

# GM 34104

REPORT ON DETAIL GEOLOGY OF THE ULTRAMAFIC FLOWS, GUYER LAKE AREA

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GROUPE MINIER SES

REPORT ON DETAIL  
GEOLOGY OF THE ULTRAMAFIC FLOWS  
GUYER LAKE AREA

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Ministère des Richesses Naturelles, Québec	
SERVICE DE LA DOCUMENTATION TECHNIQUE	
Date	24 AV 1978
No. RM	34104

Karen St. Seymour  
August 14, 1975

The correction of this report and many original ideas about the interpretation of the structure, as well as supervision of the mapping of the vent have been contributed by R.H. Desjardins.  
Marie-Laure Turcotte has been efficiently assisting in the field work.

Ultramafic flows were first noted in reconnaissance mapping during the first part of the programme. The ultramafic sequence exhibits its greatest thickness at Mt. Wallace in the lac Guyer area. The ultramafic and a small part of the associated mafic rocks have been mapped at a scale of 1 inch to 100 feet.

The area extends 9,000 feet east and west of an ancient volcano first noticed in the field by R. Desjardins, located at the eastern most edge of Mt. Wallace.

From the outer to the inner ring of the vent we find the following rock types:

- 1) gabbro
- 2) massive peridotite
- 3) gabbro
- 4) massive peridotite
- 5) quench komatiiteflows

The eastern half of the vent structure is well preserved while the western half is "truncated" by the picritic (?) basalts, micro-gabbros and basic tuffs of the mafic sequence which underlies the west and north plateau of Mt. Wallace and to the north shore of lac Echoe. The ultramafic volcanics continue east of the ancient volcano for 7,000 feet to 8,000 feet and are limited to the south by an extensive swamp and sand plains with outcrops of porphyritic granodiorite gneiss. To the north they are bordered by mafic volcanics along an imaginary line connecting lac Echoe with lac Coussin. To the east the ultramafics come in contact with a felsic tuff.

These ultramafic volcanics consist of:

- 1) minor basalt, gabbro and amphibolite
- 2) peridotite sills
- 3) pillowed komatiites
- 4) magnetite komatiites

South of the road and near the volcanic center only a wedge of ultramafic volcanics persists. This wedge comprises the same rock units as to the north and is bounded to the south by magnetite-chert iron formation. The iron formation is underlain by a conglomerate consisting of rounded boulders of granito-gneiss and angular fragments of ultramafics and iron formation (Plate VII). To the east, west and north, the ultramafics disappear under sand plains and glacial deposits.



PLATE VII

Tops of the ultramafic pillows north and south of the road are to the south and the units in the mafic and ultramafic sequences dip consistently 50° towards the north.

Disseminated pyrrhotite, chalcopyrite magnetite and chromite (?) are quite common in the ultramafic units and the nickel content ranges from 0.01 - 0.04%. The pillowed komatiites are more extensive between the s.w. end of lac Echo and the south end of lac Coussin. Eastwards from this point the magnetite komatiites predominate forming low east-west ridges.

The komatiites overly a pinkish-white biotite hornblende gneiss, near the north shore of lac Coussin and on the cliff east of the vent. The gneiss possibly represents the old basement. The same gneiss outcrops near the south-east shore of lac Echoe and directly north of the vent as "enclaves" or "windows" probably representing topographic highs of the paleoterrain. The rocks here have been altered from the contact with the hot lavas. It is not known if the porphyritic granodiorite gneiss bordering the south edge of the ultramafic unit represents a porphyritic phase of the old basement gneiss or just a younger intrusion. Petrographic description for both types of gneiss is given below.

Porphyritic granodiorite gneiss

Bio-HB gneiss (composition granitic-granodiorite)

A. Minerals

35 - 40% hornblende biotite  
quartz  
plagioclase  
K-feldspar (in groundmass and phenoxsts)

A. Minerals

Mafic constituents 35 - 40% biotite  
hornblende  
feldspars  
quartz

B. Texture

Porphyritic, gneissose to massive  
medium grained

B. Texture

Medium grained, slightly gneissose to  
massive

Altered variety: oxidized, biotite  
hornblende chloritized.

Quench Komatiite

The rock weathers to a white talcose surface with a brownish tint due to the oxidization of magnetite. In the field, it can easily be mistaken for an acid tuff if judged by appearance alone. What is believed to be quench layers together with half inch diameter gas vesicles filled with fine magnetite grains, form a rough outcrop surface. (Plate I)

Flow beds approximately one inch thick are quite characteristic of this rock. Superimposed different flow directions can be seen but the predominant direction is southeast.

The quench komatiite is distorted by kinking of the flow beds and a superimposed schistosity striking 080° and dipping -50° north.



Komatiite - Gas vesicles filled  
with mag. Quench textures -  
Flow N (end of hammer)

PLATE I

Hand specimen description

a) Minerals

talc  
serpentine  
olivine  
magnetite



Peridotitic Komatiite  
Quenched textures  
(end of hammer) N

PLATE II

b) Texture

Top layers of flows (quench layers)  
composed of talc and serpentine are  
foliated. Lower layer are massive  
to slightly foliated with aphanitic  
texture.

### Massive peridotite

This unit is massive and granulose in outcrop with a characteristic olive green colour. It overlies the quench komatiite flows and sometimes beds of pillowed komatiite lava.

### Peridotite sills

The distinction between the massive peridotite and the non-pillowed magnetite komatiite is based mainly on field criteria. The unit tends to form elongated bold outcrops with a rounded surface, brownish in colour, and sometimes with spheroids of magnetite. Differentiated sills have been observed and consist of, from top to bottom: a thick peridotitic layer, a very thin metapyroxenite (now amphibolite layer) and a thin gabbroic layer.

### Hand specimen description

#### a) Minerals

serpentine  
talc  
olivine  
tremolite  
pyrrhotite  
magnetite

#### b) Texture

Massive, aphanitic



Part of vent-alter  
peridotite - Gabbro  
Top of photo → N

### Magnetite komatiite

The rock is easily recognizable in the field by its mottled surface, due to rusty spheroids, about one quarter of an inch in diameter, rich in magnetite and possibly chromite grains.

The unit is usually massive with north-south cooling fractures and a greenish-brown color on weathered surface. It is also pillowed, with pillows having a minor axis up to one meter in length (Plate IV). The amount of the magnetite spheroids varies, sometimes forming up to 35% of the rock surface (Plate III).



PLATE III

#### Hand specimen description

a) Minerals talc

talc  
serpentine  
olivine  
magnetite



PLATE IV

b) Texture

Massive, aphanitic

The magnetite is concentrated as spheroids near the outer surface of the rock.

### Pillowed komatiite

In outcrop, the unit exhibits a greenish weathered surface with excellently developed pillows at times brecciated (hyaloclastite breccias). All gradations exist between undisturbed, unbroken pillows and pillow breccias. (Plate V)

Pillow tops face consistently to the south and elongation of the pillows is along an east-west direction. The pillows are slightly disturbed in the main section of the ultramafics north of the road but they are strongly deformed in the wedge of ultramafics south of the road, rendering the definition of pillow tops difficult in this location.

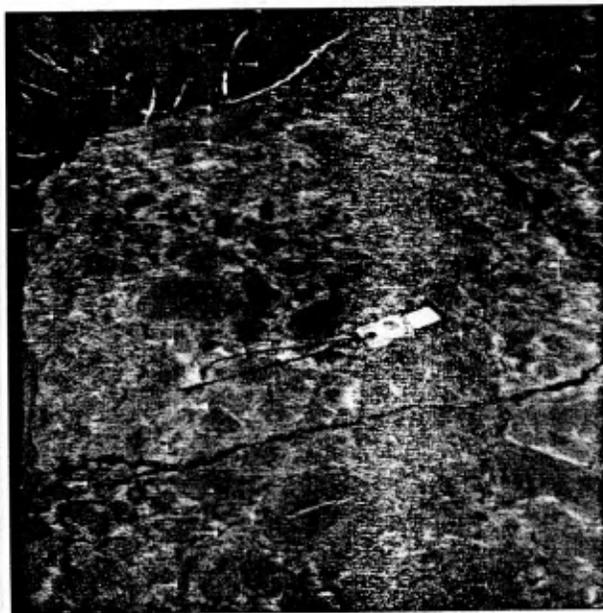
#### Hand specimen description

a) Minerals

serpentine  
talc  
chlorite  
tremolite  
pyrrhotite  
chalcopyrite

b) Texture

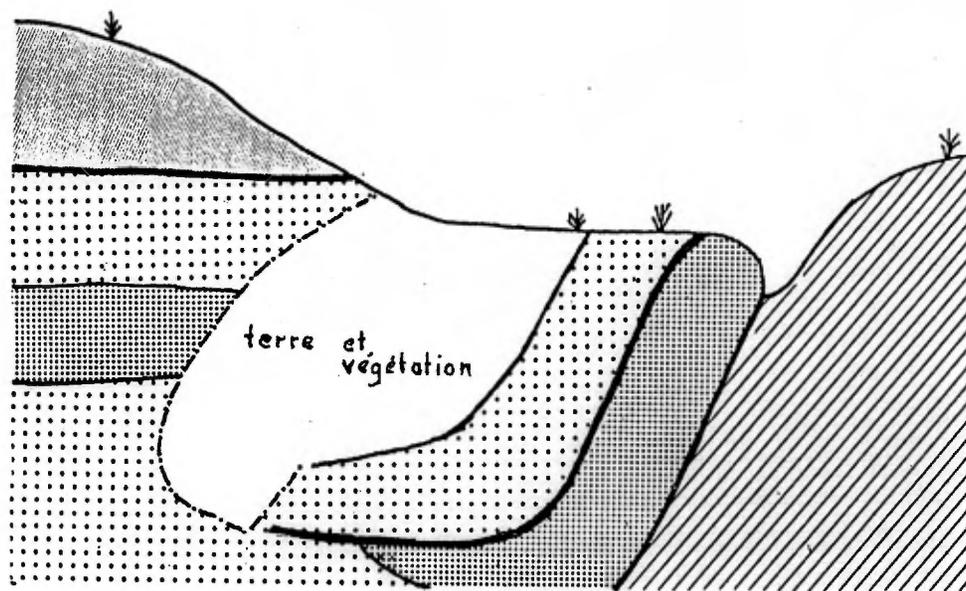
Massive, very fine grained



Komatiite Pillow Lava

(compass points north; flow to east)





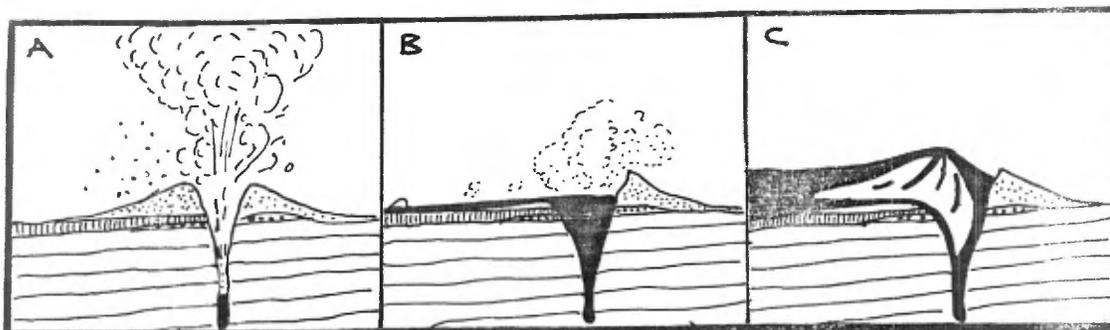
ESQUISSE I

Légende.

-  Basalt, tuf basique.
-  Gabbro.
-  Périodite.
-  Laves komatiites refroidies rapidement.

*DMC* 03/09/75

SKETCH II



The geologic history of the volcano can be summarized in the above sketches.

- A. Represents the opening of the vent through the basement gneiss, the pouring of ultramafic lavas subaqueously with the formation of pillowed komatiite and magnetite komatiite beds and initial build-up of the ultramafic cone and flowage of Q komatiites subaerially, with main direction of flow to the east.
- B. Represents the ascend of mafic material after a period of differentiation in the lava chamber. The western half of the ultramafic cone is assimilated by the younger lavas. The mafic sequence piles up.
- C. Represents the final picture, more or less what we see today with the east half of the ultramafic cone and ultramafic flows to the east and the mafic pile occupying the western part of Mount Wallace.

## Economic Geology

Interest in the area of ultramafic flows lies in the possibility of high grade, low tonnage, nickel occurrences often associated with ultramafic flows or related sills.

Samples of the different types of ultramafics sent for assay returned 0.01 to 0.04 percent nickel. A sample from an altered ultramafic sill one half mile northwest of the main center returned an assay of 0.24 percent nickel.

A bed of massive pyrite pyrrhotite up to three feet thick has been located by prospecting north of lac Echoe. In places the unit is mineralized with patchy chalcopyrite. Assays have not yet been received. The area is underlain by basic to acidic tuffs with ultramafic sills.

A swarm of Questor anomalies lie to the north of the main vent and another cluster lies to the west in the mafic volcanics. Both these areas are considered of prime interest and line cutting should begin shortly followed by ground geophysical.

ADDENDUM

(A joindre au rapport NI-156 de Karen Seymour "Report on detail geology of the ultramafic flows Guyer lake area")

A sampling program was carried out by helicopter to obtain specimens for Ni analysis from peridotitic sills located north of lac Echoe.

An area of 43.2 square kilometers was covered by this program and previously unreported ultramafic rocks were located. Magnetite komatiite, pillowed komatiite and peridotitic sills were found 7.2 kilometers west of the Mount Wallace vent. They are bordered on the west by the lac Breton basaltic sequence. Highly sheared ultramafics were located east of the vent in the vicinity of anomalies 17 and 23. Although altered by the shearing, they are the same rock types as the sequence near Mount Wallace.

Thin section and chemical analysis of specimens are under way and field names may be retained or changed to conform to new information.



/dp

(A rajouter au rapport NI-156 de Karen Seymour "Report on Detail Geology of the Ultramafic Flows, Guyer Lake Area")

THIN SECTION REPORT FOR ROCKS

FROM LAC GUYER, JAMES BAY

November 1975

MAFIC-ULTRAMAFIC ASSOCIATION

1. Rocks designated in the field as "metagabbro" (D-150) and microgabbro (D-79, D-82) :

Compositionally the term gabbro (over 70% ferromagnesian minerals in the mode) is justified only for the specimens D-150 and D-82.

Texturally : specimen D-82 is fine grained with some untwinned plagioclase and exhibits doleritic (diabasic) appearance. Specimen D-150 is a metagabbro with 70% hornblende as its main mafic constituent and some (?) relict pyroxene. Chlorite, epidote and sphene are late minerals due to secondary alteration and/or metamorphism of primary mineral assemblages. The presence of epidote indicates elevated calcium content in the rock (alteration product of hornblende and/or plagioclase).

2. Rocks designated in the field as "pillowed komatiites" (D-90, D-100A, D-104) are essentially actinolitic rocks, with 3-10% phlogophite, varying amounts of opaque minerals and chlorite as an alteration product of actinolite.

The actinolite is very pale (probably due to high content of tremolite), but perceptibly greenish and pleochroic distinguishes it from typical tremolite.

The mica is pale golden brown with a low 2V angle and has been identified as phlogophite indicating elevated magnesium content in the rock.

No plagioclase has been identified in the rock and if there is some present, it could be in the fine matrix between the actinolite chlorite sheaves.

Chemical analysis of the rock is needed to determine its mafic or ultramafic character.

3. Rocks designated in the field as "magnetite komatiite" or "magnetite peridotite" (D-124C, D-103), are essentially ultramafic rocks with phenocrysts of olivine, clinopyroxene and minor orthopyroxene (phenocrysts make-up the 30-45% of the thin section), in a matrix of tremolite, talc, chlorite, serpentine, and a glassy mineral.

The matrix minerals represent alteration products of the primary olivine and pyroxene. (Olivine alters to antigorite, talc and finally tremolite and clinopyroxene alters to chlorite)

The olivine phenocrysts are partly serpentinized and loaded with opaque minerals (ie magnetite formed due to incipient serpentinization) rimmed and veined with iddingsite alteration

Preserved textures in the two thin sections examined show cumulus rather than skeletal (spinifex, quench) textures.

FELSIC ROCKS

1. Under the term "dacite" they have been grouped in the field units of similar morphological appearance, which under the microscope exhibit distinct modal composition.

Specimen D-77 is an essentially, Plagioclase - Hornblende - Biotite rock with predominant plagioclase (up to 60%).

Specimen D-128 is a qtz-bio-musc-plag rock with quartz predominant and plagioclase subordinate.

Specimen D-86 has equal amounts of quartz and plagioclase (~ 30%) and bears also microcline feldspar ferromagnesian minerals are hornblende and biotite.

There is a noted similarity between the assemblages of the sample D-86 designated as "dacite" and the "quartz-feldspar-biotite gneiss D-87, which outcrops in the swamp south of the vent and seems to underly the mafic-ultramafic sequence in the field.

If this is correct advocates for the hypothesis, that the "dacite" occurrences represent underlying sediments exposed at topographic highs of the paleoterrain where the mafic-ultramafic lavas were "poured on". Their modal variation probably reflects the local variation in the sedimentation.

2. Rocks designated as "rhyolitic tuff" (D-140) and "acid-intermediate welded tuff" (D-133). The former is an essentially quartzofeldspathic unit with quartz + feldspar up to 50%. Altered plagioclase is present, with epidote, calcite and sericite representing the end products of the breakdown of the feldspars. Chlorite < 20% is whatever is left from the primary ferromagnesian minerals.

Unit D-133 has  $qtz + Kfeld + plag \approx 50\%$  &  $qtz > Kfeld + plag$ .

Quartz is present in the groundmass as well as phenocrysts. The ferromagnesian mineral is chloritized biotite 15-20%.

The 2 units seem to have a rhyodacitic composition but since quartz and oligoclase (possibly present in the two thin-section), are difficult to distinguish optically only chemical analysis would modify correctly the given field names.

3. The unit D-134A which was termed in the field "Granophyric dyke" due to its peculiar texture, in the thin section contains up to 30% of a mineral that has been identified optically as staurolite. Minor sillimanite is also present. The presence of both minerals and particularly of sillimanite is indicative of a sedimentary origin. Sillimanite moreover denotes high temperature conditions of metamorphism that may be prevailed locally.
4. Specimens D-136 and D-92 which are designated in the field as "Granodiorite Gneiss" and "Porphyritic granodiorite gneiss", respectively, in thin section they show a granodioritic modal composition, (except that hornblende is completely absent from D-136). Specimen D-92 has a poikiloblastic texture.