THE WADE LAKE - TIMMINS LAKE AREA, EASTERN MARGIN OF THE LABRADOR TROUGH

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INTRODUCTION

This report summarizes map work in the Wade Lake (23I/5) and Timmins Lake (23I/4) areas and is a southerly extension of previous work by Wardle (1976) on the eastern margin of the Labrador Trough.

The area straddles the contact between the Archean gneisses of the Eastern Basement Complex and the Aphebian sedimentary and volcanic rocks of the Knob Lake Group and was varyingly deformed in the Hudsonian Orogeny *circa* 1735 Ma.

Exposure in the Wade Lake area is generally good but becomes progressively poorer to the south where large areas are drift covered. The Ashuanipi River and Birch Lake have been flooded by backup waters from the Smallwood Reservoir. Geology in these flooded areas has been compiled from previous work.

The geology of the area was first described by Retty (1937, 1938) after discovery of the Sawyer Lake iron deposit. The western parts of the area containing iron formation were subsequently mapped in detail (1″ - 1000′) by geologists of the Labrador Mining and Exploration Company and Iron Ore Company of Canada (Dufrese, 1950; Kavanagh, 1952; Crouse, 1952). Much of the detailed geology of the western part of the area has been compiled from these sources. The eastern part of the area, chiefly underlain by Seward Formation and basement rocks had only been mapped on 1:250,000 scale by the Geological Survey of Canada (Wynne-Edwards, 1960).

EASTERN BASEMENT COMPLEX

Granodiorite - tonalite gneiss (Unit 1)

These are white weathering quartz-plagioclase-biotite-hornblende gneisses with variable amounts of potassium feldspar. They are predominantly of plutonic origin and contain numerous inclusions of amphiholite interpreted as deformed and migmatized xenoliths and mafic dykes.

To the east of Wade Lake the gneisses preserve a coarse gneissic foliation which is probably a relict Archean fabric. West of Wade Lake, towards the contact with the Seward Formation, this fabric becomes tightly folded and is progressively transposed into a steep, east dipping mylonite zone.

Mylonitized amphibolite, amphibolite gneiss, and granodiorite gneiss (Unit 2)

This is a mixed unit of amphibolite, amphibolite gneiss and granodiorite-tonalite gneiss which is confined to the southern part of the area where it is present as tectonic slices in the Knob Lake Group. Relict gneissic fabrics are present but the unit is dominated by an intense mylonitic fabric and has been largely retrograded to a greenschist facies mineralogy.

Amphibolite, amphibolite schist and gneiss (Unit 3)

The several large bodies which make up this unit form a series of lenses down the eastern margin of the area and are probably the result of mega-boudinage of a once continuous mafic body such as a gabbro dike or sill. The lenses generally consist of metagabbro in their interiors and grade into amphibolite schist and gneiss at their margins.

Mylonitized granite (Unit 4)

A thin strip of fine grained, pink, mylonite and quartzofeldspathic schist separates the deformed Seward Formation from the basement gneisses. In its center the unit contains recognizable granitic textures and pods of biotite-chlorite schist which appear to be mylonitized mafic dikes. The protolith of the unit was probably microgranite although in places it is difficult to distinguish from the mylonitized arkoses of the Seward Formation. The unit is probably a deformed equivalent of the leucogranite (Unit 3) mapped in the Snelgrove Lake area to the north (Wardle, 1976).

Since the unit lacks any vestige of gneissic foliation, it is presumed to postdate the basement gneisses. However, relationships to the Knob Lake Group are uncertain: just east of Wet Lake the Seward Formation contains thin pegmatites which may be related to intrusion of this granite; in the contact area itself, however, there are no veins of granite or pegmatite to support an intrusive relationship. K-Ar determinations on this unit (G.S. 60-141 and 60-142; Lowdon, 1961) gave numbers of 1590 and 1555 Ma. These, however, almost certainly date the Hudsonian mylonitic fabric rather than the intrusive age of the body.

KNOB LAKE GROUP

Seward Formation (Unit 5)

The Seward Formation is exposed in two belts; a western belt which extends between Sawyer Lake and Stewart Lake, and a more etensive eastern belt which extends between Discovery Lake and Timmins Lake. The general dip of the formation is to the west and the western belt is essentially a faulted repetition of the eastern belt, which has been brought up along a rotational fault passing through Seward Lake.

The formation has been divided into Lower (5a), Middle (5b), and upper (5c) members which are a southerly continuation of units in the Snelgrove Lake area (Wardle, 1977) In the southeastern corner of the area where the Seward Formation is poorly exposed and highly deformed the formation has been left undivided.

The Lower and Middle Seward members are broadly similar in the two belts. In the western belt the Lower Seward Member consists of coarse, cross-stratified feldspathic sandstones with thin interbeds of granule conglomerate. The sandstones weather a pale gray color but have a dark gray-green matrix which is slightly pyritiferous. In the eastern succession the Lower Seward is composed of similarly colored feldspathic sandstones but the member is generally more thinly bedded and finer grained than in the west. Cross-stratification within the member indicates northerly directed paleocurrents.

East of Wet Lake the member becomes progressively cleaved and cataclastically deformed. In a 2 km wide belt adjacent to the basement fault contact the sandstones have been converted to cataclastic quartzofeldsathic schist and mylonite.

The Middle Seward Member consists of coarse arkosic sandstones and granule conglomerates which contain subrounded clasts of milky quartz and feldspar in a light sericitic matrix. The sandstones generally have a distinctive pink or maroon weathering. The member is extensively cross-bedded, usually on a smaller scale than the Lower Seward, and contains several thick (2-50 m) intervals of red shale (locally mudcracked) and siltstone.

Beds of pebble and cobble conglomerate containing rounded clasts of quartz and granitic gneiss are present in the Middle Seward around Blanchet Lake and also in the undivided Seward rocks south of the Ashuanipi River. This, together with the northerly directed paleocurrents, suggests a southerly source area for the Middle Seward.

The Upper Seward Member contrasts sharply in lithologies between the western and eastern belts; In the west it comprises a fissile red siltstone whereas in the east it consists of thinly bedded, cross stratified, purple sandstones which pass laterally into lensoid bodies of fine grained orthoquartzite. The orthoquartzite-sandstone associaton correlates with similar lithologies mapped in the Snelgrove Lake area (Unit 4d, Wardle, 1977) and is probably a high energy sublittoral facies developed around the rising Snelgrove Lake basement high (Wardle, 1977).

The Upper Seward does not appear to be present in the Shaw Lake - Blanchet Lake area where the Middle Seward is directly overlain by Attikamagen shales.

Attikamagen Formation (Unit 6)

This formation consists of a thinly bedded sequence of gray siltstone and shale that is redefined to include only those rocks between the Seward Formation and the dolomite of unit 7.

In the eastern part of the area a fault bounded sliver of cataclastically deformed quartz-feldspar-biotite schist is present within the Eastern Basement Complex and appears to be a southerly continuation of the metamorphosed Attikamagen Formation recognized in the André Lake area (Wardle, 1977).

Denault Formation (Unit 7)

In previous work in the area by Wynne-Edwards (1960) this unit was mapped as a carbonate facies (Unit 2a of Wynne-Edwards) of the Attikamagen Formation. The unit has been traced in reconnaissance work through the Snelgrove Lake, Hollinger Lake and Knob Lake areas into the northwest arm of Attikamagen Lake, where it strikes into dolomites assigned to the Denault Formation by Barragar (1967). Consequently, the dolomite unit in the Wade Lake - Timmins Lake area has also been assigned to the Denault Formation.

The formation is best exposed in Wet Lake where it consists of a lower unit of thinly laminated, brown weathering dolomite and an upper unit of massive, cream colored dolomite veined by chert.

Dolly Formation (Unit 8)

The Denault Formation is overlain by a thick sequence of gray shales, slates and siltstones which was previously included in the Attikamagen Formation (Wynne-Edwards, 1960). The correlation of the unit 7 dolomite with the Denault Formation, however, indicates that these rocks are younger than the Attikamagen Formation.

On the western margin of the Trough, in the Knob Lake area, the Denault is normally directly overlain by the Wishart Formation or the intervening Fleming chert breccia. Proceeding east towards the center of the Trough, however, the two formations become separated by a wedge shaped unit of shale and siltstone named the Dolly Formation by Harrison *et al.* (1972). The stratigraphy in the Wade Lake - Timmins Lake area represents a southeasterly continuation of this relationship and the shales, slates and siltstones of unit 8 are accordingly correlated with the Dolly Formation.

Wishart Formation (Unit 9)

This formation is poorly exposed in the area and consists chiefly of a light gray orthoquartzite interbedded with minor amounts of gray quartzite and silicic gray siltstone. Relationships outside the area (Frarey, 1960) indicate that the Wishart oversteps the Dolly Formation onto the Denault Formation in a disconformable relationship and, therefore, disconformably overlies earlier strata.

Nimish Volcanics (Unit 10)

This is a collective name given to a varied assemblage of mafic volcanic rocks which occur above, below and interbedded with the Sokoman Iron Formation. These volcanics are a southeasterly continuation of a more extensive mass in the Dyke Lake area (Evans, this volume).

The Nimish is dominantly composed of dark green, aphyric basalt flows which vary from massive to finely vesicular. Plagioclase porphyritic basalts form occasional thin flows or sills within these rocks in the Point Lake and Galena Lake areas.

Fresh samples of the volcanics consist of clinopyroxene and plagioclase intergrown in a fine diabasic texture. Quartz is sometimes present as an interstitial phase. This primary mineralogy is commonly altered to a low grade, epidote-chlorite-actinolite metamorphic assemblage.

Near Stewart Lake in the northwestern part of the area, the volcanic rocks include a lensoid body of mafic agglomerate and brecciated pillow lava which continues north into the Snelgrove Lake area. The agglomerate, composed chiefly of pillow lava fragments, probably developed near an extrusive center in this area.

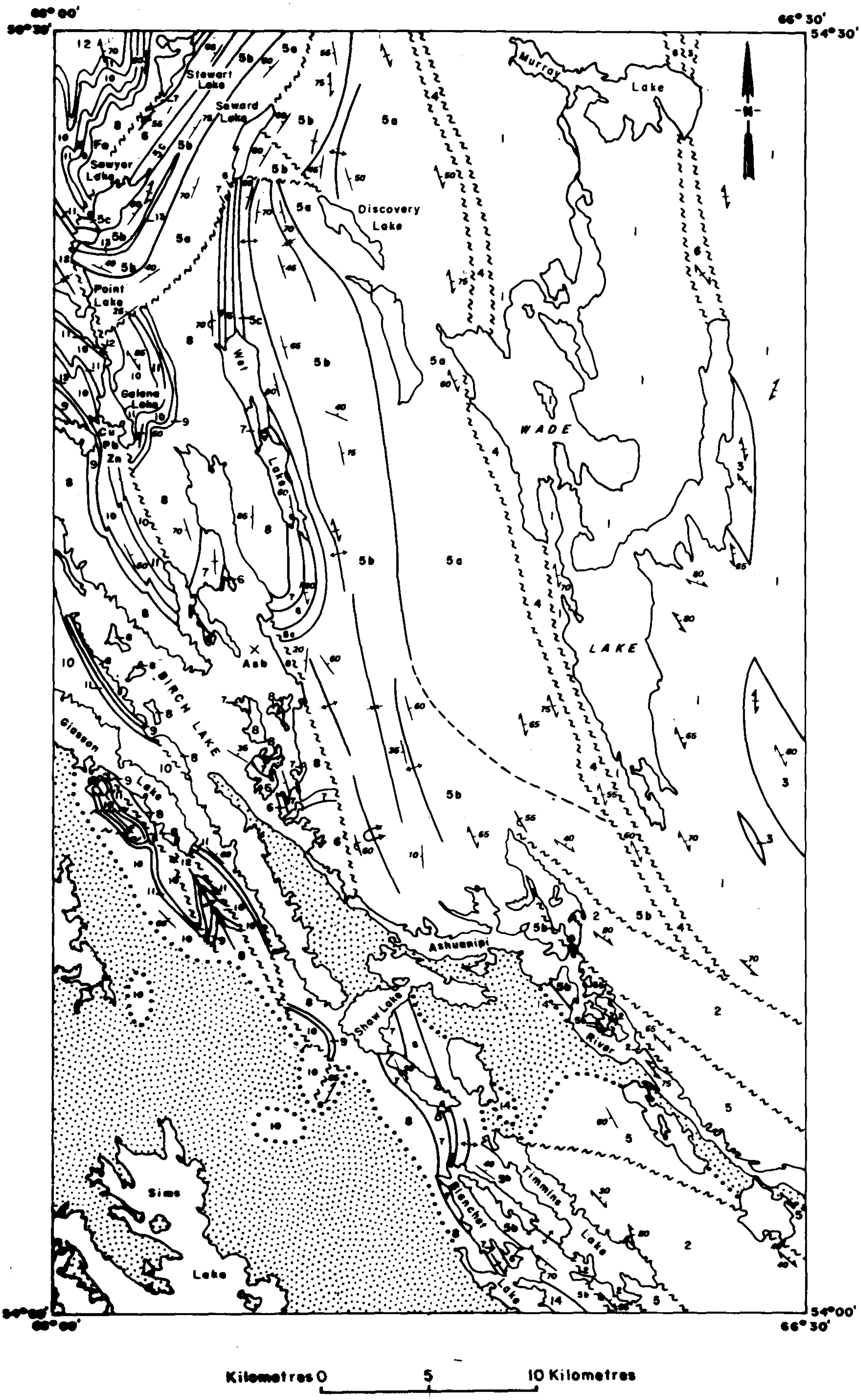
In the Galena -Giasson Lake area the basalt flows are interbedded with lesser amounts of volcanogenic conglomerate and agglomerate. The main clast types in these rocks are aphyric basalt, plagioclase basalt and jasper-oxide iron formation.

Sokoman Iron Formation (Unit 11)

This formation is composed chiefly of iron oxide, silicate and carbonate rich cherts and is underlain by a thin unit of black ferruginous shale usually assigned to the Ruth Formation (Harrison, 1972) but for the sake of clarity, has been included in the Sokoman on the accompanying map.

In the northwestern part of the area the formation is divided by Nimish agglomerates and lavas. The lower iron formation consists of thinly laminated, silicate-oxide rich cherts which have been affected by secondary alteration and weather a reddish brown color. These pass down into the black shales of the Ruth Formation. The upper iron formation is poorly exposed but appears to consist predominantly of cross-bedded tuffs and tuffaceous cherts which contain thin bands of brown, silicate rich chert. The tuffs contain abundant fragments of potassium feldspar (often intergrown with quartz in micrographic texture) and indicate that some felsic volcanism accompanied deposition of iron formation. The tuffs are identical to the clastic iron formation of the Dyke Lake area (Unit 6b; Evans, this volume).

In the western and southwestern parts of the area the Sokoman is separated from the underlying Wishart and the overlying Menihek by Nimish Volcanics. The lower iron formation in this area is generally a thinly bedded, shaly, black silicate-oxide iron formation which commonly contains beds of lean chert. The upper iron formation consists of blue-gray metallic chert speckled


66° 30'
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N
Stewart Lake
Seward Lake
Sawyer Lake
Point Lake
Discovery Lake
Murray Lake
Galena Lake
Wei Lake
WADE LAKE
BIRCH LAKE
Glasson Lake
Ashuanipi
Shaw Lake
River
Timmins Lake
Blanchet Lake
Sims Lake
Asb
Cu
Pb
Zn
Fe
Kilometres 0
5
10 Kilometres

LEGEND

HELIKIAN

14	*Shabogamo gabbro.*

APHEBIAN

13	**MONTAGNAIS GROUP** *gabbro.*

KNOB LAKE GROUP

12	**MENIHEK FORMATION** (1000 m)
11	**SOKOMAN IRON FORMATION** (300-400 m)
10	*Nimish volcanics* (300-1500 m)
9	**WISHART FORMATION** (300 m)
8	**DOLLY FORMATION** (1000-2500 m)
7	**DENAULT FORMATION** (500 m)
6	**ATTIKAMAGEN FORMATION** (500-900 m)
5	**SEWARD FORMATION: 5a,** *Lower Seward* (1500 m); **5b,** *Middle Seward* (1100 m); **5c,** *Upper Seward* (325 m).

EASTERN BASEMENT COMPLEX

ARCHEAN or APHEBIAN

4	*Mylonitically deformed granite.*
3	*Amphibolite, amphibolite gneiss and schist.*
2	*Mylonitically deformed amphibolite, amphibolite gneiss, schist, and tonalite gneiss.*
1	*Granodiorite and tonalite gneiss, in part mylonitized.*

SYMBOLS

Geological contact ....

Fault ....

Heavily drift covered area ....

Gneissic foliation ....

Schistosity and cleavage ....

Bedding (inclined, vertical, overturned) ....

Mineral prospect or showing .... ×
(Fe = iron, Cu = Copper, Pb = lead, Zn = Zinc, Asb = asbestos)

with granules of jasper and contains numerous thin lenses of intraformational jasper conglomerate. The Ruth Formation shales in this area are only exposed on the west side of Galena Lake, where they are entirely enclosed in mafic flows and sills.

Menihek Formation (Unit 12)

This is present only in the extreme western and northwestern parts of the area and consists entirely of black shale and slate.

Montagnais Group (Unit 13)

All units of the Knob Lake Group have been intruded by sills of pretectonic diabase and gabbro. Only the larger sills are shown on the map. Although all of the sills in the area are assigned to this group, it is probable that some of them, especially in the western part of the area, are of Nimish age.

Shabogamo Gabbro (Unit 14)

The Seward Formation in the southern part of the area has been intruded by a gabbro which is distinguished from the Montagnais Group by its fresh, posttectonic nature and coarse ophitic texture. Contact relationships suggest that these gabbros are present as dikes. The Shabogamo gabbro intrudes the Sims Formation to the south (Wynne-Edwards, 1961) and is therefore of Helikian age (Fahrig, 1967).

STRUCTURE AND METAMORPHISM

The Knob Lake Group was cleaved and folded during the Hudsonian Orogeny (*circa* 1735 Ma). Metamorphism during this event was generally in the lower greenschist facies. The present disposition of Knob Lake Group strata is controlled by a syncline which extends from Point Lake to Birch Lake. This structure is the southeasterly termination of a major syncline which extends northeast to the Petitsikapau Lake area (Frarey, 1960) and is provisionally termed the Petitsikapau Syncline. The sycline is disrupted along its axial plane by a sinistral strike-slip fault which is a southerly extension of the Mina Lake - Comeback Lake fault of the Snelgrove Lake area (Wardle, 1977). The fault is an important regional structure which separates the north-south trending structures of the eastern margin of the Trough from the northwesterly trending structures which characterize the central Trough.

Rocks in the western part of the area are generally only weakly cleaved. The intensity of penetrative deformation and associated folding increases eastwards towards the basement fault contact. This fault is a major mylonite zone which dips 60-70° to the east and has produced cataclastic fabrics in the Seward Formation and basement rocks for a distance of 2 km either side of the fault. In the southern part of the area large slices of mylonitically deformed basement rocks have been interleaved with the Seward Formation. Reconnaissance work in the Ossokmanuan Lake area to the south indicates the mylonite zone continues down to at least the north end of Gabbro Lake and that much of what was mapped previously as deformed silicic volcanic rocks, graywackes and conglomerates in this area (Wynne-Edwards, 1961) is really cataclastically deformed granite and granitic gneiss.

Hudsonian metamorphic overprint in the basement rocks varies from lower greenschist facies in the cataclastic zone to upper greenschist - amphibolite facies in the east where archean gneissic fabrics have been overprinted by Hudsonian biotite-hornblende fabrics.

ECONOMIC GEOLOGY

The principal feature of the area is the Sawyer Lake iron deposit, which was discovered by Labrador Mining and Exploration Company in 1937 (Retty, 1937, 1938). The host rock, the Sokoman Formation, is severely brecciated and has been completely recrystallized to a massive, dark gray, hematite ore which probably originally resulted from Mesozoic leaching and secondary enrichment. Ore reserves are estimated at 1.8 million tons. Smaller pockets of leaching and alteration occur throughout the Sokoman Formation (Dufresne, 1950; Kavanagh, 1952; Crouse, 1952) but none are considered to have any immediate economic potential.

The only significant base metal prospect in the area is at Galena Lake (Kavanagh, 1952) where galena, sphalerite and minor chalcopyrite occur in thin (3-40 cm) quartz-calcite veins. The veins occur as fracture fillings in a Nimish basalt sill, a thin lens of Ruth Formation shale, and a basalt porphyry that may be a flow or sill. No other base metal mineralization has been found.

Small veins of asbestos fibre were found in an isolated outcrop of pyroxenite on an island in Birch Lake. The pyroxenite is fresh and relatively undeformed and is most probably related to the Shabogamo gabbro.

The Seaward Formation was prospected for radioactive mineralization with a handheld scintillometer but no anomalous areas were found.

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