When replying please refer to
File #49-120.

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499-44

February 2, 1944.

A.S. Baillie, Esq., President,
Granby Consolidated Mining, Smelting,
& Power Co., Ltd.,
675 W. Hastings Street,
Vancouver, B. C.

Dear Sir:

With a view to obtaining such familiarity with the mine and understanding of the geological setting, as are possible in a limited time we should like to have two of our engineers spend ten days or so at your Company's "Copper Mountain" Mine in the near future.

At a later time we may be able to have a party examine prospects in the same area, and in that case the preliminary work now proposed would constitute a starting point for a project which would probably result in the publication of a bulletin. At present no publication is proposed. However, the information gained would be useful to the Department, both in regard to the "Copper Mountain" Mine and the study of the mineral deposits.

It will be very much appreciated if you will arrange that our engineers can be accomodated at the mine and receive such help as practicable, in being guided about the workings, and supplied with information and with copies of plans or other drawings. We should be very glad to meet the expenses for such accomodation and for plans, etc.

I hope that this request will receive your favourable consideration. Thanking you, I am,

Yours very truly,

Chief Mining Engineer.

HS/RP

PROPERTY FILE

L 49-120

February 4, 1944.

W. I. Nelson, Esq.,
General-Superintendent,
Granby Cons. M.S.andP. Co., Ltd.,
Copper Mountain, B. C.

Dear Mr. Nelson:

In accordance with telephone conversation with Mr. Baillie this morning, I would advise you that M.S. Hedley and S.S. Holland, of our staff, will arrive in Princeton by Kettle Valley East Bound, on morning of Wednesday, February 9th.

They will proceed to Copper Mountain by bus for the purpose outlined in my letter to Mr. Baillie. After the proposed closing of your staff house they will have to make whatever arrangements that can be made for accomodation.

I am much obliged to Mr. Baillie for telephoning this morning. Thanking you, I am,

Yours very truly,

Chief Mining Engineer.

HS/RP

When replying please refer to
File No. L49-120.

March 3, 1944.

A. S. Baillie, Esq.,
Manager,
Granby Consolidated Mining,
Smelting, & Power Co., Ltd.,
Copper Mountain, B. C.

Dear Mr. Baillie:

I am forwarding two copies of Dr. Holland's and my brief report on Copper Mountain, one of which you might like for your files.

Since we were at the mine I find that the material of the report might be used for purposes other than strictly Departmental record, such as the possibility of joint planning with the Dominion Government, but publication is not considered. I shall be glad if you care to make any reservations concerning any of the statements in this report and check it for accuracy, returning our copy here, with your comments. We told you at the time that the information was wanted for Departmental use only, and of course, inter-governmental use is essentially the same thing.

Dr. Holland joins me in thanking you for the courtesies shown us on our recent visit.

Yours very truly,

Mining Engineer.

MSH/RP

~~Replicate~~ P13
correction for P13

The main value of such work would be to the Copper Mountain mine, for the success of future ore exploration largely depends on it, but valuable information should result that might be of direct benefit to the development of the Voigt camp deposits.

Mining Methods:

Mining started in early years of operation with spiral stopes in large ore-bodies and shrinkage stopes in small ore-bodies, as well as glory holes. The spiral stopes were modified to suit conditions and during the last two or three years a system of "long slope" mining was employed. This consisted of systematically removing 20 per cent of the ground in an ore-body by a number of 50-degree raises, closely drilling the intervening ribs with percussion drills and blasting a whole block at one time.

The large blasts which have broken as much as 500,000 tons at once, resulted in more dilution than was anticipated. However, the falling off in grade during the past three years has been partly attributable to dilution and partly to the lower tenor of the ore blocks mined. The Company's development policy established in 1937-38 was determined after giving full consideration to the two important factors of (1) maximum recovery of ore, and (2) mining by the most economical methods. This policy necessitated the removal of the ore in proper sequence to insure maximum ore recovery regardless of the fact that certain blocks involved were of lower tenor. Some dilution, particularly from the mine dykes and weak walls, is inevitable regardless of the type of mining but the large blasts did produce boulders which further tended to increase the dilution due to channels between boulders permitting the seeping through of finer low grade material which by-passed the ore.

The mining of large ore-bodies close to the surface has resulted in much subsidence. There is one caved area about 800 by 3,000 feet, largely in the area of former glory holes, and this will increase somewhat as mining continues. In most sections the caving is on a 70-degree slope down to the workings below, but in some instances it is as low as 50 degrees.

Recently an entirely new method of stoping has been evolved. It is in course of trial at present but there is no apparent reason why

Report on

Copper Mountain Mine

March 1/44

References:

V. Dolmage - Geology of Copper Mountain - Geol. Survey Can. Mem. 171, 1934

Origin of Copper Mountain Ores - Bull. C.I.M.M. June 1929, p. 788

~~W. I. Nelson and~~ F. Buckle - Mining Methods at Copper Mountain - Trans C.I.M.M. XLIV 1941, pp. 213-229

R. S. Douglas - Mining Methods at Copper Mountain - Bull. C.I.M.M. Nov. 1943.

The following summary account of Copper Mountain mine is the report on a seven day visit to the mine from February 9 to February 15, 1944 by M. S. Hedley and S. S. Holland acting under instructions to gain a familiarity with the mine and an understanding of the geological setting.

Prints of the following maps were obtained from the company and are attached:

Claim map

Contoured surface map

Maps of Levels Nos. 1 to 8 on a scale of 1" = 100'

Two Longitudinal sections through the contact ore zone

Two Plans showing layout and loading data for a Diamond Drill Blast.

Introduction:

The Copper Mountain mine is on the summit and western slope of Copper Mountain, 12 miles south or Princeton. It is developed for a length of 6,000 feet, a width as great as 1,000 feet and a depth of 1,400 feet. Mine-run ore is crushed at the portal of No. 6, the main haulage adit level and is hauled by railroad to the mill at Allenby, 8 miles distant. All ore mined above No. 6 level is transferred down to it by a system of raises and ore mined from the lower levels, Nos. 7 and 8, is hoisted in a vertical shaft.

After many years of surface exploration and some underground development, during which time a mill was built, the property was acquired by the Granby Consolidated Mining Smelting & Power Company Limited in 1926. The mill was modified and increased to a capacity of about 2,500 tons daily; and the company operated continuously until 1930 when the price of copper fell below a profitable level.

Operations were resumed in 1937 when the company further expanded the mill to an ultimate capacity of about 4,500 tons per day, and supplied their own power in a steam generating plant using fuel from their own coal mine. All concentrates were shipped under contract to Japan, until Oct. 1940 since which time the concentrates have been shipped to the Tacoma Smelter.

In 1942 the concentrates were sold through Wartime Metals Corporation at a bonus price and this contract was maintained until December, 1943, when the contract was cancelled.

The mine is a low grade one, operating on about 1.4 per cent copper for a number of years, but the grade fell far below that figure during the past three years. Gold and silver values are low. Reserves have been maintained to about ten year's supply during the last seven years, but little exploratory work was done in 1943. The underground crew has fallen off with the manpower shortage from about 400 to 120 men.

Geology:

The following geological summary pre supposes a prior reading of Dolmage's "Geology of Copper Mountain", Memoir 171 of the Geological Survey of Canada.

The surface geology, in spite of widespread overburden, was accurately mapped by Dolmage from outcrops and from many old prospect trenches in the vicinity of the mineralized area that were open for inspection at the time of his work.

The Copper Mountain ore-bodies are in belt of volcanic rocks lying along the northeast contact of a differentiated gabbro stock. A second (Voight) stock lies several thousand feet to the northeast. In the belt of volcanics between the Copper Mountain and Voigt stocks are a series of intrusive bodies mapped by Dolmage as the Lost Horse diorite. A swarm of ramifying, post-mineral felsite porphyry and granophyre dykes cut the Copper Mountain stock, volcanics, and ore-bodies in the neighborhood of the Copper Mountain mine. Pegmatite stringers and dykes cut the margin of the gabbro and the adjacent volcanics.

The volcanic rocks as seen in the Copper Mountain workings consist of fine grained dark tuffs, some of which show bedding in a few places, as well as volcanic rocks of other types. A band of coarse volcanic breccia is exposed in crosscuts on 6 level and also on 8 level. Dark grey equigranular or porphyritic rocks in the volcanics may possibly be dykes or sills of pre-mineral age. The general strike of the volcanic rocks is northwest, parallel to the northeast contact of the Copper Mountain stock, and observed dips are to the southwest, towards the gabbro contact. Although the volcanic rocks are considerably altered and have few easily recognizable features it might be possible by detailed mine mapping to work out folded structures within them. That the volcanics are drag-folded is indicated by the surface pattern of some beds mapped by Dolmage, but not published in his Memoir 171.

The Copper Mountain stock is well described by Dolmage. Its northeastern contact is important because of the ore-bodies lying along it. The marginal phase of the stock is a massive dark grey equigranular rock containing biotite and described by Dolmage as a syeno-gabbro. For several hundred feet from the volcanic contact the gabbro is foliated parallel to the contact. For four or five thousand feet in the vicinity of the mine workings the northeastern gabbro contact is almost straight, with only minor irregularities and a slight convexity to the northeast, while at depth the contact is almost vertical within the range of the mine workings, about 1,400 feet.

The Voigt stock lies a mile to the northeast of the Copper Mountain stock. It is too far away to appear in any of the mine workings or diamond drill cores.

Dolmage maps large and small areas of Lost Horse intrusives lying to the north of the mine workings, northward from the Princess May ore-bodies. However, in crosscuts to the east on 6 level, 500 feet and more from the gabbro contact, there are exposures of altered volcanic rocks whose alteration is attributed to Lost Horse intrusives. This particular area of volcanic rock is important because of the outlying ore-bodies within it. There is however no exposure of actual Lost Horse intrusive rock seen in the mine workings and geological information is notably deficient as to the position and contact of the Lost Horse intrusive. It is not known whether it exists either as a continuous intrusive body or as a series of isolated intrusions to the northeast and east of the gabbro stock. The Lost Horse intrusives appear important, for most outlying ore-bodies lie in its alteration zone, yet nowhere is the actual intrusive encountered underground.

Pegmatite forms the core of the Copper Mountain stock. In addition narrow pegmatite stringers and dykes cut the gabbro margin of the stock as well as the adjacent volcanics. The pegmatite dykes in the volcanics are intruded along fractures parallel to the ore-fractures. The pegmatite stringers and dykes may contain some bornite, may be accompanied by a narrow selvedge of biotite alteration in the invaded volcanics, or by a bleach alteration of both gabbro and volcanics. Formerly it was thought at the mine that the pegmatites brought in the ore, but this view has been abandoned largely because there is no spatial relationship between the occurrence of ore and the abundance of pegmatites.

The Mine dykes are light coloured felsite porphyry and granophyre dykes which cut the gabbro, volcanics and ore-bodies. They are unmineralized and shatter readily so that in the mining operation they add a considerable amount of dilution.

Rock Alteration:

Throughout the mine workings the rocks are altered in varying degrees and in a variety of ways. The most pronounced alteration seen underground is a biotitization of the volcanic rocks marginal to the gabbro stock. This alteration is a contact metamorphic effect related to the gabbro intrusion, but it appears to be variable, as though original differences in rock composition might have influenced its intensity. The biotite alteration zone extends for 400 feet or more eastward from the gabbro contact. It is not known whether biotitization of volcanics in the eastern zone of Lost Horse alteration is related to the gabbro or not.

The other pronounced alteration of the volcanic rocks is in the vicinity of the outlying ore-bodies; it lies several hundred feet

east of the gabbro contact but approaches the gabbro in the zone of the Princess May ore-bodies. It is characterized by the formation of a dense chert-like rock with a pale olive green cast, presumably from the development of small augite grains. It is accompanied in places by a blotchy development of pinkish coloured feldspar, and by a coarsening of the rock texture. This alteration is more intense to the east, away from the gabbro, hence it is presumably related to the Lost Horse intrusives even though none of those rocks are seen underground. The distribution of the Lost Horse alteration zone is not shown on the mine geological plans.

The pegmatite stringers are accompanied by a bleaching of either the gabbro or volcanics, presumably from the introduction into them of feldspar. There appears to be no difference between the bleaching accompanying pegmatite, and that accompanying ore deposition; many ore fractures in the contact zone are bounded by a bleached zone. Occasional hairline cracks of epidote are seen in the gabbro.

The two rock alterations, biotitization and Lost Horse type, are particularly prominent. To what extent their development is influenced by original rock compositions or fracturing is not known. The biotitization preceded the deposition of ore but it is not known whether the Lost Horse alteration preceded or accompanied the ore. Of the two, however, the Lost Horse appears the more important because of its relation to the outlying ore-bodies.

Ore-bodies and mineralization:

The Copper Mountain ore-bodies are in zones of intense rock alteration and in a zone where the Mine dykes are most abundant. Of the numerous ore-bodies of the Copper Mountain mine the most

important during early stages of development were those which are in biotitized volcanics along the northeastern contact of the gabbro stock. They extend along the stock for about 3,000 feet, outcrop at the surface at two points and bottom approximately at 8 level, having a vertical range of about 1,400 feet. The various other ore-bodies referred to as outlying ore-bodies are in the altered volcanic rocks to the east of the Contact ore-bodies. The Princess May ore-bodies, although close to the gabbro contact, lie a thousand feet or so northwest of the Contact ore-body and differ materially from it; actually they are more like the outlying ore-bodies in mineralization and rock alteration. There are no Mine dykes in the barren zone between the north end of the Contact ore-bodies and the Princess May.

The mineralization of the Contact and outlying ore-bodies differ in that the Contact is predominantly bornite with small amounts of chalcopyrite while the outlying ore-bodies are largely chalcopyrite with a small amount of bornite and some pyrite. It is remarkable to note that there is no quartz as veinlets or gangue in any part of the mine workings.

The ore mineralization is controlled by the ore-fractures which strike more or less at right angles to the gabbro contact and dip northwest from 65 to 80 degrees. No individual fracture extends for any great distance, but both the margin of the gabbro and the adjoining volcanics are fractured; there is no ore in the gabbro. The ore minerals are deposited as thin films along the ore-fractures and in high grade contact ore there is considerable disseminated bornite between the fractures. The disseminated bornite appears to be in biotitized volcanics but not in the bleached rock which bounds some ore-fractures and some pegmatites. Although the dominant direction of ore-

fracturing is northeast there is a very much weaker conjugate direction almost east and west which is mineralized as well.

In the mine the ore-bodies in general have assay boundaries except against the sharply defined post-mineral Mine dykes and in general against the gabbro. The tenor of the ore depends on the closeness of the spacing of the mineralized ore-fractures and, in the Contact ore-bodies, also on the amount of disseminated copper minerals between them. The outlying ore-bodies have a ragged, fringed outline because of the control exercised by the ore-fractures. On the mine plans the outline is an arbitrary boundary that only in a very general way shows the shape of the ore-body. Actually both ore-fractures and ore mineralization extend beyond the limits of the mapped ore-bodies, and even within the ore-bodies there are fairly continuous bands of poorly mineralized or barren volcanics that must be mined with the ore.

Longitudinal cross sections through the outlying ore-bodies show them dipping steeply to the northwest, reflecting the dip of the ore-fractures. Transverse cross sections through them indicate a general tendency for them to plunge steeply to the southwest towards the gabbro contact, but they do not quite reach it.

Practically all of the ore-bodies are bottomed fairly sharply between 6 and 8 levels. This bottomming of the ore above the 8 level constitutes a major geological problem, the proper interpretation of which has an important bearing on future exploration.

The dominant bornite mineralization of the Contact ore-body in the biotitized volcanics along the gabbro contact stands out in sharp contrast to the chalcopyrite mineralization of the outlying ore-bodies in the Lost Horse type of alteration. The significance of this

difference is not known but it is suggestive of different origins for the two types of mineralization. At the present stage there is nothing to prove that the ore came from either the gabbro stock or the Lost Horse intrusives. But some explanation of the mineralogical difference is necessary. Should more importance be attributed to the Lost Horse intrusives than to the gabbro then a considerably greater area is available for further exploration.

Structure:

The regional trend of the volcanic rocks is northwest and the dips are generally to the southwest. However during the course of his surface mapping Dolmage mapped the outcrop of a coarse-grained non-fragmental bed whose zig-zag pattern strongly suggests that there are plunging drag-folds within the volcanic belt. Bedding observed in the mine dips towards the gabbro contact and the position of a coarse volcanic breccia on 8 and 6 levels indicates that all the ore-bodies developed so far lie in a wedge of volcanic rocks bounded on the west by the more or less vertical gabbro contact and on the east by the southwesterly-dipping coarse breccia bed.

Four generally east-west faults cut the rocks and ore-bodies. They may be accompanied by a wide shattered zone but do not have a displacement of more than 25 feet. Throughout the mine there are numerous other slips and fractures having little or no displacement but some of which are occupied by calcite stringers. The post-ore Mine dykes occupy an extensive fracture pattern whose significance is not definitely known.

The ore-fractures are discontinuous cracks occurring in swarms and having a northeast strike and a steep northwest dip.

Dolmage stresses the fact that the biotitized volcanics are foliated parallel to the gabbro contact and that the ore-fractures are at right angles to the foliation. In conversation he suggested that the ore-fractures are complementary tension openings at right angles to the direction of elongation. However, on 6 level southeast a pegmatite stringer was seen occupying an ore-fracture but having subsidiary branches at an angle suggesting tensional openings at an angle to a shear direction. Moreover examination of many ore specimens reveals that beside the predominant ore-fracturing direction there is a subsidiary mineralized fracture direction whose pattern reflects the same set of conditions. There is a suggestion therefore that the ore-fractures are shear plane directions that have subordinate tension fractures associated with them. This is no more than a suggestion but it is believed that a thorough structural analysis could prove the nature of the fracture pattern and might be of value in exploration.

The importance of the ore-fractures is apparent but the distribution of the fracturing and the relationship to possible folded structures in the volcanics, or to different rock types or zones of rock alteration, is not known. The whole course of future ore exploration hinges on the correct interpretation of these relations and the projection of the correct hypothesis into hitherto unexplored areas.

The bottomming of the ore-bodies above 8 level evidently is due to the lack of ore-fractures at that depth, probably because of the appearance of a rock type that did not fracture suitably. The appearance of coarse breccia close to the gabbro contact suggests a wedging against the gabbro. The rocks on 8 level appear different from those above; they are softer and are strongly sheared parallel to the gabbro contact. This shearing does not appear on 6 level and is difficult to explain.

Hypothetical Considerations:

Formerly it was considered at the mine that the pegmatites were the feeders of the mineralization. This idea has been abandoned since later development work has shown no spatial relationship between the number of pegmatites and the occurrence of ore-bodies.

The mineralogical differences between the Contact and outlying ore-bodies suggest that the two mineralizations are from separate sources. The present emphasis is to place more importance on the Lost Horse intrusives. This is particularly significant now that most of the Contact ore-body is mined and much of the developed ore reserve is in the outlying ore-bodies apparently related to the Lost Horse intrusive. However the actual source or sources of the mineralizing solutions is of less importance than the knowledge of the factors that have resulted in the distribution of the ore-fractures. An important point is to determine whether the Lost Horse type of alteration conditioned the volcanic rocks so that they subsequently were brittle enough to fracture or whether the rock alteration accompanied the mineralization along pre-existing ore-fractures.

The explanation of the spatial distribution of the ore-fractures is exceedingly important. It would require extremely detailed geological mapping of the mine workings, the careful plotting of minute differences between various types of volcanic rocks, the plotting of intensities of rock alteration of the various kinds, and the plotting of the density of ore-fractures and whether they are mineralized or not. This together with further information regarding the size, position and contacts of Lost Horse intrusives to the east of the mine workings are necessary to explain the distribution of the ore-bodies. At present it is possible to say that the ore-bodies are

known only in a wedge of volcanic rocks bounded on the west by the gabbro contact and on the east by a coarse volcanic breccia.

Cannon, the mine geologist, suggests that the 32, 34 and 37 ore-bodies on 6 level lie in an embayment in the Lost Horse alteration zone; Moreover the Princess May ore-bodies, which lie in a zone of Lost Horse alteration are close to the gabbro contact only because the Lost Horse intrusive is nearby. There seems no doubt but that there is ore genetically associated with the Lost Horse alteration zone. The real deficiency is the lack of knowledge regarding its position and extent.

Although the Mine dykes are younger than the ore it is significant that the greatest number of them is in the zone of ore-bodies. Dolmage maps none either north or south of the mine but to the northeast at Voigt's Camp there is a second swarm of them. The implication of this may be that the Mine dykes occupy a fracture zone that primarily served as a channel way for the introduction of mineralizing solutions into the fractured volcanic rocks.

Geological Problems:

The most important geological problem at Copper Mountain has to do with the localization of the ore-bodies. It is true that they are primarily controlled by ore-fractures but further information is required in order to explain the distribution of the ore-fracture system. Subordinately a study of the rock alteration is required mainly for the information that might be applicable to the fundamental question and to assess if possible the relative importance of the gabbro stock and Lost Horse intrusives.

The ore-control appears to be largely a structural problem whose explanation can only be obtained from a most detailed examination of the mine workings in conjunction with a surface study in special sections.

The main value of such work would be to the Copper Mountain mine, for the success of future ore exploration largely depends on it, but valuable information should result that might be of direct benefit to the development of the Voigt camp deposits.

Mining Methods:

Mining started in early years of operation with spiral stopes in large ore-bodies and shrinkage stopes in small ore-bodies, as well as glory holes. The spiral stopes were modified to suit conditions and during the last two or three years a system of "long slope" mining was employed. This consisted of systematically removing 20 per cent of the ground in an ore-body by a number of 50-degree raises, closely drilling the intervening ribs with percussion drills and blasting a whole block at one time.

The large blasts which have broken as much as 500,000 tons at once, resulted in more dilution than was anticipated. However, the falling off in grade during the past three years has been partly attributable to dilution and partly to the lower tenor of the ore blocks mined. The Company's development policy established in 1937-38 was determined after giving full consideration to the two important factors of (1) maximum recovery of ore, and (2) mining by the most economical methods. This policy necessitated the removal of the ore in proper sequence to insure maximum ore recovery regardless of the fact that certain blocks involved were of lower tenor. Some dilution, particularly from the mine dykes and weak walls, is inevitable regardless of the type of mining but the large blasts did produce boulders which further tended to increase the dilution due to channels between boulders permitting the seeping through of finer low grade material which by-passed the ore.

The mining of large ore-bodies close to the surface has resulted in much subsidence. There is one caved area about 800 by 3,000 feet, largely in the area of former glory holes, and this will increase somewhat as mining continues. In most sections the caving is on a 70-degree slope down to the workings below, but in some instances it is as low as 50 degrees.

Recently an entirely new method of stoping has been evolved. It is in course of trial at present but there is no apparent reason why

it should not prove satisfactory for most of the ore-bodies which are too large to be mined economically by standard shrinkage stoping.

This new method is a modified form of shrinkage stoping in horizontal slices drilled off with a diamond drill. Holes are drilled in a radiating pattern from conveniently located raises 100 to 150 feet apart within an ore-body. The holes are 1-3/16 inch in diameter, drilled with plug bits, and are loaded with 1-inch powder to a uniform areal density, and the entire series of holes is blasted at once. Each slice is 10 feet thick.

In practice the outlines of the ore-body are predetermined and the pattern of holes is laid out in the office, a print of which is furnished to the contract drill crew. The drillers then follow instructions implicitly as to the length of each hole and the divergence between holes, ideally drilling a complete horizontal ring from one setup in each raise. The holes are loaded to a calculated powder density and the horizontal slice is sheared (shot down) at one blast, dropping about 8 feet to the muck below to insure fragmentation.

It has been found to date that rigid control of the outlines of the stope is possible; there is little shattering of the walls, due to the fact that the holes are spaced about 6 feet apart along the stope walls at each 10-foot interval; and fragmentation is better than that obtained by the former methods of large blasts. The costs appear already to be substantially lower and a reduction in secondary breaking cost is an added advantage. By rapid drawing of completed stopes it is believed that dilution will be kept to a minimum.

Ore-bodies:

As already stated the ore-bodies are for the most part copper-

bearing zones with assay boundaries. Their outlines are established as a compromise between grade and cost of mining. There are about 45 named ore-bodies in the mine, some of which are distinct only because various factors favour their separate mining. In detail the outlines are ragged and ribs of low-grade material exist in or extend through them, but for purposes of mining the limits are set more or less arbitrarily to take in maximum tonnage at a profitable grade.

The Mine Dykes have a great influence on mining since they cut through some ore-bodies and form boundaries of others. Being barren and structurably weak the laying out and operation of stopes is, as far as possible designed to limit the chances of dilution by dyke material. In a few instances attempts have been made to mine the dykes separately but not with complete success; in many parts of the mine ore and dyke are mined together at a reduced grade within a single ore-body when it is evident that the dyke rock can not be left as a pillar.

In point of view of total tonnage the largest ore-body is that known as the "contact", with about 6 million tons. Next are the "36" with 3.36 million tons and the "A14" with 2.4 million tons. The smallest ore-body contains about 50,000 tons.

The contact ore-body is now mined out above 6 level and only a relatively small proportion remains, partly in unmined ground below 6 level and partly as sill pillars. It was the first body to be fully explored, being for its size the highest in grade, and for some years it was considered to constitute most of the total mine tonnage rather than about one quarter as now known.

The contact ore-body follows the gabbro contact for about 1,000 feet, has a width ranging from 10 to 150 feet and a total depth of 1,400 feet. It reached the surface only at one point and only one

small section persists for a short distance below 8 level. Other bodies exist on the gabbro contact which, genetically, may be considered as part of the same ore-body, with a total developed tonnage 29 per cent of the known mine.

The other ore-bodies lie within the volcanics as far as 800 feet from the gabbro. Not all reach the surface and none persist downwards as far as 7 level. The greatest single cross-section, in 36 ore-body, is 150 by 500 feet. Several of the ore-bodies are in reality parts of a single large ore zone separated by dyke rock.

In the early stages of mining most of the ore came from the Contact and related ore-bodies, where there is very little dyke rock and the percentage of dilution was small. At the same time the ore was relatively high in grade. In recent years more and more ore has come from the outlying ore-bodies, for the most part within two major ore zones. The grade is satisfactory but these ore-bodies are cut by many dykes and dilution has been such that, unless better mining methods are used, the operation is imperilled at current copper prices.

Production:

Since the start of large scale milling operations in 1925 the mine has produced approximately 3,720,000 tons at a grade of 21.75 pounds of recovered copper per ton or a millhead grade of 1.33 per cent copper. (calculated at a net recovery of 82%, as at present) At current metal prices the gold and silver content, on the average, amounts to about 33¢ recovered per ton.

The tonnage milled increased from 669,000 in 1926 to 928,000 in 1929, averaging for the five years, 1926 to 1930,

789,000 tons per year. After reopening the mine in 1937 the tonnage rose from 1,223,000 in 1938 to 1,761,000 in 1941, fell off somewhat in 1942 and was further reduced in 1943 to about 1,370,000 tons.

The grade of copper averaged about 1.40 per cent until 1941, when it dropped to 1.285 per cent; it fell to 1.14 per cent in 1942 and about 1.0 per cent in 1943.

The foregoing figures are taken from Departmental records with the exception of the 1943 tonnage and grade which are based on analysis of figures put out by the Company.

Ore Reserves:

The ore reserve sheet, furnished by the Company, shows a minable reserve of 11.48 million tons at a grade of 1.63 per cent copper. This tonnage will suffer dilution on mining and the Company's estimate is that the dilution will be 51 per cent with material at a grade of 0.35 per cent copper.

Ore Possibilities:

With the possible exception of the Princess May ore-body the ore developed to date lies in a wedge of volcanics bounded on the west by the gabbro contact and on the east by a coarse volcanic breccia. The bottomming of ore-bodies above the 8 level may be the result of the convergence of the breccia and the gabbro. In this zone from 6 level to the surface and from the Princess May southward for about 6,000 feet the gabbro contact has been fairly thoroughly prospected. That other outlying ore-bodies lie to the east of the gabbro contact and are not explored by existing crosscuts and diamond-drill holes appears as a reasonable possibility. An

accurate geological concept of the controls of mineralization within this zone would be invaluable to exploration.

Moreover the nature of the rock and the ore possibilities lying east of and beneath the coarse volcanic breccia have not been adequately tested. A considerable volume of completely unexplored ground that has distinct exploratory value could be reached by driving either 10 drift or 30 drift on 6 level farther east and diamond-drilling to both north and south from it. Doing this would yield considerable geological information as to the nature of the volcanic rock that lies to the east of the breccia, and would help to unravel one of the major problems of structure. If favorable ground lies east of the breccia it might be expected to intersect the gabbro contact at some depth below 8 level.

Diamond-drill holes for maximum information should be drilled at right angles to the plane of the ore-fractures. Any drilling done more or less parallel to the ore-fracturing direction has small chance of cutting ore for it is possible for a drill hole to cut longitudinally through an ore-body and yet show low copper mineralization.

March 1, 1944.

MINE
COPPER MOUNTAIN
B. C.

CONCENTRATOR
ALLENBY
B. C.

THE GRANBY CONSOLIDATED MINING, SMELTING AND POWER COMPANY, LTD.

1262

Copper Mountain, B. C.,
March 16th, 1944.

Mr. M. S. Hedley,
Mining Engineer,
Department of Mines,
VICTORIA, B. C.

X-mitten

Dear Sir: Your File No. L49-120

I am returning herewith one copy of your and Dr. Holland's report on Copper Mountain but wish to make the following changes.

Under References, Page 1, correction noted in pencil.

Under heading of Mining Methods - Page 13, Paragraph 2. I have discussed with our mining staff, most of whom were with us in 1937 and 1938 at the time when the future development policy of the Company was laid out and it is our joint opinion that the second paragraph should be changed to read as follows:

"The large blasts which have broken as much as 500,000 tons at once, resulted in more dilution than was anticipated. However, the falling off in grade during the past three years has been partly attributable to dilution and partly to the lower tenor of the ore blocks mined. The Company's development policy established in 1937-38 was determined after giving full consideration to the two important factors of (1) maximum recovery of ore, and (2) mining by the most economical methods. This policy necessitated the removal of the ore in proper sequence to insure maximum ore recovery regardless of the fact that certain blocks involved were of lower tenor. Some dilution, particularly from the mine dykes and weak walls, is inevitable regardless of the type of mining but the large blasts did produce boulders which further tended to increase the dilution due to channels between boulders permitting the seeping through of finer low grade material which by-passed the ore."

We would greatly appreciate it if your report would embody the above suggested corrections as we believe with these corrections your report is a very comprehensive summation of our situation.

I can assure you the staff joins me in trusting we will have the pleasure of a return visit from you and Dr. Holland at the first opportunity.

Yours very truly,

A D Baillie

Vice Pres. & Gen. Mgr.

ASB:edn
cc: WIN
encl.

In replying please refer to our File No. L49-120

March 20, 1944.

A. S. ~~Bailey~~ Baillie, Esq.,
Vice Pres. & Gen. Mgr.,
The Granby Consolidated Mining,
Smelting & Power Company, Ltd.,
Copper Mountain, B. C.

Dear Mr. ~~Bailey~~ Baillie:

Thank you for your letter of March 16th together with return of our report and comments thereon.

I am glad to follow your suggestion and substitute in its entirety your suggested paragraph in place of the one questioned on page 13 of our report.

Yours very truly,

MSH/PW

Mining Engineer.