4097

GEOLOGICAL REPORT

ON

NORTH GROUP MINERAL CLAIMS

TURNAGAIN RIVER, B.C.

Hard Creek Mines Limited

July 1, 1972 - January 15, 1973

Lat. 58°28'00 N.
Long. 128°47'00 W.

N.T.S. 104-I-7

Vancouver, B.C.
January 30, 1973

T. Clark
J. J. McDougall, P.Eng.

CONTENTS

ILLUSTRATIONS

A. INTRODUCTION

A second summer of geological mapping has been completed (summer of 1972) on the ultramafic complex underlying the Falconbridge claim groups (North and South) and on the neighbouring rocks. The present report supplements earlier reports by the writer in 1971 and earlier 1972. Previous work on the property was covered in the report by Clark (1971).

B. LOCATION, ACCESS AND PERSONNEL

The property lies astride the Turnagain River east of Hard Creek in the Liard M.D. of northern British Columbia and is located on the N.T.S. Cry Lake Sheet 104I (Lat. $58^{o}28'$N, Long. $128^{o}47'$W).

Access during the summer was provided by wheeled aircraft from Watson Lake and by the Company-owned helicopter.

The writer was capably assisted in his work by student Bob Sharpe and by J. J. McDougall during a supervisory visit toward the end of the season.

C. GENERAL GEOLOGY

The ultramafic body under study is a complex composed mainly of dunite, peridotite, pyroxene-rich peridotite, olivine pyroxenite and pyroxenite. It seems probable that the ultramafic rocks are similar to those of the so-called "zoned complexes" found in south-eastern Alaska and in several localities in the British Columbia Cordillera.

The field observations and laboratory data bearing on the nature of the rocks are as follows:

(1) The (Main) complex is rudely zoned, having a core of dunite which is surrounded by peridotite and the various pyroxene-rich rocks. The footwall side of the complex is probably fault bounded whereas the hangingwall side may not be.

(2) The contact between the dunite core and the surrounding, more pyroxene-rich rocks is evidently a highly irregular one. The excellent exposures in the northwest show the contact to be undulating. Outcrop distribution in the southeast also suggests a convoluted dunite-peridotite contact.

With the exception of the contacts between the dunite core and the enclosing rocks, and between pyroxenite veins and host rocks, contacts between rock types are usually gradational. Contacts between the dunite core and the surrounding rocks in the far northwest are often sharp although intrusive relationships are contradictory. The development of a sheath of green slip-fibre serpentine is conspicuous at one such contact. From examination of drill core taken from the hangingwall area in the southwest, gradational contacts are apparent between dunite layers and the more pyroxene-rich rocks. However, transitions are, at the same time, abrupt.

D. FIELD OBSERVATIONS DURING THE 1972 SEASON

(1) Igneous Layering in Pyroxene-rich Rocks

A more detailed examination was carried out on the pyroxene-rich in G. Davis' claim group to the north of Falconbridge's North group.

In this area igneous layering was seen to be more widespread than previously anticipated. The layering is characterized by sudden changes in the modal pyroxene-to-olivine ratio. Thus within the olivine pyroxenite there occur interlayers of peridotite. Both pyroxene and olivine are normally cumulus phases, however, in several places there are a few interlayers of peridotite in which pyroxene occurs as post-cumulus, poikilitic grains. In other parts of the complex, however, where pyroxene-rich rocks are abundant, igneous layering is much less conspicuous.

(2) Stratigraphy Above and Below the Main Complex

A single traverse across the footwall country rock succession turned up only slates and phyllites (i.e. northeast of the complex toward the Cassiar granitic batholith). In contrast, the succession above (to the southwest of) the complex consists of less than 1,000 feet of slates which are followed by about 5,000 feet of volcanic and intrusive rocks of varied composition. The abundance of ribbon and massive chert increases toward the southwest.

(3) Contact Metamorphic Aureole

The sedimentary rocks in the hangingwall of the Main complex within the Falconbridge claim group have been converted to spotted hornfels through contact metamorphism by the ultramafic rocks. The aureole is notably thin -- approximately 200 feet wide. In contrast, the footwall sediments show no alteration, a fact which supports the idea that the footwall contact is marked by a fault. In thin section, the spots turn out to consist of aggregates of quartz, muscovite and possible plagioclase, an assemblage consistent with the albite-epidote hornfels facies of contact metamorphism.

(4) Sulphides

Where assay data are sufficient, a close inspection of drill core shows a good correlation between nickel content and rock type, dunites carrying substantially more nickel than pyroxenites (e.g. DDH 10, 21). It is seen that most of the highest nickel and copper values (for Ni greater than, say, 1/2%) occur over very short core intervals (measured in inches) and that these heavy sulphide concentrations occur in any rock type. Examination of sulphide textures reveals good evidence that sulphides having heaviest concentration have been remobilized. Typical evidence includes streaked out and lenticular patches of sulphide, thin sulphide films along silicate cleavages, secondary sulphide replacing serpentine, veinlets up to several millimeters thick of pyrrhotite and chalcopyrite, lacey to fine grained impregnations, broken silicate grains disclosing a ring of sulphide contained within silicate, occurrence of very fine graphite with the lacey sulphide impregnations. That some of the sulphide has been added from an outside source is suggested by the occurrence of grains of molybdenite in several parts of the drill core.

E. DETAILS OF GEOLOGY OF THE NORTH GROUP CLAIMS

East of the Turnagain River, the ultramafic complex is characterized by a small body of dunite which grades into pyroxene-poor peridotite. The dunitic rock grades quickly into the surrounding peridotite in which the pyroxene typically occurs as poikilitic grains. Between the dunite body and the Turnagain River the rocks consist of rather monotonous peridotite with occasional lenses of olivine pyroxenite most of which contain minor sulphide concentrations. Veins of pegmatitic olivine pyroxenite and pyroxenite are locally characteristic. Near the

dunite body in a number of places the peridotite contains small lenticular to rectangular inclusions of medium-grained olivine pyroxenite or pyroxenite. The dunite itself contains a large block (about 80 feet long) of layered olivine pyroxenite and peridotite. The extreme east end of the ultramafic complex has abundant medium-grained olivine pyroxenite with minor interlayered peridotite. Characteristically, these rocks weather a rusty brown colour. The eastern termination of the complex is apparently marked by a fault. In fact it is likely that faults bound all parts of the complex east of the Turnagain River. Slates within 50 feet of the peridotite footwall east of the dunite body show no evidence of heating and, in addition, the strike of the slates is truncated by the peridotite contact.

Significant sulphide mineralization (pyrrhotite, pentlandite, chalcopyrite in a net texture) occurs associated with a layer of olivine pyroxenite very close to the footwall near the east end of the complex. The ore zone is small, perhaps 15 by 5 feet and occurs in peridotite, right at the contact with the pyroxenite-rich layer.

The Discovery showing on the Turnagain River contains heavy concentrations of net textured pyrrhotite, pentlandite and chalcopyrite in a dipping layer from 2-4 feet thick and about 20 feet long in exposed strike length. The host rock for the mineralization is black, aphanitic serpentinite and the surrounding rock is highly serpentinized pyroxenite. The outcrops along the river near the showing all show evidence of faulting - they are highly sheared in places and contain a considerable amount of disseminated graphite.

A third important showing occurs on the north side of the Turnagain River on claim, Turn 23. The sulphides generally are net textured to disseminated and occur in ordinary peridotite. Pyroxene-rich rocks are conspicuous by their absence on the outcrop. Some of the sulphides in this locality are apparently post-serpentinization since some massive, vein-like pyrrhotite-chalcopyrite is seen to replace fibrous serpentine.

Those claims of the North group which lie to the north and west of the Turnagain River are underlain in large part by the large dunite core of the Main complex. The complex is intruded by two small igneous intrusions. One of these is gabbroic in composition and the other has a wide range of composition, varying from gabbro to granodiorite. Brecciation and serpentinization appear to be related to faulting which has occurred in the central and northwest parts of the Main complex.

T. Clark

January 30, 1973

FALCONBRIDGE NICKEL MINES LIMITED
1112 West Pender Street, Vancouver 1, B.C., Canada
Telex 04-53245
Telephone (604) 682-6242

January 30, 1973

The Mining Recorder
Liard Mining Division

Dear Sir:

This is to certify that the geological mapping covered by the appended report on the North Group of the Turnagain Nickel-Copper Prospect, was done under my direction and supervision.

Mr. Thomas Clark, the author of this work, obtained his B.Sc. (Honours Geology) from the University of Toronto in 1968 and his M.Sc. from the same institution in 1970. His M.Sc. thesis topic was entitled, "Equilibria between iron-nickel divines and iron-nickel sulphides".

Mr. Clark has been attending Queen's University, Kingston, Ontario since 1970 as a Ph.D. candidate pursuing a more detailed study of the iron-nickel equilibria field.

Yours very truly,

FALCONBRIDGE NICKEL MINES LIMITED

J. J. McDougall, P.Eng.

LEGEND

Sedimentary rocks

1, Undivided

Volcanic rocks

2, Undivided

Ultramafic rocks

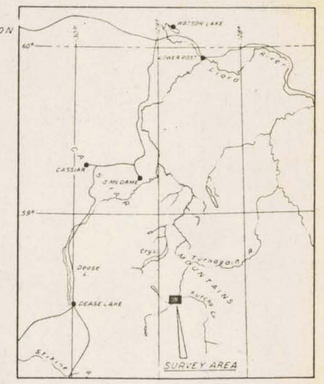
3, Undivided; 3a, Dunite and pyroxene-poor peridotite; 3b, Peridotite; 3c, Pyroxene-rich ultramafic rocks – undivided; 3c1, Pyroxene-rich peridotite; 3c2, Olivine pyroxenite; 3c3, Pyroxenite; 3d, Mafic and ultramafic dike rocks – undivided; 3e, Hornblendite; 3f, Amphibole-bearing ultramafic rocks; 3g, Mica-bearing ultramafic rocks; 3h, Serpentinite: 3h[a], Serpentinized dunite; 3j, Crosc-fibre serpentine; 3k, banded, due to serpentine veinlets; 3m, Olivine chromitite layers, veins, pods; 3n, Rodingite veins, pods; 3p, Talc-carbonate alteration; 3q, pegmatitic.

Acid to Basic intrusive rocks

4, Undivided; 4a, Granodiorite and granite; 4b, Diorite; 4c, Gabbro.

- sedimentary layering
- outcrop (large, small)
- lithologic contact (approximate)
- " " (inferred)
- lineament
- fault
- pit
- Po pyrrhotite
- Pn pentlandite
- Cp chalcopyrite
- graph graphite

Geology by T. Clark, 1971, 1972



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Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4097 MAP #1

FALCONBRIDGE NICKEL MINES LIMITED

NORTH GROUP M.C., HARD CREEK MINES LTD.

Turnagain River, Cassiar Mtns., B.C.
Liard M.D.

GEOLOGY and Claim Locations

James McGregor P.Eng.

WORKING PLACE: North Group Claims
BASED ON: Mapping by T. Clark
DATE: January 30, 1973
DRAWN BY: H.T. & T.C.
DATE OF WORK: 1971, 1972-3
MAP REF. NO.
N.T.S. NO. 104-I-7
FIG. NO. 1/72

To accompany geological report by T. Clark, on "Turnagain Nickel-Copper Prospect", dated Jan 30, 1973

58°28'30" N
129°49' W
40,000 E
45,000 E
50,000 E
55,000 E
60,000 E
N
0 500 1000 2000 3000 4000 FEET

W, 67° 52'

58° 22' 30" N

Turnagain River

Aeromagnetic Interpretation

LEGEND

Sedimentary rocks

1 — I, Undivided; 1a, Shale; 1b, Slate; 1c, Phyllite; 1d, Siltstone; 1e, laminated; 1f, graphitic, usually black; 1g, micaceous flakes visible.

Ultramafic rocks

3 — 3, Undivided; 3a, Dunite and pyroxene-poor peridotite; 3b, Peridotite; 3c, Pyroxene-rich ultramafic rocks — undivided; 3ci, Pyroxene-rich peridotite; 3cx, Olivine pyroxenite; 3cy, Pyroxenite; 3d, Mafic and ultramafic dikes — undivided; 3e, Hornblendite; 3f, Amphibole-bearing ultramafic rocks; 3g, Mica-bearing ultramafic rocks; 3h, Serpentinite; 3h[a], Serpentinized dunite; 3j, Cross-fibre serpentine; 3k, banded; due to serpentine veinlets; 3m, Olivine chromitite layers, veins, pods; 3n, Redingtite veins, pods; 3p, Talc-carbonate alteration; 3q, pegmatite.

- sedimentary layering (inclined)
- schistosity (inclined, vertical)
- igneous layering (inclined)
- jointing (inclined, vertical)
- lineation, with plunge indicated
- drag fold, with plunge indicated
- outcrop (large, small)
- lithological boundary (defined, approximate, inferred)
- lineament
- pit
- drill hole
- Po pyrrhotite
- Pn pentlandite
- Cp chalcopyrite
- graph graphite
- G gossan

Geology by T. Clark, 1971, 1972.

NORTH GROUP M.C. (EAST PART)
HARD CREEK MINES LTD.
Turnagain River, Liard M.D., B.C.
GEOLOGY
Date of work: Summers 1971, 72-3
N.T.S: 104-I
Date: January 30, 1973 Fig. 2/72

SCALE
0 200 400 800
1 in = 400 ft

N

James W. Morgan
P. Eng.

To accompany geological report by T. Clark, on "Turnagain Nickel-Copper Prospect" dated Jan 30, 1973