Careful work on an unproductive problem.

MINERAGRAPHIC STUDY OF THE ORES OF DORREEN MINE, BRITISH COLUMBIA

A Report submitted in partial fulfillment of the course in Geology 409

HENRY THOMAS CARSWELL

THE UNIVERSITY OF BRITISH COLUMBIA

April, 1955

TABLE OF CONTENTS

ACKNOWLEDGMENT

The writer would like to thank Dr. W.H. White, who supplied geological information about this mine, and Mr. J.A. Donnan, who was responsible for the making of good polished surfaces of this difficult ore.

Introduction

The Dorreen Mine, or Fiddler Creek Mine, is a small precious and base metal working on Knauss Creek about four miles west of Dorreen, a station on the Canadian National Railway, (see map). The workings are at an elevation of 2200 feet on the steep wall of a glacial valley, and may be reached by a rapidly deteriorating road from Doreen. The mine is at present not operating, and the camp has been badly damaged by the heavy snowfall of the area after an abandonment of only two winters.

History

The Fiddler group - Boulder, Indicator, and Intrusive claims - was staked in 1914 by Louis Knauss. In the same year, the property was bonded to Martin Welch, who drove the main adit. In 1916, the Fiddler Creek Gold Mining Company bought the property, built a wagon road from Doreen to the workings, and drove a lower tunnel through 183 feet of alluvium to bedrock in an attempt to intersect the vein. By 1923 this tunnel had caved, and in the same year J.F. Duthie acquired the property and continued the main adit. In 1924 Mr. Duthie shipped 80 tons of ore, averaging 1.67 oz. Au; 6 oz. Ag; 6.2 per cent Pb; 1.3 per cent Cu; 5.8 per cent Zn; and continued development. J.W. Treadway acquired the mine in 1926, and shipped 100 tons of ore, the first 30 tons averaging 1.28 oz. Au; 5.3 oz. Ag; 6.1 per cent Pb; 3.8 per cent Zn. The property then lay idle until 1949, when L.W. Patmore and J.W. Treadway sold it to the Dorreen Gold Mining Company, who completed a truck road and a 30 ton per day cyanide mill by 1950. In 1952 much development, including diamond drilling, was carried on, and 525 tons of ore were milled to produce 20 tons of bulk concentrate averaging 5.25 oz Au; 13.05 oz Ag; 17.3 per cent Pb; 7.4 per cent Zn; 2.6 per cent Cu. Work was discontinued the same year, probably because of mining costs.

Geology

Dorreen Mine is situated in rocks of the Hazelton group, intruded at the head of Knauss Creek, about two miles from the showings, by a large granitic body. A wide quartz diorite dike probably stemming from this body cuts Hazelton rocks near the main portal; this dike strikes 330° and dips 55° south-west. Near this same portal, a thick apophyse intrudes along the bedding for a short distance. The wall rocks of the vein are unaltered tuff and argillite;

a fossiliferous, argillaceous, thin limestone bed closely underlies the ore body. These strata strike 300° and dip 25° north-east. The ore body is a "bedded fissure vein", four feet to four inches wide, along a bedding fault. It occasionally shows short branches, probably along tension fractures. The vein appears to be cut by the dike, but Kindle[1] has traced the refracted and tight fracture through the dike. Gouge occurs on both hanging and foot walls of the vein, and near No. 3 portal, a three foot wide horse surrounded by ore may be seen. The dike shows little displacement along the fault, however.

The quartz vein is iron-stained, fractured, and irregular in width. The width and mineralization generally decrease with distance from the dike, the vein becoming thin and barren-looking up the dip and at the west termini of the workings. When the vein was freshly exposed by surface stripping in 1916, Galloway[2] described the outcrop as showing little mineralization. The productive parts of the vein show 5 to 10 per cent of sulphides, and a few rich ore shoots show up to 70 per cent sulphides. Lay[3] describes the gold values as persisting with decreasing width and sulphide mineralization.

---

1 Kindle, E.D., Geol. Surv. Can. Mem. 212, 1936.

2 B.C.Minister of Mines' Annual Report, 1916, pp.101-4

3 B.C.Minister of Mines' Annual Report, 1928, p. 131

Another similar vein occurs 70 feet stratigraphically above the main one. It was explored by a 21-foot adit and open cut north east of the main portal. The vein is similar in mineralogy to the lower one, and has a width in the adit of 8 - 12 inches. An 8-inch channel sample here showed .94 ozs. of gold.

Mineragraphy

The mineragraphic study of Dorreen ore was based on the examination of seven polished surfaces (specimens 3, 5, 6, 8, 12 and 21), and two briquettes of superpanned middlings and tips of crushed ore.

Minerals:

Gangue - The gangue is quartz, often fractured and iron-stained, but crisp and fresh. The ore minerals occur in fractures and in replacements guided by fractures which are not always completely filled. Rounded relicts of quartz occur in galena.

Chalcopyrite $CuFeS_2$ - Chalcopyrite occurs in structureless replacement and filling veinlets up to 5mm wide, and in inclusions within galena and sphalerite. The chalcopyrite shows mutual boundaries with all sulphides except pyrite, which at one point cuts chalcopyrite and at another point appears to be replaced by chapcopyrite (see Figure 5). The more massive veinlets of chalcopyrite show crescentic pits (see Figure 5).

Covellite - Cu_2S - Covellite occurs in grains 20 - 100 microns across on the borders of chalcopyrite, particularly adjacent to galena, and within the bodies of chalcopyrite. Because of its clear-cut and irregular boundaries, it appears to be a primary mineral.

Galena - PbS_2 - Galena occurs in grains 5 mm to 20 microns in size. It often includes rounded islands of quartz. It ramifies through the gangue in thin tartuous veinlets with matched walls, and also occurs as massive replacements seemingly unrelated to fractures. It often contains round inclusions of chalcopyrite, sphalerite, tetrahedrite, and occasionally pyrite. Small replacement veinlets of sphalerite traverse galena, as do straight-sided veinlets of pyrite. The coarse-grained galena shows very marked triangular pits. A positive microchemical test on galena for silver accounts for some of the values of this metal in the ore.

Pyrite FeS_2 - Pyrite occurs in euhedral crystals 3 mm - 100 microns, and in veinlets of widths 5 mm - 50 microns, and in rare inclusions in other sulphides. In this ore, pyrite is noticeably anisotropic. Crystalline pyrite characterizes specimen 12, where, apparently due to circulating water at low temperature in an adjacent fracture, the crystals have been altered to pseudomorphs of magnetite. Some cubes show relict textures (see Figure 6). In veins, pyrite may be wide and rounded, with prominent lateral pits, partly filling fractures side by side with other sulphides; or as hair-like, straight walled veinlets. These veins are occasionally altered to magnetite. Pyrite has no visible inclusions.

Sphalerite ZnS - Sphalerite occurs in small circular inclusions 20 - 100 microns across in galena and chalcopyrite, and occasionally in galena as larger irregular bodies. In this ore, sphalerite shows internal reflection only along fractures. In one place sphalerite encloses galena in a ring, resembling atoll structure. Very rarely sphalerite occurs alone in quartz. Inclusions of sphalerite in chalcopyrite, and the reverse, do not seem indicative of exsolution, since there is no orientation of inclusions.

Tetrahedrite(?) $3Cu_2S \cdot Sb_2S_3$ - Tetrahedrite (?) occurs as sparse round inclusions in galena, sphalerite, and chalcopyrite, 20 - 50 microns across. The mineral is negative to etch reactions, and shows occasional brown internal reflection. It is distinguished from sphalerite only by its slightly lighter colour, and where sphalerite and tetrahedrite do not occur together in the field of the microscope, determination is difficult.

Arsenophyrite FeAsS - Only two crystals of arsenophyrite occurred in the ore. The crystals were in chalcopyrite, closely associated with pyrite. Both crystals were drilled out for spectrographic analysis.

Magnetite Fe_2S_3 - Magnetite occurs only as an alteration product of pyrite.

Gold (?) - Gold was not found as inclusions in any sulphide, in the superpanned tip, or by spectrographic analysis of pyrite or arsenopyrite. It was finally tentatively identified in free form as scattered particles 1 - 10 microns in size in tiny pits in the gangue of specimen 12. Under an oil immersion lens, the grains show no texture. The gold is too small to have been freed by the crushing prior to superpanning. The gold appears to have no relation to fracture, and hence, to the sulphide. Since it occurs in closed pits, it is probably contemporaneous with the quartz.

Paragenesis

From the evidence of these specimens, only the following may be said about paragenesis.

1. Faulting of wall rocks occurred.
2. Quartz was deposited, with contemporaneous(?) deposition of gold.

3. Further movement along the fault occurred producing gouge on foot and hanging walls, and fracturing of the quartz.
4. Deposition of sulphides in fractures occurred with slight replacement of quartz. Deposition of the sulphides was probably contemporaneous, with the exception of pyrite, which may have been later.
5. Slight movement along the fault re-opened some fractures.
6. Pyrite was altered to magnetite, in part.

Temperature Type of Deposit

The intermediate temperature of deposition characteristic of galena, tetrahedrite, and sphalerite; the quartz gangue with some open space; and the lack of banding and crustification indicate that this is a mesothermal deposit, with a temperature of formation (according to Lindgren's classification) of 200° C to 300° C. The lack of the characteristic wall rock alteration may be due to nonreactivity of the wall rocks.

Spectrographic Analyses

	FeAs S	FeS_2
Cu	+	+
Zn	+	.1-1%
Ag	+	+
Pb	+	+
Mn	+	+
Sn	+	-
Bi	-	-
Sb	-	-
Mo	-	-
In	-	-
Ge	-	-
Cd	-	-
Co	-	-
Ni	-	-
Te	-	-
As	-	-

Petrographic Work

Wall Rock

Specimen 8 - a crystal tuff. Large fragments of quartz and plagioclase occur in a more fine-grained matrix in this rock. The whole thin section is iron-stained, but otherwise unaltered.

Dike Rock

Specimen 3 - Quartz Diorite porphyry. In this porphyry, some feldspar phenocrysts are partly sericitized. Accessory magnetite is present.

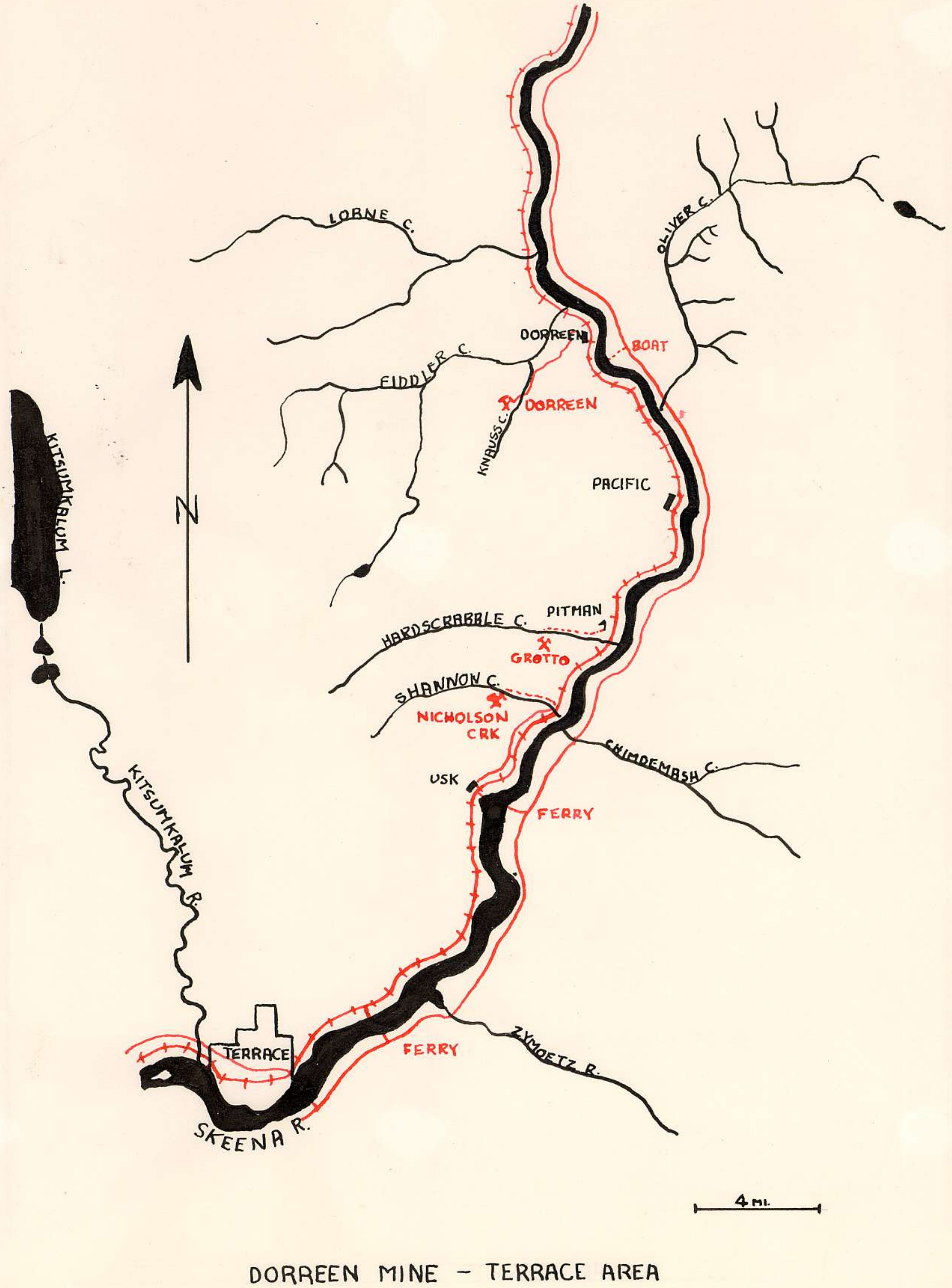
Specimen 17 - Same rock as specimen 3.

BIBLIOGRAPHY

British Columbia Annual Report of Minister of Mines, 1916, pp 101-104; 1925, p. 131; 1949, p. 94; 1950, p. 81; 1952, p. 82.

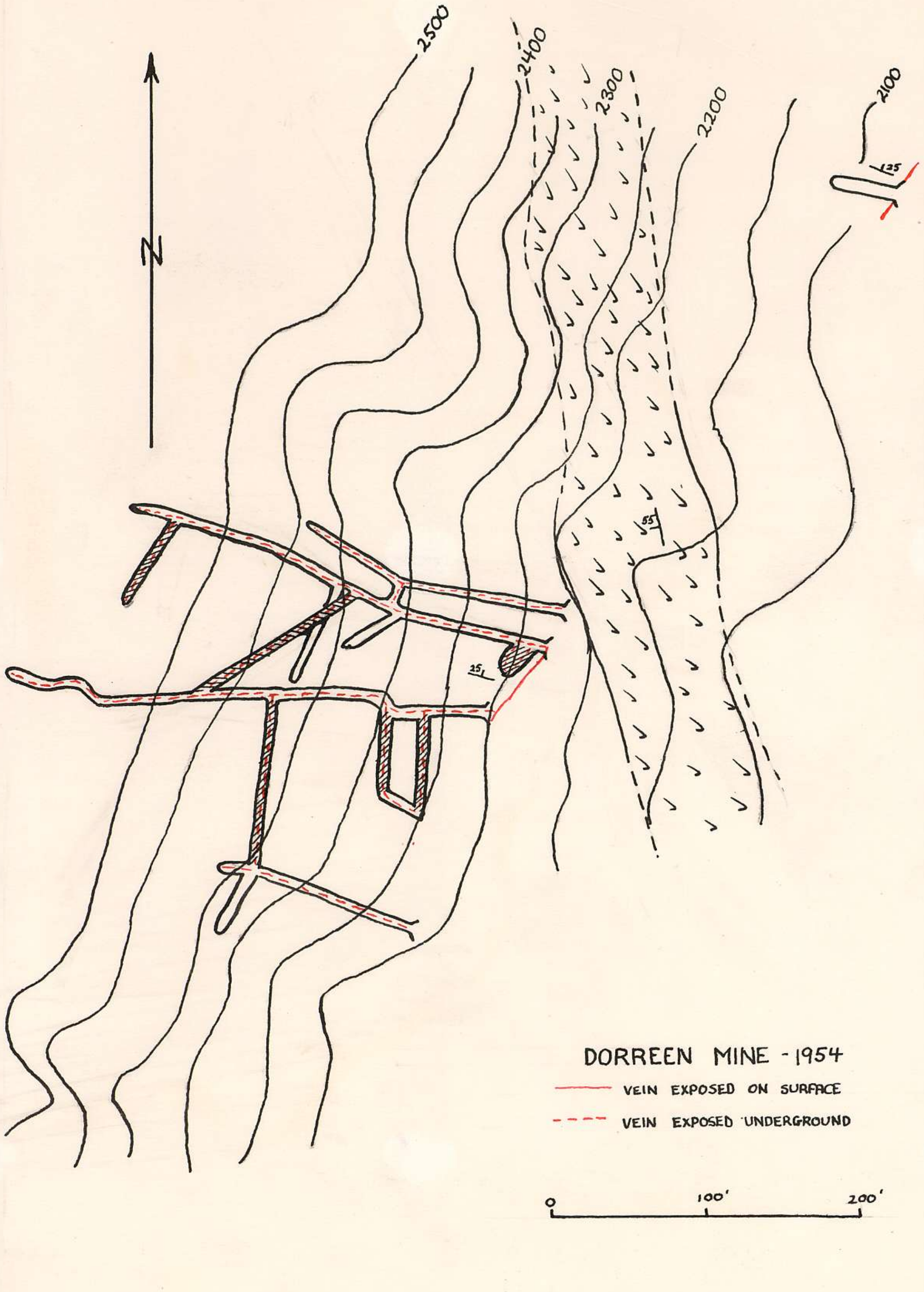
Kindle, E.D., Mineral Resources, Usk to Cedarvale, Terrace Area, Coast District, British Columbia, Geol. Surv. Can. Mem Z-12, 1936.

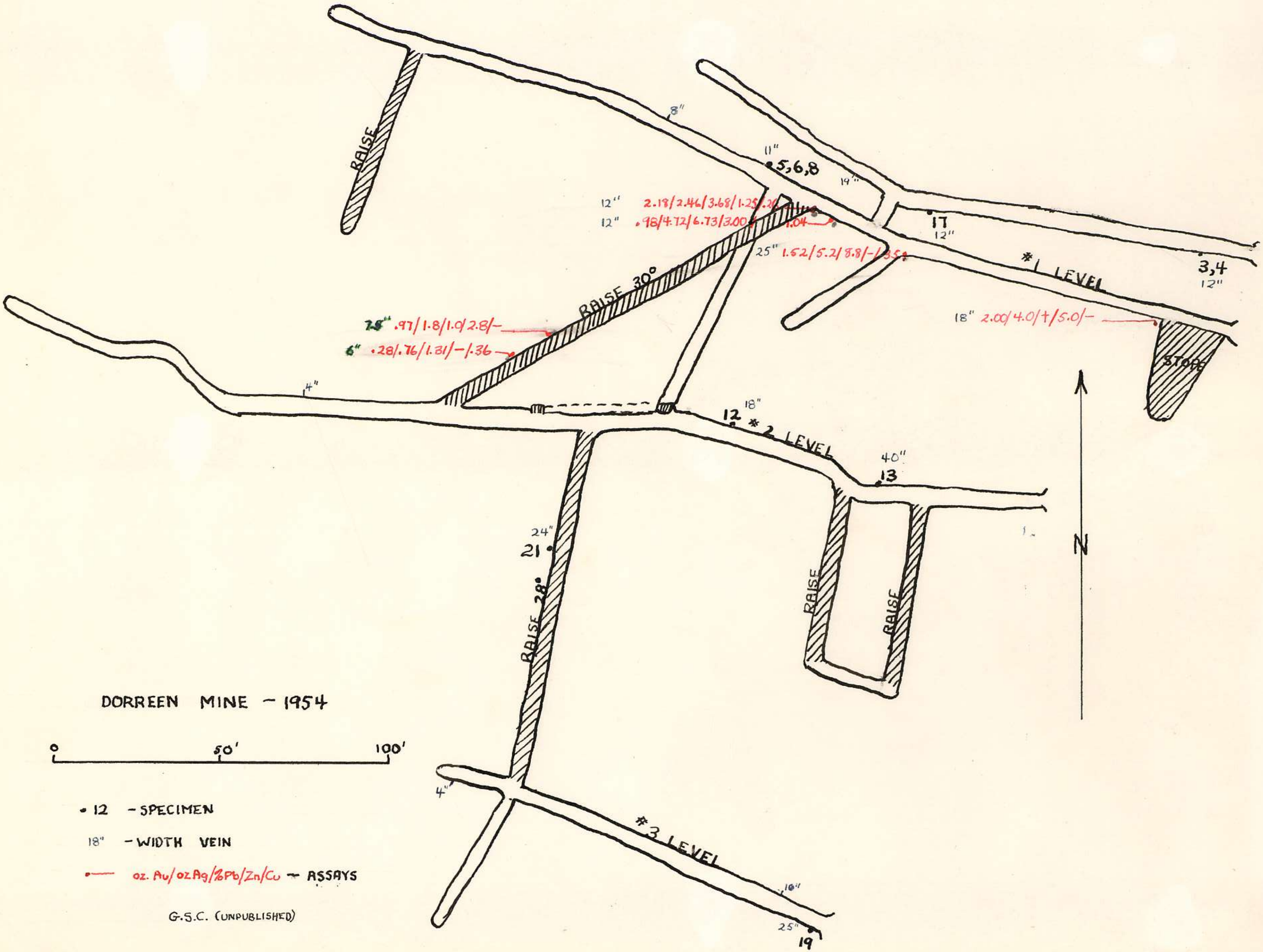
FIG. I.



DORREEN MINE - TERRACE AREA

FIG. 2.

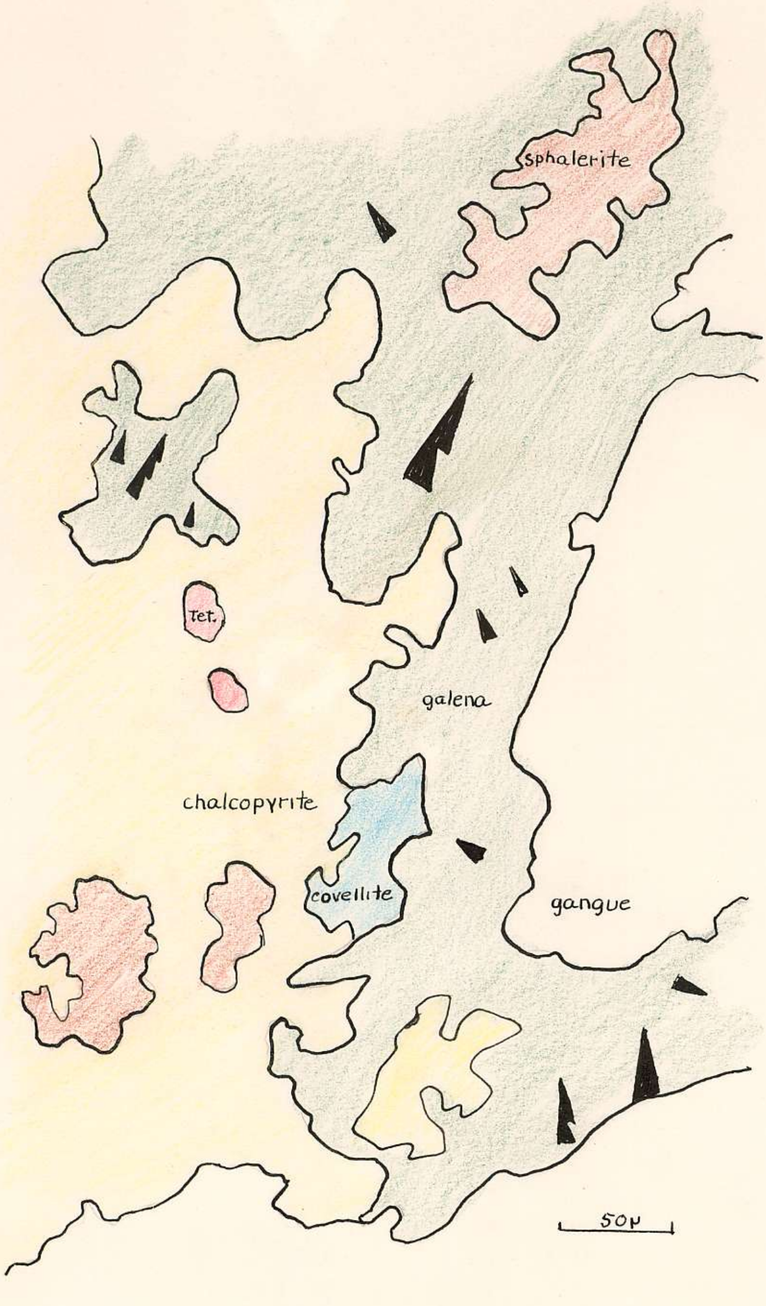

2500
2400
2300
2200
2100
N
55
25
125
DORREEN MINE - 1954
VEIN EXPOSED ON SURFACE
VEIN EXPOSED UNDERGROUND
0
100'
200'



DORREEN MINE - 1954
0
50'
100'
• 12 - SPECIMEN
18" - WIDTH VEIN
oz. Au/oz Ag/%Pb/Zn/Cu - ASSAYS
G.S.C. (UNPUBLISHED)
RAISE
RAISE 30°
RAISE 28°
#1 LEVEL
#2 LEVEL
#3 LEVEL
STOPE
N
5,6,8
17
3,4
12
13
21
19
8"
11"
14"
12"
25"
18"
40"
24"
4"
16"
2.18/2.46/3.68/1.25/.26
.98/4.72/6.73/3.00
1.04
1.52/5.2/8.8/-/.35
2.00/4.0/t/5.0/-
.97/1.8/1.9/2.8/-
.28/.76/1.31/-/.36

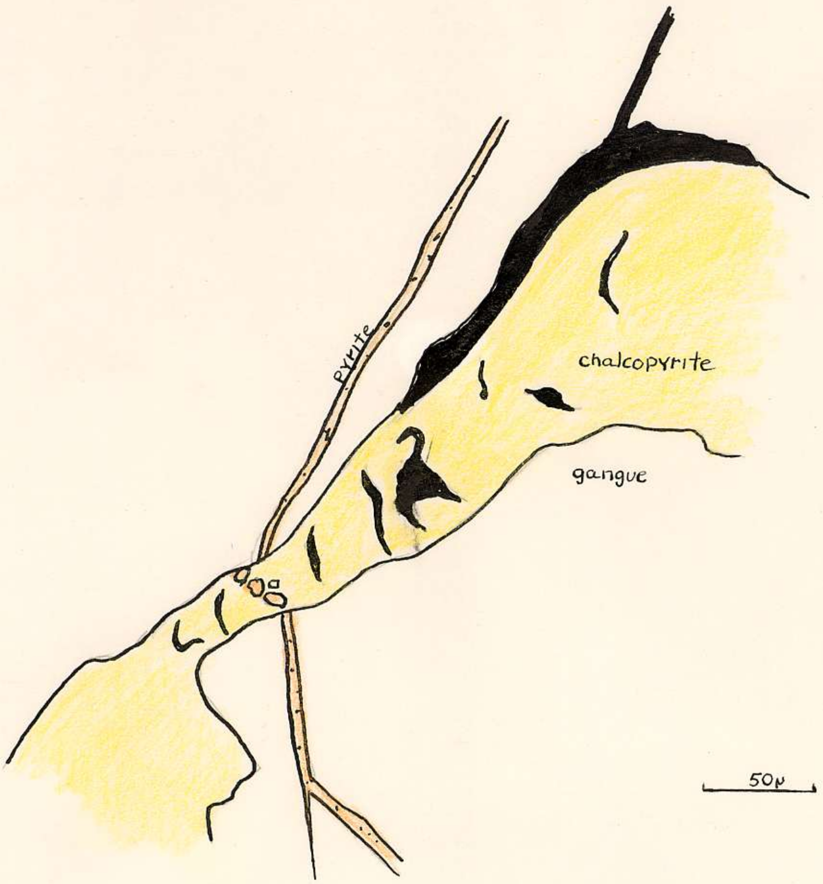
FIG. 3.

FIG. 4



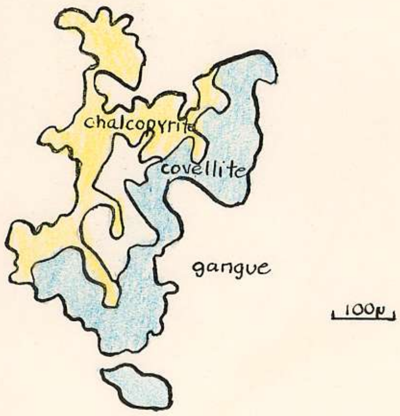
CAMERA LUCIDA DRAWING

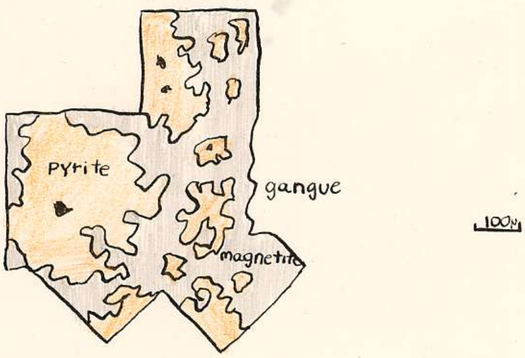
FIG. 5.



CAMERA LUCIDA DRAWING

FIG. 6.





CAMERA LUCIDA DRAWINGS (REDUCED)