PRELIMINARY REPORT ON TURNAGAIN COPPER-NICKEL PROSPECT, B. C. 1966

N.T.S. 104-I

Liard
MINING DIVISION

by
Vancouver, B.C. J.J.McDougall

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FILE

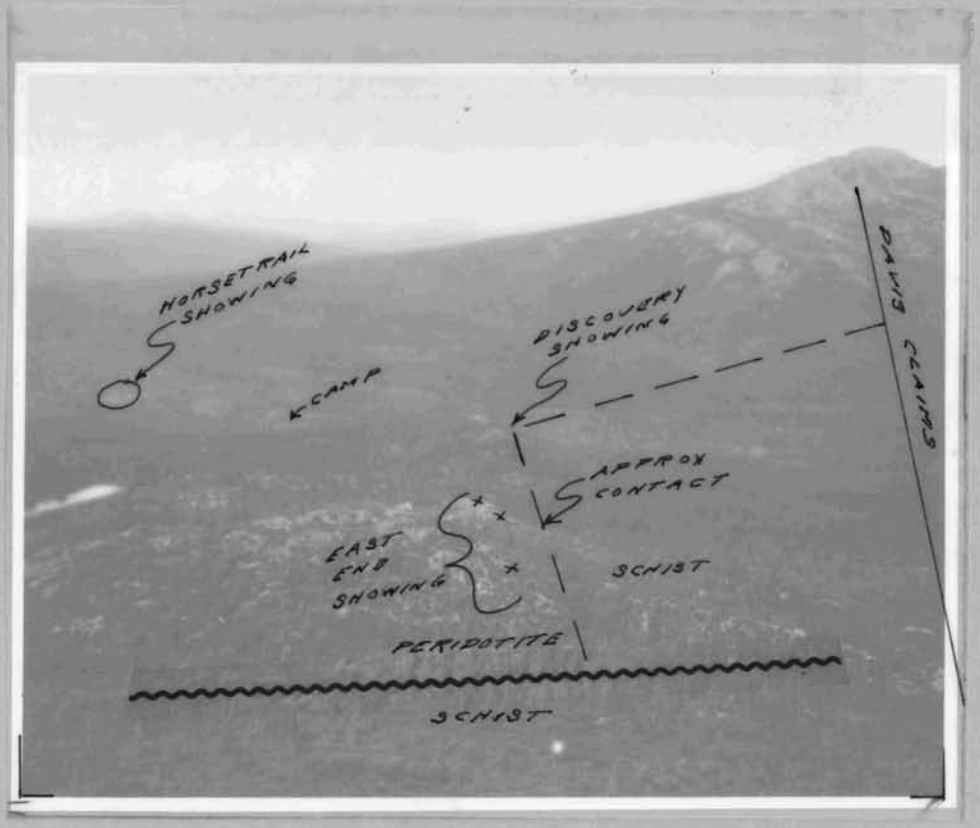

PHOTO #1

Turnagain Cu - Ni

Looking westerly from vicinity east of east showing.

PHOTO #2

Packsack Drilling
on
Discovery Showing, Turnagain Cu-Ni

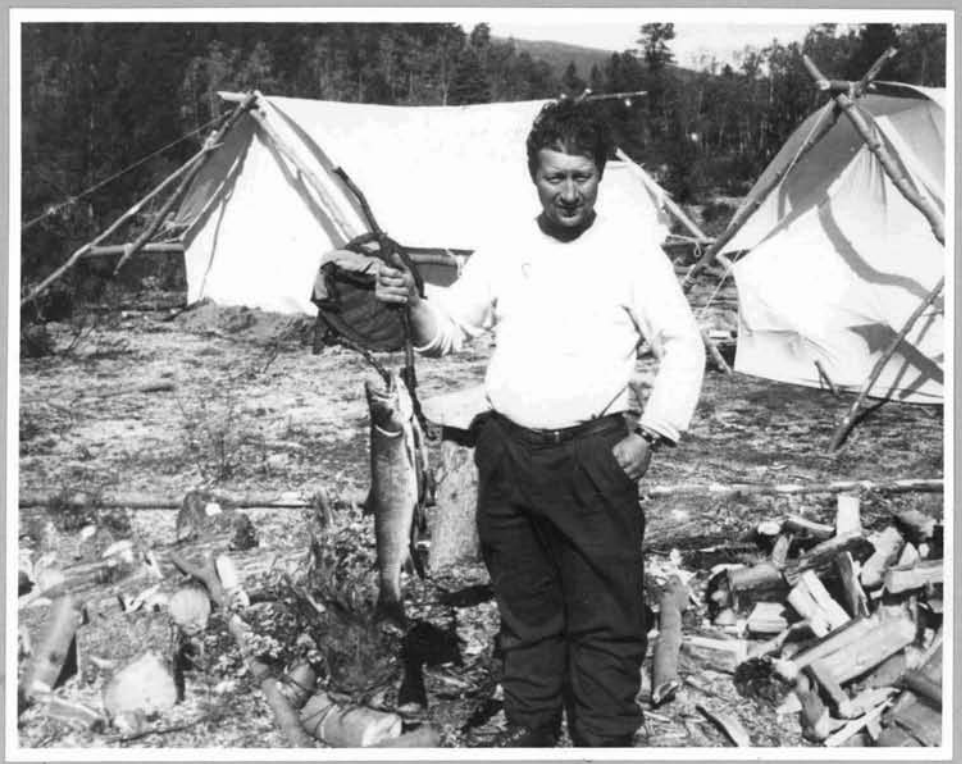

PHOTO #3

Turnagain River

Wildlife -- Dolly Varden & Grayling

PRELIMINARY REPORT

ON

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Mining Division

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Geologist

Vancouver, B.C.

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PRELIMINARY REPORT

ON

TURNAGAIN COPPER-NICKEL PROSPECT, B.C.

by

J.J. McDougall

INTRODUCTION

This report summarizes data available on the Turnagain Copper-Nickel Prospect to December 1966. During the 1966 field season the writer was in the area from mid-July to early August and during most of September and has supervised the small amount of work done on this property to date.

NAME

Turnagain Copper-Nickel, P.N. 145.

PROPERTY AND OWNERSHIP

78 TURN claims located by the writer and turned over to Falconbridge plus two claims (Pyrrhotite and Cobalt) optioned from two original owners, Thompson and Larson. Tentative option to purchase 40± additional adjoining claims from G. Davis. (Map TG/3/66).

ORE

Copper - nickel.

LOCATION AND ACCESS

The TURN claims are located near the Turnagain River in north central B.C. approximately 40 miles due east of the south end of Dease Lake. (Centre of group on Cry Lake Sheet 104I @ 58°28'N, 128° 50' W) at an elevation ranging from 3,500 (River level) to 6,000 feet. (Map TG/1/66).

Access is (a) either direct by helicopter, or (b) by float plane to a small lake one mile west of the group on to a four mile long string of larger lakes (actually widenings in the gently flowing river) which occur at intervals commencing about four miles upstream in this same direction.

A reactivated winter cat road now connects the Letaine Asbestos prospect --presently under active study by Cassiar -- to the "finally being completed" Cassiar-Stewart road some 50 miles to the west. The asbestos road along the Turnagain Valley comes to within five miles of the Turn Group and several tracked vehicles have passed through the group enroute to placer diggings on Faulkner Creek a few miles to the east. From the cat road junction near Tanzilla Butte, the distance to Stewart is about 200 miles ($175^{\pm}$ straight line).

During 1966 access was by way of helicopter based at Dease Lake. Men and supplies were flown into Wheaton Lake (G. Davis, etc. gold-jade placer area) by Watson Lake Flying Service and moved by helicopter some seven miles to the Turn property. Watson Lake is about 120 miles due north of Wheaton Lake.

The setting and climate of the area are unusually pleasant with well drained land and clear, fish laden rivers draining moose-infested lakes. Rainfall is relatively light and timber sparse but usable. Sandy terraces and flats suitable for golf courses or airfields are close at hand. Ample hydro power should be available judging by downstream canyons and gradient.

Although elevations of up to 5,000 feet could be encountered in wide upland valleys, a road west to connect with the Cassiar-Stewart highway would be a simple matter. Alternate routes some 1,000 feet lower are available but construction would be slightly more difficult.

HISTORY

The property appears to have been initially discovered around or shortly prior to 1956 by Bill Thompson, a freelance wrangler and guide who had frequently passed through this area for some ten years prior to this. The earliest staking record on the ground appears to have been in 1957 when Eric Larson, a prospector from Dease Lake, and Thompson, located the "Pyrotite MC #1" and the "Pyrotite M Group #1" mineral claims respectively. These two claims, meant to cover two copper-pyrrhotite prospects, were apparently allowed to lapse but were re-located at intervals. Although a few other claims had been staked along trails in the valley bottom, these were either not recorded or allowed to lapse so that by mid-July of 1966 the only claims in good standing were the "Pyrrhotite" of Thompson"s -- covering a small cupiferous pyrrhotite outcrop on the west bank of the Turnagain, and the "Cobalt" of Larson's immediately adjoining Thompson's to the northeast.

Thompson's discovery showing and some scattered mineralization occurring along a horsetrail about one-half mile south were examined by Kennecott (Dick Campbell and John Anderson) in 1957, but lack of assay values caused loss of interest. Little was done until about June of 1966 when Bill Plumb of Cassiar (then supervising geological investigation of the Letaine Asbestos property some ten miles to the south) also examined the same showings. Thompson to this time had made one shallow pit on the discovery showing. Prior to assay results interest was not forthcoming.

During early July of 1966, the writer along with the helicopter and R. Hepworth were carrying out prospecting and property examinations in the area. Gerry Davis, (formerly with Falconbridge) then engaged in jade mining on Wheaton Creek, suggested we look over Thompson's discovery. Thompson was located and a few samples obtained. Accompanied by Davis, the main showing

was found and sampled. Using the helicopter (which previous examiners were fortunately (?) without) a more accurate geological picture was obtained and copper-bearing, nickel-reacting outcrops were picked up along a three mile plus zone apparently not previously prospected. Checks in the mineralized areas with the MFI magnetometer, first ground and then airborne, showed a general but definite relation between magnetics and mineralization. The result was the outlining of a relatively large and easily accessible prospecting area amenable to geophysics. Options were drawn up with Thompson covering the zone as a whole and with Larson covering his specific claim.

Guided largely by distinctive air magnetometer reaction outlining probable structure, the TURN Group of 78 claims was located in the writer's name and transferred to Falconbridge to become part of the deal. Coincidental with our staking, G. Davis located about 40 claims to the north and later, for Silver Standard, an equal number to the southwest. Prior to the latter, Cassiar had returned and staked about the same number to the south and east.

Additional personnel on the project in 1966 (besides Thompson and the writer) included Dave Brown, Geologist, who did both detailed and generalized mapping, particularly of the contacts; Steve Presunka, in charge of geophysics; Kimball, Schussler, Samuelson, and Dyakowski - prospectors; Andy Smith and B. Findlay, student surveyors, and half a dozen local line cutters. Alex Smith, S. Charteris and L. Kilburn paid short visits to the property as did Bill Dunne (Silver Standard) and Bill Plumb (Cassiar) -- the latter to "option the property from Thompson" as advised too late by his head office.

DEVELOPMENT

Development to date, done as a convenient fill-in following completion of most of the seasons prospecting, includes a number of

cobra rock cuts and trenches put in by Schussler and Thompson (17 as shown on map TG 4/66/a + b) involving about 220 yards of material and one 30 foot packsack drill hole (log in appendix). Within three pre-selected areas, 31 miles of transit controlled line cutting was completed and geophysical observations, involving MFI magnetometer, involving EM 16 and MK IV Ronka EM equipment carried out along them as time allowed. A few select sections were geologically mapped and some prospecting carried out - generally in conjunction with the more urgent claim staking program. Thompson was engaged to prospect during much of August.

GENERAL GEOLOGY

The Turnagain prospect occurs intimately associated with a band or sill of ultrabasic rock within schists paralleling and a few miles distant from the northwesterly trending western contact of the Cassiar Batholith. (Map TG 1/66). Although notably less altered (serpentinized), it is one of the smaller of a number of ultrabasic bodies running through the area. Earlier mapping by Hedley and Holland (B.C. Department of Mines Bulletin #12) sketched a body of serpentine as occurring west of the River. Later mapping by the G.S.C. (H.Gabrielse (Cry Lake" sheet) left this section incomplete. Unfortunately, as is so often the case with the G.S.C., someone later "fills in the holes" by projecting contacts. The result in the published Cry lake sheet is that these projections locally were quite erroneous leaving us geologically "on our own".

Present indications are that the Turn ultrabasic body is a southwesterly dipping sill enclosed by schists (often graphitic) occupying the western limb of an inticline whose projected northwesterly or regionally trending axis is now occuped by the Cassiar Batholith. Schists a couple miles to the southwest as well as metasediments containing the nearest ultrabasic bodies a few miles beyond this dip to the northeast suggesting a band-like synclinal axis in this

direction wuthin a couple miles of the prospect under discussion. The location of such a syncline in this unmapped locale is uncertain because of extensive overburden, strong faulting in the schists, and, at least along Hard Creek, valley deposits of Tertiary basalts whose source appears to have been along the batholith contact about six miles northwest of the claim group.

Locally the ultrabasic body, consisting mostly of slightly serpentinized peridotite and gabbro with gradations to pyroxenite, as exposed, is about four miles in length with a long axis trending regionally at about N55 to 60° W (Maps TG 2/66 & TG 10/66). Termination to the east seems to be against a strong northerly trending fault which appears part of a structural lineament which can be traced regionally for a number of miles. Termination to the west, where the intrusive is about one and a half miles wide as against probably about three quarters of a mile on the east, is rather less distinct. In the northwest section, where the contact is actually exposed, it is undulating with possible fault complications. In the southwest, no rock is exposed for many miles beyond the last seen outcrop and only a gradual fall-off in magnetics suggests its poorly defined cut-off. To the south, (but west of the river), heavy glacial drift, Tertiary volcanics, and eventually schistose metasediments effectively bound it. East of the river, graphitic and/or mica schist overlie it. (Maps TG /66 3-5).

The sill-like and intrusive nature of the body seems quite well established despite G.S.C. mapping of the rocks here being younger (Jurassic) than the normal ultrabasic intrusive (Devonian-Mississippi).

Schistosity in the enclosing rocks is intensely developed with the graphite schists looking like something out of the pre-Cambrian. This contrasts markedly with the lack of schistosity in the ultrabasic complex. At the one exposed contact so far discovered, alteration of the schists is suggested with "chert-ification" being evident along with minor pyritization. The schists,

normally only slightly pyritic although containing numerous pyrite-rich, regionally trending, quartz veins, are definitely more rusty weathering near the contact. Also there is some evidence of the intrusive having penetrated along partings in the schist although this has not been clearly shown. (The peridotites, however, retain a coarse grain size immediately adjacent to the schists). The attitude of the schists, locally striking north 55 - 75° west and dipping southerly between 45 and 75°, appears to be similar on the average with that of a rough sort of banding (gabbroic layering?) within the ultrabasic complex.

Structurally the basic body appears to have been affected by northwesterly and northeasterly trending faults which have (a) cut it off on the east, and (b) cut diagonally across it immediately west of the river effecting an offset to the north, and, if geophysics is any guide, producing drag structures in what is at the moment the "main ore zone". Similarly west of the river a northwesterly trending lineament believed to represent a fault cuts the body in two. Some evidence indicates a major fault along the river which runs northeast in this locale. Smaller minor faults, which appear to have produced no offset, are indicated by drift filled depressions and occasionally pillar-like remnants containing oxidized shear material. In certain sections a flattish shear is prominent but its importance has not yet been established. As the enclosing schists are poorly exposed, tracing of the faults through them is almost impossible.

Most of the rock exposed is a medium grained peridotite (termed "monotonous peridotite" by Kilburn) only weakly altered to serpentine relative to most northern ultrabasics seen by the writer. Serpentinization is best developed near the western extremities where carbonatization with its distinctive orange tinge

is also more prominent. Paralleling veinlets of poor quality chrysolite asbestos, in a system believed tensional and at right angles to the attitude of the sill, are occasionally quite common with complete serpentinization having been restricted to the fractures such now occupy. Some of the peridotite is very hard and tough - almost jade-like; this material has resisted weathering, thus the prominence of bold steep bluffs and the right angle deflection of the Turnagain River at the northerly schist - peridotite contact.

Field terms, without the benefit of microscope work, are used to describe varieties of peridotite until such a time as thin section study is completed. Thus for mapping and logging purposes the following breakdown has been used:

(a) non-asbestos peridotite
(b) asbestos peridotite
(c) granular peridotite

The term serpentine is used only when such is readily evident (megascopic).

Although somewhat indefinite at the moment, olivine gabbro, present in far less quantity than the peridotite, appears to be the more important rock type. It appears gradational to a pyroxenite (also altered) in places but for present mapping purposes the two are lumped. In it the olivines are generally altered to a black amorphous serpentine yet retain a texture resembling dunite. Its relation to the peridotite is uncertain; it appears to have been later as evidenced by a coarse somewhat questionable banding and by globular or knot-like concentrations along "lines of weakness" in the peridotites. However the contacts so far noted, particularly in the drill core, are distinctly gradational suggesting a contemporaneous origin. Actually the rock is probably closer to a peridotite but its appearance is distinctive, thus the term is used at present for field purposes. It is broken down into:

(a) coarse amorphous
(b) coarse granular (probably pyroxenite)
(c) sieve textured (dunite derivative ???) and
(d) fine grained.

No recognizable asbestos veinlets occur within the rock. A close association with sulphides and magnetite is evident.

A third and very minor rock type has been noted particularly in fault zones. Unfortunately all specimens to date have been altered beyond the identification point but the rock would appear to have been a "spaghetti" or wormy textured medium grained hybrid gabbro of pyroxenite containing a high feldspar content which imparts a distinctively white color to it. On a piece of float this rock clearly cuts across layering and contacts within the gabbro-peridotite and thus appears to be present as a dyke. It is generally mineralized. This may be, as suggested elsewhere by Kilburn, an anorthosite.

MINERALIZATION

The only sulphides recognizable megascopically to date include pyrrhotite, chalcopyrite, and pentlandite. These are weakly disseminated throughout much of the country rock - - even the asbestiform - peridotite -- but appear to be concentrated only in proximity to faults or related structures or to "gabbro" rich sections. Magnetite (remnant?) appears to be related to the same gabbroic rock and thus used as a guide.

The rarely discernible pentlandite is generally intimately related to the pyrrhotite although occasionally, judging by assay values, it may occur almost alone. Within gobs of sieve-textured gabbro, pentlandite and about a double amount of pyrrhotite with minor chalcopyrite occur interstitially to the amorphous grains. When found in massive form, particularly nearer the footwall, considerably more chalcopyrite and pyrrhotite accompany the nickel mineral. Specks and blebs randomly disseminated in some of the peridotites appear to show the common pyrrhotite core rimmed or bordered by pentlandite-chalcopyrite.

Oxidation of the deposits beyond a few inches at surface is negligible although drilling may show such to persist deeper in any well defined sheared zones. Certainly the rusty weathering, flattish shear zones seen on surface have been affected by oxidation far more than those mineralized zones not so cut up by shearing.

DESCRIPTION OF OCCURRENCES

For purposes of clarity the mineralized zones so far established have been divided into three main divisions as follows:

(a) East End - Those occurring from about 1,000 feet east of the river to the east end of the intrusive (grid 1,500 E to 6,800 E).

(b) Discovery - Those occurrences near and on both sides of the river - (grid 2,000 W to 1,500 E).

(c) Horsetrail - Those occurrences along the trail west of the river south of the 1966 camp (grid 2,000 W to 4,400 W).

Several additional occurrences are treated separately.

Nickeliferous pyrrhotite has been found in five zones along 3,500 feet of the East Section, one zone plus a float occurrence on strike across the river on the Discovery Section, and in five zones of the Horsetrail showing where innumerable float occurrences also occur. Two occurrences have been found between the Horsetrail showing and camp, and one about 1,500 feet west of the Horsetrail.

Most of the above, which occur within a zone two miles long and three quarters of a mile wide, do not require descriptions at this time as most are poorly exposed. These are shown best on Map 3 Those of the East and Discovery Zones are the best exposed but with two exceptions such is only partial at the best. In the Horsetrail area only one zone (that on Claim 30) is reasonably free of overburden.

Most exposed are small -- measurable in tens of feet at the most, although occasionally zones containing disseminated sulphides can be traced, despite overburden, for 200 feet or more. Distinct bottoming (?) is apparent in at least two of the occurrences.

Of note is the fact that most discoveries to date occur along a zone of magnetic highs which seems to cut across the sill at a small angle.

The Discovery Zone consists of an apparently bowl shaped, one to two foot thickness of massive sulphide (pyrrhotite, chalcopyrite, and pentlandite) surrounded by a halo of disseminated and sieve-textured sulphide. The deposit, exposed for about twenty feet, seems to die out on the river cliffs to the east while any westerly extension of the regional trending body is effectively masked by seventy-five feet of glacial overburden. A thirty foot "test type" drill hole penetrated most of the zone without encountering massive "footwall" sulphides, although such may not have been reached before drill breakdown. About 15% sulphides were obtained across ten feet and about 10% across an additional ten feet (see log).

Extension across the river to the east of this zone in which massive sulphides occur is suggested by float across the river. The deposit reacts quite well to magnetic surveys although such show a restricted size (map TG 5/66/B). EM results were less impressive with reactions being very local only.

Of the East showings, the mineralized zones which contain sieve textured and randomly disseminated sulphides react magnetically only slightly better than the local country rock. (Map TG 5/66/A). Several well defined EM anomalies are present near and along the universally overburdened footwall-schist contact; this may be due to sulphides but more likely due to graphite as only a portion of one of them has favorable magnetic values as well. Minor massive sulphides have been found in rare outcrops of "spaghetti gabbro" apparently associated with the major "terminal" fault which terminates the sill. This area requires more study before legitimate descriptions can be made.

Geologically and geophysically, the Horsetrail section is the most interesting at present. Here, in an area only partially tested prior to shutdown and equipment breakdown, magnetic values and EM values are coincidental in sections where nickeliferous sulphides, despite 90% overburden, are visible. EM (MK IV) values (even if graphite which shouldn't occur, does) are of such magnitude and ratio as to indicate near massive (50%+) sulphide bodies of important areal extent. The better EM anomalies cover areas of magnetic lows or crossovers with apparent "ringing" by magnetite of what is hoped to be sulphides. The writer interprets this effect to be caused by a system of large knot-like, structurally controlled sulphide rich gabbroic (pyroxenite?) intrusives. The MK IV Ronka indicates more or less continuous bodies while the new EM 16 indicates a number of smaller conductors within the larger MK IV anomalies. Regardless of cause, the anomalies are definitely distinctive. Narrow and local graphite seams have been found near the contact along the river outcrops to the north. However, this material has not been found elsewhere on the property otherwise the geophysics would be suspect.

Geophysically, anomalous areas have been designated on maps TG 5/66/C, TG 6/66/C, TG 7/66/C and TG 8/66C.

In the general area of the Horsetrail anomalies of interest, glacial action has resulted in side morains of foreign material (i.e. granitic bounders) being mixed with local float. Very large pieces of the latter thus may or may not represent bedrock but the mineralized and angular character suggests such originated close at hand. With minor exceptions, the coincidental EM and mag. anomalies occur over either completely overburdened ground or that containing these blocks. The anomalies fall off in two instances where adjoining rock contains sparse nickeliferous sulphides.

The "S" shaped orientation along with sudden terminations of the anomalies is such as to indicate sharp folding or a complex fault network. That shearing has taken place is evident from some of the crushed material visible in the pillar-like blocks referred to and to several subdued weakly mineralized red weathering mound-like outcrops (?) of slightly schistose and crumbled ultrabasic rock which flank the lower easternmost anomalies to the south. Similar material has been noted in a little investigated area along strike within the continuing magnetic zone some 2,000 feet west of the Horsetrail group of anomalies. In this zone a large diagonal fault cuts the basic body and its intersection with other faults in this area may have provided structure of importance.

East of the river at the extreme southeast end of the Horsetrail sub-division massive nickeliferous sulphides have been picked up near a solitary peridotite outcrop in a rock strewn flat (old river channel?) immediately north of a small lake. Although not properly investigated (exploratory mag. readings only with no EM) well defined magnetics immediately to the south of the occurrence appear to continue westerly across the river and to be part of a continuous high magnetic zone which unfortunately is completely obscured by overburden.

Between the Horsetrail and the discovery zones, nickeliferous sulphides are present in small local shears in several places on a bold bluff -like protuberance of peridotite known as "Fishing Rocks". Although magnetically high, EM readings of significance appear restricted to a swamp-like area on the flat above and west of the bluffs. This section has not been properly outlined. In an area of better exposed outcrop above treeline on the extreme northwest end of the intrusive, claims located by Gerry Davis cover minor and "spotty" pyrrhotite mineralization occurring in what would appear to be shear zones in the peridotite. The character of the mineralization

in this area is quite different and less impressive than that occurring at lower elevations but similarly a large section yet remains to be explored.

ASSAYS AND RESERVES

Specimen assays to date are plotted on Fig. 1/66. These range from 0.05 to 2.77% Ni. and from 0.03 to 4.35% Cu. The only representative sample to date is that taken by the pack-sack drill hole on the discovery showing where 1.09% Ni., 0.16% Cu., and 4.84% S. was cut across 16.5 feet in a hole designed to intersect the zone at a high angle and to furnish drilling characteristics of the rock. This included 4.5 feet of 1.91% Ni., 0.17% Cu., and 4.53% S.

Because of a limited number of sulphur assays made to date, no regional correlation with respect to the Ni-S ratio can be made. Our assays show a range of from between 2.77% Ni., 3.63% total sulphur to 0.69% Ni., 14.40% S. (Kilburn). The former, taken from the most westerly Horsetrail outcrop, unlike some of those from elsewhere, represents a relatively high pentlandite to pyrrhotite ratio. The better 4.5 feet of the drill hole would theoretically give a concentrate of better than 15% Ni., while the complete 16.5 feet would suggest about an 8% concentrate. Surface specimens such as one of those picked up on the Horsetrail would theoretically indicate a 100% "total recovery" sulphide concentrate grading +25% Ni. Pyrrhotite-rich specimens from elsewhere would give a theoretical low of 2-2.5%.

Silver values are generally low, occasionally reaching 1.2 oz. Cobalt is in the 0.03 - 0.17% range and platinum 0.02 and less.

Tonnage reserve is meaningless without knowing the value of the several anomalies so far outlined. However, if such

represent sulphide bodies with widths and lengths in the hundreds of feet, tonnage would readily reach the multi-million stage. Certainly there are indicated large amount of 0.3 - 0.4% Ni. material.

CONCLUSIONS AND RECOMMENDATIONS

The Turnagain Copper-Nickel represents a large untested readily accessible and geologically favorable but extensively overburdened prospect of merit in which the minimal of work so far done has shown correlation between EM/Mag anomalies and known mineralization. That material with a relatively good nickel-sulphur ratio exists has been proven -- this with respect to a current problem which, in a few years with expected advances (i.e. bacterial leaching, pelletizing, etc.) in currently lagging nickel extraction metallurgy, surely will seem archaic. The possibility of an open pit, low grade, nickel deposit likewise should not be discarded simply because such does not exist in Sudbury or Ungava. B.C. would never have opened several of its large and more profitable mines had this type of restrictive outlook prevailed.

It is recommended that evaluation of the Turn prospect occur in two stages. The first would involve using our own diamond drill to test the more important of the coincidental mag. and EM anomalies on the Horsetrail showing. If these can be shown caused by excessive sulphides (with low nickel-sulphur ratios or not) a more expanded program will be required. Such a dual program is possible, with respect to time, in this favorable location, because of the longer season afforded.

As a first stage, sometime as early as April, camp can be set-up as in 1966 and our BBS1 machine can test drill the A,B, C, and D Horsetrail anomalies. As shown on Fig. 2, about six

northeasterly directed angle holes totalling 2,500 to 3,400 feet (flexible, depending on intersections obtained) should be completed. This would test at least one of the zones along 1,000 feet of length. A prospect hole directed southerly is also in order. Water is near at hand. The most trouble anticipated would be caused by glacial boulders; where possible, the holes should be collared in or near bedrock. Coincidental with the drilling, line cutting west of the Horsetrail at least as far as the northwesterly trending fault, should be continued and several exploratory lines run out elsewhere on the property for prospecting and tieing-in purposes. EM and Mag. work can be done as a follow-up.

Should an intersection of interest be obtained, the potential of the area (based on geophysics) is such that a more expensive look will have to be had, in which case at least two drills will be required -- one on exploration free to move around, and one to better define any one structure already indicated.

Costs, exclusive of helicopter which could be used from the same camp for local exploration, should initially be in the $35,000 - $40,000 range with an additional $100,000 available if required for the second stage.

Personnel, besides the writer, who could look after the initial stages and return at intervals for the second, should include two drill crews, a geophysicist with at least two line-cutter helpers (at least one of which is student type, capable of transit work) and a cook. During initial stages, Doug Randall could cook and drill as in the past.

The second stage would require, in addition to a larger drill crew, a handyman-type camp manager and student (?) geologist.

It would be relatively simple to construct an airstrip suitable for a wheel equipped Otter (2 men a few days with a power saw) should the second stage develop. Such machines are based in

Terrace and Stewart. With one of the Hondas or even a small jeep, expensive helicopter time could be kept to a minimum. Some of the Banks Island equipment could be flown north and used on the Turnagain.

The Geological Survey expects to spend two weeks commencing in early July to complete its mapping in the immediate area; this should help develop a better geological picture. Close regional prospecting could conceivably pick up similar deposits elsewhere.

Vancouver, B.C.
February 13, 1967

J. J. McDougall,
Geologist

PROPERTY TURNAGAIN COPPER-NICKEL

HOLE NUMBER TG 1(PS)

SHEET NUMBER 1

DIAMOND DRILL RECORD

SECTION FROM ____ TO ____

LOCATION: LAT 58.00 N (approx. only)
DEP 384.00 E " "

ELEVATION OF COLLAR 3400' ± 15'

DATUM Altimeter

DIRECTION AT START: BEARING N52°W (approx.)
DIP -52°

STARTED September 15, 1966

COMPLETED September 15, 1966

ULTIMATE DEPTH 30.0 feet

PROPOSED DEPTH ____

DEPTH FEET	FORMATION		FROM	TO	WIDTH OF SAMPLE				
		LEGEND							
	P	Peridotite							
	P (a)	non-asbestos bearing							
	P (b)	asbestos bearing							
	P (c)	granular							
	G	Gabbro							
	G (a)	Coarse amorphous							
	G (b)	Coarse granular							
	G (c)	Sieve textured							
	G (d)	Fine grained							
	SP	Serpentinized Peridotite							
	RW	Rusty weathering (oxidized)							

N. M. P. - FORM A

PROPERTY TURNAGAIN COPPER-NICKEL

HOLE NUMBER TG 1 (PS)

SHEET NUMBER 2

SECTION FROM ..... TO .....

DIAMOND DRILL RECORD

LOCATION: LAT .....
DEP .....

ELEVATION OF COLLAR .....

DATUM .....

DIRECTION AT START: BEARING .....
DIP -52°

STARTED September 15, 1966

COMPLETED September 15, 1966

ULTIMATE DEPTH 30.00 feet

PROPOSED DEPTH .....

DEPTH FEET	FORMATION	FROM	TO	WIDTH OF SAMPLE	Au	Ag	Cu	Ni	S
0 - 1.0	Coarse grained black altered phenos	0	- 5.5	5.5	tr.	0.3	0.10	0.55	3.14
	in slightly serp. peridotite. RW	5.5	- 7.0	1.5	tr.	0.3	0.17	0.48	4.10
	on jnts @ 25°	7.0	-12.0	5.0	tr.	1.2	0.19	1.15	7.26
	- 10¢ pyrr/S_2 blebs	12.0	-16.5	4.5	tr.	0.3	0.17	1.91	4.53
	1.0 - 1/8" S_2 band @ 46°	16.5	-19.0	2.5	tr.	0.2	0.10	0.46	1.24
1.0 - 5.5	1 - 5% S_2, sl CP, in medium grained Pc								
	1.5, 1.7' = dark bands @ 53°	19.0	-23.5	4.5	tr.	0.3	0.04	0.45	1.06
	3.0 3/4" irreg. bnd. Cp, Pyrr. @ 47°	23.5	-25.0	1.5	tr.	0.1	0.03	0.34	1.53
	5.0 Dk. bndy. @ 50°	25.0	-30.0	5.0	tr.	1.0	0.03	0.35	1.10
	5.5 Dk. bndy @ 28° (fracture)								
5.5 - 7	Irreg., gradational change								
	to weakly sieve textured m.g. gabbro	Best Section							
	- weak banding @ 45°			0 - 16.5 = 16.5 feet @ 1.09 Ni,					
	- S_2 10% ±						0.16 Cu,		
7 - 12.0	70% G(c), 25% S_2, occ. sl Cp.						4.84% S.		
	7.5 - bndg. @ 73°, jnty. @ 30°								
	11.0 - sl. bndg. @ 54°; trachytic								
	orientation of pyrr. @ 62°								
	11.8 - weak grey bndg. in G(d) @ 65°								
	12.0 - grad. ctct. with fg. P (c)								

N. M. P. - FORM A

PROPERTY TURNAGAIN COPPER-NICKEL

HOLE NUMBER TG 1 (PS)

SHEET NUMBER 3

SECTION FROM ____ TO ____

DIAMOND DRILL RECORD

LOCATION: LAT ____ DEP ____

ELEVATION OF COLLAR ____

DATUM ____

DIRECTION AT START: BEARING ____ DIP -52°

STARTED September 15, 1966

COMPLETED September 15, 1966

ULTIMATE DEPTH 30,00 feet

PROPOSED DEPTH ____

DEPTH FEET	FORMATION	FROM	TO	WIDTH OF SAMPLE	
12 - 16.5	30% fg. S_2 (total metallics) in P(a) and				CORE RECOVERY - 85%
	minor G				Drilling conditions - average.
	16.0 - asb. veinlet @ 64°				
					Hole was drilled to test the mineral-
16.5 - 18.0	G (d); occ. diffused feldspathic				ized country rock and narrow S_2 zone
	5% S_2.				exposed by a rock cut on the River's
	18.0 - dark bndg. @ 75°, Cp, pyrr.				edge. Hole may or may not have
	in small veinlets @ 20° to core.				penetrated extension of massive
18.0 - 19.0	3% diss. S_2 in medium grained G				sulphides exposed 27 feet away on
d	18.5 - dark bndg. (incl. S_2) @ 60°.				surface.
19.0 - 23.5	Black G (d) occ. grad. to P; 1-2% diss. S_2				
	22.0 - gray and black banding @ 65°				
	23.0 - fracturing @ 38°.				
	23.5 - Broken area; sl. Serp. on				
	jnt. @ 64°.				
23.5 - 25.0	6% diss. S_2 in G (d)				
25.0 - 28.0	V.fg. P(b) 1 1/4" asb. veinlets @ 30° to core (2-3% S_2)				
	26.5 - best veinlets @ 30° & 52°; 1/2" gab.pyrr.;poss.pentlandite.				
28 - 30	P (b); 3-4% S_2; veinlets @ 70°				
30	END OF HOLE				

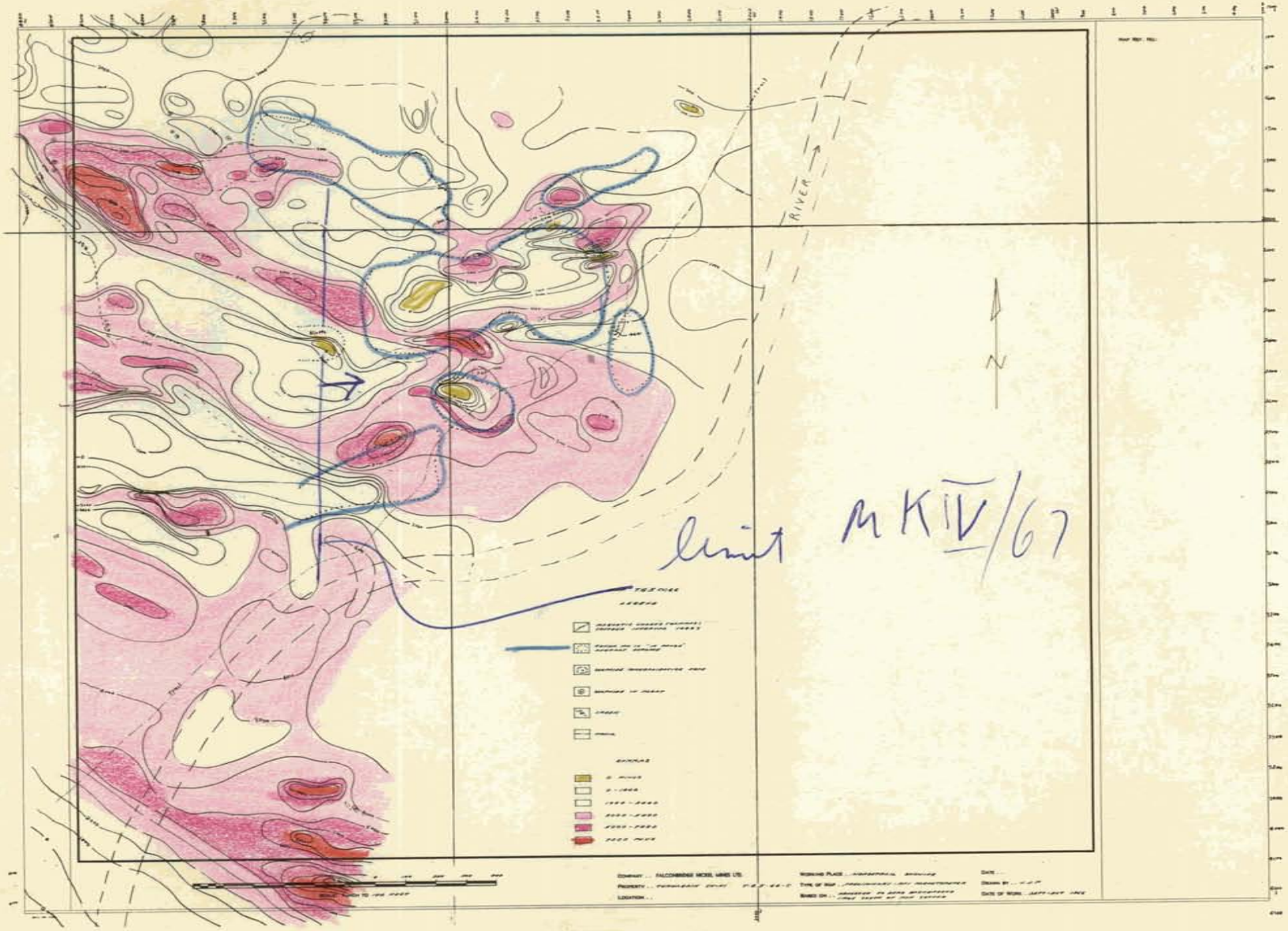
N. M. P. - FORM A

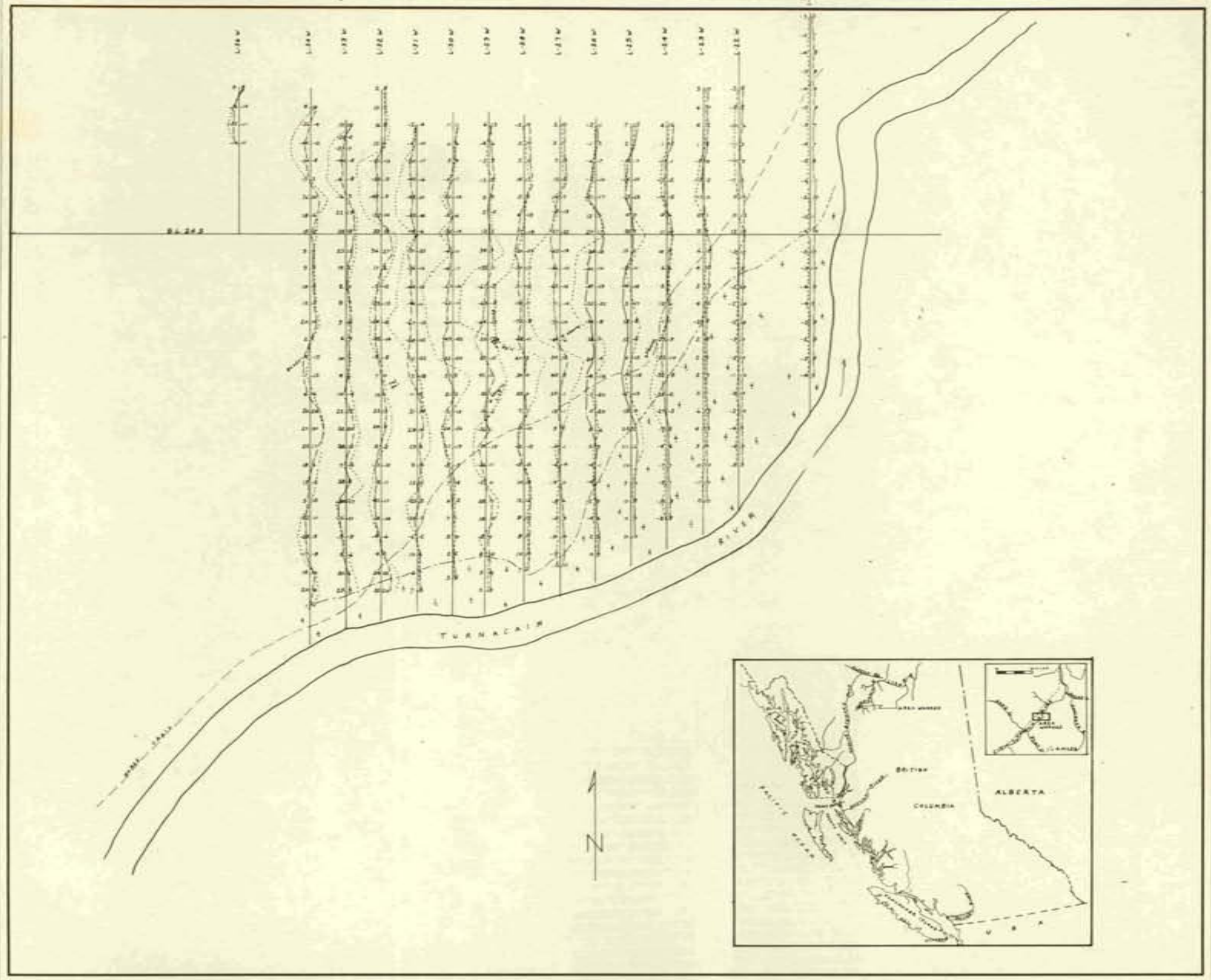
Figure 1/66

No.	Location & Description	S/Surface C/Cut D/Drill Core	Au oz.	Ag oz.	Ni %	S %	Cu %	Cp %
A.	DISCOVERY SHOWING							
1.	Massive footwall	S	Tr.	Tr.	1.14		4.35	0.09
2.	Diss. -slight sieve text.	S	0.02	Tr.	0.90		0.39	0.05
3.	3 spec.--footwall	C	Tr.	0.28	1.78		4.10	0.10
4.	Sieve textured material	C	Tr.	0.16	1.76		0.18	0.13
5.	S_2 Diss. in peridotite	C	Tr.	0.44	1.41		0.27	0.08
6.	Diss. S_2 in DDH 5.5 ft.	D	Tr.	0.30	0.55	3.14	0.10	
7.	Diss. S_2 Perid. 1.5 ft.	D	Tr.	0.30	0.48	4.10	0.17	
8.	Diss. sieve tex. 5.0 ft.	D	Tr.	1.20	1.15	7.26	0.19	
9.	Diss. sieve tex. 4.5 ft.	D	Tr.	0.30	1.91	4.53	0.17	
10.	Diss. perid. 2.5 ft.	D	Tr.	0.20	0.46	1.24	0.10	
11.	Diss. perid. 4.5 ft.	D	Tr.	0.30	0.45	1.06	0.04	
12.	Diss. perid. 1.5 ft.	D	Tr.	0.10	0.34	1.53	0.03	
13.	Diss. perid. 5.0 ft.	D	Tr.	1.00	0.35	1.10	0.03	
B.	HORSETRAIL							
14.	West of EM anomaly @1700S 3700W	S	Tr.	0.12	2.77	3.63	0.37	
15.	" " "(veined perid.) 1700S 3600W	C	Tr.	1.20	1.63)		0.29)	
16.	As 15 but sieve textured	C	Tr.	0.30	1.25)	Comp.	0.18)	Comp.
17.	As 15 but hard perid.,sl.diss.S_2	C	Tr.	0.30	0.91)	10.3%	0.14)	0.08%
18.	Sml.veined exp.in perid. @1350S 1400W	C	Tr.	0.20	1.20)		0.71)	
19.	Large rock pile NW of 18.	S	Tr.	0.40	0.29		0.06	
20.	"Crevasse" showing in mud E. of river @ 4000S 3200W (50% pyrrhotite)	S	Tr.	0.20	0.23)		0.08)	
21.	As 20. but 15% pyrrhotite	S	Tr.	0.20	0.34)	6.68	0.06)	0.02
22.	As 20 but perid.country rocks	S	Tr.	0.40	0.18)		0.04)	
23.	"Spaghetti" gabbro @ 1700S,3800W and hard peridotite	S	Tr.	0.70	0.84)	7.85	0.16)	0.05
24.	As 23 but diss. S_2 in perid.	S	Tr.	0.40	0.72)		0.18)	
25.	Red spring country rock (diss. S_2 in P) @ 2300S, 2450W	S	0.02	0.60	0.40		0.13	0.05
26.	Grab from sheared "pillar" deposit @ 2450S, 2900W	S	Tr.	0.06	0.75		0.10	0.07
C.	EAST END							
27.	50% diss. S_2 in serp. perid.	S	0.02	Tr.	2.15		0.44	0.10
28.	C.G.perid.,sl. diss. S_2	S	0.01	Tr.	0.20		0.16	0.01
29.	Sl.veining in"spaghetti gabbro"	S	0.01	0.50	0.05		3.25	Tr.
30.	Composite-2 sieve text.showings	S	Tr.	0.90	0.91		0.74	0.10
31.	Float 100' East of River-sieve t.	S	Tr.	0.10	0.55		0.34	0.04
32.	Larger blebs S_2 in black amorphous serpentinized perid.and pyroxenite E. end	C	Tr.	Tr.	0.62		0.23	0.03
33.	"Whitish" spaghetti gabbro-cliff area	S	Tr.	0.04	0.70		0.42	0.07
34.	Cut on sieve text.material near H.L.S. (6')	C	0.02	0.28	1.75		0.39	0.08

Figure 1/66 (cont'd)

No.	Location & Description	S C D	oz. Au	oz. Ag	% Ni	% S	% Cu	% Co
	G. Davis-highly altered pyrrhotitic							
35.	Peridotite 2 mi. NW of Horsetrail	S	Tr.	Tr.	0.13		0.40	
36.	As 35 but diss. S_2 in hard P.	S	Tr.	0.10	0.02		0.45	0.01
	L. Kilburn Sampling East End (uphill)							
37.		S			0.88	7.11	0.63	0.14
38.		C			0.82	14.42	1.64	0.17
39.		C			0.69	14.40	0.29	0.10

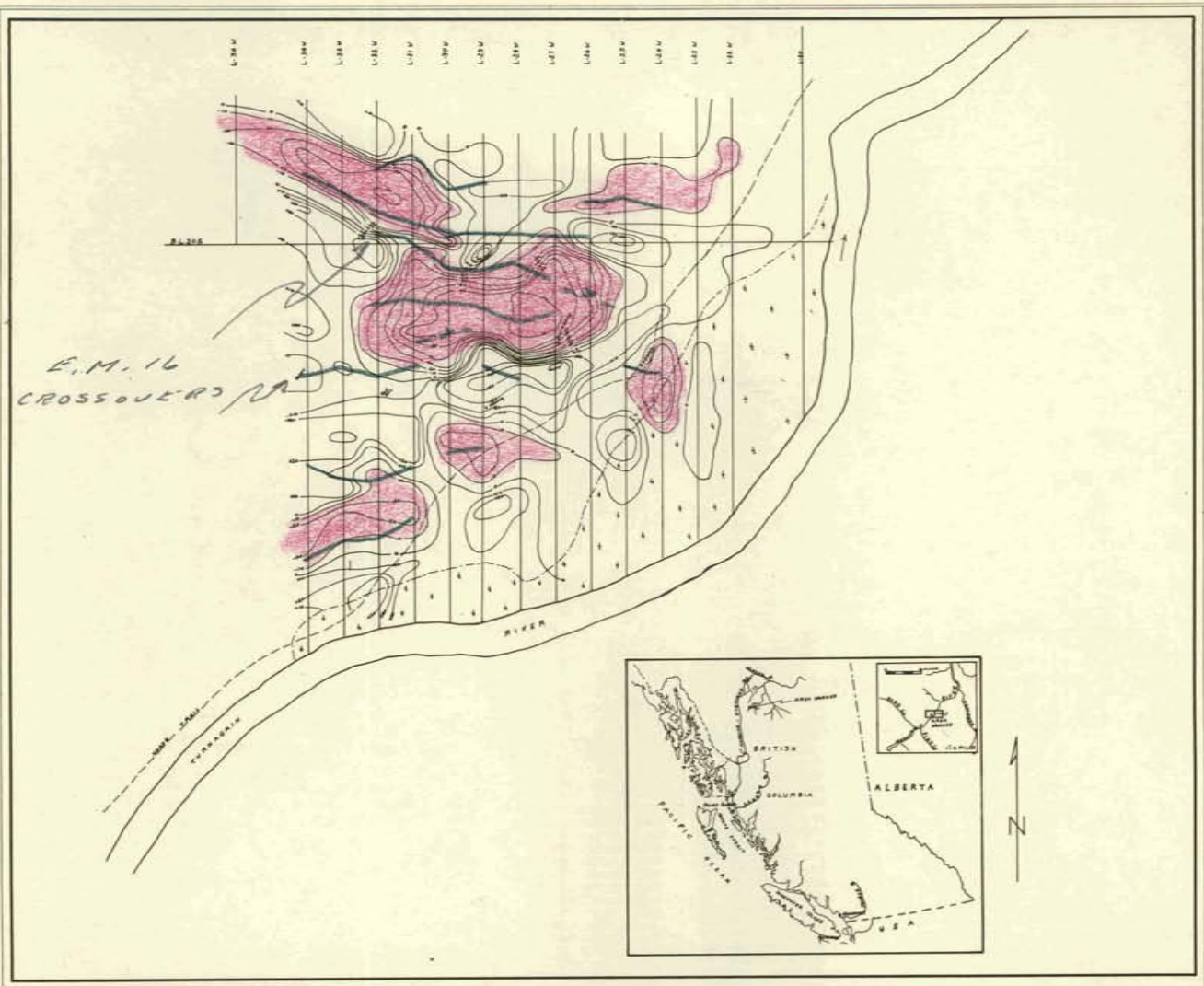

RIVER
N
limit MKIV/67



LEGEND

IN PHASE ------- } C.80%
OUT OF PHASE — — —
Receiver on South for all lines
200' CABLE Separation
RONKA-MARK 3
corrected for slope

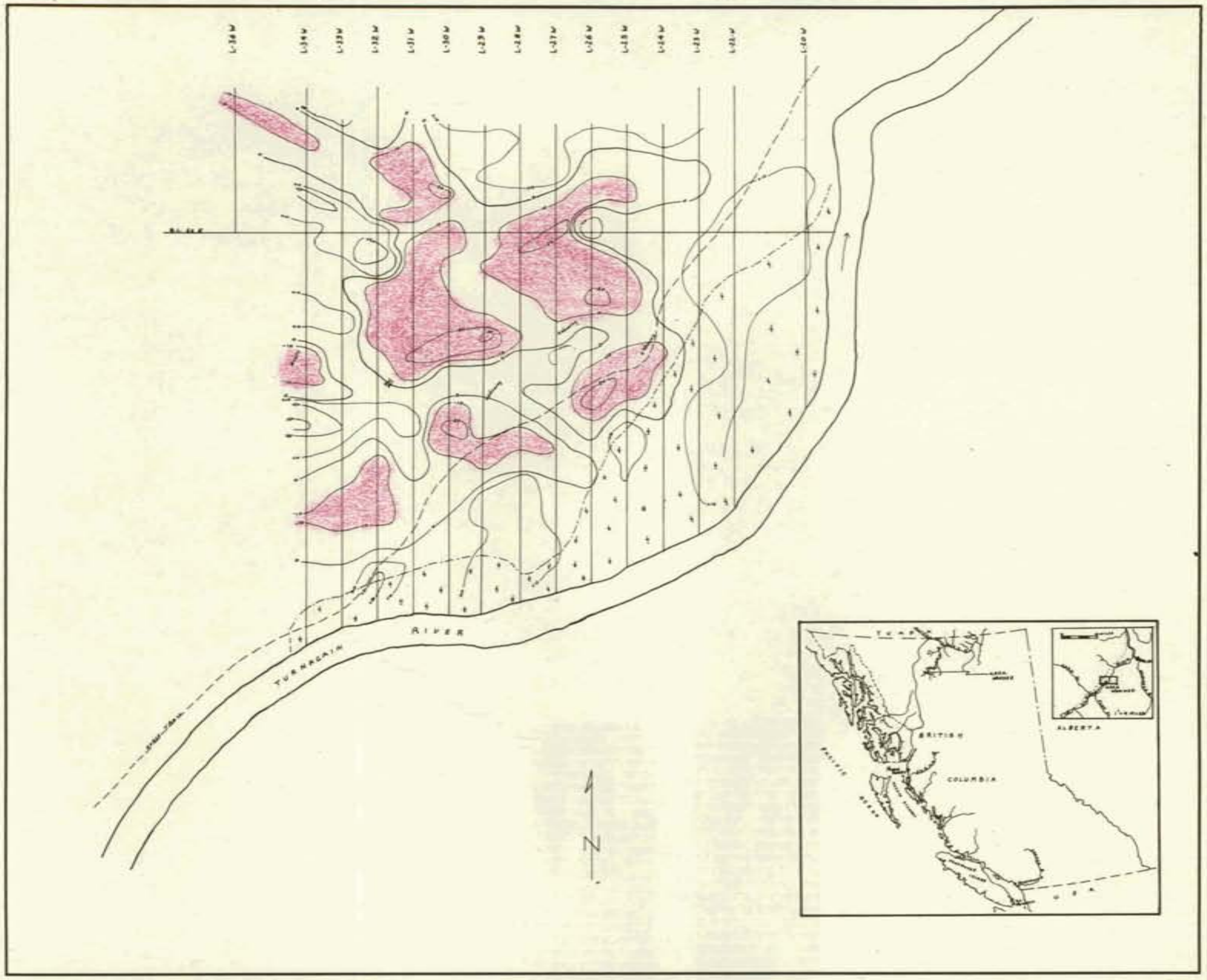
COMPANY... FALCONBRIDGE NICKEL MINES LTD.
PROPERTY... TURNACAIN CY. N.
LOCATION...
WORKING PLACE... HORSETRAIL SHOWING
TYPE OF MAP... RONKA-M.3-200' CABLE
BASED ON...
DATE... 1964
DRAWN BY... S.F.
DATE OF WORK... SEPT.-OCT. 1964



SCALE: 1 INCH TO 100'

Company . . FALCONBRIDGE NICKEL MINES LTD.
Property . . TURNAGAIN CU-NI/T46-66-C
Location . .
Drawing Place . . HORSETAIL SURVEYS
Type of Map . . SINGLE-M@ SURVEY 200' CABLE
Based on . . IN PHASE CONTOUR IN %

Date . . Dec. 1966
Drawn by . . A.P.
Date of Work . . Sept. - Oct. 1966



SCALE: 1 INCH TO 100'

COMPANY .. FALCONBRIDGE NICKEL MINES LTD.
PROPERTY .. TURNAGAIN Cu-Ni
LOCATION ..

WORKING PLACE ..
TYPE OF MAP ..
BASED ON .. OUT OF PHASE CONTOUR

DATE ..
DRAWN BY ..
DATE OF WORK .. SEPT. - OCT.

MAP REF. NO.: T.6.S/66/A

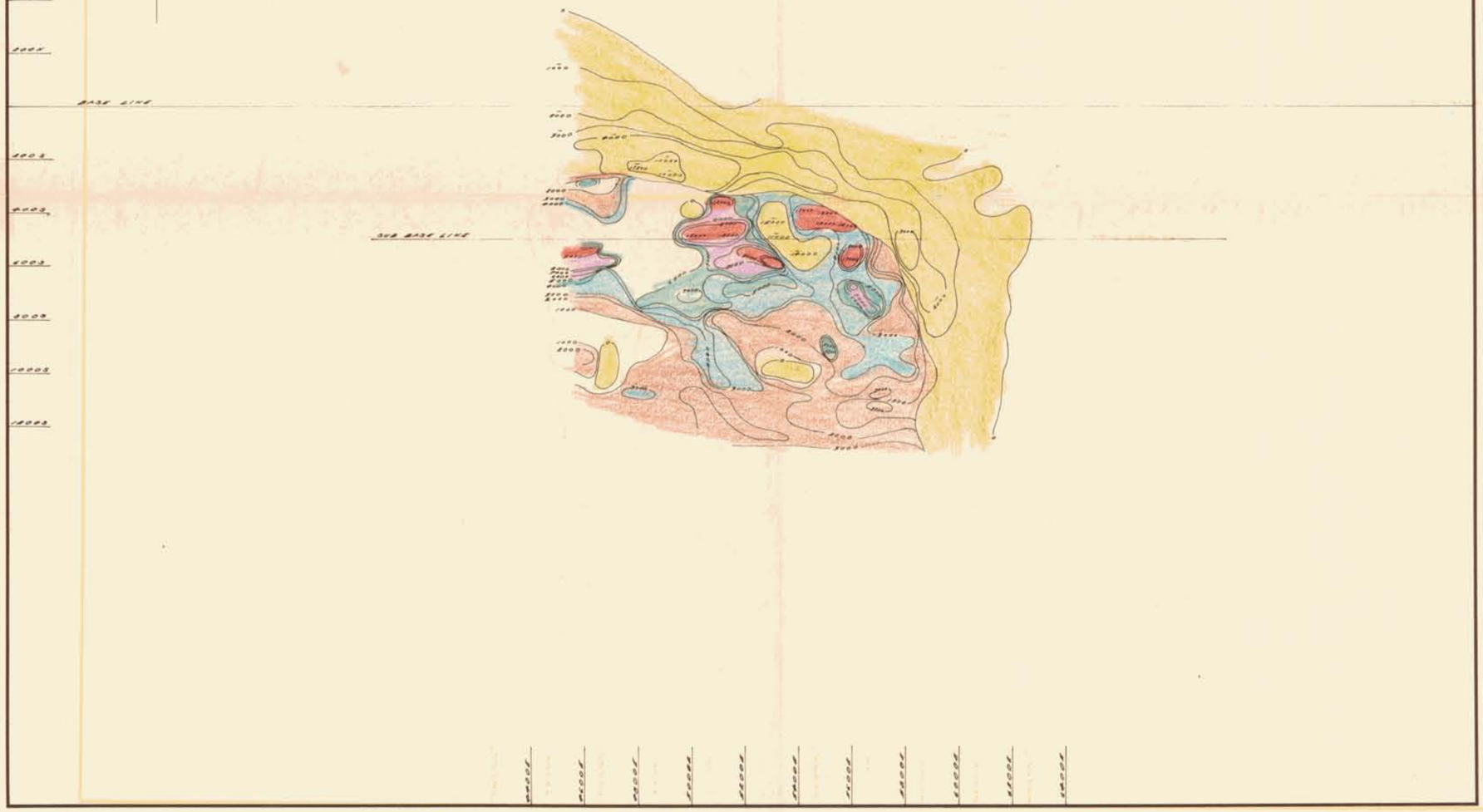
INSTRUMENT M.E.I. FLUXGATE

ADJUSTED TO ZERO BACKGROUND ON SAND FLATS ONE MILE SOUTH

CONTOUR INTERVAL 1000 Γ

GAMMAS

- MINUS READINGS
- 0 - 1000
- 1000 - 2000
- 2000 - 3000
- 3000 - 4000
- 4000 - 5000
- 5000 - 6000
- 6000 - 7000
- 7000 - 8000
- 8000 - 9000
- 9000 - 10000
- OVER 10000



SCALE: 1 INCH TO 200 FEET

COMPANY . . FALCONBRIDGE NICKEL MINES LTD.

PROPERTY . . TURNAGAIN CU-NI

LOCATION . . TURNAGAIN RIVER AREA

WORKING PLACE . . EAST END SHOWING

TYPE OF MAP . . MAGNETOMETER

BASED ON . . FIELD WORK BY J.J.H.

DATE . . JANUARY 1967

DRAWN BY . . E.J.B.

DATE OF WORK . . AUGUST 1966

MAP REF. NO.: F.G.S/66/B

INSTRUMENT: M.E. HUNTECH

ADJUSTED TO ZERO BACKGROUND ON BASE MATS ONE MILE SOUTH

CONTOUR INTERVAL - 1000 Γ

GAMMAS

- MINUS READINGS
- 0 - 1000
- 1000 - 2000
- 2000 - 3000
- 3000 - 4000
- 4000 - 5000
- 5000 - 6000
- 6000 - 7000
- 7000 - 8000
- 8000 - 9000
- 9000 - 10000
- OVER 10000

OUTCROP

SCHIST

PERIDOTITE

BOULDER MORAINE

BASE LINE

TURNAGAIN RIVER

SCALE: 1 INCH TO 200 FEET

COMPANY . . FALCONBRIDGE NICKEL MINES LTD.

PROPERTY . . TURNAGAIN CU-NI

LOCATION . . TURNAGAIN RIVER AREA

WORKING PLACE . . DISCOVERY SHOWING

TYPE OF MAP . . MAGNETOMETER

BASED ON . . FIELD WORK BY J.J.H.

DATE . . JANUARY 1967

DRAWN BY . . A.N.B

DATE OF WORK . . AUGUST 1966

MAP REF. NO.:

L-36 W L-34 W L-33 W L-32 W L-31 W L-30 W L-29 W L-28 W L-27 W L-26 W L-25 W L-24 W L-23 W L-22 W L-20 W L-18 W L-16 W L-14 W L-12 W L-10 W L-8 W L-6 W L-4 W L-2 W L-0 L-2 E L-4 E L-6 E

BL 0+00

BL 20 S

This is a transit line

TURNAGAIN RIVER

LEGEND

RONKA MARK II. 200' CABLE
Receiver on south for all lines
IN PHASE ----------
OUT OF PHASE — — — } 1"=80'

200 0 200 400 600 800 1000 1200 1400 1600 1800

SCALE: 1 INCH TO 200'

COMPANY .. FALCONBRIDGE NICKEL MINES LTD.
PROPERTY .. TURNAGAIN CU-NI. TGB-66-8
LOCATION ..

WORKING PLACE .. HORSETRAIL SHOWING
TYPE OF MAP .. RONKA - MARK II 200 CABLE
BASED ON .. IN PHASE ---------- } 1"=80'
OUT OF PHASE — — — }

DATE .. NOV. 1966
DRAWN BY .. S.P.
DATE OF WORK .. SEPT.-OCT. 1966

MAP REF. NO.: T.G.3/66/A

N

(TURN)

Davis Staking (July)

Davis Staking (Silver Standard)
(Late September)

Schist
Basic intrusives

Outline of better airborne magnetometer anomaly

A. Davis Staking (July)

Cobalt M.C.

Pyrrhotite M.C.

Davis Staking (Cassiar)
(Late September)

Prominent gossan zones

E.M. Anomalies

Basic intrusives
Schist

(TURN)

Cassiar Staking (August)

HARD CREEK

TURNAGAIN RIVER

RAT CREEK

FALCONBRIDGE STAKING

DAVIS STAKING

SILVER STANDARD STAKING

CASSIAR STAKING

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000

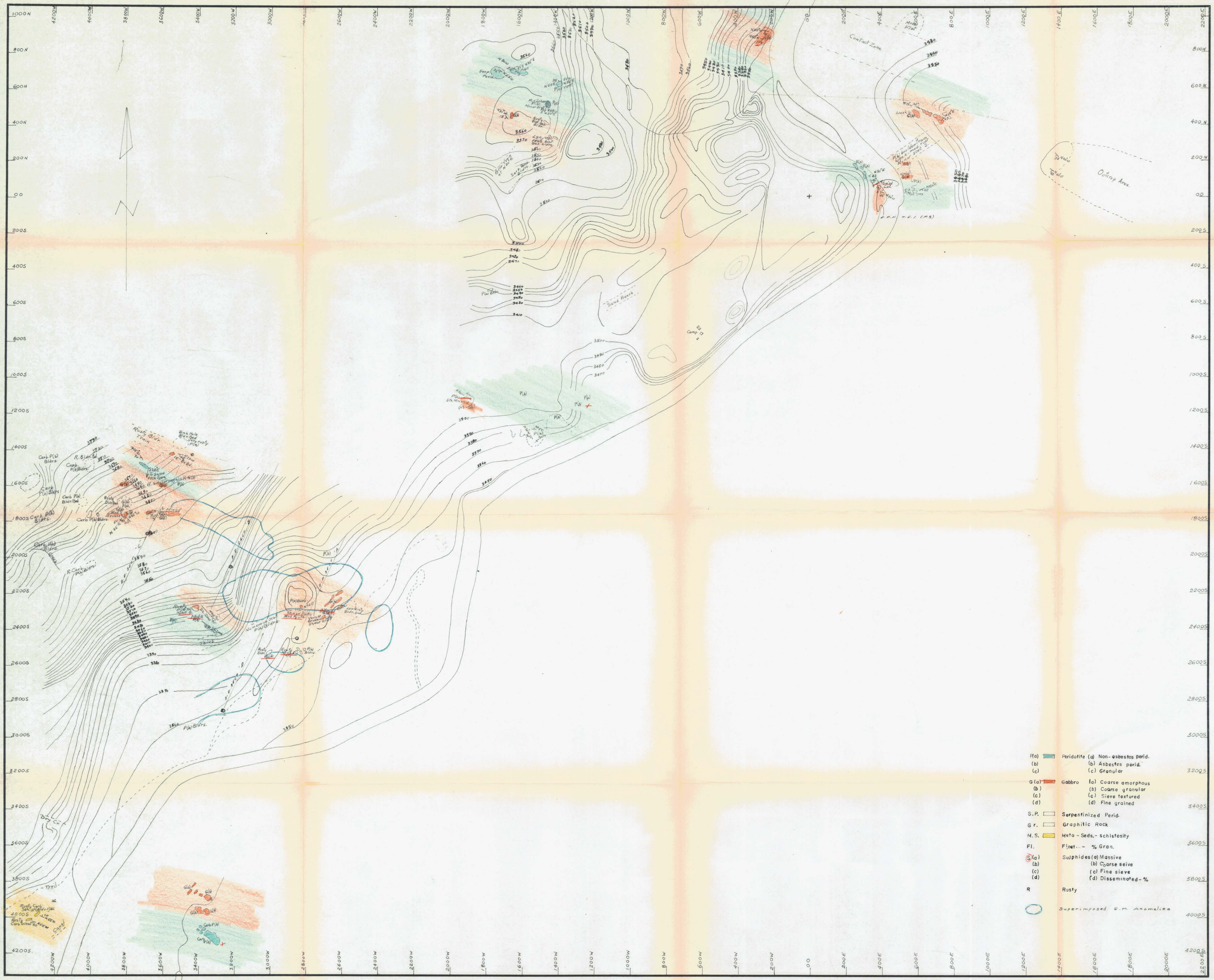
SCALE: 1 INCH TO 1000 FEET

COMPANY . . FALCONBRIDGE NICKEL MINES LTD.
PROPERTY . . TURN M.C. T.G.3-66-A
LOCATION . . 58° N. 128° W.

WORKING PLACE . .
TYPE OF MAP . . CLAIM MAP
BASED ON . .

DATE . . OCT. 1966
DRAWN BY . . D.H.B.
DATE OF WORK . .

MAP REF. NO.: TG 4/66 (c) Horsetrail



SCALE: 1 INCH TO 200 FEET

COMPANY .. FALCONBRIDGE NICKEL MINES LTD.
PROPERTY .. TURN M.C. TG 4-66-C
LOCATION .. 58° 30'N., 126° 50'W.

WORKING PLACE ..
TYPE OF MAP .. TOPOGRAPHIC - GEOLOGIC
BASED ON .. FIELD WORK

DATE .. OCTOBER - 1966
DRAWN BY .. D. H. B.
DATE OF WORK .. SEPT. - 1966