GEOLOGY AT THE KENVILLE GOLD MINE

Report submitted in partial fulfilment of the course in Applied Science, third year, at the University of British Columbia.

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Matter 10/25

Presentation 18/35

October 30, 1948

Poor.

Capilano P.O., B.C.

October 30, 1948

Dean Finlayson

University of British Columbia

Vancouver B.C.

Dear Sir:

I have the honour to submit my report, GEOLOGY AT THE KENVILLE GOLD MINE, as called for by regulations governing the course of Applied Science, third year, according to Calendar regulations of the University of British Columbia, p. 268, 1948

Yours respectfully,

Chester F. Millar

Chester F. Millar

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INTRODUCTION

The following report is written from experiences gained by the writer while working for the Kenville Gold Mines, Ltd., of Nelson, British Columbia. The areas described in particular in this report cover an area of nearly five square miles centered roughly around the Kenville Mine. The mine itself is six miles west of the city of Nelson and on the south bank of the Kootenay River.

The history of the mine began in or about the year 1898 when gold values were found in float quartz in Eagle Creek. This float was traced to the source and the "Poorman" Vein discovered. The discovery of this vein led to the further discovery of the others, among which are the Hardscrabble, Granite, Yule, Midway, Flat and similiar veins. Since that time the area has been mined intermittently. For many years the mine was known as the Granite-Poorman. The name was subsequently changed to Kenville after the recent acquisition by the Quebec Gold Corporation of Montreal, Quebec. A new 100-ton mill was completed on the property by the Corporation at the end of 1947, and the mine run at near capacity since that time.

The summers work of the writer consisted of helping to compile a geological map of the various claims held in the vicinity by the Kenville Mine. The work was done in partial fulfillment of the necessary development work to obtain a Crown Grant from the Government for each claim worked on. The more specific objective of the mapping was to determine, if possible, the most favourable places in which to do future diamond drilling or other such development work. This drilling would then accomplish two purposes - it would aid in the getting of Crown Grants for the claims and it might intersect new vein systems or ore bodies. Each diamond drill hole would cost the company several thousand dollars, se some preliminary work is certainly necessary before many such holes could be contemplated.

The mapping of the claims was accomplished by first staking them in one hundred foot intervals along two opposite sides. They were then covered by chain-and-compass traverses from one hundred to two hundred and fifty feet apart, depending on the amount of cover present or accuracy needed. In this manner all the outcrops and other surface features could be plotted with reasonable accuracy. Large scale maps were drawn of each group of claims and this geology plotted in an endeavor to obtain the subsurface structure. Rock samples were takenfrom most of the outcrops and carefully studied. The most important job was to find the positions of the contacts, since it is in ground near the edges of such contacts that favorable mineralization occurs.

RELIEF AND ELEVATIONS

The topography of the area near the mine is dominated largely by the great east-west trench of the Kootenay River. As will be mentioned later on, the area has undergone severe glaciation and hence shows many of the resulting features. Elevations range up from 1750 ft. at the riverside to the tops of Red mountain, Toad mountain, and other high peaks behind the mine at an elevation of 7300 ft. above sea level.

The terrain is quite rugged. Recent post-glacial galleys have deeply incised most of the steeper hillsides. The area shown by the accompanying map shows the more important creeks only, many of the smaller gullies and intermittent stream beds are not shown by the contours. The three principle watercourses are Forty-nine Creek, Eagle Creek, and Sandy Creek. In many places these creeks have started to cut a small, sharp V into the post-glacial and glacial debris which lies scattered along their courses.

VEGETATION

The vegetation around Nelson is very similiar to that found on the Pacific Coast. This is no doubt due to the unusually high rainfall in the Nelson area, promoting the growth of all the coast trees with the addition of white pine and larch. Most of the readily available fir was logged off fifty years ago and used in the old mines and mills. Mature stands of Hemlock cover most of the higher ground. Recent fires have swept through parts of these timber stands. The resulting burned patches subsequently grew over with an almost impassable thicket of second growth, conditions which made geological work over such areas very slow and difficult.

ROCK EXPOSURES

Rock exposures were fairly numerous on the whole and only rarely was it possible to cover a whole claim or fraction without noticing an outcropping of some extent. Most of the outcrops were found either in creek bottoms, on the tops of the shoulders flanking the mountains, or in old workings. The creek outcrops were of great value in finding the positions of contacts, since they gave continuous cross-sections for some distance. Many rock exposures were found by investigating old test pits and boomer trenches dug years ago in the first great quest for gold. These old workings were scattered over much of the area surveyed. In working out the positions of the contacts many of the small outcrops of a doubtful nature were omitted from the calculations since they might be only float and thus tend to confuse the picture.

GEOLOGIC HISTORY

Limestones and shales were deposited in the PreCambrian; they have subsequently been eroded and covered to such an extent that only a few scattered remnants can be seen at the present time. These old original sediments were later intruded and overlain in the Carboniferous and Permian periods by wide-spread igneous activity. The intrusives were first seen and classified at Rossland, B.C., and called the Rossland Group or Rossland Volcanics.

The large Coast Range Batholith started to rise in the Jurassic period. At the same time a smaller, syntectic batholith pushed its way up into the Kootenay district. This West Kootenay (or Nelson) batholith rose in several successive stages, each stage being marked by a slightely different rock composition. The mountains formed were eroded and cut by several dyke systems until the end of the Mesozoic.

The coming of the glaciers saw the mountains reduced greatly and river valleys deepened and straightened. Ice sheets covered the land in successive stages. The final retreat of the ice was very recent and left jumbled and scattered beds of till everywhere. In a few places this till has been shifted and sorted into wash alluvial clay or sand and gravel. The results of this glaciation will be described in greated detail later on in the report.

STRATIGRAPHY AND PETROGRAPHY

Since the underlying rocks at the Kenville mine are all igneous, the mapping of the underground structure was quite simple and straightforward. It is assumed that the Nelson batholith underlies the whole area. The Rossland Volcanic portions of the crust would thus be roof pendants lying on top of the batholith. It is a matter of conjecture where the original precambrian sediments disappeared to, since these rocks would theoretically lie around the edge of the batholith and thus be exposed. There are none in the Nelson area. While erosion has reduced the roof of Volcanics to mere patches, not a single outcrop of metamorphosed sediments has been seen. However they do outcrop to some extent south of Salmo, B.C.

The rocks of the Nelson batholith may be classified into two main types - a granitic rock and a diorite. The granite is more prevalent and is a medium grained rock composed of the minerals quartz, biotite, feldspar and hornblende. The other phase of the batholith is a medium grained diorite made up of hornblende, pyroxene, epidote and the darker feldspars. The minerals give it a mottled yellow and green appearance which make it easily distinguishable from the other phase. This diorite was found severly metamorphosed in some of the outcrops.

The Rossland Group include either an augite porphyry or andesite. Some small and relatively unimportant areas of crystalline limestone also belong in the Rossland Group. One of these areas lies directly across the river from the mine barely above the water level. The igneous rocks in this Rossland Group are of a greenish colour similiar to the diorite phase of the Nelson batholith but are easily distinguished by their fine to aphanitic texture. The porphyry contains perfectly formed hexagonal crystals of augite up to one eighth of an inch long, giving it a very striking appearance. Most of the outcrops of these volcanic rocks exhibited a cubic jointing. At one place thin bands of pure white, very fine grained minerals appeared between this jointing in the rocks. The texture was too fine for a determination but the writer believes these bands to be thin beds of lithified tuff.

As mentioned before, systems of dykes cut the rocks at various times after the intrusion of the Nelson batholith and before the appearance of the ice. The dykes of probable Jurassic age have a rather peculiar texture, consisting of large crystals of orthoclase surrounded by a matrix of smaller quartz, biotite and similar granitic ingredients. The large orthoclase crystals were parallelopiped in shape whith volumes up to two or three cubic inches. When the rock weathered the small crystals went first, leaving the larger crystals jutting out from the surface of the rock. This type of dyke was very rare. The rest of the dykes in the area are definitely post-Jurassic and are made up of mica, hornblende, and pyroxine lamprophyres. They range in width from a few inches to more than twenty feet.

GLACIATION

The effects of severe glaciation can be seen quite readily in most of the Kootenay. The trough in which the Kootenay River flows from the main body of Kootenay lake at least as far south as Trail is an excellent example of the typical glaciated U-shaped valley. Cirques and hanging valleys can be seen along most of this distance. A large mouton and huge beds of drift can be seen north of Castlegar. Near the Kenville mine these glacial evidences take the form of abruptly ending U-shaped valleys and the usual presence of till. Directly across from the mine (i.e. on the north bank of the Kootenay river) excellent examples of a hanging valley and several truncated spurs exist.

It is quite evident that large quantities of gold and other valuable minerals have been torn and scattered forever from this rich mining district by the glaciers. By far the richest portion of the ore shoot at Kenville was removed by this means.

GLACIAL DEPOSITS

Glacial drift of at least two distinct and separate ages can be seen near the mine. The newer depositions are distinguished from the older by the relative amounts of weathering. The old drift is darker in colour and boulders in it can be picked apart easily with a hand pick. It is found only in one spot on the top of a high ridge where it was somehow shielded from further attack. Newer drift is very fresh and has suffered no noticeable weathering.

Additional evidence of separate glacial scouring is furnished by outcrops of highly weathered granite found in the bed of Sandy creek. These rocks are weathered to a depth of at least six feet. It would be impossible to produce such weathering in the short time that the ice has been gone. The rock must have been bared previously and like the till mentioned above escaped ice erosion. These weathered rocks show also that Sandy creek was not cut by the last ice sheet, but much earlier. The last sheet was probably not as thick or extensive as the others.

ECONOMIC ASPECTS

The Nelson batholith is economically very important. The regions around its periphery contain the most important mining divisions in British Columbia. Silver, gold, lead, zinc, copper, and tungsten minerals were all deposited from the batholith. Gold and silver form the only economic depositions in the vicinity of Nelson. These metals occur in free state only and in association with pyrite. Many veins near the Kenville mine contain traces of copper (bornite) and lead (galena). About half are mineralized with pyrite and gold. The width of these veins determines their value or mineability.

The gold values at Kenville are found to be concentrated to a great extent in comparatively massive pyrite particles imbedded in vein quartz. The veins achieve a maximum width of 3 feet in the Poorman vein. All pinch out gradually to mere stringers. The ore ran a reasonably high grade when it was first mined. Subsequent mining has shown that these high values decrease the further in the mountain the mining progresses. The present bleak future of the mine may be attributed to this condition.

THE KENVILLE MINE

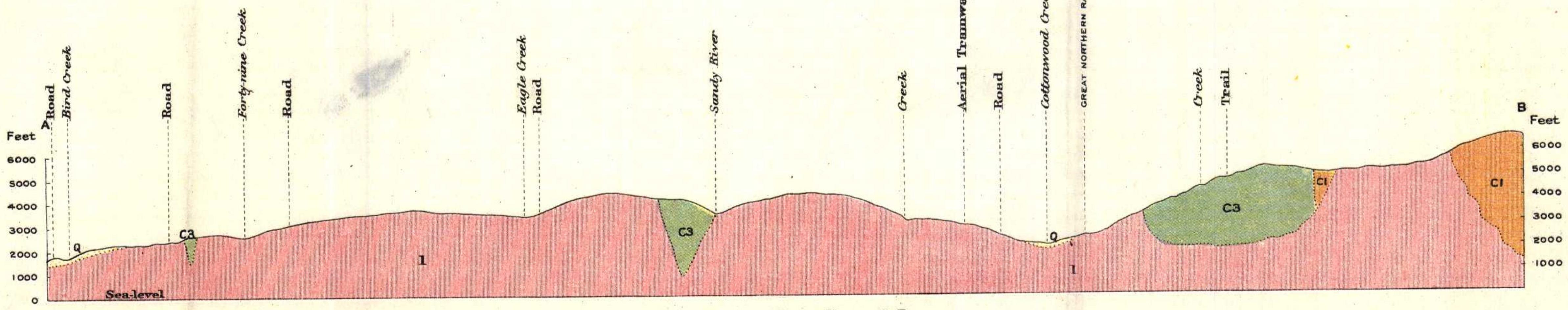
The veins in the mine are roughly parallel and spaced approximately equal intervals apart. They strike north-south and dip from 30 to 60 degrees west. One vein raked off to nearly a horizontal position but this was an exception. Four veins are being worked at the time of this writing. The average assay of the heads runs about 0.24 oz. gold per ton. Individual ore shoots may run as high as 2.0 oz. gold per ton. The writer sampled one vein outcropping on the surface which showed values up to 3.0 oz. gold per ton. Unfortunately the vein is very narrow and of limited length, factors which make it uneconomic.

The mine is being worked through two adits, one 275 ft. above the other. Both are used as haulage levels. An ore pass connects them which enables ore from the upper level to be dropped down and carried out the lower level to the mill. The shrinkage stoping system of mining is being used. Haulage is done by storage battery locomotives.

The mill, one of the modern in Canada, is rated at 120 tons per day. Gold is recovered by the cyanide process. Tails are piped down to the Kootenay river, where a settling pond has been built. The cyanide process enables an almost 100% recovery to be made.

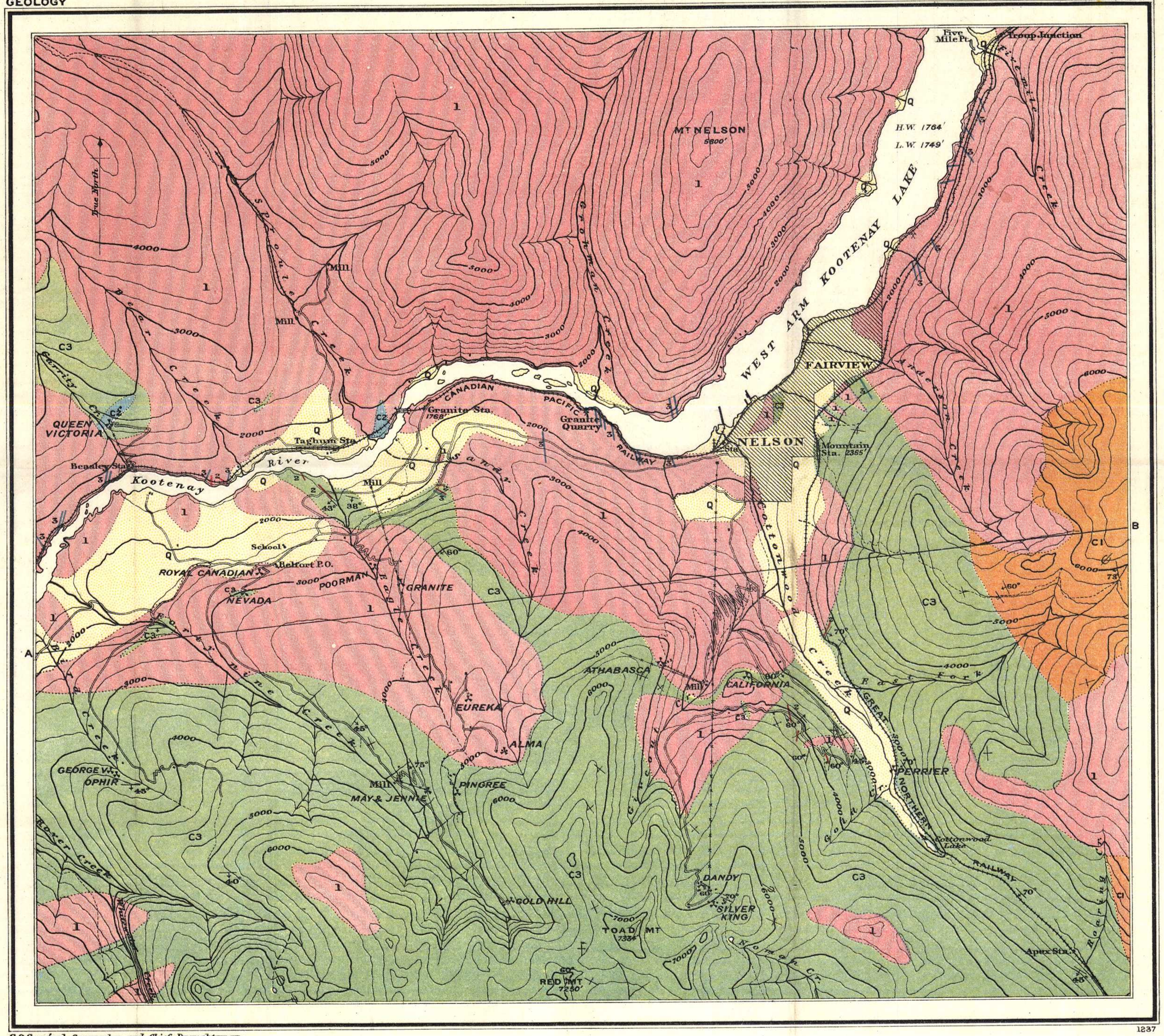
Canada
Department of Mines
GEOLOGICAL SURVEY

HON. ROBERT ROGERS, MINISTER; A.P. LOW, DEPUTY MINISTER;
R.W. BROCK, DIRECTOR



Cross section along line A B

GEOLOGY — BRITISH COLUMBIA



C.-O. Senécal, Geographer and Chief Draughtsman.
G.G. Aitken and A. Jounes, Draughtsmen.

1237

LEGEND

QUATERNARY

GLACIAL AND RECENT — Q — Boulder clay, "wash" alluvial clay, sand and gravel

MESOZOIC

POST-JURASSIC(?) — 3 — Mica, hornblende and pyroxene lamprophyres (dikes and sills)

JURASSIC(?) — 2 — Quartz porphyry, quartz syenite porphyry, granite (dikes)

1 — Nelson batholith (granite, monzonite, quartz diorite)

PALAEOZOIC

CARBONIFEROUS(?) AND POST-CARBONIFEROUS(?) — C3 — Rossland group (augite porphyrite, quartz porphyry, tuff, chlorite, actinolite and sericite schist, andesite)

C2 — Rossland group (crystalline limestone, quartz and chlorite schist)

CARBONIFEROUS(?) — C1 — Pend D'Oreille group (slate, quartzite, quartz and andalusite schist)

Symbols

45° Strike and dip

Vertical strata

Glacial striae

LEGEND

Roads and buildings

Trails

Railways

Mine tramways

Aerial tramways

Bridges

Mines

Quarries

Wharves

Rivers and streams

Contours (showing approximate land forms and elevations above sea-level) Interval 250 feet

5600' Figures (showing heights in feet above sea-level)

Magnetic declination about 24° East.

inches 0 1 2
0 1 2 3 4 5
centimetres

Scale: 100 miles to 1 inch

MAP 62 A
(Issued 1912)

NELSON AND VICINITY
WEST KOOTENAY
BRITISH COLUMBIA

Scale, 1/63360

Miles 1 3/4 1/2 1/4 0 1 2 3

Kilometres 1 0 1 2 3 4 5

1 MILE TO 1 INCH

GEOLOGY
GEOLOGICAL SURVEY, PUBLISHED MAP, 1904.
O. E. LEROY, ADDITIONS & CORRECTIONS, 1911.

TOPOGRAPHY
(Control and topography subject to revision.)
GEOLOGICAL SURVEY, PUBLISHED MAP, 1904.
C.W. DRYSDALE, ADDITIONS & CORRECTIONS, 1911.

TOPOGRAPHICAL BASE
RATED GRADE 5