Zeballos Gold Properties
In-House Report

Kim Wahl
December 2, 1999

cc. Neil Banerjee
Dave Lefebure

Introduction:

The Zeballos Gold district has been of great interest to gold miners for many years. The first area staked was the Tagore in 1924, and later properties were staked to 18 different mining companies (figure 1). The area has produced a combined total of almost 9.5 million grams of gold, and just over 4 million grams of silver. The main period of exploration and production was between 1933 to 1943. Recent interest in this area has initiated a revival of the study of the area in order to determine whether reopening old mines or perhaps developing new ones would be a viable prospect.

Geology:

Located a mere 320 km north of Victoria on the west coast of Vancouver Island, the Zeballos Gold district is easily accessed by an all season gravel road in the area around the Zeballos River (figure 2). The geology of the area is dominantly plutonic suites of various ages. The area is underlain by the Bonanza Group (lower Jurassic), an island arc sequence of mostly rhyolitic to basaltic rocks. Conformably underlying the Bonanza is the Quatsino Formation and the Parson Bay Formation. These primarily limey clastics are then underlain by the tholeitic basalts of the Karmutsen Formation. This entire package, the Upper Triassic Vancouver Group, was then intruded by the Island Intrusions, to which the quartz diorite Eocene Zeballos Stock belongs. The Zeballos Stock, associated with the Catface Intrusions, is spatially related to the majority of the gold deposits known to date. A 1,000 m zone centered on the contact of this stock

and the country rock (figure 4) has shown statistically to host all of the largest deposits in this area. The presence of these gold-hosted quartz veins is therefore attributed to this particular intrusion.

Background Information:

The veins that have been assayed have shown promising results. The pyrite, arsenopyrite, galena and sphalerite bearing tabular quartz veins are unclassified veins, meaning that they do not specify whether they are of a mesothermal or epithermal origin. The vein size ranges from centimeters to meters in width, and is typically about 50 to 200 meters in length. Grab and assay samples gave values of up to 493.8 grams per tonne gold and 171.5 grams per tonne silver, however these values are inconsistent with the average bulk sample analysis. A systematic evaluation of the ore within this 1,000 m zone, it was determined that the expected target could have from 25,000 to 250,000 tonnes of ore grading from 10 to 20 grams per tonne gold. A median deposit of 75,000 tonnes of 12 grams per tonne gold would produce a gross gold value of approximately $8 million dollars (assuming a gold price of $300 Canadian dollars per tonne).

Various plots have been used to determine the potential of the Zeballos Gold district. Figure 5 is a plot of the average gold grade versus average silver grade. This plot shows that the gold values are consistently higher than the silver values. Figure 6 shows a plot of average gold grade versus mined tonnage. Two distinct groups are

characterized by this graph; those of high grade are of small tonnage, and those of lower grade are of higher tonnage. In figure 7, precious metal content (gold and silver) are plotted against mined tonnage. It is clear to see in this figure that the higher the mined tonnage, the higher the precious metal content. This means that vein deposit value can be estimated based on the production tonnage.

Some general information with respect to the Zeballos Mining camp is given in Tables 1 and 2. (see Sinclair and Hansen, 1983)

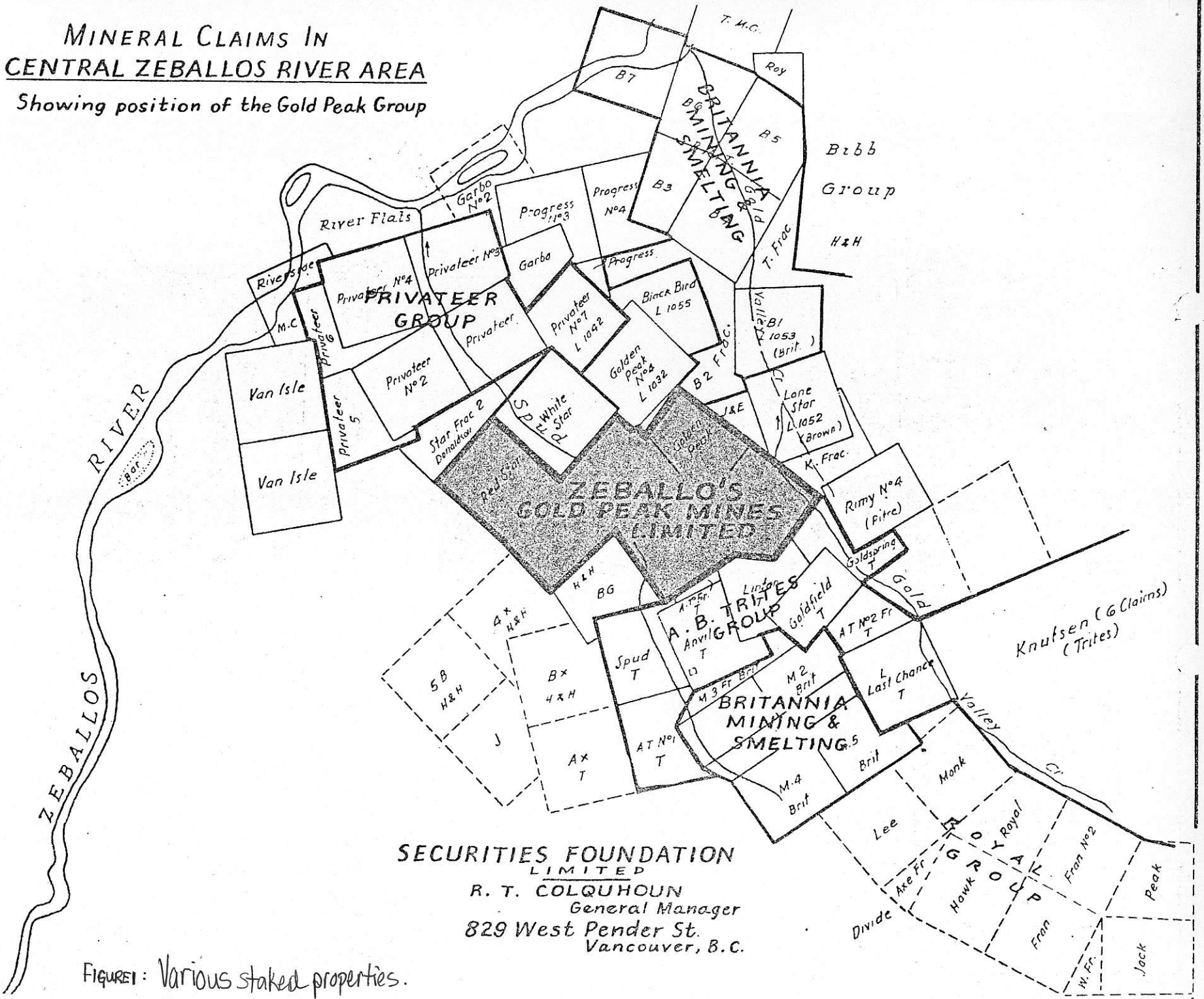
Some development exists in the area of the Zeballos Gold camp. Numerous adits with somewhat extensive drifts have been constructed. These adits may or may not be useable, as it has been many years since their latest upkeep.

Recommendations:

Based on the information in this and referenced reports, I believe that this prospect is a viable endeavor for Let's Go Mining Company. The risk is moderate, as the referenced data is old (circa 1938) and incomplete, however the mining techniques employed at that time were archaic at best. The amount of gold possibilities that exist in the Zeballos area are great, and with the slow yet inevitable comeback of gold prices, now would be a great time to step into a small but concentrated deposit area which already has some minor development. My recommendations at this time are to go ahead with negotiations with claim owners.

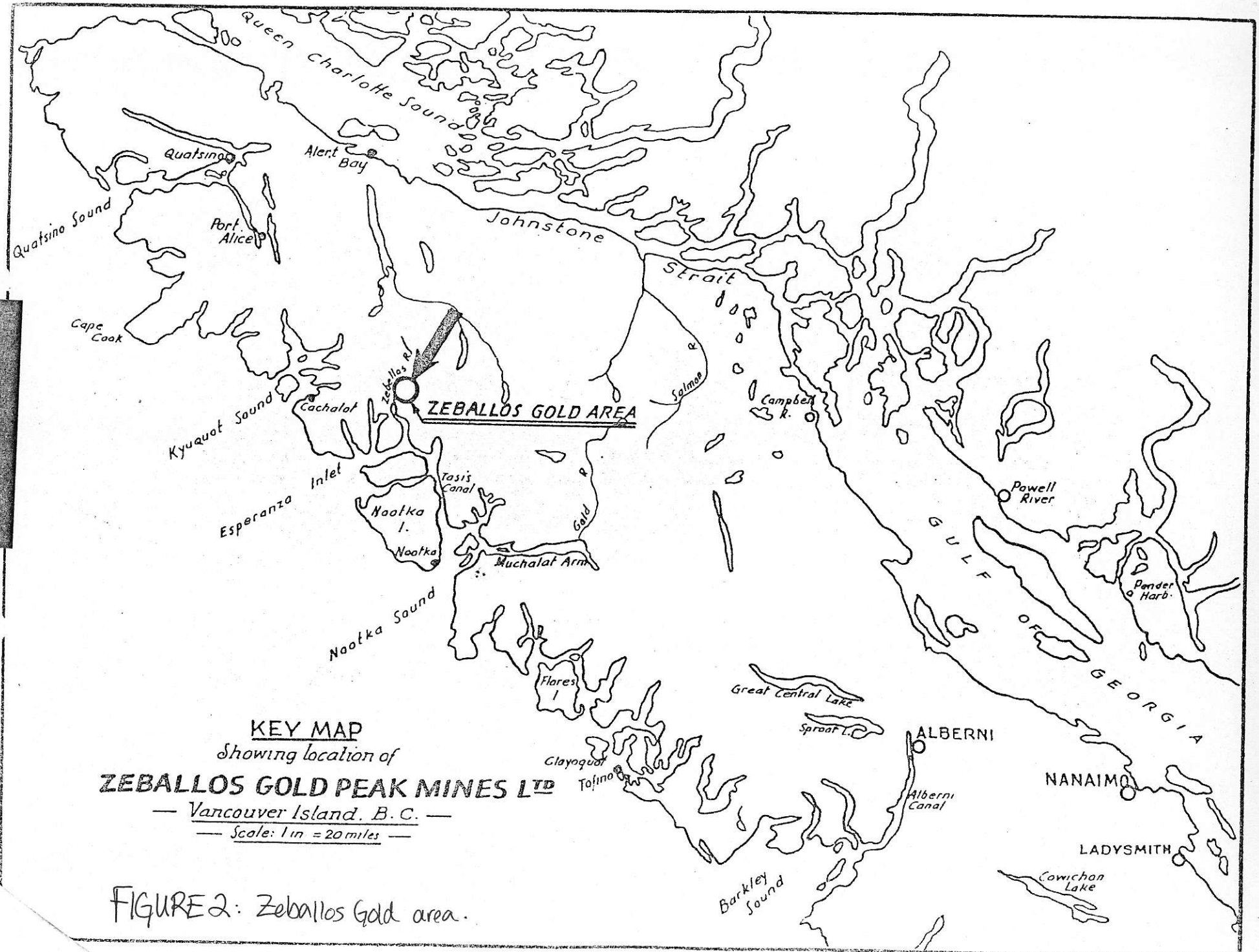
MINERAL CLAIMS IN CENTRAL ZEBALLOS RIVER AREA

Showing position of the Gold Peak Group



SECURITIES FOUNDATION
LIMITED
R. T. COLQUHOUN
General Manager
829 West Pender St.
Vancouver, B.C.

FIGURE1 : Various staked properties.



KEY MAP
Showing location of
ZEBALLOS GOLD PEAK MINES LTD
— Vancouver Island. B.C. —
— Scale: 1 in = 20 miles —

FIGURE 2: Zeballos Gold area.

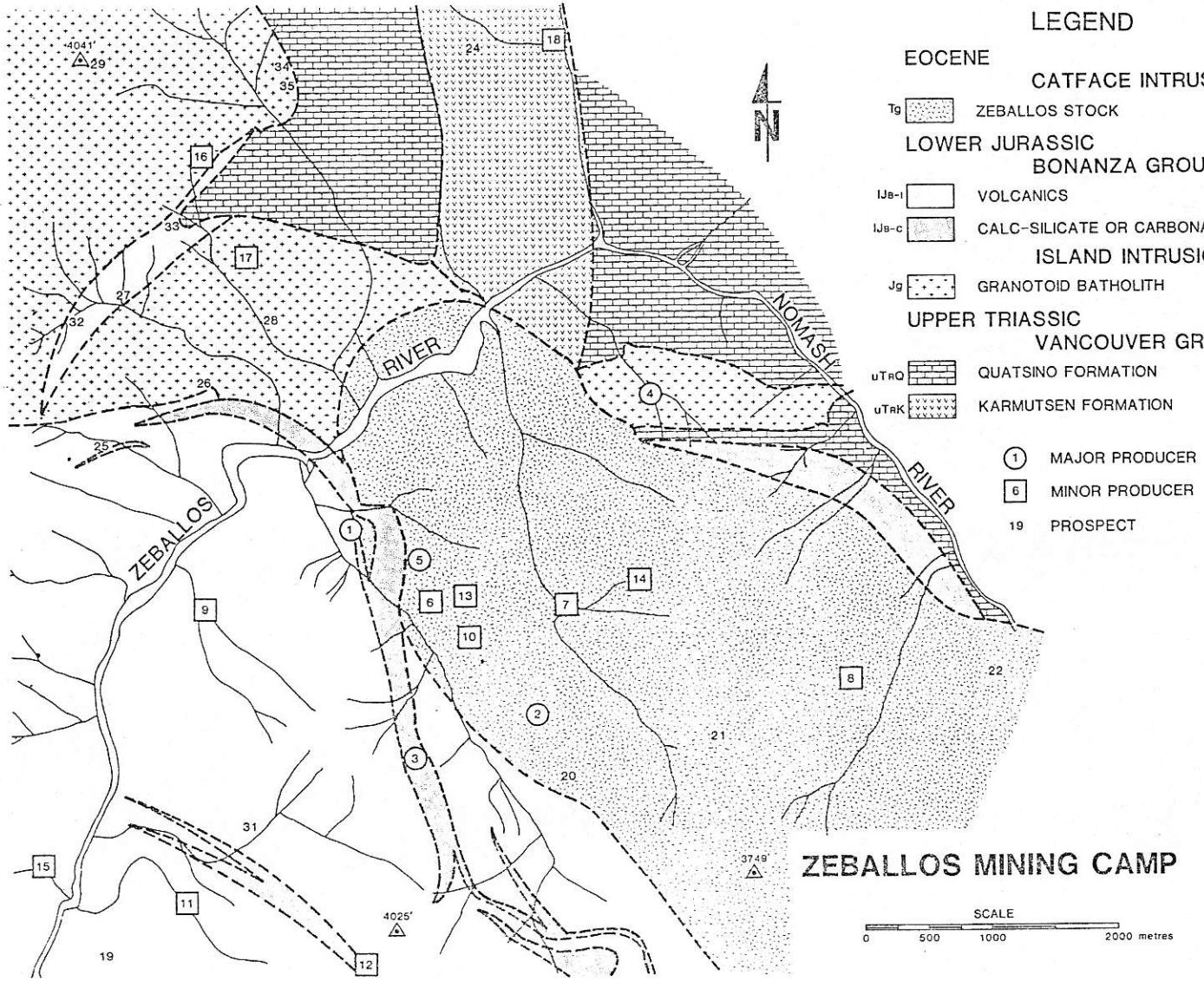


Figure 3: General geology and location of recorded mineral occurrences and past producers, Zeballos mining camp (after Stevenson, 1950).

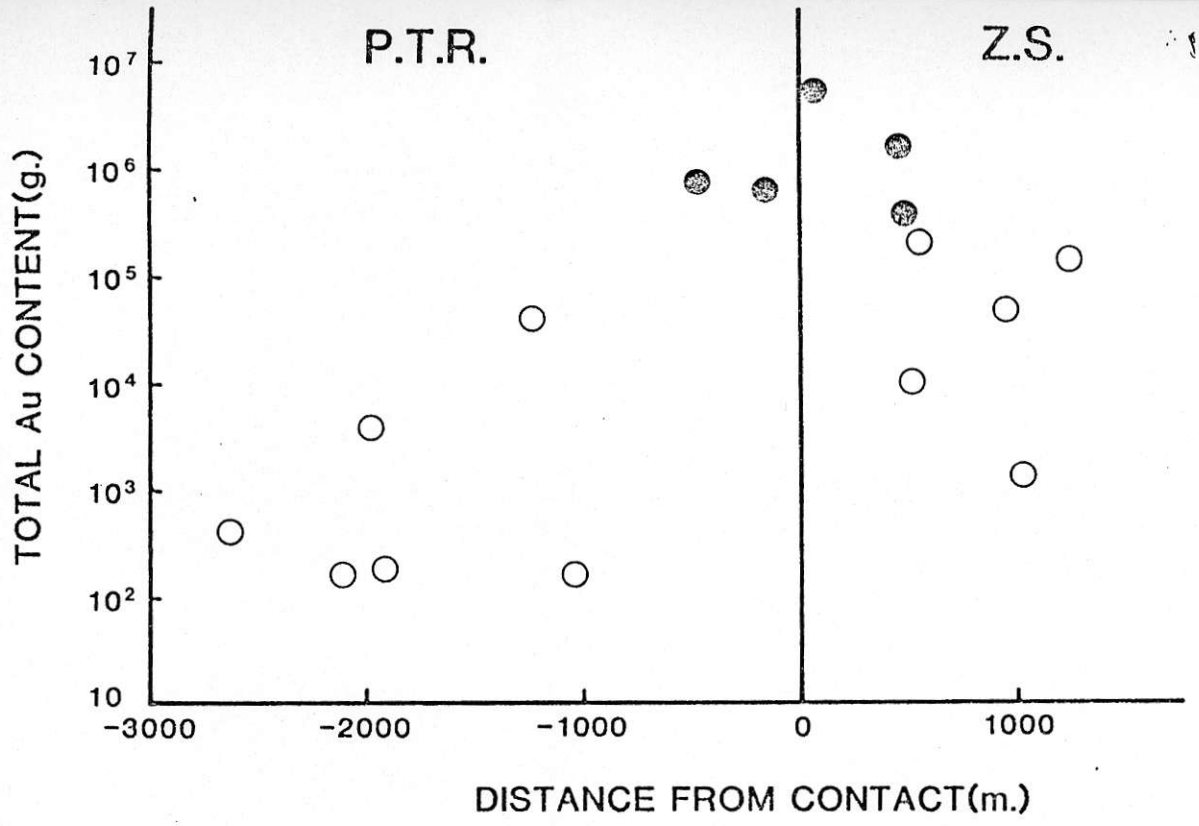


Figure 4: Total gold content (grams) versus distance of gold-quartz veins from contact of Zeballos stock (Z.S.) with pre-Tertiary rocks (P.T.R.). Positive distances are within the stock; negative distances are within country rock. Deposits greater than 2000 mined tonnes are closed circles, smaller deposits are are open circles.

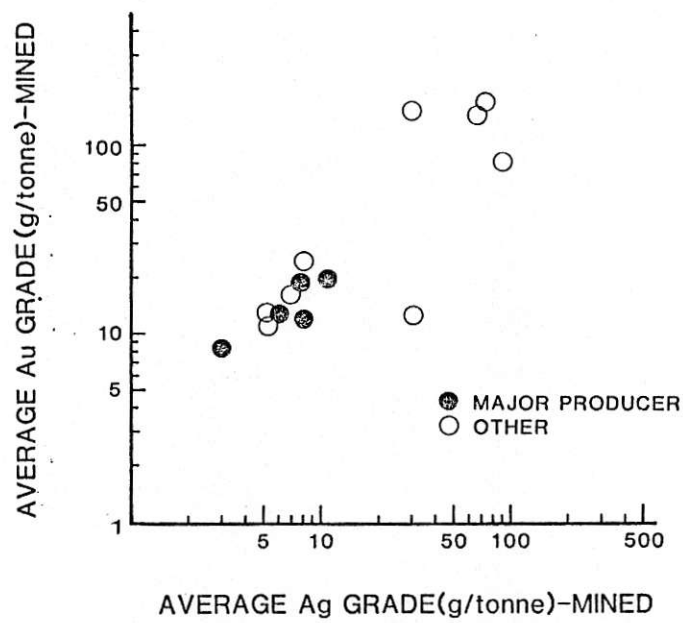


Figure 5: Average gold grade (grams per tonne) versus average silver grade (grams per tonne) for gold-quartz veins, Zeballos mining camp.

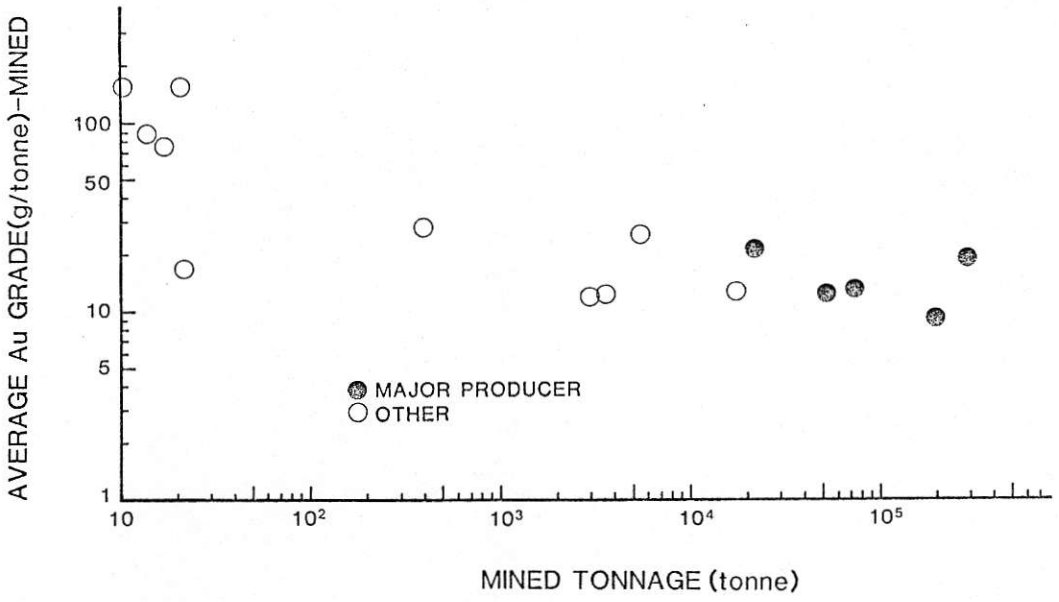


Figure 6: Average gold grade per tonne mined (grams per tonne) versus mined tonnes, Zeballos mining camp. Three deposits with tonnages of 2, 1, and 1 and corresponding gold grades of 70, 156, and 156 grams per tonne are not included in the plot.

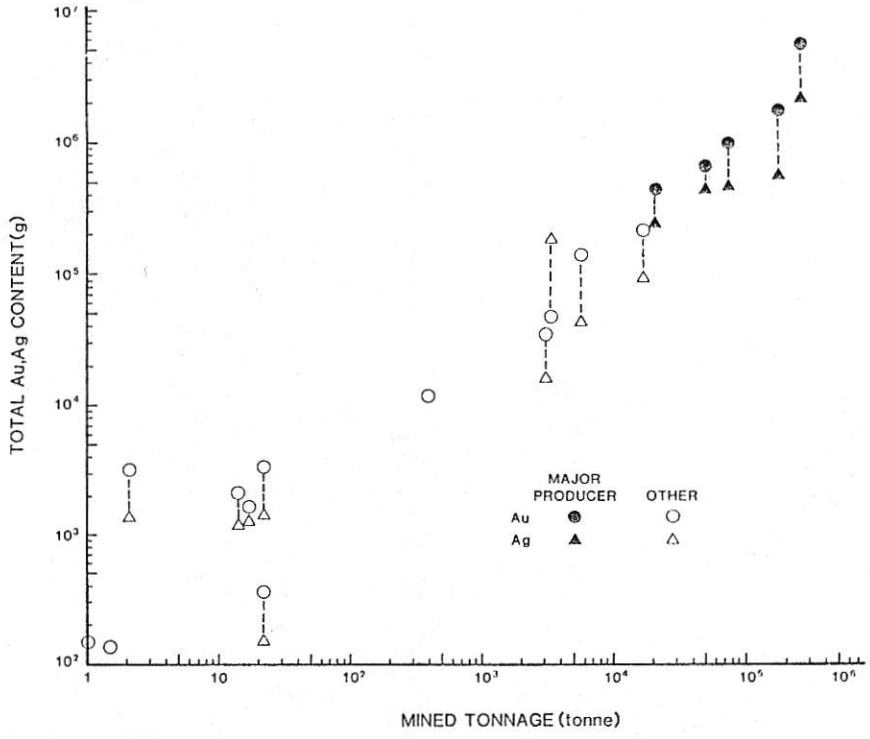


Figure 7: Plot of precious metal contents versus mined tonnes, Zeballos mining camp. Gold contents are shown with circles and silver contents by triangles.

EMPR- Geological Fieldwork 1982
paper 1983-1, p.290-303.

RESOURCE ASSESSMENT OF GOLD-QUARTZ VEINS, ZEBALLOS MINING CAMP VANCOUVER ISLAND - A PRELIMINARY REPORT (92L)

By A. J. Sinclair and M. C. Hansen
Department of Geological Sciences, The University of British Columbia

INTRODUCTION

Production data and various geological measurements have been compiled and tabulated for gold-quartz veins of the Zeballos mining camp, Vancouver Island, British Columbia. A preliminary qualitative evaluation of some of these data indicate that: (1) mined tonnage is an acceptable relative value estimator, (2) on average, large deposits are lower grade than small deposits, (3) gold and silver are highly correlated, (4) gold grade is related systematically to bulk sulphide content as indicated by average combined lead plus copper, and (5) an important systematic relation exists between gold content of a deposit and distance from the contact of the Zeballos stock. A quantitative evaluation of these data is in progress.

Zeballos mining camp is on the west coast of Vancouver Island about 320 kilometres northwest of Victoria, British Columbia. Access is via an all-weather road between the settlements of Zeballos (5 kilometres south of the mining camp) and Nimpkish. The surrounding countryside is mountainous and rugged with elevations from near sea level to about 1 300 metres; it experiences mild winters and high rainfall.

The first gold-quartz vein staked in the area was the Tagore in 1924 although limited quantities of placer gold had been mined previously. Lode production began in 1934 and reached a peak in 1937 to 1943. By 1948 most production had ceased. Two deposits, Privateer and Spud Valley, have produced 473 082 of the 651 797 tonnes of ore mined in the camp.

Recorded metal production to date totals 9 465 244 grams of gold and 4 119 118 grams of silver, as well as minor amounts of copper and lead from a total of 651 797 metric tonnes of ore mined. This tonnage includes the substantial dilution resulting from mining veins commonly about 10 to 30 centimetres wide. Average mined grades for the camps are 15 grams gold per tonne and 6.5 grams silver per tonne although vein material contained as much as 30 to 150 grams gold per tonne.

Our evaluation of Zeballos camp is oriented toward a quantitative resource assessment following the approach of Sinclair (1979), Goldsmith, *et al.* (in preparation), and Orr and Sinclair (1971). The study is divided into two parts: (1) development of a quantitative data file, and

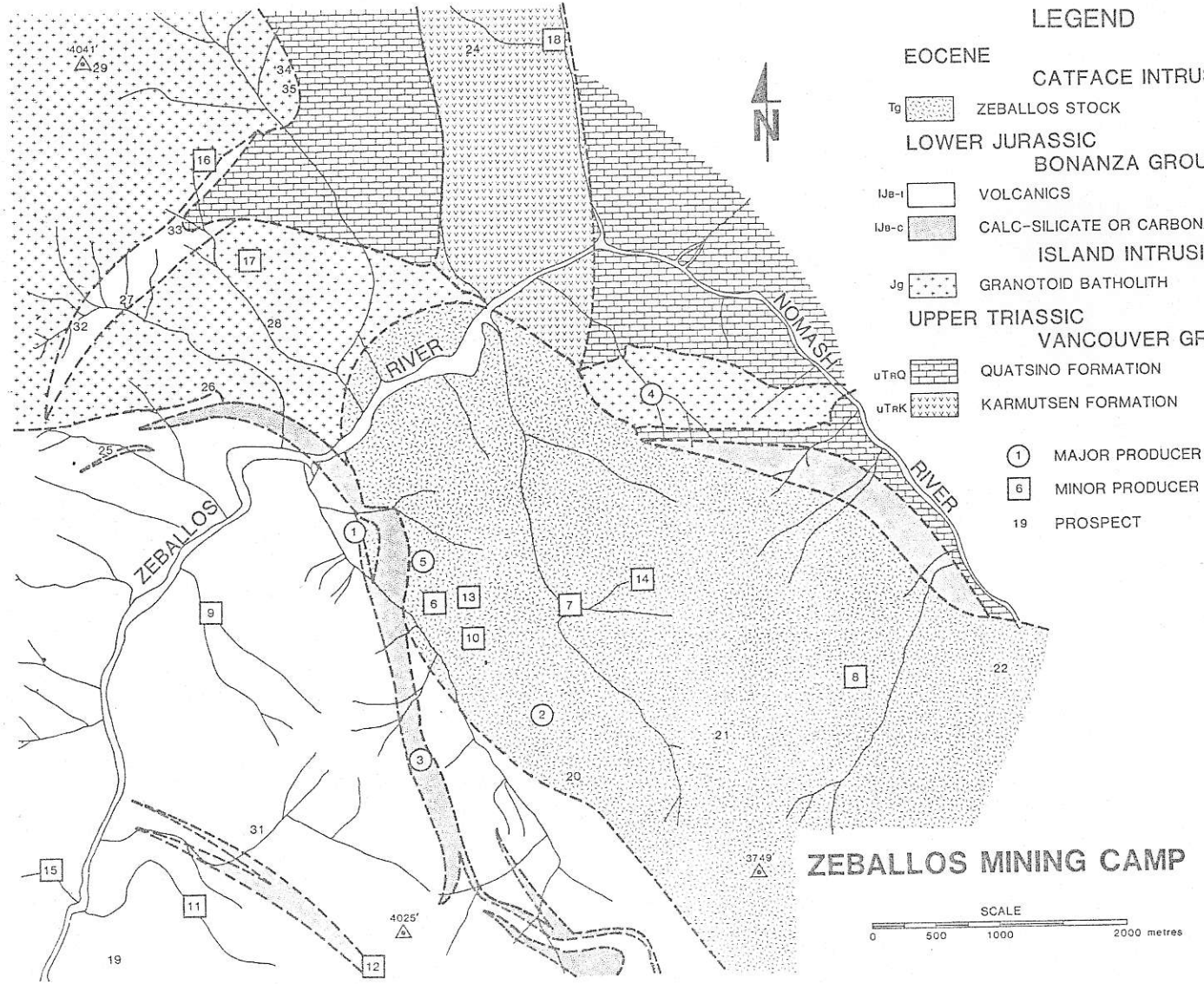


Figure 101. General geology and location of recorded mineral occurrences and past producers, Zeballos mining camp (after Stevenson, 1950).

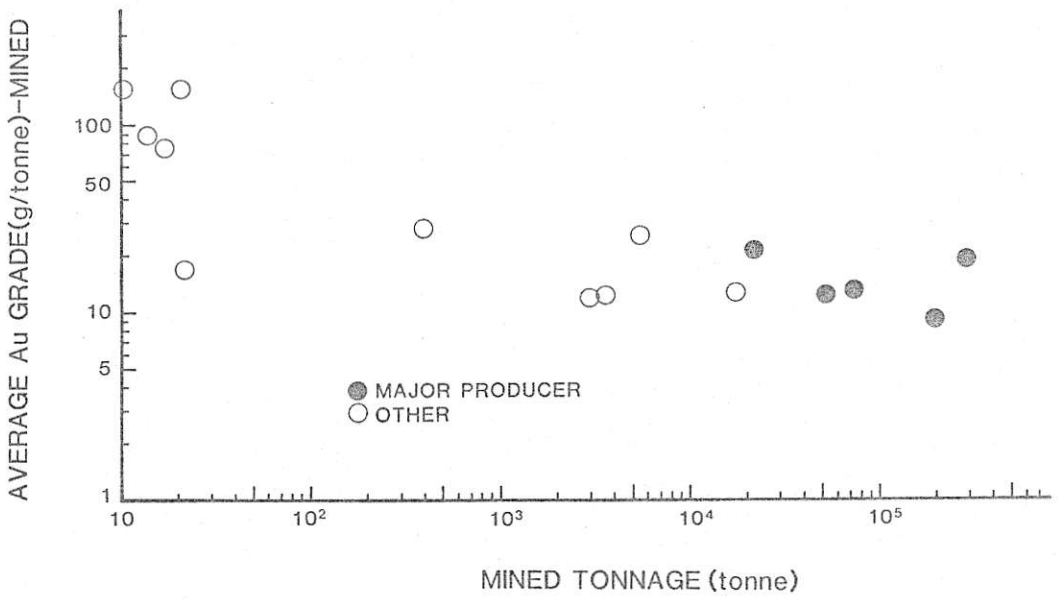


Figure 102. Average gold grade per tonne mined (grams per tonne) versus mined tonnes, Żeballos mining camp. Three deposits with tonnages of 2, 1, and 1 and corresponding gold grades of 70, 156, and 156 grams per tonne are not included in the plot.

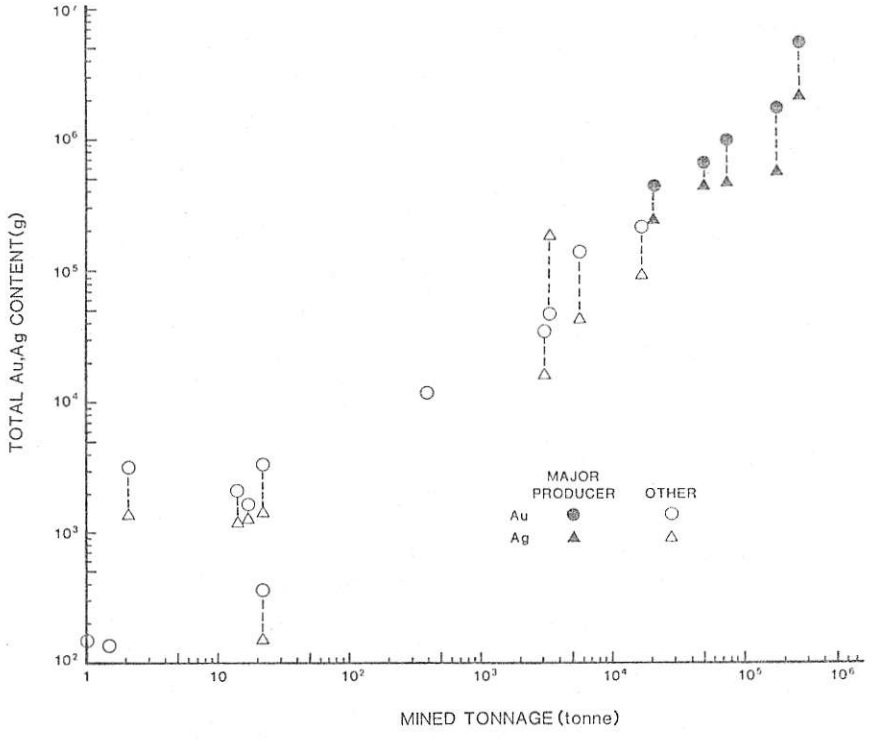


Figure 103. Plot of precious metal contents versus mined tonnes, Żeballos mining camp. Gold contents are shown with circles and silver contents by triangles.

(2) evaluation of quantitative data. This report describes the detailed data file and presents some of our initial results stemming from a preliminary evaluation of the file.

GEOLOGY OF ZEBALLOS CAMP

General geology of the area in and around Zeballos camp is shown on Figure 101. The area is underlain by an essentially monoclinal sequence of Mesozoic volcanic and sedimentary rocks cut by Jurassic and Tertiary intrusions. The Lower Jurassic Bonanza Group is a typical island arc sequence of largely basaltic to rhyolitic volcanic rocks. This unit is underlain conformably by limestones of the Quatsino Formation and tholeiitic basalts of the Upper Triassic Karmutsen Group. All these rocks are cut by Jurassic plutons of the Island intrusions, mainly dioritic and granodioritic in composition. The Zeballos stock, with its spatially related gold-quartz veins, is a quartz dioritic phase of the Catface intrusions of Eocene age.

A QUANTITATIVE DATA BASE

We have established a quantitative data base relating to mineral deposits and occurrences in Zeballos camp by reference to two sources of information: a report and map by Stevenson (1950), and the MINFILE computer file of mineral deposits in British Columbia. In addition to numerical data relating to grades and tonnage mined and/or milled, we have made a number of other measurements of a geological nature from Stevenson's (1950) map, as well as coding mineralogical information. These data are summarized in Tables 1 to 5, where deposits are listed in order of decreasing tonnage mined. The tables are self-explanatory but some comments on the nature and quality of data are warranted.

Mined tonnage refers to ore brought to surface and subject to hand sorting prior to milling. Quoted grade values refer to mined tonnage.

The two most productive vein orientations are shown for each deposit; each orientation may represent several veins. In general, an effort was made to record mean directions of undulatory surfaces.

Vein width recorded in Table 3 applies to the most productive segment of a vein; thus, is a subjective variable of uncertain value. The term 'sheeted zone' refers to '... joints spaced 2 to 8 inches apart and (which) contain either gouge or quartz-sulphide stringers an eighth of an inch to an inch wide' (Stevenson, 1950). Tensional features include gash veins and comb quartz. Associated replacement/alteration category refers to features observed in a vein or adjacent wallrock such as silicification or oxidation. In general, such data are sparse in available literature.

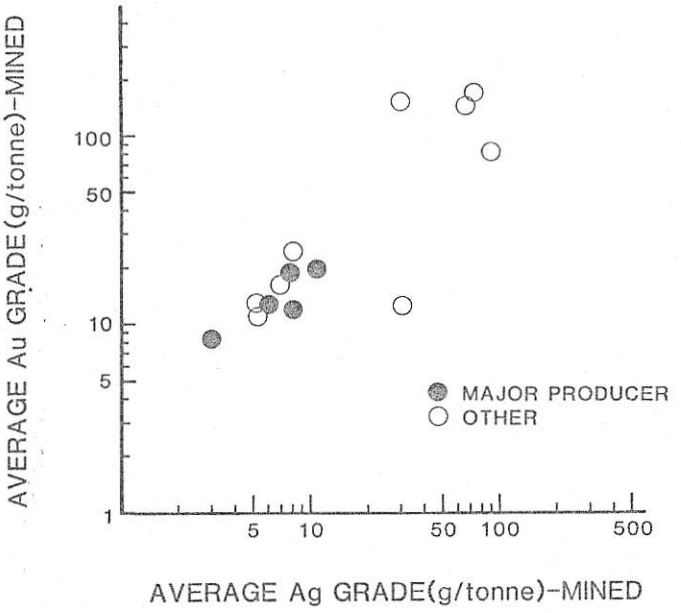


Figure 104. Average gold grade (grams per tonne) versus average silver grade (grams per tonne) for gold-quartz veins, Zeballos mining camp.

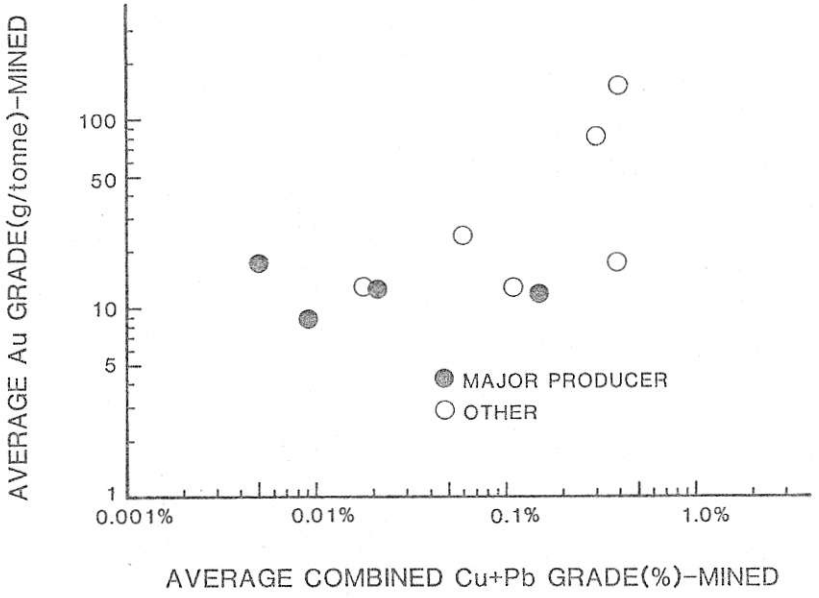


Figure 105. Average gold grade (grams per tonne) versus combined lead plus copper (per cent) for gold-quartz veins, Zeballos mining camp. Deposit 17 (Cordova) is included in this plot.

Distances of various deposits from the contact of the Zeballos stock were measured from Stevenson's (1950) geological map of the camp (*see* Fig. 101). In a few cases the contact had to be extended across drift-covered areas in order to obtain distance measurements.

PRELIMINARY EVALUATION OF ZEBALLOS DATA BASE

There are many blanks in Tables 1 to 5, particularly as regards to grade and tonnage information. Complete production statistics exist for only nine of 18 deposits with recorded production. Consequently, it will be difficult, if not impossible, to apply some of the techniques of evaluation recommended by Sinclair (1979) for vein camps.

Instead, we have chosen to examine various plots as a basis for a subjective preliminary evaluation of the data. Some of these graphs appear to establish important relations concerning deposit location or attributes. Figure 102 is a graph of average gold grades versus mined tonnages. A size of about 2 000 tonnes clearly divides the deposits into two size categories with different mean grade characteristics. The high tonnage category has a lower grand average grade and less dispersion of average grades than the low tonnage category. Some of this difference may be the result of selective mining and/or hand sorting.

Precious metal contents (gold and silver) are plotted versus production (mined tonnage) on Figure 103. This graph demonstrates that where production has been reported, both gold and silver metal contents increase systematically with an increase in size; consequently, production tonnage is an acceptable single measure of relative value of vein deposits in the Zeballos camp (*see* Sinclair, 1979).

Figure 104 is a plot of average gold grade versus average silver grade and demonstrates: (1) the consistently lower grade in silver compared with gold, and (2) the positive correlation between log gold and log silver. This correlation may be partly artificial; as indicated earlier, some of the high grades for small deposits may be the result of selective upgrading of ore. This possibility is suggested by the two clusters of points on Figure 104; such patterns represent dubious correlations. Even if this explanation is correct, it appears that a reasonable correlation exists between gold and silver as demonstrated by the five major producers in the camp.

Average gold grade of tonnes mined is plotted against copper plus lead on Figure 105 where there is a suggestion of a regular relation between the two. In general, precious metal grade is higher if copper plus lead is also high. The relation does not appear to be linear on the log-log plot suggesting that the effect is not due solely to hand sorting of ore.

Figure 106 is a plot of deposit relative value (total grams of gold per deposit) versus distance from the contact of the Zeballos stock. The graph shows a remarkably consistent pattern both in the Zeballos stock

and in the country rock. The five principal producers are localized within 500 metres of the contact and smaller producers are more removed from the contact in a surprisingly regular pattern. These trends can be approximated by the following linear equation:

Within Stock: $\log(\text{Total gold}) = -0.0029D + 6.778$
Within Wallrock: $\log(\text{Total gold}) = 0.0025D + 6.778$

where gold is in grams, D is a positive distance into the stock or a negative distance into the wallrock measured in metres. These equations provide a means of contouring expected gold content of deposits remaining to be discovered. As such they outline a zone about the contact of the Zeballos stock that has high potential for relatively large new gold-quartz veins. The expected target in this zone can be estimated from Figure 102 to have a potential of 25 000 to 250 000 tonnes of ore grading about 10 to 20 grams gold per tonne. A median deposit would contain about 75 000 tonnes grading 12 grams gold per tonne. The gross value of gold in this median deposit, assuming a price of Canadian dollars 450 per ounce, is about $12 000 000.

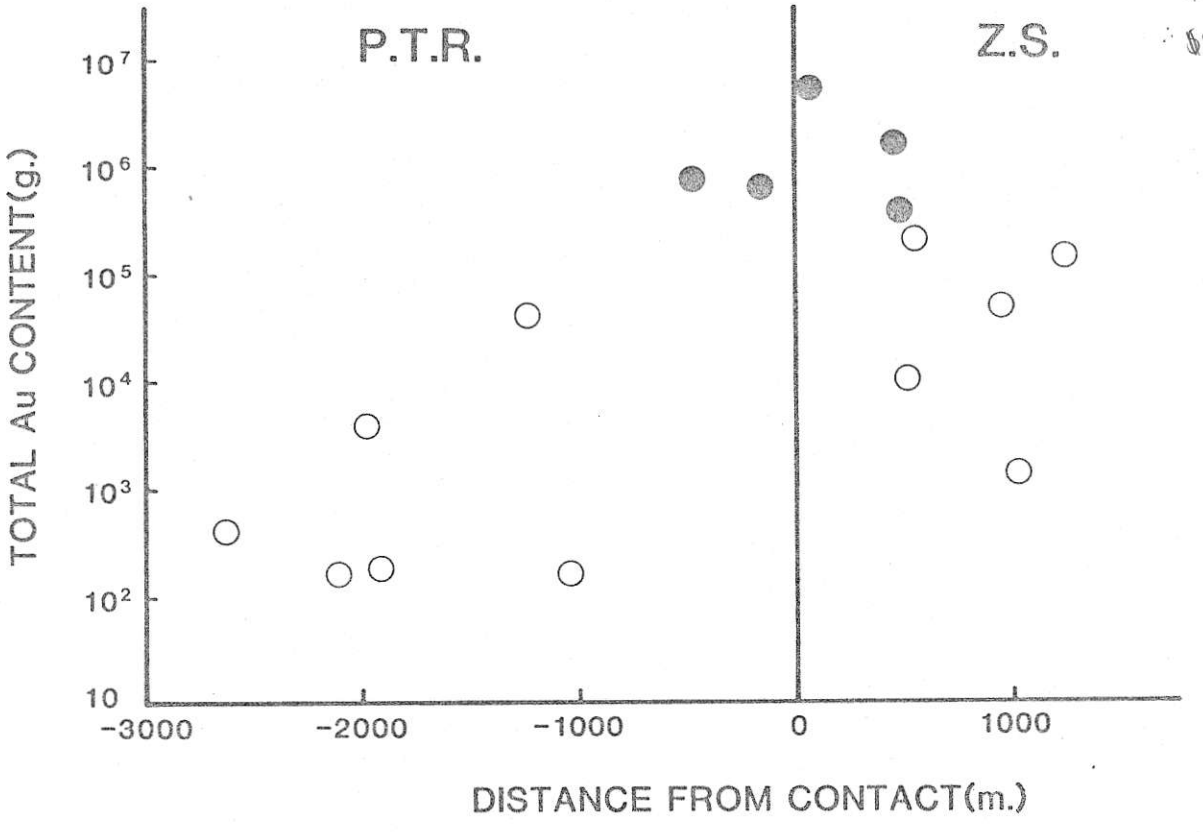


Figure 106. Total gold content (grams) versus distance of gold-quartz veins from contact of Zeballos stock (Z.S.) with pre-Tertiary rocks (P.T.R.). Positive distances are within the stock; negative distances are within country rock. Deposits greater than 2000 mined tonnes are closed circles, smaller deposits are are open circles.

TABLE 1

LISTING OF MINERAL DEPOSIT DATA FILE FOR
ZEBALLOS MINING CAMP - GENERAL INFORMATION

DEPOSIT NUMBER	DEPOSIT NAME	LOCATION UTMN	LOCATION UTME	MINFILE REF.	YEARS OF PRODUCTION (19__)	ELEVATION (FEET)	ELEVATION (METRES)
1	PRIVATEER	43400	56600	092L/008	34-53,75	750	229
2	SPUD VALLEY	42400	58000	092L/012	36,39-42,51	2000	610
3	MOUNT ZEBALLOS	42000	57000	092L/012	39-42,44	2000	610
4	CENTRAL ZEBALLOS	44800	58700	092L/018	38-42,46,47	1500	457
5	PRIDENT	43500	56900	092L/009	41-43,47,48	1500	457
6	C.D.	43300	58100	092L/015	38-41	1400	427
7	HOMEWARD	42700	60400	092L/019	41,42	2000	610
8	VAN ISLE	43100	55400	092L/038	40	600	183
9	WHITE STAR	43200	57100	092L/010	35-42,52,57	1500	457
10	ZEBALLOS PACIFIC	42900	57500	092L/011	34	1500	457
11	GOLDEN PORTAL	40900	55200	092L/005	40	750	229
12	BEANO	40600	56300	092E/002	48,49	2500	762
13	I.X.L.	43400	57300			2000	610
14	RIMY	43300	58700	092L/016	38	2500	762
15	TAGORE	41100	54300	092L/006	30,32,39	400	122
16	BARNACLE	46700	55300	092L/029		2400	732
17	CORDOVA	45800	55500	092L/027	39	2000	610
18	KING MIDAS	47700	58000	092L/020	40	500	152
19	ANSWER	40400	54600	092E/023		350	107
20	BRITANNIA	41900	58300	092L/013		1900	579
21	BIG STAR	42300	59300	092L/017		2500	762
22	MONITOR	42600	57300			1500	457
23	NORTH FORK EXPL.	48800	57800	092L/021		750	229
24	GOLD SPRING	47600	57300			1750	533
25	BODEN	44300	54400	092L/022		1200	366
26	MAQUINNA	44600	55300	092L/023		600	183
27	OMEGA	45500	54600	092L/024		1400	427
28	PANDORA	45300	55700	092L/026		850	259
29	LUCKY STRIKE	47300	54500	092L/030		3750	1143
30	FRIEND	39200	57800	092E/003		2500	762
31	PROSPERITY	41400	55500	092L/007		1000	305
32	PEERLESS	45300	54200	092L/025		1900	579
33	F.L./RIDGE	46200	55000	092L/028		2600	793
34	CHURCHILL	47400	55800	092L/031		2250	686
35	CAVALIER	47100	55800	092L/032		2500	762

NOTE: 1. DEPOSITS 1 TO 5 REFERRED TO AS MAJOR PRODUCERS.
DEPOSITS 6 TO 18 REFERRED TO AS MINOR PRODUCERS.
DEPOSITS 19 TO 35 REFERRED TO AS PROSPECTS.

2. BLANKS INDICATE NO AVAILABLE DATA, OR NON-APPLICABLE VARIABLE/ATTRIBUTE.

3. DEPOSITS 1 TO 30 & 34 ARE GOLD-QUARTZ VEIN PAST PRODUCERS OR PROSPECTS. THE CHURCHILL PROPERTY ALSO COVERS MAGNETITE REPLACEMENT MINERALIZATION. THE BEANO PROPERTY ALSO COVERS SKARN-TYPE MINERALIZATION. THE PROSPERITY PROPERTY SHOWS NO SIGN OF MINERALIZATION AT ALL, BUT IS INCLUDED FOR THE SAKE OF COMPLETENESS. DEPOSITS 33 & 34 ARE MAGNETITE REPLACEMENT DEPOSITS, AGAIN INCLUDED FOR SAKE OF COMPLETENESS.

TABLE 2

LISTING OF MINERAL DEPOSIT DATA FILE FOR
ZEBALLOS MINING CAMP - PRODUCTION DATA

DEP NO	PRODUCTION (TONNES) MINED	MILLED	TOTAL METAL CONTENT (GRAMS) Au	Ag	(KILOGRAMS) Cu	Pb	GRADE (Gr,Kg/TONNE MINED) Au	Ag	Cu	Pb
1	282328	146798	5301289	2160196	4063	10093	18.7	7.7	.01	.04
2	190754	95876	1682859	575219	9195	8093	8.8	3.0	.05	.04
3	74268	51540	946589	444399	2408	12726	12.7	6.0	.03	.17
4	52596	37789	636773	432238	7370	71140	12.1	8.2	.14	1.35
5	21585		433440	239812			20.1	11.1		
6	5645	405	143074	44322	470	2982	25.3	7.9	.08	.53
7	3586	1375	46374	108705	318	347	12.9	30.3	.09	.10
8	3044		35929	16470			11.8	5.4		
9	1293		220987	92531	1563	17144	171.0	71.6	1.21	13.25
10	393		11174				28.0			
11	22		373	156	44	39	17.0	7.1	2.00	1.77
12	21		3297	1400	33		157.0	66.7	1.57	
13	20									
14	17		1369	1586			80.5	93.3		
15	14		1245	2022	23	20	89.0	144.4	1.64	1.43
16	2		140					70.0		
17	1		156	31	0	4	156.0	31.0		4.00
18	1		156	31	10		156.0	31.0	10.00	
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FUTURE WORK

We are in the process of examining the application of a variety of multivariate statistical methods of evaluation to the Zeballos data file. Among these methods are multiple regression, discriminant function analysis, cluster analysis, and characteristic analysis. These are complex methods of data evaluation that are hampered in the case of Zeballos data by the limited number of deposits for which data are relatively complete.

In addition to statistical evaluation of our quantitative data file, a detailed structural analysis appears to warrant attention to assist in defining a resource model for Zeballos camp.

CONCLUSIONS

An extensive quantitative data file has been established for gold-quartz veins in Zeballos mining camp. A preliminary evaluation of these data leads to the following conclusions:

(1) For past producers, total production in metric tonnes is an indicator of relative gross value of a deposit.

(2) Large vein deposits are lower grade on average than are small vein deposits.

(3) Gold and silver average grades appear highly correlated on a log-log plot although this relationship appears to be accentuated by extreme hand sorting of small deposits.

(4) A systematic relation exists between gold grades and combined copper plus lead content.

(5) A pronounced systematic relationship exists between relative deposit worth (approximated by total gold content) and distance from the nearest contact of the Zeballos stock. This relationship leads to a procedure for defining areas of greatest potential for gold-quartz veins in the camp.

(6) A 1 000-metre-wide zone centred on the contact of the Zeballos stock is an area of high potential for location of a deposit equivalent to the five largest producers known in the camp.

(7) A median target defined from the five producers contains 900 000 grams of gold in 75 000 tonnes of ore.

ACKNOWLEDGMENTS

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EMPR - Bulletin #20-V (1946) Lode Gold Deposits Vanc. Is. J.S. Stevenson

therefore, to batholithic contacts, favourable prospecting areas extend farther into the area of older rocks than towards the centre of the batholith.

Experience has shown that the full length of any contact-zone will not be productive. After a mining camp has been established and numerous underground workings are available for study, correlation of surface studies with studies of the underground workings is frequently able to demonstrate why a concentration of producers is found at one place and not at others along the contact-zone. But until such time as the controlling factors have been recognized there may be little to guide the prospector to the more favourable sections of a contact-zone.

One of the best ways in prospecting is first to study the known ore deposits in the mineralized area nearest to the area to be prospected. A study of the mineralogy, structure, and rock associations of proven gold deposits should be made, so that search for duplicates of favourable conditions, if only in part, can be made intelligently in undeveloped areas. A knowledge of how veins look when high grade, marginal, or non-economic is also of value to the prospector. With this in mind, the geology and gold deposits of the various mineralized areas on the island are described in some detail, so that the prospector or scout may have the pertinent information on the areas nearest to the area he intends to prospect.

DESCRIPTION OF MINERALIZED AREAS.

Properties North of Zeballos.

(Ref. Maps 3A, 3D, and Min. Ref. Map 4T294.)*

In general, copper and lead-zinc, rather than gold prospects, have been discovered in this area. About fifteen copper, five lead-zinc, and three or four gold prospects have been reported.

On the Quatsino King property on the western side of Neurotsos Inlet a northwesterly-trending zone or stockwork of quartz veinlets cuts a variety of greenstones. The stockwork consists of many closely spaced quartz veinlets over a width of 16 feet and a known length of about 300 feet. The quartz contains small amounts of pyrite, sphalerite, and chalcopyrite, and a little gold. The wall-rock consists of greenstone tuff and breccia cut by numerous granodiorite dykes. The gold values in this deposit, as developed to date, are low. At one time the Granby Consolidated Mining, Smelting and Power Company, in search of siliceous flux for their Anyox smelter, did exploratory work on this deposit hoping that the quartz would carry enough gold to pay for mining and handling.

At the Patmore Gold mine,† on Deep Inlet in Kyuquot Sound, at least five different quartz veins have been found in granodiorite; only one has been opened up by adits. This vein consists of quartz up to 1 foot wide in a well-defined shear-zone which follows a narrow lamprophyre dyke. The quartz is massive, and contains free gold but very little sulphide. The property was originally located in 1938 and has been under development since that time, but no ore shipments have been reported.

Zeballos Area.

(Ref. Maps 3C, 2, and Min. Ref. Map 10T332.)*

The general geology of the area has been described by Gunning (1932) and Bancroft (1940). A geological map on a scale of 1½ miles to 1 inch accompanies Gunning's report.

The main gold-producing properties and many other non-producers have been described by Bancroft (1937 and 1940), Stevenson (1935 and 1939), Stevenson and Maconachie (1938), and Patmore (1938). Much of the following discussion has been abstracted from these publications; however, the present writer accepts responsibility

* *See* p. 9.

† H. C. Hughes, personal communication.

for the generalizations made about the ore-deposits and particularly about suggestions for prospecting.

Location and Access.—Zeballos is a small mining community on the western coast of the island, about 195 nautical miles north-westerly from Victoria. The Canadian Pacific Steamship Company maintains service from Victoria or Port Alberni up the western coast and calls in regularly at Zeballos. Canadian Pacific Airlines maintains a tri-weekly air service from Vancouver to Zeballos. Jitney service connects the mines with the town.

The Zeballos lode-gold area at present includes the valley of the river and its watersheds. The area in which the most important properties have been found lies in the angle between the main Zeballos River and the Nomash River and an east-west line 1½ miles northerly from tide-water; this area includes the valleys of Van Isle, Spud, and Gold Valley Creeks and the headwaters of the Little Zeballos River.

Access within the immediate area is by a truck-road which leads up the main river valley 4½ miles to Privateer mine and then for 2½ miles to Mount Zeballos and Spud Valley mines. From the Privateer it goes for 3 miles to the Central Zeballos mine. The road extends for about a mile beyond the Central Zeballos and from the end of it trails lead up the North Fork and up the Nomash (South Fork) Rivers.

Topography.—The country is extremely rugged. The hillsides are heavily wooded but steep, and often the dense growth of timber serves only to obscure unscalable rock bluffs. The floor of the main valley, where not bluffy, ranges from one-eighth to one-half mile in width. The tributary creeks flow in narrow valleys and join the main valley on steep gradients ranging from 600 to 800 feet per mile.

Mining History.—Although small amounts of placer had been obtained from the Zeballos River as early as 1907, it was not until 1924 that the first gold vein, on the Tagore property, was staked. Two years later the King Midas was staked, and by 1929 forty claims had been staked in the valley. In that year the first shipment of ore was made from the valley. It consisted of 2 tons of high-grade ore, mined from the Tagore. A period of inactivity followed until 1934, when the first of the rich gold-quartz veins that were to make the Zeballos camp an important producer in a very short time were found.

Lode-gold mining really began in the winter of 1934–35 with shipments of high-grade ore from the property of the White Star Gold mines. In 1936 the main high-grade vein on the Privateer was found and shipments of high-grade ore were made from it in 1937. Milling started in standard-sized mills later. In 1938 the Privateer 75-ton amalgamation-cyanide mill and Spud Valley Gold mines 50-ton amalgamation-flotation mill began operating. The tonnages of these mills were stepped up to 85 and 70 tons respectively in 1938. In 1938, thirty properties, employing nearly 400 men, were active in prospecting, development-work, and actual mining. In 1939 a 50-ton mill was built at the Mount Zeballos and a 40-ton mill at the Central Zeballos, and in 1941 a 25–50-ton mill at the Homeward. About the middle of 1942 shortage of men and supplies because of war forced all but the Privateer and the Prident to close down, and in October, 1943, these properties also were forced to close "for the duration." However, during the winter of 1945–46, Privateer, Prident, Central Zeballos, and Spud Valley gold mines resumed operations.

Production.—Gold-quartz ore mined from fifteen properties in the Zeballos area to the end of 1945 has amounted to a total of 344,722 tons. Of this total, 335,000 tons came from four properties, for which production has ranged from 35,000 to 137,000 tons, and the remainder from properties with production ranging from 1 ton to a few thousand tons. The total gold recovered has amounted to 261,613 oz., an over-all average of 0.76 oz. per ton mined, and has ranged from 0.4 to 5 oz. per ton. Silver has been recovered approximately in the ratio of 1 oz. silver to 2½ oz. gold. The returns for ore, shipped from several properties to the smelter, have included credit for lead and in some cases for copper.

Geology.—The general geology of the region has been described by Gunning (1932). The main feature of the geology is a northwesterly-southeasterly trending belt of granitic rocks, called by Gunning the Zeballos batholith. The rocks range in composition from gabbro to quartz monzonite, but within the area under consideration quartz diorite is most common. The batholith ranges in width from approximately 2 miles near the headwaters of Gold Valley Creek to three-quarters of a mile where it crosses the Zeballos and widens out from there as it extends north-westerly from the river. The Zeballos batholith has intruded Mesozoic volcanics and sediments of the Vancouver group that Gunning has divided into three groups—a lower assemblage of volcanic rocks called the Karmutsen volcanics; a middle limestone member, the Quatsino limestone, both groups lying north-east of the batholith; and an upper volcanic group, the Bonanza group, lying south-westerly of the granodiorite. These rocks are similar to those found elsewhere on the northern part of the island and have already been discussed on pages 11–13 of this publication.

To date the greater number of properties lie within either the quartz diorite or the volcanics and associated sediments along the south-western contact. There are a few properties, however, in the volcanics at distances from 2 to 3 miles from either contact.

Gold Deposits.

High temperature replacement deposits of iron and of copper and gold-quartz veins are found in the Zeballos area. The copper deposits are small and unimportant. One large and several smaller magnetite (iron) deposits have been found which may prove to be of considerable importance. However, because this publication is concerned only with lode-gold deposits, the copper and iron deposits will not be described.

Strike Groups.—Nearly all the gold-quartz veins in the Zeballos camp strike in the north-east quadrant. They are either vertical or have very steep dips. On the basis of their strike, the veins may be divided into three groups; both the group that strikes easterly and the group that strikes north-easterly include important producers; a third group, found outside the main productive area, consists of veins striking nearly north-south which have not been productive.

The veins in the easterly striking group range in strike from 10 degrees north of east to 7 degrees south of east, and in dip from vertical to steep northward or southward. This group includes the veins on the Privateer, Prident, Central Zeballos, Rimy, Homeward, and Monitor properties, of which the Privateer and Prident are close to the western contact of the Zeballos batholith and the remainder are near the eastern contact. All of these properties, excepting the Monitor, have produced gold, three of them over 1,400 oz., and the total production has been 165,071 oz. to the end of 1945 (this includes production from the north-easterly striking veins on Prident). One of them, the Privateer, has been the major producer in the camp.

The veins in the north-easterly striking group, ranging in strike from north 30 degrees east to north 55 degrees east and dipping steeply on either side of the vertical, are found in three main areas. In the greenstone area south-west of the main Zeballos batholith, north-easterly striking veins are found on the Tagore, Van Isle, and Friend properties. On the quartz-diorite side of the contact, north-easterly striking veins are found on the Prident, White Star, Zeballos Gold Peak, Spud, Britannia "M," and Mount Zeballos properties. Production from the White Star, Spud, and Mount Zeballos properties has been 143,000 oz. of gold, and production from the north-easterly veins on the Prident has been considerable, but as Prident production figures are incorporated in the Privateer figures, and therefore in the total production from the easterly striking group above, they are not included in the above amount. No production has as yet been made from the Zeballos Gold Peak and Britannia "M" properties. Towards the centre of the batholith, north-easterly striking veins are found on the B. and Wet claims, C.D. (Rey Oro), I.X.L., and Big Star properties.

Neither group of veins possesses any easily discernible common relationship to the structure, texture, mineralization, or wall-rock.

The main producing veins of the camp are: Easterly striking veins found close to both the west and east contacts of the batholith, and north-easterly striking veins found close to the south-west contact. To date the production has come largely from veins of both groups near the western contact, either in the greenstone or in the granite.

Vein-structure.—Most of the gold-bearing veins consist of quartz-sulphide filling in well-defined fault-fissures, rarely more than a foot wide, that maintain a fairly uniform strike and dip over considerable distances. In places the quartz-sulphide vein-matter may be lacking, and only sheared rock present. The walls of the quartz-sulphide veins are marked by films of gouge; frozen walls are not common.

Some of the gold-quartz veins occur in sheeted zones up to 4 feet wide. These zones consist of joints spaced 2 to 8 inches apart and contain either gouge films or ⅛ to 1 inch quartz-sulphide stringers. Along the strike a sheeted zone may change into a single, narrow shear containing a lenticular quartz-sulphide vein. The Goldfield vein on Spud Valley property is an example. Sheeted zones are not common.

Wide shear-zones containing mineralized veinlets of quartz are not common. However, a shear-zone about 50 feet wide has been found on the Big Star property of the Spud Valley Gold Mines, Limited, and promises to be of some importance.

Vein-texture.—Most of the Zeballos gold-quartz veins are banded either by an alternation of quartz and sulphides or by an alternation of the different sulphides themselves. Comb-texture, so called because of the comb-like appearance of pyramid-shaped quartz crystals that project inward from either side of the band, is common. The spaces between the crystals are commonly filled with sulphides.

The vein-filling consists of quartz, some carbonate, and sulphides. The sulphides, though in some veins unimportant, are very abundant in most of the Zeballos veins. They range from a small fraction to one-half of the vein-matter, and probably average about one-quarter of the vein-matter.

Listed in order of abundance the sulphides are pyrite, sphalerite, arsenopyrite, chalcopyrite, galena, and pyrrhotite.

Occurrence of Gold.—Gold is visible in much of the vein-matter, but commercial ore may contain no gold recognizable with the unaided eye. Specimens of crystalline gold have been found at Privateer and Spud Valley mines. Large masses of hackly gold have been found on the Privateer.

The relationship of the gold is fairly constant. The amount of gold is not only proportional to the sulphide content, but is also dependent on the presence of sphalerite and galena. The reason is not obvious. It is most likely that the gold, though slightly later in time of deposition, came in with the surge of mineralization that brought in the galena and sphalerite. The galena and sphalerite, though not necessarily abundant, are nevertheless significant as indicators of gold. Quartz veins that contain either pyrite or arsenopyrite alone do not as a rule contain much gold.

Zones of crushed rock which may lie immediately adjacent to gold-bearing veins, and which may contain disseminated crystals of pyrite, are usually very low in gold. Good gold values are not found in the crushed rock and gouge of a shear-zone even though found in quartz-sulphide ribbons or lenses of the same shear-zone.

The wall-rock of the veins contains no gold of economic importance.

Suggestions for Prospecting.—The present producing area is in and close to the part of the Zeballos batholith that lies south-east of the Zeballos River. In this section the batholith is about three-quarters of a mile wide. To the north-west it widens to 4 miles in the Kaouk River valley and to the south-east it widens to 2 miles near the head of Spud Valley Creek. The areal extent of the batholith is unknown to the north-west beyond the Artlish River, and also relatively unknown to the south-east beyond the head of Spud Valley and Gold Valley Creeks.

A fair amount of prospecting has been done north-west of the Zeballos River in the Kaouk and Artlish River valleys, but without any marked success. However, the country is very rugged and difficult of access, so that the amount of time spent in

actual prospecting for quartz veins is small in proportion to the time spent in travel and in the back-packing of supplies.

South-easterly from the Zeballos River the extension of the batholith has been prospected, at least as far as the Little Zeballos River. Though perhaps less so than the Kaouk-Artlish country, this section is still difficult of access, everything having to be back-packed from tide-water. Little of this section has been thoroughly prospected in the few years since the Zeballos area came into prominence.

The properties from which ore has been mined are near the north-eastern south-western contacts of the Zeballos batholith, south-easterly from the constriction of the batholith at the Zeballos River, with most of the production coming from the south-western contact. These facts suggest that the most favourable prospecting ground lies south-easterly from the river, along both contacts of the batholith, but especially along the south-western contact. It may be that gold-quartz veins as rich as those already known will not be found until another constriction in the batholith is found. However, should the batholith taper to a point in going south-easterly, the tapering might be as favourable as a constriction for the localization of rich gold-quartz veins.

The writer suggests prospecting the south-easterly extent of the batholith, either from the Little Zeballos side or from the Nomash (South Fork, Zeballos River) side. It is not necessary to stay close to the area of batholithic rocks. Greenstone cut by late dykes, granitic or otherwise, is sufficiently heterogeneous in physical characteristics, and therefore in response to fracturing forces, to permit the development of breaks suitable for vein-formation. (*See* pages 17 and 18 of this publication for a discussion of favourable prospecting ground.)

It may be that the localization of the rich gold-bearing veins is related, directly or indirectly, to some feature transverse to the batholith, either to a north-south pre-mineral line of major faulting or weakness or to a transverse depression in the original roof of the batholith. However, even if this proves true, it is still worth while to prospect the continuation of the batholith area for a repetition of whatever transverse conditions caused the localization of the known gold deposits.

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NOOTKA SOUND AREA.
(Ref. Map 2.)*

Five gold properties are found in this area: the Independence, 2 miles up the Tahsis River; the Oh Boy, on the western side of Tlupana Inlet; the Baltic and the Ash, on the south side of Muchalat Arm; and the Burman River Gold Syndicate property, at the head of the arm. On the Independence and Oh Boy, quartz veins

* *See* p. 9.

924/20
924-11

Col. Leckie

DECEMBER 27th, 1937

No. 1 Vein

An open cut 36 ft. in length has been run in on this vein. Some high grade ore was sacked and shipped from here by the original discoverers.

In the face of the cut there are two very well defined walls, nearly vertical and about five feet apart. There is grano-diorite between the walls. The strike here is N 5 E, Magnetic. On the left, or footwall side, there is a soft gouge, calcareous, showing small cubes of iron pyrite. A sample taken across 5 in. of this ran $4.60. Latterly water has washed a bit of this gouge out showing an inch or so of quartz carrying very little mineralization. A sample of this quartz ran $7.00.

On the right wall there is a seam of quartz 3" or more in width carrying galena, blende and arsenopyrite. Two samples of this ran $231.00 and $254.00 respectively. The vein has been stripped for 66 ft. up the hill, above the Open Cut, showing a foot or so of quartz in width. No shots have been put in but samples taken ran from $2.10 to over $4.00.

A survey line run up the hill following the strike shows an outcrop of ore near the top of the hill, approximately 600 feet higher than the Open Cut and 850 feet along the slope.

No work is being done here at the moment.

No. 2 Vein

This is a vein with well defined walls, three feet apart and a strike of N 10 E, Magnetic. It is 180 feet to the west of No. 1 vein. No work is being done here. The vein has been stripped for a length of about 60 feet showing mineralized quartz and calcareous vein matter. Three samples taken at different points gave $24.60 across 6 in.; $39.20 across 1 ft.; and $3.15 across 1 ft.

This vein is in the grano-diorite as are all the others.

No. 3 Vein

This vein is 190 ft. west of No. 2 and appears to be parallel to it. A tunnel is being driven in on the hanging wall and is now in 297 ft. This wall is very well defined and has more or less ore along it the whole distance to the face. 120 ft. in from the portal a crosscut was run in to the foot wall showing the distance between walls to be 10 feet. Close to the footwall there is a narrow seam of highly mineralized quartz a sample of which gave $65.10 per ton.

200 ft. in from the portal the whole face of the drift showed a soft calcareous vein filling, mineralized with small cubes of iron pyrite and with narrow high grade quartz seams on the hanging wall side. This continued for 75' in length. Drift width samples here ran $11.90; $32.20 and $46.20 while the narrow, high grade quartz seams ran $99.40, $417.90 and $925.40. The drift at this date is in 297 feet from the portal, there is now grano-diorite in the face with a vein, quartz and soft gouge, on the hanging wall. A sample of gouge and quartz here ran $4.20 across eight inches and three inches of mineralized quartz ran $67.20. The ore appears to be widening out. It is the intention to drive on another 20 or 30 feet, following the hanging wall and then crosscut again to the foot to see what ore is there.

Col. Leckie
Dec 27 1937

B

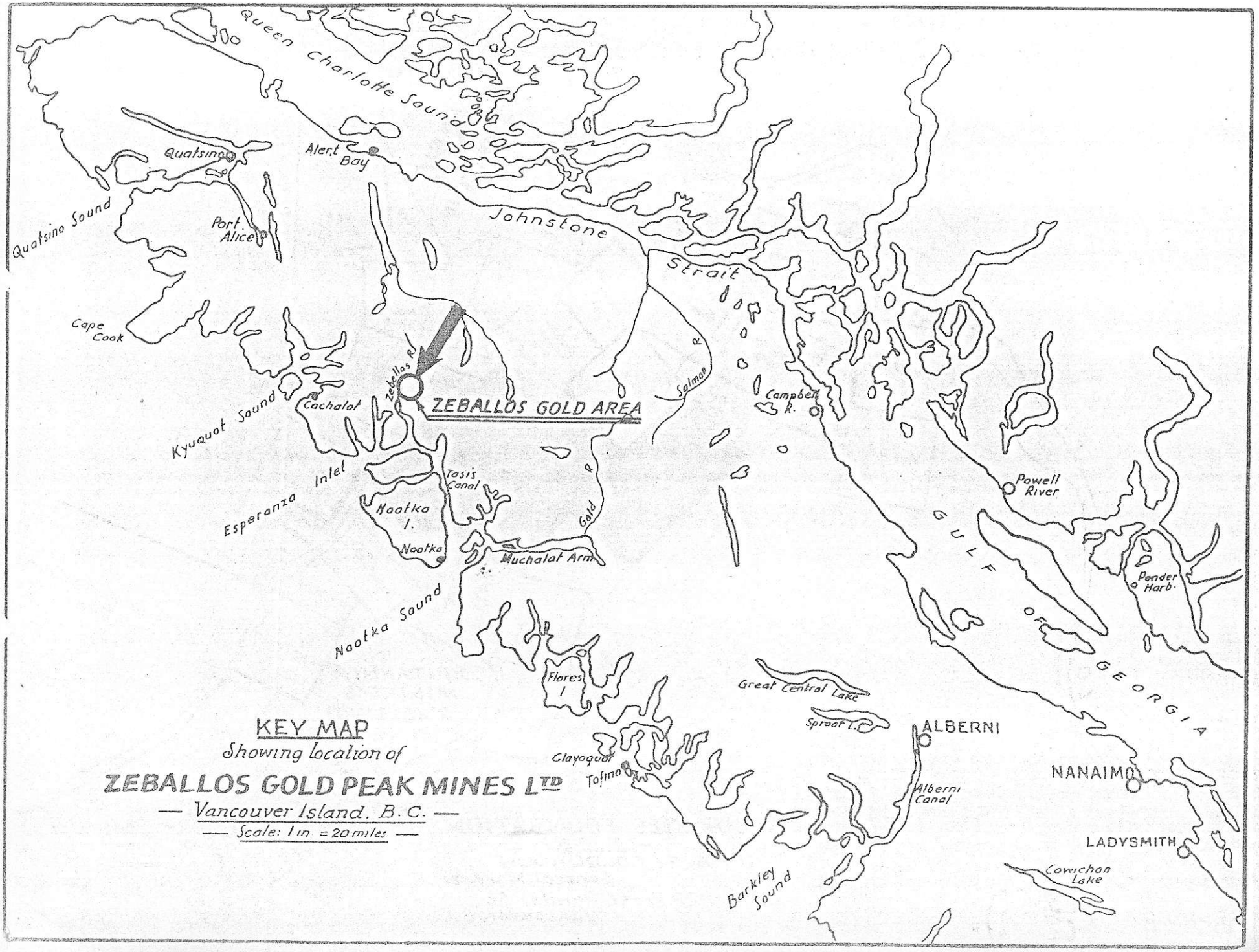
No. 4 Vein

This vein was found in the bed of a creek. On the surface it is about three feet between walls.

Owing to the Creek coming down on the vein the tunnel was driven to one side following what is probably the hanging wall.

A little ore shows along this wall and two narrow quartz veins were met with, running from the footwall and feathering out on the hanging wall. They both show considerable mineralization with iron pyrite. A general sample of these two veins gave $4.55. It is the intention now to swing the drift into the foot wall and cut the vein there.

A sample of the vein matter on the surface, across two feet, gave $1.40.



KEY MAP

Showing location of

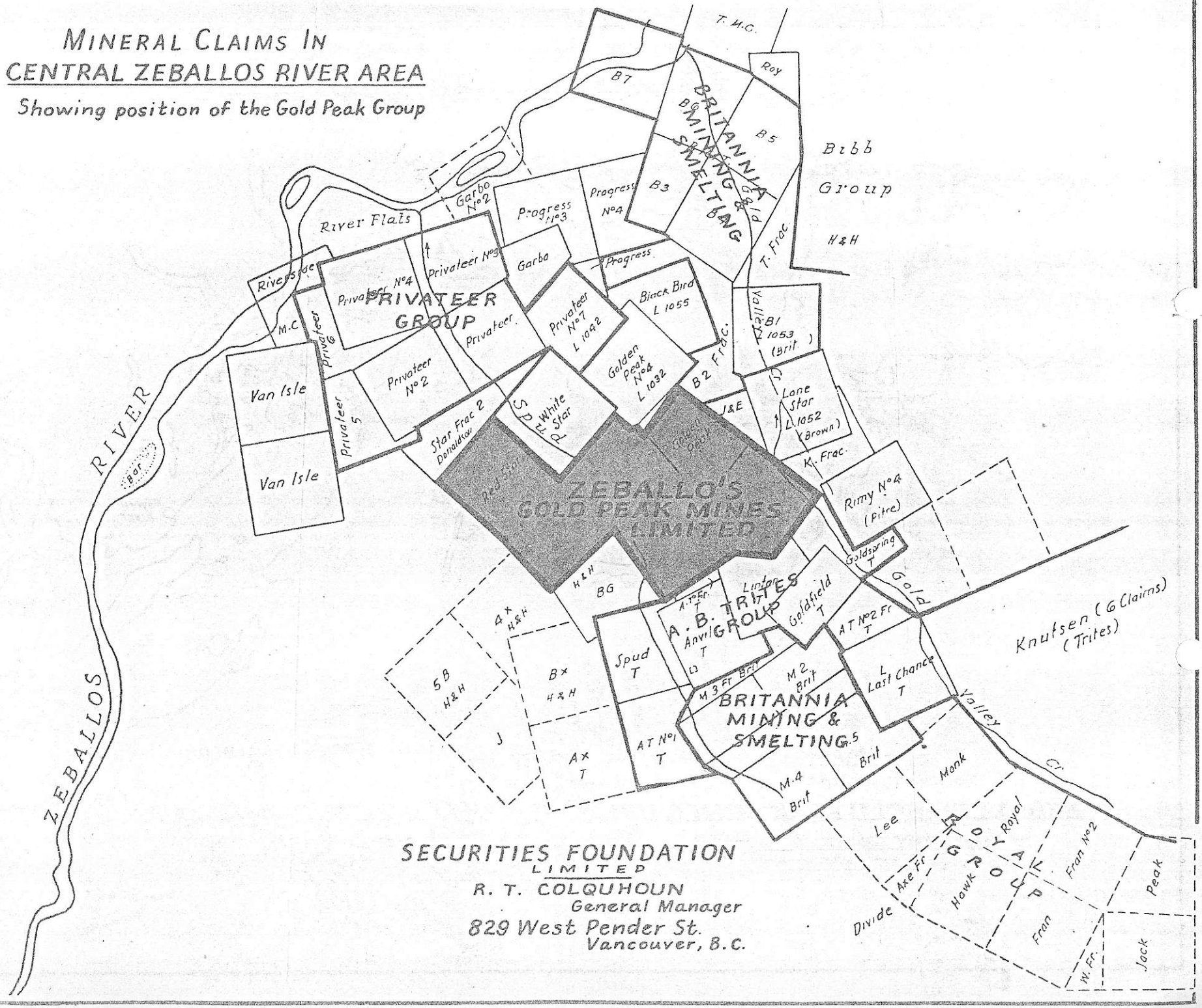
ZEBALLOS GOLD PEAK MINES LTD

— Vancouver Island, B.C. —

— Scale: 1 in = 20 miles —

MINERAL CLAIMS IN CENTRAL ZEBALLOS RIVER AREA

Showing position of the Gold Peak Group



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Statements contained in this circular have been obtained from reliable sources, but are not guaranteed to us or by us.

Extract referring to the Gold Peak Group of Mineral Claims taken from the Dominion Department of Mines Memoir 204, pages 14 and 15, 1937 by M. F. Bancroft, M. E.

GOLD PEAK GROUP

The Gold Peak group of mineral claims adjoins and lies east and southeast of the Privateer group. The mineral showings are in the vicinity of the Gold Peak cabin 5 miles from tidewater. The south boundary of the Zeballos granodiorite batholith strikes northwesterly across the group of claims, volcanic rocks lying southwest of the granitic body. The claims were staked in October 1932. Four months later a quartz vein carrying visible gold was found cutting granodiorite. Surface stripping disclosed eight or more veins in the granodiorite nearby.

#10 WHITE STAR

On the most promising vein, known as the Donaldson, an open-cut was made into the steep hill-side at a height of 1,250 feet above sea-level. The open-cut was continued for 90 feet along the strike of the vein and in places it has a depth of 50 feet. About 50 feet below the top of the open-cut an adit has been started.

The ore from the open-cut returned 150 ounces of gold. The ore was sorted, sacked, back-packed to Zeballos river, canoed to Tagore, and back-packed again around Zeballos canyon, then taken in motor boat to Ceepeecee and thence shipped by freight to Trail, B. C. The second and third shipments in 4-ton lots gave smelter returns of 23 ounces of gold and 6 ounces of silver to the ton. A shipment in June 1935 of 3,444 pounds of ore gave smelter returns of 6.26 ounces of gold and 2.15 ounces silver. By the end of June 1935 approximately 15 tons of ore had been shipped to Trail from the White Star claim of the Gold Peak group.

The Zeballos batholith which trends northwest has pronounced joints striking northeasterly and curving around from north 70 degrees east to north 35 degrees east. Two fine-grained dykes with the appearance of aplite on the weathered surface, but greenish grey on fresh fracture, were noted on the White Star claim. These dykes are clearly older than the jointing of the granodiorite, since a closely spaced joint pattern was imposed on them at the time the blocky jointing took place in the granodiorite. The granodiorite has suffered considerable faulting, movement having taken place throughout the jointed massif with varying intensity, relatively tight joints occurring along the same hill-side with parallel sheared fracture zones up to 3 feet wide.

Development work on the Gold Peak group consists of a limited amount of surface stripping, particularly along two veins to the west of the Donaldson vein and along one vein east of it higher up the slope which was discovered by Albert Bloom in February 1933, and is known as the Bloom vein. East of the Bloom vein on the summit going over into Gold creek there are three other veins exposed at an altitude of 2,000 feet above sea-level, but no work has been done on them.

The Donaldson vein follows the east side of a 6-foot dyke of dioritic feldspar porphyry for some distance, but diverges from it 70 feet from the upper end of the open-cut and continues down the slope in sheared granodiorite to a point below the dump where it splits into narrow quartz stringers. Its continuity is proved for 150 feet horizontally and for more than 100 feet in depth.

The vein strikes north 35 degrees east and dips 75 degrees southeast, its foot-wall being the 6-foot dyke. Numerous thin branches of the vein extend into joints in the hanging-wall granodiorite along lines striking north 65 degrees east. In the open-cut the vein attains a width of 15 inches, but pinches and swells, and averages somewhat over 6 inches wide. The hanging-wall rock shows marked hydrothermal alteration, the ferromagnesian minerals in the granodiorite have been completely destroyed for 4 inches back from the vein. Gouge next to the vein is white and like the altered granodiorite contains some sericite and pyrite.

In places the vein has bands of massive, mixed sulphides, along its sides, and the interior is filled with quartz growing in from both sides and forming a line of crystals in the middle. The sulphides in order of decreasing abundance are: pyrite, galena, sphalerite, arsenopyrite. Tests made on the individual minerals and also mixtures of the metallic minerals failed to show the presence of tellurium. There was considerable visible gold in the ore that was shipped.

One hundred and ten feet west of the Donaldson vein, between elevations 1,300 and 1,075 feet, a shearzone has been exposed in the granodiorite showing a quartz filling varying in width between 4 inches and 2 feet. West of the cabin is another similar quartz-filled shear in the granodiorite. The walls of this shear are impregnated with sulphide. The Bloom vein east of the Donaldson vein shows variable widths of shearing and small quartz stringers. It would require careful sampling to locate the sections of these veins where the altered country rock is barren or high in gold.

#1 #2 1033

The Donaldson vein is the most promising of the showings thus far found on the Gold Peak. The presence of the 6-foot dyke on the west side of the vein may have been effective in impounding the mineral solutions and bringing about a greater concentration of gold. At any rate the best ore occurs where the vein, striking southwesterly, turns to follow the wall of the dyke for 70 feet, other dykes in the granodiorite area should, therefore, prove of interest to the prospector.

Extract from the Report of Col. J E. Leckie, M.E.

Zeballos is situated on the northwest coast of Vancouver Island, its position being shown on accompanying key-map.

The Zeballos River runs into the sea at the head of Zeballos Arm.

GOLDFIELDS

Excepting the King Midas the most development so far done in the Camp is on the Goldfields Group where three tunnels have been driven. The results have been so satisfactory that a millsite is now being cleared and it is the intention of the owner, Mr. A. B. Trites, to erect a mill of 25—50-ton capacity. The Upper Tunnel was driven on the vein and continued through the ridge giving a depth of 110 feet below the surface. The Second Tunnel was driven in 120 feet below this again, the portal being on the Gold Creek side of the ridge. This tunnel is in 400 feet on the vein.

The Main Tunnel is being driven in on the Spud Creek side of the ridge at a depth of 450 feet below the top of the ridge. It is in ore.

It has been stated that the average width of the vein as so far worked on is approximately 3 feet and average value $45 gold per ton. I understand that there is a very high grade seam on one wall 6" to 7" in width.

A crew of twenty-four men is at work and machinery is on its way in.

PRIVATEER

This property is owned by a Syndicate of Victoria people. They are drifting on a vein which has given remarkable results. They are now in close to 200 feet and the ore is as rich as ever. The vein occurs in the volcanics close to the contact with the granodiorite. It is from 7" to 22" in width with a steep dip, and has been traced up the steep hillside for over 1200 feet. The present work will give them 800 feet of backs. A diesel power plant has been installed and three machine drills are at work. A crosscut tunnel is being run to cut the vein at greater depth.

The ore is a quartz carrying galena, blende, iron pyrite, arsenopyrite and some free gold.

Returns from a shipment of 15 tons averaged 22.24 ozs. gold per ton and the next shipment of 19 tons ran $950.00 per ton. Since then some even more spectacular ore has been shipped.

GOLD PEAK GROUP #11

The Gold Peak Group, which I examined, consists of six full claims and a fraction, four and the fraction of which have been surveyed and a Crown Grant has been applied for. The ground covered extends from the Gold Creek Valley over the ridge and to the westward of Spud Creek.

Four veins have been uncovered and a good looking outcrop has been found on the top of the ridge and whether it is a new vein or the extension of one of the others has not yet been determined. The position of these veins is marked on the map of claims. The road from the Beach passes through this property. There is a camp capable of holding a dozen men or more and a crew of men is at work drifting on one vein. This work is referred to in Mr. Carr's Progress Report.

At the time of my visit I saw an open-cut 36 feet in length driven in on a vein. The face of the cut was 20 feet in height. There were two well defined walls, nearly vertical and about 7 feet apart. Against the west wall was a soft, limey gouge some 9" in width which ran from a general sample, $4.20 in gold. On the east wall 6 inches of ore ran $254.10 gold. I saw no free gold in this sample.

200 feet to the westward a small vein had been stripped and a sample here, across 7", ran $24.50 gold.

Eleven men are at present employed but it is intended to increase this to eighteen.

No doubt there will be high grade ore shipped and the returns will go far towards meeting expenditures.

SUMMARY

The values in some of the veins now being opened up in this District are extraordinarily high. **The Gold Peak Group, lying between the other two properties referred to has every chance of turning out equally as valuable as they are and with intensive prospecting it is fairly certain that more veins will be found.**

The Camp as a whole promises to become an important factor in B. C.'s gold production.

I can strongly recommend the Gold Peak Group as a property which on development should prove to be a most profitable venture.

J Leckie