

420165W0012 2.11629 SEELEY LAKE

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GEOLOGICAL REPORT OF THE JOA OPTION

(Geordie Lake Property)

ST. JOE CANADA INC.

A.D. MacTavish J. Lukosius-Sanders R. Jowett

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Summary:

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A geological mapping program, completed during July, August and September of 1987, over St. Joe Canada Inc.'s Joa Option portion of their Geordie Lake Property, has outlined, on surface, a disseminated, Cu-Pd-(Pt)-Ag-Ti rich sulphide zone approximately 1500m in length and between 3 and 20m in width. The mineralized zone occurs within potassically altered, alkaline gabbro directly adjacent to a gabbro/quartz syenite contact, within the Coldwell Alkaline Complex.

Rock types mapped during the program include gabbro, alkali-feldspar quartz gabbro, K-spar porphyry, ferro-augite porphyry, amphibole-plagioclase porphyry dykes, lamprophyre dykes, and trachyte dykes.

Recommendations:

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- 1) Extend IP-EM coverage to the north and south to completely cover the known surface extension of the mineralized contact zone; extend IP-EM coverage to the west to cover the western contact of the main gabbro body. This survey will total 16 line kilometres.
- 2) Three thousand metres of diamond drilling to test the known mineralized zone at depth and along strike; as well as to determine the dip of the gabbro/syenite contact with greater accuracy.
- 3) Initiate a stripping and channel sampling program of the mineralized zone to better determine surface grades and widths.
- 4) Map, in detail, all areas exposed by surface stripping

Introduction:

A geological mapping program was completed over the Joa Option portion of St. Joe Canada Inc.'s Geordie Lake Property, near Marathon, Ontario, between July 4 and September 4, 1987. The group comprises 26 unpatented mining claims (see Figure 2), numbered TB864004 to 864006, inclusive; 864022 and 864023; 864025 to 864027, inclusive; 864064 to 864073, inclusive; 864098 to 864100, inclusive; 864132 and 864133; 929252 to 929254, inclusive; and 939266, located within the Thunder Bay Mining Division, Seeley Lake Area (G-613).



The purpose of the survey was to accurately map the location of a gabbro/syenite contact that was believed to host Cu-Fe-Ti-Ag and Platinum-group element mineralization.

Property Location and Access:

The Geordie Lake property is located in the Seeley Lake area of the Thunder Bay Mining Division, 14km northwest of the town of Marathon. Highway 17, the main route from Marathon to Thunder Bay, passes through the property and the interior of the claim group can be accessed by a logging road leading north from the highway.

The topography is extremely rugged with north-trending ridges often with scarp faces. The area is generally well wooded with spruce, pine, poplar and birch.

Previous Exploration:

Ameranium Mines Limited carried out magnetometer, electromagnetic and geological surveys on the property in 1964 in search for copper-nickel sulphides associated with gabbroic rocks. Disseminated chalcopyrite and chalcocite were known to occur in outcrop. There is no record of any exploration since this time and the copper prospect has never been evaluated for its platinum group metal potential.

General Geology:

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Lake property is located near the centre of the Geordie The Alkaline Complex (Figure 1), a multiphase Coldwell Neohelikian-aged 25km in diameter. Disseminated copper approximately intrusion mineralization occurs in a north-trending zone within Centre 2 gabbroic rocks in close proximity to a syenite contact. The zone of mineralization varies in width from 5 to 40cm and contains up to 5% sulphides. Magnetite is generally present in the mineralized zone and can constitute up to 40% of the rock.

Selective grab samples collected by the Ontario Geological Survey from the copper occurrence analyzed up to 1.73% copper, 394ppm nickel, 110ppb platinum, 2,130ppb palladium, 1,080ppb gold and 112ppm silver from chalcopyrite-magnetite-rich stringers and pods.

Fleck resources have outlined a low grade, large tonnage deposit on the eastern margin of the Coldwell Complex that is amenable to open pit mining (42.6 million tonnes grading 1.34g/t platinum and palladium and 0.46% copper), [Figure 1].

Survey Method:

The property was mapped at a scale of 1:5000 utilizing a cut grid with a north-south striking baseline and a 100m line-spacing interval. Every reasonable attempt was made to completed 100% mapping coverage over the whole property. All claim posts were tied into the existing grid. Mapping was done under the supervision of the authors (A.D. MacTavish and J. Lukosius-Sanders) ably assisted by J. Paul, P. Vasak, and J. McGorlick.

Property Geology:

The accompanying geology map (see back pocket) shows two narrow, variably altered gabbroic bodies almost totally surrounded by a sea of syenitic rocks. The felsic intrusive rocks encountered consist of alkali-feldspar quartz syenite, potassium-feldspar porphyry, ferro-augite syenite and some trachyte dykes. Other, but relatively minor, rock types observed throughout the map area were amphibole-plagioclase porphyry dykes and various, but unsubdivided lamprophyre dykes.

Few contacts were encountered during mapping, however those observed tend to be diffuse in nature (particularly the gabbro/syenite contacts) and are characterized by narrow mixed zones that were probably produced by assimilation.

1) <u>Gabbro</u>

The gabbroic rocks are grey-green to dark green in colour, massive to locally hornblende porphyritic, usually subophitic in texture, and exhibit abrupt grain-sized changes that range from fine to very coarse-grained, but are generally medium to coarse-grained. Mineralogically the rock is composed of 30 to 40% prismatic, greyish plagioclase grains; 40-50% subhedral to anhedral hornblende and diropyroxene; up to 10% finely disseminated subhedral to euhedral grains of magnetite; and occasionally a honey to greenish coloured interstitial apatite grain. Uralitization of pyroxenes and alteration of hornblende to fibrous amphiboles is common and minor saussuritization of plagioclase does occur. Minor hematization around plagioclase grains and traces of MnO coating along fractures were observed.

Volatile-rich magmatic fluids, derived from the syenite have permeated the outer edges of the gabbros and have sometimes penetrated deep within the mafic bodies along faults and fractures. These fluids have produced characteristic potassic alteration rims around plagioclase crystals and on occasion have totally replaced the primary plagioclase grains. Alteration increases in intensity as the gabbro/syenite contact is approached. Much of the alteration away from the contacts is irregular in nature producing 1 to 10cm in diameter, mottle-like patches composed of coarse-grained to locally pegmatitic K-spar, fibrous amphiboles, or forming narrow alteration halos along fractures and shears. For simplicity's sake the rock type resulting from the alteration process has been termed "Hybrid Gabbro," even though the processes active in its formation were more deuteric in nature than resulting from the assimilation of gabbro by syenite. Assimilations of the gabbro are only significant within the immediate but very narrow (1-3m) contact regions. Other evidence of the presence of volatile-rich fluids is the presence of fluorite, calcite and minor apatite within small vugs and cavities. Hematization of the ubiquitous magnetite is common.

The gabbros mapped in the northern portion of the map area have been extensively altered and in some areas have been rendered almost unrecognizable.

2) <u>Alkali-Feldspar Quartz Syenite</u>

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The alkali-feldspar quartz syenites underlie most of the eastern portions of the claim group. They are reddish to dark purplish-grey in colour, massive, and generally fine to medium-grained, although minor very coarse-grained patches were observed. Mineralogically the syenites are composed of 60 to 80% reddish alkali-feldspar, 8 to 40% amphiboles and pyroxenes, and trace to 10%, usually interstitial, quartz. Magnetite content is highly variable ranging from nil to 8 to 10%, however a trace to 1% is usually the norm. Minor very finely disseminated pyrite and trace to 5% pyrrhotite were occasionally observed.

Near the gabbro contact the syenite has been hybridized due to assimilation of the adjacent gabbro. This hybridization rarely exceeds 2 or 3m in width. Throughout the syenite body alteration along fractures and shears has produced narrow zones of very fine to fine-grained secondary amphiboles and chlorite. Occasionally this type of alteration, known as fenitization, has produced coarse-grained secondary amphiboles that occupy zones and patches. Occasionally stringers and blebs of pyrite are observed along the fenitized fractures.

3) <u>K-spar Porphyry</u>

The field term K-spar porphyry describes a syenite variety composed of potassium feldspar phenocrysts, set in an extremely fine-grained groundmass. In a few instances where the groundmass is somewhat coarser, it resembles a syenite. Ten to fifty percent of the rock consists of randomly oriented, tabular to prismatic potassium feldspar phenocrysts that range from medium to coarse-grained, are variably hematized and typically display Carlsbad twinning.

The occasionally hematized groundmass is aphanitic to very fine-grained, contains up to 50% mafic minerals, and ranges in colour from blue-black to brownish.

The rock is generally unmineralized, although from trace to 4% pyrite and trace chalcopyrite may be observed locally. Iron and manganese oxides coat fracture surfaces at a few localities. The K-spar porphyry is typically non-magnetic, but may rarely be weakly magnetic in patches.

4) Ferro-augite Syenite

This syenite variety is brown to dark brown in colour, strongly hematized, crumbly, friable and weathers orange in colour. It is composed of 40 to 70% coarse-grained to pegmatitic (greater than 4cm in diameter) amphiboles and dinopyroxenes; and 30 to 60% alkali feldspar of similar grains sizes, and a trace pyrite. No quartz was observed. The term ferro-augite syenite is a field designation only. Whether the dinopyroxene present is of the ferro-augite variety can only be determined by thin section analysis. This rock type does closely resemble the ferro-augite syenites positively identified in other areas of the Coldwell Complex.

5) <u>Dyke Rocks</u>

There are three varieties of dyke rocks present within the map area. The most abundant are the slightly to moderately magnetic They are composed, as their field name amphibole-plagioclase porphyries. indicates, of subhedral to euhedral phenocrysts of 1 to 2cm long, light greyish plagioclase feldspars, and 1 to 2mm in diameter, dark green amphiboles. The groundmass is aphanitic to very fine-grained and greyish-black in colour.

Lamprophyre dykes are quite variable in their appearance and mineralogy. They are usually moderately magnetic, dark grey in colour, very grained, quite calcareous and ocellar in nature. The ocellae are rounded blebs of calcite, rimmed by hematite, that may represent the presence of an immiscible liquid within the magma that formed the dyke. One massive lamprophyre dyke contained a large number of quartz syenite xenoliths while another was plagioclase-porphyritic. All of the lamprophyres contain a trace of very finely disseminated pyrite.

The final, and least abundant dyke rocks observed, are the trachyte dykes. They cut all of the major rock types, are pink in colour, aphanitic to very fine-grained, massive, non-magnetic, and usually less than 10cm in thickness. No sulphides were observed within them.

Structure:

The map area is dominated by numerous structural lineaments topographically expressed as deep, steep-sided valleys and ravines. These lineaments are probably faults that were less resistant to weathering and the action of glaciers. Offset of the gabbro/syenite contact is inferred in a number of locations, but never directly observed in outcrop.

Minor, very narrow (<1cm) shears are observed in most rock types. Fracturing is very common, especially within the quartz syenite, which tends to be quite brittle.

Most major lithologic contacts are somewhat irregular and are expressed as narrow zones rather than a sharp, well-defined line. The dips of these contacts are very difficult to determine. The eastern gabbro/syenite contact appears to dip westward at between 40 and 55°. The western contact could possibly dip in an eastward direction which might suggest that the main gabbro body is trough-shaped rather than sheet-like or dyke-like.

No layering, magnatically produced foliation, or mineral alignment were observed within the major rock types. Alignment of feldspars was observed in one of the plagiophyric dyke rocks.

Mineralization:

The most significant mineralization observed on the Joa Option occurs within the main gabbro body as a narrow (3 to 720m), irregular zone composed of 1 to 8% coarse blebs, narrow stringers and occasional small chalcopyrite, pyrrhotite, bornite, covellite and massive pods of chalcocite, adjacent to the eastern gabbro/quartz syenite directly contact. Eight to ten percent coarsely disseminated ilmenite and titaniferous magnetite also occurs within this zone. Elsewhere within the gabbro, sulphides are present as less than 1% very finely disseminated, magmatically derived, interstitial, chalcopyrite and pyrrhotite. The sulphides within the contact zone were concentrated by a number of processes; initially the disseminated, primary, magmatic chalcopyrite and were remobilized and highly reconcentrated by invading pyrrhotite volatile-rich deuteric fluids derived from the younger, adjacent quartz syenites; at a later time, probably after both the gabbro and the syenite had cooled somewhat, a deformation episode characterized by faulting, shearing and related fracturing, remobilized the copper-rich and Fe-Ti-rich mineral species forming thin stringers and pods. The most intense deformation occurred where three major lineaments intersect in the vicinity of lines 16+00 and 17+00S, $2+50\tilde{W}$ (now concealed beneath a small lake). Both the blebby and structurally remobilized sulphide mineralization increase in the vicinity of this structural intersection.

Analytical results received from 301 grab, parsel, and channel samples show that Cu, Pt, Pd, Au, Ag, Fe, and Ti all increase very dramatically near the eastern gabbro/syenite contact with an average width of 5 to 8 metres and a strike length of approximately 1500 metres. Values within the zone range from 0.05 to 1.6% Cu, 0.5 to 7.1 ppm Ag, 200 to 2380 ppb Pd, 31 to 119 ppb Pt, 39 to 253 ppb Au, and 0.93 to 3.05% Ti. Samples taken during an earlier preliminary survey ran between 0.46 and 15.0% Cu, 80 to 870 ppm Ni, 0.5 to 9.0 ppm Ag, 30 to 2900 ppb Pt, 380 to 5900 ppb Pd, and 28 to 330 ppb Au. A sample taken from a small massive chalcopyrite pod, from the main contact zone, by the Ministry of Northern Development and Mines ran 20.9% Cu, 330 ppm Co, 31.4% Fe, 70 ppm Ag, 880 ppb Pd, and 4250 ppb Pt (B.R. Schnieders, personal communication, 1986).

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CERTIFICATE OF QUALIFICATION

I, Allan MacTavish of 548 McMaster St., Thunder Bay, Ontario due hereby certify that:

- 1. I am a graduate of Laurentian University, Sudbury, Ontario and hold and Honours Bachelor of Science degree in geological sciences (1977).
- 2. I am a geologist employed by St. Joe Canada Inc. and have practiced my profession continuously since graduation.
- 3. I am a fellow, in good standing, of the Geological Association of Canada.
- 4. I personally supervised the fieldwork described herein.

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Technical Assessment Work Credits

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Date			Mining Recorder's Report of
October 7	,	1988	W8804-460

Bond Gold Canada Inc.	
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Type of survey and number of Assessment days credit per claim	Mining Claims Assessed
Geophysical	
Electromagnetic days	TB 864004-05
Magnetometer days	864022-23 864025 to 27 inclusive
Radiometric days	864064 to 73 inclusive 864099-100
Induced polarization days	864132 929252 to 54 inclusive
Other days	939266
Section 77 (19) See "Mining Claims Assessed" column	
Geological days	
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Special provision 🕅 Ground 🛛	
Credits have been reduced because of partial coverage of claims.	
Credits have been reduced because of corrections to work dates and figures of applicant.	
special credits under section 77 (16) for the following m	ining claims
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TB 864006	TB 864098
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not sufficiently covered by the survey] insufficient technical data filed
TB 864133 864131	
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Ministry of Northern Development and Mines

Ministère du Développement du Nord et des Mines

October 24, 1988

Your file: W8804-460 Our file: 2.11629

ONTARIO GEOLOGICAL SURVEY

ASSESSMENT FILES

OFFICE.

NCT 2.6 1988

Mining Recorder Ministry of Northern Development and Mines 435 James Street South P.O. Box 5000 Thunder Bay, Ontario P7C 5G6

Dear Sir:

Re: Notice of Intent dated October 7, 1988 - Geological Survey submitted on Mining Claims TB 864004 et al in the Area of Seely Lake

The assessment work credits, as listed with the above-mentioned Notice of Intent, have been approved as of the above date.

Please inform the recorded holder of these mining claims and so indicate on your records.

Yours sincerely,

W.R. Cowan Provincial Manager, Mining Lands Mines & Minerals Division

Whitney Block, Room 6610 Queen's Park Toronto, Ontario M7A 1W3

Telephone: (416) 965-4888

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Enclosure

cc: Mr. G.H. Ferguson Mining and Lands Commissioner Toronto, Ontario Resident Geologist Thunder Bay, Ontario Bond Gold Canada Inc. Thunder Bay, Ontario

Bond Gold Canada Inc. Toronto, Ontario





