GEOLOGICAL MAPPING - BAY D'ESPOIR AREA

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Introduction

The 1975 field season was spent mapping the east half of the St. Alban's 1:50,000 NTS sheet (1 M/13) (Fig. 1). Exposures along the Harbour Breton Road as far south as the Hermitage Bay Fault (Gaultois Sheet - 1 M/12) were also examined.

The area is divided into a basement terrane to the southeast, and cover rocks of the Baie d'Espoir Group to the northwest. The basement consists of gneisses intruded by dioritic and granitic bodies. Three formations of the Baie d'Espoir Group crop out within the map sheet and include volcanic rocks, shallow water clastic sediments, and turbidites. They are continuous with the Isle Galet, Riches Island and St. Joseph's Cove Formations mapped in the west half of the St. Alban's NTS sheet (Colman-Sadd, 1975). The Baie d'Espoir Group has undergone polyphase deformation including a period of recumbent folding towards the southeast; it is in tectonic contact with the gneisses of the basement terrane. Metamorphism varies from biotite to garnet grade in the Baie d'Espoir Group, and may be as high as sillimanite grade in the gneisses.

A fossil locality has been discovered in the Baie d'Espoir Group and it is hoped that this will solve the problem of the age of these rocks.

Basement Rocks

Gneisses

A belt of gneisses extends across the map sheet along the entire basement-cover contact. It is intruded in the southeast by diorite and granite. Most of the gneisses are psammitic in composition and rich in muscovite and/or biotite; garnet and amphibole are common, and sillimanite, andalusite and staurolite have been tentatively identified in hand specimen. Limonitic and hematitic staining occurs in the gneisses southeast of the lower part of Collins Brook indicating some iron enrichment over an area of about 10 sq. km.

Local bands of amphibolitic gneiss and fine-grained deformed biotite granite are concordantly interbanded with the psammitic gneiss; these are especially common near the eastern edge of the mapsheet. The bands are generally in the order of 3 to 100 m. wide.

Diorite

The gneisses are intruded by a plutonic igneous body consisting of essential plagioclase and biotite and referred to here as a diorite. In many places it is oversaturated and a biotite rich tonalite, whilst in others it is more basic, quartz is rare or absent, and hornblende is the principal ferromagnesian mineral. In the southwest corner of the mapsheet, and where the diorite occurs as xenoliths in granite, it contains pink porphyroblasts of potassium feldspar up to 3 cm. across. Pyrite is a common accessory mineral, especially in the more basic varieties.

The contact of the diorite with the gneisses generally consists of a zone of dyke intrusion up to 1 km. wide, although in the northwestern part of the diorite outcrop area the contact may be sharp or overthrust. Sheets of gneiss and disoriented xenoliths are common.

Deformation of the diorite has created a moderate preferred orientation of biotite. The fabric is most obvious close to the outcrop of the Baie d'Espoir Group.

Granite

Granite similar to the garnetiferous leucogranite west of St. Alban's (Colman-Sadd, 1975) intrudes the diorite and gneisses in the southeast corner of the mapsheet. There are two principal varieties. The first is garnetiferous muscovite granite which is generally equigranular. It occurs especially in the outer part of the intrusion and forms numerous aplite and pegmatite veins which intrude the country rocks; pyrite is a common accessory mineral in the pegmatites but no other sulphides have been recognized. The second variety, biotite granite, is more common away from the margins of the intrusion; no garnets were seen in this variety. Around Salmon River, in the extreme southeast corner of the mapsheet, this granite is porphyritic; the feldspar phenocrysts are up to 2 cm. across and have a flow alignment parallel to the tectonic fabric in the rock. Veins of tuffisite with slightly rounded fragments of biotite granite occur on the Harbour Breton road about 2 km. from the south edge of the mapsheet.

Sheets of diorite and gneiss are common in the granite and the contact with the country rocks is a zone of dyke intrusion up to 2 km. wide.

A moderate to poor tectonic fabric can generally be observed within the granite; it dips steeply towards the northwest.

Baie d'Espoir Group

Three of the four formations of the Baie d'Espoir Group occur in the east half of St. Alban's map area. They are continuous along strike with formations mapped in the west half (Colman-Sadd, 1975), but are less meta-

Figure 1

Preliminary Geologic Map of St. Alban's 1 M/13 (East Half)

LEGEND

MIDDLE ORDOVICIAN OR EARLIER

BAIE D'ESPOIR GROUP

6 Isle Galet Formation

5 Riches Island Formation

4 St. Joseph's Cove Formation

INTRUSIVE ROCKS

3 Granite

2 Diorite and associated rocks

PRECAMBRIAN?

1 Gneiss

SYMBOLS

_____ lithologic contact

_____ fault

▲▲▲ thrust fault

bedding, tops known (inclined, overturned)

bedding, tops unknown

second deformation cleavage or schistosity

cleavage or schistosity, age unspecified

gneissic foliation

Ⓕ fossil locality

_ _ _ all weather roads

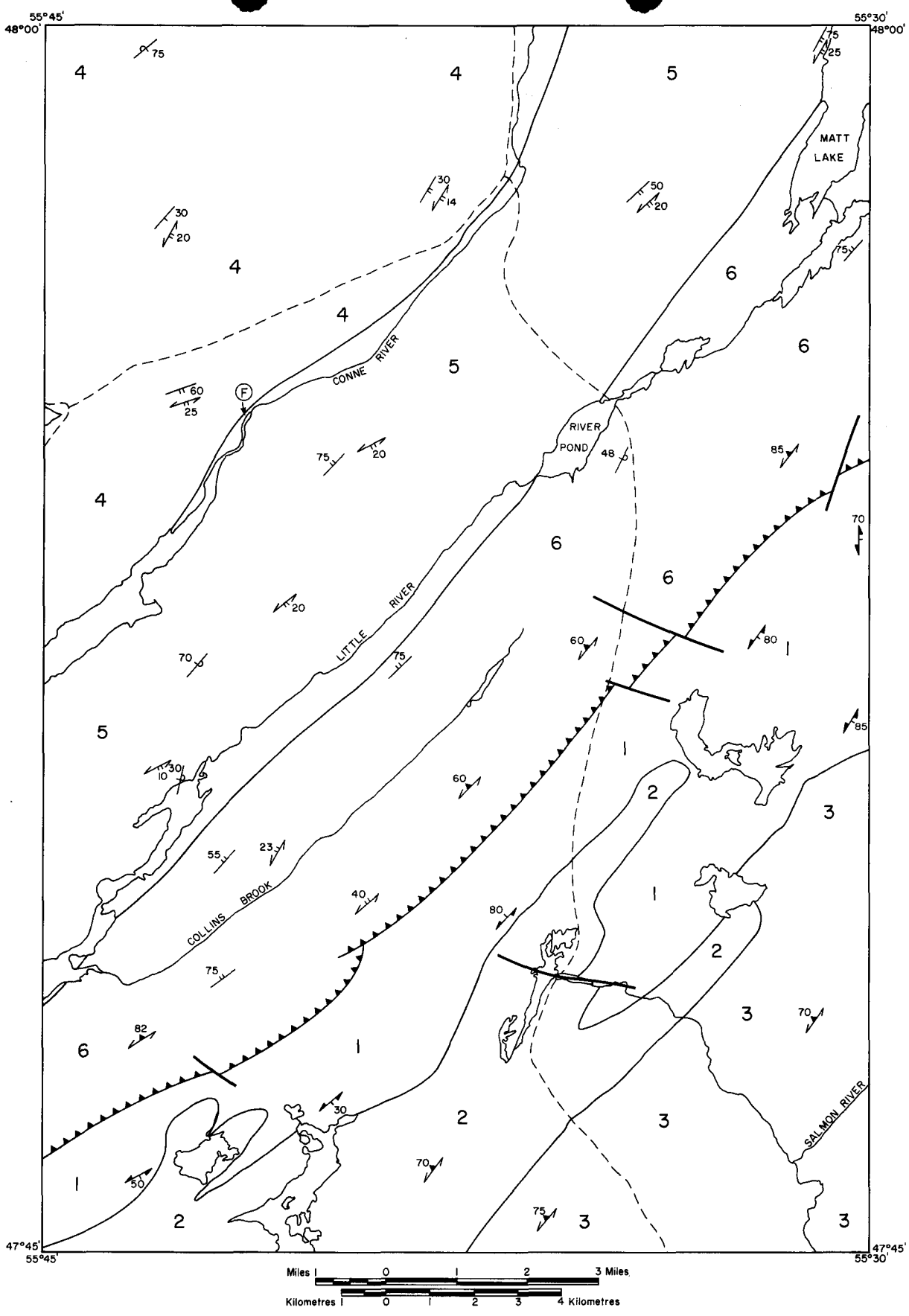

Fig.1 St. Alban's East Half Geological Sketch Map

morphosed and deformed.

St. Joseph's Cove Formation

The formation consists of a monotonous series of interbedded shale and siltstone with occasional belts of thick-bedded sandstone in the southwest part of the outcrop area. The sediments commonly have graded bedding and display the typical features of turbidites. Thin beds of tuff occur in many places but only one substantial outcrop of volcanogenic rock was found. This was a layer of acid tuff about 10 m. thick, 2 km. from the northwest corner of the map sheet; the tuff is rich in disseminated pyrite.

The St. Joseph's Cove Formation has been isoclinally folded during an early, dewatering deformation and there is a pervasive slaty cleavage subparallel to bedding. Because of this early folding, the facing directions of later folds are variable. A second period of deformation has caused open recumbent folds and a southeast dipping strain slip cleavage.

Metamorphism is low grade with the growth of muscovite, chlorite and biotite.

The formation is extensively intruded by quartz veins, which have been folded during the second deformation. In many places they contain pyrite, pyrrhotite and minor amounts of other sulphides.

Riches Island Formation

The principal lithology is phyllitic, slightly greenish siltstone and sandstone with pelitic laminae. The sediment generally has fine parallel laminations except in the thicker sandstone units which are massive or crossbedded; graded bedding is rare.

Within the typical lithology of the formation are belts of interbedded shale and siltstone similar to the rocks of the St. Joseph's Cove Formation. These are particularly common in the northern part of the outcrop and may reflect either original sedimentary interfingering, or infolding during the early period of deformation.

Belts of black pyritic and graphitic schist become thicker in the Riches Island Formation towards the east. They tend to be associated with minor occurrences of acid and intermediate volcanic rocks which are locally rich in disseminated pyrite.

Folds associated with the early dewatering deformation of the St. Joseph's Cove Formation are easily recognizable in the Riches Island Formation along Conne River, and the first schistosity is prominent through most of the outcrop area. The bedding and the first fabric are

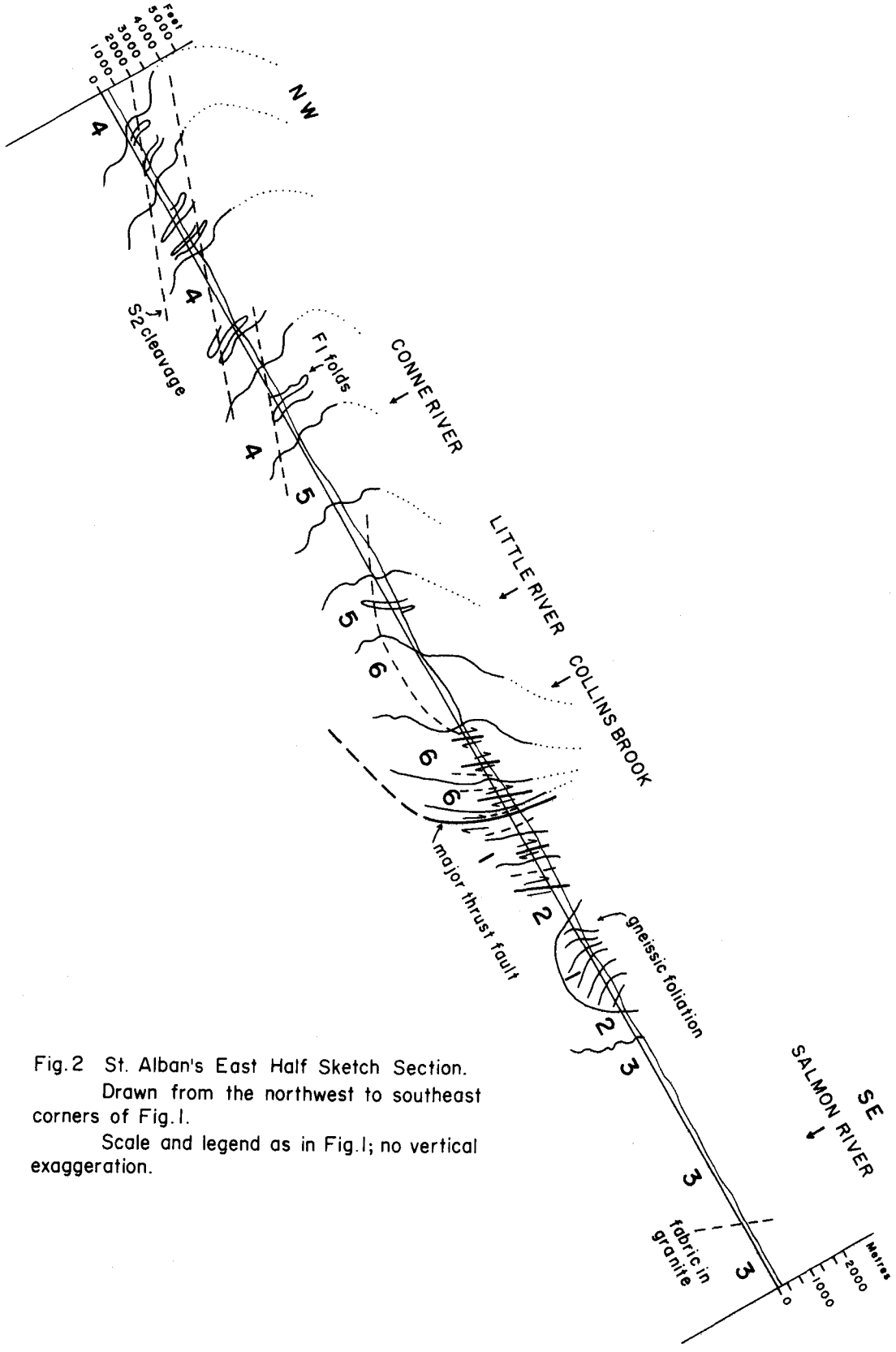

Fig. 2 St. Alban's East Half Sketch Section.

Drawn from the northwest to southeast corners of Fig. 1.

Scale and legend as in Fig. 1; no vertical exaggeration.

crenulated and recumbently folded around the second cleavage which generally is strain slip but locally becomes penetrative. It dips gently southeast in the north of the outcrop area, becoming horizontal and northwest dipping towards the southeast.

Metamorphism varies from biotite to garnet grade.

Fossils were found in the Riches Island Formation on the north side of Conne River. They occur in muddy, calcareous sandstone and siltstone with crossbedding and animal burrows. The fauna consists mainly of articulate brachiopods, but also includes bivalves, a trilobite pygidium, and possible crinoids and bryozoa.

Islet Galet Formation

Most of the volcanic rocks of the Baie d'Espoir Group are included in this formation. The dominant lithology is acid crystal tuff with minor lithic tuffs and possible flows; pyrite and pyrrhotite are common accessory minerals. A small granitic intrusion just south of Matt Lake may be associated with these volcanic rocks.

Minor bands of mafic tuff and possible metabasalt flows are present in some parts of the formation.

Grey volcanogenic, often cherty, phyllite is the main clastic lithology, but biotite semipelitic schist and black pyritic graphitic schist are also widespread. A large lens of sandstone with ripple and flaser bedding and local conglomeratic beds underlies the hills between Little River and Collins Brook.

The intensity of deformation increases southeastwards through the outcrop area of the Isle Galet Formation towards the thrust fault at the basement-cover contact. Southeastwards the second deformation cleavage becomes a penetrative schistosity, dipping towards the northwest subparallel to the early schistosity and often indistinguishable from it in the field. The basement-cover contact and associated thrust faults wholly within the cover or the basement are marked by zones of tectonic schist; these are characterised by a mass of anastomosing shear surfaces usually forming augen around numerous quartz segregations. Most of the tectonic schists appear to be derived from phyllite or graphitic schist, but in many cases slices of acid volcanics, amphibolite and reconstituted gneiss are recognizable. Bedding and the original gneissic banding are completely destroyed.

Metamorphism in the Isle Galet Formation is at garnet grade with the growth of hornblende in basic volcanic and calc-silicate rocks.

Structure

The early period of folding in the Baie d'Espoir Group does not

appear to have formed any major structure, but minor folds are widespread and make bedding tops inconsistant. Generally contortions of the bedding on fold crests during dewatering makes facing directions difficult to determine, but in a few localities in the St. Joseph's Cove Formation early folds can be shown to face upwards.

The second deformation caused recumbent folding. The general dip of bedding changes from steeply southeastwards in the St. Joseph's Cove Formation through vertical to northwest dipping in the Riches Island Formation, and then steepens again at the basement-cover contact. The second deformation cleavage changes from southeast dipping through horizontal to northwest dipping. An interpretation of the structure is shown in Fig. 2. The rocks along the line of section are folded into a recumbent syncline whose upper limb forms the lower part of the Bay d'Espoir nappe. The axes plunge gently towards the southwest so that the syncline becomes hidden beneath the nappe in the area around St. Joseph's Cove (St. Alban's West Half); it reappears on the flanks of the North Bay Granite northwest of St. Alban's where the fold axes plunge northeast. There is no evidence that the change in attitude of the second deformation cleavage is due to later folding; a more likely explanation is that it is caused by changes in stress orientation reflecting the topography on the basement.

The basement gneisses immediately adjacent to the contact with the cover are transformed to tectonic schists. Southeastwards from the contact the folds and schistosities associated with the deformations of the cover rocks become less intense. Gneiss, diorite, and granite more than 2 km. from the contact generally have a moderate fabric related to the deformation of the cover rocks.

Cross faults offset units of the Isle Galet Formation and the basement-cover contact. They generally originate in tectonic schist zones and therefore are thought to be related to the recumbent folding.

Economic Geology

The best prospects for economic mineral occurrences in the area are in the acid volcanic rocks of the Baie d'Espoir Group, particularly the Isle Galet Formation. Several units of this lithology contain disseminated pyrite and pyrrhotite and a band of massive pyrite, 30 cm. thick, was found on the headland opposite the mouth of Collins Brook. No other sulphide minerals have yet been identified in these rocks.

Pyrite, prryhotite, and minor chalcopyrite and galena occur in the quartz veins that are especially common within the outcrop of the St. Joseph's Cove Formation. None appear to have economic potential.

Pyrite occurs in basement rocks disseminated through the more basic parts of the diorite, and also in garnetiferous granite pegmatites.

Minor iron enrichment in gneisses southeast of the lower part of

Collins Brook could possibly indicate iron ore prospects in this area.

References

Colman-Sadd, S.P.
1975: Geological mapping - Bay d'Expoir area; in Report of Activities for 1974, J.M. Fleming (ed.), Nfld. Dept. Mines and Energy, Min. Dev. Div., Report 75-1, pp. 12-21.