Metasomatic-Hydrothermal Mineral Deposits of the New Ross-Mahone Bay Area, Nova Scotia

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METASOMATIC-HYDROTHERMAL MINERAL DEPOSITS OF THE NEW ROSS - MAHONE BAY AREA, NOVA SCOTIA

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METASOMATIC-HYDROTHERMAL DEPOSITS OF THE NEW ROSS-MAHONE BAY AREA, NOVA SCOTIA

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ABSTRACT

Southern Nova Scotia consists predominantly of a thick sequence of Lower Paleozoic metasedimentary rocks called the Meguma block. This metasedimentary pile was intruded in the Devono-Carboniferous by a peraluminous, cogenetic suite of granitic rocks which range in composition from tonalite to leucomonzogranite and porphyry. The granitic rocks form a number of plutons, the largest of which is known as the South Mountain batholith. Many occurrences of Mo, Sn, W, Cu, F, Mn, Li and U have been associated with the batholith in the New Ross-Mahone Bay area. These occurrences are interpreted in light of metallogenic theories postulated for the origin of similar deposits in Europe. In the New Ross-Mahone Bay area the mineral occurrences associated with the South Mountain batholith were classified into three types: (1) those that are hosted by direct late stage magmatic differentiates of the batholith such as pegmatite, leucomonzogranite and leucogranite, (2) those that are metasomatic in origin or associated with apogranite formation at the peripheral and apical parts of the batholith. This metasomatism maybe due, at least in part, to specialized granite plutons enriched in Sn, F, Li, Rb, U, Be and K, and (3) those that are hydrothermal in origin. These include occurrences related directly to the hydrothermal stage in the differentiation of the batholith and those probably related to a mixture of hydrothermal fluids with meteoric or connate waters.

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INTRODUCTION

The rocks of southern Nova Scotia have been intruded by a large composite granitic batholith named the South Mountain batholith by McKenzie and Clarke (1975). The batholith is roughly elongate in shape extending southwest from Halifax approximately 177 km, varying in width from 25 km to 50 km. Due to increased mineral exploration activity in the granitic rocks of mainland Nova Scotia in recent years a project was initiated by the Nova Scotia Department of Mines and Energy in 1979 to document the geological features of the mineral deposits found associated with the granitic rocks. The study area comprises the east-central region of the South Mountain batholith (Figs. 1 and 2).

In the New Ross-Mahone Bay area many mineral occurrences are associated with the granitic rocks of the South Mountain batholith. Little published information exists about these occurrences although considerable work has been carried out in the past, both by exploration companies and universities. Sixteen of twenty occurrences found within the study area were visited and sampled. Seven occurrences were chosen for detailed mapping and sampling to include at least one example from each type of occurrence observed and to provide detailed information on showings with the most potential. Field sampling and mapping were supplemented with petrographic studies during the fall and winter of 1979.

Previous workers have delineated several phases in the South Mountain batholith. Honeyman (1883, p. 60), and Wright (1931) have described intrusive relations in restricted areas. McKenzie (1974), Smith (1974), McKenzie and Clarke (1975), Charest (1976) and Charest et al. (in preparation) have mapped on a reconnaissance level the geology of the granitic rocks. Taylor (1969) and Smitheringale (1973) have mapped the regional geology of southwestern Nova Scotia.

Numerous unpublished reports and maps by exploration companies on particular occurrences or groups of occurrences are found in the assessment files of the Nova Scotia Department of Mines and Energy.

GEOLOGICAL SETTING

COUNTRY ROCKS

The regional geology of southwestern Nova Scotia has been described in detail by Taylor (1969) and Keppie (1977). Within the study area the oldest rock exposed is the Cambro-Ordovician Meguma Group which consists of the Goldenville Formation and conformably overlying Halifax Formation (Fig. 1). The Goldenville Formation consists of greywacke, quartzite, lesser slate and minor calcareous horizons, and the Halifax Formation consists predominantly of slate with lesser greywacke, quartzite and calcareous horizons (Fig. 2). Elsewhere in southwestern Nova Scotia the Meguma Group is conformably overlain, in sequence from oldest to youngest by the White Rock, Kentville, New Canaan and Torbrook Formations (Taylor, 1969). Schenk (1971) named the area underlain by these rocks the Meguma platform. He interpreted them as a continuous sequence of deep water turbidites and alkaline volcanics shoaling upwards into shallow water environment siltstones, quartz sandstones and minor limestones.

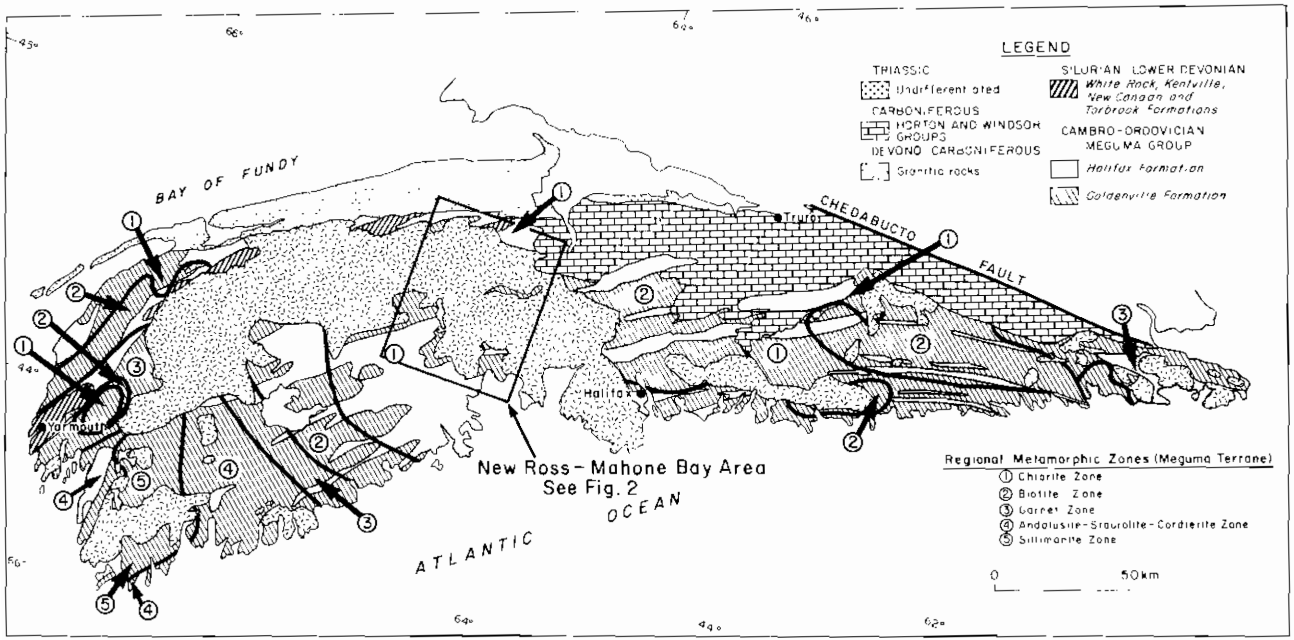

Figure 1. Geology of southern Nova Scotia

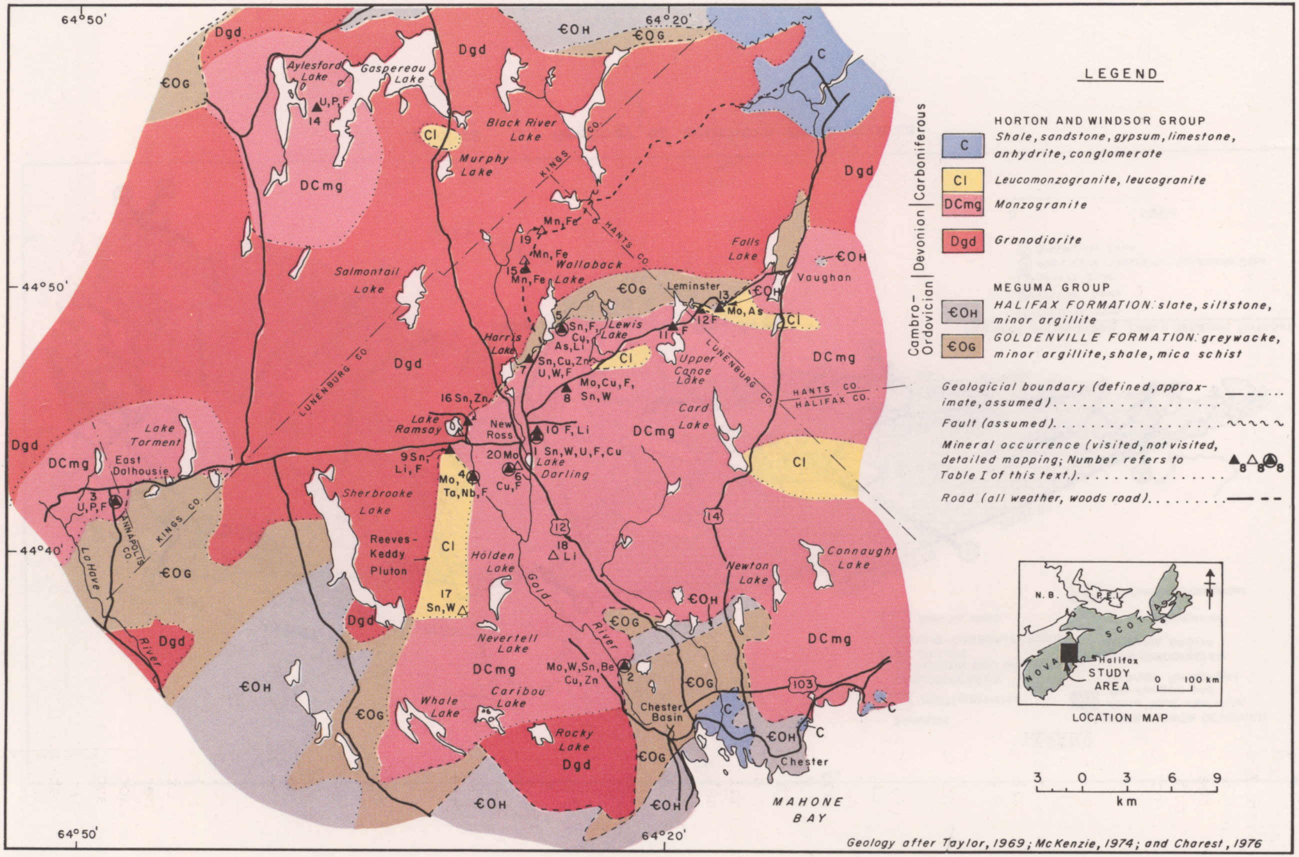

Figure 2. Geology and mineral occurrences of the New Ross – Mahone Bay area.

Rocks of the Meguma platform have been regionally metamorphosed and deformed into upright northeast-southwest trending folds by the Lower Devonian Acadian Orogeny. The regional metamorphism associated with the Acadian Orogeny has been dated at 400-415 Ma (Reynolds and Muecke, 1978). Within the study area the regional metamorphic grade does not exceed chlorite grade although an increase in metamorphism up to sillimanite grade occurs to the southwest (Taylor and Schiller, 1966; Keppie and Muecke, 1979).

The Paleozoic strata and the intrusive rocks of the South Mountain batholith are overlain unconformably by the sandstones of the Horton Group and the carbonate rocks of the Windsor Group. Both of these units are Early Carboniferous in age. Locally the base of the Horton Group contains granitic detritus.

INTRUSIVE IGNEOUS ROCKS

The South Mountain batholith is a very large composite body of approximately 10 000 km^2. Various authors have recognized and mapped the field relations and areal extent of phases for the central and eastern parts of the batholith (Smith, 1974; McKenzie, 1974; McKenzie and Clarke, 1975; Charest, 1976; Charest et al., in preparation). Field observations show the South Mountain batholith has intruded the sediments of the Meguma platform and superimposes on the regional metamorphic assemblages a thermal metamorphic halo which grades up to the hornblende-hornfels facies. The relationship of thermal and regional metamorphism infers generation of the parent magma to be related in space only to the metamorphism and deformation during the Acadian Orogeny in southwestern Nova Scotia.

The intrusive sequence of the South Mountain batholith from oldest to youngest is biotite granodiorite, biotite-muscovite monzogranite (adamellite), dykes and smaller intrusions of porphyry, leucomonzogranite, leucogranite and aplite (McKenzie and Clarke, 1975; Fig. 2). Smith (1974) stated that biotite granodiorite, quartz monzonite and a muscovite-biotite granite have gradational relations in an area of the batholith to the east of the study area. Field observations by the author in the study area are in agreement with the conclusions of McKenzie and Clarke (1975) that the biotite granodiorite has been intruded by the two mica monzongranite, both of which have been intruded by minor alaskite (leucogranite in this paper) and aplitic bodies. Within areas mapped as granite (Fig. 2) textural variations exist which can only be delineated by more detailed mapping. These variations are most obvious in the New Ross-Vaughan area where Charest (1976) believed the variation to be related to late stage pneumatolytic and hydrothermal alteration concentrated in this the highest level and most differentiated region of the batholith.

Biotite granodiorite underlies about 60 to 70 per cent of the South Mountain batholith. It is grey to light grey, coarse grained and often porphyritic. The mineralogy consists of quartz, andesine, biotite with lesser perthitic orthoclase. Microcline or perthitic orthoclase comprise the phenocrysts in the porphyritic variety. Accessories include apatite, zircon and opaques. Areas of granodiorite, often far from country rock outcrops, commonly contain abundant xenoliths of metasedimentary rock in various stages of digestion.

In the study area three areas underlain by biotite-muscovite monzongranite (adamellite) have been described by McKenzie and Clarke (1975). This rock varies in colour from pink to grey-white. Texturally it is hypidiomorphic granular and often porphyritic. Orthoclase, usually perthitic, is equal to or dominant modally to plagioclase. Plagioclase is usually zoned with andesine cores and sodic plagioclase rims. McKenzie and Clarke (1975) reported two plagioclase compositions coexisting in samples from the New Ross area. Highly altered and hematized andesine is found with medium sized grains of unaltered albite. Muscovite and biotite are found coexisting in approximately equal proportions. Accessories include opaques, zircon, and andalusite.

Dykes and minor bodies of porphyry, aplite, leucomonzogranite and leucogranite have intruded the granodiorite, but more commonly the monzogranite. Aplite dykes range up to a few metres in width and display a fine- to medium-grained saccharoidal texture.

Five small intrusions of leucomonzogranite-leucogranite are shown in Figure 2. Charest (1976, p. 29-30) stated that some of these bodies, although alaskitic in texture and appearance, must be classified as leucomonzogranite on their mineralogy. Pegmatite dykes, both zoned and massive, are often found associated with pink medium grained muscovite leucogranite. These pegmatites are found both within areas mapped as leucomonzogranite and as separate small intrusions in the granodiorite and monzogranite.

AGE AND ORIGIN OF THE GRANITIC ROCKS

The age of the South Mountain batholith is well established radiometrically and by intrusion into fossiliferous strata. The richly fossiliferous Torbrook Formation of Lower Devonian age (Fig. 1) is intruded by biotite granodiorite (Smitheringale, 1973). All phases of the batholith are overlain nonconformably by the Lower Carboniferous Horton Group and in some areas the Windsor Group. Radiometrically, Cormier and Smith (1973) reported two separate phases of intrusion. An older phase consisting of granodiorite and quartz monzonite at 417 ± 38 Ma and a genetically related muscovite-biotite granite at 387 ± 25 Ma. The intrusion of leucogranite is believed to be a younger, possibly unrelated event at 355 ± 7 Ma.

McKenzie and Clarke (1975) reported an average age of 371 ± 7 Ma for intrusion of the South Mountain batholith. Clarke and Halliday (1980) reported ages of 371.8 ± 2.2 Ma for the biotite granodiorite, 364.3 ± 1.3 Ma for the monzogranite and 361.2 ± 1.4 Ma for the late porphyry intrusions. All of the dates agree with the stratigraphic age bracket.

McKenzie and Clarke (1975) presented petrological and geochemical data to show the South Mountain batholith to be an autointruded, comagmatic suite which has differentiated in situ from a parent magma generated at least in part by partial melting of lower crust material. Biotite granodiorite crystallized first and with biotite and plagioclase fractionation the magma became monzogranitic in composition. This monzogranite intruded the granodiorite. Further fractionation gave rise to pegmatite and leucomonzogranite intrusions.

Albuquerque (1977) supported an origin of partial melting of Meguma Group metasediments to produce the parent magma for a suite of granitic rocks south of the main batholith (Fig. 1). This granitic suite is similar in composition and in age to the main batholith. Clarke and Halliday (1980) concluded, using Sr isotope data, that anatectic melting of the Meguma Group as exposed at surface could not have produced the South Mountain batholith. They do concede that the source region for the magma must include large volumes of metasediment.

DESCRIPTION OF OCCURRENCES

This paper consists of a write up for each of the mineral occurrences recorded on Figure 2. Each description conforms to the following format.

The first line contains the occurrence number from Figure 2 and Table 1 and the most commonly used name for the occurrence. Line two, in brackets has any alternate less commonly used names. Line three is the National Topographic Series (NTS 1:50 000) map sheet which contains the occurrence. Lines four and five are the Universal Transverse Mercator Grid co-ordinates (UTM) in metres. The main text of the description follows, with a paragraph to locate the occurrence followed by one summarizing all previous work done. A ground description of the area is combined with a description of the geology of the deposit. A summary with any conclusions and/or recommendations ends the description.

Table 1. Occurrences of the New Ross-Mahone Bay area.

No.*	Occurrence Name	Type of Mineralization as described in Discussion of Deposit Types section	Association
1	Morleys Pegmatite	Magmatic - pegmatite dykes and associated leucogranite intruded into monzogranite.	Sn, W, F, Li, radioactive minerals.
		Hydrothermal - jasper breccia dyke with hematized alteration halo in monzogranite.	W, Cu, F
2	Long Lake Prospect	Metasomatic - apogranite cupola and quartz-microcline veins.	Mo, W, Sn, Be, F, As, Zn, Cu, U
3	East Dalhousie U	Hydrothermal - mineralized fractures and/or shear zones in an altered monzogranite.	U, P, F
4	Keddy Prospect	Magmatic - pegmatite dykes and lenses in leucomonzogranite.	Mo, Ta, Nb, F
		Metasomatic - greisenized leucomonzogranite spatially associated with pegmatite.	Mo, F
5	Wallaback Lake Sn Prospect	Magmatic - irregular pegmatite bodies in small leucomonzogranite intrusion.	Sn, F
		Metasomatic - grsisenized leucomonzogranite and greisen patches.	Sn, Cu, F
6	Lake Darling Cu	Magmatic - pegmatite dyke with mineralized greisen selvage in monzogranite.	Cu, F
7	Turner Sn Prospect	Metasomatic - quartz and quartz greisen veins in monzogranite at contact with country rocks.	Sn, Cu, Zn, W, U, F
		Magmatic - greisen associated with quartz porphyry dyke intruded into monzogranite.	Sn
8	Walker Moly	Magmatic - pegmatite dyke, small greisen eelvages and an associated leucogranite which have intruded monzogranite.	Mo, Cu, F, Sn, W
9	Reeves Sn Pit	Magmatic - pegmatite dyke in Reeves-Keddy leucomonzogranite plutons.	Sn, Li, F
10	Mill Brook Pegmatite	Magmatic - pegmatite dyke in monzogranite	F, Li

No.*	Occurrence Name	Type of Mineralization as described in Discussion of Deposit Types section	Association
11	Canoe Lake Fluorite	Hydrothermal - fracture fillings in altered and hematized porphyritic monzogranite and leucomonzogranite dykes.	F
12	Leminster Fluorite	Hydrothermal -fracture fillings in altered and hematized leucomonzogranite	F
13	Swinimer Prospect	Hydrothermal - quartz veins in Meguma Group hornfels.	Mo
14	Gaspereau Lake U	Hydrothermal - mineralized fractures and/or shear zones in altered leucogranite.	U, P, F
15	Cain and Riddle Mine and the Marpic Shaft	Hydrothermal - northeastern trending mineralized lenses, fault controlled, intruded into and altering granodiorite.	Mn, Fe
16	Lake Ramsay Area	Deposit types not known because occurrences no longer exposed.	Sn, Zn, Au, Mo, F, Cu
17	Nevertell Lake Prospect	Magmatic - pegmatite dyke in Reeves-Keddy leucomonzogranite pluton.	Sn, W
18	Seffernsville Pegmatite	Magmatic - quartz and pegmatite dykes in porphyritic monzogranite.	Li
19	Dean and Chapter Mine	Hydrothermal - northeastern trending mineralized lenses fault controlled, intruded into and altering granodiorite.	Mn, Fe
20	Lake Darling Mo	Magmatic - pegmatite dyke in monzogranite	Mo

*Refer to Figure 2 for locations

Note: Occurrences 1 to 16 visited
Occurrences 17 to 20 not visited

SECTION 1. MORLEYS PEGMATITE

(MILL STREAM; NEW ROSS)

NTS - 21A/09C

UTM N-4954810
E- 385450

LOCATION

The Morleys pegmatite prospect is found immediately to the east of Mill Brook which enters the Gold River at New Ross (No. 1 on Fig. 2). All outcrops of the prospect are found within a short distance of the Brook and the New Russell road.

PREVIOUS WORK

Faribault (1931) mapped the occurrence as an elongate pegmatite dyke extending for approximately 1.6 km. It was reported to contain scheelite, cassiterite, beryl, columbite, lepidolite and an unidentified radioactive mineral. Campbell (1940) and Douglas and Campbell (1942b) mapped the occurrence and described a jasper breccia dyke gradational with and parallel to the pegmatite.

Faribault (1908) and Ellsworth (1932) identified tungsten minerals, rare earths and columbite from this locality. No authors since have reported any significant mineralization (Douglas and Campbell 1942b; Cameron 1950; Charest 1976). Charest (1976) described the area as a series of pegmatites and associated mica aplites intrusive into porphyritic monzogranite (adamellite) and observed that extreme reddening and shearing of the porphyritic monzogranite is associated with intrusion of a jasper breccia dyke in the southern end of the prospect. Campbell (1940) mapped outcrops of this brecciated and hematized monzogranite as pegmatite, suggesting that these outcrops form an elongate somewhat irregular pegmatite dyke extending for considerable distance.

GEOLOGY AND PROSPECT DESCRIPTION

Figure 3 displays the geology of the prospect as concluded from mapping at 1 in = 100 ft. The oldest rock in the area is a grey-white porphyritic muscovite-biotite monzogranite. Intrusive into the monzogranite are dykes and pods of pink, medium grained muscovite granite-aplite. Several pegmatite bodies are exposed in the area and were seen to grade into the muscovite granite and are hence believed to be contemporaneous. The largest of these pegmatite bodies is the Morleys pegmatite (Fig. 3) after which the prospect was named. The pegmatite is roughly zoned, although irregular in orientation. An outer zone of megacrystic pink perthitic orthoclase, quartz and muscovite grades into an inner core of graphic granite and white massive quartz. Thin lenses or selvages of muscovite greisen are dispersed throughout the pegmatite.

The youngest episode observed in the area which has affected the rocks is intense hematization and brecciation associated with intrusion of a reddish brown jasper breccia dyke. The jasper breccia strikes approximately north, dipping steeply eastward and consists of a very fine grained ground-

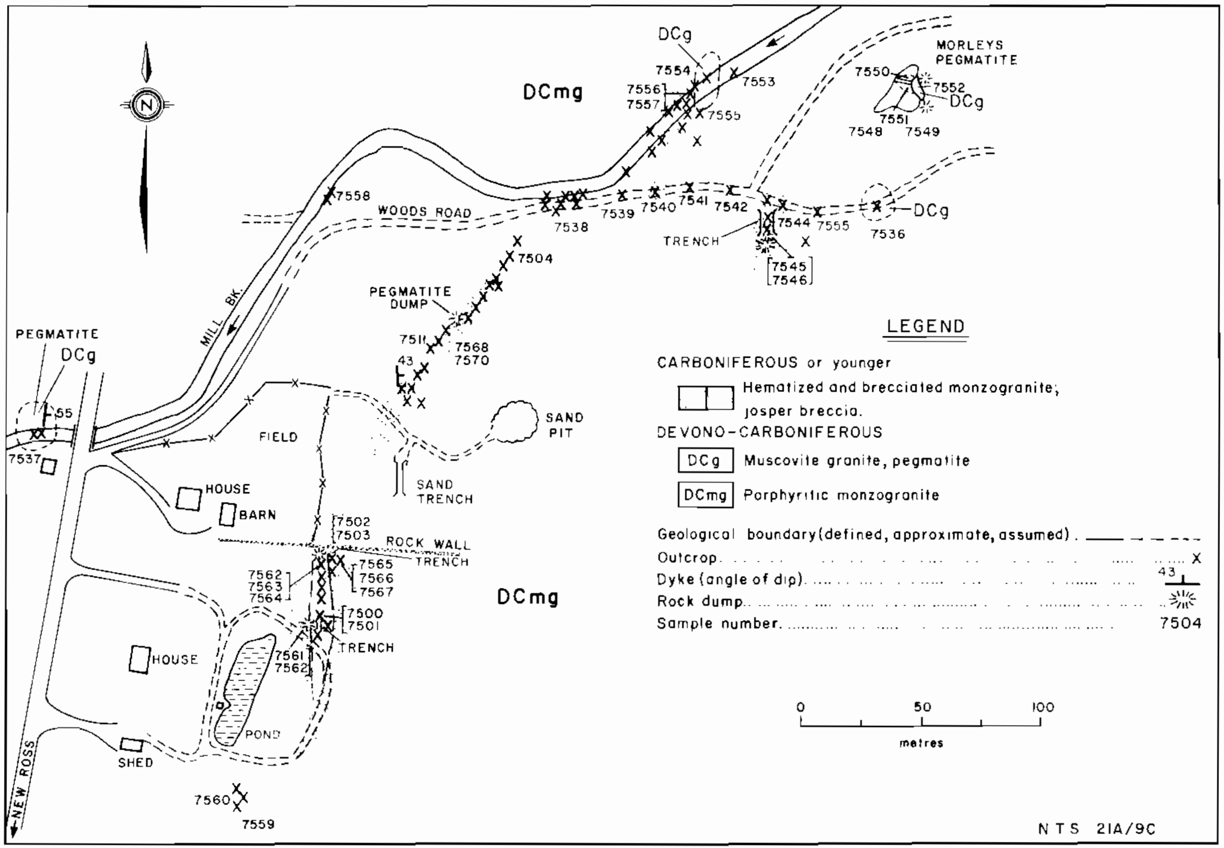

Figure 3. Geology of Morleys pegmatite and jasper breccia

mass of quartz and hematite. Some zonation exists within the dyke as evidenced by textural variation in the boulders blasted from two test pits at some time in the past. Enough of the dyke is not exposed to define a sequence. Within 1 m of the contact of the dyke with the surrounding rocks there is a decrease in size and percentage of breccia fragments possibly indicating chilling toward the margin. Breccia fragments consist mostly of white angular quartz with a lesser number of fragments of intensely hematized coarse grained monzogranite and muscovite granite.

A. K. Chatterjee of the Department of Mines and Energy collected and analyzed two samples of jasper breccia (Table 2). One sample analyzed 0.1% W. Microprobe analyses indicated the presence of fine grains of wolframite in the sample (Chatterjee, personal communication, 1980). Anomalous F and Li values attest to a volatile rich environment in which the dyke formed. The jasper breccia and associated brecciated monzogranite have never been properly prospected for tungsten.

Gradational with the jasper breccia over a 1 m contact zone is a zone of intense brecciation and hematization of the host porphyritic muscovite-biotite monzogranite. Brecciated zones with associated hematization in the monzogranite are also exposed with subparallel orientation to the jasper breccia elsewhere in the prospect (Fig. 3). Intense hematization of both plagioclase and orthoclase give this rock a reddish brown colour. This and the brecciation gives the rock a blocky pegmatitic appearance in hand specimen. This quite possibly resulted in these zones being mapped as pegmatite in the past. In thin section orthoclase is altered to muscovite and quartz and biotite is intensely altered to chlorite and rutile. Bent polysynthetic twins in plagioclase are common.

In the test pit at the northern end of the jasper breccia the brecciation and hematization, which have affected the monzogranite, can be seen to overprint the medium grained muscovite granite. Within this pit stringers of fluorite with minor pyrite and chalcopyrite are found within the brecciated monzogranite and muscovite granite.

Along the woods road which follows Mill Brook the transition within the porphyritic monzogranite from a brecciated intensely hematized rock to grey-white fresh monzogranite is exposed.

SUMMARY AND CONCLUSIONS

The sequence of events as displayed at the Morleys pegmatite and jasper breccia prospect is from oldest to youngest:

1. intrusion of porphyritic muscovite-biotite monzogranite;

2. intrusion of medium grained muscovite granite-leucogranite with associated dykes and pods of pegmatite. These pegmatites have been reported to contain scheelite, cassiterite, beryl, columbite and lepidolite. Within the present study only fluorite was observed;

3. overprinting of both monzogranite and leucogranite by intense hematization and brecciation associated with intrusion of a jasper breccia dyke. Stringers of fluorite and minor pyrite and chalcopyrite are the only mineralization visible in hand specimen associated with this process. An interesting analysis of tungsten led to the identification of wolframite from the jasper breccia. The jasper breccia and associated brecciated monzogranite should be prospected for the presence of granophile elements.

Table 2. Analyses of two samples of jasper breccia from Morleys pegmatite prospect (A. K. Chatterjee, Nova Scotia Department of Mines and Energy, unpublished data, 1980)

	Sample No.	LL-37	LL-38
Major Elements (%)	SiO_2	94.09	95.88
	TiO_2	0.02	0.02
	Al_2O_3	1.39	1.04
	Fe_2O_3	0.78	1.04
	FeO	0.59	0.36
	MnO	0.011	0.007
	MgO	0.02	0.03
	CaO	0.33	0.26
	K_2O	0.35	0.30
	Na_2O	0.36	0.30
	H_2O+	0.54	0.51
	H_2O-	0.00	0.00
	P_2O_5	0.02	0.020
	CO_2	0.070	0.105
	Total	98.58	100.03
Trace Elements (ppm)	Ba	10	26
	Cu	51	34
	F	880	770
	Mo	35	4
	Pb	<2	2
	Rb	33	29
	Sn	8	6
	Sr	9	7
	Zn	150	22
	U	3.6	2.9
	W	1000	20
	B	49	50
	Be	3.2	2.4
	Bi	9	8
	Li	132	121
	Sb	<3	<3
	Co	<1	<1
	Ni	10	16

SECTION 2. LONG LAKE PROSPECT

(HENRY LAKE, GOLD RIVER, MATTHEWS PROSPECT)

NTS - 21A/09B

UTM - N-4939350
E- 391400

LOCATION

The Long Lake Mo, W, Sn, Be, Cu, Zn, Ag prospect is located between Long Lake and the Gold River, Lunenburg County (location 2 on Fig. 2; Fig. 4). The prospect is accessible from the east by a woods road from highway 12 at Chester Grant, a distance of approximately 4.5 km. From the west the area is accessible by private logging road to the Gold River then on foot by woods trail.

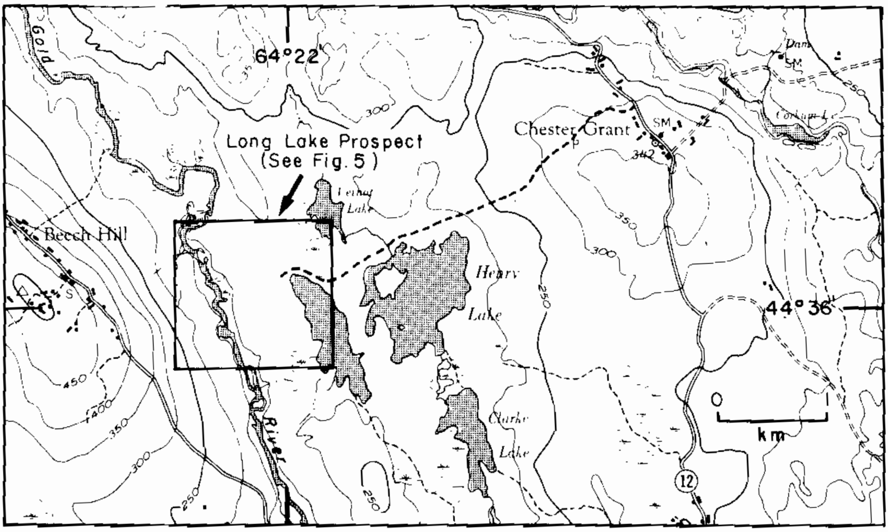

Figure 4. Location map of Long Lake prospect

PREVIOUS WORK

Faribault (1924) mapped molybdenite bearing float in the area of Long Lake. Further follow up work was not carried out until F. Matthews of Moncton, New Brunswick promoted the area in the late 1950's. Wright (1959) first documented the presence of scheelite in outcrop in the area, but concluded both W and Mo were not of economic concentration. Noranda Exploration optioned the property from Matthews in 1964. After preliminary investigation and some detailed soil sampling surveys, the option was dropped in 1965. Matthews uncovered a quartz-pegmatite body with extensive molybdenite mineralization in 1965 and approached Mariner Mines who then took up the option. The results of a ground magnetometer survey and eleven diamond-drill holes (total 457 m) are summarized by Oldale (1966) and Johnston (1966).

The existence of disseminated chalcopyrite in nearby greisenized granite outcrops prompted Riocanex to option the property in 1967. Shewman (1968) reported the results of geological mapping, induced polarization and magnetometer surveys and diamond drilling (4 holes totalling 402 m). From the sampling and geological mapping many occurrences of chalcopyrite, pyrite, arsenopyrite, wolframite, scheelite, molybdenite and fluorite were found in outcrops of muscovite granite and greisen. One sample rich in sulphide yielded by spectrographic analysis anomalous values of Au and Ag. In another sample values of Rb (0.75%), Cs (0.02%) and Li (0.09%) were reported. Shewman (1968) reported interesting sightings of scheelite and wolframite in drill core from the property, but little follow up on the potential for W was attempted. Riocanex dropped the option the following year and no further interest was expressed in the prospect until the present.

GEOLOGY AND PROSPECT DESCRIPTION

During this study the Long Lake prospect and surrounding area were mapped at a scale of 1:9600; a plane table was used to map the large stripped greisen outcrops at a scale of 1:120. Figure 5 is a sample location and geology map of the prospect modified after Shewman (1968).

Outcrops of greywacke, quartzite and slate of the Goldenville Formation in the area mapped were thermally metamorphosed by intrusion of the granitic rocks of the South Mountain batholith. Much of the granitic terrane mapped is underlain by porphyritic biotite-muscovite monzogranite similar in texture and composition to that described by McKenzie and Clarke (1975) for the monzogranite outcropping between Chester and New Ross (Fig. 2). The mineral prospect proper is underlain by granitic rocks which display variations from this phase both texturally and compositionally. Outcrops of a medium grained grey muscovite biotite granite (DCg on Fig. 5) are exposed along the Gold River west of Long Lake. The contact of this phase with the porphyritic monzogranite is exposed in one outcrop (sample location 7533-7539). The presence of small xenoliths of monzogranite in the granite within about 10 cm of the contact suggest the medium grained granite is younger than the monzogranite. Outcrops of this phase were observed along the river only, but abundant boulders of this granite in the woods between the river and the prospect suggest this area is at least in part underlain by this phase. Within this muscovite biotite granite a large greisen pod is developed in outcrop 7533-7539 (Fig. 5). Arsenopyrite, chalcopyrite, scheelite, molybdenite and beryl were observed disseminated throughout the pod.

In the area of the W, Cu bearing outcrops at the northwestern end of Long Lake all outcrops exposed have undergone a significant degree of metasomatism and recrystallization. The relationships observed compare favourably with features described by Shcherba (1970) and Stemprok (1979) for metasomatic deposits of Sn, W associated with acid granitic rocks. Pink equigranular microclinized granite (DCgm on Fig. 5) underlies most of the

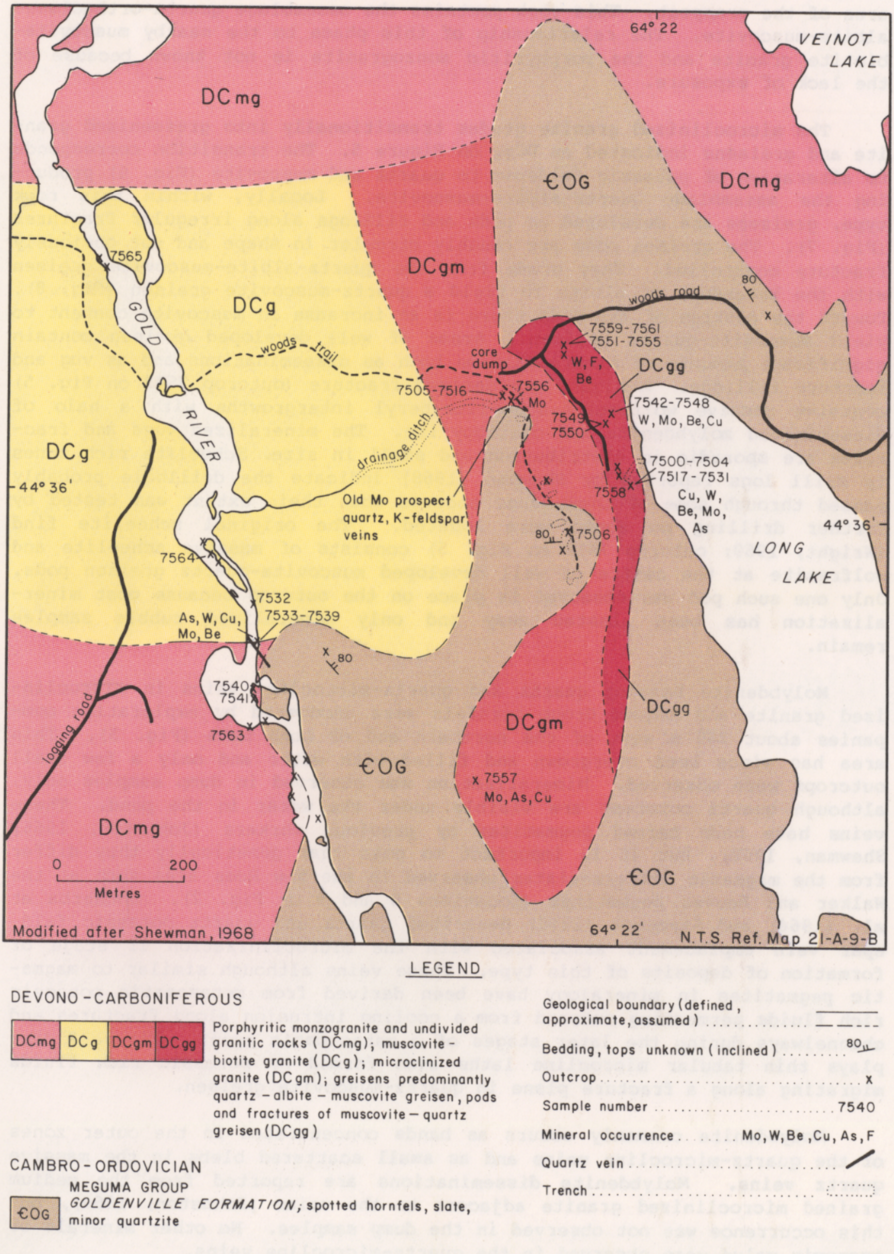

Figure 5. Geology of the Long Lake Mo-W-Sn-Be-Zn-Cu prospect.

area of the prospect. This rock contains the assemblage quartz-orthoclase-albite-muscovite. The relationship of this phase to the nearby muscovite-biotite granite and the porphyritic monzogranite is not known because of the lack of exposure.

The microclinized granite grades transitionally into greisenized granite and greisens indicated as DCgg on Figure 5. The transition corresponds to alteration of potassic feldspar to quartz and muscovite (Fig. 6) producing the assemblage quartz-albite-muscovite. Locally, within this rock type, greisens are developed as pods and fillings along irregular fractures (Fig. 7). The greisen pods are roughly circular in shape and not obviously fracture controlled. They grade from the quartz-albite-muscovite greisen with the breakdown of albite to yield a quartz-muscovite greisen (Fig. 8). Toward the centres of the pods there is an increase in muscovite content to yield muscovite-quartz greisen. Areas of well developed greisen contain significant amounts of mineralization both as disseminations and as vug and fracture fillings. A highly greisenized fracture (outcrop 7542 on Fig. 5) contains massive wolframite-scheelite-beryl intergrowths with a halo of disseminated molybdenite and chalcopyrite. The mineralized vugs and fractures are sporadic in distribution and small in size. Scheelite rich zones in drill logs reported by Shewman (1968) indicate the drillhole probably passed through some of these vugs because when their extent was tested by further drilling no zones were located. The original scheelite find (Wright, 1959; outcrop 7559 on Fig. 5) consists of massive scheelite and wolframite at the centre of well developed muscovite-quartz greisen pods. Only one such pod was observed in place on the outcrop because most mineralization has been blasted away and only mineralized rubble samples remain.

Molybdenite bearing quartz and quartz-microcline veins in microclinized granite and Meguma Group hornfels were uncovered by exploration companies about 200 m west of the northern end of Long Lake (Fig. 5). This area has since been overgrown and filled with water and only a few small outcrops were observed. Mineralization was observed in dump samples only, although quartz outcrops are visible under the water in the pond. These veins have been termed pegmatites by previous workers (Johnston, 1966; Shewman, 1968), but it is important to note that genetically they differ from the magmatic differentiates observed in the New Ross area such as the Walker and Reeves pegmatites (locations 8 and 9 on Fig. 2). Shcherba et al. (1964) and Stemprok (1979) described quartz and quartz potassic feldspar vein emplacement associated with the microclinization II stage of formation of deposits of this type. These veins although similar to magmatic pegmatites in mineralogy have been derived from metasomatic potassic rich fluids permeating outward from a cooling intrusion along fractures and channelways during the later stages of a metasomatic event. Figure 9 displays thin tabular microcline laths also formed by potassic rich fluids migrating along a fracture plane in quartz-muscovite greisen.

Molybdenite commonly occurs as bands concentrated in the outer zones of the quartz-microcline veins and as small scattered blebs in the massive quartz veins. Molybdenite disseminations are reported from the medium grained microclinized granite adjacent to the veins (Johnston, 1966), but this occurrence was not observed in the dump samples. No other minerals of economic value were observed in the quartz-microcline veins.

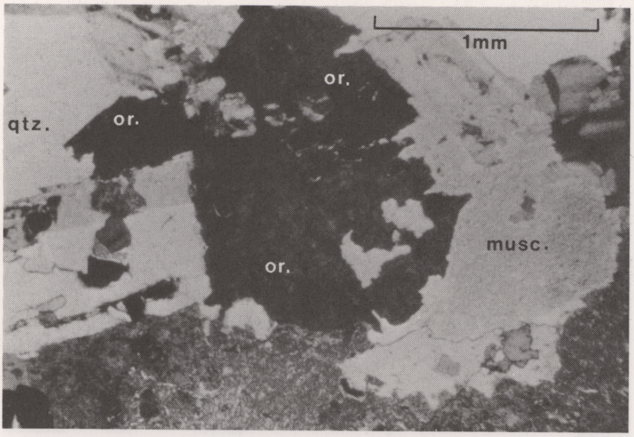

Figure 6. Orthoclase grain altering to muscovite and quartz. or.-orthoclase, musc.-muscovite, qtz.-quartz.

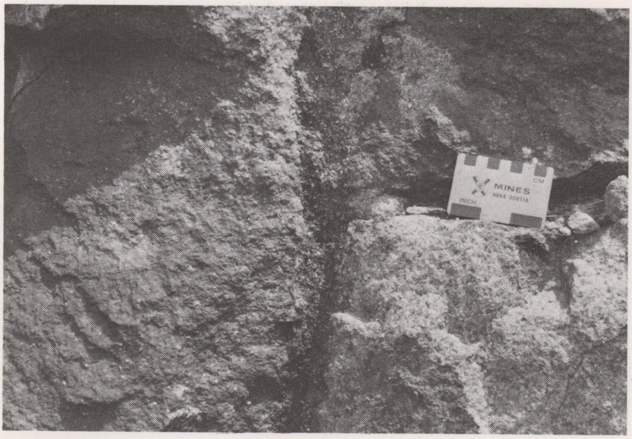

Figure 7. Wolframite bearing greisen fracture in quartz-muscovite greisen

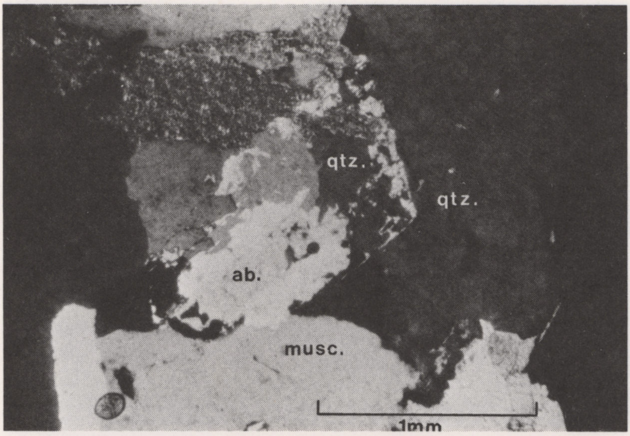

Figure 8. Albite grain being replaced by quartz. Note remnant outline of albite in quartz. qtz.-quartz, ab.-albite, musc.-muscovite.

Figure 9. Tabular potassic feldspar laths along joint surface in quartz-muscovite greisen. Formed by late potassic rich fluids.

SUMMARY

In summary the Long Lake Mo, W, Cu, Be, Ag prospect consists of a metasomatized greisen cupola with associated quartz and quartz-microcline veins. The prospect is situated at the contact of the South Mountain batholith with thermally metamorphosed quartzites and greywackes of the Meguma Group near the north end of Long Lake, Lunenburg County. A greisen zone has been partially uncovered and extends for at least 230 m along the granite-country rock contact. The original discovery consisted of molybdenite bearing veins immediately west of the greisen zone. The greisens and veins have been prospected for molybdenite and copper sulphides. Interesting showings of wolframite, scheelite and beryl are present, but the potential of W and Be in this prospect has not been tested. The potential of greisenized zones and skarnoids within the Meguma Group adjacent to the metasomatized granite also remains to be assessed. Small scheelite bearing skarnoids in Meguma Group core were observed in the core dump at the old molybdenite showing.

The relationship of the muscovite-biotite granite (DCg on Fig. 5) to the metasomatized outcrops exposed at the prospect is not known. The presence of greisen within this phase with a similar mineral assemblage to those of the Long Lake prospect raises questions concerning the role of this intrusion in the genesis of the mineralization at Long Lake. Tischendorf (1973) wrote that metasomatic deposits of Sn, W, Mo are often linked spatially with what have been termed specialized granites. These specialized granites are medium- to fine-grained granitoid subphases which have a characteristic enrichment of Si, K, Rb, Li, Be, F and Sn. The possibility of the medium grained muscovite-biotite granite at Long Lake being a specialized granite remains to be determined.

SECTION 3. EAST DALHOUSIE U

NTS - 21A/10C

UTM - N-4950770
E- 357120

LOCATION

The East Dalhousie uranium prospect is located in a gravel pit on the eastern side of the all weather road joining East Dalhousie with Highway 10 at Cherryfield (No. 3 on Fig. 2). The gravel pit is located approximately 1.2 km south of the junction with the East Dalhousie-New Ross road (Fig. 10).

PREVIOUS WORK

The occurrence was discovered in 1977 by Esso Minerals during reconnaissance prospecting of the South Mountain batholith. Following the discovery detailed airborne and ground surveys were initiated to determine the extent of mineralization. Lowe and Farstad (1978a) reported the results of geological mapping, airborne and ground radiometric surveys and an electromagnetic survey. The results of a diamond drill program are in the assessment files of the Nova Scotia Department of Mines and Energy.

Lowe and Farstad (1978a) described the uranium mineralization as autunite bearing fractures in a weathered, equigranular, muscovite biotite granite. Outcrops of this granite are found on the floor and northeastern face of the gravel pit. Grab samples from two radioactive zones assayed 7.4 and 3.6 lbs/ton U_3O_8 respectively. The fractures contain lensoid mineralization sections from 1 m to 10 m in length and generally in a 060° direction. They concluded the uranium was concentrated along pre-existing fractures in the two mica granites by preglacial weathering processes similar to the model presented by Barbier (1974).

GEOLOGY AND PROSPECT DESCRIPTION

During this study an area of approximately 8 km^2 surrounding the prospect was mapped (Fig. 10). The area is underlain predominantly by coarse grained often porphyritic biotite muscovite monzogranite. This phase consists of quartz, perthitic orthoclase, oligoclase, muscovite and biotite. Orthoclase forms both phenocrysts and groundmass grains in the porphyritic variety. Muscovite and biotite are in approximately equal concentrations. Apatite, zircon, chlorite and andalusite are found in accessory amounts. Approximately 1 km south and east of the gravel pit the monzogranite is in intrusive contact with quartzite and greywackes of the Cambro-Ordovician Meguma Group. A small roof pendant of Meguma Group hornfels is found in the northwest of the map area (Fig. 10).

The monzogranite has been intruded by a medium grained pinkish allotriomorphic granular muscovite biotite granite-leucogranite. Outcrops of this phase are exposed along a woods road east of the gravel pit. Gradational coarse grained pegmatitic patches are present in outcrops of this phase. Small dykes of this granite have intruded the monzogranite and were observed throughout the map area (e.g. sample 7519 on Fig. 10).

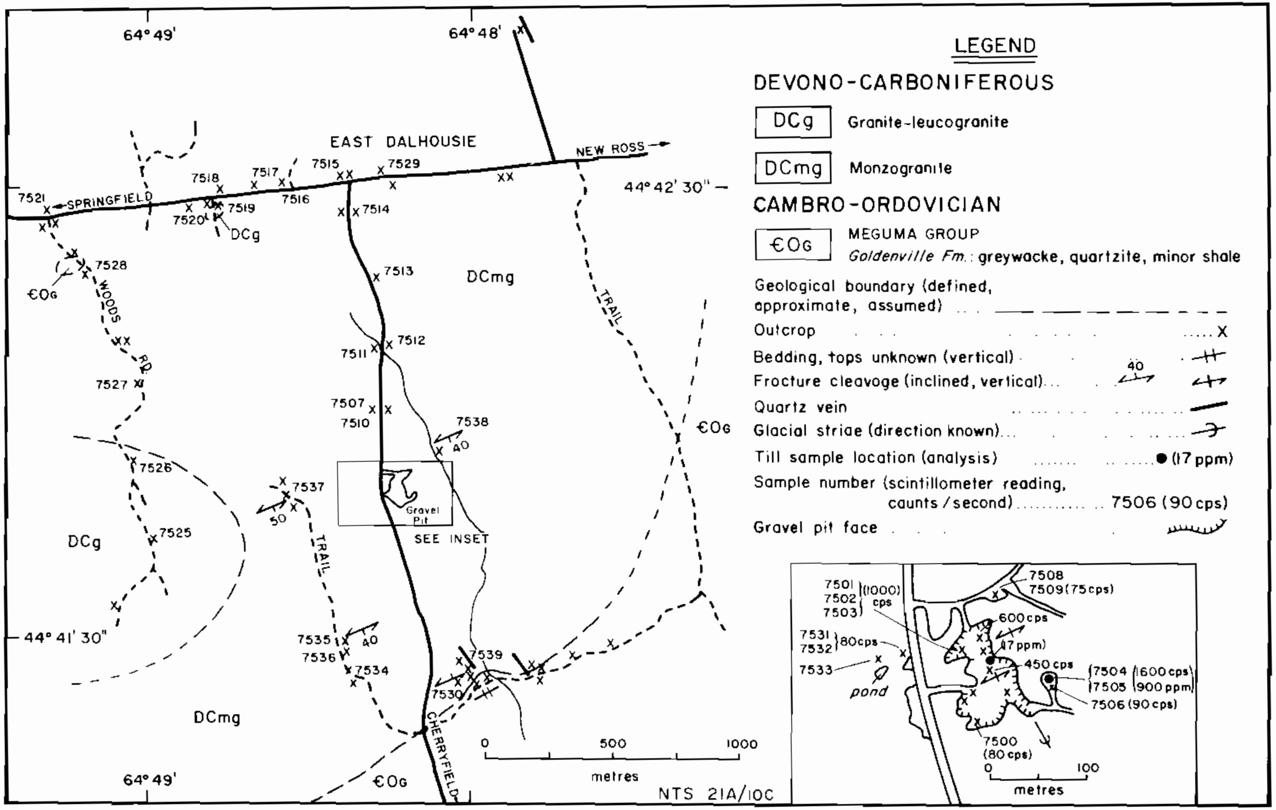

Figure 10. Geology of the East Dalhousie uranium prospect

The monzogranite in the vicinity of the gravel pit displays a progressive alteration which intensifies toward the mineralized zones. Associated with this alteration is development of a closely spaced fracture system which gives many outcrops a foliated appearance. Thin section examination indicates that little or no shearing has occurred along these fracture planes except in close proximity to mineralized zones where actual brecciation is obvious. Lowe and Farstad (1978a) reported that many of the mineralized fractures parallel this trend. Outcrops displaying this fracture cleavage are also found to the south and west of the mineralized showing, but all registered only background scintillometer readings (80 cps).

Compositional and textural transformation toward the mineralized zones exists in outcrops in the area. Sample 7510 is a fresh grey porphyritic muscovite biotite monzogranite. Perthitic orthoclase phenocrysts are fresh and plagioclase grains are only slightly altered to white mica in their cores. Biotite and muscovite are fresh. Samples 7531 and 7532 maintain the coarse grained porphyritic texture, but have a pink colour which intensifies near joints and fractures. In thin section plagioclase is strongly altered to white mica and biotite almost completely altered to chlorite. Hematization has produced a pink colour in both orthoclase and plagioclase. The fracture controlled hematization is quite pronounced in sample 7508 found immediately northeast of the gravel pit.

Outcrops exposed on the floor of the gravel pit (Fig. 10) display textural transformations and the closely spaced fracture cleavage previously described becomes obvious. Sample 7500, although a few remnant orthoclase phenocrysts are present, has been recrystallized with an increase in modal muscovite and quartz at the expense of orthoclase. Accompanying this is a transformation from an hypidiomorphic to an allotriomorphic granular texture. Apatite although still in trace amounts is more abundant than in the unaltered rock. A few grains of topaz were observed. Sample 7506 displays similar textures, but contains abundant small clear, twinned grains of albite in the groundmass.

Samples 7501 and 7505 from mineralized zones are brecciated and highly altered. In hand specimen the mineralized samples are reddish brown to yellow in colour, soft and very crumbly. Breccia fragments of hematized monzogranite are common in the matrix of quartz, clay minerals, muscovite and minor fresh biotite. Remnant coarse grained laths of highly hematized oligoclase (composition not certain) were observed, but smaller slightly hematized, clear albite crystals are abundant. Orthoclase occurs as anhedral grains filling the interstices between the brecciated fragments. In the samples examined apatite and chlorite were found only in minor amounts although samples rich in apatite have been observed (A. K. Chatterjee, personal communication, 1979).

The inset map on Figure 10 displays the geology of the gravel pit, sample locations and scintillometer readings. The highest scintillometer readings were recorded from a small pit 50 m southeast of the main pit. Within this pit readings of 1600 cps were recorded from the till while an outcrop exposed in the bottom gave only background readings. The till stratigraphy, according to R. Stea, Nova Scotia Department of Mines and Energy (personal communication, 1979), is as follows from bedrock to surface:

(A) Bedrock granite (Sample 7506).
(B) Granitic till with grey-white granitic clasts.
(C) Granite sandy till with hematized altered granitic clasts.
(D) Red clay till (North Mountain basalt clasts) possibly an inclusion in till unit C.

A sample was collected from a reddish diamict underneath a sandy granitic till immediately north of outcrop sample 7506. The diamict contained highly metasomatized granitic clasts. An analyses of the clay fraction of a sample of the unit produced a value of 900 ppm (R. Stea, personal communication, 1979). The diamict is either an equivalent of unit C previously described or it is a regolith. The diamict gave scintillometer readings of 1600 cps and the till above as well as other areas of the pit gave only background counts.

SUMMARY

In summary the East Dalhousie uranium prospect consists of 060° trending autunite bearing fractures and/or shear zones in hydrothermally altered biotite muscovite monzogranite. The prospect is exposed in a gravel pit near East Dalhousie, Annapolis County. A pink medium grained muscovite biotite granite-leucogranite has intruded the monzogranite and is found outcropping less than 1 km west of the gravel pit. Although uranium mineralization was not observed in the muscovite granite, hydrothermal alteration affects were observed in this phase which are similar to those associated with the mineralized zones. Field relations observed suggest a hydrothermal origin for the mineralizing fluids with a possible origin for these fluids being the muscovite biotite granite-leucogranite exposed nearby.

SECTION 4. KEDDY PROSPECT

(LANTZ PROSPECT, WILCOX PROSPECT, LARDER RIVER PROSPECT)

NTS - 21A/09C

UTM - N-4952320
E- 381500

LOCATION

The prospect is found on the western side of the Larder River about 2.4 km south of the New Ross-Forties road. The Larder River flows from Lake Ramsay to the Gold River and is found 3.8 km west of the village of New Ross (No. 4 on Fig. 2). The prospect is accessible by woods trail from Keddy Hill at Forties or by woods road from the Meister road to the east (Fig. 11).

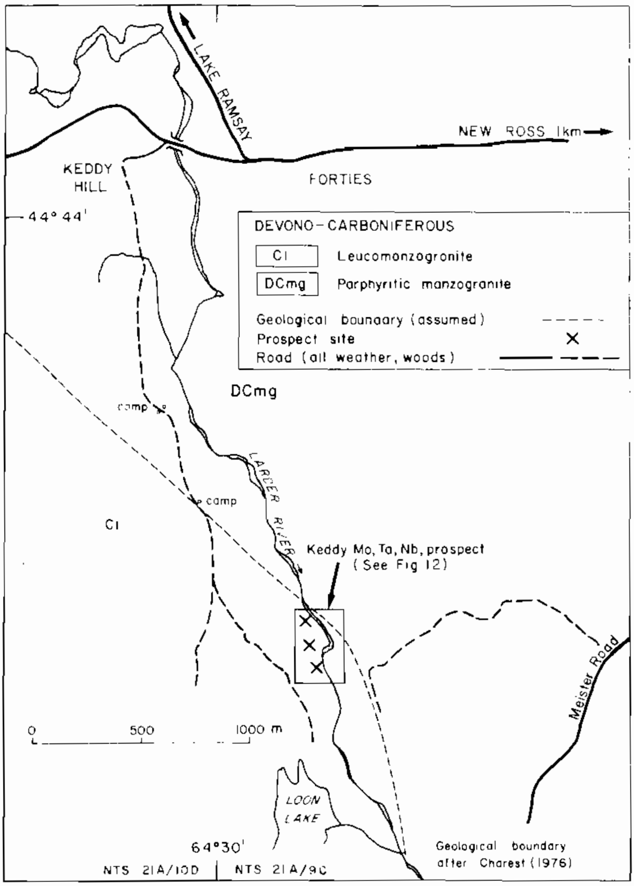

Figure 11. Location map and geology of the area surrounding the Keddy prospect

PREVIOUS WORK

The occurrence was discovered and several small test pits dug in 1890. Faribault (1924) mapped two pegmatite dykes bearing molybdenite and radioactive minerals and called them the Keddy molybdenite prospect. Douglas and Campbell (1942b) described molybdenite associated with muscovite granite similar to an occurrence of molybdenite at Rencontre, Newfoundland as described by White (1940). Cameron (1950) described three sites totalling 279 m^2 which had been prospected and stripped to bedrock with some blasting. Molybdenite was reported as 2.5 cm rosettes in an aplitic granite in a main central showing. A north striking pegmatite dyke, 0.6 m wide occurs to the south and contains flakes of molybdenite and a radioactive mineral. Molybdenite is reported in pegmatite from a small prospect pit near the river a short distance north of the main workings (Fig. 12).

The Nova Scotia Department of Mines and Energy tested the prospect with two diamond-drill holes (Wallace et al., 1963; Fig. 12). DDH NR-17 intersected two pegmatite dykes, one of which was molybdenite bearing. DDH NR-19 was drilled a short distance to the north of the map area of Figure 12 and intersected unmineralized pegmatite and aplite similar to those exposed in the Keddy pits.

Charest (1976) described samples containing molybdenite from this prospect kept in the Nova Scotia Museum collection. The molybdenite occurs as irregular rosettes and small flecks associated with medium to fine grained grey aplite. In thin section descriptions, Charest (1976) stated "the sulphide forms irregular ragged grains, the larger ones being surrounded by fine grained micaceous material. It is also closely associated with some of the topaz and fluorite in the rock".

GEOLOGY AND PROSPECT DESCRIPTION

In the present study all three exploration sites of the prospect were located and sampled. The central, previously stripped, molybdenite bearing greisen and aplite and a small test pit in pegmatite north of the greisen and aplite are overgrown with no outcrops exposed at present. The pegmatite to the south remains partially exposed. Figure 11 displays the geology of the area and location of the prospect and Figure 12 shows the relationships observed within the prospect. The country rock is the same fine- to medium-grained leucomonzogranite body which hosts the Reeves Pit to the northwest and the Nevertell Lake dyke to the south (locations 9 and 17 on Fig. 2). The leucomonzogranite here differs from the leucomonzogranite outcropping in the area of Reeves Pit because the former is generally tan-pink in colour and has biotite as a major mineral while the latter is cream coloured and only muscovite bearing. Immediately to the north and east the leucomonzogranite is in contact with porphyritic biotite-muscovite monzogranite (Fig. 11). The contact was not located, but the leucomonzogranite is believed to have intruded the monzogranite based on relations observed elsewhere.

The southern exposure of the prospect is an irregular quartz pegmatite dyke and quartz veins which have intruded the leucomonzogranite with a general northerly trend. Adjacent to this pegmatite small (1-2 cm)

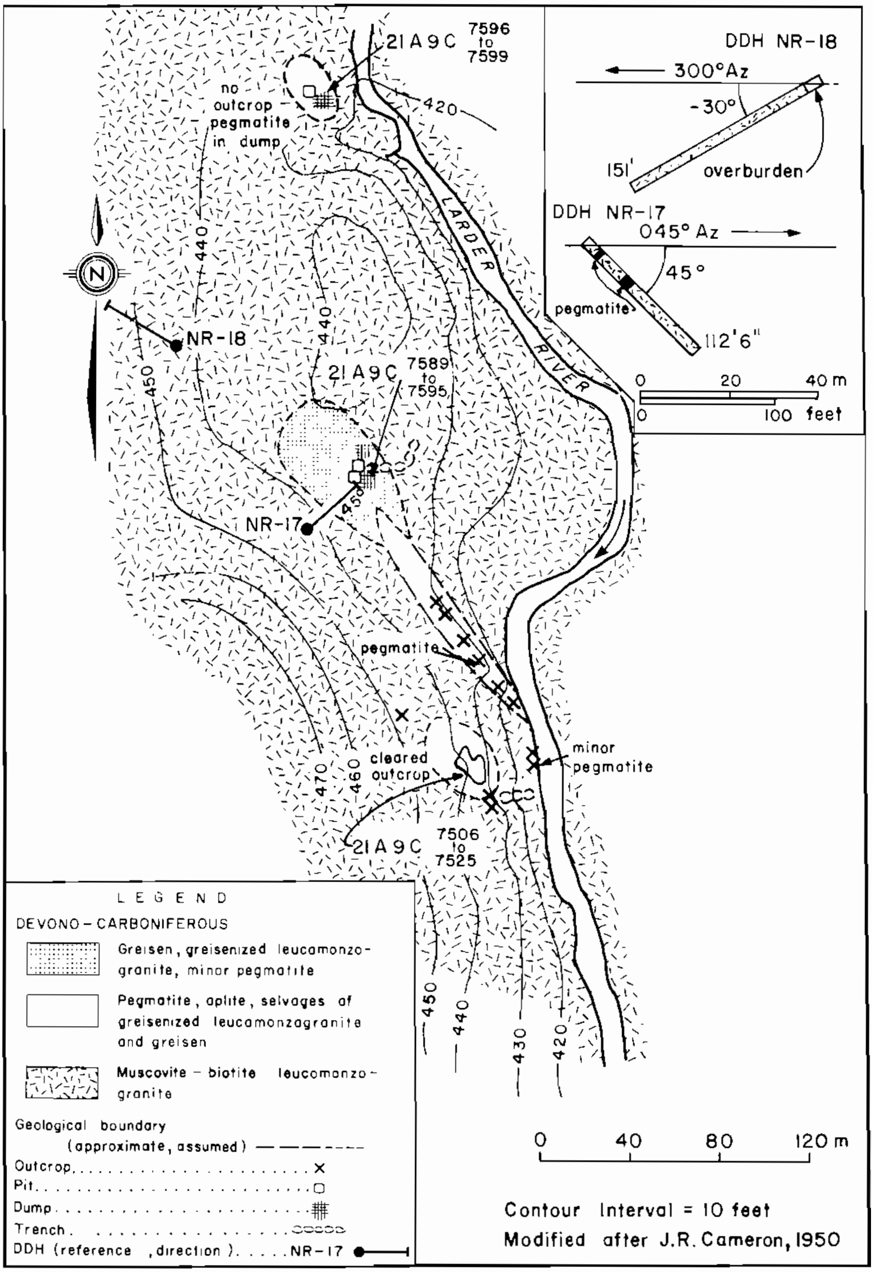

Figure 12. Geology of the Keddy prospect

selvages of greisen and greisenized leucomonzogranite are found. A few flakes of molybdenite were observed in one hand specimen of greisenized leucomonzogranite. Other minerals observed in the pegmatite, greisen and greisenized leucomonzogranite in hand specimen and thin section were topaz, dumortierite, dickite, fluorite, columbite, scheelite and wolframite.

Immediately north of the south pegmatite and outcropping on the western bank of the river is a zone of pegmatite intruded into the leucomonzogranite. For approximately 80 m this zone forms an elongate ridge striking 325° from the river. No minerals of interest were observed in this pegmatite at surface, but it appears probable the molybdenite bearing pegmatites intersected in DDH No. NR-17 (Wallace et al., 1963) are associated with this zone of intrusion.

About 150 m along strike of the pegmatite from the river is the overgrown workings of the central prospect site. Outcrop is no longer exposed, but examination of dump samples indicates a greisen and greisenized leucomonzogranite zone exists which may be associated with the pegmatite. Very little molybdenite was found in the dump (two samples), although Charest (1976, p. 96) reported 0.08 to 0.58 per cent MoS_2 from a 638 kg test sample from this area. Thin sections of the quartz-albite-muscovite greisen commonly contain topaz, dumortierite, scheelite, andalusite, fluorite and columbite(?).

A small test pit in pegmatite is located near the river about 150 m north of the prospect site just described. No outcrop is exposed but quartz and pegmatite samples in the dump contain a few flakes of molybdenite.

SUMMARY

Although interesting values of MoS_2 have been reported in the past from this prospect, the potential for molybdenum mineralization of economic quantity is poor. The possibility of extension along strike or to depth of the greisen zone which forms the central exploration site in the prospect has not been tested by drilling. The potential of this zone and the adjacent pegmatites for niobium and/or tantalum has not been explored although columbite has been observed in outcrops and dump samples of both rock types.

SECTION 5. WALLABACK LAKE Sn PROSPECT

(GRASSY BROOK Sn, MITCHELL PROSPECT)

NTS - 21A/16B

UTM - N - 4962500
E - 387580

LOCATION

The Wallaback Lake Sn prospect is found 50 m south of Grassy Brook, a tributary of Wallaback Lake, Lunenburg County (location 5 on Fig. 2). The prospect is accessible by going 1.5 km along a woods trail from Pennant road which is at the southern end of Wallaback Lake (Fig. 13).

PREVIOUS WORK

Faribault (1931) mapped two northwesterly trending Sn bearing pegmatite dykes along Grassy Brook. Douglas and Campbell (1942b) wrote that a 5-7 m shaft was sunk on a 2 m zone of greisenized granite and pegmatite near the granite-metasediment contact and that the pegmatite occurs as a zone 66 m by 8.3 m rather than two or three separate parallel dykes. McCartney (1957) described a greisen zone 1 m in width associated with pegmatite intrusion in a muscovite granite which displays pneumatolytic alteration effects. At that time the Wallaback Lake prospect was included in a regional soil geochemical survey of the New Ross area. Wallace et al. (1963) drilled two holes in a large stripped area around the old test pit, but no mineralization was encountered.

Douglas and Campbell (1942b) observed cassiterite in pegmatite and as tiny veinlets in a greisenized granite selvage to the pegmatite. A greisenized granite sample from the test pit dump assayed 1.1% Sn. A chip sample across a 1 m greisen zone near the shaft assayed 0.52% Sn. Mulligan (1975) reported 0.02% Sn for a rusty greisenized patch and 0.19% Sn for a dark, heavily stained material(?) near a small pit at the granite-metasediment contact. Charest (1976) also reported cassiterite, arsenopyrite, pyrite, sphalerite, lepidolite, fluorite, and eosphorite (Nova Scotia Museum identification).

GEOLOGY AND PROSPECT DESCRIPTION

Figure 13 displays the geology of the area and location of the prospect and Figure 14 is a plane table map of the stripped outcrop and immediate surroundings of the prospect. In the area Meguma Group greywackes and quartzites have been intruded by porphyritic medium grained pink-red muscovite-biotite monzogranite. Texturally the monzogranite in this area differs from the coarse grained muscovite-biotite monzogranite exposed to the south and east. Charest (1976) observed a gradational relationship between this porphyry and the coarse grained variety. The monzogranite in the vicinity of the Turner prospect and northeast of the Reeves Tin pit (Fig. 2) is also porphyritic. Outcrops of this phase are found on the trail leading into the prospect and in the woods surrounding the prospect.

Five rock types have been exposed by stripping and trenching of the prospect (Fig. 14). Meguma Group hornfels, red monzogranite porphyry, leucogranite, pegmatite and quartz-muscovite greisen are found. Outcrop of

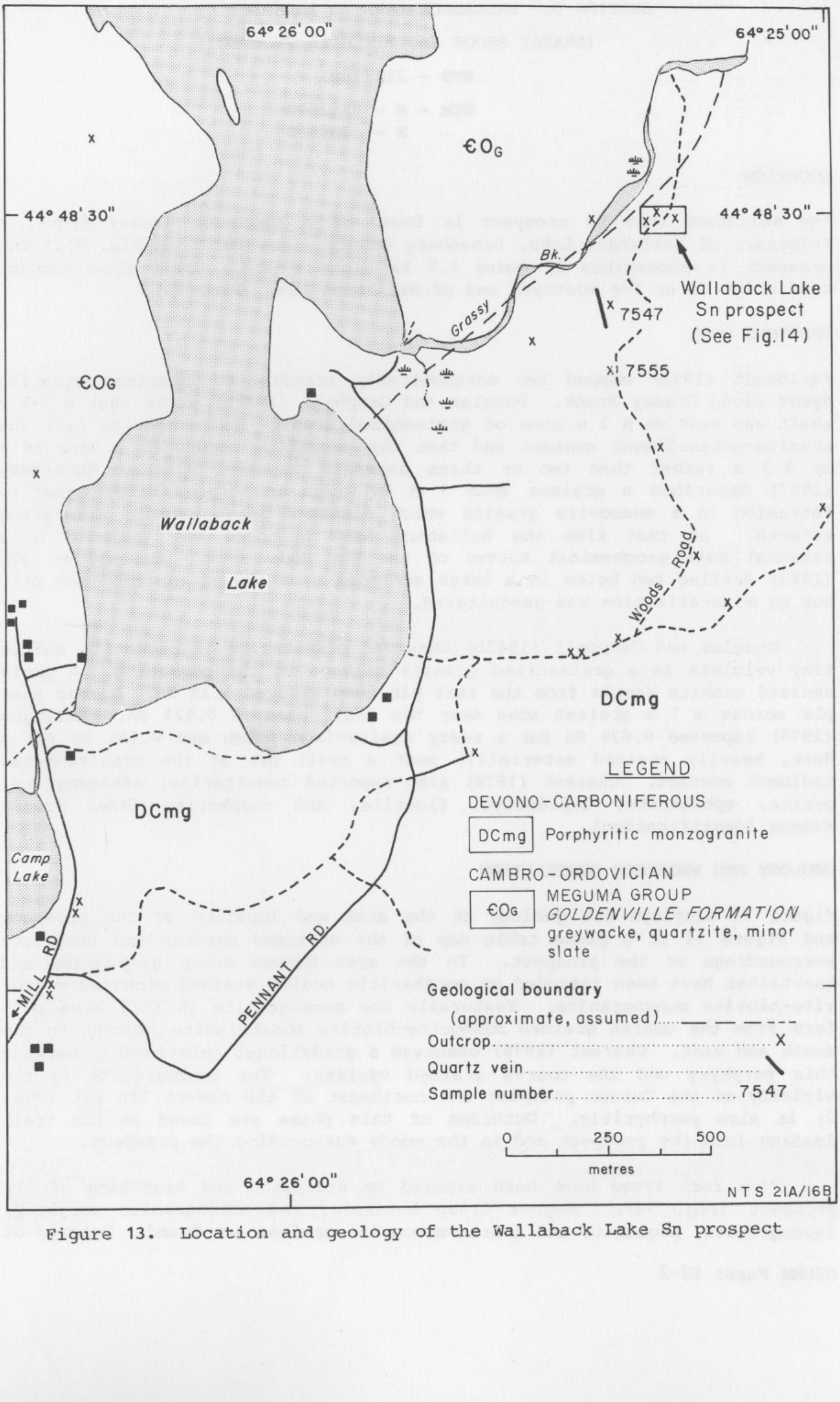

Figure 13. Location and geology of the Wallaback Lake Sn prospect

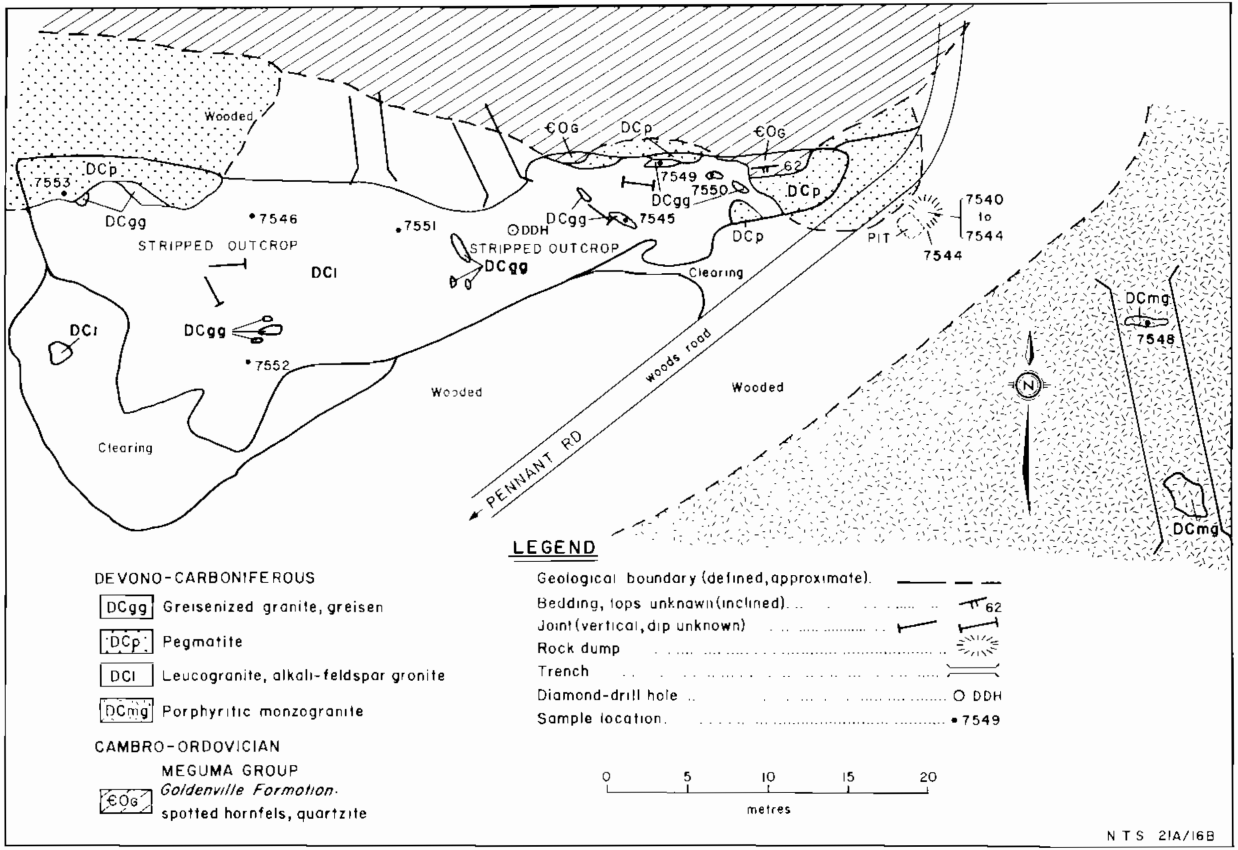

Figure 14. Plane table map of the Wallaback Lake Sn prospect

monzogranite porphyry is found in a trench to the west of the old test pit, but the relations of this phase to the other phases found in the stripped area are not exposed.

The Meguma Group-granite contact roughly follows Grassy Brook (Fig. 13) with either a large xenolith or the actual contact exposed in the stripped outcrop. Bedding layers within the hornfels are concordant with the regional trend. This suggests the hornfels are in place and therefore the prospect is located at the contact. The most abundant rock type exposed is a pink to cream coloured medium grained leucogranite to alkali feldspar granite. Muscovite quartz greisen patches are gradational with this phase. The greisens appear to be fracture controlled and not related spatially to the pegmatite intrusions. The greisen and pegmatite rich eastern end of the outcrop is assumed to be the 2 m thick greisen pegmatite zone described by Douglas and Campbell (1942b). Chalcopyrite and minor cassiterite were observed in outcrop and dump samples of greisen. In the stripped area randomly oriented pods of unzoned pegmatite were observed both to grade into leucogranite and also to have intruded leucogranite.

SUMMARY

Cassiterite has been reported from the pegmatite, but none was observed with this study although cassiterite bearing greisen samples were obtained from the dump. The relationship of the leucogranite, greisen and pegmatite package to the red monzogranite porphyry is not exposed. Similar intrusive minor bodies exposed elsewhere in the New Ross area suggest that a separate small intrusion of leucogranite with associated pegmatite intruded the porphyry.

SECTION 6. LAKE DARLING Cu

NTS - 21A/09C

UTM - N-4952500
E- 383740

LOCATION

The Lake Darling Cu occurrence is found to the north of the Meister Road which intersects the Glengary Road at Lake Darling in the village of New Ross, Lunenburg County (location 6 on Fig. 2; Fig. 15). The occurrence is found in a wooded area northeast of the farm of Carl Meister.

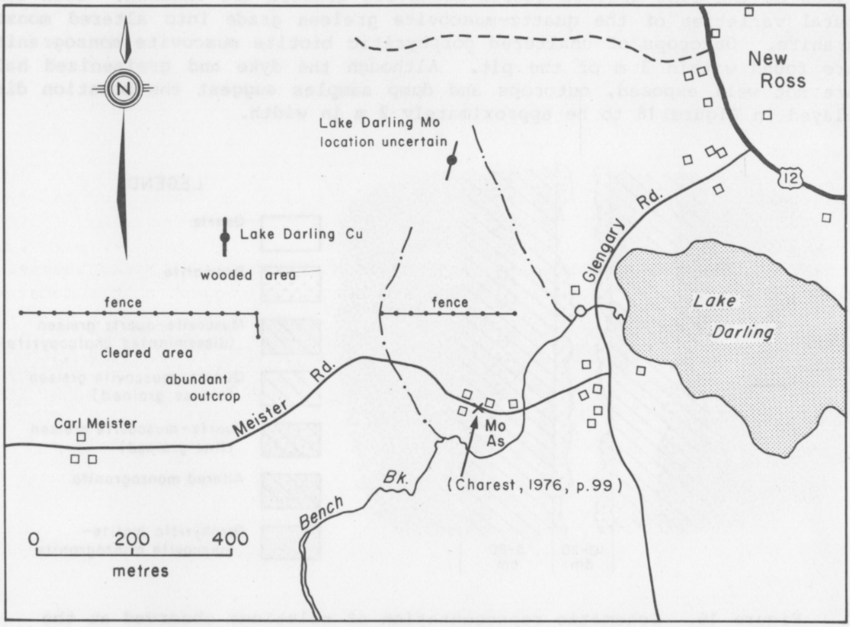

Figure 15. Location map of the Lake Darling Cu occurrence

PREVIOUS WORK

Nothing has been published on this occurrence except the original location as indicated by Faribault (1924). The occurrence at present consists of a small test pit with two small overgrown dumps.

GEOLOGY AND OCCURRENCE DESCRIPTION

In outcrop on the edge of the pit are remnants of a northerly trending quartz pegmatite dyke. Large boulders in the dump and outcrop exposures in the vicinity indicate a quartz pegmatite dyke 10 cm to 20 cm in width has intruded a coarse grained porphyritic biotite muscovite monzogranite.

Associated with the dyke is a greisen selvage and alteration of the monzogranite as displayed in Figure 16. Disseminations and small blebs of chalcopyrite were observed in muscovite-quartz greisen found immediately adjacent to the quartz pegmatite dyke. The more abundant fine and coarse grained quartz-muscovite greisens (Fig. 16) were not observed to be mineralized. Tourmaline has been reported from the pegmatite and Au associated with the Cu mineralization (NSDME mineral occurrence file), but neither was observed in the sampling. The existence of auriferous chalcopyrite is a possibility. The chalcopyrite bearing muscovite quartz greisen grades into coarse grained quartz-muscovite greisen. The coarse grained quartz-muscovite is in sharp contact with a fine grained quartz-muscovite greisen of similar mineralogy and modal composition. The origin or genetic implications of the fine grained quartz-muscovite greisen are unknown. Both textural varieties of the quartz-muscovite greisen grade into altered monzogranite. Outcrops of unaltered porphyritic biotite muscovite monzogranite are found within 3 m of the pit. Although the dyke and greisenized halo are not well exposed, outcrops and dump samples suggest the zonation displayed in Figure 16 to be approximately 2 m in width.

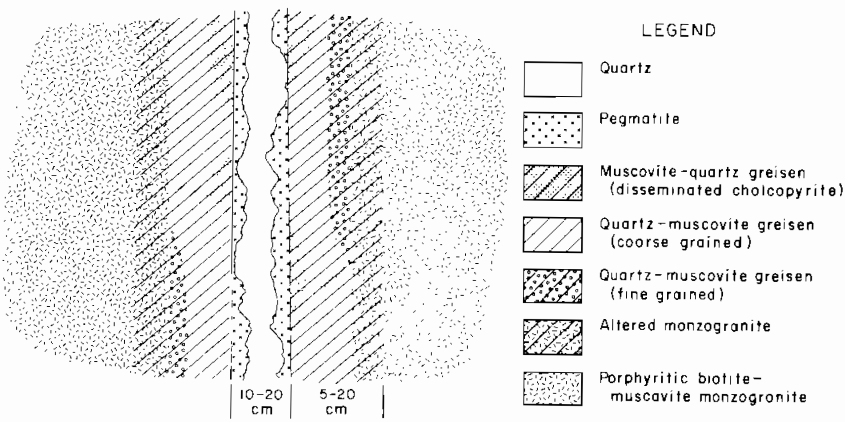

Figure 16. Schematic representation of relations observed at the Lake Darling Cu occurrence

SUMMARY

The presence of chalcopyrite as sparse disseminations in restricted portions of the greisen render this occurrence of little economic value. Thin sections of all types of greisen observed contained significant amounts of beryl.

SECTION 7. TURNER TIN PROSPECT

(NEW ROSS PROSPECT)

NTS - 21A/16B

UTM - N-4960150
E- 385160

LOCATION

The Turner Sn prospect (location 7 on Fig. 2) is located along both sides of the East Branch Gold River at Mill Road, Lunenburg County (Fig. 17). The prospect is accessible by trail from Mill Road.

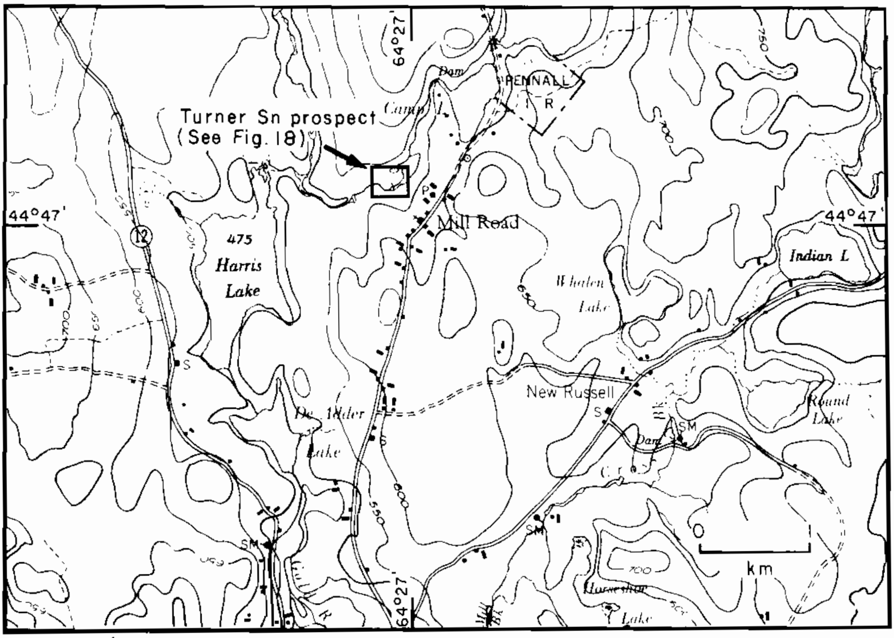

Figure 17. Location map of the Turner Sn prospect

PREVIOUS WORK

The Turner Sn prospect was first discovered in 1907 by Ernst Turner who opened the veins (Faribault, 1908). Assays were carried out on mineralized samples in 1910 (Faribault, 1910). These yielded values of 10 per cent to 30 per cent Sn and 8 per cent Cu, and "were present in the form of cassiterite and chalcopyrite, with association of tungsten and zinc bearing minerals". Faribault (1911) reported that two shafts, one 16.5 m and the other 7.5 m were sunk in the greisen vein (Discovery vein), but the vein was found to be irregular and to pinch out at depth.

Both Wright (1912) and Robinson (1914) mentioned the Turner Sn prospect in their reports, but no mining or drifting was ever carried out. Douglas and Campbell (1942b) studied the structure and mineralization in the prospect, and it was again mentioned by Cameron (1950).

A radioactive sample from one of the Turner veins was submitted for analysis to the Geological Survey of Canada in Ottawa by M. G. Goudge of the Nova Scotia Department of Mines. Ellsworth (1950) examined the analytical work and wrote, "from the nature of the material as seen under the microscope I thought it might be torbernite (or metatorbernite) and chemical tests indicate that this is almost certainly the case."

McCartney (1957) summarized the results of an exploration program for tin carried out in the New Ross area. The Turner Sn prospect was included in this survey but results were not encouraging enough to continue exploration. Wallace et al. (1963) mapped the prospect and carried out a diamond-drill program as part of a Nova Scotia Department of Mines survey of the New Ross area.

Charest (1976) included the Turner Sn prospect in a thesis study of the geochemistry of the mineral occurrences and their host rocks in the New Ross area. Farley (1978) studied the Turner and Walker prospects in detail (locations 7 and 8 on Fig. 2). Descriptions of these two prospects in this report are summarized from Farley (1978).

GEOLOGY AND PROSPECT DESCRIPTION

The geology of the Turner Tin prospect is displayed on Figure 18. Figure 19 displays cross-sections of the prospect compiled from the drill logs of Wallace et al. (1963). Veins of quartz, greisen and quartz porphyry occur in the host rock, a muscovite-biotite monzogranite. An abundance of quartz greisen zones exist in the vicinity of the Discovery vein. The texture of the host rock ranges from porphyritic in the eastern part of the area, to aplitic with scattered pegmatitic segregations in the west and northwest. The area has undergone extensive pneumatolytic alteration and is generally pink in colour with red hematized feldspars, altered biotite, and fresh quartz and muscovite. Nearby to the northwest a large roof pendant of Cambro-Ordovician Meguma Group metasedimentary rocks is found (Fig. 2).

In the prospect there are four veins of major interest: (1) Discovery, (2) Elephant, (3) Turner, and (4) Elvan. The first three are quartz-greisen zones and the fourth a quartz porphyry dyke. The main features of each of these veins and their associated host rocks are presented in Table 3. Quartz veins ranging in size from 1 mm to 0.3 m are found throughout the prospect. These strike obliquely to the greisen zones and pinch out in the greisen or surrounding granite.

Four joint and vein directions were recorded. (1) The most prominent group of joints strike 128° and dip from 80° east to vertical. These are frequently infilled with quartz and strike obliquely to the greisen zones. No mineralization is reported from these veins. (2) The next most numerous joints strike 040° and dip 80° west to 70° east. These joints were never infilled. (3) The third group strikes 119° dipping steeply east. Three quartz veins, a quartz porphyry and a greisen zone follow this direction.

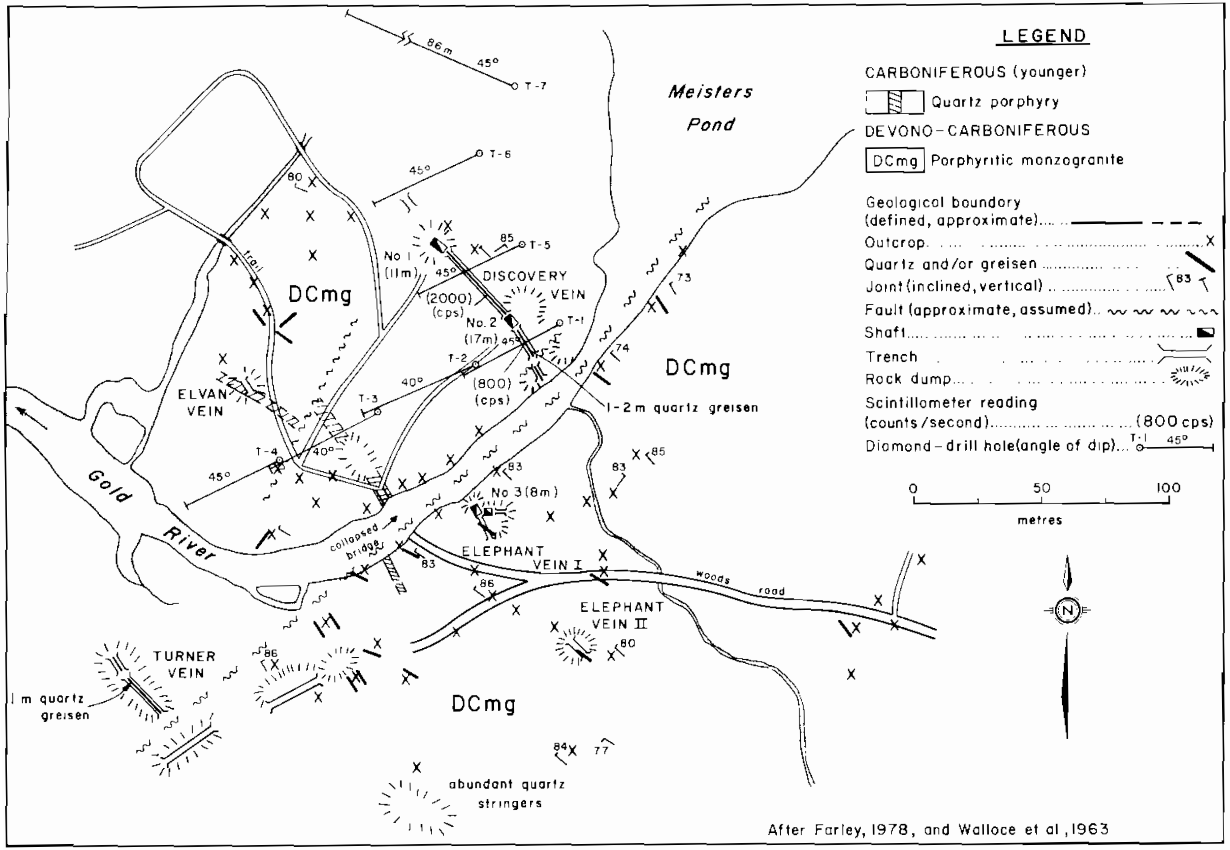

Figure 18. Geology of the Turner Sn prospect

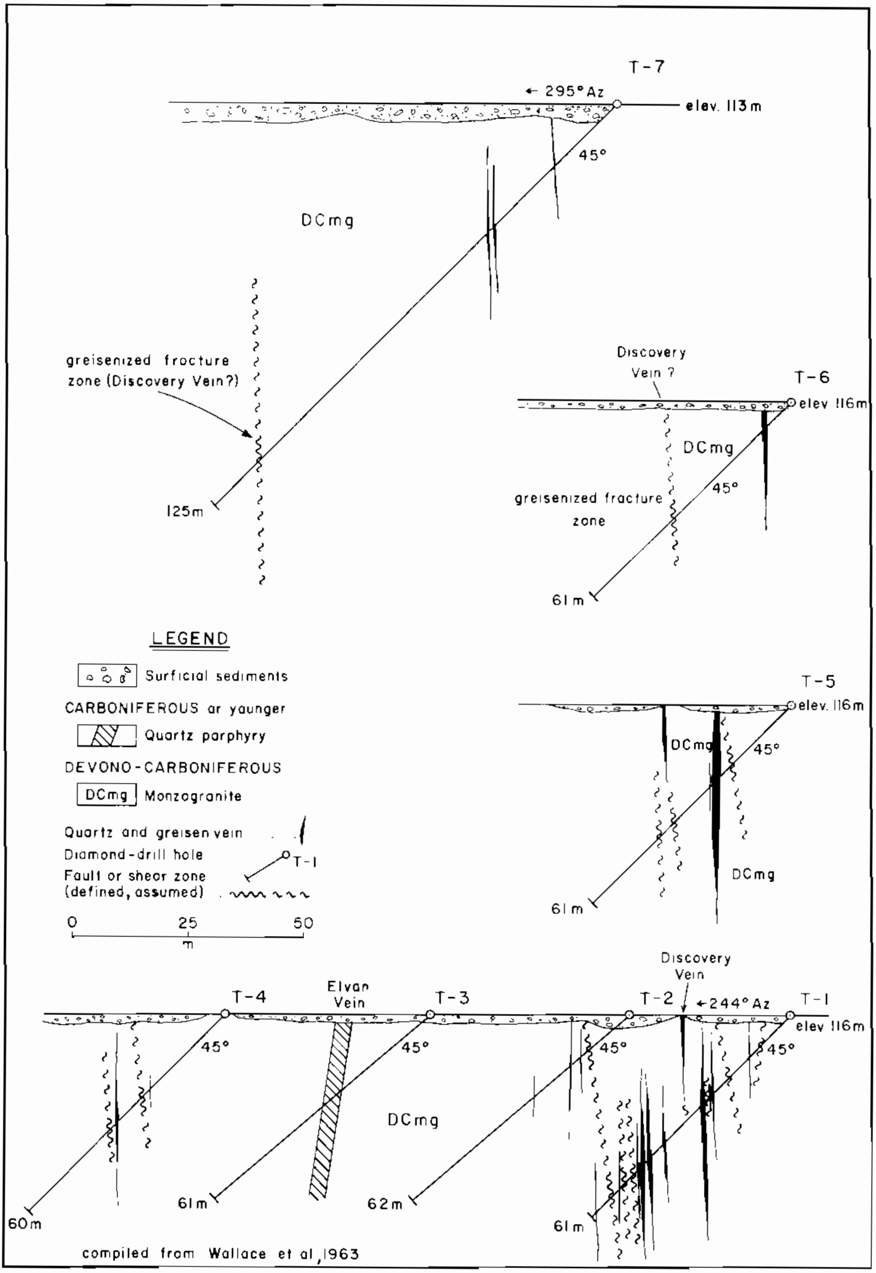

Figure 19. Cross-section of the Turner Sn prospect compiled from DDH sections of Wallace et al. (1963).

Table 3. Geological features and assays of prospected veins of the Turner Sn prospect. Modified after Farley (1978).

	Discovery Vein	Elephant Vein I	Elephant Vein II	Turner Vein	Elvan Vein
Host Rock	Pink porphyrite, 2 mica monzogranite, coarse grained (>0.5 cm). Orthoclase laths up to 2 cm. Red hematized (some) plagioclase up to 7 mm. Aggregates of quartz up to 7 mm across.	Pink porphyritic, 2 mica monzogranite. Orthoclase laths up to 2 cm. Plagioclase up to 7 mm. Quartz aggregates to 7 mm. Muscovite, biotote ± hematite.	Pink porphyritic, 2 mica monzogranite. Orthoclase up to 2.5 cm. Plagioclase up to 1 cm. Quartz aggregates to 1 cm diameter. Coarse grained (>0.5 cm).	(1) Pink aplitic monzogranite ± pegmatitic segregations (quartz, orthoclase and muscovite). Feldspars up to 5 mm. Quartz aggregates to 5 mm. Medium grain size (<0.5 cm). (2) Leucocratic monzogranite. Equigranular quartz, orthoclase, plagioclase, muscovite and biotite. Medium grain size (<0.5 cm).	(1) Subporphyritic, pink 2 mica monzogranite. Orthoclase lathe up to 6 mm. Plagioclase to 3 mm. Quartz aggregates to 4 mm. (2) Aplitic monzogranite. Quartz aggregatee to 1 cm. Feldepar, muscovite and biotite.
Transition to Greisen	Over 2 cm. Chloritized biotite. Sericitized plagioclase (hematite overgrowth). Sericitized and muscovitized K-feldspar. Quartz primary and secondary. Muscovite primary and secondary	Over 2-3 cm. Chloritized biotite. Sericitized and muscovitized orthoclase. Primary and secondary muscovite and quartz. Locally intense Fe-oxide veining. Sericitized plagioclase.	Chlorite. Chloritized biotite. Sericitized and muscovitized orthoclase. Primary and secondary muscovite and quartz.	2-3 cm. Chloritized biotite. Sericitized plagioclase. Sericitized and muscovitized K-feldspar. Primary and secondary muscovite and quartz.	Sharp contacts. Quartz porphyry. Fine grained pink or cream ground mass with phenocrysts of quartz and feldspar and xenolithe of pegmatite.
Greisen	Green. Quartz rich with mica sericite and chlorite.	Green. Quartz-sericite-mica ± chlorite	Green. Quartz-sericite-(mica) ± chlorite.	Quartz-sericite-mica ± chlorite.	Green. Quartz-sericite
Veins	Quartz. Central, 0.3 m wide, semicontinuous throughout length of trench. Quartz stringers cut the greisen and quartz vein (1.5 mm-2 cm). Miarolitic quartz. K-feldspar veins 1 mm-1 cm cut the quartz stringers and greisen.	Quartz, 1-20 mm. Cut greisen.	Quartz stringers to 2 cm. Miarolitic quartz. K-feldspar veins 1-10 mm.	Quartz stringers to 2 cm. K-feldspar veins 1 mm-1 cm	Quartz. 1-2 mm
Channel sample Sn analyses from Douglas and Campbell (1942b)	0.5% between #1 and #2 shafts 0.20% between #1 and #2 shafts 0.20% between #2 shaft and river 0.10% between #2 shaft and river		0.08%	0.08%	0.08%

(4) The least numerous and most poorly developed joint set strikes 150° and dips east. A large number of quartz veins and the greisens, except that mentioned above, strike in this direction.

Douglas and Campbell (1942b) wrote that the Elephant vein may correspond to the Discovery vein and was later displaced by faulting as was the quartz porphyry (Elvan vein). The amount of horizontal displacement (45 m) between the Elephant and Discovery veins is much larger than that shown by the quartz porphyry outcrops. It was therefore concluded that the Discovery and Elephant veins were two en echelon veins separated by 32 m and displaced to their present position by faulting.

Reconstruction of the history of the greisens from the Turner prospect is based mainly on samples from the Discovery vein which provides the best outcrop and selection of samples. The Discovery vein consists of a quartz vein (average width 0.3 m) bordered by greisen (0.5 m to east and west). The quartz vein and greisen strike in the same direction with greisenization decreasing in intensity away from the quartz vein.

The greisenization resulted in the alteration of plagioclase to mica, alteration of biotite to chlorite and muscovite, muscovitization of K-feldspar and development of rutile along cleavage planes and in patches in muscovite. Secondary muscovite and quartz overgrow earlier phases in the altered country rock. Where greisenization is most intense all traces of plagioclase and biotite are obliterated and only some ragged grains of sericitized K-feldspars may remain. Quartz and muscovite (Fe-rich, phengite) predominate. Phengite sometimes shows evidence of strain in the form of undulatory extinction and bent cleavage. Mineralization is disseminated in the greisen, in patches of phengite and quartz and/or associated with narrow oxidized iron rich veins. Minerals recognized are: arsenopyrite, pyrite, sphalerite, chalcopyrite, stannite, wittichenite, cassiterite and covellite. Digenite resulted from alteration of chalcopyrite and sphalerite. Two locations on the Discovery vein yield high scintillometer readings (Fig. 18). The uranium mineral is assumed to be torbernite or metatorbernite as described by Ellsworth (1950). The presence of autunite is suggested by the existence of a green fluorescing mineral in the radioactive patches.

The central quartz vein was deformed resulting in granulation of the quartz and the opening of fractures for intrusion of late quartz veins. These late quartz veins are in turn cut by a later generation of K-feldspar veins. Movement continued after emplacement of these veins because both the quartz and K-feldspar show evidence of strain. The quartz porphyry (Elvan vein) intruded greisenized country rock, but the porphyry itself is cut by quartz and K-feldspar veins and therefore apparently intruded prior to the late veins.

AGE RELATIONS

Ar^{40}/Ar^{39} age of the phengite micas from the Turner greisen yielded total gas ages of 376 and 375 ± 10 Ma. A 375 Ma age for the Turner greisen is anomalously high, but suggests that greisenization closely followed intrusion of the monzogranite in time and thus there is no resolvable time difference between crystallization of the host rock and greisenization. The quartz porphyry (Elvan vein) which has intruded the greisen in the Turner prospect was apparently derived from a still molten magma source elsewhere in the batholith.

SUMMARY

The host rocks and quartz porphyry (Elvan vein) probably represent very late stages of crystallization of a granitic melt. The quartz porphyry intruded greisen and is believed derived from a source in the batholith which remained molten during crystallization and greisenization in the upper roof zone. Farley (1978) concluded the greisenizing fluids were derived from a late granitic fluid enriched in incompatible elements which was concentrated below the roof zone of the batholith and invaded early formed fractures in the cooling outer shell of the monzogranite. An abundance of quartz greisen zones in the vicinity of the Discovery vein as indicated by diamond drilling (Fig. 19) suggests that a swarm of quartz greisen lenses exists in that area. The potential of economic quantities of Sn in this zone has not been thoroughly tested.

SECTION 8. WALKER MOLY
(NEW RUSSELL PROSPECT)

NTS - 21A/16B

UTM - N-4958460
E- 387970

LOCATION

The Walker molybdenite prospect (location 8 on Fig. 2; Fig. 20) is situated 120 m south of the Windsor road at New Russell. New Russell is 6.4 km east of Highway 12 and New Ross. The prospect is accessible by woods trail from the Windsor Road (Fig. 21).

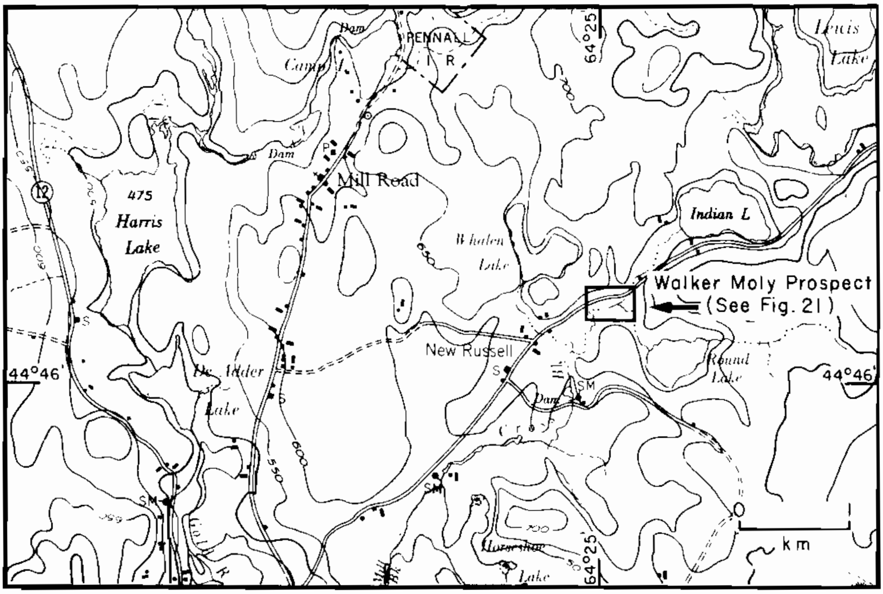

Figure 20. Location of the Walker moly prospect

PREVIOUS WORK

The Walker molybdenite prospect was first mentioned by Walker (1911). His report was based on examination of loose boulders in fields in the area. At that time their source had not been discovered.

In 1917 a shaft was sunk 120 m south of the Windsor road and a mineralized zone was intersected at the contact of a pegmatite dyke and muscovite granite (Eardley-Wilmot, 1925). The shaft was sunk to 10.5 m and 8 m of drifting was done to the north (Cameron, E. L., 1951). At that time a quarter of a ton of mineralized material was sent to Ottawa, Ontario,

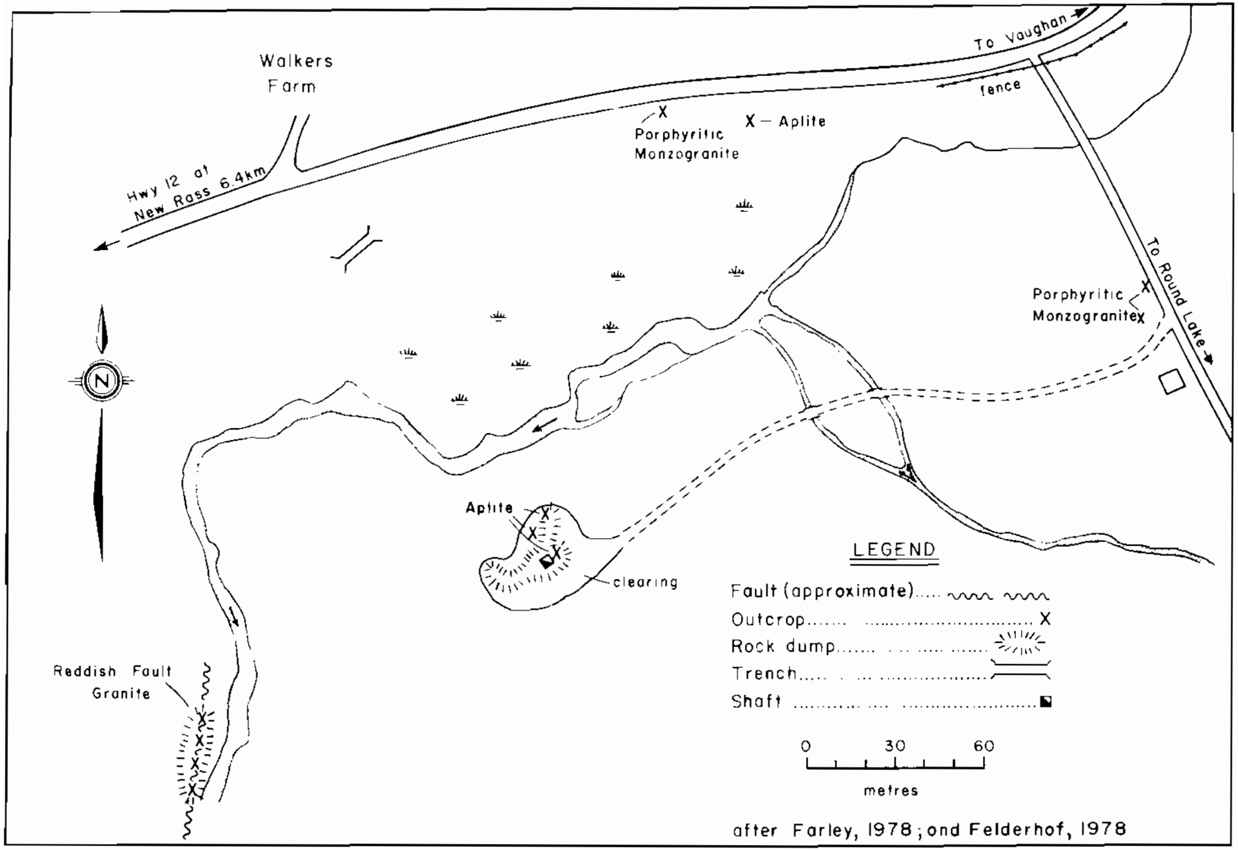

Figure 21. Geology of the Walker moly prospect

assaying 1.66% MoS_2. Two other shipments were sent in 1917-1918, assaying 1.03% and 0.49% MoS_2 with 55 lbs. of molybdenite recovered (Vokes 1963, p.221).

Cooke (1925) wrote a report on the relations between host rock and mineralization in the deposit. No further work was recorded until 1949 when the Nova Scotia Department of Mines reopened the prospect in order to carry out extensive exploration by drifting and diamond drilling. The shaft was drained out and sunk an additional 4 m, and drifts were started east and west for 3.3 m and 3.6 m respectively. Both Cameron, J. R. (1951) and Slipp (1951) reported that the Walker deposit was not found to be of economic value. Vokes (1963) merely described the work which was carried out up to 1949. Charest (1976) examined the geochemistry (major and trace elements) of the host and mineralized rocks and their mineralogy. Farley (1978) studied the Turner tin (location 7 on Fig. 2) and Walker prospects as a M.Sc. thesis at Dalhousie University, Halifax. The descriptions in this report for these two prospects have been summarized from this thesis.

GEOLOGY AND PROSPECT DESCRIPTION

The area surrounding the prospect was mapped by Farley (1978) (Fig. 21). Four outcrops are exposed in the area, but no outcrop of mineralized material was observed. In the rock dump surrounding the water filled shaft, pegmatite, aplite and greisen were recognized. On the basis of drilling and drifting Cameron, J. R. (1951) suggested that the pegmatite dyke which contains the molybdenite is a "U shaped pipe assuming a recumbent anticlinal form, the apex of which plunges to the northeast". Associated with the pegmatite (massive orthoclase in graphic intergrowth with quartz, muscovite and molybdenite) is a medium grained aplite. The aplite is white grey in colour with a saccharoidal texture. Banding of feldspar, mica and quartz was observed in dump samples. Copper sulphides and molybdenite also form bands.

Greisen selvages are distributed sporadically along the pegmatite dyke. The greisenization involves sericitization of the feldspars and growth of secondary mica, topaz and tourmaline. Two types of mica are present, siderophyllite, which occurs mainly in greisenized aplite, and phengite which dominates the mature greisen. Opaques are associated with patches and veins of mica, with fluorite a common accessory. Minerals identified in the greisens are wolframite, gahnite, cassiterite, uraninite, bornite, mawsonite, tennantite, wittichenite, molybdenite, chalcopyrite and native bismuth.

Country rock outcrop in the area is sparse. A small outcrop of aplitic monzogranite occurs on the edge of the Windsor road. Porphyritic monzogranite outcrops on the trail to the Walker shaft. The "Red Fault Granite" west of the shaft is similar to the aplite, but muscovite is more prominent in sheaves. Reddening is noticeable along fractures, but may be the result of weathering.

Slipp (1951) mentioned a granitized sediment in the area, but none was observed. A number of blocks of porphyritic monzogranite were found in the rock dump.

Boundaries between the mineralized rocks are quite sharp, although inclusions of aplite are seen in the pegmatite which makes the contact appear irregular. Where the aplite and pegmatite are greisenized there are knots of mica and copper sulphides along veins or in patches in the rock. These give way to the normal rock type which is usually only slightly altered.

AGE RELATIONS

Age dating by the K/Ar method on mica separates from greisenized aplite and a well developed greisen yielded ages of 338 ± 6 Ma and 343 ± 6 Ma respectively (Farley, 1978). As the micas did not fuse completely during degassing these ages may be unreliable. The dyke rocks and minor intrusions are the most differentiated phases of the South Mountain batholith and they have been dated radiometrically to be in the 355 Ma range (Table 4). A time gap between the host rock and the dated greisen could be interpreted to indicate the influence of fluids not directly genetically associated with the batholith but perhaps mobilized by it. This appears unlikely in view of the close age and chemical similarities between the granites and greisens (Charest, 1976; Farley, 1978). Another interpretation is that the granites may have been hydrothermally active over a long period of time i.e. the 340 Ma Walker prospect age may represent a late hydrothermal event.

Table 4. Radiometric Age dates for the South Mountain batholith (from Farley, 1978, p. 196).

Rock Type	Granodiorite	Monzogranite	Dyke Rocks and Minor Intrusions		
	364 ± 24	365 ± 35	400 ± 30	(1)	K/Ar, Rb/Sr
		387 ± 25			
			354 ± 8	(2)	Rb/Sr
Average		417 ± 38			
	359 ± 6	378 ± 10		(3)	Ar^{40}/Ar^{39}
	371.8 ± 2.2	364.3 ± 1.3	361.2 ± 1.4	(4)	

(1) Average of: Fairbairn et al. (1960); Lowden (1960); Leech et al. (1963); Reynolds et al. (1973).

(2) Cormier and Smith (1973) Rb/Sr Rb^{87} decay, constant = 1.39×10^{-11} yr^{-1}

(3) McKenzie (1974)

(1), (2) and (3) taken from Table 7.1 McKenzie (1974)

(4) Clarke and Halliday (1980) Rb/Sr data. Rb^{87} decay constant = 1.42×10^{-11} yr^{-1}

SECTION 9. REEVES Sn PIT

(FORTIES, KING PIT)

NTS - 21A/10D

UTM - N-4953870
E- 379700

LOCATION

The Reeves Sn Pit is located 0.5 km south of the highway at Forties, Lunenburg County on the Reeves farm (location 9 on Fig. 2; Fig. 22). Forties is located 5.1 km west of New Ross along the Dalhousie road. The prospect may be found by going 80 m south along the woods road starting at the small pond behind the barn on the Reeves' farm then turning west onto a foot path. Along this path (120 m) is a cleared area with a waterfilled pit, outcrops and overgrown dumps.

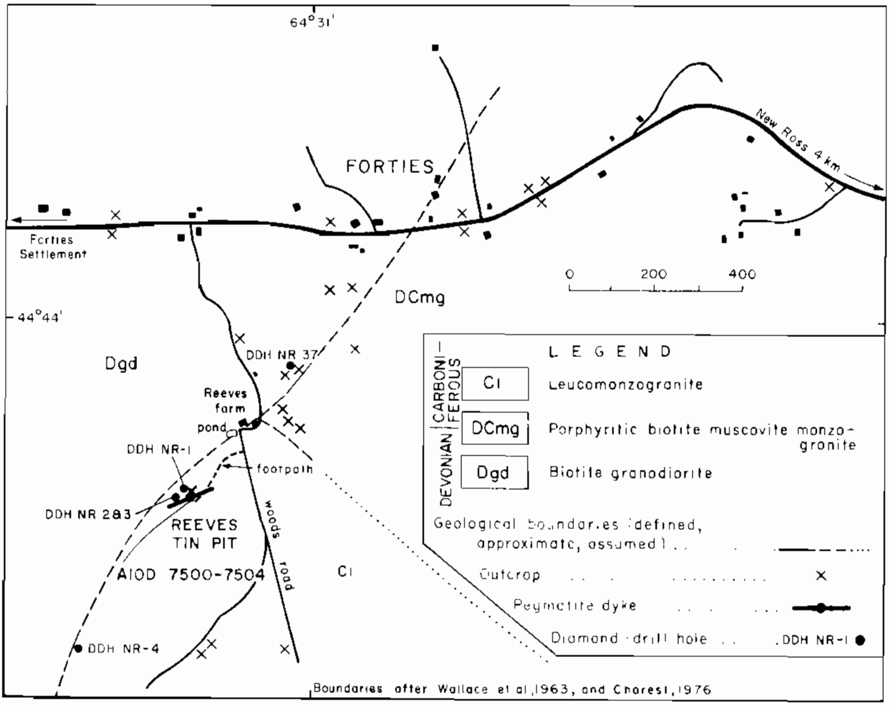

Figure 22. Location map and geology of the Reeves Sn pit

PREVIOUS WORK

Faribault (1908) reported that in 1903 a pit was dug at this site with the discovery of cassiterite and fluorite bearing quartz boulders. Digging continued and a shaft was sunk into bedrock with work continuing for the next few years. A pit 7.5 m deep, 3.6 m long and 3 m wide was sunk on a pegmatitic segregation in light grey granite (Faribault, 1908). The pegmatite is irregular in shape, but strikes in a general 065° direction dipping to the northwest. Wright (1912) described the occurrence as a "blow-out" with gradational relations with the host country rock.

Mineralogically, orthoclase, white and smoky quartz (some quartz crystals are up to 70 cm long) and lesser muscovite comprise the bulk of the dyke. The list of associated minerals reportedly found in the central part of the dyke is impressive. Cassiterite, amblygonite, lepidolite, fluorite, topaz, tourmaline, beryl, wolframite, scheelite, columbite, durangite, metatorbernite, tapiolite and monazite have been reported by various authors (Faribault, 1908; Douglas and Campbell, 1942b; Charest, 1976).

In the early 1960's detailed mapping and drilling were carried out in the vicinity of the Reeves prospect by the Nova Scotia Department of Mines (Wallace et al., 1963). Three holes were drilled to test the extent of the pegmatite intrusion. Drill logs show the pegmatite, although present, pinches out. Sn assays of up to 100 ppm were reported associated with the pegmatites and greisens from the drillholes by Wallace et al. (1963).

GEOLOGY

The Reeves pegmatite has intruded a light coloured medium grained xenomorphic granular muscovite leucomonzogranite. Flecks of fluorite and blue-turquoise fluoroapatite are common. The drill log for DDH NR-3 (Wallace et al., 1963) indicates the presence of this mineral (fluoroapatite) throughout the entire core length although no analyses for Be or P were done. Felderhof (1978, p. 351) reported one analysis of F (2.81%) for the host rock of the pegmatite.

Nearby to the west of the prospect the leucomonzogranite intruded biotite granodiorite (Fig. 22) and to the northeast it intruded porphyritic muscovite-biotite monzogranite. DDH NR-37 (Wallace et al., 1963), located immediately to the northeast of the Reeves farmhouse, started in biotite granodiorite crossed a sharp contact with porphyritic biotite-muscovite monzogranite and an intrusive contact with the younger leucogranite (Charest, 1976, p.96). Because the pit is now filled in only a small portion of the pegmatite is visible in situ. Although an impressive list of minerals has been reported from the prospect in the past, a search of the dumps was very disappointing. In this study fluorite, lepidolite, fluoroapatite were the only minerals of interest identified megascopically. Samples from this occurrence in the Nova Scotia Museum collection show pegmatitic segregations bearing cassiterite, wolframite, fluorite and columbite.

SUMMARY

Diamond-drill hole records show that pegmatite pinches out at depth and detailed mapping in the area did not indicate the presence of other bodies.

SECTION 10. MILL BROOK PEGMATITE

NTS - 21A/09C

UTM - N-4955390
E- 385660

LOCATION

The Mill Brook pegmatite (location 10 on Fig. 2) is situated high on the western bank of Mill Brook approximately 150 m downstream from the bridge crossing the Brook on the road going from Leville to New Ross (Fig. 23).

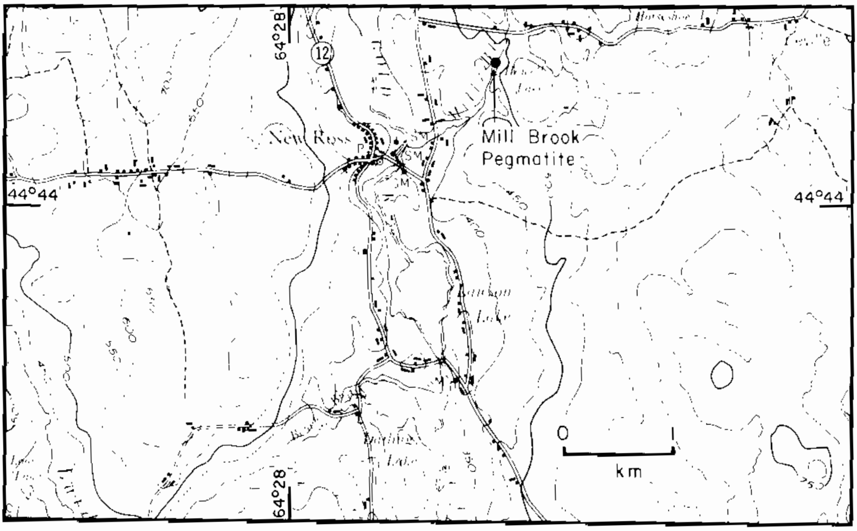

Figure 23. Location of the Mill Brook pegmatite

PREVIOUS WORK

Faribault (1931) mapped this pegmatite as a northern extension of Morleys pegmatite (location 1 on Fig. 2) found on the eastern side of Mill Brook approximately 0.5 km further downstream. No field evidence was observed to support this. Cameron (1950) reported the existence of "considerable lithium mica" in the pegmatite. The blasting of the outcrop showed that the mineralization was local and pinched out.

OCCURRENCE DESCRIPTION

The pegmatite consists of an irregular dyke of approximate northeast-southwest orientation intruded into cream coloured porphyritic biotite-muscovite monzogranite. The dyke appears to pinch out rapidly and may best be described as a lense shaped body consisting of quartz, pink orthoclase and muscovite roughly zoned with massive quartz found in the centre of the body. No mineralization other than sparse fluorite was observed. No lepidolite was observed in outcrop or in the rubble blasted from the outcrop.

SECTION 11. CANOE LAKE FLUORITE

NTS - 21A/16B

UTM - N-4962100
E- 395080

LOCATION

Fluorite occurs in roadside outcrops along the Vaughan to New Ross road (locations 11 and 12 on Fig. 2; Fig. 24) The Canoe Lake occurrence is found to the east and west of the stream connecting Upper and Lower Canoe Lakes. Most mineralization is found along the northern side of the road extending for approximately 330 m west of the stream (Fig. 25).

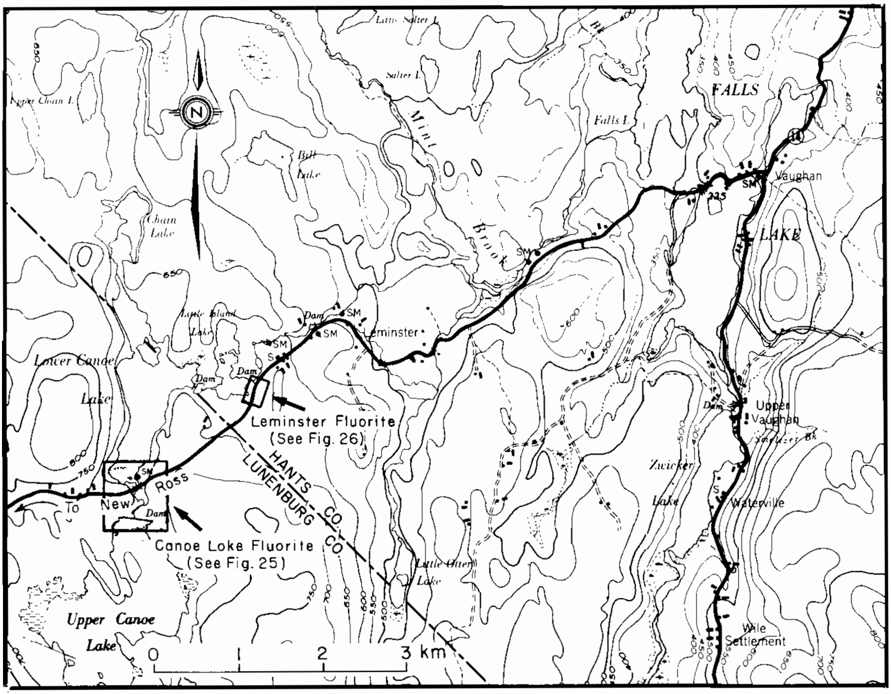

Figure 24. Location of the Canoe Lake and Leminster fluorite

PREVIOUS WORK

Faribault (1931) mapped the veins; since then no exploratory work has been reported on the occurrence. Charest (1976) described the geology of the occurrence and Felderhof (1978, p. 352) described the mineralization and chemical analyses of three grab samples.

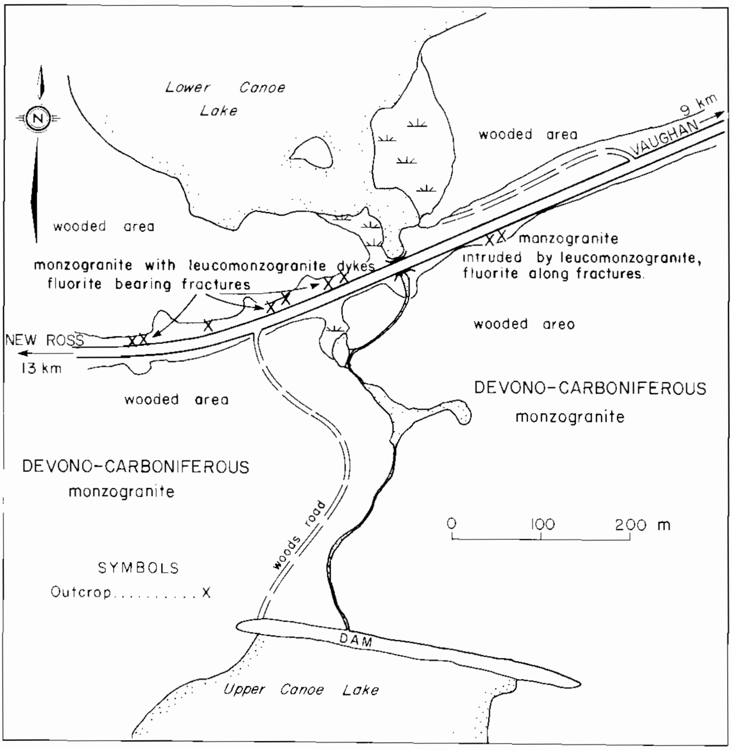

Figure 25. Canoe Lake fluorite occurrence

GEOLOGY AND OCCURRENCE DESCRIPTION

Quartz and purple to green fluorite are found as skims and fracture fillings in roughly east-west trending joints. The country rock is a coarse grained slightly porphyritic biotite-muscovite monzogranite which has been intruded by dykes of cream coloured medium grained muscovite leucomonzogranite-leucogranite. Fluorite is found in both these rock types, but the intense hematization associated with the fluorite mineralization at Leminster a short distance to the northeast (Fig. 24) is much less pronounced. The leucomonzogranite dykes are believed genetically related to the leucomonzogranite intrusion found to the east of this occurrence at Leminster. The fluorite mineralization is associated with the hydrothermal-pneumatolytic stage of this phase.

SUMMARY AND CONCLUSIONS

The fluorite occurs in insufficient amounts to be of commercial interest and no other minerals of value were observed. The presence of many occurrences in this area related to the late stage activity of the batholith, suggests the possibility of undiscovered occurrences of fluorite and other elements associated with this late stage magmatic activity.

SECTION 12. LEMINSTER FLUORITE
(LITTLE ISLAND LAKE FLUORITE)

NTS - 21A/16B

**UTM - N-4963510
E- 396700**

LOCATION

The Leminster fluorite occurrence (location 12 on Fig. 2) occurs along the Vaughan to New Ross Road, (old Windsor Road) at Leminster, Hants County, which is 7.5 km southwest of Vaughan and Highway 14 (Fig. 24). Outcrops exposed along both sides of the road and in the woods between the road and Little Island Lake are fluorite bearing (Fig. 26).

PREVIOUS WORK

Mr. Fred Rhodenizer first brought attention to the showing with a description of investigations given by Bingley (1971), Dawe (1972) and Fredericks (1972). At that time exploratory work consisted solely of blasting of some small outcrops. Felderhof (1978, p. 261-265) mapped the occurrence and reported some chemical analyses of selected outcrop samples.

GEOLOGY AND OCCURRENCE DESCRIPTION

The Leminster fluorite occurrence is hosted by pink-cream medium grained leucomonzogranite-leucogranite. This host intrusion has intruded coarse grained monzogranite with the contact found nearby to the southwest. Outcrops of monzogranite are found a short distance west from the occurrence along the road to New Ross.

Fluorite is found here in different modes of occurrence, but most abundantly as fracture fillings of vugs and veins of quartz and fluorite. The fluorite ranges in colour from clear to green or purple. Often different coloured varieties are found coexisting. Veins up to 5 cm thick were observed, but generally average about 1 cm in width. Fluorite blebs are pervasive in the wall rocks in close proximity to veins. A brecciated and sheared leucomozogranite has fragments cemented by fluorite and chalcedony at the southern end of the occurrence (Fig. 26). Joint planes with skims of purple fluorite were observed in outcrops of more massive leucomonzogranite away from zones of intense vein intrusion.

Most of the mineralization is structurally controlled along veins, fractures and shears which have a general east-west trend. This coincides with the assumed east-west trending leucomonzogranite-monzogranite contact a short distance to the southwest.

The mineralization obviously is related to and is found in a region of the South Mountain batholith which had a high degree of hydrothermal-pneumatolytic activity. Although no greisenization was observed in areas of most abundant mineralization, alteration of the host leucomonzogranite-leucogranite is in the form of intense hematization giving the rocks a pink and often reddish brown colour. Variation in grain size is common. Some outcrops exibit a fine grained aplitic texture. A thin section of the

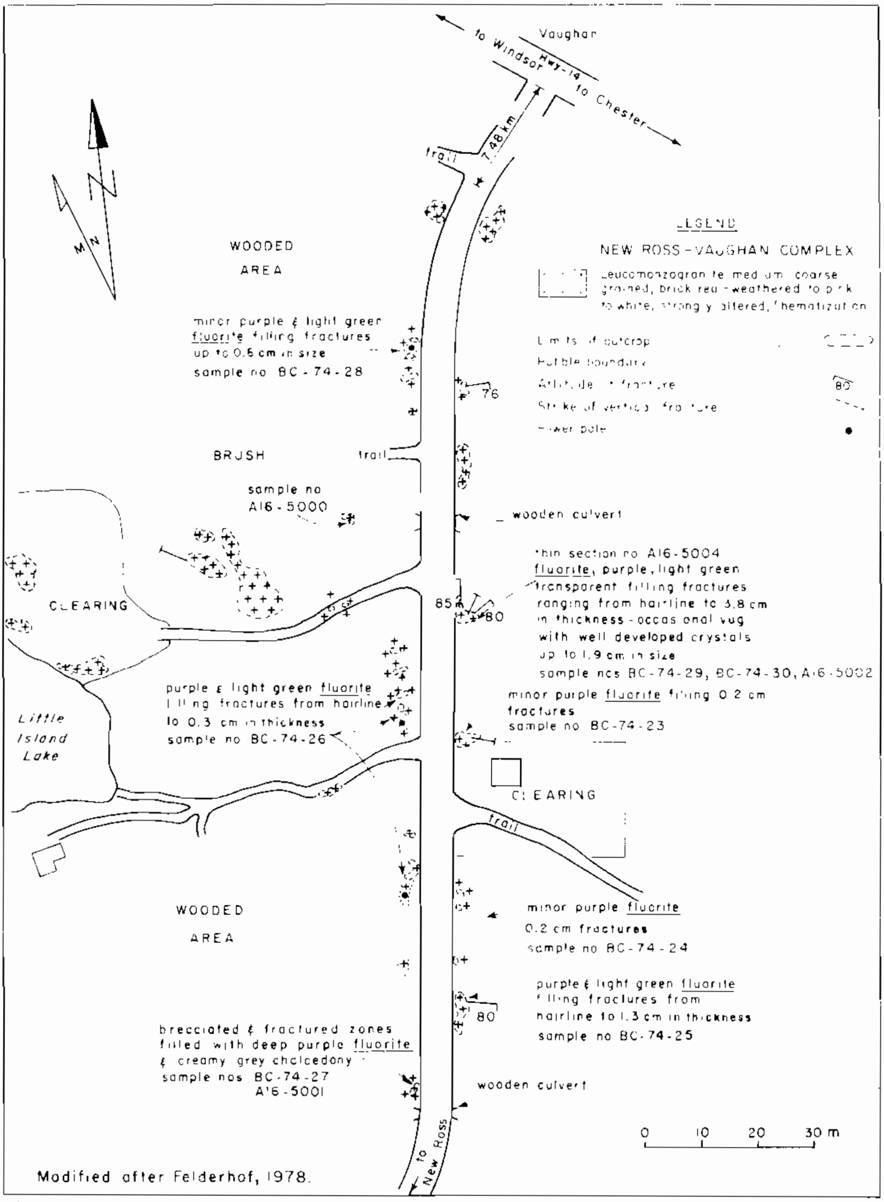

Figure 26. Leminster fluorite occurrence

aplite shows brecciation and recrystallization on a microscopic scale, with a very high quartz and albite content.

SUMMARY AND CONCLUSIONS

Felderhof (1978) reported the fluorite mineralization to be of high quality, but of insufficient extent to be of commercial interest. No minerals of interest other than fluorite were observed. The presence of this and other fluorite occurrences (Felderhof 1978, p. 270, 352; Canoe Lake occurrence, this report) and an abundance of quartz and pegmatite dykes in this area indicate a high level of hydrothermal-pneumatolytic activity, therefore this area presents a good exploration target for hydrothermal deposits.

SECTION 13. SWINIMER PROSPECT

(LEMINSTER Mo)

NTS - 21A/16B

UTM - N-4963650
E- 397550

LOCATION

The Swinimer prospect is located on the edge of a field immediately south of the New Ross-Vaughan road at Leminster, Hants County (No. 13 on Fig. 2; Fig. 27). Leminster is located 5.6 km west along the New Ross-Vaughan road from Vaughan and Highway 14.

PREVIOUS WORK

A pit was sunk on a 25.4 cm quartz-calcite vein in 1918 (Eardley-Wilmot, 1925, p. 58), but has since been filled in. At that time, molybdenite and bismuth were reported in a quartz-calcite vein striking 140° which intruded Halifax Formation slates. A 170 kg hand picked bulk sample assayed 1.08 per cent MoS_2. No significant work was carried out on the prospect until the early 1960's when the Nova Scotia Department of Mines drilled two diamond-drill holes to test the vein along strike (Wallace et al., 1963). One hole intercepted an unmineralized quartz aplite dyke 45 cm thick. No analyses were reported. Also at that time detailed mapping of the surrounding area was done.

GEOLOGY AND OCCURRENCE DESCRIPTION

At present, all that remains is an elongate trench-like digging with a small dump containing mineralized quartz boulders. Molybdenite occurs in the dump samples at the interface of white-clear quartz and grey to dark grey hornfels and schists. Within the vein elongate tourmaline needles and angular country rock fragments were observed. Douglas and Campbell (1942b, p. 112) reported arsenopyrite and specularite, but neither were observed during the present study.

Figure 27 displays the geology of the area surrounding the occurrence. Mineralization is found in quartz-calcite veins which intruded Meguma Group hornfels. In this area the Meguma Group forms a thermally metamorphosed, elongate roof pendant, which conforms structurally with the regional trend observed throughout southern Nova Scotia (Fig. 1). To the south of the occurrence (approximately 900 m) are outcrops of cream coloured medium grained muscovite-biotite leucomonzogranite. Outcrops containing dykes of pegmatite were observed associated with the leucomonzogranite intrusion. One of the dykes contains a few flecks of molybdenite, northwest of the main occurrence (Fig. 27). Further to the southwest (Fig. 2) the leucomonzogranite intruded the porphyritic biotite muscovite monzogranite.

SUMMARY AND CONCLUSIONS

Wallace et al. (1963) tested the extent of the mineralized vein with two diamond-drill holes with unfavourable results. The area was mapped in detail and no other targets were found. Positive indicators in assessing

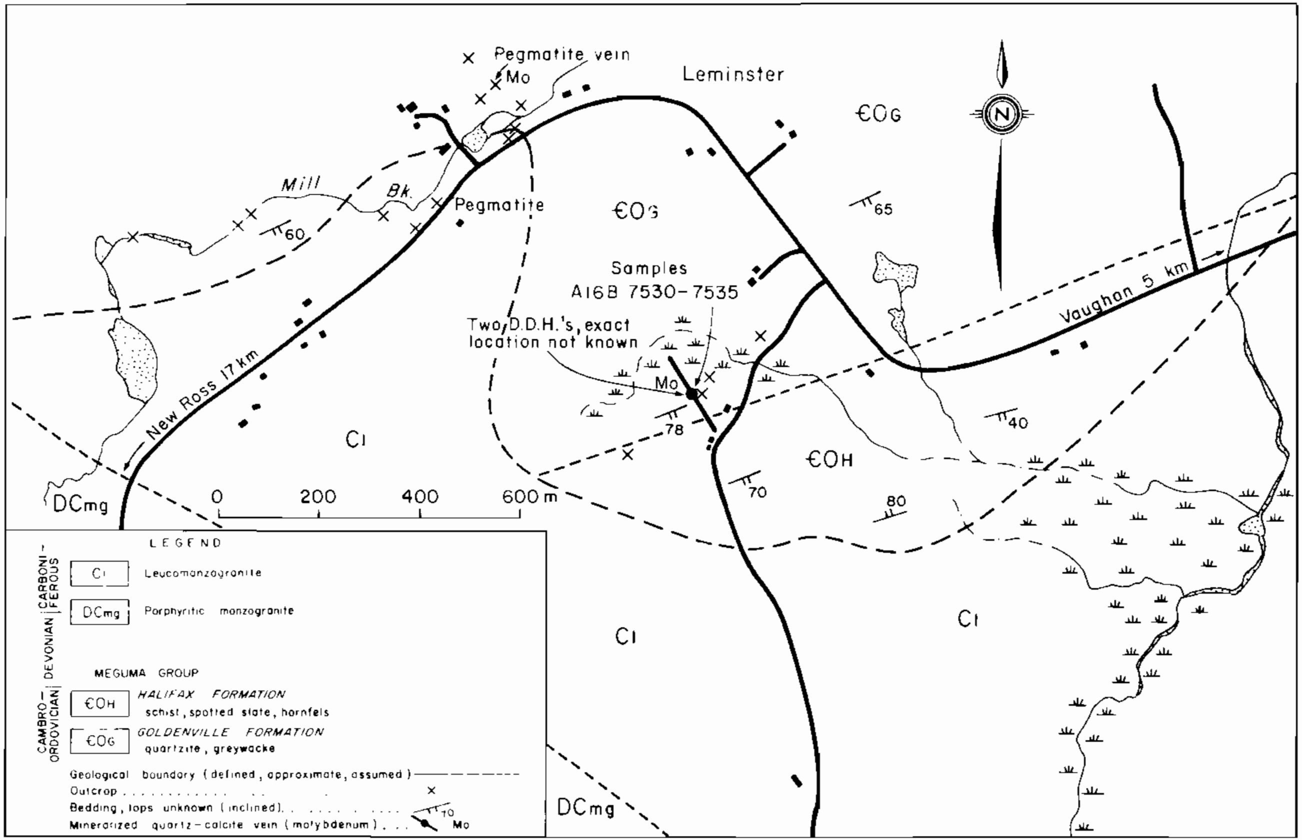

Figure 27. Location and geology of the Swinimer Mo prospect

the potential of this occurrence are the presence of pegmatite pods and dykes in the leucomonzogranite and country rocks; mineralized quartz-calcite veins; and a quartz rich aplite in one of the diamond-drill holes. These indicators suggest the presence of late stage pegmatitic-hydrothermal activity. The potential of similar occurrences related spatially to this leucomonzogranite intrusion both within the Meguma Group roof pendant and within the porphyritic biotite-muscovite monzogranite warrants examination.

SECTION 14. GASPEREAU LAKE U

NTS - 21A/15D

UTM - N-4977340
E- 370880

LOCATION

The Gaspereau Lake uranium prospect is located in a small gravel pit along a north-south trending logging road between Gaspereau and Aylesford Lakes in central Kings County (location 14 on Fig. 2; Fig. 28).

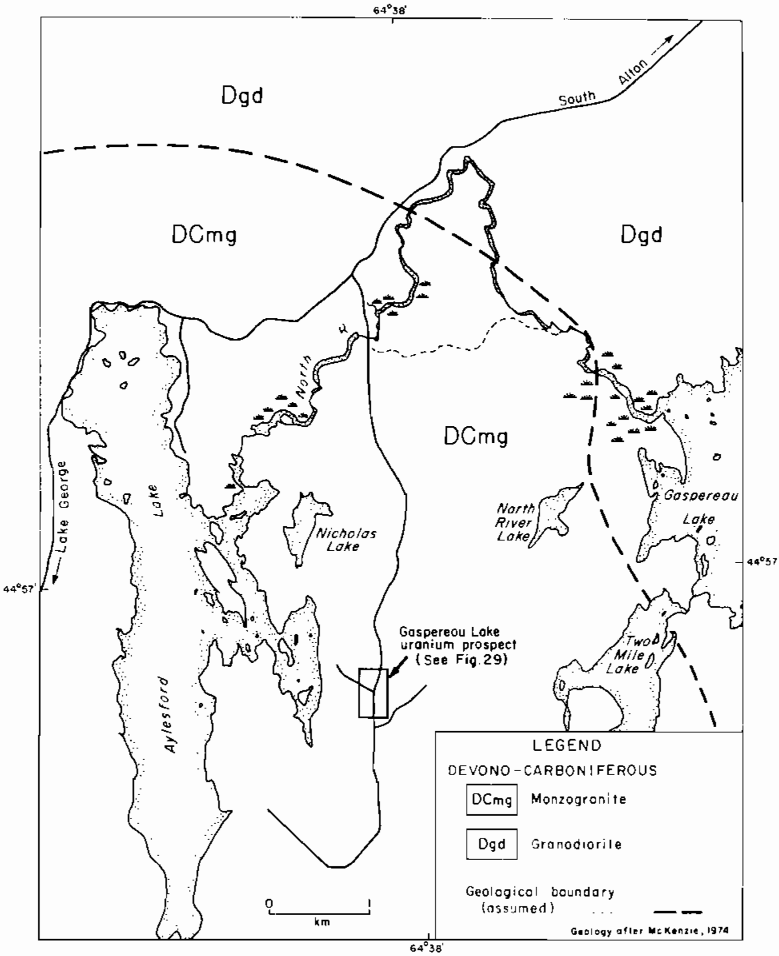

Figure 28. Location of the Gaspereau Lake uranium prospect

PREVIOUS WORK

The prospect was discovered by reconnaissance prospecting of the South Mountain batholith by Esso Minerals Canada in 1977. Following the discovery detailed airborne and ground surveys were initiated to determine the extent of mineralization. Lowe and Farstad (1978b) reported the results of geological mapping, airborne and ground radiometric surveys and an electromagnetic survey. The results of a diamond-drill program are in the assessment files of the Nova Scotia Department of Mines and Energy.

Lowe and Farstad (1978b) reported an assay of 6.6 lbs/ton U_3O_8 for a grab sample from the mineralized zone exposed in the gravel pit. Two chip samples across a 0.9 m zone and a 2.75 m zone gave 2.2 and 1.5 lbs/ton U_3O_8 respectively.

GEOLOGY AND OCCURRENCE DESCRIPTION

For this study the prospect and immediate surroundings were mapped at 1:600 scale (Fig. 29). An older coarse grained, often porphyritic biotite granodiorite outcrops 50 m south of the the gravel pit. Intrusive into the granodiorite is a pink medium grained muscovite granite-leucogranite. This phase consists predominantly of quartz, potassic feldspar, muscovite and albitic plagioclase. Biotite was observed in some outcrops. The muscovite granite is texturally inhomogeneous and grades into abundant small pegmatitic veins and pods. A long outcrop of this granite along the logging road immediately north of the gravel pit, contains abundant pegmatite. A magmatic layering was observed to be very irregular in orientation and swirls over a short distance. From mapping it is obvious that the muscovite granite intruded the granodiorite because of abundant small roof pendants or xenoliths of the granodiorite in the granite.

Uranium mineralization, although hosted by the medium grained muscovite granite, is not obviously associated with the pods and veins of pegmatite. Uranium mineralization occurs as autunite bearing fractures and joints some of which are exposed in the gravel pit (Fig. 29). Associated with the mineralization is a progressive alteration which overprints all primary magmatic textures in the muscovite granite. In outcrops 50 m west of the gravel pit the alteration was observed to intensify toward the mineralized zone. Samples 7500 and 7501 are muscovite granite and pegmatite respectively. Alteration of these samples is in the form of reddening (hematization) of feldspar. In sample 7501 (pegmatite) potassic feldspar is altered to quartz and muscovite. A fracture system (no movement) of 4 cm spacing overprints this rock giving a weak foliated texture to the outcrops. In sample 7502 the foliation is much more closely spaced and pronounced and in the same 055° orientation as the previous outcrop. Hematization and alteration of feldspars is also much more pronounced with some feldspar almost completely obliterated. A mineralized zone is exposed along an outcrop face in the gravel pit. Samples 7503-7506 were taken from this zone where alteration is most intense and the highest scintillometer reading (1200 cps) recorded. In this zone, approximately 1 m wide, fragments of intensely altered granite are found in a muscovite and clay rich matrix. Many of the fragments found within the zone display remnants of the original granitic and pegmatitic textures. The eastern end of the mineralized zone consists of a massive,

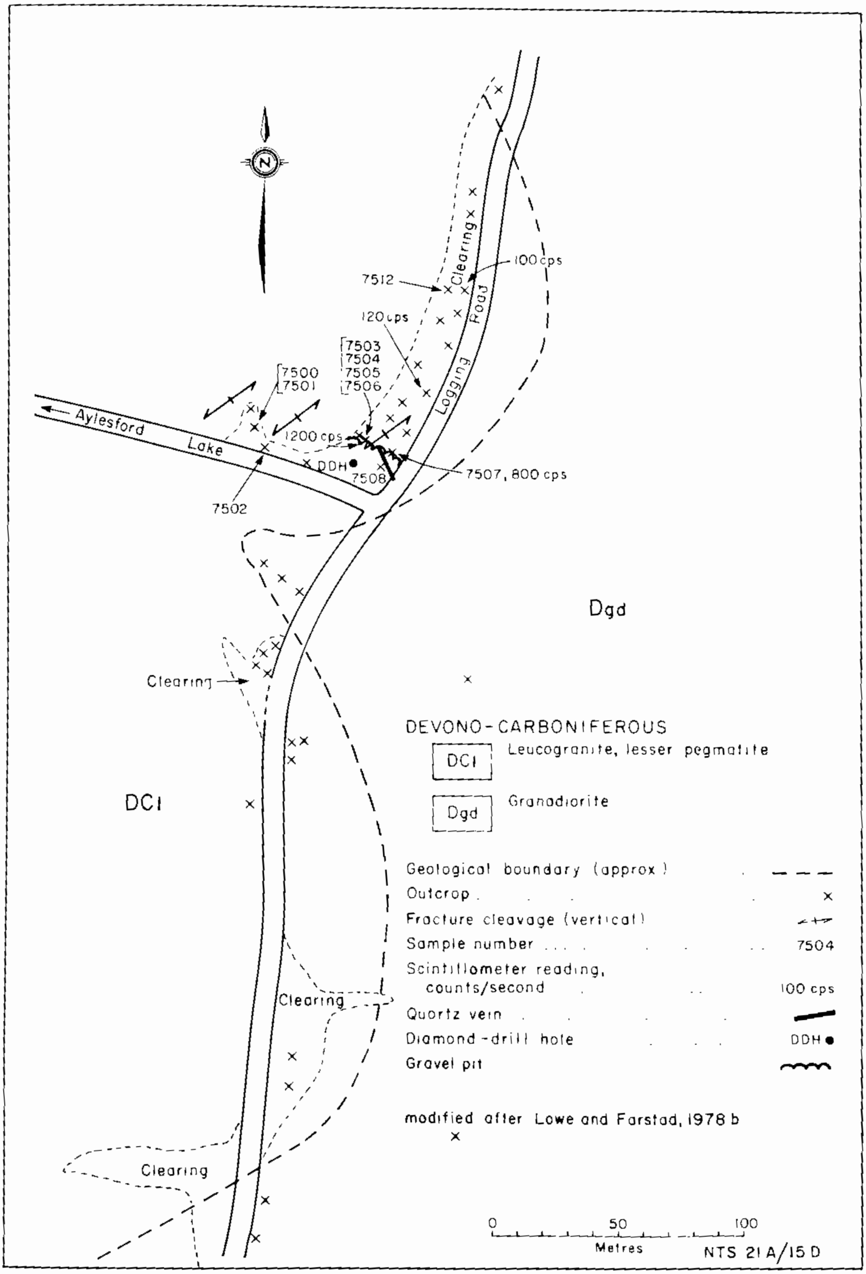

Figure 29. Geology and sample location map of the Gaspereau Lake uranium prospect

but altered and foliated outcrop of muscovite granite, pegmatite and quartz veins. It is significant to note that the alteration and fracture cleavage overprints the quartz veins. Another smaller mineralized fracture (800 cps) is found near the eastern end of the rock face.

SUMMARY AND CONCLUSIONS

In summary, at the Gaspereau Lake prospect uranium mineralization and associated alteration are localized along fractures and shear zones in a highly differentiated intrusion of muscovite granite-leucogranite. Abundant pegmatite and quartz veins are gradational with the muscovite granite. The abundance of pegmatite, quartz veins and swirled magmatic layering observed in the outcrops indicate the highly differentiated volatile rich nature of the granite. In the vicinity there are abundant roof pendants of older porphyritic biotite granodiorite, which were not observed to be altered or mineralized. At Gaspereau Lake the uranium mineralization, on surface evidence, does not extend for a significant strike distance, although locally ore grade assays have been reported. The occurrence is of significance because it is one of the first vein type uranium occurrences found associated with the granitoid rocks of Nova Scotia.

SECTION 15. CAIN AND RIDDLE MINE AND THE MARPIC SHAFT

(LOWER MINE)

NTS - 21A/16B

UTM - N-4967290
E- 385670

LOCATION

The Cain and Riddle Mine and the Marpic Shaft (location 15 on Fig. 2) are three past producing mines, located about 9 km north of Mill Road, Lunenburg County (Fig. 30). The area may be reached by woods road starting at the southwestern end of Wallaback Lake. The area is relatively flat lying and characterized by abundant swamps and bogs. The three workings are found within 800 m of each other on a northeasterly striking vein system (Fig. 31).

PREVIOUS WORK

Much work has been done in the past since the first discovery of manganese in the area in 1903 (Weeks, 1946). Detailed sections and reports are kept in the Nova Scotia Department of Mines and Energy assessment files. The mineralized zone does not outcrop and dump samples are quite weathered and oxidized so the following description is based mostly on a few of the more detailed published works. Summaries of the work reported in the Department of Mines and Energy assessment files and description of the mineralization published from observations of the underground workings by various authors are found in Weeks (1946) and Bishop and Wright (1974).

GEOLOGY AND DEPOSIT DESCRIPTION

The managanese deposits are found in a porphyritic biotite granodiorite-monzogranite along narrow zones which dip steeply to the northwest. Manganese is found in small veins and lenses within the zones. The veins and lenses vary in width up to 180 cm. Bishop and Wright (1974) reported mineralization proven by drilling to a depth of 103 m. The geology of the manganese deposits is displayed in Figure 31 with the locations of drillholes as logged by Weeks (1946).

The area consists of at least two parallel northeasterly striking mineralized zones which on the surface are manifest as low lying swampy hollows. Textures described in published drill logs and from underground workings and as observed in dump samples suggest the mineralized zones are fault related for most if not all of their lengths. Further evidence to support the presence of a fault is the fact that the hanging wall to the northwest consists of unaltered granodiorite while the footwall to the southeast grades from a highly altered and brecciated granodiorite outwards into massive, but hematized granodiorite and finally into unaltered granodiorite within 20 m (Fig. 32).

Kramm (1912) described four zones of mineralization grading into one another vertically from the surface. Figure 32 displays this zonation and shows the important manganese bearing minerals to be pyrolusite, manganite and psilomelane. These minerals decrease in abundance below 60 m from the surface.

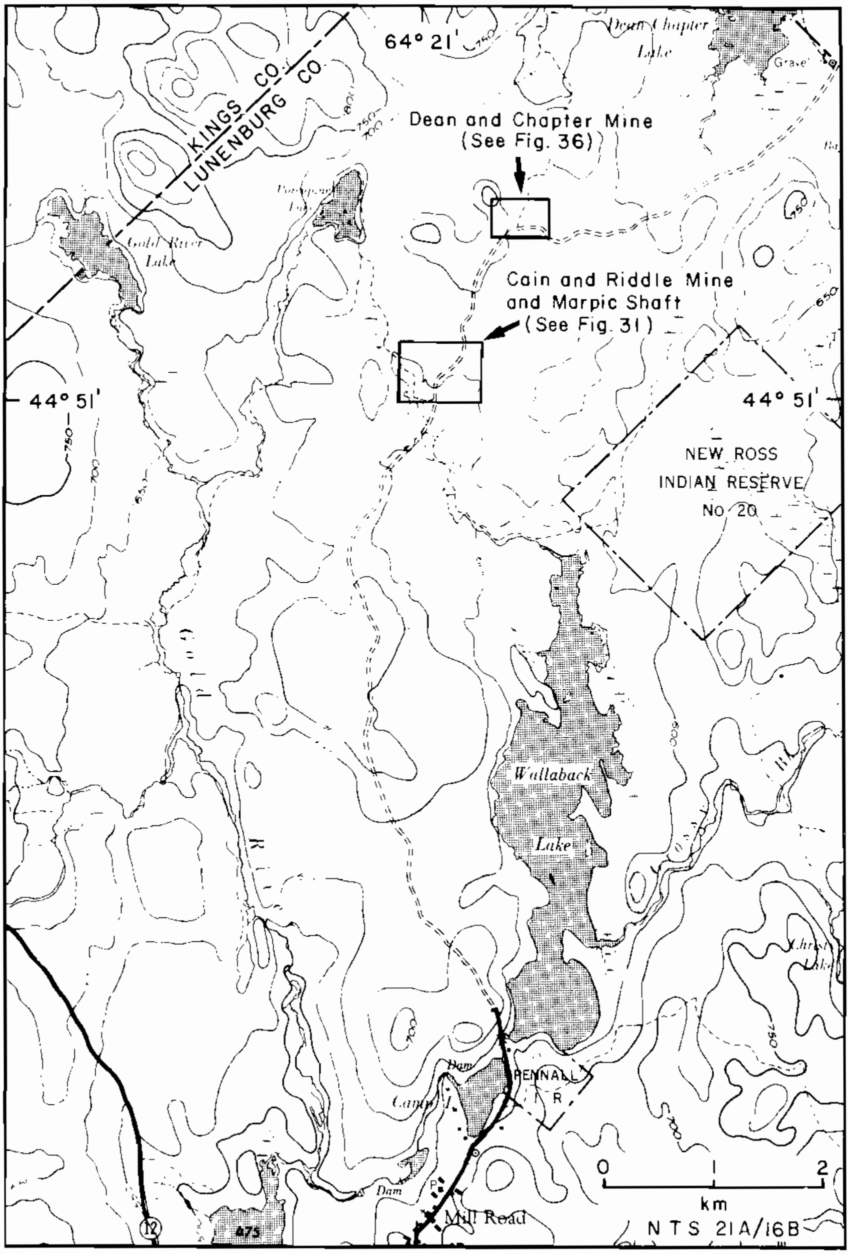

Figure 30. Location of the New Ross manganese mines

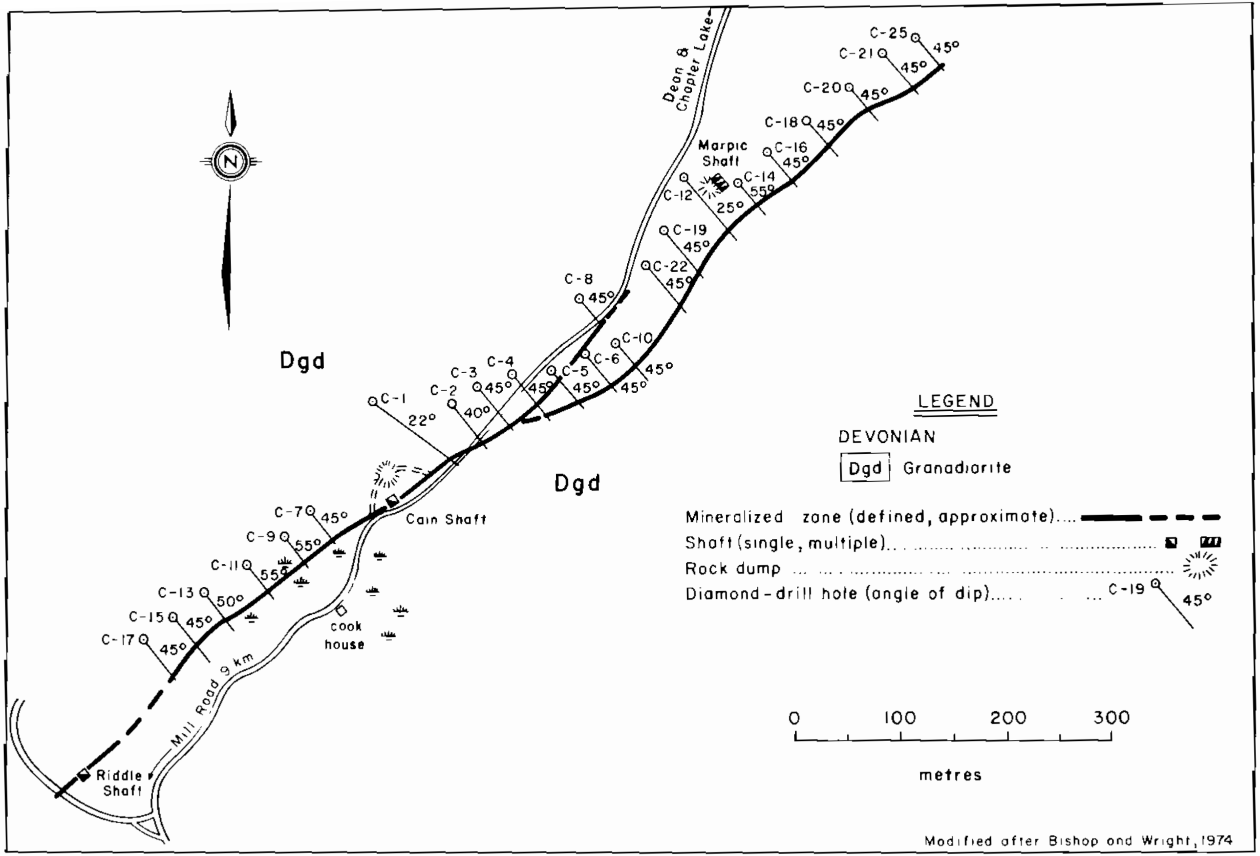

Figure 31. Plan of the Cain and Riddle mine and Marpic shaft

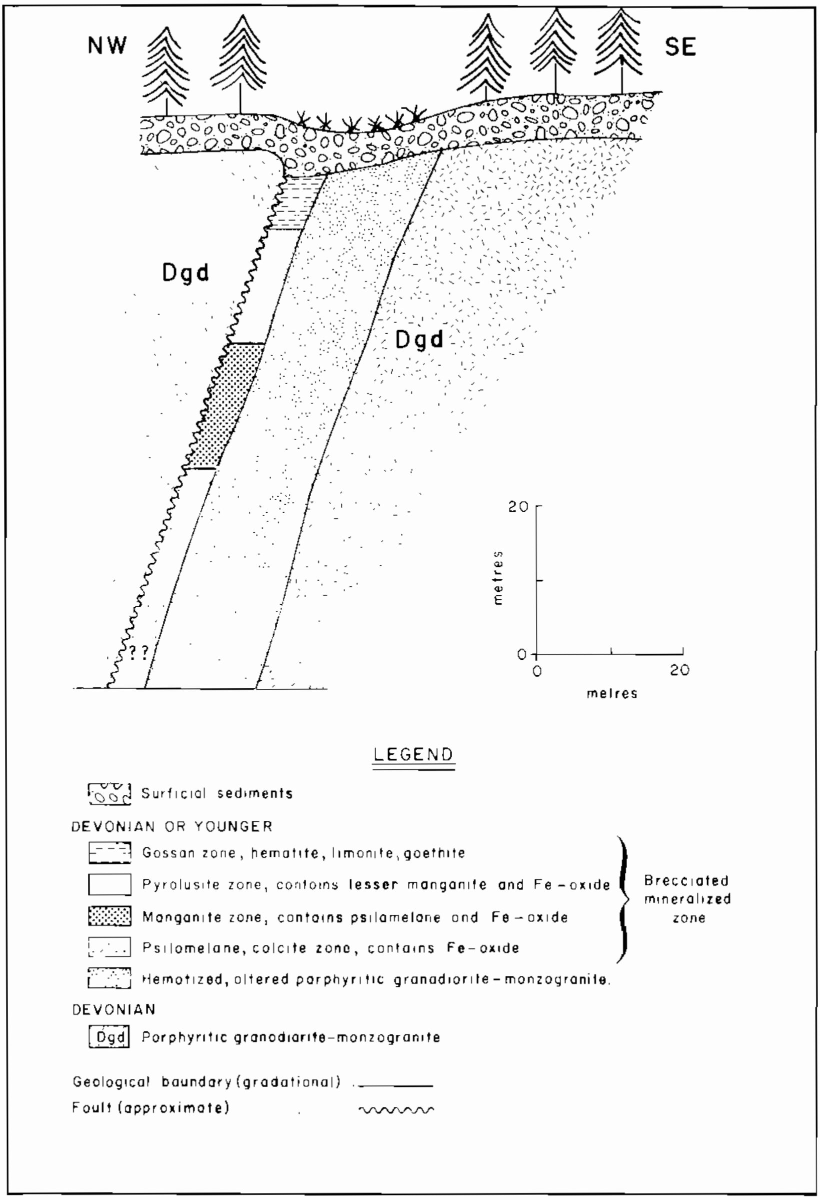

Figure 32. Idealized cross-section of the mineralized zone of the New Ross Mn mines showing horizontal and vertical gradational zonation.

Evidence exists to support both a hypogene and supergene origin for the manganese mineralization (Douglas and Campbell, 1942a). Bishop and Wright (1974) have found, using x-ray methods, that dump samples contain minerals such as rhodochrosite, knebelite (Mn silicate), pinakiolite (boron bearing Mn oxide) and barite. All of these minerals are unlikely supergene minerals and suggest a hydrothermal origin. Anomalous Sn and Be values support the contention of Bishop and Wright (1974) that the manganese deposits are related to the hydrothermal-pegmatitic occurrences found in the New Ross area to the south. Slightly anomalous scintillometer readings recorded from the mine dumps also support this theory.

SUMMARY

In summary, the New Ross manganese deposits are found in fault or shear zones which were mineralized by fluids of probable hydrothermal origin. Surface oxidizing conditions and groundwater action have resulted in supergene enrichment of the primary mineralization to a depth of approximately 30 m to 50 m.

SECTION 16. LAKE RAMSAY AREA

NTS - 21A/10D

UTM - N-4956000
E- 381000

LOCATION

Lake Ramsay is located at Forties, 3 km west of New Ross on the New Ross-East Dalhousie road (location 16 on Fig. 2; Fig. 33).

PREVIOUS WORK

Faribault (1907, 1931) indicated the presence of several occurrences of Zn, Sn, Au, Mo, and Cu in the vicinity. Confusion exists as to the existence of all of these occurrences except one.

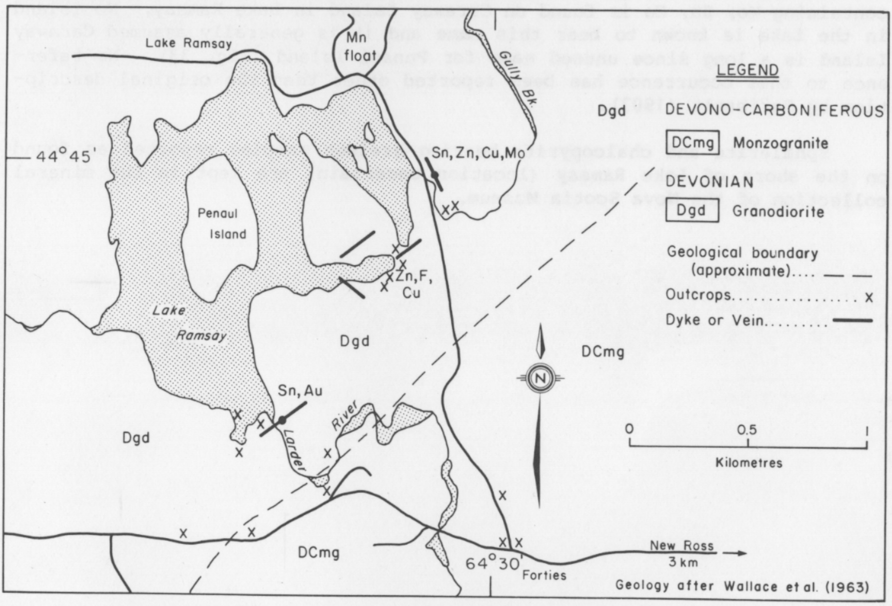

Figure 33. Location of the Lake Ramsay occurrences

On the Veniot farm immediately north of where Gully Brook flows into Lake Ramsay (Fig. 33) a 7.5 cm wide vein was reported to contain Sn, Zn, Cu and Mo (Faribault, 1931). A 6 m deep pit was sunk on the occurrence, but has since been filled in and a small barn built on the site. The barn is located along the driveway halfway between the road and the farmhouse. No dump material remains and outcrops of granodiorite nearby contain no mineralization.

Three veins containing Zn, F, and Cu are reported to occur near a peninsula on the eastern side of Lake Ramsay (Fig. 33; Faribault, 1931). Outcrops were observed at the indicated sites, but no veins or mineralized float were observed. Local farmers in the area remember some pits along the shore of the Lake immediately east of this peninsula and south of Gully Brook, but these have long since been overgrown.

Faribault (1931) indicated a vein containing Sn and Au outcropping at the southern end of Lake Ramsay where the Larder River leaves the Lake. Granodiorite outcrops, without mineralization were noted on the western shore of the River, but no outcrops at all were observed on the eastern shore where the vein is indicated by Faribault (1931).

Faribault (1907, p. 344) wrote that a quartz, feldspar and mica vein containing Mo, Zn, Cu is found on Caraway Island in Lake Ramsay. No island in the Lake is known to bear this name and it is generally assumed Caraway Island is a long since unused name for Penaul Island (Fig. 33). No reference to this occurrence has been reported other than the original description by Faribault (1907).

Sphalerite and chalcopyrite bearing greisen samples reported as found on the shore of Lake Ramsay (location uncertain) are kept in the mineral collection of the Nova Scotia Museum.

SECTION 17. NEVERTELL LAKE PROSPECT (RUSSEL PIT)

NTS - 21A/10D

UTM - N-4943420
E- 380550

LOCATION

Faribault (1908, 1924) reported a pegmatite dyke outcropping near the headwater of a tributary stream flowing into the western end of Nevertell Lake (location 17 on Fig. 2; Fig. 34). Nevertell Lake may be reached by woods trail approximately 5 km east of Walden, Lunenburg County. The exact loca-

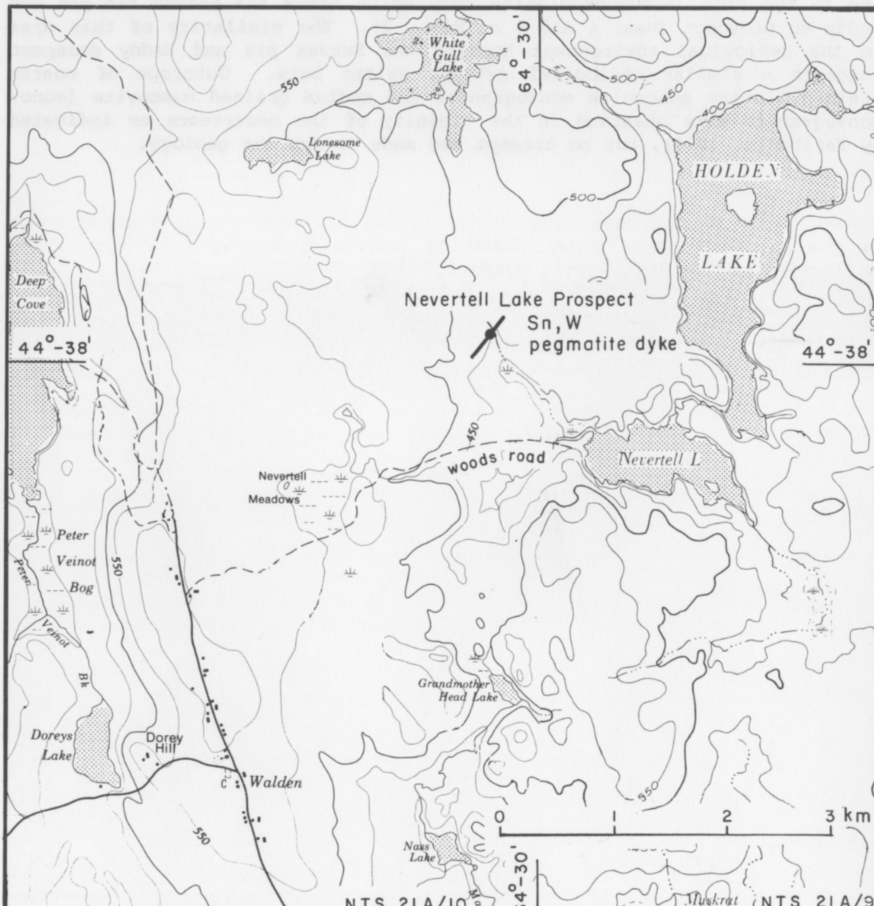

Figure 34. Location of the Nevertell Lake prospect

tion of the occurrence is poorly described and a search of the area, indicated by Faribault (1924), turned up only quartz and pegmatite boulders along the stream bank.

Faribault (1908) wrote: "Traces of tin ore were identified in a few small specimens taken from a pegmatite dyke 24 feet thick, discovered a mile north of Nevertell Lake, on a tributary of Gold River, six miles south of the Reeves' tin discovery." Cameron (1950) reported that a pit 3 m long and 2.5 m deep had been sunk at the base of a granite ridge, but tourmaline was the only mineralization observed.

GEOLOGY

The Nevertell Lake prospect is inferred to occur within or in close proximity to the same leucomonzogranite body which hosts the Reeves tin pit and Keddy Mo prospect (Nos. 4 and 9 on Fig. 2). The similarity of this area to the geological environment hosting the Reeves pit and Keddy prospect suggests a similar geological setting exists here. Outcrops of coarse grained biotite muscovite monzogranite and medium grained muscovite leucomonzogranite were observed in the vicinity of the occurrence as indicated by Faribault (1924), but no attempt was made to map the geology.

SECTION 18. SEFFERNSVILLE PEGMATITE

(GOLD MINE HILL)

NTS - 21A/09C

UTM - N-4945470
E -387000

LOCATION

The Seffernsville pegmatite is located approximately 2.5 km west of Highway 12 and Seffernsville, Lunenburg County (location 18 on Fig. 2). This occurrence was not located during this study. The location plotted on Figure 35 is the location according to Faribault (1924) and a written description of the location by Ellsworth (1932). The general area is accessible by logging roads and woods trails.

PREVIOUS WORK

Faribault (1924) mapped two dykes containing smoky quartz in the area west of Seffernsville, but did not indicate the presence of other minerals of economic value. Ellsworth (1932) visited the area and described the dyke southeast of Steeves Lake. The dyke outcrops in two places on the northern side of the prominent granite knoll which underlies the area. The two exposures of the dyke are aligned in an east-west direction and are separated by approximately 15 m. Both showings have been pitted.

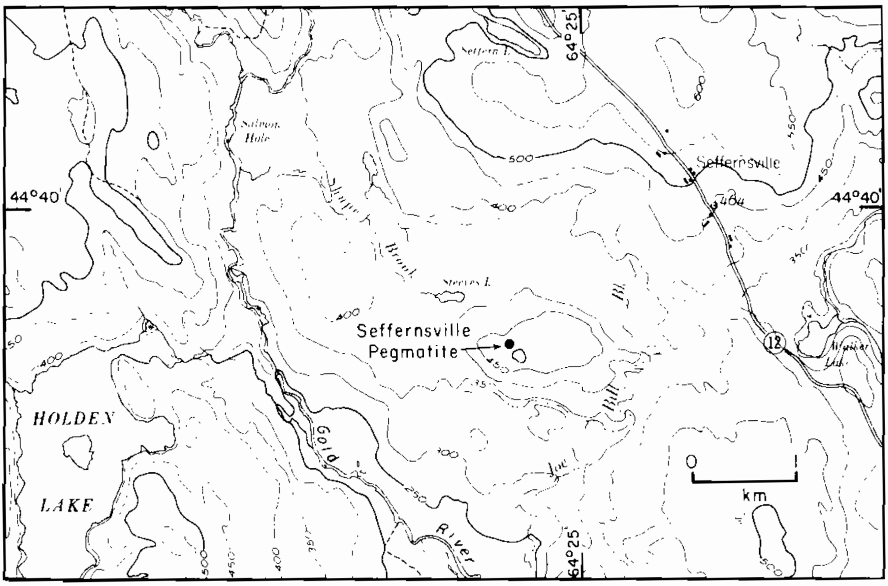

Figure 35. Location of the Seffernsville pegmatite

Feathery masses of lepidolite intergrown with quartz and potassic feldspar are reported exposed in the pits (Ellsworth 1932). Cameron (1950) visited the occurrence, but did not report the presence of lepidolite. Both authors noted the occurrence of tourmaline and smoky quartz in both pits.

SUMMARY

The area is underlain by porphyritic biotite-muscovite monzogranite. The eastern exposure consists predominantly of a dyke of massive white quartz with a 1 m northern border of pegmatite and a southern border of muscovite bearing sugary granite. The western exposure consists of quartz and graphic granite intruded into the monzogranite.

SECTION 19. DEAN AND CHAPTER MINE

(UPPER MINE)

NTS - 21A/16B

UTM - N-4968700
E- 386360

LOCATION

The Dean and Chapter manganese mine is located approximately 11 km north of Mill Road, Lunenburg County (location 19 on Fig. 2; Fig. 30). The area is accessible from the north by a woods road which is seasonably passable by four wheel drive vehicle and joins a good all seasons logging road near the southern end of Black River Lake. From the south, the Dean and Chapter mine may be reached on foot from the Cain mine where a bridge crossing a small stream is washed out.

PREVIOUS WORK

The mine consists of four shafts on a single mineralized zone which has been shown by drilling to extend for at least 70 m on a northeasterly trend (Weeks, 1946). First work started on the mine in 1910 and Weeks (1946), and Bishop and Wright (1974) summarized the work done at the mine since that time.

The geology of the Dean and Chapter mine is shown in Figure 36. The relations observed are the same as those found at the Cain, Riddle and Marpic mines 2 km south (occurrence 15).

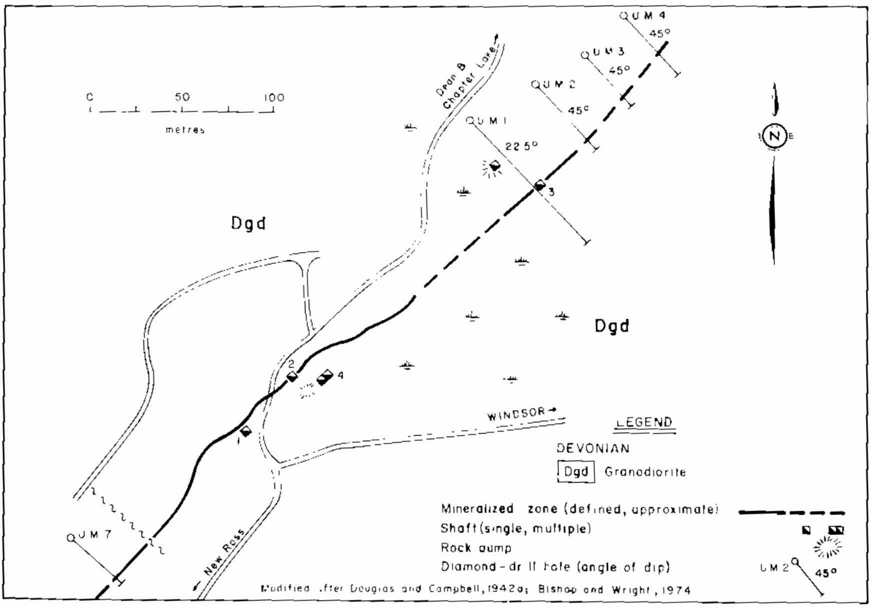

Figure 36. Plan of the Dean and Chapter Mn mine

Weeks (1946) estimated using drill core data that 5000 tons of ore reserve is probable at this mine. The mineralized zone is known to extend for a long distance beyond the mine workings.

SECTION 20. LAKE DARLING Mo

NTS - 21A/09C

UTM - N-4952840
E- 384000

LOCATION

The Lake Darling Mo occurrence is reportedly found to the west of Lake Darling and the Glengary road at New Ross, Lunenburg County (location 20 on Fig.2; Fig. 37). The occurrence is situated a short distance to the west of a small stream flowing into the western end of Lake Darling.

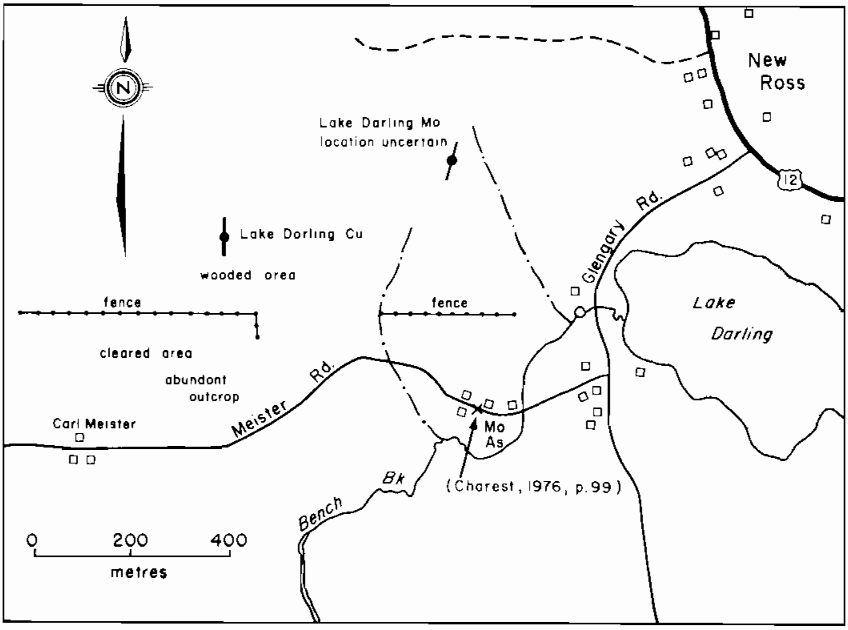

Figure 37. Location of the Lake Darling Mo occurrence

PREVIOUS WORK

Very little is known or published on this occurrence; during this study it was not located in the field. Faribault (1907, p. 82) reported that "Bismuthinite and molybdenite were found in a dyke of quartz and aplite, one mile south of New Ross corner." Later he found a pegmatite dyke northwest of Lake Darling (Faribault, 1924). Charest (1976, p. 99) found traces of molybdenite and arsenopyrite in a thin greisen zone in monzogranite porphyry (Fig. 37).

82 Lake Darling Mo

A search of the reported occurrence area showed that it is underlain by a small drumlin with no outcrop exposure. A rise in topography 100 m to the west has abundant outcrop and would seem a more likely area to host the occurrence. This is the area on Figure 37 which is considered to be the location of the occurrence.

DISCUSSION OF DEPOSIT TYPES

INTRODUCTION

The mineral occurrences hosted by the South Mountain batholith within the study area (Fig. 2) may be classed into three main types: (1) magmatic, (2) metasomatic, and (3) hydrothermal. These are summarized in Table 1. McKenzie and Clarke (1975) and Charest (1976) described a strong differentiation trend for the South Mountain batholith represented by granodiorite-monzogranite-minor intrusions and dykes of leucomonzogranite, leucogranite and porphyry. They described the New Ross area as that portion of the South Mountain batholith which has undergone the highest degree of differentiation and associated deuteric alteration. Among the field criteria used to substantiate this are the presence of many pegmatites and minor intrusions of highly evolved, volatile rich phases in this area. A large gravity low centred at New Ross (Garland, 1953; O'Reilly, 1975) and the presence of a large in situ roof pendant of Meguma Group metasediments to the north (Fig. 2) indicates the New Ross area probably represents the thick central part of the batholith near the apical or upper roof zone of the magma chamber.

TYPE 1 MAGMATIC ORIGIN

Most of the occurrences found within the study area are hosted by direct magmatic differentiates of the more evolved portions of the South Mountain batholith. Charest (1976) discussed the close association of pegmatites and late stage intrusions of leucomonzogranite and leucogranite. A large intrusion of leucomozongranite has been mapped southwest of New Ross (McKenzie, 1974) and named the Reeves-Keddy leucomonzogranite by Charest (1976). The Reeves Sn pit (location 9 on Fig. 2), Keddy Mo prospect (location 4) and the Nevertell Lake dyke (location 17) are pegmatite bodies associated with this intrusion. All are located in close proximity to the contact of the leucomonzogranite with the porphyritic monzogranite and/or granodiorite. The association of the Reeves and Keddy pegmatites with this leucomonzogranite intrusion has been described previously. The Nevertell dyke was not located, but its reported location coincides with a leucomonzogranite-monzogranite contact zone. The position of the dykes is or seems to be in the contact zones; near the margins of the plutons; or at the top of the plutons (cf. Emmons, 1940, p. 22; Park and MacDiarmid, 1970, p. 265).

Several mineralized pegmatite bodies are hosted by the porphyritic monzogranite in the New Ross area. These are: Walker Moly (location 8 on Fig. 2), Wallaback Lake Sn (location 5), Mill Brook (location 10), Morleys (location 1) and Seffernsville (location 18) pegmatites and the Lake Darling dykes (locations 6 and 20). Although intruded into monzogranite these pegmatites often have an associated leucogranitic or aplitic phase. This associated leucogranitic phase is comparable in composition and texture to the Reeves-Keddy leucomonzogranite. These pegmatites and leucogranites probably represent small plugs or offshoots of the highly differentiated and volatile rich residual melt which formed the minor plutons and dykes of leucomonzogranite and leucogranite.

The pegmatites, although having variable economic mineral assemblages, are structurally similar in the New Ross area. They form irregular dyke or lensoid bodies which tend to pinch out within 5-10 m. Although some zoning was observed, it is poorly developed other than a coarsening in grain size and decrease in muscovite content toward the centre of the bodies. Most of the pegmatites have thin, highly greisenized selvages along their contacts. Some degree of greisenization of the associated leucogranitic phase which accompanies the intrusions is also common. Field observations and a literature search indicate that the greisenized muscovite-rich selvages and greisenized aplites and leucogranites usually contain most of the Sn, W, Cu and Be mineralization while Mo, Ta, Nb, F, and Li bearing minerals are concentrated in the pegmatites themselves. The greisen selvages, although not exposed at most showings, are reportedly thin and sporadic in distribution.

At the Turner Sn prospect (location 7 on Fig. 2; Fig. 18) Sn mineralization is associated with a quartz porphyry dyke (Elvan vein). This dyke was called the Elvan vein by previous workers because it is similar in composition and texture to the "elvans" from the Cornwall tin district of England. In Cornwall, elvans are large (many metres in width) hypabyssal dyke like intrusions in the granitic and surrounding country rocks.

Douglas and Campbell (1942b) reported 800 ppm Sn for a channel sample across the Elvan vein at the Turner Sn prospect. Charest (1976) reported 77 ppm and 63 ppm Sn for samples from this vein. Farley (1978) concluded that the quartz porphyry (Elvan vein) was derived from a molten magma source during the late stages of differentiation of the South Mountain batholith.

TYPE 2 METASOMATIC ORIGIN

Two prospects within the study area, the Long Lake Mo, W, Sn, Cu, Be, Ag and the Turner Sn, Cu, W, Zn, W prospects (locations 2 and 7 on Fig. 2) are classified as apogranites (Table 1). An apogranite is defined as an albitized and greisenized granite, located at the peripheral and apical parts of certain granites rich in Nb, Ta, Li, Rb, Be, Sn, W, and Mo. Deposits of this type have long been known in the Paleozoic tin belts of Europe. Their presence in Nova Scotia has only recently been recognized (Chatterjee, 1981).

Deposits of this type are found associated with peraluminous granitic rocks of palingenetic origin. All previous workers (McKenzie and Clarke, 1975; Albuquerque, 1977; Smith, 1979; Clarke and Halliday, 1980) concluded that the parent magma of the granitic rocks of southwestern Nova Scotia was derived, at least in part, by partial melting of a pelitic metasedimentary source. The Sn, W, Mo, Be rich character of the batholith is shown by the existence of many pegmatites containing these elements associated with the most differentiated phases.

Apogranite and vein formation in the South Mountain batholith is the result of metasomatism of the granitic rocks by the pneumatolytic stage of the magmatic suite of rocks. Chatterjee (1981) discussed the petrological and geochemical effects of this metasomatic episode on the magmatic phases of the South Mountain batholith. Shcherba (1970) and Stemprok (1979) presented models to explain the observed effects of autometasomatism of a cooling granitic intrusion. The postmagmatic volatile rich solutions migrating outward through previously crystallized granitic rock alter the granite to produce a metasomatic zonation which is often consistent from occurrence to occurrence (Fig. 38). The alteration and breakdown of the pre-existing magmatic minerals, especially biotite, releases lithophile elements to the permeating solutions. The zonal pattern displayed in Figure 38 conforms to metasomatic theory for migration of an alkali rich fluid phase enriched in K, Na, Li, F, and Rb.

Stemprok (1979) reported the close association of tin and related deposits with granite contact zones for 800 deposits (Fig. 39). Granophile element enriched fluids encounter lower temperature conditions and compositionally different rocks near the outer zones of the pluton. A change in one or both of these physical or chemical parameters alters the solubility of many elements in the fluids and precipitation may result.

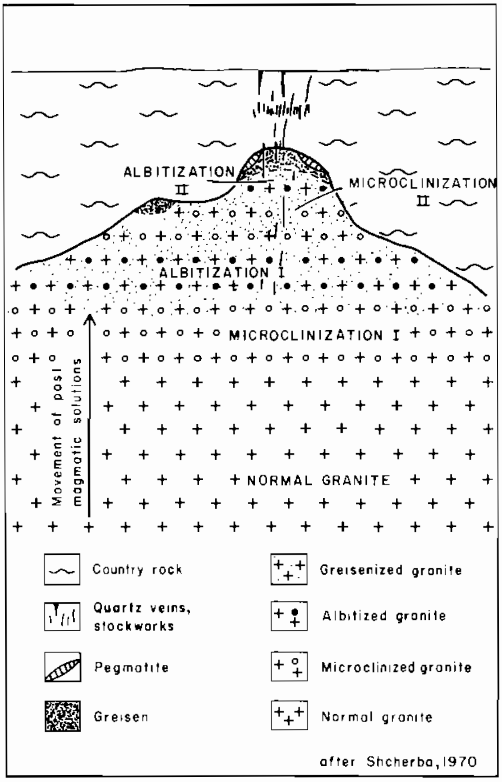

Figure 38. Autometasomatic zonation in an intrusion during cooling

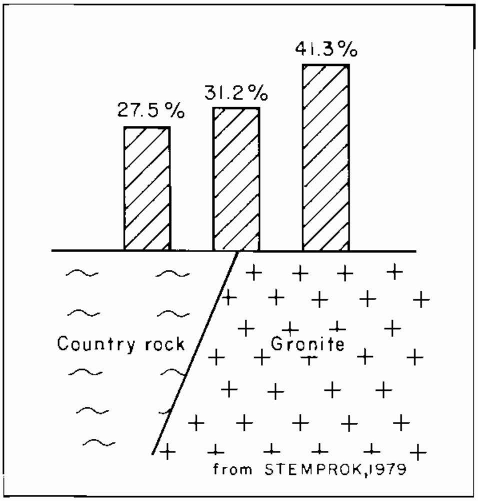

Figure 39. Distribution of 800 tin and related deposits to granite contacts, based on a study by Rundkvist, 1977

The zonal pattern observed at the Long Lake prospect (location 2 on Fig. 2) compares favourably to the classical pattern of Shcherba (1970; Fig. 38). At Long Lake mineralization is in the form of disseminations in greisen pods and fractures within a greisenized cupola at the contact of the batholith with Meguma Group metasediments. Mineralized quartz and quartz-microcline veins extend from the cupola into the country rock. Scheelite bearing skarnoid layers were observed in drill core of Meguma Group hornfels dumped at the prospect (Fig. 5).

The Turner Sn prospect (location 7 on Fig. 2) is situated at the contact of monzogranite with a Meguma Group roof pendant at the apical part of the batholith. The mineralization is found as parallel quartz greisen veins. The alteration effects of the ore solutions are not as apparent or widespread at the Turner prospect as at Long Lake, but both are derived by alteration of a previously crystallized granitic host by ore bearing solutions at the peripheral and/or apical portion of the South Mountain batholith.

Tischendorf (1973) suggested that tin deposits of the Erzgebirge region in Europe are related to one type of granitic intrusion which has a characteristic of extreme specialization in Sn, F, Li and Rb. A time interval exists between solidification of the host country rocks and actual formation of the tin deposits. During this interval, emplacement of granitoid, medium- to fine-grained subphases (quartz porphyrites or specialized granites) occurs. This suggests that the ore forming processes may be derived from these younger intrusions and are not the result of residual solutions of the host granitoids themselves. This model is interesting if applied to the Turner Sn prospect where a tin bearing quartz porphyry intrusion exists (Elvan vein).

The role of the mineralized muscovite-biotite granite intrusion (DCg on Fig. 5) at the Long Lake prospect is not certain because its relationship to the metasomatic suite is not exposed. The possibility of this subphase being a specialized granite pluton within the South Mountain batholith needs further examination.

TYPE 3 HYDROTHERMAL ORIGIN

Several occurrences within the study area (Table 1) display characteristics which classify them as: (A) directly related to the hydrothermal stage in the differentiation of the South Mountain batholith, or (B) a combination of hydrothermal fluids with meteoric or connate waters.

(A) Hydrothermal Origin

Along the New Ross-Vaughan road, east of Lewis Lake are occurrences of veins of fluorite in the granitic rocks at Canoe Lake and Leminster (locations 11 and 12 on Fig. 2).

At Leminster, quartz-fluorite veins occur as fracture and vug fillings in red-pink leucomonzogranite near its contact with porphyritic monzogranite. Most veins are structurally controlled in an east-west direction. Charest (1976) wrote that this area displays the highest degree of hydrothermal alteration in the central part of the South Mountain batholith. A brecciated and sheared zone of leucogranite is cemented by fluorite and colloidal quartz (Fig. 26) a common hydrothermal texture.

At Canoe Lake (location 11) purple fluorite occurs as fracture fillings and along joints in porphyritic biotite muscovite monzogranite. The mineralization is controlled by east-west trending joints and fractures. Dykes of medium grained leucogranite intruded the monzogranite, with fluorite also occurring in the leucogranite. The leucogranite dykes are believed to be offshoots of one of the leucomonzogranite-leucogranite plutons which hosts the Leminster fluorite showing a short distance to the east. Textures suggest the fluorite mineralization here and at Leminster are related to hydrothermal fluids from the late stage leucogranite intrusion exposed in the area.

The Swinimer Mo prospect (location 13 on Fig. 2) consists of a 25 cm quartz-calcite vein in Meguma Group hornfels (Fig. 27). The prospect is located 250 m from the leucogranite intrusion which hosts the Leminster fluorite occurrence (location 12; Fig. 2). Molybdenite was observed at the contact of a clear white quartz vein with the country rock hornfels. Elongate tourmaline crystals occur with massive quartz crystals. The vein occurs as an open space filling with little or no alteration of the surrounding wall rock.

(B) Hydrothermal and Meteoric Water Origin

Some deposits existing within the study area display characteristics which suggest deposition from a combination of hydrothermal and deep meteoric waters.

At East Dalhousie and Gaspereau Lake (locations 3 and 14 on Fig. 2) uranium mineralization is associated with fracture controlled veins in metasomatized granitic rocks. Mineralization occurs as open space fillings along features such as faults, shears, joints, and fractures. Autunite and torbernite are the main uranium bearing minerals known to date although pitchblende is common. Hematization is common in the alteration halo. Deposits of this type are found in or near two mica granites derived from metasedimentary rocks, ("S type" granites) (Rich et al., 1977). The host granite plutons are often overlain by continental redbed sequences. The above characteristics are present in Nova Scotia.

The existing data support a hypogene origin, a meteoric or supergene origin or a combination of hypogene and meteoric origin. The fact that vein type uranium deposits often become noneconomic below depths of 300 m strongly contradicts a solely hypogene origin for the mineralizing solutions and supports a supergene and/or meteoric origin. Barbier (1974) presented a model in which, during continental weathering, highly oxidized surface waters leach uranium from near surface bedrock. The uranium enriched waters deposit uranium bearing minerals at depth when a suitable reduction potential in the waters is achieved. This model is supported by the near surface concentration of uranium in deposits of this type.

In Nova Scotia vein type uranium deposits at East Dalhousie and Gaspereau Lake display characteristics which cannot be answered by a purely supergene or meteoric origin for the mineralizing solutions. Chatterjee (personal communication, 1979) has observed in thin section and identified by microprobe and x-ray: fluorite, topaz, cassiterite, wolframite, fluoroapatite, beryl, galena, Li- and Rb-rich mica from the mineralized zones at East Dalhousie and Gaspereau Lake. Figure 40 shows analyses of samples from a profile across a mineralized zone in the Gaspereau Lake prospect. Anomalous values of Rb, Ba, U, F, Sn exist. The existence of minerals such as beryl, topaz, cassiterite, fluoroapatite, wolframite and Li-rich mica in the mineralized zone are unlikely to be found deposited from fluids of supergene or meteoric origin because all are hypogene minerals.

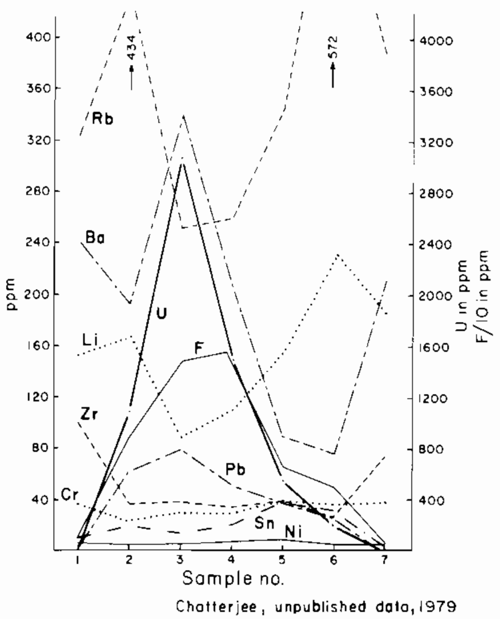

Figure 40. Analyses of seven samples across a 2.5 m mineralized zone of the Gaspereau Lake uranium prospect.

Economic concentrations of uranium do not persist at depth. This suggests a supergene enrichment or a meteoric water component which contributed to uranium enrichment of the veins near surface. Highly oxidized water is necessary to leach and carry uranium.

Magmatic or hydrothermal fluids are not oxidizing, suggesting an addition to the system of an oxidizing agent. Granitic terranes hosting these deposits are commonly overlain by continental redbed sequences (Rich et al., 1977) which lead Barbier (1974) to suggest the oxidized solutions were derived from water circulating in the highly oxidized continental sediments overlying the granites. The same process probably controlled U mineralization in the vein type U deposits.

A model which best explains the observed features of the uranium at East Dalhousie and Gaspereau Lake involves the mixing of hypogene magmatic fluids with meteoric waters.

North of Wallaback Lake are three past producing manganese mines (locations 15 and 19 on Fig. 2). Structurally these mines are similar to the uranium deposits. The manganese occurs in northeasterly trending veins which are located in fault or shear zones with associated wall rock alteration away from the mineralized zones (Fig. 32). Only slightly anomalous uranium readings were observed from these zones. This may be due to the fact that the presence of highly oxidizing manganese in the system will not allow the reducing conditions necessary for precipitation of uranium from solution. Hypogene manganese minerals have been identified by x-ray from the mineralized zones (See description of Cain and Riddle mine, location 15). This suggests a hydrothermal origin for the mineralizing fluids. The concentration of manganese decreases below 30-50 m depth, with vertical zonation of the ore body from surface reported (Fig. 32). Bishop and Wright (1974) wrote that a halo of low grade manganese veins exists in the Cornwall tin district of England and suggested a comparison of the New Ross area with Cornwall. Indications are that the New Ross manganese mines are low grade and hypogene in origin at depth. Supergene enrichment of the low grade veins has occurred which has enriched the veins from near surface to a depth of 30-50 m.

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