REPORT

Quarry 25

LEAD-ZINC ORE - H.P.H. GROUP

NAHWITTI LAKE,

VANCOUVER ISLAND.

A. Drysdale Geology IX.

18/20

a good bit of work.

You don't seem to have noticed

mineral resembling grey olivine in #21

and the alteration (?) along galena cleavages.

Some of your replacement is open to question

but this is debatable

pens.

REPORT ON LEAD-ZINC ORE, H.P.H. GROUP, NAHWITTI LAKE, VANCOUVER ISLAND.

ACKNOWLEDGEMENTS.

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Report to be accompanied by Six Polished Sections.

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ACKNOWLEDGEMENTS

The writer wishes to take this opportunity to extend his appreciation to Dr. Gunning for the specimens which made this report possible, and for his most valuable suggestions on ore paragenesis.

Appreciation is also due Mr. A. Allen and Mr. Ney, assistants in the department, for assay work and instructions on photography.

The suggestions and aid extended by Mr. Dennan of the University Fire Department in the polishing of the sections used are also greatly appreciated by the writer.

BIBLIOGRAPHY

1. G.S.C. Summary Report - 1931. Part A. Dr. Gunning -- pp. 36 - 46.

Plan and general information regarding locality and regional geology were taken from the article in this issue.

2. The Laboratory Investigation of Ores

Edited by E. E. Fairbanks.

McGraw-Hill Book Company, Inc., New York.

1928 - pp. 132 - 162.

pp. 200 - 240.

1. INTRODUCTION:

The following observations are a result of megascopic and microscopic examination of Lead-Zinc ore of the H.P.H. Group, Nahwitti Lake, Vancouver Island. The object of this report was not to find anything out of the ordinary, but to gain practice in the determination of ore paragenesis by use of the microscope and polished section.

11. LOCATION and GENERAL GEOLOGY of AREA:

The property was discovered and several claims staked by Messrs. Meade Hepler, S. S. Pugh, Frank K. Hicklenton, in June, 1930, about 2 miles east of Nahwitti Lake. Later, these claims were taken over as an option by the American Smelting and Refining Company, and development undertaken during the winter of 1930-31. Early in 1931, the Company ceased work and relinquished its option so that the claims reverted to the original owners. The camp site is about 16½ miles from Hardy Bay, and one must travel on foot and by boat in order to get there. The trails are fit only for walking and packhorses cannot be used because of this condition.

Development consists of numerous strippings and trenches, two shafts and an adit 111 feet long. Practically all the work has been done on the H.P.H. Nos. 1 and 2 CLAIMS. (See Map of workings).

On the claims, massive to banded, grey crystalline limestone outcrops all along the north face of the ridge. The limestone is about 500 feet thick, strikes a little north of

west and dips from 35 degrees to 65 degrees to the south. Volcanic rocks, andesite, amygdaloidal flows, and andesitic breccias are exposed several hundred feet north of the limestone. Near the base are a few outcrops of andesite which may be dykes or the upper part of the underlying volcanics. Overlying the limestone and interbedded with it are hard, grey, banded silicious, tuffaceous sediments, while further to the south of the top of the ridge, there are occasional outcrops of andesite, tuffs, and felsite in a flat drift covered area.

Dykes and sills cut the limestone near the main workings and vary in size up to 8 feet in width.

111. MINERALOGY: SPECIMENS and LOCATION.

N 32 - H.P.H. Group - Ore in adit; 97 feet from portal.
N 31 - H.P.H. Group - Ore from dump.
N 21 - H.P.H. Group - N. W. Corner of vertical shaft.
N 20 - H.P.H. Group - S. E. of E. shaft. Surface.
N 19 - H.P.H. Group - Surface, E. of East shaft.
N 12 - H.P.H. Group - Lead zinc ore in limestone.

A megascopic examination of the hand specimens revealed the following minerals:

GALENA: (Spec. N 32, N 12, N 31, N 21, N 19). Coarse to fine grained, and in all cases apparently replacing or veining dark grey, silicified limestone, limestone or quartz.

SPHALERITE: Spec. N 32, N 12, N 31, N 21, N 19.

Coarse to fine grained, light to dark brown sphalerite containing disseminated Galena (Spec. N 32) and disseminated in Galena (N 31).

QUARTZ: N 32, N 12, N 21, N 19, N 31.

Fine grained light to dark-grey quartz containing in it at times Chalcopyrite, Galena, and Sphalerite and replacing limestone. The quartz veins represent later quartz veining after Calcite. (Illustration 11.)

PYRRHOTITE: Spec. N 31, N 19.

Massive Pyrrhotite replacing limestone and containing smaller amounts of Chalcopyrite and limestone. This mineral is scattered through limestone in appreciable amounts (N 31) and in Galena and Sphalerite. (N 19).

CHALCOPYRITE: Spec. N 20, N 19, N 12.

The Chalcopyrite appears in recognizable amounts in the above specimens. However, it is found in all of the polished sections as minute blebs in the silicified limestone, sphalerite, quartz.

LIMESTONE: N 31, N 21, N 32, N 20.

This gangue mineral is light to dark grey and has largely been replaced by silica bearing solutions. Its contacts with the quartz have been brought out in Illustration 111. In Spec. N 19, the limestone has been replaced to such a degree by the quartz that a negative test with HCl was obtained.

OTHER MINERALS: Some copper and iron oxidation tarnishes were found in Spec. 12. The copper tarnish was probably a result of the alteration of chalcopyrite in the ore.

CALCITE& QUARTZ VEINS: The quartz and calcite veins occur in Spec. N 20 with quartz later than the calcite. (See Illustration 11.)

MICROSCOPIC EXAMINATION OF THE SECTIONS:

GALENA: Sections N 19, N 31, N 21, N 20, N 32, N 12.

Galena appears in all of the sections more or less and in one or two ways. It is found disseminated throughout the limestone and along boundaries between the sphalerite and the limestone.(Sec. N19, N31). In Section N31, the galena is separating out along fractures and in patches in the silicified limestone (See Drawing 11). In Section N21, the galena shows well developed cleavage and includes smaller particles of sphalerite. The boundaries between galena and sphalerite are sometimes smooth and flowing, and in other areas cusped and crenulated. Galena is present in smaller amounts in sections N20, N32, N12, and shows the same smooth boundaries with sphalerite.

SPHALERITE: Sphalerite appears to a lesser degree than does galena, but nevertheless in considerable quantities in all sections examined. In every case the sphalerite shows rounded boundaries with the galena and in such cases as sec. N31 (Ill. IV), the boundaries are jagged and penetrating. It is associated with pyrrhotite and contains very small amounts of what

appears to be galena (High Power). The size of the particles limited the testing of the mineral to a degree where it was impossible to tell its identity by the ordinary methods. Sphalerite appears as inclusions in galena and also as including galena.

CHALCOPYRITE: Sections N 19, N 31, N 20, N 12.

Chalcopyrite occurs with pyrite, sphalerite, and silicified limestone (See Drawing 111). In every case, chalcopyrite exists as small blebs in the sphalerite. The size of these particles vary from .05 mm. to .5 mm. Also, in Sec.N31, the chalcopyrite is disseminated throughout the quartz. In Sec. N20, the chalcopyrite is present in large quantities in the pyrrhotite and again as smaller amounts in the sphalerite.

PYRITE: Sections N 19, N 20, N 32. This mineral occurs in one or two sections (Section N19 and Drawing 111) associated with chalcopyrite, sphalerite, and dark grey quartz. Pyrite occurs in fairly large fragments in Sec. N20 (Size .5 mm.-2mm.) Again, it shows up in Sec. N32 associated with sphalerite and galena.

PYRRHOTITE: Sections N19, N 20. Pyrrhotite was determined by etching and by its anisotropism. In sec. N19, it appears in galena and sphalerite as isolated, rounded particles. In sec. N20, it is intimately mixed with chalcopyrite, pyrite and sphalerite. Pyrrhotite forms a large percentage of this section and specimen. Inclusions of galena replacing limestone appear in this section. (See Illustration 11).

QUARTZ: In this ore, dark silicified limestone is very difficult to distinguish from dark, grey quartz. However, at least two phases of quartz are represented. In Sec. N19, silicified dark to grey limestone is present in scattered patches in the galena and is associated with sphalerite and minor amounts of chalcopyrite and pyrrhotite. Irregular margins are dominant (See Illus.III). Where the identity of the limestone has definitely been established in contact with the silicified limestone, pyrite is present in small amounts. (This is no criteria for pyrite association unless supported by additional evidence). Veinlets of banded quartz (chalcedonic) are found cutting patches of sphalerite and silicified limestone. This is a later phase of injection because walls of crystals appear which match one another. Fracture fillings are of some hard, fine-grained silicious material and represent injection of silicates along these zones. In Sec. N31, silicified limestone is being replaced by galena and sphalerite along cracks. This limestone responds to HCl in the hand specimen and yet can barely be touched by the needle; indicating definitely silification in an advanced or intermediate stage. In Sec. N21, the silicified limestone is associated with sphalerite and galena and is further affected by a post galena quartz phase, crystallizing along cleavages in galena. In Sec. N20, carbonate veinlets are later injected and crosscut by banded quartz. (See Illustration II). In Sections N32 and N12, the limestone is silicified and then is followed by mineralization. A later phase is apparent as shown by quartz veinlets and quartz crystals along cleavages in galena.

V. PARAGENESIS:

Two periods of mineralization are recognized in this group of ore. First, there is a contact metamorphic period in which the limestone was altered and penetrated by solutions carrying silicates, calcite, pyrrhotite and chalcopyrite. The best evidence for this is Sec. N20, which illustrates the pyrrhotite forming the major part of the mineralization and including minor amounts of pyrite, sphalerite and silicified limestone. It also shows the later quartz and calcite phases.

Secondly, there is the replacement period of mineralization. This period replaces and superimposes itself on the first period with the introduction of lead-zinc-silver solutions. This fact is amply shown in the sections to which the writer has constantly referred. For example, pyrrhotite and pyrite are found in varying amounts in the galena-sphalerite masses. The galena is contemporaneous with and is deposited a little longer than the sphalerite. The replacement period was accompanied in its later stages by silicious and calcitic injections along fractures and zones in the minerals.

Lead-zine ores have been known to carry various amounts of silver, usually in the form of argentite *1. or tetrahedrite. At times during etch reactions with the galena, the writer thought some evidences of aureoles and fume tarnishes indicated the presence of one or the other. However, the tests could not be duplicated, even after several attempts, so no direct evidence indicated the presence of silver or silver bearing minerals. (Short stresses the unreliability of these tests due to presence of air bubbles or of microscopic dust

*1. Dr. Gunning states in his report on this mine that the silver mineral might be dyscrasiteor Tetrahedrite.

particles). An assay was made with 15 gms. of galena from specimen N 19, with the object of determining the presence of silver. The net result was 42 mg. of silver or 84 oz. of silver to the ton.

OUTLINE of PARAGENESIS:

1st PERIOD of MINERALIZATION (Contact Metamorphism).

i. Quartz - silicates - silicifying of limestone.

ii. Calcite.

iii. Pyrrhotite - minor development of pyrite and chalcopyrite.

2nd PERIOD of MINERALIZATION (Replacement).

1. Sphalerite.

ii. Galena - Sphalerite - Silver.

iii. Minor development of pyrrhotite.

iv. Cryptocrystalline quartz- cutting earlier periods.

I. CONTACT METAMORPHISM

Quartz
Silicates } ———————————
Calcite

Pyrrhotite ————

Chalcopyrite ——

Pyrite ——

II. REPLACEMENT:

Quartz ..... ——————————————

Pyrite ..... ——

Pyrrhotite ..... ——

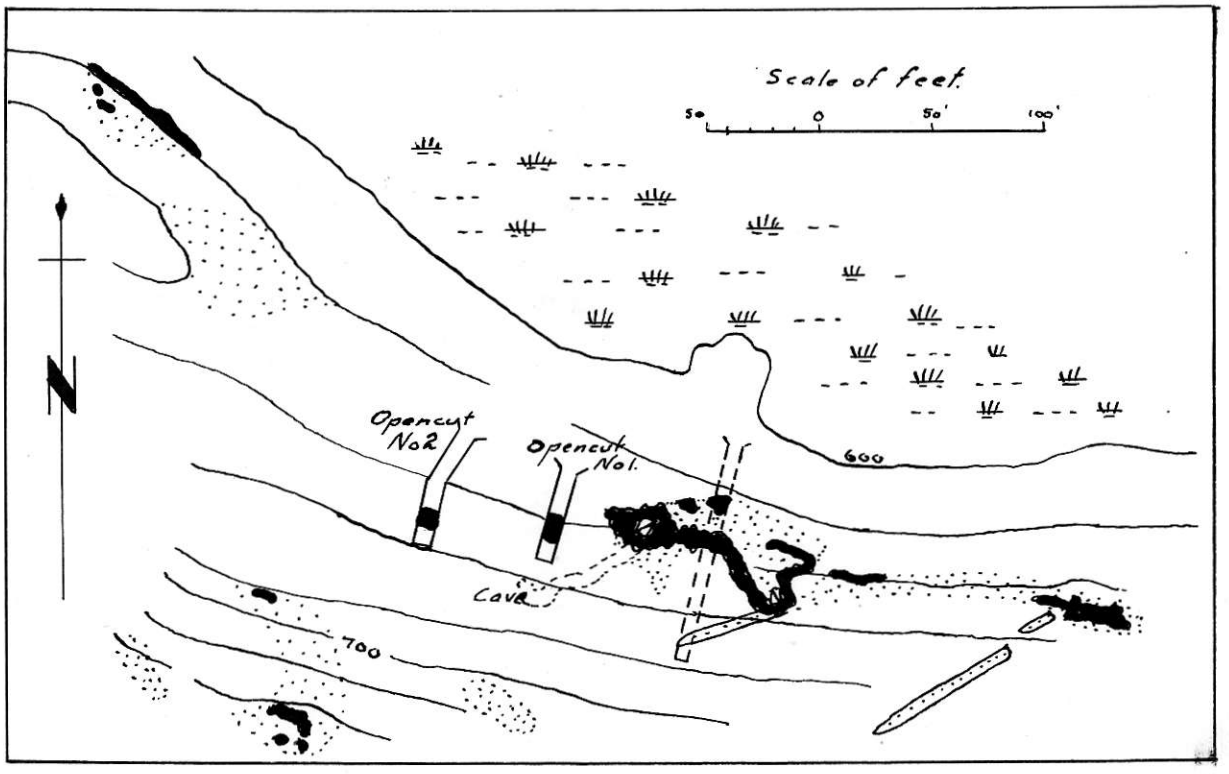
Sphalerite ..... ————————

Chalcopyrite ..... —

Galena - Sph. - Ag. ... ————————

The possibilities of this area are not very great because of the difficulties of transportation and the relatively low grade ore. Also, the outcrops are limited and the extent of mineralization has never actually been proven by anyone.

PICTURES and ILLUSTRATIONS



LEGEND.

mineralized area.

limestone.

swamp.

Illustration I.

Map of Workings.

H.P.H. Group,

Nahwitti Lake,

Vancouver Island.

Illustration II.

$^{x}45$ N 20

2 Periods of Veining

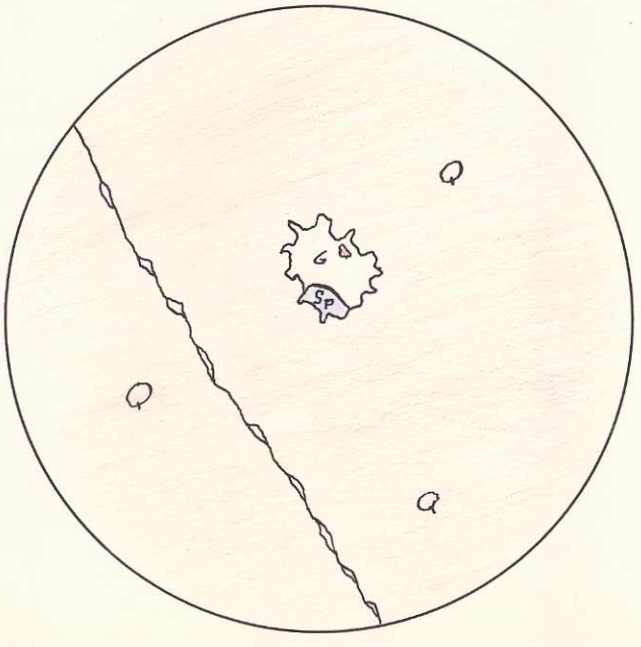
(i) Calcite - light

(ii) Chalcedonic quartz--

- dark.

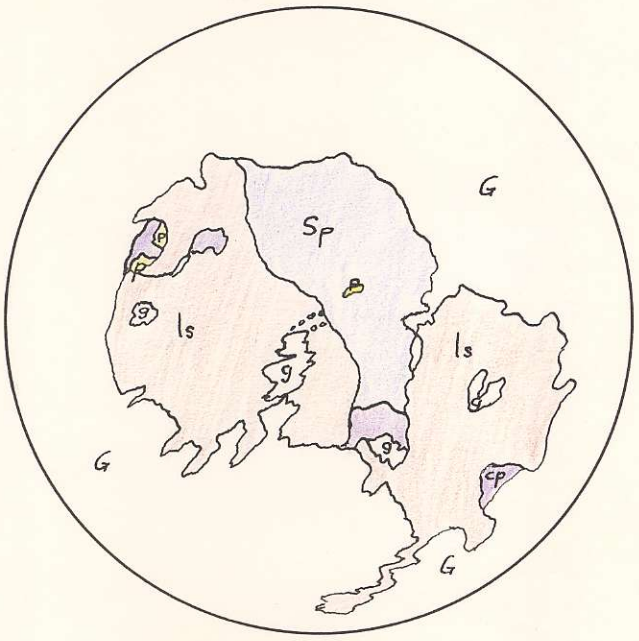
Cutting:

Pyrrhotite
Sphalerite
Pyrite.



$^{x}45$ Drawing II.

Galena separating out along fractures and in patches in the silicified limestone.



Drawing III.

x45 Section N 19.

Chalcopyrite with Pyrite, Sphalerite, and silicified Limestone.

Illustration III.

x45 N 20.

Pyrrhotite replacing silicified limestone.
Galena
Note relief in limestone.

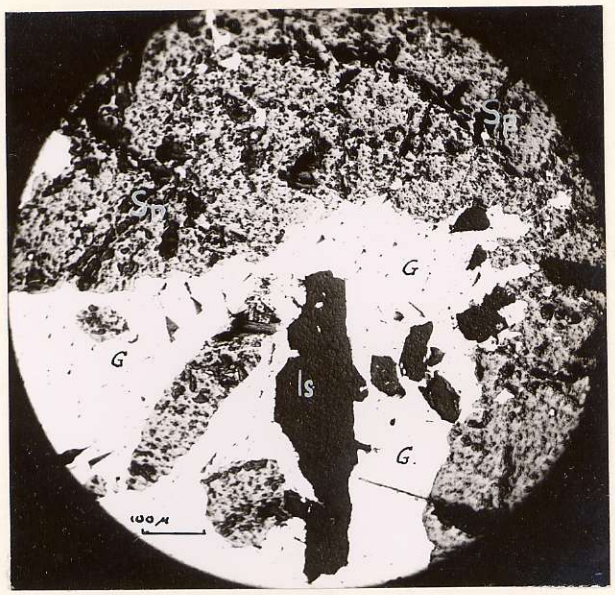


Illustration IV.

x45 N 21

Galena replacing Sphalerite and Quartz.

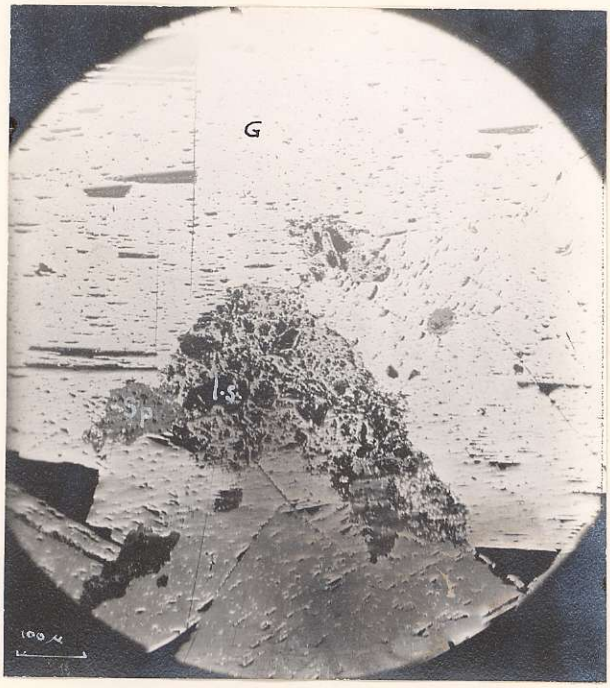


Illustration V.

x50 N 19

Galena
Sphalerite
Carbonate.

Illustration VI.

$^{x}45$ N 21

Galena (white) replacing Sphalerite along boundary between Quartz and Sphalerite.

Illustration VII.

$^{x}45$ N 21.

Galena
Sphalerite replacing Silicified Limestone.