping blocks have been selected for the initial production period. These are situated between Section 48 and Section 53, and are above the No. 5 level.

The attached calculation shows that 10 of these blocks are above and 8 of them are below the 4680 elevation or No. 2 level. The average grade for all of these blocks, which contain an estimated 425,000 tons, is 2.355% copper after mining dilution.

Other adjacent narrower blocks (4'-10') will be also prepared for a proportion of the initial production and will eventually supply most of the mill feed.

ESTIMATE - "FIRST" STOPING BLOCKS - "WIDE"- CUT & FILL

BELOW LEVEL

Section	Block	Zone	Width	Tons	Grade
48	24	6	12.7	12,710	2.35
49	29	6	28.0	24,530	2.63
50	34	2	20.0	5,710	1.82
50	41	6	11.8	34,467	3.00
51	55	6	11.0	24,067	1.75
52	59	3	30.0	14,290	3.42
52	61	3	20.0	17,140	3.29
53	84	3	28.3	33,700	2.83
Average & sub-totals- below level			20.8	166,614	2.706

ABOVE LEVEL

48	19	5	19.1	21,830	1.65
49	28	5	18.7	21,370	2.85
50	32	2	17.2	13,110	2.24
50	33	2	27.5	11,790	1.82
50	35	5	20.0	25,710	2.62
50	36	3	16.0	25,140	4.09
50	37	3	14.4	14,400	2.04
51	48	3	23.7	25,960	1.17
51	49	3*	7.6	5,430	1.37
52	58	3	20.6	22,560	3.42
Average & sub-totals- above level			19.5	187,300	2.468
Below level			20.8	166,614	2.706
			20.1	353,914	2.580
Mining dilution @ estimated 10%				35,391	0.100
Average & totals - Feed to concentrator			20.1	389,305	2.355

* To be mined because of location

ESTIMATE - "FIRST" STOPING BLOCKS - "NARROW" - SHRINKAGE

LEVEL 1

Section -	Block -	Zone	Width	Tons	Grade
54	R86	4	4.0	6,480	4.47
52	R66, 54	4	5.1	10,980	1.64
50	R40	4	4.0	3,430	0.95
52	R57	3	6.3	7,200	2.30
51	R46	3	4.7	5,820	3.43
50-51	R44, 31	2	6.0	15,530	2.88
48	R15	2	7.0	4,800	3.00
Total			5.3	54,710	2.68

LEVEL 2

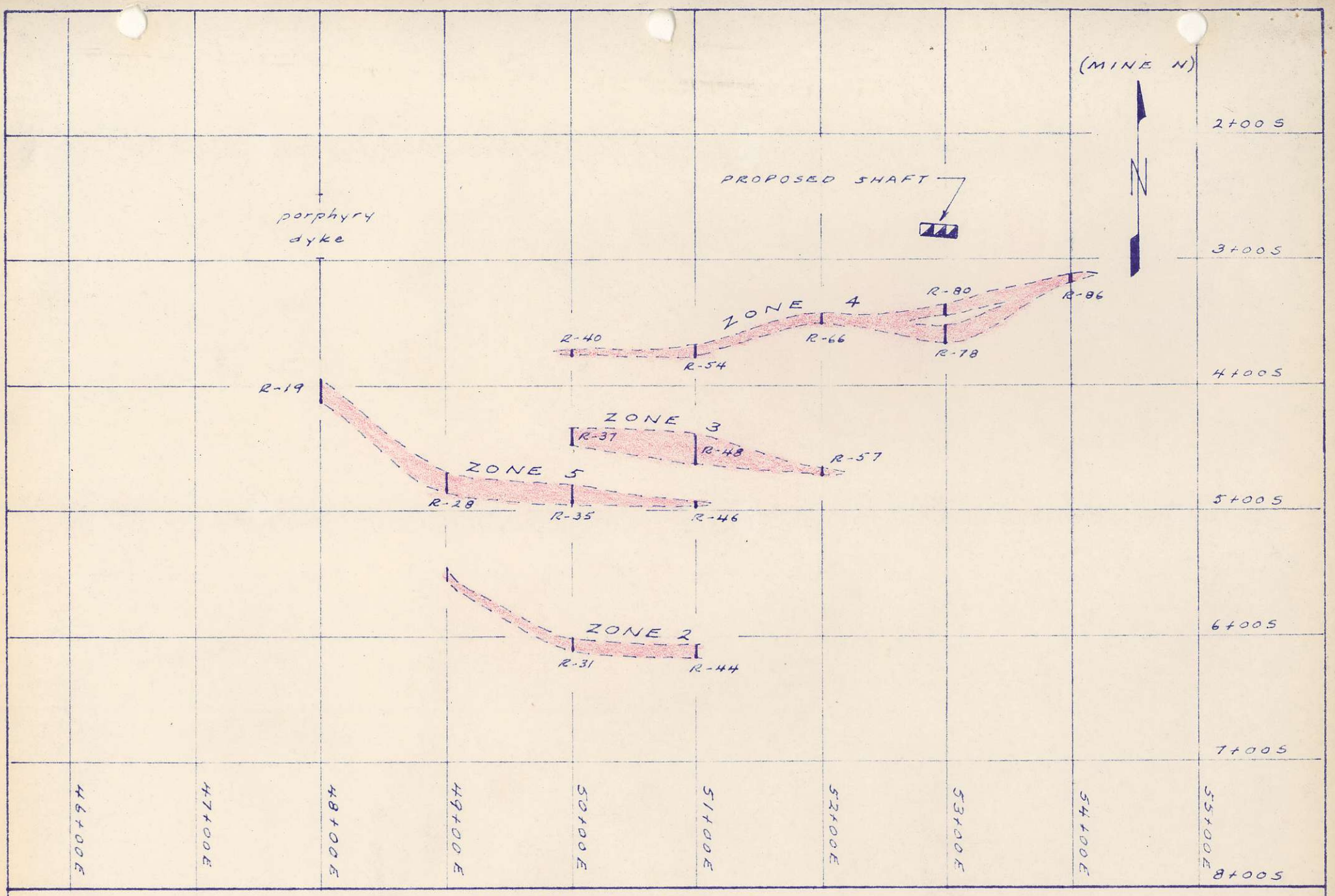
57	R109(1/5)	4	7.0	3,500	2.65
56	R100,101	4	7.3	14,140	3.85
55	R93	4	4.0	2,930	1.51
53	R78, 80	4	6.5	13,110	1.53
51-52	R67, 54	4	6.0	12,750	1.94
51	R47, 46	5	4.5	11,020	2.53
51	R52	4	5.0	2,860	2.14
50	R38,G19	3	8.2	8,460	1.36
48-49	R16, 26,) G9, 10)	2	4.6	10,120	2.21
48	R17	5	4.9	2,800	1.09
48	R21,G11	3	4.0	3,800	2.55
47	R12,G8	3	6.0	5,720	0.93
47	R8,9,10,) G7)	3-5	5.5	14,540	1.56
47	R7	2	7.7	7,630	2.53
46	R1, 2	2	5.0	9,310	3.46
46	R5, G2	5	5.0	4,760	1.66
53	R75,76,) G26,27)	2	4.0	7,600	1.60
Total			5.6	135,050	2.12

LEVEL 3

Section - Block - Zone			Width	Tons	Grade
54	R90, 85(½)	4	5.4	7,400	2.58
52	R74, 85(½)	4	4.7	3,590	2.01
52	R70	4	8.3	7,110	1.67
52	R68	3	8.9	8.060	1.36
54	R89	3	8.0	6,100	1.34
54	R88,91	3	6.3	11,900	1.85
51	R50,51	3	7.7	13,140	2.76
50	G2	4	5.0	2,380	1.66
50	R39,42	3	7.3	13,170	1.54
Total			6.8	72,850	1.93

SUMMARY - "NARROW" VEIN ORE - LEVELS 1, 2, 3

Level	No. of Stopes	Average Width	Tons	Grade
1	7	5.3	54,710	2.68
2	17	5.6	135,050	2.12
3	9	6.8	72,850	1.93
Sub-Totals & average	33	5.9	262,610	2.18
Mining dilution @ estimated 33%			86,661	0.10
Totals			349,271	1.66



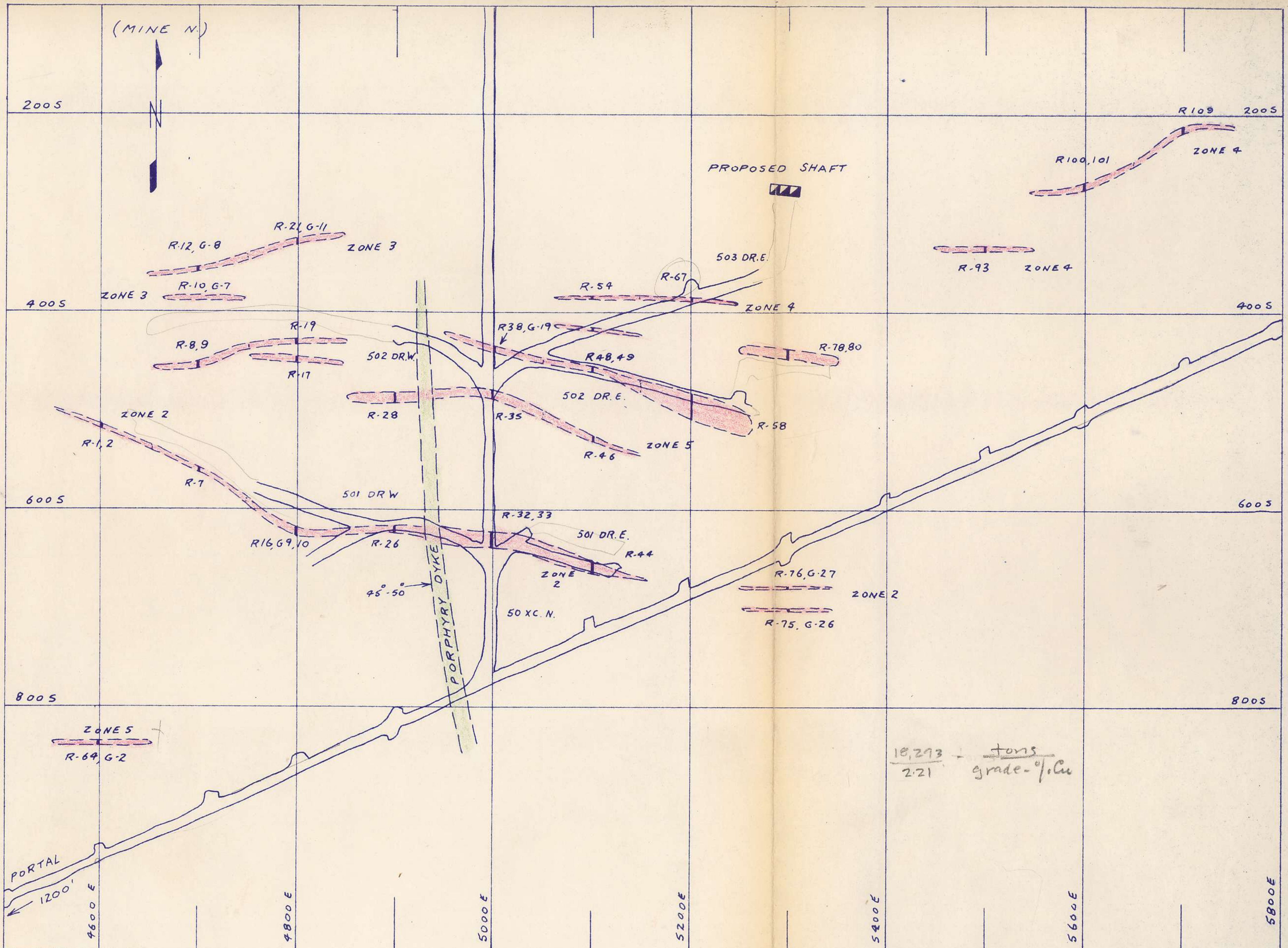
ALWIN MINING CO. LTD.

ORE OUTLINES ON Nº 1 LEVEL (4830' EL.)

SCALE: 1"=100'

APRIL 1969

PREPARED BY BACON AND CROWHURST LTD.

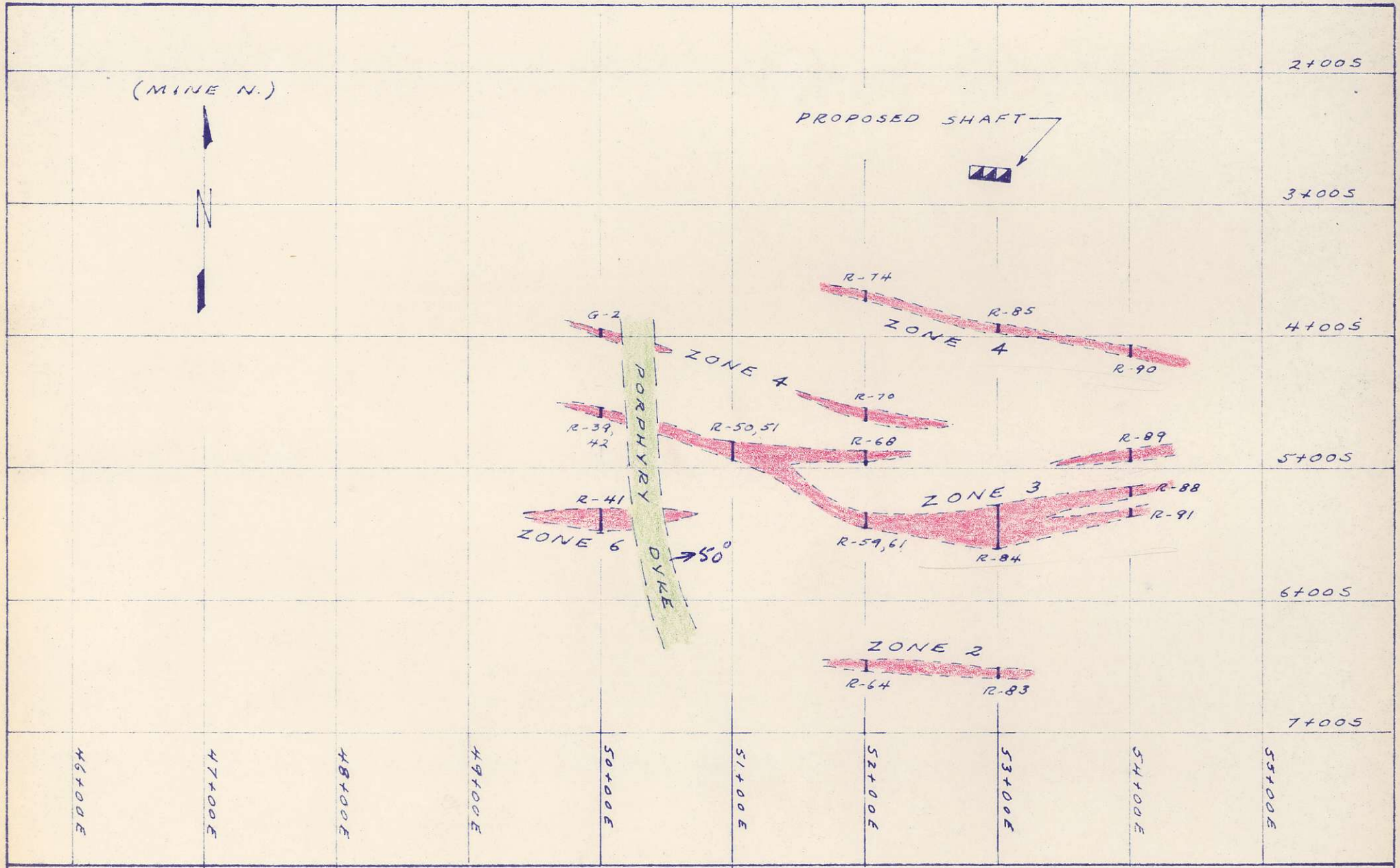


ALWIN MINING CO. LTD

ORE OUTLINES ON Nº 2 LEVEL (4680' EL)

SCALE: 1" = 100' APRIL 1969

PREPARED BY BACON AND CROWHURST LTD.



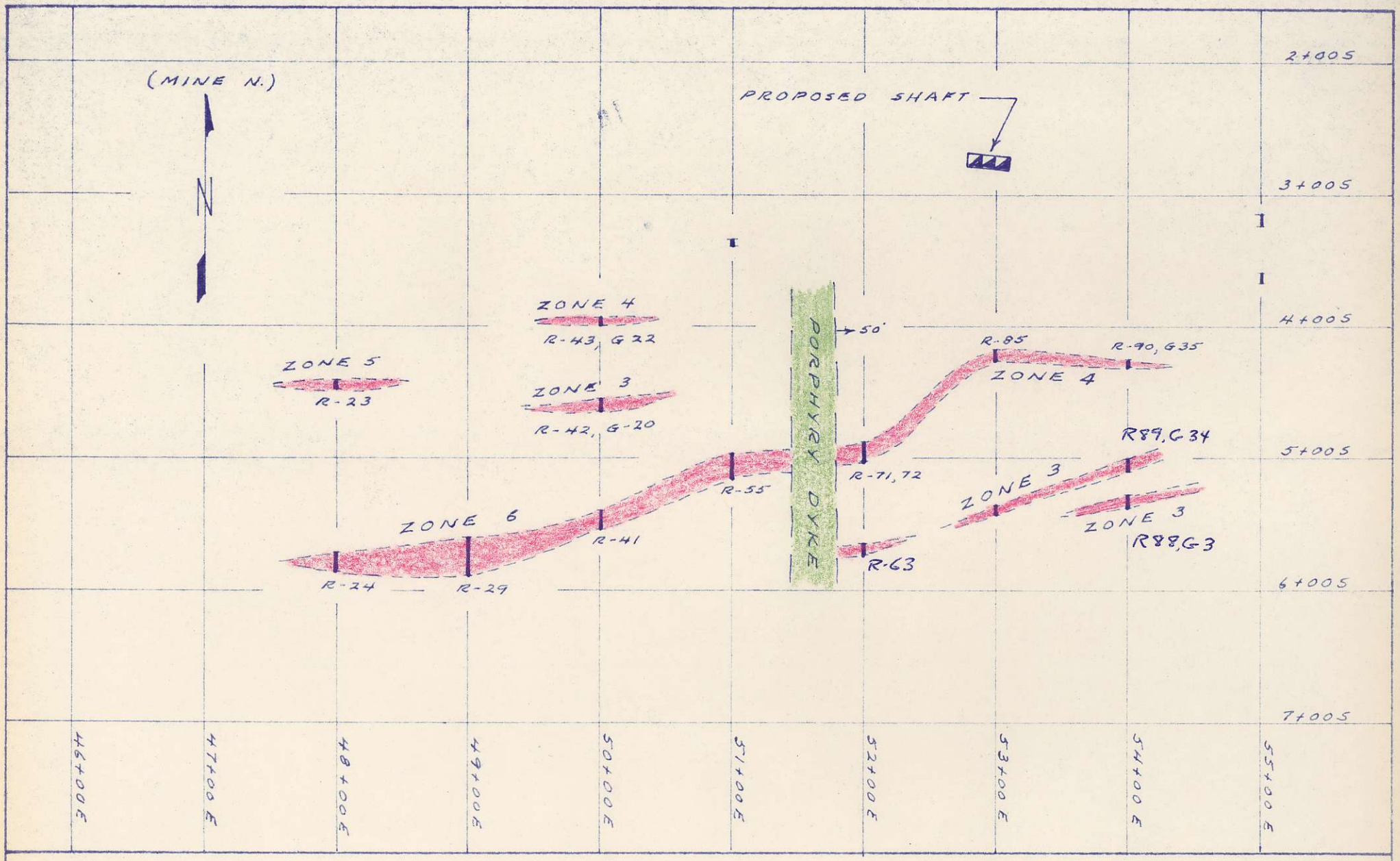
ALWIN MINING CO. LTD.

ORE OUTLINES ON Nº 3 LEVEL (4550' EL.)

SCALE: 1"=100'

APRIL 1969

PREPARED BY BACON AND CROWHURST LTD.



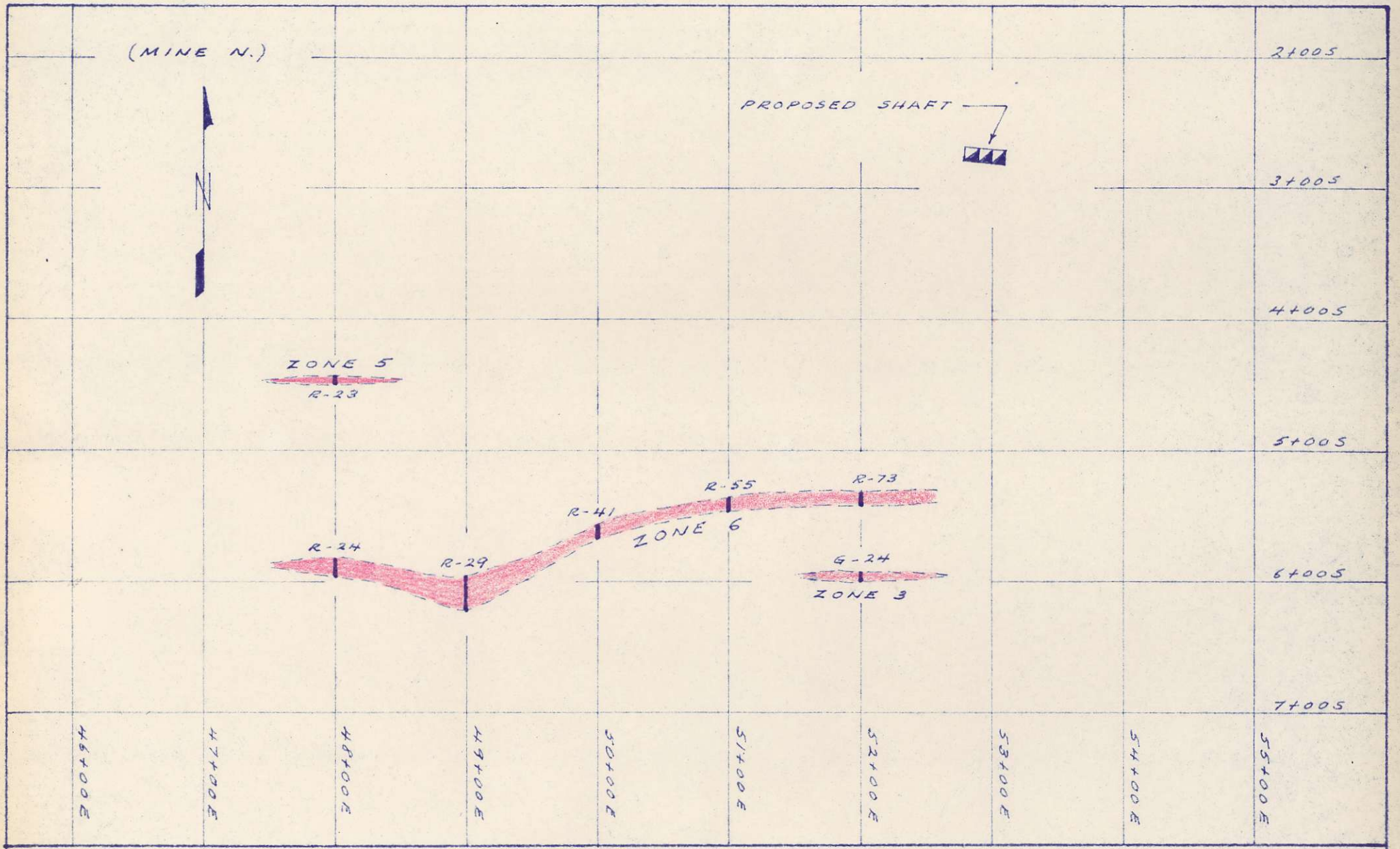
ALWIN MINING CO. LTD.

ORE OUTLINES ON Nº 4 LEVEL (4400' EL.)

SCALE: 1"=100'

APRIL 1969

PREPARED BY BACON AND CROWHURST LTD.



ALWIN MINING CO. LTD.

ORE OUTLINES ON Nº 5 LEVEL (4250' EL.)

SCALE: 1" = 100'

APRIL 1969

PREPARED BY BACON AND CROWHURST LTD.

MINING METHODS

Cut & fill stoping, using small trackless compressed-air operated equipment (~~such as the Atlas Copco Cavo 310~~), is contemplated for the wider blocks of ore. Shrinkage stoping, using similar equipment for rock removal through draw points, is proposed for the narrower zones.

~~Little~~ Not very much is known at present concerning the nature of the ore and wall rock but it is felt that the above two methods will ~~probably~~ be applicable. Proper selection will depend on future ~~exploration~~ development & development results.

Fill will be supplied by de-slimed mill tailings.

An ore & waste pass raise system will be established close to the ore blocks proposed for mining. Broken ore from the stopes will be moved about 250' average to this system and will drop ~~to one~~ initially to an ore storage and below 2 level. loading pocket for hoisting to the surface. When required an ore storage & loading pocket below No 5 level will used for the removal of the ore below No 2 level.

ESTIMATED PRODUCTION

In order to supply the concentrator with the predicted 29,000 tons per month, the mine must produce an average of 1394 tons of ore per day on a 20.8 day per month basis. Ore produced from stope development and exploration will probably supply about 3,000 tons per month, leaving 26,000 tons to result from stoping or a net of 1250 tons per day.

It is estimated 16 stopes of the "wider" category, fully developed and available, will be required initially, which will produce

75% x 1250 or 938 tons per day, representing 78 tons/stope/day. This will allow four stopes extra, or a 25% margin for breakdowns, unforeseen ground conditions, possible lack of ore continuity, "disappointing" stopes, and other contingencies.

In addition, it is estimated 13 stopes of the "narrower" category must be well advance to produce the other 312 tons required daily on the average, taking into account the fact that only 1/3 of the broken rock can be drawn. If ten of these, at any time, are producing ore, it is estimated an average of about 30 tons per stope can be drawn daily on the average.

An increasing broken ore supply will be established in the narrower shrinkage stopes by the time the wider stopes are mostly finished; this will tend to level out costs over the life of the mine.

In summary, the feed to the mill is therefore estimated as follows:

Estimate - Tons Mined (first 24 months)

	Cut & fill	Shrinkage	Development & Exploration	Total
Monthly	19,500	6,500	3,000	29,000
Daily	938	312	144	1,394
Stopes - total	16	13		
in use	12	10		
Production/day/stope	78	30		
Production/shift/stope	39	15		

ESTIMATED MANPOWER & LABOUR COST

(A) First 20-24 Months

Underground Crew

Classification		No.	Average Cost per month including 20% fringe benefits	Total Cost per month	
Machine men					
Cut & fill stopes	24				
Shrinkage	20				
Development & exploration	10				
		54	750	$40,500	
Slushermen		24	650	15,600	
Timber & fill		10	650	6,500	
Tramming & draw-point loading		10	600	6,000	
Pipefitting & track		4	600	2,400	
General underground		12	600	7,200	
Hoistmen & skiptenders		6	600	3,600	
Samplers		2	600	1,200	
Dry & lamps		2	600	1,200	
		124			$84,200
Surface Crew					
Blacksmith-welder		1	700	700	
Rockdrill repair & bits		1	650	650	
Mechanics & machinists		2	700	1,400	
Electricians		2	700	1,400	
Helpers		2	600	1,200	
		8			5,350
Underground Staff					
Superintendent		1	1,500	1,500	
Shift Bosses		2	1,000	2,000	
Geology		1	1,000	1,000	
Surveyors		2	800	1,600	
Survey helpers		2	500	1,000	
Safety & ventilation		1	700	700	
First aid man		1	700	700	
		10			8,500

Total labour cost	(Total no. - 142)	$98,050
Total supplies & other costs		54,450
Total estimated mining operating cost		$152,500

$$\text{or } \frac{152,500}{29,000} = \$5.26/\text{ton milled.}$$

(B) After first 24 months

No detailed calculations have been made but it is estimated that the mining crew will require later possibly 30 men extra, if most of the ore results from shrinkage stoping.

Tramming distances to the shaft system will increase as well.

The estimated average mining cost, therefore, amounts to $6.50 per ton milled during this period.

ESTIMATED CAPITAL EXPENDITURES

Equipment	Cost	
Compressors with allied equipment - ~~4000~~ 3600 c.f.m.	$120,000	108,000
Raise climber and/or long hole boring machine (rented)	-	
Mucking machines (~~2~~ 1 exploration & development) + (~~2 stop ins~~) - ~~4~~ @ $6,000 each (~~2 - stopes~~) = 3 @ 6,000 each	~~24,000~~	18,000
Rock drills - ~~34~~ @ $1700 each 1½ each stope × 75 stopes = 22+3 spares = 25 @ 1700 each	~~58,000~~	42,500
Rock drill carriages (cut & fill stoping) ~~12~~ 8 @ $3000 each	~~36,000~~	24,000
Cavo 310 (or similar autoloaders) - ~~3~~ 1 @ $13,000 ea.	~~39,000~~	13,000
T2GH (or similar autoloaders) - ~~4~~ 1 plus 1 spare = 2 @ $11,000 ea.	44,000	22,000
Small scraper hoists, slushers & related equipment	40,000	30,000
Ventilation fans	20,000	20,000
Locomotives (one 4 to 5 ton diesel ~~10,000~~ 12,000 2 ~~4~~ - 1½ ton battery) charging & other equipment	~~40,000~~	30,000
Mine cars - 20 - average of $800 ea.	16,000	16,000
Headframe - second hand - 100' - with rock bin & dumping mechanism - installed		40,000
Double drum - 8' diameter (?) hoist with electrics & all controls (purchased second hand) - estimated - installed price	120,000	?
Skip, cage & equipment shaft generally	40,000	~~30~~ 40,000
Service hoist & skip - 4680 level downwards - second hand	35,000	35,000
Pumps	30,000	~~15~~ 30,000
General electrical equipment	30,000	30,000
Shop equipment & miscellaneous	50,000	50,000
Total		$742,000

Total (Equipment)		$742,000
Buildings		
Compressor house	$10,000	
Hoistroom	10,000	
Repair shops & miscellaneous	10,000	
		30,000
Total Equipment & Buildings		$772,000

ESTIMATED PREPRODUCTION MINE DEVELOPMENT

Plans have been prepared showing the approximate ore zone outlines on each of the five proposed levels between Sections 46 East (?) and 58 East. (?)

The level development necessary to gain access to the eighteen "wider" ore zones on all levels and to thirty-three (?) of the "narrower" zones on No. 1, 2 and 3 levels has been planned diagrammatically. The shaft position is assumed to be at 96,470 North - 97,430 East.

This level development is as follows:

Level No.	Drifting & X-Cutting
1	1670 ft.
2	2010
3	1720
4	610
5	660
Total	6670
Contingencies @ 10%	67
Total	6737 ft.

It is, therefore, assumed that 6000' of this total will be completed prior to production.

ESTIMATED COST

(1) Shaft

Excavation & timbering

Sinking - 2 level (4680) to 6 level (4080)	600'			
Sump - 6 level (4080) to bottom (3980)	100'			
Raise - 2 level (4680) to surface (4980)	300'			
Cut 6 stations @ 25' equiv. of shaft	150'			
Total	1150' @ $400/ft -		$460,000	

Access & miscellaneous

Access & hoistroom on 2 level, & preparation	30,000		
Rental (or loss on resale) plus installation of sinking hoist	35,000		
Loading pocket & head frame dump installation	30,000	95,000	$555,000

(2) Drifting & Crosscutting

Levels 1 to 5 inclusive - 6000' @ $60/ft.		360,000

(3) Raising

Main

Ore-waste pass system 5 level (4230) to 1 level (4830) 600' x 2 = 1200' @ $50/ft.	60,000	
Ventilation & service raise - 6 level (4080) to surface (4980) - 900' @ $50/ft.	45,000	105,000

Stope

Total of 29 raises (timbered) one for each stope) x 170' = say 5000' @ $60/ft.	300,000

(4) Stope Preparation

Sub-levels

Cut & fill stopes -	2200'	
Shrinkage stopes -	1600'	
Total	3800' @ $25/ft.	95,000

Drawpoints

Cut & fill stopes - one per stope - 1 x 16 x 25' =	400'		
Shrinkage stopes - one every 20' or $\frac{1600}{20}$ = 80 x 25' =	2000'		
	2400' @ $20/ft.		48,000
Total			$1,463,000

ESTIMATED MINE PRODUCTION - TONS & GRADE

First 1½ Years	Months		Tons/month	Tons	Grade % Cu
Cut & fill ("wide") stopes	18	x	21,750	= 391,500 @	2.36
Shrinkage ("narrow") stopes	18	x	7,250	= 130,500 @	1.66
Total	18	x	29,000	= 522,000 @	2.185

Next 2½ Years	Years	Tons/yr.		
	2½	348,000	870,000	1.879
Total (as per ore reserves)			1,392,000	1.994
Next 2½ years	2½	348,000	870,000	1.994
Totals			2,262,000	1.994

CHAPTER V
MILLING & METALLURGY

MILLING & METALLURGY

No final report has been received as yet from the Department of Energy, Mines and Resources regarding the bench test work carried out on samples of ore submitted from drift muck samples and diamond drill core, but preliminary results show that the ore is amenable to ordinary copper flotation at a coarse grind (approximately 55% minus 200 mesh).

A seven state locked cycle test gave results which apparently are typical, as follows:

Product	Weight %	Assay			Distribution %		
		Au oz/ton	Ag oz/ton	Cu%	Au	Ag	Cu
Cu cl conc	6.8	0.030	5.43	32.95	85.4	89.7	95.1
Cu cl tail	0.4	0.009	0.62	2.19	1.6	0.6	0.4
Rougher tail	92.8	0.0003	0.04	0.114	13.0	9.7	4.5
Feed	100.0	0.0024	0.41	2.36	100.0	100.0	100.0

It would appear, therefore, that a sample flowsheet consisting of coarse crushing followed by fine crushing and grinding preparatory to conditioning for subsequent copper flotation, will be sufficient. Concentrates will be cleaned two or three times, filtered (perhaps dried if the economics so dictate) and stored for truck shipment to Vancouver deep sea loading facilities.

ESTIMATED CAPITAL COST - CRUSHING PLANT & CONCENTRATOR

(1) Crushing Plant

Site clearing & excavation	$30,000	
Building	50,000	
Coarse Ore bin	75,000	
Jaw crusher	80,000	
Cone crushers	90,000	
Conveyors & reclaiming	90,000	
Installation of equipment	75,000	
Fine ore bin - outside		
Total - Crushing plant		$490,000

(2) Concentrator

Site clearing & excavation	50,000	
Building	350,000	
9 x 9 Ball mill	75,000	
8 x 12 Rod mill	100,000	
Filters	25,000	
Thickener	30,000	
Cyclones & scrubbers	25,000	
Pumps	30,000	
Flotation Cells	90,000	
Dryer	50,000	
Conditioners	20,000	
Repair & maintenance equipment including overhead cranes, etc.	50,000	
Tailings disposal	40,000	
Miscellaneous	40,000	
Installation of equipment	350,000	
Total - Concentrator		1,325,000

Total	$1,815,000
Engineering @ 5%	90,700
Total	$1,905,000

Equip = 26
200
85
160
50
521

ESTIMATED TONS CONCENTRATES PRODUCED

	Mill Feed				Concentrates	
Year	Tons	Assay % Cu	Tons of Copper	000's lbs. Copper	000's lbs. Cu Recovered @ 94%	Dry Tons @ 33% Cu
1	348,000	2.185	7,603.8	15,208	14,296	21.661
2	174,000	2.185	3,801.9	7,604	7,148	10,830
	174,000	1.879	3,269.5	6,539	6,147	9,314
	348,000	2.032	7,071.4	14,143	13,295	20,144
3	348,000	1.879	6,538.9	13,078	12,293	18,626
4	348,000	1.879	6,538.9	13,078	12,293	18,626
Sub-Total	1,392,000	1.994	27,753.0	55,507	52,177	79,057
5	348,000	1.994	6,939.1	13,878	13,045	19,765
6	348,000	1.994	6,939.1	13,878	13,045	19,765
7 (½)	174,000	1.994	3,469.5	6,939	6,522	9,882
Totals	2,262,000	1.994	45,100.7	90,202	84,789	128,469

CHAPTER VI
PLANT SERVICES & CAMP

PLANT SERVICES

Because the mine is only four to five hours away from mechanical and electrical repair maintenance services in Vancouver, B.C., only minimum facilities are required at the mine.

Similarly, it is contemplated that since the concentrator can be situated immediately adjacent to the head frame over the shaft, all the buildings and services can be concentrated in one area.

The estimated capital cost for "Plant Services" is as follows:

(a)	Repair shops - provided for in "mine" estimate		
(b)	Offices & warehouses	$40,000	
(c)	Water, electrical & steam distribution	60,000	
(d)	Change house, first aid & shifter room	30,000	
(e)	Carpenter shop with equipment	5,000	
(f)	Assay office & equipment	20,000	
(g)	Heating plant	20,000	
(h)	Mobile equipment	35,000	
(i)	Road	50,000	
			$260,000

CAMP BUILDINGS & HOUSING

Houses and apartments to accommodate total of 50 employees at average cost of $15,000 per unit	750,000	
Bunkhouse accommodation for 100 men including equipment	75,000	
Sub-total		825,000
Site preparation	50,000	
Roads	15,000	
Construction camp - extra to present facilities	20,000	
Electrical & water distribution	40,000	
		125,000
Total		$950,000