GEOLOGY OF THE GRAND FALLS MAP AREA, WEST HALF (2D/13W), NEWFOUNDLAND

by B. Kean and N. Mercer

INTRODUCTION

During the 1977 field season, mapping was completed on the west half of the Grand Falls map area; minor additional work is required in some areas of the east half.

Much of the map area is accessible by a network of logging roads owned by Price (Newfoundland) Pulp and Paper, Grand Falls, Newfoundland.

The area was previous mapped on a scale of 1:250,000 by the Geological Survey of Canada (Anderson and Williams, 1970), and has been explored for base metals by numerous companies.

GENERAL GEOLOGY

Most of the central part of the map area is underlain by the Victoria Lake group, a moderately dipping sequence of dominantly marine clastic sedimentary rocks and minor volcanic rocks, containing fossils of Middle Ordovician age. The southern part of the map area is underlain mainly by volcanic and sedimentary rocks of the Tally Pond group, which is overlain by and in fault contact with the terrestrial volcanic and sedimentary rocks of the Silurian Botwood Group. The Botwood Group is in turn unconformably overlain by the Stony Lake subaerial volcanic rocks.

To the north the area is underlain by a late Ordovocian graywacke - conglomerate sequence that is intruded by a Devonian hornblende-biotite granite.

Plugs and small plutons of granite to monzonite (composite acidic intrusions), some of which may have been comagmatic with the volcanic rocks, outcrop throughout the map area. One large composite intrusion is located in the southwest section of the map area. Plugs of diorite and gabbro are also common.

STRATIGRAPHY

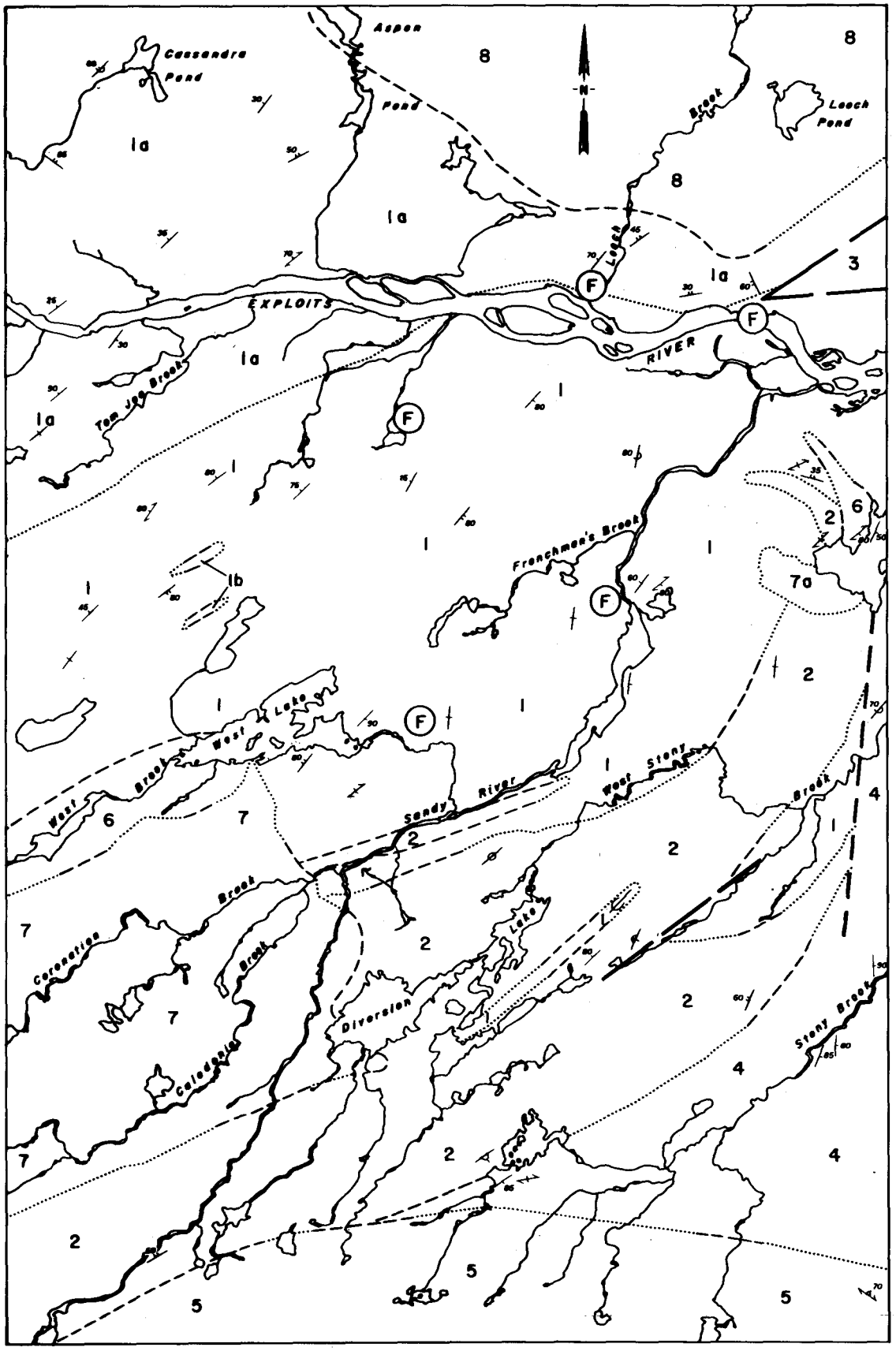
The lack of outcrop and poor stratigraphic and structural control make geological mapping of most of the rock units in this area difficult; however, eight lithological units have been recognized.

Victoria Lake group

Unit 1 consists of bedded, and locally well cleaved, gray to black, marine clastic sedimentary rocks. The predominant lithologies are repeated sequences of slate, siltstone and graywacke with minor interbeds of chert, red argillite and rare basic volcanic rocks.

A typical exposure of this repetitive sequence consists of massive fine to medium (locally coarse) grained graywacke (1 m to 5 m thick) with a coarse erosional base overlying a thin shale or mudstone bed (6 cm to 12 cm thick). Various sedimentary structures are present, including load casts, flute casts, and scour and fill. The graywacke generally grades upwards through fine sandstone , which is locally cross-bedded, into siltstone (6 cm to 24 cm thick) and finely laminated (convolute bedding locally developed) thin mudstone or shale (3 cm to 12 cm thick). All of these features, which are characteristic of turbidites, are not necessarily developed in any one sequence within this flyschlike deposit.

In the Lemottes Lake area, there are isolated outcrops of poorly sorted polymictic conglomerate containg subangular to rounded clasts of slate, a variety of volcanic rocks, minor limestones and plutonic rocks



Kilometres 1 0 1 2 3 4 5 Kilometres

Scale

LEGEND

DEVONIAN AND EARLIER

8 *Medium to coarse grained, pink and minor white, hornblende granite and hornblende-biotite granite.*

7 *Medium grained, altered, hornblende monzonite;* **7a,** *medium grained granite.*

6 *Medium grained, altered, green diorite and gabbro.*

5 *Gray, green and pink flow banded rhyolite, feldspar phyric rhyolite, crystal tuff and flow breccia.*

SILURIAN

4 *Red and gray micaceous sandstone, siltstone and conglomerate.*

3 *Purple and green, intermediate to mafic, amygdaloidal and porphyritic, massive lava.*

ORDOVICIAN AND LATER (?)

2 *Intermediate to mafic pillow lava, breccia, tuff, minor unseparated graywacke; minor siltstone and shale.*

1 *Slate, siltstone, graywacke; minor chert, red argillite and acid tuff;* **1a,** *graywacke and pebble conglomerate;* **1b,** *basic lava and agglomerate.*

SYMBOLS

Geological boundary (defined, approximate, assumed, gradational) .....

Bedding; tops known (inclined, overturned) .....

Pillow bedding; tops known (inclined, overturned) .....

Pillow bedding; tops unknown (vertical) .....

Cleavage or schistosity (inclined, vertical) .....

Fault (defined or approximate, assumed) .....

Glacial striations .....

Fossil locality ..... Ⓕ

up to 30 cm in diameter. This conglomerate is lithologically similar to the Silurian Goldson conglomerates of eastern Notre Dame Bay. If this correlation is correct, the conglomerate can be interpreted to lie near the base of the Silurian sequence; however, it may be faulted bounded in this area.

All these rocks are facies equivalents of rocks within the Victoria Lake group in the Lake Ambrose map area (Mercer, this report). Minor intermediate volcanic flows and agglomerate (1b) are intercalated with the sedimentary rocks in this area. Minor acidic tuffs and rare outcrops of basic intrusive rocks are unseparated.

A thick, fossiliferous black slate unit outcrops in scattered exposures along the Trans Canada Highway between Grand Falls and Badger (unseparated on map). Graptolites from this black slate near Red Cliff and Leech Brook include the following forms indicative of Middle Ordovician age: *Diplograptus euglyphys Lapw., Climacograptus parvus* (Hall), *Climacograptus scharenbergi Lapw., Glossograptus sp.* (Anderson and Williams, 1970). This horizon represents the Caradocian graptolitic shales that are present throughout the Notre Dame Bay area and characteristically separate two distinct phases of island arc evolution (Dean, 1977).

Unit 1A

Lithologies overlying this slate unit are predominantly interbedded graywacke and pebble conglomerate (1A). Bedding varies from 2 cm to 3 m in thickness. The graywacke varies from fine to medium grained and contains argillite, slate, feldspar and quartz clasts; plutonic rock clasts are common in the conglomerate. Thin beds of gray to black argillite and slate occur at the top of the graywacke beds.

Regionally, the rocks coarsen upwards from dominantly interbedded shale, siltstone, and graywacke below the Caradocian shale, to predominantly graywacke with interbedded conglomerate and minor argillite above (north of) the Caradocian shale.

Tally Pond group (Unit 2)

The southern section of the map area is underlain by an assemblage of basic volcanic rocks containing minor intercalated sedimentary rocks (Unit 2); this assemblage may be traced along strike to the southwest to the Tally Pond area and is tentatively referred to the Middle Ordovician and Younger (?) Tally Pond group though in this area they differ from the Tally Pond group as defined by Mercer (this volume) in the general lack of acidic volcanic rocks.

These volcanic rocks outcrop mainly along ridges between Lemottes Lake and Diversion Lake. They consist of intermediate to mafic pillow lava, pyroclastic breccia, tuff and minor unseparated carbonaceous shale, tuffaceous siltstone and graywacke. The pillows are generally dark green, feldsparphyric and vesicular. Green and white chert and thin bands of tuff are common as interpillow material. Minor gray acidic tuffs occur in a few places. Graywackes which commonly contain large xenoliths of basic volcanic rock are interbedded with the volcanics.

The volcanics are locally mineralized with pyrite and chalocopyrite.

Botwood Group

Units 3 and 4 comprise the Botwood Group within the map area. Unit 3, which generally forms the base of the Botwood Group, is in fault contact with units 1 and 2. It consists of subaerial volcanic rocks, including purple and green, intermediate to mafic, amygdaloidal and porphyritic massive lava flows, purple, intermediate agglomerates, and minor feldspar porphyry. These rocks are generally very vesicular and oxidized, and contain abundant ash, pumice and scoreaceous material.

Unit 4 consists of sedimentary rocks conformably overlying and locally intercalated with unit 3. The unit is also generally in fault contact with units 1 and 2; however, south and east of Diversion Lake, unit 2 contains interbedded red sedimentary rocks that may be transitional with unit 4. The dominant lithologies are basal red conglomerate, red micaceous sandstone, red siltstone and red mudstone. The conglomerate lenses generally overlie and are interbedded with the volcanic rocks of unit 3. They contain clasts of basic volcanic rock, scoreaceous basalt, flow banded rhyolite and sedimentary rock.

Unit 4 typically show trough cross-bedding, mud cracks, rain prints and other features characteristic of a fluviatile terrestrial depositional environment. The rocks have a northeasterly trend and moderate dip. The sequence is folded into synclinal and anticlinal structures with local overturning near the base.

Stony Lake volcanics

Unit 5 consists of gray, green and pink flow banded rhyolite, feldsparphyric rhyolite, crystal tuff (welded tuff), flow breccia and minor acidic feldspar porphyry. These rocks are undeformed subaerial volcanic. They are interpreted to unconformably overlie the Tally Pond and Botwood Groups. Evidence for this relationship may be summarized as follows: (a) They are lithologically distinctive and have no correlatives among Ordovician or nearby volcanic rocks of the Botwood Group. (b) Structural evidence, though tenuous, indicates that the Botwood sedimentary rocks underlie the acidic volcanic rocks. (c) The oval outcrop pattern of the Stony Lake

volcanics truncates southwest trending structures of the Botwood Group.(d) The Stony Lake volcanics outcrop on high hills, suggesting an elevated stratigraphic position. (e) Primary features are well preserved, indicating little structural deformation (Anderson and Williams, 1970).

INTRUSIVE ROCKS

Unit 6

This unit consists of plugs and small plutons of diorite and gabbro which outcrop throughout map area. Some of the gabbro plugs are related to composite acidic intrusions. The gabbro and diorite vary from fine to medium grained and are only locally deformed. They consist of plagioclase and altered mafic minerals. Those bodies spatially associated with composite intrusions are chloritized, sheared, fractured and mineralized (pyrite, chalcopyrite).

These basic intrusions crosscut the regional schistosity and are thought to be of Devonian age.

Unit 7

This unit consists of a large composite intrusive of sheared, medium grained, altered equigranular monzonite. The pluton is rimmed to the north by gabbro (6). Hornblende, orthoclase, plagioclase, minor quartz and biotite are the main mineral constituents. Close spatial relationship to acidic volcanic rocks of similar type to unit 2 suggests a comagmatic relationshi. However, the regional schistosity is truncated by these intrusives.

Unit 7a consists of medium grained, pink, equigranular granite with chloritized hornblende as the mafic constituent.

Unit 8

This unit consists of medium to coarse grained, pink and minor white, equigranular hornblende granite and hornblende-biotite granite. It forms part of the Hodges Hill granite.

STRUCTURAL GEOLOGY

The map area has a northeasterly trending structural grain and is characterized by an inhomogeneous, northeast trending, moderately dipping schistosity that is subparallel to bedding. This foliation is moderately to weakly developed (locally strong) and is axial planar to northeast plunging open folds. Large scale open folds can be mapped within units 1 and 2 and are evident along the Trans Canada Highway between Grand Falls and Badger.

The Botwood Group sedimentary rocks show a weakly developed schistosity that is well developed locally. The Botwood Group volcanic rocks are relatively undeformed except for local shearing. The Botwood Group is folded into open folds with moderate to steep dips and local overturning.

MINERALIZATION

Iron ore was mined at one time from the Botwood sandstone in the Grand Falls area (Mustard, 1949). No known mineral prospects are presently known in the map area. To the west and southwest there is good potential for volcanogenic sulphide deposits within the felsic volcanics of the Victoria Lake and Tally Pond groups. Disseminations of pyrite, chalcopyrite, and minor sphalerite were noted in these rocks within the map area.

The altered felsic intrusions contain molybdenum outside the map area. Sedimentary rocks of the Botwood Group may have some potential for uranium; however, no uranium showings were found.

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