PART B

ANNUAL REPORT

OF THE

MINISTER OF MINES

OF THE PROVINCE OF

BRITISH COLUMBIA

FOR THE

YEAR ENDED 31ST DECEMBER

1938

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BRITISH COLUMBIA DEPARTMENT OF MINES.

VICTORIA, B.C.

Hon. W. J. ASSELSTINE, *Minister.*

JOHN F. WALKER, *Deputy Minister.*

JAMES DICKSON, *Chief Inspector of Mines.*

D. E. WHITTAKER, *Chief Analyst and Assayer.*

P. B. FREELAND, *Chief Mining Engineer.*

R. J. STEENSON, *Chief Gold Commissioner.*

PART B.

NORTH-WESTERN DISTRICT.

BY

JOSEPH T. MANDY.

SUMMARY.

During 1938, field-work was confined to the Stewart and Alice Arm sections of the Portland Canal Mining Division and to the area tributary to the Canadian National Railway between Prince Rupert and Vanderhoof. In the latter area the field-work was generally relative to the Department of Mines' sampling plant at Prince Rupert with a view to stimulating and increasing prospecting, development, and production through the service of this plant.

In the Atlin Mining Division placer-gold operations have expanded and output has been sustained. Lode production from the *Polaris-Taku* mine, Taku River section, which was initiated at a milling rate of 150 tons a day in November, 1937, was increased to a rate of 200 tons a day during the latter part of 1938.

In the Stikine Mining Division placer operations and output materially increased on Boulder Creek, in the Turnagain (Little Muddy) River section. Several leases were optioned in this area by the Barrington interests and preparations made for extended mechanized operations during the season of 1939.

In the Unuk River area of the Portland Canal Mining Division lode prospecting declined, but the Unuk River Placer Gold Company continued exploratory work on Sulphurets Creek with a small crew.

In the Stewart section production from the Silbak-Premier Mines, Limited, has proceeded normally. In this section, a feature of the year was the completion in March of the *Big Missouri* underground mill of 750 tons daily capacity and the inception of production from this property.

Exploratory and development work in the Stewart area showed a marked decline in comparison with former years and appreciable work of this type was confined to only a few properties. Underground exploration of the *Salmon Gold* property, Salmon River area, by Consolidated Mining and Smelting Company of Canada, Limited, was continued. The Napco Company and the Excelsior Syndicate also employed small crews on superficial exploration of their holdings in the American Creek area. Towards the year-end exploration and development of the *Gold Drop* and *Gold Knife* groups in the Marmot River area, by the Chartered Mining Explorers Syndicate, was commenced and planned to continue throughout the winter months.

The decline in general prospecting activity, cited in the 1937 Annual Report of the Minister of Mines, showed a marked continuance in the Stewart area during the 1938 season.

New discoveries of interest were made on the *Napco* property in the American Creek area. Towards the close of the season low gold values were reported from a new discovery on Porter Creek, in the upper section of the Nass River drainage-basin.

Exploration and development of the *Hidden Creek* copper deposits at Anyox was continued by the Consolidated Mining and Smelting Company of Canada, Limited. In the Sylvester Bay section, adjacent to Anyox, a discovery of remarkably rich native gold mineralization in a narrow quartz vein adjacent to the beach was made on the *Gold Leaf* group by James Flynn. A small tonnage was mined and shipped to the sampling plant at Prince Rupert.

The Alice Arm area remained generally inactive during the year and prospecting in this section has continued to decline. Mining and shipping of high-grade silver ore from the *Dolly Varden* property was continued by T. W. Falconer and on the *Homestake* group energetic further exploration was carried out by British Lion Mines, Limited. Towards the close of the season the discovery of promising values in widespread pyritic mineralization was reported from the Kinskuch Lake area by G. Fiva, of Alice Arm.

In the Coast area the Surf Inlet Consolidated on Princess Royal Island was continuously operated, with production at a daily milling rate of about 70 tons. In the Prince Rupert section the mill at the *Surf Point* property of the Reward Mining Company was destroyed by fire in June.

Construction of a new mill of about 50 tons capacity was commenced towards the year-end. Production from this property and the *Edye Pass* group should resume early in 1939. Exploration of the pyritic deposits of the Ecstall River near Port Essington, Skeena River, was continued by Northern Pyrites, Limited.

In the area tributary to the Canadian National Railway between Prince Rupert and Vanderhoof, general interest in all branches of the industry was markedly revived and stimulated through the service of the Department of Mines' sampling plant at Prince Rupert. Advantage of this service was taken by many prospectors for ascertaining values in their workings through bulk-sampling as guidance to exploratory work and general prospecting. The guidance of bulk test-sampling of ore being prepared for shipment was also continuously sought by intending shippers. Many prospectors produced and received payment for shipments of ore ranging from a few hundred pounds to several tons. In the Usk, Smithers, and Topley areas, several prospectors extracting ore for shipment have continued work through the winter months. As a result of this stimulation, prospecting along the Canadian National Railway section has shown a most encouraging revival and some interesting new discoveries have been made.

In the Usk area several promising new veins have been discovered on the *Grotto* group, and gold and silver telluride mineralization (petzite and hessite) was discovered in the ore from the original veins shipped to the sampling plant from this group. In the Driftwood Creek area of the Babine Mountains a wide and continuous quartz vein carrying encouraging gold and silver values was discovered on the *Valhalla* group by Jens Baker and Ben Nelson, of Smithers, and plans were completed for the exploration of this discovery during the winter. In the Topley section new discoveries have also been made in the Finlay Creek area.

LODE-GOLD DEPOSITS.

Observatory Inlet Area.

Gold Leaf and Honeymoon.

These claims are owned by James Flynn, Anyox, B.C. They are located in the central section of Granby Peninsula, about 2 miles south of Anyox. The property is reached by regular coastal steamship service to Anyox and thence by rowboat or launch to the cabin and showings on the east shore or Sylvester Bay side of the peninsu'a. In rough weather a landing can be made on the more protected west shore (Granby Bay) of the peninsula, from where, at the narrowest section of the peninsula, a trail extends for about 300 feet to the cabin on the Sylvester Bay shore.

The claims were located on April 12th, 1938, as the result of spectacular native gold mineralization discovered in float a short time previously. This was traced to its source in a narrow quartz vein outcropping on a narrow rock bench along the shore of Sylvester Bay at about high-tide mark.

Granby Peninsula is a narrow strip of land 1½ miles wide at its southerly end and about three-eighths of a mile wide at its northerly end at Granby Point. It extends between Granby Bay on the west and Sylvester Bay on the east and in its central section at the northerly boundary of the *Honeymoon* claim is only about 300 feet wide.

In the region of the showings, the peninsula is about 900 feet wide with rock bluffs rising abruptly for 50 feet above the shore and reaching an elevation of about 260 feet above sea-level in the central area of the peninsula. The peninsula is covered with soil of comparatively shallow depth and fallen burnt timber. There is practically a complete absence of underbrush. Outcrops in longitudinal rock ridges and small rock domes frequently occur.

The area embraced by the claims is underlain by bedded, folded, and metamorphosed argillites of McConnell's Goose Bay formation, a component of the middle section of the Hazelton series. In the locality of the showings the argillites strike northward and are folded to steep but varying degrees of inclination.

This formation forms a large inclusion surrounded by granodiorite of the Coast Range batholith. In the region of the claims the inclusion is about 10 miles wide and the southerly

granodiorite contact strikes east about 3 miles south of the main showings. The argillites are intruded by numerous light and dark coloured dykes striking in varying directions and ranging from a few inches to over 20 feet in width. In places the quartz veins are adjacent to these dykes, but evidence indicates the latter as being postmineral in age.

The mineral deposit consists of quartz veins ranging from a few inches to several feet in width and generally conforming to the attitude of the formation. In places numerous quartz stringers and veinlets branch from the main veins and in the main showing form an intricate network on the foot-wall side of the vein. The veins are generally sparsely mineralized with small patches of galena, sphalerite, chalcopyrite, and pyrrhotite. In the main showing a defined ribboning is evident in places in the quartz on both the hanging- and foot-wall sides of the vein and in these sections small blebs of native gold from 1/32 to 1/16 of an inch in diameter are abundantly and intimately intermixed with galena, sphalerite, and pyrite mineralization.

The main showing consists of a quartz vein outcropping in a flat rock bench at high-tide level. The bench is about 30 feet wide and abuts the bluff which borders the shore-line. Along the central section of the vein the bluff face conforms approximately to the foot-wall of the vein. The vein strikes north 34 degrees east, obliquely across the rock bench and dips from 53 to 60 degrees south-eastward. A kersantite dyke, 2.5 feet in width, occurs adjacent to the vein on its hanging-wall side. From the high-tide line the vein can be traced by natural outcrop in a south-westerly direction for 160 feet, at which point it cuts into the bluff and further continuity in this direction is obscured by overburden.

In a north-easterly direction the vein can be seen continuing for several feet beneath the sea. Along its exposure the walls of the vein are comparatively tight and it ranges from 2 inches to 2 feet wide and averages about 8 inches in width. A network of quartz stringers and veinlets branch from it and extend into the foot-wall.

At high-tide mark an open-cut 52 feet long and at least 9 feet in depth has followed the vein below tide-mark as far as practicable. Work in this cut is carried out as the sequence of tides permits. In the face of this cut, 9 feet high, the vein ranges from 1.3 feet to 0.9 foot wide and shows ribboning on both the hanging- and foot-wall sides. It is meagerly mineralized mainly with sphalerite and pyrite with some native gold, especially in the ribboned sections. A sample of the vein in the face of this cut for a height of 9 feet and an average width of 10.8 inches, assayed: Gold, 0.46 oz. per ton; silver, 0.1 oz. per ton; copper, *nil;* lead, *nil;* zinc, 0.1 per cent.

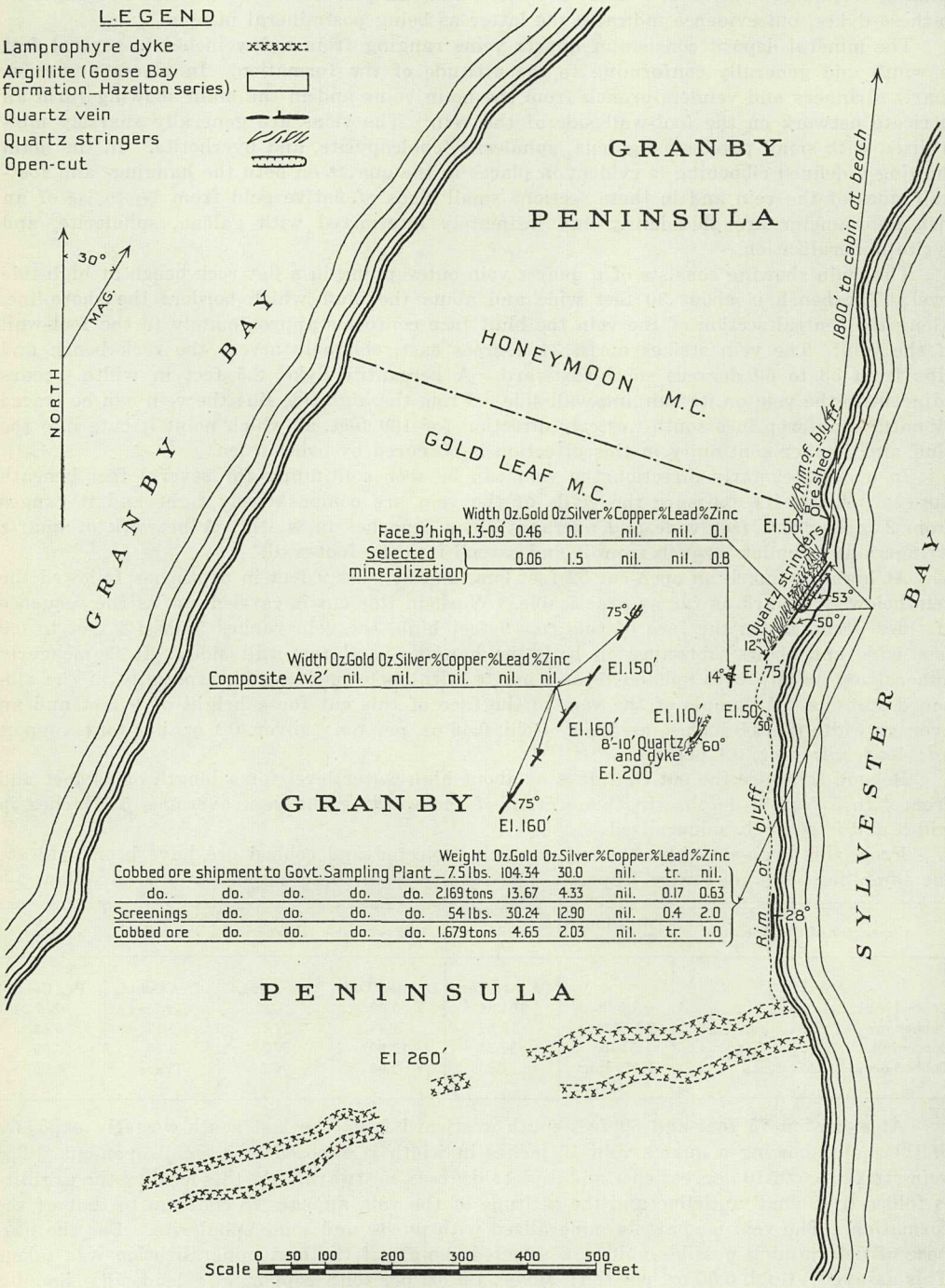
Beyond this face the cut continues at about high-water level for a length of 24 feet and from 4 to 5 feet in depth. In this section of the working the vein averages 5.4 inches in width and is sparsely mineralized.

From this open-cut shipments of carefully selected and cobbed ore have been made to the sampling plant at Prince Rupert. The results from these shipments are as follows:—

Character of Shipment.	Weight of Shipment.	Gold.	Silver.	Copper.	Lead.	Zinc.
		Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.
Cobbed ore	7.5 lb.	104.34	30.00	.....	Trace	*Nil*
Cobbed ore	2.169 tons	13.67	4.33	*Nil*	0.17	0.63
Screenings	54 lb.	30.24	12.90	*Nil*	0.40	2.00
Cobbed ore	1.679 tons	4.65	2.03	*Nil*	Trace	1.00

At elevation 75 feet and 60 feet south-westward from the last south-westerly exposure of the main showing a quartz vein 12 inches in width is exposed in a small open-cut. The vein strikes north 10 degrees east and dips 14 degrees westward. At this locality the argillite is folded to a small anticline and the attitude of the vein appears to conform to that of the formation. The vein is sparsely mineralized with pyrite and some sphalerite. For the purpose of determining possible values, a selected sample of the best mineralization was taken. This assayed: Gold, 0.06 oz. per ton; silver, 1.5 oz. per ton; copper, *nil;* lead, *nil;* zinc, 0.8 per cent.

At 110 feet elevation and about 100 feet south-westward from this showing and in approximate alignment with the main or "gold" vein, quartz and intermixed dyke, 8 to 10 feet in width, is naturally exposed on a small rock dome protruding through the overburden.



Gold Leaf Group, Observatory Inlet.

The attitude of this quartz mass is not clear, but it appears to dip 60 degrees eastward. No mineralization is apparent in it other than a few sparsely scattered specks of pyrite. No work has been done on this exposure.

On the beach, at about high-tide mark and about 400 feet south of the main showing, a quartz vein 6 to 8 inches in width outcrops for 70 feet along the edge of the bluff paralleling the shore. This vein strikes north and dips 28 degrees east, conformable to the formation. The argillite on both the hanging- and foot-walls is finely impregnated with pyrite and pyrrhotite and presents a pronouncedly rusty surface. The quartz vein is also heavily stained with iron oxide, but no sulphide mineralization was observed in it. No work has been done on this showing.

At 150 feet elevation and about 300 feet south-westward from the main showing a quartz vein 2.5 feet in width is exposed in a small open-cut. This vein shows a slightly ribboned structure, but is only sparsely mineralized with pyrite and pyrrhotite and an occasional speck of sphalerite. From this cut it can be traced in a southerly direction by five natural exposures along the crest of a small ridge for a distance of 350 feet to 160 feet elevation. In these exposures the vein ranges from 1.5 to 2.5 feet in width and exhibits the same characteristics as in the cut at the northerly end. It strikes north 34 degrees east and ranges in dip from 75 degrees north-westward at its northerly exposure to vertical in the central section and 75 degrees south-eastward at its southerly exposure, conforming in attitude to the formation. To determine possible values in this vein a composite sample across an average width of 2 feet was taken of the five exposures. This assayed: Gold, *nil;* silver, *nil;* copper, *nil;* lead, *nil;* zinc, *nil.* No work other than the one small cut at the northerly end has been done on this vein.

Alice Arm Area.

British Lion Mines, Ltd.

This is a private company incorporated in British Columbia in February, 1937, with registered office at 553 Granville Street, Vancouver. The authorized capitalization is 10,000 preferred and 20,000 common shares, both of $10 par value. A. F. Smith, Alice Arm, is the president of the company, and Thos. Slattery, Vancouver, is the secretary-treasurer.

The company owns a 25-per-cent. interest, with an option on the remainder, in the *Homestake* group, comprising the *Homestake, Homestake No. 1, Homestake No. 2, Homestake No. 3* Crown-granted mineral claims and the *Homestake* and *Homestake No. 1* fractional mineral claims, owned by A. F. Smith, A. Davidson, and Miles Donald, of Alice Arm.

The claims are amongst the earliest stakings in the Alice Arm area, and in 1918 were bonded to the Mineral Claims Development Company which did practically no work on them. In 1921 this company was reorganized into the Consolidated Homestake Mining and Development Company, with registered office at Vancouver. This company, with English and Canadian finances, carried out a small amount of surface and underground work under the supervision of Captain Gerhardi between the years 1921 and 1925.

In 1926 the property, with three other groups, was bonded to the C. Spencer interests of Vancouver, but no work was done by them on the *Homestake* group and the option was abandoned in 1927. In 1934 the property was optioned by a Vancouver syndicate, which later formed the present company. The claims are referred to in the Annual Reports of the Minister of Mines for the years 1916, 1918, 1919, 1920, 1921, 1923, 1925, 1926, 1927, 1930, 1933, and 1934; also in the Geological Survey, Canada, Summary Report, 1921, and Memoir 175.

The claims are between 2,800 and 3,700 feet elevation on the west side of the upper Kitsault Valley, bordering the Kitsault glacier, about 25 miles northward from the town of Alice Arm. They are adjoined on the west by the *Gold Reef* group and on the south by the *Vanguard* group.

The topography of the area generally is extremely rugged; but of the claims, is only moderately so. In the lower elevations comparatively steep slopes and rock bluffs border the Kitsault glacier, but are transitional into moderately-steep grass-covered slopes with some interspersed rock ridges in the higher elevations.

The area embraced by the claims is generally above timber-line, but in the lower elevations patches of good timber are available and the southerly valley-bottom near the claims is thickly timbered with spruce, hemlock, and cedar.

The property is reached by the Union Steamship Company weekly coastal service to Alice Arm, or by launch service to Alice Arm twice a week from Anyox. From Alice Arm the Dolly Varden narrow-gauge railway with gasoline-speeder transportation, conditioned for speeder and speeder-trailer loads up to about 2½ tons, extends to " Camp 8," a distance of 18 miles. From " Camp 8 " a good pack-trail and " go-devil " trail extends for about 7 miles to the *Homestake* cabin-camp at 2,980 feet elevation.

The rock exposed on the claims consists of altered andesitic volcanics of the lower Hazelton group (Dolly Varden formation). On the claims the volcanics are intruded by irregular areas of quartz diorite and feldspar porphyry relative to the Coast Range batholith, the main easterly contact of which extends north and south about 5 miles westward from the claims.

The mineral deposit consists of a siliceous replacement-zone, locally brecciated and mineralized mainly with pyrite, chalcopyrite, galena, and sphalerite, and is in andesitic volcanics contiguous to intruded feldspar porphyry.

The zone strikes north-westward and dips from 70 to 80 degrees north-eastward. It has been explored by stripping and open-cuts and three adits from the brink of the glacier at 3,365 feet elevation along a length of 725 feet in a south-easterly direction to about 3,500 feet elevation. At that point the zone appears to be intersected by a cross-vein and offset 150 feet down the hill from where it can be traced a farther 160 feet in a south-easterly direction. Farther continuity towards the south-east is obscured by overburden.

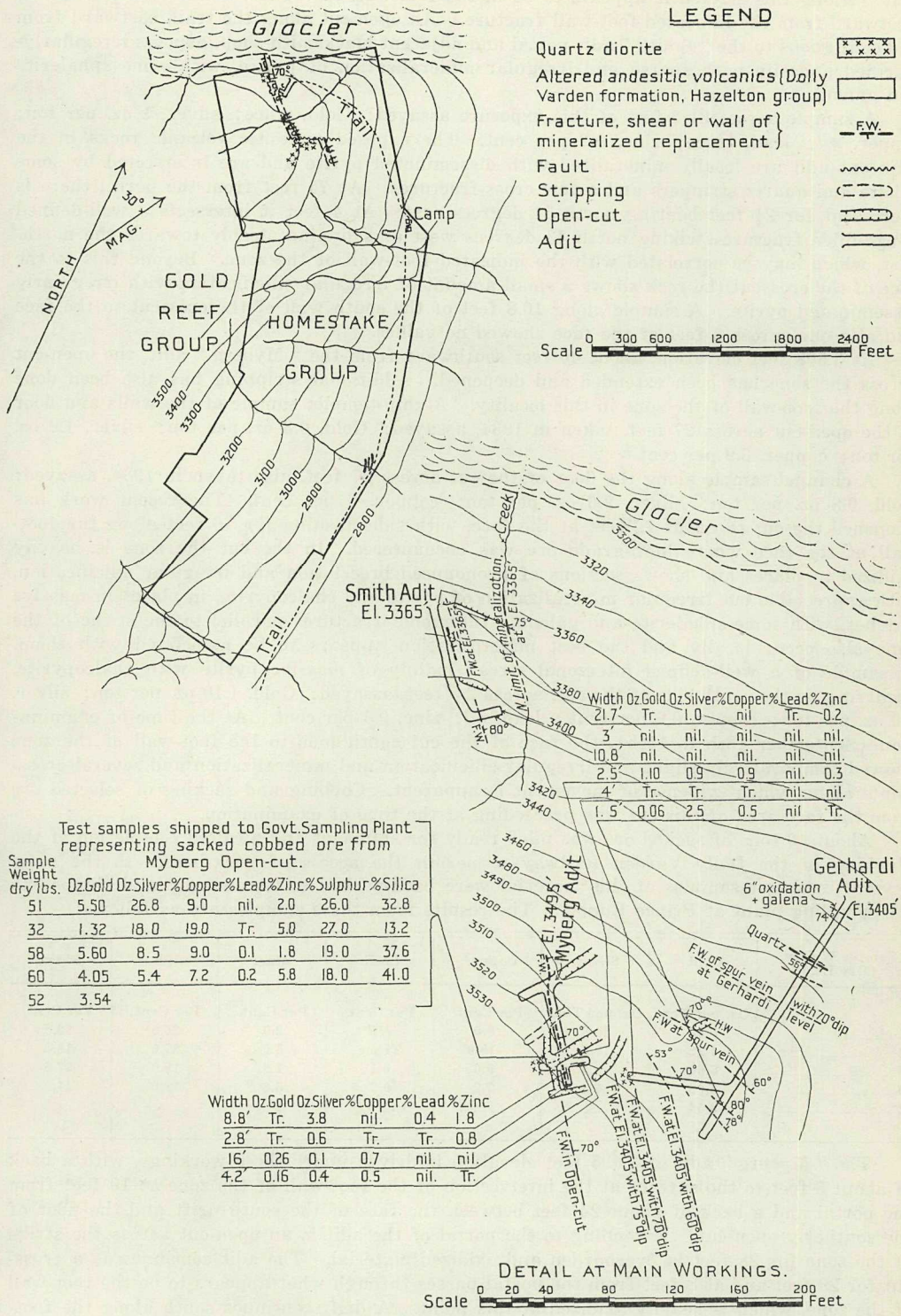
The zone ranges from about 15 to over 30 feet in width. Generally the walls are not well defined and mineralization is characteristically gradational into the formation. Interzonal slips which can be mistaken for walls occur frequently, but sulphide mineralization extends beyond these. In the north-westerly section of the zone, however, a comparatively well-defined fracture, with gouge, striking north 42 degrees west and dipping 70 to 80 degrees north-east appears to form the foot-wall for a distance of about 300 feet between the " Smith " adit and the " Myberg " adit and open-cut. In some sections unmineralized horses of rock also occur in the zone. The mineralization consists mainly of pyrite and chalcopyrite in patches, streaks and disseminations, with some sphalerite and galena and is irregularly distributed.

At 3,500 feet elevation and 80 feet eastward from the " Myberg " adit a spur or branch-vein striking north 85 degrees west and appearing to dip 70 degrees north is exposed in an open-cut. This can be traced by natural exposure and one open-cut for about 300 feet in an easterly direction; continuity at both extremities is obscured by overburden. Projection of the spur-vein strike towards the west indicates its possible junction with the main zone about 20 feet northward of the " Myberg " adit. In the surface exposures the spur-vein shows a width of from 10 to 13 feet of silicification with some calcite and is mineralized mainly with pyrite and some chalcopyrite. The foot-wall is fairly well defined but the mineralization appears to be gradational into the formation on the hanging-wall side.

The earlier work on this property consisted of surface-trenching and open-cutting by the owners and the driving of the " Gerhardi " crosscut-adit at 3,405 feet elevation for a distance of 174 feet and a short crosscut-adit at 3,000 feet elevation by the Consolidated Homestake Mining and Development Company. These workings are described in the previously mentioned reports. In the Annual Report of the Minister of Mines for 1934 the open-cuts with relative assays of samples are described.

Subsequent exploration by the Vancouver syndicate and during 1937 and 1938 by British Lion Mines, Limited, has consisted of the driving of the " Smith " adit at 3,365 feet elevation, the " Myberg " adit at 3,495 feet elevation, crosscutting to the west from the " Gerhardi " adit, and stripping and open-cutting in the locality of the " Myberg " adit. During 1938 this work was proceeding with a crew of six men, one man being continuously employed in back-packing supplies and ore samples between the camp and the terminus of the Dolly Varden railway at " Camp 8." The camp at 2,980 feet elevation consists of a log cabin with cooking and eating equipment and sleeping accommodation for three men, a smaller cabin with sleeping accommodation for two men, and a tent. There is no machinery installed at the property, all work being done by hand.

The " Smith " adit at 3,365 feet elevation, about 70 feet above and 80 feet south of the edge of the glacier, extends for 75 feet along a bearing ranging from south 55 to 68 degrees



Width	Oz Gold	Oz Silver	% Copper	% Lead	% Zinc
21.7′	Tr.	1.0	nil	Tr.	0.2
3′	nil.	nil.	nil.	nil.	nil.
10.8′	nil.	nil.	nil.	nil.	nil.
2.5′	1.10	0.9	0.9	nil.	0.3
4′	Tr.	Tr.	Tr.	nil.	nil.
1.5′	0.06	2.5	0.5	nil	Tr.

Test samples shipped to Govt. Sampling Plant representing sacked cobbed ore from Myberg Open-cut.

Sample Weight dry lbs.	Oz Gold	Oz Silver	% Copper	% Lead	% Zinc	% Sulphur	% Silica
51	5.50	26.8	9.0	nil.	2.0	26.0	32.8
32	1.32	18.0	19.0	Tr.	5.0	27.0	13.2
58	5.60	8.5	9.0	0.1	1.8	19.0	37.6
60	4.05	5.4	7.2	0.2	5.8	18.0	41.0
52	3.54						

Width	Oz Gold	Oz Silver	% Copper	% Lead	% Zinc
8.8′	Tr.	3.8	nil.	0.4	1.8
2.8′	Tr.	0.6	Tr.	Tr.	0.8
16′	0.26	0.1	0.7	nil.	nil.
4.2′	0.16	0.4	0.5	nil.	Tr.

British Lion Mines, Ltd. (Homestake Group), Alice Arm.

east. Along this stretch it appears to be in the foot-wall of the zone and from 6 to 8 feet westward from the indicated foot-wall fracture. An open-cut along the trail, eastward from and contiguous to the " Smith " adit-portal and adjacent blacksmith-shop, exposes irregularly-silicified andesite with sparse and irregular mineralization of pyrite, with some sphalerite and galena.

A sample across 21.7 feet of this exposure assayed: Gold, trace; silver, 1 oz. per ton; copper, *nil;* lead, trace; zinc, 0.2 per cent. The exposed andesitic volcanic rocks in the adjacent adit are locally mineralized with disseminated pyrite and are intersected by some calcite and quartz stringers and a few cross-fractures. At 75 feet from the portal there is a crosscut for 21 feet bearing north 54 degrees east. At 4 feet it intersects a well-defined gouge-filled fracture striking north 43 degrees west and dipping steeply towards the north-east, which may be correlated with the indicated foot-wall of the zone. Beyond this to the face of the crosscut the rock shows a small amount of irregular silicification with irregularly disseminated pyrite. A sample along 10.8 feet of the south wall of the crosscut to the face and also one across 3 feet of the face showed no values.

At 3,508 feet elevation, about 40 feet southward from the " Myberg " adit, the open-cut across the zone has been extended and deepened. Additional stripping has also been done along the foot-wall of the zone in this locality. A chip-templet sample of the walls and floor of the open-cut across 27 feet, taken in 1934, assayed: Gold, 0.3 oz. per ton; silver, 1.2 oz. per ton; copper, 3.9 per cent.

A channel sample along the floor of the cut across 27 feet, also taken in 1934, assayed: Gold, 0.8 oz. per ton; silver, 2.6 oz. per ton; copper, 3 per cent. The recent work has deepened the cut to about 12 feet at the face, with side-slashing for 16 feet along the foot-wall at the face where high-grade ore was encountered. In the cut the zone is heavily oxidized in places and shows sections of pronounced brecciation and irregular silicification, with appreciable but irregular mineralization of pyrite and chalcopyrite, in places in massive patches, with some sphalerite and galena. Interzonal fractures parallel to the strike of the zone also occur locally and the best mineralization appears to be associated with them. A sample of a well-defined interzonal streak mainly of massive pyrite with chalcopyrite, occurring on the south side of the cut, across 2.5 feet, assayed: Gold, 1.10 oz. per ton; silver, 0.9 oz. per ton; copper, 0.9 per cent.; lead, *nil;* zinc, 0.3 per cent. At the time of examination (September 13th to 15th), the face of the cut contiguous to the foot-wall of the zone showed comparatively slight and irregular silicification and mineralization and several cross-joints along which evidence of movement is apparent. Cobbing and sacking of selected ore from the face-area of this cut was proceeding at the time of examination.

About 10 tons of sacked ore was piled ready for shipment and awaited completion of the planking of the Dolly Varden Railway to permit the access of pack-horses to the area. Several bulk test samples of this material were back-packed to the railway and shipped to the sampling plant at Prince Rupert. The results from these samples are as follows:—

Sample Weight (Dry Lb.).	Gold.	Silver.	Copper.	Lead.	Zinc.	Sulphur.	Silica.
	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
51	5.50	26.8	9.0	*Nil*	2.0	26.0	32.8
32	1.32	18.0	19.0	Trace	5.0	27.0	13.2
58	5.60	8.5	9.0	0.1	1.8	19.0	37.6
60	4.05	5.4	7.2	0.2	5.8	18.0	41.0
52	3.54	------	------	------	------	------	------

The " Myberg " adit at 3,495 feet elevation is driven under these workings, with a back of about 8 feet to the surface at the intersection of the foot-wall of the zone at 10 feet from the portal and a back of about 24 feet between the face of the south drift and the floor of the southerly open-cut. Extending to the portal of the adit is an open-cut across the strike of the zone for 28 feet in overburden and oxidized material. The adit continues as a cross-cut for 29 feet and at 8 feet from the portal passes through what appears to be the foot-wall of the zone, which is heavily oxidized at this point. A drift continues south along the foot-wall for 62 feet to its face. At a distance of 46 feet along the drift a crosscut is driven north-east into the zone for 16 feet and another south-west into the foot-wall formation for 14 feet.

In the drift south the foot-wall of the zone is sheared and contains gouge. For a distance of 46 feet along the drift to the crosscuts the zone is irregularly silicified and locally brecciated. Along this stretch it is irregularly and sparsely mineralized, mainly with pyrite and some chalcopyrite. Beyond this point to the face of the drift the zone is more intensely silicified and mineralized with streaks and patches of pyrite and chalcopyrite with a little sphalerite and galena. This mineralization is also exposed in the north-east crosscut for 16 feet at this point, especially on the south side of the crosscut. At the face of this crosscut the zone contains a highly silicified and brecciated band 4.2 feet in width. A chip-templet sample of the south wall of the north-east crosscut for 16 feet across the zone, assayed: Gold, 0.26 oz. per ton; silver 1.1 oz. per ton; copper, 0.7 per cent.; lead, *nil;* zinc, *nil.* A chip-templet sample of mineralized brecciated quartz 4.2 feet in width, on the south side of this crosscut, at the face, assayed: Gold, 0.16 oz. per ton; silver, 0.4 oz. per ton; copper, 0.5 per cent.; lead, *nil;* zinc, trace. A chip-templet sample of the east wall of the "Myberg" adit drift, along the strike of the zone for a length of 8.8 feet south of the north-east crosscut, assayed: Gold, trace; silver, 3.8 oz. per ton; copper, *nil;* lead, 0.4 per cent.; zinc, 1.8 per cent. A chip sample of the best mineralization showing at the face of the drift, across 2.8 feet on its east side, assayed: Gold, trace; silver, 0.6 oz. per ton; copper, trace; lead, trace; zinc, 0.8 per cent.

The south-west crosscut for 14 feet off the "Myberg" drift at a point 46 feet from its commencement penetrates the foot-wall of the zone and extends into the foot-wall formation. This shows slight silicification, some disseminated pyrite, and some quartz stringers. Towards the face of this crosscut the volcanics show evidence of assimilation and hybridization by an intrusive rock, and at the face intrusive feldspar porphyry can be identified.

The "Gerhardi" adit is at 3,405 feet elevation, 185 feet north-eastward from the portal of the "Myberg" adit, and was driven by hand by the old Consolidated Homestake Mining and Development Company in the years 1921 to 1925. It is a crosscut driven obliquely to the strike of the zone and extends for 174 feet on a bearing of south 6 degrees west.

At 12 feet from the portal a well-defined, oxidized cross-fracture, dipping 74 degrees south, 6 inches in width and carrying some massive galena, is intersected. At 44 feet from the portal a band of barren quartz, 3 feet in width striking north 87 degrees west and dipping steeply south, cuts across the adit. At a distance of 56 feet from the portal a well-defined slip striking east and dipping 56 degrees north is intersected. The formation exposed in the adit to this point is slightly silicified, shows a few quartz and calcite stringers and is slightly mineralized with disseminated pyrite. The fractures and quartz intersected up to this point may possibly be relative to the spur-vein exposed on surface, but this relationship cannot be definitely correlated.

The adit continues in altered and slightly pyritized volcanics carrying a few quartzose cross-fractures and an occasional grain of chalcopyrite. At 132 feet from the portal a well-defined fracture striking north 73 degrees west and dipping 60 degrees north-eastward is intersected. From this point to the face the formation is more intensely silicified and mineralized with disseminated pyrite, with a little chalcopyrite and several quartz stringers and cross-fractures cut obliquely across the adit.

A sample across a width of 1.5 feet of the best mineralization of pyrite and chalcopyrite observed in this portion of the adit, taken on the west side of the adit 21 feet from the face and adjacent to a well-defined fracture striking north 70 degrees west and dipping 80 degrees north-eastward, assayed: Gold, 0.06 oz. per ton; silver, 2.5 oz. per ton; copper, 0.5 per cent.; lead, *nil;* zinc, trace. The mineralization exposed in the adit for 20 feet to the face may possibly be relative to the hanging-wall section of the zone, but computation indicates that the main adit would have to be extended about 50 feet to intersect the projection of the foot-wall of the zone at this level.

Recent work done by the British Lion Mines, Limited, in the "Gerhardi" adit, consists in driving a crosscut off the main adit from a point 140 feet in from the portal. At the time of examination this extended 64 feet along a bearing of south 72 degrees west. For a length of 40 feet along this working the formation is appreciably altered and mineralized with disseminated pyrite, shows irregular but moderate silicification and contains some quartz and calcite stringers, and is similar in character to that exposed in the last 30 feet of the main adit. At a point 30 feet from its commencement the working intersects a defined slip

striking north 55 degrees west and dipping 70 degrees north-eastward. At a point 12 feet beyond this, another well-defined slip, with gouge, striking north 56 degrees west and dipping 53 degrees north-eastward, is intersected. From this point to the face, a distance of 22 feet, mineralization with disseminated pyrite diminishes appreciably and some local, small patches and streaks of pyrite and chalcopyrite are encountered. At the face the formation shows evidence of digestion by an intrusive rock, similar to the face of the west crosscut off the "Myberg" adit, and patches of feldspar porphyry occur. A chip-templet sample of the face, across 4 feet, assayed: Gold, trace; silver, trace; copper, trace; lead, *nil;* zinc, *nil.*

The foot-wall of the zone indicated in the "Myberg" adit at 3,495 feet elevation, if projected with a dip of 60 degrees eastward to the "Gerhardi" adit level at 3,405 feet elevation, should be intersected at a point 38 feet in from the commencement of the "British Lion Mines" crosscut off the "Gerhardi" adit. With a dip of 70 degrees eastward it would be intersected at about the face and a dip of 75 degrees eastward would place it about 9 feet beyond the face. In order to be certain of intersecting the possible continuance of the indicated foot-wall of the zone to the "Gerhardi" adit-level, and in view of a possible irregularity in dip, the crosscut should be continued west for about 20 feet.

In accordance with the attitude of the indicated foot-wall of the zone in the upper workings, the mineralization intersected in the "British Lion Mines" crosscut west off the "Gerhardi" adit may possibly be correlated with the zone. In this case, one of the slips intersected in this working may be the downward extension of the foot-wall. Taking into consideration a possible north or south rake of the values indicated in the "Myberg" adit and open-cut, further constructive underground exploration of this possibility could be conveniently carried out by drifting north and south off the "British Lion Mines" crosscut along the west slip and also by continuing south in the "Smith" adit along the foot-wall indicated in that locality.

In view of the fact that it is indicated by the topography that any possible permanent development of this property could be most conveniently carried out from the easterly side of the hill-slope, the zone should be traced and explored in that direction. This would supply information relative to the location of possible permanent working sites. The topography of the locality and the attitude of the zone also lend themselves to convenient exploration of the zone by diamond-drilling. This, however, should be preceded by further detailed stripping, open-cutting, and detailed sampling of all workings.

Terrace-Usk-Pitman Area.

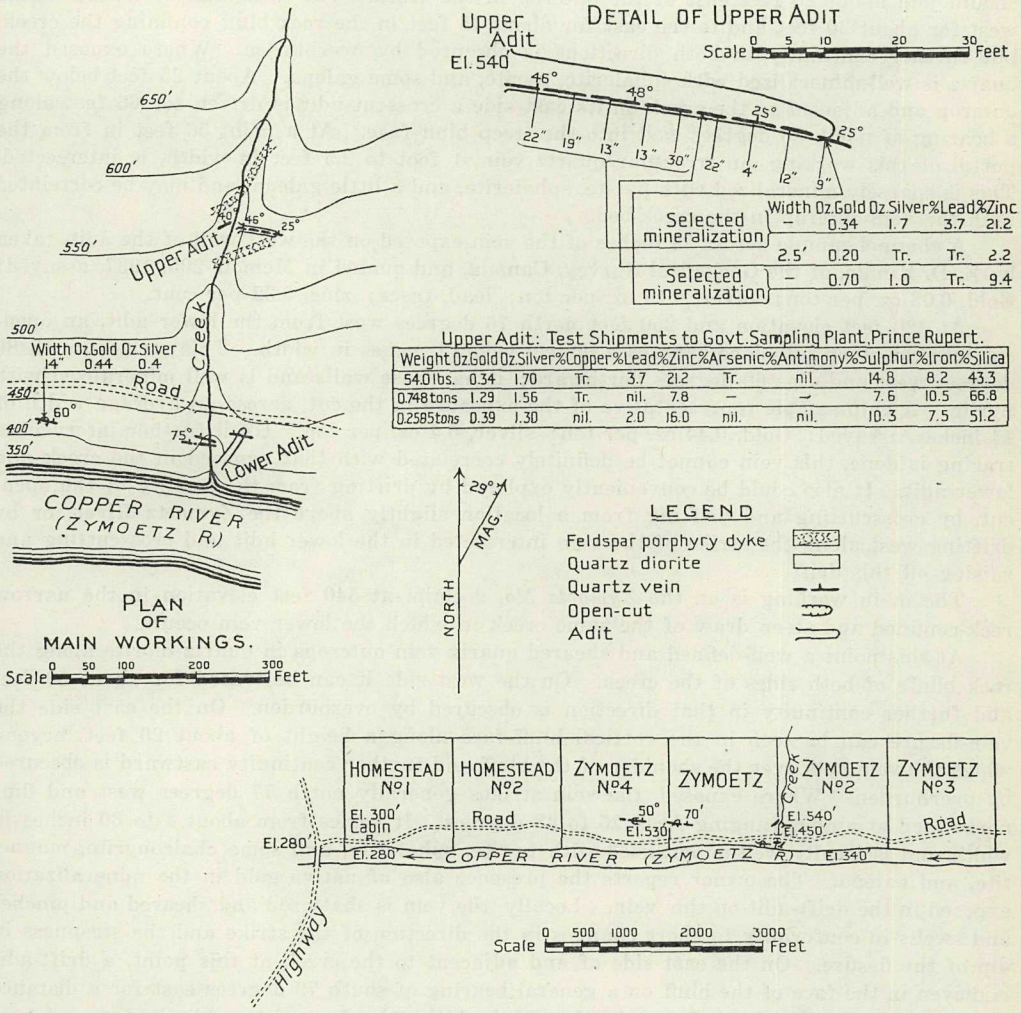
Zymoetz Group. This is a group of eight mineral claims, comprising the *Homestead No. 1* and *No. 2* and the *Zymoetz, Zymoetz No. 2, No. 3,* and *No. 4,* and is held by T. Turner, of Terrace, by location. The claims are referred to in the Annual Report of the Minister of Mines for 1934 and also in Department of Mines and Resources, Ottawa, Memoir 205, 1937.

The property is situated at the base of the southerly slope of Kleanza (O.K.) Mountain, between elevations of about 250 and 600 feet. The claims lie along and adjacent to the north side of the Zymoetz (Copper) River, about 2 miles east of its confluence with the Skeena River. The locality is about 8 miles eastward by road from Terrace station and 9 miles southward by road from Usk station on the Canadian National Railway. It is reached by a branch motor-road, suitable for light motor-cars, which leaves the Terrace–Usk Highway at the north end of the Zymoetz River bridge at about 280 feet elevation. From this point the road extends east along the north bank of the Zymoetz River for about 700 feet to T. Turner's cabin, at 300 feet elevation, from where it continues east to 450 feet elevation at the main workings about 1¼ miles from the highway. From this point, short branch-trails lead up and down the hill to the main workings which are contiguous to the branch-road.

The topography is moderately rugged with hill-slopes varying from 15 to 30 degrees and intervening rock ridges and bluffs. In the valley-bottom by the workings the Zymoetz River is deeply incised in a canyon with rock-bluff walls or steep, timbered slopes. West of this, towards the confluence of this stream with the Skeena River, the valley-bottom flattens appreciably. The area is thickly timbered and generally covered with several feet of soil and glacial debris, but the underbrush is comparatively light.

The claims lie eastward from the end of a spur of granodioritic rock, which trends north-eastward for about 15 miles across Kleanza Mountain, Kleanza (Gold) Creek, and Bornite

Mountain Range to the vicinity of Chimdemash Creek. This intrusive is an offshoot of the Coast Range batholith. At its commencement, in the region of the claims, it is about 8 miles wide and tapers to a width of about 1¼ miles at its north-easterly end on the northerly slope of the Bornite Mountain Range. Along its trend it is intrusive mainly into andesitic volcanic rocks of the Hazelton formation of Jurassic age.



Zymoetz Group, Terrace-Usk Area.

The rock formation of the workings consists of medium- to fine-grained quartz diorite. Locally, this rock shows evidence of hybridization through assimilation of roof-rocks. In some sections the degree of this hybridization is sufficient to mask almost completely the characteristics of the intrusive. The quartz diorite is cut by feldspar porphyry dykes 10 to 15 feet in width trending north-eastward. Locally, these are transitional into the quartz diorite and take the form of gradationally-segregated streaks and patches.

The mineral deposits consist of quartz veins ranging from about 4 to 30 inches in width. The veins have generally loose walls with a local development of gouge, but in places branch into stringers with intervening silicified rock. Generally they strike east and dip north at flat to moderate but generally steep angles. The greatest widths occur in the sections of steepest dip. Mineralization in the quartz veins consists of pyrite, chalcopyrite, sphalerite, galena, and some magnetite. These minerals occur in irregular streaks and patches in the quartz. The owner reports the presence also of native gold.

The lower showing is at 450 feet elevation on the *Zymoetz No. 2* claim, about 60 feet above Zymoetz River. At this point two converging quartz veins, 2 to 10 inches in width and 4 feet apart in hybrid quartz diorite, cut across the deeply-incised bed of a small creek. The lower vein strikes north 83 degrees west and dips 75 degrees northward; the upper vein strikes north 70 degrees west and dips northward at about the same angle. The two veins should join about 20 feet east of the outcrop in the creek. The veins can be traced to the west for about 30 feet and to the east for about 15 feet in the rock bluff confining the creek, but further continuity in both directions is obscured by overburden. Where exposed the quartz is well-mineralized with sphalerite, pyrite, and some galena. About 25 feet below the outcrop and adjacent to the creek on its east side a crosscut adit is driven for 66 feet along a bearing of north 36 degrees east into the steep bluff-face. At a point 56 feet in from the portal of this working, an irregular quartz vein, 1 foot to 2.5 feet in width, is intersected. This is sparsely mineralized with pyrite, sphalerite, and a little galena, and may be correlated with the vein-outcrop in the creek-bed.

A channel sample across 28 inches of the vein exposed on the west wall of the adit, taken by E. D. Kindle, of the Geological Survey, Canada, and quoted in Memoir 205, 1937, assayed: Gold, 0.08 oz. per ton; silver, 0.15 oz. per ton; lead, trace; zinc, 0.32 per cent.

At 420 feet elevation and 250 feet north 76 degrees west from the lower adit, an open-cut into the steep hill-slope exposes a quartz vein 14 inches in width. This strikes north 80 degrees west and dips 60 degrees northward; it has loose walls and is well mineralized with pyrite. A chip sample representative of the exposure in the cut, across an average width of 14 inches, assayed: Gold, 0.44 oz. per ton; silver, 0.4 oz. per ton. Until further intervening tracing is done, this vein cannot be definitely correlated with that exposed in the creek and lower adit. It also could be conveniently explored by drifting from the locality of the open-cut, by crosscutting and drifting from a location slightly above the Zymoetz River, or by drifting west along the strike of the vein intersected in the lower adit and crosscutting and raising off this drift.

The main working is on the *Zymoetz No. 2* claim at 540 feet elevation in the narrow rock-confined and steep draw of the same creek in which the lower vein occurs.

At this point a well-defined and sheared quartz vein outcrops in quartz diorite along the rock bluffs of both sides of the creek. On the west side it can be traced for about 50 feet and further continuity in that direction is obscured by overburden. On the east side the vein-fissure can be seen in the vertical bluff-face along a height of about 20 feet, beyond which the vein cuts over the shoulder of the bluff and further continuity eastward is obscured by overburden. Where exposed, the vein strikes generally north 77 degrees west and dips northward at angles ranging from 25 to 48 degrees. It varies from about 4 to 30 inches in width and is locally well-mineralized with pyrite, sphalerite, and some chalcopyrite, magnetite, and galena. The owner reports the presence also of native gold in the mineralization exposed in the drift-adit on this vein. Locally, the vein is shattered and sheared and pinches and swells in conformity to short changes in the direction of the strike and the steepness in dip of the fissure. On the east side of and adjacent to the creek at this point, a drift-adit is driven in the face of the bluff on a general bearing of south 79 degrees east for a distance of 45.7 feet. At the time of examination (July 11th) the face of the adit had veered to a bearing of south 75 degrees east along a section of flat dip, with the result that a steepening of the vein had thrown it into the roof.

By reverting to the original bearing the condition can be rectified. The vein in the adit ranges from 4 to 30 inches in width and pinches and swells in accordance with slight changes in strike and dip, the best widths occurring in the sections of steepest dip. The walls are generally loose and in places the vein is crushed and sheared. It is generally well but irregularly mineralized with pyrite, sphalerite, some chalcopyrite, magnetite, and galena. A sample of selected mineralization exposed in an average width of 19.4 inches for a length of 26 feet from the portal assayed: Gold, 0.70 oz. per ton; silver, 1 oz. per ton; lead, trace; zinc, 9.4 per cent. A sample across a width of 2.5 feet, at 28 feet from the portal, assayed: Gold, 0.20 oz. per ton; silver, trace; lead, trace; zinc, 2.2 per cent. In the face the dip flattens and the vein pinches to 9 inches in width with pronounced shearing and gouge and contains streaks and nodules of massive sphalerite with some galena. A selected sample of this

mineralization in the face assayed: Gold, 0.34 oz. per ton; silver, 1.7 oz. per ton; lead, 3.7 per cent; zinc, 21.2 per cent.

In order to ascertain values, bulk test samples of the vein in the upper adit were shipped by the owner to the sampling plant at Prince Rupert. The assay results from these are as follows:—

Weight.	Gold.	Silver.	Copper.	Lead.	Zinc.	Arsenic.	Silica.
	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
54 lb.	0.34	1.70	Trace	3.7	21.2	Trace	43.3
0.748 ton	1.29	1.56	Trace	*Nil*	7.8	.....	66.8
0.2585 ton	0.39	1.30	*Nil*	2.0	16.0	*Nil*	51.2

At 530 feet elevation on the *Zymoetz* claim and about 1,400 feet west of the upper adit an open-cut exposes quartz stringers in schistose volcanics. The stringers strike south 84 degrees east and dip 70 degrees northward and are generally barren. Continuity of the stringers in both directions beyond the open-cut is obscured by overburden. About 550 feet westward from this point and at 520 feet elevation on the *Zymoetz No. 4* claim, an open-cut exposes a quartz vein 12 inches in width in quartz diorite. This vein strikes south 85 degrees east and dips 50 degrees northward and is mineralized with some pyrite. Continuity of this vein in both directions beyond the open-cut is obscured by overburden.

These two showings may possibly be outcrops of the same vein, but further stripping and intervening tracing is required to definitely establish this possibility and also the possibility of correlation with the vein exposed in the upper adit.

Further detailed prospecting on this group by stripping and trenching, especially in the vicinity of feldspar porphyry dykes and along the projected strike of these dykes, may lead to the discovery of other veins.

Dome Mountain Area.

Babine Gold Mines, Ltd. (Free Gold Group).

This is a private company with an authorized capital of 50,000 shares of $1 par value, all of which are issued. The address of the head office is c/o W. R. Wilson and Sons, 744 Hastings Street, Vancouver, B.C. This company holds an option on sixteen claims, including the *Free Gold* group, owned by Alex Chisholm, of Smithers, and situated on Dome Mountain, Omineca Mining Division, about 26 miles eastward by motor-road and winter road from the town of Telkwa, on the Canadian National Railway.

The property is reached from Telkwa (1,677 feet elevation) by motor-road, a distance of about 9 miles to 2,600 feet elevation. From this point a winter sleigh-road extends for about 6 miles to the well-equipped Halfway cabin at Guess Lake (Paradise Lake) at 3,600 feet elevation. From there the winter road continues for about 11 miles to the Babine Gold Mines camp at 4,160 feet elevation, a total distance of about 26 miles from Telkwa. Of this route, the last 6½ miles of winter road follows a new location with a grade of 2 to 10 per cent., cut out for a width of 30 feet in heavy timber; long stretches, however, cross swampy ground and deep muskeg. The old location of this latter section of the route, although about 2¾ miles shorter and on more solid ground, traversed excessively steep grades. Pack- and saddle-horses may be procured at Latchford's ranch on the motor-road about 7 miles from Telkwa. The camp at the property is about 900 feet southward from the main surface workings. It consists of 5 well-equipped cabins with sleeping accommodation for about three men in each, a completely equipped cook-house and dining-room, a barn for horses, hay-shed, two stilt-caches, and a root-house.

Dome Mountain is a prominent outlying dome of 5,700 feet elevation, situated on the east flank of the southerly end of the Babine Range at about latitude 54° 44′ 21″ N., longitude 126° 38′ 17″ W. Its easterly slopes are drained by Federal Creek and its many tributaries into Fulton River, Fulton Lake, and Babine Lake (elevation 2,220 feet), which lies 27 miles east. The property is at about 4,200 feet elevation on the eastern slope of the mountain. The area is not rugged and on the property slopes of from 10 to 20 degrees prevail. These are well timbered, generally covered with varying depths of glacial overburden and have few bed-rock outcrops.

About the year 1914 numerous gold-bearing quartz veins were discovered in an area about 2½ miles long by 1½ miles wide on the north-eastern slope of Dome Mountain. The main period of activity on these early discoveries began in 1918, and during the subsequent four or five years considerable work was done, mainly on one vein, on claims owned by the Dome Mountain Gold Mining Company, a subsidiary of the Federal Mining and Smelting Company. Since that time the Federal property has remained idle, but the claims are still held by the company. References to these early activities are contained in the Annual Reports of the Minister of Mines for the years 1918, 1922, and 1924.

In recent years, however, prospecting of the area has continued and new discoveries have been made, on some of which appreciable exploratory work has been done with encouraging results. Among these is the *Free Gold* group, described in this report. This property was optioned by W. R. Wilson and sons in 1932, and the Babine Gold Mines, Limited, was incorporated to develop it. Appreciable exploratory work consisting of stripping, trenching, shaft-sinking, and crosscutting with some drifting was done on the property up to about 1935, since when no work has been done. Reference to this property is also contained in the Annual Reports of the Minister of Mines for the years 1933 and 1934, and in Bulletin No. 3, 1932; also in Department of Mines and Resources, Ottawa, Paper 36–20, 1936.

The showings and workings on this property are on the *Free Gold* and *Iron Mask* claims. This locality is underlain by altered andesitic volcanic rocks, probably of early Mesozoic age. These are intruded in the vicinity of the showings by an irregular mass of quartz porphyry which lies to the north-west and from which tongues and dykes extend into the volcanics.

The mineral deposit consists of a series of several quartz veins and quartzose shear-zones, ranging in width from a few inches to about 2.3 feet. These are exposed by many pits and trenches in a section about 650 feet long and 450 feet wide, lying southward and eastward from the quartz porphyry mass. The veins strike generally north-westward and dip steeply north-eastward, with the exception of some in the north-easterly section of the locality which have gentle dips. The veins are generally well defined with loose walls and locally appreciable movement along, and shattering or shearing of the vein-fractures has occurred. They are irregular both in strike and dip, and pinch or swell in conformity to the effect of movement on these irregularities and are locally split into stringers, veinlets, and quartzose shear-zones. Locally converging strikes indicate possible junctions of some veins at acute angles with each other along the strike with an attendant difficulty in definite correlation of some exposures, both on surface and underground, with the projection of any specific and closely-parallel vein. Instances of converging dips also indicate the possibility of vein junctions down the dip. This latter possibility is especially indicated in the relation in this respect between the main steeply-dipping veins and the gently-dipping veins in the north-easterly section.

This possibility of vein junction and intersection may have an important favourable bearing on the occurrence of ore-shoots at such junctions. In places the veins are contiguous to quartz porphyry dykes, which carry some pyrite, and the veins sometimes traverse this rock which in these sections is also crushed and sheared.

The veins are mineralized mainly with pyrite, with which is associated some sphalerite, galena, tetrahedrite, and chalcopyrite. Native gold was not observed by the writer, but is reported by the owner to occur and has also been identified under the microscope by the Department of Mines and Resources, Ottawa.

A bulk test sample weighing 219 lb., representative of ore from the workings, shipped by R. W. Wilson to the sampling plant at Prince Rupert, assayed: Gold, 2.12 oz. per ton; silver, 2.6 oz. per ton; copper, trace; lead, 1.6 per cent.; zinc, 4.6 per cent.

The following is from " Canada Department of Mines and Resources, Ore Dressing and Metallurgical Laboratories, Report, Ottawa, September 7th, 1938 ":—

" *Gold Ore from the Dome Mountain Mine, Smithers, British Columbia.*

"*Shipment.*—Six bags of ore, total weight 680 lb., were received on November 10th, 1937, from R. W. Wilson, 506 Pacific Building, Vancouver, British Columbia.

"*Sampling and Analysis.*—After cutting, crushing, and grinding by standard methods, a sample of the ore was obtained which assayed as follows:—

Gold	1.78 oz. per ton
Silver	2.18 oz. per ton
Lead	1.54 per cent.
Zinc	5.87 per cent.
Copper	0.15 per cent.
Arsenic	0.02 per cent.
Sulphur	10.38 per cent.

"*Characteristics of the Ore.*—Six polished sections were prepared and examined microscopically for the purpose of determining the character of the ore.

"Gangue: The gangue, which in the polished sections of selected pieces is minor in quantity to the sulphides, is white vein quartz.

"Metallic Minerals: The metallic minerals present in the sample are, in their order of decreasing abundance, pyrite, sphalerite, galena, tetrahedrite, chalcopyrite, and native gold.

"Pyrite is abundant as fine-textured masses which have been intricately shattered. Sphalerite occurs as small masses and as veinlets in pyrite. Small quantities of galena and lesser tetrahedrite are present as irregular masses and veinlets in pyrite; the two minerals occur together and also with sphalerite. Chalcopyrite is comparatively rare, occurring mostly as veinlets in pyrite.

"The succession of deposition of the sulphides is (1) pyrite, (2) sphalerite, (3) tetrahedrite, (4) chalcopyrite, and (5) galena. A period of shattering must have occurred between (1) and (2).

"A considerable number of irregular grains of native gold are visible in the sections. The metal occurs (1) as grains in galena which veins pyrite and (2) as grains in chalcopyrite which veins pyrite. The grain size of the visible gold is shown in the following table:—

"*Grain Size of the Native Gold.*

Mesh.		Gold in Galena which veins Pyrite.	Gold in Chalcopyrite which veins Pyrite.	Totals.
Minus	Plus	Per Cent.	Per Cent.	Per Cent.
.....	200	21.4	15.2	36.6
200	400	24.9	.....	24.9
400	800	16.5	5.5	22.0
800	.....	8.2	8.3	16.5
Totals		71.0	29.0	100.0

"*Investigative Work.*—Treatment by concentration and cyanidation constituted the research procedure on this ore. Over 82 per cent. of the gold was recovered in a flotation concentrate and some 15 to 16 per cent. was extracted by cyanidation from the flotation tailing."

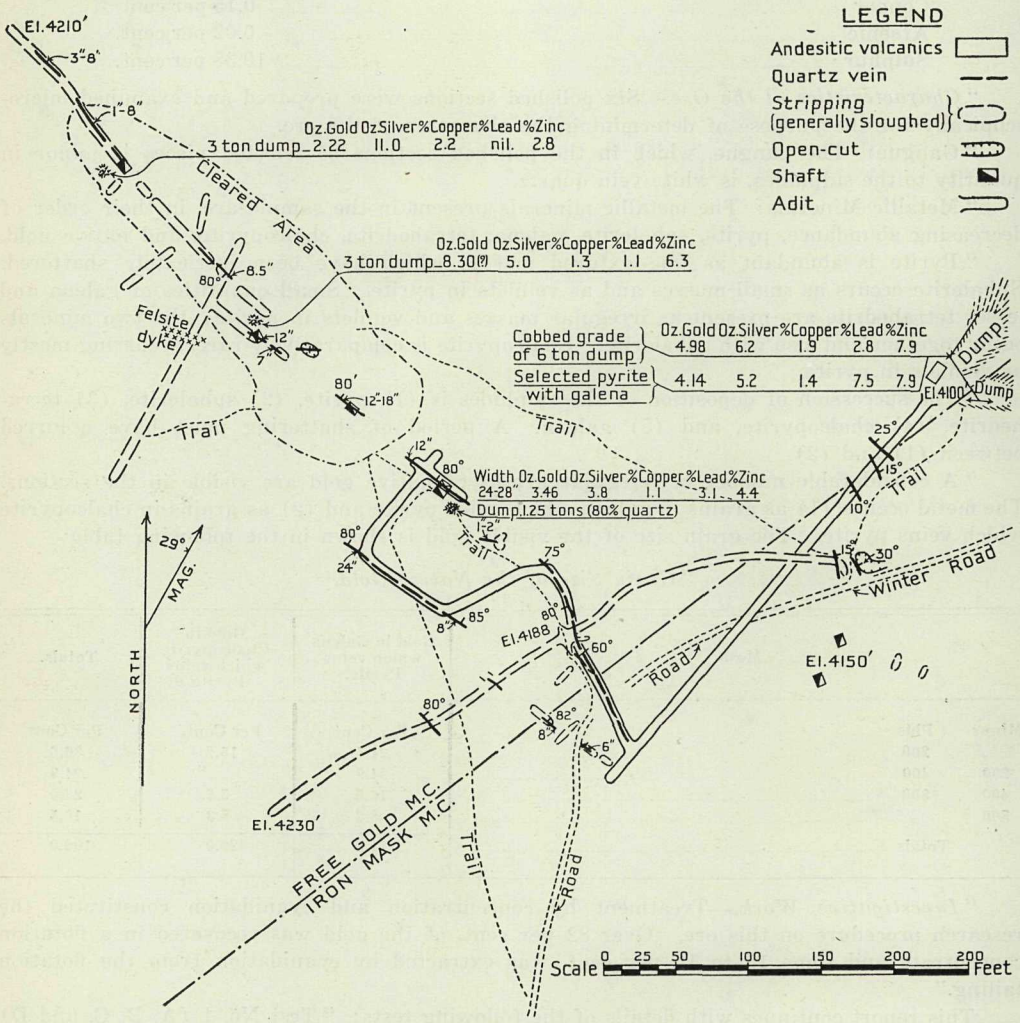
This report continues with details of the following tests: "Test No. 1 (A, B, C, and D)—Cyanidation and Flotation; Test No. 2—Bulk Flotation; Test No. 3—Flotation and Cyanidation; Test No. 4—Flotation and Cyanidation; Test No. 5—Hydraulic Classification and Amalgamation." It concludes with the following:—

"*Summary and Conclusions.*—The investigative work on this shipment shows that a bulk concentrate can be made assaying 5.9 oz. gold per ton, with recoveries of 97 per cent. of the gold and silver and 98 per cent. of the lead. Owing to the large amount of sulphides in the ore the ratio of concentration is low, 3.4: 1. These results were obtained from a soda-ash circuit. In a lime circuit over 82 per cent. of the gold and silver and 84 per cent. of the lead was recovered, the resulting concentrate assaying 17 oz. gold per ton, with a ratio of concentration of 10 9: 1; 86.1 per cent. of the gold in the flotation tailing was recovered by cyanidation, thus yielding an over-all recovery of 97.6 per cent.

"Straight cyanidation of the ore gave an extraction of 96.4 per cent. of the gold. High cyanide consumption and fouling of solutions occurred.

"Fifteen per cent. of the gold was recovered by amalgamation of a concentrate made by hydraulic concentration.

"The flow-sheet indicated by this investigation is to float, ship the concentrate, and cyanide the flotation tailing. A unit cell with a gold-trap or a mineral jig should be installed at the ball-mill discharge and the jig tailing should be sent to a classifier in closed circuit with the grinding mill."



Babine Gold Mines, Ltd., Dome Mountain.

Copies of this report with details of the tests can be procured on application to the Department of Mines and Resources, Ottawa.

The main workings are between 4,100 and 4,230 feet elevation on the *Free Gold* and *Iron Mask* claims, but no work has been done on the property since about 1935. The surface work comprises a main line of stripping in overburden from about 2 to 5 feet deep for a length of about 650 feet along the strike of the veins, with two main cross-trenches, respectively about 200 and 450 feet long and about 350 feet apart. Several pits and shallow shafts have also been sunk on the veins exposed.

Much of the stripping is sloughed, with a consequent covering of rock or veins which may formerly have been exposed, and the pits are either caved or filled with water sufficiently to prevent examination of the veins in their bottom sections. This surface work is distributed

between 4,150 and 4,230 feet elevation in a comparatively flat or gently-sloping terrain. About 335 feet north-eastward from the southerly end of the main trench-line a crosscut adit, 345 feet in length, has been driven from elevation 4,100 feet, giving a vertical back of about 90 feet at the southerly end of the main trench-line and about 100 feet at the westerly end of the workings off the crosscut. This work is shown in the accompanying map.

In this work four main veins (Nos. 1, 2, 3, and 4) or branches of one vein system, together with several minor veins, quartzose fractures, and shears, are exposed. Typical of these are local curves along the strike, and in some sections converging strikes and dips indicate possible junctions of the veins with each other. Characteristic also are branching stringers and minor parallel veins. The structure indicates a zone or belt of shattering with subsequent mineralization of the fractures, followed by shearing and repeated shattering along the planes of original fracturing. The quartz-filling in the main fractures ranges from about 1 inch to 18 inches in width with quartzose replacement and mineralization of the wall-rock in varying degree for widths of 1 foot to 2 feet on both sides of the veins.

In the northerly section of trenching at about 4,210 feet elevation, No. 2 vein is exposed at intervals for a length of 225 feet with short lenticular bands of quartz 1 inch to 8.5 inches in width, locally bordered by 1 foot of quartzose and mineralized wall-rock. This section of No. 2 vein has a general strike of north 40 degrees west and at the southerly end of the exposure it dips 80 degrees south-westward. In about the centre of this stripping a pit about 8 feet deep is filled with water, but the vein, 8 inches in width with several stringers, can be seen at the collar. An average sample from a dump of vein material adjacent to this pit estimated to contain 3 tons and composed of 50 per cent. quartz and 50 per cent. pyrite, by volume, assayed: Gold, 2.22 oz. per ton; silver, 11 oz. per ton; copper, 2.2 per cent; lead, *nil;* zinc, 2.8 per cent.

Vein No. 3 is offset about 25 feet to the south-west from the southerly end of No. 2 vein and is exposed for a length of 100 feet by stripping and two shafts, respectively 12 feet and 20 feet deep, at the northerly and southerly ends of the exposure. This vein strikes north 55 degrees west, converges towards the southerly projection of No. 2 vein, and dips 80 degrees north-eastward. It is from 7 to 18 inches in width and well mineralized with pyrite, some chalcopyrite, galena, and sphalerite. Adjacent to the shaft 12 feet deep, at the northerly end, is a dump of vein material estimated to contain about 3 tons. An average sample of this dump assayed: Gold, 8.30 oz. per ton; silver, 5 oz. per ton; copper, 1.3 per cent.; lead, 1.1 per cent.; zinc, 6.3 per cent. (The gold value in this assay is probably unreliable owing to the probable occurrence of native gold in the sample.)

Vein No. 4 is exposed for a length of 200 feet at 4,190 feet elevation at the extreme southerly end of the main line of trenching. It is offset about 100 feet from the southerly projection of No. 3 vein and strikes north 54 degrees west, practically parallel to No. 3, and dips 82 degrees north-eastward. It is from 6 to 8 inches in width and bordered by about 1 foot of small veinlets and siliceous replacement. It shows a slightly ribboned structure and is moderately mineralized with pyrite in a quartz gangue.

Vein No. 1 is exposed in an open-cut and cross-trench at 4,150 feet elevation, 225 feet north-eastward from vein No. 4. It comprises irregular outcrops of quartz veins and probably lenticular quartz masses 8 to 12 inches in width and sparsely mineralized with pyrite, striking north-westward and dipping from 15 to 30 degrees north-eastward.

At 4,150 feet elevation and respectively 50 and 75 feet southward from this are two old and caved shafts reported to be each about 15 feet deep. These were not examined, but typical vein material mineralized with pyrite, chalcopyrite, sphalerite, and galena is seen on the dump of the southerly shaft. A short distance east of these are two caved trenches.

Several minor quartz veins and sheared fractures are exposed in the trenches and others may occur in the sections that have sloughed.

At 4,100 feet elevation and 335 feet north-eastward from the southerly exposure of No. 4 vein, a crosscut-adit is driven 345 feet on a bearing of south 40 degrees west. At about 50 feet from the portal it intersects a network of irregular stringers, bunches, and lenticular masses of sparsely mineralized quartz, striking and dipping in different directions. These are probably the depth-continuation of the surface exposure designated as Vein No. 1 and beyond their south-westerly margin, of the vein in the caved shaft at 4,150 feet elevation.

The crosscut continues for a total distance of 345 feet, at which point it is about 90 feet vertically below the surface. At a point 320 feet from the portal it intersects what is

probably in part the depth-continuation of No. 4 vein and possibly in part the conjunction of No. 4, No. 3, and No. 2 veins. This is followed for 135 feet in a general north-westerly direction by a drift which shows from 3 to 10 inches of quartz moderately mineralized, mainly with pyrite. At 65 feet from the commencement of the drift a strongly-sheared quartzose fracture dipping 60 degrees north-eastward branches into the west wall of the drift.

Beyond this for 50 feet the vein in the drift dips 80 degrees south-westward and at the face of the drift dips 75 degrees north-eastward.

From the drift-face the working swings abruptly to the south-west and continues as a crosscut in that direction for 75 feet. At which point it intersects a well-defined quartz vein striking north 56 degrees west and dipping from 80 to 85 degrees north-eastward. This is followed by a drift for 75 feet in which the vein ranges from 8 inches in width at its south-easterly end to 24 inches in width at its north-westerly end in the face of the drift. It is well-mineralized mainly with pyrite and may possibly be correlated with the north-westerly projection of No. 4 vein.

The working then swings abruptly to the north-east and continues as a crosscut in that direction for 90 feet. At a distance of about 72 feet from the commencement of this crosscut it intersects a well-defined vein that may possibly be correlated with the conjunction of No. 2 and No. 3 veins. This vein is adjacent to and locally intermingled with a quartz porphyry dyke and strikes north 54 degrees west and dips 80 degrees north-eastward. It is followed for 10 feet in a north-westerly direction and for 35 feet in a south-easterly direction and ranges from 12 to 28 inches in width. It is well mineralized with pyrite, chalcopyrite, some sphalerite, and galena. At 15 feet from the south-easterly face a raise extends to the surface but was not examined. A chip-templet sample of the south-east face of the drift across the vein, 24 to 28 inches in width, assayed: Gold, 3.46 oz. per ton; silver, 3.8 oz. per ton; copper, 1.1 per cent.; lead, 3.1 per cent.; zinc, 4.4 per cent.

A sample representing the possible cobbed grade of a dump at the adit-portal, estimated to contain 6 tons of vein material from the adit-workings, assayed: Gold, 4.98 oz. per ton; silver, 6.2 oz. per ton; copper, 1.9 per cent.; lead, 2.8 per cent.; zinc, 7.9 per cent. A selected sample from this dump of pyrite with associated galena assayed: Gold, 4.14 oz. per ton; silver, 5.2 oz. per ton; copper, 1.4 per cent.; lead, 7.5 per cent.; zinc, 7.9 per cent.

There is no machinery on the property and all the work has been done by hand. No work has been done on this property for some time, but it is understood that exploration and development is planned to continue during 1939.

SILVER-LEAD-ZINC DEPOSITS.

Stewart Area.

Blue Ribbon Claim.

This claim is owned by Nels Edlund, of Stewart. It is situated between 4,900 and 5,000 feet elevation at the headwaters of Albany Creek, a south branch of Glacier Creek, and about 12 miles north-eastward by motor-road and pack-trail from seaboard at the village of Stewart. The ore-deposit on this claim was discovered in the autumn of 1937. The property is adjoined on the west by the *May No. 3* claim of the *Black Hill* group on which similar ore-deposits were partly explored a few years ago.

The property is reached by the Bear River motor-road from Stewart to the *Dunwell* mill at 250 feet elevation, a distance of 5½ miles. From this point a puncheoned pack-trail extends along the south side of Glacier Creek for a distance of 2 miles to a point near the fork of the stream at 1,000 feet elevation. Glacier Creek is then crossed to its north bank and about a quarter of a mile farther it is recrossed to its south bank and to the east side of Albany Creek. The trail then ascends the east bank of Albany Creek at a very steep grade along which it continues for 1¾ miles to 2,000 feet elevation. From this point the trail branches eastward up the mountain and continues at a generally very steep grade for 2½ miles to the tent-camp at 4,915 feet elevation, a total distance of 6½ miles from the Bear River motor-road and 12 miles from seaboard. The journey can be completed by motor-car and pack-horse in 3¾ hours from Stewart.

Rates quoted by the Stewart Cartage Company for packing and hauling ore from the showings to seaboard are as follows: Summer—2½ cents per lb., dependent on the reconditioning of the trail. Winter—$30 per ton, comprising rawhiding from the showings to the lower bridge, thence " go-devil " to the Bear River motor-road and trucking to seaboard.

The general topography of the area is rugged, the valleys bordered by steep and thickly-timbered slopes. Many bluffs rise to mountain peaks of 5,500 and 6,000 feet elevation which are surrounded by an extensive ice-field. Glaciers extend from the ice-field to the heads of the valleys and are the source of the main streams. Timber-line is at about 3,000 feet elevation. The immediate locality of the property comprises a comparatively gently-sloping terrain with moraine-covered flats and rocky or grass-carpeted knolls and ridges from which the ice has recently receded. On the south the region of the claim is bordered by a projecting glacier. The topography of the claim is illustrated on the map accompanying this report.

The claim is close to a boss of augite porphyry about 2 miles long by 1½ miles wide which is intrusive into argillite of the Lower Hazelton (Bitter Creek) series. The showings are near the east margin of the augite porphyry which, in view of the close proximity of several small roof-pendants of argillite, is exposed in this locality at about the level of its roof. The ore-deposit outcrops in the augite porphyry but has not been traced or located in an area of exposed argillite lying 200 feet north-east along the projected strike of the vein.

The ore-deposit consists of a well-defined quartz vein with some calcite, siderite, and ankerite, from 4 to 12 inches in width, with loose walls, and well mineralized with sphalerite, boulangerite, pyrite, galena, arsenopyrite, and some pyrrhotite and chalcopyrite. Microscopic examination in Department of Mines' laboratory, Victoria, of two polished sections composed mainly of a crystalline, bluish lead-grey mineral which occurs abundantly in massive aggregates or finely disseminated in the mineralization, presents the following data:—

"Metallic minerals identified in relative order of abundance: Boulangerite, arsenopyrite, sphalerite, pyrrhotite, and pyrite.

"The mineral identified as boulangerite is soft, grey, strongly anisotropic, yields good microchemical tests for lead and antimony and characteristic etch tests. It occurs finely disseminated through a quartz-carbonate gangue, in places intimately associated with finely divided subhedral to euhedral arsenopyrite crystals. In addition to occurring in boulangerite, arsenopyrite forms crystal aggregates in places. Sphalerite occurs typically as small irregular masses, in places intimately associated with boulangerite. Pyrrhotite forms irregular masses, for the most part dissociated from other minerals."

The vein strikes generally north 56 degrees east and dips from 50 to 60 degrees north-westward, but slight variations of the strike and dip occur for short distances. The foot-wall is locally sheared and the greatest vein widths generally occur at the points of steepest dip.

The vein outcrops in augite porphyry at 4,910 feet elevation, about 10 feet above the base of the frontal slope of 37 degrees of a ridge which at about 400 feet to the north-east rises to about 5,100 feet elevation. It has been explored and traced north-eastward for a horizontal distance of 68 feet by an adit 26 feet in length near the base of the slope and two long, benched open-cuts into the face of the slope extending to 4,962 feet elevation. Beyond this, spaced along a distance of 50 feet, three small trenches in shallow overburden and an open-cut have not located the vein, but may not be in alignment with its strike in the rising terrain. The details of this work and the vein exposures are illustrated in the accompanying map.

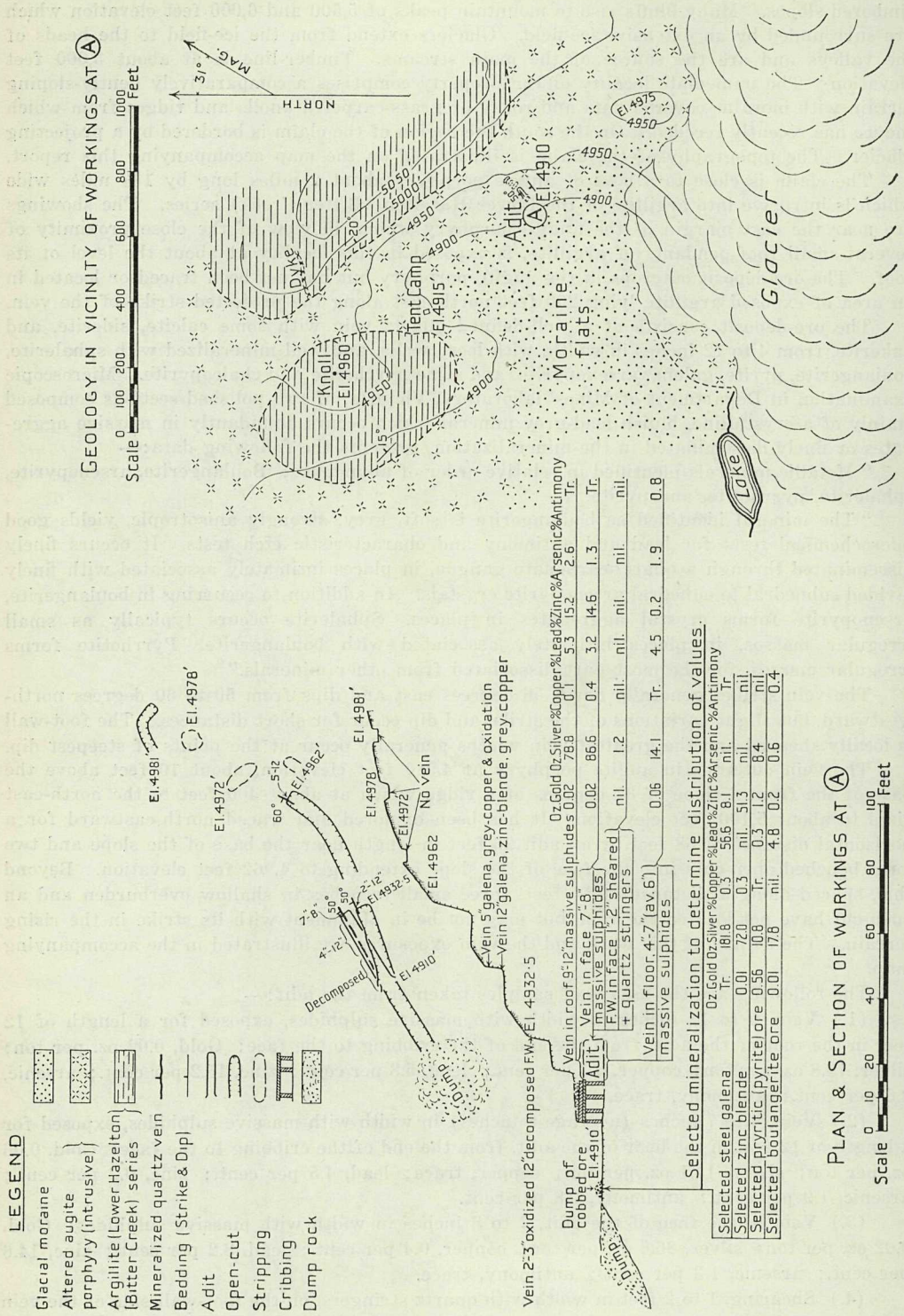
The following are the assays of samples taken from the adit:—

(1.) Vein, 9 to 12 inches in width with massive sulphides, exposed for a length of 12 feet in the roof of the adit, from the end of the cribbing to the face: Gold, 0.02 oz. per ton; silver, 78.8 oz. per ton; copper, 0.1 per cent.; lead, 5.3 per cent.; zinc, 15.2 per cent.; arsenic, 2.6 per cent.; antimony, trace.

(2.) Vein, 4 to 7 inches (average 6 inches) in width with massive sulphides, exposed for a length of 12 feet in the floor of the adit, from the end of the cribbing to the face: Gold, 0.06 oz. per ton; silver, 14.1 oz. per ton; copper, trace; lead, 4.5 per cent.; zinc, 0.2 per cent.; arsenic, 1.9 per cent.; antimony, 0.8 per cent.

(3.) Vein in the face of the adit, 7 to 8 inches in width with massive sulphides: Gold, 0.02 oz. per ton; silver, 86.6 oz. per ton; copper, 0.4 per cent.; lead, 3.2 per cent.; zinc, 14.6 per cent.; arsenic, 1.3 per cent.; antimony, trace.

(4.) Shearing, 1 to 2 feet in width with quartz stringers, on the foot-wall side of the vein in the face of the adit: Gold, *nil;* silver, 1.2 oz. per ton; copper, *nil;* lead, *nil;* zinc, *nil;* arsenic, *nil;* antimony, *nil.*



Blue Ribbon Mineral Claim, Glacier Creek, Portland Canal.

The following are assays of samples taken for the purpose of determining a possible localization of values in the mineralization to guide the selection and cobbing of a possible shipping-grade ore:—

Type of Ore.	Gold.	Silver.	Copper.	Lead.	Zinc.	Arsenic.	Antimony.
	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Steel galena	Trace	181.8	0.3	56.6	8.1	*Nil*	Trace
Sphalerite	0.01	72.0	0.3	*Nil*	51.3	*Nil*	*Nil*
Boulangerite	0.01	17.8	*Nil*	4.8	0.2	0.6	0.4
Pyrite	0.56	10.8	Trace	0.3	1.2	8.4	*Nil*

This indicates a high-grade silver content in the steel galena. It is also interesting to note the increased gold content in the selected pyrite, the arsenic content of which also indicates the presence of arsenopyrite.

To determine the possibility for profitable smelter shipments, a bulk test-sample of cobbed ore weighing 34 lb. from this property was shipped on September 6th, 1938, to the sampling plant at Prince Rupert. This assayed as follows:—

Gold, 0.02 oz. per ton; silver, 87 oz. per ton; Copper, 0.4 per cent.; lead, 6.8 per cent.; zinc, 19.5 per cent; arsenic, 1 per cent.; antimony, 0.1 per cent.; iron, 19.2 per cent.; sulphur, 15.3 per cent.; silica, 5.3 per cent.

Calculated in accordance with the Tacoma smelter schedule, to which, on account of the low lead content and relative differences in freight and treatment charges, the type of ore represented by the sample is best adapted, with prevailing metal prices (gold, $35.15 (Canadian) per ounce; silver, 42.75 cents per ounce; copper, 10.15 cents per pound) but exclusive of the lead and zinc content which are not paid for under this schedule, this shows a gross smelter value of $35.35 per dry ton and a net value of $18.45 per dry ton after deduction of smelter treatment, freight charges, etc. From this net value would have to be deducted a minimum additional cost of $30 per wet ton for transportation from the property to seaboard, plus the additional cost of mining, sorting, cobbing, and sacking of, roughly, $20 per wet ton, or a total further cost deduction of over $50 per dry ton. This indicates that when considered from the aspect of shipping, this grade and type of ore at this locality would incur a deficit or loss to the shipper of over $31.55 per dry ton. It also demonstrates that mining and shipment of this type (Tacoma type) of ore from this locality would require a gross smelter value of at least $66.90 per dry ton to cover all charges and costs before the shipper could make any profit beyond wages.

On the other hand, a profit is indicated in the selective mining, sorting, and cobbing of the steel galena and also of the sphalerite types of mineralization, should these types be found to occur in sufficient quantities and sufficiently massive distribution to permit efficient selection for shipment to the Trail smelter for disposal under the terms respectively of that smelter's Schedule " J " for lead ores and Schedule " C " for zinc ores.

The occurrence of high-grade silver-lead-zinc ores on this property exemplifies the requirements for profitable selective mining and shipping to smelters of different types of ores from outlying properties confronted with high transportation costs.

SPECIAL REPORTS.

In the 1937 Annual Report of the Minister of Mines a full description was given of the property of Napco Gold Mines, Limited (N.P.L.), in Part B, and a full description of the *Grotto* group in Part C. Reports bringing the work on these properties up to date are available on application to the Department of Mines, Victoria, at a cost of 50 cents each.

PROGRESS NOTES.

BY

CHARLES GRAHAM.

LODE-GOLD DEPOSITS.

ATLIN MINING DIVISION.

Atlin District.

There was no lode mining in the district during the year.

Tulsequah District.

Polaris-Taku Mining Co., Ltd.—B. C. Neiding, manager. The mine worked 362 days during the year and produced 59,260 tons of ore. Active development is being continued and 5,544 feet of drifting, 1,482 feet of raising, and 4,828 feet of diamond-drilling was done.

The mill only worked two shifts per day during the winter months on account of shortage of power. An additional Diesel-driven generator was installed. The plant is now able to operate at full capacity on either hydro-electric or Diesel power as required.

The only means of transportation to the mine during winter months is by airplane from Juneau, Alaska. All supplies for the winter have to be taken in during the summer months when the Taku River is open for navigation. Concentrates made during the winter months are stored at the mine and shipped out during the period of open water. Only perishable goods, passengers, mail, and emergency supplies are handled by plane in the winter months.

Additional bunk-house accommodation was provided and 145 men are employed.

LIARD MINING DIVISION.

McDame Creek District.

Very little was done in this district during the year. The Consolidated Mining and Smelting Company of Canada, Limited, who did considerable work on the *Vollaug* and *Crawford* groups of claims last year, dropped their option on the claims and removed their equipment. Some prospecting by the original owners is still being carried on.

PORTLAND CANAL MINING DIVISION.

Salmon River District.

Silbak Premier Mines, Ltd.—B. F. Smith, general manager; J. G. Pearcey, mine superintendent.

Active development, drifting, raising, and diamond-drilling totalling 17,632 feet has been carried on. The mine operated 312 days and produced 184,606 tons of ore.

Big Missouri Mine.—Owned by Buena Vista Mining Company, Limited; operated by Consolidated Mining and Smelting Company of Canada, Limited. D. S. Campbell, general superintendent; E. James, mine superintendent.

The underground mill was completed and the property went into active production in March. Since that time operations have been continuous and 154,387 tons of ore has been produced. The underground mill is operating successfully. Some adjustments have been made with a view to increasing mill capacity. Additional storage capacity for the hydro-electric plant was provided by a dam at Divide Lake.

Hercules Group.—Consolidated Mining and Smelting Company of Canada, Limited, operators. D. S. Campbell, general superintendent.

Considerable surface diamond-drilling had been done during 1936 and 1937 on this group of claims which adjoins the *Big Missouri.* The 306 drift on the 2,800-foot level of the *Big Missouri* mine was extended toward these claims during the year.

Salmon Gold Mining Co.—Consolidated Mining and Smelting Company of Canada, Limited, operators. D. S. Campbell, general superintendent.

Operations were carried on during the summer months and drifting was done on the ore-zone, with favourable results reported.

Troy Group.—Lake and McDonald, owners. Additional prospecting was done on this group during the year.

Several other groups of prospectors did assessment-work on their claims.

Marmot River District.

Gold Drop and Gold Boulder Groups.—C.M.X. Syndicate; E. Gordon McKenzie, manager. Eight men were employed by this syndicate on these claims. The property is on the Marmot River about 2 miles from the beach. There is a fair road to the property. Camp accommodation has been provided and development-work is being carried on during the winter.

BEAR RIVER DISTRICT.

Welldun Mining, Milling and Power Co., Ltd.—L. S. Davison, manager. Operations were suspended at the *Dunwell* mine and other associated properties late in 1937 and were not resumed during the year.

Oral M.—This property was operated and some tunnelling done by the Premier Gold Mining Company in 1937. They have dropped their option on the property and it is now being operated by John Haathi, of Stewart. Some additional drifting was done and some ore was mined and shipped to the sampling plant at Prince Rupert.

The Stewart Canal Gold Mines.—John Haathi, manager. The property adjoins the *Oral M.* Some additional drifting was done and a small quantity of ore shipped.

Red Reef.—This property also adjoins the *Oral M.* Some additional drifting was done by contract during the summer.

Bitter Creek Area.

Several groups of prospectors did assessment-work on their claims.

American Creek Area.

*Napco Gold Mines, Ltd. (N.P.L.).**—This company, with registered office at 800 Hall Building, Vancouver, was incorporated in February, 1938. The holdings comprise the following mineral claims: *Northern Nos. 1* to *8*, *Pass Nos. 1* to *4*, *Moonlight*, *Moonlight No. 1*, *Northern No. 10*, *Camp A*, *Protector*, *Precious*, and *Precious Nos. 1* to *3*. They lie between 3,300 and 5,400 feet elevation at the head of and on the west side of American Creek, about 27½ miles from the Stewart dock.

During 1938 a new camp with accommodation for four men was installed. About 50 feet of underground work was done; compressed air was supplied by a portable compressor driven by a Model A Ford engine.

The claims are underlain by calcareous and sandy argillite, quartzite, tuff, breccia, and greenstone of the Bitter Creek and Bear River series of the Lower Hazelton group. A sill-like mass of quartz diorite intrudes the rocks at the base of the Bear River series. Light and dark coloured dykes intrude the sediments and volcanics.

In the 1937 Annual Report of the Minister of Mines previous work is described in detail. During 1938 further work was done on the "gold stringer"; more open-cutting was done up the hill and 42 feet of crosscut and short drift was driven from a point 15.5 feet below the open-cut.

During 1938 open-cuts were made on new showings in the northern part of the claims. The showings are quartz stringers mineralized with chalcopyrite, pyrite, some galena, and sphalerite. There has been some wall-rock silicification.

At 4,030 feet elevation and about 4,500 feet northward from the "gold stringer" a number of stringers, striking northward and dipping 50 degrees eastward, outcrop in an area 130 feet long and 50 feet wide. Sulphide mineralized is exposed in an open-cut 21 feet long and 2 to 3 feet wide. A sample of unoxidized mineralized material assayed: Gold, 1.80 oz. per ton; silver, 23 oz. per ton; copper, 2 per cent.; lead, 0.9 per cent.; zinc, 6.3 per cent.

At 4,030 feet elevation and about 400 feet north of the last point two open-cuts, 50 feet apart, expose stringers striking north-westward. A selected sample of unoxidized material from the stringers which extend across a width of 3 feet assayed: Gold, 1.10 oz. per ton; silver, 16 oz. per ton; copper, 9.8 per cent.; lead, 0.7 per cent.; zinc, 3.6 per cent.

At 4,200 feet elevation and about 525 feet southward from the last point two 1- to 2-inch quartz stringers striking north-westward can be traced for 20 feet in a bluff-face, close to

* By J. T. Mandy.

a felsite dyke. A selected sample from the stringers assayed: Gold, 0.10 oz. per ton; silver, 2.2 oz. per ton; copper, 6.7 per cent.; lead, 1.2 per cent.; zinc, 3.4 per cent.

About 950 feet northward from the last point several quartz stringers striking north-westward and dipping south-westward outcrop close to a shear striking east and dipping south. The stringers are mineralized with irregular patches of chalcopyrite and some sphalerite and galena, from which a selected sample assayed: Gold, 0.26 oz. per ton; silver, 2.2 oz. per ton; copper, 6.7 per cent.; lead, 1.2 per cent.; zinc, 5.4 per cent.

At 3,975 feet elevation and about 660 feet north-eastward from the last showing, a fault striking northward occurs along the contact of volcanics on the west and calcareous argillite on the east. An 8-foot brecciated quartz vein outcrops in argillite close to and on the east side of the fault. It contains no visible sulphide minerals.

Excelsior Group.—Some open-cutting and a few feet of tunnelling was done. Some prospecting was done on the *Mountain Boy* and other groups on American Creek.

Georgia River Area.

Gold Leasers, Ltd.—Operations were suspended in 1937 and have not been resumed. Two groups of prospectors did assessment-work on their claims.

Alice Arm Area.

Wolf Group.—J. Fiva, owner, did some cleaning up in the old adit and mined a few tons which were sent to the sampling plant at Prince Rupert.

QUEEN CHARLOTTE ISLANDS MINING DIVISION.

There were no active operations in the division during the year.

SKEENA MINING DIVISION.

Princess Royal Island Area.

Surf Inlet Consolidated Gold Mines, Ltd.—Angus McLeod, manager.

Active operations continued throughout the year. The mine worked 364 days and produced 17,418 tons of ore.

The old *Surf* mine was reopened on the 900 level, the level being cleaned up and retimbered to beyond the old main shaft. Two stopes have been opened in ground which was left by the old company.

In the *Pugsley* mine considerable development has been done on the 700 and 1,000 levels and a fair reserve of ore was being built up. During the last three months of the year development was stopped, with the result that their ore reserves have been considerably reduced.

The mill equipment is being completely overhauled and considerable new equipment added, which should improve the recovery and will increase the capacity to about 90 tons per day.

Porcher Island District.

Porcher Island Mines, Ltd.—T. M. Waterland, superintendent.

The Reward Mining Company, Limited, acquired the *Surf Point* mine from the N. A. Timmins Corporation and continued with the operation. In addition they started to open a property adjoining known as the *Edye Pass* mine. The *Edye Pass* mine was closed and operations confined to the *Surf Point* mine. In June a fire destroyed the mill and power plant at *Surf Point* mine and operations had to be suspended. A new company was formed, The Porcher Island Mines, Limited, which took over both properties. A new mill was built at the *Edye Pass* mine which went into operation during December. A total of 2,350 tons of ore was mined from *Edye Pass* and 1,180 feet of drifting and raising done.

Terrace District.

Thornhill Mountain.

Globe Group.—Kenny and partners. Some prospecting was done and a small shipment made to the sampling plant at Prince Rupert.

Omineca Mining Division.

Usk Area.

*Grotto Group.**—This group comprises the following claims, held by location by T. Bell, Lee Bethurem, George Alger, and L. Brash, of Usk: *Gwen, Gwen No. 1, Poes, Grotto, Grotto No. 2, Senaca, Coselite, Gap Eagle, Talus, Monsoon, Canyon,* and *Minerva.* It is referred to in the Annual Reports of the Minister of Mines for 1916, 1929, 1931, 1937, Bulletin No. 1, 1932, and Department of Mines and Resources Paper 36–20, 1936, and Memoir 212, 1937.

The property is in the valley of Hardscrabble Creek, about 2 miles south-westward from Pitman Station on the Canadian National Railway.

The main showings along the creek consist of quartz veins ranging from a few inches to 3½ feet wide, striking north-eastward and dipping north-westward. They are mineralized with pyrite, chalcopyrite, specularite, sparse sphalerite, and small amounts of petzite (silver-gold telluride), hessite (silver telluride), and cosalite (lead-bismuth sulphide).

A report by the Department of Mines, Ore Dressing and Metallurgical Laboratories, Ottawa, on a small test-shipment indicates that "75 per cent. of the gold, 74 per cent. of the silver and 96 per cent. of the copper can be recovered in a rougher flotation concentrate. On cleaning a shipping product was made assaying 3.5 oz. gold per ton, 125 oz. silver per ton, and 25 per cent. copper.

"Agitation of the reground flotation tailing in cyanide solution gave an over-all recovery of 96 per cent. of the gold, 96 per cent. of the silver, and 96 per cent. of the copper."

At 575 feet elevation and about 150 feet south-eastward from the cabin, No. 1 adit has been driven on a vein striking north 52 degrees east and dipping 40 degrees north-westward. For 22 feet the vein is well mineralized across widths of 1 foot to 3.8 feet. During 1938 the vein was stoped to the surface along this 22-foot stretch and the cobbed product shipped to the sampling plant at Prince Rupert.

No. 2 adit is at an elevation of 590 feet, on the southerly side of the creek and about 300 feet along a bearing of south 63 degrees from No. 1 adit. It extends 21 feet along a vein striking north 48 degrees east and dipping 70 degrees north-westward. In 1938 the No. 2 vein was mined from creek-level, 582 feet, below No. 2 adit, to a point (July 15th) 9 feet from and 8 feet below the face of No. 2 adit. A sample of the vein in the face across 12 to 24 inches assayed: Gold, 0.58 oz. per ton; silver, 12.2 oz. per ton; copper, 3.4 per cent.; lead, *nil;* zinc, trace.

Test bulk-samples and tonnage lots were shipped to the sampling plate at Prince Rupert from Nos. 1 and 2 adits. Details of them are given in the sampling plant report under *Grotto* group.

New workings since the 1937 Annual Report of the Minister of Mines are on No. 3 vein, which outcrops in the face of the bluff bordering the edge of the creek at 585 feet elevation and 74.8 feet north 86 degrees east from No. 2 adit-portal. At this point an open-cut and short adit is driven on a bearing of south 54 degrees west, and an acute angle across a fault which strikes south 66 degrees west and dips 40 degrees north-westward. The vein strikes south 54 degrees west in alignment with the adit and dips 70 degrees north-westward. On the foot-wall side of the fault the vein is offset about 18 inches, is 10 inches in width and moderately mineralized with pyrite, chalcopyrite, and some sphalerite. A sample of vein, 10 inches in width in the face, assayed: Gold, 0.06 oz. per ton; silver, 2.3 oz. per ton; copper, 0.1 per cent.; lead, *nil;* zinc, trace.

No. 4 vein outcrops in the face of the bluff bordering the creek at 595 feet elevation and 26 feet north 55 degrees west from No. 2 adit-portal. At this point an open-cut and adit 15 feet in length, about 5 feet above the creek and bearing south 44 degrees west, exposes the vein 12 inches in width, striking south 44 degrees west and dipping 70 degrees north-westward. The vein is moderately mineralized with pyrite and is on the foot-wall side of a fault which strikes south 54 degrees west at an acute angle across the adit and dips 30 degrees north-westward.

On the *Poes* claim, between 1,300 and 1,465 feet elevation and 1,800 to 2,100 feet south-westward from No. 2 adit, some strippings and open-cuts expose three north-eastward-striking veins. However, most of the work has been concentrated on No. 1 and No. 2 veins and these latter ones have been but partly explored.

* By J. T. Mandy.

SILVER-LEAD DEPOSITS.

Alice Arm District.

Dolly Varden.—D. Falkoner, lessee, employed three men during the summer months mining some high-grade silver ore from the old glory-hole at the mine.

COPPER DEPOSITS.

Anyox Area.

Consolidated Mining and Smelting Co. of Canada, Ltd.—Dan Matheson, superintendent. Diamond-drilling adjacent to the old *Hidden Creek* mine indicated a considerable ore-body.

Exploratory work into the new ore-body is being carried on from the old *Hidden Creek* mine. The Victoria hoist was put back into service and the hoisting shaft reopened. Drifting into the new ore-body was carried on from 385, 150, 120, and 360 levels. A total of 2,072 feet of drifting and 8,637 feet of diamond-drilling has been done. A total of seventy-five men is employed.

PYRITE DEPOSITS.

Skeena Mining Division.

Ecstall River Area.

Northern Pyrites, Ltd.—Charles R. Cox, superintendent. The property is on the east side of Ecstall River about 45 miles from Port Essington and is reached by small river-boat from that point. The river has a flat grade and is shallow, the last 10 miles near the mine-landing can only be navigated at high tide.

Considerable diamond-drilling had been done on the property by the Granby Company in previous years. During 1937, interests represented by F. W. Guernsey, Vancouver, acquired the property. During that year a geophysical survey was made and some diamond-drilling done to check previous drill records which indicated a considerable body of ore.

During 1938, a 750-cubic-foot air compressor and a small lighting unit were taken in and installed and several permanent buildings constructed. A development adit 9 by 8 feet in section was started and is to be driven approximately 2,800 feet.

As the only means of transportation at present is by river which freezes up in winter, operations were suspended late in the year and will be resumed as soon as the river is open for navigation in the spring. Twenty-three men were employed.

PLACER-GOLD DEPOSITS.

Atlin District.

All the active operations in the Atlin district are placer. The camp is fairly active, with a great deal of interest being shown by outside interests. There are forty-five operations in the district, of which thirty-three are underground drifting on bed-rock.

Spruce Creek.

This is the most important creek in the district. All of the operations except the steam-shovel operation of the Columbia Development Company are underground; there being twenty-one separate underground operations on the creek.

Columbia Development Co., Ltd.—James Eastman, manager. This is a steam-shovel operation working on the *Olalla* lease, using two shovels, one on overburden and the other on the bed-rock gravel. Two shifts were working and a total of thirty-five men were employed.

Colpe Mining Co., Ltd.—E. Grey, manager. Nos. 1 and 2 shafts have ceased active operation but a lay has been given to some miners on No. 1 shaft. The tailings from Nos. 1 and 2 shafts were rewashed. It would appear from the recovery being obtained in rewashing that about 30 per cent. of the gold is lost in the first sluicing. This is apparently due to the clay in the gravels retaining a portion of the gold and carrying it through the sluice-boxes. After being on the dump for some time this clay disintegrates and on being resluiced a large percentage of the first loss is recovered.

No. 4 shaft which had been idle for some time was unwatered and operations resumed. On December 29th, a fire, apparently originating from an overheated stove, destroyed the shaft-house. No damage was done to the shaft itself. There was no one in the mine at the time.

Clydesdale Lease.—McDonald, McKay, and Munro, lay-men. Adjoins the *Chance* and *Goodwill* leases of the Colpe Mining Company, Limited. Pillar-extraction was being carried on along the *Chance* boundary-line. An order was issued under section 7 prohibiting drifting or pillar-extraction along the *Goodwill* lease boundary-line until the requirements of General Rule 60 (*a*) had been complied with. The order remains in force.

Wolf Lease.—Vickstrom and partners, lay-men. Only the three lay-men were drifting into bench on the south side of creek.

Croker Lease.—Fred Ohman and partners, lay-men. Four men, all partners in the lay, are engaged driving two drifts into the bench. On April 28th, 1936, an order was issued under section 7 prohibiting work along the boundary of the old Brown workings until the requirements of General Rule 60 (*a*) had been complied with.

On October 31st, 1938, application was made by Fred Ohman requesting the withdrawal of the order. As the proposed method of connection through to the old Brown workings was approved, the order was withdrawn on November 2nd. Mr. Matthews, owner of the lease, wired requesting that the order prohibiting the connection be re-established. As the requirements of the "Metalliferous Mines Regulation Act" had been complied with, it was considered that the Inspection Branch had no further jurisdiction in the matter and so advised Mr. Matthews. An injunction was obtained through the Supreme Court by Mr. Matthews prohibiting the lay-men from working this area.

Dream Lease.—J. W. Noland, owner. This is the deepest shaft in the district, being 208 feet to bed-rock. Two drifts are being carried up-stream. The attention of the management was drawn to the need for better ventilation.

The *Friendship, Sally, Joker, Keno, Peterborough, Gladstone, Pillar Fraction, Hard-scrabble, Elk, Lynx, Jewel,* and *St. Quentin* leases were also inspected. General conditions on the creek were fairly good.

Boulder Creek.

Consolidated Mining and Smelting Co. of Canada, Ltd.—MacLeod White, superintendent. This is a hydraulic operation employing twenty men, and working three shifts. Lack of water constitutes a considerable handicap.

O'Donnel River.

Grace M. Lease.—N. Murphy and son, owners. Only the owners are working on the property. This is the only property actively producing to any extent. There are several other groups employed on the creek, prospecting in the benches. None of these have, so far, found a definite channel.

Pine Creek.

Bessbrook Lease.—Gus Boquist, lay-man, has three other men employed drifting in two drives up-stream. The ground had been worked previously. All old workings were standing in good shape.

Anna C. Lease.—E. Woodean, owner. Only the owner is working, driving into the bench and is now in over 500 feet. He is endeavouring to locate the channel indicated as striking into the bench from lower Pine Creek. So far he has not located any definite channel.

Atchinson Brothers did some drilling on Pine and Willow Creeks and started this year on a hydraulic operation. They have plenty of water and have taken out a good-sized pit with satisfactory results reported. Ten men were employed.

Wright Creek.

Artic and Lynderbergh Leases.—Hodges and partners, lay-men. This is a hydraulic operation. There is very little water in the creek, only sufficient for four runs of thirty minutes each per day. After several disappointing years they have at last struck good pay.

There are several other groups prospecting farther up-stream on the creek.

Ruby Creek.

Surprise Lake Mining Co.—Matson and partners, lay-men. This is a hydraulic operation having ample water. Six men, all partners in the lay, are employed.

Farmer Lease.—E. Turnquist, lay-man, is working alone taking out pillars. He expects to finish this season.

Blackstone Lease.—E. Krumbeigal, lay-man. There is a shaft on this property down 160 feet. Nothing had been done this season. The bottom of the shaft still is about 30 feet above bed-rock.

Birch Creek.

There are six operations on the creek, all ground-sluicing and doing fairly well. There is one underground operation. The owner works this during winter and engages in ground-sluicing during the summer months.

McKee Creek.

Atlin Gold Mines, Ltd.—Adams and partners, lay-men. This is a hydraulic operation; seven men, all partners in the lay, are employed.

Otter Creek.

Compagnie Française des Mines d'or du Canada.—Walter Sweet, manager. This is an underground operation run by lay-men. There are six men interested in the lay and in addition they employ eleven men. The main drive up-stream had developed a heavy squeeze, owing principally to their method of mining. In the area involved there had been some good pay and they had taken everything there, which gave them about 40 feet width at one point. This ground has now started to settle. It will be impossible to keep a road open through the squeezed area. A new drift will have to be driven up-stream along the rim to reach the up-stream workings.

Squaw Creek District.

Several groups were engaged in ground-sluicing and prospecting on this creek. The district was not visited.

LIARD MINING DIVISION.

There was considerable activity on Boulder Creek and other creeks tributary to the Turnagain (Little Muddy) River. Considerable equipment is being taken in during the winter by the Barrington interests of Wrangell for drag-line operations on Boulder Creek. The district was not visited.

STIKINE MINING DIVISION.

Unuk River District.

Blanton and associates, of Ketchikan, did considerable prospecting on their placer-ground on Sulphurets Creek, employing several men during the summer season. The district was not visited.

DEPARTMENT OF MINES SAMPLING PLANT, PRINCE RUPERT.

BY

J. T. MANDY.

A sampling plant was constructed by the Department of Mines, Victoria, at Prince Rupert during the summer of 1937. The plant is on a portion of the "Lumber Dock" leased from the Canadian National Railways and is accessible by railway or steamship. It has a coarse crushing capacity (to 1 inch) of about 16 tons per eight-hour shift and a continuous sampling capacity of average ores, by hand-methods, of about 4 tons per day. The first shipment of ore was received at this plant on August 20th, 1937.

The service of the sampling plant is free and its function has been organized to assist prospectors and operators in the finding, exploration, and development of mining properties, by the following means:—

(1.) Bulk test-sampling of mineral deposits to ascertain the mineralization and values and to establish the commercial or non-commercial aspects of these deposits.

(2.) Guidance through information concerning the factors governing the markets and marketability of the content of mineral deposits, together with assistance in the sale of ores to the smelter or ore-buyer.

(3.) Guidance in the exploration and development of mineral deposits of commercial importance, through contact and advice in the field.

(4.) Assistance through the advantageous purchase, grading, assembly, and marketing of shipping-grade ores by the plant during the preliminary stages of exploration and development of mineral deposits.

The objective of the plant is to promote and foster the actual production of ore and in this way bring mining properties into continuous profitable production. As bearing on this, the all-important matter of freight rates and transportation costs covering shipments of ore from properties to sea-board or the railway is carefully considered. The railway and steamship companies have co-operated in this regard and grant preferential freight tariffs applied to shipments destined for the sampling plant at Prince Rupert. To assure this, a shipping permit signed by the sampling plant manager is, on application, mailed to intending shippers. On presentation of this to the transportation company agent, the shipper is granted the advantage of the preferential freight tariff. In this way many prospectors and small operators have been enabled to profitably mine, ship, and market small lots of ore, and by this means secure funds for further prospecting, exploration, and development of properties.

Shipments to the sampling plant are divided into three categories:—

(A.) Assay lots.

(B.) Bulk test-sample lots.

(C.) Tonnage lots.

The following is an example of a general flow-sheet followed at the plant for tonnage lots. The flow-sheet for bulk test lots follows the same general principle, adapted to the weights and sizing of the lots. Individual flow-sheets for different lots may vary to suit the characteristics of each individual lot.

SHIPMENT

Moisture sample — to bin.

Jaw-crusher (8- by 10-inch) to 1 inch.

Empty sacks returned.

To steel plate.

Shovel to cone, then split-shovelling or quartering cross — to bin.

Sample 8,192 lb.

Shovel to cone, then to quartering cross (in three operations) — to bin.

Sample 1,024 lb.

Jaw-crusher (3 by 4 inches) to ½ inch.

Shovel to cone, then to quartering cross — to bin.

Sample 512 lb.

Rolls (8 by 5 inches) to ⅛ inch.

Scuttle to inverted cone-fed cone-mix, then to inverted cone-fed quartering-splitter (in four operations) — to bin.

Sample 32 lb.

Disk-grinder to 20-mesh.

Scuttle to inverted cone-fed cone-mix, then to inverted cone-fed quartering-splitter (two operations) — to bin.

Sample 8 lb.

Rolling cloth mix and flattening to cake.
Spatula quartering

Sample 4 lb.

Dept. of Mines, Assay Office, Victoria.

Assay results to Plant Manager, Prince Rupert.

Settlement to shipper.

Sample 4 lb. kept on file.

Mixed with other lots and shipped to smelter.

Settlement to sampling plant.

Immediately on arrival at the sampling plant all shipments are carefully weighed on an approved and inspected Fairbanks platform scale of 2,500-lb. capacity. Following this, each lot is crushed to 1 inch in a primary 8- by 10-inch jaw-crusher and proceeds through an elaborate and detailed system of hand-sampling and reduction with interval mixing, crushing to ½ inch in a secondary crusher, reduction in rolls to ⅛ inch, and final grinding of the reduced sample to 20-mesh. The final sample is split into two parts, each weighing from 3 to 6 lb., one of which is forwarded to the Department of Mines' Assay Office at Victoria for assay and analysis and the duplicate being retained at the plant for reference. Hand-sampling permits a maximum flexibility in the selection of the sampling flow-sheet. This is worked out to suit the characteristics of each individual lot and when deemed necessary multisampling of the entire lot (duplicate, triplicate, or quadruplicate) is done. Immediately the assay and analysis results are received from Victoria they are studied and, based on these and all other observations, correlative advice with all necessary calculations and settlement is immediately submitted to the shipper.

Lots in category " A " embrace small preliminary samples of a few pounds in weight taken from outcrops and working-faces. The purpose of these is to find or indicate values that might be of commercial or shipping-grade.

Lots in category " B " comprise samples weighing from about 100 to several hundred pounds. The purpose of these is to determine more definitely the probability of a commercial or shipping-grade ore.

If a shipping-grade has been previously established, these bulk test-samples are submitted for the purpose of guidance with regards to the values and type of ore that is in process of being sacked for shipment to the sampling plant or being prepared for direct shipment to the smelter. Based on the examination of these lots and the results of the assay and analysis, shippers are advised concerning the commercial aspects of the ore. In the case of prospective shipments to the sampling plant or direct to the smelter, advice is proffered relative to sorting and cobbing to achieve the required grade and the selection of ore-type to suit the specific requirements of the particular smelter schedule to which the ore is indicated as being best adapted for the achievement of the best returns.

In the case of any lots in categories " A " or " B " in which a shipping-grade is indicated, a " *pro forma* per ton calculation " in accordance with the indicated smelter schedule is forwarded to the shipper by the first mail. On this sheet all items such as weights; assay and analysis results; metal prices; smelter payments, penalties, charges, and deductions; freight and incidental costs, are cited in detail and the net return per ton for the grade and type of ore represented is shown. If the results from bulk test lots indicate that better returns would accrue to the shipper by shipment direct from the property to the smelter, especially in car-load lots, rather than via the sampling plant, he is specifically advised to that effect. At the same time the service of the plant is available to him for guidance in the preparation of such direct shipments, through the shipment of interval bulk test lots.

If deemed necessary for certain cases in category " A," and in all cases in category " B," in which the ore is shown to be not of shipping-grade and a deficit or loss to the shipper would be incurred through shipment, the same " *pro forma* per ton calculation " with correlative advice is submitted to the shipper for his information and study. It is hoped that besides demonstrating the profit or loss accruing from the shipment of ores, all property-owners who avail themselves of this service will also become thoroughly conversant with the various factors governing the commercial aspects of mineral deposits.

Any commercial content of these bulk test lots is immediately paid for in full by the sampling plant; and appended to the " *pro forma* per ton calculation " is a detailed " settlement calculation for the test lot " covering the weight of the lot and showing exactly how the value is arrived at, with a cheque attached to cover the amount. Accompanying these sheets is a letter embodying any further information that may be deemed necessary for the shipper in connection with his particular problem and operation. Because the value of lots in categories " A " and " B " is not known at the time of shipment, the freight on these must be prepaid.

Lots in category " C " comprise shipments weighing from several hundred pounds to 15 or 20 tons which have been shown by assays and analyses of previous relative bulk test-samples or other forms of approved sampling and relative assays to be of shipping-grade.

After these tonnage lots are sampled and assayed, a "settlement calculation" sheet in accordance with the smelter schedule which, with freight costs, shows the highest returns for the type of ore, with accompanying cheque for the net value, is forwarded to the shipper by the first mail. On this sheet all items of weights; assay and analysis results; metal prices; smelter payments, penalties, charges, and deductions; freight and incidental costs, are cited in detail to enable the shipper to understand clearly how the net value is calculated. Accompanying these settlement-sheets is a letter embodying any extra elaboration or advice that may be deemed necessary for the further information of the shipper in connection with his particular operation.

Before shipping lots in category "C," shippers are requested to complete and forward to the plant a "shipping application form" on which is set out the approximate grade of the intended shipment and the basis on which this is determined. If these determinations are approved by the sampling plant manager, a shipping permit is forwarded to the intending shipper. On presentation of this permit to the railway or steamship agent the shipper is enabled to consign the lot to the sampling plant, freight collect. The freight is then deducted from the calculated net value of the lot.

In some cases shipments in category "C" may be for the purpose of determining the grade, type, and smelter suitability or commercial aspects of ores without previous bulk test-sampling in accordance with category "B." In such cases the freight costs to the sampling plant must be prepaid.

The sampling plant, through its manager, is at all times in intimate contact with the prospectors and operators who avail themselves of its service. This is done either through correspondence or by personal contact at Prince Rupert or in the field. In this way the problems involving each particular individual and property are known and it is possible to proffer fitting advice and information.

The advantages accruing to shippers of ore for marketing through the Department of Mines' sampling plant as opposed to direct shipment to the smelter, are:—

(1.) The service of technical advice and information covering the entire operation:

(2.) Security of the shipper from loss, through the previous determination of grade by bulk test-samples:

(3.) Guidance of the shipper in the matter of required grade, through interval bulk test-sampling during the process of sacking:

(4.) Reduced freight rates for small lots. This enables:—

- (*a.*) The profitable shipment of lots, the freight-rate on which would otherwise be prohibitive;
- (*b.*) The elimination of the necessity to produce car-load shipments, with their appreciable capital outlay and deferred payment, which factors are generally impossible for the average prospector to meet;
- (*c.*) Quick and frequent payments from the shipment of small lots:

(5.) Determination of the export market giving the highest returns:

(6.) Reduced smelter and export charges through mixing and bulk export from the sampling plant. This involves the following factors:—

- (*a.*) Elimination of smelter sampling charge;
- (*b.*) Elimination of smelter extra charge for small lots weighing up to about 5 tons;
- (*c.*) Elimination of smelter extra charge for handling ore in sacks;
- (*d.*) Complete or part elimination of smelter penalties, by mixing at the plant with penalty-free ores;
- (*e.*) Reduced smelter base-treatment charge on high-grade ores by mixing with lower-grade ores;
- (*f.*) Elimination of smelter representation cost;
- (*g.*) Elimination of gold export permit and insurance costs:

(7.) Salvage of empty sacks and their return immediately on completion of sampling:

(8.) Full settlement of the net return within about two weeks from the date of the arrival of the shipment at the sampling plant.

So far, the most advantageous markets are offered by the Tacoma smelter for gold-silver-copper ores, and by the Trail smelter for silver and silver-gold ores with a high lead content and high-grade zinc ores.

In view of differences in the schedules of these two smelters and the bearing of transportation and freight costs from various localities, careful and detailed calculation is required to determine the disposition of shipments. For instance, it is frequently found advantageous to forgo payment for appreciable quantities of lead which would be paid for by Trail and divert certain gold-silver-lead ores to Tacoma, which smelter does not pay for lead. Again, in certain gold-silver-lead-copper ores, it may be found advantageous, when all factors are carefully calculated, to forgo payment for either lead or copper and dispose of the lot accordingly.

During the year much research was also carried out to find advantageous markets and freight avenues for antimony, molybdenum, bismuth, and manganese to fit conditions relative to certain localities and properties.

For the initial period of operation of the sampling plant—August 20th to December 31st, 1937—seven tonnage lots totalling 34.186 dry tons from six different properties, sixteen bulk test lots totalling 1.4582 dry tons from fourteen different properties, and four assay lots totalling 0.009 dry ton were received at the plant.

The following is a synopsis of the operating data of the plant for the year 1938 from January 1st to December 31st:—

	Number of Shipments.	Different Properties.	Total Weight.
			Tons.
Tonnage lots	24	12	97.1355
Bulk test lots	90	35	7.03705
Assay lots	47	24	0.08875
Totals	161	61	104.2613

Shipments from plant to smelter: Number of shipments, six; dry tons, 147.8411.

Comparative Returns.

Dry tons shipped from plant	147.8411
Dry tons paid for by smelter	148.2335
Paid out by plant	$7,685.24*
Received from smelters	$7,536.75

* From this should be deducted $68.44 for freight absorbed by the plant on account of special circumstances governing three lots, which reduces this figure to $7,616.80. The difference of $80.05 between this total and that received from the smelter, is accounted for by the variance in the price of metals at the time of purchase and the time of sale.

The details of the tonnage and bulk test lots, with relative assay and analysis results follow.

Tonnage Lots.

Property.	Shipper.	Locality.	Dry Tons.	Gold.	Silver.	Copper.	Lead.	Zinc.	Arsenic.	Anti-mony.	Sulphur.	Iron.	Silica.
				Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Cariboo-Thompson	Endimak, J. P.	Barkerville	9.9615	3.71	1.25	*Nil*	1.4	0.7	7.1	*Nil*	23.4	23.5	35.1
D. and N. Group	Donaldson, J. G.	Telkwa	2.4355	0.105	95.0	2.9	*Nil*	0.55	*Nil*	2.5	4.5	6.3	58.15
Esperanza Mines, Ltd.	Payne, T. H.	Alice Arm	4.195	0.20	124.6	Trace	2.7	1.9	0.5	*Nil*	5.0	5.9	73.5
Glacier Gulch	Campbell, S. F.; Banta, W.; and Loveless, G.	Smithers	12.062	2.80	0.4	*Nil*	*Nil*	Trace	*Nil*	*Nil*	0.13	1.6	58.0
Glacier Gulch	Campbell, S. F.; Banta, W.; and Loveless, G.	Smithers	5.671	3.70	0.55	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	0.4	0.7	57.0
Globe Claim	Kenney, E. T.	Thornhill Mountain	1.94	1.95	0.8	*Nil*			*Nil*		22.5	35.7	18.5
Golden Eagle	Heenan, D.	Topley	0.297	0.16	248.6	1.0	17.4	12.4	*Nil*	*Nil*	10.5	4.3	44.4
Golden Eagle	Heenan, D.	Topley	0.303	0.16	291.2	2.2	20.0	12.0	*Nil*	*Nil*	10.4	6.0	28.4
Golden Eagle	Heenan, D.	Topley	0.2495	0.10	168.8	0.9	12.1	12.1	*Nil*	*Nil*	10.4	4.5	50.2
Golden Eagle	Heenan, D.	Topley	0.4185	0.12	209.6	1.2	12.0	14.0	*Nil*	*Nil*	12.0	4.0	42.0
Gold Leaf	Flynn, James	Anyox	1.679	4.65	2.03	*Nil*	Trace	1.0	*Nil*	*Nil*	1.33	3.56	85.7
Gold Leaf	Flynn, James	Anyox	2.169	13.67	4.33	*Nil*	0.17	0.63	Trace	*Nil*		3.57	84.2
Gold Group	Chisholm, A.	Topley	3.6	0.02	18.4	1.8	26.0	10.0	*Nil*	*Nil*	17.1	8.4	30.2
Gold Group	Chisholm, A.	Topley	2.645	0.02	17.2	1.8	32.6	10.5	Trace	*Nil*	17.6	7.5	24.4
Gold Group	Sam, M.	Topley	0.139	0.06	77.4	0.9	Trace	0.2			0.6	6.0	86.0
Gold Group	Sam, M.	Topley	0.1875	0.10	60.8	Trace		3.0				5.0	75.6
Grotto Group	Bell, J.	Pitman	17.795	0.36	21.0	5.0	*Nil*	2.0	*Nil*	*Nil*	18.5	20.0	48.0
Grotto Group	Bell, J.	Pitman	5.677	0.52	30.0	3.5	*Nil*	1.1	*Nil*	*Nil*	20.9	21.2	47.5
Grotto Group	Bell, J.	Pitman	6.240	0.80	20.5	4.4	*Nil*	0.3	*Nil*	*Nil*	20.4	22.1	46.9
Grotto Group	Bell, J.	Pitman	7.7145	0.93	20.8	4.3	*Nil*	0.6	*Nil*	*Nil*	22.0	19.2	43.0
Lucky Luke	Moody, L. E.	Usk	0.4680	0.22	7.0	39.2					9.1	7.6	22.8
Lucky Luke	Moody, L. E.	Usk	2.6555	0.787	14.25	23.7					7.1	8.6	43.95
Silver Pick	Elmsted, A.	Smithers	6.109	0.60	340.0	9.4	2.4	5.9	*Nil*	*Nil*	11.9	8.9	36.0
Snowshoe Group	Raymond & Berg	Smithers	2.524	0.2	69.0	0.1	10.3	13.4	3.0	*Nil*	11.2	9.6	34.9

Test Lots.

Property.	Shipper.	Locality.	Dry Tons.	Gold.	Silver.	Copper.	Lead.	Zinc.	Arsenic.	Antimony.	Sulphur.	Iron.	Silica.
				Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
August Group	Johnson, A.	Ritchie	0.00035	0.10	2.4	4.7							65.2
Bermaline Group	Johnson, A.	Ritchie	0.028	0.05	8.4	2.7	13.7	0.5					68.5
Bermaline Group	Johnson, A.	Ritchie	0.0015	Trace	0.6	0.2							93.1
Black Bull No. 1	Hagen, J.	Copper River	0.0505	0.03	4.0	Trace	0.5	4.0	*Nil*	*Nil*	1.4	4.0	72.5
Black Bull No. 2	Hagen, J.	Copper River	0.049	0.06	13.5	0.5	13.8	3.7	*Nil*	*Nil*	5.0	3.9	66.3
Blue Ribbon	Edlund, N.	Stewart	0.017	0.02	87.0	0.4	6.8	19.5	1.0	0.1	15.3	19.2	5.3
Bolton No. 2	Dyer, J.	Gardner Canal	0.414	0.04	0.6	0.8	*Nil*	*Nil*	*Nil*	*Nil*	Trace	9.3	40.6
British Lion Mines, Ltd. (Homestake)	Smith, A. F.	Alice Arm	0.035	2.2	12.3	8.0	0.3	1.9	*Nil*	*Nil*	19.3	9.0	40.0
British Lion Mines, Ltd. (Homestake)	Smith, A. F.	Alice Arm	0.033	4.75	5.4	8.4	1.7	6.9	*Nil*	*Nil*	16.8	14.8	39.4
British Lion Mines, Ltd. (Homestake)	Smith, A. F.	Alice Arm	0.025	3.95	7.1	9.3	1.8	6.8	*Nil*	1.4	19.0	16.8	31.0
British Lion Mines, Ltd. (Homestake)	Smith, A. F.	Alice Arm	0.0255	5.5	26.8	9.0	*Nil*	2.0	*Nil*	*Nil*	26.0	19.4	32.8
British Lion Mines, Ltd. (Homestake)	Smith, A. F.	Alice Arm	0.016	1.32	18.0	19.0	Trace	5.0	*Nil*	*Nil*	22.6	27.0	13.2
British Lion Mines, Ltd. (Homestake)	Smith, A. F.	Alice Arm	0.017	0.14	2.6	0.1							
British Lion Mines, Ltd. (Homestake)	Smith, A. F.	Alice Arm	0.029	5.60	8.5	9.0	0.1	1.8	*Nil*	*Nil*	20.0	19.0	37.6
British Lion Mines, Ltd. (Homestake)	Smith, A. F.	Alice Arm	0.030	4.05	5.4	7.2	0.2	5.8	*Nil*	*Nil*	18.0	16.5	41.0
British Lion Mines, Ltd. (Homestake)	Smith, A. F.	Alice Arm	0.026	3.54									
Cordillera	Darby, J.	Usk	0.045	0.46	3.1	6.5					1.8	2.7	77.6
Cordillera	Darby, J.	Usk	0.0075	0.68	3.2	4.2					1.2	2.1	90.2
Cordillera	Darby, J.	Usk	0.0042	21.1	9.0	7.8						2.7	85.6
Coronado	Goodacre, C.	Hudson Bay Mountain	0.0600	0.06	80.3	0.3	26.5	8.0	*Nil*	*Nil*	15.8	5.0	8.6
Coronado	Goodacre, C.	Hudson Bay Mountain	0.0565	0.06	29.7	0.2	9.2	16.0	0.1	*Nil*	11.2	12.0	23.0
Coronado	Goodacre, C.	Hudson Bay Mountain	0.060	0.32	42.9	0.2	15.8	16.0	*Nil*	*Nil*	15.0	10.0	14.0
Cougar M.C.	Johnson, A.	Ritchie	0.00275	Trace	8.2	2.9							73.2
Empire Group	Simpson, Mrs. D. C.	Smithers	0.056	0.15	50.0	0.5	15.0	16.4	0.2	*Nil*	17.3	7.0	17.0
Eureka	Michaud, J. A.	Terrace	0.096	Trace	Trace	*Nil*	*Nil*	1.0	*Nil*	*Nil*	10.5	3.0	40.4
Georgia	Bissonette, Mrs. J.	Copper River	0.0195	0.06	124.0	5.1	Trace	0.5	*Nil*	*Nil*	11.1	13.0	48.1

Test Lots—Continued.

Property.	Shipper.	Locality.	Dry Tons.	Gold.	Silver.	Copper.	Lead.	Zinc.	Arsenic.	Antimony.	Sulphur.	Iron.	Silica.
				Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Gem No. 1	Hagen, W.	Copper River	0.037	0.64	1.4	*Nil*		Trace				6.0	72.6
Gem No. 1	Hagen, W.	Copper River	0.0395	0.37	2.2	*Nil*	*Nil*	0.1	*Nil*	*Nil*	6.8	10.2	79.2
Glacier Gulch	Campbell, S. F.	Smithers	0.175	3.0	1.2	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	0.37	1.6	56.0
Glacier Gulch	Campbell, S. F., and Banta, W.	Smithers	0.091	0.64	4.4	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	0.1	0.9	59.3
Glacier Gulch	Campbell, S. F., and Banta, W.	Smithers	0.0870	0.18	4.4	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	0.1	0.8	55.9
Gold Group	Simonds, O. F.	Topley	0.025	0.01	26.7	2.8	61.2	3.7	*Nil*	*Nil*			
Gold Group	Simonds, O. F.	Topley	0.012	0.02	29.7	3.0	26.8	14.4	0.8	*Nil*			
Gold Group	Simonds, O. F.	Topley	0.0045	0.05	1.6	0.2	3.6	3.9	0.4	*Nil*		8.5	62.6
Gold Group	Simonds, O. F.	Topley	0.0445	0.02	17.4	1.0	57.7	7.3	Trace	*Nil*			
Gold Group	Simonds, O. F.	Topley	0.06	0.02	16.4	1.0	58.1	7.0	*Nil*	*Nil*			
Gold Group	Simonds, O. F.	Topley	0.048	0.04	21.7	4.1	38.2	13.0	0.7	*Nil*			
Gold Group	Simonds, O. F.	Topley	0.0275	0.03	40.4	3.9	11.1	12.2	0.4	*Nil*			
Gold Group	Simonds, O. F.	Topley	0.045	0.03	26.0	4.5	24.5	9.3	0.2	*Nil*	20.7		21.6
Gold Group	Simonds, O. F.	Topley	0.0025	0.02	7.0	6.2	42.9	8.6	*Nil*	*Nil*	25.1		2.4
Gold Group	Simonds, O. F.	Topley	0.0445	0.06	31.0	2.3	51.7	5.6	*Nil*	*Nil*	19.0	6.9	9.0
Gold Group	Simonds, O. F.	Topley	0.018	0.04	14.2	2.4	31.9	15.6	*Nil*	*Nil*	20.0	7.9	17.9
Gold Group	Simonds, O. F.	Topley	0.0425	0.04	21.5	1.8	43.9	9.8	*Nil*	*Nil*	18.4	7.5	16.1
Gold Group	Sam, M.	Topley	0.045	0.065	460.0	3.0	0.3	0.4	*Nil*	0.2	2.6	4.5	77.2
Gold Group	Sam, M.	Topley	0.159	0.065	394.0	2.8	0.4	0.5	*Nil*	1.8	3.4	4.9	71.7
Gold Group	Sam, M.	Topley	0.093	0.18	211.2	1.9	Trace	1.1	Trace	*Nil*	3.9	6.1	74.7
Gold Group	Sam, M.	Topley	0.144	0.06	124.5	0.88	0.4	1.0	*Nil*	*Nil*	0.63	4.7	80.8
Gold Group	Sam, M.	Topley	0.349	0.06	71.6	0.5	*Nil*	*Nil*	*Nil*	*Nil*	2.2	5.4	74.9
Gold Group	Sam, M.	Topley	0.097	0.02	69.0	0.5	Trace	0.7	Trace	*Nil*	1.0	5.0	81.3
Gold Group	Sam, M.	Topley	0.076	0.04	62.8	0.4	*Nil*	*Nil*	*Nil*	*Nil*	1.1	5.1	78.3
Gold Group	Sam, M.	Topley	0.144	0.04	67.0	0.4	*Nil*	Trace	*Nil*	*Nil*	1.0	5.0	78.0
Gold Group	Sam, M.	Topley	0.052	0.26	32.1	4.4	8.5	6.0	2.2	*Nil*	20.0	16.0	12.0
Gold Leaf	Flynn, J.	Anyox	0.00375	104.34	30.0		Trace	*Nil*	*Nil*	*Nil*	1.3	3.0	83.4
Gold Leaf	Flynn, J.	Anyox	0.027	30.24	12.9	*Nil*	0.4	2.0	*Nil*	*Nil*	4.9	8.0	66.4
Golden Eagle	Heenan, D.	Topley	0.508	0.20	253.0	0.9	11.1	11.4	*Nil*	*Nil*	11.2	5.2	44.8
Grotto Group	Bell, J.	Pitman	0.04775	0.42	25.4	5.9	*Nil*	*Nil*	*Nil*		20.6	20.6	44.8
Grotto Group	Bell, J.	Pitman	0.0055	1.35	44.4	6.21							
Grotto Group	Bell, J.	Pitman	0.035	0.18	8.2	0.5	*Nil*	*Nil*			6.0	8.0	73.5
Grotto Group	Bell, J.	Pitman	0.0275	1.18	4.5	5.3	Trace	*Nil*	*Nil*	*Nil*	22.8	23.1	44.8
Grotto Group	Bell, J.	Pitman	0.006	0.40	29.3	6.5	*Nil*	Trace	*Nil*		21.8	21.8	42.8
Grotto Group	Bell, J.	Pitman	0.001	0.46	23.5	7.2	*Nil*	*Nil*	*Nil*		25.3	26.5	35.2
Grotto Group	Bell, J.	Pitman	0.00075	1.40	104.0	Trace							

Grotto Group	Bell, J.	Pitman	0.002	0.72	26.5	5.2			*Nil*		15.6	15.0	49.6
Grotto Group	Bell, J.	Pitman	0.0015	1.07	23.0	7.0			*Nil*		18.2	18.0	52.4
Grotto Group	Bell, J.	Pitman	0.004	0.76	21.6	6.8			*Nil*		26.6	24.0	36.8
Homestead	Turner, T. M.	Terrace	0.0489	0.01	0.4	*Nil*							
Homestead	Turner, T. M.	Terrace	0.0519	Trace	0.2	*Nil*							
Kimsquit No. 3	Jorgenson, J. P.	Bella Coola	0.1309	0.02	0.4	1.6	*Nil*	Trace	*Nil*				
Last Chance Claims	Donaldson, J. G.	Telkwa	0.0695	0.11	203.5	5.0	*Nil*	1.0	*Nil*	3.0	3.1	8.3	47.0
Last Chance Claims	Donaldson, J. G.	Telkwa	0.1955	0.20	77.0	2.5	*Nil*	1.0	*Nil*	*Nil*	3.0	6.0	58.6
Loveless	Loveless, G.	Smithers	0.142	0.013	27.6	19.3	*Nil*	*Nil*	*Nil*	*Nil*	7.7	4.9	51.4
Lucky Luke	Moody, L. E.	Usk	0.029	0.56	14.6	24.5						8.5	43.0
Motherlode	Felber, J.	Terrace	0.0245	0.24	20.5	0.8	14.0	3.0	*Nil*	*Nil*	10.8	8.0	59.0
Nicholson Creek Mining Corporation	Uhland, A.	Usk	0.374	1.26	44.0	16.3	*Nil*	*Nil*	*Nil*	*Nil*	8.6	7.8	49.6
Nicholson Creek Mining Corporation	Uhland, A.	Usk	0.327	0.01	1.4	4.7	*Nil*	*Nil*	*Nil*	*Nil*	6.3	8.5	62.4
Snowbird Group	Ostrem, A. J.	Fort St. James	0.299	0.04	0.2	*Nil*	*Nil*	Trace	*Nil*	53.5			20.0
Spider	Collart, J. E.	Stewart	0.035	1.04	236.0	0.1	6.0	9.1	*Nil*	*Nil*	6.1	2.4	72.9
Spider	Collart, J. E.	Stewart	0.0315	1.36	260.0	0.2	6.9	12.7	*Nil*	*Nil*	7.8	2.5	65.4
Silene Claim	Frizzell, Gladys	Jap Inlet	0.051	Trace	2.0	9.6	*Nil*	0.6					
Silver Bow	Clore, A.	Zymoetz River	0.057	0.12	3.8								
Silver Bow	Clore, A.	Zymoetz River	0.0595	0.10	0.1	*Nil*		*Nil*				6.0	86.2
Surf Inlet	Hermanson, H.	Butedale	0.041	Trace	2.4				*Nil*	*Nil*			
Stevens Island	Warren, N.	Prince Rupert	0.0005	Trace	Trace	Trace							
Stevens Island	Warren, N.	Prince Rupert	0.0035	0.02	Trace	Trace							
Victory Group	Simpson, Mrs. D. C.	Smithers	0.276	0.18	33.0	0.5	12.8	13.3	0.8	*Nil*	15.9	4.1	20.0
Victory Group	Simpson, Mrs. D. C.	Smithers	0.563	0.52	36.1	0.9	24.5	12.3	5.4	*Nil*	16.1	9.3	15.8
Victory Group	Simpson, Mrs. D. C.	Smithers	0.127	0.20	69.6	0.7	44.7	12.1	2.4	*Nil*	14.8	5.0	7.6
Victory Group	Simpson, Mrs. D. C.	Smithers	0.100	0.33	39.2	0.25	28.3	7.7	5.7	*Nil*	12.0	8.7	23.6
Wold	Wold, C.	Topley	0.096	0.01	5.8	*Nil*	*Nil*	3.7	*Nil*	*Nil*	2.5	8.4	40.2
Zymoetz	Turner, T. M.	Topley	0.027	0.34	1.7	Trace	3.7	21.2	Trace	*Nil*	14.8	8.2	43.3