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REPORT OF GEOLOGICAL EXAMINATION

OF THE

GOODENOUGH MINE

YMIR, B.C.

To:

Mr. F. H. Weekes, Manager,

Porcupine Goldfields Development & Finance Co.Ltd.

By:

Chas. C. Starr,

August 10, 1926.

SUMMARY

The veins lie in metamorphosed sedimentaries (roof pendants) and cut the bedding planes. They also cut several granitic dikes, and are themselves cut by lamprophyre dikes. There is no evidence that they cut any large bodies of granite, or that the ore is influenced by the small dykes through which they pass.

No large faulting was found but several small faults are known, one of which has displaced the western part of the veins in the Goodenough tunnels. Movement on the east of the faults has been to the northward.

There is no evidence for or against the hope of further development exposing wider and richer ore except:- uncertain implication of wider ore under the north shaft. Probably wider and perhaps better ore at a small additional depth, on account of the indicated juncture of the north and south veins.

The veins will pass out of Goodenough ground a short distance east of the present workings at a depth of approximately 350 feet.

Development thus far indicates the mine is too low grade, or too small, to work profitably, but the most recent developments are more favorable.

Crosscutting is recommended, and if the results from it are not very favorable, the property should be dropped unless the property payments can be deferred and the Mugwump claims optioned, in which case further work is recommended.

INTRODUCTION:

The special object of this examination was to determine whether or not there were any points along the course of the vein which afforded exceptionally favorable conditions for the quick development of ore by diamond drilling.

In connection with this work the mine workings were carefully surveyed and sampled by Mr. C. D. Frith, who also made the survey on which the platting of the surface geology is based.

Definite determination of the kind of rock composing some of the dikes, and their correlation with the several ages of intrusives in the district, as given by Drysdale (Memoir 94, Canada Department of Mines, "Ymir Mining Camp, British Columbia") cannot be made without the aid of the microscope. Since it does not appear that microscopic study would be of any substantial value in the present connection, it was omitted.

Full use has been made of Mr. Drysdale's work during this examination.

FORMATIONS:

The earliest formation, the Pend d'Oreille, of Cambrian or Pre-Cambrian age, consists of sediments which have been metamorphosed to slates, argillites, quartzites, and andalusite and mica schists. The formation strikes N 5° to 30° E, and dips from 80° eastward in the southeastern part of the area to 65° westward in the northeastern part. These rocks are not greatly distorted, but are highly metamorphosed and show evidences of crushing and shearing.

Next in age (Triassic ?) is the Rossland Volcanic Group, represented by sills, dikes, and flows of augite-porphyrite

and related rocks. They vary considerably in appearance and composition, and are generally considerably altered and occasionally schisted. Typically, they are dark greyish to greenish-black and consist of numerous augite crystals in a dense groundmass. Locally they may be of a granitic appearance, made up of rounded oval or angular fragments, or vesicular.

During the Jurassic period the intrusion of the Nelson Batholith occurred, accompanied and followed by numberous dikes and tongues of more or less differentiated material. Near the Goodenough the dikes consist of semi-porphyritic granodiorite (?) showing a considerable amount of biotite, varying to porphyritic much altered rock consisting principally of semi-kaolinized feldspar with a little quartz and chlorite. The principal mineralization is believed to have occurred following the intrusion of the batholith

The Lamprophyre dikes are to two ages, the older being late differentiations from the Nelson Batholith magma, and the younger related to the Coryell Batholith (and Salmon River Monzonite) of Tertiary age, according to Drysdale. From studies near the Goodenough it appears that some of the dikes and sills mapped as "early lamprophyre" are related to the Augite-porphyrite and therefore are older than the true lamprophyre, as well as older than the veins. Since these dikes vary widely in original character as well as in subsequent alteration, and frequently grade from one appearance to another, it is difficult to distinguish between them by eye.

The Later Lamprophyre dikes are dark or balck rocks, weathering brown, which are considerably altered in most exposures.

They generally consist largely of biotite, feldspar, and hornblende in the order named. Occasionally there are large feldspar phenocrysts giving a "birds-eye" appearance.

OCCURRENCE

Argillites and schists of the Rend d'Oreille formation underlie nearly the whole area studied, and in the main form the wall rock of the veins.

Augite-porphyrite shows along the northwest edge of the map and extends for a considerable distance to the northwest, beyond the contact. The augite-porphyrite along the contact, which strikes northeast and dips 70° northwest, appears to be intrusive and to generally cut the bedding of the argillites at a small angle, although locally, on the west edge of the map, it appears to lie parallel with the bedding. Throughout the area mapped, and especially along the southeast margin, there are numerous dikes and sills, mapped as "Early Lamprophyre" many of which appear in the absence of microscopic determination to be related to the augite-porphyrite.

A granitic dike one hundred feet or more in width, related to the Nelson Batholith grano-diorite, passes through the center of the area mapped and should intersect the extension of the Goodenough vein near the No. 10 tunnel of the Ymir Mine; there is however no evidence of the Goodenough vein at this point. Accompanying this dike there are other similar, though finer grained and more porphyritic dikes. Two of these appear in the Goodenough tunnels, where they are composed of partially kaolinized feldspar with a little chlorite and quartz, forming heavy blocky ground that generally requires timbering.

They are cut and slightly faulted by the vein.

These particular occurrences are not sufficiently well exposed in the mine to definitely show their dip and strike, so that it cannot be said whether they are the extensions of the two small (fine grained, aplite) dikes showing on the surface about 300 feet southwest of the south-east corner of the Goodenough Claim, or some other dikes covered on the surface by soil.

Several small granitic dikes also appear in the tunnel of the Ymir mine, and one near the west end of the No. 10 level.

The Later Lamprophyre occurs in numerous places, generally crosscutting the strata, and also cuts the early lamprophyre. These dikes are usually small and very irregular in strike dip and width, but in the No. 2 Tunnel of the Goodenough one of them attains a width of more than 20 feet. They are distinctly later than the veins and cut them without much displacement, but are themselves cut and very slightly faulted by post-mineral movement along the vein wall.

VEINS:

The veins are assumed by Drysdale to have been formed in fractures following the intrusion of the Nelson batholith, by hot ascending solutions. There are however many indications in the occurrence and structure of the veins which point to their origin through injections of "ore"Magma, and that the veins may properly be termed "vein dikes".

There are two systems of veins, those conforming to the stratification of the argillites, and those cutting across the strata. The former is narrow, non persistent, and so far as known nearly barren. The latter system includes the veins now being developed on the Goodenough, and the Ymir vein;

these are wider, more persistent and carry much higher values.

Goodenough Vein

There are two veins on the Goodenough which are nearly parallel, but it is probable that they will intersect in depth and further to the westward. They are 90 feet apart at the outcrop and, if the identification underground is correct, they are 25 feet apart in the No. 1 tunnel and ten or fifteen feet apart in the No. 2 tunnel level. The slates between them are sheared and altered. These veins are not exposed directly on the surface on account of a thick covering of soil, but have been traced three or four hundred feet by open cuts, which have now largely caved, so that it is impossible to examine them carefully. Two shafts, one said to be 60 feet deep and the other 40 feet, have been sunk but at present one of them is completely caved and the other partly so. The shaft on the north vein is said to have shown 11 feet of good mill-ore at the bottom. The average strike of the veins is N 60° E and the dip 65° N, but there are locally quite wide variations from this.

The vein filling is quartz, rather fine grained and vitreous (apparently formed under high temperature conditions) containing galena, pyrite and sphalerite in approximately equal proportions. The walls are well defined; the footwall is continuous and accompanied by a few inches of gouge, and it is evident that there has been both pre-mineral and post-mineral movement along it.

The hanging wall, although well defined, is not continuous and regular but is broken at frequent intervals by slips which turn off into the bedding of the strata, which, in stoping, will cause considerable dilution of the ore.

In places the vein consists of solid quartz with its accompanying sulphides, but more generally it is composed of quartz alternating with small barren stringer like inclusions of wall rock. Quartz prongs also frequently project into both the foot and hanging walls along the bedding planes ofthe rock. The average width of the vein (omitting the extremely narrow part) is 2 ½ feet in No. 1 Tunnel and 3½ in No. 2 Tunnel.

Ymir Vein

The Ymir vein strikes N 70° E and dips 70° N, cutting the bedding of the argillites which form its walls.

Both walls are fairly good and continuous and generally are accompanied by a small gouge. The vein filling is comparatively massive white, somewhat vitreous quartz, containing a somewhat smaller proportion of sulphides than the Goodenough veins. The orebody was a lense some 600 feet in length with a maximum width of thirty or forty feet, and of unknown depth, but more than 1000 feet, although practically no ore was found beyond 700 feet depth. This lense consisted mainly of quartz, with frequently a long narrow band of argillite through the center of the vein. Beyond the lense, the vein pinches, - to a mere crack at the east face of the No. 10 level. Throughout the mine the vein is much larger and more regular than the Goodenough, but the character is otherwise the same.

FAULTING:

There do not appear to be any large structural faults, but there has been some small slipping along the stratification of the sedimentaries, both before and after the vein formation. A slip of this type occurs in the Goodenough mine at Station 5

in Tunnel No. 1, and at Station 207 in tunnel No. 2, and displaces the western part of the vein to the southward an unknown but probably small amount. Two other small faults appear in the No. 2 tunnel which throw the east continuation of the vein a few feet to the northward. There has been a small amount of pre-mineral movement along the vein fracture, and a smaller, almost negligible, post-mineral movement; the former moved the north side to the eastward, and the latter was in the opposite direction.

At the west end of the Ymir workings, the vein has been cut by a fault running N.E.-S.W. and dipping steeply to the westward. The throw is not definite in direction or amount but appears to conform to that of the other northerly striking faults, and to be greater. On the surface ("Line of Probable Faulting") there are rather indefinite suggestions of faulting, such as the zone of disturbance and contortion of the strata near the head of the gulch on the Rockland Claim. At the tunnel along the road below the mine there is a broken zone which may be the same, and possible faulting is indicated by the topography to the northward. To the south of the tunnel there is little indication of the presence of a fault, and its position as platted may be incorrect.

DISCUSSION OF POSSIBILITIES OF COCHRENOUGH VEIN:

There are no conditions that would suggest the weakening or impoverishment of the veins for a considerable distance laterally or in depth. Neither are there any indications of more favorable conditions in any direction except through the joining of the two veins at greater depth. Such a juncture is indicated to be at an additional depth of less than 200 feet possibly much less; it is to be expected that below the point of junction the vein will be larger and possibly somewhat more

regular. There is also some hope that the north vein may be found to be larger below the shaft, assuming the owners report of the size of the ore encountered at the bottom of the shaft is correct.

In some properties in the Ymir District the vein is larger, and the ore better, where it occurs in the granite tongues than when the walls are slate; it therefore appeared that if the vein cut the main granite dike it would be a favorable place to prospect by drilling. It is evident that the vein does not cut the dike on the Goodenough property, and no vein that correlates with it is to be found in the No. 10 tunnel of the Ymir.

In the southwestern part of the Rockland claim, two veins show in the bottom of the gulch; the southerly one is a 12 foot zone of contorted, silicified slate with quartz stringers and is much stained with limonite. Its dip and strike is not capable of accurate determination; in character it is much different from the Goodenough vein, but whether it is a continuation of it or not may only be conjectured. The northerly vein is essentially banded schist and aplite with small stringers of quartz but no other visible mineralization; possibly it should not be considered a vein.

From a point 150 feet east of the present face of the No. 2 tunnel, the vein will pass from Goodenough ground on to the Mugwump claim of the Ymir Gold Mines Ltd., giving a depth along the dip of the vein of only 300 or 350 feet belonging to the Goodenough property. It is evident therefore that the Mugwump claim must be obtained if the Goodenough is to make a real mine.

In the No. 1 tunnel the principal development has been on the south vein, while in the No. 2 tunnel it has been almost entirely on the north vein, - this is proven by the raise from the latter level which follows a continuous gouge and nearly continuous quartz into the north vein on the No. 1 level. It is impossible to be certain, on account of the faulting, whether the vein at the east end of the No. 2 level is the north vein or the south, although it is probably the former.

Thus far development has shown the higher values to be in the south vein, but since these occur also in the part of the vein where one wall is granite, it does not prove anything. On the No. 2 level the north vein is wider and possibly richer than it is on the No. 1 level.

At this writing the results of the latest sampling of the veins have not been received, and no average values can be given. It is pretty evident, however, that the average value of the ore is too low to ship with much profit, and to ship it at all it must be mined selectively and perhaps sorted; for milling, there is not yet much indication that the quantity of ore will be sufficient to justify the building of a plant to treat it. Unless future development is more productive of ore than the past, development costs per ton will be very high, also the hanging wall is irregular and weak, and the veins are generally narrow, which will cause expensive stoping and a considerable dilution of ore with waste.

RECOMMENDATIONS:

At the close of the field work, it was recommended that two crosscuts be started southeast from the No. 2 level, one of them to be located 60 feet east of the raise and designed to cut the south vein, and the other to start from the face of the branch of the tunnel east of Station 204, and designed to cut the faulted continuation of the north vein. (Crosscutting had already been planned by the management)

The first crosscut has, at this writing, cut a vein at a distance of about 12 feet which is two feet wide and assays 2.00 oz. gold and carries good silver, lead and zinc values. The second crosscut is still being advanced. Crosscutting to the southwest at numerous other points is advisable, to further explore the south vein.

At the present time the mine looks better than ever before, although, taken as a whole, the development from the time the option was taken has been discouraging as regards size and value of the ore. From the technical point of view the extension of the No. 2 tunnel to the east is justified, as well as drifting on the vein expected to be cut south of station 204, with the idea in view of locating a site for a deeper tunnel as nearly as possible on the strike of the vein.

From the business point of view, which is important factor, it seems advisable to merely drive a few crosscuts to cut the south vein and unless this shows unexpectedly favorable results, to give up the lease and bond on the property unless it be possible to obtain an option on the Mugwump claim and to

have the payments on the Goodenough property deferred for at least six months.

- The recommendations may be summarized as follows:

1 Crosscut to the south vein from the No. 2 tunnel from Station 208 eastward at frequent intervals.

2. If the vein is found, as expected, southeast of Station 204 it should be drifted on or work there discontinued depending on the size and value of the ore found.

3. Unless (1) and (2) show better values and widths of ore than heretofore found, the property should be dropped.

If, however, the development outlined is reasonably successful and the proper arrangements can be made to obtain the Mugwump and defer payments of the Goodenough, I would recommend the following:-

1. Continue the No. 2 tunnel to the eastward, and crosscut to the other vein at intervals.

2. Prospect the vein about 200 feet below the No. 2 tunnel by diamond drilling.

3. If (2) proves the vein and ore, drive a new deeper tunnel.

Respectfully submitted,

Chas. C. Starr