

H. C. GUNNING
Consulting Geologist
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Mr. N.E. McConnell,
Managing Director,
Privateer Mine Limited,
Vancouver, B.C.

Vancouver, B. C.
August 1, 1947.

Dear Sir:

Re Tranquil Creek Option (Vandora Mine)

At your request I examined the above property from July 6 to 10 inclusive. Before leaving Vancouver I was supplied with the latest assay plans of the workings and with various reports and maps by Mr. A.M. Richmond, Consulting Mining Engineer. I had had the advantage of discussing the property on two occasions with you. Mr. James Murray, mine foreman, guided and assisted me at the mine, greatly increasing the efficiency of my examination. I also had the advantage of discussions with Mr. W.J. Lynnot who has been engaged last summer and this in an investigation for the B. C. Department of Mines of the geology of a large area surrounding the mine. This enabled me to obtain a much clearer understanding of the regional setting of the mine than would have been possible otherwise. I am indebted to Mr. Lynnot.

The maps and reports with which you supplied me leave no doubt in my mind that the property has been examined, developed and evaluated according to the best engineering practice. My own remarks are restricted chiefly to geological considerations that seem to me to have a bearing on the potential value of your option. I did no sampling. The large amount that has been done by your Company and previously by Mr. E.G. Brown and Mr. G. Derome for Premier Gold seem entirely adequate and Mr. Richmond has indicated the surprisingly close correspondence of the averages from three different samplings of the same workings. As a random check on Mr. Richmond's estimates I chose a short stretch near the face of the 1500 level. The resultant average for a length of 65 feet, using your mine assay plans, was 0.626 ounce gold across 1.536 feet. Recalculating this to Mr. Richmond's assumed mining width of 4.35 feet the average gold content is 0.26 ounce per ton compared to Richmond's average of 0.257 ounce. I also endeavoured to make a check test of Mr. Richmond's estimates of the width that would probably have to be mined. Some detailed study and additional casual observations lead me to believe that he has been commendably conservative. For example, my measurements for 165 feet back from the face of the 1900 level give a probable natural breaking width of 3.5 feet. Mr. Richmond used 3.91 feet. Since an appreciable part of the total width is rock that carries little gold (Richmond assumed 0.05 ounce on the basis of a number of representative samples), his grade estimate would be increased if the smaller width were used.

The location of the property is very favourable to low-cost mining operations. The typical, mild, moist climate of the west coast of Vancouver Island facilitates year-round work and the mine is less than three miles as the crow flies from salt water at the mouth of Tranquil Creek.

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The mine workings are approximately in the middle of a large area of volcanic rocks that are believed to belong to the Triassic Vancouver Group. Near the mine they consist of lava with some tuff and agglomerate of general andesitic to basaltic composition. There are large amounts of amygdaloidal lava and similar quantities of fine-grained dioritic rock that in all probability is chiefly lava but may include intrusive volcanic material. Widespread alteration to epidote and chlorite produces a general pale green to black colour. Some exposures of pale grey-weathering feldspar porphyry, lighter in colour than the predominant country rock, were noted. Such a rock occurs at the south side of the portal of the 1500 adit, and in the tunnel, where it is difficult to distinguish from the normal volcanic rock. There is considerable doubt as to the true nature of this rock but I am of the opinion that it may be merely a phase of the volcanics. I saw nothing to indicate that these porphyries have any bearing on the occurrence of ore and for the time being at least I would consider them as an integral part of the volcanic complex.

So far as is known at present the closest major body of granitic rock is about three-quarters of one mile south of the mine. The contact runs nearly due east up Virge Creek, over the summit and down Goldflake creek to cross Tranquil creek some two miles above its mouth. This is the north edge of a complex of metamorphic rocks and granitic intrusives that in part are gneissic and include material approaching diorite and gabbro in composition. The probability is that the granitic rocks intrude and are therefore younger than the volcanic rocks to the north but this is not definitely proven as yet. It is about a mile north from the mine to the nearest granite. East or west from the mine, along the strike of the ore zone, the nearest major intrusive is about two miles distant. I saw no granitic dykes near the mine. Apparently the area of volcanic rocks is of remarkably uniform composition, comparatively free of plutonic intrusives. This is of interest because it indicates continuity of ore-zone country rock far beyond the limits of present exploration, both on surface and at depth.

Near the mine the volcanic rocks are cut by a number of andesite dykes. They are massive, greenish-grey rocks, very fine grained or inconspicuously porphyritic. The maximum observed width is sixteen feet. Microscopic examination of thin sections shows that they consist of sodic feldspar chiefly, the lath-shaped crystals seldom exceeding 0.4 millimetre in length. There are variable proportions of brown hornblende and residual augite and little or no quartz. Alteration products are chiefly carbonate, chlorite and pyrite. The microscope reveals a pronounced primary flow structure, particularly near the edges of the bodies, resulting in a parallel arrangement of the feldspar laths. The andesite is of particular interest because it occurs as tabular sheets up to fifteen feet thick along the ore zone and forms either the hanging wall or footwall of most of the ore. The microscopic data given above apply only to andesite from the ore zone; other occurrences were not studied microscopically. Presumably the ore-zone andesites are dykes but I was unable to prove this beyond doubt. They could be sills or flows. Certainly there are some dykes, near the mine, of similar composition. At the portal of the 2100 adit there are two sheets of andesite, separated by three feet of altered volcanic rock. Apparently both sheets pinch out before the face of the tunnel is reached, the footwall sheet continuing as the footwall of the ore to within 25 feet of the face. At the 1900 portal there are two sheets also, separated by six feet of altered tuff. The hanging wall sheet is four feet thick, the footwall 2½ feet and the veins are in the intervening tuff. At 1700 portal a single sheet

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fifteen feet thick carries the veins in its lower part. On the 2100 level there are again two sheets, separated by four feet of volcanic rock and the ore is in the upper sheet. In all the trenches to the east of the adits andesite is present on the footwall or hanging wall of the veins or forms both walls.

The ore zone is a major fault along which volcanic rocks and andesite have been crushed, sheared and locally converted to gouge. Movement has formed one or more well-defined fault planes and these and subsidiary fractures have been filled by veins. It is an unusually strong and persistent ore structure. Workings prove that it is continuous for a horizontal length of 2900 feet through a vertical range of 1100 feet and neither end has been reached. The westerly 1100 feet is proven by four adits to be continuously mineralized and over 55% of the drifting is in ore. There are no barren portions in this length. The most westerly exposures, at the faces of the two upper adits, show ore and there is no reason to believe that additional drifting to the west will not produce additional ore length. The easterly 1800 feet is developed by seventeen opencuts that encountered mineralization and one ore shoot 290 feet long is indicated. There is a good probability that underground work on this eastern end will materially improve the picture for the cuts are shallow and the ore in them is heavily oxidized. Throughout the entire vertical and horizontal range there is no essential change in the type of mineralization or the geologic setting.

The veins in the ore zone are well shown on the mine maps and on those prepared by Mr. Richmond. Normally there are two veins in the mineable zone, one on the hanging wall and one on the footwall separated by crushed rock that in places is slightly mineralized with quartz stringers and disseminated sulphides. In some places the two veins merge to form a single vein. Vein widths vary up to three feet approximately but on the average are much less. Normally the hanging wall and footwall of the ore zone are well-defined fault planes to which the ore, including veins and intervening rock, will break readily. In some places, however, the walls, particularly the footwall, are mineralized for additional widths of a foot or so. In other places some of the barrel wall material will break naturally with the ore. Mr. Richmond has given all this careful consideration in his estimates of tonnage and grade. He arrived at a natural mining width of 5.05 feet for the entire underground development in the four adits.

Most of the vein matter exposed to date is thoroughly oxidized and now consists of a rusty mixture of crushed quartz, gouge and broken rock stained with iron hydroxides. In a few places, however, the vein matter remains unoxidized and its original character can be determined. It consists of white to watery white quartz, intergrown carbonate and a small percentage of sulphides that include pyrite, sphalerite, galena, arsenopyrite and chalcopyrite. The metallic minerals occur as discontinuous seams and small spots in the quartz. In fresh material of this kind much native gold was observed. The gold is extremely fine grained and lies chiefly against or close to the sulphides but to some extent in otherwise barren quartz. The coarsest gold particle seen was barely visible to the naked eye. Vugs and comb structure are not common.

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Close to the veins the wall rock is altered by the formation of carbonate, sericite, pyrite and some fine, needle-like grains of arsenopyrite. Associated with this alternation there are apt to be minute quartz stringers.

The above characteristics indicate a deposit formed at intermediate temperature and depth - of the so-called Mesothermal Class.

As stated above, most of the ore is thoroughly oxidized. All that remains of the sulphides in this case is limonitic powder and stain and occasional green copper stain. The question has arisen whether there may have been appreciable secondary enrichment of gold in the oxidized ore and whether the fresh ore beneath will be less rich. A definite answer will have to await deeper development and the sampling of completely unoxidized ore. However, I saw no evidence of secondary gold and some of the richest ore in the mine, for example in the footwall at station 1901, is unoxidized. It contains much free gold that is undoubtedly primary. I am inclined to believe that there has been little or no enrichment of gold during oxidation except for the small amount due to leaching of sulphides and carbonate from the vein matter. This inevitably leads to a slight decrease in the specific gravity of the ore and induces a slight increase in gold per ton. But there would be about the same amount of gold per cubic foot in the oxidized as in the fresh material. I would consider that there is an excellent chance of finding primary ore of essentially the same grade as the oxidized material. I cannot predict the depth at which fresh ore will be encountered but the oxidized zone as proven to date is already unusually deep for Vancouver Island.

My conclusion is that your Tranquil Creek property is a valuable and promising one. Your consulting engineer estimates 76,060 tons of proven and probable ore, grading 0.395 ounces per ton on a cut assay grade. He further estimates an operating profit of \$6.68 per ton or a total profit from ore indicated to date of better than \$500,000. He recommends the erection of a 125 ton mill. In my opinion the property has an excellent chance of producing large additional tonnages of ore of similar grade at depth and on strike and I have no hesitation in recommending its continued development and exploitation.

Respectfully yours,

"H. C. GUNNING"

H.C. Gunning, P. Eng.,
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