BRITISH COLUMBIA DEPARTMENT OF MINES

Hon. W. J. ASSELSTINE, *Minister.* JOHN F. WALKER, *Deputy Minister.*

LODE-GOLD DEPOSITS *of* THE ZEBALLOS AREA

West Coast of Vancouver Island, B.C.

BY

JOHN S. STEVENSON.

VICTORIA, B.C.:
Printed by CHARLES F. BANFIELD, Printer to the King's Most Excellent Majesty.
1938.

BRITISH COLUMBIA DEPARTMENT OF MINES

Hon. W. J. ASSELSTINE, *Minister.* JOHN F. WALKER, *Deputy Minister.*

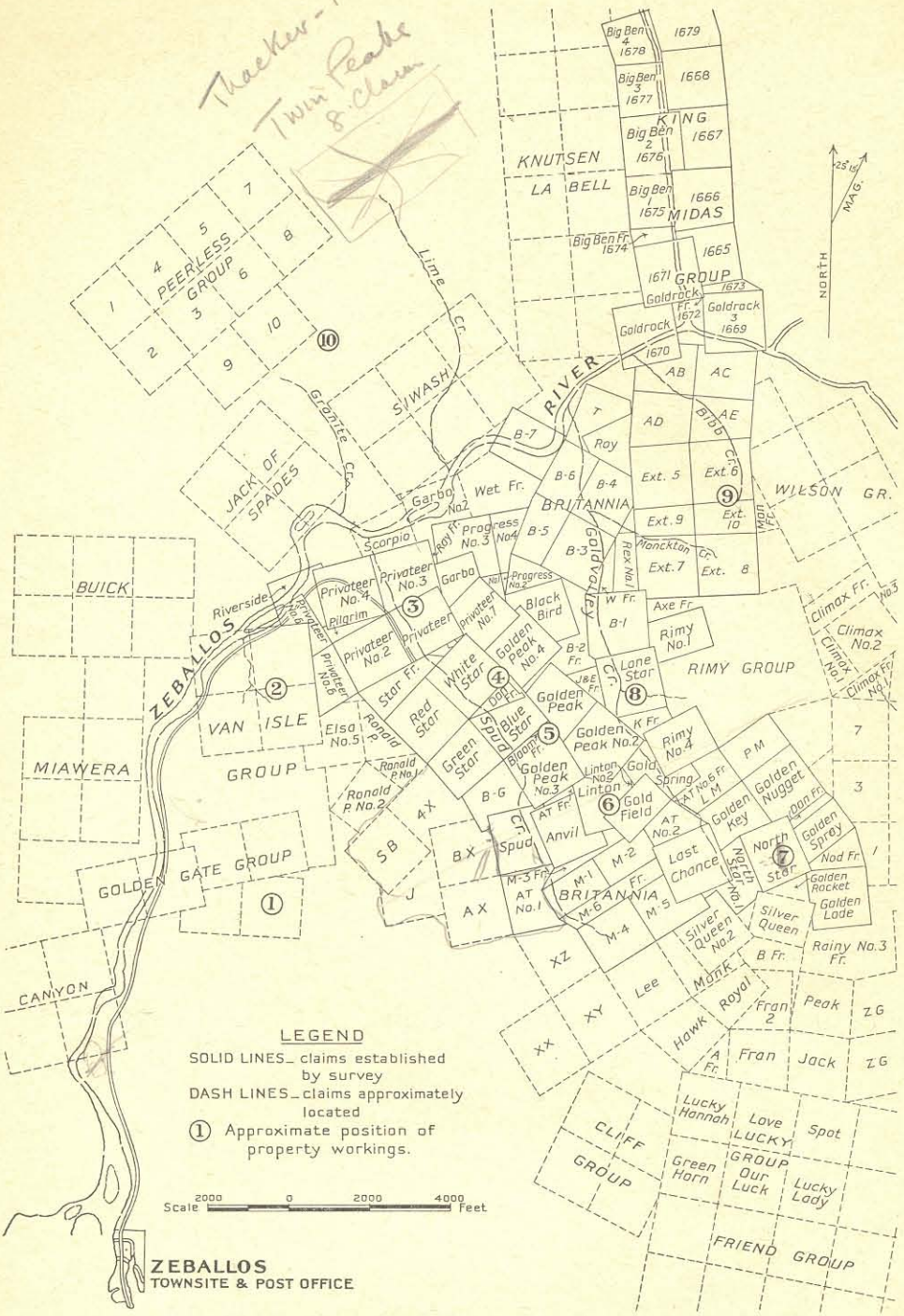
LODE-GOLD DEPOSITS *of* THE ZEBALLOS AREA

West Coast of Vancouver Island, B.C.

BY

JOHN S. STEVENSON.

VICTORIA, B.C.:
Printed by CHARLES F. BANFIELD, Printer to the King's Most Excellent Majesty.
1938.



Index map of lode-gold deposits in the Zeballos area. Modified after claim map by firm of Hawkins and Horie, Land Surveyors, Vancouver. (1) Golden Gate; (2) Van Isle; (3) Privateer; (4) White Star; (5) Golden Peak; (6) Goldfield; (7) North Star; (8) Lone Star; (9) Extension; (10) Bodin.

Lode-gold Deposits of the Zeballos Area.

INTRODUCTION.

THE following report is based on examinations made in the area between August 24th and September 6th, 1937, and on a short revisitation from December 14th to December 17th; on the second visit B. T. O'Grady accompanied the writer.

Previous work has been done in the area by:—

(1.) Bancroft, M. F.: Geological Survey Canada, Memoir 204, 1937, Gold-bearing Deposits on the West Coast of Vancouver Island between Esperanza Inlet and Alberni Canal.

(2.) Clothier, G. A.: Annual Report of the British Columbia Minister of Mines, 1929, page 376; 1930, page 441; 1932, page 205; and 1933, pages 252 to 254.

(3.) Gunning, H. C.: Geological Survey Canada, Summary Report, 1932, Part A-II., pages 29 to 50, Zeballos River Area, Vancouver Island, B.C.

(4.) Stevenson, J. S.: Annual Report of the British Columbia Minister of Mines, 1935, pages F 38 to F 40, inclusive.

In a mining camp such as that of the Zeballos area, where the inclemencies of the weather, extreme ruggedness of the topography, and the relative impenetrability of much of the timbered area, all militate against the ease of making examinations, the hospitality afforded a visitor by those already established there is doubly welcome. Therefore, the writer wishes to thank all those, old-timers and newcomers, who, by giving freely of their time, hospitality, and information, greatly facilitated the examination of properties.

LOCATION AND ACCESSIBILITY.

The Zeballos River lode-gold area at present includes the valley of the river and its watersheds. The area being most actively prospected is one of approximately 4½ square miles in extent that lies in the angle between the main river and its South-east Fork and an east-west line 1½ miles northward from tide-water; this area includes the valleys of Van Isle, Spud, and Goldvalley Creeks.

Canadian Pacific Steamships maintain a tri-monthly service between Victoria and Zeballos, leaving Victoria on the 1st, 11th, and 21st of each month and arriving at Zeballos usually about noon of the third day.

The only settlement in the area, other than the mining camps, is the recently (November, 1937) created townsite of Zeballos, where there is a post-office, deputy mining recorder's office, general store, etc.

Access within the immediate area is by truck-road up the main valley to Spud Creek and up Spud Creek to the *Goldfield* property, and by trail from the mouth of Spud Creek up the main valley to the forks and by a branch trail leading up Goldvalley Creek as far as the *North Star* property.

GENERAL TOPOGRAPHY.

The main topographic feature of the area is the Zeballos River Valley. About two-thirds of a mile up-stream from tide-water there is a canyon approximately half a mile long, above which the stream flows in a gravel bed ranging from 200 feet to 400 feet in width, usually between low stream-gravel and silt banks; in only a few places do the rock bluffs come down to the water's edge. The floor of the main valley, where not bluffy, ranges from an eighth to half a mile in width; the valley-walls rise up from the floor as heavily wooded slopes that more often than not are very bluffy. The tributary creeks flow in narrow valleys and come in to the main valley on steep gradients ranging from 600 to 800 feet per mile. The hillsides slope up steeply from the creek-bottoms to ridges of elevations within the area and south-east of the river of 4,025 feet, and north-west of the river of 4,295 feet, the valley-bottom of the river being approximately 200 feet in elevation.

For the most part, the hillsides are heavily wooded but steep, and often the timber serves only to obscure unscalable rock bluffs.

GENERAL GEOLOGY.

The general geology of the region has been described by Gunning.* The main feature of the geology is a north-westerly-south-easterly trending belt of granitic rocks, called by Gunning the Zeballos batholith. These range in composition from gabbro to quartz monzonite, but within the area under consideration granodiorite prevails. This belt ranges in width from approximately 2 miles near the headwaters of Goldvalley Creek to three-quarters of a mile where it crosses the Zeballos and widens out from there as it extends from the river towards the north-west. This body of granodiorite 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 granodiorite; and an upper volcanic group, the Bonanza group, lying south-westerly of the granodiorite.

To date the greater number of properties lie within either the granodiorite or the volcanics in the vicinity of the south-westerly contact. There are a few properties, however, in the volcanics at distances from 2 to 3 miles from either contact.

VEINS.

Structure.—The deposits constitute gold-bearing quartz-sulphide veins which occupy fractures that strike north-easterly. The majority of the strikes range from north 73 degrees east to north 30 degrees east.

The vein-fractures may be grouped in four structural varieties as follows:—

(1.) *Clean-cut, single fissures* in the granodiorite, which are completely filled with quartz-sulphide veins; such veins may range from ¼ to 6 inches in width.

(2.) *Clean-cut fissures* in either greenstone or granodiorite, completely filled by quartz and abundant sulphides, but which tend to weave slightly and to have branch quartz-sulphide stringers coming in from a side.

(3.) *Composite fracture-zones,* in either greenstone or granodiorite, that range from 4 inches to 4 feet in width; these consist mostly of crushed, leached rock, talcose gouge, and varying amounts of quartz-sulphide vein-matter. The vein-matter usually occurs as a single band that ranges from lenses 3 feet thick to bands of more constant widths, from 6 inches to a mere stringer; the vein material may even die out completely, but it may occur farther along in the same shear.

(4.) *Sheeted zones,* up to 4 feet in width, that consist of joints spaced 2 to 8 inches apart and which contain either gouge-seams or ⅛- to ½-inch quartz-sulphide stringers.

Vein-matter.—The vein-matter consists of friable quartz and sulphides, the sulphides ranging from small amounts to almost 100 per cent. of the vein in places. The sulphides include, listed in general order of abundance: pyrite, sphalerite, arsenopyrite, galena, chalcopyrite, and pyrrhotite, the latter occurring sparingly in the *Privateer* vein. The chief gangue-mineral is quartz; calcite in appreciable amounts is known from only the *Van Isle* vein.

Visible gold, though not constituting the major portion of the total amount of gold in the ore, is of rather common occurrence. Large masses of hackly gold have been found in portions of the *Privateer* vein intimately associated with the sulphides; and beautiful specimens of crystalline gold have been found in the *Goldfield* vein; one such specimen consists of three elongated crystals of gold averaging ¾ inch in length. However, it is the gold that occurs between and along the fractures in the various sulphide aggregates that contributes mostly to the value of the ore.

Vein Texture.—The texture of the veins approximates in varying degrees a comb texture. Comb texture is typically that of open fissure-filling and results from, first, the growth of elongated, prismatic crystals of quartz in open spaces away from the walls of a fissure, either partly or wholly filling the space between the fissure-walls; and, secondly, from the filling of the interstices between these crystals, and in part even replacement of them by the various sulphides and gold. Complete replacement of wall-rock by sulphides usually results in massive mineralization, but open-space filling results in coarser, looser aggregates of sulphides and makes for better loci of deposition of gold.

* Op. cit., pp. 33–37.

Vein textures resulting from wall-rock replacement are rare; only two instances of such were seen; these were when angular inclusions of granodiorite and greenstone wall-rock were included in the vein and rimmed by sulphides.

Distribution of Gold.—Sampling on the properties was done, not to determine the average grade of ore in any one deposit, but to determine the distribution of the gold and to obtain a conception of the different amounts of gold to be expected in different mineralogical and wall-rock environments. The results of such sampling have led to the following conclusions:—

(1.) In a quartz-sulphide vein the amount of gold is directly proportional to the amount of sulphide present.

(2.) The greater amounts of gold are associated with the loosely-aggregated, mixed sulphides—pyrite, sphalerite, galena, and chalcopyrite. Large amounts of massive arsenopyrite or massive pyrrhotite usually contain small amounts of gold.

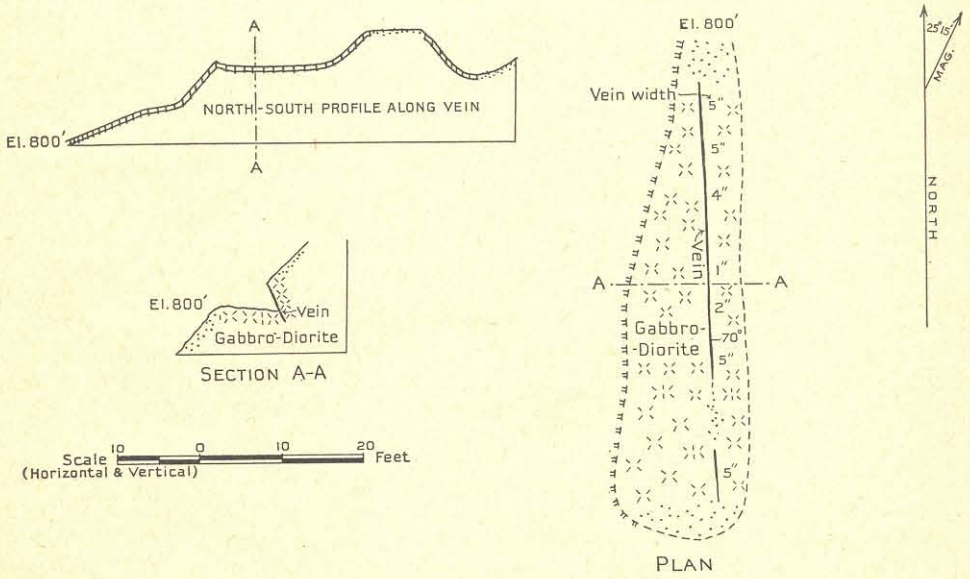
(3.) Crush-zones, even containing disseminated cubic pyrite crystals, are usually very low in gold; frequently the gouge accompanying a quartz-sulphide vein will assay up to 0.8 oz. per ton, but this is probably due to pulverized sulphides in the gouge. For this reason, it is to be expected that values within a strong shear-zone will be best only as long as quartz-sulphide veins or stringers persist; even though the crushed rock and gouge continue.

(4.) Wall-rock carries but little gold. Samples of both unaltered and altered wall-rocks were found to assay traces only in gold and silver.

In this connection, it is to be borne in mind that care must be taken in sampling wall-rock in order not to include any of the branch quartz-sulphide stringers, which frequently join a main vein; these stringers carry appreciable quantities of gold and their inclusion in a wall-rock sample would unduly raise the assay and give an incorrect result. It is only where such stringers are fairly abundant that they and the wall-rock may constitute commercial ore.

Golden Gate Group.(1)* The Golden Gate Zeballos Mines, Limited, a private company with offices at 520 Stock Exchange Building, Vancouver, is stated to have optioned a group of six mineral claims, that includes the *Golden Gate*, *Golden Gate Nos. 2*, *3*, and *4*, the *Nabob*, and the *Tagore*, staked in 1936 and 1937 and owned by D. Lutes, of Ceepeecee, Alex. MacDonald, Alfred Bird, and Chas. W. Smith, of Zeballos.

This group extends from the old *Tagore* workings eastward across the Zeballos River and up the moderately steep, heavily-wooded hillside of the easterly side of the main valley.



Golden Gate. Pace and compass survey of workings.

* This number appears on an accompanying claim map, where it indicates the approximate position of the workings.

The workings include the old *Tagore* workings and recently made open-cuts on the *Golden Gate* claims. The *Tagore* workings include an adit, a shallow shaft, now (September, 1937) completely filled with river debris, and surface cuts on the westerly bank of the Zeballos River. The adit and shaft have been driven on a level with moderately high-water level of the river. The property has been adequately described by Gunning; no work had been done since then to the time of the writer's visit to the area; however, it has been reported that work was resumed on the old *Tagore* workings late this season.

The new work on the *Golden Gate* group consists of some open-cutting on a vein at an elevation of 800 feet on the east side of the river; the location is shown on the key-map. The *Golden Gate* working is reached by a trail approximately one-half mile in length from the Zeballos River Road.

At the time of the writer's visit in September, 1937, the only work consisted of a combined stripping and open-cut some 50 feet in length, along which a little blasting had been done. The details of this stripping are shown on the accompanying sketch.

The vein is a quartz-filled fissure that weaves, pinches, and swells from 1 to 5 inches in the irregularly-sheared formation. The vein-filling is quartz with small amounts of chalcopyrite and pyrite; inasmuch as the vein has been opened for only a short distance below the surface, considerable rust occurs in the quartz. The rock formation is a variable greenstone, consisting of phases that range from gabbroic through dioritic to andesitic; the areas of the different phases being quite irregular and the transitions gradual.

The following samples indicate the values and nature of associated mineralization:—

Location from North End of Stripping.	Description.	Assay.		
		Gold, Oz. per Ton.	Silver, Oz. per Ton.	Copper, per Cent.
5 feet	Across 4 inches and along 2 feet of quartz veinlet with considerable chalcopyrite, some rust	4.0	0.4	1.5
12 feet	Across 4 feet and along 1 inch of quartz with less chalcopyrite, and much rust	0.2	0.2	0.5
16 feet	Across 5 inches and along 1 inch showing considerable pyrite, some chalcopyrite	0.12	Trace	Trace
46 feet	Across 5 inches and along 1 inch showing considerable pyrite, some chalcopyrite	1.30	0.3	Trace

Van Isle Group.(2) The Van Isle property is owned by the Man o' War Mines, Limited (N.P.L.), a public company, with offices at 601 Bank of Toronto Building, Victoria. The property includes the following claims: *Van Isle Nos. 1* and *2*, *Blue Ox Nos. 1* and *2*, *Wolverine*, *Pedro*, *Silver Bear* staked in 1933; and the *Riverside* and *V.I. Nos. 1–4*, inclusive, staked in 1937. The workings consist of several combined strippings and open-cuts and one adit. The surface cuts are reached by a trail one-third of a mile long from the camp; and the adit by a precariously-perched Jacob's ladder up the north-easterly side of the canyon. The camp is connected with the main Zeballos Valley Road by a branch road one-quarter of a mile long.

The surface workings are on the steep, heavily-wooded hillside on the south-westerly side of the south-westerly fork of Van Isle Creek; they extend south-westward from the creek-bottom, at an elevation of 650 feet, up the hillside to an elevation of 880 feet; a short distance beyond this the slope, at an elevation of 1,000 feet, flattens for 200 feet before changing direction to a westward slope. Most of the cuts have sloughed badly and only those which were open at the time of the examination will be described.

These cuts have been driven on a south-westerly-striking shear that ranges in width from a tight joint to a sheared zone 12 inches wide, consisting of broken rock and varying amounts of quartz, with fine-grained pyrite and arsenopyrite.

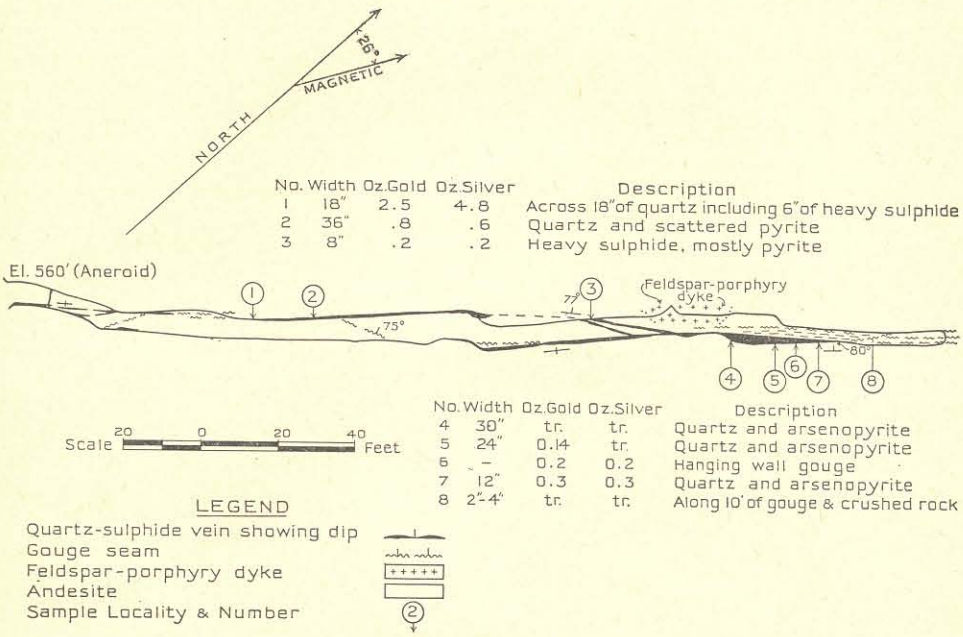
The lowest cut, at an elevation of 780 feet, has been driven in a direction south 45 degrees west for 16 feet. The north-westerly wall of the cut shows a fractured zone 8 inches in width that contains at one place, 3 feet from the portal, a lens of quartz 8 inches long and 2 inches wide, the quartz containing scattered pyrite and arsenopyrite. A sample taken across this lens assayed: Gold, 0.22 oz. per ton; silver, trace. A thin lens of sulphide 1 inch

thick and 2 inches long occurs in the floor on the south-easterly side of the cut. The face, 5 feet high, contains four equally-spaced, tight joints striking south 45 degrees west and dipping 78 degrees north-westerly; the most north-westerly joint is a continuation of the fracture in the same wall, described earlier.

South-westward, and 45 feet higher up the hillside, a showing under a tree-root exposes a lens of quartz 2 feet long and 8 inches wide. This contains very little sulphide, but lies between strong walls.

Farther south-westerly along the strike and up the hillside at an elevation of 850 feet, a stripping 10 feet long exposes a strong shear ranging from 8 to 12 inches in width, and containing fragments of blue quartz that have been cut by numerous fractures paralleling the usual south-westerly strike of the shear. This quartz contains finely disseminated arsenopyrite. A sample taken across an 8-inch width of the best-mineralized portion assayed only traces in gold and silver.

The last working, a 15-foot stripping farther south-westward up the hillside, begins at an elevation of 880 feet, exposes a section of the shear, ranging from 10 to 12 inches in width, that contains numerous ½-inch stringers of both blue quartz and vuggy quartz; small amounts of pyrite and arsenopyrite were seen in the quartz. A sample taken across 10 inches of shear, where the quartz and sulphides, pyrite and arsenopyrite were heaviest, assayed: Gold, trace; silver, 0.4 oz. per ton; and one across 8 inches of crushed rock without any quartz or sulphides assayed traces only in gold and silver.



No.	Width	Oz. Gold	Oz. Silver	Description
1	18"	2.5	4.8	Across 18" of quartz including 6" of heavy sulphide
2	36"	.8	.6	Quartz and scattered pyrite
3	8"	.2	.2	Heavy sulphide, mostly pyrite

No.	Width	Oz. Gold	Oz. Silver	Description
4	30"	tr.	tr.	Quartz and arsenopyrite
5	24"	0.14	tr.	Quartz and arsenopyrite
6	–	0.2	0.2	Hanging wall gouge
7	12"	0.3	0.3	Quartz and arsenopyrite
8	2'-4'	tr.	tr.	Along 10' of gouge & crushed rock

Van Isle. Plan of adit, chain and compass survey.

The crest of the hill is some 50 feet above this cut, the slope flattening for 200 feet and then sloping steeply westward.

The adit, at an elevation of approximately 560 feet, has been driven north-easterly into the steep canyon-wall of the north-easterly branch of Van Isle Creek. Above the portal the vein has been exposed up the bluff-face for some 100 feet. A quotation by the writer from the Annual Report of the Minister of Mines for 1935, page F 40, describes the nature of the vein as it was then, at the time of " facing up " for the adit:—

" A fissured zone, strike north 45 degrees east and dip 80 degrees north-west, in porphyritic andesite has been mineralized by quartz, pyrite, pyrrhotite, galena, and sphalerite. This fissured zone of crushed andesite, where examined, is 3 feet wide and contains quartz-sulphide veins that range in widths from 2 to 12 inches. The quartz is milky and is massive, not crustiform; pyrite, the most abundant sulphide, is fine-grained and is usually in bands

parallel to the walls of the vein; pyrrhotite and sphalerite are disseminated in small amounts amongst the pyrite. A grab sample taken in the open-cut from part of a quartz vein 3 inches wide, and containing a little pyrite, assayed: Gold, 0.90 oz. per ton; silver, 0.10 oz. per ton."

Since that time the adit has been driven some 243 feet and, although work had been suspended at the time of examination (September 4th, 1937), preparations were being made in December, 1937, for the driving of a new low-level adit below the falls of the creek.

Although the general features of the vein-structure may be seen in the accompanying plan, a few additional notes may be given. From the portal to 145 feet in, the main break is approximately constant in attitude and uninterrupted by major deflections from a uniform strike of north 42 degrees east and a vertical dip. In this section the main break, with a clean-cut hanging-wall and accompanying gouge, is persistent, the quantity and nature of vein-matter varies, the width of the vein ranging from 2 inches to 3 feet, and the sulphides in the vein ranging from a small percentage in the wider quartz-lenses to almost 100 per cent. in the narrower bands of 2- and 4-inch widths, and in one place an 8-inch width. In these sulphide-bands pyrite predominates; arsenopyrite, as contrasted to farther in, occurs here only sparingly.

Branch fissures along this section include a ⅛-inch joint at 34 feet and a similar break at 84 feet respectively from the portal. At 145 feet from the portal, the main vein, still striking 42 degrees and dipping 77 degrees north-westerly, splits into two smaller ones that cross the drift and join with another vein at 160 feet and 172 feet respectively from the portal, to make a parent vein that strikes north 38 degrees east and dips 80 degrees north-westerly. The other vein spoken of was broken into at a point 120 feet from the portal; it is a strong quartz-sulphide vein maintaining a fairly constant width of 4 inches to its junction at 160 feet and 172 feet with the branches from the first vein. Between 165 feet and 185 feet the drift cuts a tongue of feldspar porphyry, the attitude of which was indeterminant because the rock in the opposite (south-easterly) wall of the drift was obscured by the vein. Beyond this point a widening of the drift permits a better examination of the vein-matter in the so-called parent vein (*see* above). This vein consists of quartz, in places abundant coarsely-crystallized calcite, and arsenopyrite; arsenopyrite is here the most abundant sulphide, and others are almost absent; this contrasts with the comparative scarcity of arsenopyrite nearer the portal. The width of the vein ranges from 30 inches at 188 feet to 2 inches at 210 feet, and finally appears to disappear into a slip at 220 feet. It is to be noted that a marked shearing, manifested by numerous closely-spaced slips in the back, begins at 182 feet and continues to 220 feet, where the relief of stresses has been concentrated in three main gouge-filled fissures that apparently also represent a continuation of the vein-structure but which lack quartz-sulphide vein-matter—the vein-matter ended, as stated above, at 220 feet. As seen in the face, these three gouge-slips average 1 inch in thickness and one of them contains ¼ inch of calcite; sample No. 8 indicates that the gouge and accompanying crushed rock contains little gold.

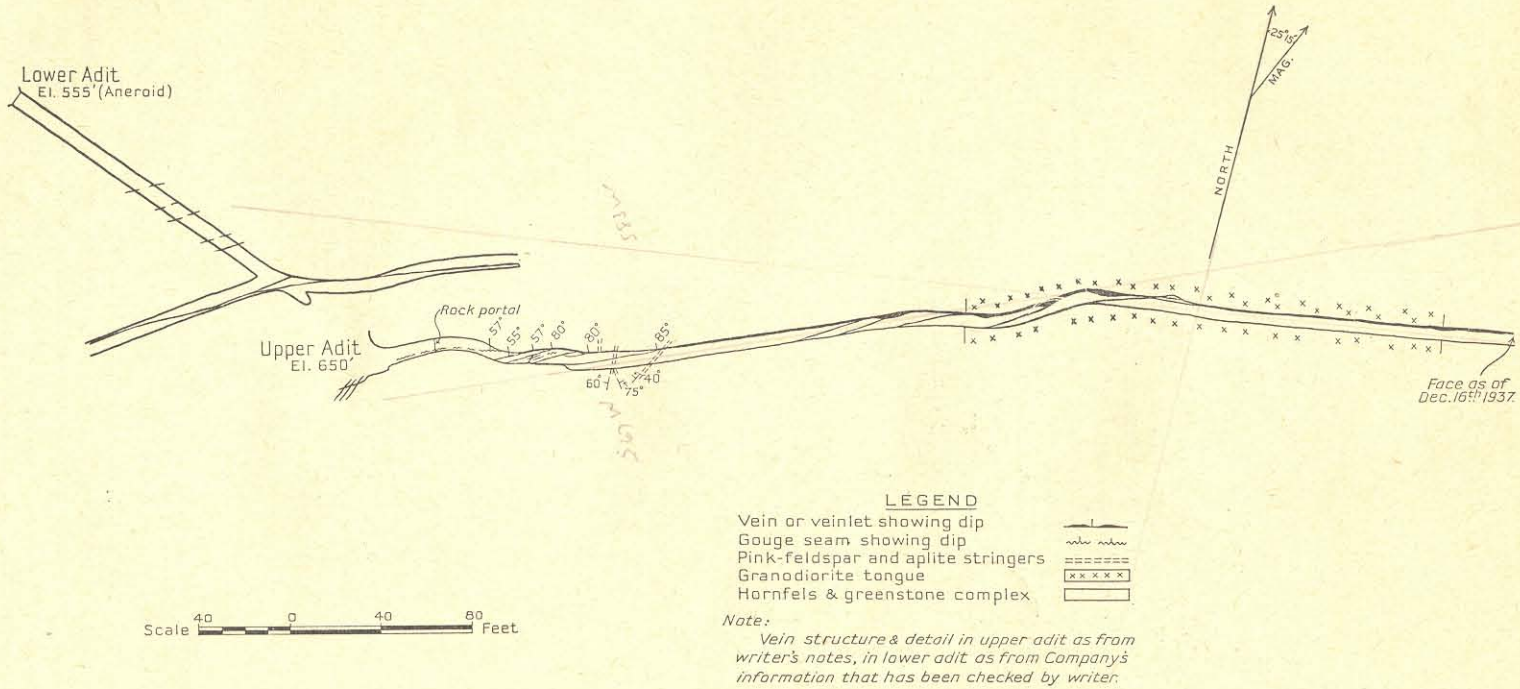
The rock formation of this adit is, with the exception of the tongue of feldspar porphyry, both altered even-grained and porphyritic andesite.

Privateer Group.(3)

The *Privateer* property is owned by a private company, the Privateer Mine, Limited, with offices at 604 Bank of Toronto Building, Victoria, and is reported to include the following mineral claims: *Privateer, Privateer No. 2, Privateer No. 3, Privateer No. 4,* all staked in 1933; the *Privateer No. 7,* staked in 1934; the *Progress Nos. 1* to *4,* inclusive, staked in 1936; and the *Ray Fraction,* staked in 1937.

The main workings consist of two adits. Open-cuts and strippings made previous to the driving of the adits are in poor shape for examination, having either sloughed or been covered by the debris resulting from land-clearing operations; however, exposed mineral-showings in the creek were examined and are described below.

The camp and compressor buildings are on the south-westerly side of Spud Creek at an elevation of approximately 430 feet, and the two adits are on the north-easterly side of the same creek at elevations of approximately 555 and 650 feet respectively; the creek below is approximately 390 feet elevation. The hillside in the immediate vicinity is heavily wooded and slopes steeply south-westward and north-eastward on both sides into the creek-bottom.



Privateer. Plan of adit-workings modified after survey by company.

A short distance north-westward the creek valley opens out and more gradual slopes lead into the main Zeballos Valley.

The property is reached by 4½ miles of truck-road up the Zeballos Valley from tide-water at Zeballos to the mine on Spud Creek. The location of the property is shown on the key-map.

The surface workings examined are in the creek in the vicinity of the power-house. A number of small stringers and a crushed zone occur in the creek between the power-house and the adit-workings; the large amount of broken timber and debris in the creek resulting from clearing operations hindered examination of these showings; however, one of the mine employees showed the writer what were considered to be all the important ones.

A short distance below the foot-log leading over the creek to the adits, the bank for 10 feet in height and 150 feet in length has been stripped to expose a section of slightly-sheared greenstone. Towards the north or lower end of the stripping a zone 2 feet wide was seen to consist of badly-crushed rock, considerable quartz, calcite, and stringers of quartz carrying a little pyrite. This material assayed traces only in gold and silver.

Approximately 120 feet farther down-stream, a cut 5 feet wide has been driven 4 feet into the west bank of the creek, exposing a quartz veinlet 1 to 2 inches wide near the bottom, but dying out towards the top. The break containing the quartz veinlet continues as a 4-inch fracture-zone. The veinlet and fracture strike north 38 degrees east and are vertical. Small amounts of pyrite, galena, sphalerite, and arsenopyrite are associated with the quartz.

On the east bank of the creek, close to the eastern end of the foot-log immediately below the power-house, a veinlet striking north 45 degrees east and vertical is exposed. This veinlet is 1 to 2 inches in width, and the filling consists of quartz with small amounts of pyrite, galena, sphalerite, and arsenopyrite.

The main vein on the property is a quartz-sulphide fissure-filling that has been drifted on for 195 feet by the lower adit and for 450 feet by the upper adit, as at December 16th, 1937. Vein-widths in the adit range as follows: Upper adit, from 4 to 24 inches, averaging 10.3 inches; lower adit, from 4 to 18 inches, averaging 11 inches. With the exception of a short section towards the portal of the upper adit, the vein is between well-defined walls, walls in which the wall-rock is quite massive and unfractured, the hanging-wall being marked by a seam of gouge, and the foot-wall fairly well defined but marked by much less gouge. The exception, in the upper adit, is a section 70 feet long that is characterized by four main sulphide stringers, which lead south-westward from a clear-cut gouge-slip diagonally across the drift, and, narrowing, disappear into the wall of the adit; there is no clear-cut foot-wall to this zone. A somewhat similar group of three veinlets occur about 35 feet outside the portal; these are stringers of quartz bordered by sulphides and range in width from ½ to 1 inch. Elsewhere the vein is a well-defined quartz-sulphide band that ranges from 3 to 24 inches, but averages 10.3 inches in width.

Extending outwards from the rock portal of the upper adit for some 30 feet, the south-easterly wall of the open-cut leading into the adit is a smooth fissure-wall, dipping approximately 55 degrees north-westerly, and on which scattered patches of sulphide occur. These patches are probably the remnants of a body of high-grade ore that is reported to have been mined from the open-cut along this section.

The vein-matter is quartz with varying amounts of the sulphides—pyrite, arsenopyrite, sphalerite, galena, and chalcopyrite, and an occasional lens of pyrrhotite. Although this ore is apparently quite massive, the texture is mostly a closely-filled comb texture that consists of closely-packed, parallel, prismatic crystals of quartz arranged normal to the vein-walls. The interstices between these crystals have been completely filled by the sulphides; the comb texture of the vein is very apparent when the ore is broken by a light blow from a hammer, when it will shatter readily. It will be noted that most of the breaking occurs between and not across the quartz crystals. Such a texture is very indicative of the open-space filling either of a fissure or of drusy cavities in a fissure, resulting from incomplete filling of the open fissure by the earlier minerals, in this instance prismatic quartz crystals, as contrasted with replacement of wall-rock. Replacement of wall-rock by sulphides usually results in massive mineralization, but open-space filling results in coarser, looser aggregates of sulphides that make for better deposition of gold. Only at one place, 235 feet from the portal of the upper adit, was any large-scale brecciation seen in the vein; here, 1- to 2-inch angular frag-

ments of greenstone have been rather completely rimmed by sphalerite crystals growing normal to the borders of the fragment and the whole set in the vein-quartz. However, preliminary microscopic study indicates that there has been rather thorough fracturing and brecciation of much of the pyrite and arsenopyrite, followed by the deposition of additional quartz, other sulphides, and gold. The main rock formations comprise biotite-hornblende hornfels, andesitic greenstone, and granodiorite.

Hornfels is the most abundant rock-type in the adits. It is definitely massive and, with one exception, no well-defined structure is evident. The exception to the massive structure is some indefinite wavy banding in a lime-silicate phase in the face of the south-west drift of the lower adit; this occurrence is described below. The average hornfels is a dark chocolate-coloured, fine-grained, equigranular rock consisting of equal amounts of quartz, plagioclase, hornblende, biotite, epidote, and some magnetite. The present nature of this metamorphic rock is the result of alteration or metamorphism of the original rock by the heat given out at the time of the intrusion of the near-by granodiorite batholith.

Bleaching, probably by hydrothermal solutions, of the hornfels has occurred outward from numerous diversely oriented joints and from the walls of quartz stringers and pink-feldspar veins. The mildest effects of these hydrothermal solutions has been the bleaching of the rock by the destruction of the dark minerals, biotite and hornblende, for a distance of ¼ to 1 inch on either side of a joint-plane. More intense effects, probably resulting from stronger and more copious hydrothermal solutions, are seen in a light buff-coloured phase developed adjacent to quartz stringers and to the irregular pink-feldspar veins. In this phase of alteration, all the dark iron minerals are gone, the feldspars are largely sericitized, and considerable calcite has been developed. As contrasted to the above phase, the rock adjacent to the chronologically later main fissure is strikingly unbleached. Although it could not be proven at the time, it is probable that these hydrothermal solutions emanated from the main vein-fissure. Within the limited area on either side of the vein available for study, no progressive variation in intensity of the alteration outward from the vein was discernible.

An indefinitely-banded, lime-silicated rock, probably related to the hornfels, occurs in the face of the south-west drift in the lower adit. The bands are variable in width, different bands ranging from 2 to 8 inches, and individual bands pinching and swelling; they are all quite wavy. The average strike is north 40 degrees east and the dip 60 degrees north-west. The bands are cut by a 6-inch white aplite dyke, and the individual bands do not continue across the dyke as such; there is only a suggestion of banding on the other, or north-westerly, side. The material of these bands ranges from a very dense, chocolate-coloured hornfels to a coarser, lighter-coloured rock that consists of large laths of the lime-silicate mineral, tremolite, set in a finer-grained base of the same. The lime-silicate bands may represent a metamorphosed lens of calcareous rock within the hornfels.

The only occurrence of greenstone noticed was towards the face of the upper adit. The rock is massive and very chloritic, and contains irregular ⅛-inch light-coloured spots that are now aggregates of sericite, but probably were originally feldspar phenocrysts; calcite is abundant in this rock.

Granodiorite occurs in the upper adit only, and as a tongue 210 feet wide; this is intersected by the adit between points 235 feet and 445 feet respectively from the portal. It is to be noted that the persistence, general width, and nature of the vein change but slightly within the granodiorite; the only variation being a couple of small lenses of pyrrhotite within the vein.

Acid differentiates related to the granodiorite batholith include: At 75 feet from the portal a narrow, 4-inch pink-feldspar vein crossing the drift south-easterly and diffusing as a 1-foot zone of blotchy pink feldspar, and yellowish bleached hornfels; at 78 feet an 18-inch zone of pink feldspar and bleached rock; and at 105 feet a 4-inch aplite dyke. The time-sequence of events as noted in the vicinity of the above is, from the earliest—hornfels—a 1-foot chocolate-coloured dyke belonging to the hornfels complex—pink-feldspar veins—aplite —vein quartz.

The geology and vein-structure of the upper adit are given on the accompanying plan, and the general geology given above discusses most of the features in this adit.

The geology of the lower adit was not done in detail; however, the general features of the vein-structure is shown in the accompanying plan. Over the length of the drift the vein

ranges from 4 to 18 inches in width, the average being 11 inches. The texture and vein-matter are similar to that of the vein as exposed in the upper adit.

The rock in this adit is the typical, dense, massive hornfels as is found in the upper adit, with the exception of the banded, lime-silicate phase occurring in the face of the south-west drift, already described. Sampling in the workings was not done to determine the average grade of the ore, but only to determine the general distribution of the gold.

Those samples taken indicate that the best gold values within the vein occur where the sulphides are not only heaviest, but where they constitute a fairly well-mixed aggregate of pyrite, arsenopyrite, sphalerite, galena, and chalcopyrite. Specimen samples of such material containing no visible gold assayed as high as: Gold, 55 oz. per ton; silver, 17.4 oz. per ton; whereas samples containing quartz and only sphalerite in abundance assayed: Gold, 2.2 oz. per ton; silver, 3.8 oz. per ton; and one, consisting chiefly of pyrrhotite, assayed only: Gold, 0.08 oz. per ton; silver, 2 oz. per ton. Two 10-inch samples taken across the vein, where appearing to contain better than average amounts of sulphides, assayed, respectively: Gold, 10.8 oz. per ton and 17 oz. per ton; silver, 3.5 oz. per ton and 6 oz. per ton. Samples taken of a clean gouge film in the vicinity of these assayed: Gold, 0.7 oz. per ton; silver, 0.3 oz. per ton. Assays of wall-rock specimens indicate that it carries but little gold. A sample of hornfels in the face, and taken 2 feet from the vein when the drift was 100 feet from the portal, assayed: Gold, 0.02 oz. per ton; silver, 0.5 oz. per ton. The following samples all ran traces only in gold and silver: Highly altered and leached rock on north-west wall of the drift, 65 feet from the portal; 4-inch pink-feldspar vein at same place; 4-inch aplite dyke from near here, altered, leached rock on south-east side of the drift at 70 feet from the portal; and typical dense hornfels at same place. Inasmuch as the narrow quartz-sulphide veins and veinlets which come in as branches to the main vein carry gold values, one must be careful when sampling wall-rock to reject any fragments of such material, the inclusion of which in an assay would give a false impression of the value of the wall-rock values. Any increase in a profitable mining-width over that of the vein itself will be determined by the extent to which any section of the drift is enriched by contributions in gold from such branch stringers.

Figures for grades of Privateer ore may be best determined by calculations based either on bulk-sampling of the vein or on smelter returns from the different lots of ore; in lieu of bulk-sampling, the latter method was adopted.

Information concerning tonnages and the gold content of various shipments has been supplied in part by the smelter and in part by the management; information about the source of each shipment has been supplied by the management, and data for the calculations of vein-widths have been supplied by the writer.

Owing to insufficient information from the lower adit, the vein, in the upper adit only, is considered. From the open-cut to 480 feet from the portal some 264 tons of ore averaging gold 7.54 oz. per ton have been shipped from the vein in the upper adit. Some forty-five measurements made by the writer over this length indicate an average vein-width of 10.3 inches. However, the different shipments have varied somewhat in grade, and in order to indicate the nature of the variations the vein has been divided into four blocks, namely, A, B, C, and D, along its length.

Block A extends from the open-cut to a point 85 feet in from the portal. Omitting a section of gouge 20 feet long, the vein-length is 115 feet, the approximate average width 8.3 inches, the average mined height 5.4 feet. The height of the open-cut is assumed to have increased from 0 to 6 feet and the drift to average 6½ feet in height. Block B extends from 85 to 231 feet from the portal. In this section the vein-length is 146 feet, the average mined height 6½ feet, and the average width 9.7 inches. Block C extends from 231 to 442 feet from the portal. The vein-length is 211 feet, the approximate average mined height 7 feet, and the average width 11.3 inches. It is important to note that this section, lower grade than the others, is the only one which is almost wholly within the granodiorite tongue.

Block D extends from 442 to 480 feet from the portal. The vein-length is 38 feet, average mined height 7 feet, and average width 14.5 inches. The wall-rock is greenstone.

Data descriptive of these blocks are tabulated in the following table, to which the following explanatory notes apply:—

Block B calculations have been subdivided into two parts, one part (*a*) including and the other part (*b*) excluding a high-grade shipment of 196.6 lb. that contained 142.877 oz.

gold. In the calculations of tonnages mined, a volume factor of 10 cubic feet per ton is used. This is based on an estimated quartz-sulphide ratio of 3 to 1. This factor may vary 10 per cent. either way. In most blocks the estimated tonnage mined exceeds that shipped. This is probably owing to the loss of vein-matter in cobbing out any waste that has been included in the mining, or in the rejection of quartz containing only a small amount of sulphide. Calculations of the grade as mined have been based on an estimated grade for the ore on the dump as 25 per cent. of the grade of that shipped. The small amount of ore on the dump does not materially affect the calculations as to grade.

The stoping-width that will be adopted (no stoping has as yet been done) will depend largely on the manner in which the wall-rock breaks and the way the vein stands up. The width chosen—namely, 3 feet—for the following calculations is therefore only arbitrary:—

Block.	Length of Section.	Average Vein-width.	Tons shipped.	Grade as shipped, Oz. per Ton.		Estimated Mined Tonnage.	Estimated Mined Grade. Oz. per Ton.	
				Over Vein-widths.	Over Stoping-width of 3 Feet.		Over Vein-widths.	Over Stoping-width of 3 Feet.
	Feet.	Inches.				Tons.		
A	115	8.3	32.11	17.50	4.04	43.0	14.2	2.84
B (*a*)	146	9.7	72.545	7.20	1.94	77.0	6.9	1.86
B (*b*)	146	9.7	72.643	9.17	2.48	77.0	8.8	2.37
C	211	11.3	126.011	4.50	1.41	139.0	4.2	1.32
D	38	14.5	32.762	5.80	2.33	32.8	5.8	2.33

White Star Group.(4) The *White Star* property is reported to include the *White Star* claim staked in 1933, the *Don and Star Fractions* in 1937, all staked by the present owners, John and Andy Donaldson, of Zeballos. The workings on this property have been described by the writer under the heading of *Goldpeak* in the Annual Report of the Minister of Mines for 1935, pages F 38 and F 39, and, since little change has been made since then, although considerable ore has been shipped, the following description is largely as it is in the above report, but it has been amended to bring the details up to date.

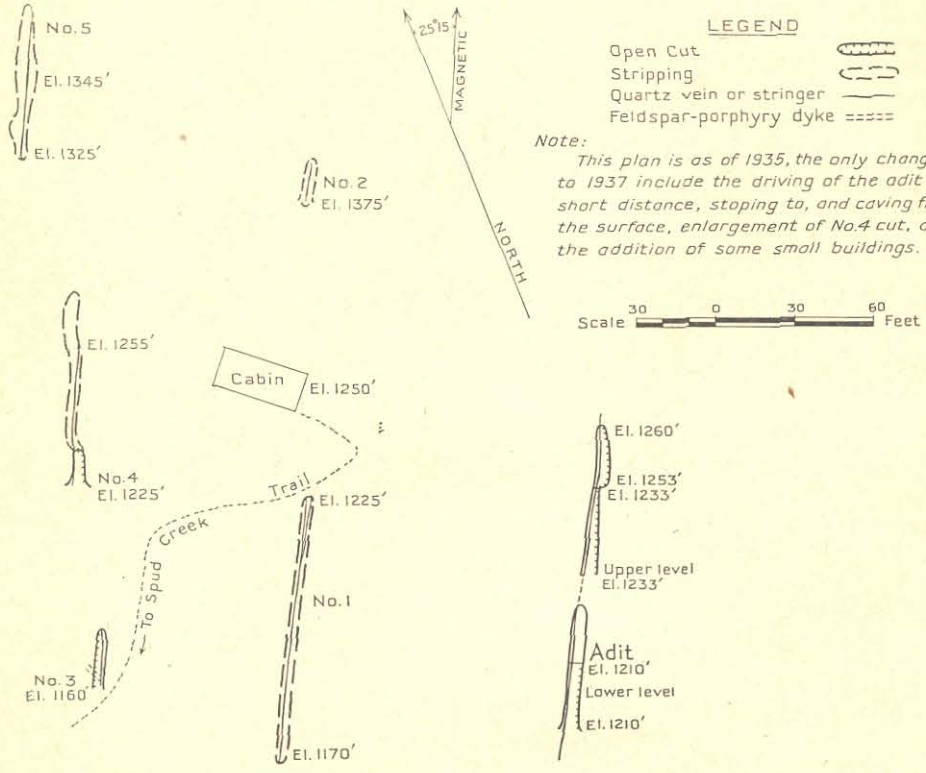
The camp and workings are reached by a steep foot-trail leading up from a place in Spud Creek approximately 500 feet down-stream from where the new road crosses the creek. They are on the steep, heavily-wooded hillside, sloping at an angle of 35 degrees south-westward into Spud Creek.

Mineralization has resulted in the filling of fissures or joints in granodiorite by quartz, pyrite, galena, sphalerite, and arsenopyrite. These fissure-fillings, five of which have been uncovered so far, include several that are only ½ to 1 inch in width and possess frozen walls; and the main vein that varies from 4 to 6 inches in width and has a small amount of gouge on both walls. Shear-zones of varying degrees of intensity and of widths ranging from 6 inches to 2 feet are usually occupied in part by quartz veins.

The workings comprise strippings and one large open-cut leading into a short adit and overhead stope to the surface, from which the bulk of the ore shipments have been made. At the time of the writer's visit (August, 1937), the adit, reported to have been in a considerable distance, had been caved from the surface at a point 40 feet in from the mouth of the cut. In 1935 this cut had included two levels, a lower one 50 feet long and an upper one 19 feet above the lower and 30 feet long, and a stripping 40 feet long exposing the vein for a length of 120 feet. (For details *see* accompanying plan.) This vein, known as the *Donaldson* vein, ranges in width from 3 to 6 inches, strikes north 30 degrees east, and is for the most part vertical, but in some places dips 80 degrees south-east. The vein-filling consists of quartz and a considerable amount of pyrite, galena, sphalerite, and a little arsenopyrite. Where the vein is widest the texture is drusy, and the quartz so well developed in crystals normal to the walls that a comb texture results. The sulphides are concentrated in bands towards the walls of the fissure.

A sample taken in 1935 in the lower level across 4 inches of rusty quartz containing only small amounts of sulphides assayed: Gold, 1.10 oz. per ton; silver, 0.1 oz. per ton. A sample taken in the upper level across 4 inches of vein-matter containing comb quartz and larger amounts of sulphides assayed: Gold 14.74 oz. per ton; silver, 5.6 oz. per ton.

The rock formation is granodiorite which, in the open-cut has been cut by a feldspar-porphyry dyke. The granodiorite has been fractured by joints in three directions, very markedly in planes striking north 65 degrees east and dipping from 85 degrees north to vertical, less prominently in planes striking north 15 degrees west and dipping 80 degrees north-east, and haphazardly in planes approaching the horizontal. A very interesting feature of the granodiorite is the perfect leaching of the dark minerals for 2 inches and less on either side of the vein. The feldspar-porphyry dyke is exposed on the north-west wall of the open-cut on both levels. It strikes north 37 degrees east and dips 80 degrees south-east. Near the entrance to the lower level of the cut the dyke is completely in granodiorite, but farther in, and also in the upper level, the vein forms the south-east wall. It appears that the vein-fissure, striking from south-west towards the dyke, was deflected by it and follows the wall of the dyke.



White Star. Chain and compass survey of workings.

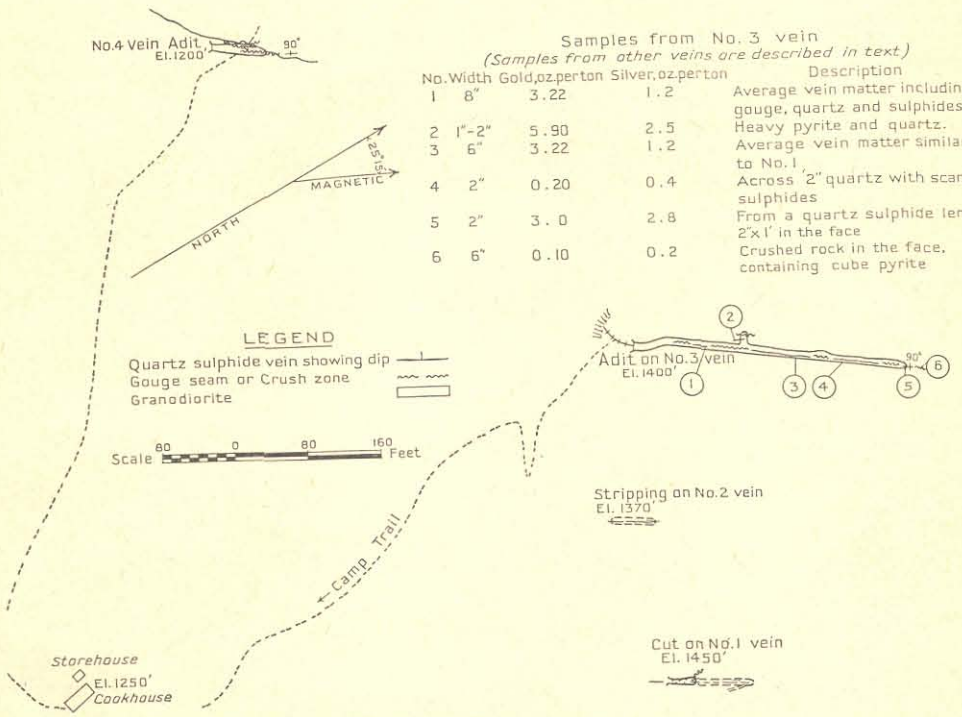
No. 1 stripping is on a quartz vein along which the quartz occurs as disconnected lenses in sheared granodiorite. The shear averages 6 inches in width, in which, although in one place the quartz-lens is 6 inches wide, the average width is 1 inch. Pyrite and arsenopyrite accompany the quartz. Near the top of the stripping the vein branches into two stringers, from the northerly strand of which 2½ tons of ore is reported to have been shipped in 1935. No. 2 stripping, north-eastward from the cabin, exposes the apparent continuation of this vein. No. 3, a small cut adjacent to the north-west side of the trail, exposes 28 feet of a narrow quartz vein and a 2-foot feldspar-porphyry dyke. The fissuring and the vein do not extend beyond the dyke. No. 4, a combined cut 10 feet long and stripping, exposes a zone 3 feet wide and 57 feet long that consists of irregular and indefinite shearing in weathered granodiorite. The zone contains scattered, small quartz-lenses that contain a little pyrite,

arsenopyrite, and galena. No. 5 stripping, north-eastward up the hill from the last, exposes a similar zone of fissuring and discontinuous quartz-lenses.

The property has been worked by the owners or by lessees who, by hand-mining, have taken out some 47 tons of ore averaging 14.5 oz. gold per ton. Most of this ore has been obtained from the adit and open-cut, although some has apparently been taken from stripping and cut No. 4. The earliest shipments of ore were back-packed all the way from camp to tide-water; but recently a light jig-back tram-line from the camp down to Spud Creek has been built; and the ore back-packed from the tram-line to the end of the road, and thence dispatched by truck to tide-water.

Golden Peak Group.(5)

The Zeballos Gold Peak Mines, Limited (N.P.L.), a public company with registered offices at 540 Columbia Street, New Westminster, is stated to have bonded from the owners six full claims and a fraction, contiguous to the *Goldfield* group on the south-east and extending north-easterly from the valley of Spud Creek over the ridge between that and Goldvalley Creek. The property is reported to include the following mineral claims: *Red Star, Green Star, Blue Star, Golden Peak, Bloom Fraction, Golden Peak No. 2, Golden Peak No. 3,* staked by Alfred Bloom (deceased) and Albert Bird in 1933.



Golden Peak. Plan of workings modified after company plan.

The camp, at an elevation of approximately 1,250 feet, is reached by a trail, one-half mile long, that leads south-easterly up the hillside from the Spud Creek Bridge of the new road up the valley. Most of the workings are some 200 feet higher up the hillside and are reached by trail leading northerly and westerly from the buildings; however, one working, the adit on No. 4 vein, is some 760 feet westerly along the hillside from and at approximately the same elevation as the camp, and is reached by trail therefrom.

The hillside in the vicinity of all the workings is the typical steep, heavily-wooded type common to the area.

The various adits and surface workings have been driven on four different shear and crush zones that vary in width and in quantity of quartz-sulphide vein-matter. These shears all possess approximately the same strike, north 32 degrees east, and are approximately vertical. The minerals found in the veins include, in addition to quartz, pyrite as perfectly-

developed cubes scattered in clusters in the crush-zone, and apparently not accompanied by gold, and pyrite associated with a small amount of galena and sphalerite in the quartz-bands, and apparently accompanied by gold values. The rock is the typical granodiorite that is rather thoroughly bleached in the crush-zones.

The most important work on No. 1 vein is a cut at an elevation of 1,450 feet. This cut has been driven in a direction north 32 degrees east along a strong vertical break that forms the south-easterly wall. This break is 2 inches in width, and is filled by gouge and a lenticular, discontinuous stringer of quartz and heavy sulphides ranging from 1 to 2 inches in width. A sample taken along a 1-foot length of this discontinuous, 1- to 2-inch veinlet assayed: Gold, 14.4 oz. per ton; silver, 5 oz. per ton. The face of this cut, which is 25 feet high, 7 feet wide at the base, and 10 feet wide at the top, shows the above-mentioned gouge-seam and veinlet on the south-east; then a 6-inch aplite dyke striking with the break but dipping 70 degrees north-westerly; then in the north-westerly wall a strong shear-zone, striking north 17 degrees east, approximately vertical, and consisting of gouge and thoroughly crushed, leached granodiorite; the width of such crushed material ranging from 2 to 10 inches. Clusters of unbroken pyrite cubes and an occasional discontinuous, narrow quartz stringer occur in the crushed zone; a sample taken across 6 inches of this material assayed: Gold, 0.20 oz. per ton; silver, trace.

Above this cut the steep hillside has been stripped for some 85 feet, thereby exposing the continuation of the main or south-easterly break of the cut. At the upper end of the stripping the fracturing is manifested by a sheeted zone 3 to 4 feet wide, consisting of closely-spaced, tight joints accompanied by the usual 1-inch border of leaching. At this place the zone is joined from the east by a strongly-sheared zone, 8 inches wide, and by a 2-inch gouge-seam, both striking north 18 degrees east and vertical; this is the system that seems to carry the structure north-easterly up the hillside. Some 50 feet below the No. 1 cut, stripping was in progress with the view to exploring the possible downward continuation of the breaks.

The work on No. 2 vein consists of a small cut and short stripping. The face of the cut exposes, in the south-easterly side, a narrow, vertical, sheeted zone striking north 32 degrees east. This zone is 13 inches wide, and consists of badly-leached, pyritized granodiorite, with three quartz-sulphide stringers ¼ to 8½ inches in thickness. A sample taken across this sheeted zone assayed: Gold, 0.80 oz. per ton; silver, 0.6 oz. per ton.

No. 3 vein has been followed by an adit some 300 feet long. The shear-zone, nearly vertical and striking north 32 degrees east, consists of highly-crushed rock and gouge, the aggregate width of which ranges from 6 to 26 inches. The vein-matter is a discontinuous band from 1 to 3 inches wide of quartz and heavy sulphides, consisting of pyrite with some arsenopyrite. The lengths of vein-matter are from 2 to 70 feet in individual sections. The details of this vein-structure are shown in the accompanying plan. The short crosscut in this working crosses a veinlet, strike north 10 degrees east, dip vertical, that consists of 1 to 2 inches of heavy pyrite and quartz; a sample across this 1- to 2-inch veinlet assayed: Gold, 5.90 oz. per ton; silver, 2.5 oz. per ton. The face of the crosscut shows a 2- to 4-inch gouge-seam that contains slickensided rounded fragments of barren quartz, and this break contains no continuous vein or veinlet of quartz, and probably therefore represents one of the few truly post quartz-vein shears in the area. The various samples taken along the main break and detailed in the accompanying plan indicate that the best values are with the narrow and discontinuous quartz-sulphide stringers, and that gouge, uncontaminated by quartz stringers, contains but little gold.

The adit on No. 4 vein has not delineated any definite vein as yet, although it breaks into the wall of a heavy crushed zone 6 to 18 inches in width that contains scattered pyrite cubes; a sample taken across 18 inches of this material assayed: Gold, 0.10 oz. per ton; silver, trace. A branch slip from this zone extends north-easterly across the back; this contains some heavy sulphide, but a sample along it assayed only: Gold, 0.12 oz. per ton; silver, 0.1 oz. per ton. This slip joins a 5-inch crush-zone that continues along the south-easterly wall of the drift to the face. A sample taken of this material assayed only traces in gold and silver.

A narrow quartz-sulphide stringer is exposed in the creek adjacent to the adit; but it is thought that the drift has not yet intersected the stringer, which probably lies to the north-westward.

Goldfield Group.[6]

The *Goldfield* property, owned by Spud Valley Gold Mines, Limited (N.P.L.), a private company with offices at 608 Pacific Building, Vancouver, is reported to consist of eleven claims and fractions, namely: *A.T. No. 1, Spud, Anvil, A.T. Fraction, Linton, Linton No. 2, Goldfield, Goldspring, A.T. No. 6 Fraction, A.T. No. 2,* and *Last Chance.* The *Goldfield* claim was staked in 1935 by Sam Knutson; the remainder variously since then. This group of claims extends north-eastward from the valley of Spud Creek across the ridge and into Goldvalley Creek.

The location of the property and main workings are shown on the accompanying key-map.

The adits are on the very steep, heavily-timbered and in part bluffy hillsides sloping into Spud and Goldvalley Valleys; No. 1 tunnel has been driven completely through the hill, No. 2 adit driven south-westerly from the Goldvalley side, and No. 4 north-easterly from the Spud Valley side. (No. 3 adit had not been started as of December, 1937.)

The present camp, at an elevation of 1,500 feet, and workings, between elevations of 1,796 feet and 2,222 feet, are reached by a foot-trail leading easterly up the hillside from the end of the road in Spud Valley. This road is under construction to a point in the valley immediately below the present camp; when the road is completed it is planned to build a permanent camp in the valley.

The present workings consist of numerous strippings; No. 1 tunnel and adits Nos. 2 and 4 that successfully explore the showings exposed in the strippings. The relative position of these workings is shown on the accompanying plan.

The two adits and tunnel have been driven on a well-defined shear-zone that ranges, along the strike, from a zone of sheeting the full width of a back to a 2-inch gouge-filled slip. This zone contains quartz-sulphide veins and stringers that have three main habits of occurrence: One, as a more or less continuous ribbon within the shear and striking with it. Such a ribbon is not necessarily continuous along the shear, and may vary in width from 8 to 2 inches or even give place to mere gouge-seams. The best vein-widths are usually found where the shear is widest and the rock material most crushed. A second habit of the quartz is as narrow, ⅛- to ½-inch stringers along many of the joints that constitute the sheeting parallel with the main shear. This sheeting is particularly well developed in No. 2 adit between points 60 feet and 120 feet in from the portal, where it occurs across the full width of the back as joints spaced 2 to 6 inches apart, some with a thin film of gouge and some with a ⅛- to ½-inch filling of quartz. It is interesting to note that a 4½-foot channel across this sheeted zone assayed: Gold, 8.30 oz. per ton; silver, 2.5 oz. per ton.

A third habit for the quartz-sulphide veins is as ¼-inch veinlets that follow many of the 70-degree joints leading off from the main fissure or shear; where these joints are sufficiently numerous the ore-widths are materially increased. The sulphides are loose, easily crushed aggregates of abundant pyrite, with minor amounts of sphalerite and galena.

The main features of the vein and shear structure are shown on the accompanying plan.

The upper working, No. 1 tunnel, follows a joint wall for 30 feet, and then crosscuts for 40 feet across a zone of master-joints, mostly spaced 8 inches apart. These joints belong to a group, well developed in the workings, that strikes north 70 degrees east, dips steeply north-westward, and for convenience are referred to as the 70-degree joints.

From near the end of this crosscut the drift along the main shear was started. At the beginning a short branch followed a 70-degree joint for some 35 feet; this joint contains 2 inches of gouge and occasional 2-inch lenses of quartz and sulphides.

Proceeding along the drift from the crosscut, the main shear ranges from 2 inches in width to 18 inches of crushed rock and gouge at 35 feet from the crosscut. It may be noted that the hanging-wall, which is very clean cut, is crenulated by slightly-curved vertical flutings, indicating that the most recent movement in the plane of the shear has been nearly vertical. Another occurrence of such curved fluting may be seen in the foot-wall of the shear at a point 180 feet from the crosscut.

With the exception of a little quartz and sulphide in thin lenses, the more or less continuous quartz-sulphide band does not commence until a point 75 feet from the crosscut. Here a ¼- to 2-inch band starts and continues along the drift with occasional swellings to 8 inches. Leading off from the main shear there are four groups of 70-degree joints at 94 feet, 120 feet, 150 feet, and 180 feet, respectively, measured from the entry crosscut. These gently curve into, but do not appear to cross, the main shear. Where these joints come in there is a widening in the vicinity of the intersection, of the average zone of crushing and

gouge, to as much as 3 feet in places, and usually a lenticular thickening of the quartz-sulphide band. In this connection the quartz-sulphide stringers that frequently fill these joints seem to add to the aggregate quartz-sulphide content of the shear, and to increase correspondingly the assays of samples taken across such zones. Between points 205 feet and 240 feet from the crosscut, although the shear ranges from 2 feet to 18 inches in width, 70-degree joints are absent, and the quartz is narrow and lenticular. Beyond this to the north-easterly portal, the quartz-band is more continuous, although the shear averages only 8 inches in width.

No. 2 adit, driven south-westerly from the Goldvalley side of the hill, is in approximately the same section of the vein-shear as No. 1 tunnel. A 30-foot crosscut, driven from the portal, intersects the main shear. For 30 feet from this crosscut the break is an 8-inch zone of crushed rock and gouge with very little quartz; from here to 60 feet in from the crosscut the zone is effectively widened by a sheeted zone along the full width of the back. This zone corresponds to the section in the tunnel already described. Here the full width of the back consists of joints spaced 2 to 6 inches apart, some of which carry a thin film of gouge, and others ⅛- to ¼-inch quartz-sulphide veinlets. The longest section of this sheeting extends between points 60 feet and 120 feet from the portal; however, two other shorter sections occur between points 155 feet and 170 feet from the portal, and between points 18 feet and 32 feet from the face. It is to be noted that, between points 70 feet and 170 feet from the portal, well-marked fissures occur on both walls of the drift; that is, on both walls of the sheeted zone. Both these fissures carry discontinuous quartz-sulphide veins up to 2 inches thick; however, at 170 feet the north-westerly or hanging-wall break tightens and disappears into the sideswiped wall as a ½-inch gouge-seam. An unusual quartz-sulphide occurrence, from the point of view of vein-structure, occurs at 85 feet from the portal in the hanging-wall break. Here the fracture includes numerous thoroughly leached and angular fragments of granodiorite that have been completely surrounded by films of sulphide, the whole set in the crushed matrix of the shear. Beyond 170 feet the foot-wall, now the only break, increases to a crushed decomposed zone 18 inches wide, with a little quartz and sulphide; a sample taken across this assayed: Gold, 0.90 oz. per ton; silver, 0.1 oz. per ton. A 6-inch width of quartz occurs between 200 feet and 215 feet from the portal. In this vicinity the drift swings so that the main break is closer to the north-westerly wall and the shear, having previously narrowed to 2 inches, widens to 18 inches, and between 242 feet and 276 feet carries a band of heavy sulphides, ranging from 2 inches to 1 foot in thickness. A sample taken across 4 inches and along 2 feet of heavy sulphide vein-matter assayed: Gold, 13.2 oz. per ton; silver, 6.5 oz. per ton; and a sample taken across 10 inches of crushed rock and gouge of the foot-wall assayed: Gold, 0.10 oz. per ton; silver, 0.5 oz. per ton. Another strong lens occurs at 285 feet; the shearing from the beginning of the last to this lens being accentuated by some three to four additional joints in the back. However, these are not numerous or close enough to constitute a sheeted zone. Beyond 290 feet the shear lacks mineralization and averages 1 foot in width for a short distance. A sample taken across the more or less barren-looking shear at 302 feet assayed: Gold, 0.30 oz. per ton; silver, 0.30 oz. per ton. Beyond here the shear tightens somewhat; strong lenses are lacking, but between 320 feet and 335 feet from the portal a strong quartz-sulphide band, ranging from 1 to 8 inches in width, comes in. This dies out, but the mineralization is maintained between points 32 feet and 18 feet from the face by quartz veinlets filling the joints and comprising an imperfectly-sheeted structure in the back. Two of the three main joints in this zone coalesce towards the face, so that the face shows a hanging- and foot-wall gouge-seam with 1-inch stringers of quartz and sulphides.

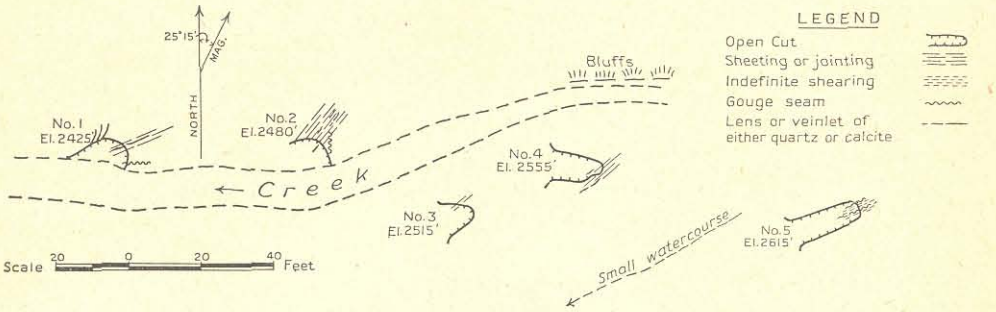
The first 340 feet of No. 4 adit, driven north-easterly from the Spud Valley side of the hill, was not on the main vein and shear, and will not be described in detail, save only to say that for the most part this early work follows a ¼- to 2-inch gouge-slip with only occasional small amounts of quartz. The resultant strike of this slip, approximately north 60 degrees east, is the result of following for considerable distances one of the 70-degree joints, gently angling northerly as a rough fracture across to another near-by 70-degree joint, following it, and repeating the crossing-over process. However, at 340 feet near the end of a short cross-cut the main break was intersected. At this point a strong 70-degree foot-wall comes into a zone of crushed rock, 4 feet wide, that contains a 3-inch and a 2-inch quartz-sulphide vein. This well-defined crush or shear-zone continues to the face (as of December 14th, 1937). Although the shear narrows to 6 inches in places, and contains only patchy, heavy sulphide-

quartz veinlets, the face shows an improvement to 3 feet in width of crushed material, with four quartz-sulphide stringers ranging from ½ to 1 inch in thickness. The usual 70-degree joints come in from the south-easterly wall, but in the section of the drift seen at the time of examination there was no perceptible widening of the crush-zone or increase in mineral content.

North Star Group.(7) The *North Star* group of claims is owned by the A. B. Trites interests of Vancouver, and is reported to consist of the following mineral claims: *Golden Key, Golden Nugget, Zero Fraction, North Star No. 2, North Star, Don Fraction, Golden Spray, Nod Fraction, Golden Rocket,* and the *Golden Lode.* The surface workings and adit on this property are between elevations of 2,425 feet and 2,615 feet on the steep, heavily-wooded and in part bluffy mountain-side sloping south-westward into the headwaters of Goldvalley Creek. The distribution of the cuts is shown on the plan as of examination on August 28th, 1937.

The workings are reached by the Goldvalley Trail, which leaves the creek-bottom at an elevation of 1,640 feet and climbs steeply to the camp and workings.

At least four north-easterly-striking sheeted or shear zones have been exposed; fresh, relatively unoxidized material consisting of gouge, calcite, quartz stringers, and disseminated pyrite may be seen in the two lower cuts; but the material of the upper cuts is badly shattered and weathered; only honeycomb quartz from stringers ⅛ to ½ inch in thickness remaining. The rock formation is typical granodiorite, leached, as is usual, in the vicinity of the joints that form the sheeted zones.



North Star. Compass and barometer survey of workings as at August 28th, 1937.

No. 1 is a cut in the north bank of the creek, on a zone of irregular jointing and lenticular calcite associated with disseminated pyrite and narrow seams of arsenopyrite. A sample taken across 14 inches of unoxidized material assayed: Gold, 0.06 oz. per ton; silver, trace; whereas one from the rusty gouge assayed: Gold, 0.4 oz. per ton; silver, 0.2 oz. per ton. A zone of curving joints with associated gouge, leached rock, and disseminated pyrite occurs towards the mouth of this cut in the northerly wall. A sample taken across 2½ feet of this material assayed: Gold, 0.02 oz. per ton; silver, trace.

No. 2 is a small cut that was started on a sheeted zone 9 feet wide consisting of leached rock badly weathered but not very rusty, and still showing joints, 2 to 6 inches apart; a few of which contain ¼ inch of quartz.

No. 3 cut has been driven as an adit since the August examination.*

No. 4 is a cut driven diagonally to intersect a badly-decomposed zone approximately 6 feet wide. The zone consists of a master-jointing, striking north 47 degrees east, in which there are stringers of rust and quartz ranging from 3 inches to ½ inch in width still recognizable; leaching of the quartz to a honeycomb texture has left a black, earthy residue in the vugs, probably indicative of an earlier comb-structure, the openings in which were possibly filled with sulphides. A 54-inch sample taken across the face assayed: Gold, 0.80 oz. per ton; silver, 0.6 oz. per ton.

No. 5 is a trench driven along a crumbly zone of badly shattered rock; the zone contains 2- to 3-inch fragments of quartz, but no well-defined rust-streaks. A sample taken across 42 inches assayed traces only in gold and silver.

* A brief return visit was made to the property on December 15th, 1937, and at that time drifting and cross-cutting from this cut as a portal were in progress.

Lone Star.[8] The *Lone Star* claim, staked by Alec McDonald in 1934, and the *Axe Fraction*, staked in 1937, are reported to be owned by Rey Oro Gold Mining Company, Limited (N.P.L.), a private company of 800 Hall Building, Vancouver. The workings are with two exceptions on the north-easterly bank of Goldvalley Creek between elevations at camp of 1,300 feet and 1,420 feet at the working farthest up the creek. The two exceptions are two showings at elevations of 1,500 feet and 1,600 feet, respectively, up the hillside north-easterly from the creek-bottom.

The workings, consisting of open-cuts and two short adits, have been driven on either individual joints, each filled with a quartz-sulphide stringer ¼ to ½ inch in thickness, or on crush-zones in the prevailing granodiorite; all these structures strike north-easterly up the hillside from the creek-bottom.

The showings, all on the north-easterly side of the creek, will be described consecutively up the creek from the one nearest the office.

No. 1 is a stripping at an elevation of 1,315 feet and 220 feet in a direction south 55 degrees east from the office; it is 60 feet south-east from the foot-log across the creek. It is a stripping 10 feet long, exposing the junction of two joints, one of which strikes north 45 degrees east and dips 80 degrees south-east, the other north 33 degrees east and nearly vertical, in the granodiorite; where they join the rock is fractured for a width of 1 foot; there is very little mineral in these joints.

No. 2, 20 feet south-easterly from No. 1, is a stripping that exposes two or three veinlets, striking easterly, that range from ¼ to ½ inch in width and contain scattered grains of pyrite, arsenopyrite, and galena.

No. 3, at an elevation of 1,325 feet and 210 feet in a direction south 28 degrees east from No. 1, is merely a showing that exposes a sheeted zone, strike north 50 degrees east, dip vertical, that is 18 inches wide and carries small amounts of arsenopyrite; although the rock immediately adjacent to the joints is somewhat leached, there is very little gouge developed.

No. 4, at an elevation of 1,335 feet and 30 feet in a direction south 65 degrees east from No. 3, commenced as an open-cut and now (December 15th, 1937) an adit 22 feet long, has been driven in a direction north 42 degrees east along a 1-inch quartz veinlet, striking north 42 degrees east and dipping 85 degrees south-easterly, that contains both grey massive and crustiform quartz with heavy pyrite and a little galena. In addition to the usual 1- to 2-inch zone of leaching on either side of the veinlet, there are recurring films of gouge. The same veinlet is exposed 25 feet south-westward from the portal, where it is of a similar character. It is to be noted that the north-westerly wall of this cut is broken by side-joints, and that each joint is filled with a thin seam of gouge and bordered by a ½-inch zone of leaching. A sample, taken along 2 feet of the ½-inch quartz-sulphide veinlet 20 feet outside the portal, assayed: Gold, 14.40 oz. per ton; silver, 5.6 oz. per ton. A sample from the face of the adit consisting of a ¼-inch quartz-sulphide veinlet and 2 inches of leached granodiorite assayed: Gold, 0.01; silver, trace. Another sample of a ½-inch veinlet with no adhering granodiorite assayed: Gold, 0.90 oz. per ton; silver, 0.1 oz. per ton. A sample of the granodiorite alone that accompanied the last sample assayed: Gold, 0.06 oz. per ton; silver, trace.

No. 5 showing, at an elevation of 1,420 feet and 260 feet in a direction south 60 degrees east from No. 4, is a combined adit and open-cut, the aggregate length of which is 34 feet. This working has been driven north-east for 34 feet along a curving shear that crosses and follows for short distances a series of joints that come into the shear at a small angle. The shear is widest in the face where it constitutes a zone 2 feet wide, and is cut by curving gouge-slips and so crushed that it is a mass of leached, disintegrated granodiorite. The foot-wall shear in this zone strikes north 70 degrees east, dips 60 degrees north-westerly, and the hanging-wall shear strikes north 95 degrees east and dips 60 degrees north. The shear-zone is cut by a few criss-crossing stringers of quartz 1 to 2 inches wide, and containing small amounts of pyrite and arsenopyrite. In addition to the quartz in the face, the only other occurrence of appreciable size was a lens 2 feet long and 2 inches wide in the shear at a point 18 feet from the mouth of the cut. Arsenopyrite and pyrite occur disseminated in small amounts in the vicinity of the 95-degree joints.

The following samples were taken in this cut and adit:—

(1.) A bulk sample from a quartz-pyrite-arsenopyrite lens, 1 foot long by 2 inches thick in the face, assayed: Gold, 0.10 oz. per ton; silver, trace.

(2.) A sample of the abundant grey-black gouge, 2 inches thick, in the hanging-wall of the shear, assayed: Gold, 0.01 oz. per ton; silver, trace.

(3.) A 14-inch channel sample taken across the back and consisting mostly of disintegrated granodiorite assayed: Gold, 0.10 oz. per ton; silver, trace.

A small showing beyond the mouth of the cut and in the creek-bottom was seen to be a quartz veinlet ½ inch wide that contained abundant sulphide.

No. 6 is a showing in the bed of a branch creek, at an elevation of 1,500 feet and 660 feet in a direction south 85 degrees east from the office. It is a sheeted zone 18 inches wide formed by joints spaced 2 to 8 inches apart, each of which is accompanied by the usual leached border and disseminated pyrite. The only quartz occurs as discontinuous ½-inch stringers.

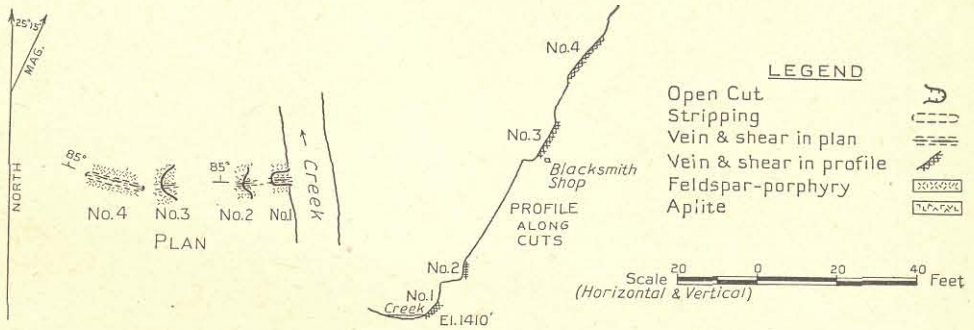
No. 7, or the McDonald stripping, in the bed of the same creek as No. 6, is at an elevation of 1,600 feet and is 220 feet in a direction north 80 degrees east from No. 6. This is a sloping stripping in the bed of the creek exposing a zone 12 to 18 inches in width and consisting of tight joints and a 2-inch blue quartz veinlet. Towards the upper end of the stripping the zone is more open and consists of alternating layers of gouge, crushed rock, and blue quartz veinlets; fine pyrite is abundantly disseminated through the quartz. A sample taken across 12 inches of the mixed material assayed: Gold, 0.01 oz. per ton; silver, trace.

Extension Group.(9)

The *Extension* group, previously owned by the firm of Hawkins & Horie, Land Surveyors, 612 Standard Bank Building, Vancouver, is now understood to be owned by the Central Zeballos Mines, Limited. This group, staked in February, 1935, by P. M. Monckton, includes the following mineral claims: *A.B., A.C., A.D., A.E., Extension Nos. 5* to *10*, inclusive.

The showings on this property occur on the precipitous mountain-side sloping easterly into the headwaters of Bibb Creek. They consist of an upper showing at an elevation of 1,550 feet and a lower group of five showings extending upwards from Bibb Creek, and lying between elevations of 1,410 feet and 1,485 feet.

The first showing is in a small rock chimney at an elevation of 1,550 feet, and some 570 feet below the crest of the mountain-top. It is a 4-inch break containing a mixture of rusty gouge, ¼-inch quartz fragments, and disseminated pyrite. A sample taken along a section 3 inches wide by 3 feet long assayed traces only in gold and silver. The rock formation consists of light-coloured granodiorite and darker-coloured feldspar-biotite porphyry; the contact between these rocks strikes north 60 degrees east.



Extension. Compass and barometer survey of workings.

The lower group of showings, consisting of five cuts and strippings, extends up the mountain-side from the creek-bottom and exposes a shear-zone which strikes north 87 degrees east and dips 85 degrees south. The rock formation consists of a dark feldspar porphyry, an aplite dyke, and highly-leached phases of both these rocks. The position of these cuts and strippings relative to each other is shown on the accompanying sketch.

At the creek-bottom, the shear, as shown in No. 1 cut, is 2 feet wide, and is on the south side of an ill-defined, leached aplite dyke 2 feet wide, that apparently strikes slightly south of the general strike of the shear, for farther up in cut No. 2 the shear is in the middle of the aplite, and still farther up the hill, in cut No. 3, it is on the north side of the aplite. The widths of maximum shearing in the zone range from 1 to 2 feet, and the material contained

is variable, both in kind and quantity. It consists of black gouge streaks 1 to 6 inches wide, scattered, irregular lenses of quartz and heavy sulphides, the lenses ranging from 2 to 6 inches in width and of indefinite length. In the upper or No. 4 stripping the strike of the shear changes from north 85 degrees east to south 75 degrees east; this is the result of either a change in strike of the shear or of the coming-in of a branch shear. The shear as seen in No. 4 stripping consists of 2 to 3 inches of rusty gouge on the south side, and of 10 inches of leached porphyry with disseminated pyrite crystals on the northerly side.

The following samples taken in the cuts will illustrate the values and related mineralization:—

Location.	Width.	Gold, Oz. per Ton.	Silver, Oz. per Ton.	Description.
No. 2 cut	6 inches	0.50	1.0	Across 6 inches black gouge, including 2-inch rib of quartz and heavy sulphides.
No. 2 cut	2 inches	5.82	76.0	Across 2 inches quartz with heavy sulphides, including pyrite, arsenopyrite, galena and sphalerite.
No. 2 cut	6 inches	0.02	1.2	Leached porphyry with bright pyrite crystals.
No. 3 cut	2 feet	0.01	Trace	Across 2 feet of leached dense aplite, also with bright pyrite crystals.

The probable eastward continuation of the shear-zone is found 50 feet up the easterly side of the canyon. Here the shear is tighter, only 2 to 3 inches wide, and contains one or two seams of black and white gouge with disseminated pyrite. The formation is the same feldspar porphyry.

Bodin Group.(10) The *Bodin* group, reported to include the mineral claims, *Bodin Numbers 1* to *4*, inclusive, was staked in July, 1937, by Albert Bloom (deceased). It is owned by the Bloom Estate and Jack Crosson, of Zeballos. The property is on the north-west side of the Zeballos Valley. The first group of showings extends north-westward up the canyonous valley of the north-east fork of what is locally known as Granite Creek, and the second group of showings lies north-westward over a summit and at the head of another canyonous draw tributary to the first-mentioned creek. The showings extend between elevations of 1,100 and 2,100 feet.

The showings may be reached by following a blazed trail, approximately 1 mile long, that leads from the Jack of Spades cabin north-westward past the Jack of Spades workings and follows up the hillside on the north-easterly side of the creek to a point of approximately 750 feet elevation, then by dropping into the canyon and following up it to the lowest showings of the first group at 1,100 feet elevation.

The first group of showings is on a strong shear, striking east and west, dipping 72 degrees north, that has been delineated by the chimney-like draw of the creek. The shear ranges from 6 inches to 2 feet in width and contains for the most part crushed rock and gouge with disseminated fine-grained pyrite and arsenopyrite; quartz is not abundant; calcite occurs frequently as lenses ranging from 1 to 12 inches in thickness and from 1 foot to several feet in length; this calcite is a white, very coarsely-cleaved variety.

The first showing in this group is a cut in the north-easterly wall of the canyon at an elevation of 1,100 feet. This cut exposes a zone of crushed rock and gouge 2 feet wide with a good hanging-wall; the minerals consist of fragmentary quartz, calcite, and the sulphides—pyrite, sphalerite, and finely disseminated arsenopyrite; the sulphides are not abundant. A sample of this material assayed: Gold, 0.10 oz. per ton; silver, trace. The rocks comprise granodiorite lying some 20 feet south of the cut and greenstone within the cut; the contact in this vicinity striking east and west.

Farther up this canyon at the forks with a second one at an elevation of 1,550 feet, diggings on the same break expose a 2-foot shear containing abundant gouge and broken fragments of calcite and greenstone; the wall-rock is a hybrid, contact phase of the greenstone.

This shear was followed up the rock chimney to an elevation of 1,900 feet, beyond which travel was impossible; however, the shear appears to continue. It may be noted that, where

left, the shear contained, in addition to the lenticular, coarsely-cleaved calcite, a silicified layer 6 inches thick containing disseminated patches of pyrrhotite.

The second group of showings is reached by following an ill-marked route north-westerly up the hillside on the south-westerly side of the last-described creek branch, crossing a divide or summit at an elevation of 2,300 feet, and dropping down a rock chimney into the head of a westerly-trending draw at an elevation of 2,100 feet.

The showings consist of some mineralization in an east-west zone 4 feet wide that consists of slight shearing and abundant silicification of the greenstone; the zone, well washed by the creek, is exposed up the stream for approximately 150 feet.

Lenses of white calcite border the south wall of this zone; elsewhere in the silicified rock of the zone there are ½- to 2-inch quartz ribs, with granular calcite, blebby pyrite, and sphalerite. Both sulphides are scarce in amount and disseminated in wide intervals in the quartz. One sample of the silicified and pyritized greenstone and three samples of the quartz-sulphide veinlets assayed traces only in gold and silver. At one place in the north wall of the zone a quartz rib with considerable pyrrhotite occurs; a sample of this assayed traces only in gold and silver. A sample of grey-black gouge in a seam 2 to 4 inches thick along the shear also assayed only traces in gold and silver.

The rocks adjacent to the zone comprise greenstone, much of it leached and carbonatized by ankeritic carbonate, that is cut by an 8-foot diabase dyke striking north 80 degrees east.

Other Properties. In addition to the properties examined by the author in August and September, and some re-examined in December, 1937, there are several smaller properties or groups of claims that are being prospected, but on which, with the exception of the *King Midas* and *Tagore*, considerably less work has been done. The *King Midas* or *Marks* property consists of a group of some thirteen claims along the North Fork of the Zeballos River, immediately above the forks. This property has been described by Gunning* and by Clothier.† It is reported that the Pioneer Gold Mines of B.C., Limited, is prospecting this property further.

The Britannia Mining and Smelting Company, Limited, has staked two groups of claims, the *B.* group near the confluence of Goldvalley Creek with the Zeballos River, and the *M.* group between the headwaters of Goldvalley and Spud Creeks. This company carried on systematic prospecting of these claims during the past summer.

The Western Holdings Company, of 402 Pender Street West, Vancouver, has (December, 1937) a group of men under the supervision of Vince Lade engaged in opening up a vein on the *Golden Peak No. 4* claim, staked in 1934 by Jas. Doyle and owned by him. This claim is adjacent to the *White Star* property on the south-west.

Work is planned on the *Rimy* group by Man-o'-War Mines, Limited. This group lies on the ridge north-easterly above Goldvalley Creek; it was staked in 1933 and is owned by Ray A. Pitrie and associates.

The *L.M.* and *P.M.* mineral claims, staked by P. M. Monckton, have been optioned to the Haida Gold Mines, Limited, and it is reported that the showings are being prospected.

Some prospecting is reported to have been done on the *Royal* group by Anglo-Huronian interests. This group, owned by Hawkins & Horie, of Vancouver, is located in the vicinity of the headwaters of Goldvalley Creek.

It is reported that Olympic Gold Mines, Limited, plans to explore the *Lucky* group south-easterly from the *M.* group.

It is reported that Pioneer Gold Mines of B.C., Limited, did some work on the *Friendly* group of claims situated in the Little Zeballos River Valley and about 1 mile from tide-water.

In addition to even this last group of prospects, there are numerous groups of claims lying around the area covered by the aforementioned properties, on which only exploratory prospecting has been done. The names and approximate locations of those groups nearest to the area described in this report may be obtained from the accompanying key and claim map.

---

* Gunning, H. C.: Geological Survey of Canada, Summary Report, 1932, Part A-II., pages 38–41.

† Clothier, Geo.: Annual Report, Minister of Mines, British Columbia, 1933, pages A 252, 253.

VICTORIA, B.C.:
Printed by CHARLES F. BANFIELD, Printer to the King's Most Excellent Majesty.
1938.

2M-138-2186