# GEOLOGY 9 REPORT

On

# ORE FROM PREMIER MINE

by

J.J. MAXWELL

FIFTH YEAR METALLURGICAL ENGINEERING

UNIVERSITY OF BRITISH COLUMBIA

## PREMIER ORE

Samples from the first, second, third and fourth levels, totalling nine, were mounted, polished and examined. The main minerals present are, pyrite, quartz, sphalerite, galena, tetrahedrite, electrum, pyrargyrite, chalcopyrite, argentite, native silver, and some calcite. The tetrahedrite is largely friebergite (argentiferous tetrahedrite).

In the specimens examined there are two distinct types of ore, sulphides predominating in each -

1. Mainly pyrite, lesser amounts of other sulphides with values in gold:
2. Pyrite largely replaced by quartz, carrying valuable silver minerals in numerous fractures, also with gold values.

The level 1,2 and 3 samples showed large amounts of pyrargyrite, with argentite and native silver also present. Pyrargyrite and native silver are confined to fracture regions. (Figure 5) and are doubtless the result of secondary enrichment. No proof was observed as to the nature (primary or secondary) of the argentite.

In the specimens examined this secondary enrichment stopped before the fourth level was reached. Thus silver values could be expected to drop off rapidly with depth.

The gold, present as electrum, is found at all depths and is doubtless due to primary enrichment.

## MINERALS

### Pyrite:

There is more pyrite present than any other mineral excepting the gangue mineral quartz. The pyrite was the first mineral present, evidenced by its irregular form and frequent replacement by other minerals in all specimens. Figures 1, 2 4 and 5 show pyrite replaced by (1) and(2) quartz,(4) quartz then sphalerite, (5) pyrargyrite.

### Quartz:

Quartz is the main gangue mineral present, containing small amounts of calcite. The quartz in some specimens is highly fractured, facilitating secondary enrichment. Figures 1 and 2 show quartz replacing pyrite and Figure 4 shows quartz replacing pyrite, with sphalerite replacing the quartz.

### Sphalerite:

Sphalerite is present in the ore in large quantities. The sphalerite frequently has inclusions of chalcopyrite -- these two are probably contemporaneous. Figure 3 shows sphalerite being replaced by tetrahedrite and galena (tetrahedrite and galena probably contemporaneous) and Figure 4 shows sphalerite replacing pyrite and quartz.

### Chalcopyrite:

This mineral is present in minor amounts, and is contemporaneous with the sphalerite.

Galena:

A minor amount of galena present (i.e. in comparison to amounts of pyrite and sphalerite). Several inclusions of electrum were observed in the galena. Figure 3 shows galena and tetrahedrite replacing sphalerite.

Tetrahedrite:

Fair amounts of this mineral were observed, often in close association with galena. See Figure 3.

Electrum:

The electrum present is apparently mostly associated with galena.

Pyrargyrite:

Large amounts of pyrargyrite in the upper levels, occurring in highly fractured material, and the absence of this mineral in samples from No.4 level show that the pyrargyrite results from secondary enrichment.

Argentite:

The small amounts of argentite found were in the highly fractured quartz.

Native Silver:

This mineral was also found in highly fractured quartz.

Calcite:

Some calcite was found veining quartz. Since calcite is known to be a secondary mineral, and since it forms a very minor part of the gangue mineral present, no further attention was paid to it.

## PARAGENESIS

The diagram facing this page gives the paragenesis of the various minerals in the ore, determined by factors mentioned above. The conclusions made could in every case be checked by numerous examples in the specimens, with the exception of argentite. No satisfactory chronological placing of argentite was made. It is placed in the paragenesis diagram as a secondary mineral because of its presence in the fractured regions of the quartz gangue.

## GRINDING

Owing to the fineness of some of the pyrargyrite, and the inclusion of very small particles of electrum in other minerals, it would probably be necessary to grind the ore to around 200 mesh, (Tyler standard screen scale) to assure releasing the smallest particles of precious metal minerals.