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REPORT ON THE COLOSSUS MINE,  
FREDERICK ARM AREA,  
VANCOUVER MINING DIVISION OF B.C.

May 2/66

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REPORT ON THE COLOSSUS MINE,  
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INTRODUCTION

This report covers an examination made by the writer on April 27th and 28th, 1966, of the Colossus Mine located near the head of Frederick Arm on the mainland coast north of Campbell River, B. C.

The examination and report was made at the request of Alquin Mines Ltd., 404 - 510 West Hastings Street, Vancouver 2, B. C.

LOCATION AND ACCESS

The Colossus mine is located on the mainland coast at the head of Frederick Arm, about 33 air miles from Campbell River, B.C.

The mine workings are on Buker Creek, at an elevation of about 1300 feet above sea level. Buker Creek flows south into Estero Basin which is connected to Frederick Arm by a narrow gap. The direct distance from the head of Frederick Arm to the mine workings would be about 3.2 miles.

Present access to the mine workings is by helicopter from Campbell River. For operational purposes however, road access to the property could easily be provided from the end of an existing logging road which extends from a wharf at the head of Frederick Arm to a point approximately 1000 feet east of the portal of the main #3 level. This section is heavily timbered but has an easy gradient, and appears to be well covered with overburden, so the construction of the connecting road would present no difficulties.

TOPOGRAPHY, CLIMATE, WATER, ETC.

The topography of the property from the water to the mine is a generally even slope of about 20 per cent. cut by shallow ravines up to an altitude of about 1500 feet. Above this level, the terrain is more rugged, rising in a series of steep escarpments and cliffs.

The climate is that of the Lower Mainland. At the elevation of the mine some snow can be expected in winter, but it should not be heavy enough to impede operations.

The creeks running down the ravines carry ample water during the spring run-off, but it is felt that a permanent year round source of water will depend on the small lakes about half a mile below the mine which are fed by the creeks and which could have their storage capacity increased by damming the outlets.

There is ample timber on the property in the form of mature fir, hemlock and cedar.

PROPERTIES

The properties of Alquin Mines Ltd., consist of four Crown Granted claims, plus twenty-five claims and three fractional claims held by location, all in the Vancouver Mining Division. The names and record numbers of the claims are as follows:

<u>Name</u>	<u>Record No.</u>
Colossus C.G.	L.256
Bluebell C.G.	L.258
Portage C.G.	L.259
Champness Fr. C.G.	L.260
Lou #1 Fr. & Lou #2 Fr.	11603 & 11604
Lou #3 to Lou #16, incl.	11605 to 11618, incl.
Lou #17 Fr.	11619

<u>Name</u>	<u>Record No.</u>
Lou #18 to Lou #23, incl.	11620 to 11625, incl.
Lou #25 to Lou #29, incl.	11626 to 11630, incl.

A location plan accompanies this report.

#### EARLY HISTORY OF THE PROPERTY

There are a number of mentions of the Colossus mine in the B. C. Minister of Mines reports from 1902 to 1929 and the following history of the property has been summarized from these accounts.

The property dates from 1899, and in 1902 there is an account of underground development work being done by the B. C. Exploration Co. of London, England. Three levels with connecting raises were driven, and it would appear that practically all the present existing workings were completed during this period.

In 1929 the property was controlled by the Colossus Copper Co. of Vancouver, B. C. In the B. C. Minister of Mines report for 1929 there is a fairly complete description of the mine, and the principal part of this account is quoted below:

"The old Colossus group was first worked in 1899 and altogether some 3,000 feet of underground work had been done when acquired by the present company. The work consists of three adit-tunnels at 1,300 feet, 1,460 feet, and 1,550 feet elevations respectively; raises between the different levels; and an intermediate level between No. 2 and No. 3 levels. The two upper levels are in the ore-zone, but the No. 3 or lowest level did not intersect the ore-body, as it was cut off by a flat fault a short distance above the tunnel, but there should be no difficulty in locating it on this level.

This underground work shows a shear-zone in the grano-

diorite in which were many diorite dykes. The shearing action has created a broken-up belt, up to 40 to 50 feet wide, of granodiorite and dykes, the latter displaced in all directions. This was later impregnated with siliceous mineral-bearing solutions, which also infiltrated into the granite and diorite in the zone, as well as along the borders of the "vein." The crushed material in the zone has naturally caused an irregular mineralization, making conclusive sampling rather difficult.

The chief mineral is chalcopyrite carrying very little gold or silver. In some sections of the zone there are indications of molybdenite which as yet cannot be considered other than a possible value. A great number of samples have been taken, resulting in averages of from 1.5 to 3.5 per cent. copper. It has been found in sampling that during the many years the property has been opened up there has been a leaching action on the exposed ore, forming a coating which, when included in sampling, gave a lower average than if this outside coating were removed and deeper sampling done.

The No. 1 or top tunnel starts in the mineralized belt and crosscuts it for about 50 feet before entering the solid granite on the north side. East-west drifts in the belt from the main crosscut prove the extension of the mineralization along its strike for about 100 feet.

The No. 2 tunnel, 80 feet vertically lower, was driven from the surface through the granite to the mineralized belt, in which east-west drifts prove its length for over 200 feet, with a width in places of 40 feet or more. The extension of the north-east drift on this level runs out of the mineral-belt on the north side, but about 100 feet farther in has encountered another ore-body which may prove important. This is called the "north ore-body" and may be



the downward extension of surface exposures in that direction from the main body.

From the No. 2 tunnel a winze was sunk 80 feet, from which depth an intermediate level was driven. The winze follows the ore-body down for 40 feet, where it runs out of it. The intermediate level, a crosscut from the winze, again entered the ore-belt, showing it to be about 20 feet wide. No drifting has been done on the belt on this level. The winze extending down to No. 3 level shows the mineral-belt to be cut off by a rather flat fault. The lowest level has been driven 1,000 feet from the surface well under the ore-body, which, as stated, should be located without difficulty.

So far as opened up, the mineral-belt has been proven for a depth of 340 feet below the surface and about 200 feet in length in No. 2 tunnel. The limits of mineralization have, however, not been reached either east or west in the two upper tunnels and therefore the probabilities of the extension of the ore-bodies have not been exhausted. With the indicated available ore and its probable extension and the average copper content, it is evident that the possibilities warrant extensive development."

In addition to the accounts of the property in the Minister of Mines reports, it has been geologically mapped, sampled and had reports submitted on it on several occasions up to 1947 since the original workings were completed. The reports and maps made available to the writer are as follows:

Report on Lagoon Mine, by James B. Rowley, June 6, 1923.

Report on Colossus Mine by O. B. Smith, M.E. dated  
Nov. 8, 1924.

Report on Colossus Mine by T. S. Davey, dated  
May 3, 1947.

Geological maps of Colossus Mine by A. M. Richmond, M.E.,  
dated May 15, 1947.

In 1960 the property was optioned by Phelps Dodge Copper Co. Canada Ltd. The work carried out by this company consisted of the cleaning out and rehabilitation of the underground workings and the geological mapping of all the levels and surface exposures. In addition, a geochemical survey was conducted over part of the claim area. Copies of the geological and geochemical maps have been made available to the writer.

### GENERAL GEOLOGY

The Colossus mine lies within the Coast Range batholith of granodiorite cut by a great number of diorite and andesite dykes which strike and dip in all directions.

The mineral occurrences lie within a strong shear zone which cuts through the granodiorite and dike rocks and has produced a shattered zone over 50 feet wide of fragments of granodiorite and sections of dyke which have been displaced and contorted. This shattered zone has been partially replaced by quartz which carries the bulk of the ore minerals present.

As exposed by the three levels developed in the mine, the ore-bodies are in the form of irregular shoots which themselves show a high degree of fracturing and post mineral fault displacement. A major post mineral fault strikes N.60°E and dips 24°N.W. This fault is exposed in the intermediate level between #2 and #3 level, and appears in #3 level and has effectively cut off the downward extension of the main ore-body below the intermediate level.

Mineralization consists mainly of pyrite and chalcopyrite with minor amounts of molybdenite and gold-silver values. Malachite and azurite are present as secondary minerals.



EXAMINATION OF THE PROPERTY

In the examination of the mine by the writer on April 27th and 28th, all the underground workings were visited and inspected with the exception of the raise between #1 and #2 levels and the raise between the intermediate level and #3 level, as the ladderways in the two raises had not been repaired. The remainder of the workings were open and in excellent condition. The principal objective of the examination was to study the nature of the mineralization, and to check the geology as mapped by A. M. Richmond, and the Phelps Dodge Copper Corp. of Canada Ltd. For a description of the extent of the underground workings see section on "Early History".

The mineralization in the quartz ore-bodies is very erratic in nature, varying from very weak disseminations and almost barren white quartz, to large pods and streaks of massive pyrite and chalcopyrite. Close examination of freshly broken ore also indicated that molybdenite was much more prevalent than had been indicated in the reports of previous examiners. In some places it occurred as quite large blebs and as fracture fillings in the quartz, and seemed to be as common in one part of the mine as another.

The examination made it quite evident that due to the irregular shape of the ore-bodies and the erratic mineralization, that a few chip and channel samples would not be indicative of the average grade of the ore-bodies developed, but would only serve to indicate the range of values that might be expected. It is felt that only the average results of a large number of closely spaced diamond drill holes, or bulk sampling would give a true picture of the average mine grade.

From the observations made by the writer the mapping by

Richmond and Phelps Dodge Copper appears to be very complete and accurate. In Davey's report of 1947 however, he indicates that the main ore-body has been displaced laterally 180 feet by the major N.60°W. flat fault which is visible in the intermediate level and the #3 level, and that the displaced section of the ore-body appears under the fault in the #3 level at a distance of 970 feet from the portal. (Richmond suggests a displacement of 400 feet or more for this fault.).

No ore was noted in the tunnel at this point nor does the mapping show it. A section of mineralized quartz does appear however on the hanging wall side of the fault in x-cut 301L. Other small showings of quartz also occur in x-cuts 303L and 301R. (See level map accompanying this report.).

It is the opinion of the writer that these hanging wall quartz occurrences could represent a separate ore-body which will require further exploration to define its trend. In the same manner, further exploration by drifting and diamond drilling will be required to locate the off-set continuation of the main ore-body below the fault.

#### SAMPLING

A total of ten cut and grab samples were taken from mineralized sections of different parts of the mine. As stated before, these samples could in no way represent the average grade of the ore-body, but do serve to give some idea of the range of values that might be expected. The results are tabulated below,

with the location of most of the samples marked on the level maps which accompany this report.

Sample No.	Au. Oz./ton	Ag. Oz./ton	Cu. %	MoS <sub>2</sub> %	Remarks
3271	0.04	0.46	4.92	0.05	Chip sample over 4.5' #2 level
3272	Tr.	Tr.	0.45	0.03	Chip sample - inter. level
3273	0.02	0.38	2.41	0.08	Grab sample - inter. level
3274) 3275)	Tr.	0.02	3.09	0.07	Combined grab sample - muck pile #2 level
3276	Tr.	Tr.	0.48	0.07	H.W. of fault - #3 level
3277	Tr.	Tr.	0.17	0.02	Random chip sample - #1 level
3278	Tr.	Tr.	0.08	0.09	Random chip sample - #1 level
3279	Tr.	Tr.	0.05	0.01	Diorite - #1 level
3280	Tr.	Tr.	0.02	0.02	Chip sample - N. end - #1 level

The copper values vary over a wide range. This was expected due to the erratic distribution of sulphides in the quartz, but may be partly due to leaching of the copper minerals from the exposed rock surfaces.

The molybdenite values show much more consistency, and it is felt that to expect an average of 0.05% MoS<sub>2</sub> or 1 lb. per ton throughout the ore-body would not be unreasonable.

#### ECONOMIC CONSIDERATIONS AND ORE POSSIBILITIES

No attempt was made during the recent examination to make an independent estimate of the ore reserves presently developed. Two previous estimates have been made however, which were based on considerable sampling and measurement of the underground workings.

O. B. Smith, in his report dated Nov. 8, 1924, estimates a minimum proven tonnage of 250,000 tons grading 2.5 to 3.5 % Cu. with excellent possibilities of increasing this reserve by further development laterally and in depth.

T. S. Davey, in his report of May 3, 1947 has calculated a proven reserve of 130,000 tons of 3.06% Cu.

These previous estimates were based on copper at 15 to 20 cents per lb., only a very small credit for the gold-silver values, and nothing allowed for molybdenum. It is the opinion of the writer that with today's copper price of around 45 cents per lb., and allowing a possible \$1.00 per ton for recoverable molybdenum values, that a much lower grade of copper would be economic to mine, as the nature of the deposit would appear to be adaptable to a cheap, long-hole type of mining method.

Acceptance of a lower cut-off grade for copper should greatly increase the proven reserves of ore in the developed section of the mine, and there exists the good probabilities for the development of further ore blocks on the upper levels as well as encountering the downward extentation of the ore below the #3 level.

#### SUMMARY AND CONCLUSIONS

The Colossus Mine lies near the head of Frederick Arm on the Mainland coast. The granodiorites of the Coast Range batholith have been cut by a wide shear zone, and this shattered zone within the shear has been partially replaced by quartz carrying mineralization in the form of pyrite, chalcopyrite, minor amounts of molybdenite, and small values in gold and silver.

The mineralized zone has been developed by three adit levels and an intermediate level connected by raises, for a total underground development of approximately 3075 feet over a vertical range of approximately 300 feet. A major flat dipping fault cuts off the main ore-body below the intermediate level, and so far the #3, or bottom adit level has not been advanced far enough to encounter the downward extension of the displaced orebody.

Previous ore estimates indicate a proven reserve of between 130,000 and 250,000 tons grading approximately 3.0% Cu. Recent sampling indicates the possibility of about \$1.00 per ton in molybdenum values.

Regional exploration work by Phelps Dodge Copper Corp. of Canada Ltd. has indicated a geochemical anomaly about 4,000 feet east of the mine, but this has not been checked out by other exploration methods.

The property is ideally situated close to tidewater and is within 1,000 feet of an existing access road. It is considered probable that the previously reported ore reserves could be greatly increased both by diamond drilling, and by inclusion of blocks of lower grade material which had been considered uneconomic to mine at the time of the estimates. In addition, regional exploration by geophysical means might locate additional ore-bodies within the claim area.

In general, the property offers definite development possibilities and should be subjected to a program as outlined under "Recommendations".



### RECOMMENDATIONS

The property requires a three phase exploration program as follows:

1. Short Range - A series of short range horizontal drill holes should be drilled from stations in the #1, intermediate, and #2 levels to outline the limits of the known ore-bodies and to provide a better evaluation of the average grade of these bodies.
2. Long Range - A detailed geological study should be made of the fault movement in the mine to be followed by a long range drifting and diamond drilling program to locate the downward extension of the main ore-body below the main fault, as the best opportunity for substantially increasing the ore reserves of the mine depend on the success of this program.
3. Outside Exploration - The geochemical indications of copper to the east of the mine should be followed up with further geochemical and geophysical surveys. If the results of this work are favorable, surface diamond drilling should be initiated.


### ESTIMATE OF COSTS

The following estimate of cost of carrying out the program outlined under "Recommendations" may be used for budgeting purposes. The actual amount of expenditure justified will depend on



appraisals of the program as it advances.

Access road .....	\$ 2,000.00
Equipment rental and purchase .....	10,000.00
Short range drilling, (allow 3,000' @ \$6.00/ft.).....	18,000.00
Long range drilling, (allow 5,000' @ \$7.00/ft.).....	35,000.00
Drifting and x-cutting .....	10,000.00
Camp construction, administration and travel .....	10,000.00
Engineering, assaying, etc. ....	5,000.00
Geological and geophysical surveys and studies .....	10,000.00
 TOTAL .....	<u>\$100,000.00</u>



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Consulting Mining Engineer.

T S L

# Laboratories Limited

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ASSAYERS  
CHEMISTS  
GEOCHEMISTS

## CERTIFICATE OF ANALYSIS


SAMPLE(S) FROM Mr. W.J. WEYMARK

REPORT NO.  
V - 204

10 SAMPLE(S) From Colossus Mine by James P. Elwell, P.Eng.

	Gold (Au) Troy ounces per 2,000 lbs.	Silver (Ag) Troy ounces per 2,000 lbs.	Copper (Cu) %	Molybdenum (MoS <sub>2</sub> ) %
3271	0.04	0.46	4.92	0.05
3272	trace	trace	0.45	0.03
3273	0.02	0.38	2.41	0.08
3274 & 75	trace	0.20	3.09	0.07
3276	trace	trace	0.48	0.07
3277	trace	trace	0.17	0.02
3278	trace	trace	0.08	0.09
3279	trace	trace	0.05	0.01
3280	trace	trace	0.02	0.02
3300	trace	trace	0.12	0.02

DATE May 2, 1966

SIGNED 

CERTIFICATE

I, JAMES PAUL ELWELL, of 4744 Caulfeild Drive, West Vancouver, B. C., do hereby certify that:

1. I am a Consulting Mining Engineer residing at 4744 Caulfeild Drive, West Vancouver, B. C., and with an office at 929 - 510 West Hastings Street, Vancouver 2, B. C.
2. I am a graduate in Mining Engineering from the University of Alberta in 1940, and am a Registered Professional Engineer in the Province of British Columbia.
3. I have no personal interest, directly or indirectly, in the properties examined or in Alquin Mines Ltd., N.P.L.
4. The findings in this report are based on an assessment of information obtained from various geological reports which have been acknowledged, and from the examination of the property by me on April 27th and 28th, 1966.

DATED at Vancouver, B. C. this 2nd day of May, 1966.

  
JAMES PAUL ELWELL, P. ENG.