

2703

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT

NO. 2703 MAP

GEOLOGICAL REPORT

ON

THE LIN GROUP

CLAIMS NO.'S 1-26 INCLUSIVE

KISHINENA VALLEY

LAT. 49°04' LONG. 114°17'

FORT STEELE MINING DIVISION, B. C.

N.T.S. 82 G/1 W

CONDUCTED JUNE 26 TO JULY 14, 1970

Holders of Claims:

Ronald J. Goble - Lin 1-12
Frances Goble - Lin 13-20
Erik O. Goble - Lin 21-26

T. Gyr - Geologist

J. J. McDougall -
Geologist, Prof. Eng.

Vancouver, B. C.

November 3, 1970

C O N T E N T S

	<u>Page</u>
INTRODUCTION	1
LOCATION AND ACCESS	1
SCOPE AND METHOD OF SURVEY	1
REGIONAL GEOLOGY	2
LOCAL STRATIGRAPHY	2
STRUCTURES	4
MINERALIZATION	4
CONCLUSIONS	5
APPENDIX: STRATIGRAPHIC SECTIONS	16
STATEMENT OF WORK DONE	13
STATEMENT OF QUALIFICATIONS	14

ILLUSTRATIONS:

#1 Index Map	(following page 1)
#2 Geological Map of the Lin Group 1:10,000	(in pocket)
#3 Stratigraphic Sections of the Grinnell Formation 1 in. = 100 ft.	(in pocket)

INTRODUCTION

The examination of the Lin Group of claims was part of a major exploration program of Falconbridge Nickel Mines Limited on strata form copper in southeastern B. C. and adjoining Alberta. The object was to examine the Pre-Cambrian Belt Formations in general and the Grinnell Formation in detail on possibilities of economical copper concentrations. The search for strata bound copper in the Grinnell Formation of Canada was initiated after a large strata form copper deposit had been found in the Revett Quartzites west of Bull Lake in north western Montana. The Grinnell Formation east of the Flathead Valley, a stratigraphic equivalent of the Revett Quartzites, and known for minor copper indications, was a further target for exploration.

The Lin claims were staked in October and November 1969 by members of the Goble family and optioned to Falconbridge Nickel Mines Limited.

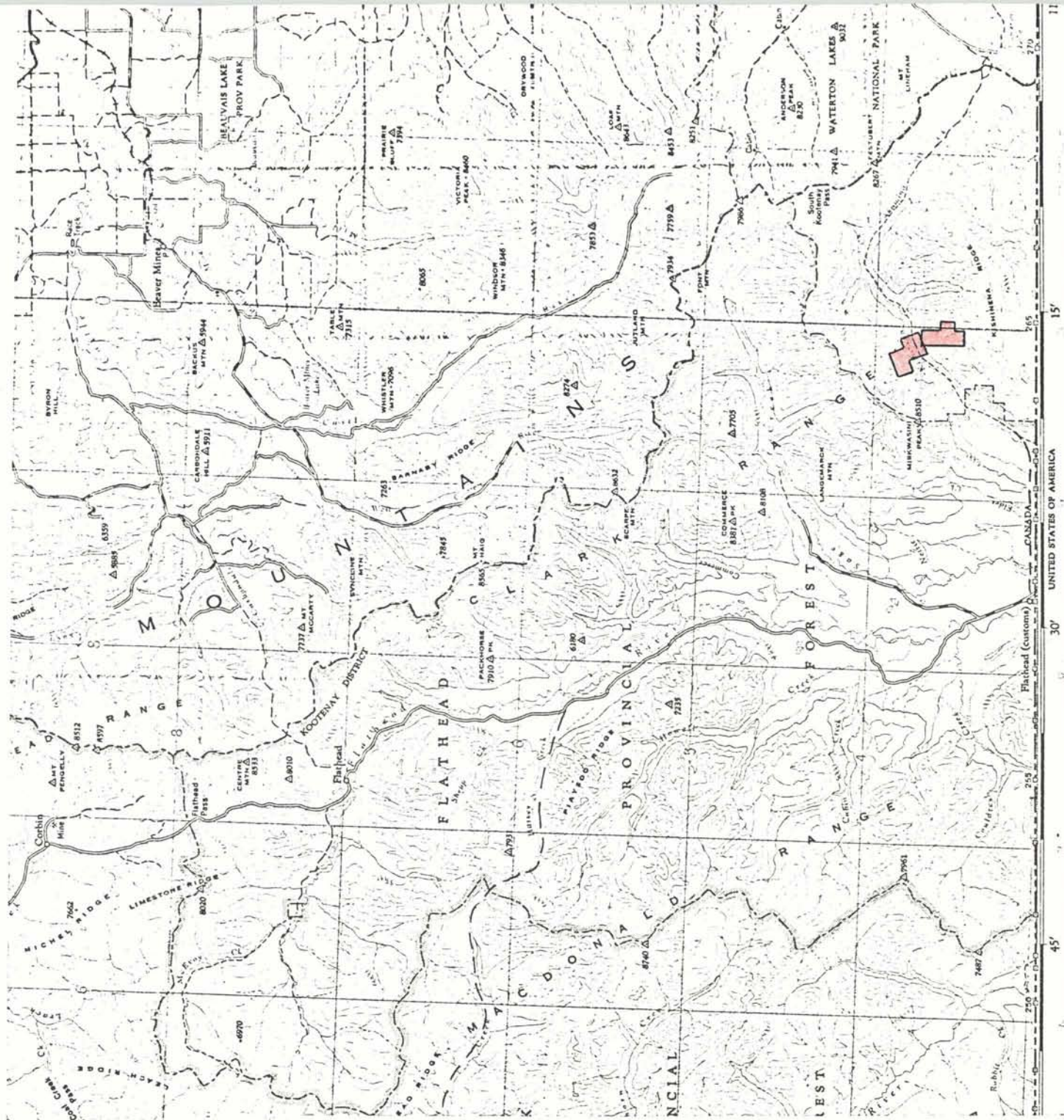
LOCATION AND ACCESS (see index map)

The Lin claims are situated north and south of the Kishinena Creek, a left hand tributary to the Flathead River. They range in elevation from 4500 ft. at the creek bottom to 6500 ft. on the north side and to over 9000 ft. on the south side. The claims can be reached at low water level of Sage Creek from the Flathead custom station via a rough 12 mile seismic road (4 wheel drive and possibly chains). An approach by road from Waterton Park is possible at low water level of Akamina Creek or Kishinena Creek respectively.

Helicopter access proved to be the most economical way to cover the two steep slopes in reasonable detail.

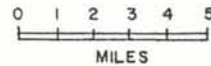
SCOPE AND METHOD OF SURVEY

The scope of this survey was to locate and trace copper bearing strata within the Grinnell Formation and to examine their possible potential. Geological



INDEX MAP
LIN GROUP

 LIN CLAIM GROUP



NTS 82G/IW
MAP REF. 157-70-7

J. G. [Signature]

11
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CANADA
UNITED STATES OF AMERICA

mapping and measurements of sections across the Grinnell Formation were applied in order to determine the stratigraphic positions and possible connections between the different copper showings. Good outcrop conditions allowed a reasonable correlation.

REGIONAL GEOLOGY

The regional geology was mapped by R. A. Price, G.S.C. Paper 61-24, accompanied by map 35-1961, Fernie East Half. The area east of Flathead River is formed by a synclinorium (Akamina Syncline) of Precambrian and Lower Cambrian rocks which is over thrustted relatively from the west onto younger sediments along the Lewis Thrust Fault. These rocks represents the most eastern outcrops of the Pre-Cambrian Belt Series.

The Grinnell Formation of the Clarke Range with its mainly red argillites can be traced westwards into the American Whitefish Range. However, west of this last mentioned range, the lithology of the formation changes considerably. Most of the red argillite beds disappear and thick quartzite beds take over (Revett quartzites). The correlation can only be maintained by the relative stratigraphic position of the two units.

LOCAL STRATIGRAPHY

The lower part of the Precambrian succession includes the following formations: (with increasing age)

Purcell Lava
Siyeh Formation
Grinnell Formation
Appekunny Formation
Altyn Formation
Waterton Formation

Three of these formations were encountered within the Lin Group: Appekunny,

Grinnell, and Siyeh Formation.

Appekunny Formation

Only a few outcrops were examined in the Kishinena Creek bed and in a cliff northwest of Starvation Peak. The formation is built up mainly by grey-green coloured argillites with interbedded one inch to one foot thick quartzite beds. The argillites are fine grained, thin bedded and often arenaceous. Mud cracks and ripple marks are abundant. The quartzite beds in the examined upper part of the formation are all thin bedded, medium-coarse grained and laterally persistent over several hundred feet.

The contact to the overlying Grinnell Formation is gradational and can be best determined by the colour change from green to red argillites.

Grinnell Formation

Several sections were examined and measured across the Grinnell Formation (see Appendix and stratigraphic sections in pocket). The formation is formed by a sequence of red argillites with interbedded green argillites and white quartzites. Additionally, two subdivisions are noticeable: An andesitic sill and in the upper part of the Grinnell Formation a change from red to green argillites. However, both features are non-persistent and, therefore, only of local importance.

The main rock type is a red silty argillite, fine grained and fine bedded with local ripple marks and mud cracks. It is often mottled and interbedded with pale green argillite and white quartzite. The colour change from red to green can be abrupt from one bed to the next one or it can be by gradational fading of the main colours. Even lateral change of colours was observed. There is no obvious lithological difference between the red and green argillites and the green colour may well be a result of post sedimentary leaching.

The quartzite bands are distinct but non-persistent and can seldom be used as marker horizons. The grain size varies considerably from the extremely fine grained silt stone types to the coarse grained recrystallized quartzites. The quartzites often contain rounded argillite pebbles with matching colours to the surrounding argillites.

The sill rocks are usually fine grained and of andesitic composition. They are comparable to fine grained types of the Purcell Lava Groups. Within the Lin Claim Groups, they are perfectly strata form and no conclusion can be drawn as to their possible genesis.

Siyeh Formation

The lower part of the Siyeh Formation as encountered within the Lin Group of claims shows intensive interbedding of grey-green argillites (minor red argillites) with grey-brown dolomites. The beds vary in thickness between one inch and approximately two feet. Both units are arenaceous. The contact to the Grinnell Formation is noted by the disappearance of dolomitic material. Only the middle and upper part of the Siyeh Formation show the well known thick and massive beds of dolomites with "molar tooth" structures.

STRUCTURES

The local structures show no implications. A regular bedding dipping 20-25° to the northeast is persistent. Minor folds do not exceed the range of approximately 10 feet.

MINERALIZATION

Mineralization is confined to the quartzite beds interbedded with green argillites. The copper sulfides are fine disseminated or partially recrystallized to 2-3 mm nests or blebs. The minerals are chalcopyrite, bornite and chalcocite in decreasing order of abundance. Malachite is widespread in the surface outcrops and in many cases down to at least three feet below surface.

The mineralized quartzite bands can often be traced over several hundred feet, however, the width of the mineralization rarely exceeds 1-3 feet. The sulfide content varies laterally and reaches in places up to 10% over several inches. The distribution of the mineralized quartzite bands is shown on the included geological map. The relative stratigraphic position within the Grinnell Formation is shown on the stratigraphic sections.

The best mineralized beds are found in the upper part of the Grinnell Formation. South of the Kishinena Creek, the mineralization occurs in the same stratigraphic horizon than the andesitic sill and in one location, weak mineralization of the sill was observed. The mineralization in a quartzite band ends laterally, sometimes suddenly, although no sedimentary change can be observed. Replacement by mineralized solutions could explain this feature.

CONCLUSIONS

Copper mineralization in the Grinnell Formation of the Lin Group is strata form. Several horizons are preferred, the best ones being in the upper part of the formation. The lateral extent is with interruptions several thousand feet. The thickness of the mineralized beds remains within a few feet. The genesis of the copper showings remains obscure. Sedimentary origin is not impossible but lateral movement of mineralized solutions is suspected.

T. Gyr

A handwritten signature in dark ink, appearing to read 'T. Gyr' followed by a more elaborate signature that includes the name 'James M. Doyle' and a date '11.3.70'.

Vancouver, B. C.

November 3, 1970

A P P E N D I X

STRATIGRAPHIC SECTIONS

Section 'A' - 'A'

This section was measured along Kishinena Creek approximately between the first two road crossings. The direction of the section is close to 230° and the beds dip between 19 and 24°.

Horizontal distance (feet)	Thickness (feet)	
		SIYEH FORMATION
		Dolomite and Argillite interbedded
		GRINNELL FORMATION
136	45	Argillite, arenaceous, green, platy with 5-10% interbedded white quartzite, one inch to 10 inches thick.
287	50	Covered (green argillite float)
290	1	Quartzite, white, coarse grained, with minor green argillite pebbles.
411	40	Argillite, green, platy locally with ripple marks, with minor 1-2 inch thick quartzite bands.
654	80	Covered (green argillite float and white quartzite pebbles)
715	20	Argillite, pale green, platy, with light green quartzite bands.
730	5	Quartzite, white, with green argillite pebbles, several ½ inch thick green argillite interbeds. Mineralization: mainly malachite, disseminated chalcopyrite, approx. 2% sulphide over 1 foot.
815	30	Argillite, green, platy, with 5% one inch thick quartzite bands.
875	20	Argillite, red, platy, with minor green and white interbeds, locally with mud cracks
1026	50	Covered (red argillite float)
1329	100	Argillite, red, platy with abundant mud cracks and ripple marks, 5-10% interbedded quartzite, 1-5 in. thick.
1450	40	Covered (red argillite float and white quartzite pebbles)
1874	140	Argillite, red, platy, with 1 in. to 1 ft. thick beds of white and pale green quartzite partly iron stained, minor green argillite.
1993	40	Covered (red argillite float)
2296	100	Argillite, red, platy, with 3-5% white quartzite and green argillite beds, 1-5 in. thick.
2895	200	Argillite, red, platy, with abundant mud cracks and ripple marks, 5% interbeds of white quartzite with red argillite pebbles, 1-5 in. thick.

Horizontal distance (feet)	Thickness (feet)	
3016	40	Covered (red argillite float)
3274	85	Argillite, red but dark weathered, platy, with 5% white quartzite in 1-5 in. thick beds.
3577	100	Covered (red argillite float)
3820	80	Argillite, red, platy, with mud cracks and minor ripple marks.
3835	5	Argillite, arenaceous, green, platy
3986	50	Argillite, pale red, platy, with mud cracks
<hr/>		
1321		Total thickness of Grinnell Formation
APPEKUNNY FORMATION		
Argillite and Quartzite interbedded		

Section 'B' - 'B'

This section represents only a minor part of the Grinnell Formation and was measured north of Kishinena Creek approximately along the 4600' contour line. The beds dip 20° to N65°E.

Horizontal distance (feet)	Thickness (feet)	
GRINNELL FORMATION		
.....
4.5	1.5	Argillite, grey green, platy, with minor one inch thick red beds.
6.0	0.5	Quartzite, white, medium grained.
14.5	3.0	Argillite, platy, interbedding of red and grey bands, 2-10 inch thick, minor ripple marks.
17.5	1.0	Quartzite, white, coarse grained
23.5	2.0	Argillite, red, platy, mud cracked
54.5	10.0	Argillite, platy, interbedding of red and green bands, 1-5 inch thick, ripple marks and mud cracks.
60.5	2.0	Argillite, red, platy.
78.0	6.0	Quartzite, white, crossbedded, with 30% interbedded 1-10 in. green argillite bands. Mineralization: malachite over approx. 1 ft.
159.0	28.0	Argillite, platy, interbedding of red and green bands, 1-5 in. thick.
170.5	4.0	Argillite, grey, platy, with minor 1-2 in. red interbeds

Horizontal distance (feet)	Thickness (feet)	
228.5	20.0	Covered (red argillite float)
230.0	0.5	Quartzite, grey green, fine grained
240.0	3.5	Argillite, red, platy, mud cracked
241.5	0.5	Quartzite, white, with green argillite pebbles
295.5	18.5	Argillite, red, platy, with ripple marks and mud cracks
298.5	1.0	Quartzite, grey green, coarse grained, minor cross bedding.
300.0	0.5	Argillite, green, platy, with several one in. thick quartzite bands.
304.5	1.5	Argillite, red, platy
306.0	0.5	Quartzite, white, coarse grained, with red argillite pebbles.
323.5	6.0	Argillite, red, platy, with ripple marks and mud cracks
.....
	110.5	Total thickness of measured section

Section 'C' - 'C'

This section was measured parallel to section 'B' - 'B' on the north side of Kishinena Valley along the 4800' contour line. The average dip is 22°. Only a minor part of the Grinnell section was measured.

Horizontal distance (feet)	Thickness (feet)	
GRINNELL FORMATION		
.....
64.0	24.0	Argillite, red, platy, with minor one in. thick grey bands, mud cracks and ripple marks.
70.5	2.5	Argillite, red, platy, with several 1-2 in. quartzite bands, white coarse grained.
74.5	1.5	Quartzite, white, coarse grained, beds 2-3 in thick, partly with red argillite coating.
90.5	6.0	Argillite, red, platy, with mud cracks and ripple marks.
93.0	1.0	Argillite, grey green, arenaceous, platy
97.0	1.5	Argillite, red, platy
138.5	15.0	Argillite, red, platy, ripple marks and mud cracks.
140.0	0.5	Quartzite, white, medium grained, minor cross bedding, 2-4 in. beds.
188.0	18.0	Argillite, red, platy, with approx. 20% grey green interbeds, 1-5 in. thick.

Horizontal distance (feet)	Thickness (feet)	
189.5	0.5	Quartzite, grey, fine grained, in 1-2 in. beds.
247.0	21.5	Argillite, red, platy, with mud cracks and ripple marks in the lower part with green interbeds, 2-3 in. thick.
248.5	0.5	Quartzite, white, coarse grained, 2-4 in. beds. Mineralization: Chalcocite and malachite, approx. 1% sulfides.
262.0	5.0	Argillite, grey green, platy with interbeds of 1-3 in. quartzite beds, white, coarse grained.
342.0	30.0	Argillite, red, platy, with mud cracks and ripple marks.
346.0	1.5	Argillite, grey, platy, with quartzite interbeds, white 1-2 in. thick.
347.5	0.5	Quartzite, white, coarse grained. Mineralization: Chalcocite and malachite, approx. 1% sulfide.
350.0	1.0	Argillite, grey, platy, with quartzite interbeds, white, coarse grained, 1-2 in. thick.
422.0	27.0	Argillite, red, platy, partly mottled and interbedded with green argillites, 1-2 in. thick, minor ripple marks.
423.5	0.5	Quartzite, white, coarse grained, 3-4 in. beds.
427.5	1.5	Argillite, red, platy, with minor quartzite interbeds, 1 in. thick, white fine grained.
430.0	1.0	Argillite, grey green, platy, arenaceous.
446.0	6.0	Argillite, red, platy, minor ripple marks.
454.0	3.0	Argillite, red and green, platy, intensive interbedding of red and green bands, 1-2 in. thick.
459.5	2.0	Argillite, red, platy.
.....
	171.5	Total thickness of measured section

Section 'D' - 'D'

This section was measured north of Kishinena Valley approx. along the 5000 ft. contour line. The direction of the section is approximately 225° and the average dip of the beds 20° to N70E.

Horizontal distance (feet)	Thickness (feet)	
.....	SIYEH FORMATION
		Grey green argillites interbedded with dolomites

Horizontal distance (feet)	Thickness (feet)	
GRINNELL FORMATION		
20.5	7.0	Argillite, red, platy, with minor ripple marks
55.5	12.0	Argillite, green, platy, arenaceous, with minor quartzite interbeds, grey, fine grained, 1-2 in. thick.
79.0	8.0	Quartzite, white, coarse grained, with interbedded green argillite, ½ in. to 5 in., quartzite beds 3-5 in thick.
82.0	1.0	Argillite, green, platy.
108.0	9.0	Quartzite, grey green, medium grained, with green argillite interbeds, 1-2 in. thick.
117.0	3.0	Argillite, green, platy, minor ripple marks.
123.0	2.0	Quartzite, white, coarse grained, in 2-3 in. beds.
146.5	8.0	Argillite, green, platy, with mud cracks on bedding surfaces.
152.5	2.0	Quartzite, white coarse grained, in 2-3 in. beds.
295.5	49.0	Argillite, red, platy, with interbedded grey green argillite, arenaceous, 2-4 in. thick beds.
336.5	14.0	Argillite, grey green arenaceous, relatively massive one in. beds.
424.0	30.0	Quartzite, green, coarse grained, with 20% green argillite material in one in. beds and as ¼ in. pebbles.
427.0	1.0	Argillite, red, platy.
471.0	15.0	Argillite, red, relatively massive one in. thick beds, with quartzite interbeds, 1-3 in. thick, pink, coarse grained.
494.5	8.0	Argillite, red, platy, with one inch thick massive arenaceous interbeds.
500.5	2.0	Quartzite, white, coarse grained, 3-4 in. thick beds, with ½ inch argillite interbeds.
605.5	36.0	Argillite, red, platy, with interbands of grey green argillite, 1-2 inc. thick.
620.0	5.0	Quartzite, white, coarse grained, with green argillite pebbles, beds 3-4 inch thick. Mineralization: diss. chalcopyrite, bornite and malachite. Well mineralized over 10 ih., approx. 2-3% sulfides.
667.0	16.0	Argillite, red, platy, with grey green interbeds, 2-5 in. thick.
673.0	2.0	Quartzite, white, coarse grained, with ½ in. red argillite beds.
684.5	4.0	Argillite, red, platy, minor ripple marks
687.5	1.0	Quartzite, grey, coarse grained, with green argillite pebbles.
844.0	53.5	Argillite, red, platy, with grey green interbeds, 1-2 in. wide.
845.5	0.5	Quartzite, white, coarse grained, with green argillite pebbles.
1004.5	54.5	Argillite, red, platy, with interbeds of grey argillite, 1-2 in. thick, minor ripple marks.
1006.0	0.5	Quartzite, white, coarse grained, with green argillite pebbles.

Horizontal distance (feet)	Thickness (feet)	
1020.5	5.0	Argillite, red, platy, arenaceous.
1023.5	1.0	Quartzite, white, fine grained, 2-3 in. beds.
1066.0	14.5	Argillite, red, platy, with mud cracks and ripple marks on bedding surfaces.
1067.5	0.5	Quartzite, white, fine grained, 2 in. beds.
1117.0	17.0	Argillite, red, platy, with mud cracks and ripple marks
1234.0	40.0	Argillite, red, arenaceous, interbedding of 3 inch massive beds with 2 in. platy beds, with mud cracks
1279.5	15.5	Argillite, red, platy
1281.0	0.5	Quartzite, white coarse grained with red argillite pebbles
1287.0	2.0	Argillite, red, platy, with ripple marks and mud cracks
1288.5	0.5	Quartzite, dark, fine grained, 3 in. thick beds.
1358.5	24.0	Argillite, red, platy, with mud cracks on bedding surfaces.
1360.0	0.5	Quartzite, white, coarse grained, 2 inch beds
1459.0	34.0	Argillite, red, platy, with white and rusty quartzite band, 1-3 in. thick, with green argillite pebbles.
1617.0	54.0	Argillite, red, platy, with green argillite interbeds, 1-2 ft. thick.
1795.0	61.0	Argillite, red, platy, with 10% green argillite interbeds, 1-5 in. thick, with minor white quartzite beds, 1 in. thick.
1796.5	0.5	Quartzite, white, coarse grained, in 2 in. beds. Mineralization: diss. chalcocite, approx. 1% sulfides.
1839.0	14.5	Argillite, red, platy, with ripple marks and mud cracks on bedding surfaces.
1840.5	0.5	Quartzite, white, medium grained
2042.5	69.0	Argillite, red, platy, with grey green interbeds, 2-3 in. thick.
.....
	698.5	Total thickness of measured section

J. T. G. Jr.
James H. K. ...

DOMINION OF CANADA:
PROVINCE OF BRITISH COLUMBIA.

In the Matter of Geological Report on the
Lin Group.

To Wit:

I, Thomas Gyr
#500 - 1112 West Pender Street
of Vancouver

in the Province of British Columbia, do solemnly declare that the following work was performed under my direction at a cost as outlined: Geological mapping, measurements of profiles, geological report.

Costs

Geologist:

T. Gyr June 26, 27,) 6 days @\$55.00 \$330.00
July 1, 6, 10, 14)

Geological Assistants:

D. Moule June 26, 27,) 8 days @35.00 \$280.00
July 1, 6, 10, 11, 12, 14)

J. Steele June 26, 27) 8 days @35.00 \$280.00
July 1, 6, 10, 11, 12, 14)

Transportation:

Helicopter 7.6 hours @\$230.00 \$1,748.00

Total \$2,638.00
=====

To be applied to the Lin Claims Nos. 1-26 at \$100.00

per claim \$2,600.00
=====

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

Declared before me at the City
of Vancouver, in the
Province of British Columbia, this 20th
day of November, 1970, A.D.

T. Gyr

L. Phillips
A Commissioner for taking Affidavits within British Columbia or
A Notary Public in and for the Province of British Columbia.

Sub-mining Recorder

Jan Holroyd

FALCONBRIDGE NICKEL MINES LIMITED

1112 WEST PENDER STREET

VANCOUVER 1, B. C., CANADA

TELEPHONE: 682-6242

TELEX: 04-5938

November 3, 1970

The Mining Recorder
Fort Steele Mining Division
Cranbrook, B. C.

Dear Sir:

This is to certify that the geological work on the Lin Group of claims was done under my supervision.

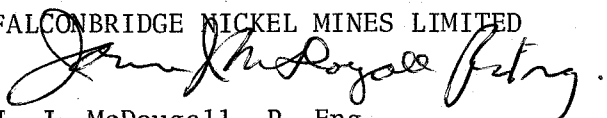
The fieldwork was performed under the supervision of Dr. T. Gyr of Vancouver, B. C.

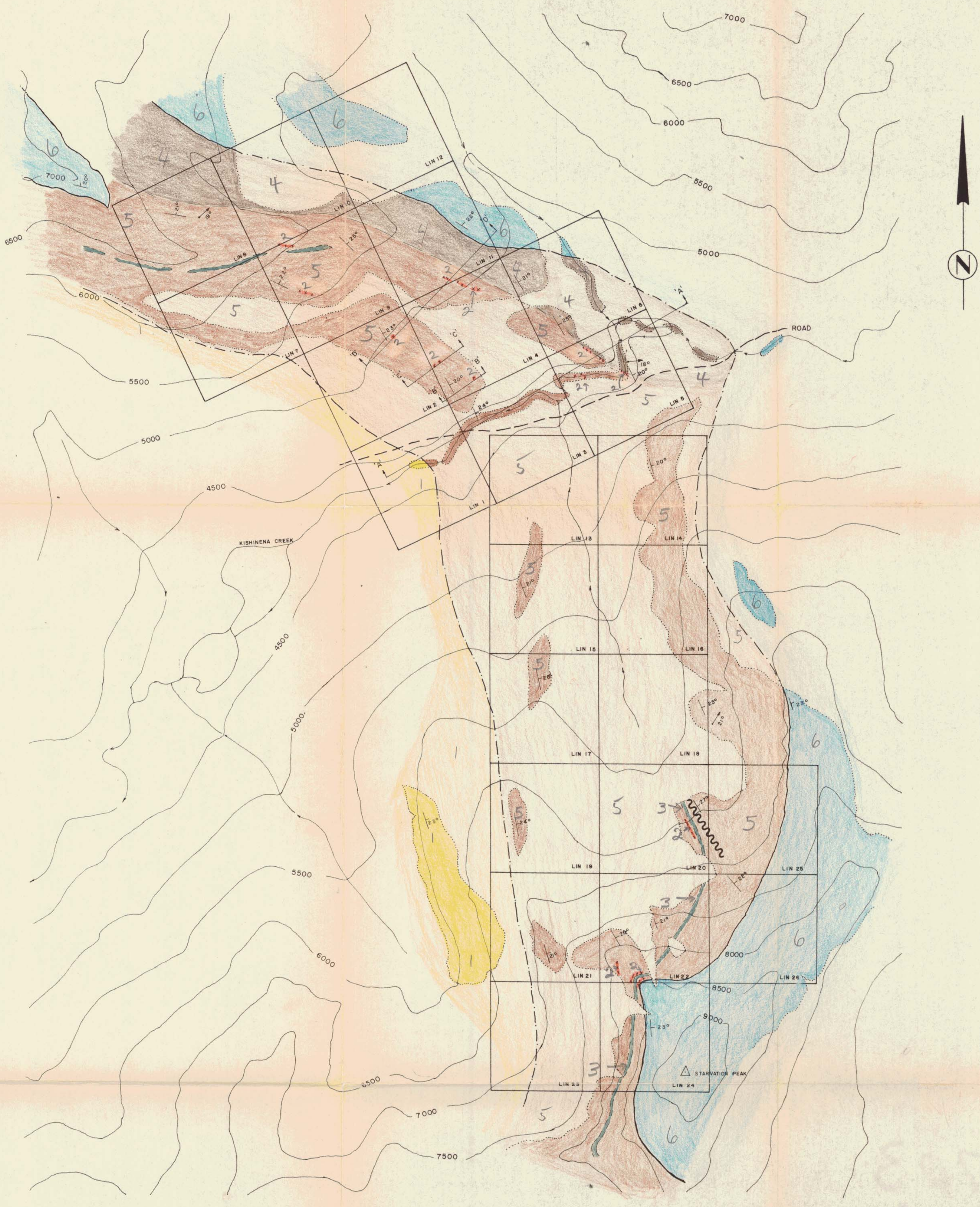
Dr. Gyr received his Doctorate in Geology from the Swiss Federal Institute of Technology (ETH), Zurich, Switzerland in 1966. From 1966 to 1968, he worked as an exploration geologist with the Geological Survey of Guyana. Since May 1969, he has been employed by Falconbridge Nickel Mines Limited as a field geologist in B. C.

Mr. J. Steele and Mr. D. Moule are both third-year students in geology at U.B.C. in Vancouver, and were qualified as geological assistants.

Very truly yours,

FALCONBRIDGE NICKEL MINES LIMITED

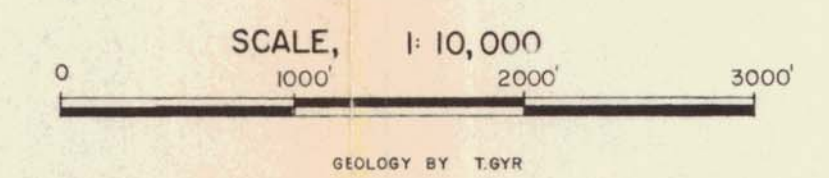

J. J. McDougall, P. Eng.



Department of
 Mines and Petroleum Resources
 ASSESSMENT REPORT
 NO. 2703 MAP #2

FALCONBRIDGE NICKEL MINES, LTD.

GEOLOGICAL MAP OF LIN GROUP
 KISHINENA VALLEY, FORT STEELE M.D., B.C.



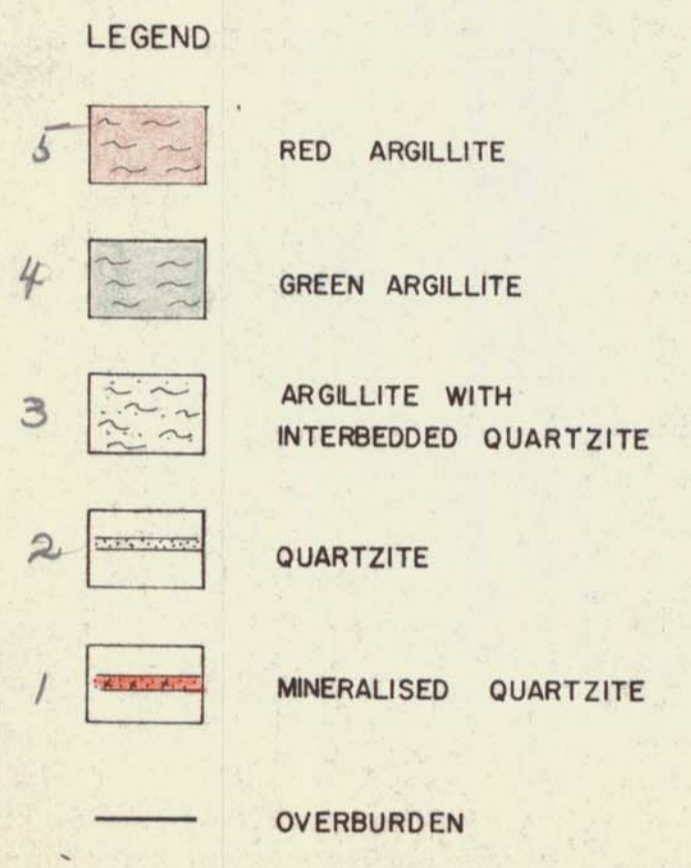
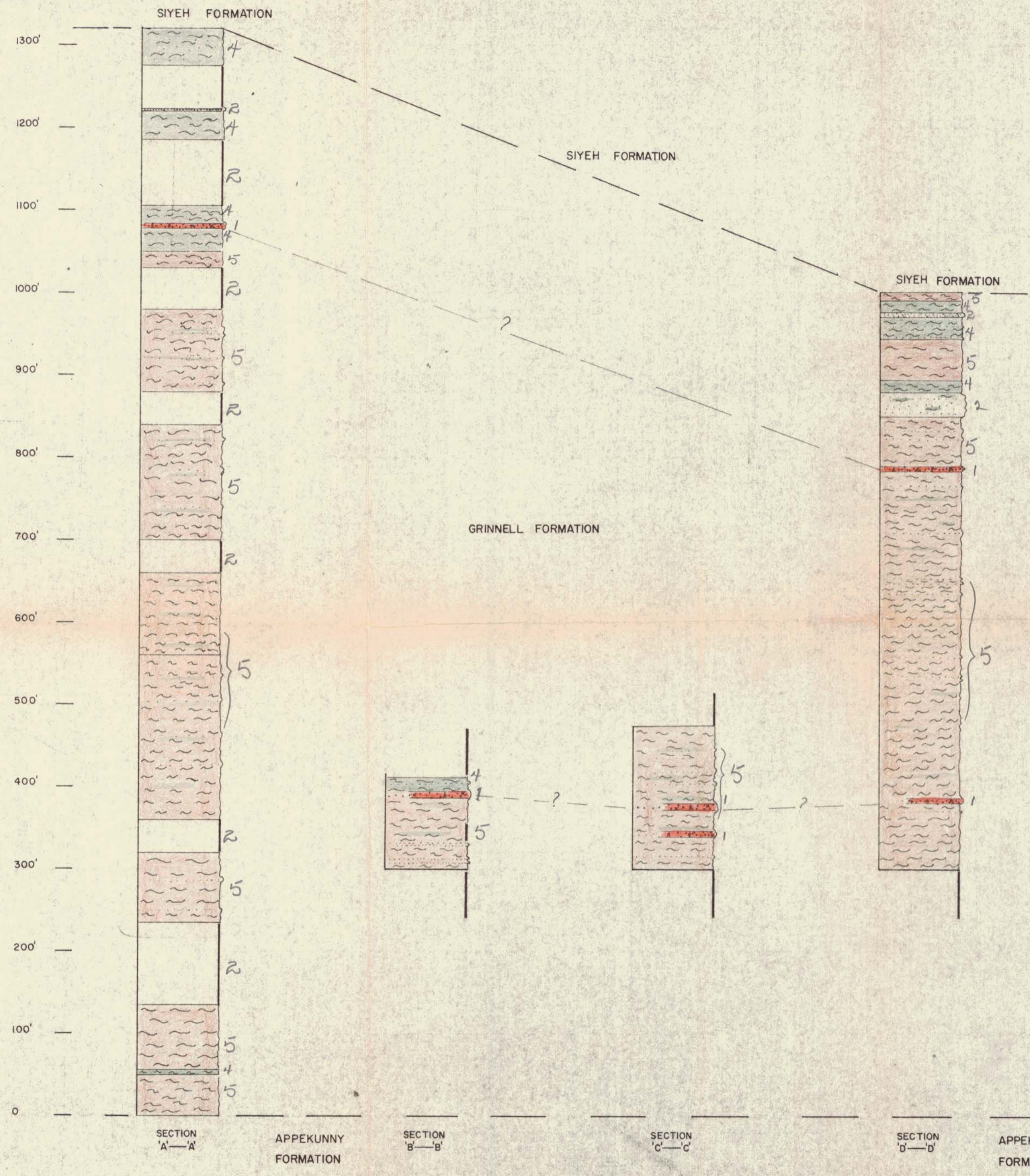
LEGEND

- OUTCROP
- GEOLOGICAL FORMATION BOUNDARIES DEFINED, ASSUMED
- SUBDIVISION BOUNDARIES DEFINED, ASSUMED
- SIYEH FORMATION OUTCROP, ASSUMED
- GRINNELL FORMATION — general OUTCROP, ASSUMED
- GRINNELL FORMATION — mainly green beds OUTCROP, ASSUMED
- ANDESITIC SILLS
- COPPER MINERALIZATION
- APPEKUNNY FORMATION OUTCROP, ASSUMED
- FAULT
- BEDDING LINEATIONS, MINOR FOLDS
- PROJECTED SECTION

To accompany geological report by T. Gyr and J.J. McDougall, R.Eng.,
 on the LIN group of claims, Kishinena Valley, Fort Steele M.D., B.C.
 dated: Nov. 3, 1970

T. Gyr
J.J. McDougall R.Eng.

2703
 M-2



To accompany geological report by T.Gyr and J.J. McDougall, P.Eng., on the LIN Group of claims in Kishinena Valley, Fort Steele M.D., B.C., dated Nov. 3, 1970.

T. Gyr

Department of
 Mines and Petroleum Resources
 ASSESSMENT REPORT
 NO. 2703 MAP #3

*John McDougall
 P. Eng.*
2703 M-3

STRATIGRAPHIC SECTIONS
 GRINNELL FORMATION
 LIN GROUP
 KISHINENA VALLEY
 FORT STEELE M.D., B.C.
 SCALE 1"=100'
 FALCONBRIDGE NICKEL MINES LTD.
 GEOLOGY BY T. GYR