1025

GEOLOGICAL & METALLURGICAL REPORT

CLAIMS: Frank M.C. 20 units Rec.# 9123 (10)
Mag #1-#6 : 2-Post, Rec.# 8952-53 (7)
and 8954-57 (8).

Omineca M.D.

NTS Sheets 93-K-7E & 93-K-8W

NTS Coords: 6027500 m N, 402000 m E.

Owner : Orion Resources Ltd.

Operator : Orion Resources Ltd.

Consultant : Whiting Mining Services International Ltd.

Author : F.B. Whiting, P.Eng.

Date submitted: October 17, 1988.

TABLE OF CONTENTS

A. INTRODUCTION

Location & access

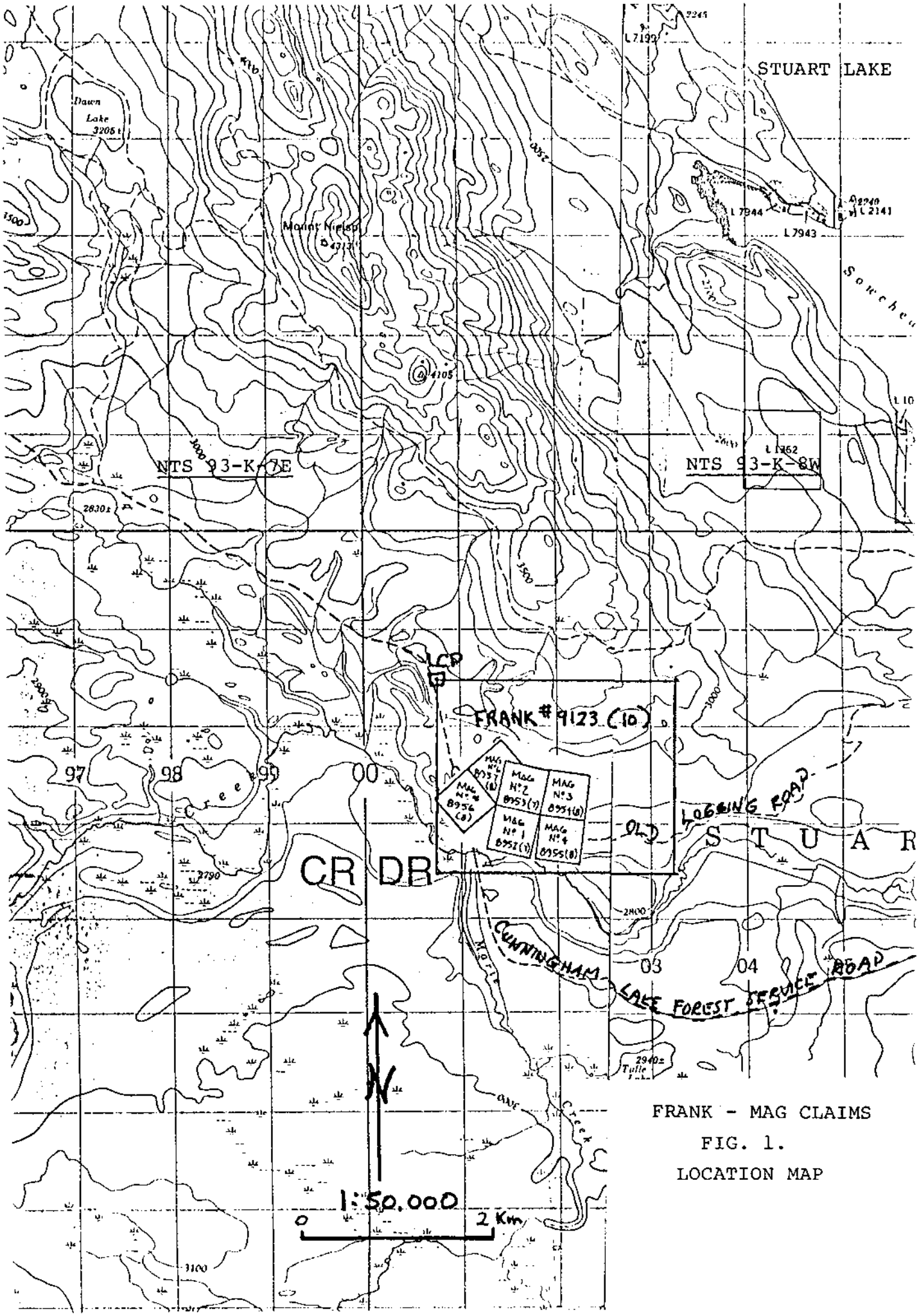
The FRANK GROUP of mineral claims near Fort St. James, B.C., was sampled for gold, and bulk samples of the vermiculite-bearing rock were subjected to metallurgical testing to determine the commercial value of that mineral.

The property is situated 18 km west-southwest of Fort St. James, B.C. in the Omineca Mining Division, at Lat. 54°23'N, Long. 124°30'W, at an elevation of 900 to 980 metres. It is reached by the Cunningham Lake Forest Service Road and lies mainly on the north side of Sowchea Creek. Figure 1 is the Location Map.

Property definition

The property consists of the Frank M.C. of 20 units, Rec.# 9123(10) which covers the Mag #1-#2 M.C., 2=Post, Rec.# 8952-53 (7) and Mag # 3-#6, 2-Post, Rec. # 8954-57(8). The Mag M.Cs. were staked in 1987 by Adolph Almond of Vanderhoof , B.C. and were optioned by Orion Resources Ltd. in late 1987. The covering Frank M.C. was staked by A. Almond and transferred to Orion Resources Ltd. to provide a broader coverage of the intrusive body. Orion Resources Ltd. is owner and operator.

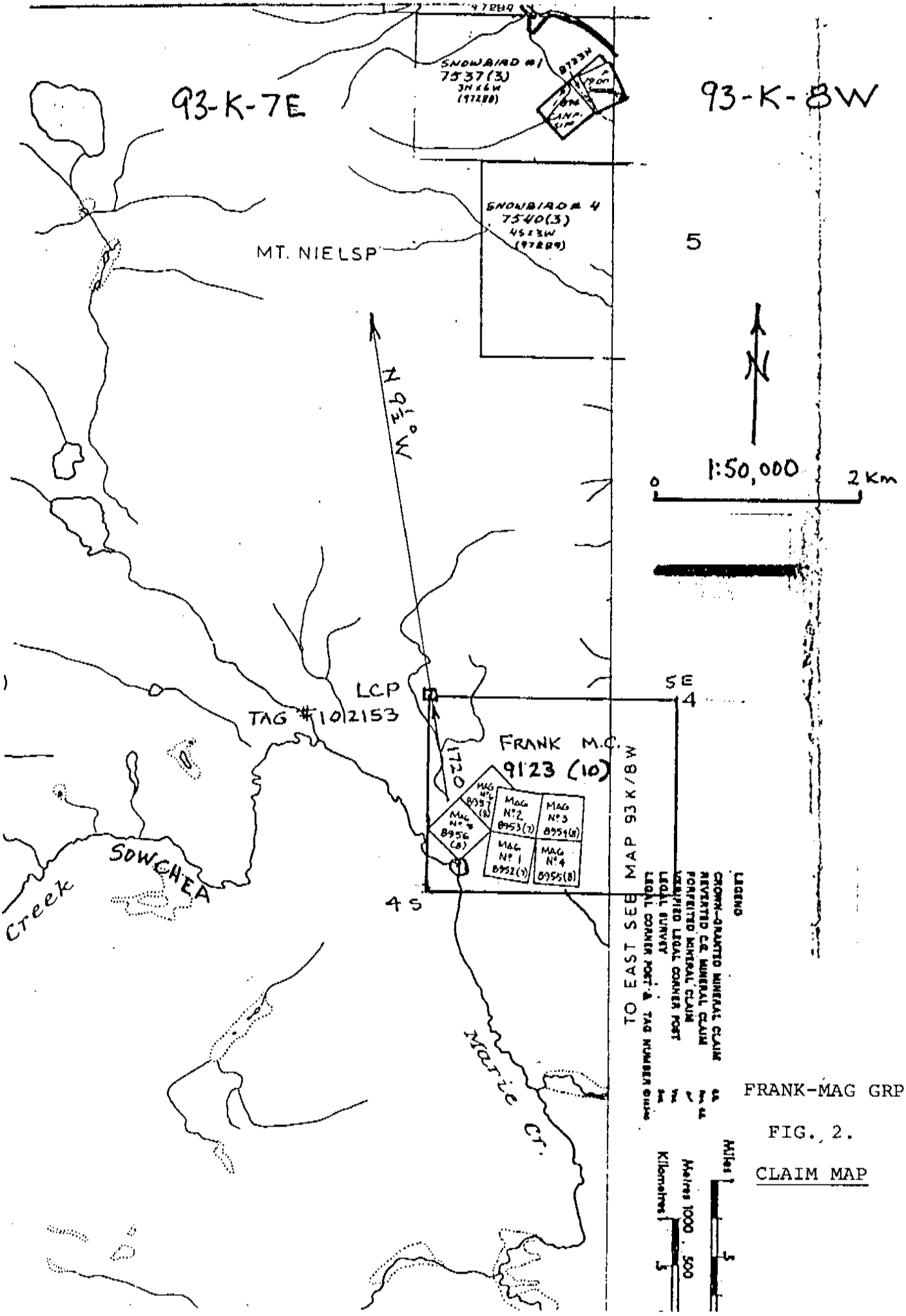
The principal value of the property at this time is in the content of the inductrial minera vermiculite. Bulk samples were subjected to metallurgical testing to determine the recoverable content of this mineral and its physical properties. The report by Bacon Donaldson & Associated Ltd. concluded that the recoverable percentage was small and of fine grain size, with a low swelling index, and hence probably not of much economic value. Samples of the intrusive rock and of a dyke or vein cutting it showed small amounts of gold and silver.



FRANK - MAG CLAIMS

FIG. 1.

LOCATION MAP



FRANK-MAG GRP.

FIG. 2.

CLAIM MAP

Summary of work done

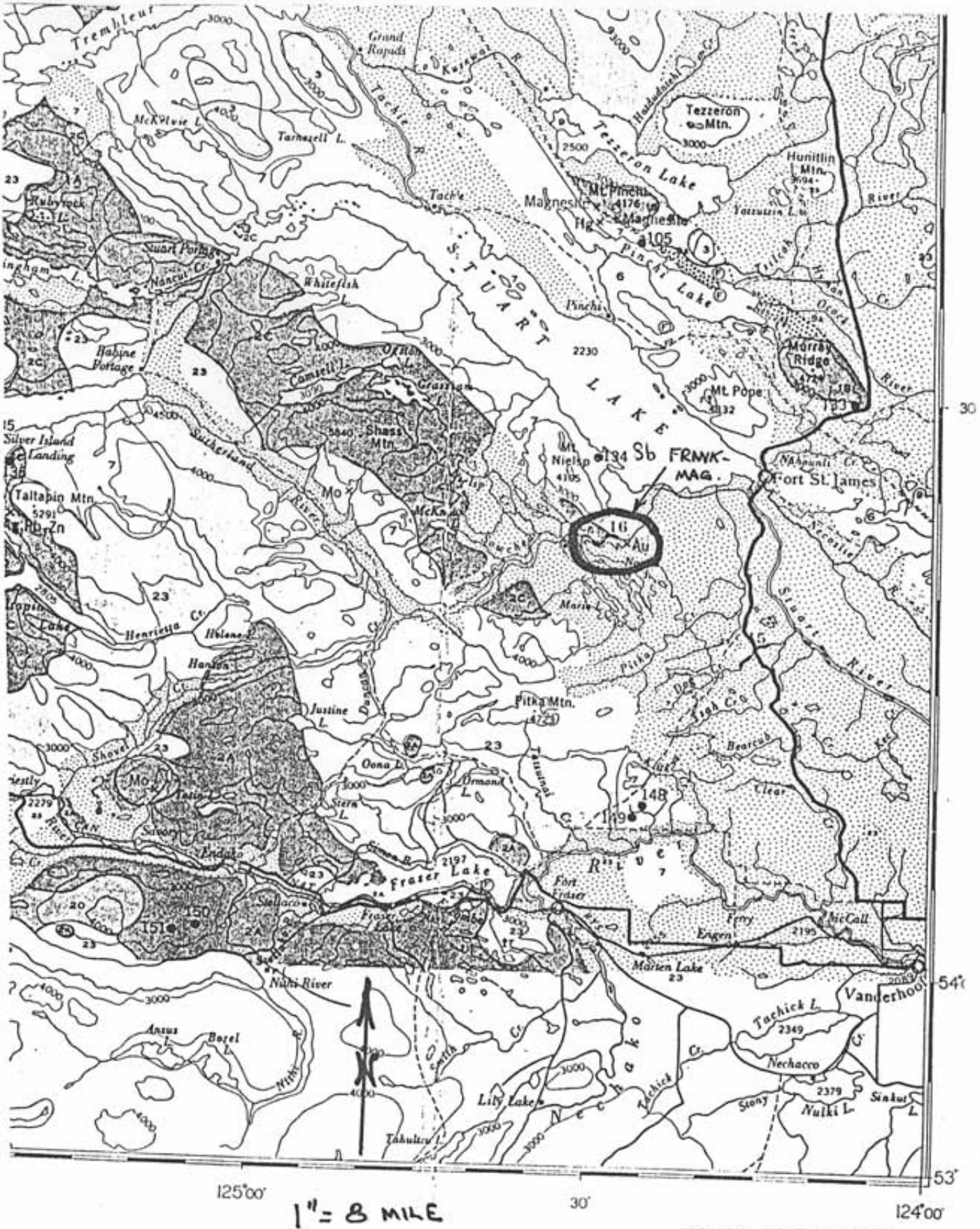
A preliminary surface geological map was made, two bulk samples were taken for gold assays, and 250-kilo bulk samples were taken at two locations, which were given milling tests by Bacon Donaldson & Associates Ltd. of Vancouver. The samples were collected from inside the MAG #1 & #2 claims. Figure 2 is the Claim Map.

B. GEOLOGICAL REPORT

Figure 3 is a print of part of G.S.C. Map 971A, " Smithers - Fort St. James " map area. Following pages give the Legend for that map. It shows the area of the claims as underlain by diorite of unit 2 C, of " Permian and/or Later " age.

Figure 4 is the preliminary geological map of the central portion of the property. All outcrops found are of a granitic-appearing rock with abundant white feldspars, some quartz, and a black mica similar to biotite. Heating tests show that this mica expands on moderate heating, so having the essential characteristic of the industrial mineral " vermiculite " . The intrusive rock carrying this mineral is exposed in steep rock bluffs along the north side of Sowchea Creek and on a rocky ridge north of the old logging road that runs along the flat top of those bluffs. The rock may be a quartz diorite, or an unusual intrusive rock with more quartz than is common in plagioclase-rich bodies.

Two varieties of this " quartz diorite " were seen, one a relatively hard fresh rock, the other a semi-decomposed and crumbly type. The metallurgical tests showed no significant differences in the vermiculite in the two varieties. The softer



1" = 8 MILE

1 : 506880.

0 10 Mi.

FRANK-MAG CLAIMS

FIG. 3.

REGIONAL GEOLOGY

LEGEND

SEDIMENTARY AND VOLCANIC ROCKS

CENOZOIC

TERTIARY

OLIGOCENE OR LATER

ENDAKO GROUP

23 — *Mainly vesicular and amygdaloidal basalt, andesite and dacite; flow breccia and agglomerate; 23a, trachyte and andesite flows, dykes, and sills; may be older than 23*

EOCENE OR OLIGOCENE

22 — *Rhyolitic flows, tuffs, and intrusions; minor dacite, andesite, and basalt*

21 — *Conglomerate, sandstone, and shale; minor tuff; coal*

CRETACEOUS OR LATER

UPPER CRETACEOUS OR LATER

19,20 — **19**, *andesite, trachyte, and rhyolite; intercalated arkose and conglomerate:* **20**, *rhyolite, dacite, andesite, basalt; minor related tuffs and breccias; may be partly or entirely of same age as 21*

UPPER CRETACEOUS AND PALEOCENE

SUSTUT GROUP

18 — *Conglomerate, shale, greywacke, and tuff;* **18a**, *conglomerate, sandstone, shale, greywacke, argillite, minor quartzite and andesite; may be in part younger than 18*

LOWER CRETACEOUS OR LATER

17 — *Andesitic, dacitic, rhyolitic, and basaltic flows, tuffs, and breccias; minor sandstone, shale, and conglomerate*

CRETACEOUS

LOWER CRETACEOUS

16 — *USLIKA FORMATION: conglomerate; minor sandstone and shale*

JURASSIC AND CRETACEOUS

UPPER JURASSIC AND LOWER CRETACEOUS

15 — *Conglomerate, sandstone, shale, argillite, greywacke, quartzite, tuff, and minor lava; some coal*

JURASSIC OR (?) CRETACEOUS

TACHEK GROUP

13 — *Andesite and andesite breccia; basalt and rhyolite;* **13a**, *argillite and conglomerate*

JURASSIC

MIDDLE OR UPPER JURASSIC

12 — *Andesitic, dacitic, and rhyolitic flows, tuffs, and breccias; minor argillite*

MIDDLE JURASSIC

11 — *Argillite, argillaceous quartzite, quartzite, sandstone, limestone, and tuff; fossiliferous*

LOWER JURASSIC (?)

10 — *Andesitic, dacitic, rhyolitic, and basaltic flows, tuffs, breccias, and agglomerates*

MESOZOIC

JURASSIC AND CRETACEOUS

HAZELTON GROUP

14 — *Andesite, rhyolite, trachyte, basalt, and related breccia and tuff; minor argillite, arkose, sandstone, and limestone. May include some undifferentiated Triassic rocks*

LOWER JURASSIC (?)

10 — *Andesitic, dacitic, rhyolitic, and basaltic flows, tuffs, breccias, and agglomerates*

TRIASSIC AND JURASSIC

UPPER TRIASSIC AND LATER

TAKLA GROUP

9 — *Andesitic and basaltic flows, tuffs, breccias, and agglomerate; interbedded conglomerate, shale, greywacke, limestone, and coal;* **9a**, *shale, greywacke, conglomerate, tuff, and limestone (Upper Triassic)*

PALÆOZOIC

CARBONIFEROUS (?) AND PERMIAN

PENNSYLVANIAN (?) AND LATER

CACHE CREEK GROUP (6,7,8)

8 — *Andesitic flows, tuffs, and breccias, with minor basic intrusions (greenstone); chlorite and hornblende schists; minor argillite, chert, and limestone. May include some undifferentiated younger rocks*

7 — *Ribbon chert, argillaceous quartzite, argillite, greenstone similar to 8, limestone; minor conglomerate and greywacke. Mainly younger than 6 and older than 8*

6 — *Massive limestone; minor argillite, slate, chert, and greenstone; mainly older than 7 and 8*

PROTEROZOIC

CAMBRIAN AND EARLIER

LOWER CAMBRIAN AND EARLIER

WOLVERINE COMPLEX (in part)

5 — *Micaceous, chloritic, and garnetiferous schists; quartzite, crystalline limestone; minor granitic gneiss and pegmatite*

INTRUSIVE ROCKS

MESOZOIC

CRETACEOUS OR LATER

UPPER CRETACEOUS OR LATER

Granite, granodiorite, and diorite, in part porphyritic; some rhyolite

JURASSIC OR CRETACEOUS

UPPER JURASSIC OR LOWER CRETACEOUS

OMINECA INTRUSIONS

3 — *Granodiorite, quartz diorite, diorite; granite, syenite, gabbro, pyroxenite*

PERMIAN (?) AND/OR LATER

POST-MIDDLE PERMIAN, PRE-UPPER JURASSIC (?)

TOPLEY INTRUSIONS

2A-2C — 2A, *granite and granodiorite*
2B, *syenite*
2C, *diorite*

POST-MIDDLE PERMIAN, PRE-UPPER TRIASSIC (?)

TREMBLEUR INTRUSIONS

1A, 1B — 1A, *peridotite, dunite; minor pyroxenite and gabbro; serpentinized and steatitized equivalents.*
1B, *pyroxenite; minor peridotite and gabbro; serpentinized and steatitized equivalents; may be in part post-Triassic*

WOLVERINE COMPLEX (in part)

A — *Granitic gneiss, pegmatite, granite or granodiorite; minor schists. Mainly granitized equivalents of 5*

* *Sedimentary rocks (not otherwise distinguished by colour from associated volcanic rocks)*

Heavily drift-covered areas

Fault or fault zone (mainly inferred)

Anticlinal axis

Synclinal axis

Fossil locality (f)

Mining Recording Office

Sub-Mining Recording Office

Mining property (metallic, non-metallic) 75 80

Mineral occurrence (metallic, non-metallic) Au Coal

Placer gold (creek placers, bar placers)

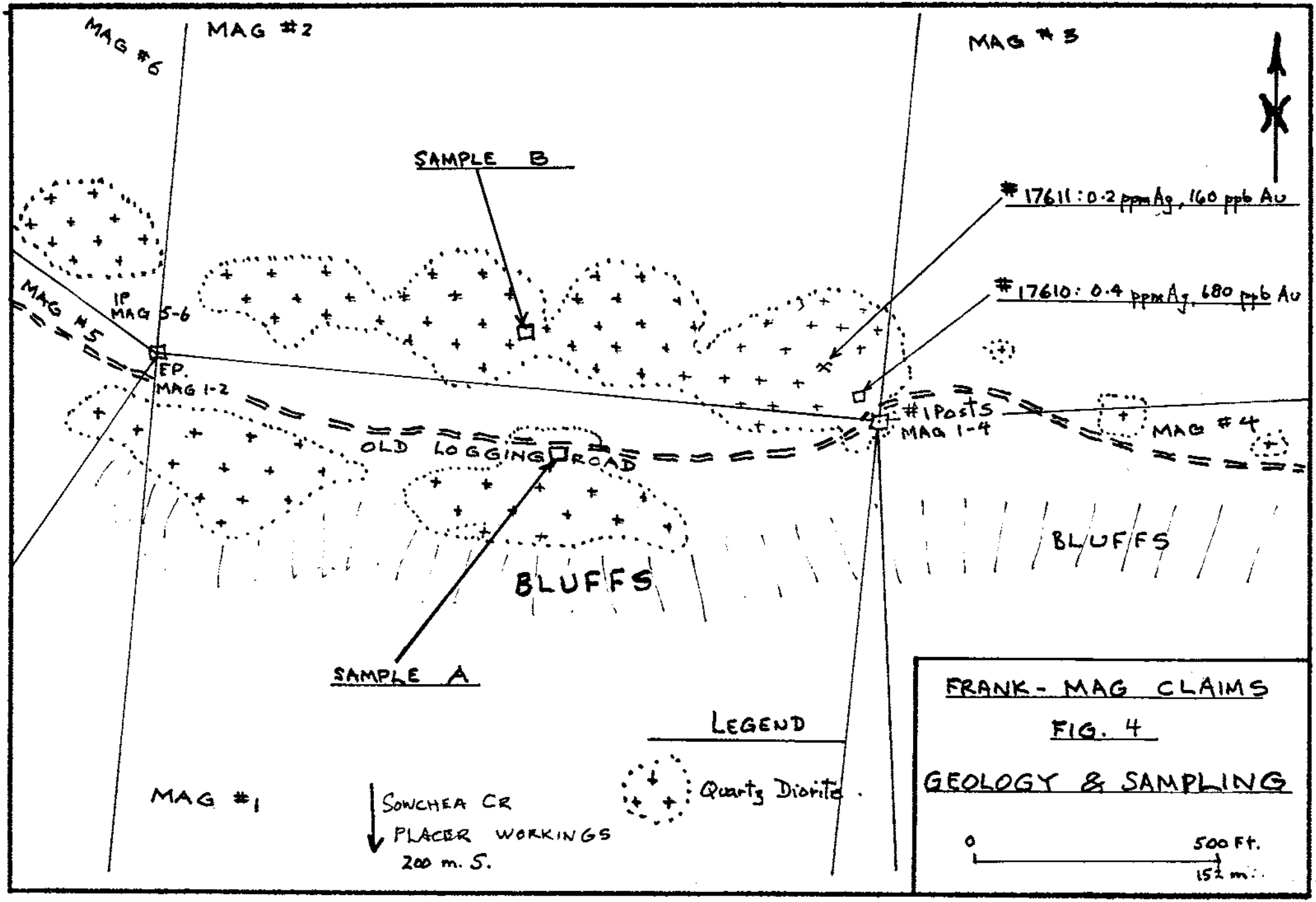
variety in places occurs as concentric shells of exfoliation on rounded outcrops which in their centers are the fresher, harder type.

Two samples were taken for assay. These samples # 17610 and 17611 are located on Figure 4. Sample 17611 was a grab sample of semi-decomposed quartz diorite; it assayed 0.2 ppm silver and 160 ppb gold. Sample 17610 was of a quartz-rich material, either a rhyolitic dyke or a fine-grained quartz vein, from an old prospect pit situated just west of the #1 Posts for the Mag # 1 & 32 M.Cs.; this pit is 1m x 1m x 60 cm deep; the sample assayed 0.4 ppm silver and 680 ppb gold. At $ 400 U.S. per ounce for gold, 680 ppb represents a dollar value of about $ Can. 10 per metric ton - not economic, but indicative that there is gold in this geological environment. It is worth noting that a placer-mining operation is at work on Sowchea Creek in the southern part of the Frank M.C., suggesting that there are gold veins nearby.

C. METALLURGICAL REPORT

The metallurgical tests of milling, flotation, etc were conducted by the well-known firm of Bacon Donaldson & Assoc. Ltd. Their report is attached in Appendix A which also contains the assay report for samples 17610 and 17611 by Bondar-Clegg of North Vancouver.

The recovery of vermiculite mineral was only 7.2 kg of mica per tonne of +30 mesh material. The percentage of -100 mesh material was 89.4 % in the rougher concentrate and 67.5 % in the scavenger circuit. The bulk density of the rougher concentrate was 63.6 pounds per cubic foot, and following expansion at 2000°F was 36 pounds per cubic foot. No asbestos minerals were found, which is a plus feature, as asbestos occurs in most competitive products, with accompanying health risks for persons handling the material.


MAG #6
MAG #2
MAG #3
SAMPLE B
#17611: 0.2 ppm Ag, 160 ppb Au
#17610: 0.4 ppm Ag, 680 ppb Au
MAG #5
IP MAG 5-6
EP. MAG 1-2
#1 Posts MAG 1-4
MAG #4
OLD LOGGING ROAD
BLUFFS
BLUFFS
SAMPLE A
LEGEND
Quartz Diorite
MAG #1
SOWCHEA CR
PLACER WORKINGS
200 m. S.
FRANK - MAG CLAIMS
FIG. 4
GEOLOGY & SAMPLING
0
500 Ft.
152 m.

D. CONCLUSIONS

It appears that the vermiculite does not expand sufficiently to be acceptable as an insulating material in competition with existing producers. There is a possible market in potting soils, hampered by the low recovery of fair-sized particles per tonne. Open-pit mining would be cheap, but commercial exploitation would depend on finding a market for what must be concluded is low-quality vermiculite.

The gold association offers considerable interest, with anomalous gold in the " Quartz diorite " and notable amounts in the dyke or vein sampled, as well as seen in the placer operation in Sowchea Creek. This should be investigated further.

E. ITEMIZED COST STATEMENT

Personnel	Dates	Rate/Day	Days	Amount	
Francis B. Whiting	May 19-23/88	$ 300*	5	$ 1500	Map,sample.
Francis B. Whiting	July 10-11/88	$ 300	2	600	Report prep.
C.A. Whiting	May 20-21-22/88	$ 140**	3	420	Field Asst.
Report typing,copying, binders				32	
			Sub-Total.....	$ 2552.00	
Bacon Donaldson & Assoc. June/88				$ 2225.00	
Bondar-Clegg & Co. (Assaying).....				$ 20.00	
			TOTAL.....	$ 4797.00	

Note : * Daily rate covers wages,meals, motel, vehicle use.
** Daily rate covers wages, meals, motel.

Respectfully submitted:

F.B. Whiting, Ph.D.,P.Eng.

AUTHOR'S QUALIFICATIONS

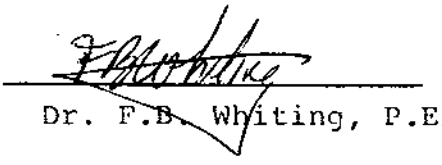
The undersigned, Francis B. Whiting, has the following qualifications:

a) Graduate of Univ. of B.C., 1946, in Geological Engineering.
Graduate of McGill University, 1948, as M.Sc., in Geology.
Graduate of Mass. Institute of Technology, as Ph.D. in Geology and Economics, 1951.

b) Geological work in B.C. in 1945 for International Mining Corp.
Geological work in 1946 for Placer Development Co.
Work at Hedley B.C. for Hedley Mascot Gold Mines, 1947 & 1948.
3 Years as Mine Geologist in Missouri for St. Joseph Lead Co.
6 years as Chief Geologist at Mina Aguilar, Argentina.
7 Years as Exploration Manager in Argentina for Cia. Minera Aguilar S.A. , 1960-68.
5 Years as Manager of Arrow Inter-America Corporation , Vancouver, B.C. 1968-73.
3 Years as Regional Manager for Western North America for Brascan Resources Ltd., based in Vancouver B.C. 1973-76.
10 Years as Consulting Geologist, Vancouver, B.C.

c) P.Eng., B.C. & Yukon.

Signed:



Dr. F.B. Whiting, P.Eng.

APPENDIX A

BACON,
DONALDSON
& ASSOCIATES LTD.

2036 COLUMBIA STREET
VANCOUVER, B.C., CANADA V5Y 3E1
TELEPHONE (604) 879-8461
TELEX 04 - 53437

EVALUATION OF VERMICULITE PRODUCTION FROM BULK SAMPLES

Prepared for:

ORION RESOURCES LTD.
200 - 675 West Hastings Street
Vancouver, B.C.
V6B 4Z1

File Number: 8318
July 14, 1988

Dr. M. J. V. Beattie, P.Eng.

INTRODUCTION

Preliminary metallurgical tests to evaluate the potential for the production of vermiculite from two bulk samples were conducted at the request of Mr. F.B. Whiting of Orion Resources Ltd. The testwork involved crushing and grinding of the samples to achieve liberation, flotation to produce mica concentrates and heating of the mica product to expand it.

SUMMARY

The bulk samples tested in the present study are a poor prospect for vermiculite production. The size of the mica flakes is very small and the mica yield is low. The mica also demonstrates a low degree of expansion when heated, resulting in product bulk densities that are several times higher than is desirable for expanded vermiculite.

SAMPLE DESCRIPTION

Two bulk samples designated "A" and "B" were received for testing. Sample A was a relatively soft, partially decomposed rock while sample B was a very hard, competent rock. Each sample was crushed through laboratory crushers to minus 6 mesh. At this size there was very little liberation of the mica. It was also noted that liberation was very poor in the -6+10 mesh material. The samples were therefore ground in a laboratory rod mill prior to flotation.

DISCUSSION

The rod mill product for sample A was screened at 30 mesh and the plus and minus 30 mesh fraction were floated separately. The rougher flotation conditions for the +30 mesh fraction were as follows:

Conditioning	5 Minutes
	H_2SO_4 to pH = 3
	150 g/t Armac T
	500 g/t Fuel Oil
	950 g/t Dowfroth 250

Rougher flotation 10.5 minutes

The mica recovery was very low at 7.2 kg mica per tonne +30 mesh material. In this size range the liberation of mica was very poor. A excessive amount of frother was required in order to maintain a stable froth.

The -30 mesh fraction of sample A was floated according to the above procedure to produce a rougher concentrate. Following nine minutes flotation, the slurry was conditioned with an equivalent addition of reagent and was then floated for an additional six minutes to produce a scavenger concentrate. The rougher concentrate represented 180 kg per tonne feed and the scavenger concentrate represented 212 kg per tonne feed. The screen analysis of each product was as follows:

FRACTION	CUM. WEIGHT % RETAINED ROUGHER	SCAVENGER
+48	1.0	5.3
-48+65	4.4	11.3
-65+100	5.2	15.9
-100	89.4	67.5

It was visually apparent that the scavenger concentrate contained a high proportion of middling particles.

The bulk density of the rougher concentrate as produced was 63.6 pounds per cubic foot and following expansion at 2000°F was 36 pounds per cubic foot. The color of the mica changed from a dark grey color to a brown color when heated.

The expanded rougher concentrate was tested for its water uptake capacity. Water was added to the mica until free water became apparent. This point was reached at a water addition of 1.1 kg per kg mica.

A sample of the mica was analyzed for the presence of asbestos minerals by examination with a scanning electron microscope equipped with an energy dispersive analyzer. No asbestos minerals were noted.

Sample B was ground, screened and floated in the same manner as sample A to produce a rougher concentrate from the +30 mesh fraction and rougher plus scavenger concentrates from the -30 mesh fractions. The products produced from this test are summarized as follows, based on original feed:

+30 mesh	concentrate	18.2 kg/t
	tailing	69.0 kg/t
-30 mesh	rougher concentrate	79.0 kg/t
	scav. concentrate	239.0 kg/t
	tailing	594.8 kg/t

The scavenger concentrate was observed to be very poor, containing approximately 50% mica. The +65 mesh fraction of the rougher concentrate had a bulk density of 44.3 lb/ft^3 prior to heating and 33.7 lb/ft^3 following expansion at 2000°F.

INVOICE

BACON, DONALDSON & ASSOCIATES LTD.
2036 Columbia Street, Vancouver, B.C. V5Y 3E1 • Phone: 879-8461 • Fax: 879-1439

In Account With ORION RESOURCES LTD.
200 - 675 West Hastings Street
VANCOUVER, B.C.
V6B 4Z1

Invoice No 6317

File No. 8318

Purchase Order No.

Date 1988 July 18

Re: Evaluation of Vermiculite Production from Bulk Samples

PROFESSIONAL SERVICES	
Engineer	$ 50.00
Technicians	1,950.00
SEM	225.00
TOTAL	$2,225.00

This is a professional invoice and is due when presented
1.5% per month charged on invoices over 30 days.
(18% per annum)

FRANCIS B. WHITING
P.O. BOX 1239 PHONE 856-3590
ALDERGROVE, B.C. V0X 1A0

578

July 30 1988

PAY TO THE ORDER OF Bacon Donaldson + Associate Ltd. $ 2,225.00

Two Thousand Two Hundred and Twenty-five xx/100 DOLLARS

THE TORONTO-DOMINION BANK
ALDERGROVE CENTRE
3100 - 272ND STREET
ALDERGROVE, B.C. V0X 1A0.

MEMO Invoice 6317 re Vermiculite

F B Whiting

⑈578⑈ ⑆90350⑉004⑆ 0686⑉021441 2⑈

Clegg & Company Ltd.
0 Pemberton Ave.
North Vancouver, B.C.
Canada V7P 2R5
Phone: (604) 985-0681
Telex: 04-352667

BONDAR-CLEGG

Geochemical Lab Report

REPORT: 127-8582

PROJECT: NONE GIVEN PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Ag PPM	Au PPB
R2 17610		0.4	680
R2 17611		0.2	160