6207

REPORT ON THE

COTTONBELT Pb/Zn OCCURRENCE

60 MILES N OF REVELSTOKE, B.C.

NTS 82 M 7

Claims: T, SNAKE EYES, COTTON, BLACK JACK

Kamloops Mining Division

Dr. Peter Levin
Murray McClaren
Robert A. Dickenson

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LIST OF ILLUSTRATIONS

1. INTRODUCTION

Metallgesellschaft Canada Ltd. and United Mineral Services Ltd. performed during the period of September 8th to September 19th, 1976, a geological study of 15 square kilometers in the GRACE MOUNTAIN area, approximately 60 miles north northwest of Revelstoke, B.C. (fig. 1a). This study included detailed geological mapping, a structural analysis of the area and an examination of sulfide rich sections.

In addition to the geological mapping a magnetometer survey was conducted over 14.5 kilometers of line in order to aid in geological mapping of covered areas.

The purpose of the investigation was to better understand the geological controls, the tectonic deformation and the mode of occurrence of the sulfide mineralization found within the Grace Mountain area.

Sulfide mineralization was first discovered in the area during the early 1900's. The COTTONBELT property was subsequently staked in 1910 and has been worked intermittently since. The most recent examination of the area was done during the years 1968 to 1973 by Great Northern Petroleum Limited.

At present, the claims within the vicinity of Grace Mountain include seven crown granted mineral claims as well as the Vegas and Nevada mineral claims held by Messieurs Leo and George Adams of Kamloops, B.C. and the D; T; Snake Eyes; Cotton and Black Jack mineral claims held by United Mineral Services Limited (fig. 1b).

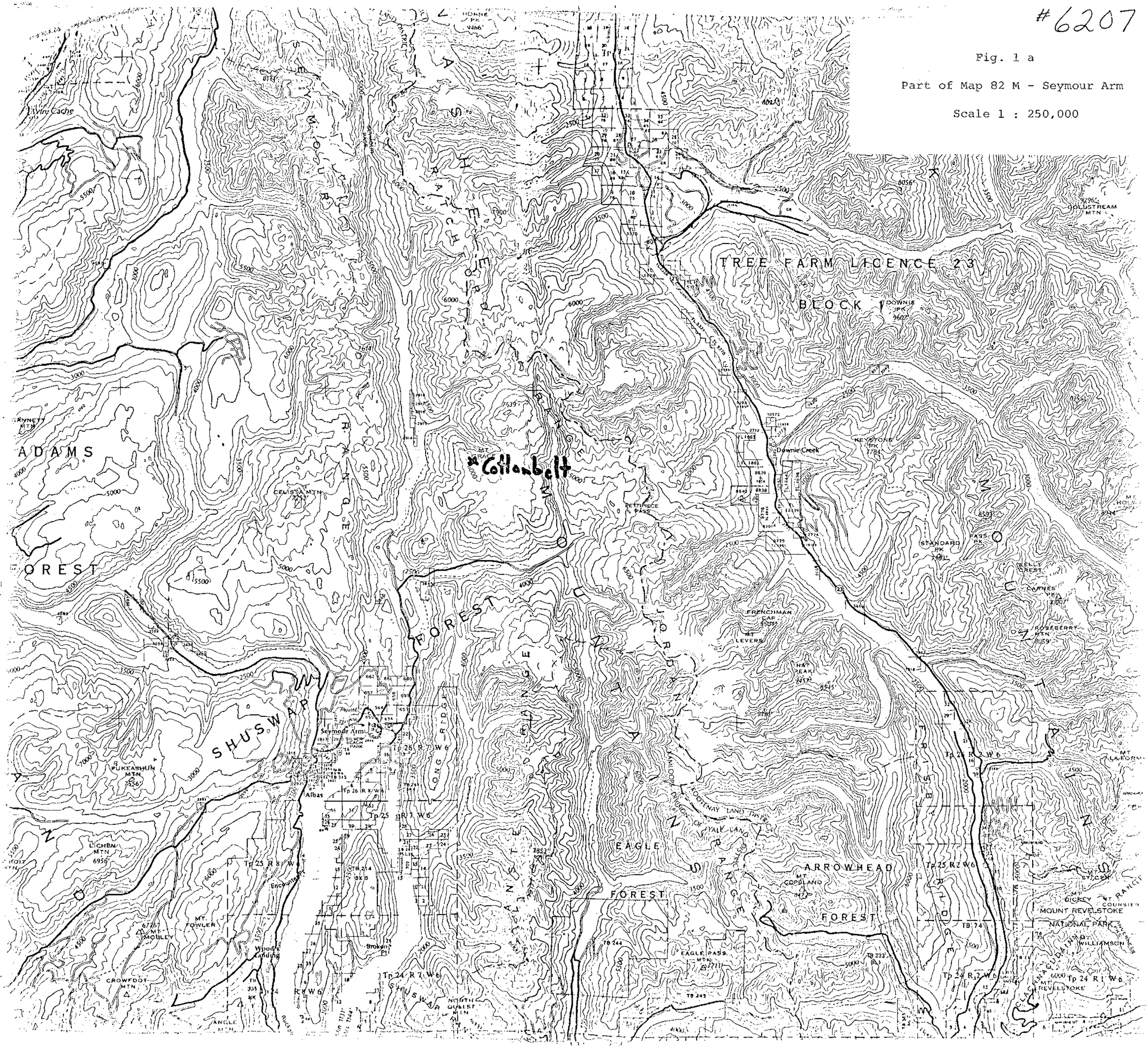
Access is by helicopter from Downie Creek 25 km to the east. An old mule trail exists from Seymour Arm (see fig. 1a).

#6207

Fig. 1 a

Part of Map 82 M - Seymour Arm

Scale 1 : 250,000



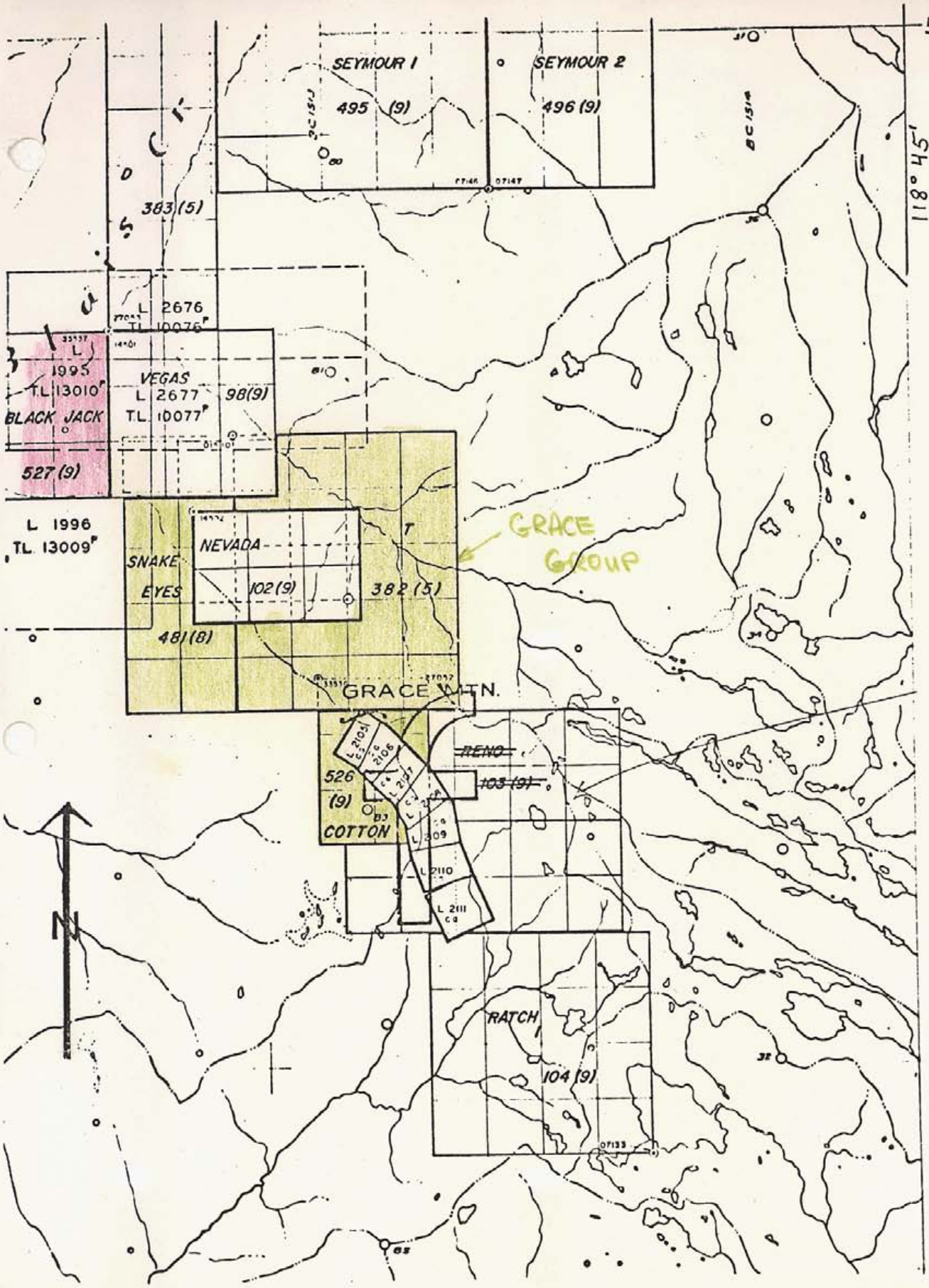


Fig. 1 b

Part of Claim Map M 87 M / 7 W of Dec.2,1976
Scale 1 : 50,000

2. GENERAL GEOLOGY

" The Grace Mountain area lies within the Shuswap Metamorphic Complex. This complex contains rocks that have been raised to a high state of high grade regional metamorphism. The age of the rocks and their correlation with formations beyond the complex is speculative, but the most recent work suggests that the metamorphic rocks include Proterozoic, Paleozoic and possibly also Mesozoic formations. Structural studies have shown that the complex is composed of a series of gneiss domes with cores of veined augen gneiss and granitic gneiss enveloped by metasedimentary gneiss and schist. The outermost layers of gneiss and schist are riddled with layers and lenses of pegmatite and leucogranite.Three gneiss domes are found between Slocan Lake and the Monashee Mountains west of the Big Bend of the Columbia River"(Fyles, 1970).

The Grace Mountain area is on the northwestern flank of the Frenchman Cap Dome, which is the most northerly of the three. The area includes the outermost core gneiss and is mainly within the overlying metasedimentary gneiss and schist (Fig.1c).

The metasedimentary rocks include quartzite, mica schist, quartz feldspar and calc-silicate gneiss and minor amounts of marble. They fall within the amphibolite facies of metamorphism and are complexly folded.

The lithologic sequences within the Grace Mountain area are folded into one syncline and two anticlines. The southwestern anticline is overturned to the northwest. The fold axes strike northwest-southeast. The tectonic framework within the Grace Mountain area appears to have been developed within the area that has been affected by the Frenchman Cap Gneiss Dome and a small well developed gneiss dome lying approximately 11 kilometers to the north of Grace Mountain.

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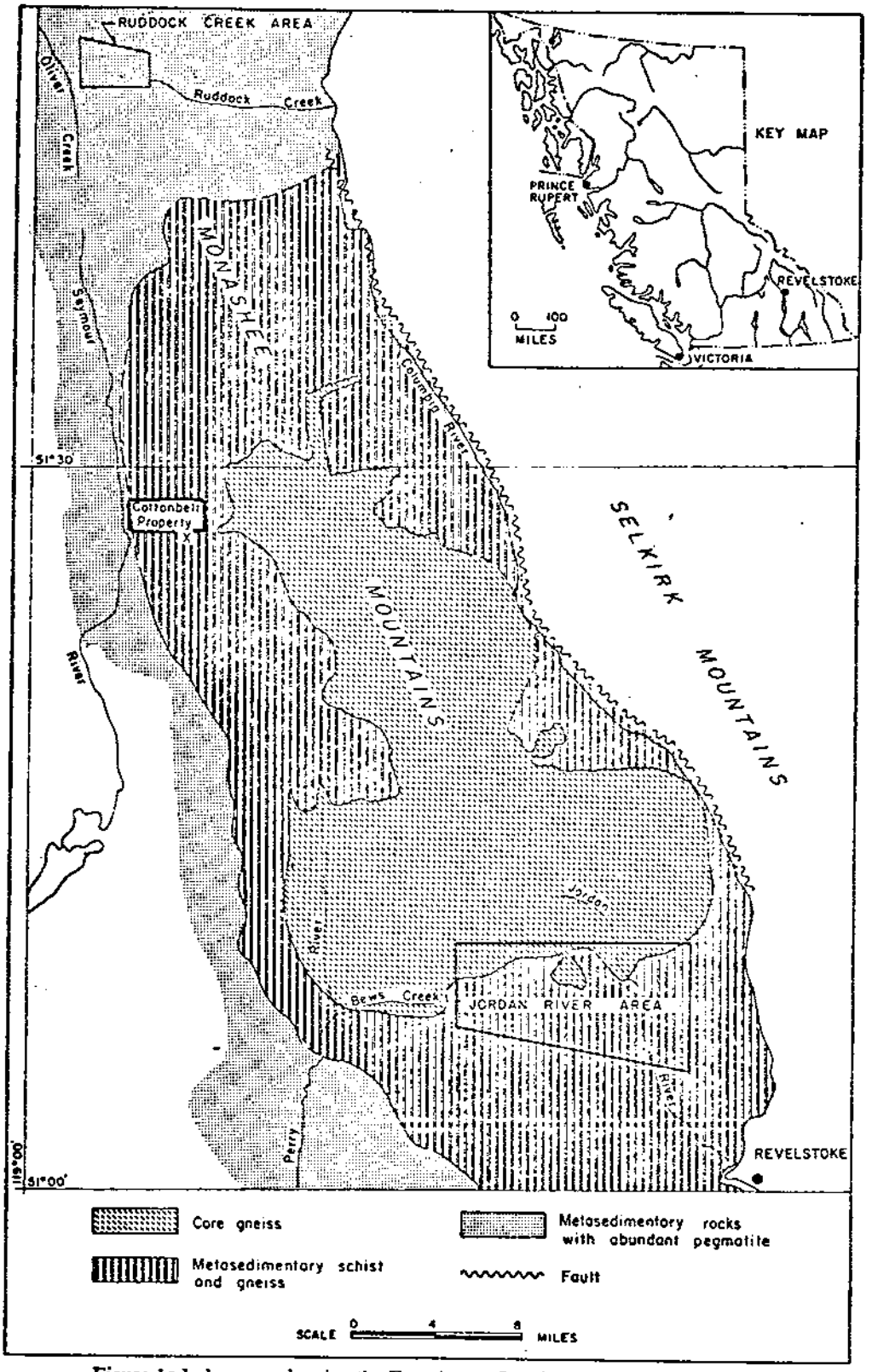

Figure 1c. Index map showing the Frenchman Cap dome

2.1 Lithology of the Grace Mountain Area

The succession of metamorphic rocks in the Grace Mountain area (refer to figure 2)include quartz-feldspathic paragneiss(?); marble; calc-silicate gneisses; fine to medium grained biotite-quartz-garnet gneiss; micaceous quartzite; amphibolite and granulitic quartz-feldspar gneiss.

Pegmatitic lenses occur throughout the succession but are most abundant in the more strongly folded portions of the succession.

Rocks within the core zone of the Grace Mountain syncline are internally folded and foliation within this succession does not necessarily follow bedding.

Rocks on the flanks of the core zone are lithologically more homogeneous and foliation is commonly parallel to the bedding direction.

2.1.1 Granulitic Quartz-Feldspar Gneiss

These rocks display a wide range of textures and proportions. Mineralogically these gneisses are composed of quartz, feldspar (orthoclase and plagioclase) with a wide ranging fraction of biotite, muscovite, sillimanite, kyanite and garnet. Granulitic fabrics such as regular planar schistosity (as determined by coarse quartz with finely crystalline quartz and feldspar layers) are present. Coarser fractions often contain xenoblastic garnet and prisms of kyanite and/or sillimanite lie in the plane of schistosity. Magnetite is a minor constituent in these rocks.

The thickness of this unit varies at different sections of the Grace Mountain syncline and has a gradational transition into rocks of different mineral assemblages.

2.1.2 Amphibolite

A garnet amphibolite underlies the granulitic quartz feldspar gneiss and appears to be a laterally continuous unit within the sequence. The amphibolite is composed essentially of hornblende and plagioclase. It is medium to coarse grained with subhedral garnets up to 1cm in diameter occurring in segregated layers.

2.1.3 Quartzite

A light coloured quartzose gneiss is characterized by the presence of greater than 90% quartz and minor amounts of muscovite and occasionally a chloritic mica. The rock has a fine to coarse granular texture with micaceous layers parallel to foliation. This unit appears to be discontinuous to the south of column 14 (fig. 2) but has been noted in areas to the north of column 14.

2.1.4 Biotite-Quartz-Garnet Gneiss

The biotite-quartz-garnet gneiss encloses the calc-silicate and sulfide units (see chapter 2.3). This unit is fine to medium grained with segregation layering and lineation normal elements in the rock fabric. The parallel structures are disturbed by the presence of porphyroblasts of garnet (up to 0.5 cm in diameter).

The biotite is found as coarse flakes (up to 0.1 cm) aligned within a fine grained quartzose matrix. In proximity to calc-silicate units the biotite-quartz-garnet gneiss can be calcareous.

2.1.5 Calc-Silicate Gneiss

Several thin horizons (see in particular column 17, fig.3) both below and above the sulphide horizon are composed of calcite, diopside, quartz and in some cases have accompanying garnet. The calcite is medium grained and comprises up to 70% of the rock. Euhedral pale-green diopside porphyroblasts comprise the remainder of the rock while a pink (grossularite(?)) garnet may be present.

2.1.6 Marble

The most persistent and distinctive unit in the field is a marble horizon which serves as a marker unit. The marble unit is white to grey and is composed of carbonates of which medium to coarsely crystalline calcite predominates. Foliation within the unit is outlined by flakes of pale-yellow phlogopite and

fine-grained graphite (?) inclusions within the calcite. An almost colourless to a very pale golden brown diopside is found as granular layer within the unit. These porphyroblasts are found up to 3 cm in length.

Underlying the marble unit are several variable lithologies. On the western limb of the Grace Mountain syncline the marble unit may be gradational into a unit with calcite, biotite and diopside cementing clasts of diverse lithologies. On the eastern limb of the Grace Mountain syncline, the marble unit is underlain by a quartzite unit.

2.1.7 Quartzo-Feldspathic Paragneiss (?)

This unit forms the predominant unit underlying the marble horizon on the western limb of the Grace Mountain syncline. The unit is coarse to medium grained with a mineral composition of quartz, feldspar and accessory hornblende and biotite. This unit forms a conformable continuation of the succession that has been described above.

2.1.8 Pegmatitic Lenses

The term pegmatitic refers to those granitic rocks having appreciable proportion of orthoclase and quartz greater than 2 cm in size. Gradation in size of the mineral components is present and accessory minerals such as tourmaline and muscovite are common.

The pegmatitic lenses occur throughout the section but are most prominent in the more intensely deformed portions of the section.

2.1.9 Summary

A stratigraphic framework is present in the gneisses of the Grace Mountain area. Lithological dissimilarity of units and demonstratable continuity of layers constitutes the characteristics of the metasedimentary sequence in the Grace Mountain area. Granulitic quartz-feldspar gneiss forms the core unit while the remainder of the sequence is composed of metasedimentary and metavolcanic rocks.

The mineral assemblages indicate metamorphism of the amphibolite facies.

Pegmatitic lenses composed of coarse grained orthoclase-quartz and accessory muscovite and tourmaline occur throughout the succession and are most abundant in the core unit.

2.2 Tectonic Structure

Two tectonic elements are distinguishable within the Grace Mountain area. These are fracture tectonics and fold tectonics. Both the fracture and fold tectonics reflect a southwest-northeast structural trend as indicated by the fold axes and conjugate fracture sets.

The folding consists of a large prominent syncline with an axial plane trace passing across Grace Mountain. An anticline adjoins the syncline to the northeast and another adjoins the syncline to the southwest (figures 4 and 5).

The syncline is asymmetric and is a continuation of a north-easterly overturned fold. The syncline is the main structure exposed within the Grace Mountain area and can be traced along a strike length of seven kilometers. The core of the syncline is composed of internal drag folds that have locally been sheared in a northeasterly direction.

The axis of the syncline plunges southeast at the southeastern end of the syncline, is horizontal at Grace Mountain and plunges to the northeast at the Cottonbelt (Appendix 1 : locality 6). The limbs of the syncline change to a more horizontal attitude towards the northwestern direction.

In the region where the plunge changes from the southeast to the northwest a supplementary set of NE-SW striking folds has been developed. This fold set has resulted from a later phase of minor folding.

The structural style of the Grace Mountain area is related to the development of the Frenchman Cap Gneiss Dome and another smaller unmapped gneiss dome situated 11 kilometers north of Grace Mountain.

2.3 Lead-Zinc-Copper-Sequence

The lead-zinc-sulfide mineralization in the studied area is predominantly stratabound. These horizons are geometrically and genetically related with a carbonate rich sequence of gneiss. There are found different transitional types between massive sulfides and disseminated lead and zinc and between carbonate rich gneiss and marble.

2.3.1 Mineralization

The common ore minerals are magnetite, pyrrhotite, galena, sphalerite; pyrite and chalcopyrite are rare; a silver sulfosalt from the McLeod N location has not been studied yet; the gangue minerals are: calcite, garnet, diopside, dolomite, tremolite, sillimanite, andalusite etc. The grain size of the ore minerals is varying between 50 μ and 3 cm. Sphalerite shows mostly a smaller grain size than galena. Intensive inter-growths exist probably between magnetite and sphalerite.

There are three types of metal-rich horizons:
- massive sulfide/oxide
- rhythmitic layers of ore minerals and carbonates/silicates
- disseminated sulfides/oxides

The metal contents of the mineralized horizons are not yet well known; sulfide channel samples are not available in all locations. Channel samples with predominantly sulfidic ore minerals were taken from the locations 1, 2, 4, 5, 6, 7.

Location	Silver oz/t	Cu %	Pb %	Zn %	As %	Sb %	Hg %
7	1.3	0.02	5.30	0.60	0.01	0.01	0.01
6	1.9	0.01	8.00	2.90	0.01	o.o1	0.01
2	1.1	0.01	4.10	0.50	0.01	0.01	0.01
1	0.59	0.01	2.55	0.35	0.01	0.01	0.01
5	0.57	0.01	2.20	0.34	0.02	0.01	0.01
4	0.18	0.02	0.57	0.40	0.01	0.01	0.01

The maximum of the lead and zinc contents occurs at the location 6. Generally lead is higher than zinc; copper and silver are low.

The samples were taken as channel samples perpendicular to the stratification, repeated three times and mixed. The length of the channel samples is 2 m in the locations 12 and 13 and includes the horizons C,D and H (fig. 11); in the other locations the length of the channel samples is 1.5 m and includes the horizons B,C,D,G, and H.

2.3.2 Stratigraphic Position

The sequence of the sulfide rich and carbonate rich horizons A to K has a thickness of approximately 40 m. It is built up of a homogeneous 2 m thick marble horizon (no E in fig. 11), overlain by a sequence of diopside-biotite-garnet-quartz-calcite-gneiss 9 m in thickness, which itself is overlain by a sequence of 9 m in thickness of biotite-muscovite-garnet-quartz-diopside gneisses. In between both sequences of gneisses a remarkable sequence 1 to 6 m in total thickness of 4 sulfide rich horizons (A to D) and 4 carbonate rich horizons (predominantly marble) is intercalated. This unit is unique within a series of more or less homogeneous gneisses with a thickness of about 500 m.

3. GEOPHYSICAL RECONNAISSANCE (Magnetic Survey)

A magnetic reconnaissance survey was done to aid the geological mapping and to possibly trace the mineralized zones below overburden.

The instrument used was a Unimag Protonmagnetometer manufactured by the company "Geometrics". Measurements are total magnetic field measurements. To all plotted measurements on fig. 7,8, and 9 the value 58 000 γ has to be added. Line spacing and the

length of the lines were very variable due to the reconnaissance nature. The survey lines were put in by pacing using a compass, controlled by an airphoto, the map 1: 10,000 (see Appendix 1) and altimeter readings. Stations were about 50 feet apart. The Geophysical Grid I (see Appendix 1 and fig. 7) tested the known Cottonbelt sulfide horizon.Due to magnetite and pyrrhotite a pronounced magnetic feature with a high of about 2 500 γ and a low of 1 000 γ could be observed.

Reconnaissance magnetic surveys along strike of the lower sulfide horizon (Geophysical Grid II and III, see Appendix 1) failed to locate such pronounced linear anomalies (fig. 8 and 9). The measurements do not indicate that the horizon continues.

4. ROCK SAMPLING

To test the possibility to trace the interesting sulfide horizon and its maximum thickness to depth with seismic, rock samples were taken for the determination of density and velocity. The quality of seismic reflections depends on the difference between the products of density times velocity of two adjoining horizons. Fresh samples were taken out of which 10-cm square cubes can be sawn.

The sulfide, the calc-silicate, marble, quartzite and gneiss horizons were sampled on a traverse close to locations 7 and 10 (see fig. 10). The velocity and density of the samples will be determined in 1977.

5. SUMMARY AND CONCLUSIONS

- The rocks within the Grace Mountain area are predominantly composed of a variety of gneisses which include a calcareous gneiss and a marble unit.
- The sedimentary features of the metamorphosed sediments are relatively well preserved.
- The main structure is an asymmetric syncline with superimposed minor folds that were developed during a later phase of deformation.

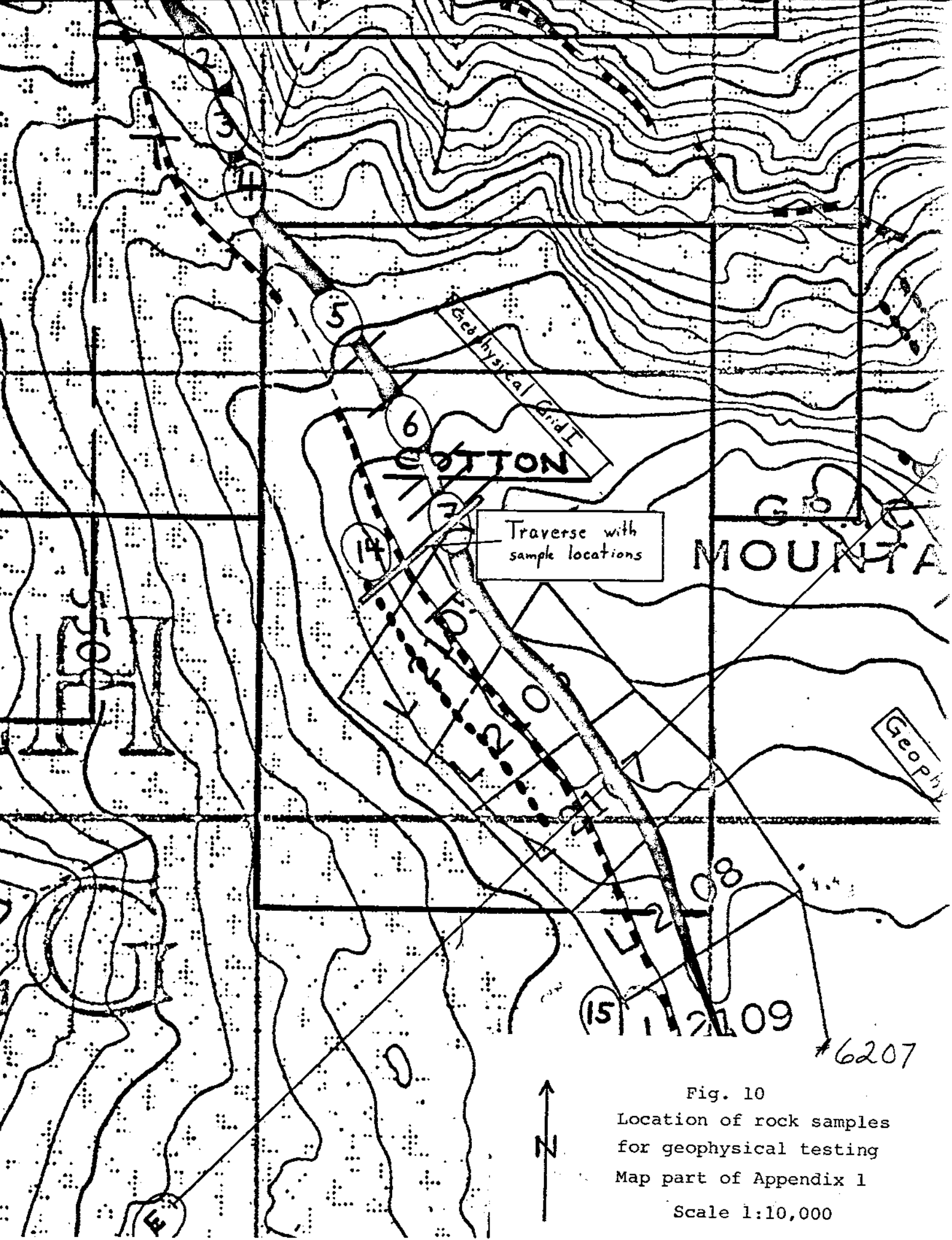

Fig. 10
Location of rock samples
for geophysical testing
Map part of Appendix 1
Scale 1:10,000

- The structural style of the area is related to the development of large and small gneiss domes located outside of the study area.

- The calcareous gneiss sequence contains the sulfide horizons.

- The metal content of the sulfide horizons is variable and includes pyrrhotite, pyrite, magnetite, sphalerite, galena and chalcopyrite.

- It is suggested that the sulfide outcrops exposed within the Grace Mountain area (Appendix 1: 1 to 10 and 11 to 13) constitute a continuous metal sulfide horizon.

6. BIBLIOGRAPHY

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Boyle, R.S. (1970): Geological Report Cottonbelt Property: Snow, GN, and Shuswap claims Dept. of Mines and Petroleum Resources Assessment Report # 2637

Fyles, J.T. (1970): The Jordan River Area near Revelstoke, B.C. B.C. Dept. of Mines and Petroleum Resources Bulletin No. 57 , p. 64

Larson, H.A. (1973): Combined Airborne Magnetic and VLF-EM Survey GN and Shuswap claims Dept. of Mines and Petroleum Resources Assessment Report # 4367

Nesbitt, B.I. (1966): Report on the Magnetometer Survey on the Shuswap Group, Seymour River Area, B.C. Dept. of Mines and Petroleum Resources Assessment Report # 958

Wheeler, J.O. (1964): Geology of the Big Bend (Seymour Arm, East Half) Map Area, B.C. Geological Survey of Canada Paper 64-32

I, Peter Levin, living in 7 Hochstrasse, Baden-Baden, West Germany hereby certify :

1) that I studied geology and mineralogy at the University of Heidelberg, W-Germany and graduated with a main diploma in May 1973

2) that I graduated with a Ph.D. in economic geology and mineralogy in September 1975 at the University of Heidelberg.

3) that I practised my profession since 1973 in Germany, Peru, Canada, Chile.

4) that I am at present working for Metallgesellschaft A.G. of Frankfurt, W-Germany, in an exploration project in Chile.

9.2.77

Dr. Peter Levin

STATEMENT OF QUALIFICATIONS

I, Robert A. Dickinson of Vancouver, B.C. hereby certify that:

1. I am a 1972 graduate of the University of British Columbia having received a Bachelor of Science Degree, Honours Geology.

2. I have been employed in the mineral exploration industry of Canada since 1966.

3. I am presently President of United Mineral Services Ltd. with Head Office located at 1326 - 510 West Hastings Street, Vancouver, B.C.

4. I have an indirect interest in the Cotton, Snake Eyes, Black Jack and T Mineral Claims.

5. I was part of a contract team to Metallgesellschaft Canada Limited participating as an exploration geologist and magnetometer operator during the period September 8 to September 18, 1976, collecting data on which part of this report is based.

Robert A. Dickinson
President and Geologist
United Mineral Services Limited
February 14, 1977

STATEMENT OF QUALIFICATIONS

I, M. McClaren, with residence at O'Byrne Road, R. R. #3, Sardis, British Columbia, declare:

1. that I graduated from the University of British Columbia with a B.Sc. degree in geology.

2. that since graduation I have been employed as an exploration geologist in British Columbia and Arctic Islands.

3. that I am presently exploration geologist for United Mineral Services Ltd.

4. that I am a member of the Geological Association of Canada and a member of the Society for Geology Applied to Mineral Deposits.

5. that I have an indirect interest in the Cotton, Snake Eyes, Black Jack and T Mineral Claims.

6. that I was part of a contract team to Metallgesellschaft Canada Limited participating as an exploration geologist during the period September 8 to September 18, 1976, collecting data on which part of this report is based.

Dated at Vancouver, B.C. this 14th day of February 1977

M. McClaren

METALLGESELLSCHAFT CANADA LIMITED

WESTERN EXPLORATION OFFICE

824-602 WEST HASTINGS ST. **VANCOUVER, B.C. V6B 1P2** TELEPHONE: (604) 681-2167

STATEMENT OF COSTS

a) Geological and geophysical work
September 8 to September 19, 1976, 12 field days

Salaries:

United Mineral Services Ltd. (R.A. Dickenson & M. McClaren)		
12 field days @ 250 $/day	$	3,000.00
compilation 9 man days @ 110 $/day	$	990.00
Dr. P. Levin (Metallgesellschaft) field work, interpretation of results and preparation of report		
24 days @ 100 $/day	$	2,400.00

Other:

Equipment	$	181.20
Maps, Airphotos	$	289.66
Enlargement of maps, printing costs	$	412.58
Helicopter charter	$	904.51
Assays	$	380.00
Travel expenses	$	54.35
	$	8,612.30

b) Taking rock samples for geophysical testing
November 25 to November 27, 1976

Salaries:

United Mineral Services Ltd. (R.A. Dickenson) @ 110 $/day	$	330.00
Dr. F.-W. Wellmer @ 130 $/day	$	130.00
Dr. J. C. Kovacik @ 120 $/day	$	120.00

HEAD OFFICE: SUITE 3100, 2 BLOOR STREET EAST, TORONTO, ONTARIO M4W 1A8
TELEPHONE: (416) 961-8788, TELEX: 06-217740, CABLES: MONTAN

Statement of costs (continued)

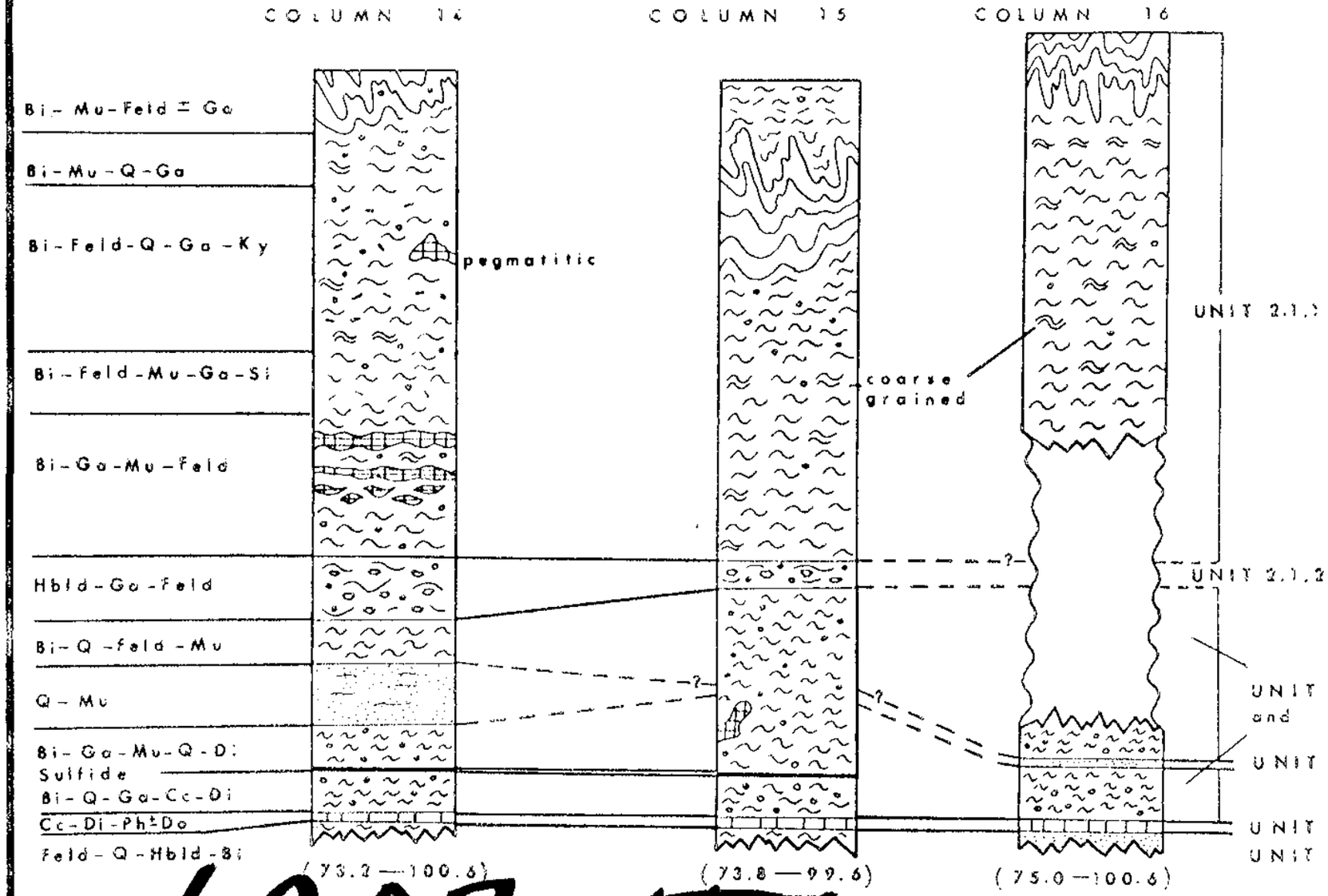
Other:

Equipment for trenching	$ 170.82
Travel expenses	$ 367.58
Helicopter charter	$ 659.03
	$ 1,779.43
c) Report typing and drafting	$ 100.00
Total:	$ 10,491.72

F.-W. Wellmer

February 8,1977

Dr. F.-W. Wellmer
Exploration Manager - Western Canada
Metallgesellschaft Canada Ltd.



MINERAL ABBREVIATIONS

Bi – biotite	Cc – calcite
Mu – muscovite	Do – dolomite
Q – quartz	Ph – phlogopite
Feld – feldspar	
Ga – garnet	
Ky – kyanite	
Si – sillimanite	
Hbld – hornblende	
Di – diopside	

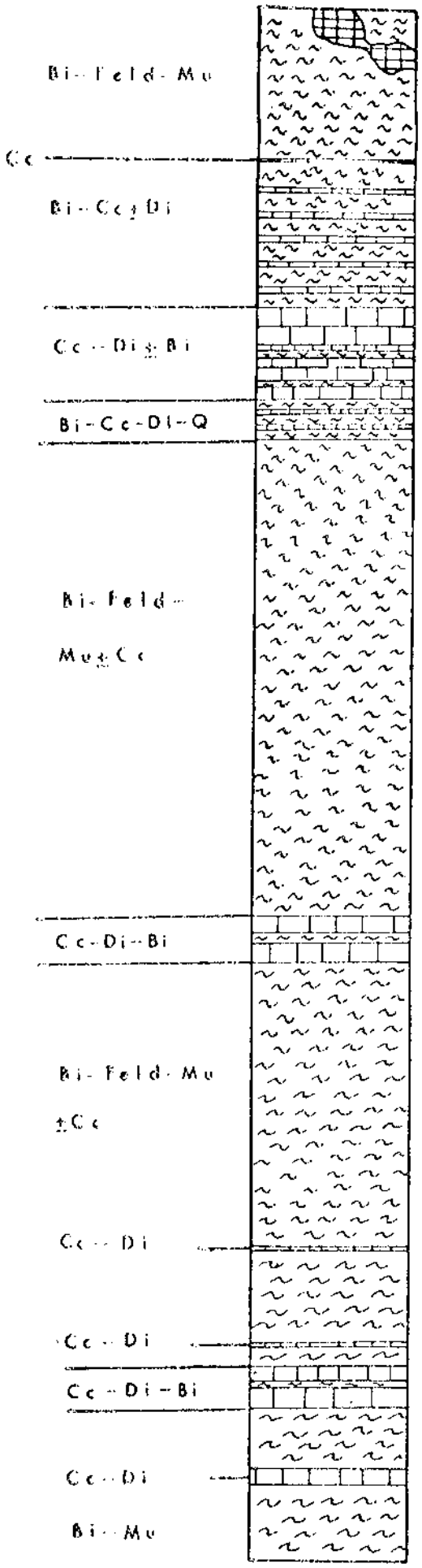
MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 6207
MAP NO. #1

6207

FIG. 2

9/76 Mc

COLUMN 17



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[redacted]

FIG. 3

(71.3 — 4.5)

9176 Mc

M. McCann

E

F

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1000 m
500 m
0m

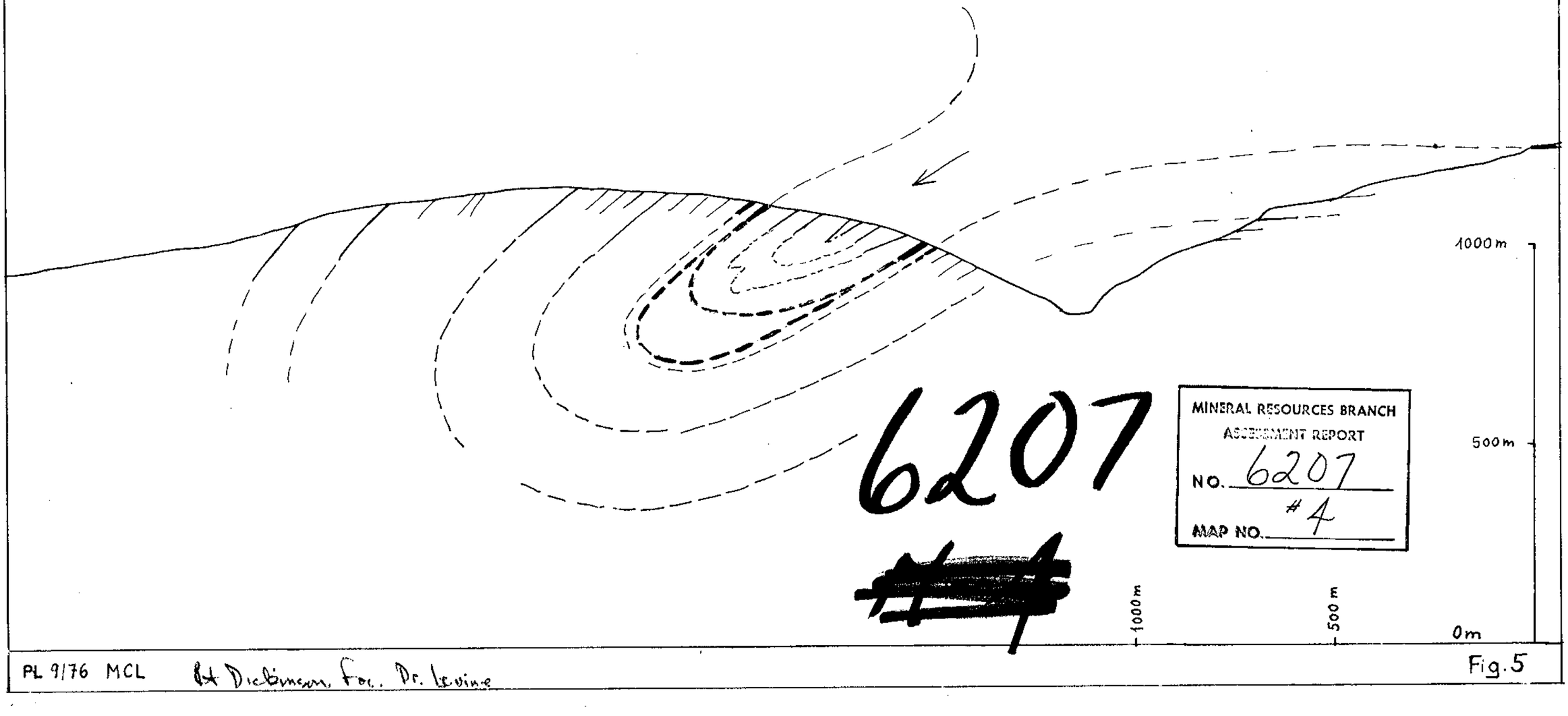
1000 m
500 m

PL 9/76 MCL Bl. Dickenson for Dr. Levinson

Fig. 4

A

B



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MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 6207
MAP NO. #4

PL 9/76 MCL ft Dickinson, For., Dr. Levine

Fig. 5

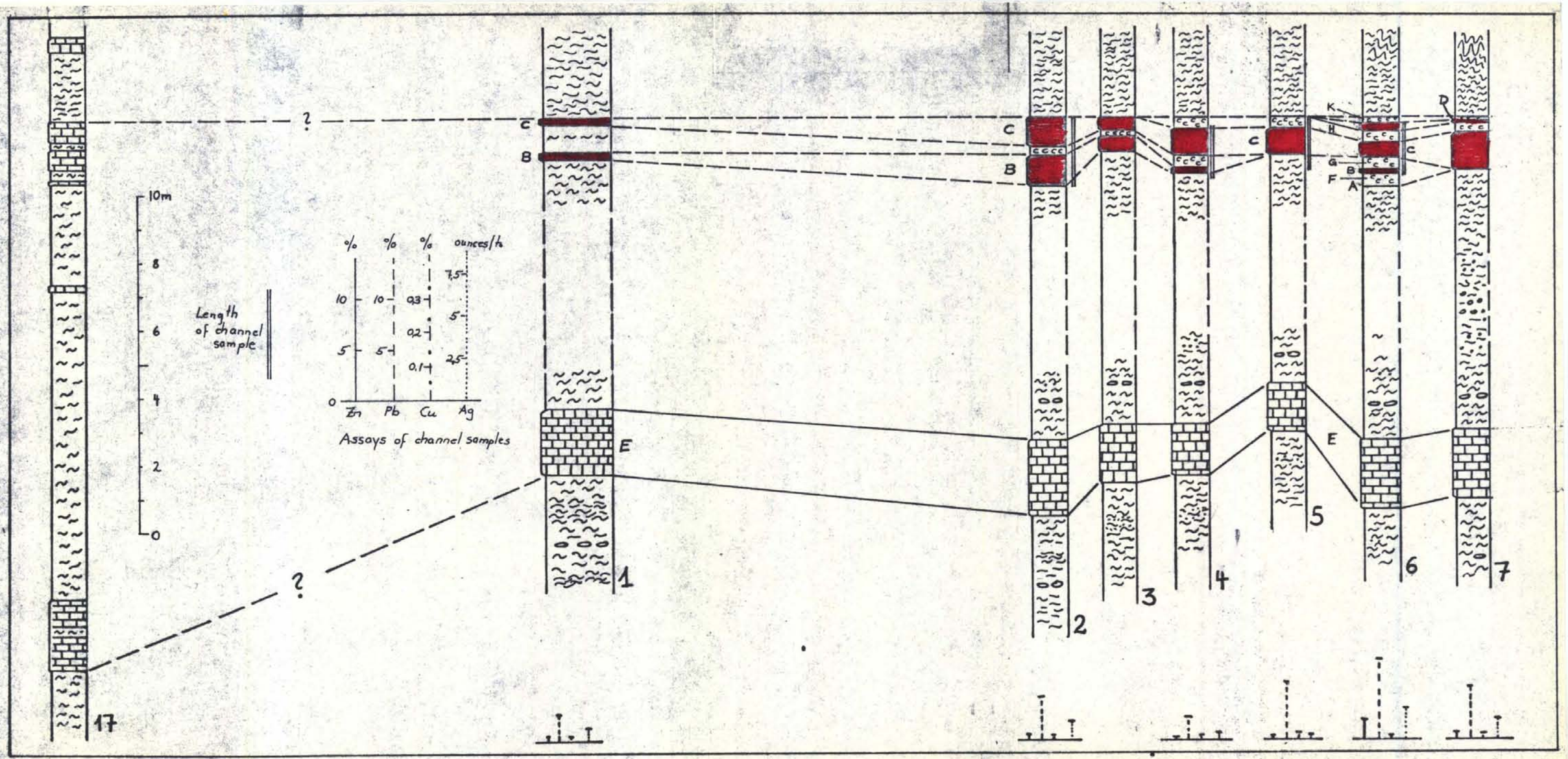

Fig.6

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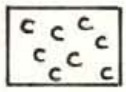
Ref Dickinson
For. Dr. Keeine

LEGEND OF PROFILES (Fig. 6)

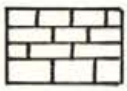
sulfide



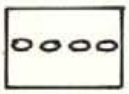
calc-silicate gneiss

biotite-quartz garnet gneiss

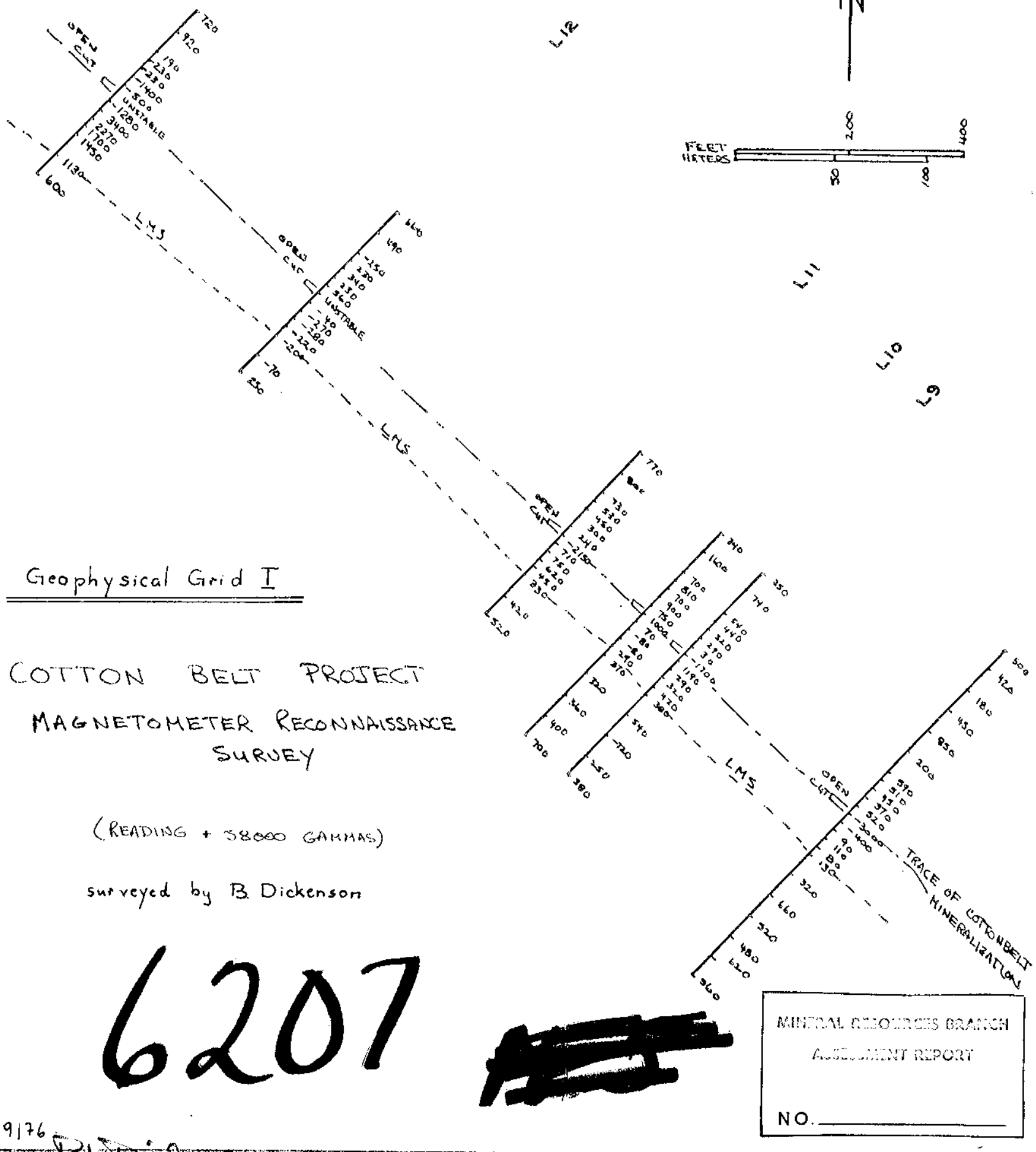
quartz rich biotite garnet gneiss



marble



quartzite horizon



Geophysical Grid I

COTTON BELT PROJECT

MAGNETOMETER RECONNAISSANCE SURVEY

(READING + 58000 GAMMAS)

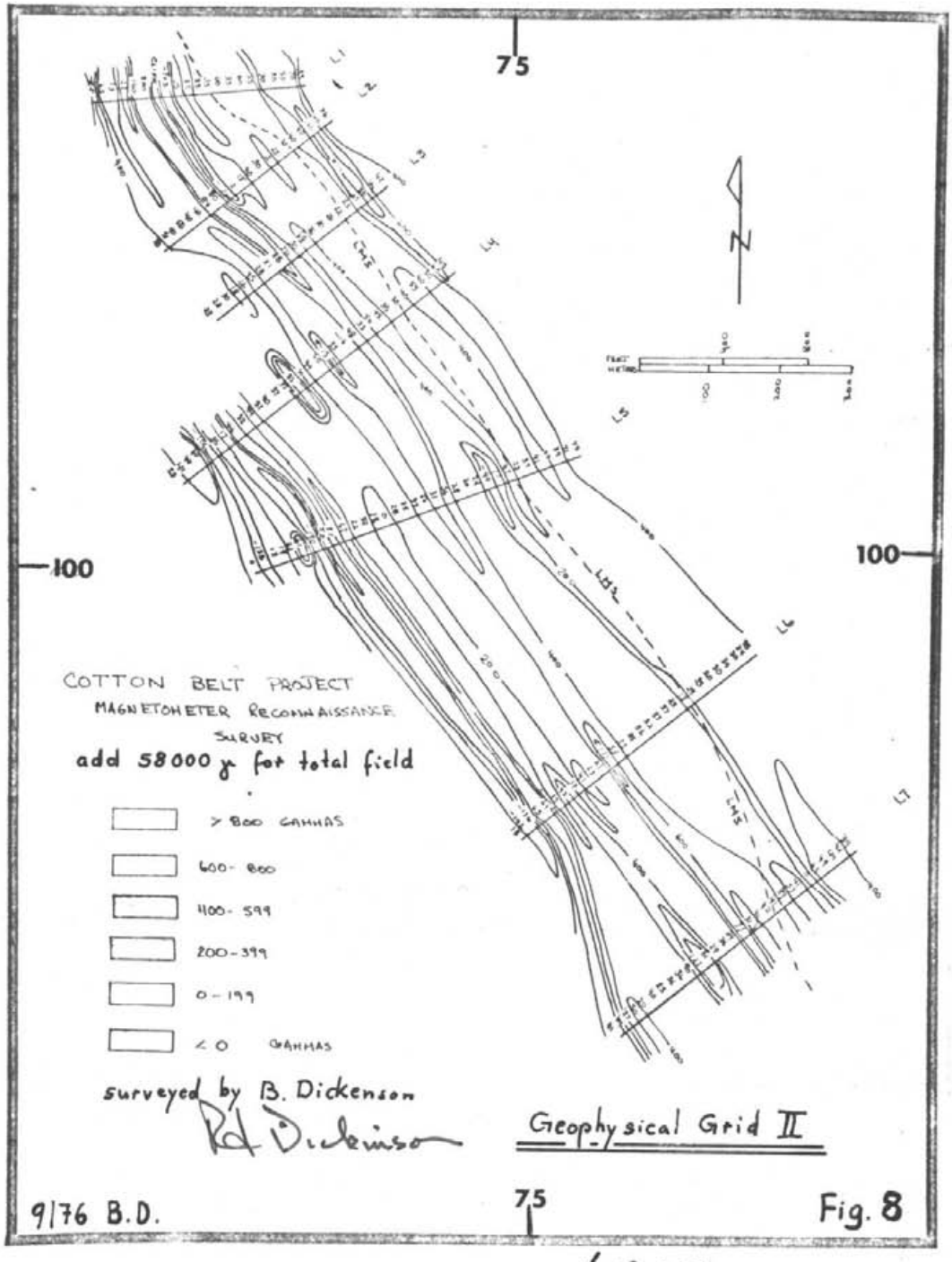
surveyed by B. Dickenson

6207

[redacted]

B.D. 9/76

Fig. 7


75
100
100
N
COTTON BELT PROJECT
MAGNETOMETER RECONNAISSANCE SURVEY
add 58000 γ for total field
> 800 GAMMAS
600 - 800
400 - 599
200 - 399
0 - 199
< 0 GAMMAS
surveyed by B. Dickenson
Geophysical Grid II
9/76 B.D.
75
Fig. 8

6207

71

D-claims

L24

L27

L26

L25

L22

L21

L20

Black-Jack-claims

04

04

COTTON BELT PROJECT
MAGNETOMETER RECONNAISSANCE SURVEY
multiply readings x 10
add 58000 γ for total field
surveyed by B. Dickenson

> 800 GAMMAS

600 – 800

400 – 599

200 – 399

0 – 199

< 0 GAMMAS

FEET 0 400 800
METERS 0 100 200

Geophysical Grid III

71

B.D. 9/76

Fig. 9

9207

B. Dickenson

To: Fairfield Minerals (B.C.) Canada Ltd.

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824 - 612 West Hastings
Vancouver, B.C.
V6B 1R2

REPORT No A76 - 784

DATE: October 12, 1976

BONDAR-CLEGG & COMPANY LTD.

CERTIFICATE OF ASSAY

Samples submitted: September 30, 1976
Results completed: October 12, 1976

I hereby certify that the following are the results of assays made by us upon the herein described ore samples.

MARKED	GOLD		SILVER	Cu	Pb	Zn	As	Sb	Mo		TOTAL VALUE PER TON (2000 LBS.)
	Ounces per Ton	Value per Ton	Ounces per Ton	Percent	Percent	Percent	Percent	Percent	Percent	Percent	
5859 - 119763			1.3	0.04	5.30	0.60	0.01	<0.01	<0.01		
5860 - 119762			1.9	0.01	8.00	2.90	0.01	<0.01	<0.01		
5861 - 119764			1.1	0.01	4.10	0.59	0.01	<0.01	<0.01		
5862 - 119765			0.59	<0.01	2.55	0.34	<0.01	<0.01	<0.01		
5863 - 119765			0.37	0.01	2.20	0.34	0.02	<0.01	<0.01		
5864 - 119766			0.18	0.02	0.57	0.40	0.01	<0.01	<0.01		
5902 - 119768			5.2	0.31	12.40	10.30	0.01	0.02	<0.01		
5903 - 119767			1.3	0.09	3.55	4.65	0.01	0.01	<0.01		

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Registered Assayer, Province of British Columbia

MARKER HORIZON MAP

COTTONBELT

LEGEND

- Sulfides
- Marble
- Quartzite
- T — claim-boundary and name
- A — B — Profile, section
- 1 — Section mapped in detail

Scale 1:10 000

0 500 m

Appendix I

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