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REPORT

ON THE

CENTRAL ZEBALLOS GOLD MINES LTD.

ZEBALLOS, B. C.

TO
The Board of Directors,
Reno Gold Mines Ltd.
Vancouver, B. C.

By
Charles C. Starr,
January 30, 1939.

SUMMARY

LOCATION: In the Zeballos district on the west coast of Vancouver Island.

PROPERTY: Consists of ten claims totaling about 412 acres.

GENERAL CONDITIONS: Fair to good.

TOPOGRAPHY: Elevations 200 to 2600 feet. Southern two thirds of property are very rough.

EQUIPMENT: Fairly good. Compressed air sufficient for two drills, generated by Diesel engine. Camp for thirty men.

DEVELOPMENT: Three tunnels have been driven; the two upper ones at the same level, 125 feet long to the east, and 408 feet long to the west. At 180 feet below, a 528 foot drift west has been driven from a crosscut to the vein. From this drift, a raise is now up 115 feet.

GEOLOGY: The veins are in the granodiorite batholith, not far from its contact with the overlying limestones and volcanics. The copper deposit is in a tongue of garnetized limestone along its contact with granodiorite.

THE GOLD VEIN: This vein has been traced nearly a thousand feet east and west on the surface, and opened 528 feet underground. It is a narrow quartz-gouge vein with pyrite and blende carrying gold; it dips 76° south. 245 feet of ore has been opened on No. 1 level and 25 feet of ore on No. 2 level, 175 feet below. These orebodies are estimated to contain 5100 tons of "Probable" ore, 1.4 feet wide, assaying 2.09 Oz. gold.

It seems probable that other ore-shoots may be found by lateral development, and that there will be a recurrence of ore below the present lowest level.

The COPPER DEPOSIT: This is a contact-metamorphic deposit carrying copper and low gold values, and is worthy of exploration.

RECOMMENDATIONS: Drift to the west on No. 1 and No. 2 tunnels as far as the vein can be followed, and raise at intervals. Drift east on No. 2 level toward the property boundary. This to be followed by lower development by crosscut tunnel or sinking, according to conditions encountered.

COSTS: Costs are estimated at $18.60 per foot of drifting. The total cost of work outlined will be upwards of $35,000, according to the results obtained.

CONCLUSION: The property is a good looking prospect, and the geological conditions are good. The failure to find such ore on No. 2 level, under the No. 1 tunnel ore, should not cause undue discouragement, as there seems a reasonable expectation that ore will again come in at further depth.

The property is recommended as a development proposition warranting a considerable outlay in further exploration and development.

THE CENTRAL ZEBALLOS MINE

INTRODUCTION: During this examination the most important parts of the surface were examined in one and a half days, after which a fall of snow occurred making a further study of the surface almost impossible. The principal showings, along the gold-vein outcrop to the west of the tunnels, and the "copper vein" were visited. The tunnel workings were examined in detail. Mr. R. W. W. McDougall, Consulting Engineer, and Mr. O. T. Bibb, Manager, gave all possible assistance.

LOCATION: The property is situated in the Zeballos District on the west coast of Vancouver Island, about six miles northeast of the town of Zeballos, and immediately south of the forks of the Zeballos River.

ACCESSIBILITY: A C.P.R. steamer makes tri-monthly calls at Zeballos and there are almost daily air-planes to and from Vancouver. From Zeballos passengers and freight are taken over 4¼ miles of truck road to the beginning of the Central Zeballos trail , 2¼ miles long, leading to the mine. This trail is in large part floored with punchsons and is a good horse trail. It could probably be made passable for a light tractor and trailer for about $1000. It is reported that the Dominion Government engineer has recommended that a truck road be built to, or nearly to, the mine.

PROPERTY: The property consists of ten mining claims, totaling approximately 412 acres, as follows:- The AB, AC, AD, AE, and Extension Nos. 5, 6, 7, 8, 9, and 10. All have been surveyed for Crown Grant. (See Map).

TIMBER: The claims are all heavily timbered, chiefly with hemlock, fir, and balsam, much of which is too large for mining use. On account of being scattered over rough ground the gathering of mining timber is rather expensive.

WATER: The country is well watered and streams are subject to sudden floods, but the smaller ones may dry up completely during droughts. Bibb Creek furnishes water for the camp and may vary from a torrent to almost dry. Gold Valley Creek, about 3000 feet west of camp will furnish water for milling purposes.

CLIMATE: The climate is very wet. Snowfall varies from very little at sea-level to ten or twelve feet at 3000 feet elevation, but generally comes late and melts early. On the Central property no snowslides are to be expected except small ones along Bibb Creek. Temperatures seldom drop very far below freezing.

TOPOGRAPHY: Elevations vary from 200 feet at the north end of the property to about 2600 at the southeast corner. The camp is at approximately 700 feet, the lower tunnel 1375, the upper tunnel 1550, the gold-vein outcrop up to 1900, and the

copper-vein outcrop about 2400 feet. Except on the northern third of the property which is comparatively smooth, the topography is quite rough and steep. All creeks flow in steep-sided gorges and the ridges are broken by frequent bluffs so that travel is circuitous and slow.

EQUIPMENT: The following equipment is on the property and in use:-

Power House (near camp)

1 - Broom-Wade air-compressor; 2 cyl. single stage, delivering around 275 Cu. Ft. of free air per minute.

1 - Ruston-Hornsby Diesel engine, Model V4B, rated at 70 H.P. Marine type, 4 cylinder, 1000 R.P.M.

1 - 1500 Watt Fairbanks-Morse D. C. generator, 110 V.

1 - 3 H.P gasoline engine for air-pump and generator.

1 - Ingersoll-Rand Jackbit grinder, Model JA-4, air driven.

Blacksmith Shop (near camp)

1 - set of hand drill-shanking tools, and usual general tools.

To Mine

1 - Compressed-air line of 4 inch pipe from compressor house, 2680ft

1 - Aerial tramway from compressor house to mine, about 2600 feet. Single track, 7/8" track cable, 3/8" traction rope, one 800 lb. capacity bucket.

At No. 2 Tunnel Portal

1 - Ford V-8, 85 H.P. motor with gear reduction and sheaves to operate tramway. Rope speed 400 feet per minute.

1 - 80-ton ore bin at the head of the tramway.

In Mine

1 - Drifter, Ingersoll-Rand, Type DA-35, using 1¼" round lug shank I-R Jackrods and bits.

1 - Stoper, Ingersoll-Rand type K-51, using 1" quarter octagon I-R Jackrods and bits.

Above complete with hoses, bars, tank, etc.

At Camp

1 - Winch, single drum with Star auto engine on skids.

1 - 88 hand winch.

1 - Cook-house, 24 x 40 ft. of logs with office and five rooms on second floor. Completely equipped.

1 - Bunkhouse, log, 18 x 30 ft.

1 - Bunkhouse, shakes, 12 x 47 ft.

1 - Change house, shakes, 14 x 30.

1 - Power house, frame, 22 x 24 ft.

Equipment at Camp, Continued.
1 - Blacksmith shop, frame, 14 x 14 ft.

3 - Framed tents, small.

Compressor capacity is sufficient to run two drills, although possibly not at the maximum efficiency, but both engine and compressor must be operated at their utmost capacity.

The tramway is used to take supplies to the mine and to take ore down from the mine for shipment or storage, since there is no place at the tunnel portal where ore can be stored without danger of being washed away during floods.
The camp will conveniently accomodate about thirty men.

DEVELOPMENT: Development consists of two adit tunnels on the gold-vein, driven east and west at the same level, and a lower crosscut tunnel from which a drift has been driven westward, as follows:-

	Drifts	X-cuts	Raise	Elevation
No. 1 East Adit	125 feet			1548
No. 1 West Adit	408			1550
No. 2 Tunnel	528	377	110	1375
Totals	1061	377	110	- 1548 Ft. Total

There are also about a dozen small cuts on, or near the outcrop of the gold-vein. No work has been done on the copper-vein.

GEOLOGY: (See Surface Map) The claims lie on the northeastern margin of the granodiorite batholith with which the ores of the district are generally associated, and which is intrusive into the limestone and volcanics. The northern third of the property is underlain by the Quatsino limestones and a small area of the underlying Karmutsen volcanics. The southern two thirds of the property is underlain by the granodiorite except for a tongue of limestone which projects from the eastward nearly to the center of the property. Between the main body of the limestone and the tongue there is a large "bay" of granodiorite extending a thousand or two feet east of the property.

The granodiorite is rather fine grained, hard, and massive. It shows frequent joints and narrow shears striking in a northeasterly direction, and is cut by a number of dikes of varying strike which range in character from siliceous to basic. The aplite dikes appear to be the most important and are a light pinkish color, very fine grained, and apparently a mixture of feldspar and quartz. Some of the granodiorite contains numerous large inclusions which are probably fragments of the originally overlying volcanics.

The tongue of limestone, which will average over two hundred feet in width where it lies on the property, has been highly altered by the intrusion of the granodiorite and a large part of it now consists of garnet, epidote, etc.

Along the contact there is in places a considerable concentration of copper and iron sulphides which are said to carry a few dollars in gold.

THE GOLD VEIN: Practically all the work on the property has been done on this vein, which strikes nearly east and west, dips 76° south, and occurs variously along either wall of a narrow aplite dike, or in the granodiorite near the aplite.

The vein was first discovered in Bibb Creek and has been traced westward by a few open cuts for about 700 feet. Beyond this point the vein has not been found, but the aplite dike, with which the vein is closely associated, where exposed, has been quite definitely traced for a further 400 feet. At about 300 feet still further west and some 75 feet north of the projected course of the dike, another narrow aplite dike, or a faulted segment of the same dike, has been exposed in four cuts in a distance of 150 feet. A few hundred feet further to the southwest three or four small veins have been found in the granodiorite, having a northeasterly strike, approximately parallel to that of the Privateer vein. These veins are very narrow and show occasional quartz less than an inch in width, with a little gouge and traces of sulphides. So far as known they contain no appreciable amounts of gold, but are worth some prospecting.

In the first 700 feet west of Bibb Creek the vein is in direct contact with the dike, and is similar in appearance to that in No. 1 tunnel. At about 300 feet west of the creek a cut, dug on the intersection of a strong N 45° E shear with the vein, shows 2½ feet of exceptionally good ore.

At a hundred or more feet to the east of Bibb Creek, the dike and the vein fissure show on the face of a cliff. The vein is again exposed on the bank of the east fork of Bibb Creek, where the width is reported to be good but the surface values low.

The No. 1 tunnel east is now filled with mill ore to within fifty feet of the portal. In the accessible part the vein is narrow and valueless, and the dike is also very narrow. At 45 feet from the portal there is a northeast shear along which there are weak stringers of quartz with a little pyrite and traces of aplite passing into the north wall of the drift. There is a good possibility that the vein has stepped slightly to the northward here, and that the eastern part of the tunnel is too far to the south to find the vein. In the few feet of tunnel visible beyond the shear there is a gouge seam, only, which is said to extend to the face of the tunnel without mineralization.

In No. 1 tunnel West, the drift follows the vein continuously for 408 feet to the face. The vein proper varies from four inches to a foot and a half in width and consists of from two to twelve inches of gouge, sometimes black from contained sulphides, zero to eight inches of

crystalline quartz often showing comb structure and containing pyrite, arsenopyrite, and zinc blende, often partially banded. Where greater widths than 1½ feet of ore occur the extra width is usually made up of stringers in highly altered granite, or more commonly through partial replacement of shattered aplite with gold bearing sulphides.

In the No. 2 tunnel the vein is a mere gouge seam where first cut, about ten feet south of the aplite dike. The vein has been followed continuously to the west face of the drift a distance of 528 feet; it is of the same appearance as in the No. 1 tunnel west. Throughout the greater part of the drift the vein is from three to ten feet north of the dike, the intervening granodiorite being comparatively unaltered.

At 90 feet west of the main crosscut the dike diverges from the vein and passes into the south wall of the drift. It is accompanied on its hanging-wall side by a few inches of quartz containing weak sulphides and some gold.

The COPPER SHOWING: As mentioned under "Geology", the copper-vein, so called, occurs chiefly along the northern margin of a limestone tongue; there is also weaker mineralization along the southern margin. No work has been done on this showing and it is impossible to learn much about it from the present exposures. It is not a true vein, but a contact-metamorphic deposit lying in the garnetized limestone along, and adjacent to, the granodiorite contact. It is exposed in a cliff at the head of the west fork of Bibb Creek, and at several points to the westward, but the width of the ore is nowhere determinable, but is probably quite variable.

At a point two or three hundred feet west of the creek there is an exposure over a width of four or five feet which shows disseminated chalcopyrite, bornite, pyrite, and magnetite, in a gangue of limestone, garnet, and epidote. Mr. Bibb states he sampled this over a three or four foot width and got about 7% copper and about 0.12 Oz. gold. Some hundreds of feet west of this there is an exposure showing disseminated pyrite and chalcopyrite in rather scanty amount in garnetized limestone. The contact appears to dip from 65° to 75° northward; intrusive contacts of this type are, however, subject to sudden changes in both dip and strike, so that the position of the contact at depth cannot be predicted with any certainty. It is probable that the limestone tongue is the un-eroded root of a "roof pendant" in the granodiorite, and there is cause to wonder whether it will extend to any great depth; it is probable that the ore will end with the limestone. The deposit might prove to be of value and is well worth some exploration. The preliminary work might best be done by trenching across the contact at regular intervals, to be followed by shallow tunnelling or a number of short diamond drill holes, whichever may seem best after the completion of the trenching and sampling.

SAMPLING: Sixty one samples were taken, 5 on the surface of the gold-vein, 25 in No. 1 tunnel west, and 31 in No. 2 tunnel. The average of these tunnel samples checks remarkably closely with the average of the corresponding samples on the Central Company's assay map, both in width and gold content, although in individual instances there are wide variations, as was to be expected. These samples are all platted on the assay map and, with a few exceptions as follows, need not be mentioned in detail. Sample #480 is from the stringer at the face of the southwest drift from the No.2 level crosscut; this stringer is from one to four inches wide and composed of a fracture filled with gouge and a little quartz with very weak pyrite; its assay is 0.03 Oz. gold. #542 is from the before mentioned stringer on the hanging-wall of the dike at 90 feet from the No. 2 crosscut; it has a width of 0.6 feet and a gold content of 0.40 Oz. #432 is from No. 1 tunnel west at 250 feet from the portal, and is from four altered, rusty seams in otherwise unaltered granodiorite alongside the vein; these seams aggregate 0.4 feet wide in a total width of 3½ feet. This sample was taken to find whether altered seams in the granodiorite near the vein carried appreciable values; the assay is 0.12 Oz. gold.

There are two ore-shoots exposed in the No. 1 west tunnel, beginning respectively at 65 feet and 160 feet from the portal, as follows:-

First shoot	40 Ft. long	2.2 Ft wide	0.70 Oz. gold perton.
Second shoot	205 " "	1.22 " "	2.58 " " "

In No. 2 tunnel there is only one small ore-shoot, which starts at 90 feet from the crosscut, thus --

Ore-shoot	25 Ft long	2.3 Ft. wide	1.40 Oz. gold per ton.

The adjoining 225 feet to the west shows a width of 0.8 feet and a content of 0.56 Oz. gold per ton, - which is below commercial grade.

In the raise there is ore from 15 to 30 feet above the level, with a width of 1.0 Ft. and a content of 1.98 Oz. gold. Thence, up to the sub-level at 90 feet, the vein is narrow and lean. In the west sub-level the widths and values are improving and it shows a width of 0.6 Ft. and content of 1.04 Oz. gold per ton.

(I am informed that on Feb. 4th there was 18 inches of ore at the top of the raise, assaying 5.7 Oz. gold.)

ORE DEVELOPED: There is no tonnage of ore definitely blocked out. On the surface an insufficient amount of work has been done to obtain an adequate idea of the size and value of the ore body there. In No. 1 tunnel west the required data has been obtained, but in No. 2 tunnel there is little commercial ore and no definite data as to the extent of ore below No. 1 tunnel.

The following figures are given as an approximation to the "Probable Ore", which is somewhat vaguely indicated:-

	Tons	Width	Gold	
First shoot, surface to #2 Lev.	1000	2.2 Ft	0.97	Oz.p.t.
Second shoot, " to 50 Ft. below #2T	4150	1.2 "	2.58	"
Totals	5150	1.4 "	2.09	"
Figured over a stoping width of 3 ft,	11,036	3.0 "	0.98	"

It is probable that before milling this ore a considerable proportion of the waste would be sorted out.

So far as known to the writer, no mill-tests have been made on this ore, but it should offer no serious problem.

GENERAL NOTES: The gold-vein has been fairly definitely traced about a thousand feet along its strike and there is no evident reason why it may not extend much further, for the West Coast veins, while small, are often notably persistent; also the plane of the Central vein has been the locus of considerable movement, as is evidenced by the strong gouge

At the east end of the underground workings the vein is pinched and barren, but there is reason to expect that it will open up again further east, before reaching the boundary of the Central property some 450 feet east of the tunnels. The west faces of the tunnels show a good looking vein, with a little quartz and sulphide giving, roughly, half ounce assays, giving encouragement to the hope that further development to the west will result in the finding of other ore-shoots.

About 60% of the present length of No. 1 tunnel is in ore, while only about 7½% of the No. 2 level drift is ore; - that is, most of the ore on No. 1 level does not extend down as far as No. 2. There is no definite evidence as to the reason for this, but it is not believed by the writer that the zone of ore deposition has been passed, but that the vein is locally pinched and lean and may be expected to open up again at further depth. In fact it is possible that the near-ore encountered for 225 feet in the lower level may be the top fringe of an ore-shoot below. It is reliably stated that in one of the producing mines in the district ore-shoots are frequently more or less discontinuous vertically, but open up again at further depth.

The aplite dikes were intruded before the formation of the vein. The one which parallels the vein is quite erratic in course and width; it is of economic importance since, being more easily crushed and replaced by mineralizing solutions than the granodiorite, parts of it adjacent to the vein have often been impregnated with mineral and form low grade ore. When badly decomposed it is difficult to distinguish the aplite from decomposed granite, but there is

some vague suggestion in the tunnels that practically all the commercial ore yet found occurs where the vein is in direct contact with the aplite, or where a small and now decomposed stringer of aplite has been followed and mineralized by the vein. The vein is not in contact with the aplite at either end of the present mine workings, but they are not far separated and may come together at any point.

Development to date has not been as favorable on the No. 2 level as might have been hoped, but is sufficiently so to justify further extensive work.

The claims have not yet been thoroughly prospected and further work of that nature is to be recommended on the southern two thirds of the property.

RECOMMENDATIONS: In the writers opinion the following development should be undertaken, the various items being listed in the order of their importance:-

(1) Continue the No. 2 level west drift as far as the vein can be followed. The primary object of this drift is to explore the vein and develop ore; the secondary object is to find ore as far west as possible in order that lower level tunnels may be driven to the vein from the Extension No. 5 claim without a prohibitive length of crosscut, and a long drift besides. Deep crosscuts to the vein from this claim should be shorter than from Bibb Creek, provided the vein extends far enough west, and in addition would give a much better dump room, campsite, etc.

(2) Continue No. 1 tunnel west drift at least 300 feet further, or more, depending on the results obtained there and in No. 2 tunnel.

(3) Raise from No. 2 to No. 1 level at a few hundred foot intervals on any ore that may be found, both to further develop the ore and to obtain better ventilation.

(4)Drive east on No. 2 tunnel for at least 250 feet, further, up to the property line if results are favorable.

The above program calls for between 1700 and 2400 feet of drifting and raising, depending on the results obtained. If the west development on Level No. 2 results in the discovery of a satisfactory amount of ore, deeper exploration can probably best be done through a lower level crosscut tunnel on the Extension No. 5 claim.

If development on No. 2 west is not satisfactory, it will still be necessary to develop below that level under the present workings, which, in that case, should be done through a winze to be sunk in the vicinity of the present raise, from which drifts would be run each way.

COSTS: It is difficult to obtain an accurate cost per foot of development in the past, but it would appear that the direct cost of drifting has been about $11.25 per foot. This figure includes drilling, mucking, explosives, and all underground labor and supplies, but does not include compressed air cost, tramway operation, and overhead, which probably added about $9.70 per foot, making the total cost of drifts about $20.95 per foot. The raise has probably cost about $32.00 per foot.

The estimated cost of future drifting is - Direct cost $10.00 per foot, plus compressed air cost, tramway operation, and overhead $8.60, making a total cost of $18.60 per foot. (It will be necessary to operate the tramway regularly when the drifts are in ore, since there is no suitable place to store ore at the tunnel portal.) Crosscutting in granodiorite will be more costly than drifting as the granodiorite is very hard and tight.

On the basis of the above costs the minimum recommendations given in (1), (2), and (3) will involve an outlay of approximately $25,000, or $50,000 for the full program recommended.

The present equipment should be adequate to carry on the development as outlined, but a certain amount of new equipment would be necessary before shaft sinking could be started.

CONCLUSION: The Central Zeballos property, as it stands today, is a good looking prospect, but by no means an assured mine. The geological conditions are good and reasonably in line with those at the Privateer and the Spud Valley mines.

While the ore thus far found on No. 2 level is much less than would be expected from the showing on No. 1 level, this should not cause undue discouragement since there is reason to hope that the next lower level may show improvement.

It might be argued that the logical plan of development would be to sink immediately on the No. 2 level, and find definitely if the ore-shoot does recur under the No. 2. This program admittedly has some merit, but it is my opinion that it is better to first explore laterally for a new ore-shoot, the discovery of which far enough to the west would make feasible the driving of a lower level tunnel, with its many advantages over sinking.

In conclusion, I recommend the Central mine as a promising development proposition under the terms of the proposed deal, as outlined by your secretary, and believe that the mine warrants a considerable outlay in further development and exploration on both the gold vein and the copper deposit.

Respectfully submitted,

Chas. C. Starr