Report on

Morning Star

and

Nicola Ores

by

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Fifth Year Geological Engineering

U.B.C.

1935

MINERALAGRAPHIC REPORT ON THE ORES OF MORNING STAR (FAIRVIEW) GOLD MINES LTD. AND NICOLA MINES AND METALS.

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NICOLA MINES AND METALS

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MINERALAGRAPHIC REPORT ON THE ORES OF

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AND

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PART 1

Introduction.

An examination was made of ore from the Morning Star Mine with the object of determining, if possible, the relationship of the gold in the ore to the other minerals. No gold was seen in any of the specimens examined, nor was any unusual mineral seen with which the gold might be associated. In hope of finding out something about the relationship of gold, another attempt was made by examining some ore from the Nicola Mine. These ores also do not appear to carry native gold or rare minerals. This report, therefore, does not add to the knowledge of the association of gold and rare minerals, but it does give some information as regards ores from both these mines.

The work was done under the direction of Dr. H.V. Warren, and I am indebted to him and to J.M. Cummings for advice and help. The assays quoted in this report were done by Mr. J.M. Cummings in the laboratories of the University of British Columbia.

PART 11.

Morning Star.

1. Location, history, geology.

This mine is located in the Fairview camp, some five miles from Oliver, which is on the Okanagan River about twelve miles north of the International Boundary. There is a fair dirt road passing by the mine which leads to Oliver, which is on a branch line of the Kettle Valley Railway.

About thirty-seven years ago this property was first explored, and several hundred tons of high grade ore removed from a surface pocket by Steve Mangott and his associates. Some deeper development work was carried on at the time, but was not successful in discovering ore bodies. Since then, until the spring of 1933 when the present company was formed, practically nothing has been done. This company has spent a considerable amount of money and has shipped some ore direct to the smelter. There is a possibility that a mill will be built in the near future.

The quartz veins which are being developed are found in a complex of schistose rocks which are thought to be of Carboniferous age. These veins are very irregular in strike, dip and width, and conform with the bedding planes of the original sediments. It is believed that they are replacement veins rather than fissure fillings. They and the sediments follow in strike,the contact of the nearby Fairview granite.

2. Description of ore and assays.

It is quite a simple ore, being a mixture of sulphides in a gangue of quartz. The quartz is white and in a great deal of the vein is barren of all other minerals. It sometimes has a banded structure due to unreplaced portions of the country rock being left in the vein. The commonest sulphides are pyrite and sphalerite, of which the pyrite is the most abundant. Galena is also present in considerable amounts and also very small quantities of chalcopyrite.

Assays were made of the feed, table concentrates and picked sulphides and gave results as follows:

Feed		Table Concentrate	Pyrite	Sphalerite
plus 4 mesh	minus 40 mesh	minus 10 plus 20	picked	- samples
0.66	0.74	2.30, 0.52, 0.34	4.10	trace
(all values in ounces gold per ton)			.20	trace

Insufficient galena in the specimens to get a picked sample of it, but there was some in the sphalerite samples which ran only a trace, and so that indicates that neither the galena or the sphalerite carry the gold. The high assay of the pyrite indicates that this mineral carries the gold in some manner. It is not known positively, but the low gold assay of pyrite, may have been the result of using the second generation of pyrite in the sample. This would account for the wide variance. The fine feed ran slightly higher than the plus 4 mesh, indicating that the gold is associated with something that must be crushed fine to separate it. Considerable differences are found in the results of the table concentrates which show that the ore itself is extremely variable and erratic.

As stated above, the gangue is white quartz in which pyrite, sphalerite, galena and chalcopyrite are found in order of abundance. These metallic minerals occur irregularly in the gangue and sometimes in definite bands. These sulphides are intimately mixed and are fine-grained. The pyrite occurs as cubes sometimes scattered through the quartz, but generally surrounded by the other sulphides, none of which show their crystal form. All the ore has been shattered to some extent.

3. Microscopic description of ore.

Under the microscope, no minerals were seen which could not be seen with a hand lens, but their relationships could be seen more clearly. As far as could be determined, there are two generations of pyrite, two generations of quartz and at least one each of sphalerite, galena and chalcopyrite.

The quartz appears dull, almost black and also light grey in colour. Most of the quartz appears to be of one generation, but in places it is fractured and the fractures filled with another generation (Figure 3 B). Most of the quartz appears to have been deposited after the pyrite because it veins the pyrite (Figure 2A) and also the pyrite appears in it as cubes (3A). It is possible that the pyrite cubes came in only before the second generation of quartz, but does not appear probable.

Pyrite occurs massive, in cubes and as long vein-like forms. The cubes may occur in the quartz but more often are found in the sphalerite and are partially replaced by it (Figure 1A and B). The pyrite is also veined by the quartz (Figure 2A). The second generation of pyrite occurs as thin vein-like forms which are later than the other minerals (Figure 2B). They distinctly vein the sphalerite and quartz. There did not appear to be much of this generation present in the specimens examined.

Sphalerite in the sections made was particularly abundant. It veins the quartz (Figure 1B) and also replaces the pyrite (Figures 1A and 1B). It may also replace the chalcopyrite (Figure 1B) but its contact with that mineral is smooth and they may be contemporaneous. It also has a smooth contact with the galena.

The galena occurs in small irregular masses and appears to be one of the late minerals. In one place it appears to be veining the contact between quartz and sphalerite (Figure 1A) but this is not definite. In other cases, galena surrounds and replaces the pyrite cubes and is definitely younger than that mineral. It was not found in contact with the chalcopyrite.

There is very little chalcopyrite in the ore. It was only seen in one polished section and there it was surrounded by sphalerite and possibly replaced by it. Therefore, it may have been deposited slightly prior to the sphalerite.

4. Paragenesis.

There is such a small amount of the second generations of pyrite and quartz and of chalcopyrite in the sections that it is impossible to correctly determine their relationship accurately with the rest of the minerals. The following paragenesis is set forth, knowing, however, that in part it may be incorrect.

1. pyrite-in cubes and masses.
2. quartz.
3. chalcopyrite, sphalerite.
4. galena.
5. pyrite-in veinlets.
6. quartz-fracture fillings.

5. Conclusions.

The size of the particles in the ore varies greatly. The pyrite cubes average around .008 in. to the side. If the gold is associated with the pyrite, as it appears to be, probably on its contact with other minerals, then to free the fold, the ore would have to be crushed to separate the pyrite cubes from the rest of the ore. This would require then the ore to be ground to pass a 65 mesh screen.

PART 111.

Nicola.

1. Location, geology.

This property is located on the east side of Stump Lake, midway between Kamloops and Merritt, in the Nicola Mining Division. It has been explored over a long period and in 1929 a small mill was constructed and was operated part of 1929 and 1930. The total recovery for the run was in the neighborhood of $100,000.

The deposit consists of quartz veins in shear zones which strike a little west of north and dip ~~ping~~ 60 degrees to 75 degrees to the northeast. They are as wide as six and seven feet in places but for the stoped distance are only about two feet wide. The country rock is a diabase porphyry.

2. Description of ore and assays.

This ore is identical in mineral composition with that of the Morning Star, although the minerals are in slightly different proportions. The sulphides of lead, zinc and iron and chalcopyrite are in bunches in the quartz gangue. Both the sphalerite and galena occur as blebs surrounded by a matrix of quartz, pyrite and chalcopyrite. The galena and sphalerite occur separate from each other as fairly large masses which sometimes are joined by veinlets of one or the other. Pyrite is the most abundant mineral in the specimens examined and then quartz, sphalerite, galena and chalcopyrite in that order. There are quite large amounts of chalcopyrite in this ore. The country rock is grey or green and contains stringers of quartz and sometimes some pyrite.

Assays were made of fine feed from which most of the quartz had been removed, and of the sulphides, none of which, however, were picked really clean.

minus 20 mesh feed	pyrite	sphalerite	galena.
0.56	0.60	0.20	0.24

(all given in ounces of gold per ton)

Of the three sulphides, these assays show that the pyrite carries about three times as much gold as either of the other two sulphides. All of these picked samples were impure to a greater or lesser extent and it is probable that clean samples would show an even greater difference in favour of the pyrite. It is now known from work done this year that the sphalerite in most B.C. ores, if clean, does not carry gold values, and it is very probable that it does not carry much here. The assay of the minus 20 mesh feed is probably higher than the run of mine ore because most of the quartz was removed while hand crushing.

3. Microscopic description of ore.

The pyrite, of which only one generation was observed, occurs in cubes which are sometimes quite massive. It was the first mineral to form and has been fractured, veined, and replaced by other minerals (Figures 5A and B).

Quartz, the next most abundant mineral, forms the matrix for the pyrite and chalcopyrite and probably solidified immediately after these minerals formed. It occurs all through the specimens in irregular particles, filling to some extent, the interstices. It appears to be one of the later minerals but it probably was deposited over a considerable period because it appears to be intimately mixed with the pyrite and chalcopyrite.

Sphalerite occurs in large masses but is occasionally seen as small irregular particles in the fine grained mixture. In it are a great many small particles of chalcopyrite. For the most part these particles are scattered haphazardly through the sphalerite, but are sometimes arranged in definite lines as seen in Figure 4A.

The galena generally occurs as large masses but occasionally in small particles in the fine grained mixture. When massive it shows a gneissic structure (Figure 4B) which shows that it has been subjected to stress since deposition. This gneissic structure causes the pieces to break in cubes with distinctly curved faces. It veins pyrite, chalcopyrite and quartz, and probably was the last mineral to be deposited.

The chalcopyrite as already stated is intimately associated with the pyrite and is also found as numerous small particles in the sphalerite, most of which have no definite arrangement. The chalcopyrite appears to have preferred the pyrite on which to precipitate because it occurs all around the cubes of pyrite, (Figures 5A and 6B) nearly everywhere in the sections polished. It is probably just a little later than the sphalerite but is itself definitely veined by the quartz (Figure 6B). It was only seen in contact with the galena in one or two places and in these cases it appears as if the galena were the younger (Figure 6A) although the evidence is not very definite.

4. Paragenesis.

From the relationship of the minerals in the sections examined, the following paragenesis is advanced. The relation of chalcopyrite to the sphalerite as seen in (Figure 4A) may not be interpreted correctly, but I believe that it represents chalcopyrite filling incipient fractures only partially developed in the sphalerite and hence is slightly later than the sphalerite. It is possible that they are contemporaneous and that the chalcopyrite formed in zones due to selective replacement of a favourable bed of the original rock. The paragenesis is believed to be as follows:

1. Pyrite.
2. Sphalerite. ((may be contemporaneous in part.
3. Chalcopyrite. (
4. Quartz.
5. Galena.

5. Conclusions.

The size of the particles varies greatly, but by far the smallest are the particles of chalcopyrite in the sphalerite. It is not known whether or not this chalcopyrite carries appreciable amounts of gold but if it did, it would be necessary to crush the sphalerite and included chalcopyrite to at least minus 200 mesh if the gold were to be freed. It appears, however, as if the pyrite carries the major gold values and it occurs in comparatively coarse grains, averaging a little less than 0.033 inches to the side. If the ore was crushed till it could pass a minus 20 mesh screen, then it would be sufficiently fine to permit of concentration of the pyrite.

Appendix A.

Morning Star Polished Sections.

Number 1.

Megascopic:- Fine grained mixture of galena, pyrite and sphalerite in quartz, and also small particles of chalcopyrite.

Microscopic:* See Figures 1A and B. Can see cubes of pyrite being replaced by sphalerite, sphalerite veining quartz and also fairly large mass of galena possibly deposited along the contact of the quartz and sphalerite.

Number 2.

Megascopic:- Chiefly sphalerite with some pyrite and quartz.

Microscopic:- See Figure 2B. Can see the second generation well developed in this section.

Number 3.

Megascopic:- A massive piece of pyrite, with quartz and minor amounts of sphalerite and galena.

Microscopic:- See Figure 2A and Figure 3B. Both generations of quartz seen in this section, and also may see quartz veining pyrite.

Number 4.

Megascopic:- Quartz in which there is an abundance of pyrite and sphalerite and minor amounts of galena.

Microscopic:- See Figure 3A. In this specimen the small pyrite cubes are well developed.

Morning Star Ore Specimens.

Number A. Quartz containing sphalerite and minor amounts of the other sulphides.

Number B. Mass of sphalerite with minor amounts of pyrite and quartz.

Appendix B.

Nicola Polished Sections.

Number 1.

Megascopic:- Large mass of galena at one end, sphalerite at the other with an intervening mixture of pyrite, chalcopyrite and quartz.

Microscopic:- See Figures 4A and B, 5A, and 6B. Chalcopyrite veining pyrite, chalcopyrite veining sphalerite, quartz veining pyrite, and also shows cubes of pyrite and gneissic structure in galena.

Number 2.

Megascopic:- Crystalline pyrite surrounded by chalcopyrite, all in quartz, also some fairly large masses of galena and sphalerite.

Microscopic:- See Figures 5B and 6A. Galena veining pyrite and also veining chalcopyrite.

Nicola Ore Specimens.

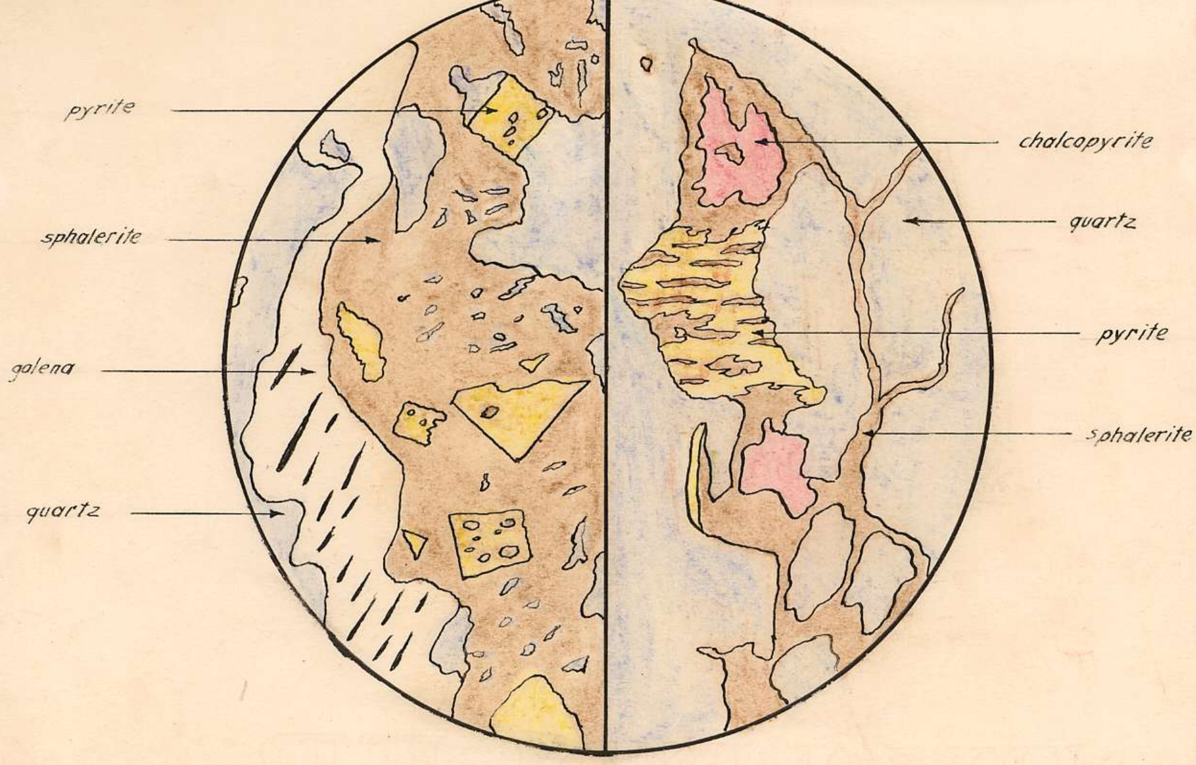
Number A. Mostly pyrite with blebs of sphalerite and galena with some quartz and chalcopyrite.

Number B. Green country rock, partially silicified and contains stringers of quartz and some pyrite.

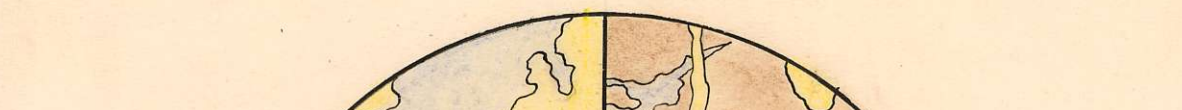
Number C. Country rock with quartz and minor amounts of sulphides.

Number D. Vein quartz having some of all the sulphides in it.

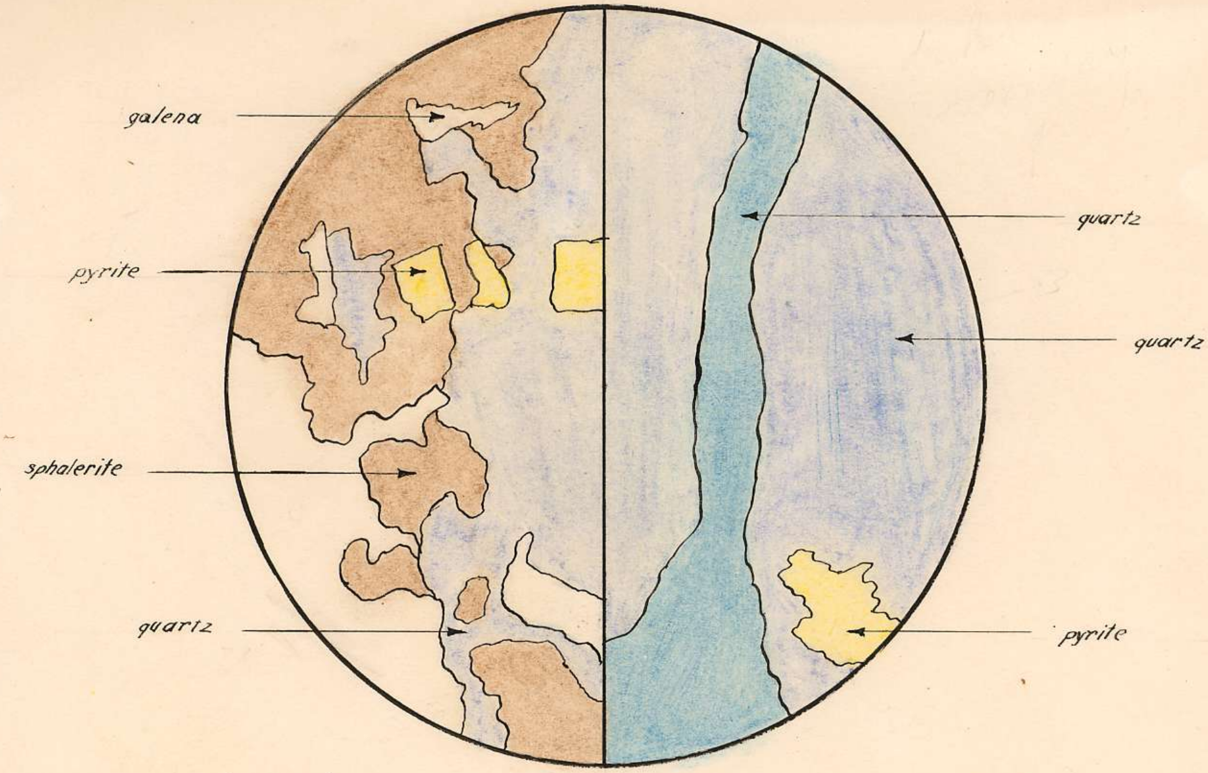
Number E. Ordinary ore, good percentage of sulphides in quartz.



(M.S.#1) A Figure 1 B (M.S#1)
x60

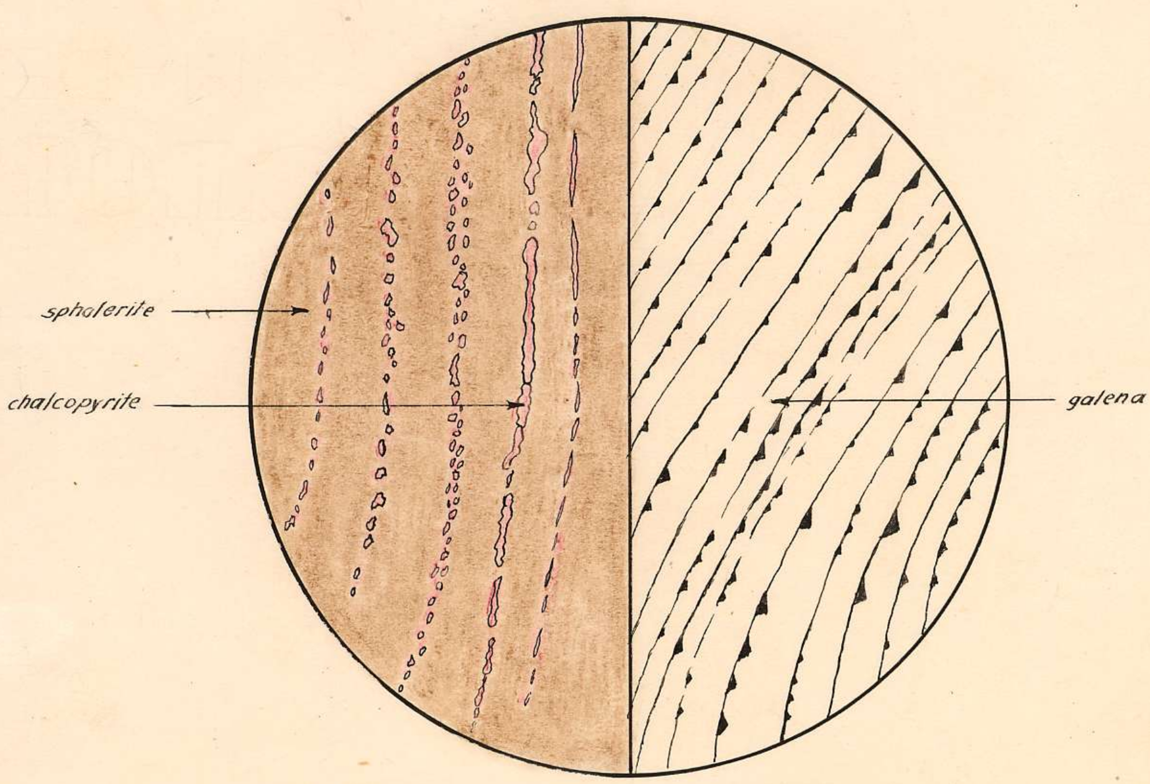


(M.S.#3) A Figure 2 B (M.S.#2)
x60



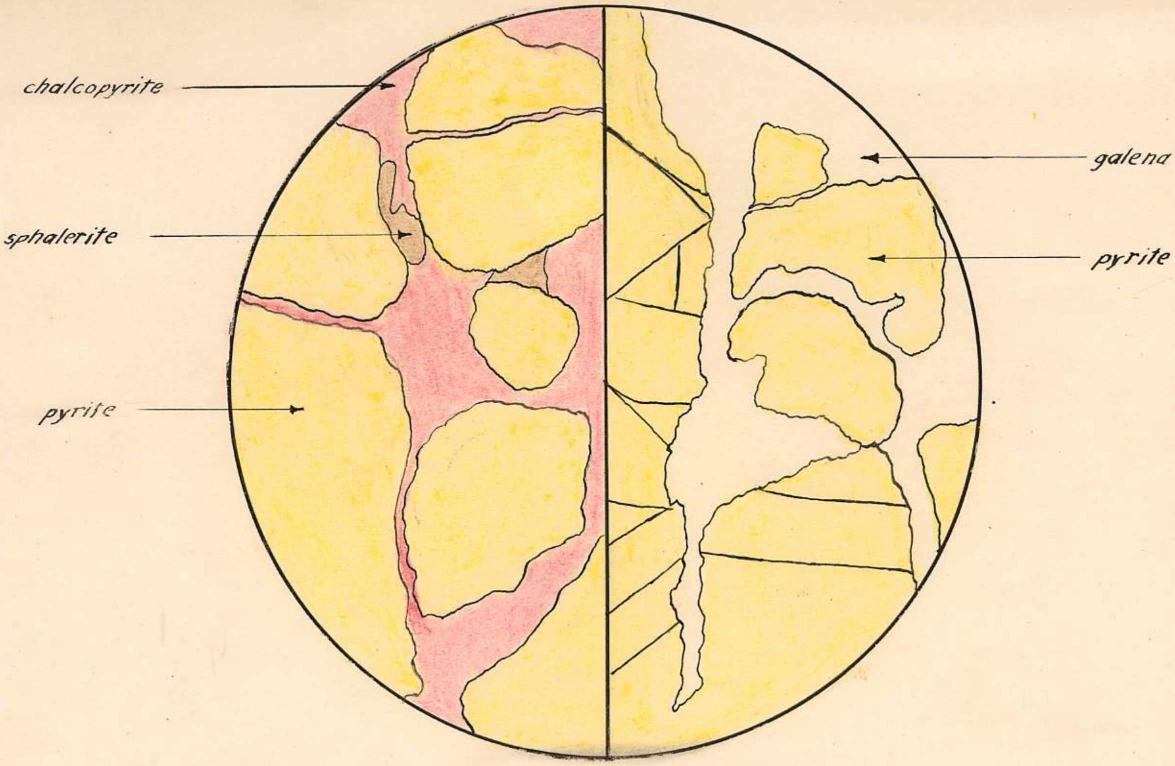
(M.S.#4) A Figure 3 B (M.S.#3)

x60



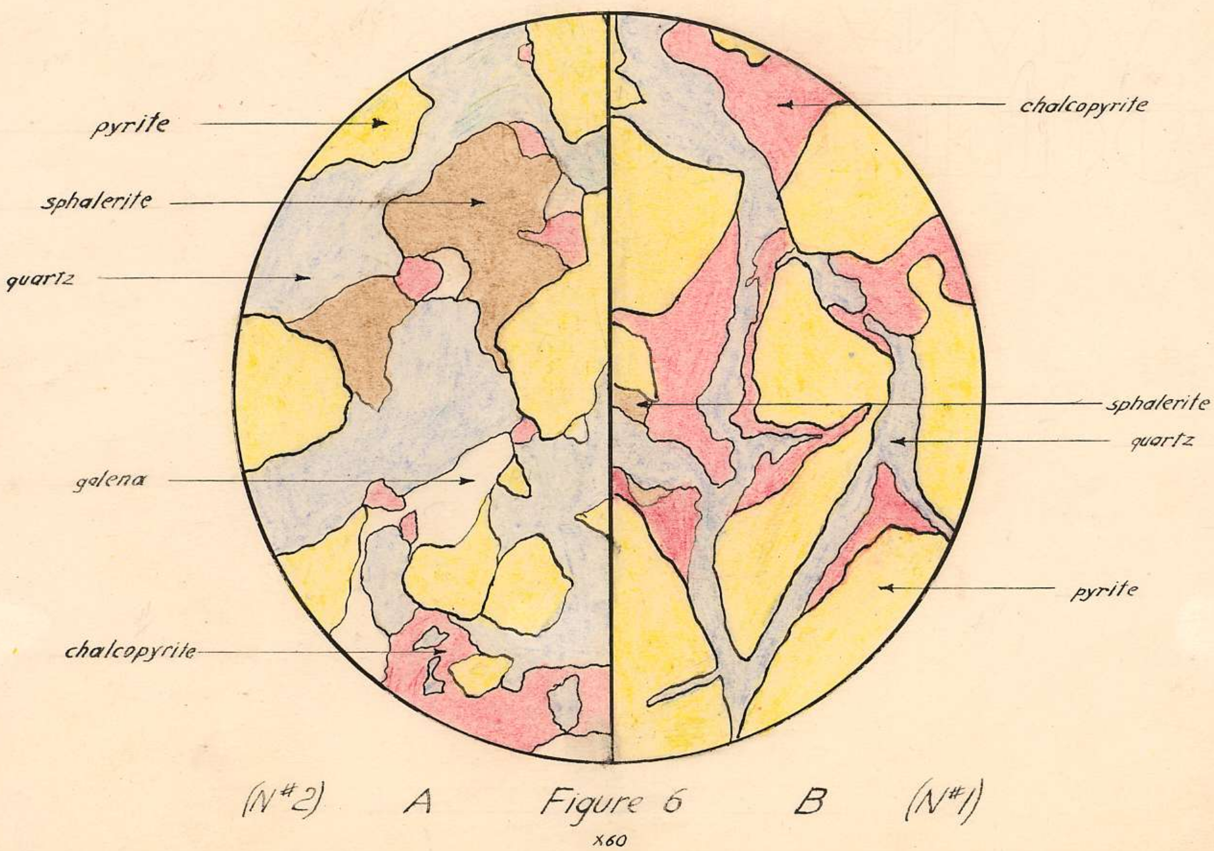
(N#1) A Figure 4 B (N#1)

x60



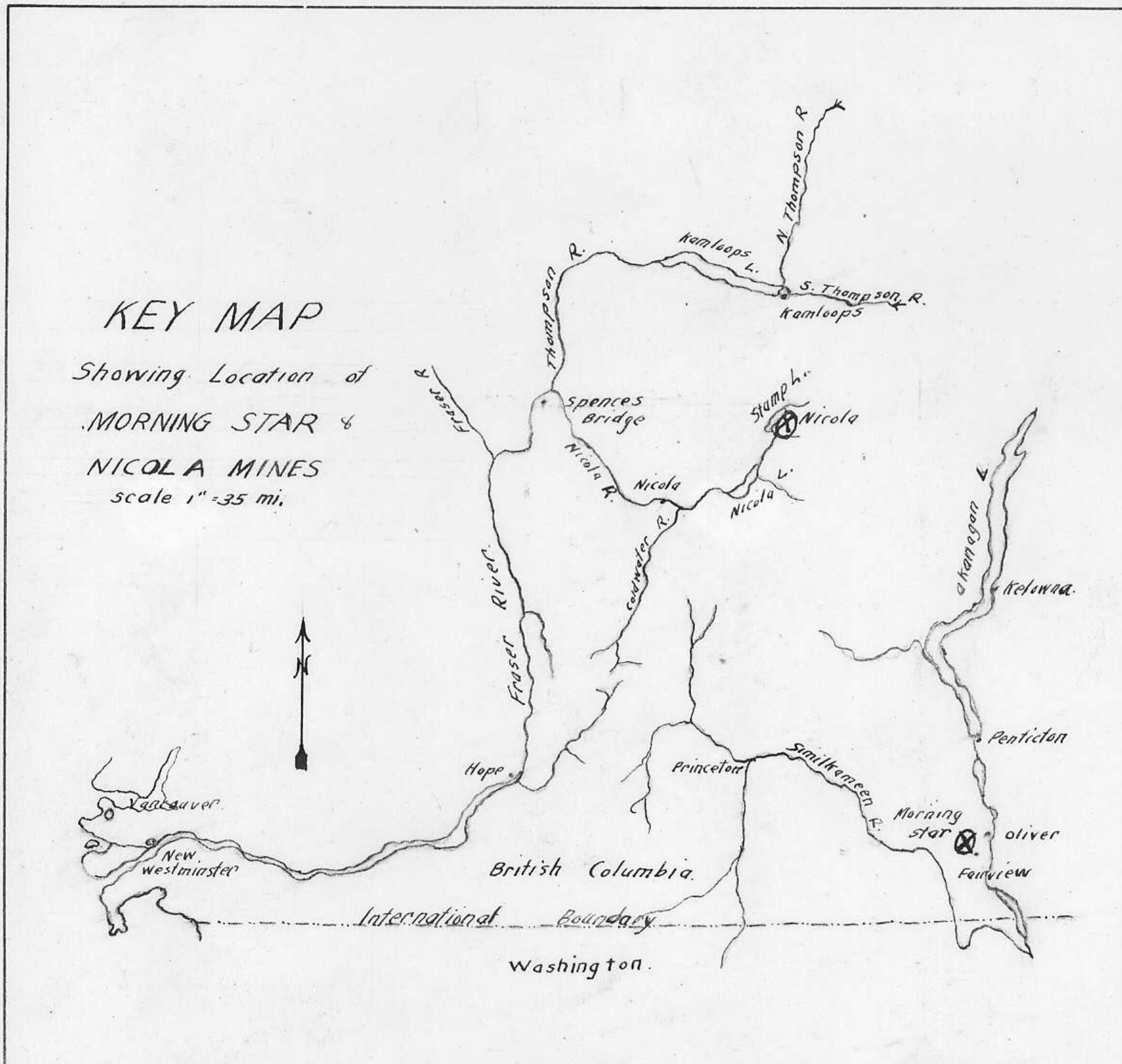
(N#1) A Figure 5 B (N#2)

x60



(N#2) A Figure 6 B (N#1)

x60


KEY MAP
Showing Location of
MORNING STAR &
NICOLA MINES
scale 1" = 35 mi.
N
N. Thompson R.
Kamloops L.
Thompson R.
S. Thompson R.
Kamloops
Fraser R.
Spences Bridge
Stump L.
Nicola
Nicola R.
Nicola
Nicola L.
Coldwater R.
Okanagan L.
Kelowna
Fraser River
Penticton
Hope
Princeton
Similkameen R.
Vancouver
Morning Star
Oliver
New Westminster
British Columbia
Fairview
International Boundary
Washington