

PART E

ANNUAL REPORT

OF THE

MINISTER OF MINES

OF THE PROVINCE OF

BRITISH COLUMBIA

FOR THE

YEAR ENDED 31ST DECEMBER

1937



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BRITISH COLUMBIA DEPARTMENT OF MINES.
VICTORIA, B.C.

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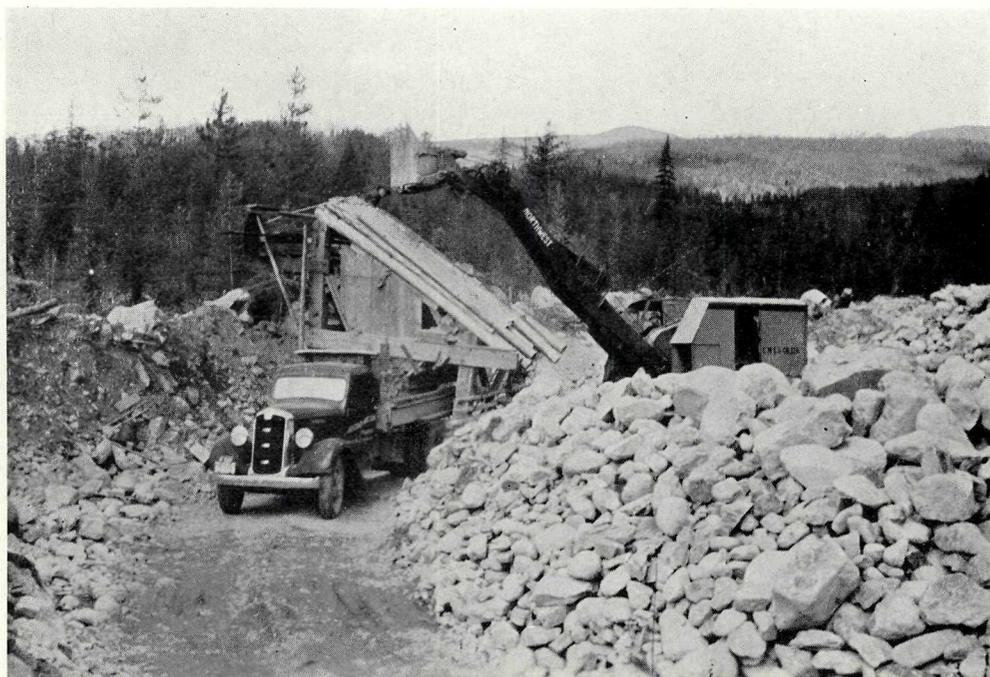
Mining at the surface, above No. 5 level, Bayonne Mine.



Tractor with bumper and fuel-oil tank, used hauling oil to the Bayonne Mine.



Looking south-westerly from upland area near Silver Bell prospect, north of Revelstoke.



Power-shovel, loading-pocket, and truck, Inca Placer Pit, Palmer Bar Creek.

PART E.
EASTERN MINERAL SURVEY DISTRICT (No. 5).

BY

H. SARGENT.

SUMMARY.

The marked increase in base-metal prices early in 1937 was followed by increased activity in a number of camps. Though by the end of the year base-metal prices had declined well below the January levels, production of silver, lead, and zinc showed substantial increases compared with 1936. The increased production came largely from the *Sullivan* mine, but there were also considerable increases in production from the Slocan-Ainsworth area, and some production from the Lardeau Mining Division. In these areas a number of properties were reopened and development-work was carried out in addition to the production activity. Several of the properties shut down on the approach of winter, influenced in part by the decline in base-metal prices. Crude ore was shipped in some volume from the Slocan-Ainsworth area, and a little was shipped from the Lardeau Mining Division. Some ore was milled at the customs mill constructed for Messrs. Ayerton and Cohen a few miles west of Nelson. Concentrates and shipping-ore went to foreign smelters as well as to the smelter at Trail.

Gold production also showed an increase over the previous year. This production came principally from properties equipped with mills, but also included shipments of siliceous ore from a number of properties in the Nelson Mining Division, as well as ore produced by leasing operations in Rossland, and some ore shipped to Kellogg, Idaho, from the *Midway* property in the Fort Steele Mining Division. Some silver-bearing fluxing-ore was shipped from the Slocan City Mining Division. A new gold producer was added to the list late in the year when the mill of Durango Gold Mines, Limited, in the Nelson Mining Division, began operating.

In the past two years marked improvements have been made to roads and trails serving mining districts and areas of prospective merit. The construction of the Big Bend Highway is rendering more accessible the large area north of the main line of the Canadian Pacific Railway. The western part of this project serves the area east of the Columbia River and north of Goldstream, though the rugged country back from the highway cannot be reached without considerable exertion. Goldstream is a tributary which enters the Columbia from the east about 60 miles northerly from Revelstoke. There has been placer activity over many years on Camp Creek, McCulloch Creek, and French Creek, which enter Goldstream from the north, and there has been some activity along the Columbia River north of Goldstream. The aggregate production of placer gold has reached a substantial figure. This gold doubtless originated in lode deposits within the area mentioned, in which there are some old lode-gold prospects. It is reasonable to suppose that the attention of prospectors interested in lode deposits will be attracted to this area.

In the following pages three placer operations are described. Some base-metal prospects are described from two localities in which until recently there has been little or no recent activity. Lode-gold deposits are described from two areas in the Nelson Mining Division and one each from the Ainsworth and Slocan City Mining Divisions. A number of these are prospects which have not been described in previous Annual Reports of the Minister of Mines.

LODE-GOLD DEPOSITS.

SLOCAN CITY AREA.

Lakeview. This Crown-granted claim, owned by P. Johnson, E. H. Kinder, and H. B. Kinder, is situated about 1 mile due east of Slocan City. A claim has been located to the north of the *Lakeview* and another to the south for the same owners. The *Lakeview* lies within a bend of Springer Creek, the north-west corner of the claim being about a quarter of a mile south-east of the bend and 500 feet above the

creek-level. The north and west boundaries of the claim are thus both roughly parallel with the course of the creek. Toward the north-west corner of the claim a camp with limited accommodation has been built on a small flat about 1,000 feet higher than Slocan Lake. The Springer Creek road, which leaves the main highway half a mile south of Slocan City, passes within a short distance of the camp, at a point about $2\frac{1}{4}$ miles from the highway.

From the little flat the ground slopes steeply to the west, and to the north there is a steep drop to Springer Creek. Not far south of the camp the flat merges with the general slope which rises to the east and south-east at a moderate angle. The ground is timbered, principally with small pine. The overburden in the vicinity of the workings is generally not more than 2 or 3 feet thick, but outcrops are infrequent. The "Slocan Sheet" accompanying Memoir 173 of the Geological Survey of Canada shows the area covered by the *Lakeview* as underlain by "crushed, mostly porphyritic, granite." The workings, which are on the slope just east of the flat, expose fracturing of north-south strike and in general of steep easterly dip. Quartz lenses and stringers occur in the fracturing, and disseminated sulphide mineralization is developed in the quartz and in the altered granite along the fracturing. Sulphides also occur along narrow parallel fractures in ribbon-quartz and as aggregates in the quartz, but in general they are sparingly developed. Pyrite is the most abundant sulphide; chalcopyrite, galena, and sphalerite also occur. Some of the pyrite is veined by quartz and by the other sulphides; it also occurs as small masses and as disseminated grains, with a little chalcopyrite or without other sulphides. Possibly a little native silver is present, though none was reported from sections studied in the laboratory. Chalcocite and covellite occur associated with late carbonate gangue replacing chalcopyrite, and cerussite replaces galena. Noticeable oxidation is shallow and was not evident on the adit-level, which, in September, 1937, had gained a depth of from 25 to 50 feet. However, there has been some alteration at that depth, as indicated by the cerussite in the sections studied microscopically. There are values in gold and silver, which in unoxidized ore are associated with sulphides, the gold in particular being associated with pyrite, as indicated in the following table of assays of samples and specimens:—

Description.	Gold.	Silver.	Lead.	Zinc.
	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.
Quartz with much pyrite, from adit; selected	1.04	21.0	----	----
Well-mineralized ribbon-quartz from adit; selected	0.38	55.0	3.1	0.7
Quartz with some pyrite, from face of drift; width, 31 inches	Trace	1.6	----	----
Quartz with some gouge, mineralized with pyrite; width, 2 feet; from 12-foot pit above adit	0.06	2.5	Trace	----
Altered granite mineralized with pyrite and containing quartz stringer, to west of previous sample, width, 2 feet	0.11	0.8	----	----

In September, 1937, the workings extended over a length of about 325 feet. In this length the average strike is north 10 degrees west and the dip about 70 degrees easterly. Quartz is developed in lenticular masses along the strike. For part of the length quartz is exposed in two fractures separated by a horse of granite. The width of quartz in the fractures varies from 3 inches to $3\frac{1}{2}$ feet, and there are quartz stringers in the wall-rock making small angles with the strike of the main fracturing. Disseminated sulphide mineralization occurring in quartz and the altered wall-rock appeared to reach a maximum width of about 6 feet. The ribbon-quartz did not appear to be much wider than 6 inches and was not continuous. The occurrence of aggregates of pyrite in the white quartz was rather irregular.

The *Lakeview* is an old Crown grant, on which a shaft about 15 feet deep remained from former work. In 1935 some prospecting was done near the old shaft. The present owners became interested in the property in 1936, and continued surface prospecting; they then commenced an adit, which was being advanced southerly. In September, 1937, a small flotation-mill with a capacity reported to be 10 to 15 tons per day was being tuned up.

The surface workings on the slope just east of the little flat will be described from north to south, in which direction the outcrop rises 60 to 70 feet. For 65 feet from the north end

stripping exposed quartz and altered granite from 1½ to 3½ feet wide. The quartz contains pyrite and sphalerite. In the next 110 feet there were rather indefinite exposures in some surface-cuts. To this point the outcrop rises quite gradually. From 175 to 280 feet from the north end of the workings the outcrop rises more steeply, and for this length stripping exposed quartz from a few inches to 3 feet in width. Between 15 and 25 feet from the north end of this stripping a pit was sunk for about 12 feet on the vein. At the hanging-wall side quartz and some gouge over a width of 2 feet contains a little galena and some chalcopyrite, as well as aggregates of pyrite. Adjoining the quartz on the foot-wall side the granite is altered for 3½ feet, of which 2 feet next the quartz contains quartz stringers and is moderately well mineralized with disseminated pyrite. The assays of two samples, each across 2 feet, are given in the preceding table. The old shaft is between 35 and 40 feet from the north end of the stripping. At the south side of the shaft the quartz has a width of 2½ feet, which narrows to 16 inches at a point 30 feet south. At this point a sample across 16 inches of cellular rusty quartz, containing some pyrite, assayed: Gold, 0.50 oz. per ton; silver, 12 oz. per ton. In the next 35 feet the quartz is narrow. About 45 feet south of this stripping there was an indefinite exposure in a shallow cut.

The adit is a crosscut for 50 feet at south 55 degrees east to the vein, which it then follows for 40 feet in a direction of south 25 degrees east, then for 75 feet on a bearing of south 5 degrees east to the face, which is about directly below the end of the stripping on the surface. There is a chute at 15 feet, and another at the end of the 40-foot course connects with the shaft from the surface. The best mineralization exposed was in the first 50 or 60 feet of the drift. Stringers running into the walls might warrant some prospecting. In the face of the drift there was quartz 31 inches wide, containing a little disseminated pyrite. A fault striking east-west and dipping 75 degrees southerly, about 12 feet north of the face, displaced the vein 3 feet to the west. The drift was being driven southerly.

RETALLACK AREA, SLOCAN.

Phoenix. Two Crown-granted claims, *Phoenix* and *Fletcher*, formerly included in the *Phoenix* group, are now owned by Highland Surprise Gold Mines, Limited.

The company also owns eight near-by or adjoining Crown-granted claims and three located claims. This report is limited to the *Phoenix* and *Fletcher* claims on which the work of the past two seasons has been done. The claims are situated in the upper basin of Lyle Creek, approximately 2 miles north-easterly from Retallack, which is on the Kaslo-New Denver road and on the Canadian Pacific Railway Company's Kaslo-Sandon and Nakusp branch line.

The upper basin of Lyle Creek is steep and rocky; several snowslides run into the basin and into Lyle Creek lower down. The workings on the *Phoenix* claim are toward the head of a south-easterly-flowing branch creek, which drops precipitously to Lyle Creek about 800 feet below the workings. The property is reached by a pack-trail, branching from the White-water Mine road, about three-quarters of a mile from Retallack. The trail, a little less than 2½ miles in length, climbs approximately 1,600 feet, reaching the camp and lowest working at about 5,450 feet elevation. For the first 1½ miles the average grade is moderate, but for the remainder of the distance the grade is steep and the country traversed is rocky. The country has been burned over and practically no living timber is left near the workings. There are good rock-exposures in the bluffs, below which there are talus slopes, while the slide-courses are filled with finer debris. The property is underlain by rocks of the Kaslo series.*

The workings are in greenstone, not far to the north-east of a serpentine belt. The greenstones are classified as andesite and dacite and related intrusives. These rocks are quite largely chloritized. In the underground workings several shear-strands are to be seen cutting the greenstone. The strikes of the shears vary from east of north to almost due west. The dips are generally steep, and vary from south-westerly to north or north-easterly. Shearing striking about 25 degrees west of north has been indicated at intervals for a few hundred feet. Quartz lenses and stringers are found in the shears of all strikes but in most cases are narrow and short. However, along shearing striking somewhat west of north, and dipping westerly or south-westerly, closely-spaced quartz stringers and lenses form most of the material for a

* Geological Survey, Canada, Memoir 173.

width of 2 or 3 feet on the surface, with an equal width in which quartz stringers are subordinate to the sheared greenstone. Underground at two points almost solid white quartz is exposed over a width of 4½ to 6 feet, and adjoining this quartz lenses or stringers are developed over a width of 5 to 10 feet in sheared greenstone. Quartz lenses or stringers, in zones from 4 to 6 feet wide, along shearing striking more nearly east-west, are exposed at one point on the surface and at one point underground, close to the shearing striking north 25 degrees west. Most of the quartz contains very little sulphide mineralization, but at some points it is moderately well mineralized with pyrite and chalcopyrite, usually as disseminated grains rather than as aggregates. The better-mineralized sections carry attractive values in gold and a little silver. Quartz more sparsely mineralized carries some values, while quartz and silicified sheared greenstone containing little sulphide mineralization carry much lower values. The following table gives the assays of typical material:—

Description.	Gold.	Silver.	Copper.
	Oz. per Ton.	Oz. per Ton.	Per Cent.
Quartz with pyrite and chalcopyrite, from surface cut; selected.....	4.00	2.0	1.5
Four inches quartz with fair sulphides; from upper level.....	0.60	0.2	Trace
Quartz with some disseminated sulphides, chiefly pyrite; from surface cut, selected.....	0.20	Trace	Trace
Sheared greenstone with quartz stringers, estimated one-third quartz; little sulphide mineralization; from face of upper level drift; width, 20 inches.....	0.04	1.0	Trace
Sheared greenstone with some quartz stringers; width 5 feet; from upper level.....	0.02	0.2	Nil

The writer did not see any free gold, but Cairnes reports one minute grain in a section studied microscopically.

Surface prospecting had been done at this property by 1917 when it was the subject of a reference in the Summary Report of the Geological Survey of Canada for that year. In 1928 and 1929 the property was under lease and bond to the Consolidated Mining and Smelting Company of Canada, Limited. During this period the upper level was driven. Work was stopped in March, 1929, and later the property reverted to the owner, M. J. Mahoney. In the fall of 1936 a camp was built for Highland Surprise Gold Mines, Limited, financed by The Old Colony Trading Company, of Vancouver. The company had a crew driving the lower adit by hand until the following spring. It was then announced that due to the hardness of the ground work would be stopped until an air-compressor had been installed, permitting machine-drilling. It was also announced that a road would be constructed to the property. The writer examined the property in June at which time no work was being done. Operations were renewed later but were suspended at the onset of winter.

The workings consist of some surface-cuts and two adit-levels. The elevation of the upper level as given in a former Annual Report of the Minister of Mines is 5,575 feet. From aneroid barometer readings the elevation of the lower adit is approximately 5,450 feet. These adits start a short distance east of a northerly-trending gulch. Quartz with sulphide mineralization is exposed at some points along the eastern side of the gulch, the floor of which rises quite steeply to the north. The writer examined exposures at approximately 80 and 200 feet northerly from the upper adit-portal but did not find a third exposure, which is understood to be farther to the north. The country is very rugged, and unconsolidated material obscures the shear-zone and mineralization except at the points noted. At the farther and higher point quartz lenses and stringers are exposed along the shearing which strikes north 25 degrees west and dips 70 degrees westerly. At the hanging-wall side for 2 to 3 feet the material is largely quartz, while the 3 feet to the east consists of sheared greenstone with quartz stringers. Some of the quartz is fairly well mineralized with medium-grained pyrite and chalcopyrite. A specimen of this material assayed: Gold, 4 oz. per ton; silver, 2 oz. per ton. Most of the quartz is mineralized with fine disseminated grains of pyrite and some chalcopyrite. A specimen of this material assayed: Gold, 0.20 oz. per ton; silver, trace; copper, trace. The other cut, 120 feet southerly, exposes irregular lenses of quartz over a width of 4 feet, which strike across the strike of the main shearing. This quartz is also mineralized with sulphides.

The upper adit is a crosscut for 80 feet at north 70 degrees west. At about 65 feet from the portal some shearing was encountered. From this point a working follows an irregular course for 250 feet northerly. This working does not follow shearing or mineralization for much of its length, and it lies west of the widest mineralized sections; however, as the average direction is about the strike of the shearing with which the mineralization is associated, the working is referred to as "the drift." The face of the drift is approximately 240 feet at north 25 degrees west from the adit-crosscut. Between 40 and 46 feet along the drift quartz lenses and stringers are to be seen in the west wall and half-way across the drift, but are not evident in the east wall, and apparently terminate against shearing along which quartz is developed 2 to 5 inches wide for 10 feet north of the cross-stringers. At the south side of this zone of cross-stringers, there is a lens of quartz 8 to 10 inches wide, which is quite well-mineralized with disseminated sulphide grains. The stringers in the 5 feet to the north are from ½ inch to 3 inches thick and contain little or no sulphide mineralization.

From a point 135 feet along the drift there is a crosscut 30 feet long at north 80 degrees east. In the last 12 feet it cuts through 6 feet consisting largely of white quartz with very little sulphide mineralization, followed by 5½ feet of sheared greenstone containing quartz stringers. From a point 55 feet farther along the drift there is a crosscut 30 feet long at north 40 degrees east. It cuts through 4½ feet consisting principally of white quartz with some sulphides. The last 4 inches contains much better sulphide mineralization. Beyond this for 10 feet the sheared greenstone contains quartz stringers. The next 11 feet to the end of the crosscut contains little quartz.

The crosscut ends at strong shearing striking north 60 degrees west and dipping almost vertically. The following channel samples were taken from south-west to north-east across the mineralized section on the south-east wall of the crosscut:—

Description.	Width.	Gold.	Silver.	Copper.
	Ft. In.	Oz. per Ton.	Oz. per Ton.	Per Cent.
White quartz with disseminated sulphides.....	4 2	0.10	0.2	Nil
White quartz, much more sulphide.....	4	0.60	0.2	Trace
Sheared greenstone with quartz stringers.....	5 0	0.02	0.2	Nil
Sheared greenstone with quartz stringers.....	5 0	0.04	1.6	Nil

The substantial width of mineralized sheared greenstone was not exposed in the workings except in the two 30-foot crosscuts.

The end of the drift is 55 feet past the second crosscut. There is a stub crosscut to the east 25 feet from the face, and from it to the face of the drift sheared greenstone 1½ to 2 feet in width contains a good deal of quartz. The strike is north 30 degrees west, and the dip is 80 degrees westerly. This strand probably diverges westerly from the hanging-wall side of the wider zone. At the face a sample across 20 inches, estimated to be one-third quartz, assayed: Gold, 0.04 oz. per ton; silver, 1 oz. per ton; copper, trace. The greenstone to the east is also much sheared. In the stub crosscut strong shearing strikes north 60 degrees west and dips vertically, the projection of this shearing would cross the wide mineralization not far north of the nearer 30-foot crosscut.

The lower adit-portal is about 200 feet from the upper portal at south 15 degrees east, and by aneroid barometer reading is 125 feet lower. It is a crosscut driven somewhat north of west, designed to intersect the north-westerly-trending shear-zone along which mineralization is developed on the upper level. This adit had been driven 215 feet when the property was examined in June, 1937. The average bearing for the first 195 feet is about north 55 degrees west; a more northerly course is followed for the remaining 20 feet. For 100 feet from the portal the working is timbered and lagged. At the end of the timbering quartz 2 to 4 inches wide is exposed for a short distance following shearing striking east-west and dipping 70 degrees to the north. Fifty-five feet farther another shear striking north 60 degrees west and dipping 80 degrees northerly is exposed. At this point some small quartz-lenses containing a little pyrite are exposed in 3 feet of sheared greenstone.

The surface exposures are at three points separated by considerable distances. On the upper level two crosscuts 55 feet apart expose quartz lenses and stringers with some sulphides, developed in sheared greenstone over widths of 11½ to 14½ feet. This mineralization,

appears to follow shearing striking north 25 degrees west and dipping rather steeply westerly. The shearing may be regarded as indicated for a length of 110 feet from the first crosscut to the end of the drift. If narrower shearing intersected by the adit and followed for some distance in the drift is the same as that farther north the indicated length of shearing is 240 feet. The length of the wide development of quartz in the sheared greenstone is uncertain; it does not extend to the adit, 130 feet south of the first 30-foot crosscut; and to the north, the south-easterly projection of strong shearing, exposed in the stub crosscut, would cut across the northerly extension of the wide mineralization with unknown effect, not far from the second 30-foot crosscut. On the upper level other shear-strands contain quartz a few inches in width, and one occurrence has been mentioned in which quartz lenses and stringers, including an 8- to 10-inch lens containing sulphides, appear to lie in crosscutting attitude just west of the main shearing. It appears that the lower adit should have crossed the projection of the most continuous shearing exposed on the upper level. The two shears exposed on the lower level cannot be correlated with the principal shear or with lesser strands on the upper level. As the mineralization is incompletely explored by the upper level the projection to the lower level is somewhat uncertain.

BAYONNE-MIDGE CREEK AREA.

The country lying west of Kootenay Lake and Kootenay River, south of the West Arm of Kootenay Lake, has been prospected with varying enthusiasm for years, and some attractive discoveries have been made. It is adjoined on the west by the country draining westerly into Salmo River and Cottonwood Creek, which contains the Sheep Creek and Ymir Camps, important producing areas, and the Porcupine Creek section, which has a record of production from the *Hunter V.*, and in which the *Howard* has recently been brought into production by Durango Gold Mines, Limited. Gold has been of principal importance in this area to the west, but silver, lead, and zinc have also been produced in some quantity. A part of the area west of Kootenay Lake and Kootenay River, in which there has been a good deal of activity for several years, is represented in the accompanying map, entitled "Sketch-map of the Bayonne-Midge Creek Area." The Crown-granted claims are indicated on the map and named in the accompanying list. The locations of some other properties are also indicated. The Canadian Pacific Railway follows the west shore of the lake and there are sidings at Midge Creek and at Tye just north of Cultus Creek. These points are between Nelson and Creston on the railway, roughly 40 miles from Nelson and 25 miles from Creston. A truck-road runs up Midge Creek for about 6 miles, and from the end there is a pack-trail to the *Wisconsin* near the head of Hughes Creek. From Tye Siding there is a truck-road to the *Bayonne*, a distance of roughly 23 miles. This road runs through the central part of the area to the south-west corner, and has branch trails serving a number of prospects. The southern part of the area is accessible from the Dewdney trail, part of which is shown on the map. The trail runs westerly up Summit Creek to the divide, then down Lost Creek, connecting with a road, which in turn connects with the Nelson-Nelway Highway. The eastern end of the Dewdney trail may be reached from the highway north of Creston, by a road across the Kootenay Flats. Access to the area is also afforded by trails from two other branch roads connecting with the Nelson-Nelway Highway. From the Sheep Creek road a trail continues up Sheep Creek over the divide and reaches the Bayonne road not far from the *Bayonne*, and from the Porcupine Creek road a trail leads to the summit, giving access to the head of Canyon Creek. Improvements were made to the Bayonne road in 1936 and 1937. The Midge Creek road was extended and the Dewdney trail and the trails from Sheep Creek and Active Creek were reconditioned in 1937. The area is thus quite accessible for prospecting and a considerable part is served by roads leading to the railway.

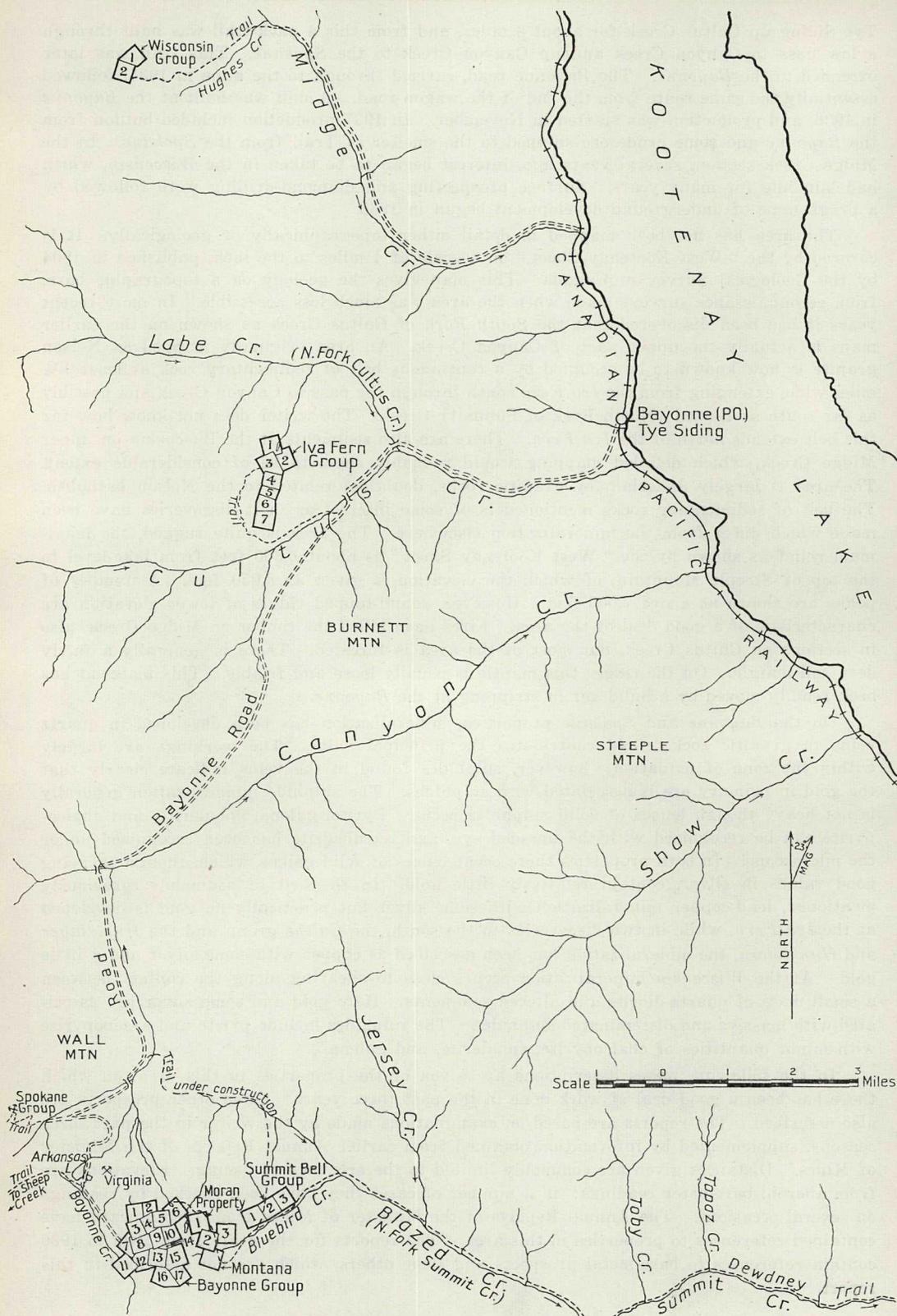
Several of the *Bayonne* claims were staked in 1901. The *Wisconsin* group was under development in 1903. Several other properties are of long standing. The discoveries were made and early prospecting was done before the construction of the present roads, which date from the past four years. From 1915 to 1918 ore was shipped to the smelter from the *Spokane* property. This ore was taken on pack-horses over the divide to the Sheep Creek wagon-road. The *Iva Fern* was first reported upon in 1917. Development-work was carried on at this property between 1925 and 1930. During this period a wagon-road was built from

Tye Siding up Cultus Creek for about 6 miles, and from this a pack-trail was built through a low pass to Canyon Creek and up Canyon Creek to the *Spokane*. This trail was later extended to the *Bayonne*. The Bayonne road, carried through to the mine in 1935, followed essentially the same route from the end of the wagon-road. A mill was built at the *Bayonne* in 1936, and production was started in November. In 1937 production included bullion from the *Bayonne* and some crude ore shipped to the smelter at Trail from the *Spokane*. In the Midge Creek section, several years ago, interest began to be taken in the *Wisconsin*, which had lain idle for many years. Surface prospecting and diamond-drilling were followed by a programme of underground development begun in 1935.

The area has not been mapped in detail either topographically or geologically. It is covered by the "West Kootenay Sheet," on a scale of 4 miles to the inch, published in 1904 by the Geological Survey of Canada. This map gives the geology on a topographic base, from reconnaissance surveys made when the area was much less accessible. In more recent years it has been discovered that the South Fork of Cultus Creek as shown on the earlier maps is actually the upper part of Canyon Creek. An area originally mapped as Nelson granite is now known to be occupied by a continuous belt of sedimentary rock at least $1\frac{1}{4}$ miles wide, extending from the *Iva Fern* south through the pass to Canyon Creek and possibly as far south as Blazed (North Fork of Summit) Creek. The writer does not know how far this belt extends north of the *Iva Fern*. There are also sediments at the *Wisconsin* on upper Midge Creek, which detailed mapping would probably show to be of considerable extent. The area is largely underlain by granitic rocks, doubtless related to the Nelson batholith. The belt of sedimentary rocks mentioned is of some interest as in it discoveries have been made which differ from the mineralization elsewhere. The area is quite rugged, the maximum relief as shown by the "West Kootenay Sheet" is about 6,300 feet from lake-level to the top of Steeple Mountain, of which the elevation is given as 8,050 feet. A number of peaks are shown as above 7,000 feet. However, round-topped ridges of lower elevation are characteristic of a good deal of the area. Fires have killed the timber on Midge Creek, also in sections on Cultus Creek, but most of the area is forested. There is generally a fairly deep soil mantle. On the ridges this mantle is usually loose and friable. This material has been readily moved by a bulldozer in stripping at the *Bayonne*.

On the *Bayonne* and *Spokane* properties, mineralization has been developed in quartz veins in granitic rock. Gold contributes the principal value. The workings are largely within the zone of oxidation; however, sulphides found in the veins indicate clearly that the gold in primary ore is associated with sulphides. The sulphide mineralization generally is not heavy though lenses of solid sulphides occur. Pyrite, galena, sphalerite, and chalcopyrite can be recognized with the unaided eye, and tetrahedrite has been recognized under the microscope. In both properties there occur lenses of solid galena which, though carrying good values in silver, contain relatively little gold. In the belt of sediments, previously mentioned, lead-copper mineralization with some silver but practically no gold is developed at the *Iva Fern*, while in two discoveries to the south, the *Cultus* group and the *Humdingers* and *Hunkadora*, the mineralization has been described as copper with some silver and a little gold. At the *Wisconsin* mineralization occurs close to shearing along the contact between a small mass of quartz-diorite and altered sediments. Here gold and some silver are associated with massive and disseminated sulphides. The sulphides include pyrite and arsenopyrite with minor quantities of chalcopyrite, sphalerite, and galena.

In the following pages descriptions are given of the properties in this area, on which there has been a good deal of work done in the past three years. Some other prospects are also described. The reports are based on examinations made by the writer in the past three seasons, supplemented by information obtained from earlier Annual Reports of the Minister of Mines. Distances given are commonly limited to the accuracy of pacing. Elevations are from aneroid barometer readings; in a number of cases they have been checked by readings on several occasions. The Annual Reports of the Minister of Mines from 1903 onward have contained references to properties in this area. The reports for the years from 1926 to 1930 contain references to base-metal prospects and some others, which are not described in this report.



Sketch-map of the Bayonne-Midge Creek Area.

BAYONNE-MIDGE CREEK AREA.

CROWN-GRANTED CLAIMS AS NUMBERED ON ACCOMPANYING MAP.

	No.		
Wisconsin Group:	1.	Lucky Strike	Lot 2929
	2.	Wisconsin	Lot 2928
Iva Fern Group:	1.	Excelsior	Lot 12657
	2.	Standard	Lot 12658
	3.	Fern	Lot 12656
	4.	Iva	Lot 12655
	5.	Black Cap	Lot 12654
	6.	Jewel	Lot 12653
	7.	Gem	Lot 12652
Bayonne Group:	1.	Kentucky	Lot 5966
	2.	Maryland	Lot 5085
	3.	Ohio	Lot 5962
	4.	Columbus	Lot 5961
	5.	Bayonne	Lot 5083
	6.	Oxford	Lot 5084
	7.	Virginia	Lot 6887
	8.	Skookum	Lot 9360
	9.	New Jersey	Lot 5967
	10.	Delaware	Lot 5960
	11.	Illinois	Lot 6888
	12.	Ontario	Lot 13016
	13.	Echo	Lot 13014
	14.	Echo Frac.	Lot 13015
	15.	St. Elmo Frac.	Lot 13018
	16.	Portland	Lot 13017
	17.	Idaho	Lot 13019
Moran Property:	1.	Mayflower	Lot 9356
	2.	Blue Bird	Lot 9357
	3.	Last Chance	Lot 9358
Montana:	1.	Montana	Lot 10778
Summit Bell Group:	1.	Summit Bell	Lot 10777
	2.	Maggie Aikens	Lot 10776
	3.	Michigan	Lot 10775

Seventeen Crown-granted claims or fractions, comprising what were at one time known as the *Bayonne* and the *Echo* groups, are being acquired by **Bayonne Mine.** Bayonne Consolidated Mines, Limited (N.P.L.). The company's head office is at 1007 Royal Bank Building, Vancouver. Under the agreement this company erected a cyanide-mill at the property, and in November, 1936, commenced production.

The claims are situated on the south-westerly slope of John Bull Mountain north of Bayonne Creek. Bayonne Creek is a tributary of the West Fork of Summit Creek. The property is connected by road with Tye Siding on the Canadian Pacific Railway on the west side of Kootenay Lake. The road, approximately 23 miles in length, is used by trucks in the summer and caterpillar tractors during the winter. The claims and the road are indicated on the accompanying sketch-map of the area.

The south-westerly slope of John Bull Mountain on which the *Bayonne* workings are situated is quite gentle. The lowest adit, No. 8, is at approximately 6,000 feet elevation, while No. 1, half a mile to the north-east, is a little less than 700 feet higher. Below No. 8 level the slope is steeper to Bayonne Creek which is at about 500 feet lower elevation. The workings do not extend to the north-easterly side of the mountain which has a very steep slope. On the south-westerly side overburden is commonly from 3 to 6 feet deep. This slope is well covered with small balsam and spruce trees.

The rocks outcropping and found underground on the *Bayonne* property are medium to moderately fine-grained, and vary somewhat in composition, but for practical purposes may be called granodiorite. The property covers ground near the south-west corner of a considerable area of intrusive rocks which has been called the Bayonne batholith.

Recent work has been concentrated on the *Bayonne* vein-system to which this report is limited. The property also includes the old *Echo* group on which extensive surface prospecting and some underground work were done years ago.

The *Bayonne* vein-system is a zone of fracturing trending from north 60 degrees east to north 80 degrees east and generally dipping steeply to the south though there are also steep northerly dips. In some sections the granodiorite is cut by a strong fracture, between the walls of which horses of wall-rock are commonly included. The fracture splits at various points, and the branches may follow the general strike, possibly reuniting again, or may diverge from the general strike at considerable angles. At some points the zone as known is a rather weak fracture, or several parallel fractures. At several points fairly strong quartz veins have been crosscut some distance from the main break; work to date has not shown their relationship clearly. Where the vein is represented by a single quartz-filled fracture the width is usually not more than 2 feet though it may reach a width of 3½ feet of quartz. Quite commonly, however, there are two or more quartz-filled openings which with the horses between may have a total width of 4 or 5 feet and occasionally greater width. Where branches diverge there may be sufficient mineralization to constitute ore for a width of as much as 10 feet.

Gold, which contributes almost the entire value to the ore, appears to have been associated with sulphides, principally pyrite, galena, and sphalerite. The development of sulphides has been localized in certain sections of the vein. Oxidation commonly extends to a depth of 100 feet or more from the surface, and the ore so far mined is almost entirely oxidized material. In general this oxidized ore consists of rusty quartz with altered wall-rock. The quartz is honeycombed with vugs or vein-like openings, the walls of which commonly are coated with dark-brown rust. This rusty material is apparently the residue from oxidized sulphides, which have been largely leached away. Such ore may assay several ounces in gold per ton. At various points underground, notably on No. 8 level, at several points on No. 6 level, and at the inner stope on No. 5 level, white quartz containing unaltered sulphides has been found. In such places the widths have commonly been too narrow to permit profitable mining. The significance of this fact may well be that it is only the tightest and narrowest parts of the vein, as so far opened up, which have been preserved from oxidation. The sulphide minerals noted are pyrite, galena, and sphalerite. They appear to have been introduced into fractures in the vein-filling. The fractures being generally parallel with the vein-walls give the ore a pronouncedly banded appearance particularly notable in the high-grade oxidized ore.

In 1935 the writer selected typical vein-matter from No. 6 dump, which with a sample of selected mixed sulphides from the inner stope on No. 5 level gave the following assays:—

Description.	Gold.	Silver.	Lead.	Zinc.
	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.
White quartz essentially free from sulphides.....	0.02	0.2	----	----
Massive mixed sulphides.....	1.18	10.0	10.6	10.0
Massive pyrite.....	2.10	5.2	----	----
Selected mixed sulphide ore from chute, inner end No. 5 level.....	3.16	7.0	----	----

Material similar to the last sample was studied microscopically in the laboratory and reported on as follows:—

“Metallic minerals identified in order of abundance: Galena, pyrite, sphalerite, chalcopyrite, tetrahedrite.

“Galena occurs as irregular masses in a quartzose gangue also veins, and replaces pyrite in some places and replaces sphalerite. It contains a few tiny blebs of tetrahedrite.

“Pyrite occurs as disseminated crystals.

“Sphalerite occurs as irregular masses, commonly associated with galena.

“Chalcopyrite occurs as small irregular masses and blebs in sphalerite.

“Tetrahedrite occurs as tiny inclusions in galena.”

The mine manager, P. N. Pitcher, supplied the information that a lens of galena encountered in one of the stopes assayed about 100 oz. in silver per ton, but contained relatively little gold. Information made public from time to time indicated that to the end of September from about 0.4 to 0.7 oz. of gold had been recovered per ton of ore milled, and that in the last three months recovery was roughly 0.67 oz. of gold per ton of ore milled.

The original staking of the *Bayonne* group was done in 1901 and the claims were brought to Crown grant in 1904. The *Echo* group, which adjoined the *Bayonne* group, was mentioned as a prospect in the Annual Report of the Minister of Mines, British Columbia, for 1904. The claims were brought to Crown grant in 1935. By 1915 the *Bayonne* vein-system had been developed by numerous surface-cuts, and by three adit-levels with two winzes and some raises. The two higher levels now known as No. 1 and No. 6 were reported to be about 500 and 1,200 feet in length, respectively. The length of the third adit, now known as No. 8 level, was not given. Apparently there was not much activity at the property from 1915 to 1929, but from 1929 till 1935 work was done intermittently, and during this period the present road was constructed to the property, following the route of a pack-trail, from a point on Cultus Creek about 5½ miles from Tye Siding. The road was extended to the mine in 1935 and that fall a shipment of high-grade ore was made to the smelter at Trail. This ore, amounting to about 36 tons, was mined from the No. 1 level. Control of the company passed to Grull-Wihksne Gold Mines, Limited, about the end of 1935. Work was resumed in 1936 as soon as it became possible to take in necessary material. Construction of the mill was completed in November and production was commenced.

Power is developed from fuel-oil hauled to the property. Diesel engines, in a flexible combination, drive the compressors and the mill machinery. The mill and power-house are situated a short distance from No. 8 portal. The process is dominantly cyanidation but a mineral jig is included in closed circuit with the ball-mill and classifier, and the tailings from cyanidation are passed over a concentrating-table. The oxidized ore has been found to settle very slowly, which has limited the capacity at times. This difficulty has been overcome in part by using thickeners in parallel. Following grinding and preliminary agitation, there are two thickeners in parallel, the overflow from which goes to the pregnant solution storage, thence through a clarifier to Merrill-Crowe precipitation equipment. The underflow from the primary thickeners goes through a second set of agitators to two more thickeners in parallel. The underflow from these thickeners is dewatered and washed in an American filter. The cake from the filter is repulped and passed over a concentrating-table, the tailings from which go to waste. The concentrates are of rather low grade, but contain values in silver, lead, and gold. The quantity of concentrates made is not large, and this material was being accumulated at the property. The jig concentrates are cleaned on a corduroy blanket and then

amalgamated. Precious metal from the retorted amalgam and from the cyanide precipitate is converted to bullion at the property. The ore would be expected to be difficult to mill, and for a while the recovery was rather low. Adjustments in the flow-sheet and in the manner of feeding reagents have made it possible to secure a good extraction and maintain a fair capacity. Recently the mill has been treating about 40 tons of ore per day.

Description of Workings.

The *Bayonne* vein-system has been developed by seven adits, the highest being No. 1 and the lowest No. 8. There is no No. 7 level. The intervals between successive levels from No. 1 to No. 6 vary somewhat, but are generally a little more than 100 feet vertically. From No. 6 to No. 8 the distance is approximately 160 feet. As mentioned above, the old workings on the property are now known as Nos. 1, 6, and 8 levels. Of these workings, No. 8 has been driven about 600 feet before reaching a point vertically under the portal of No. 6 level. No. 6 level, though about 1,400 feet in length, was still about 700 feet short of reaching a point vertically below No. 1 level 520 feet above. This indicates the gentle slope of the hill. As a consequence of this feature and the fact that commercial ore discovered to date has been within the oxidized zone, comparatively near the surface, the workings are spread along a considerable distance.

The lower levels being nearer the mill were first brought into production and recent development has proceeded up the hill. Adits Nos. 5, 4, 3, and 2 have been driven, of which Nos. 5 and 4 were started at, or made connections with, raises from No. 6 level; Nos. 3 and 2 were being driven ahead in September, 1937, and No. 1 level was being retimbered. At that time levels Nos. 1 and 2 had no underground connections with the lower workings.

The various adits have been driven into the hill in a direction somewhat north of east. The general strike of the vein system is from north 60 degrees east to north 80 degrees east. No. 8 level starts as a crosscut driven about north-east, turning to follow the general trend at 350 feet from the portal. The other adits, even if started off the vein, follow the general trend closely. Not much crosscutting has been done. A composite plan of the workings is a long narrow belt with the lower workings overlapping, each lying close to or upon the levels immediately below. The upper levels have less overlap along the strike, but are restricted to the continuation of the same narrow belt. A longitudinal vertical projection as of September, 1937, shows the surface sloping down to the south-west at an inclination of about 15 degrees, with the various levels driven into the hill at vertical intervals of 100 feet or so.

The levels above No. 6 are limited to a few hundred feet in length and attain depths from the surface at their inner ends of from 80 to 180 feet. No. 2 level had been driven for a short distance under No. 1, but No. 3 had not yet advanced to a position under the portal of No. 2. The end of No. 4 was about under the portal of No. 3. No. 5 level was under No. 4 for 250 feet, while No. 6 level followed under No. 5 for the full length of that level and 300 feet farther into the hill. No. 8 level, 160 feet below No. 6, followed along under the outer 500 feet of that level. The stoped ground was in two sections; one extended from somewhat below No. 6 level near the portal, the other included ground principally above No. 5 level, but also a considerable block of ground between Nos. 5 and 6 levels.

No. 1 level: When the property was visited in September retimbering had reached a point about 300 feet from the portal, where a fault striking about north-south and of moderate dip to the west cut the vein. This fault steepened and curved to a north-westerly course a few feet ahead and above. The working beyond the fault was temporarily inaccessible because of caving. The best ore section up to the fault appeared to be about 90 feet in length, from 160 to 250 feet from the portal, in which the vein-width was from 2 feet to 4 feet. There is comparatively little cover overhead in this drift, as will be readily appreciated from the fact that at 225 feet from the portal a raise about 35 feet long reaches the surface. About at the fault there is an old winze down approximately 20 feet. The old level extends for about 200 feet past the fault, and near the face has a crosscut 60 feet to the east which cuts two quartz-filled fractures, on one of which about 60 feet of drifting was done.

No. 2 level was started when the ground was covered with snow. The portal, which is about 500 feet south-westerly from No. 1 portal and about 100 feet lower, is apparently north-west of the vein and the working did not cut the vein-fracture till 180 feet in. A rather weak fracture was followed to 320 feet from the portal, beyond which point the working was driven on line. When the writer visited the property the face was about 650 feet from the portal.

For the last 10 feet, 12 to 15 inches of mineralized vein had been followed. This was above a slip of low dip to the south-east, below which there was little vein-matter to be seen.

No. 3 level was started about 400 feet south-westerly from No. 2. Near the portal there is a raise connecting with No. 4 level. Though apparently not far from the vein the vein-fracture was not reached till the working was 140 feet from the surface. Beyond this point a fracture generally 2 to 6 inches wide was followed. About 340 feet from the portal there were two fractures each 3 to 4 inches wide. The left-hand one was followed. At 360 feet a short crosscut driven to the south-east revealed two good streaks of ore about 2 feet apart. Side-swiping to the south-east 6 feet ahead of the crosscut had exposed good ore, which was followed for 70 feet; the width, including horses of waste between the fractures, ranged from 2½ to 7½ feet. In the face the width was about 2½ feet. The two fractures had come together materially in the last 20 feet and the one on the north-west side had become much narrower. In this section the strike was about north 55 degrees east and the dip was steep to the north-west. The writer sampled the pay-streaks about 50 feet back from the face. After allowing for the waste in the vein, the average across a width of 6 feet was between 3 and 4 oz. of gold per ton.

No. 4 level was started near the top of the longest of the old raises from No. 6 level, and in the vicinity of one of the most important stopes. However, except near the portal, the stope had not been carried far above No. 4 level. From 120 to 220 feet from the portal a stope was started and carried up for a couple of sets. The vein here was narrow and the pay-streaks, from 1 inch to perhaps 4 inches in width, lying on either side of a horse, did not contain enough value to carry the waste which had to be broken. North-east of this stope the drift followed a weak fracture, some slips striking about due east cut the south wall here. At 240 feet from the portal a narrow fracture filled with rusty quartz runs into the south-east wall, while the drift follows a fracture dipping from 40 degrees to 55 degrees to the north-west. About 50 feet ahead the working turned easterly and crosscuts a slip at about 25 feet. The raise to No. 3 level from farther ahead in the crosscut cut through several narrow fractures.

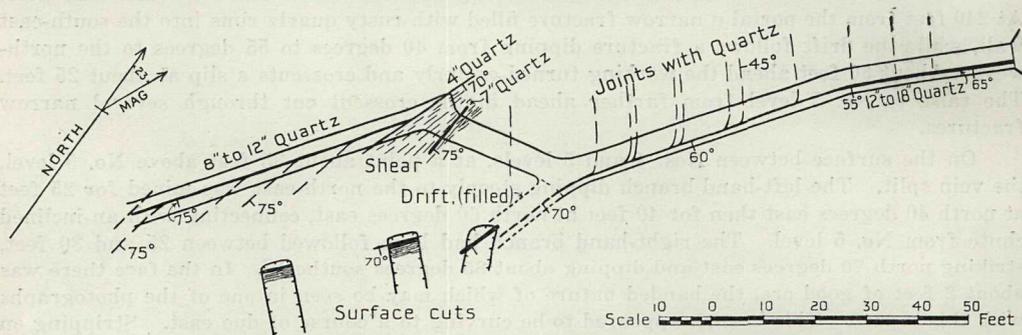
On the surface between Nos. 4 and 5 levels, at a point about 35 feet above No. 5 level, the vein split. The left-hand branch dipping steeply to the north-east was mined for 25 feet at north 40 degrees east then for 40 feet at north 60 degrees east, connecting with an inclined chute from No. 5 level. The right-hand branch had been followed between 25 and 30 feet, striking north 70 degrees east and dipping about 85 degrees southerly. In the face there was about 2 feet of good ore, the banded nature of which may be seen in one of the photographs with this report. This branch appeared to be curving to a course of due east. Stripping on the surface about 40 feet ahead of the face exposed a mineralized break. For a short distance from their intersection the ground between the two branches contained sufficient values to constitute ore, the width reaching a maximum of about 10 feet, after which the branches were mined separately. On No. 5 level the vein under this surface stope was not commercial. Crosscutting was in progress to test the value of a fracture which runs easterly into the wall of the drift.

No. 5 level starts some 400 feet north-east of the portal of No. 6 and about 110 feet higher. Known ore above this level had been very largely stoped when the property was visited. The first stope, which extended from 200 to 330 feet from the portal, was carried very nearly to the surface. The ground extending from about 400 to 550 feet from the portal was stoped up to No. 4 level. These stopes were connected above No. 5 level. Some ground was mined below the level in the first 35 feet under the first stope. A third stope from 580 to 660 feet in had been carried up a few sets, but had not proved to be profitable. In it the vein was from 6 to 12 inches in width and contained some unoxidized sulphides. The drift was stoped a few feet past this stope.

On No. 6 level the known ore-bodies had also been very largely stoped out. 6-1 stope, extending from about 170 to 350 feet from the portal, was carried to the surface a distance of from 50 to 80 or 90 feet. In that distance both upper and lower margins of the ore-shoot were followed westerly on a rather flat rake. The width of the stope was generally from 2 to 3 feet. Below the north-eastern end of 6-1 stope the ground was stoped from a raise put up on a vein-fracture from No. 8 level. The stope was started about 40 feet below No. 6 level and had a maximum length of about 80 feet. 6-2 stope, about 50 feet long, was opened

about 60 feet past 6-1 stope. At about 900 feet from the portal a raise goes through to the surface, connecting with Nos. 4 and 5 levels. 6-3 stope was carried up to No. 5 level on the south-west side of the raise, the stope length being from 40 to 50 feet. On the north-east side of the raise 6-4 stope was carried through to No. 5 level. It was started about 80 feet long in sulphide ore, reported to average approximately 0.3 oz. of gold per ton. The ore-length shortened to about 30 feet not far above the level, but, as oxidized ore, increased somewhat in length as No. 5 level was neared. No. 6 level drift extends for 1,400 feet north-easterly from the portal, or about 500 feet beyond the raise separating 6-3 and 6-4 stopes. In this section there are two 65-foot crosscuts to the north-west which cut quartz veins or shears striking north 55 degrees east or somewhat more northerly than the main drift. The main-drift fracture is weak near the end. Nearer the portal there is a 50-foot crosscut to the south-east which cuts some quartz-filled joints. To a point past the last stope the main break on this level is generally quite strong though it may be represented by two narrow veins lying on either side of a horse. At other points the vein is filled with from 2 to 3½ feet of quartz. Considerable sections of the vein are of fair width but are not well mineralized.

No. 8 level follows narrow irregular fractures for most of its drift length; that is, from about 350 feet from the portal to near the face. The quartz-filling is generally less than 6 inches wide and frequently is a mere stringer. However, at one point there was quartz from 8 to 10 inches wide for a length of about 30 feet, which was moderately well-mineralized with sulphides. This was found to pinch out a short distance above the roof. The dip of the fracturing on this level is steep to the north. From well in on this level a raise was driven through to No. 6, and used in connection with 6-1 stope and the stope below No. 6 level. An ore-pass and a manway were driven up to No. 6 level from points farther in.



Summit Bell Group. Plan of surface and underground workings from compass survey.

Three Crown-granted claims, *Summit Bell*, *Maggie Aiken*, and *Michigan*, are owned jointly by F. Aiken, of Bayonne P.O., and the estate of P. Casey, care of Mrs. P. Casey, of Spokane, who also own the *Montana*, lying to the south at the head of Blue Bird Creek. The *Summit Bell* group lies on the north-west side of Blue Bird Creek, a tributary of Blazed Creek (North Fork of Summit Creek). The property was formerly reached by a trail along Blue Bird and Blazed Creeks connecting with the Dewdney Trail on Summit Creek. It is accessible from the *Bayonne* by about 2½ miles of very rough trail. In the summer of 1937 Aiken was working on a new trail to connect with the Bayonne road at a point between 15 and 16 miles from Tye Siding. The proposed route would be between 5 and 6 miles in length. For three-quarters of a mile north-easterly from the *Summit Bell* cabin it lay along a rather steep slope, some sections of which are rocky. Beyond this the route crossed Blazed Creek and made its way north-westerly to a pass about 5,600 feet elevation. From the pass the route dropped to the South Fork of Canyon Creek, and climbed a short distance to the road on the far side.

There is a small cabin at 5,500 feet elevation, a short distance north-west of which the north-easterly-trending side-hill rises sharply. The workings lie on a steep slope above bluffs of granodiorite. The adit-portal is about 500 feet north-westerly from and approximately 235 feet higher than the cabin. The property was referred to briefly in the Annual Report of the Minister of Mines, British Columbia, for 1917. Since that time about 100 feet of additional work has been done underground.

The principal workings, consisting of an adit and three surface-cuts, are shown on the accompanying plan. There has been additional prospecting by surface-cuts farther west and some float was found, but the source was not exposed. The cuts are from 35 to 40 feet above the level of the adit floor. The two cuts to the west expose a foot-wall slip striking about north-east and dipping steeply to the south-east. There is quartz from 8 to 12 inches wide lying on the slip. On the hanging-wall side of the quartz the granodiorite is altered and rusty and is impregnated with quartz from 1½ to 2 feet. The quartz, and to some extent the altered wall-rock, have been mineralized chiefly with pyrite. In the most western cut the quartz at the foot-wall is about 8 inches wide, in the hanging-wall of which the granodiorite is altered and rusty for 22 inches. A sample was taken across 11 inches, including the quartz at the foot-wall and some altered granodiorite. In the next cut the quartz at the foot-wall 12 inches wide was sampled and a sample was taken across the next 22 inches, consisting of altered granodiorite containing a good deal of quartz toward the foot-wall side and mineralized with pyrite. The assays of the samples are as follows:—

Description.	Gold.	Silver.	Lead.
	Oz. per Ton.	Oz. per Ton.	Per Cent.
11 inches quartz and altered granodiorite from most westerly cut	0.72	1.0	<i>Nil</i>
12 inches quartz at foot-wall from middle cut	0.14	1.0	<i>Nil</i>
Next 22 inches altered granodiorite with quartz and pyrite	0.48	0.8	<i>Nil</i>

In the third cut quartz 18 inches wide, striking north 20 degrees east, is exposed. This would be expected to intersect the other vein a short distance to the north. Distributed between the dumps of the three cuts there is a ton or so of rusty honeycombed quartz.

The adit-portal is 110 feet north-easterly from the last cut. It starts as a drift following a quartz vein from 12 to 18 inches wide for 35 feet, at south 45 degrees west. For the next 55 feet on a course of south 35 degrees west the quartz is narrower. Notably in this section rather closely-spaced parallel joints in the foot-wall are filled with quartz which curves southerly to join the main fracture. Jointing is not conspicuous in the hanging-wall. The drift curves again at 90 feet from the portal. Ahead of this point the drift was filled with broken rock, but the fracture could be seen striking south 15 degrees west for 20 feet or so. A crosscut has been driven 25 feet south-westerly from this point, cutting through sheared granodiorite from 17 to 25 feet. There are some irregular quartz-lenses in the shear and one lens or vein 7 inches wide crosses the working. A joint containing 4 inches of quartz, striking south 15 degrees west, crosses the working at 25 feet. From this joint a fracture containing from 8 to 12 inches of quartz has been followed by drifting for 45 feet at south 35 degrees west. In this section the hanging-wall is cut by numerous parallel joints which are filled with quartz. A few joints also cut the foot-wall.

Much of the quartz is quite unmineralized, but some pyrite is developed at places in the quartz and in the wall-rock. A grab sample, from two small piles of quartz containing pyrite, one pile underground and the other at the portal, assayed: Gold, 0.96 oz. per ton; silver, 0.1 oz. per ton; lead, *nil*. As the mineralization appears to be irregular, extensive sampling, possibly bulk-sampling, would be required to determine the value of the deposit. Though the workings do not show it conclusively, there appear to be two roughly-parallel fractures 20 to 25 feet apart, between which numerous joints are filled with quartz. The pyrite mineralization is associated with the quartz veins cutting the granodiorite, and the pyrite apparently carries gold. There is some possibility that in favourable sections a deposit of this kind may contain a considerable tonnage of ore.

The eight claims, *Spokane*, *Spokane No. 1*, *Granite*, *Timberline*, *International*, *Continental*, *Meadow*, and *Bedrock*, are recorded in the names of R. M. and K. K. Laib, of Bayonne P.O. The claims are situated on the south slope of Wall Mountain, north of a tributary of Canyon Creek. The approximate position is indicated on the sketch-map of the area. From a switchback on the Bayonne road, approximately 18 miles from Tye Siding, a branch road has been built westerly up Canyon Creek about one-half mile. There the creek is crossed by a small bridge at approximately 5,200 feet elevation. From the bridge a switchback trail a little more than three-quarters of a mile long leads to the *Spokane* camp at approximately 6,050 feet elevation.

About a quarter of a mile westerly from the camp there is a pass leading north-westerly to another fork of Canyon Creek. The claims extend from the pass easterly on the mountain-side which slopes at from 25 degrees to 35 degrees in a direction somewhat east of south. The slope becomes more moderate on approaching the creek 850 feet below the camp. From the pass to a little east of the camp there is a fair cover of small timber, with larger trees on the lower slope. East of the timbered section the slope is swept by snowslides.

Rock outcrops on the ridge above the workings and at other points, but in general there is a cover of 2 to 3 feet of overburden. The exposures are of a moderately fine-grained granitic rock, containing occasional segregations of dark minerals. This rock, which for the purposes of the report is called "granodiorite," is probably continuous with the intrusive in which the *Bayonne* vein-system occurs. On the *Hilltop* and *Sitka* claims, which adjoin the *Spokane* group on the west, there are outcrops of sedimentary rocks intruded by tongues of granodiorite.

Work on the *Spokane* property has been largely on what is probably one vein, striking generally east to west and dipping steeply to the south. When followed westerly the outcrop angles up the slope, passing several hundred feet north of the camp. Underground workings and surface-cuts extend westerly from No. 5 adit for about 1,400 feet, then after a gap of 700 feet across a talus slope cuts in the pass and up the western side on the *Hilltop-Sitka* property expose quartz-filled fracturing of the same general dip and strike. Where well exposed the vein-width varies from a few inches to 4½ feet, in which the filling consists of quartz and sheared or altered granodiorite. The quartz varies from narrow stringers to lenses 2½ feet in width. Quartz may lie on both sides of a horse of granodiorite. Quartz-filled branch-fractures diverge from the main break at numerous points. Several lamprophyre dykes cut the vein without displacing it.

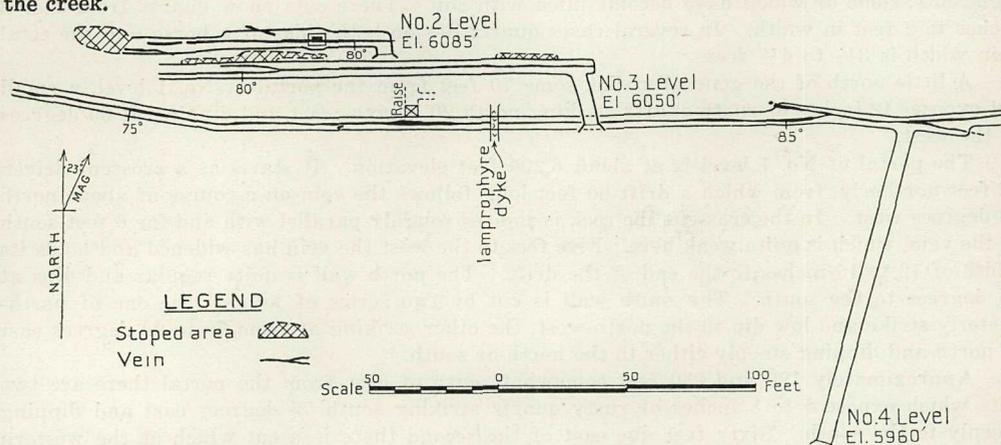
Sulphide minerals, pyrite, galena, some sphalerite, and some chalcopyrite, are developed as lenses and stringers and disseminated in the vein-filling. Copper and lead carbonates and iron oxide are developed in the weathered vein-matter. The workings reach a maximum of about 170 feet below the surface, at the inner end of No. 4 level. Most of the workings are at depths of less than 75 feet. Oxidation has affected most of the vein-matter exposed, but a good deal of sulphide mineralization is to be seen in the various workings. The ore contains variable values in gold and silver. Mixed sulphide may carry substantial quantities of gold. There are lenses of galena, which carry more silver than the mixed sulphides, but have only a little gold. An idea of the variation will be obtained from the following assays of three samples:—

Description.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.
Sample from roof of slope, No. 3 level	0.88	13.0	0.5	14.4	-----
Mixed sulphides, foot-wall streak, No. 3 level	0.20	1.0	Trace	2.6	5.6
Specimen of sorted lead ore, No. 3 level	0.04	45.0	0.5	79.0	Nil

Up to the fall of 1937, ten lots of ore had been shipped to the smelter. Details concerning the first six lots, amounting to 129.7 tons, appear in the Annual Report of the Minister of Mines for 1927. Four lots shipped in the first half of 1937 amounted to 127.4 tons. The smelter assays for the first lot—gold, 0.12 oz. per ton; silver, 48.5 oz. per ton; lead, 71.2 per cent.—were the lowest in gold and the highest in silver and lead of all shipments. A lot shipped in 1937 for which the smelter assays were: Gold, 0.82 oz. per ton; silver, 11.9 oz. per ton; lead, 16.1 per cent.; had the highest gold assay of all shipments. The ten lots amounting to 257 tons had an average content of: Gold, 0.597 oz. per ton; silver, 18.7 oz. per ton; lead, 27 per cent. From the sulphur-content of the shipments it is apparent that the ore was very largely oxidized.

According to information supplied by the Laib brothers, some old workings a short distance south of the camp are on ground which was staked in 1902, but which was allowed to run out in 1909. Laib brothers staked four claims in 1911, having discovered the east-to-west vein on which their work has been chiefly expended. In 1913 they staked two additional claims and staked the last two in 1936. Work has been done on the claims in all the years

since 1911. In that time they have driven about 1,000 feet of horizontal underground workings on five levels; they have also done the stoping and have sunk a shallow winze underground. On the surface a great many cuts and trenches have been made. All this work was done by hand. An arrastre was built near the creek in 1918, but the ore was found to be unamenable to amalgamation. For some years the property was reached by coming over the divide from Sheep Creek. From 1915 to 1918 six lots of ore were taken on pack-horses over the divide and down to the Sheep Creek wagon-road. Construction of the trail from Kootenay Lake via Cultus Creek made that route somewhat easier, particularly as it led directly to the railroad. With the construction of the truck-road through to the *Bayonne* in 1935, it has become much easier to move ore to the railway. The shipments made in the first half of 1937 were taken over the new road. In the fall the Laib brothers were engaged in the construction of an aerial tramway from the portal of No. 4 adit to a point on the more gentle slope near the creek.



Spokane Group. Plan of 2, 3, and 4 levels from compass survey.

The principal workings consist of five adits, of which Nos. 2, 3, and 4 are represented on the accompanying plan. The camp is about 700 feet south-westerly from the portal of No. 3 level and at the same elevation. The portal of No. 1 level is situated about 400 feet west of the portal of No. 2 level at approximately 6,200 feet elevation. The portal of No. 5 level is about 400 feet easterly from No. 4 portal, at approximately 5,870 feet elevation. As the ground slopes steeply in a direction somewhat east of south, and the vein, striking generally east to west, has a steep dip to the south, it has been possible to reach the vein at the various levels with very little crosscutting. No. 4 level starts as a crosscut reaching the vein in 135 feet, the surface trace of the vein at this elevation is in the course of a snowslide. No. 5 adit starts as a drift on the vein. It would be possible to reach the projected position of the vein at several hundred feet greater depth, with adit-crosscuts of reasonable length.

In examining the property the writer mapped the underground workings in considerably greater detail than can be recorded here; however, as the walls of workings have become coated with mud and products of oxidation, it is probable that some features of interest were overlooked. The vein splits at a number of points and some very narrow cracks were observed, which in a short distance opened up to a fair width of ore. Some rather strong branches of the vein pass into the walls of the workings and have not been followed. The appearance of certain sections suggests that branching fractures may have been important in the formation of ore-shoots. As there has been no crosscutting from the drifts it appears to the writer that there are possibilities that additional ore might be found within a comparatively short distance of the present workings, either in branches of the vein or possibly in fractures which may exist parallel with the present workings. The writer's mapping was based on a rough compass survey; it is quite probable that careful mapping based on a precise survey would yield valuable information. The writer did comparatively little sampling as there was already a good deal of information available from previous examinations and from shipments of ore. As the ore shipped had to stand quite high freighting charges in addition

to the usual railway freight and treatment charges, it had to be mined selectively and sorted. This implies that a considerable quantity of second-grade material must have been left in the dumps and unmined, in addition to the higher-grade ore now exposed underground.

There are several cuts and test-pits in the pass west of the camp. This is near the boundary between the *Granite* claim of the *Spokane* group and the *Hilltop* claim, recorded in the name of John Bell. As the boundary has not been surveyed the writer does not know the precise relationship of some cuts to it. The quartz-filled fracturing in granodiorite exposed by this prospecting has the general dip and strike of the fracturing in the more extensive *Spokane* workings.

About 700 feet easterly, after crossing granodiorite talus from a knob just east of the pass, one comes to a cut exposing 30 inches of jointed rusty granodiorite containing a 12-inch section largely of quartz. From this to the portal of No. 1 adit 400 feet easterly there are eight cuts, some of which have become filled with soil. These cuts show quartz from 2 or 3 inches to 2 feet in width. In several cases quartz lies on both sides of a horse and the total vein width is $3\frac{1}{2}$ to $4\frac{1}{2}$ feet.

A little north of the general strike, some 70 feet from the portal of No. 1 level, a small cut exposes 12 inches of rusty quartz striking north 20 degrees east and dipping at 60 degrees to the west.

The portal of No. 1 level is at about 6,200 feet elevation. It starts as a crosscut driven 12 feet northerly, from which a drift 60 feet long follows the vein on a course of about north 78 degrees west. In the crosscut the rock is jointed roughly parallel with and for 6 feet south of the vein, which is quite weak here. Five feet to the west the vein has widened and holds its width of 12 to 15 inches to the end of the drift. The north wall is quite regular and dips at 85 degrees to the south. The south wall is cut by two series of joints; the one of north-easterly strike and low dip to the north-west, the other striking at from 70 to 90 degrees east of north and dipping steeply either to the north or south.

Approximately 190 and 230 feet somewhat south of east from the portal there are two cuts which expose 5 to 8 inches of rusty quartz striking south 75 degrees east and dipping steeply to the south. Sixty feet due east of the second there is a cut which at the western side exposes 15 inches of rusty quartz containing some galena. This appears to be parallel with, rather than a continuation of, the vein exposed in the two cuts to the west, though it has the same dip and strike. On the east side of the same cut rusty quartz 18 inches wide strikes north 85 degrees east and dips 80 degrees to the south. The intersection of the two was covered with debris. This cut is over the inner end of No. 2 level and about 35 feet above the floor of the level.

No. 2 level at 6,085 feet elevation is about 400 feet easterly from No. 1. The working reaches the vein at about 3 feet from the portal then follows the vein about due west for 105 feet. The vein widens from about 2 feet at the entry to $3\frac{1}{2}$ feet of rusty ledge-matter 30 feet along the drift. There is a winze down 5 or 6 feet about 25 feet from the entry. On the south side at 45 feet the vein is very rusty for a width of 12 inches. From 50 feet in the vein tends to split and several fractures branch off. The width of the main break is reduced to about 2 feet. At a split in the south wall at 80 feet very rusty quartz 12 inches wide appears, it becomes less rusty ahead. At 90 feet, 15 inches of vein cuts out a curving slip on the north side, but on the south side from that point to the face there is 18 inches of rusty vein. Ahead of the face for about 25 feet and above the drift in the last 10 feet the ground has been stoped to a height of 15 feet above the floor. It is reported that lots 4 and 5 of the earlier shipment came from this stope. These amounted to 65.4 tons, averaging: Gold, 0.73 oz. per ton; silver, 14.5 oz. per ton; lead, 14.5 per cent.

No. 3 level at 6,050 feet elevation starts as a crosscut about 20 feet in length. To the east of the end of the crosscut there is a drift about 5 feet long. The vein has been followed due west in a drift about 160 feet long. From 5 to 30 feet from the entry there is a stope, the roof of which is 12 to 15 feet from the rail. The vein in this section is about 3 feet wide. It is reported that the sixth lot of ore shipped came from this stope. This lot amounted to 20.7 tons and assayed: Gold, 0.16 oz. per ton; silver, 32.5 oz. per ton; lead, 57.8 per cent. The vein-walls on this level are generally quite regular and are usually from $2\frac{1}{2}$ to 3 feet apart. From the end of the stope westerly along the foot-wall there is a fairly persistent streak, from 2 to 6 inches wide, consisting of rather fine-grained mixed sulphides stained with copper carbonates. The rest of the vein is rusty quartz and altered wall-rock. In this

section the vein is cut by several narrow lamprophyre dykes. From about 110 to 150 feet there is a stope above the drift; the manway is at 130 feet. In the 10 feet from the end of the stope to the end of the drift there is rusty, honeycombed quartz with some galena along the hanging-wall (south side). The width reduces from 18 inches at the end of the stope to 10 inches at the face. The hanging-wall quartz-lens was mined for the length of the stope, about 40 feet. Beginning 15 feet from the west end a foot-wall lens 6 to 12 inches wide, containing a good deal of galena, was mined to the east end of the stope. The roof of the stope at the west end was about 12 feet above the drift floor for 15 feet, then increased to 18 feet 30 feet from the west end. The foot-wall lens appears in the roof of the higher section, quite well-mineralized with galena, the hanging-wall quartz-lens contained less galena. On the first floor of the stope the foot-wall lens extends to the east end narrowing to 6 or 8 inches; on the other side of a 12-inch horse of granodiorite the hanging-wall lens is 18 inches wide. On the second floor 13 feet above the drift floor the stope is extended 21 feet farther east, giving a total length of about 40 feet at this elevation. The total length was reduced to 30 feet at 19 feet above the drift floor and to about 15 feet at the roof of the stope, roughly 30 feet above the drift floor. At the east end of the stope the foot-wall curves in and the width is reduced to about 18 inches on the second floor, but at the top of the stope at the east end there was a width of 27 inches of well-mineralized vein, a sample across which assayed: Gold, 0.88 oz. per ton; silver, 13 oz. per ton; copper, 0.5 per cent.; lead, 14.4 per cent. At the west end there was 3 feet of vein, but the whole width was not so well mineralized. The ground left at the west end of the stope for some distance below the roof had 6 to 8 inches well-mineralized with galena along the foot-wall, separated by a horse from 12 to 18 inches of ore along the hanging-wall. The top of the stope was within a few feet of No. 2 level in the section not far west of the winze. Shipments made in the first half of 1937 were reported to have come entirely from this stope; they amounted to 127.4 tons, which averaged: Gold, 0.65 oz. per ton; silver, 12.8 oz. per ton; lead, 20 per cent. Additional ore from this stope, amounting to 12 or 13 tons, was sacked and piled at the portal. A narrow fracture has been exposed by stripping for about 15 feet westerly from No. 3 portal. It is filled with quartz containing a little galena. For most of the length the fracture is not more than 1 inch wide, it strikes south 65 degrees west and dips 65 degrees southerly. At the end of the stripping the strike is due west and the dip is 80 degrees to the south, the width is 3½ inches. At this point there are parallel joints in the 2 feet south of the fracture.

No. 4 adit at 5,960 feet elevation starts as a crosscut driven northerly following a narrow lamprophyre dyke of steep westerly dip. It reaches the vein at 135 feet from the portal. A drift extends 40 feet to the east and to the west there is a drift 350 feet long. The vein contains 2 feet of quartz where intersected; 8 feet east it splits, one branch, 6 to 8 inches wide, strikes south 80 degrees east and at 22 feet passes into the wall. The other branch narrows gradually and is 8 to 10 inches wide at the face, 40 feet from the adit-crosscut; the strike is north 85 degrees east. This quartz is not well mineralized. West of the crosscut the strike of the vein is almost due west for about 270 feet. The width of quartz decreases from 2 feet to about 15 inches in the first 20 feet. This quartz contains some galena. The vein then splits, a foot-wall branch leaves the drift about 50 feet from the crosscut. Another branch continues along the south wall and 18 inches of quartz has been exposed by breaking through a slip at the south wall. This quartz is rusty and honeycombed. The amount of quartz decreases for some distance to the west, and there is more wall-rock between the walls of the fracture. From 140 to 185 feet there is a width of 6 to 8 inches along the foot-wall which is quite well-mineralized with mixed sulphides. Several narrow lamprophyre dykes cut the vein, and at 185 feet there is a 3-foot dyke, striking north to south. In 10 feet beyond the dyke the quartz widens from 8 to 24 inches, and widens to 30 inches at about 200 feet from the adit-crosscut, at which point there is a raise. Beyond the raise the width of quartz is 15 to 18 inches, to about 270 feet from the crosscut. At the widest point the quartz at the foot-wall is fairly well-mineralized. For 20 feet east and 70 feet west of this point the quartz is generally well-mineralized with sulphides. At 270 feet the course of the vein changes to north 80 degrees west and the width narrows gradually to 6 inches, but increases to 12 inches and narrows again to 8 inches in the face of the drift. On this level the walls of the fracture are usually from 2 to 3½ feet apart; quartz and altered wall-rock, or in some sections less altered horses of granodiorite, fill the fracture. The raise has reached a point about 55 feet above the level; a short drift runs 10 feet to the east at about 30 feet up. Some stoping was

done from this raise, presumably behind the chute which is on the west side. From immediately above the roof of the level to a point about 15 feet higher the vein-filling consists of 6 to 8 inches of mineralized quartz on each side of a horse about 12 inches thick. Beyond this point rusty quartz 18 to 24 inches wide containing some galena extends to the top of the raise. The foot-wall appears to be sheared here. It is reported that the first three shipments of ore from the mine came from this raise and stope. These amounted to 43.5 tons, averaging: Gold, 0.44 oz. per ton; silver, 35.5 oz. per ton; lead, 51 per cent.

No. 5 adit portal at approximately 5,870 feet elevation is about 400 feet from No. 4 portal, on a course of north 75 degrees east. It starts from a 20-foot open-cut driven on the vein, and continues as a drift for about 80 feet. The strike of the vein is north 85 degrees west and the dip 75 to 80 degrees to the south. The vein-filling, generally from 6 to 15 inches wide, is quite oxidized, though it contains some galena. It is reported that values so far obtained in this working have been low.

Between 20 and 300 feet southerly from the camp on the steep slope there are some old workings, consisting of small cuts and two short adits. The one adit at about 100 feet below the camp was driven 25 feet, following 3 to 6 inches of quartz which strikes from east to west and dips steeply to the south. In the face on the north side there is a quartz-stringer striking from north-east to south-west and dipping north-westerly. Straight down the hill, about 50 feet lower, the second adit was driven at from 20 to 30 degrees west of north for 60 feet. For 40 feet from the portal the adit was timbered and lagged. The inner 20 feet showed a shear from 12 to 15 inches wide striking north 30 degrees west and dipping steeply to the west. Quartz on the dumps of both adits is honeycombed, rusty, and contains a little galena.

The *Wisconsin* and *Lucky Strike* Crown-granted claims are owned jointly by C. Hussey, A. T. Fleming, and G. Fleming, of Spokane, and the estate of H. H. Stambaugh, c/o F. Stambaugh, of Youngston, Ohio. The claims are situated on the ridge between Seeman Creek and Hughes Creek, tributaries of Midge Creek. The position of these claims is shown on the sketch-map of the Bayonne-Midge Creek area. Surrounding and extending north and south from the *Wisconsin* and *Lucky Strike* there are sixteen located claims in three groups. The *Aerielle* and *Belknap* groups are held in the names of A. C. Frost, of Seattle, and his associates. It is understood that the Crown-granted claims, and also the *Strathecona* group, which is owned by E. C. Wragge, of Nelson, and associates, are under lease and bond to Frost and associates.

From Midge Creek Siding, on the railway at Kootenay Lake, a narrow truck-road extends for about 6 miles up Midge Creek. From the end of the road a pack-trail continues up the creek, then crosses to the south-west side of the valley and a short distance farther crosses Hughes Creek. From the Hughes Creek bridge the trail climbs about 2,500 feet to the workings at 6,100 feet elevation, in a distance of roughly 4 miles. The total distance from the railway is about 12 miles. The country traversed was burned over a few years ago, and is generally steep, but from the crossing of Midge Creek there is very little rock exposed. There is a warehouse, with accommodation for the packer, at the siding. The camp at the property will accommodate about fifteen men.

The camp is in a little basin at the head of a small tributary which flows south-easterly to Hughes Creek. The portal of No. 1 adit is 200 feet north-west of the camp. To the west the ground rises in a gentle slope to a ridge about 500 feet above the camp. The basin is in the bend where a north-easterly-trending spur leaves the ridge. The rounded crest of the spur is at about 6,350 feet elevation on the line between No. 1 adit and No. 4 adit, the latter being on the north-westerly slope to Seeman Creek. In the vicinity of the workings the slopes toward Hughes Creek are moderate. Outcrops are not numerous and there is commonly from 2 to 8 feet of overburden, as shown by the surface-cuts. This section also was burned over and practically all the trees were killed.

The outcrops on the ridge to the west are principally quartzite, mica-schist, and limestone. Some of the schist contains curious twig-like aggregates of mica, and some of the quartzite is micaceous. There are fewer outcrops on the north-east spur, but it appears to be underlain principally by similar rocks including some argillite. In the vicinity of the camp there are outcrops of a medium-grained grey granitic rock which is also exposed underground. A specimen of this rock has been determined as a biotite-quartz-diorite. The occasional outcrops and the exposures underground suggest that in the vicinity of the principal workings there is a small and very irregular mass of quartz-diorite, from which narrow offshoots

penetrate the other rocks. The sediments generally have a northerly strike and dip from 45 degrees westerly to vertically.

The development-work has been principally on mineralization which has an average strike of north 30 degrees east and dips from 55 degrees to 70 degrees westerly. Oxidation has extended to considerable depths and in the surface and shallow workings the sulphides are quite largely represented by rusty gossan. Mineralization has been traced by cross-cutting surface-trenches over a length of about 900 feet. The workings expose shearing following the general strike, from which branch shears tend to diverge. The shearing is marked by from 6 inches to 2 feet of gouge and at some points by brecciation extending for several feet. From the central part of the deposit northerly the shearing appears, in a general way, to follow the western margin of the intrusive. The contact is very irregular, salients of sediments occur in the granitic rock, and offshoots of quartz-diorite extend north-westerly into the sediments. For some distance from the shearing and the contacts the rocks have been altered hydrothermally to the extent that recognition of the original character may appear impossible. The widespread staining by iron oxide increases the difficulty of recognition in the shallow workings. Some apparently pure limestone has not been materially altered. Quartz and sulphides occur in irregular lenticular masses, generally along the shearing. The sulphide lenses are from a few inches to 4 or 5 feet wide. Quartz and sulphides are also developed in the altered rock; calcite and siderite also occur. At some points overlapping sulphide lenses with disseminated mineralization give widths of 15 or 20 feet, and it appears that greater widths may occur where a branch diverges from the main shear. The greatest widths usually include horses of barren or very low-grade material.

Some of the oxidized material carries good values in gold, and some appears to have been thoroughly leached. Gold and silver are apparently associated with sulphide minerals below the zone of oxidation. Pyrite and arsenopyrite are abundant, chalcopyrite can be recognized occasionally, and in some sections sphalerite is to be seen. A small lens of galena was encountered in the north drift on the 150-foot level, and this mineral is also found veining the other sulphides. A sample of siderite from the north drift was found to contain 15 per cent. manganese. Some specimens of sulphide mineralization were studied in the laboratory; the microscopic study indicates that pyrite and arsenopyrite may be quite fine-grained, and in some cases are intimately intergrown. Chalcopyrite was found principally in veinlets in fractured pyrite and arsenopyrite. Some ore submitted by the operators of the property was tested in the Ore-dressing Laboratory of the Department of Mines and Resources at Ottawa. Microscopic study there indicated that sphalerite and a little chalcocite were found veining pyrite and arsenopyrite. Sphalerite as small masses, and sphalerite and chalcocite as tiny grains, were found in chalcopyrite. A little fine free gold was also reported as occurring in chalcopyrite.

Gold, silver, and copper occur in variable quantity through a considerable volume of mineralized material, zinc and lead appear to be more localized. The following tabulation of assays of samples of unoxidized material, taken by the writer, from the 150-foot level and from the winze, give an indication of the variability:—

Description.	Width.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Ft. In.	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.
From face north drift, 156 feet from winze, disseminated sulphides in altered limestone with quartz and carbonate	5 4	0.09	0.4	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Lens of galena east side north drift, 150 feet from winze	7	0.12	33.6	----	56.0	----
Lens of sulphides west side drift, 118 feet north of winze	18	0.64	2.4	0.5	<i>Nil</i>	<i>Nil</i>
Lens of sulphides in hanging-wall of winze, about 125 feet below No. 1 level	----	0.27	2.6	<i>Nil</i>	----	----
Quartz with sulphides from crosscut to east, 30 feet south of winze	3 6	0.20	0.6	<i>Nil</i>	20.0	<i>Nil</i>
Face of drift, 145 feet south of winze, massive mixed sulphides, east side drift	15	0.50	4.6	<i>Nil</i>	4.0	<i>Nil</i>
Quartz with disseminated sulphides adjoining previous sample	15	0.20	1.0	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>

In this deposit there seems to be a good chance of developing a substantial tonnage of material carrying moderate values in gold and some silver. Testing to date indicates that the gold is intimately associated with sulphides. The ratio of precious metal to sulphides is rather low, and base metals are not present in sufficient quantity to be of much value. According to the last information which reached the writer, metallurgical tests, which were still in progress, had not yet resulted in discovery of an economic milling process for treating this ore. Failing a milling process, the value of the deposit would appear to depend on discovery of material of sufficient quantity and value to warrant construction of a smelting plant within range of the property.

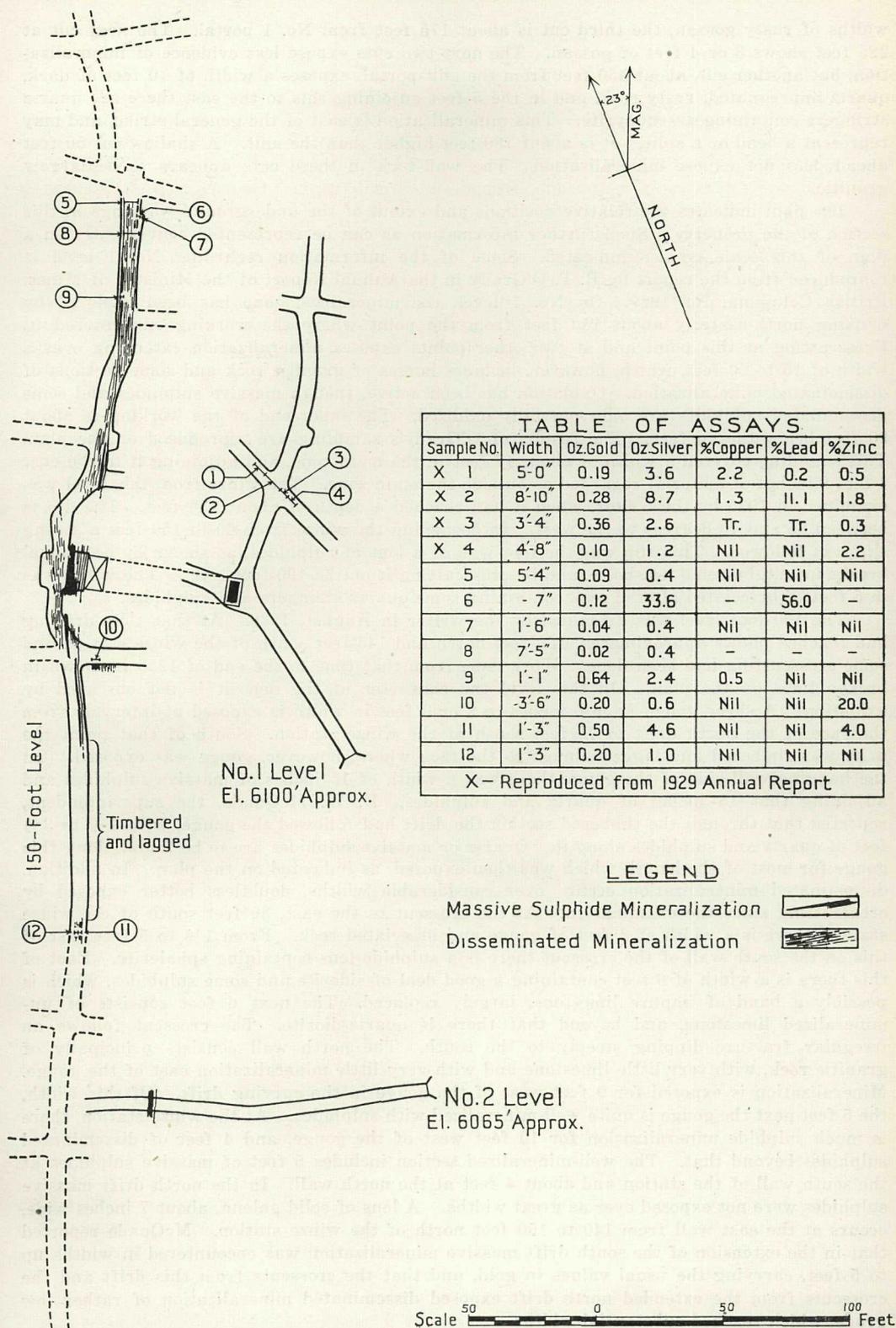
The property was the subject of a report by W. Fleet Robertson, under the heading "Lucky Strike group," in the Annual Report of the Minister of Mines for 1903, and under the heading "Wisconsin" was referred to in the Annual Report of the Minister of Mines for 1928, and in several reports since then. After many years of inactivity the property was examined in 1926 for Porcupine Goldfields Development and Finance Company, Limited. Since that date there have been several examinations and more recently substantial development-work has been done. In 1928 there was a radiore survey. In 1933 a programme of surface-trenching was carried out and three diamond-drill holes, totalling about 1,000 feet in length, were put down. These holes deflected from the initial directions and the results were inconclusive. A. C. Frost, of Seattle, and associates became interested in the property and have financed the work done in the past three years. In 1935 a McCormick-Deering Diesel engine rated at 50 horse-power, a Gardener-Denver compressor rated at 220 cubic feet of free air per minute, a small hoist, pumps, rock-drills, and other equipment were taken to the property from Midge Creek Siding on pack-horses. The winze extending 60 feet below No. 1 level was straightened and reconditioned, and by the end of the season had been extended to an inclined depth of 150 feet, and a station had been cut at that depth. The next season, after unwatering the winze, drifting was commenced on the 150-foot level. By the end of the season approximately 520 feet of drifting and 225 feet of crosscutting had been accomplished. In 1937 the workings were unwatered, but operations were suspended about mid-summer. In 1936 and 1937 a road from Midge Creek Siding was built to a point about 6 miles from the railway.

The workings are principally on the Crown-granted claims, and include about a score of cuts distributed along the general trend of the mineralization, explored underground by Nos. 1 and 2 adits, the 150-foot level, and by a shaft sunk from a point about 425 feet southerly from No. 1 portal. The No. 1 portal is near the common boundary between the *Wisconsin* and *Lucky Strike* claims. The other workings, consisting of surface-cuts, a 10-foot shaft, and adits Nos. 3, 4, and 5, are not directly connected with the principal showing.

The underground workings on the principal showing are represented on the accompanying plan. From a cut 75 feet south-west of No. 1 portal, surface-cuts crossing the strike are spaced at intervals of about 50 feet for about 500 feet southerly. These cuts are at about the same elevation as No. 1 level. The collar of the shaft, previously mentioned, is about 380 feet southerly from the first cut and 15 feet lower than No. 1 level. The shaft is reported to be 113 feet deep. The shaft-dump consists largely of rusty gossan, though some sulphides were noticed. The cuts expose rusty gossan from 3 or 4 feet to about 12 feet wide. There is a suggestion of lenses arranged *en échelon*. The wall-rock is largely mica-schist or micaeous quartzite, though quite commonly one wall is composed of altered granitic rock.

No. 2 level is a crosscut driven westerly from a point about 140 feet south of No. 1 portal, and at approximately 35 feet lower elevation. It cuts through quartz-diorite at the portal, then enters a band of limestone followed by altered sediments. At about 100 feet from the portal it encounters 2 feet of gouge followed by 3½ feet of massive, partly oxidized sulphides, and beyond that 12 feet of thoroughly oxidized material. The crosscut continues to about 140 feet from the portal in shattered rusty schist.

There is a gap of about 100 feet from the first cut mentioned to the next cut north, which is about 60 feet north of No. 1 portal. A series of cuts extends northerly up the slope for about 450 feet. The first cut north of the portal exposes 2½ feet of solid sulphide mineralization lying just west of 6 feet of kaolinized, quartz-impregnated, rusty, granitic rock. On the east side rusty, honeycombed rock, 6 feet wide, composed largely of quartz, is separated from the sulphide lens by 5 feet of kaolinized quartz-diorite. Three cuts up the slope show good



Wisconsin Group. Principal underground workings. 150-foot level from Superintendent's compass survey, extensions after August, 1936, in broken lines.

widths of rusty gossan, the third cut is about 175 feet from No. 1 portal. The next cut at 225 feet shows 3 or 4 feet of gossan. The next two cuts expose less evidence of mineralization, but another cut, about 450 feet from the adit-portal, exposes a width of 10 feet of dark, quartz-impregnated, rusty rock, and in the 5 feet adjoining this to the east there are quartz stringers containing arsenopyrite. This mineralization is east of the general strike, and may represent a bend or a split. It is about 180 feet higher than the adit. A shallow cut 50 feet ahead does not expose mineralization. The wall-rock in these cuts appears to be largely granitic.

The plan indicates the relative positions and extent of the underground workings in this section of the property. Such further information as can be represented conveniently on a plan of this scale is also indicated. Some of the information regarding No. 1 level is reproduced from the report by B. T. O'Grady in the Annual Report of the Minister of Mines, British Columbia, for 1929. On No. 1 level, the mineralized zone has been explored by drifting north-easterly about 150 feet from the point where the working encountered it. Crosscutting at this point and at two other points exposes mineralization extending over a width of 15 to 20 feet, which, however, includes horses of granitic rock and some sections of disseminated mineralization. Oxidation has been active, though massive sulphides and some disseminated sulphides are only partially oxidized. The inner end of the working is about 90 feet below the surface. The results of O'Grady's sampling are reproduced on the plan. This sampling covered a width of about 17 feet in the main zone, and adjoining it to the east 4 feet 8 inches of material regarded as outside the main zone. The winze from this level was examined in 1935 by the writer, when it had reached a depth of about 130 feet. The dip is between 65 and 70 degrees to the west. In deepening the winze from 60 to 150 feet a strong slip was followed. This slip was the foot-wall of a lens of sulphides, as shown by occasional breaks into it, by some test-holes, and by crosscutting it on the 150-foot level. The winze was in 5 feet of brecciated altered rock containing some quartz stringers and sulphides.

The 150-foot level was examined by the writer in August, 1936. At that time drifting had reached points approximately 150 feet north and 145 feet south of the winze station and some crosscutting had been done. Work done from that time to the end of 1936 is shown in broken lines on the plan. On this level the character of the deposit is not obscured by oxidation. A shear-gouge from 6 inches to 2 or 3 feet in width is exposed at intervals from the face of the north drift to 75 feet south of the winze station. South of that point the drift was timbered and lagged almost to the face where, however, gouge was exposed. On the hanging-wall side of the gouge there was a width of 15 inches of massive sulphides and adjoining that 15 inches of quartz and sulphides. E. W. McQuade, the superintendent, reported that through the timbered section the drift had followed the gouge, with 1½ to 3½ feet of quartz and sulphides along it. Quartz or massive sulphides are to be found along this gouge for most of the length which was then exposed, as indicated on the plan. In addition, disseminated mineralization occurs over considerable widths, doubtless better exposed by crosscutting since the examination. At the crosscut to the east, 30 feet south of the winze station, there is a width of 3 feet of gouge and brecciated rock. From 1½ to 5 feet east of this on the south wall of the crosscut there is a sulphide lens containing sphalerite. East of this there is a width of 6 feet containing a good deal of siderite and some sulphides, which is possibly a band of impure limestone, largely replaced. The next 6 feet consists of un-mineralized limestone, and beyond that there is quartz-diorite. The crosscut follows an irregular fracture dipping steeply to the south. The north wall consists principally of granitic rock, with very little limestone and with very little mineralization east of the gouge. Mineralization is exposed for 9 feet west of the gouge in the curving drift. Of this width, the 5 feet next the gouge is quite well-mineralized with sulphides. At the winze station, there is much sulphide mineralization for 10 feet west of the gouge, and 4 feet of disseminated sulphides beyond that. The well-mineralized section includes 5 feet of massive sulphides at the south wall of the station and about 4 feet at the north wall. In the north drift massive sulphides were not exposed over as great widths. A lens of solid galena, about 7 inches wide, occurs at the east wall from 140 to 150 feet north of the winze station. McQuade reported that in the extension of the south drift massive mineralization was encountered in widths up to 5 feet, carrying the usual values in gold, and that the crosscuts from this drift and the crosscuts from the extended north drift exposed disseminated mineralization of rather low grade, which reached substantial widths.

No. 3 level, an adit now caved at the portal, was driven northerly from a point about 1,000 feet easterly from No. 1 portal, and at 120 feet lower elevation. It is reported that No. 3 level was designed to intersect the mineralization explored in the principal workings, and that it was apparently deflected to follow some minor fractures or joints. According to report, more than 1,000 feet of driving was done on this level. No. 5 level is a short adit driven from a point 500 feet east of No. 1 portal, at about 50 feet higher elevation. The underground work amounts to about 40 feet, exposing rusty, leached micaceous material, probably chiefly mineralized mica-schist. It is reported that this material carries negligible values. There are several open-cuts in the section extending up the slope between the portals of Nos. 3 and 5 levels. A 10-foot shaft on the crest of the spur exposes a little evidence of mineralization.

On the north-westerly slope of the spur, about 900 feet north-easterly from the last cut on the main showing and 1,400 feet from No. 1 portal, trenching has exposed bands of limestone lying between bands of mica-schist. In a 10-foot band of thin-bedded limestone, near the eastern end of the trenching, a rusty fracture 6 to 8 inches wide is exposed. The strike is about north-south and the dip 65 degrees westerly. No. 4 adit is about 90 feet south of this showing at approximately 6,200 feet elevation. The adit has been driven 25 feet due south and is timbered to the face, where there is a 2-inch rusty streak in limestone which strikes north 20 degrees west and dips 65 degrees westerly.

GREENSTONE AREA SOUTH OF NELSON.

In the following pages a property on Toad Mountain, another south-east of the highway 9 miles south of Nelson, three properties on Hall Creek, and one on the East Fork of Erie Creek are described. Small shipments of gold-bearing ore were made from four of the properties in 1937 and from a fifth in 1936. The properties have in common the fact that they are situated in an area underlain principally by greenstones which have been called the Rossland volcanic group. Tuffs and limestone occur with the greenstones, and in the vicinity of lower Hall Creek argillaceous sediments and conglomerate are found. Nelson is near the north-east corner of the area which is indicated on the West Kootenay Sheet of the Geological Survey of Canada published in 1904, and in greater detail on the Nelson Sheet published in 1912, the Ymir Sheet published in 1916, and the Salmo Sheet published in 1934. On the Salmo Sheet the rocks are mapped as Beaver Mountain-Rossland group, and in the Salmo Memoir 172 J. F. Walker points out that the association of the younger Beaver Mountain series with the Rossland series is so intimate that it is impossible to differentiate between them on a map at a scale of 1 mile to the inch. The geology of the area in the vicinity of Nelson and Ymir is described in Memoirs 94 and 191 of the Geological Survey, while the geology of the area to the south is described in Memoir 172. Concerning the volcanic group W. E. Cockfield wrote, in Memoir 191 published in 1936:—

“The rocks of this belt consist of a complex assemblage of basic volcanic rocks with pyroclastics. Bands of slate, tuff, and limestone occur. Augite andesite, augite porphyrite, hornblende andesite, and augite-feldspar porphyry are the main rock types. In places these rocks are highly sheared and converted to chlorite schists.”

The volcanic group adjoins, and in part surrounds, considerable masses of granitic rocks of the Nelson batholith. Numerous dykes, which are not necessarily related to the Nelson granitic intrusive, cut the rocks of the volcanic group. Veins in the area quite commonly occur along or close to dykes.

The principal producing mine in the Greenstone area is the *Second Relief* on Erie Creek, where approximately 100 tons of ore are mined and treated daily. At intervals for several year lessees have shipped ore from the *Arlington* and *Keystone* mines, which occur in argillaceous rocks within the greenstone area in the Erie Creek section. For several years there has been a considerable production of shipping-ore from the *Clubine-Comstock* property on Boulder Creek. Lessees have made shipments of ore from the *Porto Rico* and *Spotted Horse* properties on Barrett Creek. A small quantity of ore was produced from the *Fern* on Hall Creek in 1935. In the vicinity of Nelson lessees have been making shipments of ore from the *Venus-Juno* and the *Athabasca* properties, on which the veins are partly in greenstone and partly in granitic rock. Several properties farther west are similarly situated, and have production records from former years. A number of the properties which have been mentioned also have previous production records, as has the *Perrier* property. Gold contributes

the principal value to the ores from all these properties, though values in silver are present. This is also true of the properties described in the following pages. While in general the veins are narrow, very good values have been obtained. Quite commonly high values in gold occur in the oxidized parts of veins. The gold was apparently deposited largely in association with sulphides. The quantity of quartz or carbonate vein-filling is variable, in some cases very little of such gangue matter is present, and the sulphide mineralization is developed along fracturing or shearing. In other cases there are more typical quartz veins. The sulphide minerals present are also variable in quantity and species. In some cases the base-metal content is of value, principally where galena gives the ore value in lead. Within the area the *Silver King*, on Toad Mountain, is a former producer of copper and silver, and there are some copper prospects.

The area is readily accessible from the Canadian Pacific and Great Northern Railways, the Provincial highways, and branch roads which serve various sections. Roads or trails are to be found on most of the creeks. From the end of the road up Barrett Creek a trail over the summit connects with the Erie Creek road, giving access to a considerable section. In 1937 the trail up Hall Creek and over the summit to Forty-nine Creek was reconditioned and work was done on the upper parts of the roads up both creeks. Three of the properties described are situated on Hall Creek, up which a road extends for 2½ miles from a point on the Nelson-Nelway Highway about 10 miles south of Nelson.

References to various properties in this area will be found in the Annual Reports of the Minister of Mines, British Columbia, and in the publications of the Geological Survey of Canada which have been mentioned. With the exception of the *Euphrates*, the properties described in this section have not been described in the Annual Reports of the Minister of Mines.

Daylight and Berlin.

Two adjoining Crown-granted claims, the *Daylight* and *Berlin*, which had reverted to the Crown, were leased in 1936 by the four Rolick brothers, of Nelson. The claims are situated south of Nelson a short distance north-easterly from the workings of the *Silver King* mine. The ground covered by the claims includes a flat area extending north-easterly on top of a spur from Toad Mountain. The sides of the spur slope steeply to the north-west and to the south-east. This area was apparently cut over when the *Silver King* mine was in operation, but is now grown up with young spruce, balsam, and pine. The property is reached by a branch from the *Silver King* road. The distance from Nelson is about 9 miles. The road climbs by a series of switchbacks, gaining a total elevation of about 4,000 feet above lake-level.

The property had been prospected by a shaft intersected by a short adit and by several pits or trenches reported to have been made about forty years ago. The Rolicks cleaned out the old adit and two short drifts running southerly from it, and stoped ore on either side of the shaft for a short distance below the adit-level. A shipment of 16.8 tons, made in June, 1937, contained 3.05 oz. gold and 1.6 oz. silver per ton. A similar quantity was ready for shipment in September.

There are extensive outcrops west of the workings, but on the flat outcrops are not so numerous. The shaft and adit are in sericite-schist which strikes at about 55 degrees west of north and dips at from 45 degrees to 55 degrees to the south-west. Similar rock is exposed on the north-east side of a low ridge about 500 feet north-west of the adit. The main part of this low ridge, which trends north-westerly between the *Daylight* and *Silver King* workings, consists of foliated greenstone. The strike and dip of the foliation are roughly parallel with those of the sericite-schist. Some 300 feet south-west of the sericite-schist outcrop there are several small veins and lenses in the greenstone in general following the foliation. These contain chlorite, small needles of tourmaline, and a little epidote; one showed a little copper-stain.

Roughly 100 feet north-easterly from the sericite-schist outcrop there is a pit down 7 feet, which exposes greenstone sheared across a width of 3 feet. The shearing strikes north 20 degrees west and dips 45 degrees westerly. In this shear there are small lenses of rusty quartz-carbonate material, the rust probably being derived from ankerite. Three hundred feet north-westerly is a second pit down 10 feet. It exposes greenstone intensely sheared for a width of 8 feet. The shearing strikes north 50 degrees west and dips 50 degrees to the south-west. A sample of 2 feet of rusty greenstone at the hanging-wall side of the shear

assayed: Gold, trace; silver, 0.2 oz. per ton. A sample of 18 inches of rusty quartz in the middle of the south side of the pit also assayed: Gold, trace; silver, 0.2 oz. per ton.

From the end of a 20-foot cut in rock the adit is driven south-west for 55 feet, ending at the shaft, which it intersects about 25 feet below the surface. From a point 35 feet from the portal a drift extends for about 20 feet at south 55 degrees east. The wall-rock is sericite-schist of light greenish-grey colour when fresh. It strikes about north 55 degrees west and dips 55 degrees to the south-west. The drift follows 4 to 10 inches of quartz mineralized with fine-grained pyrite and chalcopyrite, dipping less steeply than the schist and flattening toward the end of the drift, where it dips 35 degrees to the south-west. At this point the ground is stoped to the surface. From the shaft a narrow drift extends for about 35 feet at south 60 to 70 degrees east. A wedge-shaped block of ground has been stoped below this drift; the depth stoped runs from 12 feet at the shaft to nothing toward the end of the drift, where a slip of low dip to the west was encountered. A break-through connects this drift with the end of the drift nearer the portal. At the shaft there is a quartz-lens 6 to 8 inches wide on the north side, and another 4 to 8 inches wide on the south side. These appear to die out about where the flat slip was encountered, say, 20 feet in. From this point on the drift follows a narrow fracture dipping steeply to the north. On the opposite side of the shaft a narrow quartz vein striking due west and dipping 70 degrees to the south has been followed for 5 feet.

The shaft is reported to extend 75 feet below the adit-level. When the property was examined in September the water-level was about 12 feet below the adit. From this level a narrow drift extends 45 feet in a direction of about north 75 degrees west. In the first 15 feet from the shaft the ground below the drift has been stoped to a depth reported to be 8 feet. The inner 25 feet of the drift has been stoped to about 10 feet above the floor. The sericite-schist in this working is seen to be cut by irregular lenses and veinlets of quartz, the schist being silicified along the sides of small fractures which have no uniform attitude. Fine-grained pyrite and chalcopyrite are developed as small grains in the quartz and the silicified schists. Silicified schist containing very little sulphide was sampled; it assayed a trace in gold and silver.

The sorted shipping-ore consists of quartz or intensely silicified schist, mineralized with fine-grained pyrite and chalcopyrite. There are occasional small masses of chalcopyrite and of grey copper. Some of the material is rusty, but quite fresh-looking ore may assay several ounces in gold per ton. A large grab sample from about 2 tons of fine screenings from the rejects assayed: Gold, 0.34 oz. per ton; silver, 0.5 oz. per ton. This material, consisting very largely of schist, was being separated with a view to shipment. The total ore shipped in the year amounted to 43 tons, yielding 89.0 oz. gold and 45.0 oz. silver.

Material reported to be typical of the highest-grade ore consisted of schist largely replaced by quartz, mineralized with small disseminated sulphide grains. A microscopic study of a specimen of this material shows that the sulphides consist of small grains of pyrite, some of which contain minute inclusions of pyrrhotite. Gold was observed in the form of grains and stringers, in the gangue near pyrite, in pyrite, and at the contact of pyrite with gangue. The size-distribution reported was as follows:—

Number of Grains.	Largest Dimension.
2	plus 50 mesh (plus 250 microns).
3	minus 50 plus 100 mesh (minus 250 plus 140 microns).
5	minus 100 plus 200 mesh (minus 140 plus 74).
8	minus 200 plus 325 mesh (minus 74 plus 43 microns).
8	minus 43 microns plus 30 microns.
3	minus 50 microns plus 20 microns.
2	minus 20 microns plus 10 microns.
9	minus 10 microns plus 5 microns.
12	minus 5 microns.

Gold exceeding 200 mesh in size in the above table in all cases takes the form of stringers. In other words, the length of the stringer is shown here; the width varies from 10 to 1 microns.

Euphrates. Twenty located claims, situated south-east of Salmo River, about 9 miles south of Nelson, are owned by the Euphrates Mining Company, Limited (N.P.L.). The executive office of the company is in Nelson. The camp built for the *Golden Age* property on the other side of Cottonwood Creek is used. The camp, the *Euphrates* power plant, and the lower terminal of an aerial tramway from the workings, are convenient to Golden Age Siding on the Great Northern Railway Company branch line to Nelson, and to the Nelson-Nelway Highway. Supplies are taken up on the aerial tramway, the upper terminal of which is near the lower *Ell Tee* portal and the mine camp, approximately 1,000 feet above the Salmo River. The workings and camp are also served by a trail up the steep slope. The power plant consists of an air-compressor driven by a Pelton wheel, the water for which is flumed from Clearwater Creek, a distance of about 7,000 feet. There is also a 125-horse-power Diesel engine available in the event of failure of the water-power supply.

The claims cover a north-westerly-facing slope which rises steeply to an elevation of about 1,500 feet above the Salmo River, and more moderately beyond that point. Most of the area covered has been burned over, though some patches of living trees remain. There are extensive rock-exposures on the steep slopes. At higher elevation overburden is generally 2 or 3 feet thick. The rocks exposed are greenstones of the Rossland volcanic group, including augite porphyry, andesitic phases, finer phases, and a considerable mass of volcanic conglomerate. The matrix is generally chloritic and the rocks are commonly schistose. The foliation strikes about north 40 degrees west and generally dips steeply to the south-west. Mineralization occurs in four veins or shear-zones, the *Lost Cabin*, *Ell Tee*, *Minto*, and *Nickel Plate*. This report is concerned principally with the last two, on which recent work has been concentrated. All these occurrences are developed along shearing which in general has the same strike as the foliation in the greenstone. The dips are less uniform. The *Ell Tee* vein dips to the north-east cutting the dip of the foliation. The *Minto* vein has an irregular dip, which cuts across the dip of the foliation in some sections and in others follows it. The *Lost Cabin* shearing generally follows the dip and strike of the foliation, but quartz-lenses in the shear-zone cut the foliation on the dip. The so-called *Nickel Plate* vein consists of a light-coloured dyke intruded along shearing in the greenstone. The dyke contains disseminated sulphides. Quartz-filled fractures or stringers cut the dyke and to some extent cut the altered wall-rock. Sulphides are developed in the quartz and disseminated in the altered wall-rock. Lenses of sulphides occur in the *Ell Tee* and *Minto* veins, but in the *Lost Cabin* shear-zone the mineralization is generally sparingly disseminated. The sulphides include arsenopyrite, pyrite, sphalerite, galena, and chalcopyrite, all visible to the naked eye, while some tetrahedrite has been recognized under the microscope. Good values in gold were obtained in oxidized material from the *Ell Tee* vein, and sulphide lenses in the same vein also carry gold. Quite good values in gold occur with the sulphides in the *Minto* vein. A small vein on the *Ell Tee* lower level, well beyond the zone of oxidation, contains free gold. Gold values in the oxidized zones of the *Log Cabin* and *Nickel Plate* deposits do not appear to be high, but apparently are higher than in unoxidized material.

The property includes the old *Lost Cabin* group which was under development during the war. The *Euphrates* and several other claims were staked in 1926, and additional claims have been staked more recently. The Annual Report of the Minister of Mines, British Columbia, for 1917, contains a reference to the *Lost Cabin*, and under the name of "*Euphrates*" references appear in the Annual Reports of the Minister of Mines, British Columbia, from 1926 to 1934. Particularly in the 1929 report more detail will be found concerning the *Lost Cabin* and *Ell Tee* occurrences than is given here. The *Lost Cabin* was the subject of a reference in Memoir 94 of the Geological Survey of Canada, and a more extensive report on the *Euphrates* appears in Memoir 191, published in 1936.

Workings on the property are distributed over a considerable area. A number of the older workings are now inaccessible. The principal accessible underground workings are indicated on the accompanying small-scale map. These workings consist of two adits on the *Minto* vein and an extensive adit-level exploring the *Ell Tee* and *Nickel Plate* veins.

Two old adits on the *Lost Cabin* shear-zone are now inaccessible. Three surface-cuts in a distance of about 300 feet and a partly caved winze 250 feet south-east of the last cut are accessible. According to the company map, the winze is 830 feet higher than the portal of

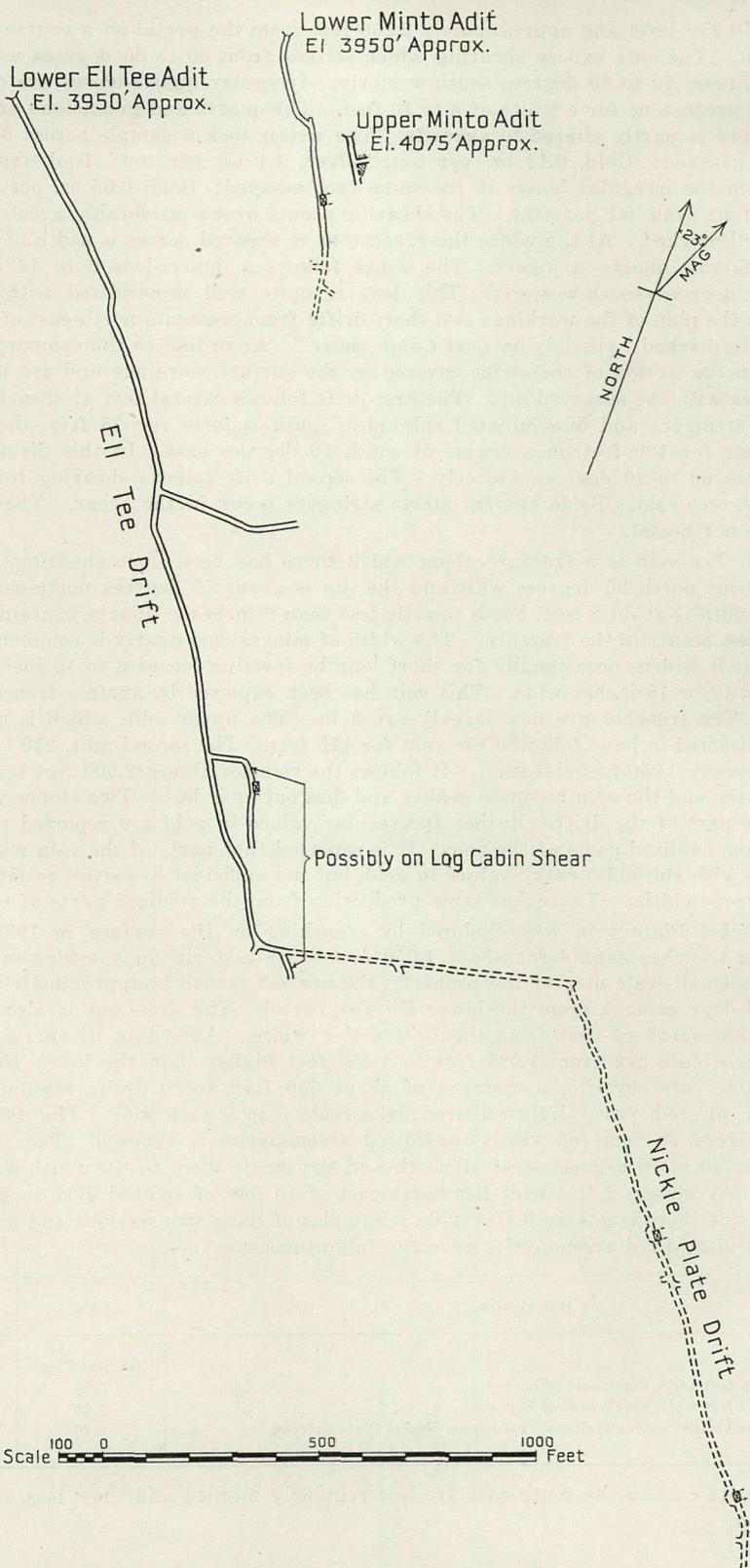
the lower *Ell Tee* level and approximately 2,200 feet from the portal on a course of south 42 degrees east. The cuts expose shearing which strikes from 30 to 50 degrees west of north and dips at from 70 to 80 degrees south-westerly. Irregular quartz-lenses are developed in the sheared greenstone for a width of 8 to 10 feet. The quartz and greenstone are rusty and the greenstone is partly altered to ankerite. The writer took a sample across 6 feet in one cut, which assayed: Gold, 0.12 oz. per ton; silver, 1.1 oz. per ton; lead, trace. Quartz selected from the irregular lenses in the same face assayed: Gold, 0.06 oz. per ton; silver, 1.8 oz. per ton; lead, 0.1 per cent. The shearing occurs over considerably greater width but is not so well marked. At the winze the greenstone is sheared across a width of 10 feet and is cut by narrow quartz stringers. The winze follows a quartz-lens 6 to 12 inches thick dipping 25 degrees south-westerly. This lens is quite well mineralized with pyrite and galena. On the plan of the workings two short drifts from crosscuts north-east of the *Ell Tee* adit-drift are marked "possibly on *Lost Cabin* shear." According to the company map these drifts are in the section of the strike covered by the surface workings and are in a position which agrees with the observed dip. The first drift follows several feet of shearing, containing quartz stringers and disseminated sulphides, south-easterly for 75 feet, then follows a narrow shear for 120 feet on a course of south 10 degrees east. In this distance the dip changes from 60 to 20 degrees westerly. The second drift follows shearing for 70 feet at south 40 degrees east. Some barren quartz stringers occur in the shear. The dip here is steep to the north-east.

The *Ell Tee* vein is a fracture along which there has been some shearing. The strike averages about north 35 degrees west and the dip is about 75 degrees north-easterly. The maximum width is about 2 feet, but is usually less than 9 inches. Quartz, containing more or less sulphides, occurs in the fracture. The width of mineralized quartz is commonly less than 4 inches, but it widens occasionally for short lengths forming lenses 8 to 10 inches wide and occasionally 12 or 15 inches wide. This vein has been explored by surface-trenching and by two adits. The trenches are now largely caved in. The upper adit, which is caved at the portal, is reported to have followed the vein for 175 feet. The second adit, 210 feet lower, is at approximately 3,950 feet elevation. It follows the vein for almost 2,000 feet south-easterly, but toward the end the vein becomes weaker and dies out or is lost. Two stopes were started in the outer part of the drift. Rather spectacular values in gold are reported to have been obtained from oxidized parts of the vein. It is reported that parts of the vein which are well mineralized with sulphides carry values in gold, but not sufficient to permit profitable mining of such narrow widths. There was some production from the oxidized parts of the vein.

The *Nickel Plate* vein was explored by trenching on the surface in 1935 and 1936. Crosscutting-trenches extend for about 1,050 feet south-easterly up a moderate slope. According to a small-scale map of the property, the nearest trench is approximately 3,300 feet, at south 55 degrees east, from the lower *Ell Tee* portal. The same cut is also about 1,300 feet somewhat south of east from the *Lost Cabin* winze. According to aneroid barometer readings these cuts are from 1,025 feet to 1,450 feet higher than the lower *Ell Tee* level. The first nine cuts covering a distance of about 650 feet are in quite regular alignment, exposing an altered, rusty, light-coloured dyke from 5 to 9 feet wide. The dyke is cut by quartz stringers, in some of which unoxidized arsenopyrite is exposed. The strike of the dyke is from 40 to 50 degrees west of north and the dip is steep to the south-west. At the ninth cut rusty gossan 2 feet wide lies north-east of 10 feet of spotted dyke-rock and on the south-west side there is gossan 9 feet wide. Samples of these two sections and a specimen of quartz with unoxidized arsenopyrite gave the following assays:—

Description.	Gold.	Silver.
	Oz. per Ton.	Oz. per Ton.
Rusty gossan, 2 feet wide, north-east of horse.....	0.20	Trace
Rusty gossan, 9 feet wide, south-west of horse.....	0.24	Trace
Quartz with unoxidized arsenopyrite, selected from <i>Nickel Plate</i> outcrop.....	0.20	Trace

Four more cuts to the south-east are less regularly aligned and show less quartz in the rusty gossan.



Euphrates Mining Company, Ltd. Plan of principal workings after company plan, extensions in broken lines from compass survey.

From the end of the adit-drift on the lower *Ell Tee* level a crosscut was driven somewhat north of east. It intersected a light-coloured dyke at about 730 feet. A drift followed the dyke for about 1,400 feet on an average course of south 40 degrees east. For most of its length the drift is narrower than the dyke, and swings back and forth exposing the walls at intervals. Three short crosscuts were driven from the drift. In September, 1937, raises were being put up at 625 and 1,275 feet from the start of the drift. From a compass survey, which the writer plotted on a small-scale company map, the position of this drift corresponds with the projection on this level of the surface exposures at a dip of about 73 degrees, and extends as far south-east as the cut which showed the split in the mineralization. Underground the wall-rock on both sides of the dyke is seen to be bleached, silicified, and platy for several feet, passing outward into slightly altered augite porphyry. Where first encountered the dyke is between 2 and 3 feet wide and has very irregular contacts. It is quite apparent here that the dyke has replaced some of the altered schist along the shear. To the south-east the width increases rapidly; the contacts are gradational, the change from fine-grained altered wall-rock to granular dyke-rock takes place in from 1 to 2 feet. The width of the dyke appears to be from 10 to 14 feet for most of the length, but about 40 feet from the face only 3 feet of true dyke-rock is exposed in the drift which, however, does not expose the hanging-wall. At the face sheared and altered wall-rock contained irregular quartz stringers and a good deal of pyrite across a width of 20 inches, the rest of the face consisted of less altered greenstone. The central part of the dyke is a medium-grained, light-coloured rock containing a great many disseminated grains of sulphides, principally arsenopyrite and pyrite. The marginal, finer-grained phase contains finer-grained disseminated sulphides. A specimen of the medium-grained dyke-rock was studied in the laboratory and classified as "altered porphyritic diorite." It is described as follows:—

"The fine-grained, equigranular ground-mass is composed almost entirely of altered plagioclase, probably oligoclase. Calcite and sericite occur as small irregular grains and laths; very little quartz or orthoclase is present. The rock is traversed by a tiny quartz-albite veinlet, and by several calcite stringers. Sulphide grains are disseminated through the section."

The dyke is cut by numerous quartz stringers commonly less than 2 inches thick. Many of these stringers are flat lying, others are in various attitudes. Aggregates of sulphides and fine disseminated grains occur in the stringers and in the dyke. The sulphides are principally arsenopyrite and pyrite; occasionally sphalerite occurs. Under the microscope some chalcopyrite was observed in grains of sphalerite. The assays of a few samples and specimens from this dyke are as follows:—

Description.	Gold.	Silver.	Lead.	Zinc.
	Oz. per Ton	Oz. per Ton	Per Cent.	Per Cent.
20 inches altered wall-rock, mineralized with pyrite and containing quartz stringers, face <i>Nickel Plate</i> drift	Trace	0.2	---	---
3 feet dyke-rock mineralized with disseminated sulphides, 40 feet north-west from face	Trace	0.2	---	---
Selected quartz with sphalerite	Trace	0.2	<i>Nil</i>	0.5
Selected quartz with arsenopyrite	0.08	Trace	---	---

The altered porphyritic diorite dyke is cut at a number of places by a much darker dyke, but the relationship of this dyke to the walls of the diorite was not exposed in the workings.

The crosscut to the *Nickel Plate* drift went through considerable widths of sheared greenstone containing irregular quartz stringers and at some points fine grains of disseminated sulphides. A 70-foot drift from the crosscut, which may be on the *Lost Cabin* shear, was mentioned previously. At another point a drift has followed quartz stringers south-easterly for 18 feet from the crosscut. About 265 feet from its start, the working crosscut a quartz vein about 2 inches wide. This vein was streaked with chlorite and contained a little free gold, but no sulphides were observed in it. The strike of the vein is north 20 degrees west and the dip is 75 degrees easterly.

The workings on the *Minto* vein consist of two adits. The lower *Minto* portal, as indicated on the plan, is approximately 650 feet north-east of the lower *Ell Tree* portal, and at

about the same elevation. The upper portal, approximately 125 feet higher, is about 300 feet south-east of the lower *Minto* portal. The upper adit is a drift 120 feet long following mineralization developed along shearing striking south 40 degrees east. The strike of the vein is about that of the foliation of the schistose greenstone in which it occurs. The dip of the vein, however, is quite irregular on this level and averages flatter than the dip of the foliation. The drift followed mineralization dipping about 55 degrees south-westerly, but about 80 feet in the vein turned over to the north in a flat roll, the axis of which plunges south-easterly at a moderate angle. Sixty feet from the portal an excavation on the south-west side of the drift encountered a widening which suggests the possibility of another roll below the level. The vein, which has a width of 2 to 8 inches in sections where the dip is parallel with the foliation, that is about 55 degrees south-westerly, is up to 18 inches thick where it cuts across the foliation in the flat roll. In the face the south-easterly plunge of the roll brings it near the floor of the drift. Here the roll is about 2 feet across, and the mineralization is 2 or 3 inches thick. In September, 1937, the ground had been stoped for a few feet north-east of the drift, from a point about 100 feet from the portal, back to a crosscut 60 feet from the portal. From the crosscut, a stope was advancing north-westerly a few feet above the level. This stope started about 12 feet from the drift and extended 15 feet farther to the north-east. The vein was exposed in the crosscut in a flat roll from the drift. At the south-west side of the stope it followed the foliation upward for a few feet, then rolled over to the north-east. From 12 feet north-east to the stope wall at 15 feet the vein was narrow, following down a slip dipping to the north-east. The ore exposed in the stope face was from 4 inches to 1 foot thick. There was also a narrow parallel stringer nearer the roof at the south-west side. The ore was being sorted and shipped to the smelter at Trail. Production in 1937 from this level amounted to 104 tons, of an average assay: Gold, 0.54 oz. per ton; silver, 12.4 oz. per ton; lead, 4.5 per cent; zinc, 2.5 per cent. The ore is a mixture of sulphides in quartz and carbonate gangue. A microscopic study of a specimen shows sulphide mineralization occurring as irregular masses in veinlets and replacing quartz and calcite gangue. The minerals identified in order of abundance are: Galena, sphalerite, chalcopyrite, pyrite, tetrahedrite, and arsenopyrite. Pyrite and arsenopyrite are present in relatively small euhedral and subhedral crystals. Sphalerite contains blebs of chalcopyrite and is commonly closely associated with both chalcopyrite and galena. Galena is dissociated from other sulphides for the most part, but in places veins and replaces sphalerite and chalcopyrite. Tetrahedrite occurs as small masses in galena, usually in contact with chalcopyrite. Both calcite and quartz are present as gangue minerals.

The lower *Minto* adit follows the formation south-easterly for about 200 feet, then turns easterly for 50 feet and cuts a narrow shear. This shear is followed for 325 feet at south 25 degrees east. The shear is from 6 to 10 inches wide and contains from 2 to 8 inches of quartz, some sections of which are well mineralized with sulphides. The dip averages about 60 degrees south-westerly. A composite sample of quartz and sulphides, taken at five points from 235 to 300 feet along the drift, averaging 5 inches in width, assayed: Gold, 0.52 oz. per ton; silver, 4 oz. per ton; copper, *nil*; lead, 1.3 per cent. In the 30-foot section, centered at a short raise started about 270 feet along the drift, the wall-rock is sheared and contains numerous quartz stringers for 4 feet in the hanging-wall of the continuous vein. This quartz contains very little sulphide mineralization. At 325 feet along the drift, the vein-shear is cut by another which strikes south 10 degrees east and dips at about 80 degrees to the west. This shear, containing occasionally a width of 2 inches of barren quartz, is followed 115 feet southerly to the face. In this section two crosscuts were driven from the drift.

A Spokane company, known as the Canadian Belle Mining Company, is acquiring four adjoining Crown-granted claims, the *Canadian Belle*, *Canadian Belle No. 2*, *Canadian Girl Frac.*, and *Safeguard*, and three adjoining located claims, *Union Jack Fraction*, *Erin Fraction*, and *Yankee Boy*, from M. Herman, of Hall Siding, and his associates.

The claims are situated about three-quarters of a mile south of Hall Creek, in part west but principally east of Keno Creek, a north-easterly-flowing tributary which enters Hall Creek approximately 1 mile west of the Nelson-Nelway Highway at Hall Siding. The ground was burned over several years ago. It slopes steeply toward Hall and Keno Creeks. In general there is a heavy mantle of surface-wash but there are good rock-exposures on the steep upper slopes and at some other points. The trail to the workings leaves the Hall Creek

road about three-quarters of a mile from the main highway, and climbs 950 feet in its length of approximately $1\frac{1}{2}$ miles. It appears that the four claims were brought to Crown grant in 1901, and had been prospected by open-cuts, a shaft, and several short adits. They had reverted to the Crown for taxes and were acquired from the Crown by M. Herman and his associates in 1934. An additional claim was located in 1935 and two others were staked in 1936. Late in 1936 the present company became interested in the property. Recent work has consisted chiefly in drifting on the upper and lower "A" levels.

The underlying rocks consist principally of argillaceous sediments, mapped by Drysdale (Geological Survey of Canada, Memoir 94), as Hall series, and shown as intruded south of the workings by a considerable mass of granitic rock referred to the Nelson batholith. The sedimentary rocks are cut by tongues of porphyritic granite. These rocks are in many places altered and rendered schistose, and may be difficult to distinguish. In general the beds have a north-westerly strike and dip rather steeply to the south-west, but they are much disturbed locally. Numerous surface and underground workings expose shears and fractures, varying in width from less than 1 inch to 5 or 6 feet, which cut the altered sediments and porphyritic granite. Most work has been done on shears or fractures striking from due north to north 30 degrees east, usually of steep westerly dip, though there are flatter dips to the west and some steep easterly dips. Some work has also been done on a mineralization of general east-to-west trend. At favorable points along the breaks quartz and sulphides developed as filling and also replacing the wall-rock. The sulphides include arsenopyrite, pyrite, pyrrhotite, and chalcopyrite, of which arsenopyrite is the most abundant. Samples of disseminated sulphide mineralization from various points yield rather low values in gold and silver. At some points almost solid sulphides are developed over widths up to 6 or 8 inches. A selected sample of sulphide, obtained from the "Upper A" dump assayed: Gold, 1.08 oz. per ton; silver, 0.8 oz. per ton. A microscopic study of a specimen of such material showed that arsenopyrite, occurring as massive crystalline aggregates, forms 90 per cent. of the section. The arsenopyrite has been fractured in places and veined by pyrite and chalcopyrite. In places pyrite is intimately intergrown with arsenopyrite. Pyrrhotite occurs as minute inclusions in arsenopyrite. Gold occurs as minute grains enclosed in arsenopyrite crystals, without any apparent relationship to the crystal boundaries or fractures in the latter. Seven grains were noted, all smaller than 1.5 microns in diameter. Six of these were enclosed in arsenopyrite, one was enclosed in gangue.

The workings, which are entirely east of Keno Creek, extend along the steep hillside on a general northeast-southwest trend for about 1,300 feet, in which there is one 300-foot section and one 400-foot section without exposures. The vertical range is from 4,500 to 4,800 feet elevation. The numerous surface and underground workings do not appear to be on a single break, but rather along a series of rather closely-spaced parallel breaks which in general are not followed far. The writer examined the property in May, 1936, and again in June, 1937; he was dependent upon a Brunton compass, pacing, and an aneroid barometer for determining the relative positions of various exposures. Lacking precise mapping certain relationships in an occurrence such as this remain in doubt.

The most easterly working is an adit at approximately 4,525 feet elevation, driven 70 feet at south 50 degrees east from the end of a 25-foot rock-cut. The wall-rock is rather blocky argillite, striking north 20 degrees west and dipping 75 degrees westerly. The working follows a fracture from 1 to 4 inches wide, which dips about 75 degrees to the south-west, and is filled with quartz, calcite, and sheared argillite, containing some sulphides. About 100 feet south-east of the portal and 35 feet higher there is a test-pit down 4 feet exposing shearing, which has the dip and strike of the fracture in the adit. At the surface there is a width of 10 inches of rusty material, and at the bottom of the pit 2 feet of silicified sheared argillite mineralized with sulphides. A sample half-way up the pit, where the width was 15 inches, assayed: Gold, 0.32 oz. per ton; silver, 0.1 oz. per ton.

South-westerly from this pit at distances of 100 feet, 140 feet, and 200 feet there are cuts not far from the trail. These expose rusty quartz in widths up to 4 feet. The quartz appears to be irregularly developed. At the best exposure the strike appears to be south 10 degrees west.

The top of a 30-foot shaft is about 300 feet south-westerly from the pit and at approximately 4,640 feet elevation. There are two adits in this section, for the purposes of this report called "Upper A" and "Lower A." South-west of the top of the shaft a cut exposes

shearing 2 feet wide in altered porphyritic granite. Quartz and sulphides are developed in the shearing which strikes about south 10 degrees west. Beyond this the exposures are of thin-bedded argillite to about 150 feet south-westerly from the shaft, at which point porphyritic granite is exposed lying south of the argillite. Some mineralization is developed in the granite near the contact. From this point to about 550 feet south-west of the shaft the overburden is deep and there are no exposures. The next working is a 10-foot adit driven south 60 degrees east from the end of a 10-foot rock-cut at approximately 4,800 feet elevation. In the face there is shearing containing blue quartz with sulphides, including pyrrhotite. The strike is north 30 degrees east. Selected well-mineralized material from the dump assayed: Gold, 0.52 oz. per ton; silver, trace.

About 75 feet south of the short adit is a cut on rusty shearing, which is exposed for 30 feet easterly. It strikes north 70 degrees east and dips 60 to 70 degrees northerly. Twenty feet west of the cut, down the slope to Keno Creek, there is 8 to 12 inches of sparingly-mineralized blue quartz with some parallel stringers. A sample of the best-mineralized material assayed: Gold, 0.04 oz. per ton; silver, 0.1 oz. per ton. Westerly down the hill there are no outcrops or cuts for 300 feet. In the next 100 feet there are four or five shallow cuts exposing quartz stringers which have a general east-to-west strike. In the lowest cut at 4,650 feet elevation, a narrow quartz-stringer containing some chalcopyrite strikes north 80 degrees west and dips steeply to the north.

The 30-foot shaft mentioned above is old work, and the timbering has not been renewed. "Upper A" adit at 4,610 feet elevation was driven 35 feet at south 45 degrees east to intersect the shaft at the bottom. At this point the shearing is 5½ feet wide. The eastern, or foot-wall, 12 inches is the best mineralized section. A sample of this material assayed: Gold, 0.12 oz. per ton; silver, trace. The remaining 42 inches assayed: Gold, 0.08 oz. per ton; silver, trace. A drift has been driven for 120 feet southerly following shearing in porphyritic granite. In the first 40 feet the strike is south 20 degrees west. The foot-wall slip dips 75 degrees westerly, while the hanging-wall is vertical or dips steeply to the east. Several shears of north-easterly trend cut the walls. For the next 50 feet the drift follows a white quartz-lens, which has a low dip to the west and strikes about due south. The quartz has an average thickness of 12 inches and contains some sulphides in segregations or bunches; it is cut by north-easterly-trending fractures of steeper dip, which contain mineralized quartz 4 to 10 inches thick. The last 30 feet of the drift follows two or three narrow shear-strands striking south 25 degrees west and dipping about 60 degrees westerly. They contain some quartz and sulphides. From a pile of ore at the portal the writer selected the sample of massive sulphides previously mentioned; it assayed 1.08 oz. of gold per ton. The average assay of two samples of quartz and partly replaced porphyritic granite, mineralized with disseminated grains of sulphide, was 0.2 oz. of gold per ton. This represents better-mineralized material than is exposed in any considerable volume underground.

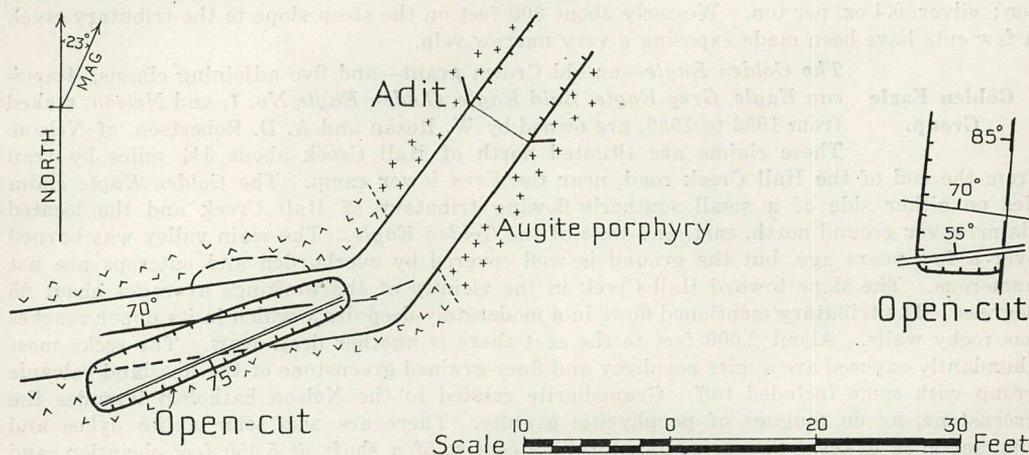
The "Lower A" adit, 60 feet below, starts at a point about 70 feet at north 70 degrees west from the upper portal. It is a slightly curved crosscut driven approximately 155 feet at about south 60 degrees east. At 65 feet from the portal a fracture, striking south 20 degrees west, which crosses the adit was being followed southerly in a drift, then in 17 feet. The dip of the hanging-wall is 75 degrees easterly; the foot-wall is not so well defined. In the face there were some little stringers of sulphides. On the north-east side of the adit there is a wedge of white quartz. The rock north of the slip appears to be altered porphyritic granite. At approximately 105 feet from the portal there is 3 feet of sheared rock silicified and containing some sulphides. The strike is about south 10 degrees west and the dip is almost vertical. This may represent the downward continuation of the fracture in the shaft and "Upper A" level. A shear 2 or 3 inches thick, striking north 30 degrees west and dipping 50 degrees north-easterly, cuts the mineralized section.

This claim, which was located in 1936 and brought to Crown grant in 1937, is registered in the name of Carl Peterson, of Hall Siding. It is situated on the south side of Hall Creek, lying to the west and south of the *Fern*. The property is reached by a branch trail from the end of the Hall Creek road, about 2½ miles from the Nelson-Nelway Highway. The trail climbs approximately 1,200 feet in the distance of roughly 1 mile from the end of the road to the lowest workings, which are at an elevation of approximately 4,900 feet.

The ground covered by the claim has been burned over quite recently. The overburden is from 1 to 5 feet thick. Rock-exposures are quite good. The steep slope to Hall Creek is intersected by the almost precipitous slope to a small tributary west of the workings.

The bed-rock consists of augite porphyry of the Rossland volcanic group, intruded by dykes of porphyritic granite, a rock with a dark fine-grained ground-mass and light feldspar phenocrysts. The contacts are commonly very irregular.

The lowest workings, consisting of a short adit and two open-cuts, are at the eastern side of the claim close to the western boundary of the *Fern*. These workings are in porphyritic granite except for the portal of the adit which is in augite porphyry. Near the blacksmith-shop 150 feet to the west a 20-foot porphyritic granite dyke is exposed. Some distance farther west there is a shear striking about due north and dipping 60 degrees to the west. Just west of it another dyke-segment is exposed, it is 15 to 20 feet wide and can be traced for 100 feet on a course of south 70 degrees west. These may be segments of the dyke in which the workings are found.



Bear Claim. Plan of workings.

The two open-cuts and a short adit situated near the north-east corner of the claim are shown on the accompanying sketch-plan. These workings expose joints or fractures in the porphyritic granite varying considerably in dip and strike but having a general east-west trend and rather steep dips. There is some crushing of the wall-rock along them and some quartz is developed. The ledge-matter is rusty and partially decomposed, and may show fine free gold in considerable quantity. Three tons of ore from these workings shipped shortly before the property was examined in September, contained 9.65 oz. of gold and 0.94 oz. of silver. A sample of vein-matter mineralized with unaltered pyrite selected from the adit dump, assayed: Gold, 3.26 oz. per ton; silver, 0.4 oz. per ton.

In the eastern cut two fractures are exposed. Rusty sheared porphyritic granite and quartz about 8 inches thick, filling the more southerly fracture, contained a good deal of fine free gold. The adit-portal is about 30 feet to the west at approximately the same elevation. The adit starts as a crosscut from the end of a 4-foot rock-cut. At 14 feet from the portal the working turns to follow a vein-fracture 25 feet at south 82 degrees west. The fracture dips about 70 degrees to the north. It is weak crossing the adit, and may be lost at the irregular contact of porphyritic granite with augite porphyry which lies to the north-east. The contact is observed in the east wall of the adit just before the drift is reached. It appears to be offset a little to the south on the west wall, but as the ground is timbered this is not certain. At the floor of the drift, in the first few feet, the vein widened to about 10 inches of crushed wall-rock and quartz mineralized with pyrite. A few feet ahead it narrowed to 4 inches. In the face and last few feet it could not be distinguished definitely.

Almost vertically above the drift and 17 feet higher is a cut on the surface, which, for its length of 20 feet, exposes a rusty fracture one-half inch to 2 inches wide, striking south 65 degrees west and dipping about 75 degrees to the south in contrast with the northerly dips

of the other mineralized fractures or joints. The projection of the drift fracture at this level would be south of the cut, and the projection of the fracture in the cut to the level of the drift would be south of the drift. Two series of joints are exposed in the cut; south of the fracture parallel joints strike about north 20 degrees west and dip 80 degrees to the east. North of the fracture joints strike from 40 to 60 degrees east of north and dip north-westerly at about 60 degrees. Overburden obscures the relationship of the mineralized fractures in the adit and cut above it with those in the cut to the east.

Up the hill from these workings, about 350 feet to the south and at an elevation of roughly 5,150 feet, there are several cuts over a distance of 50 feet. The most northerly exposes shearing 4 feet wide, striking about north 20 degrees east and dipping 80 degrees to the west in the augite porphyry. On the hanging-wall side 10 inches of quartz containing a little chlorite is exposed. Due south 40 feet there is a cut 8 feet long following 4 to 5 inches of very rusty quartz lying on sheared greenstone. The strike is north 40 degrees east and the dip 55 degrees to the north-west. A sample of the rusty quartz assayed: Gold, 4.0 oz. per ton; silver, 0.4 oz. per ton. Westerly about 300 feet on the steep slope to the tributary creek a few cuts have been made exposing a very narrow vein.

Golden Eagle Group. *The Golden Eagle*—an old Crown grant—and five adjoining claims, *American Eagle*, *Grey Eagle*, *Bald Eagle*, *Golden Eagle No. 1*, and *Nelson*, staked from 1933 to 1936, are owned by W. Rozan and A. D. Robertson, of Nelson.

These claims are situated north of Hall Creek about $3\frac{1}{4}$ miles by trail from the end of the Hall Creek road, near the *Fern* lower camp. The *Golden Eagle* claim lies on either side of a small southerly-flowing tributary of Hall Creek and the located claims cover ground north, east, and west of the *Golden Eagle*. The main valley was burned over a few years ago, but the ground is well covered by overburden and outcrops are not numerous. The slope toward Hall Creek in the vicinity of the workings averages about 25 degrees. The tributary mentioned flows in a moderately-deep draw which in its upper reaches has rocky walls. About 2,000 feet to the east there is another deep draw. The rocks most abundantly exposed are augite porphyry and finer-grained greenstone of the Rosland volcanic group with some included tuff. Granodiorite related to the Nelson batholith intrudes the greenstone, as do tongues of porphyritic granite. There are also some aplite dykes and younger mica dykes. The principal workings consist of a shaft at 5,450 feet elevation, and surface-cuts on an irregular quartz vein near the small creek, and open-cuts about 1,600 feet south-easterly from the shaft at 5,600 feet elevation, where an aplite dyke is fractured and contains mineralization.

The quartz vein is exposed in a cut for about 20 feet west of the creek, in the shaft 20 feet east of the creek, and at intervals in cuts which run up the slope easterly for about 200 feet from the shaft. The width varies from a narrow stringer to 18 inches. In the vicinity of the creek the greenstone is intruded by porphyritic granite. The irregular southern contact has an east-to-west trend. The fracture cuts through both rocks near the contact, striking about north 80 degrees west and dipping at about 65 degrees to the north. Sulphide mineralization is not abundant in the vein as exposed and consists of pyrite with a little galena. A sample across 18 inches of vein in the cut 25 feet east of the shaft assayed: Gold, 0.16 oz. per ton; silver, 0.8 oz. per ton. Fifteen feet down the shaft on the east wall the vein is 10 inches wide, and assayed: Gold, trace; silver, 1.0 oz. per ton. On the west wall the maximum width is 3 or 4 inches. The shaft was 20 feet deep when the property was examined. West of the creek the vein is from 10 to 18 inches wide. It is cut by a 15-inch aplite dyke which strikes north 5 degrees east and dips 70 degrees to the east. The western segment of the vein is displaced 5 feet to the north. Mica dykes striking about due north cut the vein in the shaft and west of the creek without apparent displacement.

The two cuts about 1,600 feet south-easterly from the shaft are on a point sloping on the one side toward Hall Creek and on the other toward the draw mentioned above. The first cut is driven 12 feet into rock, passing from greenstone at 5 feet into aplite. The aplite is cut by fractures, of which two rather strong ones strike north 20 degrees east and dip steeply; they have a width of 1 foot at the surface but narrow going down. These and other fractures are quartz-filled. Pyrite and some chalcopyrite are developed in grains or small masses in the aplite close to the fractures. Selected aplite, cut by quartz stringers showing a little rust, assayed: Gold, 0.08 oz. per ton; silver, trace; copper, trace. Selected aplite containing

sulphides assayed: Gold, 0.26 oz. per ton; silver, 0.3 oz. per ton; copper, 0.1 per cent. The second cut is about 40 feet to the north-east and exposes quartz-filled fractures in the aplite. One fairly strong fracture strikes north 70 degrees east and dips 60 degrees northerly. In the aplite near the fractures small lenses of sulphides are developed. The aplite dyke is not well exposed, but appears to be 15 to 20 feet wide and to strike a little north of east. About 200 feet north-east of the second cut there are four old cuts on a fracture in porphyritic granite. This fracture which runs northerly up the hill is filled with 8 inches of rusty quartz in the lowest cut. The higher cuts show only rusty breaks in the wall-rock.

The seven claims, *Harriet*, *Minnie M.*, *Ruby*, *Tulip Fraction*, *Dew Drop*, **Harriet Group**, *Rainbow*, and *Monitor*, were located in 1934 and 1935 by E. Ballinger, of Salmo. Recent work at the property has been done by a syndicate represented by A. S. Curwen, of Ymir, and C. A. Cawley, of Salmo, who have an agreement providing for purchase of the claims from Ballinger. The ground covered is near the head of the East Fork of Erie Creek, $3\frac{1}{4}$ miles by trail northerly from the point where the Erie Creek road crosses the East Fork. This point is about 10 miles by road from Salmo. The country has been burned over recently. It is drift-covered to a depth of from 1 to 6 feet in the vicinity of the workings which lie west of the creek on a moderate slope to the south-east.

The rock-formation where exposed is rather fine-grained greenstone. Two vein-fractures have each been traced by surface-cuts and explored by a short adit. The surface-wash is loose and soon covers the bed-rock exposed in cuts. The veins are narrow, varying from a mere crack to 10 inches, and probably average about 3 inches in width. They consist of white quartz containing a little chlorite and occasionally some pyrite. A good deal of free gold may be seen in certain sections in the surface-cuts. The wider sections do not appear to be rich. Moderately-coarse free gold may occur in milky quartz with little rust. A specimen of rusty vuggy quartz, containing inclusions of wall-rock, assayed: Gold, 4.40 oz. per ton; silver, 0.4 oz. per ton; and a specimen of quartz with fine-grained pyrite coated sooty-black assayed: Gold, 6.8 oz. per ton; silver, 0.3 oz. per ton. These specimens were selected from the lower adit dump. The veins are roughly parallel, about 90 feet apart, and strike from south-west to west, dipping from 40 to 70 degrees northerly, or into the hill. The outcrops of the veins rise as they are followed south-westerly. The vein which outcrops farthest from the creek is called "No. 1" and the other "No. 2."

The No. 1 vein was indicated at the easterly end in three cuts over a length of about 50 feet varying from $1\frac{1}{2}$ to 8 inches in width. Under these cuts No. 1 adit has been driven. South-westerly, on the projected strike about 250 feet from the last cut, a vein was exposed and followed in a series of cuts for a length of 100 feet. In this section the writer took a composite sample from five points, which assayed: Gold, 1.28 oz. per ton; silver, 0.4 oz. per ton; the average width was 3 inches. This was exclusive of sections showing a great deal of free gold. No. 1 adit at approximately 4,700 feet elevation was driven as a crosscut at north 55 degrees west for 25 feet where it cut the vein, which is 2 to 4 inches wide, dips 40 degrees to the north-west, and strikes north 65 degrees east. The vein was followed 10 feet north-easterly and 25 feet south-westerly to a fault, beyond which it was followed 15 feet striking north 80 degrees west and dipping 65 degrees to the north. The fault, which at the vein strikes due north-south and dips 75 degrees to the west, has been followed for 15 feet, in which distance it curves to a south-westerly course. From the fault white quartz, 8 inches wide, curves to join the vein on the south side 5 feet to the west. Two narrow quartz-stringers also run into the vein which, however, has the usual width of 2 to 4 inches west of the intersection.

The No. 2 vein 80 or 90 feet to the south-east was prospected by surface-cuts for a length of about 500 feet, and No. 2 adit has been driven under the cuts at the eastern end. Cuts were fairly closely-spaced at the eastern end, exposing a vein 3 to 5 inches in width striking south-westerly and dipping from 40 to 60 degrees north-westerly. The cuts to the south-west showed a similar vein carrying free gold at various points. The last 100 feet appeared to be offset up the hill about 20 feet to the north-east. This section had a width of about 3 inches and carried free gold. From a caved cut near the western end quartz, 8 inches wide, assayed: Gold, 0.03 oz. per ton; silver, 0.2 oz. per ton. No. 2 adit-portal is about 90 feet at south 20 degrees east from and 35 feet lower than No. 1 portal. The first 30 feet is a crosscut driven at north 80 degrees west to intersect the vein which was followed for 22 feet by a drift

at south 65 degrees west. In the face the vein is 3 inches wide. A sample across 4 inches, including a little rock from each wall, assayed: Gold, 3.86 oz. per ton; silver, 0.8 oz. per ton. Back from the face 3 feet the width is 10 inches. Here an 11-inch sample assayed: Gold, 0.92 oz. per ton; silver, 0.1 oz. per ton.

Six tons of ore shipped from the property in 1937 yielded 18 oz. of gold.

COPPER-GOLD DEPOSITS.

SALMO-CRESTON AREA.

Motherlode Group. The six claims forming this group were staked in July, 1937, by L. R. Clubine, of Salmo, and D. Archibald, of Creston. The claims cover ground north of Monk Creek, about 3 miles north of the International Boundary and 21 miles west of Port Hill, the United States customs port on the east side of the Kootenay River, about 7 miles south of Creston. The claims are in the valley of a southerly-flowing tributary of Monk Creek. Monk Creek flows easterly to Priest River, which flows south across the International Boundary. The claims may be reached by a branch trail about 1 mile long which runs north from the old Boundary Trail. From the ferry at Port Hill to the start of the Boundary Trail the distance is about 17 miles by fair road. The Boundary Trail is suitable for pack-horses; the grades are easy; some sections run through swampy ground. The distance to the branch trail is approximately 10½ miles. It is reported that the claims can also be reached from the Dewdney Trail, by coming southerly up a tributary of Summit Creek. The claims are situated near the divide between Summit Creek and Monk Creek.

The branch trail from Monk Creek to the claims climbs steeply for about three-quarters of a mile, then follows an easy grade northerly up the valley of the tributary creek to old surface-cuts about 1 mile from Monk Creek and 900 feet higher. The valley of the tributary creek is fairly broad; the slope rising to the west is quite moderate, the slope to the east is steeper. The country is timbered with balsam and spruce and some pine. Overburden is fairly deep and rock-exposures are infrequent. At the creek near the workings sheared greenstone is exposed striking north 10 degrees west and dipping 65 degrees easterly. Sheared greenstone is also exposed at various points west of the creek. East of the creek outcrops were not found for a considerable distance up the slope, but about 2,000 feet north-easterly there are extensive outcrops of sheared pebble conglomerate.

The claims cover ground prospected by Clubine about ten years ago, at which time a number of cuts and trenches were made. Nothing has been done recently and the cuts were partly caved in when the writer examined the property. The cuts at approximately 5,750 feet elevation are just east of the creek which flows southerly. The cuts and trenches run east-west designed to prospect mineralization in a zone of fracturing and shearing of general north-south strike and steep westerly dip. There are six cuts or trenches crossing the strike in a distance of 110 feet, and another cut a further 120 feet to the south. As the cuts were partly caved and the overburden is from 2 to 5 feet deep the occurrence was quite incompletely exposed. There was evidence of mineralization across a maximum width of 20 feet with an easterly extension which appeared to be along a cross-fracture. Clubine reported a considerably greater width from the caved-in part of one cut. In addition to rusty gossan, pyrite, chalcopyrite, pyrrhotite, and a little galena were exposed in a gangue of quartz, ankeritic carbonate, and sericitic material. Well-mineralized material was found to carry values in copper and silver, while rusty gossan gave an assay of 0.20 oz. of gold per ton.

The most northerly working is a shallow trench 60 feet long, extending easterly from a point near the creek. The next cut, about 40 feet to the south, is 20 feet long and largely caved in, but a good deal of quartz was to be seen over a width of about 3½ feet. Three cuts, each about 20 feet long, are at distances of 45 feet, 65 feet, and 90 feet from the most northerly working. These are partly caved in but showed evidence of quartz and sulphide mineralization for most of their lengths. At the west end of the cut at 45 feet a strong slip was exposed, striking due north and dipping 70 degrees to the west. The best exposure was in a cut which started near the creek and extended 45 feet easterly, attaining a depth of 10 feet at the east end. This cut, about 110 feet from the north end of the workings, was caved in for 30 feet from the west end. The rock walls exposed from 30 feet to the 10-foot face at 45 feet were rusty and cut by quartz-filled fractures. Near the face a 2-foot fracture,

striking north 20 degrees east and dipping 70 degrees westerly, contained quartz and rusty gossan. A sample of selected rusty gossan assayed: Gold, 0.20 oz. per ton; silver, 2.5 oz. per ton; copper, 0.4 per cent. The face exposed strong jointing striking somewhat south of east, standing vertically, and a quartz-filled cross-fracture 2 to 4 inches wide, striking a little north of east and dipping steeply to the south. A sample of the quartz assayed: Gold, trace; silver, 0.2 oz. per ton; copper, 0.1 per cent. On the surface, above the 10-foot face, a cross-fracture was followed 15 feet easterly in a shallow trench. Near the creek there was a pile of 5 or 6 tons of well-mineralized material, which Clubine reported came from the caved-in part of the cut from 23 to 30 feet west of the face. This material consisted of quartz, ankeritic carbonate, and sericitic material with fairly coarse pyrite, aggregates of chalcopyrite containing pyrrhotite, and a little galena. A sample of fairly well-mineralized material from this pile assayed: Gold, trace; silver, 4.5 oz. per ton; copper, 2.4 per cent. A 20-foot cut near the creek 120 feet farther south was almost completely caved in.

SILVER-LEAD-ZINC AND COPPER-SILVER DEPOSITS.

SOUTH-EAST KOOTENAY AREA.

Burt Group. The six claims constituting this group are held by John Powelson, of Dumont Siding, and his associates. The group lies north of Sand Creek, about 2½ miles north-easterly from Dumont Siding, which is on the Crowsnest branch of the Canadian Pacific Railway. The Dumont sawmill at the siding is adjacent to the southern Trans-Provincial Highway, at a point approximately 17 miles easterly from Wardner. The *Burt* group is reached from Dumont's sawmill by a logging-road, the distance being 3½ miles. From the road a trail about a third of a mile long climbs 400 feet to the upper adit, at approximately 3,900 feet elevation. The western end of the *Burt* group is about three-quarters of a mile from the transmission-line of the East Kootenay Power Company.

The fairly broad valley of Sand Creek runs south-westerly through the most westerly range of the Rocky Mountain system and merges with broad bench lands which extend to the Kootenay River some miles to the west. On the westerly slope of the mountain north of Sand Creek there is an extensive rock-slide. The workings on the *Burt* group extend from the intersection of the steep westerly slope with the equally steep south-easterly slope toward Sand Creek.

The slope to Sand Creek, in the vicinity of the workings, is generally grassy, with some trees. Overburden is up to 3 feet deep and there are not many outcrops. Rocks outcropping in the vicinity are principally of sedimentary origin. The workings consist of two adits starting from the westerly slope and some rather widely-spaced surface-cuts, the farthest of which is about 2,300 feet somewhat north of east from the upper adit. These workings expose flat-lying argillaceous beds, of a greenish-grey colour. The beds are cut by a dyke which has been very much altered but which may have had a composition of the general order of diorite. The dyke strikes north 75 degrees east and dips steeply southerly. It appears to have a width of 30 or 40 feet. Fracturing in the dyke, from 6 inches to 2½ feet in width, is filled with quartz and chloritic wall-rock. The fracturing strikes somewhat north of east and dips steeply northerly. At several points the vein contains a good deal of sulphide mineralization over widths from 1 foot to 18 inches. The sulphide minerals are principally galena and sphalerite, but also include a little pyrite and occasionally some chalcopyrite. Moderate values in silver were obtained from samples of the lead and lead-zinc mineralization. In the adits, and in a cut near the upper adit, the vein is displaced by faulting, the western segment is offset some feet to the south relative to the eastern segment.

The lower adit is an old working which, according to Powelson, was driven prior to 1914. Powelson and associates staked the group in 1936 and did surface work that fall. When the writer examined the property in June, 1937, further work had been done on surface-cuts; the upper adit had been driven 70 feet from the end of a 30-foot rock-cut; and the old adit, 60 feet below, was being reopened. Preparations were being made to make a shipment of sorted lead ore.

The vein is exposed in surface-cuts near the upper adit, the width between walls being from 1½ to 2½ feet, a good deal of the included material being chloritic wall-rock. Between 1,350 and 1,450 feet easterly from the upper adit-portal there are three cuts, the first shows

the vein 2 feet in width, the next appears to be in the foot-wall and exposes quartz stringers only. The third cut exposes fracturing across 30 inches of which 15 inches at the northern side consists principally of quartz containing some sulphides. From the dump here the writer selected quartz well-mineralized with galena, somewhat gneissic in texture. This material assayed: Gold, trace; silver, 8.0 oz. per ton; lead, 31.0 per cent.; zinc, 1.6 per cent.

About 550 feet farther a cut at 4,075 feet elevation has been driven 25 feet northerly to the vein. It cut through flat-lying sediments for 8 feet before reaching the contact with the dyke, which strikes north 75 degrees east and dips 75 degrees southerly. The dyke is rather fine-grained and altered. At the end of the cut the vein was exposed, striking north 75 degrees east and dipping 70 degrees northerly. Quartz 12 to 15 inches wide was fairly well-mineralized with galena and sphalerite. This cut is 250 feet or so above a bench just north of Sand Creek. There is an old partly-caved trench 300 feet to the east, beyond which a draw cuts across the projection of the strike.

The upper adit at 3,900 feet elevation was driven 50 feet at north 75 degrees east, following a vein containing 6 to 18 inches of quartz and a little sulphide mineralization. The drift then follows a 3-foot fault-strand at north 25 degrees east for 18 feet. The fault-strand dips 60 degrees north-westerly. At the end of the working, east of the fault, the quartz vein striking north 75 degrees east and dipping steeply to the north was encountered. This quartz, 18 inches wide, was mineralized with galena and sphalerite, a sample across the full width assayed: Gold, trace; silver, 7.0 oz. per ton; lead, 3.1 per cent.; zinc, 6.2 per cent.

Down the westerly slope, at 60 feet lower elevation, the old adit started near the edge of the talus slope. This working followed a vein with quartz-filling from 6 inches to 2 feet wide for 150 feet at north 65 degrees east. The quartz was rusty, but did not appear to be well mineralized, numerous quartz stringers striking north-south cut the walls. At 150 feet the drift encountered a fault-strand striking due north and dipping 65 degrees to the west. The vein was encountered on the east side of the fault about 10 feet to the north. The working continued some distance past the eastern segment of the vein, but was partly filled with debris. From what could be seen it appeared that south of the fault the working had gone through the dyke into flat-lying sediments. The vein striking north 75 degrees east and dipping steeply to the north had been followed easterly for 15 feet from the fault. For this distance quartz 12 to 15 inches in width was well mineralized with galena and sphalerite.

Near the *Burt* group work has been done on three other properties, on copper-silver mineralization. West and north-west of the *Burt* group, Powelson and associates have located the *Dean* group and the *Rex* group. Both of these are old prospects on which pyrite and chalcopyrite in quartz and siderite had been exposed in the old workings. The writer visited the *Dean* group in 1937 and was shown some old surface-cuts and two short adits, one of which was caved. The *Rex* group was visited in 1936, at which time the workings consisted of shallow trenches and an 8-foot pit. Lying north of the *Burt* group there are the *Empire* and *Strathcona*, Crown-granted claims, which in 1936 were under option to Powelson and associates. This property has been described in the Annual Reports of the Minister of Mines, British Columbia, for 1898, 1929, and 1930. A good deal of work has been done on this property, and several of the workings were accessible in 1936. Much of the vein consists of siderite with some quartz and very little sulphide mineralization; however, there are better mineralized sections. Quite well-mineralized material may be selected from the dump of the highest adit. In the following table the assays are given of specimens and samples from these three properties:—

Description.	Gold.	Silver.	Copper.
	Oz. per Ton.	Oz. per Ton.	Per Cent.
<i>Dean</i> group, quartz with pyrite and chalcopyrite, from pile near portal of open adit.....	0.01	6.2	1.5
<i>Dean</i> group, grab samples from dump near portal of caved adit.....	Trace	0.4	1.4
<i>Rex</i> group, quartz and wall-rock with chalcopyrite; width, 5 feet; from west end of pit.....	Trace	1.6	1.1
<i>Empire-Strathcona</i> group, selected from highest adit dump—			
(a.) Material well-mineralized with chalcopyrite.....	0.06	3.2	8.9
(b.) Material well-mineralized with pyrite, some chalcopyrite.....	0.10	1.1	4.2

PLACER-GOLD DEPOSITS.

Inca Placer Leases. During the past three seasons placer operations have been conducted by the Consolidated Mining and Smelting Company on the Inca Placer Leases which are adjacent to Palmer Bar Creek, not far from Lumberton, in the Fort Steele Mining Division. The workings may be reached by a branch road about 2 miles long which leaves the highway 7 miles from Cranbrook. Another route is by a branch road through Lumberton.

Palmer Bar Creek flows south-easterly in the vicinity of the workings, which are situated on the north-east side of the creek. Extensive testing has indicated an area of gravel 400 feet wide and about half a mile in length, carrying sufficient gold to be attractive commercially. This area trends northwest-southeast, parallel with the stream, and from 5 to 30 feet above the stream-level. North-east of the bench the ground rises fairly steeply to higher benches. The valley of the creek narrows between 30-foot walls of quartzite, not far north of the pay-gravel. The gravel is unsorted and contains many large boulders of granitic rocks and quartzite. As in other placer deposits adjacent to Palmer Bar Creek gold is found in the top few feet of gravel. Testing by the company included drilling several holes to bed-rock, the deepest going down about 200 feet. Numerous test-pits were also sunk. According to information supplied by company officials values of any consequence were confined to the top 3 to 6 feet of gravel. The gold, which is comparatively coarse, was found to become more flaky toward the south-east end of the pay area, while at the north-west end paying values ceased abruptly. In 1937 testing in one section indicated values extending north-easterly up the slope from the low bench.

While there is no barren overburden to be handled in this deposit there is a great quantity of very large boulders in the pay-gravel, and the great depth of underlying barren gravel presents unusual difficulties. Considerable ingenuity has been shown in the efforts designed to recover the gold economically. Water for sluice-boxes is obtained from a dam half a mile up-stream from the upper end of the pay-gravel. A flume carrying water from the dam has been built parallel with the long dimension of the pay area, along the slope which rises to the north-east above the low bench. Limited sections of the deposit have been worked by hand-shovelling into a line of sluice-boxes extending south-westerly from the flume across the pay-gravel toward the creek. Because of its cost and because of the quantity of large boulders this method had limited applicability. A later procedure was to load gravel mechanically into a substantially-built line of boxes designed to be moved along the deposit. The gravel was dug by a Diesel power-shovel which dropped its load on a belt-conveyor driven by a small gasoline-engine. The conveyor elevated the gravel to the sluice-boxes. It is 70 feet in length and was designed to be moved readily along the sluice-boxes. More recently the practice has been to move the gravel from the shovel to the conveyor in motor-trucks. A picture of a truck being loaded at a movable loading-pocket appears in this report. A grizzly with 6-inch openings is used above the loading-pocket, and the power-shovel stacks the oversize boulders nearby. The largest boulders are left in the pit. Two trucks were engaged hauling gravel from the loading-pocket to the conveyor at the sluice-boxes. This method of operation is flexible and eliminates the necessity of moving the conveyor frequently.

Hail Columbia Group. This group of three placer leases held by A. McCrae is situated on the east side of the Columbia River, approximately 62 miles north-westerly from Revelstoke. The workings are accessible by a trail about a third of a mile long connecting with the Big Bend Highway. In 1937 the northern part of the highway was under construction but was passable as far as Mile 62; it is at no great distance from the river at this point. The McCrae leases were staked to cover ground extending for about a mile along the east side of the river. There is a narrow bench along the river in the vicinity of the workings, the ground rising rather steeply back of the bench. The slope is timbered with spruce and cedar trees up to 3 feet in diameter.

McCrae and his two sons operate the property. Work was started on the river-bank during the low-water period in 1934. The present working consists of a pit extending some distance from the river. A cut has been run for about 160 feet from the river-bank, starting at a point a short distance down-stream from the first working. The cut was made through unconsolidated material for 140 feet, but in the last 20 feet went through thin-bedded cherty sediments extending 3 or 4 feet above the floor of the cut. From the end of the cut the pit

was advanced easterly and was about 80 feet long in July, 1937. The pit averaged about 20 feet in width, the depth increasing from 10 feet where the pit started to more than 20 feet at the face. The surface slopes fairly steeply to the pit from the south-east. Near the face of the pit, at the south side, blue clayey ground 3 feet thick rests on bed-rock. Gravel 12 to 15 feet thick overlying the clay contains boulders, a few of which are 3 feet across. The gravel is quite rusty at the bottom and is weakly cemented. McCrae reported that values were obtained from the clay at bed-rock, and from the overlying gravel, but that the best values were coming from boulder-clay which overlies the gravel. The boulder-clay rests on an undulating surface marked by a layer of hard-pan; it is overlain by surface-wash containing a great deal of humus. The thickness of the boulder-clay is somewhat variable, averaging about 6 feet where exposed; it contains large boulders, some of which are 8 feet long. The gold is rather coarse, McCrae reported one nugget weighing 16 dwt. and others running up to 7 dwt.

A ditch running about 700 feet south-westerly carries water from a creek to a small draw in which a dam has been constructed. From the dam the water is conducted south-westerly through 800 feet of ditch and split-cedar flume to a reservoir just ahead of the pit. The reservoir, about 15 feet wide, 50 feet long, and 4 to 5 feet deep, is closed by a boom gate. When the writer visited the property it required about half an hour to fill the reservoir. Sluice-boxes built of split cedar were laid in the cut, from the end of the pit to the river. A track was also laid in the cut, and boulders which would not pass the 10-inch grizzly at the entrance to the sluice-boxes were trammed to the dump near the river. Where possible the very large boulders were being left in the pit, those around which it was inconvenient to work were being broken by blasting.

In 1937 the six placer leases known as the *Last Chance* group were the scene of operations of a partnership represented by R. M. Reid. The leases are situated in a basin on the east side of McCulloch Creek, and lie north of leases held by D. Philmore and C. Williams lower on the creek. The creek flows southerly into Goldstream, a westerly-flowing tributary of the Columbia River, north of Revelstoke. From a point on the Big Bend Highway, about 57 miles from Revelstoke, the Old Goldstream trail runs north-easterly for about 5 miles to Goldstream. There is a cable-ferry crossing Goldstream, and from the north side a trail runs northerly for half a mile to the cabin occupied by Philmore and Williams. From this point a trail climbs the steep slope east of McCulloch Creek, attaining an elevation of 4,200 feet in the basin, 2½ miles by trail from the ferry and at 2,200 feet higher elevation. Three hundred yards farther, near the east side of McCulloch Creek, there is a small cabin which is understood to be on the No. 1 lease of the *Last Chance* group.

On the west side of McCulloch Creek opposite the basin the slope rises steeply, with numerous rock bluffs. About half a mile northerly from the cabin the basin terminates at a talus slope rising steeply to the north. The floor of the basin extends for about a quarter of a mile easterly from the creek. The slope to the south begins to be steep about a quarter of a mile south of the cabin. For a considerable distance the creek drops in a series of cascades. The steep slope east of the creek is wooded with small evergreen trees, as are also the more gentle slopes within the basin. Rock-exposures were noted west of the creek opposite the basin, but were not observed within the basin. It was reported that a shaft north of the cabin had reached a depth of 65 feet. It is apparent that there is a large volume of unconsolidated material in the basin but when the writer visited the property there seemed to be little precise information available concerning the depth to bed-rock, the nature of the unconsolidated material, and whether or not it carries values in gold. Information supplied by Reid after the operation had been shut down for the winter indicated that a considerable amount of testing had been done during the season.

When the writer visited the property in July, work was being done at the east side of the creek, about 300 yards southerly from the cabin, at approximately 3,950 feet elevation. Near this point the caved portal of an old drift indicated that former workers had done some prospecting here. The slope west of the creek rises steeply, but on the east side the slope is gentle and on this side there appears to be from 20 to 30 feet of unconsolidated material. In the creek channel there are many angular boulders, doubtless derived largely from the bluffs on the west side. The recent work had consisted in advancing a grade on the east side of the

stream from a point where the grade to the creek was steep and bed-rock was exposed. About 160 feet of sluice-boxes had been laid. Large boulders were moved by the aid of a hand-powered derrick. This work is reported to have yielded a little gold, but much better returns were being obtained from a point where the bed-rock dropped sharply toward the eastern bank of the stream. It was reported that values were almost entirely concentrated on bed-rock. The gold which had been recovered varied from moderately fine to quite coarse, the largest nugget being about $\frac{3}{16}$ by $\frac{3}{8}$ by $\frac{5}{8}$ inch. The gold was angular and some of it was rather porous.

SPECIAL REPORTS.

Typewritten copies at 25 cents each are available to those who specially request reports on the following properties:—

Montana.
Virginia Group.
Hilltop and Sitka.

BAYONNE-MIDGE CREEK AREA.

PROGRESS NOTES.

LODE-GOLD DEPOSITS.

BY

H. E. MIARD.

VICINITY OF NELSON.

Granite-Poorman.—Sited on Eagle Creek near Blewett, about 5 miles west of Nelson. The Livingstone Mining Company, Incorporated, with H. R. Smith as manager, operated the mine throughout the year with a crew of eighteen (fourteen underground, two on the surface, and two at the mill). The total production amounted to 2,403 tons. Two hundred and sixteen tons, shipped to Trail, yielded 216 oz. gold and 239 oz. silver. In addition, 77 tons of concentrates yielded a total of 135 oz. gold and 210 oz. silver.

Venus-Juno.—This property, situated on Morning Mountain and owned by R. Heddle, of Nelson, was operated by lessees during the year, and 169 tons of ore shipped to Trail yielded 231 oz. gold and 451 oz. silver.

Athabasca.—Sited on Morning Mountain adjoining the *Venus-Juno*. Owned by the Noble Five Mines, Limited; manager, Paul Lincoln. Seventy-four tons of ore shipped to the Trail smelter yielded 127 oz. gold, 261 oz. silver, 2,742 lb. lead, and 3,567 lb. zinc. In addition, 4 tons of concentrates yielded 7 oz. gold, 12 oz. silver, 67 lb. lead, and 222 lb. zinc.

California.—This property was operated desultorily by four different groups of lessees, seven men entering into the various partnerships. A total of 31 tons was shipped from the mine, this yielding 41 oz. gold, 117 oz. silver, 454 lb. lead, and 2,019 lb. zinc.

Perrier.—Sited about 4 miles south of Nelson, on the road to Ymir. Owned by Perrier Gold Mines, Limited, with headquarters at Nelson. Four hundred and seventy-nine tons of ore shipped to the Trail smelter contained 121 oz. gold, 481 oz. silver, 2,055 lb. lead, and 8,009 lb. zinc; while one ton of concentrates yielded 1 oz. gold and 2 oz. silver.

Starlight.—Twelve tons of ore shipped from this property by J. Poje, of Nelson, yielded 12 oz. gold and 60 oz. silver.

Fern.—Sited on Hall Creek, and operated by Gold Fern Mines, Limited. Five tons of ore yielded 3 oz. gold and 28 oz. silver.

Alpine Group.—Sited at the head of Sitkum Creek. Operated by the Alpine Syndicate under the direction of B. N. Sharp. The construction of 9 miles of road along Sitkum Creek was completed; some camp buildings were erected; No. 10 level was started; and some surface-stripping was done. Twenty men were employed.

YMIR CAMP.

Tamarac.—Sited on Elise Mountain and operated by Balsam Gold Mines, Limited. Construction of a road from the *Goodenough* to the mine was completed. The old workings

were repaired, one of the winzes was pumped out, and an adit intended to intersect the vein at depth commenced. The number of men employed varied between twelve and seventeen, and the operations were directed by Paul M. Smith, who resigned late in the year and was succeeded by Fred O. Orr.

Ymir.—Operated by the Ymir Consolidated Gold Mines, Limited; manager, G. G. Sullivan. Lessees worked for some time during the early part of the year; the mine then remained idle until the later part of the year, when some exploratory-work was started underground. Three men were employed for some time on the surface in stripping operations. Twenty-two tons of ore shipped to the Trail smelter yielded 20 oz. gold, 95 oz. silver, 2,962 lb. lead, and 3,248 lb. zinc. The development-work done amounted to 72 feet of drifting and 77 feet of crosscuts.

Goodenough.—On Elise Mountain. Operated by the Ymir Consolidated Gold Mines, Limited; G. G. Sullivan, manager. The number of men employed varied considerably, according to the momentary nature of the operations, as few as nineteen and as many as forty-one being on the pay-roll at one time. The development and exploratory work done consisted of 719 feet of drifting, 234 feet of raising, and 1,532 feet of diamond-drilling. The total output was 8,702 tons, from which 863 tons of concentrates were produced, these yielding 2,806 oz. gold, 16,358 oz. silver, 294,565 lb. lead, and 185,453 lb. zinc.

Blackcock.—This property was operated under lease by Thos. Wilkinson, of Ymir, and associates. Eight tons of ore shipped to the Trail smelter yielded 4 oz. gold, 22 oz. silver, 479 lb. lead, and 386 lb. zinc. In addition, 9 tons of concentrates produced from ore treated at the mill of the Ymir Consolidated Gold Mines, Limited, yielded 33 oz. gold, 79 oz. silver, 2,577 lb. lead, and 1,984 lb. zinc.

Ymir-Wilcox.—Owned by the Wilcox Mines, Limited, and under lease to the Ymir-Wilcox Mining Syndicate; manager, Jas. A. Cullinane. The mine was operated during seven months, a total of ten men being employed. The development-work done consisted of 200 feet of crosscuts. A 10-stamp mill is operated. The total production amounted to 2,440 tons, from which 59 tons of concentrates were obtained, these yielding 156 oz. gold, 576 oz. silver, 8,592 lb. lead, and 6,550 lb. zinc. In addition, amalgam yielded 458 oz. gold and 457 oz. silver.

Yankee Girl.—Operated by the Ymir Yankee Girl Gold Mines, Limited; manager, H. W. Seamon, who resigned in September and was succeeded by L. G. Morrell. Mine superintendent, Jas. D. Ferguson; mill superintendent, Jno. Vallance. The average working force numbered 102, seventy men being employed underground, sixteen on the surface, and sixteen at the mill. The development-work done included 2,755 feet of drifting, 1,146 feet of raising, 129 feet of crosscutting, and 2,593 feet of diamond-drilling. The total production was 39,356 tons. A total of 2,956 tons of lead concentrates yielded 10,889 oz. gold, 44,937 oz. silver, 911,473 lb. lead, and 547,801 lb. zinc.

Ymir Centre Star.—This property, situated on Jubilee Mountain, is operated by the Wesko Mines, Limited, with Harold Lakes as manager, Harry Stevens as mine superintendent, and John Sandberg in charge of the mill. Operations were carried on actively throughout the year. The mine crew numbered thirty-nine, while twenty-three men were employed on the surface and six at the mill, including the technical staff. The development-work done comprised 1,618 feet of drifting and 781 feet of crosscutting. In addition, 3,407 feet of diamond-drilling were done also. A total of 34,633 tons was mined and milled, from which 2,874 tons of concentrates were obtained, these yielding 7,454 oz. gold, 59,939 oz. silver, 1,388,710 lb. lead, and 553,717 lb. zinc. In addition, 210 lb. of bullion shipped carried 244 oz. gold and 856 oz. silver.

Myrtle.—This property, situated on the outskirts of Ymir and owned by A. S. Curwen, was operated for some time by H. Brown, who shipped 3 tons of ore from it to the Trail smelter, the total returns being 3 oz. of gold and 9 oz. of silver.

Spotted Horse.—The Spotted Horse Syndicate, of Ymir, shipped 24 tons of ore from this property, which yielded 23 oz. gold and 14 oz. silver.

VICINITY OF SALMO.

Queen.—Operated by Sheep Creek Gold Mines, Limited; manager, H. E. Doelle; mine superintendent, F. R. Thompson; mill superintendent, Louis Vogel. Exploration of the *Bruhn* and *Hideaway* veins, on the Nos. 5 and 7 levels, disclosed the presence of ore-shoots carrying high values, and the development of these new sections of the mine proceeded actively

throughout the year. Another crosscut was driven towards them on the No. 9 level. Little work was done on the *Yellowstone* vein. A new adit was started on the *Hideaway* and this, when connected with the workings opened from the *Queen* levels, will facilitate the ventilating of the entire mine by natural means. The average number of men employed was ninety-nine, sixty-eight underground, twenty-one on the surface, and ten at the mill. The development-work done totalled 9,302 feet; this comprising 5,546 feet of drifting, 2,737 feet of crosscuts, and 1,019 feet of raises. The tonnage mined and milled was 54,243, from which bullion, yielding 23,923 oz. gold and 8,419 oz. silver was obtained.

Kootenay Belle.—Operated by the Kootenay Belle Gold Mines, Limited; manager, Vere McDowall; mine foreman, Jno. Tonkin; mill superintendent, Neil Munro. The development of the section opened by No. 3 adit-level continued actively during the year and No. 4 level, started 313 feet below No. 3 in the early summer, had nearly reached A vein when some difficult ground was encountered, this decreasing the rate of advance to some extent. The power plant was reinforced by the addition of a Canadian Ingersoll-Rand 24-inch and 14½-by 12-inch L-type compressor, driven by a 300-horse-power synchronous motor. Development-work totalled 3,137 feet; this comprising 1,445 feet of drifting, 1,612 feet of crosscutting, and 80 feet of raising. The tonnage mined and milled was 39,935, from which bullion yielding 16,098 oz. gold and 5,476 oz. silver was obtained. Ninety-eight men were employed.

Reno.—Operated by the Reno Gold Mines, Limited; manager, W. S. Ellis; mine superintendent, A. K. Olsen; mill superintendent, Albert Norcross.

Exploratory-work, in the form of a crosscut driven to the *Donnybrook* vein and of some drifting done on this and on another parallel vein met while driving towards the former, was carried on in the course of the year. The sinking of a winze, from the lower level on the *Reno* vein, is contemplated as a means of exploring the deposit and continuing development at greater depth. Some of the older workings above No. 4 level were repaired with the object of resuming operations. In the early period of operation, owing to various factors, some ore-bodies now considered as valuable were left behind and must now be recovered under conditions which cannot be considered otherwise than as presenting considerable difficulty.

The total number of men employed averaged 120; seventy-eight underground, twenty-three on the surface, and nineteen at the mill. Development-work consisted of 3,581 feet of drifting, 1,400 feet of crosscutting, 297 feet of raising, and 14,618 feet of diamond-drilling. A total of 45,984 tons was mined and milled, this yielding 22,811 oz. gold and 9,373 oz. silver.

Gold Belt.—Situated on Sheep Creek and operated by the Gold Belt Mining Company, Limited (head office, 616 Stock Exchange Building, Vancouver). Manager, M. O'Donnell. Operations were limited to development-work, but it is reported that the construction of a mill is to be undertaken in the spring. Early in the year an ore-body was met in the 1,300 (now known as the 8,000) drift, and this led to considerable development-work being done on this and on a parallel vein. A further consequence was the driving of the 2,100 adit-crosscut, intended to strike these two veins 250 feet below the present workings. Incidentally, two other small but apparently rich veins were met unexpectedly in this new work. The total number of men employed varied between twenty-two (fourteen underground) in January and forty-three (thirty-two underground) in August. In the inner section of the mine diamond-drilling was done during the year. The development-work done totalled 6,505 feet, this consisting of 3,481 feet of drifting, 2,655 feet of crosscutting, and 369 feet of raising.

Clubine-Comstock.—On Boulder Creek, about 4 miles north of Salmo. Operated by Clubine-Comstock Gold Mines, Limited, with L. R. Clubine as manager. A crew of fifteen (eleven underground) was employed throughout the year, most of the work being done by hand. The production amounted to 998 tons, which yielded 956 oz. gold and 1,669 oz. silver.

Ore Hill.—Situated near the head of Billings Creek and about 4 miles by road from the Queen Mine. Operated by Kootenay Ore Hill Gold Mines, Limited, with H. D. Forman as manager. Eighteen men were employed (ten underground). The total production amounted to 974 tons. Of this, 505 tons shipped to the Trail smelter yielded 751 oz. gold, 1,102 oz. silver, 47,457 lb. lead, and 48,549 lb. zinc; while 68 tons of concentrates contained 233 oz. gold, 226 oz. silver, 9,540 lb. lead, and 7,966 lb. zinc.

ERIE CREEK AREA.

Keystone.—Situated on the mountain of the same name. After having been operated desultorily by lessees for several years, the property was taken under option by Dufferin

Golds, Limited (head office, 729 Standard Bank Building, Vancouver). Four men were employed underground and four on the surface under the direction of Andrew Sostad. Sixty-four tons of ore shipped to the Trail smelter yielded 39 oz. gold, 83 oz. silver, 1,151 lb. lead, and 2,557 lb. zinc.

Second Relief.—On the north fork of Erie Creek, 13 miles by road from Erie. Owned and operated by the Relief-Arlington Mines, Limited, with S. M. Manning as manager, Walter Tattrie as mine superintendent, and Gustav Kvist as mill superintendent. The newly-discovered vein, on the north side of the gulch, has been opened by drifting over a length of several hundred feet. The shaft was sunk to the depth of another level in the course of the past winter, and the conditions found there differed little from those met at higher points. The number of men employed varied between ninety-two in March (fifty-five underground) and 103 in September (sixty-six underground, thirty-six on the surface, and eleven at the mill). The total tonnage mined and milled amounted to 26,822, this yielding bullion carrying 13,070 oz. gold and 2,963 oz. silver. In addition, refinery slag and amalgam shipped to Trail contained 66 oz. gold and 280 oz. silver.

ROSSLAND-TRAIL AREA.

Properties of the Consolidated Mining and Smelting Company of Canada, Limited—*The Iron Mask, Centre Star, War Eagle, Josie No. 1, Josie No. 2, Le Roi, Black Bear, Annie, and Columbia-Kootenay*—were operated by lessees under the arrangements made by the company in 1933. In all, thirty-four underground and surface leases, in which ninety-two men participated, were in effect in the course of the year. The total tonnage shipped to the Trail smelter amounted to 8,216 tons; this yielding 6,381 oz. gold and 7,596 oz. silver.

Velvet.—Situated on Sophie Mountain, about 12 miles west of Rossland, on the Cascade Highway, and operated by the Velvet Mining Company, Limited (head office, 8655 East Marginal Way, Seattle, Wash.), with Lewis Frederick as manager. The mine was operated for several months in 1937. Work on the property was suspended in September owing to a shortage of water. A crew of thirty-four was employed (sixteen underground, twelve on the surface, and six at the mill) for a period of eight months. The total tonnage mined and milled amounted to 7,948. The concentrates, shipped to the Tacoma smelter, yielded 1,085 oz. gold, 875 oz. silver, and 96,491 lb. copper.

I.X.L.—This property, situated on Mount Roberts, was operated for some time by the I.X.L. Lessors, Limited (of Rossland), three men being employed under the direction of Ole Osing. Two hundred and eighty-four tons of ore shipped to the Trail smelter yielded 270 oz. gold and 121 oz. silver. In addition, 86 oz. gold and 15 oz. silver were recovered from 393 lb. of concentrates.

O.K.—Operated by the O.K. Leasing Company (c/o Ira L. Hendrickson, Rossland). Only two men were employed during the year. Twenty-three tons of ore shipped to the Trail smelter yielded 3 oz. gold and 25 oz. silver. The development-work done consisted of 10 feet of drifting, 25 feet of crosscutting, 45 feet of shaft, and 28 feet of winzes.

Midnight.—Two lessees worked on this property during the year. Sixty-eight tons of ore shipped to the Trail smelter yielded 11 oz. gold and 34 oz. silver.

Gold Drip.—This property, owned by Mrs. M. D. McKinnon of Beverley Hills, California, was operated under lease by C. A. Ritchie and partner. Fifty-two tons of ore sent to the Trail smelter yielded 19 oz. gold and 29 oz. silver, while 30 lb. of high-grade ore, shipped separately, carried 3 oz. of gold.

Silverine.—Five tons of ore shipped from this property by the owners, A. O. Fried and M. Penny, of Rossland, yielded 1 oz. gold and 20 oz. silver.

Evening Star.—Situated on Monte Cristo and owned by the Evening Star Mining Co. The property was operated under leases held by R. H. Griswold, Sanford Heidler, Philip Krpan, the brothers Conroy, and Werner Nelson, a total of eleven men being employed. Aggregate shipments of 165 tons yielded 61 oz. gold and 42 oz. silver.

Iron Colt.—Philip Krpan and J. Radowich, of Rossland, shipped 9 tons of ore from this property, with total metal contents amounting to 2 oz. gold and 2 oz. silver.

Georgia Group.—On Monte Cristo. Operated by the Gold Cup Mining Company, Limited. A crew varying in number between seven and twelve (eight underground in the latter case), was employed in exploratory and development work under the direction of R. W. Haggen. The possibilities of the *Mascot* claim, adjoining the *Columbia-Kootenay* on the south and east,

were also investigated. The development-work done comprised 452 feet of drifting, 262 feet of crosscutting, 40 feet of sinking, and 304 feet of diamond-drilling.

In addition to the foregoing, small shipments were made from the *Queen* by O. Gowing and L. J. Penny (6 tons, yielding 10 oz. gold and 8 oz. silver); the *Bear*, by T. Mighton, of Trail (6 tons, yielding 18 oz. gold and 2 oz. silver); the *Snow Drop*, by C. Penny, of Rossland; and the *Columbia* mineral claim at Waneta, by W. Crowe (1 ton yielding 1 oz. gold and 3 oz. silver).

CRANBROOK AREA.

Midway Mine.—Operated under lease by Moyie Gold Mines, Limited; G. Todd, manager. This property is situated approximately 6 miles west of Moyie, and was leased in January from J. Leask, of Cranbrook, by G. Todd and associates. Work was commenced in the beginning of February to clean up around the surface, repair the ore bins and relay tracks preparatory to resuming operations underground. After some necessary repairs had been made to the main adit operations were begun at a point 1,100 feet from the portal, where some ore was mined for a test shipment. Apparently this did not turn out to be as satisfactory as anticipated, because operations were then continued in a more or less spasmodic manner during the summer, and finally suspended in the beginning of September, when the leasers dismantled the machinery and abandoned the property.

SILVER-GOLD DEPOSITS.

SALMO AREA.

Shamrock.—Godfrey Birtsch shipped 5 tons from this claim which yielded 1 oz. gold, 23 oz. silver, 561 lb. lead, and 126 lb. zinc.

Lone Silver.—This property, owned by John and Robert Sapples, is situated near Rosebud Lake, approximately 13 miles by road south of Salmo. In 1937 it was operated first by a group of three lessees, headed by S. Heidler, of Rossland; then by the owners, with the help of two other men; and finally by the Lone Silver Gold Mines, Limited (head office 515 Royal Bank Building, Vancouver), with Guy S. Clarkson as manager. Eleven men (six underground) were employed in the latter case for a few months. The development-work done amounted to 120 feet of drifting and 40 feet of sinking. A total of 44 tons shipped to the Trail smelter yielded 9 oz. gold, 5,648 oz. silver, 5,842 lb. lead, and 3,727 lb. zinc.

TRAIL-ROSSLAND AREA.

May Flower.—C. R. Adams and C. Hutchinson shipped 6 tons from this property, the returns being 1 oz. gold, 169 oz. silver, 745 lb. lead, and 756 lb. zinc.

Rossland Union.—This property, situated on Union Hill about $3\frac{1}{2}$ miles north of Rossland, was for some time under option to Calgary interests. A crew of eleven (six underground) was employed under the direction of G. S. Levis. After development-work consisting of 60 feet of sinking and 37 feet of drifting had been done, besides some surface trenching, operations were discontinued. Seven tons of ore shipped to the Trail smelter yielded 1 oz. gold, 240 oz. silver, 1,912 lb. lead, and 888 lb. zinc.

SLOCAN LAKE AREA.

Little Daisy.—This property, owned by Mrs. McNaught, of Silverton, was operated for some time by the Slocan Lake Gold Mining Company, Inc. (head office, 503 West Sprague Avenue, Spokane, Wash.), represented by S. E. Jones. A crew of six was employed under the direction of E. A. Erickson, the work done consisting in 106 feet of drifting and 12 feet of raising.

Molly Hughes.—This property, situated on the shore of Slocan Lake about 1 mile north of New Denver, was operated by the Slocan Idaho Mines Corporation (head office, 509 Hutton Building, Spokane, Wash.), with O. C. Born as manager. A crew varying in number between four and sixteen (eleven men underground in the latter case) was employed. The power plant was reinforced by the installation of a 23 k.v.a. Fairbanks-Morse alternator, driven by a 30-horse-power Fairbanks-Morse Diesel engine. The development-work done consisted of 44 feet of sinking, 200 feet of drifting, and 48 feet of crosscutting. Thirty-four tons of ore shipped to the Trail smelter yielded 2 oz. gold, 886 oz. silver, 180 lb. lead, and 205 lb. zinc.

Morning Star.—Situating on Springer Creek. P. W. Munroe and H. E. Scovil shipped 6 tons of ore from this property, the total metal contents being 7 oz. gold, 55 oz. silver, 340 lb. lead, and 344 lb. zinc.

McAllister.—This property, situated on London Mountain, was operated first by the Denver Mining Syndicate, the affairs of which were wound up in December, and afterwards by the Slocan Silver Mines, Limited, with George Allen as manager in both cases. A crew of five was employed underground. The tonnage mined and shipped amounted to 1,281, this yielding 17 oz. gold, 83,317 oz. silver, 179 lb. lead, and 129 lb. zinc.

GOLD-SILVER-LEAD-ZINC DEPOSITS.

YMIR CAMP.

Howard.—This property, situated on the South Fork of Porcupine Creek, about 9 miles by road from Ymir, is operated by the Durango Mines, Limited (head office, 850 Hastings Street West, Vancouver), with Major A. W. Davis as manager, Jno. Anderson as mine foreman, and Wm. B. Donohue as mill superintendent. During the greater part of the year operations were limited to exploratory development and construction work. A mill was built close to Porcupine Siding, on the G.N. Railway, most of the machinery installed being brought from the *Dentonia*. At the mine a power plant consisting of a Canadian Ingersoll-Rand 15½-inch and 9½- by 8-inch compressor, driven by a 120-horse-power Fairbanks-Morse Diesel engine, and an Ingersoll-Rand 7½-inch and 12- by 12-inch compressor, driven by a 72-horse-power Diesel engine was installed. An aerial tramway 5 miles in length was built to link the mine and mill. The development-work done totalled 1,688 feet; this including 723 feet of drifts, 165 feet of crosscutting and 800 feet of diamond-drilling. The tonnage milled was 650, with production of 27 tons of lead concentrates yielding 52 oz. gold, 291 oz. silver, 12,007 lb. lead, and 3,840 lb. zinc; and of 28 tons of zinc concentrates with total metal contents of 4 oz. gold, 40 oz. silver, 1,099 lb. lead, 149 lb. cadmium, and 19,948 lb. zinc.

Nevada Group.—David Grobe, of Spokane, employed a few men in exploratory-work on this property, situated on Porcupine Creek. Ten tons of ore shipped to the Trail smelter by the owners, J. A. and M. Armes, of Vancouver, yielded 2 oz. gold, 56 oz. silver, 1,144 lb. lead, and 715 lb. zinc.

Porcupine Group.—An option on this property, owned by E. Haukedahl, of Ymir, was taken late in the year by C. Wolf, of Spokane.

DRY SILVER-ORES.

VICINITY OF SALMO.

Florence.—Three tons of ore shipped from this claim by R. Sapples and C. Peterson yielded 72 oz. silver, 58 lb. lead, and 155 lb. zinc.

SLOCAN LAKE AREA.

Ottawa.—Situating on Springer Creek about 6 miles by road from Slocan City, and operated by the Ottawa Silver Mining and Milling Company, Limited (head office, 401 Sherwood Building, Spokane). W. R. Green, formerly in charge of operations, resigned late in the year, and was succeeded by C. R. Thomas, of Spokane, with D. D. Fairbanks as assistant at the mine. A new power plant, consisting of a Canadian Ingersoll-Rand 13½-inch and 8- by 8-inch L-type compressor, driven by a Deutz 150-horse-power Diesel engine, was installed. The development-work done was limited to the advancement of No. 8 adit crosscut over a distance of 1,000 feet. The number of persons employed varied between twenty (eleven underground) while the mill was being operated, and nine (seven underground) in December. The total tonnage mined was 375. Fifteen tons of dry ore sent to the Trail smelter yielded 1 oz. gold and 4,722 oz. silver; while the 18 tons of concentrates produced contained 8,749 oz. silver and 3,444 lb. lead.

L.T. and Riverside.—B. E. O'Neil, of Slocan City, shipped 4 tons from the *L.T.*, this yielding 794 oz. silver, 844 lb. lead, and 524 lb. zinc; and T. Elsmore, of Silverton, shipped 17 tons from the *Riverside*, with metal contents of 714 oz. silver, 759 lb. lead, and 679 lb. zinc.

SILVER-LEAD DEPOSITS.

VICINITY OF NELSON.

Boadicea.—Lessees working on this property shipped 9 tons of ore, yielding 393 oz. silver and 5,042 lb. lead.

AINSWORTH CAMP.

Banker.—Situating near Ainsworth; owned by H. Giegerich, of Kaslo, and operated by the Ainsworth Mines, Limited (head office, 101 Adelaide Street West, Toronto), with Carl M. Mohr as manager. The number of men employed varied between nineteen (ten underground) in March, and fifty-two (thirty-two underground) in September. Later this was again reduced to twenty-three (fourteen underground). The chief development-work done consisted in drifting from the shaft and extending the adit-crosscut driven when the Consolidated Mining and Smelting Company was operating the property. The total tonnage mined (including 161 tons shipped in the name of the owner) amounted to 3,305 tons, with metal contents amounting to 27,464 oz. silver and 1,557,552 lb. lead.

Spokane-Trinket.—Adjoining the *Banker* and held by the Maestro Silver Lead Mines, Limited, with Carl M. Mohr as manager. No work was done on this property in the course of the year, beyond erecting a compressor-house, an ore bin, and a blacksmith-shop.

Jewel.—Some work of an exploratory nature was done on this property by the Ainsworth Mines, Limited, under the direction of Carl M. Mohr, this consisting chiefly in the sinking of a small winze. Three men were employed for some time. Twenty-six and a half tons of ore shipped from the mine yielded 196 oz. silver and 14,358 lb. lead.

Lady of the Lake.—S. Romer and A. Prestmo shipped 3 tons of ore from this property, yielding 118 oz. silver and 1,580 lb. lead.

Crow Fledgling.—The owner, W. E. Lane, shipped 7 tons of ore from this property, which yielded a total of 35 oz. silver and 835 lb. lead.

Crescent and Eden.—Robert Sherraden, holding a lease on this mine, shipped 22 tons of ore, which yielded 205 oz. silver and 17,368 lb. lead.

New Jerusalem.—This property, owned by Mrs. Elizabeth Bishop, of Los Angeles, California, was operated under lease by R. Hughes and A. A. Vassar, of Ainsworth. Three men were employed. The chief development-work done consisted in the driving of a raise connecting the adit-level with the foot of a small shaft sunk higher on the hill-side.

KASLO-RETALLACK AREA.

Lucky Boy.—The Wayside Gold Mines, Limited, employed four men for some time on this property under the direction of B. N. Sharp, and 50 feet of drifting was done.

Eureka.—Nine tons of ore shipped from this property by lessees yielded 601 oz. silver and 10,332 lb. lead.

Caledonia.—Three tons of ore shipped from this property by George McCready, of Retallack, yielded 1 oz. of gold, 1,217 oz. silver, and 9,047 lb. lead.

Fourth of July.—Lessees working on this claim shipped 3 tons of ore with total metal contents amounting to 136 oz. silver and 1,376 lb. lead.

SANDON-THREE FORKS AREA.

Slocan Monitor.—This property, owned by the Slocan Monitor Silver Mines, Limited, is situated near Three Forks. Manager, Arthur Lakes. Operations were carried on successively by two different groups of lessees in the course of the year, the company, however, having some exploratory-work done at the same time, in the form of diamond-drilling and surface-stripping. A total of 71 tons shipped by the lessees yielded 6 oz. gold, 2,927 oz. silver, 50,840 lb. lead, and 15,059 lb. zinc. The development and exploratory work done consisted of 100 feet of raising, 28 feet of drifting, 822 feet of diamond-drilling, and 160 feet of cross-cutting.

Black Colt and Palmita.—Owned by the Cunningham Mines, Limited. Clarence Cunningham, of Alamo, employed a small crew on these properties, and shipped 39 tons of ore which yielded 2,831 oz. silver and 31,054 lb. lead.

Queen Bess.—A group of four lessees, headed by E. Betalli, of New Denver, shipped 38 tons of ore from this property yielding 1 oz. gold, 3,880 oz. silver, 48,781 lb. lead, and 2,729 lb. zinc.

SLOCAN LAKE AREA.

Galena Farm.—This property, owned by the Galena Farm Mines, Limited, and situated a short distance south of Silverton, was under lease to a group of residents of that locality, headed by Warren Nelson, until late in the year, when operations were discontinued. Eight men were employed while the lease was in effect. A total of 234 tons shipped yielded 1 oz.

gold, 19,393 oz. silver, 110,656 lb. lead, and 22,343 lb. zinc; this including a shipment of 3 tons made independently by Chas. McAulay.

SILVER-LEAD-ZINC DEPOSITS.

CRANBROOK AREA.*

Sullivan Mine.—Owned and operated by the Consolidated Mining and Smelting Company of Canada, Limited. A. B. Ritchie, general superintendent;† Wm. Lindsay, mine superintendent; H. R. Banks, mill superintendent.

Back-filling of extracted areas: The surface operations in connection with this programme were suspended during the year, as a much larger quantity of ore was discovered in the particular stopes marked off for filling than was originally estimated, due to irregularities in the foot-wall. However, all available ore has now been recovered from these places, and an earlier start than usual will be possible with the tractor equipment on the surface in the spring of 1938. During the first seven months of this year, there were 72,000 cubic yards of fill provided by surface-caving through No. 14 shaft into X-9 stope. Above the 4,600 level, 140,000 cubic yards of stope volume were stowed by surface-caving after the stope pillars extracted, while in the other parts of the mine approximately 25,000 cubic yards of development waste was dumped into various stopes in preparation for back-filling.

The 3,932 shaft was extended for a distance of 25 feet below the main station on 3,900 level to provide a more efficient safeguard in the event of underwind while lowering men. The hoisting engine at the top of this shaft was also thoroughly overhauled and equipped with the latest safety features.

First-aid classes for the mine and mill were carried on, at which a large number of students were successful in obtaining their certificates. Of the total number of men actually on the mine pay-roll, 92 per cent. hold certificates for this important subject. Ten new men were trained and passed their examinations in mine-rescue work; added to those formerly trained, this makes a total of fifty-one men engaged at this mine who have qualified for this work under the supervision of J. M. Wolverton, safety engineer, and J. Shaw and S. Smith, instructors.

All mining men were deeply shocked to hear of the fatal accident to A. B. Ritchie, general superintendent, who was instantly killed on the morning of December 27th by being struck on the head by a flying rock off a blast while making his usual inspection of the underground workings. The late Mr. Ritchie was universally liked by all with whom he came in contact, men and officials alike, and through his untimely death the community of Kimberley and the Consolidated Company lost a good citizen and valuable executive official. Development at the *Sullivan* during the year consisted of 4,016 feet of drifting, 5,509 feet of raising, 426 feet of sinking, and 7,934 feet of diamond-drilling. A total of 2,227,123 tons was mined and 2,219,576 tons milled, producing 285,597 tons of lead concentrates and 238,413 tons of zinc concentrates. It might be of interest to mention in passing that the above tonnage is a record output for any one year from this mine. An average of 914 men was employed.

St. Eugene Extension.—Owned and operated by St. Eugene Extension Mines, Limited; S. S. Saxton, manager. For the purpose of proving and developing its claims in the vicinity of Moyie Lake, this company leased the *Lake Shore* claim including the *St. Eugene* shaft, from the Consolidated Mining and Smelting Company of Canada. This shaft has been full of water for nearly thirty years to a depth of 800 feet from the collar. The head-frame has been repaired and new buildings erected. Power is supplied by East Kootenay Power Company. A new hoist and necessary machinery for development has been installed. An average of fourteen men has been employed steadily at this operation during the last five months of the year. At the last inspection in December, the water had been lowered in the shaft to the bottom level but this area had not then been completely drained. During the dewatering operations, all necessary repairs were carried out in the hoisting and manway compartments.

WINDERMERE AREA.*

Excelda Mine.—Operated under option by Thunderbird Mines, Limited; R. C. Moffitt, president and general manager. Eight men were employed, five underground and three on

* By John McDonald.

† Deceased; Wm. Lindsay now general superintendent.

the surface. From information supplied by the manager, it appears that failure to reach a satisfactory renewal of their agreement with the original owners of the *Excelda* claims caused this company to suspend operations after having operated only for a period of six weeks, during which time a total drivage of 202 feet of drifting and crosscutting was accomplished. The light equipment from the mine was removed and stored in Wilmer and Invermere and the camp closed for the winter. To complete the season, the company completed some development-work on the *Queen Bess*, a group of mineral claims which are situated in close proximity to the *Thunderbird* trail; these claims were operated under lease and bond by Thunderbird Mines, Limited. Five men were engaged at this work, which consisted of two large open-cuts and a crosscut adit 23 feet in length. Some ore was discovered.

GOLDEN AREA.*

Monarch and Kicking Horse Mines.—Owned and operated by Base Metals Mining Corporation, Limited; Thomas Oxley, mine superintendent.

As in 1936, operations were confined principally to development-work and general repairs to the mill machinery. Development in the *Monarch* mine consisted of 739 feet of drifting, 1,701.5 feet of crosscutting, 350.6 feet of raising, 14 feet of sinking, and 7,766 feet of diamond-drilling.

Total drivage in the *Kicking Horse* mine consisted of 290 feet of main incline 11 by 10 feet for the new tram terminal underground, 56.5 feet of drifting, 36 feet of crosscuts, and 240 feet of raising for ore pockets and manway.

A new aerial tramway 1,700 feet in length was installed during the latter part of the year in preparation for production from this mine immediately the market price for lead and zinc is favourable. A storage-bin of 150 tons capacity is located at the lower terminal from which the ore will be transported by truck across the valley to the *Monarch* mill.

SOUTH KOOTENAY LAKE AREA.

Lakeview (Sanca).—Some work has been done intermittently on this property by different operators over a period of years. A small shaft sunk on the side of the Creston-Grey's Creek Highway is now connected by a raise to an adit-level started at a low elevation above the lake-shore. Improvised machinery was used for hoisting purposes. In the summer Robert J. Long, of Creston, who held an option on the property, employed four men in exploratory and development work for some time; 90 feet of sinking, 120 feet of crosscutting, and 500 feet of drifting being done. Seventy-two tons shipped yielded 320 oz. silver, 15,239 lb. lead, and 37,132 lb. zinc.

VICINITY OF NELSON.

Silver King.—Jos. Pavich, working under lease, shipped 28 tons from this property with total metal contents amounting to 556 oz. silver, 3,703 lb. lead, and 5,159 lb. zinc.

VICINITY OF SALMO.

Aspen.—On Deer Creek, operated by the Salmo-Malartic Mines, Limited, with Percy F. Horton as manager. During the first few months of the year a crew of twenty-two (seventeen underground) was employed, but this was reduced considerably later on. The work done in the course of the year consisted of 1,000 feet of drifting, 500 feet of crosscutting, 200 feet of sinking, and 1,700 feet of diamond-drilling.

Reeves-MacDonald.—Situated on the Pend d'Oreille River, close to the International Boundary, and about 5 miles from the customs house at Nelway. Early in March the Reeves MacDonald Mines, Limited, resumed the driving of the crosscut adit known as the River Tunnel, which had been abandoned since 1930. A crew of twenty-seven (sixteen underground) was employed for about eight months, this number being reduced somewhat towards the end of the year. The operations were conducted under the direction of Charles R. Lambly, of Metaline Falls, with B. N. Murphy in charge at the mine. The development-work done consisted of 1,615 feet of drifting.

AINSWORTH CAMP.

Krao.—The Krao Mines, Limited (B. F. Palmer, secretary, Kaslo, B.C.), shipped 18 tons of ore from this property to the Trail smelter, with total metal contents of 9,209 oz. silver, 1,206 lb. lead, and 3,022 lb. zinc.

* By John McDonald.

KASLO-RETAILLACK AREA.

Cork Province.—On Mansfield Creek. Lessees working on this property shipped 6 tons of ore yielding 37 oz. silver, 1,061 lb. lead, and 1,122 lb. zinc; and 6 tons concentrates with total metal contents amounting to 201 oz. silver, 5,640 lb. lead, and 735 lb. zinc.

Utica.—Situated on Paddy Peak and operated by the Utica Mines, Limited, with L. McLellan in charge of the operations which were limited to development-work. The number of men employed varied between nineteen (ten underground) in the second quarter of the year and four in the third, this being increased again to eleven later on. The work done consisted of 132 feet of drifting and 122 feet of raising.

Whitewater.—At Retallack. Operated by the Whitewater Mines, Limited (head office Stock Exchange Building, Vancouver), with S. N. Ross as manager and Clarence Garrett as mine foreman. Operations were suspended at the mine late in the year. The average number of men employed ordinarily was fifty-one (thirty-one underground, eleven on the surface, and nine at the mill), with an additional seven for some time in the course of the summer.

Twenty-three tons shipped directly to the Trail smelter yielded 2 oz. gold, 1,962 oz. silver, 26,450 lb. lead, and 3,842 lb. zinc. From 56,180 tons milled, 674 tons of lead and 2,135 tons of zinc concentrates were obtained. The concentrates of the former class yielded 33,606 oz. silver, 594,440 lb. lead, and 121,240 lb. zinc; and the zinc concentrates yielded 23 oz. gold, 8,132 oz. silver, 44,333 lb. lead, 14,823 lb. cadmium, and 1,952,815 lb. zinc.

Wellington.—Situated at Retallack. Operated by the Wellington Mines, Limited (head office Nelson, B.C.), with A. G. Larson as manager and Stephen Kohar as mine foreman. Operations were limited entirely to development. Thirteen men were employed (eight underground).

Jackson.—E. W. Garrett, of Retallack, acting for James Anderson, of Vancouver, shipped 87 tons from this property, yielding 1,723 oz. silver, 28,010 lb. lead, and 44,931 lb. zinc.

Lucky Jim.—At Zincton. Operated by the Lucky Jim Lead and Zinc Company (head office, 616 Stock Exchange Building, Vancouver). Manager, John A. Fingland; mine foreman, Norman Nystad. Operations were resumed in the spring, after the mine had been idle for several years. The mill was operated irregularly as the supply of ore fluctuated considerably. The number of men employed varied between thirty-nine (twenty-three underground) in June, and twelve (seven underground) in November. The tonnage mined and milled was 12,100, from which 259 tons of concentrates were obtained, these yielding 452 oz. silver, 912 lb. lead, 1,682 lb. cadmium, and 238,224 lb. zinc.

SANDON-THREE FORKS AREA.

Slocan Rambler.—Near Three Forks. This property has been idle for several years. However, the Ross Mining Syndicate, of Retallack, employed a few men for some time in sorting ore on the dumps and conveying it to the *Whitewater* mill. Eight tons of concentrates, with total metal contents amounting to 657 oz. silver, 3,000 lb. lead, and 2,122 lb. zinc were obtained.

Noble Five.—At Cody. Operated by the Noble Five Mines, Limited, with Paul Lincoln as manager and Peter Hansen as mine foreman. The mine was operated during several months with a crew of twenty-six (fifteen underground) the development-work consisting of 110 feet of sinking and 348 feet of drifting. The tonnage mined and milled amounted to 3,249, from which 281 tons of lead and 265 tons of zinc concentrates were obtained. The lead concentrates yielded 3 oz. gold, 23,855 oz. silver, 265,519 lb. lead, and 37,793 lb. zinc; while the zinc concentrates yielded 1 oz. gold, 2,031 oz. silver, 5,707 lb. lead, 1,796 lb. cadmium, and 235,223 lb. zinc. Operations were suspended early in December.

Ruth-Hope.—Owned by Ruth Hope Mines, Limited (head office, 616 Stock Exchange Building, Vancouver). Shipments made to the Trail smelter from this property consisted of 50 tons of ore, yielding 3,079 oz. silver, 43,351 lb. lead, and 8,129 lb. zinc; and 88 tons zinc concentrates yielding 2 oz. gold, 1,407 oz. silver, 3,590 lb. lead, 641 lb. cadmium, and 71,146 lb. zinc.

Number One.—Owned by J. M. Harris, of Sandon, and F. T. Kelly. Lessees working on this property shipped 90 tons of ore, yielding 1 oz. gold, 5,592 oz. silver, 80,862 lb. lead, and 18,610 lb. zinc.

Slocan Sovereign.—A group of four lessees, headed by E. J. Vandergrift, discovered an apparently fairly rich ore-shoot below No. 2 level, and took an option on the property. The mine had been abandoned for some time. A shipment of 61 tons to the Trail smelter yielded 3,187 oz. silver, 52,529 lb. lead, and 12,560 lb. zinc.

Silver Ridge.—Operated by the Silver Ridge Mining Company, with R. A. Grimes as manager. The work done was entirely of an exploratory nature and the method of surface prospecting by stripping and trenching with a bulldozer, heretofore untried in the Slocan, was introduced with highly gratifying results. The number of men employed was eleven, and 600 feet of drifting and 100 feet of crosscutting was done.

Victor.—Owned by Mrs. Dacy Petty, of Nelson, and worked under lease by E. Doney and son. Shipments from this property amounted to 226 tons, yielding 22 oz. gold, 27,449 oz. silver, 120,686 lb. lead, and 102,880 lb. zinc. The development-work done consisted of 50 feet of drifting, 50 feet of raising, and 45 feet of crosscutting.

Canadian Group.—Situated on Silver Ridge, at an altitude of approximately 7,000 feet, and adjoining the *Ivanhoe*. The Basal Mines, Limited (head office, Royal Bank Building, Vancouver), began exploratory and repair work in the early summer, and considerable headway had been made with the rehabilitation of the property when operations had to be suspended owing to the approach of winter. Ten men were employed (five underground) under the direction of A. J. Gaul.

Other properties in this section on which some work was done were the *Hinckley*, from which G. H. Murhard, of Sandon, shipped 2 tons yielding 166 oz. silver, and 2,434 lb. lead; the *Rio*, from which J. H. Pendray shipped 5 tons, yielding 501 oz. silver, 1,380 lb. lead, and 509 lb. zinc; the *Mercury*, operated for some time by Sam Marjoli, who shipped 5 tons yielding 628 oz. silver, 3,396 lb. lead, and 841 lb. zinc; and the *Springfield*, from which P. Chmelar, of Sandon, shipped 1 ton yielding 15 oz. silver, 297 lb. lead, and 328 lb. zinc.

SLOCAN LAKE AREA.

Mountain Chief.—Owned by H. Giegerich, of Kaslo, and operated under lease by John Cechelero, of New Denver, and associates. Forty-seven tons of ore shipped from this property yielded 3,565 oz. silver, 11,870 lb. lead, and 23,280 lb. zinc.

Hartney.—Owned by Thos. Avison, of New Denver. E. Cripps and associates took an option on the property, which had been idle for a number of years; a considerable amount of repair-work was done and a cabin and an ore bin were built.

Bosun.—Lessees (J. Zamboni and J. Beber) shipped 52½ tons from this property, yielding 2,986 oz. silver, 10,928 lb. lead, and 24,547 lb. zinc.

Mammoth.—On Avison Creek. Operated by the Western Exploration Company, Limited. Manager, A. M. Ham; mine foreman, Chas. Hanna; mill superintendent, Guy Waterman. Operations were resumed in the spring after the mine had been idle for rather more than a year, but were suspended again in December owing to the difficulties presented by transportation and the danger of snowslides. The average number of men employed was ninety-two (fifty-two underground, thirty on the surface, and sixteen at the mill). Development-work done consisted of 351 feet of drifting, 22 feet of crosscutting, and 547 feet of raising. The total tonnage mined was 25,008. Fifteen tons of ore shipped to the Trail smelter yielded 479 oz. silver, 3,208 lb. lead, and 2,929 lb. zinc; 2,160 tons of lead concentrates yielded 31 oz. gold, 256,244 oz. silver, 1,778,148 lb. lead, and 868,279 lb. zinc; while 2,801 tons of zinc concentrates shipped yielded 24 oz. gold, 36,772 oz. silver, 37,245 lb. lead, 25,657 lb. cadmium, and 2,631,790 lb. zinc. These totals include the concentrates obtained from ore mined at the *Standard* and treated at the *Mammoth* mill.

Standard.—Owned and operated by the Western Exploration Company, Limited. Manager, A. M. Ham. A considerable amount of repair-work had to be undertaken to bring this mine into working condition again. The number of men employed varied between a maximum of twenty-three (with seventeen underground) in September and eleven (seven underground) in November. Operations were conducted more actively after the *Mammoth* had been closed down for the winter. The development-work consisted of reopening old tunnels. The total tonnage mined was 3,861. Seventeen tons shipped to Trail yielded 471 oz. silver, 3,065 lb. lead, and 6,270 lb. zinc. The balance of the output was treated at the *Mammoth* mill.

Hewitt.—This property, owned by the Galena Farm Consolidated Mines, Limited, was operated by three groups of lessees, comprising a total of eleven men headed by Ed. Mathews, E. Burke, and G. Kirk, respectively. The tonnage shipped amounted to 314 tons, with total metal contents of 5 oz. gold, 31,257 oz. silver, 130,492 lb. lead, and 67,689 lb. zinc.

Slocan-Arlington.—Situated on Springer Creek. The Slocan-Arlington Mines Development Company (head office, Penticton, B.C.) shipped 528 tons of ore from the dumps on this property to the Trail smelter, and yielded 3,418 oz. silver, 9,823 lb. lead, and 5,947 lb. zinc.

Lucky Thought.—H. V. Dewis, of Silverton, shipped 83 tons of ore from this property, which yielded 2 oz. gold, 4,564 oz. silver, 23,424 lb. lead, and 39,695 lb. zinc.

LARDEAU AREA.

Spider.—Formerly known as the *Multiplex*. On this property, situated near Camborne, exploratory and development work was carried on through the greater part of the year by I. G. Nelson and Grover Cady, of Nelson, under the direction of W. S. Harris. Eleven men were employed (six underground), this number being reduced to three for the winter months. There is no machinery on the property, but arrangements are under way to secure electric power from the *Meridian* plant, about 1½ miles away from the mine in a straight line. Ninety tons of ore shipped to the Trail smelter yielded 8 oz. gold, 6,784 oz. silver, 34,019 lb. lead, and 29,838 lb. zinc.

True Fissure.—Situated about 5 miles from Ferguson and operated by the New True Fissure Mining and Milling Company, Limited (head office, 800 Guarantee Trust Building, Windsor, Ontario), with Alexander H. Smith as manager, John Asher as mine foreman, and Fred Robinson in charge of the mill. Operations were begun in the spring, and the summer was largely spent in improving the road, cleaning and repairing the mine workings, completing the construction of the mill, and erecting new living accommodation. The power plant was badly damaged by a freshet in the month of August and had to be rebuilt. Mining operations began in the fall, about 50 tons being treated at the mill daily. Electric power is supplied by a 300-horse-power alternator driven by a Pelton wheel, and is transmitted to the mine at a line voltage of 2,400. A 15½-inch and 9½-inch by 8-inch Canadian Ingersoll-Rand compressor driven by a 100-horse-power C.G.E. induction-motor has been installed. The development-work done consisted of 410 feet of drifting, 50 feet of raising, and 9 feet of crosscutting. Seventy-nine tons of concentrates shipped to the Trail smelter yielded 31 oz. gold, 3,804 oz. silver, 62,747 lb. lead, and 16,216 lb. zinc.

Silver Cup.—Situated about 8 miles from Ferguson and operated by the Silver Cup Mining and Milling Company, Limited. Operations, begun late in 1936, have so far been limited to the construction of a small flotation-mill and of an aerial tramway 1,700 feet in length, the erection of living-quarters and the treatment of ore recovered from the mine dumps. The only underground work attempted was the cleaning of a part of No. 7 level. A total of twenty-four men were employed (all on the surface and at the mill), at first under the direction of L. C. Penhoel, and later under that of M. C. Arnold. Two hundred and nine tons of concentrates shipped to the Trail smelter yielded 229 oz. gold, 22,344 oz. silver, 73,609 lb. lead, and 66,546 lb. zinc. The recovery of the latter metal is incomplete, a high percentage of it finding its way in the tailings. Owing to the condition of the road from Ferguson, after the first heavy snowfall, operations were suspended on the 13th day of December.

VICINITY OF ALBERT CANYON.

Allco Silver.—At this property, operated by the Allco Silver Mines, Limited (head office, 708 Yorkshire Building, Vancouver), and situated on the middle fork of Silver Creek, about 12 miles north of Silver Creek Siding on the Canadian Pacific Railway, a crew of six (three underground) was employed for nearly a year under the direction of Roy D. Watson. The development-work done consisted of 65 feet of sinking, 50 feet of winze, and 115 feet of cross-cutting. A total of 114 tons of ore shipped yielded an estimated 4,469 oz. silver and 86,640 lb. lead.