Minister of Mines

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

For the Year Ended 31st December

1954

VICTORIA, B.C.
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1955

BRITISH COLUMBIA DEPARTMENT OF MINES

VICTORIA, B.C.

Hon. R. E. SOMMERS, *Minister.*

JOHN F. WALKER, *Deputy Minister.*

H. C. HUGHES, *Chief Inspector of Mines.*

G. CAVE-BROWNE-CAVE, *Chief Analyst and Assayer.*

HARTLEY SARGENT, *Chief, Mineralogical Branch.*

P. J. MULCAHY, *Chief Gold Commissioner.*

To His Honour CLARENCE WALLACE, C.B.E.,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Mining Industry of the Province for the year 1954 is herewith respectfully submitted.

R. E. SOMMERS,
Minister of Mines.

Minister of Mines' Office.
May, 1955.

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ANNUAL REPORT OF THE MINISTER OF MINES, 1954

Introduction

A Report of the Minister of Mines of the Province of British Columbia has been published each year since 1874.

The Annual Report records the salient facts in the progress of the industry, also much detail about individual mining operations, including those undertaken in the search for, exploration of, and development of mineral deposits, as well as the actual winning of material from mineral deposits.

The Annual Report of the Minister of Mines now contains introductory sections dealing with Statistics and Departmental Work, followed by sections dealing with Lode Metals; Placer; Structural Materials and Industrial Minerals; Petroleum and Natural Gas; Inspection of Lode Mines, Placer Mines, and Quarries; Coal; and Inspection of Electrical Equipment and Installations at Mines and Quarries, each with its own table of contents. A table listing the properties described, in geographic groupings, precedes the index.

An introductory review of the mining industry and notes at the first of several of the main sections deal generally with the industry or its principal subdivisions. Notes in the various sections deal briefly with the work done on individual properties during the year or describe a property in more complete detail, outlining the history of past work and the geological setting as well as describing the workings and the mineral deposits exposed in them. Some notes deal with areas rather than with a single mine or property.

The work of the branches of the Department is outlined briefly in the section on Departmental Work. This section is followed by notes dealing briefly with the work of the British Columbia or Federal Government services of particular interest to the mining industry of British Columbia. Information concerning mine operations and some of the activities of the Inspection Branch of the Department of Mines is contained in the section on Inspection of Lode Mines, Placer Mines, and Quarries, early in the section on Coal and in the section on Inspection of Electrical Equipment and Installations at Mines and Quarries.

The section on Statistics begins with an outline of current and past practice in arriving at quantities and calculating the value of the various products.

Review of the Mining Industry in British Columbia, 1954

By Hartley Sargent

The metals, industrial minerals, fuels, and structural materials produced by the mineral industry of British Columbia in 1954 had a combined value of $153,377,315, compared with $152,628,683 in 1953. The products include twenty-three mineral substances and three structural products manufactured from mineral substances. Only for the structural products—cement, lime, and clay products—does manufacturing enter into the value assigned. Dominantly the value assigned is that of basic products won from natural deposits by the mineral industry. The industry processes ores of metals to produce high-grade concentrates or refined metals, and some industrial minerals are also concentrated. The products of the industry are mainly basic commodities that secondary industry manufactures into products of much greater unit value. In so far as the manufacturing is done in British Columbia, the increase over the value of the basic commodity makes a further contribution to the economy of the Province. A notable example is the industrial mineral, sulphur, to which the value assigned is $2,308,422. Some of the sulphur is used in the production of wood pulp, and some is sold as sulphuric acid or for use in the manufacture of sulphuric acid, but most of the sulphur is used in plants at Trail and Kimberley in the production of fertilizer that has a market value several times that assigned to sulphur.

The details of 1954 mineral production are set out in Tables III and VIIA.

The prices in Canadian funds used in valuing the principal metals and concentrates are listed on page 18.

The selling prices for most of the metal produced are in United States funds. The United States dollar was at a discount in Canadian funds throughout 1954; the discount averaged 2.6 per cent, compared with 1.6 per cent in 1953. United States prices for copper, lead, and zinc rose moderately during 1954, and the price for silver was constant. The greater discount resulted in somewhat lower average prices for silver, copper, and zinc in Canada; however, the price for lead was somewhat higher than in 1953.

Most of the copper produced went to the Tacoma smelter mainly in the form of concentrates, but in part as dross shipped from the lead smelter at Trail for recovery of the copper content. Lead and zinc refined at Trail were shipped to other Provinces of Canada, to Europe, including the British Isles, and to the United States. Additional quantities of lead and zinc were shipped to United States smelters in the form of concentrates. Copper continued to enter the United States duty free, and the duties on lead and zinc continued to be: On lead in ores and concentrates, 0.75 cent per pound; on lead in bullion, 1.06 cents per pound; on zinc in concentrates, 0.6 cent per pound; on refined zinc in slabs, 0.7 cent per pound.

Compared with 1953, the quantity of gold produced was essentially unchanged; an increase in the output of lode mines offset the decreased output of placer gold. Loss of lode-gold output from Portland Canal was more than offset by increases in the Tulsequah, Wells, Bridge River, and Hedley areas. The Island Mountain mine was taken over by The Cariboo Gold Quartz Mining Company Limited in August, and continued in production as the Aurum mine, the ore being trucked to the mill at the Cariboo Gold Quartz mine. Significant contribution to the output of gold is made by base-metal mines, including the copper mines and some of the silver-lead-zinc mines. The Big Bull and Tulsequah Chief mines at Tulsequah yield gold, silver, copper, lead, and zinc, as does the Silver Standard at Hazelton. However, copper production is mainly from the Britannia and Copper Mountain mines, and gold from the Cariboo Gold Quartz-

Aurum, the Bralorne and Pioneer, and the Nickel Plate mines. Copper output at the Britannia mine was increased, and Cowichan Copper Co. Ltd., a new producer, shipped crude ore from the Blue Grouse mine near Cowichan Lake.

More than a dozen silver-lead-zinc mines were in regular production, and shipments of crude ore or of customs mill concentrates were made from numerous other properties. Silver output increased in 1954, mainly because of increases in the Fort Steele and Skeena Mining Divisions. In the Skeena Mining Division the Torbrit company operations were carried on throughout 1954, whereas in 1953 operations were suspended for several months. Lead and zinc output increased materially in the Golden, Fort Steele, and Revelstoke Mining Divisions. In the Golden Mining Division the Mineral King mine began production, and the output of the Silver Giant mine was increased. In other mining divisions, notably Nelson and Slocan, the output of zinc was reduced materially.

Less iron ore was exported to Japan than in 1953. Tungsten output was considerably more than in 1953; however, the Red Rose mine, one of the two tungsten producers, was shut down before the end of 1954 because of marketing difficulties. A substantial increase in asbestos production and an increase in sulphur raised the value of industrial minerals materially above the 1953 value. The value of structural materials was moderately greater than in 1953.

Coal output was somewhat less than in 1953. On Vancouver Island, coal production came from the Tsable River colliery and from several small operators in the Nanaimo area. Output in the Princeton area was materially greater than in 1953 and was sold mainly for use in the Granby steam power plant at Princeton. Strip-mined coal continues to make a substantial contribution to the output in the East Kootenay District. Strip mines are operated by The Crow's Nest Pass Coal Company Limited near Michel and by Coleman Collieries Limited at Tent Mountain on the British Columbia-Alberta Boundary. Production of briquetted coal was begun at Michel in 1953. The markets for steam coal and for coke have long been very important to the East Kootenay coal-producers. Production of coal at Telkwa and in the Peace River area was about at the 1953 rate.

Exploration for and development of metal deposits was directed mainly to copper, uranium, and iron. Exploration was carried on actively by the Cowichan Copper Company, some interest was shown in copper occurrences in the Merritt area, and the exploration of the Granduc property indicated the existence of large copper orebodies. In addition to the more usual development and exploration at producing silver-lead-zinc mines, mention should be made of the adit begun at Beaverdell, 700 feet lower than the lowest workings of the Highland-Bell mine. This project involves driving more than a mile of adit to permit deep exploration of this long-productive silver-lead mine. The search for uranium has indicated its presence associated with titanium or niobium in lode deposits in several parts of the Province, and in some placer deposits. Uranium in the mineral uraninite was recognized several years ago in two cobalt-bearing deposits, and uraninite appears to be the uranium-bearing mineral in deposits that were discovered on the west side of Atlin Lake in 1953. The uranium-bearing deposit at Birch Island, where the uranium-bearing mineral is pyrochlore, is being explored by underground workings and diamond drilling by Rexspar Uranium & Metals Mining Co. Limited. A fairly active campaign of prospecting for iron ore was carried out on Vancouver Island and is expected to continue in 1955. In northern British Columbia a discovery of fluorite and witherite near the hot springs not far from the point where the Alaska Highway crosses the Liard River, and discoveries of the beryllium minerals, beryl and helvite, east of Dease River point to interesting possibilities. This most northerly part of the Province has come into prominence in recent years because of the successful development and production of high-quality asbestos by Cassiar Asbestos Corporation Limited.

Perhaps the most significant exploration in British Columbia in 1954 has been the continued search for petroleum and natural gas. This activity has been carried on mainly in northeastern British Columbia, although interest has been shown in other parts of the Province. Work was done on a total of thirty-four wells, of which fifteen were completed as potential gas-producers and nine were abandoned. At the end of 1954 drilling was being done at seven wells, one was being tested, and work had been suspended at two wells. Production of gas for use in Fort St. John was begun at the end of the summer, and announcements at the end of the year indicate more certain prospects for early construction of a pipe-line to convey gas from northeastern British Columbia and some near-by fields in Alberta to southern British Columbia and northwestern United States.

Production of refined metal in British Columbia was increased by the production of aluminium begun at Kitimat in August, 1954. The aluminium is derived from ore mined in Jamaica and does not enter into British Columbia production figures.

The average number employed throughout 1954 in placer, lode, coal, industrial-mineral, and structural-materials mining was 14,128. Major expenditures by those branches of the industry included: Salaries and wages, $48,702,746; fuel and electricity, $7,128,669; process supplies, $19,654,724; Federal taxes, $13,692,190; Provincial taxes, $2,443,691; municipal and other taxes, $1,537,067; levies for workmen's compensation (including silicosis), unemployment insurance, and other items, $1,647,642. Dividends amounted to $25,368,262, and the lode-mining industry spent $29,135,673 in freight and treatment charges on ores and concentrates. Expenditure in exploration for petroleum and natural gas in 1954 was $4,266,998.

Statistics

Mining statistics are collected and compiled and the statistical tables for this Report are prepared by the Bureau of Economics and Statistics, Department of Trade and Industry.

In the 1951 Report, extensive rearrangements of tables and of their order were made. The tables in the present Report closely parallel those presented in Reports for years preceding 1951, but additional details have been incorporated, and the present order is considered to make more apparent the relationship between summary tables and the tables giving the details summarized.

METHOD OF COMPUTING PRODUCTION

The tables of statistics recording the mineral production of the Province for each year are compiled from certified returns made by the operators of mines, augmented by some data obtained from the Royal Canadian Mint (Assay Office) and from the operators of customs smelters. The value of each mineral product, in Canadian funds, is calculated at the average price for the year (*see* p. 18). The quantities of metals are net after making deductions for losses in smelting and refining.

Prior to 1925 the average prices for gold and copper are true average prices, but, as a means of correcting for losses in smelting and refining, the prices of other metals were taken at the following percentages of the year's average price for the metal: Silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent. For 1925 and subsequent years the value has been calculated using the true average price and the net metal contents, in accordance with the procedures adopted by the Dominion Bureau of Statistics and the co-operating Provincial Departments of Mines.

Beginning with the Annual Report for 1948, production figures for individual lode-mining operations are the assay contents of the products shipped (ore, concentrates, or bullion), no deductions being made for losses in smelting and refining. In previous Annual Reports the production figures given for individual properties are net, after deductions for smelting and refining losses.

METALS

Placer Gold

The data on placer-gold production were very largely obtained from the Gold Commissioners until 1925. The value of placer gold in dollars is now obtained from returns received annually from the operators. At the old standard price, $20.67 per ounce of fine gold, $17 was regarded as a close approximation of the average value per ounce of crude placer gold produced in British Columbia. Dividing the production reported in dollars by 17 gave the equivalent in crude ounces. The average value $17 per ounce is equivalent to a fineness of 822½. Beginning with 1932 the average value per crude ounce has been based on the same fineness but has recognized the varying price of gold. The average price per ounce of crude placer gold for each year is listed on page 18.

Lode Metals, Gross and Net Contents

The gross contents are the gold and silver contents of bullion and for ores and concentrates the total assay contents, obtained by multiplying the assay by the weight. The quantities for gold, silver, copper, lead, and zinc in Table XV and in "Notes on Metal Mines" are gross.

Calculations of the value of production are based on the total assay content for gold and on net content for the other principal metals. These are: in lead ores and concentrates and zinc concentrates, for silver 98 per cent, lead 95 per cent, and zinc

85 per cent of the total assay content; and in copper concentrates, 95 per cent of the silver and the total assay content of copper less 10 pounds per ton of concentrates. Quantities for silver, lead, zinc, and copper in Tables I to VIII, inclusive, are net.

Average Metal Prices

In the interests of uniformity the Statistical Bureaux of the Provinces and the Dominion Bureau of Statistics use the same average metal prices in valuing mineral production. Up to and including the year 1939 the prices used in evaluating metal and mineral production were:—

Gold and silver: The average United States price for the year, as quoted in the Engineering and Mining Journal, converted into Canadian funds at the average exchange rate.

Copper, lead, and zinc: For lead and zinc, the average London Metal Market prices for the year converted into Canadian funds at the average exchange rate; for copper, until 1932 the New York price for copper was used, thereafter the average London Metal Market price was used.

Suspension of trading on the London Metal Exchange in September, 1939, and the controls of metals during the war years necessitated changes from the procedures which had been followed.

The method of arriving at the price for gold continued unchanged, but the prices for the metals controlled were those set by the Canadian Metals Controller. In 1945 the controls were largely removed from sales but not from prices. Control of metal prices ended on June 6th, 1947. For 1945 and subsequent years the prices are those computed by the Dominion Bureau of Statistics, using information supplied by the principal Canadian refiners of silver and the base metals.

In the period 1945–47 the prices received for silver, lead, and zinc sold for use in Canada were substantially less than the prices received for these metals exported to the United States. The prices for silver in 1945 and 1946 and for copper, lead, and zinc in 1946 and 1947 are weighted averages, taking into consideration sales in Canada at the ceiling prices and sales abroad at New York prices converted into Canadian funds.

Prices are now arrived at by the methods that were in effect prior to World War II.

Fuel

In 1926 a change was made in computing coal and coke statistics. The practice in former years had been to list as coke production only the coke made in bee-hive ovens, the coal used in making it not being listed; coke made in by-product ovens was not listed as coke, but the coal used in making this coke was credited as coal production. The result was that both the coal and the coke production figures were incomplete. Starting with the 1926 Annual Report, the standard practice of the Bureau of Statistics, Ottawa, was adopted. This consists of crediting all coal produced, including that used in making coke, as primary mine production. Coke-making is considered a manufacturing industry. As the data are of interest to the mining industry, Table X is included in the Report to show the total coke produced in the Province, together with by-products, and the values given by the producers. The pre-1926 data have now been reworked and brought into conformity with current practice. Table IXA lists the full mine output (gross) produced and its net value, and these figures are incorporated in Table I, in the total mine production for the Province. Table X gives the complete data for coke, gas, and by-products manufacture for the period 1895 to 1925, and for each year subsequent to 1925.

Up to and including the year 1947, production was recorded in long tons (2,240 pounds). Beginning in 1948, production is given in short tons (2,000 pounds). The quantity of coal produced in the preceding years has been recalculated in short tons.

The average price for coal, listed year by year (*see* p. 18), is the total value divided by the quantity. Up to and including 1945, the quantity is the gross mine output; for 1946 and subsequent years, the quantity is the quantity sold and used. For 1946 and subsequent years, the value (Tables I, III, VIIA, IXA, IXB, and IXC) is the amount realized from sales of coal, at colliery loading points, plus the colliery valuation of coal used, under the headings given in Table IXC. For 1946 and subsequent years the quantity sold and used is shown in Table IXC. "Use" includes coal used under company stationary and locomotive boilers, and used in making coke. Washery loss and changes in stocks, year by year, are shown in the table, "Collieries of British Columbia, Production and Distribution by Collieries and by Districts," page 214 of this Report.

AVERAGE PRICES USED IN VALUING PROVINCIAL PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, AND COAL

Year	Gold,[1] Crude, Oz.	Gold, Fine, Oz.	Silver, Fine, Oz.	Copper, Lb.	Lead, Lb.	Zinc, Lb.	Coal, Short Ton
	$	$	Cents	Cents	Cents	Cents	$
1901	17.00	20.67	56.002 N.Y.	16.11 N.Y.	2.577 N.Y.	.....	2.679
1902	.....	.....	49.55 ,,	11.70 ,,	3.66 ,,	.....	.....
1903	.....	.....	50.78 ,,	13.24 ,,	3.81 ,,	.....	.....
1904	.....	.....	53.36 ,,	12.82 ,,	3.88 ,,	.....	.....
1905	.....	.....	51.33 ,,	15.59 ,,	4.24 ,,	.....	.....
1906	.....	.....	63.45 ,,	19.28 ,,	4.81 ,,	.....	.....
1907	.....	.....	62.06 ,,	20.00 ,,	4.80 ,,	.....	3.125
1908	.....	.....	50.22 ,,	13.20 ,,	3.78 ,,	.....	.....
1909	.....	.....	48.93 ,,	12.98 ,,	3.85 ,,	.....	.....
1910	.....	.....	50.812 ,,	12.738 ,,	4.00 ,,	4.60 E. St. L.	.....
1911	.....	.....	50.64 ,,	12.38 ,,	3.98 ,,	4.90 ,,	.....
1912	.....	.....	57.79 ,,	16.341 ,,	4.024 ,,	5.90 ,,	.....
1913	.....	.....	56.80 ,,	15.27 ,,	3.93 ,,	4.80 ,,	.....
1914	.....	.....	52.10 ,,	13.60 ,,	3.50 ,,	4.40 ,,	.....
1915	.....	.....	47.20 ,,	17.28 ,,	4.17 ,,	11.25 ,,	.....
1916	.....	.....	62.38 ,,	27.202 ,,	6.172 ,,	10.88 ,,	.....
1917	.....	.....	77.35 ,,	27.18 ,,	7.91 ,,	7.566 ,,	.....
1918	.....	.....	91.93 ,,	24.63 ,,	6.67 ,,	6.94 ,,	4.464
1919	.....	.....	105.57 ,,	18.70 ,,	5.19 ,,	6.24 ,,	.....
1920	.....	.....	95.80 ,,	17.45 ,,	7.16 ,,	6.52 ,,	.....
1921	.....	.....	59.52 ,,	12.50 ,,	4.09 ,,	3.95 ,,	.....
1922	.....	.....	64.14 ,,	13.38 ,,	5.16 ,,	4.86 ,,	.....
1923	.....	.....	61.63 ,,	14.42 ,,	6.54 ,,	5.62 ,,	.....
1924	.....	.....	63.442 ,,	13.02 ,,	7.287 ,,	5.39 ,,	.....
1925	.....	.....	69.065 ,,	14.042 ,,	7.848 Lond.	7.892 Lond.	.....
1926	.....	.....	62.107 ,,	13.795 ,,	6.751 ,,	7.409 ,,	.....
1927	.....	.....	56.37 ,,	12.92 ,,	5.256 ,,	6.194 ,,	.....
1928	.....	.....	58.176 ,,	14.570 ,,	4.575 ,,	5.493 ,,	.....
1929	.....	.....	52.993 ,,	18.107 ,,	5.050 ,,	5.385 ,,	.....
1930	.....	.....	38.154 ,,	12.982 ,,	3.927 ,,	3.599 ,,	.....
1931	.....	.....	28.700 ,,	8.116 ,,	2.710 ,,	2.554 ,,	4.018
1932	19.30	23.47	31.671 ,,	6.380 Lond.	2.113 ,,	2.405 ,,	3.795
1933	23.02	28.60	37.832 ,,	7.454 ,,	2.391 ,,	3.210 ,,	.....
1934	28.37	34.50	47.461 ,,	7.419 ,,	2.436 ,,	3.044 ,,	.....
1935	28.94	35.19	64.790 ,,	7.795 ,,	3.133 ,,	3.099 ,,	.....
1936	28.81	35.03	45.127 ,,	9.477 ,,	3.913 ,,	3.315 ,,	.....
1937	28.77	34.99	44.881 ,,	13.078 ,,	5.110 ,,	4.902 ,,	.....
1938	28.93	35.18	43.477 ,,	9.972 ,,	3.344 ,,	3.073 ,,	.....
1939	29.72	36.14	40.488 ,,	10.092 ,,	3.169 ,,	3.069 ,,	.....
1940	31.66	38.50	38.249 ,,	10.086 ,,	3.362 ,,	3.411 ,,	.....
1941	31.66	38.50	38.261 ,,	10.086 ,,	3.362 ,,	3.411 ,,	.....
1942	31.66	38.50	41.166 ,,	10.086 ,,	3.362 ,,	3.411 ,,	.....
1943	31.66	38.50	45.254 ,,	11.75 ,,	3.754 ,,	4.000 ,,	.....
1944	31.66	38.50	43.000 ,,	12.000 ,,	4.500 ,,	4.300 ,,	.....
1945	31.66	38.50	47.000 ,,	12.550 ,,	5.000 ,,	6.440 ,,	.....
1946	30.22	36.75	83.650 ,,	12.80 ,,	6.750 ,,	7.810 ,,	5.57
1947	28.78	35.00	72.000 ,,	20.39 ,,	13.670 ,,	11.230 ,,	6.51
1948	28.78	35.00	75.000 Mont.	22.35 U.S.	18.040 ,,	13.930 ,,	7.20
1949	29.60	36.00	74.250 U.S.	19.973 ,,	15.800 U.S.	13.247 U.S.	6.55
1950	31.29	38.05	80.635 ,,	23.428 ,,	14.454 ,,	15.075 ,,	6.46
1951	30.30	36.85	94.55 ,,	27.70 ,,	18.4 ,,	19.9 ,,	6.46
1952	28.18	34.27	83.157 ,,	31.079 ,,	16.121 ,,	15.874 ,,	6.93
1953	28.31	34.42	83.774 ,,	30.333 ,,	13.265 ,,	10.675 ,,	6.96
1954	**27.52**	**34.07**	**82.982 ,,**	**29.112 ,,**	**13.680 ,,**	**10.417 ,,**	**7.06**

[1] Unrefined placer gold, average price per ounce, is taken as $17 divided by $20.67 times the price of an ounce of fine gold.

Prices for fine gold are the Canadian Mint buying prices. Prices for other metals are those of the markets indicated, converted into Canadian funds. The abbreviations are: Mont.=Montreal; N.Y.=New York; Lond.=London; E. St. L.=East St. Louis; and U.S.=United States.

Prior to 1925 the prices for gold and copper are true average prices, but the prices of other metals were taken at the following percentages of the year's average price for the metal: Silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent.

For coal *see* last paragraph under "Fuel," page 17.

The bases for the prices listed are discussed in detail on pages 15 and 16.

TABLE I.—TOTAL MINE PRODUCTION FOR ALL YEARS UP TO AND INCLUDING 1954

	Total Quantity	Total Value	Quantity, 1954	Value, 1954
Gold—placer ..... crude, oz.	5,185,829	$95,547,105	8,684	$238,967
„ —lode ..... fine, oz.	14,478,674	412,724,866	258,388	8,803,279
Silver ..... oz.	378,389,896	218,410,740	9,825,153	8,153,108
Copper ..... lb.	2,791,156,351	433,971,639	50,150,087	14,599,693
Lead ..... lb.	11,416,655,478	750,595,634	332,474,456	45,482,505
Zinc ..... lb.	8,570,751,124	620,107,557	334,124,560	34,805,755
Miscellaneous metals[1]	.....	89,881,257	.....	11,866,409
Industrial minerals[2]	.....	44,740,833	.....	5,877,881
Structural materials	.....	187,183,516	.....	14,395,174
Coal ..... tons	136,204,493[3]	514,535,282	1,308,284[3]	9,154,544
Totals	.....	$3,367,698,429	.....	$153,377,315

[1] For individual miscellaneous metals, *see* Tables III and VIIIc, pages 21 and 33.
[2] For individual industrial minerals, including sulphur, *see* Tables III and VIIIb, pages 21 and 36.
[3] Total quantity is gross mine output; it includes material discarded in picking and washing. The quantity shown for 1954 is that sold and used (*see also* Table IXc).

TABLE II.—PRODUCTION FOR EACH YEAR FROM 1836 TO 1954, INCLUSIVE

1836–95 (incl.)	$95,355,010	1926	$67,188,842
1896	7,507,956	1927	60,729,358
1897	10,455,268	1928	65,372,583
1898	10,906,861	1929	68,245,443
1899	12,429,707	1930	55,391,993
1900	16,344,751	1931	34,883,181
1901	19,671,572	1932	28,798,406
1902	17,486,550	1933	32,602,672
1903	17,495,954	1934	42,305,297
1904	18,977,359	1935	48,821,239
1905	22,461,325	1936	54,081,967
1906	24,980,546	1937	74,475,902
1907	25,882,560	1938	64,485,551
1908	23,851,277	1939	65,681,547
1909	24,443,025	1940	75,701,145
1910	26,377,066	1941	78,479,719
1911	23,499,072	1942	75,551,093
1912	32,440,800	1943	65,892,395
1913	30,296,398	1944	54,923,803
1914	26,388,825	1945	63,343,949
1915	29,447,508	1946	72,319,951
1916	42,290,462	1947	113,314,314
1917	37,010,392	1948	151,436,039
1918	41,782,474	1949	131,100,468
1919	33,296,313	1950	148,289,687
1920	35,543,084	1951	175,613,693
1921	28,066,641	1952	171,309,429
1922	35,162,843	1953	152,628,683
1923	41,304,320	1954	153,377,315
1924	48,704,604		
1925	61,492,242	Total	$3,367,698,429

TABLE III.—QUANTITY AND VALUE OF MINE PRODUCTS FOR YEARS 1945 TO 1954

Description	1945		1946		1947		1948		1949	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Principal Metals		$		$		$		$		$
Gold—placer, crude ..... oz.	12,589	398,591	15,729	475,361	6,969	200,585	20,332	585,200	17,886	529,524
,, lode, fine ..... oz.	175,373	6,751,860	117,612	4,322,241	243,282	8,514,870	286,230	10,018,050	288,396	10,382,256
Silver ..... oz.	6,157,307	2,893,934	6,365,761	5,324,959	5,707,691	4,109,538	6,718,122	5,038,592	7,636,053	5,669,769
Copper ..... lb.	25,852,366	3,244,472	17,500,538	2,240,070	41,783,921	8,519,741	43,025,388	9,616,174	54,856,808	10,956,550
Lead ..... lb.	353,497,689	17,674,884	347,990,146	23,489,335	306,400,709	41,884,977	332,996,351	60,072,542	263,580,549	41,645,726
Zinc ..... lb.	301,737,902	19,431,921	270,718,128	21,143,086	268,450,926	30,147,039	296,012,941	41,234,603	276,324,451	36,604,700
Totals		50,395,662		56,995,052		93,376,750		126,565,161		105,788,525
Miscellaneous Metals										
Antimony ..... lb.	1,679,878	292,635	642,145	96,322	1,150,463	384,255	310,062	113,173	158,288	61,020
Bismuth ..... lb.	189,815	260,047	234,020	327,628	284,357	560,183	222,000	444,000	102,913	210,972
Cadmium ..... lb.	510,432	505,328	632,539	771,698	547,248	941,266	617,226	1,126,437	665,449	1,364,170
Indium ..... oz.	.....	.....	.....	.....	.....	.....	.....	.....	689	1,550
Iron ore ..... tons	.....	.....	.....	.....	.....	.....	.....	.....	5,472	27,579
Mercury ..... lb.	.....	.....	.....	.....	.....	.....	679	3,735	.....	.....
Platinum ..... oz.	.....	.....	.....	.....	1	59	242	21,175	99	7,468
Tin ..... lb.	849,983	484,490	874,186	480,802	714,198	517,794	691,332	688,567	619,117	633,047
Tungsten (WO_3) ..... lb.	366	331	.....	.....	496,023	680,792	1,409,297	1,409,297	.....	.....
Totals		1,542,831		1,676,450		3,084,349		3,806,384		2,305,806
Industrial Minerals										
Barite ..... tons	31,155	45,780	2,728	19,000	2,875	26,650	1,632	16,317	1,314	13,145
Diatomite ..... tons	22	498	40	1,027	59	1,472	24	817	36	963
Flux (quartz, limestone) ..... tons	45,221	70,266	55,732	71,531	102,918	174,655	83,389	248,977	108,531	213,773
Granules (slate and rock) ..... tons	969	16,272	1,116	19,917	1,156	19,686	4,958	68,937	5,941	79,661
Gypsum and products ..... tons	23,718	127,434	40,900	318,500	67,112	523,298	77,055	546,707	98,977	616,490
Iron oxides ..... tons	397	1,985	427	2,135	58	464	3,386	30,472	2,752	23,301
Mica ..... lb.	1,284,000	17,136	1,616,000	23,420	1,808,000	24,240	894,000	9,494	578,000	5,675
Sodium carbonate ..... lb.	286	3,146	210	2,310	163	1,793	.....	.....	47	517
Sulphur ..... tons	127,653	1,267,350	126,622	1,258,576	157,161	1,503,714	144,448	1,409,156	160,435	1,546,798
Totals		1,549,867		1,716,416		2,275,972		2,330,877		2,500,323
Structural Materials										
Brick—common ..... No.	3,092,000	80,556	3,300,000	94,000	4,318,000	122,660	3,810,000	111,300	3,220,000	95,075
,, face, paving, sewer ..... No.	1,319,743	49,814	2,077,683	84,353	1,232,812	64,849	2,584,752	129,268	509,560	24,793
,, firebrick, blocks	.....	217,275	.....	283,317	.....	389,899	.....	392,458	.....	135,391
Clays ..... tons	510	7,899	601	8,241	11,428	9,675	5,673	32,922	6,500	22,339
Structural tile, hollow blocks	.....	70,376	.....	105,194	.....	158,276	.....	116,513	.....	145,512
Drain-tile, sewer-pipe, flue-linings	.....	205,883	.....	263,864	.....	361,975	.....	597,541	.....	265,098
Pottery—glazed or unglazed	.....	3,245	.....	2,811	.....	3,476	.....	5,138	.....	5,176
Other clay products	.....	2,632	.....	3,611	.....	9,332	.....	9,611	.....	9,676
Cement	.....	1,182,297	.....	1,739,966	.....	1,896,772	.....	2,441,304	.....	3,029,425
Lime and limestone ..... tons	162,334	522,692	159,493	642,912	151,671	714,126	209,453	1,177,632	179,400	1,295,087
Rubble, riprap, crushed rock ..... tons	71,949	65,194	154,164	158,446	222,044	216,873	896,780	839,780	1,112,272	916,841
Sand and gravel	.....	865,557	.....	1,713,138	.....	1,828,919	.....	3,060,535	.....	3,967,132
Stone ..... tons	4,284	127,809	4,354	99,710	19,835	119,971	3,579	54,220	2,287	44,345
Totals		3,401,229		5,199,563		5,896,803		8,968,222		9,955,890
Fuel										
Coal[1] ..... tons	1,700,914	6,454,360	1,284,904	6,732,470	1,514,598	8,680,440	1,604,480	9,765,395	1,621,268	10,549,924
Provincial totals		63,343,949		72,319,951		113,314,314		151,436,039		131,100,468

TABLE III.—QUANTITY AND VALUE OF MINE PRODUCTS FOR YEARS 1945 TO 1954—*Continued*

Description	1950		1951		1952		1953		1954	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Principal Metals		$		$		$		$		$
Gold—placer, crude ..... oz.	19,134	598,717	23,691	717,911	17,554	494,756	14,245	403,230	8,684	238,967
,, lode, fine ..... oz.	283,983	10,805,553	261,274	9,627,947	251,393	8,615,238	253,553	8,727,294	258,388	8,803,279
Silver ..... oz.	9,507,225	7,666,151	8,215,884	7,768,118	8,796,720	7,315,088	8,376,953	7,017,709	9,825,153	8,153,108
Copper ..... lb.	42,212,133	9,889,458	43,249,658	11,980,155	42,005,512	13,054,893	49,021,013	14,869,544	50,150,087	14,599,693
Lead ..... lb.	307,122,803	44,391,530	273,456,604	50,316,015	284,949,396	45,936,692	296,559,781	39,338,655	332,474,456	45,482,505
Zinc ..... lb.	324,263,778	48,882,765	333,910,764	66,448,242	372,871,717	59,189,656	378,345,159	40,388,346	334,124,560	34,805,755
Totals		122,234,174		146,858,388		134,606,323		110,744,778		112,083,307
Miscellaneous Metals										
Antimony ..... lb.	643,540	216,229	1,310,836	622,647	2,333,239	1,028,025	1,551,043	570,474	1,302,333	382,104
Bismuth ..... lb.	162,616	369,138	191,471	451,872	142,246	312,941	71,298	157,569	225,351	493,519
Cadmium ..... lb.	650,540	1,535,274	1,164,933	3,122,021	726,172	1,561,270	787,158	1,550,701	680,734	1,123,211
Indium ..... oz.	4,952	12,132	582	1,368	404	889	6,752	14,922	477	1,281
Iron ore ..... tons	.....	.....	113,535	790,000	900,481	5,474,924	991,248	6,763,105	535,746	3,733,891
Platinum ..... oz.	111	9,239	22	2,085	2	176	.....	.....	4	408
Tin ..... lb.	796,403	828,259	346,718	495,807	212,113	250,293	1,092,228	581,746	587,528	280,437
Tungsten (WO_3) ..... lb.	281,160	281,160	.....	.....	1,434,640	4,565,024	2,168,977	5,950,323	2,206,443	5,851,558
Totals		3,251,431		5,485,800		13,193,542		15,588,840		11,866,409
Industrial Minerals										
Asbestos	.....	.....	.....	.....	.....	23,000	.....	988,716	.....	2,920,751
Barite ..... tons	1,440	17,284	1,248	16,224	848	13,408	3,560	52,845	5,056	115,337
Diatomite ..... tons	4	108	8	223	12	240	.....	.....	.....	.....
Flux (quartz, limestone) ..... tons	144,325	268,411	144,235	292,100	55,588	141,478	37,358	110,698	39,897	40,804
Granules (slate and rock) ..... tons	7,886	104,590	5,727	73,767	1,610	21,026	4,620	59,321	4,541	65,507
Gypsum and products ..... tons	92,882	620,108	124,729	263,072	91,112	235,453	172,665	387,655	175,480	421,734
Mica ..... lb.	456,000	5,533	606,000	7,462	314,000	3,001	604,000	11,338	284,000	5,326
Perlite ..... tons	.....	.....	.....	.....	.....	.....	1,112	11,120	.....	.....
Sulphur ..... tons	143,343	1,421,806	194,874	1,840,992	182,607	1,745,258	151,954	1,590,055	219,999	2,308,422
Totals		2,437,840		2,493,840		2,182,864		3,211,748		5,877,881
Structural Materials										
Brick—common ..... No.	3,980,500	117,770	1,353,000	41,820	830,815	28,248	1,382,883	51,381	1,289,911	35,550
,, face, paving, sewer ..... No.	974,380	52,823	3,127,888	153,575	2,566,540	121,254	4,307,894	226,459	5,651,262	316,676
,, firebrick, blocks	.....	282,962	.....	380,742	.....	435,681	.....	426,783	.....	372,528
Clays ..... tons	6,706	32,264	14,786	60,255	11,483	51,797	5,226	31,990	6,609	36,425
Structural tile, hollow blocks	.....	191,016	.....	171,481	.....	60,273	.....	123,469	.....	122,903
Drain-tile, sewer-pipe, flue-linings	.....	428,418	.....	410,206	.....	468,110	.....	627,097	.....	753,297
Pottery—glazed or unglazed	.....	5,860	.....	4,695	.....	6,536	.....	30,012	.....	31,081
Other clay products	.....	11,335	.....	10,393	.....	11,296	.....	19,267	.....	32,697
Cement	.....	3,088,296	.....	3,311,439	.....	3,603,273	.....	5,071,260	.....	4,935,298
Lime and limestone ..... tons	221,454	1,133,776	241,723	1,251,327	321,710	1,552,772	338,005	1,357,958	317,976	1,555,002
Rubble, riprap, crushed rock ..... tons	1,164,049	990,257	972,178	1,145,072	739,504	982,792	770,415	1,122,516	920,707	1,253,856
Sand and gravel	.....	3,723,487	.....	3,355,693	.....	3,839,965	.....	4,388,594	4,331,127	4,850,469
Stone ..... tons	26,758	188,675	4,837	309,350	122,308	434,964	2,611	78,252	3,055	99,392
Totals		10,246,939		10,606,048		11,596,961		13,555,038		14,395,174
Fuel										
Coal[1] ..... tons	1,574,006	10,119,303	1,573,572	10,169,617	1,402,347	9,729,739	1,384,138	9,528,279	1,308,284	9,154,544
Provincial totals		148,289,687		175,613,693		171,309,429		152,628,683		153,377,315

[1] For 1946 and subsequent years the quantity of coal is that sold and used. Previously gross mine output, including waste discarded in picking and washing, has been listed.

TABLE IV.—MINERAL PRODUCTION VALUE, 1895–1954

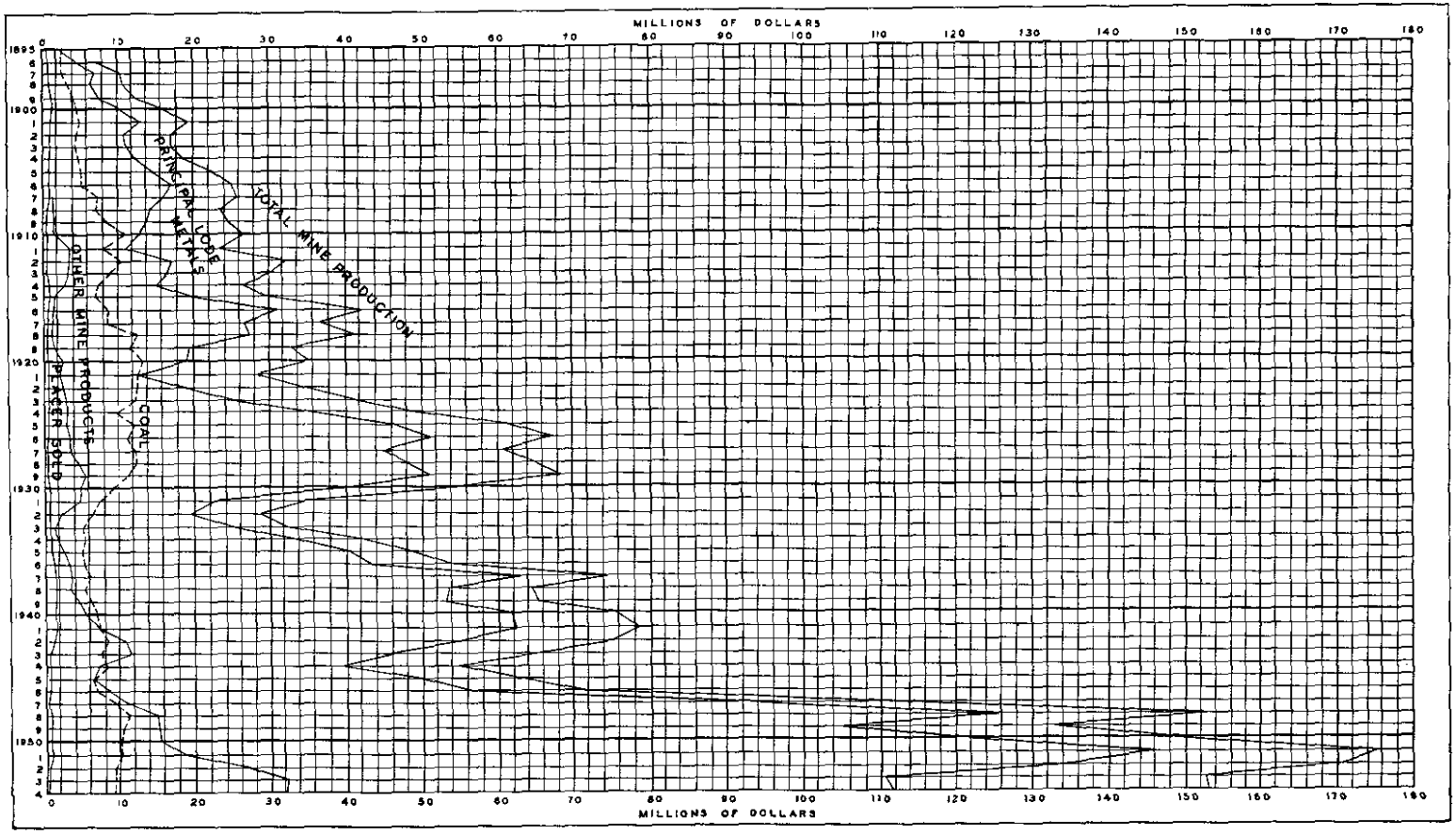


TABLE V.—LODE-MINE PRODUCTS, 1913–54

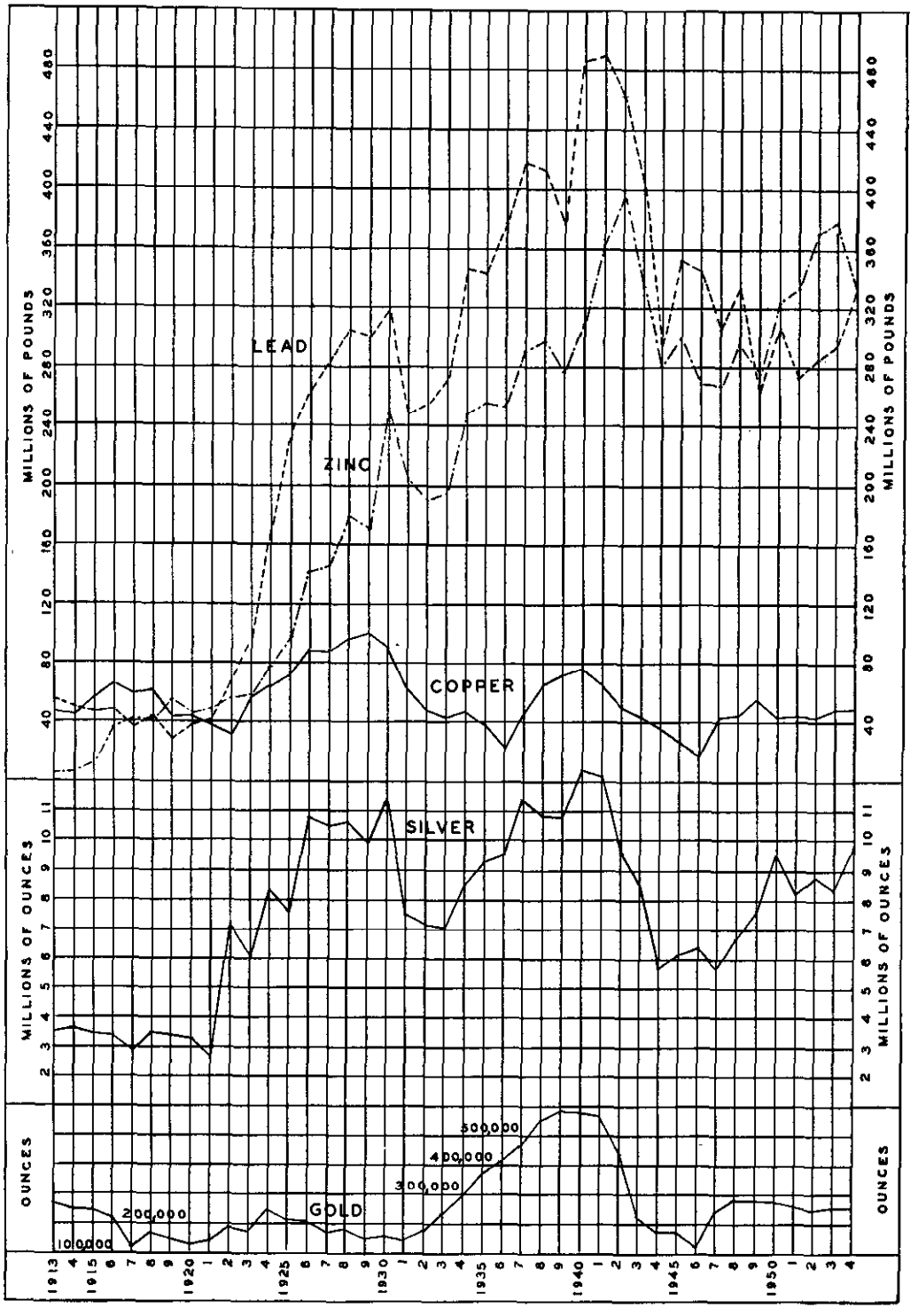


TABLE VI.—PRODUCTION OF PRINCIPAL METALS, 1858–1954

Year	Placer Gold		Gold		Silver		Copper		Lead		Zinc		Total Value
	Quantity[1]	Value	Quantity[2]	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
1858–86, incl.	3,105,775	52,798,364											52,798,364
1887	40,810	693,709			17,690	17,331			204,800	9,216			720,256
1888	36,280	616,731			79,780	75,000			674,500	29,813			721,544
1889	34,640	588,923			53,192	47,873			165,100	6,498			643,294
1890	29,080	494,436			70,427	73,948							568,384
1891	25,280	429,811			4,500	4,000							433,811
1892	23,500	399,526			77,160	66,935			808,420	33,064			499,525
1893	20,950	356,131	1,170	23,404	227,000	195,000			2,135,023	78,996			653,531
1894	23,850	405,516	6,252	125,014	746,379	470,219	324,680	16,234	5,662,523	169,875			1,186,858
1895	28,330	481,683	39,270	785,400	1,496,522	977,229	952,840	47,642	16,475,464	532,255			2,824,209
1896	32,000	544,026	62,259	1,244,180	3,135,343	2,100,689	3,818,556	190,926	24,199,977	721,384			4,801,205
1897	30,210	513,520	106,141	2,122,820	5,472,971	3,272,836	5,325,180	266,258	38,841,135	1,390,517			7,565,951
1898	37,840	643,346	110,061	2,201,217	4,292,401	2,375,841	7,271,678	874,781	31,693,559	1,077,581			7,172,766
1899	79,110	1,344,900	138,315	2,857,573	2,939,413	1,663,708	7,722,591	1,351,453	21,862,436	878,870			8,096,504
1900	75,220	1,278,724	167,153	3,453,381	3,958,175	2,309,200	9,997,080	1,615,289	63,358,621	2,691,887			11,348,481
1901	57,060	970,100	210,384	4,348,605	4,396,447	2,462,008	27,603,746	4,446,963	51,582,906	2,010,260			14,237,936
1902	63,130	1,073,140	236,491	4,888,269	3,917,917	1,941,328	29,636,057	3,446,673	22,536,381	824,832			12,174,242
1903	62,380	1,060,420	232,831	4,812,616	2,996,204	1,521,472	34,359,921	4,547,535	18,089,283	689,744			12,631,787
1904	65,610	1,115,300	222,042	4,589,608	3,222,481	1,719,516	35,710,128	4,578,037	36,646,244	1,421,874			13,424,335
1905	57,020	969,300	238,660	4,933,102	3,439,417	1,971,818	37,692,251	5,876,222	56,580,703	2,399,022			16,149,464
1906	55,790	948,400	224,027	4,630,639	2,990,262	1,897,320	42,990,488	8,288,565	52,408,217	2,667,578			18,432,502
1907	48,710	828,000	196,179	4,055,020	2,745,448	1,703,825	40,832,720	8,166,544	47,738,703	2,291,458			17,044,847
1908	38,060	647,000	255,582	5,282,880	2,631,389	1,321,483	47,274,614	6,240,249	43,195,733	1,632,799			15,124,411
1909	28,060	477,000	238,224	4,924,090	2,532,742	1,239,270	45,597,245	5,918,522	44,396,346	1,709,259	8,500,000	400,000	14,668,141
1910	31,760	540,000	267,701	5,533,380	2,450,241	1,245,016	38,243,934	4,871,512	34,658,746	1,386,350	4,184,192	192,473	13,768,731
1911	25,060	426,000	228,617	4,725,513	1,892,364	958,293	36,927,656	4,571,644	26,872,397	1,069,521	2,634,544	129,092	11,880,063
1912	32,680	555,500	257,496	5,322,442	3,132,108	1,810,045	51,456,537	8,408,513	44,871,454	1,805,627	5,358,280	316,139	18,218,266
1913	30,000	510,000	272,254	5,627,490	3,465,856	1,968,606	46,460,305	7,094,489	55,364,677	2,175,832	6,758,768	324,421	17,700,838
1914	33,240	565,000	247,170	5,109,004	3,602,180	1,876,736	45,009,699	6,121,319	50,625,048	1,771,877	7,866,467	346,125	15,790,061
1915	45,290	770,000	250,021	5,167,934	3,366,506	1,588,991	56,918,405	9,835,500	46,503,590	1,939,200	12,982,440	1,460,524	20,762,149
1916	34,150	580,500	221,932	4,587,334	3,301,923	2,059,739	65,379,364	17,784,494	48,727,516	3,007,462	37,168,980	4,043,985	32,063,514
1917	29,180	496,000	114,523	2,367,190	2,929,216	2,265,749	59,007,565	16,038,256	37,307,465	2,951,020	41,848,513	3,166,259	27,284,474
1918	18,820	320,000	164,674	3,403,812	3,498,172	3,215,870	61,483,754	15,143,449	43,899,661	2,928,107	41,772,916	2,899,040	27,910,278
1919	16,850	286,500	152,426	3,150,645	3,403,119	3,592,673	42,459,339	7,939,896	29,475,968	1,526,855	56,737,651	3,540,429	20,036,998
1920	13,040	221,600	120,048	2,481,392	3,377,849	3,235,980	44,887,676	7,832,899	39,331,218	2,816,115	47,208,268	3,077,979	19,665,965
1921	13,720	233,200	135,663	2,804,154	2,673,389	1,591,201	39,036,993	4,879,624	41,402,288	1,693,354	49,419,372	1,952,065	13,153,598
1922	21,690	368,800	197,856	4,089,684	7,101,311	4,554,781	32,359,896	4,329,754	67,447,985	3,480,316	57,146,548	2,777,322	19,600,657
1923	24,710	420,000	179,245	3,704,994	6,032,986	3,718,129	57,720,290	8,323,266	96,663,152	6,321,770	58,343,462	3,278,903	25,767,062
1924	24,750	420,750	247,716	5,120,535	8,341,768	5,292,184	64,845,393	8,442,870	170,384,481	12,415,917	79,130,970	4,266,741	35,958,997
1925	16,476	280,092	209,719	4,335,269	7,654,844	5,286,818	72,306,432	10,153,269	237,899,199	18,670,329	98,257,099	7,754,450	46,480,227
1926	20,912	355,503	201,427	4,163,859	10,748,556	6,675,606	89,339,768	12,324,421	263,023,937	17,757,535	142,876,947	10,586,610	51,863,534

	Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
1927	9,191	156,247	178,001	3,679,601	10,470,185	5,902,043	89,202,871	11,525,011	282,996,423	14,874,292	145,225,443	8,996,135	45,133,329
1928	8,284	143,208	188,087	3,888,097	10,627,167	6,182,461	97,908,316	14,265,242	305,140,792	13,961,412	181,763,147	9,984,613	48,425,033
1929	6,983	118,711	145,339	3,004,419	9,918,800	5,256,270	101,483,857	18,375,682	302,346,268	15,269,696	172,096,841	9,268,792	51,293,570
1930	8,955	152,235	160,778	3,323,576	11,289,171	4,307,270	90,421,545	11,738,525	319,199,752	12,535,931	250,287,306	9,010,093	41,067,630
1931	17,176	291,992	146,039	3,018,894	7,524,320	2,247,514	63,194,299	5,289,363	248,783,508	6,742,282	205,071,247	5,237,520	22,827,565
1932	20,400	395,542	181,564	4,261,307	7,130,838	2,258,453	49,841,009	3,179,956	254,488,952	5,378,878	192,120,091	4,621,641	20,095,777
1933	23,928	562,787	223,529	6,392,929	7,006,406	2,650,720	42,608,002	3,176,341	271,606,071	6,495,731	195,963,751	6,291,416	25,569,924
1934	25,181	714,431	297,130	10,250,985	8,572,916	4,068,792	48,084,658	3,567,401	347,366,967	8,461,859	247,926,844	7,546,893	34,610,361
1935	30,929	895,058	365,244	12,852,936	9,251,544	5,994,075	38,791,127	3,023,768	344,268,444	10,785,930	256,239,446	7,940,860	41,492,627
1936	43,389	1,249,940	404,472	14,168,654	9,521,015	4,296,548	20,806,672	1,971,848	377,971,618	14,790,029	254,581,393	8,439,373	44,916,392
1937	54,153	1,558,245	460,781	16,122,727	11,308,685	5,075,451	46,057,584	6,023,411	419,118,371	21,416,949	291,192,278	14,274,245	64,471,028
1938	57,759	1,671,015	557,522	19,613,624	10,861,578	4,722,288	65,769,906	6,558,575	412,979,182	13,810,024	298,497,295	9,172,822	55,548,348
1939	49,746	1,478,492	587,180	21,221,272	10,771,585	4,361,199	73,254,679	7,392,862	378,743,763	12,002,390	278,409,102	8,544,375	55,000,590
1940	39,067	1,236,928	583,416	22,461,516	12,327,944	4,715,315	77,980,223	7,865,085	485,364,420	16,317,952	310,768,251	10,600,261	63,197,057
1941	43,775	1,385,962	571,026	21,984,501	12,175,700	4,658,545	66,435,583	6,700,693	490,185,657	16,480,042	363,302,195	12,392,238	63,601,981
1942	32,904	1,041,772	444,518	17,113,943	9,677,881	4,080,775	50,097,716	5,052,856	463,269,005	15,575,104	396,857,260	13,536,801	56,401,251
1943	14,600	462,270	224,403	8,639,516	8,526,310	3,858,496	42,307,510	4,971,132	405,285,476	15,214,417	335,137,014	13,405,481	46,551,312
1944	11,433	361,977	186,632	7,185,332	5,705,334	2,453,293	36,300,589	4,356,070	294,797,469	13,265,886	280,356,477	12,055,328	39,677,886
1945	12,589	398,591	175,373	6,751,860	6,157,307	2,893,934	25,852,366	3,244,472	353,497,689	17,674,884	301,737,902	19,431,921	50,395,662
1946	15,729	475,361	117,612	4,322,241	6,365,761	5,324,959	17,500,538	2,240,070	347,990,146	23,489,335	270,718,128	21,143,086	56,995,052
1947	6,969	200,585	243,282	8,514,870	5,707,691	4,109,538	41,783,921	8,519,741	306,400,709	41,884,977	268,450,926	30,147,039	93,376,750
1948	20,332	585,200	286,230	10,018,050	6,718,122	5,038,592	43,025,388	9,616,174	332,996,351	60,072,542	296,012,941	41,234,603	126,565,161
1949	17,886	529,524	288,396	10,382,256	7,636,053	5,669,769	54,856,808	10,956,550	263,580,549	41,645,726	276,324,451	36,604,700	105,788,525
1950	19,134	598,717	283,983	10,805,553	9,507,225	7,666,151	42,212,133	9,889,458	307,122,803	44,391,530	324,263,778	48,882,765	122,234,174
1951	23,691	717,911	261,274	9,627,947	8,215,884	7,768,118	43,249,658	11,980,155	273,456,604	50,316,015	333,910,764	66,448,242	146,858,388
1952	17,554	494,756	251,393	8,615,238	8,796,720	7,315,088	42,005,512	13,054,893	284,949,396	45,936,692	372,871,717	59,189,656	134,606,323
1953	14,245	403,230	253,553	8,727,294	8,376,953	7,017,709	49,021,013	14,869,544	296,559,781	39,338,655	378,345,159	40,388,346	110,744,778
1954	8,684	238,967	258,388	8,803,279	9,825,153	8,153,108	50,150,087	14,599,693	332,474,456	45,482,505	334,124,560	34,805,755	112,083,307
Totals	5,185,829	95,547,105	14,478,674	412,724,866	378,389,896	218,410,740	2,791,156,351	433,971,639	11,416,655,478	750,595,634	8,570,751,124	620,107,557	2,531,357,541

[1] Ounces of crude gold. [2] Ounces of fine gold.

TABLE VIIA.—SUMMARY OF PRODUCTION, 1953 AND 1954, BY MINING DIVISIONS

Mining Division	Year	Gold—Placer		Principal Lode Metals	Miscellaneous Metals	Industrial Minerals	Structural Materials	Coal		Total
		Quantity[1]	Value					Quantity	Value	
		Oz.	$	$	$	$	$	Tons	$	$
Alberni	1953	3	85	4,654	.....	.....	22,742	.....	.....	27,481
	1954	.....	.....	.....	.....	.....	**89,885**	.....	.....	**89,885**
Atlin	1953	6,659	188,495	4,380,271	.....	.....	1,375	.....	.....	4,570,141
	1954	**6,723**	**185,004**	**4,784,245**	**96,368**	.....	**2,924**	.....	.....	**5,068,541**
Cariboo	1953	6,352	179,805	1,564,832	.....	11,338	174,627	.....	.....	1,930,302
	1954	**899**	**24,739**	**1,644,015**	.....	**5,326**	**192,771**	.....	.....	**1,866,851**
Clinton	1953	12	340	.....	.....	.....	8,100	.....	.....	8,440
	1954	**10**	**275**	**68**	.....	.....	**48,285**	.....	.....	**48,628**
Fort Steele	1953	52	1,472	49,819,514	582,233	79,437	149,099	1,122,408	7,031,158	57,662,913
	1954	**23**	**633**	**62,520,540**	**280,437**	**330,426**	**302,963**	**1,054,314**	**6,848,655**	**70,083,654**
Golden	1953	.....	.....	1,649,262	13,875	207,545	135,133	.....	.....	2,005,815
	1954	**2**	**55**	**2,941,347**	**36,841**	**319,037**	**41,000**	.....	.....	**3,338,280**
Greenwood	1953	.....	.....	650,082	.....	21,046	18,218	.....	.....	689,346
	1954	.....	.....	**555,011**	**4,097**	**17,000**	**7,032**	.....	.....	**583,140**
Kamloops	1953	30	849	16,909	.....	200,838	370,894	.....	.....	589,490
	1954	**19**	**523**	**971**	.....	**191,878**	**305,652**	.....	.....	**499,024**
Liard	1953	92	2,604	.....	.....	988,716	77,445	4,835	50,895	1,119,660
	1954	**41**	**1,128**	.....	.....	**2,920,751**	**79,197**	**4,359**	**33,079**	**3,034,155**
Lillooet	1953	177	5,010	3,747,271	2,636	.....	12,517	.....	.....	3,767,434
	1954	**118**	**3,247**	**3,825,770**	.....	.....	**41,607**	.....	.....	**3,870,624**
Nanaimo	1953	.....	.....	9,851	6,763,105	.....	1,396,924	206,729	2,059,828	10,229,708
	1954	**5**	**138**	.....	**3,733,891**	**23,804**	**1,626,718**	**182,070**	**2,029,099**	**7,413,648**
Nelson	1953	11	311	6,907,651	4,675,474	.....	65,031	.....	.....	11,648,467
	1954	**3**	**83**	**4,250,684**	**4,916,830**	.....	**89,657**	.....	.....	**9,257,254**
New Westminster	1953	5	142	.....	.....	7,464	2,735,369	.....	.....	2,742,975
	1954	**45**	**1,238**	.....	.....	**8,505**	**3,129,853**	.....	.....	**3,139,596**
Nicola	1953	.....	.....	.....	.....	.....	22,514	1,040	10,400	32,914
	1954	.....	.....	.....	.....	.....	**25,759**	**1,256**	**12,769**	**38,528**
Omineca	1953	109	3,085	1,943,769	1,460,902	11,120	96,771	42,079	324,986	3,840,633
	1954	**54**	**1,486**	**1,850,594**	**1,135,894**	.....	**106,118**	**36,572**	**292,862**	**3,386,954**
Osoyoos	1953	.....	.....	1,739,725	.....	109,937	35,653	.....	.....	1,885,315
	1954	.....	.....	**1,738,265**	.....	**26,775**	**32,449**	.....	.....	**1,797,489**
Quesnel	1953	478	13,531	1,357	.....	.....	30,965	.....	.....	45,853
	1954	**665**	**18,299**	.....	.....	.....	**77,801**	.....	.....	**96,100**
Revelstoke	1953	4	113	702,971	21,711	.....	47,547	.....	.....	772,342
	1954	**1**	**28**	**1,114,455**	**24,132**	.....	**47,563**	.....	.....	**1,186,178**
Similkameen	1953	.....	.....	7,959,284	.....	.....	90,075	7,047	51,012	8,100,371
	1954	**22**	**605**	**7,350,375**	**408**	.....	**85,314**	**29,713**	**138,080**	**7,574,782**
Skeena	1953	223	6,312	1,805,894	108,513	.....	306,667	.....	.....	2,227,386
	1954	.....	.....	**1,815,016**	.....	.....	**199,366**	.....	.....	**2,014,382**
Slocan	1953	.....	.....	10,681,513	87,475	.....	24,230	.....	.....	10,793,218
	1954	.....	.....	**7,407,227**	**149,703**	.....	**27,906**	.....	.....	**7,584,836**
Trail Creek	1953	.....	.....	2,917	.....	1,350,700	105,582	.....	.....	1,459,199
	1954	.....	.....	**11,246**	.....	**1,716,490**	**107,819**	.....	.....	**1,835,555**
Vancouver	1953	.....	.....	7,309,360	5,325	223,607	1,761,272	.....	.....	9,300,064
	1954	.....	.....	**7,554,806**	.....	**317,889**	**1,938,238**	.....	.....	**9,810,933**
Vernon	1953	30	849	.....	.....	.....	130,288	.....	.....	131,137
	1954	**54**	**1,486**	**5.499**	.....	.....	**130,179**	.....	.....	**137,164**
Victoria	1953	8	227	.....	.....	.....	5,736,000	.....	.....	5,736,227
	1954	.....	.....	**292,123**	.....	.....	**5,659,140**	.....	.....	**5,951,263**
Not assigned	1953	.....	.....	9,444,261[2]	1,867,591[3]	.....	.....	.....	.....	11,311,852
	1954	.....	.....	**2,182,083**	**1,487,808**	.....	.....	.....	.....	**3,669,891**
Totals	1953	14,245	403,230	110,341,548	15,588,840	3,211,748	13,355,038	1,384,138	9,528,279	152,628,683
	1954	**8,684**	**239,967**	**111,844,340**	**11,866,409**	**5,877,881**	**14,395,174**	**1,308,284**	**9,154,544**	**153,377,315**

[1] Crude gold. [2] Includes estimated zinc and lead recovered at the Trail smelter from current and reclaimed slags and gold, silver, copper, and lead recovered from copper dross (matte) derived from British Columbia mines in several mining divisions. [3] Includes antimony, bismuth, and indium recovered at the Trail smelter; part of the quantities of these metals may be derived from sources outside of British Columbia.

NOTE.—Full details for placer gold are given in this table. The columns headed "Principal Lode Metals," "Miscellaneous Metals," "Industrial Minerals," and "Structural Materials" give the total value only, details being set forth in Tables VIIB, VIIC, VIID, and VIIE. The coal is that sold and used; details for coal are given in Tables IXB and IXC.

TABLE VIIB.—PRODUCTION OF PRINCIPAL LODE METALS, 1953 AND 1954, BY MINING DIVISIONS

Division	Year	Gold—Lode		Silver		Copper		Lead		Zinc	
		Quantity[1]	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$
Alberni	1953	133	4,578	91	76	.....	.....	.....	.....	.....	.....
	1954	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Atlin	1953	16,073	553,233	497,736	416,974	4,032,407	1,223,150	4,027,001	534,182	15,482,271	1,652,732
	1954	20,665	704,057	592,707	491,840	4,554,340	1,325,859	4,253,916	581,936	16,132,797	1,680,553
Cariboo	1953	45,335	1,560,431	4,895	4,101	.....	.....	.....	.....	.....	.....
	1954	48,141	1,640,164	4,841	3,851	.....	.....	.....	.....	.....	.....
Clinton	1953	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	1954	2	68	.....	.....	.....	.....	.....	.....	.....	.....
Fort Steele	1953	120	4,130	2,919,080	2,445,430	.....	.....	199,035,581	26,402,070	196,420,460	20,967,884
	1954	307	10,460	3,719,028	3,086,124	.....	.....	255,012,518	34,885,712	235,559,606	24,538,244
Golden	1953	.....	.....	108,820	91,163	.....	.....	11,006,201	1,459,973	919,211	98,126
	1954	.....	.....	222,114	184,315	27,780	8,087	15,403,294	2,107,171	6,160,829	641,774
Greenwood	1953	210	7,228	670,596	561,785	.....	.....	302,770	40,162	383,200	40,907
	1954	195	6,644	564,825	468,703	11,702	3,407	290,061	39,680	351,127	36,577
Kamloops	1953	12	413	3,352	2,808	.....	.....	96,436	12,792	8,393	896
	1954	.....	.....	8	7	3,311	964	.....	.....	.....	.....
Liard	1953	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	1954	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lillooet	1953	108,300	3,727,686	23,378	19,585	.....	.....	.....	.....	.....	.....
	1954	111,707	3,805,857	23,997	19,913	.....	.....	.....	.....	.....	.....
Nanaimo	1953	.....	.....	235	197	31,828	9,654	.....	.....	.....	.....
	1954	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nelson	1953	466	16,040	61,567	51,577	.....	.....	20,073,682	2,662,774	39,131,245	4,177,260
	1954	1,187	40,441	42,444	35,221	.....	.....	16,406,922	2,244,467	18,532,738	1,930,555
New Westminster	1953	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	1954	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nicola	1953	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	1954	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Omineca	1953	3,149	108,389	1,032,391	864,875	96,051	29,135	3,442,442	456,640	4,540,792	484,730
	1954	2,919	99,450	966,117	801,703	37,533	10,927	3,521,770	481,778	4,384,526	456,736
Osoyoos	1953	50,386	1,734,286	5,241	4,391	3,456	1,048	.....	.....	.....	.....
	1954	50,907	1,734,401	4,656	3,864	.....	.....	.....	.....	.....	.....
Quesnel	1953	.....	.....	675	565	.....	.....	5,973	792	.....	.....
	1954	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Revelstoke	1953	1,105	38,034	155,605	130,357	23,909	7,252	2,219,294	294,389	2,182,095	232,939
	1954	2,117	72,126	293,267	243,359	.....	.....	3,715,772	508,318	2,790,168	290,652
Similkameen	1953	7,288	250,853	173,442	145,299	24,933,674	7,563,132	.....	.....	.....	.....
	1954	7,960	271,197	166,211	137,925	23,843,270	6,941,253	.....	.....	.....	.....
Skeena	1953	4,977	171,308	1,233,142	1,033,052	44,601	13,529	2,568,016	340,647	2,317,174	247,358
	1954	73	2,487	2,030,426	1,684,388	.....	.....	924,771	126,509	10,864	1,132
Slocan	1953	598	20,583	1,233,832	1,033,631	.....	.....	39,446,870	5,232,628	41,167,877	4,394,671
	1954	257	8,756	924,921	767,518	.....	.....	30,456,315	4,166,424	23,658,720	2,464,529
Trail Creek	1953	66	2,272	33	28	2,035	617	.....	.....	.....	.....
	1954	164	5,588	111	92	19,118	5,566	.....	.....	.....	.....
Vancouver	1953	15,198	523,115	96,634	80,954	16,878,729	5,119,825	528,415	70,094	14,200,204	1,515,872
	1954	11,569	394,156	94,586	78,489	17,751,513	5,167,820	549,388	75,156	17,685,613	1,839,185
Vernon	1953	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	1954	.....	.....	4,076	3,382	.....	.....	12,941	1,770	3,335	347
Victoria	1953	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	1954	.....	.....	5,290	4,390	988,366	287,733	.....	.....	.....	.....
Not assigned[2]	1953	137	4,715	156,208	130,861	2,974,323	902,202	13,807,100	1,831,512	61,592,237	6,574,971
	1954	218	7,427	165,728	137,524	2,913,154	848,077	1,926,788	263,584	8,884,237	925,471
Totals	1953	253,553	8,727,294	8,376,953	7,017,709	49,021,013	14,869,544	296,559,781	39,338,655	378,345,159	40,388,346
	1954	258,388	8,803,279	9,825,153	8,153,108	50,150,087	14,599,693	332,474,456	45,482,505	334,124,560	34,805,755

[1] Fine gold. [2] Gold, silver, copper, and some lead "not assigned" were recovered at the Tacoma smelter from dross shipped from the Trail smelter. The zinc and most of the lead were recovered at the Trail smelter by "fuming" current and reclaimed slag.

TABLE VIIc.—PRODUCTION OF MISCELLANEOUS METALS, 1953 AND 1954, BY MINING DIVISIONS

Division	Year	Antimony[1]		Bismuth		Cadmium[2]		Indium		Iron Ore		Platinum		Tin		Tungsten (WO_3)		Totals
		Lb.	$	Lb.	$	Lb.	$	Oz.	$	Tons	$	Oz.	$	Lb.	$	Lb.	$	$
Atlin	1953																	
	1954					**58,405**	**96,368**											**96,368**
Fort Steele	1953					247	487							1,092,228	581,746			582,233
	1954													**587,528**	**280,437**			**280,437**
Golden	1953	37,723	13,875			233	459											14,334
	1954					**22,328**	**36,841**											**36,841**
Greenwood	1953					3,591	7,074											7,074
	1954					**2,483**	**4,097**											**4,097**
Lillooet	1953															1,677	2,636	2,636
	1954																	
Nanaimo	1953									991,248	6,763,105							6,763,105
	1954									**535,746**	**3,733,891**							**3,733,891**
Nelson	1953					342,098	673,933									1,549,880	4,519,149	5,193,082
	1954					**84,830**	**139,970**									**1,695,020**	**4,776,860**	**4,916,830**
Omineca	1953	15,392	5,661			51,831	102,107									617,420	1,428,538	1,536,306
	1954					**39,411**	**65,028**									**505,040**	**1,070,866**	**1,135,894**
Revelstoke	1953	9,394	3,455			19,511	38,437											41,892
	1954					**12,303**	**20,300**									**6,383**	**3,832**	**24,132**
Similkameen	1953																	
	1954											**4**	**408**					**408**
Skeena	1953					55,083	108,513											108,513
	1954																	
Slocan	1953	429	158			120,311	237,013											237,171
	1954					**90,729**	**149,703**											**149,703**
Vancouver	1953					2,703	5,325											5,325
	1954																	
Not assigned[1 2 3]	1953	1,488,105[3]	547,325	71,298	157,569	191,550	377,353	6,752	14,922									1,097,169
	1954	**1,302,333[3]**	**382,104**	**225,351**	**493,519**	**370,245**	**610,904**	**477**	**1,281**									**1,487,808**
Totals	1953	1,551,043	570,474	71,298	157,569	787,158	1,550,701	6,752	14,922	991,248	6,763,105			1,092,228	581,746	2,168,977	5,950,323	15,588,840
	1954	**1,302,333**	**382,104**	**225,351**	**493,519**	**680,734**	**1,123,211**	**477**	**1,281**	**535,746**	**3,733,891**	**4**	**408**	**587,528**	**280,437**	**2,206,443**	**5,851,558**	**11,866,409**

[1] Antimony assigned to individual mining divisions is the reported content of concentrates exported to foreign smelters. Antimony "not assigned" is the antimony content of antimonial lead produced at the Trail smelter and antimony reported as recovered from Dore slag and flue dust exported.

[2] Cadmium assigned to individual mining divisions is the reported content of customs shipments to the Trail smelter and to foreign smelters. Cadmium "not assigned" is the remainder of the reported estimated recovery at the Trail refinery from British Columbia concentrates.

[3] Antimony, bismuth, and indium recovered at the Trail smelter may include some metal from sources outside British Columbia, in addition to metal contained in British Columbia ores and concentrates. The Trail output of each of the three metals is shown as "not assigned."

TABLE VIId.—PRODUCTION OF INDUSTRIAL MINERALS, 1953 AND 1954, BY MINING DIVISIONS

Division	Year	Asbestos		Barite		Fluxes (Limestone, Quartz)		Granules (Roofing)		Gypsum and Products		Mica		Perlite		Sulphur		Totals
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
		Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Lb.	$	Tons	$	Tons	$	$
Cariboo	1953											604,000	11,338					11,338
	1954											**284,000**	**5,326**					**5,326**
Fort Steele	1953									14,274	32,117					4,732	47,320	79,437
	1954									**11,624**	**26,156**					**30,427**	**304,270**	**330,426**
Golden	1953			3,560	52,845					60,234	154,700							207,545
	1954			**5,056**	**115,337**					**60,200**	**203,700**							**319,037**
Greenwood	1953					21,046	21,046											21,046
	1954					**17,000**	**17,000**											**17,000**
Kamloops	1953									98,157	200,838							200,838
	1954									**103,656**	**191,878**							**191,878**
Liard	1953	3,102	988,716															988,716
	1954	**8,598**	**2,920,751**															**2,920,751**
Nanaimo	1953																	
	1954					**22,897**	**23,804**											**23,804**
New Westminster	1953							865	7,464									7,464
	1954							**1,080**	**8,505**									**8,505**
Omineca	1953													1,112	11,120			11,120
	1954																	
Osoyoos	1953					16,312	89,652	1,897	20,285									109,937
	1954							**1,785**	**26,775**									**26,775**
Trail Creek	1953															135,070	1,350,700	1,350,700
	1954															**171,649**	**1,716,490**	**1,716,490**
Vancouver	1953							1,858	31,572							12,152	192,035	223,607
	1954							**1,676**	**30,227**							**17,923**	**287,662**	**317,889**
Totals	1953	3,102	988,716	3,560	52,845	37,358	110,698	4,620	59,321	172,665	387,655	604,000	11,338	1,112	11,120	151,954	1,590,055	3,211,748
	1954	**8,598**	**2,920,751**	**5,056**	**115,337**	**39,897**	**40,804**	**4,541**	**65,507**	**175,480**	**421,734**	**284,000**	**5,326**			**219,999**	**2,308,422**	**5,877,881**

TABLE VIIe.—PRODUCTION OF STRUCTURAL MATERIALS, 1953 AND 1954, BY MINING DIVISIONS

Division	Year	Cement	Lime and Limestone	Building-stone	Rubble, Riprap, and Crushed Rock	Sand and Gravel	Brick (Common)	Face, Paving, and Sewer Brick	Fire-bricks, Blocks	Clays	Structural Tile (Hollow Blocks), Roof-tile, Floor-tile	Drain-tile and Sewer-pipe	Pottery (Glazed or Unglazed)	Other Clay Products	Division Totals
		$	$	$	$	$	$	$	$	$	$	$	$	$	$
Alberni	1953	.....	.....	.....	319	22,423	.....	.....	.....	.....	.....	.....	.....	.....	22,742
	1954	.....	.....	.....	**908**	**88,957**	.....	.....	.....	.....	.....	.....	.....	.....	**89,865**
Atlin	1953	.....	.....	.....	.....	1,375	.....	.....	.....	.....	.....	.....	.....	.....	1,375
	1954	.....	.....	.....	.....	**2,924**	.....	.....	.....	.....	.....	.....	.....	.....	**2,924**
Cariboo	1953	.....	.....	.....	10,000	164,627	.....	.....	.....	.....	.....	.....	.....	.....	174,627
	1954	.....	.....	.....	**41,419**	**151,352**	.....	.....	.....	.....	.....	.....	.....	.....	**192,771**
Clinton	1953	.....	.....	.....	.....	8,100	.....	.....	.....	.....	.....	.....	.....	.....	8,100
	1954	.....	.....	.....	.....	**48,285**	.....	.....	.....	.....	.....	.....	.....	.....	**48,285**
Fort Steele	1953	.....	.....	.....	3,173	145,926	.....	.....	.....	.....	.....	.....	.....	.....	149,099
	1954	.....	.....	.....	**20,469**	**282,494**	.....	.....	.....	.....	.....	.....	.....	.....	**302,963**
Golden	1953	.....	.....	.....	.....	135,133	.....	.....	.....	.....	.....	.....	.....	.....	135,133
	1954	.....	.....	.....	**1,000**	**40,000**	.....	.....	.....	.....	.....	.....	.....	.....	**41,000**
Greenwood	1953	.....	.....	.....	2,134	16,084	.....	.....	.....	.....	.....	.....	.....	.....	18,218
	1954	.....	.....	.....	**1,110**	**5,922**	.....	.....	.....	.....	.....	.....	.....	.....	**7,032**
Kamloops	1953	.....	.....	.....	34,858	336,036	.....	.....	.....	.....	.....	.....	.....	.....	370,894
	1954	.....	.....	.....	**163,997**	**141,655**	.....	.....	.....	.....	.....	.....	.....	.....	**305,652**
Liard	1953	.....	.....	.....	405	77,040	.....	.....	.....	.....	.....	.....	.....	.....	77,445
	1954	.....	.....	.....	**500**	**78,697**	.....	.....	.....	.....	.....	.....	.....	.....	**79,197**
Lillooet	1953	.....	.....	.....	1,800	10,717	.....	.....	.....	.....	.....	.....	.....	.....	12,517
	1954	.....	.....	.....	.....	**41,607**	.....	.....	.....	.....	.....	.....	.....	.....	**41,607**
Nanaimo	1953	.....	1,232,450	26,462	2,006	136,006	.....	.....	.....	.....	.....	.....	.....	.....	1,396,924
	1954	.....	**1,367,768**	**45,000**	**4,822**	**209,126**	.....	.....	.....	.....	.....	.....	.....	.....	**1,626,716**
Nelson	1953	.....	.....	9,110	.....	55,921	.....	.....	.....	.....	.....	.....	.....	.....	65,031
	1954	.....	.....	**8,300**	**51,256**	**30,101**	.....	.....	.....	.....	.....	.....	.....	.....	**89,657**
New Westminster	1953	.....	82,994	.....	319,804	945,258	9,870	226,459	426,783	31,990	78,459	572,647	22,533	18,573	2,735,369
	1954	.....	**97,596**	.....	**258,418**	**1,222,909**	**12,420**	**278,054**	**372,528**	**36,370**	**103,152**	**695,245**	**23,389**	**29,772**	**3,129,853**
Nicola	1953	.....	.....	.....	8,659	13,855	.....	.....	.....	.....	.....	.....	.....	.....	22,514
	1954	.....	.....	.....	**18,029**	**7,730**	.....	.....	.....	.....	.....	.....	.....	.....	**25,759**
Omineca	1953	.....	.....	.....	115	96,656	.....	.....	.....	.....	.....	.....	.....	.....	96,771
	1954	.....	.....	.....	**5,000**	**101,118**	.....	.....	.....	.....	.....	.....	.....	.....	**106,118**
Osoyoos	1953	.....	.....	.....	.....	35,653	.....	.....	.....	.....	.....	.....	.....	.....	35,653
	1954	.....	.....	.....	.....	**32,449**	.....	.....	.....	.....	.....	.....	.....	.....	**32,449**
Quesnel	1953	.....	.....	.....	.....	30,965	.....	.....	.....	.....	.....	.....	.....	.....	30,965
	1954	.....	.....	.....	.....	**77,801**	.....	.....	.....	.....	.....	.....	.....	.....	**77,801**
Revelstoke	1953	.....	.....	.....	17,574	29,973	.....	.....	.....	.....	.....	.....	.....	.....	47,547
	1954	.....	.....	.....	**135**	**47,428**	.....	.....	.....	.....	.....	.....	.....	.....	**47,563**
Similkameen	1953	.....	.....	.....	56,671	33,404	.....	.....	.....	.....	.....	.....	.....	.....	90,075
	1954	.....	.....	.....	**19,568**	**65,746**	.....	.....	.....	.....	.....	.....	.....	.....	**85,314**
Skeena	1953	.....	37,814	.....	95,934	173,419	.....	.....	.....	.....	.....	.....	.....	.....	306,667
	1954	.....	**82,998**	.....	**17,362**	**99,006**	.....	.....	.....	.....	.....	.....	.....	.....	**199,366**
Slocan	1953	.....	.....	.....	.....	24,230	.....	.....	.....	.....	.....	.....	.....	.....	24,230
	1954	.....	.....	.....	**5,443**	**22,463**	.....	.....	.....	.....	.....	.....	.....	.....	**27,906**
Trail Creek	1953	.....	.....	7,500	3,576	94,506	.....	.....	.....	.....	.....	.....	.....	.....	105,582
	1954	.....	.....	.....	**7,800**	**100,019**	.....	.....	.....	.....	.....	.....	.....	.....	**107,819**
Vancouver	1953	.....	.....	34,180	555,372	1,139,114	31,911	.....	.....	.....	.....	.....	.....	695	1,761,272
	1954	.....	.....	**45,000**	**614,074**	**1,224,487**	**13,130**	**38,622**	.....	.....	.....	.....	.....	**2,925**	**1,938,238**
Vernon	1953	.....	.....	1,000	1,200	128,088	.....	.....	.....	.....	.....	.....	.....	.....	130,288
	1954	.....	.....	**1,092**	**19,655**	**109,432**	.....	.....	.....	.....	.....	.....	.....	.....	**130,179**
Victoria	1953	5,071,260	5,200	.....	8,916	534,085	9,600	.....	.....	.....	45,010	54,450	7,479	.....	5,736,000
	1954	**4,935,298**	**8,640**	.....	**2,891**	**618,761**	**10,000**[1]	.....	.....	**55**	**19,751**	**58,052**[1]	**7,692**	.....	**5,659,140**
Totals	1953	5,071,260	1,357,958	78,252	1,122,516	4,388,594	51,381	226,459	426,783	31,990	123,469	627,097	30,012	19,267	13,555,038
	1954	**4,935,298**	**1,555,002**	**99,392**	**1,253,856**	**4,850,469**	**35,550**	**316,676**	**372,528**	**36,425**	**122,903**	**753,297**	**31,081**	**32,697**	**14,395,174**

[1] Estimated.

TABLE VIIIA.—SUMMARY OF PRODUCTION TO DATE, BY MINING DIVISIONS

Division	Gold—Placer[1]		Principal Lode Metals	Miscellaneous Metals	Industrial Minerals	Structural Materials	Coal		Total
	Quantity	Value					Quantity	Value	
	Oz.	$	$	$	$	$	Tons	$	$
Alberni	1,610	33,052	11,657,082	.....	9,398	574,936	.....	.....	12,274,468
Atlin	719,709	16,931,588	21,127,479	96,728	20,325	147,788	.....	.....	38,323,908
Cariboo	1,949,569	40,105,719	32,516,696	21,548	124,931	1,626,504	290	1,100	74,396,498
Clinton	10,063	240,004	847,454	900	162,867	71,945	.....	.....	1,323,170
Fort Steele	20,388	464,314	1,257,598,742	6,796,929	667,388	2,803,101	49,262,132	193,153,477	1,461,483,951
Golden	469	11,268	22,511,251	51,962	942,008	805,041	.....	.....	24,321,530
Greenwood	5,051	114,996	112,368,016	35,492	2,154,614	452,758	.....	.....	115,125,876
Kamloops	27,483	601,580	3,036,930	65,678	6,009,042	2,780,969	14,995	59,765	12,553,964
Liard	50,051	1,244,312	5,314	79	3,932,467	485,000	75,293	478,070	6,145,242
Lillooet	91,442	1,880,954	95,139,319	48,100	5,129	548,442	.....	.....	97,621,944
Nanaimo	866	19,300	5,876,314	16,938,840	594,682	18,805,064	79,074,719	288,972,017	331,206,217
Nelson	3,492	86,403	92,293,524	15,578,624	64,126	1,945,949	.....	.....	109,968,626
New Westminster	11,463	239,566	126,458	87,724	47,148	33,203,876	.....	.....	33,704,772
Nicola	230	4,652	568,779	17	9,610	236,407	2,924,862	11,028,661	11,848,126
Omineca	52,241	1,382,983	13,371,996	15,207,331	11,460	820,001	361,520	2,144,513	32,938,284
Osoyoos	190	4,142	48,709,896	1,020	1,222,124	855,400	1,122	5,008	50,797,590
Quesnel	635,617	13,343,770	13,330	2,182	31,183	157,344	.....	.....	13,547,809
Revelstoke	7,256	155,246	5,334,825	47,698	.....	805,699	.....	.....	6,343,468
Similkameen	12,069	286,010	101,621,582	128,401	18,558	1,543,292	4,489,560	18,692,671	122,290,514
Skeena	4,589	105,172	202,609,714	269,575	1,240,215	3,837,252	.....	.....	208,061,928
Slocan	362	9,286	126,558,996	473,631	.....	413,192	.....	.....	127,455,105
Trail Creek	848	24,176	92,575,940	35,564	22,579,205	904,599	.....	.....	116,119,484
Vancouver	182	5,306	168,809,278	291,034	4,699,924	17,053,414	.....	.....	190,858,956
Vernon	2,300	60,923	188,310	.....	3,978	1,066,961	.....	.....	1,320,172
Victoria	628	15,680	5,068,306	24,508	190,451	69,311,027	.....	.....	74,609,972
Not assigned	1,577,661	18,176,703	15,274,905	33,677,692	.....	25,927,555	.....	.....	93,056,855
Totals	5,185,829	95,547,105	2,435,810,436	89,881,257	44,740,833	187,183,516	136,204,493	514,535,282	3,367,698,429

[1] *Quantity of placer gold is given in crude ounces. The year of first recorded production for the major placer-producing mining divisions was: Atlin, 1898; Cariboo, 1858; Lillooet, 1874; Quesnel, 1858.*

NOTE.—Full details for placer gold are given in this table. The columns headed "Principal Lode Metals," "Miscellaneous Metals," "Industrial Minerals," and "Structural Materials" give the total value only, details being set forth in Tables VIIIB, VIIIC, and VIIID. The quantity of coal is gross mine output; *see* footnotes to Tables IX.

TABLE VIIIB.—PRODUCTION OF PRINCIPAL LODE METALS, 1896–1954, BY MINING DIVISIONS (QUANTITY AND VALUE)

Division	Gold—Lode		Silver		Copper		Lead		Zinc		Division Totals
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Alberni	300,091	11,231,599	161,219	77,492	2,290,699	343,518	112,888	4,473			11,647,082
Atlin	294,374	10,422,905	1,458,343	1,203,989	10,988,575	3,277,481	10,879,113	1,528,633	40,093,343	4,694,471	21,127,479
Cariboo	894,186	32,458,517	98,477	57,792			2,815	371	492	16	32,516,696
Clinton	23,390	827,328	31,564	14,214	57,548	5,905	193	7			847,454
Fort Steele	3,014	73,444	183,384,410	98,913,008	28,592	6,193	10,272,574,703	664,356,915	7,240,174,427	494,249,182	1,257,598,742
Golden	100	2,503	2,105,838	1,422,053	96,155	20,021	151,496,592	11,569,743	152,788,924	9,496,931	22,511,251
Greenwood	1,132,971	24,367,639	28,376,714	15,903,708	441,237,723	70,507,472	12,315,743	813,217	12,789,922	775,980	112,368,016
Kamloops	47,867	1,608,294	302,887	180,540	6,411,583	1,179,668	505,695	40,049	426,510	28,379	3,036,930
Liard	114	4,120	204	146			5,810	1,048			5,314
Lillooet	2,700,826	94,757,176	682,137	379,560	400	41	62,463	2,542			95,139,319
Nanaimo	84,009	1,919,998	570,270	336,232	22,123,948	3,620,084					5,876,314
Nelson	1,328,515	41,542,287	7,294,840	4,195,402	14,702,422	1,648,622	140,026,828	15,352,859	214,864,943	29,554,354	92,293,524
New Westminster	4,416	112,407	13,259	6,072	26,489	6,379	28,425	1,119	12,755	481	126,458
Nicola	8,525	234,914	267,345	126,522	549,975	106,230	2,235,428	90,516	320,683	10,597	568,779
Omineca	21,838	663,483	7,505,815	5,787,468	6,555,551	1,477,669	20,154,645	2,420,588	24,136,230	3,022,788	13,371,996
Osoyoos	1,580,385	47,922,309	580,454	380,159	2,781,401	398,879	256,957	8,151	6,839	398	48,709,896
Quesnel	218	7,871	2,601	2,086	82	17	21,745	3,353	13	3	13,330
Revelstoke	28,892	797,482	3,040,670	1,828,346	31,360	8,357	20,707,320	1,572,873	9,106,486	1,127,767	5,334,825
Similkameen	167,114	5,747,509	3,910,423	2,309,175	553,769,372	93,551,091	245,026	10,193	69,390	3,614	101,621,582
Skeena	2,392,484	60,207,439	61,220,865	37,389,752	689,106,270	98,025,648	53,507,610	4,551,030	16,388,781	2,435,845	202,609,714
Slocan	14,138	399,055	64,831,527	40,282,295	229,696	43,512	657,828,110	43,106,739	485,931,187	42,727,395	126,558,996
Trail Creek [1] [2]	2,949,412	62,579,505	4,168,457	2,416,811	140,466,937	21,354,122	18,484,672	919,716	158.016,197	5,305,786	92,575,940
Vancouver	407,208	12,890,596	4,446,882	2,617,515	870,221,115	133,111,673	14,435,064	1,301,435	141,568,003	18,888,059	168,809,278
Vernon	5,223	176,048	12,823	8,084	654	100	24,913	2,932	10,816	1,146	188,310
Victoria	37,663	812,730	807,615	446,303	22,545,393	3,505,502	210,097	19,848	3,568,709	283,923	5,068,306
Not assigned [3]	355	12,142	321,936	268,385	5,887,477	1,750,279	15,733,888	2,095,096	70,476,474	7,500,442	11,626,344
Totals	14,427,328	411,779,300	375,597,575	216,553,109	2,790,109,417	433,948,463	11,391,856,743	749,773,446	8,570,751,124	620,107,557	2,432,161,875

[1] Includes zinc and lead recovered at the Trail smelter from current and reclaimed slags, prior to 1953. From 1953 this recovery is listed as "not assigned."

[2] Includes gold, silver, copper, and lead recovered at the Tacoma smelter from dross shipped by the Trail smelter, prior to 1953. From 1953 this recovery is listed as "not assigned."

[3] Includes all metals recovered from dross and slag (*see* notes 1 and 2) in 1953 and 1954.

TABLE VIIIc.—PRODUCTION OF MISCELLANEOUS METALS, 1885–1954, BY MINING DIVISIONS (QUANTITY AND VALUE)

Division	Antimony		Bismuth		Cadmium		Chromite		Cobalt		Indium		Iron Ore		Magnesium		Manganese	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	Lb.	$	Lb.	$	Lb.	$	Tons	$	Lb.	$	Oz.	$	Tons	$	Lb.	$	Tons	$
Atlin					58,405	96,368												
Cariboo																		
Clinton							126	900										
Fort Steele					2,418	5,155									204,632	88,184		
Golden	40,062	14,906			22,428	37,056												
Greenwood					2,483	4,097	670	31,395										
Kamloops													17,109	59,883				
Liard																		
Lillooet	13,466	4,321																
Nanaimo													2,596,928	16,938,840				
Nelson					259,532	497,580												
New Westminster																		
Nicola			12	17														
Omineca	104,489	15,217			52,966	91,731			1,730	420								
Osoyoos																		
Quesnel																		
Revelstoke	9,394	3,455			21,570	38,556												
Similkameen																		
Skeena					120,349	248,835							1,200	6,000				
Slocan	31,865	8,133			235,271	457,338											541	8,160
Trail Creek													550	1,925				
Vancouver					109,311	291,034												
Victoria																	1,167	24,508
Not assigned[1]	29,538,641	6,581,203	4,114,934	6,481,241	15,397,319	20,577,219					14,327	38,029						
Totals	29,737,917	6,627,235	4,114,946	6,481,258	16,282,052	22,344,969	796	32,295	1,730	420	14,327	38,029	2,615,787	17,006,648	204,632	88,184	1,708	32,668

[1] *See* notes below Table VIIc.

Year of first recorded production: Antimony, 1907; bismuth, 1929; cadmium, 1929; chromite, 1918; cobalt, 1928; indium, 1942; iron ore, 1885; magnesium, 1941; manganese, 1918.

TABLE VIIIc.—PRODUCTION OF MISCELLANEOUS METALS, 1885–1954, BY MINING DIVISIONS (QUANTITY AND VALUE)—*Continued*

Division	Mercury		Molybdenite		Nickel		Palladium		Platinum		Selenium		Tin		Tungsten (WO_3)		Division Totals
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Lb.	$	Lb.	$	Lb.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Atlin															273	360	96,728
Cariboo									3	117					27,698	21,431	21,548
Clinton																	900
Fort Steele													9,374,976	6,703,590			6,796,929
Golden																	51,962
Greenwood																	35,492
Kamloops	10,987	5,795															65,678
Liard									2	79							79
Lillooet	1,708	3,305	2,448	2,440					3	113					32,353	37,921	48,100
Nanaimo																	16,938,840
Nelson			25,058	18,378											6,982,985	15,062,666	15,578,624
New Westminster					281,453	87,724											87,724
Nicola																	17
Omineca	4,150,892	10,400,259	1,600	1,840					3	154					2,210,892	4,697,710	15,207,331
Osoyoos			1,020	1,020													1,020
Quesnel									56	2,182							2,182
Revelstoke															7,784	5,687	47,698
Similkameen									1,276	128,401							128,401
Skeena			13,022	13,020							731	1,389			366	331	269,575
Slocan																	473,631
Trail Creek							749	30,462	53	3,177							35,564
Vancouver																	291,034
Victoria																	24,508
Not assigned																	33,677,692
Totals	4,163,587	10,409,359	43,148	36,698	281,453	87,724	749	30,462	1,396	134,223	731	1,389	9,374,976	6,703,590	9,262,351	19,826,106	89,881,257

Year of first recorded production: Mercury, 1895; molybdenite, 1914; nickel, 1936; palladium, 1930; platinum, 1887; selenium, 1931; tin, 1941; tungsten, 1937.

TABLE VIIID.—PRODUCTION OF INDUSTRIAL MINERALS, 1904–54, BY MINING DIVISIONS (QUANTITY AND VALUE)

Division	Arsenious Oxide		Asbestos		Barite		Bentonite		Diatomite		Fluorspar		Flux (Quartz and Limestone)		Granules (Roofing)		Gypsum and Gypsite		Hydromagnesite	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	Lb.	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$
Alberni																				
Atlin																			1,450	20,325
Cariboo																				
Clinton																	983	6,676	803	7,211
Fort Steele					8	80											112,827	298,824		
Golden					67,616	417,055											150,811	523,677		
Greenwood											40,165	783,578	1,621,219	1,371,036						
Kamloops																	1,108,253	5,805,987		
Liard			11,720	3,932,467																
Lillooet																				
Nanaimo													548,258	594,682						
Nelson													7,601	8,174	2	51				
New Westminster															4,623	47,148				
Nicola																	2,297	9,610		
Omineca	16,997	340																		
Osoyoos	22,002,423	272,861											159,126	854,965	3,682	47,060				
Quesnel									1,369	31,015					48	168				
Similkameen							791	16,858									250	1,700		
Skeena													601,019	1,050,722						
Trail Creek																				
Vancouver															27,774	389,578				
Vernon																				
Victoria													50	760	9,702	159,471				
Totals	22,019,420	273,201	11,720	3,932,467	67,624	417,135	791	16,858	1,369	31,015[1]	40,165	783,578	2,937,273	3,880,339	45,831	643,476	1,375,421	6,646,474	2,253	27,536

[1] Includes 30 tons of volcanic ash, worth $300, recorded from Quesnel Mining Division.

Year of first recorded production: Arsenious oxide, 1917; asbestos, 1952; barite, 1940; bentonite, 1926; diatomite, 1928; fluorspar, 1918; flux (quartz and limestone), 1911; granules, 1930; gypsum and gypsite, 1911; hydromagnesite, 1904.

TABLE VIIID.—PRODUCTION OF INDUSTRIAL MINERALS, 1904–54, BY MINING DIVISIONS (QUANTITY AND VALUE)—*Continued*

Division	Iron Oxide and Ochre		Magnesium Sulphate		Mica		Natro-alunite		Perlite		Phosphate Rock		Sodium Carbonate		Sulphur		Talc		Division Totals
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Tons	$	Tons	$	Lb.	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	$
Alberni							522	9,398											9,398
Atlin																			20,325
Cariboo					9,183,200	124,931													124,931
Clinton			1,923	39,085									9,524	109,895					162,867
Fort Steele											3,842	16,894			35,159[2]	351,590			667,388
Golden	27	920															5	356	942,008
Greenwood																			2,154,614
Kamloops			8,742	193,967									968	9,088					6,009,042
Liard																			3,932,467
Lillooet																	296	5,129	5,129
Nanaimo																			594,682
Nelson	7,292	55,901																	64,126
New Westminster																			47,148
Nicola																			9,610
Omineca									1,112	11,120									11,460
Osoyoos			3,229	21,300	1,588,800	25,938													1,222,124
Quesnel																			31,183[1]
Similkameen																			18,558
Skeena					634,250	10,815									41,624	178,678			1,240,215
Trail Creek																			
Vancouver	10,669	97,389													515,626	4,212,957			4,699,924
Vernon					160,500	3,978													3,978
Victoria	120	840															1,504	29,380	190,451
Not assigned															2,272,890[3]	22,579,205			22,579,205
Totals	18,108	155,050	13,894	254,352	11,566,750	165,662	522	9,398	1,112	11,120	3,842	16,894	10,492	118,983	2,865,299	27,322,430	1,805	34,865	44,740,833

[1] Includes 30 tons of volcanic ash, worth $300, recorded from Quesnel Mining Division.

[2] Recovery in 1953 and 1954 for use in fertilizer plant at Marysville.

[3] Recovery at Trail smelter for use in Warfield fertilizer plants, and derived from ores from several mining divisions.

Year of first recorded production: Iron oxide and ochre, 1918; magnesium sulphate, 1915; mica, 1932; natro-alunite, 1912; perlite, 1953; phosphate rock, 1927; sodium carbonate, 1921; sulphur, 1916; talc, 1916.

TABLE IXA.—QUANTITY (GROSS[1]) AND VALUE OF COAL PER YEAR TO DATE

Year	Tons (2,000 Lb.)	Value	Year	Tons (2,000 Lb.)	Value
1836–59	41,871	$149,548	1907	2,485,961	$7,637,713
1860	15,956	56,988	1908	2,362,514	7,356,866
1861	15,427	55,096	1909	2,688,672	8,574,884
1862	20,292	72,472	1910	3,515,944	11,108,335
1863	23,906	85,380	1911	2,573,444	8,071,747
1864	32,068	115,528	1912	3,388,795	10,786,812
1865	36,757	131,276	1913	2,879,251	9,197,460
1866	28,129	100,460	1914	2,426,399	7,745,847
1867	34,988	124,956	1915	2,209,290	7,114,178
1868	49,286	176,020	1916	2,783,849	8,900,675
1869	40,098	143,208	1917	2,686,561	8,484,343
1870	33,424	119,372	1918	2,888,170	12,833,994
1871	55,458[2]	164,612	1919	2,698,022	11,975,671
1872	55,458[2]	164,612	1920	3,020,387	13,450,169
1873	55,459[2]	164,612	1921	2,877,995	12,836,013
1874	91,334	244,641	1922	2,890,625	12,880,060
1875	123,362	330,435	1923	2,848,146	12,678,548
1876	155,895	417,576	1924	2,226,037	9,911,935
1877	172,540	462,156	1925	2,737,607	12,168,905
1878	191,348	522,538	1926	2,609,640	11,650,180
1879	270,257	723,903	1927	2,748,286	12,269,135
1880	299,708	802,785	1928	2,829,906	12,633,510
1881	255,760	685,171	1929	2,521,402	11,256,260
1882	315,997	846,417	1930	2,113,586	9,435,650
1883	238,895	639,897	1931	1,912,501	7,684,155
1884	441,358	1,182,210	1932	1,719,172	6,523,644
1885	409,468	1,096,788	1933	1,416,516	5,375,171
1886	365,832	979,908	1934	1,508,741	5,725,133
1887	462,964	1,240,080	1935	1,330,524	5,048,864
1888	548,017	1,467,903	1936	1,508,048	5,722,502
1889	649,411	1,739,490	1937	1,618,051	6,139,920
1890	759,518	2,034,420	1938	1,466,559	5,565,069
1891	1,152,590	3,087,291	1939	1,655,217	6,280,956
1892	925,495	2,479,005	1940	1,867,966	7,088,265
1893	1,095,690	2,934,882	1941	2,018,635	7,660,000
1894	1,134,509	3,038,859	1942	2,170,737	8,237,172
1895	1,052,412	2,824,687	1943	2,040,253	7,742,030
1896	1,002,268	2,693,961	1944	2,165,676	8,217,966
1897	999,372	2,734,522	1945	1,700,914	6,454,360
1898	1,263,272	3,582,595	1946	1,639,277	6,732,470
1899	1,435,314	4,126,803	1947	1,923,573	8,680,440
1900	1,781,000	4,744,530	1948	1,809,018	9,765,395
1901	1,894,544	5,016,398	1949	1,917,296	10,549,924
1902	1,838,621	4,832,257	1950	1,756,667	10,119,303
1903	1,624,742	4,332,297	1951	1,824,384	10,169,617
1904	1,887,981	4,953,024	1952	1,650,619	9,729,739
1905	2,044,931	5,511,861	1953	1,576,105	9,528,279
1906	2,126,965	5,548,044	1954	1,447,608	9,154,544
			Totals	136,204,493	$514,535,282

TABLE IXB.—COAL PRODUCTION (GROSS[1]) BY DISTRICTS AND MINING DIVISIONS

District and Mining Division	Total to Date			1953		1954	
	Period	Quantity	Value	Quantity	Value	Quantity	Value
		Tons	$	Tons	$	Tons	$
Vancouver Island District							
Nanaimo Mining Division	1836–1954	79,074,719	288,972,017	265,427	2,059,828	205,920	2,029,099
Nicola-Princeton District							
Kamloops Mining Division	1893–1945	14,995	59,765	.....	.....	.....	.....
Nicola Mining Division	1907–1954	2,924,862	11,028,661	1,040	10,400	1,256	12,769
Osoyoos Mining Division	1926–1927	1,122	5,008	.....	.....	.....	.....
Similkameen Mining Division	1909–1954	4,489,560	18,692,671	7,047	51,012	29,713	138,080
District totals	1893–1954	7,430,539	29,786,105	8,087	61,412	30,969	150,849
Northern District							
Cariboo Mining Division	1942–1944	290	1,100	.....	.....	.....	.....
Liard Mining Division	1923–1954	75,293	478,070	4,835	50,895	4,359	33,079
Omineca Mining Division	1918–1954	361,520	2,144,513	42,136	324,986	36,572	292,862
District totals	1918–1954	437,103	2,623,683	46,971	375,881	40,931	325,941
East Kootenay District							
Fort Steele Mining Division	1898–1954	49,262,132	193,153,477	1,255,620	7,031,158	1,169,788	6,648,655
Provincial totals	1836–1954	136,204,493	514,535,282	1,576,105	9,528,279	1,447,608	9,154,544

[1] Gross mine output, including washery loss and coal used in making coke (*see* Table X and discussion under "Fuel," page 16).

[2] A combined total for 1871, 1872, and 1873 has previously been noted in Annual Reports and the above breakdown is estimated.

TABLE IXc.—QUANTITY[3] AND VALUE OF COAL SOLD AND USED,[4] 1946–54

Year	District and Mining Division	Total Sales[4]*	Used under Companies' Boilers[4]†	Used in Making Coke[4]‡	Total Sold and Used[4]		District Totals, 1954	
		Tons	Tons	Tons	Tons	$	Tons	$
	Vancouver Island	.....	.....	.....	.....	.....	**182,070**	**2,029,099**
1946	Nanaimo	502,406	4,396	.....	506,802	3,474,182		
1947	,,	450,968	3,786	.....	454,754	3,625,348		
1948	,,	365,328	2,801	.....	368,129	3,219,868		
1949	,,	451,074	3,925	.....	454,999	4,055,572		
1950	,,	472,690	4,329	.....	477,019	4,060,337		
1951	,,	391,687	3,425	.....	395,112	3,486,615		
1952	,,	267,346	2,986	.....	270,332	2,749,206		
1953	,,	204,931	1,798	.....	206,729	2,059,828		
1954	,,	**181,534**	**536**	.....	**182,070**	**2,029,099**		
	Nicola-Princeton	.....	.....	.....	.....	.....	**30,969**	**150,849**
1946	Nicola	1,711	81	.....	1,792	8,957		
1947	,,	1,997	261	.....	2,258	15,493		
1948	,,	1,777	.....	.....	1,777	15,281		
1949	,,	1,672	.....	.....	1,672	14,809		
1950	,,	1,125	.....	.....	1,125	9,926		
1951	,,	899	.....	.....	899	8,640		
1952	,,	1,139	.....	.....	1,139	11,493		
1953	,,	1,040	.....	.....	1,040	10,400		
1954	,,	**1,256**	.....	.....	**1,256**	**12,769**		
1946	Similkameen	43,556	.....	.....	43,556	214,098		
1947	,,	49,324	.....	.....	49,324	329,179		
1948	,,	49,859	.....	.....	49,859	299,387		
1949	,,	49,906	.....	.....	49,906	298,293		
1950	,,	16,784	.....	.....	16,784	87,483		
1951	,,	3,941	.....	.....	3,941	28,094		
1952	,,	6,306	.....	.....	6,306	48,760		
1953	,,	7,047	.....	.....	7,047	51,012		
1954	,,	**29,713**	.....	.....	**29,713**	**138,080**		
	Northern	.....	.....	.....	.....	.....	**40,931**	**325,941**
1946	Liard	2,501	78	.....	2,579	14,540		
1947	,,	5,958	59	.....	6,017	35,012		
1948	,,	8,570	60	.....	8,630	52,721		
1949	,,	12,364	.....	.....	12,364	76,697		
1950	,,	12,250	.....	.....	12,250	82,258		
1951	,,	3,199	.....	.....	3,199	26,095		
1952	,,	3,854	.....	.....	3,854	42,606		
1953	,,	4,815	20	.....	4,835	50,895		
1954	,,	**4,359**	.....	.....	**4,359**	**33,079**		
1946	Omineca	12,087	51	.....	12,138	67,928		
1947	,,	10,751	59	.....	10,810	63,375		
1948	,,	10,920	66	.....	10,986	85,981		
1949	,,	11,468	63	.....	11,531	92,865		
1950	,,	13,037	62	.....	13,099	104,790		
1951	,,	27,904	.....	.....	27,904	206,799		
1952	,,	37,270	.....	.....	37,270	285,732		
1953	,,	42,079	.....	.....	42,079	324,986		
1954	,,	**36,572**	.....	.....	**36,572**	**292,862**		
	East Kootenay	.....	.....	.....	.....	.....	**1,054,314**	**6,648,655**
1946	Fort Steele	744,941	21,161	106,122	872,224	2,952,765		
1947	,,	973,358	24,163	175,665	1,173,186	4,612,033		
1948	,,	990,530	20,227	154,342	1,165,099	6,092,157		
1949	,,	842,979	19,025	228,792	1,090,796	6,011,688		
1950	,,	825,315	15,196	213,218	1,053,729	5,774,509		
1951	,,	889,669	15,977	236,871	1,142,517	6,413,374		
1952	,,	822,071	15,813	245,528	1,083,412	6,591,942		
1953	,,	878,865	12,729	230,814	1,122,408	7,031,158		
1954	,,	**820,081**	**15,310**	**218,923**	**1,054,314**	**6,648,655**		
1946	Provincial totals	1,307,202	25,767	106,122	1,439,091	6,732,470		
1947	,,	1,492,356	28,328	175,665	1,696,349	8,680,440		
1948	,,	1,426,984	23,154	154,342	1,604,480	9,765,395		
1949	,,	1,369,463	23,013	228,792	1,621,268	10,549,924		
1950	,,	1,341,201	19,587	213,218	1,574,006	10,119,303		
1951	,,	1,317,299	19,402	236,871	1,573,572	10,169,617		
1952	,,	1,137,986	18,799	245,528	1,402,313	9,729,739		
1953	,,	1,138,777	14,547	230,814	1,384,138	9,528,279		
1954	,,	**1,073,515**	**15,846**	**218,923**	**1,308,284**	**9,154,544**	**1,308,284**	**9,154,544**

[3] For difference between gross mine output and coal sold refer to table "Production and Distribution by Collieries and by Districts" in section headed "Coal" or "Coal-mining" in Annual Reports of the Minister of Mines.

[4] The totals "sold and used" include:—

* Sales to retail and wholesale dealers, industrial users, and company employees.

† Coal used in company boilers, including steam locomotives.

‡ Coal used in making coke.

See also discussion under "Fuel," page 16.

TABLE X.—COKE AND BY-PRODUCTS PRODUCTION FOR YEARS 1895 TO 1925 AND 1926 TO 1954

Year	Coal Used in Making Coke		Coke Made in Bee-hive Ovens		Coke Made in By-product Ovens		Coke Made in Gas Plants		Total Coke Made		Gas Sold and Used	Tar Produced	Other By-products[1]	Total Production Value of Coke Industry
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value				
	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	$	$	$	$
1895–1925	7,955,795	25,673,600	4,920,457	25,673,600	.....	.....	.....	.....	4,920,457	25,673,600	.....	.....	.....	25,673,600
1926	299,839	1,338,565	105,227	795,841	42,209	244,469	42,468	221,600	189,904	1,261,910	1,009,613	50,035	45,772	2,367,330
1927	269,482	1,290,760	95,281	595,504	35,900	327,215	39,464	178,682	170,645	1,101,401	1,222,379	44,402	18,080	2,386,262
1928	210,207	940,668	68,734	429,590	32,322	263,781	41,711	187,882	142,767	881,253	1,313,407	45,313	14,036	2,254,009
1929	226,363	950,243	75,426	574,279	33,339	308,867	46,573	214,732	155,338	1,097,878	1,461,445	61,084	39,203	2,659,610
1930	225,325	1,002,684	73,708	558,801	31,904	298,004	45,751	232,917	151,363	1,089,722	1,547,092	65,770	11,935	2,714,519
1931	211,334	924,279	73,248	548,550	27,717	236,537	41,836	210,470	142,801	995,557	1,541,454	66,506	32,603	2,636,120
1932	151,750	710,432	33,090	247,615	25,436	217,221	44,645	237,174	103,171	702,010	1,589,656	54,771	14,109	2,360,546
1933	107,400	554,152	6,097	44,813	24,263	213,750	34,156	214,454	64,516	473,017	1,473,433	45,610	3,666	1,995,726
1934	141,384	571,167	24,840	154,105	23,512	213,653	51,184	198,217	99,536	565,975	1,439,287	43,939	4,756	2,053,957
1935	127,776	494,492	27,066	160,565	14,911	109,684	46,111	160,694	88,088	430,943	1,430,057	44,876	3,081	1,908,957
1936	125,810	436,595	34,009	191,843	.....	.....	48,859	138,787	82,868	330,630	1,422,783	38,872	.....	1,792,285
1937	166,124	570,250	48,393	277,726	.....	.....	59,141	330,821	107,534	608,547	1,746,047	46,698	.....	2,401,292
1938	176,877	623,649	54,602	315,294	.....	.....	58,643	345,790	113,245	661,084	1,770,839	44,324	.....	2,476,247
1939	171,242	569,945	50,153	286,491	7,196	37,015	55,395	325,435	112,744	648,941	1,768,977	44,108	.....	2,462,026
1940	184,160	577,706	37,845	220,211	29,124	151,931	60,726	303,421	127,695	675,563	1,810,083	54,379	3,060	2,543,085
1941	235,809	717,584	64,707	392,473	86,656	467,440	8,378	43,758	159,741	903,671	1,925,270	63,569	1,716	2,894,226
1942	255,862	866,795	66,824	439,464	96,428	608,521	6,528	54,307	169,780	1,102,292	2,165,888	86,113	22,028	3,376,321
1943	260,334	983,910	42,766	291,843	43,895	274,402	93,714	647,482	180,375	1,213,727	2,453,592	96,249	18,321	3,781,889
1944	212,883	1,439,891	36,966	301,201	47,401	347,245	88,430	565,393	172,797	1,213,839	2,562,610	56,476	19,046	3,851,971
1945	230,868	1,211,584	13,464	117,369	59,098	434,876	91,682	577,479	164,244	1,129,724	2,721,690	83,828	20,756	3,955,998
1946	251,954	1,441,415	20,542	178,556	53,525	423,025	101,094	648,297	175,161	1,249,878	3,079,009	88,947	53,097	4,470,931
1947	284,049	1,682,602	44,517	427,330	59,638	531,114	91,755	579,635	195,910	1,538,079	3,390,713	124,885	25,780	5,079,457
1948	235,297	1,440,415	47,461	559,735	57,112	630,390	57,678	455,096	162,251	1,645,221	4,520,886	153,130	19,489	6,338,726
1949	323,899	1,979,138	66,407	690,045	89,268	1,018,288	67,449	496,933	223,124	2,205,266	4,148,124	194,728	27,406	6,575,524
1950	333,955	2,027,470	23,703	269,728	127,477	997,200	92,704	686,871	243,884	1,953,799	4,298,161	277,138	27,944	6,557,042
1951	332,416	1,949,117	32,598	387,796	138,051	1,552,764	72,215	571,161	242,864	2,511,721	4,263,754	277,786	22,132	7,075,393
1952	323,922	1,972,918	35,110	440,756	142,156	1,729,924	64,906	525,384	242,172	2,696,064	4,625,747	252,070	25,639	7,599,520
1953	310,431	2,005,551	.....	.....	177,790	2,090,147	60,407	525,411	238,197	2,615,558	4,857,116	238,771	21,046	7,732,491
1954	302,052	2,052,641	.....	.....	168,982	2,032,902	67,108	566,660	236,090	2,599,562	5,113,334	226,824	20,586	7,960,306
Totals	14,644,599	57,000,218	6,223,241	35,571,124	1,675,310	15,760,365	1,680,711	10,444,943	9,578,359	61,776,432	72,672,446	2,971,201	515,287	137,935,366

[1] "Other by-products" total includes ammonium sulphate, $52,492; ammonia liquor, $103,850; light oils, $16,571; motor fuel, $7,009; naphthalene, $4,077; creosote, $34; benzol (thinning), $312; solvent naphtha, $644; cinders, $305,352; pitch, $5,131; sulphuric acid, $6,658; tar-paint, $2,330; and miscellaneous, $10,827.

TABLE XI.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1954

Dividends Paid during 1953 and 1954

	1953	1954
Britannia Mining and Smelting Co. Ltd.	$975,113	$579,899
Bulkley Valley Collieries Ltd.	6,000	6,000
Consolidated Mining and Smelting Co. of Canada, Ltd.	19,656,283	22,113,331
Crow's Nest Pass Coal Co. Ltd.	248,472	248,472
Granby Consolidated Mining Smelting and Power Co. Ltd.	225,116	225,116
Island Mountain Mines Co. Ltd.		735,501[1]
Kelowna Mines Hedley Ltd.	180,000	180,000
Pioneer Gold Mines of B.C. Ltd.	175,175	218,969
Silver Standard Mines Ltd.	214,415	192,974
Torbrit Silver Mines Ltd.		150,000
Violamac Mines (B.C.) Ltd.	350,000	400,000
Others	292,515	318,000
Totals	$22,323,089	$25,368,262

Dividends Paid Yearly, 1917–1954, Inclusive

Year	Amount Paid	Year	Amount Paid
1917	$3,269,494	1937	$15,085,293
1918	2,704,469	1938	12,068,875
1919	2,494,283	1939	11,865,698
1920	1,870,296	1940	14,595,530
1921	736,629	1941	16,598,110
1922	3,174,756	1942	13,627,104
1923	2,983,570	1943	11,860,159
1924	2,977,276	1944	11,367,732
1925	5,853,419	1945	10,487,395
1926	8,011,137	1946	15,566,047
1927	8,816,681	1947	27,940,213
1928	9,572,536	1948	37,672,319
1929	11,263,118	1949	33,651,096
1930	10,543,500	1950	34,399,330
1931	4,650,857	1951	40,921,238
1932	2,786,958	1952	32,603,956
1933	2,471,735	1953	22,323,089
1934	4,745,905	1954	25,368,262
1935	7,386,070		
1936	10,513,705	Total	$494,827,840

[1] Initial "liquidating" payment.

TABLE XI.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1954—*Continued*

Lode-gold Mines[1]

Company or Mine	Locality	Class	Amount Paid
Arlington	Erie	Gold	$94,872
Athabasca	Nelson	Gold	25,000
Bayonne	Tye Siding	Gold	25,000
Bralorne Mines Ltd.	Bridge River	Gold	16,699,550
Belmont-Surf Inlet	Princess Royal Island	Gold	1,437,500
Cariboo Gold Quartz Mining Co. Ltd.	Wells	Gold	1,679,976
Cariboo-McKinney Con. M. & M. Co.	Camp McKinney	Gold	565,588
Canadian Pacific Exploration (Porto Rico)	Nelson	Gold	37,500
Centre Star	Rossland	Gold-copper	472,255
Fairview Amalgamated	Oliver	Gold	5,254
Fern Gold Mining & Milling Co. Ltd.	Nelson	Gold	9,375
Gold Belt Mining Co. Ltd.	Sheep Creek	Gold	668,595[2]
Goodenough (leasers)	Ymir	Gold	13,731
Hedley Mascot Gold Mines Ltd.	Hedley	Gold	1,290,553
Island Mountain Mines Ltd.	Wells	Gold	2,253,775[2]
I.X.L.	Rossland	Gold	134,025
Jewel-Denero	Greenwood	Gold	11,751
Kelowna Exploration Co. Ltd. (Nickel Plate)	Hedley	Gold	2,040,000
Kelowna Mines Hedley Ltd.	Hedley	Gold	780,000[3]
Kootenay Belle Gold Mines Ltd.	Sheep Creek	Gold	357,856
Le Roi Mining Co.	Rossland	Gold-copper	1,475,000
Le Roi No.2 Ltd.	Rossland	Gold-copper	1,574,640
Lorne (later Bralorne)	Bridge River	Gold	20,450
Motherlode	Sheep Creek	Gold	163,500
Mount Zeballos Gold Mines Ltd.	Zeballos	Gold	165,000
Nickel Plate (Hedley Gold Mining Co. Ltd.)	Hedley	Gold	3,423,191
Pioneer Gold Mines of B.C. Ltd.	Bridge River	Gold	9,693,537
Poorman	Nelson	Gold	25,000
Premier Gold Mining Co. Ltd.	Premier	Gold	18,858,075[4]
Privateer Mine Ltd.	Zeballos	Gold	1,914,183
Queen (prior to Sheep Creek Gold Mines Ltd.)	Sheep Creek	Gold	98,674
Relief Arlington Mines Ltd. (Second Relief)	Erie	Gold	308,000[2]
Reno Gold Mines Ltd.	Sheep Creek	Gold	1,433,640[2]
Sheep Creek Gold Mines Ltd.	Sheep Creek	Gold	3,609,375[5]
Silbak Premier Mines Ltd.	Premier	Gold	2,425,000[4]
Spud Valley Gold Mines Ltd.	Zeballos	Gold	168,000
Sunset No. 2	Rossland	Gold-copper	115,007
Surf Inlet Consolidated Gold Mines Ltd.	Surf Inlet	Gold	120,279
War Eagle	Rossland	Gold-copper	1,245,250
Ymir Gold	Ymir	Gold	300,000
Ymir Yankee Girl	Ymir	Gold	415,002[2]
Miscellaneous mines		Gold	108,623
Total, lode-gold mines			$76,021,582

[1] The gold-copper properties of Rossland are included in this table.

[2] Includes "return of capital" distributions and distribution of initial "liquidating" payment.

[3] Former Kelowna Exploration Company Limited; changed in January, 1951.

[4] Up to and including 1936, dividends paid by Premier Gold Mining Company Limited were derived from operations of the company in British Columbia. Subsequent dividends paid by Premier Gold Mining Company Limited have been derived from the operations of subsidiary companies in British Columbia and elsewhere and are not included in the figure given. In 1936, Silbak Premier, a subsidiary of Premier Gold Mining Company, took over the former gold operations of that company in British Columbia. Dividends paid by Silbak Premier are given above.

[5] In several years, preceding 1953, company revenue has included profits from operation of the Lucky Jim zinc-lead mine.

TABLE XI.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1954—*Continued*

Silver-Lead-Zinc Mines

Company or Mine	Locality	Class	Amount Paid
Antoine	Rambler	Silver-lead-zinc	$10,000
Base Metals Mining Corporation Ltd. (Monarch and Kicking Horse)	Field	Silver-lead-zinc	586,143[1]
Beaverdell-Wellington	Beaverdell	Silver-lead-zinc	97,200
Beaver Silver Mines Ltd.	Greenwood	Silver-lead-zinc	48,000
Bell	Beaverdell	Silver-lead-zinc	388,297
Bosun (Rosebery-Surprise)	New Denver	Silver-lead-zinc	25,000
Capella	New Denver	Silver-lead-zinc	5,500
Consolidated Mining and Smelting Co. of Canada, Ltd.	Trail	Silver-lead-zinc	377,885,793[2]
Couverapee	Field	Silver-lead-zinc	5,203
Duthie Mines Ltd.	Smithers	Silver-lead-zinc	50,000
Florence Silver	Ainsworth	Silver-lead zinc	35,393
Goodenough	Cody	Silver-lead-zinc	45,668
H.B. Mining Co.	Hall Creek	Silver-lead-zinc	8,904
Highland Lass Ltd.	Beaverdell	Silver-lead-zinc	132,464
Highland-Bell Ltd.	Beaverdell	Silver-lead-zinc	1,398,025
Horn Silver	Similkameen	Silver-lead-zinc	6,000
Idaho-Alamo	Sandon	Silver-lead-zinc	400,000
Iron Mountain (Emerald)	Salmo	Silver-lead-zinc	20,000
Jackson	Retallack	Silver-lead-zinc	20,000
Last Chance	Three Forks	Silver-lead-zinc	213,000
Lone Bachelor	Sandon	Silver-lead-zinc	50,000
Lucky Jim	Three Forks	Silver-lead-zinc	80,000
Mercury	Sandon	Silver-lead-zinc	6,000
Meteor	Slocan City	Silver-lead-zinc	10,257
Monitor and Ajax	Three Forks	Silver-lead-zinc	70,500
Mountain Con	Cody	Silver-lead-zinc	71,387
McAllister	Three Forks	Silver-lead-zinc	45,088
Noble Five	Cody	Silver-lead-zinc	72,859
North Star	Kimberley	Silver-lead-zinc	497,901
No. One	Sandon	Silver-lead-zinc	6,754
Ottawa	Slocan City	Silver-lead-zinc	110,429
Payne	Sandon	Silver-lead-zinc	1,438,000
Providence	Greenwood	Silver-lead-zinc	142,328[3]
Queen Bess	Alamo	Silver-lead-zinc	25,000
Rambler-Cariboo	Rambler	Silver-lead-zinc	467,250
Reeves MacDonald Mines Ltd.	Remac	Silver-lead-zinc	1,169,000
Reco	Cody	Silver-lead-zinc	334,992
Ruth Mines Ltd.	Sandon	Silver-lead-zinc	125,490
St. Eugene	Moyie	Silver-lead-zinc	566,000
Silversmith and Slocan Star[4]	Sandon	Silver-lead-zinc	1,267,600
Silver Standard Mines Ltd.	Hazelton	Silver-lead-zinc	1,672,450
Spokane-Trinket	Ainsworth	Silver-lead-zinc	10,365
Standard Silver Lead	Silverton	Silver-lead-zinc	2,734,688
Sunset and Trade Dollar	Retallack	Silver-lead-zinc	88,000
Torbrit Silver Mines Ltd.	Alice Arm	Silver-lead-zinc	150,000
Utica	Kaslo	Silver-lead-zinc	64,000
Violamac Mines (B.C.) Ltd.	New Denver	Silver-lead-zinc	850,000
Wallace Mines Ltd. (Sally)	Beaverdell	Silver-lead-zinc	135,000
Washington	Rambler Station	Silver-lead-zinc	20,000
Western Exploration Co. Ltd.	Silverton	Silver-lead-zinc	30,867
Whitewater	Retallack	Silver-lead-zinc	592,515
Miscellaneous mines		Silver-lead-zinc	70,239
Total, silver-lead-zinc mines			$394,355,549

[1] Includes $466,143 "return of capital" distribution prior to 1949.
[2] Earnings of several company mines, and customs smelter at Trail.
[3] Includes $10,504 paid in 1944 but not included in the yearly figure.
[4] These two properties were amalgamated as Silversmith Mines Limited in August, 1939.

TABLE XI.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1954—*Continued*

Copper Mines

Company or Mine	Locality	Class	Amount Paid
Britannia M. & S. Co.[1]	Britannia Beach	Copper	$18,803,772
Canada Copper Corporation	Greenwood	Copper	615,399
Cornell	Texada Island	Copper	8,500
Granby Cons. M.S. & P. Co.[2]	Copper Mountain	Copper	29,535,052
Marble Bay	Texada Island	Copper	175,000
Hall Mines	Nelson	Copper	233,280
Miscellaneous mines		Copper	261,470
Total, copper mines			$49,632,473

[1] Britannia Mining and Smelting Company Limited is a subsidiary of the Howe Sound Company, which is the holding company for Britannia and for other mines in Canada, Mexico, and the United States. Dividends paid by the Howe Sound Company, therefore, cannot be credited to British Columbia. Dividends in the above table for Britannia have been paid by that company, none being paid subsequent to 1930, until 1939. In making comparison with yearly totals, the amounts shown as paid by the Howe Sound Company have been deducted for the years shown, so the total in the annual report concerned will show the higher figure.

[2] The Granby Consolidated Mining Smelting and Power Company dividends commenced in 1904 and cover all company activities in British Columbia to date, the present operations being conducted at Allenby and Copper Mountain. The dividends as set out in the table in the Minister of Mines Annual Report for 1942 were incorrect; the correct total is as above. The figure now includes all dividends, capital distributions, and interim liquidating payments, the latter being $4,500,000, paid, in 1936, prior to reorganization.

Coal Mines

Company or Mine	Locality	Class	Amount Paid
Wellington Collieries Ltd.	Nanaimo	Coal	$16,000,000
Bulkley Valley Collieries Ltd.	Telkwa	Coal	24,000
Crow's Nest Pass Coal Co. Ltd.	Fernie	Coal	15,476,838
Canadian Collieries (D.) Ltd.	Nanaimo	Coal	563,272
Total, coal mines			$32,064,110

Aggregate of All Classes

Lode-gold mining	$76,021,582
Silver-lead-zinc mining and smelting	394,355,549
Copper-mining	49,632,473
Coal-mining	32,064,110
Miscellaneous, structural, and placer gold	5,643,170
Total	$557,716,884

NOTE.—The term "miscellaneous" noted in each class of dividend covers all payments of $5,000 and under, together with payments made by companies or individuals requesting that the item be not disclosed.

In compiling the foregoing table of dividends paid, the Department wishes to acknowledge the kind assistance given by companies, individuals, and trade journals in giving information on the subject.

TABLE XII.—PRINCIPAL ITEMS OF EXPENDITURE, REPORTED FOR MINING OPERATIONS OF ALL CLASSES

Class	Salaries and Wages	Fuel and Electricity	Process Supplies
Lode-mining	$35,221,674	$4,018,613	$12,563,690
Placer-mining	149,362	15,246	51,827
Coal-mining	5,721,948	556,222	4,187,368
Miscellaneous metals and industrial minerals	3,783,308	842,766	1,302,162
Structural materials industry	3,826,454	1,695,822	1,549,677
Totals, 1954	**$48,702,746**	**$7,128,669**	**$19,654,724**
Totals, 1953	55,543,490	8,668,009	20,979,411
1952	62,256,631	8,557,845	27,024,500
1951	52,561,952	7,283,051	24,724,101
1950	42,738,035	6,775,998	17,500,663
1949	41,023,786	7,206,637	17,884,408
1948	38,813,506	6,139,174	11,532,121
1947	32,160,338	5,319,470	13,068,948
1946	26,190,200	5,427,458	8,367,705
1945	22,620,975	7,239,726	5,756,628
1944	23,131,874	5,788,671	6,138,084
1943	26,051,467	7,432,585	6,572,317
1942	26,913,160	7,066,109	6,863,398
1941	26,050,491	3,776,747	7,260,441
1940	23,391,330	3,474,721	6,962,162
1939	22,357,035	3,266,000[1]	6,714,347
1938	22,765,711	3,396,106	6,544,500
1937	21,349,690	3,066,311	6,845,330
1936	17,887,619	2,724,144	4,434,501
1935	16,753,367	2,619,639	4,552,730
Grand totals, 1935–54	$649,263,408	$112,357,160	$229,381,019

[1] Estimated.

NOTE.—" Process supplies " include explosives, chemicals, drill-steel, lubricants, etc.

TABLE XIII.—AVERAGE NUMBER EMPLOYED IN THE MINING INDUSTRY, 1901–54

Year	Placer-mining	Lode-mining			In Concentrators	In Smelters	Coal-mining			Structural Materials		Miscellaneous	Total[1]
		Under	Above	Total			Under	Above	Total	Quarries and Pits	Plants		
1901	.....	2,736	1,212	3,948	.....	.....	3,041	931	3,974	.....	.....	.....	7,922
1902	.....	2,219	1,126	3,345	.....	.....	3,101	910	4,011	.....	.....	.....	7,356
1903	.....	1,662	1,088	2,750	.....	.....	3,137	1,127	4,264	.....	.....	.....	7,014
1904	.....	2,143	1,163	3,306	.....	.....	3,278	1,175	4,453	.....	.....	.....	7,759
1905	.....	2,470	1,240	3,710	.....	.....	3,127	1,280	4,407	.....	.....	.....	8,117
1906	.....	2,680	1,303	3,983	.....	.....	3,415	1,390	4,805	.....	.....	.....	8,788
1907	.....	2,704	1,239	3,943	.....	.....	2,862	907	3,769	.....	.....	.....	7,712
1908	.....	2,567	1,127	3,694	.....	.....	4,432	1,641	6,073	.....	.....	.....	9,767
1909	.....	2,184	1,070	3,254	.....	.....	4,713	1,705	6,418	.....	.....	.....	9,672
1910	.....	2,472	1,237	3,709	.....	.....	5,903	1,855	7,758	.....	.....	.....	11,467
1911	.....	2,435	1,159	3,594	.....	.....	5,212	1,661	6,873	.....	.....	.....	10,467
1912	.....	2,472	1,364	3,837	.....	.....	5,275	1,855	7,130	.....	.....	.....	10,967
1913	.....	2,773	1,505	4,278	.....	.....	4,950	1,721	6,671	.....	.....	.....	10,949
1914	.....	2,741	1,433	4,174	.....	.....	4,267	1,465	5,732	.....	.....	.....	9,906
1915	.....	2,709	1,435	4,144	.....	.....	3,708	1,283	4,991	.....	.....	.....	9,135
1916	.....	3,357	2,036	5,393	.....	.....	3,694	1,366	5,060	.....	.....	.....	10,453
1917	.....	3,290	2,198	5,488	.....	.....	3,760	1,410	5,170	.....	.....	.....	10,658
1918	.....	2,626	1,764	4,390	.....	.....	3,658	1,769	5,247	.....	.....	.....	9,637
1919	.....	2,513	1,746	4,259	.....	.....	4,145	1,821	5,966	.....	.....	.....	10,225
1920	.....	2,074	1,605	3,679	.....	.....	4,191	2,158	6,349	.....	.....	.....	10,028
1921	.....	1,355	975	2,330	.....	.....	4,722	2,163	6,885	.....	.....	.....	9,215
1922	.....	1,510	1,239	2,749	.....	.....	4,712	1,932	6,644	.....	.....	.....	9,393
1923	.....	2,102	1,516	3,618	.....	.....	4,342	1,807	6,149	.....	.....	.....	9,767
1924	.....	2,353	1,680	4,033	.....	.....	3,894	1,524	5,418	.....	.....	.....	9,451
1925	.....	2,298	2,840	5,138	.....	.....	3,828	1,615	5,443	.....	.....	.....	10,581
1926	299	2,606	1,735	4,341	808	2,461	3,757	1,565	5,322	493	324	124	14,172
1927	415	2,671	1,916	4,587	854	2,842	3,646	1,579	5,225	647	138	122	14,830
1928	355	2,707	2,469	5,176	911	2,748	3,814	1,520	5,334	412	368	120	15,424
1929	341	2,926	2,052	4,978	966	2,948	3,675	1,353	5,028	492	544	268	15,565
1930	425	2,316	1,260	3,576	832	3,197	3,389	1,256	4,645	843	344	170	14,032
1931	688	1,463	834	2,297	581	3,157	2,957	1,125	4,082	460	526	380	12,171
1932	874	1,355	900	2,255	542	2,036	2,628	980	3,608	536	329	344	10,524
1933	1,134	1,786	1,335	3,121	531	2,436	2,241	853	3,094	376	269	408	11,369
1934	1,122	2,796	1,729	4,525	631	2,800	2,050	843	2,893	377	187	360	12,985
1935	1,291	2,740	1,497	4,237	907	2,771	2,145	826	2,971	536	270	754	13,737
1936	1,124	2,959	1,840	4,799	720	2,678	2,015	799	2,814	931	288	825	14,179
1937	1,371	3,603	1,818	5,421	1,168	3,027	2,286	867	3,153	724	327	938	16,129
1938	1,303	3,849	2,266	6,115	919	3,158	2,088	874	2,962	900	295	369	16,021
1939	1,252	3,905	2,050	5,955	996	3,187	2,167	809	2,976	652	311	561	15,890
1940	1,004	3,923	2,104	6,027	1,048	2,944	2,175	699	2,874	827	334	647	15,705
1941	939	3,901	1,823	5,724	1,025	3,072	2,229	494	2,723	766	413	422	15,084
1942	489	2,920	1,504	4,424	960	3,555	1,892	468	2,360	842	378	262	13,270
1943	212	2,394	1,699	4,093	891	2,835	2,240	611	2,851	673	326	567	12,448
1944	255	1,896	1,825	3,721	849	2,981	2,150	689	2,839	690	351	628	12,314
1945	209	1,933	1,750	3,683	822	2,834	1,927	503	2,430	921	335	586	11,820
1946	347	1,918	1,817	3,735	672	2,813	1,773	532	2,305	827	555	679	11,933
1947	360	3,024	2,238	5,262	960	3,461	1,694	731	2,425	977	585	809	14,899
1948	348	3,143	2,429	5,572	1,126	3,884	1,594	872	2,466	1,591	656	754	16,397
1949	303	3,034	2,724	5,758	1,203	3,763	1,761	545	2,306	2,120	542	626	16,621
1950	327	3,399	2,415	5,814	1,259	3,759	1,745	516	2,261	1,916	616	660	16,612
1951	205	3,785	3,695	7,480	1,307	4,044	1,462	463	1,925	1,783	628	491	17,863
1952	230	4,171	3,923	8,094	1,516	4,120	1,280	401	1,681	1,530	557	529	18,257
1953	132	3,145	2,589	5,734	1,371	3,901	1,154	396	1,550	1,909	559	634	15,658
1954	**199**	**2,644**	**2,520**	**5,164**	**1,129**	**3,119**	**1,076**	**358**	**1,434**	**1,861**	**638**	**584**	**14,128**

[1] The average number employed in the industry is the sum of the averages for individual companies. The average for each company is obtained by taking the sum of the numbers employed each month and dividing by 12, regardless of the number of months worked.

TABLE XIV.—LODE-METAL MINES—TONNAGE, NUMBER OF MINES, NET AND GROSS VALUE OF PRINCIPAL METALS,[4] 1901–54

Year	Tonnage[1]	Number of Shipping Mines	Number of Mines Shipping over 100 Tons	Gross Value as Reported by Shipper[2]	Freight and Treatment[2]	Net Value to Shipper[3]	Gross Value of Lode Metals Produced[4]
1901	926,162	119	78	.....	.....	.....	$14,100,282
1902	1,009,016	124	75	.....	.....	.....	11,581,153
1903	1,288,466	125	74	.....	.....	.....	12,103,237
1904	1,461,609	142	76	.....	.....	.....	12,909,035
1905	1,706,679	146	79	.....	.....	.....	15,980,164
1906	1,963,872	154	77	.....	.....	.....	18,484,102
1907	1,805,614	147	72	.....	.....	.....	17,316,847
1908	2,083,606	108	59	.....	.....	.....	15,847,411
1909	2,057,713	89	52	.....	.....	.....	15,451,141
1910	2,216,428	83	50	.....	.....	.....	14,726,731
1911	1,770,755	80	45	.....	.....	.....	11,454,063
1912	2,688,532	86	51	.....	.....	.....	17,662,766
1913	2,663,809	110	58	.....	.....	.....	17,190,838
1914	2,175,971	98	56	.....	.....	.....	15,225,061
1915	2,720,669	132	59	.....	.....	.....	19,992,149
1916	3,229,942	169	81	.....	.....	.....	31,483,014
1917	2,797,368	193	87	.....	.....	.....	26,788,474
1918	2,912,516	175	80	.....	.....	.....	27,590,278
1919	2,146,920	144	74	.....	.....	.....	19,750,498
1920	2,215,445	121	60	.....	.....	.....	19,444,365
1921	1,586,428	80	35	.....	.....	.....	12,920,398
1922	1,592,163	98	38	.....	.....	.....	19,227,857
1923	2,447,672	77	28	.....	.....	.....	25,347,092
1924	3,413,912	86	37	.....	.....	.....	35,538,247
1925	3,849,269	102	40	.....	.....	.....	46,200,135
1926	4,775,327	138	55	.....	.....	$38,558,613	51,508,031
1927	5,416,411	132	52	.....	.....	27,750,364	44,977,082
1928	6,241,672	110	49	.....	.....	29,070,075	48,281,825
1929	6,977,903	106	48	.....	.....	34,713,887	51,174,859
1930	6,804,276	68	32	.....	.....	21,977,688	40,915,395
1931	5,549,622	44	22	.....	.....	10,513,931	22,535,573
1932	4,354,904	75	29	.....	.....	7,075,393	19,700,235
1933	4,063,775	109	47	.....	.....	13,976,358	25,007,137
1934	5,141,744	145	69	.....	.....	20,243,278	33,895,930
1935	4,927,204	177	72	.....	.....	25,407,914	40,597,569
1936	4,381,173	168	70	.....	.....	30,051,207	43,666,452
1937	6,145,244	185	113	$48,617,920	$4,663,843	43,954,077	62,912,783
1938	7,377,117	211	92	40,222,237	4,943,754	35,278,483	53,877,333
1939	7,212,171	217	99	45,133,788	4,416,919	40,716,869	53,522,098
1940	7,949,736	216	92	50,004,909	6,334,611	43,670,298	62,848,642
1941	8,007,937	200	96	52,354,870	5,673,048	46,681,822	62,216,019
1942	6,894,844	126	76	50,494,041	5,294,637	45,199,404	55,359,479
1943	5,786,864	48	32	37,234,070	3,940,367	33,293,703	46,089,042
1944	4,879,851	51	31	29,327,114	2,877,706	26,449,408	39,315,910
1945	4,377,722	36	27	34,154,917	2,771,292	31,383,625	49,997,071
1946	3,705,594	50	32	48,920,971	2,904,130	46,016,841	56,519,691
1947	5,011,271	75	33	81,033,093	4,722,010	76,311,087	93,176,165
1948	5,762,321	97	51	118,713,859	18,585,183	100,128,727	125,979,961
1949	6,125,460	118	54	99,426,678	19,613,185	79,814,604	105,259,001
1950	6,802,482	112	58	108,864,792	22,113,431	86,751,361	121,635,457
1951	6,972,400	119	64	142,590,427	25,096,743	117,493,684	146,140,477
1952	9,174,617	95	58	140,070,389	30,444,575	106,601,451	134,111,567
1953	9,660,281	80	48	94,555,069	27,815,152	66,739,892	110,341,548
1954	**8,513,885**	**63**	**40**	**106,223,833**	**29,135,673**	**77,088,160**	**111,844,340**

[1] Includes mercury ores, tungsten ores, iron ores, and silica (flux).

[2] Data not collected before 1937.

[3] Previous to 1937 the shipper reported "Net Value at Shipping Point," no indication being given as to how the net value was computed. From 1937 on, the shipper has reported "Gross Value," from which deduction of freight and treatment gives "Net Value."

[4] Gross value as represented by valuing gold, silver, copper, lead, and zinc at yearly average prices.

TABLE XV.—LODE-METAL PRODUCERS IN 1954

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
NORTHERN BRITISH COLUMBIA										
Atlin Mining Division			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Big Bull and Tulsequah Chief	Tulsequah	Tulsequah Mines Ltd., Trail	193,225	Zinc concentrates, 16,876 tons; lead concentrates, 3,958 tons; *copper concentrates and gold* concentrates, 14,621 tons; bullion	20,665	619,192	5,219,956	4,893,766	22,821,414	83,436
Liard Mining Division										
Nil										
CENTRAL BRITISH COLUMBIA										
Cariboo Mining Division										
Cariboo Gold Quartz	Wells	Cariboo Gold Quartz Mining Co. Ltd., Vancouver	86,751	Bullion	35,223	3,012				
Island Mountain	Wells	Island Mountain Mines Co. Ltd., Vancouver	30,584	Bullion	12,918	1,629				
Clinton Mining Division										
Taylor Windfall	Hanceville	Mine Leasor's Syndicate, Hanceville		Gold concentrates, 0.36 ton	2					
Omineca Mining Division										
Red Rose	Skeena Crossing	Western Tungsten Copper Mines *Ltd., Vancouver*	29,642	Copper-gold concentrates, 89 *tons;* ***tungsten concentrates,*** **25,252 units WO_3**	272	361	38,423			
Sil-Van	Smithers	Sil-Van Consolidated Mining and Milling Co. Ltd., Vancouver	14,694	Lead concentrates, 1,112 tons; zinc concentrates, 1,373 tons	552	30,553	15,445	1,589,623	1,498,867	10,352
Silver Standard	Hazelton	Silver Standard Mines Ltd., Vancouver	21,378	Lead concentrates, 2,457 tons; zinc concentrates, 2,751 tons	2,095	956,972	137,496	2,117,503	3,665,965	45,950
Quesnel Mining Division										
Nil										
COAST AND ISLANDS										
Alberni Mining Division										
Nil										

TABLE XV.—LODE-METAL PRODUCERS IN 1954—*Continued*

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
COAST AND ISLANDS—*Continued*										
Nanaimo Mining Division			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Iron Hill	Quinsam Lake	The Argonaut Mining Co. Ltd., Campbell River	460,941	Iron-ore concentrates, 164,388 tons	.....	.....	.....	.....	.....	.....
Prescott, Paxton, Lake	Texada Island	Texada Mines Ltd., Vananda	580,301	Iron-ore concentrates, 371,358 tons	.....	.....	.....	.....	.....	.....
New Westminster Mining Division										
Nil	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Skeena Mining Division										
East	Tide Lake	A. A. Phillips, Stewart	2	Crude ore	60	118	6	1,243	.....	.....
Toric	Kitsault River	Torbrit Silver Mines Ltd., Toronto, Ont.	150,235	Silver-lead concentrates, 2,407 tons; silver bullion	13	2,063,590	.....	972,263	12,793	.....
Vancouver Mining Division										
Britannia	Britannia Beach	Britannia Mining and Smelting Co. Ltd., Britannia Beach	916,419	Copper concentrates and precipitates, 30,022 tons; zinc concentrates, 17,455 tons; iron pyrite concentrates, 64,890 tons	11,569	98,990	18,051,733	1,098,880	20,448,413	.....
Victoria Mining Division										
Blue Grouse	Cowichan Lake	Cowichan Copper Co. Ltd., Lake Cowichan	8,082	Crude ore	.....	5,568	1,040,385	.....	.....	.....
SOUTH CENTRAL BRITISH COLUMBIA										
Greenwood Mining Division										
Copper Queen	Greenwood	W. E. McArthur, Greenwood	102	Crude ore	15	149	12,318	.....	.....	.....
Gold Bug	Greenwood	E. Ruzicka, Greenwood	5	Crude ore	3	478	.....	546	407	.....
Highland-Bell	Beaverdell	Highland-Bell Ltd., Vancouver	12,784	Lead concentrates, 366 tons; zinc concentrates, 330 tons; jig concentrates, 133 tons	176	571,295	.....	292,352	403,073	3,547
Wellington	Beaverdell	J. J. McDonell, Beaverdell	24	Crude ore	1	3,150	.....	3,000	5,175	.....
W.S.	Coryell	Cascade Lode Mines Ltd., Vancouver	14	Crude ore	.....	264	.....	9,429	4,505	.....
Kamloops Mining Division										
North Star group	Birk Creek	Geo. C. Hay, 418 Victoria St., Kamloops	34	Ore from dump	.....	9	3,485	.....	.....	.....

Lillooet Mining Division										
Bralorne	Bridge River	Bralorne Mines Ltd., Vancouver	181,494	Bullion; gold concentrates, 2,938 tons	65,221	14,563				
Pioneer	Bridge River	Pioneer Gold Mines of B.C. Ltd., Vancouver	85,501	Bullion	46,486	9,661				
Nicola Mining Division										
Nil										
Osoyoos Mining Division										
Nickel Plate	Hedley	Kelowna Mines Hedley Ltd., Hedley	125,228	Gold precipitates, 4.4 tons	50,907	4,751				
Oregon (French)	Hedley	Kelowna Mines Hedley Ltd., Hedley	5,767	Gold precipitates included in Nickel Plate						
Similkameen Mining Division										
Copper Mountain	Copper Mountain	Granby Cons. M.S. & P. Co. Ltd., Copper Mountain	1,870,383	Copper concentrates, 56,765 tons	7,960	174,959	24,410,920			
Vernon Mining Division										
Waterloo	Lightning Peak	Paycheck Mining and Development Co. Ltd., Nelson	1,114	Lead concentrates, 13 tons		4,159		13,622	3,924	
SOUTHEASTERN BRITISH COLUMBIA										
Fort Steele Mining Division										
Estella	Wasa	Estella Mines Ltd., Vancouver		Zinc concentrates, 180 tons (produced in 1953)					199,481	
Sullivan	Kimberley	Cons. Mining & Smelting Co. of Canada, Ltd., Trail	2,681,635	Lead concentrates, 173,008 tons; zinc concentrates, 281,425 tons; tin concentrates, 178 tons	307	3,794,927	297,029	268,434,229	276,928,147	
Golden Mining Division										
Mineral King	Invermere	Sheep Creek Gold Mines Ltd., Vancouver	84,197	Lead concentrates, 2,411 tons; zinc concentrates, 4,938 tons		86,814	80,564	3,007,707	5,673,209	28,878
Silver Giant	Spillimacheen	Giant Mascot Mines Ltd., Vancouver	187,653	Lead concentrates, 9,606 tons; zinc concentrates, 930 tons		139,833		13,206,287	1,535,043	3,018
Nelson Mining Division										
Arlington	Erie	New Arlington Mines Ltd., Nelson	9,165[1]	Gold concentrates, 141 tons	429	1,361		19,324	29,695	
Emerald-Feeney-Dodger	Salmo	Canadian Exploration Ltd., Vancouver	141,020	Tungsten concentrates, 84,751 units WO_3						
Eureka	Nelson	Eureka Copper Syndicate, Nelson	80	Lead concentrates, 3 tons	4	191		1,572		
Granite	Taghum	Buckland-Kenville Concentrating Co., Nelson	1,900[1]	Gold concentrates, 69 tons; bullion	516	243		2,341	1,949	
Jersey Zinc	Salmo	Canadian Exploration Ltd., Vancouver	369,484	Lead concentrates, 11,368 tons; zinc concentrates, 16,041 tons		39,523		17,222,231	21,753,326	84,830

[1] Estimate.

TABLE XV.—LODE-METAL PRODUCERS IN 1954—*Continued*

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
SOUTHEASTERN BRITISH COLUMBIA—*Continued*										
Nelson Mining Division—Continued										
			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
John (Magnuson group)	Fruitvale	Magnuson Mines Ltd., Trail	8	Crude ore		13		176	320	
Nugget	Sheep Creek	A. Endersby, Sr., and A. Endersby, Jr., Fruitvale	124	Crude ore	133	82				
Goodenough (Protection)	Ymir	J. Turk, Ymir	157	Crude ore	91	1,573		14,793	17,511	
Spokane	Bayonne	S. MacDonald and K. K. Laib, Bayonne	30	Crude ore	14	300		10,008	420	
Revelstoke Mining Division										
Regal Silver	Albert Canyon	Columbia Lead & Zinc Mines Ltd., Albert Canyon	2,800	Tungsten concentrates, 314 units WO_3						
Spider	Camborne	Sunshine Lardeau Mines Ltd., Vancouver	17,904	Crude lead ore, 685 tons; lead concentrates, 2,611 tons; zinc concentrates, 2,654 tons	2,117	299,252		3,911,339	3,280,068	17,575
Slocan Mining Division										
Baltimore group	Woodbury Creek	Victoria Mines Ltd., Kaslo	11	Crude ore		172		444	289	
Bluebell	Riondel	Cons. Mining & Smelting Co. of Canada, Ltd., Trail	163,134	Lead concentrates, 12,565 tons; zinc concentrates, 20,642 tons		246,226	276,387	18,247,076	21,077,328	96,601
Buckeye	Ainsworth	A. Burgess and M. Burgess, Ymir	92	Crude ore		249		15,307	918	
Caledonia	Retallack	G. E. McCready, Kaslo	103	Crude ore, 8 tons; lead concentrates, 17 tons; zinc concentrates, 80 tons	5	1,874		33,207	75,378	270
Dixie Fraction	Woodbury Creek	J. G. Isaacs and Dr. L. D. Besecker, Kaslo	148	Crude ore, 8 tons; lead concentrates, 11 tons		359		20,711	2,061	
Hewitt	Silverton	E. Merrill and H. Lyon, lessees, Silverton	16	Crude ore		1,405		7,836	5,935	
Highland, etc.	Ainsworth	S. McLellan and F. Dumas, Ainsworth	232	Crude ore, 21 tons; lead concentrates, 39 tons		868		56,617	4,753	
Highlander	Ainsworth	Yale Lead & Zinc Mines Ltd., Ainsworth	53,760	Lead concentrates, 4,317 tons; zinc concentrates, 1,205 tons		112,424		6,326,400	1,498,650	
Jackson	Retallack	Jackson Basin Mining Co. Ltd., Vancouver	1,330	Lead concentrates, 51 tons; zinc concentrates, 258 tons	6	4,215		78,700	283,362	2,000
Lulu	Kaslo	Dr. L. D. Besecker, Kaslo	6	Crude ore		113		7,163	440	

Noble Five, Slocan Sovereign	Sandon	Cody-Reco Mines Ltd., Toronto, Ont.		Zinc concentrates, 41 tons (ore milled in 1952 on test basis, when lead concentrates, 66 tons, were shipped)		530		1,694	40,747	273
Noonday-Curley	Silverton	H. B. Lyon, E. Merrill, and M. Arishenkoff, lessees, Silverton	20	Crude ore		891		3,850	1,933	
Noonday (Leadsmith)	Sandon	P. J. McCrory, New Denver	4	Crude ore		140		3,363	609	
Scranton	Woodbury Creek	F. Hubic and M. Ansaldo, lessees, Ainsworth	17	Crude ore	4	240		5,375	5,173	
Silversmith, Richmond-Eureka, Ruth-Hope	Sandon	Carnegie Mines of B.C. Ltd., Montreal, Que.	700	Lead concentrates, 25 tons; zinc concentrates, 54 tons	1	3,601		30,881	60,419	136
Spokane	Ainsworth	Thos. Hawes, Ainsworth	21	Crude ore		292		22,388	2,005	
Standard, Enterprise, Mammoth, and Monarch	Silverton	Lessees from Western Exploration Co. Ltd., Silverton	190	Lead ore, 18 tons; lead concentrates, 8 tons; zinc concentrates, 58 tons		3,133		29,730	70,126	397
Surprise	Glacier Creek	J. Gallo and L. Desereau, Howser	42	Crude ore	1	3,092		1,500	750	
Trinket	Ainsworth	Thos. Hawes, Ainsworth	7	Crude ore		83		7,506	383	
Utica	Kaslo Creek	J. A. Cooper, Kaslo	106	Crude ore	1	15,667		35,919	44,505	
Van Roi	Silverton	M. Slobodzian and L. Fried, lessees, Silverton	1,000[1]	Crude ore, 25 tons; lead concentrates, 82 tons	1	6,693		138,493	5,325	
Victor	Silverton	Violamac Mines (B.C.) Ltd., New Denver	22,633	Crude ore, 397 tons; lead concentrates, 4,674 tons; zinc concentrates, 4,226 tons	238	541,532		6,990,919	4,673,164	29,935
Trail Creek Mining Division										
Velvet	Rossland	Velvet Leasors Ltd., Rossland	1,158	Copper concentrates, 106 tons	164	117	20,178			

[1] Estimate.

TABLE XVI.—LODE-METAL MINES EMPLOYING AN AVERAGE OF TEN OR MORE MEN DURING 1954[1]

Name of Mine or Operator	Days Operating		Tons		Average Number Employed	
	Mine	Mill	Mined	Milled	Mine	Mill
Shipping Mines						
Big Bull and Tulsequah Chief (Tulsequah Mines Ltd.)	365	365	193,225	193,225	189	20
Cariboo Gold Quartz Mining Co. Ltd.	365	365	86,751	86,751	217	18
Island Mountain Mines Co. Ltd.	227	227	30,584	30,584	64	8
Silver Standard Mines Ltd.	281	334	28,699	21,378	65	14
Sil-Van Consolidated Mining & Milling Co. Ltd.	95	98	15,064	14,694	26	2
Torbrit Silver Mines Ltd.	365	365	150,235	150,235	88	24
Britannia Mining & Smelting Co. Ltd.	256	256	916,419	916,419	649	195
Highland-Bell Ltd.	258	243	12,784	12,784	40	5
Bralorne Mines Ltd.	365	365	181,494	181,494	408	25
Pioneer Gold Mines of B.C. Ltd.	365	365	85,501	85,501	256	17
Nickel Plate (Kelowna Mines Hedley Ltd.)	279	364	130,995[2]	130,995[2]	109	59
Copper Mountain (Granby Cons. M.S. & P. Co. Ltd.)	365	365	1,870,383	1,870,383	395	167
Bluebell (Cons. M. & S. Co. of Canada, Ltd.)	192	254	163,134	163,134	277	17
Noble Five (Cody-Reco Mines Ltd.)	300	.....	([3])	([3])	16	.....
Silversmith (Carnegie Mines Ltd.)	300	.....	.....	700[4]	10	.....
Standard, Enterprise, and Mammoth (Western Exploration Co. Ltd.)	180	225	190[5]	([5])	15	13
Highlander (Yale Lead & Zinc Mines Ltd.)	280	280	53,760	53,760	63	15
Jackson (Jackson Basin Mining Co. Ltd.)	184	.....	1,330	.....	13	.....
Victor (Violamac Mines (B.C.) Ltd.)	365	.....	22,633	.....	64	.....
Jersey (Canadian Exploration Ltd.)	365	365	369,484	369,484	132	16
Sullivan (Cons. M. & S. Co. of Canada, Ltd.)	251	253	2,681,635	2,681,635	1,163	394
Giant Mascot Mines Ltd.	365	365	187,653	187,653	80	19
Mineral King (Sheep Creek Gold Mines Ltd.)	309	235	84,197	84,197	56	8
Spider (Sunshine Lardeau Mines Ltd.)	305	242	18,375	17,904	39	9
Cowichan Copper Co. Ltd.	287	.....	8,082	.....	21	.....
The Argonaut Mining Co. Ltd.	317	317	460,941	460,941	98	10
Texada Mines Ltd.	365	365	.....	580,301	82	12
Red Rose (Western Tungsten Copper Mines Ltd.)	221	268	.....	29,642	79	26
Emerald-Dodger-Feeney (Canadian Exploration Ltd.)	365	365	.....	141,020	159	30
Non-shipping Mines						
Northwestern Exploration (exploration only)	.....	.....	.....	.....	22	.....
Rexspar Uranium & Metals Mining Co. Ltd.	.....	.....	.....	.....	17	.....
Canam Copper Co. Ltd.	.....	.....	.....	.....	28[6]	.....
Deer Horn Mines Ltd.	.....	.....	.....	.....	12	.....
Granduc Mines Ltd.	.....	.....	.....	.....	18	.....

[1] The average number employed includes wage-earners and salaried employees. The average is obtained by adding the monthly figures and dividing by 12, irrespective of the number of months worked.

[2] Includes ore mined and milled from French mine.

[3] Included with tonnage milled in 1952.

[4] Estimated.

[5] Ore mined by lessees and mill operated on custom basis only.

[6] Exploration and development conducted by company and also the American Metal Co. Ltd. on "option" basis.

Departmental Work

OFFICES

The Department of Mines offices in Victoria are on the fourth floor of the Douglas Building. The analytical laboratories are housed in the one-story building that originally housed the Legislative Assembly and now faces Superior Street.

ADMINISTRATION BRANCH

The Administration Branch is responsible for the administration of the Provincial laws regarding the acquisition of rights to mineral and to coal, petroleum and natural gas, and deals with other departments of the Provincial service for the Department or for any branch. Under the terms of the "Petroleum and Natural Gas Act," 1954, which became effective on April 1st, P. J. Mulcahy was appointed Chief Commissioner, and K. B. Blakey was appointed Deputy Chief Commissioner.

Gold Commissioners, Mining Recorders, and Sub-Mining Recorders, whose duties are laid down in the "Mineral Act" and the "Placer-mining Act," administer these Acts and other Acts relating to mining. Mining Recorders, in addition to their own functions, may also exercise the powers conferred upon Gold Commissioners with regard to mineral claims within the mining division for which they have been appointed. Similar duties may be performed by Mining Recorders with regard to placer claims but not in respect of placer-mining leases. Recording of location and of work upon a mineral claim as required by the "Mineral Act" and upon a placer claim or a placer-mining lease as required by the "Placer-mining Act" must be made at the office of the Mining Recorder for the mining division in which the claim or lease is located. Information concerning claims and leases and concerning the ownership and standing of claims and leases in any mining division may be obtained from the Mining Recorder for the mining division in which the property is situated or from the Central Records Offices at Victoria and Vancouver. Sub-Mining Recorders, who act as forwarding agents, are appointed at various places throughout the Province. They are authorized to accept documents and fees, and forward them to the office of the Mining Recorder for the correct mining division. *Officials and their offices in various parts of the Province are listed in the table* on pages 54 and 55.

Central Records Offices (Victoria and Vancouver)

The transcripts of all recordings made in Mining Recorders' offices throughout the Province are sent to the office of the Chief Gold Commissioner in Victoria twice each month, and include the names of lessees of reverted Crown-granted mineral claims. These records and maps showing the approximate positions of mineral claims held by record and of placer-mining leases may be consulted by the public during office hours at Victoria and at the office of the Gold Commissioner at Vancouver, 300 West Pender Street. The maps conform in geographical detail, size, and number to the reference and mineral reference maps issued by the Department of Lands, and the approximate positions of mineral claims held by record and of placer-mining leases are plotted from details supplied by the locators. Provision has been made to supply the general public, on request to the office of the Chief Gold Commissioner, with copies of the maps.

Mining Divisions Amalgamated since 1949

Date	Mining Divisions Amalgamated	New Name	Mining Recorder's Office
Oct. 1, 1949	Revelstoke and Lardeau	Revelstoke	Revelstoke.
Dec. 1, 1949	Kamloops and Ashcroft	Kamloops	Kamloops.
Apr. 1, 1951	*Skeena and Portland Canal*	*Skeena*	*Prince Rupert.*
Mar. 1, 1952	Stikine and Peace River	Liard	Victoria.
Aug. 2, 1954	Slocan and Ainsworth	Slocan	Kaslo.
May 1, 1955	Cariboo and Quesnel	Cariboo	Quesnel.

List of Gold Commissioners, Mining Recorders, and Sub-Mining Recorders in the Province

Mining Division	Location of Office	Gold Commissioner	Mining Recorder	Sub-Mining Recorder
Alberni	Alberni	T. G. O'Neill	T. G. O'Neill.	
Sub-office	Nanaimo			W. H. Cochrane.
Sub-office	Quatsino			Axel Hansen.
Sub-office	Tofino			R. R. Barr.
Sub-office	Zeballos			W. Gilchrist.
Atlin	Atlin	W. E. McLean	W. E. McLean.	
Sub-office	Lower Post			J. Dowsett.
Sub-office	Pouce Coupe			H. O. Callahan.
Sub-office	*Telegraph Creek*			*Mrs. S. E. Brand.*
Sub-office	Tulsequah			H. L. Abbott.
Cariboo	Quesnel	F. E. P. Hughes	F. E. P. Hughes.	
Sub-office	Barkerville			Mrs. J. E. Kelly.
Sub-office	Fort McLeod			J. E. McIntyre.
Sub-office	Likely			C. W. Speed.
Sub-office	McBride			B. H. Haynes.
Sub-office	Prince George			S. M. Carling.
Sub-office	Williams Lake			Miss J. Foster.
Clinton	Clinton	W. H. Cope	W. H. Cope.	
Sub-office	Haylmore			W. Haylmore.
Sub-office	Williams Lake			Miss J. Foster.
Fort Steele	Cranbrook	E. L. Hedley	E. L. Hedley.	
Sub-office	Fernie			B. J. H. Ryley.
Golden	Golden	W. T. McGruder	W. T. McGruder.	
Sub-office	Invermere			T. N. Weir.
Greenwood	Grand Forks	R. MacGregor	R. MacGregor.	
Sub-office	Beaverdell			G. E. Simpson.
Sub-office	Greenwood			G. A. Hartley.
Sub-office	Oliver			L. M. McKinnon.
Kamloops	Kamloops	D. Dalgleish	D. Dalgleish.	
Sub-office	Ashcroft			W. A. Munro.
Sub-office	Chu Chua			G. M. Fennell.
Sub-office	Likely			C. W. Speed.
Sub-office	*Salmon Arm*			*R. W. Sangster.*
Liard	Victoria	R. H. McCrimmon.		
Sub-office	Burns Lake			W. H. M. Collison.
Sub-office	Fort St. James			N. Henry.
Sub-office	Fort St. John			W. G. Cosens.
Sub-office	Lower Post			J. Dowsett.
Sub-office	Pouce Coupe			H. O. Callahan.
Sub-office	Prince George			S. M. Carling.
Sub-office	Telegraph Creek			Mrs. S. E. Brand.
Lillooet	Lillooet	E. B. Offin	E. B. Offin.	
Sub-office	Haylmore			W. Haylmore.
Nanaimo	Nanaimo	W. H. Cochrane	W. H. Cochrane.	
Sub-office	Alberni			T. G. O'Neill.
Sub-office	Alert Bay			D. J. Phillips.
Sub-office	Courtenay			G. W. McFarland.
Sub-office	Quatsino			Axel Hansen.
Nelson	Nelson	K. D. McRae	K. D. McRae.	
Sub-office	Creston			R. S. Allen.
Sub-office	Salmo			M. C. Donaldson.
New Westminster	New Westminster	J. F. McDonald	G. C. Kimberley.	
Sub-office	Chilliwack			E. L. Anderson.
Sub-office	Hope			J. H. Richmond.
Nicola	Merritt	D. Dalgleish (Kamloops)	S. Tatchell.	

List of Gold Commissioners, Mining Recorders, and Sub-Mining Recorders in the Province—*Continued*

Mining Division	Location of Office	Gold Commissioner	Mining Recorder	Sub-Mining Recorder
Omineca	Smithers	G. H. Beley	G. H. Beley.	
Sub-office	Burns Lake			W. H. M. Collison.
Sub-office	Dorren			W. E. Horwill.
Sub-office	Fort St. James			Norman Henry.
Sub-office	Fort St. John			W. G. Cosens.
Sub-office	Hazelton			C. H. Drake.
Sub-office	Manson Creek			T. C. Hamilton.
Sub-office	Prince George			S. M. Carling.
Sub-office	Takla Landing			Mrs. G. M. Henry.
Sub-office	Telkwa			T. J. Thorp.
Sub-office	Terrace			D. J. Kidd.
Sub-office	Vanderhoof			F. B. Wheeler.
Osoyoos	Penticton	T. S. Dalby	T. S. Dalby.	
Sub-office	Keremeos			L. S. Coleman.
Sub-office	Oliver			L. M. McKinnon.
Revelstoke	Revelstoke	W. G. Fleming	W. G. Fleming.	
Sub-office	Beaton			J. T. Slater.
Similkameen	Princeton	B. Kennelly	B. Kennelly.	
Skeena	Prince Rupert	T. H. W. Harding	T. H. W. Harding.	
Sub-office	*Alice Arm*			*A. D. York.*
Sub-office	Burns Lake			W. H. M. Collison.
Sub-office	Leduc Glacier			J. J. Crowhurst.
Sub-office	Queen Charlotte			H. R. Beaven.
Sub-office	Stewart			W. S. Orr.
Sub-office	Terrace			D. J. Kidd.
Slocan	Kaslo	C. Macdonald	B. F. Palmer.	
Sub-office	New Denver			T. P. McKinnon.
Sub-office	Poplar			A. Robb.
Sub-office	Slocan			W. E. Graham.
Trail Creek	Rossland	W. L. Draper	W. L. Draper.	
Vancouver	Vancouver	J. Egdell	Mrs. F. Sherman (Deputy).	
Sub-office	Alert Bay			D. J. Phillips.
Sub-office	Powell River			J. V. Gaspard.
Vernon	Vernon	G. F. Forbes	G. F. Forbes.	
Sub-office	Kelowna			E. R. Oatman.
Victoria	Victoria	R. H. McCrimmon	R. H. McCrimmon.	

GOLD COMMISSIONERS' AND MINING RECORDERS' OFFICE STATISTICS, 1954

Mining Division	Free Miners' Certificates				Lode-mining					Placer-mining				Revenue		
	Individual	Company	Special	Provisional (Placer)	Mineral Claims Recorded	Certificates of Work	Certificates of Improvements	Bills of Sale, etc.	Leases of Reverted Crown-granted Mineral Claims	Placer Claims Recorded	Placer Leases Granted	Certificates of Work, Placer Leases	Bills of Sale, etc.	Free Miners' Certificates	Mining Receipts	Totals
Alberni	71	2	2	.....	107	202	.....	26	16	1	1	.....	.....	$495.00	$2,140.00	$2,635.00
Atlin	227	1	2	.....	357	174	.....	49	19	8	25	39	31	1,184.50	8,887.00	10,071.50
Cariboo	349	11	5	.....	115	145	.....	11	.....	4	55	297	34	2,825.50	12,540.50	15,366.00
Clinton	24	.....	.....	.....	63	173	6	8	.....	.....	10	12	13	102.50	2,980.75	3,083.25
Fort Steele	255	3	3	.....	394	259	1	47	9	.....	19	27	16	1,268.00	4,930.75	6,198.75
Golden	81	5	2	1	165	228	.....	22	7	.....	9	25	19	964.00	5,284.25	6,248.25
Greenwood	88	.....	2	2	125	117	.....	14	55	2	6	3	1	392.00	2,369.50	2,761.50
Kamloops	377	2	3	.....	597	1,192	3	137	39	3	8	5	.....	1,865.75	8,820.00	10,685.75
Liard	361	1	9	.....	241	353	6	46	.....	4	20	25	33	2,261.75	5,231.00	7,492.75
Lillooet	162	2	3	.....	192	346	2	25	10	.....	3	36	5	1,065.00	3,025.75	4,090.75
Nanaimo	122	2	.....	.....	171	194	.....	26	15	.....	.....	.....	.....	720.75	2,392.25	3,113.00
Nelson	315	12	8	8	194	467	2	43	21	3	3	4	1	2,411.50	6,257.75	8,669.25
New Westminster	238	3	3	15	295	131	6	39	1	.....	12	9	13	1,352.25	12,035.25	13,387.50
Nicola	28	.....	1	1	157	123	.....	8	.....	.....	.....	.....	.....	121.25	778.00	899.25
Omineca	257	4	5	.....	408	633	11	65	5	3	20	35	8	1,542.00	13,784.85	15,326.85
Osoyoos	134	1	2	1	51	98	.....	12	.....	1	.....	1	.....	712.00	1,901.25	2,613.25
Quesnel	316	6	13	10	87	127	.....	4	.....	2	9	89	3	2,015.00	4,193.50	6,208.50
Revelstoke	103	2	.....	.....	60	91	.....	27	4	.....	8	9	16	625.00	6,919.55	7,544.55
Similkameen	130	4	5	1	106	133	4	18	8	1	4	11	8	886.00	1,616.00	2,502.00
Skeena	304	1	2	.....	622	1,242	.....	798	203	.....	10	.....	4	1,535.50	17,213.50	18,749.00
Slocan	212	5	3	.....	381	451	.....	40	35	1	.....	3	.....	1,404.25	5,894.75	7,299.00
Trail Creek	78	2	.....	.....	24	27	.....	4	1	.....	.....	.....	.....	555.00	366.50	921.50
Vancouver	1,213	117	22	6	166	164	.....	25	3	.....	.....	.....	.....	16,912.50	2,691.37	19,603.87
Vernon	154	1	2	14	59	39	.....	1	.....	.....	19	5	15	751.50	1,232.50	1,984.00
Victoria	245	18	3	.....	159	56	.....	18	3	.....	4	2	.....	2,554.50	7,304.72	9,859.22
Totals for Province, 1954	5,844	205	100	59	5,296	7,165	41	1,513	454	33	245	637	220	$46,523.00	$140,791.24	$187,314.24
Totals for Province, 1953	5,889	243	119	60	5,608	7,248	132	1,772	546	36	213	755	261	49,177.50	150,860.28	200,037.78

Coal, Petroleum and Natural Gas

The Administration Branch has been responsible for the administration of the "Petroleum and Natural Gas Act" and for the "Coal Act" since April 1st, 1953. Information concerning applications for permits, licences, and leases issued under the "Petroleum and Natural Gas Act" and concerning the ownership and standing of them may be obtained upon application to the office of the Chief Commissioner, Department of Mines, Victoria, B.C. Similar information may be obtained respecting licences and leases issued under the "Coal Act." A series of maps showing the locations of permits and licences under the "Petroleum and Natural Gas Act" is provided, and copies may be obtained upon application to the office of the Surveyor-General, Department of Lands, Victoria, B.C., accompanied by payment of $3 per sheet. Monthly reports listing additions and revisions to permit-location maps and giving information listing changes in title to permits, licences, and leases and related matters are available from the office of the Chief Commissioner upon application and payment of a fee of $1 per annum.

Petroleum and Natural-gas Statistics, 1954

Permits—		
Issued		8
Renewed		238
Assigned		124
Licences—		
Issued		387
Renewed		63
Assigned		7
Leases—		
Issued		4
Renewed		*Nil*
Assigned		*Nil*
Permits—		
Fees	$65,000.00	
Rent	2,091,393.28	
Cash in lieu of work	228,955.97	
		$2,385,349.25
Licences—		
Fees	$11,700.00	
Rent	28,549.75	
		40,249.75
Leases—		
Fees	$50.00	
Rent	1,096.99	
		1,146.99
Tender bonuses		787.77
Assignment fees		385.00
Operators' licences		2,530.00
Miscellaneous		689.00
Royalty—gas		761.21
		$2,431,898.97

Coal Statistics, 1954

Licences—		
Fees	$1,200.00	
Rent	7,230.35	
		$8,430.35
Leases—		
Fees	$1,300.00	
Rent	2,966.25	
Cash in lieu of work	600.00	
		4,866.25
Miscellaneous		12.50
		$13,309.10

Mining Laws and Laws Related to Mining

Synopses of mining laws and of laws related to mining are available on application. The titles of the various Acts and the price charged for each are listed below. Upon payment of the price a copy of any Act may be obtained from the office of the Chief Gold Commissioner, or from the Queen's Printer, Victoria.

	Price
Department of Mines Act	$0.15
Mineral Act	.25
Placer-mining Act	.25
Metalliferous Mines Regulation Act	.50
Coal-mines Regulation Act	.70
Mines Right-of-way Act	.15
Iron and Steel Bounties Act	.15
Indian Reserves Mineral Resources Act	.15
Prospectors' Grub-stake Act	.15
Taxation Act	.75
Forest Act	.80
Greater Vancouver Water District Act	.80
Security Frauds Prevention Act	.30
Coal Sales Act	.15
Coal Act	.15
Petroleum and Natural Gas Act	.25
Regulations under Petroleum and Natural Gas Act	.40

ANALYTICAL AND ASSAY BRANCH

By G. C. B. Cave, Chief Analyst

Rock Samples

During 1954 the chemical laboratory in Victoria issued reports on 1,908 samples from prospectors* and Departmental engineers. A laboratory examination of a prospector's sample generally consists of the following: (1) A spectrographic analysis to determine if any base metals are present in interesting percentages; (2) assays for precious metals, and for base metals shown by the spectrographic analysis to be present in interesting percentages. The degree of radioactivity is measured on all samples

* A reasonable number of specimens are examined, and a reasonable number of samples are assayed, without charge, for a prospector who makes application for free assays and who satisfies the Chief Analyst that prospecting is his principal occupation during the summer months. A form for use in applying for free assays may be obtained from the office of any Mining Recorder.

submitted by prospectors and Departmental engineers; these radiometric assays are not listed below in the table.

The laboratory reports were distributed in the following manner among prospectors who were not grantees, prospectors who were grantees under the "Prospectors' Grubstake Act," and Departmental engineers:—

	Samples	Spectrographic Analyses	Assays
Prospectors (not grantees)	1,221	1,205	2,591
Prospectors (grantees)	336	333	732
Engineers	351	156	850
Totals	1,908	1,694	4,173

Mineralogical specimens submitted for identification and rocks for classification are examined by the Mineralogical Branch of the Department.

Coal, Petroleum, and Gas Samples

A total of sixty-five samples was analysed. Of these, nine were samples of coal for proximate analysis and calorific value; twenty-seven were samples of formation water from wells being drilled for oil and gas in the Province; one was a sample of petroleum for a routine examination; eleven were samples of suspected oil seepages, of which one was a seepage of oil from the roof of a coal mine; and seventeen were gas samples, five of which were of mine air to be analysed for carbon dioxide, carbon monoxide, and oxygen, and the rest were of diesel exhaust gas to be analysed for aldehydes and nitrogen oxides.

Police and Coroners' Exhibits

For the Attorney-General's Department and the Royal Canadian Mounted Police, fifty-six cases of a chemico-legal nature were undertaken. They involved a scientific examination of 119 exhibits.

Of the fifty-six cases, ten required analysis for narcotics under "The Opium and Narcotic Drug Act," fifteen were toxicological analyses for possible poisons in viscera, four were determinations of the alcoholic content of blood, and twenty cases required the analysis of liquor for alcoholic content. Seven cases of a diversified nature required examination of various materials, such as safe-packing, paint, fibres, and earth. Expert evidence was presented in Courts of law on ten occasions.

Miscellaneous Samples

For the Purchasing Commission, specification analyses were made on three samples of soap, one sample of dish-washing compound, on seven samples of fabric, and on five samples of anti-freeze. In addition, a short investigation was made to determine why cutlery was acquiring a stain after being washed; the cause was found, and a remedy was proposed.

For the Taxation Branch of the Department of Finance, ten samples of gasoline were analysed for marker dyestuff.

For the Department of Agriculture, three samples of limestone were assayed for lime, and one sample of limestone was analysed spectrographically.

For the Department of Lands and Forests, Forest Service, 182 samples of evergreen foliage from the vicinity of the Kitimat smelter were accepted for determination of the fluorine content. The samples were prepared for analysis, with the help of technicians from the Forest Service.

For the Forest Biology Laboratory of the Federal Department of Agriculture, fifty-seven samples of foliage were analysed for the moisture and sulphur contents. One of their technicians assisted in the analyses.

For the British Columbia Research Council, spectrographic analyses were made on two samples of fish scales, two samples or ore, two samples of white powder, and one sample of sand from the ocean floor.

For the Department of Mining and Metallurgy of the University of British Columbia, a spectrographic analysis was made on one ore sample.

For the Department of Public Works, two samples of cement and two samples of water were analysed.

For the Provincial Museum, two specimens were examined for ambergris and none found, and one sample of a calcareous deposit was analysed.

Research

At the request of the Chief Inspector of Mines, a study was made of the determination of aldehydes and nitrogen oxides in diesel exhaust gas. Improved methods were developed for these constituents, so that the laboratory can now make routine analyses for them.

An examination was made of known chemical methods for determining small amounts of phosphorus in tungsten concentrates. A new method was conceived, and the factors which affect its accuracy are currently being studied.

Revisions were made to the semi-quantitative method of spectrographic analysis being used for ore samples. For example, by modifying the shape of the carbon electrode which holds the sample, it proved possible to use a larger sample for analysis, and also to reduce the intensity of the spectrogram's background. Thus, these changes have resulted in better sampling, and in lower limits of detectability of metals. As a separate project, a quantitative spectrographic method was set up to determine the niobium content of low-grade ore.

Examinations for Assayers

Provincial Government examinations for certificates of competency and licence to practise assaying in British Columbia were held in May and in December. In May six candidates were examined; four passed and two failed. In December three candidates were examined; one passed, one was granted a supplemental examination in fire assaying, and one failed.

In December, 1953, eight candidates were examined; six passed, one was granted a supplemental examination in wet assaying, and one was granted a supplemental examination in fire assaying. These results had not been released in time for the Annual Report of 1953.

INSPECTION BRANCH

Organization and Staff

Inspectors and Resident Engineers

H. C. Hughes, Chief Inspector ..... Victoria
Robert B. Bonar, Senior Inspector of Mines ..... Victoria
J. D. Lineham, Senior Inspector and Acting Chief Conservation Engineer ..... Victoria
L. Wardman, Electrical Inspector ..... Victoria
J. A. Mitchell, Senior Inspector of Mines ..... Victoria
J. W. Patterson, Inspector and Resident Engineer ..... Prince Rupert
Robert B. King, Inspector and Resident Engineer ..... Vancouver
A. R. C. James, Inspector and Resident Engineer ..... Cumberland
J. E. Merrett, Inspector and Resident Engineer ..... Lillooet
E. R. Hughes, Inspector and Resident Engineer ..... Princeton
J. W. Peck, Inspector and Resident Engineer ..... Nelson

H. N. Curry, Inspector and Resident Engineer.....Cranbrook
D. R. Morgan, Inspector and Resident Engineer.....Fernie
R. R. McLeod, District Petroleum Engineer.....Dawson Creek

The Inspectors are stationed at the places listed and inspect coal mines, metalliferous mines, and quarries in their respective districts. They also examine prospects and mining properties.

J. A. Mitchell supervises the Department's programme as regards roads and trails and grub-stakes.

J. D. Lineham is responsible for the administration of regulations governing the drilling, completion, and abandonment of all wells drilled for oil and gas in British Columbia.

R. R. McLeod undertakes inspection work in connection with drilling, completion, and abandonment of all wells drilled for oil and gas in the Peace River area.

Instructors, Mine-rescue Stations

Arthur Williams.....Cumberland Station
T. H. Cunliffe.....Princeton Station
Joseph J. Haile.....Fernie Station
H. W. Aitchison.....Nelson Station

Board of Examiners for Coal-mine Officials

H. C. Hughes, Chairman.....Victoria
Robert B. Bonar, Secretary.....Victoria
E. R. Hughes, Member.....Princeton

R. B. Bonar, E. R. Hughes, and the Inspectors for the district in which an examination is being held form the Board for granting certificates of competency to coal-miners. In the absence of the Inspector, the mine-rescue instructor is authorized to act in his stead.

An Inspector is empowered to grant provisional certificates to coal-miners for a period not exceeding sixty days between regular examinations.

Staff Changes

On November 12th, 1954, H. N. Curry resigned to take the position of Chief Inspector of Mines for the Province of Nova Scotia.

On December 1st, 1954, J. E. Merrett was transferred from Lillooet to Cranbrook.

On December 8th, 1954, J. W. Patterson was transferred from Prince Rupert to Lillooet.

On December 8th, 1954, A. R. C. James was transferred from Cumberland to Prince Rupert.

The inspection of coal mines on Vancouver Island was taken over by R. B. Bonar, Senior Inspector of Mines, when Mr. James was moved to Prince Rupert.

MINERALOGICAL BRANCH

Field work by officers of the Mineralogical Branch includes geological mapping and examination of mineral deposits, and studies related to ground-water and engineering geology. The results are published partly in the Annual Report of the Minister of Mines and partly in a series of bulletins. The Mineralogical Branch supplies information regarding mineral deposits and the mineral industry, in response to inquiries received in great number. The activities of the Branch also include identification of rock and mineral specimens submitted by prospectors and others, and the examination of samples submitted by prospectors to the Analytical Branch. Since April 1st, 1953, the Min-

eralogical Branch has been responsible for preparing and logging samples representing the bit cuttings from wells drilled for petroleum and natural gas and cores from the wells.

Professional Staff

On December 31st, 1954, the professional staff included the following engineers classified as geologists or mineral engineers: H. Sargent, Chief of the Mineralogical Branch; M. S. Hedley, S. S. Holland, W. R. Bacon, J. W. McCammon, N. D. McKechnie, G. E. P. Eastwood, J. T. Fyles, A. Sutherland Brown, S. S. Cosburn, H. W. Nasmith, A. F. Shepherd, R. A. Stuart, C. G. Hewlett, and J. E. Hughes.

Technical editing of the Annual Report of the Minister of Mines and of other publications was directed by M. S. Hedley. Copy for printing was prepared under the direction of Mrs. C. C. Savage, who serves as editor for English. Messrs. Hedley and Holland assisted in directing and supervising field work. Most of the other members of the professional staff are assigned to mapping the geology of the selected areas and of mineral deposits. The following have special assignments: J. W. McCammon, industrial minerals and structural materials; H. W. Nasmith, ground-water and engineering geology; S. S. Cosburn, preparation and logging of well samples; A. F. Shepherd, records and library.

Staff Changes

John E. Hughes joined the staff of the Mineralogical Branch in June, 1954.

Field Work

Eleven field assistants were employed for the 1954 season to work under members of the professional staff who had the following assignments.

S. S. Holland with S. S. Cosburn and J. E. Hughes began the mapping of a strip along the John Hart Highway. Later Mr. Hughes assumed full responsibility for this project. The mapping undertaken is between the Parsnip River bridge and Commotion Creek.

In the later part of the field season Mr. Holland made reconnaissance studies along the Alaska Highway where it passes through the Rocky Mountains. He examined a fluorspar-witherite deposit discovered recently near Liard Hotsprings and a carbonatite deposit containing niobium (columbium) in the Wolverine Range (55° 124° N.E.).

S. S. Cosburn spent about a month on reconnaissance geological mapping along and adjacent to Wapiti River, and with N. D. McKechnie continued mapping for an additional eighteen days in the Lone Mountain area adjacent to the Monkman Pass road.

W. R. Bacon made geological examinations of prospects or properties under exploration in southwestern British Columbia, including the following localities: Tahsis Inlet and Menzies Bay on Vancouver Island, Hope, Choate, the Bridge River district, and Porcupine Mountain in the southern part of the Chilcotin area.

J. W. McCammon examined clay and shale deposits between Telkwa and Prince Rupert, and a limestone deposit near Shames in the same area. He also examined uranium and rare-metal deposits at Birch Island and Lempriere on the North Thompson River and on Moose Creek southeast of Golden, and examined several industrial-mineral deposits in the Kootenays.

G. E. P. Eastwood continued mapping in the Lardeau area in the strip containing Trout Lake and Ferguson and extending northeasterly up Gainer Creek. The base map is an interim map at 1,000 feet to 1 inch and with contours at 50-foot intervals.

J. T. Fyles and C. G. Hewlett continued areal mapping and examination of properties in the Salmo-Pend d'Oreille Rivers area using an interim base map at 1,000 feet to 1 inch with contours at 50-foot intervals.

A. Sutherland Brown made reconnaissance geological surveys in the Cariboo Mountains near Bowron Lake and between Cariboo Lake and the north arm of Quesnel Lake.

He also continued mapping on Rocher Déboulé Mountains. The base map for the latter work is an interim map at one-half mile to the inch with contours at 500-foot intervals.

H. W. Nasmith completed ground-water studies in the area tributary to the lower part of Cowichan River and began studying ground-water and Pleistocene geology in the Okanagan Valley.

R. A. Stuart completed surface and underground mapping in the Kemano-Whitesail Lake area, including the underground working and the surface along the tunnel route. The National Advisory Committee for Research in the Geological Sciences, the Aluminum Company of Canada Limited, and the British Columbia Department of Mines have co-operated on this project. In 1954 mapping on the surface was extended by the Department of Mines considerably beyond the boundaries covered by the joint project. An interim map at one-half mile to the inch with 500-foot contours was used as the base map. At the end of the field season Mr. Stuart was granted leave of absence to continue postgraduate studies in geology.

GRUB-STAKING PROSPECTORS

Each year since 1943 the Department of Mines has provided grub-stakes to applicants who were able to qualify. During 1954 the maximum grub-stake of $300 was provided to most grantees, usually in two instalments. An amount up to $200 was added where necessary for travelling expenses to enable the grantee to reach the prospecting area.

STATISTICS

Field Season	Approximate Expenditure	Men Grub-staked	Samples and Specimens Received at Department Laboratory	Mineral Claims Recorded
1943	$18,500	90	773	87
1944	27,215	105	606	135
1945	27,310	84	448	181
1946	35,200	95	419	162
1947	36,230	91	469	142
1948	35,975	92	443	138
1949	31,175	98	567	103
1950	26,800	78	226	95
1951	19,385	63	255	137
1952	19,083	50	251	95
1953	17,850	41	201	141
1954	19,989	48	336	123

Samples and specimens received from grub-staked prospectors are spectrographed, assayed, and tested for radioactivity. Mineralogical identifications are made on request.

There were 105 applications for grub-stakes for the 1954 season. Of the forty-eight successful applicants, twenty-four were given grants for the first time, and a large percentage of these proved to be excellent men. Only three of the new men failed to give a satisfactory account of their activities and will not be eligible for further grants. To the unsatisfactory list were added four of the older men previously listed as doubtful.

The following notes compiled by the field supervisor from the diaries of the grantees and from his observations in the field cover the activities of prospectors grub-staked during 1954.

Options were taken on at least three of the discoveries recorded.

Atlin Mining Division.—Nothing of importance was discovered as a result of prospecting in and east of the valley of Graham Creek on the north side of Graham Inlet, and in the vicinity of Cathedral Mountain west of Torres Channel, Atlin Lake.

Liard Mining Division.—Beryl crystals were found in the talus slopes on the west side of the Horseranch Range, and further prospecting will be done to locate the source of this material.

Limonite discovered on a tributary of Sandpile Creek was investigated, and considerable bog iron was discovered on outcrops of limestone and schist near Berg Creek.

Prospecting was done on Iverson Creek near McDame Lake, and on Walker Creek and elsewhere in the vicinity of Deadwood Lake.

Four men working from a base camp at Tootsee Lake prospected a large area of the surrounding mountainous country. Several interesting mineral occurrences were discovered close to a granite-limestone contact and a granite-schist contact, respectively southeast and northeast of the lake, but none appeared to be of commercial importance.

Stream valleys tributary to the Toad River 12 to 15 miles south of Mile 444 on the Alaska Highway were examined. A low-grade hematite occurrence was discovered, and chalcopyrite float was found in one of the stream beds.

One man spent the season prospecting within the Racing River watershed south of Mile 408 on the Alaska Highway and reported the discovery of copper mineralization.

Skeena Mining Division.—Some prospecting was done in the area north of the Bella Coola River between Bella Coola and Anahim Lake.

The Coast Range was prospected on the fringes of Mussel Inlet, the lower reaches of Mussel River, and westerly along the north side of the inlet to Lizette Lake. Some prospecting was also done in the Laredo Sound area and in the vicinity of Butedale and Whale Channel.

The previous season's work on the northeast and west forks of the Kitsault River was continued with encouraging results. A mineralized zone previously discovered was reported on favourably by examining engineers.

Previous investigations of zinc occurrences in the Dean Channel area were continued but no new discoveries were reported. However, the same prospectors located a body of low-grade graphite which was examined by company engineers.

Omineca Mining Division.—Additional work was done at the east end of Francois Lake where an occurrence of perlite was previously discovered. Some short-fibre asbestos was discovered in faulted serpentine in the vicinity of Mount Sidney Williams. Members of the same group of prospectors also prospected in the vicinity of Mount Swannel, Antimony Hill at Stuart Lake, and at Granite Creek near Manson Creek P.O.

At Granite Creek, tributary to Manson River, an occurrence of rare metals was discovered that created considerable interest. The property was optioned by one of the major mining companies.

North of Omineca River a wide carbonate zone, several fracture zones, and quartz carbonate veins in the vicinity of Nina Lake were investigated. Interesting copper showings were discovered near the head of Thane Creek.

Some work was done on quartz outcrops containing a small amount of copper 12 miles north of the headwaters of Pelly Creek.

Some prospecting was done near Takla, Bear, and Thutade Lakes, but nothing of interest was reported.

The valleys of Lorne and Fiddler Creeks, tributary to the Skeena River near Dorreen, were prospected, and a heavily pyritized dyke was found on high ground at the head of Lorne Creek.

Cariboo Mining Division.—Some superficial prospecting was done along the lower reaches of the Goat River near McBride.

Quesnel Mining Division.—Two men spent a short time investigating outcrops containing low-grade copper mineralization near the north end of Quesnel Lake.

Clinton Mining Division.—Prospecting was continued in the vicinity of Clinton and Pavilion Lakes and in the Taseko Lake area. Prospecting was also continued west of the Fraser River on Big Bar Creek and in the Poison Mountain and Porcupine Mountain areas. Nothing of importance was found.

Kamloops Mining Division.—A granite contact was prospected and several quartz veins examined in the Fly Hill area and in the vicinity of Wallensteen and Bolean Lakes

near Salmon Arm. Prospecting was also done on Bear Creek near the north end of Adams Lake.

Nicola Mining Division.—Prospecting done around Brookmere and Juliet did not produce discoveries of apparent interest.

Similkameen Mining Division.—A considerable amount of prospecting was done on the higher ridges along the Tulameen River between Coalmont and Princeton, but nothing of importance was reported.

Vernon Mining Division.—Scattered deposits of fluorite near Whiteman Creek on the west side of Okanagan Lake were explored. An attempt was made to locate the source of galena float found on Angle Mountain.

Osoyoos Mining Division.—A small amount of prospecting was done 10 miles north of the highway near Rock Creek and also in the vicinity of Olalla.

Nelson Mining Division.—A pegmatitic area near Destiny Bay on Kootenay Lake and in the vicinity of the Valparaiso mine was prospected without success.

Fort Steele Mining Division.—Surface stripping was done on a showing containing quartz and siderite at the junction of Bloom and Gold Creeks, 9 miles west of Waldo.

Revelstoke Mining Division.—Efforts were made to locate reported occurrences of beryl near Beaton on Upper Arrow Lake.

Encouraging copper mineralization was found associated with garnierite close to a granite contact on Joss Mountain south of Three Valley Lake.

New Westminster Mining Division.—The ground adjacent to a belt of granite and serpentine in the Nahatlatch River area near Hannah Lake was prospected for asbestos but none was found. Another serpentine belt was prospected on Dewdney and Cedar Creeks near Jessica without success.

Vancouver Mining Division.—Some prospecting was done along the coast near Stuart Island and Knight Inlet.

Alberni Mining Division.—Last year's work was continued in the vicinity of the old King Midas group on the Nomash River. Some heavily pyritized limestone and a fine-grained pyritized dyke were sampled, but the assay returns were low.

Some magnetite float and copper-stained granite were noted farther south in the vicinity of Hesquiat Lake, Hotsprings Cove, and Escalante Point. Still farther south, intensive prospecting was done at Uchucklesit Inlet near Toquart, from Effingham Inlet to Uchuck Lake, and in the vicinity of Dutch Harbour and Mayne Bay. It appears that the rocks in this area are mainly coarse crystalline limestone with some rhyolite. Nothing of interest was found other than a little magnetite float.

Nanaimo Mining Division.—Some prospecting was done near and east of an old copper prospect at Humpback Bay, 11 miles west of Rock Bay. Nothing of commercial interest was found.

Prospecting was continued on sporadic occurrences of native copper in volcanics west of Menzies Bay in the vicinity of Morton and Mohun Lakes. This work was extended into the Roberts Lake area.

A wide zone mineralized with pyrite, chalcopyrite, and magnetite was found in the Dimple Lake-Robertson River area south of Cowichan Lake but did not appear to have commercial possibilities.

A little prospecting was done in the Oyster River area.

MUSEUMS

The Department has a large exhibit of mineral and rock specimens in the Douglas Building, Victoria; collections are also displayed in the joint office in Vancouver and in the offices of the Inspectors of Mines in Nelson and Prince Rupert.

Information regarding collections of specimens of rocks and minerals available to prospectors and schools in British Columbia will be found on page 270.

Specimens from the collection in Victoria, accumulated in a period of nearly sixty years, are displayed in cases on the fourth floor of the Douglas Building. The collection includes specimens from many of the mines and prospects in the Province, and also specimens of type rocks and special minerals from British Columbia and elsewhere.

British Columbia material includes specimens collected by officers of the Department of Mines and specimens donated by property-owners. The collection also includes type specimens purchased from distributers. Other valued specimens or groups of specimens have been donated or loaned to the museum.

PUBLICATIONS

Annual Reports of the Minister of Mines, bulletins, and other publications of the Department, with prices charged for them, are listed on pages 267 to 269.

Publications may be obtained from the offices of the Department in Victoria and elsewhere in the Province. They are also available for reference use in the Department's library (Mineralogical Branch) at Victoria, in the joint office in Vancouver, and in the offices of the Inspectors of Mines in Nelson and Prince Rupert, as well as in public libraries listed on page 271.

MAPS SHOWING MINERAL CLAIMS, PLACER CLAIMS, AND PLACER-MINING LEASES

From the details supplied by the locators, the approximate positions of mineral claims held by record and of placer-mining leases are shown on maps that may be inspected in the Central Records Offices of the Department of Mines in Victoria and in Vancouver. Copies of these maps may be obtained on request. The boundaries of surveyed claims and leases are shown on the reference maps and other maps of the British Columbia Department of Lands and Forests.

JOINT OFFICES OF THE BRITISH COLUMBIA DEPARTMENT OF MINES AND THE DEPARTMENT OF MINES AND TECHNICAL SURVEYS, CANADA.

The Provincial Department's Inspector and Resident Engineer, the Gold Commissioner and Mining Recorder for the Vancouver Mining Division, and the officers of the Federal Geological Survey occupy one suite of offices. All official information relating to mining is now available to the public in the one suite of offices in Vancouver.

The services offered to the public include technical information on mining, the identification of mineral specimens, distribution of Federal and Provincial mining publications, a reference library, a display of rocks and minerals, and a central records office.

Topographic Maps and Air Photographs

Topographic mapping and air photography continue to be carried on by the Surveys and Mapping Branch of the British Columbia Department of Lands and Forests and by the Canadian Government Departments of Mines and Technical Surveys and of National Defence.

In addition, the Legal Surveys Division of the British Columbia Surveys and Mapping Branch makes various types of cadastral surveys which in the 1954 season consisted of approximately 33,500 acres of Crown land surveyed in the Peace River for settlement purposes; 79 miles of control and right-of-way survey on the John Hart Highway, which completes the said survey except for the last 10 miles into Dawson Creek which is not yet in its final location; 53 miles of control and right-of-way survey on the Alaska Highway between Miles 533 and 586, together with thirteen district lots covering gravel pits, bridge-sites, etc.; forty-four district lots at Nimpo Lake, Range 3, Coast District, for the purpose of summer-home sites; numerous subdivision surveys and some inspection surveys widely scattered over the Province.

Interim maps based on air photographs and existing ground control are compiled by the Air Division of the British Columbia Surveys and Mapping Branch. On a scale of 2 inches to 1 mile they include planimetric and cadastral information and also show the centres of vertical air photographs used, but do not show contours. During 1954 some 44,600 square miles were covered with this type of map which, with a further 69,900 square miles in hand at the end of the year, brought the total area mapped to date in this way to 171,000 square miles. Except for about 7,500 square miles, all of the Province south of the height of land north of the Canadian National Railway between Prince Rupert and Prince George is now covered by interim maps completed or in hand, which are proving of great value as base maps since they act as the stop-gap until standard topographic maps can be purchased.

During 1954 the Topographic Division of the British Columbia Surveys and Mapping Branch was engaged exclusively in obtaining ground control in the northeastern part of the Province. This was a continuation of the project commenced the previous year designed primarily to provide horizontal control to enable the co-ordinating of permits to be made, as located under the " Petroleum and Natural Gas Act."

The necessary tower stations were considerably higher than the previous year and seventy-three were built, including one that measured 136 feet to the instrument head. Ten thousand square miles were controlled in 1954 by this method of triangulation, carrying the work north of the 59th parallel of latitude. Included was the co-ordination of seven staking posts of key permits, one of which is located approximately 40 miles from the 60th parallel. A chartered helicopter and a Lands Department Beaver aircraft provided adequate transportation support for this project, which it is planned to complete to the 60th parallel in 1955.

The Canadian Government Departments of Mines and Technical Surveys and of National Defence, working in close co-operation, together, during 1954 in the Province, completed the field work for fifty-six half sheets of the 1-mile topographic series and three and a quarter sheets of the 4-mile topographic series.

Already an integral part of current mapping, increased use is being made of air photographs as recorded in loans by the Air-photo Library in Victoria. During 1954 some 35,000 square miles of new photography involving nearly 17,000 photographs was added to the said Library.

In the Annual Report of the Deputy Minister of Lands for 1954, coverage by air photographs and by topographic and interim maps is indicated on a series of base maps. Further information concerning these or the corresponding Federal mapping may be obtained from the Director, Surveys and Mapping Branch of the Department of Lands and Forests.

Department of Mines and Technical Surveys

The Canadian Government Department of Mines and Technical Surveys, created by an Act of Parliament introduced in November, 1949, took over most of the branches and functions related to mining of the former Department of Mines and Resources. The Mines Branch, Geological Survey of Canada, and Surveys and Mapping Branch are the three branches of the Department of the most direct interest to the mining industry. Brief reference to the work of the Surveys and Mapping Branch in British Columbia is made in the preceding note headed "Topographic Maps and Air Photographs." A note on the Geological Survey of Canada follows this paragraph and is followed by a note on the Mines Branch.

GEOLOGICAL SURVEY OF CANADA

By an arrangement made at the time the Province of British Columbia entered Confederation, geological investigations and mapping in the Province are carried on by the Geological Survey of Canada. Several geological parties are in the field each year. Many excellent reports and maps covering areas of British Columbia have been issued by the Geological Survey of Canada, and they have made available a great amount of information that has been of much benefit to the mining and prospecting activities in British Columbia.

A branch office of the Geological Survey of Canada is maintained in Vancouver. Maps and reports on British Columbia can be obtained there. W. E. Cockfield is in charge of this office.

Field Work by the Geological Survey of Canada in British Columbia, 1954

J. D. Aitken continued the geological mapping of the Atlin area (longitude 132° to 134°, latitude 59° to 60°).

H. Gabrielse completed the geological mapping of the McDame area (longitude 128° to 130°, latitude 59° to 60°).

S. Duffell continued the geological mapping of the Terrace area (longitude 128° to 130°, latitude 54° to 55°), and J. Souther completed a detailed study of granitic rocks of the same area.

J. E. Armstrong continued the geological mapping of the Tertiary, Pleistocene, and Recent sedimentary deposits of the Canadian position of the Lower Fraser Valley (Flood to Gulf of Georgia).

J. A. Roddick, using a helicopter, completed most of the geological mapping of the Coquitlam 4-mile map-area (longitude 122° to 123°, latitude 49° to 50°).

H. W. Little continued geological mapping of the Kettle River area (longitude 118° to 119°, latitude 49° to 50°).

J. E. Reesor continued geological mapping of the Lardeau area (longitude 116° to 117°, latitude 50° to 51°).

W. E. Cockfield undertook various geological investigations logically handled from the British Columbia office of the Geological Survey.

H. W. Tipper commenced geological mapping of the Anahim Lake area (longitude 125° to 126°, latitude 52° to 53°).

W. L. Fry commenced and completed a detailed study of the Tertiary palæobotany and stratigraphy of the Lower Fraser Valley.

J. A. Jeletzky completed detailed stratigraphic studies of the fossiliferous Mesozoic and Tertiary rocks on the west coast of Vancouver Island between Kyuquot Sound and Quatsino Sound.

E. C. Halstead commenced and completed a ground-water survey of Langley Municipality, and commenced a similar work in Matsqui Municipality.

E. Hall continued to assist the Engineering and Water Resources Branch, Department of Northern Affairs and National Resources, by examining drill cuttings and cores at prospective dam-sites on the Columbia River, and by other geological means.

T. E. Bolton commenced a detailed stratigraphic and palæontological study of the Cambrian, Ordovician, and Silurian formations exposed on the western flank of the Rocky Mountains between Canal Flats and Golden.

H. Frebold investigated the Jurassic fauna and stratigraphy of Pine Pass.

F. P. DuVernet commenced and completed a reconnaissance aeromagnetic survey of a strip, about 15 miles wide, across the Cordillera at the 49th parallel.

B. A. Latour continued the investigation of the coal reserves of Alberta and eastern British Columbia.

Publications of the Geological Survey

The following reports relating to British Columbia published by the Geological Survey were received by the British Columbia Department of Mines during 1954:—

National Advisory Committee on Research in the Geological Sciences, Fourth Annual Report, 1953–54.

Paper 53-17: Tertiary Rocks of the Hesquiat-Nootka Area, West Coast of Vancouver Island, British Columbia, by J. A. Jeletzky.

Paper 53-25: Dewar Creek, British Columbia, by J. E. Reesor.

Paper 53-28: Vancouver North, British Columbia, by J. E. Armstrong.

Paper 53-34: Findlay Creek Map-area, British Columbia, by J. E. Reesor.

Paper 54-7: Canal Flats, British Columbia, by G. B. Leech.

Paper 54-10: McDame, British Columbia, by H. Gabrielse.

Memoir 272: Geology and Mineral Deposits of the Zeballos-Nimpkish Area, Vancouver Island, British Columbia, by J. W. Hoadley.

Memoir 274: Geology and Mineral Deposits of Aiken Lake Map-area, British Columbia, by E. F. Roots.

Map 1027A: Zeballos, Vancouver Island, British Columbia.

Map 1028A: Woss Lake, Vancouver Island, British Columbia.

Map 1029A: Nimpkish, Vancouver Island, British Columbia.

Map 1030A: Aiken Lake, Cassiar District, British Columbia.

MINES BRANCH

The Mines Branch has branches dealing with mineral resources, mineral dressing and process metallurgy, physical metallurgy, radioactivity, and fuels and explosives. Publications of the Mines Branch pertaining to British Columbia received in 1954 included tabular pamphlets dealing with coal mines, gold mines, stone quarries, petroleum refineries, and milling plants in Canada, and the reports listed below:—

Mines Branch No. 842: Industrial Water Resources of Canada, Water Survey Report No. 6: Fraser River Drainage Basin, 1950–51, by J. F. J. Thomas.

Mines Branch No. 847: Cobalt in Canada, by R. J. Jones.

Mines Branch No. 848: The Spectrum of Steel, a table, for the selection of Homologous Spectral Lines, by J. Convey and J. K. Hurwitz.

Memorandum Series 128: Preliminary Report on Coated Lightweight Concrete Aggregate from Canadian Clays and Shales; Part VI—British Columbia, by H. S. Wilson.

Technical Paper No. 7: The Constitution of Bone China, Part II, by P. D. S. St. Pierre.

Technical Paper No. 8: The Determination of Uranium Concentrates Using Ethyl Acetate, by R. J. Guest and J. B. Zimmermann.

Technical Paper No. 9: Electrode Potentials and the Dissolution of Gold, by G. Thomas.

The Mineral Dressing and Process Metallurgy Division investigates the milling of ores and industrial minerals from many deposits and also tests clays and other ceramic materials. The British Columbia Department of Mines has received the following reports

on work performed by the Mineral Dressing and Process Metallurgy Division, in 1954, on British Columbia ores:—

Investigation No.	Title
MD3020.	Cyanidation and Flotation Tests on a Gold-Silver-Lead-Zinc Ore from Yankee Dundee Mines Limited, Ymir, British Columbia.
MD3032.	Investigation on a Sample of Refractory Gold Ore from the "B.C. Vein" of The Cariboo Gold Quartz Mining Company, Limited, at Wells, British Columbia.

Lode Metals

CONTENTS

NOTES ON METAL MINES—*Continued*

NOTES ON METAL MINES—*Continued*

NOTES ON METAL MINES—*Continued*

GENERAL REVIEW

The quantity of ore mined, the quantity of each metal and its value, the average number employed, for 1954 and preceding years, and other data are tabulated under "Statistics," in the section that begins on page 15. Table XV lists the production of individual properties and gives the name and address of the owner or agent of each producing property. Before 1951 the production of individual properties was incorporated in the property descriptions. The statistical tables are listed on page 5.

In 1954 the average prices of the principal metals were not greatly different from those for 1953. The New York quotation for lead was 13.5 cents at the start of the year and was 15 cents from mid-October until the end of the year. The St. Louis quotation for zinc was 10 cents at the start of the year and was 11.5 cents from early September until the end of the year. The price of silver was about 2 cents per ounce higher at the end of 1954 than at the start, and the price of copper similarly showed an increase of about 2 cents per pound.

Gold, silver, copper, lead, and zinc produced at British Columbia lode mines in 1954 had a gross value of $111,844,340. Miscellaneous metals, including iron ore, tungsten, tin, and minor metals recovered at the Trail smelter had a gross value of $11,866,409. The total quantity of ore mined at all lode mines amounted to 8,513,865 tons and came from sixty-three mines, of which forty produced 100 tons or more. The average number employed in the lode-mining industry in 1954, including mines, concentrators, and smelters, was 9,412.

In 1954 thirty-one mills, including two magnetic concentrators, were operated. Of these, one operated for the first time and four closed before the year's end. The Mineral King was brought into production, and the Island Mountain, Sil-Van, Red Rose, and Regal Silver operations ceased. Of the twenty-seven mills that were operative throughout the year, one treated custom ore steadily and six others operated intermittently. Custom ore was treated at five mills, of which three had no domestic ore supply in 1954. Two small mills were in course of construction at the end of the year.

The Trail smelter recorded custom receipts of 988 tons of crude ore, 1,367 tons of lead concentrates, and 26,604 tons of zinc concentrates from properties in British Columbia. Totals of 41,249 tons of lead concentrates and 28,674 tons of zinc concentrates were shipped out of the country for smelting. Copper concentrates were shipped to the Tacoma smelter. Concentrated iron ore was shipped to Japan. Tungsten concentrates were sold under government contract.

The Monarch and Kicking Horse mines were abandoned after many years of operation in the period from 1888 to 1952. The Monarch was closely associated with the earliest attempts at smelting in the Province. Island Mountain Mines Company Limited was liquidated on August 15th after twenty years of successful operation, and the property was bought by The Cariboo Gold Quartz Mining Company Limited. The Red Rose, one of the two producers of tungsten, closed on December 15th.

The Mineral King came into production with a 500-ton mill in March, after rapid development. The Highland-Bell started a new low-level adit planned to be more than 1 mile in length. Development continued at the Granduc property. Supplies were airborne from Stewart, and some supplies were hauled over the snowfield by tractor train. At the B.C. Nickel property a major development project terminated when investigation failed to add materially to the known reserves. Development was most active in the Kootenays in point of view of numbers of properties, and many small mines were worked in the Ainsworth and Slocan areas. Successful exploration of an old copper property north of Greenwood resulted in the optioning of the Copper Queen late in 1954.

Varied sorts of investigation were carried out at seven uranium-bearing properties. Three of these showed an association of niobium and uranium.

In mining, a new method of stope filling was put into practice at the Pioneer mine where a sand-preparation plant for dewatering mill tailings came into operation. Several empty stopes were backfilled with sand, and the same material was used in the new cut-and-fill stopes. At the Bluebell, experimental stope filling was done with tailings material. At the Jersey mine a 1,500-ton daily production was attained with an operating crew of thirty men using trackless mining methods.

NOTES ON METAL MINES

ATLIN*

CONSOLATION CREEK (59° 133° N.E.)

Lead-Zinc-Copper

Sunrise (Selco Exploration Company Limited).—Head office, 77 York Street, Toronto; company office, 510 West Hastings Street, Vancouver. This group of claims is on Consolation Creek, 3 miles by tractor-road from the head of Surprise Lake. Six men under the direction of P. Andrews, geologist, built 3 miles of truck-road and 3 miles of tractor-road, and did 800 feet of diamond drilling.

TAKU RIVER*

Gold-Silver-Copper-Lead-Zinc

Big Bull, Tulsequah Chief (Tulsequah Mines, Limited).—(58° 133° N.W.) Company office, Tulsequah. J. C. MacLean, property superintendent. This company, a subsidiary of The Consolidated Mining and Smelting Company of Canada, Limited, operates the Tulsequah Chief and Big Bull mines and has leased the Polaris-Taku mill, which treats the ore from both mines.

Development and exploration at the two mines were as follows:—

	Tulsequah Chief	Big Bull	Total
	Ft.	Ft.	Ft.
Drifting	1,493	433	1,926
Crosscutting	9	21	30
Subdrifting	802	547	1,349
Raising	3,756	1,161	4,917
Diamond drilling (underground)	6,602	2,828	9,430
Diamond drilling (surface)	1,427	.....	1,427

Production, ore milled: Tulsequah Chief, 84,481 tons; Big Bull, 108,744 tons. Concentrate totalling 35,455 tons, the largest amount ever handled in one year, was shipped to the Tacoma and Trail smelters.

At the Big Bull, the section of the mine serviced by the shaft was closed, and the glory-hole was converted to a shovel open pit from which 83,562 tons of ore was mined.

A total of 318 feet of new bridging was constructed to replace parts of the bridges across the Tulsequah River that were destroyed by a flood.

Due to an intensified effort by the company and its safety officer, R. Davidson, there were only four lost-time accidents. In 1953 there were twenty-three.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1929, pp. 136–141; 1947, pp. 68–70.]

UNUK RIVER AREA*

Copper

Granduc (Granduc Mines, Limited) (56° 130° S.E.) Company office, 1613 Royal Bank Building, Vancouver; mine office, Stewart. President, L. T. Postle; manager, J. J. A. Crowhurst. Capital: 4,000,000 shares, $1 par value. This company is financed by The Granby Consolidated Mining Smelting and Power Company Limited and Newmont Corporation of Canada Limited. The property is 25 miles northwest of Stewart and is reached most easily by air from Stewart.

What are now the Leduc showings, or part of them, were apparently located in 1931 by Wendell Dawson and the late W. Fromholz, but the claims were allowed to lapse.

* By J. W. Patterson.

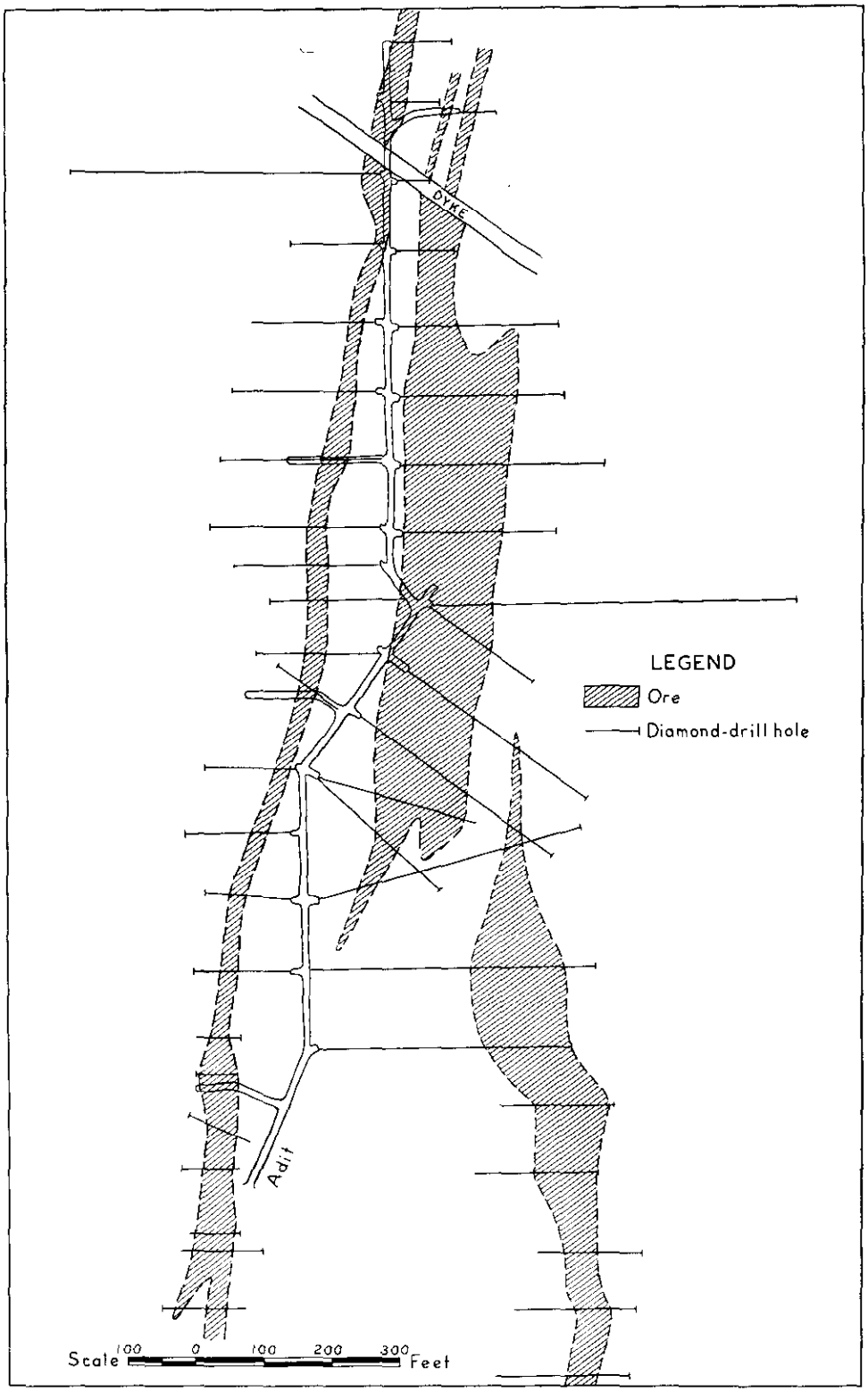


Figure 1. Granduc Mines, Limited—orebodies outlined by development in 1953 and 1954.

The showings were rediscovered by E. Kvale in 1948 and subsequently located by Kvale and T. McQuillan in 1951 for Helicopter Exploration Co. Ltd.

In 1954 the first air-borne supplies were transported to the camp-site from Stewart on January 26th. Later some supplies were moved by tractor train by way of the Salmon and Leduc glaciers and the connecting snowfield, which at one point along the route is 6,000 feet above sea-level. A total of 278 tons was transported by air and 90 tons by tractor train.

The first camp was established on the Leduc glacier on January 25th. Diamond drilling started on March 15th and drifting on May 26th. Between these dates and November 20th a short airstrip was built in the Leduc River valley 3 miles from the mine-site, and the following development work was done:—

Work Done	Ft.
Drifting and crosscutting	2,133
Short diamond-drill raises	99
Underground diamond drilling	15,591
Surface diamond drilling	3,565
Glacier ice diamond drilling	829

Figure 1 shows the orebodies as outlined at the end of 1954.

A geophysical survey was made to check the thickness of the glacial ice covering ground held by the company. The survey was checked at one point by two vertical diamond-drill holes, one 407 feet deep and the other 422 feet deep, the last 16 feet of the latter hole being in rock. The depth of ice indicated by these holes checked closely with the depth recorded by the geophysical survey. As much as 150 feet was drilled in one twelve-hour shift.

Jackleg drills with tungsten-carbide-tipped steel were used for all the percussion drilling. Air was supplied by four 125-cubic-feet-per-minute compressors powered by diesel engines. Broken rock was loaded with an overhead loader and transported by an air locomotive in a car equipped with a pneumatic dump mechanism. An average of twenty-one men was employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1953, pp. 84–86.]

PORTLAND CANAL*

Bear River (55° 129° N.W.)

Silver-Lead-Zinc-Gold

Portland Canal Tunnel (Cassiar Consolidated Mines Limited)

Company office, 1519 Marine Building, 355 Burrard Street, Vancouver; mine office, Stewart. Capital: 3,000,000 shares, 50 cents par value. The portal of this adit is about 50 feet above the old Dunwell mill near the junction of Glacier Creek with the Bear River and is 5¾ miles by road from Stewart. The adit was started in 1912 by Portland Canal Tunnels Limited to crosscut the Portland Canal fissure zone and investigate whatever veins might be encountered. It was driven several thousand feet, and some drifting was done before work ceased in 1914. The adit was later used by Dunwell Mines Limited to carry water to their power plant. The present company has acquired by option and located fifty-six mineral claims in the general vicinity of the adit.

Gravel deposited in the adit by water was removed, and track and pipe were laid for a distance of 2,540 feet since work started on June 15th. An average of five men was employed.

[Reference: *Geol. Surv., Canada,* Mem. 175, 1935, p. 135.]

* By J. W. Patterson.

SALMON RIVER (56° 130° S.E.)

Silver-Lead-Zinc

Silver Tip (Silver Tip Gold Mines Limited)

Company office, 303 Times Building, Victoria. George Winkler, managing director. This property north of the old Big Missouri camp is connected to Stewart by about 21 miles of road, the last 5 miles of which is suitable only for truck and jeep travel. Between July 20th and September 25th a complete survey was made of the surface and underground workings on the May P.J. claim, and 139 feet of drifting was done on the Blind vein. The average number of men employed was four.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1950, pp. 77–78.]

SUMMIT LAKE (56° 130° S.E.)

Gold-Silver

East

The East group, about 4 miles north of Summit Lake, is owned by A. A. Phillips, of Stewart. Float-equipped aircraft can land on Summit Lake, which is connected to the East group by 5½ miles of tractor-road, and small wheel-equipped aircraft can land on an airstrip constructed in 1954 one-half mile north of the camp. No mining was done, but 1¾ tons of ore mined in previous years was shipped to the Tacoma smelter.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1946, pp. 68–72.]

ALICE ARM*

Silver

Toric (Torbrit Silver Mines Limited)

(55° 129° N.W.) Registered office, 309 Royal Bank Building, Vancouver; executive office, 44 King Street West, Toronto. R. W. Burton, manager; A. M. Cormie, mine superintendent; A. R. Johnson, mill superintendent. Capital: 3,000,000 shares, $1 par value. A 17-mile road along the west bank of the Kitsault River connects the mine with Alice Arm. In September, G. B. Tribble, formerly manager, was transferred to the Toronto office of the Mining Corporation of Canada, Limited, which owns a controlling interest in the company.

The mill treated 150,235 tons of ore, averaging 412 tons per day, an increase of about 35 tons per day over the tonnage treated in 1953. As the grade of ore was lower than in previous years, this increase was necessary to maintain metal production at a comparable rate. In addition to 1,663,824 ounces of silver and 972,263 pounds of lead produced by flotation methods, 399,766 ounces of silver was recovered by cyanidation of the flotation tailings.

* By J. W. Patterson, except as noted.

A summary of the work performed underground follows:—

Work Done	Advance	Ore	Waste
	Ft.	Tons	Tons
Drifting—			
800 level	479	2,518	1,453
900 „	213	1,085	535
1000 „	467	304	3,307
1150 „	10	.....	104
Totals	1,169	3,907	5,399
Raising—			
800 level	129	.....	463
1000 „	38	.....	85
Totals	167	.....	548
Stope drifting—			
800 level	394	767	729
900 „	877	394	2,389
1000 „	75	302	32
Totals	1,346	1,463	3,150
Stope raising—			
800 level	431	665	726
900 „	1,070	2,074	1,435
1000 „	111	210	213
Totals	1,612	2,949	2,374
Stoping—			
900 level	.....	86,943	.....
1000 „	.....	15,829	.....
1150 „	.....	23,574	.....
Total	.....	126,346	.....
Diamond drilling—			
800 level	2,301	.....	.....
900 „	3,644	.....	.....
1000 „	2,993	.....	.....
1150 „	1,682	.....	.....
Surface	2,711	.....	.....
Total	13,331	.....	.....

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 102–103.]

Copper-Silver-Lead

Surprise* (55° 129° N.W.) The Surprise claim is the southernmost of a group of eleven claims owned by A. F. Smith, of Alice Arm. It is on the west bank of the Kitsault River, about 1½ miles upstream from the Torbrit Silver mine. The Surprise is essentially a relocation of the Ouray.

Mineralization is exposed in a series of trenches and open-cuts. The line of the trenches is northeasterly, and the distance between southernmost and northernmost trenches is approximately 460 feet. The minerals are quartz, barite, calcite, pyrite, chalcopyrite, galena, sphalerite, and marcasite. A sample across 12 feet in one of the more southerly trenches assayed: Gold, 0.02 oz. per ton; silver, 3.9 oz. per ton; copper, 2.84 per cent.

In 1954 Noranda Exploration Company Limited made a self-potential survey in the vicinity of the showings.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1935, pp. B 24–25; 1951, p. 98.]

David Copperfield (55° 129° N.W.) This property, consisting of two mineral claims, was acquired in 1952 by R. L. Clothier, 744 West Hastings Street, Vancouver. It is a short distance south of the Torbrit Silver mine, 17 miles by road from Alice Arm. A considerable amount of stripping was done along two quartz-barite veins and 770 feet of diamond drilling with a small portable diamond drill, but no new ore occurrences were revealed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1919, pp. 52–53.]

* By J. W. Patterson and W. R. Bacon.

OBSERVATORY INLET*

Copper

Anyox (The Consolidated Mining and Smelting Company of Canada, Limited).—(55° 129° S.W.) Electromagnetic surveys were made of several areas near the former Hidden Creek mine, some contact areas within sixty claims recorded in 1954, and the Red Wing, the Double Ed, and Eden properties. A total of 4,182 feet of diamond drilling was done on the Eden property and 17,100 feet on the Double Ed property. A 23- by 50-foot dock with an aircraft float was constructed on the Bonanza delta. Work started in late April and ended in early December.

MORESBY ISLAND*

Copper

Garnet (The Consolidated Mining and Smelting Company of Canada, Limited).—(52° 132° N.E.) This group of claims in Tasu Sound on Moresby Island was recorded in 1953. Some trenching was done in 1954.

USK*

Copper

Nicholson Creek Mining Corporation.—(54° 128° N.E.) Mine office, Usk. W. D. Galbraith, manager. Two miles of road connect this property with Usk. Exploration work consisted of 35 feet of drifting, 851 feet of diamond drilling, and 90 feet of trenching and open-cutting. Three men were employed.

[Reference: *Geol. Surv., Canada,* Mem. 205, 1937, pp. 53–56.]

Copper-Silver-Lead-Zinc-Gold

Grotto (Tungsten of British Columbia Ltd.) (54° 128° N.E.) Company office, 717 West Pender Street, Vancouver. J. Bell, manager. Two miles of tractor-road along the north side of Hardscrabble Creek connect this property with the railway at Pitman. Underground work consisted of 250 feet of diamond drilling in No. 2 adit and 30 feet of drifting in No. 1 and No. 2 adits. On surface, 350 feet of diamond drilling was done on the creek fracture zone. Work was stopped in June.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1937, pp. C 4–7.]

HAZELTON*

Silver-Lead-Zinc-Gold-Cadmium

Silver Standard Mines Limited (55° 127° S.W.) Company office, 602 West Hastings Street, Vancouver. William Dunn, superintendent. Capital: 3,500,000 shares, 50 cents par value. The property is on Glen Mountain 5½ miles north of Hazelton. To test biogeochemical anomalies indicated by analyses of 563 twig samples from silver birch trees, and to further explore the 00, 1, 7, 10, 12, and Discovery veins, 6,000 feet of stripping and 400 feet of trenching were done. Several mineralized vein extensions were uncovered and a high-grade oreshoot in the Discovery vein, 100 feet long and averaging 1.3 feet wide. No oreshoots were discovered where the biogeochemical anomalies were observed. A total of 4,552 feet of surface diamond drilling and 4,611 feet of underground diamond drilling provided important geological information concerning the 0, 00, 1, 4, 6, 7, 11, and 12 veins, and revealed high-grade ore in No. 1 vein at the 1,000-foot level.

As shown in the following summary of work performed underground, development was concentrated on the 850 and 1500 levels. This development revealed the downward

* By J. W. Patterson.

extension of No. 9 vein which was followed for 170 feet by a drift on the 1500 level. Several narrow, very high-grade oreshoots were exposed. The No. 1 vein, as developed by 298 feet of drift on the 850 level, was sparsely mineralized. However, better mineralization and greater widths were indicated in a raise 75 feet above the level. On the 1900 level, drifting on No. 11 vein exposed an oreshoot 125 feet long and averaging 1.4 feet wide.

Work Done	Advance	Ore Broken
	Ft.	Tons
Drifting—		
1900 level	320	
1500 ,,	170	
850 ,,	298	
Total	788	
Raising—		
1500 level	255	
1300 ,,	78	
1150 ,,	449	
1000 ,,	100	
850 ,,	496	
Total	1,378	
Subdrifting—		
1500 level	49	
1150 ,,	238	
1000 ,,	99	
Total	386	
Crosscutting—		
1900 level	131	
1500 ,,	1,207	
850 ,,	1,025	
Total	2,363	
Stoping—		
1500 level		1,911
1300 ,,		1,109
1150 ,,		18,353
1000 ,,		4,281
850 ,,		66
Surface (No. 12 vein)		226
Development		1,716
Total		27,662

Of the 28,462 tons of ore taken from the mine, 7,084 tons was sorted out as waste and 21,378 tons was treated in the mill. Except for the Christmas holiday period the mill operated continuously, averaging about 60 tons per day.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1950, pp. 87–95.]

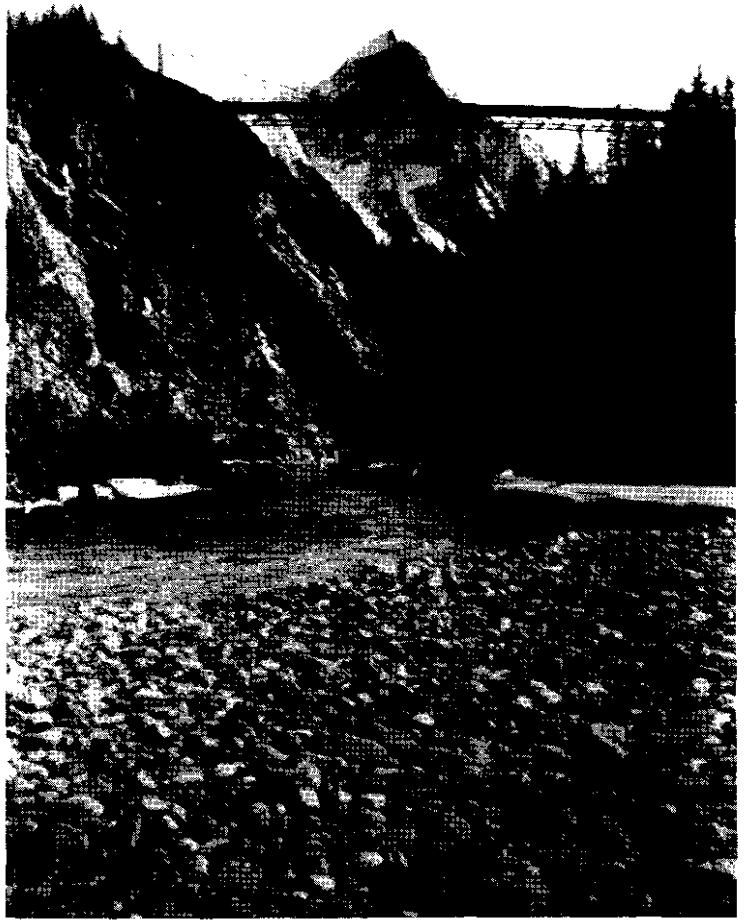
Tungsten

Red Rose (Western Tungsten Copper Mines Limited)*

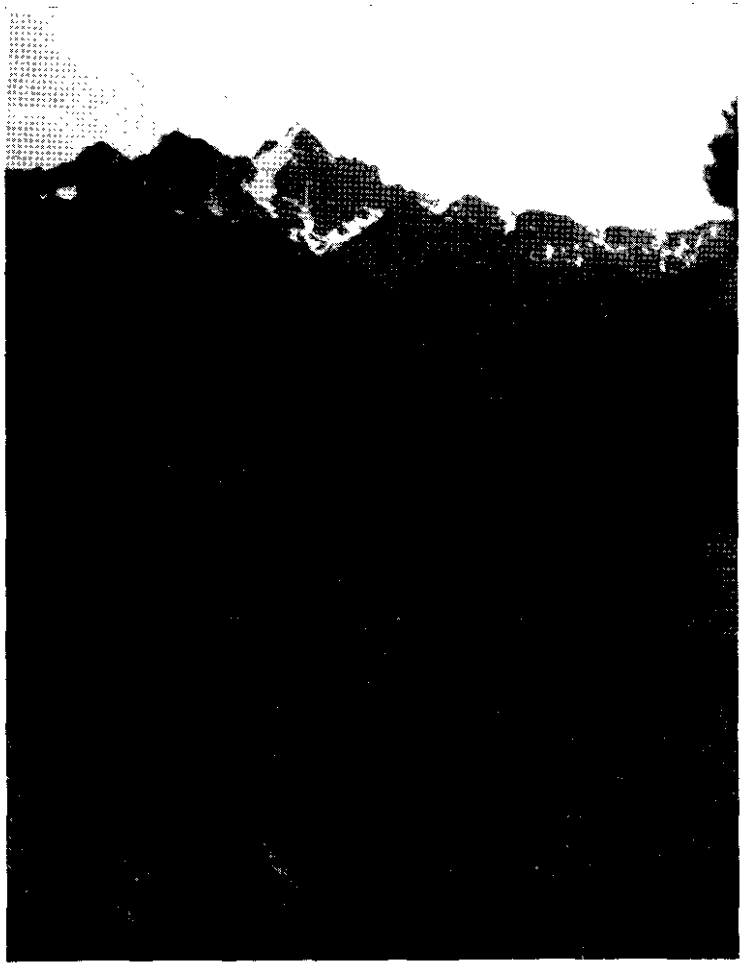
(55° 127° S.W.) Company office, 505 Dunsmuir Street, Vancouver. W. N. Taylor, general manager. Capital: 3,000,000 shares, $1 par value. The Red Rose mine is in the Rocher Déboulé Mountains on the ridge between Armagosa and Red Rose Creeks which are both tributary to Juniper Creek. The mill camp (elevation 4,000 feet) is on Red Rose Creek, 11 miles by road from Skeena Crossing. The mine camp is approximately 1 mile northeast of and 1,600 feet above the mill camp. The property consists of nine Crown-granted and six located claims and is leased by the present company from The Consolidated Mining and Smelting Company of Canada, Limited.

The Red Rose was first located in 1912 by C. Peterson and C. Ek. Over the next seven years the property was vigorously prospected, work being chiefly directed to the Red Rose shear on the south slope where some encouraging assays in gold, silver, and copper were obtained. Four small adits were driven between elevations of 5,150 and

* By A. Sutherland Brown.



Rocher Déboulé Mountain and Hagwilget bridge.



Brian Boru Peak, east of Skeena Crossing.

5,696 feet. Only minor attention was paid to the large quartz vein which occurred in the shear at the top of the ridge and in which tungsten-bearing minerals were found in 1923. In 1939 The Consolidated Mining and Smelting Company optioned the claims from Mrs. B. Sargent, of New Hazelton, and the following summer started a drilling programme on the quartz vein. The vein was subsequently developed by adits from the western slope and a 75-ton-per-day mill constructed on Red Rose Creek. The mill was in operation from early in 1942 until November, 1943. The property was inactive until 1951, when Western Tungsten Copper Mines Limited (then Western Uranium Cobalt Mines Limited) leased the property from The Consolidated Mining and Smelting Company of Canada, Limited. A new mill was built which started operating at the end of the year. In the mine the 800 level was driven to the vein, and later an inclined shaft sunk in the vein to the 1100 level. Mill capacity was increased to 140 tons per day. On March 13th, 1954, a fire at the upper tram terminal and ore-bin caused the mill to be shut down for three months. On December 15th, 1954, the mine was shut down; according to the management, difficulty was experienced in producing a concentrate satisfactory to the General Services Administration, to which the output was contracted.

Production from 1942 to the end of 1954 was as follows:—

Year	Tons	Gold	Silver	Copper	WO_3	
					Conc.	Units
		Oz.	Oz.	Lb.	Tons	
1942	8,066	.....	.....	.....	132	8,760
1943	17,884	.....	.....	.....	469	25,303
1952	21,137	.....	.....	.....	276	20,359
1953	37,446	291	462	21,285	377	30,871
1954	29,642	272	361	38,423	444	25,252
Totals	114,175	563	823	59,708	1,698	110,545

In 1954 the mill heads averaged 1.43 per cent WO_3 and the tails 0.48 per cent WO_3.

The mine has twelve levels and sublevels, and most of the workings are in the plane of the vein. The level interval is not constant but between the lower four levels is 87 feet (100 feet in the plane of the vein). Access is provided by four adits—the 800 (elevation 5,659 feet), 600 (5,920 feet), 300 (6,133 feet), and 200 levels (6,237 feet). The 600 level is the main haulage, and from it the ore is transported to the mill by aerial tram. From this level an inclined shaft extends in the vein to the lowest level (1100). The four old adits on the Red Rose shear on the south slope are caved at the portals.

Mine development during 1954 was as follows:—

Drifting	1,246 feet
Subdrifting	190 feet
Raising	562 feet
Shaft sinking	280 feet
Total	2,278 feet

In 1954 the shaft was completed, and drifting had progressed on the 1100 level as shown on Figure 4. An average number of eighty-six men was employed.

Regional Geology.—The geology of part of the Rocher Déboulé Mountains surrounding the Red Rose mine is shown by Figure 2 and the table of formations.

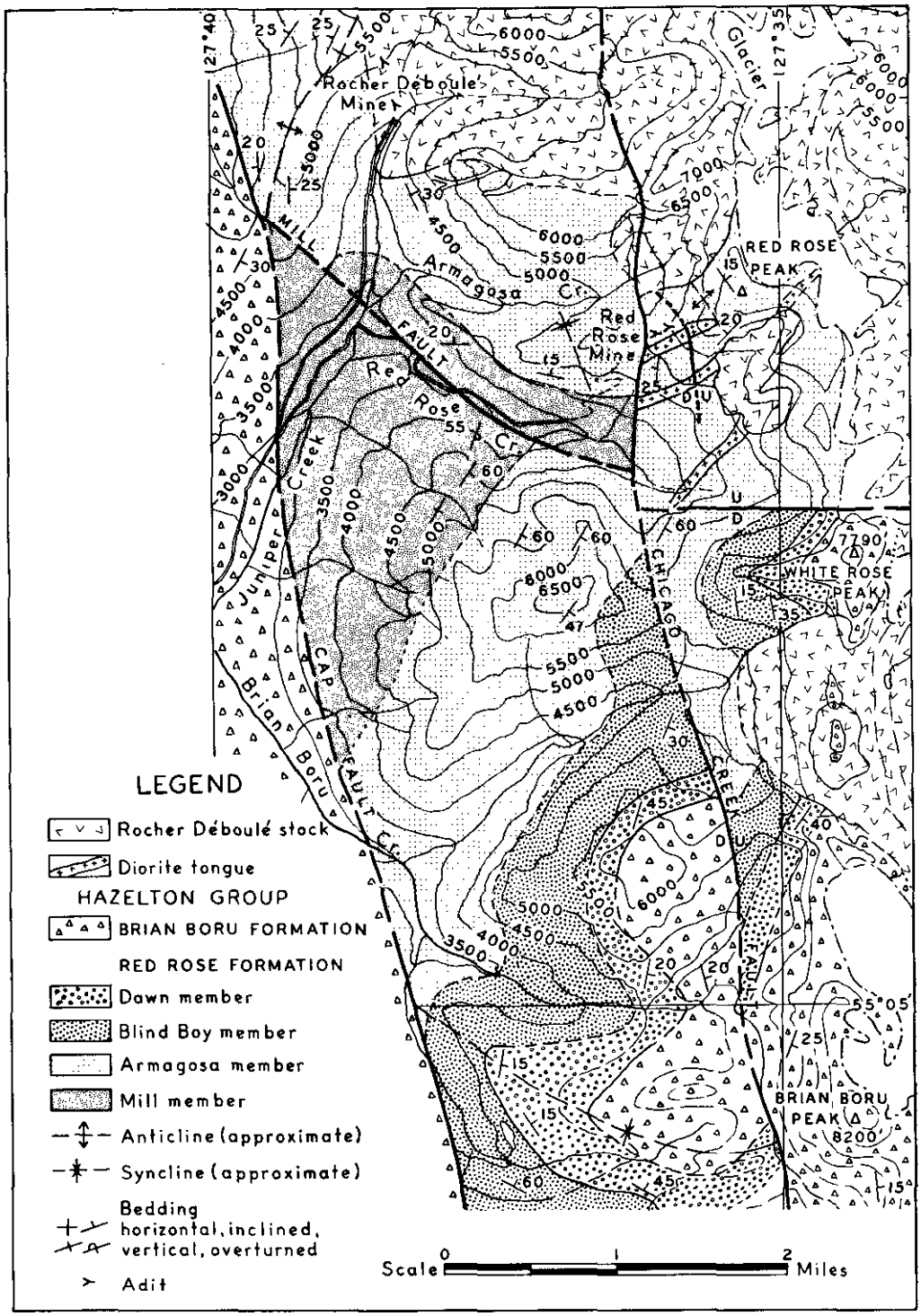


Figure 2. Geology of part of Rocher Déboulé Mountains.

TABLE OF FORMATIONS

Era	Period or Epoch	Formation and Thickness		Lithology
Mesozoic	Upper Cretaceous or later.	Felsite dykes.		
		Intrusive contact.		
		Rocher Déboulé stock.		Granodiorite.
		Intrusive contact.		
		Diorite tongues.		Diorite, porphyritic diorite.
	Intrusive contact.			
	Lower Cretaceous?	Hazelton group.	Brian Boru formation, 4,000+ feet.	Andesitic and dacitic breccias, flows, tuffs, and related sills in Red Rose formation.
			Conformable contact.	
	Upper Jurassic and Lower Cretaceous.		Red Rose formation, 7,500+ feet.	Dawn member.	Argillite, greywacke, conglomerate, and hornfelsic equivalents.
				Blind Boy member.	
				Armagosa member.	
				Mill member.	
			Not observed in contact.		
	Middle or Upper Jurassic.		John Brown formation.		Andesitic, dacitic, and rhyolitic breccias, flows, and tuffs.

The oldest rocks are part of the Hazelton group, which in the Rocher Déboulé Mountains was divided by Armstrong (1944) into three divisions. These were not named by him but are named in this report. The oldest, the John Brown formation, is not known to occur in the area of Figure 2. The Red Rose formation is greater than 7,500 feet thick and is divided into four members: Mill member, non-marine greywacke and siltstone, 1,500+ feet; Armagosa member, marine argillite and siltstone, 4,000 feet; Blind Boy member, non-marine greywacke, argillite, and shale, 1,500 feet; Dawn member, conglomerate and greywacke, 600+ feet. The Brian Boru formation consists of more than 4,000 feet of porphyritic andesite and dacite breccias, flows, and tuffs and related sills and dykes in the Red Rose formation; marine fossils of Late Jurassic or Early Cretaceous age have been found in tuffs near the base of this member. Rocks of the Hazelton group are cut by a succession of minor and major intrusions. First porphyritic andesite sills and dykes associated with the Brian Boru episode of volcanism were emplaced. These were followed by fine-grained diorite tongues, then dykes of feldspar porphyry, and then the major intrusion of the Rocher Déboulé granodiorite stock. This stock truncates fold structures in the older rocks without causing additional deformation. It has altered the otherwise poorly lithified rock of the Red Rose formation to hornfels in an aureole 1 to 2 miles wide. Although the flanks of the stock are steep, its top is relatively flat. Much later than the emplacement of the stock, minor felsite dykes were intruded.

Fold structures are in general large-scale features with few or no dragfolds and no axial plane cleavage. Bedding may be steep or overturned, but the rocks do not appear to be very closely folded. There is a lack of relation between folds in adjacent fault blocks, and some folds may be minor readjustments to major block faulting. There appear to be two major ages of faulting—one prior to the major intrusion, represented by the Mill fault,

and one later than the intrusion, represented by the Chicago Creek fault and two other northerly striking faults. Bedding attitudes in the north block of the Mill fault are relatively gentle and commonly are less than 30 degrees. This block seems to be tilted northward so that the gentle folds in it trend and plunge northward. Attitudes in the south block of the Mill fault are steeper and the block appears to be tilted moderately to the east.

The later faults trend approximately north 10 degrees east and are major features. The last movement on them post-dates the emplacement of the Rocher Déboulé stock, but because displacement in the granodiorite apparently differs greatly from that in the stratified rocks, it is possible that the faults are in part older than emplacement of the stock. The Chicago Creek and Cap faults are shown on Figure 2, and a third fault occurs at an equivalent interval to the east. The Chicago Creek fault dips steeply west and appears to be a normal fault with a dip slip of the order of 2,000 to 4,000 feet.

Local Geology.—The geology in the vicinity of the mine is shown in Figure 3. The oldest rocks are part of the Armagosa member of the Red Rose formation. They are purplish-brown hornfels (altered siltstones) composed of varying proportions of detrital quartz and feldspar with much porphyroblastic biotite. Commonly detrital quartz and feldspar make up 60 to 80 per cent of the rocks (quartz more abundant than feldspar), and biotite most of the remainder, with a few per cent of iron ores and rare detrital zircon grains. The detrital grains are all silt size. Adjacent to the Red Rose vein some quartz-tourmaline veinlets ramify through the rock.

The hornfels is cut by a series of intrusive rocks in the following sequence:—

1. Porphyritic andesite.
2 (*a* and *b*). Diorite and porphyritic diorite.
3. Feldspar porphyry.
4. Granodiorite.
5. Felsite.

Modes of these rocks are as follows:—

	1	2*a*	2*b*	3	4	5
Quartz	3	....	1	3	20	....
Calcite	..	..	....	....	....	5
Orthoclase	....	....	....	70	23	5
Plagioclase	75	62	74		45	55
Hornblende	2	10	18	5	7	15
Biotite	19	12	5	20	3	4
Chlorite	....	15	....	..	....	15
Iron ores	0.5	2	2	1	2	1

1. The porphyritic andesite is a dark-grey aphanitic to fine-grained rock with approximately 40 per cent light-grey tabular andesine phenocrysts. The phenocrysts average 3 by 3 by 0.8 millimetres and are not uncommonly gathered in groups. Original mafic phenocrysts form 2 to 5 per cent of the rock and are normally altered to a felted mass of small biotite crystals. The matrix is composed of andesine-oligoclase and biotite with minor quartz and iron ores.

2*a*. The diorite is a fine-grained dark greenish-grey rock of hypidiomorphic texture, but with some slightly larger than normal euhedral plagioclase grains. It is composed of 65 per cent zoned plagioclase (An_{42-26}) and 30 per cent formerly uniform pale-green hornblende and now a patchy mosaic of amphibole and biotite. Accessory minerals include quartz, iron ores, and sphene. The average size of plagioclase laths is 1.2 by 1.2 by 0.4 millimetres and of the hornblende areas 0.8 millimetre in diameter. The diorite and porphyritic diorite are distinct types that seem to be associated in time and space.

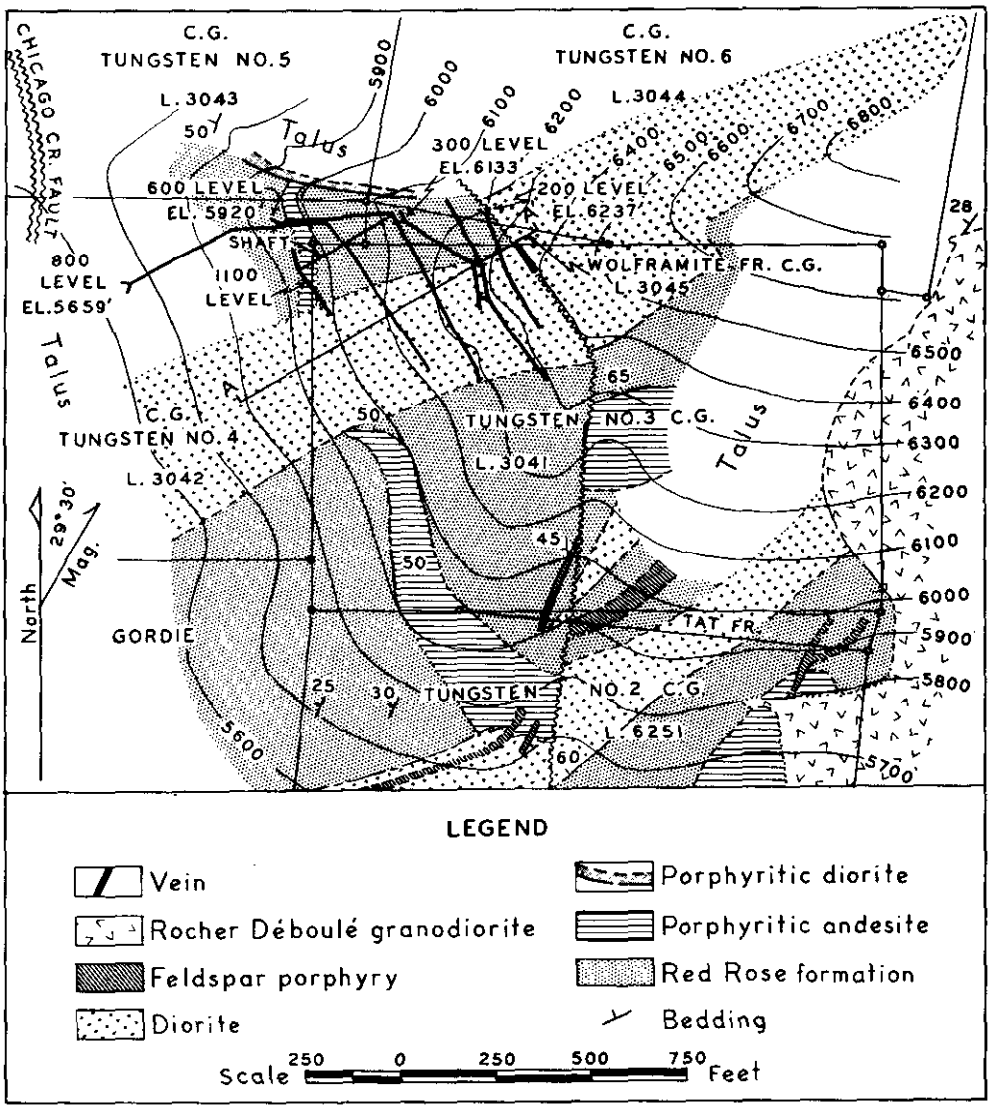


Figure 3. Geology in the vicinity of the Red Rose mine.

2*b*. The porphyritic diorite is a medium-grained, middle-grey porphyritic rock with a fine-grained matrix. In contrast to the diorite it weathers light grey. Phenocrysts form 50 per cent of the rock and are on the average 2 by 1.2 millimetres in section, whereas the crystals of the matrix are on the average about 0.7 by 0.3 millimetre in section. Plagioclase phenocrysts (An_{60-50}) form 40 per cent of the rock and many are deformed. Hornblende phenocrysts form 10 per cent of the rock, are fresh, and commonly twinned. The matrix is composed of feldspar hornblende, biotite, quartz, and iron ores.

3. The feldspar porphyry is a dark purplish-grey rock composed of 20 to 25 per cent tabular andesine phenocrysts and about 5 per cent mafic phenocrysts. The mafic phenocrysts are now a felted mass of biotite but may originally have been hornblende. The andesine phenocrysts are on the average approximately 2.5 by 1 millimetres in section, the biotite masses about 1 by ½ millimetre, and the matrix crystals 0.1 millimetre or less in long dimension. The matrix is composed of feldspar laths, biotite, and minor quartz and iron ores. The matrix grains and some of the phenocrysts are commonly

oriented in a flow structure. The feldspar porphyry is not always distinguishable from the porphyritic andesite in a small outcrop, but the former is younger, commonly occurs in small dykes, has fewer phenocrysts, and these are more angular and rarely grouped.

4. The Rocher Déboulé stock is composed dominantly of a medium-grained light-grey hornblende-biotite granodiorite. This consists essentially of quartz, andesine, and orthoclase with biotite and hornblende and accessory zircon, apatite, sphene, and iron ores. The grain size averages about 1.5 millimetres in diameter.

5. The felsite is a middle greenish-grey fine-grained rock of somewhat conchoidal fracture. It is composed of a felted mass of oligoclase and hornblende laths with interstices filled with chlorite, biotite, quartz, and iron ore. The feldspar and hornblende laths are on the average approximately 0.3 millimetre long and 0.07 millimetre in diameter. Calcite occurs as a secondary mineral in dispersed large grains. Oligoclase forms about 55 per cent of the rock, hornblende 15 per cent, and matrix and secondary material the remainder.

The intrusion of the Rocher Déboulé granodiorite stock has thermally metamorphosed all older rocks. The metamorphism has resulted in a general growth of brown biotite, not only in the matrices of the older rocks, but also in phenocrysts of hornblende and even along the cleavage planes of plagioclase. The felsite dykes and the vein are younger than the granodiorite and are unaffected.

Structural Geology.—Bedding in the hornfels is obscure but can be detected on careful, detailed search. In common with the remainder of the north block of the Mill fault, most dips are low, and individual folds plunge gently northward. The mine is on the west limb of one of a series of gently plunging anticlines. At the mine the beds strike about north 15 degrees east and dip 30 degrees to the west, except near the Chicago Creek fault, where the dip is as steep as 50 degrees west. To the east of the mine the bedding swings to a strike of north 45 degrees east and a dip of 20 degrees northwest. At Red Rose Peak the bedding strikes north 30 degrees west and dips 15 degrees northeast. The structure of the sedimentary rocks seems unimportant as an ore control, but bedding may have controlled the position of the footwall of the mine diorite tongue.

The porphyritic andesite forms three main bodies in the vicinity of the mine—one west and two east of the Red Rose shear. It is not unlikely that the northern body of the east fault block is the same as the body in the west block. All the bodies are dykes which cut the hornfels, and in turn are cut by diorite, porphyritic diorite, feldspar porphyry, and granodiorite. The porphyritic andesite dykes resemble many of the rocks of the Brian Boru formation and seem to be related to them in age and origin.

Diorite forms two major and one minor body in the vicinity of the mine. The major ones are about 300 to 400 feet wide and trend north 65 degrees east. The shape of the northernmost body (the mine diorite) is actually tongue-like, with a footwall dipping westward at 38 degrees and sides raking northward at 75 to 80 degrees (*see* Figs. 3 and 4). The diorite tongues cut the porphyritic andesite and are cut by feldspar porphyry, granodiorite, and felsite. The precise relation to the porphyritic diorite is not known.

The porphyritic diorite is mineralogically different from the mine diorite, and although adjacent to the mine diorite in the underground workings, it forms a discrete dyke at the surface. In the mine the contact with the diorite appears to be gradational over a short distance. The body is more complex in form than the diorite and has many digitations.

The feldspar porphyry occurs as many small dykes, commonly 15 feet wide or less. These dykes are younger than the diorite and are cut by the granodiorite, but they appear to coarsen toward a stock. Possibly they are related to the granodiorite in age and origin although mineralogically they are quite distinct.

The granodiorite occurs in a window in the cirque southeast of the mine and also in the cirque at the head of Armagosa Creek. The contact under Red Rose Peak between these exposures is a nearly plane surface that dips gently west at about 6,700 feet eleva-

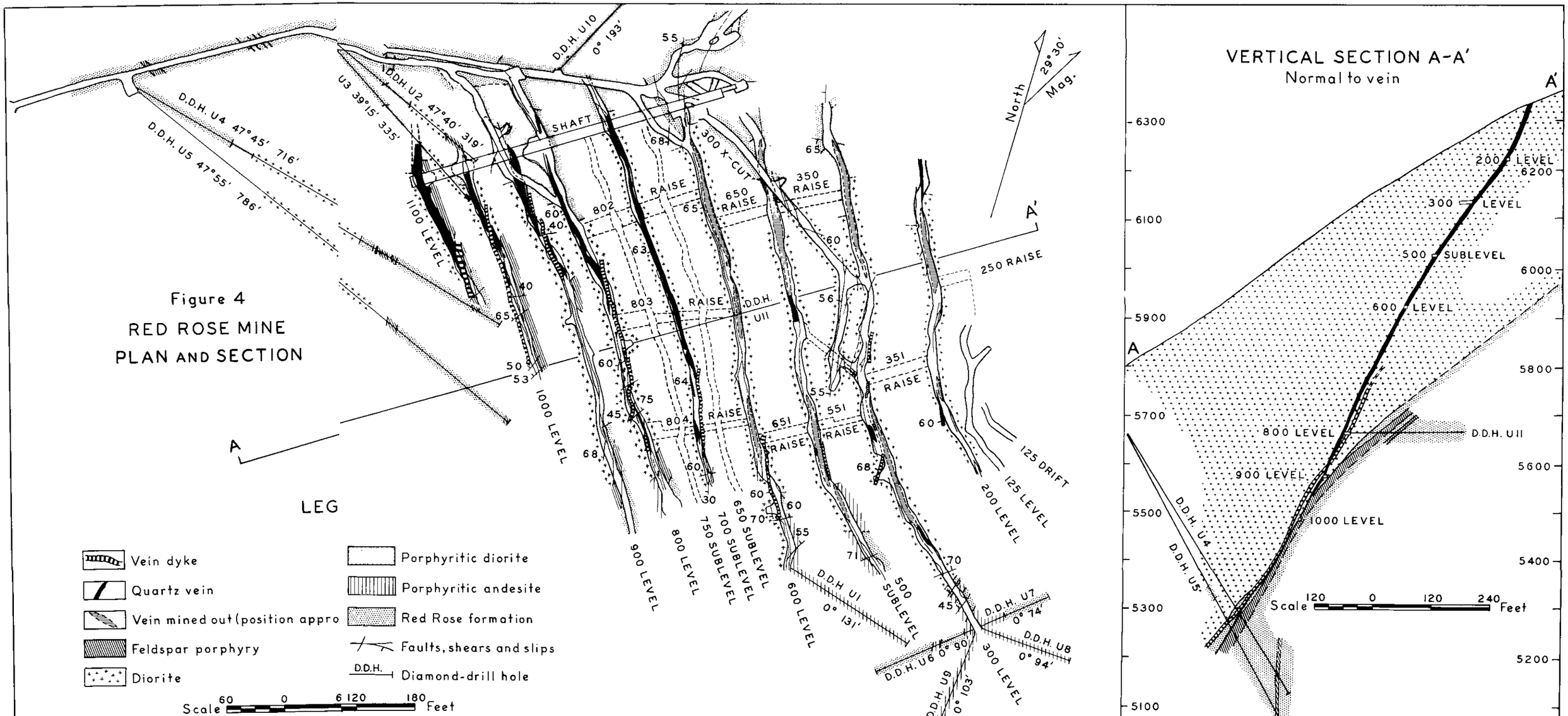
tion. Toward the mine from the peak the contact steepens sharply so that at the 800 level of the mine (5,660 feet) it should be 400 to 500 feet east of the Red Rose shear and dipping more steeply in the same direction.

The felsite dykes are chiefly thin but extensive bodies. They are younger than the granodiorite or the Red Rose vein. One, the vein dyke, follows the Red Rose shear from the 300 to the 1100 level. It is commonly only 2 to 4 feet wide, but on the 1100 level is 7 to 8 feet wide. The vein dyke meets the footwall of the shear or vein in the north, follows it, cuts across to the hangingwall, and eventually passes into the hangingwall in the south. The dyke is not necessarily continuous, but on any one level it may pinch out and begin again in echelon.

The Red Rose shear strikes north 30 to 40 degrees west and dips 60 to 65 degrees southwest. It is well defined in the diorite tongue, but in the hornfels and porphyries it ramifies into a group of small tight fractures. The shear cannot be traced continuously on the surface from the vein outcrop to the south slope, but it seems reasonably certain that the same zone is represented if not the same actual shear. The movement on the shear is normal. Stevenson (1947, p. 452) states that the hangingwall has moved 50 feet down and 150 feet southwest (on the basis of offset contacts and slickensides). Possibly the normal component is larger than he estimated. Most slickensides observed by the writer raked 75 to 80 degrees to the northwest and not at an angle to the south as reported by Stevenson. If the two porphyritic andesite dykes between the diorite tongues on opposite sides of the shear are equivalent, the movement would have to be of the order of 300 to 400 feet. Such movement would bring a wide section of the diorite-porphyritic diorite composite body to the surface on the footwall, and this is the case. The precise relation between the shear and the Chicago Creek fault is unknown, but the shear is probably tributary to the fault. The general movement on the Red Rose shear, the Chicago Creek fault, and the granodiorite contact has in each case been east side up.

The Red Rose vein fills the shear for 200 to 400 feet along strike, at least 1,100 feet down dip, and for a width of 4 to 8 feet. Variation in width occurs in a short distance; e.g., on the 900 level from 9 feet to nothing within 40 feet. The vein is massive and unsheared but contains many small drusy cavities largely filled by euhedral quartz. The vein is formed largely of quartz with lesser amounts of feldspar, biotite, hornblende, ankerite, tourmaline, apatite, scheelite, ferberite, and chalcopyrite. The vein has a pegmatitic appearance because of the many euhedral crystals of quartz, scheelite, ferberite, ankerite, and hornblende. The euhedral nature of many crystals is the result of vug-filling, but of other crystals the result of replacement. In detail the quantity of scheelite and ferberite varies widely, but in general is fairly uniform. Scheelite is the main ore mineral, and on the average constitutes about 1½ per cent of the vein. Some of the scheelite is a light-green colour, but most is buff to cream coloured. All fluoresces a bluish-white. The green scheelite may be coloured by a somewhat larger than normal content of copper (0.1 to 1 per cent). Ferberite is a minor component compared to scheelite, but magnetic rejects produced by the mill during 1954 amounted to 97 tons containing 31.4 per cent WO_3, as compared to 272 tons of high-grade (scheelite) concentrate containing 75.5 per cent WO_3. The magnetic rejects are distinctly radioactive, probably owing to a small content of uraninite. The Red Rose vein becomes richer in chalcopyrite with depth and on the lower levels contains some 2 per cent of that mineral. The chalcopyrite occurs particularly in the hangingwall shear in some fairly extensive lenses.

There are two separate subparallel orebodies that rake steeply northwest, as does the barren septum between them. This septum is narrowest on the 700 sublevel. The shear strikes more northerly in the barren zone and contains no vein filling. The vein of the northwest orebody is as wide, long, and well mineralized on the 1100 level as anywhere in the mine, but the southeast orebody becomes thin and discontinuous below


D.D.H. U10 0° 193'
D.D.H. U2 47°40' 319'
U3 39°15' 335'
D.D.H. U4 47°45' 716'
D.D.H. U5 47°55' 786'
SHAFT
1100 LEVEL
1000 LEVEL
900 LEVEL
800 LEVEL
750 SUBLEVEL
700 SUBLEVEL
650 SUBLEVEL
600 LEVEL
500 SUBLEVEL
300 LEVEL
200 LEVEL
125 LEVEL
300 X-CUT
650 RAISE
350 RAISE
250 RAISE
351 RAISE
551 RAISE
651 RAISE
802 RAISE
803 RAISE
804 RAISE
D.D.H. U11
125 DRIFT
D.D.H. U1 0° 131'
D.D.H. U6 0° 90'
D.D.H. U7 0° 74'
D.D.H. U8 0° 94'
D.D.H. U9 0° 103'
North 29°30' Mag.
A
A'
Figure 4
RED ROSE MINE
PLAN AND SECTION
LEG
Vein dyke
Quartz vein
Vein mined out (position appro
Feldspar porphyry
Diorite
Porphyritic diorite
Porphyritic andesite
Red Rose formation
Faults, shears and slips
D.D.H. Diamond-drill hole
Scale 60 0 6 120 180 Feet
VERTICAL SECTION A-A'
Normal to vein
6300
6200
6100
6000
5900
5800
5700
5600
5500
5400
5300
5200
5100
200 LEVEL
300 LEVEL
500 SUBLEVEL
600 LEVEL
800 LEVEL
900 LEVEL
1000 LEVEL
D.D.H. U11
D.D.H. U4
D.D.H. U5
Scale 120 0 120 240 Feet

the 800 level. The orebodies are entirely within the mine diorite and adjacent porphyritic diorite. The footwall of the mine diorite dips at a shallower angle than the Red Rose shear, and at or shortly below the 1100 level the shear must pass entirely into the hornfels unless the porphyritic diorite continues vertically rather than dipping to the west.

The control that appears to limit the vein, and consequently the ore, to the diorite and porphyritic diorite is largely structural, although Stevenson (1947, p. 455) suggests it is also chemical because a high-calcium rock such as diorite may be needed to precipitate the scheelite. The structural control is more obvious. The shear degenerates into a group of ramifying slips in other rocks but in general is strong and cleanly cut in the massive diorite. Furthermore, the attitude of the shear determines whether it is vein-filled or not. Where the shear strikes north 35 to 40 degrees west in the diorite it is vein-filled, but where it strikes more northerly it is barren. In the hornfels the shear swings to a more northerly strike. Undoubtedly the northerly striking part of the shear was under compression, whereas the northwesterly striking part was more or less open. The vuggy nature of the vein confirms the existence of openings. The structure of the hornfels exerted a control on the footwall of the diorite tongue and consequently on the orebodies.

No estimate of the present status of ore reserve can be made.

Possibilities of developing additional ore in the Red Rose shear cannot be ignored in spite of the fact that geometric considerations superficially suggest that the present orebodies are completely developed and nearly exhausted above the 1100 level. In actual fact, nothing is known of the downward continuation of the northern orebody. Two deep diamond-drill holes (U_4 and U_5) from the 800 level crosscut were driven well south of the possible continuation of this orebody. On the 1100 level this orebody is as wide as it is anywhere in the mine and more extensive than on the 1000 level. The porphyritic diorite may continue to depth even though the mine diorite appears to be passing away from the shear. In addition, the shear has not been explored along its continuation to the south, particularly where it intersects the other major diorite body.

[References: J. J. O'Neill (1910), *Geol. Surv., Canada,* Mem. 110. E. D. Kindle (1940), *Geol. Surv., Canada,* Mem. 223. J. S. Stevenson (1943), *B.C. Dept. of Mines,* Bull. 10, revised. J. S. Stevenson (1947), *Ec. Geol.,* Vol. 42, pp. 433–464. J. E. Armstrong (1944), *Geol. Surv., Canada,* Paper 44-24. *Minister of Mines, B.C.,* Ann. Rept., 1914, p. 190; 1916, p. 113; 1926, p. 126; 1951, pp. 111–112; 1952, pp. 92–93; 1953, p. 93.]

SMITHERS*

Gold-Silver-Lead-Zinc

Duthie, Mamie, Sil-Van (Sil-Van Consolidated Mining & Milling Company Ltd.).—(54° 127° N.E.) Company office, 602 West Hastings Street, Vancouver. A. C. Ritchie, general superintendent. Capital: 3,500,000 shares, no par value. This property is on Hudson Bay Mountain, 15 miles by road from Smithers. Operations were suspended on April 16th, 1954, due to unfavourable prices of lead and zinc. From January 1st to that date 14,694 tons of ore was treated and 31 feet of drifting and crosscutting were done. The average number of men employed was thirty-eight.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1948, pp. 82–85.]

WHITESAIL LAKE*

93E-19

Gold-Silver-Tungsten

Harrison (Deer Horn Mines Limited)

(53° 127° S.E.) Company office, 44 King Street, Toronto; mine office, Burns Lake. W. Tattrie, manager. This property, on the north side of Lindquist Lake, can be reached by air from Burns Lake or by boat from Wistaria on Ootsa Lake. Between June 5th and December 31st a new landing was built at the west end of

* By J. W. Patterson.

Whitesail Lake, the 5½ miles of road between Whitesail Lake and the mine-site was completed, and living accommodation for fifteen men, an office, an assay laboratory, a power-house, a mine shop, and a powder magazine were built at the mine-site. An adit at an elevation of 4,260 feet above sea-level has been extended for 360 feet. An average of eleven men was employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1945, p. 71.]

OMINECA*

Gold-Silver

Lustdust (Bralorne Mines Limited) (55° 125° N.E.) This group of claims is on Kwanika Creek north of Tsayta Lake. A road suitable only for jeep and truck travel connects it with Germansen Lake. Seven men supervised by E. Bronlund drilled nine diamond-drill holes totalling 1,791 feet. Results of the diamond drilling were discouraging and exploration was stopped in September.

Mercury

Takla Mercury Mine (Bralorne Mines Limited).—(55° 125° N.E.) This property, from which 556 tons of cinnibar ore was produced in 1943, is near the headwaters of Silver Creek. Access from Germansen Lake is by road suitable only for jeep or truck travel. Six men supervised by E. Bronlund diamond-drilled nine holes totalling 1,716 feet.

Niobium

Lonnie† (55° 124° N.E.) In the autumn of 1953 niobium was determined by spectrographic analyses made in the laboratory of the Department of Mines on samples sent in by E. A. Floyd, of Manson Creek, and J. C. Kay, of Victoria. The material was obtained by them from an outcrop on the Remmington trail which runs between Manson Creek and Finlay Forks. Subsequently the presence of uranium was discovered. Assays of more than half of 1 per cent niobium led to the locating of the Lonnie group of eight claims by E. A. Floyd, of Manson Creek; C. S. Powney, of Fort St. James; A. Almond, of Vanderhoof; and J. C. Kay, of Victoria, in June, 1954. The claims were bought by Northwestern Explorations, Limited, in December, 1954.

The claims are on the southeast side of Granite Creek about 1½ miles from the Fort St. James–Manson Creek road. The claims are two abreast in a line running southeastward from Granite Creek.

A band of carbonate rocks crosses the Remmington trail at an elevation of about 4,000 feet and continues northwestward downhill to Granite Creek about 300 feet below. The main showings lie just east of the trail and extend for a hundred feet or more southeastward, and other showings have been found discontinuously down to creek level to the northwest.

The niobium and uranium minerals are within a band of carbonate rocks which is flanked on each side by hornblende gneiss of the Wolverine complex. The rocks strike about north 70 degrees west and dip steeply to the south. The margins of the band are not clearly exposed, and a width of about 50 feet is indicated in two strippings east of the trail.

The highest niobium assays were obtained from specimens of zircon-rich rock along the north side of the band. The margins of this higher-grade material are not exposed, but a width of 4 to 5 feet may be present. The average assay of five specimens taken from an upper stripping was 0.60 per cent niobium pentoxide. One specimen from the

* By J. W. Patterson.
† By Stuart S. Holland.

trench just east of the trail assayed 0.47 per cent niobium pentoxide, and a sample from a small pit just west of the trail assayed 0.79 per cent niobium pentoxide. The average assay of two specimens taken at creek level was 0.09 per cent niobium pentoxide.

X-ray work by Professor R. M. Thompson, of the University of British Columbia, resulted in the identification of ilmenorutile as well as columbite and ilmenite. These black minerals are finely disseminated through the zircon-rich band, and an electromagnetic separation of the minerals resulted in two concentrates, the first of which assayed 44.4 per cent niobium, 2.4 per cent titanium, 14.5 per cent iron, and less than 0.3 per cent vanadium; the second concentrate assayed 10.9 per cent niobium, 43.0 per cent titanium, 4.2 per cent iron, and 0.9 per cent vanadium. The first concentrate is inferred to be largely columbite and the second largely ilmenorutile.

Other rocks in the main carbonate band are faintly radioactive, and X-ray work by Professor Thompson has determined the presence of uranian pyrochlore.

CARIBOO*

WELLS-BARKERVILLE (53° 121° S.W.)

Gold

The Cariboo Gold Quartz Mining Company Limited

Company office, 1007 Royal Bank Building, Vancouver; mine office, Wells. W. B. Burnett, president; A. Shaak, general manager; M. Guiguet, general superintendent; F. E. Rutquist, mill superintendent. Capital: 2,000,000 shares, $1 par value. The Cariboo Gold Quartz mine is half a mile south of the town of Wells, which is 51 miles by road from Quesnel on the Pacific Great Eastern Railway.

On August 15th this company purchased and commenced operating Island Mountain mine, which was renamed the Aurum mine. The purchase price for the mine and all underground equipment was $300,000. The ore now produced at the Aurum mine is hauled by truck to the Cariboo Gold Quartz mill. In addition to providing ore from the Island Mountain mine, this purchase permits the investigation and mining of ore occurrences which are on Cariboo Gold Quartz property but are inaccessible from the present workings.

Development work comprised 4,455 feet of drifting, 972 feet of crosscutting, 1,183 feet of raising, 1,171 feet of box-holes and subdrifts, and 9,298 feet of diamond drilling in seventy-four holes. No major exploration was undertaken, and the development work was done to investigate and provide access on the different levels to the various vein zones of which each usually contains several parallel veins.

The chief new ore developments were the extension of rich replacement ore in 19-172R stope, the development of quartz ore in 19-185T and 21-176 stopes in the Cariboo Gold Quartz mine, and the exploration of ore occurrences in the 1000-1E block of the Aurum mine. This block is near the East fault at the former boundary between the two mines.

A total of 86,751 tons of ore was milled, with gold recovery by amalgamation and cyanidation.

The average number of men employed was 190, of which 120 were employed underground.

Island Mountain Mines Company Limited

Company office, 744 West Hastings Street, Vancouver; mine office, Wells. F. W. Guernsey, president; J. A. Pike, mine manager; G. G. Sullivan, general superintendent; J. I. Stone, mill superintendent. Capital: 1,100,000 shares, 50 cents par value. This company, a subsidiary of Newmont Mining Corporation of New York, owned claims on the south and southeast slopes of Island Mountain and operated Island Mountain mine immediately west of Wells. The claims are adjoined to the south,

* By J. E. Merrett.

east, and north by holdings of The Cariboo Gold Quartz Mining Company Limited. Development work consisted of 240 feet of raising, 1,515 feet of drifting and crosscutting, and 6,085 feet of diamond drilling. This work was directed chiefly to the exploration of a new ore zone known as the 1000-1E block located near the East fault close to the Island Mountain-Cariboo Gold Quartz boundary.

A total of 30,584 tons of ore was milled between January 1st and August 15th, at which date the mine was sold to The Cariboo Gold Quartz Mining Company Limited. The ore was mined by cut-and-fill, shrinkage, and longwall advance methods. The major portion of the ore was obtained between the 750 and 1300 levels.

The average number of men employed was 101, of which sixty-five were employed underground.

QUESNEL*

YANKS PEAK (52° 121° N.E.)

Gold

Jim

Lieut.-Col. F. H. M. Codville, of Duncan, employing two men, did 150 feet of crosscutting and 98 feet of drifting between June 25th and October 14th on the Jim group near Yanks Peak, about 11 miles by road from Keithley Creek P.O. The crosscutting was directed to intersect both the Main and Don veins. The latter vein was intersected and followed by a drift for 98 feet in an easterly direction. The Main vein had not been reached when it became necessary to suspend operations because of sub-zero temperatures.

A road 3½ miles in length was bulldozed from the Jim group to the top of Base Mountain, where it joins the old road to the Cariboo-Hudson mine. These roads were suitable only for four-wheel-drive vehicles.

CLINTON†

Gold

Porcupine Mountain

(51° 122° S.E.) Porcupine (Black Dome) Mountain is the highest peak (elevation 7,392 feet) between the Fraser River and Churn Creek. It is reached by 29 miles of road from the Churn Creek suspension bridge which spans the Fraser River about 1 mile to the north of the mouth of Churn Creek.

The gold-bearing quartz leads of Porcupine Mountain are described in detail in the 1948 Annual Report. In 1953 and 1954 certain of these veins were stripped and sampled by Empire Valley Gold Mines Ltd., which holds by record the following claims: Moosehorn, Saddle, Whiskey Jack, Pinion Pine, Electrum Fraction, Bonanza, Eldorado, Black Dome, Ptarmigan, and Sugar Bowl Fraction. W. E. Brett, director of the aforementioned company, is the recorded owner of the Turrett, Spud, and Ogden fractional claims. In 1954 Wilson Mining Corporation Limited investigated veins on the Black Dome No. 1 and No. 2 claims, owned by W. Schrader.

The writer visited Porcupine Mountain in September, 1954, with the intention of examining and sampling the veins. Because of an early snowfall, only a few samples were obtained.

Although overburden is generally not deep on the claims, outcrops are rather scarce, except on the higher slopes of Porcupine Mountain. The bedrock consists of greenish-grey to dark-greenish volcanic rock, much of which is highly porphyritic. These rocks bear no resemblance to the Tertiary volcanics that outcrop extensively in the Chilcotin area. The Porcupine Mountain volcanics are considered to be Mesozoic or older in age.

Attitudes in the volcanics are not easily obtainable, for most of the outcrops are jumbles of badly broken, frost-heaved rock.

* By J. E. Merrett.
† By W. R. Bacon.

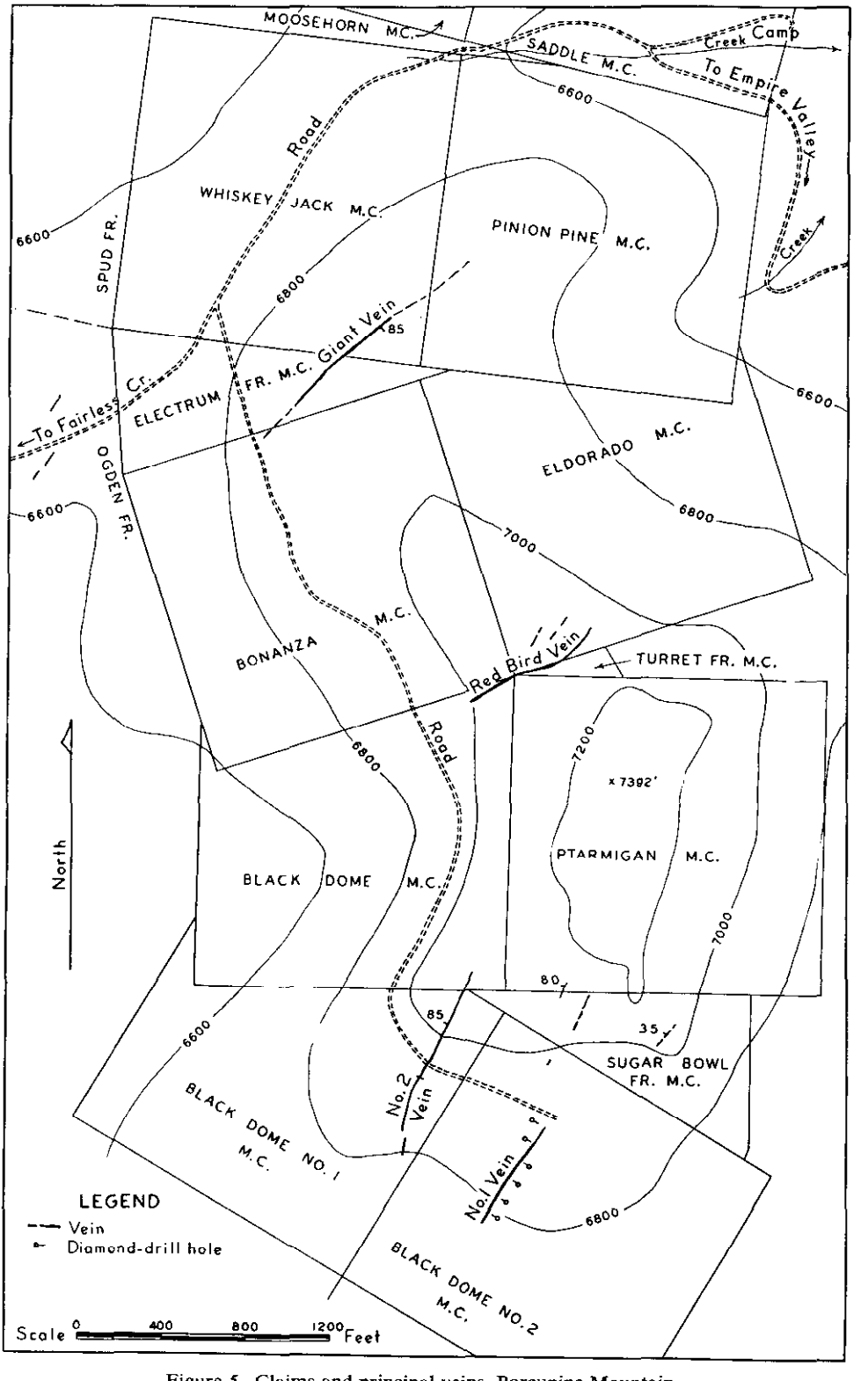


Figure 5. Claims and principal veins, Porcupine Mountain.

Numerous narrow northeasterly trending, steeply dipping quartz veins have been found on Porcupine Mountain. The more prominent of these are shown on Figure 5.

Druses are present in many of the veins, and amethystine quartz was noted in a few of these cavities. Some of the narrower fractures are filled with comb quartz in which the larger crystals are more than 2 inches in length. Red jasper is conspicuous in the Red Bird vein and locally elsewhere.

With the exception of a very minor amount of pyrite, the veins are barren of sulphides. Pyrite is also present in the wallrock, which generally exhibits a bleached appearance.

Gold occurs sporadically in the quartz veins, and here and there is sufficiently coarse to be detected with the unaided eye. Low gold assays have been obtained from sampling the altered wallrock.

Several of the veins have been traced on the surface for hundreds of feet (*see* Fig. 5). Empire Valley Gold Mines Ltd. has concentrated mainly on the Giant and Red Bird veins. A bulldozer cut, 1,170 feet long, has exposed bedrock along the strike of the Giant vein. Quartz vein material occurs over a length of 625 feet with an approximate average width of 4 feet; a more accurate figure for the width cannot be given as heavy rains caused sloughing of the overburden across parts of this vein. The northeastern 545 feet of the cut exposed a zone of fracturing in altered bleached volcanics. Transverse cuts to the southwest of the longitudinal cut, across the projected strike of the vein, encountered increasing depths of overburden but gave some evidence that the vein may persist in this direction. Six channel samples of the quartz returned low assays in gold, a fact which merely proves that parts of the Giant vein are subcommercial.

Numerous trenches have exposed the Red Bird vein over a strike length of 700 feet. This vein has an approximate average width of 3.5 feet. No samples were obtained from the Red Bird vein.

Wilson Mining Corporation Limited did some stripping and sampling of the No. 1 and No. 2 veins on the Black Dome No. 2 and No. 1 claims respectively. The No. 2 vein has been traced for a length of 960 feet and has a maximum width of 2 feet.

The No. 1 vein has been traced for 540 feet. According to information supplied by the company, their samples averaged 0.284 ounce of gold per ton and 1.8 ounces of silver per ton in a length of 375 feet across an average width of 8.2 feet. Six holes, totalling 783 feet in length, were diamond-drilled to test the vein beneath the outcrop.

LILLOOET*

Bridge River

Gold

Bralorne Mines Limited

(50° 122° N.W.) Company office, 555 Burrard Street, Vancouver; mine office, Bralorne. A. C. Taylor, president; M. M. O'Brien, vice-president and managing director; D. N. Matheson, general manager; C. M. Manning, mine superintendent; C. D. Musser, mill superintendent. Capital: 1,250,000 shares, no par value. The Bralorne mine is on Cadwallader Creek, a tributary of Bridge River, and is 51 miles by road from Shalalth on the Pacific Great Eastern Railway.

Development work comprised 4,556 feet of drifting, 3,480 feet of crosscutting, 672 feet of raising, 764 feet of shaft sinking, and 8,688 feet of diamond drilling in thirty-seven holes.

Drifting and crosscutting were concentrated on the following: Continuation of the Taylor (Bridge River) Mines crosscut; development of the 79 vein and its branches on the 2200 and 2600 levels; development of the 77 vein on the 2600, 2700, and 2800

* By J. E. Merrett, except as noted.

levels; and minor development of the 51, 53, 85, and 97 veins on the 1600, 2000, and 2600 levels.

The Taylor-Bridge crosscut was extended 2,230 feet to a total distance of 4,050 feet. The last 410 feet of crosscut is in the Taylor (Bridge River) Mines property. Lateral development from this crosscut included 79 feet of drifting on the 97 vein and 215 feet of drifting on the 02 vein. This latter vein was extensively developed in the King mine above. Work continues in both the crosscut and the 02 drift, in which some visible gold was seen in a narrow quartz vein.

During the sinking of the Queen shaft the 79 vein was intersected at the 2700 level station and was followed by the shaft for a distance of 60 feet. It is reported that in this section the vein had an average width of 3.6 feet and an assay value of 1.57 ounces gold per ton. Such grade and width prompted development of the vein on the 2000 and 2600 levels, but the results obtained from this work were not encouraging.

The three-compartment Queen shaft was sunk from the 2600 level to just below the 3100 level. Stations were cut at 150-foot intervals down to the 3100 level. The dumping installation was completed above the 2600 level, and a loading-pocket was installed below the 2800 level. Sinking continued on a single-shift basis, while development work on the 2700 and 2800 levels was done on the other two shifts. This development work consisted of drifting on the 77 and 79 veins, in which, it was reported, encouraging oreshoots were disclosed.

Diamond drilling was done to test known veins on horizons not otherwise developed and to test the walls of productive veins in search of parallel structures.

The average number of men employed was 406, of which 295 were employed underground.

Ore was mined by cut-and-fill and shrinkage methods. Totals of 179,019 tons of ore and 42,035 tons of waste were mined. The total ore milled was 181,494 tons.

Pioneer Gold Mines of B.C. Limited (50° 122° N.W.) Company office, 711 Yorkshire Building, 525 Seymour Street, Vancouver; mine office, Pioneer Mine. Victor Spencer, president; H. T. James, managing director; W. B. Montgomery, mine manager; H. A. Rose, general superintendent; J. C. Moore, mine superintendent; T. Bevister, mill superintendent. Capital: 2,500,000 shares, $1 par value. The Pioneer mine is on Cadwallader Creek, a tributary of Bridge River, and is about 54 miles by road from Shalalth on the Pacific Great Eastern Railway. The property adjoins that of Bralorne on the east.

Development work comprised 5,099 feet of drifting, 1,545 feet of crosscutting, 1,890 feet of raising, and 2,340 feet of diamond drilling in twenty-nine holes.

The main development programme was concentrated on the 27 vein below the 2500 level. On the 2600, 2700, 2800, and 2900 levels, which are separated by 125-foot vertical intervals, development drifts were driven, and some connecting raises were completed in order to improve ventilation. On the 2000 level an exploration crosscut to the east of No. 2 shaft intersected a strong quartz vein, designated the 92 vein, parallel in dip and strike to the main vein. Drifting exposed 495 feet of this vein.

The main ventilation system was put into operation in January and has successfully reduced the temperature in the lower workings of the mine.

The sand-preparation plant in the mill was put into operation, and sand was conveyed to the mine where several empty stopes were backfilled. During the last four months of the year all new stopes were operated as horizontal cut-and-sandfill.

Mechanical installations included the sandfill separation equipment in the mill and overspeed and overwind controls on No. 5 hoist. The surface domestic power-distribution system was overhauled to permit the use of heavy equipment such as electric stoves, water-heaters, etc.

Two six-roomed houses were built on the townsite on Cadwallader Creek between Pioneer and Pacific Eastern mines.

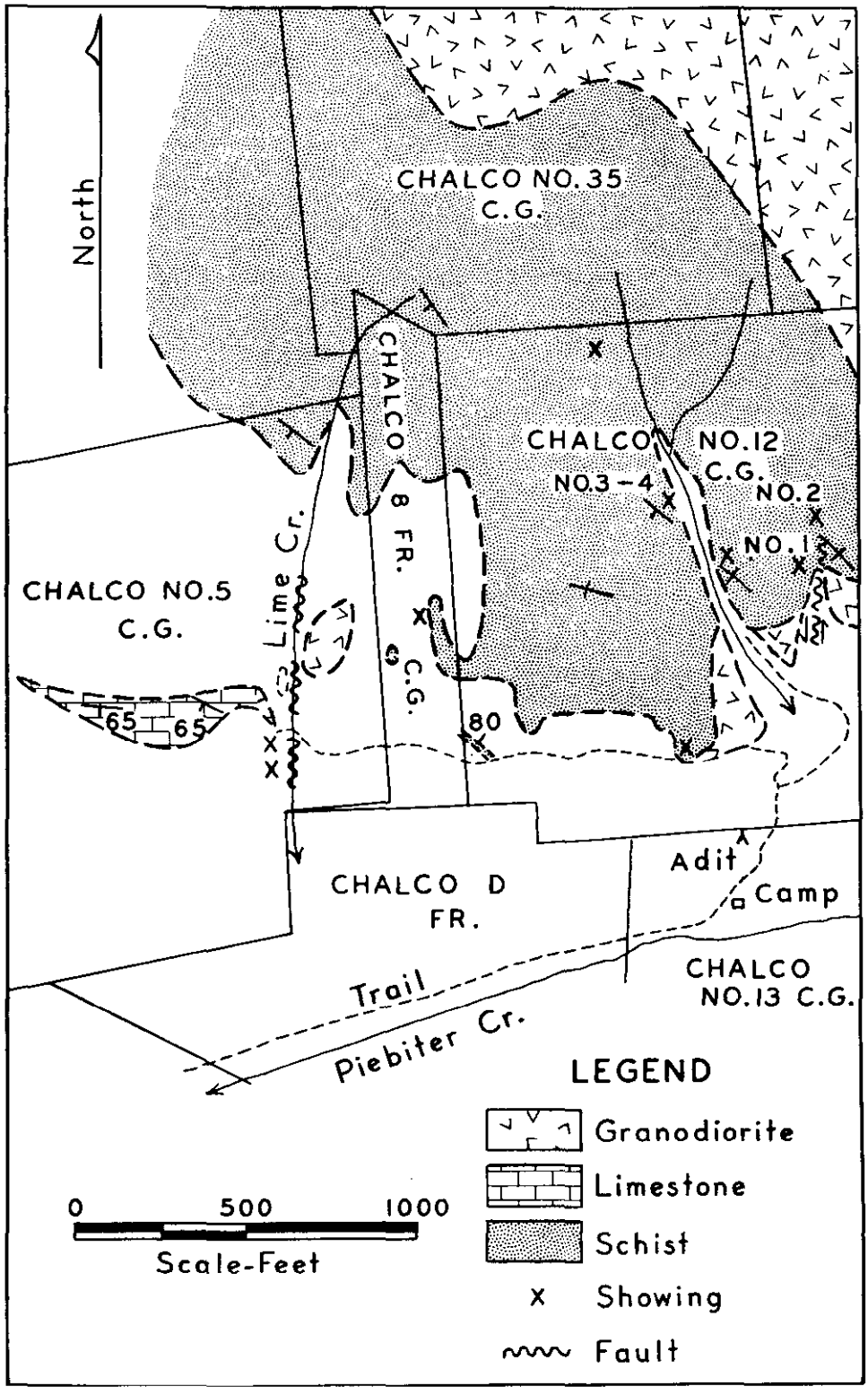


Figure 6. Western part of Chalco group.

The average number of men employed was 345, of which 186 were employed underground.

Production: Ore mined, 100,202 tons; waste mined, 19,194 tons; ore milled (after sorting), 85,501 tons.

Tungsten-Copper

Chalco* (50° 122° N.W.) The Chalco group is owned by Mrs. D. C. Noel, pioneer prospector of the Bridge River area. The property includes nine Crown-granted claims—namely, Chalco Nos. 5, 6, 9, 10, 12, 13, 35, Chalco 8 Fraction, and Chalco 39 Fraction—and four claims held by record—namely, Chalco Nos. 36, 37, 38, and Chalco D Fraction. The claims extend for a distance of more than 2 miles along the valley of Piebiter Creek.

The Chalco camp is reached by following the old road up Cadwallader Creek for a distance of 6 miles beyond the Pioneer mine, thence by 1 mile of good trail up the north bank of Piebiter Creek.

The property is described in the Annual Report for 1948. Since then Mrs. Noel has continued to prospect her claims, making further discoveries.

The showings are in metamorphosed sediments that are intruded by the Bendor batholith. The southern margin of the batholith trends approximately northwestward across the claims.

The metamorphosed sediments are mainly dark-grey schists composed of hornblende and intermediate plagioclase with minor amounts of biotite. Streaks and lenses of garnet-diopside rock, from a fraction of an inch to 10 or more feet in thickness, are common in the sedimentary assemblage. They are thought to be replacements of impure limy beds.

The prevailing attitude of the sediments is a strike of north 60 degrees west and a vertical to steeply southwestward dip.

The showings described in the 1948 Annual Report are on the Chalco No. 12 claim. Their localities are indicated on Figure 6 by the numbers used in the 1948 Report. Other mineralized exposures have been found on this claim and on Chalco No. 37 claim, south of Piebiter Creek and 1¼ miles upstream from the camp. All these showings are within a few hundred feet of the Bendor batholith.

Most of the showings consist of lenses of garnet-diopside rock sporadically mineralized with scheelite. The showings on Chalco No. 12 claim, particularly No. 2 showing, contain in addition chalcopyrite and pyrrhotite. These exposures of mineralized skarn appear to be rather limited in size.

A new showing on Chalco No. 5 claim (*see* Fig. 6) holds considerable interest. Ground-sluicing immediately west of Lime Creek has revealed a zone of garnetiferous rock in which some scheelite occurs. Thus far this zone has been found to persist southward from the eastern tip of the large limestone outcrop for a horizontal distance of 150 feet, with a width of from 12 to 17 feet. A sample taken immediately west of the eastern tip of the limestone assayed 0.41 per cent WO_3 across 12.5 feet. About 140 feet south of this point, a grab sample from the incompletely exposed zone assayed 1.71 per cent WO_3 and 0.55 per cent copper.

The southern extremity of this new zone is obscured by overburden. To the north its location with respect to the limestone is intriguing, particularly as it seems possible that the zone may turn west and parallel the limestone along its southern border. Here, too, the bedrock is covered by overburden.

* By W. R. Bacon.

Antimony-Silver-Lead

2J-104

Gray Rock (Gray Rock Mining Company Limited)*

(50° 122° N.W.) Company office, 355 Burrard Street, Vancouver. G. H. Clarke, president. Capital: 3,000,000 shares, no par value. The Gray Rock property, comprising sixteen claims, is on the south side of Bridge River, near the headwaters of Truax Creek. It is reached by 18 miles of truck-road from Gold Bridge. The surface showings are described in detail in the Annual Reports for 1936 and 1949.† In recent years attention has been confined to the No. 1 vein because it is the strongest, most promising structure on the property.

The No. 1 crosscut adit was started on August 1st, 1950, at an elevation of 6,800 feet and was driven 400 feet before work stopped for the winter. In 1951 the adit was driven an additional 12 feet to intersect the No. 1 vein, which was followed by a drift for 25 feet and further explored by four short diamond-drill holes. Engineers of Bralorne Mines Limited examined the property in 1951.

On March 31st, 1952, the Gray Rock Company made an agreement with Bralorne Mines Limited whereby development was to be undertaken by the latter company. The No. 2 crosscut adit was started in July at an elevation of 6,500 feet, and work in this adit was continuous until December. The No. 1 vein was intersected at 994 feet from the portal, and the adit was continued an additional 202 feet. A total length of 576 feet of drift was driven on the vein.

In 1953 an additional 241 feet of drift was driven on the No. 1 vein in the No. 2 adit. Two raises, 40 and 37 feet long, were driven on the vein above this level. Bralorne also did 959 feet of exploratory diamond drilling in the No. 2 adit.

The present report results from an examination made in August, 1954. The surface and underground workings were examined and mapped, the available drill core logged, and ninety-six channel samples were taken in the No. 2 adit.

The showings are quartz veins in metamorphosed sediments in an embayment of the Bendor batholith. The batholithic rock is a uniformly medium-grained granodiorite consisting of 60 per cent plagioclase (An_{30}), 17 per cent quartz, 15 per cent biotite partly altered to chlorite, and 7 per cent hornblende.

The metasediments are mainly dark-grey to greenish-grey greywackes consisting of varying proportions of hornblende, biotite, chlorite, quartz, and plagioclase feldspar of intermediate composition. Some thick inequigranular layers contain fragments which have been squeezed and silicified. Conglomerate containing white to bluish chert fragments and limestone pebbles and boulders and calcite fragments occurs west of Figure 7. Bedding in the metasediments was noted in the northwest corner of Figure 7, but elsewhere it is obscure.

Fractures are fairly common. Two sets predominate. One set strikes northward and dips steeply to vertical. The other set strikes north 65 degrees east and dips 35 to 70 degrees southward. These two sets of fractures have influenced the pattern of erosion and appear to be responsible for the West and East draws.

The northerly striking fractures are particularly abundant in the vicinity of the portal of No. 2 adit, and these fractures extend to the south up the steep West draw. The No. 1 and No. 2 veins occur in northeasterly striking, southerly dipping fractures. Both sets are shear fractures. The net horizontal movement along the No. 1 vein fracture cannot be great, for the narrow granitic dyke near the western edge of Figure 7 is offset only 27 feet. The net horizontal movement along the northerly striking fractures is small, at most a few feet. Several such fractures have been responsible for turning the No. 1 vein northward at the west end of No. 2 adit (*see* Fig. 7), and their cumulative effect on the No. 1 vein fracture is a right-hand offset of about 35 feet.

* By W. R. Bacon.
† *See under* Bellore Mines Limited.

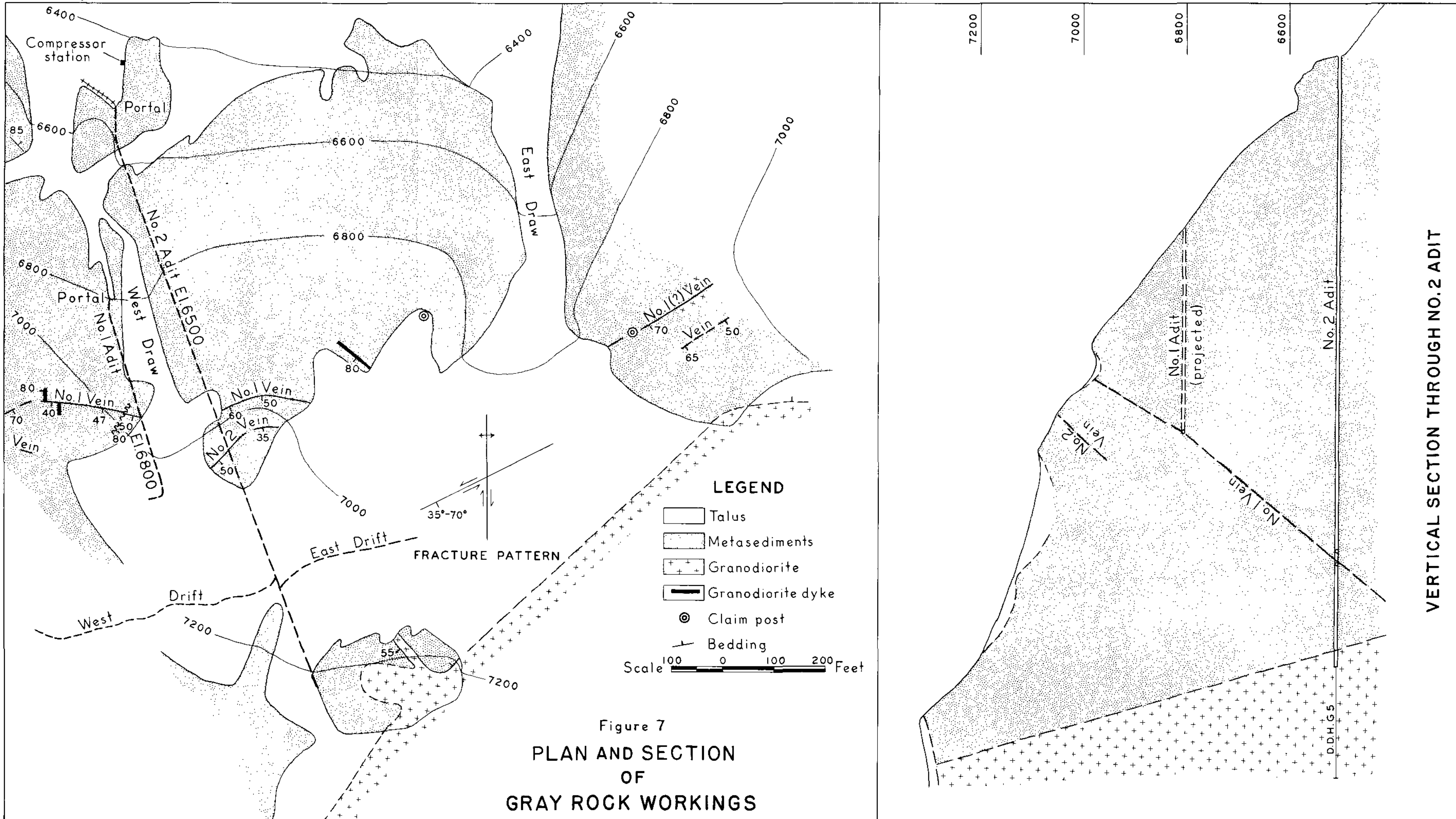


Figure 7

PLAN AND SECTION OF GRAY ROCK WORKINGS

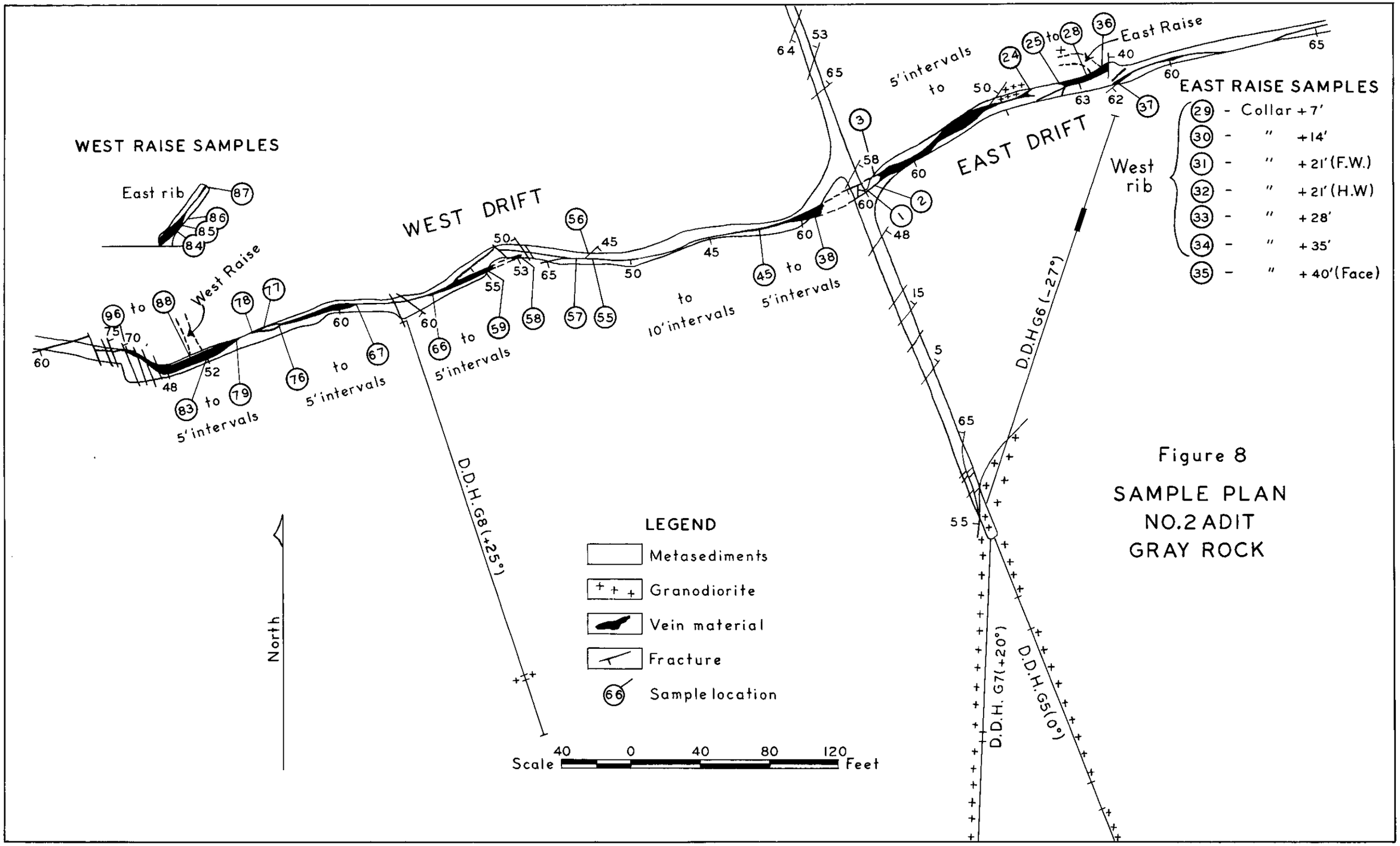


Figure 8

SAMPLE PLAN
NO. 2 ADIT
GRAY ROCK

The No. 1 vein material consists mainly of lenticular masses of quartz containing some stibnite, tetrahedrite, galena, and a little sphalerite. Pyrite is not common and arsenopyrite is rare. A very minor amount of realgar was noted here and there on the margins of the vein and in certain parts of the vein fracture where other sulphides and quartz are lacking. Apple-green chromium-bearing muscovite was noted at several places in the vein.

Stibnite is present in the quartz, but is most abundant in lenticular bands a few inches to a foot or more wide on either wall of the vein. In places the stibnite is coarsely crystalline; crystals as much as 3 inches long were noted immediately east of the West raise in No. 2 adit.

Department of Mines engineers, O'Grady (1936) and Stevenson (1949), sampled the surface showings. The results of their sampling gave assays of the same order as later, more-detailed sampling by company engineers.

No. 1 vein at surface contained several shoots of mineral, of which the two principal shoots are on either side of the West draw. According to information supplied by the company, the western shoot, 90 feet long and 4.8 feet wide, assayed: Silver, 12.4 oz. per ton; lead, 0.8 per cent; antimony, 3.0 per cent. The eastern shoot, 100 feet long and 3.5 feet wide, assayed: Silver, 45.4 oz. per ton; lead, 3.9 per cent; antimony, 10.7 per cent.

No. 1 vein is exposed for 25 feet in a drift at the end of the No. 1 crosscut adit. Company sampling showed an average width of 2.6 feet, and an average assay: Silver, 3.13 oz. per ton; lead, 10.1 per cent; antimony, 6.9 per cent.

The underground work has shown that the No. 1 vein structure persists down the dip for at least 600 feet. In this distance there is no change in mineralogy.

Figure 8 is a plan of the No. 1 vein in No. 2 adit, showing the location of samples taken by the writer. Samples were cut across the vein at intervals of 5 feet where there was any appreciable vein material. Narrow bands of well-mineralized material were not sampled separately. Antimony and lead assays were determined by chemical methods, and more than half of these were checked by quantitative spectrographic methods.

Gray Rock Sampling Results

Sample No.	Width	Gold	Silver	Lead	Antimony
	Ft.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
1	1.0	Trace	Trace	N.D.	T.
2	1.5	*Nil*	1.1	T.	T.
3	1.0	0.01	0.8	0.07	0.05
4	5.4	Trace	3.6	0.13	1.81
5	5.4	0.01	5.9	0.34	0.83
6	5.0	0.01	6.8	0.26	2.12
7	3.6	0.01	19.4	0.48	0.94
8	3.1	0.01	3.6	T.	0.20
9	3.1	0.02	6.9	0.31	5.20
10	2.8	0.01	2.3	0.08	3.70
11	2.7	0.01	0.7	T.	0.14
12	2.7	Trace	0.2	T.	1.40
13	4.2	0.01	0.7	T.	1.00
14	4.7	Trace	0.7	0.15	3.01
15	4.7	0.01	1.2	T.	0.88
16	4.8	0.01	1.9	0.18	0.33
17	3.8	0.01	1.0	T.	1.77
18	2.0	Trace	0.4	N.D.	0.49
19	2.3	0.01	2.5	0.48	0.61
20	0.8	*Nil*	0.5	N.D.	T.
21	1.0	*Nil*	1.0	T.	T.
22	1.8	Trace	0.6	T.	T.
23	2.2	Trace	1.2	0.12	T.
24	0.5	*Nil*	0.1	T.	T.
25	5.1	Trace	1.5	0.17	0.10
26	2.2	0.02	7.4	1.56	0.44
27	3.3	0.01	2.2	0.33	0.19

Gray Rock Sampling Results—Continued

Sample No.	Width	Gold	Silver	Lead	Antimony
	Ft.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
28	3.6	0.01	16.0	1.08	0.51
29	3.0	0.02	18.9	1.52	0.38
30	2.0	0.03	23.3	5.09	0.47
31	1.2	0.03	30.4	4.56	0.43
32	2.9	0.01	2.8	0.19	T.
33	3.6	0.02	8.8	2.30	0.28
34	4.4	0.01	12.4	0.56	0.31
35	2.9	0.01	2.3	0.16	0.09
36	3.8	Trace	12.8	0.69	0.41
37	2.3	0.01	2.2	0.58	0.47
38	4.0	0.01	2.6	0.81	0.47
39	3.7	0.01	7.2	1.06	0.31
40	2.4	Trace	1.7	0.15	T.
41	1.6	Trace	4.8	0.80	T.
42	1.1	Trace	1.7	0.19	T.
43	1.6	Trace	1.9	T.	T.
44	1.6	0.01	2.6	0.19	0.10
45	1.4	*Nil*	0.4	T.	T.
46	1.0	Trace	0.2	T.	T.
47	0.9	Trace	*Nil*	T.	T.
48	2.3	Trace	*Nil*	N.D.	T.
49	2.1	Trace	0.4	0.05	0.31
50	0.9	0.01	0.2	N.D.	T.
51	1.9	Trace	0.1	T.	0.39
52	0.8	Trace	0.1	N.D.	T.
53	0.9	Trace	0.2	N.D.	T.
54	2.0	Trace	*Nil*	N.D.	T.
55	0.9	Trace	*Nil*	N.D.	T.
56	1.2	0.01	6.2	2.58	0.24
57	0.5	0.01	Trace	T.	0.20
58	0.8	Trace	1.2	T.	0.25
59	1.9	Trace	3.1	0.24	0.19
60	2.4	0.01	7.7	1.34	0.33
61	2.5	Trace	2.4	0.83	1.13
62	2.7	Trace	2.0	0.16	0.12
63	2.3	Trace	8.7	0.44	0.75
64	2.7	0.01	3.5	0.47	0.19
65	2.0	Trace	5.1	1.32	0.25
66	1.0	0.01	10.0	2.73	0.19
67	0.4	0.01	Trace	T.	T.
68	2.5	Trace	0.4	T.	0.50
69	4.0	Trace	1.6	1.16	0.44
70	3.0	0.03	3.8	1.07	0.47
71	3.4	Trace	3.5	0.54	0.35
72	2.6	Trace	2.5	0.51	6.15
73	2.7	Trace	2.7	1.17	5.65
74	3.0	0.01	4.9	0.83	1.78
75	2.3	Trace	1.1	0.20	0.75
76	1.1	0.01	0.8	0.07	2.16
77	2.3	0.01	0.7	T.	2.66
78	1.0	0.01	0.6	T.	1.07
79	1.9	0.05	0.3	T.	T.
80	3.0	0.01	0.8	0.11	4.01
81	3.9	0.01	0.5	0.23	4.00
82	4.0	Trace	3.0	0.27	9.48
83	4.3	Trace	2.4	0.22	6.00
84	3.2	0.01	31.1	1.01	7.16
85	1.7	Trace	10.8	1.20	0.56
86	1.4	Trace	6.8	1.99	0.50
87	1.4	Trace	0.3	0.10	0.08
88	2.9	Trace	1.5	0.13	0.82
89	3.5	0.01	22.5	2.42	0.56
90	4.4	0.01	13.9	3.49	0.44
91	5.1	0.01	11.8	1.67	0.69
92	2.8	0.01	10.4	3.94	0.38
93	2.3	Trace	3.3	0.41	0.25
94	2.0	Trace	1.4	0.07	0.04
95	3.1	Trace	1.7	0.27	0.19
96	1.0	0.01	1.8	0.12	0.16

T.—Means detected spectrographically, and thereby estimated to be less than 0.2 per cent.
N.D.—Means not detected.

Gray Rock property, headwaters of Truax Creek.

Ground-sluicing on steep hillside, Chalco group.

ANDERSON LAKE*

Silver

Old Century (50° 122° S.E.) This property, comprising eight claims, is on Cayoosh Ridge between Anderson and Duffy Lakes. It is reached by 16 miles of pack-trail from D'Arcy station on the Pacific Great Eastern Railway. Three men were employed on development work over a two-month period. A trial shipment of ore was made, but the high cost of handling and packing made the enterprise uneconomic.

BIRCH ISLAND†

Fluorite-Celestite-Uranium

Rexspar Uranium & Metals Mining Co. Limited (51° 119° N.W.) Head office, Room 1922, 44 King Street West, Toronto; mine office, Birch Island. John W. Scott, mine manager. This company holds 114 claims in the Red Ridge area 2 to 3 miles south of Birch Island, a Canadian National Railway station 81 miles by rail or 90 miles by road north of Kamloops. Different sections of the ground covered by the company claims have been investigated at various intervals since 1918 for fluorite, silver-lead, manganese, and, since 1949, uranium. The present company has been active on the property since 1950.

A good road 5½ miles long has been built from Birch Island south up the ridge to the mine camp at 3,600 feet elevation. The road passes through the camp area and on southward for another mile to the portal of the underground workings on the Black Diamond zone. A jeep-road continues for another half-mile south beyond the adit. A second jeep-road leads from the camp area south and slightly east three-fifths of a mile to the Fluorite and A zones, which are at 4,400 feet elevation.

The claims lie along a steep north-sloping hillside and across a narrow ridge. Bush is thick and outcrops are infrequent.

The area is underlain by schists and slates that are probably of Precambrian age. Associated with these metasediments is a body of alkali feldspar porphyry. Within the porphyry are tabular zones containing radioactive mineralization and fluorite.

The porphyry is a light-grey medium- to fine-grained rock, in many places stained brownish or yellow. Thin sections show that it consists essentially of large orthoclase and microcline crystals, as long as half an inch, in a groundmass of small feldspar crystals and fine-grained pale-green mica with scattered pyrite grains and minor quartz. The large crystals are generally fractured and exhibit undulose extinction. The rock is streaky: in places it is mylonitic with a finely crushed groundmass drawn out around large feldspar crystals that are cracked, partly pulled apart, and commonly crushed around the edges; in other places a trachytic texture is pronounced, with small feldspar laths in streams around large orthoclase and microcline crystals; in still other places a definite brecciation is present with fragments as broad as 1½ inches. The streakiness, in places a definite lineation, appears to be parallel to the general attitude of the bedded rocks which strike east of north and dip flatly northwestward. Drilling on the Black Diamond zone indicates that there the porphyry is a tabular body roughly 250 feet thick sandwiched between layers of the metasediments.

At the end of July, 1954, five major mineralized areas were recognized on company property, and a sixth was known on the ground to the northeast.

One of the mineralized zones is the old original fluorite showing on the Spar 1 and 2 claims. This was described in the Annual Report for 1949. The mineralization consists mainly of fluorite, celestite, and pyrite with feldspar, mica, and minor amounts of minerals containing rare earths. The zone is tabular, strikes northeastward, and dips flatly to the northwest. Little or no trace of radioactivity has been found in the fluorite zone, although interesting indications have been noted just beyond the north end of the zone.

* By J. E. Merrett.
† By J. W. McCammon.

The other mineralized areas are of interest because they contain radioactive material. In laboratories of the University of British Columbia and the Mines Branch, Department of Mines and Technical Surveys, the principal radioactive mineral has been identified as uraninite, and uranothorite and metatorbernite have also been recognized. The uraninite is very fine grained and apparently relatively evenly distributed through the radioactive rock. The radioactive zones are composed chiefly of pyrite, mica, and feldspar with minor purple fluorite. Hand specimens of the material are dark grey to black with a streaky appearance. Some of the mica flakes are one-half inch in diameter, although most are microscopic. In hand specimens the mica appears lead grey, but under the microscope it is pale green and the angle 2V is very small. A spectrochemical analysis of the mica shows that appreciable magnesium is present. In contrast to the main fluorite zone which is well exposed on the surface, bedrock exposures of the radioactive zones are small and poor. Diamond drilling indicates that the zones are tabular, approximately parallel to the surfaces of the porphyry body, and have rather ragged terminations up and down dip. Faults are common, and delineation of the mineral zones is complicated by them.

Radioactive zone A is about 800 feet southeast of the main fluorite zone and lies within the Rex 12 and Spar 1 and 2 claims. The zone is exposed at the surface by three trenches on a steep northeast-sloping hillside. No. 1 trench is 250 feet southeast of the southeast corner post of the Spar 1 claim. It is 200 feet long and trends north 79 degrees east. Near the west end 6 feet of typical dark pyrite-feldspar-mica-fluorite " ore " is exposed, striking north 5 degrees east and dipping 35 degrees west. A sample across 6 feet perpendicular to the banding assayed: Uranium oxide, 0.08 per cent; thorium oxide, 0.06 per cent; niobium, 0.015 per cent; yttrium, lanthanum, cerium, trace. Exposed above the mineralized zone, apparently conformably, is lineated feldspar porphyry. The eastern part of the trench is on a small flat, and in it are exposures of mineralized rock that are only doubtfully in place. No. 2 trench is 25 feet south of No. 1. It is 119 feet long and trends north 59 degrees east. Near the east end of this trench, rock of ore type having a low scintillometer count is exposed for 26 feet. It is questionable as to how much of the mineralized material is in place. No. 3 trench, 96 feet south of No. 2, is 87 feet long and trends north 73 degrees east. A small section of radioactive mineralization is exposed in the west end. No other surface exposures of zone A were seen. The company has drilled many diamond-drill holes in the area, and these have outlined a zone of moderate size. In July, 1954, drilling was proceeding to the southwest in an attempt to trace the mineralization farther in that direction.

B zone is on the Rex 20 claim about 400 feet west of the fluorite zone. Two shallow east-west trenches 150 feet apart have uncovered coarse-grained mineralization. Slump has filled parts of the trenches. One sample taken across 5 feet of mineralization in the south trench assayed: Uranium oxide, 0.08 per cent; thorium oxide, 0.08 per cent; niobium, 0.04 per cent; lanthanum, trace.

The BD or Black Diamond zone is on the BD 2 and Jane 4 fractional claims about 1,500 feet southwest of the fluorite zone. This zone has been explored by many diamond-drill holes and nearly 1,000 feet of underground workings. A moderate-sized orebody is indicated. A plan of the underground workings is shown in Figure 9. Two samples were taken at points shown in the diagram. Sample No. 1 was taken across 6 feet from the back to the floor of the crosscut perpendicular to the lineation of the mineralization. Sample No. 2 consisted of chips taken from the wall along 110 feet of the entry. This section is in loose ground and is largely lagged. Sample No. 1 assayed: Uranium oxide, 0.11 per cent; thorium oxide, 0.14 per cent; niobium, 0.025 per cent; yttrium, lanthanum, trace. Sample No. 2 assayed: Uranium oxide, 0.12 per cent; thorium oxide, 0.10 per cent; niobium, 0.03 per cent; yttrium, lanthanum, trace. Diamond-drill logs indicate that the BD zone lies along the upper surface of the porphyry, whereas the A zone seems to be at a lower horizon in the porphyry mass.

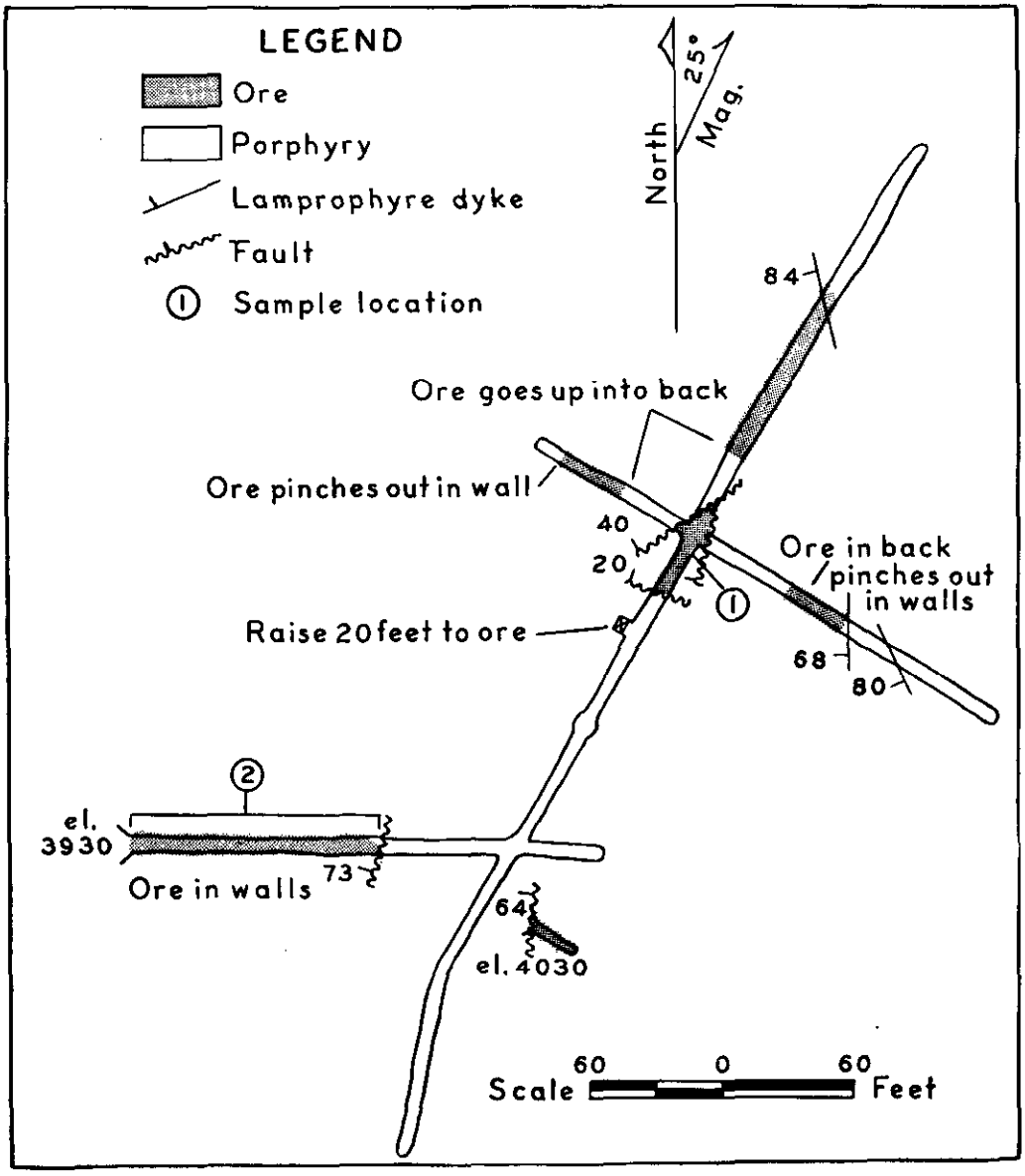


Figure 9. Tape-compass survey of B.D. workings, Rexspar Uranium & Metals Mining Co. Limited.

A limited amount of drilling and prospecting has been done on a fourth zone, the F zone, on the Jane 7 fractional claim about 1,500 feet southwest of the BD zone. F and BD zones are separated by Foghorn Creek, which runs north down a gully between them.

Five diamond-drill holes totalling 1,406 feet were drilled on the fifth or G zone, which is 2 miles northeast of the fluorite zone and is on a property of forty-three claims held by a subsidiary company, Deer Horn Mines Limited.

The niobium (columbium), thorium, and uranium oxide values quoted were determined by wet chemical analysis.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1924, p. 151; 1926, p. 187; 1927, p. 191; 1930, p. 192; 1931, p. 107; 1949, p. 250; 1953, p. 101. *Munition*

Resources Commission, Canada, Final Rept., 1920, p. 49. *Geol. Surv., Canada,* Sum. Rept., 1930, Pt. A, p. 146.]

LEMPRIERE*

Uranium-Niobium

Verity, Paradise, etc. (52° 119° S.E.) Uranium-bearing pyrochlore is found in a peculiar carbonate rock on claims east of and adjacent to the Canadian National Railway tracks at Mile-post 109, 4 miles south of Lempriere station. The original discovery of the carbonate rock was made in 1950. In 1952 St. Eugene Mining Corporation Limited optioned the property and carried out a programme of geological mapping and prospecting. In 1953 the company brought in a bulldozer and did about 3 miles of road-building, stripping, and trenching. The property was described in 1950 and 1952.†

Work done by the bulldozer proved up the continuity of the carbonate body on the Verity 1 and 2 claims, where previously only isolated outcrops had been exposed by pits. In addition, the bulldozing exposed carbonate rock on the Mill 1, 2, and 10 claims about 1¼ miles north of the Verity showing. The relationship of these two carbonate masses is not yet clear because few outcrops can be found in the area between them.

A model 963 C.A.E. scintillometer was used to test the exposures for radioactivity. It was found that the reactivity of the carbonate rock varied from zero to ten times background count. In most cases the count was around three times background, zero counts were rare, and the highest counts were where pyrochlore crystals were recognizable in the outcrop.

Because exposures on the Verity claims were sampled in 1952, few samples were taken during an examination made in 1954. Sample No. 1 was taken along 20 feet in the central part of a road-cut in carbonate rock near the northwest corner of the Mill 2 claim. Sample No. 2 was a grab sample of carbonate rock from a road-cut about 400 feet south of sample No. 1. Sample No. 3 was taken across 18 inches of carbonate rock directly below the contact with the gneiss hangingwall in a cut on the road near the centre of the northeast half of the Verity 1 claim. Samples Nos. 1 and 2 were taken to indicate the grade of the Mill group carbonate body, and sample No. 3 was taken to test a particularly high scintillometer count.

Sample No.	U_3O_8 (Per Cent)	Nb_2O_5 (Per Cent)
1	Trace	Not detected
2	0.008[1]	Not detected
3	0.04[2]	0.086

[1] Radiometric assay. [2] Chemical assay.

A relatively narrow zone in which pyrochlore crystals are abundant is exposed at the V-bend near the end of the road toward the southwest corner of the Verity 1 claim. From this "specimen pit" a variety of crystals has been recovered. The crystals range in size from pin-point to 1¾ inches in diameter; they range in development from irregular grains to perfect octahedrons and octahedral penetration twins, and range in colour from pale translucent brown and reddish brown to dark blackish brown.

TULAMEEN RIVER‡

SUMMIT CAMP (49° 121° S.E.)

Silver-Lead-Zinc

Silver Hill Mines Ltd. Company office, 402 Bank of Nova Scotia Building, Vancouver. E. Borup, president. This property is in the Summit camp, on the south slope of Treasure Mountain, 21 miles by road southwest of Tulameen, which is on the Kettle Valley Railway. The property

* By J. W. McCammon.
† *Minister of Mines, B.C.*, Ann. Rept., 1950, pp. 229–230; 1952, pp. 115–119.
‡ By E. R. Hughes.

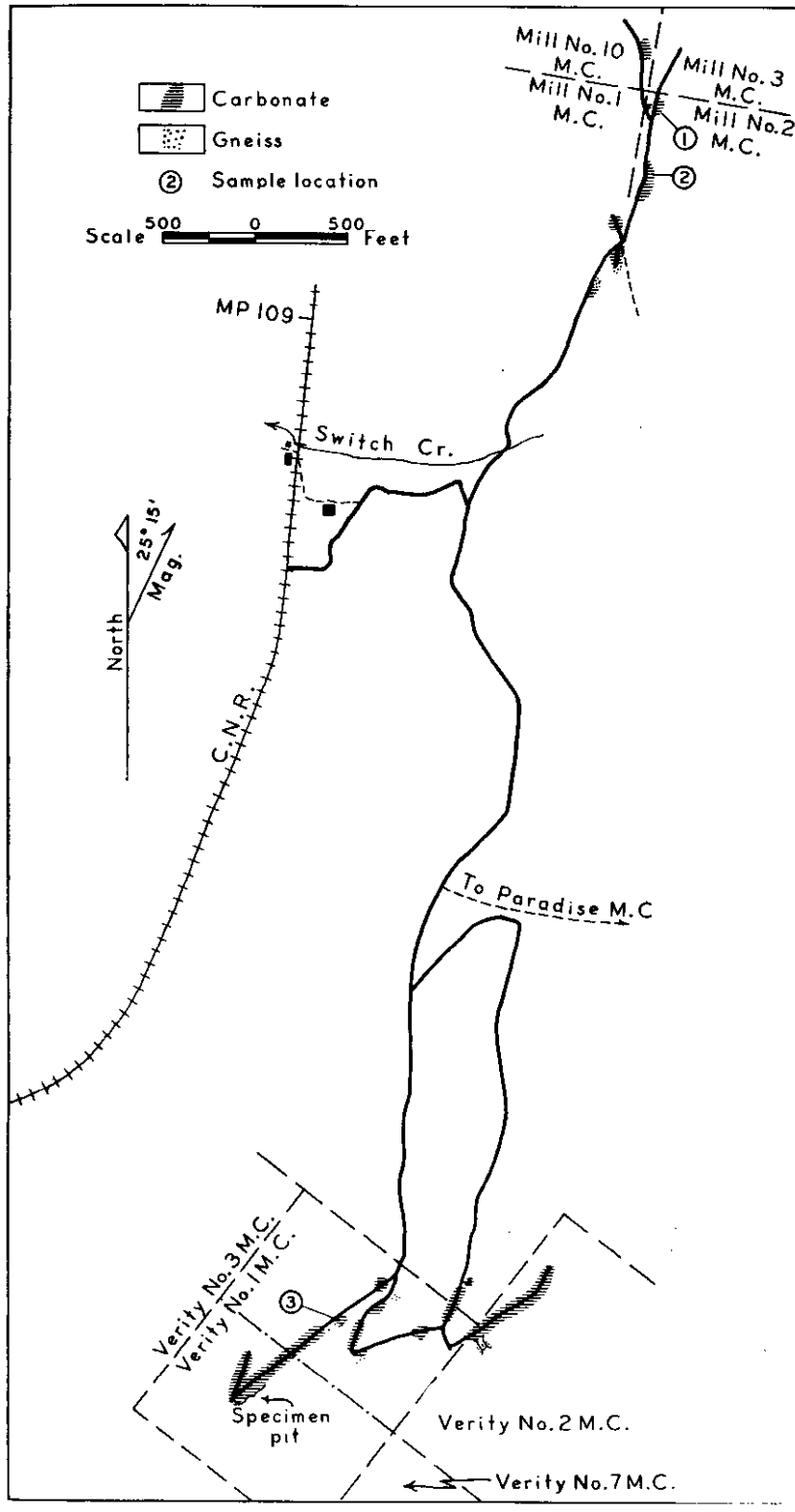


Figure 10. Roads on pyrochlore deposit, Lempriere.

comprises twenty-two claims, including the old Dornberg mine (also known as the Mary E., or Silver King), as well as the old Jensen mine, and ten claims owned by the company and held by record. The Dornberg and Jensen groups are held under a royalty agreement.

The 50-ton concentrator at the Kootenay King mine near Fort Steele was acquired by the company, and during the summer and fall months was moved to the Summit camp and re–erected near the portal of the Dornberg No. 3 adit. The construction of the mill building and the installation of machinery was completed in October, but the electrical equipment had not been installed at the end of the year.

The underground workings at the Dornberg mine have been developed from three crosscut adits—Nos. 1, 2, and 3, at elevations of 5,150, 4,733, and 4,330 feet respectively. In November, 1954, the raise from No. 3 level was driven through to No. 2 level. Work was done on rehabilitating the portal of No. 2 level. On October 29th eighteen men were employed on surface construction work and five were employed underground. In December snow conditions on the road from Tulameen to the mine, in addition to a mechanical breakdown of the snow-plough tractor, resulted in the closing of the mine for the winter months.

COQUIHALLA*

Gold-Silver-Lead-Zinc

92H/NW - 23

Keystone (49° 121° N.E.) Golden Ledge Syndicate Ltd. Company office, 503 Rogers Building, Vancouver. Joseph S. Harrison, president. This property consists of twelve recorded claims, seven of which were located by Elmer Strom and five by Joseph S. Harrison. The Keystone, Keystone Nos. 1, 3, and 5, and Coldwater Nos. 1, 2, and 3 were located by Strom and were acquired by the Golden Ledge Syndicate. The Keystone Nos. 2, 4, 6, and 7, and Waterfall were located by Harrison. The workings are on the Keystone No. 2, 1 mile by road north of Mile 14.2 on the Kettle Valley Railway, midway between Coquihalla station and Juliet. A camp-site has been cleared on the flat, 130 feet lower in elevation than the No. 3 adit, and between this adit and the railway. A bunk-house, dining-room, and dry have been built to accommodate ten men. There is also an office-residence for the manager. A compressor-house, oil-house, and explosives magazine have been constructed, and water has been piped from 3-Joe Creek to the camp. In November a crew of nine men commenced preparatory work at the No. 3 adit. This adit, at an elevation of 3,769 feet, is approximately 300 feet long and is a crosscut intersecting veins "A," "B," "C," and "D." The adit was cleaned out, rehabilitated, and widened, and "C" and "D" veins were slashed for sampling.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1936, pp. D 31–32, under "Coldwater."]

SIMILKAMEEN RIVER*

Gold-Silver-Copper-Zinc

Red Star (49° 120° S.W.) The Red Star group of mineral claims is on the Hope–Princeton Highway, 32 miles south of Princeton. The property, formerly owned by the late Charles Bonnevier, is now owned by Roy A. Tower, Sr., and consists of six claims, of which the Red Star and Anaconda are Crown-granted. William Fraser leased the property and in 1954 cleaned out and rehabilitated the No. 1 and No. 2 adits and constructed a jeep-road up the hillside to service the two adits. The lease expired in October, and since then no work has been done. Two men were employed.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1901, p. 1173; 1927, p. 250; 1928, p. 265; 1938, p. D 25. *Geol. Surv., Canada,* Mem. 243 (1947), pp. 104–105.]

* By E. R. Hughes.

COPPER MOUNTAIN*

Copper

Copper Mountain (The Granby Consolidated Mining Smelting and Power Company Limited)

(49° 120° S.W.) Company office, 675 West Hastings Street, Vancouver. L. T. Postle, president; J. A. C. Ross, general manager; D. W. Pringle, mine superintendent, all of Copper Mountain; H. L. Armes, mill superintendent, Allenby. This company operates the Copper Mountain mine at Copper Mountain, 12 miles south of Princeton. The company's steam-electric power plant in Princeton supplies power to the mine and to the concentrator at Allenby, 3½ miles south of Princeton. A branch line of the Kettle Valley Railway from Princeton serves the power plant, mine, and concentrator.

The main development of the mine is from No. 6 adit level, No. 1 and No. 2 vertical shafts, No. 3 inclined shaft, 4-260 service raise, and an auxiliary raise. No. 1 shaft is a service shaft that extends from the surface at the mine camp to the No. 6 or main haulage level. No. 2 is used to service No. 7 and No. 8 levels and is an internal shaft with the hoist on No. 5 level. An auxiliary raise connects Nos. 3, 4, 5, and 6 levels with the surface at a point 350 feet southwest of the collar of No. 1 shaft. This auxiliary raise is equipped with a manway and skipway and is used chiefly as a means of entrance into the mine for the electric cables and compressed-air pipes. No. 3 shaft is inclined at 45 degrees and extends for 1,026 feet from No. 6 level to the surface near the camp messhouse, and is used as a ventilation airway and auxiliary exit. The 4-260 service raise extends from No. 6 level to the surface at an elevation of 4,130 feet and provides an aircourse and manway to the east and north ends of the mine workings.

Open-pit mining was further expanded, with five pits in various stages of development. The pits are on the north and east sides of the mine workings. No. 1 pit is on the Princess May mineral claim, 1,700 feet northwest of the company's office at the Copper Mountain camp. No. 2 pit is 3,000 feet northeast of the office on the Princess Maude claim. No. 3 pit is 2,200 feet southeast of the office on the Sunset claim. No. 4 pit is 4,800 feet southeast of the office on the Oriole claim. No. 5 pit is 2,100 feet east of the office on the Sunset claim. The pits were operated continuously throughout the year, No. 2 pit being the largest producer. All trucking and shovelling in open pits is done by independent contractors. In December a third mechanical shovel was added to the contractors' equipment so that production could be increased. A road 3,600 feet long was constructed from No. 3 pit to No. 4 pit, and a new road was built from No. 3 pit to the surface ore-bin. Improved facilities were provided at the surface ore-bin for the sampling of open-pit ore. This entailed the installation of a sampling crusher powered by a 15-horsepower induction motor, and the erection of a building and sampling platform on the dumping-ramp. Additions to open-pit equipment included two Canadian Ingersoll-Rand X-72 wagon-drill units, one bulldozer-mounted drill jumbo with two hydro-jib booms and self-contained 500-cubic-feet-per-minute compressor, and one D-6 bulldozer. Drilling is done from the top of 20-foot benches, and short-period blasting-caps are used in ore-breaking operations. A CD-48 Dupont electric blasting-machine, capable of firing 1,000 shots, is used in open-pit blasting.

For the second successive year exploration was kept to a minimum. Underground development consisted of 2,059 feet of drifting and 6,844 feet of raising; of this amount, 446 feet of drifting and 1,744 feet of raising were done in developing narrow high-grade lenses, and the remainder in preparing known ore-blocks for production. Core drilling amounted to 21,124 feet, of which 3,345 feet was for underground development, 4,000 feet was for underground exploration, and 13,779 feet was for surface exploration. The continued curtailment of exploratory work was reflected in the progressive lessening of ore reserves. The practice of concreting scraper-drifts and draw points was almost entirely replaced by rock bolting, with considerable saving in cost. The bolts used are

* By E. R. Hughes.

the wedge type, and are made in the company's shops at Copper Mountain. Concrete was used to line 204 feet of drifts and raises. Rock bolting was used in 829 feet of drifts and raises, and 2,682 bolts were used in this work. Two new chutes and ten new grizzlies were built. Two of the new grizzlies were built on haulage levels to permit scraping directly into ore-cars. Tungsten-carbide integral chisel-bit steel was used almost entirely for underground drifting, and nine Holman Silver Bullet stoping-machines and twenty-one jackleg machines were used in this work. Blast-hole drilling is now done entirely by percussion drilling-machines using 3½-inch-diameter drifters, threaded rods, and four-wing tungsten-carbide insert detachable bits. During the year 173,725 feet of blast-hole was drilled. Sampling of sludge from percussion drilling is now replacing sampling of diamond-drill core in areas of known geology underground.

The mine is ventilated by mechanical means, and air is brought into the mine and distributed through the workings by means of nine fans strategically located on the various levels. Ventilation doors installed in some of the workings serve to direct the flow of air and prevent contamination of active workings with dust-laden air currents. Ventilation raises, equipped with auxiliary fans, provide scraper units with fresh air. At the time tests were made, it was found that dust concentrations underground in 1954 were slightly lower than in similar tests made in 1953. The average dust concentration found underground, exclusive of drilling operations, during the last test was 398 particles per cubic centimetre of air. Compressed air for the underground workings and for most of the open pits is supplied by two Ingersoll-Rand compressors and one Sullivan compressor, the three units having a total capacity of 7,200 cubic feet of air per minute. In addition, one Canadian Ingersoll-Rand 500-cubic-feet-per-minute compressor and one Jager 210-cubic-feet-per-minute compressor are used in isolated open-pit locations.

All ore mined at Copper Mountain, both from the surface and underground, is passed to No. 6 level and taken from the mine in Granby-type cars hauled by electric-trolley locomotives. After it is crushed in the coarse-crushing plant on the surface near the portal of No. 6 level, the ore is hauled 8 miles by rail to the concentrator at Allenby. Ore shipments during the year totalled 1,870,383 tons, again an all-time record for this property. The average content of copper in the ore was 0.815 per cent. The average tonnage milled was 5,128 tons per calendar day. The ore from the open pits amounted to 16.7 per cent of the total.

Various types and sizes of explosives are used in the several operations. In the open pits 1⅛- and 1½-inch 70 per cent Dynamex is chiefly used, with lesser amounts of 1⅛-inch 50 per cent Cilgel, and 1½-inch 75 per cent Forcite. In drifting and raising, 1⅛-inch 50 per cent Cilgel is used, and 1¼- and 1½-inch 75 per cent Forcite is used in primary breaking in blast-holes. For secondary blasting in scraper drifts and in chutes 1¼-inch 75 per cent Dygel is used, and for plugging on grizzlies 1⅛-inch 50 per cent Cilgel is used.

Safety committees make regular tours of inspection of all surface and underground workings, and their recommendations are discussed at subsequent meetings. The company employs a safety engineer. The competitive bonus system, now in use for three years, whereby shiftbosses are awarded merits or demerits for standards of safety and efficiency, has no doubt played an important part in the continued lessening of the accident rate. In 1954 the frequency rating for accidents involving more than six shifts of lost time was 0.055 per 1,000 man-shifts worked. The reduction in development and exploratory work resulted in still further lessening of the crew. During 1954 fifty-seven men were hired and 126 men either quit or were laid off. The total number of persons employed at Copper Mountain at the end of the year was 392, of which 200 were employed underground. In addition, thirty-two men were employed by the contractors in the open pits as truck-drivers, padmen, and shovel operators. An emergency hospital with the customary equipment and supplies is maintained at the camp. A trained nurse

and industrial first-aid attendants are available at all times. Aluminium-dust therapy is available for employees. A doctor visits the Copper Mountain camp twice a week and is available in emergencies. An ambulance is maintained for transporting sick or injured persons to the Princeton General Hospital, 12 miles from the mine. Courses in first aid and mine-rescue were conducted at the camp. Fifty-two seniors and fifty-two juniors received first-aid awards. A local first-aid competition was held at Copper Mountain in the spring for company employees and their families, and trained teams competed in the mine-rescue and first-aid field-day held in Princeton on June 5th.

HEDLEY*

Gold

Nickel Plate and French (Kelowna Mines Hedley Limited).—(49° 120° S.E.) Company office, Room 2630, 630 Fifth Avenue, New York 20, N.Y.; British Columbia office, 640 West Pender Street, Vancouver; mine office, Hedley. George L. Mill, manager; L. D. Smillie, mill superintendent; J. Biggs, mechanical superintendent. This is a private company operating the Nickel Plate mine and the French mine at Hedley.

Nickel Plate Mine.—C. T. Williams, mine superintendent; P. C. B. Emery, chief engineer; R. E. C. Richards, mine captain. Full descriptions of the operation have appeared in previous Annual Reports. The Morning shaft workings, including the 4150, 4300, 4450, and 4600 levels, were abandoned in July and all the equipment was taken out of this lower part of the mine. The Morning shaft was sunk in 1942 and was in continuous production until the available ore was exhausted in 1954. Since the closing of the Morning workings production has been confined to the Dickson and Sunnyside sections.

Mining is done in open and timbered stopes, and the broken ore is scraped into mill-holes above chute draw-points. Total development consisted of 769 feet of raising, 351 feet of drifting, and 161 feet of crosscutting. Of this, 308 feet of drifting, 170 feet of raising, and 161 feet of crosscutting was for exploration, and the remainder was for stope preparation. Diamond drilling amounted to 16,166 feet, of which 14,125 feet was for exploration and the remainder for stope preparation. At the end of the year 152 men were employed, of which 78 were on the mine payroll, including 65 men underground. There were no major additions of equipment at the mine, and there were no major underground developments.

The percentage production of ore from the main parts of the mine was: Nickel Plate, 66.5 per cent; Morning, 10.3 per cent; and Sunnyside, 23.2 per cent. Production: Ore milled, 125,228 tons. Grade: 0.435 oz. per ton.

Hedley Mill.—The ore from the Nickel Plate mine is transported by the surface tramway to the company's mill at Hedley for treatment. The mill operated throughout the year at its rated capacity of 350 tons daily. Gold is recovered in the form of a cyanide precipitate which is shipped to the United States for refining. There were no major additions to the surface plant or the milling equipment.

French Mine.—Brian T. Stephens, mine foreman. This mine is on the Oregon mineral claim, about 8 miles by road from Hedley and 1½ miles east of the Hedley–Nickel Plate road. As far as is known at present, the ore occurs in a shallow deposit. The mine has been developed from two adit levels at an elevation of approximately 3,900 feet. The adits are about 300 feet apart and are connected. Two stopes have been developed, the 39-17 stope and the 39-20 stope. The broken ore is scraped into ore-pockets and is hand-trammed to the outside storage bin.

A small crushing and sampling plant is installed at the mine. A 500-cubic-foot Holman belt-driven air compressor, powered by a 100-horsepower General Electric motor, provides compressed air. Electrical power is obtained from the West Kootenay

* By E. R. Hughes.

Power and Light Company Limited. Ore mined at the rate of 30 to 40 tons per day is trucked to the company's mill at Hedley for treatment. Development work consisted of 381 feet of drifting and 58 feet of raising. In addition, a total of 2,030 feet of exploratory diamond drilling was done. The mine is operated only during the spring, summer, and autumn months. In 1954 the season started on April 15th and production was suspended on November 22nd. Following the suspension of production the mine was put on a development basis. Six men were employed. Production: 5,767 tons.

OLALLA*

Tungsten

Williams, Williams 1, etc.

(49° 119° S.W.) In March, 1953, B. E. Williams, of Keremeos, recorded four claims, the Williams and Williams Nos. 1 to 3, on a scheelite occurrence 3½ miles northeast of Olalla. The deposit is on a narrow bare rock terrace on the hillside 1,000 feet above and one-half mile south of the Keremeos–Kaleden highway opposite the east entrance to the Green Mountain road. The claims adjoin the southeast corner of Indian Reserve No. 12A. The showings are reached by means of a trail six-tenths of a mile long that leads off northwestward from a point on the old Twin Lakes road six-tenths of a mile south of the highway.

The scheelite is in an indefinite zone in Triassic† quartzite near a contact with later granodiorite and altered dark volcanic rock best designated as greenstone. The quartzite forms a wedge-shaped area pointing west. The wedge is exposed for a length of 300 feet and is about 80 feet wide at the eastern edge of the workings. It lies between granodiorite on the north and greenstone on the south and is cut off on the west by the contact between these rocks.

The scheelite is present as pin-point grains and as crystals as much as one-half inch in diameter scattered through an indefinite zone in the quartzite adjacent to and partly along the granodiorite contact. Other minerals associated with the scheelite are pyrite, pyrrhotite, diopside, calcite, and secondary quartz. The outcropping is iron stained.

Workings on the property consist of twelve shallow trenches and small pits spread over a distance of 450 feet in a flat arc oriented roughly east-west and convex to the north. The diggings will be numbered consecutively from 1 on the east to 12 on the west for the purpose of this report. Most of the workings are in the southeast corner of the Williams claim, and the rest are along the northeast edge of the Williams 1 claim. Except for the three most westerly pits which are in granodiorite, all the workings are in quartzite or along the quartzite-granodiorite contact. Trench 4 is the largest of the diggings. It is 80 feet long by 15 feet wide and has three crosscut trenches perpendicular to it, one at each end and the third near the centre.

By the use of an ultra-violet lamp at night, scheelite was detected in six of the trenches. It was found as scattered pin points along 1 foot of the wall at the southwest end of trench 2. More was found as scattered pin points and crystals as large as one-half inch along the southwestern 10 feet of trench 3. In trench 4 a few specks were seen in the southeast corner, specks were seen disseminated along the wall of the centre crosscut, and more were found in the crosscut at the northwest end and along the main trench. Odd specks were visible in the 5th and 8th pits and on the dump at the 9th.

Three samples were taken: Sample No. 1 was across the western 10 feet of trench 3; No. 2 was across 14 feet on the wall of the centre crosscut of trench 4; and No. 3 was across 9 feet at the northwest end of trench 4. Assay results on the samples follow: No. 1, 0.7 per cent WO_3; No. 2, 0.3 per cent WO_3; and No. 3, 0.4 per cent WO_3.

* By J. W. McCammon.

† *Geol. Surv., Canada*, Map 538A, 1940, and Map 628A, 1941.

FAIRVIEW CAMP*

Silica-Gold

82E/SW-8 **Fairview (The Consolidated Mining and Smelting Company of Canada, Limited).**—(49° 119° S.W.) G. S. Ogilvie, mine superintendent. Quartz has been mined here for some years and shipped to Trail for use as flux in the smelter. Owing to sufficiency of the accumulated stockpile at Trail, the mine was closed on January 4th, and had not been reopened at the end of the year. A watchman resides at the mine.

BEAVERDELL*

Silver-Lead-Zinc-Cadmium

Prod file

Highland-Bell (Highland-Bell Limited)

(49° 119° S.E.) Company office, 604, 789 West Pender Street, Vancouver; mine office, Beaverdell. K. J. Springer, president; D. F. Kidd, director and consulting geologist; O. S. Perry, manager; G. W. West, mine engineer; Wm. Makinen, mill superintendent; J. DeYaeger, mine foreman. The Highland-Bell mine on Wallace Mountain is 4 miles by road east of the main camp at Beaverdell. No. 4 adit, at 3,976 feet elevation, is the main haulage level. Compressors, power plant, and steel-shop are at the portal of No. 4 level. The 34-degree main winze connects No. 4 with No. 7 and No. 8 levels. A second winze connects No. 8 with No. 9 and No. 10 levels. Mining in 1954 was done on Nos. 7, 8, 9, and 10 levels. No. 7 level continued to be the largest producer. From the No. 10 level an exploratory tunnel was driven 500 feet in the Wallace formation beyond the eastern terminal fault, and three diamond-drill holes were put down to test the area below the present workings. The result of this drilling was sufficiently encouraging that, on September 16th, a start was made to drive a new low-level adit.

The new adit, known as the 2,900-foot level, has its portal about 1½ miles by road northeasterly from the office at Beaverdell. The tunnel is 8 by 7½ feet and is to be driven 5,500 feet, and a raise will then be driven 700 feet to connect with No. 10 level in the main mine workings. A Sturtevant fan, size No. 45, belt-driven from a 25-horsepower electric motor, is used to ventilate the new tunnel. The fan is located at the portal and the air is conducted to the face through 20-inch pipe. An Eimco 12-B mucking-machine is used to load out the rock, and the loaded cars are hauled to the surface by an 18-brake-horsepower Ruston diesel locomotive. At the end of the year the adit had been driven 1,390 feet.

The ore from the upper workings is trucked to the mill, which is adjacent to a spur of the Canadian Pacific Railway at Beaverdell. Development work, excluding the new tunnel, consisted of 5,452 feet of diamond drilling, 626 feet of drifting and crosscutting, and 122 feet of raising. The total ore milled was 12,784 tons. On July 9th a fire of unknown origin destroyed the compressor-house and power plant near the No. 4 adit portal, with a loss estimated at $105,000. The destroyed machinery was replaced with portable air compressors and a building was erected for temporary shelter. At the end of the year fifty-six men were employed, of which thirty were underground.

Silver-Lead-Zinc

Wellington (Silver Bounty Mines Limited)

(49° 119° S.E.) Company office, 633 Hornby Street, Vancouver. G. S. Eldridge, president. This mine is on Wallace Mountain, near Beaverdell. No. 5 level, at 3,506 feet elevation, is the main haulage adit, and a winze connects this level with Nos. 6, 7, and 8 levels. The company did no mining in 1954. J. McDonell and R. Meyers obtained a lease and mined remnants in the old workings. This work was confined to the area adjacent to No. 2 level and was done in the first few months of the year. A caretaker was then left in residence at the camp.

* By E. R. Hughes.

LIGHTNING PEAK*

Silver-Lead-Zinc

Waterloo (Paycheck Mining and Development Company Limited) (49° 118° N.W.) Company office, P.O. Box 72, Nelson. L. N. Renwick, general manager; H. G. McKen, mine manager. Capital: 4,000,000 shares, no par value. This private company controls the principal mineral discoveries in the Lightning Peak area, including such old groups as the Waterloo, Dictator, Rampalo, and Pay Day. Most of the claims lie between the headwaters of Rendell Creek and Granby River on a plateau terrain with an average elevation of 5,900 feet. As in previous years all activity in 1954 was at the Waterloo mine, which is situated 18½ miles by poor road from Inonoaklin Crossing, a point on the Monashee Highway 20 miles from Needles.

All underground work at the Waterloo mine was done prior to 1937. Four adits have been driven eastward on a nearly vertical mineralized shear zone over a vertical range of 150 feet. The veins have been as much as 4 feet wide. Length of adits, Nos. 1 to 4, are 140, 340, 40, and 1,780 feet respectively. In 1954 the No. 4 adit was rehabilitated and the vein within 200 feet of the portal was stoped to surface and the level above. At 600 feet from the portal a raise was driven 75 feet to within 25 feet of No. 2 level.

The 75-ton mill, located 1,000 feet from the mine, operated intermittently until the end of October, when all work ceased for the winter. The ore milled totalled 1,114 tons, of which 290 tons came from the dumps and the remainder from underground. Lead concentrates shipped to the Trail smelter amounted to 13 tons, including 3 tons produced in 1953. It is estimated that 3 tons of lead concentrate and 45 tons of zinc concentrate remain on site.

The camp was improved by the erection of a new bunk-house and a change-house. The number of men employed averaged ten. R. Halvorsen was mill superintendent.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1933, pp. 149–150; *Geol. Surv., Canada,* Sum. Rept., 1930, Pt. A, pp. 99–103.]

GREENWOOD†

Gold-Silver-Lead-Zinc

82E/SE-1 **Providence** (49° 118° S.W.) W. Madden, owner. This mine is 1½ miles north of Greenwood and has been worked intermittently for more than fifty years. The property was leased to R. Barker and S. Downham, Vancouver, and in the spring and summer two men were employed in driving No. 460 sublevel 50 feet southward on a narrow quartz stringer. No ore was shipped.

D.A. and Gold Bug (49° 118° S.W.) E. Ruzicka, owner. These claims are on the west side of the valley, at the north end of the City of Greenwood. The portal of the adit is on the Gold Bug, and development has proceeded northward and across the boundary into the D.A. claim. Seven diamond-drill holes totalling 300 feet were drilled underground, and an open-cut 15 by 3 by 3 feet was made on the surface about 400 feet south of the portal of the Gold Bug. A shipment of 4½ tons of ore made in May to the Trail smelter netted $445.14. The owner and his two sons were the only persons employed.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1927, p. 235; 1932, p. 129; 1953, p. 110.]

Copper

Copper Queen* (49° 118° S.W.) This property is controlled by W. E. McArthur and associates, of Greenwood. Options have been taken on the King Solomon and Copper Queen Crown-granted claims, and

* By J. W. Peck.
† By E. R. Hughes, except as noted.

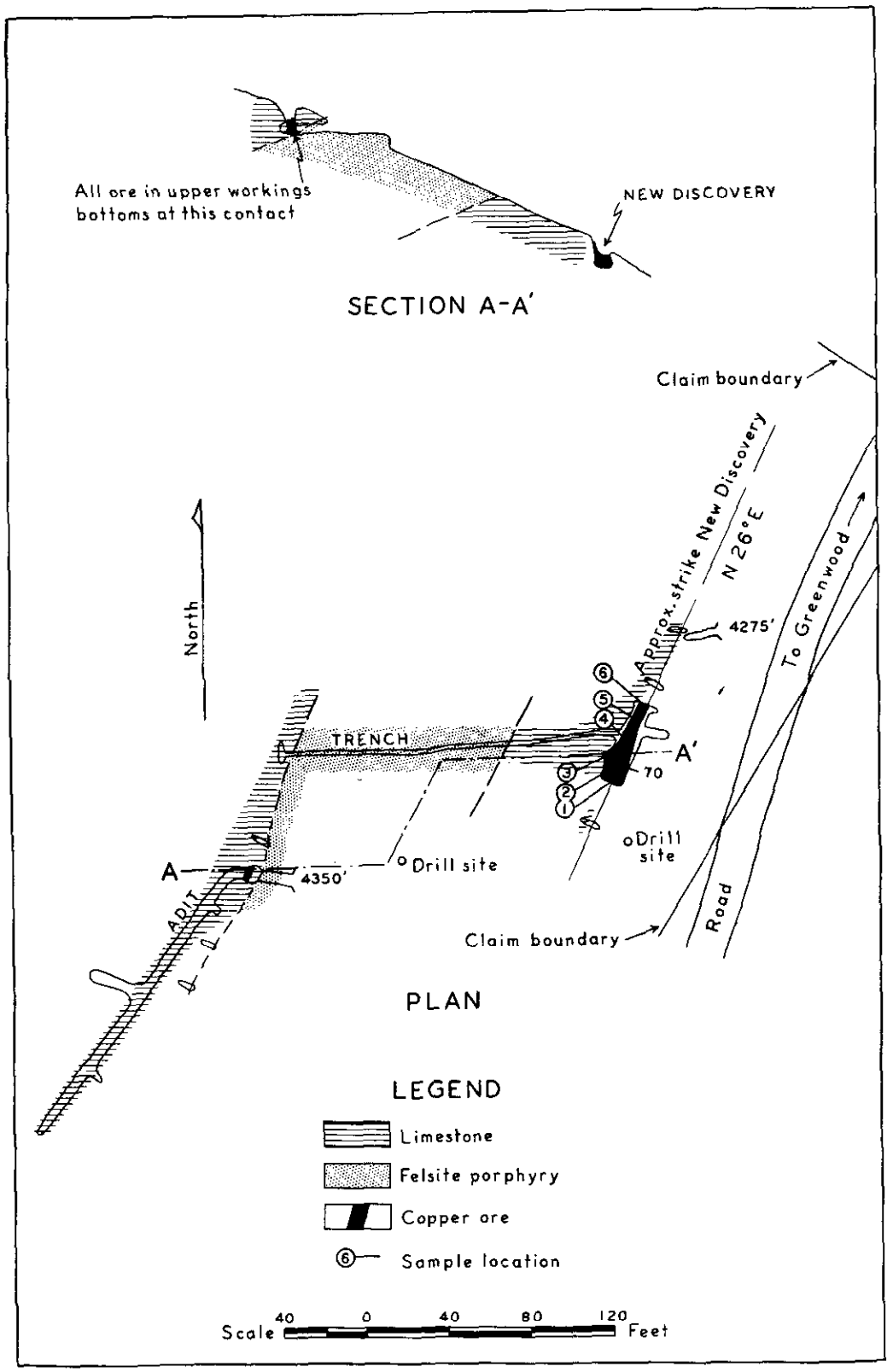


Figure 11. Copper Queen, Greenwood—plan and section.

leases have been applied for on the Copper King, Honolulu, Last Chance, and Enterprise Crown-granted claims. In addition, there are six located claims which more than cover the cancelled Grown-granted claims known as the Quien Sabe, Keystone Fraction, and Magnolia. Arrangements are also reported under way to obtain the Copper Mine Crown-granted claim known also as the Big Copper.

The property is in the old Copper camp, 6 miles by road west of Greenwood, at an elevation of about 4,300 feet. The last mile of existing road is part of a logging-road, the use of which is at the discretion of the logging company. The claims are on a hillside which slopes at about 25 degrees to a small tributary of Motherlode Creek.

Most of the work on the claims was done between 1896 and 1904, although there was a revival of interest from 1916 to 1918. The King Solomon produced about 1,100 tons containing 4.5 per cent copper and the Copper Mine about 2,400 tons containing 3.2 per cent copper. During 1953 and 1954 W. E. McArthur carried out a programme of diamond drilling and surface stripping. A new orebody was discovered, and two carloads of ore were shipped to the Tacoma smelter.

The old orebodies were discovered along a north-south contact between crystalline limestone and felsite porphyry, with the Copper Mine workings at the north end, King Solomon in the middle, and Copper Queen at the south end. The ore was heavily oxidized and considerable hematite was present, particularly at the northerly end of the contact. Copper minerals observed on the dumps are chalcocite, malachite, and azurite. Native copper was reported in the early work. The King Solomon and Copper Mine workings are open pits as much as 40 feet deep, with indications that the ore zone was from 10 to 15 feet wide. The ore appears to have bottomed at the contact with the felsite porphyry. At the Copper Queen an adit was driven, but ore was found only near the portal and that also bottomed at the felsite porphyry. McArthur diamond-drilled below the Copper Queen adit on the assumption that the orebody had been cut off by the felsite porphyry, but was unsuccessful in locating ore on the projected dip. He then trenched down the hillside across the porphyry and was successful in locating the lower contact, beneath which was limestone similar to that above the upper contact. This indicated that the felsite porphyry is a dyke cutting the limestone. Further trenching discovered an orebody in the limestone about 50 feet below the contact, and an open-cut 40 feet long, 8 feet wide, and as much as 17 feet deep was made in this orebody.

The orebody strikes north 26 degrees east and dips 70 degrees southeast. Oxidation has been complete, and azurite, malachite, hematite, and chalcocite are the visible minerals. The depth of oxidation is not known, and the hangingwall has not yet been determined. Six samples taken along the floor of the pit assayed as follows:—

Sample No.	Location of Sample	Width	Gold	Silver	Copper
		Ft.	Oz. per Ton	Oz. per Ton	Per Cent
1	South face	8.0	0.12	0.7	3.1
2	10 feet north of south face	8.0	0.14	1.2	5.4
3	10 feet north of south face (footwall side of No. 2)	4.0	0.24	0.4	5.3
4	20 feet north of south face	7.0	0.08	1.0	4.4
5	30 feet north of south face	4.5	0.20	1.8	5.3
6	37 feet north of south face (2 feet south of north face)	7.0	0.17	1.7	2.6

Sample No. 6 was at the shallowest end of the pit where overburden overlies bedrock, and this possibly accounts for its having the lowest value. Sample No. 3 was taken from a slash into the limestone footwall. The hangingwall is mineralized, so the orebody may be wider than is exposed.

Shipments of 102 tons were made to the Tacoma smelter. Gross content: Gold, 15 oz.; silver, 149 oz.; copper, 12,318 lb. From the appearance of the dump near the pit it is estimated that less than 10 per cent of the material mined had been sorted out.

This new find on the Copper Queen opens a new prospecting area inasmuch as similar deposits might be found to the east of the limestone-felsite porphyry contact, especially to the east of the old orebodies found on the King Solomon and Copper Mine claims. The new orebody appears to be vein-like, conformable with the limestone bedding, and not of contact-metamorphic type. There is a possibility that the felsite-porphyry dyke followed a fault plane, and if so the location of the faulted segments of the upper orebodies could be projected.

The property was optioned late in 1954 by Noranda Exploration Company Limited.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1896, p. 582; 1913, p. 150.]

CORYELL*

Silver-Lead-Zinc

W.S. (Cascade Lode Mines Limited) (49° 118° S.E.) Registered office, 736 Granville Street, Vancouver. C. J. L. Lawrence, president. This property is on the west side of McRae Creek, about 1 mile northwest of Coryell. The steep road up the hillside to No. 2 adit was improved. Some stoping was done in August from the raise in No. 2 adit, and 14 tons of ore was shipped to the Trail smelter in September. Three men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1953, pp. 111–112.]

ROSSLAND†

Gold-Copper

Velvet (49° 117° S.W.) This old gold-copper producer on the Rossland–Cascade Highway, 13 miles west of Rossland, is owned by H. F. Kenward, of Vancouver, and W. W. Sweet, of Seattle, Wash., but has been under lease since 1952 to J. C. Urquhart, H. W. Lefevre, R. Lefevre, and B. W. Price. The mine is developed by a vertical shaft serving six levels and by two adits connected to the shaft workings. During 1954 the shaft was repaired where necessary. A gasoline-powered winch was installed near the hoistroom for hoisting ore up the shaft in a bucket in place of the electric hoist and skips used formerly. An ore remnant near the shaft on No. 3 level was then mined.

The small mill erected in 1953 was operated intermittently on dump material and on ore from underground. Concentrates were shipped to the Tacoma smelter. Production: Ore milled, 1,158 tons. Gross content: Gold, 164 oz.; silver, 117 oz.; copper, 20,178 lb.

Gold

I.X.L.—(49° 117° S.W.) The I.X.L. mine is under lease to L. McLellan, J. Herman, and H. Wuori, of Rossland and Trail. Only intermittent development work was done, and no ore was shipped.

Snowdrop (49° 117° S.W.) This Crown-granted claim lies astride the Rossland–Cascade Highway to the north of the Midnight and I.X.L. mines. It is owned by Warren Crowe, of Waneta, who also owns the adjoining Crown-granted Gold King and Concordia claims. An adit situated below the highway develops a quartz vein by more than 200 feet of drifts and crosscuts. The vein is faulted at the face. Two holes, each about 45 feet long, were drilled in an effort to locate the faulted section, and this work was in progress at the end of 1954. Other development work consisted of a small underhand stope and one short raise. Two men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1948, p. 129.]

* By E. R. Hughes.
† By J. W. Peck.

FRUITVALE*

Silver-Lead-Zinc

John (Magnuson Group)

(49° 117° S.W.) The Magnuson group is north of Fruitvale between the confluence of Fruitvale and Beaver Creeks. The Floyd No. 1 and Floyd No. 2 claims are owned by Floyd Magnuson, of Seattle, Wash., who also has a lease and bond from John Grieve of Fruitvale on the adjoining John, John 2, and John 5 claims. The workings appear to be on the John claim and are accessible by road, 2 miles from the railway crossing at Fruitvale. The elevation of the workings is 2,500 feet, or 500 feet above Fruitvale. They consist mainly of an open pit and an adit 15 feet below and driven for 60 feet. These workings explore a fissure which varies from a crack to 18 inches. Pyrite is the main visible mineral. The fissure is nearly vertical and strikes north 80 degrees west. The country rock consists of thin-bedded limestones and argillites lying above massive limestone. The bedding strikes north 27 degrees west and dips 40 degrees to the southwest. The property was idle most of 1954, but a shipment of development rock was made to the Trail smelter. The plant on site consisted of a portable Sullivan compressor, a small shed, and an ore-bunker. Production: Ore shipped, 8 tons. Gross content: Silver, 13 oz.; lead, 176 lb.; zinc, 320 lb.

NELSON*

Eagle Creek (49° 117° S.E.)

Silver-Lead-Zinc

Kenville Base Metals Concentrator (Emerald Glacier Mines Limited)

Company office, 1408 Royal Bank Building, Vancouver. This concentrator is located at the Granite Poorman mine, 7 miles by road west of Nelson. It was formerly a 125-ton cyanide gold-mill but was converted in 1949 to a lead-zinc flotation mill and later enlarged to a 250-ton capacity. It was under lease during early 1954 to J. P. Dion, D. H. Norcross, and W. W. Cooper, of Nelson. The tonnage treated amounted to 1,900 tons from the Granite mine and 80 tons from the Eureka mine. In the latter half of 1954 J. P. Dion and W. Maybank, of Nelson, obtained a lease. Only the crushing plant was used to produce aggregate of various sizes for concrete and road-construction demands. The mine dumps, which are mainly granite, supplied the material. Production amounted to 6,500 tons.

Gold-Copper

Eureka (Copper Leaf Mines Limited)

Company office, 1403 Royal Bank Building, 675 West Hastings Street, Vancouver. The Eureka mine is 2¾ miles by steep road from the Kenville Base Metals Concentrator. It was worked during 1953 by a partnership known as the Eureka Copper Syndicate. No work was done during 1954 and all portable machinery was removed, but 80 tons of ore mined in 1953 was milled at the Kenville Base Metals Concentrator. In September, J. E. Crockart, of Calgary, obtained an option but no work was done.

Gold

Granite (Kenville Gold Mines, Limited)

Company office, Royal Bank Building, 675 West Hastings Street, Vancouver. The Granite mine, located about 7½ miles from Nelson, has been under lease since 1953 to J. P. Dion and associates, of Nelson. A sublevel, accessible by a raise 600 feet from the portal on the lower level, was extended to a total length of about 90 feet. A quartz vein in granite, averaging 1 foot wide, was followed until it pinched out at the face. A stope 60 feet long was carried 20 to 85 feet up the 42-degree

* By J. W. Peck.

dip. At one point a break-through was made to a caved underhand stope which extended downward from the upper Granite adit. Operations ceased early in 1954 when most of the easily available ore was mined. About 1,900 tons was trucked to the Kenville Base Metals Concentrator, where 600 tons of waste was sorted out before the remainder was milled.

HALL CREEK (49° 117° S.E.)

Sun Fraction

This property is owned by W. Rozan, J. Haines, R. Gauthier, and N. E. Morrison, of Nelson, and the estate of J. Morrison. It is on the summit between Fortynine and Hall Creeks and is reached by 15 miles of road from Nelson up Fortynine Creek. The general area has been described in Reports previous to 1951 under Golden Eagle and T.S. Most of the work since 1946 has been concentrated on the Sun Fraction, where W. Rozan, assisted in recent years by R. Gauthier, has been developing quartz veins in granite. One vein at an elevation of 6,400 feet has been developed by an adit more than 400 feet long; the first 120 feet was driven as a crosscut and the vein intersected at 70 feet from the portal. A drift was driven northward on the vein for 300 feet, at which point a fault was encountered. For 200 feet short of the fault the vein ranged from 6 to 16 inches wide and had an average dip to the east of 50 degrees.

The vein filling is mainly quartz with some sections containing soft iron sulphides. Previous sampling has indicated that these sulphides contain considerable gold. Samples taken from a section containing the most sulphides gave the following results:—

Location of Sample	Width of Sample	Gold	Silver
	In.	Oz. per ton	Oz. per ton
300 feet from portal	12	1.37	0.4
310 feet from portal	9	2.16	0.4
320 feet from portal	10	1.14	0.2
330 feet from portal	6	3.58	0.5
340 feet from portal	8	0.03	0.1
350 feet from portal	8	0.01	*Nil*

Work was at a minimum during 1954 and no shipments were made, although a considerable amount of sorted ore is on site.

TOAD MOUNTAIN (49° 117° S.E.)

Great Eastern

J. E. Riley, of Trail, owns the Great Eastern, Great Western, and Irene Crown-granted claims on Toad Mountain, 8 miles south of Nelson via the Silver King mine road. The property has been idle since 1939, but an option was obtained in 1954 by N. Rollick, of Nelson. On the Great Eastern claim at an approximate elevation of 5,100 feet, a quartz vein in granite, with reported widths as great as 10 inches, was followed in the past by a 70-foot drift and stoped to surface at the end of the drift. This drift was rehabilitated and was extended 30 feet. The vein at the old face was only a stringer, but in the stope 20 feet directly above it was 6 inches wide. A sample taken at that point in the stope assayed: Gold, 0.56 oz. per ton; silver, 0.2 oz. per ton.

YMIR*

Gold-Silver-Lead-Zinc

Goodenough (Protection)

(49° 117° S.E.) This mine, on the north slope of Ymir Creek valley 5½ miles by road from Ymir, is owned by J. Turk and F. Padulo, of Ymir. A third partner, T. Kushner, has been taken in on a lease arrangement. The main camp is located near the

* By J. W. Peck.

No. 2 portal and consists of compressor-house, utility building, and living-quarters. Underground work was carried out mostly in the No. 1 adit, 130 feet above the No. 2 adit. An underhand stope was started about 600 feet from the portal. When visited in August the vein in this stope was 2 feet wide and well mineralized with galena, sphalerite, and pyrite. All ore obtained was trucked to the Trail smelter. Production: Ore shipped, 157 tons. Gross content: Gold, 91 oz.; silver, 1,573 oz.; lead, 14,793 lb.; zinc, 17,511 lb.

Yankee Girl, Dundee (Yankee Dundee Mines Limited)

(49° 117° S.E.) Company office, 105, 614 West Pender Street, Vancouver. L. L. MacLean, Spokane, Wash., president; Ralph A. Sostad, managing director. Capital: 4,000,000 shares, 50 cents par value. This company was formed in 1952 to develop the Yankee Girl and Dundee mines, which are situated east of Ymir between Oscar and Ymir (Wild Horse) Creeks. During 1953 the Wild Horse low level adit, driven in 1929, was extended with the object of intersecting the Yankee Girl vein system which had formerly been developed by adits on the Oscar Creek slope at a much higher elevation. This work was at a standstill throughout most of 1954, but in November sufficient funds were obtained to permit development to continue. The Bonus vein, intersected at 4,092 feet from the portal, was followed by a drift for more than 65 feet. The drift to the southwest was disappointing, but in the drift to the northeast the vein maintained a width of 4 feet. The vein is made up of a mixture of quartz and sheared rock mineralized with pyrite, sphalerite, and galena. At 4,650 feet from the portal another vein was encountered, which was suspected to be the downward extension of the Yankee Girl vein as projected from the 1235 level, 765 feet vertically above. It was followed eastward by a drift for 45 feet, but the vein fissure contained very little mineralization. In December a raise was started to explore this vein and with the intent of providing a second exit via the 1235 adit level, but only 35 feet had been driven when all work ceased. Five men were employed in this work.

Zinc

Jack Pot, Oxide, Last Chance (New Jersey Zinc Exploration Company (Canada) Ltd.)

(49° 117° S.E.) Company office, 714, 525 Seymour Street, Vancouver. R. C. Macdonald, manager. This company owns a group of claims extending northward from the summit between Hidden and Porcupine Creeks to the summit between Oscar and Ymir Creeks. The main showings are reached by roads branching from the Porcupine Creek road. At the Jack Pot, which is south of Porcupine Creek, R. Golac, of Nelson, completed his contract, begun in 1953, for approximately 5,000 feet of drifting and crosscutting. The 4100 adit was extended 1,154 feet in a southerly direction to a total length of 3,030 feet. The 4400 adit was driven a total distance of 1,070 feet in two headings. The north heading reached a point 865 feet from the portal, and the south heading was 2,735 feet from the portal when work ceased. The 4400 adit encountered lead-zinc mineralization at intervals, but the 4100 adit, 295 feet lower in elevation, did not encounter the mineralized zone. Four diamond-drill holes, totalling 1,297 feet, were drilled to interpret the structure, but the results were not disclosed.

At the Oxide, which is north of Porcupine Creek, two men were employed during January in driving the Ox 4 adit. This adit, at an elevation of 4,085 feet, has been driven intermittently in a northerly direction during the past few years. It is heavily timbered except for the last 250 feet. It was 873 feet long when work ceased.

At the Last Chance and Elm groups north of Oscar Creek, only bulldozer trenching was carried out for assessment purposes.

The company maintained an office in Ymir with E. Livingstone in charge. The crew under Golac varied from six to fourteen men.

SALMO*

ERIE CREEK (49° 117° S.E.)

Gold-Silver-Lead-Zinc

Arlington (New Arlington Mines Limited)

Company office, 609 Baker Street, Nelson. J. A. Russell, president; A. H. Shrieves, secretary-treasurer; W. Maybank, consulting engineer; D. H. Norcross, mill superintendent. Capital: 3,500,000 shares, $1 par value. This company owns the Arlington mine on Rest Creek, 7 miles by road from Salmo. No underground work was done, but the concentrator operated from May to August, the mill-feed being obtained from the large dumps adjacent to the mine portals. The peak production was 110 tons per day, but difficulty was encountered in maintaining this rate because of breakdowns of the diesel engines supplying the power. Only a bulk concentrate was made, which was trucked to the Trail smelter. The highest value of the recovered metals was in gold. It is estimated the dump material treated had a recovered value of 0.11 ounce gold per ton. Twelve men were employed while the mill was operating.

SHEEP CREEK (49° 117° S.E.)

Gold

Nugget

This mine is part of the old Reno holdings in the Sheep Creek camp. It is owned by A. Endersby, of Fruitvale, who worked a short period with the aid of a partner. Most of the ore mined came from the main vein in the upper Nugget mine between No. 3 and No. 4 levels, except for 25 tons mined from the Calhoun vein, a branch of the main Nugget vein. All ore was trucked to the Trail smelter. Production: Ore shipped, 124 tons. Gross content: Gold, 133 oz.; silver, 82 oz.

IRON MOUNTAIN (49° 117° S.E.)

Lead-Zinc-Tungsten

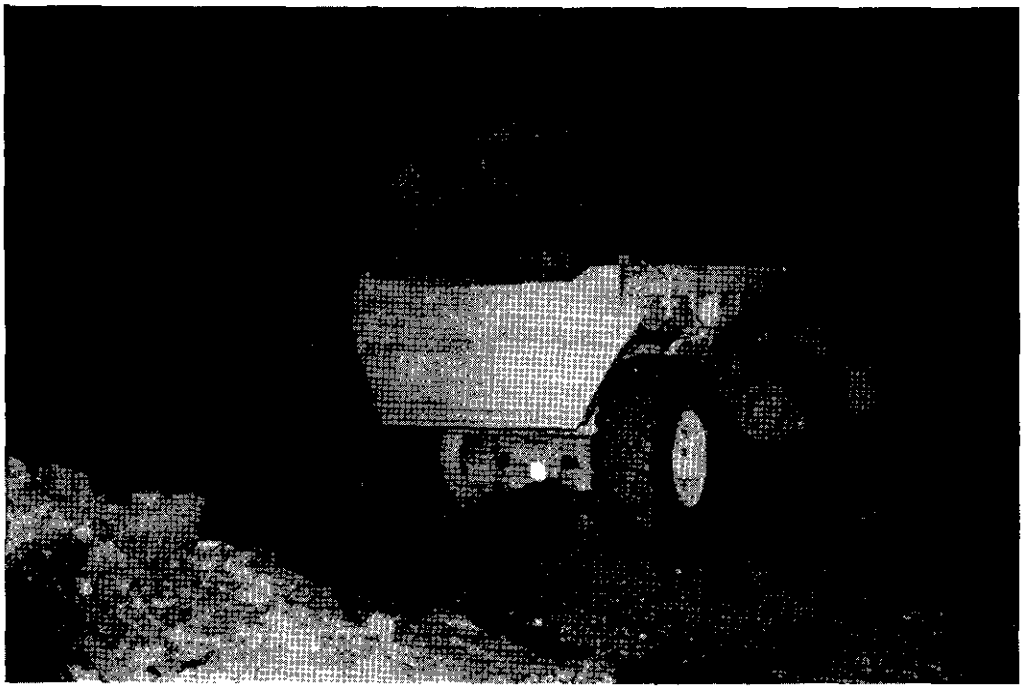
Emerald, Jersey, Dodger, Feeney (Canadian Exploration Limited)

Head office, Royal Bank Building, Vancouver; mine office, Salmo. G. A. Gordon, general manager; G. W. Walkey, assistant general manager: A. D. McCutcheon, mine superintendent, lead-zinc operations; H. V. Maxwell, mine superintendent, tungsten operations; E. A. Erickson, superintendent, lead-zinc concentrator; R. MacLeod, superintendent, tungsten concentrator. This company is a wholly owned subsidiary of Placer Development Limited. The Emerald, Feeney, Dodger, and Jersey mines, the tungsten concentrator, and the main camp are located on the summit between Sheep Creek and Lost Creek. The property is reached by two roads which leave the Nelson–Nelway Highway 4 and 5½ miles respectively south of Salmo. The lead-zinc concentrator is on the Nelson–Nelway Highway and is served from the mine by a series of surface and underground conveyors. The labour force remained steady at about 325 employees.

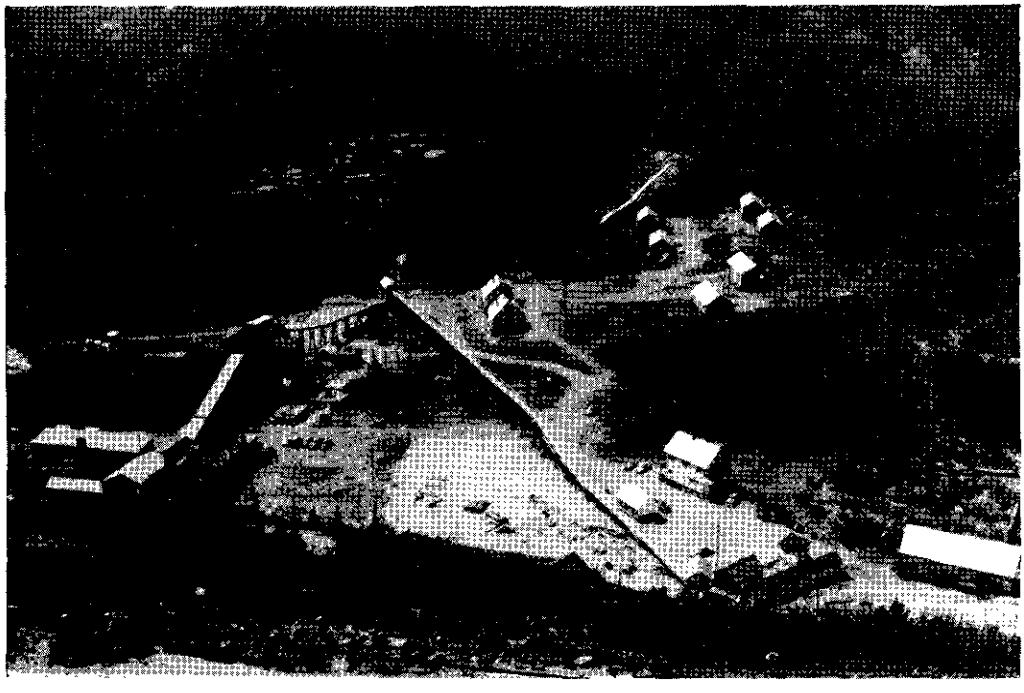
Emerald.—This tungsten mine continued to produce most of the ore for the tungsten concentrator. All ore came from above the 3800 level, which is the main haulage to the concentrator. The ore was recovered from remnants in the vicinity of previously mined sections and produced a tonnage greater than expected. Large open pits were made along the outcrop, and by this method it was possible to mine remnants which would otherwise have been too dangerous to recover by underground means. Below the 3800 level an ore block has been developed for production by the sinking of a 755-foot 32-degree inclined winze. Three levels are being developed from this winze.

Dodger.—The Dodger 4400 mine is a 14- by 15-foot adit driven south 1,050 feet at a portal elevation of 4,405 feet. In 1953 the ore in a stope about 50 feet directly above the adit was nearly all removed. In 1954 the sill between the adit and the stope was taken down. This ore was loaded by electric slushers into diesel trucks which trans-

* By J. W. Peck.



Jersey mine. Loading trailer truck with 2-ton loader.



Emerald tungsten mill and camp. Conveyor system leading to Canadian Exploration lead-zinc concentrator.

ported the ore to the top of a raise near the portal of the 4200 Dodger. This raise leads to the underground crusher on the 3800 level of the Emerald mine.

The Dodger 4200 mine is about 5,000 feet southwest of the Dodger 4400 mine. A 14- by 15-foot crosscut adit with a portal elevation of 4,125 feet has been driven east for 2,500 feet and an 8- by 8-foot drift driven north in the ore zone from a point near the end of the crosscut. This drift was extended during 1954 to a point 1,300 feet south of the south end of the Dodger 4400 workings. Diamond drilling was done in this drift in an effort to block out another orebody similar to the one developed above the same drift during 1953. This work was sufficiently encouraging to warrant enlarging the drift to allow diesel trucks to be driven all the way from the portal to points below these orebodies. The slashing of the drift to 15- by 15-foot size was in progress at the end of 1954.

Feeney.—This tungsten mine is located to the north of the Emerald workings. It is served by one adit, and the orebody has been stoped from the adit to surface. The mining of ore remnants continued throughout most of 1954 and produced a greater tonnage than had been expected.

Tungsten Concentrator.—This mill is near the 3800 portal of the Emerald mine. It can receive ore by track haulage from this mine, by conveyor from the underground crushing chamber on the Emerald 3800 level, or by truck from outside sources. The milling rate varied between 10,000 and 12,000 tons per month. Recovery had been mainly by flotation and tabling, but during 1954 upgrading of concentrates was accomplished by the following installations: (1) An acid leaching circuit to eliminate phosphate, (2) a roaster to roast sulphur and other impurities, (3) a twin screw for drying concentrates, (4) a de-sliming circuit to take the slime out of the table feed. All tungsten concentrates continued to be sold to the United States Government under contract.

Jersey.—The Jersey lead-zinc mine extends for about 7,000 feet in a northerly direction through Iron Mountain from the Lost Creek slope to the Sheep Creek slope. It is delimited on the east and west to a width of about 2,000 feet. The ore occurs as a replacement of dolomite. Maximum thickness is 60 feet; the average is about 12 feet. The plunge of the deposit is to the south at angles ranging from 10 to 20 degrees. All mining during 1954 was in the west section or "A" orebody and was done by "trackless mining" through the 4200 Jersey adit. A room-and-pillar or panel system of mining was used, working up the plunge of the orebody. Ventilation was greatly improved by making a raise connection with the 4200 Dodger mine and installing a large fan in this raise. A slight revision was made of the diesel equipment in use. The following pieces of equipment were used in various teams in compliance at all times with the ventilation requirements of the Department of Mines of 75 cubic feet of air per minute per horsepower:—

Haulage Units	Number on Hand	Engine Type	Horsepower
Dart truck, 10-ton	3	Cummins HRB 400 4-cycle	110
Euclid U.D., 10-ton	1	G.M.C. 4-73 2-cycle	115
Koehring Model 60 Dumptor	5	G.M.C. 4-73 2-cycle	109
Caterpillar DW 10 and Landis wagon	1	Caterpillar 4-cycle	110
Loaders			
Eimco 104	3	Caterpillar 4-cycle	43
Eimco 105	1	G.M.C. 3-71 2-cycle	85
HD 9 loader (Allis-Chalmers)	1	G.M.C. 3-71 2-cycle	85
Thew Lorain TL 25K scoop shovel	1	G.M.C. 3-71 2-cycle	60
Drill Jumbos			
RD 7 Caterpillar	1	Caterpillar 4-cycle	80
TD 14 International	1	International 4-cycle	60
Auxiliary Equipment			
D-6 Caterpillar dozer	1	Caterpillar 4-cycle	66
D-7 Caterpillar dozer	1	Caterpillar 4-cycle	81
Caterpillar 212 grader	1	Caterpillar 4-cycle	50
Model 500 D Le Roi compressor	1	Caterpillar D-13,000 4-cycle	120
Converted Dart service trucks	2	Cummins HRB 400 4-cycle	110
Trump industrial giraffe mounted on Dart truck	1	Cummins HRB 400 4-cycle	110

Some of the above equipment was in use in the Dodger 4200 and 4400 mines. "Trackless mining" became quite efficient during 1954. About 1,500 tons of ore was mined per day with an actual production crew of about thirty.

Lead-zinc Concentrator.—This mill has a capacity of about 2,200 tons per day. The milling rate during 1954 was about 30,000 tons per month. All ore was transported by the conveyor system, which operated quite satisfactorily except during the spring run-off when water entered some of the ore-passes. The lead and zinc concentrates were shipped respectively to smelters at Kellogg, Idaho, and Black Eagle, Mont. Zinc concentrates were also shipped to the Trail smelter.

NELWAY*

Silver-Lead-Zinc

Reeves MacDonald Mines Limited (49° 117° S.E.) Company office, 413 Granville Street, Vancouver; mine office, Remac. W. L. Zeigler, Metaline Falls, Wash., general manager; L. M. Kinney, Metaline Falls, Wash., general superintendent; G. F. Camroux, superintendent. Capital: 3,000,000 shares, $1 par value. This company owns the Reeves MacDonald mine on the Pend d'Oreille River on the Nelway–Waneta road, 4 miles west of Nelway. Mining and milling ceased in 1953, and only the key staff personnel remained with the company during 1954. Zinc concentrates, amounting to 5,100 tons, were not sold and remained on site.

SOUTH KOOTENAY LAKE*

Next Creek (49° 116° S.W.)

Gold-Silver-Lead-Zinc

Spokane This mine is on Wall Mountain, 18 miles by rough road from Tye. The owner, K. K. Laib, of Bayonne, made one carload shipment to the Trail smelter during the summer months. Production: Ore shipped, 30 tons. Gross content: Gold, 14 oz.; silver, 300 oz.; lead, 10,008 lb.; zinc, 420 lb.

Sanca (49° 116° S.W.)†

Lead-Zinc

Lakeview.—E. G. Timmons, of Boswell, retimbered the shaft collar of this mine located on the highway near Sanca, midway between Creston and Kootenay Bay.

Tungsten-Gold-Silver-Lead

Valparaiso (Akokli Tungsten Mine Ltd.) Mine office, Boswell. N. E. Willson, president and manager. This private company holds two Crown-granted and fifteen recorded claims on the east side of Kootenay Lake near Akokli (Goat) Creek. The mine is at an elevation of 4,240 feet and is reached by a 4½-mile truck-road which leaves the Nelson–Creston Highway 1 mile south of Akokli Creek.

Development work comprised 680 feet of drifting, 100 feet of crosscutting, 40 feet of test pitting, and 1,500 feet of long-hole drilling with sectional drill steel. The south Valparaiso drift was extended a total distance of 785 feet to a point midway between the Valparaiso adit and the old shaft on the Government claim near which the camp is established. This drift exposed a continuous quartz vein, ranging from 0.5 to 6 feet wide. The wider sections were found to occur at points where a series of narrow diagonal quartz veins intersected the main vein. The final 125 feet of drift disclosed a uniform 6-foot-wide quartz vein containing appreciable visible wolframite. Throughout this length the hangingwall side of the vein was composed of a 14-inch band of heavy

* By J. W. Peck, except as noted.
† By J. E. Merrett.

sulphides reported to contain good values in lead and silver. The crosscutting and test drilling revealed the existence of a series of wolframite-bearing quartz veins in echelon with the main vein.

Underground work was suspended in July, and the crew was employed constructing a 50-ton pilot-mill building, compressor-house, and new headframe for the Government shaft.

The West Kootenay Power and Light Company erected 1 mile of transmission-line to deliver electric power to the mine where an Ingersoll-Rand 90-B compressor and a General Electric 100-horsepower induction motor were installed.

During mining operations a crew of four men was employed underground and a crew of ten men was employed on construction work.

NORTH KOOTENAY LAKE*

RIONDEL (49° 116° N.W.)

Silver-Lead-Zinc

Bluebell (The Consolidated Mining and Smelting Company of Canada, Limited)†

D. S. Campbell, superintendent; J. B. Donald, mine superintendent; T. F. Walton, mill superintendent. This property is at Riondel on the east shore of Kootenay Lake, about 6 miles north of Kootenay Bay. It is reached by a road that leaves the highway a short distance from the ferry landing. Electrical energy is supplied by company-owned power plants on the Kootenay River. Production was suspended between June 16th and September 15th owing to a strike of the workmen. The concentrator treated 632 tons per operating day or 447 tons per calendar day.

Development work comprised 2,304 feet of drifting and crosscutting, 2,683 feet of raising, 255 feet of shaft sinking, and 11,336 feet of diamond drilling in eighty-four holes.

No. 1 shaft, between the Bluebell and Kootenay Chief ore zones, was extended to a point 90 feet below the 675 level. The major portion of the drifting and crosscutting was done on the 525 and 675 levels to develop the Kootenay Chief ore zone which was further outlined by diamond drilling. The principal portion of the raising was done to provide access to the stopes for gravel backfill from the surface and to ventilate the mine. Ventilation is becoming increasingly important in view of the fact that increased concentrations of carbon dioxide gas are being encountered on the 375 and 525 levels.

Ore was obtained mainly from the Kootenay Chief ore zone by horizontal cut-and-fill mining methods. A lesser amount of ore was obtained from the Comfort zone where, on the 225 level, two shrinkage stopes were developed. Gravel, by-passed from the surface through fill-raises, was the principal backfill used in the stopes. In a stope experimentally backfilled with mill tailings, no heating or oxidation was noted, and in view of the satisfactory results obtained, plans have been made to establish a de-sliming plant at the mill to treat the tailings for use as backfill.

A 1,000-cubic-feet-per-minute Ingersoll-Rand compressor was added to the compressor plant but was not put into operation pending the installation of its electrical equipment.

The average number of persons employed was 285, of which 146 were employed underground. Production: 163,134 tons.

CRAWFORD CREEK (49° 116° N.W.)

Silver-Lead

Santa Fe (Victoria Group)

This property, comprising four claims and formerly known as the Victoria group, is between Canyon Creek, a tributary of Crawford Creek and Sawyer Creek, a tributary of the headwaters of St. Mary River. It is at an elevation of 5,000 feet and is reached by 13½

* By J. W. Peck, except as noted.
† By J. E. Merrett.

miles of road and trail from Crawford Bay on the Nelson–Creston Highway. The owner, J. W. Mulholland, of Nelson, employing two men, constructed 1½ miles of pack-horse trail and did 75 feet of deep trenching on a 30-foot-wide flatly dipping quartz vein containing silver-lead mineralization.

AINSWORTH (49° 116° N.W.)

Silver-Lead-Zinc

Highlander, etc. (Yale Lead & Zinc Mines Limited)

Company office, 525 Seymour Street, Vancouver; mine office, Ainsworth. H. W. Knight, president; H. D. Forman, manager. Capital: 3,000,000 shares, $1 par value. This company controls most of the claims lying between Coffee and Cedar Creeks in the Ainsworth camp. The mine plant and crushing plant are above and the mill is below the Nelson–Kaslo Highway, about three-quarters of a mile south of Ainsworth. The mill operated at 4,500 tons per month, which was a slight increase over 1953. The Highlander mine produced over 80 per cent of the mill-feed with the remainder coming from other company mines and custom shippers.

The Highlander mine is serviced by the 2150 or main haulage level. This level explores for several thousand feet the 7-foot-wide Highlander ore-bearing shear which strikes north-south and dips 45 degrees west. Two orebodies, the Albion and Banker, have been developed by raises to the 2600 Albion adit and the 2500 Banker adit respectively. Sublevels have been driven off these raises. Open stoping is done with the back supported by pillars, timber, and roof bolts. The Albion orebody, by the end of 1954, had been almost mined to its limits above the 2150 level, and pillar recovery was in progress. On the 2150 level the crosscut which was started in the Albion section in 1953 to investigate the Mamie vein was stopped early in 1954 after the vein was reached and a large flow of water and mud encountered. Other development included some drifting in the south end of the 2600 level of the old Banker shaft workings. This level is connected by raise to the 2500 adit level.

A new low-level adit was collared just above the mill and below the Nelson–Kaslo Highway. It was driven westward and had reached about 2,000 feet by the end of 1954. This low level will develop the Highlander vein 200 feet below the 2150 level. The Albion section was expected to be reached early in 1955.

At the Krao a vein conformable with the north-striking limestone beds has been developed in the past by a 75-degree shaft and three short levels at 35, 100, and 200 feet. As in 1953, all ore in 1954 was mined by open stoping above the 100 level. Three men operated this property under a contract arrangement.

At the Trinket a vein conformable with the quartzite and limestone bedding has been developed in the past by a short adit crosscut and by drifts on the vein. Stoping operations began in 1953 and continued during the first half of 1954. Two stopes, 4 to 5 feet wide and as much as 60 feet long, were carried up the 45-degree dip. Breakthroughs were made to surface. Two men were employed on a contract arrangement. After this work ceased, a lease was given to Thomas Hawes, of Ainsworth, who made a shipment of 7 tons to the Trail smelter.

At the Eden and Crescent, production was spasmodic, ranging from 50 to 250 tons per month. A vein about 5 feet wide and dipping 45 degrees has been developed in the past by about 500 feet of adit crosscut and a raise on the vein to surface. Stoping began in 1952 in the vicinity of the raise, and during 1954 this area was stoped to surface. The hangingwall was weak and gave considerable trouble. During the latter half of 1954, work was concentrated on sinking a winze on the vein from a point on the adit level near the bottom of the raise. Four men were employed under a contract arrangement.

Three men were employed in the McCune adit. This is a crosscut driven westward for 1,380 feet, and containing several hundred feet of drifts to north and south at 1,300

feet from the portal. Most of the work done consisted of exploratory drifting and stope raising in the north drift.

At the Hector, a ½-mile road was built to the old workings, which were rehabilitated; drifting was started at the south end of the workings.

The total ore milled from all sources is tabulated as follows:—

		Tons
Highlander		45,228
Eden and Crescent	2,134	
Krao	3,927	
Trinket	1,935	
McCune	162	
Krao Dump	191	
United Dump	183	
		8,532
Total, Yale properties		53,760

Custom ore amounted to 211 tons from the Highland mine.

Construction began on a new crushing plant adjacent to the mill and the new low-level adit. When the new adit has reached its objective it will become the main haulage, and the existing crushing plant and flume transfer to the mill will be eliminated.

Development: Raising, 1,398 feet; crosscutting, 2,034 feet; drifting, 1,783 feet. The number of Yale employees averaged eighty-five.

Spokane

This mine is owned by Yale Lead & Zinc Mines Limited. It was under lease to Thomas Hawes, of Ainsworth, who made shipments to the Trail smelter. Production: Ore shipped, 21 tons. Gross content: Silver, 292 oz.; lead, 22,388 lb.; zinc, 2,005 lb.

Kootenay Florence (Western Mines Limited)

Company office, 1768 East Hastings Street, Vancouver; mine office, Ainsworth. H. M. Wright, president. Capital: 2,500,000 shares, $1 par value. This company acquired the Kootenay Florence property in 1951. The property covers an area 2 by 1½ miles extending westward from the mouth of Princess Creek. The mine plant and mill are on the Nelson–Kaslo Highway, 2 miles north of Ainsworth. Milling and underground mining ceased in 1953, but the entire plant has been kept intact. In the latter half of 1954 The Consolidated Mining and Smelting Company of Canada, Limited, which owns the adjoining Highland group, made an agreement for eventual control and carried out a geological and geophysical survey of the surface. The results were reported to be inconclusive, and diamond drilling was planned for 1955.

Ayesha, No. 5 (Triumph Mines Limited)

Company office, 355 Burrard Street, Vancouver. S. A. Liening, Seattle, Wash., president. Capital: 3,000,000 shares, $1 par value. Late in 1953 this company acquired the Logan McPhee group of claims in the Ainsworth camp. Most of the past work has been done on the Ayesha claim, which is accessible by a 4-mile truck-road from the Kootenay Florence camp or by a 2½-mile jeep-road from Ainsworth. Work in the Ayesha adit ceased in December, 1953, when a raise to surface was completed. In 1954 a new adit was driven on a fissure vein exposed on the surface on the No. 5 claim, about 1,500 feet east from and 500 feet lower than the Ayesha adit. The vein crosses the limestone formation at north 35 degrees west, and in the first 30 feet of drift was 1 foot wide. It then passed into narrow stringers. When the drift was 209 feet long a crosscut was driven north for 170 feet to intersect another vein which had been explored from the surface about 100 feet above by a shaft 30 feet deep. A drift about 30 feet long was driven on this second vein.

A small utility building was erected at the portal of the new adit, and air for drilling was supplied by a Le Roi 105 compressor. About 3 tons of ore heavily mineralized

with galena, sphalerite, pyrite, and chalcopyrite was salvaged from the outer part of the first drift and stored at the portal. C. Lind was in charge of the work with two men employed. No work was done in the latter half of 1954, and the equipment was moved to the Hercules group.

Buckeye (Guichon Mine Limited)

Company office, 913 Vancouver Block, 736 Granville Street, Vancouver. W. D. Gillespie, president; J. D. Ferguson, manager. Capital: 2,000,000 shares, no par value. This company owns the Buckeye mine, 3½ miles by road from the Kootenay Florence camp. The mine consists of an adit containing 400 feet of drifts and crosscuts and a shaft-raise connection to the surface 110 feet above. A lease was given to A. Burgess and M. Burgess, both of Ymir. These partners drove a short drift in the adit to investigate diamond-drill results obtained in 1953. A small orebody was located and was mined and shipped to the Can-Amer custom mill. Some sorted ore was obtained from a small stope off the shaft-raise and was trucked to the Trail smelter. Production: Ore milled, 90 tons. Gross content in concentrates: Silver, 188 oz.; lead, 12,659 lb.; zinc, 833 lb. Ore shipped, 2 tons. Gross content: Silver, 61 oz.; lead, 2,648 lb.; zinc, 85 lb.

Hercules (Pataha) (Triumph Mines Limited)

This group of claims comprises the Hercules, Sullivan, and Noranda, which are respectively the former Pataha, Ellen, and Bugaboo cancelled Crown-granted claims. The claims extend in line north from the Buckeye claim and are accessible by road from the Kootenay Florence camp. Triumph Mines Limited (*see* Ayesha, No. 5) acquired the property in 1954. Development was concentrated on the north end of the claims, where a fissure vein had been explored by diamond drilling in 1952. An adit crosscut was driven below the surface showings for 90 feet, the vein was intersected, and about 300 feet of drift was driven to the west. It is reported that the vein was 1 foot wide and that replacement into the limestone wallrock had occurred at intervals up to the width of the drift.

A utility building was erected near the portal. Air for drilling was supplied by two portable compressors. The crew was transported daily from Kaslo. C. Lind was in charge with two men employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1952, p. 165.]

Highland

The Highland mine is on Cedar Creek, 2 miles by road from Ainsworth. It is owned by The Consolidated Mining and Smelting Company of Canada, Limited, but was under lease to S. McLellan, of Ainsworth. Shipments of milling ore were made to the Yale mill and one truckload of crude ore was sent to the Trail smelter. Production: Ore milled, 211 tons. Gross content in concentrates: Silver, 468 oz.; lead, 37,194 lb.; zinc, 3,665 lb. Ore shipped, 10 tons. Gross content: Silver, 204 oz.; lead, 9,791 lb.; zinc, 294 lb.

Another lease was operated by F. Dumas, of Ainsworth, who made a shipment to the Trail smelter. Production: Ore shipped, 11 tons. Gross content: Silver, 196 oz.; lead, 9,632 lb.; zinc, 794 lb.

Woodbury Creek

Woodbury

(49° 116° N.W.) Dr. L. D. Besecker, of Ainsworth, owns the Woodbury group of claims at the mouth of Woodbury Creek. The Nelson–Kaslo Highway crosses the property. On the Lulu the extension of the fissure vein, developed on the adjoining Vigilant claim, was traced by open-cuts at intervals along the strike. A portal site was chosen below a good exposure and one-half mile of road was built to this site. The adit was driven to a point below the exposure, but the vein was disappointing at this horizon. A small shipment of sorted ore was made to the Trail smelter. Two men were employed in this work.

On the Dixie Fraction, which adjoins the Vigilant to the south, Dr. Besecker, assisted by two men on a lease arrangement, worked on a vein that can be traced from the adjoining Budwiser No. 2 claim (see *Minister of Mines, B.C.*, Ann. Rept., 1951, p. 162). A new adit was started and was driven intermittently. The sorted crude ore was trucked to the Trail smelter, and lower-grade material was delivered to the Can-Amer custom mill. Production: Lulu, 6 tons to Trail smelter. Gross content: Silver, 113 oz.; lead, 7,163 lb.; zinc, 440 lb. Dixie Fraction, 140 tons to Can-Amer mill, 8 tons to Trail smelter. Gross content in ore and concentrates: Silver, 359 oz.; lead, 20,711 lb. zinc, 2,061 lb.

Can-Amer Mining & Milling Company Ltd.

(49° 116° N.W.) Company office, 459 Baker Street, Nelson. G. A. Matthews, Kennewick, Wash., president; Dr. L. D. Besecker, Ainsworth, manager. Capital: 400 shares, $500 par value. Late in 1953 this company completed construction of a custom mill at the mouth of Woodbury Creek. A few improvements were made during 1954. The mill operated intermittently on whatever custom ore was available. The following tonnage was treated: Buckeye, 90 tons; Silver Bear, 85 tons; Caledonia, 93 tons; Dixie Fraction, 140 tons. G. Green, of Nelson, was in charge of the milling of most of this ore.

82F NW 111 112

Gold-Silver-Lead-Zinc

Scranton (Scranton Mines Limited)

(49° 117° N.E.) Company office, 1519 Marine Building, 355 Burrard Street, Vancouver. A. A. Loeb, president; C. J. Bailer, general manager. Capital: 3,000,000 shares, $1 par value. This company owns the Scranton group of claims in Kokanee Glacier Park, astride Pontiac Creek, a northerly flowing tributary of Woodbury Creek. The mine camp is on Pontiac Creek, at 5,600 feet elevation, 11½ miles by private road from a point on the Nelson–Kaslo Highway 8 miles south of Kaslo. The group consists of fourteen claims including the Granite, Sunrise, Grandview, Scranton, Pontiac, and Tecumsie Crown-granted claims.

A series of fissure veins in granite strike northeastward and southwestward and are exposed at intervals across the property over a horizontal distance of about 7,000 feet. The northeasterly workings, known as the Pontiac, and the southwesterly workings, known as the Sunrise and Grandview, were developed about fifty years ago and are, with the exception of the Sunrise, inaccessible. Scranton Consolidated Mining Company (changed in 1952 to Scranton Mines Limited) purchased the property about 1930 and commenced investigation of the Scranton claim at the centre of the holdings near the main camp. There is little record of work being done until 1939 and 1940, during which years most of the underground development was done on the Scranton claim. The property was then idle until 1945, when construction of the present road started, the work taking three years to complete. Ore shipments started in 1948 and continued through 1953 to a total of 5,613 tons. During this time the Sunset workings were also developed.

The Sunset mine is on the west bank of Pontiac Creek, adjacent to the camp. The adit portal is just above the creek and the level contains 830 feet of drifts and crosscuts. A winze extends 50 feet below the adit level to a sublevel on which 270 feet of drifting has been done. The adit follows a well-defined quartz vein for about 250 feet, but the vein then splits and pinches, and further exploration was not successful. An oreshoot near the portal, about 70 feet long and with a stoping width of 4 feet, has been mined from the sublevel through the adit level to surface. The winze remained flooded during 1954, but two lessees, F. Hubic and M. Ansaldo, mined a remnant of ore from the surface pillar. This produced 17 tons, which was trucked to the Trail smelter.

The Scranton mine (also known as lower Pontiac) is on the east side of Pontiac Creek, also adjacent to the camp. Two adits, less than 30 feet apart vertically, have been

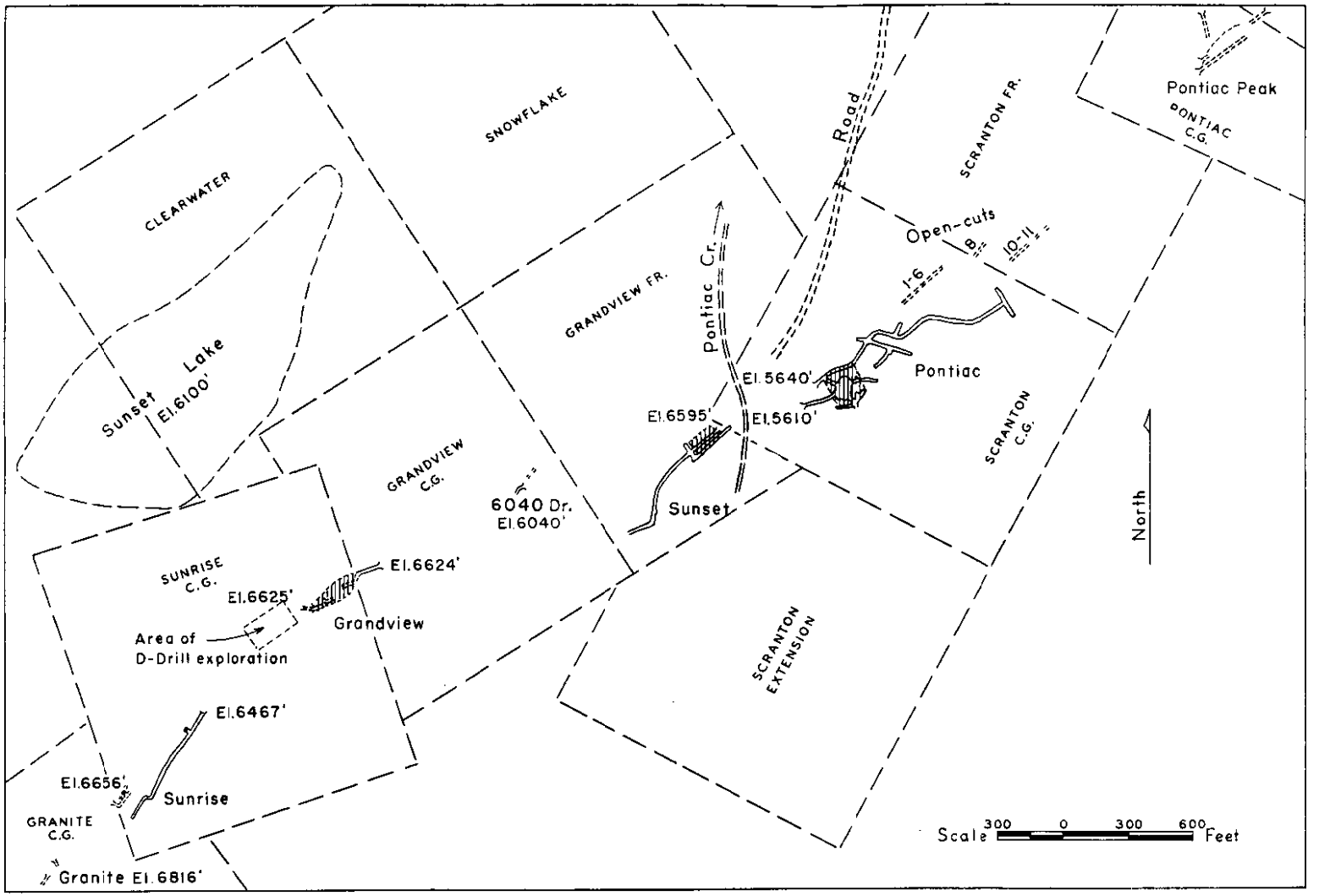


Figure 12. Property and workings, Scranton Mines Limited.

driven on a quartz vein which dips about 18 degrees within granite walls. The upper adit contains about 1,800 feet of drifts and crosscuts, and the lower adit is a drift on the vein about 400 feet long. The levels are connected by two raises. A sublevel below the lower level is reached by a winze on the vein 75 feet long. The vein passes into sediments about 350 feet from the portal of each adit and becomes narrow and of no commercial value. The best vein section was in the lower adit between 160 and 320 feet from the portal. Here the vein averaged between 1½ and 2 feet wide, but most of the ore has been mined from the sublevel a slope distance of 40 feet above the lower adit level. There are still remnants of ore in the stope extremities, but the vein exposed in the raises to the upper adit contains only minor sulphide mineralization. A sample across a width of 1 foot on the wall of a stope remnant about 325 feet from the portal assayed: Gold, 1.14 oz. per ton; silver, 11.2 oz. per ton; lead, 1.9 per cent; zinc, 2.2 per cent. The production of this mine has been grouped with that of the Sunset mine in the previously mentioned total of 5,613 tons, which is exclusive of any 1954 production. The gross metal content was: Gold, 1,166 oz.; silver, 53,688 oz.; lead, 1,267,005 lb.; zinc, 1,106,919 lb.; cadmium, 5,539 lb. This represents a calculated average grade of ore: Gold, 0.22 oz. per ton; silver, 10 oz. per ton; lead, 11.9 per cent; zinc, 10.6 per cent. It is estimated that this production was derived equally from the Sunset and Scranton mines. About 3,000 tons was milled at a custom concentrator, and the rest was shipped direct to the Trail smelter.

On the surface above the upper Scranton adit the vein and its presumed offsets have been traced by open-cuts and stripping for a length of about 1,000 feet. The sections of vein exposed in the open-cuts were erratic in width and mineralization. Five samples were taken from some of these open-cuts which are numbered consecutively to the northeast, starting above the upper adit. The assay results follow:—

Location of Sample	Width of Sample	Gold	Silver	Lead	Zinc
	In.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
Cut No. 2	12	0.01	*Nil*	(1)	Trace
Cut No. 4	39	0.04	1.3	1.8	3.1
Cut No. 5	16	0.05	1.4	2.8	Trace
Cut No. 8	14	0.18	17.4	25.8	0.2
Cut No. 10	14	0.01	*Nil*	Trace	Trace

[1] Under 0.1 per cent.

The sample from Cut No. 2 contained between 0.2 and 2 per cent tungsten, and the sample from Cut No. 8 contained a trace of tin.

In 1954 a geophysical survey was conducted of the company's holdings. Two holes totalling 377 feet were diamond-drilled on the Scranton claim, one to check a vein extension and the other a geophysical anomaly.

The Pontiac workings at the northeastern end of the property are presumed to be along a vein with the same strike as that in the Scranton mine. They are reached from the main camp by 1½ miles of poor trail. The workings are inaccessible, but old records indicate that a vein was mined over a length of 400 feet and a depth of 190 feet. Past production is listed as 1,251 tons with an average content of 0.15 oz. gold per ton, 16 oz. silver per ton, and 6 per cent lead. The lowest level is accessible for only 50 feet. A sample taken across a 3-foot vein 50 feet from the portal assayed: Gold, 0.06 oz. per ton; silver, 0.6 oz. per ton; lead, 0.1 per cent; zinc, 0.5 per cent. The dump at this portal contains several hundred tons of material in which sulphide mineralization is readily discernible. It is reported that the 1954 geophysical work obtained its best results in the vicinity of these workings.

The Sunrise mine is at the southwestern end of the property and accessible by 3 miles of good trail from the main camp. A quartz vein in granite has been followed by an adit

which contains about 700 feet of drifts and crosscuts. A raise extends to surface near the portal. Another adit 200 feet above on another slope is inaccessible. In the lower adit the quartz appears barren except for a section 350 to 540 feet from the portal in which sulphide mineralization is quite noticeable. Fifteen samples were taken in this section, but not all were at regular intervals as the vein has twice been offset into the wall of the drift. The averaged result of sampling was as follows: Width, 1.4 feet; gold, 0.22 oz. per ton; silver, 7.5 oz. per ton; lead, 7.7 per cent; zinc, 9.2 per cent. It will be noted these values are quite similar to the grade of ore mined in the Sunset and Scranton mines. The sample locations and assays are as follows:—

Location of Sample	Width of Sample	Gold	Silver	Lead	Zinc
	Ft.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
353 feet from portal	1.4	0.83	4.5	2.3	3.4
258 feet from portal	1.6	0.12	1.8	4.4	2.9
363 feet from portal	1.2	0.19	25.8	17.0	15.8
368 feet from portal	1.3	0.10	5.2	4.7	46.6
373 feet from portal	2.0	0.11	20.4	18.2	22.0
378 feet from portal	1.2	0.24	10.2	10.6	3.9
383 feet from portal	1.7	0.36	13.4	14.7	11.5
388 feet from portal	1.6	0.15	6.9	3.1	5.5
393 feet from portal	1.5	0.19	4.9	2.6	2.0
398 feet from portal	1.2	0.52	2.5	1.3	2.2
403 feet from portal	0.6				
408 feet from portal	1.3	0.30	8.1	5.2	9.6
413 feet from portal	1.3				
418 feet from portal	1.0	0.15	1.4	0.3	5.3
425 feet from portal	0.6				
First offset	1.5	0.26	1.3	0.9	1.0
Second offset	1.3	0.12	10.3	10.2	4.9
Vein returns to main drift	1.0	0.03	4.5	2.1	4.7

Most samples contained a fraction of 1 per cent cadmium.

At the portal of the upper adit the dump was estimated to contain 150 tons of vein material. There is also a 10-ton dump of selected ore. Grab samples assayed as follows: Large dump—Gold, 0.25 oz. per ton; silver, 2.6 oz. per ton; lead, 2.9 per cent; zinc, 0.8 per cent. Small dump—Gold, 1.71 oz. per ton; silver, 14.9 oz. per ton; lead, 13.3 per cent; zinc, 13.1 per cent. A sample was taken across the vein, 2 feet wide, where exposed above the adit near a small raise-breakthrough. This assayed: Gold, 1.92 oz. per ton; silver, 2.9 oz. per ton; lead, 0.2 per cent; zinc, 0.08 per cent.

The Grandview workings are 700 feet northeast of the lower portal of the Sunrise. They are inaccessible. Late in 1953 surface diamond drilling was done to determine the vein extension between the Sunrise and Grandview workings. Eleven holes were drilled. Examination of the drill core indicated that six of these holes were encouraging.

82 F NW 10

Silver-Lead-Zinc

Baltimore (Victoria Mines Ltd.) (49° 117° N.E.) Company office, 510 Maclean Block, Calgary, Alta. N. J. Briscoe, president; C. K. Hansen, manager. Capital: 4,000,000 shares, no par value. This company holds an option on the Baltimore group of claims situated on the southern slope of Woodbury Mountain east of Silver Spray Creek. Recent work has been in the lowest or No. 5 adit, which is 300 feet lower and 500 feet west of the upper workings from which there was some production prior to 1907. A vein 10 inches wide, containing high silver values, is exposed just above the No. 5 portal. However, the vein narrowed to a crack only a few feet inside the portal of the adit, and additional work was disappointing. By the end of July the adit was 225 feet long and work ceased shortly after. Ore sorted from the development work was shipped to the Trail smelter. Production: Ore shipped, 11 tons. Gross content: Silver, 172 oz.; lead, 444 lb.; zinc, 289 lb.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1953, p. 136.]

KEEN CREEK*

Silver-Lead-Zinc

Cork Province (Base Metals Mining Corporation Limited)

(49° 117° N.E.) Head office, 62 Richmond Street West, Toronto. C. D. Cameron, president; E. J. Gleason, manager. Capital: 3,000,000 shares, no par value. This property is on Keen Creek, about 10 miles by road from Kaslo. The property remained closed throughout 1954 and the lower levels of the mine became flooded. When base-metal prices rose slightly, consideration was given to resuming operations, but the project was abandoned when a satisfactory zinc contract could not be obtained.

Silver Bear (Abacot Mines Limited)

(49° 117° N.E.) Head office, Calgary, Alta.; company office, 373 Baker Street, Nelson. W. Belzberg, president; I. A. Young, managing director. Capital: 350,000 shares, no par value. This company was formed in 1953 to develop the Silver Bear and Broughton Crown-granted claims on the southeast side of Keen Creek, 14 miles by road from Kaslo. The lowest or No. 3 adit is just above the Keen Creek road. A raise leads to No. 2 adit, 240 feet vertically above, and two intermediate levels are driven from the raise. Most of the work in 1954 was done on the second intermediate level above No. 3 level. Stope-raising was carried out in the footwall side of a wide shear zone in limy and quartzitic argillites containing minor amounts of sphalerite, galena, calcite, and siderite. The ground is heavy and square-setting was necessary. After raising 15 feet and subdrifting 15 feet, a break-through was made into old workings which probably represent underhand mining from No. 2 level. About 85 tons was obtained from this work and trucked to the Can-Amer custom mill. All work ceased in August and the machinery was removed. Six men were employed up to that time.

PADDY PEAK*

Silver-Lead-Zinc

Utica

(49° 117° N.E.) The Utica mine is at the head of Twelve Mile Creek, about 15 miles by road from Kaslo. It is owned by Utica Mines (1937) Limited, and has been under lease since 1953 to J. A. Cooper, of Kaslo. The main level is the No. 7 adit, which is connected by raise to the No. 4 adit. A sublevel, the No. 5, has been driven from the raise to develop two parallel veins known as the East and West veins. A new stope was started on the East vein on No. 7 level about 200 feet north of the main raise. It was carried up 75 feet over a length of 90 feet. The vein was nearly vertical and varied from a crack to 2 feet wide. All ore produced in 1954 came from this stope, with the exception of 5 tons obtained from the West vein on No. 7 level for a bulk mill-feed sample. Horse haulage was used on No. 7 level. Air for drilling was supplied by the old water-driven compressor. Production totalled 106 tons, of which 46 tons went to the Bunker Hill smelter at Kellogg, Idaho, and the remainder to the Trail smelter. On the surface a small jig plant was set up near No. 7 portal but was used only for a brief period. A small hydro-electric plant was installed for lighting purposes. Four men were engaged at this operation.

RETALLACK-THREE FORKS*

Silver-Lead-Zinc

Jackson (Jackson Basin Mining Co. Ltd.)

(50° 117° S.E.) Company office, 809, 525 Seymour Street, Vancouver. B. I. Nesbitt, managing director; J. Ives, superintendent. Capital: 3,000,000 shares, no par value. This company owns the Jackson mine on Stenson (Jackson) Creek, 5.7 miles by road from Retallack. The mine reopened in the summer of 1954 after being

* By J. W. Peck.

closed since the autumn of 1952. The Jackson lode has been developed by five adits and a 45-degree inclined shaft. No. 5, the lowest adit, intersects the shaft 80 feet below the collar at a point 200 feet from the adit portal. The shaft extends to No. 6 level, about 150 feet vertically below No. 5 level.

Most of the ore mined in 1954 came from a stope 165 feet southwest of the shaft on No. 5 level. This stope was carried up 60 feet over a length of 30 feet, on a fissure 2¼ feet wide containing massive sphalerite. It is reported that considerable galena was encountered as stoping progressed. This stope was exhausted and the ground allowed to cave. The lode also contains massive sphalerite averaging 2¼ feet wide between the shaft and the No. 5 portal. Some ore was mined from this area, but the work was discontinued because of problems of oxidation and bad ground. On No. 6 level a development drift was driven to the northeast to explore the latter orebody. At 95 feet from the shaft a raise was driven to No. 5 level and a sublevel established halfway up this raise. Drifting on No. 6 level was in progress at the end of 1954. All ore obtained was trucked to the Western Exploration mill at Silverton.

On the surface a new vein was reported to be discovered 190 feet north of No. 5 portal, when a road was made to the ore-bin site. No work was done on this vein in 1954.

The new mill building, erected in 1952, was destroyed partly by a snowslide in 1953 and partly by the weight of snow early in 1954. The new metal prefabricated cook-house, also erected in 1952, was demolished by the snow load at about the same time. About eleven men were employed.

Caledonia (50° 117° S.E.) The Caledonia mine is east of Rossiter Creek, a southerly flowing tributary of Kaslo River. A short access road leads to the workings from Blaylock. The property is owned by G. E. McCready, of Retallack. An east-west fissure zone with a steep southerly dip has been developed by surface workings and two adits. During 1954 ore was obtained from a stope in the east drift in the lower adit in the same area as worked in 1953. Production: Ore milled at Can-Amer mill, 93 tons. Gross content in concentrates (including 1953 production): Silver, 871 oz.; lead, 12,158 lb.; zinc, 71,941 lb. Ore shipped to Trail smelter, 8 tons. Gross content: Silver, 430 oz.; lead, 9,266 lb.; zinc, 941 lb.

SANDON*

Silver-Lead-Zinc

Silversmith, etc. (Carnegie Mines of British Columbia, Ltd.) (49° 117° N.E.) Head office, 1160 Peel Street, Montreal; mine office, Sandon. A. E. Sinclair, president; T. R. Buckham, mine manager. Capital: 3,000,000 shares, no par value. This company owns the Silversmith, Slocan Star, Richmond-Eureka, Ruth Hope, and Slocan King mines on Sandon Creek, south of Sandon. A truck-road extends to all mines from the mill on the western outskirts of Sandon. The main development was at the Ruth Hope during the early part of 1954. A raise was driven near the west end of the lowest or No. 5 adit to service a sublevel 150 feet above, which had been accessible only from No. 4 level. This allowed exploration of the lower Stewart lode at this horizon. Some diamond drilling was done in the south section on No. 5 level.

The Richmond-Eureka was idle except for 50 feet of drifting and 40 feet of raising on No. 7 sublevel. About 300 tons of ore was trucked to the mill from this mine.

In the Silversmith three holes, totalling 837 feet, were diamond-drilled from the 1026 crosscut to test a narrow vein which diverges from a mined section. It was reported that a few inches of sphalerite was intersected. The No. 10 level was rehabilitated past the old shaft in preparation for a long drive to investigate projections of structures determined by geological mapping, but this drive had not started by the end of 1954.

* By J. W. Peck.

The mill operated briefly, treating Richmond-Eureka ore and about 1,000 tons of Van Roi ore. About seven men were employed at irregular intervals.

Noble Five, American Boy, Deadman (Cody Reco Mines Limited)

(49° 117° N.E.) Head office, 721 Eastern Avenue Toronto. James A. Taylor, president; D. M. Kline, consultant; R. Olson, manager. Capital: 3,000,000 shares, $1 par value. This company owns a group of claims north of Cody. Included in the group are old mines such as the Noble Five, Slocan Sovereign, Last Chance, American Boy, and Deadman. A road extends from the mill at Cody to all chief workings.

The Noble Five mine is serviced by a long adit crosscut (No. 18 level) and a 1,000-foot, vertical, interior, four-compartment shaft extending from this adit to No. 8 adit. On the Spur vein the back was taken down in the best section on No. 18 level to a height of 40 feet. A raise was driven on this vein to No. 16 level, but the vein was only 1 inch wide for most of the distance. The Noble Five vein was investigated by the driving of raises from No. 18 to No. 16 level and by several hundred feet of drifting on No. 16 level. On No. 18 level a 15-horsepower air-cooled Hunslet diesel locomotive was installed and proved quite satisfactory for the development programme.

At the Deadman 40 feet of drifting was done on an 18-inch zinc-bearing vein in No. 4 adit. A new adit was started 200 feet below No. 4, and 170 feet was driven without intersecting the lode when work ceased.

At the American Boy about 350 feet of drifting was done to get around a cave on No. 9 adit level. Raises were rehabilitated down to No. 10 and No. 11 levels.

The Slocan Sovereign was explored by entering through the No. 3 adit of the No. 1 mine (owned by the late J. M. Harris, of Sandon). A raise was driven on a vein and a sublevel established 50 feet above. Drifting and raising were then done on the vein at this horizon, extending into Slocan Sovereign ground. In the main Slocan Sovereign mine a small amount of exploratory drifting and crosscutting was done.

The mill did not operate, but a stockpile was built up at the mill from development work. The number of men employed averaged twelve.

Victor (Violamac Mines (B.C.) Limited)

(49° 117° N.E.) Head office, 67 Yonge Street, Toronto; mine office, New Denver. Mrs. Viola R. MacMillan, president; J. C. Black, mine manager. This company, a wholly owned subsidiary of Violamac Mines Limited, owns the Victor mine, 2½ miles by road northwest of Sandon or 2½ miles by road southeast of Three Forks. The nearly vertical Victor vein has been developed by several adits, but recent production has been from Nos. 5 and 7. During 1954 most of the ore was produced from stopes above No. 7 level. The ground was heavy and required close timbering. The grade and width of the vein varied considerably. There were many lean sections, but the best sections exposed clean galena 6 feet wide. The new No. 9 adit was extended to a length of more than 3,000 feet, or to a point 500 feet ahead of the face on No. 7 level. The only mineralization encountered was 100 feet of zinc-bearing vein. In November a winze was started from No. 7 level.

Sorted ore was shipped to the Trail smelter. The remainder was trucked to the Western Exploration mill at Silverton at a rate of about 1,900 tons per month. The number of men employed averaged sixty. A good safety record was maintained, and the safety trophy of the West Kootenay Mine Safety Association was won for the third consecutive year.

On January 1st, 1955, Violamac Mines (B.C.) Limited ceased to exist, and operations were carried on after that date by Violamac Mines Limited.

Lone Bachelor (Lone Bachelor Mines Limited)

(49° 117° N.E.) This company was formed by Violamac Mines (B.C.) Limited to develop the Lone Bachelor mine to the east of the Victor mine. The No. 4 adit was driven in 1951 and 1952, and in 1953 was connected by raise to the old No. 3 adit. A sublevel was established 75 feet above No. 4 level. Work was on a

small scale during 1954. The sublevel was extended and some drifting was done on the veins exposed on No. 4 level. Small lenses of galena were encountered in these drifts. No. 3 level was cleaned up to provide a second exit and to improve ventilation. Three men were employed.

Noonday (Leadsmith) (49° 117° N.E.) The Noonday mine, also known as the Leadsmith, is on Cody Creek, 1½ miles by tractor-road south of Cody. The mine has been inactive for over twenty years, although an attempt was made to reopen the mine in 1951. It is owned by Noonday Mines Limited (company office, 415 Baker Street, Nelson) but was under lease in 1954 to P. J. McCrory and J. Gibbs, of New Denver. A small shipment of crude ore was salvaged from the upper levels and sent to the Trail smelter. Production: Ore shipped, 4 tons. Gross content: Silver, 140 oz.; lead, 3,363 lb.; zinc, 609 lb.

Hinckley (49° 117° N.E.) The Hinckley is an old Crown-granted claim situated east of the Victor claim about 1½ miles from Sandon along the Sandon–Victor mine road. It is owned by a syndicate comprised of W. D. Pengelly, A. Elsmore, R. Harding, R. Fairhurst, and C. Uphill. It has been inactive since 1941. A short access road was made to an old adit at 3,800 feet elevation. This adit was driven on a narrow lode to a total length of about 200 feet. Small lenses of galena were encountered and were sorted and stored at the portal. Air for drilling was supplied by a portable Jaeger 125-cubic-feet-per-minute compressor. Two men were engaged in this work, which ceased in October.

SLOCAN LAKE*

Silver-Lead-Zinc

Mammoth, Standard, Enterprise, Monarch (Western Exploration Company Limited) (49° 117° N.E.) Company office, 38 South Dearborn Street, Chicago, Ill.; mine office, Silverton. M. P. McCulloch, Chicago, president; A. M. Ham, Silverton, managing director; R. A. Avison, mine superintendent; T. Leask, mill superintendent. Capital: 2,000,000 shares, 50 cents par value. This company owns the Mammoth, Monarch, and Standard mines near Silverton, and the Enterprise mine on Enterprise Creek, 12½ miles by road south of Silverton. Most of the work since 1952 has been concentrated in the Monarch adit, which is situated alongside the Standard–Mammoth road, 900 feet west of the Mammoth mine. Several thousand feet of drifting and crosscutting have been done exploring a lode which was mainly unmineralized except for a section west of a swing of the lode from north 75 degrees west to south 70 degrees west. A crosscut was driven at this point, and five holes diamond-drilled in this area outlined an orebody lying below the level. A total of forty-four holes were drilled in the course of exploration from this level. To investigate the orebody outlined by diamond drilling, the No. 7 level of the Mammoth mine, which is 315 feet vertically below, was extended to the west to reach under the orebody. Most of the estimated 1,800 feet of drifting had been completed by the end of 1954.

The Standard was idle except for leasing operations. C. E. Towgood and J. Nesbitt worked intermittently on the No. 2 level of the Standard. About 200 tons of zinc ore was obtained from the same area as mined in 1954. This was milled at the Western Exploration mill at Silverton. Messrs. Detta and Postlethwaite and Messrs. Day and Pengelly also operated leases and shipped 8 and 10 tons respectively to the Trail smelter.

The Enterprise mine remained closed, but equipment is intact and a watchman is employed.

The mill operated throughout 1954, treating Violamac ore on a custom basis at a rate of about 1,900 tons per month. In addition, custom milling was done for the Jackson mine and for the Standard lease. The number of men employed averaged thirty-one.

* By J. W. Peck.

Van Roi (49° 117° N.E.) The Van Roi mine and camp is 6½ miles by road southeast of Silverton. It is owned by Van Roi Consolidated Mines Ltd. (company office, 532 Burrard Street, Vancouver) but was under lease during 1954 to M. Slobodzian, J. W. Miller, and L. Fried. Most of the production came from the southwest end of the workings on No. 3 level where an underhand stope was started in 1953 below the 346 stope. This stope was enlarged and an incline track installed for handling ore and supplies. Ore was also obtained from "A" level. Most of the ore was lowered through raises to No. 5 level, where the track had to be reinstalled. Over 1,000 tons of ore was trucked to the Carnegie mill at Sandon for custom milling. Twenty-five tons of sorted ore was trucked to the Trail smelter.

Hewitt (49° 117° N.E.) This mine is west of the Van Roi mine and is served by the same road from Silverton. It has been idle since 1952, when Van Roi Consolidated Mines Ltd. ceased operations, but was under lease, in the latter half of 1954, to E. Merrill and H. Lyon. A remnant of ore was mined in the 1046 stope about 40 feet above No. 10 level. This stope is about 2,300 feet from the portal, and some track had to be reinstalled to allow hand-tramming of the ore. Air for mining was supplied by a small compressor set up near No. 10 portal. Production: Ore shipped, 16 tons. Gross content: Silver, 1,405 oz.; lead, 7,836 lb.; zinc, 5,935 lb.

Galena Farm (49° 117° N.E.) This mine is about 2 miles by road south of Silverton. It was again under lease to Frank S. Mills, of Silverton. Bulldozer stripping was done in an effort to locate a granite-sediment contact near the old shaft workings. Considerable high-grade float was uncovered in this work but the source was not located. No underground work was done except for a short exploratory adit driven near the stripping.

Noonday (49° 117° N.E.) The Noonday workings are just east of the Galena Farm mine. A lease was obtained by H. Lyon and E. Merrill, of Silverton, who did some underhand mining about 200 feet from the portal of the main adit. A later lease was given to M. Arishenkoff, also of Silverton, who made a shipment to the Trail smelter of much lower-grade material.

Production: Ore shipped, Lyon and Merrill lease, 4 tons. Gross content: Silver, 628 oz.; lead, 2,925 lb.; zinc, 1,075 lb. Ore shipped, Arishenkoff lease, 16 tons. Gross content: Silver, 263 oz.; lead, 925 lb.; zinc, 858 lb.

UPPER ARROW LAKE*

Uranium-Thorium

Sta-Tite (50° 117° S.W.) This is a group of seven located claims astride a small westerly flowing tributary of Arrowpark (Mosquito) Creek, 9 miles by road north of Arrow Park. The claims are owned by H. S. Murphy and F. D. Jordon, of Nakusp. A narrow seam in granite on the north bank of the tributary stream was found to activate a Geiger counter three to four times the background count. A small amount of stripping has been done and an access jeep-road built to the showing which is at 2,700 feet elevation. The strike of the showing appears to be north-south. Two samples were taken at the pit of material giving the strongest reaction. One grab sample was taken of pit material. The assay results are as follows:—

Location of Sample	Width of Sample	Uranium Oxide	Thorium Oxide
	In.	Per Cent	Per Cent
North end of pit	8	0.01	0.14
South end of pit (6 feet from above sample)	15	0.004	0.016
Grab	....	0.005	0.11

* By J. W. Peck.

NORTH LARDEAU*

Gold-Silver-Lead-Zinc

Spider (Sunshine Lardeau Mines Limited) (50° 117° N.W.) Company office, 307, 413 Granville Street, Vancouver; mine office, Camborne. J. Drybrough, president; D. R. Wilson, manager; J. M. Currie and later E. Hall, mill superintendents. Capital: 4,000,000 shares, no par value. Berens River Mines Limited has operating control. The mine camp and mill are at Camborne, and the mine is on Pool Creek, 2 miles distant by very steep road. A nearly vertical vein-like orebody has been developed by several adits, the lowest being No. 10. This level was extended during 1954 to a length of 1,200 feet. Two stoping areas were established over a total length of 450 feet. A raise was driven from No. 10 to No. 8 adit, and a sublevel, No. 9 level, established. Most of the ore was produced from No. 8 and No. 10 levels. The ore above No. 7 sublevel was almost mined through to No. 6 adit by the end of 1954. Some high-grade ore was obtained from an oxidized section above No. 6 level. This was sacked and shipped direct to the smelter.

An option was taken on the Eclipse claim, which adjoins the Spider holdings to the east. Surface diamond drilling totalling about 2,000 feet was done. A 900-foot crosscut was then started from No. 10 adit of the Spider mine to investigate the drilling results.

The Barclay zone, 100 feet west of the Spider mine, was tested by four holes totalling 443 feet.

An investigation was started of the Sandy claim west of the Spider mine. Surface diamond drilling was in progress at the end of 1954.

The mill operated at over 1,800 tons per month, except for the period March to June, inclusive, when operations were suspended owing to marketing and road troubles. The concentrates and crude ore were transported by truck and Arrow Lakes barge service to rail-head at Nelson and then by the Great Northern Railway to the Bunker Hill smelter at Kellogg, Idaho. Some zinc concentrates were also sent to the Trail smelter. The number of men employed averaged forty-five.

Silver-Lead-Zinc

Beatrice (Beatrice Mining Co. Ltd.) (50° 117° N.W.) Company office, 404 Pemberton Building, 744 West Hastings Street, Vancouver. W. J. Scorgie, president. Capital: 50,000 shares, $1 par value. This company was formed in 1954 to develop the Beatrice mine at the head of the east fork of Mohawk Creek, 4 miles by trail from the Spider mine road. The last work was done in 1920. In 1954 the trail was repaired, the adits rehabilitated, and improvements made to the old camp. As the workings are at 7,000 feet elevation, snow conditions forced withdrawal of the crew in late autumn.

Molly Mac (Mollie Mac Mines Limited)† (50° 117° N.E.) Company office, 850 West Hastings Street, Vancouver. W. R. Wheeler, president; C. C. Rutherford, consultant; E. Lonergan, superintendent. Capital: 3,000,000 shares, $1 par value. This company was formed in 1952 to develop the Molly Mac group of claims on the northwest side of Gainer Creek valley, 9½ miles by road from Ferguson. No work was done in 1953. Galena-pyrite mineralization in limestone has been traced in the past by trenches, and by some diamond drilling in 1952. An old adit at 4,450 feet elevation has been driven northwestward for 100 feet, but no mineralization is reported in it. In 1954 a new adit was collared at 4,575 feet elevation from a point 145 feet northwest of the portal of the old adit. It was driven northwestward in the hangingwall of an ore zone that is exposed in trenches on the surface above, and was 265 feet long when work ceased at the end of

* By J. W. Peck, except as noted.
† By J. W. Peck and G. P. Eastwood.

November. Short exploratory crosscuts were driven on both sides of the drift at 40, 145, and 245 feet respectively from the portal.

This ore zone is the lowest of the Molly Mac group of showings, the main showings being 600 feet to the north and 700 feet higher. The mineralization consists of pockets of galena and pyrite in bodies of siderite replacing limestone in the cores of steeply dipping drag anticlines. The dragfolds plunge gently northwest. The bodies vary considerably along strike in width and in shape of cross-section. The greatest width observed was 15 feet, but the average is probably about 5 feet. Vertical and longitudinal dimensions are unknown. The new adit follows one siderite body, and two others are exposed in the trenches.

Within the siderite bodies, galena and pyrite are localized as small pods and pockets of massive or thickly disseminated ore along random joints and slips. The intervening siderite is essentially barren. Sphalerite is present but is uncommon. A sample across a width of 13 feet assayed: Gold, trace; silver, 1.0 oz. per ton; copper, trace; lead, 5.5 per cent; zinc, *nil*.

A tent camp was established in 1951 at 4,600 feet elevation. Air for drilling was supplied by a G.M.C. 87-horsepower diesel motor driving a Holman 315-cubic-feet-per-minute compressor. A start was made on erecting a more permanent camp beside Gainer Creek. Six men were employed.

SOUTH LARDEAU*

Silver-Lead-Zinc

St. Patrick (Hamil Silver-Lead Mines, Limited)

(50° 116° S.W.) Company office, 817 Granville Street, Vancouver. W. A. Rutledge, president; H. F. Kenward, managing director. Capital: 3,000,000 shares, 50 cents par value. The St. Patrick mine is near the ridge summit on the north side of Hamil Creek and is reached by 3 miles of steep road from a point on the Argenta–Howser road 6 miles from Argenta. Activity was on a minor scale. One large open-cut made 90 feet west of the old shaft exposed zinc-lead mineralization on the nose of a fold at a contact between schist and limestone. Some underground drifting on a sublevel was also reported. Geological mapping was done by A. G. Pentland.

Silver

Surprise

(50° 116° S.W.) This property is on the west side of Glacier Creek, 3 miles by road from the Argenta–Howser road. It is owned by J. Gallo and associates, of Howser. A quartz-tetrahedrite vein has been developed by two adits, but most shipments have come from the upper adit, which is 1,300 feet in elevation above the camp on Glacier Creek. During the winter of 1953–54 ore was mined from near the end of the upper level and one carload was shipped to the Trail smelter. About the same time The Granby Consolidated Mining Smelting and Power Company Limited did some exploratory diamond drilling. Five holes, with a maximum length of 200 feet, were drilled from locations on both levels.

CRESTON†

Lead-Silver-Copper

82 F SE - 50 **King**

(49° 116° S.W.) J. B. Vaughn and L. J. Lansing, of Creston, hold by record four claims on Glaser Creek, 2 miles north of Creston and one-quarter mile west of the Nelson–Creston Highway. In October this property was leased to A. Johnson, of Creston.

Discontinuous surface stripping and test pitting over a distance of 400 feet on the east side of Glaser Creek has disclosed a quartz vein 2 feet in average width. A test

* By J. W. Peck.
†By J. E. Merrett.

pit 10 feet long and 10 feet deep was sunk on the north end of the discovery, and 25 feet of drift was driven in a northerly direction. The drift disclosed local concentrations of galena and pyrite with minor amounts of chalcopyrite in quartz.

Copper

82F/SE-42

Creston Hill (Bon Ton Syndicate).—(49° 116° S.E.) This property is on the south range of mountains 10 miles east of Creston and 1 mile from the Creston–Cranbrook Highway. One thousand feet of diamond drilling in four flat holes was done from stations underground in an old drift. This work did not indicate downward extension of the surface ore occurrences.

MOYIE RIVER*

Lead-Zinc-Tungsten-Uranium

82F/SE-3

Cariboo (49° 116° S.E.) F. H. Giles, of Kimberley; G. F. Olson, of Seattle, Wash.; and C. B. Waring, of Sand Point, Idaho, jointly hold five claims by record astride the Nelson-Fort Steele Mining Division boundary on the headwaters of the North Fork of Moyie River. Surface stripping and trenching have indicated a mineralized zone, reported to be 40 feet wide and 200 feet long, containing galena, sphalerite, scheelite, and uranium mineralization.

CRANBROOK*

Northwestern Explorations, Limited (49° 115° S.W.) This company, employing a crew of seven men, conducted a programme of geophysical prospecting and geological mapping in the vicinity of Cranbrook during the summer season. Geophysical surveys were made on groups of claims immediately north of Cranbrook, northeast of Kimberley, and south of Marysville near Pitt Creek. Some exploratory diamond drilling was done in the latter locality. During September and October geological investigations were made in St. Mary River valley.

ST. MARY RIVER*

Silver-Lead-Zinc

Boy Scout (Thomas Consolidated Mines Incorporated) (49° 116° N.E.) Head office, 640 Peyton Building, Spokane; mine office, Marysville. David E. Watson, president; W. N. Campbell, mine manager. This property, composed of the Warhorse, three other Crown-granted claims, and twenty-four located claims, is on Hellroaring Creek, 5 miles by road from St. Mary Lake. The Warhorse mine has been developed by four exploratory drifts which follow a shear zone mineralized in part with lead and zinc sulphides. The highest adit is at 5,400 feet elevation and the lowest is at 4,500 feet elevation.

Development work comprised 754 feet of drifting and crosscutting, and 333 feet of diamond drilling in six holes. The work, all on the 4500 level, disclosed one short oreshoot.

On the surface a major overhaul was completed on a UD-24 diesel power unit and an RD-6 Caterpillar tractor was purchased. A crew of five men was employed.

KIMBERLEY*

Silver-Lead-Zinc

Sullivan (The Consolidated Mining and Smelting Company of Canada, Limited) (49° 115° N.W.) Company office, 215 St. James Street West, Montreal; mine and smelter office, Trail. R. E. Stavert, Montreal, president; R. W. Diamond, vice-president and general manager. Sullivan mine office, Kimberley. B. E. Hurdle, general superintendent; J. R. Giegerich, mine superintendent; A. G. Robertson, mill superintendent. Capital: 4,000,000 shares, $5 par value. This company owns 678 Crown-granted mineral claims and frac-

* By J. E. Merrett.

tions in a block in the Kimberley area, covering and surrounding the mine workings from which 66,000,000 tons of ore has been removed since December, 1909, at which time the company commenced operations on this property.

The Sullivan mine and concentrator continued operations on the same scale as in 1953 with a production rate of approximately 53,000 tons per week. Approximately 20 per cent of this came from the open pit where ore pillars are being removed by quarrying. Pillar recovery accounted for the major portion of the production from the North, South, and Centre sections of the mine above the 3900 level, which areas furnished more than 50 per cent of the mine production. The remainder of the ore was produced by primary stoping in the area below the 3900 level.

Above the 3900 level some ore was obtained by ordinary bench-mining methods in which conventional steel was used. In a few of the stopes above and in most of the stopes below the 3900 level, long-hole methods employing sectional steel or diamond drills were used. Long-hole drilling from subdrifts has been partly superseded by long-hole drilling from raises. Development footage was less than in 1953 because work was concentrated on completing a programme to improve the over-all mine ventilation. This improvement was partly necessitated by the release of sulphur dioxide from some spontaneously heated broken ore and from float backfill.

Work progressed on the completion of new intake and return airways for the mine. The main surface fans for these airways have not yet been installed, but temporary booster fans were being used underground to increase the airflow. A Sheldon 86-96 fan of 150,000-cubic-feet-per-minute capacity boosts the intake through No. 28 shaft to the 3900 level, and a Sirocco 60-6 fan, installed on the 3900 level, boosts the exhaust through No. 29 shaft. The volume handled by Twin-Joy fans at No. 26 shaft, which exhaust from the 3800 level crusher and fume-control circuit, has been increased to 164,000 cubic feet per minute. The total volume of air exhausted from the mine is 602,000 cubic feet per minute.

As in past years, part of the waste from the concentrator sink-float plant was used for backfilling in stopes below the 3900 level. In the upper levels, 407,000 cubic yards of gravel backfill was placed in mined areas.

All lead and zinc concentrates were shipped to the Trail metallurgical plants for further treatment. The tin-recovery plant operated all year, and the concentrates, which produced 185 tons of metallic tin, were shipped to the Texas City smelter for treatment. Iron concentrates were supplied to the Kimberley fertilizer plant, which completed its first calendar year in operation.

The company's transmission-line by way of Kootenay Lake was completed the previous year but was not put into full service until 1954. All Cominco plants in Kimberley are now operated on power delivered by this line from power plants on the Kootenay River below Nelson.

A well organized and executed safety programme was successful in reducing the accident frequency to 0.11 per thousand shifts worked in both mine and mill. Severity was 6.1 shifts lost per thousand shifts worked. Thirty-eight employees attended the underground school of instruction, making a total of 1,841 who have received training since 1946. First-aid instruction was given to 172 adults and 153 children in the district. Mine-rescue and first-aid teams competed in local and East Kootenay competitions.

The average number of men employed was 1,500, of which 720 were employed underground.

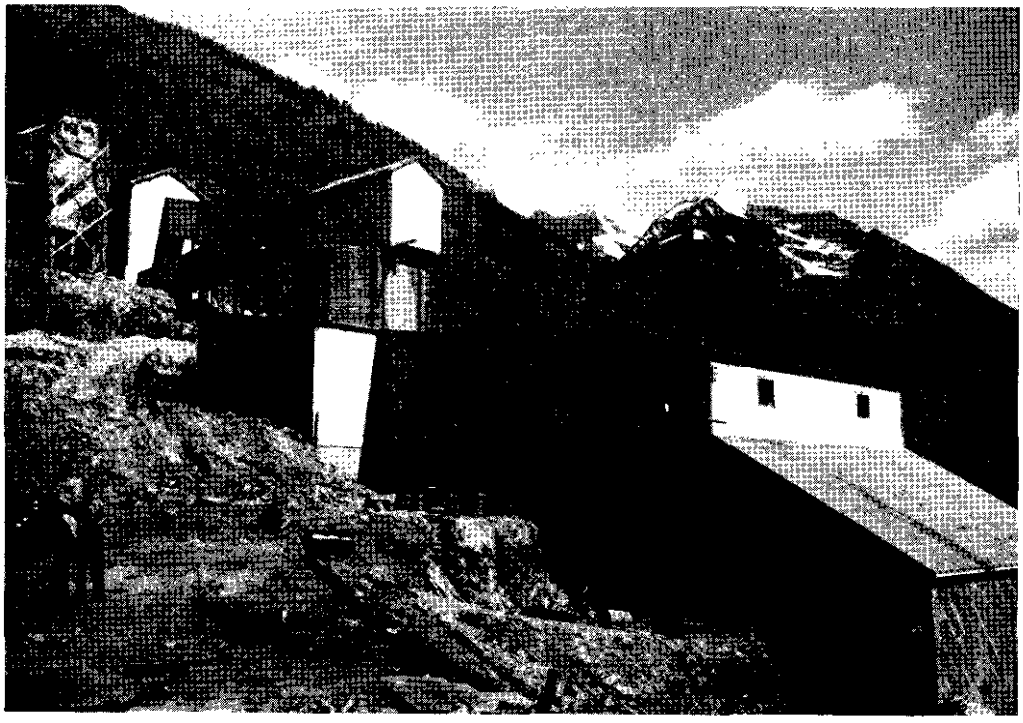
ELKO*

Silver-Lead

Leah Mining Company

(49° 115° S.E.) R. Monesmith and partners hold by record six claims on the south flank of Sheep Mountain, 4 miles by jeep-road from the Elko–Roosville Highway. Surface stripping over a wide area has revealed the presence of a number of parallel

* By J. E. Merrett.



Mineral King 500-ton mill on Toby Creek.

Air-controlled chute gate, No. 7 level of Silver Giant mine.

quartz veins and has disclosed one narrow vein, 2 to 3 inches wide, reportedly carrying good silver-lead values over an exposed length of 100 feet.

FORT STEELE*

Silver-Lead-Zinc

Kootenay King (Kootenay Base Metals Limited).—(49° 115° N.W.) Company office, 525 Seymour Street, Vancouver. Owing to continued low base-metal prices, this property did not reopen after October, 1953. Late in the summer of 1954 the mill and power-house equipment was dismantled and removed from the property.

Big Chief (49° 115° N.W.) C. F. Myrene and E. H. Nagle reopened the lower adit on the Big Chief group of claims on Boulder Creek, a tributary of Wild Horse River. An access road was built and a small mining plant was installed. A small section of ore was mined from the back of the adit. When this ore pinched out, mining was suspended.

WASA*

Silver-Lead-Zinc

Estella (Estella Mines Limited) (49° 115° N.W.) Company office, 736 Granville Street, Vancouver. E. J. Chapman, president; G. Annesley, managing director. The mill-site is at Wasa, 11 miles north of Fort Steele, and the mine, at an elevation of 6,000 feet, is about 5 miles east in a basin at the head of Tracy Creek. The mine and mill have been closed since February, 1953.

Between August and November, 1954, a crew of three men did 1,020 feet of diamond drilling. This work was successful in locating a faulted continuation of the ore zone at the southeast end of the Estella adit.

WINDERMERE*

Silver-Lead-Zinc

Mineral King (Sheep Creek Gold Mines Limited) (50° 116° S.E.) Company office, K.W.C. Block, Nelson; mine office, Invermere. H. E. Doelle, managing director; J. S. McIntosh, resident manager; F. R. Thompson, superintendent. This property is on the Toby Creek slope of the ridge between Jumbo and Toby Creeks, at an elevation of 5,500 feet. It is reached by 27 miles of road from Athalmer.

Development work comprised 567 feet of drifting and crosscutting, 1,355 feet of raising, and 164 feet of diamond drilling. The major portion of this work was done on the 5600 and 5450 levels to develop the "A" and "B" orebodies. The concentrator began operation on March 15th. A total of 84,197 tons of ore was mined and milled.

On the surface a second compressor of 1,000-cubic-feet-per-minute capacity was put into operation in the power-house. The following buildings were constructed: Assay office, steel-shop, main powder magazine, and three employee residences. The average number of men employed was fifty-eight, of which twenty-eight were employed underground.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1953, pp. 151–154.]

SPILLIMACHEEN*

Silver-Lead-Zinc

Silver Giant (Giant Mascot Mines Limited) (50° 116° N.E.) Company office, 908 Royal Bank Building, Vancouver; mine office, Spillimacheen. B. H. Gunning, managing director. A management contract is held by H. L. Hill, consulting mining engineer, Vancouver. L. P. Starck, resident manager; H. Shuttleworth, mine superintendent; J. M. MacDearmid,

* By J. E. Merrett.

mill superintendent; G. W. McCool, mechanical superintendent. Capital: 3,500,000 shares, $1 par value. The property is on the northeast side of the Spillimacheen River, 8 miles by road from Spillimacheen station on the Kootenay Central Railway.

The mine has been developed by adits on Nos. 1, 2, 3, 5, and 6 levels. Nos. 7 and 8 levels are serviced from the main haulage or No. 6 level by No. 1 shaft, which is a three-compartment 6- by 18-foot internal shaft inclined at 49 degrees.

Development work comprised 1,640 feet of drifting and crosscutting, 1,370 feet of stope raising, 168 feet of shaft sinking, and 2,757 feet of diamond drilling in seventeen holes.

The majority of this work was done below No. 7 level when No. 1 shaft was extended from the No. 7 level sump to below No. 8 level, and No. 8 level was developed for mining. This development work included the excavation and equipping of the station, loading-pockets, and transformer-room; driving of two slusher footwall crosscuts from the shaft to the orebody; a slusher drift under the footwall zone; and two raises to No. 7 level. No. 8 level is 140 feet vertically below No. 7 and 275 feet vertically below No. 6 level. The balance of the development work was done on 7 hangingwall drift and 7B and H.W. stope raises.

The footwall and hangingwall ore zones between Nos. 7 and 6 levels were completely extracted by shrinkage stoping except for the level pillars. The floor and roof pillars on No. 5 and part of No. 7 level were removed by long-hole drilling. Mining was completed in the 8C area of the footwall ore zone between Nos. 7 and 8 levels. At the end of the year, shrinkage stoping was under way in the 8B area, and long-hole drilling of the remaining No. 7 level pillars was in progress. Work preparatory to resumption of mining commenced in the " nose " and hangingwall areas above No. 6 level.

Diamond drilling and development work on No. 8 level have shown the lead content of the footwall orebody on this horizon to be 97,500 pounds per vertical foot as compared with 90,800 pounds on the levels above. This calculation was substantiated by mining.

The open-cut operation on the hangingwall zone above No. 2 level was worked spasmodically and accounted for approximately 10 per cent of the tonnage. Due to the removal of the Nos. 2, 3, and 5 level pillars over the past two years the internal by-pass raises from the open-cut to the main haulage-way are no longer accessible, and, therefore, it was necessary to truck the ore from the open-cut to the coarse-ore bin.

Underground installations during the year included a 25-horsepower air slusher, a 60-horsepower electric slusher, and three 50-kva. 2,300–440-volt step-down transformers on No. 8 level; a 25-horsepower centrifugal pump in the sump below No. 8 level; a 2,300-volt vertical shaft cable from No. 6 to No. 8 level; and a 15-horsepower 5-foot-diameter fan on No. 6 level. The No. 1 shaft hoist motor was replaced with a 75-horsepower unit and safety dogs were installed on one skip.

A geophysical survey was completed on the geologically favourable slate-limestone contact east of the main ore zone. Three anomalies were indicated, the largest of which was 750 feet long by 65 feet wide.

Forty claims were located on the northern extension of the property, and a group of claims was also located on a lead-bearing outcrop 6 miles north of the mine on Lead Mountain. This ground was formerly covered by the Rose group. The mineral occurrence is a replacement deposit in limestone and, unlike the Giant, contains no barite. Sampling by the company to date on one area indicates a grade of 3.75 per cent lead over a width of 15 feet and a length of 125 feet. The full width and length of this occurrence is obscured by thick overburden; there are several other interesting lead-zinc mineralized outcrops at higher elevations.

During the summer a 6-mile access road was built from the Silver Giant mine to these claims. A geological study was made of the area and a crosscut has been started

to examine the mineralized zone underground. It is anticipated that the crosscut will be 400 feet long and will intersect the zone 200 feet below the lowest outcrops.

The mill circuit was effectively redesigned for improved efficiency, eleven cells were added, and lead and zinc concentrates were produced by selective flotation methods. An average of 544 tons was treated per operating day.

The coarse-ore bin was reconstructed to increase its capacity from 200 to 450 tons. Many minor changes were made in the crushing plant, and its capacity was raised to 600 tons in sixteen hours. The dust-collecting units in both the crushing plant and assay sample-grinding room were rebuilt.

Considerable test work was done on the recovery of barite from the mill tailings, and a comprehensive study was made of the market potential for barite. On the basis of this work the design of a barite-recovery plant for the production of well-drilling mud is under way.

A new 180-horsepower 2,300-volt diesel-electric unit was added to the power plant. Work was started on the transmission-line from the British Columbia Power Commission's new hydro project at Spillimacheen and also on the 12,000–2,300–440-volt step-down transformer-stations and distribution-lines, etc., on the property. The average number of men employed was 100. Production was 187,653 tons.

MOOSE CREEK*

Uranium-Niobium

Demon No. 1, etc. (51° 116° S.E.) In June, 1953, W. H. Patmore and R. P. Walker, of Vancouver, recorded eleven claims on radioactive and niobium-bearing mineralization near the head of Moose Creek, a tributary of the Beaverfoot River. Other claims were recorded in the same vicinity in November and December by J. R. Ashdown, of Kamloops; R. C. Macdonald and E. Livingston, of Vancouver; and R. Renn and J. S. Adamson, of Calgary. Patmore, Walker, and Helen G. McPherson recorded additional claims in March, 1954.

The claims cover the only known exposures of the Ice River intrusive igneous complex† that lie outside of Federal parkland.

Access to the area is by the Ice River road and thence by pack-trail. The road, a good gravel one, extends from the Banff–Golden Highway at the horseshoe bend east of Leanchoil up the Beaverfoot Valley for 12 miles to the Ice River. In August, 1954, the pack-trail, about 15 miles long, was in good condition, except for the last 3 miles at the head of Moose Creek.

That part of the area covered by the eleven original claims was examined in early August, 1954. Snow lay on much of the ground; therefore, observations were limited to narrow ribs of rock on the crests of minor spurs that extend from the main ridges down into Moose Valley. The ground examined is on the west slope of the ridge between Sharp and Helmet Mountains, covered by the Demon Nos. 1 to 7 claims, and on the east slope of the ridge between Zinc Mountain and Buttress Peak, covered by the Colti Nos. 1 to 4 claims. The Demon claims extend from 6,750 feet elevation on the valley floor to more than 9,000 feet on the ridge crest. The Colti claims extend from 6,550 feet elevation in a minor basin to more than 8,500 feet on the ridge top. Although old workings exist, none of recent origin were seen on any of the claims.

The exposures on the Demon claims are mainly of a dark jacupirangite type of rock with a rim of intermediate ijolite-urtite around the western and southern sides. The contact of the two rock types is not sharp but consists of a zone of intermingling of streaks and layers of each. The contact is further obscured by numerous streaks and masses of light-coloured syenitic phases of the igneous complex. Irregular pegmatitic dykes and lenses occur in several places, particularly on the fourth spur from the north

* By J. W. McCammon.

† *Geol. Surv., Canada*, Mem. 55, 1914, and Map 142A, 1915.

end of the valley. The pegmatites consist of large crystals and coarse masses of calcite, biotite, pyroxene, magnetite-ilmenite, and schorlomite, with minor amounts of pyrite, pyrrhotite, nephelite, and other accessories.

A vertical shear zone 1 to 20 feet wide strikes northeastward and crosses at a very small angle the crest of the third spur from the north end of the valley. The zone was traced from the edge of loose talus at 8,000 feet elevation to 8,900 feet elevation where it crosses the main ridge between Sharp and Helmet Mountains. It appears to be localized largely in pegmatite of the type described above. Scintillometer counts along the shear zone ranged from three to six times background, but uranium assays were low (*see* below).

In some exposures the dark rock is about half pyroxene and the remainder titanite and magnetite in equal proportions. One large outcrop of this type of rock is in the valley at the foot of the spur cut by the shear just described. In other outcrops heavy concentrations of magnetite occur in lenses. Apparently, in the past, prospectors have recorded claims on these types of exposures as iron and titanium deposits.*

Specimens of the rare mineral knopite have been found on this ground in a pegmatite dyke similar to those described above.†

The geological setting at the Colti claims is similar to that at the Demon claims except that the area of dark rock is much smaller. No major shears were noted, and only one or two small lenses of pegmatite similar to that on the Demon claims were seen.

Sodalite is present in both claim-group areas. It is in short irregular veins one-quarter inch to 4 inches wide that cut the lighter-coloured igneous rocks.

Samples were taken at nine places as follows: (1) Magnetite-titanite outcrop at the bottom of the second spur from the north end of the valley, (2) magnetite-titanite outcrop at the bottom of the third spur, (3) across a mass of pegmatite at 8,000 feet elevation on the third spur, (4) at 8,300 feet elevation across the shear zone previously mentioned, (5) picked sample of metallics from the same shear 200 feet west of the crest of the main ridge. (6) across a pegmatite dyke near the bottom of the fourth spur from the north, (7) across a pegmatite dyke on the main ridge at the top of the fourth spur, (8) across an exposure of very coarse pegmatite on the south side near the bottom of the sixth spur from the north, (9) across a pegmatite near the centre of the Colti group. Samples (1) to (8) were all from the Demon group.

Sample	Width	TiO_2	Fe	ThO_2	Nb
	Ft.	Per Cent	Per Cent	Per Cent	Per Cent
(1)	40	10.23	15.70	.....	0.016
(2)	Grab	10.60	12.90	.....	
(3)	50	.....	.....		0.026
(4)	10	.....	.....	0.077	Trace
(5)	.....	.....	.....	0.056	Trace
(6)	25	.....	.....	0.045	0.026
(7)	10	.....	.....	0.013	0.08
(8)	30	.....	.....	0.005	0.076
(9)	20	.....	.....	.....	*Nil*

Thorium was determined by chemical analysis and niobium by spectrographic analysis. Radiometric assays indicated that the uranium content in each sample was less than 0.01 per cent. Spectroscopic analyses indicated traces of rare earths (chiefly lanthanum and ytterbium) in samples (1), (3), and (4).

FIELD‡

Silver-Lead-Zinc

Monarch and Kicking Horse (Base Metals Mining Corporation Limited).—(51° 116° S.E.) Mining and milling ceased at both these mines in August, 1952, when

* *Minister of Mines, B.C.*, Ann. Rept., 1929, p. 291.

† *Geol. Surv., Canada*, Sum. Rept. 1925, Pt. A, pp. 230–232. *Minister of Mines, B.C.*, Ann. Rept., 1925, p. 220; 1926, p. 238.

‡ By J. E. Merrett.

the Monarch orebody was exhausted. Development and exploration work ceased at the Kicking Horse mine in November of the same year. Metal prices were not favourable for continued exploration, and these properties remained idle during 1953. In September, 1954, they were abandoned, and all salvable material was removed from underground.

REVELSTOKE*

Silver-Lead-Zinc-Tungsten

Regal Silver, Snowflake (Columbia Lead & Zinc Mines Limited)

(51° 117° S.W.) British Columbia office, 615 Credit Foncier Building, Vancouver. T. R. Harrison, president; W. Tattrie, mine manager. Capital: 5,000,000 shares, 50 cents par value. Columbia Metals Corporation obtained operating control of this company in 1952. The Regal Silver and Snowflake mines are on Clabon Creek, 7½ miles by road from Silver Creek siding on the Canadian Pacific Railway, 19 miles east of Revelstoke. Activity in recent years has been restricted to the Regal Silver. All mining and milling ceased in January, 1954, and only watchmen were employed after that date.

SKAGIT RIVER†

Copper

A.M. (Canam Copper Company Ltd.)

(49° 121° S.E.) Company office, 571 Howe Street, Vancouver; mine office, Mile 26, Hope–Princeton Highway. E. Doyle, president; D. Burns, resident engineer. The A.M. group, consisting of eight Crown-granted claims, is 24 miles southeast of Hope and 1 mile south 20 degrees east of the old Invermay mine. The claims are at the head of a northeastward-flowing tributary of the Skagit River. A road 5 miles long has been built to the No. 10 adit from a point on the highway one-half mile east of the mine office. This road is suitable for trucks. A branch road leads to the No. 6 camp and adit.

A detailed account of the A.M. group is in the 1949 Annual Report. It should be reviewed in conjunction with the present report which results from an examination made in July, 1954.

The Canam company continued exploration of the northwestern part of the mineralized area in 1951 and 1952. Some diamond drilling and a minor amount of crosscutting and drifting were done in the No. 6 adit. Encouraged by the results of four downwardly directed holes drilled from this adit, the company undertook a programme of deep development. In March, 1953, the No. 10 adit was collared 2,290 feet north 74 degrees east of the portal of No. 6 adit and 598 feet below it. The westernmost part of the No. 10 adit is shown in Figure 13.

The southeastern part of the mineralized area also received some attention. The No. 3† adit was extended a short distance and a new adit, No. 7, was driven.

On July 23rd, 1954, Canam shareholders ratified an agreement whereby development of the property was to be undertaken by The American Metal Company, Limited, of New York. This company, before withdrawing from the property in November, drilled eleven flat holes with a total footage of 2,500 feet and drove 120 feet of exploratory tunnel, all in the No. 10 adit.

The principal rocks on the A.M. group are chert, cherty argillite, and argillite. They are various shades of grey. Although massive bands up to 150 feet in thickness occur, these rocks in general are thinly bedded. It is possible that certain of the massive bands are of tuffaceous origin, but this has not been proved. Conformable bands of

* By J. W. Peck.
† By W. R. Bacon.
‡ In accordance with the Canam numbering system, the No. 1 and No. 3 adits of the 1949 Report are herein interchanged.

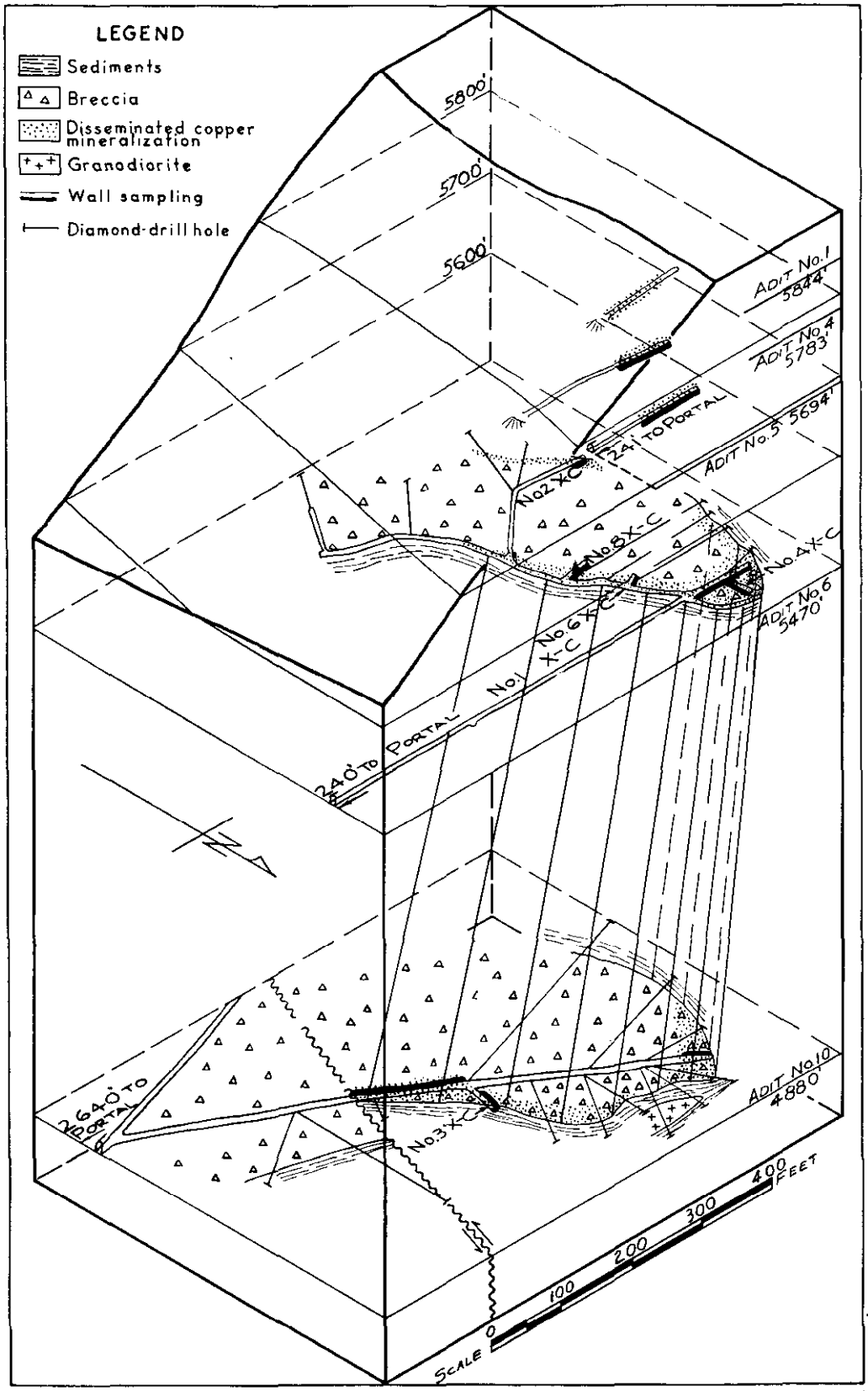


Figure 13. Isometric diagram of main deposit, A.M. group.

pyrrhotite, a fraction of an inch in thickness, are not uncommon in the well-bedded rocks, and fine tourmaline was observed at various places.

The sediments strike slightly west of north and dip quite steeply, generally eastward; however, sharp divergences from this prevailing attitude are fairly common.

Dark-grey dioritic sills, in which slender prismatic crystals are conspicuous, are fairly common in the sediments. They are abundant in the first 400 feet of No. 10 adit. In general the sills are less than 25 feet in thickness, but a few are as much as 100 feet thick. Under the microscope the sills are seen to consist largely of amphibole (pargasite) and plagioclase (near An_{50}). The plagioclase occurs as large crystals, extensively saussuritized, interstitial to random laths of amphibole.

The Invermay quartz diorite stock outcrops 2,000 feet north of the mineralized area. It intrudes the sediments. Tourmaline occurs in joints and fractures and is conspicuous in the brecciated quartz diorite exposed in the Invermay workings.

A steeply dipping mass of granitic rock is exposed in the No. 10 adit, between 1,640 and 2,215 feet from the portal. Between 1,640 feet and 1,800 feet this rock is strongly sheared. A specimen of the less-sheared material was examined microscopically and was found to contain 55 per cent highly twinned, oscillatory zoned plagioclase (An_{45-50}), 30 per cent crushed and recrystallized quartz, and 15 per cent ferromagnesian minerals completely altered to carbonate and chlorite. Tourmaline was noted here and there along fractures.

Breccia outcrops of reddish-brown to brown colour occur on the A.M. and A.M. No. 1 claims. The area of breccia outcrops is roughly elliptical; the longitudinal axis trends northwestward and is about 1,100 feet long. The lesser axis is about 450 feet. Exploration has been carried to a point where it seems reasonably safe to assume that this area is largely, if not entirely, underlain by breccia.

The breccia consists of angular to subrounded fragments of sedimentary rock in a matrix of secondary minerals. The fragments are of sedimentary material identical to the rocks that surround the breccia outcrop area. Approximately 90 per cent of the fragments are less than a foot in length and many measure less than 6 inches. Of the remainder, few are more than 3 feet in length, but several much larger blocks of unbrecciated rock within the brecciated zone have been partly exposed by the underground workings.

The subrounded outline of certain of the fragments is clearly the result of replacement. Light-grey to greenish alteration rims are fairly common around darker cores. Some of the smaller fragments are fractured and veined by minerals of the matrix. Tourmaline occurs sporadically in fragments and matrix.

The matrix presents a variable appearance. In the upper adits (Nos. 1 to 7) it is commonly light grey in colour and appears to consist largely of quartz, chlorite, carbonate, alkali feldspar, white mica, and kaolin. In the No. 10 adit, however, the matrix of the breccia is generally dark green, due to a predominance of chlorite. Microscopic examination of the dark-green matrix shows that some of the chlorite is a rare iron-rich variety, thuringite. Minor amounts of carbonate and alkali feldspar are also present.

The breccia is the host rock for the Canam copper deposits. Chalcopyrite, pyrrhotite, and pyrite are the most abundant minerals. Smaller amounts of magnetite, molybdenite, uraninite, dark-brown sphalerite, and arsenopyrite occur sporadically, as well as minute amounts of galena and scheelite. With the exception or arsenopyrite, these minerals are confined to the matrix of the breccia. Arsenopyrite occurs mainly in the matrix, but at the northern extremity of No. 10 adit it was found within fragments. Although clearly an introduced mineral, the magnetite is not closely associated with the sulphides.

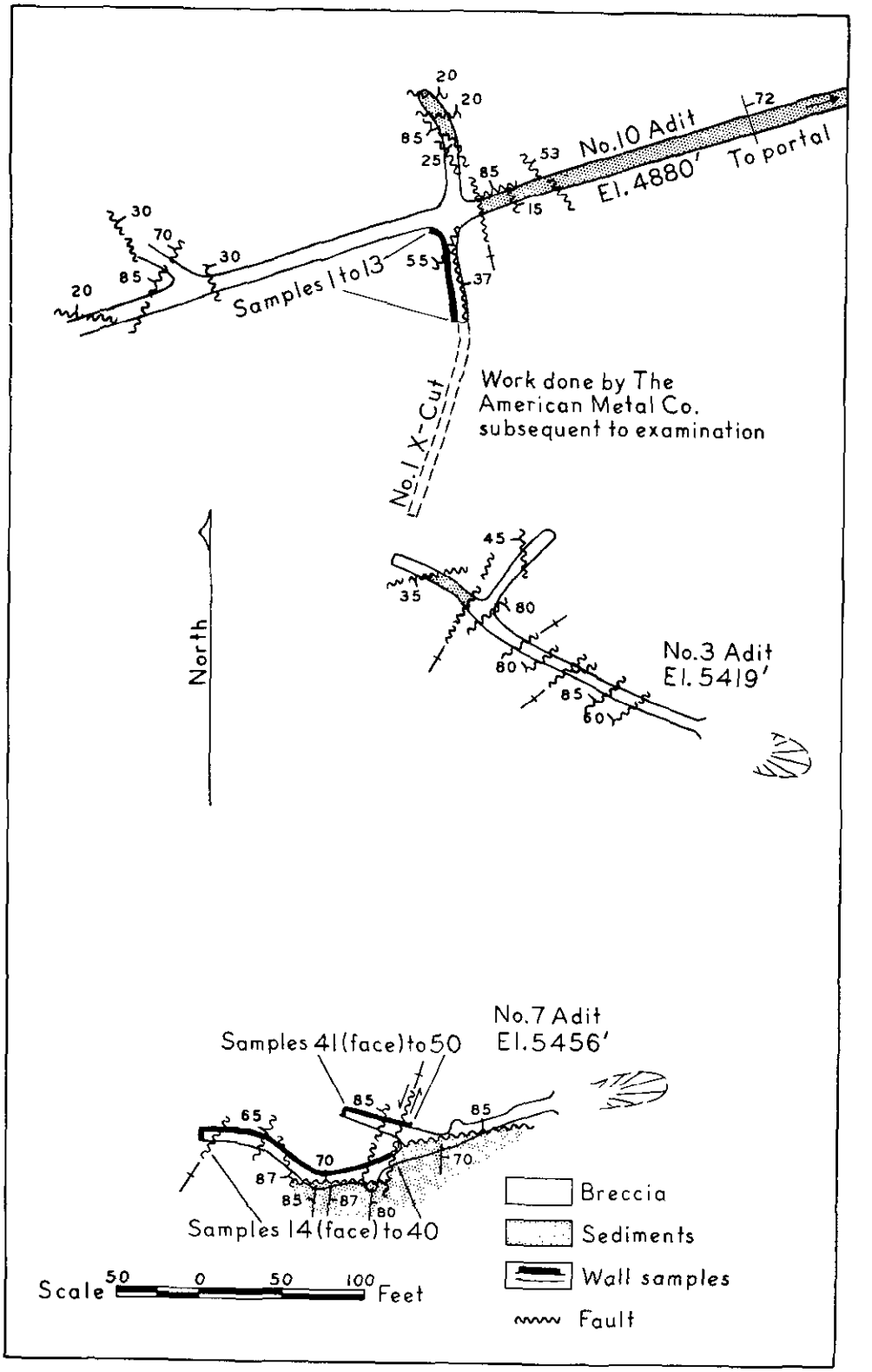


Figure 14. Plan showing location of samples taken in No. 1 crosscut in No. 10 adit, and in No. 7 adit, A.M. group.

Molybdenite and uraninite are rare in the No. 10 adit. As the sampling results show, these minerals are closely associated spatially, a feature that has been noted at several other British Columbia properties.

Some of the better grade of ore has a striking appearance. Black tourmaline may be found rimming the barren fragments, accentuating the brecciated nature of the host rock, and the interstitial material consists largely of chalcopyrite and pyrrhotite. These sulphides are intimately associated, the chalcopyrite veining and replacing pyrrhotite.

The main deposit found to date occurs in the northwestern part of the breccia mass, around its periphery. The mineralization gradually weakens toward the centre of the breccia, much of which is essentially barren. This deposit is roughly U-shaped in plan; the outer margin is sharply defined, being the abrupt contact between barren unbrecciated sediments and mineralized breccia, whereas the inner boundary of the deposit is an "assay wall" (*see* Fig. 13).

Copper mineralization was also encountered in the No. 10 adit where it intersects the breccia (2,490 feet from the portal) and in the No. 7 adit, at the southeastern extremity of the breccia outcrop area. The following table gives the assays of samples of this mineralization, in addition to assays of samples from the main deposit. The location of the samples is indicated in Figures 13 and 14.

A.M. Sampling Results

Working	Width	Copper	Silver	Gold	Molybdenum	Uranium Oxide (U_3O_8)[1]
MAIN DEPOSIT (SEE FIG. 13)						
No. 4 Adit[2]	Ft.	Per Cent	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
	10	1.8	0.6	0.01	No assay	0.025
	10	1.8	0.6	0.01	No assay	0.024
	10	1.8	1.3	Trace	No assay	0.019
East to west	10	1.3	1.1	0.30	No assay	0.023
	10	0.8	0.9	0.01	No assay	0.011
	10	0.7	0.3	*Nil*	No assay	0.017
	10	1.5	1.6	*Nil*	No assay	0.018
No. 5 Adit[2]						
	10	1.3	0.5	0.01	No assay	0.014
	10	1.2	0.5	0.02	No assay	0.030
	10	2.0	0.5	Trace	No assay	0.015
	10	1.8	1.3	Trace	No assay	0.016
East to west	10	1.3	0.6	Trace	No assay	0.0095
	10	1.4	0.7	Trace	No assay	0.014
	10	1.3	0.6	*Nil*	No assay	0.0065
	10	0.8	0.4	0.01	No assay	0.006
No. 6 Adit, No. 1 Crosscut[2]						
	10	1.0	0.5	0.02	No assay	0.012
	10	0.7	0.1	*Nil*	No assay	0.015
	10	0.5	0.2	0.01	No assay	0.017
	10	0.6	Trace	0.01	No assay	0.011
East to west	10	0.6	*Nil*	0.02	No assay	0.025
	10	0.7	0.2	*Nil*	No assay	0.030
	10	1.0	0.2	0.01	No assay	0.040
	10	0.8	0.3	0.04	No assay	0.025
	10	1.6	0.7	0.02	No assay	0.025
No. 6 Adit, No. 4 Crosscut						
	4	0.29	*Nil*	0.01	0.064	0.024
	5	0.21	*Nil*	0.01	0.054	0.036
	5	0.35	0.1	0.01	0.060	0.025
South to north	5	0.92	0.3	0.01	0.029	0.025
	5	1.2	0.3	0.01	0.017	0.015
	5	1.3	0.5	0.01	0.014	0.014
	5	1.5	0.5	0.01	0.015	0.015
	5	1.2	0.4	0.01	0.016	0.012

[1] Radiometric assay. Chemical assay confirmed that the radioactivity is due practically entirely to uranium oxide in the sample reported as assaying 0.052 per cent U_3O_8. Uraninite and minute amounts of monazite were identified in samples sent to the Department of Mines and Technical Surveys, Ottawa.

[2] Sampled by W. H. White, 1949.

A.M. Sampling Results—Continued

Working	Width	Copper	Silver	Gold	Molybdenum	Uranium Oxide (U_3O_8)[1]
MAIN DEPOSIT—*Continued* (SEE FIG. 13)—*Continued*	Ft.	Per Cent	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
No. 6 Adit, No. 6 Crosscut						
East to west	5	0.99	0.3	0.01	0.041	0.030
	5	0.98	Nil	Trace	0.095	0.028
	4	0.95	Nil	Trace	0.105	0.025
	4	0.73	Nil	0.01	0.104	0.032
No. 6 Adit, No. 8 Crosscut						
East to west	5	1.24	0.2	0.01	0.032	0.015
	5	0.92	0.5	Trace	0.144	0.052
	5	0.58	0.4	Trace	0.093	0.020
	5	0.62	0.2	Nil	0.052	0.010
	5	1.20	0.7	Nil	0.005	0.005
	5	0.64	0.5	Nil	0.006	0.005
	5	0.42	0.3	0.01	0.004	0.0025
	5	0.66	0.4	Trace	0.006	0.0025
No. 6 Adit, No. 2 Crosscut						
East end[2]	10	1.6	0.7	0.05	No assay	0.018
West end—west to east	5	0.69	0.8	0.01	0.080	0.0025
	5	1.6	1.6	Nil	0.049	0.001
	5	1.3	1.3	0.02	0.009	0.0005
	5	2.0	1.3	0.01	0.005	0.0005
	5	0.60	0.5	Nil	Trace	0.0005
No. 10 Adit, Northwest Extremity						
Northwest to southeast	5	0.34	0.2	0.02		0.003
	5	2.60	1.1	0.08		0.0025
	5	2.68	0.7	0.02	Composite	0.0015
	5	1.08	0.6	Trace	0.014	0.0015
	5	1.23	1.0	0.01		0.0015
	5	0.38	0.2	Trace		0.002
No. 10 Adit, South of No. 3 Crosscut						
Northwest to southeast	5	1.38	1.1	0.01	0.005	0.0025
	5	0.54	0.6	Trace		0.002
	5	0.62	0.8	0.01		0.0015
	5	0.46	0.6	Trace		0.001
	5	1.19	2.1	0.01		0.002
	5	1.10	2.3	0.01		0.0025
	5	0.83	1.3	0.01		0.002
	5	1.10	2.0	0.01	Composite	0.0015
	5	1.06	2.1	0.02	0.009	0.0015
	5	2.32	3.9	0.03		0.002
	5	1.52	2.5	0.01		0.002
	5	0.86	1.4	0.01		0.001
	5	1.44	2.2	0.02		0.0015
	5	1.20	1.4	0.02		0.0015
	5	1.33	0.5	0.02		0.0015
	5	0.98	0.6	0.01		0.002
	5	0.57	0.9	0.02		0.0015
	5	0.93	1.3	0.01	Composite	0.0015
	5	0.60	0.6	0.01	0.007	0.002
	5	1.12	1.0	0.02		0.003
	5	0.76	0.3	0.01		0.0025
	3.4	2.02	0.4	0.01		0.0035
No. 10 Adit, No. 3 Crosscut						
North to south	5	1.91	1.0	0.02		0.002
	5	3.09	1.7	0.02		0.0015
	5	1.80	0.5	0.01	Composite	0.002
	5	1.38	1.9	0.02	0.006	0.0015
	5	1.12	1.2	0.01		0.0015
	5	1.34	1.7	0.01		0.0015
	5	0.50	0.6	Trace		0.0015

[1] Radiometric assay. Chemical assay confirmed that the radioactivity is due practically entirely to uranium oxide in the sample reported as assaying 0.052 per cent U_3O_8. Uraninite and minute amounts of monazite were identified in samples sent to the Department of Mines and Technical Surveys, Ottawa.

[2] Sampled by W. H. White, 1949.

A.M. Sampling Results—Continued

Working	Width	Copper	Silver	Gold	Molybdenum	Uranium Oxide (U_3O_8)[1]
SOUTHEAST OF MAIN DEPOSIT (SEE FIG. 14)						
No. 10 Adit, No. 1 Crosscut	Ft.	Per Cent	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
Sample No. 1	5	1.77	3.1	0.01		0.001
Sample No. 2	5	1.17	2.3	0.01		0.001
Sample No. 3	5	1.06	1.4	Trace		0.001
Sample No. 4	5	2.79	2.7	0.03		0.0015
Sample No. 5	5	1.82	1.7	0.02		0.0015
Sample No. 6	5	1.38	0.4	0.01	Composite	0.0025
Sample No. 7	5	1.09	1.1	0.02	0.007	0.002
Sample No. 8	5	1.32	2.2	0.02		0.0025
Sample No. 9	5	1.40	0.7	0.01		0.0015
Sample No. 10	5	0.76	0.6	0.01		0.0015
Sample No. 11	5	0.95	0.5	0.01		0.0025
Sample No. 12	5	1.21	0.8	0.01		0.0025
Sample No. 13	5	0.93	0.3	0.01		0.002
No. 7 Adit						
Sample No. 14	4	0.08	*Nil*	0.01	0.004	0.0015
Sample No. 15	5	0.16	*Nil*	*Nil*		0.003
Sample No. 16	5	0.50	0.3	Trace		0.001
Sample No. 17	5	0.26	0.1	Trace		0.0015
Sample No. 18	5	0.42	0.2	*Nil*	Composite	0.0015
Sample No. 19	5	0.12	0.2	*Nil*	0.005	0.0015
Sample No. 20	5	0.18	*Nil*	*Nil*		0.0005
Sample No. 21	5	0.21	Trace	Trace		0.0005
Sample No. 22	5	0.22	Trace	Trace		0.001
Sample No. 23	5	0.26	0.2	Trace		0.001
Sample No. 24	5	0.26	*Nil*	Trace	0.002	0.0005
Sample No. 25	5	0.56	0.2	0.01		0.003
Sample No. 26	5	0.14	0.1	Trace		0.0025
Sample No. 27	5	1.61	0.9	Trace		0.004
Sample No. 28	5	0.92	0.8	Trace	Composite	0.0106
Sample No. 29	5	0.78	0.6	0.02	0.056	0.0182
Sample No. 30	5	0.78	0.7	0.01		0.0142
Sample No. 31	5	1.38	0.5	0.01		0.0145
Sample No. 32	5	0.56	0.3	Trace		0.0093
Sample No. 33	5	1.48	0.5	0.01		0.0112
Sample No. 34	5	5.16	2.6	0.04	0.017	0.0054
Sample No. 35	5	1.38	0.5	*Nil*		0.005
Sample No. 36	5	1.98	0.6	0.01		0.005
Sample No. 37	5	2.99	0.8	Trace		0.004
Sample No. 38	5	0.06	0.1	*Nil*		0.0025
Sample No. 39	5	2.50	1.3	0.01		0.0045
Sample No. 40	5	0.77	0.6	Trace	Composite	0.0035
Sample No. 41	4	0.03	0.1	*Nil*	0.009	0.002
Sample No. 42	5	0.08	0.2	*Nil*		0.0025
Sample No. 43	5	0.16	0.2	*Nil*		0.002
Sample No. 44	5	0.34	0.3	*Nil*		0.002
Sample No. 45	5	0.95	0.5	Trace		0.0025
Sample No. 46	5	0.66	0.3	*Nil*		0.005
Sample No. 47	5	0.29	*Nil*	*Nil*		0.0025
Sample No. 48	5	0.98	0.5	Trace	Composite	0.0035
Sample No. 49	5	0.61	0.5	*Nil*	0.014	0.004
Sample No. 50	5	0.78	0.5	Trace		0.0122

[1] Radiometric assay. Chemical assay confirmed that the radioactivity is due practically entirely to uranium oxide in the sample reported as assaying 0.052 per cent U_3O_8. Uraninite and minute amounts of monazite were identified in samples sent to the Department of Mines and Technical Surveys, Ottawa.

Economic mineralization has been found only in the breccia. It is therefore important, particularly with respect to possibilities at depth, to consider the probable origin of the breccia. The following facts should be taken into account:—

(1) The apparent outline of the breccia strongly indicates a pipe-like form.

(2) The breccia fragments are of sedimentary material identical to the sediments that enclose the breccia mass in plan.

(3) Where exposed, the contact between breccia and surrounding sediments is sharply defined.

(4) There is no diminution in brecciation toward the periphery of the breccia mass; on the contrary, abundant fragments can be noted in several places within inches of the periphery.
(5) The periphery of the breccia is well exposed in No. 6 adit and in No. 3 crosscut of No. 10 adit. In both workings the bedding of the adjacent sediments parallels the periphery of the breccia.
(6) Brecciation in the Invermay stock, crushing of the granitic tongue in No. 10 adit, and the presence of innumerable faults in the workings all testify that great stresses have been operative, not only in the vicinity of the deposits but in the area as a whole.

Although the form of the breccia mass might suggest a mode of origin related to explosive igneous activity, the evidence is inadequate to substantiate this theory, and facts (3), (4), and (5) are hardly compatible with such an origin.

Fact (2) does not suggest that a distinct horizon in a layered sequence yielded by brecciation during folding. It is obvious, however, that the shape of the breccia mass has been modified by deformation.

Because of the occurrence of slickensides along parts of the breccia-sediment contact and of a great many faults in the workings, a theory of origin related to faulting merits consideration. It would be difficult, however, to reconcile such a theory with the rather smooth horizontal outline of the breccia as it is known, or with the conformability of breccia and adjacent sediments (5). (In No. 7 adit there is a lack of conformability between breccia and sediments that is attributed to faulting.)

The theory of origin that would seem to be consistent with most of the evidence involves an originally fragmental horizon; i.e., a sharpstone conglomerate or intraformational breccia. Possibly the breccia mass is a fanglomerate or a fossil talus slide. Such a theory is entirely acceptable, however, only if the conformability of breccia and sediments in the workings is either overlooked or considered accidental.

Deformation in the area has been intense and, although the breccia as a whole is not considered to be a product of deformation, there is evidence that a minor amount of fragmentation was caused by stresses. Innumerable faults, in addition to fractures in the matrix of the breccia, are evidence of considerable adjustment to stresses.

The distribution of copper mineralization found thus far indicates that parts of the contact between breccia and sediments formed an important channelway for the mineralizing solutions. There is no obvious concentration of mineralization along any of the known faults. The prominent northeasterly trending fault in Figure 13 may have acted as a dam to mineralizing solutions, for no mineral of consequence occurs immediately south of it. Thus, movement along this fault plane is probably pre-ore as well as post-ore. The resultant left-hand offset is approximately 70 feet.

Much of the exploration to date has been directed toward the development of ore in the northwestern part of the breccia. A medium-sized deposit of low-grade copper ore has been partly outlined, and this mineralization has been shown to be continuous over a minimum vertical range of 1,000 feet. Exploration below the No. 10 adit has been confined to one deep hole which provided inconclusive evidence.

A minor amount of exploration elsewhere in the breccia has not been particularly encouraging, but it has shown that the copper mineralization is not restricted to the northwestern part of the breccia.

CHEAM RANGE*

Copper

Lucky Four (Rico Copper Mines Limited)

(49° 121° S.W.) Company office, 413 Granville Street, Vancouver. T. H. Wilkinson, mine manager. This property is on the summit of the Cheam Range at the head of Wahleach Creek, about 15 miles from Laidlaw. The adit on the Lucky Four No. 4 claim, at an elevation of 5,975 feet, was extended 200 feet to an over-all

* By R. B. King.

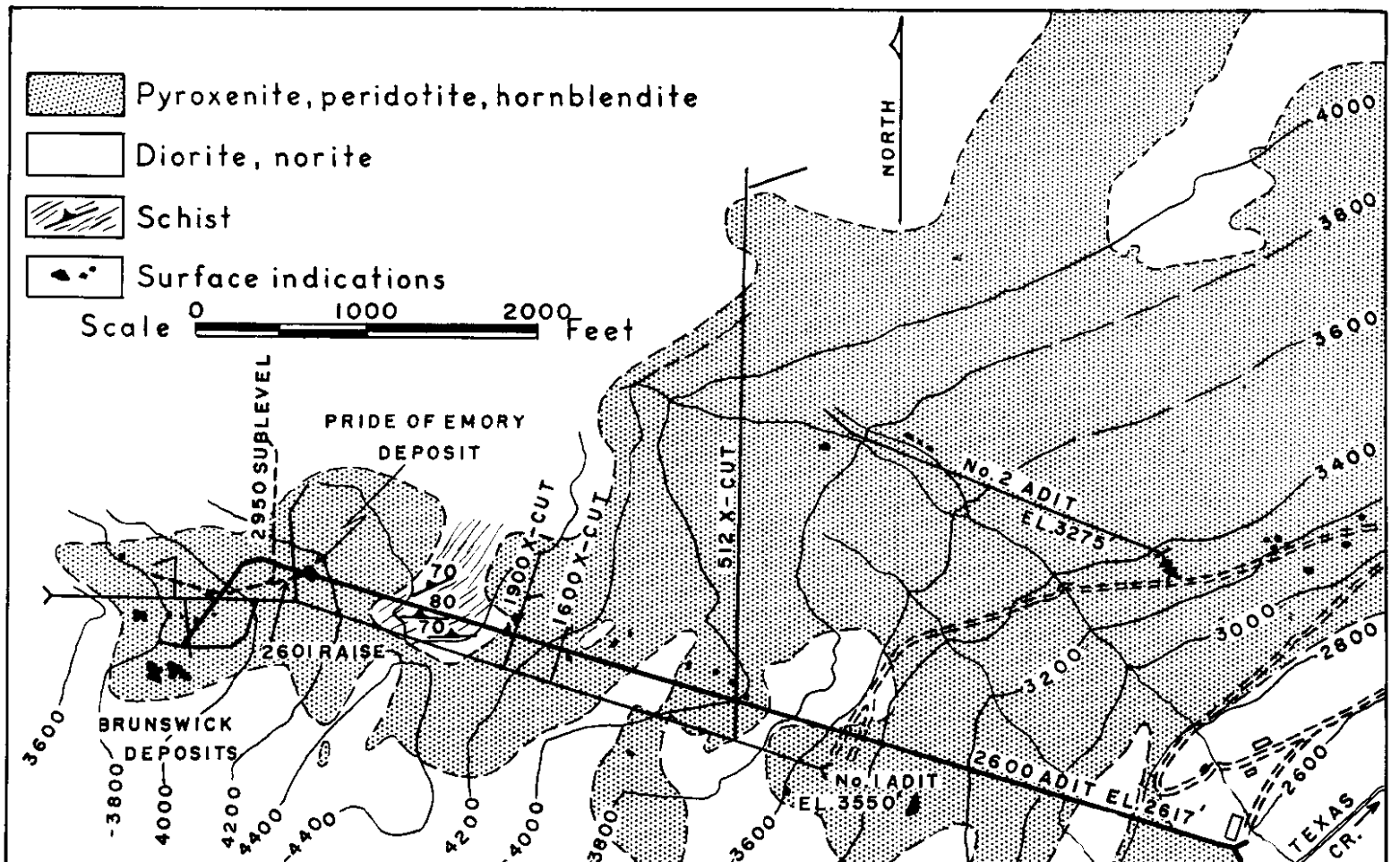


Figure 15. Western Nickel Limited (from company plans).

length of 550 feet. Diamond drilling from the adit totalled 7,000 feet. All men, supplies, and equipment were flown from Laidlaw to the mine by helicopter. Seven men were employed.

HOPE*

Nickel-Copper

B.C. Nickel (Western Nickel Limited)

(49° 121° S.W.) Company office, 744 West Hastings Street, Vancouver. Directors: J. Drybrough, Winnipeg; Fred Searls, Jr., New York; Eldon L. Brown, Toronto; J. A. Pike, Sherwood Lett, Victor Spencer, F. M. Ross, G. N. Staccy, A. H. Douglas, all of Vancouver. Manager, B. B. Greenlee. Western Nickel Limited is a private company, incorporated November 6th, 1952. Capital: 4,000,000 shares without nominal or par value.

The property of Western Nickel Limited (*see* Fig. 15) covers an area of about 4 square miles at the head of Stulkawhits (Texas) Creek, which drains eastward into the Fraser River about 6 miles north of the village of Hope.

Both the Canadian Pacific Railway and the Cariboo Highway are on the west bank of the Fraser River below the property. From a point on the highway less than a mile south of Choate, a good gravel road, 5.3 miles long, leads up Stulkawhits Creek to the mine camp near the 2600 adit portal. A rough branch road leads to the No. 1 and No. 2 adits.

The Pride of Emory showing was found in 1923 by Carl Zofka, and development was first undertaken in 1928. In 1929 B.C. Nickel Mines, Limited, was organized as a 3,000,000-share company, and in 1933 the capitalization of the company was increased to 6,000,000 shares. The No. 1 adit was started in December, 1933, and operations were continuous until July, 1937.

In 1936, 2,134 tons of crude ore averaging 4.97 per cent nickel was mined and shipped from the 1600 orebody. In 1937, 3,422 tons of ore was shipped to Trail from five of the Brunswick orebodies and from the Pride of Emory. This shipment averaged 1.27 per cent nickel and 0.48 per cent copper. The 1936 shipment and the concentrates from the 1937 shipment were sent to Japan.

Failure to find markets for ore or concentrates forced the closure in 1937. By then the No. 1 and No. 2 adits had been completed as shown on Figure 15, and approximately 130,000 feet of surface and underground drilling had been done. This work partly outlined twelve nickel-copper deposits.

In 1938 a new company, Pacific Nickel Mines Limited, acquired the assets of the former company but work was not resumed until 1951. During that summer much of the surface and underground was tested by Pulse,† self-potential and resistivity surveys conducted by Newmont Exploration Company. Electromagnetic and magnetic surveys were conducted by McPhar Geophysics of Toronto. The electromagnetic survey included the testing of various drill-holes.

In 1952 Pacific Nickel Mines Limited and Newmont Mining Corporation formed a new company, Western Nickel Limited, to further explore the property under Newmont management. Twelve surface holes, aggregating 3,237 feet, were drilled to test Pulse anomalies. The 2600 adit was driven to test certain Pulse anomalies and to explore at depth the more important deposits encountered in No. 1 adit. Underground drilling completed by the end of October, 1954, amounted to 43,575 feet.

The geology of the property has been described in published reports by Cairnes,‡ Cockfield and Walker,§ and Horwood.¶ The deposits are in an irregular, northerly

* By W. R. Bacon.

† By this method a condenser-like discharge is measured from disseminated sulphide particles in ground which has been subjected to a strong, high-voltage direct current. The discharge is proportional to the abundance of individual sulphide particles and consequently is high for disseminated sulphides but low for massive sulphides.

‡ Cairnes, C. E.: *Geol. Surv., Canada,* Sum. Rept., 1924, Pt. A, pp. 100–106.

§ Cockfield, W. E., and Walker, J. F.: *Geol. Surv., Canada,* Sum. Rept., 1933, Pt. A, pp. 62–68.

¶ Horwood, H. C.: *Geol. Surv., Canada,* Mem. 190, 1936.

plunging mass of ultrabasic rocks, approximately 2 square miles in area. The ultrabasics are bordered by dioritic rocks on three sides and by quartz-mica schists on the south.

There is not unanimity of opinion concerning the relative ages of diorite and ultrabasics. Cairnes believed the ultrabasics to be the younger rocks, while Horwood agreed with Cockfield and Walker that the reverse is true. A. E. Aho,* who spent two summers mapping in detail the surface and underground workings and made an extensive microscopic study of the rocks and ores, concluded that most of the diorite is older than the ultrabasic complex. He determined that gradations to norite are present within the diorite and that the principal ultrabasic rocks are pyroxenite and less peridotite, with hornblendite as a minor component.

Pyrrhotite, pentlandite, and chalcopyrite are the most abundant sulphides. They are sporadically disseminated in hornblendic pyroxenite and peridotite and in places are sufficiently concentrated to constitute orebodies. The ore consists of massive sulphides and disseminations.

The orebodies are pipe-like in form. In plan their outlines are subcircular, crescentic, or lenticular, but the outline of any orebody may vary markedly in depth. The horizontal cross-sectional area of an individual body is in general less than 5,000 square feet and in some instances is less than half that figure. The more extensively investigated deposits plunge in a direction similar to that of the enclosing ultrabasic mass—northerly at angles of 50 to 80 degrees. The largest deposit, the Pride of Emory, persists from surface for a minimum distance of 1,000 feet with a northerly plunge of 51 degrees.

The task of outlining these irregular deposits by diamond drilling is not easy, and it is made more difficult by the absence of rock alteration. Because the orebodies are in most instances rather sharply defined against normal rock, it is possible for a drill-hole to pass within a foot of the periphery of an orebody without any indication in the core.

No ore controls are recognized. All that can be said in this regard is that the western tip of the ultrabasic mass has so far proved to be the most favourable ground in the search for nickel-copper mineralization.

In 1937 a company estimate of probable and possible ore was as follows:—†

Orebody	Access	Tonnage	Nickel	Copper
			Per Cent	Per Cent
Brunswick No. 1	No. 1 adit	165,700	1.05	0.36
Brunswick No. 2	No. 1 adit	177,600	1.30	0.54
Brunswick No. 5	No. 1 adit	171,100	1.30	0.41
Brunswick No. 6	No. 1 adit	5,400	2.08	0.77
Brunswick No. 7[1]		80,000	2.37	0.75
Brunswick No. 8	No. 1 adit	4,100	1.75	0.61
Brunswick No. 9	No. 1 adit	2,400	1.40	0.52
Pride of Emory	No. 1 adit	402,300	1.49	0.57
1900	No. 1 adit	32,000	0.92	0.48
1600	No. 1 adit	109,000	1.20	0.36
512	No. 1 adit	15,000	1.40	0.42
Trail[1]	No. 2 adit	18,900	1.26	0.49
Total tonnage and average grade		1,183,500	1.39	0.50

[1] The Brunswick No. 7 and Trail orebodies are known only by diamond drilling. The former is below the level of No. 1 adit.

The new 2600 level adit was driven westward for 5,950 feet, thence southwestward for 650 feet. Between 145 and 365 feet from the portal, sparsely disseminated sulphides in peridotite were intersected. This zone, which appears to trend northeastward, coincides with a Pulse anomaly. The mineralization is remarkably uniform, averaging 0.31 per cent nickel and 0.16 per cent copper. At 6,290 feet from the portal, lenses and

* Aho, A. E.: Geology and Ore Deposits of Pacific Nickel Property, 1954. (Unpublished Ph.D. thesis, Univ. of Calif.)

† In addition to nickel and copper, very minor amounts of gold, silver, platinum, palladium, and cobalt have been determined in samples of the ore.

patches of massive sulphide occur, apparently associated with a fault that strikes north 30 degrees west and dips 40 degrees westward.

The new 2950 sublevel was driven to provide access for diamond-drilling the ground beneath the Brunswick orebodies and the Pride of Emory.

The present programme has not added significant amounts to the 1937 reserves. After a considerable amount of drilling from the 2950 sublevel, operations were suspended early in November, 1954.

HOWE SOUND*

Copper-Zinc

Britannia Mining and Smelting Co. Limited

Britannia Beach (49° 123° N.E.). Head office, 730 Fifth Avenue, New York, N.Y.; mine office, Britannia Beach. H. H. Sharpe, president; E. C. Roper, manager; T. M. Waterland, mine superintendent; L. Allan, assistant mine superintendent. This company owns and operates the Britannia mine and mill at Britannia Beach. The following report, supplied by the management, provides details of the operation in 1954.

The development work totalled 20,172 feet for all sections of the mine and was made up as follows:—

Classification by Type

Class	Jane Mine	No. 8 Mine	Bluff Mine	Fairview Mine	Empress Mine	Victoria Mine	Robinson Mine	Total
	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.
Drifts	1,044	3,495	457	670	89	3,280	518	9,553
Crosscuts	428	454	65	98	43	365	.....	1,453
Raises	293	1,072	1,335	1,569	504	1,220	....	5,993
Winzes	.....	.....	.....	.....	.....	5	.....	5
Powder workings	135	.....	2,608	425	.....	.....	.....	3,168
Totals	1,900	5,021	4,465	2,762	636	4,870	518	20,172

Classification by Mine

Mine	Current	Stope	Total	Per Cent of Total
	Ft.	Ft.	Ft.	
Jane	1,765	133	1,900	9.4
No. 8	3,857	1,164	5,021	24.9
Bluff	184	4,281	4,465	22.1
Fairview	345	2,417	2,762	13.7
Empress	237	399	636	3.2
Victoria	3,649	1,221	4,870	24.1
Robinson	518	.....	518	2.6
Totals	10,555	9,617	20,172	100.0

Ore is mined by caving, shrinkage, and cut-and-fill methods, and the tonnage broken in the various sections of the mine was as follows: Bluff mine, 398,786 tons; Fairview mine, 110,157 tons; Victoria mine, 87,133 tons; No. 5 mine, 40,241 tons; No. 8 mine, 194,657 tons; Jane mine, 52,096 tons; Empress mine, 13,171 tons; development, 25,698 tons; a total of 921,939 tons (dry).

The consumption of explosives and blasting accessories was: Powder, 20,966 cases; electric blasting-caps, 10,327; No. 6 blasting caps, 342,518; safety fuse, 2,734,817 feet; primacord, 85,500 feet.

The mine ventilation equipment was well maintained. Ventilation of the No. 8 mine was improved considerably by slashing to a cross-section of 60 square feet the raise giving air entry to the mine, and by providing a better set-up for the fan on the 4100 level.

* By R. B. King.

The accident-prevention programme was a continuance of sound supervision aided by underground safety meetings, monthly management-labour accident-prevention meetings, supervisors' meetings, the showing of sound films, National Safety Council material, current accident reports, locally made posters, and the use of personal safety equipment.

The Britannia safety record for the year showed an improvement over that of the previous year. For the mining department the frequency rate for compensable injuries was 0.540 per 1,000 shifts worked, compared to 0.616 per 1,000 shifts for 1953. The severity rate was 32.13 shifts per 1,000 shifts worked, compared to 33.21 in 1953.

The total number of men on the mine payroll at the year-end was 562. The total number of shifts worked in the mining department was 142,780. Production: Ore milled, 916,419 tons.

TEXADA ISLAND*

Iron

Prescott, Paxton, Lake (Texada Mines Ltd.)

(49° 124° N.W.) Registered office, 626 West Pender Street, Vancouver. A. D. Christensen, San Francisco, president; B. L. Alexander, general manager; J. Kenneth Halley, chief engineer; J. Yuill, mine superintendent; E. Fox, mill superintendent. The Prescott, Paxton, and Lake mines and the concentrator near Gillies Bay on Texada Island were operated during 1954, and the following is a summary of the operations. Magnetite ore is mined from open pits in which levels are established at 20-foot intervals. Waste rock is stripped where necessary and hauled to waste dumps. Vertical holes are drilled by Joy rotary drills and wagon drills, loaded with explosives, and blasted electrically. The broken ore and waste is loaded by 2½-cubic-yard diesel-driven shovels into 15-ton trucks and transported to stockpiles or to the concentrator.

Exploratory diamond drilling, to outline ore in the present pits and the Yellow Kid body, totalled 13,770 feet. About 91 per cent of this was done on the Yellow Kid claim.

Stripping and preparation for mining required the removal of 160,193 cubic yards of waste material. In 1954, 580,301 tons of magnetite ore was treated in the concentrator, the Lake pit supplying 46.8 per cent, the Paxton pit 39.0 per cent, and the Prescott pit 14.2 per cent; 371,358 tons of concentrate was shipped. Approximately 110 men were employed.

VANCOUVER ISLAND*

QUATSINO (50° 127° S.W.)

Copper

Yreka (Noranda Exploration Company Limited)

British Columbia office, 1403 Royal Bank Building, Vancouver; mine office, Quatsino Sound. B.O. Brynelson, field engineer; S. G. Bruce, superintendent. This property consists of sixteen Crown-granted claims and eleven claims held by record by Noranda Exploration. It is on the west shore of Neroutsos Inlet, about 2 miles south of Pender Point. During 1954, 6,610 feet of EX core diamond drilling was done in the vicinity of No. 6 adit but at a higher elevation. Fourteen men were employed during the operating year.

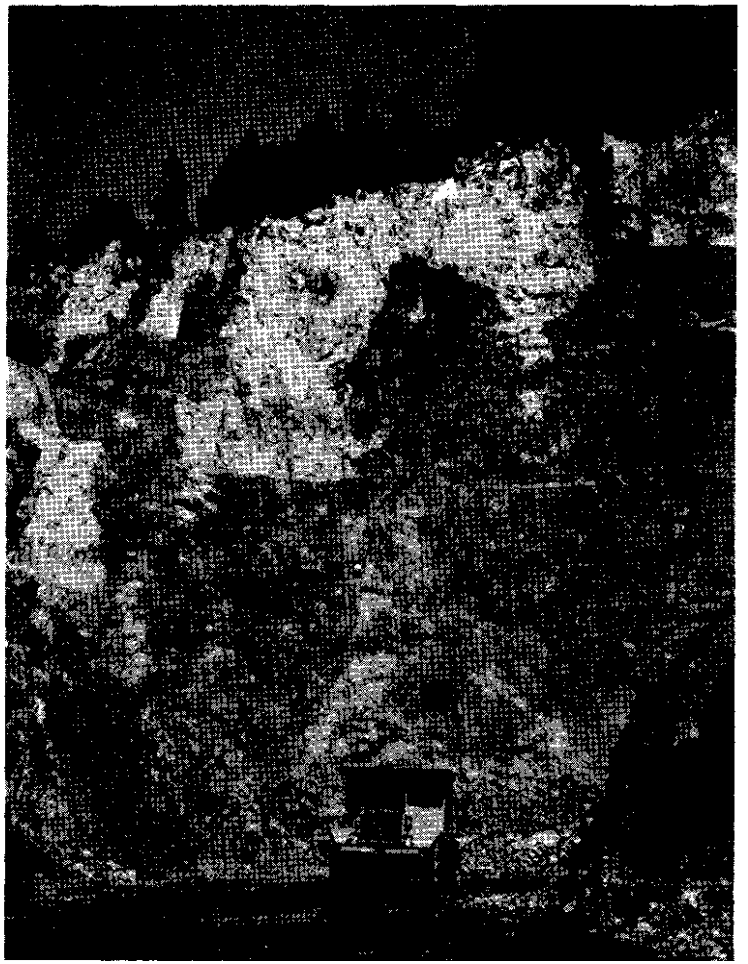
[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1953, p. 167.]

MENZIES BAY (50° 125° S.E.)

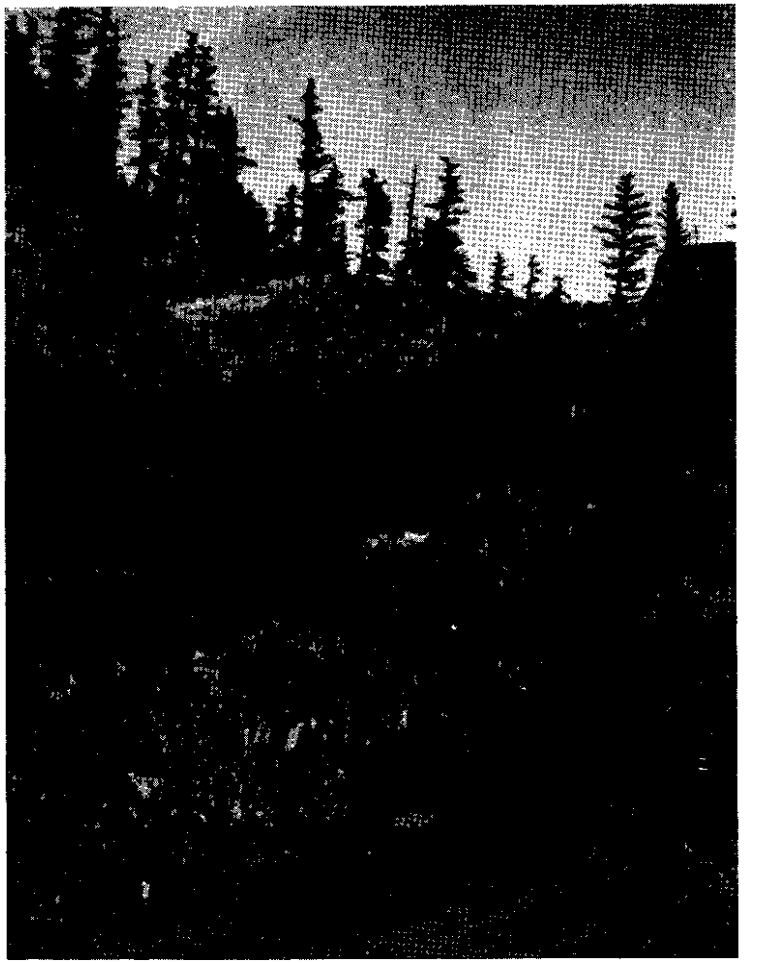
Argus Consolidated Mines Limited

Head office, 501–510 Rogers Building, Vancouver; mine office, Campbell River. Grant Mahood, superintendent. This company holds by record twenty-nine claims about 14 miles northwest of Campbell River. Surface work was done on showings of chalcocite that occur sporadically in thin interbedded tuffs in a volcanic series. Two men were employed.

* By R. B. King.



Prescott pit, Texada Mines Ltd. Mineralized skarn (dark) in contact with limestone.



Lake pit, Texada Mines Ltd. Limestone (light) capping altered volcanic rocks.

UPPER QUINSAM LAKE (49° 125° N.W.)

Iron

Iron Hill (The Argonaut Mining Co. Ltd.)

Company office, Campbell River. A. F. Geiger, general manager; E. DeMoss, mine superintendent. Iron ore was mined in 1954 from this property, which is just south of Upper Quinsam Lake. The mine and mill are 23 miles from the ore-loading dock near Campbell River. Ore is mined from an open pit in which levels are established at 15- and 30-foot intervals. Limestone waste is stripped where necessary and hauled to stockpiles.

Vertical holes are drilled, loaded with explosive, and blasted electrically or by primacord. The broken ore or waste is loaded by 2½-cubic-yard diesel-driven shovels into 18-cubic-yard Euclid trucks and transported to the concentrator or stockpiles.

In April the mill was changed to include wet magnetic separation of ore in fine sizes. The mill operated only eight and one-half months in 1954.

Exploration during 1954 included ground magnetometer surveying and diamond drilling on the Iron River (49° 125° N.E.).

In 1954 the mine produced 460,941 tons of ore averaging 38.4 per cent iron. The mill produced 263,116 tons of concentrates, of which 164,388 tons was shipped.

COWICHAN LAKE (48° 124° N.E.)

Copper

Blue Grouse (Cowichan Copper Co. Ltd.)

Osgood G. MacDonald, president and manager; Lisle Gatenby, superintendent. The property includes the old Blue Grouse and Sunnyside groups on the south side of Cowichan Lake, about 3 miles westerly from Honeymoon Bay. Development work was continued from an adit at 1,178 feet elevation. Ore from the development work was sorted and shipped to the Tacoma smelter. Level development totalled 585 feet, sublevel development totalled 425 feet, and raising nearly 800 feet. Twelve men were employed.

Production: Ore shipped, 8,082 tons. Gross content: Silver, 5,568 oz.; copper, 1,040,385 lb.

Placer

CONTENTS

ATLIN*

SPRUCE CREEK (59° 133° N.W.)

Noland Mines Limited

Five partners, A. V. Mattson, T. R. Mattson, D. S. Mattson, and R. F. Smith, with J. D. Ward as manager, operated the Noland mine under an agreement with Noland Mines Limited. The Noland mine is at the junction of Dominion Creek with Spruce Creek and is 12 miles by road from Atlin. Excavation was as follows:—

	Cubic Yards Excavated	Per Cent
Safety drives, ventilation and haulage	220	3.7
Pillar development	613	10.3
Pillar extraction	5,087	85.6
Mine clean-up	24	0.4
Totals	5,944	100.0

From this total of 5,944 cubic yards of gravel, 3,580.02 fine ounces of gold and 657.60 ounces of silver were obtained, having a total value of $122,599.

* By J. W. Patterson.

The gravels from which the major portion of this production was taken came from the pillars bounded by the new "J" drive, and the 52 and 56 crosscuts. All excavation in this area was done at the new low bedrock elevation established by development in 1953.

New sluice-boxes were constructed and a washing-screen installed.

Enterprise Placers

Between June 1st and October 26th, three partners, John M. Acheson, Floyd M. Wilson, and Clyde B. Day, and six employees worked ground leased from Spruce Creek Placers Limited. About 105,900 yards of gravel was sluiced. The gravel and tailings were moved with a shovel, a bulldozer, and a dragline.

Birch Creek (59° 133° N.E.)

George E. Cash and two employees did 85 feet of underground work on Birch Creek.

Gold Run Creek (59° 133° N.E.)

Encouraging values were obtained in the gravels tested by nine churn-drill holes, drilled by Noland Mines Limited, on Gold Run Creek above the old town of Discovery.

McKee Creek (59° 133° S.W.)

Three partners, Joe and Luigi Piccolo and George Watt, hydraulicked about 100,000 cubic yards of gravel on McKee Creek.

Pine Creek (59° 133° N.E.)

S. R. Craft worked his placer property alone.

Fred W. Giesen did some rehabilitation work on his property.

OMINECA*

Manson Creek (55° 124° N.W.)

Art Hyndman worked his placer property alone.

Slate Creek (55° 124° N.W.)

W. H. Mathews did some hydraulic work for a short time on his property.

Carl Nelson worked his ground alone.

John Erickson worked his property alone, using a wheelbarrow and a sluice-box.

Germansen River (55° 124° N.W.)

Germansen River Placers

Ground leased from Germansen Mines Limited by K. H. Armstrong, of Seattle, Wash., was worked between June 1st and September 15th with an average of six employees. A short sluice-box was set up, and trucks hauled gravel loaded by a ¾-yard shovel. Two centrifugal pumps provided water for sluicing. Tailings were passed through two jigs. The gravel handled was from a scoured-out section of bedrock, and recovery was small.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1936, pp. C 8–10.]

A. Pendle and A. Markesen and four employees worked G. H. Loper's hydraulic property on the north side of Plughat Creek about 1 mile from Germansen Landing. The ditch, intake diversion, and trestles were repaired, and 250 feet of bedrock was cut. There was no production.

* By J. W. Patterson.

SILVER CREEK (55° 125° N.E.)

Canadian Exploration Limited, Royal Bank Building, Vancouver, drilled ten holes totalling 877 feet on five leases owned by Mrs. W. Tait on Silver Creek. The results were reported by the company to be disappointing. An average of eight men was employed.

LOST CREEK (55° 124° N.W.)

E. A. Ostjord worked his ground alone for a short period.

CARIBOO*

HIXON CREEK (53° 122° S.W.)

Hixon Placers Inc. Company office, 712 Jones Building, Seattle, Wash.; mine office, Hixon P.O. H. W. Hargood, president; C. J. Norris, superintendent. The property, 3 miles east by road from the Cariboo Highway at Hixon, is held under option from B. Briscoe, of Vancouver. A crew of five men hydraulicked 50,000 cubic yards of overburden from an old channel of Hixon Creek. In addition, work began on laying a pipe-line to bring water from upper Hixon Creek to the high-level ditch which extends to a point opposite the present hydraulic workings. When completed, this installation should provide additional water which will enable a greater yardage to be handled.

Government Creek.—*H. Schmalz did a small amount of ground-sluicing on* Government Creek.

WILLOW RIVER (53° 121° S.W.)

Mink Gulch.—N. Broswick and one man hydraulicked 2,500 cubic yards of gravel on Mink Gulch, a tributary of Williams Creek.

Walker Gulch.—E. Hanson hydraulicked 1,000 cubic yards of gravel on Walker Gulch, a tributary of Williams Creek.

Williams Creek.—John MacInnes and S. Radencic hydraulicked 3,000 cubic yards of gravel on Williams Creek opposite the mouth of Walker Gulch.

R. Collishaw, employing a crew of two men, hydraulicked 100 cubic yards of gravel on Williams Creek opposite Stouts Gulch.

J. J. Gunn hydraulicked 2,000 cubic yards of gravel on Williams Creek opposite Barkerville.

Provincial Exploration (1952) Ltd. Head office, 800 Hall Building, 789 West Pender Street, Vancouver; mine office, Barkerville. M. R. Benischke, president and manager. The placer drift begun in 1953 on the east side of Williams Creek, downstream from Barkerville, was extended 200 feet to a total length of 320 feet. The last 35 feet are in bedrock, and at the drift face a vertical raise 40 feet high was driven into surface gravel.

In addition, the crew of six men constructed a footbridge over Williams Creek and installed flume and sluice-boxes for washing the gravel now being drawn down the raise.

Kumhila Exploration Co. Ltd. Several Keystone-drill test-holes were drilled on Williams Creek between the Bowron Lake road crossing and Barkerville, and on Conklin Gulch above the old hydraulic workings. In September the dragline and washing plant used by this company in 1944 near Devlin Bench was moved to Conklin Gulch at the Proserpine Mountain road crossing. Approximately 33,600 cubic yards of gravel was stripped from the surface in removing barren gravel and in making a pond. The floating washing plant was assembled prior to stopping the operation for the winter. A new all-weather road, approximately half

* By J. E. Merrett.

a mile in length, was built from the washing plant to the Cariboo-Hudson road. A crew of eighteen men was employed.

Placer Creek.—H. C. Christensen hydraulicked 1,400 cubic yards of gravel on Placer Creek, which flows into the south end of Jack of Clubs Lake.

Lowhee Creek.—R. E. MacDougall, in partnership with F. Jamieson and O. K. Nason, continued cleaning the sides of Lowhee pit in the vicinity of Watsons Gulch. The bedrock lies below the main sluice grade at the point of working, and it was necessary to use a truck and tractor to remove tailings. Early cold weather forced a clean-up to be made before all the bedrock was cleaned. Five men were employed.

Jack of Clubs Lake.—William Suran ground-sluiced 5,000 cubic yards of gravel on the east side of Jack of Clubs Lake.

Mosquito Creek.—P. J. Macdonald hydraulicked 5,000 cubic yards of gravel on Mosquito Creek.

Burns Creek.—R. E. MacDougall, employing two men, hydraulicked 20,000 cubic yards of gravel on the bench between Devils Canyon and Burns Creek.

Devils Lake.—Rudolph Strome ground-sluiced 125 cubic yards of gravel at the east shore of Devils Lake.

Nelson Creek.—Anton Haryluk, of Langley Prairie, employing a crew of four men, ground-sluiced and hydraulicked 1,500 cubic yards of gravel on Nelson Creek above the Slough Creek bench workings.

Dramont Mines, Inc.—Company office, 10335 Forty-eighth Avenue N.E., Seattle, Wash.; mine office, Wells. J. E. Ritchie, president; A. C. Johnston, vice-president and manager. A water-storage dam and sluice-boxes were built, and 10,000 cubic yards of gravel was hydraulicked from the side of Dragon Creek pit by a crew of four men.

Beaver Gold Placers.—W. E. North and W. K. Nichols, employing a crew of two men, hydraulicked 3,600 cubic yards of gravel in a bench pit south of Kwong Foo Creek, a tributary of Beaver Pass Creek.

Rucheon Creek.—J. H. Feyer hydraulicked 8,000 cubic yards of gravel on Rucheon Creek on a lease held by T. Fry.

Cooper Creek.—A. Frankish hydraulicked 1,000 cubic yards of gravel on Cooper Creek, a tributary of Sugar Creek.

Eight Mile Lake.—M. A. Anderson hydraulicked 600 cubic yards of gravel near Eight Mile Lake.

Antler Creek (53° 121° S.E.)

Oro Mio Limited.—M. R. Benischke, employing a crew of four men, surveyed and constructed an access road from Antler Creek road to the bench of Beggs and California Gulches.

Antler Mountain Gold Ltd.—A. W. Ludditt, employing one man, hydraulicked 500 cubic yards of gravel on the west bank of Grouse Creek.

Canadian Creek.—John Holland hydraulicked 300 cubic yards of gravel on Canadian Creek.

Lightning Creek (53° 121° S.W.)

Houseman Creek.—Mr. and Mrs. Leroy Biggs drifted and sluiced 2,000 cubic yards of gravel on three leases on Houseman and Lightning Creeks.

Channel Placers Syndicate.—D. H. Wells, employing a crew of four men, hydraulicked 20,000 cubic yards of slide material in the Amador pit.

Ennerdale Placers.—F. W. Freeman and J. Hind hydraulicked 2,000 cubic yards of gravel at the mouth of Grub Gulch. A road was bulldozed from the mouth of Grub Gulch to the mouth of Van Winkle Creek.

Campbell Creek.—Edward M. Johnson hydraulicked 6,000 cubic yards of gravel on Campbell Creek, a tributary of Peters Creek.

Quesnel River Area (52° 121° N.W.)

Quesnel River.—L. LaHaye, of Likely, sluiced 200 cubic yards of gravel near Horseshoe Bend on the Quesnel River.

Morehead Creek.—R. C. C. Smith, of Victoria, hydraulicked 2,500 cubic yards of gravel on leases held by H. C. Webber, of Vancouver, on Morehead Creek, three-quarters of a mile below its junction with Hydraulic Creek.

Lawless Creek Mining Company.—Company office, 6930 Beverley Boulevard, Everett, M 26, Wash.; mine office, Likely. C. V. Landon, manager. A crew of four men was employed hydraulicking 27,500 cubic yards of gravel from a bench on the east bank of Lawless Creek near its junction with the Quesnel River.

Likely.—A. Carbillet sluiced 1,500 cubic yards of gravel on two bench leases near Likely.

E. A. Bradley, employing a crew of two men, extended the drift a total distance of 500 feet, on a lease located on the south side of Quesnel River opposite Likely.

Cariboo River.—A. Anderson, of Likely, hydraulicked 3,800 cubic yards of gravel on the north bank of Cariboo River, 3 miles downstream from Spanish Creek.

D. A. and H. C. Miller hydraulicked 2,500 cubic yards of gravel on a bench on the south side of Cariboo River near Murderer Gulch.

Keithley Creek (52° 121° N.E.)

Rollie (Duck) Creek.—A. Sandberg hydraulicked 6,000 cubic yards of gravel on Rollie Creek, approximately 3 miles upstream from Cariboo Lake.

W. A. Blauvelt sluiced 900 cubic yards of gravel on Rollie Creek at the Keithley road crossing.

Keithley Creek.—G. S. Baker sluiced 190 cubic yards of gravel on lower Keithley Creek.

V. E. Johnson sluiced 550 cubic yards of gravel removed by his drift in the east bank of Keithley Creek near Weaver Creek.

A. E. McGregor, employing a bulldozer and three men, constructed 1,700 feet of ditch from Rabbit Creek to the hydraulic pit at the junction of Keithley and Snowshoe Creeks.

E. Lang and E. Rachoy drill-tested the east bank of Keithley Creek one-quarter of a mile downstream from its junction with Snowshoe Creek. This work was done on a lease held by C. H. Pitt, of Vernon.

Cariboo Falls Placer.—G. A. Goldsmith and a crew of five men installed 2,200 feet of hydraulic pipe, varying in diameter from 20 to 30 inches, at the falls on upper Keithley Creek.

Nigger Creek.—T. A. Payne sluiced 700 cubic yards of gravel on Nigger Creek, a tributary of Cariboo Creek.

Horsefly River

Turner Placer (52° 120° N.E.) G. E. and E. W. Turner and R. and J. Durran, as partners, installed a ¾-yard back-hoe shovel, a T.D. 14 bull-dozer, and a portable washing plant on leases on the Horsefly River approximately half a mile below its junction with Mackay River. The attempt to mine the shallow surface deposits with this equipment was not economically successful.

Black Creek.—(52° 121° N.E.) H. Armes completed 40 feet of placer drift and sluiced 250 cubic yards of gravel in the old hydraulic pit above the second falls of Black Creek, a tributary of the Horsefly River.

FRASER RIVER*

Watson Bar Creek (51° 122° S.E.)

E. H. Roseneau and two men, using a D-4 bulldozer, constructed 2½ miles of road to placer leases on the North Fork of Watson Bar Creek. Preparatory to installing sluices and commencing mining, a drain for removing tailings was constructed with the bulldozer. This drain was 2,500 feet long, 14 feet wide, and 6 feet deep.

Cayoosh Creek (50° 121° N.W.)

Lillooet Mining and Dredging Company Limited

Eight men were employed, using a dragline and stationary washing plant on three leases held near the junction of Cayoosh Creek and the Fraser River. Fifteen hundred cubic yards of gravel was washed, and the concentrate shipped to England to a custom smelter. On completion of this work, a suction dredge was assembled on the Fraser River immediately north of Cayoosh Creek.

BRIDGE RIVER*

McKee Leases.—(50° 122° N.E.) A crew of four men sluiced 900 cubic yards of gravel on twelve leases held by J. H. McKee, of Vancouver, between Michelmoon Creek and the British Columbia Electric Railway's diversion dam on Bridge River.

Hurley River.—(50° 122° N.W.) W. Haylmore, employing a bulldozer and four men, sluiced 330 cubic yards of gravel on the Hurley River near Gold Bridge.

SALMO RIVER†

F. J. Morrish.—(49° 117° S.E.) During the summer F. J. Morrish, of Trail, worked on the south bank of Salmo River about a mile upstream from Pend d'Oreille River. Work was done near the old placer camp 1.2 miles by rough road from the Nelway–Waneta road. The logging-road on the south side of Salmo River was extended almost half a mile to the camp. Most sluicing was done in an old pit 100 yards upstream from the camp. A few hundred yards of material, ranging from sand to coarse gravel containing many boulders, was washed.

* By J. E. Merrett.
† By J. T. Fyles.

Structural Materials and Industrial Minerals

CONTENTS

INTRODUCTION

Structural materials and industrial minerals production statistics are shown under the appropriate sub-headings in Table I, page 19; Table III, page 20; Table VIIA, page 26; Table VIID, page 29; Table VIIE, page 30; Table VIIID, page 35.

During 1954 Conwest Exploration Company Limited carried out a programme of trenching and geological mapping on a fluorite-witherite showing near Liard Hot Springs.

An American company examined a limestone deposit on Texada Island with a view to the possibility of building a cement plant. A second American company explored limestone east of Rosedale with the intention of using the rock in a small cement plant to be built in that vicinity during 1955.

The production rate of most structural and industrial minerals remained about the same as for 1953 with the exception of asbestos, which increased threefold.

ASBESTOS

Cassiar Asbestos Corporation Limited*

Mount McDame (59° 129° S.W.). Head office, 85 Richmond Street West, Toronto; British Columbia mine office, Royal Bank Building, Vancouver. J. D. Christian, general manager; N. F. Murray, general superintendent. Building construction at the mill-site consisted of a jaw crushing plant, a curling-rink, twelve pri-

* By J. W. Patterson.

vately owned dwellings, two company private dwellings, two bunk-houses, and the completion of the power-house extension and the dining-hall and cookery. A total of 4,000 feet of pipe-line was laid and 3,000 feet of power-line was hung. Between the mill and mine sites thirty-one trestles of the proposed aerial tramway were erected and one double-tension station partially erected. At the mine-site one lunchroom, two compressor buildings, and one power-unit shelter were put up.

The mill operated continuously except for the period April 6th to June 19th when it was shut down for alterations. Production of fibre from 101,535 tons of ore milled was as follows:—

Grade	Tonnage
Crude 1	11
Crude 2	2
AAA	31
3K	4,736
4K	3,793
Total	8,573

A stockpile of 143,202 tons of ore was made at the mill-site.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 211–214.]

BARITE

Mountain Minerals Limited*

Company office, Morris Building, P.O. Box 273, Lethbridge, Alta. R. A. Thrall, managing director. Capital: 2,000 shares, $100 par value. This company owns one barite quarry 7 miles by road from Parson siding and another 5 miles from Brisco, both in the Windermere Valley, south of Golden.

As the available reserves at Parson quarry (51° 116° S.W.) were almost depleted, 375 feet of drifting and crosscutting were completed in search of new reserves. At the No. 3 quarry, 100 feet of drifting added only a small block of mineable barite. The remainder of the underground development work was done in No. 2 quarry, where an appreciable tonnage of good-quality barite was proven.

Reserves at the Brisco quarry (50° 116° N.E.) are still considerable; however, this ore contains more impurities than that produced at Parson.

In 1954, 744 tons of crude barite was shipped from Parson to the processing plant at Lethbridge and 4,030 tons was shipped from Brisco.

A crew of five men was employed under the direction of William McPherson.

82G/5E-1

Phillipps Creek†

(49° 114° S.W.) Veins containing barite with minor copper sulphide are found in volcanic and metasedimentary rocks on the north side of Phillipps Creek 3 miles northeast of Roosville in southeastern British Columbia. The veins have been known for many years. In 1940 Meth Gorrie and his sons, of Flagstone, built a 3-mile wagon-road into the deposit from the Roosville–Elko highway. They quarried 8 tons of barite which was hauled to Elko and shipped by train to Lethbridge.

The main vein is at 4,400 feet elevation across the nose of the ridge between the forks of the second major tributary that enters Phillipps Creek from the north. The wagon-road leaves the highway about one-quarter of a mile north of the Phillipps Creek bridge, follows up the north side of the creek, turns up the tributary, and then crosses it and switchbacks up the nose to a loading-bin at the main showing. The road has been washed out and is overgrown in several places but is readily followed on foot.

* By J. E. Merrett.
† By J. W. McCammon.

The vein is in volcanic rocks of Precambrian age. At the quarry the hangingwall is altered porphyry and the footwall is brecciated argillaceous tuff. About 300 feet north and 200 feet higher up the slope, quartzites, argillites, and dolomite of the Gateway formation overlie the volcanics conformably. The rocks strike east-west and dip 15 to 20 degrees north.

The barite vein strikes between north 80 degrees west at its east end and north 65 degrees west at its west end. It dips between 80 degrees south and vertical. It is exposed continuously for 350 feet along strike where it crosses the open ridge nose. Earthy overburden is not deep but effectively covers the ground between natural exposures. To the west the vein disappears downslope into valley debris, and to the east it passes under a long talus slide. The vein width varies abruptly and unpredictably from a maximum of 5 feet to as little as 6 inches or less. The walls are irregular and show variable amounts of replacement.

The bulk of the vein matter is opaque white barite, but considerable carbonate, partly iron-bearing, and minor amounts of pyrite, chalcopyrite, and quartz are also present. The carbonate is scattered irregularly but persistently through the barite in masses as great as 6 inches in diameter. The iron from the carbonate and pyrite is largely oxidized, and the resulting limonite stains much of what would otherwise be clean white barite.

Other small veins carrying barite and copper sulphides are present in the surrounding rocks. These veins are commonly parallel or perpendicular to the main vein. All those seen were small, 1 foot or less wide, irregular, and discontinuous.

Workings on the main vein consist of three shallow pits and two small quarries each about 25 feet long by 15 feet wide.

One sample was taken across 3½ feet of relatively clean vein in the largest quarry opening. The sample assayed: BaO (barium oxide), 57.46 per cent; CaO (calcium oxide), 0.64 per cent; total Fe (iron), 0.18 per cent; SO_3 (sulphate), 31.45 per cent. It had a specific gravity of 4.38.

BUILDING-STONE

Andesite

Haddington Island Quarry*

(50° 127° N.E.) Company office, J. A. and C. H. McDonald Limited, 1571 Main Street, Vancouver; quarry, Haddington Island. Andesite is quarried to obtain dimension stone for building purposes. The stone is drilled to size and broken by blasting with black powder and then moved by derricks to scows by which it is transported to Vancouver. Seven men were employed.

Granite

Vancouver Granite Co. Limited*

Nelson Island (49° 124° N.E.). Company office, 744 West Hastings Street, Vancouver; quarry, Nelson Island. Dimension stone for building purposes and monuments, jetty-rock, and rubble are mined at this quarry. The rock is drilled to size and then wedged or blasted for removal. Three 20-ton-capacity wooden derricks are used to move stone from the quarry face to scows. The blocks are shipped to Vancouver for cutting and finishing. Approximately 1,600 tons of stone was produced from March 16th to August 31st. The average number of men employed was eight.

Coast Quarries Limited*

Granite Falls (49° 122° S.W.). Company office, 1840 West Georgia Street, Vancouver; quarry office, Granite Falls. W. A. Bickell, manager; D. R. Ross, superintendent. Jetty-rock, riprap, and rubble are produced by this company. During 1954 mining of

* By R. B. King.

the high quarry face was changed from blasting flat drill-holes to "coyote hole" method of mining. The original quarry was reopened and mining was carried out by blasting vertical drill-holes. Broken rock is loaded by a 1-cubic-yard diesel-driven shovel into wire-rope nets of 10-ton capacity. The nets serve as a coarse screen. These are transported by a steam-driven derrick and loaded directly on to scows. Seven men were employed.

Gilley Bros. Limited*

Pitt River (49° 122° S.W.). Company office, 902 Columbia Street, New Westminster; quarry office, Pitt River. J. H. Gilley, general manager; Francis J. MacDonald, superintendent. Quartz diorite for jetties, dykes, and concrete aggregate is produced by this company. Rock is broken from a quarry face, which is nearly 100 feet in height, mainly by the " coyote hole " method of mining. Broken rock is loaded by a 2-cubic-yard diesel-driven shovel into 12-cubic-yard-capacity trucks. The crushing plant consists of a 42- by 60-inch jaw crusher and a 6-inch grizzly with a conveyor-belt for loading scows. Undersize material (—6-inch) is stockpiled. Thirty-four men were employed.

Valley Granite Products Limited*

Cheam View (49° 121° S.W.). Company office, 410 Mayfair Avenue, Chilliwack; plant, Bridal Falls. The quarry and crushing plant are 11 miles east of Rosedale. The granite is drilled, blasted, and hand-loaded into a 1-ton-capacity car and transported to a crushing and screening plant. During wet weather the broken granite is piled under temporary shelters and dried, before crushing, with open-flame kerosene burners. The plant produces turkey, chicken, and bird grit, stucco-dash, sand-blasting material, filler for asphalt roofing, and sanding material for automotive vehicles. Fine material is also used as a soil-amendment product. Twelve men were employed.

SLATE

McNab Creek Slate Quarry*

Howe Sound (49° 123° N.E.). Head office, Richmix Clays Limited, 2890 East Twelfth Avenue, Vancouver; quarry, McNab Creek. G. W. Richmond, manager. Slate is mined by drilling and blasting horizontal holes. Broken slate is hand-loaded into 1-ton cars and dumped directly into scows. Production is intermittent. Slate is used for flagstones and also roofing granules. Five men were employed.

CLAY AND SHALE

Bear Creek Brick Company*

Surrey (49° 122° S.W.). Head office, Victoria Tile & Brick Supply Co. Ltd., Vancouver; plant, Archibald Road, Surrey District. James McBeth, plant manager. Surface clay is mined from a small pit adjacent to the plant. Cars are hand-loaded and hauled by winch to the plant. The bricks are formed by a wet-press process and placed in hacks to be weather-dried. Wood-fired scove kilns are built for burning bricks.

Port Haney Brick Company Limited*

Haney (49° 122° S.W.). Company office, 846 Howe Street, Vancouver; plant, Haney. E. G. Baynes, president; J. Hadgkiss, plant manager. This company operates a large plant producing structural tile, drain-tile, facebrick, common brick, and Roman brick. A plastic clay is dug by a ½-cubic-yard gasoline-driven shovel from pit faces about 20 feet high and is transported by truck to a covered air-drying area. The clay is dried in a rotary wood-fired kiln and then conveyed to a dry pan for grinding. Brick and tile are formed by the stiff-mud extrusion process and dried in a controlled-temperature drying-room. The clay products are burned in down-draught beehive kilns. Approximately 12,598 tons of clay products were produced in 1954. Fifty-five men were employed.

* By R. B. King.

Mainland Clay Products Limited*

Barnet (49° 122° S.W.). Head office, 8699 Angus Drive, Vancouver; plant, Barnet. D. Pitkethly, general manager. Surface clay is mined from a pit adjacent to the plant. Some fireclay is trucked from Kilgard. Dry-pressed common brick and firebrick are burned in rectangular coal-fired kilns.

Clayburn Company Limited*

(49° 122° S.E.) Head office, 302 Credit Foncier Building, Vancouver; plants, Kilgard and Abbotsford. R. M. Hungerford, managing director; P. S. Jagger, plant manager. Two plants are operated by this company—one, in which sewer-pipe and flue-lining are manufactured, is at Kilgard; the other, in which facebrick, firebrick, and special refractory shapes are made, is at Abbotsford.

Three underground mines and an open-pit mine produce shale for the plants. Room-and-pillar method of mining is used in the underground mines. Roof bolting is being used extensively. Holes are drilled with tungsten-carbide-tipped augers which are driven by air-operated drills. Black powder is used in blasting down the shale. Scrapers, operated by 30-horsepower electrically driven hoists, are used to move the broken shale directly to the cars.

Clay mined during 1954 totalled 61,566 tons, of which 44,212 tons was used for facebrick and firebrick, and 17,354 tons was for sewer-pipe and flue-lining. Twenty men were employed in the mines.

Richmix Clays Limited*

Kilgard (49° 122° S.E.). Office and plant, 2890 East Twelfth Avenue, Vancouver; quarry, Kilgard. G. W. Richmond, manager. Stripping and mining of fireclay is being carried on intermittently at this property. Clay is drilled and blasted, and loaded by diesel-driven shovels on to trucks and transported to markets. One man was employed.

Fairey & Company Limited.†—Vancouver (49° 123° S.E.). L. T. Fairey, manager. This company produced a variety of fireclay blocks and shapes and high-temperature cements. Local and imported raw materials were used.

Baker Brick & Tile Company Limited*

Victoria (48° 123° S.E.). Office and plant, Victoria. J. V. Johnson and D. E. Smith, joint managers. Surface clays are mined by gas shovel and transported by trucks to storage bins. Drain-tile, hollow-ware, Roman brick, and flower-pots are formed by the soft-mud extrusion process and are dried with waste heat from kilns. Down-draught wood-fired kilns are used to burn the ware. During 1954, 156,283 flower-pots, 2,857.5 tons of drain-tile, 238.5 tons of structural tile, and 317 tons of Roman brick were manufactured. Eighteen men were employed.

FLUORITE-WITHERITE

Gem‡

Liard River (59° 126° S.E.). Prospectors in search of radioactive mineralization that might be the source of the radioactivity at the Liard River hot springs near Mile 497 on the Alaska Highway discovered outcrops of fluorite and witherite in the summer of 1953. The main showings are about 2 miles north of the highway at Mile 497 and about 1,300 feet in elevation above it. The claims, Gem Nos. 1 to 25, Gem Nos. 1 to 6 fractional mineral claims, and Rank No. 1 and No. 2 claims, are owned by Conwest Exploration Company Limited, 1001, 85 Richmond Street West, Toronto 1.

For a mile or more north of the Liard River hot springs, Upper Devonian Fort Creek shales overlie grey Middle Devonian limestone of the Ramparts formation. The

* By R. B. King.
† By J. W. McCammon.
‡ By Stuart S. Holland.

rocks lie in a gentle open anticline whose axis plunges gently southward and whose axial plane strikes almost north.

Exposures of fluorite, witherite, and barite have been found at several places on the gently dipping disconformity between the two formations. Two showings are exposed on the Gem No. 1 claim at an elevation of about 2,800 feet. The first is a mesa-like outcrop capped by slate and underlain by limestone where a mixture of fluorite and witherite having a maximum thickness of 20 feet is exposed. The outcrop is about 100 feet wide and about 200 feet long.

At the second, about 1,000 feet to the north, the mixture of fluorite and witherite is about 8 feet thick. It underlies an area about 50 by 100 feet and may extend farther east beneath rising ground. Outcrops of fluorite to north and south of these exposures have been found, and several others as much as 3,000 feet to the west are known.

The ore material consists of purple fluorite, white to grey witherite, barite, and quartz replacing both limestone and slate. The fluorite which is normally dark purple to black in colour bleaches white on exposure to light. The ratio of fluorite to witherite varies from place to place, but it is estimated that on the average the two minerals occur in about equal amounts. The amount of quartz and barite is low.

In the various exposures it is estimated that the total fluorite and witherite amounts to 50 to 80 per cent of the ore material. However, a close estimate of grade must await further stripping of outcrops, diamond drilling in covered areas, and extensive sampling.

In 1954 Conwest Exploration Company Limited, under the direction of J. R. Woodcock, bulldozed a road from Mile 498 on the highway into the Gem No. 1 claim. Some stripping was done on the known exposures, and a bulk sample was shipped to Ottawa for testing. Several new showings were found in the course of surveying and geological mapping of the property.

GYPSUM

Gypsum Lime and Alabastine, Canada, Limited*

Falkland (50° 119° N.W.). Head office, Paris, Ont.; British Columbia office, 1272 West Pender Street, Vancouver. Norman Jessiman, British Columbia manager; Alex. Jessiman, quarry manager; Leonard G. Hoover, quarry foreman. This company quarries gypsum at Falkland, 40 miles east of Kamloops, on the Kamloops–Vernon highway and on the Vernon branch of the Canadian National Railway. Gypsum is produced from open quarries 500 to 1,100 feet above the railway on the steep hillside north of the village. Work was continuous throughout the year, and a crew of thirty men was employed. The production of gypsum averaged approximately 360 tons daily, which was quarried from the No. 2 and No. 10 quarries and was shipped to the company processing plants at Port Mann and Calgary.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1952, p. 119.]

Canada Cement Company†

Mayook (49° 115° S.W.). This company owns a gypsum quarry on the Cranbrook–Fernie highway, 16 miles east of Cranbrook and a quarter of a mile northeast of Mayook. The existence of a 50-foot-wide band of waste in the middle of the quarry face necessitated the surface stripping of a new section in the north end of the quarry.

A mechanical rock-breaker was added to the plant equipment; however, its operation was not satisfactory.

A crew of five men quarried and shipped 13,171 tons of gypsum rock to the company plant at Exshaw, Alta.

* By E. R. Hughes.
† By J. E. Merrett.

Columbia Gypsum Products, Inc.*

Windermere (50° 115° S.W.). Head office, 425 Symon's Building, Spokane, Wash.; quarry office, Athalmer. This company owns a gypsum deposit on Windermere Creek. The quarrying and hauling contracts are held by General Construction Company, of Vancouver and Calgary, who in turn sublet the hauling contract.

In maintaining an adequate supply of broken gypsum rock for shipment, two benches were drilled and blasted at the north and west faces of the pit. Drilling completed during 1954 was nineteen holes, 5½ inches in diameter, totalling 3,018 feet. These holes were loaded with 40 per cent Forcite and were doubly detonated with the assistance of primacord and millisecond delay electric blasting-caps. The crew of eighteen men mined 84,850 tons, of which 64,000 tons was trucked 10 miles to Lake Windermere station at Athalmer and shipped by rail to Canada Cement Company at Exshaw, Alta.; British Columbia Cement Company Limited at Bamberton; Lehigh Portland Cement Co., Metaline Falls, Wash.; and the Columbia Gypsum plant at Spokane, Wash. An additional 18,815 tons of gypsum was stockpiled at the mine and at the rail shipping-point.

LIMESTONE AND CEMENT

Barr Limestone Quarry (Shames Quarry)†

Shames (54° 128° S.W.). Office, 247 East First Avenue, Prince Rupert. In July, 1953, A. E. Barr opened a quarry on a limestone deposit 2 miles northeast of Shames, a Canadian National Railway station 77 miles east of Prince Rupert. This quarry is on the South Half of Lot 4510, Range 5, Coast District, which is leased by J. P. McCulloch, G. W. Bissonette, and the estate of W. Robinson, all of Terrace.

The quarry is at an elevation of 800 feet, one-third of a mile east of the Shames River and 1 mile north of Provincial Highway No. 16. A road 1½ miles long from the quarry to a loading-ramp at the railway crosses Highway No. 16 just east of the Shames River bridge.

In the vicinity of the quarry the ground slopes steeply at an average of 35 degrees. Earthy overburden is only 1 or 2 feet deep, but timber is thick and the trees are as much as 3 feet in diameter. A large spring 25 feet southeast of the quarry face provides adequate water for working requirements.

The limestone forms a band interbedded with sheared gneissic and schistose rocks that strike between north 50 and 60 degrees east and dip between 68 and 77 degrees southeastward. A few narrow dykes cut the limestone.

At the quarry the limestone band is 145 feet thick. No outcrops were found downslope from the quarry. Relatively continuous limestone outcrops can be followed for half a mile northeast of the quarry to 2,000 feet elevation. Over this distance the band ranges from 100 to 300 feet thick. Above the 2,000-foot level are steep cliffs in which the limestone can be seen to continue. Duffell‡ reports that the limestone continues up over the ridge at 2,700 feet elevation and then appears to lens out. He did not find any continuation of the limestone in the first large creek 2 miles northeast of the quarry, but did find thin lenses in the next creek 1 mile farther northeast.

One cross-fault offsets the band 130 feet northwestward at the bluffs 200 feet northeast of the quarry, and another fault offsets the band 500 feet southeastward at a point 400 feet northeast of the quarry.

The limestone varies from brownish through greenish and bluish grey to white. Colour contacts are gradational. The whiter rock is most commonly in the central part or toward the northern edge of the band. The texture is coarsely crystalline with grains having diameters of from 2 to 4 millimetres. Scattered grains of pyrite and flakes of a green micaceous mineral are visible in some outcrops.

* By J. E. Merrett.
† By J. W. McCammon.
‡ S. Duffell, personal communication.

In June, 1954, the quarry consisted of an opening 35 feet wide by 60 feet long with a face 50 feet high. It was being dug in a white zone northeastward into the hillside along the strike of the limestone. Thirty feet of badly shattered and discoloured stone lay between the quarry and the northwest contact, and about 80 feet of shattered discoloured limestone between it and the southeast contact. Fractures and faults were numerous in the quarry face. Some gouge zones consisted of as much as 1 foot of clay-like and serpentinous material. The top 10 feet or so of the limestone was weathered and dirty.

Chip samples were taken at the deposit as follows: (1) Across 32 feet of white limestone in the quarry face, (2) across 80 feet of discoloured limestone exposed in the road between the quarry and the southeast contact, (3) at the bluffs 200 feet northeast of the quarry across 20 feet of limestone at the northwest contact, (4) continuing for 64 feet southeast from sample No. 3, (5) continuing for 72 feet southeast from sample No. 4. Sample (6) consisted of a grab sample of rock broken for shipment.

Sample No.	CaO[1]	MgO[1]	Fe_2O_3 (Total)	Acid Insoluble
	Per Cent	Per Cent	Per Cent	Per Cent
1	48.9	4.4	0.35	2.5
2	49.0	2.4	0.71	5.9
3	51.6	1.3	0.51	4.0
4	53.1	1.6	0.14	1.2
5	50.6	2.5	0.42	3.5
6	53.8	1.3	.....	.....

[1] Acid soluble.

The quarry supplies limestone for the Columbia Cellulose Company pulp-mill at Port Edward which requires clean white rock. In order to meet the standard of whiteness demanded, the broken rock is carefully sorted and each truckload is washed before leaving the quarry.

The fact that no stripping was done in advance of quarrying created two problems. It made it difficult to follow the white zone in the deposit, and every time a new lift was blasted off the lip of the quarry, a mass of dirt and dirty surface rock fell into the working space. This material had to be removed before more white rock could be obtained, and so a break occurred in the shipping schedule.

Water from the spring mentioned above was beginning to seep through fractures in the quarry face. This indicated a possible danger that the entire flow of the spring might soon break through into the workings.

During 1954 a crew averaging seven men produced 7,561 tons of limestone per week.

[References: *Minister of Mines, B.C.*, Ann. Rept. 1914, p. 152; 1953, p. 191; *Canada, Dept. Mines and Resources,* Mines Br. Pub. 811, p. 218.]

The Consolidated Mining and Smelting Company of Canada, Limited*

Fife (49° 118° S.E.). Head office, Trail; quarry, Fife. G. S. Ogilvie, engineer; Oscar Tedesco, quarry foreman. The limestone quarried here is shipped to Trail for use as flux in the smelter. The quarry is alongside the Kettle Valley branch of the Canadian Pacific Railway, half a mile north of Fife. A ⅝-cubic-yard Northwest diesel shovel is used to load the broken rock, which is hauled by truck to a loading-bin at the railway. Owing to the sufficiency of the accumulated stockpile of this material at Trail, the quarry was closed for the seven-month period from the end of January to the beginning of September. The limestone shipped in 1954 amounted to 17,500 tons. Seven men were employed.

* By E. R. Hughes.

Purex Lime Co. Ltd.*

Nelway (49° 117° S.E.). Company office, Box 168, Salmo. O. Bakka, president. Capital: 200,000 shares, $1 par value. This company was formed to develop a limestone deposit on the north half of Lot 9056 about 1 mile north of Nelway. The Nelson–Nelway highway crosses the property. Late in 1954 access roads were built and two buildings erected. Diamond drilling was begun in January, 1955.

Agassiz Lime Quarry†

Agassiz (49° 121° S.W.). Hiram Cutler, owner. Agricultural limestone is produced from this quarry. Broken rock, from a 25-foot face, is transported by a ¼-cubic-yard loader from the quarry to the crushing plant. The daily capacity of the crushing plant is 40 tons. The average number of men employed was five.

Fraser Valley Lime Supplies†

Popkum (49° 121° S.W.). Arthur Isaacs, superintendent. Limestone is produced and crushed at this quarry and plant for industrial and agricultural purposes. Limestone is blasted from the quarry face, hand-loaded into trucks, and transported to a crushing plant. During 1954, 2,272 tons of crushed limestone was produced. Five men were employed.

Beale Quarries Limited†

Vananda (49° 124° N.W.). Head office, 744 West Hastings Street, Vancouver; quarry office, Vananda. W. D. Webster, superintendent. Limestone is quarried to produce pulp rock for paper-mills, agricultural lime, crushed limestone, and stucco products. The quarry is worked on two levels, with faces nearly 45 feet high. Wagon drills are used to drill holes for blasting. Broken rock is loaded with two ¾-cubic-yard diesel-driven shovels and transported by truck to a crushing plant. A new conveyor system for loading scows, a secondary crushing plant to handle —5-inch sizes, and a power plant were built in 1954. Approximately 130,000 tons of limestone was mined during 1954. Of this, 4,000 tons was shipped as agricultural limestone, 81,000 tons was shipped to pulp plants, 25,000 tons was sold as crushed limestone, and 4,000 tons was sold for stucco products. The remaining 16,000 tons was stockpiled. The number of men employed during 1954 was thirty.

W. S. Beale Limited†

Vananda (49° 124° N.W.). Office and quarry, Vananda. Stanley Beale, manager. Limestone is quarried to produce pulp rock for paper-mills and smelter flux. The quarry is worked with one face nearly 80 feet high and sloping at 45 degrees to the horizontal. Air-leg types of drills are used to drill horizontal holes, parallel to the face, for blasting. Broken rock is loaded with a ½-cubic-yard diesel-driven shovel and transported by trucks to a ramp, where it is dumped on to a heavy-duty vibrating screen which separates pulp rock from finer material. The pulp rock is loaded on to scows; spalls are stockpiled. During the year 60,000 tons of limestone was produced. Ten men were employed.

McKay Quarry†

Vananda (49° 124° N.W.). Don McKay, owner. This quarry is on the main road about 2 miles south of Vananda. White limestone is mined and sold for stucco-dash. Selective mining of irregular white masses of limestone in grey limestone is necessary. About 10 tons of limestone is produced daily.

Pacific Lime Company Limited†

Blubber Bay (49° 124° N.W.). Head office, 744 West Hastings Street, Vancouver; quarry, Blubber Bay; plants, Blubber Bay and Vancouver. F. W. Harvie, general manager; A. M. Stewart, assistant general manager; E. O. Magnusson, plant superintendent. Limestone is quarried nearly 2 miles from the Blubber Bay plant, along the Blubber Bay–Vananda road. The quarry is being worked in levels, with faces nearly 25 feet high. Wagon drills are used to drill holes for blasting. Broken rock is loaded by a diesel-driven shovel on to 18-cubic-yard-capacity trucks and hauled to the Blubber Bay

* By J. W. Peck.
† By R. B. King.

plant. Crushed limestone is loaded on scows and brought to the Vancouver plant for treatment. The limestone is used in pulp-mills, cement manufacture, and smelter flux or is burned for lime products. The number of men employed was fifty-five.

British Columbia Cement Company Limited*

Head office, 500 Fort Street, Victoria. N. A. Tomlin, managing director; R. E. Haskins, general superintendent. Quarries are operated at Bamberton (48° 123° N.W.) and Cobble Hill (48° 123° N.W.) on Vancouver Island and at Blubber Bay (49° 124° N.W.) on Texada Island to produce limestone and greenstone, used in manufacturing cement.

At Blubber Bay the quarry faces range from 70 to 85 feet in height. A Bucyrus-Erie 27 churn drill is used to drill vertical blast-holes. These holes are spaced at 20-foot centres, have 25 feet of burden, and are drilled 9 feet below the grade line of the quarry floor. Broken rock is loaded by diesel-driven shovels into 15-ton-capacity Euclid trucks and is transported to the crushing plant. Rock from the crushing plant is stockpiled, and when required is loaded by conveyor-belt to scows for shipment to the cement plant at Bamberton. Seventeen men were employed.

At Cobble Hill the quarry face is about 30 feet in height. Air-leg types of drills are used to drill flat blast-holes, and in special places a churn drill is used to drill vertical holes. Broken rock is loaded by a diesel-driven shovel into 15-ton trucks and is transported nearly 13 miles to the Bamberton plant. Hauling of rock is done by contract. Five men were employed at this quarry.

At Bamberton, rock is mined by similar methods to those used at both Blubber Bay and Cobble Hill. Broken rock is loaded by an electric shovel and transported by 15-ton Euclid trucks to the crushing plant. Nineteen men were employed at this quarry.

During 1954, 129,978 tons of limestone was quarried at Blubber Bay, 127,403 tons was quarried at Cobble Hill, and 174,163 tons was quarried at Bamberton.

Alaska Pine & Cellulose Limited*

Jeune Landing (50° 127° S.W.). Head office, 1111 West Georgia Street, Vancouver. Nils Erickson, quarry superintendent. This quarry is on the west shore of Neroutsos Inlet about 1¼ miles north of Jeune Landing. Limestone is quarried for pulp rock for the Port Alice pulp plant. The quarry is worked by advancing a low face. Air-leg types of drills are used to drill holes for blasting. Broken rock is loaded with a ½-cubic-yard diesel-driven shovel and transported by truck to a ramp, where it is dumped over a scalping grizzly. The coarse material is loaded on scows and the fine material is stockpiled. During 1954, 17,000 tons of limestone was produced. Three men were employed.

92L-151

Cobble Hill Lime Products (Bonner's Quarry)*

Cobble Hill (48° 123° N.W.). Norman Bonner, owner and operator. Production, in this quarry, has increased from about 50 tons a month to about 70 tons a month. Rock is blasted from a 40-foot face, loaded by hand, and transported to a small crushing plant. The crushed limestone is used mainly for agricultural purposes. One man was employed.

Harble-ite Limestone Deposit†

Harbledown Island (50° 126° N.W.). A large band of limestone outcrops on the southeast corner of Harbledown Island. This island is at the entrance of Knight Inlet, about 180 miles northwest of Vancouver. There are no settlements on the island. The nearest regular steamship ports of call are Minstrel Island, 10 miles to the east, and Alert Bay, 20 miles to the west.

92L-152

The limestone forms a low ridge that extends westward from the shoreline at the most southeasterly corner of the island. Lease 1594, Range 1, Coast District, held by R. H. Chestnut, of Vancouver, covers the limestone band from the shore west for 1,980

* By R. B. King.
† By J. W. McCammon.

feet. Lease 1966, held by J. T. Protheroe, of Maillardville, adjoins Lease 1594 on the west and covers the next 1,320 feet of limestone. No development or exploration work has been done on the deposit.

Although overburden appears to be light, the only good rock exposures seen on Lease 1594 are at the 30- to 70-foot-high bluffs along the waterfront and on the three knolls in the west central part of the lease. Thick brush, scrub timber, logging slash, or forest debris covers most of the underlying rock. A fire burned over most of Lease 1966 in the summer of 1954 and exposed large areas of bare rock.

There does not appear to be a suitable site for a wharf in the immediate vicinity of the two leases. However, an old logging-road, about 4 miles long and in fair condition, extends from a sheltered cove on the north shore of the island to within 500 feet of the west boundary of Lease 1966.

The rocks in this area were mapped by Bancroft* as part of the Triassic(?) Valdes formation. The limestone forms a thick band interbedded with volcanics on the south and thin bedded argillites and volcanics on the north. Dykes, normally 1 to 2 feet wide, intrude the limestone at frequent intervals. One large dyke nearly 500 feet wide extends most of the way across the limestone band in the centre of Lease 1594.

The limestone band averages about 700 feet thick and can be traced for more than a mile along strike from the shore. The strike is nearly east-west and the dip is between 65 degrees north and vertical. Some exposures show minor folds.

The rock has an over-all dark bluish-grey streaked appearance. Occasional narrow bands, veinlets, and irregular lenses of white calcite occur throughout the main mass. The texture is granular, with individual grains having diameters ranging from one-quarter of a millimetre to 1 millimetre. Surface outcrops are so friable that lumps rubbed between the fingers are readily crumbled into individual calcite grains. When struck by a hammer, the rock emits a strong fetid odour. Apart from the above-mentioned dykes, the central part of the limestone band is relatively free of foreign material. Scattered pyrite grains occur in some outcrops, generally near dykes. Toward the edges of the limestone belt, lenses and nodules of cherty and igneous material are noticeable.

Three samples were taken at the deposit. Each sample was composed of chips taken at 10-foot intervals across a distance of 150 feet. The samples were taken along the west boundary of Lease 1966 in a continuous straight line perpendicular to the strike of the formation. Sample No. 1 started at the south contact of the limestone. Sample No. 2 continued north from the end of No. 1, and sample No. 3 extended for 150 feet north from the north end of No. 2. Limestone outcrops occur for 300 feet north of the end of sample No. 3 but were too scattered for continuous sampling. Goudge† published the analyses of two samples taken at the eastern end of the limestone band. These are included in the table below as Nos. 4 and 5. No. 4 was taken across the north half and No. 5 across the south half of the band. All samples were taken so as to exclude material other than limestone. It would be necessary to quarry selectively and discard foreign material in order to obtain a product as pure as that indicated by the analyses.

Sample No.	CaO	MgO	Fe_2O_3	S	Insoluble	MnO	P_2O_5
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
1	50.54[1]	0.06	0.12	0.012	9.64	0.27	0.035
2	54.68[1]	0.12	0.08	0.023	2.06	0.27	0.047
3	54.02[1]	0.08	0.14	0.020	3.30	0.26	0.054
4	54.30	0.14	0.15	Trace	....	....	0.032
5	54.27	0.13	0.30	0.10	....	....	0.018

[1] Acid soluble includes a fraction of 1 per cent of SrO.

* *Geol. Surv., Canada,* Mem. 23, 1913, map.

† *Canada, Dept. Mines and Resources,* Mines Br. Pub. No. 811, pp. 165, 175.

MARL

Cheam Marl Products Limited.*—Popkum (49° 121° S.W.). A. M. Davidson, manager. Marl is mined from a deposit near the east shore of Cheam Lake by a diesel-driven dragline shovel. The marl is sold wet or is dried in a rotary kiln. Three men were employed.

Popkum Marl Products Limited*

Popkum (49° 121° S.W.). W. A. Munro, manager. Marl and humus is mined by this company from a deposit on the east shore of Cheam Lake. A ¾-cubic-yard dragline digs marl and humus and loads it on to trucks. Some of the material is dried in a sawdust-fired rotary kiln. Wet, semi-dry, and dry humus and marl are produced. Three men were employed during the operating year.

Rosedale Marl Lime Products Ltd.*

Rosedale (49° 121° S.W.). C. C. Shaver, manager. Travertine is mined from a deposit which is about 2 miles southerly from Rosedale and is at the base of the Skagit Range. Rock is drilled, washed, and loaded by a front-end loader into a storage bin. The rock is crushed and then dried in an oil-fired rotary kiln. The dried travertine is ground in a small ball mill and elevated to a storage bin. It is used for agricultural purposes. Three men were employed.

PERLITE

Obsidian†

Prospect Creek (50° 121° S.E.). In the summer of 1953 L. Frenier recorded the Obsidian claim on a small showing of volcanic glass in the valley of Prospect Creek about 14 miles southwest of Merritt. The glass outcrops 10 feet above water-level on the west bank of Prospect Creek about 350 feet south of the bridge where the Spius (Petite) Creek trail crosses Prospect Creek. This is half a mile up Prospect Creek from its junction with Spius Creek.

A road extends 7.2 miles up the west side of Spius Creek from a bridge that crosses the Nicola River 1½ miles west of Canford. A good pack-trail continues on up Spius Creek from the end of the road. This trail crosses Prospect Creek about 5 miles from the road-end.

The glass is in volcanic rocks of the Lower Cretaceous Kingsvale‡ group. It is exposed for about 120 feet along and 30 feet up the creek bank. Structural relationships are not clear, but there appears to be a layering that strikes north 27 degrees east and dips 45 degrees southeast. The glass layer seems to be about 10 feet thick. Under the glass is a zone consisting of a glass matrix full of stony spherules, then a layer with a stony matrix full of spherules, next brick-red porphyry, and then grey-green porphyry. One small exposure shows a 3-inch-thick layer of clayey material on top of the glass layer and dark grey-green porphyry above the clay. Whether the clay represents a thin ash bed or fault gouge is not known. Other rocks seen on the claim include coarse breccia, amygdaloidal, vesicular, and porphyritic andesites and basalts, and a few flows of spherulitic and flow-lined rhyolite. No other outcrops of glass were found.

The glass varies through shades of brown, red, green, and grey. It has a very pitchy lustre. In thin sections it shows perlitic fractures, although in the hand specimen these are not conspicuous. A few scattered feldspar crystals and some spherules are present throughout the glass. Laboratory tests indicate that the glass will expand readily when heated to form a light but fragile product.

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* By R. B. King.
† By J. W. McCammon.
‡ *Geol. Surv., Canada,* Map 1010A, Ashcroft, 1951

SAND AND GRAVEL

Abbotsford Gravel Sales Ltd.*

Abbotsford (49° 122° S.E.). Donald MacNeil, superintendent. This pit is 7 miles west and 6 miles south of Abbotsford. Gravel is mined by shovel and scraper from the pit and is either sold as pit run or is crushed, washed, and sized in an adjacent plant. A ready-mix cement plant was built in 1954. Four men were employed.

Dueck's Gravel Pit*

Clearbrooke (49° 122° S.E.). Dueck Building Supplies Ltd., owner. This pit is about 1 mile north of Clearbrooke. Sand and gravel is washed from a gravel face 15 feet high and is pushed by a bulldozer to a bucket elevator, by which it is elevated to a washing plant. A ready-mix cement batch plant furnishes cement for local sales. Three men were employed.

Foster's Gravel Pit.*—Aldergrove (49° 122° S.E.). C. N. Foster, owner. This pit is 3 miles south of Aldergrove. Sand and gravel are mined from low faces by a front-end loader. Pit-run gravel is sold locally. One man was employed.

Border Sand and Gravel Company*

White Rock (49° 122° S.W.). Office and plant, Boundary Road, R.R. 4, White Rock. H. Lapierre, manager. The gravel pit and washing plant were operated intermittently during the year. Gravel is mined with an overhead loader and is placed in a hopper, from which it is conveyed, by belt, to a washing plant. The plant has a capacity of 60 cubic yards a day of washed and sized material.

Colebrook Sand & Gravel Company Limited.*—Cloverdale (49° 122° S.W.). Office and plant, R.R. 1, Cloverdale. F. Bray and J. Bray, owners and operators. Sand and gravel is mined by a ½-cubic-yard-capacity diesel-driven shovel and is loaded on to trucks and hauled to a small washing and screening plant. Sand and gravel for fill, concrete, and plaster are produced by this company. Two men were employed.

Corporation of the Township of Surrey.*—Cloverdale (49° 122° S.W.). John Furiak, works superintendent. Several gravel pits are operated within this township for the purpose of road maintenance and construction. Gravel is mined by diesel-driven shovels or by scrapers and is crushed in portable crushers.

Corporation of the Township of Langley.*—Murrayville (49° 122° S.W.). W. Merrell, superintendent of works. Several gravel pits are operated within the township for the purpose of road maintenance and construction. All gravel is mined by diesel-driven shovels and is transported by trucks to portable crushers.

Deeks-McBride Ltd.*

Company office, 1051 Main Street, Vancouver. J. W. Sharpe, general manager. Two gravel pits with crushing and screening plants were operated during 1954 by this company. One pit is near Coquitlam (49° 123° S.E.), and the other is near the mouth of Seymour Creek (49° 123° S.E.). The Coquitlam plant is capable of crushing, washing, and screening 500 cubic yards of gravel a day. Gravel is dug with a 1-cubic-yard-capacity dragline and transported by a conveyor-belt to a jaw crusher and then by a conveyor-belt to the washing plant. Ten men were employed. At Seymour Creek, gravel is mined by a ¾-cubic-yard dragline at the edge of Burrard Inlet. Gravel is transported by a conveyor-belt to the plant. This plant produces nearly 1,600 cubic yards of sized and washed gravel products in a sixteen-hour work-day. Twenty-five men were employed.

Capilano Crushing Co. Ltd.*

West Vancouver (49° 123° S.E.). C. W. Bridge, general manager. Crushed and sized gravel products are produced by this company at its plant on the Capilano River. Gravel is mined from the bed of the river by a 1-cubic-yard-capacity dragline and is transported to the crushing and washing plant by 15-cubic-yard-capacity trucks. Seven men were employed.

* By R. B. King.

E. R. Taylor Construction Co. Ltd.* Burnaby (49° 122° S.W.). Office, Maplewood. The Stride Avenue pit is operated by this company for the Municipality of Burnaby. Gravel is mined and loaded with a ¾-cubic-yard diesel-driven shovel and is transported by trucks to a portable crushing plant. In 1954, 104,600 tons of gravel and 26,050 cubic yards of fill material were mined and sold. The crushing plant, in addition to this, produced 179,848 tons of 1⅛-inch crushed gravel. Seven men were employed.

Gilley Bros. Limited (Maryhill Division)*† Coquitlam (49° 122° S.W.). Company office, 902 Columbia Street, New Westminster. J. H. Gilley, general manager; E. Johnston, superintendent. Sand, gravel, and crushed products are produced from this pit and plant on the Fraser River, near Coquitlam. Gravel is mined by digging gravel from 30-foot gravel faces and is trucked to a central conveyor-belt, which transports it to a crushing plant. Thirty-five men were employed.

Highland Sand and Gravel Company Limited* Lynnmour (49° 123° S.E.). Company office and plant, Lynnmour. W. J. Barrett-Leonard, manager; W. Hills, superintendent. Sand, gravel, crushed products, road materials, concrete blocks, and concrete tile are produced by this company. Material is dug from low gravel faces and loaded on to trucks by a ¾-cubic-yard diesel-driven shovel. A crushing, screening, and washing plant, which has a daily capacity of 800 cubic yards, is operated to produce sized products. A 24- by 36-inch primary jaw crusher was installed in the plant. Glacial till is mined and prepared for road material. During 1954, 124,634 cubic yards of material was produced. Twenty-three men were employed.

Hassel's Sand and Gravel Pit.*—Whalley (49° 122° S.W.). Office, Hjorth Road, Whalley. J. Hassel, owner and operator. Sand and gravel are produced from this pit on Hjorth Road. Gravel is dug by a ⅜-cubic-yard shovel and loaded on to trucks. Two men were employed.

Lynn Gravel Company Limited.*—Lynn Creek (49° 123° S.E.). Office, 2265 East Hastings Street, Vancouver; plant, Lynn Creek. Ron Daly, superintendent. Gravel is dug by a dragline from the bottom of Lynn Creek and transported by truck to a crushing plant. The crushing plant is capable of crushing 500 cubic yards a day. Seven men were employed.

Coldwater Sand & Gravel Co. Ltd.*—Lynn Creek (49° 123° S.E.). Office, 691 West Twenty-fifth Street, Vancouver; plant, Lynn Creek. T. R. Burnett, superintendent. Gravel is mined from the bed of Lynn Creek by a dragline shovel and is transported, by truck, to a washing and crushing plant. Three men were employed.

McIntyre and Harding Gravel Company Limited* Saanich (48° 123° N.E.). Company office and plant, Royal Oak P.O., Saanich. J. H. Harding, manager. Sand, gravel, and washed and sized gravel products are produced from this pit. Gravel is mined by hydraulicking and digging or is dug directly from the gravel faces by ½-cubic-yard diesel-driven shovels and is transported to the washing plant by trucks and a conveyor-belt. The washing and screening plant is capable of producing 30 tons an hour. A concrete plant, for making bricks and other concrete shapes, was operated in 1954.

Butler Brothers Supplies Ltd.* Royal Oak (48° 123° N.E.). Office and plant, Keating Cross-road. Claude Butler, manager. Gravel is dug by diesel-operated shovels and an overhead loader, and trucked to a washing plant or sold as run-of-the-bank gravel. Of the gravel mined, 175,101 tons was used for road gravel, and 12,178 tons was washed. Seven men were employed.

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* By R. B. King.
† Formerly Fresh Water Sand & Gravel Company Limited.

Producers' Sand & Gravel Company (1929) Limited*

Albert Head (48° 123° S.E.). Company office, 900 Wharf Street, Victoria; plant, Royal Bay. A. Parker, plant superintendent. Sand and gravel is mined by using a scraper on a slack-line cableway to loosen packed gravel from the steep, high face. The gravel is loaded by a 1¼-cubic-yard shovel into a hopper, where it is conveyed by a series of conveyor-belts to the plant. Gravel is crushed, screened, washed, and classified into six grades of gravel and two grades of sand. Nineteen men were employed.

A. V. Richardson Ltd.*

Duncan (48° 123° N.W.). Company office, Duncan. Lorne McLeod, pit superintendent. Sand, gravel, and crushed products are produced by this company from a pit on the Cowichan road nearly 4 miles from Duncan. Gravel is mined by digging with an overhead-loading machine and also by scrapers. Gravel is either used directly as fill and road dressing or is washed and sized in an adjoining plant and used for concrete. About 7,000 cubic yards of gravel was mined in 1954. Three men were employed.

SILICA

Oliver Silica Quarry†

Oliver (49° 119° S.W.). Stucco Supply Company; office, 937 Main Street, Vancouver. W. Gilmour, manager. This silica quarry is on the Gypo mineral claim, owned by The Consolidated Mining and Smelting Company of Canada, Limited, and is 1 mile north of the village of Oliver, and about 800 feet west of the main highway. The silica is blasted from the quarry face and is hand-loaded and hand-trammed in 1-ton cars to a bin above the crusher. The silica is crushed to —¼ inch, and is then sacked and shipped to Vancouver and Prairie points for use as stucco-dash and in ornamental work. Production is at the rate of about 10 tons per day. Four men were employed.

SLAG

Granby Slag Dump†

Grand Forks (49° 118° S.E.). The old Granby Company smelter-slag dump at Grand Forks is owned by the City of Grand Forks. The mining, sorting, loading, and hauling of this material is done by the Grand Forks Cartage Company Limited. Slag is blasted from benches 20 feet high at the south end of the dump. After blasting, the slag is hand-loaded and passed over a vibrating screen, and is then hauled by truck to the railway. A total of 206 tons was shipped to Vancouver and Calgary. The slag is used in stucco work and in the manufacture of insulating material. A crew of three men worked at intermittent periods.

* By R. B. King.
† By E. R. Hughes.

Petroleum and Natural Gas*

CONTENTS

EXPLORATION SUMMARY

During 1954 oil companies continued geological investigations in northeastern British Columbia east of the Rocky Mountains. The methods of geological investigation employed included surface geological mapping, drilling of test-holes, reflection seismograph, gravity meter, magnetometer surveys, and photogeology.

Review of Gas and Oil Discoveries, 1954

Gas.—Wildcat wells—Pacific Fort St. John 35, Pacific Union Buick Creek 1, Pacific Sunray Montney 2, and Texaco N.F.A. Nig Creek 1—appear to have indicated the following four new gasfields: Red Creek, West Buick Creek, Montney Creek, and Nig Creek, in northeastern British Columbia.

Additional wells in previously tested fields have extended the areas known to be capable of producing gas or gas with condensate.

Oil.—At the end of 1954 no wells had been completed in British Columbia as commercial oil wells. However, drill-stem testing found significant oil shows in three wells:—

(*a*) Pacific Buick Creek 3 recovered oil by drill stem in several tests of the Nikanassin. The best recovery was 2,780 feet of light-gravity green oil. This well was completed as a gas well.

(*b*) Texaco N.F.A. Boundary Lake 1 recovered a small flow of light oil to the surface (5 to 10 barrels per hour of 35° A.P.I.) from the Triassic dolomite during a drill-stem test in November. The well was still drilling and testing at the end of 1954.

(*c*) White-Lloyd Halfway 1 recovered 450 feet of oil (46° A.P.I.) in a drill-stem test of the basal Cadomin but was completed as a gas well in the Cadomin.

Wells Operated, 1954

Well	Company	Spudded	Rig Released	Total Depth	Results
				Ft.	
Pacific Fort St. John 23	Pacific Petroleums Ltd.	1953	June 30	13,955	Gas well, Permo-Penn.
Pacific Fort St. John 29	Pacific Petroleums Ltd.	1953	Feb. 9	6,672	Suspended.
Pacific Fort St. John 35	Pacific Petroleums Ltd.	1953	Mar. 19	5,593	Gas well, Triassic.
Pacific Fort St. John 36	Pacific Petroleums Ltd.	Mar. 29	May 25	5,394	Gas well, Triassic.
Pacific Fort St. John 38	Pacific Petroleums Ltd.	June 14	Aug. 13	5,035	Gas well, Triassic.
Pacific Fort St. John 39	Pacific Petroleums Ltd.	Aug. 29	Nov. 25	6,889	Gas well, Permo-Penn.
Pacific Union Buick Creek 1	Pacific Petroleums Ltd.	1953	Feb. 27	4,790	Gas well, Triassic.
Pacific Buick Creek 2	Pacific Petroleums Ltd.	Mar. 9	May 23	6,000	Gas well, Nikanassin.
Pacific Buick Creek 3	Pacific Petroleums Ltd.	June 3	July 15	4,122	Gas well, Nikanassin.
Pacific Buick Creek 4	Pacific Petroleums Ltd.	Aug. 19	Sept. 21	3,900	Gas well, Nikanassin.
Pacific Buick Creek 5	Pacific Petroleums Ltd.	Dec. 3	.....	3,760	Testing.
Pacific Kiskatinaw 1	Pacific Petroleums Ltd.	Feb. 5	May 14	5,695	Abandoned.
Pacific Sunray Montney 2	Pacific Petroleums Ltd.	Oct. 12	Dec. 19	6,442	Gas well, Triassic.
Pacific Sunray Montney 3	Pacific Petroleums Ltd.	Dec. 31	.....	.....	Drilling at 280 feet.

* Statistics showing data on permits and licences issued, renewed, assigned, etc., appear on page 57.

Wells Operated, 1954—Continued

Well	Company	Spudded	Rig Released	Total Depth	Results
Southern Production Atlantic B2-1	Pacific Petroleums Ltd. and Southern Production Co. Inc.	Mar. 23	Dec. 23	8,965	Abandoned.
Southern Production Atlantic B7-1	Pacific Petroleums Ltd. and Southern Production Co. Inc.	Mar. 10	Oct. 3	10,917	Abandoned.
Southern Production Atlantic B14-1	Pacific Petroleums Ltd. and Southern Production Co. Inc.	Nov. 12	.....	.....	Drilling at 4,164 feet.
Texaco N.F.A. Nig Creek 1	Texaco, Shell, Gulf, and Socony Vacuum	1953	Feb. 12	11,999	Gas well, Triassic.
Texaco N.F.A. Nig Creek 3	Texaco, Shell, Gulf, and Socony Vacuum	Sept. 3	Oct. 27	4,960	Abandoned.
Texaco N.F.A. Nig Creek 4	Texaco, Shell, Gulf, and Socony Vacuum	Nov. 1	Dec. 8	4,432	Abandoned.
Texaco N.F.A. Nig Creek 5	Texaco, Shell, Gulf, and Socony Vacuum	Dec. 19	.....	.....	Drilling at 3,444 feet.
Texaco N.F.A. Buick Creek 4	Texaco, Shell, Gulf, and Socony Vacuum	June 4	Aug. 3	4,852	Gas well, Triassic.
Texaco N.F.A. Buick Creek 5	Texaco, Shell, Gulf, and Socony Vacuum	Nov. 12	Dec. 24	4,891	Abandoned.
Texaco N.F.A. Boundary Lake 1	Texaco, Shell, Gulf, and Socony Vacuum	Oct. 29	.....	6,925	Drilling.
White-Sun Blueberry 3	J. B. White and Sun Oil Co.	1953	Apr. 5	4,770	Gas well, Permo-Penn.
White-Sun Blueberry 5	J. B. White and Sun Oil Co.	Apr. 15	May 22	4,158	Gas well, Nikanassin.
White-Lloyd Blueberry 6	J. B. White and A. M. Lloyd	July 8	Aug. 14	4,950	Abandoned.
White-Lloyd Blueberry 7	J. B. White and A. M. Lloyd	Aug. 24	Sept. 19	4,430	Abandoned.
White-Lloyd Halfway 1	J. B. White and A. M. Lloyd	Nov. 10	Dec. 31	4,114	Gas well, Cadomin.
Fargo Nig Creek 1	Fargo Oils Ltd.	Feb. 27	Apr. 29	4,829	Suspended.
Bekami Lake 1	B.C. Oil Lands	Feb. 2	.....	.....	Drilling at 3,801 feet.
Toad River 1	Central Leduc Oils Ltd.	July 9[1]	Aug. 19	6,201	Abandoned.
Canada Southern Alaska Highway 1	Canada Southern Petroleums Ltd.	Dec. 7	.....	.....	Drilling at 1,030 feet.
Enderby 1	Enderby Oils	Nov. 26	.....	.....	Drilling at 1,859 feet.

[1] Resumed.

All the above wells are located in northeastern British Columbia, with the exception of Enderby 1, which is located in the Okanagan District.

Summary.—Total wells operated, 34; annual footage, 147,654. Results: Gas, 15; abandoned, 9; suspended, 2; drilling, 8.

WELL SAMPLES

Unless otherwise directed, any operator who drills a well* for petroleum or natural gas is required to take samples of the bit cuttings representing interval depths of 10 feet, or lesser intervals. The samples are to be washed, dried, and accurately labelled and shipped prepaid to the Department of Mines, Victoria, B.C.

The operator may be required to take samples by means of a core barrel.

All cores taken must be put in suitable boxes, accurately labelled, must be properly protected and stored, and must be delivered as required.

So far as possible, cores taken in 1954 were examined and logged in the field. They have been left in the hands of the operators, who remain responsible for delivering the core when so directed.

Samples of well cuttings are received at the laboratory at frequent intervals. A part of each sample is washed, dried, and logged, and is then stored in a glass bottle in sequence with other samples from the same well, so that a complete set of samples from each well is available for examination. A part of each sample is sent to the laboratory of the Geological Survey of Canada in Calgary.

During 1954, 15,391 samples were washed and bottled.

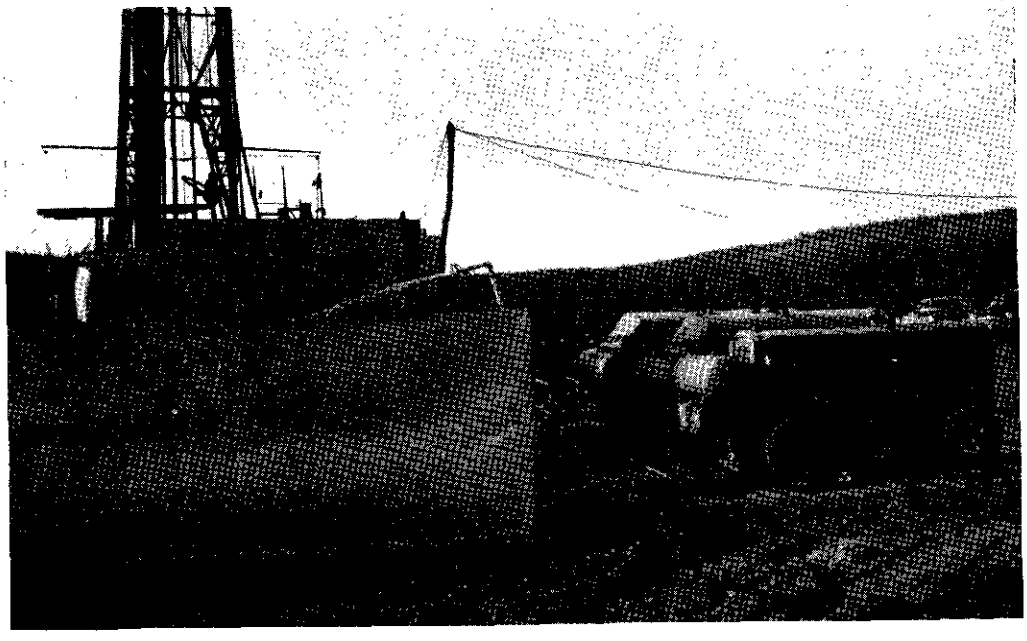
FIELD WORK

Geological Reconnaissance of Wapiti River and Lone Mountain Areas

With the aid of air photos a reconnaissance geological survey was made along and adjacent to the Wapiti River; sections were measured, rock specimens collected, and surface geology was mapped.

* Printed copies of the "Petroleum and Natural Gas Act" and of "Regulations Governing the Drilling, Production, and Working of Wells and the Conservation of Petroleum and Natural Gas" may be obtained from the Department of Mines, Victoria, B.C.

Mount St. George, east side of McDonnell River, Alaska Highway. Note glacial cirque.



Air compressors at Gulf State-Fargo Gundy Creek No. 1 well, 8 miles west of Alaska Highway at Mile 108.

The work was done by S. S. Cosburn and one assistant in the period July 15th to August 10th, 1954. The party, with a packer, cook, and fifteen horses, rode from Hazelmere, Alta., southeast to the Wapiti River at the British Columbia-Alberta boundary, where mapping was commenced. Work continued upstream for about 30 miles to the confluence of Ferguson Creek with the Wapiti at approximately north latitude 54° 44′, west longitude 120° 31′.

This foothills section of the Wapiti River contains the southern extension of the Lone Mountain and Stony Lake anticlines. More than 4,000 feet of Upper Cretaceous beds are in part exposed, including Shaftesbury, Upper Wapiti, and intervening formations.

On August 10th the packer and cook returned to Hazelmere with the horses, and reconnaissance mapping was continued until August 28th in the Lone Mountain area adjacent to the Monkman Pass road. This latter work was done by N. D. McKechnie and S. S. Cosburn with one assistant.

Inspection of Lode Mines, Placer Mines, and Quarries

By H. C. Hughes, Chief Inspector of Mines

CONTENTS

PRODUCTION

The output of metal mines for 1954 was 8,513,865 tons. This tonnage was produced from sixty-three mines, of which forty produced 100 tons or more.

FATAL ACCIDENTS

During 1954 there were eleven fatal accidents connected with actual mining operations in metal mines and quarries. This was two more than in 1953. There were 5,164 persons employed below and above ground in metal mines and 1,129 persons employed in concentrators in 1954.

The ratio of fatal accidents per 1,000 persons employed in mines and concentrators was 1.75, as compared with 1.015 in 1953.

Tonnage mined per fatal accident during the last ten-year period was 641,304 tons.

The following table shows the mines at which fatal accidents occurred during 1954, with comparative figures for 1953:—

Mine	Mining Division	Number of Fatal Accidents	
		1954	1953
Giant Mascot	Golden	--	1
Sullivan	Fort Steele	1	--
Western Exploration Company	Slocan	--	1
Bluebell	Ainsworth	--	1
Yankee Dundee	Nelson	--	1
Bon Ton	Nelson	--	1
Bralorne	Lillooet	3	--
Pioneer	Lillooet	2	--
Cariboo Gold Quartz	Cariboo	--	1
Copper Mountain	Similkameen	--	1
Highland Sand & Gravel	Vancouver	--	1
Capilano Crushing Co. Ltd.	Vancouver	1	--
Britannia	Vancouver	1	--
Argonaut Co. Ltd.	Nanaimo	1	--
Red Rose	Omineca	2	--
Lorne Creek Placer	Omineca	--	1
Totals		11	9

The following table classifies fatal accidents as to cause and location:—

Cause	Number	Location
Falls of ground	4	Underground.
Run of muck from chute	1	Underground.
Fell down shaft	1	Underground.
Struck by skip in shaft	1	Underground.
Struck by diesel shovel	1	Surface.
Caught by rotary dump	1	Surface.
Gassed	1	Underground.
Drowned	1	Surface gravel pit.
Total	11	

A brief description of all fatal accidents follows.

Howard Melvin Tams, age 24, Canadian, married and employed as a switchman by The Consolidated Mining and Smelting Company of Canada, Limited, on the main haulage from the mine to the concentrator, was instantly killed at the 601 rotary dumper on March 12th, 1954.

The rotary dumper discharges into the concentrator primary ore-bin. It holds five cars and can dump them without their being uncoupled from the train. It is equipped with an electric eye to aid in spotting the cars.

Tams and his motorman, E. Clemmer, on No. 2 motor, arrived at the dumper with a loaded train. There were four empty cars on the dumper, a fact which had been told to Tams and Clemmer by the motorman of the previous No. 1 train. (It often happens that cars become uncoupled when being dumped.) Tams left the locomotive at the switch shed and proceeded to the dumper. The usual procedure is for the switchman to go to the west end of the dumper to dump the train, walking on the north side of the track. The motorman then pushes the empty cars across the dumper and then dumps his train, moving it as required by a red light signal from the switchman operating the dumper. For some unknown reason Tams crossed over the tracks between the train and dumper to the south side and attempted to couple up the end of the train to the empty cars on the dumper. Clemmer, not knowing this, pushed five loaded cars on the dumper and waited for the signal to move the next five cars. Not receiving a signal, he investigated and found that Tams had been caught between the dumper and the first loaded car and had been decapitated.

An inquest was held in Kimberley on March 16th, 1954, and the jury returned the following verdict:—

"We, the jury, summoned to consider the evidence regarding the death of Howard Melvin Tams, do find as follows: That Howard Melvin Tams met his death at the South East corner of the rotary dump at the Sullivan Concentrator which is approximately 2 miles from Kimberley in the county of Kootenay, Province of British Columbia. That his death occurred at approximately 12.05 a.m. on the twelfth day of March, 1954. That his death occurred accidentally by decapitation while on duty as switchman. We respectfully suggest the following:—

"(1) That some method be devised to insure that the ore cars will not become uncoupled from one another while dumping operations are being carried on.

"(2) That the platforms at the North and South sides of the track at the east end of the rotary dump be removed and some cow catcher type of approach be installed to prevent anyone from approaching too closely to the end of the rotary dump.

"(3) That the tail light on the ore trains be placed in such a position as to be visible at all times from the locomotive of the train."

Tams was an experienced switchman, and there is no known reason why he apparently attempted to couple the empty cars on the dumper to the loaded train, as this action was contrary to established routine and there was nothing to be gained by it.

Herbert Lutz, German, and employed as a miner by the Western Tungsten Copper Mines Limited at the Red Rose mine, died as a result of being overcome by smoke and fumes from a fire which destroyed the upper tram terminal on March 13th, 1954.

The Red Rose mine, near Skeena Crossing, was at this time developed by ten levels, from the 125 level near the surface outcrop to the 900 level served by an internal shaft below the 600 level. The 200, 300, 600, and 800 levels are open to surface, but the 200 level was closed by snow. There is an escape-way to surface above the 125 level. The aerial-tram terminal is at the 600 level, and there is a covered snowshed to the 300 level, where there is a surface lunchroom. The 600 and 800 levels are equipped with fire-doors.

About noon a fire, presumably from a newly installed Salamander oil stove, broke out in the upper tram terminal. The crew were at lunch, and the fire was not noticed until it had burned long enough to release the brakes on the tramway and allow the buckets to move. An attempt was made to fight the fire, but when the flames reached the power-line going into the 600 portal, the line broke and cut the power off from the electrically driven pump on the water-line. Telephone connections to the mill-site were destroyed, and it was some time before the power was restored. In a short time the upper terminal and all snowsheds between it and the 300 level were completely destroyed. The door at the 600 level portal was also destroyed, but the fire-door was not closed. All men working on the 600 level and below, except the trammer on the 800 level, were having lunch in the 600 level lunchroom when the fire started. The men were lowered down the shaft to the 800 level, the hoistman being the last to leave.

Three men were working on the 200 level, two in a raise which had just been started, and the other as a trammer. The trammer, Spisak, and the raise helper, Ericson, left to have lunch in the lunchroom at the 300 level portal, but the miner, Herbert Lutz, stayed behind to do some more work. Possibly Spisak and Ericson were having lunch when the fire started. When they noticed it they ran down to the terminal, thinking someone might be trapped there. When they saw they could be of no assistance, they and another miner tried to get to Lutz through the 200 portal, as by now the 300 portal snowshed was full of smoke. They could not find the 200 portal because of drifted snow, although it had been shoveled out the day before, and reported dense smoke issuing from the auxiliary exit above the 125 level. Lutz's body was recovered from the 200 level that evening.

An inquest was held, and the Coroner's jury returned the following verdict:—

"We, the jury, have come to the conclusion that Herbert Lutz came to his death on the morning of March 13th, at the Red Rose mine of the Western Tungsten Copper Mines Limited, by suffocation caused by smoke and various gases resulting from the fire near the portal of the No. 600 level."

John Howdick, aged 37, Canadian, single, and employed as a mucking-machine operator at the Pioneer mine, was almost instantly killed by a very heavy fall of ground in the 2600-27N drift on March 24th, 1954.

The 2600-27N drift is a standard development heading on the 2600 level. It was timbered to within about 16½ feet from the collar of the last round blasted.

John Howdick and Robert Fisher, motorman, were engaged in mucking out a round at the face. Several cars of muck had been taken out. Howdick was on the mucking-machine platform, having just connected an empty car to the machine. Fisher had just brought this car in and had returned to his motor under the first set of timber when he looked up to see a very large slab, 16 by 7 by 1 foot, fall on the mucking-machine and car, where it broke up, and several large pieces pinned Howdick to the ground. Assistance was obtained immediately, and Howdick was placed in a stretcher and was being

taken out of the mine when the doctor met the rescue party. He examined Howdick and pronounced him dead.

The drift had been scaled at the beginning of the shift and at intervals later by the two men mucking it out. The mine manager, superintendent, and shiftboss had examined the working-place just before the accident; all stated that there was no outward appearance of a slabby condition.

An inquest was held at Pioneer on March 26th, 1954, and the jury returned the following verdict:—

"We, the jury, find that according to the evidence submitted and after viewing the scene of the accident, that the deceased, John Howdick, came to his death on the 24th day of March, 1954, at approximately 10.30 a.m. at Pioneer Gold Mines of B.C. Limited on 26-27 North Drift as a result of injuries sustained by a fall of muck. We consider said death accidental with no blame attached to any person or persons. We, the jury, recommend that the timber should be carried closer to the face or other appropriate action be taken immediately to prevent occurrence of an accident of this nature."

Frank Emmit Emde, Canadian, aged 41, married with three dependent children, and employed as a shovel oiler by The Argonaut Co. Ltd. at its Iron Hill quarry near Upper Quinsam Lake, was instantly killed on July 7th, 1954, at approximately 11.30 p.m., when he was presumably crushed between the counterweight of the shovel and the sloping rock pile in the quarry.

The Iron Hill quarry is a strip-mining operation and is worked in a series of benches. The shovel, an 80-D Northwest 2½-yard, and three trucks were removing broken waste rock from the 1520 level and dumping it into a mined-out pit a short distance away. The shovel operator sits on the right side of the cab facing the bucket, and the access door to the cab is on the same side just behind the operator. There are four powerful flood-lights on the front of the shovel. The position of the shovel and trucks while loading was such that the bank or face of that part of the quarry was on the right or operator's side of the shovel, and the shovel had to make a swing of from 45 to 90 degrees to the left after picking up its load in order to dump it into the trucks.

The story, as given during the investigation of the accident, and in the evidence taken at the Coroner's inquest, was as follows: About 11 p.m. Emde entered the cab of the shovel, oiled and cleaned up the motor, and, on completing his work, went out of the cab. The operator, Robert Fiscus, continued loading trucks during this time. At 11.45 p.m. he received a signal from one of the truck-drivers that it was quitting time. He swung the shovel through about 180 degrees, putting it in a position opposite to that from which he picked up rock. As he brought the shovel to rest he saw Emde lying on the sloping rock pile about 4 feet above the level of the quarry floor and 8 to 10 feet beyond the end of the inside shovel track. The company ambulance and first-aid man were summoned immediately, and Emde was taken to the hospital at Campbell River, where he was pronounced dead on arrival by the doctor. A post mortem examination revealed the whole pelvic and abdominal region completely crushed and all organs therein broken. Death was due to shock and hæmorrhage and must have been instantaneous.

Apparently Emde, after leaving the cab, had walked around the back of the shovel and had been crushed between the counterweight at the back of the cab and the sloping rock bank as the shovel swung.

Both Emde and Fiscus were experienced men and had worked together as a team for one and a half years. An inquest was held in Campbell River on July 8th, 1954, at 10.30 a.m. The Coroner's jury returned the following verdict:—

"We, the jury, impanelled (to enquire) into the death of Frank Emde, do find that he came to his death on July 7, 1954, at approximately 11.00 to 11.45 p.m. at The Argonaut Co. Ltd. (Iron Hill) by instantaneous death. We find that Frank Emde's death was accidental with no blame attached to anyone. Manner of death, caught between counterweight of shovel and bank, possibly due to rock slide and thrown clear

of shovel upon swing. The jury hereby recommends that flood lights be placed at rear of shovel facing ground for illumination."

The findings and recommendations of the jury are concurred with.

Rupert Payer, aged 31 years, Austrian, single, and employed as a skip-tender at the Red Rose mine, was instantly killed when he fell 140 feet down the Red Rose shaft on August 20th, 1954.

The Red Rose shaft is an internal shaft inclined at 66 degrees and extends from the 600 level to just below the 1100 level. The incline distance between levels is 100 feet. It contains two compartments, a manway and a skipway. The skip runs on steel rails and is provided with wooden guides. Hoist signals can be given electrically or by a pull-cord.

Before going on shift on Friday morning, August 20th, H. Rudolph and G. Giometti were instructed by the mine superintendent to dismantle an electric pump on the 1000 level and take it to the 800 level via the shaft. They had loaded the pump in the skip and, accompanied by the skip-tender, R. Payer, were proceeding slowly to 800 level when the accident occurred. Payer was riding on the manway side of the bail and Rudolph on the opposite side. Giometti was in the skip with the pump. Just as the skip reached a point about 40 feet above the 1000 level, a trammer on the 900 level emptied water from a mine car into the 900 level loading-pocket. Most of this water, and possibly some muck from the sides of the empty loading-pocket, escaped through a hole about 3 by 9 inches above the arc gate. This muck and water may have knocked Payer off balance or he may have become panicky and tried to reach the bell rope or jump. At any rate he fell just after the run of water and small muck occurred. His body was recovered from the sump.

An inquest was held on August 25th, 1954, and the Coroner's jury returned the following verdict:—

" We, the jury, from the evidence at hand, find that Rupert Payer came to his death accidentally Friday, August 20, 1954, at approximately 9.30 a.m., while operating a skip at the Red Rose mine."

The men showed poor judgment in riding on the bail, as this is a very dangerous procedure and is primarily responsible for this accident. There was not sufficient room in the skip for the three men and the pump, and another trip for the men would have been a reasonable precaution.

William Sokoloski, aged 34 years, Canadian(?), divorced, and employed as a skip-tender at the Bralorne mine, was instantly killed at the 2800 loading-pocket in the Queen shaft on August 29th, 1954.

The Queen shaft is being sunk from the 2500 level. It is a three-compartment shaft with development being done on the 2700 and 2800 levels. There is a bulkhead in the north compartment below the 2800 level pocket. The north compartment contains the sinking-bucket and crosshead. In order to hoist waste in the skip it is necessary to fill the bucket with muck to provide a counterbalance. The bucket is filled in the following manner: It is lowered to the 2800 pocket loading-deck where a hook and cable is attached to the bucket suspension chains on each side of the bucket. The bucket and crosshead are lowered slowly, thus allowing the cables to draw the bucket under the loading-pocket chute-lip. The bucket is then filled by opening the chute gate. After being filled, the bucket is hoisted to the loading-platform and the cable and hooks are disconnected. The filled bucket may be used in counterbalance with the skip, and is hoisted up and down until hoisting is completed in the skip compartment. It is emptied at the 2500 dump.

On August 29th an extra crew was called for work on the 2800 level of the Queen shaft. On arriving at the shaft they found no hoistman on duty. By phoning one of the supervisors a hoistman was obtained and the crew moved to the 2800 level. A skip-tender was not on duty as it was not believed at the time the shift was called that it would

be necessary to hoist any waste. However, on getting to the 2800 station, the crew found the loading-pocket almost full so they advised the hoistman. The hoistman called the Crown hoistman, advising that a skip-tender would be needed for a short while to hoist waste. As the Crown skip-tender, Sokoloski, was not busy, he was sent over to do the job.

Sokoloski came to the Queen hoist on the 2500 level and accompanied the hoistman to the 2500 pocket, where the hoistman instructed him in the method of hoisting waste in this shaft, showing him both the bucket and crosshead so he should have been aware of the existence of both. He then asked Sokoloski if he thought that he would be able to do the job. Sokoloski, who had had about two months' experience as skip-tender in the Crown shaft, advised that he thought that he could do the job because once the bucket was filled, the rest of the job would be similar to loading at any pocket chute elsewhere in the mine.

The hoistman then returned to the hoist on the 2500 level while Sokoloski climbed down to the 2600 level. Sokoloski was then picked up in the skip and taken to the 2800 pocket. At first Sokoloski had some difficulty in sending a proper signal on the signal-cord extension used during the sinking operation. The hoistman phoned him and advised him of this and asked him to try sending a signal again, remembering to pull harder on the rope. Sokoloski did this and the hoistman advised him that the signal was now coming through clearly. Sokoloski then advised he had attached the cable and hooks to the bucket suspension changes and was ready to have the bucket lowered. The hoistman told him to give the signal to lower. This signal 3–2 was correctly given and the hoistman said he slowly lowered the bucket and crosshead. About 2 feet above the normal bottom position for this operation the hoistman said that he noticed a bump and observed a slackness in the hoist cable so he stopped immediately. He then phoned the 2800 pocket but got no answer. He then phoned the 2800 level and got one of the crew to go down to investigate. On going down Sokoloski was found to be in the measuring-chute below the loading-platform and considerable blood was on the wallplate at the loading-platform.

The doctor was sent for immediately and arrived at the 2600 Queen station soon after Sokoloski was brought up. He examined Sokoloski and pronounced him dead. An autopsy was performed and it was found that two large basal fractures existed in the skull with some minor injuries elsewhere. The doctor stated that death would have been almost instantaneous because of the skull fractures.

It is believed that Sokoloski was either leaning over the wallplate, watching the bucket going into position when the crosshead caught him, or else he may have slipped at that instant into the same position. As the opening between the wallplate and crosshead is only 5 inches, there was no possible way for the man to have escaped injury had his head been in that position.

The jury's verdict was accidental death with no blame attached to any person or persons and added the following rider:—

"Any man taking this skip-tending job to have the previous (meaning usual) skip tender with him for one shift to give him instructions about the job."

The rider is believed to be quite reasonable, and the Bralorne management have advised that they intend to put this suggested practice into effect. In addition, it is intended to hang short ropes from the bottom of the crosshead so as to warn anyone of the approach of the crosshead should they forget its presence and lean into the shaft while this loading operation is being done.

Lachlan McMillan, aged 48 years, Canadian, married, and employed as a miner at the Bralorne mine, was almost instantly killed by a fall of ground on the 2177-10 sill on September 20th, 1954, at 1.30 p.m. Recently a raise from the 2200 level had broken through to the 2100 level at the west end of 77-10 sill. In addition, a sill round had been blasted at the west end of the sill and a set of timber directly over the raise had been

blasted out when the sill round broke. There was a chute 7 feet east of the edge of the break-through. McMillan, accompanied by J. Morriseau, miner, and A. Hannert, motorman, were cleaning up the drift after the blast and were to repair the raise and sill timbers after the removal of the muck.

At the beginning of the shift McMillan scaled the loose off the drift back across the open section. By mid-shift the drift had been cleaned up to the first chute. After lunch McMillan rescaled the open section and was standing under it with Morriseau immediately to the west of him, under a stull, and Hannert next to the chute and immediately to the east, when a slab broke from the stope back and struck McMillan, knocking him forward into the open raise where he lodged some 20 feet down. Help was obtained immediately and McMillan was taken to the 800 level Crown shaft station, where he was met by the doctor who pronounced him dead.

The post mortem examination disclosed multiple rib and leg fractures, fractured pelvis, and a small cut in the aorta along with several lesser injuries. The cut aorta permitted a heavy hæmorrhage in the chest, which was considered the actual cause of death. An inquest was held, and the Coroner's jury returned the following verdict:—

" We the jury find that on September 20, 1954, Lachlan McMillan, employed by Bralorne Mines Limited as a miner working on 2100 level, 77 lead 10 sill was struck by a falling slab, causing death. In our opinion it was entirely accidental. We commend the speed in which the doctor and first aid man responded to this accident."

McMillan was an experienced miner.

Otto Wasshuber, aged 27, Austrian, single, and employed as a mucker at the Pioneer mine, was instantly killed by a fall of ground in 23-91 stope on September 27th, 1954, at 9.15 a.m. At the scene of the accident, 24-93 stope overlies 23-91 stope and is parallel to it. The footwalls of the two stopes slope at about 40 degrees, are parallel, and the veins 4 to 5 feet wide are separated by a horse of waste about 7 feet thick which ends abruptly about 35 feet above the 2300 level sill. Above this point the stope is about 15 feet wide. The hangingwall of the stope is supported by horizontal lines of stulls at 6-foot centres, 15 to 16 feet long and spaced about 4 feet apart. The timbering is kept as close to the face as possible. The broken ore is removed by a scraper, and it had been taken out to a point 4 feet below the horse or pillar of waste between the two stopes, leaving an overhanging brow that distance above the 23-91 stope muck level.

Wasshuber and John Luca, timberman, were engaged in cleaning down 23-91 stope. Wasshuber was apparently bending down under the brow when it caved on him. Luca, after calling for assistance from the tramming crew, made an attempt to remove Wasshuber. While he was doing this a second cave occurred and he was severely injured. The tramming crew observed this second cave as they entered the stope. Both men were removed and examined by the doctor a short distance from the working-place. Wasshuber was pronounced dead and Luca sustained a broken back, ribs, and arm.

Before being flown to Vancouver for treatment, and while under severe physical and mental stress, Luca advised the Coroner he had told Wasshuber not to go under the brow until the shift boss had a chance of seeing it, but that his advice was unheeded. The Coroner would not accept this statement as admissible evidence at the inquest as Luca was in no condition to give a signed statement to this effect. The Coroner's jury returned the following verdict:—

" The verdict of this jury is that Otto Wasshuber met his death by accident, caused by a fall of rock in 23-91 stope, on September 27 at Pioneer mine. We, the jury, recommend that only proved, experienced men be allowed to work in this type of stope. The Mines Inspector to examine this stope before any resumption of work."

In commenting on the recommendations, Wasshuber's hiring record shows that he had worked underground for nine months at Kemano and for eight months at Tulsequah. Luca's record shows that he was an experienced timberman, having worked for more than three years at Kemano, Yellowknife, and Kimberley.

Alfred Percival Lunt, aged 32, Canadian, married, and employed as a truck-driver by Capilano Crushing Co. Ltd., was drowned in the Capilano River when he backed his truck over the west bank on October 19th, 1954, at about 2.15 p.m.

The workings are near the mouth of the river on the west bank. Gravel is dredged from the river bed by a dragline and is loaded into 15-cubic-yard Euclid bottom-dump tractor trailer units for hauling to the crushing plant. Each freshet refills the river bottom with sand and gravel, so the operation is a continuous one.

The tide was high about 2.30 p.m., and this backed the river up so that the bank was covered in places with about 3 inches of water. The Euclid is about 40 feet long and has a turning radius of 48 feet. There was no cab on the truck, but there was a canvas cover over the seat. Lunt had driven his truck to the position for filling beside the dragline, making a left-hand turn toward the river bank while doing so. The shovel operator filled the Euclid, signalled Lunt to go, and then turned his dragline to prepare to load the next truck. Lunt pulled out, turning his truck to the left to get on the road, but found that he had insufficient room to turn as another small truck had stopped in his way. Lunt backed his truck up and, in backing, turned so that he was nearly at right angles to the river bank. As the truck neared the water's edge the bank gave way and the whole truck slid into the river to such a depth that only the windshield and radiator front were above water. Lunt came to the surface and the dragline operator brought his bucket over and placed it about 2 feet from Lunt so that Lunt could grab the chain bails. Lunt submerged again, and when he reappeared the bucket was again placed near him. He was unable to grasp the chains and disappeared under the water. His body was recovered by dragging. Lunt was wearing rubber boots and heavy clothing. The Euclid was examined and the brakes were found to be in good condition. The small truck which was in the way belonged to a subsidiary company. The driver was unaccustomed to the procedure, and was adjusting the tail gate on his truck at the time and did not see the accident happen.

An inquest was held at Hollyburn Funeral Home on October 21st, 1954, and the Coroner's jury returned the following verdict:—

" We find that Percival Alfred Lunt came to an unnatural death by drowning, caused by his vehicle backing into the Capilano River at the Capilano Crushing Co. Ltd., West Vancouver, on October 19th, 1954. A combination of unusual working conditions caused his death.

"(1) Due to a parked truck in usual truck route.

"(2) Two inches of flood water lying in the turn around area.

"(3) Difficulty in seeing the bank due to high water in the Capilano.

"(4) Erosion of bank due to flood water.

" No blame can be attached to anyone."

Hector Lefois (alias Joseph H. Cote), aged 41, Canadian, single, and employed as a miner by Britannia Mining and Smelting Co. Limited, was suffocated when he was buried in a run of wet muck from the 25-221A waste pass control-chute on the 2500 level of the Victoria mine on October 28th, 1954, at about 8.30 p.m.

The 25-221A raise is one of a series of raises drawing waste from a glory-hole on the surface. This waste can be by-passed at various levels and used for stope filling in the Victoria mine. The chute gate on the 2500 level is of the arc type and is so arranged that the weight of the muck will tend to close it if it is less than half open, but will force the gate farther open if it is beyond the halfway point. A chain is provided to prevent the gate from opening too wide. On either side of the chute and opposite it were plank barricades designed to prevent muck from filling the passageway and to allow an escapeway if the chute should overflow.

Lefois and his partner, Eric Paul Sczesny, were pulling fill from this chute to fill a stope below the 2500 level. They had pulled three 1-ton cars when the chute hung up. Lefois attempted to start the chute running by opening the gate and poking under it with

a piece of bulldoze stick. To do this successfully it was necessary to open the gate more than half way. The hang-up was brought down and Sczesny tried to close the gate over the wet muck. He had trouble in doing so and Lefois attempted to help him. The wet muck was pouring out and the men found they could not hold it. Lefois shouted, " Let's get out of here," and both men let go the gate handle. This allowed the muck to run out freely and both men were caught. Sczesny was buried to the arm pits and could only see Lefois's hands. He extricated himself with difficulty after about one and a half hours, and went to assist Lefois. There was no sign of life after he had dug out Lefois's head. Assistance was obtained and the body removed.

The drift was filled to a depth of 6 feet with fine wet sticky muck which extended about 20 feet on either side of the chute gate. A car and Mancha trammer were completely covered.

An inquest was held on November 5th, 1954, and the Coroner's jury returned the following verdict:—

" We, the jury, find that Hector Lefois met his death on October 28th, approximately at 8.30 p.m. on 2500′ L., Victoria Mine, of suffocation caused by a spill of muck from a chute. We, the jury, bring in a verdict of accidental death and attach no blame to any person or persons. We, the jury, are of the opinion that there is not enough clearance in the escape ways and also recommend that the shiftboss see that the places are kept clear of waste timber and muck from previous spills and their places be kept clear at all times to give a man a chance to escape."

William Oliver Thompson, aged 24, Canadian, married, and employed as a miner at the Bralorne mine was instantly killed by a fall of ground in 1753-E-3 stope on November 4th, 1954, at about 10 p.m.

The 1753-E-3 is a cut-and-fill stope. It had broken through to the 1600 level, and a sill pillar some 60 feet long and 10 feet thick remained to be mined. The stope was about 18 feet wide at this point. No trouble had been experienced with caving ground in this stope previous to the accident and, in order to maintain this condition, the previous night shift had blasted the sill hole by hole so that too much ground would not be loosened. Access to the stope was through a short manway from the 1600 level. A slusher hoist near the centre of the pillar was used to scrape the broken muck into a cribbed chute.

On coming to his working-place Thompson scaled the brow of the sill and then entered the stope by way of the manway. He intended to bring the slusher cables under the sill brow, but when he got to the slusher he noticed some loose just ahead of the scraper. He commenced to bar this down when a large slab over his head fell on him, knocking him down and crushing his skull.

An inquest was held, and the Coroner's jury returned the following verdict:—

" We the Jurors on this investigation have found by the evidence given that William Oliver Thompson died on November fourth 1954 by a fall of rock striking him on the head and crushing his skull. The cause of falling rock was purely accidental and no blame can be attached to anyone. We the jury recommend that if at all possible a more extensive posting job be done under pillars to be extracted."

FATAL ACCIDENTS AND ACCIDENTS INVOLVING LOSS OF TIME

Eleven fatal accidents and 284 accidents involving a loss of time of seven days or more were reported to the Department. These were investigated and reported on by the Inspectors of Mines.

The following three tables classify these accidents as to cause, occupation, and as to the parts of the body injured.

Accidents Causing Death or Injury Classified as to Cause

Cause	Number of Accidents	Percentage of Total
Blasting	7	2.4
Breaking of staging or ladders	1	.3
Falls of ground	59	20.0
Falling or flying material	15	5.1
Falls from ladders, staging, etc.	2	.7
Slipping and falling	50	16.9
Lifting and handling material	124	42.1
Machinery and tools	24	8.1
Run of ore or waste	1	.3
Burns or shock	2	.7
Miscellaneous	10	3.4
Totals	295	100.0

Accidents Causing Death or Injury Classified as to the Occupation of Those Injured

Occupation	Number of Accidents	Percentage of Total
Underground—		
Chutemen	8	2.7
Haulagemen	31	10.5
Miners	118	40.0
Muckers	24	8.1
Timbermen	27	9.2
Repairmen	6	2.0
Trackmen and pipe-fitters	2	.7
Skip-tenders	8	2.7
Supervisors and staff	4	1.4
Miscellaneous	21	7.1
Surface—		
Shops	19	6.4
Mill	11	3.8
Surface, general	14	4.7
Quarries	2	.7
Totals	295	100.0

Accidents Causing Injury Classified as to Parts of Body Injured

Location	Number of Accidents	Percentage of Total
Head and neck	19	6.4
Eyes	9	3.1
Trunk	21	7.1
Back (including shoulder)	56	18.9
Hands and fingers	65	22.0
Arms (including wrist)	15	5.1
Legs (including ankles)	64	21.7
Feet	25	8.5
Toes	7	2.4
Shock	2	.7
Gas poisoning	1	.3
Fatal	11	3.8
Totals	295	100.0

DANGEROUS OCCURRENCES

The following dangerous occurrences were reported, as required by section 9 of the "Metalliferous Mines Regulation Act" and investigated by the Inspectors of Mines:—

On January 30th, 1954, a sudden rush of water entered the main ventilation raise system of the Pioneer mine at the 500 level. On this level the ventilation raise intersected a crosscut from the No. 3 shaft leading to hangingwall exploration drifts. These drifts drain naturally through the crosscut and old mine workings to the No. 2 shaft sump. Apparently a slough from the ventilation raises above the 500 level lodged at the elevation of the crosscut on that level, damming some water and diverting the overflow to the ventilation raise below the 500 level. The extremely low temperature of the intake air built up an ice dam where the obstruction first occurred and impounded a considerable volume of water. When temperatures moderated the ice dam melted, allowing the water to flow down the raise. No damage was done and no injuries sustained by anyone. The natural drainage is now being led past the raise through an electrically heated pipe.

On February 10th, 1954, at Britannia mine a miner was placing a ten-stick bulldoze in a blasting chamber to bring down a hang-up some distance above the sill. To place the charge in the required place it was necessary to tie together two and a half blasting-sticks. Because of the time taken to do this, the charge detonated before it was in place, although a 10-foot fuse was used. No one was injured.

On May 11th, 1954, at Britannia mine a miner and his helper prepared and lit two small charges in a bulldoze chamber. The men retired and guarded the approaches to the blast. At that time the crew from a near-by bulldoze chamber lit a blast and notified the miner. On hearing two shots he returned to his working-place just as his second shot went off. He was only slightly injured. His blasting certificate was suspended for six months because of his disregard for safety regulations.

On June 3rd, 1954, at Britannia mine a shiftboss entered a shrinkage stope manway to check on the level of the muck in the stope. He was overcome by carbon monoxide which had accumulated in the manway from a large number of chute blasts. He was hospitalized for a few days.

On June 11th, 1954, at the Red Rose mine a loaded bucket on the tram became detached from the running-cable and crashed into and damaged the lower terminal. One of the two clamps on the cable was not adjusted properly and the other released its grip.

On June 15th, 1954, at the Bralorne mine a raise round blasted at the end of the shift broke through to the 2300 level just as two miners were passing near the spot. The reason for this occurrence was that the raise survey was not up to date. To guard against a recurrence it was ordered that compulsory surveys be made in all raises when three-quarters of the expected distance to the break-through had been reached, and that miners must obtain permission from the shiftboss before blasting a raise round that has been drilled through to the level.

On July 9th, 1954, at the Highland-Bell mine a fire was discovered near the No. 4 level portal about 6.30 a.m. By the time that personnel reached the scene the power-house was engulfed in flames and little could be done to extinguish it. All efforts were then directed to saving other buildings. The power-house and contents, diesel engines, compressors, and electrical generating equipment, etc., were completely destroyed, with an estimated loss of $105,000. The mine was closed at the time for the employees' annual vacation period. Investigations failed to discover the origin of the fire.

On August 24th, 1954, at the Copper Mountain mine the afternoon shift, on coming to work in the No. 32-34 block above No. 8 level, found ladders and air-line in the blasting manway had been destroyed. The previous shift had blasted part of the No. 1 undercut and Nos. 2 and 3 undercut were being loaded. A supply of powder, moved to the scene of the loading, had been left too near the blast and nine cases were thus

detonated. A small tugger-hoist was partially destroyed. The electric blasting-station was far enough away to be safe, and as all entrances were guarded, no one was injured.

On September 14th, 1954, at the tungsten mill of Canadian Exploration Limited, two men were momentarily overcome by suspected hydrogen sulphide fumes from the boiling over of an experimental leach solution. A closer check of solutions has been instituted, and ventilation has been increased to prevent a recurrence.

On September 20th, 1954, in 48-020 stope at Britannia mine, a survey crew was entering the stope from above when they smelled burning fuse. They retreated just as the shots were detonated. The manway had been left unguarded.

On September 21st, 1954, in 45-017 stope at Britannia mine, a survey crew was about to enter the stope when some shots were detonated. They retreated without ascertaining if the shots had been properly guarded.

On September 29th, 1954, at the Torbrit Silver mine, two trammers, the only men in the mine at the time, informed the superintendent that they noticed smoke issuing from one of the drifts on the 1000 level. All fire-doors were closed and electrical services in the mine shut off by external switches. Three hours later, when smoke no longer issued from the shaft, three men with appropriate safety equipment were lowered in the shaft to the 1000 level. The fuseroom was found completely destroyed, with only a few burning timbers remaining. The timbers and adjacent debris were thoroughly saturated with water. Work was resumed in the mine the following day. The cause of the fire was not determined.

On October 2nd, 1954, the compressor-house and machine-shop of the Silver Hill mine was completely destroyed by fire. The compressed-air supply to underground had been cut off and one member of the two-man crew had gone outside to investigate. As trouble had already been experienced with dirt in the gasoline, the workman reported that he removed the sediment-bowl on the gasoline feed-line when flames shot up in his face. In his excitement the man neglected a fire-extinguisher on the wall near by and ran for help. The fire could not be brought under control. The loss was estimated at $16,000 to $17,000.

On October 5th, 1954, on the 4200 level of the Jersey mine, a bulldozer operator received lacerations and puncture wounds on face and body when it was presumed the bulldozer blade struck and detonated by impact some unexploded powder left from a previous blast.

On October 22nd, 1954, at No. 6 conveyor adit of Canadian Exploration Limited, a workman suffered damage to eyes and fingers of both hands when an electric detonator exploded as he removed it from an old scrap heap. The copper shell of a detonator will deteriorate very rapidly in contact with powder and must be handled with extreme care.

On November 10th, 1954, two miners were driving a drift on the 800 level of the Toric mine using a jackleg machine and a bar-mounted drifter. The steel from the jackleg slipped into a bootleg and detonated a small amount of powder left in it. This happened in spite of the fact that the face had been washed down and checked for undetonated powder before drilling commenced. Both men received facial injuries.

On December 10th, 1954, on the 2300 level pump-station in the Pioneer mine, a fire started in the insulation of an electric-motor winding. Smoke was observed by a timberman working in No. 2 shaft and was reported. A check was made and it was found that the fire had burned itself out without spreading beyond its point of origin. The location was made safe before the crew from the next shift was allowed to go to work. The exact cause of the fire was not determined, but it is believed to have been caused by a breakdown in the insulation that shorted the wiring.

PROSECUTIONS

There were no prosecutions in metalliferous mines and quarries in 1954.

Several violations of the "Metalliferous Mines Regulation Act" in regard to

explosives and blasting procedure resulted in the offenders having their blasters' certificates suspended for a period of six months.

EXPLOSIVES USED IN MINES

The table below shows the quantities of explosives and blasting accessories used in metal mines and quarries in British Columbia in 1950, 1951, 1952, 1953, and 1954:—

	1950 Total	1951 Total	1952 Total	1953 Total	1954 Total	1954	
						Mines	Quarries
High explosives (lb.)	7,318,962	9,162,179	9,935,946	9,237,700	7,652,574	7,212,863	439,711
Blasting-caps	2,518,200	2,570,600	3,159,900	1,890,000	1,815,250	1,596,000	219,250
Electric blasting-caps	65,725	163,920	166,740	141,000	232,270	134,670	97,600
Delay electric blasting-caps (short period)	.....	232,375	250,649	182,771	191,513	177,998	13,515
Delay electric blasting-caps (sure-fire delays)	110,269	105,950	205,140	138,055	70,300	70,300	.....
Primacord (ft.)	460,000	283,000	522,000	647,000	824,000	816,000	8,000
Safety fuse (ft.)	19,934,700	19,832,300	22,754,200	17,679,000	13,429,800	12,296,200	1,133,600
Ignitercord (ft.)	.....	151,700	146,600	142,000	206,180	206,180	.....
Ignitercord connectors	.....	100,900	114,100	114,000	160,501	160,501	.....

The increase in the use of electric blasting-caps, primacord, ignitercord, and connectors shows a trend toward safer blasting procedure.

UNDERGROUND DIESEL EQUIPMENT

Five diesel locomotives were in use underground in metal mines during 1954. Three of these locomotives were used in development headings and two in a producing mine.

The trackless underground diesel equipment at Canadian Exploration Limited operations near Salmo has continued to give satisfaction from the standpoint of both economy and safety. This equipment includes drill jumbos, loaders, trucks, and bulldozers.

The exhaust gases of all diesel engines used underground and the mine air in which they are working are periodically sampled and analysed for noxious ingredients, and ventilation requirements are periodically checked.

The rules formulated for the operation of diesel equipment underground have stood up well under practical conditions.

AIR-SAMPLING

Air samples were taken wherever conditions indicated the possibility that noxious gases might be present or that the oxygen content of the air might be below normal and to check determinations made by carbon-monoxide detectors, methane detectors, and mine safety lamps. A total of twenty-eight samples were taken and analysed for oxygen, nitrogen, carbon dioxide, carbon monoxide, methane, and hydrogen as circumstances and conditions indicated. Of these samples, nine were taken to test diesel exhaust gases, sixteen to check mine air, and three to check special conditions in a mill and repair-shop.

Equipment and a method of procedure for sampling and analysis of diesel exhaust gases for aldehydes and oxides of nitrogen were developed by the staff of the Department of Mines analytical laboratory. Preliminary tests with this equipment where diesels were used underground gave concentrations below the limits where harmful effects would be experienced. Early in 1954 two units of a recently developed piece of equipment for on-the-spot determinations for certain oxides of nitrogen were purchased, after a sample kit had been given a trial. This is another advance in determining satisfactory underground conditions where diesel equipment is operating.

At the Sullivan mine, in connection with special problems resulting from the formation of sulphur dioxide from the oxidation of sulphides in ore and in the tailings used as backfill, complete facilities have been set up by the company for the sampling and analysis of the mine gases.

DUST CONTROL AND VENTILATION

Problems in dust control and ventilation have continued to receive the attention of mine operators and Government departments. Sixty-five complete dust-count and ventilation surveys were made in underground mines and seven in quarries by the Silicosis Branch of the Workmen's Compensation Board. In addition, forty-six surveys of dust conditions were made in the crushing plants and assay offices of operating mills. Some of the larger mines employ ventilation engineers and trained personnel to make dust counts.

Over-all dust counts were generally found to be below the range where a hazard is thought to exist. There was one exception, and in this case it was found necessary to close a crushing plant until an adequate ventilation system was installed. In some cases, as a result of these surveys, recommendations were made as to methods of improving ventilation and suppressing dust. Subsequent dust counts have proved the value of these recommendations. The results of dust and ventilation surveys are made available to the Inspectors of Mines and are of considerable assistance to them. In general, mine managements are making a conscientious effort to reduce this hazard. Aluminium therapy for the prevention of silicosis is available at nearly all mines of any size where a silicosis hazard exists.

MINE-RESCUE, SAFETY, AND FIRST AID

During 1954 the mine-rescue stations at Cumberland, Princeton, and Fernie were fully maintained with modern equipment, and an instructor qualified in mine-rescue and first aid was on duty at each station. Each station is equipped with several sets of McCaa two-hour self-contained oxygen breathing apparatus, one set of Chemox one-hour self-contained oxygen breathing apparatus, all-service gas masks, self-rescuers, methane and carbon-monoxide detectors of the latest type, one or more H.H. inhalators, and a complete supply of first-aid equipment. Supplies and facilities for charging and servicing all this equipment are maintained.

Training in the use of mine-rescue equipment is given at the stations to all who apply for it, and fully trained mine-rescue teams are given regular monthly practice-training as a unit, not only to keep them familiar with the use of the machines, but to teach them the value of teamwork in mine-rescue operations.

The mobile mine-rescue unit and instructor, first stationed at Nelson in 1950, continued to be of great assistance in promoting and giving instruction in mine-rescue and first aid at mines tributary to that centre. In March, 1954, the truck used for the unit was replaced by a new and more satisfactory one, and the old truck was taken to the Cumberland mine-rescue station for emergency use.

Classes in first aid were held at the following mines and localities: Princeton, Argonaut mine, Slocan City, New Denver, Sandon, Violamac mine, Riondel, Canadian Exploration mine, Salmo, Kaslo, Ainsworth, Giant Mascot mine, Mineral King mine and Sunshine Lardeau mine. At these localities a total of 325 seniors and ninety-four juniors took first-aid courses. In addition to the regular certificates, twenty-six vouchers, eighteen medallions, and eight labels were awarded for first-aid proficiency. As the year ended, first-aid classes with a total enrolment of 133 were in progress at Kaslo, Riondel, Ainsworth, and New Denver.

Mine-rescue courses were given at Riondel, Canadian Exploration mine, and New Denver; and refresher courses in mine-rescue were given at Cumberland and Princeton.

Mine-rescue competition at Cumberland, May, 1954. Mine-rescue team taking out a "patient."

Mine-rescue competition at Cumberland, May, 1954. Mine-rescue team exploring a "longwall face" in a "mine."

An M.S.A. pneolator was purchased for the mobile mine-rescue unit at Nelson. Special classes for the fire departments at New Denver, Kaslo, and Nelson were given. These included instruction in the use of Chemox apparatus, H.H. inhalators, M.S.A. pneolator, and artificial respiration.

The Princeton mine-rescue station was made available to the St. John Ambulance Association for lectures and instruction in first aid, and the Similkameen Branch of the Canadian Institute of Mining and Metallurgy made use of the lecture-room for meetings throughout the year. The building was also used by the Motor-vehicle Branch for two weeks for the purpose of giving drivers' examinations.

In addition to the mine-rescue equipment maintained at the Government mine-rescue station, there are several complete sets of McCaa and Chemox apparatus at the Sullivan mine at Kimberley, a set of McCaa at Copper Mountain, and complete sets of Chemox at Wells, Hedley, the Bridge River camp, and Britannia. Minor amounts of mine-rescue equipment are kept at the operations at Tulsequah, the Toric mine at Alice Arm, and the Giant Mascot mine at Spillimacheen. This equipment is periodically checked by one of the mine-rescue instructors.

A certificate of competency in mine-rescue work is granted to each man who takes the full training course and passes the examination set by the Department of Mines. During 1954, in addition to the regular teams in training, thirty-eight men took the full course and were granted certificates, as follows:—

Certificate No.	Name	Where Trained	Certificate No.	Name	Where Trained
2773	Donald Oswald McCullough	Fernie.	2792	Duncan James Spence	Riondel.
2774	William Brown	Fernie.	2793	James Albert Sutcliffe	Riondel.
2775	John Henry McMullen	Fernie.	2794	Wilbert Roy Wilson	Riondel.
2776	Leonard Kopchiak	Fernie.	2795	Harry Gritchen	Salmo.
2777	Richard John Bryant	Fernie.	2796	Harold Kettleson	Salmo.
2778	Thomas William Lockhart	Fernie.	2797	Eugene H. Petersen	Sandon.
2779	Victor Joseph Marasco	Fernie.	2798	Gerald Newcombe	Mount Sheer.
2780	Clifford Lloyd Hoskley	Fernie.	2799	Ronald Baverstock	Mount Sheer.
2781	Harvey Atkinson Whitworth	Calgary, Alta.	2800	Ronald Beauchamp	Mount Sheer.
2782	Franc Oberle	Pioneer Mine.	2801	Charles Opheim	Mount Sheer.
2783	John William Birch	Pioneer Mine.	2802	Glyn R. D. Parry	Natal.
2784	Olaf Thyvold	Pioneer Mine.	2803	Anthony Joseph DeLuca	Natal.
2785	Jack Williams	Pioneer Mine.	2804	Mickey Nicholas Malinosky	Natal.
2786	Kenneth H. McMahon	Pioneer Mine.	2805	Gerhard Franz Nowotny	Michel.
2787	Harold James Farquhar	Riondel.	2806	William Cytko	Michel.
2788	Leho Joaveski	Riondel.	2807	George MacDonald B. Watson	Fernie.
2789	William F. McLay	Riondel.	2808	Henry Corrigan	Fernie.
2790	Erling R. Mathisen	Riondel.	2809	Dalmonte Cervo	Wells.
2791	Lawrence Arthur Riedel	Riondel.	2810	Albert P. Morgan	Wells.

The Mine Safety Associations in the different centres of the Province, sponsored by the Department of Mines and aided by company engineers, officials, and safety supervisors, Inspectors of Mines, and mine-rescue instructors, continued to promote mine-rescue, first aid, and safety education in their respective districts.

First-aid and mine-rescue competitions were held at Cumberland, Princeton, Nelson, Kimberley, and Bralorne. The problems for these competitions are set by the Department of Mines, and the judges are chosen from the staff of Inspectors and mine-rescue instructors.

The Vancouver Island Mine Safety Association held its annual competition at Cumberland on May 29th, 1954. Two teams from the Tsable River mine and a visiting team from Copper Mountain took part in this competition. Tsable River No. 1 team, captained by J. Thompson, and the Copper Mountain team, captained by E. H. Pickard, drew for first place.

The Similkameen Valley Mine Safety Association held its annual competition in Princeton on June 5th, 1954. Five teams competed—two from Copper Mountain, two

from Hedley, and a visiting team from the Tsable River mine. The winning team was from Copper Mountain and was captained by Luke Kirby.

The West Kootenay Mine Safety Association held its annual competition at Lakeside Park, Nelson, on June 12th, 1954. Four teams took part in this competition—two from the Bluebell mine, one from New Denver, and one from the Canadian Exploration mine. The Bluebell No. 1 team, captained by B. C. Ramage, took first prize. A plastic cover over part of the mine was successfully used again this year.

The East Kootenay Mine Safety Association held its annual competition at Chapman Camp on June 19th, 1954. Seven teams took part in this competition—two from Kimberley, two from Michel, one from Fernie, one from Coal Creek, and a visiting team from Copper Mountain. The first prize was won by the team from Coal Creek, captained by David Brown. In this competition a section of the "mine" was covered with transparent plastic and filled with smoke and noxious gas. The teams were required to conduct "patients" equipped with suitable respirators through the smoke-filled section. This realistic part of the competition was successfully performed by all competing teams.

The Central British Columbia Mine Safety Association held its annual competition at Bralorne on June 26th, 1954. Six teams took part in this competition—two from the Bralorne mine and one each from the Pioneer, Cariboo Gold Quartz, Island Mountain, and Britannia mines. The Bralorne No. 1 team, captained by Bert Mracek, and the Britannia team, captained by William Harrison, tied for first place.

At all meets, competitions were held in first aid as well as mine-rescue work. In all these competitions, events were held for women and juniors. Representatives from other industries and organizations not necessarily directly connected with mining also participated.

JOHN T. RYAN TROPHY

The John T. Ryan Regional Safety Award for the metal mine with the lowest accident record for 1953 was won by The Granby Consolidated Mining Smelting and Power Company Limited mine at Copper Mountain and concentrator at Allenby. An intensive accident-prevention campaign, instituted some years ago, has consistently lowered this company's accident record, and this year it was the best that had ever been achieved in British Columbia. The company's safety organization, officials, and employees are highly commended for the effort which brought about this fine result. The award was presented to the men and officials of the company at the annual mine-rescue and first-aid competition of the Similkameen Valley Mine Safety Association that was held in Princeton on June 5th, 1954.

The 1953 regional safety award for coal mines was won by the Elk River Colliery of The Crow's Nest Pass Coal Company Limited and was presented at the annual mine-rescue and first-aid competition of the East Kootenay Mine Safety Association that was held at Chapman Camp on June 19th, 1954.

WEST KOOTENAY MINE SAFETY ASSOCIATION TROPHY

Because the West Kootenay District contains many small mines not eligible for the John T. Ryan Safety Awards, and in order to encourage and promote safety in these operations, the West Kootenay Mine Safety Association in 1951 donated a safety trophy for annual competition.

The award is made to the mine having the lowest accident rate and working a total of from 2,500 to 30,000 shifts per year, one-third of these having been worked underground. An accident is taken as one which involves more than four days' loss of time.

The 1954 award was won for the third consecutive year by the Violamac mine near Sandon and was presented at a joint meeting of the West Kootenay Mine Safety Association and the Nelson Branch of the Canadian Institute of Mining and Metallurgy held in Nelson on January 29th, 1955.

Coal

By Robert B. Bonar, Senior Inspector of Coal Mines

CONTENTS

PRODUCTION

The output of the collieries is given in short tons. The gross output of the coal mines of the Province for the year 1954 was 1,447,608 tons, a decrease of 128,497 tons or 8.1 per cent from 1953. A total of 383,585 tons came from strip mines at Michel, Tent Mountain (Corbin), Blakeburn, and Vancouver Island.

The Vancouver Island District produced 205,920 tons, a decrease of 59,507 tons or 22 per cent from 1953.

The Northern District production was 40,931 tons, a decrease of 6,040 tons or 12.8 per cent from 1953.

The Nicola-Princeton District production was 30,969 tons, an increase of 22,882 tons or 283 per cent over 1953.

The East Kootenay District production was 1,169,788 tons, a decrease of 85,832 tons or 6.8 per cent from 1953.

OUTPUT AND PER CAPITA PRODUCTION, 1954

Colliery and Mine	Gross Output Mined during Year (Tons)	Days Worked	Total Number of Employees	Daily Output per Employee (Tons)	Yearly Output per Employee (Tons)	Number of Employees Underground	Daily Output per Underground Employee (Tons)	Yearly Output per Underground Employee (Tons)
Tsable River Colliery	200,666	237	228	3.71	880	209	4.05	960
Chambers mine (strip)	1,423	218	2	3.26	711	.....	.....	.....
Loudon mine	322	169	2	0.95	161	2	0.95	161
Lewis mine (Timberlands)	751	178	2	2.11	375	2	2.11	375
Wellington mine (Carruthers)	561	184	2	1.52	280	2	1.52	280
Stronach mine	1,470	220	5	1.33	294	4	1.67	367
Wellington Blue Flame mine	283	77	2	1.83	141	2	1.83	141
Wende mine	65	120	1	0.54	65	1	0.54	65
Berkley Creek mine	135	41	3	1.09	45	3	1.09	45
Undun mine	244	96	2	1.26	122	2	1.26	122
Taylor Burson mine (Blue Flame)	12,431	260	12	3.98	1,036	11	4.34	1,130
Coldwater Coal mine	1,256	272	4	1.15	314	3	1.54	416
Blakeburn mine (strip)	17,282	132	11	11.90	1,571	.....	.....	.....
Bulkley Valley Collieries	36,572	252	50	2.90	731	33	4.39	1,108
Reschke mine	1,755	115	5	3.05	351	4	3.81	438
Gething No. 3 mine	2,604	180	8	1.81	325	7	2.06	372
Elk River Colliery	281,315	182	352	4.39	799	279	5.54	1,008
Michel Colliery (underground)	523,593	203	693	3.72	754	508	5.07	1,030
Michel Colliery (strip)	233,780	203	26[1]	44.29	8,990	.....	.....	.....
Coleman Collieries (strip)	131,100	.....	24	.....	.....	.....	.....	.....

[1] Does not include men employed in removing overburden.

Collieries of Vancouver Island District

The output of Vancouver Island collieries was 205,920 tons. Of this amount, 39,195 tons or 19.0 per cent was lost in preparation for market and 523 tons or 0.2 per cent was used by the operating companies as fuel under boilers, etc. The total sales amounted to 176,785 tons, and 10,583 tons was taken from stocks. Of the amount sold in competitive market, 176,287 tons was sold in Canada and 498 tons sold in the United States.

Collieries of the Nicola-Princeton District

The gross total of 30,969 tons produced in the collieries of the Nicola-Princeton District was sold in Canada.

Collieries of the Northern District

The gross total of 40,931 tons produced in the collieries of the Northern District was sold in Canada.

Collieries of the East Kootenay District

The gross output of the collieries in the East Kootenay District was 1,169,788 tons. Of this amount, 118,054 tons or 10.1 per cent was lost in preparation for market, 15,310 tons or 1.3 per cent was used as fuel under company boilers, etc., and 218,923 tons was used in making coke. Of the amount sold in competitive market, 783,785 tons was sold in Canada and 36,296 tons sold in the United States.

Output and per Capita Production in the Various Districts, 1954

District	Gross Output Mined during Year (Tons)	Total Number of Employees at Producing Collieries	Yearly Output per Employee (Tons)	Number of Men Employed Underground in Producing Collieries	Yearly Output per Underground Employee (Tons)
Vancouver Island District	204,497	247	828	227	900
Nicola-Princeton District	13,687	16	855	14	977
Northern District	40,931	63	650	48	852
East Kootenay District	804,908	1,045	770	787	1,022
Whole Province	1,064,023	1,371	776	1,076	989

Note.—The above table deals only with coal mined from underground operations. Coal-stripping operations and the men employed at strip mines are not included.

Output per Man-shift, Underground Mines, 1944–54

Year	Man-shifts[1]	Tonnage	Average per Man-shift (Tons)
1944	703,384	1,767,989	2.51
1945	627,110	1,518,673	2.42
1946	596,631	1,463,640	2.45
1947	496,727	1,485,476	2.99
1948	434,074	1,281,530	2.95
1949	520,188	1,589,131	3.05
1950	460,159	1,481,813	3.22
1951	442,170	1,434,974	3.24
1952	383,422	1,388,732	3.62
1953	333,922	1,171,932	3.51
1954	280,353	1,064,023	3.79

[1] Includes both surface and underground workers.

COLLIERIES OF BRITISH COLUMBIA, 1954—PRODUCTION AND DISTRIBUTION, BY COLLIERIES AND BY DISTRICTS (IN SHORT TONS)

Mine	Gross Output	Washery Loss	Net Output	Used under Companies' Boilers, etc.	Used in Making Coke	Stocks				Sales				Total Coal Sold and Used[1]
						On Hand First of Year	On Hand Last of Year	Added To	Taken From	In Canada	In U.S.A.	Elsewhere	Total Sales	
Vancouver Island District	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Canadian Collieries (D.) Ltd.—														
Tsable River Colliery	200,666	39,195	161,471	523	.....	32,168[2]	21,585	.....	10,583	171,033	498	.....	171,531	172,054
Bright mine	.....	.....	.....	13	.....	4,762	.....	.....	4,762	4,749	.....	.....	4,749	4,762
Chambers mine (strip)	1,423	.....	1,423	.....	.....	.....	.....	.....	.....	1,423	.....	.....	1,423	1,423
Loudon mine	322	.....	322	.....	.....	.....	.....	.....	.....	322	.....	.....	322	322
Lewis mine (Timberlands)	751	.....	751	.....	.....	.....	.....	.....	.....	751	.....	.....	751	751
Wellington mine (Carruthers)	561	.....	561	.....	.....	.....	.....	.....	.....	561	.....	.....	561	561
Stronach mine	1,470	.....	1,470	.....	.....	.....	.....	.....	.....	1,470	.....	.....	1,470	1,470
Wellington Blue Flame mine	283	.....	283	.....	.....	.....	.....	.....	.....	283	.....	.....	283	283
Wende mine	65	.....	65	.....	.....	.....	.....	.....	.....	65	.....	.....	65	65
Berkley Creek mine	135	.....	135	.....	.....	.....	.....	.....	.....	135	.....	.....	135	135
Undun mine	244	.....	244	.....	.....	.....	.....	.....	.....	244	.....	.....	244	244
Totals, Vancouver Island District	205,920	39,195	166,725	536	.....	36,930	21,585	.....	15,345	181,036	498	.....	181,534	182,070
Nicola-Princeton District														
Taylor Burson mine (Blue Flame)	12,431	.....	12,431	.....	.....	.....	.....	.....	.....	12,431	.....	.....	12,431	12,431
Coldwater Coal mine	1,256	.....	1,256	.....	.....	.....	.....	.....	.....	1,256	.....	.....	1,256	1,256
Blakeburn mine (strip)	17,282	.....	17,282	.....	.....	.....	.....	.....	.....	17,282	.....	.....	17,282	17,282
Totals, Nicola-Princeton District	30,969	.....	30,969	.....	.....	.....	.....	.....	.....	30,969	.....	.....	30,969	30,969
Northern District														
Bulkley Valley Collieries	36,572	.....	36,572	.....	.....	.....	.....	.....	.....	36,572	.....	.....	36,572	36,572
Reschke mine	1,755	.....	1,755	.....	.....	.....	.....	.....	.....	1,755	.....	.....	1,755	1,755
Gething No. 3 mine	2,604	.....	2,604	.....	.....	.....	.....	.....	.....	2,604	.....	.....	2,604	2,604
Totals, Northern District	40,931	.....	40,931	.....	.....	.....	.....	.....	.....	40,931	.....	.....	40,931	40,931
East Kootenay District														
Crow's Nest Pass Coal Co. Ltd.—														
Elk River Colliery	281,315	21,196	260,119	3,887	4,221	1,894	.....	.....	1,894	247,166	6,739	.....	253,905	262,013
Michel Colliery (underground and strip)	757,373	82,568	674,805	11,423	214,702	1,846	1,160	.....	686	419,809	29,557	.....	449,366	675,491
Coleman Collieries (strip)	131,100	14,290[3]	116,810	.....	.....	.....	.....	.....	.....	116,810	.....	.....	116,810	116,810
Totals, East Kootenay District	1,169,788	118,054	1,051,734	15,310	218,923	3,740	1,160	.....	2,580	783,785	36,296	.....	820,081	1,054,314
Coal														
Grand totals for Province	1,447,608	157,249	1,290,359	15,846	218,923	40,670	22,745	.....	17,925	1,036,721	36,794	.....	1,073,515	1,308,284
Coke														
Crow's Nest Pass Coal Co. Ltd.—														
Michel Colliery	168,983	.....	.....	.....	.....	26,418	22,766	.....	3,652	90,857	81,778	.....	172,635	.....

[1] Includes coal used in making coke and coal used under company stationary and locomotive boilers, etc. [2] Includes inventory overrun of 813 tons. [3] Estimated.

Collieries of British Columbia, 1954—Men Employed, Distribution by Collieries and by Districts

Mine	Supervision and Clerical			Miners			Helpers			Labourers			Mechanics and Skilled Labour			Boys			Total Men Employed		
Vancouver Island District	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.
Canadian Collieries (D.) Ltd.—																					
Tsable River Colliery	12	2	14	123		123				53	13	66	21	4	25				209	19	228
Chambers mine (strip)					2	2														2	2
Loudon mine				2		2													2		2
Lewis mine (Timberlands)				2		2													2		2
Wellington mine (Carruthers)				2		2													2		2
Stronach mine	1	1	2	3		3													4	1	5
Wellington Blue Flame mine				2		2													2		2
Wende mine				1		1													1		1
Berkley Creek mine	1		1	2		2													3		3
Undun mine				2		2													2		2
Totals, Vancouver Island District	14	3	17	139	2	141				53	13	66	21	4	25				227	22	249
Nicola-Princeton District																					
Taylor Burson mine (Blue Flame)	1	1	2	8		8				1		1	1		1				11	1	12
Coldwater Coal mine		1	1	3		3													3	1	4
Blakeburn mine (strip)		1	1											10	10					11	11
Totals, Nicola-Princeton District	1	3	4	11		11				1		1	1	10	11				14	13	27
Northern District																					
Bulkley Valley Collieries	4	1	5	20		20	12		12		4	4		7	7		2	2	36	14	50
Reschke mine	1		1	4		4													5		5
Gething No. 3 mine	1		1	3		3	3		3		1	1							7	1	8
Totals, Northern District	6	1	7	27		27	15		15		5	5		7	7		2	2	48	15	63
East Kootenay District																					
Crow's Nest Pass Coal Co. Ltd.—																					
Elk River Colliery	20	14	34	154		154	46		46	25	35	60	34	20	54		4	4	279	73	352
Michel Colliery (underground)	33	23	56	261		261	125		125	70	79	149	19	81	100		2	2	508	185	693
Michel Colliery (strip)		6	6											20	20					26	26
Coleman Collieries (strip)		3	3								5	5		16	16					24	24
Totals, East Kootenay District	53	46	99	415		415	171		171	95	119	214	53	137	190		6	6	787	308	1,095
Grand totals for Province	74	53	127	592	2	594	186		186	149	137	286	75	158	233		8	8	1,076	358	1,434

Note.—U.=Underground; A.=Above ground; T.=Totals.

Coal-preparation Plants

The primary object of preparation plants is to obtain a uniform marketable product by removing from the run-of-mine coal all rock and other non-combustible material. A second practice followed at many modern plants is blending the different grades or sizes, or the products from the different seams, to form a fuel for a specific purpose, such as stoker coal and coke.

Elk River Colliery.—The equipment of the cleaning plant, housed in a steel and brick structure 120 by 100 feet and 68 feet high, includes two furnaces for heating the air supplied to the cleaned-coal driers, two Ty-Rock 6- by 16-foot sizing-screens, three Vissac jigs, two Vissac driers, one M.C. centrifugal drier, three Ty-Rock dewatering-screens, two boom-loaders, and three box-car loaders. The capacity of the plant is 2,000 tons in eight hours.

The raw coal is transported from the rotary dump by belt-conveyor to the picking-table, then directly by a 42-inch belt-conveyor to the screens whereby the coal is sized and the minus ¼-inch slack removed. When necessary the coal from the picking-table may be switched to the 500-ton steel bin for storage and blending. This bin, together with the 300-ton bin, is used in storing, temporarily, a portion of the afternoon-shift coal to allow the preparation plant to remain idle on that shift. The slack is by-passed directly to railway cars, but the coarser sizes are passed through Vissac jigs for the removal of rock and high-ash material, then over the dewatering-screens to the driers, whereby most of the surface moisture is removed. The plant is equipped so that different sizes, after being dried, may be segregated or blended to suit market demands.

Michel Colliery.—The preparation plant, erected in 1938, is capable of treating a maximum of 380 tons of coal per hour of operation. The coal is sized by shaking and vibrating screens prior to being transported to the rock-removing jigs. All sizes above ¼-inch are treated on three Vissac jigs, and those below ¼-inch are diverted to an American Coal Cleaning pneumatic table. The moisture adhering to the washed coal under 1⅝-inch size is removed by a stream of air delivered to four Vissac driers at a temperature of approximately 700 degrees Fahrenheit. To keep the liberation of dust to a minimum in subsequent handlings, the coal, as it is loaded into railway cars, is sprayed with hot oil.

Comox Colliery.—This preparation plant at Union Bay is of the wet type throughout and handles the output from the Tsable River mine.

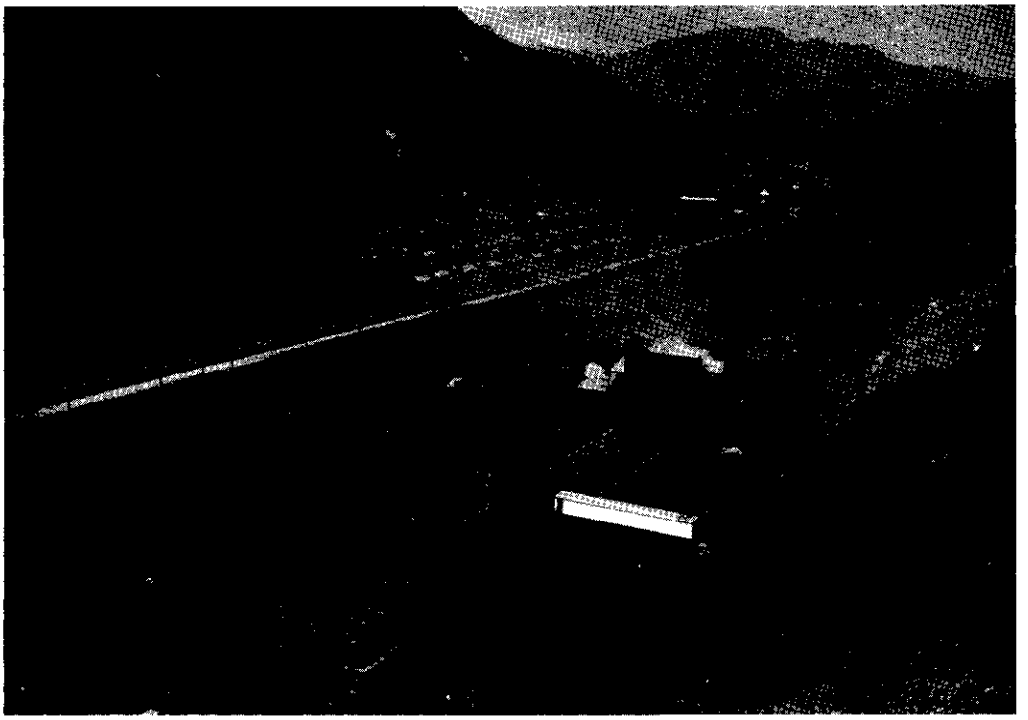
A reciprocating feeder delivers the coal from the track bin on to a 30-inch belt-conveyor, which in turn transports the coal to a two-deck 6- by 14-foot Ty-Rock screen that has 1¼-inch and $^{3}/_{16}$-inch perforations whereby the coal is sized to plus 6-inch, 1¼- to $^{3}/_{16}$-inch, and minus $^{3}/_{16}$-inch. All sizes above $^{3}/_{16}$-inch are treated by two Vissac jigs for the removal of rock, and the minus $^{3}/_{16}$-inch is directed to four Masco wet-type cleaning-tables.

The coarser sizes in the refuse are crushed and recirculated through the cleaning plant for recovery of the coal that formerly adhered to the rock. The washed coal is again screened to size before loading for market.

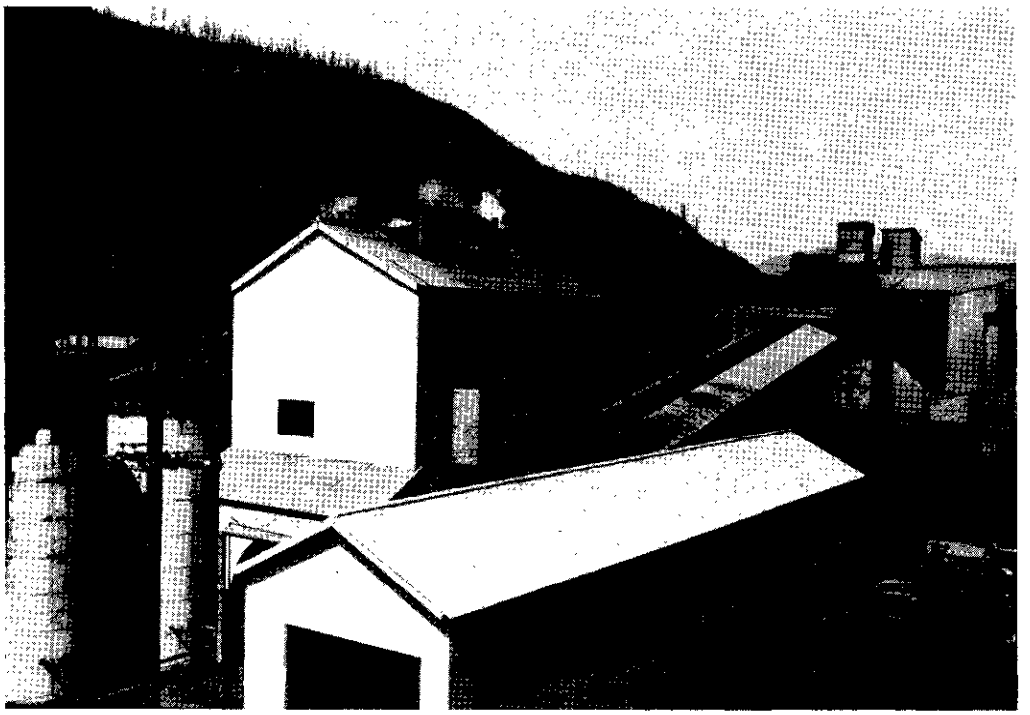
Coke-making

The earliest record of commercial coke-making in the Province was in 1892 at the Union Colliery's No. 4 slope mine near Comox Lake, Vancouver Island. In 1898 coke was made at The Crow's Nest Pass Coal Company Limited plant at Fernie in beehive ovens. This company recorded production of coke at its Michel and Morrissey Collieries in 1902 and 1904 respectively, also in beehive ovens. In December, 1908, Hosmer Mines Limited commenced making coke at its Hosmer Colliery.

Of the plants mentioned, the one at Michel Colliery is now the only one active in coke-making. The coke produced there is dense, hard, and very low in sulphur content,



Coke plant at Michel, consisting of fifty-two Curran-Knowles ovens.



Briquette plant at Michel.

making it an excellent product for metallurgical use. Production of coke in the beehive ovens at Michel continued from 1902 until October, 1952, when the last of these ovens was shut down. The entire output of coke is now made in Curran-Knowles by-product ovens. The No. 1 battery of Curran-Knowles ovens went into production in 1939, and was followed by three batteries of the same type, numbered in order of building. No. 2 battery went into production in 1943, No. 3 in 1949, and No. 4 in October, 1952.

Batteries Nos. 1 and 2 each consist of ten ovens, each 30 feet long and 8½ feet wide, batteries Nos. 3 and 4 each consist of sixteen ovens, each 40 by 8½ feet. The coal charge per oven in batteries Nos. 1 and 2 is 5½ tons, and in batteries Nos. 3 and 4, 7½ tons. From a total of approximately 775 tons of coal per day charged into the fifty-two ovens, the coke yield is about 580 tons, of which 540 tons is sized coke, plus ¼-inch, and about 40 tons is breeze, minus ¼-inch. With a charge depth of 10½ to 11 inches of coal, the coking time is ten and a half hours at temperatures of 2,500 to 2,600 degrees Fahrenheit.

By-products amount to about 6 gallons of tar and 8,000 to 10,000 cubic feet of gas per ton of coal charged. The tar is sold commercially. Part of the gas is burnt in the combustion flues of each oven to bring the coal charges therein to the required coking temperatures. The excess gas not used for this purpose is burnt under boilers at the company's power-house.

The ovens are charged from the top from hopper-cars, and the coke is expelled mechanically from the ovens by use of a ram operated by an engine using by-product gas.

The plant is operated continuously on a three-shift basis. To ensure continuous operation, slack coal is stored in bins having a total capacity of 3,200 tons. This bank of coal allows the plant to operate throughout week-ends, statutory holidays, etc. The total number of men employed at the plant is sixty.

Briquetting

In the third week of February, 1954, the first successful briquetting plant in the Province was brought into production on a twenty-four-hour basis at the Michel Colliery of The Crow's Nest Pass Coal Company Limited.

An earlier attempt at briquetting in the Province had been made at the Union Bay preparation plant of Canadian Collieries (Dunsmuir) Limited but had proved unsuccessful.

The Michel plant is housed in an insulated steel structure. Slack coal from both the Michel and Elk River Collieries is utilized for the making of briquettes. The plant consists of two units, each designed to produce 25 tons of briquettes per hour.

A brief description of the process is as follows. The coal, minus ¼-inch slack, on leaving the bin at the colliery tipple is mixed with low-grade flour (approximately 1 per cent of flour for binding) then conveyed by an inclined belt-conveyor to coal surge bins at the briquette plant. From the surge bins it is distributed to the two units by a forked coal-feeder to the pre-heaters which, in conjunction with steam injectors, are used to raise the temperature of the coal. From the pre-heaters the coal is carried along paddle mixers, sprayed with asphalt, and then conveyed to vertical fluxers. During transit to the fluxers the temperature of the coal is raised to approximately 250 degrees Fahrenheit, the temperature necessary for the proper blending of the coal and asphalt. On leaving the fluxers the mixture is conveyed to the presses by tempering conveyors on which the temperature of the mix is lowered to 120 degrees Fahrenheit.

After formation in the presses, the briquettes are conveyed by chute on to a bar screen for screening. After being screened the briquettes are transported by conveyor out of the building, where they are cooled by the outside atmosphere on their way to the plant surge bin, from which they are loaded directly into railway cars.

The screenings from the briquettes are returned to the plant for recirculation.

The asphalt is stored in two 20,000-gallon-capacity tanks situated behind the plant.

LABOUR AND EMPLOYMENT

In 1954, 1,434 persons were employed in and about the coal mines of the Province, a decrease of 116 from 1953.

Because of the five-day week in force throughout the Province at the larger mines, and the legal holidays, the maximum number of working-days is rated at 241. In the Vancouver Island District the one large mine, the Tsable River mine, worked 237 days. In the East Kootenay District the loss of working-days averaged 20.3 per cent, owing mainly to the progressive increase in the use of oil-fired and diesel-powered engines on the railways. In the Northern and Nicola-Princeton Districts the average loss of working-days was 24.4 and 8.3 per cent respectively, owing to the lack of coal orders.

COMPETITION FROM COAL PRODUCED OUTSIDE OF BRITISH COLUMBIA

In 1954 the shipment of Alberta coal and briquettes to British Columbia totalled 891,194 and 32,763 tons respectively. The following table shows the amount of Alberta coal brought into British Columbia during the past ten years:—

Year	Short Tons	Year	Short Tons
1945	868,396	1950	873,558
1946	982,413	1951	898,533
1947	899,403	1952	1,021,484
1948	945,700	1953	859,385
1949	891,132	1954	891,194

Of the 1,073,515 tons of British Columbia coal marketed, 250,579 tons was sold for domestic and industrial use in Alberta, Saskatchewan, Manitoba, Ontario, and Yukon Territory; 383,866 tons was sold for railroad use in Canada; 36,794 tons was exported to the United States; and 3,868 tons was sold for ships' bunkers.

The amount sold for domestic and industrial use in the Province was 398,408 tons.

ACCIDENTS IN AND AROUND COAL MINES

During 1954, 1,434 persons were employed in and around coal mines, including strip-mining operations. One fatal accident occurred in the year, as compared with five in 1953. The number of fatal accidents per 1,000 persons employed was 0.69, compared with 3.22 in 1953, 1.78 in 1952, 3.11 in 1951, 2.21 in 1950, 0.43 in 1949, 2.04 in 1948, 0.82 in 1947, 1.73 in 1946, and 2.05 in 1945. The average for the ten-year period was 1.29.

The number of fatal accidents per 1,000,000 tons of coal produced in 1954 was 0.94, compared with 4.26 in 1953.

The following table shows the collieries at which fatal accidents occurred in 1954, with comparative figures for 1953:—

Name of Company	Name of Colliery	1954	1953
The Crow's Nest Pass Coal Co. Ltd.	Michel Colliery	1	2
The Crow's Nest Pass Coal Co. Ltd.	Elk River Colliery	....	3
Totals		1	5

The following three tables classify the fatal accidents in coal mines in 1954 as to cause, quantity of coal per accident, and inspection districts:—

Fatal Accidents Classified as to Cause

Cause	1954		1953	
	Number	Per Cent	Number	Per Cent
By falls of roof and coal	...	.....	3	60.00
By mine cars and haulage (underground)	....	.....	1	20.00
Asphyxiated by methane gas	....	.....	1	20.00
By falling into coal-chute	1	100.00	....	.....
Totals	1	100.00	5	100.00

Fatal Accidents Classified as to Quantity of Coal Mined

Cause	1954		1953	
	Number of Fatal Accidents	Coal Mined per Fatal Accident[1]	Number of Fatal Accidents	Coal Mined per Fatal Accident[1]
		Tons		Tons
By falls of roof and coal	....	.....	3	390,644
By mine cars and haulage (underground)	....	.....	1	1,171,932
Asphyxiated by methane gas	....	.....	1	1,171,932
By falling into coal-chute	1	1,064,023	....	.....
Average	1	1,064,023	5	234,386

[1] Excludes coal from strip mines.

NOTE.—There were no fatal accidents in strip-mining operations in the years 1954 and 1953.

Fatal Accidents Classified as to Inspection Districts

District	Number of Deaths from Accidents				Totals	
	Falls of Roof and Coal	Mine Cars and Haulage	Asphyxiated by Methane	Falling into Coal-chute	1954	1953
Vancouver Island	....	....	....	....	....	....
Nicola-Princeton	....	....	....	....	....	....
East Kootenay	....	....	....	1	1	5
Northern	....	....	....	....	....	....
Province, 1954	....	....	....	1	1	....
Province, 1953	3	1	1	....	....	5

Ratio of Fatal Accidents

District	Accident Death Rate			
	Per 1,000 Persons[1] Employed		Per 1,000,000 Tons[2] of Coal Mined	
	1954	1953	1954	1953
Vancouver Island	.....	.....	.....	.....
Nicola-Princeton	.....	.....	.....	.....
East Kootenay	0.95	4.55	1.24	5.86
Northern	.....	.....	.....	.....
Province, 1954	0.73	.....	0.94	.....
Province, 1953	.....	3.33	.....	4.26

[1] Excludes strip-mining personnel. [2] Excludes strip-mine coal.

In 1954 there was one fatal accident at the coal mines in the Province; it occurred underground.

On September 27th, 1954, Joseph Caravetta, a timber-packer employed at the Michel Colliery, was killed when he fell or slipped into a coal-chute which dipped about 38 degrees. He was crossing over the chute on a narrow bridge when he apparently slipped and fell into the chute.

Including the foregoing fatal accident, 254 accidents involving loss of seven days or more were reported to the Department by the management of the various mines. All these accidents were investigated and reported by the District Inspector of Mines.

The following three tables classify the accidents in coal mines in 1954 as to occupation of the men involved, as to cause, and as to injury. The fatal accident is included in the totals.

ACCIDENTS CLASSIFIED AS TO OCCUPATION

Occupation	Number of Accidents	Percentage of Accidents
Underground—		
Miners	147	57.87
Drillers and foremen	1	0.39
Haulagemen	46	18.11
Trackmen and mechanics	7	2.76
Supervisors	6	2.36
Timbermen	10	3.94
Coal-cutters	1	0.39
Miscellaneous	10	3.94
Surface—		
Shops	2	0.79
Surface	13	5.12
Preparation and coke-ovens	10	3.94
Miscellaneous	1	0.39
Totals	254	100.00

ACCIDENTS CLASSIFIED AS TO CAUSE

Cause	Number of Accidents	Percentage of Accidents
Fall of ground	48	18.90
Fall of material and flying material	24	9.44
Lifting and handling equipment and material	77	30.32
Machinery and tools	46	18.11
Slipped and tripped	42	16.54
Falling off staging and platforms	6	2.36
Miscellaneous	11	4.33
Totals	254	100.00

Accidents Classified as to Injury

Injury	Number of Accidents	Percentage of Accidents
Head and neck	14	5.52
Eyes	10	3.94
Trunk	63	24.80
Back	23	9.05
Arms	12	4.72
Hands and fingers	50	19.69
Legs	51	20.08
Feet	20	7.87
Toes	11	4.33
Totals	254	100.00

EXPLOSIVES

The following table shows the quantity of explosives used in underground coal mines in 1954, together with the number of shots fired, tons of coal produced per pound of explosive used, and the average number of pounds of explosive per shot fired (these quantities include all the explosives used for breaking coal and rock work in coal mines):—

Vancouver Island District

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots Fired	Average Tons of Coal per Pound of Explosive Used	Average Pounds of Explosive per Shot Fired
Tsable River Colliery	87,300	200,666	112,250	2.29	0.78
Chambers mine (strip)	.....	.....	.....	.....	.....
Loudon mine	1,100	322	1,100	0.29	1.00
Lewis mine (Timberlands)	1,450	751	1,400	0.51	1.03
Wellington mine (Carruthers)	600	561	820	0.93	0.73
Stronach mine	1,350	1,470	1,250	1.09	1.08
Wellington Blue Flame mine	300	283	650	0.94	0.46
Wende mine	360	65	400	0.18	0.90
Berkley Creek mine	150	135	250	0.90	0.60
Undun mine	200	244	350	1.22	0.57
Totals for district	92,810	204,497	118,470	2.20	0.78

Nicola-Princeton District

Taylor Burson mine (Blue Flame)	6,200	12,431	6,100	2.00	1.01
Coldwater Coal mine	630	1,256	750	1.90	0.84
Blakeburn mine (strip)	.....	.....	.....	.....	.....
Totals for district	6,830	13,687	6,850	4.53	1.00

Northern District

Bulkley Valley Collieries	19,130	36,572	19,150	1.91	1.00
Reschke mine	740	1,755	750	2.37	0.98
Gething No. 3 mine	1,300	2,604	2,000	2.00	0.65
Totals for district	21,170	40,931	21,900	1.93	0.96

East Kootenay District

Elk River Colliery	11,650	281,315	14,850	24.15	0.78
Michel Colliery (underground)	111,206	523,593	77,701	4.78	1.43
Coleman Collieries (strip)	.....	.....	.....	.....	.....
Totals for district	122,856	804,908	92,551	6.55	1.32
TOTALS FOR PROVINCE	243,666	1,064,023	239,497	4.36	1.01

QUANTITY OF DIFFERENT EXPLOSIVES USED

	Lb.
Monobel of different grades	236,118
Permissible rock powder	7,548
Total	243,666

MACHINE-MINED COAL

In 1954, mining-machines produced approximately 417,522 tons or 35.7 per cent of the total output from underground mining. A total of 383,585 tons of strip-mined coal was removed by mechanical means.

District	Number Driven by—		Type of Machine Used	
	Electricity	Compressed Air	Chain Undercutting	Puncher Type
Vancouver Island	—	—	—	—
Nicola-Princeton	—	6	—	6
Northern District	—	1	—	1
East Kootenay	1	24	12	13
Totals	1	31	12	20

In addition to the above, 211 air picks were used in the mines of The Crow's Nest Pass Coal Company Limited.

SAFETY LAMPS

There were 1,462 safety lamps in use in the mines of the Province. Of this number, 112 were flame safety lamps and 1,350 were approved electric lamps, mostly of the Edison type.

APPROVED SAFETY LAMPS—ELECTRIC AND FLAME

The following is a list of approved safety lamps, electric and flame:—

The Wolf lamp, flame type.

The Koehler lamp, flame type.

The Edison electric lamp (cap) as Approval No. 18 of the United States Bureau of Mines, and all Edison lamps up to and including Model P, carrying the Approval Certificate No. 26 of the United States Bureau of Mines; Model R-4, Approval No. 29.

The Wheat electric lamp and having Approval No. 20, as issued by the United States Bureau of Mines.

The Wolf electric lamp, No. 830C.

The electric lamp manufactured by the Portable Lamp and Equipment Company, under Approval No. 27 of the United States Bureau of Mines.

M.S.A. single-cell trip lamp, carrying United States Bureau of Mines Approval No. 1009, approved for use on haulage trips in mines.

The Davis M.L. model pneumatic electric lamp.

ELECTRICITY

Electricity is used for various purposes on the surface at six coal mines and underground at five. A total of 14,097 horsepower was used in and about these mines. Detailed information as to how and where this power is used is given in the report of the Electrical Inspector of Mines.

VENTILATION

Information regarding the quantity of air passing in the main airways and working-places in the various mines is given in the reports of the District Inspectors. Blasting operations are not allowed in working-places where methane can be detected by the use of a flame safety lamp.

Although it has been necessary for the District Inspector to issue orders prohibiting blasting in several instances, the ventilation in general, as found during inspection visits, was adequate to meet requirements.

METHANE DETECTION

The principal methods used to detect small percentages of methane in the mines are by the use of the M.S.A. detector and by gas analysis.

Regular tests are made on every shift in the working-places and roadways by the firebosses and other certified mine officials, principally by means of the flame safety lamp. Every candidate for a miner's certificate must show, over and above the other necessary qualifications, that he has a thorough knowledge of the flame safety lamp, of handling it safely, and of the method of testing for methane before he is given a certificate.

AIR-SAMPLING

In addition to regular tests made by use of the flame safety lamp and methane detectors, the Inspector of Mines in each district takes mine-air samples regularly in main return airways and return airways of the various splits, so that a complete record may be kept of the condition of the air passing through the mine. Air samples are also taken by the Inspector and mine officials when there is an abnormal issuance of gas in working-places, and to ascertain the condition of the atmosphere in gob areas and old workings.

Periodic samples were also taken by the District Inspector and officials of the No. 9 mine, Elk River Colliery, to ascertain the condition of the exhaust fumes of the diesel locomotive working on the main haulage level. Samples were also taken of the ventilating current on the return side of the operating diesel. The analyses were, in general, satisfactory.

INSPECTION COMMITTEES

The provisions of the "Coal-mines Regulation Act," section 65, General Rule 19, require that an inspection committee of workmen shall inspect the mine regularly on behalf of the workmen and make a true report of the conditions found. In all the larger mines of the Province this rule is fully observed, and copies of the reports are sent to the Inspectors for the district. The work of these committees is valuable and assists in furthering the interests of safety at the various mines.

COAL DUST

The danger of accumulations of coal dust on the roadways and in the working-places is fully realized, and as a rule the regulations regarding the control of coal dust are adequately carried out. Large quantities of limestone dust are used continually in the larger mines to combat this hazard. It is used in the roadways, working-places, and for the tamping of shots.

Dust samples are taken regularly from roof, sides, and floor of mine roadways and analysed. The reports of the analyses are forwarded to the District Inspector. In 1954, 1,675 dust samples from the various mines were analysed, and in all these samples the incombustible content was well over the 50 per cent as required by the "Coal-mines Regulation Act."

DIESEL LOCOMOTIVES

Early in August, 1950, the first diesel underground locomotive to be used in any mine in British Columbia made its trial runs in No. 9 mine, Elk River Colliery, The Crow's Nest Pass Coal Company Limited.

The locomotive is a 15-ton 100-horsepower North British type, and is fully permissible for use in coal mines. To date its performance has been satisfactory.

MILLISECOND DELAY DETONATORS

In February, 1951, an amendment to the "Coal-mines Regulation Act" was passed to allow, with the permission of the Chief Inspector of Mines, more than one shot to be fired at a time in any coal mine or district of a mine. The amendment was endorsed by the industry.

Early in May, 1951, experiments with millisecond delay detonators were conducted at No. 4 mine, Elk River Colliery, The Crow's Nest Pass Coal Company Limited, by officials of the British Columbia Department of Mines, the coal company, and Canadian Industries Limited.

In the latter part of May, 1951, and also in December, 1951, further experiments with millisecond delay detonators were conducted at the Tsable River mine, Canadian Collieries (Dunsmuir) Limited, by officials of the company and British Columbia Department of Mines.

This method of blasting coal, from both solid and machine-cut places, is now in general use at the mines of both The Crow's Nest Pass Coal Company Limited and Canadian Collieries (Dunsmuir) Limited.

On February 18th and 19th, 1953, the technique of blasting coal from solid and machine-cut places by the use of millisecond delay detonators was demonstrated at the Bulkley Valley Colliery by officials of the British Columbia Department of Mines.

The conclusions reached from these experiments are as follows: That the method provides for a safer and more economical operation of coal blasting; that, although more powder was being detonated at one time than in the one-shot-at-a-time method, there was a definite lessening of concussion felt and a reduction in the over-all amount of powder used.

DANGEROUS OCCURRENCES

On March 23rd, 1954, a heavy rush of water entered a section, No. 3 slope district, "A" East mine, Michel Colliery. No one was injured and the material damage was slight. Subsequent investigation disclosed that the water had been forced out of a small gob area off No. 7 room due to sudden and extensive caving.

On May 27th, 1954, while a trip of five empty cars was being lowered on No. 1 slope, No. 3 mine, Elk River Colliery, the first four cars became uncoupled. The damage caused by the resulting runaway was confined to the four cars, which were badly wrecked.

On June 7th, 1954, at the Tsable River mine, signs of heating were discovered issuing from an inaccessible gob area to the rise off No. 6 left level. An attempt was made to tunnel to the fire area with the object of loading out the burning material, but conditions on the return side of the fire became such that on June 9th this method of dealing with the fire was abandoned. From June 11th to the morning of June 15th an attempt to flood the area by means of dams erected on the low side of the gob also proved unsuccessful as carbon monoxide and the smell of heating persisted on the return side of the area together with an increasing percentage of methane.

It was then decided to withdraw all men from the mine and seal off the gob by temporary wooden seals faced with mastic. These seals were completed by the evening of June 15th. After a waiting period of over forty hours the seals were found to be intact. Normal operation of the mine resumed at 3 p.m. on June 17th. The construction of

permanent seals outby the temporary seals was started immediately and these were completed on June 24th.

Trained mine-rescue personnel using Chemox apparatus were used continuously while men were working in the return air side of the fire area. The crews were under the supervision of competent officials on all shifts.

On June 24th, 1954, a comparatively severe bump occurred on No. 5 incline, "B" seam, Michel Colliery. No one was injured. Thirty feet of track was thrown against the rib of the incline; 100 feet of 4-inch compressed-air pipe was thrown into the middle of the track; and the floor of the incline for about 30 feet was heaved 1 foot. It is believed that extensive uncaved gobs in the area was the primary cause of the bump.

On July 7th, 1954, a small fire occurred at the preparation plant at Michel Colliery at the belt-drive of the top flight conveyor. The fire was extinguished immediately after its discovery, and the damage was confined to a number of V-belts of the drive. The cause of the fire is attributed to a breakdown of the conveyor, resulting in frictional heating taking place between the motor pulley and the belts.

On September 9th, 1954, during a severe electrical storm at Michel three large electric motors were damaged when lightning struck the electrical system. The 100-horsepower motor driving "A" East mine fan had one burnt coil and, in the coal-preparation plant, one 150-horsepower motor and one 100-horsepower motor had two and six burnt coils respectively.

BUMPS AND OUTBURSTS

On January 7th, 1954, a minor outburst occurred at the face of a crosscut off No. 8 room, No. 3 slope district, "A" East mine, Michel Colliery. No one was injured and no material damage was done. A large quantity of methane was released, and 30 tons of coal was expelled from the top section of the seam at the face of the crosscut.

On April 22nd, 1954, an outburst occurred at the face of No. 5 room, slope section, No. 3 mine, Elk River Colliery. Sufficient warning was given by the pending blowout to allow the miners to retire to a place of safety. The top section of the seam blew out 10 feet ahead of the original faceline, and methane was released in considerable quantity. Several posts were dislodged near the face, and 30 tons of coal was loaded after the working-place was cleared of gas five hours later.

On October 6th, 1954, an outburst occurred at the face of No. 1 split off No. 6 room pillar, No. 3 slope district, "A" East mine, Michel Colliery. A considerable quantity of methane was given off and about 30 tons of coal discharged from the face. No one was injured and no material damage was done.

On November 23rd, 1954, an outburst occurred at the face of No. 6 split off No. 6 room, slope section, No. 3 mine, Elk River Colliery. The outburst gave the usual prior warnings, which allowed the miners to retire to a place of safety. Considerable methane and about 40 tons of coal were discharged from the face, and 50 tons of coal was loosened by the outburst. No one was injured and no material damage was done.

On November 29th, 1954, an outburst occurred at the face of No. 6 split off No. 6 room, slope section, No. 3 mine, Elk River Colliery. About 50 tons of coal was expelled from the face, accompanied by methane for a short period. No one was injured and no material damage was done.

On December 30th, 1954, a face bump occurred in No. 7 split off No. 6 room, slope section, No. 3 mine, Elk River Colliery. No one was injured, although considerable methane was given off and the floor was heaved to a height of from 1 to 4 feet for a distance of 12 feet from the face.

PROSECUTIONS

Joseph Lepacek, miner, Michel Colliery, was prosecuted on October 7th, 1954, under Special Rule 112 of The Crow's Nest Pass Coal Company Limited, for failure to warn miners in an approaching working-place that blasting was about to be done. He was found guilty and fined $10 and costs.

SUPERVISION OF COAL MINES

During 1954 eighteen companies operated thirty-three mines, employing 1,076 men underground. In the supervision of underground employees there were 4 managers, 14 overmen, 4 shiftbosses, and 66 firebosses, or approximately 1 official for every 12 men.

"COAL SALES ACT"

LIST OF REGISTERED NAMES OF BRITISH COLUMBIA COALS, APPROVED BY THE CHIEF INSPECTOR OF MINES, IN ACCORDANCE WITH THE PROVISIONS OF THE "COAL SALES ACT."

Registered Name of Coal	Colliery and Location	Producing Company
Comox	Tsable River mine, Comox Colliery (Cumberland)	Canadian Collieries (D.) Ltd.
Hi-Carbon	Mixture of Canadian Collieries coal and B.C. Electric coke	Canadian Collieries (D.) Ltd.
Old Wellington	No. 9 mine (Wellington)	Canadian Collieries (D.) Ltd.
Chambers-Extension	Chambers-Extension	R. H. Chambers.
Cassidy-Wellington	Cassidy mine (Cassidy)	A. H. Carroll.
Taylor Burson	Blue Flame No. 2 mine (Princeton)	Taylor Burson Coal Co. Ltd.
Hat Creek	Hat Creek (Lillooet)	Canada Coal and Development Co. Ltd.
Bulkley Valley	Bulkley Valley (Telkwa)	Bulkley Valley Collieries.
Crow's Nest, Elk River	Elk River (Coal Creek)	Crow's Nest Pass Coal Co. Ltd.
Crow's Nest, Michel	Michel (Michel)	Crow's Nest Pass Coal Co. Ltd.
Coldwater	Coldwater No. 3 mine (Merritt)	S. Gerrard.
Black Prince	Black mine (Princeton)	R. B. Savage.
Bowron River Coal	Bowron River mine (Prince George)	Central Industries Ltd.
Comac	Tsable River Colliery (Cumberland) and McLeod River Colliery (Alberta)	Canadian Collieries (D.) Ltd.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS

FIRST-, SECOND-, AND THIRD-CLASS CERTIFICATES AND MINE SURVEYORS' CERTIFICATES

The Board of Examiners, formed on July 10th, 1919, consists at present of H. C. Hughes, Chief Inspector of Mines, chairman; Edward R. Hughes, Inspector of Mines, member; and Robert B. Bonar, Senior Inspector of Coal Mines, secretary and member.

The meetings of the Board are held in the office of the Department of Mines in Victoria. The examinations are held in accordance with the amended rules of the Board of Examiners and approved by the Minister. The examinations are held at least once a year, and more often if necessary. One examination was held in 1954 on the following dates: May 12th, 13th, and 14th at the Fernie and Telkwa centres.

The total number of candidates at these examinations was as follows: For first-class certificates, 1 (failed); for second-class certificates, 3 (2 passed); for third-class certificates, 2 (none passed).

The following were the successful candidates: Second class—John Whittaker and Leonard Brett.

All officials, before engaging in multiple blasting with millisecond delay detonators, are required to obtain a permit to do so from the Board of Examiners (Coal-mine Officials). This permit is issued only after the applicant has successfully passed oral and practical examinations in such work.

Examinations for Certificates of Competency as Coal-miners

In addition to the examinations and certificates already specified as coming under the Board of Examiners, the Act further provides that every coal-miner shall be the holder of a certificate of competency as such. Examinations are held regularly in coal-mining districts, and no certificate is granted where the candidate has failed to satisfy the Board as to his fitness, experience in a coal mine, and a general working knowledge of the English language.

During 1954 there were ninety-six candidates for coal-miners' certificates, six of whom were unsuccessful.

In addition to the certificates granted above, substitute certificates were issued to those who had lost their original certificates.

Permits to act as coal-miners, as provided by the Act, have been granted to younger men by Inspectors in their respective districts. This method allows promising men with less than one year's experience underground to work at the coal face as miners under the guidance of an experienced miner.

The Board of Examiners desires to thank the different coal-mining companies for the use of their premises for holding examinations where necessary.

NOTES ON COAL MINES

VANCOUVER ISLAND INSPECTION DISTRICT

By A. R. C. James

The gross output of coal from the Vancouver Island Inspection District was 205,920 tons, a decrease of 22.4 per cent from the 1953 output. Only one large coal mine, the Tsable River mine, is now in production on the Island. Operations in the once important Nanaimo coalfield are now restricted to eight very small mines, providing employment for no more than twenty men. These mines operate in outcrop, pillars, and barriers left during earlier working.

The Island coal-mining industry has suffered a rapid decline in the past few years. Production has declined by as much as 60 per cent since 1951. This condition has resulted from loss of markets due to competition from other fuels, high costs of operation, and from the depletion of reserves in the Nanaimo coalfield.

It is pleasing to report that 1954 has been a year free from fatal accidents in the Vancouver Island coal mines, the second such year in succession. There were four accidents classified as serious, all of which occurred underground at Tsable River mine. Two of these accidents involved fractures of the tibia and fibula, one a fracture of the humerus, and the remaining accident resulted in the severing of three toes of the right foot. Two of the accidents were caused by contact with moving conveyors and machinery, a third occurred while setting timber, and the fourth resulted from coal sloughing off the face.

In addition to the above, ninety-seven minor accidents have been reported and investigated. One dangerous occurrence took place at Tsable River mine on June 7th, arising from a gob heating. This is described elsewhere in this Report.

The annual mine-rescue and first-aid meet organized by the Vancouver Island branch of the British Columbia Mine Safety Association was held at Cumberland on May 29th. Two teams from Tsable River mine and a visiting team from Copper Mountain mine participated in the mine-rescue competition and a high standard of performance was maintained. The winning team was the Copper Mountain team, captained by E. Pickard.

NANAIMO (49° 123° S.W.)

Chambers Strip Mine, Extension

R. H. Chambers and associates, operators; R. H. Chambers, manager. This small strip pit is in Section 14, Range 7, in the Douglas district, near Extension. The area at present being mined was opened up during the latter part of 1952 and comprises a small section of the Wellington seam lying close to the surface in the vicinity of the old Vancouver slope workings. The seam dips gently in a westerly direction, and the thickness of overburden ranges from 8 to 15 feet. The following seam section is typical, though in part of the property the top coal has been eroded: Top coal, 4 feet 5 inches; carbonaceous shale, 1 foot 6 inches; coal, 1 foot 5 inches; rock, 4 inches; coal, 1 foot 8 inches.

The coal is hand-loaded into cars which are hauled up to the tipple by a gasoline-driven hoist. A small shaker screen sorts the coal into over 2-inch, 1- to 2-inch, and under 1-inch sizes.

Total production in 1954 was 1,423 tons over a working period of 218 days with a crew of two men. Working conditions were found to be satisfactory in the course of inspections, and no accidents were reported.

No. 8 Mine, Timberlands

G. Lewis, operator and fireboss. This property comprises two small mines operating in the Wellington seam in a small area of outcrop coal that was left when No. 8 mine was abandoned by Canadian Collieries (Dunsmuir) Limited. The seam outcrops on the side of a ridge parallel to and immediately south of the Nanaimo River valley at an elevation of 540 feet above sea-level. The coal measures dip southward at 8 degrees. The two mines are one-third of a mile apart. The old mine, which has been described in previous Annual Reports, is now worked only for short periods in the winter months when the new mine is inaccessible due to flooding.

The new mine, which commenced production in May, 1951, is in Range 1, Section 2 of the Cranberry district. It is operated in the Wellington seam in an area of outcrop coal about 1 acre in extent, which is bounded on the west by a thrust fault that also formed the western boundary of the old No. 8 mine. The seam in this area is 6 feet thick, including two thin rock bands. In 1954 the main slope of the new mine was extended in a southerly direction to a distance of approximately 500 feet from the portal where it made contact with a level in the old No. 8 mine workings. Levels were set off to the right and left from the slope. Work in the old mine was confined to the extraction of pillars to the east of the slope.

At both mines the coal is blasted off the solid and hand-loaded into cars which are hauled to the surface by a small gasoline-driven hoist. A shaker screen sorts the coal into lump, nut, and pea sizes. Total production in 1954 was 751 tons over a working period of 178 days with a crew of two men. Working conditions were usually found to be satisfactory, and no accidents were reported.

Blue Flame, Wellington (Timberlands) Mine

F. Vlasich, operator and fireboss. This mine is on Lot 194 in the Bright district, about 600 feet west of the Timberlands road and 16 miles by road from Nanaimo. It is operating in the western outcrop of the Wellington seam about half a mile south of the Nanaimo River. The coal ranges from 2 to 3 feet thick and is overlain by a bed of mudstone ranging from 10 inches to 2½ feet thick. In places as much as 10 inches of top coal lie above the mudstone. The roof is a massive conglomerate. The formation dips 45 degrees to the northeast.

The layout and method of operating this mine have been described in previous Annual Reports. In 1954 the mine operated for four and a half months. A level, started in 1953 from a point 30 feet from the bottom of the slope, was driven southeast along the strike of the seam for a total distance of approximately 300 feet from the slope. A raise was driven up 30 feet near the end of this level, and the coal was found to have pinched out. At the face of the level, too, the coal had thinned to such an extent as to make it uneconomic to carry on, and the level was abandoned. At the time of the writer's last inspection in November the operator was preparing to work the coal from the bottom level northwest of the slope.

Total production in 1954 was 283 tons over a working period of seventy-seven days with a crew of two men. Conditions were found fairly satisfactory in the course of inspections, and no accidents were reported.

Berkley Creek Mine

R. H. Chambers and A. Vanger, operators; H. Kirkpatrick, fireboss. This mine is in the Cranberry district, near the old White Rapids mine. It is situated close to the Nanaimo Lakes road, and is 15 miles by road from Nanaimo. The mine was brought into production in October, 1954, and is operating in the Wellington seam. The intention of the operators is to mine coal that was left after the closure of the Extension mine, and also to mine the barrier coal that was left between the Extension and White Rapids workings. The mine was opened up by dewatering and retimbering the old No. 17 incline of the Extension mine for a distance of 300 feet from the portal of an old adit which connects this incline with the surface.

The seam in this area is split into two sections, each consisting of approximately 3 feet of coal, separated by 4 to 5 feet of shale. The measures dip slightly in a northeasterly direction. At the time of the writer's last inspection in November, a heading had been driven for a distance of 25 feet to the right off the incline in the lower section of the seam. The initial plan of operation is to drive two parallel headings, one in the upper and one in the lower section of the seam. The heading in the upper section will follow the old Extension faceline and from time to time will make contact with the old workings.

The coal is cut by radial punching machines, and the cars are hauled to the surface by a gasoline-driven hoist. A small shaker screen sorts the coal into lump, nut, and stoker sizes. Production in 1954 amounted to 135 tons over a working period of forty-one days with a crew of three men.

Undun Mine

J. Unsworth and A. Dunn, operators; A. Dunn, fireboss. This mine, which was brought into production in August, is three-quarters of a mile northwest of the village of Extension. It operates in the Wellington seam, and the output comes from the mining of pillars and small areas of coal left near the outcrop in the workings of the old Extension No. 6 mine. The Wellington seam is of variable thickness, but the coal is of excellent quality. The measures dip about 10 degrees southwest. The roof is a strong conglomerate.

The coal is blasted off the solid and hand-loaded into cars which are hauled to the surface by a small gasoline-driven hoist. Production in 1954 amounted to 244 tons over a working period of ninety-six days with a crew of two men. Working conditions have been found to be satisfactory in the course of inspections, and no accidents were reported.

NORTH WELLINGTON (49° 124° S.E.)

Loudon No. 5 and 6 Mines

W. Loudon and associates, operators; W. Loudon, fireboss. Both these mines are about 1 mile southeast of Wellington and operate in a small area of outcrop coal in the No. 2 or Upper Wellington seam adjacent to the old No. 9 mine workings. The No. 5 mine was finally abandoned in May, after operating for the past ten years and producing 11,348 tons of coal.

The No. 6 mine was started following the closing of No. 5 mine, and is about 600 feet north of the No. 5 mine portal. It operates in the same area of outcrop coal in the Upper Wellington seam. A slope has been driven in the seam from the outcrop with the intention of making contact with the old No. 9 mine workings. At the time of the writer's last inspection in November, this slope had been driven over 200 feet but had not broken into the old workings.

The coal is blasted off the solid and hand-loaded into cars which are hauled to the surface by a small gasoline-driven hoist. Production in 1954 amounted to 322 tons over a working period of 169 days with a crew of two to three men. Working conditions were usually found satisfactory in the course of inspections. No accidents were reported.

Carruthers and Wakelam No. 3 Mine

R. B. Carruthers and W. Wakelam, operators; R. B. Carruthers, fireboss. This mine is near the Loudon mine and is also in the No. 2 or Upper Wellington seam adjacent to the abandoned workings of No. 9 mine. Production in 1954 amounted to 561 tons over a working period of 184 days with a crew of two men. Working conditions were found to be satisfactory in the course of inspections. No accidents were reported.

Stronach No. 2 Mine

C. Stronach, operator; H. Gilmour, fireboss. This mine is in a section of the Upper Wellington seam adjacent to the old No. 9 mine. Most of the output comes from the mining of pillars and small areas of coal left in the earlier workings. Production in 1954 amounted to 1,470 tons over a working period of 220 days with a crew of from

four to five men. Working conditions were usually found to be satisfactory in the course of inspections. No accidents were reported.

Wende Mine

J. McArthur, operator and fireboss. This mine is in Section 20, Range 4, of the Mountain district, about 1 mile southwest of Wellington, and was operated from the outcrop of the Upper Wellington seam. The mine was worked from March 8th until August 4th, when it was permanently abandoned. The seam section at the face of the main entry contained only 18 inches of coal.

Production in 1954 amounted to 65 tons over a working period of 120 days with one man working. Conditions were usually found to be satisfactory in the course of inspections.

Comox (49° 124° N.W.)

Canadian Collieries (Dunsmuir) Limited

Company office, Union Bay. F. Ronald Graham, chairman of the board; R. Whittall, president; E. O. T. Simpson, general manager; W. W. Johnstone, district superintendent. In 1954 this company operated one mine on Vancouver Island, the Tsable River mine.

Tsable River Mine.—S. J. Lawrence, manager; T. Ecclestone, overman; L. Cooper and J. Weir, shiftbosses; W. Bennie, J. Cochrane, A. Cullen, M. Frobisher, W. High, L. Hutchinson, C. Lewis, and A. Somerville, firebosses. This mine is on the left bank of Tsable River, approximately 5 miles west of Buckley Bay. It is in the upper or westerly portion of the Tsable River coalfield, which is separated from the lower or easterly part by a buried ridge of volcanic rocks that projects up into the coal-bearing Comox formation. The seam being worked, the No. 2 seam, ranges in thickness from 6 to 10½ feet and in places contains several bands of shale of varying thickness. The roof strata consist of sandy shales and sandstones. The average dip of the formation is from 6 to 9 degrees in a northeasterly direction. The general structure is that of a syncline crossed by two systems of faults which strike northwestward in the same general direction as the formation. Along the southeastern flank of this syncline the No. 2 seam pinches out against the unconformable pre-Cretaceous floor of volcanic rock.

The mine is developed by a main slope and three counter slopes driven for 3,000 feet on the full dip of the seam, and by a main diagonal and counter diagonal slopes driven northeast from a point near the bottom of the main slope, for a distance of 2,100 feet. By the end of 1951 the main diagonals had penetrated the first fault system and by the end of 1953 had reached the second fault system, 1,600 feet beyond the first. In the course of development work in 1954 the second fault system was contacted at intervals along a front of 3,400 feet, but all attempts to find the continuation of the No. 2 seam beyond the fault ended in failure. Meanwhile extensive development work has been done in the Diagonal section of the mine between the two major faults. Levels have been driven and coal blocked out for a distance of 2,000 feet southeast and 1,400 feet northwest of the main diagonal. The total amount of development in 1954 amounted to 18,446 feet of drivage on the seam.

The mine is worked on a modified room-and-pillar system. Levels are set off in pairs from each side of the main slope and main diagonal at intervals of 250 to 450 feet, and are driven to the boundary of the property or to the limits of workable coal. The coal between the pairs of levels is extracted by driving a series of rooms, commencing at the boundary and working back toward the slopes on a retreating system. As much of the coal as possible is removed during pillar extraction, and the worked-out areas are allowed to cave. All the coal, both in development and pillar-extraction workings, is blasted off the solid. Electrical multiple blasting with millisecond delay detonators is used throughout the mine. A total of 99,850 pounds of Monobel No. 4 explosive and 128,150 detonators were used during the year.

In most cases the coal is conveyed from the faces by shaker-conveyors to a convenient loading point on one of the levels where it is loaded into cars. Four Joy loaders and four Goodman duckbill units are used, mainly for development work. Twelve Climax compressed-air-operated rotary drills are used for drilling shot-holes.

In addition to development work, pillar extraction was continued between Nos. 3, 4, and 5 right levels. Extraction was also begun between Nos. 6 right and 6 left levels and the first fault.

Total production in 1954 amounted to 200,666 tons over a working period of 237 days with a crew of 209 men underground and nineteen on the surface. During the year the total crew was increased by 4.5 per cent and the total output by 20 per cent.

Additions to the plant during the year included the installation on the surface of an Ingersoll-Rand air compressor to supplement the two similar compressors already in use. This is a unit of 3,300 cubic-feet-per-minute capacity and is electrically driven by a 500-horsepower electric motor.

Conditions at the mine have usually been found to be satisfactory in the course of inspections. The seam normally gives off very little methane; small accumulations have been found on a few occasions at the working-faces, but these were usually diluted without difficulty.

First-aid arrangements have been maintained at a satisfactory standard. A suitably equipped first-aid room is provided on the surface, and an ambulance car is held in readiness for emergencies. Five employees hold industrial first-aid certificates, and twenty-four employees hold other first-aid certificates.

Two mine-rescue teams of six men each are maintained, and these attend periodic practices at the Cumberland mine-rescue station.

Ninety-one accidents were reported and investigated, four of which were classed as serious and the rest as minor. This represents a decrease of 24 per cent in the number of lost-time accidents compared with 1953, although the number of accidents classed as serious is three more than the 1953 total. One dangerous occurrence was reported; this was a heating in the gob off No. 6 left level, and is described elsewhere in this Report.

Six minor accidents were reported from the surface departments of the company at Union Bay and were investigated.

Regular inspections of the mine were made each month by the inspection committee appointed by the workmen, and copies of their reports were forwarded to the office of the District Inspector through the courtesy of this committee.

NICOLA-PRINCETON INSPECTION DISTRICT

By E. R. Hughes

Although coal-mining in this district continued on a comparatively small scale, there was a substantial increase in production as compared with that of the past four years. The total output in 1954 amounted to 30,969 short tons, compared with 8,087 tons produced in 1953. Most of the increase was due to the coal produced from the Mullin strip mine at Blakeburn, which started to ship coal in July. Increased production was also recorded by the other two operators in the district, namely, the Taylor Burson Coal Company Limited at Princeton and the Coldwater Coal mine at Merritt. A coal licence was granted to Edward W. Pechr, Cliffview Colliery Limited, Enderby, to develop and produce coal from an area of 320 acres situated about 2 miles east of Grindrod, and some exploratory work was done in an attempt to find a coal seam on the property. Coal Licences Nos. 67 and 68 were granted to John Luttin covering 2 square miles in the White Lake coalfield, and two diamond-drill holes were put down to test the area. Coal Licence No. 61 covering Lot 4222 in the Shorts Creek area was cancelled. Coal, Petroleum and Natural-gas Lease No. 13, covering Lot 385 in the Princeton coalfield, was forfeited, and Coal Licence No. 23, covering part of Lot 788 in the Tulameen coalfield, was also forfeited.

No compensable accidents or dangerous occurrences were reported, nor were there any prosecutions under the "Coal-mines Regulation Act" during the year.

The Similkameen Valley Mine Safety Association held its annual field-day competitions at Princeton on Saturday, June 5th. The mine-rescue competition was held in the forenoon at Princeton Memorial Park, and the first-aid events were held in the auditorium at the Princeton school. Four teams competed in the mine-rescue event, which was won by a Copper Mountain mine team captained by Luke Kirby.

PRINCETON (49° 120° S.W.)

Taylor Burson Coal Company Limited

Blue Flame No. 2 Mine.—James Fairley, overman; Arthur Hilton, Thomas Bryden, and Edward Surtees, firebosses. This mine is about 10 miles by road south of Princeton and about half a mile west of the Hope–Princeton Highway. The mine was started in June, 1953, and the portal is 1,750 feet northeasterly from the portal of the old Blue Flame No. 1 mine. Starting at an elevation 274 feet higher than the No. 1 mine portal, the No. 2 mine adit was driven northwestward on a level course for 80 feet, crosscutting the measures. On reaching the seam a slope was driven 480 feet to the full dip, which here averages approximately 14 degrees. Six levels were turned off to the right from the slope, and one level was started to the left. The slope followed the axis of a northwesterly plunging anticline, and the face was 180 feet from the abandoned workings of the No. 1 mine. The movement of the measures resulted in crushing which so adversely affected operations that development in this area was discontinued when the No. 6 Right level face had been driven 60 feet from the slope. Contact with the old workings was made in No. 5 Right level, and in two places in the No. 2 Right level. Pillar coal was extracted in the No. 5 Right level, and when this was completed the worked-out area was isolated by the erection of a seal. A compressed-air-operated chain-conveyor was installed in No. 2 Right level for the purpose of cleaning out, rehabilitating, and developing the old No. 1 mine workings to the dip of this level.

Ventilation is by natural means and so far has been sufficient, but if the mine increases in size a fan will be required. No inflammable or explosive gas has yet been found, but on occasions blackdamp has escaped from the old workings. The coal-bearing zone is about 35 feet thick, and mining is confined to a 6-foot section near the centre of the zone. There are seven thin rock and clay partings, totalling 4 inches, in the part of the seam that is mined.

A new compressor-house was built with a concrete floor and equipped with underground storage for diesel oil. Two compressors with a combined total capacity of 865 cubic feet of air per minute were installed to supply the mining machinery. The coal is cut with post-type punching machines and is hand-loaded into 1-ton cars which are then hauled up the slope by a small compressed-air hoist. In the chain-conveyor road, dump cars are hand-trammed to the conveyor and then emptied. The conveyor discharges into a bin in No. 2 Right level, whence the coal is loaded into mine cars and taken to the surface. The total production of coal in 1954 was 12,431 short tons. The greatest monthly production was in December, when the output was 1,315 tons and twenty men were employed.

Hewitt Prospect

The licence held by Arthur W. Hewitt to mine coal from a portion of Lot 1133, Yale Division of Yale District, was assigned to Robert Evans in July, 1953, and was transferred to Michael J. Mullin, of Princeton, in June, 1954. The area comprises 57.9 acres and covers the most easterly 20 chains as measured along the southerly boundary of Block A of Lot 1133. Part of this area covers the most westerly workings of the now abandoned Tulameen No. 3 mine. Under the supervision of Edward Mullin some surface stripping was done which uncovered a 4-foot section of the seam which, in places, was stained and weathered. In June a test shipment of 1,167 tons of this strip-coal was sent to the Granby steam-electric

power plant near Princeton. Stripping was then suspended and had not been resumed at the end of the year.

COALMONT (49° 120° S.W.)

Blakeburn Strip Mine

Edward Mullin, manager, Princeton. On June 15th, Coal Licence No. 69, covering Lot 297, Yale Division of Yale District, and Coal Licence No. 70, covering Lot 298, were issued to Edward Mullin. On June 25th, Coal Licence No. 71, covering the east half of Lot 295, was issued to Michael James Mullin, Princeton. These three licences cover 2½ square miles and include most of the area underlain by the abandoned workings of the Coalmont Collieries Limited Nos. 3, 4, and 5 mines at Blakeburn, and are about 5 miles by road from the railway at Coalmont. The present stripping of overburden and removal of coal is confined to Lot 298, which is underlain by the workings of the old No. 3 mine. Overburden is light in this area, and the coal removed is that remaining between the old workings and the outcrop. The seam here is about 80 feet thick. A channel sample taken across the bottom 8 feet of the footwall section on November 24th was analysed at the Department of Mines laboratory in Victoria, with the following results: Moisture, 5.7 per cent; volatile combustible matter, 31.3 per cent; fixed carbon, 46.3 per cent; ash, 16.7 per cent; sulphur, 0.4 per cent; gross calorific value, 11,030 B.t.u. per pound; classification, high volatile B bituminous. A bulldozer is used to remove the overburden and the coal. The coal is pushed into a bin, from which it is carried by chain-conveyor to a Bradford breaker and is then discharged into a storage bin. The coal is trucked to the Granby steam-electric power plant near Princeton. Twelve men were employed, including eight truck-drivers. During the six months of operation 17,282 tons of coal was produced.

MERRITT (50° 120° S.W.)

Coldwater Coal Mines

This property, 1 mile south of Merritt, is operated by the owners, S. Gerrard and partners; F. Kelly, fireboss. Activities were confined to the Coldwater No. 5 mine and consisted of splitting pillars and extracting remnants of coal left between the abandoned Middlesboro No. 5 mine and the surface in the area adjacent to and west of the old water-tank, and about 250 feet west of the portal of the old Middlesboro No. 4 mine. A channel sample taken from the face of the pillar split across the full seam thickness of 4 feet 6 inches on November 19th was analysed at the Department of Mines laboratory in Victoria, with the following results: Moisture, 5.6 per cent; volatile combustible matter, 35.4 per cent; fixed carbon, 47.6 per cent; ash, 11.4 per cent; sulphur, 0.7 per cent; gross calorific value, 12,060 B.t.u. per pound; classification, high volatile B bituminous. This is a coking coal. The sample analysed did not include the two partings consisting of 3 inches of bone and 1 inch of hard shale.

The coal is blasted off the solid and is hand-loaded into 1-ton cars which are hauled up the slope by a gasoline-operated hoist on the surface. Ventilation is natural and is sufficient for such a small operation. No methane has been detected in the mine workings. The total production of coal in 1954 was 1,256 tons. In December 162 tons was produced and four men were employed.

ENDERBY (50° 119° N.E.)

Cliffview Colliery Limited

Edward W. Pechr, president; S. A. Lundman, secretary; N. S. Johnson, director; all of Enderby. Late in December, 1953, a licence was granted to develop and produce coal on the south half of Section 20, Township 19, Range 8, containing 320 acres, situated about 2 miles east of Grindrod. This licence covers part of the area acquired by Enderby Coal Mines Limited, which did some tunnelling, drilling, and surface work from

1905 to 1908. During the summer of 1954 a road 2 miles long was built up the side of the mountain east of Grindrod to where some of the work had been done by the old company. At the end of this road, at an elevation of approximately 1,100 feet above the valley floor, a bulldozer was used during the summer in an unsuccessful effort to find a coal seam. Some coal had been found in an old excavation, but the working had penetrated beyond the coal, which may not have been in place. In an additional attempt to find a seam, the management decided to go underground, and in November a tunnel was started near the end of the road. At the end of the year the tunnel had been driven 57 feet in a southwesterly direction, but no commercial coal seam had been found. Four men were employed. Fireboss (on permit), Edward W. Pechr.

White Lake (49° 119° S.W.)

White Lake Coalfield

On January 8th, Coal Licence No. 67, covering the east half of Section 34 and the west half of Section 35, Township 53, Similkameen Division of Yale District, was granted to John Luttin. On January 27th, Coal Licence No. 68, covering the east half of Section 35 and the west half of Section 36, Township 53, was also granted to John Luttin. These two licences cover 2 square miles in the White Lake coalfield. The coal exposures are from 2 to 2½ miles in a straight line southwest of Okanagan Falls, and about 15 miles by road south of Penticton. During the past sixty years several attempts have been made to develop this coalfield, and many inquiries have been made as to its potential value. At least seven seams have been reported, the two thinnest being less than 1 foot thick and the thickest ranging from 48 to 55 inches, including two rock partings. The most active period of development was during the years 1926, 1927, and 1933, and the total output of coal reported during these three years amounted to 1,232 tons. In addition to the recorded production, some coal was mined about fifty-five years ago and was used for blacksmithing purposes at the gold mines in the Fairview camp.

A sample of coal taken in 1949 from a disused bin on Lot 35 was analysed at the Department of Mines laboratory in Victoria, with the following result: Moisture, 0.9 per cent; volatile combustible matter, 16.5 per cent; fixed carbon, 67.5 per cent; ash, 15.1 per cent; sulphur, 2.5 per cent; gross calorific value, 13,190 B.t.u. per pound. In the summer of 1954 two diamond-drill holes were put down near the portal of the old No. 3 mine, but these did not add to the information already available. The drilling constituted the only development in 1954.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1920, p. 158; 1926, pp. 219, 412; 1927, p. 448; 1931, p. 136; 1933, pp. 172, 336. *Geol. Surv., Canada,* Mem. 69, pp. 247–253.]

EAST KOOTENAY INSPECTION DISTRICT

By D. R. Morgan

Coal-mining operations in the East Kootenay Inspection District during 1954 were under the direction of two companies and comprised underground and open-cast mines in the Crowsnest Pass area. The production of coal was 1,169,788 tons, a decrease of 85,832 tons from the 1953 production. Most of the operations were carried out by The Crow's Nest Pass Coal Company Limited, whose mines, situated at Michel and Coal Creek, produced 1,038,688 tons, a decrease of 84,850 tons from the 1953 output. The remainder of production was obtained by Coleman Collieries Limited, of Coleman, Alta., which conducts a large stripping operation on both sides of the interprovincial boundary at Tent Mountain, near Corbin. This company produced 131,100 tons from the British Columbia side in 1954, a decrease of 982 tons from 1953. The production of both companies was curtailed by the loss of a considerable number of working-days owing to the present state of the coal market.

The accident rate for the district in 1954 showed a substantial improvement, which was brought about mainly by a marked drop in the number of accidents at Michel Colliery. Eleven serious accidents were reported under section 59 of the "Coal-mines Regulation Act," one of which was fatal. This was five serious accidents less than in 1953, and four less fatalities. Minor accidents totalled 236, of which 204 occurred underground and thirty-two on the surface, a total that was ninety-four less than in 1953. The serious accidents were classified as follows: Two caused by falls of rock and coal; seven involving haulage and machinery; one struck by timber sliding down incline; and one by falling down a coal-chute (fatal). No accidents were reported from the British Columbia side of the stripping operation at Tent Mountain.

A successful mine-rescue and first-aid competition was held under the direction of the East Kootenay Mine Safety Association at Kimberley on June 19th. Seven teams from Fernie, Michel, Kimberley, and Copper Mountain entered the mine-rescue competition, and the British Columbia Department of Mines shield was won by the Coal Creek No. 1 team, captained by David Brown. In the first-aid competitions there were 185 entries, and the men's first-aid cup and shield were won by the Sullivan mill team from Kimberley, captained by R. I. Ralph. Presentation of the regional Ryan Trophy was made by the Chief Inspector of Mines to Elk River Colliery for the best safety record in 1953 for the coal mines of British Columbia.

The Crow's Nest Pass Coal Company Limited

T. G. Ewart, president, Fernie; Thomas Balmer, vice-president, 305 Great Northern Railway Building, Seattle, Wash.; H. H. Gardner, general manager, Fernie; James Littler, general superintendent, Fernie; A. L. McPhee, treasurer, Fernie; W. R. Prentice, secretary, Fernie. This company owns extensive coal lands in the Crowsnest area and has conducted large-scale coal-mining operations at Michel and Fernie since 1897. The head offices are at Fernie, and present operations include the Michel Colliery at Michel and Elk River Colliery at Coal Creek. Michel Colliery, the larger of the two, consists of extensive underground workings, a stripping operation, a by-product plant, and a briquette plant. Construction of the briquette plant was commenced in 1953 and was completed in February, 1954.

MICHEL COLLIERY.—(49° 114° N.W.) William Chapman, manager; Irving Morgan, senior overman; Walter McKay, safety inspector; Glyn Parry, afternoon shiftboss.

The colliery is situated at Michel, on the Crowsnest branch of the Canadian Pacific Railway, 24 miles east of Fernie. It is the oldest operation of the company and has the largest coal production in the district. The colliery comprises five mines developed in three different seams, the mines being named according to the seams in which they are located and the direction in which they are developed. Four of the mines are developed off a pair of rock tunnels driven into the synclinal structure of the coal measures on the south side of Michel valley and the other, the "A" North mine, is being developed on the north side of the valley. Air is supplied to each mine by a separate ventilation fan. The chief motive power used underground is compressed air, which is supplied by three electric and two steam-driven compressors on the surface; two other compressors supply high-pressure air for use in the compressed-air locomotives. Electricity is used for driving some of the conveyors in "A" West mine, and was introduced into "A" North mine and the slope district in " B " seam in 1954. Haulage is by compressed-air locomotives on all the main levels, with the exception that in "A" North mine a small diesel locomotive was used for the greater part of the year and was replaced by a battery locomotive in December. The production of all the mines is cleaned and treated for market at a modern preparation plant on the site of the colliery.

The combined underground operations of the colliery are under the direct supervision of six overmen, one shiftboss, and twenty-five firebosses.

"A" East Mine.—William Gregory, overman; Frank McVeigh, Harry Saunders, Frederick Nash, David Thewlis, Sr., and Stephen Lazaruk, firebosses.

This mine, on the left side of the tunnels in the "A" seam, is on the eastern limb of the Michel syncline. The seam averages 10 feet thick and dips 20 degrees in a south-westerly direction. The coal is of good quality and is friable and gassy; the roof is weak and requires careful attention to its support. The mine is worked on the room-and-pillar method, and the pillars are extracted on the retreat.

The coal in the rooms is generally cut by compressed-air coal-cutters or blasted off the solid by the use of millisecond delay detonators, and is loaded by duckbill-equipped conveyors. The pillars are extracted by the shortwall method and, as the coal is friable, pneumatic picks are used to advantage and only occasional shots are necessary. The coal from the pillars is loaded by hand on to shaker-conveyors and transferred to loading points in the rooms by shaker, chain, and belt conveyors. From these loading points the coal is hauled in trips of cars by compressed-air hoists to the main east level, and from there by compressed-air locomotives.

The operations in 1954 were confined mainly to two sections of slope workings known as No. 1 and No. 3 slope districts. An average of 550 tons of coal was produced per day with a crew of 120 men. Most of the production was obtained from the No. 3 slope district, where considerable extraction of pillars has been carried out on the left side of the main slope. This work is nearing completion, and the present operations are confined to a small section of dip workings below No. 7 room that were developed in 1954 to prolong the life of the district. The No. 1 slope district (outby No. 3) is being developed off the main east level preparatory to completion of No. 3 slope district. In general, the conditions prevailing at the mine were found to be satisfactory during the course of inspections.

The mine is ventilated by an electrically driven aerodyne fan which delivers 100,000 cubic feet of air per minute at a 4.6-inch water-gauge. The ventilation was usually found to be satisfactory, but during one period difficulty was experienced in ventilating the working-places in No. 3 slope district, and this difficulty was overcome by driving a new return airway for this section of workings to increase the quantity of air reaching the faces. Difficulties were also experienced at times in coursing the air to the faces of the pillar extractions in this section due to leakages of air through the extensive gobs. Various quantities of methane were found on occasions at the faces, and were immediately dispersed.

"A" West Mine.—Harry Corrigan, overman; James Walsh, Thomas Krall, John McInnes, Reginald Taylor, Robert Taylor, Stanley Menduk, and Mario Pettoello, firebosses.

This mine, like the "A" East mine, is in the "A" seam on the eastern limb of the Michel syncline. It is entered on the right side of the tunnels and all the workings are toward the outcrop. The seam ranges in thickness from 10 to 28 feet, is of good quality, and dips from 20 to 35 degrees to the west.

The system of working is by the room-and-pillar method, the pillars being extracted on the retreat. Rooms are driven on the strike of the seam, and the coal at the faces of the rooms is mined by shortwall coal-cutters, and then blasted. The coal in all the working-places on the pitch of the seam is blasted off the solid by the use of millisecond delay detonators. The broken coal is loaded by duckbill conveyors on to shaker and chain conveyors, and is transferred to a central loading point on the main west level by a series of belt-conveyors. The total production of the mine is loaded at this point, and large trips are hauled to a parting in the rock tunnel by compressed-air locomotives. Both compressed air and electricity are used for driving the equipment in this mine, the latter being confined to operating the series of belt-conveyors on the main incline. Electricity was introduced into this part of the mine in 1953, when six compressed-air

motors on the conveyors were replaced by six 20-horsepower electric motors of permissible type. Their operation to date has been successful, and it is expected that the use of electricity will be extended as the incline is developed.

This mine is the largest producer at the colliery and has an average daily output of 825 tons with 150 men employed. Most of the production in 1954 was obtained by extracting pillars from two sections of the mine known as No. 4 and No. 7 belt-road sections. In No. 7 belt-road section the seam is 28 feet thick and the pillars are extracted by the caving system. All the roadways in this section are driven on the footwall of the seam, and the top coal on the roadways is supported by timber sets. During retreat the sets are withdrawn and the coal is allowed to fall or is blasted by the use of millisecond delay detonators into the roadways, from where it is loaded by duckbill conveyors. The rooms are driven at 45-foot centres from the development raises, and the workings are partitioned into panels leaving 60-foot pillars between the panels to support the main roof. When extraction is complete, each panel is sealed at the entrances of the raises. A similar series of panels is now being developed off No. 3 belt-road, and it is expected the process will be repeated above the 4,600-foot elevation. The seam in No. 4 belt-road section of the mine is of normal thickness, and the pillars are extracted in the ordinary manner.

The mine is ventilated by a Sirocco double-inlet fan driven by a 100-horsepower electric motor, at the outcrop on the mountainside. The fan delivers 65,000 cubic feet of air per minute at a 1.5-inch water-gauge. Very little gas is given off by the coal, and the ventilation was generally found to be satisfactory during 1954.

"A" North Mine.—John Whittaker, overman; Thomas Slee, Henry Eberts, and Sidney Hughes, firebosses.

This mine is operated in the "A" seam on the north side of Michel valley, approximately half a mile east of the preparation plant. At present it is at an early stage of development, and is worked by a crew of fourteen men producing 80 tons per day. Physical conditions so far encountered seem favourable, and it is anticipated that the mine will develop into a large operation.

The seam is 12 feet thick, of good quality, and the dip ranges from 15 to 20 degrees in the present location. The mine is to be worked by a modified room-and-pillar system, with extraction of the pillars both on the advance and retreat. Present operations include the driving of three companion levels and two inclines off these levels. The coal at all the faces is mined with pneumatic picks or blasted off the solid by the use of millisecond delay detonators. It is loaded on to shaker and chain conveyors by hand, and transferred to points on the main level where it is loaded into 10-ton bottom-dumping cars. These cars are hauled from the mine by locomotive and unloaded into a bin of 50-ton capacity situated on the surface outside the main portal. From this bin the coal is trucked to the preparation plant along the old Erickson strip-mine road.

Electricity was introduced into the mine in 1954, and most of the equipment at present is operated by this means. The equipment is of permissible type, and its operation has been satisfactory. Compressed air for the pneumatic picks is supplied by a portable compressor located outside the mine.

The mine is ventilated by an electrically driven Joy axivane fan which delivers 30,000 cubic feet of air per minute at a 0.3-inch water-gauge. This quantity of air has been found to be sufficient for the needs of the mine in its present state of development.

No. 3 Mine.—William Davey, overman; Roger Pasiaud and Robert Woods, firebosses.

This mine is in No. 3 seam on the western limb of the Michel syncline. The seam is 5½ feet thick, of hard coal, and has a fairly strong shale roof. Considerable development has been carried out since the mine was commenced in 1949 by means of four inclines toward the outcrop, and rooms to the south of the inclines. Development has been abandoned because of adverse conditions, such as dirt bands in the coal and

numerous small faults at higher elevations in the mine. Current operations are confined to extracting pillars already formed at the lower part of the mine, and this work is rapidly nearing completion.

A description of the mine is included in the 1953 Annual Report, but operations have since been considerably reduced. All the electrical equipment was removed in 1954 and transferred to the "A" North mine, and compressed-air equipment is now in use. The stopping of development work has resulted in a 20-per-cent reduction in output, but the mine still produces 200 tons per day with thirty-seven men employed. The coal is mined with pneumatic picks and is conveyed by shaker-conveyors and chutes to a loading point on the main south level.

The conditions in general were found to be fairly satisfactory during the course of inspections. The mine is ventilated by an axivane fan which delivers 85,000 cubic feet of air per minute at a 2.7-inch water-gauge. The fan normally forces the air into the mine but is reversed in the winter months to avoid the formation of ice in the fan drift.

"B" South Mine (South Level District).—Vans Hulbert, overman; Paul Kusnir, Thomas Taylor, Ronald Saad, Harry Parsons, and Andrew Davey, firebosses.

This mine is operated in the "B" seam on the western limb of the Michel syncline. The seam averages 5½ feet thick, is of excellent coking quality, and dips at 30 degrees beneath a roof of strong shale. The method of working is by a modified room-and-pillar system with pillar extraction on the retreat.

The major operations in "B" South mine are in the South Level district, which has been developed toward the outcrop from the main south level. The district consists mainly of a large panel of workings 1,500 feet wide, developed off three raises driven up the pitch of the seam for a distance of 2,290 feet. Development of this panel has been completed, and most of the pillars have been extracted. Other operations in the district include pillar extraction from a small panel of workings, inby the large panel, known as No. 5 raise panel. Development of this panel was commenced in 1953 but was later abandoned because the seam in this locality contained several dirt bands which increased considerably the percentage of ash in the coal. Further advancement of the main south level has been abandoned for the same reason.

The coal at the faces is mined by shortwall and longwall coal-cutters, or blasted off the solid by the use of millisecond delay detonators. It is conveyed to loading points on the main level by angle chutes, and shaker, chain, and belt conveyors. The average daily production at the end of 1954 was 500 tons with ninety men employed.

The district is ventilated by an axivane fan which delivers 74,000 cubic feet of air per minute at a 4.5-inch water-gauge.

"B" South Mine (Slope District).—William Davey, overman; Henry Batchelor, John Krall, and Robert Doratty, firebosses.

This district is operated off the main south level to the dip of the South Level district. It is entered by No. 3 haulage slope, along which the entire output of the district is hauled. The rooms are driven in pairs from the slope, and are connected by crosscuts and "splits" which later form shortwall faces for extracting the pillars. The length of the rooms is limited to approximately 1,500 feet owing to the presence of a large fault which runs parallel to the slope. Four of the rooms have reached this fault, and pillars are now being extracted from the rooms. Very little advancement of the main haulage slope was made in 1954 because of pumping difficulties. In order to overcome these difficulties two electric pumps were installed at the face of the slope in July, following approval of the Chief Inspector of Mines to introduce electricity into the district. The pumps are driven by 50-horsepower motors of the flame-proof type, and their operation to date has been satisfactory. No other electrical equipment is being used in the district.

The average daily production from the district is 250 tons, with fifty-five men employed. The coal at the faces is mined by pneumatic picks, and because it is friable

no shot-firing is necessary. It is conveyed to loading points on the lower level by shaker and belt conveyors, then hauled in trips of cars to the main south level by compressed-air hoists.

The district is ventilated by the same fan as the " B " South Level district, 35,000 cubic feet of air per minute being circulated through the workings. Difficulties were experienced on a few occasions from gas escaping from the gobs, but in general the ventilation was found to be satisfactory.

In 1954, 106,408 pounds of Monobel No. 4, 4,798 pounds of C.X.L.-ite, and 77,701 electric detonators were used at the colliery in coal and rock blasting. No misfired shots were reported.

Four hundred and twenty tons of limestone dust was used for application to the roadways at the various mines to minimize the coal-dust hazard and for tamping of shots. Monthly mine-dust samples were collected at all mines and analysed. All the samples were above the minimum requirements of incombustible content.

Monthly examinations were made by the miners' inspection committees at all the mines, and a regular meeting was held at the colliery office each month by the pit safety committee. All report books kept at the various mines in accordance with the " Coal-mines Regulation Act " were examined and found in order.

BALDY MOUNTAIN STRIP MINE.—C. M. Matson, foreman. The coal-stripping operations of The Crow's Nest Pass Coal Company are situated on Baldy Mountain, near Michel. Activity in 1954 was confined to No. 4A pit, and was carried out by Mannix Ltd. on a contract basis. The coal at this site is from 40 to 60 feet thick and outcrops at an angle of 45 degrees along the mountainside. It is of fairly good quality, but some sections of the seam have inferior coking properties and sometimes a high moisture content.

Stripping operations commenced at No. 4A mine in October, 1952. The current production exceeds 1,000 tons of coal per day. The mine is 2,300 feet long, and the superincumbent strata have been removed along the strike of the seam to a predetermined cut-line, providing a slope ranging from 45 to 60 degrees in the wall above the seam. The coal is loaded into trucks by power-shovels and hauled along a private road to the preparation plant at Michel, a distance of 5 miles.

Conditions in general during the course of inspections were found to be satisfactory, with the exception of one period when several cracks appeared in the mountainside above the south side of the pit. Several large slides occurred at this point, and it was decided to recover with a dragline as much coal as was safely possible, following which the operation at that portion of the pit was abandoned. A considerable length of pit remains to be mined, and it is estimated that there is a year's supply of coal at the present rate of production. In anticipation of the finish of this mine, another mine-site has been surveyed at a lower elevation on the mountainside. Diamond drilling has also been done to trace the seam farther up the valley.

BY-PRODUCT PLANT.—George Lancaster, superintendent. The by-product plant is on the colliery-site at Michel, and comprises four batteries of Curran-Knowles ovens. The batteries were in constant operation during 1954 and produced 168,983 tons of coke. This was a decrease of 8,807 tons from the 1953 production. No alterations worthy of note were made at the plant, and conditions in general were found to be satisfactory.

BRIQUETTE PLANT.—Charles Sivell, superintendent. This plant is adjacent to the preparation plant at Michel Colliery, and was first put into operation in February, 1954. It is capable of producing 1,200 tons of briquettes per day, but to date its operation has been governed by the number of days worked by the mines. Production in 1954 was 152,852 tons.

The conditions in general were found to be satisfactory during the course of inspections. A description of the plant is given elsewhere in this Report.

ELK RIVER COLLIERY.—(49° 114° S.W.) James E. Morris, manager. This colliery is in the Coal Creek valley, 4 miles east of Fernie. It comprises four mines, which are driven from the outcrops of their respective seams and are all on the south side of the valley. The coal is treated on the site in a modern preparation plant and, following preparation, is transported to Fernie by the Morrissey, Fernie, and Michel Railway for distribution. No alterations were made on the surface in 1954, and a description of the preparation plant is given elsewhere in this Report.

The combined underground operations are under the direct supervision of three overmen, one assistant overman, and sixteen firebosses. A brief description of the mines follows, in descending order of the seams worked.

No. 1 East Mine.—Arnold Webster, overman; John Cairns, Eric Singleton, and James Corrigan, firebosses.

This mine is operated in No. 10 seam, and is half a mile east of the present preparation plant. It is the oldest producing mine at the colliery and has been in operation since 1911, when it was part of the old Coal Creek colliery. The present workings, however, are confined to a small area on the west side of the old workings, and transportation is by way of a new portal at a higher elevation on the mountainside. The old section of the mine was abandoned in August, 1954, following extraction of pillars, although part of the old main roadway is still used as a travelling road for men and horses to the new section of the mine via the old portal. All the workmen from the old section of the mine were transferred to the new section, which is now worked on a double-shift basis.

The mine continues to be an important producer at the colliery, despite the closure of the old section, and has an average daily production of 400 tons of coal with seventy men employed at the end of the year. Most of the production was obtained from development of pillars in No. 1 West section. The coal ranges from 12 to 25 feet thick, of which the top 12 feet is worked and is of good quality. It is very friable and is worked by pneumatic picks, no shot-firing being necessary. The coal is loaded at the faces directly into cars which are hauled by horses to the partings near the main slope. From the partings the cars are hauled in six-car trips to the new portal by a 100-horsepower electric hoist, lowered on a surface incline to No. 4 landing, and then taken in large trips to the preparation plant by steam locomotive.

The underground conditions in general were found to be fairly good during inspections, although difficulty was experienced in maintaining height and width on the roadways in the old section of the mine prior to abandonment due to excessive squeezing induced by the extensive pillar extraction. The mine is ventilated by an electrically driven Sirocco double-inlet fan which delivers 125,000 cubic feet of air per minute at a 2-inch water-gauge. Of this quantity, 98,000 cubic feet is supplied to the active workings and the remainder is circulated through abandoned workings.

No. 9 Mine.—Daniel Chester, overman; Ralph Larner, Albert Littler, Leonard Brett, William Waller, Archie Allen, Henry O'Neil, and Henry Miller, firebosses.

This mine is operated in the No. 9 seam, the main entries being driven from the outcrop at a high elevation on the mountainside above the preparation plant. The coal is of excellent quality and is normally 9 feet thick; the seam pitches at 15 degrees and is overlain by a hard sandstone roof. It is a large mine, worked on the room-and-pillar system, but geological disturbances have restricted further development, with the exception of small areas to the dip in the vicinity of the abandoned workings of the old No. 2 mine in the same seam. In an effort to maintain production and prolong the life of the present workings, it is the intention to extend both No. 1 and No. 5 slopes into the old workings in order to extract some large pillars left in that area. Advance bore-holes have been drilled from both slopes, and a connection was made from No. 5 slope at the end of the year.

Despite these difficulties the mine continues to be one of the larger producers at the colliery, and at the end of 1954 averaged 490 tons per day with 112 men employed. The workings are widely scattered, and comprise three districts from which most of the production was obtained by extracting pillars. The coal at the faces is cut by pneumatic picks and radial-punching machines, or is blasted off the solid by the use of millisecond delay detonators. The coal is conveyed from the faces by conveyors and loaded into cars at various points. The trips of cars are brought to the main level by compressed-air hoists, and are taken out of the mine by a 100-horsepower diesel locomotive. On No. 1 slope, which was driven as a separate entry, the coal is loaded into 10-ton bottom-dumping cars which are hauled up the slope by a 300-horsepower electric hoist on the surface. The cars are unloaded on a ramp outside the mine, and the coal is conveyed by a short belt-conveyor to the retarding conveyor, which transports the entire production of the mine down the mountainside to the preparation plant.

The mine is ventilated by two axivane fans, of which one delivers 90,000 cubic feet of air per minute against a 5-inch water-gauge to the main workings of the mine, and the other 64,500 cubic feet per minute with a 1.1-inch water-gauge to the No. 1 slope section. These quantities were found to be sufficient for the needs of the mine. Small quantities of methane were found near the roof at some of the faces on a few occasions during the course of inspections, but were usually due to defective bratticing.

No. 4 Mine.—James Brown, assistant overman. This is a small mine operated in the No. 4 seam on a single-shift basis. The seam is 8 feet thick and of good quality, but the erratic distribution of ash and frequent occurrence of thin rock bands in the coal complicate its preparation for market. The seam pitches at 15 degrees and is overlain by a shale roof which in many places is so fractured as to require close timbering.

The mine is operated on the room-and-pillar system, the pillars being extracted on the retreat. Rooms are driven 12 feet wide on a slight grade in favour of the load, and are connected by "splits" driven on the pitch which are later utilized as shortwall faces in extracting the pillars. The coal is mined with pneumatic picks, radial-punching machines, and blasted by the use of millisecond delay detonators. It is loaded directly on to cars or conveyors by hand, and the cars are later formed into trips on the partings and taken out of the mine by compressed-air hoists.

During 1954 the mine produced on an average 125 tons of coal per day with twenty-eight men employed. Most of the production was obtained by developing an area of workings on the dip side of the main level. Extraction of pillars on No. 4 incline above the main level was completed early in the year, and the material and equipment were withdrawn. The conditions at the mine in general were found to be satisfactory, although considerable difficulties are caused by an influx of surface water through the roof at the faces in the slope section.

The mine is ventilated by an electrically driven double-inlet Sirocco fan which delivers 32,000 cubic feet of air per minute at a 0.3-inch water-gauge. Normally the mine is ventilated by the exhaust system, but the fan is reversed in the winter months to act as a blower to prevent ice forming on the main level and in the slope. The emission of gas from the coal is slight because of nearness to the surface.

No. 3 Mine.—James Anderson, overman; Roger Girou, David Brown, Michael Tymchuk, Brindley Morris, Kenneth Kniert, and William Verkerk, firebosses.

This is the largest producing mine at the colliery. It is operated in No. 3 seam, which is the lowest seam being worked in Coal Creek valley at the present time. The seam is 17 feet thick under normal conditions, but thickens considerably toward the inner end of the main levels. Only the top 10 feet of the coal is worked, and the seam pitches 20 degrees on an average. The coal is friable and is mined by pneumatic picks, only occasional shots being necessary. It is very gassy, and a large volume of air is required to dilute the gasses effectively. The mine comprises both slope and incline workings and is worked on the room-and-pillar system in a manner similar to the other mines.

In 1954 the average daily production was 450 tons with seventy-five men employed. The major operation was in No. 1 slope section, where both development work and pillar extraction are proceeding. Mining conditions in this district are very favourable, and a considerable amount of pillar extraction was carried out on the north side of the slope. A small number of pillars were extracted during advance on the south side, but operations in this section are mainly concentrated on development work, preparatory to exhaustion of coal on the other side. In No. 4 Incline district, difficulties have been experienced due to faulted ground and the presence of several dirt bands in the coal which increased the percentage of ash considerably. Operations in this dictrict were stopped in July and had not been resumed at the end of the year.

Progress made in driving Nos. 7 and 8 inclines at the innermost section of the mine in 1954 was very slow, owing to the fact that major repairs had to be carried out on the roadways. These inclines are being driven into a large area of virgin coal, and considerable difficulty is being experienced due to the breaking of timber supports under heavy roof pressures.

The mine is ventilated by an electrically driven aerodyne fan which delivers 85,250 cubic feet of air per minute at a 2.7-inch water-gauge. In general, conditions were found to be fairly good during the course of inspections. On one occasion the ventilation in the slope district was insufficient, but it was improved by repairing several stoppings which were found to be leaking. On a few occasions small quantities of methane were found near the roof at some of the working-faces, usually because of defective bratticing.

During 1954, 11,550 pounds of Polar Monobel No. 4, 100 pounds of C.X.L.-ite, and 14,850 electric detonators were used at all the mines at the colliery in coal and rock blasting. Three misfired shots were reported. The shot-firing operations at all the mines were reduced considerably in comparison with former years.

To neutralize the coal dust, 213.5 tons of limestone dust were applied to the underground roadways of the mines and used in shot-firing. Monthly mine-dust samples were collected from all the mines and analysed. All the samples were above the minimum requirements of incombustible content.

Monthly inspections were made at all the mines by the miners' inspection committees, and a copy of each inspection report was forwarded to the office of the District Inspector through the courtesy of the committee members. Meetings were held at the colliery office each month by the safety committees. All report books kept at the various mines in accordance with the "Coal-mines Regulation Act" were examined regularly and were found in order.

Coleman Collieries Limited

(49° 114° N.W.) H. Wilton-Clark, general manager, Coleman, Alta.; Arni S. Halldorson, mine superintendent, Coleman Alta.

Activity by this company in East Kootenay District in 1954 was confined to stripping operations on the interprovincial boundary at Tent Mountain, near Corbin. The operations comprise three open-cast mines which are worked in different seams and are known as Nos. 2, 3, and 4 pits. Most of the operations are on the Alberta side of the boundary.

Coal has been produced in British Columbia from No. 3 pit since 1950. The seam is 100 feet thick, dips at 65 degrees, and passes out of the Province a short distance below the outcrop. Numerous 18-foot benches have been mined along the strike of the seam, and the pit is now at a depth where further extraction is not profitable.

No. 2 pit is operated in an overlying seam a short distance northwest of No. 3 pit but at a much higher elevation. The seam is in the form of a syncline, and work to date has been confined mainly to removal of overburden. A small quantity of coal was obtained from the limbs of the syncline in 1954, and will gradually increase with depth of the workings. The thickness of the seam varies, but it is expected, from information furnished by several diamond-drill holes, that in some places it will be over 100 feet thick.

No. 4 pit is located southwest of the other two pits, and operations to date have been confined to portions of Lots 7215 and 7002 in British Columbia. This operation will later extend into Alberta. The seam ranges from 30 to 60 feet thick, and dips at 65 degrees. The mine was in production throughout 1954.

The production from all the mines is loaded by power-shovels and transported by trucks to the company's preparation plant at Coleman. Nearly all the roadways are on the Alberta side of the boundary.

NORTHERN INSPECTION DISTRICT

By A. R. C. James

The coal mines of the Northern Inspection District produced a total of 40,931 tons of coal in 1954, a decrease of 13 per cent from the peak output of 1953. A decline in production to 36,572 tons in the Telkwa area may be attributed to the change-over from an old mine to a new one, a process which usually involves a period of adjustment. Production in the Peace River area remained at 4,359 tons, about the same as 1953. The increasing use of natural gas in the communities of the Peace River district tends to restrict the market for coal in this area to outlying schools, homes, and military installations.

No accidents were reported from the coal mines of this district during 1954, nor were there any dangerous occurrences.

TELKWA (54° 127° N.E.)

Bulkley Valley Collieries Limited

Company office, Telkwa. F. M. Dockrill, managing director; A. H. Dockrill, superintendent. This is a private company mining coal on a royalty basis on property comprising six Crown-granted lots, Nos. 388 to 392 and 401. The property is on Goat Creek, a tributary of the Telkwa River, about 7 miles southeast of Telkwa.

Four mines were in operation in 1954. The No. 2 mine was in operation for two months to meet local demand for domestic coal. No. 3 mine, the main producer for the past three years, was finally closed on March 30th and the equipment transferred to No. 4 mine, which began production on April 7th. No. 4 is a new mine and is on Lot 401 on the west bank of Goat Creek; it is an underground extension of the strip mine described in the 1953 Annual Report. Operations at the strip mine were completed on March 16th, after 4,739 tons of coal had been mined.

The total production in 1954 was 36,572 tons. This represents a 13-per-cent decrease from the 1953 output, but the average level of production over the past three years has been maintained. Most of the coal was shipped to the Columbia Cellulose plant at Prince Rupert. The mines are connected by a good road with the Canadian National Railway and Highway No. 16 at Telkwa.

No. 2 Mine.—F. Bond, fireboss. This mine is on the west bank of Goat Creek, about 200 feet above river-level, in the southwest corner of Lot 401. The workings are in the Betty seam, which dips westward at 7 degrees. The seam is 13 feet thick and contains two bands of rock 2½ and 1½ inches thick. The top 2 feet of coal is left to form a roof.

Operations in 1954 were confined to the extraction of pillars near the outcrop south of the portal. The mine was operated only in January and February, when a crew of eight men was employed and 1,314 tons of coal was mined. Conditions at the mine were found to be generally satisfactory in the course of inspections, and no accidents were reported.

No. 3 Mine.—G. Mack and L. Gething, firebosses. This mine, on the east side of Goat Creek on Lot 391, was for the past three years the company's largest operation.

The total production since the mine was opened in the fall of 1950 until it closed on March 30th, 1954, was 101,000 tons. The layout and method of working have been described in previous Annual Reports. Operations this year were confined mainly to the extraction of pillars previously blocked out. The extraction of the final pillars near the outcrop proved difficult due to severe crushing.

Working conditions were usually found to be satisfactory in the course of inspections. No accidents were reported.

Strip Mine.—A. H. Dockrill, supervisor. Strip mining was carried out from October, 1953, to March, 1954, on Lot 401 on the west bank of Goat Creek about 700 yards north of No. 2 mine. A seam of coal ranging from 6 to 7 feet thick, which appears to be stratigraphically below the Betty seam, outcrops on the west bank of the creek. The coal measures strike in a northerly direction and dip east at about 20 degrees to form a small shallow syncline underlying the creek valley. Up dip from the outcrop the seam rises at from 6 to 10 degrees to the west under the gently sloping hillsides on the west side of Goat Creek.

During the summer and autumn of 1953 the seam was uncovered for 700 feet along the outcrop (parallel to the creek), and the overburden was stripped for a distance of 25 feet up dip. Production began in October, 1953, and continued until March 16th, 1954; during this period 4,739 tons of coal was mined. A crew of three men was employed, and the coal was mined and loaded into trucks by a Finning D-6 caterpillar with a Hyster ½-cubic-yard shovel. By March it was decided that, owing to the difficulty of dealing with the overburden, it would be more profitable to continue mining the seam by underground methods.

No. 4 Mine.—G. Mack and L. Gething, firebosses. The driving of the main entries of this mine, now the company's principal producer, was begun on April 7th. The No. 4 mine is an underground extension up dip and to the west of the strip mine just described. In the underground workings the seam continues to strike in a northerly direction and dips eastward at 5 degrees. The seam is 6 feet 8 inches thick and, except for irregular thin lenses of pyritic material, the seam section consists of clean coal. The seam is overlain by a thick bed of strong grey shale. The coal is rather friable, and in this it differs very much from the Betty seam. A sample of the seam taken at the face in September gave the following analysis, on an as received basis: Moisture, 2.1 per cent; volatile matter, 32.4 per cent; fixed carbon, 56.3 per cent; ash, 9.2 per cent; sulphur, 1.6 per cent; gross calorific value, 13,570 B.t.u. per pound. The A.S.T.M. (American Society for Testing Materials) classification of this coal is high volatile A bituminous. The sample made a good coke.

As developed up to the present time, the mine broadly comprises two parallel main entries driven up dip in a westerly direction at 100-foot centres. The main conveyor entry has been driven 850 feet from the portal. Nine crosscuts have been driven at intervals of 70 to 100 feet to connect the two entries. Two pairs of levels have been driven in a northerly direction off the main conveyor entry at distances of 350 feet and 550 feet from the portal respectively. The first pair of levels has been advanced 200 feet, and the second pair 470 feet. Rooms have been set off west at 40-foot centres from the second pair of levels. Several small faults and volcanic dykes were encountered in the main entries and other development work in the first 400 feet from the portals. The total amount of development work completed in 1954 amounted to 5,527 feet.

The mine is worked, so far as is practicable, by a mechanized room-and-pillar system. The coal is either blasted off the solid or undercut by a shortwall coal-cutter. Shot-holes are drilled with Siemens-Schuckert E-47 rotary electric drills, of which two are in use. The coal is blasted by means of millisecond delay detonators, and the broken coal is conveyed from the faces of the rooms by shaker and scraper chain-conveyors. A Goodman duckbill unit is also in use to speed up loading. The chain and shaker

conveyors deliver coal on to a Mavor & Coulson 24-inch troughed-belt conveyor in the main entry. This conveyor carries the coal across a bridge over Goat Creek and delivers it on to a screen. Here the run-of-mine coal is separated into plus and minus ¾-inch sized products which are stored in two 150-ton bunkers. The average rate of production is 150 tons per day with a crew of fifty men, of which thirty-six are employed underground and fourteen on the surface. All the machinery is electrically driven and is of modern design. Power is purchased from the British Columbia Power Commission at 440 volts.

Conditions in the mine were usually found to be satisfactory in the course of inspections, and no methane was detected. The mine is ventilated by a 30-inch Sirocco axial-flow fan which circulates approximately 10,000 cubic feet of air per minute.

First-aid arrangements consist of a No. 2 first-aid kit and carrying-stretcher. The superintendent holds an industrial first-aid certificate, and four employees hold other first-aid certificates. A resident doctor is now established in Telkwa.

Cariboo

Bowron River (53° 121° N.W.)

Central Industries Ltd.

Company office, 409, 713 Columbia Street, New Westminster. Earl N. Lehna, managing director. This is a private company formed at the end of 1952 to continue development of the coal lands held under licence by Bowron Coal Company Limited. These coal lands comprise part of Lots 9592 and 9596 on the Bowron River, about 30 miles due east of Prince George.

This property is in the Bowron River coalfield, which comprises Tertiary coal-bearing sediments underlying the Bowron River valley and forming a belt 1½ to 2 miles wide and about 7 miles long. The valley bottom is mantled by gravel, so that outcrops are restricted to the river banks. The coal measures in general strike about north 40 degrees west and dip north at 20 to 60 degrees. The surrounding rocks are largely volcanic.

From 1946 to 1950 the Bowron Coal Company explored coal seams exposed on the west bank of the river on Lot 9593. Seven drill-holes were put down, and a prospect level was driven for a distance of 50 feet along the strike of the formation with the intention of later crosscutting a promising seam which outcrops at river-level under the gravel overburden. Underground work ceased in the summer of 1950, but was resumed by the present company in December, 1952, and was continued until May 21st, 1953. The prospect level was driven 193 feet from the portal and two crosscuts were driven northeast across the dip. One of these struck gravel after being driven 40 feet. The other crosscut, started from a point on the level 65 feet from the portal, was driven a total distance of 83 feet and crossed two seams of coal. The writer visited the property in February, 1954, and measured the following columnar section in the crosscut: Coal, 9 feet (the top of this seam is eroded and is overlain by clay and gravel); fine-grained sandstone, 5 inches; dirty coal, 2 feet 11 inches; mudstone, 7½ inches; coal, 6 inches; bone, 5 inches; coal (interbedded with thin bands of clay and shale), 8 feet 2 inches. The remainder of the section consists of successive lenticular bands of thin coals and dark shales. The beds do not appear to be very regular in thickness, and there is no well-defined roof or floor of the seams. The formation dips 41 degrees northeastward. A channel sample taken from the 9-foot seam of coal at the top of the section gave the following analysis, on an as received basis: Moisture, 3.8 per cent; volatile matter, 41.9 per cent; fixed carbon, 43.1 per cent; ash, 11.2 per cent; sulphur, 1.6 per cent; gross calorific value, 11,700 B.t.u. per pound. The A.S.T.M. classification of this coal is a high volatile B bituminous. The sample made coke.

No further underground work has been done since May, 1953. Up to the middle of 1954, work was concentrated on improving the access road from Buckhorn Lake. About 25 miles of this road has been widened and relocated where necessarry to shorten distances and improve grades. Seventeen culverts have been put in to improve the drainage. The very wet summer caused considerable deterioration of this road, and there is no doubt that a good deal of work remains to be done before it would be fit to carry heavily loaded coal-trucks. An additional 6 miles of the original road remains to be widened and relocated where necessary.

In October the company rented a Keystone drill, and by the end of the year had drilled nine holes in the vicinity of Mine Creek, about half a mile northwest of the adit level. It is the opinion of the management that this would be a more suitable site for a mine, being farther from the river. According to information received from the company, two of the drill-holes cut a coal seam of workable thickness, and the remainder of the holes were put down to test the thickness of the gravel overburden.

Peace River (56° 122° S.E.)

King Gething Mines

Quentin F. (King) Gething, operator and fireboss. This property is on Lot 1039, on the southeastern slope of Portage Mountain at an elevation of 2,300 feet; it is 12 miles by road from Hudson Hope and 72 miles from Fort St. John. The present mine, known as the King Gething No. 3 mine, was started in 1949. The following section is typical of the seam being worked: Coal, 1 foot 7 inches; inferior coal, 9 inches; coal, 4 feet 3 inches; clay ironstone, 8 inches; bottom coal, 1 foot 6 inches. The clay ironstone and bottom coal are not mined. The immediate roof is a fine-grained sandstone. The seam occurs in the lower part of the Gething formation (Lower Cretaceous), which dips at 16 degrees in an easterly direction and forms part of the eastern limb of the Bullhead anticline.

The mine has been developed by two parallel adit levels driven at 100-foot centres due north along the strike of the seam. The upper level has been driven 480 feet and the lower level 610 feet from the portals. These adit levels have been connected by seven raises driven at 50- to 70-foot intervals. The raises have been extended beyond the upper level for distances ranging from 30 to 60 feet. The pillars formed by the raises have been split by a sublevel, driven midway between the two adit levels; this sublevel has been driven 380 feet from the first raise.

The coal is blasted from the solid and hand-loaded into cars which are hand-trammed out of the mine to the tipple. It is then screened by a small gasoline-driven shaker and vibrating screen into lump, nut, and stoker sizes and stored in three 30-ton bunkers.

At the end of 1953 some strip mining was attempted in a small area immediately to the dip side of the portal of the lower adit level, where the thickness of overburden ranges from 4 to 30 feet. This did not prove successful owing to difficulty in removing the sandstone which overlies the seam. However, the slusher equipment used in the strip mining has since been put to good use in driving a third level into the seam from the strip pit. This level has been driven due north along the strike of the seam and is 100 feet down dip from the previously driven lower level. It is 25 feet wide and has been driven 120 feet from the portal.

The mine worked mainly during the winter months. In October a crew of three men was employed. Production in 1954 amounted to 2,604 tons.

Conditions in the mine were found to be fairly satisfactory in the course of inspections. No methane was detected. No accidents were reported.

Reschke Coal Ltd.

Company office, Fort St. John. P. F. Tompkins, managing director; A. Chapple, fireboss. This property is at about 2,600 feet elevation on the steep southern end of a spur of Butler Ridge, 1 mile north of the Peace River. It is 23 miles by road from Hudson Hope and 83 miles from Fort St. John. The seam at present being worked is 4 feet thick and dips at 46 degrees due west. Both roof and floor are a silty shale.

The mine has been developed from two parallel adit levels driven due north along the strike of the seam from the outcrop. The lower level is the main haulage level and intake airway, and the upper level, 330 feet up dip, provides a return airway and alternate exit. The lower level has been driven for a total distance of 1,130 feet from the portal and the upper level 470 feet.

The coal is mined from a series of 30-foot-wide rooms set off from the lower level at 50-foot centres and driven up the full dip of the seam to connect with the upper level. Nineteen rooms have been worked out, and Nos. 20, 21, and 22 rooms are at present being worked. Pillars of coal 15 feet wide are left between the rooms to support the roof.

The coal is blasted off the solid, and is transported by gravity chutes into cars on the level, from which it is brought out of the mine by horses or trammed by hand. In November, millisecond delay detonators were introduced with the object of improving the efficiency of blasting. The shot-holes are drilled with Huwood & Davis compressed-air-operated rotary drills. Power for this equipment is supplied by an air compressor of 240-cubic-feet-per-minute capacity driven by a 75-horsepower Allis-Chalmers diesel engine. The run-of-mine coal is screened on the surface into lump, nut, and stoker sizes and stored in bunkers with a total capacity of 120 tons.

The mine worked four months in the year. The average monthly production was about 300 tons. In November a crew of five men was employed. Conditions were found to be fairly satisfactory in the course of inspections, and no methane was detected. No accidents were reported.

Inspection of Electrical Equipment and Installations at Mines and Quarries

By L. Wardman, Electrical Inspector of Mines

CONTENTS

ELECTRIC POWER

In 1954 electric power was used at fifty-seven properties for operations including mining, concentrating, coal preparation, and quarrying. Of fifty-eight properties using electric power at the end of 1953, one was not operated at all in 1954, and five others closed during the year. Fifty-two properties using electric power were in operation at the end of 1954.

LODE MINES

The kva. generating capacity of privately owned power plants at those mines which were operated in 1954 was as follows:—

Prime Mover	Generator Kva. Capacity
Steam turbines	17,500
Diesel engines	14,151
Water-wheels	13,295
Total	44,946

The electric power produced by these plants was approximately 155,312,000 kilowatt-hours during 1954. These figures are approximate because many of the small plants are not equipped with recording meters and, therefore, the power produced by those plants was estimated. During 1954, 140,548,300 kilowatt-hours of electric power was purchased from public utilities.

In addition to the aforementioned generating capacity, 7,351 horsepower used for direct mechanical application was produced as follows:—

Prime Mover	Horsepower
Diesel engines	5,100
Water-wheels	1,750
Gasoline engines	501
Total	7,351

The connected load at the metal mines which were in operation during 1954 was approximately as follows:—

Equipment	Horsepower
Hoists	6,617
Scraper hoists	5,121
Ventilating fans	3,772
Pumps	3,732
Rectifiers and M.G. sets	8,328
Air compressors	17,306
Crushing equipment	9,143
Sink-float equipment	1,048
Milling and concentrating equipment	40,205
Conveyor systems	892
Workshop equipment	2,700
Miscellaneous equipment	9,362
Total	108,226

For surface and underground haulage there were in use 116 battery locomotives, 99 trolley locomotives, and 5 diesel locomotives.

Placer Mines

Electric power was used at two placer mines. The generating capacity was as follows:—

	Kva.
Diesel-engine-driven generators	110
Hydro-electric	600
Total	710

The connected load was as follows:—

Equipment	Horsepower
Shaft hoists	40
Ventilating fan	5
Air compressors	75
Trommel screens	10
Miscellaneous	20
Total	150

During 1954, 887,398 kilowatt-hours of electric energy was produced at the Noland Mines Limited plant.

One battery locomotive was used for underground haulage.

Non-metallic Mines and Quarries

Electric power was used at five non-metallic mines and quarries for loading, crushing, separating, and conveying the materials removed. At three non-metallic quarries electric power was used only for blasting.

Coal Mines

During 1954 electric power was used at seven coal mines. At one of these mines a small underground pump was used to dewater the mine. After dewatering the mine a diamond-drill hole was opened up and use of the pump was discontinued, leaving only six mines at which electric power was in use at the end of the year. At five of the six mines electric power was used underground. At the other it was used for surface operations only.

The distribution of electric power was as follows:—

Surface

	Horsepower	
Compressed air	5,225	
Ventilation	1,105	
Hoisting	1,075	
Haulage	318	
Coal washing and screening	3,014	
Pumping	415	
Coke production	1,182	
Briquetting	642	
Miscellaneous	237	
Total		13,213

Underground

Ventilation	20	
Hoisting	35	
Haulage	40	
Pumping	268	
Coal-cutters	100	
Coal-loaders	20	
Conveyors	387	
Miscellaneous	14	
Total		884
Total for surface and underground		14,097

One battery locomotive and one diesel locomotive were used for underground haulage.

Oil Wells

In 1954 the "Petroleum and Natural Gas Act, 1954," was enacted. This Act governs the drilling and working of wells, and contains regulations covering the type of electrical equipment which may be used on the drilling rig. Within 25 feet of the hole only equipment suitable for hazardous locations may be used. Seven drilling rigs were visited, and with one exception the electrical equipment was found to require considerable maintenance work to restore it to the required standards.

MINE ELECTRICAL INSTALLATIONS

Following is a brief general description of new electrical installations and of alterations and improvements to existing installations, together with mention of some of the irregularities found at the time of inspection.

LODE MINES

Taku River

Tulsequah Mill (Tulsequah Mines, Limited)

(58° 133° N.W.) No new electrical equipment was installed in 1954. During inspection of the electrical equipment it was found that many of the portable electrical tools did not have their frames grounded. The management was instructed to have cables containing grounding conductors installed on the tools and to have

additional polarized grounding-type receptacles installed. These changes have since been made.

Big Bull (Tulsequah Mines, Limited).—(58° 133° N.W.) Use of the shaft hoist was discontinued in June, and the two mine pumps, power cable, and signal equipment were removed from the shaft. One battery locomotive was moved to the Tulsequah Chief mine.

Tulsequah Chief (Tulsequah Mines, Limited).—(58° 133° N.W.) No new electrical equipment was installed in 1954. At the time of inspection there was temporary lighting-circuit wiring in the power-house, which was to be replaced with permanent wiring in conduit.

Alice Arm

Toric (Torbrit Silver Mines Limited)

(55° 129° N.W.) No additions or alterations were made to the electrical installations in 1954. In December samples of oil from the three 440–13,200-volt transformers at the power plant and from the three 13,200–440-volt transformers at the mill were received for testing for breakdown voltage and acidity. These samples were sent to the British Columbia Electric Company Limited for testing. The results of the tests showed the oil from two of the mill transformers to be unsatisfactory for further use unless filtered. The breakdown voltage on one oil sample was 16,000 volts and the acidity was 0.15. On the other the breakdown voltage was 21,000 and the acidity was 0.2. The unsatisfactory oil has been replaced.

At the time of inspection the mine hoist required an adjustment of the overspeed governor; underground, several motor frames required bonding into the grounding system, and the cap and fuse make-up and storage rooms required rewiring to comply with code regulations. In the mill several temporary wiring installations required replacing with permanent wiring.

Hazelton

Silver Standard Mines Limited

(55° 127° S.W.) Electrical work consisted of moving the D-13000 and U.D. 18A diesel-electric units from the mill power-house to the new power-house. These units, which were formerly stand-by units, are now operated with the Petters units as the load demands. A Mancha Little Trammer and battery-charging equipment was obtained from the Sil-Van Mining Company and installed at the 1506 drift.

A 10-kva. transformer was installed in the lower camp to supply extra power to the new residences which were formerly bunk-houses.

A trammer was moved to the 850 level and a charging-station was installed near the 850 shaft station.

Operation of the mill was suspended on December 11th for an indefinite period.

Red Rose (Western Tungsten Copper Mines Limited)

(55° 127° S.W.) New electrical equipment installed in 1954 was as follows: A D-17,000 Caterpillar diesel engine direct-connected to a 125-kva. generator was installed to augment the generating capacity. The total generating capacity is now 850 kva. To improve the power factor and voltage regulation, three 10-kva. capacitators were installed in the mine and three 15-kva. capacitators were installed in the mill.

The upper tram terminal was destroyed by fire early in 1954. It was rebuilt and rewired.

A high-tension electrostatic separator was installed in the mill. With this machine it was hoped to effect a better mineral separation. A 7½-horsepower pump and motor were installed in the shaft.

Operation of the property was terminated on December 15th, 1954.

At the time of inspection several motor frames in the mine required grounding, and a disconnecting switch was required for the capacitators.

Smithers

Sil-Van (Sil-Van Consolidated Mining and Milling Company Ltd.).—(54° 127° N.E.) Operation of the property was terminated on May 1st for an indefinite period. The electrical installations were as given in the 1953 Annual Report at the time operations ceased.

Cariboo

Wells-Barkerville (53° 121° S.W.)

Cariboo Gold Quartz (The Cariboo Gold Quartz Mining Company Limited) In September, 1954, the company purchased the Island Mountain mine (Aurum claims) and all equipment in the mine. A 2,300-volt line was built from the Cariboo Gold Quartz power plant to the Aurum property. Three 150-kva., 440–2,300-volt transformers were moved from Island Mountain and installed adjacent to the power-house. Two Ruston diesel engines driving 440-volt generators were purchased from the Island Mountain company and were installed in the power-house to supply power for the increased load imposed by the Aurum operation. One diesel is a 4-cylinder 250-horsepower and the other is a 6-cylinder 400-horsepower. These units increase the generating capacity by 500 kva.

Island Mountain (Island Mountain Mines Company Limited).—Operation of the property by Island Mountain Mines Company Limited was terminated in September, and the mine and all equipment in the mine were sold to The Cariboo Gold Quartz Mining Company Limited. The mill and other surface equipment will be sold separately and the company liquidated.

Bridge River

Bralorne (Bralorne Mines Limited) (50° 122° N.W.) No electrical installations were made in 1954. At the time of inspection the management was required to install 3-wire polarized outlets and provide all portable tools with 3-conductor cords so that the tools could be grounded to comply with electrical code regulations.

Pioneer (Pioneer Gold Mines of B.C. Limited) (50° 122° N.W.) New electrical work in 1954 was as follows: Nine fractional horsepower fans were installed in the mine. A powder magazine on the 1300 level and a machine-shop on the 2500 level were wired for lighting only. A new steel-shop was built on the surface and wired for lighting. An aluminium-sheathed power cable and an aluminium-sheathed signal cable have been installed in the manway of No. 5 shaft. Special permission was granted for the installation of these cables.

Preparations were being made to install polarized grounding-type outlets for portable tools.

Copper Mountain

Copper Mountain (The Granby Consolidated Mining Smelting and Power Company Limited) (49° 120° S.W.) Electrical work done in 1954 was as follows: Three transformer-stations, two fans, and several slushers were moved to new underground locations. At the crushing plant automatic controls were installed on the shuttle conveyor and a new waste conveyor was installed. At the concentrator a new ball mill driven by a 150-horsepower 2,300-volt wound-rotor motor was installed. The classifier for this ball mill is driven by a 10-horsepower 440-volt motor. The switchgear for the feeder, conveyor, and classifier motors serving the other ball mills was banked on the reagent floor for greater convenience.

At the time of inspection the service for the motors in the foundry required rewiring as it did not comply with electrical code regulations.

HEDLEY

Nickel Plate and French (Kelowna Mines Hedley Limited)

(49° 120° S.E.) Mining in the Morning Incline area has been discontinued, and all equipment, including the hoist, has been removed from it. No additions were made to the electrical installations in other parts of the mine or in the mill. No additions or alterations were made to the equipment in the French mine. At the time of inspection several blasting leads were installed in such a manner as to be a potential hazard. Instructions were given to have these leads installed correctly.

FAIRVIEW CAMP

Fairview (The Consolidated Mining and Smelting Company of Canada, Limited).—(49° 119° S.W.) Operation of this property was suspended on January 4th, 1954, for a period of eighteen months.

BEAVERDELL

Highland Bell (Highland-Bell Limited)

(49° 119° S.E.) In the summer the power-house at the mine was destroyed by fire. A new power-house was built and wired for lighting. A transmission-line was built from the mill to a new low-level adit. This line is at present transmitting power at 2,200 volts to a fan and compressor. At the mill two 25-kva. 460–2,300-volt transformers step up the voltage for transmission to the mine. At the mine two 25-kva. 2,300–460-volt transformers step down the voltage. At the camp three 10-kva. 2,300–230/115-volt transformers step down the voltage for lighting. At the mine one 10-kva. 460–230/115-volt transformer steps down the voltage for lighting.

At the time of inspection the frames of the portable electrical equipment required grounding by the use of suitable cables containing grounding conductors, together with the use of polarized grounding-type outlet receptacles. The wiring in the assay office and some open wiring in the shops required attention.

GREENWOOD

Providence.—(49° 118° S.W.) No new electrical equipment was installed in 1954. Some improvement in the condition of the electrical wiring was made.

ROSSLAND

I.X.L.—(49° 117° S.W.) This mine was worked intermittently by three partners. At the time of inspection the wiring for the compressor motor was found to be satisfactory, but the lighting-circuit wiring required attention.

SALMO

Erie Creek (49° 117° S.E.)

Arlington

At the time of inspection the following equipment had been added to the mill: Six Denver cells driven by three 10-horsepower motors, a vacuum pump driven by a 7½-horsepower motor, a drum filter driven by a 2-horsepower motor, a sump pump driven by a 5-horsepower motor. The old jaw crusher had been replaced with a 12- by 24-inch crusher driven by a 20-horsepower motor.

Iron Mountain (49° 117° S.E.)

Jersey, Emerald, Feeney, and Dodger (Canadian Exploration Limited)

Electrical work at the various operations of Canadian Exploration Limited consisted of the following: Between the surface substation and the underground crushing plant, 450 feet of 3-conductor paper-insulated lead-covered galvanized-steel-wire-armoured cable was installed. A substation, No. 411, in the Dodger 4200 mine was dismantled. A new substation, No. 420, was built at the end of the Dodger 4200 east drift. Equipment in this station consists of three 600-ampere 50-mva. 5,000-volt oil circuit-breaker panels. In a separate vault in the substation a 75-kva. 2,300–460-volt oil-filled transformer was installed and a 200-ampere 20-mva. 3,000-volt protective oil circuit-breaker set to trip at 50 amperes. Low-voltage equipment installed in the station consists of two Westinghouse 75-ampere 600-volt air circuit-breakers and two size 3 magnetic starters controlling two 50-horsepower fan motors. A 5-kva. 460–230/115-volt transformer was installed to supply lighting.

A 1-kva. 440–220-volt isolating transformer was installed to supply blasting-switches.

A semi-permanent-type unit substation was installed in a shallow vault in the Dodger 4200 north drift. The equipment in the station consists of a 45-kva. 2,300–440-volt non-inflammable dielectric liquid-filled transformer, a 3-kva. 440–220/110-volt transformer for lighting, high- and low-voltage switchgear. From this substation is fed a ramp loader driven by a 50-horsepower motor and a slusher driven by a 50-horsepower motor.

The above-mentioned station is fed through 1,200 feet of 3-conductor paper-insulated lead-covered double-steel-tape-armoured cable.

A 2,200-volt tie line was run between the underground crushing-plant feeder and the Dodger 4200 cable.

The 75-kva. nitrogen-filled transformer in substation No. 410 was exchanged with a 150-kva. nitrogen-filled transformer from No. 407.

No. 2 substation in the Jersey mine was closed and the equipment removed.

A second 45-kva. transformer was installed in substation No. 409, and paralleled on high-tension and low-tension sides.

A new substation, No. 413, was installed on the first level at the tungsten shaft. The equipment installed consists of a 75-kva. 2,300–460-volt dry-type transformer. High-voltage switchgear consists of a 200-ampere 20-mva. oil circuit-breaker set to trip at 100 amperes. Low-voltage switchgear consists of two 75-ampere 600-volt and two 15-ampere air circuit-breakers. A 5-kva. 440–200/100-volt transformer supplies lighting. Two 50-horsepower pumps are supplied from this station.

Other work consisted of removing and replacing equipment.

Electrical equipment installed in the tungsten mill consisted of the following: A 27-kw. screw-type dryer driven by a 15-horsepower motor was added to the drying equipment; four pumps, two driven by 15-horsepower motors and two driven by 7½-horsepower motors were added to the de-sliming circuit; installed for leaching was a filter press driven by a 25-horsepower motor, two agitators driven by 5-horsepower motors, and several pumps driven by motors totalling 10 horsepower; installed for roasting was a fan driven by a 20-horsepower motor, and several smaller motors driving other equipment; motors ranging in size from ¼ to 5 horsepower and totalling 20 horsepower were installed for a pilot mill.

At the time of inspection the equipment in two underground transformer-stations required protection from moisture which was dripping from the back; several blasting-switch circuits required to be effectively isolated. A modification was required to the auxiliary brake control system on the shaft hoist so that the brake would be operative at all times. An automatic discharge device was required for the capacitators in the Jersey concentrator.

An accident took place on Friday, January 15th, 1954, at approximately 11.15 a.m. at the portal substation of the Dodger 4200 tunnel as follows:—

Verne Miller, electrician first class, climbed a pole of the substation "H" frame to change a fuse. On reaching the transformer platform he gripped the conduit containing the 440-volt conductors with his left hand and a 2,300-volt armoured cable with his right hand. He received a shock which burned his fingers and knocked him to the ground. He went to the Dodger repair-shop near by and first aid was immediately called. After receiving first aid he was sent to Nelson hospital. He was released after about three months in hospital, during which time a series of grafts was made. He lost the tip of one index finger.

Investigation of the cause of this accident showed that a 2,300-volt transformer lead had been bent, either by the wind or a falling branch, to within one-quarter of an inch of the 440-volt mains conduit. The grounding wire had been removed from the conduit when the transformers had been changed, and its replacement had been overlooked. Mr. Miller's body made a bond from the conduit to the grounded armoured cable. It is estimated that he received the charging current to ground of between 1,200 and 1,300 volts.

North Kootenay Lake

Riondel (49° 116° N.W.)

Bluebell (The Consolidated Mining and Smelting Company of Canada, Limited).—New electrical work done in 1954 consisted of the following: Two 150-horsepower motors and starting controls were installed on the 525 level at No. 1 shaft to drive two 500-imp.g.p.m. pumps.

One 30-horsepower motor and controls were installed at the 525 level shaft station to drive a sinking-hoist.

At the time of inspection, guards were required on several motor shaft couplings.

Ainsworth (49° 116° N.W.)

Highlander (Yale Lead & Zinc Mines Limited).—No new electrical equipment was installed in 1954. At the time of inspection it was found that the frames of a number of small motors required grounding, an automatic discharge device was required on the capacitators, and the ground fault detecting device needed to be put into operating condition.

Woodbury Creek (49° 116° N.W.)

Can-Amer Mining & Milling Company Ltd.—This mill was operated for only a very short period in 1954. At the time of inspection on June 28th the electrical installation was nearly completed and was found to comply with the electrical code regulations.

Sandon

Silversmith (Carnegie Mines of British Columbia Ltd.) (49° 117° N.E.) At the time of inspection, June 26th, the milling equipment, which had been closed down early in 1954, was undergoing an overhaul before commencing operations. Material was on hand for completing the improvements required to bring the electrical installations within electrical code standards. The improvements required were a fence around the transformer-station, a ground fault indicating device, and grounding of the frames of all ungrounded electrical equipment.

Cody Reco Mines Limited.—(49° 117° N.E.) No alterations or additions were made to the electrical equipment in 1954. The mill was not operated, but one compressor driven by a 125-horsepower electric motor was operated to provide air for development work.

Victor (Violamac Mines (B.C.) Limited).—(49° 117° N.E.) A fan driven by an electric motor was installed in the ore-bin. Otherwise no alterations or additions were made to the electrical equipment in 1954.

SLOCAN LAKE

Western Exploration Company Limited.—(49° 117° N.E.) No alterations were made to the electrical installations in 1954. At the time of inspection several motors required equipment grounds.

NORTH LARDEAU

Spider (Sunshine Lardeau Mines Limited).—(50° 117° N.W.) The mine and mill were closed from March until June, 1954. The electrical equipment was reconditioned when preparations were made to recommence operations.

KIMBERLEY

Sullivan (The Consolidated Mining and Smelting Company of Canada, Limited).—(49° 115° N.W.) Electrical work done in 1954 was as follows:—

Sullivan Mine.—A 100-horsepower fan was removed from the 3350 level and was reinstalled on the 3900 level. Two new 150-horsepower fans were installed on the surface at No. 29 shaft.

Sullivan Concentrator.—A new 150-horsepower motor and drive was installed on the 520 conveyor-belt in the 3800 crushing plant.

A 3-foot Symons crusher and 60-horsepower motor were removed from the tripper floor and were replaced with a screen, conveyor, and tripper to screen the float product for use in the mine. Forty-five horsepower is required for this installation.

Three new pumps driven by 75-horsepower motors were installed next to the turbo plant for fire protection, and a pump driven by a 40-horsepower motor was installed to handle iron concentrate.

Lighting of the secondary ball-mill floor was improved and a number of switches in the mill were replaced.

The installation of the Kimberley substation and alterations at the concentrator substation were completed.

Use of the steam-driven power plant was discontinued in 1953. This plant is now considered obsolete.

WINDERMERE

Mineral King (Sheep Creek Gold Mines Limited) (50° 116° S.E.) The installation of the crushing and milling equipment mentioned in the 1953 Annual Report was completed, and the plant was put into operation. Much of the equipment installed was taken from properties formerly operated by Sheep Creek Gold Mines Limited. One condemned piece of equipment was installed and had to be replaced. The electrical work generally was very well done.

SPILLIMACHEEN

Silver Giant (Giant Mascot Mines Limited) (50° 116° N.E.) Electrical work done in 1954 consisted of the following: A D-375 Caterpillar engine driving a 2,300-volt 185-kva. 4-wire 3-phase 60-cycle generator was installed in the power-house. This unit is used to supply the underground equipment only. It does not feed into the power-house bus. A new 2,300-volt shaft cable was installed from No. 6 level to No. 8 level to supply power for two slushers driven by 60-horsepower motors and two pumps driven by 25-horsepower motors. The voltage is stepped down to 440 volts by three 50-kva. 2,300–440-volt 60-cycle transformers installed on No. 8 level.

The 50-horsepower hoist motor on No. 6 level was replaced with a 75-horsepower motor. New switchgear was installed for the new motor.

During the inspection of electrical equipment on June 22nd, it was found that rearrangement of the transformer-station on No. 6 level was necessary to allow adequate working space, and the temporary wiring in this station required replacing with permanent wiring. Also several lighting circuits in the mill which had been overloaded sufficiently to damage the insulation required rewiring.

HOPE

B.C. Nickel (Western Nickel Limited)

(49° 121° S.W.) Operations at the B.C. Nickel mine were terminated in October for an indefinite period. Early in the year an air compressor driven by a 300-horsepower 2,300-volt synchronous motor was installed to provide additional compressed air. At the time of inspection a potential of 10 volts existed between the water-line and haulage track in the mine. This potential was eliminated by bonding the track to the water-line. Stray potentials are a hazard where electric blasting is used.

HOWE SOUND

Britannia (Britannia Mining and Smelting Co. Limited)

(49° 123° N.E.) Electrical work done in 1954 was as follows: One 35-horsepower and two 50-horsepower slushers were installed in various parts of the mine. A fan driven by a 75-horsepower motor was relocated, a fan driven by a 5-horsepower motor was installed on the 3700 level at the Victoria shaft, and two small fans were removed. A 333-kva. 6900–440-volt 3-phase transformer was installed at No. 5 transformer-station on the 1000 level to supply power for the Empress mine. The three transformers formerly in this station were removed when No. 5 mine was closed.

A 75-horsepower sinking-hoist was installed on the 5100 level at No. 8 shaft. It is expected that sinking at the bottom of No. 8 shaft will be commenced in 1955.

At the Victoria camp the pole-line from the transformer-station to the hoistroom was rebuilt.

A battery-charging station was installed on the 1200 level at No. 1 shaft.

At the mill a 64-inch-diameter 240-volt magnet was installed on No. 1 conveyor, relays were installed to stop six conveyors feeding on to No. 3 conveyor should No. 3 conveyor stop, and the 112-horsepower motor was removed from No. 11 secondary mill and a 75-horsepower motor installed.

At the 4100 yard, permanent wiring was installed in the framing-shed and the temporary wiring was removed.

At the beach assay office a hairpin-type furnace and a 5-horsepower blower motor were installed. A fire in this building in November made it necessary to replace some electrical wiring and repair damaged electrical equipment.

In the copper precipitation plant a 40-horsepower 440-volt motor was installed to drive an air-blower.

At the time of inspection it was found that deterioration of some of the conduit and wiring in the mill had taken place. Also some temporary wiring had been installed for temporary and emergency purposes.

In the mine the cables to No. 1 hoist motor short-circuited, and it was necessary to install temporary wiring to keep the hoist operating. A new distribution panel will be installed at No. 1 shaft substation and new wiring will be installed to the hoist motor.

The light wiring in the Victoria shaft is showing deterioration and will require attention.

The oil circuit-breaker for the Victoria hoist motor was not operating satisfactorily and required attention.

Negligence in the locking of blasting-switches was observed. It was recommended to the management that disciplinary action be taken if, after due warning, a blaster failed to lock the blasting-switches.

Safety devices were required on No. 9 hoist. The management was required to install them without delay.

TEXADA ISLAND

Texada Mines Ltd.—(49° 124° N.W.) A small conveyor driven by a 20-horsepower 3-phase 440-volt 60-cycle motor was installed. Otherwise, electrical work done during the year consisted of maintenance work.

VANCOUVER ISLAND

Upper Quinsam Lake (49° 125° N.W.)

Iron Hill (The Argonaut Co. Ltd.) New electrical work was done as follows: Two 5-horsepower motors were installed in the pre-concentrator; a 5-horsepower motor was installed on the Dillon screen; two xw-6 double-drum Ding separators, 30 inches in diameter and 48 inches long, requiring 29.1 amperes at 230 volts, and each driven by a 5-horsepower motor were installed; a 5-horsepower motor was installed to drive a classifier; a 10-horsepower motor was installed to drive a fan at the secondary crusher; a 200-horsepower magnetic starter was installed on the G-3 gyrosphere; three 5-horsepower motors were installed in the shops to drive respectively a lathe, compressor, and a turret lathe; a 7½-horsepower motor was installed to drive an upsetter; a 22.5-kv. 440-volt 60-cycle Marcus transformer was installed for tempering bits; and a 440-horsepower motor was installed to drive a compressor in the power-house.

The electric motor driving the primary crusher was replaced with a diesel engine.

PLACER MINES

ATLIN

Spruce Creek (59° 133° N.W.)

Noland Mines Limited The U.D. 24 International diesel direct-connected to a 75-kw. Palmer self-regulating alternator was removed from service. It was replaced by a D-17,000 Caterpillar diesel direct-connected to a 125-kw. alternator. This unit will be used in periods when there is insufficient water to supply hydro-electric power.

At the time of inspection it was found that the portable electrical tools required grounding. Otherwise the condition of the electrical installation was satisfactory.

CARIBOO

Hixon Creek (53° 122° S.W.)

Hixon Placers Inc.—A small lighting plant is used for lighting the buildings.

NON-METALLIC MINES AND QUARRIES

McDAME

Cassiar Asbestos Corporation Limited (59° 129° S.W.) The mill equipment was rearranged and additional equipment was installed as follows: The electric-power generating capacity was increased to 1,750.5 kva. by the addition of a 562.5-kva. 2,300-volt diesel-driven alternator; the crushing-plant load was increased to 290 horsepower by the installation of

crushing equipment requiring 215 horsepower; the primary screening load was increased to 13 horsepower by the installation of screens requiring 7 horsepower; the conveyor load was increased to 173 horsepower by the installation of conveyors requiring 34 horsepower; the secondary screening load was increased to 111 horsepower by the addition of screens requiring 61 horsepower; the power required for dust collecting was increased to 47 horsepower by the addition of dust-collecting equipment requiring 35 horsepower; the power required for bagging was increased to 69 horsepower by the addition of bagging equipment requiring 39 horsepower; and the lighting and laboratory testing load was increased to 81 horsepower by the addition of 22 horsepower.

The total connected load at the mill and mine is 1,618 horsepower. In 1954, 2,649,346 kwh. of power was generated.

The switchgear was moved from the walls of the mill switchroom and was installed on metal frames.

An inspection of the above-mentioned installations was made in July, and it was observed that the electrical work had been very well done.

Blubber Bay

Pacific Lime Company Limited.—(49° 124° N.W.) Only electrical blasting equipment is in use in the quarry. At the time of inspection this equipment was found to be in satisfactory condition.

British Columbia Cement Company Limited

Only electrical blasting equipment and electrical welding equipment is in use at the Blubber Bay Quarry (49° 124° N.W.). At the time of inspection some unsatisfactory wiring required replacing. Electrically powered shovels and electrical blasting equipment is in use at Bamberton Quarry (48° 123° N.W.). This equipment was in satisfactory condition at the time of inspection.

Vananda

W. S. Beale Limited.—(49° 124° N.W.) Electrical blasting equipment is used in the quarry, and a small lighting plant is used for lighting the shops. At the time of inspection the blasting equipment was found to be in satisfactory condition, but the lighting-circuit wiring required attention.

Kilgard

Clayburn Company Limited.—(49° 122° S.W.) No major alterations were made to the electrical installations in 1954. At the time of inspection some maintenance work was required on the electrical equipment and lighting circuit.

Coquitlam

Deeks-McBride Ltd.—(49° 122° S.W.) The gravel pit was closed at the time of inspection. Only an electrically powered shovel is used in the quarry. The management was instructed to have temporary splices in the power cable vulcanized before digging operations were commenced.

Gilley Bros. Limited.—(49° 122° S.W.) The use of electric power in the gravel pit was discontinued, and the electrically powered shovel will be kept only as a stand-by.

Windermere

Columbia Gypsum Products, Inc.—(50° 115° S.W.) No alterations were made to the electrical installations in 1954. Except for a few electrical bonds being required, no unsatisfactory conditions were found at the time of inspection.

COAL MINES

NANAIMO (49° 123° S.W.)

Blue Flame (Timberlands) Mine.—No additions were made to the electrical installations in 1954.

No. 8 Mine, Timberlands.—The use of the underground electrically driven pump has been discontinued as the mine is now dewatered through a diamond-drill hole from the lower part of the workings.

NORTH WELLINGTON (49° 124° N.W.)

Carruthers and Wakelam Mine.—No electrical equipment was added during the year. The 3-horsepower electrically driven pump is still in use for dewatering.

COMOX (49° 124° S.E.)

Tsable River Mine (Canadian Collieries (Dunsmuir) Limited)

No alterations were made to the electrical installations in 1954. Some maintenance work was required in the underground pumping-station. Otherwise the condition of the electrical equipment was satisfactory at the time of inspection. The annual reports of the resistance test for the underground cable showed a progressive decrease in insulation resistance since the first test made in 1951. Examination of the cable revealed a slight dent in the wire armour about 2,700 feet from the portal. This section was removed and a splice box installed. The resistance measurements showed a very satisfactory increase after the splice box was installed.

Union Bay Washery (Canadian Collieries (Dunsmuir) Limited)

Coal-bunkers and a screening plant were installed in 1954. The equipment installed consists of the following: Three feeders and a cross-conveyor each driven by a 5-horsepower motor; an incline belt driven by a 20-horsepower motor; a crusher driven by a 30-horsepower motor; a screen driven by a 2-horsepower motor; and a boom loader driven by a 3-horsepower motor.

The electrical work in this plant was found to be satisfactory.

EAST KOOTENAY (49° 114° S.W.)

Michel Colliery (The Crow's Nest Pass Coal Company Limited)

Electricity was introduced into "A" North mine on February 15th by the installation of a short chain-conveyor driven by a 20-horsepower motor. During 1954 additional equipment consisting of the following was installed: A 1½-horsepower electric drill; a loader driven by a 20-horsepower electric motor; three fans each driven by 5-horsepower motors; a shaker-conveyor driven by a 20-horsepower motor; and a tugger driven by a 5-horsepower motor.

All the above-mentioned equipment is permissible coal-mine electrical equipment.

Four second-hand permissible-type battery locomotives were bought for use in "A" North mine.

In November a 6,000-volt cable was installed in the mine to supply a 200-kva. mine-type transformer. All underground electrical equipment will be supplied from this transformer. It was formerly supplied from a 200-kva. transformer on the surface.

Two pumps driven by a 50-horsepower 550-volt 3,600-r.p.m. motor were installed in B Seam slope in "B" mine.

Electrification of No. 3 mine commenced in March, 1954, by the installation of a shaker-conveyor and a chain-conveyor each driven by a 20-horsepower motor. However, in October, 1954, the plan to electrify this mine was abandoned, and all electrical equipment was removed.

At the time of inspection all underground electrical equipment was found to be in satisfactory condition. On the surface, there was temporary wiring in the shops and preparation plant which required removing and replacing with permanent wiring.

A switchroom has been built to house the switchgear in the sludge-screen room. When the electrical work is completed in this room, it will eliminate some of the unsatisfactory wiring in the sludge-screen room.

A new switchroom was built on top of the slack-bin to house switchgear and controls.

In September the electrical system was struck by lightning which damaged three motors. The "A" East mine fan motors had one coil damaged. In the preparation plant a 150-horsepower motor had two coils damaged and a 100-horsepower motor had six coils damaged.

Some trouble was experienced with moisture condensing in the underground electrical equipment during June.

Elk River Colliery (The Crow's Nest Pass Coal Company Limited).—A fan driven by a 50-horsepower 550-volt motor was installed at No. 1 slope, No. 9 mine, and put into service. At the time of inspection the motor frame required grounding. Several small temporary wiring installations in the plant required removing or replacing with permanent wiring.

TELKWA (54° 127° N.E.)

Bulkley Valley Collieries Limited

The No. 3 coal mine was abandoned, and all electrical equipment was moved to the new No. 4 mine. At the time of inspection the new installation was found to be in satisfactory condition. In October a short circuit caused by the condensation of moisture developed in a 5-horsepower motor.

BRITISH COLUMBIA DEPARTMENT OF MINES
LIST OF PUBLICATIONS

The publications listed are available for distribution except as noted. Recent publications for which no charge is made may be obtained from the Department's offices at Victoria, Vancouver, and Nelson.

CHARGES*

A reserve stock of each Annual Report or Bulletin is set aside; the greater part of each issue is distributed free of charge. When the free stock has been exhausted, copies may be obtained from the reserve stock on payment of the price set. The price for a cloth-bound copy of an Annual Report is $1 or $2.50. If a charge is made, application for the Annual Report or Bulletin should be made to the Department of Mines, Victoria, B.C., and should be accompanied by the proper sum, including the tax.

On receipt of a request, two free publications may be supplied to an applicant without charge. If more than two nominally free publications are requested, the applicant should remit 50 cents for each such publication in excess of two.

INDEXES

No. 1.—Index to Annual Reports of the Minister of Mines of British Columbia for the years 1874 to 1936, inclusive. (By H. T. Nation.) Paper bound, $1; cloth bound, $2.

No. 2.—Index to Annual Reports of the Minister of Mines, 1937–43, and Bulletins Nos. 1–17. (By H. T. Nation.) Paper-bound copies, 50 cents each.

No. 3.—Index to Publications of the British Columbia Department of Mines, Annual Reports of the Minister of Mines, 1937 to 1953, and Bulletins Nos. 1 to 35. (Tables listing the recorded production of lode-metal mines and the occurrences of metals in lode deposits are appended.) Paper bound, $2; cloth bound, $4.50.

Index No. 3 incorporates corrections to the 1874–1936 index and replaces the 1937–1943 index.

ANNUAL REPORTS

For each year the entry "free" or the price* charged appears in the following table if the report is available. If neither "free" nor a price is entered, the report for that year is not available for distribution.

Year	Paper Bound[1]	Cloth Bound	Year	Paper Bound[1]	Cloth Bound
1874–1915	.....	.....	1935	Free	.....
1916	50¢	.....	1936	(2)	$1.00
1917	50¢	.....	1937	(2)	1.00
1918	Free	.....	1938	(2)	1.00
1919	50¢	.....	1939	Free	1.00
1920	50¢	.....	1940	Free	1.00
1921	50¢	.....	1941	Free	1.00
1922	50¢	.....	1942	Free	1.00
1923	50¢	.....	1943	Free	.....
1924	.....	.....	1944	Free	1.00
1925	.....	.....	1945	Free	1.00
1926	.....	.....	1946	Free	1.00
1927	Free	.....	1947	Free	1.00
1928	Free	.....	1948	Free	1.00
1929	Free	.....	1949	Free	1.00
1930	.....	.....	1950	Free	1.00
1931	.....	.....	1951	Free	1.00
1932	.....	.....	1952[3]	$1.00	2.50
1933	Free	$1.00	1953[3]	Free	2.50
1934	Free	1.00	1954[3]	Free	2.50

[1] *See* second paragraph under CHARGES.

[2] Parts A to F, bound separately in paper, are available (free) for the years 1936, 1937, and 1938. Part G, "Inspection of Mines," is not available for these years.

[3] The statistical and introductory part of the report for year noted is available as a pamphlet, as is also the Lode-metals section. Other parts of the report are available as unbound separates.

*** NOTE.—All charges for sales within British Columbia are subject to the 5-per-cent sales tax.**

BULLETINS, OLD SERIES

Bulletin No. 2, 1918: Bumps and Outbursts of Gas. (By George S. Rice.)
Bulletin No. 2, 1919: The Commercial Feasibility of Electric Smelting of Iron Ores in British Columbia. (By Alfred Stansfield.)
Bulletin No. 2, 1932: Report on McConnell Creek Placer Area. (By Douglas Lay.)

MISCELLANEOUS

Special Reports on Coal-mine Explosions. (By George Wilkinson, Thomas Graham, and James Ashworth.) 1918. Out of print.
Report on Snowflake and Waverley-Tangier Mineral Properties. (By J. D. Galloway.) 1928.
Report on Mineral Properties of the Goldside Mining Company. (By B. T. O'Grady.) 1935. Out of print.
Elementary Geology Applied to Prospecting. (By John F. Walker.) Revised, 1953. 75 cents.
Possibilities for Manufacture of Mineral Wool in British Columbia. (By J. M. Cummings.) 1937.
Lode-gold Deposits of the Zeballos Area. (By J. S. Stevenson.) 1938. Out of print.
Preliminary Investigations into Possibilities for Producing Silica Sand from British Columbia Sand Deposits. (By J. M. Cummings.) 1941.
Iron Ores of Canada: Vol. I, British Columbia and Yukon. (By G. A. Young and W. L. Uglow, Geological Survey, Canada, Department of Mines.) 1926.
Mining in British Columbia—an outline of the development of the industry, 1953.

BULLETINS, NEW SERIES, STARTING IN 1940

(Free, except as noted.*)

Bulletin No. 1: Aiken Lake Area, North-Central B.C. (By Douglas Lay.) 50 cents.
Bulletin No. 2: Placer-gold Deposits, Wheaton (Boulder) Creek, Cassiar District. (By Stuart S. Holland.) Out of print.
Bulletin No. 3: Fraser River Tertiary Drainage-history in Relation to Placer-gold Deposits. I. (By Douglas Lay.) 50 cents.
Bulletin No. 4: Saline and Hydromagnesite Deposits of British Columbia. (By J. M. Cummings.) Out of print.
Bulletin No. 5: Mercury Deposits of British Columbia. (By John S. Stevenson.) Out of print.
Bulletin No. 6: Geology of Camp McKinney and the Cariboo Amelia Mine. (By M. S. Hedley.) Out of print.
Bulletin No. 7: Lode-gold Deposits of the Upper Lemon Creek area and Lyle Creek-Whitewater Creek area, Kootenay District. (By R. J. Maconachie.) Out of print.
Bulletin No. 8: Preliminary Report on the Bedwell River Area. (By H. Sargent.) 50 cents.
Bulletin No. 9: Molybdenite in British Columbia. (By John S. Stevenson.) Out of print.
Bulletin No. 10: Tungsten Deposits of British Columbia. (By John S. Stevenson and staff of the Department of Mines.) Revised. Out of print.
Bulletin No. 11: Fraser River Tertiary Drainage-history in Relation to Placer-gold Deposits. II. (By Douglas Lay.)
Bulletin No. 12: Reconnaissance in the Area of Turnagain and Upper Kechika Rivers. (By M. S. Hedley and Stuart S. Holland.)
Bulletin No. 13: Supplementary Report on Bedwell River Area. (By H. Sargent.)
Bulletin No. 14: Coal Analyses of British Columbia. (By James Dickson.)

* *See* second paragraph under CHARGES.

Bulletin No. 15: Hydraulic Mining Methods. (By Stuart S. Holland.) Out of print.
Bulletin No. 16: Dragline Dredging Methods. (By Stuart S. Holland.) Out of print.
Bulletin No. 17: An Introduction to Metal-mining in British Columbia. (By Officers of the Department.) Out of print.
Bulletin No. 18: Specimens and Samples—Their Treatment and Use. (By Officers of the Department.)
Bulletin No. 19: The Tuya-Teslin Area, Northern British Columbia. (By K. DeP. Watson and W. H. Mathews.)
Bulletin No. 20: Lode-gold Deposits—
Part II: South-eastern British Columbia. (By W. H. Mathews.) Revised, 1948.
Part III: Central Southern British Columbia. (By M. S. Hedley and K. DeP. Watson.)
Part IV: South-western British Columbia—exclusive of Vancouver Island. (By J. S. Stevenson.) Revised, 1946.
Part V: Vancouver Island. (By J. S. Stevenson.) Revised, 1946.
Part VI: North-eastern British Columbia and Cariboo and Hobson Creek Areas. (By S. S. Holland.) Revised, 1946.
Bulletin No. 21: Notes on Placer-mining in British Columbia. (By Officers of the Department.)
Bulletin No. 22: Geology of the Whitewater and Lucky Jim Mine Areas. (By M. S. Hedley.)
Bulletin No. 23: Calcareous Deposits of the Georgia Strait Area. (By W. H. Mathews.)
Bulletin No. 24: Geology and Coal Resources of the Carbon Creek-Mount Bickford Map-area. (By W. H. Mathews.)
Bulletin No. 25: The Squaw Creek-Rainy Hollow Area. (By K. DeP. Watson.)
Bulletin No. 26: Report on the Stanley Area, Cariboo Mining Division. (By Stuart S. Holland.)
Bulletin No. 27: Geology and Mineral Deposits of the Zeballos Mining Camp, British Columbia. (By John S. Stevenson.)
Bulletin No. 28: Placer Gold Production of British Columbia. (By S. S. Holland.)
Bulletin No. 29: Geology and Ore Deposits of the Sandon Area, Slocan Camp, British Columbia. (By M. S. Hedley.)
Bulletin No. 30: Clay and Shale Deposits in British Columbia. (By J. W. McCammon and J. M. Cummings.)
Bulletin No. 31: Geology of the Sheep Creek Camp. (By W. H. Mathews.)
Bulletin No. 32: Geology and Mineral Deposits of the Shulaps Range, Southwestern British Columbia. (By G. B. Leech.)
Bulletin No. 33: Geology of the Crowsnest Coal Basin with Special Reference to the Fernie Area. (By C. B. Newmarch.)
Bulletin No. 34: Geology of the Yanks Peak-Roundtop Mountain Area, Cariboo District, British Columbia. (By Stuart S. Holland.)
Bulletin No. 35: Geology of the Stanford Range of the Rocky Mountains, East Kootenay District, British Columbia. (By G. G. L. Henderson.)
Bulletin No. 36: Coal Reserves of the Hasler Creek-Pine River Area, British Columbia. (By N. D. McKechnie.)
Bulletin No. 37: Geology of the Cowichan Lake Area, Vancouver Island, British Columbia. (By James T. Fyles.)

WELL SCHEDULES

Schedule of Wells Drilled for Oil and Natural Gas in British Columbia to January 1st, 1954. $1.
Schedule of Wells Drilled for Oil and Natural Gas in British Columbia during 1954. This is a supplement to above schedule.

NOTICES *RE* PUBLICATIONS

Applications are invited from those who wish to receive notices when new publications become available.

MAPS SHOWING MINERAL CLAIMS AND PLACER LEASES

Maps showing the approximate locations of placer-mining leases and mineral claims held by record may be seen at the Central Records Offices at Victoria and Vancouver. Prints are obtainable on request made to the Chief Gold Commissioner at Victoria, and accompanied by the proper sum. The charges* are: Full sheet, $1; half-sheet, 50 cents; quarter-sheet, 25 cents. The maps conform to the reference and mineral-reference maps issued by the Lands Department in size and geographical detail and correspond as to numbers.

PERMITS AND LICENCES UNDER "PETROLEUM AND NATURAL GAS ACT"

Maps showing the locations of permits and licences under the "Petroleum and Natural Gas Act" may be obtained upon application to the office of the Surveyor-General, Department of Lands, Victoria, B.C., accompanied by payment of $3* per sheet.

Monthly reports giving information on changes in permits, licences, and leases held; changes in title to permits, licences, and leases; additions and revisions to permit-location maps, and related matters are available from the office of the Chief Commissioner, Petroleum and Natural Gas, upon application and payment of a fee of $1 per annum.

SETS OF SPECIMENS

Prospectors working in British Columbia, and schools in British Columbia giving instruction in prospecting or related to prospecting, may obtain sets of specimens on payment of the proper charge. Each set includes sixty identified specimens of rocks and minerals. Most of the specimens are about an inch square. The localities from which the specimens were obtained are not indicated.

When applying for a set of specimens, the prospector should give the number of his free miner's certificate or otherwise indicate that he is seriously interested in prospecting. Sets will be supplied for a class or a school on request from the principal, teacher, or School Board. The charge (including tax) in British Columbia is $2.10.

Prospectors in other Provinces and in the United States who are seriously interested in prospecting in British Columbia may be supplied with sets of specimens. The price will be $2.50, provided that the collection can be shipped parcel post by surface mail. Sales outside British Columbia are not subject to the 5-per-cent sales tax.

A request for a set of specimens should be addressed to the Chief of the Mineralogical Branch, Department of Mines, Victoria, B.C., and should be accompanied by the proper sum.

* Charges for sales within British Columbia are subject to the 5-per-cent sales tax, which must accompany the remittance.

LIST OF LIBRARIES

Department publications are being sent to the following Government departments and legislative, university, and public libraries:—

CANADA

Government departments—

Department of Mines and Technical Surveys, Ottawa.
Department of Resources and Development, Ottawa.
Department of Mines and Resources, St. John's, Newfoundland.
Department of Mines, Halifax, Nova Scotia.
Department of Lands and Mines, Fredericton, New Brunswick.
Department of Mines, Quebec, Quebec.
Department of Mines, Toronto, Ontario.
Department of Mines and Natural Resources, Winnipeg, Manitoba.
Department of Natural Resources and Industrial Development, Regina, Saskatchewan.
Department of Mines and Minerals, Edmonton, Alberta.

Legislative libraries—

Library of Parliament, Ottawa.
Legislative Library, Halifax, Nova Scotia.
Legislative Library, Fredericton, New Brunswick.
Legislative Library, Quebec, Quebec.
Legislative Library, Toronto, Ontario.
Legislative Library, Winnipeg, Manitoba.
Legislative Library, Regina, Saskatchewan.
Legislative Library, Edmonton, Alberta.
Provincial Library, Victoria, British Columbia.

University libraries and museums—

Dalhousie University, Halifax, Nova Scotia.
Acadia University, Wolfville, Nova Scotia.
Laval University, Quebec, Quebec.
McGill University, Montreal, Quebec.
Queen's University, Kingston, Ontario.
Royal Ontario Museum of Geology and Mineralogy, Toronto, Ontario.
University of Toronto, Toronto, Ontario.
University of Manitoba, Winnipeg, Manitoba.
University of Montreal, Montreal, Quebec.
University of Saskatchewan, Saskatoon, Saskatchewan.
University of Alberta, Edmonton, Alberta.
University of British Columbia, Vancouver, British Columbia.

Public libraries—

Public Library, Halifax, Nova Scotia.
Public Library, Montreal, Quebec.
Public Library, Toronto, Ontario (Reference Division).
Public Library, Edmonton, Alberta.
Public Library, Calgary, Alberta.
Public Library, New Westminster, British Columbia.
Nelson Municipal Library, Nelson, British Columbia.
Public Library, Prince Rupert, British Columbia.
Public Library, Prince George, British Columbia.
Public Library, Vancouver, British Columbia (Science and Industry Division).
Public Library, Victoria, British Columbia.

ENGLAND

British Columbia House, Regent Street, London, England.
Canada House, London, England.
Joint Library, Institution of Mining Engineers, Finsbury Circus, London, England.

SOUTH AFRICA

Public Library, Johannesburg, South Africa.

AUSTRALIA

Public Library, Sydney, Australia.

UNITED STATES

Government departments and legislative libraries—
- Library of Congress, Washington 25, D.C.
- The Interior Department Library, Washington 25, D.C.
- United States Geological Survey, Washington 25, D.C.
- California State Division of Mines, Ferry Building, San Francisco, California.
- Oregon State Department of Geology and Mineral Industries, 702 Woodlark Building, Portland, Oregon.
- Washington State Division of Mines and Geology, Olympia, Washington.
- Idaho State Bureau of Mines, Boise, Idaho.

University and society libraries—
- Columbia University, New York 27, New York (Document Division).
- University of California, Berkeley, California (Document Division).
- Engineering Societies Library, 29 West Thirty-ninth Street, New York, New York.
- State University of Iowa, Iowa City, Iowa.
- Montana School of Mines, Butte, Montana.
- Oregon State College, Corvallis, Oregon.
- University of Washington, Seattle, Washington.
- University of Nevada, Reno, Nevada.

Public libraries—
- New York Public Library, New York, New York.
- Free Library, Philadelphia Zone 3, Pennsylvania.
- Public Library, Boston, Massachusetts.
- Public Library, Los Angeles, California.
- Public Library, San Francisco, California.
- Library Association of Portland, Portland, Oregon.
- Public Library, Seattle, Washington.
- Public Library, Spokane, Washington.

Lode-metal Deposits Referred to in the 1954 Annual Report

The names of the properties are arranged alphabetically within five areas. Each area consists of the mining divisions listed below. The table shows the principal metals produced or indicated in the deposits in 1954:—

Northern British Columbia.—Atlin, Liard.

Central British Columbia.—Cariboo, Clinton, Omineca, Quesnel.

Coast and Islands.—Alberni, Nanaimo, New Westminster, Skeena, Vancouver, Victoria.

South Central British Columbia.—Greenwood, Kamloops, Lillooet, Nicola, Osoyoos, Similkameen, Vernon.

Southeastern British Columbia.—Fort Steele, Golden, Nelson, Revelstoke, Slocan, Trail Creek.

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Antimony	Uranium	Thorium	Molybdenum	Nickel	Niobium	Mercury	Page
Northern British Columbia																			
Big Bull	Atlin	58° 133° N.W.	1	1	1	1	1	..	2	..	..	..	..	..	..	..	..	..	80
Sunrise	Atlin	59° 133° N.E.	..	..	3	3	3	..	..	..	..	..	..	..	..	..	..	..	80
Tulsequah Chief	Atlin	58° 133° N.W.	1	1	1	1	1	..	2	..	..	..	..	..	..	..	..	..	80
Central British Columbia																			
Cariboo Gold Quartz	Cariboo	53° 121° S.W.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	97
Grotto	Omineca	54° 128° N.E.	3	3	3	3	3	..	..	..	..	..	..	..	..	..	..	..	85
Harrison	Omineca	53° 127° S.E.	3	3	..	..	..	3	..	..	..	..	..	..	..	..	..	..	95
Island Mountain	Cariboo	53° 121° S.W.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	97
Jim	Quesnel	52° 121° N.E.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	98
Lonnie	Omineca	55° 124° N.E.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	96
Lustdust	Omineca	55° 125° N.E.	3	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	96
Mamie	Omineca	54° 127° N.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	95
Nicholson Creek	Omineca	54° 128° N.E.	..	3	3	..	..	..	..	..	..	..	..	..	..	..	..	..	85
Porcupine Mountain	Clinton	51° 122° S.E.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	98
Red Rose	Omineca	55° 127° S.W.	2	2	2	..	..	1	..	..	..	..	..	..	..	..	..	..	86
Sil-Van	Omineca	54° 127° N.E.	2	2	2	1	1	..	2	..	..	..	..	..	..	..	..	..	95
Silver Standard	Omineca	55° 127° S.W.	2	1	2	1	1	..	2	..	..	..	..	..	..	..	..	..	85
Takla mercury mine	Omineca	55° 125° N.E.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	96
Taylor Windfall	Clinton	51° 123° S.E.	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	47
Coast and Islands																			
A.M.	New Westminster	49° 121° S.E.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	152
Anyox	Skeena	55° 129° S.W.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	85
Argus Consolidated	Nanaimo	50° 125° S.E.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	164
B.C. Nickel	New Westminster	49° 121° S.W.	..	..	3	..	..	..	..	..	..	..	..	..	..	3	..	..	161
Blue Grouse	Victoria	48° 124° N.E.	..	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	166
Britannia	Vancouver	49° 123° N.E.	2	2	1	2	1	..	..	..	..	..	..	..	..	..	..	..	163
East	Skeena	56° 130° S.E.	1	2	2	2	..	..	..	..	..	..	..	..	..	..	..	..	83
Granduc	Skeena	56° 130° S.E.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	80
Iron Hill	Nanaimo	49° 125° N.W.	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	166
Iron River	Nanaimo	49° 125° N.E.	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	166
Keystone	New Westminster	49° 121° N.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	113
Lake	Nanaimo	49° 124° N.W.	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	164
Lucky Four	New Westminster	49° 121° S.W.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	159
Paxton	Nanaimo	49° 124° N.W.	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	164
Prescott	Nanaimo	49° 124° N.W.	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	164
Silver Tip	Skeena	56° 130° S.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	83
Sunnyside	Victoria	48° 124° N.E.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	166
Surprise	Skeena	55° 129° N.W.	..	3	3	3	..	..	..	..	..	..	..	..	..	..	..	..	84
Toric	Skeena	55° 129° N.W.	2	1	..	2	2	..	..	..	..	..	..	..	..	..	..	..	83
Yreka	Nanaimo	50° 127° S.W.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	164
South Central British Columbia																			
Bralorne	Lillooet	50° 122° N.W.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	100
Chalco	Lillooet	50° 122° N.W.	..	..	3	..	..	3	..	..	..	..	..	..	..	..	..	..	103

Shipping Mines.—(1) Metal contributed at least 10 per cent of gross value of the shipment. (2) Metal contributed less than 10 per cent of gross value of the shipment.

Non-shipping Mines.—(3) Metal present, indicated by assay or mineralogical determination.

LODE-METAL DEPOSITS REFERRED TO IN THE 1954 ANNUAL REPORT—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Antimony	Uranium	Thorium	Molybdenum	Nickel	Niobium	Mercury	Page
South Central British Columbia—Continued																			
Copper Mountain	Similkameen	49° 120° S.W.	2	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	114
Copper Queen	Greenwood	49° 118° S.W.	1	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	119
D.A.	Greenwood	49° 118° S.W.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	119
Fairview	Osoyoos	49° 119° S.W.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	118
French	Osoyoos	49° 120° S.E.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	116
Gold Bug	Greenwood	49° 118° S.W.	1	1	..	2	2	..	..	..	..	..	..	..	..	..	..	..	119
Gray Rock	Lillooet	50° 122° N.W.	..	3	..	3	..	..	..	..	..	3	..	..	..	..	..	..	104
Highland-Bell	Greenwood	49° 119° S.E.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	118
Nickel Plate	Osoyoos	49° 120° S.E.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	116
North Star	Kamloops	51° 119° S.W.	..	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	48
Paradise	Kamloops	52° 119° S.E.	..	..	..	..	..	..	..	..	..	..	3	..	..	..	3	..	111
Pioneer	Lillooet	50° 122° N.W.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	101
Providence	Greenwood	49° 118° S.W.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	119
Red Star	Similkameen	49° 120° S.W.	3	3	3	..	3	..	..	..	..	..	..	..	..	..	..	..	113
Rexspar	Kamloops	51° 119° N.W.	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	108
Silver Hill	Similkameen	49° 121° S.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	111
Verity	Kamloops	52° 119° S.E.	..	..	..	..	..	..	..	..	..	..	3	..	..	..	3	..	111
W.S.	Greenwood	49° 118° S.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	122
Waterloo	Greenwood	49° 118° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	119
Wellington	Greenwood	49° 119° S.E.	2	1	..	2	1	..	..	..	..	..	..	..	..	..	..	..	118
Williams	Osoyoos	49° 119° S.W.	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	117
Southeastern British Columbia																			
Albion	Slocan	49° 116° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	131
American Boy	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	140
Arlington	Nelson	49° 117° S.E.	1	2	..	1	1	..	..	..	..	..	..	..	..	..	..	..	126
Ayesha No. 5	Slocan	49° 116° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	132
Baltimore	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	137
Banker	Slocan	49° 116° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	131
Beatrice	Revelstoke	50° 117° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	143
Big Chief	Fort Steele	49° 115° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	148
Bluebell	Slocan	49° 116° N.W.	..	2	2	1	1	..	2	..	..	..	..	..	..	..	..	..	130
Boy Scout	Fort Steele	49° 116° N.E.	3	3	3	3	3	..	..	..	..	..	..	..	..	..	..	..	145
Buckeye	Slocan	49° 116° N.W.	..	1	..	1	2	..	..	..	..	..	..	..	..	..	..	..	133
Caledonia	Slocan	50° 117° S.E.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	139
Carilboo	Fort Steele	49° 116° S.E.	..	..	..	3	3	3	..	..	..	..	3	..	..	..	..	..	145
Colti	Golden	51° 116° S.E.	..	..	..	..	..	..	..	..	..	..	3	..	..	..	3	..	150
Cork Province	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	138
Creston Hill	Nelson	49° 116° S.E.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	145
Deadman	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	140
Demon	Golden	51° 116° S.E.	..	..	..	..	..	..	..	..	..	..	3	..	..	..	3	..	150
Dixie Fraction	Slocan	49° 116° N.W.	..	1	..	1	2	..	..	..	..	..	..	..	..	..	..	..	134
Dodger	Nelson	49° 117° S.E.	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	126
Dundee	Nelson	49° 117° S.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	125
Eden and Crescent	Slocan	49° 116° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	131
Emerald	Nelson	49° 117° S.E.	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	126
Enterprise	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	141
Estella	Fort Steele	49° 115° N.W.	..	3	..	3	1	..	..	..	..	..	..	..	..	..	..	..	148
Eureka	Nelson	49° 117° S.E.	1	1	3	1	..	..	..	..	..	..	..	..	..	..	..	..	123
Feeney	Nelson	49° 117° S.E.	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	126
Galena Farm	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	142
Goodenough (Protection)	Nelson	49° 117° S.E.	1	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	124
Grandview	Slocan	49° 117° S.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	137
Granite	Nelson	49° 117° S.E.	1	2	..	2	2	..	..	..	..	..	..	..	..	..	..	..	123
Great Eastern	Nelson	49° 117° S.E.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	124
Hercules (Pataha)	Slocan	49° 116° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	133
Hewitt	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	142
Highland	Slocan	49° 116° N.W.	..	1	..	1	2	..	..	..	..	..	..	..	..	..	..	..	133
Highlander	Slocan	49° 116° N.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	131
Hinckley	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	141
I.X.L.	Trail Creek	49° 117° S.W.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	122
Jack Pot	Nelson	49° 117° S.E.	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	125
Jackson	Slocan	50° 117° S.E.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	138
Jersey	Nelson	49° 117° S.E.	..	2	..	1	1	..	2	..	..	..	..	..	..	..	..	..	126
John (Magnuson)	Nelson	49° 117° S.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	123
Kicking Horse	Golden	51° 116° S.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	151
King	Nelson	49° 116° S.W.	..	3	3	3	..	..	..	..	..	..	..	..	..	..	..	..	144
Kootenay Florence	Slocan	49° 116° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	132

LODE-METAL DEPOSITS REFERRED TO IN THE 1954 ANNUAL REPORT—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Antimony	Uranium	Thorium	Molybdenum	Nickel	Niobium	Mercury	Page
Southeastern British Columbia—Continued																			
Kootenay King	Fort Steele	49° 115° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	148
Krao	Slocan	49° 116° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	131
Lakeview	Nelson	49° 116° S.W.	..	..	..	3	3	..	..	..	..	..	..	..	..	..	..	..	129
Last Chance	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	140
Last Chance	Nelson	49° 117° S.E.	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	125
Leah	Fort Steele	49° 115° S.E.	..	3	..	3	..	..	..	..	..	..	..	..	..	..	..	..	146
Lone Bachelor	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	140
Lulu	Slocan	49° 116° N.W.	..	1	..	1	2	..	..	..	..	..	..	..	..	..	..	..	133
Mamie	Slocan	49° 116° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	131
Mammoth	Slocan	49° 117° N.E.	..	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	141
Mineral King	Golden	50° 116° S.E.	..	2	2	1	1	..	2	..	..	..	..	..	..	..	..	..	148
Molly Mac	Revelstoke	50° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	143
Monarch	Golden	51° 116° S.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	151
Monarch	Slocan	49° 117° N.E.	..	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	141
Noble Five	Slocan	49° 117° N.E.	..	2	..	2	1	..	2	..	..	..	..	..	..	..	..	..	140
Noonday, Silverton	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	142
Noonday (Leadsmith), Cody	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	141
Nugget	Nelson	49° 117° S.E.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	126
Oxide	Nelson	49° 117° S.E.	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	125
Reeves MacDonald	Nelson	49° 117° S.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	129
Regal Silver	Revelstoke	51° 117° N.W.	..	3	..	3	3	1	..	..	..	..	..	..	..	..	..	..	151
Richmond-Eureka	Slocan	49° 117° N.E.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	139
Ruth-Hope	Slocan	49° 117° N.E.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	139
St. Patrick	Slocan	50° 116° S.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	144
Santa Fe (Victoria)	Slocan	49° 116° N.W.	..	3	..	3	..	..	..	..	..	..	..	..	..	..	..	..	130
Scranton	Slocan	49° 117° N.E.	2	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	134
Silver Bear	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	138
Silver Giant	Golden	50° 116° N.E.	..	2	..	1	1	..	2	..	..	..	..	..	..	..	..	..	148
Silversmith	Slocan	49° 117° N.E.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	139
Slocan King	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	139
Slocan Sovereign	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	140
Slocan Star	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	139
Snowdrop	Trail Creek	49° 117° S.W.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	122
Snowflake	Revelstoke	51° 117° N.W.	..	3	..	3	3	3	..	..	..	..	..	..	..	..	..	..	152
Spider	Revelstoke	50° 117° N.W.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	143
Spokane	Slocan	49° 116° N.W.	..	1	..	1	2	..	..	..	..	..	..	..	..	..	..	..	132
Spokane	Nelson	49° 116° S.W.	1	1	..	1	2	..	..	..	..	..	..	..	..	..	..	..	129
Sta-Tite	Slocan	50° 117° S.W.	..	..	..	..	..	..	..	..	..	..	3	3	..	..	..	..	142
Standard	Slocan	49° 117° N.E.	..	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	141
Sullivan	Fort Steele	49° 115° N.W.	2	1	2	1	1	..	..	..	..	..	..	..	..	..	..	..	145
Sun Fraction	Nelson	49° 117° S.E.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	124
Sunrise	Slocan	49° 117° N.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	136
Sunset	Slocan	49° 117° N.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	134
Surprise	Slocan	50° 116° S.W.	2	1	..	2	2	..	..	..	..	..	..	..	..	..	..	..	144
Tecumsie	Slocan	49° 117° N.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	134
Trinket	Slocan	49° 116° N.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	131
Utica	Slocan	49° 117° N.E.	2	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	138
Valparaiso	Nelson	49° 116° S.W.	3	3	..	3	..	3	..	..	..	..	..	..	..	..	..	..	129
Van Roi	Slocan	49° 117° N.E.	2	2	..	1	2	..	..	..	..	..	..	..	..	..	..	..	142
Velvet	Trail Creek	49° 117° S.W.	1	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	122
Victor	Slocan	49° 117° N.E.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	140
Woodbury	Slocan	49° 116° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	133
Yankee Girl	Nelson	49° 117° S.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	125

Shipping Mines.—(1) Metal contributed at least 10 per cent of gross value of the shipment. (2) Metal contributed less than 10 per cent of gross value of the shipment.

Non-shipping Mines.—(3) Metal present, indicated by assay or mineralogical determination.

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LIST OF ILLUSTRATIONS

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