Minister of Mines and Petroleum Resources

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

for the Year Ended December 31

1962

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1963

BRITISH COLUMBIA
DEPARTMENT OF MINES AND PETROLEUM RESOURCES

VICTORIA, B.C.

HON. W. K. KIERNAN, *Minister.*

P. J. MULCAHY, *Deputy Minister.*

J. W. PECK, *Chief Inspector of Mines.*

S. METCALFE, *Chief Analyst and Assayer.*

HARTLEY SARGENT, *Chief, Mineralogical Branch.*

K. B. BLAKEY, *Chief Gold Commissioner and Chief Commissioner, Petroleum and Natural Gas.*

J. D. LINEHAM, *Chief, Petroleum and Natural Gas Conservation Branch.*

Major-General the Honourable GEORGE RANDOLPH PEARKES,
V.C., P.C., C.B., D.S.O., M.C.,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Mineral Industry of the Province for the year 1962 is herewith respectfully submitted.

W. K. KIERNAN,
Minister of Mines and Petroleum Resources.

Minister of Mines and Petroleum Resources Office,
March 31, 1963.

Howard Allan Sharp, engineering assistant with the Petroleum and Natural Gas Branch, British Columbia Department of Mines and Petroleum Resources, died from asphyxiation by hydrogen sulphide gas at 2 p.m. on March 6, 1963, in the Peejay oilfield, 53 miles north of Fort St. John. Mr. Sharp was witnessing a production test being conducted on the well Sinclair et al Peejay d-39-E, and became exposed at 9.30 a.m. to a lethal concentration of the gas when he opened the thief hatch of an oil-storage tank. Mr. Sharp is survived by his wife, Janet Grace, his son, Kevin David, born July 6, 1960, and his daughter, Lynda Christine, born January 7, 1962.

Mr. Sharp was born in Shaunavon, Sask., on August 31, 1935, and was educated there and at Maple Creek. At the time of his death he was enrolled as an engineering pupil with the British Columbia Association of Professional Engineers. After working with Royalite Oil Company Limited for five years as draughtsman and geological and engineering assistant, he joined the Department of Mines and Petroleum Resources at Dawson Creek on March 31, 1958. Mr. Sharp was transferred to the field office at Charlie Lake in June, 1960.

CONTENTS

LIST OF ILLUSTRATIONS

Photographs

Drawings

ANNUAL REPORT OF THE MINISTER OF MINES AND PETROLEUM RESOURCES, 1962

Introduction

A report of the Minister of Mines of the Province of British Columbia has been published each year from 1874 to 1959. Beginning in 1960, it is the Report of the Minister of Mines and Petroleum Resources.

The Annual Report records the salient facts in the progress of the mineral industry, also much detail about individual 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 and Petroleum Resources 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 mineral 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 exploration or production operations 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 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 other British Columbia or Federal Government services of particular interest to the mineral industry of British Columbia. Information concerning mine operations and some of the activities of the Inspection Branch of the Department of Mines and Petroleum Resources 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 Mineral Industry, 1962*

The year 1962 was marked by a high level of activity and of production in almost all phases of the mineral industry of British Columbia. The total value of products, $229,276,385,† the greatest for any year to date, exceeds the previous record year, 1956, by more than $40,000,000. Record production of copper, iron, asbestos, natural gas, and petroleum with high production of most other products and prices, that were generally good, account for the increase. Metals made up 69.6 per cent of the total; industrial minerals, 6.2 per cent; structural materials, 9.3 per cent; and fuels, 14.9 per cent.

The Canadian dollar was at a discount in the United States throughout 1962, reaching a low of less than 92 cents in June. Thereafter it ranged between 92 and 93 cents. Consequently, British Columbia producers of minerals for export gained by the Canadian premium on United States funds, which for the year averaged almost 7 per cent.

As consequences of price movements in the United States and of the exchange premium, the prices of gold, silver, copper, zinc, and iron were significantly higher than in 1961. The United States price for silver began to rise in the latter part of 1961 and rose further in 1962. The average for 1962, 116.029 cents an ounce in Canadian funds, is much higher than for any previous year, including 1919, when the previous record of 105.57 cents was reached. The prices for copper, lead, and zinc in the United States were quite steady throughout 1962. Copper rose about half a cent, and zinc and lead fell about half a cent a pound. Lead had fallen late in 1961 and fell a further half cent early in 1962, but regained half a cent in November. The average price in Canadian funds for lead was 0.71 cents a pound below the 1961 price, for copper the price was higher than 1961 by 2.18 cents a pound, and for zinc higher than 1961 by 0.73 cents a pound.

Gold and silver were produced in lesser quantities than the averages for the preceding decade, although the high price gave silver a value close to the decade average. Lead and zinc both exceeded the decade averages in quantity; lead fell below and zinc exceeded the decade average value.

Copper output established new records in quantity and value. The previous records were for 1929 quantity, 102,793,669 pounds; value, $18,612,850, compared with 1962 quantity, 108,979,144 pounds; value, $33,209,215. The 1962 output was more than three times that of 1961, and reflects the first full year of production of the Craigmont mine, increased capacity of Phoenix Copper Company, and the beginning of production at the Sunro and Coast Copper mines. Bethlehem Copper Corporation started " tuning up " in December, but shipments of copper did not begin until 1963. Phoenix, Sunro and Coast Copper, and Bethlehem are expected to operate at capacity throughout 1963, and it is apparent that a new record for copper production will be set.

Compared with 1961, iron production increased 34 per cent in quantity. The increase reflects production from three new mines, Brynnor Mines Limited, Jedway Iron Ore Limited, and Zeballos Iron Mines Limited, and increased production by Texada Mines Limited. The four mines shipped concentrates averaging from 62 to 66 per cent iron. Higher average grade of concentrates combined with the ex-

* By Hartley Sargent, Chief of the Mineralogical Branch.

† *See* note page A14 *re* adjustment in asbestos pricing in 1962 and preceding years.

change premium gave a significant increase in the average price per ton, and combined with the increase in quantity gave a total value more than 50 per cent greater than that of 1961. The total value for iron includes $533,199 for by-product concentrates converted to pig iron at the Sullivan mine, and brings the combined value of iron concentrates exported from and used in British Columbia in 1962 to $18,326,911. This is by far the greatest value for iron for any year to date and puts it in the fourth place among the metals and also fourth of any mineral product, exceeding oil by $710,000.

The lode-metal mining industry produced just over 11,000,000 tons of ore, of which open-pit copper and iron mines produced nearly one-half.

Industrial minerals established a new record in 1962. The gain came mainly from an increase of about 18 per cent in asbestos. Sulphur sales declined slightly in quantity and more in value. Gains were recorded in fluxes and in granules. Structural-materials production exceeded 1961 and the ten-year average but did not reach the 1957 value.

The fuels group, including coal, petroleum, natural gas, and liquid by-products of natural gas, recorded a great increase over previous values because of a great increase in oil and a considerable increase in natural gas. However, coal continued to decline in quantity and in value. Oil production in 1962 was 9,747,729 barrels, compared with 1,810,984 barrels in 1961, and production of natural gas was 108,699,997 thousand cubic feet in 1962, compared with 95,967,110 thousand cubic feet in 1961. The outstanding increase in oil marks the first year of operation for the Western Pacific Oil and Products pipe-line, bringing British Columbia output to the market in the populous southwestern part of the Province. The combined value for fuels rose to $34,000,000, compared with $11,000,000 as the annual average for the preceding decade. The group contributed almost 15 per cent of the total value of mineral products in 1962, coal contributing 2.7 per cent; natural gas, about 4.5 per cent; and oil, 7.7 per cent.

Exploration for copper was pursued actively in northwestern British Columbia, on Vancouver Island, and in the Merritt-Highland Valley area. Exploration for iron was done mainly on Vancouver Island and the Queen Charlotte Islands. Molybdenum was the objective of much work in central British Columbia. The improved price for silver stimulated activity in the Alice Arm area, and two projects looking toward the discovery of deep silver-lead-zinc ore were started in the Slocan district. Exploration for lode metals included much diamond drilling. Increasing use was made of geophysical and geochemical surveys.

A campaign of airborne magnetometer surveying was carried on at the joint expense of the Geological Survey of Canada and the Department of Mines and Petroleum Resources. This work was done with a nuclear precession magnetometer in northern Vancouver Island, primarily as a research project with the objective of solving problems of airborne magnetometer surveying in areas of high relief.

In the non-metallic field, interest was shown in magnesite in the East Kootenay district and interest was revived in coal at Bowron River.

In northeastern British Columbia, drilling for oil and gas was at an accelerated rate—320 wells were started, compared with 207 in 1961. The total footage drilled was 1,554,408 feet, compared with 1,074,243 feet in 1961. Of the 1962 drilling in proven fields, close to 64 per cent was classed as development, almost 14 per cent as exploratory outpost, and 22 per cent as exploratory wildcat wells. Of the holes completed in 1962, ninety-six were abandoned as dry wells, 163 were completed as oil wells, and seventy-seven as gas wells; 212 new oil wells and thirty-seven new gas wells were placed on production. Intensified development drilling for oil in the latter part of 1961 and in 1962 was stimulated by the construction of the Western Pacific Products and Crude Oil pipe-line, which provides access to the market in the southwestern part of the Province.

The number of lode-mineral claims recorded was 20,602, compared with 19,064 in 1961, and the number of certificates of work issued was 22,957, compared with 16,665 in 1961. Revenue from the sale of free miners' certificates and from recording fees, lease rentals, etc., amounted to $316,672.60, compared with $295,608.88 in 1961.

Revenue to the Government from iron ore subject to royalty amounted to $92,282.17, paid on 369,128.7 long tons of iron concentrates.

Revenue to the Government from petroleum and natural gas amounted to $22,214,283, including rentals, fees, and miscellaneous, $7,183,276; sale of Crown reserves, $11,364,734; royalties—gas, $1,260,419; oil, $2,265,167; processed products, $108,737; miscellaneous fees, $31,950.

At the end of 1962 land held for petroleum and natural gas amounting to 27,665,218 acres was mainly in northeastern British Columbia, but also included holdings in the Groundhog Basin, Chilcotin River, and Flathead River areas. An additional 600,000 acres was held in Hecate Strait and Georgia Strait.

The average number employed through 1962 in placer, lode, coal, industrial-mineral, and structural-material mining was 11,560. Major expenditures by those branches of the industry included: Salaries and wages, $53,693,063; fuel and electricity, $9,315,324; process supplies (inclusive of explosives, chemicals, drill-steel lubricants, etc.), $10,802,386; Federal taxes, $11,413,763; Provincial taxes, $5,861,606; municipal and other taxes, $1,235,473; levies for workmen's compensation (including silicosis), unemployment insurance, and other items, $2,259,387. Dividends amounted to $24,394,297. The lode-mining industry spent $34,274,698 in freight and treatment charges on ores and concentrates. Returns from some operators in the metal-mining and industrial-mineral sections of the industry indicate that they spent $59,089,281 on roads, new construction, machinery, major repairs, and alterations, plus cost of goods, materials, and supplies not chargeable to fixed-assets account. Some of this latter amount is duplicated in the cost of fuel and electricity used and process supplies.

Returns from twenty-seven operators in the petroleum and natural-gas industry show the following expense items: Salaries and wages, $1,829,108; fuel and electricity, $190,235; process supplies, $3,222,413.

In addition to the expenditures shown in the preceding paragraph, and to the information on revenue to the Government contained in an earlier paragraph, the Canadian Petroleum Association presented the following estimates of expenditures: (1) Exploration—(*a*) geological and geophysical work, $7,500,000, (*b*) exploratory drilling, $14,900,000; (2) development drilling, $17,500,000; (3) operation of wells and flow-lines, $3,900,000; (4) operation of gas plants, $1,500,000; (5) capital expenditures, $5,500,000; (6) general—(*a*) taxes excluding income tax, $500,000, (*b*) additional items not including capital expenditure, land acquisition, nor overhead, $3,000,000.

Statistics

The statistics of the mineral industry are collected and compiled and the statistical tables for this Report are prepared by the Bureau of Economics and Statistics, Department of Industrial Development, Trade, and Commerce.

The tabulated statistics are designed to cover mineral production in quantity and value, employment, principal expenditures of the mineral industry, and dividends paid. The data are arranged so as to facilitate comparison of the production records for the various mining divisions, and from year to year (1951, 1958).*

In the 1960 Report, Tables I and II were given new forms, Table VIII has been amalgamated with Table VII, and subsequent tables were renumbered.

From time to time, revisions have been made to earlier figures as additional data became available or errors came to light.

METHODS 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, augmented by some data obtained from the Royal Canadian Mint, from the operators of custom smelters, and from the records of the Petroleum and Natural Gas Branch of the Department of Mines and Petroleum Resources. The values are in Canadian funds. Weights are avoirdupois pounds and tons (2,000 lb.) and troy ounces.

METALS

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 Department of Mines and Petroleum Resources.

PLACER GOLD

The value of placer gold in dollars is obtained from returns received annually from the operators (1958) and other sources. A fineness of 822½ is taken for crude placer gold (p. A 16) if Mint records of the actual fineness are not available. Prior to 1962 the fineness 822½ has been used for all placer gold reported.

LODE METALS, GROSS AND NET CONTENTS, AND CALCULATED VALUE

The gross contents are compiled from the returns made each year by the producers and for any metal are the total assay contents, obtained by multiplying the assay by the weight of ore, concentrates, or bullion.

The value for each principal metal is calculated by multiplying the quantity (gross for gold, net for silver, copper, lead, and zinc) by the average price for the year. The net contents are calculated by taking a percentage of the gross content: in lead ores and concentrates and zinc concentrates—silver, 98 per cent; lead, 95 per cent; zinc, 85 per cent† of the total assay content; and in copper concentrates,

* In these notes, references such as (1958) are to this section of the Report of the Minister of Mines for the year indicated, where additional information will be found.

† For zinc concentrates shipped to foreign smelters the net contents are calculated as the assay content less eight units of zinc per ton of concentrate.

95 per cent of the silver and the total assay content of copper less 10 pounds per ton of concentrates.

Other metals, including by-product metals refined in British Columbia and iron, tin, and tungsten exported as ores and concentrates, are treated similarly, except that quantities and values for several are as reported by shippers for sales in the year. The value of by-product iron ore used in making pig iron at Kimberley has been computed from the value per ton of ore of comparable grade, at the point of export from British Columbia, 1960 and 1961 valuations have been recalculated on this basis.

Industrial Minerals and Structural Materials

Prices for these materials approximate the price at the point of origin. From 1953 to 1961 asbestos was valued at the shipping point in North Vancouver. For 1962 the value has been taken as the value at that pricing point less the shipping cost from the mine to North Vancouver. The values for the preceding years have also been reduced by the amount of the shipping charges.

Average Metal Prices

The methods of computing prices have varied because of changing conditions (1958). The prices are now arrived at by methods given in footnotes to the table of average prices on page A 16.

Fuel

Coal

All coal produced, including that used in making coke, is shown as primary mine production (1959, tables renumbered in 1960). 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 " (p. 258).

*Natural Gas**

Commercial production of natural gas began in 1954. The production shown in Tables I, III, and VIIA is the total dry and residue gas sold; that is, the quantity delivered to the main transmission-line. The quantity is net after deducting gas used on leases, metering difference, and gas used or lost in the cleaning plant. The gross well output is shown in Table 12, page 222. The quantity is reported as thousands of cubic feet at standard conditions (standard conditions—14.4 pounds per square inch pressure, 60° F. temperature up to and including the year 1960, and thereafter 14.65 pounds per square inch pressure, 60° F. temperature).

*Natural-gas Liquid By-products**

This heading covers condensate removed from natural gas in preparation for transmission through the main gas pipe-line. The by-products consist of butane and propane. Prior to the 1962 Report the by-products included butane, propane, and condensate/pentanes plus. Beginning with the 1962 Report, the figure for liquid by-products covers only butane and propane, natural gasoline in quantity and value being included with petroleum. Figures for the preceding years have been brought to conformity with the new practices.

* For petroleum, natural gas, and liquid by-products, production figures are supplied by the Petroleum and Natural Gas Branch of the Department of Mines and Petroleum Resources and are compiled from the monthly disposition report, and Crown royalty statement filed with the Department by the producers.

*Petroleum**

Production of petroleum began in 1955, and is shown in Tables I, III, and VIIA. The quantity is " net sales " (*see* Tables 11 and 14, pp. 221 and 226), reported in barrels (35 imperial gallons=1 barrel). *See* preceding paragraph *re* natural gasoline.

CO-OPERATION WITH DOMINION BUREAU OF STATISTICS

In the interests of uniformity and to avoid duplication of effort, beginning with the statistics for 1925, the Dominion Bureau of Statistics and the various Provincial Departments have co-operated in the collection and processing of mineral statistics.

Producers of metals, industrial minerals, structural materials, coal, and petroleum and natural gas are requested to submit returns in duplicate on forms prepared for use by the Province and by the Dominion Bureau of Statistics.

So far as possible both organizations follow the same practice in processing the data. The final compilation by the Dominion Bureau is usually published considerably later than the Report of the Minister of Mines and Petroleum Resources for British Columbia. Differences between the figures published by the two organizations arise mainly from the facts that the Dominion Bureau bases its quantities of lode metals on returns made by smelter operators, whereas the British Columbia mining statistician uses the returns covering shipments from individual mines in the same period, and the Dominion Bureau uses average prices for metals considered applicable to the total Canadian production, whereas the British Columbia mining statistician uses prices considered applicable to British Columbia production. Peat, included under the classification of fuel by the Dominion Bureau, has not been regarded as mineral or fuel, and accordingly has not been included in the British Columbia statistics of mineral production.

* For petroleum, natural gas, and liquid by-products, production figures are supplied by the Petroleum and Natural Gas Branch of the Department of Mines and Petroleum Resources and are compiled from the monthly disposition report, and Crown royalty statement filed with the Department by the producers.

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	....	....	56.87 ,,	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 ,,	4.68
1947	28.78	35.00	72.000 ,,	20.39 ,,	13.670 ,,	11.230 ,,	5.12
1948	28.78	35.00	75.000 Mont.	22.35 U.S.	18.040 ,,	13.930 ,,	6.09
1949	29.60	36.00	74.250 U.S.	19.973 ,,	15.800 U.S.	13.247 U.S.	6.51
1950	31.29	38.05	80.635 ,,	23.428 ,,	14.454 ,,	15.075 ,,	6.43
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 ,,	6.94
1953	28.31	34.42	83.774 ,,	30.333 ,,	13.265 ,,	10.675 ,,	6.88
1954	27.52	34.07	82.982 ,,	29.112 ,,	13.680 ,,	10.417 ,,	7.00
1955	28.39	34.52	87.851 ,,	38.276 ,,	14.926 ,,	12.127 ,,	6.74
1956	28.32	34.44	89.373 ,,	39.787 ,,	15.756 ,,	13.278 ,,	6.59
1957	27.59	33.55	87.057 ,,	26.031 ,,	14.051 ,,	11.175 ,,	6.76
1958	27.94	33.98	86.448 ,,	23.419 ,,	11.755 ,,	10.009 ,,	7.45
1959	27.61	33.57	87.469 ,,	27.708 ,,	11.670 ,,	10.978 ,,	7.93
1960	27.92	33.95	88.633 ,,	28.985 ,,	11.589 ,,	12.557 ,,	6.64
1961	29.24	35.46	93.696 ,,	28.288 ,,	11.011 ,,	11.695 ,,	7.40
1962	**30.77**	**37.41**	**116.029** ,,	**30.473** ,,	**10.301** ,,	**12.422** ,,	**7.43**

[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.

TABLE I.—MINERAL PRODUCTION: TOTAL TO DATE, LATEST DECADE, AND LATEST YEAR

	Total Quantity to Date	Total Value to Date	Total Quantity, 1953–62	Total Value, 1953–62	Quantity, 1962	Value, 1962
Principal Metals		$		$		$
Gold—placer, crude ..... oz.	5,224,235	96,629,855	61,335	1,724,947	3,456	100,550
,, lode, fine ..... oz.	16,026,856	466,148,590	2,059,312	70,930,206	156,847	5,867,175
Silver ..... oz.	437,347,023	272,255,037	76,882,215	68,895,371	6,186,937	7,178,641
Copper ..... lb.	3,121,339,212	536,449,766	420,875,327	131,044,731	108,979,144	33,209,215
Lead ..... lb.	13,918,259,800	1,060,106,263	3,133,170,503	398,078,015	335,282,537	34,537,454
Zinc ..... lb.	11,866,502,762	1,008,279,885	4,077,880,754	471,594,794	413,430,817	51,356,376
Totals	.....	3,439,869,396	.....	1,142,268,064	.....	132,249,411
Miscellaneous Metals						
Antimony ..... lb.	42,691,896	11,222,327	15,807,170	5,547,678	1,931,397	748,223
Bismuth ..... lb.	5,638,950	9,717,413	1,820,653	3,887,243	228,601	507,494
Cadmium ..... lb.	29,523,851	43,250,223	14,839,726	23,775,316	2,086,692	3,839,513
Chromite ..... tons	796	32,295	.....	.....	.....	.....
Cobalt ..... lb.	1,730	420	.....	.....	.....	.....
Iron concentrates ..... tons	9,722,803	75,886,476	8,634,010	69,376,824	1,793,847	18,326,911
Magnesium ..... lb.	204,632	88,184	.....	.....	.....	.....
Manganese ..... tons	1,724	32,668	.....	.....	.....	.....
Mercury ..... lb.	4,163,662	10,409,609	75	250	.....	.....
Molybdenite (MoS_2) ..... lb.	52,171	46,198	9,023	9,500	.....	.....
Nickel ..... lb.	14,188,497	10,570,105	13,907,044	10,482,381	3,476,467	2,902,850
Palladium ..... oz.	749	30,462	.....	.....	.....	.....
Platinum ..... oz.	1,405	134,858	13	1,043	5	375
Selenium ..... lb.	731	1,389	.....	.....	.....	.....
Tin ..... lb.	14,469,474	11,137,426	7,471,968	5,296,019	650,941	442,640
Tungsten (WO_3) ..... lb.	16,019,324	38,663,751	11,132,374	30,639,526	.....	.....
Other	.....	4,477,079	.....	4,455,253	.....	535,537
Totals	.....	215,700,883	.....	153,471,033	.....	27,303,543
Industrial Minerals						
Arsenious oxide ..... lb.	22,019,420	273,201	.....	.....	.....	.....
Asbestos[1] ..... tons	285,933	61,814,006	285,913	61,792,406	55,133	10,297,360
Barite ..... tons	194,127	2,394,020	134,437	2,145,067	6,511	57,062
Bentonite ..... tons	791	16,858	.....	.....	.....	.....
Diatomite ..... tons	2,044	55,310	675	24,595	211	10,228
Fluorspar ..... tons	35,341	784,964	.....	.....	.....	.....
Fluxes ..... tons	3,723,397	6,195,863	863,411	2,468,412	62,743	228,477
Granules ..... tons	179,281	2,466,547	142,554	1,954,329	18,251	311,902
Gypsum and gypsite ..... tons	2,294,572	9,299,402	1,229,157	3,462,317	147,900	443,700
Hydro-magnesite ..... tons	2,253	27,536	.....	.....	.....	.....
Iron oxide and ochre ..... tons	18,108	155,050	.....	.....	.....	.....
Magnesium sulphate ..... tons	13,894	254,352	.....	.....	.....	.....
Mica ..... lb.	.....	185,818	.....	36,820	.....	.....
Natro-alunite ..... tons	522	9,398	.....	.....	.....	.....
Perlite ..... tons	1,112	11,120	1,112	11,120	.....	.....
Phosphate rock ..... tons	3,842	16,894	.....	.....	.....	.....
Sodium carbonate ..... tons	10,492	118,983	.....	.....	.....	.....
Sulphur ..... tons	4,757,974	50,648,723	2,264,628	27,224,770	239,191	2,934,725
Talc ..... tons	1,805	34,871	.....	.....	.....	.....
Totals	.....	134,762,916	.....	99,119,836	.....	14,283,454
Structural Materials						
Clay products	.....	46,260,390	.....	20,065,389	.....	2,507,438
Cement ..... tons	7,867,372	113,796,608	3,839,371	63,371,557	397,435	7,112,890
Lime and limestone ..... tons	.....	32,256,216	4,377,630	14,798,702	559,028	1,513,579
Rock[2] ..... tons	27,911,414	29,711,042	14,596,200	16,424,792	1,897,272	1,284,301
Sand and gravel ..... tons	.....	110,082,367	123,414,931	72,849,704	17,757,391	8,862,767
Stone ..... tons	1,071,826	8,706,725	103,016	1,039,852	8,023	85,290
Not assigned	.....	7,010,452	.....	.....	.....	.....
Totals	.....	347,823,800	.....	188,549,996	.....	21,366,265
Fuels						
Coal[3] ..... tons	136,161,251	569,796,907	10,547,691	73,944,448	825,339	6,133,986
Natural gas—						
To pipe-line ..... M s.c.f.	414,891,356	33,915,721	414,891,356	33,915,721	108,699,997	10,226,323
Liquid by-products[4] ..... bbl.	1,821,195	307,479	1,821,195	307,479	464,036	96,347
Petroleum crude ..... bbl.	15,889,791	26,863,664	15,889,791	26,863,664	[5]9,747,729	17,617,056[6]
Totals	.....	630,883,771	.....	135,031,312	.....	34,073,712
Grand totals	.....	4,769,040,766	.....	1,718,440,241		229,276,385[7]

[1] *See* note under "Industrial Minerals and Structural Materials," page A14.
[2] Rubble, riprap, and crushed stone.
[3] Quantity from 1836 to 1909 is gross mine output and includes material lost in picking and washing. From 1910 and subsequent years the quantity is that sold and used.
[4] Butane and propane.
[5] 8,900,284 barrels of crude petroleum sold and 847,445 barrels of condensate/pentanes plus produced.
[6] Value to producer of $16,845,302 for crude petroleum and $771,754 for condensate/pentanes plus.
[7] Does not include 75,880.4 tons of peat moss valued at $2,703,064.

TABLE II.—TOTAL VALUE OF PRODUCTION, 1836–1962

1836–1910	$375,474,891	1952	$171,203,321	1958	$144,952,994
1911–20	331,334,419	1953	152,840,132	1959	147,638,139
1921–30	533,190,993	1954	152,893,626	1960	177,354,648
1931–40	521,179,200	1955	173,852,478	1961	179,786,043
1941–50	941,352,650	1956	188,853,229	1962	229,276,385
1951	176,865,051	1957	170,992,567	Total	$4,769,040,766

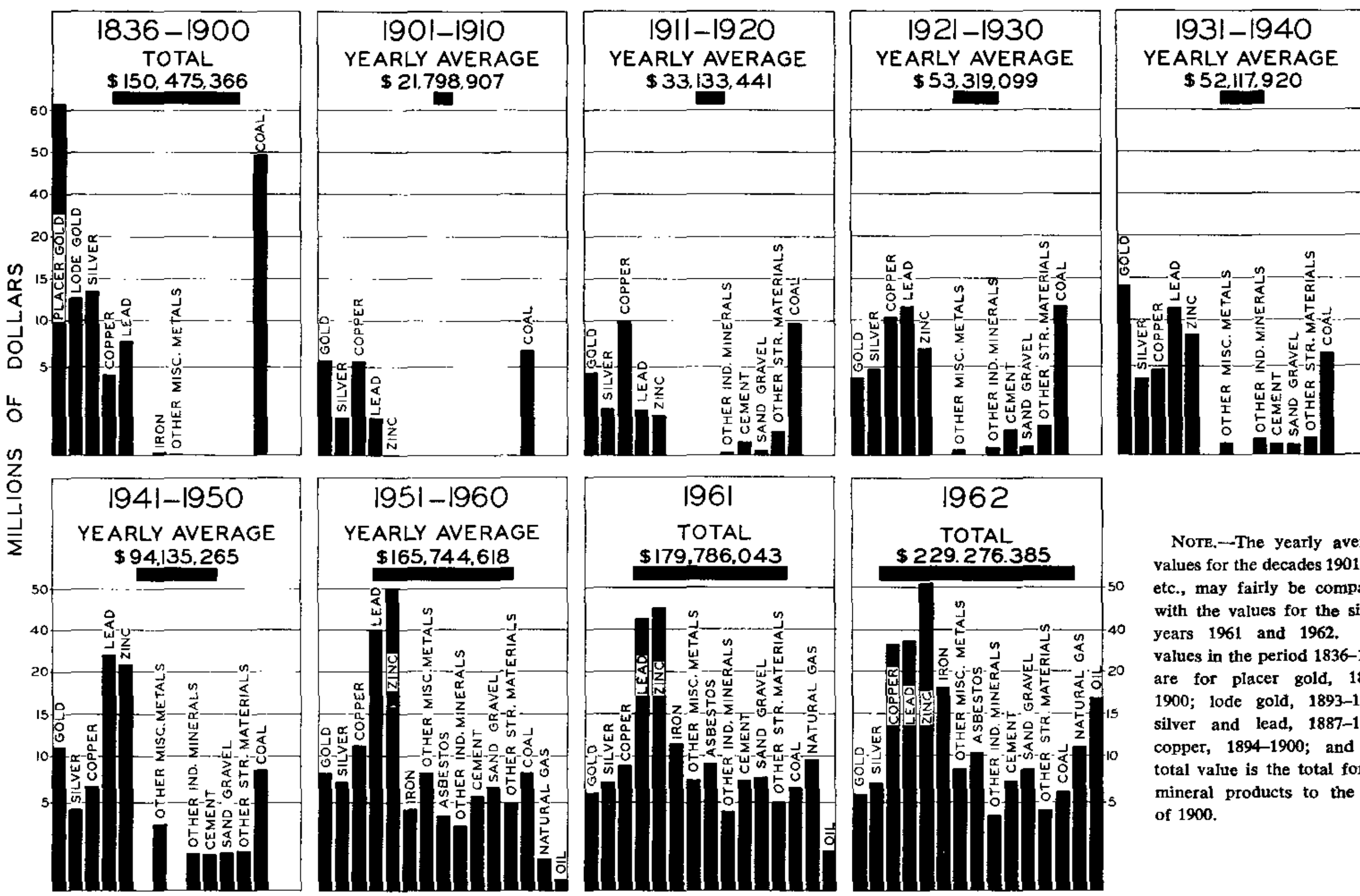
Table III.—Quantity and Value of Mineral Products for Years 1953 to 1962

Description	1953		1954		1955		1956		1957	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Principal Metals		$		$		$		$		$
Gold—placer, crude .... oz.	14,245	403,230	8,684	238,967	7,666	217,614	3,865	109,450	2,936	80,990
„ lode, fine .... oz.	253,553	8,727,294	258,388	8,803,279	242,477	8,370,306	191,743	6,603,628	223,403	7,495,170
Silver .... oz.	8,376,953	7,017,709	9,825,153	8,153,108	7,902,145	6,942,113	8,404,600	7,511,443	8,129,047	7,076,904
Copper .... lb.	49,021,013	14,869,544	50,150,087	14,599,693	44,328,031	16,932,549	43,360,575	17,251,872	31,387,441	8,170,465
Lead .... lb.	297,634,712	39,481,244	332,474,456	45,482,505	302,567,640	45,161,245	283,718,073	44,702,619	281,603,346	39,568,086
Zinc .... lb.	382,300,862	40,810,618	334,124,560	34,805,755	429,198,565	52,048,909	443,853,004	58,934,801	449,276,797	50,206,681
Totals	—	111,309,639	—	112,083,307	—	129,672,736	—	135,113,813	—	112,598,296
Miscellaneous Metals										
Antimony .... lb.	1,551,043	570,474	1,302,333	382,104	2,021,721	667,776	2,140,432	768,843	1,360,731	577,344
Bismuth .... lb.	71,298	157,569	225,351	493,519	160,767	356,903	156,753	346,424	145,634	314,569
Cadmium .... lb.	787,158	1,411,698	680,734	1,123,211	1,593,591	2,677,233	1,937,927	3,236,338	1,946,397	3,172,627
Indium .... oz.	6,752	9,588	477	1,278	104,774	232,389	363,192	795,390	384,360	693,770
Iron concentrates .... tons	991,248	6,763,105	535,746	3,733,891	610,930	3,228,756	369,955	2,190,847	357,342	2,200,637
Mercury .... lb.	—	—	—	—	75	250	—	—	—	—
Platinum .... oz.	—	—	4	408	—	—	—	—	—	—
Tin .... lb.	1,092,228	581,746	587,528	263,359	391,228	311,613	756,934	637,792	709,102	555,936
Tungsten (WO_3) .... lb.	2,168,977	5,950,323	2,172,163	5,752,172	1,914,000	5,460,967	2,264,775	6,351,376	1,921,483	5,240,479
Totals	—	15,444,503	—	11,749,942	—	12,935,887	—	14,327,010	—	12,755,362
Industrial Minerals										
Asbestos[1] .... tons	3,102	779,641	8,599	2,329,906	17,187	3,234,751	20,356	5,398,730	31,714	7,342,966
Barite .... tons	3,560	52,845	5,056	115,337	9,465	238,825	11,436	287,626	20,072	433,200
Diatomite .... tons	—	—	—	—	14	280	40	800	120	2,400
Fluxes (quartz, limestone) .... tons	37,358	110,698	39,897	40,804	111,759	208,198	176,311	392,429	137,433	442,204
Granules (quartz, limestone, granite) .... tons	4,620	59,321	4,541	65,507	6,355	73,858	13,220	173,214	17,295	221,864
Gypsum and products .... tons	172,665	387,655	175,480	421,734	149,719	383,934	72,973	391,919	66,499	142,751
Mica .... lb.	604,000	11,338	284,000	5,326	505,300	2,861	198,000	4,884	180,000	1,200
Perlite .... tons	1,112	11,120	—	—	—	—	—	—	—	—
Sulphur .... tons	151,954	1,590,055	234,252	2,525,500	227,530	2,796,783	212,885	2,523,190	228,882	2,887,465
Totals	—	3,002,673	—	5,504,114	—	6,939,490	—	9,172,792	—	11,474,050
Structural Materials										
Brick—common .... No.	1,382,883	51,381	1,289,911	35,550	4,853,940	232,139	2,248,447	75,767	663,828	24,345
„ face, paving, sewer .... No.	4,307,894	226,459	5,651,262	316,676	3,901,866	248,913	6,913,682	485,176	4,660,231	345,081
„ firebrick, blocks	—	426,783	—	372,528	—	578,578	—	604,063	—	658,873
Clays .... tons	5,226	31,990	6,609	36,425	8,033	46,757	7,985	30,263	3,849	29,495
Structural tile, hollow blocks	—	123,469	—	122,903	—	114,460	—	129,257	—	200,216
Drain-tile, sewer-pipe, flue-linings	—	627,097	—	753,297	—	801,019	—	696,385	—	697,611
Pottery—glazed or unglazed	—	30,012	—	31,081	—	38,035	—	38,385	—	47,612
Other clay products	—	19,267	—	32,697	—	55,514	—	69,659	—	38,868
Cement .... tons	319,645	5,071,260	305,117	4,935,298	334,057	5,474,875	396,138	6,339,071	443,469	7,078,108
Lime and limestone .... tons	338,005	1,357,958	317,976	1,555,002	318,152	1,711,348	396,012	1,220,792	334,303	1,494,578
Rubble, riprap, crushed rock .... tons	770,415	1,122,516	920,707	1,253,856	890,613	962,272	2,028,143	2,210,315	2,364,301	4,272,768
Sand and gravel .... tons	7,564,574	4,388,594	8,547,021	4,850,469	9,650,699	4,886,890	13,762,227	8,535,348	16,829,816	10,503,274
Stone .... tons	2,611	78,252	3,055	99,392	26,079	148,454	35,266	139,150	2,403	236,110
Totals	—	13,555,038	—	14,395,174	—	15,299,254	—	20,573,631	—	25,626,939
Fuels										
Coal—sold and used .... tons	1,384,138	9,528,279	1,308,284	9,154,544	1,332,874	8,986,501	1,417,209	9,346,518	1,085,657	7,340,339
Natural gas delivered to pipe-line .... M s.c.f.	—	—	60,883	6,545	168,651	18,130	187,846	20,143	7,126,346	433,830
Natural-gas liquid by-products[3] .... bbl.	—	—	—	—	—	—	—	—	—	—
Petroleum, crude[4] .... bbl.	—	—	—	—	582	480	148,454	299,322	373,284	763,751
Totals	—	9,528,279	—	9,161,089	—	9,005,111	—	9,665,983	—	8,537,920
Provincial totals	—	152,840,132	—	152,893,626	—	173,852,478	—	188,853,229	—	170,992,567

Description	1958 Quantity	1958 Value	1959 Quantity	1959 Value	1960 Quantity	1960 Value	1961 Quantity	1961 Value	1962 Quantity	1962 Value
Principal Metals		$		$		$		$		$
Gold—placer, crude .... oz.	5,650	157,871	7,570	208,973	3,847	107,418	3,416	99,884	3,456	100,550
„ lode, fine .... oz.	194,354	6,604,149	173,146	5,812,511	205,580	6,979,441	159,821	5,667,253	156,847	5,867,175
Silver .... oz.	7,040,416	6,086,299	6,197,159	5,420,593	7,446,237	6,599,823	7,373,568	6,908,738	6,186,937	7,178,641
Copper .... lb.	12,658,649	2,964,529	16,233,546	4,497,991	33,064,429	9,583,724	31,692,412	8,965,149	108,979,144	33,209,215
Lead .... lb.	294,573,159	34,627,075	287,423,357	33,542,306	333,608,699	38,661,912	384,284,524	42,313,569	335,282,537	34,537,454
Zinc .... lb.	432,002,790	43,234,839	402,342,850	44,169,198	403,399,319	50,656,726	387,951,190	45,370,891	413,430,817	51,356,376
Totals	—	93,674,762	—	93,651,572	—	112,589,044	—	109,325,484	—	132,249,411
Miscellaneous Metals										
Antimony .... lb.	858,633	284,208	1,657,797	540,276	1,651,786	538,482	1,331,297	469,948	1,931,397	748,223
Bismuth .... lb.	154,034	308,068	181,843	345,502	213,009	419,628	283,363	637,567	228,601	507,494
Cadmium .... lb.	1,425,108	2,166,164	1,695,821	2,170,651	1,778,866	2,525,990	907,432	1,451,891	2,086,692	3,839,513
Indium .... oz.	75,434	117,677	—	—	—	—	—	—	—	—
Iron concentrates .... tons	630,271	4,193,442	849,248	6,363,848	1,160,355	10,292,847	1,335,068	12,082,540	1,793,847	18,326,911
Molybdenite (MoS_2) .... lb.	—	—	—	—	9,023	9,500	—	—	—	—
Nickel .... lb.	1,408,490	996,507	1,061,532	743,072	3,779,878	2,645,915	4,180,677	3,194,037	3,476,467	2,902,850
Platinum .... oz.	4	260	—	—	—	—	—	—	5	375
Tin .... lb.	795,496	625,260	747,443	627,852	621,718	522,243	1,119,350	727,578	650,941	442,640
Tungsten (WO_3) .... lb.	690,976	1,884,209	—	—	—	—	—	—	—	—
Others	—	—	—	632,933	—	760,364	—	676,327	—	535,537
Totals	—	10,575,795	—	11,424,134	—	17,714,969	—	19,239,888	—	27,303,543
Industrial Minerals										
Asbestos[1] .... tons	30,078	6,398,679	33,883	7,878,947	40,748	9,482,923	45,113	8,648,503	55,133	10,297,360
Barite .... tons	16,144	341,700	23,142	187,368	23,573	279,716	15,478	151,388	6,511	57,062
Diatomite .... tons	27	540	5	100	44	1,430	214	8,817	211	10,228
Fluxes (quartz, limestone) .... tons	90,635	311,630[2]	70,570	248,913	83,370	294,559	53,335	190,500	62,743	228,477
Granules (quartz, limestone, granite) .... tons	22,674	284,330	19,072	254,251	19,063	257,067	17,463	253,015	18,251	311,902
Gypsum and products .... tons	70,498	211,494	112,223	282,030	107,900	337,200	153,300	459,900	147,900	443,700
Mica .... lb.	—	—	—	—	122,000	3,186	250,000	8,025	—	—
Sulphur .... tons	211,300	2,410,395	251,552	3,253,677	264,765	3,095,696	242,377	3,207,284	239,191	2,934,725
Totals	—	9,958,768	—	12,105,286	—	13,751,777	—	12,927,432	—	14,283,454
Structural Materials										
Brick—common .... No.	427,550	15,125	385,810	11,954	2,262,653	187,673	244,532	14,809	1,179,165	54,849
„ face, paving, sewer .... No.	4,871,562	344,133	5,412,822	428,100	1,775,591	145,091	3,728,779	326,346	3,313,179	309,582
„ firebrick, blocks	—	405,485	—	538,566	—	621,865	—	584,969	—	640,307
Clays .... tons	4,105	12,579	6,250	17,001	8,003	22,671	7,908	28,396	8,105	30,027
Structural tile, hollow blocks	—	122,877	—	149,383	—	83,842	—	45,753	—	36,665
Drain-tile, sewer-pipe, flue-linings	—	639,173	—	680,702	—	616,858	—	686,998	—	898,908
Pottery—glazed or unglazed	—	68,387	—	46,902	—	48,825	—	11,890	—	23,947
Other clay products	—	32,416	—	80,910	—	346,883	—	667,303	—	513,153
Cement .... tons	414,396	6,755,619	427,181	7,049,638	384,853	6,432,752	417,336	7,122,046	397,435	7,112,890
Lime and limestone .... tons	269,747	997,819	519,580	1,481,292	565,945	1,602,019	758,882	1,864,315	559,028	1,513,579
Rubble, riprap, crushed rock .... tons	1,866,950	2,098,952	1,169,854	1,128,353	1,148,305	1,075,373	1,539,640	1,016,086	1,897,272	1,284,301
Sand and gravel .... tons	14,173,169	8,442,676	11,349,121	7,342,698	12,355,955	7,597,278	11,424,958	7,439,710	17,757,391	8,862,767
Stone .... tons	2,141	64,335	13,710	69,710	4,328	48,859	5,400	70,300	8,023	85,290
Totals	—	19,999,576	—	19,025,209	—	18,829,989	—	19,878,921	—	21,366,265
Fuels										
Coal—sold and used .... tons	796,413	5,937,860	690,011	5,472,064	788,658	5,242,223	919,142	6,802,134	825,339	6,133,986
Natural gas delivered to pipe-line .... M s.c.f.	58,039,491	3,368,327	64,525,633	3,921,583	80,115,399	7,101,949	95,967,110	8,818,891	108,699,997	10,226,323
Natural-gas liquid by-products[3] .... bbl.	150,704	30,935	303,954	43,695	428,553	53,910	473,948	82,592	464,036	96,347
Petroleum, crude[4] .... bbl.	845,168	1,406,971	1,374,116	1,994,596	1,589,474	2,070,787	1,810,984	2,710,701	9,747,729[5]	17,617,056[6]
Totals	—	10,744,093	—	11,431,938	—	14,468,869	—	18,414,318	—	34,073,712
Provincial totals	—	144,952,994	—	147,638,139	—	177,354,648	—	179,786,043	—	229,276,385

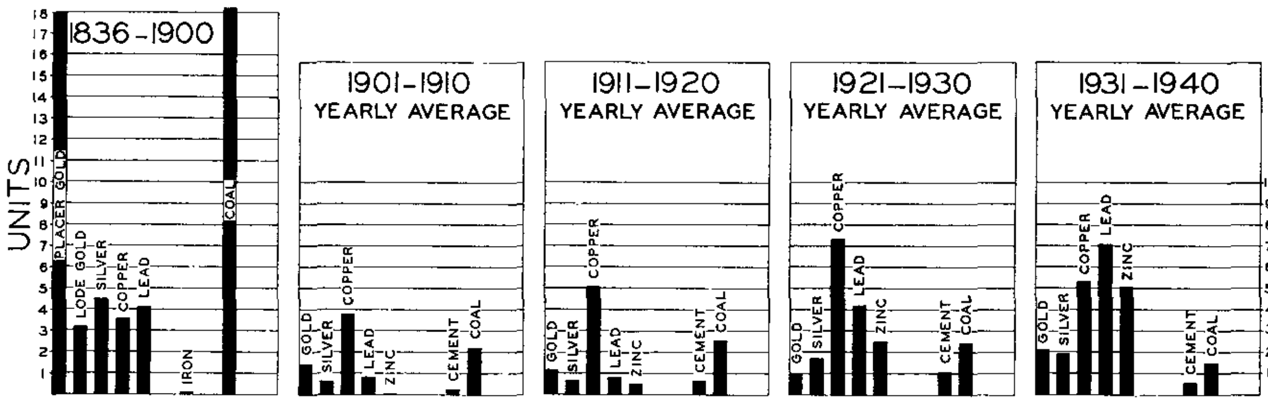
[1] *See* note under "Industrial Minerals and Structural Materials," page A 14. [2] Includes 32 tons of fluorspar mined in 1958. [3] Butane and propane.
[4] All petroleum sales including well-head sales, refinery sales, and condensate/pentanes plus. [5] *See* footnotes 5 and 6, page A 17.

TABLE IV.—MINERAL PRODUCTION OF BRITISH COLUMBIA—VALUES



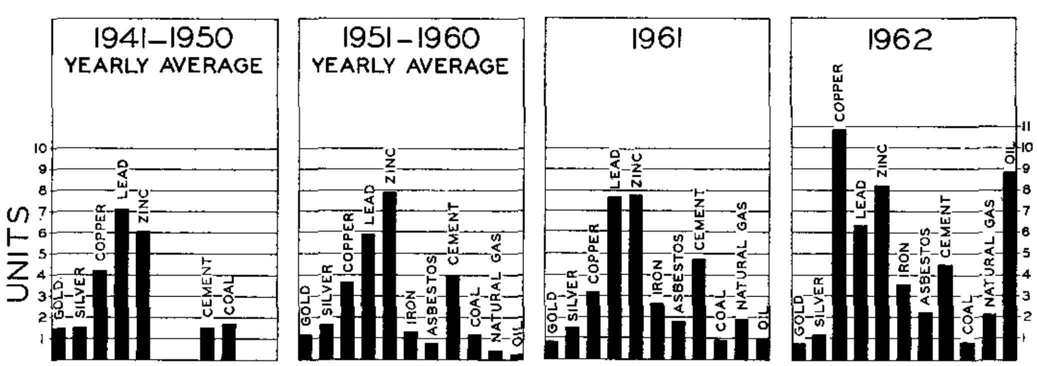
NOTE.—The yearly average values for the decades 1901–10, etc., may fairly be compared with the values for the single years 1961 and 1962. The values in the period 1836–1900 are for placer gold, 1858–1900; lode gold, 1893–1900; silver and lead, 1887–1900; copper, 1894–1900; and the total value is the total for all mineral products to the end of 1900.

Table V.—Mineral Production of British Columbia—Quantities



UNIT VALUES

GOLD-200,000 OZ.	ASBESTOS-25,000 TONS
SILVER-5,000,000 OZ	CEMENT-500,000 BBLS.
COPPER-10,000,000 LBS.	COAL-1,000,000 TONS
LEAD-50,000,000 LBS.	NATURAL GAS-50 000 000 MSCF.
ZINC-50,000,000 LBS.	OIL-1,000,000 BBLS.
IRON-500,000 TONS	



NOTE.—The yearly average quantities for the decades 1901–10, etc., may fairly be compared with the quantities for the single years 1961 and 1962. The quantities in the period 1836–1900 are for placer gold, 1858–1900; lode gold, 1893–1900; silver and lead, 1887–1900; copper, 1894–1900.

Table VI.—Production of Principal Metals, 1858–1962

Year	Placer Gold		Gold		Silver		Copper		Lead[3]		Zinc[3] [4]		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	79,310	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	—	139,200	16,288,664
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	—	17,100	18,449,602
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	—	46,100	17,090,947
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	—	99,296	15,223,707
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

	Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
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
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	8,424	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	145,387	3,005,411	9,960,172	5,278,194	102,793,669	18,612,850	307,999,153	15,555,189	172,096,841	9,268,792	51,839,147
1930	8,955	152,235	160,853	3,325,126	11,328,263	4,322,185	92,362,240	11,990,466	321,803,725	12,638,198	250,479,310	9,017,005	41,445,215
1931	17,176	291,992	146,133	3,020,837	7,550,331	2,254,979	64,134,746	5,365,690	261,902,236	7,097,812	202,071,702	5,160,911	23,192,221
1932	20,400	395,542	181,651	4,263,349	7,150,655	2,264,729	50,608,036	3,228,892	252,007,574	5,326,432	192,120,091	4,621,641	20,100,585
1933	23,928	562,787	223,589	6,394,645	7,021,754	2,656,526	43,149,460	3,216,701	271,689,217	6,497,719	195,963,751	6,291,416	25,619,794
1934	25,181	714,431	297,216	10,253,952	8,613,977	4,088,280	49,651,733	3,683,662	347,366,967	8,461,859	249,152,403	7,584,199	34,786,383
1935	30,929	895,058	365,343	12,856,419	9,269,944	6,005,996	39,428,208	3,073,428	344,268,444	10,785,930	256,239,446	7,940,860	41,557,691
1936	43,389	1,249,940	404,578	14,172,367	9,547,124	4,308,330	21,671,711	2,053,828	377,971,618	14,790,029	254,581,393	8,439,373	45,013,867
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	587,336	21,226,957	10,821,393	4,381,365	73,254,679	7,392,862	378,743,763	12,002,390	278,409,102	8,544,375	55,026,441
1940	39,067	1,236,928	583,416	22,461,516	12,327,944	4,715,315	77,980,223	7,865,085	466,849,112	15,695,467	312,020,671	10,643,025	62,617,336
1941	43,775	1,385,962	571,026	21,984,501	12,175,700	4,658,545	66,435,583	6,700,693	456,840,454	15,358,976	367,869,579	12,548,031	62,636,708
1942	32,904	1,041,772	444,518	17,113,943	9,677,881	4,080,775	50,097,716	5,052,856	507,199,704	17,052,054	387,236,469	13,208,636	57,550,036
1943	14,600	462,270	224,403	8,639,516	8,526,310	3,858,496	42,307,510	4,971,132	439,155,635	16,485,902	336,150,455	13,446,018	47,863,334
1944	11,433	361,977	186,632	7,185,332	5,705,334	2,453,293	36,300,589	4,356,070	292,922,888	13,181,530	278,063,373	11,956,725	39,494,927
1945	12,589	398,591	175,373	6,751,860	6,157,307	2,893,934	25,852,366	3,244,472	336,976,468	16,848,823	294,791,635	18,984,581	49,122,261
1946	15,729	475,361	117,612	4,322,241	6,365,761	5,324,959	17,500,538	2,240,070	345,862,680	23,345,731	274,269,956	21,420,484	57,128,846
1947	6,969	200,585	243,282	8,514,870	5,707,691	4,109,538	41,783,921	8,519,741	313,733,089	42,887,313	253,006,168	28,412,593	92,644,640
1948	20,332	585,200	286,230	10,018,050	6,718,122	5,038,592	43,025,388	9,616,174	320,037,525	57,734,770	270,310,195	37,654,210	120,646,996
1949	17,886	529,524	288,396	10,382,256	7,636,053	5,669,769	54,856,808	10,956,550	265,378,899	41,929,866	288,188,620	38,176,346	107,644,311
1950	19,134	598,717	283,983	10,805,553	9,507,225	7,666,151	42,212,133	9,889,458	284,024,522	41,052,905	290,344,227	43,769,392	113,782,176
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	337,511,324	67,164,754	147,574,900
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	297,634,712	39,481,244	382,300,862	40,810,618	111,309,639
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
1955	7,666	217,614	242,477	8,370,306	7,902,145	6,942,113	44,238,031	16,932,549	302,567,640	45,161,245	429,198,565	52,048,909	129,672,736
1956	3,865	109,450	191,743	6,603,628	8,404,600	7,511,443	43,360,575	17,251,872	283,718,073	44,702,619	443,853,004	58,934,801	135,113,813
1957	2,936	80,990	223,403	7,495,170	8,129,047	7,076,904	31,387,441	8,170,465	281,603,346	39,568,086	449,276,797	50,206,681	112,598,296
1958	5,650	157,871	194,354	6,604,149	7,040,416	6,086,299	12,658,649	2,964,529	294,573,159	34,627,075	432,002,790	43,234,839	93,674,762
1959	7,570	208,973	173,146	5,812,511	6,197,159	5,420,593	16,233,546	4,497,991	287,423,357	33,542,306	402,342,850	44,169,198	93,651,572
1960	3,847	107,418	205,580	6,979,441	7,446,237	6,599,823	33,064,429	9,583,724	333,608,699	38,661,912	403,399,319	50,656,726	112,589,044
1961	3,416	99,884	159,821	5,667,253	7,373,568	6,908,738	31,692,412	8,965,149	384,284,524	42,313,569	387,951,190	45,370,891	109,325,484
1962	3,456	100,550	156,847	5,867,175	6,186,937	7,178,641	108,979,144	33,209,215	335,282,537	34,537,454	413,430,817	51,356,376	132,249,411
Totals	5,224,235	96,629,855	16,026,856	466,148,590	437,347,023	272,255,037	3,121,339,212	536,449,766	13,918,259,800	1,060,106,263	11,866,502,762	1,008,279,885	3,439,869,396

[1] Ounces of crude gold.

[2] Ounces of fine gold.

[3] Revisions have been made in 1958 to some yearly totals for lead and zinc to bring them into agreement with the best records of recoveries of lead and zinc from slags treated at the Trail smelter.

[4] For 1905–08, inclusive, records show shipments of a combined total of 18,847 tons of zinc ore and zinc concentrates of unstated zinc content.

TABLE VIIA.—PRODUCTION, 1961 AND 1962, AND

Division	Period	Placer Gold		Principal Lode Metals	Miscellaneous Metals	Industrial Minerals	Structural Materials
		Quantity[1]	Value				
		Oz.	$	$	$	$	$
Alberni	1961	4	117	5,095			85,576
	1962	141	3,853	48,299	7,296,141		104,685
	To date	1,758	37,106	11,745,593	7,296,141	9,398	1,249,630
Atlin	1961	2,271	66,404				16,050
	1962	658	19,938	102			4,537
	To date	734,967	17,364,658	37,483,446	562,122	20,325	296,256
Cariboo	1961	645	18,860	720,827		16,842	733,870
	1962	1,668	47,918	700,689		10,228	562,814
	To date	2,604,590	53,992,669	40,327,330	23,730	198,490	6,069,182
Clinton	1961	48	1,404				
	1962						
	To date	10,141	242,238	847,454	900	162,427	110,928
Fort Steele	1961	12	351	56,145,948	1,226,495	610,950	249,246
	1962	44	1,347	56,585,577	975,839	607,175	203,701
	To date	20,531	468,450	1,657,817,757	12,261,549	6,149,772	5,112,315
Golden	1961			3,557,806	59,539	611,288	114,986
	1962			3,352,115	107,450	500,762	89,178
	To date	469	11,268	48,153,863	634,097	5,054,630	1,681,389
Greenwood	1961	18	526	3,592,712	8,822		33,876
	1962			4,239,322	10,766		25,887
	To date	5,074	115,662	128,941,014	108,002	2,323,897	865,207
Kamloops	1961	1	29				637,651
	1962	15	486	1			702,513
	To date	27,571	604,106	3,044,837	101,646	6,528,308	9,272,402
Liard	1961	72	2,105			9,742,161	216,995
	1962	30	860	4		11,160,051	332,182
	To date	50,184	1,248,151	6,316	79	65,001,948	2,087,594
Lillooet	1961	32	936	3,787,608			132,255
	1962			3,760,290			165,840
	To date	91,891	1,893,549	130,454,321	48,350	5,129	1,620,997
Nanaimo	1961			577,450	11,583,623	19,445	1,907,459
	1962			887,213	10,009,514	32,317	1,817,992
	To date	866	19,300	8,683,470	66,966,386	778,100	35,322,447
Nelson	1961	4	117	15,505,864	909,050		183,675
	1962			14,174,936	942,255	17,512	203,273
	To date	3,585	88,988	194,458,264	42,371,177	81,638	3,136,272
New Westminster	1961	16	468	417,194	3,194,037	114,437	5,086,910
	1962			470,893	2,902,850	106,890	4,745,898
	To date	11,608	243,614	1,706,186	10,570,105	894,261	74,328,643
Nicola	1961			1,855,744			37,031
	1962			23,910,483			12,625
	To date	234	4,764	26,338,944		10,050	507,765
Omineca	1961	278	8,129	34,002	1,542		346,610
	1962	807	23,604	13,613			414,864
	To date	53,739	1,426,264	17,393,123	15,633,718	11,460	3,971,656
Osoyoos	1961			119,560		309,573	51,450
	1962	13	374	38,072		383,600	95,579
	To date	221	5,013	51,089,477	1,020	4,117,902	1,120,235
Revelstoke	1961	3	88				35,911
	1962						25,972
	To date	7,582	164,477	11,053,917	185,244		1,316,121
Similkameen	1961	2	58				73,175
	1962	3	75	1,651	375		131,550
	To date	12,151	288,286	120,063,362	129,036	18,558	2,474,377
Skeena	1961			344,680			183,562
	1962			190,039	488,057		256,384
	To date	4,603	105,569	210,835,087	825,561	1,229,400	7,350,549
Slocan	1961			5,970,229	167,459		61,975
	1962			5,340,469	186,541		106,928
	To date	366	9,397	190,060,354	3,234,905		1,034,460
Trail Creek	1961			86,043			116,386
	1962			34,984			92,088
	To date	851	24,260	82,906,262	35,774		1,929,971
Vancouver	1961			4,634,683		101,426	4,553,416
	1962			5,171,932	39,613	65,799	4,539,748
	To date	182	5,306	213,648,383	1,008,371	6,448,314	52,089,656
Vernon	1961	10	292				48,131
	1962						66,164
	To date	2,705	72,282	188,345	9,500	3,978	2,718,566
Victoria	1961					60	4,972,725
	1962			1,574,464		60	5,025,619
	To date	628	15,680	10,350,025	35,437	188,306	119,306,687
Not assigned[5]	1961			11,870,155	2,089,321	1,401,250	
	1962	77	2,095	11,653,713	4,344,142	1,399,060	1,586,244
	To date	1,577,738	18,178,798	145,642,411	53,658,033	35,526,625	12,850,495
Totals	1961	3,416	99,884	109,225,600	19,239,888	12,927,432	19,878,921
	1962	3,456	100,550	132,148,861	27,303,543	14,283,454	21,366,265
	To date	5,224,235	96,629,855	3,343,239,541	215,700,883	134,762,916	347,823,800

1 Crude gold—equivalent in fine gold; 1961, 2,817 oz.; 1962, 2,688 oz. The year of first recorded production for the major placer-producing mining divisions was: Atlin, 1898; Cariboo, 1858; Lillooet, 1874; Quesnel, 1858.

2 Quantity from 1836 to 1909 is gross mine output and includes material lost in picking and washing. For Cariboo, 1942; Fort Steele, 1898; Kamloops, 1893; Liard, 1923; Nanaimo, 1836; Nicola, 1907; Omineca, 1918; Osoyoos, 1926; Similkameen, 1909; Skeena, 1912.

Total to Date, by Mining Divisions—Summary

Fuels								
Coal		Petroleum[3]		Natural Gas (Direct to Pipe-line)		Liquid By-products[4]		Division Totals
Quantity[2]	Value	Quantity	Value	Quantity	Value	Quantity	Value	
Tons	$	Bbl.	$	M S.C.F.	$	Bbl.	$	$
								90,788
								7,452,978
								20,337,868
								82,454
								24,577
								55,726,807
								1,490,399
								1,321,649
290	1,100							100,612,501
								1,404
								1,363,947
834,716	5,979,805							64,212,795
734,531	**5,255,540**							**63,629,179**
53,924,438	236,310,671							1,918,120,514
								4,343,619
								4,049,505
								55,535,247
								3,635,936
								4,275,975
								132,353,782
								637,680
								703,000
15,087	59,765							19,611,064
2,062	17,000	1,810,984	2,710,701	95,967,110	8,818,891	473,948	82,592	21,590,445
1,389	**12,501**	[6]**9,747,729**	**17,617,056**	**108,699,997**	**10,226,323**	**464,036**	**96,347**	**39,445,324**
98,237	688,357	15,889,791	26,863,664	414,891,356	33,915,721	1,821,195	807,479	130,119,309
								3,920,799
								3,926,130
								134,022,346
76,009	736,814							14,824,791
83,534	**801,294**							**13,602,330**
74,142,813	299,319,780							411,089,483
								16,598,706
								15,337,976
								240,136,339
								8,813,046
								8,226,531
								87,742,809
159	1,719							1,894,492
125	**1,375**							**23,924,483**
2,929,524	11,080,176							37,941,699
5,850	64,024							454,307
5,760	**63,276**							**515,357**
482,762	2,778,209							41,214,430
								480,583
								517,625
1,122	5,008							56,388,655
								85,999
								25,972
								12,719,759
346	2,774							76,007
								133,651
4,617,442	19,553,725							142,527,344
								528,242
								934,480
86	116							220,346,282
								6,199,663
								5,633,938
								194,339,116
								202,429
								127,072
								84,896,267
								9,289,525
								9,817,092
								273,200,030
								48,423
								66,164
								2,992,671
								4,972,785
								6,600,143
								129,896,135
								15,360,726
								18,985,254
								265,856,362
919,142	6,802,134	1,810,984	2,710,701	95,967,110	8,818,891	473,948	82,592	179,786,043
825,339	**6,133,986**	**9,747,729**	**17,617,056**	**108,699,997**	**10,226,323**	**464,036**	**96,347**	**229,276,385**
136,161,251	569,796,907	15,889,791	26,863,664	414,891,356	33,915,721	1,821,195	807,479	4,769,040,766

[3] All petroleum sales including well-head sales, refinery sales, and condensate/pentanes plus.
[4] Butane and propane.
[5] *Re* "not assigned," *see* footnotes under Tables VIIB and VIIC.
[6] *See* footnotes 5 and 6, page A 17.
NOTE.—For individual metals, industrial minerals, and structural materials, *see* Tables VIIB, VIIC, VIID, and VIIE.

TABLE VIIB.—PRODUCTION, 1961 AND 1962, AND TOTAL TO DATE, BY MINING DIVISIONS—PRINCIPAL LODE METALS

Division	Period	Lode Gold		Silver		Copper		Lead		Zinc		Division Total
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
		Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Alberni	1961	189	4,929	98	91			690	75			5,095
	1962	1,266	47,357	576	669			2,574	265	67	8	48,299
	To date	802,509	11,317,910	163,099	78,755	2,280,699	343,518	121,201	5,402	67	8	11,745,593
Atlin	1961											
	1962			95	102							102
	To date	344,197	12,126,732	3,375,428	2,894,044	24,777,661	8,160,266	23,765,211	3,437,907	91,067,749	10,864,497	37,483,446
Cariboo	1961	20,243	717,817	3,213	3,010							720,827
	1962	18,624	696,668	3,465	4,021							700,689
	To date	1,119,802	40,235,973	130,289	86,694	2,352	920	24,560	3,724	505	19	40,327,330
Clinton	1961											
	1962											
	To date	23,390	827,328	31,564	14,214	57,548	5,905	193	7			847,454
Fort Steele	1961	367	13,014	5,199,531	4,871,753			281,169,600	30,959,585	173,592,100	20,301,596	56,145,948
	1962	392	14,664	3,790,116	4,397,634			238,618,684	24,580,111	222,131,449	27,593,168	56,585,577
	To date	5,673	165,742	211,853,844	125,301,718	28,592	6,193	11,784,835,285	865,793,047	8,537,128,049	666,551,057	1,657,817,757
Golden	1961			283,669	265,787	40,590	11,482	9,435,501	1,038,943	19,167,112	2,241,594	3,557,806
	1962			224,288	260,240	74,123	22,588	8,739,952	900,302	17,460,837	2,168,985	3,352,115
	To date	169	4,844	3,692,313	2,896,148	1,168,211	365,531	231,835,597	22,082,687	266,215,812	22,804,653	48,153,863
Greenwood	1961	17,207	610,160	943,009	883,562	6,744,419	1,907,861	782,690	86,182	897,363	104,947	3,592,712
	1962	16,812	628,886	889,745	1,032,363	7,768,401	2,367,265	888,962	91,572	959,875	119,236	4,239,322
	To date	1,193,485	26,503,850	34,793,402	21,842,317	466,074,548	77,719,124	17,414,354	1,421,995	18,577,005	1,453,728	128,941,014
Kamloops	1961											
	1962			1	1							1
	To date	47,868	1,608,328	304,513	181,985	6,411,583	1,179,668	538,097	45,030	438,023	29,826	3,044,837
Liard	1961											
	1962			4	4							4
	To date	114	4,120	544	450	56	22	10,102	1,724			6,316
Lillooet	1961	106,226	3,766,774	22,236	20,834							3,787,608
	1962	99,902	3,737,034	20,043	23,256							3,760,290
	To date	3,719,641	129,872,492	900,747	579,238	400	41	62,513	2,548	15	2	130,454,321
Nanaimo	1961	1,269	44,999	32,351	30,312	1,775,097	502,139					577,450
	1962	829	31,010	19,082	22,141	2,737,051	834,062					887,213
	To date	89,957	2,126,469	688,701	447,456	30,935,877	6,109,545					8,683,470
Nelson	1961	565	20,035	185,788	174,076	4,615	1,305	39,997,332	4,404,106	93,256,453	10,906,342	15,505,864
	1962	983	36,771	141,444	164,117			31,339,691	3,228,302	86,505,761	10,745,746	14,174,936
	To date	1,330,969	41,629,828	8,365,529	5,186,014	14,802,985	1,683,575	356,966,983	41,993,644	847,421,274	103,965,203	194,458,264
New Westminster	1961			49	46	1,474,646	417,148					417,194
	1962	17	636	911	1,058	1,539,719	469,199					470,893
	To date	4,466	114,164	15,114	7,720	5,573,270	1,582,702	28,425	1,119	12,755	481	1,706,186
Nicola	1961	16	567	8,063	7,555	6,528,767	1,846,858	3,696	407	3,052	357	1,855,744
	1962					78,464,488	23,910,483					23,910,483
	To date	8,541	235,481	275,499	134,158	85,554,397	25,867,428	2,239,124	90,923	323,735	10,954	26,338,944
Omineca	1961	15	532	11,352	10,636			111,115	12,235	90,632	10,599	34,002
	1962	21	786	8,256	9,580	3,360	1,024	12,166	1,253	7,806	970	13,613
	To date	25,111	775,212	9,566,135	7,603,610	6,753,562	1,546,358	28,032,247	3,554,322	31,611,532	3,913,621	17,393,123

		Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Osoyoos	1961	3,332	118,153	1,233	1,155	......	......	1,227	135	1,003	117	119,560
	1962	**851**	**31,833**	**4,452**	**5,166**	......	......	**6,050**	**623**	**3,622**	**450**	**38,072**
	To date	1,648,771	50,270,775	596,970	393,947	2,843,616	417,190	135,173	6,421	13,042	1,144	51,089,477
Revelstoke	1961	......	......	......	......	......	......	......	......	......	......	......
	1962	......	......	......	......	......	......	......	......	......	......	......
	To date	37,300	1,069,260	4,107,618	2,766,476	153,686	51,037	36,343,774	3,853,894	27,194,200	3,313,250	11,053,917
Similkameen	1961	......	......	......	......	......	......	......	......	......	......	......
	1962	**3**	**112**	**27**	**31**	**4,948**	**1,508**	......	......	......	......	**1,651**
	To date	184,015	6,327,872	4,219,466	2,582,297	601,192,869	111,136,369	382,544	13,360	72,275	3,964	120,063,362
Skeena	1961	6,471	229,462	110,593	103,621	......	......	53,109	5,848	49,154	5,749	344,680
	1962	**3,292**	**123,144**	**51,229**	**59,441**	......	......	**27,839**	**2,868**	**36,922**	**4,586**	**190,039**
	To date	2,411,166	60,862,519	68,728,968	43,996,874	689,106,270	98,025,648	59,940,735	5,428,971	17,065,144	2,521,075	210,835,087
Slocan	1961	133	4,716	450,278	421,892	......	......	22,684,369	2,497,776	26,043,994	3,045,845	5,970,229
	1962	**40**	**1,496**	**455,538**	**528,557**	......	......	**21,157,419**	**2,179,426**	**21,180,081**	**2,630,990**	**5,340,469**
	To date	15,828	457,220	70,797,510	45,702,864	229,696	43,512	897,440,361	74,004,805	714,240,156	69,851,953	190,060,354
Trail Creek	1961	518	18,368	1,359	1,273	234,734	66,402	......	......	......	......	86,043
	1962	**780**	**29,177**	**524**	**608**	**52,362**	**15,956**	**2,836**	**292**	**2,745**	**341**	**46,374**
	To date	2,951,395	62,647,084	3,624,790	2,069,825	121,630,213	18,174,741	138,590	11,296	122,366	14,706	82,917,652
Vancouver	1961	3,213	113,933	53,718	50,332	13,466,438	3,809,386	59,194	6,518	5,596,531	654,514	4,634,683
	1962	**11,152**	**417,163**	**54,854**	**63,647**	**12,683,238**	**3,864,963**	**82,927**	**8,542**	**6,582,011**	**817,617**	**5,171,932**
	To date	466,958	14,967,767	4,941,041	3,071,017	973,150,020	165,411,755	18,236,748	1,838,462	219,964,141	28,359,382	213,648,383
Vernon	1961	......	......	......	......	......	......	......	......	......	......	......
	1962	......	......	......	......	......	......	......	......	......	......	......
	To date	5,224	176,082	12,823	8,084	654	100	24,913	2,933	10,816	1,146	188,345
Victoria	1961	......	......	......	......	......	......	......	......	......	......	......
	1962	**1,218**	**45,562**	**13,497**	**15,661**	**4,965,843**	**1,513,241**	......	......	......	......	**1,574,464**
	To date	38,881	858,292	889,717	521,916	40,994,393	8,666,046	210,097	19,848	3,568,709	283,923	10,350,025
Not assigned[1]	1961	107	3,794	67,028	62,803	1,423,106	402,568	29,986,001	3,301,759	69,253,796	8,099,231	11,870,155
	1962	**665**	**24,876**	**508,790**	**590,344**	**685,611**	**208,926**	**34,403,437**	**3,543,898**	**58,559,641**	**7,274,279**	**11,642,323**
	To date	51,426	963,746	5,271,399	3,887,216	47,616,054	9,952,572	459,532,973	36,492,194	1,091,455,392	94,335,293	145,631,021
Totals	1961	159,821	5,667,253	7,373,568	6,908,738	31,692,412	8,965,149	384,284,524	42,313,569	387,951,190	45,370,891	109,225,600
	1962	**156,847**	**5,867,175**	**26,186,937**	**27,178,641**	**108,979,144**	**33,209,215**	**336,282,537**	**34,537,454**	**413,430,817**	**51,356,376**	**132,148,861**
	To date	16,026,856	466,148,590	437,347,023	272,255,037	3,121,339,212	536,449,766	13,918,259,800	1,060,106,263	11,866,502,762	1,008,279,885	3,343,239,541

[1] 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.

[2] Includes 471 oz. of silver valued at $546 contained in placer gold received at the Mint during 1962.

TABLE VIIc.—PRODUCTION, 1961 AND 1962, AND TOTAL TO DATE, BY MINING DIVISIONS—MISCELLANEOUS METALS

Division	Period	Antimony		Bismuth		Cadmium		Chromite		Iron Concentrates		Manganese		Mercury	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		Lb.	$	Lb.	$	Lb.	$	Tons	$	Tons	$	Tons	$	Lb.	$
Alberni	1961														
	1962									**702,020**	**7,296,141**				
	To date									702,020	7,296,141				
Atlin	1961														
	1962														
	To date					319,212	561,762								
Cariboo	1961														
	1962														
	To date														
Clinton	1961														
	1962														
	To date							126	900						
Fort Steele	1961									51,171	498,917				
	1962									**49,416**	**533,199**				
	To date					1,837	3,823			100,587	1,032,116				
Golden	1961					37,212	59,539								
	1962					**58,397**	**107,450**								
	To date	40,062	14,906			368,852	619,191								
Greenwood	1961					5,514	8,822								
	1962					**5,851**	**10,766**								
	To date					45,092	76,607	670	31,395						
Kamloops	1961														
	1962														
	To date									21,167	95,851			10,987	5,795
Liard	1961														
	1962														
	To date														
Lillooet	1961														
	1962														
	To date	13,466	4,321											1,783	3,555
Nanaimo	1961									1,283,897	11,583,623				
	1962									**988,896**	**10,009,514**				
	To date									8,843,764	66,966,386				
Nelson	1961					568,156	909,050								
	1962					**512,095**	**942,255**								
	To date					4,958,273	8,452,488								
New Westminster	1961														
	1962														
	To date														
Omineca	1961					964	1,542								
	1962														
	To date	104,489	15,217			262,114	518,118							4,150,892	10,400,259
Osoyoos	1961														
	1962														
	To date											162			
Revelstoke	1961														
	1962														
	To date	9,394	8,455			103,612	176,102								

		Lb.	$	Lb.	$	Lb.	$	Tons	$	Tons	$	Tons	$	Lb.	$
Similkameen	1961														
	1962														
	To date														
Skeena	1961														
	1962									**53,515**	**488,057**				
	To date					141,890	316,764			54,715	494,057				
Slocan	1961					104,662	167,459								
	1962					**101,381**	**186,541**								
	To date	31,865	8,133			1,800,438	3,218,612					541	8,160		
Trail Creek	1961														
	1962														
	To date					115	210			550	1,925				
Vancouver	1961														
	1962					**21,529**	**39,613**								
	To date					494,894	1,008,371								
Vernon	1961														
	1962														
	To date														
Victoria	1961														
	1962														
	To date					7,000	10,929					1,167	24,508		
Not assigned[3 4 5]	1961	1,331,297	469,948	283,363	637,567	190,924	305,479								
	1962	**1,931,397**	**748,223**	**228,601**	**507,494**	**1,387,439**	**2,552,888**								
	To date	42,492,620	11,176,295	5,638,950	9,717,413	21,020,522	28,287,246								
Totals	1961	1,331,297	469,948	283,363	637,567	907,432	1,451,891			1,335,068	12,082,540				
	1962	**1,931,397**	**748,223**	**228,601**	**507,494**	**2,086,692**	**3,839,513**			**1,793,847**	**18,326,911**				
	To date	42,691,896	11,222,327	5,638,950	9,717,413	29,523,851	43,250,223	796	32,295	9,722,803	75,886,476	1,724	32,668	4,163,662	10,409,609

1 Sinter required to produce 32,049 tons and 31,441 tons of pig iron in 1961 and 1962 respectively.

2 Estimated manganese content of about 40 tons of ore shipped for testing by Olalla Mines Ltd. in 1956.

3 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 or of other antimony products at the Trail smelter.

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

5 Bismuth and indium recovered at the Trail smelter are not assigned to mining divisions and may include some metal from sources outside British Columbia.

Principal productive periods: Antimony, 1939–62; bismuth, 1929–62; cadmium, 1928–62; chromite, 1918 and 1929; indium, 1942–62; iron concentrates, 1951–62; manganese, 1918–20; mercury, 1940–44; molybdenite, 1914–18; nickel, 1958–62; palladium, 1928; platinum, 1887–1951; tin, 1941–62; tungsten, 1937–58.

TABLE VIIC.—PRODUCTION, 1961 AND 1962, AND TOTAL TO DATE, BY MINING DIVISIONS—MISCELLANEOUS METALS—*Continued*

Division	Period	Molybdenite (MoS_2)		Nickel		Palladium		Platinum		Tin		Tungsten (WO_3)		Other Value	Division Totals
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value		
		Lb.	$	Lb.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	$	$
Alberni	1961														
	1962														**7,296,141**
	To date														7,296,141
Atlin	1961														
	1962														
	To date											292	360		562,122
Cariboo	1961														
	1962														
	To date							59	2,299			27,698	21,431		23,730
Clinton	1961														
	1962														
	To date														900
Fort Steele	1961									1,119,350	727,578				1,226,495
	1962									**650,941**	**442,640**				**975,839**
	To date									14,469,474	11,137,426			88,184[6]	12,261,549
Golden	1961														59,539
	1962														**107,450**
	To date														684,097
Greenwood	1961														8,822
	1962														**10,766**
	To date														108,002
Kamloops	1961														
	1962														
	To date														101,646
Liard	1961														
	1962														
	To date							2	79						79
Lillooet	1961														
	1962														
	To date	2,448	2,440					3	113			32,358	37,921		48,350
Nanaimo	1961														11,583,623
	1962														**10,009,514**
	To date														66,968,386
Nelson	1961														909,050
	1962														**942,255**
	To date	25,058	18,378									13,789,939	33,900,311		42,871,177
New Westminster	1961			4,180,677	3,194,037										3,194,037
	1962			**3,476,467**	**2,902,850**										**2,902,850**
	To date			14,188,497	10,570,105										10,570,105
Omineca	1961														1,542
	1962														
	To date	1,600	1,840					3	154			2,210,892	4,697,710	420[7]	15,633,718
Osoyoos	1961														
	1962														
	To date	1,020	1,020												1,020

		Lb.	$	Lb.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	$	$
Revelstoke	1961														
	1962														
	To date											7,784	5,687		185,244
Similkameen	1961														
	1962							**5**	**375**						**375**
	To date							1,285	129,036						129,036
Skeena	1961														
	1962														**438,057**
	To date	13,022	13,020									366	331	1,389[8]	825,561
Slocan	1961														167,459
	1962														**186,541**
	To date														3,234,905
Trail Creek	1961														
	1962														
	To date					749	30,462	53	3,177						35,774
Vancouver	1961														
	1962														**39,613**
	To date														1,008,371
Vernon	1961														
	1962														
	To date	9,023	9,500												9,500
Victoria	1961														
	1962														
	To date														35,437
Not assigned	1961													676,327	2,089,321
	1962													**535,537**	**4,344,142**
	To date													4,477,079	53,658,033
Totals	1961			4,180,677	3,194,037					1,119,350	727,578			676,327	19,239,888
	1962			**3,476,467**	**2,902,850**			**5**	**375**	**650,941**	**442,640**			**535,537**	**27,303,543**
	To date	52,171	46,198	14,188,497	10,570,105	749	30,462	1,405	134,858	14,469,474	11,137,426	16,019,324	38,663,751	4,567,072	215,700,883

[6] Magnesium, 204,632 lb., 1941 and 1942.
[7] Cobalt, 1,730 lb., 1928.
[8] Selenium, 731 lb., 1931.

TABLE VIID.—PRODUCTION, 1961 AND 1962, AND TOTAL

Division	Period	Asbestos Quantity	Asbestos Value[1]	Barite Quantity	Barite Value	Diatomite Quantity	Diatomite Value	Fluxes (Quartz and Limestone) Quantity	Fluxes (Quartz and Limestone) Value	Granules (Quartz, Limestone, and Granite) Quantity	Granules (Quartz, Limestone, and Granite) Value
		Tons	$	Tons	$	Tons	$	Tons	$	Tons	$
Alberni	1961										
	1962										
	To date										
Atlin	1961										
	1962										
	To date										
Cariboo	1961					214	8,817				
	1962					**211**	**10,228**				
	To date					2,014	55,010			48	168
Clinton	1961										
	1962										
	To date										
Fort Steele	1961										
	1962										
	To date			8	80						
Golden	1961			15,478	151,388						
	1962			**6,511**	**57,062**						
	To date			194,119	2,393,940						
Greenwood	1961										
	1962										
	To date							1,790,502	1,540,319		
Kamloops	1961										
	1962										
	To date										
Liard	1961	45,113	8,648,508								
	1962	**55,133**	**10,297,360**								
	To date	285,933	61,814,006								
Lillooet	1961										
	1962										
	To date										
Nanaimo	1961							12,459	19,445		
	1962							**17,386**	**32,317**		
	To date							704,819	778,100		
Nelson	1961										
	1962									**839**	**17,512**
	To date							7,601	8,174	841	17,563
New Westminster	1961									8,004	114,437
	1962									**6,612**	**106,890**
	To date									69,487	894,261
Nicola	1961										
	1962										
	To date										
Omineca	1961										
	1962										
	To date										
Osoyoos	1961							40,869	170,995	9,459	138,578
	1962							**45,350**	**196,100**	**10,800**	**187,500**
	To date							619,380	2,817,548	69,608	978,869
Similkameen	1961										
	1962										
	To date										
Skeena	1961										
	1962										
	To date							601,019	1,050,722		
Vancouver	1961										
	1962										
	To date									29,692	418,606
Vernon	1961										
	1962										
	To date										
Victoria	1961							7	60		
	1962							**7**	**60**		
	To date							76	1,000	9,605	157,080
Not assigned	1961										
	1962										
	To date										
Totals	1961	45,113	8,648,508	15,478	151,388	214	8,817	53,335	190,500	17,463	253,015
	1962	**55,133**	**10,297,360**	**6,511**	**57,062**	**211**	**10,228**	**62,743**	**228,477**	**18,251**	**311,902**
	To date	285,933	61,814,006	194,127	2,394,020	2,014	55,010	3,723,397	6,195,863	179,281	2,466,547

[1] Value f.o.b. mine, not including containers; *see also* note under "Industrial Minerals and Structural Materials," page A14.
[2] Arsenious oxide: Omineca, 1928, 16,997 lb., $340; Osoyoos, 1917–30 and 1942, 22,002,423 lb., $272,861.
[3] Bentonite: 1926–44, 791 tons.
[4] Fluorspar: Greenwood, 1918–29 and 1942, 35,309 tons, $783,578; Osoyoos, 1958, 32 tons, $1,386.
[5] Hydromagnesite: Atlin, 1915–16, 1,450 tons, $20,325; Clinton, 1921, 803 tons, $7,211.
[6] Iron oxide and ochre: Golden, 1927–39, 27 tons, $920; Nelson, 1948–50, 7,292 tons, $55,901; Vancouver, 1918–50, 10,669 tons, $97,389; Victoria, 1923, 120 tons, $840.
[7] Magnesium sulphate: Clinton, 1918–20, 1,923 tons, $39,085; Kamloops, 1918–42, 8,742 tons, $193,967; Osoyoos, 1915–19, 3,229 tons, $21,300.
[8] Natro-alunite: 1912–27, 522 tons.

TO DATE, BY MINING DIVISIONS—INDUSTRIAL MINERALS

Gypsum and Gypsite Quantity	Gypsum and Gypsite Value	Mica Quantity	Mica Value	Sulphur Quantity	Sulphur Value	Other Value	Division Totals	Period	Division
Tons	$	Lb.	$	Tons	$	$	$		
								1961	Alberni.
								1962	
						9,398[8]	9,398	To date	
								1961	Atlin.
								1962	
						20,325[5]	20,325	To date	
		250,000	8,025				16,842	1961	Cariboo.
							10,228	**1962**	
		10,013,800	143,012			300[13]	198,490	To date	
								1961	Clinton.
								1962	
873	6,236					156,191[5, 7, 11]	162,427	To date	
				40,730	610,950		610,950	1961	Fort Steele.
				36,206	**607,175**		**607,175**	**1962**	
112,878	298,824			824,811	5,833,974	16,894[10]	6,149,772	To date	
153,300	459,900						611,288	1961	Golden.
147,900	**443,700**						**500,762**	**1962**	
931,246	2,659,414					1,276[6, 12]	5,054,630	To date	
								1961	Greenwood.
								1962	
						783,578[4]	2,323,897	To date	
								1961	Kamloops.
								1962	
1,246,918	6,323,178	424,700	2,075			203,055[7, 11]	6,528,308	To date	
				52,681	1,093,658		11,160,051	1961	Liard.
				57,787	**862,691**		**9,742,161**	**1962**	
				191,218	3,187,942		65,001,948	To date	
								1961	Lillooet.
								1962	
						5,129[12]	5,129	To date	
							19,445	1961	Nanaimo.
							32,317	**1962**	
							778,100	To date	
								1961	Nelson.
							17,512	**1962**	
						55,901[6]	81,638	To date	
							114,437	1961	New Westminster.
							106,890	**1962**	
							894,261	To date	
								1961	Nicola.
								1962	
2,407	10,050						10,050	To date	
								1961	Omineca.
								1962	
						11,460[2, 9]	11,460	To date	
							309,573	1961	Osoyoos.
							383,600	**1962**	
		1,588,800	25,938			295,547[2, 4, 7]	4,117,902	To date	
								1961	Similkameen.
								1962	
250	1,700					16,858[3]	18,558	To date	
								1961	Skeena.
								1962	
				41,624	178,678		1,229,400	To date	
				8,841	101,426		101,426	1961	Vancouver.
				5,292	**65,799**		**65,799**	**1962**	
		634,250	10,816	632,689	5,921,504	97,389[6]	6,448,314	To date	
								1961	Vernon.
								1962	
		160,500	3,978				3,978	To date	
							60	1961	Victoria.
						612	**60**	**1962**	
						30,226[6, 12]	188,306	To date	
				140,125	1,401,250		1,401,250	1961	Not assigned.
				139,906	**1,399,060**		**1,399,060**	**1962**	
				3,567,632	35,526,625		35,526,625	To date	
153,300	459,900	250,000	8,025	242,377	3,207,284		12,927,432	1961	Totals.
147,900	**443,700**			**239,191**	**2,934,725**		**14,283,454**	**1962**	
2,294,572	9,299,402	12,822,050	185,818	4,757,974	50,648,723	1,703,527	134,762,916	To date	

[9] Perlite: 1953, 1,112 tons, $11,120.
[10] Phosphate rock: 1927–33, 3,842 tons.
[11] Sodium carbonate: Clinton, 1921–49, 9,524 tons, $109,895; Kamloops, 1931–35, 968 tons, $9,088.
[12] Talc: Golden, 1927, 5 tons, $356; Lillooet, 1916–36, 296 tons, $5,129; Victoria, 1919–35, 1,504 tons, $29,386.
[13] Volcanic ash: Cariboo, 30 tons.
First production: Arsenious oxide, 1917; asbestos, 1952; barite, 1940; bentonite, 1926; diatomite, 1928; fluorspar, 1918; flux, 1911; granules, 1930; gypsum and gypsite, 1911; hydromagnesite, 1904; 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.

2

TABLE VIIe.—PRODUCTION, 1961 AND 1962, AND TOTAL TO DATE, BY MINING DIVISIONS—STRUCTURAL MATERIALS

Division	Period	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	Unclassified Material	Division Totals
		$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Alberni	1961				830	84,746										85,576
	1962				**5,225**	**99,460**										**104,685**
	To date				60,867	1,188,763										1,249,630
Atlin	1961					16,050										16,050
	1962				**1,000**	**3,537**										**4,537**
	To date		1,108		98,478	196,670										296,256
Cariboo	1961				1,056	730,814								2,000		733,870
	1962				**387**	**562,427**										**562,814**
	To date		7,500		960,286	5,068,319	1,193	184	4,651	15,807				11,242		6,069,182
Clinton	1961															
	1962															
	To date				1,606	109,322										110,928
Fort Steele	1961				140,499	108,747										249,246
	1962		**38,523**		**62,325**	**102,853**										**203,701**
	To date		43,873	71,941	1,236,274	3,744,309	7,800							8,118		5,112,315
Golden	1961				8,149	94,683								12,154		114,986
	1962				**15,000**	**74,178**										**89,178**
	To date		1,000	24,000	125,339	1,517,396								13,654		1,681,389
Greenwood	1961					33,876										33,876
	1962				**2,000**	**23,887**										**25,887**
	To date		102,442	30,500	170,319	440,663	114,361			6,922						865,207
Kamloops	1961				250,291	387,360										637,651
	1962				**304,717**	**397,796**										**702,513**
	To date		12,000	18,000	4,879,335	4,290,688	72,379									9,272,402
Liard	1961				2,405	214,590										216,995
	1962				**1,000**	**331,182**										**332,182**
	To date				33,665	2,053,929										2,087,594
Lillooet	1961				9,276	122,979										132,255
	1962				**86,304**	**79,536**										**165,840**
	To date		100	2,000	397,742	1,221,155										1,620,997
Nanaimo	1961		1,601,464	10,450	97,580	197,965										1,907,459
	1962		**1,342,439**		**249,253**	**280,300**										**1,871,992**
	To date		27,856,343	3,199,257	421,403	2,666,452	1,104,295	38,939		35,758						35,322,447
Nelson	1961				60,728	122,947										183,675
	1962			**2,940**	**144,435**	**55,898**										**203,273**
	To date		34,543	359,619	490,675	2,229,461	19,110	2,864								3,136,272
New Westminster	1961		209,175		351,375	2,590,022	1,320	316,331	536,902	28,396	45,753	619,396	5,091	383,149		5,086,910
	1962		**62,945**	**5,000**	**229,802**	**2,264,192**	**54,849**	**303,082**	**616,307**	**30,027**	**36,665**	**856,908**	**21,947**	**264,174**		**4,745,898**
	To date		1,422,335	14,310	8,835,891	28,232,630	1,667,448	5,119,489	12,079,403	880,479	2,847,395	11,691,811	351,337	1,186,115		74,328,643
Nicola	1961				7,350	29,681										37,031
	1962				**7,625**	**5,000**										**12,625**
	To date			8,000	123,341	376,424										507,765
Omineca	1961				33,226	313,384										346,610
	1962				**50,715**	**364,149**										**414,864**
	To date		3,077		644,430	3,318,875	5,274									3,971,656

		$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Osoyoos	1961					51,450										51,450
	1962				**3,400**	**92,179**										**95,579**
	To date		32,070	14,850	148,957	924,358										1,120,235
Revelstoke	1961				3,241	32,670										35,911
	1962				**42**	**25,930**										**25,972**
	To date		1,000	5,575	325,562	983,984										1,316,121
Similkameen	1961				175	73,000										73,175
	1962				**18,625**	**112,925**										**131,550**
	To date	10,500	11,571	24,000	529,844	1,885,107				1,363				11,992		2,474,377
Skeena	1961		39,954		38,484	105,124										183,562
	1962		**53,550**		**92,846**	**109,988**										**256,384**
	To date		1,487,185	144,000	1,322,950	4,383,165				4,925				8,324		7,350,549
Slocan	1961				6,814	55,161										61,975
	1962				**1,722**	**105,206**										**106,928**
	To date		1,000	115,143	102,800	815,517										1,034,460
Trail Creek	1961			8,500	500	107,386										116,386
	1962			**2,900**	**4,143**	**85,045**										**92,088**
	To date		28,000	78,634	216,685	1,606,652										1,929,971
Vancouver	1961	3,142,150		51,350		1,316,928	10,014	10,015	22,959							4,553,416
	1962	**3,220,693**		**74,405**	**288**	**1,244,362**										**4,539,748**
	To date	13,828,080	40,885	4,010,781	7,648,644	25,472,674	142,208	241,216	580,778	12,724			23,362	88,304		52,089,656
Vernon	1961				2,747	45,384										48,131
	1962				**2,912**	**63,252**										**66,164**
	To date		46,499	81,052	197,081	2,232,680	131,467	6,202	1,011	5	18,224	4,325		20		2,718,566
Victoria	1961	3,979,896	13,722		1,360	604,763	3,475		25,108			67,602	6,799	270,000		4,972,725
	1962	**3,892,197**	**16,122**	**45**	**535**	**823,241**		**6,500**	**24,000**			**42,000**	**2,000**	**218,979**		**5,025,619**
	To date	99,958,028	808,187	45	456,413	13,566,930	1,814,647	29,552	119,930	1,050	705,821	1,072,346	136,504	637,234		119,306,687
Not assigned	1961															
	1962					**1,556,244**								**30,000**		**1,586,244**
	To date		315,498	505,018	282,455	1,556,244								3,180,828[1]	7,010,452[2]	12,850,495
Totals	1961	7,122,046	1,864,315	70,300	1,016,086	7,439,710	14,809	326,346	584,969	28,396	45,753	686,998	11,890	667,303		19,878,921
	1962	**7,112,890**	**1,513,579**	**85,290**	**1,284,301**	**8,862,767**	**54,849**	**309,582**	**640,307**	**30,027**	**36,665**	**898,908**	**23,947**	**513,153**		**21,366,265**
	To date	113,796,608	32,256,216	8,706,725	29,711,042	110,082,367	5,080,182	5,438,446	12,785,773	959,033	3,571,440	12,768,482	511,203	5,145,831	7,010,452	347,823,800

[1] Includes $3,150,828 of unclassified clay products, 1886–1910.
[2] Includes a value of $7,010,452 that cannot be allotted to a particular class of structural material.

TABLE VIIIA.—QUANTITY[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	1912	3,211,907	$10,786,812
1860	15,956	56,988	1913	2,713,535	9,197,460
1861	15,427	55,096	1914	2,237,042	7,745,847
1862	20,292	72,472	1915	2,076,601	7,114,178
1863	23,906	85,380	1916	2,583,469	8,900,675
1864	32,068	115,528	1917	2,436,101	8,484,343
1865	36,757	131,276	1918	2,575,275	12,833,994
1866	28,129	100,460	1919	2,433,540	11,975,671
1867	34,988	124,956	1920	2,852,535	13,450,169
1868	49,286	176,020	1921	2,670,314	12,836,013
1869	40,098	143,208	1922	2,726,793	12,880,060
1870	33,424	119,372	1923	2,636,740	12,678,548
1871	55,458[2]	164,612	1924	2,027,843	9,911,935
1872	55,458[2]	164,612	1925	2,541,212	12,168,905
1873	55,459[2]	164,612	1926	2,406,094	11,650,180
1874	91,334	244,641	1927	2,553,416	12,269,135
1875	123,362	330,435	1928	2,680,608	12,633,510
1876	155,895	417,576	1929	2,375,060	11,256,260
1877	172,540	462,156	1930	1,994,493	9,435,650
1878	191,348	522,538	1931	1,765,471	7,684,155
1879	270,257	723,903	1932	1,614,629	6,523,644
1880	299,708	802,785	1933	1,377,177	5,375,171
1881	255,760	685,171	1934	1,430,042	5,725,133
1882	315,997	846,417	1935	1,278,380	5,048,864
1883	238,895	639,897	1936	1,352,301	5,722,502
1884	441,358	1,182,210	1937	1,446,243	6,139,920
1885	409,468	1,096,788	1938	1,388,507	5,565,069
1886	365,832	979,908	1939	1,561,084	6,280,956
1887	462,964	1,240,080	1940	1,662,027	7,088,265
1888	548,017	1,467,903	1941	1,844,745	7,660,000
1889	649,411	1,739,490	1942	1,996,000	8,237,172
1890	759,518	2,034,420	1943	1,854,749	7,742,030
1891	1,152,590	3,087,291	1944	1,931,950	8,217,966
1892	925,495	2,479,005	1945	1,523,021	6,454,360
1893	1,095,690	2,934,882	1946	1,439,092	6,732,470
1894	1,134,509	3,038,859	1947	1,696,350	8,680,440
1895	1,052,412	2,824,687	1948	1,604,480	9,765,395
1896	1,002,268	2,693,961	1949	1,621,268	10,549,924
1897	999,372	2,734,522	1950	1,574,006	10,119,303
1898	1,263,272	3,582,595	1951	1,573,572	10,169,617
1899	1,435,314	4,126,803	1952	1,402,313	9,729,739
1900	1,781,000	4,744,530	1953	1,384,138	9,528,279
1901	1,894,544	5,016,398	1954	1,308,284	9,154,544
1902	1,838,621	4,832,257	1955	1,332,874	8,986,501
1903	1,624,742	4,332,297	1956	1,417,209	9,346,518
1904	1,887,981	4,953,024	1957	1,085,657	7,340,339
1905	2,044,931	5,511,861	1958	796,413	5,937,860
1906	2,126,965	5,548,044	1959	690,011	5,472,064
1907	2,485,961	7,637,713	1960	788,658	5,242,223
1908	2,362,514	7,356,866	1961	919,142	6,802,134
1909	2,688,672	8,574,884	1962	825,339	6,133,986
1910	3,314,749	11,108,335			
1911	2,541,698	8,071,747	Totals	136,161,251	$569,796,907

[1] Quantity from 1836 to 1909 is gross mine output and includes material lost in picking and washing. For 1910 and subsequent years the quantity is that sold and used.

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

TABLE VIIIB.—QUANTITY[1] AND VALUE OF COAL SOLD AND USED[2]

Mining Division and Period	Total Sales	Used under Company Boilers	Used in Making Coke	Total Sold and Used	
	Tons	Tons	Tons	Tons	$
Cariboo—					
Total to 1950	257	33	....	290	1,100
Total to date	257	33	....	290	1,100
Fort Steele—					
Total to 1950	31,287,472	2,006,789	9,704,778	42,999,039	166,468,348
1951–60	7,014,784	145,624	2,195,744	9,356,152	58,606,978
1961	619,828	14,698	200,190	834,716	5,979,805
1962	532,289	10,788	191,454	734,531	5,255,540
Total to date	39,454,373	2,177,899	12,292,166	53,924,438	236,310,671
Kamloops—					
Total to 1950	14,348	739	....	15,087	59,765
Total to date	14,348	739	....	15,087	59,765
Liard—					
Total to 1950	58,417	266	....	58,683	325,395
1951–60	36,083	20	....	36,103	333,461
1961	2,062	....	....	2,062	17,000
1962	1,389	....	....	1,389	12,501
Total to date	97,951	286	....	98,237	688,357
Nanaimo—					
Total to 1950	67,181,037	4,280,602	558,985	72,020,624	278,647,173
1951–60	1,951,075	11,071	....	1,962,146	19,134,499
1961	76,009	....	....	76,009	736,814
1962	83,534	....	....	83,534	801,294
Total to date	69,291,655	4,291,673	558,985	74,142,313	299,319,780
Nicola—					
Total to 1950	2,731,340	188,884	....	2,920,224	10,985,359
1951–60	9,016	....	....	9,016	91,725
1961	159	....	....	159	1,717
1962	125	....	....	125	1,375
Total to date	2,740,640	188,884	....	2,929,524	11,080,176
Omineca—					
Total to 1950	214,126	4,095	....	218,221	1,034,134
1951–60	202,931	....	....	202,931	1,616,775
1961	5,850	....	....	5,850	64,024
1962	5,760	....	....	5,760	63,276
Total to date	428,667	4,095	....	432,762	2,778,209
Osoyoos—					
Total to 1950	1,122	....	....	1,122	5,008
Total to date	1,122	....	....	1,122	5,008
Similkameen—					
Total to 1950	4,055,080	349,235	....	4,404,315	18,426,725
1951–60	212,781	....	....	212,781	1,124,226
1961	346	....	....	346	2,774
1962	....	....	....	....	....
Total to date	4,268,207	349,235	....	4,617,442	19,553,725
Skeena—					
Total to 1950	36	....	....	36	116
Total to date	36	....	....	36	116
Provincial totals—					
Total to 1950	105,543,235	6,830,643	10,263,763	122,637,641	475,953,123
1951–60	9,426,670	156,715	2,195,744	11,779,129	80,907,664
1961	704,254	14,698	200,190	919,142	6,802,134
1962	623,097	10,788	191,454	825,339	6,133,986
Total to date	116,297,256	7,012,844	12,851,151	136,161,251	569,796,907

[1] For differences 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 this and preceding Annual Reports.
[2] 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.

TABLE IX.—COKE AND BY-PRODUCTS PRODUCTION FOR YEARS 1895 TO 1925 AND BY YEARS 1926 TO 1962

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	27,044	6,556,142
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
1955	314,994	2,122,303	—	—	177,031	2,180,516	70,387	594,482	247,418	2,774,998	5,407,842	292,984	18,369	8,494,193
1956	328,805	2,277,402	—	—	180,263	2,270,167	78,185	738,292	258,448	3,008,459	5,145,851	287,437	20,961	8,462,708
1957	199,654	1,284,833	—	—	153,493	2,005,570	—	—	153,493	2,005,570	14,600	121,849	—	2,142,019
1958	224,158	1,420,328	—	—	173,920	2,253,102	—	—	173,920	2,253,102	14,600	97,803	—	2,365,505
1959	173,227	1,135,222	—	—	134,134	1,789,906	—	—	134,134	1,789,906	14,600	76,891	—	1,881,397
1960	186,960	1,124,760	—	—	139,040	1,948,370	—	—	139,040	1,948,370	—	108,360	—	2,056,730
1961	200,190	1,201,140	—	—	153,843	2,232,690	—	—	153,843	2,232,690	—	115,291	—	2,347,981
1962	191,454	1,196,588	—	—	152,885	2,171,128	—	—	152,885	2,171,128	—	116,499	—	2,287,627
Totals	16,464,041	70,762,794	6,223,241	35,571,124	2,939,919	32,611,814	1,829,283	11,777,717	10,991,540	79,960,655	83,269,939	4,188,315	553,717	167,972,626

[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, $344,682; pitch, $5,131; sulphuric acid, $6,658; tar-paint, $2,330; and miscellaneous, $10,827.

Table X.—Dividends Paid by Mining Companies, 1897–1962

Dividends Paid during 1961 and 1962

	1961	1962
Bralorne Pioneer Mines Ltd.	$642,040	$642,540
Cassiar Asbestos Corporation Ltd.	2,376,000	2,376,000
Craigmont Mines Ltd.	....	893,972
Consolidated Mining and Smelting Co. of Canada, Ltd.	16,380,368	18,018,452
Crow's Nest Pass Coal Co. Ltd.	489,326	582,781
Giant Mascot Mines Ltd.	....	174,387
Highland-Bell Ltd.	160,750	161,200
Nimpkish Iron Mines Ltd.	....	860,750
Reeves MacDonald Mines Ltd.	467,600	467,600
Sheep Creek Mines Ltd.	187,500	206,250
Others	16,655	10,365
Totals	$20,720,239	$24,394,297

Dividends Paid Yearly, 1917 to 1962, Inclusive

Year	Amount Paid	Year	Amount Paid
1917	$3,269,494	1941	$16,598,110
1918	2,704,469	1942	13,627,104
1919	2,494,283	1943	11,860,159
1920	1,870,296	1944	11,367,732
1921	736,629	1945	10,487,395
1922	3,174,756	1946	15,566,047
1923	2,983,570	1947	27,940,213
1924	2,977,276	1948	37,672,319
1925	5,853,419	1949	33,651,096
1926	8,011,137	1950	34,399,330
1927	8,816,681	1951	40,921,238
1928	9,572,536	1952	32,603,956
1929	11,263,118	1953	22,323,089
1930	10,543,500	1954	25,368,262
1931	4,650,857	1955	35,071,583
1932	2,786,958	1956	36,262,682
1933	2,471,735	1957	24,247,420
1934	4,745,905	1958	14,996,123
1935	7,386,070	1959	16,444,281
1936	10,513,705	1960	20,595,943
1937	15,085,293	1961	20,720,239
1938	12,068,875	1962	24,394,297
1939	11,865,698		
1940	14,595,530	Total	$667,560,408

TABLE X.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1962—*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.[2]	Bridge River	Gold	17,759,500
Bralorne Pioneer Mines Ltd.[2]	Bridge River	Gold	2,527,425
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[3]
Goodenough (leasers)	Ymir	Gold	13,731
Hedley Mascot Gold Mines Ltd.	Hedley	Gold	1,290,553
Island Mountain Mines Ltd.	Wells	Gold	2,491,236[3]
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[4]
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.[2]	Bridge River	Gold	10,048,914
Poorman	Nelson	Gold	25,000
Premier Gold Mining Co. Ltd.	Premier	Gold	18,858,075[5]
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[3]
Reno Gold Mines Ltd.	Sheep Creek	Gold	1,433,640[3]
Sheep Creek Gold Mines Ltd.[7]	Sheep Creek	Gold	3,796,875[6]
Silbak Premier Mines Ltd.	Premier	Gold	2,425,000[5]
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[3]
Miscellaneous mines		Gold	108,623
Total, lode-gold mines			$80,629,295

[1] The gold-copper properties of Rossland are included in this table.
[2] Early in 1959 Bralorne Mines Ltd. and Pioneer Gold Mines of B.C. Ltd. were merged under the name of Bralorne Pioneer Mines Ltd., and dividend payments for 1959 and subsequent years are entered under the new company listing.
[3] Includes " return of capital " and " liquidating " payments.
[4] Former Kelowna Exploration Company Limited; changed in January, 1951.
[5] 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.
[6] In several years, preceding 1953, company revenue included profits from operations of the Lucky Jim zinc-lead mine.
[7] Since March, 1956, company name is Sheep Creek Mines Ltd.

TABLE X.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1962—*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
Canadian Exploration Ltd.	Salmo	Silver-lead-zinc	11,175,400
Capella	New Denver	Silver-lead-zinc	5,500
Consolidated Mining and Smelting Co. of Canada, Ltd.	Trail	Silver-lead-zinc	532,679,822[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
Giant Mascot Mines Ltd.	Spillimacheen	Silver-lead-zinc	179,263
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	2,111,840
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	142,238[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	4,033,050
Reco	Cody	Silver-lead-zinc	334,992
Ruth Mines Ltd.	Sandon	Silver-lead-zinc	125,490
St. Eugene	Moyie	Silver-lead-zinc	566,000
Sheep Creek Mines Ltd.	Invermere	Silver-lead-zinc	637,500
Silversmith and Slocan Star[4]	Sandon	Silver-lead-zinc	1,267,600
Silver Standard Mines Ltd.	Hazelton	Silver-lead-zinc	1,715,333
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
Sunshine Lardeau Mines Ltd.	Beaton	Silver-lead-zinc	164,000
Torbrit Silver Mines Ltd.	Alice Arm	Silver-lead-zinc	390,000
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
Yale Lead and Zinc Mines Ltd.	Ainsworth	Silver-lead-zinc	278,620
Miscellaneous mines			70,239
Total, silver-lead-zinc mines			$565,445,019

[1] Includes $466,143 " return of capital " distribution prior to 1949.
[2] Earnings of several company mines, and custom 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 X.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1962—*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
Craigmont Mines Ltd.	Merritt	Copper	893,972
Granby Cons. M.S. & P. Co.[2]	Copper Mountain	Copper	29,873,226
Marble Bay	Texada Island	Copper	175,000
Hall Mines	Nelson	Copper	233,280
Miscellaneous mines		Copper	261,470
Total, copper mines			$50,864,619

[1] The Britannia Mining and Smelting Co. Limited, a wholly owned subsidiary of the Howe Sound Company (Maine), paid the dividends shown to its parent company. On June 30, 1958, consolidation between the Howe Sound Company (Maine) and Haile Mines Inc. became effective, bringing into existence Howe Sound Company (Delaware). The Britannia mine became a division of the new Howe Sound Company, and in August Britannia Mining and Smelting Co. was liquidated voluntarily.

[2] The Granby Consolidated Mining Smelting and Power Company dividends commenced in 1904 and cover all company activities in British Columbia to date. The figure 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	18,536,721
Canadian Collieries Resources Ltd.	Nanaimo	Coal	828,271
Unsworth & Dunn	Nanaimo	Coal	7,065
Total, coal mines			$35,396,057

Aggregate of All Classes

Lode-gold mining	$80,629,295
Silver-lead-zinc mining and smelting	565,445,019
Copper-mining	50,864,619
Coal-mining	35,396,057
Miscellaneous, structural, and placer gold	17,851,625
Total	$750,186,615

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 XI.—PRINCIPAL ITEMS OF EXPENDITURE, REPORTED FOR OPERATIONS OF ALL CLASSES

Class	Salaries and Wages	Fuel and Electricity[1]	Process Supplies[1]
Lode-mining[2]	$42,912,392	$5,813,426	$8,755,480
Placer-mining	159,975	32,697	8,519
Fuel—coal, coke and gas plant	3,123,207	307,987	480,078
„ petroleum and natural gas	1,829,108	190,235	3,222,413
Industrial minerals	2,864,545	992,347	487,489
Structural-materials industry	4,632,944	2,168,867	1,070,820
Totals, 1962	**$55,522,171**	**$9,505,559**	**$14,024,799**
Totals, 1961	50,887,275	8,907,034	17,787,127
1960	52,694,818	7,834,728	21,496,912
1959	49,961,996	7,677,321	17,371,638
1958	48,933,560	8,080,989	15,053,036
1957	56,409,056	8,937,567	24,257,177
1956	57,266,026	9,762,777	22,036,839
1955	51,890,246	9,144,034	21,131,572
1954	48,702,746	7,128,669	19,654,724
1953	55,543,490	8,668,099	20,979,411
1952	62,256,631	8,557,845	27,024,500
1951	52,607,171	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	6,139,470	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	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	16,758,367	2,619,639	4,552,730
Grand totals, 1935–62	$1,072,873,770	$182,207,163	$382,540,119

[1] In some cases this detail is not available and is included in a total that contains expenditures on fixed assets plus cost of goods, materials, and supplies not chargeable to fixed assets.

[2] Prior to 1962 this included data related to the principal lode metals as detailed in Table I. The lode metals classed as miscellaneous metals in Table I were previously included under the heading "Miscellaneous Metals and Industrial Minerals."

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

TABLE XII.—AVERAGE NUMBER EMPLOYED IN THE MINING INDUSTRY,[1] 1901–62

Year	Placer-mining	Lode-mining			In Concentrators	In Smelters	Coal-mining			Structural Materials		Industrial	Total[2]
		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	6,247	......	......	......	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	15,566
1930	425	2,316	1,260	3,576	832	3,197	3,389	1,256	4,645	843	344	170	14,082
1931	688	1,463	834	2,297	581	3,157	2,957	1,125	4,082	460	526	380	12,171
1932	374	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	370	260	408	11,369
1934	1,122	2,796	1,729	4,525	631	2,890	2,050	848	2,898	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	13,787
1936	1,124	2,959	1,840	4,799	720	2,678	2,015	799	2,814	981	288	825	14,170
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	869	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	1,208	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	15,790
1954	190	2,644	2,520	5,164	1,129	3,119	1,076	358	1,434	1,861	638	584	14,128
1955	102	2,564	2,553	5,117	1,001	3,304	1,100	378	1,478	1,646	641	722	14,102
1956	106	2,637	2,827	5,464	1,043	3,339	968	398	1,366	1,598	770	854	14,589
1957	67	2,393	2,447	4,840	833	3,328	1,020	360	1,380	1,705	625	474	13,257
1958	75	1,919	1,809	3,728	625	3,081	826	260	1,086	1,483	677	446	11,201
1959	99	1,937	1,761	3,698	618	3,008	765	291	1,056	1,357	484	459	10,779
1960	88	1,782	1,959	3,741	648	3,034	894	288	1,182	1,704	557	589	11,541
1961	74	1,785	1,582	3,367	626	3,118	705	237	942	1,828	508	571	11,034
1962	**35**	**1,684**	**2,238**	**3,922**	**850**	**3,356**	**548**	**228**	**776**	**1,523**	**481**	**517**	**11,560**

[1] Mining industry includes all branches of the mineral industry except petroleum and natural gas.

[2] 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 XIII.—LODE-METAL MINES—TONNAGE, NUMBER OF MINES, NET AND GROSS VALUE,[4] 1901–62

Year	Tonnage[1]	Number of Shipping Mines	Number of Mines Shipping over 100 Tons	Gross Value as Reported by Shipper[2]	Freight and Treatment[3]	Net Value to Shipper[3]	Gross Value of Lode Metals Produced[4]
1901	926,162	119	78	....	....	....	$13,287,947
1902	1,009,016	124	75	....	....	....	11,136,162
1903	1,288,466	125	74	....	....	....	11,579,382
1904	1,461,609	142	76	....	....	....	12,309,035
1905	1,706,679	146	79	....	....	....	15,180,164
1906	1,963,872	154	77	....	....	....	17,484,102
1907	1,805,614	147	72	....	....	....	16,222,097
1908	2,083,606	108	59	....	....	....	14,477,411
1909	2,057,713	89	52	....	....	....	14,191,141
1910	2,216,428	83	50	....	....	....	13,228,731
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	....	....	....	27,595,278
1919	2,146,920	144	74	....	....	....	19,756,648
1920	2,215,445	121	60	....	....	....	19,451,725
1921	1,586,428	80	35	....	....	....	12,925,448
1922	1,592,163	98	33	....	....	....	19,228,257
1923	2,447,672	77	28	....	....	....	25,348,399
1924	3,413,912	86	37	....	....	....	35,538,247
1925	3,849,269	102	40	....	....	....	46,200,185
1926	4,775,327	138	55	....	....	$38,558,618	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	51,720,436
1930	6,804,276	68	32	....	....	21,977,688	41,292,980
1931	5,549,622	44	22	....	....	10,513,931	22,900,229
1932	4,354,904	75	29	....	....	7,075,393	19,705,043
1933	4,063,775	109	47	....	....	13,976,858	25,057,007
1934	5,141,744	145	69	....	....	20,243,278	34,071,955
1935	4,927,204	177	72	....	....	25,407,914	40,662,633
1936	4,381,173	168	70	....	....	30,051,207	43,813,898
1937	6,145,244	185	118	$48,617,920	$4,663,843	43,954,077	62,950,536
1938	7,377,117	211	92	40,222,237	4,943,754	35,278,483	53,878,093
1939	7,212,171	217	99	45,133,788	4,416,919	40,716,869	53,554,092
1940	7,949,736	216	92	50,004,909	6,334,611	43,670,298	61,735,604
1941	8,007,937	200	96	52,354,870	5,673,048	46,681,822	62,607,882
1942	6,894,844	126	76	50,494,041	5,294,637	45,199,404	59,694,192
1943	5,786,864	48	32	37,234,070	3,940,367	33,293,703	52,651,868
1944	4,879,851	51	31	29,327,114	2,877,706	26,449,408	39,369,738
1945	4,377,722	36	27	34,154,917	2,771,292	31,383,625	48,724,001
1946	3,705,594	50	32	48,920,971	2,904,130	46,016,841	56,653,485
1947	5,011,271	75	33	81,033,098	4,722,010	76,311,087	93,124,847
1948	5,762,321	97	51	118,713,859	18,585,183	100,128,727	121,696,891
1949	6,125,460	118	54	99,426,678	19,613,185	79,814,604	107,775,413
1950	6,802,482	112	58	108,864,792	22,113,431	86,751,361	113,464,619
1951	6,972,400	119	64	142,590,427	25,096,743	117,493,684	147,646,989
1952	9,174,617	95	58	140,070,389	30,444,575	106,601,451	144,151,515
1953	9,660,281	80	48	94,555,069	27,815,152	66,739,892	123,619,837
1954	8,513,865	63	40	106,223,833	29,135,673	77,088,160	120,829,789
1955	9,126,902	53	34	119,039,285	30,696,044	88,343,241	138,145,095
1956	8,827,037	70	40	125,043,590	31,933,681	93,110,262	143,546,586
1957	7,282,436	59	40	95,644,930	30,273,900	65,370,185	119,409,764
1958	6,402,198	57	28	83,023,111	28,068,396	54,955,069	100,591,049
1959	6,990,985	60	44	92,287,277	27,079,911	65,208,728	100,549,519
1960	8,242,703	67	31	114,852,061	29,505,158	85,346,903	125,674,531
1961	8,392,161	59	39	112,488,918	30,304,050	82,184,868	123,913,897
1962	**11,212,106**	**64**	**45**	**137,759,188**	**34,274,698**	**103,484,490**	**153,378,622**

[1] Includes ores of iron, mercury, nickel, tungsten, 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 calculated by valuing gold, silver, copper, lead, zinc, mercury (1938–44, 1955), and nickel (1936–37, 1958–62) at yearly average prices, and iron (1901–03, 1907, 1918–23, 1928, 1948–62) and tungsten (1939–45, 1947–58) at values given by operators.

Table XIV.—Lode-metal Production in 1962

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents: Gold	Silver	Copper	Lead	Zinc	Cadmium
			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Northern British Columbia										
Atlin Mining Division										
Nil										
Liard Mining Division										
Nil										
Central British Columbia										
Cariboo Mining Division										
Cariboo Gold Quartz and Aurum	Wells	The Cariboo Gold Quartz Mining Co. Ltd., Vancouver	38,638	Bullion	18,624	3,274				
Clinton Mining Division										
Nil										
Omineca Mining Division										
?	Telkwa	Canadian American Mining Co., Seattle	27	Copper ore	12	371	3,630			
Silver Standard	Hazelton	P. Kindrat, Smithers	52	Crude ore	9	7,932		12,806	9,184	
Coast and Islands										
Alberni Mining Division										
Brynnor	Kennedy Lake	Brynnor Mines Ltd., Vancouver	716,054	Iron concentrates, 451,623 tons						
F.L.	Zeballos	Zeballos Iron Mines Ltd., Vancouver	369,289	Iron concentrates, 250,397 tons						
Musketeer	Tofino	Copper Town Mines, Vancouver	3,120	Concentrates, 75 tons	878	483	376	4,848		
Tofino	Tofino	W. E. McArthur, Greenwood	40	Crude ore	388	85		158	79	

			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Nanaimo Mining Division										
Copper Road	Quadra Island	R. I. Bennett, Heriot Bay	44	Crude ore		37	4,692			
Merry Widow and Kingfisher	Benson Lake	Empire Development Co. Ltd., Vancouver	148,055	Iron concentrates, 24,895 tons						
Nimpkish	Beaver Cove	Nimpkish Iron Mines Ltd., Vancouver	672,008	Iron concentrates, 362,271 tons						
Old Sport	Benson Lake	Coast Copper Co. Ltd., Port McNeill	66,449	Copper concentrates, 1,776 tons			1,081,320			
Prescott, Paxton, Yellow Kid	Texada Island	Texada Mines Ltd., Vancouver	1,103,693	Iron concentrates, 601,730 tons; copper concentrates, 5,850 tons	829	20,048	1,727,739			
New Westminster Mining Division										
Pride of Emory	Choate	Giant Mascot Mines Ltd., Vancouver	311,443	Nickel-copper concentrates, 19,900 tons			1,806,437			
Seneca	Agassiz	M. Poschner, North Surrey	287	Crude ore	17	959	7,118		40,657	
Skeena Mining Division										
Jessie	Harriet Harbour	Jedway Iron Ore Ltd., Vancouver	166,430	Iron concentrates, 53,515 tons						
Silbak Premier	Premier	Silbak Premier Mines Ltd., Vancouver	465	Crude ore	3,292	52,274		29,304	43,438	
Vancouver Mining Division										
Britannia	Britannia Beach	Howe Sound Co. (Britannia Division), Britannia Beach	501,400	Copper concentrates and precipitates, 25,223 tons; zinc concentrates, 6,969 tons; tailings, 40,177 tons	11,152	57,577	12,935,468	165,855	7,697,051	30,755
Victoria Mining Division										
Sunro	River Jordan	Cowichan Copper Co. Ltd., Vancouver	144,009	Copper concentrates, 10,148 tons	1,218	14,207	5,067,323			
SOUTH CENTRAL BRITISH COLUMBIA										
Greenwood Mining Division										
Albion	Paulson	Albion Mining Co. Ltd., Castlegar	152	Siliceous ore	16	147		309	309	
Cariboo-Amelia	Rock Creek	McKinney Gold Mines Ltd., Vancouver	1,836	Crude ore	1,365	1,407		14,944	18,669	
Colby	Westbridge	A. L. Jones, Westbridge	48	Crude ore	3	52		95	95	
Enterprise	Rhone	S. Ruzicka, Grand Forks	33	Crude ore	4	33		66	66	

TABLE XIV.—LODE-METAL PRODUCTION IN 1962—*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
SOUTH CENTRAL BRITISH COLUMBIA—*Continued*			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Greenwood Mining Division—Continued										
Highland-Bell	Beaverdell	Mastodon-Highland Bell Mines Ltd., Vancouver	19,480	Lead concentrates, 1,886 tons; zinc concentrates, 299 tons; jig concentrates, 792 tons	581	833,153	—	908,747	1,105,153	8,359
King Midas	Greenwood	King Midas Mines Ltd., Vancouver	4	Crude ore	2	335	—	645	16	—
Mother Lode	Greenwood	Consolidated Woodgreen Mines Ltd., Vancouver	62,584	Copper concentrates, 2,177 tons	1,740	8,916	825,452	—	—	—
Paddy	Rhone	S. Ruzicka, Grand Forks	26	Siliceous ore	6	47	—	52	52	—
Phoenix	Greenwood	Phoenix Copper Co. Ltd., Grand Forks	554,699	Copper concentrates, 14,423 tons	13,087	65,265	7,108,949	—	—	—
Skomac	Rock Creek	Skomac Mines Ltd., Vancouver	166	Crude ore	8	819	—	10,890	4,903	—
Kamloops Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
Lillooet Mining Division										
Bralorne	Bridge River	Bralorne Pioneer Mines Ltd., Vancouver	149,998	Bullion; gold concentrates, 8 tons	99,121	20,043	—	—	—	—
Golden Contact	Anderson Lake	Cassiar Copperfields Ltd., Vancouver	927	Bullion	7	—	—	—	—	—
Pioneer	Bridge River	Bralorne Pioneer Mines Ltd., Vancouver	—	Mill residue	774	—	—	—	—	—
Nicola Mining Division										
Craigmont	Merritt	Craigmont Mines Ltd., Vancouver	1,850,252	Copper concentrates, 135,649 tons	—	—	79,820,978	—	—	—
Osoyoos Mining Division										
Nickel Plate	Hedley	Hedley Mining Syndicate, c/o L. J. Penney and J. Rail, Vernon	—	Mill clean-up; ore, 57 tons; tailings, 47 tons	288	111	—	—	—	—
Standard	Oliver	Continental Consolidated Mines Ltd., Vancouver	2,068	Siliceous ore	563	4,430	—	6,368	4,261	—
Similkameen Mining Division										
Copper Mountain	Princeton	H-G Mining Co. Ltd., Princeton	20	Crude ore	3	28	5,184	—	—	—

Vernon Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
Fort Steele Mining Division										
Midway	Moyie	J. A. Farrell, Moyie	235	Siliceous ore	39	816	—	1,562	1,116	—
Sullivan	Kimberley	The Consolidated Mining & Smelting Co. of Canada, Ltd., Trail	2,583,068	Lead concentrates, 173,946 tons; zinc concentrates, 260,344 tons; tin concentrates, 556 tons	353	3,866,645	614,200	251,176,000	261,330,000	—
Golden Mining Division										
Mineral King	Toby Creek	Sheep Creek Mines Ltd., Nelson	212,412	Lead concentrates, 6,711 tons; zinc concentrates, 17,780 tons	—	228,865	87,203	9,199,949	20,321,992	83,424
Nelson Mining Division										
H.B.	Salmo	The Consolidated Mining & Smelting Co. of Canada, Ltd., Trail	468,979	Lead concentrates, 4,726 tons; zinc concentrates, 36,251 tons	—	60,003	—	7,255,780	40,587,340	325,331
Jersey	Salmo	Canadian Exploration Ltd., Vancouver	384,894	Lead concentrates, 10,315 tons; zinc concentrates, 26,607 tons	—	41,342	—	16,547,436	31,543,694	239,398
Kenville (White Lease)	Nelson	D. H. Norcross, Nelson	21	Crude ore	22	—	—	—	—	—
Kootenay Belle	Salmo	K-Belle Enterprise Co., Linden, Alta.	8,712	Crude ore	791	833	—	17,583	18,188	—
Lucky Strike	Nelson	L. C. de Kock, Nelson	3	Crude ore	4	59	—	153	38	—
New Arlington	Erie	G. D. Fox, Trail	277	Crude ore	148	262	—	5,299	5,152	—
Queen	Salmo	A. Endersby, Fruitvale	29	Crude ore	18	9	—	58	58	—
Reeves MacDonald	Remac	Reeves MacDonald Mines Ltd., Vancouver	417,448	Lead concentrates, 7,253 tons; zinc concentrates, 26,266 tons	—	41,823	—	9,161,914	29,201,464	166,834
Revelstoke Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
Slocan Mining Division										
Anna	Slocan	H. Marasek, Slocan	2	Crude ore	—	61	—	55	15	—
Arlington	Slocan	B. I. Nesbitt, Vancouver	635	Siliceous dump material	—	3,334	—	8,600	6,888	—
Bank of England	Slocan	J. K. Pearson, Calgary	4	Crude ore	—	47	—	76	68	—
Bluebell	Riondel	The Consolidated Mining & Smelting Co. of Canada, Ltd., Trail	237,742	Lead concentrates, 13,721 tons; zinc concentrates, 27,407 tons	—	297,191	211,600	21,164,684	23,572,471	135,983
Bosun	Silverton	W. H. McLeod, Silverton	42	Lead concentrates, 7 tons; zinc concentrates, 6 tons	—	1,596	—	7,175	8,135	45
Caledonia	Retallack	Northwest Mining Partnership, Kellogg, Idaho	140	Lead concentrates, 7 tons; zinc concentrates, 14 tons	—	867	—	9,865	16,341	60
Crown	Ainsworth	D. H. Norcross, Nelson	13	Crude ore	—	1,253	—	2,445	1,025	—

TABLE XIV.—LODE-METAL PRODUCTION IN 1962—*Continued*

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents					
					Gold	Silver	Copper	Lead	Zinc	Cad-mium
SOUTH CENTRAL BRITISH COLUMBIA—*Continued*			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Slocan Mining Division—Continued										
Enterprise	Silverton	J. Kelly and F. Pho, Silverton	345	Lead concentrates, 24 tons; zinc concentrates, 75 tons	1	3,174	......	34,340	95,657	680
Fisher Maiden	Silverton	F. Mills, Silverton	188	Lead concentrates, 8 tons; zinc concentrates, 41 tons	1	4,931	......	12,476	47,918	357
Freddy	Silverton	V. C. Hanson, H. Lyon, and K. Millar, Silverton	13	Crude ore	1	554	......	78	104	......
Hewitt	Silverton	Philco Mining Partnership, New Denver	625	Lead concentrates, 41 tons; zinc concentrates, 72 tons	3	16,252	......	43,572	84,673	618
Idaho	Three Forks	M. Tarnowski, Silverton	7	Crude ore	......	954	......	9,901	512	......
Mammoth	Silverton	Western Exploration Co. Ltd., Silverton	6,494	Lead concentrates, 495 tons; zinc concentrates, 639 tons	11	50,721	......	651,145	757,739	4,990
Ottawa	Slocan	Ottawa Silver Mines Ltd., Spokane, Wash.	740	Crude ore	2	46,327	......	1,824	2,042	......
Ruth	Sandon	E. Perepolkin & Son, Hills; H. E. Singel and B. Fried, Kaslo	327	Lead concentrates, 31 tons; zinc concentrates, 51 tons; crude ore, 25 tons	4	6,587	......	57,950	66,954	401
Slocan Prince	Slocan	J. K. Pearson, Calgary	253	Crude ore	......	3,948	......	4,810	6,518	......
Victor	Sandon	Violamac Mines Ltd., New Denver, and lessees E. Anderson, J. C. Stewart, L. Fried, E. de Rosa, New Denver, and E. Perepolkin & Son, Hills	1,168	Lead concentrates, 117 tons; zinc concentrates, 198 tons; crude ore, 74 tons	17	27,037	......	261,935	250,587	1,694
Trail Creek Mining Division										
Velvet	Rossland	Mid-West Copper & Uranium Mines Ltd., Vancouver; Velvet Leasers, Rossland, lessees	2,002	Concentrates, 143 tons	179	404	53,792	......	......	......
W.D.	Trail	W. D. Mining Co. Ltd., Trail	1,492	Crude ore	601	142	......	2,985	3,230	......

Table XV.—Lode-metal Mines Employing an Average of Ten or More Persons during 1962[1]

Name of Mine or Operator	Days Operating		Tons		Average Number Employed	
	Mine	Mill	Mined	Milled	Mine	Mill
Shipping Mines						
Bluebell (Cons. M. & S. Co. of Canada Ltd.)	235	323	237,742	237,742	**222**	15
Bralorne Pioneer Mines Ltd. (Bralorne Division)	365	365	149,998	149,998	**306**	17
Brynnor Mines Ltd. and Kie Mine Co. Ltd.	320	263	702,809	716,054	**118**	43
Cariboo Gold Quartz Mining Co. Ltd.	274	365	40,061	40,061	**118**	9
Coast Copper Co. Ltd.	101	125	66,449	66,449	**84**	3
Craigmont Mines Ltd. (including Pooley Bros.)	365	365	1,850,252	1,850,252	**372**	32
Cowichan Copper Co. Ltd. (Sunro mine)	365	245	144,009	144,009	**114**	17
Empire Development Co. Ltd. and Mannix Co. Ltd. (Iron Production Division)	171	63	82,589	148,055	**35**	18
Giant Mascot Mines Ltd. (Pride of Emory mine)	365	365	311,443	311,443	**132**	24
H.B. (Cons. M. & S. Co. of Canada Ltd.)	251	364	468,979	468,979	**102**	12
Howe Sound Co. (Britannia Division)	270	240	501,400	501,400	**325**	34
Jedway Iron Ore Ltd.	310	80	166,430	166,430	**80**	27
Jersey (Canadian Exploration Ltd.)	365	365	398,691	384,894	**146**	11
Mastodon-Highland Bell Mines Ltd.	243	288	14,480	14,480	**31**	6
McKinney Gold Mines Ltd.	154	......	1,835	......	**11**	......
Mineral King (Sheep Creek Mines Ltd.)	307	359	212,412	208,670	**84**	12
Mother Lode (Consolidated Woodgreen Mines Ltd.)	117	117	62,584	62,584	**7**	7
Nimpkish Iron Mines Ltd.	313	284	672,008	672,008	**36**	33
Ottawa Silver Mines Ltd.	252	—	740	......	**10**	......
Phoenix Copper Co. Ltd.	270	365	554,699	554,699	**69**	16
Reeves MacDonald Mines Ltd.	251	356	417,779	417,448	**87**	19
Sullivan (Cons. M. & S. Co. of Canada Ltd.)	252	258	2,583,068	2,583,068	**851**	318
Texada Mines Ltd. and Inspiration Ltd.	300	350	1,089,363	1,103,693	**218**	37
Zeballos Iron Mines Ltd.	365	275	369,509	369,509	**24**	39
Non-shipping Mines						
Bethlehem Copper Corp. Ltd.	—	—	—	—	**39**	1
Bethlehem Copper—Pooley Bros. Ltd.	—	—	—	—	**11**	......
Bethlehem Copper—Floods Mining & Aggregate Co. Ltd.	......	......	......	......	**36**	.
Dolly Varden Mines Ltd.	......	......	—	—	**23**	—
Granduc Mines Ltd.	......	......	—	—	**39**	......
Kennco Explorations (Western) Ltd.	......	......	......	......	**45**	—
Noranda Exploration Co. Ltd. (Boss Mountain)	......	......	—	—	**15**	......
Phelps Dodge Corp. of Canada Ltd.	......	......	......	......	**13**	......
Southwest Potash Corporation	......	......	......	......	**25**	......

[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.

Departmental Work

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.

Gold Commissioners, Mining Recorders, and Sub-Mining Recorders, whose duties are laid down in the *Mineral Act* and *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 Department's offices at Victoria, and Room 101, 739 West Hastings Street, Vancouver. Officials in the offices of the Gold Commissioner at Victoria and the Gold Commissioner at Vancouver act as Sub-Mining Recorders for all mining divisions. 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 page A53.

Central Records Offices (Victoria and Vancouver)

Transcripts of all recordings 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 surveyed 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, Room 101, 739 West Hastings Street. The maps conform in geographical detail, size, and number to the reference and mineral reference maps issued by the Legal Surveys Branch of the Department of Lands, Forests, and Water Resources, and the approximate position 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. The charge for these maps is $1.25 for each sheet.

LIST OF GOLD COMMISSIONERS AND MINING RECORDERS IN THE PROVINCE

Mining Division	Location of Office	Gold Commissioner	Mining Recorder
Alberni	Alberni	T. G. O'Neill	T. G. O'Neill.
Atlin	Atlin	T. R. McKinnon	T. R. McKinnon.
Cariboo	Quesnel	F. E. P. Hughes	F. E. P. Hughes.
Clinton	Clinton	R. H. Archibald	R. H. Archibald.
Fort Steele	Cranbrook	E. L. Hedley	E. L. Hedley.
Golden	Golden	R. E. Manson	R. E. Manson.
Greenwood	Grand Forks	R. Macgregor	R. Macgregor.
Kamloops	Kamloops	D. Dalgleish	D. Dalgleish.
Liard	Victoria	R. H. McCrimmon.	
Lillooet	Lillooet	E. B. Offin	E. B. Offin.
Nanaimo	Nanaimo	W. H. Cochrane	W. H. Cochrane.
Nelson	Nelson	K. D. McRae	K. D. McRae.
New Westminster	New Westminster	J. F. McDonald	G. C. Kimberley.
Nicola	Merritt	T. S. Dobson	T. S. Dobson.
Omineca	Smithers	G. H. Beley	G. H. Beley.
Osoyoos	Penticton	T. S. Dalby	T. S. Dalby.
Revelstoke	Revelstoke	W. T. McGruder	W. T. McGruder.
Similkameen	Princeton	B. Kennelly	B. Kennelly.
Skeena	Prince Rupert	T. H. W. Harding	T. H. W. Harding.
Slocan	Kaslo	W. E. McLean	W. E. McLean.
Trail Creek	Rossland	W. L. Draper	W. L. Draper.
Vancouver	Vancouver	J. Egdell	Mrs. S. Jeannotte (Deputy).
Vernon	Vernon	G. F. Forbes	G. F. Forbes.
Victoria	Victoria	R. H. McCrimmon	E. J. Bowles.

Gold Commissioners' and Mining Recorders' Office Statistics, 1962

Mining Division	Free Miners' Certificates		Lode-mining						Placer-mining						Revenue		
	Individual	Company	Mineral Claims Recorded	Certificates of Work	Cash in Lieu	Certificates of Improvements	Bills of Sale, etc.	Mineral Leases	Placer Claims Recorded	Placer Leases Granted	Certificates of Work	Cash in Lieu	Bills of Sale, etc.	Free Miners' Certificates	Mining Receipts	Total
Alberni	123	3	1,217	2,044	$3,500.00	26	154	7	1	—	6	—	—	$935.00	$15,312.50	$16,247.50
Atlin	137	1	301	100	1,700.00	—	14	12	2	30	68	$2,200.00	40	785.00	10,943.75	11,728.75
Cariboo	920	13	746	610	1,900.00	—	67	1	4	72	470	1,500.00	124	5,637.00	28,369.25	34,006.25
Clinton	38	—	475	236	1,300.00	—	10	5	—	3	27	—	6	190.00	4,183.75	4,373.75
Fort Steele	175	4	251	250	3,200.00	—	35	1	—	15	62	500.00	11	1,171.00	7,855.75	9,026.75
Golden	131	4	100	260	300.00	—	25	5	—	13	7	—	11	960.00	2,608.50	3,568.50
Greenwood	119	4	457	563	600.00	—	45	34	—	2	5	—	—	995.00	6,848.00	7,843.00
Kamloops	376	8	2,638	2,731	800.00	—	182	3	—	4	13	—	—	2,690.00	18,961.50	21,651.50
Liard	293	—	963	3,779	4,100.00	—	92	—	—	7	56	1,250.00	—	1,470.00	17,831.90	19,301.90
Lillooet	198	5	526	470	800.00	—	43	2	2	7	44	500.00	11	1,440.00	7,039.50	8,479.50
Nanaimo	138	1	596	678	6,000.00	—	77	1	—	2	—	—	—	740.00	9,810.00	10,550.00
Nelson	278	9	433	545	1,100.00	—	51	22	—	1	12	—	1	2,190.00	5,608.00	7,798.00
New Westminster	380	10	638	650	2,400.00	—	240	1	5	5	17	500.00	3	2,653.00	7,814.50	10,467.50
Nicola	105	—	3,863	2,518	2,400.00	4	217	4	—	—	—	—	—	525.00	21,889.50	22,414.50
Omineca	291	4	3,008	1,340	3,100.00	—	98	2	1	40	87	250.00	49	1,717.00	23,214.25	24,931.25
Osoyoos	172	1	384	1,189	800.00	—	39	3	—	—	—	—	—	910.00	5,539.20	6,449.20
Revelstoke	77	5	155	64	1,900.00	—	15	1	—	2	28	—	3	836.00	4,125.50	4,961.50
Similkameen	97	3	1,672	719	2,000.00	—	25	4	2	9	21	—	23	685.00	11,288.50	11,973.50
Skeena	223	3	864	2,750	9,000.00	—	81	14	—	1	—	—	—	1,370.00	22,030.00	23,400.00
Slocan	128	2	205	444	—	—	42	16	—	4	4	—	1	840.00	4,539.00	5,379.00
Trail Creek	71	1	131	34	100.00	—	8	4	—	3	1	500.00	—	455.00	1,671.75	2,126.75
Vancouver	1,918	242	563	486	1,600.00	—	39	4	—	—	1	—	9	30,699.00	8,869.50	39,568.50
Vernon	181	1	120	289	200.00	—	116	1	2	7	16	—	16	955.00	2,416.50	3,371.50
Victoria	399	28	296	208	1,000.00	—	15	2	1	6	6	—	—	4,571.00	2,483.00	7,054.00
Totals for Province, 1962	6,968	352	20,602	22,957	$49,800.00	30	1,730	149	20	233	951	$7,200.00	308	$65,419.00	$256,253.60	$316,672.60
Totals for Province, 1961	7,180	308	19,064	16,665	$54,640.00	—	1,544	110	36	379	767	$9,350.00	189	$64,481.00	$231,127.88	$295,608.88

Coal, Petroleum, and Natural Gas

The Administration Branch is responsible for the administration of the *Petroleum and Natural Gas Act* and for the *Coal Act*. Information concerning applications for permits 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 and Petroleum Resources, Victoria, B.C. Similar information may be obtained respecting licences and leases issued under the *Coal Act*. Maps showing the locations of permits and leases under the *Petroleum and Natural Gas Act* are available, and copies may be obtained upon application to the office of the Department of Mines and Petroleum Resources, Victoria, B.C. Monthly reports listing additions and revisions to permit-location maps and 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 the required fee.

Coal Revenue, 1962

Licences—		
Fees	$600.00	
Rental	5,419.45	
		$6,019.45
Leases—		
Fees	*Nil*	
Rental	$94.50	
Cash in lieu	*Nil*	
		94.50
		$6,113.95

At the end of 1962, 27,665,218 acres, or approximately 43,000 square miles, of Crown petroleum and natural-gas rights, issued pursuant to the *Petroleum and Natural Gas Act*, were held in good standing. This acreage, held by operators ranging from small independent companies to major international ones, comprised:—

	Acres
297 permits	17,374,307
3 natural-gas licences	84,499
26 drilling reservations	471,487
2,821 leases (all types)	9,734,925
	27,665,218

Petroleum and Natural-gas Revenue, 1962

Rentals and fees—		
Permits	$2,138,070	
Drilling reservations	126,149	
Natural-gas licences	2,086	
Petroleum, natural-gas, and petroleum and natural-gas leases	4,916,971	
Total rentals and fees		$7,183,276

Sales of Crown reserves—		
Permits	$1,208,400	
Drilling reservations	3,067,675	
Leases	7,088,659	
Total Crown reserve sales		$11,364,734
Royalties—		
Gas	$1,260,419	
Oil	2,265,167	
Processed products	108,737	
Total royalties		3,634,323
Miscellaneous fees		31,950
Total petroleum and natural-gas revenues		$22,214,283

ANALYTICAL AND ASSAY BRANCH

By S. W. Metcalfe, Chief Analyst and Assayer

Rock Samples

During 1962 the chemical laboratory in Victoria issued reports on 2,163 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 submitted by prospectors and Departmental engineers; these radiometric assays are not listed in the table below.

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

	Samples	Spectrographic Analyses	Assays
Prospectors (not grantees)	1,674	1,671	4,018
Prospectors (grantees)	233	233	538
Departmental engineers	256	91	830
Totals	2,163	1,995	5,386

Samples submitted to the laboratory for identification are examined by the Mineralogical Branch of the Department. During the year 101 such samples were examined.

Petroleum and Natural-gas Samples

Reports were issued on fifty-one samples. Of this number, forty-three were samples of formation waters from wells being drilled for gas and oil in the Province; two were samples of wet mud on which water analyses could not be performed; three were samples of oil; two were suspected oil seeps; and one was a deposit from

* 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.

the engine of a Government vehicle. Thirty-nine spectrographic analyses were reported on samples in this category.

Coal Samples

Reports were issued on fifty-five samples of coal submitted by the Purchasing Commission for proximate analysis and calorific value.

Miscellaneous Samples

Reports were issued on ninety samples of a miscellaneous nature. One hundred and forty-four assays and thirty-seven spectrographic analyses were reported in this category.

For the British Columbia Research Council, five coals were ashed and spectrochemical determinations of germanium and gallium were made upon the ash; one deposit in a water system was examined and found to be a mixture of hydrous aluminum oxides; four different cement samples were spectrographed; and pellets of calcium chloride were spectrographed for minor elements present.

For the Purchasing Commission, two samples of anti-freeze were examined.

For the Department of Agriculture, seven samples of marl were analysed for their content of oxides of calcium and magnesium; one sample of water was analysed and the dissolved salts spectrographed.

For the British Columbia Hydro and Power Authority, a deposit in three plastic tubes was examined and found to be crystallized paraffin.

For the Department of Highways (Materials Testing Branch), six water samples were analysed; eighteen clays were spectrographed and analysed for sodium chloride and hygroscopic water, and four other clays were analysed for sodium chloride only; water-soluble salts were determined in a gravel sample; one crustation was spectrographed and found to be mainly calcium carbonate; three sediments were spectrographed—two were found to be clay and one calcium carbonate.

For the Department of Recreation and Conservation (Fish and Game Branch), the gritty material in a paste and the crankcase oil from a Department vehicle were examined and found to be corundum in each instance, and the gritty material in a valve-grinding paste was found to be a mixture of corundum and carborundum.

For the Department of Lands, Forests, and Water Resources, the Water Rights Branch submitted four water samples for determination of phosphorus pentoxide; the Forest Service submitted one gasoline sample for the determination of its lead content, and seven gravel samples for the determination of water-soluble sodium chloride and calcium chloride; the Grazing Division submitted five soil samples for the determination of arsenic, and one sample of a wood preservative for a determination of the major base metals present.

For the Victoria Metropolitan Board of Health, a residue in water was found to contain mainly iron.

For citizens of the Province, four water and two salt deposits from a saline lake were analysed; one clay was identified as illite; one natural-gas sample from the Sooke River was analysed; one sample of resin was identified; a dark-brown sediment in well water was found to contain mainly manganese; and a chip of wood stained purple was examined.

X-ray Powder Diffraction Analyses

One hundred and seventeen analyses of this type were performed for identification purposes.

Examination for Assayers

Four Provincial Government examinations for certificates of efficiency were held in Victoria during the year, when eight candidates were granted licences to practise assaying in the Province, six of them after having written supplemental examinations.

INSPECTION BRANCH

Organization and Staff

Inspectors and Resident Engineers

J. W. Peck, Chief Inspector	Victoria
Robert B. Bonar, Deputy Chief Inspector of Mines	Victoria
L. Wardman, Senior Electrical Inspector of Mines	Victoria
E. R. Hughes, Senior Inspector of Mines	Victoria
R. J. Craig, Senior Inspector of Mines, Silicosis Control	Vancouver
J. E. Merrett, Inspector and Resident Engineer	Vancouver
A. R. C. James, Inspector and Resident Engineer	Vancouver
J. D. McDonald, Inspector and Resident Engineer	Nelson
D. R. Morgan, Inspector and Resident Engineer	Fernie
David Smith, Inspector and Resident Engineer	Kamloops
W. C. Robinson, Inspector and Resident Engineer	Prince Rupert
S. Elias, Inspector, Silicosis Control	Vancouver

The Inspectors are stationed at the places listed and inspect coal mines, metalliferous mines, and quarries in their respective districts. They also examine prospects, mining properties, and roads and trails. The Silicosis Control Inspectors make dust and ventilation surveys at all mines and quarries.

E. R. Hughes supervised the Department's roads and trails programme and prospectors' grub-stakes.

Instructors, Mine-rescue Stations

Arthur Williams	Fernie Station
W. H. Childress	Nelson Station
R. H. Robertson	Kamloops Station
W. High (part time)	Cumberland Station

Board of Examiners for Coal-mine Officials

Robert B. Bonar, Chairman and Secretary	Victoria
A. R. C. James, Member	Vancouver
D. R. Morgan, Member	Fernie

R. B. Bonar, A. R. C. James, D. R. Morgan, and the mine-rescue instructors for the district in which an examination is being held form the Board for granting certificates of competency to coal-miners.

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

Board of Examiners for Shiftbosses (Metalliferous Mines)

Robert B. Bonar, Chairman	Victoria
A. R. C. James, Member	Vancouver
J. E. Merrett, Member	Vancouver

The Board conducts written examinations in various mining centres for applicants for underground shiftboss certificates. The Board is also empowered to grant provisional certificates without examination under such conditions as the Board considers necessary.

MINERALOGICAL BRANCH

Field work by officers of the Mineralogical Branch includes geological mapping and examinations 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 Petroleum Resources 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 directly by prospectors and others, or through the Analytical Branch.

Professional Staff

On December 31, 1962, 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, J. W. McCammon, N. D. McKechnie, G. E. P. Eastwood, J. T. Fyles, A. Sutherland Brown, J. M. Carr, W. G. Jeffery, W. C. Jones, A. F. Shepherd, and J. E. Hughes. In November, 1961, Dr. Jeffery went on leave for a year in order to go to Ghana on a Canadian External Aid mission. R. W. Yole was employed for a month mainly on stratigraphic studies of Palæozoic limestones on southern Vancouver Island.

Technical editing of the Annual Report of the Minister of Mines and Petroleum Resources and of other publications was directed by M. S. Hedley. Copy for printing was prepared by and under the direction of Mrs. Rosalyn J. Moir. 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 selected areas and of mineral deposits. Mr. McCammon is responsible for studies of industrial minerals and structural materials, and Mr. Shepherd for records and library.

Field Work

A. Sutherland Brown completed mapping the geology of the Queen Charlotte Islands at the scale of 1:50,000. The area mapped in the past five field seasons, some 3,840 square miles, excludes the considerable part of Graham Island, where unconsolidated material completely masks the bedrock.

J. M. Carr devoted the major part of the field season to studying the western contact of the Guichon batholith over a length of 11 miles, where it is within 1 to 2 miles of the Thompson River, from near Martel northward. Pyrite mineralization is widespread in the area, and several large gossans in schist are exposed along the western side of the river. Copper mineralization occurs locally, mainly at the Red Hills property and near Spatsum. Magnetite in small bodies associated with skarn is known in a few places close to batholithic rocks.

A considerable part of the season was spent within the Guichon batholith in the vicinity of Gnawed Mountain mapping part of the margin of the Bethsaida porphyry stock and the adjacent breccias and copper occurrences. The extent of the stock north of Gnawed Mountain has not been determined but was found to be less than had been anticipated.

Nine properties in the Kamloops-Highland Valley-Merritt area were visited and data for short notes were collected.

G. E. P. Eastwood spent the major part of the field season mapping the Draw Creek pit of the Brynnor mine and mapping in the mine belt. Study of the rock sequences and over-all structure supports lithologic correlation of the major volcanic sequence with the Karmutsen Group, and the limestone and tuffaceous rocks, including the exposures in Draw Creek pit, with the Quatsino Formation. Recognition of the dissimilarity of this limestone and the Palæozoic limestones contributed to this conclusion.

The remainder of the field season was spent mainly at Zeballos, where the F.L. magnetite deposit being mined by Zeballos Iron Mines Limited was studied in some detail and the Ridge and Cordova magnetite deposits were examined. Four days were devoted to visiting the Power River magnetite occurrences, studying the local geology, and logging diamond-drill core.

J. T. Fyles mapped the Duncan Lake area at 2,000 feet to the inch, and examined mineral deposits in that area, about 10 miles from east to west and 20 miles from north to south. Work in this area and in an area including Ainsworth and extending north on Kootenay Lake was started in 1960.

Replacement lead-zinc mineralization of the type developed at the Duncan Lake mine appears to be confined to the Duncan anticline, where it is localized in particular types of dolomite and siliceous dolomite at folds and shears that are subsequent to the main anticline.

Visits were made to five properties outside the area mapped, and data for short notes were collected.

S. S. Holland continued the study of jade occurrences by examining the occurrences of bedrock and alluvial jade (nephrite) on Ama Creek, a tributary of Bridge River.

Placer-mining was investigated along Bridge River, and in the Likely-Keithley Creek, Wells, Beggs Gulch, and Germansen Creek areas.

Lode-mineral property examinations included the Golden Contact on McGillivray Creek, the Stella (Endako Mines Limited) south of Endako, the Cariboo Gold Quartz mine, the Skarn group at Copper Creek, and the Three Hills group at Skeena Crossing.

A geological reconnaissance was made north of Stewart in the Salmon River-Cascade Creek area. The conclusion was reached that the volcanic rocks have undergone more severe deformation and that the structure is probably more complex than indicated in the published reports. This is an area of great interest for mineral exploration and prospecting (to the end of 1961 it had produced 11.7 per cent of the lode gold and 9.6 per cent of the silver produced in British Columbia). Geological work, prospecting, and production are seriously hampered by the state of the roads. Early in 1962 a flood on the Salmon River, within Alaska, washed out some 3 miles of the road by which the area is connected with Stewart. The road northward from the Silbak Premier mine has been washed out at a point 3 miles south of the Big Missouri mine.

J. E. Hughes carried the studies* begun in 1961 in the eastern part of the Stone Range westward into the Sentinel Range of the Rocky Mountains and into the Liard plain. The exposures in a strip along the highway were mapped at 4 miles to the inch from Mile 390 to Mile 520; that is, from Summit Lake near

* A mimeographed summary report on this work may be obtained from the Chief of the Mineralogical Branch for the sum of 35 cents (plus tax).

Mount St. Paul to the Smith River. Within this length, six separate sections of Devonian and adjacent Palæozoic strata were examined.

W. C. Jones made detailed examinations and mapped two sites for dams proposed on the lower reaches of Clearwater River.

A start was made in the study of 220 miles of dykes in the lower Fraser Valley, concerning the stability of the dykes under specified flood conditions.

Both projects are for the Fraser River Board; Mr. Jones acts in an advisory capacity in the dyke study.

A beginning was made in the study of rock stability in open-pit and underground mines. Most of the open-pit mines now operating and one underground mine were visited. A study is being made of the use of certain geophysical equipment as a means of evaluating the stability or predicting failure of rock slopes.

J. W. McCammon investigated the following industrial-mineral and structural-material deposits: Talc south of Cawston; stone and marble quarries, Nelson area; magnesite at Perry Creek and Brisco; dolomite at Bull River; asbestos at Sidmouth; limestone near Terrace and near Kennedy Lake. Short visits were made to barite deposits, Windermere area; asbestos deposits, Cassiar; fluorite-barite showings along the Alaska Highway; molybdenite deposits at Glacier Gulch, Endako, and Boss Mountain.

N. D. McKechnie examined numerous mining and exploration operations in southern British Columbia, including Vancouver and Quadra Islands, and collected data for reports on fourteen of the properties.

R. W. Yole, a Ph.D. candidate at the University of British Columbia, whose thesis is on Palæozoic limestones on southern Vancouver Island, spent a month for the Mineralogical Branch amplifying data on recognized Palæzoic limestones. He contributed to correlating the limestone in the Kennedy Lake area, with the Quatsino Formation considered to be of Upper Triassic age.

An airborne magnetometer survey was made of northern Vancouver Island, lying west of 127 degrees west longitude. The southern boundary was in part 50 degrees 15 minutes north latitude, and continued southeasterly to include Brooks Peninsula on the west coast. Our Department shared the flying cost of this project with the Geological Survey of Canada. The magnetic data are being compiled by the Geological Survey. This project was undertaken in part to assist in developing the application of airborne magnetometer surveys in areas of moderate to high relief. A nuclear precession magnetometer was used, mounted in a Beaver aircraft.*

PETROLEUM AND NATURAL GAS BRANCH

The Petroleum and Natural Gas Branch is responsible for the administration of the " Regulation Governing the Drilling of Wells and the Production and Conservation of Oil and Natural Gas," made pursuant to the *Petroleum and Natural Gas Act*. The regulation provides for the use of efficient and safe practices in the drilling, completion, and abandonment of wells; for the orderly development of fields discovered within the Province; and for the conservation and prevention of waste of oil and natural gas within the reservoir and during production operations.

Estimates of reserves of oil and natural gas are made twice a year, at the end of June and the end of December. Crown reserves for oil and natural gas, disposed of by public tender, are evaluated prior to sale. Comprehensive records of all drilling and producing operations are maintained and made available for

*Eight map-sheets based on this work have been produced and are obtainable from the Department of Mines and Petroleum Resources, Victoria, or the Geological Survey of Canada, 739 West Hastings Street, Vancouver, for 25 cents a sheet.

study, or are published, for the use and benefit of those interested in the development of the oil and natural-gas industry in British Columbia.

Investigations are made of complaints of property damage resulting from drilling and producing operations and from geophysical-work programmes.

Staff

J. D. Lineham, Chief of the Branch	Victoria
R. R. McLeod, Senior Reservoir Engineer and member of the Board of Arbitration	Victoria
W. L. Ingram, Senior Development Engineer	Victoria
S. S. Cosburn, Senior Petroleum Geologist	Victoria
K. C. Gilbart, Reservoir Engineer	Victoria
G. V. Rehwald, Reservoir Engineer	Victoria
P. K. Huus, Reservoir Assistant	Victoria
M. B. Hamersley, Development Assistant	Victoria
D. L. Griffin, Petroleum Geologist	Victoria
D. M. Callan, Petroleum Geologist	Victoria
J. F. Tomczak, Statistician	Victoria
L. A. Inman, Production Clerk	Victoria
G. E. Blue, District Engineer	Charlie Lake
H. B. Fulton, Field Geologist	Charlie Lake
D. L. Johnson, Field Engineer	Charlie Lake
H. A. Sharp, Field Technician	Charlie Lake
M. A. Churchill, Field Technician	Charlie Lake
D. A. Selby, Field Technician	Charlie Lake

The total Branch staff numbered twenty-five at the end of the year, excluding two unfilled positions, of whom sixteen were employed at headquarters and nine in the field office at Charlie Lake. Four other persons were employed, in various capacities, on a casual basis.

Staff Changes

In 1961 there was one resignation from the professional staff and one from the technical staff.

A. N. Lucie-Smith, former supervisor of the Reserves and Evaluation Section, resigned on October 15th to move to Australia.

T. A. Mackenzie, former supervisor of the Statistics and Well Records Section, resigned on August 15th.

J. F. Tomczak joined headquarters staff as statistician on November 21st.

L. A. Inman joined headquarters staff as production clerk on August 20th.

D. A. Selby joined the field staff as field technician on January 16th.

Administration

The Petroleum and Natural Gas Branch was reorganized in 1962 to decrease the number of sections from five to three. The Reservoir Engineering Section assumed the responsibilities of the Reserves and Evaluation Section, and those of the Statistics and Well Records Section were transferred to the Development Engineering Section. The Branch now is subdivided for administrative purposes into three sections, each of which is headed by a supervisor who is responsible for a specific phase of Branch work. These sections and respective section heads are as follows: Reservoir Engineering, R. R. McLeod; Development Engineering, W. L. Ingram; and Geology, S. S. Cosburn.

The field office at Charlie Lake, which includes sample-washing and core-storage facilities, is under the supervision of G. E. Blue.

Board of Arbitration

Chairman: A. W. Hobbs, solicitor, Department of the Attorney-General. Members: R. R. McLeod, engineer, Department of Mines and Petroleum Resources; S. G. Preston, agrologist, Department of Agriculture.

The Board of Arbitration, responsible to the Minister of Mines and Petroleum Resources, held no hearings in 1962.

Five applications pending at the end of 1962 were adjourned until 1963 at the request of the solicitor for the owner. Of four applications concerning right of entry made in 1962, three were pending at the end of the year, and one was settled by agreement between parties.

Conservation Committee

Chairman: Vacant. Members: N. D. McKechnie, mineral engineer, Department of Mines and Petroleum Resources; M. H. A. Glover, economist, Department of Industrial Development, Trade, and Commerce.

A. N. Lucie-Smith was chairman until October 15th, the effective date of his resignation from the service.

No official business was referred to the Conservation Committee during the year.

GRUB-STAKING PROSPECTORS

Under authority of the *Prospectors' Grub-stake Act* the Department has provided grub-stakes each year since 1943 to a limited number of applicants able to qualify. The normal maximum grub-stake is $300, with an additional amount up to $200 for travelling expenses. A limited number of experienced prospectors of proven ability may be granted top priority grub-stakes of as much as $400, plus a maximum of $300 for travelling expenses, where prospecting is to be done in approved areas where air transportation is necessary. Items such as guns, fishing-gear, stoves, boats, and outboard motors are not a legitimate charge against the grant and must be provided by the applicant. Costly items such as geophysical survey equipment, mineralights, Geiger counters, berylometers, packsack diamond drills, two-way radios, horses, and packsaddles are not expendable in any one season and cannot be accepted at full cost against the grant, but a reasonable rental charge may be considered.

To qualify at the present time, the Department requires that the applicant shall be a bona fide prospector holding a free miner's certificate. He must be a British subject, between the ages of 18 and 70 years, and must have resided in British Columbia during the year preceding the date of application. He must be able to identify common rocks and minerals. He should have bush experience and be physically and mentally fit. He must agree to abide by the regulations which the Department may make. The grub-staked prospector is provided with maps, a current list of prices of metals and ores, and the latest Departmental information circulars on prospecting and related matters.

It is required that in order to obtain the maximum grub-stake he agree to spend at least sixty days actually prospecting in the area of his choice in British Columbia considered favourably by officers of the Department. If he prospects a lesser time, the grant will be reduced proportionately. The grub-stakes are not intended for week-end prospecting or for short trips from a home base. The grant is usually made in two payments: the first at the beginning of the season, and the second after he has completed sixty days in the field and has submitted a diary. In the past, rebates have been recovered from grantees to whom payments have exceeded the proper amount for the time and effort devoted to prospecting. A field engineer is employed, who contacts as many prospectors as he is able during the field season and gives advice and direction to those who need it. Grantees are permitted a reasonable number of free assays.

The grub-stakes are granted with the object of maintaining the search for mineral occurrences with mine-making possibilities. Any discoveries made, staked, and recorded are exclusively the grantee's own property. The grants are not intended for the purpose of exploring and developing occurrences already found, but one year is allowed to prospect ground that has been staked by a grantee while on a grub-stake. The grantee must not accept pay from other sources for services rendered during the period credited to the grub-stake.

It is recognized that competent and experienced prospectors are capable of looking after themselves in wilderness areas. Nevertheless, experience has shown that less hazard may result when prospecting is done by two or three men in a team. A man working alone may be injured or be taken seriously ill and, if alone, he may have to endure extreme hardship and pain.

Grub-stake grantees are not working for the Government but are self-employed and are not covered under the provisions of the *Workmen's Compensation Act*. Therefore, it is recommended that prospectors make their own arrangements concerning insurance coverage to provide for medical and other expenditures that may be incurred in the event of an accident.

The grants are intended only to assist grantees to go out and prospect and are not intended for the support of dependents. Therefore, applicants who are married and have dependents are required to give assurance that their dependents will be adequately provided for during the time the applicant is absent in the field.

Statistical information covering the grub-stake programme since its inception is given in the following table:—

GRUB-STAKE 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
1955	21,169	47	288	183
1956	20,270	47	163	217
1957	22,000	46	174	101
1958	24,850	47	287	211
1959	21,575	38	195	202
1960	28,115	50	358	241
1961	29,175	47	309	325
1962	26,730	52	233	189

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

Seventy-six applications were received in 1962, and fifty-two grub-stakes were authorized. Three of the grantees were unable to go out, and they returned their initial payments. Grantees who were unable to complete the terms and conditions of the grant received only partial payment. Thirteen prospectors were given grants for the first time, and five proved unsatisfactory. A few grantees used aircraft for transportation to their prospecting areas. Three grantees received injuries in the field but were able to complete the season. One grantee was taken seriously ill and was unable to continue prospecting; fortunately he was accompanied by a partner who took care of him and brought him out to receive medical attention.

D. H. Rae again gave able service in interviewing applicants and was able to contact twenty-eight grantees in the field. The following notes have been largely compiled from Mr. Rae's observations while the in the field and from information provided in the diaries of the grantees.

Alberni Mining Division.—In the Nahmint River area a chalcopyrite-magnetite occurrence was prospected close to a granodiorite-limestone contact; at the headwaters of Handy Creek a granite-limestone contact received some attention. In the Sarita River valley near Bamfield many mineralized shear zones were observed. At Mount Blenheim a granite-limestone contact was examined; at the headwaters of the south Sarita River a large pyritized shear zone was seen and a quartz vein containing stibnite, in granite. In upper Corrigan Creek valley, near Mount Olsen, a large shear zone showing a network of tiny quartz stringers mineralized with pyrrhotite was uncovered, and along south Corrigan Creek to the headwaters of Nitinat River a wide sheared quartz porphyry dyke was seen mineralized with quartz, chalcopyrite, and pyrrhotite. Some work was done off Dewney and Coleman Creeks near Alberni Canal, where quartzite containing finely disseminated pyrite and minor amounts of pyrrhotite and chalcopyrite was prospected.

Atlin Mining Division.—Ten miles west of mile 118 on the Haynes road, mineralization of bornite, chalcopyrite, and minor amounts of hematite was found in an area underlain by greenstone and quartzite; serpentine containing narrow veinlets of asbestos fibre was investigated. In the Squaw Creek valley, and near its headwaters, malachite was found in granodiorite; and along a limestone-serpentine contact, good-grade asbestos fibre. Near the head of the main branch of Squaw Creek a copper deposit was discovered, prospected, and staked. Near mile 87 on the Haynes road another strong zone, well mineralized with chalcopyrite, was reported, as well as a large gossan area containing some galena. Near Stuhini Creek several gossans and heavily pyritized volcanics were prospected. Near Sittakanay Mountain, stibnite float was found and considerable quartz containing scattered pyrite and limonite. Some work was done close to Mount Manville and at the base of Mount Strong. At the south end of Teslin Lake, parallel quartz veins in grey granite showed mineralization of chalcopyrite, cuprite, and native copper, with malachite and minor bornite. Crystalline limestone in the area showed some free gold. Near Hall Lake, and close to Dawson Peaks, copper and silver mineralization was found across good average widths. Some claims were staked on these showings.

Cariboo Mining Division.—Some work was done on Spanish Mountain, where quartz veins in alaskite were mineralized with pyrite, galena, and some free gold. Some work was done in the Willow River area east of Strathnaver, near Barry and Alces Creeks, and at Stony and Stevens Lakes. Prospecting was carried on at Dragon Mountain and in the Slough Creek area. Some work was done in the vicinity of Ahbau Lake. Some work was also done along the Parsnip River, 10 miles southeast of the Hart highway, and around Scovil Flats, Modeste Lake, and Snowshoe Lake. In the southern Groundhog area a wide quartz vein carrying fair gold values was uncovered. Considerable work was done in the valley of Bounding Creek, which flows northwest into Goat River, and within a 3-mile radius of the junction of Milk and Goat Rivers. Nothing of economic interest was found.

Clinton Mining Division.—Some work was done southwest of Kleena Kleene, in the Bluff Lake area, where gold values were reported, on the west fork of Homathko River, and adjacent to Tatlayoko Lake. Some work was done in the Poison Mountain area on rock exposures showing some cinnabar, and cinnabar was panned from Churn Creek. Considerable work was done between Yalakom River and Churn Creek. Work was done at Dog Creek, China Gulch, French Bar Creek, Red Mountain, near Quartz Mountain, and Quartz Mountain Creek.

Fort Steele Mining Division.—A little work was done near Wasa Creek.

Greenwood Mining Division.—Some inconclusive work was done near Wilkinson Creek, Sterling Creek, Campbell Creek, and northeast of Baldy Mountain.

Kamloops Mining Division.—At Copper Creek, on the north side of Kamloops Lake, a considerable amount of work was done on a wide shear zone in which bornite and native copper were visible. Five miles east of Savona a great deal of work was done in an area in which disseminated bornite was found in basalt and copper values in a syenite dyke. Three miles northwest of Walhachin work was done on a low-grade copper deposit. Narrow quartz stringers containing minor amounts of galena were reported east of Black Pool. At Miledge Creek, 17 miles north of Blue River, some vermiculite was found in mica schist. In the upper Thunder River valley, quartz veins were found associated with a garnet-skarn rock. At the south end of Adams Lake heavy sulphides were uncovered in schists. A magnetite deposit near White Lake was investigated.

Liard Mining Division.—Some work was done in the vicinity of Tatsho Creek and on the upper Tanzilla River. Southeast of Dease Lake heavily pyritized granodiorite and some shear zones were investigated. Between Tanzilla and McBride Rivers some magnetite float was picked up—search failed to find it in situ. Much work was accomplished from a base camp on Tucho Lake, at the headwaters of Denetiah Creek, near the Pitman River divide, and east of Lamarque Pass. Nothing of commercial importance was reported. Some work was done near Poorman Lake, up the Blue River where a large sulphide body was uncovered, and some asbestos float picked up. Careful prospecting within a 10-mile radius of the Cassiar asbestos mine came up with two finds, one molybdenite and the other asbestos, both of which are currently under option and being developed. Some work was done close to Juniper Mountain and Mount Pendleton. Work was also done between the south end of Dease Lake and Telegraph Creek, around Grass Mountain, Glenora Creek, and Winter Creek. The headwaters of Racing River was prospected. At the head of the Iskut River field work was continued near Ealue and Kluea Lakes, and near Todagin Lake a zone containing considerable malachite stain and disseminated copper sulphides was prospected.

Lillooet Mining Division.—Some work was done on Peridotite Creek up the Yalakom River. On Ama Creek on the lower Bridge River, semi-jade was found along a serpentine-granite contact, and in La Rochelle Creek valley a jade-like material was found in serpentine. Some short-fibre chrysotile asbestos was found one-half mile west of Moha and disseminated chalcopyrite in quartz on McKay Creek on a granite-serpentine contact. On the east side of the Fraser River, 15 miles north of Lytton, some tetrahedrite was reported along a fault zone. Southeast of Birkenhead Lake a large sulphide zone was found, and in the Gates River valley interesting values were found in zinc and copper. A shear zone was prospected in the Phair Creek valley off lower Cayoosh Creek.

Nanaimo Mining Division.—A little work was done up French Creek, where narrow quartz veins were found in sedimentary rock.

Nelson Mining Division.—Some work was done in the Priest River area, near Monk Creek, Ripple Mountain, North Star Creek, and Corn Creek.

New Westminster Mining Division.—In the Coquihalla River area some work was done up Sowaqua Creek. On the east side of Ladner Creek narrow quartz veins were reported to carry values in silver. Nine Mile Creek valley received some attention, and near Lear narrow gold-quartz veins were prospected. Some work was also done near Silverdaisy Creek, near Boston Bar Creek, and in the Anderson River valley. Some work was done on a sulphide zone on Norrish Creek near Hatzic. Near Falls Lake off the upper Coquihalla Valley a showing containing minor amounts of chalcopyrite and molybdenite was found in gneissic granite. More work is planned on this showing. Molybdenite float was reportedly found in the region of Jones and Lorenzetta Creeks.

Nicola Mining Division.—West of Stump Lake a mineralized outcrop showing chalcopyrite, bornite, and tetrahedrite in quartz-carbonate rock was prospected and staked. Similar showings northeast of Stump Lake were also investigated and work done northeast of Peterhope Lake. Narrow quartz veins containing minor copper and molybdenite were uncovered east and south of Nicola Lake.

Omineca Mining Division.—On Huckleberry Mountain (Tahtsa reach) a stock of monzonite porphyry and its contact rocks were found to contain disseminated chalcopyrite. This ground will be further investigated. From a base camp on Chikamin Creek 2½ miles from Eutsuk Lake a considerable amount of work was done. One mineralized contact zone contained pyrite with minor amounts of chalcopyrite, arsenopyrite, and magnetite. At the east end of Surel Lake minor amounts of molybdenite were observed along a contact zone. Some work was also done on Martin Creek, Musclow Lake, and the south fork of Chikamin Creek. Considerable detailed information was obtained from a group of young prospectors working from McDonnell Lake to Coal Creek at the head of the Zymoetz River, south to Burnie Lake, where large boulders containing pyrite and chalcopyrite were found, and in the Seven Sisters area. Encouraging signs of mineralization were scarce. At Sinkut Mountain granite and white limestone were observed. North of Hulatt grey limestone and volcanics were observed; northeast of Endako and in the Stern Lake area granite and volcanics.

Some work was done near Granite Creek (Manson area), in Skeleton Gulch, along the Wolverine Range, and on the south side of Germansen Lake. Some work was also done at Mount Milligan, where quartz veins along a contact were prospected, and in an area east of the Nation River bridge on the Manson Creek road.

Claims were staked on the north slope of Mount Sidney Williams, northwest of Trembleur Lake, on narrow to fairly wide veins of asbestos fibre in serpentine. Float of similar mineralization was found a mile from the main showings. More work will be done in this area.

Considerable work was done west of Smithers, and a low-grade copper deposit was staked and prospected on the southwest flank of Hudson Bay Mountain.

Osoyoos Mining Division.—Some work was done west of Osoyoos and south of Richter Pass. Work was done on Mount Kobau, and claims were located near Apex Mountain in an area where there were numerous outcrops of massive pyrrhotite. From a base camp 20 miles west of Peachland, work was done north of Mount Kathleen, along Trout Creek, and north of Crescent and Whitehead Lakes. On Trepanier Creek several massive sulphide bodies of interest were discovered.

Revelstoke Mining Division.—An occurrence of molybdenite was reported 30 miles north of Revelstoke, on the Big Bend highway.

Similkameen Mining Division.—On Railroad Creek mineralized sediments were prospected, and a narrow copper-bearing vein was uncovered. On upper Sutter Creek pyritized sediments containing narrow veins mineralized with galena and a wide well-mineralized fracture zone were prospected. Further work in this area is merited. Some inconclusive work was done west of Otter Creek and near Hedley.

Skeena Mining Division.—Prospecting was done along the northern coastline at Porcher Island (Edye Pass), Larcom Island, and Observatory Inlet. On Strohn Creek, flowing into Meziadin Lake, narrow veins mineralized with molybdenite, galena, and tetrahedrite were found. Near Mercer Lake, at Athlow Bay, on the west coast of Graham Island, an attempt was made to locate the source of copper-iron float. On Kahylskt (Burnt Bridge) Creek east of Bella Coola encouraging mineralization of molybdenum, lead, and copper was found.

Slocan Mining Division.—Some work was done in the Lardeau district, mainly at the headwaters of Poplar, Cascade, and Tenderfoot Creeks.

Vancouver Mining Division.—In Jervis Inlet, at the head of Queens Reach, prospecting was done on Mount Alfred.

Vernon Mining Division.—In Creighton Valley gneissic rock containing minor amounts of pyrrhotite and pyrite was prospected, and a small amount of work was done in the Monashee Creek valley. In Whiteman Creek valley search was made for better-grade deposits of fluorite. Near Sugar Lake work was done in the basins of Kate, Sugar, Schunter, Specht, and Currie Creeks.

MINING ROADS AND TRAILS

Provision is made in the *Department of Mines and Petroleum Resources Act* whereby the Minister may, with the approval of the Lieutenant-Governor in Council, authorize the expenditure of public funds for the construction or repair of roads and trails into mining areas. Assistance on a half-cost basis may also be provided on roads and trails to individual properties.

Requests for road and trail assistance must be made to the Department before the commencement of work. The type of access upon which assistance may be given depends upon the value of the property, the stage of development, and the amount of work to be done. A trail is sometimes sufficient for initial exploration, and a tractor-road may be adequate for preliminary work. Subsequent development might warrant assistance on the construction of a trunk-road. A carefully drawn sketch or plan of the location of the road is required to be submitted and, where warranted by the amount of assistance requested, a report on the property by a professional geological or mining engineer may be required. An engineer from the Department may be required to report on the property before a grant is made and to inspect the road after the work has been done.

Total mileages and disbursements under "Grants in Aid of Mining Roads and Trails" during the fiscal year ended March 31, 1963, were as follows:—

	Miles	Cost
Mining roads and trails—		
Construction and reconstruction	54	$102,866.93
Maintenance	167	20,227.22
Bridges—		
Construction and reconstruction	.....	53,500.00
Maintenance	.....	16,944.45
Total	.....	$193,538.60

In addition to the above, work was continued on the Stewart–Cassiar road. This road is being constructed under the " Roads to Resources " agreement between Canada and British Columbia. The construction is supervised by the Department of Highways on behalf of the Department of Mines and Petroleum Resources. At the north end of the road, construction of the 26.6-mile section from the Tanzilla River to the Stikine River was completed and a ferry crossing was installed on the Stikine. The 24.76-mile section from the Stikine River to Eddontenagon Lake was completed in September, and the 40.12-mile section from Eddontenagon Lake to Burrage River was 40 per cent completed when work was suspended for the winter at the end of October. At the south end of the road the Bear Pass contract was extended to include 3 miles northeasterly from Bitter Creek. At the end of the season this work was 97 per cent completed. The 31.87-mile section between Strohn Lake and the lower crossing of the Bell Irving River was 46 per cent completed.

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.

Specimens from the collection in Victoria, accumulated in a period of more than 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 Petroleum Resources and specimens donated by property-owners. The collection also includes type specimens purchased from distributors. Other valued specimens or groups of specimens have been donated or loaned to the museum.

ROCK AND MINERAL SPECIMENS

Information regarding collections of specimens of rocks and minerals available to prospectors and schools in British Columbia may be obtained from the Chief of the Mineralogical Branch.

PUBLICATIONS

Annual Reports of the Minister of Mines and Petroleum Resources, bulletins, and other publications of the Department, with prices charged for them, are listed in the Department of Mines and Petroleum Resources List of Publications available from the Chief of the Mineralogical Branch.

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.

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 and Petroleum

Resources 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, Forests, and Water Resources.

JOINT OFFICES OF THE BRITISH COLUMBIA DEPARTMENT OF MINES AND PETROLEUM RESOURCES 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 available to the public in the one suite of offices at 739 West Hastings Street, Vancouver 1.

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 Mapping and Air Photography

Under the direction of the Surveyor-General, the Surveys and Mapping Branch of the Department of Lands, Forests, and Water Resources is responsible for official maps and Crown land surveys. The following paragraphs outline a few achievements of the Legal Surveys, Topographic, Geographic, and Air Divisions of the Surveys and Mapping Branch during 1962.

The Legal Surveys Division received field notes covering twenty-three lots surveyed under the *Mineral Act* and 598 lots surveyed under the *Land Act*. New large-scale (mostly 1 inch to 500 feet) composite maps showing subdivision surveys were prepared for the Gulf Islands (forty-six sheets), Revelstoke (four sheets), Smithers (four sheets), Burns Lake (three sheets), and Hazelton and Clinton (one sheet each). Field work recorded by Legal Surveys Division included town lot surveys of six lots at Savona, six at Sointula, one at Westbank, and eight at the University of British Columbia. Rural lot surveys were undertaken at Ootishenia, Nelson, Pemberton, Tulameen, Howser, 100 Mile House, Cheakamus, and Isle Pierre.

One field crew of the Topographic Division established survey control for fifteen standard National Topographic map-sheets in the vicinity of Babine, Takla, Nation, and Germansen Lakes, while another crew operating from the motor-vessel " B.C. Surveyor " completed photo identification of 236 triangulation stations from Jervis Inlet to Douglas Channel. Also twenty-three new second-order control stations were established in the lower Fraser Valley between Chilliwack and Vancouver. Among the large-scale mapping projects completed were Liard River (sixty-eight sheets at scale of 1 inch to 1,000 feet), Stuart Lake Pondage (nine sheets at 1 inch to 1,320 feet), McGregor River Pondage (six sheets at 1 inch to 1,000 feet), and Skeena River (eleven sheets at 1 inch to 500 feet).

New maps reproduced and printed by the Geographic Division numbered eight in 1962. Northwest British Columbia, the sixth and final sheet of the 1-inch-to-10-miles regional series, was published in three editions. These were: Map 1B (planimetric), 1BL (landforms in grey or light sand), and 1BLS (special brown landforms). New seven-colour National Topographic sheets showing up-to-date land-status detail and contours were printed at 1:250,000 scale for Victoria (92 B-C), Alberni (92 F), and Vancouver (92 G), and at 1-inch-to-2-miles scale for Creston (82 F/SE), and Slocan (82 F/NW).

Federal Government mapping agencies reproduced seven Provincial topographic manuscripts; sixty black, blue, and white provisional sheets; and sixty-three full-colour National Topographic maps, all at 1:50,000 scale.

A modest increase in the price of maps was made in November. However, further adjustments were anticipated in 1963 to conform with price changes to become effective January 1, 1963, for maps printed by the Federal Government.

Slightly under 20,000 aerial photographs were exposed by the Air Division. Among the special projects completed were eighty-one photographs of Strathcona Provincial Park for the Department of Mines and Petroleum Resources. Mining and oil and natural-gas companies accounted for 12,052 aerial photographs borrowed or purchased from the Air Division in 1962. This represents nearly one-third of the total volume of loans and reprints to the general public.

The mapping and compilation sections of the Air Division continued to produce interim sheets at 1-inch-to-20-chains scale for the Surveys and Inventory Division of the Forest Service. Sixty final tracings, covering 2,875 square miles of cadastral detail, were completed for public distribution.

Indexes 1 to 18 showing published maps, air-photo cover, Departmental reference maps, and manuscripts are contained in the envelope attached to the back cover of the 1962 Annual Report of the Lands Service and Water Resources Service. *Further inquiries may be made to the Director, Surveys and Mapping Branch,* Department of Lands, Forests, and Water Resources, Victoria, B.C.

Department of Mines and Technical Surveys

The Canadian Government Department of Mines and Technical Surveys performs many functions related to mining and the mineral industry in general. The Mines Branch, Geological Survey of Canada, Surveys and Mapping Branch, and Mineral Resources Division are services of the Department of direct interest to the mineral industry. Brief reference to the work of the Surveys and Mapping Branch in British Columbia is made in the preceding note headed " Topographic Mapping and Air Photography." A note on the Geological Survey of Canada follows this paragraph and is followed by notes on the Mines Branch and the Mineral Resources Division.

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. J. E. Armstrong is in charge of this office at 739 West Hastings Street, Vancouver 1.

Field Work by Geological Survey of Canada in British Columbia, 1962

A. J. Baer commenced field work in the Bella Coola (93 D) map-area.

R. B. Campbell completed field work in the Quesnel Lake East Half (93 A, E. ½) map-area, and began work in the Adams Lake West Half (83 M, W. ½) map-area.

R. J. Fulton completed his study of the surficial geology of the Nicola (92 I, E. ½) map-area.

E. C. Halstead continued the study and mapping of the surficial geology of the Nanaimo and Gulf Islands map-areas (92 F/1, E. ½, G/4, C/16, B/13, B/14).

W. W. Hutchison worked in Prince Rupert East Half (103 J, E. ½) and Port Essington West Half (103 I, W. ½) map-areas to obtain information to aid in a forthcoming systematic study of the Coast Mountains.

D. W. Hyndman completed his study of sedimentary and metamorphic rocks in the Nakusp (82 K/4) map-area.

E. J. W. Irish completed field work in the Halfway River (94 B) map-area.

S. F. Leaming completed field work in a study of sand and gravel deposits of the Strait of Georgia area.

H. W. Little completed mapping of the Rossland-Trail (82 F/4) map-area.

B. R. Pelletier continued his Triassic stratigraphic and sedimentation studies in the Halfway River (94 B) and Trutch (94 G) map-areas.

P. B. Read began a study of the eastern contact of the Kuskanax batholith in the Poplar Creek (82 K/6) map-area.

J. E. Reesor for part of a season continued his studies of granite and associated metamorphism in southern British Columbia.

D. F. Sangster completed a study of magnetic iron-ore deposits in coastal British Columbia.

D. F. Stott continued his study of Lower Cretaceous stratigraphy in northeastern British Columbia.

H. W. Tipper continued mapping the Taseko Lakes (92 O) map-area.

S. Washkurak and others, in co-operation with the Department of Mines and Petroleum Resources, made an aeromagnetic survey of northern Vancouver Island north of 50 degrees and west of 126 degrees 30 minutes.

J. O. Wheeler began mapping the Big Bend East Half (82 M, E. ½) map-area.

W. J. Wolfe made a study of metamorphism of the Blue River ultramafic intrusion in the Cassiar district (parts of 104 O and 104 D quadrangles).

Publications of the Geological Survey

A total of thirty-two publications of the Geological Survey of Canada relating to British Columbia was received by the British Columbia Department of Mines and Petroleum Resources in 1962.

MINES BRANCH

The Mines Branch has branches dealing with mineral dressing and process metallurgy, physical metallurgy, radioactivity, and fuels and explosives. A total of nineteen publications of the Mines Branch pertaining to British Columbia was received in 1962 by the British Columbia Department of Mines and Petroleum Resources. They included tabular pamphlets dealing with coal mines, gold mines, stone quarries, petroleum refineries, and milling plants in Canada.

MINERAL RESOURCES DIVISION

The Mineral Resources Division, which was a division of the Mines Branch, has now been transferred from the Mines Branch to the office of the Deputy Minister of Mines and Technical Surveys.

The Mineral Resources Division publishes studies on mineral resources, mineral economics, mineral legislation, mineral taxation, mining technology, and other miscellaneous mineral-industry subjects. A total of three publications published by this Division was received by the library.

Lode Metals

CONTENTS

NOTES ON METAL MINES—*Continued*

GENERAL REVIEW

The average Canadian prices paid in 1962 for gold, silver, copper, and zinc were up and the price for lead was down, compared with the 1961 prices. Due to the premium on United States funds, the price for gold advanced almost $2 per ounce to the highest mark in twelve years. The price for silver continued to rise to the unprecedented Canadian price in 1962 of $1.16 per ounce, a one-third increase over the preceding ten-year average. A rise of a little more than 2 cents in the average Canadian price of copper was largely the result of the rate of exchange and signified little change in price. A fraction of a cent rise in the price of zinc was offset by a similar drop in the price of lead.

Gold, silver, copper, lead, and zinc produced at British Columbia lode mines in 1962 had a value of $132,148,861. Miscellaneous metals, including iron ore, nickel, tin, and minor metals recovered at the Trail smelter, had a value of $27,303,543. The total quantity of ore mined at all lode mines amounted to 11,212,106 tons and came from sixty-four mines, of which forty-five produced 100 tons or more. The average number employed in the lode-mining industry in 1962, including mines, concentrators, and smelters, was approximately 7,900.

In 1962 twenty-eight mills were operated, fifteen of them throughout the year. Of the others, six were operated part time or closed. Six operated for the first time, and one was closed shortly after being built. Two mills shut down—the Mother Lode at Greenwood for want of ore and the Empire at Benson Lake upon exhaustion of the open pit and pending underground development. It was a banner year for new mills—three began treating copper ore at the Coast Copper, Sunro (Cowichan Copper), and Bethlehem mines, and three iron ore at the Brynnor, Zeballos Iron, and Jedway mines. This brought the total number of mills that operated in 1962 to nine on silver-lead-zinc ore, eight on copper ore, six on iron ore, four on gold ore, and one on nickel ore.

The Trail smelter recorded custom receipts of 17,019 tons of ore, 2,907 tons of lead concentrates, and 29,560 tons of zinc concentrates from British Columbia mines. The ore was from twenty-eight mines, half of which shipped about 15,500 tons of gold-bearing siliceous ore and half shipped about 1,500 tons of silver-lead-zinc ore. The lead concentrates were from ten mines, of which one shipped 70 per cent of the total. The zinc concentrates were from twelve mines, of which one shipped 88 per cent of the total. Lead concentrates exported to American smelters totalled 24,279 tons, and zinc concentrates, 49,863 tons. Copper concentrates were all exported—42,041 tons to the Tacoma smelter and 153,423 tons to smelters in Japan. Nickel-copper bulk concentrates amounting to 19,900 tons were shipped to Japan. All iron-ore concentrate was shipped under contract to Japan, a total of 1,744,431 tons.

Gold production was about 2 per cent below that for 1961, but the increase in price brought the value of production to about 3½ per cent more than in 1961. There was little change in the outlook for gold, with 75 per cent of production coming from the Bralorne and Cariboo Gold Quartz mines and another 5 per cent from sundry shipments of gold ore. The old Cariboo mine at Camp McKinney closed after shipping ore for 2½ years and contributing 12,000 ounces of gold in that time. At the old Golden Contact property near McGillivray Falls a mill was built on the strength of a few high gold assays, which, however, were found to be too erratic to represent ore, and the mill closed.

The rise in price of silver, coming late in the year, had little effect on the production of silver. Less silver was produced at the Sullivan mine, and consequently the Provincial total was below that in the last two years.

Copper production set a new record for quantity of 109 million pounds, worth a little more than a record 33 million dollars. For the first time in thirty years the value of copper was almost that of lead. Seventy-two per cent of the copper was produced by the Craigmont mine, which started operation in September, 1961. Three new copper mills went into production—those at the Sunro, Coast Copper, and Bethlehem (first shipment in 1963) mines—and, although the Mother Lode operation closed, production at Phoenix increased. Plainly, copper will be in a position of first-rank importance for some time to come.

The progress of the Bethlehem operation, with an ore grade below what is generally considered desirable, will be watched with great interest. Phoenix, although started as a relatively small salvage operation, has steadily increased its tonnage and its reserves, and operated in 1962 on a mill head little more than 0.7 per cent copper. At the same time the Granby company has not given up thought of an operation at its property on Babine Lake, with a grade understood to be less than 0.7 per cent. The low-grade copper ores of British Columbia are in the limelight, and are being tested throughout the length of the western "copper belt" of the Province.

At the Western Mines property at the south end of Buttle Lake, a substantial amount of complex ore of good grade has been demonstrated. Granduc concluded another season's work with confirmation of previously estimated tonnage, but, because of physical difficulties, without reaching a decision regarding production. In the Province generally the cost of continuing exploration is expensive, and the money available to small groups is limited, but the rewards of success are great, and a good number of smaller companies continue to do surface work in the southern Interior. On the other hand, the exploration wings of many major companies are active; of these, several are attempting comprehensive regional studies, some are taking a second or third look at ground investigated by themselves or by others, some are prospecting, and some are participating with others in exploration ventures.

The production of lead dropped sharply from the high figure of 1951, but remained above the average for the last ten years. The difference was largely in the output of the Sullivan mine. In the Slocan the Victor mine produced the last company ore and was turned over to lessees. Two new exploration ventures—one at the Ruth-Hope at Sandon and the other at the Standard-Mammoth at Silverton—started late in 1962. This is the first such development in a number of years. The Reeves MacDonald shaft was sunk to within 60 feet of sea-level to provide for complete extraction of the Reeves orebody.

The production of zinc was above that of 1961 and fractionally above the average for the past ten years.

The production of iron ore increased with the opening in 1962 of three new mills at Kennedy Lake, Zeballos, and Jedway. The fact that the mine at Zeballos was in financial difficulty by the end of the year serves to emphasize the fact that considerable expense is incurred in bringing an iron-ore property into production in the rugged terrain of coastal British Columbia. The Brynnor mine near Kennedy Lake was brought into production at 3,000 tons of ore per day, twenty-seven months after discovery of the deposit. In addition to the activity at Jedway, exploration continued at Tasu Harbour and elsewhere on the Queen Charlotte Islands. A substantial magnetite deposit was diamond drilled on the Max property near the Granduc.

The interest in molybdenite increased. The only development was at Boss Mountain, but exploration was carried out in several localities. Deposits of low-grade molybdenite mineralization at Endako were diamond drilled, and a staking rush took place. About 1,800 claims were recorded in the general Endako area at the end of 1962. Many groups were involved in staking and in surface exploration. The main showings centre about the old Stella group, first located in 1927, where the obviously large amounts of very low-grade material apparently warrant the spending of large amounts of money to determine, by diamond-drill sampling, whether commercial deposits exist.

There were 20,602 mineral claims located in the Province in 1962, 538 more than in 1961.

The use of sensitized ammonium nitrate continued to increase, particularly in underground mines. A factory licence was issued to The Consolidated Mining and Smelting Company of Canada, Limited, to blend ammonium nitrate and fuel oil for use in the Sullivan mine. Texada Mines Ltd. prepared to change its iron-mining operation from open pit to underground when the present surface ore is exhausted. A shaft was sunk, and workings were laid out. The first friction hoist in British Columbia was installed in the Texada shaft. Several mines showed an interest in the relatively new study of rock mechanics. Chief among these were the Jersey mine, in connection with pillar extraction, and the Craigmont mine, with regard to both open-pit stability and the laying-out of underground development workings. One of the Inspectors of Mines attended a rock mechanics symposium in Minnesota in 1961.

A fire occurred in the No. 8 mine at Britannia. The mine was closed for a short period while the section of No. 8 mine in which the fire occurred was sealed off by mine-rescue crews. At the Bluebell mine, inflows of thermal water and carbon dioxide continued to hamper development.

The helicopter, which has made much exploration work possible and has greatly increased the efficiency of many preliminary operations, was put to a new use. W. E. McArthur airlifted by helicopter 40 tons of high-grade gold ore from his operation at the Tofino Gold Mines property on Tranquil Creek.

NOTES ON METAL MINES

TOOTSEE RIVER*

Lead-Silver

Silver Tip (Pegasus Explorations Limited) (59° 130° N.E.) Registered office, 133 East Fourteenth Street, North Vancouver. E. P. Chapman, Jr., president. This property of thirty-six recorded claims is about 4 miles northeast of Tootsee Lake and 17 miles by road south of Mile 701 on the Alaska Highway. Work on the property commenced on May 14th and was suspended in July. An average crew of fourteen men was employed under the direction of G. M. Hurd. An additional geophysical survey was made and two holes were diamond drilled, totalling 829 feet. The property was not visited.

CASSIAR*

Molybdenum

Star (Fort Reliance Minerals Limited) (59° 129° S.W.) Company office, 3100, 25 King Street West, Toronto 1. J. A. Harquail, president; A. D. Wilmot, exploration manager. The property is about 8 miles northwest of Cassiar, and consists of the Star group of twelve claims held by option and five claims held by record. The mineralized zone has been exposed in trenches, along a northerly trending contact of granite and limestone, for a distance of about 300 feet. Molybdenite and minor amounts of pyrrhotite occur mainly in the granite, which is altered near the contact.

Work in 1962 commenced in June and was suspended on September 1st. An average crew of eight men was employed under the direction of S. Farquharson. Fourteen AX holes, totalling 6,349 feet, were diamond drilled. Access to the property was by jeep-road from the Cassiar mine road.

Gold

Vollaug (Table Mountain Mines Limited) (59° 129° S.W.) Company office, 1519, 355 Burrard Street, Vancouver 1. R. W. Wilson, president; W. St. C. Dunn, engineer in charge. The property, which is essentially the old Vollaug group, consists of twelve Crown-granted claims and six recorded claims. The claims are on Table Mountain, about 1½ miles south of McDame Lake. A gold-bearing quartz vein, known as the Vollaug vein, can be traced on the surface for a reported distance of 6,000 feet. The showings have been described in the 1937 Annual Report.

Work done between July 20th and August 20th consisted of trenching and sampling. The work was done by four men. Access to the property was by jeep from the Cassiar–Stewart road. The property was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1937, pp. B 24–B 34.]

Copco, Liz (Hanna Gold Mines Ltd.) (59° 129° S.W.) Head office, 401, 470 Granville Street, Vancouver 2; mine office, Cassiar. J. A. Hanna, president; W. C. Hood, Jr., managing director. The property consists of the Copco and Liz groups, totalling seventy-seven claims held by record. The claims lie on the east slope of Quartzrock Creek valley, 2 to 3 miles north of McDame Lake.

Work in 1962 commenced in April and continued for the remainder of the year. Development of the 3600 level continued and comprised 1,621 feet of drift-

* By W. C. Robinson.

ing and crosscutting. Work also included diamond drilling four holes underground, totalling 1,068 feet. Preparation of the adit site for a proposed lower level and 500 feet of road construction to the site were completed. An average crew of eight men was employed under the supervision of Donald Martin. The property is serviced by the Cassiar–Stewart road.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1947, pp. 70–72.]

STIKINE*

Molybdenum

Sam (57° 132° N.E.) Southwest Potash Corporation holds eighty recorded mineral claims—the Sam Nos. 1 to 80—near the headwaters of the Barrington River, approximately 35 miles west of Telegraph Creek. The showings on this property are reported to contain molybdenite mineralization. Work in 1962, which was carried out by an average crew of six men under the direction of J. R. Loudon, commenced on June 20th and was suspended on September 4th. Three AX holes, totalling 3,075 feet, were diamond drilled. A limited amount of geological mapping was done. Transportation was by fixed-wing aircraft and helicopter. The property was not visited.

Copper

Kid (58° 131° S.W.) Kennco Explorations (Western) Limited holds twelve recorded mineral claims—the Kid Nos. 1 to 12—about 4 miles westerly from the junction of the Hackett and Sheslay Rivers. It has been reported that chalcopyrite mineralization occurs along a contact between a quartz diorite stock and volcanic rocks. Work on the property commenced on June 4th and was terminated on June 25th. An average crew of five men was employed under the direction of D. A. Barr. Work included the drilling of four packsack holes, totalling 156 feet, and geophysical surveying. Transportation was by fixed-wing aircraft to a small lake, about 4 miles southwest of the property, and by helicopter. The property was not visited.

Galore Creek (Kennco Explorations (Western) Limited) (57° 131° S.E.) Company office, 1111, 1030 West Georgia Street, Vancouver 5. C. J. Sullivan, president, Toronto; J. A. Gower, manager, Vancouver. This company holds a large number of claims by record and sixteen claims by option from Hudson Bay Exploration and Development Company Limited, all in the headwaters of Galore Creek, about 20 miles southeast of the junction of the Stikine and Scud Rivers. Work during 1962 commenced on May 11th and was suspended on October 3rd. Thirty-nine holes, totalling 15,471 feet, were diamond drilled. Other work included geological mapping, trenching, sampling, and geophysical surveying. Construction on the property included the erection of a core-storage building and cabin storage. An average crew of forty men was employed under the supervision of D. A. Barr.

Transportation to the property was by river-boat to the mouth of the Anuk River and thence by helicopter. The property was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1961, p. 7.]

Molybdenum

Decker Creek (57° 131° S.W.) Southwest Potash Corporation holds the Decker 1 to 79 claims at the headwaters of Decker Creek, which is an easterly flowing tributary of the Stikine River.

* By W. C. Robinson.

Molybdenite mineralization is reported to be exposed over a considerable area. Work on the property, which commenced on July 10th and was suspended on September 10th, included rock-trenching, sampling, and geological mapping. An average crew of eight men was employed under the direction of D. Silversides. Transportation was by river-boat to the mouth of Decker Creek and thence by helicopter to the property. The property was not visited.

UNUK RIVER*

Copper and Copper-Iron

Granduc (Granduc Mines, Limited) (56° 130° S.E.) Company office, 604, 744 West Hastings Street, Vancouver 1. J. Drybrough, president; L. G. White, mine manager. This company owns the Granduc property, at the head of the Leduc River 25 miles north-northwest of Stewart, and holds large groups of claims farther north in the Unuk River district. Work at the Granduc mine was continuous during 1962, and former underground development headings were extended in conjunction with exploratory diamond drilling. Property examinations were continued, and diamond drilling was done at two other properties, as noted below. A 4,000- by 200-foot compacted snow strip was prepared on the North Leduc glacier and airfreighting commenced on February 4th. Two C-46 aircraft were used, and by May 4th 2,500 tons of freight had been transported from Stewart. A leased helicopter and chartered Beaver and Otter aircraft were also used to service the properties. Camp accommodation was increased and included the construction of twelve 16- by 20-foot prefabricated huts, two portable change-houses, a 30- by 60-foot Amfab style warehouse, a 24- by 40-foot cook-house, and several temporary shop and storage buildings. A portable sawmill, of 15,000 f.b.m. daily capacity, was erected near the junction of Divelbliss Creek and the South Unuk River. An average crew of sixty-five men was employed at the Granduc mine, and an average of ten men was employed at the other properties.

The Granduc property comprises sixty-four Crown-granted and 180 recorded claims. In 1962 the shaft was dewatered and a concrete water-bulkhead was installed on the 2475 level. The 3600 and 2475 levels were advanced, and a total of 2,533 feet of drifting and 1,564 feet of crosscutting was done. Underground work included excavations for an underground power-house, dry, and explosive magazine. Thirty-six AX holes, totalling 15,077 feet, were diamond drilled from underground. Additional drilling, amounting to 6,145 feet, was done from the surface to determine ice thickness in the south fork of the Leduc glacier, and seismic surveying was done to determine ice thickness in the upper part of the Salmon glacier.

Max.—This group of 122 recorded claims extends northward from McQuillan Ridge to Harrymel Creek. Mineralization consists of magnetite and pyrrhotite associated with garnet-epidote skarn along a contact of diorite and limestone. In 1962 thirty-one EX holes, totalling 13,721 feet, were drilled from the surface. A 25-ton bulk sample for metallurgical test work was obtained by stripping two sections of the mineralized zone.

Ted Ray.—This group comprises seventy recorded claims on the north side of Sulphurets glacier. Mineralization is reported to consist of minor chalcopyrite associated with pyrite, sericite, carbonate, and quartz in a large altered area of a syenite porphyry-volcanic complex. Work in 1962 included geological mapping and the drilling of two EX holes, totalling 1,504 feet. The property was not visited.

* By W. C. Robinson.

MOTASE LAKE*

Silver-Gold

F.C. (Huestis Mining Corporation Ltd.) (56° 127° S.E.) The F.C. group of nineteen claims on the west side of Motase Lake is held by Huestis Mining Corporation Ltd., and during 1962 was under option to Noranda Exploration Company Limited. It has been reported that the property is underlain by interbedded tuffs and sediments cut by calcareous dykes, dioritic intrusions, and quartz veins. Some of the quartz veins are reported to contain values in gold and silver. Work in 1962 included geological mapping, geophysical surveying, prospecting, and the diamond drilling of five holes totalling 302 feet. Transportation to Motase Lake was by aircraft based at Fort St. James. It is reported that the option has been dropped. The property was not visited.

PORTLAND CANAL*

SALMON RIVER (56° 130° S.E.)

Gold-Silver-Lead-Zinc

Silbak Premier Mines Limited Company office, 844 West Hastings Street, Vancouver 1. A. E. Bryant, president; H. Hill & L. Starck & Associates Ltd., consulting engineers. The property has been described in previous Annual Reports. Work in 1962, which was carried out by a crew of seven men under the supervision of D. McLeod, commenced on June 15th and was suspended on November 30th. During the summer thirteen holes, totalling 800 feet, were diamond drilled. Mining of the high-grade oreshoot in the south wall of the Premier glory-hole was continued, and 465 tons of ore was shipped to the smelter at East Helena, Montana. The washed-out sections of the road to Stewart were by-passed by travelling the gravel bars of the Salmon River at low water.

Copper

JO and IM (Newconex Canadian Exploration Limited) (55° 130° N.E.) Company office, 914, 525 Seymour Street, Vancouver 2. B. I. F. Breaky, president; J. Sullivan, engineer in charge of property. This company holds the JO and IM groups, totalling 127 recorded claims. The JO group lies in the area between the Georgia River and the Portland Canal. The IM group lies eastward and mainly on the eastern side of the Georgia River.

Work in 1962, which was carried out by an average crew of eight men, commenced on May 15th and was suspended on October 15th. Initial work consisted of 4 miles of trail construction. This was followed by geological mapping, trenching, and sampling, plus magnetometer and electromagnetic surveying.

The property was serviced by pack-dogs and airdrops.

ALICE ARM*

Silver

Dolly Varden Mines Limited (55° 129° N.W.) Company office, 617, 837 West Hastings Street, Vancouver 1. F. C. Buckland, president; H. Bapty, engineer in charge. The company holds twenty-one Crown-granted claims, seven recorded claims, and seven optioned claims. The properties include the Dolly Varden, Torbrit, and Wolf groups. The

* By W. C. Robinson.

Dolly Varden property is on the west slope of Kitsault Valley and on top of Dolly Varden Mountain, between 1,000 and 2,200 feet elevation. The Wolf property is on the east slope and bottom of Kitsault Valley about one-quarter of a mile south of Trout Creek. The 1951 Annual Report describes the geology and mineral occurrences of the Upper Kitsault Valley.

Work commenced in April and continued throughout the remainder of 1962. The old Torbrit camp, power-line, and hydro-power plant were rehabilitated. Other work included 930 feet of diamond drilling on the Dolly Varden property and 2,322 feet of diamond drilling on the Wolf property. Underground development on the North Star workings commenced in November, and by the end of the year a raise had been driven 51 feet. The number of men employed ranged from eighty during the summer to twenty during the winter. Transportation to the Torbrit camp was by truck from Alice Arm.

QUEEN CHARLOTTE ISLANDS*

Graham Island

Copper

Magnet (Mastodon-Highland Bell Mines Limited)

(53° 132° S.W.) This property, originally called the Northwester, consists of eleven claims and is about 1 mile north of the head of Van Harbour. It can be reached by tractor-road and trail from Shields Bay on Rennell Sound. The showings occur at about 2,000 feet elevation and consist of skarn deposits in the Kunga limestone, which is cut by andesitic sills and dykes of the Yakoun Formation and by numerous steep faults. The contact with the Kano batholith is about 500 feet below the showing on the steep hillside. The irregular skarn areas contain some showings of massive chalcopyrite. During June and July a party of three men mapped the area and conducted magnetometer and electromagnetic surveys.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1928, p. 64.]

Iron-Copper

Dal (Mastodon-Highland Bell Mines Limited).—(53° 132° S.W.) This property is on Gudal Bay on the exposed southwest coast of Graham Island. The property consists of thirty-two claims. A party of three men during August prospected iron-copper skarns in Kunga limestone remnants in this area.

Moresby Island

Iron-Copper

Garnet†

(52° 131° S.E.) Silver Standard Mines Limited, 808, 602 West Hastings Street, Vancouver 2, holds five located claims under option agreement. The property is east of Gowing Island in Tasu Sound. The showings are reported to contain magnetite and chalcopyrite, occurring in volcanics and along the base of a limestone deposit. Irregular pods and veins of sphalerite occur within the limestone. Work done on the property, between November 12th and December 10th, consisted of drilling four pack-sack holes totalling 213 feet, trenching, and magnetometer surveying. The work was under the direction of W. St. C. Dunn, and was carried out by three men. Transportation to Tasu Sound was by aircraft based at Sandspit. A 32-foot boat was used in Tasu Sound. The property was not visited.

* By A. Sutherland Brown, except as noted.
† By W. C. Robinson.

Tasu (Wesfrob Mines Limited)

(52° 132° N.E.) Head office, 7 King Street East, Toronto; Vancouver office, 504, 1112 West Pender Street. P. N. Pitcher, president; G. K. Polk, resident geologist. Wesfrob Mines Limited is a subsidiary of Falconbridge Nickel Mines Limited. The property is on Tasu Sound near the entrance of Fairfax Inlet and consists of twenty-one Crown-granted and twenty-seven recorded claims.

Exploration continued throughout the year by surface diamond drilling and magnetometer surveys and detailed geological mapping. One hundred and fourteen AX holes were drilled, with a total of 36,587 feet. An access road about 1½ miles long was built from the camp at sea-level to the upper ore zone (No. 3) at 1,300 feet. A new 40-man bunk-house was built.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1913, pp. 96–97; 1956, pp. 125–127; 1961, pp. 11–13; Western Miner, October, 1959, pp. 38–44.]

Iron

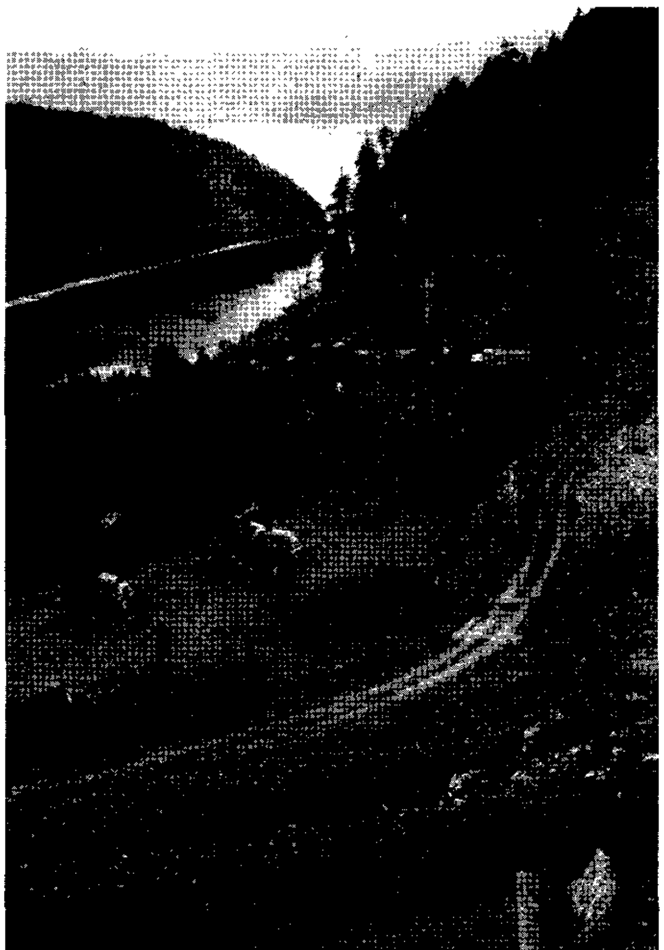
Harriet Harbour (Jedway Iron Ore Limited)*

(52° 131° S.E.) Head office, 507, 1111 West Georgia Street, Vancouver 5; mine office, Jedway. L. T. Postle, president; J. M. Stitt, manager; N. G. Cornish, mine superintendent; F. G. Gillet, mill superintendent. Harriet Harbour is on Skincuttle Inlet, on the southeastern coast of Moresby Island, and is 70 miles south of Sandspit. The properties on Harriet Harbour consist of twelve Crown-granted claims, fifty-nine recorded claims, and one optioned claim. The geology is described in previous Annual Reports.

Mining is by conventional open-pit methods, maintaining a 30-foot bench. Drilling is done with one Ingersoll-Rand drillmaster and two Gardner-Denver air-track drills. The bulk of the explosive used is AN/FO. Two 2½- and one 1½-cubic-yard capacity Northwest shovels are used to load the broken material onto nine 20-ton Euclid rear-dump trucks. The ore is trucked to a 60- by 48-inch Traylor primary crusher near the lower limit of the proposed open pit. In 1961 an adit was driven beneath the orebody and a raise driven to reach the surface near the primary crusher. The product from the primary crusher, which is minus 6 inches in size, passes into the raise, or ore-pass, and is delivered to the mill by trains of eight 10-ton cars.

The concentrating plant is located near the ship-loading terminal. The product delivered from the primary crusher is conveyed to a double-deck screen, the minus ⅝-inch product being passed directly to a single-deck Dillon dewatering screen. Minus 8 mesh slime material is pumped to a D.S.M. screen in the wet grinding circuit, by-passing the rod mill. The oversize product from the dewatering screen is conveyed to a fine-ore storage. The plus ⅝-inch oversize from the primary screen passes to a standard Symons cone crusher. The crusher discharge is conveyed to a single-deck Dillon screen. Screen undersize is conveyed over an electromagnetic drum separator, which makes a three-way split. Waste is discharged, ore is conveyed to the fine-ore stockpile, and high-grade concentrate is directed into the concentrate circuit. Plus ⅜-inch oversize from the single-deck screen is passed over a magnetic pulley. Non-magnetic waste is discharged, and the magnetic material is passed to a Symons Short Head crusher. The crusher discharge is conveyed to the fine-ore stockpile. Material from the fine-ore stockpile is ground by an 8- by 12-foot rod mill. The rod-mill discharge is pumped to the D.S.M. screen, and the screen undersize is fed to two Sala triple-drum wet permanent magnetic separators. The magnetic concentrate is passed to a 72-inch Akins classifier. The classifier sands are

* By W. C. Robinson.



. Jedway open pit, August, 1962.

Jedway primary crusher under construction at head of raise.

conveyed directly to the concentrate stockpile, while the classifier overflow is de-watered with the aid of an Allen cone and an American type filter. From the 100,000-ton capacity concentrate stockpile the material is conveyed to the loading-dock for shipment to Japan. The " Harriet Maru," on her maiden voyage, sailed with the first load of concentrates on October 27, 1962.

During 1962 the milling plant and dock loading facilities were constructed, and milling commenced in September; 2,562,000 tons of waste material was removed, 166,430 tons of ore was mined, and 53,515 tons of concentrate produced. The average number of men employed was 102. The camp is supplied by Northland Navigation freighter as well as by barge. Transportation of personnel is by aircraft from Sandspit.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1959, pp. 11–14; 1960, pp. 11–12; 1961, pp. 13–15; *B.C. Dept. of Mines,* Prel. Geol. Map, Southern Queen Charlotte Islands, 1960.]

Louise Island

Iron

Iron Duke* (52° 131° N.W.) This property consists of nine Crown-granted and two recorded claims. The property, which is about 2½ miles west of Girard Point on the northeast coast of Louise Island, has been described in the 1961 Annual Report. During January and February, 1962, fifteen AX holes, totalling 3,054 feet, were drilled by Magnum Consolidated Mining Co. Ltd.

In the spring of 1962 the property was optioned by Silver Standard Mines Limited. Work on the property commenced on June 1st and was suspended on July 10th. Eight men were employed under the direction of A. C. Ritchie. Thirty-three EX holes, totalling 4,805 feet, were drilled.

Ore reserves calculated by the company from all the drilling are 515,000 tons of 45 per cent iron as magnetite with a probable 100,000 tons. The company feels that the drilling established that the ore does not extend beyond the area of notable magnetic anomaly and that the favourable stratigraphy is cut off below by relatively flat-lying granitic rocks.

Transportation to Louise Island was by landing-barge and aircraft from Sandspit. A helicopter was used between the beach and the camp at the 1,500-foot elevation. The property was not visited.

[References: *Geol. Surv., Canada,* 1926, Iron Ores of Canada, Vol. 1, pp. 27–30; *Minister of Mines, B.C.,* Ann. Rept., 1961, p. 17.]

Burnaby Island

Iron-Copper

Jib (Mastodon-Highland Bell Mines Limited) (52° 131° S.E.) Head office, 502, 1200 West Pender Street, Vancouver 1. This property is on the southeast point of Burnaby Island about 1½ miles south of Poole Point. It was discovered in 1961 by Denison Mines Limited by aeromagnetic mapping, but claims then located were allowed to lapse. The showing was relocated by Highland Bell in September, 1962, with nine claims. The claims include the old Poole showings, which were first investigated in 1862–63.

A magnetic anomaly of about 1,000 gammas is centred just off the shore near the southeastern point of Burnaby Island. No magnetite body is exposed. Adjacent rocks on the shore are sugary fine white marbles of the basal Kunga Formation and

* By W. C. Robinson and A. Sutherland Brown.

andesitic sills, which together strike northeastward and dip 10 to 25 degrees northwestward. A contact with the Burnaby stock of quartz monzonite to monzonite occurs on the shore about 2,000 feet north of the centre of the anomaly. The area is cut by steep block faults of small movement, many striking about north 75 degrees west and about north 25 degrees west. Several small garnet skarn zones occurring at the contacts of sills and limestone contain chalcopyrite and magnetite. These were the target of Poole's work a hundred years ago.

Highland Bell surveyed the area with a ground magnetometer in the fall of 1962 and commenced drilling angle holes on the shore in January, 1963.

Iron

Mac (Merrican International Mines Ltd.) (52° 131° S.E.) Company office, 404, 510 West Hastings Street, Vancouver 2. This property consists of twelve recorded claims that cover showings described by Young and Uglow under the heading "Burnaby Island." The showings are 3¼ miles southwest of Scudder Point. They may be reached by 1½ miles of trail from either of two exposed bays on the northeast coast of Burnaby Island. The showings occur between 250 feet and 400 feet elevation on the north side of a large stream flowing to the northern of the two bays. No outcrops occur below the lowest showing, and overburden mantles much of the area.

The showings are in the upper part of the basal Kunga limestone, which strikes about north 70 degrees east and dips about 35 degrees north. The limestone is overlain by the thin-bedded calcareous argillites of the formation that contain the distinctive pelecypod *Halobia*. Limestone and argillite are cut by a number of dark-green fine-grained amygdaloidal dykes, one of which is about 50 feet wide and has a trace that strikes about east and hence on the surface truncates the beds at an acute angle. Monzonite of the Burnaby stock outcrops east of a gully 350 feet east of the showings.

The showings consist of four outcrops of relatively pure magnetite, primarily in the limestone. The main showing is a sill-like body that outcrops along the hillside for 70 feet and ranges in width from 5 feet at the west to 25 feet at the east, where it abuts the large basic dyke. The western end is covered. Just east of the large dyke and some 70 feet from the main showing and at about the same elevation a narrow dyke-like body of magnetite occurs in limestone. Another body up to 4 feet wide and about 45 feet long occurs in limestone about 50 feet below and slightly to the west of the main showing. This body is steeply dipping, is covered at the east, and abuts a dyke on the west. The fourth showing consists of a small body in the large basic dyke adjacent to limestone and about 75 feet above and 75 feet to the west of the main showing.

During the year the company carried out a ground magnetometer survey and drilled ten short EX holes.

[Reference: Young and Uglow, Iron Ores of Canada, Vol. I, *Geol. Surv., Canada,* pp. 32–33.]

KITIMAT*

Iron

Iron Mountain (54° 128° S.W.) Quebec Metallurgical Industries Ltd., 2200, 25 King Street West, Toronto, holds four Crown-granted and nine recorded mineral claims on magnetite showings on the south side of Iron Mountain. The magnetite occurs in three zones. The property has been described in the 1961 Annual Report.

* By W. C. Robinson.

In 1962 exploration work on the upper zone was continued. Seventeen EX holes, averaging about 400 feet long, and ten packsack-drill holes, averaging 70 feet long, were drilled. The work, which was carried out by a crew of ten men under the direction of H. S. Lazenby, commenced in April and was suspended in October, 1962.

Transportation to the base camp, which was near the Wedeene River crossing of the Terrace–Kitimat branch of the Canadian National Railway, was by rail. Transportation to the drill camp, which had been established on Iron Mountain at an elevation of 1,800 feet, was by helicopter and back-packing.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1961, pp. 17–18.]

KITSUMKALUM LAKE*

Gold

Ike (54° 128° N.W.) Kootenay Base Metals Ltd., 510 West Hastings Street, Vancouver 2, holds twenty-two recorded claims in an area previously covered by the Beaver group. The property is at an elevation of about 4,000 feet, on a ridge of a mountain north of Mayo Creek, 7 miles west of Kitsumkalum Lake. The showings consist of a ribboned quartz vein which is contained in a strong northeasterly striking shear. The vein shows sulphide mineralization, including, in order of abundance, pyrite, arsenopyrite, galena, and chalcopyrite.

Work on the property during 1962 commenced in June and was suspended in October. Initial work consisted of diamond drilling two holes to intersect the vein about 75 feet below ground-level. Core recovery was poor, and the vein was further explored by driving 202 feet of adit about 150 feet lower in elevation than the main surface outcrop. The number of men employed varied from two to seven. The property can be reached by a logging-road from Terrace to Mayo Creek and thence by a 5-mile trail. However, transportation was mainly by helicopter based at Terrace.

ZYMOETZ RIVER*

Copper

Northwest (54° 128° S.E.) This property consists of eight claims located by L. Belliveau and associates and forty claims located by Cariboo Gold Quartz Mining Company Limited. It was known as the Northwest group in a report in the 1914 Annual Report. The property is at an elevation of about 4,000 feet on the southerly slope of a high mountain range that forms the divide between the Zymoetz River and the headwaters of Kleanza Creek. The showings have been described in the 1914 Annual Report.

During November, 1962, some trenching and sampling was done under the direction of Marcel Guiget. Transportation was by helicopter. The property was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1914, pp. K 118–K 119.]

HAZELTON*

Silver-Lead

Silver Standard (Silver Standard Mines Limited).—(55° 127° S.W.) Company office, 808, 602 West Hastings Street, Vancouver 2. R. W. Wilson, president. The property is on Glen Mountain, 5½ miles north of Hazelton. The mine was

* By W. C. Robinson.

leased by Paul Kindrat, of Smithers. Fifty-two tons of silver-lead ore was shipped to the Trail smelter in 1962.

SMITHERS*

Molybdenum

Glacier Gulch (Southwest Potash Corporation)

(54° 127° N.E.) Executive office, 1270 Avenue of the Americas, New York 20. F. Coolbaugh, president; R. E. Anderson, geologist in charge. The company holds a total of 224 claims and fractions on Hudson Bay Mountain: thirty under option from W. Yorke-Hardy and partners, about 190 located claims and fractions, and fourteen Crown-granted claims under a lease agreement. The property is in the cirque at the head of Glacier Gulch on Hudson Bay Mountain. The showings consist of widespread low-grade molybdenite mineralization outcropping principally near the toe of the glacier. Mineralization occurs primarily in association with quartz veinlets and is present in both volcanic and intrusive rocks.

During 1962 a camp was established on the glacier below the ice-fall. Movement of ice below the ice-fall was negligible, and eight vertical AX holes, totalling 14,700 feet, were diamond drilled from the surface of the glacier. An average crew of twenty-one men was employed from June to November. The camp was supplied by pack-horse, helicopter, and fixed-wing aircraft.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1958, pp. 10–11.]

Silver-Lead-Zinc

Cronin (New Cronin Babine Mines Limited)

(54° 126° N.W.) Company office, 844 West Hastings Street, Vancouver 1. L. C. Creery, president; H. Hill & L. Starck & Associates Ltd., consulting mining engineers. The property is on the east slope of Cronin Mountain, about 30 miles by road from Smithers. A description of the property was given in the 1949 Annual Report. During 1962 P. Kindrat, lessee, is reported to have mined approximately 400 tons of ore and driven about 40 feet of raise. The mill was not operated during 1962, and no concentrate or ore was shipped.

BABINE LAKE*

Copper

McDonald Island (Granisle Copper Company Limited)

(54° 126° N.E.) Head office, 1111 West Georgia Street, Vancouver 5. L. T. Postle, president. The property, which has been described in previous Annual Reports, is on McDonald Island, in the northern section of Babine Lake at the mouth of Hagan Arm. Previous diamond drilling has defined a low-grade copper deposit of considerable size. During 1962 three long cross-cutting holes, totalling 1,648 feet, were diamond drilled to provide material for milling tests. Topographic surveying and testing of overburden were also carried out during 1962. The work was done by a crew of seven men under the direction of K. C. Fahrni. The property was serviced by boat from Topley Landing.

OMINECA*

Tungsten

Floyd

(55° 124° N.E.) Twenty-four mineral claims, Troy 1 to 20 and Glo 1 to 4, are held under option by Southwest Potash Corporation from A. E. Floyd, of Manson Creek. The

* By W. C. Robinson.

showing is about 2 miles southeast of Manson Creek Post Office. It consists of scheelite-bearing quartz veins lying in the Manson Creek fault zone. Work between September 1st and September 20th was done by three men and included trenching, sampling, and geological mapping.

EUTSUK LAKE*

Molybdenum

C A F B (53° 127° S.E.) Phelps Dodge Corporation of Canada Limited, 404, 1112 West Pender Street, Vancouver 1, holds by record fifty-five mineral claims extending northward from Haven (Bone) Lake toward the summit of Red Bird Mountain. Haven Lake is 8 miles west of Pondosy Bay on Eutsuk Lake. The claims cover a small stock of granite porphyry which contains some molybdenite mineralization.

During August and September, 1962, work included rock trenching and magnetic and induced potential surveying. Six men were employed under the direction of W. Meyer. Transportation was by fixed-wing aircraft and helicopter.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1960, p. 14.]

ENDAKO†

Molybdenum

Endako (Endako Mines Ltd.) (54° 125° S.E.) Company office, 1218 Burrard Building, 1030 West Georgia Street, Vancouver 5. Andrew Robertson, president; R. C. Coutts, resident manager. Endako Mines Ltd. holds fifty-seven claims covering molybdenite showings south of Endako, which originally were known as the Stella. A drill camp, core rack, and shed were established on the ground in the summer of 1962. The camp is reached by following the Nithi Lake road to a point 3 miles south of Highway No. 16 at Endako, thence westward about 4 miles along old logging-roads.

Surface trenching, an inclined shaft, and an adit were dug in the 1930's by the locator, C. H. Foote, of Fraser Lake. In 1952 the ground was under option to Kennco Explorations (Western) Limited, who did a small amount of bulldozer stripping. Assessment work was recorded by them in advance to 1957, at which time the original claims were allowed to lapse. Later, key claims were acquired by C. Riley and H. T. James, of Vancouver, from whom they were acquired by the company.

The immediate area is underlain by coarse pink granite of the Topley Intrusions. These intrusions underlie an area some 80 miles long in a northwesterly direction and 15 to 20 miles wide.

The granite as seen in surface trenches and diamond-drill core is remarkably uniform in grain and composition, although varying somewhat in the type and intensity of hydrothermal alteration. Two types are obvious: one the change of pink colour of the orthoclase to brick red, and the other the alteration of the sodic plagioclase largely to pale-green hydro-mica, sericite, and carbonate. Variation in intensity of alteration is seen in the drill core, but, on the basis of the amount of diamond-drill core seen, the intensity could not be related to known or inferred shear or fracture structures in the granite nor could it be correlated with the distribution and amount of molybdenite mineralization.

In surface trenches and in diamond-drill core the pink granite is seen to be cut by dykes a few feet or a few tens of feet wide of white to pale pinkish-brown quartz feldspar porphyry having phenocrysts of quartz and feldspar in a dense to fine-

* By W. C. Robinson.
† By Stuart S. Holland.

grained matrix. Although there are similarities in the several dykes seen, there are nevertheless distinctions to be made microscopically between those having a fine even-grained groundmass and those which are brecciated or granophyric. The dykes are fractured, and some are mineralized with molybdenite.

The surface showings consist of the old Foote incline shaft and several trenches on a quartz molybdenite vein on the crest of a low ridge, closely spaced open cuts on flat or gently dipping veins to the southeast on the lower slope of the same ridge, and bulldozed trenches on a quartz molybdenite vein on a ridge 650 feet to the northwest, across a swamp from the Foote incline.

The Foote incline and associated open cuts expose a quartz molybdenite vein striking north 70 degrees east and dipping 55 to 60 degrees southeast. The quartz vein ranges in width up to 3 feet. It is a silicification vein along a shear zone with the parting planes of the ribboned quartz occupied by fine-grained molybdenite.

Six closely spaced open cuts 300 feet southwest of the Foote incline expose several quartz veins, maximum width 16 inches, ribboned and well mineralized with molybdenite, and for the most part flat or very gently dipping. Bulldozing for drill-sites Nos. 3 and 14 have partly obscured these veins.

On a second low ridge 650 feet northwest of the Foote incline the company has exposed granite bedrock in seven deep bulldozed trenches. The trenches, extending for 800 feet along a direction north 65 degrees east, expose a shear zone occupied by ribboned quartz mineralized with molybdenite. The quartz dips 45 to 60 degrees southeast. In several trenches, quartz strands are separated by several feet of fractured granite which is mineralized along the fractures by narrow veinlets of quartz and molybdenite. Four samples taken in the third trench from the west assayed as follows: 1.5 feet of quartz on the hangingwall side, 2.90 per cent MoS_2; 3 feet of granite with quartz stringers, 1.66 per cent MoS_2; 3 feet of granite with quartz stringers, 0.56 per cent MoS_2; 1 foot of quartz on the footwall side, 2.95 per cent MoS_2. These indicate the high grade of mineralization in the quartz vein, but the future of the property will depend on the amount of molybdenite present along systematic fractures in the granite. The vein quartz is mineralized with fine-grained molybdenite; a very small amount of pyrite is present, as also are specular hematite, magnetite, and, very rarely, chalcopyrite. At the surface and in float the mineralized vein quartz is strongly coloured by brilliant yellow molybdic oxide.

In May, 1962, the company began a programme of diamond drilling. By early September two drills had completed fourteen holes totalling 8,134 feet of A-size core. At that time Canadian Exploration Limited concluded a financing arrangement with the company, a third drill was brought in, and by the end of the year diamond drilling of fifty-two holes totalling 27,291 feet had been completed.

At the time of examination in mid-September the core from sixteen drill-holes, totalling about 9,000 feet, was available for examination. Since then thirty-six more holes have been drilled whose core has not been seen.

For the most part the drill-holes are laid out on five lines of section that strike north 10 degrees east. The westernmost line is 2,050 feet west of the incline, the second is 650 feet west, the third is 250 feet west of the incline, the fourth is 2,750 feet east of the incline, and the fifth is a further 800 feet east. In addition, there are several inclined holes, dipping 45 degrees northward and directed toward the downward extension of the northerly vein shear.

It is apparent from the diamond drilling that molybdenite not only accompanies the quartz occupying the several northeasterly striking shear zones, but occupies fractures and accompanies narrow quartz veinlets along fractures in the pink granite and quartz feldspar porphyry. Two sets of fractures seem to be mineralized. This fracturing of the granite is widespread, and from observation at the time of examination does not appear to be structurally related to movement along the northeasterly shears. The intensity of molybdenum mineralization moreover does not appear to be related to intensity of alteration nor to the northeasterly striking shears.

Molybdenite is widely present in the core, but there is no disseminated molybdenite, and in all instances it is related to quartz molybdenite veinlets along fractures. The drilling has indicated the presence of molybdenite mineralization in a zone trending east and about 4,000 feet long. The grade of mineralization can only be determined by assaying the split core from holes drilled systematically. This essentially is what the drill programme is laid out to accomplish.

[References: *B.C. Dept. of Mines*, Bull. No. 9, 1940, pp. 11–16; *Geol. Surv., Canada,* Mem. 252, 1949, pp. 192–193.]

CARIBOO

WELLS-BARKERVILLE (53° 121° S.W.)*

Gold

Aurum (The Cariboo Gold Quartz Mining Company Limited)

Company office, 617 West Pender Street, Vancouver; mine office, Wells. J. Royden Morris, president; Marcel Guiget, general manager. Charles McNeil, mine superintendent; J. J. Stone, mill superintendent. Capital: 2,000,000 shares, $1 par value. This company operates the Aurum mine on the east side of Island Mountain adjacent to the community of Wells, which is 51 miles by road from Quesnel.

The mine has been in continuous production since 1934 and has been operated by the present company since 1954. It is developed from a main haulage adit at the 4,000-foot level. Eleven levels have been developed from the Aurum shaft, which is a three-compartment internal shaft 1,450 feet deep and collared at the 4000 level.

The ore occurrences are of two kinds. Pyritized quartz veins are found in groups and clusters in the micaceous quartzites of the Snowshoe Formation. Pyritic replacement bodies occur in the Baker limestone beds of the same formation at the contact with the micaceous quartzites, and these bodies are directly related to the amount of folding, being more numerous where major folding has taken place. Both types of ore occurrence appear to be related to major faulting in the area. The average grade of the quartz ores of the Aurum mine has usually been in the range of 0.35 ounce of gold per ton, while the replacement ore is usually of higher grade, an average being 0.75 ounce per ton. The quartz orebodies are usually mined by a cut-and-fill method, while the replacement deposits are usually developed by inclined drifting and are mined by slashing the ore on a retreating system.

The workings of the mine may be divided into two sections. The older part of the mine comprises the Aurum fault zone and associated zone of folding. More recently (from 1958 to 1961) the Mosquito Creek property, 2,000 to 4,000 feet northwest of the Aurum shaft, has been developed on three levels—the 2850, 3000, and 3125 levels. In 1962 mining was carried on in both sections of the mine. A considerable amount of rehabilitation and exploration was done in the older sections of the mine, and a number of small new orebodies and extensions of known orebodies were found. In the Mosquito Creek section the main new development was the extension of the 3000-west drift, 853 feet west through the Mosquito Fault. This is the farthest extension of the mine westward and underlies Mosquito Creek on the surface, 4,000 feet west of the Aurum shaft.

* By A. R. C. James.

The following is a summary of development work done in the mine in 1962:—

	Ft.
Deferred development	869
Current development	1,536
Crosscutting	1,211
Raising	722
Box-holes and sub-drifts	171
Diamond drilling	23,546
Test-holes (jackleg and ribbon steel)	23,003

At the end of the year a crew of 125 men was employed, of which eighty-three were underground. The excellent safety record of the past two years was maintained in 1962, there being only one lost-time accident.

A total of 38,638 tons of ore was milled, yielding 18,624 ounces of gold and 3,274 ounces of silver. This is approximately a 4½-per-cent decrease in gold production from 1961 and a 1-per-cent increase in the amount of ore milled.

LAC LA HACHE

Takomkane Mountain (52° 120° S.W.)*

Molybdenum

Boss Mountain (Noranda Exploration Company, Limited)

British Columbia office, 202, 2256 West Twelfth Avenue, Vancouver 9; mine office, Box 247, 100 Mile House. B. O. Brynelsen, manager, Vancouver; S. G. Bruce, superintendent, Boss Mountain. The property comprises eleven Crown-granted claims and 135 recorded claims. The prinicipal showings are near the headwaters of Molybdenite Creek in a large cirque on the eastern side of Takomkane (Big Timothy) Mountain at an elevation of 5,500 feet and about 50 air miles due east of Williams Lake. The property is reached by 57 miles of road from 100 Mile House via Forest Grove, Eagle Creek, and the Hendrix Creek forest access road.

The showings were first discovered in the early years of the century, and intermittent work was done on them between 1914 and 1956. From 1956 to 1960 the property was held under option by Climax Molybdenum Company and its successor, American Metal Climax Inc., and a subsidiary, Southwest Potash Corporation. A considerable amount of diamond drilling, trenching, and mapping was done, but in 1960 the option was relinquished. In 1961 the property was bought by Noranda Exploration Company, Limited. Since then work on the property has been continuous. In 1961 it included the construction of 8 miles of new road to connect the Hendrix Creek forest access road with the property, together with diamond drilling, trenching, geophysical and geochemical surveys, and mapping.

The molybdenite mineralization occurs in two principal showings. The upper showings, which received more attention in the earlier exploration, are on a long narrow zone of small quartz veins from a few inches to 2 feet wide containing molybdenite in thin isolated seams and scattered flakes. These have been uncovered in short sections by cuts and trenches. Previous drilling has failed to disclose any important reserves of ore in these quartz veins. The lower showings occur in a quartz diorite breccia pipe. The breccia pipe forms a northwesterly trending lens-shaped outcrop about 400 feet long and 100 feet wide. The molybdenite mineralization forms an irregular orebody 20 to 30 feet wide and about 350 feet

* By A. R. C. James.

long within the breccia pipe. Recent exploration work has been directed to outlining the extent and grade of this orebody.

Preparations were begun early in 1962 to drive a long crosscut to reach the orebody at a depth of 500 feet below surface, from which crosscut drifting and raising would be carried out. The portal site was selected at a point 5,800 feet approximately due east of the orebody. A well-furnished camp was set up here, and the 9- by 9-foot crosscut was collared in March. By the end of 1962 the crosscut had been driven 4,207 feet, the tunnelling work being done under contract. Other work done included the drilling of eleven AX diamond-drill holes totalling 5,128 feet. The 8-mile mine road from the Hendrix Creek forestry road was improved by some relocation to reduce grades and sharp bends and by extensive application of gravel and rock fill; the road is now a good all-weather road.

A crew of eleven men was employed by Noranda Exploration Company Limited, under the supervision of S. G. Bruce. R. F. Fry and Associates (Western) Ltd. employed a crew of thirteen men under the supervision of J. Pierobon. No serious accidents were reported.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1956, pp. 34–35; 1957, pp. 18–22; 1961, pp. 21–22; Stevenson, J. S., *B.C. Dept. of Mines*, Bull. 9, 1940.]

TASEKO LAKE*

Copper

Fish Lake (Phelps Dodge Corporation of Canada, Limited)

(51° 123° S.W.) Field office, 404, 1112 West Pender Street, Vancouver 1. D. C. Malcolm, geologist. This company holds seventy-five claims and fractions on both sides of the creek immediately northwest of Fish Lake, some 7 miles due north of Taseko Lake. Work in 1962 included six diamond-drill holes totalling 2,005 feet which were drilled in a single northeasterly section 4,000 feet in length across the creek. An average crew of six men was employed from June to August under the supervision of V. Preto.

The property is largely drift covered and is underlain in the explored area by altered tuffs and dacite porphyry intrusions containing disseminated chalcopyrite and pyrite together with some bornite.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1961, p. 24.]

Chita (Phelps Dodge Corporation of Canada, Limited).—(51° 123° S.E.) This company holds sixty-eight claims in the Chita group east of the narrows of Taseko Lake. Work in 1962 was supervised by H. W. Agnew and included geological mapping and trenching.

LILLOOET

Bridge River (50° 122° N.W.)†

Gold

Ace (Bralorne Pioneer Mines Limited)

Company office, 355 Burrard Street, Vancouver 1. F. A. McGonigle, president. The company holds an option on forty-one recorded mineral claims covering a considerable area lying for the most part north of Bridge River and extending for 4 miles west of the junction of Gun Creek. It includes the Wayside, Congress, and Minto mines. The option agreement with the Ace Mining Company Limited, the original holders of the claims, was made early in 1960, and exploration work has been done each summer since that time. In

* By J. M. Carr.
† By A. R. C. James.

1962 work was concentrated in the old Congress mine in the exploration of a structure called the Hangingwall vein. This is a rather flat-lying altered shear zone and is roughly parallel to and about 160 feet northwest of the Main vein, which was explored by previous companies from 1934 to 1938 and 1945 to 1947. The vein shear strikes northward and dips westward but is faulted into several segments, and there are splits off the main structure. A total of 729 feet of drifting and 81 feet of raising was completed, mostly on the Hangingwall vein, with a small amount of drifting on a subsidiary vein. Four holes were diamond drilled, totalling 693 feet. The results indicate an oreshoot 165 feet long averaging 5.3 feet wide, with average values of 0.33 ounce of gold per ton and 1.30 per cent antimony. The work was begun on April 9th and was continued until December 18th. Two men were employed.

[References: *Minister of Mines, B.C.,* Ann. Repts. 1948, pp. 106–112; 1960, pp. 20–21; 1961, pp. 25–26; Cairnes, C. E., *Geol. Surv., Canada,* Mem. 213, 1937, pp. 102–104.]

Bralorne Pioneer Mines Limited

Company office, 355 Burrard Street, Vancouver 1; mine office, Bralorne. F. A. McGonigle, president; C. M. Campbell, Jr., resident manager; J. S. Thomson, mine superintendent E. H. Hall, mill superintendent; A. J. Learmonth, plant superintendent. This company operates the Bralorne mine on Cadwallader Creek. It is reached by 51 miles of road from Shalalth or 75 miles from Lillooet, both stations on the Pacific Great Eastern Railway. The extensive workings, comprising over 50 miles of tunnels, raises, and shafts, are in a northwesterly trending vein system within a diorite stock. Development of the surface showings began about 1898, and production has been continuous since 1931. The total gold production of the mine from 1900 to 1962 is 2,355,109 ounces of gold from 4,528,687 tons of ore. The present active workings are mainly in the Queen section of the mine, between 4,100 and 4,700 feet below surface, with development work proceeding up to a depth of 5,400 feet below surface.

The workings are approached by a main haulage adit on No. 8 level. There are three internal shafts: the Crown shaft, approximately 2,600 feet deep from No. 8 to No. 26 level; the Empire shaft, approximately 3,280 feet deep from No. 3 to No. 26 level; the Queen shaft, 2,300 feet deep from No. 26 to No. 41 level. The major portion of present production is mined in cut-and-fill stopes between No. 31 and No. 35 levels, the 77 vein being the principal producing vein, together with a small production from the 79 vein. Most of the stopes are sand-filled with mill tailings, which are piped into the mine. The ore is hoisted in the Queen shaft to No. 26 level and is then hauled by battery locomotive to the Crown shaft, hoisted to No. 8 level, the main haulage level of the mine, and hauled by trolley locomotive to the mill. The ore is treated in a 600-ton cyanide mill, which was put into operation in 1961. In 1962 a new 1,000-ton fine-ore bin was completed and brought into use, and in the latter part of the year a new 1,000-ton coarse-ore bin was built. The old gravity and flotation mill was dismantled, except for the No. 3 section, comprising a ball mill and flotation unit which is being retained for possible custom milling. In 1962, 149,998 tons of ore was milled, yielding 99,121 ounces of gold.

A summary of development work done in 1962 is given below:—

	Ft.
Drifting	4,333
Crosscutting	3,031
Raising	390
Diamond drilling	19,702

In August the mine was closed for a month while the Queen shaft was deepened a further 300 feet from No. 39 to No. 41 level. Exploration in 1962 was largely directed eastward toward the Pioneer mine. Drifting or crosscutting was done on Nos. 4, 8, 20, 26, and 38 levels. New ore was developed on the 52 vein on No. 20 level; one shoot found was 240 feet long, 5.8 feet wide, and averaged 0.55 ounce of gold per ton, and a second shoot was 45 feet long, 3.4 feet wide, and averaged 0.74 ounce per ton. Further development of the 77 vein was continued on Nos. 36 and 37 levels, and a series of ventilation raises was driven from No. 38 to No. 35 level.

The mine ventilation is effected by two Jeffrey fans situated at the surface at the top of the ventilation raise. These fans operating in parallel force 120,000 cubic feet of air per minute down the raise to No. 25 level. From this point the air passes down into the Queen section by the developed part of the 79 vein and the Queen shaft. Auxiliary fans are used on the levels below No. 32 level to direct the air flow to the working places. The exhaust air flows upward via stopes and manways and the Crown and Empire shafts to the surface at Nos. 3 and 8 levels. Rock temperatures in the deeper workings reach 108 degrees, and an ample air flow is required to maintain reasonable working conditions. In some development drifts and raises the air temperatures reach 95 degrees, but the average temperature of twelve stopes at the beginning of November was 80 degrees.

The number of employees was 308, of whom 224 were underground.

Jade

Crest and Jade* (50° 121° N.W.) The Crest Nos. 1 and 2 mineral claims at the very headwaters of Ama Creek are held by E. A. Floyd and Lawrence Frenier, of Lillooet. They adjoin the Jade Nos. 1 to 4 mineral claims, which extend westward down into the valley of Moon Creek and are held by H. J. Street, of Lillooet. The claims are underlain by serpentinite, which outcrops on the ridge between Ama Creek and Moon Creek. The claims in part cover ground previously held by W. Michel, of Lillooet, and on which some bulldozer trenching was done a few years ago to expose asbestos veinlets in serpentinite. The claims are reached by a truck-road branching from the Bridge River road immediately south of the Bridge River bridge and leading to a sawmill about 4 miles distant. From there an old trail leads uphill to showings at about 4,500 feet elevation.

A line of shallow open cuts extending uphill to the south has been put in to expose a zone of pale-green alteration in serpentinite. The zone, which appears to be along the contact of a diorite dyke, is up to 3 feet in width and is seen as a bleaching of the otherwise dark serpentinite. In thin-section the rock comprises aggregates of small tremolite crystals having a nephritic fabric in part but crossed by strands of tremolite of coarser grain in parallel orientation. The material is best termed semi-nephrite, a word coined by Turner to describe comparable fissile and schistose nephritic material in New Zealand.

Although this material has little commercial value, its occurrence should attract the attention of any prospector interested in the geological environment in which nephrite may occur.

Mercury

TYAUGHTON CREEK (51° 122° S.W.)†

Silverquick Development Co., Inc. Company office, 400 Hoge Bldg., Seattle 4, Wash., U.S.A.; Vancouver office, 301, 535 Howe Street, Vancouver 1; mine address, Gold Bridge. President, Robert E. Woods. Capital: 250,000 shares, $1 par value. The company holds a group of twenty claims between Tyaughton Creek and Taylor

* By Stuart S. Holland.
† By A. R. C. James.

Creek. Showings reportedly containing cinnabar mineralization occur on the property.

The work done in 1962 was mainly confined to road construction and to clearing a camp-site. According to company reports, the Tyaughton Creek road was repaired over a distance of 6 miles. A total of 3½ miles of jeep-trail was improved, and 3½ miles of new road was built to the showings. A camp-site was cleared and four tents were erected, and construction of a cook-house and bunk-house was started. Two storage sheds were erected for tools and small machinery. A crew of five men was employed, together with some contract labour. Work was suspended for the winter on November 1st.

Fraser River (50° 121° N.W.)*

Copper

Pine, Elm (Mount Askom Mining Company Limited)

Company office, 817, 402 West Pender Street, Vancouver 3. George Milburn, president. This private company holds thirty recorded claims in the vicinity of Nesikep Creek, about 15 miles southeast of Lillooet and about 2 miles west of the Fraser River. The property appears to be in part a relocation of the Askom group, which was explored in 1960 by Tombac Exploration Ltd. The showings are reported to contain disseminated chalcopyrite mineralization.

Work on the property was commenced in April and concluded in November. Approximately 4 miles of road was constructed to provide access to the property, and several open cuts were made on the showings. A magnetometer and a soil survey were carried out. A crew of three men was employed.

ANDERSON LAKE†

Gold

Golden Contact (Cassiar Copperfields Limited)

(50° 122° N.E.) The company has under option from Anderson Lake Mining and Milling Co. Ltd. two mineral claims which were located in 1898 and which at that time were known as the Brett group. The Anderson Lake Mining and Milling Co. Ltd. acquired the claims in 1900 and installed a ten-stamp mill. Between 1900 and 1904 the mill recovered 674 ounces of gold from 8,890 tons of quartz mined. In 1908 Northern Exploration Company of Seattle milled 1,200 tons, for which there is no record of production, and in 1910, 300 tons was milled, from which 7 ounces of gold was recovered. The property lay idle until 1929, when it was acquired by McGillivray Gold Mines Ltd., who did some work, then in 1932 the ground was acquired by National Gold Mines Ltd., who operated until 1934. At that time three levels had been driven on a wide quartz vein which extends for a considerable distance. Nothing further was done until 1947, when Golden Contact Mines Limited acquired the ground. This company, between 1947 and 1953, did some diamond drilling, drove the Mac level at 3,320 feet elevation, the 49er at 3,187 feet elevation, and the Pep at 2,918 feet elevation.

The present company acquired the ground in 1960, and in May of that year began to rehabilitate the bottom two levels and to construct a camp and small concentrator of about 100 tons daily capacity. The concentrator was completed by May of 1962, and about 847 tons of vein material mined from the 49er level at the head of the raise from the Pep level and 80 tons of quartz and wallrock from Ben's

* By A. R. C. James.
† By Stuart S. Holland.

stope on the Pep level was milled. Gold recovered from this operation amounted to 7 ounces. Mining operations terminated at the mine in August, 1962.

The camp, about 50 feet above the Pep level, is reached by about 5 miles of truck-road from Marne station on the Pacific Great Eastern Railway.

The vein outcrops at and above 3,640 feet elevation. It strikes north and dips 65 to 70 degrees to the west and very largely lies within black slates, with which it is conformable in strike.

The vein has been explored by six adit levels driven northward as follows: No. 1 level at 3,650 feet elevation; No. 2 at 3,550 feet elevation, in which there is some 400 feet of drift on the vein; No. 3 at 3,400 feet elevation, in which there is some 800 feet of drift on the vein; the Mac adit at 3,320 feet elevation, with about 250 feet of drift on the vein; the 49er level at 3,187 feet elevation, with about 410 feet of drift on the vein; and the Pep level at 2,918 feet elevation, with about 500 feet of drift on the vein. A raise on the vein connects the Pep and 49er levels.

Only the Pep, 49er, and No. 3 levels were open to examination. In them the vein is intersected by a fault zone striking about north 40 degrees west and dipping 35 to 70 degrees southwest, which displaces the vein to the right. This is a major fault which is encountered in all the mine workings from No. 2 level down and which separates the vein into two segments—one west and one east of the fault. On the 49er level the horizontal separation at right angles to the vein is 90 feet and on the No. 3 level it is about 200 feet.

It is evident that the vein which was drifted on in No. 1 and No. 2 levels lies on the hangingwall side of, or west of, the fault. From the portal on No. 3 level there is some 460 feet of drift on the vein west of the fault before the vein is offset some 200 feet to the right; on the same level there is approximately 340 feet of drifting on the vein segment east of and on the footwall side of the fault. On the 49er level there is about 250 feet of drifting west of the fault and 160 feet on the segment east of the fault. On the Pep level, all drifting on the vein, some 500 feet, is on the footwall side, east of the fault.

The vein varies greatly in width, from a foot, locally, to as much as 16 feet in the north face of the drift on the 49er level; for considerable lengths the vein is of drift width or greater. The vein is very sparsely mineralized with pyrite, and visible gold is locally present. In places the vein has a falsely encouraging appearance because of a ribboning along the footwall side that consists of closely spaced shear planes smeared with black argillaceous material from the wallrock. Such vein material simulates the appearance of the high-grade ribboned ore that occurred in the Bralorne and Pioneer mines. Selected samples of ribboned quartz failed to show the presence of exceptional amounts of gold.

The width and continuity of the vein and the presence of visible gold, some of which may be coarse, has induced, over the years, the driving of a good many hundred feet of underground workings to explore the vein in order to find and develop sufficient mineable quartz for a profitable operation.

The gold content of the vein is disclosed by the amount of gold recovered by early milling, by assay plans of No. 2 and No. 3 levels prepared by several reliable examining engineers, and by detailed assay investigation of twenty-two samples taken during the course of an examination in February, 1962.

Between 1900 and 1910, 9,190 tons of ore was mined, largely above No. 2 level, and milled in the old ten-stamp mill. From this amount of ore 681 ounces of gold was recovered—the equivalent of 0.074 ounce recovered per ton mined. If the recovery by the stamp mill was as low as 50 per cent, then the average grade of the quartz mined probably was not more than 0.148 ounce gold per ton.

Detailed assay plans showing the systematic sampling results of three reliable examining engineers are available of the No. 2 and No. 3 levels. An analysis of No. 2 level shows that, of sixty-eight samples taken, only five assayed more than 0.20 ounce gold per ton; the numerical average of the assays is 0.05 ounce gold per ton in the segment west of the fault.

On No. 3 level west of the fault, in one set of 134 samples taken only ten assayed more than 0.20 ounce gold per ton, and of these one assayed more than 9 ounces gold per ton. In a second set of 112 samples taken, ten assayed more than 0.20 ounce per ton, the highest assaying 8.72 ounces per ton. There is no correspondence in position between the high assays of the two sets of samples.

Moreover, it is impossible from information available to reconcile the two independent sets of assay results on samples taken from the drift on No. 3 level on the vein east of the fault. For example, at the south end a 70-foot section, with an average width of 5.0 feet, is shown on one plan as assaying 0.36 ounce gold per ton and on another 0.009 ounce gold per ton. Toward the north end of the same drift a 135-foot length of vein on one plan averages 5.3 feet in width and is shown as assaying 0.30 ounce gold per ton, and on the other a 95-foot length at the same location averages 5.7 feet in width and assays 0.005 ounce gold per ton.

These assay results illustrate the problem of determining by assay the average gold content of a vein in which some of the gold is coarse and randomly distributed.

In February, 1962, a special examination was made at the property in order to investigate the source of some samples from which the company had obtained extremely high assay results. The company had taken ten samples on the 49er level from vein quartz exposed in the drift south of the head of the Pep level raise, and reported that the numerical average of these samples was 63.07 ounces gold per ton, with one sample assaying 442.92 ounces gold per ton. Twenty-two samples were taken during the course of the present examination, of which thirteen were channel samples of the vein as it was exposed in the drift for 60 feet south from the head of the raise from the Pep level. The sample results are tabulated below:—

Sample			Location and Description	Assay—Gold, Silver (Oz. per Ton)	
No.	How Taken	Width (Ft.)			
1801	Chipped	1.0	Pep level—Ben's raise—quartz with small amount of pyrite on hangingwall side of fault.	Tr.	Tr.
1802	Chipped	1.5	Pep level—Ben's raise—quartz with small amount of pyrite and pyrrhotite on the hangingwall side of fault	Tr.	Tr.
1803	Channel	7.0	49er level—east segment of vein; across back of drift north of raise; ribboned quartz with argillaceous partings	0.14 0.60 Tr. 0.12	0.1 0.4 Tr. 0.2
1804	Channel	16.9	49er level—east segment of vein; horizontal channel along west wall of drift between No. 1803 and fault; ribboned quartz with argillaceous partings	Tr. Tr. *Nil* 0.03	Tr. Tr. *Nil* Tr.
1805	Channel	6.0	49er level—east segment of vein; across the back on the south side of the raise; ribboned quartz with argillaceous partings and small amount of pyrite	Tr. Tr. Tr. *Nil* *Nil*	0.1 Tr. *Nil* 0.1 *Nil*
1806	Channel	5.6	49er level—east segment of vein; 5 feet south of No. 1805; ribboned quartz with argillaceous partings	*Nil* Tr. Tr. Tr.	*Nil* Tr. Tr. Tr.
1807	Channel	5.5	49er level—east segment of vein; 10 feet south of No. 1805; quartz with argillaceous partings and sparse pyrite	2.38 Tr. 0.11 Tr.	0.6 Tr. Tr. Tr.

Sample			Location and Description	Assay—Gold, Silver (Oz. per Ton)	
No.	How Taken	Width (Ft.)			
1808	Channel	5.5	49er level—east segment of vein; 15 feet south of No. 1805; faulted sections of vein quartz	0.03 Tr. *Nil* Tr. Tr.	0.2 0.2 *Nil* Tr. 0.3
1809	Channel	1.8	49er level—east segment of vein; 20 feet south of No. 1805; quartz with argillaceous inclusions and some carbonates	Tr. Tr. Tr. Tr. Tr.	0.4 Tr. Tr. Tr. 0.2
1810	Channel	2.0	49er level—east segment of vein; 25 feet south of No. 1805; intermixed quartz and argillaceous material	Tr. Tr. Tr. Tr. Tr.	0.1 0.2 0.2 0.2 0.3
1811	Channel	0.85	49er level—east segment of vein; 30 feet south of No. 1805; faulted end of quartz lens	Tr. Tr. Tr. 0.10	Tr. Tr. Tr. 0.2
1812	Channel	4.0	49er level—east segment of vein; 35 feet south of No. 1805; quartz with horse of argillite	Tr. Tr. Tr. Tr.	0.2 Tr. Tr. Tr.
1813	Channel	5.9	49er level—east segment of vein; 40 feet south of No. 1805; quartz with intermixed argillite	*Nil* Tr. Tr. Tr.	*Nil* *Nil* *Nil* *Nil*
1814	Channel	9.0	49er level—east segment of vein; 45 feet south of No. 1805; massive quartz without sulphides	Tr. Tr. Tr. Tr. *Nil*	0.2 Tr. Tr. Tr. Tr.
1815	Channel	7.9	49er level—east segment of vein; 54 feet south of No. 1805; quartz with inclusion of argillite	33.41 0.17 8.54 0.06	15.4 Tr. 1.9 0.1
1816	Selected	....	49er level—east segment of vein; at head of raise from Pep level; selected piece of quartz well mineralized with pyrite; no visible gold	0.14	0.2
1817	Selected	....	49er level—east segment of vein; 5 feet south of raise; selected pieces of quartz well mineralized with pyrite; no visible gold	0.01 Tr. 0.03 Tr.	0.2 Tr. 0.1 Tr.
1818	Selected	....	49er level—east segment of vein; 15 feet south of raise; quartz with "lacy" pyrite	16.50 Tr.	3.66 Tr.
1819	Selected	....	49er level—east segment of vein; 15 feet south of raise; well-ribboned quartz with argillaceous partings	Tr. Tr. *Nil* *Nil* *Nil*	0.2 0.2 *Nil* Tr. Tr.
1820	Selected	....	49er level—east segment of vein; 6-inch vein in wall of drift	Tr. Tr.	Tr. Tr.
1821	Selected	....	49er level—east segment of vein; from west wall of drift between samples Nos. 1806 and 1807; selected pieces of quartz well mineralized with pyrite	Tr. Tr. Tr. Tr.	Tr. Tr. Tr. Tr.
1822	Selected	....	49er level—east segment of vein; from west wall of drift between samples Nos. 1807 and 1808; selected pieces of quartz	0.36 0.04 0.02 Tr.	0.1 Tr. 0.1 Tr.

When the first assays were made, coarse "metallics" were found in some samples, indicating that coarse free gold was present in the vein. It was decided therefore to assay additional cuts of each crushed sample (not additional assays of a single pulp) so as to obtain better information on the gold content. The difficulties of determining the true gold content of the quartz are readily apparent when one observes in the table the wide range of assay values that may be obtained from a single sample of material (*see* samples Nos. 1803, 1807, 1815, and 1818).

These assay results show that a single fire assay of an individual sample may not be reliable. The only way to obtain a true assay of a sample would be to extract by amalgamation, or other means, the entire gold content of each sample. The problem is entirely a consequence of the random gold distribution. The difficulties are compounded many times when only a few samples are used in an attempt to assess the gold content of a tonnage of quartz many thousand times the weight of the samples assayed.

The thirteen channel samples, and other selected samples, taken from the 49er level from the 60-foot length of vein exposed in the drift south from the head of the raise from the Pep level, indicate that ore of the grade reported by the company does not exist. The assay value of the 60-foot length of vein quartz represented by the samples in the table can only be obtained by using an arbitrary method of " cutting " the several high assays. By one method an average of 0.22 ounce gold per ton across a width of 5.1 feet is obtained.

Despite the fact that no sytematic sampling was done elsewhere in the mine workings, all available observations and assay information fail to indicate the presence of vein quartz of mineable grade in the mine.

[References: *B.C. Dept. of Mines,* Bull. No. 1, 1932, p. 72; *Minister of Mines, B.C.,* Ann. Repts., 1961, p. 28; 1934, p. F 27; *Geol. Surv., Canada,* Sum. Rept., 1933, Pt. A, p. 71.]

Gold-Silver

Barkley Valley Mines Ltd.*

(50° 122° S.E.) Office, 870 Blundell Road, Richmond. Thomas Barkley, president. This company holds the Gladys No. 1, Gladys No. 2, Nita, and Bluff groups of claims, totaling thirty claims, on Haylmore, Lawlawton, and Crystal Creeks, about 15 miles by road southeast of Darcy station on the Pacific Great Eastern Railway. Surface showings on the claims are reported to contain values in gold and silver. Work in 1962 has been mainly confined to constructing a road to the property. In previous years about 10 miles of road was completed, starting from the vicinity of Darcy and following the north side of the valley of Haylmore Creek. In 1962 a further 3 miles of road was completed and repairs carried out on 5 miles of existing road. A further 2 miles of road remains to be built to reach the property. A temporary camp was built at Mile 10 on the road. A log cabin was built on the Gladys No. 1 group, and some trenching and stripping was done on the claims. Work was started on May 11th and terminated on October 6th. A crew of three men was employed.

THE GEOLOGY OF PART OF THE THOMPSON RIVER VALLEY BETWEEN ASHCROFT AND SPENCES BRIDGE†

INTRODUCTION

About ten weeks in 1962 were spent mapping the geology along the west side of the Guichon batholith in southern British Columbia. The area mapped is a narrow strip extending northward on either side of the Thompson River for 13 miles, midway between Ashcroft and Spences Bridge (Fig. 1). Parts of this area were

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mapped in greater detail than others, and on the west side of the river work was largely confined to a traverse along the Trans-Canada highway. Field information was recorded on vertical air photographs and subsequently transferred to enlargements of National Topographic maps, scale 1:50,000.

In this area the topography broadly reflects the geology. To east and west of the area a dissected plateau surface at elevations above 3,500 feet is underlain by massive rocks of the Guichon batholith and the Marble Canyon Limestone respectively. Between is a broad wedge of lower ground, containing the valleys of Thompson River, Venables Creek, and other tributaries of Thompson River, underlain by diverse, less massive rocks.

The Thompson River flows southward at about 1,000 feet elevation, its broad and terraced valley floor being flanked by slopes that are mantled by superficial deposits to elevations in some places of as much as 1,400 feet. North of Basque and south of a point near Martel the river has cut canyons partly into bedrock, but throughout the intervening stretch no bedrock is exposed in the valley bottom. The east side of the valley rises fairly steeply and is precipitous in some places, notably above the rockslide between Martel and Spatsum. Once the higher ground is reached, rock exposures are generally poor.

The area is readily accessible. Road bridges at Ashcroft and Spences Bridge give access to the east side, where a dirt road follows the east bank of the Thompson River and is reached either from the Highland Valley road near Ashcroft or from highway No. 8 near Spences Bridge. This road is also connected to the Highland Valley road at Mile 14 from Ashcroft by a rough road from Spatsum. The main Canadian Pacific and Canadian National railways follow the course of the Thompson River.

The geology of the area is shown at a 4-mile scale on successive maps of the Geological Survey of Canada, the latest of which accompanies the Ashcroft Memoir (Duffell and McTaggart, 1952). Intrusive rocks of the Guichon batholith are shown in contact with older strata belonging to the Palæozoic Cache Creek Group and the Upper Triassic Nicola Group, the whole being partly overlain by Middle Jurassic strata, which in turn are partly covered by Tertiary volcanic rocks. The west margin of the batholith is irregular and lies as much as 2 miles distant from the east bank of Thompson River. At the south end of the present area, a belt of Cretaceous volcanic rocks of the Spences Bridge and Kingsvale Groups overlies the southwest margin of the Guichon batholith and continues northwestward.

Cache Creek Group

Rocks provisionally assigned to this Palæozoic group occur on either side of the Thompson River and are a heterogeneous collection of strata not easily distinguished from those of the Nicola Group. West of the area, limestone in the Marble Canyon Formation of the Cache Creek Group contains Permian fossils. Fossil evidence for the existence of Palæozoic rocks within the area is very scarce, but some fossils were reported by Selwyn (1872, pp. 61–62), apparently at a locality near the present highway somewhere between Venables Creek and Spatsum.

On the west side of the river, presumed Cache Creek rocks are exposed along the Trans-Canada highway from Oregon Jack Creek southward to a contact with the Spences Bridge Group, and are interrupted by Nicola rocks in two places near Venables Creek. The northernmost of the Cache Creek rocks are in contact with sheared rocks, which are mapped as a separate unit but probably include highly altered representatives of the Cache Creek rocks. Southward almost to a point opposite Coldstream Creek, the rocks are mostly volcanic sediments together with greenstones and rare, thin lenses of limestone. The rocks are massive and are altered mainly in propylitic fashion, and bedding is generally not discernible. In places there are sheared rocks similar to those more widespread to the north, and the shearing is mostly steep and strikes north or northwest. The volcanic sediments are variously conglomerate, grit, greywacke, and tuff, which generally weather to either dark or buff colours and are green on a freshly broken surface. The conglomerate is a massive indurated rock with a dark-green greywacke matrix and closely packed, rounded cobbles as much as 10 inches across. The cobbles are mostly of fine-grained igneous rocks and chert, or cherty tuff. In places the rock contains both angular and rounded volcanic debris and has characters intermediate between conglomerate and volcanic breccia. The greywacke is a green, granular textured rock apparently composed mainly of grains of plagioclase and chloritized dark minerals together with lithic grains and a small proportion of quartz grains, set in a fine-grained clastic matrix. The grit is also greenish and is characterized by a plentiful cherty matrix, seen under the microscope to be a fine-grained chloritic quartzofeldspathic aggregate containing scattered, prominent quartz grains and less prominent ones of plagioclase. Some of the quartz grains show evidence of magmatic corrosion, and the rock is therefore tuffaceous. Other cherty rocks, which may be tuffs, are comparable to this rock, except that they lack the larger-sized grains.

Opposite Coldstream Creek, and south of most of the above-described rocks, is a limestone zone which is exposed for more than 2,000 feet along the highway. Although no fossils were observed, the zone apparently occurs near the place described by Selwyn as a Palæozoic fossil locality. Limestone comprises about half the zone, and is repeatedly interbedded with cherty rocks and argillite. These rocks, like those farther south in both the Cache Creek and Nicola Groups, possess a regional dip to the south or southwest at moderate angles, but are much affected by faults and attendant dragfolds. The limestone beds are grey, white, or banded streakily in black and white and are largely recrystallized and in places altered to skarn with the introduction of epidote. The argillite is partly black and partly green, soft, limy, and schistose. The cherty rocks are mostly pale but are partly multicoloured and banded, and at faults and in dragfolds they are brecciated by movement within limestone and adjacent argillite. Intrusive pods of diabase occur in these deformed rocks.

Farther south, opposite the rockslide, cliffs to the west of the highway expose mainly greenstone together with rare thin lenses of limestone and poorly bedded greywacke. Despite a general southerly or southwesterly dip, rocks exposed high in the cliffs do not continue eastward to lower elevations, and faulting is therefore suspected. The rocks include dragfolded limestones interbedded with massive cherts and chert breccia and, farther south, greywacke and distorted limestones containing rusty pebbles. Some of these rocks may be Nicola, but cannot be separated on the information available. This locality is near the old " 89 Mile stable " and is referred to by Crickmay (1930) and earlier authors.

South of Venables Creek on the highway there is probably an involved structural sequence of Cache Creek and Nicola rocks. The first outcrops south of the creek are apparently Nicola, and are separated by a fault from succeeding outcrops of Cache Creek cherts. The cherts dip southwestward and are about 300 feet thick, as exposed. They are green, brown, and black rocks which include siltstone layers. Nicola limestone succeeds them after a covered interval and, after a second interval, is succeeded by probable Cache Creek rocks, which outcrop intermittently from Martel to a contact farther south with the Spences Bridge Group. These

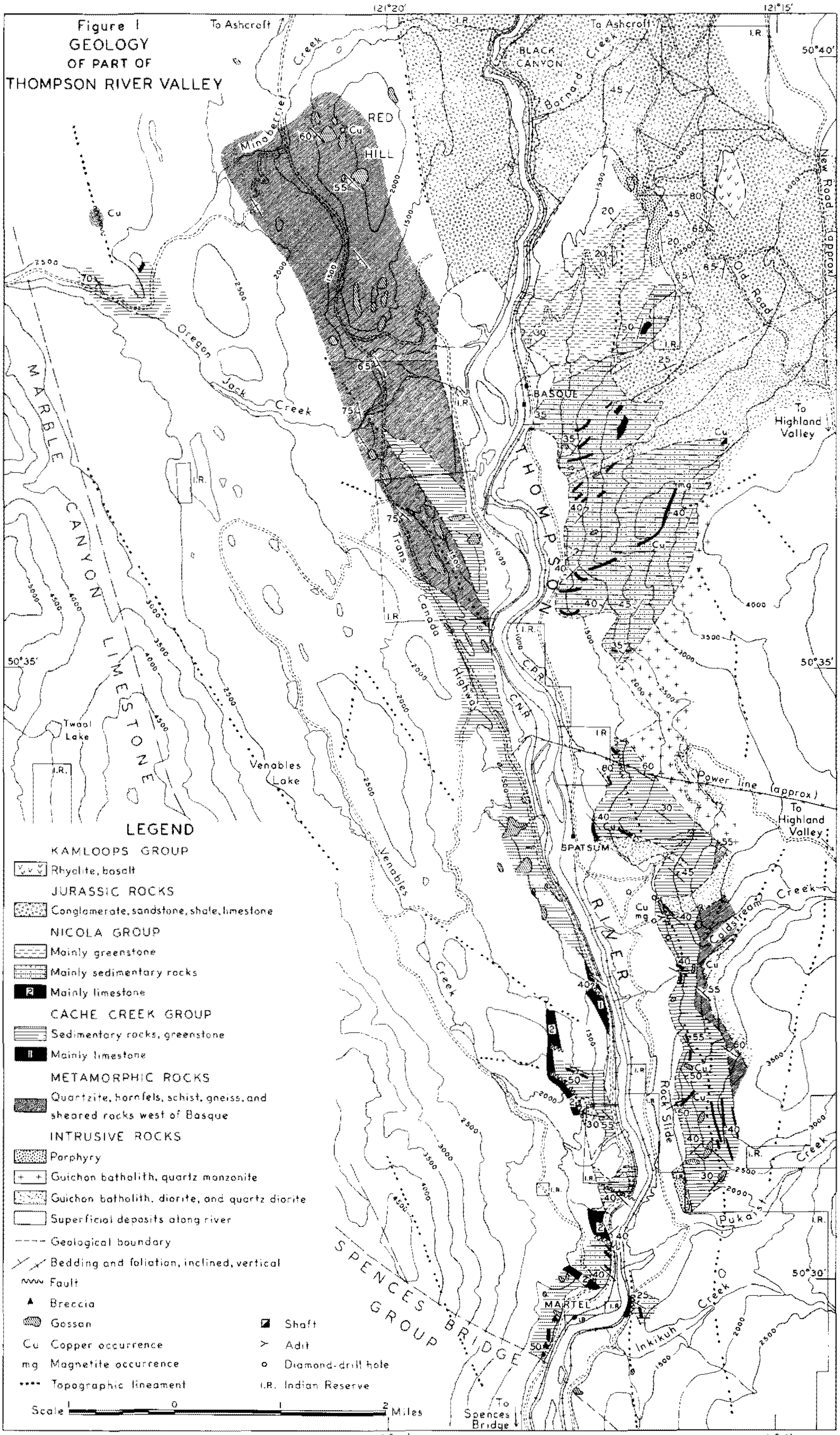


Figure 1
GEOLOGY
OF PART OF
THOMPSON RIVER VALLEY
121°20'
121°15'
50°40'
50°35'
50°30'
To Ashcroft
To Ashcroft
BLACK CANYON
Barnard Creek
Minaberriet Creek
RED HILL
Oregon Jack Creek
MARBLE CANYON LIMESTONE
Twaal Lake
Venables Lake
Venables Creek
Trans Canada Highway
C.N.R.
C.P.R.
BASQUE
THOMPSON RIVER
SPATSUM
MARTEL
New Road (approx)
Old Road
To Highland Valley
Power line (approx)
To Highland Valley
Coldstream Creek
Rock Slide
Pukaist Creek
Inkikuh Creek
SPENCES BRIDGE GROUP
To Spences Bridge
LEGEND
KAMLOOPS GROUP
Rhyolite, basalt
JURASSIC ROCKS
Conglomerate, sandstone, shale, limestone
NICOLA GROUP
Mainly greenstone
Mainly sedimentary rocks
2 Mainly limestone
CACHE CREEK GROUP
Sedimentary rocks, greenstone
1 Mainly limestone
METAMORPHIC ROCKS
Quartzite, hornfels, schist, gneiss, and sheared rocks west of Basque
INTRUSIVE ROCKS
Porphyry
Guichon batholith, quartz monzonite
Guichon batholith, diorite, and quartz diorite
Superficial deposits along river
Geological boundary
Bedding and foliation, inclined, vertical
Fault
Breccia
Gossan
Cu Copper occurrence
mg Magnetite occurrence
Topographic lineament
Shaft
Adit
Diamond-drill hole
I.R. Indian Reserve
Scale 1 0 1 2 Miles

southernmost Cache Creek rocks are massive, brecciated cherts and dragfolded, dark fissile limestone which contain andesite dykes and small bodies of breccia.

Strata assigned to the Cache Creek Group on the east side of the river comprise a main assemblage of limestones, cherty rocks, volcanic greywackes, grits, and conglomerate together with a more or less separate assemblage of greenstones, dark volcanic sediments, and very rare limestone. The greenstone assemblage occurs to the north and east of the other rocks, close to the edge of the batholith on either side of the branch road east of Spatsum. A lack of marker beds and complexities of structure prohibit any determination of the succession and thickness of the strata. All the rocks are more or less fractured and altered, and the non-limy beds are widely mineralized by weak disseminations of pyrite whose oxidation gives a rusty appearance to the outcrops. Dips are mostly to the northeast and east at moderate angles, but in places the strata possess different attitudes. Locally, dragfolding affects the limestones and associated thin beds and may produce breccias. Faults are seen in a number of places, and many others are presumed to exist.

Limestone forms a fairly small proportion of the rocks but is widely distributed. It occurs partly as well-spaced beds as much as 30 feet in exposed thickness and partly in successions of thin beds interstratified with other rocks. Due perhaps to insufficient exposure, few beds can be traced for any distance, although some which occur east of bluffs above the rockslide apparently make topographic features which indicate their continuation for several thousand feet along the strike. In addition, a thin-bedded zone of limestone about 60 feet thick is exposed for several hundred feet in a southwesterly direction in the northern part of the bluffs above the slide. This zone has not been recognized elsewhere and shows as much resemblance to Nicola rocks as it does to other Cache Creek limestones. All the limestones are recrystallized, and no fossils have been found in them. They are variously white, grey, black, or banded, and in places are patchily bleached. Both they and the adjacent rocks are commonly veined by calcite.

Cherty rock is commonly interbedded with limestone and is of uncertain origin. It is a pale- to dark-coloured rock, occasionally somewhat banded, and is a hard, dense rock which fractures conchoidally and rings to the hammer. It occurs in beds of thicknesses ranging from an inch to as much as several feet, and possesses well-bedded contacts against limestone. Except for scattered and vaguely defined larger grains, some of which are quartz, the rock largely resembles ordinary chert, but some beds contain ovoid to elongate gritty and pebbly shapes, some light and some dark, as though the rock was of clastic origin. Unfortunately no specimens have been examined under the microscope. A very similar appearing rock, whose field relationships were not understood, occurs on the north side of a prominent rock cleft in the hill face immediately east of Spatsum station and, under the microscope, is seen to be a fine-grained aggregate of quartz together with some calcite, chlorite, and zoisite, and scattered strongly argillized larger feldspar grains. This rock may be a silicified tuff or greywacke. A thick bed, or beds, of cherty rock underlying the thinly bedded limestone zone at the rockslide contains abundant blocks and irregular pebbles both of limestone and cherty rocks, and encloses occasional thin lenses or layers of limestone.

Other rocks associated with the limestones are well-bedded volcanic greywacke and siltstone, which are seen under the microscope to consist mainly of grains and chips of feldspar and glassy, vesicular, microporphyritic volcanic rocks set in a plentiful dark, very fine grained matrix containing minute plagioclase laths. The siltstone layers are cherty in appearance. Quartz grains are rare or absent in these rocks, but occur prominently in the grits, which are grey-green or buff weathering rather massive rocks chiefly occurring south of Coldstream Creek.

Conglomerate was seen only as a single bed with a north-northwest strike at the north end of the area underlain by the Cache Creek Group. The bed is not fully exposed but is probably 30 feet or more thick, and occupies a position between the greenstone assemblage on the east and the more varied assemblage to the west. Its northern exposures are cut by faults, and limestones on the west are strongly dragfolded. The conglomerate is a dark rock composed of rounded cobbles, as much as 4 inches in size, set in a greywacke matrix. The cobbles are mostly of dark- and light-coloured cherty rocks. The greenstone assemblage consists mainly of dark volcanic sediment containing rare thin limestones and of dense propylitized cherty tuffs, some of which contain scattered small grains of feldspar. The rocks are massive except for subordinate banded layers.

Nicola Group

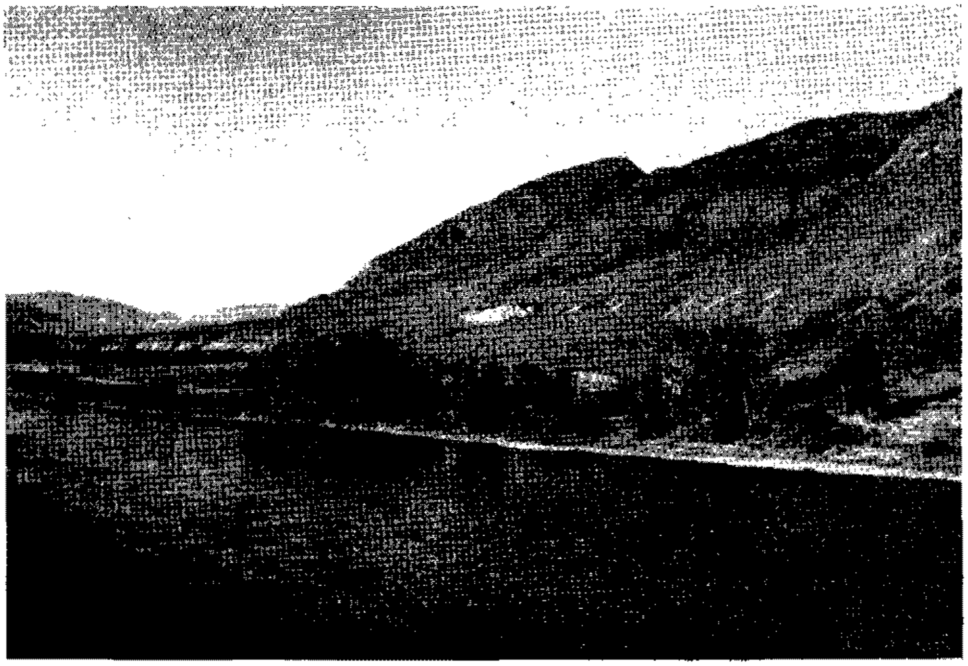
Strata of this Upper Triassic Group occupy a large area near Basque and a smaller area farther south near Martel.

The area near Basque extends northward for about 4 miles on the east side of the river and is as much as 1 mile wide. It is occupied by a stratified succession which dips at moderate angles mainly toward the west-northwest, and is bounded westward by superficial deposits in the Thompson Valley and eastward and southward by the intrusive contact of the Guichon batholith. Northward the succession is covered by Jurassic rocks. As exposed, the succession is probably as much as 9,000 feet thick, of which approximately the lower two-thirds consists of sedimentary rocks, including limestones, and the upper third is mainly greenstone. Most of the lower part is well exposed and gives rise to a topography dominated by steep south-facing scarps and moderately inclined, northwest-facing dip slopes (*see* upper photo, opposite page). Because suitable marker beds are absent and exposures are in places insufficient, this succession has not been subdivided in detail. For purposes of description, however, it is divided into six broadly defined units which are in stratigraphic order and are each several hundreds of feet thick. These units are as follows:—

Unit No. 1 at the base of the succession consists mainly of dark volcanic greywacke, or feldspathic tuff, succeeded by lighter-coloured greywacke and siltstone. One or more narrow zones with limestone occur near the base. The rocks strike approximately parallel to the adjacent batholithic contact and dip away from it at about 40 degrees. The volcanic greywacke, or feldspathic tuff, generally resembles the feldspathic rocks of the Promontory Hills area (Ann. Rept., 1960, p. 28). It is a dark rock which weathers either rusty or with a grey-green colour and which contains conspicuous white feldspar laths as much as 3 millimetres in length. It forms massive beds which are occasionally interspersed with more pebbly beds or with finer-grained lighter-coloured beds of quartz-tuff and cherty tuff, or volcanic siltstone. Under the microscope the volcanic greywacke is seen to consist mainly of altered or fresh, subhedral crystals of plagioclase feldspar together with irregular fragments of volcanic rocks, angular quartz grains, altered chloritic grains, and a plentiful dark fine-grained matrix which, in some specimens, contains myriad minute laths of feldspar in local alignment.

The succeeding lighter-coloured rocks comprise thick beds of greywacke and associated thin-bedded sequences of greywacke, siltstone, and conglomerate which have current bedding and local washouts. The greywacke is blue-grey where freshly exposed and is a granular rock with a high content of quartz, feldspar, and rock chips which are set in a fine-grained dense matrix.

Unit No. 2 starts close to the road 2 miles south of Basque and forms the prominent hill seen on the upper photo. It is probably part of Dawson's subdivision



Looking northeast along strike of Nicola rocks near Basque.

Rockslide south of Spatsum.

No. 8 (1896, p. 113B) and consists of limestone, tuffaceous greywacke, and chert in beds as much as 50 feet thick. The fairly regular and somewhat undulate attitude of the beds is interrupted locally by isolated upfolds and bunches of dragfolds, as seen on the scarp-face of the hill. These folds, which affect only a limited thickness of beds and invariably involve limestone, plunge generally northward approximately parallel to the major bedding and probably have resulted from interbedding slip.

The limestones vary not only in colour, some being white and others cream, buff, grey, or black, but also in texture, which is porcellaneous, fine grained, or sandy. Some of the darker ones are bleached in patches and along seams which have been dragfolded, and make complex patterns in the rock. Although no fossils were seen in rocks of this assemblage during the present work, Upper Triassic forms were identified probably in these rocks by the Geological Survey (Dawson 1896; Duffell and McTaggart, 1952, p. 30). Crickmay (1930, p. 26) also records Upper Triassic (Karnian) fossils, probably from beds in this part of the succession.

Chert is commonly interbedded with the limestones, and on a fresh surface is either white, greenish, buff, or pinkish.

Tuffaceous greywacke closely resembles some of the rocks found in the Promontory Hills area, and is a massive to thin-bedded rock ranging in grain size from siltstone to pebbly grit. Graded bedding is well developed in some layers. The rock is generally light green to white but weathers rusty. It consists largely of irregular white grains and andesite fragments which occur with feldspar grains in a fine-grained clastic matrix that becomes the chief constituent of some very fine grained, cherty layers.

Unit No. 3 starts with massive beds of volcanic greywacke and other rocks resembling those in the lower part of unit No. 1. These beds occupy the dip slope of the prominent hill and are overlain near a southernmost small body of quartz diorite by a few thin white limestones with intervening rusty beds. Above these are massive beds, altogether as much as 500 feet thick, of dark grit and breccia composed largely of lithic volcanic fragments in a tuffaceous or greywacke matrix. The remaining strata are diverse in composition and include rocks similar to the preceding. Limestone increases in amount upward and occurs with greenish, mostly non-limy clastic rocks that are mainly volcanic greywackes, grits, pebble beds, and breccias. The limestone beds are mostly a few feet thick and are grey with brown lamellæ, thus resembling beds at Lookout Point in Promontory Hills.

Unit No. 4 includes the remaining well-exposed beds, which outcrop north of a central small body of quartz diorite, on the flank of a hill rising to 2,700 feet elevation. The summit and part of the dip slope of this hill is of massive white limestone as much as 100 feet thick. At lower elevations grey or white limestone forms about one-third of the assemblage and occurs mostly as thin beds interstratified with rusty beds which are variously of chert, cherty breccia, or tuffaceous greywacke. The thin-bedded parts of the sequence show undulations and minor irregularities of attitude.

Unit No. 5 is of poorly exposed rocks which include limestones. Contorted grey limestone underlies greywacke conglomerate on the road a few hundred yards south of Basque and contains shell fragments together with rusty debris of porphyry. The conglomerate contains well-rounded cobbles of chert, porphyry, and limestone, and may dip northward at about 35 degrees. Specimens of the limestone were examined by Professor W. R. Danner, who identified a spongiomorph and suggested that the rock was Upper Triassic because in this region spongiomorphs are so far only known in Nicola rocks. Two miles east-northeast of Basque near Indian

Reserve No. 9, massive, grey crystalline limestone occurs in considerable thickness near quartz diorite. The limestone contains thin contorted beds and is overlain by tuffaceous grit which dips west-northwestward at about 50 degrees.

Unit No. 6 is the uppermost part of the succession and consists of greenstones, which are massive, dark-green or brown weathering rocks that may include tuffaceous greywacke as well as altered basic flows and tuffs. The attitude of these rocks is shown in one place by narrow layers of white limestone and elsewhere by an alignment of either feldspar and hornblende laths or vesicles. Thin-sections show that some of the rocks consist of volcanic rock fragments and feldspar crystals in a chloritic and epidote-rich granular feldspathic matrix, and that others are andesites or diabases, with porphyritic hornblendes.

Near Martel the Nicola rocks have an uncertain structure and distribution. Massive limestone is partly exposed for a distance of as much as 2 miles in a north-northwesterly direction, from east of Martel to north of Venables Creek. In the north the limestone occupies high ground between Venables Creek and Thompson River and is totally massive where examined, except in its easternmost outcrops, which are foliated and steeply dragfolded. Rocks on the highway immediately south of Venables Creek may be Nicola. They include greenish tuffaceous greywacke beds which range in texture from conglomerate to sandstone and are composed largely of angular to rounded, green or white fragments of glassy and fine-grained volcanic rocks, chiefly andesite. Although partly massive and coarser, the beds resemble those of unit No. 2 in the Basque area. They dip mostly to the northeast or east at about 20 degrees and are dissected by faults and diabase dykes mostly in northeasterly directions. Farther south on the highway, Cache Creek strata separate these presumed Nicola rocks from massive limestone which occurs for a distance of several hundred feet and is a buff-weathering dark rock containing crinoid stems and shell fragments. Professor Danner examined specimens of the rock, which he noted is oolitic and, because of its general appearance and petrographic character, is probably Nicola. The northernmost outcrops of the limestone contain diversely orientated dykes, or beds, of quartz-sericite schist and are cut by diabase and feldspar porphyry dykes which trend west-northwest. The southernmost outcrops show bedding which dips southeastward at a moderate angle and are succeeded by rocks that are severely deformed and broken by faults. Limestone in these rocks is partly schistose and is associated with argillite and, locally, conglomerate. The rocks are dragfolded in diverse directions and contain numerous irregular diabase intrusions. Rock alteration is widespread and includes chloritization, bleaching of limestone, and the development of epidote and pyrite. Less altered rocks to the south include interbedded dark- and light-coloured limestones, grey-brown sandy limestones, and carbonaceous slaty layers, which partly dip to the southwest. The contact of these rocks with Cache Creek strata to the south is not exposed.

East of Martel, massive limestone on the east bank of Thompson River is apparently faulted against other well-bedded Nicola rocks farther east. The well-bedded rocks dip northeastward at approximately 25 degrees and include grey limestones with crinoid plates and shell fragments, and also pale-green or white cherty beds, greenish volcanic tuffaceous greywacke, and hard black rocks.

Metamorphic Rocks

These rocks underlie a large area to the west of Basque and a smaller area adjoining the Guichon batholith to the south of Spatsum. In both places they are in contact with Cache Creek strata, of which they may be the more altered equivalent.

The rocks south of Spatsum form an irregular northerly strip lying between the Guichon batholith and the Cache Creek rocks to the west. The strip is rarely as much as 1,000 feet wide and contains foliated and banded rocks which mostly strike northwestward and possess moderate or steep dips to the northeast. Contacts with the Cache Creek strata are poorly exposed and may be partly or wholly faulted. The metamorphic rocks near the batholith are veined by diorite and quartz diorite. The southernmost rock is micaceous quartzite, which extends northward for as much as 2,000 feet and decreases in width in that direction. The quartzite is succeeded northward, possibly at a fault, by a mixed assemblage of dark hornfels, hornblende-plagioclase schist, and cherty rocks, some of which are pebbly and resemble Cache Creek strata. Pebbles in both the micaceous quartzites and the cherty rocks are stretched parallel to the foliation. The strip of metamorphic rocks ends northward at a spur of quartz diorite, beyond which only one outcrop of comparable rocks was seen. This outcrop, which lies southeast of the side road from Spatsum, is near a contact between quartz diorite and quartz monzonite and consists of hornblende-plagioclase schist which strikes northwestward and dips to the northeast.

The rocks west of Basque underlie country of fairly low relief on either side of the Trans-Canada highway, and are sheared rocks. They make isolated, rusty outcrops which display lustrous foliation planes that may be curved, mullioned, and locally crumpled, and which mostly dip steeply to the southwest and strike in directions close to north 35 degrees west. The planes are coated with sericite and are closely spaced or intersecting in rock which otherwise lacks a foliated or schistose texture and is a pale-grey or greenish cherty material containing scattered, visible grains of quartz as much as 3 millimetres in size. Under the microscope the rock consists of a fine-grained somewhat chloritic quartzofeldspathic mosaic in which occur disoriented, scattered crystals of plagioclase, as much as one-half millimetre in length, and of quartz larger than 1 millimetre. The crystals of plagioclase are subhedral, and those of quartz are either semi-angular or rounded and embayed, like those of dacite tuffs and quartz porphyry intrusions. In some outcrops the rock has a brecciated, foliated appearance under the sericite coating. It may also be severely kaolinized, silicified, and cut by pods and veins of quartz. Some of the rocks at the Red Hill copper prospect are much affected in this way and consist almost entirely of quartz, chlorite, epidote, and sulphide. In the southern part of Red Hill the rock varies from only moderately foliated and altered to strongly foliated, chloritic, and siliceous. In several places along the highway and elsewhere, the sheared rocks enclose massive greenstone bodies, some of which are marginally sheared. East of the highway, on the south side of Oregon Jack Creek, the sheared rocks are close to massive volcanic greywacke of the Cache Creek Group, which remains unsheared. Dawson (Kamloops Sheet, 1895) mapped limestone at the north end of Red Hill, which suggests that isolated bodies of recognizable Cache Creek strata may be enclosed in the sheared rocks.

Similar sheared rocks occur locally in the Cache Creek rocks to the south, and are confined to gossans such as those near Spatsum. Though somewhat variable, the attitude of the foliation in these rocks is fairly similar to that farther north, and the rocks have a similar porphyritic appearance and quartzofeldspathic composition. They are associated with quartz tuffs of darker colour together with some highly silicified rocks.

The origin of the sheared rocks is uncertain, but in composition and textural appearance some of them resemble either dacite tuff or quartz porphyry.

North of Oregon Jack Creek about 2 miles west of the highway, quartz-feldspar gneiss makes isolated outcrops which are several hundred feet across. The rock shows a steep northwesterly foliation and contains numerous veins of quartz and ankerite together with small amounts of malachite.

Jurassic Rocks

Except for a small isolated patch near Venables Creek, these strata are in the northern part of the mapped area and form the southern end of a belt, as much as 14 miles long and 5 miles wide, which extends northward and disappears under the Tertiary lava plateau east of Cache Creek. The strata in this belt have been described in some detail by Crickmay (1930) and more briefly in the Ashcroft Memoir and consist of conglomerate, sandstone, fossiliferous black shale, and rarely of limestone, which range in age from earliest Middle Jurassic to early Upper Jurassic. The belt has been described as a syncline that is complicated in the north by folds trending north 35 degrees west, and is much disturbed and broken by faults. In the northern part the strata strike north or northwestward and dip mostly toward the west. In the mapped southern part the strata vary locally in attitude but mostly strike north-northeastward and dip to the west. The prevalence of westerly dips in the belt, which in many places persist to within a short distance of the western margin, suggests the presence of steep faults or flexures in the vicinity of this margin, which is chiefly against sheared rocks and strata of the Cache Creek Group. The belt terminates southward in two prongs—one assumed from previous mapping to exist along the Thompson River and not further examined, and the other on higher ground to the east. At the south end of the eastern prong, beds of conglomerate and sandstone overlie a northwesterly dip slope of Nicola strata and a nearby surface of quartz diorite. Farther north, the eastern margin of the Jurassic rocks is not exposed and its position has to be assumed. The most easterly exposure is of black shales, seen in one place on the new road to Highland Valley.

The strata near the west side of the old Highland Valley road mostly form bare hills marked by ridges striking parallel to the strata, which mostly dip westward. Farther south near the road, conglomerate with thin sandstone layers dip steeply to the west. A few boulders in the conglomerate are of typical Guichon quartz diorite, whilst others are of finer-grained porphyritic quartz diorite, quartz porphyry, and feldspar porphyry. Disseminated blebs of pyrite were seen in some porphyry boulders. Other boulders seen at this and other localities include cherty rocks, greenstones, porphyritic volcanic rocks, and occasionally sandstone. Rocks on a prominent hill to the west of the road are at the top of Crickmay's " Section A" (1930, p. 27), and they include conglomerates and interbedded sandstones and shales which are partly limy, possess westerly dips, and are locally crumpled into an isolated fold, apparently by slip on an underlying shaly bed. Lower down on the west flank of the hill, two or more beds of limestone strike northward and dip eastward at a low angle. The limestone beds are associated with conglomerate, and the uppermost one is as much as 40 feet thick. They are of grey-brown impure limestone containing abundant rusty pebbles and possessing a fetid odour. No good fossils were seen, and specimens submitted to Professor Danner contained only crinoid plates and shell fragments of no diagnostic value. Crickmay, however, found limestone with earliest Middle Jurassic fossils. The limestone beds are stratigraphically at the base of the Jurassic succession and are separated from Nicola rocks to the west by outcrops of quartz diorite porphyry.

To the west of this locality, near the Basque road, a small isolated mass of west-dipping conglomerate and limy sandstone forms an outlier whose base is not exposed.

At the northern limit of mapping, conglomerate immediately south of Barnard Creek is overlain by sandstone and shale beds which strike northeastward and dip at moderate angles to the west. The shales have fracture cleavage whose attitude confirms that the strata are right side up. Black shales in Black Canyon at the mouth of Minaberriet Creek were not visited but can be seen also to dip westward. According to Crickmay, they are intersected by one or more faults, causing stratigraphic displacements.

The small patch of Jurassic rocks north of Venables Creek is about 8 miles south of the main belt and consists of fossiliferous limestone together with conglomerate. The conglomerate and limestone both dip to the south at about 30 degrees, and their relationship is uncertain. The conglomerate contains closely packed boulders of fine-grained quartz diorite, greywacke, greenstone, and vein quartz. The limestone is at a higher elevation to the northwest and is grey-brown, impure, and platy weathering. It contains abundant shells and casts of which those submitted to Professor Danner for identification are as follows:—

Brachiopods: Two types of *Terebratula;* two types of *Rhynchonella.*

Pelecypods: *Pecten* sp. (a medium-sized coarsely ribbed species); *Chlamys; Entolium semlini* Crickmay; *Pleuromya chlutosensis* Crickmay; *Buchia?* sp.

Of this collection, Professor Danner says: " This fauna is probably of Middle Jurassic age. The pelecypod resembling *Buchia* may be a species of Mytilus, as *Buchia* is not to be expected in rocks of this age, but it bears a very close similarity to *Buchia.*"

The field relationships suggest that these Jurassic rocks are faulted against Cache Creek and Nicola rocks to the east and west respectively. It was presumably from this locality that Dawson (1896, p. 115B) recorded Jurassic fossils.

Spences Bridge Group

Immediately south of the mapped area a belt of Lower Cretaceous volcanic rocks extends both northwestward and southeastward for many miles. The oldest rocks of the belt are those of the Spences Bridge Group, which are exposed northward on the Trans-Canada highway to the edge of the belt, about one-half mile south of Martel. At this point, which is close to the southernmost outcrops of Cache Creek strata, a zeolitized and argillized mixture of andesite lava and agglomerate contains blocks of andesite as much as 1 foot in size, and smaller inclusions either of dark lava or argillite. Stratification is crude and its attitude hard to define, and the rock is cut by pyritized faults and later dykes. Spences Bridge rocks exposed three-quarters of a mile farther south are of andesite agglomerate, which apparently dips west-southwestward and is likewise cut by faults and subsequent dykes.

Kamloops Group

An isolated body of Tertiary volcanic rocks belonging to this group occurs east of the old Highland Valley road. It has not been closely examined or mapped by the writer and was described by Dawson (1896, p. 237B) as a horizontal basalt flow overlying rhyolite porphyry. One mile and a half farther north, a much larger body of rhyolite porphyry occurs between the road and Barnes Lake, and together these rocks may have been extruded from a north-south fissure on the line of their present outcrops.

Intrusive Rocks

The principal intrusive body is the Guichon batholith whose western margin lies east of Thompson River, partly in the mapped area. West of the river, Geological

Survey maps show a small granitic body at Red Hill and another near the gneissic outcrops north of Oregon Jack Creek. Many dykes and other small intrusions occur in the area, and range in composition from basic to acid.

The outermost part of the batholith is irregular in shape and is partly overlain by Jurassic strata. It consists of quartz diorite and diorite together with quartz monzonite, which forms a large body between Spatsum and Basque and is younger than most, if not all, of the other batholithic rocks in the area. Quartz diorite and diorite appear to be intergradational, with diorite subordinate and mostly near the outer contacts. Both rocks are massive and generally of medium colour and grain size, though locally they are dark in colour and rather fine grained. They show little evidence of cooling against the adjacent country rocks, which are penetrated by unchilled dykes of quartz diorite. Inclusions are rare, but occasionally the dioritic rocks show darker patches, possibly resulting from incorporation of foreign material. A weak foliation due to crystal alignment was seen in a few places; near the old Highland Valley road it strikes slightly west of north and dips fairly steeply eastward. The typical quartz diorite consists approximately of the following: Quartz, 15 per cent; plagioclase feldspar, 60 per cent; hornblende and occasional biotite, 20 per cent; magnetite and other minerals, 5 per cent. The typical diorite differs from this in increased amounts of all the main components except quartz, which is present in small amounts. In both rocks, quartz has a granular-interstitial texture, the hornblendes are ragged prisms, the feldspars are subhedral and marginally zoned, and biotite is in shreds and small flakes. A few hornblendes and feldspars as much as one-half centimetre in size give some rocks a weakly porphyritic appearance. In many places the dark minerals are partly chloritized and the feldspars are greenish in colour. Pink feldspar is rarely present except in very minor amounts, or as veins which have been locally introduced. Augite accompanies hornblende in an ultramafic diorite found between typical diorite and quartz monzonite near the road loop east of Spatsum. A rather fine-grained porphyritic quartz diorite is the principal rock of three small bodies occurring near Thompson River south of Basque, and of a larger, possibly connected mass at higher elevations. In this rock plagioclase and hornblende crystals reach 2 millimetres in size but are mostly much smaller; quartz is plentiful and has a granular habit; biotite is scarce and chloritized; orthoclase is restricted to a rim on the plagioclase crystals.

The quartz monzonite body is emplaced in the older batholithic rocks and Cache Creek and Nicola strata. It is not in contact with the Jurassic rocks, and its probable pre-Jurassic age cannot therefore be confirmed. The rock largely resembles the younger quartz diorite and quartz monzonite of the Highland Valley area and is a light-coloured pinkish rock which is traversed by sets of parallel joints and veins carrying calcite, epidote, and chlorite. At the margins, dykes and sheets cutting the adjacent rocks are variously of porphyritic quartz monzonite and related porphyry. In the interior of the body, the texture grades from medium grained and granitic to that of a porphyry. The body is mostly free of inclusions but in places contains scattered pieces of dark crystalline, fine-grained rock with rather blurred and rounded outlines seldom greater than 1 inch across.

The granitic textured quartz monzonite commonly has a grain size ranging from one-quarter millimetre to as much as 3 millimetres and averaging between 1 and 2 millimetres. The estimated modal composition of a specimen is as follows: Quartz, 30 per cent; plagioclase, 40 per cent; orthoclase, 25 per cent; biotite and hornblende, 4 per cent; magnetite, epidote, etc., 1 per cent. In this rock quartz forms a few subhedral crystals as large as 2 millimetres and countless smaller, anhedral crystals partly forming aggregates as large as 3 millimetres. Plagioclase crystals are well formed, slightly greenish in colour, and reach a size of 4 millimetres. Under the microscope, they show strongly sericitized cores in which any zoning is obscured. Orthoclase feldspar is pink and, in thin-section, either enwraps all other minerals or forms rather shapeless small crystals. Biotite and hornblende are not plentiful, and biotite, especially, is generally somewhat chloritized. Biotite occurs as scrappy plates or shreds, and hornblende forms prismatic crystals, rarely as much as 1½ millimetres in length. In the porphyritic rocks, quartz phenocrysts in places exceed 1 centimetre in size and are accompanied by others of plagioclase. In porphyry the phenocrysts of quartz and plagioclase are from 2 to 3 millimetres in size and together constitute about 40 per cent of the rock. They are enclosed in a pale grey-green or pink aplite-textured groundmass mainly of quartz and feldspar with an average grain size less than 0.3 millimetre. In some of these finer-grained rocks, orthoclase equals or exceeds plagioclase in amount and may be graphically intergrown with quartz.

Various porphyry bodies occur in widely separated places east of the river, and are partly dykes and partly larger bodies of uncertain shape. Near the road junction approximately 2 miles north-northeast of Basque, quartz diorite porphyry occupies hilly outcrops for a distance of as much as 3,000 feet northwestward, and in the south has an apparent width of several hundred feet. The margins of this body are mostly hidden, and their attitude could nowhere be determined. In the southern part a prominent set of eastward-dipping joints is more or less parallel to the adjacent Jurassic strata and suggests that the top of the body is inclined to the east. Whether the porphyry is older or younger than these strata could not be determined. The porphyry on the west side is chilled against brecciated Nicola greenstones.

The quartz diorite porphyry is a massive, rather fine-grained rock which weathers brown but is grey-green where fresh. Although remarkably uniform considering the size of the body, the rock varies somewhat in texture. The coarsest variety is a medium dark rock whose porphyritic and quartz-rich character is not easy to see. On the broken surface, abundant greenish crystals of zoned plagioclase and darker ones of hornblende reach a size of 3 millimetres and show conspicuous cleavage faces. They are enclosed in material of a dull, feldspathic appearance, and the rock appears like an ordinary, rather fine-grained diorite. Under the microscope, however, it is seen to consist of well-shaped plagioclase and poorly shaped hornblende phenocrysts, both considerably altered and set in an irregular textured groundmass of smaller crystals. The groundmass forms nearly half the rocks and includes quartz, plagioclase, hornblende, and magnetite. Quartz is partly in discrete rounded or elongate granules and partly in long granular aggregates which are either grouped in radiating fashion or distributed at random. The shape of the long aggregates suggests inversion of tridymite to quartz during rapid cooling of the porphyry. In addition, granular quartz occurs as graphic intergrowths with orthoclase and as veinlets cutting the rock. Other varieties of the porphyry have a much more porphyritic appearance and differ mostly in the groundmass, which is finer grained and shows two main variations of texture. One involves extensive, feathery, graphic intergrowths of quartz and orthoclase which surround small crystals of either plagioclase or quartz, and the other involves minute seed-like crystals of quartz which are either closely packed in orthoclase or distributed at random amongst other minerals. The modal composition of the quartz diorite porphyry is probably fairly constant and is estimated as follows: Quartz, 30 per cent; plagioclase, 40 per cent; orthoclase, 15 per cent; hornblende, 10 per cent; magnetite, 4 per cent; apatite, etc., 1 per cent.

From a point approximately 1,000 feet west of the southern part of this porphyry body, a gentle topographic depression extends due south for as much as 1 mile and is probably a structural lineament. Close to it at intervals are outcrops of quartz porphyry and feldspar porphyry which occur partly as successive north-northwesterly dykes cutting earlier aplitic-textured quartz porphyry of unknown extent. The porphyries weather dark or light brown and salmon pink and are distinguished from other fine-grained porphyries in the area by containing hornblende phenocrysts as well as plagioclase and, in some cases, quartz phenocrysts. Disseminated cubic pyrite was seen even in chilled porphyry and may have a primary origin.

South of the rockslide immediately north of Pukaist Creek, quartz porphyry forms a partly exposed north-trending body with an eastern contact against grits and other rocks of the Cache Creek Group. The porphyry is a dacite in which quartz and plagioclase phenocrysts are set in a prevailing aplitic groundmass consisting mainly of these two minerals together with chlorite, sericite, and a small amount of magnetite. The rock contains small angular inclusions of diabasic rock and is cut by northwesterly dykes and irregular veins of diabase or andesite.

Dykes and other small intrusions of diabase occur widely in the Cache Creek and Nicola strata and in the metamorphic rocks west of Basque. They are most numerous near the contact of the Spences Bridge Group, where other lighter-coloured dykes also occur. The trend of the dykes is mainly northwesterly near Martel, easterly in the Nicola strata south of Basque, and in various or several directions elsewhere. All appear to be more or less altered to chlorite, sericite, calcite, or epidote, and those in the metamorphic rocks are partly schistose. Most of the lighter-coloured dykes are feldspar porphyries, either with little or no free quartz and therefore andesites, or with a good deal of quartz and therefore dacites. Some are younger than diabase dykes and are emplaced along them.

A breccia considered to be of intrusive or explosive origin forms narrow outcrops on the highway in two places—one at Martel and the other 1,500 feet farther south. The breccia adjoins gossan in Cache Creek cherty rocks at the northern outcrop and dragfolded limestone at the southern outcrop, and in neither case are its margins well exposed. It consists of a dense, grey-green matrix resembling volcanic greywacke, or tuff, together with angular, disordered fragments, as large as 6 inches, of chert, argillite, and a fine-grained granitic rock. In outcrop the matrix of the breccia shows scattered crystals of flesh-coloured feldspar and smaller grains of quartz, together with rock chips. Under the microscope, it is seen to consist of broken and altered plagioclase crystals, newly generated prisms of epidote, shreds and masses of chlorite, and chips of argillite, or tuff, and finely granular quartzofeldspathic rock which, together with a few larger quartz grains, occur in a chloritic, quartzofeldspathic, clastic matrix. Pyrite shows replacive features and is disseminated in both the breccia and a later dacite dyke.

Rock Alteration and Mineralization

These related effects mainly occur in the older rocks, which include the Cache Creek and Nicola strata together with the metamorphic and instrusive rocks. Cretaceous rocks of the Spences Bridge Group are affected only by argillic alteration and weak pyrite mineralization, whilst the Jurassic and Tertiary strata in the area are apparently unaltered and unmineralized.

The older rocks are affected principally by a propylitic kind of alteration that is accompanied in many places by a weak pyrite mineralization. The propylitic alteration is pronounced in crushed, brecciated, and faulted rocks and is weak or absent in massive rocks. It produces veins and disseminations chiefly of chlorite, epidote, and calcite. Limestone beds are unaffected, whereas adjacent strata may be altered and mineralized.

Metamorphic rocks on the west side of the river are prone to sericite alteration, which is also accompanied by pyrite mineralization and in places by silicification. Silicification occurs in several of the gossans. It may also account for the formation of stratified chert breccias which are seen, for example, in Cache Creek rocks to the north of the isolated Jurassic strata near Venables Creek. Other kinds of rock alteration are apparently on a small scale. Epidote skarn occurs in Nicola limestones on the south side of the central small body of quartz diorite near the road south of Basque, and also near altered diabase intrusions on the highway north of Martel. Garnet and epidote skarns were seen at the prospect southeast of Spatsum, near a contact of diorite and Cache Creek rocks that include limestone. Tourmalinization locally affects quartz monzonite at its contact with the southernmost Nicola rocks south of Basque, and either prehnite or white zeolite was noted in brecciated Cache Creek rocks immediately north of the rockslide south of Spatsum. Pink orthoclase occurs as veins in quartz diorite near a fault on Coldstream Creek, adjacent to a small copper showing.

Mineralization exposed in the area consists mainly of pyrite but is locally chalcopyrite or, in a few places, magnetite. Small amounts of pyrite are widely distributed, mostly in the older strata and metamorphic rocks which consequently weather predominantly rusty. Gossans were formed where sulphide mineralization was strongest and oxidation occurred. Many of the gossans in the area are shown on the accompanying map. They vary both in size and in the intensity of mineralization and oxidation and, seen from a distance, their colour ranges from brick-red to yellow and white. The largest are several hundred feet across and show a vertical relief of as much as 100 feet. Their shape varies and is generally irregular or, in some cases, elongate or branching. The largest and most spectacular gossans are west of the river; one is on Indian Reserve No. 5, about 1,500 feet south of the Canadian National Railway bridge near Basque, and two others are farther south and 1,500 feet apart above the highway opposite Spatsum. All three are enclosed by dark, massive Cache Creek rocks, which are mainly greenstones, tuffs, and clastic strata. Each gossan consists partly of varicoloured ochreous earthy material containing rock debris, and partly of rock in harder ribs and masses. The rock is of two kinds, one being greenish but weathering maroon owing to oxidation, and the other being white and sheared, with foliation and cleavage planes that are coated with sericite, kaolin, and gypsum. The greenish rock apparently is tuff and shows scattered grains of quartz, plagioclase, and lithic material in an aphanitic, quartzofeldspathic matrix. Feldspar in the white rock has apparently been totally replaced by quartz and sericite, and the rock consists of scattered quartz grains and a fine-grained inhomogeneous groundmass of quartz and sericite. In appearance the white rock strongly resembles the sheared rocks west of Basque and probably had a similar origin. It is foliated on planes which vary in direction but partly strike north-northwest and dip to the west. The greenish rock and the white rock both contain disseminated pyrite. Gypsum is abundant in the gossans as flakes and crystals and occurs near the south wall of the northern Spatsum gossan as a massive foliated vein or replacement body as much as 8 feet wide in sericitized schistose rock. The structure of the gossans is entirely unknown but probably involves faulting. Evidence of copper mineralization is lacking in all gossans seen, except those on the northern part of Red Hill and southeast of Spatsum respectively, which contain chalcopyrite partly oxidized to malachite in situations recently explored. A sample of earthy gossan was collected near the copper showing at Red

Hill for chemical comparison with samples of material from the Basque gossan and the two Spatsum gossans respectively. For the four samples, the assays of gold, silver, and copper together with the semi-quantitative spectrographic analyses of zinc, nickel, cobalt, and molybdenum are as follows:—

	Assays			Quantitative Analysis			
	Au	Ag	Cu	Zn	Ni	Co	Mo
Red Hill gossan	*Nil*	Tr.	0.03%	Tr.	Tr.	Tr.	Tr.
Basque gossan	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.
Northern Spatsum gossan	Tr.	Tr.	Tr.	*Nil*	Tr.	*Nil*	*Nil*
Southern Spatsum gossan	*Nil*	Tr.	Tr.	*Nil*	Tr.	*Nil*	*Nil*

The known copper occurrences in the area are few in number and are all in the older rocks. West of the Thompson River, gneissic rocks north of Oregon Jack Creek contain small amounts of malachite together with quartz and ankerite veins. East of the river, copper mineralization occurs either as malachite or chalcopyrite at intervals from Spatsum southward. One small showing is in brecciated, altered quartz diorite on the south bank of Coldstream Creek; others are in fractured white cherty beds above and also north of the rockslide; and yet others occur in a drag-folded sequence of thin limestones and bedded gossans in cliffs midway along the rockslide. Farther north, malachite float was seen below the scarp of the large hill of Nicola rocks southeast of Basque. About one-half mile northeast of this hill, on the Tag group of claims, chalcopyrite is disseminated in hornfels adjacent to quartz diorite. Two showings, each with a shaft, are spaced about 100 feet apart in an easterly direction and are separated by quartz diorite. The eastern shaft is sunk about 10 feet in the mineralized footwall of a west-dipping fault. The western shaft is about 6 feet deep, and the amount of chalcopyrite is less.

In a short adit southeast of Spatsum, a magnetite lens is a few feet wide in cherty rock, or greywacke, and is close to diorite which intrudes these and other rocks, including limestones, of the Cache Creek Group. Copper mineralization occurs nearby but not in the adit. Southeast of Basque, magnetite float was found at the north end of the large hill of Nicola rocks, and probably comes from a band of magnetite reported to be 2 feet wide in limestone on this hill.

Structure

The structure of the area apparently accords with a regional pattern of block faulting, Figure 2, reproduced from a published article by the writer (Western Miner and Oil Review, Vol. 35, 1962, pp. 46–49), is an attempt to show this pattern, which involves a branching system of trenches or grabens that extend fanwise from the Columbia River basalt plateau. The grabens partly lie along the margins of batholiths, including the Guichon batholith of Lower Jurassic age. They contain sedimentary and volcanic deposits which accumulated in them and range in age from Middle Jurassic to Tertiary.

In the present area the Guichon batholith is partly rimmed by grabens which include a north-trending one filled with Jurassic rocks at Ashcroft and an extensive northwesterly one in which Spences Bridge and later Cretaceous and Tertiary volcanic rocks occur.

East of the Thompson River the remnants of two structural blocks are transected by the batholith. The northern Basque block is underlain by Nicola strata which dip northwest, whereas the southern Spatsum block is underlain by Cache

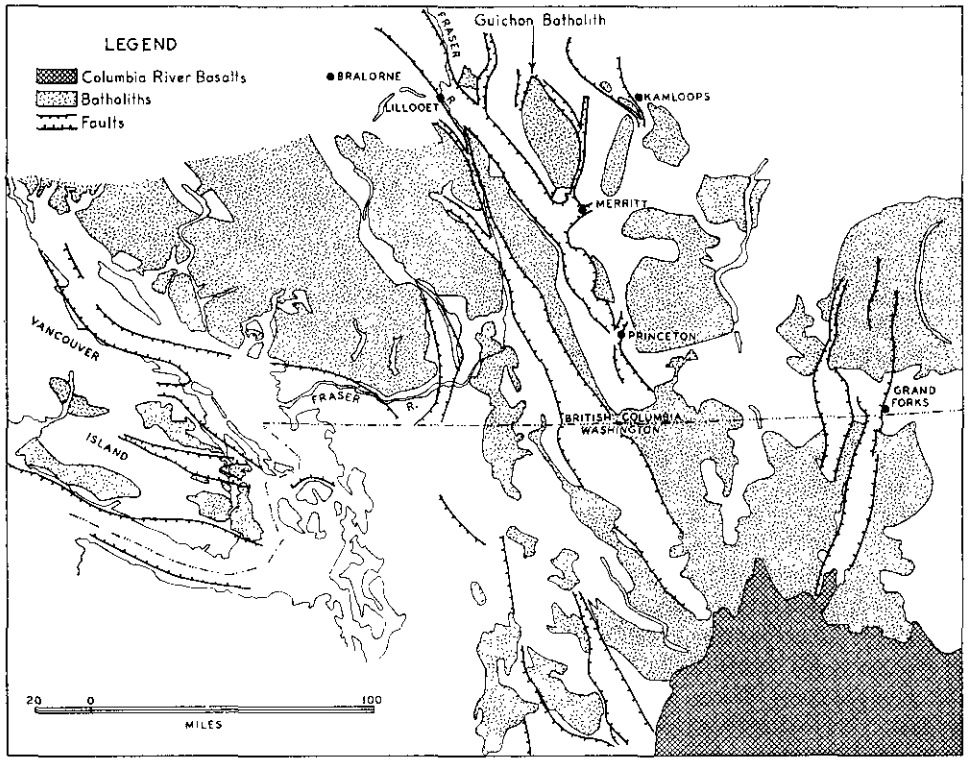


Figure 2. Regional graben pattern in southwestern British Columbia.

Creek and metamorphic rocks which mostly dip northeast. The blocks are apparently welded together by quartz monzonite, whose age is uncertain but may be pre-Middle Jurassic. Both blocks terminate westward on the line of the river, which in this part of its length evidently marks an important structural discontinuity or fault. Rocks west of the river bear no evident relationship to those to the east, and their structure is conjectural. Southwestward-dipping Cache Creek and Nicola rocks occur together in a complex, probably faulted manner and may form a single structural block enclosed between sheared rocks and Marble Canyon limestone. Farther north, massive Cache Creek rocks possess interfingering, sharp contacts against sheared rocks which strike mainly north-northwest and dip steeply to the west.

The sheared rocks probably represent a major fault zone which involved porphyry intrusions or small volcanic vents and which subsequently localized hydrothermal alteration and mineralization. Outliers of these rocks farther south in the gossans near the Thompson River suggest that the zone continues southward under the river.

The Jurassic strata near Ashcroft and the Lower Cretaceous rocks near Spences Bridge occupy separate structural depressions or grabens in older rocks, whose structure is hidden from view. The Jurassic strata are marine clastic rocks with a restricted, belt-like distribution near the margin of the Guichon batholith, which contributed boulders to the rocks. They evidently formed in a marine trench, bounded to the east by a high landmass in which the batholith, although not long emplaced, was bared to erosion.

This trench was the ancestor of the present Ashcroft graben, which therefore started to develop as early as the Jurassic. Within the graben the Jurassic rocks are deformed more by tilting and faulting than by folding, and the style of their deformation suggests adjustment of the beds consequent upon faulting in the underlying older rocks. The age of this post-Jurassic deformation is unknown, except that it pre-dates the extrusion of Tertiary lavas. Little is known about the structure of the Cretaceous rocks near Spences Bridge, but they, too, are affected to some extent by faults.

In strata throughout the area, folding is subordinate to tilting, warping, and faulting. Where folds occur they are small and may have been caused by movements on adjacent faults, or by adjustment of warping beds. The pattern of faulting is largely uncertain. Faults are assumed to exist between the blocks discussed, and other faults have been mapped. Small faults and brecciated or sheared zones are plentiful in many parts of the area. Probably many faults are hidden beneath overburden. Topographic lineaments are evident on vertical air photographs and are shown on the map, but not all may express faults. Portions of the Thompson and Venables Valleys are lineaments, and Dawson believed that both valleys might mark important faults (1896, p. 80B). Most formational contacts, other than those involving intrusive rocks, are apparently faults. Dykes and minor intrusions occur chiefly in faulted and brecciated rocks, especially close to the Cretaceous boundary. Near Martel, mapped faults strike northwestward in strongly dragfolded rocks and are invaded by irregular small bodies of diabase.

Although a direct relationship between faults and the occurrence of mineralization can be verified only in a few places, rocks which are mineralized are invariably brecciated and altered, and in many cases are close to inferred faults. Gossans west of the river occur in north-northwesterly alignment for a distance of about 8 miles, from Spatsum to Red Hill. The reason for the alignment is unknown but appears related to the occurrence of sheared rocks and therefore possibly to a fault zone. An extension of the alignment northward for 8 and 18 miles, respectively, intersects serpentine at Cornwall Creek and the Maggie gossan, which is between Cache Creek and Clinton.

[References: *Geol. Surv., Canada,* Ann. Rept., 1894 (new series), Vol. VII, Pt. B, pp. 1–427, 1896; *Geol. Surv., Canada,* Sum. Rept., 1912, pp. 115–150; Crickmay, C. H., The Jurassic Rocks of Ashcroft, British Columbia, Univ. California Publication in Geological Sciences, Vol. 19, 1929–1931, pp. 23–39; *Geol. Surv., Canada,* Mem. 262, Ashcroft Map-area, 1952; Selwyn, A. R. C., *Geol. Surv., Canada,* Rept. of Prog., 1871–72; *Minister of Mines, B.C.,* Ann. Rept., 1960, pp. 26–40.]

SPATSUM*

Copper-Iron

Spatsum (Alscope Consolidated Ltd.) (50° 121° N.E.) Company office, 549 Howe Street, Vancouver 1. N. Martini, president; V. M. Prescott, secretary-treasurer; H. C. B. Leitch, consulting geologist. This new company, formerly in part Vanex Minerals Ltd., holds about 150 located claims mainly on the east side of the Thompson River to the north and south of Spatsum. The principal showings on the property are east of the river between Spatsum and Coldstream Creek near a short adit at about 1,400 feet elevation. Work done in 1961 and 1962 included induced polarization surveys, magnetometer surveying, trenching, and drilling seven surface diamond-drill holes totalling at least 2,100 feet and an uncompleted hole which at year-end was 426 feet long. Only some of these holes were core drilled. A small crew camped near the adit from about May, 1961, onward and was supervised by T. Bilinski.

* By J. M. Carr.

The showings are near the base of the hillside and lie immediately east of a broad alluvial terrace flanking the Thompson River. Cache Creek strata, which include greywacke, chert, limestone, and dioritized rocks, dip mainly eastward toward an exposed body of diorite which apparently extends beneath part of the showings and is met in drill-holes. The adit contains a small body of massive magnetite occurring in non-limy strata. Trenches nearby and at some distance, mainly to the north, expose faulted rocks with gossans and, to the north, garnet and epidote skarn and other rocks containing oxidized copper mineralization. A wide northerly fault is exposed north of the adit and is apparently unmineralized. A hole drilled near the adit is reported to have encountered some low-grade copper mineralization. Other holes drilled at distances of several hundred feet variously to north, south, and west of the adit encountered mainly disseminated pyrite mineralization and, in one hole, veins of magnetite. The hole being drilled at the year-end was located about 2,000 feet north-northwest of the adit in an area wholly covered by overburden.

ASHCROFT*

Copper

Red Hill (Noranda Exploration Company, Limited)

(50° 121° N.E.) Company office, 202, 2256 West Twelfth Avenue, Vancouver 9. In 1962 this company optioned a group of mineral claims on the northern part of Red Hill from the owner, H. Reynolds, of Lillooet, and located other claims making a total in all of thirty-eight. Work was done by a small crew supervised by A. Burton and included electromagnetic surveying, soil sampling, magnetometer surveying, stripping, and surface diamond drilling of six or more holes, one of which was 303 feet long. Following this work the option was dropped.

On the property several large pyritic gossans occur in sheared rocks, which are largely either quartz porphyry or dacite tuff, whose foliation mainly strikes north 40 degrees west and dips fairly steeply southwest. New showings on the hill lie at various distances east-southeastward from an old short adit at the base of the slope. Mineralization at surface includes chalcopyrite, which is partly oxidized to malachite and chalcocite, together with pyrite and veins of quartz in chloritic, altered rock. Faults in the gossan follow various directions.

HIGHLAND VALLEY

Copper

Transvaal (Highland Valley Mining Corporation Ltd.)*

(50° 120° N.W.) Company office, 204, 569 Howe Street, Vancouver 1. R. A. Brossard, president. In 1962 this company worked on the Transvaal group of Crown-granted and located claims on behalf of the late L. O. McNabb. The group consists of about ten claims and fractions between the peaks of Forge Mountain about 1 mile northwest of the Trojan mine and is underlain by rocks of the Guichon batholith. Starting in May a small crew under the direction of G. F. Groves mapped and sampled the surface showings and the Transvaal adit and diamond drilled nine surface holes totalling 1,433 feet. Six of the holes were collared within 200 feet of the Imperial shaft, two holes were collared about 200 feet northwest of the Transvaal adit portal, and the remaining hole was collared 75 feet north of the Highland No. 2 shaft.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1956, p. 44.]

* By J. M. Carr.

Trojan Consolidated Mines Ltd.*

(50° 120° N.W.) Company office, 809, 837 West Hastings Street, Vancouver 1. This company holds fifty claims, including twenty-four which are Crown granted, to the north and east of the south peak of Forge Mountain about 30 miles by road from Ashcroft. In 1962 work was done at the Trojan mine by Scope Mining and Exploration Consultants Limited (address: 2200, 372 Bay Street, Toronto) and consisted of six surface diamond-drill holes totalling 1,903 feet together with dewatering, sampling, and mapping of the mine. A crew of ten men was employed for several months under the supervision of H. Parliment.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1961, p. 30.]

Lodge, Dave (Huestis Mining Corporation Ltd.)†

(50° 120° N.W.) Company office, 1818 Marine Building, 355 Burrard Street, Vancouver 1. This property lies mainly north of the Bethlehem property and consists of 132 claims; 101 located in 1962 and thirty-one claims purchased from Northlodge Copper Mines Limited. Work done consisted of geological mapping and some bulldozer trenching. Access is from the Bethlehem mine road.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1956, p. 44.]

Bethlehem Copper Corporation Ltd.†

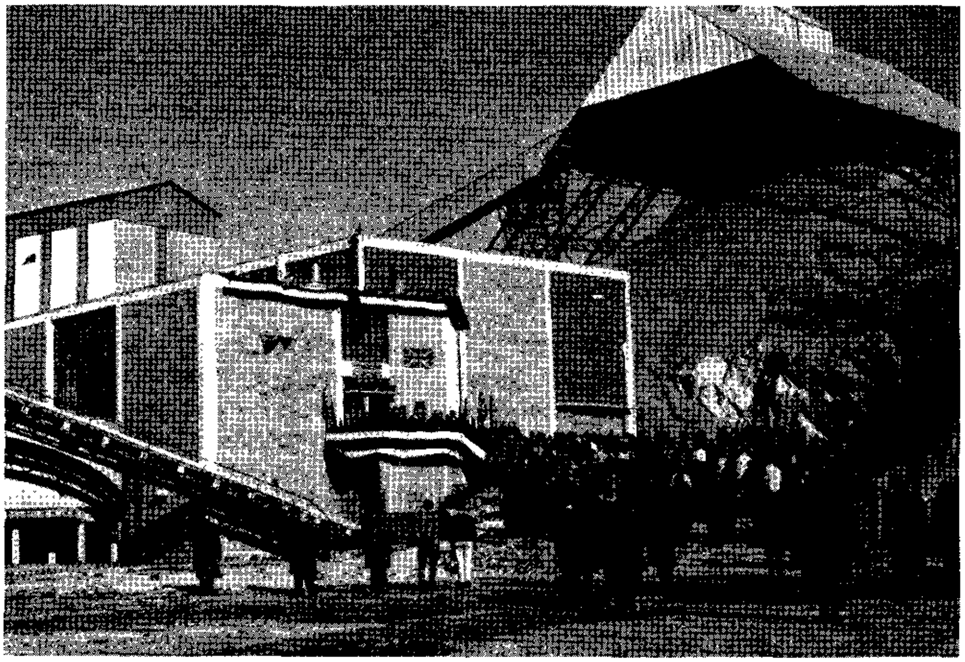
(50° 120° S.W.) Company office, 1825, 355 Burrard Street, Vancouver 1. Mine office, Box 520, Ashcroft. H. H. Huestis, president; D. W. Pringle, manager; C. J. Coveney, production superintendent; R. G. Blundell, mill superintendent. Access to the property is by about 30 miles of secondary road from Ashcroft. This company holds fifty-six Crown-granted and 106 recorded claims and fractions, immediately east of Quiltanton (Divide) Lake. A start was made in 1961 to prepare the property for production; in November of 1962 initial production began as the plant was completed and milling commenced. The plant, with a rated capacity of 3,500 tons per day, was built under contract.

A contract has been let to load, haul by truck, and unload concentrate at Vancouver Wharves in North Vancouver. In 1962, in the East Jersey open pit, 423,417 cubic yards of overburden was removed under contract. Mining of the East Jersey open pit is under contract, including the handling and distribution of waste and ore. Equipment at the mine meets all production requirements and the pit is ready for production. In 1962 production in the pit was 908,000 tons of waste, 171,600 tons of marginal ore, and 72,000 tons of ore which was stockpiled at the crusher. There has been no work underground.

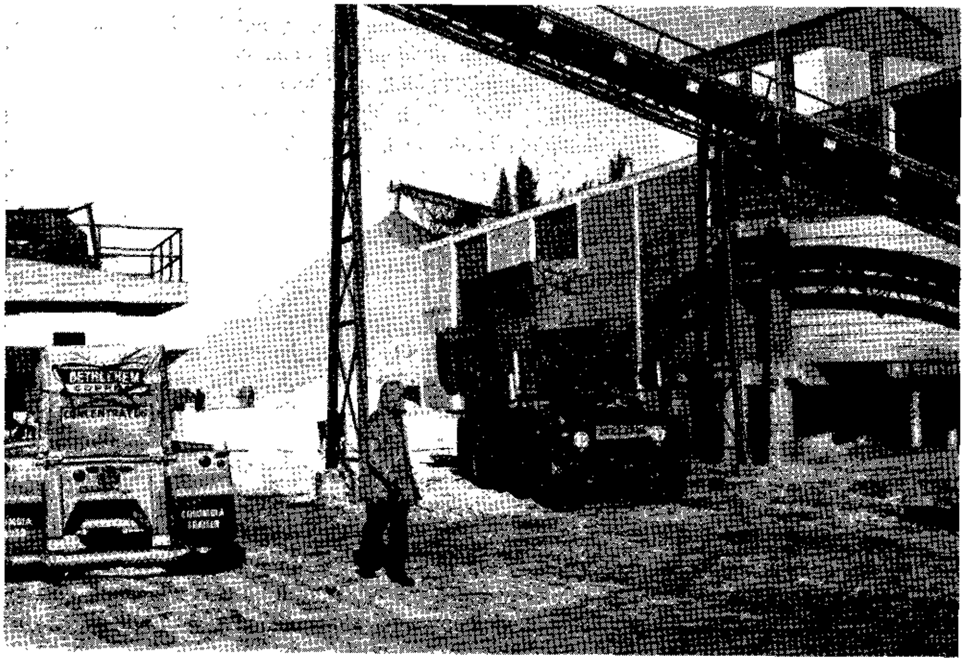
Power-lines were completed in 1962, and in October the property was supplied with electricity from the main line near Ashcroft. One feature of this installation was the use of helicopters for the placement of poles in the more rugged situations. A new telephone-line was placed in service. The road to Ashcroft has been nearly completed and will provide a first-class highway to the property. It is planned that the crew employed will number approximately 110, of which sixty will be company employees and fifty will be employed by the contractor. No housing is provided on the property, and the crew lives mainly in Ashcroft.

Other work done on the property in 1962 was mainly on the Huestis zone, which is west of the Jersey and East Jersey zones, and included cleaning out of trenches made in about 1958, some new trenching, an induced polarization survey, and one diamond-drill hole 302 feet long.

* By J. M. Carr.
† By David Smith.



Bethlehem mill—formal opening, February 1, 1963.



Bethlehem mill—loaded trailer truck at concentrate-bin and empty truck on right.

Victor (Skeena Silver Mines Ltd.)*

(50° 121° S.E.) Company office, 301, 744 West Hastings Street, Vancouver 1. A. F. Lungley, president; C. Rutherford, consulting engineer. This property is about 2 miles southeast of Quiltanton (Divide) Lake and consists of twenty claims and fractions—Divide Copper Nos. 1 to 6 and Skeena Copper Nos. 1 to 14. Four diamond-drill holes totalling 1,484 feet were drilled. A crew of ten men was employed under the direction of P. Gottselig.

Sheba (Peel Resources Limited)†

(50° 120° S.W.) Company office, 408, 580 Granville Street, Vancouver 2. N. H. McDiarmid, president; Chapman, Wood and Griswold Ltd., consulting engineers. This company controls a large number of claims owned by Sheba Copper Mines Limited and situated in the southern part of Highland Valley on the north slope of Gnawed Mountain. Following the discovery of a copper showing on the Jay No. 101 claim during road construction late in 1961, the company trenched and diamond-drilled the immediate area. Work in 1961 and 1962 included six diamond-drill holes totalling approximately 1,400 feet and geophysical surveys. Camp was established and occupied almost continually by a small crew headed by R. Fast.

The new showing is at 5,000 feet elevation about one-half mile north-northwest of Gnawed Lake and is reached by road from Highland Valley, either from the north through the Sheba camp or from the south by a longer route through the Skeena camp. The area in which the showing occurs is largely covered by overburden and was trenched at intervals for a northerly distance of as much as 1,500 feet. When visited, the trenches were partly caved and flooded, and showed very little copper mineralization. The discovery trench and nearby trenches showed pyrite disseminated in a strongly sericitized and partly chloritized zone in younger quartz diorite of the Guichon batholith. In the zone, one or more northerly or northeasterly striking faults dip eastward at fairly steep angles. The zone has been explored by drilling for a northerly distance of about 300 feet and to a depth of about 250 feet, and is shown to be as much as 80 feet wide with bornite and chalcopyrite mostly disseminated at intervals.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1957, p. 26.]

Highmont (Torwest Resources (1962) Ltd.)†

(50° 120° S.W.) Company office, 404, 409 West Hastings Street, Vancouver 1. W. E. Garnett, president; R. E. Falkins, secretary-treasurer. This company holds twenty-seven claims in the IDE and AM groups on the north slope of Gnawed Mountain immediately south of the Sheba property. The claims were formerly held by Ventures Limited and Minex Development Ltd. and are accessible from Highland Valley by the road connecting the Skeena and Sheba camps. Work by the present company in 1962 was spread over a distance of as much as 3,500 feet, extending north and south of a camp west of Gnawed Lake, and included thirteen trenches and twenty diamond-drill holes, totalling 5,816 feet, together with an induced polarization survey by contractors. A crew of as many as ten men was supervised latterly by W. G. Hainsworth, geologist.

Some of the trenches and drill-holes are located about 2,000 feet south-southwest of the Sheba showing, and are in partly sheared and altered quartz diorite containing rare dykes of quartz porphyry and very small amounts of copper sulphide. Other trenches and drill-holes are farther south and are close to a porphyry body

* By David Smith.
† By J. M. Carr.

which is mainly on the adjoining Minex property. They encountered bornite and chalcopyrite as disseminations, seams, and veins in chloritized, sericitized, and silicified quartz diorite which is cut by north-dipping faults of both northwesterly and northeasterly trends.

Minex Development Ltd.*

(50° 120° S.W.) Company office, 310, 850 West Hastings Street, Vancouver 1. Walter Brown, president; John A. Hallberg, manager. This company holds thirty-three claims partly in the IDE and AM groups lying mainly west and south of Gnawed Mountain summit. The property adjoins the southeast part of the Highmont property and is reached by road from either the Skeena or Sheba camp. Together with some adjoining properties, it was optioned in 1957 by American Smelting and Refining Co. and in 1959 by Kennco Explorations (Western) Limited. Work by the present company in 1961 and 1962 included trenching in three main localities on or near the IDE No. 2 claim, together with construction of a cabin and some road building.

One of the trenched localities is north of the cabin, near an old shaft at the northwest corner of the IDE No. 2 claim, and is about 1,000 feet south of the southern Highmont showing. Near the shaft, brecciated porphyry contains specular hematite and chalcopyrite in quartz. A second locality is on the road near the cabin, where mineralization is rather sparse in quartz diorite. The third locality is near the northeast corner of the IDE No. 2 claim, mainly on the adjoining fractional claim about 3,000 feet northwest of the summit of Gnawed Mountain. Trenches here expose mainly quartz porphyry, which is partly mineralized with bornite and chalcopyrite that occur on or near fractures filled with quartz.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1957, p. 27; 1959, p. 30.]

Jericho Mines Ltd.†

(50° 120° S.W.) Company office, 1531 Davie Street, Vancouver 5. H. B. Hatch, secretary-treasurer. This company holds 153 claims south of Witches Brook, about 7 miles east of Quiltanton (Divide) Lake. Work done in 1962 consisted of surface trenching. A crew of four men was employed under the direction of H. B. Hatch.

BROOM CREEK

Copper

Chataway (Chataway Exploration Co. Ltd.)†

(50° 120° S.W.) Company office, Box 384A, Vancouver. This property, consisting of 213 recorded claims, lies about 10 miles to the north of the Craigmont mine. Access is by secondary road to the Aberdeen mine and by 5 miles of jeep-road to the camp-site. A geochemical survey was carried out on part of the ground and some bulldozer stripping was done. A crew of two men was employed under the direction of S. W. Wright. In December, 1962, a diamond drill was moved to the property.

Earlcrest Resources Ltd.*

(50° 120° S.W.) Company office, 213, 678 Howe Street, Vancouver 1. E. M. Olts, president. This company holds about seventy claims in the Strike and Resources groups on either side of Broom Creek, about 15 miles north-northwest of Merritt. In 1962 work included line cutting, prospecting, soil sampling of selected areas, magnetometer surveying, induced polarization surveying, road build-

* By J. M. Carr.
† By David Smith.

ing, and extensive trenching. A topographic map was prepared from air photographs. A crew of four men occupied a trailer camp for most of the summer and worked under the supervision of R. B. Stokes.

The property is partly covered by superficial deposits and is apparently underlain chiefly by quartz diorite of the Guichon batholith. Exploration has mostly been done on Broom Creek, which, for more than 2 miles upstream from the Aberdeen mine, occupies a straight, steep valley that may overlie a north-northwesterly zone of fracture. About 2 miles upstream from the mine, quartz diorite on either side of the creek is partly fractured, altered, and mineralized. Trenches southwest of the creek are on the Strike group and those northeast of the creek are on the adjoining Rich group, which was explored by agreement. On both sides of the creek, bornite and malachite occur chiefly on west-northwesterly fractures that mostly dip southward. North-northeasterly faults are apparently unmineralized. Another explored showing lies nearly 1 mile farther northwest and was not visited.

This company also holds a large number of claims northwest of the Strike group between Chataway and Skuhun Creeks, and six claims in the Crest group south of Promontory Hills on the south side of Nicola River. Work on the Crest group in 1962 included magnetometer surveying and soil sampling.

General Resources Limited*

(50° 120° S.W.) This company holds twenty-six claims all named Rover, of which six adjoin the southwest part of the Strike group near Broom Creek and the others are about 3 miles farther south, on the west bank of Guichon Creek at Tyner Creek. Work in 1962 was supervised by R. B. Stokes and, on the northern Rover claims, it included soil sampling, magnetometer surveying, and trenching at a showing approximately one-half mile south of the described showing on the Strike group. On the southern Rover claims, work included line cutting, soil sampling, magnetometer surveying, and an induced polarization reconnaissance survey.

MERRITT

Copper

Tormont Mines Limited*

(50° 120° S.W.) Western office, 1218, 1030 West Georgia Street, Vancouver 5. A. Robertson, president. This company holds thirty claims in the Laron group adjoining the northeast part of the Craigmont property, about 10 miles northwest of Merritt. Access is by the Aberdeen mine road and from Craigmont. Work in 1962 included induced polarization surveys and six diamond-drill holes totalling 5,950 feet. The work was supervised to August by R. C. Coutts and afterwards by B. A. Nekrasov and was mainly on the eastern part of the property, which is underlain by poorly exposed rocks of the Guichon batholith. Some holes were drilled on the Laron No. 24 claim and the remaining ones on the Laron No. 12 claim. Small amounts of disseminated bornite were intersected in at least one hole on the Laron No. 24 claim, and chalcopyrite was reported in a hole on the Laron No. 12 claim. Small amounts of native copper occur in various holes. Drilling was continuing at the end of 1962.

Marb Group (Torwest Resources (1962) Ltd.)†

(50° 120° S.W.) Company office, 404, 409 West Hastings Street, Vancouver 1. W. E. Garnett, president. This property, consisting of sixty-nine claims held by record, lies approximately 2 miles northwest of the Craigmont pit. In March, 1962, an induced polarization survey was conducted

* By J. M. Carr.
† By David Smith.

Craigmont open pit, September, 1962.

. Craigmont mill, office, and shops.

over a portion of the group. One diamond-drill hole, 320 feet long, was drilled. No other work was done in 1962.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1961, p. 39.]

Copper-Iron

Craigmont Mines Limited* (50° 120° S.W.) Company office, 700, 1030 West Georgia Street, Vancouver 5; mine office, Box 399, Merritt. J. D. Simpson, president; R. G. Duthie, mine manager. This company holds 106 mineral claims and fractions, of which twenty-two claims and fractions are held in ten separate leases. The Craigmont ore-bodies are on the Merrell Nos. 7 and 8 claims and McLeod Nos. 5 and 6 claims, and are between the forks of Birkett Creek at surface elevations between 3,800 and 4,200 feet.

Mining and milling was continuous throughout 1962. Production was mainly from the open pit. Underground development was stepped up, and a small tonnage of ore was milled. The concentrate was shipped to Japan. The iron content of the ore was impounded in the tailings pond. In 1962, material moved in the open pit by the contractors in advance of production measured 1,124,800 cubic yards, including glacial till, waste rock, and stockpile ore. An additional 8,695,900 tons of this material was moved by the company, which also mined 1,770,100 tons of open-pit ore. Underground development was continued on three levels and is summarized as follows:—

	Ft.
2400 level—	
Drifting	2,715
Crosscutting	225
Subdrifting	90
Diamond-drill stubs	480
Raising	1,570
3000 level—	
Crosscutting	230
Raising	1,140
Subdrifting	1,080
30–901 Stope ... tons broken	57,800
3500 level—Raising	190

Diamond drilling was continued on all levels.

The 2400 haulage level has been equipped with an A.C. locomotive (20 tons) and ore-cars with a capacity of 16 tons. The gauge of the track has been changed to 42 inches. A fourth raise machine was ordered; two of the machines were in constant service in 1962. A start was made on an internal service shaft to be equipped with a friction type of hoist. A primary jaw crusher, with a capacity of 550 tons per hour, is presently being installed directly in front of the 2400 level portal, and a conveyor is being installed to carry the crushed ore to the coarse-ore stacker.

In 1962 the number of persons employed was 400. No housing is provided on the property and the crew commutes from Merritt, a distance of approximately 8 miles.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1959, pp. 31–34; 1960, pp. 35–40; 1961, pp. 31–37.]

* By David Smith.

Copper

Shot (Consolidated Standard Mines Limited)*

(50° 120° S.W.) Company office, 320, 355 Burrard Street, Vancouver 1. This company, which is controlled and managed by Bralorne Pioneer Mines Limited, holds by option twelve claims and fractions known as the Shot group and lying to the east of the Craigmont property. Access is by road a quarter of a mile north of the Craigmont mill. The ground is largely covered by overburden. In 1962 three holes were drilled from surface and failed to reach bedrock at depths up to 525 feet. Work was done under the direction of D. H. James, geologist. The option was dropped.

Tom (Peel Resources Limited)†

(50° 120° S.W.) Company office, 408, 580 Granville Street, Vancouver 1. N. H. McDiarmid, president; Chapman, Wood and Griswold Ltd., consulting engineers. This company holds several claims in the Tom group near the Lookout Point road, high on the south slope of Promontory Hills. Work in 1962 included trenching, an induced polarization survey, and some diamond drilling, and was done under the direction of Ruben Fast.

Mid-west Copper & Uranium Mines Ltd.*

(50° 120° S.W.) Company office, 535 Howe Street, Vancouver 1. G. S. Shaw, president. This company holds thirty-four claims in three separate groups to the south of the Craigmont property. The groups are the Har 1 to 6, ARH 1 to 24, and RAH 1 to 4. In 1962 diamond drilling totalling 500 feet was carried out. A crew of six men was employed under the supervision of J. Tregilges.

Copper Soo Mining Company Limited*

(50° 120° S.W.) T. G. Wilson, managing director, Osoyoos; H. Hill & L. Starck & Associates Ltd., consulting engineers, Vancouver. This company holds twenty-four claims and fractions in the East-West group located on Promontory Hills, 12 miles northwest of Merritt and approximately 1 mile south of the Craigmont mine. Work done in 1962 consisted of geological, geochemical, and magnetometer surveys under the direction of the consulting engineers.

P.C.M., Cap, Domino, Hank, Freda (Britmont Mines Limited)†

(50° 120° S.W.) Company office, 402, 25 Adelaide Street West, Toronto 1. S. A. Perry, president; W. M. Sharp, engineer in charge, Box 305, Merritt. This company holds 100 claims and fractions on the south slope of Promontory Hills to the south and southwest of the Craigmont property. Work in 1962 was from May to December and included an induced polarization survey together with dip-needle surveys, stripping, trenching, road building, and one diamond-drill hole 547 feet long on Hank No. 31 claim.

Wade, Sarg, Major (General Resources Ltd.)†

(50° 120° S.W.) Company office, 213, 678 Howe Street, Vancouver 1. E. M. Olts, president. This company holds sixty claims partly in the Wade group, which includes the Wade, Tex, and Apache Claims, and partly in the Sarg and Major groups, which adjoin the Wade group on the west. The property is on the southwestern slopes of Promontory Hills immediately north

* By David Smith.
† By J. M. Carr.

of highway No. 8 and was optioned early in 1962 by American Smelting and Refining Co. Work by this company on the Wade group included geological mapping, magnetometer surveying, and induced polarization surveying, followed by trenching, after which the option was dropped. Later in 1962 the company did work on its own which included magnetometer surveying, geological mapping on the Apache claims, construction of a road into the Sarg group, and diamond drilling of an uncompleted hole on the Wade No. 7 claim. Also at this time, induced polarization surveys were made under contract. A maximum crew of twelve men, under the supervision of R. B. Stokes, was employed throughout the season in the Merritt and Broom Creek areas on this and other properties held either by this company, Earlcrest Resources Ltd., or Vanmetals Exploration Limited.

P.L.*

(50° 120° S.W.) This group is mainly north of and parallel to highway No. 8 on the southern slopes of Promontory Hills. Although consisting nominally of sixty-five claims and fractions held by Canford Explorations Limited (company office, 204, 569 Howe Street, Vancouver), the group may be much smaller due to overstaking on Crown-granted district lots in which base-metal rights are invested. In 1962 Canford Explorations Limited diamond drilled four holes totalling 290 feet in the western part of the group. In the eastern part of the group, between P.L. Nos. 1 and 2 claims on the east and P. L. Nos. 3 and 4 claims on the west, and also on lots Nos. 132 and 134 to the south, Hurley River Mines Ltd. (P. Polischuk, president, Bralorne) and Continental Consolidated Mines Ltd. (company office, 535 Howe Street, Vancouver) together diamond drilled as many as fourteen holes in 1962. Some of these holes did not reach bedrock, but others are reported to have intersected copper mineralization and were drilled near rocks exposed a short distance up the Lookout Point road. These rocks include quartz diorite together with limy and non-limy hornfels and are cut by dykes and by oxidized northerly and northwesterly faults. Nearby to the north, quartz diorite is overlain by Kingsvale volcanic rocks.

Small crews were employed by all three companies under the direction of M. K. Lorimer for Canford Explorations Limited, W. A. McLelland for Hurley River Mines Ltd., and John Tregilges for Continental Consolidated Mines Ltd.

B.K., Clint (Bralorne Pioneer Mines Limited)†

(50° 120° S.W.) Company office, 320, 355 Burrard Street, Vancouver 1. This company, in partnership with Consolidated Standard Mines Limited, holds by option sixteen claims known as the B.K. group and the Clint group. The property is 6 miles west of Merritt, on the east side of Logan Creek, south of the Nicola River. It is reached by 2 miles of dirt road connecting with the Merritt–Spences Bridge highway. Work done in 1962, under the direction of D. H. James, geologist, consisted of bulldozing and diamond drilling.

Justice (Vanmetals Exploration Limited)*

(50° 120° S.W.) Company office, 213, 678 Howe Street, Vancouver 1. This company holds forty-seven claims and fractions which are variously named Justice, Ivy, and Metex and are included in the Justice group. The property is about 4 miles north of Merritt on Jesse Creek, and in 1958 was partly covered by the former J.S.S. group held by Northwestern Explorations Limited. It is accessible by road from a point about 1 mile along the Mamit Lake road from highway No. 8. In 1962 work included line cutting, soil sampling, mag-

* By J. M. Carr.
† By David Smith.

netometer and induced polarization surveys, geological mapping, preparation of a topographic map from air photographs, road building, and a small amount of bulldozer and hand trenching. A maximum crew of twelve men was employed on this property for part of the season under the supervision of R. B. Stokes.

The claims are principally covered with overburden. North of Jesse Creek various intrusive rocks are exposed, including pink quartz monzonite, pink altered quartz andesite spotted with chlorite and tourmaline, porphyritic fine-grained quartz diorite with epidote and tourmaline, intrusion or explosion breccia containing pink fragments of aplite and granite, or quartz monzonite, and dark diorite porphyry which may be a post-breccia dyke. Chalcopyrite is disseminated in places, generally in blobs of chlorite, and malachite occurs adjacent to a wide calcite vein on a sericitized fault. Disseminations of magnetite in the rocks may be partly introduced but do not appear to be associated closely with sulphide.

NICOLA

Copper

Clapperton Creek (Prudential Petroleums Ltd.)*

(50° 120° S.W.) Company office, 980 West Pender Street, Vancouver 1. This property, previously referred to as the Peacock group, consists of eight claims held by option from T. Matier. It is on Clapperton Creek about 5 miles from Nicola. Work on the property consisted of X-ray diamond drilling totalling 658 feet. A crew of three men was employed under the direction of W. Mar.

Copperado (Toluma Mining and Development Co. Ltd.)*

(50° 120° S.W.) Head office, 1040 West Georgia Street, Vancouver 5. Mine office, Merritt. W. B. Montgomery, general manager. The property consists of sixty claims held by record and the Turlite Crown-granted claim. The property is 4½ miles by road north of Nicola at an elevation of between 3,500 and 4,500 feet. Work done in 1962 consisted of a geochemical survey, a self-potential geophysical survey, some stripping and trenching, and a total of 1,432 feet of diamond drilling. An average crew of three men was employed under the supervision of W. B. Montgomery.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1929, p. 246; 1947, p. 136; 1948, p. 120; 1949, pp. 115–120; 1950, p. 112; 1951, p. 128; 1961, pp. 45–46; *Geol. Surv., Canada,* Mem. 249, p. 130.]

Gold-Silver

Quilchena (Guichon Mines Limited)†

(50° 120° S.W.) The property is controlled by Quilchena Mining and Development Co. Ltd., 201, 901 Jervis Street, Vancouver 5. It comprises seven Crown-granted mineral claims held by lease agreement with Guichon Mines Limited, a mineral lease covering twelve former Crown-granted claims, and fifty-five claims held by record, all on the west side of Quilchena Creek and south of Nicola Lake. A dirt road leads about 1 mile from the Nicola–Kamloops highway to the workings.

The showings have been known since 1895, and Crown grants of the claims containing the underground workings were obtained in 1925. A description of the geology, a map, and a record of sampling are in the Annual Report for 1949, pages 120 to 124. A brief description of the showings is contained in Geological Survey

* By David Smith.
† By N. D. McKechnie.

of Canada Memoir 249, 1948, page 131. Descriptions in the Annual Report are not repeated here.

The rocks are basaltic volcanic flows and breccias of the Upper Triassic Nicola Group. They are intruded by dykes of feldspar porphyry which strike about north 45 degrees west and dip steeply northeastward. Poorly exposed porphyry near a shear on the Al No. 11 and No. 12 claims appears to dip flatly southwestward.

The mineralization consists of quartz veins and stringers in narrow shears. The quartz is erratically mineralized with bornite and chalcopyrite and with sparse hematite which veins the sulphides. The showings are described in detail in the Annual Report for 1949. Sketches of the adits (Fig. 3) accompany the present report. Adit No. 1 of Figure 3 is the same as " No. 1 vein " of the 1949 Report; adits 2, 3, and 4 include the " No. 2 vein " of the 1949 Report; and adits 5 and 6 are at " No. 4 vein " and " No. 5 vein " respectively.

A vein exposed in an adit on the Camperdown claim, the " No. 7 vein " of the 1949 Report, differs from the others in that the sulphide in the quartz is grey copper. This vein is separated from the others by a post-mineral fault.

Mineralization has been exposed at two sites not mentioned in the 1949 Report. At the boundary between the Spitfire No. 2 and the Sunnyboy No. 7 fraction, now part of Mineral Lease No. 13, at 4,500 feet south 65 degrees west of No. 5 and No. 6 adits, four narrow quartz veins are exposed—three in trenches and one in a trench and a shallow shaft. The veins are from 2 inches to 12 inches wide. One, exposed for a strike length of about 50 feet, is in a feldspar porphyry dyke near its hangingwall contact. The other three veins are in basalt on the hangingwall side of the porphyry, the most distant being 240 feet northeast of the porphyry contact. Two are exposed for strike lengths of 30 feet, and one for 60 feet. The quartz carries sparse chalcopyrite and hematite. The second new site is on the Al No. 11 and No. 12 claims, 2½ miles south 60 degrees west of No. 5 and No. 6 adits. It consists of a strong shear some 15 feet wide striking north 20 degrees west and dipping 60 to 70 degrees northeastward. It is sparsely mineralized with quartz and chalcopyrite. The shear was cut by three diamond-drill holes to a depth of about 150 feet below the outcrop. Sparse mineralization was found in the cores.

Most of the vein shears strike northwest and dip northeast at angles between 40 and 85 degrees; the Camperdown vein dips 85 degrees southwest. Two nearly east-west striking planes are evident; one dips 80 degrees north, the other 60 degrees south.

The feldspar porphyry dyke on the Al No. 11 and No. 12 claims appears to be offset by the mineralized northwest-striking shear (*see* Fig. 3), and a narrow dyke occurs within the shear. The dyke in the shear is fractured, although much less so than the older sheared rocks, and the dyke fractures are mineralized. The writer believes the feldspar porphyry dykes and the vein shears to be contemporaneous and that the shears are subsidiary structures in a fracture system of which the tension fractures are now occupied by the dykes. The dyke fractures appear to be much more strongly developed than the shears.

The vein shears in the adits are offset by post-mineral faults (*see* Fig. 3) which probably are related to a large fault zone exposed in the low-level adit driven some 1,400 feet westward from the valley of Quilchena Creek. The fault zone is well exposed in the adit and has the appearance of having been the locus of considerable movement. There is no evidence of any mineralization in it or in any of the smaller faults exposed east of it in the adit. This is the northerly striking vertical fault described on page 120 of the 1949 Report. The fault strikes northward toward the valley of Moore Creek, which flows southward into Nicola Lake. The writer has

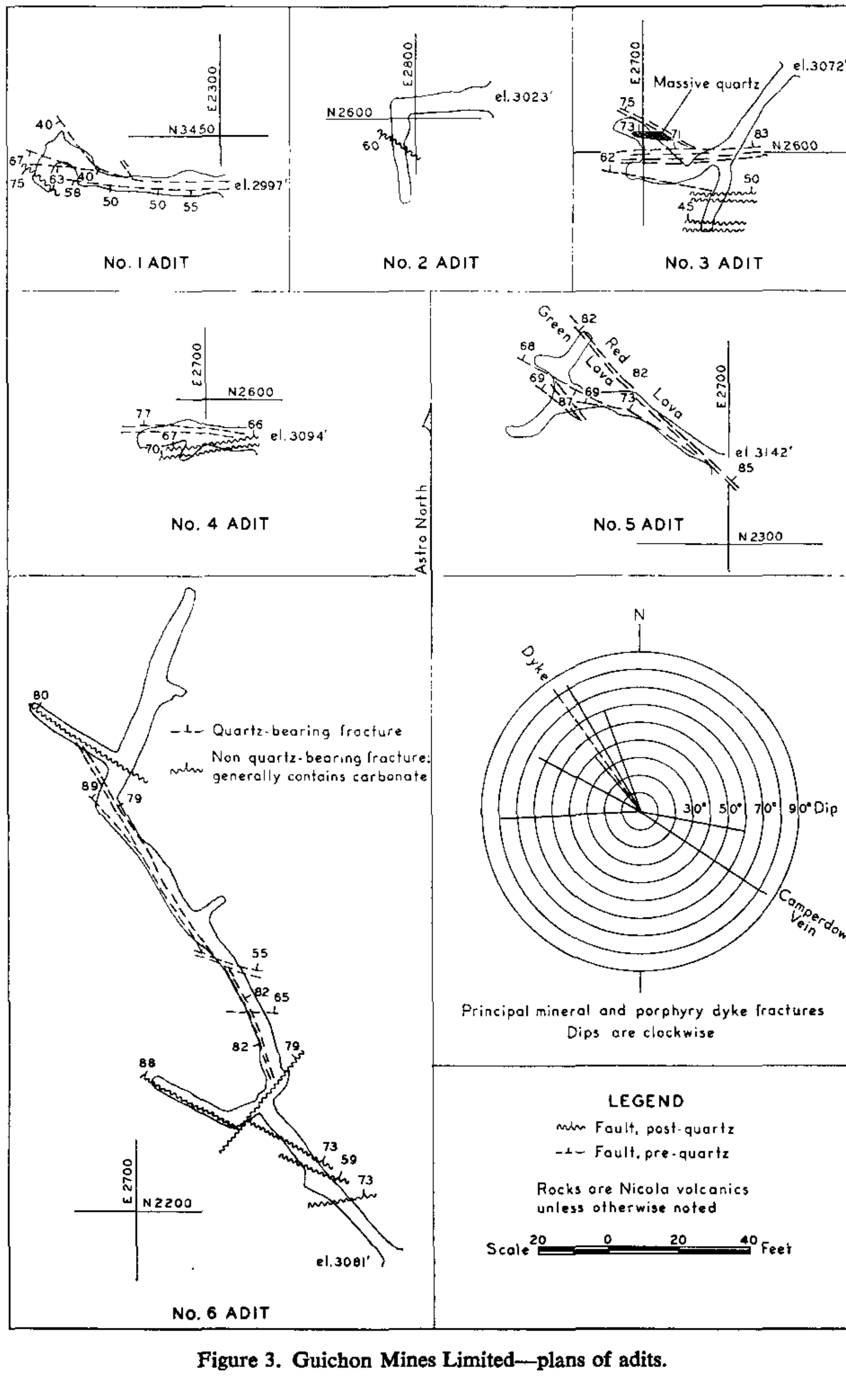


Figure 3. Guichon Mines Limited—plans of adits.

seen evidence of faulting along the valley of Moore Creek. Southward, along the strike of the fault, is the topographic depression of Quilchena Creek valley and the valley of Alleyne and Kentucky Lakes. The fault may well prove to be an important regional feature, and it is proposed that it be named the Quilchena fault. A number of narrow north-trending linear depressions occur west of the main fault zone. These probably represent parallel faults of the same age as the Quilchena fault.

Copper

Vanmetals Exploration Limited* (50° 120° S.E.) Company office, 213, 678 Howe Street, Vancouver 1. In 1962 this company explored twenty-four claims in the Gunda group, which was later partly relocated as the Pearl group, on the west side of Quilchena Creek. The work was supervised by R. B. Stokes and H. H. Shear and included line cutting, prospecting, soil sampling, magnetometer and geological surveying, and trenching. The claims are reported to be underlain by Nicola strata containing copper mineralization.

ASPEN GROVE†

Copper

Skeena Silver Mines Ltd. (49° 120° N.W.) Company office, 301, 744 West Hastings Street, Vancouver 1. A. F. Lungley, president; C. Rutherford, consulting engineer. This company holds thirty-two claims, the Malachite 1 to 14 and Chalcocite 1 to 18, 1 mile southwest of Tommy Lake, east of Aspen Grove. The claims are reached by 9 miles of logging-road which branches from highway No. 97, 15 miles south of Merritt. The showings consisted of skarn containing chalcopyrite and magnetite in coarsely fragmental volcanic rock. Work done in 1962 consisted of a magnetometer survey, some bulldozer trenching, and drilling nineteen diamond-drill holes totalling 3,989 feet. A crew of ten men was employed under the direction of P. Gottselig.

Par Group (Tormont Mines Limited) (49° 120° N.W.) Company office, 405, 25 Adelaide Street West, Toronto 1. A. Robertson, president. This company holds thirty-six claims, Par 1 to 36, in the Aspen Grove area. The claims are reached by the Otter Creek road, 7 miles south of Aspen Grove. Work done in 1962 consisted of a magnetometer survey and four diamond-drill holes totalling 2,178 feet. A crew of six men was employed under the direction of R. C. Coutts.

KAMLOOPS

Copper

Galaxy Minerals Ltd.* (50° 120° N.E.) Company office, 1403, 1030 West Georgia Street, Vancouver 5. W. Fred Evans, president; W. I. Nelson, consulting engineer. This company holds six Crown-granted and forty-six recorded claims east of the road to Le Jeune Lake, about 5 miles southwest of Kamloops. Work in 1962 continued to be done on or near the Evening Star and Golden Star claims and included eleven surface diamond-drill holes totalling 5,416 feet, together with trenching totalling 3,378 feet and about 2,000 feet of road construction. Including those on contract, eight men were employed from April to July and two from October to December.

* By J. M. Carr.
† By David Smith.

The explored zone is part of a sheared zone striking west-northwest in diorite and diorite porphyry of the Iron Mask batholith, and is as much as 1,200 feet long and several hundred feet wide. Mineralization includes stringers and disseminations of chalcopyrite which are concentrated partly near the walls of the sheared zone and partly across it.

Iron Mask (Kamloops Copper Company Ltd.)*

(50° 120° N.E.) Company office, 105 Seymour Street, Kamloops. R. W. Kennedy, president; H. Hill & L. Starck & Associates Ltd., Vancouver, consulting engineers. This company holds twenty-eight claims, twenty-two of which are Crown granted, in the vicinity of the Iron Mask mine, 7 miles west of Kamloops. In 1961 dewatering of the mine from the Norma shaft permitted examination of most of the workings, including the lowest workings, which are on the 750 level. In 1962 diamond drilling underground totalled about 11,000 feet, and the mine has been permitted to flood. A crew of ten men was employed under the supervision of J. Hungle.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1913, pp. 185–189; 1926, pp. 183–185; 1956, pp. 47–69; 1961, pp. 47–48.]

D.M. (Cadamet Mines Limited)*

(50° 120° N.W.) Company office, 600, 250 University Avenue, Toronto. H. E. Martin, president. This company holds forty-two claims and fractions extending south from the Trans-Canada Highway, about 10 miles west of Kamloops and surrounding the old Pothook mine and the Cliff and Gift Crown-granted claims. Three holes were diamond drilled, totalling 837 feet. A crew of eight men was employed under the direction of J. G. Bragg.

Tenderfoot (Kamloops Copper Company Ltd.)*

(50° 120° N.W.) Company office, 105 Seymour Street, Kamloops. R. W. Kennedy, president. This company acquired an option on the Tenderfoot Crown-granted claims and other claims held by record. The property lies on the north shore of Kamloops Lake about one-half mile east of Copper Creek. The underground workings were examined and sampling was done. Three diamond-drill holes were put down beneath the old workings. The option has been dropped. Work was under the direction of H. Hill & L. Starck & Associates Ltd.

Hilltop (Arequipa Mining Co. Ltd.)*

(50° 120° N.W.) Exploration office, 105 Seymour Street, Kamloops. This company holds twenty claims lying on the north shore of Kamloops Lake at Frederick siding, 10 miles west of North Kamloops. Access is by secondary road. Work done consisted of geological mapping and the drilling of two diamond-drill holes totalling 400 feet. A crew of four men was employed under the direction of D. Tidsbury.

NORTH THOMPSON

Barriere*

Copper-Lead-Zinc

Harper (Barriere Lake Mines Ltd.)

(51° 119° S.W.) Company office, 1479 Palmerston Avenue, West Vancouver. This property is located on the west and north shores of North Barriere Lake. A small camp was built alongside the road near the western end of the lake, and a small amount of stripping and diamond drilling was done. The area is covered with overburden. Mineralization is similar to that found at

* By David Smith.

Agate Bay—namely, chalcopyrite, galena, sphalerite, and much pyrite in schist. A crew of three men was employed.

BIRCH ISLAND*

Fluorite-Celestite-Uranium

Rexspar Uranium & Metals Mining Co. Limited

(51° 119° N.W.) Head office, 550 Sherbrooke Street West, Montreal; mine office, Birch Island. J. W. Scott, consulting engineer. This company's property is in the Red Ridge area, 2 to 3 miles in a straight line southeasterly from Birch Island. The company holds 109 claims, which are accessible by 7 miles of secondary road. Work done in 1962 consisted of nine diamond-drill holes totalling 1,200 feet on the fluorite mineralization. A crew of four men was employed under the direction of J. W. Scott.

SIMILKAMEEN RIVER†

Copper

Friday Creek Development Co. Ltd.

(49° 120° S.W.) Company office, 1055 Eyrmont Drive, West Vancouver. D. F. Hamelin, president. The property comprises twenty-two claims—the Elk, Ilk, and Ni groups—recorded in the name of Douglas F. Hamelin. The claims are 17 miles south of Princeton, and most lie between the Hope–Princeton highway and the Similkameen River. Access from the highway is by a 2-mile dirt road which begins about 3 miles south of the Kennedy Lake turnoff.

The principal working area is a large stripping on the south bank of Friday Creek between elevations of 3,200 and 3,300 feet on the Ilk and Ilk No. 3 mineral claims. The geology is illustrated on Figure 4.

Pyroxenite is exposed north and south of Friday Creek, trending east of north and underlying an area some 700 feet long by 400 feet wide, including the area of principal stripping. The pyroxenite grades into gabbro exposed to the northeast, on the north bank of the creek, and in one outcrop on the west, on the southern bank of the creek.

Monzonite intrudes pyroxenite. The only contacts observed trend north to northeast across the east side of the area. Here tongues of the monzonite cut the pyroxenite, and inclusions of pyroxenite in monzonite can be seen. Monzonite underlies the east and southeast quarters of the area and is exposed on the northwest in one outcrop in fault contact with diorite.

Diorite is exposed only where it is in fault contact with the monzonite, and its age relative to the other intrusives is not known. It is readily distinguished from the monzonite by the presence of pink feldspar. The feldspars are considerably more altered than are those of the gabbro and the monzonite, so the diorite may represent an older intrusion.

Toward the south side of the area the monzonite is cut by a dyke of diorite porphyry; this rock is exposed also in a trench and in natural outcrops toward the southwest corner of the area.

Nicola volcanic rocks outcrop in the southwest corner of the area and were seen to extend up Friday Creek for at least 300 feet beyond the map.

Mineralization, consisting of bornite, chalcopyrite, and chalcocite, with malachite and azurite, is associated with small red pegmatite dykes. The dykes cut both

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* By David Smith.
† By N. D. McKechnie.

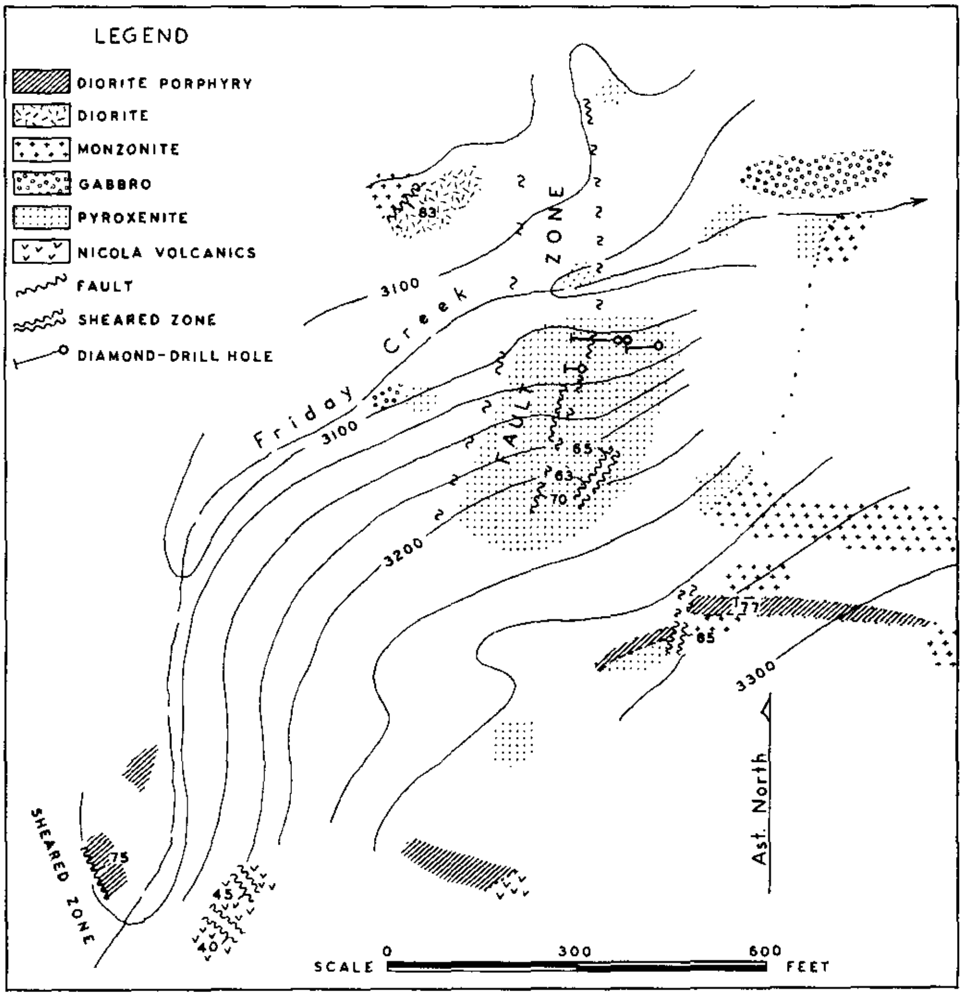

Figure 4. Friday Creek Development Co. Ltd.—surface geology.

pyroxenite and monzonite but are scarce in the monzonite. The sulphides are found chiefly in the pegmatite; they occur also in the pyroxenite but only near pegmatite.

All the faulting appears to be post-mineral; no pre-mineral faulting was recognized. The stripped area on the south bank of Friday Creek exposes a fault zone 80 feet wide striking north-northeast and dipping 70 to 77 degrees southeastward. Pegmatite occurrences seem more frequent in and near the fault than elsewhere, but there is no evidence that the fault controlled the emplacement of the pegmatite and, or, of the sulphides. Strikes and dips of pegmatites within the fault zone are erratic, and the pegmatites frequently are terminated by shear planes. A comparable fault striking north-northwest and dipping 75 degrees northeastward cuts diorite porphyry in the southwest corner of the map; only the hangingwall and 70 feet of fault zone are exposed. A north-northeast striking fault, dipping 85 degrees eastward, cuts the diorite porphyry dyke.

Sampling of the principal showing does not provide reliable information because the showing is a haphazard mixture of faulted material. No ordinary sample could be considered representative.

Outside the pyroxenite of the main fault zone the proportion of pegmatite, and sulphides, is much too low for this material to have any apparent possibilities as a source of ore.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1960, p. 56; 1961, p. 56.]

Silver

Mazie* (49° 120° S.W.) Company office, 2650 East Eighth Avenue, Vancouver 12. This company, Mazie Mines Ltd., holds twelve claims on Whipsaw Creek. The property is reached by a good secondary road 14 miles up Whipsaw Creek from the Hope–Princeton highway. In 1962 a 200-foot adit was driven to intersect at depth a zone of mineralization uncovered on the surface by trenching. Work was carried out by a crew of two men under the supervision of F. Johnson.

OLALLA†

Manganese

Dief (The Consolidated Mining and Smelting Company of Canada, Limited) (49° 119° S.W.) The Dief group of nine recorded claims is held by The Consolidated Mining and Smelting Company of Canada, Limited, Trail. The claims are between the north and middle forks of Olalla Creek 6 miles by road from Olalla. The elevation of the adit portal by barometric readings from Olalla is 4,850 feet. Five diamond-drill holes were drilled, totalling 493 feet. A crew of five men was employed under the direction of N. D. MacRae.

The manganese occurs in jasper rock of the Permian or Upper Triassic(?) Shoemaker Formations, on the north side of the middle fork of the creek. In the jasper rock is a bed of conglomerate with pebbles up to 1½ inches in diameter; both pebbles and matrix have been replaced by chert. The conglomerate strikes north 40 degrees west and dips 47 degrees northeast. The jasper is terminated by a fault zone 30 feet wide striking north 70 degrees west, about parallel to the middle fork, and dipping 40 degrees to the south. The rocks on the footwall side of the fault are thin-bedded cherts.

The manganese occurs as rhodonite and as secondary silicates and oxides in fractures in the jasper. The secondary minerals fade out away from the fault and may be due to the action of surface waters circulating in the fault zone.

The association of rhodonite with jasper is characteristic of some sedimentary manganese deposits (Lindgren, Mineral Deposits, 1933, p. 281). Rhodonite is known elsewhere in the Shoemaker Formation, as in the steep bluffs immediately west of Keremeos on the Princeton highway and on Oro Fino Mountain just north of Oro Fino Creek.

Geological mapping in the area (*see* Geological Survey Map 628A, Olalla) shows an unconformity truncating Shoemaker and Old Tom rocks. The presence of conglomerate with the manganese on the Dief group suggests that the manganese there may be near the unconformity.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1949, p. 132 (Iron King); 1955, p. 42 (Olalla 1–8); 1956, p. 73 (Olalla Mines Limited).]

* By David Smith.
† By N. D. McKechnie.

Gold-Copper

Bullion (Friday Mines Limited)

(49° 119° S.W.) Company office, 408, 580 Granville Street, Vancouver 2; field office, P.O. Box 45, Keremeos. N. H. McDiarmid, president; G. E. Leonard, project engineer. The property consists of one mineral lease and four recorded mineral claims on the east side of Keremeos Creek valley at Olalla. The workings are between 2,000 and 2,700 feet above sea-level.

The property is mentioned in the Annual Reports for 1899–1904, 1906, 1908, and 1928. The present workings, comprising five adits and an inclined winze, all were completed by 1908. In 1928 brief interest was revived by a reported nickel occurrence in one of the adits.

The property is underlain by Shoemaker sediments intruded by gabbro and diorite on the north side of the Olalla pyroxenite stock (*see* Geological Survey Map 628A, Olalla).

Mineralization shows only in and near the three upper, and shortest, adits and at the winze, where the rocks are argillites with a little limestone. The two lower adits, 600 feet long and about 175 feet below the upper adits, and 650 feet long and about 650 feet below the upper adits, expose no mineralization. There is considerably more diorite and less sediments in the lowest adit than in the next above.

The only mineralization seen to indicate much continuity was sparse coarse pyrite and chalcopyrite in skarn exposed outside the portals of the three upper adits, and in the winze. It appeared to be a saddle-shaped body about 6 feet wide plunging, at the winze, about 20 degrees in a direction south 65 degrees east. At the next lower adit the plunge was more nearly east. Near the winze, one limb had a near vertical dip and the other limb dipped about 25 degrees northeast.

The third highest adit has Iceland spar on a steep fault which strikes a little east of north.

KEREMEOS*

Copper-Molybdenum

King Edward (Friday Mines Limited)

(49° 119° S.W.) Head office, 408, 580 Granville Street, Vancouver 2; mine office, Box 45, Keremeos. N. H. McDiarmid, president; G. E. Leonard, project engineer. The property comprises twelve mineral claims and fractions held by record and four mineral claims held under option from Ben Williams, of Keremeos. Except for the southern boundary of one claim, the property is entirely surrounded by Indian Reserve No. 13, and the areas now valid as mineral claims are those within the boundaries of Crown-granted mineral claims for which titles were issued before the Indian Reserve was established and which have since lapsed. Consequently, some of the claims are separated from others by Reserve lands. The claims are 3 miles west of the Similkameen River and about 7 miles north of the International Boundary. At an elevation of about 4,500 feet, they are on a topographic nose between Susap Creek and its tributary, Hunter Creek. A pack-trail connects the principal showings with the road on the west side of the river.

The first recorded work was by King Edward Mines Limited in 1903. On the King Edward claims an adit was driven to intersect, at a depth of 150 feet, mineralization exposed in an open cut on surface. The 1921 Annual Report states that an attempt was made in 1918 to mine for molybdenum, but no production is recorded. In 1921 another adit was driven about 100 feet higher in elevation and a little to the east of the 1903 adit. On adjoining claims a shallow shaft and a third adit

* By N. D. McKechnie.

explored other showings. In 1962 surface diamond drilling and trenching was begun by the present company.

The geology of the region is shown on Geological Survey Map 341A, Keremeos. The mineralization is in syenite, correlated with the Kruger and Olalla syenites, near the north contact of the Similkameen batholith.

The showings examined were those at the old King Edward workings. Other strippings, said to be about a mile northward, were, for lack of a guide, not seen by the writer.

The 1903 adit is driven on a bearing of north 10 degrees west. At 125 feet from the portal there is a fault, apparently post-mineral, striking north 45 degrees east and dipping 60 degrees southeast. A joint plane mineralized with molybdenite on the footwall side of the fault strikes north 55 degrees west and dips 30 degrees northeastward. A flat raise up the fault to the northeast exposes copper-stained joints or weak slips containing a little chalcopyrite in the hangingwall of the fault. These are in two sets; one strikes north 13 degrees west and dips 30 degrees eastward, the other strikes north 7 degrees east and dips 65 degrees westward. On the west side of the adit in the hangingwall of the fault, a zone of closely spaced joints or slips strikes near parallel to the adit and dips 75 degrees westward. This zone was not recognized on the footwall side of the fault. A joint plane containing molybdenite on the hangingwall of the zone strikes north 25 degrees east and dips 45 degrees southeastward.

At the open cut 150 feet higher than the adit, a sheeted zone is exposed over a width of about 10 feet. It is mineralized by quartz stringers parallel to the zone and about 6 inches apart, and by irregular masses of quartz. The quartz appears to be barren. Chalcopyrite and molybdenite occur as thin stringers in the syenite and along quartz-syenite contacts. In a few places the sulphides appeared to occur as inclusions in the quartz. The zone strikes north 60 degrees west and dips 35 degrees northeastward, subparallel to one of the mineralized joints in the adit. About 50 feet eastward and 10 feet higher than the open cut, two joint systems are exposed, both carrying chalcopyrite and molybdenite. One strikes north 5 degrees west and dips 85 degrees westward, or about parallel to the closely spaced joints in the hangingwall of the fault in the adit. The other strikes north 5 degrees east and dips 35 degrees eastward.

The chalcopyrite-molybdenite mineralization is associated with three sets of joint planes: strike approximately north 10 degrees west, dip 80 degrees westward; strike about north-south, dip 35 degrees east; strike north 60 degrees west, dip 35 degrees southwestward. No other control of the mineralization was recognized.

FAIRVIEW CAMP*

Gold

Standard (Continental Consolidated Mines Limited)

(49° 119° S.W.) Company office, 535 Howe Street, Vancouver 1. This property of eight recorded claims, the Standard Nos. 1 to 8, is 2 miles northwest of Oliver and is accessible by the Fairview road for 2½ miles and by road north for 2 miles. In 1962 development consisted of 600 feet of drifting, 153 feet of crosscutting, and 527 feet of raising. Ore shipped to Trail, 2,417 tons. Surface trenching and stripping was done with a bulldozer. A crew of six men was employed under the supervision of J. Smeddle.

* By David Smith.

VERNON*

Copper

Goodenough (Highland Valley Mining Corporation) (50° 119° S.E.) Company office, 204, 569 Howe Street, Vancouver 1. This company holds twenty-eight claims, the B-R 1 to 20 and Win Art 3 to 10 along the north bank of Equesis Creek on the west side of Okanagan Lake. The property is reached by road 20 miles from Vernon. Diamond drilling totalled 902 feet in six holes. A crew of three men was employed under the direction of G. F. Groves, engineer in charge.

MONASHEE*

Gold

St. Paul Mines Ltd. (50° 118° S.E.) Office, c/o Whiteside & Whiteside, 470 Granville Street, Vancouver. This property of three claims is on the north side of Monashee Mountain and is reached by a mine road that connects with the highway near the summit of the Monashee Pass. In the past, several adits have been driven on a narrow high-grade stringer and shipments of high-grade ore were made. In 1961 another adit was started, and in 1962 it was extended to an over-all length of 200 feet. Work was done under contract. The road to the property was maintained in a passable condition.

CAMP McKINNEY†

Gold

Cariboo-Amelia (McKinney Gold Mines Limited) (49° 119° S.E.) Company office, 1831, 355 Burrard Street, Vancouver 1. R. W. Hunstone, president; H. Hill & L. Starck & Associates Ltd., management consultants; A. G. Ditto, superintendent. The Cariboo-Amelia mine closed in July, 1962, after two and a half years of production. One of British Columbia's oldest mines, it operated with a stamp mill from 1894 to 1903. In subsequent years, and chiefly from 1940 to 1946, leasing operations at and near surface produced a moderate amount of shipping ore. In late years, W. E. McArthur, of Greenwood, searched for, and found, by diamond drilling from surface, continuation of ore that previous efforts had failed to find beyond faults on the lower levels. In 1959 H. & W. Mining Co. Ltd. dewatered the shaft, located the faulted ore block on No. 5 level, and raised a new shaft from No. 4 level to surface.

Mining in 1960 and 1961 and until May, 1962, was of siliceous ore shipped to the Trail smelter. It came from stopes above No. 5 and No. 6 levels, to a depth of some 500 feet below surface. About 1,000 feet of development work was done on No. 6 level. In 1962 No. 6 level was extended 450 feet to the east, and 2,600 feet of surface diamond drilling was done. It is reported that the ore bottomed against porphyry below No. 6 level, and that to the east the vein was much broken by post-ore faulting. Commercial ore was not found.

Production from the mine has been as follows. Silver was not always included in the older records.

Date	Tonnage	Gold	Silver
		Oz.	Oz.
1894–1904	123,848	67,864	-------
1907–1946	2,044	1,738	2,266
1960–1962	11,292	12,001	14,261

* By David Smith.
† By M. S. Hedley.

Equipment was removed from the mine and the workings were allowed to flood. Surface buildings and installations were under the care of a watchman at the end of 1962.

WESTBRIDGE*

Gold

Amcana Gold Mines Limited (49° 118° N.W.) Company office, 4181 Miller Street, Vancouver 12. H. A. Thielman, managing director. This company holds twenty claims and fractions, including the Barnato Crown-granted claim, five recorded fractions, and Mineral Lease 61, on Horseshoe Mountain. The property is reached by 20 miles of good logging-road up the Kettle River from Westbridge and then by 5 miles of mine road to the Amcana camp. Work done in 1962 consisted of prospecting, stripping and trenching, and three diamond-drill holes totalling 211 feet. A crew of two men was employed under the direction of H. A. Thielman.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1938, pp. D 17–D 22.]

BEAVERDELL

Silver-Lead-Zinc

Highland-Bell (Mastodon-Highland Bell Mines Limited)* (49° 119° S.E.) Company office, 502, 1200 West Pender Street, Vancouver 1; mine office, Beaverdell. K. J. Springer, president; O. S. Perry, manager; A. Zelmer, mine superintendent. The property consists of thirty-two Crown-granted and four recorded claims. Production for 1962 was obtained from the 2800, 2900, and 3000 levels, the main haulage being the 2900 adit. Development work continued, and ore has been opened up on the 2950 level, accessible from the 2900 level by means of a winze. In 1962 the normal production of 75 tons per day was maintained. Further exploration work and diamond drilling was carried out on the Sally.

The following is a summary of operations for 1962: Drifting, 936 feet; crosscutting, 204 feet; raising, 223 feet; diamond drilling, 8,242 feet; ore milled, 20,000 tons. An average crew of forty men was employed, of whom twenty-one worked underground.

Copper

MATT (Kennco Explorations (Western) Limited)† (49° 119° S.E.) Company office, 1030 West Georgia Street, Vancouver 5. The MATT group of seventy-five recorded claims is on the south side of Tuzo Creek, 4 miles southwest of Beaverdell. Work on the property in 1962 consisted of an induced polarization survey, geological mapping, and some trenching using a bulldozer. A crew of six men was employed under the direction of J. M. Anderson.

In an area about 1½ by 2½ miles the rocks are chiefly varieties of porphyritic monzonite, as well as granodiorite, cut by a complex pattern of porphyritic and felsitic dykes. There is some breccia. Alteration is widespread and is of four varieties, of which one consists of silica, sericite, fluorite, and topaz. In spite of the indications of mineralizing activity, no commercial concentration of copper was found.

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* By David Smith.

† By David Smith and M. S. Hedley.

Molybdenum

FAN (Kennco Explorations (Western) Limited)*

(49° 119° S.E.) Company office, 1030 West Georgia Street, Vancouver 5. The FAN group of twenty-four recorded claims lies 2½ miles northwest of Carmi. Work on the property in 1962 consisted of geological mapping and some trenching using a bulldozer. A crew of eight men was employed under the direction of J. M. Anderson.

Small amounts of molybdenite were found associated with silicification and sericitization in granodiorite, and accompanied by a little pyrite and chalcopyrite. Small grains of molybdenite were also seen in apparently unaltered biotite gneiss.

MIDWAY†

Copper

Texas-Granada (Yankee Dundee Mines Limited)

(49° 118° S.W.) Company office, 404, 409 Granville Street, Vancouver 2. R. Sostad, president. The property consists of twenty recorded claims and two single-claim mineral leases, and is owned by the Midway Syndicate. It is about 2½ miles west of Midway and just north of the Kettle River and the highway. Four diamond-drill holes totalling 400 feet were drilled. A crew of three men was employed under J. MacLean.

GREENWOOD

Copper-Gold-Silver

Mother Lode (Consolidated Woodgreen Mines Limited)‡

(49° 118° S.W.) Company office, 204, 569 Howe Street, Vancouver 1; mine office, Greenwood. R. A. Brossard, president; C. W. S. Tremaine, manager; G. F. Groves, chief engineer. No development work was done at the Mother Lode or Sunset ore zones. The Mother Lode orebody was discovered in 1891. In 1898 development under the ownership of B.C. Copper Co. Ltd. brought the mine into production, and for twenty-one years, to 1919, it was one of the major copper mines not only of the Boundary district and British Columbia, but of Canada. It was the principal source of ore for the Greenwood smelter, built by the same company, and supplied 3,772,723 tons, which contained 159,349 ounces of gold, 632,652 ounces of silver, and 70,101,047 pounds of copper. Both mine and smelter closed in 1919, in part because of a strike at the coal mines at Fernie which cut off the smelter's fuel source. In 1957 the mine was reopened by Surety Mines and Metals, later Woodgreen Mines Limited, with the object of mining the shaft pillar as an open pit and of exploring for additional ore. A 1,000-ton mill was erected, but the operation was unsuccessful and closed the same year. In 1958, reorganized as Consolidated Woodgreen Mines Limited, the company resumed production at 500 to 650 tons per day. In the period 1957–62, 643,985 tons of ore was mined, containing, in concentrates, 13,973 ounces of gold, 55,562 ounces of silver, and 6,874,469 pounds of copper, representing an ore grade about 60 per cent of that of the ore mined to 1919.

In 1962 a total of 62,584 tons of ore was milled to April 25th, when the operation closed. Thirty-three men were employed.

* By David Smith and M. S. Hedley.
† By David Smith.
‡ By N. D. McKechnie.

Silver-Lead-Zinc

Skomac (Skomac Mines Limited)* (49° 118° S.W.) Company office, 901, 736 Granville Street, Vancouver 2; mine office, Greenwood. J. J. McMahon, president; J. J. McMahon, mine manager. Capital: 3,000,000 shares, 50 cents par value. This property consists of fourteen claims, six Crown-granted and eight recorded, and is located on the north side of the valley at Boundary Falls. It is reached by 2½ miles of dirt road which leaves the Grand Forks–Osoyoos highway on the west side of the bridge across Boundary Creek.

The ore occurs in a quartz vein in argillites. In the No. 4 adit the vein is irregular, widening out to 6 feet in places. Mineralization is galena, sphalerite, and considerable pyrite.

A total of 166 tons of ore was mined from No. 4 level and shipped to the Trail smelter. This contained 8 ounces of gold and 819 ounces of silver. A new No. 5 level was started 100 feet below No. 4 level. This was driven through argillites to intersect the downward extension of the vein. An average crew of three men was employed for five months.

Lincoln (King Midas Mines Ltd.)* (49° 118° S.W.) Company office, 1402, 736 Granville Street, Vancouver 2; mine office, Greenwood. P. MacDonald, president; D. Faulk, manager. This property consists of twenty-eight claims, the present work being concentrated on the Lincoln mining claim. The property is 5 miles due south of Greenwood, near the International Boundary on the east side of Norwegian Creek. It is accessible by 8 miles of road which leaves Highway No. 3 just south of Greenwood.

Considerable stripping was done to uncover a quartz vein, and a compressor building and ore-bin were constructed. Drifting on the vein started in October. It was difficult to follow the vein due to faulting. By the end of November approximately 100 feet of drifting was done. An average crew of three men was employed for five months. A trial shipment of 4 tons of ore was made to the Trail smelter. Gross content: Gold, 2 ounces; silver, 335 ounces.

PHOENIX*

Copper-Gold-Silver

Phoenix Copper Company Limited (49° 118° S.W.) Company office, 1111 West Georgia Street, Vancouver 5; mine office, Phoenix. L. T. Postle, president; P. R. Matthew, manager; J. S. Kermeen, mine superintendent. This property consists of seventy-seven claims as follows: Twenty-nine Crown-granted, thirty-eight recorded, and ten leased.

All mining is by open-pit method with production coming from three pits—Old Ironsides, 426,241 tons; Snowshoe, 119,352 tons; and Rawhide, 3,194 tons. The Rawhide pit is not owned by Phoenix but is operated on a royalty basis. The total ore mined, 548,787 tons, required the removal of 1,548,545 tons of waste rock.

Equipment, owned by Phoenix and used in the pit, was one 1½-cubic-yard and one 2½-cubic-yard shovels, three 20-ton Euclid trucks, and five air-tracs using 10-foot 1¼-inch rods with 2¾-inch bits. In addition, some hauling was done under contract using three 20-ton trucks and employing five men. Mining in the Snowshoe and Rawhide pits was done under contract using a 1½-cubic-yard shovel and three 10-ton trucks; five men were employed for eight months. The explosive used is AN/FO, mixed on the property. In the drilling, detergent was used to reduce the dust. This was found to be very successful in warm weather.

* By J. D. McDonald.

Water shortage continued to be a serious problem, and with an increase in tonnage more water was required for the concentrator. A small dam was constructed to reclaim water from the tailings pond. To pump this water back to the mill, a high-pressure piston pump was installed at the dam, pumping 200 U.S. gallons per minute through a 4-inch line to the mine water tank. Power for the pump was from a newly installed 2,300-volt transmission-line from the main transformer station at the mine plant. In addition, a 3,000-foot 2,300-volt power-line was installed to the old Brooklyn mine workings, where a small pump was installed to reclaim water.

In the concentrator the installation of a rod mill in April increased the capacity from approximately 1,100 to 1,700 tons per day. In November a propane-fired drier was installed below the concentrate filter. This drier will dry concentrates to approximately 7 per cent moisture, to comply with shipping regulations when the concentrates are shipped to Japan starting January 1, 1963. The concentrator treated 554,699 tons of ore during 1962.

A total crew of ninety men was employed, as follows: Surface, eleven; open pit, thirty-four; crusher and concentrator, twenty-nine; and staff, sixteen.

PAULSON*

Gold

Albion (Albion Mining Co. Ltd.) (49° 118° S.W.) Company office, Suite 3, Laudin Building, Castlegar; mine office, Castlegar. W. W. Schwartzenhauer, president and manager. This property consists of six Crown-granted mineral claims and six claims held by record in the name of Mr. Schwartzenhauer. It is on the height of land between McRae and Big Sheep Creeks at 5,600 feet elevation, 2 miles east-southeast of Paulson, a flag station on the Kettle Valley branch of the Canadian Pacific Railway. It is reached by motor-road some 2½ miles south of the Grand Forks–Castlegar highway.

The showing is an old one and is one of a number in the vicinity which have been prospected at intervals since 1902.

The geology is shown on Geological Survey of Canada Map 6-1957, Kettle River East Half. The claims are underlain by syenitic rocks of the Nelson batholith. Immediately to the south is a large inclusion of Mount Roberts sediments. Coryell granite also is exposed.

The principal showing is on the Albion No. 2 mineral claim and is a quartz vein 4 to 6 feet wide striking north to north 10 degrees west and dipping 75 degrees east. It contains pyrite and very minor galena; some specularite was seen in fractures. It is exposed in an old shaft and adit and in surface cuts for a strike length of about 200 feet.

Two miles of road was reconstructed and 1 mile constructed to the property. Stripping was done on the vein. The old adit was opened up and some drifting was done; an old stope was rehabilitated and some stoping done. A total of 152 tons of ore was shipped to the Trail smelter. An average crew of four men was employed for five months.

ROSSLAND†

Gold-Copper

Velvet (Velvet Mine Leasers) (49° 117° S.W.) This property was leased from Mid-West Copper & Uranium Mines Ltd. by Velvet Mine Leasers—R. Lefevre, H. W. Lefevre, J. C. Urquhart, and B. W. Price. Company office, P.O. Box 340, Rossland. The property is on

* By N. D. McKechnie and J. D. McDonald.
† By J. D. McDonald.

the western slope of Sophie Mountain, 11 miles from Rossland on the Rossland–Cascade highway.

Mining was done on No. 7 and No. 8 levels. The operation shut down on April 30, 1962. A total of 2,002 tons of ore was treated at the concentrator, operating on a one-shift basis for a total of seventy-eight days. The concentrate was shipped to the Tacoma smelter. The average number of men employed was ten for a period of four months. The lease on the property has been dropped.

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

(49° 117° S.W.) The Consolidated Mining and Smelting Company of Canada, Limited, holds ten recorded claims—Grey 1 to 10, inclusive—and four under mineral lease. The property is approximately 2 miles northwest of Rossland, on the lower east flank of Granite Mountain and the north flank of Red Mountain. Access is by means of a road leading from Rossland to the Red Mountain Ski Lodge. Three men were employed under the direction of D. W. Heddle doing geological mapping, magnetometer surveying, and electromagnetic surveying.

TRAIL*

Gold

W.D.

(49° 117° S.W.) This property, owned by W.D. Mining Company Limited, was optioned by Casino Gold Mines Limited from June to September, 1962. The property was then bought by F. Donelly, A. Pompu, and R. Ernewin, all of Trail. The property is on the west side of the Columbia River, 5 miles south of the old Trail bridge along the Casino road.

The mine is situated at the east end and on the south side of a westerly trending intrusion of monzonite, which lies between the Nelson plutonic and Rossland volcanic rocks. The gold occurs in a series of narrow quartz veins which occur along the north-dipping contact of the monzonite with tuffs on the south. Steep north-dipping rhyolite dykes can be observed in the mine. Minor mineralization of galena, sphalerite, pyrite, and arsenopyrite occur with the quartz. Where arsenopyrite occurs, gold assays up to 3 ounces per ton are obtained. Production for 1958, 1959, and 1960 was 1,435 tons, containing 796 ounces of gold and 272 ounces of silver.

Casino made a geological survey of the property. In addition, some development work was done on No. 1 level and five diamond-drill holes were drilled from No. 1 level. The property was managed by R. Ernewin. A total of 959 tons of ore was shipped to the Trail smelter. An average crew of five men was employed for four months.

The new owners, F. Donelly, A. Pompu, and R. Ernewin, started mining in October. Stoping was done above No. 1 level, and 533 tons of ore was shipped to the Trail smelter. Two men were employed for three months.

NELSON†

Copper

Queen Victoria (Great West Mining Corporation Ltd.)

(49° 117° S.E.) This property consists of two Crown-granted mineral claims and seven claims held by record, all in the name of Guaranty Trust Co. of Canada, 624 Howe Street, Vancouver. It lies about 1½ miles northeast of Beasley and east of Garrity Creek, some 8 miles west of Nelson. A road connects the workings with the Nelson–Trail highway.

* By J. D. McDonald.
† By N. D. McKechnie.

Surface and near-surface workings were made between 1906 and 1927. The Annual Report for 1961 contains an account of developments since.

In 1962 twelve diamond-drill holes were drilled by Great West Mining Corporation Ltd., of Vancouver, under the direction of F. L. C. Price—six in the vicinity of the workings and six in a group about 2,000 feet west-southwest of the workings.

The geology in the vicinity is described in Paper 52-13 and Memoir 308 of the Geological Survey of Canada. The property description on page 35 of the Paper is reproduced in the Memoir.

The property is in an inclusion in Nelson granodiorite of sedimentary and metamorphic rocks about 1½ miles long in a northeast direction and from one-quarter to

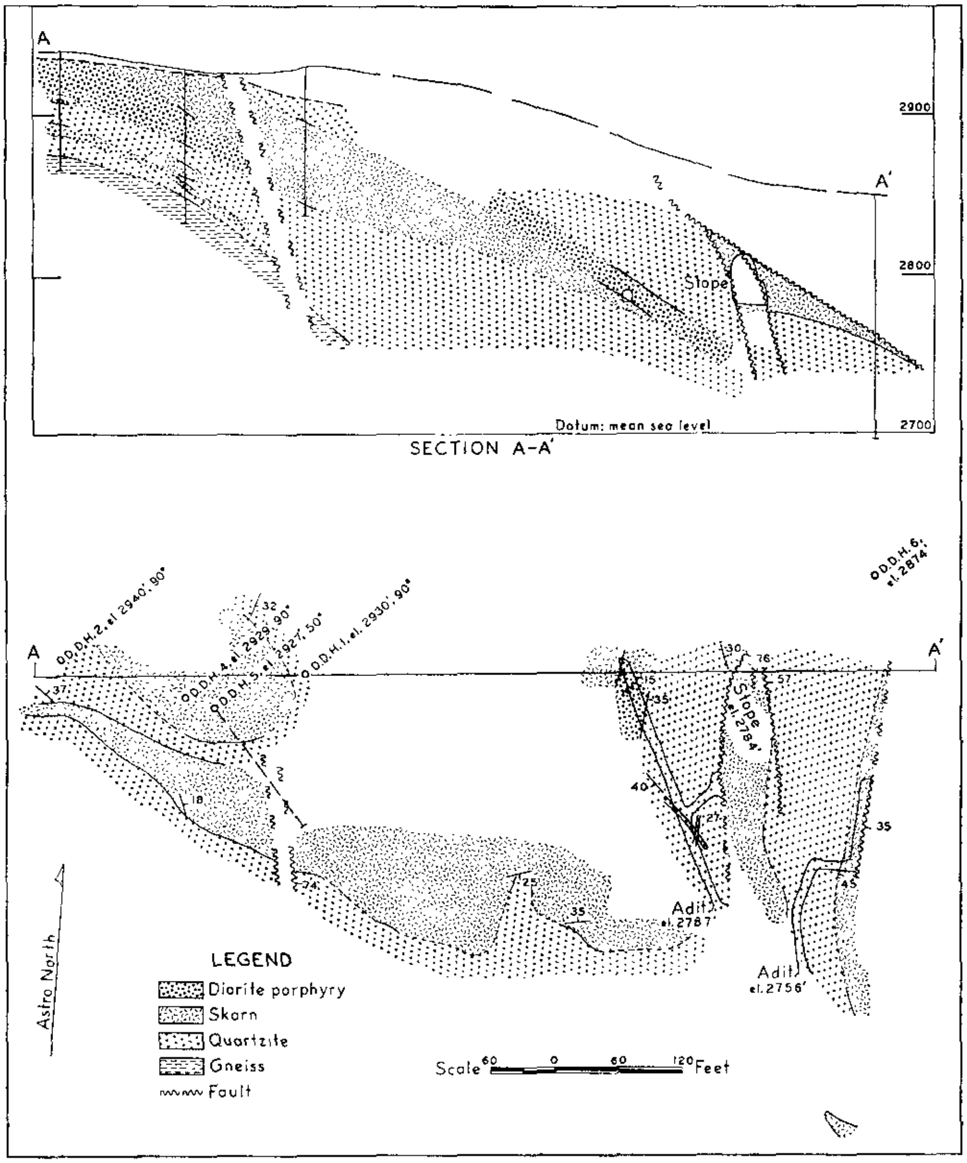


Figure 5. Queen Victoria mine—plan and section.

one-half mile wide. The age of the rocks is uncertain. Paper 52-13 correlates them tentatively with the Hall Formation, Middle Jurassic and (?) later; Memoir 308 refers them to a range of probably not older than Carboniferous, but possibly in part Jurassic.

The geology in the vicinity of the workings is illustrated on Figure 5. The principal showings and the workings are in a body of garnet-epidote skarn having a strike of north 15 degrees east and a dip of 20 degrees eastward. The skarn lies in dark-grey quartzites near their contact with gneiss and greenstone of the Bonnington complex. Locally, the skarn is in contact with rocks of the complex. Westward, up dip, the skarn pinches out and another and similar skarn appears in echelon to the right. Eastward, down dip, the skarn also narrows but terminates against a fault. However, there is a small exposure of skarn, again in echelon to the right, about 50 feet lower in elevation than the floor of a small open stope. The skarn at the eastern end, where the small stope was opened, terminates against faults as shown. It is not certain that this skarn is part of the main skarn body to the west; the skarn at the stope contains a very considerable proportion of amphibolite and little calcite, whereas the skarn west of the fault is rich in calcite and amphibolite is less prominent.

Sills and minor dykes of diorite porphyry cut sediments and skarn. A little epidote was seen in the porphyry but no sulphides.

Mineralization consists of chalcopyrite and pyrite with minor bornite and magnetite and is confined to the skarn. The distribution seems erratic. A high-grade section is exposed about 200 feet west of the upper adit, but it fades into more or less barren skarn without evidence of a controlling structure within the skarn.

Two post-mineral fault zones strike nearly north-south and dip at 70 degrees and 55 degrees or less east. The zone at the east end of the skarn bounds the stoping area; the direction and magnitude of movement are not known. The fault toward the western end of the skarn has an apparent normal movement. Drill-core intersections with the gneiss on either side indicate a throw of some 30 feet; the other components of the movement are not known. Three more or less north-south striking faults are exposed east of the workings, as shown on Figure 5.

About 2,000 feet west-southwest of the workings and at nearly the same elevations, six holes were drilled. Of these, four indicated a body of skarn about 40 feet thick striking a little east of north, dipping flatly eastward, and mineralized with chalcopyrite and pyrite. The strike length so exposed is about 150 feet. The skarn pinches westward about 200 feet up dip. The relationship to the principal showing is not known.

YMIR*

Gold-Silver-Lead-Zinc

Yankee Dundee (Cayzor Athabaska Mines Limited) (49° 117° S.E.) Company office, 3669 West Thirty-fifth Avenue, Vancouver 13. J. D. Lippmann, president. Capital: 3,500,000 shares, no par value. D. C. Smith, exploration superintendent. Cayzor Athabaska Mines Limited has the property under option from Yankee Dundee Mines Limited. The 5- by 12-foot two-compartment raise was continued to the 1625 level of the old workings. The raise, which followed the vein at approximately 70 degrees, is 471 feet long, of which 325 feet was driven in 1962. This work was done by Golac Tunnel and Drilling Contractors, of Nelson. An average crew of five men was employed from January to August.

* By J. D. McDonald.

In the raise, ore and marginal ore were found along a slope distance of 309 feet, from 162 feet to breakthrough at 471 feet. The oreshoot is very irregular in both width and grade. Systematic samples were taken over 4- to 5-foot widths. In the old workings some geological work was done in the Dundee 1200 level winze and the Yankee Girl 1200 level winze, which were rehabilitated sufficiently to enter. No work was done in the last five months of 1962. The option remains in force.

Lead-Zinc

Oxide (New Jersey Zinc Exploration Company (Canada) Ltd.).—(49° 117° S.E.) This company drilled two diamond-drill holes on the Oxide property, 4 miles east of Ymir. A total of 669 feet was drilled.

SALMO*

Erie Creek (49° 117° S.E.)

Gold

New Arlington This property is leased by G. D. Fox, 1396, 3307 Dahlia Crescent, Trail, from J. Russell, Borrega Springs, Calif. Other lessees are F. Singer and S. Hadler. The property is on Rest Creek, 7 miles by road from Salmo. The lessees, working part time, mined and shipped 277 tons of ore.

Sheep Creek (49° 117° S.E.)

Silica

Kootenay Belle K. Belle Enterprise Company Limited, Linden, Alta., has under lease the waste dumps of the old Kootenay Belle mine from M. Arishenkoff, of Shoreacres. The dump material is shipped to the Trail smelter for flux, and the gold content is paid for in addition to the silica. Material was stockpiled near Salmo for shipment during the winter months. A front-end loader and one truck were used to load and haul the silica rock to Trail. Total shipped: 8,712 tons.

Queen F. R. Rotter, of Salmo, is shipping silica rock from the Queen waste dumps to the Trail smelter for flux, having leased the mine dumps from Sheep Creek Mines Limited. This silica rock is shipped solely as flux material, and no gold content is paid for. A front-end loader and truck were used to load and haul the silica rock to Trail. Total shipped: 19,605 tons.

Aspen Creek (49° 117° S.E.)

Lead-Zinc

H.B. (The Consolidated Mining and Smelting Company of Canada, Limited) Company office, Trail; mine office, Salmo. D. S. Campbell, property superintendent; R. R. McMichael, mine superintendent; P. Conder, mill superintendent. The H.B. mine is on the west side of Aspen Creek, with the main camp on the north side of Sheep Creek, 7 miles by road from Salmo. The ore occurs as lead-zinc replacement of dolomite. The main production comes from the No. 1 and No. 2 orebodies, in which the ore is mined by long-holing from sublevels on the hangingwall and footwall, and is scraped to ore-passes from slusher drifts. The total long-hole footage for the year was 79,030 feet. The pillars have been removed from the No. 1 ore-

* By J. D. McDonald.

body and are included in the long-hole tonnage. This type of mining accounted for 64 per cent of the total production. The remainder is mined in flat-lying orebodies named X-1 and X-2, and No. 4 orebody. Mining is done by slashing and benching with jacklegs, using a panel system of pillars and stopes. Development: Drifting and crosscutting, 217 feet; sublevels, 3,530 feet; raising, 2,156 feet; total, 5,903 feet. AN/FO explosive is being used for blasting in all mining except long-holing. At the end of the year this was 75 per cent of the explosives used.

Underground diamond drilling was 15,963 feet, and surface diamond drilling was 1,831 feet. Exploration was done from the No. 7 tunnel. The concentrator treated 468,979 tons of ore during 1962, an average of 39,081 tons per month. This was the highest in the West Kootenay area. The average number of men employed was 112, fifty of whom were employed underground.

The mine-rescue team competed in the West Kootenay competition. There were no lost-time accidents over six days during 1962. This is a continuation of the outstanding safety record which the H.B. mine has had over the past five years.

Lead-Zinc

IRON MOUNTAIN (49° 117° S.E.)

Jersey (Canadian Exploration Limited)

Head office, 700 Burrard Building, Vancouver; mine office, Salmo. R. G. Weber, mine manager; J. W. Robinson, mine superintendent; R. W. Gould, mill superintendent. This company is a wholly owned subsidiary of Placer Development Limited. The property is reached by two roads which leave the Nelson–Nelway highway 4 and 4½ miles respectively south of Salmo, the north road being the main access road. The lead-zinc concentrator is beside the Nelson–Nelway highway and is served by a conveyor system from the underground crusher at the mine. The mine, offices, and camp are located on the summit between Sheep Creek and Lost Creek.

All production came from the Jersey lead-zinc mine. The majority of production is now coming from relatively thin and locally steeply dipping beds, and is being mined by conventional open stoping with jacklegs and slushers above the trackless mine, and is hauled from chutes or loading points to the coarse-ore bin on surface. The trackless production was 276,297 tons; the remainder was 18,931 tons from the track mine, 13,108 tons from the open pit, and 25,296 tons from pillar recovery.

The pillar recovery programme is continuing on the retreating basis. Stope backs are standing up well, with the large spans being left after pillar removals. To assist the management in assessing rock stresses in pillar removal, C.I.M. Consultants, of Toronto, did some rock mechanics work at the Jersey. Three methods of rock stress observation were employed: visual observation, rock bolt dynamometers, and photoelastic strain gauge disks. The main programme consisted of using the strain gauge disks. The disks are cemented to the rock with a special cement in predetermined locations. The direction of stress or changes in the intensity of stress can be read visually with the use of a polaroid glass. Three separate areas of the mine were instrumented with disks, which were read regularly and the readings noted. There were no sudden changes in the readings, and in general they indicated very little change in rock stress patterns.

Total development was 7,722 feet, consisting of 1,282 feet of 16- by 16-foot drifting, 5,832 feet of subdrifting, and 608 feet of raising.

AN/FO explosive was in continued use during the year and constituted 55 per cent of the total explosives used.

Surface exploration consisted of geological mapping, diamond drilling, and stripping. Two diamond-drill holes were drilled on the Otter group of claims on the east side of fifty-six Crown-granted claims which comprise the company's holdings on Iron Mountain. These holes were vertical, and the total footage was 2,497 feet. On the west side of Quartzite Ridge two holes were drilled, one on the TK5 mineral claim and the other on the Mastadon mineral claim, with a total footage of 1,781 feet. Bulldozer stripping was done in selected areas on the TK and Truman groups of mineral claims.

The concentrator treated 384,894 tons of ore during 1962. Concentrates were shipped to the Bunker Hill smelter at Kellogg, Idaho.

The mine-rescue team competed in the West Kootenay Mine Rescue Competition at Riondel. The property continued its excellent safety record of the past four years, having only one lost-time accident over five days during 1962. The average number of men employed was 154, of whom fifty-five worked underground.

NELWAY

Lead-Zinc

Reeves MacDonald Mines Limited* (49° 117° S.E.) Company office, 410 Metropolitan Building, 837 West Hastings Street, Vancouver 1; mine office, Remac. L. M. Kinney, Metaline Falls, Wash., general manager; F. R. Thompson, manager; W. Pollock, mine superintendent; J. M. McDearmid, mill superintendent. Capital: 3,000,000 shares, $1 par value. The Reeves MacDonald mine is on the Pend d'Oreille River, on the Nelway–Waneta road 4 miles west of Nelway. Lead-zinc replacement orebodies in limestone have been developed from the 1900 main haulage level.

The major development and stoping is below the 1900 level in the Reeves orebody. There was no tonnage from the O'Donnell orebody. Mining has been completed in the B.L. orebody. In the No. 4 orebody, tonnage is being produced on a small scale. Mining is done with long-hole machines, drilling down-holes from horizontal slots. These slots are slashed to the ore outline and are at 50-foot intervals. On three levels, instead of slashing a horizontal slot, hanging and footwall subdrifts have been driven and the drilling done from the sublevel. In all cases, a vertical slot is taken out along the main longitudinal pillar and the down-holes are blasted to the vertical slot. Drilling is done with 2⅛-inch (73,710 feet) and 3-inch (36,361 feet) tungsten carbide bits.

The No. 3 shaft, inclined at 55 degrees, is the main production shaft for the Reeves orebody below the 1900 level. This shaft was extended another 408 feet to the 60-foot elevation. This will be bottom for No. 3 shaft as drilling has indicated a fault zone at the 60-foot elevation known as the Reeves fault. The sinking was done under contract, and mucking was done with a Cryderman mucker mounted in the centre compartment. Scram levels will be established at the 650- and 220-foot levels.

Total development, excluding shaft sinking, was 7,172 feet, consisting of primary drifting, 2,313 feet; sublevels, 2,189 feet; raising, 1,900 feet; slot raise, 638 feet; shaft stations, 60 feet; sump, 72 feet. A new haulage drift on the 1900 level was completed, connecting the main haulage directly to the coarse-ore bin. This eliminates the surface track from the 1900 level adit to the coarse-ore bin.

Underground diamond drilling was 4,561 feet. Surface drilling was 2,430 feet on the company's claims on the south side of the Pend d'Oreille River opposite the mine. Three holes were drilled to check anomalies found from a geochemical survey.

* By J. D. McDonald.

The concentrator treated 417,448 tons of ore during 1962. Zinc concentrates were shipped to the Trail smelter. Lead concentrates were shipped to the smelter at Kellogg, Idaho. The number of men employed, including staff, was 115, of whom fifty-two worked underground.

Red Bird (The Consolidated Mining and Smelting Company of Canada, Limited)*

(49° 117° S.E.) This property, comprising sixteen Crown-granted mineral claims and fractions, is held under option by The Consolidated Mining and Smelting Company of Canada, Limited. Fourteen recorded claims, held by Consolidated adjacent to the Red Bird group, are included in the group. The property is on the south side of the Pend d'Oreille River and adjacent to claims belonging to Reeves MacDonald Mines Limited. It is accessible by 14 miles of road north from Metalline Falls, Wash., to the International Boundary (via the Gardner Cave–Frisco Standard road) and then approximately 2 miles to the No. 1 adit. A geological description of the property is contained in British Columbia Department of Mines Bulletin No. 41.

Recent exploration by the Consolidated company has been directed toward finding primary sulphide mineralization beneath zones of rusty gossan carrying secondary lead and zinc minerals which are exposed on surface and in the No. 1 adit. On the basis of regional geological studies and the experience at the Reeves MacDonald mine, it is expected that the longest dimension of mineralized zones on the Red Bird will be parallel to the plunge of the lineations and dragfolds in the surrounding rocks. These plunge at moderate angles to the southwest. It is also expected that limestone and dolomite on the property occur in a moderately plunging isoclinal syncline which is open to the west. Not enough work has been done to prove or disprove these conclusions. In extending the No. 1 adit and in diamond drilling, an interlayered sequence of limestone and mica schist was encountered. The rocks resemble infolded parts of the Reeves limestone and underlying Truman member. They are offset by a number of northerly trending cross-faults. No sulphides have been found, and oxidized material continues to an elevation of 2,260 feet above sea-level or 1,070 feet below the surface.

A total of 692 feet of drifting and crosscutting done under contract was completed in September. An average crew of nine men was employed for three months.

On completion of the development, three diamond-drill holes were drilled with a total footage of 1,956 feet. An average crew of eight men was employed for two months. The property was completely shut down in December. F. D. Gill was geologist at the property.

NORTH KOOTENAY LAKE

Riondel (49° 116° N.W.)†

Silver-Lead-Zinc

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

Company office, Trail; mine office, Riondel. J. B. Donald, property superintendent; N. Anderson, mine superintendent; T. F. Walton, mill superintendent. This property is at Riondel, on a small peninsula 1½ miles long, on the east shore of Kootenay Lake, 6 miles by road north from the Southern Trans-Provincial highway at Kootenay Bay ferry-landing. The mine is serviced by No. 1 shaft, inclined at 35 degrees. The levels are at intervals of 150 vertical feet. All levels service the Koo-

* By J. D. McDonald and J. T. Fyles.
† By J. D. McDonald.

tenay Chief zone on the south, with No. 2 level and No. 5 level extending north to the Bluebell and Comfort zones.

Mining methods are open stoping and cut-and-fill stoping with deslimed tailings. Longitudinal pillars are being recovered using cut-and-fill methods, and sill pillars are being recovered using square sets and deslimed tailings fill. A total of 56,449 cubic yards of tailings was placed in the mine.

Development work was done in all three zones. Crosscutting on No. 9A level was slow, due to heavy ground, thermal water, and carbon dioxide gas. Pre-grouting of ground before tunneling was found to be effective, but slow. Development work in 1962: Drifting and crosscutting, 4,938 feet; raising, 3,713 feet; total, 8,651 feet. Diamond drilling consisted of 13,553 feet of core hole and 7,650 feet of grout hole.

Present pumping is at the rate of 4,100 imperial gallons per minute. Main pump stations are on No. 5, No. 8, and No. 9A levels. Total pumping capacity is 3,400 horsepower on all pumping intallations.

The main ventilation system consists of four 48-inch dual-duty aerofoil fans installed in parallel, exhausting from the main ventilation raise at the south end of the Kootenay Chief zone. Installed capacity is 200,000 cubic feet per minute exhausting from the mine. In addition, a fan rated at 70,000 cubic feet per minute is installed on No. 5 level at the Bluebell zone and exhausts through the Comfort zone. There are twenty-seven auxiliary fans, aerofoil type, sizes 15, 19, and 24 inches, with a total rated capacity of 144,600 cubic feet per minute. Total capacity for installed fans, both main and auxiliary, is 414,600 cubic feet per minute. For stand-by power there are three diesel units, two 375 kva. and one high-speed 187.5 kva. In power outages these fans supply power to the main fans, auxiliary fans on No. 8 and No. 9A levels, No. 6 level hoist, and essential pumping on No. 5, No. 8, and No. 9A level pump stations.

The Cementation Company (Canada) Limited continued its grout programme until December, 1962. Although the major objective was not entirely achieved, a number of lesser objectives were. The majority of grout holes were drilled by diamond drilling, generally AX size holes. The collar gear consisted of a valve big enough to accept the core barrel, secured to the rock face by adequate rock bolts, inset at least 3 feet. The casing attached to the valve is up to 10 feet in length, depending on conditions, and is grouted into place with a sealing pressure of 2,000 pounds per square inch.

Cement grout was the major sealant and was carried to a 2,000-pounds-per-square-inch sealing pressure, except in areas where the grout-hole collars were in fractured, incompetent ground. The only other additives used, in very minor amounts, were sodium silicate and bentonite. Sawdust was injected occasionally to seal off the leakage of grout in broken zones around the collar of the hole. The grout-mixing tank was of 30 imperial gallons capacity. The grout mixtures ranged from a rock penetrating mix of one-half shovel to one-half bag per 30-gallon tank, to an average grout mix of 3 bags per 30-gallon tank, to a choking mix of 5 bags per 30-gallon tank. In August, 1962, an installation erected near the main portal started mixing grout on surface and pumping it via a 1-inch pipe-line to the desired location on No. 8 level or No. 9A level. A standard pattern of grout holes was used in advance of a drift face, and a core hole was drilled ahead to check the effectiveness of the grout cover.

Mine-rescue and first-aid classes were held. Two mine-rescue teams competed in the West Kootenay Mine Rescue Competition at Riondel. The team captained by P. Rowan won the West Kootenay competition and competed in the Provincial competition in Nelson. The number of men employed at the end of 1962 was 241, of whom 149 were employed underground.

The concentrator treated 237,742 tons of ore. This was a reduction from previous years, due to a shut-down period from March 6th to April 2nd from lack of power. The power shortage was caused by the blasting of the east tower of the Kootenay Lake power span by terrorists on March 6th. This created a very serious power shortage until a temporary span was completed on April 2nd.

RETALLACK-THREE FORKS*

Silver-Lead-Zinc

Caledonia (Northwest Mining Partnership)

(50° 117° S.E.) Company office, 519 West Mission, Kellogg, Idaho; mine office, Retallack. This is a private company consisting of three partners, E. B. Olds, D. G. Lehn, and D. M. Russell, of Kellogg, Idaho. The property consists of fourteen Crown-granted mineral claims which were optioned in May, 1961, from Mrs. G. E. McCready, of Kaslo. In April, 1962, work was again started on the 200-foot raise to connect No. 3 level to No. 2 level. After driving a short distance the raise was stopped, at a total length of approximately 100 feet. Operations were shut down and the option was dropped in the spring of 1962. A total of 131 tons of stockpiled ore was shipped to the Carnegie concentrator.

Antoine (Antoine Silver Mines)

(50° 117° S.E.) Company office, Box 509, Kaslo. This is a private company of five partners, L. N. Garland, V. J. Dresser, H. Friedrich, E. Friedrich, and H. Loewentraut. L. N. Garland is mine manager. The property consists of the Antoine group of five Crown-granted and three recorded mineral claims. Also held under option is the Soho group of eight Crown-granted mineral claims at the headwaters of McGuigan Creek, at an elevation of 7,000 feet. Three miles of road was constructed from the end of the Rambler mine road to the Antoine mine. The Rambler road is 6 miles long with twenty-seven switchbacks and connects with the Kaslo–New Denver highway 3 miles east of Three Forks.

Work commenced on the property in May when 5 tons of supplies were flown in by helicopter to the 7,000-foot elevation. This allowed an early start on the property as 10 feet of snow at this time prevented access on the ground. The main No. 5 level was opened for 1,000 feet; the Antoine shaft was retimbered; a compressor-house, powder magazine, and a 12- by 40-foot bunk-house and cook-house were built. The road was started in August and completed in early September. All the equipment was then hauled in to the mine and sufficient supplies to operate until June, 1963, when the road could be opened again. Four men were employed, all partners in this operation. It is the intent of the men to work all winter and to snowshoe or ski out and in once a month. Ore will be stockpiled, and trucked out in the summer months. The ore contains high silver values. A geological description of the property is contained in Geological Survey of Canada Memoir 184, by C. E. Cairnes.

Wellington (Blue Star Mines Limited)

(50° 117° S.E.) Company office, 800, 675 West Hastings Street, Vancouver 2; mine office, Retallack. E. L. Borup, president; C. E. Lind, manager. The property is above Retallack, at an elevation of 4,300 feet, and is reached by 2.3 miles of road which leaves the Kaslo–New Denver highway at Retallack. Slashing and retimbering of the east Matheson adit was completed in October; 1,040

* By J. D. McDonald.

feet of drift was slashed, and rails, water and air lines, and ventilation-pipe were extended to the face. The crosscut was driven 310 feet in 1962. Heavy flows of water hampered development work. The average number of men employed for the year was ten. In August the road to the property was widened and the switchbacks opened. The road work uncovered a vein below the present camp, and this was being investigated in December.

SANDON*

Silver-Lead-Zinc

Silversmith, Richmond-Eureka, etc. (Carnegie Mining Corporation Limited) (49° 117° N.E.) Company office, 416, 25 Adelaide Street West, Toronto; mine office, New Denver. A. W. White, president; J. C. Black, manager. Capital: 5,000,000 shares, no par value. This company is controlled by Violamac Mines Limited. The property consists of forty-six Crown-granted and six recorded claims and fractions which include the Silversmith, Slocan Star, Richmond-Eureka, Ruth-Hope, and Slocan King mines on Sandon Creek, south of Sandon.

In the Ruth-Hope mine, lessees E. Perepolkin and son shipped 9.5 tons of ore to the Trail smelter and 302 tons to the Carnegie mill. The operational period was eleven months. Other lessees were H. E. Singel and B. Fried, who shipped 15 tons of crude ore.

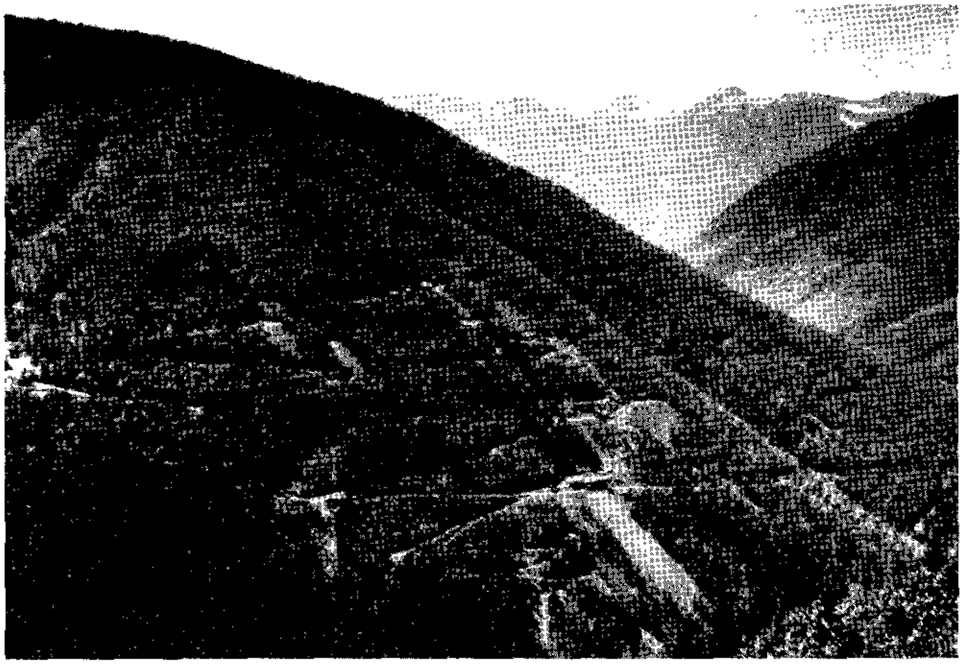
The concentrator operated on a one-shift part-time basis for a total of forty operating days with two men employed. The total amount of ore treated was 1,715 tone, made up of ore from the Victor, 1,094 tons; Ruth-Hope, 302 tons; Fisher Maiden, 188 tons; Caledonia, 131 tons.

Silmonac (Silmonac Syndicate) (49° 117° N.E.) Syndicate office, New Denver; mine office, New Denver. This syndicate is composed of three companies—Silver Standard Mines Limited, Moneta Porcupine Mines Ltd., and Violamac Mines Limited. Each company has equal voting rights, with one vote each. Violamac will manage the exploration work; J. C. Black, mine manager. The syndicate has the fifty-nine Crown-granted claims and fractions in the Sandon area formerly held by Kelowna Exploration Limited. In addition, it has limited mining rights on four Carnegie claims. The exploration drive is to explore the Silversmith-Hope lode at an elevation of 4,000 feet. Mine plant and surface installations are located at what was formerly the Ruth No. 5 level. The installations were started in November and were completed in December. It is reached by 2 miles of road from Sandon.

The No. 5 level was slashed for a distance of 300 feet. From a point along the drift a crosscut will be driven approximately 600 feet to the main lode and then a drift will be driven along, or parallel to, the lode. A 2,300-volt power-line and a compressed-air line were brought to the mine plant from the Carnegie power plant. For a two-month period a total of fifteen men was employed, of whom six were underground.

Victor (Violamac Mines Limited) (49° 117° N.E.) Company office, 416, 25 Adelaide Street West, Toronto; mine office, New Denver. A. W. White, president; J. C. Black, mine manager. Capital: 1,000,000 shares, $1 par value. Violamac Mines Limited is controlled by New Dickenson Mines Ltd. The Victor mine is 2½ miles by road northwest of Sandon, or 2½ miles by road southeast of Three Forks.

* By J. D. McDonald.



Violamac Mines Limited—workings on Victor vein; Lone Bachelor at left.

Silver Ridge from the northeast; Sandon in valley bottom and above it the Ruth and Hope mine dumps.

Operations were suspended in January, 1962, and resumed for a month in June. The length of this salvage operation was two months, with the men employed averaging twelve. A total of 589 tons was shipped to the Carnegie concentrator. A small amount of development and stope exploration was done.

Violamac leased certain sections of the mine. Lessees L. Fried and E. DeRosa shipped 193 tons of ore to the Carnegie mill and 62 tons of ore to the Trail smelter. The operational period was eight months. Lessees J. Stewart and E. Anderson shipped 270 tons to the Carnegie mill and 12 tons to the Trail smelter. The operational period was eight months. Lessees E. Perepolkin and son shipped 42 tons to the Carnegie mill. The operational period was one month. The total production from the Victor was 1,168 tons.

Slocan Base Metals (Violamac Mines Limited)

(49° 117° N.E.) Violamac Mines Limited has under option this group of claims adjacent to the Victor property. The adit that was started in 1961 was continued along the vein to a point 1,384 feet from the portal. The advance for the year was 350 feet. The vein was explored above the level by driving two short raises and subdrifting along the vein. The total development was 498 feet: raising, 126 feet; drifting and crosscutting, 372 feet. Two men were employed for six months.

SLOCAN LAKE*

Silver-Lead-Zinc

Mammoth (Loma Minerals Limited)

(49° 117° N.E.) Company office, 801 Fina Building, 736 Eighth Avenue Southwest, Calgary; mine office, Silverton. D. W. Hilland, president; R. T. Avison, mine manager; C. Towgood, mill superintendent. This company had under lease the holdings of Western Exploration Company Limited, in the Silverton area.

Development consisted mainly of 150 feet of drifting and 400 feet of raising on No. 9 and No. 10 levels. Production was from the 970 stope area immediately below the No. 9 level. Additional ore was found on the No. 10 level at the junction of the Mammoth and Buffalo shears. The ore was trucked from the mine to the concentrator at Silverton. The concentrator operated on a one-shift basis for a total of 185 days. A total of 7,506 tons of ore was treated—6,494 tons from the Mammoth, 1,012 tons of lessee ore, of which 625 tons came from the Hewitt, 345 tons from the Enterprise, and 42 tons from the Bosun. A total of fifteen men was employed, twelve of whom worked at the mine and three at the mill.

Operations were closed on October 22, 1962, when a new company, Johnsby Mines Limited, acquired all interests of the Western Exploration Company Limited, at Silverton. The main shareholders in Johnsby are Rayrock Mines Limited and Faraday Uranium Mines Limited. The crew from the Mammoth transferred to Johnsby to work on an extensive development programme on the Standard-Mammoth lode.

Hecla (Johnsby Mines Limited)

(49° 117° N.E.) Company office, 509, 25 Adelaide Street West, Toronto; mine office, Silverton. J. C. Byrne, president; R. C. Phillips, project engineer; R. T. Avison, mine superintendent. This company was formed in November, 1962, as a result of an agreement between Western Exploration Company Limited, Rayrock Mines Limited, and Faraday Uranium Mines Limited. The Standard-Mammoth group of claims, including all the ore reserves developed by Loma Minerals, have been acquired by Johnsby Mines Limited.

* By J. D. McDonald.

An exploration drive is planned to investigate the Standard-Mammoth lode system, starting about 500 feet above the inner workings of the Standard No. 5 level and passing about 850 feet below an ore zone on the Hecla claim. The ultimate objective is a connection with the Mammoth No. 12 level, which is about 200 feet higher than the new drive. The entire project involves several thousand feet of underground work. The adit for the Hecla drive, as it is called, is above the Standard No. 5 level at an elevation of 4,170 feet, on the Surprise Crown-granted claim. Access to the adit is by 1 mile of new road which leaves the old Standard camp at No. 5 level.

The mine plant and surface installations were started in October and completed early in December. Power was brought to the plant by a 2,300-volt transmission-line from the old Standard line. A 7- by 8-foot drift was started in December and is being driven north 65 degrees east toward the Standard-Mammoth lode. Drift footage at the end of 1962 was 260 feet. A crew of fifteen men was employed for two months; six were employed underground.

Bosun (New Santiago Mines Limited) (49° 117° N.E.) Company office, 511, 850 West Hastings Street, Vancouver 1. R. Crowe-Swords, president. Capital: 3,000,000 shares, 50 cents par value. The Bosun mine is on the east shore of Slocan Lake, 1½ miles south of New Denver on the Nelson–Nakusp highway. W. H. MacLeod, of Silverton, did some development work off the winze which was sunk previously. A small amount of stoping was done on the vein. A total of 42 tons of ore was shipped to the Western Exploration mill.

Hewitt (Kopan Developments Limited).—(49° 117° N.E.) Company office, 906, 11 Adelaide Street West, Toronto. W. W. Dennis, president. Lessees F. Pho and J. Hichert continued mining below the No. 10 level. A short shaft was sunk and the ore was hauled to the Western Exploration mill. The total ore treated was 625 tons.

Enterprise (49° 117° N.E.) F. Pho and J. Kelly, of Silverton, leased this mine and operated it for five months. The mine is on Enterprise Creek, 8 miles by road from the Slocan City–New Denver highway. Operations ceased in November. The ore was hauled to the Western Exploration mill. The total ore treated was 345 tons.

SPRINGER CREEK*

Silver

Anna (Silver King Mines Limited) (49° 117° N.E.) This group of five claims is owned by Silver King Mines Limited; mine office, Slocan City. B. Marasek, president and manager. The property is on the northern side of Springer Creek, adjoining the Ottawa mine on the east. It is accessible by 5 miles of good road from Slocan City.

B. Marasek and one man worked on the property for eight months. The ventilation raise from No. 4 level to No. 3 level was completed, a total distance of 120 feet. Diamond drilling consisted of nine holes with a total footage of 940 feet. A 40-foot crosscut was driven to explore the shear. Two tons of ore was shipped to the Trail smelter.

* By J. D. McDonald.

Ottawa (Ottawa Silver Mines Limited) (49° 117° N.E.) Company office, 19 North Bernard Street, Spokane, Wash.; mine office, Slocan City. T. C. Hughes, president; C. Thickett, mine manager. This mine is accessible by 5 miles of good road from Slocan City. The company started a development programme in March. A ventilation raise was driven from No. 8 level to No. 6 level, a distance of approximately 470 feet, following the dip of the vein. In driving the raise, several lenses of very high-grade ore were opened up. Some outstanding specimens of native silver were observed. The ventilation in the mine is now good. On completion of this raise two small stopes were developed. Drifting on No. 9 level was started on a one-shift basis. This drift is being driven along the Ottawa shear, to explore the shear and to intersect the downward extension of the vein on No. 8 level. A total of 500 feet of drifting has been done, 200 feet in 1962.

An average crew of twelve men was employed for ten months. A total of 740 tons of ore was shipped to the Trail smelter.

Slocan Prince (49° 117° N.E.) This group of Crown-granted claims is owned by J. K. Pearson, 1728 Thirteenth Street Southwest, Calgary. The property is at the head of Springer Creek and is accessible by 11½ miles of road from Slocan City. Pearson and one man did a considerable amount of stripping on the vein, with the idea of trying open-pit mining. A total of 257 tons was shipped to the Trail smelter, 4 tons of which came from the Bank of England claim.

CRESTON*

Silver-Lead-Zinc

Liz B (49° 116° S.E.) This property consists of eight recorded claims owned by Mrs. E. Barclay, of Nelson. It is at 3,100 feet elevation on Wildes Creek, 2 miles north of Wynndel. Mineralization occurs in limestone which dips steeply to the east and strikes north 35 degrees east. The footwall and hangingwall rocks vary from schist to limy schist. This series of rocks can be traced from the Kootenay Bay–Creston highway up the hill along the strike for 1½ miles, and mineralization is noted in some exposed sections of rocks.

The main mineral showings occur on the Liz B claims, a distance of 1,000 feet along strike. The predominant minerals are fine-grained and very light-coloured sphalerite, fine-grained pyrite, and minor galena. Fairly abundant sphalerite can be observed in cuts across the mineralized showings.

Seven diamond-drill holes have been drilled on the property. Newmont Mining Corporation of Canada Limited drilled five holes in 1954, four of which cut mineralized zones down dip. Sheep Creek Mines Limited optioned the property in the fall of 1961 and completed their second drill-hole in January, 1962. The option was dropped in the spring of 1962.

MOYIE†

Gold-Silver

Midway (Moyie Mines Limited) (49° 115° N.W.) This property is near No. 3 highway, 5 miles southwest of Moyie. It comprises sixteen mineral claims which were optioned or located by the company in 1962 for exploration, and includes two long adit levels which have been driven in past years. A detailed description of the property is included in the 1933 Annual Report.

* By J. D. McDonald.
† By D. R. Morgan.

The two adit levels were rehabilitated in 1962, and two short raises were driven between the levels. Two small shipments of development muck were sent to the Trail smelter. Other activities were directed to the repair and construction of an ore-bin and compressor-house on the surface, and a short access road was built from the highway to the portal of the upper adit. Two men were employed for six months. The property has been inactive since October, 1962.

Silver-Lead-Zinc

St. Eugene, St. Eugene Extension, Aurora

(49° 115° N.W.) This property is directly south of Moyie, and is adjacent to No. 3 highway. It consists of twenty-three Crown-granted claims owned by The Consolidated Mining and Smelting Company of Canada, Limited, and eighty-one Crown-granted claims owned by the St. Eugene Mining Corporation. The property lies astride the lower Moyie Lake and includes the old St. Eugene mine area. The two companies conducted a joint exploration programme in 1962, which included geological mapping and the drilling of three diamond-drill holes totalling 5,129 feet on the east side of the lake. The drilling was done by contract under the supervision of R. G. Gifford, Cominco geologist. A maximum crew of eight men was employed on the property.

KIMBERLEY*

Silver-Lead-Zinc

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

(49° 115° N.W.) Company office, Box 1510, Station B, Montreal 2; W. S. Kirkpatrick, president. Western headquarters, Trail; D. D. Morris, vice-president and general manager. Sullivan mine office, Kimberley; S. M. Rothman, general superintendent; R. M. Porter, mine superintendent; H. J. Chalmers, Chapman Camp, superintendent, Sullivan concentrator. The Sullivan mine is on Mark Creek, 2 miles north of Kimberley, and the concentrator is at Chapman Camp, 2 miles south of Kimberley. The holdings include 678 Crown-granted claims and fractions. The following report prepared by the management is a synopsis of the operations.

" During 1962 the mine produced and the concentrator treated about 2,583,000 tons of ore. One major pillar blast of 1,078,000 tons was made in February, 1962.

"Approximately 10,100 tons of slag were loaded and shipped to Trail from the old smelter site at Marysville, B.C.

" Installation of the new 2500-level crushing plant and a 1500-foot hoisting conveyor were completed in June, 1962, to handle production from below the 3050 level. Stope production was started on the 2850 level in the latter half of the year. A new underground hoist for the No. 32 shaft was put into service early in the year.

" The total development footage was 36,910 feet. This included drifting on the new 2600 and 2700 levels, stope development on the 2850 level and development in new ventilation circuits to No. 31 and No. 39 shafts.

" The total backfill placed was 617,928 cubic yards. This consisted of 405,393 cubic yards (66%) of planned cave, 203,315 cubic yards (33%) of float rock placed in 8 stopes below the 3900 level, and 9,220 cubic yards (1%) of development waste. The float rock placed included 91,452 cubic yards to which 5% iron

* By D. R. Morgan.

sulfide had been added and 111,863 cubic yards to which no iron sulfide had been added.

" The ventilation system supplied fresh air and exhausted 900,000 c.f.m. of air. A new exhaust shaft was put into operation to supplement 3900 level circuits and to service dumps and transfers below the 3900 level.

" Experimental work included noise suppression by using rubber mufflers on stopers, and the spark-erosion method of sharpening tungsten carbide bits. The use of Nitro-Carbo-Nitrate as a blasting agent increased in 1962 and a surface blending plant was constructed and put into operation late in the year.

" The Sullivan mine had 22 lost-time accidents in 1962 including two fatalities. There were no lost-time accidents at the Sullivan Concentrator for the second consecutive year. Accident frequency rate at the mine was 14.1 accidents per million man-hours worked and the severity was 1,299 days lost per million man-hours worked or a total time loss of 1,939 days.

AN/FO explosive factory at the Sullivan mine. (Cominco photo.)

"At the mine, No. 1 Shaft Section, employing about 130 men, reached 1,094 calendar days (867,638 man-hours) without a lost-time accident. The Surface Section, employing about 280 men, reached 412 calendar days without a lost-time accident.

" Ten Sullivan mine and concentrator employees obtained or renewed their Industrial First Aid certificates. Ninety-nine employees passed St. John's First Aid examinations. A Sullivan mine team won the East Kootenay First Aid competition and another Sullivan mine team won the Department of Mines Cup for the East Kootenay Novice First Aid competition. Eight employees obtained their Mine Rescue certificates, making a total of 287 since 1930.

" The concentrator operated 258 days during 1962 at an average of 10,012 tons of ore per day. Employees at the year-end totalled 771 at the mine and 358 at the concentrator."

Lead-Zinc

Western Exploration (Reeves MacDonald Mines Limited)

(49° 115° N.W.) Head office, 410 Metropolitan Building, 836 West Hastings Street, Vancouver 1; mine office, Remac. L. M. Kinney, Metaline Falls, Wash., general manager; F. R. Thompson, superintendent. This property lies between the headwaters of the east fork of Mark Creek and Mather Creek. It is 10 miles north of Kimberley, and can be reached by an old forestry road leading from the open-pit area of the Sullivan mine. The property comprises 110 Crown-granted claims which have been optioned from Western Exploration Company Limited, of Silverton, and six mineral claims held by record, at the north end of the group.

A crew of four men slashed and cleared 6,300 feet of line for an electromagnetic survey, and drilled four diamond-drill holes totalling 2,161 feet during the period June 22nd to October 12th. The work was done by contract, under the direction of Roy Anderson, chief engineer of the Pend Oreille Mines and Metals Company, of Metaline Falls.

WASA*

Silver-Lead-Zinc

Estella (Copper Soo Mining Company Ltd.)

(49° 115° N.W.) Registered office, 150 Marine Building, 355 Burrard Street, Vancouver 1; mine office, Wasa. A. G. DesMazes, president, Penticton; T. G. Wilson, managing director, Osoyoos; H. Hill & L. Starck & Associates Ltd., Vancouver, consultants. This property is near the headwaters of Tracey Creek, 10 miles north of Fort Steele. It is at an elevation of 6,000 feet, and can be reached by an 18-mile road leading from the valley at Wasa. The property was formerly operated by the United Estella Mines Limited, but was abandoned in 1955 when the company went into liquidation.

The present company acquired an option to purchase the Estella claims in the summer of 1962. The group consisted of twelve Crown-granted claims and an additional eight claims held by record. An additional forty-two mineral claims were staked and recorded on the south and north side of the optioned group. Since that time the Copper Soo Company has purchased the optioned group and received title to the whole property.

The present company initiated an exploration programme at the mine in late September, and both the Estella and Rover levels were rehabilitated. Some 397 feet of crosscutting, drifting, and raising were completed in the vicinity of the No. 2 surface shaft, and an orebody ranging from 3 to 5 feet thick has been exposed. This will be further investigated. The operation was closed on December 4th and is expected to be reopened in the early part of 1963.

A maximum crew of eleven men was employed on the property, and a trailer camp was established near the Estella portal. A number of buildings which were suitable for workshops and housings for compressors and other machinery on the surface were repaired. The underground work was done under contract.

* By D. R. Morgan.

WINDERMERE

Toby Creek (50° 116° S.E.)*

Silver-Lead-Zinc

Mineral King (Sheep Creek Mines Limited)

Company office, 6, 490 Baker Street, Nelson; mine office, Toby Creek. J. R. Pyper, president; J. S. McIntosh, managing director; J. B. Magee, resident manager. This mine is at Toby Creek, 28 miles southwest of Athalmer. It is in a mountain ridge between Toby and Jumbo Creeks, and is entered by four levels, three of which, numbered 2, 3, and 7, have been driven at various elevations from the Toby Creek side, and the other, No. 9 level, has been driven from the Jumbo Creek side. There are also four intermediate levels, Nos. 4, 5, 6, and 8, which do not extend to the surface. The mine is operated by the open-stope method, and the workings are in four irregularly shaped orebodies known as the " A," " B," " C," and " D " zones.

The mine produced 212,412 tons of lead-zinc ore in 1962, most of the ore being mined from the stopes above No. 4 level. The ore was developed and mined from the " A," " C," and " D " zones on all the levels between No. 2 and No. 7. Total development included 3,707 feet of drifting and crosscutting, 1,941 feet of raising, and 29,774 feet of diamond drilling. New development during 1962 included the driving of No. 7, the main haulage level, to the north. No. 9 level, which was started in 1961 at a lower elevation than No. 7 level, was connected to the No. 7 level by raises. Further development is in progress on No. 7 and No. 9 levels, and an intermediate level known as No. 8 is being driven between the two levels. Regular ore deliveries are expected from No. 8 and No. 9 levels shortly.

A detailed description of the deposit is included in the Annual Report for 1959. Since 1959 considerable geological information has been obtained from drilling and from the new drifts and crosscuts. The orebodies are replacements of dolomite on the eastern limb and in the trough of a complex tight syncline. The axial plane of the syncline dips steeply to the west, and the axis plunges at variable angles to the north and northwest. The syncline has coarse conglomerate in the trough and fine-grained massive dolomite on the limbs. A lenticular body of grey argillite locally separates the dolomite from the conglomerate. Lenses of dolomite occur also beneath the dolomite along the upper contact of dark-grey slates of the Dutch Creek Formation. The rocks themselves give little evidence for the synclinal structure, but extensive drilling and mining has outlined the over-all form of the rock units.

The orebodies are in the dolomite, the thickness of which varies from place to place and in general is a few hundred feet. The orebodies mined recently have a wide variety of forms. The largest are pipe-like and steeply plunging. Others are tabular and apparently follow steeply dipping shears or fractures. Some ore is found along cross joints more or less perpendicular to the plunge of the syncline, and in other places ore is in trough-like structures parallel to the fold. Exploration and development is closely guided by diamond drilling.

During 1962, 3,742 tons of barite was produced mainly from the " C " and " D " zones above No. 3 level. The reserves in this area are rapidly nearing depletion, and future shipments will be restricted to the lower levels. The barite is sold in the crude state. It is trucked to Invermere for shipment by rail.

The mine was ventilated by both mechanical and natural means. Approximately 29,000 cubic feet of air per minute was exhausted from the workings, and of this quantity 18,000 cubic feet per minute was supplied by a 15-horsepower elec-

* By D. R. Morgan and J. T. Fyles.

trically driven fan which is located in the No. 2 intake airway. The remainder was by natural means. This quantity was found to be sufficient for the requirements of the workings.

The concentrator operated throughout the year and produced 17,780 tons of zinc concentrates which averaged 57.1 per cent zinc and 6,711 tons of lead concentrates averaging 68.5 per cent lead. There were no major changes in the concentrating method, and the concentrates were trucked to Invermere for shipment by rail. New surface construction during 1962 included the building of an ore-bin and roads and dumping facilities at the portal of No. 9 level at Jumbo Creek.

The maximum number of men employed at the mine was 100, of whom fifty-eight were employed underground.

RUDDOCK CREEK*

Lead-Zinc

IT and IN (Falconbridge Nickel Mines Limited)

(51° 118° N.W.) Exploration office, 1112 West Pender Street, Vancouver 1. Alex. Smith, manager; H. R. Morris, geologist in charge. The Ruddock Creek property is about 60 miles northwest of Revelstoke and consists of the following groups of claims held by record: IT, sixty-eight claims; IN, twenty claims; and TO, fourteen claims. The claims are on Gordon Horne Peak, a 9,500-foot summit between the head of Ruddock Creek, which flows east into the Columbia River, and Oliver Creek, which flows north and west into Tumtum Lake.

The claims cover lead-zinc mineralization in a calcareous layer in the schists and gneisses of the Shuswap terrain. On Gordon Horne Peak the schists and gneisses dip gently to the southwest, more or less parallel to the slope of the hill. In 1962 a total of 4,246 feet of diamond drilling was done, trails were cut, and geological mapping was carried out. A crew of twelve men was employed under the direction of H. R. Morris. A helicopter based near Revelstoke was used for transportation to the property as well as for servicing prospecting crews in the general area.

SKAGIT RIVER

Nickel-Silver-Copper

Mammoth (Foundation Mines Ltd.)†

(49° 121° S.E.) Company office, 202, 736 Granville Street, Vancouver 2. R. J. MacKinnon, chairman and property manager; N. Mussallem, president. Capital, 3,500,000 shares. The company controls twenty-five recorded claims, including the Mammoth, Diamond, B.B., Star, Ruby, and Heart groups. These are at the old "23-mile camp" near the confluence of Sumallo River and Skagit River, 23 miles by road from Hope.

Recent work has been concentrated on the Mammoth Nos. 1 and 2 claims. These are on the north side of Sumallo River, close to the Hope–Princeton highway. Mineralization was discovered here in 1911, and the claims have been held by the present company since 1955. Some diamond drilling was done in 1955, and prospecting and geological mapping in 1961. The claims are underlain mainly by altered volcanic and sedimentary rocks of the Hozameen Group. A zone believed to consist of ultrabasic rocks contains pyrrhotite, and samples and drill cores of this material have indicated a low nickel, silver, and copper content. According to samples taken by the company, the nickel content of the mineralized zone is usually within the range 0.02 to 0.70 per cent.

* By David Smith.
† By A. R. C. James.

In 1962 three holes were diamond drilled, totalling 350 feet. A small change-room and dry was completed, and trails were improved.

Copper

D & J (Silco Development Company Ltd.)*

(49° 121° S.W.) P.O. address, c/o Fernand Lemieux, Box 768, Hope. The property comprises six Crown-granted mineral claims held in the names of W. R. Corbett, E. J. Corbett, and Fernand Lemieux, all of Hope, and six recorded mineral claims held in the name of Silco Development Company Ltd. It is on the west bank of the Skagit River 23 miles east of Hope and about 1 mile south of the Hope–Princeton highway.

The property is one of several which were known collectively in the early years of the century as "23-mile camp." As the "Diamond Group," "Bell Group," and "Silver Bell," it is described in Geological Survey of Canada Summary Reports, 1911, page 122; 1920, Part A, page 39; 1922, Part A, page 122; and in Annual Reports, 1915, page 265; 1923, page 164; and 1938, page F-11.

The rocks are cherts, volcanic rocks, and subordinate limestone of the upper Palæozoic Hozameen Group. The sediments are intruded by numerous andesitic sills and dykes. The bedding strikes fairly uniformly north-northwest and dips from about 30 degrees to vertical, both eastward and westward.

Mineralization is chiefly pyrrhotite and chalcopyrite with minor sphalerite and occasional stringers of arsenopyrite; galena has been reported. The sulphides occur as fillings in four sets of fractures with the following average attitudes: Strike north 40 degrees west, dip 80 degrees northeast; strike north 10 degrees west, dip 75 degrees west; strike north 75 degrees west, dip 85 degrees south; and a weaker set, mineralized predominantly with sphalerite, striking north 50 degrees east and dipping 80 degrees northwest. The mineralization is found in all rock types, including the andesite intrusives.

The workings consist of a number of trenches and open cuts extending from an elevation of 2,200 feet on the D and J No. 3 claim to 3,600 feet on the D and J No. 5 claim. The elevation of the Skagit River valley here is about 2,000 feet. All but two are small showings with little indication of continuity.

The lowest of the two principal showings is on the D and J No. 3 claim at an elevation of 2,400 feet. It consists of skarn and sulphides in a zone about 20 feet wide striking north 20 degrees west and dipping steeply northeastward. The strongest mineralization is in a fine-grained well-silicified bed or sill within the zone and about 10 feet thick; the rock shows considerable green amphibole in hand specimens and possibly is an altered andesite. A series of trenches exposes the continuation as a rusty zone for a distance of about 180 feet northwestward; sulphides diminish progressively, the zone weakens, and the strike swings to more nearly north-south. The zone is fractured on the following planes: Strike north 20 degrees west, dip 80 degrees west; strike north 5 degrees west, dip 45 degrees east; and strike north 30 degrees west, dip 75 degrees northeast. Southeast of the lowest showing the mineralization strikes toward a dry gully in which is exposed, about 250 feet higher in elvation, a 10- to 15-foot mineralized shear striking north 70 degrees west and dipping 75 degrees southwestward. This is the highest showing. It is possible that the fracturing of the principal showing is subsidiary to this shear.

* By N. D. McKechnie.

HOPE*

Nickel-Copper

Pride of Emory (Giant Mascot Mines Limited) (49° 121° S.W.) Company office, 844 West Hastings Street, Vancouver 1; mine office, P.O. Box 820, Hope. W. Clarke Gibson, president; H. Hill & L. Starck & Associates Ltd., consulting management engineers; F. Holland, mine superintendent; C. Coffey, mill superintendent; O. G. Gilroy, surface superintendent. The property is at the head of Stulkawhits (Texas) Creek, which flows eastward into the Fraser River about 6 miles north of Hope. From a point on the Trans-Canada highway 10 miles north of Hope, a good gravel road 5.1 miles long leads up Stulkawhits Creek valley to the mill and surface buildings at the 2600 adit portal, the adit number being the elevation above sea-level.

The Pride of Emory showing was found in 1923 by Carl Zofka, and since that time development and production have been carried on by several different companies. A short review of the history of the property is contained in the Annual Reports for 1959 and 1961.

The ore occurs in a number of separate orebodies, the principal ones being the Pride of Emory, the Brunswick Nos. 1, 2, 5, and 7, and the 2663. The orebodies are steeply plunging pipe-like deposits and occur in an irregular stock-like intrusion of ultrabasic rocks approximately 1½ square miles in area. They comprise disseminated and massive sulphides, of which pyrrhotite, pentlandite, and chalcopyrite are the most common. The mine is developed from two adit levels—the 3550 level, with portals on both the west and east side of the mine, and the 2600 level, which is the main haulage level. An ore-pass and an internal inclined shaft joins the two adit levels. Three other levels at 3,400, 3,250, and 2,950 feet elevation respectively have been developed from the inclined shaft. The ore is mined by horizontal and vertical long-hole blasting. The ore is drawn off by slusher scram drifts and mucking-machine draw points and either trammed or scraped into the main ore-pass. At the 2600 level it is loaded into 6-ton Granby cars and hauled to surface by trolley locomotive. During the year a by-pass was driven around the 2600 shaft station, and a second chute was installed in the ore-pass. This has resulted in increased loading efficiency.

The following is a summary of mining and development in 1962:—

	Ft.
Drifting and crosscutting	2,665
Raising	3,452
Diamond drilling (EX core)	33,376
Long-hole drilling (blast-holes)	209,206

During the year the Brunswick No. 1 orebody was developed and brought into production between the 3400 and 3550 levels. On the 3250 level, crosscutting to the Brunswick Nos. 2, 5, and 7 orebodies was completed, and these orebodies were developed and brought into production above this level. Crosscuts to the Pride of Emory and the 1600 orebodies were started on the 3250 level. On the 2950 level a crosscut was driven to the Brunswick No. 2 orebody, and this orebody was developed and brought into production between the 2950 and 3250 levels. On the 2600 level a crosscut has been started to intersect the Brunswick No. 2 orebody, and a raise was started in the 2663 orebody. In the course of development in 1962, substantial reserves of ore were proved up in the Brunswick No. 2 orebody.

* By A. R. C. James.

In the second half of 1962 the use of a commercial form of AN/FO was extended to a major proportion of long-hole blasts. The management reports that considerable efficiencies, especially in handling, are being realized, as compared with the use of conventional explosives. For major blast-hole loading operations, two C.I.L. blast-hole chargers are connected up in tandem so that continuous loading can be effected. The Amex prills are blown through as much as 500 feet of hose with a possible vertical lift of 250 feet. Loading is controlled by the loader by means of an electrical signalling system. A three-man crew has loaded in excess of 5,000 pounds of Amex in an 8-hour shift under these conditions. A total of 54,000 pounds of Amex was used for long-hole blasting in 1962, together with 100,000 pounds of 75 per cent Forcite.

On the surface the changes at the crushing plant begun in November, 1961, were completed in 1962. These were designed to increase milling capacity to 1,500 tons per day. The main water system was improved, and a compressor cooling-water tank installed. In November the main mine road and part of the mill and crushing plant were extensively damaged by flood water from an unusually severe rain.

The mill continued to produce a bulk nickel concentrate, which is supplied to Sumitomo Metal Mining Company Ltd. in fulfilment of a three-year contract. The concentrates are trucked from the property to Vancouver Wharves Ltd. bulk-loading plant at North Vancouver by two Mack truck-trailer units. In 1962 a total of 311,443 tons of ore was milled, a 17-per-cent increase from 1961. A total of 19,900 tons of bulk concentrate was shipped, containing 3,950,531 pounds of nickel and 1,806,437 pounds of copper. The crew in December comprised 153 men (including staff), of whom seventy-nine were employed underground.

Silver

Eureka Victoria (Tru-West Explorations Ltd.)

(49° 121° S.W.) Company office, 3925 Myrtle Street, Vancouver. W. Ferguson, president; J. Knopp, manager. This company controls four Crown-granted claims (including the two oldest in the Province) and twenty-two recorded claims on Silver Peak, 5 miles due south of Hope. The showings are at an elevation of 5,700 feet in rugged terrain. For a short period the property acquired some fame as one of the first producing lode mines in the Province, and high-grade silver shipments were made in the years 1868 to 1874. Little work has been done on the property since, except for an adit which was driven in 1925.

The property is reached by turning west off the Skagit road near Silver Lake and following a series of logging-roads up the mountain. These roads terminate at an elevation of 4,100 feet, and from here it is necessary to climb on foot to the showings.

The company worked intermittently in 1962. In February and March a small temporary camp comprising a bunk-house and cook-house was established near the end of the road at 3,900 feet elevation. A crosscut adit was started at an elevation of 5,200 feet with the object of exploring possible extensions at depth of the surface mineralization. This crosscut was driven 230 feet, and 225 feet of raise was driven from a point near the face. A small aerial tram-line was installed in June to haul to and from the portal at 5,200 feet elevation to the end of the road at 4,100 feet elevation. A crew varying from two to three men was employed intermittently.

HARRISON LAKE*

Copper-Gold

Lucky Jim, Seneca, Harrison Group

(49° 121° S.W.) This group of thirty-one claims on the east side of the Chehalis River is held by record by Isaac Miller, of White Rock, and associates. The road up the Chehalis Valley turns northwestward from the Morris Valley road 4.3 miles from the Mission–Agassiz highway at Harrison Mills. The mine-road turnoff is 1.7 miles from the Morris Valley road. The showings are at an elevation of about 900 feet.

In 1961 an open pit was made on a showing of copper mineralization, and an adit 470 feet long was driven eastward toward the open cut and about 45 feet lower in elevation. Some diamond drilling was done, but the cores were not available at the time of the writer's visit. (*See* Table XIV for shipment.)

The claims are underlain by the Middle Jurassic volcanic rocks of the Chehalis Formation. Southwest of the Chehalis River these rocks are in contact with Coast Range intrusive rocks.

The rocks are amygdaloidal and massive andesites with lenses of agglomerate. The agglomerate has fragments up to about 1 foot diameter of thin-banded tuff, grey cherty material, and of andesitic rock. Contacts in the adit strike near north-south and have near-vertical dips. A flow contact north of the portal strikes northwest and dips 65 degrees southwest. A large mass of agglomerate south of the adit strikes about north 70 degrees west and shows widely variable dips.

Mineralization in the adit consists of a number of thin quartz-pyrite stringers striking north 80 degrees west and dipping 45 degrees to 70 degrees southward. A quartz-pyrite vein in agglomerate is exposed 100 feet from the face. It strikes north 30 degrees west and dips 70 degrees southwestward and is about 10 feet wide. A sample of the quartz and pyrite assayed: Gold, trace; silver, 0.3 ounce per ton. In the open pit, which is about 100 feet east of the adit face, a similar quartz-pyrite vein strikes north 80 degrees west and dips 40 degrees northward. The vein walls are andesite on the bench above the pit and are agglomerate in the pit floor. On both sides of the quartz vein, but more pronouncedly on the footwall side, the agglomerate is mineralized with chalcopyrite up to possibly 3 per cent copper. No copper mineralization shows in agglomerate elsewhere, neither in the adit nor in the large area of exposures south of the adit. The copper mineralization is very restricted, and there is no evidence that it may be a faulted segment of a nearby larger body.

HOWE SOUND†

Copper-Zinc

Britannia (Howe Sound Company (Britannia Division))

(49° 123° N.E.) Head office, 500 Fifth Avenue, New York, N.Y.; mine office, Britannia Beach. William M. Weaver, Jr., president; A. D. McCutcheon, manager; A. J. McDougall, general superintendent. Shrinkage, cut-and-fill, filled square-set, sublevel caving, and blast-hole mining methods were used to remove ore from the Victoria, No. 8, and Bluff ore zones. The following is a summary of development work done in 1962:—

	Drifting	Cross-cutting	Raising	Diamond Drilling
	Ft.	Ft.	Ft.	Ft.
No. 8 mine	3,426	976	3,622	....
Bluff mine	1,353	133	2,925	....
Victoria mine	2,629	177	2,589	....
Totals	7,408	1,286	9,136	28,510

* By N. D. McKechnie.
† By J. E. Merrett.

The concentrator milled 501,400 tons of ore, from which 22,556 tons of copper concentrate, 6,969 tons of zinc concentrate, and 9,206 tons of pyrite concentrate were produced. The pyrite was stockpiled, and copper and zinc concentrates were shipped to the Tacoma and Anaconda smelters respectively. Some metallic copper was recovered at the mine and beach leaching plants. Slime-free mill tailing was sold to Lafarge Cement of North America Ltd., to Construction Aggregates Ltd., to Routledge Gravel Ltd., and to Canadian Pozzolan Industries Ltd.

A small grinding and drying plant was installed in an unused building. This plant ground pozzolanic rock shipped from the Quesnel area by Canadian Pozzolan Industries Ltd.

The average number of men employed was 348, of which 210 were employed underground.

TEXADA ISLAND*

Iron-Copper

Texada Mines Ltd. (49° 124° N.W.) Registered office, 626 West Pender Street, Vancouver 2; mine office, Box 35, Vananda. A. D. Christensen, San Francisco, president; B. L. Alexander, general manager; J. Kenneth Halley, chief engineer. This property, comprising eight Crown-granted and twelve recorded claims, is at Welcome Bay, 3 miles northwest of the mine camp at Gillies Bay on the southwest coast of Texada Island.

In March, Temiskaming-Inspiration commenced the underground development at this property under contract. At the end of 1962, 736 feet of shaft sinking, together with stations, loading-pockets, and hoistroom had been completed. The approximate outside dimensions of the shaft are 9 by 25 feet, and where finished has five compartments—two for counterweights, one 6- by 6-foot skip opening, one 6- by 6-foot cage opening, and one 4- by 6-foot manway. Total drifting, including main haulageways, scram drifts, and subdrifts, amounted to 5,036 feet. Total raise driving, including main raises, draw-points, and an ore-pass, amounted to 2,566 feet. In continuing the exploration of the ore zones, 23,648 feet of diamond drilling was done from 100 surface-located drill-holes, while 2,919 feet was done underground in twenty-two holes.

Concurrent with the underground development, a large surface construction programme was carried to completion. This included the erection of a concrete headframe and the installation of two Koepe (friction) hoists with their necessary electrical equipment. Adjacent to the headframe building, a building housing a shaft-house, machine-shop, warehouse, and change-house was completed. A compressor building housing two 3,000-cubic-feet-per-minute compressors was built and put to use. An 80,000-gallon capacity fresh-water supply tank, a heavy-duty machine-shop and warehouse, a welding and electrical shop, and one new and one rebuilt explosives magazine have all been added to the mine plant. Additions to the crushing and concentrating plants included a copper-concentrate storage building, an iron-concentrate radial stacker with its necessary conveyor belts, a 150-foot extension to the crushing-plant tailings-disposal conveyor, and an elevated conveyor to transfer ore from the shaft-head to the mill surge pile. In the camp area two new bunk-houses were constructed, an addition was made to the staff house, and the cook-house was doubled in size.

A total of 1,104,887 tons of ore was mined and 775,805 cubic yards of waste was removed from the open-pit and underground workings. The concentrator milled

* By J. E. Merrett.

1,103,693 tons of ore, from which 601,730 tons of iron concentrate and 5,850 tons of copper concentrate were produced.

Excepting those engaged in the surface construction projects, the company employed an average of 191 men in the open-pit mining operation and in the surface plant. The average number of men employed underground was forty-five.

QUADRA ISLAND*

Copper

Copper Road (50° 125° S.E.) This property consists of fourteen recorded mineral claims held by E. A. Adams, John Adams, Blanche Adams, and Antoinette Adams, all of Campbell River, and four recorded mineral claims held by R. I. Bennett, of Heriot Bay. The Adams claims are leased to Mr. Bennett. It is on the west side of Quadra Island about 2 miles northeast of Deepwater Bay and is connected by road with the ferry terminus at Quathiaski Cove. At about 9 miles north of Heriot Bay a steep logging-road leads one-half mile west and north to the principal showing, which is at the east end of the property.

The property is described briefly in the Annual Reports for 1953, 1960, and 1961. The geology in the vicinity is described in Geological Survey of Canada Summary Report for 1913, pages 58 to 75, accompanied by Map 120A.

The writer's examination was confined to an area about 1,500 by 2,000 feet north and west of the principal showings.

The rocks underlying the claims are dark-green to green andesitic lavas. Amygdaloidal areas contained amygdules of a zeolite and epidote; in one place hematite and chalcopyrite were observed in some of the amygdules. Only one good flow contact was observed; the strike was east-west and the dip 35 degrees north. No limestone or other sediments were seen near the showings. The only intrusive rock seen was a small dyke of fine grained diorite striking north 45 degrees west and dipping 85 degrees south.

A deep ravine trending north 60 degrees west crosses the northeast corner of the property, 1,300 feet due north of the principal showing. It may mark the location of a fault. Limestone is exposed on the northeast side of the ravine near the turnoff from the Heriot Bay road. Along the southwest side of the ravine, north of the showing, numerous epidote-bearing fractures are parallel to the ravine and form a zone about 200 feet wide.

The principal showing is a mineralized shear in andesite, 4 to 5 feet wide, and containing quartz, calcite, bornite, and minor chalcopyrite. The shear strikes north 80 degrees west and dips 80 degrees southward. It is opened by a shallow shaft, water-filled at the time of the writer's visit, and by about 150 feet of trench extending westward from the shaft. Nine hundred feet westward on strike a copper-stained shear is exposed in a road cut, and about 1,000 feet farther a similarly copper-stained shear, here at least 18 feet wide, is exposed in a stripping. Near the footwall of the 18-foot exposure is a quartz-healed breccia up to 2 feet wide. The hanging-wall side of the breccia shows malachite stain, but none was seen in the breccia. No sulphides were seen in the breccia or in the two exposures of the shear. The principal showing and the other two exposures are on line of strike and probably presumably on a single shear zone. The distance from the shaft to the westerly stripping is 2,000 feet.

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* By N. D. McKechnie.

VANCOUVER ISLAND

SAYWARD (50° 125° S.W.)*

Iron

Iron Mike

Office, c/o Caldwell and Hart, R.R. 1, Campbell River. The group consists of seventy claims, held by record, 4 miles southwest of Sayward and 3 miles west of the junction of the White and Salmon Rivers. A small amount of X-ray diamond drilling and bedrock stripping was done by a crew of three men working on various mineral showings.

NIMPKISH LAKE (50° 126° S.W.)*

Iron

Nimpkish, Klaanch (Nimpkish Iron Mines Ltd.)

Company office, Room 419, 404 Granville Street, Vancouver 2; mine office, Camp A, Beaver Cove. S. V. Wines, project manager; H. M. Grenier, mine superintendent; R. W. Bick, mill superintendent. The camp is on Anutz Lake, immediately south of Nimpkish Lake, and the pit is 5 miles farther south, on the southwest bank of Nimpkish River. The crushers are immediately southeast of the pit, and the mill is across the river and adjacent to the Canadian Forest Products Limited railway. Iron concentrate was shipped by this railway to the loading-dock at Beaver Cove.

Open-pit quarrying continued on the Road, East, South, and River pits, the bottom of the River pit being slightly below river-level. Stripping and initial drilling were done in the area of the "A" magnetic anomaly, approximately 1,000 feet northwest of the main pit.

During 1962, 672,008 tons of ore was mined, to produce 362,271 tons of concentrate. In addition, 375,000 cubic yards of waste was removed. Twenty-one diamond-drill holes totalling 2,998 feet were completed in outlining the "A" orebody and in investigating an extension of the ore zone crossing the main road. Fifty-eight men were employed.

HOLBERG INLET (50° 128° N.E.)*

Copper

Holberg Mines Limited

Company office, 823 Vancouver Block, 736 Granville Street, Vancouver 2. P. F. Wishart, manager. This property, comprising forty recorded mineral claims, is on the north slope of Mount Hansen, approximately 2½ miles by road from Holberg at the head of Holberg Inlet, Quatsino Sound. Access is by way of 3,000 feet of newly constructed road from Mile 2 on the airbase road and thence by way of a quarter mile of trail. The mineral showings are scattered occurrences of bornite in greenstone in a small creek and on the north slope of Mount Hansen between elevations of 400 and 600 feet.

In addition to constructing the road, the crew of three men built a base camp and did surface stripping and 270 feet of trenching on the mineral occurrences.

BENSON RIVER (50° 127° S.E.)*

Iron

Empire Development Company Limited

Company office, 1012, 736 Granville Street, Vancouver 2; mine office, Port McNeill. E. C. Oates, general manager; P. W. Billwiller, mine manager. The mine was operated by Mannix Co. Ltd. (company office, 737 Eighth Avenue Southwest, Calgary, Alta.) from May to July, during which period

* By J. E. Merrett.

100 men were employed. All open-pit mining terminated at the completion of the Mannix contract. From August to November eighteen men were employed by the Empire company at the underground operation on the Kingfisher orebody.

In addition to mining 5,653 tons of waste, 82,589 tons of ore was mined from the Merry Widow open pit and 105,781 tons of ore was mined from the Kingfisher underground workings. The concentrator closed in July after having produced 52,280 tons of iron concentrate. The bulk of the ore produced underground was stockpiled at the top of the surface tram-line.

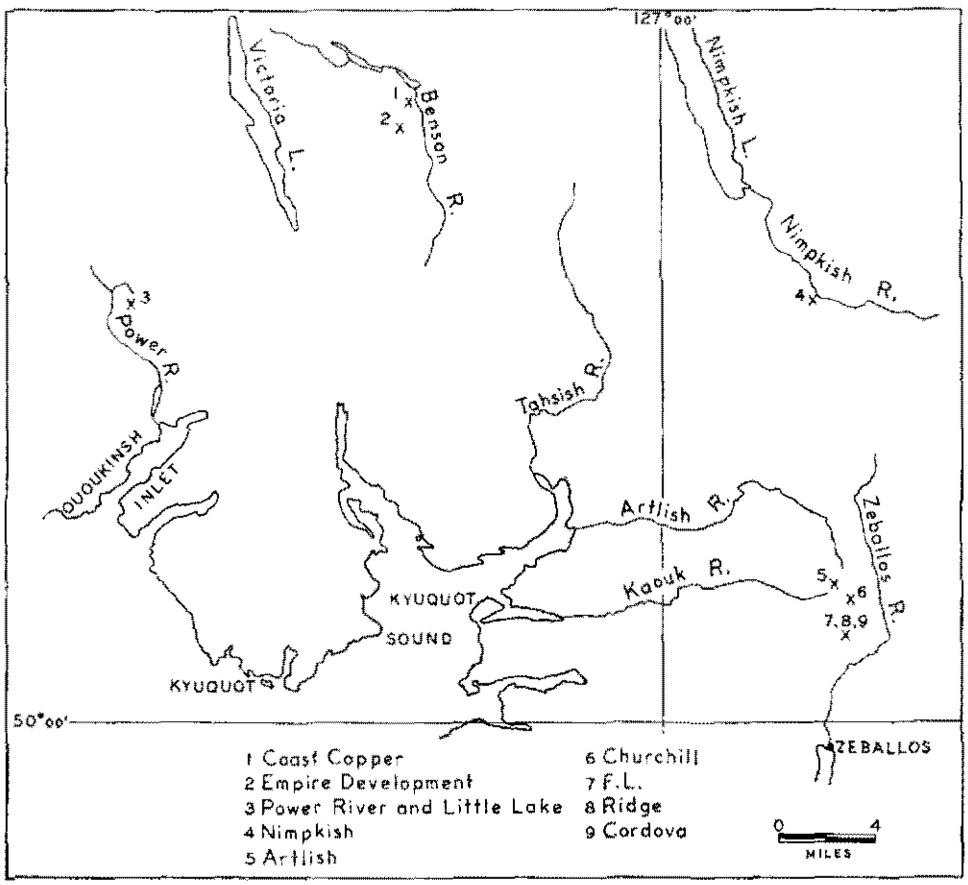


Figure 6. Magnetite properties referred to in north central Vancouver Island.

A magnetometer survey was made in a small area south of the tramway, and 1,786 feet of exploratory diamond drilling was done in six holes.

Copper

Old Sport (Coast Copper Company Limited)

Company office, Tadanac; mine office, Port McNeill. The Consolidated Mining and Smelting Company of Canada, Limited, is principal shareholder and manages the operation. H. G. Barker, property superintendent; R. M. Matson, mine superintendent; J. Giovanetti, mill superintendent. The property comprises forty-eight Crown-granted claims southward from Benson Lake on the west side of Benson River, and adjoins the Empire property on the north and east. Access is by way of a 26-mile gravel road from Port McNeill, where an employee residence townsite is located.

The construction of the 1,800-kw. hydro plant, the mine plant, and the 750-tons-per-day mill was completed in 1962. Test milling operations commenced on August 27th. Work done in underground development included 2,453 feet of cross-cuts, drifts, and subdrifts, 2,404 feet of raises, and 9,771 feet of diamond drilling in seventy-seven holes.

Of the 69,777 tons of ore mined, 66,449 tons was milled. The average number of men employed was 120, of whom thirty-six were employed underground.

Power River (50° 127° S.W.)*

Iron

Power (Rio Tinto Canadian Exploration Limited)

British Columbia office, Suite 818, 726 Granville Street, Vancouver 2. A. Saddler, president; L. B. Gatenby, exploration manager; J. M. Newell, geologist in charge. This company, a wholly owned subsidiary of Rio Algom Mines, holds about sixty-five claims by record athwart the Power River, near the west coast of Vancouver Island (*see* Fig. 6). The property adjoins the Little Lake group of Benjamin and Clement on the northwest. Access is by aircraft landing on Power Lake and by 6 miles of foot-trail up the river to the base camp.

In 1961 a prospecting team employed by the company found magnetite showings northwest of the Little Lake showings and erected a base camp. In 1962 three of these showings, known as the " A," " C," and " B " zones, were geologically and magnetically mapped (*see* Fig. 7). A gravity survey was made of the B zone, and two holes totalling 478 feet were diamond drilled in it. Five holes totalling 1,104 feet were drilled in the A zone. The exploration crew numbered eight, the drilling crew four, and the temporary geophysical crew five. Most of the cost was borne by Japanese interests on a participation basis.

The regional geology is sketchily known from the prospecting. The layered rocks on the east side of the Power River valley and on the lower part of the west side are dark-green basalts that resemble the Karmutsen group. Part way up the west side these basalts are overlain by a band of limestone, 30 to 50 feet thick, that resembles the Quatsino limestone, and this in turn is overlain by tuffs typical of the lower part of the Bonanza Group. Beds in the limestone dip about 50 degrees west, and graded beds near the top indicate that they are right side up. One or both contacts of the limestone are faulted in most exposures, but it is not known whether this is sufficient to account for the extreme thinness of the formation. The basalt and limestone have been intruded by dykes, sills, and small masses of andesite, diorite, and gabbro of unknown affinities. The area has been extensively faulted.

Some magnetite has been found along the poorly exposed base of the limestone, accompanied by epidote and a little garnet in the underlying basalt, but most of the magnetite showings, including the three mentioned above, are lenses along or near faults or shear zones in basalt east of the river. Andesite, gabbro, and diorite dykes give the impression of intruding the magnetite, but in a few places magnetite is found sparsely disseminated in them; it is possible that the magnetite is younger than the dyke rocks, but was, for the most part, unable to replace them. In several of the deposits the magnetite is offset by small cross-faults. The lenses are thus irregular in detail. The magnetite in the lenses is either massive or it contains scattered grains of epidote and pyroxene and small lenses of pyroxene; it usually

* By G. E. P. Eastwood.

contains sparsely disseminated sulphides. Garnet has not been found. Contacts of magnetite with basalt are knife sharp, and the basalt is unaltered. On the other hand, basalt is more or less silicified within a few feet of some of the faults. Only relatively short sections of the faults have associated magnetite, and some additional factors seem to have been involved, such as a roll in the master fault, or intersections with subsidiary faults.

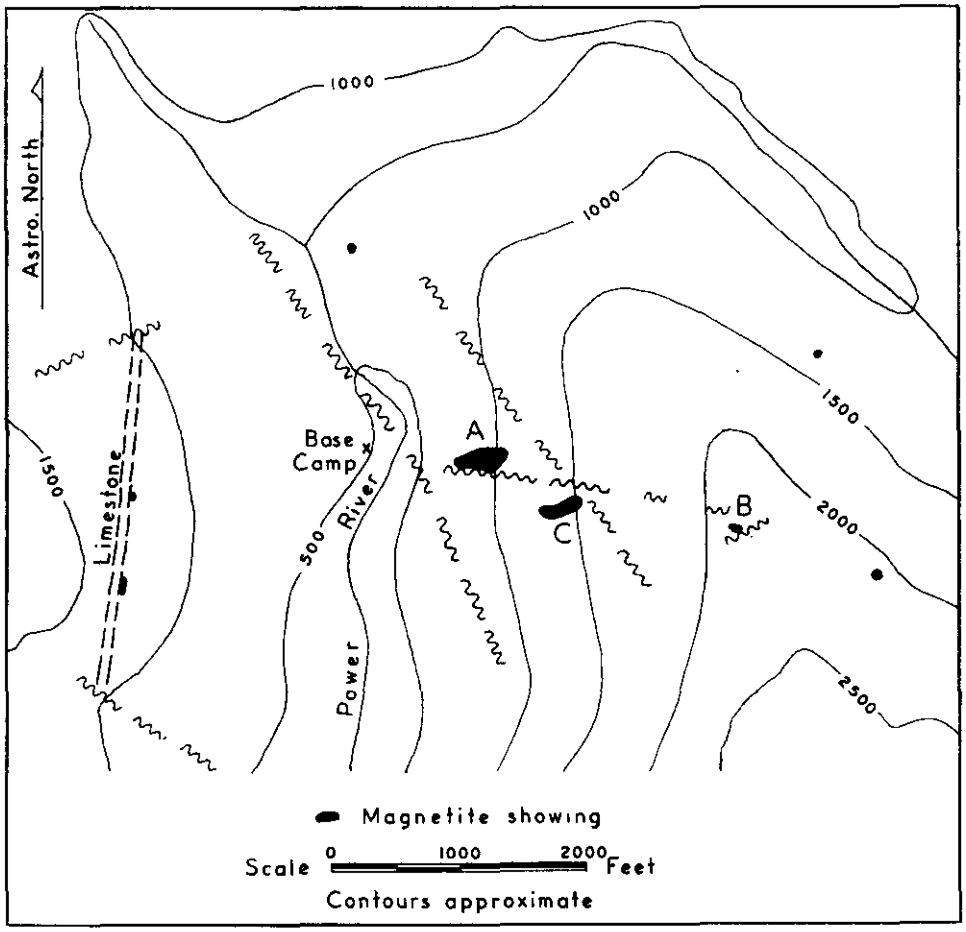


Figure 7. Sketch-map of part of the Power River group—from company maps.

The A, C, and B zones lie in a nearly straight line running slightly south of east from the river at 400 feet elevation, opposite the base camp, to the north nose of a mountain ridge at 2,300 feet elevation. The A zone is shaped like a narrow canoe, with a V-shaped cross-section and a blunt upper end. It lies between 425 and 675 feet elevation and has a slope length of 500 feet. The average width and depth are 60 and 150 feet respectively. The B zone consists of two small bodies of magnetite, respectively 40 and 20 feet across, at 2,300 feet on the ridge. The C zone lies between 800 and 1,100 feet elevation. It consists of magnetite, dyke rocks, and basalt in an irregular pattern, and the over-all dimensions are not meaningful. The quantity of magnetite in it may be slightly more than in the A zone.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1961, p. 100.]

ZEBALLOS (50° 126° S.W.)

Iron

F.L., Ridge, Cordova (Zeballos Iron Mines Limited)*

Company office, Room 504, 850 West Hastings Street, Vancouver 1; mine office, Zeballos. F. C. Shanaman, president; John Lamb, general superintendent; P. M. Stiles, assistant superintendent; A. Jorgenson, pit superintendent; F. W. Robinson, mill superintendent. The company is a wholly owned subsidiary of International Iron Mines Ltd., of which the major shareholder is National Bulk Carriers Incorporated of New York.

The F.L. deposit is covered by the F.L., F.L. No. 2, F.L. No. 3, F.L. No. 4, Extension No. 2, and Extension No. 4 Crown-granted mineral claims. The Ridge deposit is covered by the Extension No. 4 and by the Ridge Fraction recorded claim. The F.L. and Extension claims are owned by Falconbridge Nickel Mines Limited, and Zeballos Iron Mines Limited was mining the F.L. deposit under royalty agreement. In 1962 Zeballos Iron Mines optioned the Churchill group of recorded claims from S. N. Ray and J. W. Foster, the Ridge Fraction from A. Morod, of Zeballos, and the Cordova and Treena recorded claims from H. Sutton, of Zeballos. The Churchill and Cordova-Treena options were dropped.

The F.L., Ridge, and Cordova magnetite deposits are on the steep north slope of the Zeballos River valley, and the Churchill lies 2 miles to the north, on the dividing ridge between the Zeballos and Kaouk Rivers (*see* Fig. 6). The F.L. lies between 2,350 and 2,900 feet elevation, diagonally crossing the canyon of Blacksand Creek, a tributary of the Zeballos River. The Ridge deposit is on the upper west slope of the ridge between Blacksand and Lime Creeks. The Cordova magnetite showings are on the upper Lime Creek slope, a short distance east of the Ridge (*see* Fig. 8). For practical purposes the F.L. orebody is divided into an A zone south of Blacksand canyon and a B zone north of it. An open pit has been established on the A zone, with the main bench at about 2,400 feet elevation.

The F.L. open pit is reached by 5 miles of road from Zeballos to the mill and office at 400 feet elevation on the north side of the Zeballos River, and by 3 miles of steep switchback road up the ridge between Pandora and Blacksand Creeks. An extension of this road crosses Blacksand Creek above the canyon and provides access to diamond-drill sites on the B zone. A foot-trail crosses the canyon at the 2,400-foot bench and leads to the Ridge deposit. The Cordova showings may be reached by foot-trail up Lime Creek, but are now more easily reached by descending from the Ridge.

Ore from the open pit is trucked down to the crusher at 2,100 feet elevation. From the crusher it is carried by surface tram down the ridge between Pandora and Blacksand Creeks to a stockpile at about 800 feet elevation. From the stockpile it is carried by belt conveyor to the mill, where it is split into three sizes. The two coarser sizes pass over dry magnetic separators, the finest over a wet separator. The three concentrates are combined into a lump concentrate between one-quarter and 3 inches and conveyed by belt to a stockpile. From the stockpile the concentrate is hauled in Kenworth tandem trucks to the deep-sea loading-dock in Zeballos.

Ore and waste rock were mined concurrently. The A zone dips west at about 45 degrees into the wall of Blacksand Creek canyon, and a large volume of waste rock has to be removed from the hangingwall. Ore was mined solely from the main, 2400 level, bench. Several subsidiary benches were established between 2,470 and 2,750 feet elevation to facilitate waste removal. In part the waste was bulldozed directly into the canyon over the north end of the A zone; in part it had to be bull-

* By G. E. P. Eastwood and J. E. Merrett.

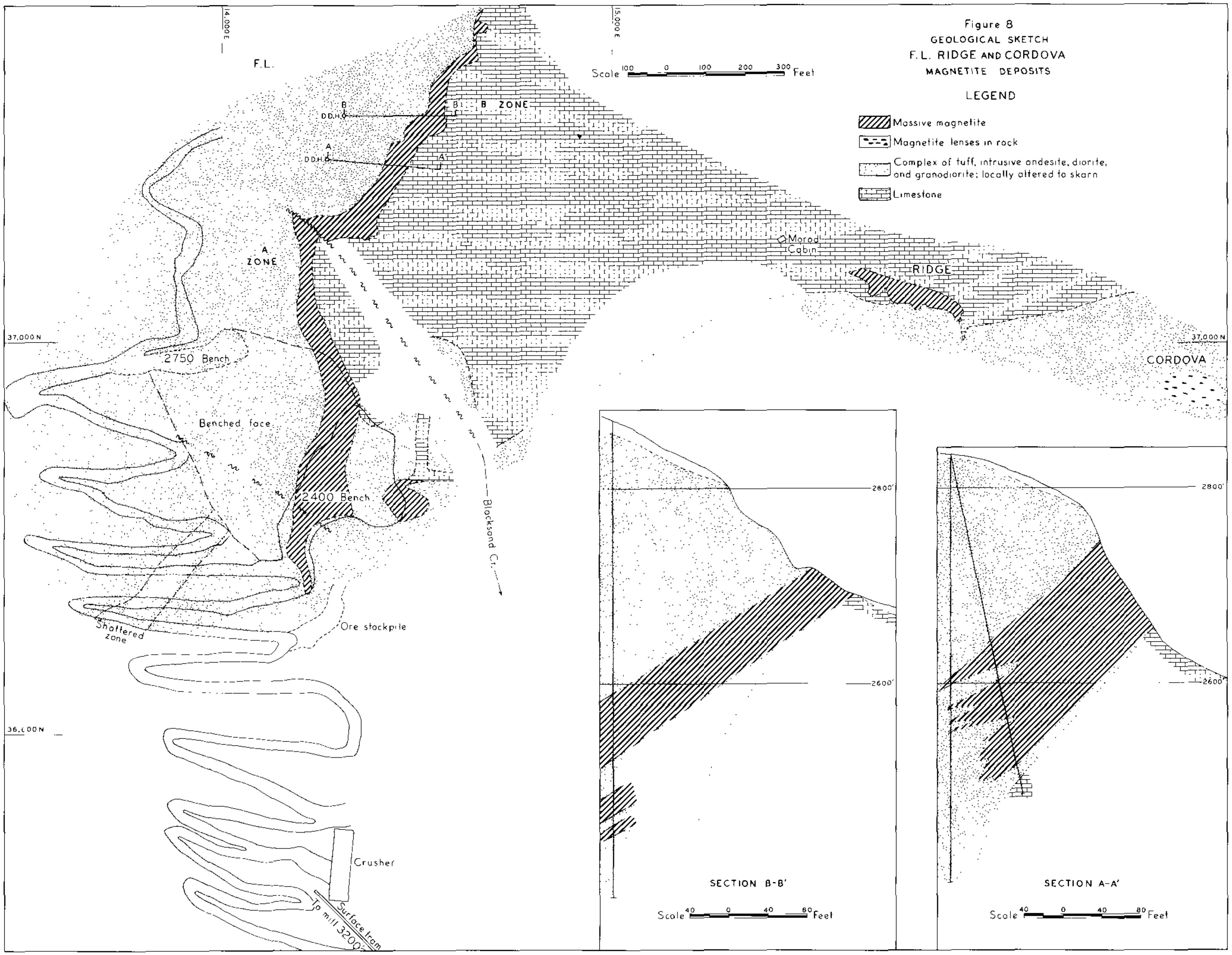


Figure 8
GEOLOGICAL SKETCH
F.L. RIDGE AND CORDOVA
MAGNETITE DEPOSITS
LEGEND
Massive magnetite
Magnetite lenses in rock
Complex of tuff, intrusive andesite, diorite, and granodiorite; locally altered to skarn
Limestone
Scale 100 0 100 200 300 Feet
14,000 E
15,000 E
37,000 N
36,000 N
F.L.
B ZONE
A ZONE
RIDGE
CORDOVA
Morod Cabin
2750 Bench
2400 Bench
Benched face
Shattered zone
Ore stockpile
Blacksand Cr.
Crusher
Surface tram to mill 3200'
SECTION B-B'
SECTION A-A'
2800'
2600'
Scale 40 0 40 80 Feet

dozed onto the 2400 level bench and loaded into trucks for dumping over the outer edge of the bench. A total of 369,289 tons of ore and 687,000 cubic yards of waste was mined. The mill started up in April, and produced 250,397 tons of concentrate in 1962. The first ore ship loaded late in May. On the average, 115 men were employed, and were accommodated in Zeballos. Catering was by Crawley and McCracken Co. Ltd.

Diamond drilling included 1,064 feet in four holes on the south end of the A zone, about 9,500 feet in several holes on the B zone, 1,102 feet in seven holes on the Ridge deposit, and about 300 feet in one hole on the Cordova claim. Dip-needle surveys were made of the Ridge and Churchill deposits.

The regional and local geology have been described by Stevenson and Hoadley.* Briefly, the deposits occur along the contact zone between Quatsino limestone and the Zeballos batholith, where the limestone bulges southwest into the intrusive. In this part of the area the batholith is not a homogeneous body, but rather a complex of diorite and variably recrystallized Bonanza pyroclastics that is further intruded by dykes, stockworks, and irregular small stocks of light-coloured quartz diorite and granodiorite. Toward the south end of the F.L. deposit, at the south corner of the bulge, the limestone is in contact with this complex, but to the north and east it is separated from the complex by a continuous sheath of Bonanza pyroclastics. Hoadley termed the bulge a lobate roof pendant preserved on a cross anticline plunging southwest down the dip of the regional structure. This cross-warp has been modified by local contortion and by faulting.

The relative positions of the F.L., Ridge, and Cordova deposits are shown in Figure 8, together with the generalized rock distribution. For the F.L. the geology is shown in more detail in Figure 1 of Memoir 272, but some modification is necessitated by the recent work. The limestone is more or less recrystallized, and in part bedding has been obliterated. It is intruded by many small dark-green dykes, which are interpreted as an intrusive version of the Bonanza pyroclastics. The Bonanza pyroclastics are massive, fine to coarse grained, and medium to dark green. Bedding is rare. The coarser varieties have distinctly clastic texture even adjacent to the F.L. deposit, and medium-grained varieties show clastic texture south of the Ridge. Amygdules and other features distinctive of lava flows are lacking. It is therefore probable that most of the Bonanza remnants are tuffs. Near the A zone they are intruded and engulfed by small and large bodies of medium- to coarse-grained dark-green diorite that is distinguishable from the coarser tuffs mainly by its interlocking texture. The contacts are gradational, and there has probably been considerable recrystallization of the tuffs as well as widespread intrusion. Northward and eastward along the limestone contact from the A zone the proportion of diorite in the complex decreases considerably. Irregualr dykes and small stocks of white to light-grey granodiorite intrude the tuff-diorite complex, more commonly near the A zone but also near the Ridge and Cordova. In some of the bodies, mafic minerals are confined to the interiors, the border zones being entirely felsic. The largest granodiorite body in the area of Figure 8 is about 100 feet across, but most are 10 feet or less. Intruding both the tuff-diorite complex and the limestone are scattered grey and greenish-grey dykes that Hoadley termed feldspar porphyry, but which are conspicuous more for their needles of amphibole. The relative ages of granodiorite and porphyry are unknown, but from structural considerations it seems likely that the porphyry is somewhat younger.

* Stevenson, J. S.: Geology and Mineral Deposits of the Zeballos Mining Camp, *B.C. Dept. of Mines*, Bull. No. 27, 1950.

* Hoadley, J. W.: Geology and Mineral Deposits of the Zeballos-Nimpkish Area, *Geol. Surv., Canada*, Mem. 272, 1953.

The area of Figure 8 covers the southwest part of the limestone bulge. The detailed structure of the bulge is not altogether clear. In outcrop, limestone beds in the footwall of the B zone dip west to northwest at low to moderate angles, but in diamond-drill hole sections the limestone hangingwall appears to steepen to vertical, and it may be overturned a few hundred feet below the present surface. In the footwall of the north part of the A zone, limestone beds dip gently west or southwest, but on the 2400 level bench bedding is rarely recognizable, and a contact between limestone and tuff-diorite trends east away from the A zone. East of this bench, down the southwest bank of Blacksand Creek, an L-shaped area of limestone occurs in volcanic looking rocks that may in part be intrusive into the limestone. Between Blacksand Creek and the Morod cabin the limestone contact has not been traced and its position is approximate. Around the Ridge deposit, bedding is obscure and the structure is not known in any detail, but it seems reasonably certain that the limestone in general dips south beneath the tuffs. The limestone-tuff contact is generally covered, by overburden or magnetite, but is exposed in two places. In a small cave it dips about 50 degrees south at a point 10 feet below surface; above this point it is overlapped by magnetite. At the east tip of the Ridge deposit, limestone in a small crumple plunges gently south beneath tuffs. East of this crumble the tuff-limestone contact follows a shallow draw over the crest of the ridge and down the Lime Creek slope, and may be faulted.

Several relatively small faults are exposed as narrow shear zones or are inferred from offsets of contacts. Two are shown crossing the F.L. deposit. In addition, several broad, northeast-striking shattered zones are exposed in the road cuts. One of the strongest is shown on Figure 8. They consist of intersecting shear and gouge zones and fractures that isolate blocks of tuff, diorite, and granodiorite. None of them could be traced into ore or skarn. At least some of the faults are post-ore, but the shattered zones may be pre-ore.

The main F.L. orebody is a nearly planar dyke-like body of nearly massive magnetite which in part appears to follow the Quatsino-Bonanza contact on the nose and northwest limb of the bulge. It dips about 45 degrees west and strikes due north in the A zone and north-northeast in most of the B zone. Adjacent to Blacksand Creek structure contours on the hangingwall swing to a northwest strike, reflecting drag on a fault in the creek that has offset the orebody to the right. The A and the south part of the B zone are about 100 feet thick; northward the body tapers to a pinchout. Actually, the orebody transgresses the limestone contact almost everywhere. Toward the south end the limestone contact turns sharply east, but the magnetite body continues south on an essentially constant strike, presumably transecting original bedding in the Bonanza pyroclastics at a large angle. In outcrop the B zone cuts the beds at a small angle, resting on progressively older limestone beds toward the north. Locally it bulges sharply down into the limestone, apparently along concentrations of small andesite dykes. The bulges contain scattered blocks of limestone. Diamond-drill holes show that magnetite passes into the tuff-diorite complex down dip, where it appears to finger out. The limestone contact, as noted above, appears to steepen down dip, so that the magnetite diverges from it. The magnetite seems to have no necessary relation to the limestone, but rather to have been emplaced along a surface of weakness that transected the doubly curving limestone contact. It is not known what this surface may have been. A zone of somewhat broken rock is exposed just west of the ore stockpile, off the south end of the orebody, and contains a small lens of magnetite, but its spatial relation to the orebody may be fortuitous. This broken zone strikes more northeasterly than the orebody, and it is much weaker than the parallel shattered zone to the northwest that is shown on Figure 8.

A small second orebody occurs 150 feet in the footwall of the main body at the south end. It dips steeply east. A narrow tail follows a limestone contact; otherwise it lies entirely in the tuff-diorite complex.

Overlying the main magnetite orebody, and of roughly the same thickness, there is an almost continuous layer of abundant garnet and epidote. It contains scattered relics of tuff and diorite. In part this skarn is in contact with magnetite, but in part it is separated from it by some 10 feet of almost fresh tuff. The skarn layer is more or less interrupted by irregular dykes of little-altered granodiorite, and it fades away irregularly in the hangingwall rocks. At the south end of the deposit, where the ore passes into the tuff-diorite complex, the rock between the main and footwall bodies has been largely replaced by skarn, including a large lens of almost pure epidote. In the footwall of the B zone, where the deeper drill-holes entered tuff between ore and limestone, the occurrence of skarn is irregular. In some holes the tuff is fresh, in others it is considerably replaced. There appears to be a second skarn layer some 200 feet above the first, extending for about 500 feet across the upper part of the pit; no magnetite has so far been found associated with it.

The dyke-like character of the main F.L. orebody is interesting. The possibility of intrusive magnetite has been reviewed by Daly,* who emphasizes its high melting point (1,580° C.). It seems extremely unlikely that the F.L. magnetite could have been maintained at such a high temperature, and consequently it could have been intruded only if suitably fluxed or if the rigidity of solid magnetite had somehow been reduced sufficiently to permit plastic flow.

The Ridge deposit is a small rectangular plate of almost pure magnetite lying on limestone close to its east-trending contact with Bonanza tuffs. It is 300 feet long and 50 feet wide; diamond drilling has shown it to be shallow, so that it is estimated at 50,000 tons. The only impurities are a few scattered inclusions of limestone and feldspar porphyry. Skarn is extremely rare in the magnetite, in the limestone, and also in feldspar porphyry dykes and a body of intrusive andesite along the west part of the north contact of the magnetite. The tuffs do contain considerable pyroxene, which may be regarded as a skarn mineral, but they contain very little epidote and garnet. This pyroxene continues in tuffs near the limestone contact over the crest of the ridge and down the Lime Creek slope onto the Cordova claim.

The Cordova magnetite showing is on the steep west slope of Lime Creek between 2,200 and 2,300 feet elevation. It consists of small lenses of massive magnetite in heavily pyroxenized tuffs, some 200 feet south of the limestone contact and just north of and below a small quartz diorite intrusion. The lenses generally have their long axes vertical and range in size from about a pound to several tons.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1952, 1960.]

Artlish Group (Utah Construction & Mining Co.)† British Columbia office, 204, 510 West Hastings Street, Vancouver 2. G. A. Noel, district geologist. The company optioned the Artlish group of four recorded claims from Olaf Skogland, of Zeballos, and located about sixty additional claims. In the autumn of 1961 a camp was assembled from prefabricated sections that were flown in, and geophysical surveys were made. From July to September, 1962, 2,500 feet of AX diamond drilling was done in fourteen holes. Access was by helicopter from Zeballos. About twelve men were employed, under the direction of H. Jones and C. Aird.

* Daly, R. A., 1933: Igneous Rocks and the Depths of the Earth, McGraw-Hill, pp. 559–562.

† By G. E. P. Eastwood and J. E. Merrett.

The property straddles the divide between the Kaouk basin and upper Artlish River (*see* Fig. 6). The general geology is outlined on Geological Survey of Canada Map 1028A, Woss Lake. Quatsino limestone and overlying Bonanza pyroclastics dip about 50 degrees southwest, toward the Zeballos batholith.

It is reported that a longitudinal normal fault, called the Hiller fault, crosses the head of the basin about half a mile southwest of the main limestone contact. The fault dips about 45 degrees northeast and has raised the beds on the southwest, so that a narrow band of the limestone is exposed across the basin in the fault footwall. A narrow, irregular band of pyroclastics occurs between this limestone band and the batholith. This fault would appear to be a continuation of the fault along Fault Creek, northeast of the Churchill property. The batholith contact is reported to be irregular, with a dyke-like tongue crossing the fault and following the main limestone contact for some distance. Areas of hybrid rocks occur in the pyroclastics. Numerous dykes and small north to northeast faults cut the limestone, pyroclastics, and batholithic diorite.

The magnetite is reported to occur in two main zones. One is in pyroclastics northeast of the fault, 200 to 800 feet southwest of the limestone. The other zone follows the upper contact of the limestone southwest of the fault; the magnetite is partly in limestone and partly in pyroclastics. In the pyroclastics the magnetite is associated with a garnet-epidote-actinolite skarn. Pockets of magnetite are scattered through all the rock types outside the main zones. The property was not visited.

Copper

Star of the West (Belle Tahsis Mines Ltd.)*

Company office, 1161 Melville Street, Vancouver 5; mine office, Tahsis. This company, formerly known as Juan de Fuca Mining Company Limited, holds fifty-one claims west and north of the head of Tahsis Inlet. The showings at an elevation of 1,500 feet, approximately 1 mile northwest of Tahsis, are at the headwaters of Poole Creek, a tributary of Extravagant Creek. They are in flat-lying garnet skarn zones along irregular limestone-diorite contacts. The main diorite mass lies to the northeast, and from it tongues of diorite have intruded the adjacent limestone and have formed skarn bands at the contacts. Chalcopyrite associated with magnetite occurs irregularly and as masses, veinlets, or disseminations within the skarn zones.

In 1962 a crew of seven men, including four diamond drillers, was employed during the summer. Surface trenching, mapping, magnetometer and electromagnetic (E.M.) surveying, and 1½ miles of road were completed by the company employees. The diamond drillers completed 2,105 feet of drilling in eleven holes.

A sample shipment of 1,500 pounds of ore was shipped to the Tacoma smelter. It was reported to have assayed: Gold, 0.18 ounce per ton; silver, 0.40 ounce per ton; copper, 5.2 per cent.

Gold

HERBERT INLET (49° 125° S.W.)

Berton Gold Mines Limited*

Company office, 42, 610 Jervis Street, Vancouver 5; mine office, Herbert Inlet via Tofino. B. L. Clayton, president; J. C. Jackson, manager. This company owns twenty-one Crown-granted and two recorded mineral claims on the south slope of Abco Mountain at the head of Herbert Inlet. A crew of two men did 950 feet of diamond drilling at the face of the 1,000-foot level adit.

* By J. E. Merrett.

Copper

Catface (Falconbridge Nickel Mines Limited)*

British Columbia office, 1112 West Pender Street, Vancouver 1. Alex. Smith, exploration manager. This company owns 129 recorded claims on Catface Range at the west end of the peninsula between Herbert Inlet and Bedwell Sound. The writer spent part of one day on the property. Most of the following data were supplied by J. J. McDougall, engineer in charge.

The mineralization is of the porphyry-copper type and consists of chalcopyrite and bornite replacing the ferromagnesian minerals in fractured quartz monzonite. The west side of the mineralized zone is marked by a fault along which the rock is brecciated over a width of about 20 feet. The fault strikes nearly north-south and dips steeply east. The best grade of mineralization is on the west side of the zone and is some 500 feet in width. The mineralization fades into barren rock. Inclusions of volcanic rocks in monzonite as a rule show more sulphides than does the monzonite. A younger quartz diorite occurs with the monzonite; it contains chalcopyrite and bornite, but in different proportions than the monzonite. The chalcopyrite to bornite ratio appears to be higher in the quartz diorite. The better grade of mineralization is all in the monzonite. Some molybdenite is present and appears to be more abundant in the quartz diorite.

The granitic rocks intrude volcanic rocks of the Vancouver Group.

In 1961, 667 feet of diamond drilling was done in seven holes. In 1962 a crew of ten men did 11,835 feet of exploratory diamond drilling in twenty-six holes.

BEDWELL RIVER (49° 125° S.W.)†

Gold

Musketeer (Copper Town Mines Limited)

Registered address, 312 Standard Building, 510 West Hastings Street, Vancouver 2. Mine office, Tofino. L. Wolfin, president; H. B. Johnston, mine superintendent. This property reopened in February, and production was intermittent until the end of August. During this period 3,120 tons of ore was mined and, after sorting, 1,990 tons was milled to produce 75 tons of concentrate, containing 878 ounces of gold and 483 ounces of silver. The ore was obtained by underhand stope-mining methods from stopes on the Main and Trail veins.

In October a crosscut was started on the main adit level approximately 1,000 feet from the portal. This crosscut was driven in a southwesterly direction a total distance of 270 feet. The crosscut intersected two quartz veins, each having similar mineralization to the Main and Trail veins. The first vein, 8 inches wide, was intersected 25 feet from the collar of the crosscut, and a vein 2 inches wide was intersected 78 feet from the collar. A crew of ten men was employed.

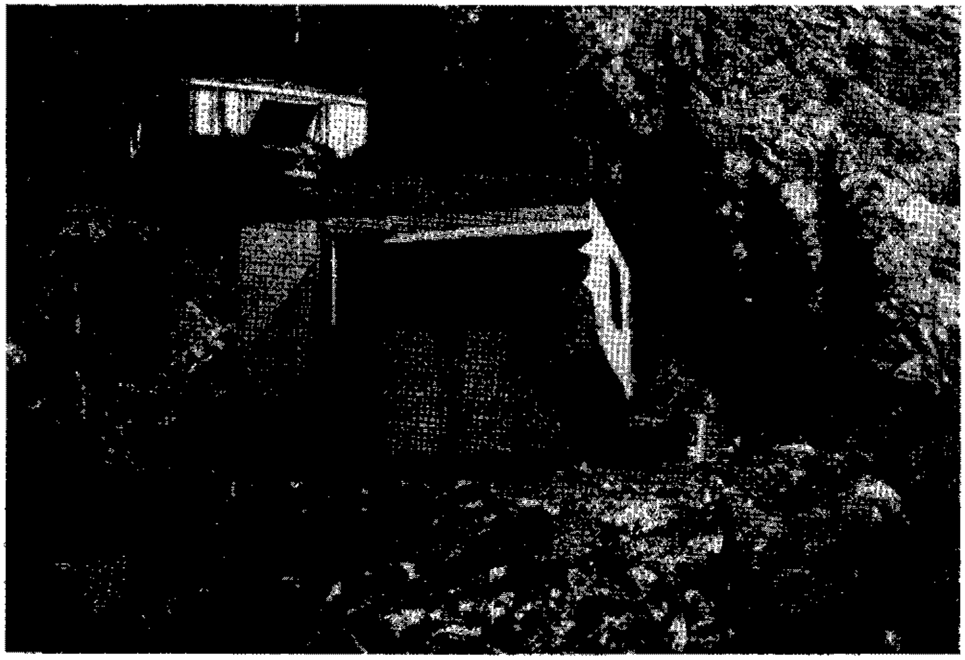
TSOLUM RIVER (49° 125° N.W.)†

Copper-Silver

Domineer (Qualicum Mines Limited)

Operating company, Mt. Washington Copper Co. Ltd.; registered office, Suite 404, 1111 West Georgia Street, Vancouver 5; executive office, 581 Hornby Street, Vancouver 1; mine office, Courtenay. J. L. Gibson, president; S. J. O. McClay, mine manager. Mt. Washington Copper owns 65 per cent interest of Qualicum Mines Limited and holds the remaining interest under option. This property, comprising four Crown-granted and 155 recorded claims held by

* By N. D. McKechnie.
† By J. E. Merrett.



Exploration camp, Catface Mountain.

Western Mines Limited—portal of 1200 adit, June, 1962.

Qualicum Mines Limited and forty claims held by Mt. Washington Copper, encompasses the summit and slopes of Mount Washington, 15 miles northwest of Courtenay. Access is by public motor-road to the Comox Logging Company gate near the southwest end of Wolf Lake. From there logging-roads and 4.6 miles of newly constructed connecting road lead to the showings at about 4,500 feet elevation. The property lies within the land grant of the Esquimalt and Nanaimo Railway Company, Limited, the owners of the base-metal rights and with whom an operating agreement has been made for the removal of the ore.

The 6- by 8-foot adit commenced in 1961 was extended 730 feet to a total length of 800 feet. The adit was collared immediately east of the open pit and was driven in a northerly direction along a flat-lying quartz vein mineralized with covellite, bornite, chalcopyrite, pyrite, and arsenopyrite. In order to examine the area northwest of the adit and the area drill-tested in 1960 by Noranda Exploration Limited, thirty-one diamond-drill holes with a total length of 3,300 feet were drilled by H. Hill & L. Starck & Associates Ltd. In the area north and northeast of the adit a total of 3,500 feet of drilling was done in thirty-five percussion-drill test-holes. The drilling, supplemented by stripping and trenching, has indicated copper mineralization in a flat-lying quartz vein for a distance of 4,500 feet in a north-south direction and in one instance up to 500 feet in an east-west direction. The indicated thickness ranged from 5 to 20 feet. A crew of fifteen men was employed.

Buttle Lake (49° 125° N.W.)

Gold-Silver-Copper-Lead-Zinc

Lynx, Paramount, Price (Western Mines Limited)* Company office, Room 802, 850 West Hastings Street, Vancouver 1; mine office, Campbell River. The principal holdings are the Lynx, Paramount, and Price groups of mineral claims in the vicinity of Myra and Thelwood Creeks at the south end of Buttle Lake. The property comprises two mineral leases, twenty-three Crown-granted claims, and eighty recorded claims. The Lynx showings are at several locations between elevations of 1,200 and 1,700 feet on the north side of Myra Creek, approximately 2½ miles west of Buttle Lake. The Paramount showings, at an elevation of 1,500 feet, are south of the Lynx and on the south side of Myra Creek. The Price showings are on the east slope of Mount Myra at several locations between elevations of 900 and 1,900 feet, and are one-half to 1½ miles southwest of the south end of the lake.

Sections of the jeep-road from Buttle Lake to the Lynx property were relocated and the road improved to truck standard. A branch road was constructed to the Paramount property, and in December a road from the Thelwood camp to the Price property was under construction. A total of 5.8 miles of road, including three bridges, was constructed or improved.

Most of the exploration development work was done on the Lynx property, where 765 feet of crosscut, 1,796 feet of drift, and 68 feet of raise were driven. Twenty-four diamond-drill holes totalling 9,917 feet were completed on the surface, while 11,600 feet of diamond drilling was done underground in eighty-one holes. At the beginning of 1962 eleven men were employed, and by December the crew had increased to sixty-seven men.

The general geology of the Buttle Lake area is described in Geological Survey of Canada Summary Report, 1930, Part A, pages 56 to 78.

* By N. D. McKechnie and J. E. Merrett.

The rocks underlying the Western Mines property are considered to be of Permian age or older. Recent work by R. W. Yole indicates an age of from Permian to Mississippian. They are described in the Summary Report as "a thick series of volcanic rocks including andesitic and basaltic flows, tuffs, and coarse volcanic breccias with at least two and probably three interbedded horizons of white, grey, or pink, crystalline limestone and minor amounts of argillite and quartzite." They conformably underlie the rocks of the Vancouver Group, and the whole is folded immediately west of Buttle Lake into "a broad anticline pitching to the north."

Surface diamond drilling and trenching on the Lynx showings has indicated mineralization for a strike length of about 1,200 feet, in schistose rocks striking northwest and dipping about 80 degrees northeast. The mineralization is not continuous. Widths range up to about 45 feet; the average is calculated in company estimates to be 15 feet. The principal assays are in copper and zinc, and the company's annual report, December, 1962, quotes the following average grade: Gold, 0.09 ounce per ton; silver, 3.37 ounces per ton; copper, 1.8 per cent; lead, 1.2 per cent; zinc, 9.8 per cent.

The distribution of mineralization on the Lynx 1200 level, as indicated by the present underground workings and by horizontal diamond drilling from them, is shown on Figure 9. Continuities, particularly along the plunge, are not yet clear.

The rocks exposed in the Lynx workings are andesite flows, tuff, agglomerate, and sericite and chlorite-sericite schist, all cut by narrow dykes of greenstone. No granitic rocks were recognized.

The andesite is dark green, fine grained, and characterized by evenly distributed round dark specks of serpentine. Red jasper is locally prominent.

The tuff is grey to green and in general coarse grained, with lithic fragments up to the size of walnuts. There are occasional bands of fine-grained material.

The agglomerate is grey to greenish and has subangular to rounded fragments up to 2 feet in diameter.

The sericite schist is grey and pale buff in colour; contacts between the two are often apparent, but thin-section examination of specimens did not reveal any significant difference between the grey and the buff schist. The chlorite-sericite schist is green. There appear to be gradations between sericite schist, sericite-chlorite schist, and chlorite-sericite schist; there are also in places readily discernible contacts. The texture of the agglomerate is easily recognizable in schist northwest of No. 4 crosscut, as is the texture of tuff in schist at a point just southeast of No. 10 crosscut. Many of the contacts have been disturbed by faulting, so that relationships are obscured.

The greenstone dykes resemble the andesite in appearance but lack the serpentine specks and in general are lighter in colour. They are extensively sericitized, and their original composition is uncertain.

The sulphide mineralization occurs entirely in the schist or along a contact between schist and the less altered rocks. It includes pyrite, sphalerite, chalcopyrite, and galena in about that order of abundance, although the proportions are not everywhere the same. The sulphides may be massive or disseminated. The sulphides commonly are banded into thin pyrite-rich, sphalerite-rich, and chalcopyrite-rich layers which locally follow small dragfold structures and so suggest a selective replacement of thin beds. That banding of sulphides may also be predominantly due to replacement of schist is illustrated in No. 7 crosscut about 140 feet northeast of the drift. Here the curving schistosity of a boudinage structure, formed around fragments of a greenstone dyke, has been replaced by sulphides.

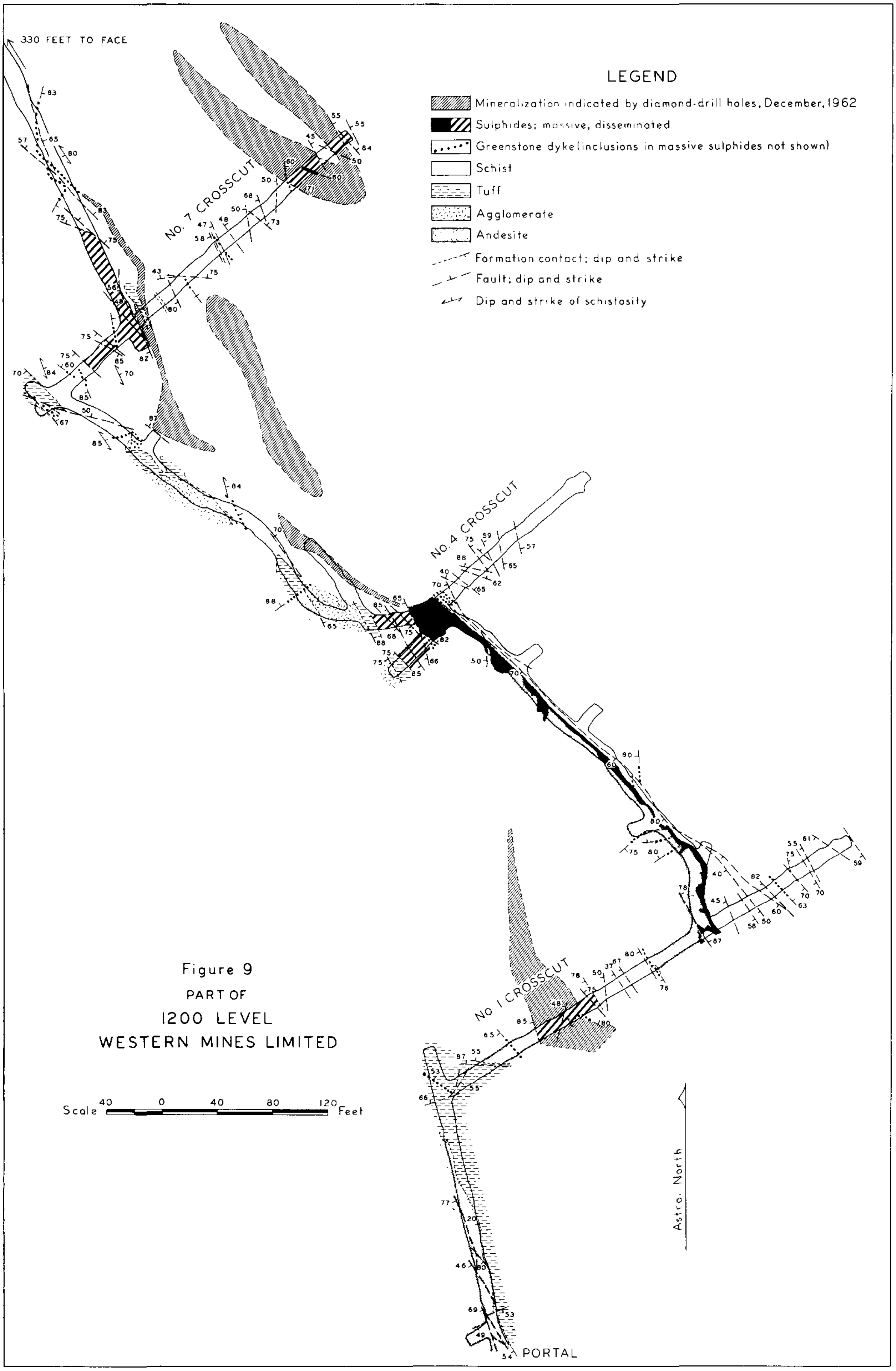


Figure 9
PART OF
1200 LEVEL
WESTERN MINES LIMITED

Although agglomeratic texture is recognizable in the schist, the writer saw no evidence of replacement of agglomerate by sulphides.

Sulphides do not replace greenstone dykes, but inclusions of dykes in massive sulphides are common. The dyke rocks show an alteration rim against the sulphides, and there is ample other evidence that the dykes are older than the mineralization, although the superficial appearance is that of dykes intrusive into the sulphides.

The non-schistose volcanic rocks strike northwestward and dip at angles of from 45 to 65 degrees both to the northeast and the southwest, except at contacts with the schist where dips are uniformly near vertical. In the entry drift and in No. 1 crosscut immediately to the northeast, an andesite-tuff contact reveals a fold that is Z-shaped looking down the northwestward-plunging axes which are about 60 feet apart. The axis of the major anticline west of Buttle Lake is described as trending almost due north. The Z-fold indicates a movement in which the western side moved up and northward relative to the eastern side. Such a fold could be developed on the east limb of a north-plunging syncline, such as those described as occurring within the major anticline. The trend of the Z-fold axes parallels the strike of the schistosity.

The greenstone dykes apparently were intruded after the development of the Z-fold. As shown (Fig. 9) they occupy fractures on or near both axes of the fold. Northwest of No. 4 crosscut a greenstone dyke occupies a fault which offsets an andesite-agglomerate contact against tuff. There was, then, appreciable faulting as well as folding of the volcanic rocks before the intrusion of the greenstone dykes.

Sericite schists are exposed in No. 1 crosscut in two bands separated by about 50 feet of andesite. The first band is 95 feet wide; the contacts strike about north 20 degrees west and dip steeply, 71 to 85 degrees southwestward. The northeast contact is folded into a small dragfold S-shaped in plan, and greenstone dykes lie in the schist along the axes of this fold. The second band, 50 feet to the northeast, is at least 100 feet wide, although the actual width is not known. The contact of this schist with the andesite is obscured by massive sulphides. Dips as low as 36 degrees southwestward were measured on the andesite-sulphide contact.

Measurements of dips and strikes of schistosity show that from southeast to northwest the strike swings gradually from north 20 degrees west to north 50 degrees west. The dips are over 80 degrees eastward, except at about half-way between No. 7 and No. 10 crosscuts, where the schistosity dips 80 degrees westward.

At 140 feet southeast of No. 7 crosscut a small S-fold is well exposed in green tuff in the back of the drift. As measured directly, the axial plane strikes north 12 degrees west and dips 73 degrees eastward, and the plunge is 50 degrees in a direction south 55 degrees east. A similarly oriented axial plane and a similar plunge are indicated by the attitudes of the limbs of the fold. The attitude of the axial plane is about the same as that of the schistosity at the same place. Structures related to the S-fold would have a similar plunge, which is in a direction opposite to that of the Z-shaped fold and the regional plunge.

In No. 7 crosscut, from 150 feet to 210 feet northeast of the drift, a well-mineralized anticlinal structure is indicated by formational outlines within the schist. The axial region is occupied by brecciated material and no reliable measurement of plunge could be obtained, but it is calculated to be 65 degrees at north 75 degrees east.

At 200 feet northwest of No. 10 crosscut a greenstone dyke in schist has the shape of a sharp fold having a plunge of about 70 degrees, nearly due south. Two nearby irregular dykes lie close to the axial plane of this fold-like structure.

At 65 feet northwest of No. 1 crosscut a greenstone dyke striking eastward in the andesite turns sharply northward as it terminates against massive sulphides. A similar dyke 40 feet farther northwest shows an opposite bend in leaving the sulphides and crossing the schist. The sulphides are not fractured.

The curved greenstone dykes indicate a movement in the schist zone which is later than the dykes and of which the horizontal component is that of an eastern side moving northward. The movement is earlier than the deposition of the sulphides since these are not fractured. Sulphides appear to follow an eastward-plunging anticline in No. 7 crosscut. A possible eastward to southeastward plunge of mineralization must be considered, at least relative to individual oreshoots.

Gold-Silver-Copper-Lead-Zinc

Buttle Lake Mining Company Limited*

Company office, 1121 Marine Building, 355 Burrard Street, Vancouver 1. Patrick A. Crammond, president; Arthur O. Hall, managing director. This company holds sixty-three recorded claims adjoining the Western Mines Limited property on the northwest and an additional fifty-four claims adjoining the same property on the southeast. During 1962 a crew of five men employed for a period of seven months carried out geological mapping on both properties and dug test-pits and trenches to examine fault zones. A geophysical survey was made on the Jay group to the northwest.

Gold-Silver-Copper-Zinc

New Indian Mines Limited*

Registered office, c/o Meredith and Company, 789 West Pender Street, Vancouver 1. T. E. Blossom, president; G. L. Mill, engineer. This company optioned eighteen claims adjoining on the southeast the Price group of Western Mines Limited, 1 mile southeast of the confluence of Price and Thelwood Creeks at the south end of Buttle Lake. A crew of five men employed for a two-month period constructed 1,000 feet of road and completed a total of 1,759 feet of diamond drilling in four holes. The holes were collared in Price Creek canyon and were drilled across a strong shear zone believed to be the southern extension of the Price shear zone. It was reported that minor amounts of chalcopyrite were present in some of the drill core.

TRANQUIL INLET (49° 125° S.W.)*

Gold

Tofino Mines Limited

This property, 2½ miles north of the head of Tranquil Inlet, is under lease to W. E. McArthur, Sr., of Greenwood. Access to the property is by way of 3 miles of road from the base camp, 1 mile upstream from the mouth of Tranquil Creek, to the lower tram terminal below the mine. For more rapid access a helicopter landing-pad was constructed near the portal. A crew of four men commenced a raise and small cut-and-fill stope on the hangingwall vein 1,200 feet from the portal of the bottom or 1500 level. Close assay control was maintained on the portion of the vein mined. Where the gold content of the vein was below 2 ounces per ton, the vein material was left either as pillars or for fill. The ore mined was trammed to the portal and passed over a 2-inch mesh screen. Because of the fractured nature of the quartz, most of the ore passed through the screen and the oversize was discharged as waste. Ore containing less than 5 ounces gold per ton was stockpiled

* By J. E. Merrett.

for future milling, while ore in excess of that grade was sacked for shipment to the Trail smelter. A helicopter was used to transfer 39.6 tons of ore from the portal to a scow-loading point at the beach.

Iron-Copper-Gold-Molybdenum

Tofino Inlet (Sun West Minerals Limited) Company office, Tofino. Lorne Hansen, president. This company holds sixty-five recorded claims encompassing the area around Deer Bay at the head of Tofino Inlet. A crew of four men using a bulldozer did intermittent stripping on mineral showings of chalcopyrite, magnetite, bornite, and minor molybdenite occurrences along a strike length of 6,000 feet. In addition, 650 feet of diamond drilling was done in four drill-holes.

Geology of the Kennedy Lake Area*

This report accompanies a geological map of an area of about 12 square miles (Fig. 10) along the southeast side of Kennedy Lake on the west coast of Vancouver Island. The Brynnor Mines Limited iron mine is in the southeast corner of the map-area. Previous geological observations were restricted to shore-line cruises by Webster and Haycock (1902) and Dolmage (1920), to examination of prospects by the Provincial Assayer (1902), Lindeman (1908), and others, and to scattered observations by the Noranda staff and by prospectors working for the company. In 1961 an area of about one-quarter square mile, in and around the mine, was plane-tabled at 100 feet to the inch, and it was clear that regional mapping was desirable to provide a framework for further mineral exploration, to clarify the structure, and to forward the correlation of the rocks with formations in other parts of Vancouver Island. Two months of the 1962 field season were spent on this work, using Department of Lands manuscript maps at one-half mile to the inch as a base. R. W. Yole, a graduate student at the University of British Columbia, spent five days in the area searching the limestones for fossils.

Topography

The map-area includes the southeast quarter of Kennedy Lake, which lies in a rock basin. Scattered soundings by the Fish and Game Branch indicate that much of the lake is no deeper than 230 feet, but that in the northeast it deepens to as much as 500 feet. The mean surface is 22 feet above mean sea-level; therefore, most of the basin is below sea-level.

The Long Beach plain lies between Kennedy Lake and the Pacific Ocean, and extends from Tofino Inlet to Barkley Sound. It is an area of sands, gravels, and other unconsolidated materials, lying generally below 200 feet elevation, through which project scattered hills of bedrock, rising as high as 1,000 feet beside Tofino Inlet. A small part of this plain is included in the southwest corner of the map-area, and a narrow extension continues eastward along the south shore of Kennedy Lake.

An irregular group of low, timbered mountains rises abruptly east from the Long Beach plain and south from Kennedy Lake. The map-area includes the two northernmost summits, Salmonberry Mountain and Mount Dawley, about 2,200 and 2,300 feet elevation respectively, which are separated by the valley of a small creek which enters Kennedy Lake at the Kie mine camp-site. The northeast and east slope of Mount Dawley is undulating and generally less steep than the slope facing the lake.

* By G. E. P. Eastwood.

The Draw Valley separates this mountain group from a spur of the Mackenzie Range on the east. It extends southeast from Kennedy Lake to the mine, thence south to Maggie Lake. It is floored with thick deposits of sand and gravel, which near Kennedy Lake assume the form of a river delta, deposited at a time when the direction of drainage was reversed. The present drainage is predominantly southeast and south, and only minor creeks flow to Kennedy Lake through and beside the delta. Draw Creek enters the valley from the north at a point about a mile from Kennedy Lake and flows to Maggie Lake, which drains via the Maggie River to Barkley Sound. The drainage divide has an elevation of about 350 feet. Through the map-area the valley has a width of about a mile between the foots of the mountain slopes.

East of Kennedy Lake and northeast of the Draw Valley the surface rises irregularly to Draw Mountain, of about 2,600 feet elevation. This mountain and a lower summit immediately to the east constitute a semi-detached segment of a south-trending spur of the Mackenzie Range. A deep saddle separates this segment from a high ridge extending south between the Draw Valley and Toquart Bay. Redford Creek rises in this saddle and flows west and south to join Draw Creek at the mine.

Climate and Vegetation

The area has a high annual precipitation, which falls mostly, but not entirely, between October and May. Precipitation records at the mine have been kept by the mine staff since October, 1960. The total from October 1, 1960, to September 30, 1961, was over 300 inches; for the succeeding twelve-month period it was much less, and no average yearly figure can be given. Snow seldom falls below 1,000 feet elevation.

The area is thickly timbered with large cedar, hemlock, and fir, and much of it has dense underbrush and a tangle of deadfall.

Access

The Kennedy highway passes through the area, connecting Alberni and the Island highway system with Tofino and Ucluelet on the west coast. From this highway along the southeast shore of Kennedy Lake one private road leads southeast to the mine, and a second passes southward along the west foot of the mountain group. From the mine another private road leads up Redford Creek onto the lower south slope of Draw Mountain.

General Geology

The bedrocks include a sequence of volcanic and sedimentary rocks on the northwest margin of a batholith or very large stock. This batholith contains many small and some large inclusions of the volcanic rocks. A roof pendant, or extra-large inclusion of tuff and limestone, extends almost 2 miles north-northeast from the mine, and is conveniently referred to as the mine belt. The layered rocks are tentatively correlated with the Karmutsen Group, Quatsino Formation, and Bonanza Group of northern Vancouver Island, on the basis of lithologic similarity. The diorite and quartz-bearing intrusions are lithologically similar to the Coast Intrusions, but their age is not known.

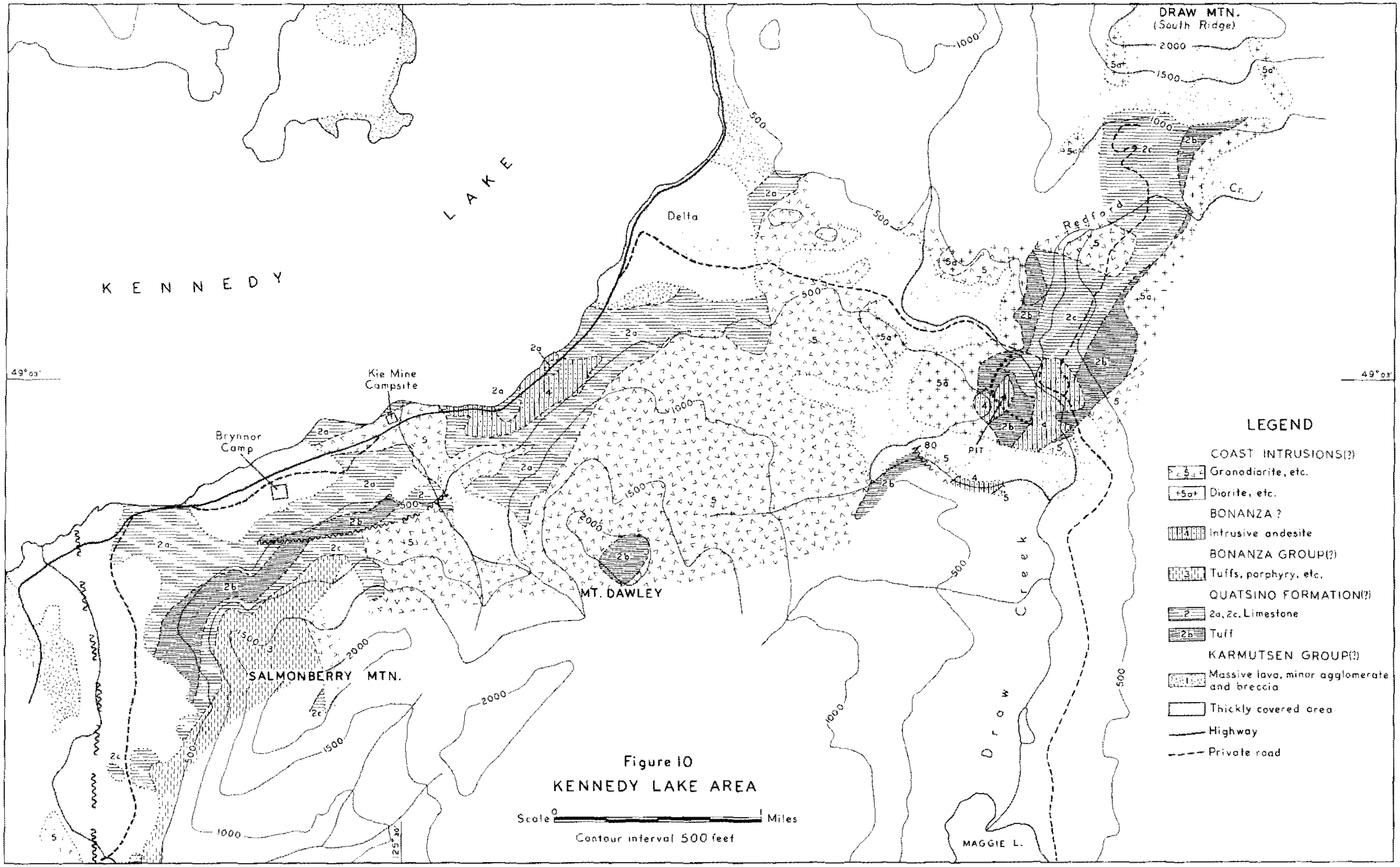


Figure 10
KENNEDY LAKE AREA

Table of Formations

Unit	Lithology	Map-unit No.
Quaternary.	Till, sand, gravel, subordinate clay.	—
	Non-conformity.	
?	Basalt and gabbro dykes.	—
	Intrusive contact.	
Coast Intrusions(?).	Batholithic quartz diorite, granodiorite, etc.; late felsite dykes.	5
	Contact intrusive to gradational.	
	Diorite stock; leucogabbro dykes.	5a
	Intrusive contacts.	
Bonanza(?).	Andesitic dykes, sills, and small stocks.	4
	Relations unknown.	
Bonanza Group(?).	Non-calcareous tuffs, dark porphyry, minor amygdaloid.	3
	Apparent conformity.	
Quatsino Formation(?).		2
Upper member.	Massive-bedded grey limestone.	2c
Middle member.	Calcareous tuff, mostly banded.	2b
Lower member.	White to grey limestone, thin to thick bedded.	2a
	Apparent conformity.	
Karmutsen Group(?).	Massive, dark greyish-green volcanics, epidote-rich and (or) amygdaloidal in part; minor volcanic breccia.	1

Karmutsen Group(?)

Karmutsen-like volcanic rocks have been mapped in three separate parts of the map-area. They are exposed almost continuously along the Kennedy highway in the northern part. Core from a hole drilled through the middle of the big lakeside delta, and exposures along the southwest side of it closely resemble these rocks. A second area of the same rocks underlies most, if not all, of Laylee Island. The third area is exposed on the west edge of the map-area.

These volcanic rocks are dark green to dark greyish-green in colour, fine grained, and massive in the sense of lacking any semblance of bedding or flow banding. Veins, veinlets, and irregular lenses of epidote are common along the Kennedy highway; a few vein-like bands in road cuts form closed loops and resemble pillow rinds. Amygdules are rare adjacent to the delta but are common farther north along the highway, presumably lower in the section. In general the smaller amygdules are white and consist almost entirely of quartz, whereas the larger are greenish and contain varying amounts of epidote. They are common on the southeast part of Laylee Island. Farther north along the east shore of the island a few sub-angular blocks and poorly shaped pillows are outlined by epidote rinds. A little farther north a band of agglomerate or volcanic breccia trends northeast through the summit of the main hill on the island. The dark-green rocks on the west edge of the map-area contain small sporadic amygdules. The composition of these volcanics has not been determined, but the uniformly dark colour suggests basalt rather than andesite. Five grab samples from points along the Kennedy highway assayed between 7.3 and 10.3 per cent total iron.

On both sides of the delta the massive volcanics are apparently overlain by limestone beds dipping 30 to 40 degrees southeast. The actual contact was seen only in the highway cut west of the delta, where it is in fact a transitional zone about 5 feet thick, of light to medium green, somewhat sheared rock. The area of massive volcanics on the west edge of the map-area is inferred to be in fault contact with limestone to the east.

North and northeast of the delta the volcanic rocks are intruded by many dykes of Coast Intrusion type, most of them quartz-bearing. Dark dykes may be present, but have not been recognized in the dark volcanics. On Laylee Island and on the west edge of the area, only a few Coast Intrusion dykes were found.

Quatsino Formation(?)

Limestones and tuffs assigned to the Quatsino Formation form two belts—one along the south shore of Kennedy Lake and south along the west face of Salmonberry Mountain, and the mine belt, between the Brynnor mine and Draw Mountain. Some inclusions of tuff occur in the batholith.

Relationships.—The Quatsino succession is well exposed on the northwest and west slopes of Salmonberry Mountain, where a dip of 40 to 60 degrees southeast in the north decreases to nearly flat in the south. A thick lower limestone member is successively overlain by 800 feet of banded calcareous tuff and 350 feet of massively bedded limestone. The base of the lower member is not exposed here, and its thickness is not known, but the evidence indicates that it is at least 2,000 feet thick. The succession is apparently conformable. The lower contact of the tuff is drawn arbitrarily through a 50-foot transitional zone of tuffaceous limestone and highly calcareous tuff. The upper contact of the tuff is sharper, but a few tuff lenses occur in the lower part of the upper limestone. The upper limestone member is overlain with apparent concordance by banded and massive non-calcareous tuffs assigned to the Bonanza Group.

Farther east along the north slope of Salmonberry Mountain the upper limestone turns uphill against the batholith and is cut off by it. Exposures are rare between this point and the mountain crest, but the float is all granodiorite, suggesting that the upper slope is underlain by a lobe of the batholith as far west as a contact with Bonanza rocks exposed in a small creek. Exposures just south of the mountain crest are of limestone, the massive character of which indicates that it is the upper limestone. These discontinuous exposures of the upper limestone appear to outline a south-plunging syncline.

On the lower north slope of Salmonberry Mountain the Quatsino succession is transected by a fault. The tuff member extends for about 1¼ miles along the north side of the fault and then disappears under cover. Along the creek between Salmonberry Mountain and Mount Dawley the succession is interrupted by a tongue of the batholith extending north to Kennedy Lake. A small wedge of massive grey limestone lies between the tuff and the fault, and is exposed intermittently eastward to the intrusive tongue. This wedge cannot be assigned to either member because the structure is not clear. The strip of tuff north of the fault is strongly sheared, and bedding in it is increasingly obscured toward the east.

Northeast of the batholith tongue the tuff member has not been found, and the layered rocks are all limestone. The absence of tuff and the generally bedded character of the limestone would seem to indicate that it all belongs to the lower member. Northeast of the delta it continues as a narrow band between the volcanics and the batholith.

The mine belt extends from the southwest side of the Brynnor pit to the south slope of Draw Mountain. It appears to be surrounded by intrusive rocks, and is nearly bisected by a tongue of granodiorite. Tuffs form a discontinuous ring around a central limestone. These rocks as they appear in the pit have been described in the Annual Report for 1961, and the rarity of bedding in the limestone and the sporadic occurrence of banding in the tuffs has been emphasized. Limestone bedding is rare throughout the belt, and tuff banding is generally steep. The over-all structure of the belt is not certain, but drill-holes just east of the pit passed downward from limestone into tuff, and this fact, together with the general outcrop pattern, suggests a general synclinal structure. The limestone lithologically resembles the upper member more than the lower, and the tuff resembles the Quatsino tuff much more than the Bonanza tuffs. The mine belt is probably a synclinal remnant of the middle and upper members of the Quatsino Formation.

Lithology.—The limestone of both upper and lower members varies from white to medium and dark grey and from coarse to medium grained. It has evidently been extensively recrystallized. Most outcrops give off a strong hydrogen sulphide odour when struck with a hammer. An isolated small bluff of the upper limestone in the southwest corner of the area weathers to a distinctive dark bluish grey. A similar weathering colour occurs in the middle of the north segment of the mine belt. Predominantly, however, the limestones weather light buff or shades of grey.

For the most part, the limestone is fairly pure. Pyrite occurs sporadically. Yellow grains that are probably ankerite were noted in a few places. Brucite plates were found in the upper limestone on Salmonberry Mountain, where it is truncated by the batholith. Analyses of samples of the lower limestone taken along the south side of the delta are given in the Industrial Minerals section of this Report.

Bedding in the limestones is not as a rule evident. In the upper member, bedding-like structures are rarely seen. In the open pit some light and dark banding occurs in the limestone, but some of it is definitely not bedding. In at least one place, two sets of dark bands were seen to cross at a large angle, and possibly the thinner, blacker bands represent segregations of impurities along old sheeting planes. In Redford Creek, near the east edge of the mine belt, flat-lying buff bands of diopside rock, 1 to 5 inches thick, weather in relief; they may or may not represent bedding.

In the lower member, bedding-like structures are common, and since they are generally consistent with each other and with the contacts, most of them probably do represent bedding. The commonest structures are extensive fractures which weather to southeast-dipping cracks. Weathering patterns produce a crude banding, especially along the north face of Mount Dawley. Some bands are deeply etched in crude diamond patterns, whereas adjoining bands may be only slightly etched or smooth weathering. The deeply etched bands are commonly cream or light buff in colour, whereas the smooth-weathering bands are commonly white or shades of grey. These features would suggest compositional differences, but none has been found in the samples studied. The bands are commonly separated by the extensive fractures. Straight colour banding, in white and shades of grey, is common but can be identified as bedding only where confirmed by other features. Individual bands are rarely recognizable for more than 50 feet due to colour changes along the strike.

The lateral colour changes are irregular in over-all pattern and are probably related to factors of metamorphism and recrystallization rather than to primary features; therefore, the banding itself may be in part related to recrystallization. On the shore of Kennedy Lake north of the Brynnor camp the limestone contains sheets of angular andesitic fragments which maintain uniform spacings and even outline a small, shallow dragfold. The fragments range from nearly cubic blocks an inch across to plates 2 or 3 inches thick and a foot long. Probably they are broken-up tuff beds, and their over-all distribution represents bedding surfaces. Stylolitic partings occur here and there.

Solution features are common in the limestones. Etched surfaces have already been noted. Cliffs of smooth-weathering limestone are deeply fluted. The inter-flute ridges are normally rounded, but in parts of the upper limestone they are sharp and on Redford Creek greatly attenuated. Flat or gently sloping outcrops of limestone have been subject to considerable solution along steep joint planes, resulting in a series of deep, narrow trenches. Sink-holes occur here and there. On Salmonberry Mountain small creeks disappear and reappear, and a traverse at one elevation may cross a deep gully, whereas another traverse 300 feet higher or lower may be on a uniform slope.

The tuff member is characteristically well banded, and is in general calcareous. The bands are 1 to 3 inches thick and are white, cream, pale pink, pale to medium green, or light to medium grey in colour. On Salmonberry Mountain the lower 30 feet or so consists of interbedded limestone and tuff, the limestone beds growing thinner and fewer upward. In contrast, the uppermost tuff beds are thicker than normal, are uniformly white, and grade up into limestone by becoming increasingly calcareous. In the mine belt generally, the tuffs are as well banded and as calcareous as on Salmonberry Mountain, but in the open pit the banding is sporadic, a greater amount of medium- to dark-green material is intermixed, and the rock is generally non-calcareous. These differences are thought to result from deformation, intrusion, and metamorphism. Three or four small pods of dark-grey argillite were noted in the southwest wall of the pit and immediately to the southwest. The tuff inclusions in the batholith southwest of the pit are commonly light coloured and unbanded, and macroscopically resemble aplite.

Bonanza Group(?)

Rocks assigned to the Bonanza Group outcrop sporadically on Salmonberry Mountain, forming a broad south-trending band. They are a varied assortment of banded to massive, greenish tuffs, nodular tuff, hard light-brown tuffs, microbreccias, green porphyries, green rocks with amygdule-like nodules of epidote, and extensive dark porphyries. No sequence is known. The dark porphyries may be intrusive. They consist of plagioclase phenocrysts 1 to 5 millimetres across, in a fine-grained dark-brown to black groundmass. They have been found in small, isolated exposures on the upper north slope of Salmonberry Mountain, but have not been seen in contact with the tuffs. On the creek south of Salmonberry Mountain no tuffs were found within 1,000 feet of the upper limestone, the principal rock being the dark porphyry. The contact with limestone is covered, but the porphyry nearest to it contains blocks of limestone. The porphyry is in turn intruded by diorite dykes. Another patch of this dark porphyry is exposed along a small creek about a mile south of the open pit, just outside the map-area. It is probably a roof pendant or inclusion in the batholith.

Age and Correlation

No fossils have been found in place in the area. Three poorly preserved forms were collected from a limestone boulder (now demolished) in the open pit; one was sent to J. A. Jeletzky, of the Geological Survey of Canada, who commented that it suggested a Dentalium-like scaphopod. Any age assignment of the layered rocks must therefore be based on lithological correlation.

Only two widespread and relatively thick limestone units are known to occur on Vancouver Island. They are a lensy Upper Palæozoic unit and the Upper Triassic Quatsino Formation. Lenses of limestone found at other horizons are very local. R. W. Yole has pointed out the following differences between the Kennedy Lake and Upper Palæozoic sequences:—

(1) The volcanics underlying the limestone are much less altered than the Palæozoic volcanics.
(2) The Kennedy Lake limestones are not crinoidal, and fossils are remarkably scarce.
(3) The Kennedy Lake tuffs are pale compared with the deeply coloured tuffs associated with the Upper Palæozoic limestone and are more crystalline.
(4) Chert has not been found at Kennedy Lake, whereas it is abundant in Upper Palæozoic tuffs and limestone, both as bedded units and as nodules.

On the other hand, the Kennedy Lake sequence shows more similarities to than differences from the Triassic-Lower Jurassic sequence of the Zeballos-Nimpkish-Quatsino district. The similarities are:—

(1) The volcanics underlying the limestone at Kennedy Lake are identical with the upper part of the Karmutsen Group at Zeballos and on the Benson River.
(2) The Kennedy Lake limestones resemble the Quatsino in texture, in its tendency to thick bedding, and in scarcity of fossils.
(3) The pyroclastics overlying the limestone at Kennedy Lake resemble some parts of the Bonanza Group.
(4) Chert appears to be as rare in the Karmutsen-Quatsino-Bonanza sequence as it is at Kennedy Lake.

Against these similarities are the following differences:—

(1) No tuff member has been observed within the Quatsino limestone.
(2) A discontinuous argillaceous unit that in many places separates Quatsino limestone from Bonanza pyroclastics has not been found at Kennedy Lake.
(3) The Kennedy Lake limestones are much more fetid than the typical Quatsino.

It is probable that the three main units at Kennedy Lake are correlative with the Karmutsen, Quatsino, and Bonanza, but the correlation must remain tentative until confirmatory evidence is obtained.

Intrusive Andesite

Innumerable dykes, sills, and stockworks of dense to fine-grained dark-green to greenish-black rock intrude both limestones and tuffs of the Quatsino Formation. Four small stocks of similar rock were also observed, and are shown on the map. Many inclusions of similar rock occur in the batholith. This type of intrusive is common through the Quatsino Formation on the north part of Vancouver Island, and has been called variously intrusive greenstone or trap. The few bodies from which thin-sections have been taken have been identified as andesite, and this term is used for convenience in this report. It has been suggested that these bodies are an intrusive counterpart of Bonanza vulcanism.

Of the small stocks, one is exposed in the southwest wall of the open pit and has been traced one-quarter mile southwest. It is massive, dark greyish-green andesite, and has been described in some detail in the Annual Report for 1961. The various features then noted led to the suggestion that it is a flow. Deeper mining has disclosed that the body does not have a flat lower contact, as suggested by the drilling, but that it forms a concave wedge pointing downward. More significantly, flows have not been found in the tuff member elsewhere in the area. The balance of evidence now points to this andesite being a stock.

A second stock is poorly known from drilling and from a few scattered outcrops east and west of the dump. It appears to have an over-all length of at least 4,000 feet. Just within the southeast part of the pit it is in fault contact with tuff and limestone.

The third stock is displayed on the lower north slope of Mount Dawley. It is about 4,000 feet long with a minimum width of 1,300 feet. It is an over-developed stockwork in which thick, short sills in the lower limestone are connected by thick dykes. The result is a stock containing large tabular inclusions of limestone. The rock is in part medium grained, and feldspar is commonly discernible.

The fourth stock is shown on the map as a dioritic wedge of the batholith extending 4,200 feet west along the highway from the Kie mine camp-site. Some parts of the exposures are definitely diorite, whereas others are clearly feldspathized andesite. The body is hybrid—as a whole it is now more nearly diorite than anything else, but genetically it appears to be a made-over andesitic stock. It may at one time have been continuous with the third stock.

The smaller andesitic bodies are common in limestone everywhere, but are especially abundant in some areas. They form nearly half the rock-mass where the logging-road crosses Redford Creek.

Coast Intrusions(?)

Rocks assigned to the Coast Intrusions form a batholith or very large stock underlying the southeast half of the area and numerous dykes intruding the layered rocks. In general they are characterized by medium to coarse grain and medium to light colour. Light and dark minerals give the coarse-grained rocks a mottled appearance at close range. The over-all colours are grey or green, tinged with pink where orthoclase is common. With rare exceptions the rocks are massive.

The rocks vary in composition in several ways, but only the presence or absence of quartz has been, partially, shown on the map. Small areas lacking discernible quartz were found through a large part of the batholith, but they appeared to be completely gradational with the quartz-bearing rock and did not appear sufficiently significant to warrant the time required to outline them. Indeed, many, if not most, are too small to outline on a scale of half a mile to the inch. A narrow border zone along the northwest contact of the batholith is also quartz-poor or quartz-free and is likewise gradational to the quartz-rich variants. It is generally not more than 300 feet wide and could not conveniently be shown on the map. Around the mine belt, however, much larger areas are almost entirely quartz-free, and have been generally intruded by the quartz-bearing rocks. These areas are shown as diorite on the map. The designation is based on a very few thin-sections; it is possible that the rock may grade to gabbro or monzonite in places, and in a few places on the northeast side of the Draw Valley it grades to hornblendite. At these latter localities the diorite also contains hornblende segregations and has been broken up by quartz-rich rocks to form a rather striking breccia. Elsewhere the contact is generally covered, but the general rock distribution suggests that the quartz-bearing rocks intrude the diorite. It would seem, therefore, that the diorite areas around the mine belt represent an earlier stage of intrusion of the magma, or possibly intrusion of an earlier magma.

Both the mine belt diorite and the remainder of the batholith vary in composition in other ways. They vary in their proportion of light and dark minerals, in a few places being devoid of one or the other. In some outcrops biotite predominates over hornblende; in others, biotite is subordinate or lacking. Pink feldspar, apparently orthoclase, is common in some areas, but rare or lacking in most; potash feldspar may, however, be more common than the distribution of the pink mineral would suggest. Thin-sections of a few scattered specimens indicate that the plagioclase varies in composition, at least from calcic oligoclase to sodic labradorite. It was not feasible to map any of these variations at the half-mile scale. The quartz-bearing rocks of the Coast Intrusions are, for convenience, hereafter called granodiorite, even though they range from quartz gabbro to quartz monzonite and possibly even granite. Coast Intrusion dykes are commonly quartz bearing, but in the pit they are predominantly light-coloured gabbro.

The granodiorite is injected by a few small aplite dykes, which are thought to represent a late stage of the batholithic intrusion.

Both granodiorite and diorite contain many inclusions of andesite and tuff. The tuff inclusions tend to be restricted to the northwest edge of the mine belt and to a zone extending from the pit southwest and west to the summit of Mount Dawley; the two largest are mapped on the summit and on a small creek southwest of the pit. The andesite inclusions are commonest between the zone of tuff inclusions and the northwest contact of the batholith. Most show some recrystallization, at least near the borders, and some grade to diorite. Macroscopically these andesitic inclusions resemble both Karmutsen volcanics and intrusive andesite, except that amygdules have not been found in them. If they were intrusive, the distribution would suggest that they are relics of intrusion of limestone. Limestone inclusions have not been found anywhere in the batholith.

Contact relations of the batholith vary with the rock intruded and with location. On the east side of the mine belt there is commonly a 50-foot contact zone in which gneissic tuffs have been injected lit-par-lit by diorite. Northwest of the pit massive tuffs grade to massive diorite by an increase in grain size and a general darkening of the rock. Within tuffs, not more than 200 feet from recognizable diorite, there is a fringing zone of intrusive breccia about 30 feet wide, striking northeast parallel with the tuff-diorite contact and exposed intermittently along the northwest wall of the pit and in a ditch to the southwest. North of the pit there is a narrow zone of intrusive breccia which is not inside the tuffs but rather along the tuff-diorite contact. Generally the diorite does not show chilling against the mine belt, but the granodiorite and the dykes do. The contact between the andesite stock and granodiorite appears sharp and regular south of the pit, but in the small creek to the southwest the andesite is injected by many tongues of the granodiorite. The granodiorite makes sharp, even contacts with the dark porphyry of the Bonanza Group. To limestones along the northwest contact the granodiorite presents both crosscutting and sill-like relations. A large dyke-like tongue of the batholith extends down the creek east of Salmonberry Mountain, transecting the limestone and sending wedge-shaped offshoots into it along bedding. East of this tongue, across the northwest slope of Mount Dawley, the granodiorite-limestone contact is essentially bedded. The granodiorite appears to embay the limestone to some extent on the north slope. Along the east side of the large delta the contact is steep and crosscutting. A dyke-like tongue extends about 150 feet into the limestone at the south end of the limestone exposures.

Late Basalt and Gabbro Dykes

Several dark dykes intrude skarn and other rocks in the pit, and both diorite and granodiorite to the north. They are dark grey to black on fresh surfaces and weather brown. The weathered surfaces are commonly rounded and friable. Some contain coarse pyrite cubes. The margins of the wider dykes are noticeably chilled. Some dykes resemble the andesitic inclusions, but the brown weathering, chilled margins, tabular form, fracture pattern related to margins, and apophyses usually distinguish them. In the pit they show grooving and polishing along faults but are not noticeably offset. They may therefore be coincident with a late stage of the faulting.

Metamorphism and Alteration

The Karmutsen Group shows very little macroscopic alteration apart from the epidote lenses. Slight bleaching is apparent in strongly fractured areas and adjacent to some of the larger granodiorite dykes. One thin-section from the delta shows an apparent breakdown of pyroxene to magnetite and chlorite.

The limestones are thoroughly recrystallized, locally becoming very coarse, but are not generally altered otherwise. Local diopside bands and brucite plates have been noted in the upper limestone. A small part of the limestone in the pit has been replaced by serpentine, and a serpentine vein cuts limestone in the northwest face of Mount Dawley.

The Quatsino tuff has been converted to diorite along the east boundary of the mine belt and to some extent in the large inclusions to the southwest, and has been sericitized in some places. But the most spectacular alteration is in the pit, where most of the banding has been obliterated and a considerable part of the rock has been altered to garnet-epidote skarn.

A few of the intrusive andesite bodies are irregularly bleached, and the resulting rock macroscopically resembles massive tuff. This effect was noted in the northwest wall of the pit and near the west edge of the area, where the highway bends away from the lake. The mineralogical changes associated with this bleaching have not been studied. In the pit the dykes near ore have been partly altered to skarn.

The Coast Intrusions generally show no alteration, but the light colour of many dykes in the pit appears to be due largely to chloritization and sericitization. These dykes show very little alteration to skarn. However, a band of the batholith about 200 feet wide adjacent to the contact with the lower limestone east of the delta is variably altered to epidote and subordinate garnet and pyroxene.

Structural Geology

In general the layered rocks dip southeast, but the Quatsino and Bonanza rocks have been thrown into at least two syncline-like structures and have been further deformed by the batholith. All the rocks have been broken by large and small faults.

The westerly syncline-like structure trends southwest and south through the summit of Salmonberry Mountain. It has been truncated by a fault in the north and has not been recognized near Kennedy Lake. It continues beyond the area to the south. On the west side the beds dip southeast near the fault and are almost flat farther south. The apparent east limb, outlined by an interrupted band of the upper limestone, seems to be steep. It is not clear whether this structure is a syncline in the regional structure or whether it has been produced by the batholith wedging up the upper limestone to form the east limb of a highly assymetrical fold. The lowest Bonanza beds are not exposed on the apparent east limb, and the internal structure of the fold is not known. Also, the structure is not known immediately north of the fault due to scarcity of exposure and lack of recognizable bedding. The band of tuff north of the fault may represent the tail of the syncline or a part of the regional southeast-dipping structure isolated by the tongue of the intrusive.

The easterly syncline-like structure is the mine belt, lying between the mine dump and the south end of Draw Mountain. It appears to be a canoe-shaped structure, outlined by the contact between the Quatsino tuff and upper limestone and enclosed by intrusive rocks, principally diorite. Exposures in the pit and intersections in diamond-drill holes nearby indicate that the syncline there plunges irregularly northeast. The internal structure of the fold is unknown due to lack of bedding in the limestone, but tuff banding indicates steep limbs. Deformation appears to have been more intense than on Salmonberry Mountain. Closure at the north end of the syncline has not been observed due to lack of exposure on the south end of Draw Mountain but is suggested by a more northerly strike of the east contact of the limestone north of Redford Creek. Exposures of diorite at the ends of the transverse ridge on the south end of the mountain suggest that the syncline is enclosed by diorite. Here also it is not clear whether the fold is part of the regional structure or a product of forceful intrusion, but at least the irregularities in the tuff-limestone contact in the open pit would appear to have resulted from deformation during intrusion.

Apparent wedging action by the batholith is shown in the northwest slope of Mount Dawley. Along most of this slope, limestone bedding and the contact dip uniformly southeast, but on the west corner of the mountain above a thick sill that wedges out to the east, the strike is more southerly and the dip flatter. The southwest end of the block has apparently been pried up.

The Quatsino rocks terminate abruptly at the west foot of Salmonberry Mountain, and a large fault is inferred to separate them from Karmutsen exposures west of the creek. The abrupt, relatively straight west front of the mountain group would also suggest a fault. The fault zone itself has not been seen, and too little is known of the geology west of it to suggest the probable direction and amount of movement.

A second fault has been mentioned as truncating the westerly fold in the north. It is marked topographically by a deep notch along the north slope of Salmonberry Mountain. It is exposed in two creek beds as a 25-foot zone of gouge and breccia in the creek flowing to the Kie mine camp-site. East of this creek and west of the tuff exposures it has not been identified. The topographic notch dies out where the tuff ends on the north side, and it is not clear which of several chasms in the lower limestone represents the continuation of the fault. The fault trace in relation to topography suggests that the fault dips north at a moderate to fairly steep angle. The displacement is apparently left hand. If the band of tuff on the north is synclinal, the north side is upthrown and the fault is probably a high-angle thrust.

Small faults are seen here and there through the area, mainly in creek beds. One truncates the patch of tuff southwest of the pit on the east. A shear zone in dark porphyry is exposed for several hundred feet in the bed of the creek south of Salmonberry Mountain. These and others are thought to be only a small fraction of the total number of faults and shear zones in the area. A profusion of them traverse rocks in the open pit.

All of the faults appear to be younger than the Coast Intrusions, and at least some of those in the open pit have displaced and comminuted magnetite. The magnetite has also, in part, been grooved and polished along slip surfaces, and some serpentine has been deposited on them. The late basalt dykes also show some grooving and polishing, but do not appear to be offset on any faults.

Economic Geology

The only metalliferous mineral of consequence so far found in the area is magnetite. The main occurrence is in and beside the open-pit mine on Draw Creek, but four minor occurrences have been found elsewhere in the area. The mine has been described in the Annual Report for 1961. Briefly, the mineralization comprises an array of small and large magnetite lenses in tuff and limestone near their mutual contact at the southwest end of the limestone. Near the lenses the tuff has been more or less altered to garnet-epidote skarn. The controls of individual lenses are not apparent. Some small lenses are strung out along a shear zone near the southwest side of the pit, but the magnetite has been comminuted. In a broad way, however, magnetite deposition appears to have favoured the tuff-limestone contact. This impression from the open pit and the nearby drilling is strengthened by the occurrence of magnetite for some 300 feet along the tuff-limestone contact about half a mile north of the pit.

A few small pods of magnetite occur in limestone about a mile northeast of the pit, just southeast of the logging-road bridge over Redford Creek, and about 700 feet from the southeast contact of the limestone. A third small occurrence of magnetite is in a skarn zone in batholithic rocks along the east side of the large delta, at the limestone contact. The occurrence is at the south tip of limestone exposure, in the re-entrant between a small prong of the intrusive and the main mass. The limestone itself is somewhat sheared in the re-entrant, but shows very little alteration or mineralization. The fourth small occurrence of magnetite is in the hangingwall of a 30-foot andesite sill in the lower limestone at 1,000 feet elevation on the northwest slope of Mount Dawley. Magnetite and pyrite coat the sheared upper surface of the sill, and some magnetite is disseminated in a small felsite body about 25 feet higher on the hillside.

Gold and copper mineralization is known at several points within a few miles of the area, but none has been found within it. A small pod of massive pyrite in limestone on the northwest slope of Mount Dawley assayed: Gold, trace; copper, 0.15 per cent.

Thick deposits of sand and gravel occur along the floor and lower walls of Draw Valley.

[References: Bancroft, M. F., *Geol. Surv., Canada,* Mem. 204, 1937, pp. 3–13; Dolmage, Victor, *Geol. Surv., Canada,* Sum. Rept., 1920, Pt. A, pp. 13–18; Haycock, Ernest, *Geol. Surv., Canada,* Ann. Rept., Vol. XV, 1902, Pt. A, pp. 81–90; Hoadley, J. W., *Geol. Surv., Canada,* Mem. 272, 1953, pp. 9–29; Lindeman, Einar, *Mines Branch, Ottawa,* Publ. No. 47, 1910, p. 16; *Minister of Mines, B.C.,* Ann. Repts., 1902, p. 210; 1960, pp. 108–110; 1961, pp. 104–110; Uglow, W. L., and Young, G. A., *Geol. Surv., Canada,* Econ. Geol. Ser., No. 3, 1926, pp. 155–158.]

Iron

Brynnor Mines Limited*

(49° 125° S.E.) Company office, Room 1700, Bank of Nova Scotia Building, 44 King Street West, Toronto 1; British Columbia office, Suite 105, 2256 West Twelfth Avenue, Vancouver 9; mine office, Ucluelet. R. V. Porritt, president; T. R. Wearing, manager; D. W. Burns, mine superintendent; A. W. Haggerty, mill superintendent; W. I. Nelson, Jr., geologist. This company is a wholly owned subsidiary of Noranda Mines, Limited. A seven-year contract with Japanese ore-buyers calls for delivery of 700,000 tons of concentrate per year.

* By G. E. P. Eastwood.

The mine camp is on the Kennedy highway on the south shore of Kennedy Lake, about 8 miles from the junction with the Ucluelet–Tofino road. The mine is reached by 2½ miles of MacMillan, Bloedel and Powell River Limited logging-road, which leaves the highway about 2 miles east of the camp. The open pit and crusher building are on the west side of Draw Creek, and the mine office is on the east side. Crushed ore is trucked 8 miles down Draw Creek and past Maggie Lake to the mill at New York Point on Toquart Bay. A deep-sea dock has been built near the mill.

Stripping of overburden and waste rock under contract was completed in May. The company then proceeded with the mining of ore and intermixed waste by standard benching methods. The benches were approximately 30 feet apart. Down holes were drilled with a 6-inch C.I.R. Drillmaster and a 9-inch Bucyrus-Erie 40-R rotary drill, and were loaded with AN/FO. Lifters were drilled with air-tracks and loaded with 40 per cent Forcite. All blasts were fired electrically. Muck was loaded by two Dominion and one Bucyrus-Erie shovels into Dart end-dump trucks and hauled to the crusher or the waste dump.

In the crusher building, trucks dumped directly into a gyratory crusher. The crushed ore was conveyed by belt to dry magnetic separators. The scalped waste was conveyed to a separate waste dump; some was sold to MacMillan, Bloedel and Powell River Limited for road metal. The cleaned ore was stockpiled in an open shelter, then recrushed in two Symonds cone crushers before being hauled to the mill.

The mill started up on an experimental basis in mid-April and was in essentially full production by the end of May. Ore dumped through a grizzly was conveyed to a large storage tower. From the tower it was conveyed to a splitter at the top of the mill, thence over two weightometers to two Dominion 6 by 12 rod mills, powered by two English Electric 550-horsepower motors. The oversize accumulated in small bins and was cleaned out periodically. The undersize, 35 per cent minus 100 mesh, was pumped to two banks of three Magnetic Engineering and Manufacturing Company 30 by 72 wet magnetic drums. The waste was laundered to Toquart Bay. The concentrate was pumped to two Allen settling-cones. The cone underflow was discharged to two Dorrco rotary filters. The cone overflow was settled in a Denver thickener, the underflow from which was fed to the filters. The cake was conveyed to the top of a shielded storage pile. From the bottom of the pile a reclaim conveyor belt rose to a track-mounted tower on the dock. Another conveyor on a boom of the tower fed the concentrate to a compartment of the ship's hold. By moving the tower on its tracks it was possible to alternate loading of compartments on opposite sides of the ship, and so keep it reasonably trimmed. The first ship loaded on May 28th to 30th. The mill treated 716,054 tons of ore, producing 451,623 tons of concentrate.

A 975-foot vertical hole was drilled southwest of the pit at the site of a proposed shaft.

The supervisory and technical staff totalled thirteen. Office staff numbered fifteen (including Vancouver office). Other employees averaged 135.

The regional geology is described on pages 111 to 122, and the pit geology is described in the Annual Report for 1961. In brief, limestone underlies the eastern part of the pit and tuff underlies much of the western part. Many sills and dykes of andesite intrude both tuff and limestone. One andesite stock extends into the southwest part of the pit, and another is in fault contact with tuff and limestone along the southeast side. These rocks are intruded by many light-coloured gabbro dykes that are believed to be related to batholithic rocks of Coast Intrusion type nearby.

The tuff appears to underlie the limestone, on a contact that apparently outlines an irregular northeast-plunging syncline.

The magnetite forms an array of orebodies, lenses, and pockets in tuff and limestone near the tuff-limestone contact. Many of these bodies lie southeast of the pit or below the level reached by mining in the summer of 1962, and are sketchily known from the drilling. Two irregular orebodies were at that time exposed in the north and central parts of the pit, and lenses of ore showed up from time to time along the southwest side as mining proceeded. The north orebody is the cigar-shaped body mentioned in the previous report. As exposed on a bench at about 280 feet elevation, it was striking northeast and had a length of 300 feet and a width of 50 feet. Several small pockets of ore occurred in limestone nearby. The north orebody lies more or less along the tuff-limestone contact, but transects lobes of the limestone. The second orebody was exposed along 150 feet of the lift between the 270 and 240 benches. A short section of magnetite and sulphides was exposed in the 300/270 lift 100 feet to the west. The orebody is traversed by many tight, curving fractures along which the magnetite has been deeply grooved and highly polished, in places almost to a mirror finish. These slips strike generally northeast and dip southeast around 50 degrees. Some of the polished surfaces are coated with serpentine, which in turn is commonly grooved and polished.

Some of the magnetite lenses along the southwest side of the pit appear to be ranged along a shear zone, and others are scattered through partly altered tuff to the south of it. They range in size from lenses at least 50 feet long and 30 feet deep to pods about 5 feet long and a foot across, to irregular pockets about 2 feet across, and to irregular veins a few inches wide. The shear zone, as exposed in the west wall of the pit, is a zone of gouge and breccia 8 feet thick traversing a large gabbro dyke. It there dips 45 degrees northeast, and intermittent exposures showed that it strikes south 44 degrees east for 300 feet, passing out of the dyke and traversing tuff and the tip of the andesite stock. Farther southeast it appears to split into several branches; one of the main branches curves to an easterly strike and steep northerly dip, and passes into limestone. As it was exposed at the south end of the 240 bench in June, the shear zone consisted of slices of gabbro, limestone, and of tuff partly altered to skarn, separated by narrow bands of gouge, breccia, and schist. This ground-up or sheared rock was largely altered to serpentine, talc, and possibly brucite. Tongues of magnetite extended up through the gabbro and appeared to coalesce down at bench level. Nearby, lenses of magnetite in tuff and skarn along the shear zone were rather thoroughly comminuted.

South of this zone, two relatively large but isolated exposures of magnetite were seen on the 270 bench, almost on the strike of the shear zone in the andesite stock but occurring in tuff just southeast of the stock. Other exposures of magnetite south of the shear zone were small and scattered. Some were narrow bands along one or both walls of gabbro dykes. Others were pods along the footwalls of north- or northeast-striking shears. One small pod extended a few feet diagonally down the south wall of the pit off the end of a small lens of argillite in the tuff. Other pods were scattered through skarn-bearing tuff without noticeable associated structures.

In summary, magnetite appears to have favoured contacts and various kinds of fractures. The comminution along shear zones is thought to be due to renewed, post-magnetite movement.

COWICHAN LAKE (48° 124° N.E.)*

Copper

Alpha, Beta, etc. (Albeta Mines Ltd.) Company office, 764 Cowichan Lake Road, Lake Cowichan. Allan H. Harder, president and managing director; George E. Apps, general manager. The property consists of three Crown-granted and twenty recorded mineral claims and fractions on the east fork of Robertson River, northwest and southeast of Long Creek, 7 miles south of Mesachie Lake. Access from the end of the Forest Service road is by way of four-fifths of a mile of road and a bridge over the river.

The mineral showings were located in 1904. Three original claims—Alpha, Beta, and Taboga—were Crown-granted in 1910, and although lying within the Esquimalt and Nanaimo Railway belt carry both mineral and surface rights. Results of various development undertakings are described in the Annual Reports for 1927, 1929, 1930, and 1931.

The present company began work in 1961 with magnetometer surveys. Two anomalies were found southeast of the original showing at the junction of Long Creek and Robertson River. Diamond drilling from surface at these anomalies and at other sites comprised some 4,400 feet. A crosscut adit started on the north side of Robertson River at 920 feet elevation and 350 feet southeast of the mouth of Long Creek had been driven on a bearing of north 60 degrees east to a length of 250 feet by late August. About 480 feet of diamond drilling had been done underground. A raise was driven to an elevation of 30 feet above the adit. A plan and section at the adit is shown on Figure 11.

The rocks are basaltic flows of the Franklin Creek Formation overlain by tuffs and limestones of the Sutton Formation. Limestone is scarce in the vicinity of the showings and of the adit; the beds become more numerous and thicker eastward. The beds strike about east-west and dip steeply both northward and southward.

The beds are cut by three successive intrusive rocks determined megascopically as granodiorite, granite porphyry, and diorite porphyry. The granodiorite is a medium-grained, equigranular, crystalline rock composed chiefly of hornblende and white feldspar, sometimes showing a pink tinge, and quartz. It is appreciably coarser grained than the other two and so is readily distinguished from them. It appears to follow irregular fractures in the lavas and sediments, and drill cores indicate that it commonly holds large inclusions of these rocks. The granite porphyry is younger than the granodiorite and is the principal intrusive rock of the vicinity. It is grey to green, medium to fine grained, with more or less rounded feldspar phenocrysts. Surface exposures show that it occupies fractures striking east-west and dipping 70 degrees south, and striking north 30 degrees east and dipping 65 degrees to the southeast. Distributions in drill cores show that the granite porphyry may have very low dips, at least locally, and that its masses may take very irregular shapes. A similar condition obtained with a porphyry at the Cowichan Copper (Blue Grouse) property at Cowichan Lake, distant 11 miles west of north. Diorite porphyry, dark grey to green with somewhat irregularly distributed small feldspar phenocrysts in a fine-grained to aphanitic matrix, is the youngest intrusive rock and is also younger than the mineralization. It forms small lenticular bodies.

The lavas and sediments and the granodiorite have been locally silicified and altered to skarn. The skarns are of four main types—a garnet-epidote skarn, a red garnetite, a light buff to brown garnetite, and epidotite. There are no obvious relationships between these types and the original rocks. Magnetite occurs most commonly with the garnet-epidote skarn but is found also in the others. Distribu-

* By N. D. McKechnie.

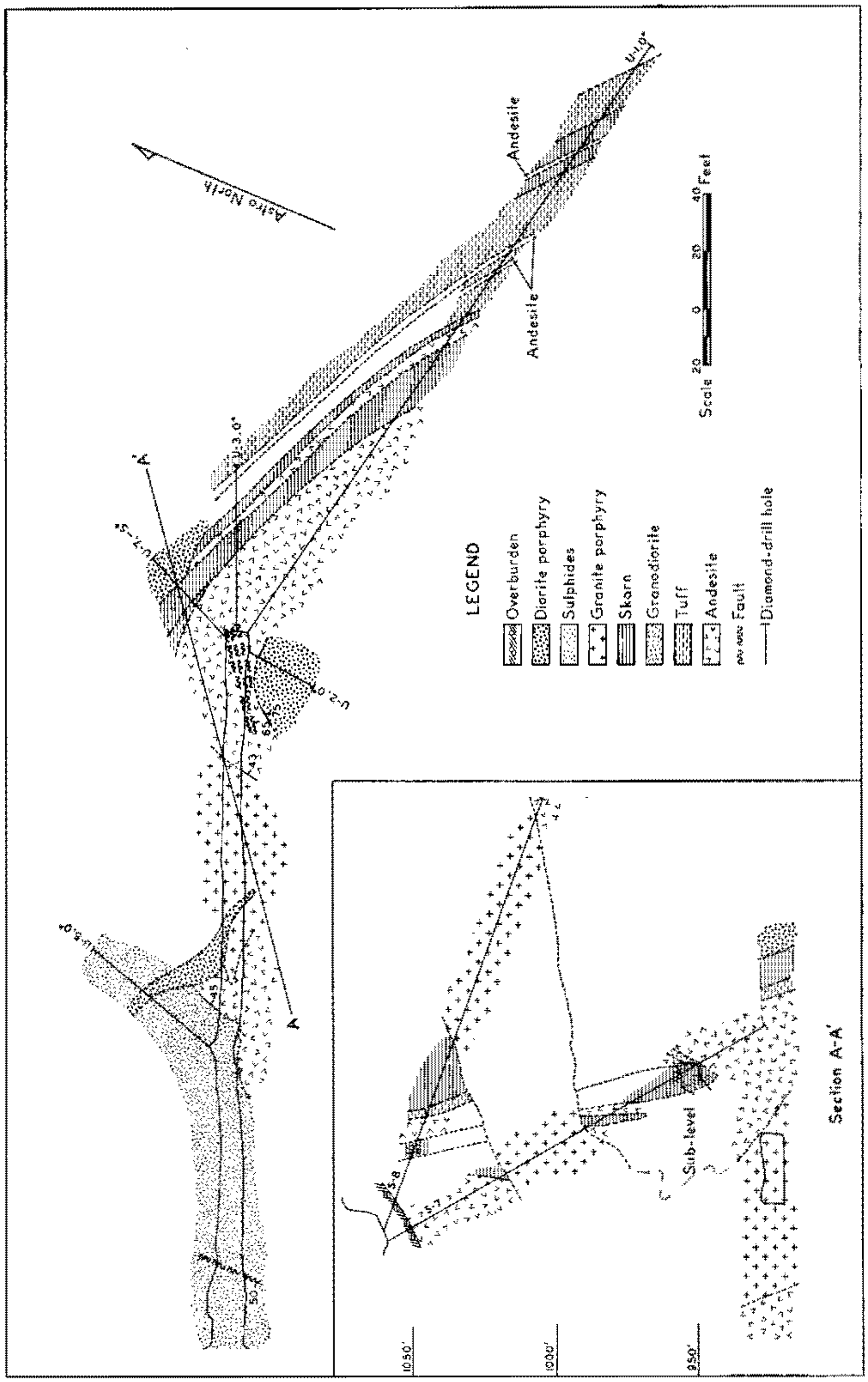


Figure 11. Albeta Mines Ltd.—underground geology.

tion of skarn in drill cores indicates that it may form along favourable beds and also along fractures in tuff, andesite, or granodiorite. In the sublevel from the raise a narrow dyke of granodiorite was seen to be changed to skarn where it crossed the skarn zone there. It was apparent that the skarn alteration followed a structure crosscutting the dyke. No skarn was seen in the granite porphyry nor in the still younger diorite porphyry; presumably these rocks are younger than the skarn alteration.

Pyrite and chalcopyrite are found locally in the skarn and, like the magnetite, usually in the garnet-epidote type. Control of the distribution of sulphides is not apparent, but it is not the same as that of the skarn. At the original discovery, at the junction of Long Creek and Robertson River, the sulphides occur in skarn on the hangingwall of an 18-foot-wide granite porphyry dyke striking north 30 degrees east. Skarn on the footwall side of this dyke is barren of sulphides. The northeastward-striking dyke here joins an east-west striking dyke of the same rock. At less than 100 feet northeast along the hangingwall of the first-mentioned dyke, both skarn and sulphides die out and the rock becomes basaltic lava. It is possible that the mineralization is a pipe-like deposit associated with the junction of the two dykes. Relationships are obscured by a post-mineral fault striking north 60 degrees east and dipping 65 degrees southeast which crosses the junction of the dykes; skarn and sulphides are exposed in the hangingwall of the fault, but granite porphyry is not. As illustrated on Figure 11, there is an apparent alignment on dip between sulphides in the skarn at the sublevel and sulphides in skarn in diamond-drill hole S-8. The intervening granite porphyry is barren. Diamond drilling from surface on sections 70 feet northwest and 60 feet southeast of the adit sections did not show this mineralization to continue that far. Sulphide intersections obtained in a drill section some 250 feet southeast of the adit have not been developed further. Sulphides were cut by two underground holes in skarn about 30 feet ahead of the adit face.

The sulphides probably follow structures allied to the intrusion of the granite porphyry. A possible sequence of events is: development of the skarn alteration, immediately followed by intrusion of granite porphyry accompanied and followed by the introduction of sulphides, and the intrusion of the post-mineral diorite porphyry which cuts skarn and sulphides in the sublevel. The results of the work done indicate that within the present working area no structures exist which are likely to lend much lateral continuity to mineralization. The possibility of mineral pipes remains.

Jordan River (48° 120° S.E.)*

Copper

Sunloch and Gabbro (Cowichan Copper Co. Ltd.) Company office, 620 Howe Street, Vancouver 1; mine office, River Jordan. Oswood G. MacDonald, president; J. R. Billingsley, mine manager. This property is on the Jordan River about 1 mile upstream from its mouth and is reached by a road which leaves the Victoria highway about one-half mile east of the River Jordan Post Office. An operating lease was obtained by Cowichan Copper Co. Ltd. from Sunro Mines Limited (controlled by The Consolidated Mining and Smelting Company of Canada, Limited) to remove ore from eighteen claims which include the Cave, Central, and River ore zones.

The installation of the crushing, grinding, and concentrating sections of the underground mill, commenced in 1961, was completed by the end of April, and the production of concentrates began May 1st. The initial mill rate of 600 tons per

* By N. D. McKechnie and J. E. Merrett.

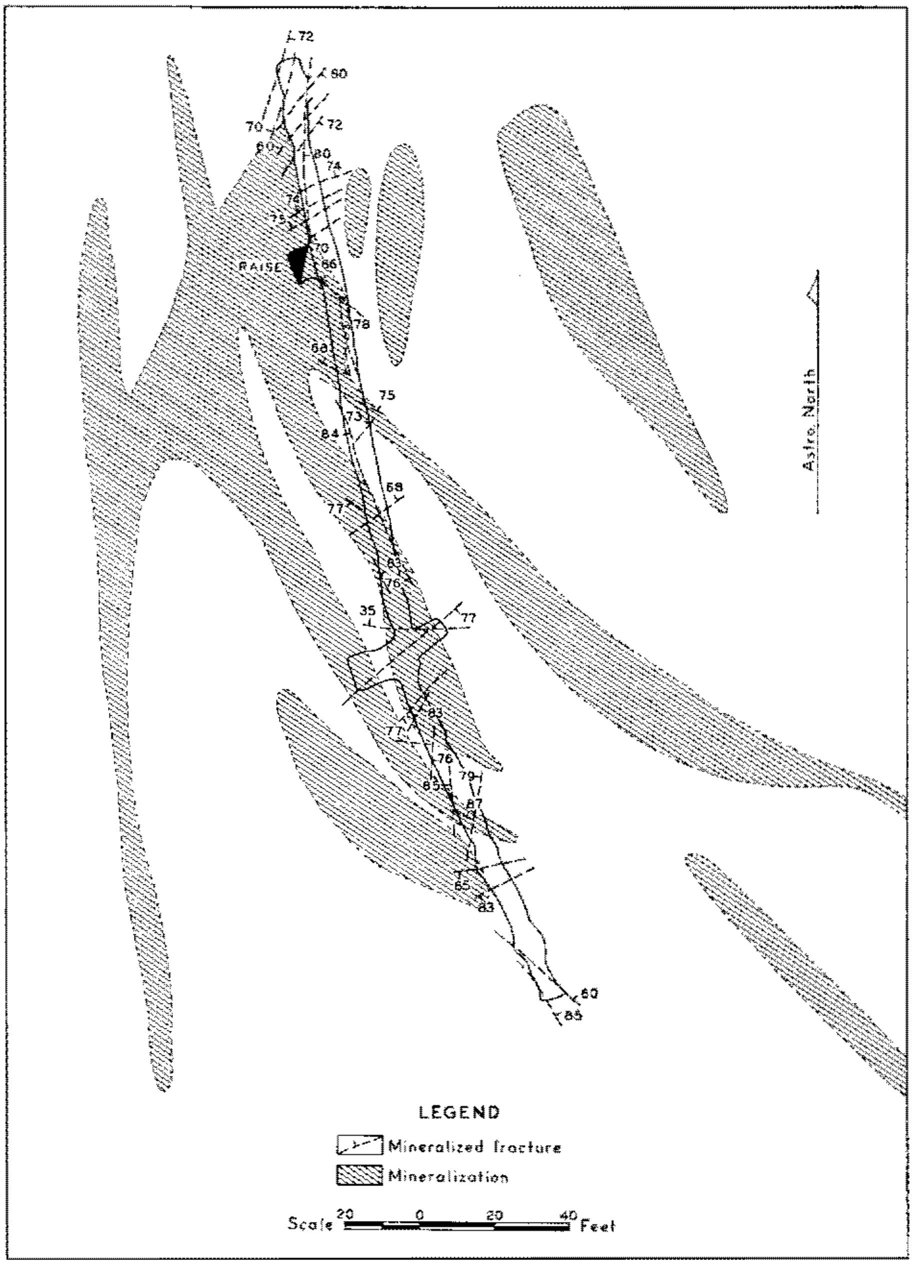


Figure 12. Sunro mine, 5300 level—mineralization outlined by diamond drilling.

day was increased to 1,000 tons per day by the end of December. As the mill was underground, special consideration was given to the handling of the concentrate and mill tailing. Concentrate was loaded into 5-ton-capacity containers mounted on flat cars and transferred to trucks at the portal. The containers were transported 58 miles to and unloaded onto the covered stockpile at the Hatch Point loading-dock. The mill tailing was pumped to the portal, a distance of 7,800 feet, in a 6-inch-diameter plastic pipe-line. At the portal pump station the tailing was pumped an additional 5,000 feet for disposal at tidewater.

The major portion of all development work and ore removal was done in the " B " and " C " orebodies of the River ore zone. The development work comprised 2,485 feet of drifting, 2,774 feet of raising, and 93 feet of shaft raising. A total of 23,697 feet of diamond drilling was completed in 157 drill-holes in order to determine the mining boundaries of the " B " and " C " orebodies. The total amount of ore mined was 192,667 tons, of which 149,599 tons was produced by long-hole stoping. The mill treated 144,009 tons of ore to produce 10,148 tons of copper concentrate which was shipped to Japan.

A crew of 123 men was employed, of whom ninety-five were employed underground mining or in the crushing and milling operations.

The geology of the property is fully described in the Annual Report for 1950, pages 180 to 193; a bibliography of prior publications is included. Recent work is summarized in the Annual Reports for 1957 to 1961.

The property is underlain by lower Eocene Metchosin basaltic flows which are intruded by sills(?) of lower Oligocene Sooke gabbro. The occurrence is unique in British Columbia in being the only mineable metalliferous deposit found so far in Tertiary country rock. The basalt and the gabbro are cut by diabase dykes. These dykes so closely resemble the basalt that they are virtually impossible to map in underground workings, although they are readily distinguished in drill core, particularly if the core is dry.

Mineralization consists of chalcopyrite, pyrrhotite, and pyrite, in that order, with a little molybdenite. Magnetite is present as a constituent of the basalt—it is not confined to the mineralized zones. The sulphides are later than the diabase.

The mineralization is associated with insignificant appearing but persistent shear zones. The River zone, as exposed in the present limited workings, strikes west of north and, according to surface drilling, dips about 75 degrees west. Drilling to date has indicated the zone to have widths of up to 100 feet and a strike length of 1,100 feet. Mineralization in this zone, mapped on the 5300 level (Fig. 12), appears to follow three principal sets of fractures: (1) Striking northeast and dipping steeply north; (2) striking northeast and dipping steeply southeast; (3) striking northwest and dipping steeply southwest.

In the 1950 Annual Report, page 187, it is noted that diabase dykes in the Jordan River canyon strike northwest and, in lesser numbers, northeast.

REPORTS ON GEOLOGICAL, GEOPHYSICAL, AND GEOCHEMICAL WORK

Reports accepted to the end of 1958 for credit on assessment requirements for properties held under the *Mineral Act* and the *Placer-mining Act* since January 17, 1947, and reports on geochemical surveys accepted since April 6, 1951, are listed in the Annual Report for 1958. Starting with 1959, each Annual Report lists the reports accepted during the current calendar year. A copy of each report may be examined in the office of the Mining Recorder for the mining division in which the property is located. A second copy of each report is filed in the office of the Chief of the Mineralogical Branch, Department of Mines and Petroleum Resources, Victoria.

The property name is that which appears to be in most common use. It is not feasible to list all the claim names in each property. The author of each report is given and the principal for whom the report was written.

The co-ordinate given for each report is the southeast corner of the 1-degree quadrilateral within which the property lies.

REPORTS CREDITED FOR ASSESSMENT, 1962

Geographic Position		Property Owner or Principal Author of Report Date of Submission of Report	Kind of Work		
1° Quadr.	Quarter		Geological	Geophysical	Geochemical
49° 115°	N.W.	P.M.L. 922, 926, 929, 930 Hughes and Newmarch. P. R. Brier and F. C. McConnell. December 17, 1962.	—	×	—
49° 115°	N.W.	P.M.L. 922, 926, 929, 930 Hughes and Newmarch. R. L. Hughes and C. B. Newmarch. December 17, 1962.	×	—	—
49° 117°	S.E.	Bell Group Great West Mining Corporation Ltd. Franklin Price. November 13, 1962.	—	×	—
49° 117°	S.W.	Grey Group The Consolidated Mining and Smelting Company of Canada, Limited. D. W. Heddle. November 14, 1962.	—	×	—
49° 118°	S.W.	Boundary Group Moneta Porcupine Mines, Limited. R. H. Seraphim. April 17, 1962.	×	×	×
49° 119°	N.W.	Dief Group The Consolidated Mining and Smelting Company of Canada, Limited. J. Richardson. March 9, 1962.	×	—	—
49° 119°	S.E.	Matt Group Kennco Explorations (Western) Limited. R. A. Bell and D. B. Sutherland. December 3, 1962.	—	×	—
49° 119°	S.W.	Olalla Property Friday Mines Limited. R. A. Bell and P. G. Hallof. January 29, 1962.	—	×	—
49° 120°	N.W.	H.N. 1–12, 15–18; WEN 1–16 Skeena Silver Mines Limited. C. Rutherford. February 27, 1962.	—	×	—

REPORTS CREDITED FOR ASSESSMENT, 1962—*Continued*

Geographic Position: 1° Quadr.	Geographic Position: Quarter	Property / Owner or Principal / Author of Report / Date of Submission of Report	Kind of Work: Geological	Kind of Work: Geophysical	Kind of Work: Geochemical
49° 120°	S.W.	Whip and Saw Groups Texas Gulf Sulphur Company. W. Holyk. February 28, 1962.	×	—	×
49° 121°	S.E.	Rico A, B, and C Groups Rico Copper Mines Limited. T. M. Kerr. June 29, 1962.	×	—	—
49° 121°	S.E.	Rico D and E Groups Rico Copper Mines Limited. T. M. Kerr. June 20, 1962.	×	×	—
49° 124°	S.E.	Cruickshank A, B, and C Groups Cruickshank Explorations Limited. P. G. Hallof and R. A. Bell. July 31, 1962.	—	×	—
49° 124°	N.E.	G.L.M. 3–6 D. Lawson, A. Gotfredson, and W. McLeod. G. I. MacInnis. May 18, 1962.	×	×	—
49° 125°	S.E.	H.M. Group Noranda Exploration Company, Limited. M. M. Menzies. June 26, 1962.	×	—	—
49° 125°	N.W.	Jay Group Buttle Lake Mining Company. J. McCue and D. M. Cannon. November 13, 1962.	×	×	—
49° 126°	N.W.	Hesquiat Lake North, South, and Satchie Paco Resources Ltd. R. E. Chaplin. December 6, 1962.	×	×	—
49° 126°	N.W.	Hesquiat Lake; Stewardson Inlet Paco Resources Ltd. H. G. Agnew. December 6, 1962.	—	×	—
49° 126°	N.W.	Indian Chief; Prince Paco Resources Ltd. Lynn Woodside. December 6, 1962.	—	×	—
50° 115°	S.W.	Aztex-Pyramid Group Georgian Gypsum Products Ltd. J. F. V. Millar. May 24, 1962.	—	×	—
50° 116°	S.E.	Skyline Group T. R. Buckham. T. R. Buckham. August 21, 1962.	×	—	—
50° 117°	N.E.	May Nos. 1–6 Larrie B. York and Loyd York. H. C. B. Leitch. May 5, 1962.	×	—	—
50° 120°	N.W.	A1 Group Alan B. Swan. H. H. Cohen. February 19, 1962.	—	×	—
50° 120°	S.W.	Chalcocite and Malachite Groups Skeena Silver Mines Limited. W. M. Sirola. December 10, 1962.	—	×	×
50° 120°	S.W.	Copperado Property Toluma Mining and Developing Co. Ltd. W. B. Montgomery. August 3, 1962.	—	—	×

REPORTS CREDITED FOR ASSESSMENT, 1962—*Continued*

Geographic Position: 1° Quadr.	Geographic Position: Quarter	Property / Owner or Principal / Author of Report / Date of Submission of Report	Kind of Work: Geological	Kind of Work: Geophysical	Kind of Work: Geochemical
50° 120°	S.W.	Fault 1–24 Angus MacDonald. W. M. Sirola. May 4, 1962.	—	×	×
50° 120°	N.W.	Fault 25–40 Kerr-Addison Gold Mines Ltd. W. M. Sirola. June 8, 1962.	—	×	×
50° 120°	N.E.	Hay 1–8 Mrs. A. MacKenzie. Henry L. Hill. April 9, 1962.	—	×	—
50° 120°	S.W.	H.J. Group W. D. Barr. M. K. Lorimer. Feburary 7, 1962.	—	×	—
50° 120°	S.W.	Justice Mineral Claims Vanmetals Explorations Limited. C. W. Faessler. December 5, 1962.	—	×	—
50° 120°	S.W.	Kim 1–4; Mike 2–5 Copper Soo Mining Company Ltd. A. D. Stanley and H. L. Hill. May 30, 1962.	×	×	×
50° 120°	S.W.	Lower Rover Group General Resources Limited. C. W. Faessler. November 26, 1962.	—	×	—
50° 120°	S.W.	Mint Group Canford Explorations Ltd. Sherwin F. Kelly. February 7, 1962.	—	×	×
50° 120°	S.E.	Pine 1, 3, 5, 7, and 9 G. L. Oates. G. L. Oates. April 4, 1962.	—	×	—
50° 120°	S.W.	Red, White, and Blue Groups Britmont Mines Limited. C. W. Faessler. December 20, 1962.	—	×	—
50° 120°	S.E.	Roi Group G. L. Oates. G. L. Oates. March 23, 1962.	—	×	—
50° 120°	S.W.	Soo and Verna Groups Copper Soo Mining Company Ltd. H. L. Hill. January 22, 1962.	×	×	—
50° 120°	S.W.	Strike 1–2, Resources 29–30, Rick 9–12 Earlcrest Resources Limited. C. W. Faessler. December 3, 1962.	—	×	—
50° 120°	S.W.	Tormont and Laron Groups Tormont Mines Limited. C. W. Faessler. February 12, 1962.	—	×	—
50° 120°	S.W.	Wade Nos. 7 and 15; Tex No. 1 General Resources Limited. P. G. Hallof and D. B. Sutherland. December 5, 1962.	—	×	—
50° 120°	S.W.	Wade Group General Resources Limited. C. W. Faessler. January 12, 1962.	—	×	—

REPORTS CREDITED FOR ASSESSMENT, 1962—*Continued*

Geographic Position: 1° Quadr.	Geographic Position: Quarter	Property / Owner or Principal / Author of Report / Date of Submission of Report	Kind of Work: Geological	Kind of Work: Geophysical	Kind of Work: Geochemical
50° 120°	S.W.	Wade Group General Resources Limited. H. H. Shear. July 6, 1962.	×	—	—
50° 120°	S.W.	West Group Copper Soo Mining Company Ltd. Henry L. Hill. September 12, 1962.	×	×	×
50° 120°	S.W.	Willy Group Craigmont Mines Limited. W. S. Pentland. January 24, 1962.	—	×	—
50° 121°	S.E.	Rock, K. C., K. W., Viking, Park, Pat Kamloops Copper Company Limited. Henry L. Hill. March 20, 1962.	×	×	—
50° 121°	S.E.	Skeena Group Skeena Silver Mines Limited. C. Rutherford. January 15, 1962.	—	×	—
50° 123°	S.E.	Callaghan Group Huestis Mining Corporation Ltd. R. E. Chaplin. August 1, 1962.	×	—	—
50° 126°	S.W.	Artlish Group O. L. Skogland. G. A. Noel. June 15, 1962.	×	×	—
50° 126°	S.W.	Contact Group O. L. Skogland. M. J. Young. May 29, 1962.	×	×	—
50° 126°	S.E.	Hazel Group Camloc Copper Ltd. C. F. Millar. November 2, 1962.	—	×	—
50° 126°	S.W.	Martha-Storey Group Utah Construction & Mining Company. J. E. O'Rourke and C. A. Aird. July 4, 1962.	×	×	—
50° 127°	S.E.	Alfons 1–3 and Caledonia 4 Rio Tinto Canadian Exploration Ltd. L. B. Gatenby. March 29, 1962.	×	×	×
51° 116°	S.W.	A Group Newconex Limited. J. Sullivan. January 10, 1962.	×	×	—
51° 119°	N.W.	Sinbad, Roc, and McCorvie Groups B. Hersley and A. Humphrey. H. C. B. Leitch. July 17, 1962.	×	×	—
51° 122°	N.W.	H.P. Group American Smelting and Refining Company. L. A. Hewitt and D. M. Fletcher. May 14, 1962.	×	×	—
52° 122°	N.E.	Atlas Group C. L. Erickson. J. S. Scott. January 4, 1962.	—	×	—
52° 122°	N.W.	D.R.D. Group Bell Asbestos Mines Ltd. J. H. Low and H. F. Morrow. January 11, 1962.	×	—	—

REPORTS CREDITED FOR ASSESSMENT, 1962—*Continued*

Geographic Position		Property / Owner or Principal / Author of Report / Date of Submission of Report	Kind of Work		
1° Quadr.	Quarter		Geological	Geophysical	Geochemical
52° 132°	S.E.	Swede Group Queen Charlotte Resources Ltd. H. R. Morris. June 6, 1962.	×	×	—
54° 126°	S.W.	Emil, Lew, Diamond, Belle, Black Bear, and Ethel A. Berglund. G. N. Woollett and J. S. Scott. February 2, 1962.	×	×	×
54° 126°	S.W.	Owl 5–12; Nadina 1–4; Angus 1–4 Kerr-Addison Gold Mines Ltd. W. M. Sirola. July 13, 1962.	—	×	—
55° 125°	N.E.	Dorel Group Kennco Explorations (Western) Limited. P. G. Hallof. July 16, 1962.	—	×	—
55° 125°	N.E.	Duckling, Dorothy, Elizabeth, Eldor Kennco Explorations (Western) Limited. R. W. Stevenson. July 16, 1962.	×	—	×
55° 125°	N.E.	Duckling No. 1 Group Kennco Explorations (Western) Limited. R. W. Stevenson. July 17, 1962.	—	×	—
55° 125°	N.W.	Fore Group Fort Reliance Minerals Limited. A. D. Wilmot. September 26, 1962.	—	×	×
55° 125°	N.E.	Lorrex No. 1 Group Kennco Explorations (Western) Limited. R. W. Stevenson. July 16, 1962.	—	×	—
55° 125°	N.E.	Valley Group Kennco Explorations (Western) Limited. P. G. Hallof. July 6, 1962.	—	×	—
55° 129°	S.W.	Red 1–6 Kennco Explorations (Western) Limited. R. W. Stevenson. July 30, 1962.	×	—	—
56° 130°	N.W.	Don Groups Newmont Mining Corporation of Canada Limited. Gordon Gutrath and G. W. H. Norman. October 15, 1962.	—	×	—
56° 130°	S.E.	EV and Lakeshore Groups New Indian Mines Limited. R. V. Best and W. H. White. October 25, 1962.	×	—	—
56° 130°	N.W.	Ken Group Newmont Mining Corporation of Canada Limited. Gordon Gutrath and G. W. H. Norman. October 12, 1962.	—	×	—
57° 131°	S.E.	CC No. 50 and J.L. No. 100 Groups Southwest Potash Corporation. G. W. H. Norman. August 23, 1962.	—	×	—
57° 131°	S.E.	G.C., Hab, and Buy Groups Kennco Explorations (Western) Limited. P. G. Hallof and R. A. Bell. September 21, 1962.	—	×	×
58° 128°	S.E.	Ant Group Julian Mining Co. Ltd. Roderick Macrae. September 14, 1962.	×	—	—

REPORTS CREDITED FOR ASSESSMENT, 1962—*Continued*

Geographic Position: 1° Quadr.	Geographic Position: Quarter	Property / Owner or Principal / Author of Report / Date of Submission of Report	Kind of Work: Geological	Kind of Work: Geophysical	Kind of Work: Geochemical
58° 128°	S.E.	Bee Group Julian Mining Co. Ltd. Roderick Macrae. September 14, 1962.	×	—	—
58° 128°	S.E.	Bee Nos. 1 and 3 Julian Mining Co. Ltd. Roderick Macrae. September 14, 1962.	—	×	—
58° 131°	S.W.	Kid Group Kennco Explorations (Western) Limited. P. G. Hallof. August 1, 1962.	—	×	—

Placer

CONTENTS

ATLIN*

Pine Creek (59° 133° N.W.)

During the winter and spring Karl Sieger drifted on his lease, near Discovery, with Albert Miller.

Bill Husselbee continued to work alone on his lease.

Goldrun Creek (59° 133° N.W.)

Spruce Creek Placers Limited continued to sluice gravel on Goldrun Creek, a tributary of Pine Creek. This operation used a dragline and shovel.

* By W. C. Robinson.

BIRCH CREEK (59° 133° N.E.)

Bill Yates, with three partners, worked on Birch Creek. A 1½-yard shovel was used.

RUBY CREEK (59° 133° N.E.)

Sidney Craft, George Craft, and J. Suits hydraulicked gravel on Ruby Creek.

LINA CREEK (59° 133° N.W.)

Bruce Morton, Joe Andre, and Doug Morrill hydraulicked on Lina Creek.

MCKEE CREEK (59° 133° S.W.)

Joe and Luigi Piccolo and Charles Schroeder hydraulicked gravel on McKee Creek.

OMINECA*

SLATE CREEK (55° 124° N.W.)

Gene Jack sluiced gravel on ground, sub-leased from The Consolidated Mining and Smelting Company of Canada, Limited, on Slate Creek. A D-8 tractor was used for stripping and a ¾-yard dragline was used for building a dam and handling the material to be sluiced. Other equipment included two diesel-driven pumps, a truck, and a welding outfit.

LOST CREEK (55° 124° N.E.)

Hector McCollough hydraulicked gravel on his placer property on Lost Creek near its junction with Manson Creek.

SKELETON CREEK (55° 124° N.E.)

George Ihas worked alone on his placer lease on Skeleton Creek.

CARIBOO†

HIXON CREEK (53° 122° S.W.)

Hixon Placers Inc. Company office, 2032 Third Avenue, Seattle, Wash., U.S.A.; mine office, Hixon. H. W. Hargood, president; N. R. Bunten, superintendent. This company holds twenty-one placer leases on Hixon Creek, the camp being on P.M.L. 2288 about 3 miles east of the Quesnel–Prince George highway. The work done on the property in 1962 consisted of installing 1,000 feet of hydraulic pipeline and stripping approximately 17,000 cubic yards of overburden to start a new hydraulic pit on the upper part of the property. Work was hampered during the year by floods and slides. A crew averaging six men was employed between May 15th and November 30th.

Foremost Miners and Developers Ltd. Company office, 617, 837 West Hastings Street, Vancouver 1. This company did some testing on P.M.L. 6217 on upper Hixon Creek, 6 miles west of the Quesnel-Prince George highway. The ground consists of shallow gravels about 150 feet wide in the creek valley, together with the top decomposed portion of the bedrock. The plant included a D-8 bulldozer, a mobile front-

* By W. C. Robinson.
† By A. R. C. James.

end loader, pump, and sluice-boxes. It was reported that 1,200 cubic yards of gravels was washed. Work was suspended about the beginning of August.

WILLOW RIVER (53° 121° S.W.)

Pundata Mining Limited

Registered office, tenth floor, 850 West Hastings Street, Vancouver 1. This company, formed by R. A. Coppage and associates, controls eight leases on Pundata Creek. In 1961 a camp was established about 6 miles up from the mouth of the creek and a jeep-road was made to the property from the Willow River forest access road. A washing plant, comprising trommel screen, tables, and stacking conveyor, was erected. In 1962 shallow gravels were mined, using a Lorain power-shovel with a 1½-yard bucket to feed into the washing plant. The work was held up by exceptionally wet weather and some mechanical troubles, but the plant continued to operate up to the beginning of November. When the writer visited the property in August, a crew of ten men was employed under the supervision of R. A. Coppage.

Inland Dredging Limited

Richard C. Stein, president. This company holds three placer leases on the west side of Jack of Clubs Lake. In the summer of 1962 Mr. Stein, with the aid of a specially designed floating drill rig, put down a series of test-holes in Jack of Clubs Lake to test the unconsolidated material of the lake bed. In the area where the test-holes were drilled, the lake was found to vary from 120 to 140 feet deep, with about 40 feet of fine silt on the lake bed. It is reported that no appreciable gold values were found.

Mosquito Creek.—Jack Gunn hydraulicked on his lease on the upper part of Mosquito Creek and completed a clean-up by August 20th. Over the past two years he has hydraulicked 24,000 cubic yards of gravel and uncovered 3,000 square feet of bedrock. The greater part of this work was done in 1962. A good recovery of gold is reported to have been made.

Tregillus Creek.—J. W. Armstrong carried out repairs to his dam and maintenance work on his camp.

Jack of Clubs Creek.—J. W. Carruthers dug some test-pits, built a foot-bridge, and washed 50 yards of gravel on P.M.L. 6215.

Big Valley Creek.—Nolan Fisher sluiced gravel on his lease on the south side of Big Valley Creek near Nine Mile Lake.

George Creek.—James Lahay cleared a ditch with a bulldozer on P.M.L. 5816.

WILLIAMS CREEK (53° 121° S.W.)

Dillmac Mining Ltd.

R. MacDonald worked on the Benischke lease (P.M.L. 5265) on the east side of Williams Creek just outside the northern limits of the Barkerville Historical Park. Overburden was removed with a Dominion shovel with a 1½-yard bucket, and some gravel was washed. A truck-mounted gold-washing machine proved unsuitable on this site due to the high clay content of the gravels.

Williams Creek Hydraulic Mines Ltd.

Company office, Box 745, Prince George. Frank Jamieson, president; Vern Saur, foreman. In 1962 this company commenced to rework the old tailings on Devlin's Bench on P.M.L. 3534, about midway between Wells and Barkerville and approximately one-half mile up the road to Bowron Lake and just north of the road. The tailings were excavated by means of a Bucyrus Monaghan dragline with a 100-foot boom and a 4½-yard bucket. This loaded the gravels direct into a dump box which fed them onto portable steel sluice-boxes fitted with rail, Hungarian, and punch-plate riffles. Water for the sluice-boxes was supplied from a 16-inch centrifugal pump powered by a D-8 Caterpillar diesel motor. The tailings were stacked by a bulldozer. The writer was told that the company intends to remove the tailings and then rework the bedrock, since it is believed that this was not done very effectively by the previous operators.

The company began washing gravels about June 1st and closed down for the winter at the end of October. It is estimated that about 150,000 cubic yards of gravel was treated. The gold recovered is reported to be fairly coarse, better than 50 per cent being retained on a No. 4 mesh screen, and the fineness runs approximately 840.

A crew of four men was employed under the supervision of Vern Saur.

ANTLER CREEK (53° 121° S.E.)

Antler Creek.—Arvid Holm worked for 2½ months stripping overburden on his lease on upper Antler Creek.

China Creek.—John Kelly ground-sluiced on the south side of the creek.

California Gulch.—Peter McLanders hydraulicked on P.M.L. 5665 and carried out maintenance work.

Grouse Creek.—Ernest Vallame cleaned out an old ditch and did two months' mining on P.M.L. 5901.

Andrew McGuire ground-sluiced and sank a 20-foot shaft on P.M.L. 6175.

Grouse Creek Barkerville Gold Ltd.

Company office, 314 Burrard Building, 1030 West Georgia Street, Vancouver 5. D. G. McCrae, president. This private company holds four leases in the vicinity of Grouse Creek. The objective of the present work is to locate the downstream extension of the rich channel worked by the Heron Company almost a century ago. According to reports, the Heron channel was mined for over 400 feet and yielded gold valued at $750,000 at 1867 prices. The workings were said to have been abandoned because of difficulty in coping with slum and water.

A shaft was sunk in the early part of the summer to a depth of about 50 feet, but was abandoned after it was found that the attitude of bedrock in the shaft bottom indicated it was in the wrong position for exploring the channel. A second shaft was sunk 55 feet to bedrock. This shaft is a 4- by 8-foot double-compartment shaft. The slope of the bedrock in the shaft bottom appeared to indicate the proximity of the buried channel, and a drift was started out from the shaft bottom. Work was still in progress at the year-end. Other work done includes the construction of a jeep-road about three-quarters of a mile long to the property from Antler Creek road, and the erection of a small camp and installation of a portable compressor and hoist. A crew of five men was employed under the supervision of D. G. McCrae.

Kamloops Copper Company Ltd. Company office, 105 Seymour Street, Kamloops. R. W. Kennedy, president. This company optioned the Wade lease (P.M.L. 5351) on Beggs Gulch. A drift was driven with the object of exploring the bottom of the buried channel in the lower part of Beggs Gulch. This drift had been driven about 80 feet at the end of the year. A crew of four men was employed under the supervision of Eric Larsen.

Lightning Creek (53° 122° S.E.)

D. W. Wells holds four placer-mining leases on upper Lightning Creek above Stanley. In 1962 he constructed 1 mile of road and sank a 4- by 6-foot shaft to bedrock at a depth of 73 feet.

Wingdam & Lightning Creek Mining Co. Ltd. Company office, 204, 509 Howe Street, Vancouver 1; mine office, Wingdam. R. A. Brossard, president; C. W. S. Tremaine, consulting engineer; J. P. MacCulloch, general superintendent. Capital: 10,000,000 shares, no par value. This company controls leases on Lightning Creek in the Wingdam area, 30 miles by road from Quesnel. The Company's objective is to reopen the old Melvin workings and resume mining in the deep lead gravels of Lightning Creek.

A short history of the property and description of the present operation was given in the 1961 Annual Report. Activity throughout 1962 has been concentrated in the Melvin shaft area in an attempt to pump out the 282-foot shaft and gain access to the old Melvin workings. In the spring of 1962 it became evident that the grouting done from surface drill-holes in the summer of 1961 to seal off the No. 1 downstream raise had not been entirely successful and the make of water in the shaft was often more than the pumps could consistently handle. It was therefore decided to carry out further grouting in the No. 1 downstream raise. During the summer, six additional holes were drilled in and around the No. 1 raise, and cement grouting was pumped into these holes under high pressure. The indications by the end of 1962 were that an effective seal had been made in this area.

Another factor causing considerable delay in reopening the workings was the presence of large quantities of slum or fine silt in the lower section of the shaft. A compressed-air line was installed in the shaft, and the silt and water was agitated by the discharge of the compressed air; this made it possible to continue pumping, but trouble with the pumps was experienced due to the high percentage of gritty solids being handled. The station was not uncovered until September, and this, too, was found to be filled with slum. In October a start was made in cleaning out the shaft station and sump. Work was still proceeding at the end of the year. Meanwhile the pumping capacity at the shaft has been considerably increased; it now includes two 125-horsepower Peerless deepwell pumps and two 65-horsepower Flygt deepwell pumps operating in stages.

Other work done in 1962 included the completion by about the beginning of February of the installation of a double-drum mine hoist powered by a 75-horsepower Crocker Wheeler motor controlled by a Lilly hoist-controller. In April an additional Westinghouse 132-kilowatt diesel-driven generator set was installed in the power-house. Miscellaneous rehabilitation on the surface has been done, including some work on the old gold-washing plant. The crew employed throughout the year has varied from fifteen to twenty-three men.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1961, pp. 131–132.]

Hannandor Gold Ltd. Company office, 10644—109th Street, Edmonton, Alta.; field office, Box 937, Quesnel. John Hannley, president; This company holds five placer-mining leases on Mostique Creek and five on Lightning Creek, and has been operating intermittently in this area for several years.

In the latter part of July the company acquired an Allen suction dredge and operated this during the month of August in the old Slade pit and on Mostique Creek upstream from the Slade pit.

The company reports that a total of 3,000 feet of the right bank of Mostique Creek was opened up with a D-7 bulldozer for testing. Two hundred feet of sluice-boxes was set up, and 3,000 cubic yards of gravel was washed. An average crew of three men was employed.

Cottonwood River (53° 122° S.E.)

Carl E. Johnson operated a suction dredge for about two months on his leases on Cottonwood River near Jessie Lake.

Albert Petitclerc did some road repairs and worked on P.M.L. 6265 on Cottonwood River. He reports that he recovered 21.5 ounces of gold.

R. B. Haley did 108 feet of drifting and dug test-pits on his leases on Cottonwood River near the confluence of Frye Creek.

Norman Olausen ground-sluiced and dug gravel with a front-end loader on P.M.L. 5553 on Cottonwood River about 1 mile below Umiti Creek.

L. E. Knudson worked on P.M.L. 5412 in Cottonwood Canyon with a small suction dredge. It is estimated that 2,000 yards of gravel was treated.

Swift River (52° 122° N.E.)

Cottonwood Placer Ltd. Company office, 284 Main Street, Penticton. This company controls twenty-two placer leases in the area of Swift River and Lightning Creek. In 1962 the ground was sub-leased to H. H. Hemsworth & Co. Ltd., who in turn leased the ground to Inland Gold Mines Ltd. The leases are believed to cover a buried pre-glacial channel extending from Lightning Creek to Swift River. Test work was done in 1961 on 1,200 yards of gravel. In 1962 a road 1½ miles long was built to the test site on the east bank of Swift River from the Swift River forest access road. Three test-holes, drilled 50 to 100 feet to bedrock, are reported to have yielded discouraging results.

McMartin Explorations Ltd. Company office, 870 Blundell Road, Richmond. This company holds leases on McMartin Creek, a tributary of Swift River. Work was commenced in September on the construction of a road to the property from the Keithley Creek–Yanks Peak road. A TD-9 bulldozer was used, and the work was supervised by R. Grant, of Keithley Creek. Three miles of road is reported to have been completed.

Quesnel River (52° 121° N.W.)

Thomas Corless worked on P.M.L. 3707 in the Big Canyon. He sluiced 600 yards of gravel, which he excavated with a front-end loader.

Spanish Placers Ltd. Registered office, 703, 470 Granville Street, Vancouver 2; mine office, Likely. D. Harris, president. This company holds eleven leases, five of which are adjacent to the north fork of the Quesnel River and six are on Spanish Creek.

Operations were begun on April 15th, when a camp was established near the confluence of Spanish Creek and the north fork of the Quesnel River and close to the Likely–Keithley Creek road. A crew of six men was employed in the summer constructing about 1½ miles of road, moving in equipment, and building sluice-boxes. Mining work was begun on September 25th and was suspended due to severe weather conditions on November 10th. During this time the company reports that 10,000 cubic yards of overburden was moved by hydraulic monitor. A 600-horsepower Cummins portable diesel generator set was used to supply power. Water was supplied from the river by a Byron Jackson centrifugal pump. The work was under the supervision of D. Harris.

Spanish Creek.—Dallas Morgan did some stripping and ditching on his lease at the southwest end of Spanish Lake.

Patrick Doyle ground-sluiced on P.M.L. 5979 on Black Bear Creek, a tributary of Spanish Creek. He used a No. 1 monitor, supplied with water from the creek by a diesel-driven two-stage centrifugal pump.

Rose Gulch.—R. H. Spooner washed gravels on his lease at the upper end of Rose Gulch.

Leo Foley ground-sluiced and moved boulders on P.M.L. 2485, 1 mile northwest of Likely.

Cedar Creek.—Percy Ogden ground-sluiced on his leases north of Cedar Creek. Some stripping was done in preparation for moving to a new location.

Keithley Creek (52° 121° N.E.)

Keithley Creek.—Ernest Lang worked with two men on his lease 1,700 feet below the confluence of Snowshoe and Keithley Creeks. In 1961 he lost the pay-streak 200 feet in from the portal of his main drift. He turned another drift south from the main drift at a point 140 feet in from the portal and drifted south for 60 feet. In 1962 a shaft was sunk 23 feet to bedrock. At the time of the writer's visit in August, Lang reported finding pay gravels at a point 10 feet down the shaft and again on bedrock.

Four Mile Creek.—Lee Fournier ground-sluiced on his lease in the Placer Engineers pit near the mouth of the creek.

Little Snowshoe Creek.—Tom Kinvig cleared overburden with water from a boomer dam on his lease about 1½ miles upstream from the mouth of the creek.

Nigger Creek.—A crew of three or four men was employed under the supervision of Barney Boe for about three months on his leases on Nigger Creek. Mr. Boe is preparing to resume operations at the upper end of the old hydraulic pit. Approximately 300,000 cubic yards of overburden was removed and washed down the valley by means of water from a boomer dam. Two bulldozers were used to strip the overburden. A supply of lumber and hydraulic pipe was transported to the property ready for use next season.

CRANBROOK*

Monilee (49° 116° S.W.) This placer-mining lease is at the lower end of the falls on the Moyie River, 14 miles southwest of Cranbrook. It is owned by D. J. Oscarson, of Kimberley,

* By D. R. Morgan.

and operated by two parties who sub-leased the property in 1958. Each party is driving an adit tunnel toward an old course in the river. The activities are confined to week-ends.

T. O. Bloomer and partner drove the No. 1 tunnel 40 feet, partly in rock and partly in the gravel of the old channel. There was no recovery. The workmen installed a small unit operated by a pelton wheel for supplying electricity to the property.

P. Kotush and two partners drove No. 2 tunnel 60 feet in bedrock from the bottom of the winze that was driven in 1961. A number of test-holes were drilled into the gravel of the old channel. There was no recovery.

Fort Knox

(49° 116° S.W.) This lease is approximately 1 mile downstream from the falls on the Moyie River, 14 miles southwest of Cranbrook, and is held by D. Jackson and two partners from Kimberley. The workmen sank a small shaft 16 feet toward the bedrock. Activities were confined to week-ends.

FORT STEELE*

Wildhorse Golds Limited

(49° 115° N.W.) Company office, 5504—109th Street, Edmonton, Alta. M. J. Pritchard, manager. This company was formerly known as Boreas Mines Limited, but the name was changed to Wildhorse Golds Limited in 1962. The property comprises four placer-mining leases near the mouth of Fisher Creek, a tributary of the Wildhorse River, 5 miles northwest of Fort Steele. It has been in operation for several years.

The company installed a 1½-yard dragline and small trommel washing plant during the summer of 1962, and washed approximately 6,000 cubic yards of gravel from the west bank of the river. Three men were employed. A fair amount of gold was recovered.

Maus Creek (49° 115° N.W.)

A crew of two men under the direction of G. R. Castles, of Lethbridge, Alta., continued to sink a small shaft toward bedrock, over a period of three weeks.

KIMBERLEY*

Lisbon Creek (49° 115° N.W.)

This placer-mining lease is near the confluence of Lisbon and Perry Creeks, 9 miles south of Kimberley. It can be reached by road from Wycliffe. R. E. Williams and W. Kludash, of Kimberley, drove a short adit on the property but had to abandon the adit due to water. A number of cuts were made.

COLUMBIA RIVER†

Kirbyville Creek (51° 118° N.W.)

Columbia Gold, Ltd.

Company office, 342 Lawrence Avenue, Kelowna. W. A. Mitchell, manager. This property lies on the west side of the Columbia River at the confluence of Kirbyville Creek. A total of eight exploratory holes was drilled, using a Key-

* By D. R. Morgan.
† By David Smith.

stone churn drill. The property is serviced by a boat and high line across the Columbia River. A crew of five was employed.

McCulloch Creek (51° 118° N.W.)

Gold Acres Development, Ltd. Company office, Box 463, Revelstoke. G. Laforme, manager. This company holds nine placer leases which extend to the headwaters of McCulloch Creek. The property is reached by a road which leaves the Big Bend highway at Mile 57 and follows the north side of Goldstream River for a distance of 5 miles, then turns and follows the east side of McCulloch Creek for 3 miles. Operations were limited in 1962 to some exploration work and road maintenance.

Graham Creek (51° 118° N.W.)

Argus Placer Company office, Box 393, Revelstoke. A. E. Horne, manager. This property lies on the headwaters of Graham Creek, a tributary of French Creek. The property is accessible by road from Mile 57 on the Big Bend highway. A small crew was employed at this hydraulic operation.

Structural Materials and Industrial Minerals

CONTENTS

ASBESTOS

Cassiar Asbestos Corporation Limited*

Mount McDame (59° 129° S.W.). Head office, 1001, 85 Richmond Street West, Toronto, Ont.; mine office, Cassiar. F. M. Connell, president; J. D. Christian, general manager; J. G. Berry, general superintendent. The property is 86 miles by road southwesterly from Mile 648.8 on the Alaska Highway. The mine is on McDame Mountain at an elevation of approximately 6,200 feet. The mill and townsite are in Troutline Creek valley at 3,500 feet elevation. The property has been described in the 1960 Annual Report.

In 1962 mining commenced on January 27th and continued for the remainder of the year with no winter shut-down planned. Ore was mined from benches at elevations 6,150, 6,115, 6,080, 6,050, 6,020, and 5,990 feet in the open pit. During the mining season 738,393 tons of ore and 2,304,311 tons of waste were broken. The rock reject plant at the mine treated 462,218 tons of ore and rejected 167,677 tons of waste. The aerial tram-line began operating on January 29th. The mill operated for 335 days to process 552,739 tons of ore, which yielded 57,567 tons of fibre.

Throughout the year an average crew of 451 men was employed.

Plant expansion included an addition to the mill and an addition to the mill laboratory to provide materials testing facilities. An extension to the No. 2 fibre storage doubled its capacity.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1960, pp. 127–128.]

* By W. C. Robinson.

Canadian Johns-Manville Company Limited*

Sproat Mountain (50° 117° N.W.). In March and April, 1962, Canadian Johns-Manville Company Limited of Asbestos, Que., bought sixty-nine mineral claims on an old asbestos prospect on Sproat Mountain. In October the company bought four additional adjoining claims. The showings are on the western slope of Sproat Mountain, 2 miles in a straight line northeast from and 2,800 feet above Sidmouth, a station on the Arrowhead branch of the Canadian Pacific Railway 24 miles south of Revelstoke.

Access to the property is by a rough, steep road about 4½ miles long that branches off the main road a mile north of Sidmouth.

This deposit has been known since before 1921. It was explored by trenching and diamond drilling by Pacific Asbestos Corporation in 1950 and by Western Asbestos and Development Ltd. in 1953.

The asbestos is in an ultrabasic dyke now altered to talc and serpentine that is more than one-quarter of a mile long and as much as 700 feet wide. Previous exploration had shown cross-fibre chrysotile in scattered 1/16- to ¾-inch wide veinlets striking at random throughout a 500-foot-long zone at the south end of the dyke. Slip-fibre occurs with the cross-fibre. Bulk tests run by the Federal Department of Mines in 1928 rated the fibre as cement stock, and further tests in 1949 rated it as paper stock or 4Z grade.

The work in 1962 was aimed at checking previous results and attempting to find more asbestos. A series of fourteen east-west oriented trenches 50 to 250 feet long were dug across the fibre zone. The trenches are in line due north of the old cabin starting 200 feet from it. Beginning from the south end, the first seven trenches are spaced at 50-foot intervals and the remaining seven are at 100-foot intervals. When examined, most of the trenches had been washed out by means of a high-pressure fire-hose so fibre occurrences and rock conditions were clearly seen. The most abundant fibre is in the nine trenches at the south. These are in the area of the older workings. Except for a minor amount in the most northerly trench, the only other fibre of any significance that was seen was in the third trench from the north. In this trench scattered cross-fibre and considerable slip-fibre showed along 80 feet of its length. Linear measurements for grade estimation were made on some zones which appeared to contain the greatest concentrations of cross-fibre veinlets. The seventh trench from the south end had two sections 3 feet long that contained 2½ and 3 per cent fibre. The sixth trench from the south end had a 16-foot-long section that contained three-quarters per cent fibre. The fourth trench from the south end had a 5-foot section that contained 1½ per cent fibre. Undoubtedly bulk samples processed in a mill would indicate higher fibre content, but it is felt these figures give a general indication of the over-all nature of the deposit. The longest fibre measured was seven-sixteenths inch, but this was exceptional, and most was in the range of one-sixteenth to three-sixteenths inch.

In the latter part of the 1962 season the property was mapped geologically and surveyed with a magnetometer.

A crew of six men was employed under the supervision of R. H. Janes.

[References: (1) *Canada Dept. of Mines,* Mines Branch, No. 711, Investigations in Ore Dressing and Metallurgy, 1928, pp. 95–96; (2) *Bureau of Mines,* Ottawa, Report of the Mineral Dressing and Metallurgical Laboratories, Investigation No. 2594, October, 1949; (3) *Geol. Surv., Canada,* Sum. Rept., 1921, Pt. A, pp. 111A–112A; Mem. 161, Lardeau Map-area, British Columbia, p. 112 (1930); (4) *Minister of Mines, B.C.,* Ann. Repts., 1921, p. 160; 1928, pp. 313–314; 1950, pp. 214–217; 1953, p. 184.]

* By J. W. McCammon and D. Smith.

BARITE*

Mountain Minerals Limited Company office, P.O. Box 700, 529 Sixth Street South, Lethbridge, Alta.; quarry office, Brisco. R. A. Thrall, managing director; William McPherson, superintendent. This company owns and operates two barite properties in the Windermere Valley, south of Golden. The properties are operated at alternate periods. The major operation is at Brisco (50° 116° N.E.) and the other at Parson (51° 116° S.W.). A detailed description of the properties is included in the 1958 Annual Report.

The Brisco operation was active for ten months during 1962, during which period a crew of three men mined, crushed, and shipped 1,946 tons of barite to the company's processing plant at Lethbridge and a further 398 tons of crude barite to Winnipeg. Most of the barite was mined from the No. 2 quarry that was started in 1960. The remainder was mined from an adit which is being driven beneath the No. 1 quarry to test the continuation of the deposit.

From the Parson property, 582 tons of chemical-grade barite was mined and shipped to Montreal and a further 242 tons was mined and shipped to Lethbridge. The barite came from the drift that was started in 1958.

Baroid of Canada Ltd. (50° 116° N.E.) Company office, 44 King Street West, Toronto, Ont. J. A. Martino, president; H. K. Beggs, plant superintendent. This company purchased the former Giant Mascot property at Spillimacheen, south of Golden, in 1960 for the purpose of mining barite. The property comprises forty-five Crown-granted claims and one recorded claim. Most of the activities to date have been confined to the recovery of barite from the tailings dump of the former workings. The tailings are trucked to the old mill, where the barite is separated. A new unit has been installed to convert the tailings to a slurry; four Deister No. 666 and two Deister No. 6 tables are used for the separation process and a Dorrco filter is used for dewatering the concentrate.

There were no shipments during 1962, but a crew of four men treated and recovered approximately 2,000 tons of barite which was stockpiled near the mill for future shipment. The men were employed for four months, and the work was suspended for the winter in October. The mill superintendent and a mechanic remained on the property during the winter.

Allan Mining and Exploration Co. (50° 116° S.E.) Company office, 927 Third Avenue Northwest, Calgary, Alta. W. M. Allan, president. This company operated the top quarry on the Larrabee property, near Invermere, for a period of two months in the spring of 1962. A small quantity of barite was quarried and loaded for shipment to Alberta, following which the operation was suspended. There were four men employed.

BUILDING-STONE

International Marble & Stone Company Limited† Sirdar (49° 116° S.W.). Company office, 540 Howe Street, Vancouver 1; main office, 4106 MacLeod Trail, Calgary, Alta.; plant office, Sirdar. W. R. Rookes, president; H. Rennich, general superintendent. Capital: 3,000,000 shares, 50 cents par value. This company owns a crushing and bagging

* By D. R. Morgan.
† By J. D. McDonald.

plant at Sirdar. The plant is 2 miles north of Sirdar on the Kootenay Bay–Creston highway. During 1962 the company operated quarries at Sirdar (328 tons of granite), Swift Creek (120 tons of limestone), and Crawford Bay (538 tons of dolomite). In addition, the company has options on or owns other holdings of granite, quartzite, marble, and silica.

Products manufactured by the company are stucco chips, terrazo chips, roofing chips and granules, turkey and chicken grit, and structural stone. A new bagging-machine was installed in the plant. Most of the production consisted of 511 tons of dolomite stucco chips. In addition, 328 tons of turkey and chicken grit was produced and 147 tons of structural stone was shipped. Other material was produced on an experimental basis. Most of the production was shipped to the prairies.

The plant at Sirdar was operated on a part-time basis. Two men were employed at the plant and two men were employed in the quarries.

Valley Granite Products Limited*

Cheam View (49° 121° S.W.). Company office, 410 Mayfair Avenue, Chilliwack; plant, Cheam View. K. Jessiman, general manager. The quarry and plant are on the west side of the Trans-Canada highway about 10 miles west of Hope. A crew of eight men produced approximately 8,000 tons of granite products, including poultry grits, stucco dash, and sand-blast materials. New construction in 1962 included a substantial extension to the warehouse to provide increased storage space for a greater variety of products.

Inland Quarries Ltd.†

Agassiz (49° 121° S.W.). Company office, 5498 Fraser Street, Vancouver 15. W. E. Chandler, president; R. W. Hamilton, quarry superintendent. The quarry is adjacent to the Canadian Pacific Railway, 1 mile east of Agassiz. Prior to World War I the site was known as the Sinclair quarry. A crew of two men was employed for a six-month period, during which time 207 tons of granite of dimension-stone quality was produced and 187 tons was shipped to Vancouver.

Evans, Coleman & Evans Limited (Gilley Quarry)†.—Pitt River (49° 122° S.W.). Company office, 902 Columbia Street, New Westminster. E. Thorsen, production manager; Francis J. MacDonald, quarry superintendent. The quarry is on Pitt River immediately south of its confluence with Munro Creek. During a four-month operating period a crew of sixteen men produced 45,000 tons of quartz diorite.

Granite Falls Quarries Ltd.†—Granite Falls (49° 122° S.W.). Company office, 630 Taylor Street, Vancouver 3. D. Milavsky, manager. This company succeeded Indian River Quarries Limited. During a period of six weeks a crew of four men shipped 5,968 tons of granite riprap.

Richmix Clays Limited†

McNabb Creek (49° 123° N.E.). Office, 2890 Kent Avenue, Vancouver 12; quarry, McNabb Creek. G. W. Richmond, manager. The quarry, which produces slate, is at the mouth of McNabb Creek on Howe Sound, 6 miles northeast of Port Mellon. Two men, working on contract, mined 5,375 tons of slate, which was shipped to the company plant to produce asphalt shingle surfacing granules.

* By A. R. C. James.
† By J. E. Merrett.

British Columbia Slate Co. Ltd.*—Nelson Island (49° 124° N.E.). Company office, 813, 475 Howe Street, Vancouver 1; granite quarry, Nelson Island. Philip Graham, president. During 1962, 428 tons of quarry rubble was removed and shipped to the Vancouver plant. The material was used to produce split-face granite for building-finish veneers.

CEMENT

British Columbia Cement Company Limited.†—Bamberton (48° 123° N.W.). Head office, 540 Burrard Street, Vancouver 1. W. F. Foster, president; B. M. Brabant, executive vice-president; R. E. Haskins, vice-president in charge of production. During 1962 this company operated its cement plant at partial capacity.

Lafarge Cement of North America Ltd.‡—Lulu Island (49° 123° S.E.). This company operated its cement plant at partial capacity during 1962.

CLAY AND SHALE*

Clayburn-Harbison Ltd.—(49° 122° S.E.) Head office, 1690 West Broadway, Vancouver 9; plants, Kilgard and Abbotsford. R. M. Hungerford, president; G. H. Peterson, general manager. Two plants are operated by this company—one at Kilgard, where sewer-pipe and flue-linings are manufactured, and the other at Abbotsford, where face-brick and refractories are made. Clay was produced from one underground and two open-pit operations. Four men employed underground at the Kilgard Fireclay mine produced 12,540 tons of clay. Three men employed at the Kilgard No. 9 pit, on the mountain above the Fireclay portal, produced 17,180 tons of clay, while three men working in the Selby pit, 2½ miles east of Abbotsford, produced 13,198 tons of clay.

Richmix Clays Limited.—Kilgard (49° 122° S.E.). Office and plant, 2890 Kent Avenue, Vancouver 12; quarry, Kilgard. G. W. Richmond, manager. One man mined and trucked 5,523 tons of fireclay to the Vancouver plant.

Haney Brick and Tile Ltd.—Haney (49° 122° S.W.). Company office and plant, Haney. E. G. Baynes, president; J. Hadgkiss, managing director. Two men were employed removing clay from a pit adjacent to the plant at the edge of the Fraser River. Thirty men were employed in the plant, which produced 8,317 tons of clay products, of which 78 per cent was drain-tile, 21 per cent structural tile, and 1 per cent flower-pots.

Mainland Clay Products Limited—Barnet (49° 122° S.W.). Head office, 8699 Angus Drive, Vancouver 14; plant, Barnet. This company, a subsidiary of Pitkethly Brothers Limited, employing a crew of three men, produced 370 tons of red clay building-bricks and fire-bricks at the plant adjacent to the highway on the north slope of Burnaby Mountain. Clay for the building-bricks was obtained from an adjacent pit, and fireclay was obtained from Kilgard.

* By J. E. Merrett.
† By R. B. Bonar.
‡ By J. W. McCammon.

Fairey & Company Limited.*—Vancouver (49° 123° S.E.). L. T. Fairey, manager. This company produced a variety of fireclay blocks, shapes, and high-temperature cements. Local and imported raw materials were used.

British Columbia Lightweight Aggregates Ltd.†—Saturna Island (48° 123° N.E.). This company has a shale expanding plant and quarry at Lyall Harbour on Saturna Island.

Evans, Coleman & Evans Limited (formerly Baker Brick & Tile Company Limited).†—Victoria (48° 123° N.E.). Plant shut down and demolished..

DIATOMITE‡

Fairey & Company Limited

Quesnel (53° 122° S.E.). Company office and plant, 661 Taylor Street, Vancouver 3. L. T. Fairey, president. Four carloads (440 cubic yards) of diatomite was quarried on Lot 6182, on the east bank of the Fraser River about 6 miles north of Quesnel. The material was excavated by a local contractor. It is used in making insulating-back and as a concrete admixture.

DOLOMITE*

International Marble & Stone Company Limited

Crawford Bay (49° 116° N.W.). This company quarried a small amount of dolomite marble from a deposit near Crawford Bay. The quarry is on a side road 50 feet northeast of and 50 feet above Highway No. 3 at a point two-thirds of a mile south of the Crawford Creek bridge. The quarry consists of a narrow cut extending for 75 feet northwestward along the edge of the road. The maximum face height is 15 feet. Coarse-grained white dolomite is exposed along the full length of the cut. A few scattered thin streaks of clear to pale brown phlogopite occur scattered through the dolomite. At the northwest end of the quarry, tremolite is moderately abundant. The dolomite is interbedded with a group of metamorphic rocks that are intruded by pegmatite dykes and are close to a granite contact. Rice (Ref.) has mapped the dolomite as part of the Badshot Formation, which is now considered to be of Lower Cambrian age. A partial analysis of a grab sample of the white dolomite from the quarry showed 20.70 per cent MgO and 30.86 per cent CaO.

Rock quarried from the deposit was hauled by truck to the company crushing plant at Sirdar, where it was made into granules and bird grits.

[Reference: Rice, H. M. A., Nelson, B.C., *Geol. Surv., Canada,* Map 603A (1940).]

GYPSUM§

Western Gypsum Products Limited

Windermere (50° 115° S.W.). Company office, 306, Electric Railway Chambers, Winnipeg 2, Man.; quarry office, Athalmer. N. W. Puttock, general manager; A. E. Portman, superintendent. This company operates a large gypsum property on the north side of Windermere Creek, 8 miles east of Windermere. The property was formerly owned and operated by the Columbia Gypsum Company but

* By J. W. McCammon.
† By R. B. Bonar.
‡ By A. R. C. James.
§ By D. R. Morgan.

was bought by the present company in 1957. The claims worked are the Blue Grouse 1-15729 and Blue Grouse 2-15731.

The 1962 production was mined from the No. 2 quarry that was opened in 1958. The gypsum is mined in 15-foot lifts using AN/FO explosives and trucked 11 miles by private road to a crushing plant adjacent to the Kootenay Central Railway near Wilmer. The plant was built in 1960, and is described in the 1960 Annual Report.

Total production in 1962 was 197,759 tons, of which 147,874 tons was shipped by rail and the remainder placed on stockpile near the mill. Most of the production was sent to the company's processing plants at Calgary and Vancouver. Small shipments were sent to the Domtar Construction Materials Limited plants at Calgary and New Westminster; Canada Cement Company at Exshaw and Clover Bar, Alta.; Inland Cement Company at Edmonton, Alta.; Greenacres Gypsum Company at Austin, Wash.; and Lehigh Portland Cement Company at Metaline Falls, Wash.

The quarry was operated for ten months. Ten men were employed, most of whom were on contract.

Domtar Construction Materials Limited Canal Flats (50° 115° S.W.). Office address, Box 506, Sta. F, Toronto 5, Ont. This company optioned a number of gypsum claims from A. H. Nichols and Mrs. B. Iverson, of Kimberley. The property is near the confluence of Roam Creek and the Lussier River, 16 miles southeast of Canal Flats, and can be reached by a 21-mile rough roadway leading from No. 95 highway north of Skookumchuk. A three-man crew drilled fifteen AX and EX diamond-drill holes totalling 1,100 feet and completed some surface mapping during the summer months. The drilling was done by contract and under the supervision of A. C. Ogilvy, geologist.

LIMESTONE

LIMESTONE IN THE KENNEDY LAKE AREA (49° 125° S.E.)*

Several irregular masses of limestone occur in the vicinity of Kennedy Lake on the west coast of Vancouver Island. The greatest concentration and the largest of the deposits are at the southeast corner of the lake. These have been mapped in detail by Eastwood (*see* pp. 111–122 of this Report). Other deposits are near the west side of the lake and close to Ucluelet.

A rock cut exposes limestone for 100 feet along the south side of the main road 1.2 miles northwest of Ucluelet. The limestone forms a mound 30 feet high. No other rock is visible in the immediate vicinity, but 350 feet farther to the northwest along the road brecciated grey chert has been uncovered. The limestone can be traced 50 feet southward, more is exposed on a trail 500 feet to the south, and still more is exposed for 400 feet along the beach 1,000 feet south of the road cut. On the beach, associated rocks consist of dark-green flows, tuffs, breccias, and some ribbon chert. Structural relationships are complex and are complicated by considerable faulting. The limestone is massive fine-grained dark-grey rock. It is crisscrossed by numerous hairline veinlets of coarse-grained calcite that stand out in relief on weathered surfaces. No identifiable fossils were found, but tiny round crinoid plates are present. Northwest-striking vertical joints at 2- to 10-inch spacings are abundant in the road cut. A sample consisting of chips taken at 2-foot intervals across 30 feet of exposure in the road cut had the analysis shown as No. 1 in the accompanying table.

* By J. W. McCammon.

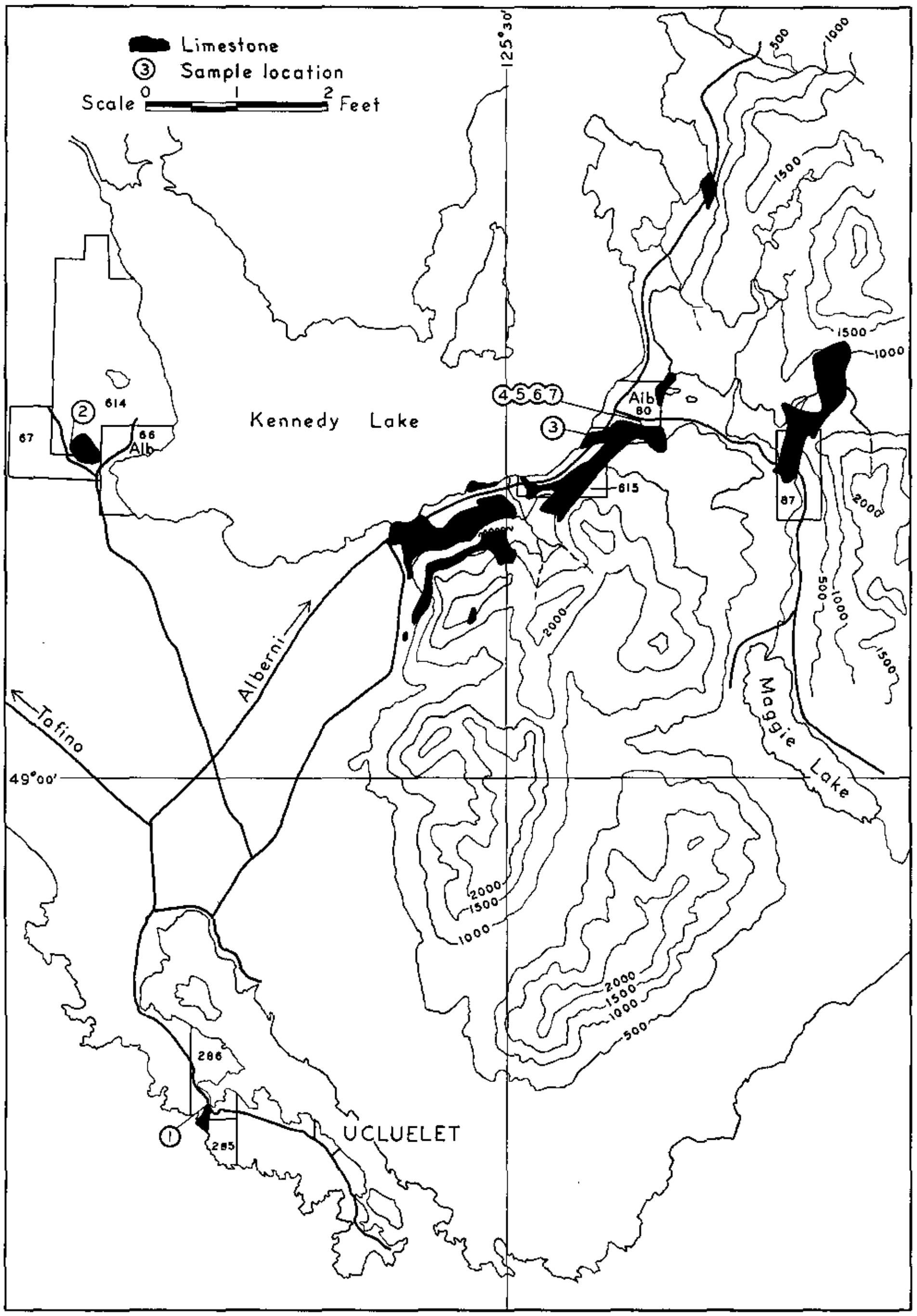


Figure 13. Limestone in the Kennedy Lake area.

A low isolated hill about one-third of a mile in diameter consisting mainly of limestone is located half a mile west of Kennedy Lake on Lot 614 near the junction of Lots 66 Alb. and 67. Good logging-roads pass the south and west sides of the hill. At the southwest corner of the hill, fine-grained tuff or argillite underlies the limestone. The contact dips flatly to the northeast. The limestone is medium-grained dark-grey rock. It has a slightly fetid odour when freshly broken. Few impurities are visible and no fossils were found. A grab sample of chips from a good exposure at the northwest corner of the hill had the analysis shown as No. 2 in the table.

At the southeast corner of Kennedy Lake, outcrops of limestone extend along the hillside parallel to the Alberni road for 2½ miles. At the west end two separate bands are present. Outcrops near the road are not large, most of the bare exposures being several hundred feet up the steep slope. Along the road, aplite dykes, diorite, and volcanic rocks cut and intermingle with the limestone. Some zones of mottled dolomite are present. The limestone is medium- to coarse-grained medium-grey coloured rock. Most is massive and structureless with few recognizable impurities. Veinlets as wide as 1 inch of coarse-grained white calcite occur occasionally. Analysis No. 3 in the table is of a sample made up of chips cut at 10-foot intervals going westward along 300 feet of outcroppings beside the main road starting one-quarter mile west of the side road to Maggie Lake.

Samples 4, 5, 6, and 7 were taken by Eastwood. They were collected in succession eastward across the limestone band exposed in outcrops along the bed of the creek that follows the south border of Lot 80 Alb.

Sample No.	Insol.	R_2O_3	Fe_2O_3	MnO	MgO	CaO	P_2O_5	S	Ig. Loss	H_2O
1	0.60	0.23	0.19	0.018	0.33	55.13	Trace	0.041	43.52	0.06
2	0.70	0.22	0.14	0.012	0.49	54.98	Trace	0.001	43.46	0.08
3	0.84	0.17	0.11	0.008	0.74	54.80	Trace	0.002	43.37	0.05
4	5.19	0.91	0.89	0.026	0.79	51.25	0.016	0.66	39.89	0.07
5	1.70	0.34	0.21	0.017	0.69	53.91	0.007	0.03	42.67	0.06
6	0.69	0.28	0.20	0.019	1.06	54.09	0.007	0.09	42.99	0.05
7	1.08	0.31	0.24	0.020	1.56	53.29	0.005	0.10	43.14	0.06

Zymoetz River* (54° 128° N.E.) At the lower end of the canyon 3½ miles upstream from its mouth, the Zymoetz River cuts through a band of Permian limestone. The Zymoetz River flows westward into the Skeena River 5 miles east of Terrace. A good gravel road up the south side of the river passes close to a bluff of the limestone 1.43 miles from Highway 16, and it passes through a cut in a second exposure of the stone 1.87 miles from the highway. No other exposures of limestone occur near the road; however, Duffell (Ref.) indicates that the band is one-half mile wide and extends 2½ miles west of the river and 5 miles east of the river.

The road cut is 400 feet long. From west to east it exposes the following sequence: 50 feet of limestone, 20 feet of andesite dyke, 50 feet of limestone, 40 feet of andesite, 30 feet of limestone, 170 feet of loose gravel, 40 feet of white extremely siliceous limestone partly covered by gravel. The limestone is medium- to fine-grained pale-green rock. One sample, consisting of chips from across the two 50-foot-wide zones of limestone, had the following percentage composition: Insol.=9.28; R_2O_3=0.60; Fe_2O_3=0.70; MnO=0.019; MgO=0.70; CaO=49.73; P_2O_5=0.019; S=0.004; Ig. Loss=39.44; H_2O (105° C.)=0.01.

[Reference: Duffell, S., and Souther, J. G., *Geol. Surv., Canada,* Terrace, B.C., Map 11-1956.]

* By J. W. McCammon.

Norkay (The Consolidated Mining and Smelting Company of Canada, Limited)*

Fort Steele (50° 115° N.W.). This property is located on the north side of the Kootenay River 5 miles northeast of Wardner and 2 miles west of the Bull River. The property is owned by The Consolidated Mining and Smelting Company of Canada, Limited, and is operated by a contract company to supply dolomitic flux to the Consolidated company's iron-reduction plant at Kimberley. The quarry was worked at intermittent periods during 1962, and a total of 8,760 tons of limestone was produced and shipped to the plant. Most of the production, 6,400 tons, was loaded from a talus slope, and the remainder from the first bench in the quarry. The bench was blasted by the use of AN/FO in August, and it is estimated approximately 3,000 tons of limestone was broken by the blast. The quarry was shut down in November, when another source of stone was obtained. Two men were employed on the property.

International Marble & Stone Company Limited†

Swift Creek (49° 117° S.E.). Head office, 4106 MacLeod Trail, Calgary, Alta. This company mined a small amount of marble from a quarry on Swift Creek 8½ miles south of Salmo. The quarry is 300 feet north of Swift Creek at a point 1,500 feet upstream from the creek mouth at the Salmo River. It can be reached by means of a rough road up the west bank of the Salmo River from a private bridge that connects with Highway No. 6 about 2 miles south of the South Salmo River bridge.

In June, 1961, the quarry consisted of an opening dug northward into the hillside for 150 feet, the top edge being 100 feet above the main floor, and the width ranging from 75 feet at the entrance to 62 feet at the top.

The rock at the quarry consists of interlayered 1- to 2-inch bands of blue-grey and white medium-grained limestone with a few random 2- to 3-foot zones of coarsely crystalline white marble. The banding strikes about north 60 degrees east and dips 45 degrees northwest. Continuous exposures of the rock extend 500 feet east, 100 feet north, and 100 feet west of the quarry. Fyles (Ref. 1) has traced the same limestone for more than one-quarter mile to the northeast and to the west. It is part of the Lower Cambrian Reeves Member of the Laib Formation. A sample consisting of chips taken at 1-foot intervals across 62 feet of the face near the top of the quarry had the following percentage composition: Insol.=6.32; R_2O_3= 0.46; Fe_2O_3=0.46; MnO=0.012; MgO=1.7; CaO=50.89; P_2O_5=0.011; S=0.014; Ig. Loss=41.16; H_2O (105° C.)=*nil.*

The company shipped a few truckloads of rock, chiefly coarse-grained white marble, to its processing plant at Sirdar. The rock was crushed to make chips and bird grit.

[References: (1) Fyles, J. T., and Hewlett, C. G., Stratigraphy and Structure of the Salmo Lead-Zinc Area, *B.C. Dept. of Mines,* Bull. No. 41, 1959, Fig. 3, Sheet C; (2) Little, H. W., Nelson, B.C., *Geol. Surv., Canada,* Map 1090A (1960).]

Fraser Valley Lime Supplies‡

Popkum (49° 121° S.W.). Head office, 7, 583 Edmonds Street, Burnaby. Thomas Mairs, manager. The quarry and crushing plant are on the east side of the Trans-Canada highway adjoining the southernmost tip of Indian Reserve No. 1, three-quarters of a mile east of Popkum station on the Canadian National Railway. The limestone is blasted from a 30-foot face and transported to a crushing plant by

* By D. R. Morgan.
† By J. W. McCammon.
‡ By A. R. C. James.

a mobile loader. The products are sold for agricultural use and as an industrial filler. A crew of seven men produced 6,584 tons of limestone. A total of 6,604 tons of limestone products was sold in 1962.

Beale Quarries Division (Lafarge Cement of North America Ltd.).*— Vananda (49° 124° N.W.). Head office, 1051 Main Street, Vancouver 4; quarry office, Vananda. W. D. Webster, quarry superintendent. The quarry, crushing plant, and loading-dock are on the east coast of Texada Island, 1 mile south of Vananda. Open-pit benching was used to produce 502,279 tons of limerock, of which 435,000 tons was crushed and 401,000 tons was shipped. A crew of twenty-three men was employed.

Ideal Cement Company Ltd.* Vananda (49° 124° N.W.). British Columbia office, 1155 West Georgia Street, Vancouver 5; quarry office, Vananda. W. S. Beale, manager, Rock Products Division; J. K. Johnson, superintendent. Rock quarries were operated on Lot 25, 2 miles south of Vananda and adjacent to the crushing plant and loading-dock at Marble Bay. Open-pit bench-quarrying methods were used to produce 125,000 tons of limerock, of which 103,000 tons was crushed and shipped. The materials shipped included rip-rap rock, pulp rock, cement rock, metallurgical limerock, and limerock for the production of calcium carbide. A crew of twelve men was employed.

Imperial Limestone Company Limited* Vananda (49° 124° N.W.). Office, 7309½ East Marginal Way, Seattle 8, Wash.; plant and quarry office, Vananda. J. A. Jack, president; E. Jack, superintendent. The quarry and primary crushing plant are on Lot 500, near the summit of a small hill 1 mile west of Spratt Bay on the east coast of Texada Island. At the quarry plant the limerock is sorted into white and grey fractions. The select white limestone is trucked to the plant at Vananda for further crushing to produce stucco dash and whiting. The run-of-pit and sorted grey rock was trucked to the main crushing plant at Spratt Bay.

A crew of fourteen men mined, crushed, and shipped 44,483 tons of limerock.

Gypsum, Lime Division (Domtar Chemicals Limited)* Blubber Bay (49° 124° N.W.) British Columbia office, 1105 West Pender Street, Vancouver 1; quarry office, Blubber Bay; lime plants, Blubber Bay and Vancouver. A. M. Stewart, west coast manager; J. M. Greenaway, Blubber Bay plant manager. The limestone quarry is approximately 2 miles south of Blubber Bay at the north end of Texada Island. The crushing, storage, and loading facilities were expanded by the addition of a 42- by 48-inch Telsmith jaw crusher, a 50-foot extension to the reclaiming tunnel, and a new shuttle conveyor for loading barges up to 10,000 tons capacity. A new haulage road was constructed from the pit to the plant in order to avoid the payment of highway overload penalties.

A crew of fifteen men was employed at the quarry and crushing plant, and forty-five men in the lime plant. Open-pit bench-mining methods were used to produce 388,000 tons of limestone, of which 345,000 tons was shipped.

* By J. E. Merrett.

British Columbia Cement Company Limited.*—Cobble Hill (48° 123° N.W.). Head office, 540 Burrard Street, Vancouver 1. W. F. Foster, president; B. M. Brabant, executive vice-president; R. E. Haskins, vice-president in charge of production. Limestone for the Bamberton cement plant is quarried by this company from a deposit at Cobble Hill on Vancouver Island. In 1962, 286,788 tons of raw material was mined.

MAGNESITE†

A. P. Green Fire Brick Company Limited

Dunbar Creek (50° 116° N.E.). Company office, 2122 Eighth Avenue Southeast, Calgary, Alta. This company has an option on the Jab 1, 2, and 3 mineral claims. These claims were located on a magnesite deposit by J. A. Brown, of Calgary, in June, 1959. The deposit is about 1,000 feet west of Dunbar Creek, 4 miles airline southwest of Brisco. It is reached by an 800-foot-long tractor-road off the west side of the Dunbar Lake road at a point 8¼ miles from Brisco station.

The magnesite forms a bare, oval, 50-foot-high knoll about 400 feet long and 100 to 170 feet wide, with the length oriented a little west of north. A circular 10-foot-wide patch of bluish dolomite, possibly float, was found 100 feet west of the south end of the magnesite. Apart from this, no other rock was seen near the showing. Two magnesite boulders occur 150 and 200 feet southeast of the main outcrop, and a 100-foot-long slab 30 feet wide lies just off the southeast tip of the knoll. On the lake road, thin-bedded white quartzite forms bluffs one-quarter mile south of the magnesite, and interbedded dolomite and quartzites are exposed one-third of a mile north of the showing. These rocks were mapped by Reesor (Ref.) as part of the Proterozoic Upper Purcell Mount Nelson Formation.

Most of the visible magnesite is pale-grey to white coarse-grained rock with crystals one-eighth to one-half inch in diameter. It weathers to a buff or brown stained rough surface. A few patches of the rock are fine grained and bluish grey. In some parts of the outcrop white quartz and bluish chalcedony form discontinuous ⅛- to 1-inch-wide stringers 1 to 3 feet long. At scattered points pyrite crystals as long as one-quarter inch occur in patches and 2- to 3-inch-long stringers. Traces of chalcopyrite are associated with the pyrite. A few small patches of very coarse-grained white dolomite with some talc are present on the top of the knoll. On the whole, the outcropping is quite massive and structureless, but in places it exhibits a vague colour layering that may represent relic bedding. At the south end of the exposure the layers strike north 15 degrees west and dip 65 degrees southwest, whereas at the north end the strike is north 10 degrees east and the dip is 25 degrees northwest. One sample, consisting of chips collected at random across the top of the knoll, had the following percentage composition: $MgO = 44.02$; $CO_2 = 43.82$; $SiO_2 = 8.99$; $CaO = 0.47$; $Fe = 0.99$.

Development work done on the property has consisted of diamond drilling and bulldozer trenching. Four diamond-drill hole sites were located, but no cores or core logs were seen. Four east-west trenches up to 10 feet deep and 100 feet long were dug at 100-foot intervals south of the knoll, but none reached bedrock. A road, in parts dug 10 feet deep, was excavated completely around the magnesite knoll, but it revealed nothing of apparent interest.

[Reference: Reesor, J. E., *Geol. Surv., Canada,* Lardeau (East Half), Map 12-1957.]

* By R. B. Bonar.
† By J. W. McCammon.

A. P. Green Fire Brick Company Limited*

Cleland Lake (50° 116° N.E.). This company holds an option on the Whitehorse 1, 2, 3, 4, 5, and 6 mineral claims. These claims were located on a magnesite deposit in August, 1960, and July, 1961, by John and Gordon Hart, of Brisco. The claims are 5 miles due west of Brisco. They lie along a low, narrow ridge at the south end of Topaz Lake, about one-quarter of a mile southwest of Cleland Lake. Access is by means of a rough road, 7½ miles long, from Brisco by way of Cleland Lake.

On the property, magnesite is exposed in one main mass and four smaller ones. Two additional small outcrops occur to the northwest beyond the claim limits. The main showing is a flat mass 200 to 400 feet wide that is exposed for 800 feet along the top of a low ridge. Diamond drilling has shown it is 50 to 100 feet thick and is underlain by dolomite. Two small showings—one about 200 feet long and 100 feet wide and the other about 50 feet in diameter—form low mounds on the flat 200 feet west of the main showing. A third minor showing forms a lens 400 feet long and 100 feet wide along the edge of the ridge 500 feet south of the main exposure. The fourth minor outcropping is 100 to 200 feet wide and is exposed for nearly 400 feet along a small ridge parallel to the main ridge and 250 feet northeast of it. About 1,300 feet north of the principal showing and 150 feet east of Topaz Lake, an irregular patch of magnesite 15 to 20 feet in diameter is exposed on the face of a dolomite bluff. Half a mile northwest of the main showing and 500 feet west of the north end of Topaz Lake, magnesite is exposed in an area 100 feet in diameter on the western slope of a low dolomite ridge. Dolomite is the only other rock found near the magnesite. Outcrops of it are relatively abundant north and east of the main showing but are scarce elsewhere.

The magnesite is light- to pearl-grey rock that weathers to a rusty brown rough surface. Most of it is coarse grained with crystals ranging from one-eighth to one-half inch in diameter. The chief visible impurities are quartz in scattered veinlets and talc in minute shears. The dolomite is generally fine-grained blue-grey rock. Parts are quite siliceous, and in one or two places interbedded chert is visible. Contacts between magnesite and dolomite where seen in two or three places were sharp. No attitudes were recognized in the magnesite. East of the main showing the dolomite strikes northwest and dips between 15 and 65 degrees northeast. Reesor (Ref.) has mapped these rocks as Proterozoic Upper Purcell Mount Nelson Formation. A sample consisting of chips picked up at random from the top of the main exposure had the following percentage composition: $MgO=43.34$; $CO_2=47.60$; $SiO_2=5.54$; $CaO=0.51$; $Fe=1.02$. A sample consisting of chips picked up at random from the exposure west of the north end of Topaz Lake had the following percentage composition: $MgO=42.79$; $CO_2=46.72$; $SiO_2=6.48$; $CaO=1.04$; $Fe=0.87$.

Under the direction of James F. Westcott, chief geologist, a four-man crew drilled twenty-eight diamond-drill holes, totalling 3,542 feet, on the property. In addition, a series of bulk samples for test work were taken.

[Reference: Reesor, J. E., *Geol. Surv., Canada*, Lardeau (East Half), Map 12-1957.]

MARL†

Cheam Marl Products

Popkum (49° 121° S.W.). Office, 13 Fletcher Street South, Chilliwack. P. C. Woodward, general manager. This property consists of a lake deposit of marl ranging up to 10 feet thick. The deposit is post-glacial and accumulated on the

* By J. W. McCammon and D. R. Morgan.
† By A. R. C. James.

bed of Cheam Lake, which was drained some years ago. The marl and topsoil are excavated by two small draglines and sold for agricultural purposes. The material is either trucked wet to the consumer or stockpiled on a draining-pad. A crew of three men produced 29,704 tons of marl and 9,941 cubic yards of topsoil in 1962.

MICA*

Georgian Minerals Industries Ltd. Cedarside (52° 119° N.E.). Company office, 1050, 707 Seventh Avenue Southwest, Calgary, Alta. C. McKinney, plant manager. This company operates a mica-grinding plant at Cedarside near Valemount. Schist from a quarry on the Canoe River 1½ miles upstream and west of the Canadian National Railway is used as raw material for the plant. The schist consists chiefly of muscovite and quartz with minor garnet, biotite, and feldspar. In 1961 eighteen holes were drilled on the property by Magcobar Mining Company; it is estimated that reserves of 200,000 tons of ore were blocked out.

Broken ore is trucked from the quarry 3 miles to the plant, which is located on the west side of the railway at Cedarside siding. In 1962 the remodelling of the plant was completed and testing begun. Several shipments of mica were made to dry-wall joint cement consumers. A crew of five men was employed.

SAND AND GRAVEL

Data on sand and gravel production are presented on the following pages. The abbreviations used in the table for the types of sand and gravel produced are as follows: AA=asphalt aggregate; SA=sized aggregate; WS=washed and sized aggregate; RP=run-of-pit material; AP=asphalt paving mix; RM=ready-mix concrete.

* By David Smith.

Sand and Gravel Pits

Location	Operator	Equipment and Plant	Men	Production
Fort St. John—				
(1) Boundary Lake	C. B. Harden Cartage Ltd.	Front-end loader and screening plant	5	RP and SA.
(2) Boundary Lake	D. Bonk	Front-end loader	10	RP.
(3) North bank of Peace River south of Fort St. John	Blair's Sand & Gravel	Three tractors and screening plant	11	RP=37,000 tons. SA=3,000 yd.
(4) ½ mile east of above pit	Hershell Evans and Robert Chase	Front-end loader	2	RP.
(5) North bank of Peace River 2 miles west-southwest of Blair's pit	Columbia Bitulithic Limited		—	AP=7,800 tons.
Taylor	Norby Bros. Construction Ltd.	Front-end loader, crushing, screening, and washing	5	SA.
Dawson Creek	Columbia Bitulithic Limited		—	AP=11,000 tons.
Chetwynd	Department of Highways		—	
Kitimat	Kitimat Concrete Products (1961) Ltd.	Sauerman dragline, crushing, screening, washing, and ready-mix concrete	10	RP, WS, and RM.
Prince George—				
(1) North Nechako Road	Central Sand & Gravel Ltd. (J. W. Phillips, president)	Scoopmobile, Sawyer Massey jaw and roll crusher, screening plant, and conveyors; ready-mix plant with automatic batching	4	Sand No. 4, No. 8 and ⅜-inch, 17,322 cu. yd.; rock ⅜-inch, ¾-inch, 1-inch, and 1½-inch, 19,636 cu. yd.; crushed rock 1½-inch, 622 cu. yd.; pit-run concrete gravel 2-inch, 2,261 cu. yd.; fill gravel, 5,212 cu. yd.; total, 45,053 cu. yd.
(2) Parcel Y, Lot 2507, Plan 833, Central Fort George	Northwest Paving Co. Ltd.	Mobile crushing, screening, and loading plant	2	Mainly custom crushing for paving plant.
Golden	Columbia Bitulithic Limited		—	AP=35,000 tons.
Creston—Goat River bank	Louis Salvador & Son	Crushing, screening, washing	3	WS.
Wynndel—				
(1) Duck Creek	Louis Salvador & Son	Loader, screening	2[1]	SA.
(2) Duck Creek	C. Ostrensky	Loader, screening	1[1]	SA.
(3) Beside highway 4½ miles north of town	F. Merriam	Crushing, screening	2[1]	SA and AA.
Nelson—Anderson Creek, above Fairview	Premier Sand and Gravel Company Limited (A. S. Shrieves, president)	Dragline, crushing, screening	4	SA and RM.
Trail—				
(1) Ferrara pit, Casino Road, 2 miles south of Trail	Korpack Cement Products Limited	Portable crushing, screening	2[1]	SA.
(2) McGauley pit, Casino Road, 1 mile south of Trail	McGauley Ready-Mix Concrete Company (J. McGauley, owner)	Scraper, crushing, screening, washing, ready-mix	3	WS and RM.
Castlegar—McGauley pit, river bank east of Castlegar	McGauley Ready-Mix Concrete Company, Trail	Loader, crushing, screening	2[1]	SA and RM.
Salmo—Erie Creek	Valley Concrete Products Limited (E. Cameron, owner)	Loader, screening, concrete plant	2[1]	SA.

Sand and Gravel Pits—Continued

Location	Operator	Equipment and Plant	Men	Production
Boston Bar	Columbia Bitulithic Limited		....	AP=12,900 tons.
Garibaldi	Columbia Bitulithic Limited		....	AP=6,400 tons.
Vancouver—Granville Island	Columbia Bitulithic Limited	Paving plant	....	AP=37,000 tons.
North Vancouver—				
(1) Seymour Creek mouth, foot of Riverside Drive	Jamieson Construction Co. Ltd.	Suction dredge, portable crushing, washing, and screening plant	....	AP=60,000 yd.
(2) West end of East Keith Road, east of Seymour Creek	E. R. Taylor Construction Co. Ltd., 2645 Dollarton Highway	Gas shovel, paving plant	2[1]	Sand=10,400 yd.
Indian Arm—Bishop Creek	Indian Arm Sand & Gravel Co. Ltd., Barnet	Bulldozer, crushing, washing, and screening	8[1]	
	Capilano Crushing Co. Ltd., 107 East First Ave., Vancouver	Bulldozer, crushing, washing, and screening	4[1]	RP=173,250 yd.
Port Moody—Barnet Road	Scott Bros. Gravel Co. Ltd., Port Coquitlam (G. Scott, manager)	Shovel, front-end loader, crushing, washing, and screening	27	RP and SA=100,000 yd.
Coquitlam Municipality—				
(1) West end of Westwood Road	Corporation of the District of Coquitlam	Front-end loader, portable crushing, and screening	....	RP and SA.
(2) North Road at Lougheed Highway	Percy Contracting Services	Front-end loader	3	RP=29,906 yd.
(3) Pipeline Road, Coquitlam River, 1 mile north of Lougheed Highway	Deeks-McBride Ltd., 1051 Main St., Vancouver	Shovel, 600-tons-per-day crushing, washing, and screening plant; ready-mix	9	WS and RM=190,000 yd.
(4) Adjacent to Deeks-McBride	Columbia Bitulithic Limited	Paving plant	....	AP=23,000 tons.
(5) Westwood Road	Independent Ventures Limited, 2065 Coquitlam Ave., Port Coquitlam	Shovel, crushing, and screening	3[1]	RP and SA=33,365 yd.
(6) Pipeline Road, 2 miles north of Lougheed Highway	F. Dotten, 677 Fairview St., New Westminster	Shovel, crushing, and screening	....	Fill=500 yd.
(7) Pipeline Road, 2½ miles north of Lougheed Highway	Peter Kiewit Sons Company of Canada Ltd., 2412 Columbia St., Vancouver	Shovel, portable crushing, and screening	9[1]	SA=200,000 yd.
(8) Pipeline Road, 2¾ miles north of Lougheed Highway, Taylor pit	Lougheed Gravel Co. Ltd., Box 129, Mission	Shovel, portable crushing, washing, and screening	....	
(9) Pipeline Road, 3¼ miles north of Lougheed Highway	S. & S. Sand & Gravel Limited, 1101 Eighth Ave., New Westminster	Front-end loader, crushing, screening, and washing	5	WS and RP=73,284 yd.
(10) Pipeline Road, 3½ miles north of Lougheed Highway	Jack Cewe Ltd., 309 Cedar St., New Westminster	Shovel, paving plant	12	AP=80,000 yd.
(11) East side of Coquitlam River, 2½ miles north of Lougheed Highway	Scott Bros. Gravel Co. Ltd., Port Coquitlam (G. Scott, manager)	Shovel, front-end loader, crushing, washing, and screening	38[2]	WS and RP=125,000 yd.
Port Coquitlam—Fraser River at Mary Hill, 2 miles south of Port Coquitlam	Evans, Coleman & Evans Limited, 902 Columbia St., New Westminster	Shovels, 500-tons-per-hour processing plant	31	WS=730,000 yd.
Pitt Meadows Municipality—				
(1) 1 mile northwest of Port Hammond	Haney Brick & Tile Ltd.	Front-end loader	2[1]	Sand=2,739 yd.
(2) Bonson Road, 1 mile north of Fraser River	Lasser Trucking Co., Box 38, Pitt Meadows	Front-end loader	....	RP.

Maple Ridge Municipality—				
(1) Grant Hill, 1 mile east of Albion and also adjoining Kirkpatrick pit	Corporation of the District of Maple Ridge		....	Fill; AP=9,300 tons.
(2) Grant Hill, 1 mile north of first pit above	McIntosh Sand and Gravel, Box 245, Haney	Shovel, screening	4	RP and SA=11,000 yd.
(3) Grant Hill, north of McIntosh pit	Henry Van Boeyen, Albion	Shovel	....	RP.
(4) Grant Hill, 1 mile north of municipal pit	Valley Ready-Mix, Albion	Shovel; washing, screening, and mixing plant near Albion Landing	2	WS and RM=25,500 yd.
(5) East end of No. 27 Road, Alouette River	Kirkpatrick Sand and Gravel Co. Ltd.	Shovel, crushing, screening, and washing	2	WS and RP=9,143 yd.
(6) Lougheed Highway, 1 mile east of Whonock	R. E. George, Whonock	Front-end loader	1[1]	RP=1,650 yd.
Mission Municipality—				
(1) 1 mile and 3 miles east of Stave Falls power-house	Corporation of the District of Mission	Screening plants	....	RP and fill.
(2) 1.8 miles south of Steelhead, Dewdney Trunk Road	Department of Highways		....	
(3) 2.3 miles south of Steelhead, Dewdney Trunk Road	Cannon Contracting Ltd., 33323 Broadway, Mission	Front-end loader	2[1]	RP=2,338 yd.
Dewdney—Lougheed Highway, 2 miles west of Squakum	Department of Highways	Front-end loader	....	RP.
Kent Municipality—				
(1) West end of Cemetery Road, south of Mount Agassiz	Corporation of the District of Kent	Shovel and front-end loader in large gravel pit and rock quarry	....	RP.
(2) McCallum Road, 1 mile west of Harrison Hot Springs road	Department of Highways	Front-end loader	....	RP.
(3) McCallum Road, 1½ miles west of Harrison Hot Springs road	Dannielson Contractors Ltd.	Front-end loader	2	RP=15,000 yd.
Chilliwhack Municipality—				
(1) Chilliwack Creek	B. and G. Sand and Gravel Co. Ltd.	Scraping from river bottom; screening and washing	3	WS=11,954 yd.
	Valley Aggregates Ltd. (successor to B. and G. Sand and Gravel Co. Ltd. at end of July) (Geo. Beeman, manager)	Scraping from river bottom; screening and washing	1	WS=3,826 yd.
(2) Keith Wilson Road pit	Columbia Bitulithic Limited	Paving	....	AP=23,600 tons.
Sumas Municipality—				
(1) Northwest slope of Sumas Peak	Dawson Wade & Company Limited	Shovel, large pit	....	Highway fill.
(2) Vye Road pit, 3 miles south of Abbotsford	Columbia Bitulithic Limited	Paving	....	AP=18,000 tons.
(3) At foot and east of Taggert Peak	Department of Highways—Quadling pit	Shovel	....	Highway fill=164,800 yd.
	Local operators—Quadling pit	Front-end loader	....	Fill=5,922 yd.
Matsqui Municipality—				
(1) 1 mile east of Abbotsford	Blackham's Construction Limited	Screening and crushing	3	RP and SA=32,872 yd.
(2) Tretheway Road, ¾ mile north of Clearbrook	Department of Highways	Two adjoining pits	....	
(3) Tretheway Road, ½ mile north of Clearbrook	Deeks-McBride Ltd., 1051 Main St., Vancouver	Screening, washing, and ready-mix; shovel and front-end loader	2	WS, RP, and RM=13,700 yd.

[1] Part time.
[2] Including truck-drivers.

Sand and Gravel Pits—Continued

Location	Operator	Equipment and Plant	Men	Production
Matsqui Municipality—*Continued*				
(4) Clearbrook Road, ½ mile north of border	Abbotsford Gravel Sales Ltd.	Scraper, front-end loader, screening; ready-mix plant of Totem Trucking Ltd.	2	WS, RP, and RM=26,673 yd.
(5) Twelfth Ave., ¼ mile west of Clearbrook Road	Valley Rite-Mix Ltd., Abbotsford	Front-end loader, screening, washing, ready-mix	6	WS, RP, and RM=16,474 yd.
(6) Corner of King (Sixteenth Ave.) and Foy (316th St.)	Lepp Trucking, Abbotsford	Shovel, front-end loader	7[1]	RP=10,550 yd.
(7) Lefevre Road at Eighth Ave.	R. L. Caplette, Aldergrove	Front-end loader	2[1]	RP=2,037 yd.
(8) Lefevre Road, ¼ mile north of Eighth Ave.	Corporation of the District of Matsqui	Shovel	....	RP.
(9) Ross Road pit	Columbia Bitulithic Limited		....	AP=86,000 tons.
Langley Municipality—				
(1) Northwest corner Jackman Road and Eighth Ave.	Corporation of the Township of Langley	Shovel	....	RP and fill.
(2) ½ mile west of Carvolth Road, above Twenty-fourth Ave.	Corporation of the Township of Langley	Shovel	....	RP and fill.
(3) At Matsqui boundary north of Eighth Ave.	Dupont Bros.	Front-end loader	([1])	RP.
(4) North of northeast corner of Jackman Road and Eighth Ave.	Aldergrove Cement Tile Product (S. Omelaniec, manager)	Front-end loader	1[1]	RP=1,600 yd.
(5) ¼ mile north of corner of Jackman Road and Eighth Ave.	J. Craig, Trans-Canada Highway, Langley	Front-end loader	1[1]	RP=1,154 yd.
(6) Dogwood Ave. off Brown Road	Kitsul Bros., 24306 Trans-Canada Highway	Front-end loader	1[1]	RP.
(7) Bradshaw and Berry Roads (Gun Club pit)	B. and B. Trucking, Cloverdale	Shovel	3[1]	RP and AP=37,700 yd.
(8) 2962 Lambert Road	Highland Sand and Gravel Co. Ltd. and Evans, Coleman & Evans Ltd.	Shovel	5[1]	RP and WS=49,900 yd.; AP=4,300 tons.
(9) Thirty-second Ave. at Kinch Road	Oscar W. Rees	Shovel	2[1]	RP=9,000 yd.
(10) Boundary Road at Surrey boundary	Border Sand and Gravel Ltd.	Front-end loader, crushing, screening, washing	3	WS=25,069 yd.
(11) Sixteenth Ave. at Surrey boundary	Department of Highways	Shovel	....	Fill.
(12) South side, Fort Langley	F. Trouton in pit owned by C. Groundwater, Williams Lake	Front-end loader	2[1]	RP=5,000 yd.
(13) 23212 Hudson Bay Road, Fort Langley	Dawson Wade & Company Limited		....	RP.
(14) 8802 Hudson Bay Road, Fort Langley	H. G. Clark, Box 145, Langley	Front-end loader, screening, washing	1	WS and R.M.
(15) Denine pit, McLellan Road	F. Trouton	Front-end loader	....	RP=5,000 yd.
Surrey Municipality—				
(1) East end of Stokes Road (Twentieth Ave.)	Corporation of the District of Surrey	Shovel	....	Fill.
(2) Stokes Road, ½ mile east of 184th St.	D. Beardsley	Front-end loader	1[1]	RP=3,400 yd.
(3) Larsen Road (Twenty-eighth Ave.) at 193rd St.	Deeks-McBride Ltd., 1051 Main St., Vancouver	Scraper, screening, crushing, washing, ready-mix	5	WS, RP, and RM=54,000 yd.

Surrey Municipality—*Continued*				
(4) South of McLellan Road, at Delta boundary	Corporation of the District of Surrey	Shovel and asphalt plant	—	RP and AP.
(5) Fifty-third Ave. at Delta boundary	Colebrook Sand and Gravel Company, Limited	Front-end loader, crushing, screening, washing	2	RP and WS=153,807 yd.
(6) 15945—112th Ave., North Surrey	Richmond Sand and Gravel Ltd.	Loader, portable washing, screening	2	WS and RP=48,750 yd.
(7) 112th Ave. east of Pike (160th) St.	United Sand and Gravel Ltd. (Steeves and Mann Equipment Ltd.)	Two shovels, portable washing and screening	2	WS and RP=26,859 yd.
(8) Wilson Townline Road at Langley boundary	United Contractors Ltd., White Rock	Shovels	—	Fill for new Trans-Canada Highway.
Delta Municipality—				
(1) ¼ mile south of west end of Seventy-second Ave.	Lock Holmes, 5508 Forty-seventh Ave., Ladner	Pit leased from Industrial Peat Products Ltd.; production contracted	1[1]	RP=33,124 yd.
(2) ½ mile west of Scott Road at Sixty-eighth Ave.	Linton's Construction Co. Ltd.	Shovel	7[1]	RP=245,000 yd.
	Western Paving Ltd.	Asphalt mixing	22	AP=37,500 tons.
Howe Sound—				
(1) Furry Creek	Routledge Gravel Ltd.	Front-end loader; crushing, washing, screening (new 1,200-yards-per-day plant)	6	WS, RP, and SA=171,395 yd.
(2) Britannia Beach	Construction Aggregates Ltd.	Scraper, crushing, screening, washing	14	WS, RP, and SA=350,867 yd.
(3) Mamquam River, Squamish	Paco Cement Products Ltd.; Goss Contracting Ltd.	Front-end loader, screening, crushing, truck ready-mix	4[1]	WS and RM=15,561 yd.
(4) Hastings Creek, 1 mile south of Port Mellon	Evans, Coleman & Evans Limited, 902 Columbia St., New Westminster	Shovel, crushing, screening, washing	25	WS=390,000 yd.
Powell River—				
(1) Haslam Lake Road, 3 miles northwest of Westview	G. & H. Sand and Gravel Company Ltd.	Screening, washing, ready-mix	—	WA and RM.
(2) Allen Road, 3 miles northeast of Westview	P. Nassichuk	Screening	—	RP and SA.
Vancouver Island—				
(1) Keating Cross Road	Butler Brothers Supplies Ltd.	Diesel-driven shovels, overhead loader, washing and sizing	9	RM, RP, and WS=288,141 yd.
(2) Saanich	Keystone Concrete Limited	Diesel-driven shovels, washing and sizing	16	WS=21,571 yd.
(3) Royal Bay	Evans, Coleman & Evans Limited	Plant No. 1—scraper on a slack-line cableway, shovel, crushing, screening, and washing; Plant No. 2—diesel-driven shovel, washing and cleaning	13	WS=287,678 yd.
(4) Langford Lake	McRae Bros. Ltd.	Overhead loader	2	RP.
(5) Langford Lake	Midland Pit (George F. Fox)	Overhead loader, cleaning and sizing	—	SA.
(6) 4 miles from Duncan on Lake Cowichan road	Butler Brothers Supplies (Duncan) Ltd.	Overhead loader, washing, sizing, and ready-mix	9	RP, WS, and RM=32,307 yd.
(7) Adjacent to Island Highway at Cassidy	Evans, Coleman & Evans Limited	Overhead loaders, washing and sizing	4	WS=39,011 yd.
(8) 2½ miles from Courtenay	S. H. Marriott Sand and Gravel	Mobile loader, rotary screening	3	SA.

[1] Part time.

SILICA

Mountain Minerals Limited*

Golden (51° 116° S.W.). Company office, P.O. Box 700, 529 Sixth Street South, Lethbridge, Alta. R. A. Thrall, managing director; William McPherson, superintendent. This company holds leases covering a large silica deposit on the southwestern slope of Moberly Mountain, 5 miles northeast of Golden. The showings are at an elevation of 5,000 feet, and the property can be reached by a 6-mile road leading from the Golden–Field highway. A description of the deposit is included in the 1959 Annual Report.

There was some minor development for a short period in 1962, and a small number of samples were sent for testing purposes.

Snowdrift (Western Minerals Ltd.)†

Winlaw (49° 117° N.E.). Company office, 702 Imperial Bank Building, Edmonton. E. L. Harvey, president; R. T. Marshall, project engineer. This is a privately owned company. In 1961 the company optioned the Snowdrift group of recorded claims. The property is 4 miles due east of Winlaw station. A geological description of the property is contained in the Annual Report for 1961.

A 3-mile tractor-road was built into the property in February and March. Diamond drilling was done to determine the extent of the quartz deposit. An average crew of four men was employed for four months. Field work was completed at the end of May. The option was dropped in December.

Oliver Silica Quarry‡

(49° 119° S.W.). Pacific Silica Limited. Registered office, 717 West Pender Street, Vancouver 1; quarry office, Box 397, Oliver. I. A. Hunter, manager. The Oliver silica quarry is on the Gypo mineral claim, owned by The Consolidated Mining and Smelting Company of Canada, Limited, and operated under a lease by Pacific Silica Limited. The claim is less than one-quarter of a mile west of Highway No. 97, 1 mile north of Oliver. Estimated production for the year was 50,000 tons, and shipments made were 10,334 tons sacked and 46,000 tons in bulk. The washing plant was completed in 1962 and has been in continuous operation. Twenty-nine men were employed.

TALC§

Western Minerals Ltd.

Cawston (49° 119° S.W.). Head office, 31 Michael Building, Calgary, Alta. This company has been interested in a talc showing near Cawston Creek. Kolbjorn Paulsen, of Cawston, located the first claim on the talc in October, 1957, and then in September, 1959, acting as agent for the company, he located five more claims adjoining the original one.

The showings are 2 miles southeast of Cawston on an open grassy slope between 200 and 600 feet above and one-quarter mile east of the highway.

The talc occurs as scattered patches of schist in a layered series of rocks that includes chlorite schist, dark thin-bedded quartzite, coarse-grained white quartzite cemented by carbonate, and greenstone. At the showings the rocks strike between north 20 and 30 degrees west and dip from 15 to 55 degrees southwest. The talc patches are approximately in line along a north 55-degree west bearing. Minor

* By D. R. Morgan.
† By J. D. McDonald.
‡ By David Smith.
§ By J. W. McCammon.

folds and faults are numerous. Bostock (Ref.) placed these rocks in the Carboniferous(?) Kobau Group.

Rock exposures are small and scattered. Talc was seen in two small areas in adjoining parallel gullies. One area is 200 feet above the highway. Here an open cut 18 feet wide has been dug for 25 feet along the bottom of a small northwest-trending gully. Talc schist is exposed along the sides of the cut with chlorite schist in the centre. More chlorite schist is visible along the outer edges of the talc. Folds and faults that can be seen in the cut suggest the two apparent talc zones actually represent a single zone repeated by movement. The widest continuous exposure of talc, on the southwest side of the cut, was sampled across its 10-foot width. The sample had the following percentage composition: SiO_2=52.77; Al_2O_3=1.35; CaO=4.17; MgO=21.92; CO_2=6.59; Fe=4.53; H_2O (105° C.)=0.13; H_2O (+105° C.)=5.64. The pulverized talc was pale greenish white and slightly gritty.

One hundred feet to the northwest, down the gully, a 5-foot-wide zone of talc schist has been uncovered for 40 feet along the gully bank. This talc is enlosed in chlorite schist with some quartzite interbeds.

A small open cut 10 feet long by 3 feet wide and 1½ feet deep has been dug on a 3-foot-wide lens of talc 50 feet up the bank of the gully midway between the two exposures previously described.

The second talc area is in another gully 1,000 feet to the southwest of and 370 feet higher than the first. Talc is exposed for 170 feet along the gully bottom. Associated rocks are thin bedded contorted quartzites.

In the area between the two main exposures, only two small outcrops of talc, about 3 feet in diameter, could be found.

[Reference: Bostock, H. S., Keremeos, B.C., *Geol. Surv., Canada,* Map 341A (1940).]

Petroleum and Natural Gas

CONTENTS

TABLES—*Continued*

GENERAL ADMINISTRATION

For purposes of administration of the *Petroleum and Natural Gas Act,* the Department is divided between a General Administrative Section and the Petroleum and Natural Gas Branch. The former, under the direction of the Chief Commissioner, is responsible for the administration of the *Petroleum and Natural Gas Act,* which included all matter related to and affecting title to Crown petroleum and natural-gas rights. The regulations governing geophysical operations are also administered by the Chief Commissioner.

The Petroleum and Natural Gas Branch, under the direction of the Chief of the Branch, is responsible for administration of the "Regulations Governing the Drilling of Wells and the Production and Conservation of Oil and Natural Gas," made pursuant to the *Petroleum and Natural Gas Act.* The regulations specify the conditions which must be employed for efficiency and safe practice in the drilling, completion, and abandonment of wells; for well spacing; prevention of waste; conservation; and all related matters.

As at December 31, 1962, 27,665,218 acres, or approximately 43,000 square miles, of Crown petroleum and natural-gas rights, issued under the *Petroleum and Natural Gas Act,* were held in good standing by operators ranging in stature from small independent companies to major international ones. The form of title held, total number issued, and acreage in each case were as follows:—

Form of Title	Number	Acreage
Permits	297	17,374,307
Natural-gas licences	3	84,499
Drilling reservations	26	471,487
Leases (all types)	2,821	9,734,925
Total		27,665,218

Details of land disposition for the years 1947 to 1960, inclusive, may be found on page A 61 of the 1960 Annual Report. Figures for 1961 will be found in the Annual Report for that year.

The area of major land-holding interest, development, and production lies in the northeastern corner of the Province, in that segment of British Columbia roughly flanked by the Rocky Mountain Trench. Other acreage is held in the Prince Rupert, Williams Lake, and Fernie Land Recording Districts, in areas generally referred to as the Groundhog Basin area, Chilcotin River area, and Flathead River area respectively. In addition, some 600,000 acres are held in the coastal regions of the Mainland and Vancouver Island.

During the year, land disposition was changed by the following transactions:—

	Issued	Terminated	Decrease (−) or Increase (+)
Permits	17	144	−127
Natural-gas licences	......	2	−2
Drilling reservations	21	27	−6
Leases—			
Petroleum and natural gas	847	47	+800
Natural gas	15	......	+15
Petroleum	......	......	......

Petroleum and natural-gas revenue for the year 1962 was as follows:—

Rentals and fees—		
Permits	$2,138,070	
Drilling reservations	126,149	
Natural-gas licences	2,086	
Petroleum, natural-gas, and petroleum and natural-gas leases	4,916,971	
Total rentals and fees		$7,183,276
Sale of Crown reserves—		
Permits	$1,208,400	
Drilling reservations	3,067,675	
Leases	7,088,659	
Total Crown reserve sales		11,364,734
Royalties—		
Gas	$1,260,419	
Oil	2,265,167	
Processed products	108,737	
Total royalties		3,634,323
Miscellaneous fees		31,950
Total petroleum and natural-gas revenues		$22,214,283

Cumulative totals April 1, 1947, to December 31, 1962, are as follows:—

Rentals and fees—		
Permits	$34,245,023	
Drilling reservations	404,345	
Natural-gas licences	59,050	
Petroleum, natural-gas, and petroleum and natural-gas leases	15,190,189	
Total rentals and fees		$49,898,607
Sales of Crown reserves—		
Permits	$15,546,032	
Drilling reservations	9,363,682	
Leases	19,347,708	
Total Crown reserve sales		44,257,422
Royalties—		
Gas	$4,263,979	
Oil	3,205,058	
Processed products	436,304	
Total royalties		7,905,341
Miscellaneous fees		135,030
Total petroleum and natural-gas revenues		$102,196,400

PETROLEUM AND NATURAL-GAS REVENUES

	1947–54[1]	1954	1955	1956	1957	1958	1959	1960	1961	1962	Cumulative 1947–62
Rentals and Fees											
Permits	$8,337,460	$2,425,599	$3,465,295	$2,773,067	$2,737,989	$3,307,732	$3,000,337	$3,202,923	$2,856,551	$2,138,070	$34,245,023
Drilling reservations	———	———	———	———	———	5,147	76,115	136,945	59,989	126,149	404,345
Natural-gas licences	———	———	———	———	———	10,157	4,521	29,648	12,638	2,086	59,050
Petroleum, natural-gas, and petroleum and natural-gas leases	———	1,147	78,288	122,157	430,177	990,383	1,695,153	3,339,790	3,616,123	4,916,971	15,190,189
Total rentals	$8,337,460	$2,426,746	$3,543,583	$2,895,224	$3,168,166	$4,313,419	$4,776,126	$6,709,306	$6,545,301	$7,183,276	$49,898,607
Sale of Crown Reserves											
Permits	———	$788	$605,307	$1,614,325	$1,342,813	$4,144,059	$3,486,337	$1,650,324	$1,493,679	$1,208,400	$15,546,032
Drilling reservations	———	———	———	———	———	72,370	1,004,711	2,136,105	3,082,821	3,067,675	9,363,682
Leases	———	———	———	———	———	293,694	6,499,766	2,400,198	3,065,391	7,088,659	19,347,708
Total Crown reserve sales	———	$788	$605,307	$1,614,325	$1,342,813	$4,510,123	$10,990,814	$6,186,627	$7,641,891	11,364,734	$44,257,422
Royalties											
Gas	———	$761	$2,612	$2,826	$7,264	$433,546	$492,053	$912,102	$1,152,396	$1,260,419	$4,263,979
Oil	———	———	17	37,196	104,569	140,158	231,403	219,156	207,392	2,265,167	3,205,058
Processed products	———	———	———	———	———	62,105	69,998	76,059	119,405	108,737	436,304
Total royalties	———	$761	$2,629	$40,022	$111,833	$635,809	$793,454	$1,207,317	$1,479,193	$3,634,323	$7,905,341
Miscellaneous fees	———	$3,604	$12,392	$12,428	$10,027	$12,870	$14,722	$13,220	$23,817	$31,950	$135,030
Total petroleum and natural-gas revenues	$8,337,460	$2,431,899	$4,163,911	$4,561,999	$4,632,839	$9,472,221	$16,575,116	$14,116,470	$15,690,202	$22,214,283	$102,196,400

[1] Administered under the Department of Lands and Forests until March 31, 1953. Details of revenue are not available by calendar years; total revenues are shown under permits by fiscal years ending March 31st for the period 1947–54. The detailed amounts of revenue for each fiscal year, 1947 to 1954, are shown on page A 61 of the 1960 Annual Report.

PETROLEUM AND NATURAL GAS BRANCH

VICTORIA

Reorganization of the Branch in 1962 resulted in reduction of the number of sections from five to three. The responsibilities of the Reserves and Evaluation Section were transferred to the Reservoir Engineering Section, while those of the Statistics and Well Records Section were placed under the Development Engineering Section. The changes were made subsequent to the effective dates of the resignations of the former section supervisors. The organization is as follows:—

J. D. Lineham	Chief of the Branch
R. R. McLeod	Reservoir Engineering
W. L. Ingram	Development Engineering
S. S. Cosburn	Geology

The headquarters staff includes also two engineers, two engineering assistants, two geologists, four clerks, one clerk-stenographer, and three clerk-typists.

CHARLIE LAKE

The field office is situated at Charlie Lake, a small community on the Alaska Highway about 5 miles northwest of Fort St. John.

G. E. Blue	District Engineer
H. B. Fulton	Field Geologist
D. L. Johnson	Field Engineer
H. A. Sharp	Field Technician
M. A. Churchill	Field Technician
D. A. Selby	Field Technician

The field-office staff also includes two general assistants, one clerk, and one clerk-stenographer. Two university students were employed during the summer months. The staff was increased in 1962 by one field technician and one clerk.

GENERAL REVIEW

Activity in the exploration, development, and production phases of the oil and gas industry in British Columbia was significantly greater than in any previous year. The main factor contributing to the increase was the availability of oil pipeline facilities to the Vancouver market area.

Nearly all the activity took place in the area east of the Rocky Mountains and north of the 56th degree of latitude. Some exploration work was done on Vancouver Island, in the Hecate Strait area, and near Fernie, while a three-well drilling programme was carried out by one of the major oil companies in the Fraser Valley area. An unsuccessful well was drilled about 5 miles south of Fernie. The over-all seismic operations in the Province decreased; 366 crew-weeks were worked, compared to 550 crew-weeks in 1961.

Sixty-four per cent of the 1,554,408 feet of drilling was done in development wells, an indication of the concentration by operators to develop the known pools. Wells spudded increased by 54 per cent and the total wells completed by 66 per cent, relative to 1961. There were nearly twice as many oil completions, whereas gas completions were approximately the same. Abandonments increased by 74 per cent. Of every three locations drilled, two were successful as either oil or gas wells, thus maintaining British Columbia's high success ratio. Discovery wells indicating new pools or substantially extending existing pools numbered three for oil and nineteen for gas. The objective of most of the wells drilled was either the Triassic Halfway zone along the Boundary Lake to Beatton River oil trend or the Devonian gas formations in the northern part of the area of activity. Oil and gas fields designated by the Branch were increased by four to thirty-nine.

The greatest increases in the oil and gas activity was in the number of oil completions and the volume of oil produced. Crude-oil production increased by 776 per cent compared to 1961. During the latter part of the year the monthly production exceeded 1,000,000 barrels, with 330 of the 353 capable oil wells on steady production at the end of 1962.

Gas production increased by 16 per cent to an annual total of 120,937,329,000 cubic feet. Many of the completed gas wells are, at present, a great distance from the network of pipe-line facilities, and therefore only 194 of the 388 wells capable of gas production were operating at the end of 1962.

Several extensions were made to the oil- and gas-gathering pipe-lines, and the capacities of both the Trans Prairie and the Western Pacific Products and Crude Oil pipe-lines were substantially increased. The British Columbia Oil Transmission Company line, which delivers oil from the Blueberry field, started operation in 1962, as did the Western Pacific Products line that transports the crude oil to the Trans Mountain interprovincial pipe-line at Kamloops and to the Kamloops refinery. Gas distribution-lines were extended from the Inland Natural Gas and the British Columbia Hydro and Power Authority systems. The Kootenay region received gas from the Columbia Natural Gas pipe-line, which delivers Alberta gas from the Alberta Natural Gas pipe-line.

Reserves of oil, gas, and the various by-products were increased during 1962. Crude-oil reserves increased 42 per cent to 147,994,689 barrels; disposable natural gas, 3 per cent to 6.69 trillion cubic feet; gas liquids, 6 per cent to 126,602,300 barrels; and sulphur, 4 per cent to 3,453,784 short tons.

FIELD OFFICE

Field Work

The field administration of the " Regulations Governing the Drilling of Wells and the Production and Conservation of Oil and Natural Gas " and the compiling of field and other data is accomplished through a permanent field office at Charlie Lake.

A temporary trailer office was established at Fort Nelson during the winter drilling season. Field personnel drove a total of 106,906 miles to carry out their duties.

The increase in oil and gas production during 1962 resulted in an increase in total time spent inspecting and checking production equipment. A total of 767 meters was fast checked. Fifty-one meters and lease equipment inspections were completed in detail.

Bottom-hole pressure and temperature surveys were made in 171 wells. A number of these surveys were completed with the co-operation of operating companies in the area. The surveys are used in reservoir engineering studies, and the data are compared with the annual surveys submitted by the operating companies. The data obtained from all pressure and temperature runs are processed at the Charlie Lake office.

Field personnel witnessed seventy absolute open-flow tests on gas wells and twenty-eight segregation tests on oil and gas wells. Determinations of segregation and absolute open flows are made at the Charlie Lake office.

A 10,000-pounds-per-square-inch Coleman tester and a Coleman temperature bath serve as standards for bottom-hole pressure and temperature bombs in use in British Columbia. During 1962 a total of 129 calibrations was made on pressure and temperature bombs. No charge is made for these calibrations. The following calibration services are available at the Charlie Lake office:—

(1) Routine air calibration.
(2) Air calibration for special reasons.
(3) Routine temperature calibration.
(4) Temperature calibration for special reasons.
(5) Combination temperature-pressure calibrations.

There were 245 lease and abandonment inspections made on abandoned and producing leases. Inspections of producing leases increased during 1962 due to the increase in oil and gas production.

Routine inspections were made on 170 drilling and service rigs. All drilling rigs were inspected once during 1962, and an attempt was made to inspect each rig once on each hole drilled.

GEOLOGICAL SECTION

Field Work

The geological staff was engaged in the compilation and interpretation of the surface and subsurface geology of the sedimentary basins of the Province, with special attention to the oil- and gas-producing zones of northeastern British Columbia.

S. S. Cosburn and D. M. Callan measured and reported on three sections of Palæozoic rocks in the Mount Redfern area of northeastern British Columbia in July. A mimeographed report on this work is obtainable on application. Price, 50 cents.

J. E. Hughes, of the Mineralogical Branch spent parts of the 1961 and 1962 field seasons in geological studies along the Alaska Highway. A strip along the highway from Mile 390 to Mile 520 was mapped at 4 miles to the inch, from Summit Lake near Mount St. Paul to the Smith River. Within this length six separate sections of the Devonian and adjacent Palæozoic rocks were examined. A mimeographed report on this work is obtainable on application to the Chief of the Mineralogical Branch, Department of Mines and Petroleum Resources, Victoria. Price, 35 cents.

During 1962, core stored at Charlie Lake was examined with special reference to oil- and gas-producing horizons of northeastern British Columbia, as follows:—

S. S. Cosburn: Mississippian core—Blueberry Field.
D. M. Callan: Triassic core—Peejay and Nig Creek Fields.
H. B. Fulton: Devonian core—northeastern British Columbia, and Triassic core—Beatton River Field.
D. L. Griffin: Devonian core—northeastern British Columbia.

Geological Laboratories

Core and Well Samples

All cores from British Columbia wells must be preserved in labelled boxes not more than 30 inches inside length and must be delivered to the geological laboratory at Charlie Lake, where it is stored. In 1962, 2,894 boxes of core from 230 wells and 869 boxes of diamond-drill core from the Peace River dam-sites were received for permanent storage.

Present core-storage facilities provide space for approximately 20,000 core boxes, and at the end of 1962, 16,872 boxes from 769 wells were stored.

Unless otherwise directed, any operator who drills a well for petroleum or natural gas is required to take a sample of drilled rock (bit cuttings) at least every 10 feet of depth. Each sample, consisting of several ounces of rock fragments, is placed in a small bag at the well, labelled, and submitted to the geological laboratory, where it is washed and bottled.

Each 10-foot sample is divided into three parts, making three sets of samples for each well. One set is retained at the laboratory library, one is sent to headquarters at Victoria, and the other to the Geological Survey of Canada in Calgary. The remainder of the 10-foot sample from the original sample bag is retained at the laboratory for a period not exceeding one year, should further sample sets be required. The main sample-examination facilities are located at Charlie Lake, with limited facilities available at Victoria.

The Charlie Lake sample library has samples from wells drilled since September, 1957, while the Victoria sample library and the Geological Survey of Canada sample library in Calgary each has a set of samples from wells drilled in British Columbia since 1948. At the end of 1962 the Victoria sample library contained a total of 359,948 samples from 929 wells and the Charlie Lake library 262,312 samples from 750 wells.

During 1962, samples were received at the laboratory from 385 wells; this represented over 1,500,000 feet of drilling, mainly in northeastern British Columbia. A total of 61,583 10-foot samples was washed and bottled in 1962.

Core and Sample Examination

The use of core- and sample-examination facilities increased in 1962. The main area of interest in core and sample studies continued to be the carbonate rocks of Middle Devonian and Triassic age, although much work was done in sandstones of Lower Cretaceous and Upper Jurassic age. A nominal fee is charged for the use of core- and sample-examination facilities provided by the Department.

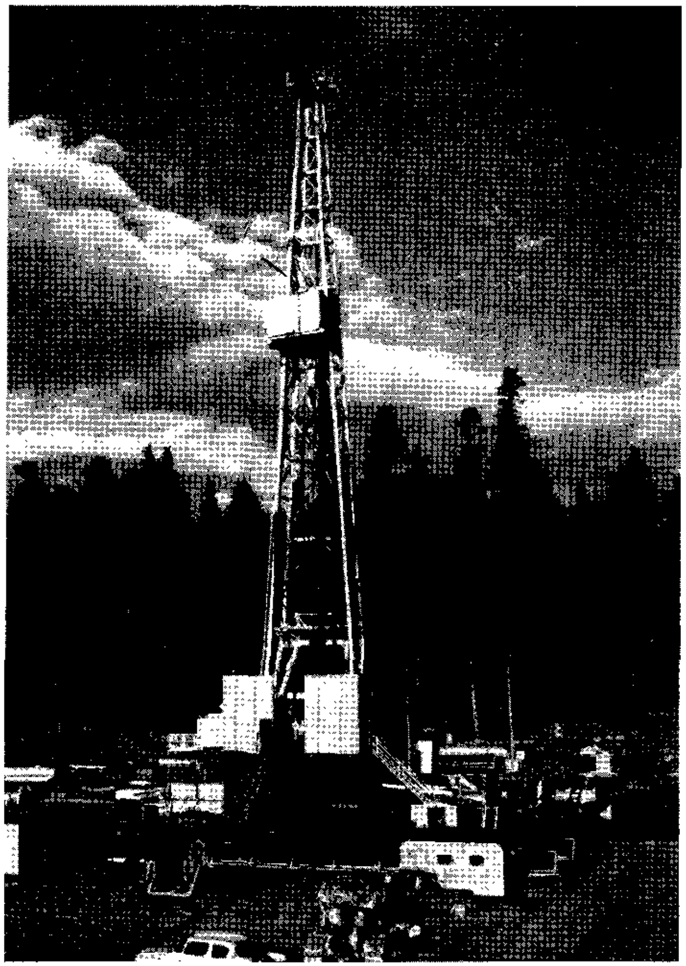
In 1962, 7,776 boxes of core from 414 wells were studied by company personnel and interested individuals. Approximately 1,700 boxes of core from various key wells were examined by the Department. Cores from forty-one wells were temporarily removed from the laboratory for re-analysis and other studies. Samples from seventy-five wells were studied, using the laboratory facilities at Charlie Lake.

Since the core- and sample-examination laboratory at Charlie Lake was made available to the public in February, 1961, 12,827 boxes of core from 687 wells have been removed from racks for examination.

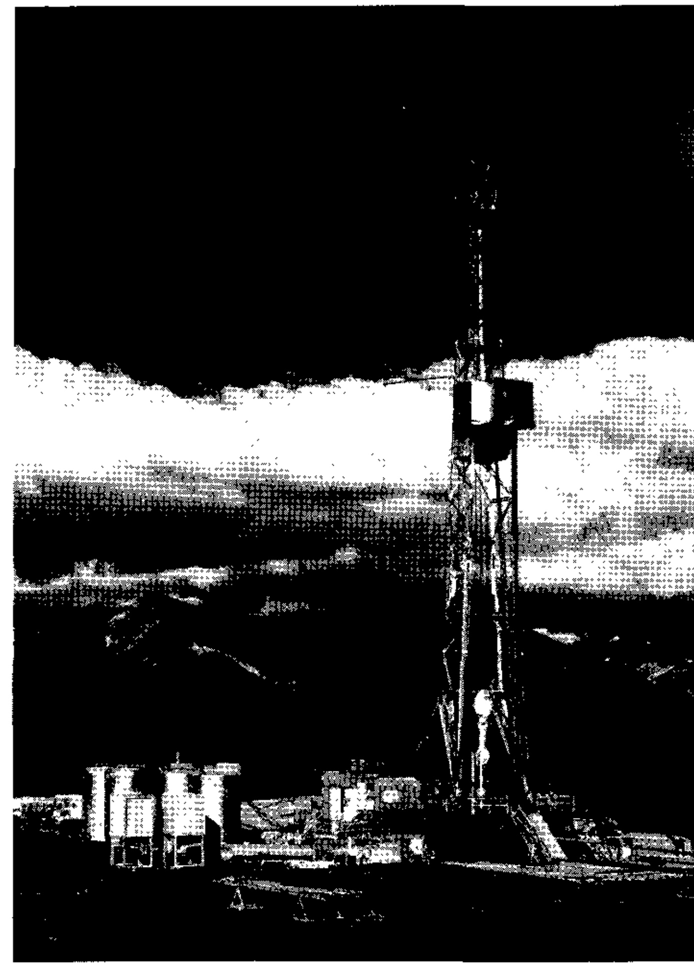
EXPLORATION

Twenty-six oil and gas companies did seismic work in British Columbia in 1962. Twenty-five companies worked in northeastern British Columbia, one of which also had a crew in the Fernie area. One company operated a marine seismic survey in Hecate Strait (*see* Table 1). In northeastern British Columbia, 366 seismic crew-weeks were completed. Twelve companies had surface geological parties in the field in northeastern British Columbia; of these companies, two also made surface studies in the Fernie area and one had a party in the Sooke area of Vancouver Island (*see* Table 2). Two companies drilled thirty-five test-holes in the Peace River Block of northeastern British Columbia (*see* Table 3).

In 1962 forty-eight exploratory wildcat wells were drilled. Forty-six of these were located in northeastern British Columbia testing potential reservoir strata



BA CNP Fernie d-42-I, 5 miles southeast of Fernie.
(Loffland Bros. photo.)



Richfield Pure Pt. Roberts 6-3-5 well, east of Tsawwassen Beach.
(Loffland Bros. photo.)

ranging in age from Lower Cretaceous to Palæozoic. One well was drilled in the Fernie Basin near the western end of the Crowsnest Pass to test Mesozoic and Upper Palæozoic horizons. One well tested Tertiary and Cretaceous strata in the lower Fraser Valley near Abbotsford.

As in 1961, major exploration objectives in northeastern British Columbia were the Devonian gas reservoirs of the northern plains region, the oil trend of the Triassic Halfway Formation, and Mississippian and Triassic objectives in the Rocky Mountain foothills region.

Drilling during 1962 resulted in the discovery of twenty-five oil or gas accumulations. Three oil pools and seven natural-gas pools were a direct result of exploratory wildcat drilling, and fifteen natural-gas pools were discovered by follow-up or development drilling.

The three oil accumulations discovered in 1962 were all in rocks of Triassic age. Hunt Sands Pac Imp Coplin 7-16-86-23, drilled 35 miles northwest of Fort St. John, tested the first commercial oil to be found in the Triassic Baldonnel Formation. Discoveries of oil in the Triassic Halfway Formation by Pacific SR West Cdn W Peejay d-54-G and Triad BP Conroy d-67-D extended the trend of stratigraphically isolated reservoirs that is now established along the pinchout edge of the Halfway Formation.

A significant gas discovery was made by Hunt Sands Sun Falls c-18-G in the Triassic Baldonnel Formation in the foothills region near Chetwynd. Gas was also found in the Baldonnel Formation adjacent to the foothills in Texaco NFA N Townsend a-8-J, approximately 6 miles north of the Kobes-Townsend gas field.

Exploration activity in the northern plains region was reflected in five new gas discoveries in this area. Middle Devonian carbonate gas pools were found by West Nat et al Yoyo a-74-H, 10 miles west of Kotcho Lake gas field; Triad Sohio Pac Jackfish a-30-K, 21 miles south of the Clarke Lake gas field; and Imp Junior c-98-C, 33 miles southeast of the Clarke Lake field. Two Mississippian gas discoveries, also in the northern plains region, were made by Sohio C&E Ekwan a-55-G, which tested gas in the Banff Formation, 30 miles southeast of Kotcho Lake field, and Texaco NFA Walrus b-86-L, in which gas was reported at the erosional top of the Mississippian sequence, 28 miles east of the Kotcho Lake field.

Triassic and Lower Cretaceous horizons continued to provide new gas reservoirs in the more densely drilled portion of northeastern British Columbia south of latitude 58 degrees. In this area eight additional Triassic gas pools were discovered. The wells White Rose Sec Montney 10-29-86-18, Tenn Osborn 6-35-87-15, and Texaco NFA N LaGarde 10-12-88-16 each found gas in the Triassic Baldonnel Formation. Follow-up drilling adjacent to the Laprise field resulted in the discovery of two new gas pools in the upper carbonate unit of the Triassic Schooler Creek Group by Dome CDP C&E Laprise c-82-G and Amerada Sojer c-56-D. New gas pools in both the upper carbonate unit and the Halfway Formation were also indicated adjacent to the Jedney field by the discovery wells Pacific et al W Jedney b-84-K and Pacific Imperial S Jedney b-99-H. The Boundary Lake zone produced gas in Texaco NFA LaGarde 10-29-87-15, 9 miles north of the Boundary Lake field, which produces oil from this zone.

Lower Cretaceous gas discoveries in 1962 included a Dunlevy gas pool 5 miles west of Buick Creek field, discovered by CDR Union E Fireweed d-55-H; a gas pool in the Gething Formation in the Jedney field, discovered by Pacific Pan Am Dome Jedney c-8-F; and two gas pools in the undivided Bluesky-Gething Formation, one 3 miles west of the Blueberry field, discovered by Sun et al Bernadet 8-1-88-25, and one in the Boundary Lake field, discovered by Texaco NFA Boundary 8-23-86-14.

RESERVOIR SECTION

The Reservoir Section is responsible for the general evaluation of oil and gas reservoirs, the calculation of reserves, the establishment of production rate limits for gas wells, maximum permissible rates for oil wells, and the assessment of pressure maintenance and secondary recovery programmes.

During 1962 the section established 314 maximum permissible rates for oil wells, of which four were interim rates, 167 were initial rates, and 143 were revisions of previously established rates. Approved maximum permissible rates at December 31, 1962, are given in Table 7.

In addition, 222 absolute open-flow potential tests of gas wells were calculated, and the corresponding production rate limits were established for the wells.

Oil-field and gas-field reservoir data, as compiled at the end of 1962, are given in Tables 4 and 5.

Pressure Maintenance

During 1962, pressure maintenance of oil pools became a matter of intense interest to the Department. The marked increase in production that followed completion of the oil pipe-line to Kamloops had an effect on the reservoirs that indicated that early pressure maintenance of the producing pools would probably be required to achieve the optimum recovery of oil.

The term " pressure maintenance " means the replacement, as it declines, of the natural energy in an oil pool by the injection of fluids. When oil is produced from a pool by natural flow, the supply of energy available in the pool to move oil to the well-bore and lift it to the surface is usually exhausted at a greater rate than is the oil itself. As a result, natural depletion may leave in the ground much oil that would be recoverable were the energy supply sufficient to move it to the well-bore at economical rates. Fluids are injected into the reservoir as the oil is withdrawn to supply the additional energy to maintain a high rate of production and increase the amount of oil recovered.

The injected fluids may be natural gas, liquefied petroleum gas, water, or a mixture or a succession of fluids. The natural gas or water may be obtained from the producing wells themselves, with additional gas or water from other sources, or the fluids may be obtained entirely from other sources. Water is commonly used as the injected fluid because it is readily available in quantity, and because it displaces oil efficiently.

In 1962 four applications were made to the Branch for approval of various pressure-maintenance and pilot water-flood schemes. These schemes and the dates of approval follow.

Sinclair Canada Oil Company requested approval of a pilot water flood in the Boundary Lake field. The application was approved on August 16th.

Union Oil Company of Canada Limited requested approval of a pressure-maintenance scheme by water injection into the Halfway pool of the Milligan Creek field. The application was approved on October 19th.

Imperial Oil Limited requested approval of a pilot water flood in the Boundary Lake field. The application was approved on November 16th.

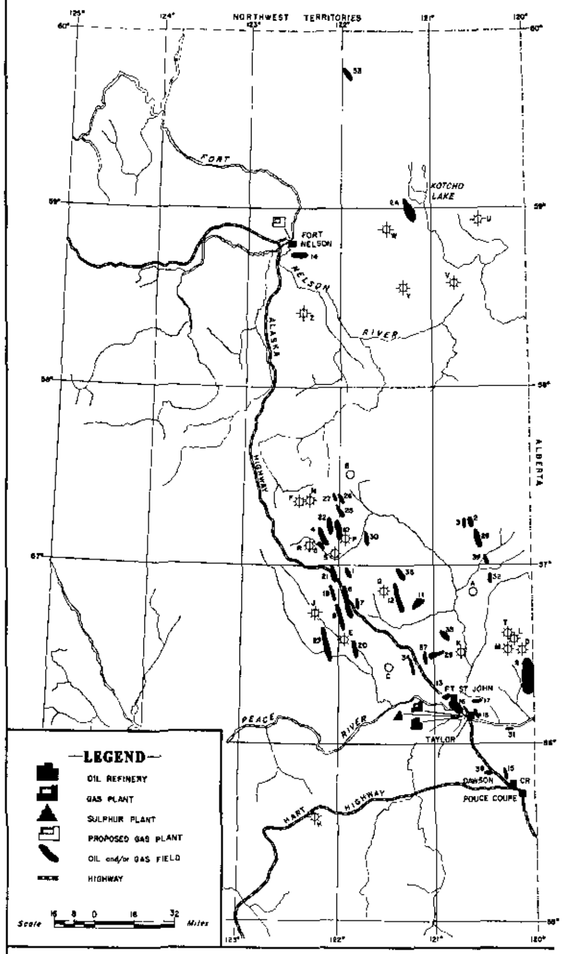
Triad Oil Company requested approval of a pilot water flood in the Halfway pool of the Beatton River field. The application was approved on December 18th.

Reserves

Proved recoverable reserves of oil and established reserves of gas increased substantially during 1962. A summary of these reserves with explanatory notes is given in Table 6.

OIL & GAS FIELDS OF NORTHEASTERN BRITISH COLUMBIA

INCLUDING 1962 DISCOVERY WELLS



1	Aitken Creek	Gething	Oil
2	Beatton River	Halfway	Oil
3	Beatton River West	Bluesky-Gething	Oil
4	Beg	U.C of Schooler Creek	Gas
		Halfway	Gas
5	Beg West	U.C of Schooler Creek	Gas
6	Blueberry	Dunlevy	Gas
		Baldonnel	Gas
		Charlie Lake	Gas
		Mississippian	Oil
7	Blueberry East	Baldonnel	Gas
		Halfway	Gas
		Mississippian	Gas
8	Blueberry West	Dunlevy	Gas
		Baldonnel	Gas
9	Boundary Lake	Bluesky-Gething	Gas
		Gething	Gas
		Dunlevy	Gas
		Baldonnel	Gas
		Boundary Lake	Oil
		Halfway	Oil
10	Bubbles	U.C of Schooler Creek	Gas
11	Buick Creek	Buick Creek	Gas
		Charlie Lake	Gas
12	Buick Creek West	Buick Creek	Oil
		Baldonnel	Gas
		Halfway	Gas
13	Charlie Lake	Gething	Oil
14	Clarke Lake	Devonian Carbonate	Gas
15	Dawson Creek	Cadotte	Gas
16	Fort St John	Cadomin	Gas
		Baldonnel	Gas
		Charlie Lake	Oil
		Halfway	Gas
		Belloy	Gas
17	Fort St John Airport	Cadomin	Gas
		Baldonnel	Gas
		Halfway	Gas
18	Fort St John Southeast	Cadomin	Gas
		Baldonnel	Gas
		Halfway	Gas
		Belloy	Gas
19	Gundy Creek	Baldonnel	Gas
		Charlie Lake	Gas
20	Halfway	Baldonnel	Gas
		Halfway	Gas
21	Highway	Dunlevy	Gas
		Baldonnel	Gas
		Mississippian	Gas
22	Jedney	Gething	Gas
		U.C. of Schooler Creek	Gas
		Halfway	Gas
23	Kobes-Townsend	Dunlevy	Gas
		Charlie Lake	Gas
		Halfway	Gas
		Mississippian	Gas
24	Kotcho Lake	Devonian Carbonate	Gas
25	Laprise Creek	U.C of Schooler Creek	Gas
26	Laprise Creek East	U.C of Schooler Creek	Gas
27	Laprise Creek West	U.C of Schooler Creek	Gas
28	Milligan Creek	Halfway	Oil
29	Montney	Bluesky-Gething	Gas
		Charlie Lake	Gas
		Halfway	Gas
30	Nig Creek	U.C of Schooler Creek	Gas
31	Parkland	Upper Devonian	Gas
32	Peejay	Halfway	Oil
33	Petitot River	Devonian Carbonate	Gas
34	Red Creek	Charlie Lake	Gas
		Halfway	Gas
35	Rigel	Gething	Gas
36	Snyder Creek	Dunlevy	Gas
37	Stoddart	Belloy	Gas
38	Sunrise	Cadotte	Gas
39	Wildmint	Halfway	Oil

—ABBREVIATIONS—

U.C.— Upper Carbonate

—DISCOVERY WELLS OF 1962—

A — Pacific SR West Cdn W Peejoy d 54 G — Triassic Halfway — Oil
B — Triad BP Conroy d 67 D — Triassic Halfway — Oil
C — Hunt Sands Imp Pac Caplin 7 16 86 23 — Triassic Baldonnel — Oil
D — Texaco NFA Boundary 6 23 86 14 — Lower Cretaceous Bluesky — Gas
E — Sun et al Bernadet 8 1 88 25 — Lower Cretaceous Bluesky — Gas
F — Pacific Pan Am Dome Jedney c 8 F — Lower Cretaceous Gething — Gas
G — CDR Union E Fireweed d 55 H — Lower Cretaceous Dunlevy — Gas
H — Hunt Sands Sun Falls c 18 G — Triassic Baldonnel — Gas
J — Texaco NFA N Townsend a 8 J — Triassic Baldonnel — Gas
K — White Rose Sec Montney 10 29 86 18 — Triassic Baldonnel — Gas
L — Texaco NFA N La Garde 10 12 88 16 — Triassic Baldonnel — Gas
M — Tenn Osborn 6 35 87 15 — Triassic Baldonnel — Gas
N — Dome CDP CBE W Laprise c 82 G — Triassic Upper Carbonate — Gas
P — Amerada Sojer c 56 D — Triassic Upper Carbonate — Gas
R — Pacific et al W Jedney b 84 K — Triassic Upper Carbonate & Halfway — Gas
S — Pacific Imperial S Jedney b 99 H — Triassic Upper Carbonate & Halfway — Gas
T — Texaco NFA La Garde 10 29 87 15 — Triassic Boundary Lake — Gas
U — Texaco NFA Walrus b 86 L — Mississippian — Gas
V — Sohio CBE Elwan a 55 G — Mississippian Banff — Gas
W — West Nat et al Yoyo a 74 H — Devonian Slave Point — Gas
Y — Imp Junior c 98 C — Devonian Slave Point — Gas
Z — Triad Sohio Pac Jackfish a 30 K — Devonian Slave Point — Gas

Figure 14. Petroleum and natural-gas fields, 1962.

During 1962 proved reserves of crude oil increased 50.6 per cent. Production was 8.6 per cent of the 1961 reserves, thus giving a net increase of 42 per cent. The net increase of established reserves of gas was 3.2 per cent, whereas the 1962 production was 1.4 per cent of the reserves established at the end of 1961. The slight net increase was affected by a revision in the method of calculating reserves adopted in 1962.

Pipe-lines

Gas-gathering System

During 1962 the gas-gathering system was extended by Westcoast Transmission Company to the Rigel and Texaco fields. The Rigel extension consisted of 19.8 miles of 10- and 12-inch pipe, and the Texaco extension comprised 6.6 miles of 8-inch pipe. Gas Trunk Line of British Columbia, Ltd., extended its network in the Beg field with 2.7 miles of 6-inch line.

Oil-gathering System

The oil-gathering system of Trans Prairie Pipelines Limited was extended to the Peejay West field with 4.5 miles of 4-inch line, and small gathering extensions were added in the Wildmint and Peejay fields.

The Boundary Lake gathering system was increased with the addition of 10 miles of 4-inch and 2 miles of 6-inch pipe-line.

The increased production and reserves in the Boundary Lake field necessitated an increase in capacity of the transmission-line from the field to the terminal at Taylor. The line was therefore looped with 25 miles of 8⅝-inch pipe, bringing the capacity to 52,000 barrels per day.

In addition to the Boundary Lake loop, Trans Prairie completed a loop from the Taylor terminal to the Western Pacific Products and Crude Oil Pipelines Limited pumping station. Two miles of 8⅝-inch line were laid, increasing the capacity of this section to 84,000 barrels per day.

The British Columbia Oil Transmission Company, which gathers oil from the Blueberry field and delivers it to the Taylor terminal of the Western Pacific Products system, came into operation on February 8th. This line, of 12,000 barrels per day capacity, delivered 591,774 barrels during 1962, or an average of 1,620 barrels per day. This average increased to 2,700 barrels per day at the end of 1962.

Oil Transmission-line

The Western Pacific Products and Crude Oil Pipelines Limited transmission-line from Taylor to Kamloops came into operation in 1962, and from start-up on January 20th until the end of the year maintained an average throughput of 22,428 barrels per day, with the greatest monthly volume of 32,500 barrels per day in October.

A new 120,000-barrel storage tank was added to the Kamloops tank farm and filled in November. Increased pumping facilities at a cost of approximately $2,000,000 were added to the system during 1962. Pumps driven by turbines at stations 3 and 4 and reciprocating engines at stations 2, 5, and 6 were installed to raise the capacity of the line from 27,500 barrels per day to over 45,000 barrels per day, or more than 60 per cent of the ultimate 75,000 barrels per day capacity.

Data concerning natural-gas pipe-lines, gas-processing plants, sulphur plants, crude-oil pipe-lines, and crude-oil refineries are given in Tables 18, 19, 20, 21, and 22 respectively.

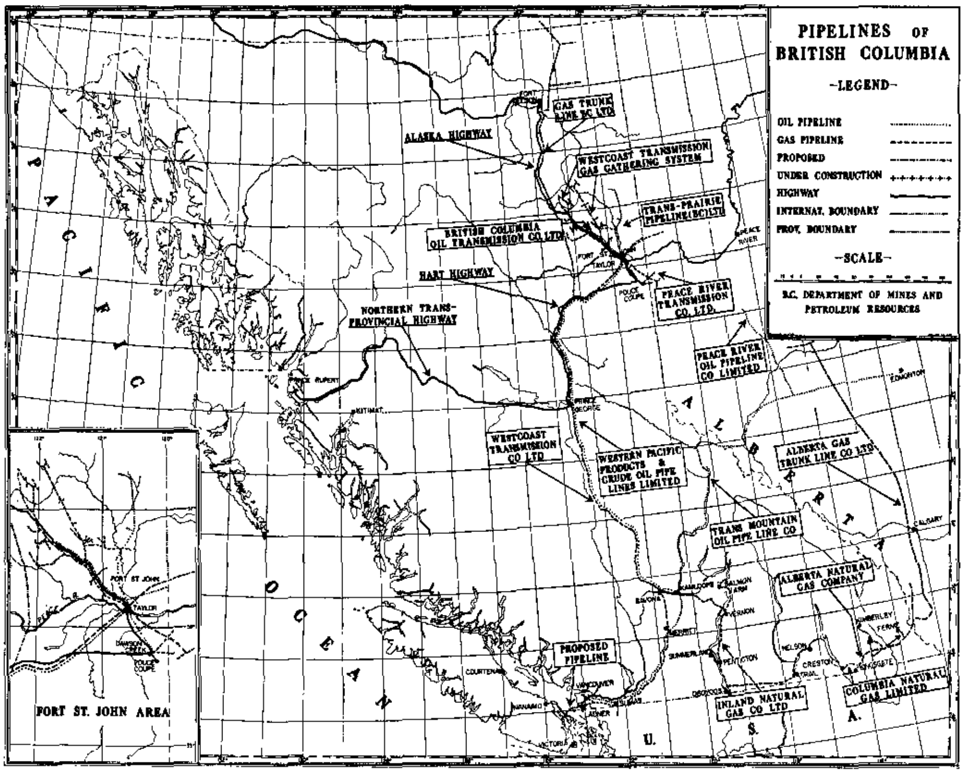


Figure 15. Petroleum and natural-gas pipe-lines.

DEVELOPMENT SECTION

Drilling

During 1962 there was a further increase in drilling activity in British Columbia. Except for five locations, four of which were in the Fraser Valley area, the drilling was concentrated in northeastern British Columbia.

All aspects of drilling showed gains over 1961. Thirty-nine oil companies employed twenty different contractors and sixty-six individual drilling rigs, compared with twenty-seven, eighteen, and fifty-three respectively in 1961.

Completed wells totalled 345 during the year. These included 163 oil and seventy-seven gas wells, counting as one well each zone of a multiple completion. Ninety-six locations were abandoned, nearly double the fifty-five abandoned in 1961. Nine wells were completed as service wells for the injection of water into oil reservoirs to increase production, compared with the first well drilled for this purpose in the latter part of 1961.

At the end of 1962 nineteen wells were being drilled and two were suspended pending further deepening.

Total footage drilled was 1,554,408 feet, 5 per cent higher than the 1961 total.

Ninety-one wells were reportedly worked over during the year to complete new pools, stimulate producing wells, repair damaged equipment, or to abandon potential wells.

A summary of the wells drilled and drilling in 1962 is shown in Table 7, and the footage drilled relative to the three previous years is shown graphically in

Figures 16 and 17. This graph also indicates the comparative footages for the well classifications.

The most significant factor in the increased activity was the accelerated development in the Boundary Lake oil field. Of the 163 oil completions in the Province, 119, or more than 70 per cent, were in this area. With the construction of the Western Pacific Products and Crude Oil pipe-line in the latter part of 1961, operators concentrated their efforts to drill out British Columbia's largest known oil field. An additional thirty-three oil wells were completed along the potential Triassic trend, extending from the Boundary Lake field north to the Beatton River field.

Five new fields were designated as Beg West, Kotcho Lake, Laprise Creek West, Rigel, and Wildmint, and amendments were made to ten existing fields. These bring the designated fields to thirty-nine at December 31, 1962. They are listed in Table 8.

During 1962 a total of 320 applications for drilling authorities was received and approved by the Development Engineering Section. Each application involves consideration of the proposed drilling programme, the title clearance of the petroleum and natural-gas rights, and the various conditions regarding the submission of geological and engineering data. Further approval is required for any proposed alteration to the completion, suspension, or abandonment methods. The section issues rig licences for all drilling and service rigs operating in the Province. Seventy-six rig licences were issued or renewed during 1962.

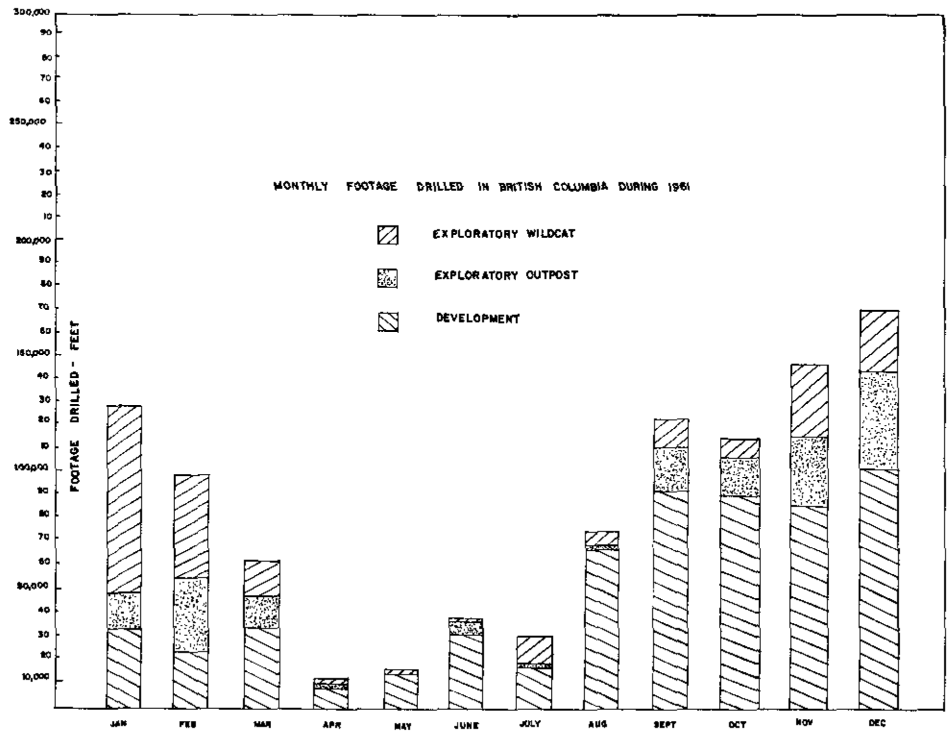
Another duty is approval of the official well name, which is recorded in the Well-names Register. The established system used in British Columbia divides a well name into three basic parts:—

(1) The full or abbreviated name of the company or companies responsible for the well.

(2) Reference to the general or specific area in which the well is located. This part of the name refers to a geographic area, topographic feature, or to an established position such as a triangulation station. In areas where a definite reference is not possible, a name is selected on some other basis.

(3) Reference to the survey system recognized in the area. This part of the name indicates either the legal subdivision, section, township, and range or, in areas not surveyed into townships, the quarter-unit, unit, and block as described in the publication entitled "Permit and Lease 'Grid' System." The National Topographic Series map numbers given in this publication are not included in the official well names but are recorded by the Branch for reference purposes.

At the time of approval of a drilling authority the location is classified as Development, Exploratory Outpost, or Exploratory Wildcat, based upon its position relative to other completed wells. This classification is used as the basis for the submission of well information to the Branch. A Development well may be defined as a well located in a spacing area that is contiguous to another spacing area containing a completed well. The general term "exploratory" is used to describe all locations that do not meet this condition, and a further division is made into Outpost and Wildcat well locations. Wildcat well locations are those greater than 4½ miles from a completed well, and Outpost well locations are in the area between Development and Exploratory Wildcat well locations. A well is considered to be completed if it is either physically able to produce or is a potential producer requiring further completion work. Each geological pool is considered separately, and



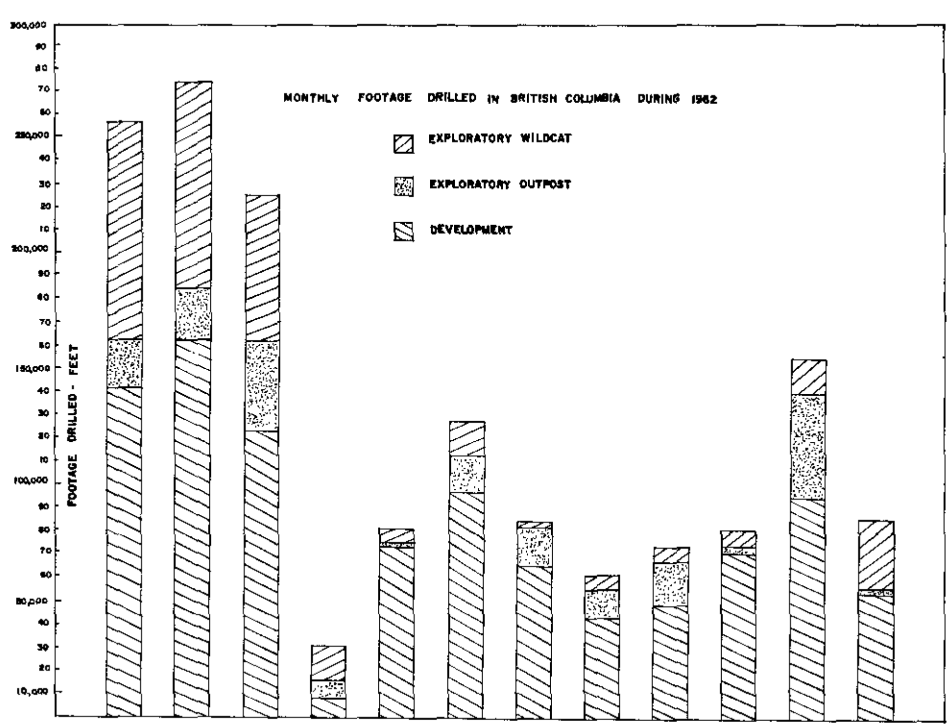
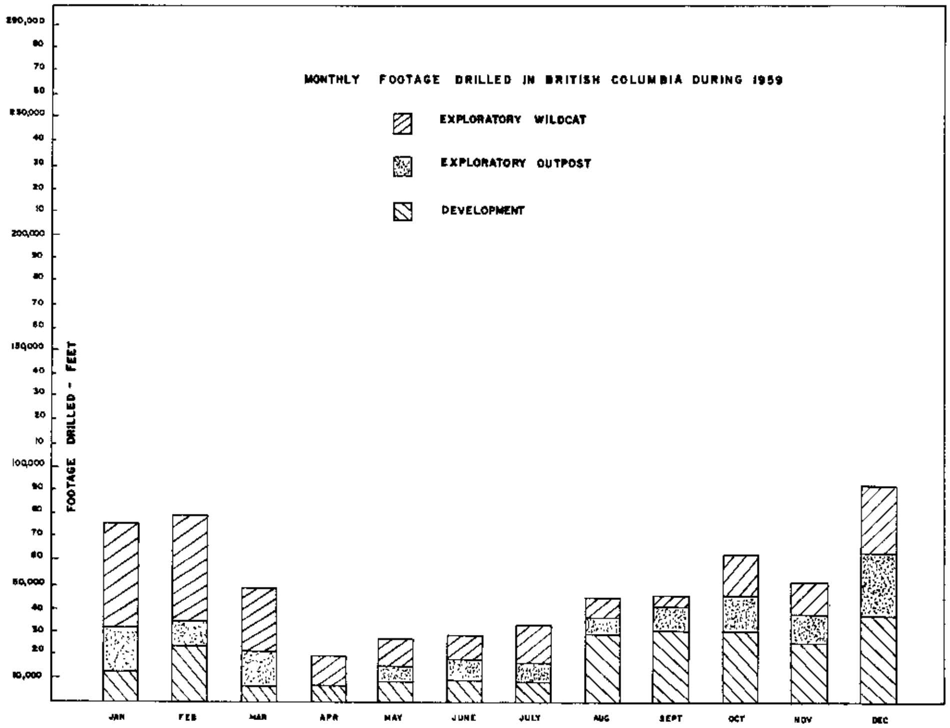


Figure 16. Footage drilled in British Columbia wells, 1959–60.



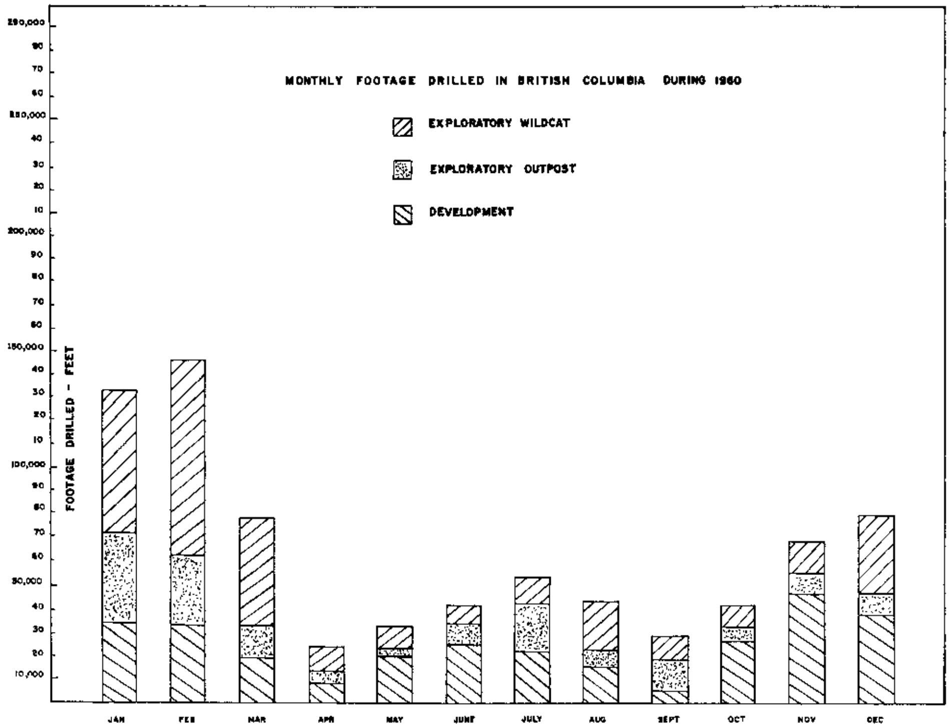


Figure 17. Footage drilled in British Columbia wells, 1961–62.

locations to be drilled to pools above and below known pools are classified as shallow-pool and deep-pool tests respectively.

The salt-water disposal well, Pacific Ft St John 3-30-83-18 (6), received a total of 34,432 barrels for return into the Belloy Formation from nearby producing gas wells. This well serves only a small number of the wells producing significant quantities of salt water. The balance of the salt water produced, 132,496 barrels, was contained in surface pits near the producing wells for disposal by evaporation. The dispersement of salt water must be carefully controlled, as arable land may be rendered sterile for several years if contaminated.

Four minor fires reported in 1962 at well locations resulted from production equipment failures.

The exploration carried out in northeastern British Columbia by geophysical and well-drilling companies has greatly contributed to the opening of new lands for settlement. Many of the areas that were without road connection to the populated areas now have year-round access, except possibly during spring break-up. Proper road construction by the oil companies to areas previously considered inaccessible has been a major factor in encouraging settlers to clear land in these new areas. The area north of the Nelson River, previously isolated except during the winter, is now served by a permanent bridge constructed by the Provincial Government, and a permanent access road is under construction to the Milligan-Beatton River area.

Production

The 1962 production of crude oil in British Columbia was 8,914,220 barrels, 776 per cent more than in 1961. The increase was attributable to the existence of a pipe-line to the Vancouver refinery area. The Boundary Lake field produced 6,250,313 barrels, or over 70 per cent of the Provincial total.

The number of producible oil wells completed in the Boundary Lake field in 1962 showed an increase of 92 per cent over the 1961 total, whereas in all other fields and areas the number of producible oil wells completed increased by 62 per cent. The Triassic Boundary Lake and Triassic Halfway pools continued to be the most important productive oil horizons.

The 1962 production of natural gas was 120,937,329 M s.c.f., an increase of 16 per cent over that of 1961. Fields which produced more than 5 billion cubic feet of gas each were Beg, Boundary Lake, Bubbles, Buick Creek, Buick Creek West, Fort St. John, Fort St. John Southeast, Jedney, Kobes-Townsend, Laprise Creek, Laprise Creek East, Nig Creek, and Stoddart. Three of these—namely, Beg, Fort St. John, and Jedney—exceeded 10 billion cubic feet.

The well count of producing and producible oil and natural-gas wells at the end of 1962 is shown in Table 10. Compilation of the producing and producible wells shown in Table 13 is based upon one well for each multiple completion, and thus differs from the totals given in Table 10. The increase in production compared to previous years is shown graphically in Figure 18, and the monthly production by fields and pools is given in Tables 10 and 11.

In 1962 marketed sales of natural gas, including imported Alberta natural gas, amounted to 132,349,526 M s.c.f., of which 99,130,731 M s.c.f. was exported to the United States. Of the latter amount, 80,447,419 M s.c.f. was produced in British Columbia. The marketed sales of natural gas reported by distributors within the Province amounted to 33,691,717 M s.c.f., distributed as follows: Residential, 12,783,603 M s.c.f.; commercial, 4,195,917 M s.c.f.; and industrial, 16,712,197 M s.c.f.

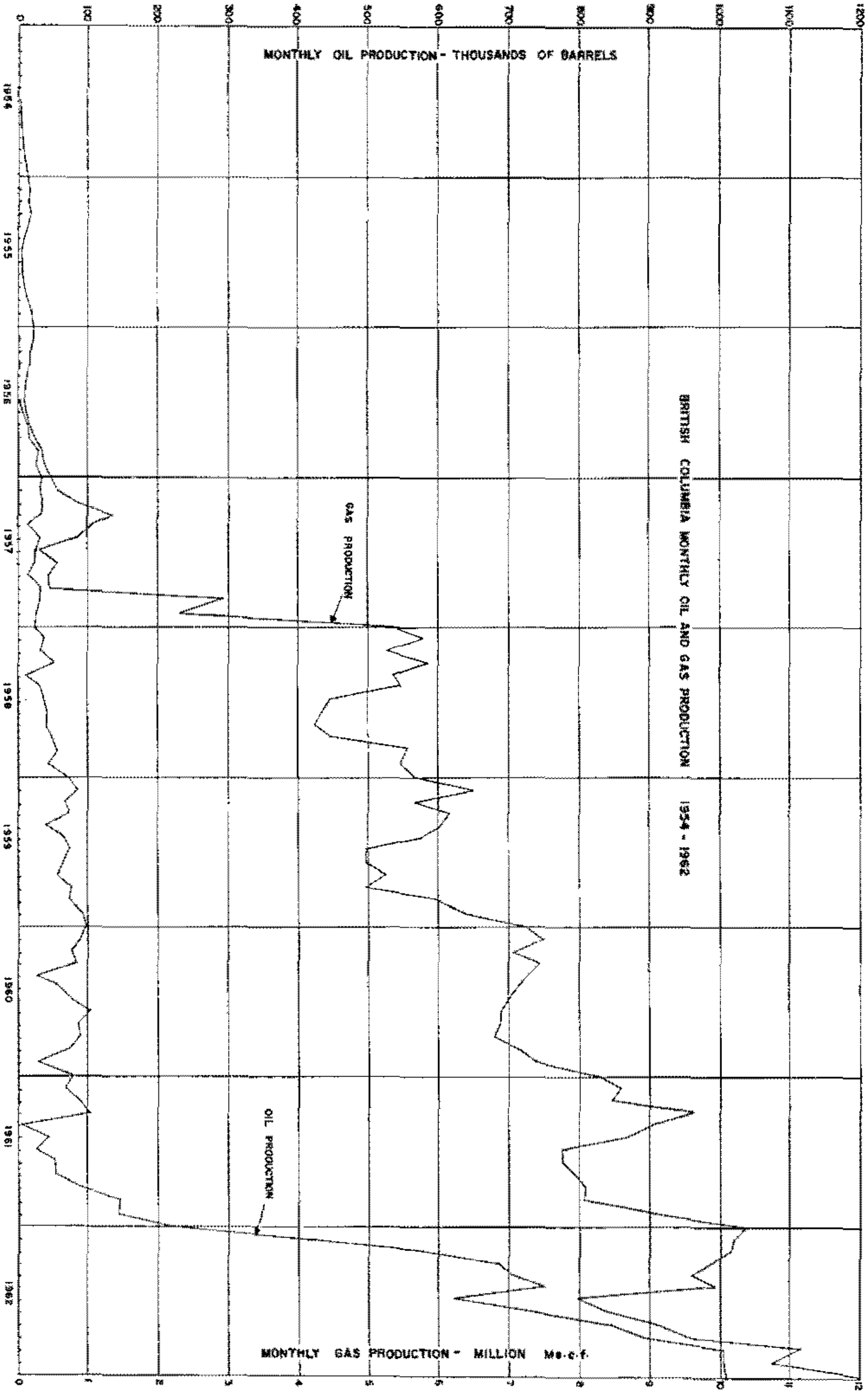


Figure 18. Petroleum and natural-gas production, 1954–62.

The 1962 production of condensate-pentanes plus amounted to 847,445 barrels, as compared to 813,724 barrels in 1961, a gain of 4 per cent.

The 1962 production of butane amounted to 383,324 barrels as compared to 319,231 barrels in 1961, a gain of 20 per cent.

The 1962 production of propane was 200,273 barrels, as compared to 154,717 barrels in 1961, a gain of 30 per cent.

The production of sulphur increased 24 per cent in 1962 to an annual output of 69,187 short tons.

It should be noted that the totals reported for the last-mentioned three products are only for the McMahon gas plant and the Jefferson Lake sulphur plant at Taylor.

A tabulation of general statistics concerning well operation and production data is shown in Table 12. Monthly dispositions of petroleum products are given in Tables 13, 14, and 15, and monthly values of the various products are given in Table 16.

Well Records

Information concerning the British Columbia oil and gas industry is collected, classified, and tabulated by the Petroleum and Natural Gas Branch and is made available in statistical content and form to all interested parties in accordance with the regulations.

Well information, other than the basic data regarding depth and status, is released according to the relationship of the well location to the designated fields. All such information is held confidential for one year following the release of the drilling rig for wells located outside the field boundaries. Field well information is held confidential for thirty days following the release of the drilling rig, providing a year has expired since the release of the drilling rig from the discovery well. Data from shallow-pool and deep-pool tests in a designated field are held confidential for one year following the release of the drilling rig. Confidential well information may be made available to an interested person upon the Branch receiving authorization by letter from the operator to release specific information to a named person.

Generally, information is released by means of publication or by opening the records for examination. In certain instances the Branch will reproduce records upon request. For these services, cost-defraying charges are made.

An important aspect of the handling of well information and the preparation of statistics is the establishment of flexible and detailed well records and production data for use by the staff of the Branch as well as by interested persons outside the Branch. Within the Branch, the records are in daily use by the other sections.

The Branch has representation on the Statistical Sub-committee which was established at the request of the Mines Ministers' Conference in 1955 and which is composed of personnel from the petroleum industry and the various Provincial authorities. The objectives of this group are as follows:—

(1) Standardization of forms designed for the same purpose but which are required individually by both the Provincial and Federal Governments under different formats.
(2) Standardization of forms to accommodate machine accounting procedures for reporting production statistics to the Provincial Governments.
(3) Amendment of existing model report forms to conform with present requirements.
(4) Investigation of ways and means of obtaining the co-operation of both Provincial and Federal Government agencies to provide earlier availability of information on all phases of the oil and gas industry.

During 1962 a complete set of model forms drafted by this sub-committee was presented to the Mines Ministers' Conference for consideration.

The Petroleum and Natural Gas Branch has adopted many features of these model forms, and presently uses the following applications and reports:—

*(1) Well-names Register.
(2) Application for a Drilling Authority.
(3) Application to Amend a Drilling Authority.
(4) Application to Change a Well Name.
(5) Application to Abandon a Well.
(6) Application to Alter a Well.
(7) New Oil Well Report.
(8) New Gas Well Report.
(9) Application for M.P.R.—Oil.
(10) Application to Commingle Production before Measurement.
(11) Battery Test Data Report.
(12) Monthly Proration and Production Report.
(13) Monthly Disposition Report and Crown Royalty Statement.
(14) Monthly Oil Gathering Operations Report.
(15) Monthly Gas Gathering Operations Report.
(16) Monthly Natural Gas Plant Statement.
(17) Monthly Natural Gas Processing Statement.
(18) Monthly Sulphur Plant Operations Report.
(19) Monthly Refinery Operations Report.
(20) Monthly Crude Oil and Condensate/Pentanes Plus Purchaser's Statement.
(21) Monthly Liquefied Petroleum Gas Purchaser's Statement.
(22) Well Completion Report.
(23) Supplement to Well Completion Report.
(24) Work-over Report.
*(25) Work-over Card.
*(26) Monthly Operations Report.
(27) Application for a Rig Licence.
(28) Monthly Water Flood Operations Report.
(29) Monthly Water Receipts and Disposal Report.
(30) Statement of Nomination and Estimate Requirements for British Columbia Crude Oil, Condensate/Pentanes Plus.
(31) New Service Well Report.
†(32) Monthly Natural Gas Distributor's Statement.

The Branch has representation on the Provincial-Federal Committee on Oil and Gas Statistics, which held two meetings during 1962. The purpose of this committee was to establish and revise, as required, statistical forms on the production, transportation, and distribution of oil and gas and to foster the joint collection of these statistics, eliminating as much duplication by the Provincial and Federal agencies as possible.

Reports

Schedule of Wells

Each year a volume is prepared dealing with the wells drilled for petroleum and natural gas in British Columbia during the year. It covers the period from

* For Departmental use only.
† Prepared in conjunction with the Dominion Bureau of Statistics.

8 a.m. January 1st to 8 a.m. January 1st of the succeeding year. The following well information is listed when applicable: Well name, drilling authority number, classification, operator, title and number, location, co-ordinates, spud date, rig release date, ground elevation, Kelly bushing elevation, total depth, well status, interval open to production, casing, logs, core intervals, sample intervals, drill-stem tests, wire-line tests, and geological markers.

The foregoing information is condensed from reports submitted to the Branch by the operators of the listed wells.

Weekly Report

The weekly report is prepared for Branch use from data collected from the operators by the field office at Charlie Lake. The week reported is from 8 a.m. Friday to the following 8 a.m. Friday. The report includes the following information:—

(1) New locations approved.
(2) New locations pending approval.
(3) Locations cancelled.
(4) Well-name changes.
(5) Changes of well classification.
(6) Changes of well status.
(7) Wells spudded.
(8) Rigs operating.
(9) Suspended wells.
(10) Abandoned wells.
(11) Completed oil wells.
(12) Completed gas wells.
(13) Completed injection wells.
(14) Workovers.
(15) Summary of well count giving the following totals:—
  (*a*) Locations drilled in British Columbia.
  (*b*) Producible oil wells.
  (*c*) Producible gas wells.
  (*d*) Abandoned wells.
  (*e*) Injection wells.
  (*f*) Disposal wells.
  (*g*) Wells completed in British Columbia.

Monthly Oil and Gas Report

The Monthly Oil and Gas Report is prepared from returns made monthly by the operators of the producing wells. Totals are carried cumulatively for the year on a comparative basis with the preceding year.

The contents of the report are as follows:—

(1) Graphical presentation of the daily average for oil production, the daily average for gas production, and the footage drilled, with comparisons to the preceding year.
(2) Monthly summary of drilling and completion activity, with comparisons to the same month of the preceding year and annual totals.
(3) Crude oil—
  Number of producing and producible oil wells by field and pool.
  Crude-oil production by field and pool.
  New oil wells placed on production.

Crude-oil disposition.
Value of crude-oil sales to British Columbia producers.
Tabulation of nominations and estimated requirements for British Columbia crude oil, condensate/pentanes plus.
Approved maximum permissible rates.

(4) Natural gas—
Number of producing and producible gas wells by field and pool.
Natural-gas production by field and pool.
New gas wells placed on production.
Natural-gas disposition.
Value of natural-gas sales to British Columbia producers.

(5) Water—
Water production by field and pool.
Water disposition.

(6) Natural-gas liquids and sulphur—
Production and disposition of condensate/pentanes plus, butane, propane, and sulphur.
Value of natural-gas liquids and sulphur to British Columbia producers.

This report is compiled and mailed to subscribers approximately two weeks after receipt of returns from the operators.

Drilling and Land Report

The Drilling and Land Report is published concurrently with the Monthly Oil and Gas Report. The Drilling Section is prepared from information submitted by the operators to the Branch. The contents of the report are as follows:—

A. Drilling Section—
- (1) Monthly summary of drilling and completion activity.
- (2) Drilling authorities approved.
- (3) Locations outstanding.
- (4) Locations cancelled.
- (5) Changes in well status.
- (6) Changes in well classification.
- (7) Changes in well names.
- (8) Suspended wells.
- (9) Drilling and completed wells.
- (10) Estimated monthly oil production.
- (11) Rig licences issued.
- (12) Rig licences renewed.
- (13) Rig licences cancelled.
- (14) Well data released from confidential status, which is presented in a form similar to that used in the Schedule of Wells.

B. Land Section—
- (1) Summary of changes in acreage held under the following titles:—
  - (*a*) Permits.
  - (*b*) Leases.
  - (*c*) Natural Gas Licences.
  - (*d*) Drilling Reservations.
- (2) Operators' licences issued.
- (3) Summary of disposition of permits, leases, natural-gas licences, and drilling reservations.

PUBLICATIONS

Write to the Chief, Petroleum and Natural Gas Branch, for the following:—

Regulations Governing the Drilling of Wells and the Production and Conservation of Oil and Natural Gas	$0.50 per copy
Schedule of Wells Drilled for Oil and Natural Gas in British Columbia (1906–1959), Volume I	7.50 per copy
Schedule of Wells Drilled for Oil and Natural Gas in British Columbia (1960), Volume II	5.00 per copy
Schedule of Wells Drilled for Oil and Natural Gas in British Columbia (1961), Volume III	5.00 per copy
List of Petroleum and Natural Gas Publications, Services and Maps	No charge
Oil and Gas Field Descriptions	.50 per copy
Annual Report reprints	No charge
Stratigraphic Correlation Chart—	
28 by 40 inches	1.25 per copy
14 by 20 inches	.75 per copy
List of Released Geological Reports on Oil and Gas Permits	.50 per list
Representative Well Logs of Northeastern British Columbia	2.00 per copy
Regional maps (1 inch=2 miles)	Price on application
Oil and Gas Field Boundary Plats	.35 per copy

Write to the Chief Commissioner for the following:—

Petroleum and Natural Gas Act	.35 per copy
Permit and Lease Grid System	1.00 per copy
Geophysical Regulations	.25 per copy
Monthly Oil and Gas Report (Summary Statistics)	$6.00 per calendar year or $0.75 per copy
Drilling and Land Report (Monthly)	$6.00 per calendar year or $0.75 per copy
List of Leases in Peace River District showing Lease Number, Lessee, Acreage, Issue Date, Years, and Ex. Permit Number	2.50 per list
Additions and Revisions to Permit, Licence and Lease Maps (Monthly Report)	2.50 per year
Permit and Lease Location Maps	Price on application

TABLES

TABLE 1.—SEISMIC EXPLORATION, 1962

NOTE.—Unless otherwise indicated, exploration method is reflection seismic survey. For indicating location, the National Topographic map numbering system is used, except in the Peace River Block, where the township system is used.

Company	Location of Exploration	Number of Seismic Crews	Number of Crew-weeks
January			
Amerada Petroleum	93-P-9, 16	1	4
Apache Corporation	94-J-10	1	1
Atlantic Refining	94-H-3, 4; 94-A-13, 14	1	2
	94-B-8	1	3
British American	94-J-8, 9	1	4
California Standard	94-P-2, 7, 8	1	3
	94-J-9		2
Canadian Fina	94-J-8, 94-I-5	1	2
Canadian Oil	Tp. 86, 87, R. 18, 19, W. of 6th M.	1	2
Central-Del Rio	94-J-3	1	5
Hudson's Bay	94-A-16	1	3.5
	94-H-2		0.5
	94-B-10	2	8
Imperial Oil	Tp. 81, R. 15, 16, W. of 6th M.	1	1
	94-P-8	1	4
	94-H-7	1	2
Marathon Oil	94-J-2, 3	1	4
Mobil Oil	94-I-5	1	4
Pacific Petroleum	Tp. 86, R. 15, W. of 6th M.		1
	94-G-8	1	1
	94-B-9		2
	94-J-10		1
Pan American	94-P-5, 94-P-12		3
	94-O-8, 9	1	1
	94-G-8		1
	94-J-9, 94-I-13	1	3
	94-O-16		0.5
	94-N-16	1	0.5
Pure Oil	94-J-10, 11	1	6
	Tp. 77, 78, R. 20-24, W. of 6th M.; Tp. 78, 79, R. 18, 19, W. of 6th M.	1	8
Shell Oil	94-K-15, 16	1	3
	94-B-6, 7, 11		3
	94-J-13	1	4
Sinclair Canada	94-I-11, 14	1	3
	94-G-7, 10		1.5
Sohio Petroleum	94-P-2, 3	1	4
Texaco Exploration	94-P-5, 12; 94-O-8, 9	1	4
Triad Oil	94-J-7, 8	1	4
February			
British American	94-J-8	1	4
California Standard	94-A-1, 10, 12, 13		2
	94-J-9	1	1
	Tp. 81, 82, R. 14, 15, W. of 6th M.		2
Canadian Fina	94-J-8, 94-I-5	1	2
Canadian Oil	Tp. 86, 87, R. 18, 19, W. of 6th M.	1	1
Central-Del Rio	94-J-3	1	4
French Petroleum	94-B-15	1	1[1]
Hudson's Bay	94-A-16		2
	94-H-2	1	1
	94-H-8		0.5
	94-H-9		0.5
	94-B-10	2	6
Imperial Oil	94-I	2	6
Mobil Oil	94-I-5	1	4
Pacific Petroleum	94-I-13, 14	1	4
Pan American	94-O-10, 15, 16; 94-P-4, 5, 12	1	4
	94-J-9; 94-I-12, 13; 94-P-2, 3	1	4
	94-N-16	1	2.5

[1] Seismic refraction.

TABLE 1.—SEISMIC EXPLORATION, 1962—*Continued*

Company	Location of Exploration	Number of Seismic Crews	Number of Crew-weeks
February—Continued			
Pure Oil	94-J-10, 11	1	9
	Tp. 77, 78, R. 20–24, W. of 6th M.; Tp. 78, 79, R. 18, 19, W. of 6th M.	1	6.5
Richfield Oil	94-B-15	1	1[1]
Shell Oil	94-B-6, 7, 11	1	4
	94-J-14, 15	1	4
Sinclair Canada	94-G-2, 7	1	3
	94-G-2		1
Sohio Petroleum	94-I-10		2
	94-J-12	1	1
	94-J-2, 7		1
Tenneco Oil	94-P-2		1.5
	94-P-3	1	0.5
	94-H-14		0.5
Texaco Exploration	94-P-4, 5	1	4
Triad Oil	94-J-7, 8	1	1
March			
California Standard	94-H-2		1.5
	94-H-10		0.5
	94-H-6	1	1
	94-H-15		1
	94-A-10		2
Central-Del Rio	94-J-3	1	2
Dome Petroleum	94-I-12	1	2
French Petroleum	94-B-15	1	1[1]
	94-B-15		1
Hudson's Bay	94-H-2		2.5
	94-H-8		0.5
	94-H-9	1	0.5
	94-A-16		0.5
	94-G-6		2
	94-G-11	1	2
Imperial Oil	94-I	2	8
Mobil Oil	94-J-8; 94-I-12, 13	1	4
Pacific Petroleum	94-I-13	1	1
Pan American	94-P-4	1	1
	94-P-1, 2; 94-I-15, 16	1	2
	94-P-16	1	2.5
Pure Oil	94-J-10, 11	1	2
Richfield Oil	94-B-15	1	1[1]
	94-B-15		1
Shell Oil	94-B-6, 7, 11		1
	94-N-2, 7		2.5
	94-K-16	1	0.5
	94-I-11, 14, 15; 94-P-7, 10, 11		1
	94-O-2; 94-J-15; 94-P-10, 11		2
	94-I-12, 13; 94-J-9, 16; 94-P-3, 4	1	1
Sinclair Canada	94-G-1, 2, 6, 7, 10	1	1
Sohio Petroleum	94-J-2, 7	1	3
Sun Oil	Tp. 86, 87, R. 12–15	1	3
	94-J-14, 15	1	1
Tenneco Oil	94-P-2	1	1
Texaco Exploration	94-I-8, 9	1	4
April			
British American	93-P	1	4
Imperial Oil	94-I	2	6
May			
British American	93-P	1	3
June			
British American	93-P	1	1
	94-A		3
Pan American	94-G-11	1	4
July			
British American	94-A-3	1	4
Canadian Husky	92-C-10, 13; 92-F-4	1	1[2]

[1] Seismic refraction.
[2] Marine Geophysical Survey (continuous profile gas exploder technique), Tofino area.

TABLE 1.—SEISMIC EXPLORATION, 1962—*Continued*

Company	Location of Exploration	Number of Seismic Crews	Number of Crew-weeks
August			
British American	94-A-3	1	1.5
	94-A-4		2.5
Canadian Husky	103-G-11, 12, 13, 14	1	2.5[3]
Triad Oil	94-I-12	1	1
September			
Richfield Oil	94-G-1	1	4
Triad Oil	94-I-12	1	2
October			
British American	94-A-4	1	1
Pan American	94-G-14	1	2
	94-K-9	1	3
Richfield Oil	94-G-1	1	2
Triad Oil	94-H-2	1	0.5
November			
Atlantic Refining	94-H-4; 94-G-1	1	4
British American	94-A-3, 4; 93-P-15	1	4
Pacific Petroleum	94-A-4	1	1
Pan American	94-G-14	1	2
	94-K-9	1	2
Richfield Oil	94-G-1	1	3
Sohio Petroleum	94-B-15, 16	1	2
Triad Oil	94-H-2	1	1
	94-I-11, 12	1	2
Union Oil	94-A-13	1	1
December			
Atlantic Refining	94-H-4; 94-J-9, 10, 14; 94-I-6, 11	1	5
British American	93-P-15	1	4
Hudson's Bay	94-B-10, 15	1	4
Pacific Petroleum	94-J-9, 10, 14, 15; 94-O-3	2	7
Pure Oil	94-I-14	1	0.5
Shell Oil	94-G-15	1	2
Sinclair Canada	94-G-7	1	2
Sohio Petroleum	94-B-9, 10, 15, 16	1	3
Triad Oil	94-I-11, 12	1	4
Union Oil	93-A-13	1	1
	94-G-15	1	3

[3] Marine Geophysical Survey (continuous profile gas exploder technique), Hecate Strait.

TABLE 2.—SURFACE GEOLOGICAL EXPLORATION, 1962

Company	Location	Number of Geologists	Two-man Party-weeks
May			
Atlantic Refining	94-J-12	2	1
Imperial Oil	94-M, N	7	2
Pan American	94-G-3, 6, 11	5	5.5
Shell Oil	94-P-10	4	2
	94-I-14	5	2.5
	92-B, 82-J	4	8
June			
Atlantic Refining	94-J-12, 13	4	4
British American	94-B, G	3	6
	82-G	2	4
French Petroleum	94-G	2	1
Hudson's Bay	94-G-3, 6; 94-B-7, 10, 11, 14	7	7
Imperial Oil	94-M, N	7	8
Pan American	94-G-11, 16	5	5
	94-B-3, 5, 6	5	5
	93-O-8, 9, 10, 15, 16; 93-P-3, 4, 5, 6	5	3
Shell Oil	94-P-10	4	8
	94-I-14	5	10
	92-B	4	8
Union Oil	94-G-11	5	4
	94-B-2, 7	5	4
July			
Atlantic Refining	94-G	4	5
British American	94-B, G; 93-O, P	10	8
	82-G	2	4
California Standard	93-I-1, 7, 8	5	5
	82-J-6, 7, 11	5	8
Hudson's Bay	94-G	7	14
Pan American	94-B-3, 4, 5, 6	5	10
	93-O-1, 7, 8, 10, 14	5	11
Shell Oil	94-B-3	4	8
	93-I-14	5	10
	92-E	4	8
Union Oil	94-B	5	5
	93-O	5	5
August			
British American	93-O, 93-P	3	6
	82-G	2	4
California Standard	82-J-2, 3	5	2
	82-G-2, 7, 10, 11, 14, 15	6	7
Hudson's Bay	94-B, G	7	10
Pan American	94-B-12, 13	5	10
	93-I-1, 8	5	10
Richfield Oil	94-G, J, K, N	2	3
Shell Oil	94-B-3	4	8
	93-O-7	4	5
	93-I-14	5	10
	92-E	4	8
Sohio Petroleum	94-K-9	2	2
	94-B-7, 10	2	1
Union Oil	93-O	5	2.5
	93-P	5	7.5
September			
British American	82-G	3	1.5
California Standard	82-G-2, 7	5	2
Pan American	94-B-12, 13	5	5
	94-G-6; 93-I-1, 8	3	1.5
Shell Oil	93-O-7	4	4
	93-I-14	5	5
	92-E	4	4

TABLE 3.—EXPLORATORY TEST-HOLES DRILLED, 1962

Company	No.	Location by Co-ordinates (Distances in Feet)	Section	Township	Range
January					
Sinclair Canada	1–62	S. 925 W. 1,384 N.E. corner	23	82	21
February					
Pacific Petroleum	1	N. 710 W. 695 N.E. corner	34	83	25
	2	N. 2,250 E. 3,950 N.E. corner	34	83	25
	3	N. 4,400 W. 800 N.E. corner	36	83	25
	3A	N. 2,582 E. 2,770 N.E. corner	35	83	25
	3B	N. 4,180 E. 268 N.E. corner	36	83	25
	4	N. 5,650 E. 2,950 N.E. corner	36	83	25
	5	N. 7,550 E. 8,550 N.E. corner	36	83	25
	6	N. 9,150 E. 13,150 N.E. corner	36	83	25
	7	S. 10,300 E. 1,490 N.E. corner	36	83	25
	8	S. 7,800 E. 6,600 N.E. corner	36	83	25
	9	S. 12,550 W. 3,120 N.E. corner	36	83	25
	10	S. 1,184 W. 3,000 S.E. corner	7	83	24
	11	S. 14,760 W. 7,560 N.E. corner	36	83	25
	12	N. 2,236 E. 275 S.E. corner	7	83	24
	13	W. 1,290 N.E. corner	8	83	24
	14	S. 17,000 W. 12,200 N.E. corner	36	83	25
	15	N. 600 E. 1,300 N.E. corner	34	82	25
	16	N. 3,200 E. 7,800 N.E. corner	7	83	24
Sinclair Canada	2–62	S. 635 W. 964 N.E. corner	15	82	21
	3–62	S. 3,495 W. 4,074 N.E. corner	15	82	21
	4–62	S. 2,265 W. 64 N.E. corner	8	82	21
	5–62	S. 635 W. 3,744 N.E. corner	5	82	21
	6–62	S. 1,035 W. 3,764 N.E. corner	7	82	21
	7–62	S. 3,495 W. 74 N.E. corner	32	81	21
	8–62	S. 2,315 W. 1,124 N.E. corner	28	81	21
	9–62	S. 1,475 W. 1,774 N.E. corner	22	81	21
	10–62	S. 795 W. 4,364 N.E. corner	22	82	21
	11–62	S. 845 W. 4,264 N.E. corner	12	82	21
	12–62	N. 65 W. 4,264 N.E. corner	12	82	21
	13–62	S. 1,695 W. 4,284 N.E. corner	36	81	21
	14–62	S. 3,015 W. 66 N.E. corner	2	82	21
March					
Sinclair Canada	15–62	S. 5,200 W. 540 N.E. corner	33	80	20
	16–62	S. 840 W. 160 N.E. corner	21	80	21
	17–62	S. 1,310 W. 130 N.E. corner	13	80	21

TABLE 4.—OIL-FIELD RESERVOIR DATA AS OF DECEMBER 31, 1962

Field	Pool	Rock Type	Age	Trap	Drive Mechanism	Av. Porosity (per Cent)	Av. Net Thickness (Ft.)	Av. Permeability (Md.)	Av. Water Saturation (per Cent)	Shrinkage Factor (Stock Tank Barrel per Reservoir Barrel)	Gravity Degrees (A.P.I.)	Original Pressure (Psig.)	Av. M.P.R. (Bbl./Day)
Aitken Creek	Gething	Sandstone	Lower Cretaceous	Stratigraphic-structural	Depletion with gas cap	11.0	17.0	1,993.0	25.0	0.765	38.0	1,548	86
Beatton River	Halfway	Sandstone	Triassic	Stratigraphic-structural	Depletion	17.5	13.0	130.0	25.0	0.86	40.0	1,190	132
Beatton River West	Bluesky-Gething	Sandstone	Lower Cretaceous	Stratigraphic-structural	Depletion and gas cap	13.3	13.0	65.0	25.0	0.80	42.0	1,040	82
Blueberry	Mississippian	Limestone	Mississippian	Structural-stratigraphic	Gas cap and partial water	9.1	63.0	31.1[1]	25.0	0.745	40.0	2,710	235
Boundary Lake	Boundary Lake	Limestone	Triassic	Structural-stratigraphic	Depletion with small gas cap	19.2	14.2	45.0	5.0	0.77	35	1,825	125
Boundary Lake	Halfway	Sandstone	Triassic	Structural	Water with partial gas cap	13.2	19.0	13.9	30.0	0.75	42.6	1,696	69
Charlie Lake	Gething	Sandstone	Lower Cretaceous	Stratigraphic	Depletion	10.0	8.0	......	25.0	0.832	34.4	1,134	36
Fort St. John	Charlie Lake	Sandstone	Triassic	Stratigraphic	Gas cap	13.8	6.4	570.0	25.0	0.79	36.0	1,950	37
	Belloy	Limestone	Permian	Stratigraphic-structural	Depletion	10.0	21.0	23.0	25.0	0.75	43.0	2,770	85
Milligan Creek	Halfway	Sandstone	Triassic	Stratigraphic-structural	Depletion	23.0	21.0	23.0	8.0	0.86	41.0	1,190	279
Peejay	Halfway	Sandstone	Triassic	Stratigraphic-structural	Depletion	14.4	16.8	90.0	16.0	0.83	39.0	1,380	115
Wildmint	Halfway	Sandstone	Triassic	Stratigraphic-structural	Depletion	20.0	15.8	380.0	8.0	0.86	39.0	1,208	145

[1] Plus fractures.

TABLE 5.—GAS-FIELD RESERVOIR DATA AS OF DECEMBER 31, 1962

Field	Pool	Rock Type	Age	Trap	Av. Porosity (per Cent)	Av. Net Thickness (Ft.)	Av. Permeability (Md.)	Av. Water Saturation (per Cent)	Compressibility Factor	Specific Gravity (Air=1.0)	Original Pressure (Psig.)	Av. A.O.F.P. (M S.C.F./Day)
Beg	U.C. of Sch. Cr.	Limestone	Triassic	Structural	9.5	88.3	64.7[1]	20.8	0.861	0.670	1,630	2,950
Beg	Halfway	Sandstone	Triassic	Structural	10.3	105.0	8.5	34.9	0.836	0.674	1,826	4,370
Beg West	U.C. of Sch. Cr.	Limestone	Triassic	Structural	9.8	76.0	10.6[1]	22.6	0.836	0.666	1,674	2,850
Blueberry	Dunlevy	Sandstone	Lower Cretaceous	Structural	10.9	60.0	10.3	25.0	0.820	0.650	1,366	1,365
Blueberry	Baldonnel	Limestone	Triassic	Structural	10.6	23.8	37.1	29.6	0.810	0.687	1,639	4,443
Blueberry	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	9.9	31.0	—	30.0	0.823	0.645	2,380	—
Blueberry	Mississippian	Limestone	Mississippian	Structural	15.9	55.0	106.4	20.0	0.841	0.670	2,792	17,000
Blueberry East	Baldonnel	Limestone	Triassic	Structural	11.1	22.0	47.7	25.0	0.781	0.684	1,886	7,100
Blueberry East	Halfway	Sandstone	Triassic	Structural	10.0	39.0	7.3	25.0	0.767	0.733	2,066	6,400
Blueberry East	Mississippian	Limestone	Mississippian	Structural	12.3	30.0	32.5	30.5	0.871	0.612	2,686	3,575
Blueberry West	Dunlevy	Sandstone	Lower Cretaceous	Structural	9.5	39.0	61.8	25.0	0.821	0.658	1,406	5,250
Blueberry West	Baldonnel	Limestone	Triassic	Structural	9.7	24.0	83.7	22.8	0.819	0.648	1,726	5,400
Boundary Lake	Bluesky-Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	17.7	15.0	—	19.3	0.844	0.634	1,276	3,925
Boundary Lake	Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	15.8	63.0	—	32.5	0.830	0.641	1,393	11,700
Boundary Lake	Baldonnel	Limestone	Triassic	Structural	12.9	24.5	—	35.1	0.814	0.670	1,453	4,616
Boundary Lake	Halfway	Sandstone	Triassic	Structural	6.4	8.6	—	23.4	0.841	0.632	1,686	—
Bubbles	U.C. of Sch. Cr.	Limestone	Triassic	Structural	9.9	133.4	33.3	17.7	0.831	0.665	1,596	11,098
Buick Creek	Buick Creek	Sandstone	Lower Cretaceous	Structural-stratigraphic	13.3	38.0	139.8	23.7	0.847	0.646	1,286	12,580
Buick Creek	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	8.0	5.0	—	10.4	0.834	0.670	1,536	7,887
Buick Creek West	Buick Creek	Sandstone	Lower Cretaceous	Structural-stratigraphic	10.9	73.7	165.0	31.9	0.854	0.693	1,309	26,890
Buick Creek West	Baldonnel	Limestone	Triassic	Stratigraphic	11.4	19.8	44.9	11.5	0.829	0.675	1,521	3,250
Buick Creek West	Halfway	Sandstone	Triassic	Structural	12.3	69.9	20.8	49.8	0.750	0.773	1,715	8,500
Clarke Lake	Devonian	Limestone	Devonian	Stratigraphic	9.7	150.0	247.8	13.2	0.935	0.670	2,886	75,000
Dawson Creek	Cadotte	Sandstone	Lower Cretaceous	Structural-stratigraphic	17.3	50.3	31.0	35.0	0.921	0.580	686	5,733
Fort St. John	Cadomin	Sandstone	Lower Cretaceous	Structural	12.4	12.0	421.0	40.0	0.844	0.610	1,340	29,000
Fort St. John	Baldonnel "A"	Limestone	Triassic	Structural	16.2	33.0	120.4	28.0	0.809	0.670	1,604	13,960
Fort St. John	Baldonnel "A/B"	Limestone	Triassic	Structural	10.7	62.3	101.6	27.0	0.818	0.686	1,604	19,480
Fort St. John	Charlie Lake	Sandstone	Triassic	Stratigraphic	10.9	5.0	—	30.0	0.802	0.670	1,882	—
Fort St. John	Halfway	Sandstone	Triassic	Structural	11.1	37.4	22.6	25.0	0.808	0.679	2,006	10,000
Fort St. John	Belloy	Limestone	Permian	Structural-stratigraphic	11.1	44.5	59.3	25.0	0.828	0.670	2,756	13,500
Fort St. John Airport	Cadomin	Sandstone	Lower Cretaceous	Structural	17.5	25.0	—	40.0	0.832	0.640	1,443	—
Fort St. John Airport	Baldonnel "A"	Limestone	Triassic	Structural	10.0	25.0	—	28.0	0.813	0.670	1,614	—
Fort St. John Airport	Halfway	Sandstone	Triassic	Structural	10.0	15.0	—	25.0	0.804	0.670	2,039	1,400
Fort St. John Southeast	Cadomin	Sandstone	Lower Cretaceous	Structural	15.8	22.0	64.2	40.0	0.847	0.620	1,376	2,400
Fort St. John Southeast	Baldonnel "A"	Limestone	Triassic	Structural	14.7	35.0	30.0	28.0	0.813	0.670	1,626	13,680
Fort St. John Southeast	Halfway	Sandstone	Triassic	Structural	9.8	37.8	14.5	25.0	0.798	0.670	2,107	11,083
Fort St. John Southeast	Belloy	Limestone	Permian	Structural-stratigraphic	9.2	23.3	62.2	25.0	0.871	0.626	2,814	15,500

[1] Plus fractures.

TABLE 5.—GAS-FIELD RESERVOIR DATA AS OF DECEMBER 31, 1962—*Continued*

Field	Pool	Rock Type	Age	Trap	Av. Porosity (per Cent)	Av. Net Thickness (Ft.)	Av. Permeability (Md.)	Av. Water Saturation (per Cent)	Compressibility Factor	Specific Gravity (Air=1.0)	Original Pressure (Psig.)	Av. A.O.F.P. (M S.C.F./Day)
Gundy Creek	Dunlevy	Sandstone	Lower Cretaceous	Structural	15.6	8.0	......	23.0	0.822	0.626	1,650	805
Gundy Creek	Baldonnel	Limestone	Triassic	Structural	8.9	22.0	69.3	19.2	0.840	0.636	1,790	4,150
Gundy Creek	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	6.5	10.0	......	25.0	0.813	0.653	2,339	5,500
Halfway	Baldonnel	Limestone	Triassic	Structural	7.9	32.3	5.9[1]	35.0	0.812	0.653	1,646	10,860
Halfway	Halfway	Sandstone	Triassic	Structural	12.0	62.0	49.1	25.0	0.800	0.670	2,223	3,300
Highway	Dunlevy	Sandstone	Lower Cretaceous	Structural	8.7	20.0	84.9	25.0	0.839	0.650	1,346	540
Highway	Baldonnel	Limestone	Triassic	Structural	10.0	22.0	124.0	25.1	0.812	0.663	1,666	5,812
Highway	Mississippian	Limestone	Mississippian	Structural	11.0	83.0	104.7	19.7	0.898	0.611	3,145	41,000
Jedney	U.C. of Sch. Cr.	Limestone	Triassic	Structural	8.8	124.0	33.7	19.0	0.852	0.693	1,553	12,764
Jedney	Halfway	Sandstone	Triassic	Structural	12.7	151.0	16.4	19.5	0.842	0.673	1,692	10,580
Kobes-Townsend	Dunlevy	Sandstone	Lower Cretaceous	Structural	12.5	101.6	17.9	19.8	0.797	0.651	1,486	3,526
Kobes-Townsend	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	16.3	76.6	......	25.0	0.812	0.646	2,586	5,160
Kobes-Townsend	Halfway	Sandstone	Triassic	Structural-stratigraphic	7.6	289.0	5.1	28.0	0.810	0.650	2,636	10,895
Kobes-Townsend	Mississippian	Limestone	Mississippian	Structural-stratigraphic	4.9	30.0	10.4	16.2	0.859	0.640	3,025	7,500
Kotcho Lake	Devonian Carbonate	Limestone	Devonian	Stratigraphic	10.0	50.0	45.7	11.8	0.885	0.670	2,550	......
Laprise Creek	U.C. of Sch. Cr.	Limestone	Triassic	Structural-stratigraphic	10.6	106.0	43.5	22.4	0.837	0.686	1,523	7,500
Laprise Creek East	U.C. of Sch. Cr.	Limestone	Triassic	Structural-stratigraphic	11.5	154.1	21.8	10.1	0.813	0.679	1,526	8,325
Laprise Creek West	U.C. of Sch. Cr.	Limestone	Triassic	Structural-stratigraphic	10.3	75.0	47.7	23.0	0.864	0.656	1,286	3,600
Montney	Bluesky-Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	17.0	15.0	......	45.0	0.862	0.620	1,266	895
Montney	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	20.0	37.0	......	30.0	0.817	0.670	1,746	4,900
Montney	Halfway	Sandstone	Triassic	Structural	14.6	20.0	67.1	33.5	0.757	0.730	1,846	10,000
Nig Creek	U.C. of Sch. Cr.	Limestone	Triassic	Structural-stratigraphic	10.8	69.5	61.3	21.5	0.849	0.678	1,613	15,559
Parkland	Upper Devonian	Limestone	Devonian	Structural-stratigraphic	19.0	72.0	......	13.7	1.014	0.620	4,900	16,200
Petitot River	Devonian Carbonate	Limestone	Devonian	Structural-stratigraphic	8.6	70.0	......	12.6	0.929	0.674	2,782	198,500
Red Creek	Charlie Lake	Sandstone	Triassic	Structural-stratigraphic	18.0	5.0	......	32.0	0.788	0.668	1,741	2,400
Red Creek	Halfway	Sandstone	Triassic	Structural	13.3	16.0	18.1	25.0	0.698	0.810	2,089	3,500
Rigel	Gething	Sandstone	Lower Cretaceous	Structural-stratigraphic	15.9	17.0	25.1[1]	21.9	0.848	0.646	1,274	11,740
Snyder	Dunlevy	Sandstone	Lower Cretaceous	Structural-stratigraphic	12.0	10.5	......	30.0	0.858	0.623	1,275	9,900
Stoddart	Belloy	Limestone	Permian	Structural-stratigraphic	15.8	26.0	105.9[1]	12.0	0.822	0.680	2,411	21,000
Sunrise	Cadotte	Sandstone	Lower Cretaceous	Structural-stratigraphic	20.6	69.0	36.2	35.0	0.909	0.590	686	5,700

[1] Plus fractures.

TABLE 6.—PROVED RESERVES OF CRUDE OIL, NATURAL GAS, AND NATURAL-GAS PRODUCTS AS OF DECEMBER 31, 1962

	Crude Oil[1] (Barrels)	Established		
		Disposable Gas[2] Thousand M S.C.F.	Gas Liquids (Barrels)	Sulphur (Short Tons)
Reserves remaining at December 31, 1961	104,212,368	6,483,500	120,799,706	3,336,630
Revisions and extensions[3]	+52,696,541	+311,800	+9,133,272	+207,399
Production during 1962	8,914,220	104,000	3,330,678	90,245
Reserves remaining at December 31, 1962	147,994,689	6,691,300	126,602,300	3,453,784

[1] Crude-oil reserves include only proved drilled reserves. There are an additional 24,302,077 barrels of probable reserves which are proved undrilled reserves.

[2] Associated gas is excluded.

[3] Includes discovery from new drilling and revisions arising from new information.

The production of residual gas, gas liquids, and sulphur are the quantities calculated from gas analyses to have been produced with the raw gas, both sweet and sour, and are not the quantities actually extracted. The actual quantity of gas delivered to the transmission-line in 1962 was 108,699,997 M s.c.f., and the amounts of gas liquids and sulphur actually extracted were 1,451,998 barrels and 69,187 short tons respectively.

TABLE 7.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1962

Field	Drilling Authority No.	Well Name	Location	Pool	Maximum Permissible Rate (Bbl./Day)
Aitken Creek	1160	Union Aitken d-33-L	d-33-L/94-A-13	Gething	23
	1205	Union Aitken d-34-L	d-34-L/94-A-13	Gething	205
	485	Union Aitken Creek b-42-L	b-42-L/94-A-13	Gething	32
	1173	Union Aitken d-43-L	d-43-L/94-A-13	Gething	85
	1186	Union Aitken d-44-L	d-44-L/94-A-13	Gething	87
Beatton River	396	Triad Beatton River d-28-J	d-28-J/94-H-2	Halfway	27
	395	Triad Beatton River d-29-J	d-29-J/94-H-2	Halfway	207
	309	Triad Beatton River b-38-J	b-38-J/94-H-2	Halfway	115
	393	Triad Beatton River d-39-J	d-39-J/94-H-2	Halfway	107
	869	Triad et al Beatton d-41-K	d-41-K/94-H-2	Halfway	49
	896	Triad Beatton d-49-J	d-49-J/94-H-2	Halfway	316
	816	Triad Beatton d-50-J	d-50-J/94-H-2	Halfway	94
	1038	Triad Beatton b-59-J	b-59-J/94-H-2	Halfway	141
Beatton River West	538	Triad West Beatton River d-38-K	d-38-K/94-H-2	Bluesky-Gething	109
	408	Triad West Beatton River d-39-K	d-39-K/94-H-2	Bluesky-Gething	47
	441	Triad West Beatton River d-48-K	d-48-K/94-H-2	Bluesky-Gething	94
	515	Triad West Beatton River d-57-K	d-57-K/94-H-2	Bluesky-Gething	78
	512	Triad West Beatton River d-59-K	d-59-K/94-H-2	Bluesky-Gething	78
Blueberry	943	Sun et al Blueberry d-9-K	d-9-K/94-A-12	Mississippian	86
	785	Sun et al Blueberry d-19-K	d-19-K/94-A-12	Mississippian	539
	549	Sun et al Blueberry c-A29-K	c-29-K/94-A-12	Mississippian	380
	746	Sun et al Blueberry d-30-K	d-30-K/94-A-12	Mississippian	267
	783	Sun et al Blueberry d-40-K	d-40-K/94-A-12	Mississippian	350
	242	Sun et al Blueberry d-50-K(13)	d-50-K/94-A-12	Mississippian	302
	851	Sun et al Blueberry b-60-K	b-60-K/94-A-12	Mississippian	231
	948	Sun et al Blueberry c-71-L	c-71-L/94-A-12	Mississippian	192
	205	Sun et al Blueberry d-82-L(11)	d-82-L/94-A-12	Mississippian	110
	1146	Sun et al Blueberry b-35-D	b-35-D/94-A-13	Mississippian	189
	960	Sun et al Blueberry d-36-D	d-36-D/94-A-13	Mississippian	173
	272	Sun et al Blueberry d-46-D(16)	d-46-D/94-A-13	Mississippian	78
	745	Sun et al Blueberry 6-25-88-25	6-25-88-25 W6M	Mississippian	146
	850	Sun et al Blueberry 14-25-88-25	14-25-88-25 W6M	Mississippian	253
Boundary Lake	590	Amerada Cr BC-B Boundary 14-18-85-13	14-18-85-13 W6M	Boundary Lake	151
	628	Amerada Boundary Lake 16-18-85-13	16-18-85-13 W6M	Boundary Lake	181
	563	Amerada Cr BC-C Boundary 14-20-85-13	14-20-85-13 W6M	Boundary Lake	164
	591	Amerada Cr BC-C Boundary 6-29-85-13	6-29-85-13 W6M	Boundary Lake	125
	629	Amerada Boundary Lake 14-13-85-14	14-13-85-14 W6M	Boundary Lake	125
	580	Amerada Cr BC-B Boundary 16-13-85-14	16-13-85-14-W6M	Boundary Lake	137
	639	Amerada Boundary Lake 6-24-85-14	6-24-85-14 W6M	Boundary Lake	89
	608	Amerada Cr BC-D Boundary 8-24-85-14	8-24-85-14 W6M	Boundary Lake	131

TABLE 7.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1962—*Continued*

Field	Drilling Authority No.	Well Name	Location	Pool	Maximum Permissible Rate (Bbl./Day)
Boundary Lake	692	Amerada Boundary 11-24-85-14	11-24-85-14 W6M	Boundary Lake	36
	736	Amerada Boundary 16-24-85-14	16-24-85-14 W6M	Boundary Lake	163
	736	Amerada Boundary 16-24-85-14	16-24-85-14 W6M	Halfway	146
	918	Basin Boundary 6-17-86-13	6-17-86-13 W6M	Boundary Lake	73
	962	Basin Boundary 14-17-86-13	14-17-86-13 W6M	Boundary Lake	74
	361	Decalta Boundary Lake 14-32-85-13	14-32-85-13 W6M	Boundary Lake	93
	624	Dome Boundary Lake 6-12-85-14	6-12-85-14 W6M	Boundary Lake	187
	625	Dome Boundary Lake 8-12-85-14	8-12-85-14 W6M	Boundary Lake	194
	602	Dome Boundary Lake 16-12-85-14	16-12-85-14 W6M	Boundary Lake	171
	603	Dome Boundary Lake 8-13-85-14	8-13-85-14 W6M	Boundary Lake	181
	1033	Dome Boundary 6-22-85-14	6-22-85-14 W6M	Boundary Lake	119
	768	Dome Boundary 8-22-85-14	8-22-85-14 W6M	Boundary Lake	130
	575	Dome Boundary Lake 6-26-85-14	6-26-85-14 W6M	Boundary Lake	138
	550	Dome Boundary Lake 8-26-85-14	8-26-85-14 W6M	Boundary Lake	132
	573	Dome Boundary Lake 14-26-85-14	14-26-85-14 W6M	Boundary Lake	186
	465	Dome Boundary Lake 16-26-85-14	16-26-85-14 W6M	Boundary Lake	167
	1022	Dome Boundary 16-34-85-14	16-34-85-14 W6M	Boundary Lake	188
	574	Dome Boundary Lake 6-35-85-14	6-35-85-14 W6M	Boundary Lake	149
	488	Dome Boundary Lake 8-35-85-14	8-35-85-14 W6M	Boundary Lake	118
	528	Dome Boundary Lake 14-35-85-14	14-35-85-14 W6M	Boundary Lake	69
	606	Dome Boundary Lake 16-35-85-14	16-35-85-14 W6M	Boundary Lake	144
	642	Dome Boundary Lake 8-2-86-14	8-2-86-14 W6M	Boundary Lake	13
	1064	Dome Boundary 14-2-86-14	14-2-86-14 W6M	Boundary Lake	66
	605	Dome Boundary Lake 16-2-86-14	16-2-86-14 W6M	Boundary Lake	120
	1156	Dome Boundary 8-3-86-14	8-3-86-14 W6M	Boundary Lake	108
	1142	Dome Boundary 6-11-86-14	6-11-86-14 W6M	Boundary Lake	30
	764	Dome Boundary 8-11-86-14	8-11-86-14 W6M	Boundary Lake	131
	765	Dome Boundary 16-11-86-14	16-11-86-14 W6M	Boundary Lake	59
	808	Dome Boundary 8-14-86-14	8-14-86-14 W6M	Boundary Lake	68
	1070	Dome Boundary 16-14-86-14	16-14-86-14 W6M	Boundary Lake	73
	1041	Homestead et al Boundary 6-18-84-13	6-18-84-13 W6M	Boundary Lake	99
	1108	Homestead et al Boundary 8-18-84-13	8-18-84-13 W6M	Boundary Lake	122
	1104	Imp Pac Boundary 14-18-84-13	14-18-84-13 W6M	Boundary Lake	28
	1098	Imp Pac Boundary 6-19-84-13	6-19-84-13 W6M	Boundary Lake	91
	1078	Imp Pac Boundary 8-19-84-13	8-19-84-13 W6M	Boundary Lake	64
	998	Imp Pac Boundary 14-19-84-13	14-19-84-13 W6M	Boundary Lake	80
	1018	Imp Pac Boundary 16-19-84-13	16-19-84-13 W6M	Boundary Lake	64
	1117	Imp Pac Boundary 6-20-84-13	6-20-84-13 W6M	Boundary Lake	41
	296	Imp Pac Boundary 14-20-84-13	14-20-84-13 W6M	Boundary Lake	105
	1091	Imp Pac Boundary 6-29-84-13	6-29-84-13 W6M	Boundary Lake	118

1060	Imp Pac Boundary 14-29-84-13	14-29-84-13 W6M	Boundary Lake	82
1061	Imp Pac Boundary 8-30-84-13	8-30-84-13 W6M	Boundary Lake	94
975	Imp et al Boundary 14-30-84-13	14-30-84-13 W6M	Boundary Lake	144
1062	Imp et al Boundary 16-30-84-13	16-30-84-13 W6M	Boundary Lake	101
931	Imp et al Boundary 6-31-84-13	6-31-84-13 W6M	Boundary Lake	140
930	Imp et al Boundary 8-31-84-13	8-31-84-13 W6M	Boundary Lake	120
888	Imp Pac Boundary 14-31-84-13	14-31-84-13 W6M	Boundary Lake	165
369	Imp Pac Boundary 16-31-84-13	16-31-84-13 W6M	Boundary Lake	154
965	Imp Pac Boundary 6-32-84-13	6-32-84-13 W6M	Boundary Lake	120
991	Imp Pac Boundary 8-32-84-13	8-32-84-13 W6M	Boundary Lake	30
935	Imp Pac Boundary 14-32-84-13	14-32-84-13 W6M	Boundary Lake	149
939	Imp Pac Boundary 16-32-84-13	16-32-84-13 W6M	Boundary Lake	194
813	Imp Pac Boundary 6-5-85-13	6-5-85-13 W6M	Boundary Lake	180
878	Imp Pac Boundary 8-5-85-13	8-5-85-13 W6M	Boundary Lake	193
832	Imp Pac Boundary 14-5-85-13	14-5-85-13 W6M	Boundary Lake	166
882	Imp Pac Boundary 16-5-85-13	16-5-85-13 W6M	Boundary Lake	72
789	Imp Pac Boundary 6-6-85-13	6-6-85-13 W6M	Boundary Lake	138
795	Imp Pac Boundary 8-6-85-13	8-6-85-13 W6M	Boundary Lake	113
792	Imp Pac Boundary 14-6-85-13	14-6-85-13 W6M	Boundary Lake	152
796	Imp Pac Boundary 16-6-85-13	16-6-85-13 W6M	Boundary Lake	157
763	Imp Pac Boundary 6-7-85-13	6-7-85-13 W6M	Boundary Lake	165
807	Imp Pac Boundary 8-7-85-13	8-7-85-13 W6M	Boundary Lake	194
368	Imp Pac Boundary 14-7-85-13	14-7-85-13 W6M	Boundary Lake	172
775	Imp Pac Boundary 16-7-85-13	16-7-85-13 W6M	Boundary Lake	206
847	Imp Pac Boundary 6-8-85-13	6-8-85-13 W6M	Boundary Lake	161
906	Imp Pac Boundary 8-8-85-13	8-8-85-13 W6M	Boundary Lake	162
767	Imp Pac Boundary 14-8-85-13	14-8-85-13 W6M	Boundary Lake	165
889	Imp Pac Boundary 16-8-85-13	16-8-85-13 W6M	Boundary Lake	152
760	Imp Pac Boundary 6-17-85-13	6-17-85-13 W6M	Boundary Lake	16
738	Imp Pac Boundary 14-17-85-13	14-17-85-13 W6M	Boundary Lake	165
734	Imp Pac Boundary 6-18-85-13	6-18-85-13 W6M	Boundary Lake	165
523	Imp Pac Boundary 8-18-85-13	8-18-85-13 W6M	Boundary Lake	76
524	Imp Pac Boundary 6-20-85-13	6-20-85-13 W6M	Boundary Lake	164
774	Imp Pac Boundary 8-20-85-13	8-20-85-13 W6M	Boundary Lake	57
1166	Imp Pac Boundary 14-2-84-14	14-2-84-14 W6M	Boundary Lake	73
1164	Imp Pac Boundary 14-8-84-14	14-8-84-14 W6M	Boundary Lake	61
1133	Imp et al Boundary 16-9-84-14	16-9-84-14 W6M	Boundary Lake	92
843	Imp Pac Boundary 14-10-84-14	14-10-84-14 W6M	Boundary Lake	69
1079	Imp Pac Boundary 16-10-84-14	16-10-84-14 W6M	Boundary Lake	58
1127	Imp Pac Boundary 6-11-84-14	6-11-84-14 W6M	Boundary Lake	110
1136	Imp Pac Boundary 8-11-84-14	8-11-84-14 W6M	Boundary Lake	92
1080	Imp Pac Boundary 14-13-84-14	14-13-84-14 W6M	Boundary Lake	62
1085	Imp Pac Boundary 16-13-84-14	16-13-84-14 W6M	Boundary Lake	104
1059	Imp Pac Boundary 14-14-84-14	14-14-84-14 W6M	Boundary Lake	111
1175	Imp Pac Boundary 16-14-84-14	16-14-84-14 W6M	Boundary Lake	108
1084	Imp Pac Boundary 6-15-84-14	6-15-85-14 W6M	Boundary Lake	101
1076	Imp Pac Boundary 8-15-84-14	8-15-84-14 W6M	Boundary Lake	114
1035	Imp et al Boundary 6-16-84-14	6-16-84-14 W6M	Boundary Lake	154

TABLE 7.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1962—*Continued*

Field	Drilling Authority No.	Well Name	Location	Pool	Maximum Permissible Rate (Bbl./Day)
Boundary Lake	1128	Imp et al Boundary 8-16-84-14	8-16-84-14 W6M	Boundary Lake	64
	1143	Imp Pac Boundary 14-16-84-14	14-16-84-14 W6M	Boundary Lake	59
	1112	Imp Pac Boundary 16-16-84-14	16-16-84-14 W6M	Boundary Lake	82
	1102	Imp Pac Boundary 6-17-84-14	6-17-84-14 W6M	Boundary Lake	82
	1151	Imp Pac Boundary 8-17-84-14	8-17-84-14 W6M	Boundary Lake	75
	1158	Imp Pac Boundary 16-17-84-14	16-17-84-14 W6M	Boundary Lake	71
	1189	Imp Pac Boundary 8-20-84-14	8-20-84-14 W6M	Boundary Lake	87
	1157	Imp Pac Boundary 6-21-84-14	6-21-84-14 W6M	Boundary Lake	131
	1120	Imp Pac Boundary 8-21-84-14	8-21-84-14 W6M	Boundary Lake	96
	1172	Imp Pac Boundary 14-21-84-14	14-21-84-14 W6M	Boundary Lake	139
	1122	Imp Pac Boundary 16-21-84-14	16-21-84-14 W6M	Boundary Lake	129
	250	Imp Pac Boundary 1-23-84-14	1-23-84-14 W6M	Boundary Lake	50
	1017	Imp Pac Boundary 6-23-84-14	6-23-84-14 W6M	Boundary Lake	115
	929	Imp Pac Boundary 14-23-84-14	14-23-84-14 W6M	Boundary Lake	154
	997	Imp Pac Boundary 16-23-84-14	16-23-84-14 W6M	Boundary Lake	141
	1036	Imp Pac Boundary 6-24-84-14	6-24-84-14 W6M	Boundary Lake	91
	978	Imp Pac Boundary 8-24-84-14	8-24-84-14 W6M	Boundary Lake	111
	1010	Imp Pac Boundary 14-24-84-14	14-24-84-14 W6M	Boundary Lake	156
	872	Imp Pac Boundary 16-24-84-14	16-24-84-14 W6M	Boundary Lake	96
	979	Imp Pac Boundary 6-25-84-14	6-25-84-14 W6M	Boundary Lake	131
	928	Imp Pac Boundary 8-25-84-14	8-25-84-14 W6M	Boundary Lake	50
	1077	Imp et al Boundary 14-25-84-14	14-25-84-14 W6M	Boundary Lake	102
	1063	Imp et al Boundary 16-25-84-14	16-25-84-14 W6M	Boundary Lake	139
	927	Imp Pac Boundary 6-26-84-14	6-26-84-14 W6M	Boundary Lake	146
	966	Imp Pac Boundary 8-26-84-14	8-26-84-14 W6M	Boundary Lake	147
	1111	Imp et al Boundary 14-26-84-14	14-26-84-14 W6M	Boundary Lake	117
	1099	Imp et al Boundary 16-26-84-14	16-26-84-14 W6M	Boundary Lake	163
	1019	Imp Pac Boundary 6-30-84-14	6-30-84-14 W6M	Boundary Lake	97
	888	Imp Pac Boundary 14-31-84-14	14-31-84-14 W6M	Boundary Lake	165
	861	Imp Pac Boundary 8-34-84-14	8-34-84-14 W6M	Boundary Lake	160
	883	Imp Pac Boundary 14-34-84-14	14-34-84-14 W6M	Boundary Lake	97
	846	Imp Pac Boundary 16-34-84-14	16-34-84-14 W6M	Boundary Lake	145
	833	Imp Pac Boundary 6-35-84-14	6-35-84-14 W6M	Boundary Lake	131
	815	Imp Pac Boundary 8-35-84-14	8-35-84-14 W6M	Boundary Lake	153
	805	Imp Pac Boundary 14-35-84-14	14-35-84-14 W6M	Boundary Lake	158
	797	Imp Pac Boundary 16-35-84-14	16-35-84-14 W6M	Boundary Lake	152
	804	Imp et al Boundary 6-36-84-14	6-36-84-14 W6M	Boundary Lake	48
	814	Imp et al Boundary 8-36-84-14	8-36-84-14 W6M	Boundary Lake	124
	793	Imp et al Boundary 14-36-84-14	14-36-84-14 W6M	Boundary Lake	122
	798	Imp et al Boundary 16-36-84-14	16-36-84-14 W6M	Boundary Lake	147

761	Imp et al Boundary 6-1-85-14	6-1-85-14 W6M	Boundary Lake	122
770	Imp et al Boundary 8-1-85-14	8-1-85-14 W6M	Boundary Lake	104
521	Imp et al Boundary 14-1-85-14	14-1-85-14 W6M	Boundary Lake	202
776	Imp et al Boundary 16-1-85-14	16-1-85-14 W6M	Boundary Lake	129
501	Imp et al Boundary 6-2-85-14	6-2-85-14 W6M	Boundary Lake	125
788	Imp Pac Boundary 8-2-85-14	8-2-85-14 W6M	Boundary Lake	149
493	Imp Pac Boundary 14-2-85-14	14-2-85-14 W6M	Boundary Lake	243
777	Imp Pac Boundary 16-2-85-14	16-2-85-14 W6M	Boundary Lake	186
362	Imperial Pacific Boundary 6-3-85-14	6-3-85-14 W6M	Boundary Lake	198
379	Imperial Pacific Boundary 8-3-85-14	8-3-85-14 W6M	Boundary Lake	209
363	Imperial Pacific Boundary 14-3-85-14	14-3-85-14 W6M	Boundary Lake	154
359	Imperial Pacific Boundary 16-3-85-14	16-3-85-14 W6M	Boundary Lake	218
267	Imperial Pacific Boundary 16-4-85-14	16-4-85-14 W6M	Boundary Lake	189
360	Imperial Pacific Boundary 8-10-85-14	8-10-85-14 W6M	Boundary Lake	188
227	Imperial Pac Boundary 11-10-85-14	11-10-85-14 W6M	Boundary Lake	113
282	Imperial Pacific Boundary 6-11-85-14	6-11-85-14 W6M	Boundary Lake	128
769	Imp Pac Boundary 8-11-85-14	8-11-85-14 W6M	Boundary Lake	67
821	Imp Pac Boundary 14-11-85-14	14-11-85-14 W6M	Boundary Lake	274
356	Imperial Pac Boundary 16-11-85-14	16-11-85-14 W6M	Boundary Lake	155
759	Imp Pac Boundary 14-12-85-14	14-12-85-14 W6M	Boundary Lake	176
758	Imp Pac Boundary 6-13-85-14	6-13-85-14 W6M	Boundary Lake	130
1124	Imp Pac Boundary 6-14-85-14	6-14-85-14 W6M	Boundary Lake	295
848	Imp Pac Boundary 8-14-85-14	8-14-85-14 W6M	Boundary Lake	177
618	Marathon Boundary 6-19-85-13	6-19-85-13 W6M	Boundary Lake	147
632	Marathon Boundary 8-19-85-13	8-19-85-13 W6M	Boundary Lake	117
635	Marathon Boundary 14-19-85-13	14-19-85-13 W6M	Boundary Lake	131
636	Marathon Boundary 16-19-85-13	16-19-85-13 W6M	Boundary Lake	32
898	Marathon Boundary 14-5-86-13	14-5-86-13 W6M	Boundary Lake	68
949	Marathon Boundary 6-8-86-13	6-8-86-13 W6M	Boundary Lake	98
604	Marathon Boundary 14-8-86-13	14-8-86-13 W6M	Boundary Lake	70
1037	Marathon Boundary 14-12-84-14	14-12-84-14 W6M	Boundary Lake	67
989	Marathon Boundary 6-13-84-14	6-13-84-14 W6M	Boundary Lake	110
1068	Marathon Boundary 8-13-84-14	8-13-84-14 W6M	Boundary Lake	51
667	Pacific Boundary Lake 11-14-85-14	11-14-85-14 W6M	Halfway	8
895	Pacific Boundary 16-14-85-14	16-14-85-14 W6M	Boundary Lake	229
895	Pacific Boundary 16-14-85-14	16-14-85-14 W6M	Halfway	102
961	Pacific Boundary 16-15-85-14	16-15-85-14 W6M	Boundary Lake	120
982	Sinclair et al Boundary 6-3-84-14	6-3-84-14 W6M	Boundary Lake	64
941	Sinclair Boundary 8-3-84-14	8-3-84-14 W6M	Boundary Lake	103
969	Sinclair et al Boundary 14-3-84-14	14-3-84-14 W6M	Boundary Lake	87
942	Sinclair Boundary 16-3-84-14	16-3-84-14 W6M	Boundary Lake	107
841	Sinclair Boundary 14-11-84-14	14-11-84-14 W6M	Boundary Lake	114
865	Sinclair Boundary 16-11-84-14	16-11-84-14 W6M	Boundary Lake	146
803	Sinclair Boundary 6-14-84-14	6-14-84-14 W6M	Boundary Lake	121
866	Sinclair Boundary 8-14-84-14	8-14-84-14 W6M	Boundary Lake	64
755	Sinclair Boundary 14-15-84-14	14-15-84-14 W6M	Boundary Lake	80
752	Sinclair Boundary 16-15-84-14	16-15-84-14 W6M	Boundary Lake	129

TABLE 7.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1962—*Continued*

Field	Drilling Authority No.	Well Name	Location	Pool	Maximum Permissible Rate (Bbl./Day)
Boundary Lake	780	Sinclair Boundary 6-22-84-14	6-22-84-14 W6M	Boundary Lake	96
	742	Sinclair Boundary 8-22-84-14	8-22-84-14 W6M	Boundary Lake	166
	794	Sinclair Boundary 14-22-84-14	14-22-84-14 W6M	Boundary Lake	134
	727	Sinclair Boundary 16-22-84-14	16-22-84-14 W6M	Boundary Lake	105
	802	Sinclair Boundary 6-27-84-14	6-27-84-14 W6M	Boundary Lake	127
	743	Sinclair Boundary 8-27-84-14	8-27-84-14 W6M	Boundary Lake	133
	853	Sinclair Boundary 14-27-84-14	14-27-84-14 W6M	Boundary Lake	133
	753	Sinclair Boundary 16-27-84-14	16-27-84-14 W6M	Boundary Lake	126
	646	Sun Boundary Lake 6-23-85-14	6-23-85-14 W6M	Boundary Lake	181
	646	Sun Boundary Lake 6-23-85-14	6-23-85-14 W6M	Halfway	83
	652	Sun Boundary Lake 8-23-85-14	8-23-85-14 W6M	Boundary Lake	73
	643	Sun Boundary Lake 14-23-85-14	14-23-85-14 W6M	Boundary Lake	172
	719	Sun Boundary 16-23-85-14	16-23-85-14 W6M	Boundary Lake	219
	1137	Texaco NFA Boundary 6-30-85-13	6-30-85-13 W6M	Boundary Lake	166
	1097	Texaco NFA Boundary 8-30-85-13	8-30-85-13 W6M	Boundary Lake	139
	1097	Texaco NFA Boundary 8-30-85-13	8-30-85-13 W6M	Halfway	56
	1171	Texaco NFA Boundary 14-30-85-13	14-30-85-13 W6M	Boundary Lake	163
	183	Texaco NFA Boundary L 6-31-85-13	6-31-85-13 W6M	Boundary Lake	107
	1150	Texaco NFA Boundary 8-31-85-13	8-31-85-13 W6M	Boundary Lake	131
	167	Texaco NFA Boundary L 14-31-85-13	14-31-85-13 W6M	Boundary Lake	100
	218	Texaco NFA Boundary L 16-31-85-13	16-31-85-13 W6M	Boundary Lake	136
	101	Texaco NFA Boundary L 6-6-86-13(1)	6-6-86-13(1) W6M	Boundary Lake	114
	972	Texaco NFA Boundary 8-6-86-13	8-6-86-13 W6M	Boundary Lake	92
	152	Texaco NFA Boundary L 14-6-86-13	14-6-86-13 W6M	Boundary Lake	87
	1009	Texaco NFA Boundary 16-6-86-13	16-6-86-13 W6M	Boundary Lake	156
	862	Texaco NFA Boundary 6-7-86-13	6-7-86-13 W6M	Boundary Lake	92
	953	Texaco NFA Boundary 8-7-86-13	8-7-86-13 W6M	Boundary Lake	99
	1100	Texaco NFA Boundary 14-7-86-13	14-7-86-13 W6M	Boundary Lake	130
	844	Texaco NFA Boundary 16-7-86-13	16-7-86-13 W6M	Boundary Lake	193
	811	Texaco NFA Boundary 6-18-86-13	6-18-86-13 W6M	Boundary Lake	200
	995	Texaco NFA Boundary 8-18-86-13	8-18-86-13 W6M	Boundary Lake	147
	1116	Texaco NFA Boundary 14-18-86-13	14-18-86-13 W6M	Boundary Lake	181
	1066	Texaco NFA Boundary 16-18-86-13	16-18-86-13 W6M	Boundary Lake	68
	1074	Texaco NFA Boundary 6-19-86-13	6-19-86-13 W6M	Boundary Lake	126
	1049	Texaco NFA Boundary 8-19-86-13	8-19-86-13 W6M	Boundary Lake	120
	1123	Texaco NFA Boundary 14-19-86-13	14-19-86-13 W6M	Boundary Lake	69
	901	Texaco NFA Boundary 16-19-86-13	16-19-86-13 W6M	Boundary Lake	127
	1167	Texaco NFA Boundary 8-30-86-13	8-30-86-13 W6M	Boundary Lake	201
	1050	Texaco NFA Boundary 6-30-86-13	6-30-86-13 W6M	Boundary Lake	85
	1073	Texaco NFA Boundary 14-22-85-14	14-22-85-14 W6M	Boundary Lake	20

	823	Texaco NFA Boundary 16-22-85-14	16-22-85-14 W6M	Boundary Lake	137
	656	Texaco NFA Boundary Lake 14-25-85-14	14-25-85-14 W6M	Boundary Lake	78
	1144	Texaco NFA Boundary 16-25-85-14	16-25-85-14 W6M	Boundary Lake	131
	1144	Texaco NFA Boundary 16-25-85-14	16-25-85-14 W6M	Halfway	22
	924	Texaco NFA Boundary 6-27-85-14	6-27-85-14 W6M	Boundary Lake	119
	845	Texaco NFA Boundary 8-27-85-14	8-27-85-14 W6M	Boundary Lake	157
	971	Texaco NFA Boundary 14-27-85-14	14-27-85-14 W6M	Boundary Lake	158
	812	Texaco NFA Boundary 16-27-85-14	16-27-85-14 W6M	Boundary Lake	152
	857	Texaco NFA Boundary 8-34-85-14	8-34-85-14 W6M	Boundary Lake	209
	662	Texaco NFA Boundary Lake 6-36-85-14	6-36-85-14 W6M	Boundary Lake	30
	1058	Texaco NFA Boundary 8-36-85-14	8-36-85-14 W6M	Boundary Lake	70
	657	Texaco NFA Boundary Lake 14-36-85-14	14-36-85-14 W6M	Boundary Lake	156
	206	Texaco NFA Boundary L 16-36-85-14	16-36-85-14 W6M	Boundary Lake	127
	663	Texaco NFA Boundary Lake 6-1-86-14	6-1-86-14 W6M	Boundary Lake	112
	1083	Texaco NFA Boundary 8-1-86-14	8-1-86-14 W6M	Boundary Lake	196
	664	Texaco NFA Boundary Lake 14-1-86-14	14-1-86-14 W6M	Boundary Lake	110
	860	Texaco NFA Boundary 16-1-86-14	16-1-86-14 W6M	Boundary Lake	112
	829	Texaco NFA Boundary 16-12-86-14	16-12-86-14 W6M	Boundary Lake	96
	1096	Texaco NFA Boundary 8-12-86-14	8-12-86-14 W6M	Boundary Lake	109
	900	Texaco NFA Boundary 14-12-86-14	14-12-86-14 W6M	Boundary Lake	117
	593	Texaco NFA Boundary L 16-12-86-14	16-12-86-14 W6M	Boundary Lake	155
	880	Texaco NFA Boundary 6-13-86-14	6-13-86-14 W6M	Boundary Lake	115
	1101	Texaco NFA Boundary 8-13-86-14	8-13-86-14 W6M	Boundary Lake	84
	952	Texaco NFA Boundary 14-13-86-14	14-13-86-14 W6M	Boundary Lake	46
	858	Texaco NFA Boundary 16-13-86-14	16-13-86-14 W6M	Boundary Lake	89
	885	Texaco NFA Boundary 6-24-86-14	6-24-86-14 W6M	Boundary Lake	91
	1086	Texaco NFA Boundary 8-24-86-14	8-24-86-14 W6M	Boundary Lake	93
	633	Texaco NFA Boundary Lake 14-24-86-14	14-24-86-14 W6M	Boundary Lake	107
	1024	Texfel Boundary 6-10-84-14	6-10-84-14 W6M	Boundary Lake	92
	1023	Texfel Boundary 8-10-84-14	8-10-84-14 W6M	Boundary Lake	92
Charlie Lake	269	Imp Pac Charlie 13-5-84-18	13-5-84-18 W6M	Gething	36
Fort St. John	34	Pacific Ft St John 3-14-83-18 (9)	3-14-83-18 W6M	Charlie Lake	46
	214	Pacific Ft St John 10-14-83-18 (76)	10-14-83-18 W6M	Charlie Lake	14
	171	Imp Pac Ft St John 9-19-83-18 (45)	9-19-83-18 W6M	Belloy	85
	225	Pacific Ft St John 1-23-83-18 (81)	1-23-83-18 (81) W6M	Charlie Lake	23
	216	Pacific Ft St John 9-23-83-18 (78)	9-23-83-18 W6M	Charlie Lake	65
Milligan Creek	1002	Union HB Milligan d-32-G	d-32-G/94-H-2	Halfway	367
	409	Union HB Milligan Creek d-42-G	d-42-G/94-H-2	Halfway	514
	435	Union HB Milligan Creek d-43-G	d-43-G/94-H-2	Halfway	463
	983	Union HB Milligan d-44-G	d-44-G/94-H-2	Halfway	172
	401	Union HB Milligan Creek d-52-G	d-52-G/94-H-2	Halfway	357
	398	Union HB Milligan Creek d-53-G	d-53-G/94-H-2	Halfway	469
	402	Union HB Milligan Creek d-54-G	d-54-G/94-H-2	Halfway	290
	1001	Union HB Milligan d-62-G	d-62-G/94-H-2	Halfway	170
	440	Union HB Milligan Creek d-63-G	d-63-G/94-H-2	Halfway	213
	341	Union HB Milligan Creek d-64-G	d-64-G/94-H-2	Halfway	320
	957	Union HB Milligan b-72-G	b-72-G/94-H-2	Halfway	191

TABLE 7.—AUTHORIZED MAXIMUM PERMISSIBLE RATES TO DECEMBER 31, 1962—*Continued*

Field	Drilling Authority No.	Well Name	Location	Pool	Maximum Permissible Rate (Bbl./Day)
	248	Union HB Milligan Creek d-73-G	d-73-G/94-H-2	Halfway	155
	436	Union HB Milligan Creek d-74-G	d-74-G/94-H-2	Halfway	192
	1011	Union HB Milligan b-82-G	b-82-G/94-H-2	Halfway	161
	937	Union HB Milligan d-83-G	d-83-G/94-H-2	Halfway	322
	1014	Union HB Milligan d-84-G	d-84-G/94-H-2	Halfway	182
	985	Union HB Milligan b-93-G	b-93-G/94-H-2	Halfway	231
	1170	Union HB Milligan d-94-G	d-94-G/94-H-2	Halfway	259
Peejay	981	Medallion AORCO Blair Peejay d-60-E	d-60-E/94-A-16	Halfway	54
	903	Medallion Ashland Peejay d-70-E	d-70-E/94-A-16	Halfway	122
	725	Pacific SR West Cdn Peejay d-33-I	d-33-I/94-A-15	Halfway	5
	569	Pacific SR West Cdn Peejay d-80-E	d-80-E/94-A-16	Halfway	60
	954	Pacific SR West Cdn Peejay d-90-E	d-90-E/94-A-16	Halfway	151
	612	Sinclair et al Peejay d-18-E	d-18-E/94-A-16	Halfway	51
	1006	Sinclair et al Peejay d-19-E	d-19-E/94-A-16	Halfway	85
	589	Sinclair et al Peejay d-28-E	d-28-E/94-A-16	Halfway	101
	543	Sinclair et al Peejay d-29-E	d-29-E/94-A-16	Halfway	70
	578	Sinclair et al Peejay d-38-E	d-38-E/94-A-16	Halfway	114
	418	Sinclair Pac Peejay d-39-E (B8-3)	d-39-E/94-A-16	Halfway	288
	915	Sinclair et al Peejay d-47-E	d-47-E/94-A-16	Halfway	83
	577	Sinclair et al Peejay d-48-E	d-48-E/94-A-16	Halfway	191
	588	Sinclair et al Peejay d-49-E	d-49-E/94-A-16	Halfway	141
	914	Sinclair et al Peejay d-58-E	d-58-E/94-A-16	Halfway	104
	881	Sinclair et al Peejay d-59-E	d-59-E/94-A-16	Halfway	226
Wildmint	1121	Tenn Wildmint d-5-A	d-5-A/94-H-2	Halfway	70
	984	Union HB Wildmint d-15-A	d-15-A/94-H-2	Halfway	102
	840	Union HB Wildmint b-24-A	b-24-A/94-H-2	Halfway	27
	919	Union HB Wildmint d-25-A	d-25-A/94-H-2	Halfway	107
	1195	Union HB Wildmint b-34-A	b-34-A/94-H-2	Halfway	166
	810	Union HB Wildmint d-45-A	d-45-A/94-H-2	Halfway	186
	530	Union HB Wildmint d-46-A	d-46-A/94-H-2	Halfway	264
	945	Union HB Wildmint b-56-A	b-56-A/94-H-2	Halfway	173
	584	Union HB Wildmint d-56-A	d-56-A/94-H-2	Halfway	114
Other areas	1162	Dome Boundary 16-35-83-15	16-35-83-15 W6M	(1)	57
	933	Hunt Sands Pac Imp Coplin 7-16-86-23	7-16-86-23 W6M	(1)	152
	831	Sinclair et al Flatrock 9-22-83-14	9-22-83-14 W6M	Boundary Lake	31
	1008	Pacific SR Can Del W Peejay d-44-G	d-44-G/94-A-15	(1)	192
	956	Pacific SR Can Del W Peejay d-54-G	d-54-G/94-A-15	(1)	149
	1191	Tenn Wildmint d-95-I	d-95-I/94-A-15	(1)	47
	1184	Tenn Wildmint d-6-A	d-6-A/94-H-2	(1)	237

1 Confidential at December 31, 1962.

TABLE 8.—WELLS DRILLED AND DRILLING, 1962

Drilling Authority No.	Well Name	Date Spudded	Date Rig Released	Total Depth	1962 Footage	Status at Dec. 31, 1962
1176	Amerada Beg d-97-B	Oct. 22, 1962	Dec. 16, 1962	5,332	5,332	Abandoned—dry.
1138	Amerada Briar Ridge 7-23-78-14	July 27, 1962	Aug. 8, 1962	3,004	3,004	Abandoned—dry.
864	Amerada Ft St John W 6-5-83-19	Dec. 8, 1961	Feb. 11, 1962	6,875	2,670	Abandoned—dry.
1177	Amerada Sojer c-56-D	Oct. 27, 1962	Dec. 7, 1962	4,390	4,390	Triassic upper carbonate of Schooler Creek gas well.
970	Apache Pacific Fort Nelson a-91-C	Feb. 7, 1962	Apr. 1, 1962	7,560	7,560	Abandoned—dry.
977	Atlantic Deadhorse 4-22-88-24	Feb. 2, 1962	Mar. 6, 1962	4,935	4,935	Abandoned—dry.
1004	Atlantic Nig d-13-B	Feb. 20, 1962	Mar. 16, 1962	4,225	4,225	Triassic upper carbonate of Schooler Creek gas well.
918	Basin Boundary 6-17-86-13	Jan. 3, 1962	Jan. 17, 1962	4,250	4,250	Triassic Boundary Lake oil well.
962	Basin Boundary 14-17-86-13	Jan. 19, 1962	Feb. 1, 1962	4,300	4,300	Triassic Boundary Lake oil well.
1113	BA CNP Fernie d-42-I	July 28, 1962	Dec. 9, 1962	8,531	8,531	Abandoned—dry.
940	BA Shell Klua b-49-F	Jan. 22, 1962	Mar. 19, 1962	7,972	7,972	Abandoned—dry.
859	BA Pocketknife b-6-L	Dec. 8, 1961	Apr. 18, 1962	6,118	5,671	Abandoned—dry; whipstocked hole.
1196	CDR Union Fireweed d-55-G	Nov. 12, 1962	Dec. 8, 1962	4,449	4,449	Abandoned—dry.
1201	CDR Union E Fireweed d-55-H	Nov. 20, 1962	Dec. 12, 1962	4,072	4,072	Lower Cretaceous Dunlevy gas well.
1236	CDR Pac Sinc Prophet d-21-B	Dec. 26, 1962	....	....	330	Drilling.
891	Champlin Midwest Osborn 1-23-88-15	Dec. 28, 1961	Jan. 15, 1962	4,251	2,195	Abandoned—dry.
1053	Dome Boundary 6-21-85-14	Mar. 9, 1962	Mar. 24, 1962	4,631	4,631	Abandoned—dry.
1033	Dome Boundary 6-22-85-14	Mar. 2, 1962	Mar. 23, 1962	4,460	4,460	Triassic Boundary Lake oil well.
1022	Dome Boundary 16-34-85-14	Feb. 20, 1962	Mar. 6, 1962	4,409	4,409	Triassic Boundary Lake oil well.
1064	Dome Boundary 14-2-86-14	May 30, 1962	June 10, 1962	4,475	4,475	Triassic Boundary Lake oil well.
1156	Dome Boundary 8-3-86-14	Oct. 5, 1962	Oct. 17, 1962	4,455	4,455	Triassic Boundary Lake oil well.
1142	Dome Boundary 6-11-86-14	July 26, 1962	Aug. 10, 1962	4,445	4,445	Triassic Boundary Lake oil well.
1070	Dome Boundary 16-14-86-14	Mar. 24, 1962	May 31, 1962	4,275	4,275	Triassic Boundary Lake oil well.
1162	Dome et al Boundary 16-35-83-15	Sept. 11, 1962	Sept. 30, 1962	4,700	4,700	Triassic Boundary Lake oil well.
1212	Dome et al Boundary 14-1-84-15	Nov. 22, 1962	Dec. 7, 1962	4,353	4,353	Abandoned—dry.
955	Dome CDP C&E E Bubbles b-35-A	Jan. 26, 1962	Feb. 18, 1962	4,593	4,593	Abandoned—dry.
1013	Dome et al Elleh a-14-E	Feb. 15, 1962	Mar. 30, 1962	7,296	7,296	Abandoned—dry.
1225	Dome Provo E Laprise c-70-E	Dec. 7, 1962	....	....	4,146	Drilling.
1056	Dome Provo E Laprise c-92-H	Aug. 3, 1962	Aug. 22, 1962	4,285	4,285	Triassic upper carbonate of Schooler Creek gas well.
1015	Dome CDP C&E W Laprise c-71-G	Feb. 21, 1962	Mar. 16, 1962	4,590	4,590	Triassic upper carbonate of Schooler Creek gas well.
873	Dome CDP C&E W Laprise c-82-G	Dec. 4, 1961	Jan. 23, 1962	5,297	350	Triassic upper carbonate of Schooler Creek gas well.
1139	Dome Provo Nig d-35-B	Sept. 6, 1962	Sept. 23, 1962	4,446	4,446	Triassic upper carbonate of Schooler Creek gas well.
916	Fina White Rose Zero b-16-H	Jan. 7, 1962	Mar. 17, 1962	8,585	8,585	Abandoned—dry.
988	FPC Whitehall Peejay d-17-E	Feb. 12, 1962	Mar. 7, 1962	3,923	3,923	Abandoned—dry.
611	Fraser Valley Chilliwack 14-19-26	Nov. 30, 1959	....	....	....	Suspended.
1069	HB Chowade b-18-J	Mar. 26, 1962	May 11, 1962	5,598	5,598	Abandoned—dry.
827	HB Cypress a-86-C	Oct. 30, 1961	July 12, 1962	12,110	8,641	Triassic Baldonnel gas well; whipstocked hole.
1134	HB Cypress c-38-F	Aug. 27, 1962	Nov. 28, 1962	4,760	4,760	Abandoned—dry.
932	HB Imp Union Gutah a-99-K	Jan. 9, 1962	Mar. 20, 1962	9,213	9,213	Abandoned—dry.
1210	Herkimer Pure Chetwynd 14-20-77-23	Nov. 20, 1962	Dec. 20, 1962	4,207	4,207	Abandoned—dry.
1115	Homestead et al Boundary 16-7-84-13	July 1, 1962	July 12, 1962	4,540	4,540	Abandoned—dry.

TABLE 8.—WELLS DRILLED AND DRILLING, 1962—*Continued*

Drilling Authority No.	Well Name	Date Spudded	Date Rig Released	Total Depth	1962 Footage	Status at Dec. 31, 1962
1041	Homestead et al Boundary 6-18-84-13	Mar. 13, 1962	Mar. 28, 1962	4,520	4,520	Triassic Boundary Lake oil well.
1108	Homestead et al Boundary 8-18-84-13	June 20, 1962	June 30, 1962	4,545	4,545	Triassic Boundary Lake oil well.
933	Hunt Sands Pac Imp Coplin 7-16-86-23	Jan. 12, 1962	Mar. 24, 1962	7,497	7,497	Triassic Baldonnel oil well.
1028	Hunt Sands Sun Falls c-18-G	Feb. 25, 1962	Nov. 8, 1962	10,590	11,528	Triassic Baldonnel gas well; whipstocked hole.
1206	Husky Colo Wildmint b-23-A	Nov. 18, 1962	Dec. 5, 1962	3,685	3,685	Triassic Halfway oil well.
1052	Imp Pac Boundary 8-8-84-13	Mar. 8, 1962	Mar. 18, 1962	4,545	4,545	Abandoned—dry.
1104	Imp Pac Boundary 14-18-84-13	June 24, 1962	July 5, 1962	4,515	4,515	Triassic Boundary Lake oil well.
1098	Imp Pac Boundary 6-19-84-13	June 14, 1962	June 23, 1962	4,491	4,491	Triassic Boundary Lake oil well.
1078	Imp Pac Boundary 8-19-84-13	May 25, 1962	June 4, 1962	4,485	4,485	Triassic Boundary Lake oil well.
998	Imp Pac Boundary 14-19-84-13	Feb. 12, 1962	Feb. 22, 1962	4,475	4,475	Triassic Boundary Lake oil well.
1018	Imp Pac Boundary 16-19-84-13	May 15, 1962	May 25, 1962	4,454	4,454	Triassic Boundary Lake oil well.
1117	Imp Pac Boundary 6-20-84-13	June 25, 1962	July 5, 1962	4,480	4,480	Triassic Boundary Lake oil well.
1091	Imp Pac Boundary 6-29-84-13	June 4, 1962	June 14, 1962	4,447	4,447	Triassic Boundary Lake oil well.
1060	Imp Pac Boundary 14-29-84-13	June 15, 1962	June 24, 1962	4,380	4,380	Triassic Boundary Lake oil well.
1019	Imp Pac Boundary 6-30-84-13	Feb. 23, 1962	Mar. 7, 1962	4,440	4,440	Triassic Boundary Lake oil well.
1061	Imp Pac Boundary 8-30-84-13	Mar. 19, 1962	Mar. 29, 1962	4,486	4,486	Triassic Boundary Lake oil well.
975	Imp et al Boundary 14-30-84-13	Feb. 11, 1962	Feb. 22, 1962	4,420	4,420	Triassic Boundary Lake oil well.
1062	Imp et al Boundary 16-30-84-13	May 9, 1962	May 19, 1962	4,408	4,408	Triassic Boundary Lake oil well.
931	Imp et al Boundary 6-31-84-13	Jan. 18, 1962	Jan. 29, 1962	4,344	4,344	Triassic Boundary Lake oil well.
930	Imp et al Boundary 8-31-84-13	Jan. 31, 1962	Feb. 9, 1962	4,365	4,365	Triassic Boundary Lake oil well.
888	Imp Pac Boundary 14-31-84-13	Dec. 28, 1961	Jan. 7, 1962	4,305	990	Triassic Boundary Lake oil well.
965	Imp Pac Boundary 6-32-84-13	Feb. 9, 1962	Feb. 20, 1962	4,360	4,360	Triassic Boundary Lake oil well.
991	Imp Pac Boundary 8-32-84-13	Feb. 22, 1962	Mar. 6, 1962	4,380	4,380	Triassic Boundary Lake oil well.
935	Imp Pac Boundary 14-32-84-13	Jan. 10, 1962	Jan. 21, 1962	4,330	4,330	Triassic Boundary Lake oil well.
939	Imp Pac Boundary 16-32-84-13	Jan. 23, 1962	Feb. 6, 1962	4,335	4,335	Triassic Boundary Lake oil well.
1218	Imp Pac Boundary 4-8-85-13	Nov. 28, 1962	Dec. 9, 1962	4,321	4,321	Triassic Boundary Lake injection well.
906	Imp Pac Boundary 8-8-85-13	Dec. 30, 1961	Jan. 8, 1962	4,331	2,131	Triassic Boundary Lake oil well.
1166	Imp Pac Boundary 14-2-84-14	Sept. 30, 1962	Oct. 8, 1962	4,559	4,559	Triassic Boundary Lake oil well.
1135	Imp et al Boundary 14-9-84-14	Aug. 2, 1962	Aug. 12, 1962	4,360	4,360	Abandoned—dry.
1133	Imp et al Boundary 16-9-84-14	July 23, 1962	Aug. 1, 1962	4,482	4,482	Triassic Boundary Lake oil well.
1079	Imp Pac Boundary 16-10-84-14	May 24, 1962	June 4, 1962	4,475	4,475	Triassic Boundary Lake oil well.
1127	Imp Pac Boundary 6-11-84-14	July 9, 1962	July 22, 1962	4,530	4,530	Triassic Boundary Lake oil well.
1136	Imp Pac Boundary 8-11-84-14	Aug. 20, 1962	Aug. 28, 1962	4,518	4,518	Triassic Boundary Lake oil well.
1080	Imp Pac Boundary 14-13-84-14	May 16, 1962	May 26, 1962	4,495	4,495	Triassic Boundary Lake oil well.
1085	Imp Pac Boundary 16-13-84-14	May 27, 1962	June 12, 1962	4,460	4,460	Triassic Boundary Lake oil well.
1059	Imp Pac Boundary 14-14-84-14	May 5, 1962	May 16, 1962	4,490	4,490	Triassic Boundary Lake oil well.
1175	Imp Pac Boundary 16-14-84-14	Oct. 21, 1962	Oct. 31, 1962	4,500	4,500	Triassic Boundary Lake oil well.
1084	Imp Pac Boundary 6-15-84-14	June 5, 1962	June 16, 1962	4,420	4,420	Triassic Boundary Lake oil well.
1076	Imp Pac Boundary 8-15-84-14	May 12, 1962	May 23, 1962	4,430	4,430	Triassic Boundary Lake oil well.
1035	Imp et al Boundary 6-16-84-14	Mar. 8, 1962	Mar. 18, 1962	4,280	4,280	Triassic Boundary Lake oil well.
1128	Imp et al Boundary 8-16-84-14	July 12, 1962	July 20, 1962	4,320	4,320	Triassic Boundary Lake oil well.

1143	Imp Pac Boundary 14-16-84-14	Aug. 3, 1962	Aug. 11, 1962	4,190	4,190	Triassic Boundary Lake oil well.
1112	Imp Pac Boundary 16-16-84-14	June 17, 1962	June 28, 1962	4,233	4,233	Triassic Boundary Lake oil well.
1102	Imp Pac Boundary 6-17-84-14	June 11, 1962	June 23, 1962	3,980	3,980	Triassic Boundary Lake oil well.
1151	Imp Pac Boundary 8-17-84-14	Aug. 12, 1962	Aug. 20, 1962	4,178	4,178	Triassic Boundary Lake oil well.
1220	Imp Pac Boundary 14-17-84-14	Dec. 8, 1962	Dec. 20, 1962	4,142	4,142	Triassic Boundary Lake oil well.
1158	Imp Pac Boundary 16-17-84-14	Sept. 8, 1962	Sept. 17, 1962	4,145	4,145	Triassic Boundary Lake oil well.
1189	Imp Pac Boundary 8-20-84-14	Oct. 31, 1962	Nov. 9, 1962	3,982	3,982	Triassic Boundary Lake oil well.
1228	Imp Pac Boundary 16-20-84-14	Dec. 22, 1962			4,150	Drilling.
1157	Imp Pac Boundary 6-21-84-14	Aug. 30, 1962	Sept. 7, 1962	4,165	4,165	Triassic Boundary Lake oil well.
1120	Imp Pac Boundary 8-21-84-14	July 1, 1962	July 11, 1962	4,180	4,180	Triassic Boundary Lake oil well.
1172	Imp Pac Boundary 14-21-84-14	Oct. 9, 1962	Oct. 17, 1962	4,030	4,030	Triassic Boundary Lake oil well.
1122	Imp Pac Boundary 16-21-84-14	July 25, 1962	Aug. 2, 1962	4,154	4,154	Triassic Boundary Lake oil well.
1017	Imp Pac Boundary 6-23-84-14	Feb. 23, 1962	Mar. 6, 1962	4,458	4,458	Triassic Boundary Lake oil well.
929	Imp Pac Boundary 14-23-84-14	Jan. 4, 1962	Jan. 17, 1962	4,390	4,390	Triassic Boundary Lake oil well.
997	Imp Pac Boundary 16-23-84-14	Mar. 19, 1962	Mar. 29, 1962	4,450	4,450	Triassic Boundary Lake oil well.
1036	Imp Pac Boundary 6-24-84-14	Mar. 20, 1962	Mar. 31, 1962	4,465	4,465	Triassic Boundary Lake oil well.
978	Imp Pac Boundary 8-24-84-14	Feb. 2, 1962	Feb. 12, 1962	4,480	4,480	Triassic Boundary Lake oil well.
1010	Imp Pac Boundary 14-24-84-14	Feb. 23, 1962	Mar. 17, 1962	4,545	4,545	Triassic Boundary Lake oil well.
1219	Imp Pac Boundary 4-25-84-14	Dec. 11, 1962	Dec. 20, 1962	4,440	4,440	Triassic Boundary Lake injection well.
979	Imp Pac Boundary 6-25-84-14	Feb. 8, 1962	Feb. 22, 1962	4,456	4,456	Triassic Boundary Lake oil well.
928	Imp Pac Boundary 8-25-84-14	Jan. 4, 1962	Jan. 17, 1962	4,432	4,432	Triassic Boundary Lake oil well.
1077	Imp et al Boundary 14-25-84-14	June 1, 1962	June 10, 1962	4,370	4,370	Triassic Boundary Lake oil well.
1063	Imp et al Boundary 16-25-84-14	May 22, 1962	May 31, 1962	4,395	4,395	Triassic Boundary Lake oil well.
927	Imp Pac Boundary 6-26-84-14	Jan. 10, 1962	Jan. 27, 1962	4,280	4,280	Triassic Boundary Lake oil well.
966	Imp Pac Boundary 8-26-84-14	Jan. 29, 1962	Feb. 6, 1962	4,380	4,380	Triassic Boundary Lake oil well.
1111	Imp et al Boundary 14-26-84-14	July 4, 1962	July 11, 1962	4,200	4,200	Triassic Boundary Lake oil well.
1099	Imp et al Boundary 16-26-84-14	June 24, 1962	July 3, 1962	4,280	4,280	Triassic Boundary Lake oil well.
1089	Imp Pac Boundary 6-34-84-14	May 26, 1962	June 3, 1962	4,097	4,097	Abandoned—dry.
950	Imp Pac Boundary 8-4-85-14	Jan. 19, 1962	Jan. 30, 1962	4,037	4,037	Abandoned—dry.
1164	Imp Pac Boundary 14-8-85-14	Sept. 20, 1962	Sept. 29, 1962	4,180	4,180	Triassic Boundary Lake oil well.
1124	Imp Pac Boundary 6-14-85-14	July 5, 1962	July 21, 1962	4,670	4,670	Triassic Boundary Lake oil well.
1203	Imp Pac Boundary 6-1-85-15	Nov. 12, 1962	Nov. 24, 1962	4,437	4,437	Abandoned—dry.
1093	Imp Pac Argus 16-32-82-15	June 1, 1962	June 19, 1962	4,740	4,740	Abandoned—dry.
1207	Imp Pac Argus 13-14-82-16	Nov. 19, 1962	Dec. 12, 1962	4,614	4,614	Abandoned—dry.
934	Imp Fontas d-37-B	Jan. 12, 1962	Mar. 9, 1962	7,636	7,636	Abandoned—dry.
926	Imp Junior c-98-C	Jan. 3, 1962	Mar. 15, 1962	6,632	6,632	Middle Devonian carbonate gas well.
1238	Imp Junior c-60-E	Dec. 27, 1962			1,425	Drilling.
905	Imp Kyklo b-73-F	Dec. 23, 1961	Mar. 11, 1962	7,914	6,481	Abandoned—dry.
1153	Imp Pac Parkland 10-28-81-15	Aug. 29, 1962			11,505	Drilling.
1209	Imp Fina Rigel 11-28-87-17	Nov. 17, 1962	Dec. 1, 1962	3,672	3,672	Abandoned—dry.
1187	Imp Fina Rigel 6-3-88-17	Oct. 31, 1962	Nov. 13, 1962	3,626	3,626	Lower Cretaceous Gething (?) gas well.
1208	Imp Fina Rigel 6-8-88-17	Nov. 15, 1962	Nov. 27, 1962	3,556	3,556	Lower Cretaceous Gething (?) gas well.
1090	Imp Fina Rigel 6-10-88-17	June 2, 1962	June 13, 1962	3,585	3,585	Lower Cretaceous Gething (?) gas well.
1168	Imp Fina Rigel, 6-16-88-17	Sept. 27, 1962	Oct. 10, 1962	3,595	3,595	Lower Cretaceous Gething (?) gas well.
1107	Imp et al Rigel 7-19-88-17	June 15, 1962	June 25, 1962	3,586	3,586	Lower Cretaceous Gething (?) gas well.
1032	Imp et al Rigel 6-30-88-17	Mar. 10, 1962	Mar. 24, 1962	3,530	3,530	Lower Cretaceous Gething (?) gas well.
1118	Imp et al Rigel 6-21-88-18	Aug. 3, 1962	Aug. 20, 1962	3,646	3,646	Lower Cretaceous Gething (?) gas well.

TABLE 8.—WELLS DRILLED AND DRILLING, 1962—*Continued*

Drilling Authority No.	Well Name	Date Spudded	Date Rig Released	Total Depth	1962 Footage	Status at Dec. 31, 1962
1163	Imp et al Rigel 7-23-88-18	Oct. 20, 1962	Oct. 31, 1962	3,530	3,530	Lower Cretaceous Gething (?) gas well.
1003	Imp et al Rigel b-22-K	Feb. 15, 1962	Mar. 5, 1962	3,515	3,515	Lower Cretaceous Gething (?) gas well.
1051	Imp et al Rigel d-55-K	Mar. 10, 1962	Mar. 30. 1962	3,975	3,975	Abandoned—dry.
1132	Kewanee et al Beg b-82-L	July 31, 1962	Aug. 29, 1962	4,870	4,870	Triassic upper carbonate of Schooler Creek gas well.
994	Kewanee et al Osborn 14-27-88-15	Mar. 12, 1962	Apr. 1, 1962	4,152	4,152	Abandoned—dry.
898	Marathon Boundary 14-5-86-13	Dec. 19, 1961	Jan. 16, 1962	4,295	186	Triassic Boundary Lake oil well.
949	Marathon Boundary 6-8-86-13	Jan. 21, 1962	Feb. 8, 1962	4,281	4,281	Triassic Boundary Lake oil well.
1037	Marathon Boundary 14-12-84-14	Mar. 5, 1962	Mar. 19, 1962	4,550	4,550	Triassic Boundary Lake oil well.
989	Marathon Boundary 6-13-84-14	Feb. 10, 1962	Mar. 1, 1962	4,525	4,525	Triassic Boundary Lake oil well.
1068	Marathon Boundary 8-13-84-14	Mar. 21, 1962	May 16, 1962	4,565	4,565	Triassic Boundary Lake oil well.
981	Medallion AORCO Blair Peejay d-60-E	Feb. 8, 1962	Feb. 24, 1962	3,890	3,890	Triassic Halfway oil well.
902	Medallion Ashland Peejay d-69-E	Jan. 20, 1962	Feb. 6, 1962	3,900	3,900	Triassic Halfway oil well.
903	Medallion Ashland Peejay d-70-E	Jan. 5, 1962	Jan. 18, 1962	3,890	3,890	Triassic Halfway oil well.
980	Medallion Charter Red Willow c-64-L	Feb. 6, 1962	Feb. 19, 1962	4,150	4,150	Abandoned—dry.
1216	Medallion Charter Sapphire b-84-H	Dec. 2, 1962	Dec. 20, 1962	4,300	4,300	Abandoned—dry.
876	Mobil W Sahtaneh c-89-I	Dec. 6, 1961	Feb. 9, 1962	7,650	2,043	Abandoned—dry.
1114	Monsanto Nig b-50-A	July 14, 1962	Aug. 5, 1962	4,573	4,573	Abandoned—dry.
1154	Pacific Imperial Beg d-35-B	Aug. 24, 1962	Oct. 1, 1962	5,664	5,664	Triassic upper carbonate of Schooler Creek and Halfway gas well.
806	Pacific Imperial Beg d-46-B	Jan. 3, 1962	Feb. 9, 1962	5,412	5,412	Triassic upper carbonate of Schooler Creek and Halfway gas well.
1095	Pacific Imperial Beg d-57-B	June 6, 1962	July 8, 1962	5,429	5,429	Triassic upper carbonate of Schooler Creek and Halfway gas well.
992	Pacific Pan Am Dome N Beg d-37-D	Feb. 12, 1962	Mar. 25, 1962	5,603	5,603	Abandoned—dry.
1000	Pacific Boundary 16-5-86-13	Feb. 18, 1962	Mar. 8, 1962	4,194	4,194	Abandoned—dry.
921	Pacific Boundary 14-14-85-14	Jan. 10, 1962	Jan. 22, 1962	4,240	4,240	Abandoned—dry.
895	Pacific Boundary 16-14-85-14	Dec. 20, 1961	Jan. 9, 1962	4,615	135	Triassic Boundary Lake and Halfway oil well.
1140	Pacific Boundary 14-15-85-14	Nov. 25, 1962	Dec. 5, 1962	4,385	4,385	Abandoned—dry.
961	Pacific Boundary 16-15-85-14	Jan. 26, 1962	Feb. 15, 1962	4,685	4,685	Triassic Boundary Lake oil well.
1055	Pacific Imperial N Bubbles d-6-G	Mar. 16, 1962	Apr. 10, 1962	5,213	5,213	Triassic Halfway gas well.
1071	Pacific Apache Fort Nelson b-76-G	Apr. 5, 1962	May 9, 1962	6,691	6,691	Middle Devonian Carbonate gas well.
1178	Pacific Imperial Jedney d-31-C	Oct. 17, 1962	Nov. 1, 1962	5,300	5,300	Triassic upper carbonate of Schooler Creek and Halfway gas well.
868	Pacific Imperial Jedney b-73-C	Nov. 27, 1961	Jan. 22, 1962	5,303	———	Triassic upper carbonate of Schooler Creek and Halfway gas well.
1152	Pacific Pan Am Dome Jedney c-8-F	Oct. 31, 1962	Nov. 27, 1962	5,500	5,500	Lower Cretaceous Gething and Triassic Halfway gas well.
944	Pacific Pan Am Dome Jedney b-28-F	Jan. 27, 1962	Mar. 7, 1962	4,805	4,805	Triassic upper carbonate of Schooler Creek and Halfway gas well.
1183	Pacific Imperial S Jedney c-57-H	Nov. 4, 1962	Nov. 26, 1962	5,405	5,405	Triassic Halfway gas well.
1129	Pacific Imperial S Jedney c-78-H	July 24, 1962	Aug. 20, 1962	5,250	5,250	Triassic upper carbonate of Schooler Creek and Halfway gas well.

1054	Pacific Imperial S Jedney b-99-H	Mar. 18, 1962	Apr. 10, 1962	5,279	5,279	Triassic upper carbonate of Schooler Creek and Halfway gas well.
1082	Pacific Imperial S Jedney c-100-H	May 27, 1962	June 27, 1962	5,405	5,405	Triassic upper carbonate of Schooler Creek and Halfway gas well.
1081	Pacific et al W Jedney b-84-K	June 13, 1962	Aug. 27, 1962	5,685	5,685	Triassic upper carbonate of Schooler Creek and Halfway gas well.
954	Pacific SR West Cdn Peejay d-90-E	Jan. 20, 1962	Feb. 3, 1962	3,865	3,865	Triassic Halfway oil well.
1030	Pacific SR CanDel Peejay d-100-E	Feb. 23, 1962	Mar. 6, 1962	3,850	3,850	Triassic Halfway oil well.
990	Pacific SR CanDel Peejay d-81-H	Feb. 10, 1962	Feb. 22, 1962	3,976	3,976	Triassic Halfway oil well.
893	Pacific SR West Cdn Peejay d-43-I	Dec. 31, 1961	Jan. 14, 1962	3,736	3,681	Triassic Halfway gas well.
1045	Pacific SR CanDel W Peejay d-43-G	Mar. 23, 1962	Apr. 2, 1962	3,960	3,960	Abandoned—dry.
1008	Pacific SR CanDel W Peejay d-44-G	Feb. 21, 1962	Mar. 7, 1962	4,065	4,065	Triassic Halfway oil well.
956	Pacific SR CanDel W Peejay d-54-G	Jan. 17, 1962	Feb. 3, 1962	3,950	3,950	Triassic Halfway oil well.
1044	Pacific SR CanDel W Peejay d-55-G	Mar. 10, 1962	Mar. 22, 1962	3,970	3,970	Abandoned—dry.
1190	Pacific Stoddart 11-10-86-20	Nov. 20, 1962	———	———	6,491	Drilling.
877	Pan Am et al Dilly a-30-K	Dec. 4, 1961	Jan. 30, 1962	6,900	698	Middle Devonian Carbonate gas well.
907	Pan Am Philis a-65-G	Jan. 23, 1962	———	———	8,637	Suspended.
976	Pan Am Trail d-68-H	Feb. 9, 1962	———	———	8,298	Drilling.
951	Placid Federal c-29-E	Jan. 19, 1962	Oct. 4, 1962	9,696	9,696	Abandoned—dry.
892	Pure Pac Cheves c-5-A	Dec. 12, 1961	Feb. 26, 1962	8,596	5,610	Abandoned—dry.
1231	Pure Pacific Klowee c-37-A	Dec. 16, 1962	———	———	3,240	Drilling.
912	Pure ROC Mike b-46-H	Jan. 4, 1962	Jan. 20, 1962	4,032	4,032	Abandoned—dry.
884	Richfield Pure Abbotsford 16-17-16	Dec. 5, 1961	Jan. 5, 1962	3,144	27	Abandoned—dry.
1233	Richfield Sohio Beg d-77-B	Dec. 31, 1962	———	———	41	Drilling.
1075	Richfield Pure Pt Roberts 6-3-5	June 16, 1962	———	———	14,415	Drilling.
913	Richfield Pure Sunnyside 16-13-1	Jan. 9, 1962	Apr. 8, 1962	10,895	10,895	Abandoned—dry.
1103	Sinclair et al Boundary 8-26-83-14	June 11, 1962	July 30, 1962	4,503	4,503	Abandoned—dry.
982	Sinclair Boundary 6-3-84-14	Feb. 14, 1962	Mar. 7, 1962	4,516	4,516	Triassic Boundary Lake oil well.
941	Sinclair Boundary 8-3-84-14	Jan. 12, 1962	Feb. 13, 1962	4,525	4,525	Triassic Boundary Lake oil well.
1105	Sinclair et al Boundary 10-3-84-14	July 31, 1962	Aug. 15, 1962	4,550	4,550	Triassic Boundary Lake injection well.
969	Sinclair et al Boundary 14-3-84-14	Feb. 1, 1962	Feb. 17, 1962	4,525	4,525	Triassic Boundary Lake oil well.
942	Sinclair Boundary 16-3-84-14	Jan. 11, 1962	Jan. 30, 1962	4,535	4,535	Triassic Boundary Lake oil well.
865	Sinclair Boundary 16-11-84-14	Dec. 16, 1961	Jan. 6, 1962	4,502	———	Triassic Boundary Lake oil well.
853	Sinclair Boundary 14-27-84-14	Dec. 18, 1961	Jan. 9, 1962	4,085	418	Triassic Boundary Lake oil well.
1007	Sinclair et al Caribou a-48-H	Feb. 28, 1962	Mar. 13, 1962	3,906	3,906	Abandoned—dry.
870	Sinclair et al Datcin a-54-G	Dec. 12, 1961	Feb. 16, 1962	5,960	1,035	Abandoned—dry.
1198	Sinclair et al Flatrock 16-2-83-14	Nov. 8, 1962	Nov. 27, 1962	5,175	5,175	Abandoned—dry.
986	Sinclair Pacific Fox d-49-D	Feb. 7, 1962	Feb. 25, 1962	4,110	4,110	Abandoned—dry.
1119	Sinclair et al Julienne b-71-A	July 30, 1962	Aug. 29, 1962	5,325	5,325	Abandoned—dry.
1159	Sinclair et al Julienne b-A71-A	Aug. 31, 1962	Oct. 15, 1962	6,640	6,640	Abandoned—dry.
1047	Sinclair et al N Julienne d-76-H	Mar. 14, 1962	Apr. 22, 1962	8,410	8,410	Abandoned—dry.
1057	Sinclair et al Kahta b-70-J	Mar. 24, 1962	June 26, 1962	9,080	9,080	Abandoned—dry.
968	Sinclair Pacific Lichen c-41-A	Jan. 28, 1962	Mar. 2, 1962	6,310	6,310	Abandoned—dry.
1016	Sinclair Pacific Lynx a-68-A	Mar. 16, 1962	Mar. 29, 1962	4,310	4,310	Abandoned—dry.
1006	Sinclair et al Peejay d-19-E	Feb. 21, 1962	Mar. 9, 1962	4,065	4,065	Triassic Halfway oil well.
996	Sinclair et al Peejay d-37-E	Feb. 4, 1962	Feb. 19, 1962	4,000	4,000	Abandoned—dry.
915	Sinclair et al Peejay d-47-E	Jan. 20, 1962	Feb. 2, 1962	3,950	3,950	Triassic Halfway oil well.

TABLE 8.—WELLS DRILLED AND DRILLING, 1962—*Continued*

Drilling Authority No.	Well Name	Date Spudded	Date Rig Released	Total Depth	1962 Footage	Status at Dec. 31, 1962
914	Sinclair et al Peejay d-58-E	Dec. 30, 1961	Jan. 17, 1962	3,877	3,358	Triassic Halfway oil well.
1155	Sinclair Pink c-90-C	Nov. 9, 1962			4,009	Drilling.
938	Sinclair et al Rabbit d-63-B	Jan. 18, 1962	Feb. 4, 1962	4,090	4,090	Abandoned—dry.
946	SOBC HB Trimble c-98-L	Jan. 19, 1962			5,985	Drilling.
1109	Sohio Huber Balsam 10-24-87-14	Sept. 18, 1962	Oct. 5, 1962	4,750	4,750	Abandoned—dry.
897	Sohio S&E Ekwan a-55-G	Dec. 15, 1961	Feb. 4, 1962	6,050	2,428	Mississippian Banff gas well.
993	Sohio Union Snyder b-94-L	Feb. 28, 1962	Apr. 10, 1962	4,926	4,926	Abandoned—dry.
1094	Sun et al Alexander b-100-K	June 4, 1962	July 26, 1962	7,243	7,243	Abandoned—dry.
1106	Sun et al Bernadet 8-1-88-25	July 18, 1962	Oct. 14, 1962	7,400	7,400	Lower Cretaceous Bluesky-Gething gas well.
850	Sun et al Blueberry 14-25-88-25	Dec. 6, 1961	Jan. 26, 1962	6,570	1,994	Mississippian Rundle oil well.
1169	Sun et al Blueberry d-25-D	Nov. 3, 1962	Dec. 27, 1962	7,301	7,301	Mississippian Rundle oil well.
1146	Sun et al Blueberry b-35-D	Sept. 2, 1962	Oct. 29, 1962	7,357	7,357	Mississippian Rundle oil well.
960	Sun et al Blueberry d-36-D	Apr. 20, 1962	June 5, 1962	7,300	7,300	Mississippian Rundle oil well.
943	Sun et al Blueberry d-9-K	Jan. 29, 1962	Apr. 15, 1962	6,560	6,560	Mississippian Rundle oil well.
851	Sun et al Blueberry b-60-K	Dec. 5, 1961	Mar. 7, 1962	6,810	2,019	Mississippian Rundle oil well.
948	Sun et al Blueberry c-71-L	Mar. 14, 1962	May 20, 1962	7,047	7,047	Mississippian Rundle oil well.
1072	Sun et al Blueberry b-92-L	Nov. 11, 1962			6,823	Drilling.
1211	Tenn Wildmint d-2-A	Nov. 21, 1962	Dec. 5, 1962	3,717	3,717	Triassic Halfway oil well.
1092	Tenn Wildmint d-4-A	June 12, 1962	June 25, 1962	3,736	3,736	Triassic Halfway gas well.
1121	Tenn Wildmint d-5-A	July 14, 1962	July 27, 1962	3,795	3,795	Triassic Halfway oil well.
1184	Tenn Wildmint d-6-A	Oct. 25, 1962	Nov. 6, 1962	3,844	3,844	Triassic Halfway oil well.
1240	Tenn Wildmint d-86-I	Dec. 31, 1962			133	Drilling.
1191	Tenn Wildmint d-95-I	Nov. 7, 1962	Nov. 17, 1962	3,695	3,695	Triassic Halfway oil well.
1200	Tenn Osborn 6-35-87-15	Nov. 15, 1962	Dec. 7, 1962	4,343	4,343	Triassic Baldonnel gas well.
1137	Texaco NFA Boundary 6-30-85-13	Aug. 20, 1962	Sept 6, 1962	4,635	4,635	Triassic Baldonnel gas and Triassic Boundary Lake oil well.
1097	Texaco NFA Boundary 8-30-85-13	June 6, 1962	June 24, 1962	4,656	4,656	Triassic Boundary Lake and Halfway oil well.
1171	Texaco NFA Boundary 14-30-85-13	Oct. 8, 1962	Oct. 19, 1962	4,325	4,325	Triassic Boundary Lake oil well.
1150	Texaco NFA Boundary 8-31-85-13	Sept. 7, 1962	Sept. 18, 1962	4,317	4,317	Triassic Boundary Lake oil well.
972	Texaco NFA Boundary 8-6-86-13	Jan. 30, 1962	Mar. 18, 1962	4,342	4,342	Triassic Boundary Lake oil well.
1009	Texaco NFA Boundary 16-6-86-13	Feb. 17, 1962	Feb. 26, 1962	4,350	4,350	Triassic Boundary Lake oil well.
953	Texaco NFA Boundary 8-7-86-13	Jan. 15, 1962	Jan. 26, 1962	4,365	4,365	Triassic Boundary Lake oil well.
1100	Texaco NFA Boundary 14-7-86-13	June 15, 1962	June 24, 1962	4,306	4,306	Triassic Boundary Lake oil well.
995	Texaco NFA Boundary 8-18-86-13	Feb. 7, 1962	Feb. 15, 1962	4,280	4,280	Triassic Boundary Lake oil well.
1116	Texaco NFA Boundary 14-18-86-13	June 25, 1962	July 2, 1962	4,280	4,280	Triassic Boundary Lake oil well.
1066	Texaco NFA Boundary 16-18-86-13	Mar. 22, 1962	Apr. 1, 1962	4,309	4,309	Triassic Boundary Lake oil well.
1074	Texaco NFA Boundary 6-19-86-13	May 26, 1962	June 5, 1962	4,298	4,298	Triassic Boundary Lake oil well.
1049	Texaco NFA Boundary 8-19-86-13	Mar. 12, 1962	Mar. 21, 1962	4,324	4,324	Triassic Boundary Lake oil well.
1123	Texaco NFA Boundary 14-19-86-13	July 3, 1962	July 10, 1962	4,330	4,330	Triassic Boundary Lake oil well.
901	Texaco NFA Boundary 16-19-86-13	Dec. 27, 1961	Jan. 13, 1962	4,707	1,107	Triassic Boundary Lake oil well.
1181	Texaco NFA Boundary 14-20-86-13	Oct. 28, 1962	Nov. 10, 1962	4,383	4,383	Abandoned—dry.

1050	Texaco NFA Boundary 6-30-86-13	Mar. 12, 1962	Mar. 22, 1962	4,370	4,370	Triassic Boundary Lake oil well.
1167	Texaco NFA Boundary 8-30-86-13	Sept. 22, 1962	Oct. 5, 1962	4,728	4,728	Triassic Boundary Lake oil well.
1073	Texaco NFA Boundary 14-22-85-14	May 17, 1962	May 30, 1962	4,440	4,440	Triassic Boundary Lake oil well.
1144	Texaco NFA Boundary 16-25-85-14	July 26, 1962	Aug. 12, 1962	4,726	4,726	Triassic Boundary Lake and Halfway oil well.
924	Texaco NFA Boundary 6-27-85-14	Jan. 4, 1962	Jan. 16, 1962	4,375	4,375	Triassic Boundary Lake oil well.
971	Texaco NFA Boundary 14-27-85-14	Jan. 28, 1962	Feb. 6, 1962	4,348	4,348	Triassic Boundary Lake oil well.
1031	Texaco NFA Boundary 6-34-85-14	Feb. 28, 1962	Mar. 12, 1962	4,340	4,340	Abandoned—dry.
1058	Texaco NFA Boundary 8-36-85-14	Mar. 21, 1962	Mar. 29, 1962	4,432	4,432	Triassic Boundary Lake oil well.
1083	Texaco NFA Boundary 8-1-86-14	May 23, 1962	May 31, 1962	4,405	4,405	Triassic Boundary Lake oil well.
1096	Texaco NFA Boundary 8-12-86-14	June 1, 1962	June 11, 1962	4,325	4,325	Triassic Boundary Lake oil well.
900	Texaco NFA Boundary 14-12-86-14	Dec. 18, 1961	Jan. 2, 1962	4,350	———	Triassic Boundary Lake oil well.
1101	Texaco NFA Boundary 8-13-86-14	June 9, 1962	June 18, 1962	4,298	4,298	Triassic Boundary Lake oil well.
952	Texaco NFA Boundary 14-13-86-14	Jan. 17, 1962	Jan. 28, 1962	4,300	4,300	Triassic Boundary Lake oil well.
1125	Texaco NFA Boundary 8-23-86-14	July 11, 1962	July 23, 1962	4,320	4,320	Lower Cretaceous Bluesky-Gething gas well.
1086	Texaco NFA Boundary 8-24-86-14	May 31, 1962	June 8, 1962	4,295	4,295	Triassic Boundary Lake oil well.
1029	Texaco NFA Boundary 16-24-86-14	Feb. 25, 1962	Mar. 8, 1962	4,330	4,330	Triassic Boundary Lake oil well.
1067	Texaco NFA Boundary 6-25-86-14	Mar. 24, 1962	Apr. 1, 1962	4,335	4,335	Abandoned—dry.
1188	Texaco NFA Buick a-28-A	Nov. 3, 1962	Nov. 15, 1962	3,823	3,823	Abandoned—dry.
1048	Texaco NFA Buick b-8-B	Mar. 11, 1962	Apr. 1, 1962	3,909	3,909	Lower Cretaceous Buick Creek gas well.
1179	Texaco NFA Buick b-10-B	Oct. 23, 1962	Nov. 1, 1962	3,958	3,958	Lower Cretaceous Buick Creek gas well.
1213	Texaco NFA Buick c-40-B	Dec. 12, 1962	Dec. 26, 1962	3,940	3,940	Lower Cretaceous Buick Creek gas well.
1194	Texaco NFA La Garde 10-29-87-15	Nov. 13, 1962	Dec. 22, 1962	4,367	4,367	Triassic Boundary Lake gas well.
1192	Texaco NFA N La Garde 10-12-88-16	Nov. 10, 1962	Dec. 19, 1962	4,250	4,250	Triassic Baldonnel gas well.
1180	Texaco NFA Nig d-15-B	Oct. 24, 1962	Nov. 18, 1962	4,432	4,432	Triassic upper carbonate of Schooler Creek gas well.
1161	Texaco NFA Nig c-90-B	Sept. 20, 1962	Oct. 10, 1962	4,527	4,527	Triassic upper carbonate of Schooler Creek gas well.
967	Texaco NFA Nig a-8-G	Feb. 1, 1962	Mar. 3, 1962	4,415	4,415	Triassic upper carbonate of Schooler Creek gas well.
1222	Texaco NFA Rigel 10-29-88-18	Dec. 13, 1962	———	———	3,865	Drilling.
1185	Texaco NFA Texaco c-18-D	Nov. 4, 1962	Nov. 18, 1962	3,690	3,690	Lower Cretaceous Dunlevy gas well.
1199	Texaco NFA Texaco d-59-D	Nov. 18, 1962	Dec. 2, 1962	3,637	3,637	Abandoned—dry.
1087	Texaco NFA Texaco c-80-D	June 3, 1962	June 22, 1962	4,020	4,020	Lower Cretaceous Bluesky-Gething and Dunlevy gas well.
1088	Texaco NFA Texaco c-98-L	June 2, 1962	June 25, 1962	3,830	3,830	Lower Cretaceous Dunlevy gas well.
1165	Texaco NFA N Townsend a-8-J	Sept. 26, 1962	Dec. 16, 1962	7,765	7,765	Triassic Baldonnel gas well.
917	Texaco NFA Townsoitoi d-44-C	Jan. 2, 1962	Mar. 10, 1962	6,959	6,959	Abandoned—dry.
923	Texaco NFA N Tsea d-47-C	Jan. 6, 1962	Feb. 22, 1962	8,320	8,320	Abandoned—dry.
947	Texaco NFA Walrus b-86-L	Feb. 5, 1962	Mar. 22, 1962	6,501	6,501	Mississippian gas well.
1024	Texfel Boundary 6-10-84-14	Mar. 24, 1962	Apr. 5, 1962	4,545	4,545	Triassic Boundary Lake oil well.
1023	Texfel Boundary 8-10-84-14	May 4, 1962	May 15, 1962	4,560	4,560	Triassic Boundary Lake oil well.
1223	Triad Beatton b-39-J	Dec. 21, 1962	———	———	2,910	Drilling.
1202	Triad Beatton b-48-J	Dec. 7, 1962	Dec. 19, 1962	3,770	3,770	Abandoned—dry.
925	Triad Beatton d-48-J	Jan. 2, 1962	Jan. 14, 1962	3,783	3,783	Abandoned—dry.
1038	Triad Beatton b-59-J	Mar. 5, 1962	Mar. 14, 1962	3,755	3,755	Triassic Halfway oil well.
1020	Triad Beatton d-60-J	Feb. 19, 1962	Mar. 1, 1962	3,760	3,760	Triassic Halfway gas well.
987	Triad BP Birley d-17-A	Feb. 4, 1962	Feb. 17, 1962	4,076	4,076	Lower Cretaceous Bluesky-Gething gas well.
886	Triad BP Conroy d-67-D	Jan. 6, 1962	Mar. 3, 1962	6,030	6,030	Triassic Halfway oil well.
1043	Triad BP Conroy d-47-E	Mar. 7, 1962	Mar. 26, 1962	4,162	4,162	Abandoned—dry.

TABLE 8.—WELLS DRILLED AND DRILLING, 1962—*Continued*

Drilling Authority No.	Well Name	Date Spudded	Date Rig Released	Total Depth	1962 Footage	Status at Dec. 31, 1962
922	Triad et al Jackfish c-13-I	Jan. 2, 1962	Mar. 9, 1962	7,770	7,770	Abandoned—dry.
999	Triad Sohio Pac Jackfish a-30-K	Feb. 11, 1962	Mar. 25, 1962	7,431	7,431	Middle Devonian Carbonate gas well.
908	Triad BP Pickell b-84-I	Jan. 17, 1962	Jan. 29, 1962	4,055	4,055	Triassic Halfway gas well.
959	Union HB BA Adskwatin b-39-A	Jan. 16, 1962	Jan. 28, 1962	3,610	3,610	Abandoned—dry.
1229	Union Aitken d-24-L	Dec. 15, 1962	Dec. 28, 1962	4,510	4,510	Abandoned—dry.
1160	Union Aitken d-33-L	Sept. 5, 1962	Sept. 19, 1962	4,420	4,420	Lower Cretaceous Gething oil well.
1205	Union Aitken d-34-L	Nov. 19, 1962	Dec. 10, 1962	4,800	4,800	Lower Cretaceous Gething oil well.
1173	Union Aitken d-43-L	Oct. 12, 1962	Oct. 27, 1962	4,470	4,470	Lower Cretaceous Gething oil well.
1186	Union Aitken d-44-L	Oct. 29, 1962	Nov. 14, 1962	4,543	4,543	Lower Cretaceous Gething oil well.
920	Union HB BA Aster a-78-F	Jan. 3, 1962	Jan. 14, 1962	3,558	3,558	Abandoned—dry.
1034	Union HB Beaverdam d-13-L	Mar. 1, 1962	Mar. 10, 1962	3,890	3,890	Abandoned—dry.
1012	Union HB Buckthorn d-64-D	Feb. 15, 1962	Feb. 27, 1962	4,120	4,120	Abandoned—dry.
1046	Union HB Sinclair Bulrush d-77-F	Mar. 11, 1962	Mar. 24, 1962	3,816	3,816	Abandoned—dry.
974	Union KCL ROC Juniper d-30-A	Jan. 30, 1962	Feb. 8, 1962	3,831	3,831	Abandoned—dry.
1040	Union HB Milligan b-31-G	Mar. 4, 1962	Mar. 13, 1962	3,760	3,760	Abandoned—dry.
1002	Union HB Milligan d-32-G	Feb. 11, 1962	Feb. 20, 1962	3,776	3,776	Triassic Halfway oil well.
1221	Union HB Milligan b-41-G	Nov. 30, 1962	Dec. 8, 1962	3,761	3,761	Abandoned—dry.
973	Union HB Milligan b-42-G	Jan. 31, 1962	Feb. 10, 1962	3,765	3,765	Triassic Halfway injection well.
1217	Union HB Milligan a-43-G	Dec. 10, 1962	Dec. 19, 1962	3,757	3,757	Triassic Halfway injection well.
983	Union HB Milligan d-44-G	Feb. 22, 1962	Mar. 2, 1962	3,798	3,798	Triassic Halfway oil well.
936	Union HB Milligan b-51-G	Jan. 5, 1962	Jan. 16, 1962	3,750	3,750	Abandoned—dry.
909	Union HB Milligan b-52-G	Jan. 17, 1962	Jan. 28, 1962	3,779	3,779	Triassic Halfway injection well.
899	Union HB Milligan b-53-G	Dec. 21, 1961	Jan. 3, 1962	3,770	55	Triassic Halfway injection well.
1001	Union HB Milligan d-62-G	Feb. 9, 1962	Feb. 19, 1962	3,715	3,715	Triassic Halfway oil well.
910	Union HB Milligan b-63-G	Mar. 14, 1962	Mar. 21, 1962	3,775	3,775	Abandoned—dry.
957	Union HB Milligan b-72-G	Jan. 21, 1962	Feb. 2, 1962	3,760	3,760	Triassic Halfway oil well.
1182	Union HB Milligan c-72-G	Oct. 25, 1962	Nov. 2, 1962	3,750	3,750	Triassic Halfway injection well.
911	Union HB Milligan b-73-G	Mar. 11, 1962	Mar. 18, 1962	3,770	3,770	Triassic Halfway injection well.
1011	Union HB Milligan b-82-G	Feb. 15, 1962	Feb. 24, 1962	3,753	3,753	Triassic Halfway oil well.
937	Union HB Milligan d-83-G	Jan. 7, 1962	Jan. 19, 1962	3,794	3,794	Triassic Halfway oil well.
1014	Union HB Milligan d-84-G	Feb. 20, 1962	Mar. 2, 1962	3,790	3,790	Triassic Halfway oil well.
985	Union HB Milligan b-93-G	Feb. 4, 1962	Feb. 14, 1962	3,764	3,764	Triassic Halfway oil well.
1170	Union HB Milligan d-94-G	Oct. 11, 1962	Oct. 19, 1962	3,750	3,750	Triassic Halfway oil well.
1042	Union HB ROC Milligan b-3-J	Mar. 7, 1962	Mar. 17, 1962	3,778	3,778	Triassic Halfway oil well.
1065	Union HB ROC Milligan d-4-J	Mar. 24, 1962	Apr. 2, 1962	3,795	3,795	Abandoned—dry.
1204	Union HB Wildmint d-14-A	Nov. 13, 1962	Nov. 22, 1962	3,640	3,640	Abandoned—dry.
984	Union HB Wildmint d-15-A	Feb. 2, 1962	Feb. 14, 1962	3,818	3,818	Triassic Halfway oil well.
1214	Union HB Wildmint b-21-A	Nov. 22, 1962	Dec. 1, 1962	3,682	3,682	Abandoned—dry.
1226	Union HB Wildmint d-24-A	Dec. 2, 1962	Dec. 22, 1962	3,783	3,783	Triassic Halfway oil well.
919	Union HB Wildmint d-25-A	Dec. 31, 1961	Jan. 11, 1962	3,828	3,322	Triassic Halfway oil well.
1195	Union HB Wildmint b-34-A	Nov. 4, 1962	Nov. 12, 1962	3,736	3,736	Triassic Halfway oil well.
964	Union HB Wildmint b-35-A	Jan. 23, 1962	Feb. 3, 1962	3,773	3,773	Abandoned—dry.

1215	Union HB Wildmint d-47-A	Nov. 23, 1962	Nov. 30, 1962	3,760	3,760	Abandoned—dry.
945	Union HB Wildmint b-56-A	Jan. 12, 1962	Jan. 22, 1962	3,783	3,783	Triassic Halfway oil well.
1027	Union HB Willow b-2-G	Feb. 26, 1962	Mar. 10, 1962	3,825	3,825	Abandoned—dry.
1237	Union HB Woodrush a-63-H	Dec. 28, 1962	—	—	3,333	Drilling.
856	West Nat et al Clarke a-52-J	Dec. 1, 1961	Jan. 21, 1962	6,412	2,929	Middle Devonian Carbonate gas well.
958	West Nat Lesellen b-75-F	Jan. 28, 1962	Mar. 4, 1962	7,796	7,796	Abandoned—dry.
1174	West Nat et al Evie d-64-C	Nov. 10, 1962	Dec. 22, 1962	7,392	7,392	Abandoned—dry.
1147	West Nat Kotcho d-12-C	Oct. 6, 1962	—	—	2,080	Drilling.
879	West Nat Kotcho b-54-K	Dec. 17, 1961	Jan. 21, 1962	6,630	2,461	Middle Devonian Carbonate gas well.
887	West Nat et al Yoyo a-74-H	Jan. 28, 1962	Mar. 9, 1962	6,790	6,790	Middle Devonian Carbonate gas well.
1230	West Nat et al Yoyo b-29-I	Dec. 19, 1962	—	—	1,588	Drilling.
1193	Whitehall et al Milligan d-95-G	Nov. 10, 1962	Nov. 20, 1962	3,790	3,790	Abandoned—dry.
1149	Whitehall Rigel 6-14-88-17	Oct. 4, 1962	Oct. 15, 1962	3,656	3,656	Lower Cretaceous Gething (?) gas well.
1148	Whitehall Rigel 6-15-88-17	Sept. 23, 1962	Oct. 2, 1962	3,588	3,588	Lower Cretaceous Gething (?) gas well.
1130	White Rose Sec Montney 10-29-86-18	July 24, 1962	Aug. 17, 1962	4,770	4,770	Triassic Baldonnel gas well.
1131	Wintershall Nig b-26-A	Aug. 20, 1962	Sept. 10, 1962	4,310	4,310	Abandoned—dry.

Table 9.—Oil and Gas Fields Designated as of December 31, 1962

Field	Date Designated	Date(s) Revised	Field Location	Pool(s)	Number of Wells	Discovery Well(s)	Pool(s) Discovered
Aitken Creek	Feb. 15, 1960	Jan. 1, 1961	N.T.S. 94-A-13	3	6	Union Aitken Creek b-42-L, oil Union Aitken Creek a-53-L (3), gas	3 3
Beatton River	Aug. 7, 1959	Jan. 1, 1962	N.T.S. 94-H-2	11	9	Triad Beatton River b-38-J, oil Triad Beatton d-60-J, gas	11 11
Beatton River West	Aug. 7, 1959	Jan. 1, 1961	N.T.S. 94-H-2	2	5	Triad West Beatton River d-39-K, oil	2
Beg	July 1, 1961	Jan. 1, 1962 Apr. 1, 1962 July 1, 1962	N.T.S. 94-G-1, 94-G-8	8, 11	17	Sinclair et al Beg b-17-K, gas Sinclair et al Beg d-10-G, gas	8 11
Blueberry	Feb. 7, 1958	Dec. 22, 1958 Feb. 15, 1960 May 27, 1960 Oct. 1, 1961	N.T.S. 94-A-12, 94-A-13 Tp. 88, R. 25, W. of 6th M.	5, 7, 9, 13	26	Sun et al Blueberry c-32-D (2), gas Sun et al Blueberry d-87-D (1), gas Sun et al Blueberry a-61-L, gas Sun et al Blueberry c-82-L (11), oil Sun et al Blueberry a-34-D (10), gas	5 7 9 13 13
Blueberry East	Dec. 22, 1958		N.T.S. 94-A-13	7, 11, 13	2	Sun et al E Blueberry b-38-C (7), gas Sun et al E Blueberry b-36-C (17), gas	7, 11 13
Blueberry West	Feb. 7, 1958	July 1, 1961	N.T.S. 94-A-12, 94-B-9, 94-B-16 Tp. 88, R. 25, W. of 6th M.	5, 7	3	Sun et al W Blueberry d-82-I (9), gas Sun et al W Blueberry d-19-L (12), gas	5 7
Boundary Lake	Oct. 30, 1956	Feb. 7, 1958 Aug. 7, 1959 Feb. 15, 1960 Jan. 1, 1961 Apr. 1, 1961 July 1, 1961 Jan. 1, 1962 Apr. 1, 1962 Oct. 1, 1962	Tp. 84, 85, 86, R. 13, W. of 6th M. Tp. 84, 85, 86, R. 14, W. of 6th M. Tp. 83, 84, 85, 86, 87, R. 13, W. of 6th M. Tp. 83, 84, 85, 86, R. 14 W. of 6th M.	2, 3, 7, 10, 11	258	Pacific Boundary 8-15-85-14, gas Pacific Boundary 12-10-85-14, gas Texaco NFA Boundary L 6-6-86-13 (1), oil Sun Boundary Lake 6-23-85-14, oil	2, 7 3 10 11
Bubbles	Nov. 24, 1959	Feb. 15, 1960 May 27, 1960 Jan. 1, 1961	N.T.S. 94-G-1, 94-G-8, 94-H-4	8	13	Pacific Imperial Bubbles b-33-I, gas	8
Buick Creek	Feb. 7, 1958	Aug. 7, 1959 Jan. 1, 1961 July 1, 1961 Oct. 1, 1961	N.T.S. 94-A-11, 94-A-14	6, 9	14	Texaco NFA Buick Creek d-98-I (1), gas Texaco NFA Buick Creek d-83-J (4), gas	6 9
Buick Creek West	Feb. 7, 1958	Jan. 6, 1959 Feb. 15, 1960	N.T.S. 94-A-11, 94-A-14	6, 7, 11	15	Pacific W Buick Creek c-83-K (13A), oil Pacific West Buick Creek b-78-C (2), gas Pacific West Buick Creek d-58-C (8), gas Pacific West Buick Creek b-23-E (1), gas	6 6 7 11
Charlie Lake	Jan. 1, 1961		Tp. 84, R. 18, W. of 6th M.	3	1	Imp Pac Charlie 13-5-84-14, oil	3
Clarke Lake	Feb. 15, 1960	May 27, 1960 Jan 1, 1961 Apr. 1, 1962	N.T.S. 94-J-9, 94-J-10, 94-J-15, 94-J-16	15	8	West Nat Imp Clarke Lake d-88-L, gas	15
Dawson Creek	Feb. 7, 1958		Tp. 79, R. 15, W. of 6th M.	1	4	Pacific Sc Dawson Ck 1-15-79-15 (1), gas	1

Fort St. John	Aug. 22, 1955	Feb. 7, 1958 Feb. 15, 1960 Jan. 1, 1961	Tp. 83, R. 18, W. of 6th M.	4, 7, 9, 11, 12	26	Pacific Ft St John A3-29-83-18 (31), gas Pacific Ft St John 14-15-83-18 (7), gas Pacific Ft St John 3-14-83-18 (9), oil Pacific Ft St John 1-20-83-18 (30), gas Imp Pac Ft St John 9-19-83-18 (45), oil Pacific Ft St John 14-21-83-18 (4), gas	4 7 9 11 12 12
Fort St. John Airport	Feb. 7, 1958		Tp. 83, R. 17, W. of 6th M.	4, 7, 11	3	Pacific Airport 8-32-83-17 (3), gas Pacific Airport 9-32-83-17 (97), gas Pacific Airport 12-34-83-17 (10), gas	4 7 11
Fort St. John Southeast	Feb. 7, 1958		Tp. 82, 83, R. 17, W. of 6th M.	4, 7, 11, 12	15	Pac Ft St John SE 10-31-82-17 (80), gas Pac Ft St John SE A4-10-83-17 (55), gas Pac Ft St John SE 10-33-82-17 (22), gas Pac Ft St John SE 4-10-83-17 (12), gas	4 7 11 12
Gundy Creek	Feb. 7, 1958	Jan. 6, 1959	N.T.S. 94-B-16	7, 9	4	West Nat Gundy Creek c-80-A, gas West Nat Gundy Creek b-69-A, gas	7 9
Halfway	Dec. 22, 1958		Tp. 86, 87, R. 25, W. of 6th M.	7, 11	3	Sun et al Halfway 5-1-87-25, gas Sun et al Halfway 8-11-87-25, gas	7 11
Highway	Feb. 7, 1958		N.T.S. 94-B-16	5, 7, 13	5	Sun et al Highway b-3-I, gas Phillips Highway b-25-I (1), gas Phillips Highway a-90-I (4), gas	5 7 13
Jedney	Aug. 7, 1959	Nov. 24, 1959 Feb. 15, 1960 Jan. 1, 1961 Apr. 1, 1961	N.T.S. 94-G-1, 94-G-8	3, 8, 11	19	Pacific Pan Am Dome Jedney c-8-F, gas Pacific et al Jedney b-88-J, gas Pacific Imp Jedney d-99-J, gas	3 8 11
Kobes-Townsend	Dec. 22, 1958	Feb. 15, 1960	N.T.S. 94-B-8, 94-B-9	5, 9, 11, 13	9	Phillips Kobes a-3-A (4), gas Phillips Kobes d-94-I (1), gas Phillips Townsend a-20-H (A-1), gas	5 9, 11 13
Kotcho Lake	Apr. 1, 1962		N.T.S. 94-I-14	15	3	West Nat Kotcho c-67-K, gas	15
Laprise Creek	Feb. 15, 1960	Jan. 1, 1961 Apr. 1, 1961	N.T.S. 94-G-8, 94-H-5	8	8	Dome Basco Laprise Ck a-35-H, gas	8
Laprise Creek East	Jan. 1, 1961	Apr. 1, 1961 Oct. 1, 1962	N.T.S. 94-G-8, 94-H-5	8	11	Pacific Sunray Imp E Laprise d-68-E, gas	8
Laprise Creek West	July 1, 1962		N.T.S. 94-G-H	8	2	Dome CDP C&E W Laprise c-82-G, gas	8
Milligan Creek	Feb. 7, 1958	Aug. 7, 1959 Feb. 15, 1960 Jan. 1, 1961 Apr. 1, 1962	N.T.S. 94-H-2	11	21	Union H.B. Milligan Creek d-73-G, oil Whitehall et al Milligan d-75-G, gas	11 11
Montney	Feb. 7, 1958	Jan. 6, 1959 Jan. 1, 1962	Tp. 87, R. 18, W. of 6th M. Tp. 86, 87, R. 19, W. of 6th M.	2, 9, 11	4	Pac Sunray Montney 16-32-86-19 (3), gas Pac Sunray Montney 14-36-86-19 (2), gas Pac Sunray Montney 14-31-86-19 (5), gas	2 9 11
Nig Creek	Aug. 7, 1959	Feb. 15, 1960 Jan. 1, 1961 Apr. 1, 1961 Jan. 1, 1962 Apr. 1, 1962	N.T.S. 94-A-13, 94-H-4	8	15	Texaco NFA Nig Creek a-79-B (1), gas	8
Parkland (formerly Kiskatinaw)	Feb. 7, 1958		Tp. 81, R. 15, W. of 6th M.	14	1	Pacific Imp Parkland 6-29-81-15, gas	14

TABLE 9.—OIL AND GAS FIELDS DESIGNATED AS OF DECEMBER 31, 1962—*Continued*

Field	Date Designated	Date(s) Revised	Field Location	Pool(s)	Number of Wells	Discovery Well(s)	Pool(s) Discovered
Peejay	Feb. 15, 1960	May 27, 1960 Jan. 1, 1961 Jan. 1, 1962 Apr. 1, 1962	N.T.S. 94-A-15, 94-A-16	11	21	Sinclair Pac Peejay d-39-E (B8-3), oil Pacific SR West Cdn Peejay d-52-I, gas	11 11
Petitot River	Apr. 1, 1961		N.T.S. 94-P-12, 94-P-13	15	3	West Nat Petitot River d-24-D, gas	15
Red Creek	Feb. 7, 1958	Aug. 7, 1959 Feb. 15, 1960	Tp. 85, R. 21, W. of 6th M.	9, 11	2	Pacific Red Creek 5-27-85-21 (36), gas	9, 11
Rigel	Oct. 1, 1962		N.T.S. 94-A-10 Tp. 88, R. 17, W. of 6th M. Tp. 88, R. 18, W. of 6th M. Tp. 88, R. 19, W. of 6th M.	3	14	Imp Fina Rigel 4-27-88-17, gas	3
Snyder Creek	Apr. 1, 1961		N.T.S. 94-A-14	5	1	Union Snyder Creek a-28-K (1), gas	5
Stoddart	Jan. 6, 1959	Feb. 15, 1960	Tp. 86, R. 20, W. of 6th M.	12	2	Pacific Stoddart 4-24-86-20 (85), gas	12
Sunrise	Feb. 7, 1958	Jan. 1, 1961	Tp. 78, 79, R. 16, W. of 6th M.	1	3	Pacific Sunrise 10-7-79-16 (3), gas	1
Wildmint	Jan. 1, 1962	July 1, 1962	N.T.S. 94-A-15, 94-H-2	11	15	Union HB Wildmint d-46-A, oil Tenn Wildmint d-4-A, gas	11 11

Numerical list of pools:—

1. Lower Cretaceous Cadotte sandstone.
2. Lower Cretaceous Bluesky-Gething sandstone.
3. Lower Cretaceous Gething sandstone.
4. Lower Cretaceous Cadomin sandstone.
5. Lower Cretaceous Dunlevy sandstone.
6. Lower Cretaceous Buick Creek sandstone.
7. Triassic Baldonnel carbonate (includes Baldonnel " A " and " B " of Fort St. John area).
8. Triassic upper carbonate of Schooler Creek.
9. Triassic Charlie Lake sandstone and carbonate.
10. Triassic Boundary Lake carbonate.
11. Triassic Halfway sandstone.
12. Permian Belloy carbonate.
13. Mississippian Rundle carbonate.
14. Upper Devonian Wabamun carbonate.
15. Middle Devonian carbonate.

TABLE 10.—NUMBER OF PRODUCING AND PRODUCIBLE WELLS AT DECEMBER 31, 1962[1]

Field and Pool	Oil Wells		Natural-gas Wells	
	Producing	Producible	Producing	Producible
Aitken Creek field—Gething	2	5	......	1
Beatton River field—Halfway	8	8	......	1
Beatton River West field—Bluesky Gething	4	5	......	......
Beg field—				
Schooler Creek, Upper Carbonate	......	......	12	16
Halfway	......	......	9	12
Field totals	......	......	21	28
Beg West field—Schooler Creek, Upper Carbonate	......	......	1	1
Blueberry field—				
Dunlevy	......	......	6	6
Baldonnel	......	......	2	4
Charlie Lake	......	......	......	2
Mississippian	15	15	......	1
Field totals	15	15	8	13
Blueberry East field—				
Baldonnel	......	......	......	......
Halfway	......	......	......	......
Mississippian	......	......	......	1
Field totals	......	......	......	1
Blueberry West field—				
Dunlevy	......	......	2	2
Baldonnel	......	......	1	1
Field totals	......	......	3	3
Boundary Lake field—				
Bluesky Gething	......	......	2	2
Gething	......	......	1	2
Dunlevy	......	......	......	1
Baldonnel	......	......	4	6
Boundary Lake	246	249	......	......
Halfway	5	5	......	1
Field totals	251	254	7	12
Bubbles field—Schooler Creek, Upper Carbonate	......	......	10	13
Buick Creek field—				
Buick Creek	......	......	11	13
Charlie Lake	......	......	1	1
Field totals	......	......	12	14
Buick Creek West field—				
Buick Creek	......	2	8	9
Baldonnel	......	......	......	3
Halfway	......	......	1	1
Field totals	......	2	9	13
Charlie Lake field—Gething	......	1	......	......
Clarke Lake field—Devonian Carbonate	......	......	1	8
Dawson Creek field—Cadotte	......	......	2	4
Fort St. John field—				
Cadomin	......	......	......	2
Baldonnel "A"	......	......	5	5
Baldonnel "A/B"	......	......	6	6
Charlie Lake	4	4	1	1
Halfway	......	......	5	6
Belloy	......	1	2	2
Field totals	4	5	19	22
Fort St. John Airport field—				
Cadomin	......	......	......	1
Baldonnel "A"	......	......	......	1
Halfway	......	......	......	1
Field totals	......	......	......	3
Fort St. John Southeast field—				
Cadomin	......	......	1	1
Baldonnel "A"	......	......	2	2
Halfway	......	......	3	6
Belloy	......	......	4	6
Field totals	......	......	10	15
Gundy Creek field—				
Baldonnel	......	......	......	4
Charlie Lake	......	......	......	1
Field totals	......	......	......	5

[1] Each zone of a multiple completion is counted as one well.

TABLE 10.—NUMBER OF PRODUCING AND PRODUCIBLE WELLS AT DECEMBER 31, 1962[1]—*Continued*

Field and Pool	Oil Wells		Natural-gas Wells	
	Producing	Producible	Producing	Producible
Halfway field—				
Baldonnel	......	......	2	3
Halfway	......	......	1	1
Field totals	......	......	3	4
Highway field—				
Dunlevy	......	......	1	1
Baldonnel	......	......	1	4
Mississippian	......	......	1	1
Field totals	......	......	3	6
Jedney field—				
Gething	......	......	......	1
Schooler Creek, Upper Carbonate	......	......	13	14
Halfway	......	......	3	4
Field totals	......	......	16	19
Kobes-Townsend field—				
Dunlevy	......	......	2	3
Charlie Lake	......	......	4	5
Halfway	......	......	2	2
Mississippian	......	......	2	2
Field totals	......	......	10	12
Kotcho Lake field—Devonian Carbonate	......	......	......	3
Laprise Creek field—Schooler Creek, Upper Carbonate	......	......	8	8
Laprise Creek East field—Schooler Creek, Upper Carbonate	......	......	11	11
Laprise Creek West field—Schooler Creek, Upper Carbonate	......	......	2	2
Milligan Creek field—Halfway	17	19	......	1
Montney field—				
Bluesky Gething	......	......	......	1
Charlie Lake	......	......	......	1
Halfway	......	......	1	2
Field totals	......	......	1	4
Nig Creek field—Schooler Creek, Upper Carbonate	......	......	12	15
Parkland field—Upper Devonian	......	......	1	1
Peejay field—Halfway	17	19	......	2
Petitot River field—Devonian Carbonate	......	......	......	3
Red Creek field—				
Charlie Lake	......	......	1	1
Halfway	......	......	1	2
Field totals	......	......	2	3
Rigel field—Gething	......	......	9	13
Snyder Creek field—Dunlevy	......	......	1	1
Stoddart field—Belloy	......	......	2	2
Sunrise field—Cadotte	......	......	......	3
Wildmint field—Halfway	10	11	......	1
Other areas—				
Cadotte	......	......	......	2
Notikewin	......	......	......	1
Bluesky Gething	......	1	1	7
Gething	......	......	......	4
Buick Creek	......	......	......	1
Dunlevy	......	......	3	8
Jurassic Triassic	......	......	......	1
Schooler Creek	......	......	......	3
Upper Carbonate of Schooler Creek	......	......	3	11
Baldonnel "A"	......	......	......	1
Baldonnel	......	1	......	16
Boundary Lake	......	2	......	1
Charlie Lake	......	......	......	5
Halfway	2	5	3	21
Permo Carboniferous	......	......	......	3
Belloy	......	......	......	2
Mississippian	......	......	......	12
Kiskatinaw	......	......	......	1
Upper Devonian	......	......	......	1
Devonian Carbonate	......	......	......	16
Areas totals	2	9	10	117
Total fields and areas	330	353	194	388

[1] Each zone of a multiple completion is counted as one well.

TABLE 11.—MONTHLY CRUDE-OIL PRODUCTION BY FIELDS AND POOLS, 1962

(Quantities in barrels.)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Aitken Creek field—Gething									1,018	1,005	305	256	2,584
Beatton River field—Halfway	4,587	13,625	21,263	7,504			4,536	26,346	18,629	23,918	21,006	28,079	169,493
Beatton River West field — Bluesky-Gething	412	3,889	4,981	2,740				3,555	6,576	7,792	7,087	6,523	43,555
Blueberry field—													
Dunlevy	103	79	92	77	84	110	38	146	138	104	71	31	1,073
Mississippian	18,614	28,355	46,143	8,786	4,231	50,350	64,016	70,886	74,466	79,455	76,332	80,291	601,925
Field totals	18,717	28,434	46,235	8,863	4,315	50,460	64,054	71,032	74,604	79,559	76,403	80,322	602,998
Boundary Lake field—													
Charlie Lake													
Boundary Lake	356,752	369,512	448,866	527,206	587,475	476,143	206,565	535,822	592,128	678,355	678,792	723,270	6,180,886
Halfway		678	3,744	7,310	9,076	6,949	1,852	6,666	7,703	6,754	8,248	10,447	69,427
Field totals	356,752	370,190	452,610	534,516	596,551	483,092	208,417	542,488	599,831	685,109	687,040	733,717	6,250,313
Buick Creek field—Buick Creek	428	839	1,163	173	47	910	468	561	964	1,657	1,532	879	9,621
Buick Creek West field—Buick Creek													
Charlie Lake field—Gething													
Fort St. John field—													
Charlie Lake	2,718	4,130	4,394	4,435	4,627	4,441	4,597	4,614	4,452	4,586	4,468	4,391	51,853
Belloy													
Field totals	2,718	4,130	4,394	4,435	4,627	4,441	4,597	4,614	4,452	4,586	4,468	4,391	51,853
Milligan Creek field—Halfway	23,314	77,667	82,648	92,837	112,681	20,606	18,400	110,759	105,192	124,449	121,124	131,918	1,021,595
Peejay field—Halfway	12,600	43,549	52,614	24,952	7,743	56,938	57,366	59,862	57,426	60,968	57,682	60,146	551,846
Wildmint field—Halfway	606	17,602	17,964	24,796	22,758	3,434		21,738	15,723	23,713	23,322	25,017	196,673
Other areas—													
Baldonnel							784	374					1,158
Boundary Lake		155	306										461
Halfway			1,573			1,452	1,253	1,025	1,185	1,116	681	3,785	12,070
Areas totals		155	1,879			1,452	2,037	1,399	1,185	1,116	681	3,785	13,689
Totals	420,134	560,080	685,751	700,816	748,722	621,333	359,875	842,354	885,600	1,013,872	1,000,650	1,075,033	8,914,220

TABLE 12.—MONTHLY NATURAL-GAS PRODUCTION BY FIELDS AND POOLS, 1962

(Quantities in M s.c.f.)

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Beg field—													
Schooler Creek, upper carbonate	406,956	621,793	641,370	404,717	606,147	431,052	432,490	475,129	581,687	567,345	600,383	651,950	6,421,019
Halfway	343,763	325,990	349,610	322,268	301,282	235,765	289,548	255,296	326,163	352,320	379,110	429,012	3,910,127
Field totals	750,719	947,783	990,980	726,985	907,429	666,817	722,038	730,425	907,850	919,665	979,493	1,080,962	10,331,146
Beg West field—													
Schooler Creek, upper carbonate	18,654	16,855	17,992	16,489	17,393	12,491	16,655	14,694	17,387	16,602	19,275	18,476	202,963
Blueberry field—													
Dunlevy	107,369	104,389	119,289	99,366	98,403	70,717	71,996	101,542	93,379	125,716	119,424	116,889	1,228,479
Baldonnel	52,692	31,484	47,714	60,726	55,782	45,071	41,150	49,575	47,745	71,692	68,548	73,990	646,169
Mississippian	—	—	25,183	6,715	58,200	52,377	44,624	—	1,524	30,627	4,309	—	223,559
Field totals	160,061	135,873	192,186	166,807	212,385	168,165	157,770	151,117	142,648	228,035	192,281	190,879	2,098,207
Blueberry East field—													
Baldonnel	—	—	—	—	—	—	—	—	—	37,714	57,205	68,669	163,588
Halfway	—	—	—	—	—	—	—	—	—	—	—	—	—
Mississippian	—	—	—	—	—	—	—	—	—	—	—	—	—
Field totals	—	—	—	—	—	—	—	—	—	37,714	57,205	68,669	163,588
Blueberry West field—													
Dunlevy	13,425	5,416	4,566	1,322	4,810	5,190	17,868	2,033	15,505	23,119	3,050	15,300	111,604
Baldonnel	23,838	41,829	37,693	8,950	12,592	21,975	31,627	5,311	19,784	38,509	4,785	31,598	278,491
Field totals	37,263	47,245	42,259	10,272	17,402	27,165	49,495	7,344	35,289	61,628	7,835	46,898	390,095
Boundary Lake field—													
Bluesky-Gething	21,140	49,442	17,168	20,660	9,530	12,458	18,749	12,188	6,712	7,585	2,867	64,548	243,047
Gething	118,782	105,098	111,127	108,634	83,542	91,849	102,755	69,511	62,671	99,010	96,684	93,969	1,143,632
Baldonnel	23,122	78,828	115,710	145,600	15,435	52,645	131,782	93,755	86,832	157,614	180,593	110,277	1,192,193
Field totals	163,044	233,368	244,005	274,894	108,507	156,952	253,286	175,454	156,215	264,209	280,144	268,794	2,578,872
Bubbles field—													
Schooler Creek, upper carbonate	900,197	868,294	880,143	768,576	730,958	796,044	818,819	754,360	718,959	939,370	893,266	874,826	9,943,812
Buick Creek field—													
Buick Creek	826,500	639,471	783,299	669,561	736,344	633,112	691,184	528,560	728,949	645,561	602,710	795,743	8,280,994
Charlie Lake	100,713	48,669	47,148	24,099	45,184	33,887	61,890	53,710	35,267	1,702	—	61,836	514,105
Field totals	927,213	688,140	830,447	693,660	781,528	666,999	753,074	582,270	764,216	647,263	602,710	857,579	8,795,099
Buick Creek West field—													
Buick Creek	828,508	747,204	805,607	713,646	730,323	625,200	427,106	677,526	592,647	625,636	502,668	428,686	7,704,757
Baldonnel	59,788	56,662	63,214	60,909	62,455	55,764	38,762	57,961	36,503	64,456	49,789	59,018	665,281
Halfway	82,085	63,623	67,671	47,186	49,105	36,830	14,174	38,013	21,517	42,903	17,752	—	480,859
Field totals	970,381	867,489	936,492	821,741	841,883	717,794	480,042	773,500	650,667	732,995	570,209	487,704	8,850,897

Clarke Lake field—													
Devonian Carbonate	6,286	6,013	6,832	4,558	4,628	3,985	3,902	3,376	5,739	5,500	7,293	8,760	66,872
Dawson Creek field—													
Cadotte	77,928	66,034	70,164	63,380	69,833	64,334	40,165	15,790	59,306	63,141	63,815	52,807	706,697
Fort St. John field—													
Cadomin	—	—	—	—	—	—	—	—	—	—	—	—	—
Baldonnel " A "	278,702	256,517	280,516	125,257	226,454	210,779	134,841	248,504	226,199	281,773	243,544	251,465	2,764,551
Baldonnel " A/B "	364,239	340,620	390,149	330,723	377,089	342,386	288,584	377,737	312,332	374,924	285,297	339,668	4,123,748
Belloy	64,023	363,163	400,853	322,754	375,178	348,695	265,292	333,309	290,532	316,545	257,444	325,786	4,005,782
Halfway	406,231	59,693	73,235	57,918	74,042	64,627	54,098	66,946	64,205	65,478	57,075	53,410	754,750
Field totals	1,113,195	1,019,993	1,144,753	836,652	1,052,763	996,487	742,815	1,026,496	893,268	1,038,720	843,360	970,329	11,648,831
Fort St. John S.E. field—													
Cadomin	60,266	58,678	61,474	44,859	62,368	32,061	59,597	51,546	60,014	61,134	53,645	64,604	670,246
Baldonnel " A "	60,544	56,832	59,327	51,403	82,001	55,006	103,535	94,287	102,960	94,221	47,664	72,346	880,126
Halfway	206,520	173,158	204,022	170,057	180,347	101,590	172,675	159,679	162,338	164,236	123,670	150,386	1,968,678
Belloy	489,627	466,109	502,600	467,932	493,055	266,166	454,808	462,719	459,159	464,016	419,175	450,906	5,396,272
Field totals	816,957	754,777	827,423	734,251	817,771	454,823	790,615	768,231	784,471	783,607	644,154	738,242	8,915,322
Gundy Creek field—													
Baldonnel	21,157	3,458	23,344	6,164	10,683	1,065	—	—	1,614	—	—	—	67,485
Baldonnel-Charlie Lake	—	—	—	—	—	—	—	—	—	—	—	—	—
Field totals	21,157	3,458	23,344	6,164	10,683	1,065	—	—	1,614	—	—	—	67,485
Halfway field—													
Baldonnel	38,821	40,184	44,735	29,576	41,199	33,463	20,457	38,534	38,252	42,134	39,593	37,597	444,545
Halfway	37,681	30,515	33,204	20,702	29,103	21,547	12,147	23,015	24,223	26,900	23,736	16,639	299,412
Field totals	76,502	70,699	77,939	50,278	70,302	55,010	32,604	61,549	62,475	69,034	63,329	54,236	743,957
Highway field—													
Dunlevy	13,875	12,253	12,740	10,237	8,550	2,433	7,948	—	7,763	12,110	7,786	8,725	104,420
Baldonnel	10,271	10,206	11,064	8,190	1,341	—	—	—	6,798	11,295	11,194	9,687	80,046
Mississippian	44,048	42,719	48,118	25,223	5,628	10,760	7,586	—	26,251	59,118	50,294	48,379	368,124
Field totals	68,194	65,178	71,922	43,650	15,519	13,193	15,534	—	40,812	82,523	69,274	66,791	552,590
Jedney field—													
Schooler Creek, upper carbonate	748,564	909,030	931,851	692,172	620,594	542,610	694,894	807,086	680,048	918,244	881,523	917,048	9,343,664
Halfway	460,745	590,334	701,428	472,687	352,883	253,635	379,970	573,181	298,226	689,960	717,775	664,161	6,154,985
Field totals	1,209,309	1,499,364	1,633,279	1,164,859	973,477	796,245	1,074,864	1,380,267	978,274	1,608,204	1,599,298	1,581,209	15,498,649
Kobes-Townsend field—													
Dunlevy	109,418	113,957	115,126	110,575	109,416	55,385	115,352	110,710	104,038	88,856	87,552	84,460	1,204,845
Charlie Lake	138,866	125,803	139,104	93,289	103,335	58,808	116,627	100,838	94,914	109,738	104,498	102,049	1,287,869
Halfway	150,973	178,484	210,504	181,289	194,489	108,406	185,643	188,628	191,584	179,306	195,865	199,572	2,164,743
Mississippian	159,767	107,448	188,265	182,426	183,824	109,568	154,285	176,653	175,374	169,487	180,752	185,420	1,973,269
Field totals	559,024	525,692	652,999	567,579	591,064	332,167	571,907	576,829	565,910	547,387	568,667	571,501	6,630,726
Laprise Creek field—													
Schooler Creek, upper carbonate	562,544	486,404	599,851	566,102	565,920	442,743	219,328	318,197	491,045	567,655	527,784	539,985	5,887,558

TABLE 12.—MONTHLY NATURAL-GAS PRODUCTION BY FIELDS AND POOLS, 1962—*Continued*

Field and Pool	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Laprise Creek East field—													
Schooler Creek, upper carbonate	709,464	622,103	671,069	592,414	658,422	343,786	513,236	339,036	592,221	718,402	722,024	691,626	7,173,803
Laprise Creek West field—													
Schooler Creek, upper carbonate			6,498	18,142	19,233	20,391	9,934	30,706	23,236	36,760	26,903	20,421	212,224
Montney field—													
Bluesky-Gething													
Charlie Lake													
Halfway							6,520	24,753	43,818	41,185	62,694	63,889	242,859
Field totals							6,520	24,753	43,818	41,185	62,694	63,889	242,859
Nig Creek field—													
Schooler Creek, upper carbonate	788,871	698,926	810,748	782,534	731,322	588,086	337,871	465,892	604,727	878,391	776,707	923,189	8,387,264
Parkland field—													
Upper Devonian	221,869	199,704	222,887	182,329	222,751	198,269	192,605	198,515	210,442	192,365	190,213	197,050	2,428,999
Red Creek field—													
Charlie Lake	37,493	41,166	36,741	33,616	33,081	26,157	28,480	13,470	22,340	9,641	24,139	37,097	343,421
Halfway	26,898	25,311	30,821	23,885	27,325	27,765	33,357	29,684	15,199	28,302	17,683	26,652	312,882
Field totals	64,391	66,477	67,562	57,501	60,406	53,922	61,837	43,154	37,539	37,943	41,822	63,749	656,303
Rigel field—													
Gething											207,897	625,535	833,432
Snyder Creek field—													
Dunlevy							14,590	52,357	52,513	52,492	48,594	21,801	242,347
Stoddart field—													
Belloy	447,103	431,380	467,195	359,657	457,493	424,291	468,758	516,660	494,275	519,274	497,743	506,892	5,590,721
Other areas—													
Bluesky-Gething												8,505	8,505
Dunlevy												126,503	126,503
Schooler Creek	39,864	16,012	27,936						66,059	86,887			236,758
Schooler Creek, upper carbonate										3,116	61,791	119,391	184,298
Baldonnel "A"													
Charlie Lake													
Halfway										4,747	99,581	189,211	293,539
Devonian Carbonate		12,908	233,500										246,408
Areas totals	39,864	28,920	261,436						66,059	94,750	161,372	443,610	1,096,011
Totals	10,710,190	10,350,169	11,750,405	9,509,474	9,939,072	7,971,224	8,348,264	9,010,972	9,400,975	11,184,814	10,725,361	12,036,409	120,937,329

NOTE.—The Kotcho Lake, Petitot River, and Sunrise Fields did not produce and therefore are not included in this table.

TABLE 13.—SUMMARY OF DRILLING AND PRODUCTION STATISTICS, 1962

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Drilling authorities—													
Issued	57	54	38	1	25	26	21	16	9	21	31	21	320
Cancelled							2				3		5
Wells spudded	61	53	38	2	17	27	22	13	14	21	33	19	320
Rigs operated during month	53	60	60	24	25	27	28	23	25	30	42	40	[1] 66
Rigs operating at month-end	48	56	20	14	13	16	21	11	16	22	33	19	
Development footage	141,233	163,419	115,764	9,972	74,991	91,378	65,643	47,904	52,917	72,718	95,218	57,379	988,536
Exploratory outpost footage	22,437	20,614	47,375	7,775	1,148	22,989	12,508	10,908	16,443	2,951	47,664	6,197	219,009
Exploratory wildcat footage	92,183	90,066	63,022	13,409	6,170	14,463	8,427	4,375	6,602	8,583	15,637	23,926	346,863
Total footage drilled	255,853	274,099	226,161	31,156	82,309	128,830	86,578	63,187	75,962	84,252	158,519	87,502	1,554,408
Wells abandoned	9	13	27	9	1	3	3	4	1	3	8	15	96
Service wells	2	1	1					1			1	3	9
Oil wells completed[2]	25	28	29	3	12	20	11	8	7	9	5	6	163
Producible oil wells[3]	215	244	275	277	289	307	316	324	331	341	346	352	352
Producing oil wells[3]	171	210	238	228	224	236	248	284	301	316	316	326	
Production in barrels	420,134	560,080	685,751	700,816	748,722	621,333	359,875	842,354	885,600	1,013,872	1,000,650	1,075,033	8,914,220
Average daily production	13,553	20,003	22,121	23,360	24,152	20,711	11,609	27,173	29,520	32,706	33,355	34,678	
Gas wells completed[2]	8	4	12	4	1	8	4	8	2	8	11	7	77
Producible gas wells[3]	301	304	315	316	318	322	327	333	334	341	350	357	357
Producing gas wells[3]	144	150	153	148	148	148	148	139	158	152	170	175	
Production in M s.c.f.	10,710,190	10,350,169	11,750,405	9,509,474	9,939,072	7,971,224	8,348,264	9,010,972	9,400,975	11,184,814	10,725,361	12,036,409	120,937,329
Average daily production	345,490	369,649	379,045	316,982	320,615	265,707	269,300	290,677	313,366	360,800	357,512	388,271	

[1] Rigs operated during 1962.
[2] Oil and gas wells completed count one well for each zone of a multiple completion.
[3] Monthly producible and producing wells count one well for each multiple completion.

TABLE 14.—MONTHLY CRUDE-OIL[1] DISPOSITION, 1962

(Quantities in barrels.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Field													
Production	420,134	560,080	685,751	700,816	748,722	621,333	359,875	842,354	885,600	1,013,872	1,000,650	1,075,033	8,914,220
Opening inventory	35,886	30,758	36,619	44,713	40,638	39,858	37,429	46,571	40,889	56,765	37,498	36,197	35,886
Receipts	5,471	8,230	22,212	2,783	3,824	15,973	8,760	2,838	9,025	5,121	3,400	6,491	94,128
Losses and adjustments	−1,857	255	597	———	1,626	7,957	−1,022	−27	−114	−323	———	———	7,092
Transfers	4,193	11,469	19,566	2,553	12,511	11,962	6,577	3,045	9,247	5,700	2,946	8,091	97,860
Closing inventory	30,758	36,619	44,713	40,638	39,858	37,429	46,571	40,889	56,765	37,498	36,197	38,998	38,998
Well-head sales	6,497	7,238	7,047	176	144	1,414	758	1,346	1,148	2,437	2,248	2,524	32,977
Refinery sales	421,900	543,487	672,659	704,945	739,045	618,402	353,180	846,510	868,468	1,030,446	1,000,157	1,068,108	8,867,307
Total sales	428,397	550,725	679,706	705,121	739,189	619,816	353,938	847,856	869,616	1,032,883	1,002,405	1,070,632	8,900,284
Transporters													
Receipts—													
Field crude	421,900	543,487	672,659	704,945	739,045	618,402	353,180	846,510	868,468	1,030,446	1,000,157	1,068,108	8,867,307
Plant condensate	———	———	———	48,522	51,435	31,044	25,567	40,585	54,137	58,512	77,816	86,219	473,837
Opening inventory	290,354	727,183	796,505	815,044	1,038,352	976,047	846,834	818,472	986,969	976,176	1,043,906	1,062,752	290,354
Losses and adjustments	−15,095	25,577	−20,018	−15,976	−11,689	4,087	9,030	−14,389	−35,296	21,876	−6,435	−5,365	−63,693
Closing inventory	727,183	796,505	815,044	1,038,352	976,047	846,834	818,472	986,969	976,176	1,043,906	1,062,752	998,484	998,484
Deliveries—													
B.C. refineries	166	448,588	674,138	526,695	824,594	717,941	343,595	560,807	890,047	910,917	970,099	1,105,387	7,972,974
Alberta	———	———	———	———	———	———	———	———	———	———	———	———	———
Export	———	———	———	19,440	39,880	41,438	28,482	168,209	78,647	88,435	95,463	118,573	678,567
Other	———	———	———	———	———	15,193	26,002	3,971	———	———	———	———	45,166
Total deliveries	166	448,588	674,138	546,135	864,474	774,572	398,079	732,987	968,694	999,352	1,065,562	1,223,960	8,696,707
B.C. Refineries													
Receipts—													
B.C. crude	166	448,588	674,138	526,695	824,594	717,941	343,595	560,807	890,047	910,917	970,099	1,105,387	7,972,974
Alberta crude	2,533,084	1,965,519	1,952,111	1,782,174	1,870,935	1,070,523	966,769	1,419,393	1,514,511	1,544,568	1,372,633	1,546,427	19,538,647
Opening inventory	526,932	515,608	521,707	516,227	489,081	605,543	568,417	556,658	730,721	645,130	532,761	547,775	526,932
Losses and adjustments	−1,646	21,351	2,313	−2,812	−17,493	15,540	1,363	−22,509	1,966	215	907	985	180
Closing inventory	515,608	521,707	516,227	489,081	605,543	568,417	556,658	730,721	645,130	532,761	547,775	608,860	608,860
Sales	———	———	———	———	———	———	———	———	19,515	———	———	———	19,515
Refinery runs	2,546,220	2,386,657	2,629,416	2,338,827	2,596,560	1,810,050	1,320,760	1,828,646	2,468,668	2,567,639	2,326,811	2,589,744	27,409,998

[1] Includes condensate delivered to transporters. For complete summary of condensate production and disposition *see* Table 16.

NOTE.—Opening inventory for 1962 corrected for inventory adjustments during year.

TABLE 15.—MONTHLY NATURAL-GAS DISPOSITION, 1962

(Quantities in M s.c.f.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Field													
B.C. production—													
Wet gas	10,404,107	10,078,418	11,450,522	9,259,207	9,641,860	7,704,636	8,113,558	8,795,220	9,125,488	10,923,808	10,464,040	11,777,792	117,738,656
Dry gas	306,083	271,751	299,883	250,267	297,212	266,588	234,706	215,752	275,487	261,006	261,321	258,617	3,198,673
Associated gas	315,121	356,186	500,303	502,237	666,723	601,490	337,158	690,441	766,978	934,750	1,017,591	1,100,376	7,789,354
Totals	11,025,311	10,706,355	12,250,708	10,011,711	10,605,795	8,572,714	8,685,422	9,701,413	10,167,953	12,119,564	11,742,952	13,136,785	128,726,683
Flared	315,121	368,139	711,496	504,585	724,957	450,277	292,850	672,338	731,156	860,633	946,030	1,055,979	7,633,561
Lease use	160,638	67,804	148,927	76,770	106,872	109,032	142,985	98,023	138,453	310,181	87,906	65,846	1,513,437
Delivered to gas-gathering system	10,549,552	10,270,412	11,390,285	9,430,356	9,773,966	8,013,405	8,249,587	8,931,052	9,298,344	10,948,750	10,709,016	12,014,960	119,579,685
Gas-gathering System													
Received from B.C. producers	10,549,552	10,270,412	11,390,285	9,430,356	9,773,966	8,013,405	8,249,587	8,931,052	9,298,344	10,948,750	10,709,016	12,014,960	119,579,685
Line loss and metering difference	45,369	76,008	9,421	76,500	−49,871	−4,163	−63,015	−38,339	−58,692	21,895	8,293	32,208	55,614
Delivered to—													
Westcoast Transmission	313,151	268,108	296,795	247,719	295,318	264,930	234,706	215,752	275,401	253,105	251,224	247,046	3,163,255
Gas plants	10,191,032	9,926,296	11,084,069	9,106,137	9,528,519	7,752,638	8,077,896	8,753,639	9,081,635	10,673,750	10,449,499	11,735,706	116,360,816
Gas Plants													
Receipts, B.C. gas	10,191,032	9,926,296	11,084,069	9,106,137	9,528,519	7,752,638	8,077,896	8,753,639	9,081,635	10,673,750	10,449,499	11,735,706	116,360,816
Plant fuel	163,960	151,377	155,118	131,224	108,500	119,559	128,387	167,229	200,387	249,940	244,449	237,003	2,057,133
Processing shrinkage	515,042	489,412	586,721	426,769	443,785	379,309	394,733	453,596	385,010	540,062	535,400	561,964	5,711,803
Plant waste and metering difference	151,230	251,250	280,349	168,809	471,611	303,794	189,564	118,805	309,432	160,046	224,837	425,411	3,055,138
Marketable residual gas	9,360,800	9,034,257	10,061,881	8,379,335	8,504,623	6,949,976	7,365,212	8,014,009	8,186,806	9,723,702	9,444,813	10,511,328	105,536,742
Transporters' Receipts													
Marketable residual gas	9,360,800	9,034,257	10,061,881	8,379,335	8,504,623	6,949,976	7,365,212	8,014,009	8,186,806	9,723,702	9,444,813	10,511,328	105,536,742
B.C. dry gas	313,151	268,108	296,795	247,719	295,318	264,930	234,706	215,752	275,401	253,105	251,224	247,046	3,163,255
Alberta dry gas	3,001,222	2,489,011	2,819,382	2,115,442	1,909,384	1,756,304	1,571,367	981,385	1,981,594	2,276,286	2,711,018	2,946,535	26,558,930
Totals	12,675,173	11,791,376	13,178,058	10,742,496	10,709,325	8,971,210	9,171,285	9,211,146	10,443,801	12,253,093	12,407,055	13,704,909	135,258,927
Line loss and metering difference	266,735	144,018	407,154	63,981	242,210	39,267	301,097	242,134	230,086	312,286	269,502	390,931	2,909,401
Sales—													
British Columbia—													
Northeast	233,269	215,743	200,478	131,174	109,935	71,132	73,215	84,166	101,330	148,619	168,445	286,609	1,824,115
Interior	1,034,877	808,012	858,480	602,751	580,711	481,954	473,800	486,865	543,749	745,322	816,131	996,679	8,429,331
Lower Mainland	2,712,535	2,124,699	2,407,888	1,817,007	1,708,626	1,485,654	1,064,687	1,156,613	1,364,765	1,814,089	2,462,434	2,846,352	22,965,349
Totals	3,980,681	3,148,454	3,466,846	2,550,932	2,399,272	2,038,740	1,611,702	1,727,644	2,009,844	2,708,030	3,447,010	4,129,640	33,218,795

TABLE 15.—MONTHLY NATURAL-GAS DISPOSITION, 1962—*Continued*

(Quantities in M s.c.f.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Transporters' Receipts—Continued													
United States—													
B.C. gas	6,500,281	6,770,441	7,868,123	6,574,139	6,643,526	5,201,407	6,011,020	6,495,413	6,660,860	7,537,350	6,868,404	7,316,455	80,447,419
Alberta gas	1,927,476	1,728,463	1,435,935	1,553,444	1,424,317	1,691,796	1,247,466	745,955	1,543,011	1,695,427	1,822,139	1,867,883	18,683,312
Totals	8,427,757	8,498,904	9,304,058	8,127,583	8,067,843	6,893,203	7,258,486	7,241,368	8,203,871	9,232,777	8,690,543	9,184,338	99,130,731
Total sales	12,408,438	11,647,358	12,770,904	10,678,515	10,467,115	8,931,943	8,870,188	8,969,012	10,213,715	11,940,807	12,137,553	13,313,978	132,349,526
B.C. Purchasers and Distributors													
Metering difference	—200,080	—166,723	—181,817	—234,850	—123,816	—113,125	—70,521	—89,571	—97,767	—140,157	—35,010	16,989	—1,436,448
Received from transporters	4,180,761	3,315,177	3,648,663	2,785,782	2,523,088	2,151,865	1,682,223	1,817,215	2,107,611	2,848,187	3,482,020	4,112,651	34,655,243
Sales in British Columbia—													
Residential	1,973,897	1,552,395	1,589,906	1,120,544	838,536	470,687	384,805	382,254	482,997	909,529	1,339,689	1,738,364	12,783,603
Commercial	605,502	543,138	521,583	372,738	268,533	188,068	157,887	150,538	180,789	291,484	403,637	512,020	4,195,917
Industrial	1,445,016	1,259,915	1,391,985	1,347,862	1,398,364	1,495,373	1,120,424	1,238,017	1,368,126	1,474,801	1,534,105	1,638,209	16,712,197
Metering difference	156,346	—40,271	145,189	—55,362	17,655	—2,263	19,107	46,406	75,699	172,373	204,589	224,058	963,526
Total sales	4,024,415	3,355,448	3,503,474	2,841,144	2,505,433	2,154,128	1,663,116	1,770,809	2,031,912	2,675,814	3,277,431	3,888,593	33,691,717

TABLE 16.—MONTHLY NATURAL-GAS LIQUIDS AND SULPHUR DISPOSITION, 1962

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Condensate/Pentanes Plus													
Production (bbl.)	58,529	52,477	62,402	54,565	73,818	60,201	65,939	69,178	74,117	90,883	87,801	97,535	847,445
Opening inventory	113,854	109,059	105,687	126,672	104,418	79,668	74,283	84,889	90,061	86,161	101,556	113,502	113,854
Receipts	592	11,635	—	—	—	—	—	—	—	—	—	—	12,227
Losses and adjustments	515	—	—	−6,803	−602	−698	−1,181	−2,745	−1,963	−3,355	−2,621	−5,672	−25,125
Transfers	—	—	—	—	30,792	50	200	500	377	645	—	343	32,907
Closing inventory	109,059	105,687	126,672	104,418	79,668	74,283	84,889	90,061	86,161	101,556	113,502	24,665	24,665
Sales—													
British Columbia—													
Northeast B.C. refineries	32,041	66,396	41,106	27,106	29,684	39,591	30,306	25,683	26,821	34,731	12,582	11,164	377,211
Other B.C. refineries	187	1,088	311	—	150	979	347	50	143	177	1,140	820	5,392
Alberta	31,173	—	—	—	—	—	—	—	—	—	—	—	31,173
Export	—	—	—	56,516	38,544	25,664	25,661	40,518	52,639	43,290	64,754	179,717	527,303
Total sales	63,401	67,484	41,417	83,622	68,378	66,234	56,314	66,251	79,603	78,198	78,476	191,701	941,079
Butane													
Production (bbl.)	33,710	28,209	36,990	29,792	24,217	25,998	26,607	32,435	31,273	38,572	39,949	39,806	387,558
Opening inventory	3,382	1,158	2,873	4,116	4,191	2,627	3,395	2,460	1,060	3,486	2,191	3,179	3,382
Receipts	—	—	—	—	—	—	—	—	—	—	—	—	—
Losses, transfers, consumed	11,705	15,599	23,278	22,314	18,127	19,777	21,070	24,657	17,550	15,307	17,111	15,914	222,409
Closing inventory	1,158	2,873	4,116	4,191	2,627	3,395	2,460	1,060	3,486	2,191	3,179	4,463	4,463
Sales—													
British Columbia	9,533	4,433	9,185	5,942	7,654	5,453	6,472	7,695	—	7,934	5,529	8,627	78,457
Alberta	825	252	574	—	—	—	—	—	162	248	307	—	2,368
Export	13,871	6,210	2,710	1,461	—	—	—	1,483	11,135	16,378	16,014	13,981	83,243
Total sales	24,229	10,895	12,419	7,403	7,654	5,453	6,472	9,178	11,297	24,560	21,850	22,608	164,068
Propane													
Production (bbl.)	24,321	22,081	21,090	8,208	12,627	15,259	13,926	15,066	19,152	19,873	21,193	24,199	216,995
Opening inventory	2,559	807	2,285	3,088	2,410	897	2,017	3,166	1,782	1,670	2,482	1,274	2,559
Losses, transfers, consumed	—	152	—	−2	1,371	2,813	1,265	1,223	1,472	1,029	805	677	10,805
Closing inventory	807	2,285	3,088	2,410	897	2,017	3,166	1,782	1,670	2,482	1,274	2,415	2,415
Sales—													
British Columbia	17,883	14,746	13,607	6,609	9,660	8,419	8,129	11,345	15,226	13,506	15,014	15,516	149,660
Alberta	5,625	3,766	3,502	980	1,469	1,094	1,179	1,658	1,479	2,411	3,537	4,317	31,017
Northwest Territories	282	295	291	93	178	275	272	183	366	280	192	238	2,945
Yukon	1,067	722	1,766	671	832	656	510	1,050	357	944	1,125	1,060	10,760
Ontario	—	—	—	—	—	—	—	470	—	—	—	—	470
Export	1,216	922	1,121	535	630	882	1,422	521	364	891	1,728	1,250	11,482
Total sales	26,073	20,451	20,287	8,888	12,769	11,326	11,512	15,227	17,792	18,032	21,596	22,381	206,334

TABLE 16.—MONTHLY NATURAL-GAS LIQUIDS AND SULPHUR DISPOSITION, 1962—*Continued*

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Sulphur													
Production (short tons)	6,078	6,110	7,095	5,361	5,367	4,467	4,581	5,793	4,186	6,761	6,463	6,925	69,187
Opening inventory	101,153	103,469	105,336	107,556	109,125	110,525	111,168	109,919	110,521	109,337	110,129	110,329	101,153
Losses and adjustments	....	....	....	....	....	....	....	....	....	....	....	....	....
Closing inventory	103,469	105,336	107,556	109,125	110,525	111,168	109,919	110,521	109,337	110,129	110,329	112,553	112,553
Sales—													
British Columbia	1,309	1,636	2,102	1,467	1,665	1,444	1,510	1,455	1,595	2,099	2,429	1,241	19,952
Export	2,453	2,607	2,773	2,325	2,302	2,380	4,320	3,736	3,775	3,870	3,834	3,460	37,835
Total sales	3,762	4,243	4,875	3,792	3,967	3,824	5,830	5,191	5,370	5,969	6,263	4,701	57,787

NOTE.—Opening inventories for 1962 corrected for inventory adjustments during year. Reports for propane, butane, and sulphur are for Taylor gas plant only.

TABLE 17.—MONTHLY VALUE OF CRUDE OIL, NATURAL GAS, NATURAL-GAS LIQUIDS, AND SULPHUR TO PRODUCER, 1962

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Crude oil	$790,183	$1,022,522	$1,264,383	$1,304,749	$1,412,461	$1,220,087	$663,449	$1,605,937	$1,655,080	$1,961,784	$1,908,135	$2,036,532	$16,845,302
Natural gas	891,949	848,049	946,829	804,350	843,612	692,474	722,262	781,515	805,873	948,898	919,645	1,020,867	10,226,323
Products—													
Natural-gas liquids	$67,070	$60,699	$70,433	$60,754	$74,605	$64,984	$70,093	$75,334	$78,185	$84,451	$83,008	$78,485	$868,101
Sulphur	7,488	9,365	11,640	5,072	5,237	4,371	4,597	6,700	4,123	10,357	9,990	10,621	89,561
Totals	$74,558	$70,064	$82,073	$65,826	$79,842	$69,355	$74,690	$82,034	$82,308	$94,808	$92,998	$89,106	$957,662
Total values	$1,756,690	$1,940,635	$2,293,285	$2,174,925	$2,335,915	$1,981,916	$1,460,401	$2,469,486	$2,543,261	$3,005,490	$2,920,778	$3,146,505	$28,029,287

NOTE.—Values include amendments received to March 31, 1963.

TABLE 18.—NATURAL-GAS PIPE-LINES, 1962

Company	Source of Natural Gas	Transmission-lines		Compressor Stations		Present Daily Capacity (M S.C.F.)	Gathering and Distribution Lines		Areas Served by Distributors
		Size (In.)	Mileage	Number	Horsepower		Size (In.)	Mileage	
British Columbia Hydro and Power Authority	Westcoast Transmission Co. Ltd.	30	18.0	......	......	188,000	......	2,523.0	Lower Mainland of British Columbia
		24	12.0	......	......	......	......	......	
		20	13.6	......	......	......	......	......	
		18	36.0	......	......	......	......	......	
		12	25.0	......	......	......	......	......	
Columbia Natural Gas Ltd.	Alberta Natural Gas Co. Ltd.	6	38.5	......	......	......	8	1.7	
		4	1.0	......	......	......	6	2.5	
		3	14.0	......	......	......	4	5.4	
		3, 4	23.0	......	......	......	3	8.9	
							2	20.5	
							1¼	25.2	
Gas Trunk Line of British Columbia Ltd.	Beg field	......	......	......	......	......	16	27.4	
							6⅝	5.9	
	Boundary Lake field	......	......	......	......	......	16	31.4	
	Jedney and Bubbles fields	......	......	......	......	......	12¾	31.5	
							10¾	7.0	
	Laprise Creek field	......	......	......	......	......	12¾	23.8	
	Nig Creek	......	......	......	......	......	16	28.3	
Inland Natural Gas Co. Ltd.	Westcoast Transmission Co. Ltd.	12	152.8	......	......	50,000	8	12.2	Interior area of British Columbia
		10	116.0	......	......	......	6	17.5	
		8	15.0	......	......	......	4	54.4	
		6	33.4	......	......	......	3	30.4	
		4	70.2	......	......	......	2	272.4	
		2	5.2	......	......	......	1½	20.7	
							1¼	11.9	
Northland Utilities (B.C.) Ltd.	Peace River Transmission	......	9.4	......	......	......	......	46.7	Dawson Creek, Pouce Coupe, and Rolla
Plains Western Gas & Electric Co. Ltd.	Westcoast Transmission Co. Ltd.	6	0.3	......	......	......	4	5.6	Fort St. John, Aennofield, and Taylor
		4	10.8	......	......	......	3	1.1	
		3	5.7	......	......	......	2	19.5	
		2	0.3	......	......	......	1¼	0.1	
Sun Oil Co. Ltd. (high-pressure system)	Blueberry field	......	......	......	......	......	6	2.4	
							4	4.6	
							3	10.7	
							2	6.2	

Sun Oil Co. Ltd. (low-pressure system)	Blueberry field	—	—	1	495	20,000	10¾	2.7
							8⅝	4.9
							6⅝	2.8
							4½	0.6
							3½	1.6
Sun Oil Co. Ltd.	Buick Creek field	—	—	—	—	15,000	8	1.5
							6	1.0
							4	1.2
Westcoast Transmission Co. Ltd.	McMahon Plant and 26-in. line from Alberta	30	646.6	4	57,690	450,000[1]	—	—
	Alberta	26	32.5	—	—	215,000	—	—
	Alaska Highway system	—	—	—	—	—	26	37.5
							20	19.3
							18	17.9
							12¾	9.9
	Blueberry West field	—	—	—	—	—	8⅝	6.7
	Boundary Lake field	—	—	—	—	—	16	0.5
	Buick Creek field	—	—	—	—	—	10¾	5.6
	Buick Creek West field	—	—	—	—	—	20	16.2
	Dawson Creek field	—	—	—	—	—	8⅝	5.4
	Fort St. John field	—	—	—	—	—	18	7.8
							10¾	0.9
							8⅝	0.7
	Fort St. John Southeast field	—	—	—	—	—	12¾	4.0
	Gundy Creek field	—	—	—	—	—	10¾	6.1
	Kobes-Townsend field	—	—	—	—	—	12¾	18.9
							8⅝	5.5
	Montney field	—	—	—	—	—	4½	7.4
	Parkland field	—	—	—	—	—	8⅝	6.6
	Red Creek field	—	—	—	—	—	4½	2.9
	Rigel field	—	—	—	—	—	{12¾ / 10¾}	19.8
	Stoddart field	—	—	—	—	—	8⅝	6.3
	Texaco field	—	—	—	—	—	8	6.6

[1] Minimum.

Table 19.—Gas-processing Plants, 1962

Operator	Location	Fields Served	Plant Type	Date on Stream	Plant Capacity, Thousand M S.C.F./Day		Natural-gas Liquids	Residual Gas to—
					In	Out		
Pacific Petroleums Ltd.	Taylor	All B.C. producing gas-fields except Parkland, Dawson Creek, and Boundary Lake.	Inlet separator, M.E.A. treating dry dessicant, dehydration oil absorption, distillation	1957	365	330	Condensate/pentanes plus	Westcoast Transmission Co. Ltd. and Plains Western
Gas Trunk Line of British Columbia Ltd.	N.W. ¼ Sec. 10, Tp. 85, R. 14, W. of 6th M. (Boundary Lake area).	Boundary Lake	Inlet separator, M.E.A. treating absorption, condensate stabilization	......	10	9.5	Condensate	Westcoast Transmission Co. Ltd.

Table 20.—Sulphur Plants, 1962

Name	Location	Raw Material	Principal Product	Capacity (Long Tons)	Remarks
Jefferson Lake Petrochemical Co. of Canada Ltd.	Taylor	Hydrogen sulphide	Sulphur	300	Began operation in November, 1957

Table 21.—Crude-oil Pipe-lines, 1962

Company	Fields Served	Size and Mileage of Main and Lateral Lines		Pumping Stations		Present Capacity (Bbl./Day)	Gathering Mileage	Throughput (Bbl./Day)	Storage Capacity (Bbl.)
		Size (In.)	Mileage	Number	Capacity (Bbl./Day)				
B.C. Oil Transmission Co. Ltd.	Blueberry	8⅝ 12¾	62.8 2.23	1	12,000	12,000	11.97	—	74,800
Trans-Prairie Pipelines (B.C.) Ltd.	Beatton River, Beatton River West, Boundary Lake, Milligan Creek, Peejay, Peejay West, Wildmint	4 4½ 6⅝ 8⅝	4.5 8.6 24.3 103.0	6	—	52,000[1] 84,000[2]	49.9	22,600[3]	60,000
Western Pacific Products and Crude Oil Pipelines Ltd.		12	505	4	45,000	45,000	—	22,428	340,000

[1] Boundary Lake.
[2] Terminal to Pacific Products and Crude Oil line.
[3] Average for 1962.

TABLE 22.—CRUDE-OIL REFINERIES, 1962

Name	Location of Refinery	Type of Refinery	Date of First Operation	Source of Crude	Crude-oil Capacity (Bbl. per Calendar Day)	Storage Capacity (Bbl.)	Cracking-plant Units	Cracking Capacity (Bbl. per Calendar Day)	Other Units
The British American Oil Co. Ltd.	Port Moody	Comp.	1958	B.C. and Alberta	18,000	1,500,000	Catalytic-fluid	8,480	Catalytic reformer, distillate desulphurization, alkylation-sulphuric acid.
Imperial Oil Ltd.	Ioco	S.C.A.	1915	B.C. and Alberta	32,000	2,918,000	Catalytic-fluid	9,000	Catalytic polymerization, powerformer.
Royalite Oil Co. Ltd.[1]	Kamloops	Comp.	1954	B.C.	5,000	400,000	Catalytic-fluid	1,400	Catalytic polymerization, platformer, naphtha hydrogen treater, distillate hydrogen treater.
Shell Oil Co. of Canada Ltd.	Shellburn	Comp.	1932	B.C. and Alberta	21,000	2,455,300	Catalytic-fluid Thermal visbreaking	6,000 3,000	Catalytic polymerization platformer, vacuum flashing, solvent fractionation distillate hydrotreater.
Standard Oil Co. of British Columbia Ltd.	North Burnaby	Comp.	1936	B.C. and Alberta	18,000	1,441,500	Catalytic-fluid	8,100	Catalytic polymerization, catalytic reformer, lube-oil blending plant, asphalt.
Pacific Petroleums Ltd.	Taylor	Comp.	1957, 1961	B.C.	3,500	400,000	Catalytic-fluid	2,000	Alkylation, asphalt, depropanizer, pentane splitter.

[1] Figures for Royalite are stream-day capacities.
Symbols: S.C.A.—Skimming, cracking, and asphalt; Comp.—complete.

Inspection of Lode Mines, Placer Mines, and Quarries

By J. W. Peck, Chief Inspector of Mines

CONTENTS

FATAL ACCIDENTS

During 1962 there were nine fatal accidents connected with lode mines, placer mines, and quarries. This was three more than in 1961.

The following table shows the mines at which fatal accidents occurred during 1962, with comparative figures for 1961:—

Mine	Mining Division	Number of Fatal Accidents	
		1962	1961
Bralorne	Lillooet	—	1
Capilano Crushing	Vancouver	1	—
Cassiar	Liard	1	—
Clayburn	New Westminster	1	—
Craigmont	Nicola	1	—
Glacier Gulch	Omineca	1	—
Granduc	Skeena	1	—
Iron Mask	Greenwood	—	1
Keller P.M.L.	Fort Steele	—	1
Mother Lode	Greenwood	—	2
Sunro	Victoria	—	1
Sullivan	Fort Steele	2	—
Zeballos Iron	Alberni	1	—
Totals		9	6

The following table classifies fatal accidents as to cause and location:—

Cause	Number	Location
Falls of person	2	Surface.
Fall of rock	1	Surface.
Fall of tree	1	Surface.
Subsidence	1	Underground.
Explosives	2	Underground.
Snowslide	1	Surface.
Vehicles	1	Surface.
Total	9	

A description of all fatal accidents follows.

Roy McConnell, aged 54, married, with three children, and employed as a driller by Clayburn-Harbison Ltd., was killed by a fall of rock in the company's No. 9 pit at Kilgard at about 2.40 p.m. on May 8th.

The No. 9 pit is a quarry development of a clay deposit. At the time of the accident the working-face was approximately 34 feet high, comprised of 12 feet of clay and 22 feet of shale. Old mine workings are in the lower or clay portion and one tunnel had been uncovered in the course of quarrying, almost directly below the face where the accident occurred. The usual method of quarrying was to drill and blast 20-foot vertical holes, horizontal lifter holes being used at the base of the face as required. The blasted material is loaded out with mobile loaders, and the face is scaled down from the top.

On the morning of May 8th, McConnell and a truck-driver were engaged in the secondary breaking of the muckpile of clay which had been blasted at quitting time the previous day. At 1.30 p.m. the truck-driver left with the loader for other duties. Another truck-driver saw McConnell at 2.30 p.m., but when he returned again at 2.45 p.m., he found the deceased face down on the muckpile bleeding from the head. There was no indication of pulse or breathing. Medical help was obtained, but it was later ascertained death was probably instantaneous due to a broken neck and fracture of the base of the skull.

McConnell had been working about one-quarter of the way up the muckpile and some 20 feet from the working-face. The height of the working-face was approximately 34 feet, and the muckpile, which was fairly flat on top, extended from a point about 11 feet below the top of the face to a point about 35 feet horizontally from the toe of the face. The average slope of the muckpile was about 25 degrees. The lower 12 feet of the face in this area had been undermined by an old tunnel. The evidence was that a piece of shale, with a volume of about 25 cubic yards, fell from the upper part of the face above the muckpile. Most of the fallen material remained on top of the pile but three or four chunks, averaging 1½ cubic yards in size, rolled down the pile. One of these apparently struck the deceased.

The working-face at the top of the pile had been examined by the mine foreman on the morning of May 8th. The area appeared safe at that time. After the accident, a strong slip was evident running parallel to the face and about 5 feet back from it. This slip was not visible on the top of the bench prior to the accident. The combination of heavy rain in the afternoon and possible underground caving probably contributed to the fall of material from the hidden slip face.

The Coroner's jury returned a verdict of accidental death with no blame attached.

William Leslie Pratt, aged 47, married, and employed as a shiftboss at the Sullivan mine of The Consolidated Mining and Smelting Company of Canada, Limited, was fatally injured at 11 a.m. on June 18th, when the bulkhead on which he was standing was destroyed by a blast from below.

Pratt had been supervising the blasting of a bulkhead which had been placed at the junction of a sublevel and a vertical raise, 45 feet from a stope below. The raise extended a further 40 feet above the sublevel, or 30 feet above the high point of a sloping muckpile which covered the bulkhead. Two miners had been detailed by Pratt to place thirty sticks of explosives below the bulkhead, and this charge was connected by primer cord to the stope below. Pratt left one man at this point to ignite the primer cord while he took the other man to inspect the sublevel, the instructions being he would send word when to blast. While en route to the sublevel, Pratt instructed another miner who was working in the vicinity to warn two miners nearby to retreat to a place of safety. This miner was not aware of where Pratt was going, and assumed he was to inform the blaster when all men were out from the vicinity. This he did, but the blaster took this as a message from Pratt and ignited the charge. In the meantime Pratt and the blaster's partner had reached the muckpile which covered the bulkhead at the sublevel. Pratt spent some time on this muckpile endeavouring to measure the face of the raise. The other man was back a short distance in the sublevel. When the blast went off the bulkhead collapsed and Pratt fell with the timbers and muck, landing in the stope 45 feet below. His body was quickly recovered, but death must have been instantaneous as there were multiple fractures to the skull with severe brain injury while the heart was displaced with rupturing of the right and left auricles and ascending aorta.

The verdict of the inquest was that death was accidental with no blame attached. The jury recommended " that the blasting procedures be strictly adhered to according to the blasting regulations of the Sullivan mine."

Harold Dean Johnson, aged 41, married with nine children, and employed as a miner and spare shiftboss at the Sullivan mine was killed by a blast when he drilled into a misfired hole at 8.30 p.m. on July 3rd.

Johnson was engaged in the development of draw-holes above a new scraper drift. The draw-hole in which he was working had been driven its full distance before the turnback, and Johnson was in the act of drilling the first round of holes on the left side of the draw-hole so that a break-through could be made to the adjacent draw-hole. He had completed nine holes, collared another four, and was in the act of collaring the fourteenth hole when the drill apparently entered a bootleg hole approximately 4 to 6 inches from the side of the draw-hole. This hole had been drilled during the driving of the draw-hole, and its position indicated it was part of the second round back from the face. At that time it had been loaded with AN/FO explosive with a primer cartridge and fuse blasting-cap at the bottom of the hole. It is believed it was this cartridge and cap which was struck by the drill. The resulting explosion was heard by a miner working in a nearby draw-hole, who found Johnson apparently dead from extensive injuries to body and head. The medical practitioner's report was that death would have been instantaneous due to multiple injuries to the head and thorax, and damage to the brain and right lung.

The bootleg hole in question was part of a round which was blasted on June 14th. On June 15th Johnson and his partner reblasted two holes which had misfired. The reblasting was done by removing just sufficient of the AN/FO to insert a new primer. The working-place was then idle until June 22nd and 25th, when the next round at the face was drilled and blasted. Some barring down and washing was done on June 29th, but it is not known if Johnson washed out any bootlegs on the day of the accident. The shiftboss visited the working-place about three hours prior to the accident, and his examination did not reveal any misfired holes.

The Coroner's jury returned a verdict of accidental death with no blame attached to anyone but added the recommendation " that a form be kept showing missed holes or bootlegs, who reported them, and to whom, and signed by the miners and shiftboss; and further instructions on N.C.N. (AN/FO) be carried out to underground men."

NOTE.—The Department of Mines and Petroleum Resources issued a circular on March 2, 1962, pointing out that any AN/FO remaining in a hole after a blast is probably insensitive, and thus for a reblast the AN/FO should all be washed out of the hole and high explosives used. Only in this way can there be some assurance that the original primer will be detonated.)

Donald L. Christianson, aged 25, married, and employed as a meter operator by Seismograph Service Corporation of Canada, was fatally injured on July 17th when he fell into a crevasse on the Salmon Glacier while engaged in seismic work his company was doing for Granduc Mines Limited.

The seismic work was for the purpose of determining the depth of glacial ice. For this a survey line was run on the glacier and a number of shot points and recording stations established. Three men were involved on the day of the accident. The surveyor was at the transit, a geophysicist was pacing to the next point, and Christianson was walking behind him carrying a 12-foot stadia rod. The time was about 11.45 a.m. The geophysicist noticed some bad ground ahead so he veered to the right. Christianson also veered to the right but broke through about 3 feet of snow to disappear into a crevasse. Help was obtained from other nearby personnel on the glacier, but although Christianson was located alive about 35 feet down the crevasse, the only rescue equipment immediately available was a roll of lamp cord. This was doubled up and passed down to him and he was able to wrap it around himself. A length of rope one-half inch in diameter and 35 feet long was then obtained, and it also was passed down to Christianson who was able to grasp it. He was then pulled up to the lip of the crevasse, which was about 4 feet wide at the top, but he was unable to get over the snow overhang. All this time he could be heard but not seen. Apparently he let go of the rope at the overhang, and on dropping back the lamp cord broke, allowing him to fall much farther down into the crevasse.

Rescue attempts continued with the use of a tractor brought to the scene, but the attempts were futile because the winch cable on the tractor was too short. Radio communications with the main Granduc camp were also poor, but luckily an aircraft flying overhead was able to relay a message so that more rescue help could be obtained from Stewart and Granduc via helicopter. During this time Christianson could be heard, but he became incoherent about 2 p.m., and all sounds ceased about 3 p.m. The final rescue was not completed until 8 p.m., and this was only through the perseverance of a workman, Frederick Hasselberg, who was able to descend 80 to 85 feet to the point where the body was wedged.

The Coroner's jury rendered a verdict that death was accidental and caused by a fractured skull and suffocation. It recommended that in future no men be allowed to work on glaciers without the proper safety equipment, and that a man capable of handling an emergency of this nature be readily available.

James Calvin Hayden, aged 30, married, with two children, and employed as a bulldozer operator by Capilano Crushing Co. Ltd., was fatally injured about 1.45 p.m. on August 13th when he fell into Bishop Creek, a stream flowing into the west shore of Indian Arm, near Vancouver.

Hayden and another bulldozer operator were operating machines in a gravel pit near Bishop Creek. Hayden was on the upper bench above the crusher, bulldozing glacial till toward the crusher, when he decided to add water to the radiator, which had been slightly damaged when he was operating the bulldozer the day before. Previously, when water had been required it was obtained below some falls on the creek or from a seepage pool on the north side of the pit. Hayden decided to obtain the water from a point on the creek as close as possible to the tractor. He took the bucket from his machine and obtained a second bucket from the other bulldozer operator and proceeded to the creek.

Some ten to fifteen minutes later, because he was nowhere to be seen, a search was made for him. One bucket was observed lying on its side on the granite outcrop in the stream bed. The area concerned is under water only during flood periods, but a 3-foot band of sloping, wet, slime-covered rock had to be passed over on the way to the water. A scraped section was noted below the bucket location and was possibly caused when Hayden passed over it. This slope continued at 15 to 20 degrees downward a distance of 20 feet to a bluff edge which dropped off about 50 feet to a steep granite slope at the edge of a pothole. Investigation in this area indicated a blood stain near the water's edge and a wrist-watch cover-glass.

Subsequently Hayden's body was observed in the pothole and was removed by grapple. This was approximately three hours after he went to the creek for water. Because of the steepness of the canyon walls, it was not possible to examine the body until it was removed from the creek. The post-mortem examination indicated cuts and a blow to the forehead, skull fracture, fractured second and fifth ribs, left side, lungs ballooned by hæmorrhage, and froth in air passage. Death was due to drowning in this froth, plus hæmorrhage, and not to water, as none of the latter was found in the mouth, nose, or lung passages. It is believed death occurred within two to three minutes of the fall.

It was learned Hayden was wearing smooth composition soled shoes, which would slip easily on the slime surface. In addition, he wore prescription dark glasses, which may have affected his vision when walking over the slippery area. It was also learned it was the first time an employee had entered the creek in this area in order to obtain water, but as water had been obtained from the creek at a lower level it was reasonable to assume this practice would be continued elsewhere. The Coroner's jury inquiring into the accident returned a verdict of accidental death with the recommendation that safety rails or ropes be placed at water-hole locations.

John Francis Haffey, aged 24, single, and employed as a truck-driver at the open-pit mine of Cassiar Asbestos Corporation Limited, was fatally injured when the truck he was driving apparently skidded and left the road about 6.20 a.m. on October 27th.

On the day of the accident Haffey was driving one of three trucks used to move broken waste rock from a loading-shovel to a dump point approximately 2,000 feet away along a bench hillside road of the open-pit mine. He was returning from the dump point with his empty truck and had reached a point about 450 feet from the dump when the accident occurred. It was dark, and lights were in use, but according to an oncoming truck-driver, Haffey's truck veered in front of him when he was about 150 feet away and then went over the bank and down the hillside. The first point of impact was 50 feet below the road and the second point 170 feet below the road, where Haffey was thrown out. The truck then disintegrated, with the fuel tank, rear wheels, motor and transmission, truck frame, truck box, front wheels, and truck cab being found in that order down the mountainside. The lowest item was 1,250 feet below the road.

Haffey was conscious when found but slightly incoherent. He complained that his back was hurting. Careful stretcher work was done and the services of a doctor obtained. He was removed to the Cassiar hospital but died during treatment for shock at 9 a.m. The post-mortem indicated he died from massive hæmorrhage caused by a badly torn liver.

The road where the accident occurred has a slight downgrade from dump to shovel. It has an average width of about 50 feet. It is required that the loaded trucks keep to the inside, so in all probability it was necessary for Haffey to steer his empty truck closer to the outside when he saw the other truck approaching. There was a further dip in the road at this point and the surface of the road was slippery. Thus it is quite probable that the truck went into a skid and when at right angles to the road went over the bank. Haffey was considered a very capable driver and had been put through the company's training course after being hired in May. There was no evidence that the truck was in other than good condition.

The verdict was that death was accidental for reasons unknown.

Harry Joseph Martin Flynn, aged 51, married, with one child, and employed as a pumpman at the Glacier Gulch prospect of Southwest Potash Corporation, died by suffocation sometime between 8 p.m., November 18th, and 6.15 a.m. on November 19th when buried by a snowslide.

Southwest Potash Corporation had been investigating a molybdenum prospect on Hudson Bay Mountain near Smithers by diamond drilling through glacial ice. The main camp was set up in the centre of a cirque area and on the glacier at an elevation of about 5,650 feet. Water was supplied to this camp from a pump-house located 2,500 feet in an easterly direction and about 800 feet lower in elevation. The pump-house was below the toe of the glacier and 400 to 500 feet out from the south wall of the cirque, which rises approximately 1,500 feet vertically.

Flynn's job was to attend the pump, which was housed in a plywood shack, with another plywood building nearby for living-quarters. There was radio communication with the main camp.

Flynn's last radio communication was about 8 p.m. on November 18th. He could not be contacted at 6.15 a.m., November 19th, and two men went to investigate. They had considerable difficulty as 2½ to 3 feet of fresh snow had fallen during the night and no snowshoes were available. When the two men arrived at the pump-site, they found both buildings had been struck by a snowslide and debris carried for 1,000 to 1,500 feet. Flynn could not be found, and the men, on being unable to return to camp, went downhill and on to Smithers for help. A search party was taken to the scene by helicopter the next morning, and after some digging the body of the deceased was found 3 feet down, fully clothed, and covered by part of a wall. A later autopsy revealed cause of death was suffocation. There were no fractures.

The pump-site had been set up in July at the only place where water could be obtained at that time. There was evidence that slides had occurred in other years in this area, but it had been expected the season's work would have been completed by November 18th. There was some warning as a small snowslide reached the cabin on the evening of November 18th, but Flynn reported over the radio he had decided it was safe to stay. It would seem that the slide which buried Flynn occurred about 6 a.m. on November 19th as the water in the main camp ceased running shortly after.

The Coroner's jury made no comment other than to remark that suffocation was the cause of death. It is evident, however, that the selection of work-sites in mountainous areas must be made with great care, especially if there is any possibility of winter work. Winter equipment, such as snowshoes, etc., must also be on hand.

Alexander Phillip Flatman, aged 19, single, and employed as a surveyor's helper, was fatally injured in the Craigmont mine at about 1 p.m. on December 5th when he was buried by broken rock during the draw-down of a muck raise.

The scene of the accident was the hoistroom excavation for an underground friction hoist to be installed directly over a vertical shaft. The shaft was in pilot form, about 5 by 5 feet, and was full of broken muck from the hoistroom excavation when the surveyor, together with the deceased and the foreman of the contractors, R. F. Fry and Associates (Western) Limited, entered the hoistroom to lay out the final excavation. The surveyor set up his transit and Flatman and the foreman worked together to mark out stations on the floor of the hoistroom. One station was established near the muckpile, which indicated the top of the raise, and then both Flatman and the foreman crossed to the back of the hoistroom over a plank walkway to mark out the second station on the other side of the raise. When this was completed the foreman recrossed on the walkway to the surveyor's position. At this time the muck settled in the raise due to the drawing of the muck by a crew on a lower level. It is not known whether Flatman had stepped onto the broken muck or lost his balance, but he was carried into the raise by the subsidence and buried. Rescue attempts from above were not successful. The muck was then drawn from the raise at a lower elevation until Flatman's body was recovered after an interval of twenty-five to thirty minutes. First aid was of no avail, and it was later established death was due to traumatic asphyxia.

Both the foreman and the surveyor were experienced men, but for the deceased it was only his third day underground. The foreman was unaware of this, and the surveyor was unaware that the muck in the raise was to be pulled. The foreman, who had made the arrangements to have the muck pulled, did warn Flatman to be careful around the top of the raise, but it is doubtful if Flatman fully understood what the danger was.

The Coroner's jury rendered a verdict of accidental death.

Karl Shepluk, aged 50, and employed as a driller at Zeballos Iron Mines Limited, was instantly killed at approximately 5 p.m. on December 14th when he was struck on the chest and abdomen by a section of falling tree.

Shepluk and another workman were engaged in the drilling of a protruding rock point on a section of the road to the open-pit mine. A bulldozer operator was also on site, and it was the lights from his machine which provided illumination for the drilling. It was dusk, raining heavily, and strong winds of gale intensity had sprung up shortly before the accident. Apparently the wind blew over a tree which struck a stump on the bank above the road. The upper part of the tree beyond the stump broke off and continued downward, striking the canopy of the bulldozer. It glanced off the canopy, struck Shepluk, and knocked down the other driller. The bulldozer operator, who was in his cab, was not injured and was able to go for help, which was nearby. The other driller was only slightly injured, but Shepluk showed no sign of life and could not be revived with mouth-to-mouth respiration. It was later revealed that he had suffered multiple rib fractures with penetrations of the lungs, and punctured spleen and kidneys. Any one of these injuries to the vital organs was so extensive that it might have caused almost instantaneous death.

The workmen involved apparently did not believe there was any danger from the storm, possibly because of the closeness of the drilling set-up to the bank, which provided protection. The Coroner's jury found that death was accidental and blame could be attached to no one. The jury felt, however, " that greater caution should have been exercised due to the existence of hazardous weather conditions and the lateness of the hour at the time of the accident. Poor visibility may have been a contributing factor."

FATAL ACCIDENTS AND ACCIDENTS INVOLVING LOSS OF TIME

Nine fatal accidents and 198 accidents involving a loss of time of over three days 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. The fourth table lists all fatal and compensable accidents which occurred in lode mines over a ten-year period and relates these accidents to the number of persons employed and tons of ore mined.

ACCIDENTS CAUSING DEATH OR INJURY CLASSIFIED AS TO CAUSE

Cause	Number of Accidents	Percentage of Total
Explosives	3	1.4
Falls of ground	31	15.0
Falls of persons	38	18.4
Lifting and handling material	42	20.3
Machinery and tools	59	28.5
Transportation	27	13.0
Miscellaneous	7	3.4
Totals	207	100.0

ACCIDENTS CAUSING DEATH OR INJURY CLASSIFIED AS TO THE OCCUPATION OF THOSE INJURED

Occupation	Number of Accidents	Percentage of Total
Underground—		
Chutemen	2	1.0
Haulagemen	2	1.0
Miners	75	36.2
Helpers	18	8.7
Timbermen	4	2.0
Mechanics, electricians, etc.	30	14.5
Miscellaneous	4	1.9
Surface—		
Shops	2	1.0
Mill	10	4.8
Quarries	15	7.2
Surface, general	45	21.7
Totals	207	100.0

ACCIDENTS CAUSING DEATH OR INJURY CLASSIFIED AS TO PARTS OF THE BODY INJURED

Location	Number of Accidents	Percentage of Total
Head and neck	10	4.8
Eyes	6	2.9
Trunk	57	27.5
Upper extremities	54	26.1
Lower extremities	60	29.0
General	20	9.7
Totals	207	100.0

COMPENSABLE AND FATAL ACCIDENTS RELATED TO TONS MINED AND MEN EMPLOYED

Year	Number of Accidents	Number of Persons Employed	Frequency per 1,000 Persons	Tons Mined	Tons Mined per Accident
1953	899	7,105	125	9,660,281	11,750
1954	718	6,293	114	8,513,865	11,850
1955	679	6,208	109	9,126,902	13,450
1956	615	6,507	94	8,827,037	14,350
1957	535	5,678	94	7,282,436	13,600
1958	396	4,353	91	6,402,198	16,200
1959	310	4,316	72	6,990,985	22,550
1960	394	4,389	90	8,242,703	20,920
1961	338	3,993	85	8,392,161	24,830
1962	429	4,872	88	11,212,106	26,135

DANGEROUS OCCURRENCES

Twenty-three dangerous occurrences were reported as required by section 9 of the *Metalliferous Mines Regulation Act* and were investigated by the Inspectors of Mines. This compares with twenty-two reported for 1961.

Of these occurrences, eight were connected with hoisting, five with explosives, four with subsidence, three with fires, two with inflow of water or gas, and one with machinery.

On February 2, 1962, at Bralorne, the regulator on an oxygen bottle caught fire underground when the welder turned on the oxygen to clear the torch before lighting it. It is believed some oil or grease may have accumulated at the regulator, either during transportation or through neglect of safety practices.

On February 6, 1962, at the Sullivan mine, the emergency brake on a shaft hoist failed to function when a number of routine tests were being made to the speed controls. The skip, which was descending, crashed to the bottom of the shaft and was broken in two places. The cause was attributed to the " gumming " of a solenoid on the speed controls. No one was injured.

On February 7, 1962, at the Reeves MacDonald mine, the skip in No. 3 shaft was hoisted through the dump position and past the limit switch. The limit switch worked, but the speed was apparently too fast.

On February 22, 1962, at Britannia, two miners were returning to the face of a drift after reblasting a misfired hole when they observed smoke issuing from this hole. They retreated and a second shot detonated. The hole had been previously loaded with Amex and bottom primed with a stick of forcite and tape fuse. The reblast had been done with another stick of Forcite and a 6-foot tape fuse, sufficient Amex being removed to permit collar priming. It is thus believed that while the reblast failed to detonate the Amex, it relit the old fuse, thus detonating the original primer. As a result of this incident, recommendations were issued to all mines that AN/FO explosives must be washed out of a hole if a reblast is required, and only high explosives used.

During February, 1962, at Craigmont, a crack developed behind the headwall of the open-pit mine, which allowed an area containing about 400,000 cubic yards of rock to settle slowly into the pit.

On May 2, 1962, at Britannia, a descending cage hung up in the No. 7 shaft due to the engagement of the safety dogs with the shaft guides. There was no apparent reason for this.

On May 6, 1962, at Britannia, a sudden flow of water occurred at an underground ore-pass control chute and caused flooding of two mine levels. No damage was done and no persons were injured.

On May 21, 1962, at the Granduc mine, a premature explosion caused slight injury to one of two workmen who were igniting fuses at a drift face. The cause is unknown, but there is a possibility that deteriorated explosives had been used and that some nitroglycerin had been deposited at the collar of a hole and became ignited.

On May 21, 1962, at the Phoenix Copper mine, a large loading-shovel ran away while being moved under its own power on one of the roads of the open-pit mine, on a downgrade. Cause of the runaway was a broken chain drive. No one was injured, but the shovel was severely damaged.

On May 29, 1962, at the Zeballos Iron mine, a runaway took place on the surface inclined railway when the hoist operator apparently lost control when the skips approached within 100 feet of their terminals. The post brakes were applied, but the momentum of the skips was sufficient to carry them past their stopping points.

On May 31, 1962, in the Granduc interior shaft, the cage was lowered 24 feet under water with the cage-tender aboard. A large inrush of water had occurred on the bottom level of the mine. The incident was discovered in time, and the cage-tender was revived by artificial respiration.

On June 17, 1962, at Texada Mines, a fall of rock of about 20,000 cubic yards took place from the headwall of the open pit. No persons were working in the vicinity, but two compressors and a drilling-machine were destroyed by the falling rock.

On June 26, 1962, at Cassiar, a falling rock in the open pit detonated 25 pounds of explosives which had been placed in position for secondary blasting. No one was in the immediate area.

On July 4, 1962, at the Bluebell mine, a heavy flow of water and carbon dioxide from a drill-hole forced abandonment of the lowest level of the mine. The water flow was 400 imperial gallons per minute with a pressure of 325 pounds per square inch and a temperature of 105 degrees F. Carbon dioxide content of the mine air on this level reached a high of 18 per cent. Mine-rescue procedure was invoked, and up to forty-six hours was needed to bring the flow under control.

On September 8, 1962, at Britannia, a motorman lost the tip of a finger when a blasting-cap exploded in his hand. He had removed the lit fuse from a chute charge and was endeavouring to cut off the fuse ahead of the burning point. His blasting certificate was suspended.

On September 28, 1962, at the Giant Mascot mine, two timbers, 22 feet long, fell 650 feet down the interior 52-degree incline shaft when they were being removed from their position below the skip by means of a tugger hoist at the upper-level station. The incident was due to the cable pulling off the drum of the tugger hoist.

On September 30, 1962, at Cassiar, a bench in the open-pit mine collapsed while a bulldozer was working near the edge. A loading-shovel was on the bench below, and its operator was able to use the equipment to prevent injury to the bulldozer operator.

On November 15, 1962, at the Craigmont open-pit mine, after a blast using AN/FO had been detonated, blue flames appeared in the muckpile accompanied by intermittent rumblings, and this phenomenon occurred from time to time, possibly up to twenty-five minutes after the initial blast. The accepted explanation is that the phenomenon could have occurred if the AN/FO explosive had a negative oxygen balance due to too much oil in the mixture, as this would permit the burning of oxygen-deficient products of detonation.

On November 16, 1962, at Texada Iron mine, the hoisting-rope was damaged when a deflection sheave broke loose.

On November 16, 1962, at the Phoenix Copper open-pit mine, a blast broke through into unsuspected underground workings over a surface length of 165 feet.

On November 22, 1962, at Britannia, a loaded skip broke free while being hoisted and lodged in the shaft when the connecting bail to the cage above broke.

On December 10, 1962, at Britannia, a smoldering underground fire was discovered in the No. 8 mine. All persons were evacuated from the mine while mine-rescue crews installed nineteen stoppings to seal off the area. This sealing was a success, and the area was eventually reopened. The origin of the fire could not be determined, but the location was where there had been spillage of Amex during the loading of a blast-hole round.

On December 17, 1962, at the Craigmont open-pit mine, a fire of unkown origin destroyed a special truck equipped to service heavy equipment.

PROSECUTIONS

Four prosecutions were instituted under the *Metalliferous Mines Regulation Act*, as follows:—

A skip-tender employed by Bralorne Pioneer Mines Limited was charged under section 21, General Rule 221, for being around moving machinery while intoxicated and for carrying intoxicating liquor underground. The hearing was held at Bralorne on February 26, 1962, and the defendant pleaded guilty. He was fined $15 on each charge and $5 costs, for a total of $35.

The owner of the Coffee Creek mine was charged under section 21, General Rule 40, for failing to dispose of ten cases of dynamite when the mine closed down in 1957. The hearing was held at Nelson on April 19, 1962, and the owner pleaded guilty. He was fined $100 and costs.

The operator of the Salmo quarry of International Stone and Marble Co. Ltd. was charged under section 21, Rule 42 (*a*), for leaving dynamite and blasting-caps around the quarry unattended for a period of a week. The hearing was held at Salmo on April 24, 1962, and the defendant pleaded guilty. He was fined $100 and costs.

The agent for Paycheck Mining Co. Ltd. was charged under section 21, Rule 40, for failing to dispose of fifty-three cases of dynamite when the mine closed down in 1954. The hearing was held at Nakusp on October 1, 1962, and the defendant pleaded guilty. He was fined $100 and costs.

The manager of the Black Fox mine was charged under section 21, Rule 40, for failing to dispose of twenty sticks of explosives when the mine closed down. The charge was laid in Kaslo in October, 1962, but was later dropped when the defendant proved that the management of the mine was not his responsibility.

BLASTING CERTIFICATE SUSPENSIONS

There were violations of the provisions of the *Metalliferous Mines Regulation Act* in regard to the use of explosives and blasting procedure. Blasting certificates of a total of seven offenders were suspended for periods ranging from one month to an indefinite period. The offences were failing to guard a blast properly, leaving explosives improperly stored, using a too lengthy timing device, and smoking near explosives.

EXPLOSIVES USED IN MINES

The table below shows the quantities of explosives and ammonium nitrate used in metal mines and quarries in British Columbia in 1958, 1959, 1960, 1961, and 1962:—

	1958 Total	1959 Total	1960 Total	1961 Total	1962 Total	1962	
						Mines	Quarries
High explosives (lb.)	5,485,000	6,319,000	7,188,000	7,280,000	4,522,619	3,898,283	624,336
Hydromex		325,000	862,000	2,116,000	2,013,850	1,502,950	510,900
Amex II		30,000		169,000	2,429,550	2,349,550	80,000
Ammonium nitrate	190,0000	872,000	1,641,000	2,647,000	5,921,690	5,108,410	813,280

The quantity of high explosives used in 1962 decreased 37 per cent over that used in 1961. However, this large decrease was more than offset by the increased use of ammonium nitrate explosives. The use of the slurry type of explosive, Hydromex (ammonium nitrate, T.N.T., and water), remained about constant, but the do-it-yourself explosive of ammonium nitrate and fuel oil (AN/FO) continued its spectacular rise in annual consumption. In 1961 the commercial form of AN/FO (Amex II) was allowed underground and rapidly replaced the standard explosives. In 1962 a factory licence was issued to The Consolidated Mining and Smelting Company of Canada, Limited, to blend ammonium nitrate and fuel oil for use at the Sullivan mine, this being the first of its kind in British Columbia and the first factory licence issued in several decades for the Province (*see* photo, p. 86). This AN/FO type of explosive has good safety features in that it cannot be detonated by ordinary impact, but there is a danger that its fume characteristics will change under certain conditions. Thus its use is contingent on a permit being obtained from the Chief Inspector of Mines, Victoria. For those operators who wish to blend their own ammonium nitrate and fuel oil, written permission must be obtained from the Chief Inspector of Explosives, Ottawa.

DUST CONTROL AND VENTILATION

On September 1, 1962, the Department undertook the responsibility of directly carrying out dust and ventilation surveys in mines, quarries, and concentrators. In the past these surveys had been conducted by officials of the Workmen's Compensation Board and their reports made available to the Inspectors of Mines. The new set-up is expected to allow for better co-ordination and processing of any recommendations resulting from these surveys. Two experienced Silicosis Control Inspectors, R. J. Craig and S. Elias, were transferred to the Department from the Workmen's Compensation Board. The high level of co-operation with the Board made this transfer of responsibility possible without any dislocation of services to the industry. Due recognition is also given to the work of Donald A. MacLeod, Chief Inspector, Silicosis Branch of the Workmen's Compensation Board, who retired in September, 1962. Mr. MacLeod pioneered the work of this Branch since its inception in 1937 and was acknowledged as one of Canada's top authorities on dust control and ventilation.

A summary of the combined work of the Board and the Department, as prepared by R. J. Craig, Senior Inspector, Silicosis Control, follows:—

1. Sixty-six surveys on dust control were made at forty-seven mines during 1962.

2. The main object of this work is to lower the amount of dust breathed by the workmen as much as possible. It is not known what concentration of silica dust is considered safe to breathe without producing silicosis as there are other factors to consider. Recent research is trying to develop an instrument which will sample dust selectively so that the dust count and silica analysis will represent the respirable dust retained in a man's lung. Until a better instrument is developed, the count of 300 particles per cubic centimetre as measured with a konimeter remains a concentration that is obtained under good conditions of ventilation and dust control.

3. Stoper drilling operations still produce higher dust counts than usual in the mine, and for this reason are kept separate from the other averages. During recent years smaller-bore machines are being used, and the dust counts have improved.

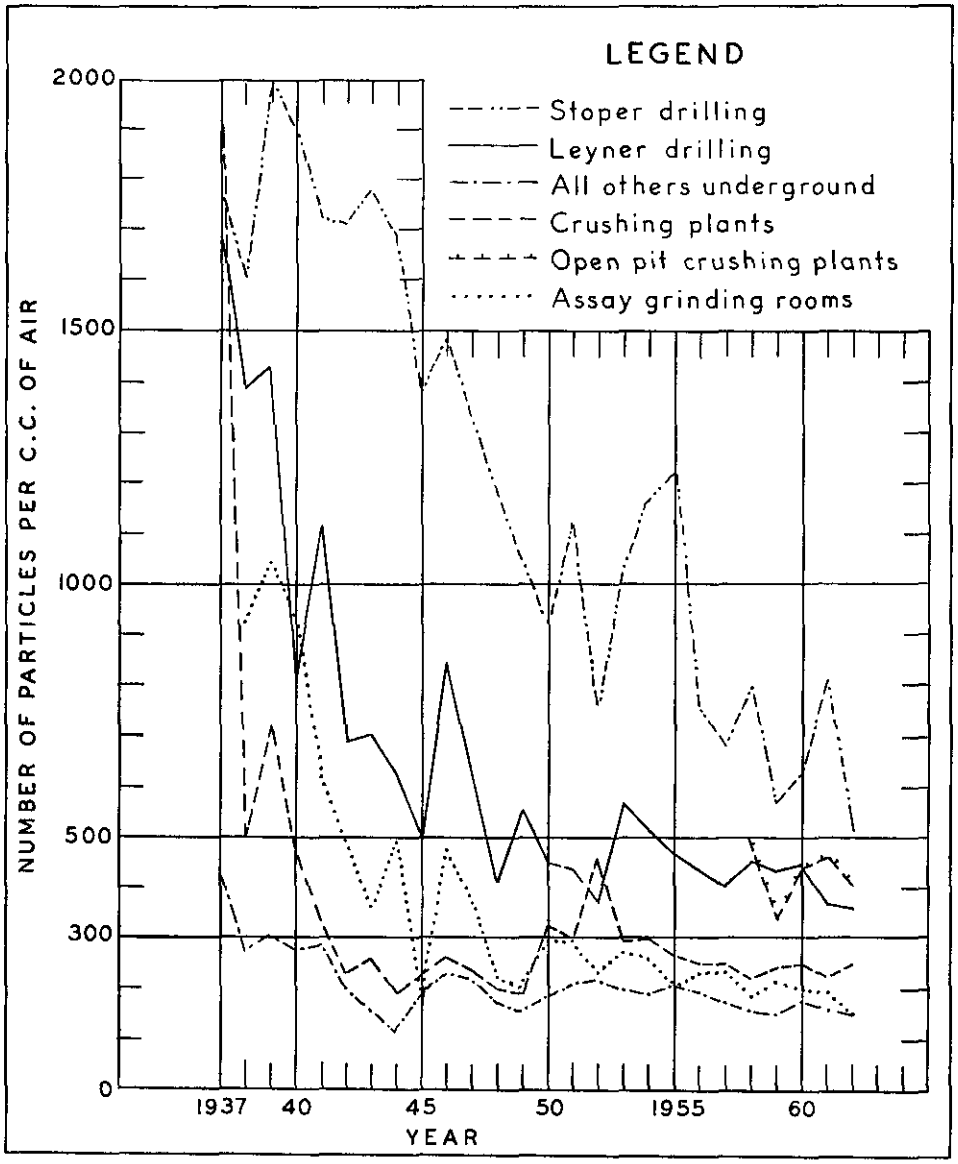


Figure 19. Average dust counts obtained each year since 1937.

The dust counts at these operations used to be 2,000 or more particles per cubic centimetre of air. Seventy-nine per cent of the surveys made in 1962 gave less than 1,000 particles per cubic centimetre.

4. At leyner, jackleg, and plugger drilling operations underground the dust concentrations are lower than at stoper drilling operations. Sixty-five per cent of the surveys gave averages of less than 500 particles per cubic centimetre of air.

5. The averages for all other underground locations are quite satisfactory. Seventy-seven per cent of the surveys made in 1962 gave averages of less than 300 particles per cubic centimetre. This condition is satisfactory when considering that most of the men work in this lower dust concentration.

6. Sixty-two per cent of the crushing plants at underground operations showed an average of less than 300 particles per cubic centimetre. This average has been kept separate from the open pits this year and remains fairly constant.

7. The drilling operations at open-pit mines are the main source of dust. During the last few years the use of detergent to wet down the dust during drilling operations has been introduced at most of the mines. This has resulted in lower dust concentrations. Fifty-four per cent of the open-pit mines showed an average of less than 500 particles per cubic centimetre at drilling operations. In the other operations at open-pit mines there is very little exposure to dust. Ninety-one per cent of the surveys of the general atmosphere in open pits apart from the drilling showed an average of less than 300 particles per cubic centimetre.

8. The dust concentrations found in the crushing plants at the open-pit mines are higher than normal due to the coarseness and dryness of the ore which is fed to the plants. Exhaust systems have been installed and water sprays are used as much as possible to reduce the dust concentrations. Only 20 per cent of the surveys at crushing plants gave an average of less than 300 particles per cubic centimetre. More work on dust control will have to be done at these plants.

9. Seventy-one per cent of the surveys made in assay grinding-rooms gave averages of less than 300 particles per cubic centimetre. All assay grinding-rooms are equipped with exhaust systems.

10. The percentage of certificates of fitness in good standing held by the employers for their workmen who require medical examination was more than 94 per cent.

11. Aluminum-powder prophylaxis treatments for the prevention of silicosis were given in the dry-houses of two of the mines during the year and were made available at a third mine to those men who desired it.

12. Figure 19 is a graph showing the median of all the averages in various operations in the metalliferous mines, obtained each year since 1937.

SHIFTBOSS CERTIFICATES

The *Metalliferous Mines Regulation Act,* as amended in March, 1960, requires that every person employed underground be under the daily supervision of an official who is the holder of a shiftboss certificate issued under this Act. An applicant for a shiftboss certificate is required to pass an examination on the *Metalliferous Mines Regulation Act* and general safe working practices. He must have three years' practical experience or one year plus a degree in mining engineering. He must also be the holder of a mine-rescue certificate and a first-aid certificate. A fee of $5 is charged for the examination.

The Board of Examiners may grant provisional certificates under such conditions as the Board considers advisable. During 1962 seventy-seven provisional certificates were issued, each good for two years from date of issue. Examinations for permanent certificates were held in Fernie, Victoria, Bralorne, Jordan River, Beaverdell, Phoenix, Kimberley, Grand Forks, Merritt, Hope, and Vancouver. Sixty-nine men received certificates, as follows:—

Cert. No.	Name	Date	Cert. No.	Name	Date
8	Leonard W. Bishop	20-6-62	174	Olaf A. Mathers	16-5-62
140	Larry G. Jacobsen	4-1-62	175	Bruno E. Goetting	1-6-62
141	Olof Gunner Adolphson	12-1-62	176	Peter R. Matthew	1-6-62
142	Colin Edgar Brown	12-1-62	177	Theodor S. Romo	1-6-62
143	Raymond Clifford Rowe	12-1-62	178	Noel J. Kirby	11-6-62
144	William Patrick MacDonald	12-2-62	179	Robert E. Miller	1-6-62
145	Harry Bapty	26-2-62	180	Edwin H. P. Paulett	1-6-62
146	Harold S. Aikins	21-3-62	181	Arthur Wilkinson	1-6-62
147	Kenneth L. Chatson	21-3-62	182	John Robert Barrie	6-7-62
148	Lionel J. Lambie	21-3-62	183	William Betcher	6-7-62
149	Andrew Robertson	21-3-62	184	Arthur Lewis Burrows	6-7-62
150	Douglas W. Thompson	21-3-62	185	William Miles Fergus	6-7-62
151	James S. Whiting	21-3-62	186	Rudolf Iskra	6-7-62
152	William Francis Black	26-3-62	187	Ambrose Joseph Kennedy	6-7-62
153	Robert Bitner	26-3-62	188	Charles Stanley Kinrade	6-7-62
154	Lemuel Perrot	26-3-62	189	Melvin Victor Maki	6-7-62
155	Clifford J. Simons	26-3-62	190	John Michael Millner	6-7-62
156	Allan M. Morrison	26-3-62	191	Leonard Nelson	6-7-62
157	John Michael Anderson	27-3-62	192	Robert Windsor Shannon	6-7-62
158	Harold Ross Chenoweth	27-3-62	193	Terrance William Johnston	6-7-62
159	Alexander Morris Laird	27-3-62	194	William Hogg Graham	6-7-62
160	Fritz Fred Arthur Westman	27-3-62	195	James Seaton Kermeen	10-7-62
161	Thomas Manville Waterland	27-3-62	196	Bruno Martschles	26-7-62
162	Harry Thomas Cole	27-3-62	197	George C. Sharpe	26-7-62
163	Edwin O. Fitch	27-3-62	198	Anthony J. Petrina	26-7-62
164	Michael N. Osoko	27-3-62	199	Lawrence H. Kniert	7-8-62
165	Victor Zaporozan	28-3-62	200	Roland D. Harrison	7-11-62
166	Harry Skoglund	28-3-62	201	Michael Karwtski	7-11-62
167	George Allan Murray	2-4-62	202	Ugo Peressini	7-11-62
168	Edward Elgin Howes	6-4-62	203	John Hungle	7-12-62
169	Anthony John Poloskas	6-4-62	204	Merl A. Rodocker	7-12-62
170	William Oliver Pollock	17-4-62	205	John Graney	7-12-62
171	Donald L. Lindley	25-4-62	206	Kurt F. Dahlke	7-12-62
172	William K. Wilson	30-4-62	207	Cornelius Richert	7-12-62
173	Charles Eugene Gobert	16-5-62			

MINE RESCUE, SAFETY, AND FIRST AID

The promotion of mine rescue and first aid continued at a high level throughout 1962. Three mine-rescue stations were fully maintained and another on a part-time basis. An instructor qualified in mine rescue and first aid was available at each station. Each station is equipped with sufficient self-contained oxygen breathing apparatus to maintain two mine-rescue teams of six men each should any emergency in nearby mines arise. There are also sets of mine-rescue equipment maintained at various mines, either on loan from the Department or owned by the mine. In 1962 Department-owned equipment totalled fifty McCaa two-hour apparatus and forty-four Chemox three-quarter-hour apparatus, while that owned by mining companies totalled forty-three McCaa's and fifty-two Chemox's. Each station also has auxiliary equipment such as all-service masks, self-rescuers, gas detectors, inhalators, and a complete set of first-aid equipment. The district instructor makes a periodic check of mine-rescue and first-aid equipment at mines in his district.

The station at Cumberland was maintained to serve the Tsable River coal mine with an instructor hired on a part-time basis. In December an underground fire broke out at Britannia (*see* Dangerous Occurrences), and the station's supply of all-service canisters was moved to the mine as a precautionary measure. A truck is kept at the station for emergency purposes.

The Kamloops station was moved from Princeton in 1961. A mobile unit is used to give service over a wide area. Mine-rescue and (or) first-aid training were given at the Kamloops Copper, Phoenix Copper, Giant Mascot, Clayburn-Harbison, Craigmont, Bethlehem, Cassiar Asbestos, Highland Bell, Bralorne Pioneer, Cariboo Gold Quartz, Cowichan Copper, and Britannia mines. Classes in mine rescue were held for prospectors and exploration geologists at Kamloops and Vancouver, with special emphasis on the dangers of entering abandoned mines. The first-aid classes held in communities near mines were open to the general public. Emergency calls consisted of a first-aid case at Kamloops, a highway truck fire, and an underground fire at Britannia.

The mine-rescue station at Fernie is maintained principally to serve the coal mines in the area, but assistance in mine-rescue training is also given to personnel of the Sullivan and Mineral King mines. Thirty-eight candidates completed the course in mine rescue and were awarded certificates. First-aid classes were fairly well attended, and twenty-nine persons completed the courses and received awards. There were no emergency calls for equipment during 1962.

The East and West Kootenay areas have been serviced since 1950 by a mobile mine-rescue unit stationed at Nelson. Mine-rescue courses were held at the Bluebell, Jersey, H.B., Reeves MacDonald, and Mineral King mines. First-aid classes were also given at most mines or nearby villages.

A certificate of competency in mine-rescue work is granted to each man who takes the training course and passes the examination set by the Department. For those who take a refresher course, a sticker is given for attaching to the certificate. All mine-rescue men are also entitled to a hat emblem. During 1962, in addition to the regular teams in training, 117 men took the course and were granted certificates, as follows:—

Certificate No.	Name	Where Trained	Certificate No.	Name	Where Trained
3341	Donald Ian McKinnon	Kamloops.	3378	Andrew Wingerak	Salmo.
3342	Terrance John Millar	Kamloops.	3379	Jack Peters	Fernie.
3343	Leonard Raymond Root	Kamloops.	3380	Basilio Bertucci	Mineral King.
3344	Wayne E. Zinger	Kamloops.	3381	Adelio Tovani	Mineral King.
3345	Alexander John Wasnock	Fernie.	3382	Emilo Anemone	Mineral King.
3346	William Joseph Thomson	Fernie.	3383	Tito Calzuola	Mineral King.
3347	Charles Alfred Hornquist	Fernie.	3384	Imre Kametler	Mineral King.
3348	Albert Henry Brulotte	Fernie.	3385	Richard Karl Grawehr	Mineral King.
3349	Don Ivon Slavens	Fernie.	3386	Gunter Rentmeister	Mineral King.
3350	Victor Lawrence Gleason	Fernie.	3387	Imre Tarpal	Mineral King.
3351	Gordon Peters	Fernie.	3388	Dennis James Gordon	Mineral King.
3352	John Michael Millner	Kimberley.	3389	Laszlo Paul Riha	Mineral King.
3353	Lionel John Lambie	Kimberley.	3390	Ameodeo DeLaurentis	Mineral King.
3354	Melvin Victor Maki	Kimberley.	3391	Ernest Oppliger	Mineral King.
3355	Harold Samuel Aikins	Kimberley.	3392	Ralph (Raffaele) Grigolette	Mineral King.
3356	Douglas Wayne Thompson	Kimberley.	3393	John (Janos) Ruha	Mineral King.
3357	Kenneth Lawrence Chatson	Kimberley.	3394	Oriano Bacci	Mineral King.
3358	James Stanley Whiting	Kimberley.	3395	Kurt Stahl	Salmo.
3359	Andrew Robertson	Kimberley.	3396	Heinz E. Kreuzer	Salmo.
3360	George Howard Fedorek	Fernie.	3397	Paul Heuscher	Salmo.
3361	Walter Strukoff	Grand Forks.	3398	Jack Keller	Salmo.
3362	Gerhard F. Bosinski	Grand Forks.	3399	William Hingsburger	Salmo.
3363	William John Durham	Grand Forks.	3400	Richard Davis Smith	Ashcroft.
3364	Arthur Wilkinson	Grand Forks.	3401	John Roehricht	Beaverdell.
3365	Howard E. Debnam	Grand Forks.	3402	Raymond L. Frederick	Beaverdell.
3366	James J. Kermeen	Grand Forks.	3403	Gaston Chavigny	Bralorne.
3367	Arthur R. Topp	Grand Forks.	3404	Norman David Long	Ashcroft.
3368	Stanley Anthony Wasiewicz	Fernie.	3405	Edmund Paul Walters	Ashcroft.
3369	Norman H. McLeod	Hope.	3406	Stephen Earl King	Ashcroft.
3370	George D. Moore	Hope.	3407	Bernardus J. T. H. VanRyne	Bralorne.
3371	Ray Schmidt	Hope.	3408	James Scholes Thomson	Bralorne.
3372	Merl A. Rodocker	Hope.	3409	Charles M. Campbell	Bralorne.
3373	Cornelius Richert	Hope.	3410	Thomas E. Dexter	Bralorne.
3374	William Colin McLoughlin	Merritt.	3411	Gordon A. Boychuk	Bralorne.
3375	Wendell Lee McLeod	Riondel.	3412	Marius VanHerk	Bralorne.
3376	Joel Ackert	Salmo.	3413	Rene Dupasquier	Bralorne.
3377	John Toften	Salmo.	3414	Kenneth Ross Gordon	Bralorne.

Certificate No.	Name	Where Trained	Certificate No.	Name	Where Trained
3415	Reginald A. Easton	Bralorne.	3436	Carl Otto Walker	Riondel.
3416	William E. Field	Bralorne.	3437	Eric Walter Holdsworth	Riondel.
3417	Donald B. Cameron	Bralorne.	3438	Robert Edward LaJavenesse	Riondel.
3418	Arne Rasmussen	Bralorne.	3439	Ambrose Schwarz	Wells.
3419	James Peter Weeks	Bralorne.	3440	Bernard E. Schneider	Wells.
3420	George N. Woollett	Bralorne.	3441	Allan C. Bruce	Wells.
3421	Rinaldo Donisi	Mineral King.	3442	Dieter H. Taube	Wells.
3422	Albert H. O. Reiss	Britannia Beach.	3443	William A. Prescott	Wells.
3423	Paul Hoodikoff	Britannia Beach.	3444	Hans Ilginnis	Wells.
3424	Juan Sevirn Olson	Britannia Beach.	3445	Rudolf Skowaisa	Jordan River.
3425	William Marsh McKenzie	Riondel.	3446	Hendrik W. Felderhof	Jordan River.
3426	Stephanus Petrus VanRooyan	Riondel.	3447	Joseph M. Renaud	Jordan River.
			3448	Per Anders Lantz	Jordan River.
3427	Dwight McEwan Collins	Riondel.	3449	Robert Crompton	Jordan River.
3428	Edwin Alfred Shannon	Riondel.	3450	Pieter Groot	Jordan River.
3429	Leo Hummel	Riondel.	3451	George L. Dvorak	Jordan River.
3430	Howard Andrew Simpson	Riondel.	3452	James R. Billingsley	Jordan River.
3431	Donald Ralph Roemer	Riondel.	3453	Joseph Wasiuta	Jordan River.
3432	Russel Pasiechnyk	Riondel.	3454	Oswald Joseph Rottmann	Jordan River.
3433	Guiseppe Collazzo	Riondel.	3456	Darryl A. Waite	Jordan River.
3434	Gregory Stockerl	Riondel.	3457	John D. Ormrod	Jordan River.
3435	Johann Soriat	Riondel.			

The mine safety associations in different centres of the Province, sponsored by the Department of Mines and Petroleum Resources and aided by company officials, safety supervisors, Inspectors of Mines, and mine-rescue instructors, continued to promote mine-rescue, first-aid, and safety education in their respective districts.

The Bridge River Valley Mine Safety Association held its annual competition at Bralorne on April 28, 1962. This was a first-aid meet with events for juniors and seniors. The senior event was designed for good spectator appeal in that it demonstrated what could happen if a grandstand collapsed and five people were injured. The event was won by a team captained by M. Mitchell.

The Vancouver Island Mine Safety Association held its forty-eighth annual competition in Cumberland on May 26, 1962. Three teams competed in the mine-rescue event—two from the Tsable River mine and a visiting team from Bralorne. The winning team was from the Tsable River mine and was captained by J. Thomson.

The West Kootenay Mine Safety Association held its sixteenth annual competition at Riondel on June 2, 1962. Four teams took part in the mine-rescue event—two from the Bluebell mine and one each from the Canadian Exploration and H.B. mines. A Bluebell team, captained by P. E. Rowan, took first place.

The East Kootenay Mine Safety Association held its forty-first annual competition at Kimberley on June 9, 1962. Four teams took part in the mine-rescue event—one each from Michel, Fernie, Kimberley, and Toby Creek. First place was won by the Mineral King team from Toby Creek, captained by B. A. Maconachie.

The Central British Columbia Mine Safety Association held its fourteenth annual competition at Kamloops on June 16, 1962. Six teams took part in the mine-rescue competition—one each from the Highland Bell, Craigmont, Bethlehem, Britannia, Cariboo Gold Quartz, and Bralorne mines. The Bralorne team, captained by T. W. Illidge, took first place.

At all four preceding meets, competitions were held in first-aid as well as mine-rescue work. In these competitions, events were held for women and juniors. There were entries in these competitions from industries and organizations not necessarily connected with mining.

The seventh Provincial mine-rescue competition was held at Nelson on June 23, 1962. The winning teams from the Cumberland, Kimberley, Riondel, and Kamloops events competed for a trophy and silver trays. The event was won by the Bralorne Pioneer mine, captained by T. W. Illidge. The team also won a silver cup which has been donated by the International Union of Mine, Mill and Smelter Workers for annual competition for mine-rescue teams from metalliferous mines. In conjunction with this competition, the Workmen's Compensation Board sponsored the sixth Provincial men's first-aid competition and St. John Ambulance sponsored the fourth Provincial ladies' first-aid competition. Teams competed which had won local events at Victoria, Terrace, Vancouver, Kimberley, Kamloops, Cumberland, and Riondel. The men's winning team was the Warfield Engineering No. 2 team, captained by K. H. Hill. The ladies' winning team was the Vancouver First Aid Ski Patrol team, captained by C. Hill.

JOHN T. RYAN TROPHY

In metalliferous mining a new record has been established. The H.B. mine of The Consolidated Mining and Smelting Company of Canada, Limited, had a zero accident frequency in 1962 and became the only mine in Canada to have achieved this for the fourth time. This fine accomplishment had its beginning in 1958 and was continued in 1959, 1961, and 1962. Thus the Regional Award again goes to this mine, and the Dominion Trophy is shared with Quebec Lithium Corporation, another mine with a zero accident frequency.

In coal-mining the Michel Colliery of The Crow's Nest Pass Coal Company Limited won the Dominion Ryan Trophy as well as the Regional Award. This is noteworthy as it is the second time in the history of the competition that the Dominion Trophy has come to British Columbia.

WEST KOOTENAY MINE SAFETY ASSOCIATION TROPHY

The West Kootenay Mine Safety Association in 1951 donated a safety trophy for annual competition in order to encourage and promote safety in small mines not eligible for the John T. Ryan awards. At first the trophy was restricted to mines in the West Kootenay area, but in 1956 this restriction was removed.

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 involved more than three days' loss of time.

In 1962 the award was won by the Benson Lake mine of The Consolidated Mining and Smelting Company of Canada, Limited. This is an excellent record, it being the second year of operation for this mine and the second time it has won the award.

SAFETY COMPETITION, OPEN-PIT MINES AND QUARRIES

The open-pit or quarry industry has become increasingly important to the economy of British Columbia, but while its safety record has compared favourably with the rest of the mining industry, there has been little recognition of this fact. In 1961 the Department of Mines and Petroleum Resources instituted a safety competition for this industry and put up awards and a trophy for annual competition.

The trophy is awarded to the operation having worked a minimum of 75,000 man-hours in the year and having the lowest number of compensable injuries per million man-hours of exposure. For those operations which amass over 15,000 man-hours ending in the competition year, certificates of achievement are given when no compensable accidents occur during this period.

In 1962 the trophy was won by the Cassiar Asbestos Corporation Limited, with an injury frequency rate of 7.19. Eight quarries received certificates of achievement, as follows: British Columbia Cement Company Limited, at Cobble Hill; Cassidy Sand and Gravel, division of Evans, Coleman and Evans Limited; Coquitlam Gravel Pit of Deeks-McBride Ltd.; Hillside Sand & Gravel of Evans, Coleman and Evans Limited; Ideal Cement Company Ltd.; Pitt River Quarry of Evans, Coleman and Evans Limited; Producers Sand & Gravel Division of Evans, Coleman and Evans Limited; Western Gypsum Products Limited.

BRITISH COLUMBIA MINING ASSOCIATION, SAFETY DIVISION

This division continues to foster and encourage safe working conditions and practices to prevent accidents and injuries, and to supervise a safety-training programme in the mining industry. The lost-time injury frequency of the reporting lode-mining companies in 1962 was twenty-seven injuries for each million man-hours of work. This frequency for reporting coal-mining companies was 100. The average lost-time injury frequency for all of the reporting mines in 1962 was thirty-four injuries for each million man-hours of work.

The injury statistics for 1962 are based on reports from twenty-seven mining companies which recorded 12,250,609 man-hours of work.

Training in safety is being continued, so that work procedures and methods may be improved and interest in safety may be expanded.

Coal

By Robert B. Bonar, Deputy Chief Inspector of Mines

CONTENTS

PRODUCTION

The gross output in short tons of the coal mines of the Province for 1962 was 912,837 tons, a decrease of 105,995 tons or 10.4 per cent from 1961. A total of 107,786 tons came from strip mines at Michel Colliery.

The Vancouver Island District production was 81,586 tons, an increase of 3,276 tons or 4.2 per cent over 1961.

The Northern District production was 7,341 tons, a decrease of 485 tons or 6.2 per cent from 1961.

The Nicola-Princeton District production was 125 tons, a decrease of 380 tons or 75.2 per cent from 1961.

The East Kootenay District production was 823,785 tons, a decrease of 108,406 tons or 11.6 per cent from 1961.

Output and per Capita Production, 1962

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	78,706	239	108	3.05	729	84	3.92	937
Midan mine	850	225	2	1.89	425	2	1.89	425
Loudon No. 6 mine	303	83	2	1.82	152	2	1.82	152
Lewis mine (Timberlands)	599	138	3	1.45	200	3	1.44	200
Carruthers and Wakelem No. 3 mine	225	130	1	1.73	225	1	1.73	225
Stronach mine	136	58	2	1.17	68	2	1.17	68
Undun No. 3 mine	767	92	2	4.16	384	2	4.16	384
Coldwater mine	125	80	2	0.78	63	2	0.78	63
Bulkley Valley Collieries	5,952	189	19	1.65	313	14	2.25	425
Gething No. 3 mine	1,389	165	5	1.68	278	4	2.10	347
Michel Colliery (underground)	715,999	210	617	5.52	1,160	432	7.89	1,657
Michel Colliery (strip)	107,786	210	13	39.50	8,291	......	......	......

District Output and per Capita Production, Underground Mines, 1962

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	81,586	120	680	96	850
Nicola-Princeton	125	2	63	2	63
Northern	7,341	24	306	18	408
East Kootenay	715,999	617	1,160	432	1,657
Whole Province	805,051	763	1,055	548	1,469

Output per Man-shift, Underground Mines, 1953–62

Year	Man-shifts[1]	Tonnage	Average per Man-shift (Tons)
1953	333,922	1,171,932	3.51
1954	280,353	1,064,023	3.79
1955	304,139	1,157,813	3.86
1956	307,821	1,100,434	3.57
1957	226,536	945,848	4.17
1958	204,148	728,722	3.56
1959	171,608	646,788	3.77
1960	210,254	766,581	3.66
1961	213,962	877,085	4.10
1962	160,418	805,051	5.02

[1] Includes both surface and underground workers.

Collieries of British Columbia, 1962—Production and Distribution, by Collieries and by Districts (in Short Tons)

Mine	Gross Output	Washery Refuse	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														
Comox Mining Company Ltd.—Tsable River Colliery	78,706	55	78,651	—	—	11,453	9,450	—	2,003	80,654	—	—	80,654	80,654
Midan mine (Chambers No. 5)	850	—	850	—	—	—	—	—	—	850	—	—	850	850
Loudon No. 6 mine	303	—	303	—	—	—	—	—	—	303	—	—	303	303
Lewis mine (Timberlands)	599	—	599	—	—	—	—	—	—	599	—	—	599	599
Carruthers and Wakelem No. 3 mine	225	—	225	—	—	—	—	—	—	225	—	—	225	225
Stronach mine	136	—	136	—	—	—	—	—	—	136	—	—	136	136
Undun No. 3 mine	767	—	767	—	—	—	—	—	—	767	—	—	767	767
Totals, Vancouver Island District	81,586	55	81,531	—	—	11,453	9,450	—	2,003	83,534	—	—	83,534	83,534
Nicola-Princeton District														
Coldwater mine	125	—	125	—	—	—	—	—	—	125	—	—	125	125
Totals, Nicola-Princeton District	125	—	125	—	—	—	—	—	—	125	—	—	125	125
Northern District														
Bulkley Valley Collieries	5,952	—	5,952	—	—	220	412	192	—	5,760	—	—	5,760	5,760
Gething No. 3 mine	1,389	—	1,389	—	—	—	—	—	—	1,389	—	—	1,389	1,389
Totals, Northern District	7,341	—	7,341	—	—	220	412	192	—	7,149	—	—	7,149	7,149
East Kootenay District														
The Crow's Nest Pass Coal Co. Ltd.—Michel Colliery (underground and strip)	823,785	90,996	732,789	10,788	191,454	20,932	19,190	—	1,742	197,584	3,610	331,095	532,289	734,531
Totals, East Kootenay District	823,785	90,996	732,789	10,788	191,454	20,932	19,190	—	1,742	197,584	3,610	331,095	532,289	734,531
Coal														
Grand totals for Province	912,837	91,051	821,786	10,788	191,454	32,605	29,052	192	3,745	288,392	3,610	331,095	623,097	825,339
Coke														
The Crow's Nest Pass Coal Co. Ltd.—Michel Colliery	145,442	—	145,442	—	—	31,393	23,950	—	7,443	79,703	73,182	—	152,885	—

[1] Includes coal used in making coke and coal used under company stationary and locomotive boilers, etc.

COLLIERIES OF BRITISH COLUMBIA, 1962—MEN EMPLOYED, DISTRIBUTION BY COLLIERIES AND BY DISTRICTS

Mine	Supervision and Clerical			Miners			Helpers			Labourers			Mechanics and Skilled Labour			Total Men Employed		
	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.
Vancouver Island District																		
Comox Mining Company Ltd.—Tsable River Colliery	7	4	11	58	—	58	—	—	—	14	17	31	5	3	8	84	24	108
Midan mine (Chambers No. 5)	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	2	—	2
Loudon No. 6 mine	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	2	—	2
Lewis mine (Timberlands)	1	—	1	2	—	2	—	—	—	—	—	—	—	—	—	3	—	3
Carruthers and Wakelem No. 3 mine	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	1	—	1
Stronach mine	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	2	—	2
Undun mine	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	2	—	2
Totals, Vancouver Island District	12	4	16	65	—	65	—	—	—	14	17	31	5	3	8	96	24	120
Nicola-Princeton District																		
Coldwater mine	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	2	—	2
Totals, Nicola-Princeton District	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	2	—	2
Northern District																		
Bulkley Valley Collieries	2	2	4	5	—	5	6	—	6	1	1	2	—	2	2	14	5	19
Gething No. 3 mine	1	—	1	2	—	2	1	—	1	—	1	1	—	—	—	4	1	5
Totals, Northern District	3	2	5	7	—	7	7	—	7	1	2	3	—	2	2	18	6	24
East Kootenay District																		
The Crow's Nest Pass Coal Co. Ltd.—																		
Michel Colliery (underground)	36	20	56	191	—	191	91	—	91	58	47	105	56	59	115	432	185	617
Michel Colliery (strip)	—	1	1	—	—	—	—	—	—	—	—	—	—	12	12	—	13	13
Totals, East Kootenay District	36	21	57	191	—	191	91	—	91	58	47	105	56	71	127	432	198	630
Grand totals for Province	52	27	79	264	—	264	98	—	98	73	66	139	61	76	137	548	228	776

NOTE.—U.=underground.; A.=above ground; T.=total.

Coal-preparation Plants

An additional cleaning plant, using feldspar as a medium, was completed in 1962 at Michel Colliery, The Crow's Nest Pass Coal Company Limited. It is estimated to have cost three-quarters of a million dollars and is capable of cleaning 150 tons of minus ¼-inch or ½-inch coal per hour. Provisions have been made so that the capacity may be increased to 180 tons per hour when necessary.

The coal-preparation plant at the Tsable River mine, Comox Mining Company Limited, was altered and new coal-screening apparatus added, giving an improved product besides increasing the tons of coal handled per hour.

Coke-making

Coke is made at only one plant in the Province, that of the Michel Colliery, The Crow's Nest Pass Coal Company Limited, Fernie.

LABOUR AND EMPLOYMENT

In 1962, 776 persons were employed in and about the coal mines of the Province, a decrease of 166 from 1961. 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 was 241. In the Vancouver Island District, the one large mine, the Tsable River mine, worked 239 days. In the East Kootenay District, the Michel Colliery worked 210 days.

COMPETITION FROM COAL PRODUCED OUTSIDE OF BRITISH COLUMBIA

In 1962 the shipment of Alberta coal and briquettes to British Columbia totalled 283,651 and 7,954 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
1953	859,385	1958	532,911
1954	891,194	1959	437,118
1955	932,764	1960	379,668
1956	860,329	1961	321,909
1957	672,527	1962	283,651

Of the 623,097 tons of British Columbia coal marketed, 171,049 tons was sold for domestic and industrial use in Alberta, Saskatchewan, Manitoba, and Ontario; 3,610 tons was exported to the United States; and 331,095 tons was exported to Japan.

The amount sold for domestic and industrial use in the Province was 117,343 tons.

ACCIDENTS IN AND AROUND COAL MINES

In 1962 there were no fatal acidents, as compared with six in 1961. The number of fatal accidents per 1,000 persons (underground and strip-mine personnel) employed was 0.00, compared with 6.37 in 1961, 0.00 in 1960, 1.89 in 1959, 0.00 in 1958, 1.45 in 1957, 4.39 in 1956, 3.38 in 1955, 0.69 in 1954, and 3.22 in 1953.

The number of fatal accidents per 1,000,000 gross tons of coal (underground and strip-mine coal) produced was 0.00, compared with 5.88 in 1961.

The following table shows comparative figures for fatal accidents for 1961 and 1962:—

Company	Colliery	1962	1961
The Crow's Nest Pass Coal Co. Ltd.	Michel	----	6

The following table classifies the fatal accidents in coal mines as to cause:—

FATAL ACCIDENTS CLASSIFIED AS TO CAUSE

Cause	1962		1961	
	Number	Per Cent	Number	Per Cent
Runaway trip	----	----	2	33.3
Fall of roof rock	----	----	1	16.7
Struck by runaway plank in raise	----	----	1	16.7
Fall of coal	----	----	2	33.3
Totals	----	----	6	100.0

The following tables classify the accidents in coal mines in 1962:—

ACCIDENTS CLASSIFIED AS TO OCCUPATION

Occupation	Number of Accidents	Percentage of Accidents
Underground—		
Miners	71	52.98
Drillers and facemen	----	----
Haulage and conveyor men	19	14.17
Trackmen and mechanics	6	4.48
Supervisors	6	4.48
Timbermen	9	6.71
Coal-cutters	2	1.49
Miscellaneous	6	4.48
Surface—		
Shops	5	3.73
Surface	4	3.00
Preparation and coke-ovens	6	4.48
Miscellaneous	----	----
Totals	134	100.00

ACCIDENTS CLASSIFIED AS TO CAUSE

Cause	Number of Accidents	Percentage of Accidents
Fall of ground	27	20.15
Fall of material and flying material	9	6.71
Lifting and handling equipment and material	19	14.17
Machinery and tools	40	29.85
Slipped and tripped	29	21.65
Falling off staging and platforms	8	5.98
Miscellaneous	2	1.49
Totals	134	100.00

Accidents Classified as to Injury

Injury	Number of Accidents	Percentage of Accidents
Head and neck	8	5.98
Eyes	4	3.00
Trunk	25	18.65
Back	19	14.17
Arms	7	5.22
Hands and fingers	18	13.43
Legs	42	31.34
Feet	8	5.98
Toes	3	2.23
Totals	134	100.00

Compensable[1] Accidents, Including Fatal Accidents Related to Tons Mined and Men Employed in and about Coal Mines

Year	Number of Accidents	Number of Persons Employed	Frequency per 1,000 Persons	Tons Mined (Gross)	Tons Mined per Accident
1953	557	1,550	359	1,576,105	2,829
1954	360	1,434	251	1,447,608	4,021
1955	372	1,478	252	1,484,066	3,989
1956	385	1,366	282	1,589,398	4,129
1957	340	1,380	246	1,221,766	3,593
1958	214	1,086	197	882,962	4,126
1959	189	1,056	179	757,628	4,009
1960	235	1,182	198	844,500	3,593
1961	219	942	232	1,018,832	4,652
1962	134	776	173	912,837	6,812

[1] Compensable accident means an injury causing a loss of more than four days' work.

EXPLOSIVES

The following table shows the quantity of explosives used in underground coal mines in 1962, 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 in coal mines):—

Vancouver Island District

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots	Average Tons per Pound of Explosives Used	Average Pounds of Explosives per Shot Fired
Tsable River Colliery (Comox Mining Company Limited)	40,000	78,706	53,000	1.96	0.75
Midan mine (Chambers No. 5)	200	850	270	4.25	0.74
Loudon No. 6 mine	290	303	415	1.04	0.69
Lewis mine (Timberlands)	300	599	300	2.00	1.00
Carruthers and Wakelem No. 3 mine	300	225	400	0.75	0.75
Stronach mine	70	136	125	1.94	0.56
Undun No. 3 mine	300	767	500	2.55	0.60
Totals for district	41,460	81,586	55,010	1.97	0.75

NICOLA-PRINCETON DISTRICT

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots	Average Tons per Pound of Explosives Used	Average Pounds of Explosives per Shot Fired
Coldwater mine	50	125	100	2.50	0.50

NORTHERN DISTRICT

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots	Average Tons per Pound of Explosives Used	Average Pounds of Explosives per Shot Fired
Bulkley Valley Collieries	7,500	5,952	9,750	0.79	0.76
Gething No. 3 mine	2,000	1,389	2,700	0.69	0.74
Totals for district	9,500	7,341	12,450	0.69	0.76

EAST KOOTENAY DISTRICT

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots	Average Tons per Pound of Explosives Used	Average Pounds of Explosives per Shot Fired
Michel Colliery (underground)	105,022	715,999	80,415	6.81	1.23

PROVINCE

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots	Average Tons per Pound of Explosives Used	Average Pounds of Explosives per Shot Fired
Totals for Province	156,032	805,051	147,975	5.16	1.05

QUANTITY OF DIFFERENT EXPLOSIVES USED

	Lb.
Monobel of different grades	155,587
Permissible rock powder	445
Total	156,032

MACHINE-MINED COAL

In 1962, mining machines produced approximately 270,125 tons or 33.5 per cent of the total output from underground mining. A total of 107,786 tons of strip-mined coal was removed by mechanical means.

SAFETY LAMPS

There were 810 safety lamps in use in the mines of the Province. Of this number, 735 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) under 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 and underground at three collieries. A total of 16,328 horsepower was used in and about these mines. Detailed information as to how and where this power was used is given in the report of the Senior Electrical Inspector of Mines.

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 report 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 each month.

DIESEL LOCOMOTIVES

Since August, 1950, diesel locomotives have been permitted in coal mines in British Columbia.

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 one time in any coal mine or district of a mine. For further details *see* 1954 Annual Report.

DANGEROUS OCCURRENCES

On January 4, 1962, a rubber-insulated electric trailing cable used for supplying power to a shuttle car in the No. 102 slope section, "A" East mine, Michel Colliery, was punctured and damaged when it slackened and caught on a cotter-pin on the tension end of a conveyor during transit of the car. A flash occurred but no one was injured. The controls isolated the electric circuit immediately the incident occurred.

On March 20, 1962, an electric trailing cable attached to a shuttle car at the No. 1 split off No. 1 level, "A" North mine, Michel Colliery, was damaged when the car was pulling a timber support to the face. A flash occurred but no one was injured. The isolating controls functioned immediately. It was suspected that the cable was damaged by the timber while it was being drawn around a curve.

On April 11, 1962, a ⅝-inch-diameter rope used for hoisting supplies at the upper portion of the No. 2 incline at Upper "A" South mine, Michel Colliery, broke while lowering two cars of supplies and two empty timber-trucks on the incline. The cars and trucks ran down the incline for a considerable distance before they were derailed. They were extensively damaged and no one was injured.

On April 26, 1962, a rubber-insulated electric cable used on a Joy continuous miner at the "A" North mine, Michel Colliery, was damaged during the operation of the machine. A flash occurred but no one was injured. The cable was an integral part of the machine. There was no indication that the cable was damaged by abuse or other outside source. It was suspected that the cable was too short and was damaged by continuous flexing during the operation of the machine.

On September 24, 1962, a flash fire occurred in the new fine-coal cleaning plant, Michel Colliery. No one was injured and no material damage was caused, apart from the overheating of a metal chamber at the discharge end of the drier. Subsequent investigation disclosed that a quantity of coal-dust spillage had been thrown into the chamber when the plant was idle and the dust ignited when the plant was started up.

On October 4, 1962, a metal locking device on a 100-ampere F.L.P. coupler connecting two trailing cables on the No. 1 level at the Balmer mine, Michel Colliery, was blown from its socket when the circuit was energized to remove a continuous miner from the mine. The device struck a workman on the knee and caused minor injury. It is suspected that moisture had entered the coupler during the flitting operation, and this had caused a short circuit in the coupler.

On October 12, 1962, smoke and sparks were found issuing from beneath a main belt conveyor on No. 1 slope, "A" North mine, Michel Colliery. The belt was immediately stopped, and it was discovered that a quantity of wet coal dust, adhering to the underside of the bottom belt, had been heated due to friction on the brake drum of the retarding pulley. The heated coal dust was extinguished and removed.

On December 5, 1962, a rubber-insulated electric cable on a continuous miner in the No. 102 slope section at "A" East mine, Michel Colliery, was damaged when it was squeezed by the headframe of the machine. A flash occurred but no one was injured. Investigation of the incident disclosed that a suspension strap supporting the cable had broken during the operation of the machine, allowing the cable to drop.

On December 5, 1962, a large volume of smoke was discovered issuing from the drive end of a belt conveyor at a transfer point on No. 1 room off No. 1 slope, "A" North mine, Michel Colliery. A blockage of coal had occurred at the transfer point that caused frictional heating between the belt and the coal, resulting in a smouldering fire. The fire was quickly extinguished. A portion of the belt on the drive pulley was extensively damaged.

BUMPS AND OUTBURSTS

On March 19, 1962, a severe bump was felt at a number of surface dwellings in the vicinity of Michel Colliery, also as far as the community of Sparwood, 2½ miles distant. The bump had occurred in the workings of the "B" South mine, which were in the process of abandonment. Full extent of the bump is unknown, owing to the fact that the main level and a number of companion roadways giving access to the mine were completely blocked by the upheaval of the floor. There were no men in the mine at the time. A small amount of equipment was lost.

On April 19, 1962, a severe bump occurred on the No. 1 right belt-road in the No. 102 slope section at "A" East mine, Michel Colliery. Approximately 80 feet of the track was lifted by the upheaval of the floor, ranging from 0 to 9 inches; a number of cars standing on the track were derailed, and a 4-inch pipe-line on the side of the roadway was thrown toward the centre of the track. Five sets of timber were broken but did not collapse. No one was injured.

On June 19, 1962, a severe bump occurred on the No. 102 slope at "A" East mine, Michel Colliery. No one was injured, but approximately 100 feet of track was lifted 0 to 18 inches by the upheaval. Five sets of timber were broken but did not collapse, and a 4-inch pipe-line at the side of the roadway was damaged.

PROSECUTIONS

There were no prosecutions instituted at the various mines during the year.

SUPERVISION OF COAL MINES

During 1962 eleven companies operated mines, employing 548 men underground. In the supervision of underground employees, there were two managers, eight overmen, and forty-one firebosses, or approximately one official for every eleven men.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS

First-, Second-, and Third-class Certificates and Mine Surveyors' Certificates

The Board of Examiners, formed on July 10, 1919, consists at present of R. B. Bonar, Deputy Chief Inspector of Mines, chairman and secretary; A. R. C. James, Inspector of Mines, member; and D. R. Morgan, Inspector of Mines, member.

The examinations are held at least once a year and more often if necessary. Examinations were held at the Cumberland and Fernie centres in 1962 on May 2nd, 3rd, and 4th.

The total number of candidates at these examinations were as follows: Third-class certificates, three (two passed, one failed); mine surveyor's certificate, one (failed).

The following were the successful candidates: Third class—Charles A. Hamilton and Stanley A. Wasiewicz.

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.

In addition to the examinations and certificates already specified as coming under the Board of Examiners, the Act provides that every coal-miner shall be the holder of a certificate of competency as such. Examinations are held as circumstances warrant 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 1962 four candidates were successful in obtaining coal-miners' certificates. In addition to the certificates granted above, substitute certificates were issued to those who had lost their original certificates.

The Board of Examiners desires to thank the different coal-mining companies for use of their premises for the holding of examinations where necessary.

NOTES ON COAL MINES

VANCOUVER ISLAND INSPECTION DISTRICT

By R. B. Bonar

The gross output of coal from the Vancouver Island Inspection District was 81,586 tons, an increase of 3,276 tons or 4.2 per cent over the 1961 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 six very small mines, providing employment for no more than thirteen 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 over 85 per cent since 1951. This condition has resulted from loss of markets due to competition from other fuels, high cost of production, and from the depletion of economic reserves in the Nanaimo coalfield.

In 1962 there were twenty-two accidents of more than five days reported. There were no fatal accidents.

The annual mine-rescue and first-aid meet organized by the Vancouver Island Mine Safety Association was held at Cumberland on Saturday, May 26th. Two teams from the Tsable River mine and a visiting team from Bralorne-Pioneer mine participated in the mine-rescue competition, and a very high standard of performance was maintained. The winning team was the Tsable River Team No. 1, captained by John Thomson.

NANAIMO (49° 123° S.W.)

Midan Mine

This mine, formerly known as Chambers No. 5 mine, is in Section 14, Range 7, in the Douglas district, near Extension. It is now operated by the Midan brothers; A. Midan, fireboss. The present workings consist of a 600-foot slope driven in a section of the Wellington seam in the vicinity of the old Vancouver slope workings. The slope pillars and the pillars between the rooms driven to the right off the slope are being mined on the retreat.

The coal is mined by picking out the middle band of carbonaceous shale with hand-picks. It is then blasted and hand-loaded into cars which are hauled to the tipple by a gasoline-driven hoist. A small shaker screen sorts the coal into 2-inch, 1- to 2-inch, and under 1-inch sizes.

Total production in 1962 was 850 tons over a working period of 225 days with a crew of two men. Working conditions were found to be satisfactory in the course of inspections. No accidents were reported.

Lewis Mine

Glyn Lewis, operator and fireboss. The 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 new mine, which commenced production in May, 1951, is in Range 1, Section 2, of the Cranberry district. It operates in an area of coal outcrop 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 is 6 feet thick, including two thin rock bands.

The coal is blasted off the solid and hand-loaded into cars which are hauled to the surface up the slope by a small hoist driven by a gasoline-operated engine. A shaker screen sorts the coal into lump, nut, and pea sizes. Total production in 1962 was 599 tons over a working period of 138 days with a crew of three men. Working conditions were found to be satisfactory, and no accidents were reported.

Undun No. 3 Mine

J. Unsworth and A. Dunn, operators; A. Dunn, fireboss. This mine was brought into production in September, 1960, and is located near the No. 3 slope, old Extension Colliery. A long outcrop pillar of fairly thick coal was encountered, which was skipped on the inside for several hundred feet to form a level haulage road. This pillar is now being mined on the retreat.

Production was 767 tons over a period of ninety-two days with a crew of two men.

Conditions found during inspections were satisfactory, and no accidents were reported.

NORTH WELLINGTON (49° 124° S.E.)

Loudon No. 6 Mine

William Loudon, operator and fireboss. This mine is about 1 mile southeast of Wellington and has been opened up by a flat-dipping slope driven in a small area of outcrop coal in the No. 2 Upper Wellington seam adjacent to the old No. 9 workings. The top portion of the seam, varying from 2 to 3 feet and consisting of carbonaceous shale, is blasted off the solid and stowed. The bottom 20 inches to 2 feet of coal is broken up with light shots and hand-loaded into cars which are hauled to the surface by a small gasoline-powered hoist. Production in 1962 amounted to 303 tons over a working period of eighty-three days with a crew of two men. Working conditions were found to be satisfactory during the course of inspections, and no accidents were reported.

Carruthers and Wakelem No. 3 Mine

R. B. Carruthers, operator and fireboss. This mine, near the Loudon mine, is also in the No. 2 or Upper Wellington seam adjacent to the abandoned workings of the old No. 9 mine. Production in 1962 amounted to 225 tons over a working period of 130 days with a crew of one man. Working conditions were found to be satisfactory in the course of inspections, and no accidents were reported.

Stronach No. 2 Mine

Charles Stronach, operator; H. Gilmour, fireboss. This mine is in a section of the No. 2 or Upper Wellington seam adjacent to the old No. 9 mine. All the output comes from the mining of pillars and small areas of coal left in the early workings. Production in 1962 amounted to 136 tons over a period of fifty-eight days with a crew of two men. Working conditions were found to be satisfactory in the course of inspections, and no accidents were reported.

COMOX (49° 124° N.W.)

Comox Mining Company Limited.—S. J. Lawrence, president; G. Dutfield, vice-president; P. F. Grundy, secretary. Head office address, P.O. Box 4, Union Bay, B.C.

Tsable River Mine.—S. J. Lawrence, manager; James Cochrane, overman; A. Somerville, M. Frobisher, J. Thomson, A. Cullen, L. Cooper, and W. High, firebosses.

Since the leasing of this property from Canadian Collieries Resources Limited on a royalty basis by the present operators, mining has been concentrated in the northeast section. By the end of 1962 the reserves in this area had been depleted and recovery of equipment was started. Work is now concentrated on No. 10 right level and on the left side of the diagonal slope.

While two Joy loaders are still being used to advantage, most of the output is hand-loaded onto shaker-conveyors. Electrical multiple blasting with millisecond delay detonators is used throughout the mine.

Production is 1962 amounted to 78,706 tons over a working period of 239 days with a crew averaging 108 men.

First-aid arrangements were maintained at a satisfactory standard. A suitably equipped first-aid room was provided on the surface, and an ambulance was held in readiness for emergencies. Two mine-rescue teams of six men each were maintained, and these attended periodic practices at the Cumberland mine-rescue station.

The mine fire in Nos. 6 and 8 right level gob areas that was sealed off during December, 1961, has been on the whole fairly quiescent, although a slight flare-up was experienced at one time during the year. However, further plastering of the seals surrounding the fire area apparently checked the leakage as subsequent air samples indicated that the fire was under control.

Conditions at the mine were usually found to be satisfactory in the course of inspections.

EAST KOOTENAY INSPECTION DISTRICT

By D. R. Morgan

The production of coal from the East Kootenay District during 1962 was restricted to the operation of Michel Colliery. The colliery, owned and operated by The Crow's Nest Pass Coal Company Limited, produced 823,785 tons, a decrease of 54,279 tons from the output of the same operation in 1961, and 108,406 tons less than was produced from the whole district in 1961. Tent Mountain strip mine, operated by Coleman Collieries Limited since 1950, was inactive.

The accident statistics at Michel Colliery during 1962 showed a marked improvement in both frequency and severity rates, and it is pleasing to report there were no fatal accidents. Nine serious accidents were reported and investigated, five of which were caused by falls of rock or coal and four by transportation. This was a reduction of three on the total number of serious accidents reported in 1961, and six less fatalities. Minor accidents resulting in the loss of one or more working-days totalled 117, of which ninety-four occurred underground and twenty-three on the surface, a reduction of ninety-seven accidents. Twelve dangerous occurrences were reported and investigated at Michel Colliery. They are reported more fully in another part of this report under the heading "Dangerous Occurrences."

The East Kootenay Mine Safety Association held its forty-first annual mine-rescue and first-aid competitions at Chapman Camp on June 9th, and the various contests were well attended. Five teams from Fernie, Michel, Kimberley, and the Mineral King mine at Toby Creek entered the mine-rescue competition. The Department of Mines and Petroleum Resources shield was won by the Mineral King mine, captained by Bertram McConachie. The Men's Open competition in the first-aid event was won by the Sullivan mine team, captained by Ralph Chatterson, and the Men's Novice competition in the first-aid event by the Sullivan mine No. 2 novice team, captained by George Chesham. The winning team from both the mine-rescue and first-aid open competitions represented the East Kootenay District at the Provincial competitions held at Nelson on June 23rd.

The Crow's Nest Pass Coal Company Limited

T. G. Ewart, president, 670 Elveden House, 717 Seventh Avenue Southwest, Calgary, Alta.; Thomas F. Gleed, vice-president, Seattle, Wash.; W. R. Prentice, secretary, Fernie; J. F. Cleeve, treasurer, Fernie; J. E. Morris, resident manager, Fernie. This company owns extensive coal lands in the Crowsnest Pass area and has conducted large-scale coal-mining operations since 1897. Present activities are confined to the Michel Colliery and include both underground and open-cast operations. The production is mainly sold on the industrial market, and a large amount is exported to the Japanese market. A large quantity of fines is also used for making coke. The operations are directed from a head office in Fernie.

Michel Colliery.—(49° 114° N.W.) Vans H. Hulbert, manager; Irving Morgan, senior overman; Walter McKay, safety supervisor; William Gregory, afternoon shift overman.

The colliery is operated at Michel, 24 miles east of Fernie, and is situated on the Crowsnest Pass branch of the Canadian Pacific Railway. It is a large colliery and has been in operation since 1899. Present workings include five underground mines, two stripping operations, and a modern by-product plant which is on the colliery-site. The mines are operated on both sides of the valley and, with the exception of one, are named according to the seam worked and the direction of development. Three of the mines have been developed from a pair of long rock tunnels which have been driven across the synclinal structure of the coal measures on the south side of the valley. The other two, Balmer and "A" North, are being developed from the outcrops of the respective seams on each side of the valley. The mines are worked by the room-and-pillar system, and the pillars are extracted on the retreat. The mines are fully mechanized, and a large percentage of the production at present is mined by " continuous miners," of which five were in operation at the end of the year. The electrical equipment is of the flame-proof type and has been approved for use in coal mines. Transportation on most of the main levels and the rock tunnels is by compressed-air locomotives. Battery and diesel locomotives are used in the "A" North and Balmer mines.

The output from all the mines is cleaned and treated at a modern preparation plant, which is located near the entrances to the rock tunnels. The plant has been in operation since 1938, and a description has been given in past Annual Reports. An additional plant was built during the winter of 1961 and is being used for cleaning fines. The new plant is estimated to have cost three-quarters of a million dollars. It is capable of cleaning and treating 120 tons of minus ¼-inch or ½-inch coal per hour, and provisions have been made whereby its capacity can be increased to 180 tons per hour. The plant is on the site of the old briquette plant and is adjacent to the remainder of the preparation plant. It embodies the very latest in coal-cleaning equipment and is part of the company's present modernization programme. Its operation to date has been satisfactory.

The underground operations are under the direct supervision of six overmen and twenty-five firebosses.

"A" East Mine.—Harry Corrigan, overman; Henry Eberts, James Walsh, and Roger Pasiaud, firebosses.

This mine is operated in the "A" seam. It is on the eastern limb of the Michel syncline, and the workings have been developed by means of three main levels which were driven on the left side of the rock tunnels. The coal is 10 to 12 feet thick, dips at an angle of 20 degrees, and is overlain by a shale roof which is heavily fractured, and requires close timbering for its support. The mine has been in operation since 1937. Areas on both sides of the main levels have been extensively worked, and the coal reserves are rapidly nearing depletion. Present activities are confined to a small area of dip workings which are below the outer end of the main levels. Portions of the workings are also below the main rock tunnels. The mine is operated by the room-and-pillar system, and a description of the workings has been given in past Annual Reports.

The mine averaged a daily output of 725 tons during 1962 with a crew of thirty-seven men. Most of the production was obtained by the extraction of pillars in the No. 102 Slope district by a Joy continuous miner. The district is in an area of coal that was partly developed from a pair of slopes from the "A" West mine and was later abandoned owing to difficulty in pumping and allowed to flood. The workings were dewatered in 1960, a new entry was made by a pair of slopes from the outer end of the main east levels, and the workings were further developed. The Joy mining unit was installed in 1961, and its operation resulted in a more rapid extraction of pillars. The unit produced 128,326 tons of coal in 1962. Systematic timbering was rigidly carried out, and the ventilation was increased at the faces of the pillar extractions to keep pace with the rapid advancement. The coal from the unit was loaded by shuttle car and fast-moving belts, and loaded into cars at a large loading point on the main east level. Other production from the mine was obtained by the extraction of pillars in the old No. 1 Slope district. The coal in this district was mined by conventional mining methods. It was loaded onto shaker and belt conveyors and loaded into cars at another loading point on the main level. Conditions in general were found to be satisfactory during the course of inspections, with the exception of two instances where the electric cables were damaged during the operation of the mining unit, and two " bumps." These instances are reported more fully in another part of this Report under the heading " Dangerous Occurrences."

The mine was ventilated by an electrically driven aerodyne fan which delivered 110,500 cubic feet of air to the workings at a 4-inch water-gauge. Auxiliary fans were also used in conjunction with the continuous miner. These quantities were found to be sufficient to meet the normal requirements of the workings.

"A" West Mine.—Daniel Chester, overman; Robert Taylor, Thomas Krall, Stanley Menduk, Herbert Parsons, Albert Littler, and Andrew Davey, firebosses.

This mine is in the "A" seam. The workings are on the eastern and western limbs of the Michel syncline and have been developed toward the outcrop. Entry is made from the right side of the rock tunnels. The seam is 12 to 28 feet thick, dips at an angle of 20 to 35 degrees, and is overlain by a moderately strong shale roof. The mine is operated by the room-and-pillar system. It is partitioned into panels, and the roadways arranged so that most of the pillars are extracted on the strike of the seam. The mine has been in operation since 1937, and a description of the workings has been given in past Annual Reports.

The mine averaged a daily output of 828 tons during 1962 with a crew of 122 men. Most of the production was obtained by the extraction of pillars, and the main activities were directed to the No. 1 left belt-road panel, which is located near the lower part of the mine. The coal in this area is 28 feet thick. The roadways are driven on the footwall of the seam, and the top coal is supported by timber sets. The rooms are driven at 45-foot centres, and the coal is mined with pneumatic picks or is blasted from the solid with the use of millisecond delay action detonators. During extraction of pillars the timber supports are withdrawn and the top coal is allowed to fall or is blasted into the roadways. The coal is loaded by duckbill conveyors, which extend beyond the timber supports to prevent the workmen being exposed to the caved areas, and is later transferred to a central loading point on the main west level by a series of belt conveyors, where it is loaded into large trips of cars and taken from the mine by compressed-air locomotives. Most of the equipment is operated by electricity, but compressed-air machines are used in the vicinity of the working-places.

The mine maintained a high production rate in 1962, but the size of the operation has been considerably reduced. Workings in the upper part of the mine were abandoned in 1961 following a number of heatings and fires. Two further working-panels were abandoned in 1962 following extraction of pillars, and most of the present activities are restricted to the No. 1 left belt-road panel. Preparations are being made for a small pillar extraction below this panel, and a continuous miner will be used shortly for extracting a limited number of pillars alongside the old No. 1 incline, which was abandoned many years ago.

The mine is ventilated by an electrically driven axivane fan which delivers 85,000 cubic feet of air per minute to the mine workings at a 2.5-inch water-gauge. The ventilation system was reorganized following the abandonment of the workings in the upper part of the mine, and the present intake airway is via the No. 1 entry in the old No. 4 right belt-road panel, which is connected to the surface outcrop. The change-over was successful, and the quantity was sufficient for the requirements of the mine. Other conditions were also found to be satisfactory during the course of inspections, and a close check was kept on the fire seals in the upper part of the mine.

Upper "A" South Mine.—James Anderson, overman; William Verkerk, Robert Doratty, John Krall, Joseph Serek, Arnold Webster, Michael Tymchuk, Benjamin Volpatti, and Harvey Travis, firebosses.

This mine is in the "A" seam. It is being worked to develop a large area of coal left between the old "A" South mine workings and the outcrop of the seam. The mine is on the western limb of the Michel syncline and was entered by two inclines which were driven in the underlying seam and later connected by two rock tunnels. The seam was entered in November, 1958, and since that time three inclines have been driven on the full pitch of the seam to the outcrop. Development levels are being driven on each side of the inclines. The coal is 26 feet thick, of good quality, and pitches at an angle of 35 degrees in a westerly direction. The mine is operated by the room-and-pillar system, and the pillars are extracted by the caving system. A description of the workings has been given in past Annual Reports.

The mine averaged a daily output of 650 tons during 1962 with a crew of 132 men. Most of the activities were directed to the extraction of pillars in the No. 1 North level district, which is located on the right side of the main inclines and at the lower part of the mine workings. Other activities were directed to the development of the levels in the No. 2 North level section, which are in the upper part of the mine, and to the development of a new panel of workings above the No. 1 South level. The two main levels in the No. 2 North section were driven by " Borecut " continuous miners, and other working-places by the use of pneumatic picks or multiple blasting. The coal is loaded onto conveyors or chutes and transferred to various loading points on the main levels, where it is loaded into 10-ton-capacity bottom-dumping cars. It is later dumped into large coal-bins on the main raises at the various levels and transferred by retarding conveyors to a central loading point on the main rock tunnel. Compressed-air locomotives are used for hauling the cars.

The mine is ventilated by an electrically driven aerodyne fan which delivers 75,000 cubic feet of air per minute to the workings at a 1.8-inch water-gauge. This quantity was found to be sufficient to meet the normal requirements of the mine, but some difficulty was experienced during one period in conducting an adequate amount of ventilation to part of the workings at the inner end of the No. 1 North level. This was later rectified. Other conditions were found to be satisfactory during the course of inspections.

"A" North Mine.—John Whittaker, overman; Thomas Taylor, Roger Gerou, Sidney Hughes, Kenneth Kniert, and John McInnes, firebosses.

This mine is in the "A" seam. It is on the north side of the Michel Valley, and is located approximately half a mile east of the colliery preparation plant. The mine has been in operation since 1951. It is entered by means of four levels which have been driven from the outcrop, and there has been some development of workings on both sides of the levels. The seam is very irregular and faulty. It is 12 feet thick where normal, dips at an angle of 15 to 20 degrees in a southerly direction, and is overlain by a moderately strong shale roof. The mine is operated by a modified room-and-pillar system. The workings are panelled, and the pillars extracted on the retreat. Most of the operations to date have been restricted to development work. The mine will eventually become a large operation.

The mine averaged a daily output of 480 tons during 1962 with a crew of fifty men. Most of the activities were directed to the development of a new section of workings known as the No. 1 Slope district, in the lower part of the mine. The workings are below the No. 0 level, which is the lowest level in the mine, and are being developed from two slopes which will eventually be driven below and beyond the main No. 3 highway and Canadian Pacific Railway track to the south side of the valley. Permission has been granted to proceed beyond the highway and railway line, and provisions are being made to leave a sufficient area of coal to prevent subsidence. The workings are being developed by two Joy continuous miners, one of which was installed in the early part of 1962 and the other in October. Their operation to date has been satisfactory, although a great deal of difficulty has been experienced at times owing to geological disturbances in the seam. Systematic timbering is rigidly enforced at the faces of the working-places, and large auxiliary fans are used with each of the continuous miners to contend with the increased emission of gas from the coal due to the more rapid advancement of the roadways. The coal from the " miners " is loaded via shuttle cars and fast-moving belts. It is transferred to a central loading point on the No. 1 level and loaded into 10-ton-capacity bottom-dumping cars. The cars are taken from the mine by diesel and battery locomotives and dumped into a 200-ton storage bin on the surface, from which it is hauled by truck to the preparation plant. The only other activity at the mine during 1962 was the extraction of pillars by a " Borecut " continuous miner in the No. 4 incline panel above the No. 2 level. This operation was abandoned in May, and the machine was transferred to the Upper "A" South mine. Total development during 1962 was 7,870 feet.

The mine is ventilated by an electrically driven axivane fan which delivers 72,000 cubic feet of air per minute to the mine workings at a 1.6-inch water-gauge. The fan is exhausting the air from the mine during most of the time but is reversed during the winter to prevent freezing conditions in the drainage level at the lower part of the mine. The conditions in general were found to be satisfactory, but on one occasion there was some difficulty in conducting a sufficient quantity of ventilation to the workings at the lower part of the mine due to a restriction in the airway. This was later rectified. In two instances electric trailing cables were damaged during the operation of the continuous miners. These happenings are reported more fully in another part of the report under the heading " Dangerous Occurrences."

" B " South Mine.—William Davey, overman. This mine, which was operated in the " B " seam and has been one of the most important producers at the colliery for many years, was abandoned in March, 1963, following depletion of coal reserves. The mine was opened in 1928. It has been extensively worked and, it is reported, produced a total of approximately 5,200,000 tons of coal. The seam was 5 feet thick, of excellent coking quality, and was worked by the shortwall system. A description of the workings has been given in past Annual Reports.

No. 1 Seam Prospect.—Harry Corrigan, overman. This roadway is being driven near the entrance to the old No. 1 mine on the right side of the main rock tunnels to obtain a number of bulk samples of coal for testing. If the coal is found suitable for coking, it is intended to re-enter part of the old mine workings to extract a large number of pillars that were left unworked when the mine was abandoned in 1938. The roadway is being driven up the pitch, and had been driven 300 feet at the end of 1962.

Balmer (No. 10) Mine.—William Davey, overman; Frank McVeigh, Harry Sanders, and Paul Kusnir, firebosses.

This mine is being worked to develop a large area of virgin coal in the No. 10 seam on the south side of the Michel Valley near Natal. The mine is approximately 1 mile west of the colliery preparation plant, and is entered by three levels which are being driven from the outcrop near creek elevation and which follow the strike of the seam. Most of the development to date has been confined to driving the levels. The seam is 40 feet thick, is of good quality, and is overlain by a moderately hard shale roof. The seam pitches at an angle of 30 degrees in an easterly direction, and the levels are driven in close contact with the hangingwall. The mine was opened in September, 1960.

The mine averaged a daily output of 240 tons during 1962 with a crew of twenty-seven men. Most of the activities were directed to driving the upper two main levels, and driving by-pass roadways on the footwall alongside the main haulage level for the construction of loading points for future development toward the outcrop. The levels and roadways were driven by a Joy continuous miner for a period of six months and by conventional hand-mining with the use of pneumatic picks and multiple blasting for the remainder of the year. The coal is loaded onto chain and belt conveyors and transferred to various loading points on the haulage level, where it is loaded into 10-ton-capacity bottom-dumping cars and taken from the mine by diesel or battery locomotives. The production from all the mine is dumped into a 200-ton steel bin that was completed on the surface during 1962 and transported to the preparation plant by truck. Other activities during 1962 included the construction of a locomotive building on the surface and the installation of a small fan at the portal of the main drainage level for ventilating the mine. The latter is a temporary installation which will be replaced by a larger fan at a later date on completion of another drive to the surface outcrop, which will become the main return airway. The fan delivers 35,000 cubic feet of air to the workings, which was found to be sufficient for present requirements. Other conditions were found to be satisfactory during the course of inspections.

During 1962, 104,577 pounds of Monobel No. 4, 445 pounds of CXL-ite, and 80,415 electric detonators were used at the colliery for coal and rock blasting. No misfired shots were reported.

One hundred and ninety-four tons of limestone dust was used for the application of inert dust on the roadways at the various mines to minimize the coal-dust hazard and for tamping shots. Monthly mine-dust samples were taken at all the mines and analysed. The samples were found to be above the minimum requirements needed for incombustible content.

The miners' inspection committees carried out regular monthly examinations at each of the mines, and regular safety meetings were held at the colliery office each month. The various report books kept at the mines in accordance with the requirements of the *Coal Mines Regulation Act* were examined periodically and found to be in order.

Baldy Mountain Strip Mine.—Vans H. Hulbert, manager; George Lancaster, foreman. This operation is at a high elevation, 4 miles east of Michel, and can be reached by private roadway leading from the preparation plant. The seam is 40 to 60 feet thick, dips at an angle of 25 to 30 degrees in an easterly direction, and is of fairly good quality. The outcrop of the seam can be traced for several miles along the mountainside, and the company has conducted several stripping operations at various elevations along the outcrop since entering the area in 1948. Present activities are directed to what is known as the No. 4B pit, which is at an elevation of 5,000 feet. The work is carried out on a contract basis by Emil Anderson Construction Company.

The operation produced 47,697 tons of coal during 1962 with a crew of one shovel operator for loading and three truck-drivers for transporting the coal to the preparation plant. The operations were considerably restricted by the coal market, and were confined to the loading of coal on a single-shift basis. The removal of overburden in the No. 4B pit was completed in 1961, and it is estimated there was approximately 140,000 tons of coal left exposed in the pit at the end of 1962.

"A" South Strip Mine.—Vans H. Hulbert, manager; George Lancaster, foreman. This operation was started in August, 1961, and is being worked with the intention of stripping a large quantity of "A" seam coal outcropping on Sparwood Ridge, 2 miles west of the colliery preparation plant. The operation is at an elevation of 5,500 feet and is located above the underground workings of the Upper "A" South mine. It can be reached via the underground workings or by means of an old mining-road leading from the No. 3 highway east of Michel. The seam is 30 feet thick, of good quality, and dips at an angle of 35 degrees in a westerly direction. Stripping operations have been contracted to Emil Anderson Construction Company with the intention of removing 200,000 cubic yards of overburden to expose 120,000 tons of coal. Removal of the overburden was completed during the spring of 1962, and since that time activities have been confined to the loading of coal.

The operation produced 60,089 tons of coal during 1962 with a crew of three men. The coal is removed in 15-foot lifts along the strike of the seam. It is loaded by power-shovel, trucked to a large bin at the entrance to one of the raises from the Upper "A" South mine which has been connected to the surface outcrop, and transported to the preparation plant via the underground workings. The stripping operation was suspended in November and will remain idle for the winter months.

By-product Plant.—George Lancaster, superintendent. This plant is on the colliery-site and is adjacent to the preparation plant. It has been in operation for many years, and a description has been given in past Annual Reports. The operations during 1962 were restricted to the Curran Knowle ovens, and the plant produced 136,124 tons of coke, 9,318 tons of breeze (coke fines), and 864,029 gallons of tar. There were sixty-three men employed. Other activities were directed to the construction of a three-oven battery of Mitchell ovens, which is expected to be completed by March, 1963. The new ovens will be built at a cost of $50,000, and will be used for testing the suitability of various blends of Michel coals for making coke, also to enable the company to obtain sufficient data regarding the construction and economics of a full battery of Mitchell ovens. The ovens operate on the same principle as the Bee-hive ovens but are claimed to be more suitable to mechanization and capable of yielding a better coke for cupola- and blast-furnace use than that produced by the Curran Knowle ovens. The new ovens will be 34 feet long, 6 feet wide, 5 feet high at the ends, and rising to 8 feet 7 inches at the centre. The charge in each oven will be 8 to 12 tons of coal.

Columbia Iron Mining Company

Company office, 120 Montgomery Street, San Francisco 6, Calif. R. C. Talbott, manager, Land and Explorations; S. G. Sargis, assistant manager, Exploration; J. K. Hayes, supervisor, Field Exploration; M. D. Okerlund, project manager, Fernie. This company, a wholly owned subsidiary of United States Steel Corporation, obtained an option in May, 1960, to explore and investigate all the coal properties of The Crow's Nest Pass Coal Company Limited with a view to purchasing all or part of the property if a sufficient quantity of suitable coal was found. The option covers a period of four years and includes an intensive exploration programme.

The exploration during 1962 was very restricted and was confined mainly to the drilling of two holes, totalling 2,000 feet, on the east side of Morrissey Ridge, south of Coal Creek. The drilling-rig was dismantled at the end of March, and all the equipment was withdrawn from the area. There were no further activities during 1962, with the exception of a short visit by a party of geologists in June. The option has since been terminated.

NICOLA-PRINCETON INSPECTION DISTRICT

By David Smith

Coal production in 1962 in the Nicola-Princeton District was 125 tons. Production was obtained from one small mine. Further exploration by diamond drilling was carried out by Imperial Metals and Power Ltd. on the Coldwater leases.

No accidents were reported by the coal mine in 1962, nor where there any prosecutions under the *Coal Mines Regulation Act*.

Merritt (50° 120° S.W.)

Coldwater Mine

This property, 1 mile south of Merritt, is operated by the owners, S. Gerrard and partners. Mining of coal has been confined to the recovery of pillars in the abandoned workings of the old Middlesboro No. 5 mine. Total production in 1962 was 125 tons, sold locally. A crew of two men was employed. Working conditions were satisfactory, and no methane was detected in the course of inspections.

NORTHERN INSPECTION DISTRICT

By David Smith, except as noted.

The coal mines of the Northern District produced a total of 7,341 tons of coal in 1962. The output is sold entirely on the domestic market, which limits all operations to seasonal work.

No accidents and no dangerous occurrences were reported from the mines of this district in 1962.

BOWRON RIVER (53° 121° N.W.)*

Northern Coal Mines Limited Registered office, 716 Hall Building, 789 West Pender Street, Vancouver 1. A. D. Ross, president; A. J. Garraway, manager. This company, together with two associated companies, holds 155 mineral claims in the vicinity of Bowron River, about 30 miles due east of Prince George. Two of the principals in the company also hold Coal Licence No. 148 covering Lot 9592. The company was formed to work coal and mineral deposits in the Bowron River coalfield, which consists of Tertiary coal-bearing sediments underlying the Bowron River valley in a belt 1½ to 2 miles wide and about 7 miles long. The valley bottom is covered by heavy overburden, so that outcrops are largely restricted to the river banks. The coal measures in general strike about north 40 degrees west and dip northeast at 20 to 60 degrees. The surrounding rocks are mainly volcanic. Intermittent exploration work has been done in past years, mainly on seams outcropping on the west bank of the river on Lot 9593; the Bowron Coal Company did some work from 1946 to 1950, and this was continued by Central Industries Ltd. from 1952 to 1954. In 1960 Tanar Gold Mines Ltd. made an option agreement with A. J. Garraway and associates and sank a shaft 30 feet. Descriptions of the work done are given in the Annual Reports for 1954, 1955, and 1960.

The present company began work in March, 1962. A new site for a slope was selected on Lot 9591 about 4,000 feet southwest of the old portal and 1,000 feet west of Bowron River. The overburden at this point was found to be only 10 feet thick. A suitable area was stripped, and a 9- by 12-foot slope was collared in solid rock. The slope was driven south 72 degrees east for 250 feet on a gradient of 20 degrees and then levelled off for a landing for a distance of 90 feet. From this landing two crosscuts were turned off northeast and southwest respectively. The northeast crosscut was driven 216 feet with the objective of cutting the major coal seams. At the end of 1962 these seams had not yet been reached, but it was reported that germanium mineralization had been found in the shales in the slope and crosscut.

On the surface a power-house was erected, and a 315-cubic-feet-per-minute Ingersoll-Rand compressor was installed, together with a small hoist, pump, and cap-lamp maintenance installation. Drilling underground was done by jackhammers mounted on airlegs, and the muck was loaded by means of an Eimco 12B mucking-machine. A small wash-house and dry and a bunk-house were erected at the camp. Two miles of road was constructed to provide access.

A crew of nine men was employed from March 5th to November 3rd. No accidents were reported, and no methane was detected in the course of inspections.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1948, pp. 233–240; 1954, p. 247; 1955, p. 162; 1960, p. 238.]

Tanar Gold Mines Ltd. Company office, 285 Seventeenth Street, West Vancouver. A. D. Ross, president; Roger Verity, vice-president and exploration manager. Capital, 3,000,000 shares, 50 cents par value. This company concluded an option agreement in 1960 with A. J. Garraway and A. D. McIsaac to undertake exploration in the area covered by Coal Licence No. 148 on Lot 9593 and part of Lot 9592 on Bowron River, 30 miles due east of Prince George. The company began work in July, 1960, and sank a 10- by 8-foot double-compartment prospect shaft. At a depth of 30 feet, with the shaft still in overburden, the sinking was stopped and the crew withdrawn. The work was not resumed until June, 1962. The shaft was then rehabili-

* By A. R. C. James.

tated, and the sinking was continued to a depth of 125 feet. At this point the shaft had entered bedrock and had cut a 42-inch seam of coal which dipped eastward at 35 degrees. There appeared to be some bands of shale in this seam. A crosscut was driven 155 feet from the bottom of the shaft, and a diamond-drill hole 130 feet long was drilled from the shaft bottom in the opposite direction to the crosscut. It is reported that the crosscut cut several thin coal seams but failed to cut the major seams as had been expected. Very bad ground was encountered, and the work was suspended on November 23rd after a fire had destroyed the bunk-house. A crew of eight men was employed under the supervision of W. J. McNeil.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1960, p. 238.]

Telkwa (54° 127° N.E.)

Bulkley Valley Collieries Limited

Company office, Telkwa. L. Gething, manager; F. Bond, fireboss. This property is on Goat Creek, a tributary of Telkwa River, about 7 miles southeast of Telkwa. Total production in 1962 was 5,952 tons. The mine was closed at the end of March and resumed operations in September. An average crew of eleven men was employed.

Conditions in the mine were found to be satisfactory in the course of inspections, and no methane was detected. No accidents were reported.

Peace River (56° 122° S.E.)

King Gething Mines

This property is on Lot 1039, 12 miles by road west of Hudson Hope, and is owned and operated by Q. F. (King) Gething. A. Rapp is fireboss. Total production for 1962 was 1,389 tons. A crew of five men was employed. Conditions in the mine were found to be satisfactory in the course of inspections, and no methane was detected. No accidents were reported.

Peace River Coal Mines Ltd.

This property is on Larry Creek, on the west slope of Portage Mountain, at the upper end of the Peace River canyon, about 18 miles by road from Hudson Hope. In July, 1951, operations ceased and the mine was abandoned. In 1962, because of its proximity to the Portage Mountain dam-site, an investigation of conditions in the underground workings was made. The main travelways and slopes were retimbered. Conditions in the retimbered areas were found to be satisfactory in the course of inspections, and no methane was detected. No accidents were reported.

Inspection of Electrical Equipment and Installations at Mines, Quarries, and Well Drilling Rigs

By L. Wardman, Senior Electrical Inspector

ELECTRIC POWER

In 1962 electric power was used by thirty-seven companies in operations at thirty-three lode mines, one placer mine, and three collieries. Twenty-nine metallurgical mills were operated. Electric power was also used at twenty-three structural-material and industrial-mineral mines and quarries. Electric power was used on sixty-six drilling rigs in drilling on 333 well locations.

Lode-metal Mines

At six properties electrical installations commenced in 1962 were completed and put into service. One power plant formerly in use on the surface was installed underground, and one power plant taken out of service in 1959 was returned to service. Operations at four properties using electric power were terminated.

The kilovolt-ampere generating capacity of mining-company-owned plants which operated in 1962 is given below:—

Prime Mover	Generator Kva. Capacity
Diesel engines	18,705
Water-wheels	13,385
Steam turbines	1,800
Total	33,890

The electric power produced by the above-mentioned plants amounted to approximately 576,633,677 kilowatt-hours. The power purchased from public utilities and from the generating division of The Consolidated Mining and Smelting Company of Canada, Limited, amounted to 259,004,671 kilowatt-hours. The total amount of power consumed at lode mines was 835,638,348 kilowatt-hours.

A general breakdown of the connected load follows:—

Equipment	Horsepower
Hoists (incline and shaft)	5,770
Hoists (scraper)	7,289
Fans (mine ventilating)	2,408
Pumps (mine unwatering)	6,158
Rectifiers and M.G. sets	6,188
Air compressors (supplying mining equipment)	19,368
Crushing	14,772
Sink float	1,900
Grinding	28,162
Concentrating	15,917
Pumps (mill)	10,236
Shovels and rotary drills	1,325
Workshops	2,221
Miscellaneous	6,751
Total	128,465

In addition to electrically powered equipment, there was in use approximately 16,916 horsepower of prime movers driving direct-connected or belt-connected equipment as tabulated below:—

Prime Mover	Horsepower
Diesel engines	12,279
Water-wheels	4,597
Gasoline engines	40
Total	16,916

On the haulage systems there were in use 101 battery locomotives, ninety-one trolley locomotives, and seventeen diesel locomotives.

Structural-material and Industrial-mineral Mines and Quarries

Electric power was used at twenty-three structural-material and industrial-mineral mines and quarries. Electric power is purchased from public utilities for these operations, with the exception of those in remote areas, which, of necessity, must produce their own power. The capacity of company-owned plants was approximately 3,966 kilovolt-amperes.

Approximately 14,789,200 kilowatt-hours of power was generated and 8,372,891 kilowatt-hours was purchased, making a total of 23,262,091 kilowatt-hours of power consumed.

The distribution of the connected load was approximately as follows:—

Equipment	Horsepower
Hoists (incline)	252
Hoists (scraper)	205
Fans (ventilating and dust-collecting)	48
Pumps	1,145
Rectifiers and M.G. sets	38
Air compressors	769
Electric drills and shovels	75
Crushing (includes drying)	5,244
Conveyors	2,930
Screens	906
Milling	2,613
Workshops	319
Miscellaneous	1,573
Total	16,117

At these properties there was also direct-driven equipment totalling 4,813 horsepower.

One battery locomotive was used for underground haulage.

Coal Mines

There was no increase or decrease in the number of collieries using electric power. The distribution of the connected load follows:—

	Horsepower	
Surface—		
Compressors	3,940	
Ventilation	1,030	
Hoisting	908	
Haulage	25	
Coal washing and screening	2,015	
Pumping	65	
Coke production	1,180	
Miscellaneous	820	
Total		9,983
Underground—		
Ventilation	440	
Hoisting	264	
Haulage	445	
Coal-loaders	84	
Conveying	2,212	
Pumping	510	
Compressors	425	
Borecuts	225	
Continuous miners	1,020	
Coal-cutters	50	
Miscellaneous	670	
Total		6,345
Total for surface and underground		16,328

Four battery locomotives and two diesel locomotives were in use for haulage above and below ground.

A total of 26,983,710 kilowatt-hours of electric power was used for mining and coal processing.

ELECTRICAL INSTALLATIONS

LODE MINES

Unuk River (56° 130° S.E.)

Granduc Mines Limited

For many years this company has had a snowslide problem at the mine that prevented the erection of permanent buildings. To avoid the danger of slides, an excavation was made underground to house three 150-kw. 480-volt three-phase a.c. generators, one 250-kw. and one 350-kw. 2,300-volt three-phase a.c. generators driven by diesel engines. Three single-phase 150-kva. 2,300–480-volt transformers connected the 2,300- and 480-volt systems. The equipment supplied by this plant consists of a 200-horsepower 2,300-volt hoist motor, two 75-horsepower and one 125-horsepower 480-volt pump motors, and one 10-horsepower fan motor in the mine. In the power-house three 125-horsepower 480-volt air-compressor motors are supplied. There is also a fourth air compressor driven by a diesel engine. The exhaust from the diesel engines is carried to the surface by a special ventilation raise.

In addition to the foregoing, a new 300-kw. diesel-driven generator and a 4.5-kw. Powertronic battery-charger was installed. Five 60-horsepower Flygt pumps for emergency and stand-by use were installed.

ALICE ARM (55° 129° N.W.)

Dolly Varden Mines Ltd.—During the summer some work was done at the Torbrit power plant to put it in service for development work at the Dolly Varden mine. Repair work was done on the control dam. The penstock pipe-line to the power plant has been retimbered. The power-plant buildings were renovated and the generating equipment was reinstalled. The 13,000-volt power-line was rebuilt and the camp distribution was rewired.

QUEEN CHARLOTTE ISLANDS

Harriet Harbour (52° 131° S.E.)

Jedway Iron Ore Limited—A crushing plant, haulage system, mill, and loading-dock was built and put into operation. At the open pit a pan-feeder driven by a 20-horsepower 460-volt motor and a jaw crusher driven by a 200-horsepower 460-volt motor were installed. In the crushing plant a 4½-inch jaw crusher and a 4-inch jaw crusher, each driven by a 150-horsepower motor, were installed. Other equipment consists of two feeders, nine conveyors, two screens, and a drum conveyor.

In the mill a rod mill driven by a 400-horsepower 2,300-volt motor was installed. Other equipment consists of a classifier, two magnetic drum separators, pumps, filter, and conveyors.

The loading-dock system consists of eight feeders and six conveyors.

The power plant for this system consists of three 1,250-kva. a.c. generators driven by diesel engines.

A trolley haulage system transports the ore from the primary crusher at the pit to the secondary crusher at the mill. Two trolley locomotives and one battery locomotive are in use.

LILLOOET

Bridge River (50° 122° N.W.)

Bralorne Pioneer Mines Limited.—The grinding section of the new mill was completed and put into service. Details of the equipment installed are given in the 1961 Annual Report.

Anderson Lake (50° 122° N.E.)

Golden Contact (Cassiar Copperfields Limited)—A 100-ton mill was built on the property consisting of the following equipment: A jaw crusher driven by a 25-horsepower motor, two conveyors driven by 5-horsepower motors, a pan-feeder driven by a 3-horsepower motor, a gyro-crusher driven by a 30-horsepower motor, a vibrating screen driven by a 30-horsepower motor, a conveyor driven by a 2-horsepower motor, a ball mill driven by a 75-horsepower motor, a jig and an amalgam barrel each driven by a 2-horsepower motor, and a Dorclone pump driven by a 5-horsepower motor.

The power plant consists of a 250-kva. 2,300-volt a.c. generator driven by a diesel engine and a 25-kva. 208/120-volt stand-by unit driven by a gasoline engine. A bank of three 37½-kva. 2,300–240-volt transformers connect the two units to the distribution system. A bank of three 100-kva. 2,300–240-volt transformers, connected delta-wye to give 440 volts, supply the motors.

Highland Valley (50° 120° S.W.)

Bethlehem Copper Corporation Ltd.

A crushing plant and concentrator were built on the property during the year. The equipment in the crushing plant consists of an Allis-Chalmers gyratory crusher and a Simons cone crusher, each driven by a 300-horsepower motor. Other equipment consists of feeders, screen, conveyors, magnet, dust-collectors, and oil-pumps.

The equipment in the concentrator consists of a rod mill driven by an 800-horsepower motor, two ball mills each driven by a 900-horsepower motor, four conditioner flotation cells driven by two 10-horsepower motors, twenty rougher flotation cells driven by ten 25-horsepower motors, thirty-six scavenger, cleaner, and recleaner cells driven by eighteen 10-horsepower motors, and a regrind-mill driven by a 200-horsepower motor. Other equipment consists of filters and pumps.

Power is supplied at 60,000-volt potential and is stepped down by three single-phase 60,000–2,475-volt transformers connected delta-wye to provide 4,160 volts potential for the large motors. A 2,000-kva. bank of 4,160–600-volt transformers step down the potential for all other motors.

Merritt (50° 120° S.W.)

Craigmont Mines Limited

A description of the open-pit and concentrator equipment is given in the 1961 Annual Report. To this equipment was added eighteen flotation cells driven by nine 15-horsepower motors, ten flotation cells driven by five 10-horsepower motors, two fresh-water pumps driven by two 75-horsepower motors, a crusher driven by a 250-horsepower motor, two conveyors driven by two 100-horsepower motors, and an a.c. trolley system with a 250-horsepower locomotive. Two diesels driving air compressors were replaced with two 300-horsepower electric motors.

Beaverdell (49° 119° S.E.)

Highland-Bell (Mastodon-Highland Bell Mines Limited).—The old Ruston diesel a.c. generating-unit control panels and wiring were removed, and a new 82-kw. diesel-driven generating unit was installed in its place. Rewiring in the mill was continued during the year.

Phoenix (49° 118° S.W.)

Phoenix Copper Company Limited

The following equipment was installed: A rod mill driven by a 400-horsepower 2,200-volt synchronous motor, two pumps driven by two 15-horsepower 440-volt motors, two flotation cells driven by a 25-horsepower 440-volt motor, a sump pump driven by a 15-horsepower motor, and two air compressors driven by two 100-horsepower motors. A power-line was built to the water dam and Idaho stope.

Iron Mountain (49° 117° S.E.)

Jersey (Canadian Exploration Limited)

Several changes have been made to the underground electrical system to accommodate the progressive mining programme. The No. 401 substation has been dismantled except for loop feeder-circuit switching. The transformer capacity of substation No. 417 has been increased to 275 kva. from 245 kva. to supply additional fans and slushers. The No. 415 substation has been eliminated, and the equipment which was supplied from this station is now supplied from the Jersey 4400 portal. In substation No. 419 two Askarel filled transformers have been installed, raising its capacity to 150 kva.

NELWAY (49° 117° S.E.)

Reeves MacDonald Mines Limited

Shaft signal cable and signalling equipment was installed in the No. 3 shaft to serve the levels from the 1100 level down to and including the 120 level. A 440-volt power cable has been installed to supply scrapers on the 480 level of No. 3 shaft. A temporary 2,300–440-volt transformer bank was installed in the sinking-hoist station.

SANDON (49° 117° N.E.)

Violamac Mines Ltd.

The M.G. sets were removed from underground, and one was placed in temporary service on the surface. A gasoline-driven d.c. generator was installed at the Slocan Base Metals adit to charge a locomotive battery. Operations at the Slocan Base Metals and Violamac were suspended on November 30, 1962.

Ruth Hope

The Carnegie 2,200-volt line to the Carnegie mine was diverted to the Ruth No. 5 level. A new transformer station consisting of three 15-kva. and one 10-kva. transformers was built. Two M.G. sets for charging locomotive batteries were installed and also a portable wedge saw. The buildings were rewired for lighting. The property was operated for one month.

KIMBERLEY (49° 115° N.W.)

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

The 2500 level crushing plant built from equipment previously used on the 3500 level was put in operation. A new conveyor (No. 10) driven by a 300-horsepower motor was added to the underground conveyor system to move ore from the crusher. In the mine power-house, new 2,300-volt starters were installed for three compressor motors; a 500-kva. transformer and a motor control centre were also installed. In the Sullivan concentrator area, further improvement was made in the lighting-system wiring by replacing obsolete fused lighting panels with no-fuse breaker panels. Over the 652–653 conveyors and over the 3800 crushing-chamber operating floor, the incandescent lights were replaced with mercury lights. Three 75-, one 40-, one 25-, one 7.5-, two 5-, and one 2.5-horsepower motors were installed to drive pumps, conveyor, fan, filter, rakes, and sampler. Seven motors on existing pumps, conveyors, and Dillon screen were replaced with motors of a larger size. Two 50-, one 20-, one 7.5-, and one 5-horsepower motors were taken out of service. The obsolete fused switches on the 300-horsepower motors on No. 1 and No. 4 ball mills were replaced with De-ion circuit-breakers. The 550-volt control circuits on the 3800 crushing-chamber floor were rewired, and the switch-room for the 1,000-horsepower rod-mill motor was relocated.

WINDERMERE

Toby Creek (50° 116° S.E.)

Mineral King (Sheep Creek Mines Limited).—A transformer-room was excavated on No. 7 level, and two 60-kva. 2,300–440-volt transformers taken from the surface at No. 3 level were installed to supply three slushers, fans, and battery-charging rectifier. A new 36- by 36-inch vibrating feeder was installed in the crusher-house.

HOPE (49° 121° S.W.)

Pride of Emory (Giant Mascot Mines Limited) On the 2950 level two 50-kva. 2,300–440-volt transformers were installed underground to supply a slusher driven by a 40-horsepower motor, a pump driven by a 15-horsepower motor, and two ventilation fans driven by a 15-horsepower and a 7.5-horsepower motor respectively. On the surface at Texas Creek, two 100-kva. 12,000–440-volt transformers were installed to supply a pump driven by a 40-horsepower motor, and heating and lighting.

In the crushing plant a 4-foot short head crusher driven by a 125-horsepower motor was installed. Also installed were three conveyors, a screen, and a vibrating grizzly.

TEXADA ISLAND (49° 124° N.W.)

Texada Mines Ltd. In 1962 two 500-horsepower compressors were installed and also a new 12,000–2,300-volt 3,000-kva. transformer bank. A new switch-room, office, warehouse, and mine dry buildings were built. Underground a shaft was driven and machinery for 2,500-horsepower skip hoist and a 125-horsepower cage hoist was installed. Both of these hoists are friction-type four-rope hoists.

VANCOUVER ISLAND

Benson Lake (50° 127° S.E.)

Old Sport (Coast Copper Company Limited) A crushing plant, concentrator, compressor-house, and service buildings were built, and the building of a hydro-electric plant was completed. The major equipment in the crushing plant consists of a jaw crusher driven by a 125-horsepower wound-rotor motor and a cone-crusher driven by a 100-horsepower line start induction motor. Other equipment consists of feeder, conveyors, and screens.

In the concentrator the major equipment is a rod mill driven by a 200-horsepower wound-rotor motor, a ball mill driven by a 450-horsepower induction motor, a classifier driven by a 7.5-horsepower motor, a regrind mill driven by a 75-horsepower wound-rotor motor, twenty cleaner cells driven by ten 15-horsepower motors, a conditioner driven by a 5-horsepower motor, six cleaner cells driven by three 7.5-horsepower motors, a vacuum pump driven by a 40-horsepower motor, a thickener, and a filter.

Power-cables were run into the mine to supply scraper hoists and fans.

Two air compressors driven by 450-horsepower motors and a 750-kva. diesel-driven stand-by plant were installed in the compressor-house.

Zeballos (50° 120° S.W.)

F.L. (Zeballos Iron Mines Limited).—The construction of the mill and installation of equipment mentioned in the 1961 Annual Report were completed, and the mill went into operation in April.

Bedwell River (49° 125° S.W.)

Musketeer (Copper Town Mines Limited).—A fan driven by a 3-horsepower motor was installed at the mine portal, a new cross-conveyor driven by a 3-horsepower motor was installed in the crushing plant, and a new power-line from the generating camp to the plant were built.

Kennedy Lake (49° 125° S.E.)

Brynnor Mines Limited

A crushing plant and mill were built and put into operation. The crushing plant consists of two crushers driven by two 200-horsepower 2,300-volt motors, eighteen conveyors driven by one 100-, one 60-, two 50-, one 40-, one 30-, four 15-, and one 10-, one 7.5-, two 5-, two 3-, and two 2-horsepower 550-volt motors. Other equipment consists of four feeders, two screens, one compressor, and one dust-collector.

The mill consists of two rod mills driven by two 550-horsepower 2,300-volt motors, five conveyors driven by one 125-, one 15-, one 5-, and two 3-horsepower motors, nineteen pumps driven by two 150-, nine 30-, three 20-, three 7.5-, one 5-, and one 2-horsepower motors, eight separators driven by eight 5-horsepower motors, two Dorrco filters driven by two 3-horsepower motors, one blower driven by a 5-horsepower motor, and an air compressor driven by a 75-horsepower motor. All motors with the exception of the two mill motors are 550-volt motors.

Power is supplied by the British Columbia Hydro and Power Authority at 25,000 volts and is stepped down to 2,300 volts by four banks of transformers for the 2,300-volt equipment. Five banks of transformers step the power down from 2,300 to 550 volts for the 550-volt equipment.

Jordan River (48° 124° S.E.)

Sunloch and Gabbro (Cowichan Copper Co. Ltd.)

The underground mill begun in 1961 was completed and put into operation. Preparations were made to install a friction hoist in 1963. The mill is divided into two separate circuits, such that each may operate independently of the other. There are four ball mills and one rod mill driven by a 150-horsepower 2,300-volt motor, one rod mill driven by a 250-horsepower 2,300-volt motor, eight No. 30 Denver cells driven by four 25-horsepower motors, twelve No. 24 Denver cells driven by six 10-horsepower motors, fourteen pumps driven by two 30-, six 25-, one 20-, one 15-, two 5-, and two 3-horsepower motors, a vacuum pump driven by a 35-horsepower motor, a conditioner driven by a 5-horsepower motor, and two settling-tank agitators driven by two 3-horsepower motors.

The crushing section consists of a jaw crusher driven by a 160-horsepower motor, a Traylor crusher driven by a 100-horsepower motor, a Telsmith crusher driven by a 150-horsepower motor, six conveyors driven by one 30-, two 15-, two 10-, and one 5-horsepower motors respectively, a feeder driven by a 10-horsepower motor, and a fan driven by a 50-horsepower motor.

Two scrapers driven by 125-horsepower motors and one scraper driven by a 50-horsepower motor move the ore to the coarse-ore pocket.

PLACER MINES

Lightning Creek (53° 121° S.W.)

Wingdam (Wingdam & Lightning Creek Mining Co. Ltd.).—A 200-kva. a.c. generator driven by a 263-horsepower D-375 diesel was installed in the power-house, and two deep-well turbine pumps driven by 125-horsepower motors were installed in the shaft.

STRUCTURAL-MATERIAL AND INDUSTRIAL-MINERAL MINES AND QUARRIES

McDAME (59° 129° S.W.)

Cassiar Asbestos Corporation Limited.—Some new equipment was installed and some of the old equipment was taken out of service, making the connected load at the end of 1962 as follows:—

	Load Added	Load Removed	Final Load
	Horsepower	Horsepower	Horsepower
Crushing and drying	33.5	......	511.20
Mill	292.6	48.5	2,613.40
Rock reject plant	10.0	......	345.50
Mine crusher	6.0	......	125.00
Mine garage	12.0	......	22.50
Tram-line	6.5	......	251.50
Townsite	12.0	......	1,115.00
Workshops	......	......	200.00
Totals	372.6	48.5	5,184.10

TEXADA ISLAND (49° 124° N.E.)

Domtar & Chemical Co. Ltd.—The following equipment was installed at the Blubber Bay plant: A crusher driven by a 200-horsepower motor, conveyors requiring 25 horsepower, feeders requiring 10 horsepower, and a scow-puller driven by a 15-horsepower motor.

CEDARSIDE (52° 119° N.E.)

Georgian Mineral Industries Limited.—In October, 1962, a 75-kw. Caterpillar D-13000 electric generating unit was installed. The plant was rewired for 440-volt three-phase power. Some new equipment was installed, making the connected load as follows:—

	Horsepower
Crushing plant	30.5
Conveyors	10.0
Screens and tables	26.0
Workshop	2.0
Miscellaneous	2.0
Total	70.5

COAL MINES

TELKWA (54° 127° N.E.)

Bulkley Valley Collieries Limited.—A belt conveyor driven by a 5-horsepower motor was installed underground, and a screen driven by a 15-horsepower motor was added to the surface equipment.

EAST KOOTENAY

Michel Colliery (The Crow's Nest Pass Coal Company Limited) (49° 114° S.W.) Construction work on the new coal-cleaning plant was completed, and the plant was put into service in April. The service-hoist installation for "A" South No. 2 incline was completed and put into operation. The No. 3 Borecut was installed in the counter level of No. 2 level. A conveyor driven by a 75-horsepower motor was installed in No. 6 incline "A" West mine.

In the Balmer mine a Joy continuous mining-machine and a shuttle car were installed. These machines were moved to "A" North mine in October. An air compressor driven by a 100-horsepower motor was installed.

In "A" North mine, No. 1 room left belt slope, a continuous miner and a shuttle car were installed. In the belt slope a Joy continuous miner, two shuttle cars, and three belts driven by three 75-horsepower motors were installed. The type E1 circuit-breaker at the portal was replaced with a type E10.

The following potentially dangerous incidents took place underground:—

On January 4th the trailing cable to the shuttle car in "A" East mine was damaged at a point about 150 feet from the car when it got caught in the tension end of the extensible belt.

On January 20th a power failure was caused in "A" South mine by a cracked bushing in the cable end coupler.

On March 20th, in "A" North mine, the power-cable supplying a shuttle car caught on a rope hook and was damaged.

On March 30th this cable was again damaged by being run over with the shuttle car.

On April 26th, in "A" North mine, the cable to the gathering head motor on the continuous miner was broken due to constant bending.

On October 2nd, in Upper "A" South mine, open electric sparking took place between the track and the wheel of the bridge conveyor of the Mk3 Borecut, caused by a faulty electric plug.

On October 4th a 100-ampere coupler on a cable used to move a shuttle car and continuous miner out of the mine shorted and blew apart, caused presumably by moisture.

Lode-metal Deposits Referred to in the 1962 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 1962:—

Northern British Columbia.—Atlin, Liard.

Central British Columbia.—Cariboo, Clinton, Omineca.

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	Uranium	Chromium	Tin	Nickel	Molybdenum	Silica	Sulphur	Mercury	Cobalt	Jade	Page
Northern British Columbia																						
Copco and Liz	Liard	59° 129° S.W.	3																			6
Decker Creek	Liard	57° 131° S.W.														3						7
Galore Creek	Liard	57° 131° S.E.			3																	7
Kid	Liard	58° 131° S.W.			3																	7
Sam	Liard	57° 132° N.E.														3						7
Silver Tip	*Liard*	*59° 130° N.E.*		3		3																6
Star	Liard	59° 129° S.W.														3						6
Vollaug	Liard	59° 129° S.W.	3																			6
Central British Columbia																						
Aurum	Cariboo	53° 121° S.W.	1	2																		19, A46
Boss Mountain	Cariboo	52° 120° S.W.														3						20
Canadian American Mining	Omineca	54° 127° N.E.	1	1	1																	A46
Chita	Clinton	51° 123° S.E.			3																	21
Cronin	Omineca	54° 126° N.W.		3		3	3															16
Endako	Omineca	54° 125° S.E.														3						17
F.C.	Omineca	56° 127° S.E.	3	3																		9
Fish Lake	Clinton	51° 123° S.W.			3																	21
Floyd Tungsten	Omineca	55° 124° N.E.						3														16
Glacier Gulch	Omineca	54° 127° N.E.														3						16
McDonald Isle	Omineca	54° 126° N.E.			3																	16
Silverquick	Clinton	51° 122° S.W.																	3			23
Silver Standard	Omineca	55° 127° S.W.	2	1		2	2															15, A46
Coast and Islands																						
Alpha, Beta	Victoria	48° 124° N.E.			3																	125
Artlish	Nanaimo	50° 126° S.W.								3												103
Berton Gold Mines	Alberni	49° 125° S.W.	3																			104
Britannia	Vancouver	49° 123° N.E.	2	2	1	2	1		2													93, A47
Brynnor Mines	Alberni	49° 125° S.E.								1												122, A46
Buttle Lake Mining	Alberni	49° 125° N.W.	3	3	3	3	3															110
CAFB	Skeena	53° 127° S.E.														3						17
Catface	Alberni	49° 125° S.W.			3																	105
Copper Road	Nanaimo	50° 125° S.E.		1	1																	95, A47
D and J	N. West'r	49° 121° S.W.			3																	90
Dal	Skeena	53° 132° S.W.			3					3												10
Dolly Varden	Skeena	55° 129° N.W.		3																		9

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 the shipment. Production for 1962 is listed in Table XIV.

Non-shipping Mines.—(3) Metal present, indicated by assay or mineralogical determination.

Lode-metal Deposits Referred to in the 1962 Annual Report—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Chromium	Tin	Nickel	Molybdenum	Silica	Sulphur	Mercury	Cobalt	Jade	Page
Coast and Islands—Continued																						
Domineer	Nanaimo	49° 125° N.W.		3	3																	105
Empire Development (Merry Widow and Kingfisher)	Nanaimo	50° 127° S.E.								1												96, A47
Eureka Victoria	N. West'r	49° 121° S.W.		3																		92
F.L., Ridge, Cordova	Nanaimo	50° 126° S.W.								1												100, A46
Fog 1–8 (Northwest Group)	Skeena	54° 128° S.E.			3																	15
Garnet	Skeena	52° 131° S.E.			3					3												10
Granduc	Skeena	56° 130° S.E.			3					3												8
Harriet Harbour	Skeena	52° 131° S.E.								1												11, A47
Holberg	Nanaimo	50° 128° N.E.			3																	96
Ike Group	Skeena	54° 128° N.W.	3																			15
Iron Duke	Skeena	52° 131° N.W.								3												13
Iron Mike	Nanaimo	50° 125° S.W.								3												96
Iron Mountain	Skeena	54° 128° S.W.								3												14
Jib	Skeena	52° 131° S.E.			3					3												13
JO and IM	Skeena	55° 130° N.E.			3																	9
Lucky Jim, Seneca, Harrison	N. West'r	49° 121° S.W.	3		3																	93, A47
Lynx, Paramount, Price	Alberni	49° 125° N.W.	3	3	3	3	3															107
Mac	Skeena	52° 131° S.E.								3												14
Magnet	Skeena	53° 132° S.W.			3																	10
Mammoth	N. West'r	49° 121° S.E.		3	3										3							89
Musketeer	Alberni	49° 125° S.W.	1	2	2	2																105, A46
New Indian Mines	Alberni	49° 125° N.W.	3	3	3		3															110
Nimpkish, Klaanch	Nanaimo	50° 126° S.W.								1												96, A47
Old Sport	Nanaimo	50° 127° S.E.			1																	97, A47
Power Group	Nanaimo	50° 127° S.W.								3												98
Pride of Emory	N. West'r	49° 121° S.W.			1										1							91, A47
Silbak Premier	Skeena	56° 130° S.E.	1	1		2	2															9, A47
Star of the West	Nanaimo	50° 126° S.W.			3																	104
Sunloch, Gabbro	Victoria	48° 120° S.E.	2	2	1																	127, A47
Tasu	Skeena	52° 132° N.E.			3					3												11
Texada (Prescott, Paxton, Yellow Kid)	Nanaimo	49° 124° N.W.	2	2	1					1												94, A47
Tofino Inlet	Alberni	49° 125° S.W.	3		3					3						3						111
Tofino Mines	Alberni	49° 125° S.W.	1	2		2	2															110, A46
South Central British Columbia																						
Ace	Lillooet	50° 122° N.W.	3																			21
Albion	Greenw'd	49° 118° S.W.	1	1		2	2															70, A47
Amcana	Greenw'd	49° 118° N.W.	3																			67
Barkley Valley	Lillooet	50° 122° S.E.	3	3																		28
Bethlehem	Kamloops	50° 120° S.W.			3																	47
B.K. and Clint	Nicola	50° 120° S.W.			3																	55
Bralorne	Lillooet	50° 122° N.W.	1	2																		22, A48
Bullion	Osoyoos	49° 119° S.W.	3		3																	64
Cariboo-Amelia	Greenw'd	49° 119° S.E.	1	2		2	2															66, A47
Cassiar Copperfields (Golden Contact)	Lillooet	50° 122° N.E.	1																			24, A48
Chataway	Nicola	50° 120° S.W.			3																	50
Clapperton Creek	Nicola	50° 120° S.W.			3																	56
Colby	Greenw'd	49° 119° S.E.	1	1		2	2															A47
Copperado	Nicola	50° 120° S.W.			3																	56
Copper Mountain	Similk'n	49° 120° S.W.	2	2	1																	A48
Copper Soo	Nicola	50° 120° S.W.			3																	54
Craigmont	Nicola	50° 120° S.W.			1																	53, A48
Crest and Jade	Lillooet	50° 121° N.W.																				23
Dief Group	Osoyoos	49° 119° S.W.									3											63
D.M.	Kamloops	50° 120° N.W.			3																	60
Earlcrest Resources	Nicola	50° 120° S.W.			3																	50

Lode-metal Deposits Referred to in the 1962 Annual Report—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Chromium	Tin	Nickel	Molybdenum	Silica	Sulphur	Mercury	Cobalt	Jade	Page
South Central British Columbia— Continued																						
Enterprise	Greenw'd	49° 119° S.E.	1	1		2	2															A47
FAN	Greenw'd	49° 119° S.E.														3						68
Friday Creek	Similk'n	49° 120° S.W.			3																	61
Galaxy Minerals	Kamloops	50° 120° N.E.			3																	59
General Resources	Nicola	50° 120° S.W.			3																	51
Goodenough	Vernon	50° 119° S.E.			3																	66
Harper	Kamloops	51° 119° S.W.			3	3	3															60
Highland-Bell	Greenw'd	49° 119° S.E.	2	1		2	1		2													67, A48
Highmont	Nicola	50° 120° S.W.			3																	49
Hilltop	Kamloops	50° 120° N.W.			3																	60
Iron Mask	Kamloops	50° 120° N.E.			3																	60
Jericho Mines	Kamloops	50° 120° S.W.			3																	50
Justice	Nicola	50° 120° S.W.			3																	55
King Edward	Osoyoos	49° 119° S.W.			3											3						64
King Midas	Greenw'd	49° 118° S.W.	1	1		2	2															A48
Lincoln	Greenw'd	49° 118° S.W.		3		3	3															69
Lodge, Dave	Kamloops	50° 120° N.W.			3																	47
Marb Group	Nicola	50° 120° S.W.			3																	51
Matt	Greenw'd	49° 119° S.E.			3																	67
Mazie	Similk'n	49° 120° S.W.		3																		63
Mid-West Copper & Uranium	Nicola	50° 120° S.W.			3																	54
Minex Development	Nicola	50° 120° S.W.			3																	50
Mother Lode	Greenw'd	49° 118° S.W.	1	2	1																	68, A48
Nickel Plate	Osoyoos	49° 120° S.E.	1	2																		A48
Paddy	Greenw'd	49° 119° S.E.	1	1		2	2															A48
Par Group	Nicola	49° 120° N.W.			3																	59
P.C.M., Cap, Domino, Hank, Freda	Nicola	50° 120° S.W.			3																	54
Phoenix	Greenw'd	49° 118° S.W.	1	2	1																	69, A48
Pine, Elm	Lillooet	50° 121° N.W.			3																	24
Pioneer	Lillooet	50° 122° N.W.	1																			A48
P.L.	Nicola	50° 120° S.W.			3																	55
Quilchena	Nicola	50° 120° S.W.			3																	56
Red Hill	Kamloops	50° 121° N.E.			3																	46
Rexspar Uranium & Metals	Kamloops	51° 119° N.W.										3										61
St. Paul Mines	Vernon	50° 118° S.E.	3																			66
Sheba	Nicola	50° 120° S.W.			3																	49
Shot	Nicola	50° 120° S.W.			3																	54
Skeena Silver	Nicola	49° 120° N.W.			3																	59
Skomac	Greenw'd	49° 118° S.W.	2	1		1	1															69, A48
Spatsum	Kamloops	50° 121° N.E.			3					3												45
Standard	Osoyoos	49° 119° S.W.	1	1		2	2															65, A48
Tenderfoot	Kamloops	50° 120° N.W.			3																	60
Texas-Granada	Greenw'd	49° 118° S.W.			3																	68
Tom	Nicola	50° 120° S.W.			3																	54
Tormont	Nicola	50° 120° S.W.			3																	51
Transvaal	Kamloops	50° 120° N.W.			3																	46
Trojan Consolidated	Kamloops	50° 120° N.W.			3																	47
Vanmetals Exploration	Nicola	50° 120° S.E.			3																	59
Victor	Nicola	50° 121° S.E.			3																	49
Wade, Sarg, Major	Nicola	50° 120° S.W.			3																	54
Southeastern British Columbia																						
Anna	Slocan	49° 117° N.E.		1		2	2															83, A49
Antoine	Slocan	50° 117° S.E.		3		3	3															79
Arlington	Nelson	49° 117° N.E.		1		1	1															A49
Bank of England	Slocan	49° 117° N.E.		1		2	2															A49
Bluebell	Slocan	49° 116° N.W.		2	2	1	1		2													77, A49
Bosun	Slocan	49° 117° N.E.		1		1	1		2													83, A49
Caledonia	Slocan	50° 117° S.E.		1		1	1		2													79, A49

Lode-metal Deposits Referred to in the 1962 Annual Report—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Chromium	Tin	Nickel	Molybdenum	Silica	Sulphur	Mercury	Cobalt	Jade	Page
Southeastern British Columbia—Continued																						
Carnegie Mining Corporation (Silversmith, Ruth-Hope, etc.)	Slocan	49° 117° N.E.	2	1		1	1															80, A50
Crown	Fort Steele	49° 116° N.W.		1		1	2															A49
Enterprise	Slocan	49° 117° N.E.	2	1		1	1		2													83, A50
Estella	Fort Steele	49° 115° N.W.		3		3	3															87
Fisher Maiden	Slocan	49° 117° N.E.	2	1		2	1		2													A50
Freddy	Slocan	49° 117° N.E.	2	1		2	2															A50
Grey	Trail Cr'k	49° 117° S.W.	3		3																	71
H.B.	Nelson	49° 117° S.E.		2		1	1		1													74, A49
Hecla	Slocan	49° 117° N.E.		3		3	3															82
Hewitt	Slocan	49° 117° N.E.	2	1		2	1		2													83, A50
Idaho	Slocan	50° 117° S.E.		1		1	2															A50
It and In	Revelstoke	51° 118° N.W.				3	3															89
Jersey	Nelson	49° 117° S.E.		2		1	1		2													75, A49
Kenville	*Nelson*	49° 117° S.E.	*1*																			A49
Kootenay Belle	Nelson	49° 117° S.E.	1	2		2	2															74, A49
Liz B	Nelson	49° 116° S.E.		3		3	3															84
Lucky Strike	Nelson	49° 117° S.E.	1	1		2	2															A49
Mammoth	Slocan	49° 117° N.E.	2	1		1	1		2													82, A50
Midway	Fort Steele	49° 115° N.W.	1	1		2	2															84, A49
Mineral King	Golden	50° 116° S.E.		2	2	1	1		2													88, A49
New Arlington	Nelson	49° 117° S.E.	1	2		2	2															74, A49
Ottawa	Slocan	49° 117° N.E.	2	1		2	2															84, A50
Oxide	Nelson	49° 117° S.E.				3	3															74
Queen	Nelson	49° 117° S.E.	1	2		2	2										1					74, A49
Queen Victoria	Nelson	49° 117° S.E.			3																	71
Red Bird	Nelson	49° 117° S.E.				3	3															77
Reeves MacDonald	Nelson	49° 117° S.E.		2		1	1		2													76, A49
St. Eugene, St. Eugene Extension, Aurora	Fort Steele	49° 115° N.W.		3		3	3															85
Silmonac	Slocan	49° 117° N.E.		3		3	3															80
Slocan Base Metals	Slocan	49° 117° N.E.		3		3	3															82
Slocan Prince	Slocan	49° 117° N.E.		1		2	1															84, A50
Sullivan	Fort Steele	49° 115° N.W.	2	2	2	1	1															85, A49
Velvet	Trail Cr'k	49° 117° S.W.	1	2	1																	70, A50
Victor	Slocan	49° 117° N.E.	2	1		2	2		2													80, A50
W.D.	Trail Cr'k	49° 117° S.W.	1	2		2	2															71, A50
Wellington	Slocan	50° 117° S.E.		3		3	3															79
Western Exploration	Fort Steele	49° 115° N.W.				3	3															87
Yankee Dundee	Nelson	49° 117° S.E.	3	3		3	3															73

INDEX

A

B

C

D

E

F

G

H

K

L

Mc and Mac

M

Q

R

S

T

U

V

W

X

Y

Z

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