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The Geology of Base Metal, Precious Metal, Iron, and Molybdenum Deposits in the Pembroke-Renfrew Area

by
T.R. Carter, A.C. Colvine
and H.D. Meyn

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TABLE OF CONTENTS

List of Tables

List of Appendices

Page

List of Figures

APPENDIX I

Page

APPENDIX II

Page

APPENDIX III

List of Maps

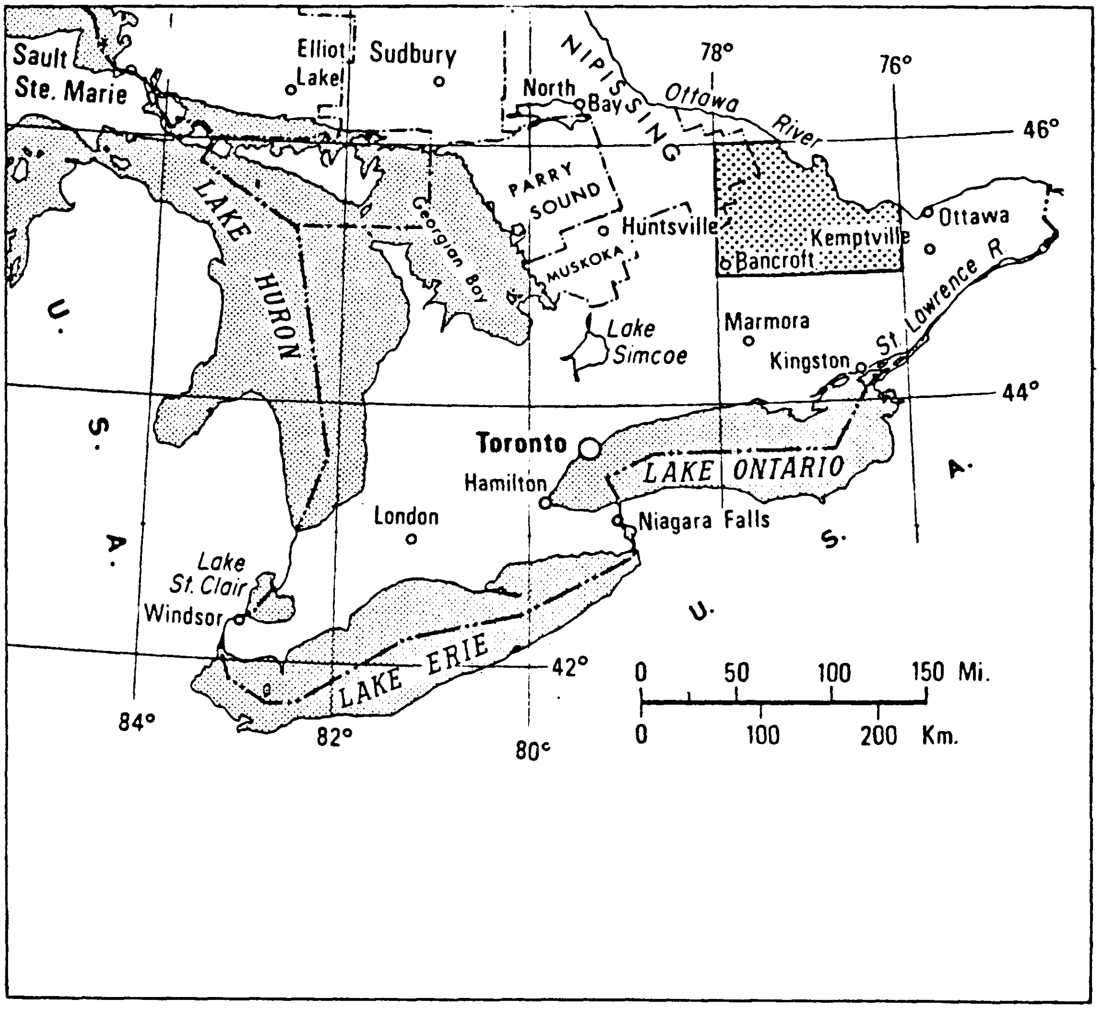

Figure 1: Location of the Pembroke-Renfrew area

THE GEOLOGY OF BASE METAL, PRECIOUS METAL, IRON AND MOLYBDENUM DEPOSITS IN THE PEMBROKE-RENFREW AREA

by
T.R. Carter[1], A.C. Colvine[2], and H.D. Meyn[2]

INTRODUCTION

This report deals with the geological features of all known deposits of metals, exclusive of uranium, which occur in the Pembroke-Renfrew area of southeastern Ontario. The Pembroke-Renfrew area, for the purposes of this study, is bounded by Long. 78°W, the Ottawa River and Long. 76°W, Lat. 45°N, and Lat. 46°N, and encompasses an area of approximately 14,000 km^2 (see Figure 1 - location map). The towns of Pembroke, Renfrew, Arnprior, Bancroft, Carleton Place, and Eganville are included within the study area.

The report summarizes the results of investigations conducted during 1977, 1978, and part of 1979. It consists of a comprehensive description of the geological association, morphology, and metal and mineral content of the deposits. In addition an attempt has been made to determine the cause of localization and concentration of mineralization in order to provide guidelines for further exploration. It does not constitute a comprehensive metallogenetic report of all mineralization in the area.

122 deposits occur in the area, including 50 iron, 45 molybdenum, and 27 base and precious metals deposits. The authors visited 76 of these deposits during the summers of 1977 and 1978 including 36 iron, 17 molybdenum, and 23 base and precious metals deposits to establish their geological characteristics and collect representative samples of host rocks and mineralization. Ninety-seven thin and polished thin sections

[1] Graduate Student, University of Toronto
[2] Geologist, Ontario Geological Survey, Ministry of Natural Resources

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were prepared from these samples and 141 samples were submitted to the Geoscience Laboratory of the Ontario Geological Survey for assays and/or determination of whole rock chemical compositions including selected trace elements. A number of the deposits reported in previous literature could not be found and others were not visited by the authors. Descriptions of these are abstracted or quoted from the reports listed in the bibliography. Comprehensive descriptions of each deposit are presented in three appendices at the end of this report.

HISTORY OF MINERAL PRODUCTION AND EXPLORATION

The area contains a wide variety of deposits of both metallic and non-metallic minerals, most of which have been described by previous workers. Deposits of metallic minerals include antimony, arsenic, copper, gold, iron, mercury, molybdenum, nickel, lead, pyrite, silver, and zinc.

Mineral exploration began in the area in the mid 1800's and the first production was attained in 1868 from the McNab hematite (iron) deposit in McNab Township (see Appendix II). Production from several other iron deposits commenced shortly afterward, most mines achieving maximum production before 1900. Some ore was mined from a few other deposits subsequently but iron ore production from the area ceased in 1914 (see Table 1). Some minor production of magnetite for use as heavy aggregate occurred in 1977 from the Summit Lake deposit. Total production from the

iron deposits is estimated at 265,345 tons of magnetite ore and 12,110 to 17,110 tons of hematite ore. In addition 5,810 tons of pyrite were shipped from the Blithfield deposit between 1915 and 1930.

The first production of molybdenum amounted to 100 pounds of pure flake mined from the Hunter deposit (see Appendix III) in 1890. Most production occurred between 1915 and 1918 from numerous small deposits and production ceased in 1942 (see Table 2). Total production for which records are available amounted to approximately 1,400 tons from which approximately 25,646 pounds of pure MoS_2 were recovered.

The only production of base metals has been from the Kingdon Mine in Fitzroy Township which operated from 1914 to 1931. 905,000 tons of Pb-Zn ore were hoisted from the mine from which 76,821,409 pounds of lead concentrate and 857,312 pounds of zinc concentrate were produced. 60,074,077 pounds of pig lead were produced from the lead concentrate in a smelter at the mine site.

Mineral exploration has continued at a reduced and sporadic pace since the 1940's. Zinc-lead deposits of the Balmat- Edwards type are currently attracting the greatest exploration interest.

PREVIOUS WORK AND ACKNOWLEDGEMENTS

A very substantial amount of work has been completed by numerous previous workers in the area, providing a basis for the

	DEPOSIT	YEAR	ORE SHIPPED (Tons*)	IRON CONTENT
2.	Bluff Point	1881-1901	9,000**	59.5%
3.	Calabogie	1883-1901	10,000	58.3%
8.	Martel	before 1890	4,000	unknown
11.	Williams	1888-1890	25,000	unknown
13.	Blithfield	1915-1930	5,810 (pyrite)	unknown
21.	McIlwraith	1899	3 carloads (pyrite)	unknown
23.	Yuill	1890-1898	about 2,000	unknown
32.	Grattan	1901-1907	18,824	unknown
36.	Wilbur	before 1900	125,000	unknown
		1907-1908	21,892	56.9%***
37.	Bessemer	1901-1913	34,980	50.7%
39.	Childs	1913	9,649	unknown
41.	Rankin	1913-1914	5,000	unknown
44.	McNab	1868-1871	2,110 (hematite)	68%
		1873-1874	10-15,000 (hematite)	68%
49.	Summit Lake	1977	uncertain	unknown

* available records usually do not specify whether long or short tons

** combined production from Bluff Point and Former Campbell mine (part of Calabogie)

*** average of one carload

TABLE 1: Summary of production from iron deposits in the Pembroke-Renfrew area.

	DEPOSIT	YEAR	ORE SHIPPED	GRADE	MoS_2 RECOVERY
1.	Gorman	1917	21.72 tons	0.38%	117 lb.
8.	Culhane	1915	200 lb.	picked flake	
			35 lb.	35%	
10.	Hunter	1890	100 lb.	pure flake	
13	Zenith	1917	?	?	7,800 lb.
			472 lb.	65%	
			86 lb.	45.5%	
			1,435 lb.	2.1%	60 lb.
			3,300 lb.	85%	
		1934	400 tons	0.85%	
		1936	7.5 tons	85%	
		1937	6.5 tons	85%	
14.	Quilty	1917	19 tons	0.45%	120 lb.
19.	Hunt	1915-1918	96,660 lb.	95%	
21.	Ross-O'Brien	1916	25.2 tons	1.45%	
			126.5 tons	?	
			10.4 tons	7.00%	
			110.3 tons	2.00%	
		1917	285.9 tons	0.91%	
			26.2 tons	1.96%	
			24.6 tons	1.81%	
			27.5 tons	1.57%	
			44.7 tons	1.84%	
22.	Sunset	1918	20 tons	0.65-5.47%	936 lb.
25.	Stoughton	1918	694 lb.	4.19%	28 lb.
30.	Spain	1915	6 tons	?	
		1916	68,482 lb.	?	16,269 lb.
32.	Jamieson	1915	73.1 tons	3%	
			12.15 tons	18%	
34.	McCoy	1916	1 ton	0.4%	
			8 tons	93%	
		1917	1 ton	0.89%	
35.	Mining Mountain	before 1925	150 lb.	cobbed ore	
41.	Liedtke	1942	27 tons	0.75%	
43.	Rose	1916	10 tons	3.64%	
		1917	6.2 tons 1.3 tons	2.19%) 1.08%)	316 lb.

TABLE 2: Summary of production from molybdenum deposits in the Pembroke-Renfrew area.

In the interest of rapid dissemination of the results contained in this Report, some of the data may not have been meticulously checked. Thus the OGS does not guarantee the accuracy of these figures and suggests the reader check original sources.

present study. Geological mapping at varied scales has been completed by Adams and Barlow (1910), Ells (1904), Evans (1964), Hewitt (1954,1955,1959), Hewitt and James (1956), Hewitt and Satterly (1957), Hills (1974), Kay (1942), Livingston,Hill,and Kirwan (1969), Lumbers (1968,1977, 1978), Peach (1958), Quinn (1952), Quinn, Wilson, and Leech (1956), Reinhardt and Liberty (1973), Satterly (1945), Smith (1958), Themistocleus (1977,1978), and Wilson (1924). The recent mapping by Lumbers (1977,1978) is the most up-to-date and comprehensive.

Studies of the mineral deposits of the area have been completed by numerous previous workers including general studies by Freeman (1936), Quinn (1952), the Royal Commission (1890), Satterly (1945), Thomson (1943), and Wilson (1921). In addition Eardley-Wilmot (1925), Johnston (1968), Parsons (1917), Vokes (1963), and Walker (1911) have conducted studies of molybdenum deposits; Abraham (1951), Frechette (1910), Ingall (1901), Lindeman (1913,1914), Lindeman and Bolton (1917), Rose (1958), and Shklanka (1968), have completed studies of iron deposits; and Alcock (1930), Hardman (1917), Sergiades (1968), Thomson et al (1957), and Uglow (1916) have published reports on some of the base and precious metals deposits of the area.

A substantial amount of work has been carried out by exploration companies, including geological mapping, diamond drilling, and geophysical and geochemical surveys on some of the

deposits. The results of only some of this work is publicly available, summarized in various publications, or is available in the Assessment Files Research Office of the Ontario Geological Survey. Several major theses have been written on aspects of the mineralization in the area and many of these are available in the university libraries.

Mining companies generally were very co-operative and information was supplied to the writer by the following: St. Joseph Explorations Limited, Dr. William Roscoe; Selco Mining Corporation Limited, Dr. I.G.L. Sinclair; and J.V. Huddard of the Algoma Steel Corporation Limited.

The writer is indebted to Dr. S.B. Lumbers, Curator of Geology of the Royal Ontario Museum for discussions on the geology of the region. The co-operation and assistance of local residents was also appreciated, especially the help provided by Fred Inwood of Ireland and Norval Wilson of Hopetown. Capable assistance was given in the field by Jim Provias and Scott Dawson during the summers of 1977 and 1978, respectively.

GENERAL GEOLOGY

The recent mapping by Lumbers (1977,1978) within Renfrew County has resulted in substantially improved understanding of the geology of the area. Outside Renfrew County, however, portions of the area have still never been mapped and many areas require remapping. The geological description of the area presented below is based largely on the recent work by Lumbers. Bedrock in the area is dominated by Late Precambrian supracrustal and intrusive rocks of the Grenville Province of the Canadian Shield. The supracrustal rocks belong to the Grenville Supergroup and comprise part of the Hastings Basin of the Central Metasedimentary Belt (Wynn-Edwards, 1972,p.268). They unconformably overlie a large batholith of Middle to Late Precambrian age (Lumbers, 1978,p.126) that occupies a large part of the northwestern portion of the area. Except for late dikes of diabase, granite pegmatite, and a few small syenite bodies, all of the Precambrian rocks have been affected by a Late Precambrian regional metamorphic event (Lumbers, 1978,p.126) known as the Grenville Orogeny.

In the eastern part of the area the Late Precambrian rocks are unconformably overlain by Paleozoic strata, part of the Ottawa Embayment of the Quebec Basin, consisting of limestone, dolostone, sandstone, and minor shale. Further west outliers of the Paleozoic strata "are preserved in down-thrown blocks developed along major faults of the Ottawa Bonnachere Graben that extends along the eastern and northern parts of the area" (Lumbers, 1978,p.126).

The Middle-to-Late Precambrian batholith has been recently mapped (Lumbers, 1977,1978) and is dominated by granitic and syenitic rocks, with numerous xenoliths of metasedimentary paragneiss. The batholith is believed to be earliest Late Precambrian in age (1.5 to 1.6 b.y., Lumbers and Krogh, 1977).

The batholith is overlain unconformably by an 'arkose' that comprises the basal unit of the Late Precambrian supracrustal succession (Lumbers, 1976a). The arkose passes upwards into a carbonate-rich sequence consisting mainly of marble and calc-silicate rocks with minor interbeds of mudstone, siltstone, and sandstone. This in turn is overlain by a mafic metavolcanic sequence in the southwestern part of the area with minor associated felsic volcanics, greywacke, and marble. The oldest portion of the metavolcanics has been isotopically dated at about 1310 m.y. (Silver and Lumbers, 1966). Carbonate meta-sedimentary rocks predominate in the southeastern portion of the area except for a narrow belt of mafic volcanics that extends southwesterly through Darling and Lavant Townships. There are some relationships south of the study area which suggest that these volcanics may form a continuous belt with those in the southwest. Impure calcitic marble is predominant in the southeastern portion of the area (Lumbers, 1977,p.127) but clean and impure dolomite marbles are usually associated with the volcanics.

The Late Precambrian supracrustal rocks have been invaded by numerous intrusive rocks of widely varying compositions. According to Lumbers (1977,p.127):

"Further work is needed to precisely define age relationships among the various intrusions, but work to date suggests that they were emplaced in about the following order: 1)gabbro sills and dikes; 2)gabbroic, trondhjemitic and granodioritic stocks and batholiths intruded both along the northwestern flank and within the metavolcanic sequence; 3) gabbroic and syenitic stocks; 4) anorthosite suite intrusions consisting mainly of gneissic anorthositic , tonalitic, and syeniticrocks and confined to the region northwest of the metavolcanic sequence; 5) gneissic, synmetamorphic(?) quartz monzonite and syenite bodies locally accompanied by alkalic and nepheline syenite and characterized by abundant apatite, xenoliths of marble and skarn, and numerous fluorite-potassic-feldspar-apatite-calcite pegmatite dikes and lenses (these bodies show the same distribution as the anorthosite suite intrusions and some are spatially associated with anorthosite suite intrusions); 6) gneissic syenite and monzonite stocks; and 7) post-metamorphic syenitic and rare gabbroic stocks. In the vicinity of Sullivan Island in the Ottawa River, Westmeath Township, prominent zones of late fenitization are developed in gneissic metasandstones and are accompanied by several dike-like bodies of carbonatite. The carbonatite is rich in rounded fragments of fenite and contains abundant apatite and pyroxene. Both the carbonatite and the fenitization postdate the regional metamorphism in the host gneisses and the emplacement of

late granitic pegmatite dikes. The youngest intrusions are diabase and rare lamprophyre dikes emplaced along and nearby WNW-trending fault zones that are related to the Ottawa-Bonnechere Graben."

Late Precambrian regional metamorphism caused most of the Precambrian supracrustal and intrusive rocks to be recrystallized and folded with a predominant northeasterly structural trend. Metamorphism "culminated at the temperature and pressure conditions of the upper almandine amphibolite facies throughout most of the area" (Lumbers, 1978,p.126). In the eastern and southeastern parts of the area, especially in McNab Township and near the metavolcanic sequence in Darling and Lavant Townships, the grade of metamorphism is much lower. Numerous granite pegmatite dikes were emplaced in the various Precambrian rocks during the waning stages of the metamorphic event.

All of the rock units in the area are cut by prominent northeasterly trending faults of the Ottawa-Bonnechere graben that may be late Cretaceous or early Tertiary in age (Kay,1942, p.641). Coarse-grained calcite and various associated minerals fill some of the fault fractures and form cross-cutting veins.

Most of the mineral deposits of the area are contained within rocks of the Late Precambrian supracrustal succession, or within or associated with some of the Late Precambrian intrusive rocks. Localization of mineralization is, in most cases, related to composition of the host rocks. Localization is also related to metamorphic grade for some deposit types. A few deposits occur within Paleozoic rocks, usually as veins occupying fault fissures of the Ottawa-Bonnechere Graben.

DESCRIPTION OF DEPOSIT TYPES

The 122 significant deposits of base and precious metals, iron, and molybdenum that are known to occur in the Pembroke-Renfrew area represent a very diverse range of geological types. The deposits have been classified by the authors on the basis of contained metals or minerals and geological associations (Table 3). In addition the classification has the inherent implication that the deposits in each group represent similar genetic types. A brief summary of the geology, mineralogy, and probable origin of each group of deposits is presented below and is followed by a discussion of the general geological relationships of the deposits and recommendations for exploration. Known reserves of base and precious metals (Table 4) and iron (Table 5) are presented in the respective sections. No estimates of molybdenum reserves are available.

BASE AND PRECIOUS METALS

1. LEAD-ZINC Deposits

All nine deposits classified in this category are associated with carbonate rocks. Two distinct sub-groups are recognized:

A) Stratiform, generally conformable zinc deposits with minor lead and,

B) Generally unconformable lead deposits with minor zinc

A. Stratiform, Carbonate-hosted, Zinc Deposits

The two deposits which comprise this group are very similar geologically and mineralogically although widely separated spatially. The Renprior deposit is the larger and apparently the more economically significant (see Appendix I). It consists of conformable layers and lenses of disseminated, coarse grained sphalerite with pyrite and minor galena within a siliceous dolomitic marble unit in a succession of interbedded marbles, fine grained clastic metasediments, and minor volcanics. The Pharoah deposit is much smaller and consists of very thin conformable layers of massive, fine grained sphalerite hosted by dolomitic marble within a thick, extensive succession of interbedded calcitic and dolomitic marbles with minor interbeds of clastic metasediments. The succession is intruded by numerous sills of diorite in the vicinity of the deposit. Both deposits contain only minor amounts of lead, copper, gold, or silver.

These deposits appear to be very similar to the presently producing deposits of the Balmat-Edwards district, New York State. The Balmat-

11c

BASE AND PRECIOUS METALS

Number of Deposits

1. LEAD-ZINC DEPOSITS
   A. Stratiform, carbonate hosted, zinc 2
   B. Unconformable, carbonate hosted, lead 7
2. COPPER AND POLYMETALLIC DEPOSITS
   A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag 9
   B. Stratiform, carbonate hosted, Cu-Sb-Ag-Hg 1
   C. Stratiform, volcanic hosted, Cu-Zn 1
3. COPPER-NICKEL DEPOSITS
   A. Gabbro hosted 4
4. GOLD-SILVER DEPOSITS
   A. Stratabound, volcanic hosted, Au-Ag-As 2
   B. Stratabound, carbonate hosted, Au 1

IRON

1. MAGNETITE DEPOSITS
   A. Stratabound, carbonate-skarn hosted, at intrusive contacts 13
   B. Stratiform, carbonate hosted 2
   C. Stratiform, skarn hosted 2
   D. Intrusion hosted 15
   E. Stratiform, volcanic hosted........................ 2
   F. Geological relationships unclear 11
2. HEMATITE DEPOSITS
   A. Carbonate hosted, fault related 3
3. PYRITE DEPOSITS
   A. No consistent geological association............... 2

MOLYBDENUM

1. MOLYBDENITE DEPOSITS
   A. Stratabound, skarn hosted 18
   B. Unconformable to conformable, pegmatite hosted..... 13
   C. Stratiform, amphibole paragneiss hosted 2
   D. Geological relationships unclear 12

TABLE 3: Classification of Base and Precious Metals, Iron, and Molybdenum Deposits in the Pembroke-Renfrew Area.

DEPOSIT		TONNAGE	GRADE
1.	Renprior	16,000	10.5% Zn
12.	Clyde Forks	60,000	0.67% Cu 0.37% Sb 0.03% Hg 1.32 oz Ag/ton
19.	Simon	253,000	1.09% Cu

TABLE 4: Reserves of base and precious metals in the Pembroke-Remfrew area.

Edwards deposits consist of pods and lenses of disseminated sphalerite and pyrite with minor galena within both clean and siliceous dolomitic marbles of Late Precambrian age which have been affected by the Grenville Orogeny. The principal differences between the two areas are:

1) the presence of a major anhydrite bed, discovered in the underground workings of the Balmat Edwards deposits. Anhydrite either does not occur with the Renprior and Pharoah deposits or is not exposed in surface outcrop and is not reported in drilling. 2) orebody localization at Balmat-Edwards is attributed to remobilization of pre-existing sulfides during structural deformation (Lea and Dill,1968,p.44). No evidence of similar ore controls were recognised at either Renprior or Pharoah.

The Balmat-Edwards deposits are believed to have been deposited as disseminated sulphides contemporaneously with their host carbonates in a shallow basin (Lea and Dill, 1968,p.47). Subsequent metamorphism and deformation resulted in remobilization of sulphides and concentration in structurally favourable areas. The Pembroke deposits are believed by the authors to have been deposited in a similar manner.

B. Unconformable Carbonate-hosted,Lead Deposits

The seven deposits in this group are all closely associated with the unconformity between the late Precambrian basement complex and the overlying Paleozoic succession in the southeastern part of the study area. The Paleozoic succession consists of a basal sandstone unit of late Cambrian age (the Potsdam or Nepean Formation) overlain by limestone of lower Ordovician age. The rock units are situated on the western margin of the Ottawa Embayment of the Quebec Basin and dip shallowly into the basin. The Precambrian basement rocks consist of essentially interbedded marbles and clastic siliceous metasediments.

The deposits consist of very coarse grained disseminated galena and rare sphalerite, barite, and celestite, contained in cross cutting calcite veins which occupy fault related fissures and tension fractures in Late Precambrian marbles and, in one case (see Ramsay deposit, Appendix I), in Lower Ordovician limestone. The fractures are probably related to the Ottawa Bonnechere graben system of late

Cretaceous or early Tertiary age (Kay,1942, p.641) which is the major post-Ordovician faulting episode to have affected the area. Consequently the mineralization must have been emplaced subsequent to the late Cretaceous or early Tertiary.

The metals probably were transported in aqueous solution and precipitated in fractures in the host rocks. The absence of any significant post-Ordovician igneous activity in the area indicates a non-igneous source for the fluids. The mineralizing fluid was most likely metal-bearing connate brine released from the Potsdam sandstones and transported along the basement unconformity to the deposition sites on the up-dip margins of the basin. The fault fissures and fractures provided channelways for release of the brine and the marbles and the limestone provided the right chemical conditions for precipitation of metals from the brine. This mode of formation has many features in common with that proposed by many authors to explain the deposition of some Mississippi Valley-type lead zinc deposits (e.g. Heyl,1968; Snyder and Gerdemann,1968).

2. COPPER AND POLYMETALLIC DEPOSITS

This group consists of deposits in a sedimentary and/or volcanic association in which copper ($\pm$ other metals) is the the principal economic constituent. The eleven deposits can be divided into three sub-types.

A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag Deposits

The nine deposits in this group are hosted by dolomitic marbles within a narrow, north to north-easterly trending succession of intercalated mafic volcanics, calcitic and dolomitic marbles, and minor calcareous mudstones and siltstones, in Lavant and Darling Townships. The succession is bounded to the west by a conformable intrusive body of quartz monzonite and to the east by a large intermediate-to-mafic intrusive complex. All the rock units have shallow to moderate (30° to 65°) easterly dips. Metamorphic grade is greenschist facies.

The deposits occur at approximately the same stratigraphic level in the marble over a strike length of about 20 kilometres. Mineralization consists of disseminated grains of chalcopyrite, and tetrahedrite, with minor bornite and pyrite in vein networks or irregular, conformable, lensoidal bodies of quartz and white dolomite which are up to 2 metres in width. Pyrite also occurs at some of

the deposits as disseminated grains in the mineralized zones and in the surrounding marble. Metal contents of the deposits are quite variable but generally they contain moderate amounts of copper (0.2 to 1.0%) and antimony (0.1 to 0.5%) with copper in excess of antimony. Both gold and silver are associated with the sulphides, especially the tetrahedrite, and some of the deposits also contain significant bismuth, mercury, and arsenic associated with the tetrahedrite. Some of the gold is also believed to be associated with pyrite in the deposits. There is a general increase in copper and a decrease in the gold and antimony content of the deposits southwards, corresponding to decreasing amounts of tetrahedrite and pyrite and increasing chalcopyrite and bornite.

The stratabound nature of the mineralization within dolomitic marble units at about the same stratigraphic level in the carbonate-volcanic sequence suggests that the mineralization is related to carbonate deposition. Contemporaneous volcanic activity may have been the source of the metals which were deposited as disseminated sulphides in the calcareous sediments. Subsequent metamorphism caused recrystallization

and remobilization, concentration and redeposition of some of the mineralization in cross-cutting vein networks.

B. Stratiform, Carbonate Hosted, Cu-Sb-Ag-Hg Deposits

The Clyde Forks deposit is the only one of this type in the study area. It consists of a conformable lens of disseminated tetrahedrite, chalcopyrite, pyrite, and stibnite with associated barite contained within calcitic marble in an interbedded sequence of calcitic marbles and minor siltstones and mudstones. Significant amounts of mercury and silver are associated with the sulphides, especially the tetrahedrite.

This deposit is very similar to the stratabound deposits of the 2A group and may have a similar origin. Nikols (1972,p.101) proposed that the mineralization was precipitated from a series of hydrothermal springs discharging into a subaqueous carbonate depositional environment.

C. Stratiform, Volcanic Hosted, Cu-Zn Deposits

The Simon deposit is the only known deposit of this type in the study area and consists of a conformable lens of disseminated pyrrhotite and chalcopyrite, with minor pyrite and sphalerite on the margin of a thick sequence of amphibolites

of probable volcanic origin. Some thin intercalated quartzo-feldspathic units near the sulphide lens are interpreted to be felsic volcanics.

The Simon deposit is similar to the New Calumet deposit in Quebec which is contained within a narrow calc-silicate horizon within a sequence of mafic metavolcanics. 3.5 million tons of Zn-Pb-Ag ore were mined from the New Calumet deposit between 1943 and 1969 (Sangster,1970, p.125).

The conformable nature of both deposits, their mineralogy, and their close volcanic association indicate that they formed synchronously with their host rocks in a manner similar to volcanogenic massive sulphide deposits.

3. COPPER-NICKEL-DEPOSITS

A. Gabbro Hosted Deposits

All four deposits in this group occur within the Raglan Hills Metagabbro Complex, which is a large sill-like intrusive body measuring 14.5 km by 5 km (9 x 3 miles) that dips moderately to steeply to the southeast (Hewitt, 1953,p.15-16). The sill consists of a complex mixture of diorite, gabbro, pyroxenite, and hornblendite and intrudes a thick metavolcanic-metasedimentary sequence. Mineralization consists of conformable pods and lenses of disseminated to massive pyrrhotite, chalcopyrite, and minor pyrite and pentlandite spatially related to small bodies of metapyroxenite within the metagabbro.

Field and petrographic relationships indicate that the mineralized sulphide bodies were formed due to segregation of a sulphide-rich phase during the cooling of the gabbroic magma following its emplacement.

4. GOLD-SILVER DEPOSITS

Only three significant deposits of precious metals are known to occur within the study area. The scarcity of deposits may be related to the high grade of regional metamorphism in the area relative to the Madoc area to the southwest where precious metals deposits are more common. The significant gold and silver associated with the 2A group of deposits in relatively low-grade metamorphic terrain in the southeastern part of the study area, are not included in this group due to their significant copper and antimony content.

A. Stratabound, Volcanic Hosted, Au-Ag-As Deposits

The two deposits in this group consist of gold and silver bearing arsenopyrite disseminated within narrow interbeds of felsic to intermediate pyroclastic volcanics contained within thick successions of carbonate rocks. Preliminary examination indicates that the mineralization probably was deposited simultaneously with its host rocks and is genetically related to volcanism.

B. Stratabound, Carbonate Hosted Au Deposits

The one known deposit of this type consists of gold-bearing pyrite and pyrrhotite disseminated within dolomitic marble in an intercalated succession of marble and mafic volcanics. The deposit is located in the same succession of intercalated marble and volcanics as the

2A group of Cu-Sb-Au-Ag deposits and its mode of formation is probably similar.

IRON

1. MAGNETITE DEPOSITS

Magnetite is the principal iron mineral present in 45 of the 50 known iron deposits. Five distinct sub-groups are recognized:

A) Stratabound, carbonate skarn* hosted deposits that occur at or near the contacts of igneous intrusions with carbonate rocks;

B) Stratabound, carbonate hosted deposits;

C) Stratiform, skarn hosted deposits contained within clastic metasedimentary rocks;

D) Deposits contained within gabbroic and syenitic intrusions; and

E) Stratiform deposits hosted by mafic volcanics. A sixth sub-group, 'F', includes deposits at which the geological relationships are either not known or not understood and consequently they have not been classified.

A. Stratabound, carbonate skarn hosted, at intrusive contacts

The thirteen deposits that comprise this group are all spatially related to felsic or mafic intrusions

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* The term 'skarn' is used to refer to a complex mineral assemblage that may include variable proportions of calcite, dolomite, diopside, hornblende, tremolite-actinolite, garnet, epidote, chlorite, muscovite, and biotite. There is no genetic connotation.

DEPOSIT	TONNAGE (Proven)	(Indicated)	GRADE (% Fe)
3.Calabogie	27,151,838		22.28
32.Grattan	3,639,600	9,099,000	27.74
35.Radenhurst-Caldwell		6,500 tons/slope foot	32.77
37.Bessemer		2,480,819	28.62
39.Childs		6,193,330	19.25
41.Rankin		15,691,599	15.32

TABLE 5: Proven and indicated reserves of iron in the Pembroke-Renfrew area.

and generally form stratabound lenses within marble, or xenoliths within the intrusions, at or near the contacts of the intrusions with carbonate rocks. The magnetite in the deposits is usually intimately intergrown with carbonate and calc-silicate minerals of the 'skarn' association, although not all these minerals may be present at an individual deposit. The deposits typically have a low titanium content.

The origin of this type of low titanium iron deposit in southeastern Ontario is controversial. The weight of recent opinion favors formation of these deposits as a result of the contact metasomatic action of intrusions on carbonate rocks (Rose,1958,p.103; Hewitt and James,1955,p.47; Park,1966,p.1; Giblin,1960,p.179). Characteristics commonly occurring at the deposits studied by the writer support this hypothesis and are as follows: 1) the proximity of a major intrusion, 2) association with and apparent replacement of marble, 3) evidence of the removal of iron from the margin of the associated intrusion in at least one case (see Williams deposit, Appendix II0, 4) the high temperature and typical contact mineral assemblage of the ore-bodies, and 5) the lack of relict, primary sedimentary structures. Alternatively, however, the intrusion may have acted as a heat source and the iron in the deposits was derived from laterally adjacent iron-rich sedimentary rocks as a result of convective movement of fluids toward the intrusion. However, there is a general lack of iron-rich sedimentary rocks in the vicinity of most

of the deposits, consequently this mode of formation is unlikely. The deposits are probably contact metasomatic in origin.

Park proposed that, for the Marmoraton iron deposit, the iron was derived and removed from the intrusion by a process of 'modified deuteric release' (Park,1966,p.100). The process involves breakdown of ferromagnesian minerals in the margin of the intrusion due to infiltrating CO_2 from marble, and removal of the liberated iron by exuding residual magmatic fluids. The process is probably applicable to this group of iron deposits in the Pembroke area.

B. Stratiform, carbonate hosted

The two deposits that comprise this group form narrow stratiform layers of disseminated magnetite within dolomitic marble. They were probably deposited as a result of chemical precipitation of iron in a carbonate depositional environment.

C. Stratiform, skarn hosted

The two deposits that comprise this group occur in a limited geographical area and consist of conformable layers of intimately intergrown magnetite and calc-silicates that are contained within a thick sequence of interbedded marbles and

fine grained clastic metasediments in South Canonto Township. The calc-silicate host rock is believed to represent interbeds of calcareous mudstone within the sedimentary succession. The deposits probably formed as a result of simultaneous chemical precipitation of iron during deposition of the calcareous mudstone.

D. Intrusion hosted

i) Gabbroic Intrusions

Eight deposits occur as irregular pods, lenses, and disseminations of magnetite in metamorphosed gabbroic intrusions. The titanium content generally is between 1 and 10 percent and is usually present in the form of sphene, ilmenite, and titan magnetite. Apatite is also commonly present as an accessory mineral.

The field and petrographic relationships of these deposits and their ores, as observed by the writer, indicate that the iron and titanium minerals are primary magmatic constituents of the intrusion and were concentrated as a result of fractional crystallization. A similar conclusion was reached by Rose (1958, p.91-93) after a study of some iron deposits in eastern Ontario.

ii) Syenitic Intrusions

The seven deposits in this group occur as pods, layers, and veins of disseminated to massive magnetite within large bodies of syenite or in syenite pegmatite dykes. The TiO_2 content of the iron ores ranges from

1 to 3 percent, but it is not known in what form the titanium is present.

The field relationships observed by the writer indicate that these iron deposits and their host rocks are magmatic in origin. They are believed to be comparable to the magnetite deposits in alkalic rock complexes that are common in northern Ontario (Gross,1964,p.63), although the form is somewhat different.

E. Stratiform, Volcanic Hosted

The two deposits that comprise this group consist of conformable layers of disseminated to massive magnetite contained within mafic volcanic rocks in an intercalated succession of marble and mafic volcanics in Darling Township. The deposits may have formed as a result of chemical precipitation of iron during periods of decreased volcanic activity or they may represent primary magmatic magnetite contained within flow units.

F. Geological Relationships Unclear

Eleven deposits have been included in this group and comprise all the deposits for which the geological information available is incomplete or at which the geological relationships, as known to the author, are not fully understood. Each of these deposits could not be reliably classified.

2. Hematite Deposits

Hematite is the principal iron mineral in three of the iron deposits in the area. The geological relationships are similar at the three deposits

A. Carbonate Hosted, Fault Related

The three deposits consist of disseminated to massive hematite contained within fault related breccia zones in calcitic dolomitic marbles or in fault fissures which cut the marbles and the overlying Lower Ordovician limestone. The faulting is probably related to the Ottawa-Bonnechere graben and is post-Ordovician in age. The hematite usually occurs as disseminated fine, earthy grains within the marble but also forms massive lenses up to 5 m (15 feet) wide in places. Quartz is sometimes associated with the hematite and both minerals appear to have occupied open spaces in the fractures and breccia zones and in some cases have replaced the marble.

The mode of formation of these deposits is uncertain. They could have formed as a result of percolation of iron and silica-rich meteoric water downward into fault breccias and fissures in the carbonate rocks and subsequent deposition of the iron as hematite and the silica as quartz.

3. Pyrite Deposits

There are only two deposits in the area in which pyrite is the principal iron mineral. They have not been sub-classified due to uncertainties about the geological relationships.

Both deposits consist of pyrite intimately intergrown with quartz in narrow, massive lenses but the geological relationships are dissimilar. The Blithfield deposit is hosted by mudstones and is reported to occupy a fault (Lumbers, Royal Ontario Museum, personal communication, 1978) although this relationship has not been observed by the author or previous workers. It may have formed as a result of chemical precipitation synchronous with deposition of the mudstones, or possibly as a result of hydrothermal replacement along a fault zone. The McIlwraith deposit is located at the contact between a gabbroic intrusion and calcitic marble and its origin is uncertain.

MOLYBDENUM

There are 45 molybdenum deposits widely scattered throughout the Pembroke-Renfrew area. Molybdenite is the only molybdenum mineral present and concentrations of other ore metals are usually absent, although uranium sometimes is associated with

the 1B group of deposits. Three distinct sub-types are recognized, including: 1A. Stratabound deposits hosted by lenses of pyroxenite skarn, 1B. Deposits hosted by cross-cutting or conformable pegmatite dykes, and 1C. Stratiform deposits hosted by beds of amphibole paragneiss. A fourth sub-type, 'D', consists only of deposits at which the geological relationships are not known or not understood.

1A. Stratabound, Skarn* Hosted

The eighteen deposits that comprise this group have a very wide geographic distribution throughout the area. They consist of stratabound lenses of skarn that occur within successions of intercalated marble and fine grained clastic metasedimentary rocks in areas of high metamorphic grade (upper amphibolite). The deposits are often spatially related to intrusive rocks of the biotite-diorite suite or large masses of late granite pegmatite (Lumbers, 1978,p.127).

The skarn host rocks are very distinctive and are very similar in mineralogy and geologic setting throughout the area. The skarns consist essentially of a massive intergrowth of coarse-grained diopside and scapolite with scattered masses of pyrite and pyrrhotite and mineralization consists of coarse flakes of molybdenite erratically scattered throughout the rock. The skarns are enriched in no other ore metals except molybdenum.

*'skarn' as used here refers to a rock composed essentially of a coarse-grained intergrowth of diopside,scapolite,iron sulphides,sphene,apatite,and calcite ± microcline,tremolite, muscovite,quartz,biotite, and plagioclase. There is no genetic connotation.

The mode of formation of these deposits is somewhat uncertain as the significance of the spatial relationship between the deposits and the biotite-diorite suite of intrusions is unknown. It appears likely, however,in consideration of the massive nature of the skarns, that the deposits formed after the culmination of regional metamorphism. Consequently the deposits in their present form are genetically unrelated to the intrusions, most of which were emplaced prior to the culmination of regional metamorphism (Lumbers, 1978,p.126). Karvinen (1973) proposed that the skarns formed as a result of metasomatic replacement of limestone along limestone-shale contacts during prograde metamorphism. Molybdenum was leached out of the surrounding sediments by chloride-rich metamorphic fluids and deposited in the skarn during replacement of the limestone. This mode of formation is consistent with geological features observed by the author.

1B Unconformable to Conformable, Pegmatite Hosted

The thirteen deposits in this group also have a wide geographic distribution throughout the area. They are generally much smaller than the deposits in skarns and amphibole paragneisses and have produced little ore.

The pegmatites consist mainly of quartz and feldspars with some hornblende, pyroxene, pyrite, and pyrrhotite and are often mineralogically similar to the rocks which they cut. Late pegmatite dykes are common throughout the Pembroke-Renfrew area

but the mineralized dykes usually cut successions of interbedded marble and hornblende-biotite paragneiss.

The probable mode of formation, as proposed by Karvinen (1973), is similar to that outlined previously for formation of the skarn hosted deposits. The molybdenum was probably leached from surrounding sediments by chlorite rich metamorphic fluids during prograde regional metamorphism and deposited in pegmatites that formed as a result of a late period of anatexis and potassium-silica metasomatism.

C. Stratiform, Amphibole Paragneiss Hosted

The two deposits within this group consist of coarse-grained molybdenite erratically disseminated within conformable layers of amphibole bearing feldspathic (or scapolitic) paragneiss, contained within sequences of intercalated marble and fine grained clastic metasediments.

The mode of formation of these deposits, as proposed by Karvinen (1973) is similar to that of the skarn and pegmatite hosted deposits. Molybdenum was probably selectively leached from surrounding sediments by chloride-rich metamorphic fluids during prograde metamorphism and deposited as a result of metasomatic alteration of shale along limestone-shale contacts to form amphibole paragneiss.

1D. Geological Relationships Unclear

Twelve deposits have been included in this group and comprise all the deposits for which the geological relationships, as known to the author, are not fully understood. Each of these deposits could not be reliably classified.

DISCUSSION AND RECOMMENDATIONS FOR EXPLORATION

Except for two deposits hosted by Paleozoic rocks, the metallic mineral deposits in the area occur within the Late Precambrian supracrustal and related intrusive rocks which dominate the southern half of the study area. The deposits represent a very diverse range of geological types with a wide geographic distribution. Eighteen distinct types of mineralization have been distinguished and classified according to metal content and geological associations (see Table 3).

Several metallogenic processes appear to have been responsible for formation of the different deposit types. 1. Syngenetic processes related to deposition of sedimentary and volcanic rocks. 2. Magmatic processes related to emplacement of intrusive rocks. 3. Contact metasomatic effects of intrusive rocks. 4. Metasomatic processes active during, and as a result of, high grade regional metamorphism. 5. Late, epigenetic, replacement and open space filling along fault fissures.

Syngenetic, Syndepositional Deposits

Twenty-three deposits occur as stratiform or stratabound

bodies within sedimentary or volcanic rocks of the Grenville Supergroup including 2 zinc (1A), 9 Cu-Sb-Au-Ag (2A), 1 Cu-Sb-Ag-Hg (2B), 1 Cu-Zn (2C), 2 Au-Ag-As (4A), 1 Au (4B), and 7 iron (1B,1C,1E,3A). The mineralization at all these deposits is believed to have been deposited synchronously with the host rocks by primary sedimentary or volcanogenic depositional processes.

The iron deposits are relatively small and consist of stratiform horizons of disseminated to massive magnetite within mafic volcanics, marbles, and calc-silicate rocks (dolomitic mudstones), and disseminated to massive pyrite within para-amphibolite (mudstone). All the deposits are located in the southeastern portion of the area. Chemical precipitation of iron during periods of decreased sedimentation or volcanism best accounts for the localization of all the mineralization. Alternatively the iron at individual deposits may have been deposited as clastic detrital magnetite, or as primary magmatic magnetite in volcanic flows or tuffs. The deposits generally are not associated with deposits of other metals, and are too small to be of economic significance. However, they may be useful as stratigraphic marker horizons, especially in the mafic metavolcanic sequence in Lavant and Darling Townships.

The base and precious metals deposits are hosted by volcanics or dolomitic marbles except for one deposit hosted by calcitic marbles (see Clyde Forks, Appendix I). Metals are believed to have been introduced into subaqueous

carbonate depositional environments by volcanic activity and deposited within carbonates and volcanics as a result of chemical precipitation of sulphides under reducing conditions. Based on proximity to known or probable volcanic sequences the deposits can be classed as proximal or distal. Au-As-Ag and Cu-Zn mineralization in volcanics, Cu-Sb-Au-Ag and Au mineralization in dolomitic marble, and probably the Cu-Sb-Ag-Hg mineralization in calcitic marbles occur in proximal environments. Stratiform zinc deposits hosted by dolomitic marbles occur in distal environments.

The Au-As-Ag deposits are very small and appear to have little economic potential in the study area. More promising Au-As mineralization occurs to the south in the mafic meta-volcanics near Madoc.

The Cu-Sb-Au-Ag deposits occur as stratabound vein networks and probably represent remobilization and redeposition in place of original stratiform mineralization. This is suggested by the restricted extent of the vein networks and their frequent occurrence at about the same stratigraphic level in the host rock sequence. All of the deposits are very small which may be due to the lack of strong structural controls on localization of the remobilized mineralization. The Clyde Forks Cu-Sb-Ag-Hg deposit (Appendix I) is probably a stratiform counterpart of these deposits and contains significant amounts of mineralization (see Table 4). Exploration for additional deposits of this type might be successful using geochemical methods utilizing Sb and/or Cu

as indicators. Self Potential surveys have been proven to be an effective geophysical technique by former investigators at the Clyde Forks property. Exploration should be directed to the vicinity of the Clyde Forks deposit and along strike within the carbonate-metaclastic host succession.

Cu-Zn (Simon-Appendix I) and Zn (Renprior, Pharoah-Appendix I) mineralization occurs as stratiform layers of disseminated to massive sulphides within volcanic and carbonate rocks respectively. Similar deposits occur elsewhere in the Grenville Supergroup in Quebec, Ontario, and New York. The Mantauban and New Calumet deposits in Quebec are closely associated with volcanics, (Gauthier and Brown, 1979), and the Balmat-Edwards deposits in New York (Lea and Dill, 1968), the Long Lake deposit in Ontario, and the deposits near Maniwaki in Quebec (Gauthier, 1978) are contained in carbonates with no spatial association with volcanics. All of the deposits are closely associated with siliceous dolomitic marbles except the Long Lake (calcitic marble) and Simon (Mafic volcanics) deposits. Production has been attained from the Balmat-Edwards,Long Lake, New Calumet, and Montauban deposits.

It has been noted by Gauthier and Brown (1979,p.1) that "zinc showings throughout the Grenville Province can be separated into two distinct groups: a polymetallic group (Zn,Pb,Cu,Ag,Au) closely related spatially to volcanic rocks (e.g., the Montauban and Calumet deposits); and a monometallic group (Zn) with no apparent relationship to volcanic rocks (e.g., the Balmat Edwards and Long Lake deposits, and the

Maniwaki, Que. showings)." Accordingly, the Simon Cu-Zn deposit is a member of the polymetallic group, and the Renprior and Pharoah zinc deposits are part of the monometallic group.

General exploration guidelines for stratiform zinc deposits in the Grenville Supergroup have been proposed by Gauthier and Brown (1979) and most of these are also tenable in the Pembroke-Renfrew area. Geochemical methods using zinc as an indicator should be useful at all levels of exploration. Geophysical methods do not work well for the monometallic deposits at which sphalerite is the only sulphide present, but EM and vertical magnetic methods may be useful in locating deposits with abundant pyrrhotite and pyrite (Gauthier and Brown, 1979, p.5). Prospecting of boulders in glacial overburden has also been proven successful in the Pembroke-Renfrew area (e.g. Pharoah deposit). In the Pembroke-Renfrew area exploration should be directed to the intercalated carbonate-metaclastic sequences in the southeastern part of the study area, especially in siliceous dolomitic marbles near the known deposits.

Magmatic Deposits

Nineteen deposits occur as concordant lenses contained within igneous intrusions that invade rocks of the Grenville Supergroup, including fifteen iron (1D) and four Cu-Ni (3A) deposits. Eight of the iron deposits are hosted by gabbroic intrusions, seven by syenitic intrusions, and

the Cu-Ni deposits are all contained within a single gabbroic intrusion. Localization of mineralization appears to have been controlled by fractional crystallization of magnetite in formation of the iron deposits, and segregation of insoluble sulphide phases in formation of the Cu-Ni deposits.

Intrusive rocks are abundant in the study area and additional Cu-Ni or iron deposits may be present in gabbroic intrusions and iron in syenitic intrusions. Both deposit types may be readily located using conventional geophysical methods. It should be noted, however, that the high titanium content of the iron deposits makes them undesirable as iron ores (Gross, 1965,p.70), and all of the deposits are very small.

Contact Metasomatic Deposits

Thirteen magnetite iron deposits occur as stratabound lenses in skarn zones developed within marbles of the Grenville Supergroup near the margins of various igneous intrusions. The intrusions are of gabbroic, tonalitic, and granitic compositions. As concluded by previous workers (Giblin, 1960; Hewitt and James, 1955; Rose,1958), localization of mineralization was principally dependent on contact metasomatic effects of the intrusions on the carbonate rocks. Additional criteria controlling localization (e.g. structural control, composition of intrusion, composition of marble) have not been identified.

These iron deposits have low titanium contents, are

easily accessible, and are close to markets, and consequently the larger deposits may be potential sources of iron ore. In addition the deposits could be utilized as sources of heavy media and high-density aggregate (e.g. Summit Lake - Appendix II) or for magnetite for use by the chemical and electronics industries.

Intrusive rocks and marbles are abundant in the area and additional deposits may be located near their contacts. The deposits may be readily located using magnetic geophysical methods.

Metamorphic-Metasomatic Deposits

In most cases the principal effect of metamorphism in the area has been recrystallization and minor remobilization of existing mineralization, especially in the case of iron and base and precious metals. However the virtual absence of gold mineralization in most of the area can be correlated with the predominantly high metamorphic grade (amphibolite facies). In addition, molybdenum mineralization is preferentially localized within sequences of intercalated carbonate and metaclastic rocks in high-grade (upper amphibolite) metamorphic terrain. Uranium is also concentrated in some of these deposits (see deposit location map). Localization of mineralization was probably dependent on metasomatic processes active during metamorphism. According to Karvinen (1973, abstract), "Molybdenum was probably derived from

sediments, perhaps organic-rich shales, from which it was selectively leached and transported by or through chloride-rich metamorphic fluids and deposited in or near carbonate rocks during the main period of metasomatism. Some molybdenum was partially remobilized from earlier-formed deposits (e.g. in hedenbergite gneisses) and further concentrated in pegmatites during the late period of metasomatism."

Most of the deposits are fairly high grade (0.5 percent MoS_2) but are too small to be mined under present market conditions. However, if custom milling facilities were available the deposits might become viable.

Additional deposits may be located in areas of intercalated carbonate and metaclastic rocks in high grade metamorphic terrain. Pyrrhotite and pyrite frequently occur as massive lenses with the molybdenum, consequently EM might be a useful geophysical method of exploration.

Late, Epigenetic Vein Deposits

Three hematite (2A) and seven lead (1B) deposits occur as cross cutting veins occupying post-Ordovician fault fissures and breccia zones in marbles and Ordovician limestones in the eastern part of the area.

The hematite deposits probably formed as a result of percolation of iron-bearing meteoric waters into fracture zones in the carbonate host rocks. The Fahey deposit (Appendix II) is the largest of the hematite deposits and the best potential for its development may be as a source of high-grade hematite for use in the chemical or electronics

industry. Additional mineralization may be located in fractured carbonate rocks near the known deposits.

Late vein deposits similar to the lead deposits are common elsewhere in southeastern Ontario and southern Quebec. They are all hosted by Late Precambrian marble or Ordovician limestone near the Paleozoic/Late PreCambrian unconformity. Calcite is the principal gangue mineral in all the deposits and mineralization consists of variable proportions of barite, celestite, fluorite, galena, and locally abundant sphalerite. According to Sangster (1970,p.259) the three most common associations are calcite-fluorite-barite,calcite-barite-galena, and calcite-celestite. Filling temperatures of 122°C to 132°C for the veins are indicated by studies of fluid inclusions in fluorite completed by McCartney (1964) on some deposits near Madoc.

Wilson (1929) and Sangster (1970) have proposed that the mineralization was emplaced by circulating meteoric waters, based on the lack of known post-Ordovician intrusive rocks and the low temperature of deposition. However, this process does not explain the close spatial relationship of the deposits to the Paleozoic/Late Precambrian unconformity. The close similarity of many aspects of the deposits to Mississippi Valley type deposits suggests that they formed in a similar manner. Various authors (e.g. Heyl,1968; Snyder and Gerdemann, 1968) have proposed that Mississippi Valley type deposits formed as the result of the release of metal-bearing connate brines from suitable Paleozoic source rocks as a result of diagenesis and movement of the fluid through

permeable horizons to the site of deposition. In the Pembroke-Renfrew area mineralized connate brines may have been transported along the basal unconformity from the down dip portions of the Quebec Basin. The fractures in the marbles and Ordovician limestones on the margins of the basin provided depositional sites. This process explains the low-temperature of deposition of the mineralization and also the spatial relationship to the unconformity.

Exploration for additional mineralization in the study area should be directed to post-Ordovician fracture zones in carbonate rocks near the Paleozoic/Late Precambrian unconformity. In addition, the similarity of the mineralization in the vein deposits to that in Mississippi Valley type deposits indicates the possibility of the occurrence of stratabound Mississippi Valley type deposits in the Paleozoic rocks of southeastern and southwestern Ontario. Reef structures and basement highs are favourable sites for deposition of such mineralization and a program to delineate such structures in the Paleozoic basins of Ontario would be useful.

SUMMARY AND CONCLUSIONS

1. Stratiform and stratabound deposits of Zn,Cu,Sb,Au, Ag, Hg,As and minor Fe are contained in Late Precambrian volcanic and carbonate (principally dolomitic) rocks in the study area. Metals probably were supplied by hydrothermal exhalative activity related to volcanism and deposited synchronously with the host rocks in sub-aqueous environments.

2. Most iron deposits in the area are associated with intrusive rocks. They occur either as primary magmatic constituents contained within the intrusions (gabbros, syenites) or as contact metasomatic bodies within carbonate rocks at the margins of intrusions of varied compositions.

3. Deposits of Au,Ag,As are not common in the study area and are localized in areas of low (greenschist) metamorphic grade.

4. Molybdenum deposits are common and occur in areas of high (amphibolite) metamorphic grade. Most of the deposits occur in areas of intercalated Late Precambrian carbonate and metaclastic rocks and probably formed as a result of potassium-silica metasomatism accompanying the high-grade regional metamorphism.

5. Some Cu and Ni is contained as concordant lenses in gabbroic intrusions and probably represent primary constituents of the gabbro.

6. A late period of faulting (Ottawa-Bonnechere Graben) provided structural sites for formation of low-temperature, epigenetic vein deposits of Pb,Zn,fluorite, barite, and celestite. Fluorite deposits of this type do not occur in the area. Hematite was also deposited in some of these structural sites as a result of supergene processes.

APPENDIX I

Detailed descriptions of individual base and precious metals deposits.

BASE AND PRECIOUS METALS DEPOSITS

TOWNSHIP	DEPOSIT NUMBER	DEPOSIT NAME
Admaston	1	Renprior
Darling	2	Bradfords Creek
	3	Darling
	4	Green Lake
Dungannon	5	Bowen Corner
Faraday	6	Jefrey
Fitzroy	7	Campbell Lead
	8	Kingdon Mine
	9	Stanton
Lanark	10	Pharoah
Lavant	11	Begin
	12	Clyde Forks
	13	Joes Lake
	14	Lavant
	15	Lavant Creek
	16	Lynx-Canada
	17	Nelson Lakes
	18	Robertson
Lyndoch	19	Simon
McNab	20	McNab
Raglan	21	Ameranium
	22	Genricks Lake
	23	Landolac
	24	Raglan
Ramsay	25	Carleton Place
	26	Lynch
	27	Ramsay

TABLE: I-1: List of deposits of base and precious metals in the Pembroke Renfrew area.

1. LEAD ZINC DEPOSITS

A. Stratiform, carbonate hosted, zinc

1.	Renprior	Admaston Township
10.	Pharoah	Lanark Township

B. Unconformable, carbonate hosted, lead

7.	Campbell Lead	Fitzroy Township
8.	Kingdon Mine	Fitzroy Township
9.	Stanton	Fitzroy Township
20.	McNab	McNab Township
25.	Carleton Place	Ramsay Township
26.	Lynch	Ramsay Township
27.	Ramsay	Ramsay Township

2. COPPER AND POLYMETALLIC DEPOSITS

A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag

2.	Bradfords Creek	Darling Township
3.	Darling	Darling Township
4.	Green Lake	Darling Township
11.	Begin	Lavant Township
13.	Joes Lake	Lavant Township
14.	Lavant	Lavant Township
15.	Lavant Creek	Lavant Township
16.	Lynx-Canada	Lavant Township
17.	Nelson Lakes	Lavant Township

B. Stratiform, carbonate hosted, Cu-Sb-Ag-Hg

12.	Clyde Forks	Lavant Township

C. Stratiform, volcanic hosted, Cu-Zn

19.	Simon	Lyndoch Township

3. COPPER-NICKEL DEPOSITS

A. Gabbro hosted

21.	Ameranium	Raglan Township
22.	Genricks Lake	Raglan Township
23.	Landalac	Raglan Township
24.	Raglan	Raglan Township

4. GOLD-SILVER DEPOSITS

A. Stratabound, volcanic hosted, Au-Ag-As

5.	Bowen Corner	Dungannon Township
6.	Jefrey	Faraday Township

B. Stratabound, carbonate hosted, gold

18.	Robertson	Lavant Township

TABLE I-2: Classification of base and precious metals deposits in the Pembroke-Renfrew Area.

1. RENPRIOR

COMMODITY	MAIN: Zinc OTHER: Lead, copper
ROCK ASSOCIATION	HOST: Siliceous dolomitic marble OTHER: Calcitic marble, minor amphibolite
CLASSIFICATION	1A. Stratiform, carbonate hosted zinc
LOCATION	Admaston Township, Renfrew County NTS 31F/7, UTM Zone 18,5030020N, 366120E LAT. 45° 24' 46"N; LONG. 76° 42' 40"W Con. 3. Lots 1 & 2 (W 1/2); Con. 4, Lot 1 (E 1/2)
ACCESS	The deposit is approximately 6.4km (4 miles) south of the town of Renfrew. Access is via a gravel road and the workings are immediately northeast of the farm of J. Hisko in Admaston Township, northeast of the road.
SIZE AND GRADE	Disseminated sphalerite with pyrite and minor galena occur in a zone 60 to 90m (200 to 300 feet) wide by 1000m (3,300 feet) long. The thickest lens within this zone is 4.6m (15 feet) wide by 37m (120 feet) long and is estimated to contain 16,000 tons grading 10.5% Zn to a depth of 30m (100 feet). Surface workings are shown in Figure 1A. Most trenches are debris filled and overgrown. Best exposures are No. 7 trench, which shows a section of the mineralization and host rock relationships, and the northwest wall and broken rock pile of the water filled Renprior Mines open cut (in the area of trenches 13 to 16, Figure 1A).

DESCRIPTION

GENERAL GEOLOGY: The Renprior zinc deposit is contained within a narrow belt of siliceous dolomitic marble that lies within a mixed suite of interbedded sandstones, mudstones, calcareous metasedimentary rocks and minor mafic and felsic volcanic rocks. These rock units are bounded to the east and south by a mixed suite of felsic intrusive rocks and are cut by dikes of white and red pegmatite. All units strike northeasterly and dip steeply (80°) to the southeast (see Figure 1B).

The host rock to the mineralization is a white, medium-grained, dolomitic marble that contains abundant silicate minerals including phlogopite, tremolite and diopside. The abundance of these silicates suggests that the original rock was a silty or muddy dolostone.

MINERALIZATION: The mineralization occurs within a conformable zone of the dolomitic marble about 1000m (3,300 feet) in length and 60 to 90m (200 to 300 feet) in width. Within the zone, mineralization consists of pods and lenses of disseminated sphalerite, pyrite and minor galena. These appear to rake to the northeast at shallow angles (Quinn, 1952, p. 74) and in places form up to three parallel, en echelon zones. The average sphalerite content of the lenses is 10%, but in places mineralization is nearly massive.

The most comprehensive description of the mineralization was prepared by Quinn in 1951 during active exploration of the property and following the attempt at production. The Renprior Mines and Cadieux Mines properties, west and east of the boundary fence respectively (Figure 1A), are described separately.

According to Quinn (1952), the Renprior property consists of three narrow, subparallel, roughly en echelon mineralized lenses designated Nos. 1, 2 and 3 zones respectively from south to north. The No. 1 zone is exposed in the open cut that was mined during the attempt at production, in 1950. The zone has two branches up to 20 feet apart, which converge to the northeast. The north branch is 120 feet by 2 to 8 feet and the south branch 70 feet by 2½ to 6 feet, and where they join, a zone width of 50 feet is reported. Galena is most common to the southwest and in the footwall of the zones. The No. 2 zone is 190 feet to the northwest of the No. 1 and has an indicated length of 100 feet. Drilling indicates two separate lenses with assays of 3.06% Zn over 8.5 feet and 5.20% Zn over 2.5 feet. The No. 3 zone is 50 to 70 feet to the northwest of No. 2 and is 125 feet by 1 to 10 feet and extends to a depth of greater than 125 feet.

The Cadieux property consists of three or four separate mineralized lenses. The lens exposed at the No. 7 pit (described above) is the richest known on the property. Diamond drill intersections in

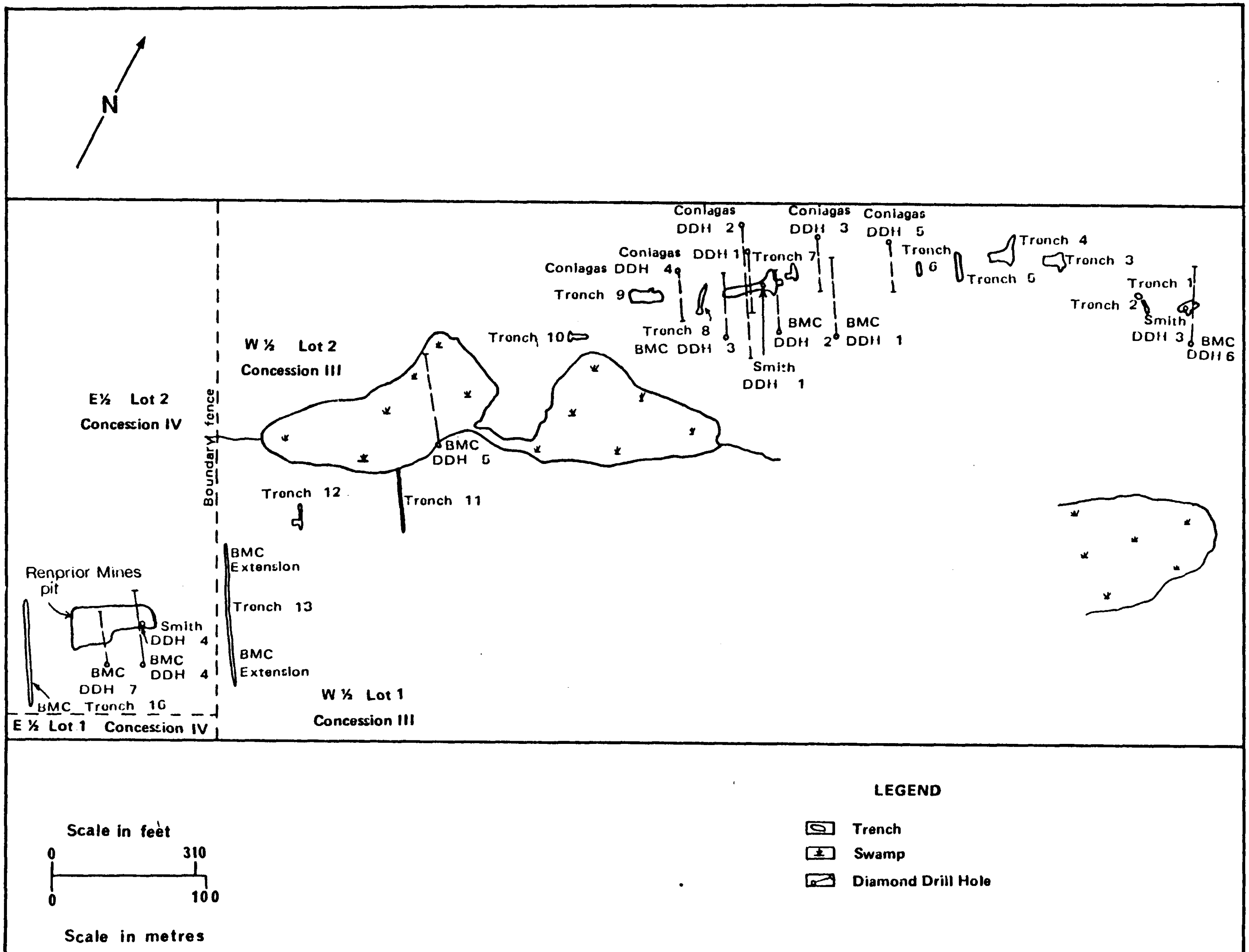

Figure 1A- Plan of the surface workings on the Renprior zinc occurrence. From a plan of the British Metal Corporation, Limited, 1926.

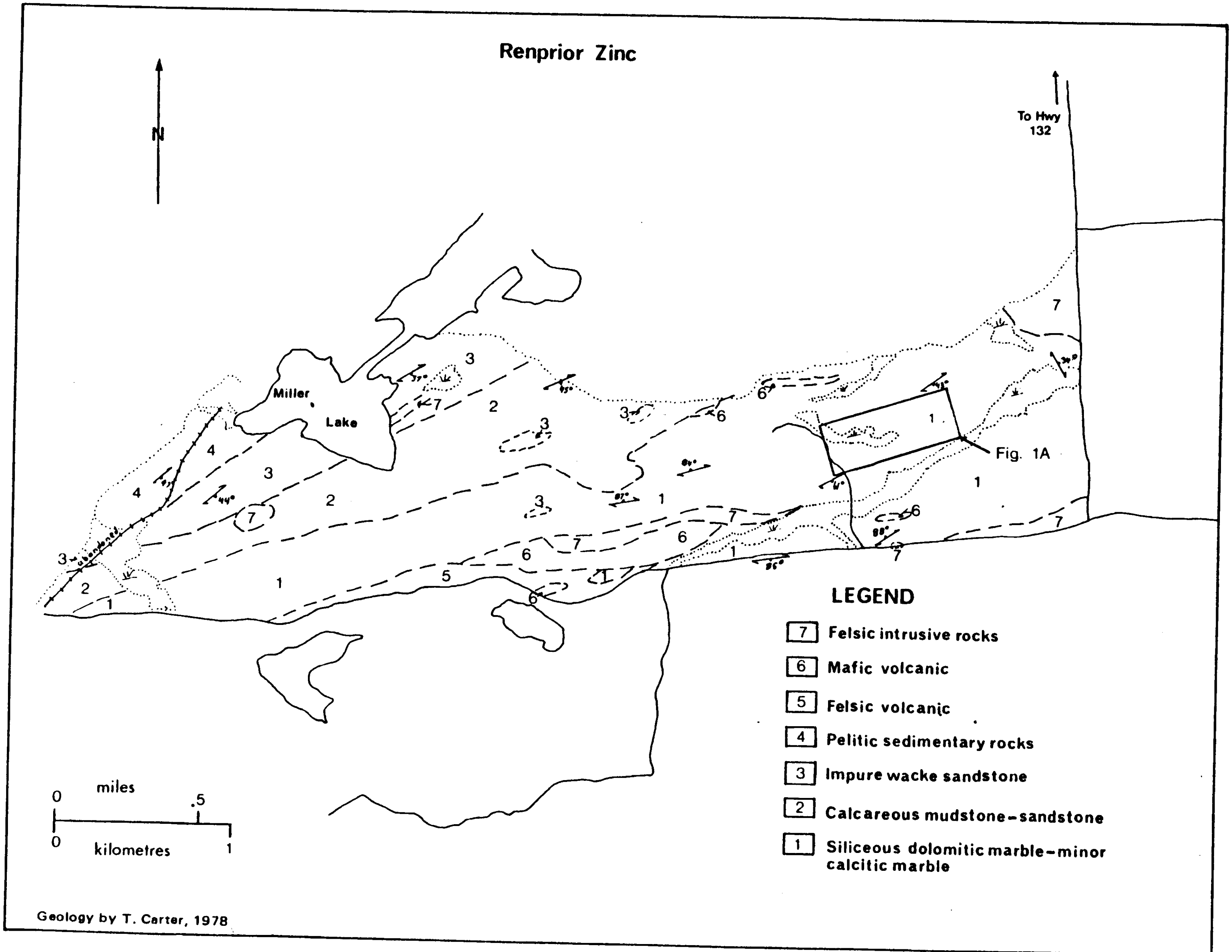

Figure 1B — Geology in the vicinity of the Renprior zinc deposit.

another lens at trenches 1 and 2 about 800 feet farther northeast shows 17.7% Zn across 5 feet, 6.6% Zn across 13.6 feet, 6.5% Zn across 7.6 feet and other comparable values and widths.

MICROSCOPY: Two polished thin sections were prepared from samples of mineralized marble collected by the author. Both sections consist essentially of homogeneous intergrowths of massive, medium grained, granoblastic (0.8mm) diopside and sphalerite with minor tremolite and pyrite in a groundmass of carbonate with minor quartz (Table 1A). The groundmass varies from a mass of very fine grained carbonate to a mosaic of large (1-1.5mm) recrystallized grains. Diopside occurs as randomly distributed subhedral to euhedral porphyroblastic grains which commonly contain carbonate intergrowths and inclusions. Tremolite, where present, forms euhedral prismatic grains. Sphalerite occurs as rounded, randomly distributed grains which are commonly rimmed by narrow carbonate overgrowths. Pyrite most commonly occurs as anhedral to subhedral grains within sphalerite grains or grain aggregates; the smaller pyrite grains are euhedral. Chalcopyrite tends to be finer grained than the sphalerite and pyrite and forms irregular, inclusion-filled grains on the margins of large pyrite grains. It also occurs as stringers between gangue minerals and as very fine blebs and fracture fillings in sphalerite grains.

	Zn-1-7	Zn-1-4
Carbonate	35%	30 - 35%
Diopside	40%	30%
Sphalerite	20%	25%
Tremolite	ND	5 - 10%
Quartz	minor	2 - 3%
Pyrite	5%	minor
Chalcopyrite	ND	1%

TABLE 1A: Modal composition of polished thin sections of mineralized dolomitic marble

GEOCHEMISTRY: Partial chemical analyses of mineralized marble and trace element contents of some sphalerite grains were measured by Sangster (1970); these results are presented in Tables 1B and 1C, respectively. Some partial chemical analyses of mineralized marble collected by the authors, are presented in Table 1D. One complete major element with some minor element, analysis of a sample of mineralized marble is presented in Table 1E.

DISCUSSION: The deposit occurs in a very similar geological environment to those currently being mined in the Balmat-Edwards district, New York state. In both cases mineralization consists of disseminated to massive sphalerite with pyrite, minor galena and very minor chalcopyrite and is contained within a thick sequence of interbedded clean and siliceous dolomitic marble, with minor fetid (H_2S bearing) marble beds. At Renprior, however, some minor interbedded units of amphibolite, interpreted as mafic volcanic in origin, are present and in the Balmat-Edwards district, one major, and several minor, anhydrite beds are present near the mineralization. At Renprior, the mineralization appears to have undergone recrystallization during metamorphism, but no significant remobilization. The final location of the Balmat-Edwards deposit appears to be structurally controlled as a result of remobilization of pre-existing sulphides during deformation.

The Balmat-Edwards deposits are thought to have been deposited as disseminated sulphides contemporaneously with the precipitation of their host carbonates in a shallow sedimentary basin (Lea and Dill, 1968, p. 47). The authors consider a similar genesis probable for the Renprior deposit. The source of the metal is not defined but may have been related to hydrothermal exhalative activity associated with either local volcanic activity or a more distal source. Remobilization of sulphides during deformation at Balmat-Edwards may have been responsible for up-grading them to a mineable concentration, but this has apparently not occurred at the Renprior deposit.

While extensive exploration work has been carried out on the Renprior property, additional drilling of the down dip extension of the mineralization is required to adequately assess its economic potential.

	SiO_2	Al_2O_3	CaO	MgO	CaO/MgO	SiO_2/CaO+MgO
Renfrew Zinc-1	23.70	1.42	8.65	8.75	0.99	1.37
Renfrew Zinc-3	16.65	0.45	18.30	11.75	1.56	0.55
Renfrew Zinc-6	25.40	3.25	15.50	10.20	1.52	0.99

TABLE 1C: Partial chemical analyses in weight percent of sintered carbonate rocks containing sphalerite, (from Sangster 1970, p.165).

	Fe(Wt.%)	Mn	Ti	Ga	Cd	Co	Ni	Cu
Renfrew 1	2.4	780	ND	ND	2500	ND	10	14
Renfrew 3	8.0	1050	6	ND	3900	ND	16	1200
Renfrew 6	3.3	700	6	ND	1200	ND	12	30

TABLE 1C: Trace element content in ppm of some sphalerite, (adapted from Sangster 1970, p.160). (Sample #3 selected because of high iron content and is not representative of the deposit).

	Zn(Wt.%)	Ag (ppm)	Au (ppb)
Zn-1-2	2.2	3	10
Zn-1-3	29.4	3	10
Zn-1-6	6.5	3	30

TABLE 1D: Partial chemical analyses of some samples of mineralized marble.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	MnO	Total
Zn-1-5	11.2	0.2	1.6	-	17.8	26.8	0.11	0.02	0.08	0.58	34.8	0.02	4.26	0.00	97.5

	Zn(Wt%)	Cu	Ni	Co	Pb	Cr	Ba	Li	Sr
Zn-1-5	7.2	33	5	5	14	5	170	6	400

TABLE 1E: Whole rock chemical composition (in wt.%) and trace element content (in ppm) of a sample of mineralized marble (FeO considered unreliable due to high S content.)

Carbonate sequences of this type are, however, common and widespread throughout the study area and are potential hosts for this deposit type.

DEVELOPMENT HISTORY

1922: Discovery of mineralization, opening of pit by J. Legree and W. Dean

1925: Strippings, trenching, 5 dd holes totalling 1483 feet by Coniagas Mines Ltd.

1926: 4 dd holes totalling 1187 feet by Ottawa Valley Mines, 7 dd holes totalling 1487 feet by British Metal Corp., (Canada) Ltd., detailed sampling.

1947: New Calumet Mines acquired control of parts of Lots 1 and 2, Con. 3; 13 dd holes totalling 2,287 feet.

1948: Property transferred to Cadieux Mines Ltd. - some diamond drilling. 4 holes totalling 1327 feet.

1950/1951: More dd holes by Cadieux Mines, 7 holes for 2889 feet, 7 X-ray holes for 825 feet.

1950: Lomega Gold Mines Ltd. optioned Lots 1 and 2 (E 1/2), Con. 4, from Mr. John Hisko, the owner, Stripping by bulldozer, trenching, sampling.

1950: Lomega Gold Mines Property transferred to Renprior Mines-mill constructed 35-50 tons daily capacity; operated for two months on an open cut.

1951: Renprior Mines Property acquired by Renprior Zinc Mines Ltd. 7,000 feet of AXT diamond drilling in 45 holes, geological mapping, and electrical and magnetic surveys.

1973: Cadieux Mines Ltd. optioned their property to Phelps Dodge who dropped the option shortly after. The property was subsequently optioned to Kerr Addison who also dropped the option after an unspecified amount of work.

1978: Property optioned to St. Joseph Lead Co. Work was incomplete at time of writing.

REFERENCE MAPS

GSC 1046A, Renfrew, 1956

ODM Map No. 53b, Renfrew Area, 1945.

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2. BRADFORDS CREEK

COMMODITY	MAIN: Copper, gold OTHER: Antimony
ROCK ASSOCIATION	HOST: Dolomitic marble OTHER: Mafic volcanics
CLASSIFICATION	2A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag
LOCATION	Darling Township, Lanark County NTS 31F/2, UTM Zone 18, 5008825 N, 375370E Lat. 45° 13' 26" N, Long. 76° 35' 15" W. Con. 5, Lot 23.
ACCESS	The deposit is located 1800 m (6000 feet) northeast of Hwy 511 between Broad Creek and Bradfords Creek and is accessible only by foot.
SIZE AND GRADE	Mineralization consists of erratically disseminated sulfides in a zone exposed in a surface showing which appears to be restricted to a small trench 1.5 m wide, 7.6 metres long, and about 0.6 metres deep in a area of abundant low, hummocky outcrop. A chip sample of typical mineralization collected by the authors contained 4220 ppm Cu, 1400 ppm Sb, 220 ppm Zn, 2000 ppb Au, and $<$3 ppm Ag. A sample of unmineralized marble 15 m (50 feet) south of the mineralized zone contained 10 ppm Cu, 12 ppm Zn, and $<$10 ppm Pb.

DESCRIPTION

GENERAL GEOLOGY: The Bradfords Creek deposit is hosted by dolomitic marble within a northeast trending unit of intercalated calcitic and dolomitic marble. The carbonate unit is contained within amphibolitic mafic volcanic rocks and varies from 150 to 320 metres (500 to 1050 feet) in width. The unit dips to the southeast at an undetermined angle.

The host rock of the mineralized zone is a very fine-grained, massive, light-to-dark grey dolomitic marble. It contains numerous, narrow pods and lenses of coarse-grained white dolomite and minor quartz and is cut by numerous narrow veinlets of coarse-grained carbonate and quartz.

MINERALIZATION: Mineralization consists of fine-grained tetrahedrite, chalcopyrite, pyrite, and sphalerite which occur as erratically disseminated grains within the coarse-grained pods, lenses, and veins of dolomite and quartz in the marble.

MICROSCOPY: Two polished thin sections of mineralized marble were prepared from samples collected by the writer. Both sections consist essentially of a massive granoblastic intergrowth of very fine-grained carbonate (90-95%), cut by one or more narrow (0.5-1 mm) veinlets of coarse-grained quartz and/or dolomite. Abundant fluid inclusions are present in the vein dolomite. Tetrahedrite, minor chalcopyrite and rare pyrite occur within the veins intergranular to the quartz and dolomite. The tetrahedrite occurs as large, irregular grains and the chalcopyrite and pyrite occur as small, scattered grains. Malachite forms secondary alteration runs around some grains of tetrahedrite and chalcopyrite.

DISCUSSION: This deposit is one of a series of nine similar deposits that extend for 19 km (12 miles) along strike within a narrow, north to northeast trending belt of intercalated marble and mafic volcanics. The mineralization at all the deposits is similar and is usually associated with irregular, stratiform pods, lenses, and layers of coarse-grained quartz and white dolomite and related cross-cutting veins of quartz and dolomite within dolomitic marble.

The metals were probably deposited as primary constituents of the dolomitic marble in a subaqueous carbonate depositional environment. The metals may have been introduced into this environment by hot spring activity related to synchronous volcanism. Subsequent diagenesis and metamorphism of the marble and local solution and remobilization of dolomite, quartz, and associated

mineralization resulted in the present morphology of the deposits.

DEVELOPMENT HISTORY 1962: Arnold Murray, Joe Rankin drilled six diamond holes, cut base line.

1967: Geological mapping of extensive claim group by E. E. Campbell for Siscoe Metals.

REFERENCE MAP ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958.

REFERENCES Assessment Files Research Office, Ontario Geological Survey, Toronto, Technical File No. 63A-530.

3. DARLING

COMMODITY	MAIN: Gold OTHER: Copper, antimony, silver
ROCK ASSOCIATION	HOST: Dolomitic marble OTHER: Mafic volcanic
CLASSIFICATION	2A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag
LOCATION	Darling Township, Lanark County NTS 31F/2, UTM Zone 18, 5008180N, 374520E Lat. 45° 13' 04" N, Long. 76° 35' 53" W. Con. 4, Lot 23.
ACCESS	The deposit is located 900 metres (3000 feet) northeast of Hwy 511 between Broad Creek and Bradfords Creek, about 30 metres south of a narrow bush road.

SIZE AND GRADE

Mineralization consists of sparsely disseminated sulfides in an irregular zone exposed by a shaft measuring 1.5 m. by 1.5 m. and 7 metres deep, and in an adjacent small trench 2.5 m. by 1 m. and less than 1 metre deep. No mineralization is exposed beyond the limits of the workings.

Assay results for several selected samples collected by the authors are presented in Table 3A. 78TC174 is a chip sample of well-mineralized marble, 78TC234 is a sample of a quartz vein well-mineralized with tetrahedrite, and the other analyses are of samples of sparsely mineralized marble, principally with pyrite. None of the samples contained more than about 10 per cent, disseminated sulfides.

	78TC174	78TC230	78TC231	78TC232	78TC234
Cu	1.10%	13	174	34	7120
Sb	5800	139	105	344	2250
Au	25.2**	795 ppb*	70 ppb*	2400 ppb*	7.4
Ag	11	<3	<3	<3	4
Zn	610	46	44	66	380
Pb	<10	-	-	-	-
Hg	-	-	-	-	180
Bi	-	-	-	-	54.0
As	-	-	-	-	285

** average of 3 analyses
* average of 2 analyses

TABLE 3A: Assay results for selected samples from the Darling deposit (in ppm unless indicated otherwise)

DESCRIPTION

GENERAL GEOLOGY: The Darling deposit is hosted by dolomitic marble within a northeast trending unit of intercalated calcitic and dolomitic marbles. The carbonate unit is bounded by amphiboliti mafic volcanics and varies from 150 to 320 metres (500 to 1050 feet) in width and is at least 4 km (2.5 miles) in length. The unit dips to the southeast at an undetermined angle.

The host rock of the mineralized zone is a very fine-grained, massive, dark grey, dolomitic marble. It contains numerous small layers, pods, and lenses of medium-grained white dolomite and is cut by narrow veins of white quartz.

MINERALIZATION: Mineralization is erratic consisting of disseminated grains of tetrahedrite and chalcopyrite contained within the quartz veins; fine-grained pyrite is disseminated within the segregations of white dolomite in the dolomitic marble. The sulfide content of the rocks rarely exceed 5 to 10 per cent.

MICROSCOPY: One polished thin section was prepared from a sample of sparsely mineralized marble collected by the authors. The section is composed essentially of carbonate (70-75%), quartz (25%) and minor muscovite and opaque minerals. The carbonate

forms a massive, granoblastic fine-grained intergrowth that is cut by an irregular, diffuse network of coarse-grained quartz and dolomite with associated opaque minerals. Pyrite is the most common opaque mineral present and occurs as scattered small, euhedral grains which usually occur in the carbonate mosaic near the quartz-dolomite zone. Some of the pyrite grains are shattered and contain very numerous fractures filled with chalcopyrite. Many of the pyrite grains are also altered to hematite along grain boundaries and near fractures.

DISCUSSION: This deposit is one of a series of nine similar deposits that extend for 19 km (12 miles) along strike within a narrow, north to northeast trending belt of intercalated marble and mafic volcanics. The mineralization at all the deposits is similar and is usually associated with irregular, stratiform pods, lenses, and layers of coarse-grained quartz and white dolomite and related cross-cutting veins of quartz and dolomite within dolomitic marble.

The metals were probably deposited as primary constituents of the dolomitic marble in a subaqueous carbonate depositional environment. The metals may have been introduced into this environment by hot spring activity related to synchronous volcanism. Subsequent diagenesis and metamorphism of the marble and local solution and remobilization of dolomite, quartz, and associated mineralization resulted in the present morphology of the deposits.

DEVELOPMENT HISTORY

1962: Arnold Murray, Joe Rankin completed six diamond drill holes for an undisclosed length, cut base line.

1967: Geological mapping of extensive claim group by E. E. Campbell for Siscoe Metals.

REFERENCE MAP

ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958

REFERENCES

Assessment Files Research Office, Ontario Geological Survey, Toronto, Technical File No. 63A-530.

4. GREEN LAKE

COMMODITY — MAIN: Gold
OTHER: Silver, copper, antimony

ROCK ASSOCIATION — HOST: Dolomitic marble
OTHER: Mafic volcanics

CLASSIFICATION — 2A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag

LOCATION — Darling Township, Lanark County
NTS 31F2, UTM Zone 18, 5006820 N, 373335 E
Lat. 45° 12' 20" N, Long. 76° 36' 46" W.
Con. 2, Lot 22.

ACCESS — The deposit is accessible via a dirt bush road, approximately 1.7 km (1.05 miles) west from Hwy. 511, at a point 15.4 km (9.6 miles) by road south of the bridge at Calabogie village. The workings are just west of the bush road on a heavily wooded hillside.

SIZE AND GRADE — Mineralization consists of disseminated sulfides in an ill-defined, apparently conformable lens estimated to be 2 to 3 metres in width and about 30 metres in length. Additional mineralization is contained in narrow, cross-cutting quartz veins. The mineralization is exposed in two narrow trenches 30 m apart which cut across the strike of the zone. Outcrop is scarce.

Assay results from analyses of several selected samples collected from the mineralized zone by the writer are presented in Table 4A. 78TC126 and 78TC238 are grab samples of very well mineralized marble, 78TC237 is a sample of an unmineralized quartz vein, and 78TC235 and Cu-3-1 are typical samples of mineralized marble.

	Cu-3-1	78TC126	78TC235	78TC237	78TC238
Cu	1180	4660	60	32	3950
Sb	1300	1800	30	10.8	2100
Au	5400 ppb	6500 ppb	1650 ppb*	40 ppb	3550 ppb*
Ag	-	115	<3	<3	103
Zn	162	380	46	18	270
Pb	23	12	-	-	-
Hg	170 ppb	-	-	-	-
Bi	20	-	-	-	-
As	96	-	-	-	-

* average of 2 analyses

TABLE 4A: Metal contents of selected rock samples from the Green Lake deposit. (In ppm unless indicated otherwise)

DESCRIPTION — GENERAL GEOLOGY: The Green Lake deposit is hosted by dolomitic marble within a northeasterly trending unit of intercalated calcitic and dolomitic marble. The carbonate unit is bounded by amphibolitic mafic volcanics and varies from 150 to 320 metres in width (500 to 1050 feet) and is at least 4 km (2.5 miles) in length; it has a southeasterly dip at an undetermined angle.

The host rock of the mineralized zone is a very fine-grained, light to dark grey, dolomitic marble. The marble is usually massive but in places is well-layered. It contains numerous conformable to unconformable pods, lenses, and layers of medium-to-coarse-grained white dolomite, and pods, lenses, and discontinuous veins of quartz are also common.

MINERALIZATION: Mineralization is erratic consisting of sparse, disseminated blebs and streaks of tetrahedrite and rare small grains of pyrite and chalcopyrite. The sulfides are usually associated with segregations of white dolomite or veins of quartz in the marble.

MICROSCOPY: Two polished thin sections (78TC126-1 and 126-2) and a thin section (78TC125) were prepared from samples collected by the writers. The two polished thin sections are typical mineralized marble while 78TC125 is typical marble cut by a quartz vein. Modal analyses of all three sections are presented in Table 4B.

Thin section 78TC125 consists of a granoblastic intergrowth of very inequigranular carbonate which has a poorly developed layering defined by variations in the grain size of the carbonate. Some coarse-grained, strained polygonized quartz grains are associated with the coarser-grained carbonate. A vein-like mass of coarse-grained quartz and carbonate cuts one corner of the section. There are a few fine, euhedral scattered opaque grains.

Section 78TC126-1 is very similar to 78TC125. Numerous fractures filled with malachite cut the section. Some of these fractures are filled with tetrahedrite near zones of coarse-grained carbonate and quartz. Scattered, irregular grains of tetrahedrite also occur within pods of coarse-grained quartz. Minor amounts of chalcopyrite occur as intergrowths on the edges of some tetrahedrite grains.

Section 78TC126-2 consists of fine-to-medium-grained carbonate which is cut by and included as angular blocks within strongly foliated, strained, sutured intergrowths of coarse and fine-grained quartz. A few large, irregular grains of tetrahedrite occupy interstices between coarse aggregates of quartz and carbonate. Chalcopyrite occurs as small grains on the edges of tetrahedrite grains, and pyrite forms rare, euhedral, isolated grains.

	78TC125	78TC126-1	78TC126-2
carbonate	92	92	35
quartz	8	4	64
opaques	minor	4	1
plagioclase	-	minor	-

TABLE 4B: Estimated modal compositions (in percent) of some thin sections of selected rock types.

GEOCHEMISTRY: A whole rock chemical analysis of a sample of typical mineralized marble collected by the writer is presented in Table 4C.

SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
9.44	0.27	0.28	2.67	17.4	29.0	0.00	0.09

H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
n.d.	0.31	41.3	0.01	0.01	0.20	0.20	101.3

TABLE 4C: Whole rock chemical composition (in percent) of a sample of typical mineralized dolomitic marble.

DISCUSSION: This deposit is one of a series of nine similar deposits that extend for 19 km (12 miles) along strike within a narrow, north to northeast trending belt of intercalated marble and mafic volcanics. The mineralization at all the deposits is similar and is usually associated with irregular, stratiform pods, lenses, and layers of coarse-grained quartz and white dolomite and related cross-cutting veins of quartz and dolomite within dolomitic marble.

The metals were probably deposited as primary constituents of the dolomitic marble in a subaqueous carbonate depositional environment. The metals may have been introduced into this environment by hot spring activity related to synchronous volcanism. Subsequent diagenesis and metamorphism of the marble and local solution and remobilization of dolomite, quartz, and associated mineralization resulted in the present morphology of the deposits.

DEVELOPMENT HISTORY	1962: Arnold Murray, Joe Rankin drilled 6 diamond drill holes of undisclosed length, cut base line.
	1967: Geological mapping of extensive claim group by E. E. Campbell for Siscoe Metals.
REFERENCE MAP	ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958.
REFERENCES	Assessment Files Research Office, Ontario Geological Survey, Toronto, Technical File No. 63A-530.

5. BOWEN CORNER

COMMODITY	MAIN: Gold OTHER: Silver, arsenic
ROCK ASSOCIATION	HOST: Volcanic tuff OTHER: Dolomitic marble
CLASSIFICATION	4A. Stratabound, volcanic hosted Au-Ag-As
LOCATION	Dungannon Township, Hastings County NTS 31F/4, UTM Zone 18, 4994845N, 289000E LAT. 45° 04' 39" LONG. 77° 40' 50" Lot. 1, Con. 10
ACCESS	The pit on the property is located 180 m (550 feet) south of Highway 500, 1.6 km (1 mile) east of Detlor Road.
SIZE AND GRADE	Mineralization is associated with disseminated arsenopyrite in a zone approximately 1 to 1.3 m (3 to 4 feet) in width by 30 m (100 feet) in length. A grab sample taken by Thomson (1943) contained 0.02 oz/ton Au, but no Ag or Pb; ore taken by the authors contained trace Au and Ag. The only working on the property is a 2 X 3 metre (6 X 10 foot) pit which is 2 m (6 feet) deep, and the development history is unknown..
DESCRIPTION	Mineralization is contained in a rusty volcanic tuff which contains up to 10 % disseminated arsenopyrite. The bed is conformable within a well layered sequence of dolomitic marble. The tuff bed strikes at 82° and dips north at 58°, has a width of 1 to 1.3 metres (3 to 4 feet) and can be traced for a strike length of at least 30 metres (100 feet). This deposit appears to be small but sufficient work has not yet been carried out to establish its nature and geological relationships. It is similar to the Jefrey Deposit, Faraday Township. Mineralization is both stratiform and stratabound, suggesting either syngenetic deposition or selective epigenitic deposition in the tuff host.
REFERENCE MAP	ODM 1955-8, Dungannon and Mayo Townships, 1955
REFERENCES	Hewitt, D. F., and James, W. 1956: Geology of Dungannon and Mayo Townships; Ontario Department of Mines, Annual Report Vol. 64, Pt. 8, p. 45-46. Thomson, J. E. 1943: Mineral Occurrences in the North Hastings Area; Ontario Department of Mines, Annual Report Vol 52, Pt. 3, 1943, P. 31.

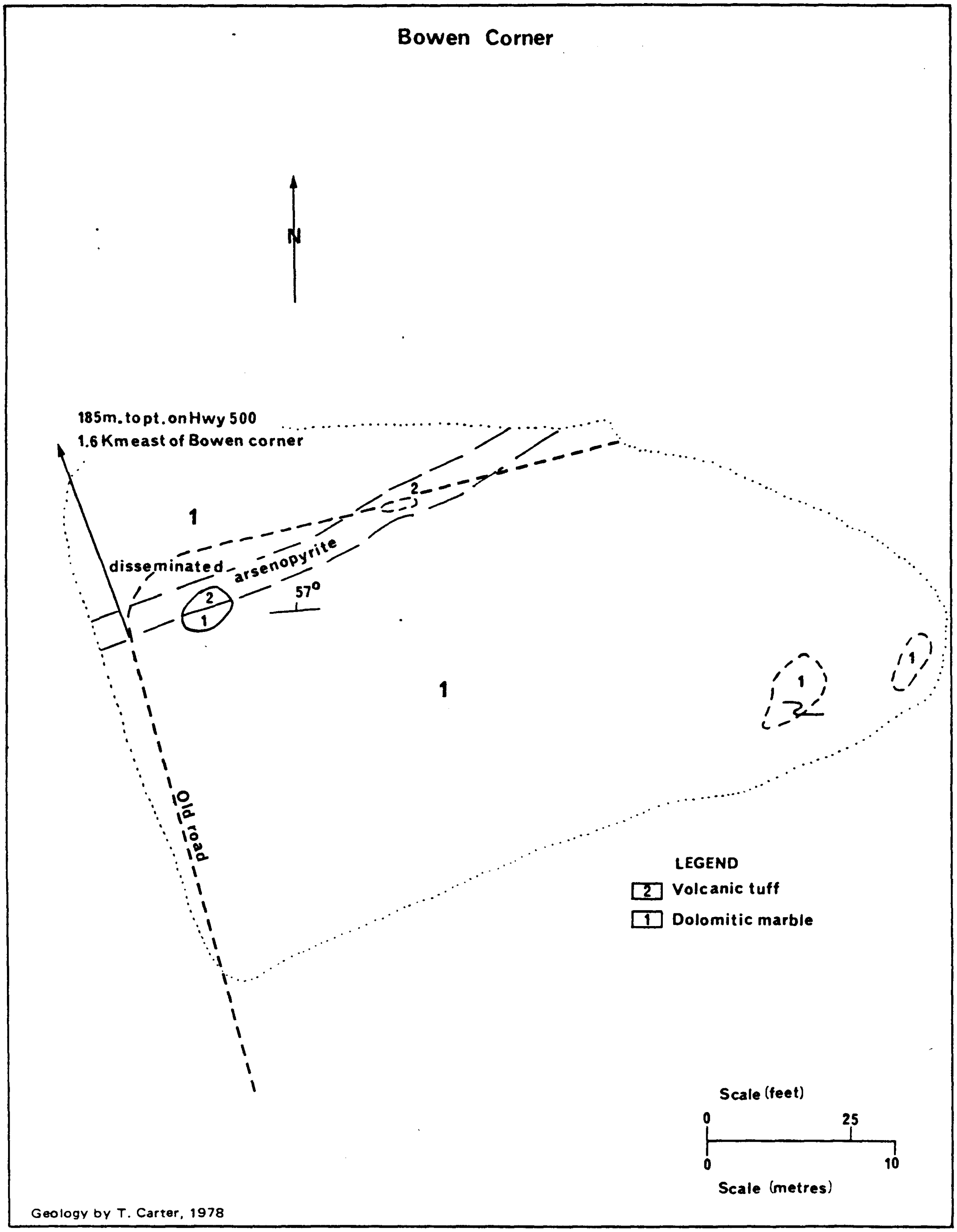

Figure 5A — Geology of the Bowen Corner gold-silver deposit.

6. JEFREY

COMMODITY — Silver, gold, arsenic

ROCK ASSOCIATION — HOST: Volcanic tuff
OTHER: Calcitic marble

CLASSIFICATION — 4A. Stratabound, volcanic-hosted Au-Ag-As

LOCATION — Faraday Township, Hastings County
NTS 31F/4, UTM Zone 18 4987280 N, 27/895E
LAT. 45° 00' 15"; LONG. 77° 53' 39" W
Lot 12, Con. 9

ACCESS — The deposit is located approximately 6.4 km (4 miles) southwest of the town of Bancroft. It is accessible from a cottage road to Carfrae Lake which runs north from a gravel road running southwest from Highway 62, 2.4km (1.5 miles) south of Bancroft. Workings are located 215 m (650 feet) west-southwest of Carfrae Lake on the south-east side of the cottage road.

SIZE AND GRADE — Arsenopyrite is unevenly disseminated within a bed of volcanic tuff which is exposed in workings over a strike length of about 21 metres (70 feet) and has an approximate width of 3 metres (10 feet). A sample of mineralized tuff collected by Wells (1902, p. 102) is reported to have contained 0.06 oz/ton Au, 3.01 oz/ton Ag and 27.54% As. A composite sample collected by Thomson (1943, p. 16) contained only trace amounts of gold and a selected sample collected by the authors also contained only trace gold and silver.

Two small shafts and one pit provide good exposure of the mineralization and there is a large amount of broken rock around the workings. The shafts are adjacent to each other and are 3 metres (10 feet) and 2.5 metres (8 feet) deep respectively, and are both partially filled with debris and water. The pit is located 15 metres (50 feet) north of the shafts and is 3 x 1.5 metres (10 x 5 feet) and 1 metre (3 feet) deep.

DESCRIPTION — The mineralized tuff is a narrow unit within an extensive marble sequence. The calcitic marble in the vicinity of the occurrence is fine-grained (1 mm) and well-layered. The tuff unit strikes at 30° and dips southwest at 72°. The arsenopyrite is unevenly disseminated throughout the tuff and is locally concentrated to massive; small arsenopyrite veins are also present, commonly associated with veins of biotite.

Sufficient work has not yet been carried out by the authors on the deposit to establish its nature and geological relationship. It is similar to the Bowen Corner Deposit in Dungannon Township. Mineralization is both stratiform and stratabound suggesting either syngenetic deposition or epigenetic deposition in the tuff host.

DEVELOPMENT HISTORY — No available information

REFERENCE MAP — O.D.M. 1957-1, Cardiff and Faraday Townships, 1957

REFERENCES

Sergiades, A. O.
1968: Silver Cobalt Calcite Vein Deposits of Ontario; Ontario Department of Mines, Mineral Resources Circular No. 10.

Thomson, J. E.
1943: Mineral Occurrences in the North Hastings Area; Ontario Department of Mines, Annual Report Vol. 52, Pt. 3, 1943, p. 16.

Wells, J. W.
1902: Arsenic in Ontario; Ontario Bureau of Mines, Annual Report Vol. 11, 1902, p. 102.

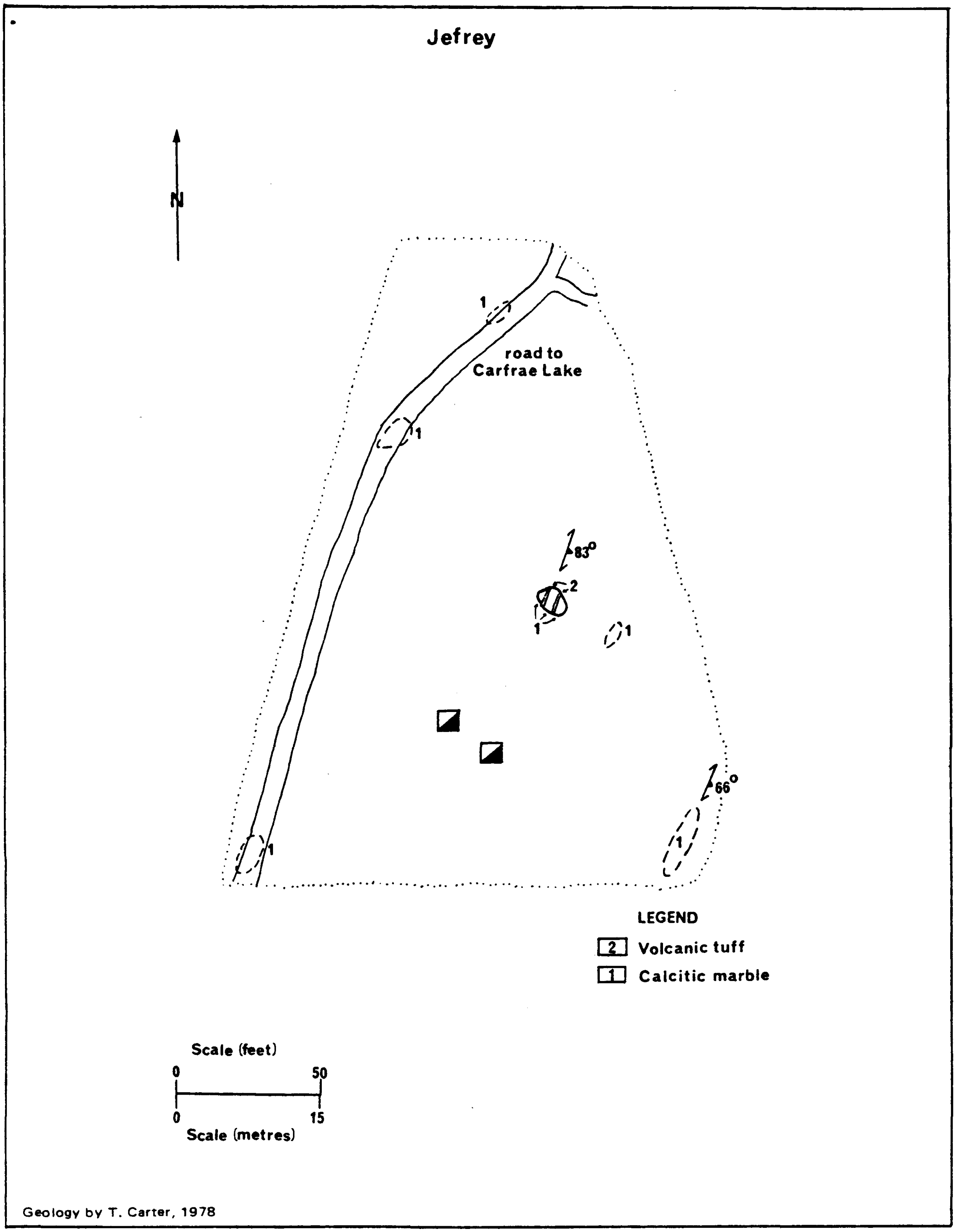

Figure 6A — Geology and workings of the Jefrey deposit.

7. CAMPBELL LEAD

COMMODITY	Lead
ROCK ASSOCIATION	HOST: Vein calcite OTHER: Marble
CLASSIFICATION	1B. Unconformable, carbonate hosted Pb deposit
LOCATION	Fitzroy Township, Carleton County NTS 31F8, UTM Zone 18, 5033665N, 399310E. LAT. 45° 27' 04"N LONG. 76° 17' 15"W Northwestern extension of Con. 6
ACCESS	The deposit, which is approximately 4 miles east of Arnprior, outcrops on an island extension of Con. 6, Fitzroy Township. It is accessible only by boat on the Ottawa River.

SIZE AND GRADE

The deposit is reported to consist of a galena bearing calcite vein, three feet in width and five hundred feet in length. The authors did not visit the property and no new information is available concerning grade of mineralization. Alcock (1930, p. 139) described the workings:

> "The development work performed on the property consists of a pit 25 feet long, 15 feet wide and 15 feet deep, a shaft 16 feet deep on the mainland to the east of the vein zone and a cement coffer dam placed in the water over the outcrop of the vein".

DESCRIPTION

GENERAL GEOLOGY: In the following description of the geology taken from Alcock (1930, p. 139), the term 'limestone' refers to Late Precambrian marble.

> "The deposit consists of outcrops of calcite along a line that trends in a northwesterly direction along the shore of Chats Lake. At times of low water the pits located on these showings are exposed, but for the greater part of the year water covers the outcrop to a depth of from 4 to 5 feet. The writer made two visits to the property in the autumn of 1925. At one place a galena-bearing calcite vein about 6 inches in width was observed and at other places, loose masses of limestone cut by narrow veinlets of calcite up to one inch in width occur. Uglow states, however, that the vein varies in width from a few inches to 3 feet, and although it has not been traced continuously for more than 70 feet, it is known to outcrop over a total of 500 feet. The vein material consists of calcite containing scattered cubes of galena."

DISCUSSION: This deposit is similar to other deposits in this group in the study area and to other vein lead deposits close to the Paleozoic margin of the Late Precambrian basement rocks. Mineralization has been located along a vein system, but its full extent has not been determined by the authors. A discussion of the genesis of this deposit type is contained in the introductory section of this report. The most significant features of rock associations and ore localization are outlined below:

- deposits occur close to the Late Precambrian/Paleozoic unconformity
- mineralization occurs in fracture filling veins with a general northwesterly trend, which appear to be related to the development of the Ottawa graben
- the widest and best mineralized veins occur as fracture fillings in marbles. The width may be the result of a competency difference between the host rock units during faulting. Deposition of mineralization in the marbles may be the result of their chemical reactivity.
- mineralization appears to be restricted to areas where basal Paleozoic sandstone forms the unconformity with basement. With an impermeable carbonate cap-rock, these may have acted as aquifers for groundwater flow and a source for metal.

A combination of the factors would appear to present a well defined exploration target for this deposit type in an area with abundant fracturing and favourable host units. While they may not be expected to be of very large extent, they must be considered economically significant.

DEVELOPMENT HISTORY	1908, 1910, 1911: surface work by J. Campbell 1916 - 1917: surface work by Ottawa Lead and Zinc Company 1925: dd holes (no?) by Ottawa Valley Syndicate
REFERENCE MAP	GSC 1363A, Arnprior, 1974
REFERENCES	Alcock, F. J. 1930: Zinc and Lead Deposits of Canada, Geological Survey of Canada, Economic Geology Series, No. 8, p. 138-139. Uglow, W.L. 1916: Lead and Zinc Deposits in Ontario and in Eastern Canada; Ontario Bureau of Mines, Annual Report Vol. 25, part 2, 1916, p. 22-23. Wilson, M.E. 1924: Arnprior-Quyon and Maniwak; Areas, Ontario and Quebec; Geological Survey of Canada, Memoir 136, p. 102.

8. KINGDON MINE

COMMODITY	MAIN: Lead OTHER: Zinc, barite, fluorite
ROCK ASSOCIATION	HOST: Vein calcite OTHER: Marble, pegmatite, granite, sandstone, dolostone
CLASSIFICATION	1B. Unconformable, carbonate hosted, Pb deposits
LOCATION	Fitzroy Township, Carleton County NTS 31F/8, UTM Zone 18, 5032485N, 401665E. LAT. 45° 26' 27"N; LONG. 76° 15' 26"W Lots 22, 23, 24, Con. 6
ACCESS	The deposit is 8km (5 miles) east of the town of Arnprior. It is accessible by gravel road 2km (1¼ miles) north from the village of Galetta.
SIZE AND GRADE	Mineralization consists of galena with minor sphalerite in a calcite vein which has an average width of 1.5m (5 feet) and has been traced over a length of 823m (2700 feet) and to a depth of 396m (1300 feet). Production between 1915 and 1931 was 905,000 tons of ore averaging 3.32% Pb. The two shafts are waterfilled and the area is overgrown; an extensive tailings dump is present to the southeast of the shafts.

DESCRIPTION

GENERAL GEOLOGY: The only outcrop in the immediate area is 225 feet southeast of the shafts consisting of medium grained marble, cut by granitic dykes; the vein itself was not located. The geological description of the deposit is, therefore, taken from Alcock (1930):

"The few rocks of the region belong chiefly to a complex of Precambrian age.

A few patches of sandstone and dolomite of Beekmantown age, however, overlie the complex. The Precambrian rocks consist of Grenville limestone in which dikes and masses of garnitiferous quartz diorite, granite, and pegmatite are included. The limestone is crystalline and banded, striking for the most part in an east-west direction".

"The deposits are in the form of two fissure veins. The main vein cuts across the Grenville limestone and its inclusions of diorite, granite, and pegmatite, in a direction about 50 degrees southwest. The chief ore mineral is galena which occurs in grains, clusters of crystals, and thin sheets, usually parallel to the banding of the gangue. In places, especially along the wall of the vein, sphalerite is also present. The gangue is calcite commonly banded; small amounts of barite, barytocelestite, fluorite, selenite, and hematite also occur. The width of the vein varies from a few inches to over 10 feet with an average of about 5 feet. It has been followed in the underground workings to a depth of over 1,300 feet and for a length of over 2,700 feet. The proportion of galena present varies greatly from point to point over the vein.

That the fissure occupied by the vein is due to faulting is shown by the striated surface of the vein wall, by the broken condition of the wallrocks, and by the way in which masses of diorite, granite and pegmatite contained in the Grenville limestone have been displaced along the fissure plane. The amount of displacement as indicated by the variation in the character of the rock on the opposite walls of the vein was evidently considerable. There is also a definite relationship between the character and width of the vein and the rock forming its walls. Where the wallrock is diorite, granite, or pegmatite, the vein breaks into numerous small veinlets, whereas where the wallrock is limestone, the vein is usually well defined and at least several feet in width.

The north vein like the main one occupies a fault fissure. It, however, is delimited by Beekmantown dolomite on the west and Grenville limestone on the east, so that the west side has evidently been downthrown with respect to the east. The vein strikes north 25 degrees west magnetic and has a width of from 2 to 2½ feet in the part exposed".

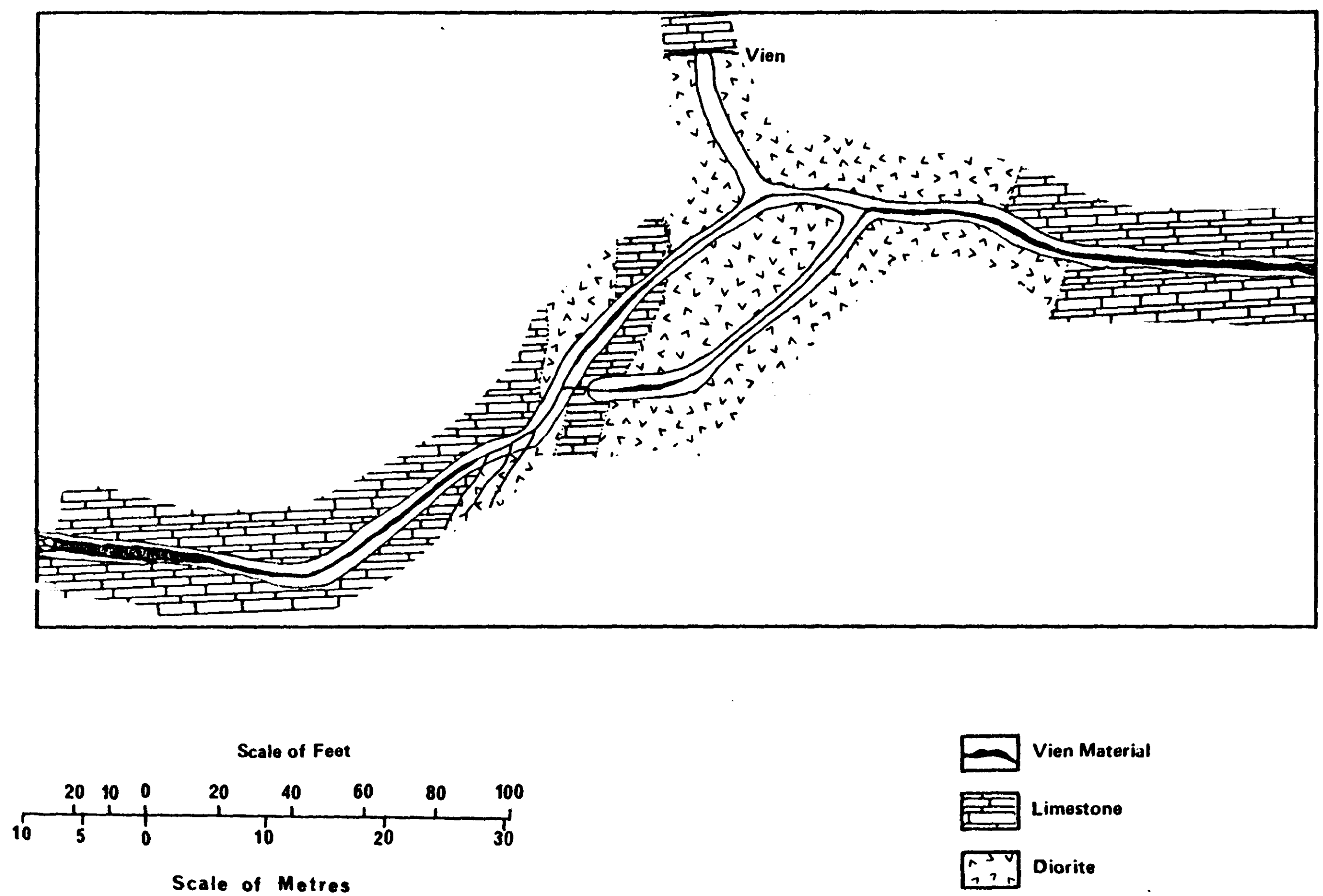

Figure 8A-Plan of part of third level, Kingdon Mine, taken from Alcock, (1930, p.137).

DISCUSSION: This deposit is similar to the other deposits in this group in the study area and to other vein lead deposits close to the Paleozoic margin of the Late Precambrian basement rocks. It is, however, the most extensive of the known deposits, having supported a successful mining operation for 15 years. A discussion of the genesis of this deposit type is contained in the introductory section to this report. The most significant features of rock associations and ore localization are outlined below:

- deposits occur close to the Late Precambrian-Paleozoic unconformity
- mineralization occurs in fracture filling veins with a general northwesterly trend, which appear to be related to the development of the Ottawa Graben
- the widest and best mineralized veins occur as fracture fillings in marbles. The width may be the result of a competency difference between the host rock units during faulting. Deposition of mineralization in the marbles may be the result of their chemical reactivity
- mineralization appears to be restricted to areas where basal Paleozoic sandstone forms the unconformity with basement. With an impermeable cap-rock these may have acted as aquifers for ground-water flow and a source for metal

A combination of the factors would appear to present a well defined exploration target for this deposit type in an area with abundant fracturing and favourable host units. While they may not be expected to be of very large extent, they must be considered economically significant.

DEVELOPMENT HISTORY

1884-1885: Shaft #1 sunk to 50', 90' of drifting work by James Robertson

1914-1931: 2 shafts sunk, No. 2 sunk to 225' in 1916, No. 3 to 1448' in 1929. In No. 3, shaft levels worked at 100, 185, 313, 400, 525, 650, 775, 900, 1025, 1150, 1275 and 1400 feet

Underground development including 20,706' of drifting

Concentrator constructed in 1915 with capacity 75 tpd increased to 200 tpd by 1919

25 tpd smelter erected in 1916- continuous operation until 1931

1922- blast furnace added to smelter - capacity 500 tpd for treatment of Pb-Zn slags accumulated from concentrate treatments

Operations terminated in May, 1931, due to poor metal prices

Work by James Robertson Estate until 1919 - Kingdon Mining, Smelting and Manufacturing Company formed

1949: 22 surface d.d. holes for 16,304' by Kingdon Mining Co. Ltd. incl. several deep holes up to 1500 feet

PRODUCTION: 905,000 tons ore hoisted

76,821,409 lbs. lead concentrates;
857,312 lbs. zinc concentrates extracted

Production of 60,074,077 lbs. pig lead valued- $4,266,938
Zinc concentrates shipped to the U.S.

REFERENCE MAPS

G.S.C. 1363A, Arnprior, 1974

REFERENCES

Alcock, F. J.
1930: Zinc and Lead Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 8, p. 136-138

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1926: Kingdon Lead Mine, Galetta Ontario, Finance by Own Production - Development Campaign Begur -

in News of the Week, July 17, 1926; Engineering and Mining Journal, Vol. 122, No. 3, p. 105

Hardman, J. E.
1917: The Kingdon Lead Mine; Transactions of the Canadian Mining Institute, Vol. 20, 1917, p. 180-187.

Shklanka, R.
1969: Copper, Nickel, Lead, and Zinc Deposits of Ontario; Ontario Department of Mines, Mineral Resources Circular No. 12, p. 114.

Thomson, J. E.
1949: Kingdon Mine, Fitzroy Township, County of Carleton; unpublished report, Source Mineral Deposit Record (Kingdon Lead), Ontario Geological Survey, Toronto.

Thomson, J. E. et al
1957: Copper, Nickel, Lead, and Zinc Deposits in Ontario; Ontario Department of Mines, Metal Resources Circular No. 2, p. 7

Uglow, W. L.
1916: Lead and Zinc Deposits in Ontario and in Eastern Canada; Ontario Bureau of Mines, Annual Report Vol. 25, part 2, 1916, p. 21-22.

Wilson, M. E.
1924: Arnprior-Quyon and Maniwaki Areas, Ontario and Quebec; Geological Survey of Canada, Memoir 136, p. 95-101.

9. STANTON

COMMODITY: Main: Lead
Other: Zinc

ROCK ASSOCIATION: HOST: Vein calcite
OTHER: Calcitic marble

CLASSIFICATION: 1B. Unconformable, carbonate hosted lead

LOCATION: Fitzroy Township, Carleton County
NTS 31F/8, UTM Zone 18, 5031520N, 403090E
LAT. 45° 25' 57"N, LONG. 76° 14' 20"W
Lot 20 (E 1/2), Con. 7

ACCESS: The deposit is approximately 5 miles east of the town of Arnprior and one mile southeast of the Kingdon Mine. It is 45m (150 feet) south of Fitzroy County Road 22, midway between Con. roads 7 and 8, northeast of the Village of Galetta.

SIZE AND GRADE: Galena mineralization is sparse and occurs erratically in a calcite vein system 76 metres (250 feet) long and up to 2 metres (6 feet) in width. A trench 60 metres (200 feet) long, 3 metres (10 feet) wide, and 2 metres (6 feet) deep, and five small pits expose the vein system. A water-filled shaft of unknown depth is also present on the property (Figure 9A).

DESCRIPTION: GENERAL GEOLOGY: The deposit consists of a galena-bearing calcite vein striking at 50° that cuts a coarse-grained, white to grey calcitic marble. The vein has been traced for over 76 metres (250 feet). The mineralization is sparse and very erratic in distribution and consists of coarse grains of galena and occasional sphalerite in the vein material.

DISCUSSION: This deposit is similar to the other deposits in this group in the study area and to other vein lead deposits close to the Paleozoic margin of the Late Precambrian basement rocks. This deposit appears to be relatively small but available records indicate that it has not been adequately investigated. A discussion of the genesis of this deposit type is contained in the introductory section to this report. The most significant features of rock associations and ore localization are outlined below:

- deposits occur close to the Late Precambrian-Paleozoic unconformity
- mineralization occurs in fracture filling veins with a general northwesterly trend, which appear to be related to the development of the Ottawa Graben
- the widest and best mineralized veins occur as fracture fillings in marbles. The width may be the result of a competency difference between the host rock units during faulting. Deposition of mineralization in the marbles may be the result of their chemical reactivity
- mineralization appears to be restricted to areas where basal Paleozoic sandstone forms the unconformity with basement. With an impermeable carbonate caprock these may have acted as aquifers for groundwater flow and a source for metal

A combination of the factors would appear to present a well defined exploration target for this deposit type in an area with abundant fracturing and favourable host units. While they may not be expected to be of very large extent they must be considered economically significant.

DEVELOPMENT HISTORY: 1948-1949: surface work by Stanton Lead Mines, Ltd.

REFERENCE MAP: GSC 1363A, Arnprior

REFERENCES:

Ells, R. W.
1904: Geology of a Portion of Eastern Ontario; Geological Survey of Canada, Annual Report, Vol. 14, 1901, part J, p.68

Source Mineral Deposit Record (Stanton Lead), Geoscience Data Centre, Ontario Geological Survey, Toronto.

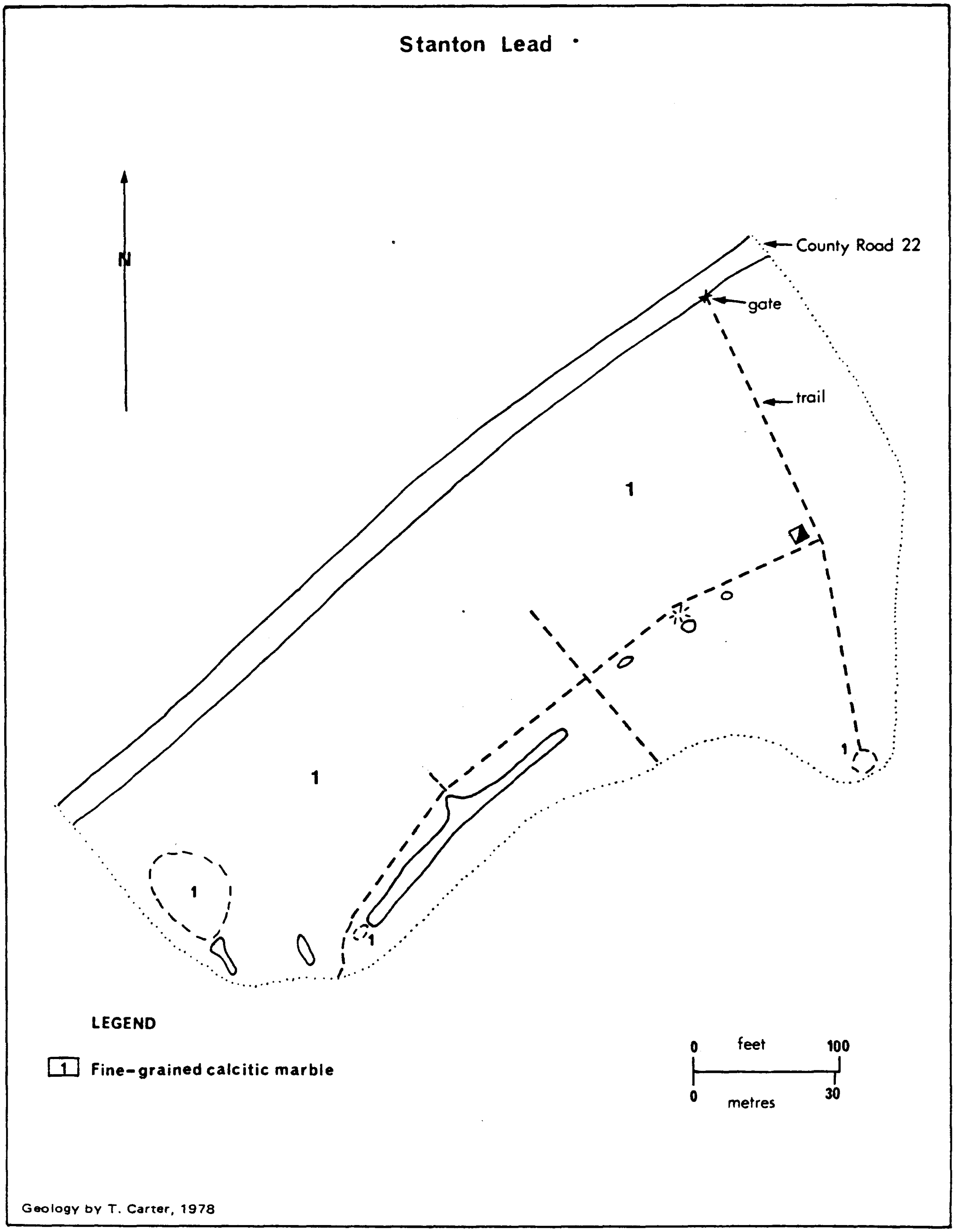

Figure 9A — Geology and workings of the Stanton lead deposit.

10. PHAROAH

COMMODITY: Zinc

ROCK ASSOCIATION: Dolomitic Marble

CLASSIFICATION: 1A. Stratiform, carbonate hosted, zinc

LOCATION: Lanark Township, Lanark County
NTS 31F/1, UTM Zone 18, 4997215N, 384245E
LAT. 45° 07' 15"N, LONG. 76° 28' 18"W
Con. 4, Lot 25, W½

ACCESS: The occurrence is located approximately 1 mile east of Highway 511 at Brightside, on the Farm of Norval Wilson. The property is accessible via a gravel road past Andersons Rapids and a farm road.

SIZE AND GRADE: The mineralization consists of very narrow layers and lenses of fine-grained sphalerite within a dolomitic marble. The one exposed zone of mineralization is 1 to 2 metres wide and up to 15 metres in length; a second zone exposed during exploration is reported to have been slightly larger. Diamond drilling indicated that neither zone has continuity laterally or at depth. A selected sample of mineralization collected by the author contained 5.5 percent Zn, 11 ppm Pb, and less than 3 ppm Ag.

DESCRIPTION: GENERAL GEOLOGY: The rocks in the vicinity of the Pharoah zinc deposit consist of interbedded calcitic and dolomitic marbles that strike northeast and dip moderately to the southeast. The marbles are intruded by conformable sills of diorite and "granite". The calcitic marble is usually well-layered and contains disseminated fine grains of muscovite. The dolomitic marble is more massive and contains some narrow calcitic interbeds.

The granite is fine to coarse-grained, pink rock composed of potassic feldspar, quartz, plagioclase and biotite. The diorite is a medium to coarse-grained black rock composed of plagioclase and hornblende.

The mineralization is contained in the dolomitic marble and consists of locally numerous thin (1-10 mm) contorted, discontinuous layers and lenses of very fine-grained sphalerite. At least two such zones are present but only one is exposed. At this location the mineralized zone is 1 to 2 metres wide and possibly 15 metres in length.

DISCUSSION: The form and rock association of this deposit are similar to the Renprior zinc deposit, suggesting a similar origin as a syngenetic stratiform, carbonate hosted deposit. This deposit probably has been adequately investigated to determine its significance. It is located on the western edge of a wide belt of similar carbonate rocks, a suitable environment for additional deposits of this type.

DEVELOPMENT HISTORY: 1975: Discovery by H. Pharoah

1975-1977: Property optioned by Selco Mining Corp. Ltd. Geological Mapping, Soil and Stream Sediment, Geochemical survey performed, 19 dd. holes totalling 1187.5m (3896 feet). Option dropped.

REFERENCE MAP: GSC 1362A, Carleton Place, 1973.

REFERENCES:

Sinclair, I.G.L.
in press: Geochemical Investigation of the Clyde River Zinc Prospect, Lanark County, Ontario; Journal of Geochemical Exploration.

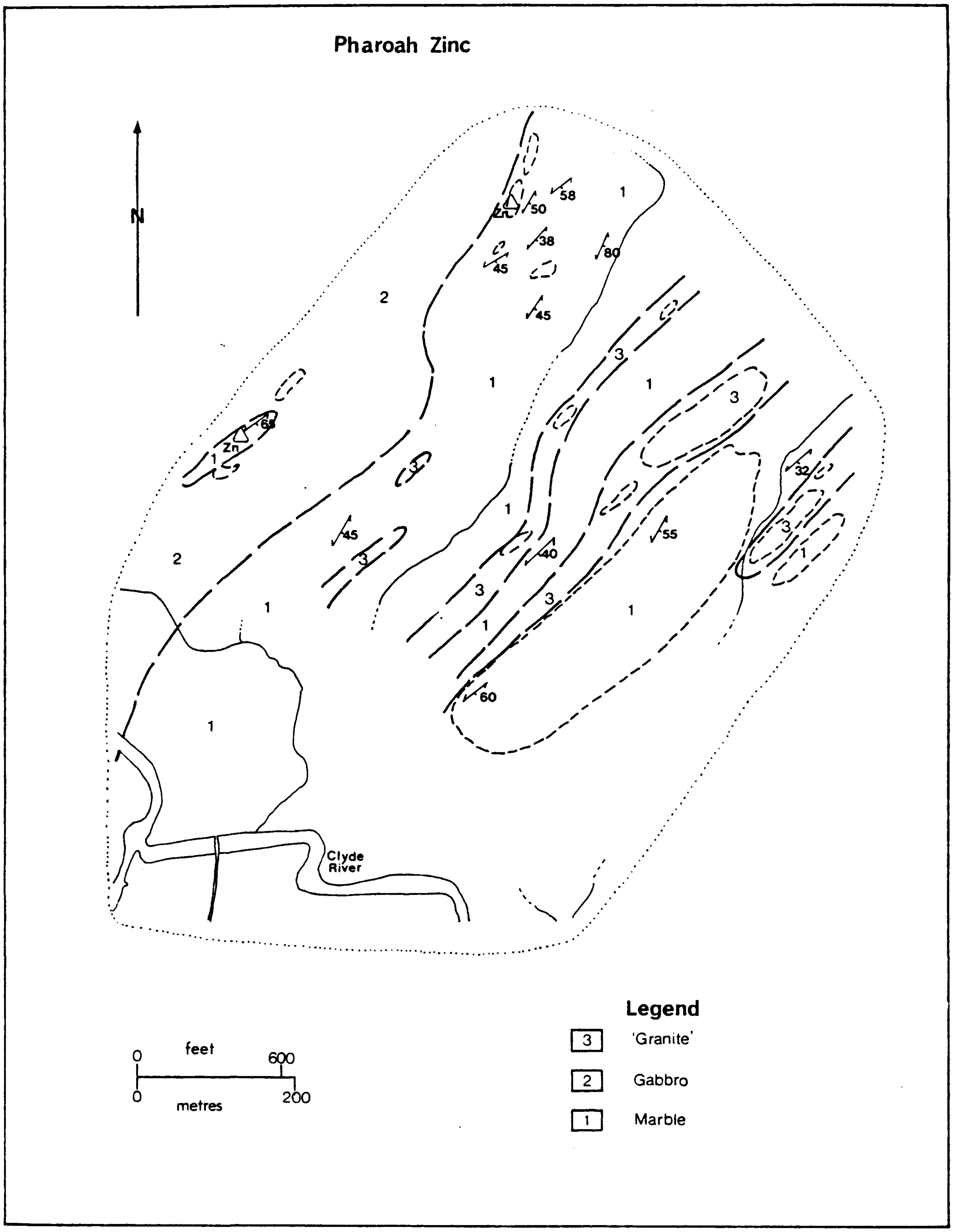

Figure 10A — Geology of the Pharoah zinc deposit. Adapted from a map prepared by Grenville Minisyndicate for Selco Mining Corp. (1975).

11. BEGIN

COMMODITY — MAIN: Copper
OTHER: Silver, antimony, bismuth

ROCK ASSOCIATION — HOST: Dolomitic marble
OTHER: Mafic volcanics, calcitic marble

CLASSIFICATION — 2A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag deposit

LOCATION — Lavant Township, Lanark County
NTS 31F/2, UTM Zone 18, 4991615 N, 370590 E
LAT. 45° 04' 05" N., LONG. 76° 38' 38" W.
Con. 7, Lot 5

ACCESS — Access is via a gravel road through the settlement of Lavant on Robertson Lake. The deposit is 60 metres north of the road on the grounds of a township garbage dump, 1 km north-east of Lavant.

SIZE AND GRADE — Mineralization consists of disseminated sulfides in a zone about 1 metre in width and at least 17 metres in length and is exposed by a trench 3 metres wide, 17 metres long, and about 2 metres deep. Assay results for several samples collected by the writer are presented in Table 11A. Cu-7-4 is a chip sample of the best mineralization at the deposit, 78TC62 is a sample of unmineralized marble cut by quartz veins, and the rest of the analyses are of selected samples of typical mineralization.

	Cu-7-4	78TC62	78TC211	78TC212	78TC213	78TC215
Cu	1.99%	54	2.46%	50	1.28%	2.10%
Sb	0.72%	-	91.5	74.4	25.4	25.0
Au	720 ppb	-	20 ppb	10 ppb	10 ppb	20 ppb
Ag	235	-	8	3	3	18
Zn	-	8	64	29	16	16
Pb	-	29	-	-	-	-
Ba	-	430	-	-	-	-
Bi	190	-	120	-	-	-
Hg	2.0	-	<20	-	-	-
As	-	-	12	-	-	-

TABLE 11A: Assays of selected samples from the Begin deposit. (in ppm unless indicated otherwise).

DESCRIPTION — GENERAL GEOLOGY: The Begin deposit is hosted by dolomitic marble within a thick (600 m) unit of intercalated calcitic and dolomitic marbles. The marble unit is bounded to the west by mafic volcanics and to the east by a large, intermediate-to-mafic, igneous intrusive complex. The rock units all strike northerly and dip moderately (60°-70°) to the east.

The host rock of the mineralized zone is a well-layered, very fine-grained, light-to-dark grey, dolomitic marble. The trench exposes a conformable siliceous zone within the marble which contains the mineralization and is gradational into the marble. Fine-grained white quartz is common in the zone and, in some places, acts as a cement to angular fragments of marble. The fragments are usually bleached and often are stained pink.

MINERALIZATION: Mineralization consists of abundant, erratically disseminated coarse-grained blebs of chalcopyrite and less abundant tetrahedrite, bornite, and disseminated fine-grained pyrite. The sulfides are contained within a narrow quartz-rich siliceous zone within the marble which appears to represent a zone of silicification. Quartz and some coarse-grained dolomite occupy fractures in the marble adjacent to this zone. Additional sulfides are contained in quartz veins which cut across the silicified marble. There are some small rings lined with terminated quartz crystals in some of the quartz veins.

MICROSCOPY: One thin section (Cu-7-1) and three polished thin sections (78TC147, Cu-7-2, 7-3) were prepared from samples of mineralized, silicified dolomitic marble collected by the writer. One thin section (78TC62) was prepared from a sample of a siliceous interbed within the marble. The four sections of silicified marble are composed of quartz and carbonate with minor biotite, muscovite, plagioclase, and opaque minerals (Table 11B). Opaque minerals present, in order of abundance, are chalcopyrite, pyrite, bornite, and tetrahedrite. Section 78TC62 is composed essentially of plagioclase and sericite with minor quartz and carbonate (Table 11B).

Two of the sections (Cu-7-1, and Cu-7-2) are breccias consisting of somewhat angular 'clasts' of very fine-grained (0.1 mm) carbonate, containing minor biotite, set in a matrix of fine to medium-grained quartz with variable amounts of biotite, muscovite, plagioclase, and sulfides. The marble clasts are sometimes cut by narrow veinlets of very fine-grained quartz. Section Cu-7-3 is composed of a massive mosaic of medium-grained quartz with small areas of intergrown quartz and carbonate. Section 78TC147 consists of a massive, granoblastic intergrowth of fine-grained carbonate cut by a vein of coarse-grained quartz and minor dolomite. The vein has sharp but irregular walls and appears to be replacing the marble.

Section 78TC62 is essentially composed of a pilotaxitic intergrowth of fine-grained plagioclase. The plagioclase is extensively altered to sericite. There are a few irregular inclusions of quartz-carbonate intergrowths.

Chalcopyrite is the most abundant opaque mineral in the sections and forms large, irregular grains, intergrown with bornite and tetrahedrite. It also occurs as fine veins filling fractures in shattered pyrite grains, and as exsolved laths within bornite. Pyrite occurs as scattered small, euhedral crystals within the quartz-rich portions of the sections. Bornite occurs as large, irregular grains but more commonly as intergrowths with chalcopyrite on the edges of large grains. Tetrahedrite often forms intergrowths with the bornite and tetrahedrite in the same manner.

	Cu-7-1	Cu-7-2	Cu-7-3	78TC62	78TC147
carbonate	50	45	10	2-3	45-50
quartz	50	30-35	80	7-8	55-60
plagioclase	-	3-4	-	70	
opaques	-	10	10		minor
biotite	-	7-8	-		
muscovite	-	3-4	minor	20	

TABLE 11B: Estimated modal compositions (in percent) of some thin sections of selected rock types.

DISCUSSION: This deposit is one of a series of nine similar deposits that extend for 19 km (12 miles) along strike within a narrow, north to northeast trending belt of intercalated marble and mafic volcanics. The mineralization at all the deposits is similar and is usually associated with irregular, stratiform pods, lenses, and layers of coarse-grained quartz and white dolomite and related cross-cutting veins of quartz and dolomite within dolomitic marble.

The metals were probably deposited as primary constituents of the dolomitic marble in a subaqueous carbonate depositional environment. The metals may have been introduced into this environment by hot spring activity related to synchronous volcanism. Subsequent diagenesis and metamorphism of the marble and local solution and remobilization of dolomite, quartz, and associated mineralization resulted in the present morphology of the deposits.

DEVELOPMENT HISTORY 1975: Geological mapping, geochemical sampling by Lynx-Canada Explorations Ltd.

MAP REFERENCE	OCM 1956-4, Clarendon-Dalhousie-Darling Area, 1958
REFERENCES	Assessment Files Research Office, Ontario Geological Survey, Toronto, Technical File No. 2-2047, 2-2022.

12. CLYDE FORKS

COMMODITY: MAIN: Copper, antimony, silver
OTHER: Mercury

ROCK ASSOCIATION: HOST: Calcitic marble
OTHER: sandstone

CLASSIFICATION: 2B. Stratiform, carbonate-hosted, Cu-Sb-Ag-Hg

LOCATION: Lavant Township, Lanark County
NTS 31F/2, UTM Zone 18, 4997975N, 364205E
LAT. 45^{o} 07' 27"N, LONG. 76^{o} 43' 36"W.
Con. 8, Lot 20-21

ACCESS: The deposit is accessible via a series of gravel and dirt bush roads west of the settlement of Clyde Forks. A road log follows. 0.0mr.-lumber yard at Clyde Forks, proceed southwest.

0.7 -junction, turn right
0.85 -junction, turn left onto MNR forest access road.
2.8 -junction, keep left.
3.1 -junction, turn right on lumber road.
3.7 -turn left into clearing, follow overgrown bush road.
4.0 -end of road. Adit 60m. straight ahead.

SIZE & GRADE: Disseminated tetrahodrite, chalcopyrite, pyrite, and barite occur in a Lens 91m (300 feet) long, 1.6m (5.2 feet) wide, and persistent to a depth of at least 152m (500 feet) as proven by diamond drilling. Reserves in this body are estimated to be 60,000 tons grading 0.67 percent Cu, 0.37 percent Sb, 0.03 percent Hg, and 1.32 oz/ton Ag.

The mineralization is exposed by a small pit and an adit in a large bull-dozed clearing. The pit is 5 metres square and 3 metres deep, and the adit extends 30 metres into a hillside, with two short cross-cuts.

There are also several small test pits above the adit on top of the hill. Two samples collected from the pit in the clearing gave the following assay results:

Cu-8-1 - 1.04 percent Cu, 1100 ppm. Sb, 380 ppm Hg, 20 ppm Bi, and 0.32 oz /ton Ag.

Cu-8-2 - 0.82 percent Cu, 0.53 percent Sb, 830 ppm Hg, 20 ppm Bi, and 2.96 oz/ton Ag. Both samples contained trace amounts of gold.

DESCRIPTION: GENERAL GEOLOGY: The following description is taken mainly from Nikols (1972).

Regionally the major rock types of the area include marble, amphibolite, quartz-biotite gneiss, siliceous marble, and pegmatite folded into assymetrical, cylindrical folds trending N55°E, plunging at 20° to the northeast, and with axial surfaces that dip at 40 degrees to the southeast. The folding is weak and is superimposed on a succession of beds which dip homoclinally to the northeast over much of the area. Faults in the area generally trend northeast, parallel to the regional strike.

In the vicinity of the Clyde Forks deposit (Fig. 12A) the main rock type is a calcitic marble, with intercalated beds of dolomitic mudstone (dolomite-biotite paragneiss) and feldspathic sandstone-siltstone (biotite-quartz-feldspar paragneiss), and cross-cutting dikes of tourmaline-bearing white pegmatite. The stratified rocks have been folded into a minor antiform striking N40°E and plunging at 32°, as measured in the adit.

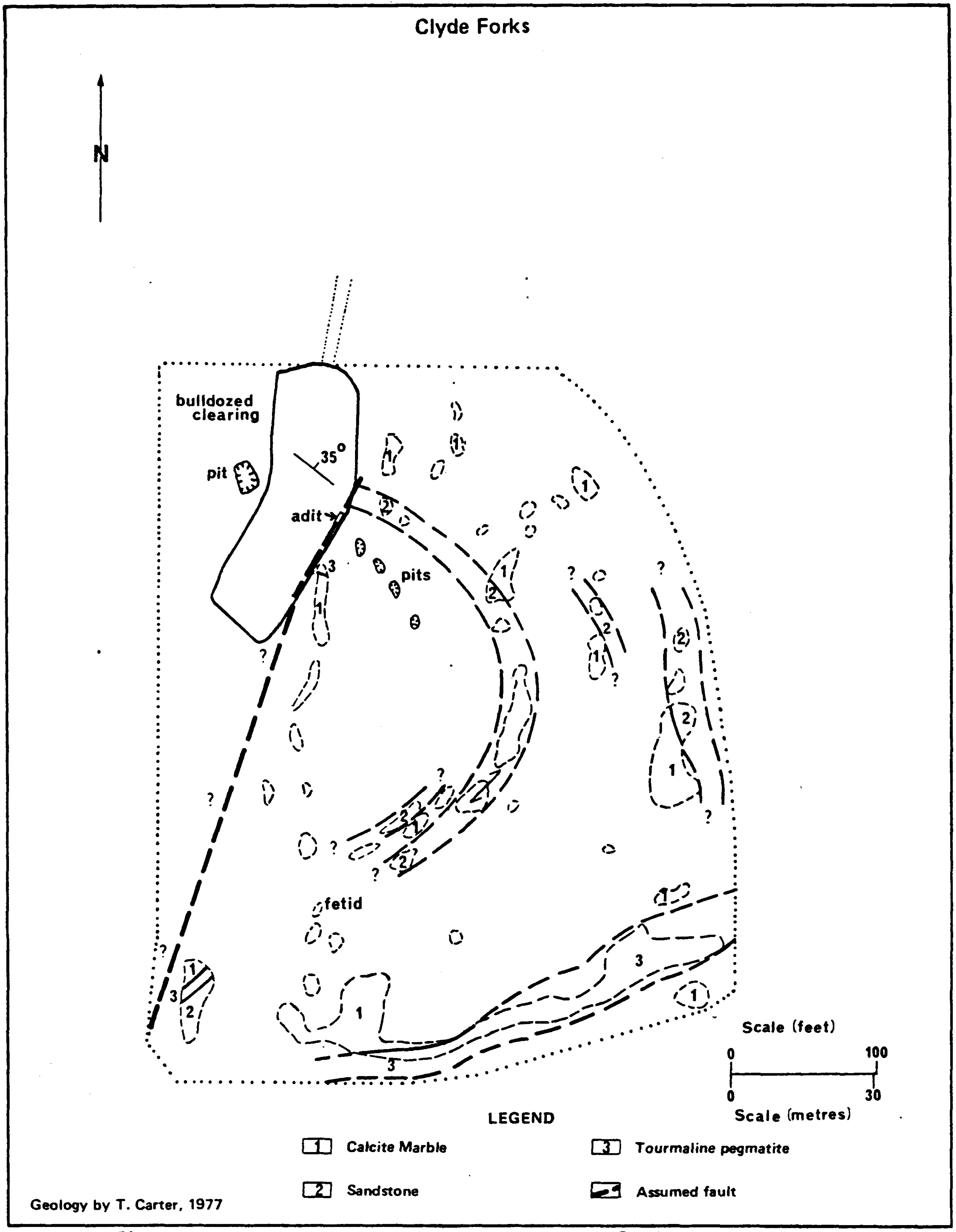

Figure 12A- Detailed geology of the Clyde Forks Cu-Sb-Hg-Ag occurrence.

The marble is white to pink, medium-grained and well-layered; it weathers to a dull brownish-white colour and is very friable. It is composed of calcite with small patches of rusty yellow carbonate and contains abundant biotite and coarse silvery muscovite.

The sandstone is a fine-grained, well foliated and composed of quartz, feldspar and biotite. The dolomitic mudstone is fine-grained and and both form fine interlayers within the marble composed of variable amounts of biotite and dolomite.

The pegmatite is white, massive, coarse-grained and is composed of feldspar (50-60%), quartz (40%) and tourmaline; it forms a large mass just south of the adit, and several small dikes.

MINERALIZATION: The mineralized zone is a conformable layer, within the marble, averaging 1.6 metres in thickness, 91 metres in length and has a down-dip extension of at least 152 metres. The mineralization consists of mercurian tetrahedrite, stibnite, chalcopyrite, arsenopyrite, chalcostibite, getchellite, cinnabar, and pyrite, in association with barite (Nikols, 1972). The authors found barite, tetrahedrite, chalocopyrite, and pyrite to be the most common.

The mineralization is very erratically distributed within the zone. In the pit opposite the adit, a layer of massive banite disseminated tetrahedrite, 1 metre thick is exposed. Within the adit, 20 metres away, the sulfides and sulfosalts occur in nodular segregations and disseminations along bedding plane shears in the marble and are accompanied by small, irregular masses of barite.

Tests run by the Geological Survey of Canada indicate that the mercury in the deposit occurs mainly in the tetrahedrite (The Northern Mines, 1969) and microscope studies conducted by Nikols confirm this. Nikols observed cinnabar filling microscopic fractures in the tetrahedrite. Tests conducted on pure tetrahedrite by the Geological Survey of Canada in Ottawa gave assays of 37 percent Cu, 21 percent Sb, 4 percent Hg and 89 oz/ton Ag. (Northern Miner, 1969).

MICROSCOPY: Two polished thin sections were prepared from samples of mineralized, barite-rich marble. The sections are composed of a massive, medium-to-coarse-grained (0.8mm to 25mm) mosaic of anhedral carbonate and barite grains (Table 12A). Chalcopyrite, tetrahedrite, pyrite, and assenopyrite, in order of abundance, occur in association with the barite. Quartz and biotite occur as accessories in both section; euhedral grains of tremolite-actinolite and large, ragged grains of diopside are common in section Cu-8-6. The diopside is largely altered to sericite.

The chalcopyrite and tetahedrite are dispersed throughout the section as medium-grained, irregular, anhedral grains frequently intergrown with each other. The tetrahedrite also occurs as small grains within carbonate and the chalcopyrite occasionally as fine blebs within gangue minerals, principally diopside grains.

Pyrite forms medium-grained, anhedral-to-subhedral grains, in places associated with the tetrahedrite and chalcopyrite. They may contain inclusions of tetrahedrite and gangue minerals. Arsenopyrite is present only in section Cu-8-6 and occurs as abundant blebs within a single chalcopyrite grain.

	Cu-8-4	Cu-8-6
Carbonate	50 - 60%	50%
Barite	40%	25%
Tremolite-actinolite		10%
Diopside		10%
Sericite		3 - 5%
Biotite	2 - 3%	4 - 5%
Opaques	3 - 4%	2 - 3%
Quartz	2 - 3%	

Table 12A: Estimated modal compositions of samples of mineralized, barite-bearing marble.

Nikols (1972) examined several polished sections of mineralized marble from the deposit and noted the presence of tetrahedrite (var. schwazite) stibnite, chalcopyrite, and minor arsenopyrite, getchellite, and cinnabar.

DISCUSSION: The Clyde Forks deposit has similarities with the nine stratabound, carbonate hosted Cu-Sb-Au-Ag deposits of group 2A, but also significant differences. According to Nikols (1972, pg. 101) "The Clyde Forks Hg-Sb-Cu deposit is probably syngenetic. The mineralogy, size (as presently known), concordant nature, and limited stratigraphic thickness of the deposit indicate deposition from a thermal spring, or series of springs which discharged near the sea floor, in a thick limy mud which was undergoing diagenesis. "The observations made by the authors support this interpretation.

There is good potential for additional deposits of this type in the area. Anomalous concentrations of copper and mercury were revealed in soil geochemical surveys conducted by West Branch Explorations within a half-mile radius of the deposit, but they were never examined in detail.

DEVELOPMENT HISTORY

1918-1919: Stripping of the barite vein, some test pitting. One ton barite, sent to U.S. Work by T.B. Caldwell.

1957-1960: Magnetic and S.P. surveys, soil sampling and 773' of d.d. in 4 holes by Lanark Silver Mines Ltd.

1964-1968: Regional soil and stream geochemical surveys, 30 d.d. holes totalling 3921 feet, surface stripping and a short adit (98 feet) with two small cross-cuts. Work by West Branch Exploration: Ltd.

1969-1970: Geochem surveys, at least 24 d.d. holes for 5,347 feet, geol. survey and some metallurgical testing by Carndesson Mines Ltd.

REFERENCE MAP: ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958.

REFERENCES

Assessment Files Research Office, Technical File 63.1061, Diamond drill record 11, 12; Ontario Geological Survey, Toronto.

Nickols, C.A.
1972: Geology of the Clyde Forks Mercury - Antimony - Copper Deposit and surrounding area, Lanark County, Ontario; unpubl. M.Sc. thesis, Queen's University, Kingston, Ontario.

Shklanka, R.
1969: Copper, Nickel, Lead, and Zinc Deposits of Ontario; Ontario Department of Mines, Mineral Resources Circular, No. 12, p. 195.

Source Mineral Deposit Record (Clyde Fork), Geoscience Data Centre, Ontario Geological Survey, Toronto.

The Northern Miner, published by Northern Miner Press, Toronto, Vol. 53, No. 7, Dec. 7, 1967, p. 1,5, Vol. 55, No. 40, Dec. 25, 1969, Vol. 55, No. 40, Feb. 5, 1970,p.1(Vol. 56, No. 2, Apr. 2, 1970, p. 17.

13. JOES LAKE

COMMODITY	MAIN: Gold, copper, silver, antimony OTHER: Bismuth, mercury, arsenic, zinc
ROCK ASSOCIATION	HOST: Dolomitic marble OTHER: Mafic volcanics
CLASSIFICATION	2A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag
LOCATION	Lavant Township, Lanark County NTS 31F/2, UTM Zone 18, 4997840N, 371880E LAT. 45° 07' 28" N; LONG. 76° 37' 44" W. Con. 4, Lot 12
ACCESS	The deposit is located about 45 m (150 feet) west of a gravel road at a point 1.1 km (0.7 miles) south of a bridge over the Clyde River at Joes Lake, and 90 metres (300 feet) southeast of the Lavant Township firehall.

SIZE AND GRADE

Mineralization consists of disseminated tetrahedrite and chalcopyrite in a zone of unknown dimensions. The main zone is a narrow, very high-grade lens 15 cm. wide and of unknown length, and disseminated mineralization is known to occur over at least 60 m (200 feet) with a width of two to three metres. The mineralization is exposed in a road-cut and in an overgrown, partially filled pit 50 m (160 feet) southwest of the road-cut.

Two diamond drill holes completed by Selco Mining Corp. intersected minor mineralization. Hole JL-3 contained 0.01 oz. Au/ton over 4 feet, 0.02 oz/ton over 2 feet, and 0.01 oz/ton over 5 feet. Hole JL-1 intersected a layer of massive pyrite 1.5 feet thick whic contained 5280 ppm Cu, 5160 ppb Au, 1919 ppm Sb, and 475 ppm Hg (Assessment Files). Several selected samples of mineralization were collected by the author and the results are presented in Table 13A. Sample 78TC227 is a grab sample from the main mineralized lens, 78TC37 is unmineralized marble, and the rest are selected samples of disseminated mineralization.

	78TC37	78TC146	78TC226	78TC227	78TC228
Ag	-	42	3	68	26
Au	-	4800 ppb	250 ppb	15100 ppb	4400 ppb
Cu	173	6160	740	2.46%	4950
Sb	-	2500	360	5800	1640
Zn	24	470	68	1640	300
Pb	<10	<10	-	-	-
Hg	-	-	120	3600	-
Bi	-	-	35.0	360	-
As	-	-	78	2300	-

TABLE 13A: Assays of selected samples of mineralization. (in ppm unless otherwise indicated)

DESCRIPTION

GENERAL GEOLOGY: The Joes Lake deposit occurs in dolomitic marble within a thick (600 m) unit of intercalated dolomitic and calcitic marble. The marble unit is bounded to the west by mafic volcanics and to the east by a large, intermediate-to-mafic igneous intrusive complex.

The host rock of the mineralization is a well-layered, very fine-grained, dark grey dolomitic marble. The carbonate unit contains abundant layers, pods, and lenses of coarse-grained white dolomite and is cut by numerous narrow veinlets of white quartz and occasional dolomite which occupy fractures and joint planes.

MINERALIZATION: Mineralization consists of blebs and streaks of tetrahedrite, chalcopyrite, and secondary malachite and azurite which are erratically disseminated within the layers, pods, and lenses of white dolomite in the marble. The main

mineralized zone consists of an irregular, poorly defined layer of this dolomite, 15 cm. wide, containing up to 10 % disseminated sulfides. There are also erratic amounts of disseminated sulfides contained in some of the cross-cutting veins of quartz and dolomite.

MICROSCOPY: One thin section was prepared from a sample of dolometic marble collected by the writer. The section consists essentially of a well-layered intergrowth of very fine-grained to medium-grained carbonate and minor amounts of quartz and opaque minerals. The layers are usually only a few millimetres thick, defined by variable grain sizes of carbonate, and some of the coarser-grained layers contain porphyroblastic aggregates of carbonate which displace the surrounding layers. The quartz and carbonate are usually associated with the coarser-grained layers. A single narrow vein of polygonized quartz and minor carbonate cuts across the section at a moderate angle to the layering.

DISCUSSION: This deposit is one of a series of nine similar deposits that extend for 19 km. (12 inches) along strike within a narrow, north to northeast trending belt of intercalated marble and mafic volcanics. The mineralization of all the deposits is similar and is usually associated with irregular, stratiform pods, lenses, and layers of coarse-grained quartz and white dolomite and related cross-cutting veins of quartz and dolomite within dolomitic marble.

The mode of genesis of mineralization is uncertain but the metals probably were deposited as primary constituents of the dolomitic marble in a subaqueous carbonate depositional environment. The metals may have been supplied by simultaneous volcanic activity Subsequent diagenesis and metamorphism of the marble and local solution and remobilization of dolomite, quartz, and associated mineralization resulted in the present morphology of the deposits. Additional laboratory studies of these deposits are underway.

DEVELOPMENT HISTORY	1978: Two diamond drill holes totalling 229 feet in length completed by Selco Mining Corporation Ltd.
REFERENCE MAP	ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958.
REFERENCES	Assessment Files Research Office (Diamond drill file 13), Ontario Geological Survey, Toronto.

14. LAVANT

COMMODITY	MAIN: Copper, antimony OTHER: Gold, silver, zinc
ROCK ASSOCIATION	HOST: Dolomitic marble OTHER: Mafic volcanics
CLASSIFICATION	2A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag
LOCATION	Lavant Township, Lanark County NTS 31F/2, UTM Zone 18, 4991450 N, 370680 E. LAT. 45° 04' 00" N, LONG. 76° 38' 33" W. Con. 7, Lot 5.
ACCESS	The Lavant deposit is located about 1 km (0.6 miles) northeast of Robertson Lake in an outcrop on a power line clearing 106 metres southeast of a gravel road.
SIZE AND GRADE	Mineralization consists of scattered grains of tetrahedrite and minor bornite contained within a network of narrow quartz veinlets in a zone up to 6 metres wide and 10 to 20 metres long. The mineralization is very erratic within this zone. A grab sample taken from a mineralized veinlet contained 85 ppm Ag, 2200 ppb Au, 2.58 % Cu, 1.3 % Sb, 1270 ppm Zn, and 51 ppm Pb, but is not representative of the zone. A sample of an unmineralized quartz vein contained 3 ppm Ag, 10 ppb Au, 20 ppm Cu, 4.7 ppm Sb, and 20 ppm Zn.

DESCRIPTION

GENERAL GEOLOGY: The Lavant deposit occurs in dolomitic marble within a wide (950 m) unit of intercalated calatic and dolomitic marble, bounded to the east by an intermedicate-to-mafic igneous intrusive complex and to the west by mafic volcanics. The rock units generally strike north-south and dip moderately (50° to 70°) to the east.

The host rock of the mineralized zone is a very fine-grained, massive, light-to-dark grey, dolomitic marble. It contains abundant narrow (3-5 mm), cross-cutting veinlets of white quartz which occupy fractures and joint planes in the marble. The veins are very irregular but the majority occupy joint planes that strike at 184° and dip at 52° to the west.

MINERALIZATION: Mineralization consists of sparse, erratically distributed grains of tetrahedrite and occasional bornite contained within the quartz veinlets or within the marble along the margins of the veins.

MICROSCOPY: One thin section (78TC87) and one polished thin section (78TC86) were prepared from samples of dolomitic marble collected by the writer. Both sections consist essentially of a massive, granoblastic intergrowth of very fine-grained (0.05-0.1 mm) carbonate which contains abundant very fine grains of opaque minerals which are probably graphite. Section 78TC87 is cut by two veins of coarse-grained, strained quartz that intersect each other at right angles. Section 78TC86 is cut by a vein of tetrahedrite, malachite, and minor quartz. The malachite forms alteration rims around the tetrahedrite grains. There are also small grains of chalcopyrite and bornite in the vein associated with the tetrahedrite, and several small isolated grains of pyrite.

DISCUSSION: This deposit is one of a series of nine similar deposits that extend for 19 km (12 miles) along strike within a narrow, north to northeast trending belt of intercalated marble and mafic volcanics. The mineralization at all the deposits is similar and is usually associated with irregular, stratiform pods, lenses, and layers of coarse-grained quartz and white dolomite and related cross-cutting veins of quartz and dolomite within dolomitic marble.

The metals were probably deposited as primary constituents of the dolomitic marble in a subaqueous carbonate depositional environment. The metals may have been introduced into this environment by hot spring activity related to synchronous volcanism. Subsequent diagenesis and metamorphism of the marble and local solution and remobilization of dolomite, quartz, and associated

	mineralization resulted in the present morphology of the deposits.
DEVELOPMENT HISTORY	1975: Geological mapping by Lynx-Canada Explorations Ltd.
REFERENCE MAP	ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958
REFERENCES	Assessment Files Research Office, Ontario Geological Survey, Toronto, Technical File No. 2-2022.

15. LAVANT CREEK

COMMODITY — MAIN: Copper

ROCK ASSOCIATION — HOST: Silicified dolomitic marble
OTHER: Granite, mafic volcanics

CLASSIFICATION — 2A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag

LOCATION — Lavant Township, Lanark County
NTS 31F/2, UTM Zone 18, 4996670 N, 370740E
LAT. 45° 06' 49" N, LONG. 76° 38' 36" W.
Con. 5, Lot 12.

ACCESS — The deposit is accessible only by foot from a point about 90 m (300 feet) south of the Lavant Township firehall, 1.1 km (0.7 miles) south of the bridge over the Clyde River at Joes Lake along a gravel road. The deposit is located on the side of a steep ridge 1600 metres (5400 feet) at a bearing of 217° from this point.

SIZE AND GRADE — Disseminated chalcopyrite is present in a zone estimated to be 1 to 3 metres wide and 15 to 30 metres in length exposed by a few small pits and a blasted area on the east side of a steep ridge. Several samples of mineralized rock were collected by the writer and assay results on some of these are presented in TABLE 15A. Sample 78TC150 is granite about 18 m (60 feet) west of the deposit, the rest are composite samples of mineralized rock.

	Cu-36-1	78TC29	78TC148	78TC150
Cu	1.90%	2600	9140	128
Sb	<100	1.8	6.5	0.8
Au	-	< 10 ppb	20 ppb	-
Ag	-	< 3	<3	-
Zn	-	9	8	96
Pb	-	<10	<10	-
Bi	< 30	-	-	-
Hg	<40 ppb	-	-	-
Mn	650	-	-	-

TABLE 15A: Assays of selected rock samples.
(in ppm unless otherwise indcated)

DESCRIPTION — GENERAL GEOLOGY: The Lavant Creek deposit is contained within a very narrow (20-30 m) unit of dolomitic marble on the western edge of an intercalated succession of marble and mafic volcanics. The host marble unit is in contact with a conformable granitic intrusion to the west and mafic volcanics to the east. All the rock units strike northerly and dip moderately (65°) to the east.

The host rock to the mineralization is a very fine-grained, white dolomitic marble which contains abundant quartz. The rock is cut by a dense criss-cross network of very narrow quartz veins containing abundant, very fine-grained chalcopyrite, and minor pyrite.

MICROSCOPY: Two polished thin sections were prepared from samples of the mineralized marble. Both sections are composed of massive intergrowths of very fine-grained (0.1 mm) carbonate and polygonized quartz (see Table 15B) cut by a network of very narrow (0.3 mm) quartz veinlets which contain abundant intergranular, anhedral grains of chalcopyrite and minor pyrite. The veins are clearly defined with somewhat gradational contacts and the sulfide content is about 30 percent. The chalcopyrite and pyrite grains are often rimmed with hematite.

	Cu-36-2	78TC149
carbonate	55 - 60	30 - 35
quartz	40 - 45	65 - 70
apaques	2	2 - 3

TABLE 15B: Estimated modal compositions (in percent) of two sections of mineralized marble.

DISCUSSION: This deposit is one of a series of nine similar deposits that extend for 19 km (12 miles) along strike within a narrow, north to northeast trending belt of intercalated marble and mafic volcanics. The mineralization at all the deposits is similar and is usually associated with irregular, stratiform pods, lenses, and layers of coarse-grained quartz and white dolomite and related cross-cutting veins of quartz and dolomite within dolomitic marble.

The metals were probably deposited as primary constituents of the dolomitic marble in subaqueous carbonate depositional environment. The metals may have been introduced into this environment by hot spring activity related to synchronous volcanism. Subsequent diagenesis and metamorphism of the marble and local solution and remobilization of dolomite, quartz, and associated mineralization resulted in the present morphology of the deposits.

DEVELOPMENT HISTORY

1957: 9 diamond drill holes totalling 1500 feet completed by A. F. Taylor. Only minor mineralization was observed in the drill case.

1975: Soil geochemical survey for Cu, Zn, Ag, Bi, As, and a geological map completed by Lynx-Canada Explorations Ltd. Inconclusive results.

1978: One diamond drill hole 177 feet in length completed by Selco Mining Corporation Ltd. No mineralization observed in core.

REFERENCE MAP

ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958.

REFERENCES

Assessment Files Research Office
Ontario Geological Survey, Toronto, Technical Files No. 63-3383, 2-2047, Diamond drill record no. 10, 13.

16. LYNX-CANADA

COMMODITY

MAIN: Copper
OTHER: Silver

ROCK ASSOCIATION

HOST: Dolomitic marble
OTHER: Mafic volcanics

CLASSIFICATION

2A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag

LOCATION

Lavant Township, Lanark County
NTS 31F/2, UTM Zone 18, 4991360N, 370780E.
LAT. 45° 03' 57" N., LONG. 76° 38' 29" W.
Con. 7, Lot 5.

ACCESS

The deposit is located 1 km (0.6 miles) northeast of Robertson Lake, 300 metres (950 feet) southeast of a gravel road and 150 m (500 feet) southeast of a high-voltage power line.

SIZE AND GRADE

Mineralization consists of chalcopyrite, tetrahedrite, bornite, and secondary malachite heavily disseminated within a quartz vein up to 0.6 m (2 feet) wide exposed over a length of 3 metres (10 feet). There are two other quartz veins of similar size within a radius of 30 m (100 feet) but neither is mineralized. The mineralized vein has been blasted and the site is littered with broken rock.

The assay results for several rock samples collected at the site by the writer are presented in Table 16A. 78TC220 and 78TC222 are samples of the two unmineralized veins and the other four samples are selected samples from the mineralized vein.

	78TC116	78TC217	78TC218	78TC219	78TC220	78TC222
Cu	2.15%	1740	8850	3.88%	420	520
Sb	36.5	18.1	24.8	25.4	3.8	31.0
Au	<10 ppb	10 ppb	20 ppb	140 ppb	20 ppb	10 ppb
Ag	16	<3	6	30	<3	<3
Zn	< 5	<5	6	6	10	10
Pb	<10	-	-	-	-	-
Ba	880	-	-	-	-	-

TABLE 16A: Metal contents of selected rock samples from the Lynx-Canada deposit (in ppm unless otherwise indicated)

DESCRIPTION

GENERAL GEOLOGY: The Lynx-Canada deposit is hosted by dolomitic marble within a wide (950 m) unit of intercalated calcitic and dolomitic marble bounded to the west by mafic volcanics and to the east by an intermediate-to-mafic igneous intrusive complex. The rock units generally strike northerly and dip moderately (50° to 70°) to the east.

The host rock of the mineralized zone is a massive, very fine-grained, dark grey dolomitic marble. The marble is cut by three wide (0.6 m), discontinuous veins of white quartz within 30 metres (100 feet) of each other that strike at 40 degrees. The dip could not be determined. The veins contain numerous poorly-defined, partially absorbed fragments of dolomitic marble oriented parallel to the vein contacts that give a banded appearance to the veins. The veins contain numerous cavities lined with terminated quartz crystals that may be clear or coated with a gold-coloured tarnish. Hematite is also common as stains and coatings on the vein material and there are a few coarse grains of barite within the vein.

MINERALIZATION: Mineralization consists of coarse blebs of chalcopyrite, bornite, and minor tetrahedrite disseminated erratically through one of the quartz veins. The sulfides are commonly altered to malachite on weathered surfaces and there are some good radiating crystals of malachite in some of the cavities.

DISCUSSION: This deposit is one of a series of nine similar deposits that extend for 19 km (12 miles) along strike within a narrow, north to northeast trending belt of intercalated marble and mafic volcanics. The mineralization at all the deposits is similar and is usually associated with irregular, stratiform pods, lenses, and layers of coarse-grained quartz and white dolomite and related cross-cutting veins of quartz and dolomite within dolomitic marble.

The metals were probably deposited as primary constituents of the dolomitic marble in a subaqueous carbonate depositional environment. The metals may have introduced into this environment by hot spring activity related to synchronous volcanism. Subsequent diagenesis and metamorphism of the marble and local solution and remobilization of dolomite, quartz, and associated mineralization resulted in the present morphology of the deposits.

DEVELOPMENT HISTORY 1975: Geological mapping by Lynx-Canada Explorations Ltd.

REFERENCE MAP ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958

REFERENCES Assessment Files Research Office, Ontario Geological Survey, Toronto, Technical File No. 2-2022

17. NELSON LAKES

COMMODITY — MAIN: Copper

ROCK ASSOCIATION — HOST: Dolomitic marble
OTHER: Mafic volcanics

CLASSIFICATION — 2A. Stratabound, carbonate hosted, Cu-Sb-Au-Ag

LOCATION — Lavant Township, Lanark County
NTS 31F/2, UTM Zone 18, 4993460 N, 370300 E.
LAT. 45° 05' 05" N, LONG. 76° 38' 53" W.
Con. 7, Lot 8

ACCESS — The deposit is accessible via a farm road north from Robertson Lake to a point about half a mile southeast of Spectacle Lake.

SIZE AND GRADE — Disseminated chalcopyrite within dolomitic marble is exposed in a small pit measuring 1.8 X 2.4 metres and 3 metres deep. The mineralized zone does not appear to extend past the boundaries of the pit.

Assay results for several samples collected by the writer are presented in TABLE 17A. 78TC118 is a chip sample of unmineralized quartz veins, Cu-37-1 is a grab sample of well-mineralized marble from the workings, and 78TC207 and 209 are mineralized samples collected from the workings.

	Cu-37-1	78TC118	78TC207	78TC209
Cu	1.10%	64	6120	2860
Sb	<100	1.9	3.9	0.5
Au	-	<10 ppb	<10 ppb	<10 ppb
Ag	-	<3	<3	<3
Zn	-	14	119	11
Hg	< 40 ppb	-	20	-
Bi	30	-	18.8	-
As	-	-	2	-
Pb	-	22	-	-

TABLE 17A: Assays of selected rock samples from the Nelson Lakes deposit (in ppm unless otherwise indicated)

DESCRIPTION — GENERAL GEOLOGY: The Nelson Lakes deposit is located within a thick (300 m) unit of intercalated dolomotic and minor calcitic marble bounded to the east by mafic volcanics and to the west by a conformable intrusive granitic body. The rock units all strike northerly and dip moderately (45°) to the east.

The host rock is a massive, very fine-grained, dark grey dolomatic marble cut by numerous narrow (0.5 - 2 cm) veins of white quartz. There are also a few conformable lenses and layers of coarse-grained white dolomite and minor quartz within the marble.

MINERALIZATION: Mineralization consists of erratically scattered coarse blebs of chalcopyrite contained within a small pod of coarse-grained dolomite and minor quartz. The mineralized pod has been completely removed by the development work and samples are available only on an adjacent dump.

MICROSCOPY: One thin section was prepared from a sample of dolomitic marble cut by a zoned quartz vein. It is composed essentially of carbonate (60%) and quartz (40%), with almost all of the quartz occupying veins. The carbonate forms a very fine-grained (0.01 mm), granoblastic intergrowth with poorly developed layering defined by variable grain sizes of carbonate and minor amounts of disseminated fine-grained quartz.

A single wide (11 mm) zoned quartz vein and several smaller veins of quartz and minor carbonate cut the carbonate mosaic. The zoned vein has a coarse-grained core with quartz grains elongate

perpendicular to the walls of the vein, bounded by narrow zones of fine-grained, polygonized quartz. The other veins form offshoots from this vein.

DISCUSSION: This deposit is one of a series of nine similar deposits that extend for 19 km (12 miles) along strike within a narrow, north to northeast trending belt of intercalated marble and mafic volcanics. The mineralization at all the deposits is similar and is usually associated with irregular, stratiform pods, lenses, and layers of coarse-grained quartz and white dolomite and related cross-cutting veins of quartz and dolomite within dolomitic marble.

The metals were probably deposited as primary constituents of the dolomitic marble in a subaqueous carbonate depositional environment. The metals may have been introduced into this environment by hot spring activity related to synchronous volcanism. Subsequent diagenesis and metamorphism of the marble and local solution and remobilization of dolomite, quartz, and associated mineralization resulted in the present morphology of the deposits.

DEVELOPMENT HISTORY 1975: Completion of geochemical soil sampling program for Cu, Zn, Ag, Bi, As, and a geological mapping program by Lynx-Canada Explorations Ltd.

REFERENCE MAP ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958

REFERENCES

Assessment Files Research Office, Ontario Geological Survey, Toronto, Technical File No. 63-3383, 2-2047.

Smith, B. L.
1958: Geology of the Clarendon-Dalhousie Area; Ontario Department of Mines, Annual Report Vol. 65, part 7, 1956, p. 34-35.

18. ROBERTSON GOLD

COMMODITY	MAIN: Gold
ROCK ASSOCIATION	HOST: Dolomitic marble OTHER: Mafic volcanic
CLASSIFICATION	4B Stratabound, carbonate hosted, Au
LOCATION	Lavant Township, Lanark County NTS 31F/2, UTM Zone 18, 4989210 N, 369560 E. LAT. 45° 02' 47" N, LONG. 76° 39' 21" W. Con. 10, Lot 4 (E½)
ACCESS	The deposit is located 190 metres south of Robertson Lake, 365 metres west of a gravel road.
SIZE & GRADE	Disseminated pyrrhotite and pyrite are present within dolomitic marble near a contact with mafic volcanics in a zone up to 100 metres long and 3 to 6 metres wide. Numerous small pits and trenches are present along this zone. The best reported assay of mineralization is 0.11 oz/ton Au over 5.6 feet (Smith, 1956, pg. 41). A sample collected by the author contained 50 ppb Au.

DESCRIPTION

GENERAL GEOLOGY: The Robertson gold deposit is located within a narrow (60 m.) unit of dolomitic marble contained within a sequence of intercalated mafic volcanics and marbles. All work units strike north-south and dip moderately (40-50°) to the east. The mineralized zone lies within the dolomitic marble along its eastern contact with massive, amphibolitic, mafic volcanic. The dolomitic marble in this zone forms an aphanitic, massive, cream-coloured rock that is cut by a criss-cross network of veinlets and irregular pods of very fine-grained white quartz. This grades into a rock composed largely of plagioclase at the contact.

MINERALIZATION: The mineralization consists of disseminated grains of pyrite and pyrrhotite within the marble near the mafic volcanics.

MICROSCOPY: A polished thin section and a thin section were prepared from samples collected at the deposit. The polished thin section (Au-24-3) is from a sample of altered marble 1 metre from the mafic volcanic contact. It is composed of medium-grained, somewhat rounded and broken, euhedral plagioclase crystals set in a foliated matrix consisting of carbonate, sericite and minor pyrrhotite and pyrite. The plagioclase crystals contain abundant small grains of sericite and carbonate and occasionally are twinned.

Thin section Au-24-4 is a sample of marble 10 metres from the mafic volcanic contact. It is composed of a massive, granoblastic, homogeneous intergrowth of fine-grained (0.2-0.4 mm) carbonate with minor amounts of quartz and sericite.

	Au-24-3	Au-24-4
plagioclase	65 - 70	
carbonate	10 - 15	90
sericite	15	5
quartz	3 - 4	5
opaques	3 - 4	
chlorite	minor	

TABLE 18A: Estimated modal compositions (in percent) of two thin sections of selected rock types.

DISCUSSION: The Robertson Gold deposit has a similar geological setting and lies within the same belt of intercalated marble and mafic volcanics as the 2A group of stratabound, carbonate hosted, Cu-Sb-Au-Ag deposits. Its origin is probably also similar; syngenetic deposition in a carbonate depositional environment and subsequent remobilization and concentration by

mobile aqueous solutions during low-grade metamorphism.

DEVELOPMENT HISTORY	1938, 1944: trenching, 3000 feet of diamond drilling by Consolidated Mining and Smelting.
REFERENCE MAP	ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958.
REFERENCES	Smith, B. L. 1958: Geology of the Clarendon-Dalhousie Area; Ontario Department of Mines, Annual Report Vol. 65, part 7, 1956, p. 33,41.

19. SIMON

COMMODITY	MAIN: Copper OTHER: Zinc
ROCK ASSOCIATION	HOST: Mafic volcanic OTHER: Felsic volcanic
CLASSIFICATION	2C. Stratiform, volcanic hosted, Cu-Zn
LOCATION	Lyndoch Township, Lennox and Addington County NTS 31F/3, UTM Zone 18, 5008480 N, 318385 E. LAT. 45° 12' 30" N, LONG. 77° 18' 46" W Range B, Lot 1 (E½)
ACCESS	The deposit is located 3.2 km (2 miles) northwest of the small settlement of Slate Falls and is accessible via a dirt road which passes within 900 metres of the deposit. To reach the deposit drive northwest along the Slate Falls Rd. from Hwy 41 until it terminates, a distance of 5.2 km (3.3 miles). From this point drive north along the dirt road on the right for about 2 km (1.3 miles) to the opposite side of a sandy hill. From this point the deposit is reached on foot, 920 metres (3000 feet) at a bearing of 250°. The two groups of workings on the property are 300 meters apart (900 feet) in a north-south direction.
SIZE & GRADE	The main deposit consists of disseminated chalcopyrite, pyrrhotite, and minor pyrite, and sphalerite in conformable lens thick (10 feet), 180 m long (600 feet) and continuous to a depth of at least 107 m (350 feet) as proven by diamond drilling. The lens is reported to contain 253,000 tons of 1.09 percent Cu. The northern deposit consists of minor chalcopyrite disseminated within a small lens of massive magnetite. There are two narrow trenches up to a metre deep and 15 and 30 metres long respectively on the main deposit. Samples collected from these trenches contained from 0.16 to 3.5 percent Cu and 0.04 to 3.4 percent Zn (Table 19C, 19D). There are also two trenches up to 1 metre deep on the northern deposit 13 metres and 21 metres in length respectively. A sample collected from one of these pits contained 0.22 percent Cu.
DESCRIPTION	GENERAL GEOLOGY: The Simon property consists of two separate deposits located within a wide belt of amphibolite gneiss extending from Denbigh Township northwards into Lyndoch Township. The gneisses and interbedded quartzite and marble, strike in a northerly direction and dip moderately to the east are considered to be the oldest rocks in the area (Hewitt, 1953). They are cut by a series of late, northwest trending faults and have been folded such that the copper deposit lies on the western edge of a large conical fold with many associated minor folds, all plunging at 40 to 60° to the east (Cochrane, 1964). The southern deposit is the larger and more important of the two deposits and occurs within amphibolite gneisses which contain several thin interbeds of quartz-feldspar paragneiss. The paragneiss is particularly abundant in the immediate vicinity of the mineralized zone and hosts some of the mineralization, but the amphibolite is the principal host rock. The second, northern deposit lies 275 m (900 feet) to the north and occurs within one of the small bodies of gabbro that intrude the amphibolite (Figure 19A). The amphibolite gneiss is the most common rock type in the vicinity and forms a black, fine to medium-grained (0.1 to 1.0 mm), very well-foliated rock composed essentially of hornblende and plagioclase, although there are some garnet-rich interlayers. Garnet, magnetite, quartz and epidote are present as minor constituents. The quartz-feldspar paragneiss is a white rock composed of fine-grained quartz (40%) and plagioclase (60%). Sometimes the quartz forms coarse angular grains set in a matrix of feldspar. The gabbro is composed of a course-grained (2mm) aggregate of plagioclase and relict pyroxene. The pyroxene has been largely replaced by amphibole, epidote, chlorite and carbonate (Cochrane, 1964).

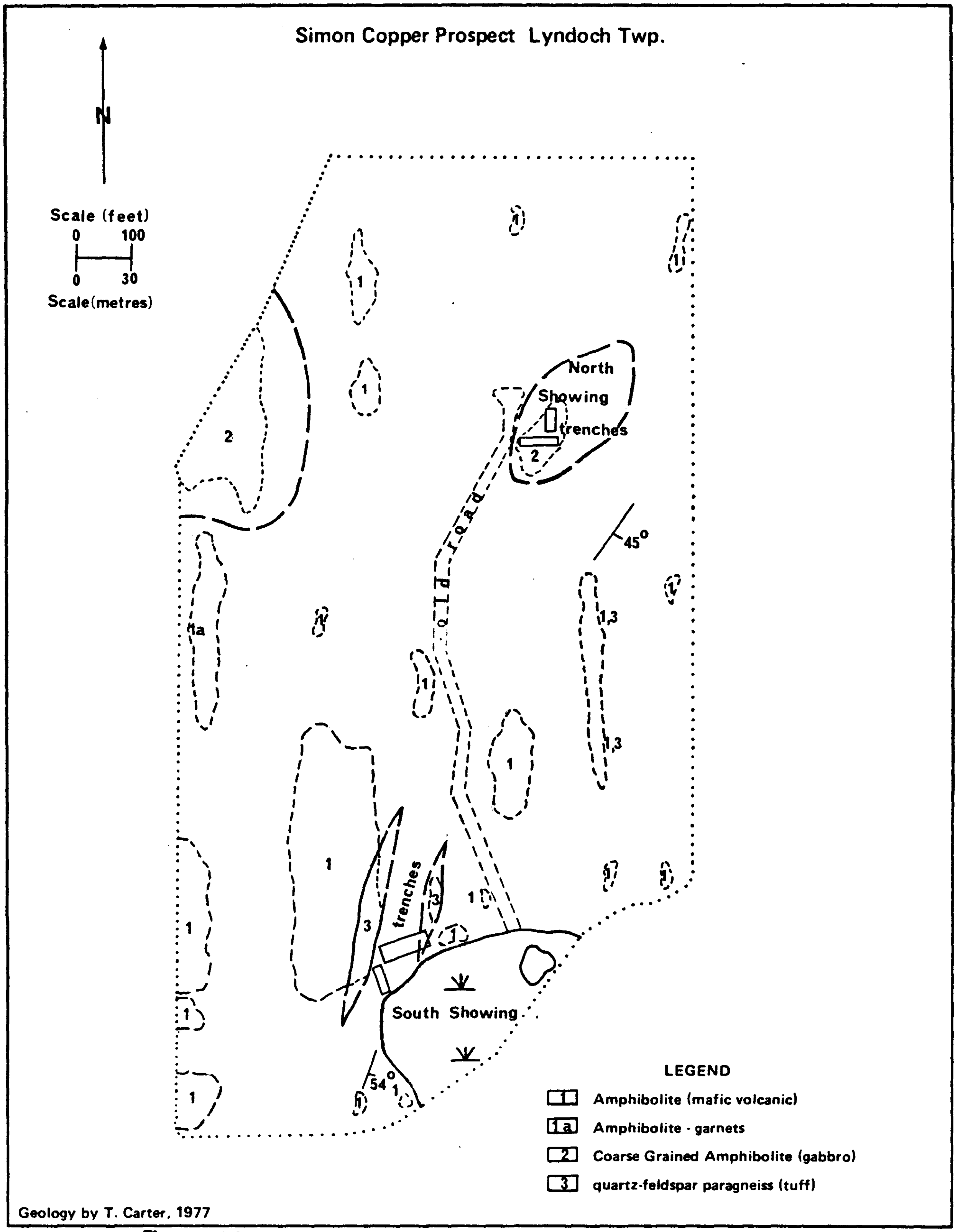

Figure 19A- Geology in the vicinity of the Simon copper occurrence.

The amphibolite gneiss and the quartz-feldspar paragneiss are believed to be metavolcanic rocks, but they could also be meta-mudstones and sandstones respectively. Evans (1964) and Hewitt (1953) believe they are sedimentary in origin but Lumbers (1977, personal communication) believes they may be volcanic in origin.

MINERALIZATION: The mineralization at the southern deposit consists of chalcopyrite, pyrrhotite, and minor pyrite and sphalerite disseminated within amphibolite gneiss and sometimes in quartz-feldspar paragneiss. It forms a lens-shaped orebody that strikes north and dips moderately (45^o) to the east. At the surface the mineralization forms a crumbly gossan of limonite and scattered sulfides. The northern deposit is 275 m. north of the main deposit and consists of minor chalcopyrite, pyrrhotite and sphalerite disseminated within a lens of massive magneite 0.3 to 1 metre thick and 5 metres long (Cochrane, 1964).

MICROSCOPY: Two thin sections of quartz-feldspar paragneiss (Cu-11-1, Cu-11-3), one thin section of amphibolite (Cu-11-4) and one polished thin section of mineralized amphibolite (Cu-11-12) from the northern deposit were prepared and examined. In addition twenty polished sections were examined by Cochrane (1964) and the observations are summarized here.

The quartz-feldspar paragneiss is composed of a granoblastic intergrowth of medium-grained, anhedral quartz and plagioclase with minor hornblende, biotite, muscovite, and chlorite. The amphibolite is composed of a foliated intergrowth of hornblende, plagioclase, quartz, and minor biotite, chlorite, carbonate, sericite, and opaque minerals. The hornblende contains inclusions of quartz and is partially altered to chlorite and the plagioclase is usually partly altered to carbonate and sericite. The amphibolite from the north deposit is a massive, granoblastic intergrowth of fine-grained (0.35 mm) hornblende, magnetite, and minor tremolite, garnet, quartz, and chalcopyrite. The hornblende occurs as subhedral to euhedral poikiloblastic grains that often contain quartz inclusions and are sometimes intergrown with tremolite. The magnetite forms clusters of anhedral to euhedral grains containing abundant inclusions of silicate minerals and occasional small blebs of chalcopyrite. The chalcopyrite forms scattered, small, anhedral grains within magnetite or silicates.

The average composition of the sections from the main deposit examined by Cochrane is 30 percent pyrrhotite, 20 percent chalcopyrite, 5 percent pyrite, 2 percent sphalerite and the remainder a mixture of hornblende, quartz, and plagioclase. The pyrrhotite forms coarse (1-3 mm) subhedral grains and grain aggregates. Chalcopyrite generally occurs as fine veinlets and blebs interstitial to silicate minerals and also commonly forms small grains and veins within pyrrhotite. Pyrite occurs as broken, skeletal crystals while sphalerite most commonly occurs as blebs within chalcopyrite and pyrrhotite.

The sections from the northern deposit are samples of massive magnetite with abundant chalcopyrite. The average composition was 60 percent magnetite, 20 percent chalcopyrite, 5 percent pyrrhotite and trace sphalerite and marcasite. The magnetite occurs as 'normal rock-forming minerals' interstitial to the silicate gangue. Chalcopyrite forms small blebs and veinlets in the magnetite and pyrrhotite is disseminated within magnetite. Marcasite occurs as collform spheres.

	Cu-11-1	Cu-11-3	Cu-11-4	Cu-11-12
quartz	60 - 65	50	30	3 - 4
plagioclase	20 - 25	40	20	1
hornblende	10 - 15		35 - 40	70
opaques			5	25
biotite	2 - 3	5	2	
tremolite				3 - 4
chlorite	1		2 - 3	
sericite	2	5 - 10	1	
carbonate			2	
garnet				1

TABLE 19A: Modal compositions (in percent) of thin and polished thin sections of selected rock types.

GEOCHEMISTRY: Cochrane (1964, p. 75-88) determined the trace element content of one sample of each of: pyrite, pyrrhotite, and chalcopyrite (Table 19B) and compared the results to other similar deposits. The results indicate that the Simon sulfides closely resemble the sulfides at Geco and Normetal, and are similar to Noranda and Chibougamau. There is little similarity to Sudbury or the McIntyre gold deposit.

Partial analyses were made of three samples of mineralization from the main deposit (Cu-11-5, Cu-11-7, Cu-11-9) and one sample of well-mineralized magnetite from the northern deposit (Cu-11-13) and the results are presented in Table 19C. The whole rock chemical composition of another sample of mineralization from the main deposit is present in Table 19D.

	Pyrite	Pyrrhotite	Chalcopyrite	Sphalerite
Ti	0.0045	0.013	0.0058	0.020
Ag	0.0014	<0.0001	0.0025	<0.0001
Ni	0.021	0.018	0.0052	<0.0009
Co	0.031	0.025	0.0023	0.0090
Mn	0.023	0.0027	0.0017	0.0073
Cr	<0.0006	<0.0006	<0.0006	<0.0006
Mo	<0.0007	<0.0007	<0.0007	<0.0007
Pb	0.093	<0.01	<0.01	<0.01
Cu	0.0090	0.0033	X	0.105
Sn	<0.01	<0.01	<0.01	<0.01
Cd	-	-	-	0.12
Fe	-	-	-	8.5

TABLE 19B: Trace Elements in sulphides at Denbigh, Ontario in weight percent, from Cochrane, 1964, p. 76.

	Zn	Pb	Cu	Fe(tot)	Fe(sol)	FeO
Cu-11-5	420	32	1560			
Cu-11-7	1550	10	3.5%			
Cu-11-9	3.4%	<10	5540			
Cu-11-13			2240	64.3%	61.8%	30.4%

	TiO_2	P_2O_5	S	Cd
Cu-11-9				106
Cu-11-13	0.80%	0.36%	0.42%	

TABLE 19C: Partial chemical analyses of some samples of mineralization (in ppm unless indicated)

	SiO_2	Al_2O_3	Fe_2O_3	FeO*	MgO	CaO	Na_2O	K_2O
Cu-11-8	56.3	8.65	17.1	*	1.84	3.38	1.80	0.16

* FeO content is unreliable due to high S content

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Cu-11-8	2.21	0.82	0.26	0.78	0.03	4.00	0.08	97.4

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li	Au	Ag
Cu-11-8	2.82%	0.89%	12	57	20	44	100	9	90 ppb	4

TABLE 19D: Whole rock chemical composition (in percent) and trace element (in ppm) of a sample of typical mineralization from the southern zone.

DISCUSSION: The northern deposit is essentially a thin layer of magnetite containing minor chalcopyrite and cannot be considered as a potential copper ore-body (Cochrane, 1964, p. 109). The low titanium content indicates it is probably genetically unrelated to the gabbro, but this is still a possibility. Cochrane (1964, p. 111) believes it is metamorphic in origin but it could also be a xenolith.

The southern deposit is very similar to the former New Calumet Zn-Pb-Ag mine on Calumet Island in the Ottawa River which produced 3.5 million tons of ore from 1943 to 1969. Both deposits probably formed syngenetically with their host rocks as a result of accumulation of metallic sulfides in a restricted area in a subaqueous environment. There may be undiscovered deposits of this type in the Pembroke area in regions of abundant volcanic rocks.

DEVELOPMENT HISTORY

pre 1953: Some pits on north deposit, operator unknown.

1956: Several test pits, trenching totalling 80 feet in length and 6 d. d. holes for 1077 feet on the north deposit - work by Eugene Simon.

1961: EM and geological surveys with 13 d. d. holes for 2502 feet by Noranda Explorations Ltd.

1965: Geophysical work and 3807 feet of d. d. by Young-Davidson Mines Ltd.

REFERENCE MAPS

ODM 1953-2, Brudenell - Raglan Area, 1953.

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Cochrane, D. R.
1964: A Copper Deposit near Denbigh, Ontario; unpublished MSc thesis, Queen's University, Kingston, Ontario.

Evans, A. M.
1964: Geology of Ashby and Denbigh Townships; Ontario Department of Mines, Geological Report No. 26, p. 35-36.

Hewitt, D. F.
1954: Geology of the Brudenell - Raglan Area; Ontario Department of Mines, Annual Report Vol. 62, part 5, 1953, p. 71.

Shklanka, R.
1969: Copper, Nickel, Lead, and Zinc Deposits of Ontario; Ontari Department of Mines, Mineral Resources Circular No. 12, p. 226-227.

Source Mineral Deposit Record (Simon Copper, Malcolm), Geoscience Data Centre, Ontario Geological Survey, Toronto.

20. McNAB

COMMODITY	Lead
ROCK ASSOCIATION	HOST: Vein calcite OTHER: Calcitic marble
CLASSIFICATION	1B. Unconformable, carbonate-hosted lead
LOCATION	McNab Township, Renfrew County NTS 31F/8, UTM Zone 18, 5032000N, 389500E. LAT. 45° 26' 05"N, LONG. 76° 24' 46"W. Lot 9 (E 1/2), Con. 11
ACCESS	The deposit is approximately 4.8km (3 miles) west of the town of Arnprior, 61m (200 feet) south of highway 17, 305m (1000 feet) west of Con. road XI.
SIZE AND GRADE	The deposit consists of disseminated galena in a calcite vein 20m (65 feet) in length by about 0.3m (1 foot) in width. No estimate of grade is available. One overgrown trench 20m x 1.5m (65 feet x 5 feet), striking 115° and two small debris filled pits are present on the property.

DESCRIPTION

GENERAL GEOLOGY: The host rock to the vein consists of a grey, coarse grained, well layered calcitic marble, in which the layering contains minor crenulations. The vein material consists of white to pink calcite; no mineralization was observed by the authors in any of the vein material. Satterly (1944, p. 62) states that the vein strikes from 90° to 105° and that "at one place the main vein is one foot wide, but material on the dump indicates that it may average only three inches. In the pits to the east the vein as seen at one place was two inches wide. A few veins or crystals of galena are present in the calcite".

DISCUSSION: This deposit is similar to the other deposits in this group in the study area and to other lead deposits close to the Paleozoic margin of the Late Precambrian basement rocks. This deposit appears to be relatively minor, with no significant concentrations of galena reported. A discussion of the genesis of this deposit type is contained in the introductory section to this report. The most significant features of rock associations and ore localizations are outlined below:

- deposits occur close to the Late Precambrian-Paleozoic unconformity
- mineralization occurs in fracture filling veins with a general northwesterly trend, which appear to be related to the development of the Ottawa Graben
- the widest and best mineralized veins occur as fracture fillings in marbles. The width may be the result of a competency difference between the host rock units during faulting. Deposition of mineralization in the marbles may be the result of their chemical reactivity
- mineralization appears to be restricted to areas where basal Paleozoic sandstone forms the unconformity with basement. With an impermeable carbonate cap-rock these may have acted as aquifers for groundwater flow and a source for metal

A combination of these factors would appear to present a well defined exploration target for this deposit type in an area with abundant fracturing and favourable host units. While they may not be expected to be of very large extent, they must be considered economically significant.

DEVELOPMENT HISTORY	1925: surface work, 3 short dd holes by Consolidated Mining and Smelting Co. of Canada
REFERENCE MAP	GSC 1363A, Arnprior, 1974
REFERENCE	Satterly, J. 1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Vol. 53, part 3, 1944, p. 61-62.

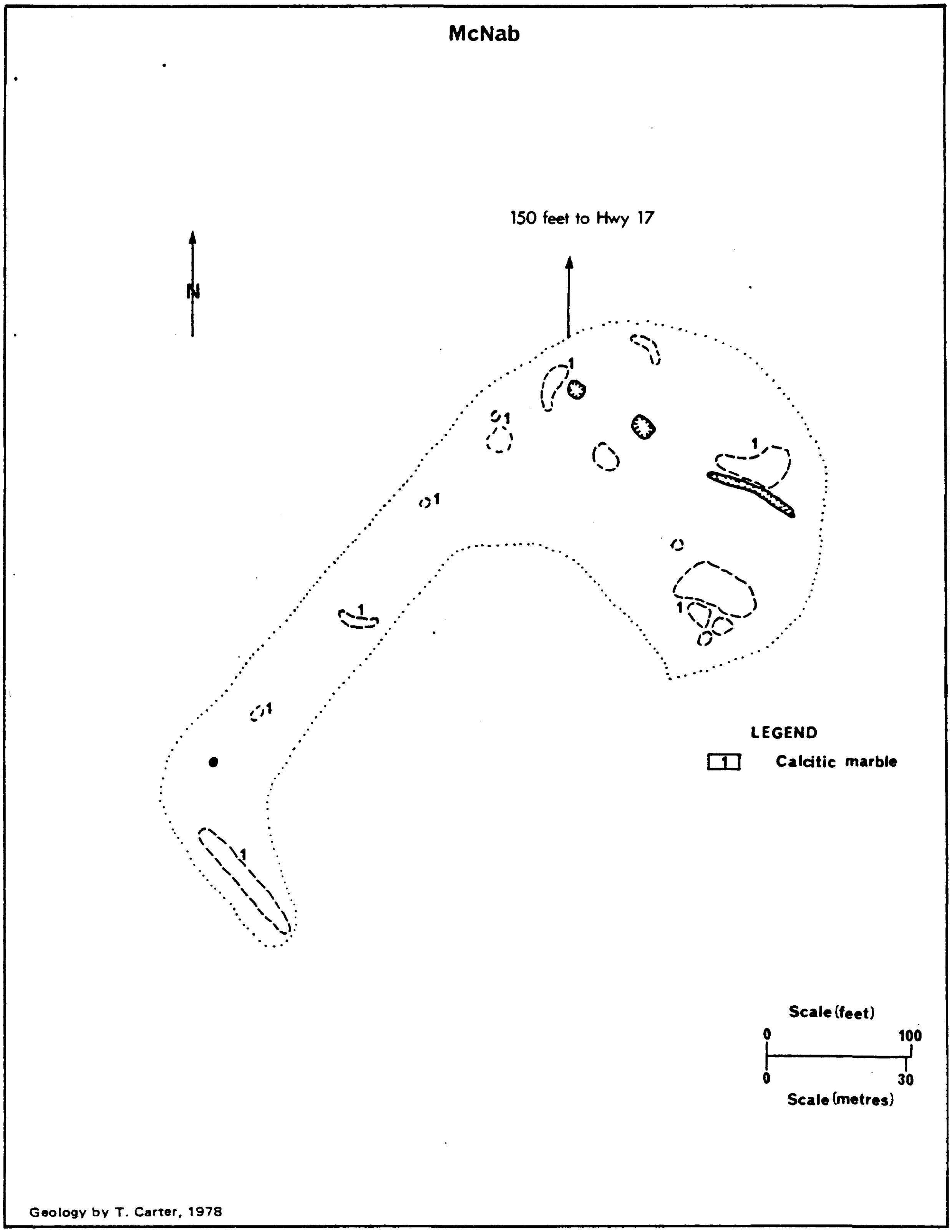

Figure 20A — Geology and workings of the McNab lead deposit.

21. AMERANIUM

COMMODITY	MAIN: Copper, nickel
ROCK ASSOCIATION	HOST: Metagabbro
CLASSIFICATION	3A Gabbro-hosted Cu-Ni deposit
LOCATION	Raglan Township, Renfrew County NTS 31F/4, UTM Zone 18, S008430 N, 302045 E. LAT. 45° 12' 13" N LONG. 77° 31' 14" W Con. 6, Lot 10
ACCESS	The exact location of the deposit is uncertain as it was not visited by the authors. There are reported to be some trenches on some mineralization just east of the road through Ireland, 64 km (4 miles) north from the junction with Hwy 500.
SIZE & GRADE	Mineralization consists of disseminated chalcopyrite and pyrrhotite in a zone of unknown extent. The best reported assay is less than 0.5 % Cu (Assessment Files)
DESCRIPTION	The Ameranium deposit is contained within a large basic intrusion called the "Raglan Hills Metagabbro Complex" (Hewitt, 1953) which forms a sill 14.4 km (9 miles) long and up to 5.6 km (3.5 miles) wide within a metavolcanic-metasedimentary sequence. The complex consists of a complicated mixture of diorite, gabbro, pyroxenite, and hornblendite and a contact phase of well-layered hornblende schist is common. The ultrabasic pyroxenite portions are chiefly in the central part of the complex. The mineralization consists of disseminated pyrrhotite and chalcopyrite within metagabbro. No further information is available. The Ameranium deposit is one of a small group of similar deposits contained within the Raglan Hills Metagabbro Complex. The petrographic and field relations of the deposits indicates that they are syngenetic with intrusion of the gabbro. They probably formed as a result of segregation and crystallization in place of an immiscible sulfide-rich phase within the gabbroic melt and have since been subjected to amphibolite grade regional metamorphism.
DEVELOPMENT HISTORY	1956: Geological survey, some trenching by Ameranium Mines Ltd.
REFERENCE MAP	ODM 1953-2, Brudenell - Raglan Area, 1954.
REFERENCES	Assessment File Research Office; Ontario Geological Survey, Toronto, Technical File No. 63A 317.

22. GENRICKS LAKE

COMMODITY	MAIN: Copper, Nickel
ROCK ASSOCIATION	HOST: Metagabbro
CLASSIFICATION	3A. Gabbro-hosted Cu-Ni deposit
LOCATION	Raglan Township, Renfrew Country NTS 31F/3, UTM Zone 18, 5009600N, 304345 E. LAT. 45° 12' 53" N, LONG. 77° 29' 30" W. Con. 6, Lot 17.
ACCESS	The road through Ireland from Hwy 500 passes 2.8 km (1 3/4 miles) to the west of the deposit. The deposit was not visited by the authors.
SIZE & GRADE	Mineralization consists of disseminated chalcopyrite and pyrrhotite in a zone of unknown extent. The best assay reported is 0.5 percent Cu (Assessment Files).
DESCRIPTION	The Genricks Lake deposit is contained within a large basic intrusion called the "Raglan Hills Metagabbro Complex" (Hewitt, 1953) which forms a sill 14.4 km (9 miles) long and up to 5.6 km (3.5 miles) wide within a metavolcanic-metasedimentary sequence. The complex consists of a complicated mixture of diorite, gabbro, pyroxenite, and hornblendite and a contact phase of well-layered hornblende schist is common. The ultrabasic pyroxenite portions are chiefly in the central part of the complex. The mineralization at this deposit is contained within metagabbro composed of hornblende and plagioclase and consists of disseminated chalcopyrite and pyrrhotite. No further information on the geology is available. The Genricks Lake deposit is one of a small group of similar deposits contained within the Raglan Hills Metagabbro Complex. The petrographic and fold relationships of the deposits indicates that they are syngenetic with intrusion of the gabbro. They probably formed as a result of segregation and crystallization of an immiscible sulfide-rich phase within the gabbroic melt and have since been subjected to amphibolite grade regional metamorphism.
DEVELOPMENT HISTORY	1956: Geological survey, some trenching by Ameranium Mines Ltd.
REFERENCE MAP	ODM 1953-2, Brudenell - Raglan Area, 1954.
REFERENCES	Assessment Files Research Office; Ontario Geological Survey, Toronto, Technical File No. 63A. 317.

23. LANDOLAC

COMMODITY — MAIN: Copper, Nickel

ROCK ASSOCIATION — HOST: Metapyroxenite
OTHER: Metagabbro

CLASSIFICATION — 3A Gabbro-hosted Cu-Ni deposit

LOCATION — Raglan Township, Renfrew County
NTS 31F/4, UTM Zone 18, 5004480N,30110SE
Lat. 45° 10' 04" N Long. 77°31' 51" W
Con. 2, Lot 4-5

ACCESS — From Hwy. 500, drive approximately 1.6 km. (1 mile) north-east along the gravel road to Ireland. At Ireland, a farm road cuts south from the Ireland road through an open field. The main deposit is on the west side of the road 600' south of the Ireland road on the farm of Mr. F. Inwood.

SIZE AND GRADE — Mineralization consists of two surface exposures of disseminated chalcopyrite and pyrrhotite in metagabbro. At the main deposit (Fig. 23A, 23B) a zone of mineralization measuring about 4.6 m. by 7.6 m. (15 by 25Feet) is exposed in a bulldozed area where the bedrock has been blasted. Assays of average blasted material gave the following results (Assessment Files):

trench no. 1 - 0.72% Cu, 0.37% Ni
trench no. 2 - 0.07% Cu, 0.16% Ni
trench no. 3 - 0.50% Cu, 0.65% Ni

Three samples collected by the authors gave the following results:

Ni-15-1 - 0.22% Co, 1.50% Cu, 4.60% Ni
Ni-15-2 - 0.01% Co, 1.90% Cu, 0.21% Ni
Ni-15-3 - 0.03% Co, 0.21% Cu, 0.45% Ni

Ni-15-1 and Ni-15-2 are samples of the best pyrrhotite and chalcopyrite mineralization respectively. Ni-15-3 is a chip sample taken across 7.6 m. of the mineralized zone.

The second mineralized zone consists of a small pitted area littered with rusty mineralized boulders of metagabbro on the crest of a ridge in an open field 335 m. (1100 feet) south of the main zone. No bedrock is visible. Assays of mineralized rock gave the following results (Assessment Files):

trench no. 3 - 0.89% Cu, 0.59% Ni
trench no. 5 - 0.12% Cu, 0.44% Ni

A sample of well-mineralized material collected by the authors contained 1.56% Cu and 0.77% Ni.

DESCRIPTION: — GENERAL GEOLOGY: The Landolac deposit is contained within a large basic intrusion called the "Raglan Hills Metagabbro Complex (Hewitt, 1953) which forms a sill 14.4 Km. (9 miles) long and up to 5.6 km. (3.5 miles) wide within a metavolcanic-metasedimentary sequence. The complex consists of a complicated mixture of diorite, gabbro, metapyroxenite, and hornblendite, and a contact phase of well-layered hornblende schist is common. The metapyroxenite portions are chiefly in the central part of the complex.

The mineralization is contained within one of two small bodies of meta pyroxenite at the main deposit (Fig. 23A, 23B). These bodies are contained within typical Raglan metagabbro and have somewhat gradational contacts. There is a large zone of well-layered amphibolite and feldspar gneiss north of the two ultramafic bodies.

The metapyroxenite forms a massive, coarse-grained (4 mm), dark green rock that is composed essentially of a homogeneous intergrowth of hornblende and relict pyroxene. It grades into the metagabbro which forms a coarse-grained, massive-to-foliated, black rock composed of variable proportions of hornblende and plagioclase. The feldspar gneiss is composed largely of fine-grained plagioclase and variable amounts of biotite and quartz. The amphibolite is a black, massive, fine-grained (0.3mm) rock composed essentially of hornblende and plagioclase.

MINERALIZATION: — The mineralization consists of scattered zones of disseminated-to-massive chalcopyrite and pyrrhotite contained principally

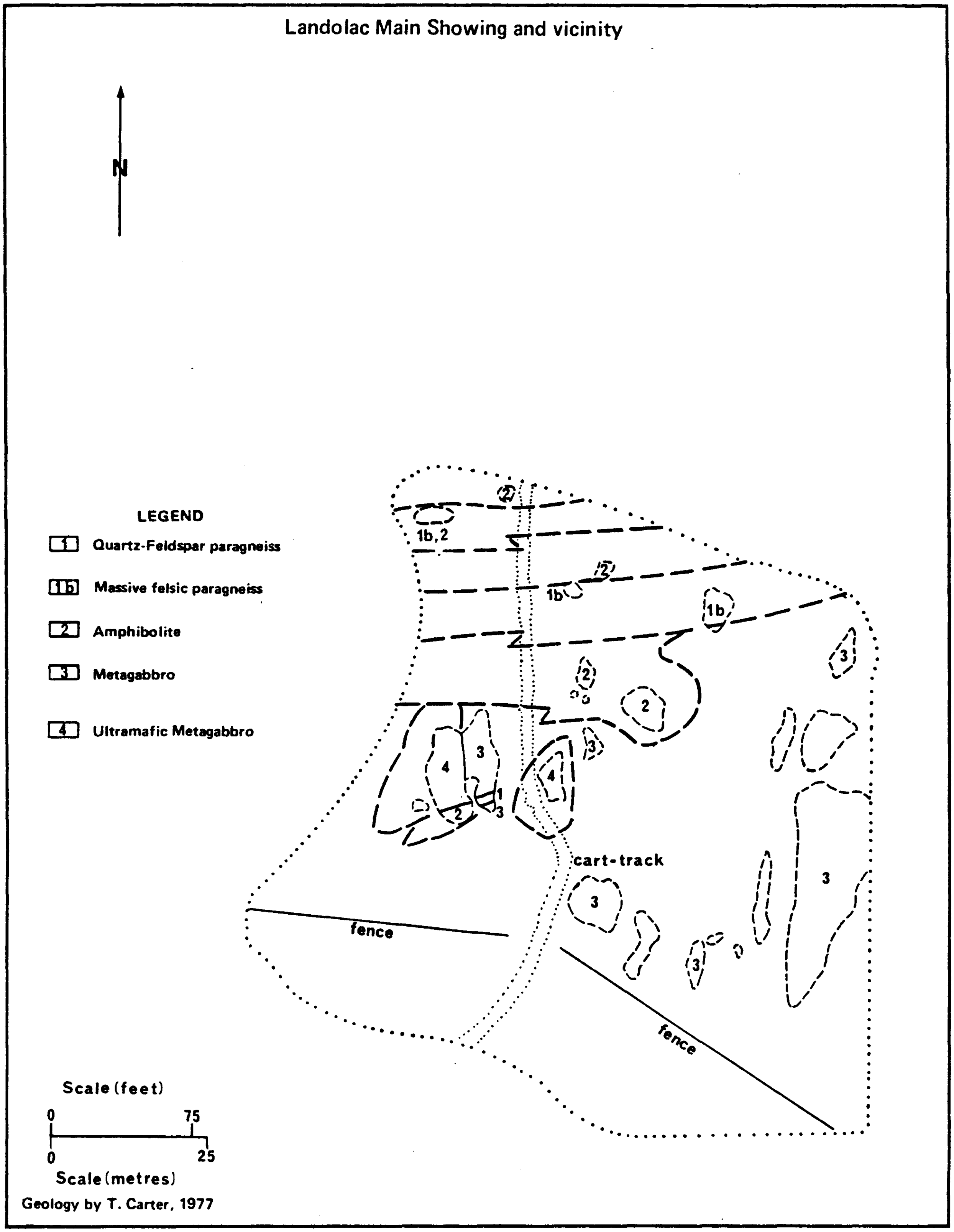

Figure 23A- Geology in the vicinity of the main showing at Landolac.

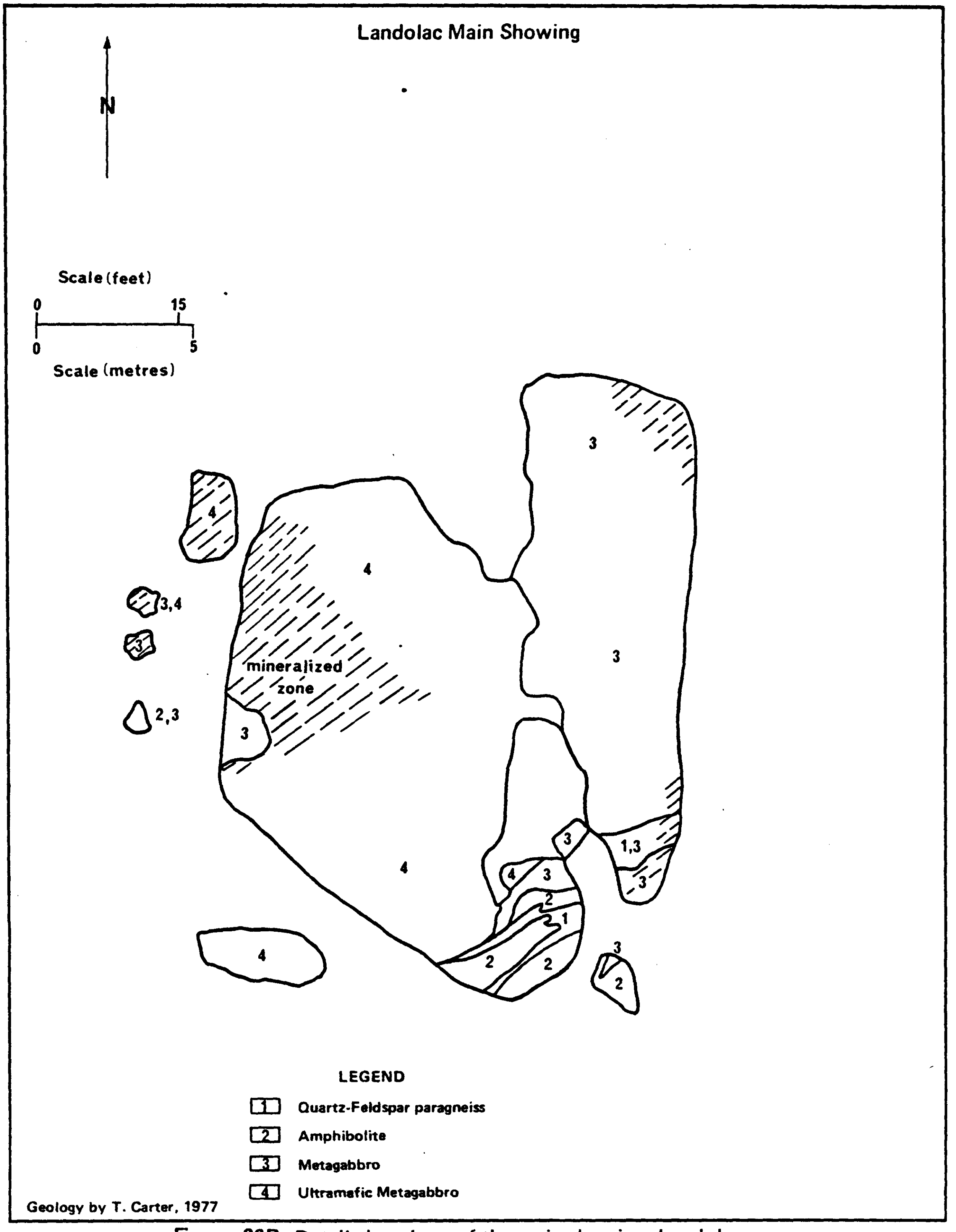

Figure 23B - Detailed geology of the main showing, Landolac.

within meta pyroxenite but also within metagabbro. The mineralization is very erratic in distribution and occasionally forms massive lenses up to 0.6 m (2 feet) thick. Pyrrhotite is the principal sulfide and usually occurs as disseminated fine grains in the rock. The chalcopyrite is most common as blebs within pyrrhotite grains but also occurs as disseminated grains and blebs within the metapyroxenite.

MICROSCOPY: Two polished thin sections of mineralized metapyroxenite (Ni-15-4, Ni-15-9), one thin section of unmineralized metapyroxenite (Ni-15-7), and one thin section of metagabbro (Ni-15-8) were prepared from samples collected by the authors.

The metapyroxenite is composed essentially of hornblende in a massive, granoblastic intergrowth with variable amounts of diopside, serpentine, plagioclase, apatite, epidote, carbonate, and sulfide minerals. The hornblende forms anhedral, medium-to-coarse grains. (0.5 to 1.0 mm) that occasionally contain poikiloblastic inclusions of plagioclase, sulfides, or serpentine. The other minerals are typically finer-grained than the hornblende and occur as randomly distributed, anhedral grains. Pyrrhotite and chalcopyrite are the principal sulfide minerals with minor amounts of pentlandite and pyrite. Pyrrhotite occurs as large, ragged, pitted grains containing abundant silicate inclusions and as coarse, anhedral grains partially replacing the ragged grains. Chalcopyrite forms medium-sized, anhedral grains which commonly occur as intergrowths within large pyrrhotite grains or less commonly forming strings of fine grains filling fractures in silicates. Pentlandite occurs as exsolution intergrowths within pyrrhotite and pyrite forms rare, isolated grains often associated with pyrrhotite.

	Ni-15-4	Ni-15-7	Ni-15-8	Ni-15-9
hornblende	55 - 60%	70 - 75%	60 - 65%	80%
plagioclase	10%	5	35 - 40	7 - 8
diopside	10 - 15%			
serpentine		15 - 20%		
opaques	15%	5	1	5
epidote	3 - 4		1	
carbonate	minor		1	6 - 7
apatite				2 - 3

TABLE 23A: Estimated modal compositions of sections of selected rock types.

GEOCHEMISTRY: The whole rock chemical compositons and trace element contents of four samples of representative rock types collected by the authors were determined (Table 23B). Ni-15-7 is metapyroxenite, Ni-15-3 is a chip sample of mineralization across the main zone, Ni-15-8 is typical metagabbro, and Ni-15-5 is mineralized metapyroxenite from the second zone.

Major Elements

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
*Ni-15-3	40.9	11.1	10.5	6.31	12.7	9.45	1.27	0.71
*Ni-15-5	38.2	8.60	10.5	9.44	8.53	11.5	0.65	1.13
Ni-15-7	45.1	9.05	3.44	7.26	20.2	9.61	0.89	0.07
Ni-15-8	48.1	16.2	1.46	6.82	9.74	12.8	2.20	0.43

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
*Ni-15-3	0.74	0.22	0.14	0.47	0.01	4.38	0.13	
*Ni-15-5	2.36	0.24	0.18	0.63	0.00	8.67	0.12	
Ni-15-7	2.14	0.37	0.32	0.37	0.00	0.15	0.19	99.2
Ni-15-8	0.53	0.38	0.32	0.64	0.00	0.05	0.15	99.8

* Totals are high and FeO is unreliable as no correction has been made for the high S content.

Trace Elements

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Ni-15-3	2130	63	4520	260	12	760	130	10
Ni-15-5	1.56%	72	7720	460	14	600	80	30
Ni-15-7	96	88	590	86	55	1440	50	<3
Ni-15-8	36	58	90	42	32	480	70	3

TABLE 23B: Whole chemical compositions (in per cent) and trace element contents (in ppm) of selected rock types.

DISCUSSION: The Landolac Cu-Ni deposit is one of a small group of similar deposits contained within the Raglan Hills Metagabbro Complex. The petrographic and field relationships at the deposits indicates that they are syngenetic with emplacement of the gabbro host. The deposits probably formed as a result of segregation and crystallization in place of a sulfide-rich phase within the gabbroic melt and have since been subjected to amphibolite grade regional metamorphism.

The relationship of the mineralization to a small body of meta-pyroxenite is similar to a relationship observed at the Raglan deposit and may be of genetic significance.

HISTORY OF DEVELOPMENT 1956: trenching, unknown amount of diamond drilling (pack-sack drill) by Landolac Mines Ltd.

REFERENCE MAP ODM 1953-2, Brudenell-Raglan Area, 1954

REFERENCES Source Mineral Deposit Record (Landolac); Ontario Geological Survey, Geoscience Data Centre, Toronto.

24. RAGLAN

COMMODITY	MAIN: Copper, Nickel
ROCK ASSOCIATION	HOST: Metagabbro OTHER: Metapyroxenite
CLASSIFICATION	3A Gabbro-hosted Cu-Ni deposit
LOCATION	Raglan Township, Renfrew County NTS 31F/3, UTM Zone 18, 5007950 N, 306000 E. LAT. 45° 12' 01" N. LONG. 77° 28' 12" W. Con. 4, Lot 18-21/ Con 5, Lot 18-20.

ACCESS

The deposit is accessible via an old overgrown bush road that is passable for the first 3/4 miles by 4- wheel drive vehicle. The road goes north from Hwy 500 at a point approximately 2 miles south of the junction of Hwy 500 and Hwy 512. A road log follows:

0.0 at Hwy 500, drive north along bush road
(0.5 mi) - junction, turn left
(0.65 mi) - clearing, keep right. Park vehicle at end of clearing
(500 ft.) - junction, turn right
(4000 ft.)- trench no. 3.

SIZE AND GRADE

Mineralization consists of disseminated pyrrhotite, pentlandite, chalcopyrite and pyrite in a lens that is 90 m (300 feet) wide, 155 m (500 feet) long, and 6 to 15 m (20 to 50 feet) thick, containing approximately 1 percent combined copper and nickel (Assessment Files).

Three samples collected by the authors were submitted for assay. Two (Ni-16-9, Ni-16-10) are representative samples but Ni-16-11 is a selected sample. The results are as follows:

Ni-16-9: 280 ppm Co, 0.36% Cu, 0.31% Ni
Ni-16-10: 265 ppm Co, 0.65% Cu, 0.21% Ni
Ni-16-11: 740 ppm Co, 1.90% Cu, 0.85% Ni

There are 3 trenches and 2 small pits which expose the mineralization on a strike length of about 150 m (500 feet). The trenches are numbered 1 to 3 from northeast to southwest on Figure 24A. The pits are 60 m (200 feet) southwest of trench 3.

DESCRIPTION

GENERAL GEOLOGY: The Raglan deposit is contained within a large basic intrusion called the "Raglan Hills Metagabbro Complex" (Hewitt, 1953) which forms a sill 14.4 km (9 miles) long and up to 5.6 km (3.5 miles) wide within a meta-volcanic-metasedimentary sequence. The complex consists of a complicated mixture of diorite, gabbro, pyroxenite, and hornblendite and a contact phase of well-layered hornblende schist is common. The pyroxenite portions are found chiefly in the central part of the complex.

The host rock of the Raglan Cu-Ni deposit is metagabbro and anorthositic metagabbro composed of variable percentages of hornblende and plagioclase. They grade into meta pyroxenite that forms a small body within the metagabbro near the mineralized zone. There is also a small zone of hornblende-biotite-quartz schist that may be chilled metagabbro.

The metagabbro is a black, coarse-grained (5 mm) rock composed of hornblende (70%) and plagioclase (30%). It is completely gradational into the anorthositic metagabbro which forms a white-to-rusty, medium-to-coarse-grained rock composed of plagioclase (80-90%) and hornblende (10-20%). The metapyroxenite is a dark greenish-black, coarse-grained (5 mm) rock composed essentially of hornblende, relict pyroxene, and very minor plagioclase. The hornblende-biotite-quartz schist is a fine-grained (1 mm) rusty rock. All the rock types are massive.

MINERALIZATION: The mineralization consists of disseminated-to massive pyrrhotite, chalcopyrite, and minor pyrite and pentlandite in metagabbro composed of equal proportions of hornblende and plagioclase. Pyrrhotite is the most common sulfide and frequently occurs as massive lenses. Near these lenses

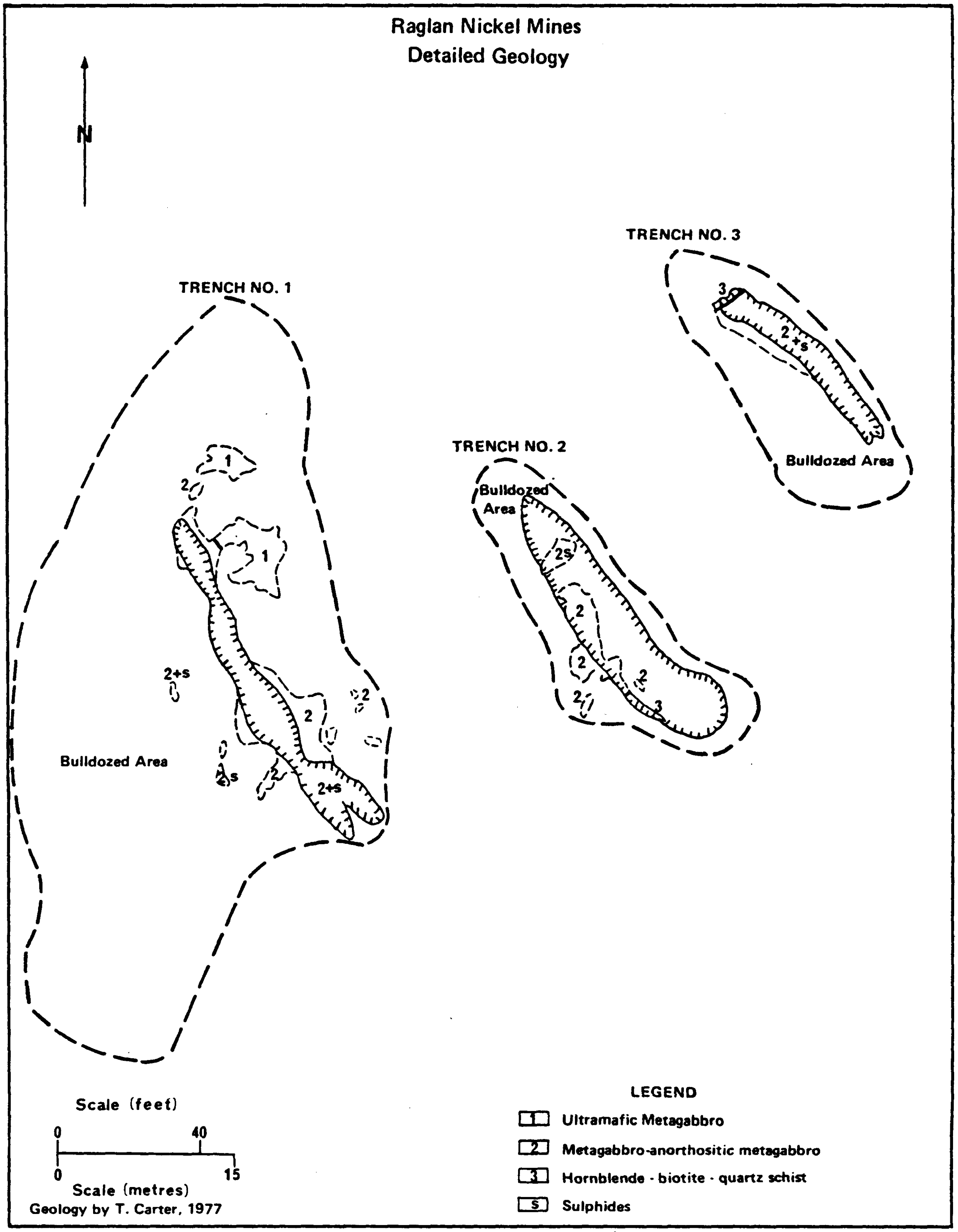

Figure 24A - Detailed geology of the Raglan Cu-Ni occurrence.(Base Map from Assessment Files.)

a rock composed of coarse, euhedral, porphyroblastic hornblende crystals and in a groundmass of fine-grained pyrrhotite, hornblende and diopside is common. Chalcopyrite usually forms blebs and streaks within the metagabbro or in association with pyrrhotite. The pentlandite and pyrite form scattered grains usually associated with pyrrhotite.

MICROSCOPY: Two polished thin sections of mineralized metagabbro (Ni-16-1, Ni-16-12) and one thin section of typical metagabbro (Ni-16-4) were prepared from samples collected by the authors. The metagabbro in the sections is composed of a very inhomogeneous, granoblastic intergrowth of coarse-grained hornblende and plagioclase with variable amount of epidote, diopside, sulfide minerals, and sphene.

The hornblende occurs as large anhedral grains which contain abundant small inclusions of diopside in the cores. The veins of the grains are generally inclusion-free. In section Ni-16-1 the hornblende occurs as large porphyroblasts up to 15 mm in diameter set in a fine-grained groundmass of pyrrhotite, hornblende, and small, colorless grains of diopside.

The plagioclase occurs as medium-sized, poorly twinned, anhedral grains. Epidote commonly forms randomly distributed, small, euhedral grains. The sphene forms small euhedral grains and grain aggregates.

The sulfide minerals are usually associated with hornblende grains. Pyrrhotite is the most common sulfide and occurs as large, irregular, anhedral grains and grain aggregates and as very fine-grained inclusions within hornblende porphyroblasts. Chalcopyrite is a minor constituent and occurs as small blebs and intergrowths within pyrrhotite grains. Pyrite occurs as rare anhedral grains within pyrrhotite.

	Ni-16-1	Ni-16-4	Ni-16-12
hornblende	70 - 75	25 - 30	25 - 30
plagioclase		60	35
sulfides	15	2	15 - 20
diopside	10 - 15		10 - 15
epidote		5	3 - 4
sphene		3 - 4	

TABLE 24A: Estimated modal compositions (in percent) thin sections of metagabbro and mineralized metagabbro.

GEOCHEMISTRY: The whole work chemical compositions and trace elements contents of four rock samples were determined. (Table 24B). Ni-16-2 is a composite sample of metapyroxenite, Ni-16-3 is typical metagabbro, Ni-16-6 is a metagabbro containing hornblende porphyroblasts set in a sulfide groundmass, and Ni-16-7 is a chip sample of mineralized anorthositic metagabbro.

Major Elements (Percent)

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Ni-16-2	49.6	9.50	1.89	6.74	12.8	14.2	1.50	0.29
Ni-16-3	48.2	19.9	2.16	5.04	6.90	12.6	2.47	0.23
*Ni-16-6	26.0	3.11	34.4	5.78	6.83	9.46	0.54	0.09
*Ni-16-7	33.1	20.0	22.2	4.89	0.43	6.80	1.81	1.73

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Ni-16-2	0.27	0.41	0.28	0.70	0.02	0.09	0.16	98.5
Ni-16-3	0.74	0.45	0.12	0.44	0.05	0.52	0.10	99.9
*Ni-16-6	0.41	0.75	0.20	0.50	0.00	18.1	0.12	106.3
*Ni-16-7	1.34	0.59	0.26	0.10	0.02	13.1	0.02	106.4

* Totals are high and FeO is unreliable as no correction was made for his S content.

Trace Elements (ppm)

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li	Au
Ni-16-2	64	82	169	43	39	580	70	9	
Ni-16-3	290	61	246	42	29	329	50	4	
Ni-16-6	4.7%	91	5000	480	11	261	30	6	
Ni-16-7	4200	14	4860	460	20	19	30	34	60

TABLE 24B: Whole rock chemical compositions of selected rock types.

DISCUSSION: The Raglan Cu-Ni deposit is one of a small group of similar deposits contained within the Raglan Hills Metagabbro Complex. The petrographic and field relationships at the deposits indicates that they are syngenetic with intrusion of the gabbro host. The deposits probably formed as a result of segregation and crystallization in place of an immiscible sulfide-rich phase within the babbroic melt and have since been subjected to amphibolite grade regional metamorphism.

The spatial relationships to metapyroxenite of the mineralization at the Raglan deposit is similar to the Landolac deposit and may be of genetic significance.

DEVELOPMENT HISTORY

1956: Magnetic, electromagnetic, and self-potential surveys, surface trenching, geological mapping, 7,070 feet (2155 m) of diamond drilling by Raglan Nickel Mines Ltd.

REFERENCE MAP

ODM 1953-2, Brudenell-Raglan Area, 1954.

REFERENCES

Assessment Files Research Office (Diamond drill record 10, Technical file no. 63A 320); Ontario Geological Survey, Toronto.

Hewitt, D.F.
1954: Geology of the Brudenell-Raglan Area; Ontario Department of Mines, Annual Report Vol. 62, part 5, 1953.

Source Mineral Deposit Record (Raglan Nickel Mines); Ontario Geological Survey, Geoscience Data Centre, Toronto.

25. CARLETON PLACE

COMMODITY	MAIN: Lead OTHER: Gold, silver, barite
ROCK ASSOCIATION	HOST: Vein calcite OTHER: Calcitic marble
CLASSIFICATION	1B. Unconformable, carbonate-hosted lead
LOCATION	Ramsay Township, Lanark County NTS 31F/1, UTM Zone 18, 4998790N, 405090E LAT. 45° 08' 17"N; LONG. 76° 12' 25"W Con. 4, Lot 5
ACCESS	The deposit is approximately 5.6km (3.5 miles) west of the town of Carleton Place. It is accessible by gravel concession roads.
SIZE AND GRADE	Mineralization is reported to consist of disseminated galena with some arsenopyrite in a calcite vein half a mile long by 4 feet in width. A picked sample contained 60% Pb, $75.Au, and $22. Ag (Royal Commission, 1890). Two small pits 12 and 13 feet deep were excavated prior to 1890 by W. H. Wylie.

DESCRIPTION

The deposit was not visited by the author. It is described by W. H. Wylie to consist of a galena-bearing vein with considerable barite. The vein strikes east-west and cuts calcitic marble.

This deposit is similar to the other deposits in the group in the study area and to other vein lead deposits close to the Paleozoic margin of the Late Precambrian basement rocks. It is not known if adequate exploration work has been done subsequent to 1890 to fully evaluate this deposit. A discussion of the genesis of this deposit type is contained in the introductory section to this report. The most significant features of rock associations and ore localization are outlined below:

- deposits occur close to the Late Precambrian-Paleozoic unconformity
- mineralization occurs in fracture filling veins with a general northwesterly trend, which appear to be related to the development of the Ottawa graben
- the widest and best mineralized veins occur as fracture fillings in marbles. The width may be the result of a competency difference between the host rock units during faulting. Deposition of mineralization in the marbles may be the result of their chemical reactivity
- mineralization appears to be restricted to areas where basal Paleozoic sandstone forms the unconformity with basement. With an impermeable carbonate cap rock these may have acted as aquifers for ground water flow and a source for metal

A combination of the factors would appear to present a well defined exploration target for this deposit type in an area with abundant fracturing and favourable host units. While they may not be expected to be of very large extent, they must be considered economically significant.

REFERENCE MAP GSC 1362A, Carleton Place, 1973

SELECTED REFERENCE

Royal Commission
1890: Report of the Royal Commission on the Mineral Resources of Ontario, p. 146.

26. LYNCH

COMMODITY	Lead
ROCK ASSOCIATION	HOST: Vein calcite OTHER: Calcitic marble, quartz-feldspathic gneiss, sandstone
CLASSIFICATION	1B. Unconformable, carbonate hosted lead deposit.
LOCATION	Ramsay Township, Lanark County NTS 31F/1, UTM Zone 18, 5000445N, 404200E. LAT. 45° 09' 11"N; LONG. 76° 13' 07"W Con. 4, Lots 4 and 8.
ACCESS	The deposit is approximately 6.4km (4 miles) west of Carleton Place. It is accessible by gravel roads.
SIZE AND GRADE	There is no information available as to the extent or grade of mineralization. Investigations of the property by the authors did not locate significant mineralization.

DESCRIPTION

GENERAL GEOLOGY: The deposit is reported to consist of a few veins of galena, of unspecified extent, that occur within "limestone" on lots 4 and 8, Con. 4, Ramsay Township. The authors were, however, unable to locate any old workings or mineralization during a search of parts of the two lots. All outcrop examined on Lot 4 consists of fine grained, flat lying white quartzite sandstone, presumed to be part of Potsdam formation of Upper Cambrian age. Lot 8 consists of graphitic calcitic marble containing a few interbeds of quartzo-feldspathic gneiss; this marble may be the "limestone" referred to.

DISCUSSION: Although the mineralization was not located, it is probable that this deposit belongs to the unconformable carbonate hosted lead deposit group, similar to others in the study area. A discussion of the genesis of this deposit type is contained in the introductory section to this report. The most significant features of rock associations and ore localization are outlined below:

- deposits occur close to the Late Precambrian-Paleozoic unconformity.

- mineralization occurs in fracture filling veins with a general northwesterly trend, which appear to be related to the development of the Ottawa graben.

- the widest and best mineralized veins occur as fracture fillings in marbles. The width may be the result of a competency difference between the host rock units during faulting. Deposition of mineralization in the marbles may be the result of their chemical reactivity.

- mineralization appears to be restricted to areas where basal Paleozoic sandstone forms the unconformity with basement. With an impermeable carbonate cap-rock these may have acted as aquifers for groundwater flow and a source for metal.

A combination of the factors would appear to present a well defined exploration target for this deposit type in an area with abundant fracturing and favourable host units. While they may not be expected to be of very large extent they must be considered economically significant.

DEVELOPMENT HISTORY:	1860 - discovery, some trenching
REFERENCE MAP:	GSC 1362A, Carleton Place, 1973
REFERENCE	National Mineral Inventory (File Pb, 31F/1, Lynch); Department of Energy, Mines, and Resources, Mineral Policy Sector, Ottawa.

27. RAMSAY

COMMODITY	MAIN: Lead OTHER: Zinc, copper
ROCK ASSOCIATION	HOST: Vein calcite OTHER: Ordivician limestone
CLASSFICIATION	1B. Unconformable, carbonate-hosted, lead
LOCATION	Ramsay Township, Lanark County NTS 31F/1, UTM Zone 18, 5000335N, 408460E. LAT. 45° 09' 09"N, LONG. 76° 09' 52"W, Con. 6, Lot 3 and Con. 7, Lot 3.
ACCESS	A gravel road separating Con. 6 and Con. 7 passes through the property at a point 1.6km (1 mile) north of the town of Carleton Place. The former Deseco Mines Ltd. workings are located on Con. 7, 60m (200 feet) east of the road and there is a long trench on Con. 6, 12m (40 feet) west of, and parallel to the road.
SIZE AND GRADE	The Ramsay lead deposit consists of 2 separate properties. The deposit on Con. 7 is the former Deseco Mines Ltd. property and consists of a network of narrow galena-bearing calcite veins in a zone 2 feet wide and 2,300 feet long (Alcock, 1930, p. 141). The deposit on Con. 6 consists of a single galena-bearing calcite vein 2½ to 5 feet wide with an ore-bearing portion 8 to 24 inches wide and fades out a depth below the Paleozoic-Late Precambrian unconformity (Alcock, 1930, p.141). This vein is at least 90 metres (300 feet) in length. There is minor sphalerite and pyrite in both deposits. A selected sample of typical mineralized material collected on Con. 7, Lot 3 contained 5.30 percent Pb and trace Ag. Workings on Con. 6 consist of a single trench about 45m (150 feet) long, up to 1.5m (5 feet) wide, and up to 3m (10 feet) deep where it isn't filled with garbage. Workings on Con. 7 consist of a large shallow pitted area 15m (50 feet) by 30m (100 feet) and up to 2.1 metres (7 feet) deep, and a trench 30m (100 feet) long, up to 3 metres (10 feet) wide and 1.8m (6 feet) deep where not filled with refuse.
DESCRIPTION	GENERAL GEOLOGY: The Ramsay lead deposit is contained within Ordivician limestone near the Late PreCambrian-Paleozoic contact. The limestone is a flat lying, very fine grained, buff-to-grey rock that overlies Potsdam sandstone of late Cambrian age which, in turn, unconformably overlies the Late PreCambrian basement complex. The mineralization is hosted by two calcite veins or vein networks that cut the Ordivician limestone. The main vein, on Lot 3, Con. 6, strikes N50°W and dips steeply to the northeast. On Lot 3, Con. 6, there is a network of narrow veins of white-to-pink calcite. MINERALIZATION: Mineralization consists of coarse, erratically distributed grains of galena and minor sphalerite, pyrite, and chalcopyrite. DISCUSSION: This deposit is similar to the other deposits in this group in the study area and to other vein lead deposits close to the Paleozoic margin of the Late Pre-Cambrian basement rocks. This is the only deposit of this group that is contained in features within the paleozoic cover rather than the Late Precambrian basement. A discussion of the genesis of this deposit type is contained in the introductory section to this report. The most significant features of rock associations and ore localization are outlined below:

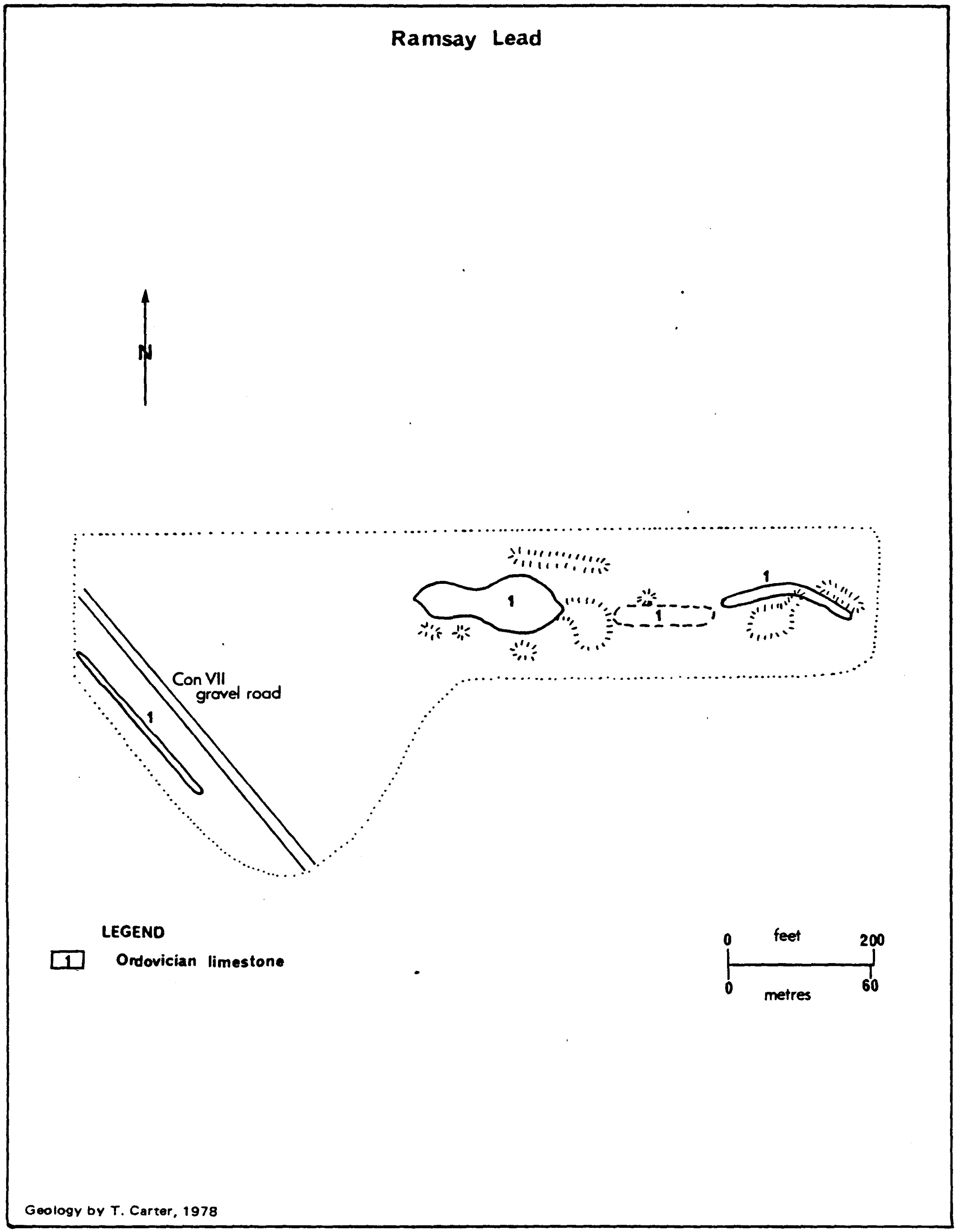

Figure 27A — Geology and workings of the Ramsay lead deposit.

- deposit occur close to the Late Precambrian Paleozoic unconformity.
- mineralization occurs in fracture filling veins with a general northwesterly trend, which appear to be related to the development of the Ottawa graben.
- the widest and best mineralized veins occur as fracture fillings in marbles. The width may be the result of a competency difference between the host rock units during faulting. Deposition of mineralization in the marbles may be the result of their chemical reactivity.
- mineralization appears to be restricted to areas where basal Paleozoic sandstone forms the uncomformity with basement. With an impermeable cap-rock these may have acted as aquifers for ground-water flow and a source for metal.

A combination of the factors would appear to present a well defined exploration target for this deposit type in an area with abundant fracturing and favourable host units. While they may not be expected to be of very large extent, they must be considered economically significant.

DEVELOPMENT HISTORY

1858: work by unknown operators. Shaft sunk 37 feet (11.3m), 450 feet (137m) vein material mined - 26 tons ore yielding 80% Pb obtained.
- second shaft sunk 21 feet (6.4m)

1863: one of previous shafts deepened to 90 feet (27.4m) by Ramsay Lead Mining and Smelting Co.

1925-26: prospecting, surface work, some diamond drilling by Ottawa Valley Syndicate.

1951: property acquired by Deseco Mines Ltd.
- surface work, construction of mile, no production.

REFERENCE MAP

GSC 1362A, Carleton Place, 1973.

REFERENCES

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1930: Zinc and Lead Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 8.

Logan, W.E.
1863: Geology of Canada; Geological Survey of Canada, Report of Progress from Its Commencement to 1863.

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1951: Deseco Mines, Ltd. (unpublished report); Ontario Geological Survey, Geoscience Data Centre, Source Mineral Deposit (Ramsay Lead).

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Uglow, W.L.
1916: Lead and Zinc Deposits in Ontario and in Eastern Canada; Ontario Bureau of Mines, Annual Report Vol. 25, part 2, 1916, p.27.

Vennor, H.G.
1876: Explorations and Surveys in the Rear Portions of Frontenac and Lanark Counties; Geological Survey of Canada, Report of Progress 1874-75, p.163.

APPENDIX II

Detailed Descriptions of Individual Iron Deposits

IRON DEPOSITS

TOWNSHIP	DEPOSIT NUMBER	DEPOSIT NAME
Bagot	1	Ashdad
	2	Bluff Point
	3	Calabogie
	4	Culhane
	5	Frechette
	6	Highway 508
	7	Lerond
	8	Martel
	9	Murphy Road
	10	Stufkos Lake
	11	Williams
Blithfield	12	Barryvale
	13	Blithfield Pyrite
Brougham	14	Blackbird
	15	Dacre
	16	Kennelly Lake
Carlow	17	Boulter
	18	Fraser Lake
Darling	19	Darling
	20	Fahey
	21	McIlwraith Pyrite
	22	White Lake
	23	Yuill
Dungannon	24	Coltson Lake
	25	Copper Lake
	26	Hastings Road East
Faraday	27	Bow Lake
	28	Carfrae
	29	Trent River
	30	Whitefoot Lake
Fitzroy	31	Fitzroy Harbour
Grattan	32	Grattan
Horton	33	Ottawa River
Lavant	34	Lavant
	35	Radenhurst-Caldwell
	36	Wilbur
Mayo	37	Bessemer
	38	Bulpit Lake
	39	Childs
	40	Hamlyn
	41	Rankin
	42	Stevens
	43	Swordfingal
McNab	44	McNab
Palmerston	45	Lavant Station
Raglan	46	Keller
Ross	47	Ross
S. Canonto	48	Longstone Lake
	49	Summit Lake
Torbolton	50	Torbolton

TABLE II-1: List of Iron Deposits in the Pembroke-Renfrew Area.

1. MAGNETITE DEPOSITS

A. Stratabound, carbonate-skarn hosted, at intrusive contacts

4. Culhane	Bagot Township
7. Lerond	Bagot Township
11. Williams	Bagot Township
16. Kennelly Lake	Brougham Township
28. Carfrae	Faraday Township
36. Wilbur	Lavant Township
37. Bessemer	Mayo Township
39. Childs	Mayo Township
40. Hamlyn	Mayo Township
41. Rankin	Mayo Township
42. Stevens	Mayo Township
43. Swordfingal	Mayo Township
45. Lavant Station	Palmerston Township

B. Stratiform, carbonate hosted

6. Highway 508	Bagot Township
9. Murphy Road	Bagot Township

C. Stratiform, skarn hosted

48. Longstone Lake	South Canonto Township
49. Summit Lake	South Canonto Township

D. Intrusion hosted

i) Gabbroic Intrusions

1. Ashdad	Bagot Township
10. Stufkos Lake	Bagot Township
12. Barryvale	Blithfield Township
31. Fitzroy Harbour	Fitzroy Township
33. Ottawa River	Horton Township
34. Lavant	Lavant Township
46. Keller	Raglan Township
50. Torbolton	Torbolton Township

ii) Granitic-syenitic intrusions

17. Boulter	Carlow Township
18. Fraser Lake	Carlow Township
24. Coltson Lake	Dungannon Township
27. Bow Lake	Faraday Township
29. Trent River	Faraday Township
30. Whitefoot Lake	Faraday Township
32. Grattan	Grattan Township

E. Stratiform, volcanic hosted

19. Darling	Darling Township
23. Quill	Darling Township

F. Geological relationships unclear

2. Bluff Point	Bagot Township
3. Calabogie	Bagot Township
5. Frechette	Bagot Township
8. Martel	Bagot Township
14. Blackbird	Brougham Township
15. Dacre	Brougham Township
25. Copper Lake	Dungannon Township
26. Hastings Road East	Dungannon Township
35. Radenhurst-Caldwell	Lavant Township
38. Bulpit Lake	Mayo Township
47. Ross	Ross Township

2. HEMATITE DEPOSITS

A. Carbonate hosted, fault-related

20. Fahey	Darling Township
22. White Lake	Darling Township
44. McNab	McNab Township

3. PYRITE DEPOSITS

A. No consistent geological association

13. Blithfield Pyrite	Blithfield Township
21. McIlwraith Pyrite	Darling Township

TABLE II-2: Classification of iron deposits in the Pembroke-Renfrew area.

1. ASHDAD

COMMODITY — Iron (magnetite)

ROCK ASSOCIATION — HOST: hornblende schist (metagabbro)

CLASSIFICATION — 1D. Intrusion hosted

LOCATION — Bagot Township, Renfrew County
NTS 31F/7/UTM Zone 18, 5024080N, 367520E
LAT. 45° 21' 35"N; LONG. 76° 41' 29"W
Con. 5, Lot 23

ACCESS — The deposit is reported to be located approximately one mile (1.6km) northeast of Norway Lake (Quinn, 1952, p. 46) and is accessible via the Ashdad Road west from Highway 508.

SIZE AND GRADE — Mineralization is reported to consist of disseminated magnetite in two zones up to 2 feet (0.6m) wide and 150 feet (46m) long, exposed in a series of small pits and trenches (Quinn, 1952, p. 46) not located by the authors. A magnetometric survey (Frechette, 1910) indicated the presence of several small magnetite bodies up to 6 feet (2m) wide, dipping slightly to the south. A composite sample of mineralized rock collected by Frechette (1910 p. 86) contained 31.02 percent Fe, 37.08 percent insoluble, 0.167 percent S, and 0.312 percent P.

DESCRIPTION — The Ashdad iron deposit is contained within metagabbro that forms a conformable intrusion within a sequence of interbedded siliceous marble and calcareous mudstone. The authors were not able to examine the bedrock or the mineralization but according to Quinn, (1951, p. 46), "Trenches and pits exposing some magnetite are found along two westerly trending zones. Although most of these did not expose bedrock, two of them showed hornblende schist dipping gently southward and containing up to 50 percent disseminated magnetite across a width of 2 feet, and a few conformable bands of massive magnetite as much as 2 inches thick."

The Ashdad deposit is one of a small group of similar iron deposits that occur as layers and lenses of disseminated-to-massive magnetite within gabbroic intrusions in the Pembroke-Renfrew area. The field and petrographic relationships of these ore bodies indicate that they are syngenetic with their gabbroic host rocks. They probably formed as a result of segregation and subsequent crystallization of separate oxide-rich phases within the intrusions.

The titanium content of this deposit is unknown but most of the deposits of this type contain greater than one percent TiO_2, making them undesirable as iron ores. Consequently, they do not constitute important potential iron orebodies at the present time.

DEVELOPMENT HISTORY — Several small pits and trenches excavated by unknown operators.

REFERENCE MAP — GSC 1046A, Renfrew 1956

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2. BLUFF POINT

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: Ampibolite schist OTHER: Syenite, calcitic marble
CLASSIFICATION	1F. Geological relationships unclear
LOCATION	Bagot Township, Renfrew County NTS 31F/7 UTM Zone 18, 5016500N, 364880 E LAT. 45° 17' 27"N; LONG. 76° 43' 23"W Cons. 10 and 11, Lot 16
ACCESS	The deposit is located about 300m (1,000 feet) east of the east end of the Calabogie Lake causeway and is accessible by foot from the causeway.
SIZE AND GRADE	Mineralization consists of disseminated to massive magnetite in a lens 425m (1,400 feet) in length and varies from 0.6 to 3.7m (2 to 12 feet) in width. An average sample of ore shipped during mining operations is reported to have contained 59.50 percent Fe, 9.10 percent SiO_2, 0.17 percent P, and 0.16 percent S (Lindeman, 1914, p. 12). There are four small open cuts and two inclined shafts on the property that provide reasonably good exposure of the ore-body. The workings have been described in detail by Satterly (1945 p. 56, 57).

DESCRIPTION

GENERAL GEOLOGY: The Bluff Point iron deposit is contained within an amphibolite schist that forms a conformable lens along the contact between a syenite intrusion and calcitic marble in a sequence of interbedded marble, calcereous mudstone, and mafic meta-volcancics. The units strike northeast and dip southeast at from 25 to 35 degrees (see Fig. 2A).

The syenite forms the hanging wall to the amphibolite schist (Fig. 2B) and is a grey to reddish grey, foliated, rock composed essentially of feldspar with minor amounts of hornblende. It is probably an offshoot of a syenite stock further to the south. Dikes of syenite cut the amphibolite schist in at least one place. The amphibolite schist is a very friable, dark greenish-grey rock composed of variable amounts of fine-grained amphibole, chlorite, talc, carbonate, magnetite, and minor hematite. Small cross cutting veinlets of talcose serpentine are common. The calcitic marble is a fine to medium-grained white rock which is poorly exposed and may not be as extensive as indicated in Figure 2A. The dolomitic marble underlying the calcitic marble is well exposed and contains abundant tremolite in addition to dolomite.

MINERALIZATION: Mineralization consists of a lens, or series of lenses of massive magnetite contained within the amphibolite schist near the marble contact. It forms a compact, fine-grained, massive grey rock composed largely of magnetite.

MICROSCOPY: Two thin sections and one polished thin section were prepared from samples collected from the deposit. Fe-1-2 is a thin section of syenite, Fe-1-5 is a thin section of magnetite-bearing amphibolite shist, and Fe-1-4 is a polished thin section of massive magnetite ore (see Table 2A).

The syenite is composed of an equigranular, granoblastic, fairly homogeneous intergrowth of subhedral-to-euhedral hornblende, anhedral plagioclase, and scattered grains of sphene, apatite, and magnetite.

The amphibolite schist is a granoblastic intergrowth of coarse-grained (0.4mm to 1.0mm), anhedral to euhedral hornblende and anhedral magnetite, with minor plagioclase. The anhedral hornblende grains are usually larger and contain abundant inclusions of magnetite. The magnetite forms large ragged grains and the plagioclase occurs as small, scattered grains.

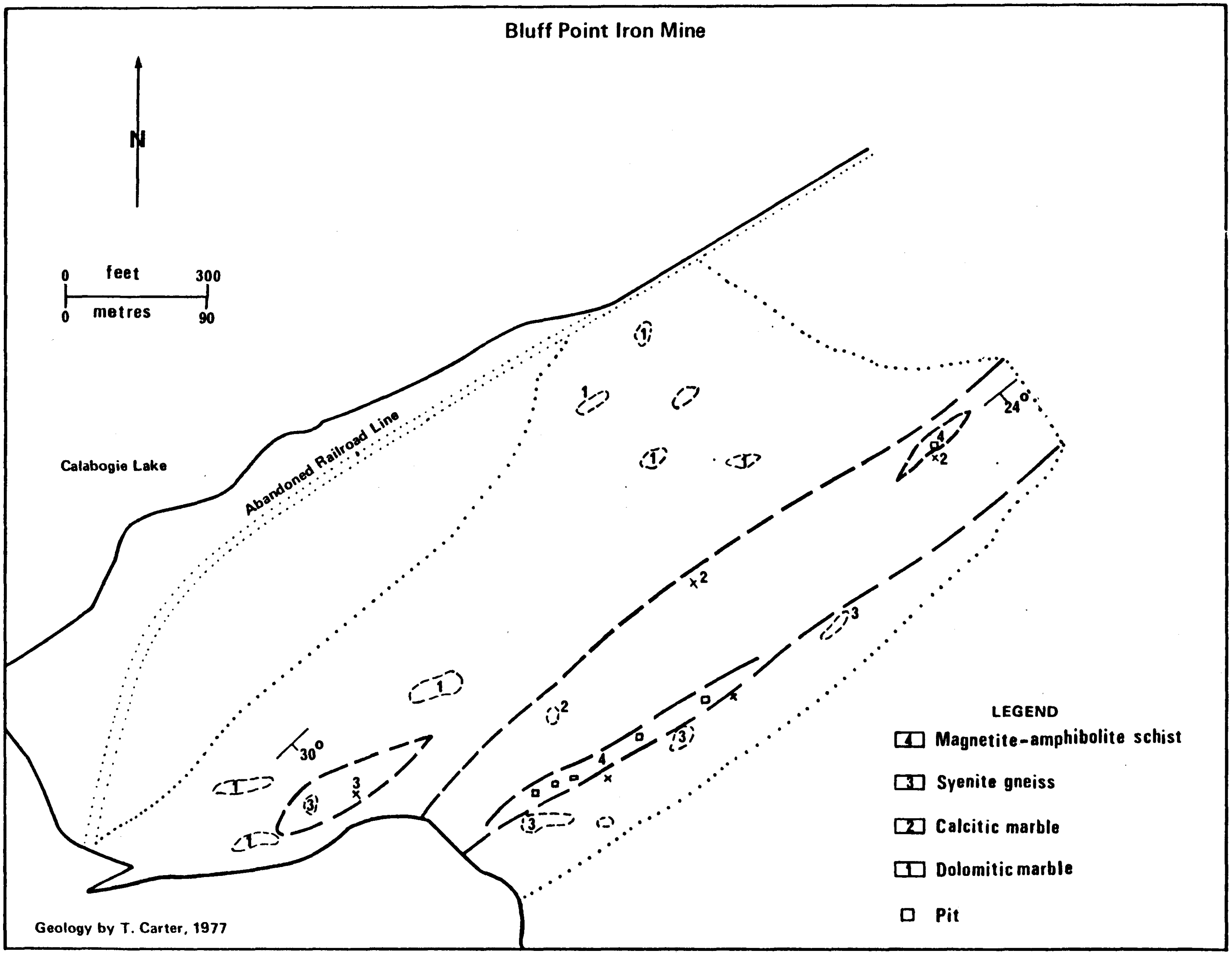
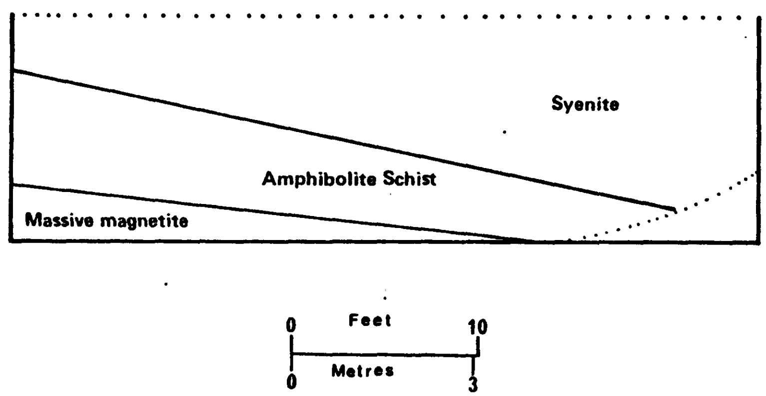


Figure 2A — Geology of the Bluff Point iron deposit.

Bluff Point Iron Mine
Cut E



Geology by T. Carter, 1977

Figure 2B — Geological cross-section exposed in open cut 'E' of the Bluff Point iron deposit.

The massive magnetite section is composed of a tightly intergrown mosaic of fine-grained (0.3mm), anhedral to subhedral magnetic containing scattered grains of muscovite and serpentine. Orientation of the muscovite and serpentine defines a poorly-developed foliation.

	Fe-1-2	Fe-1-4	Fe-1-5
hornblende	25 - 30	-	60 - 65
plagioclase	60	-	3 - 5
magnetite	2 - 3	80	30 - 35
serpentine	-	15	-
muscovite	-	5	-
sphene	2 - 3	-	-
apatite	5	-	-

TABLE 2A: Estimated modal compositions of thin sections of selected rock types (volume percent)

GEOCHEMISTRY: One whole rock and two partial chemical analyses were performed on samples collected by the authors and the results are presented in Tables 2C and 2B respectively. A partial analysis of an average sample of ore shipped to the Canada Iron Furnace Company (Lindeman, 1914, p. 12) is included in Table 2B. Fe-1-1 is a chip sample of iron mineralization in pit C, Fe-1-4 is massive magnetite from pit E, and Fe-1-7 is amphibolite schist from pit D.

	Fe(tot)	Fe(sol)	FeO	TiO_2	P_2O_5	S
Fe-1-1	68.8	61.5	29.9	0.13	0.04	0.01
Fe-1-4	57.0	56.8	19.0	0.42	0.04	0.07
Lindeman	59.50	-	-	-	0.17	0.16

	V	Al_2O_3	SiO_2	CaO	Au(oz/ton)
Fe-1-1	0.01	-	-	-	0.05
Fe-1-4	<0.05	-	-	-	-
Lindeman	-	4.80	9.10	0.01	-

TABLE 2B: Partial analyses of some samples or iron ore

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O
Fe-1-7	37.4	0.54	8.01	4.67	25.7	9.09	0.00

	K_2O	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	Total (%)
Fe-1-7	0.00	7.64	0.28	6.24	0.02	0.0	0.04	99.7

Cu	Zn	Ni	Co	Pb	Cr	Ba	Li (ppm)
34	38	<5	28	<10	8	30	10

TABLE 2C: Whole rock chemical composition of a sample of amphibolite schist

DISCUSSION: The Bluff Point deposit is somewhat similar to the 1A group of magnetite deposits that occur as strata-bound bodies at the contacts of igneous intrusions with marble. The members of this group are believed to be contact metasomatic in origin but the host rock of the Bluff Point deposit is cut by dikes of the syenite, shows no evidence of contact metasomatism, and is believed to be a mudstone or volcanic rock in origin. The magnetite deposit is conformable within this host rock and possibly formed synchronously with it. But due to uncertainties as to the nature of the host rocks, the origin of the mineralization and it's mode of disposition is uncertain.

DEVELOPMENT HISTORY

1881: Mining operations begun by Calabogie Mining Company
1882: First shaft sunk 100 feet at a 30° incline and was 8-20 feet wide. There was no drifting
1883: Mine abandoned
1886: Operations commenced again - first shaft deepened 108 feet - shipment of ore to Cleveland by Calabogie Mining Co.
1888: Second working made east of shaft No. 1 - small open cut with shaft 95 feet deep at a 40° incline.
1889: Kingston and Pembroke Company drifted 70 feet to the northeast in second shaft - couple of inclined shafts sunk together and vertical test shaft sunk to 22 feet
1894: 700-800 tons of ore shipped to Radnor furnace in Quebec by Canada Iron Furnace Company
1901: Mine abandoned
1911: Magnetometer survey by Lindeman
1919: Property mapped by M.E. Wilson to scale of 1-inch to 200 feet

REFERENCE MAP

GSC 1046A, Renfrew, 1956

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3. CALABOGIE

COMMODITY: Iron (Magnetite)

ROCK ASSOCIATION: HOST: Hornblende-bearing schists and gniesses
OTHER: Marble, amphibolite

CLASSIFICATION: IF. Geological relationships unclear

LOCATION: Bagot Township, Renfrew County
NTS 31F/7, UTM Zone 18, 5017870 N. 367280 E.
Lat. 45° 18' 14" N., Long. 76° 41' 34" W.
Con. 8 and 9, Lot 16

ACCESS: The deposit is located 915 m. (3,000 feet) northeast of Hwy 511 at a point 1 km. (0.6 mi.) southeast of the bridge over the Madawaska River in the village of Calabogie. An overgrown concession road provides access.

SIZE AND GRADE: Mineralization consists of subparallel layers of disseminated-to-massive magnetite in an ore-body 2,739 feet long (834.8 m) with an average width of 145 feet (44.2m.) and extends to a depth of at least 1,650 feet (500 m.). The deposit contains 27.2 million tons of ore grading 22.28 percent Fe, proven by diamond drilling, recoverable by open pit mining (Khan, 1972).

There are numerous workings of all types and sizes on the deposit along the northwest boundary of a large swamp. The workings have been described by previous workers but the locations are vague and confusing. A detailed description of the workings will not be given here.

All available analyses of iron ore from the Calabogie deposit are presented in Table 3A. Samples 1 to 5 are from Lindeman (1914, p. 11); sample 6 in the average composition of the ore-body as known in December, 1951 to Algoma Ore Properties (Quinn, 1952, p. 42); sample 7 is from a report by the Iron Ore Committee (1924, p. 225); and sample 8 is a partial analysis of a sample collected by the authors.

	Sample location	Fe(tot)	Fe(sol)	FeO	Insol.	SiO_2
1.	Tommy R. pit	38.30				
2.	TB pit	50.59			16.10	10.26
3.	Holden pit	60.91	60.91			4.60
4.	Campbell mine	47.86				10.60
5.	Con. 9, Lot 16 (S½)	47.81				15.00
6.	Ore body average	26.20				25.40
7.	Caldwell Mine	58.30				5.47
8.	Con. 9, Lot 16 (E½)	60.7	60.7	60.4	26.5	

	Al_2O_3	CaO	MgO	P	S	TiO_2	Mn	CO_2	V
1.				0.233	0.020				
2.	4.82	3.33	5.86	0.289	0.012	0.25			
3.	3.60	1.77	2.83	0.578	0.10	0.10			
4.	4.27	4.45	6.90	0.330	0.08	0.25			
5.	3.85	4.86	7.05	0.390	0.015	0.25			
6.	6.04	10.15	8.26	0.21	0.27	0.37	0.38	1.04	
7.	3.68	2.03	0.15	0.137	tr.				
8.				0.53	0.05	0.16			0.04

TABLE 3A: Partial analyses (in percent) of some samples of iron ore from the Calabogie iron deposit,

In the interest of rapid dissemination of the results contained in this Report, some of the data may not have been meticulously checked. Thus the OGS does not guarantee the accuracy of these figures and suggests the reader check original sources.

DESCRIPTION

GENERAL GEOLOGY: Due to the very poor exposure of the works in the vicinity of the Calabogie iron deposit, and a recent controversy as to the nature of the host rocks, its geological setting is not clearly understood. According to Quinn (1952, p. 41).

> "The rocks enclosing and adjacent to the ore consist mainly of hornblende-bearing schists and gneisses. They include hornblende-biotite schists, quartz-biotite-hornblende schist, hornblende-pyroxene schist, hornblende-feldspar schist, amphibolite, and at least one 60-foot band of crystalline limestone containing 10 to 20 per cent biotite, tremolite, pyroxene, serpentine, and other silicate minerals. Other members of the series, particularly those nearest the ore zone, are calcareous, comprising up to 20 per cent white calcite. The hornblende-bearing rocks are in general thinly banded, fine grained, and dark grey to grey in colour. The whole series strikes about north 55 degrees east and dips to the southeast at 40 to 45 degrees.
>
> Lenses and bands of crystalline limestone containing tremolite and other silicate minerals occur in the hornblende-bearing schists on the hanging-wall side of the ore zone. One of these, about 1,000 feet southeast of the ore zone, is about 300 feet wide and a little less than ½ mile long.
>
> On the foot-wall side of the northeastern part of the ore zone and about 750 feet from it is a sill of meta-gabbro. This sill is about 1,700 feet thick, trends northeasterly, and dips to the southeast. It is a grey, fine-to-medium grained, massive rock composed mainly of hornblende, plagioclase, and biotite. Toward the southwest it grades into pinkish grey, hybrid, gneissic , and schistose rocks."

Rose (1958) also mapped the geology in the vicinity of the deposit (see Figure 3A) and described the rocks very similarly. However, neither Rose nor Quinn speculates on the origin of 'hornblende-bearing schists and gneisses' that enclose the orebody. Bishop mapped the geology in the vicinity of the deposit as part of a Master's thesis and concluded that the host rocks are aluminous metasedimentary rocks (Bishop, 1978, p. 33). But Lumbers (1978, Royal Ontario Museum personal communication) as a result of field work conducted in 1978 believes that the iron deposit is contained within the margin of a gabbroic intrusion. The author examined and sampled the rocks exposed in the workings on the deposit but was unable to resolve the controversy.

MINERALIZATION: Mineralization consists of disseminated to massive magnetite contained in an orebody that is completely conformable within its host rocks. Quinn (1952, p. 41) describes the ore zone as follows:

> "The ore zone itself is marked by its higher content of magnetite, chlorite, pyroxene, hornblende, and sulphides. The rock types occurring in it include chlorite schist, amphibolite, pyroxene-hornblende gneiss, hornblende-plagioclase-scapolite gneiss, magnetite-pyroxene-calcite gneiss, chloritic quartz-biotite-hornblende and hornblende-biotite schist, quartz-pyroxene-garnet-epidote schist, and plagioclase-tourmaline-pyrite schist. Many of these, particularly the chlorite-and pyroxene-bearing types, are highly calcareous. The magnetite occurs largely as disseminated grains, strings of closely spaced grains, and veinlets less than 3 inches thick paralleling the foliation mainly in the chlorite-, hornblende-, and pyroxene-bearing rocks. Although some of the magnetite is nearly massive in bands up to 2 feet or more thick, most of it found in veinlets and bands is foliated or platy, with numerous seams and irregular masses of chlorite or other silicate minerals or calcite up to 1/8 inch thick between the laminae of magnetite. The sulphides, normally composing less than 1 per cent of the ore, consists mainly of pyrite

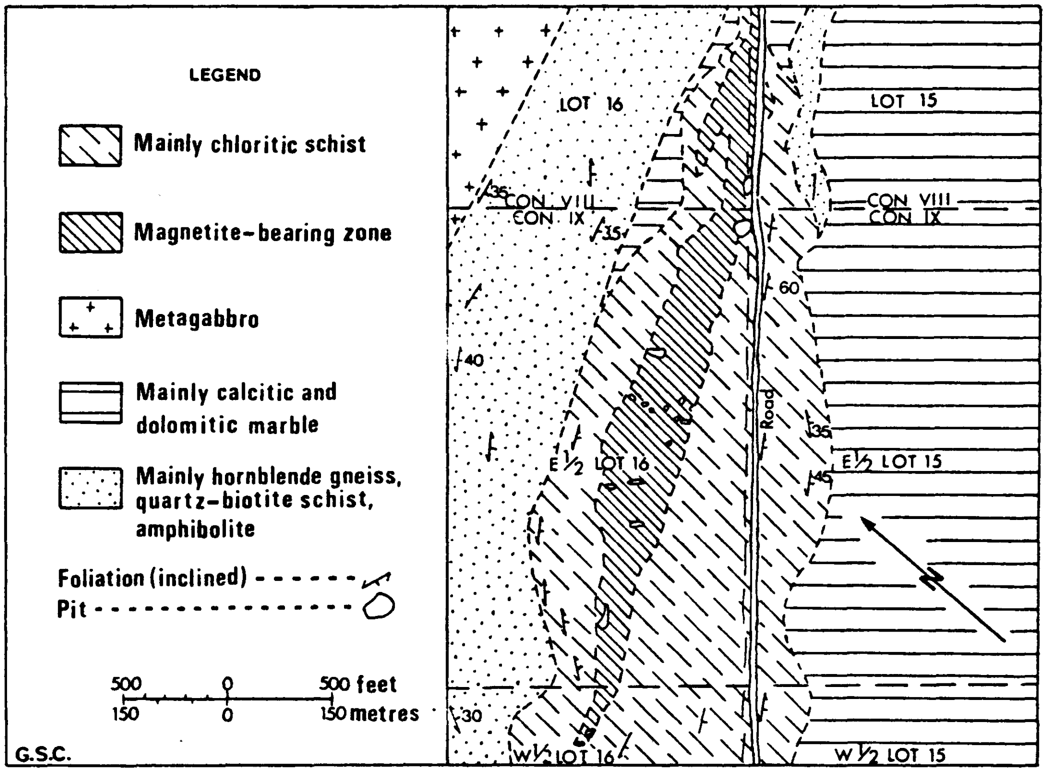

Figure 3A — Geology of the Calabogie iron deposit (Rose, 1958, p.31).

with lesser pyrrhotite, and traces of chalcopyrite. These occur as disseminated grains and as bands seams up to 3 inches wide in the ore parallel with its foliation. A few lenses and seams of hematite up to ¼ inch thick, associated in some places with pyrite, are found. Veinlets of white and pink calcite, normally 1 inch or less in width, occur both parallel with the foliation of the ore and cutting across it.

MICROSCOPY: One polished thin section was prepared from a sample of layered magnetite ore (see Table 3B). It consists of alternating, parallel, magnetite-inch and magnetite-free layers with gradational contacts. The magnetite-free layers consist essentially of carbonate grains scattered throughout intergrowths of tremolite-actinolite or, less commonly, chlorite and serpentine. The magnetite-rich layers consist essentially of massive intergrowths of anhedral magnetite and dispersed grains of carbonate, chlorite, serpentine and/or tremolite-actinolite. Minor amounts of hematite occupy fractures within some of the magnetite grains.

	Fe-2-3
magnetite	60 - 65
tremolite	10
chlorite	15
carbonate	10 - 15
serpentien	2 - 3

TABLE 3B: Estimated modal composition (in percent) of a polished thin section of iron ore.

DISCUSSION: Due to the controversy about the nature of the host rocks of the deposit, the origin of the iron mineralization is open to speculation. If the host rocks are metasediments then the magnetite was probably deposited as a chemical precipitate synchronously with deposition of the host rocks. But, if the deposit is contained within the margin of gabbroic intrusion, it may be contact metasomatic in origin or, alternatively, it may have formed as primary layers of segregated magnetite within the intrusion although this is unlikely in consideration of the low TiO_2 content of the ore.

DEVELOPMENT HISTORY

1883 - Jeanette Pit opened by Mr. Coe of Madoc

1883-1901: Approx. 10,000 tons of ore was shipped from numerous pits by Mr. Coe, Hamilton Steel and Iron Co., T.B. Caldwell and the Kingston and Pembroke Mining Co. from Caldwell Mine
- a magnetometer survey was undertaken.

The development of the property during this period consisted of the following:

1) Caldwell (Coe) Mine: a) Tommy R. Pit - This consisted of an irregular open pit and trench extending about 100 ft. and 15-45 feet wide.

b) Holden Pits - These pits are about 900 ft. west of the Tommy R. pit and are composed of three inclines, two of which are on the same run of ore, and the third, which is on a parallel body about 80 ft. north of these.

c) Jeanette Pit - This pit has been made on the dip of a magnetite body at an angle of about 35° with a depth of about 40 ft. and 100 **ft. in length.**

d) T.B. Pit - This is an irregular open pit about 90 ft. by 80 ft. by 60 ft. deep.

2) Campbell (No. 4) Mine - The excavation was about 60 ft. by 30 ft. by 55 ft. deep. A dip needle survey has also been run.

Before 1902 - Calabogie Mining Co. shipped 5,000 or less tons from an open pit 40 ft. by 100 ft. by 55 ft. deep from the Campbell Mine.

1911: magnetometer survey by Lindeman.

1951: Property was acquired by Algoma Ore Properties Ltd. - now Algoma Steel Corp. They completed 44 diamond drill holes for a total of 18,371 feet - metallurgical testing of mineralized drill core.

1952: 5 diamond drill holes for total of 911 feet completed by Algoma, also bulk sampling, metallurgical testing, dip needle survey.

1953: Preliminary engineering work, more acquisitioning of property by Algoma.

1954: 6 diamond drill holes totalling 4,852 feet completed.

1955: 2 diamond drill holes to maximum depth of 2,154 feet completed for a total of 4,187 feet.

1956: 2 diamond drill holes for an unspecified length.

1957: Detailed engineering study, metallurgical testing.

1958: Detailed magnetometer survey

Present status: Calabogie property, with mining rights, totalling 25 lots or 4,500 acres is owned by Algoma Steel Corp. Ltd.

REFERENCE MAP GSC 1046A, Renfrew, 1956

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4. CULHANE

COMMODITY: Iron (magnetite)

ROCK ASSOCIATION: HOST: amphibolite schist
OTHER: gabbro, dolomitic marble

CLASSIFICATION: 1A. Stratabound, carbonate skarn hosted, at intrusive contact.

LOCATION: Bagot Township, Renfrew County
NTS 31F/7, UTM Zone 18, 5021930 N, 366500 E,
LAT. 45° 20' 24" N; LONG. 76° 42' 14" W.
Con. 7, Lot 21

ACCESS: The deposit is located among several cottages on the southeast shore of Norway Lake and is accessible via a cottage access road.

SIZE AND GRADE: Mineralization consists of disseminated to massive magnetite contained in several stratabound lenses 3 to 5m (10 to 16 feet) in width over a strike length of 601m (2,000 feet). A sample of iron ore analysed by Lindeman (1914, p. 11) 47.70 percent Fe, 4.20 percent CaO, 0.66 percent MgO, 0.179 percent P, 0.165 percent S, and 9.3 percent insoluble. A sample collected by the writer contained 51.3 percent Fe, 22.1 percent FeO, 5.03 percent S, 0.04 percent TiO_2, 0.12 percent P_2O_5, and 0.01 percent V.

Workings on the deposit consist of (1) a trench 2.4 x 9.1m; (2) a shaft with an open cut 3 x 12m; (3) an open cut 15m long and 3 to 6m wide, and (4) a pit 3 x 3m and 1.2m deep (see Figure 4A). All the pits are partially debris and water-filled.

DESCRIPTION: GENERAL GEOLOGY: The Culhane iron deposit occurs at the contact between a gabbroic intrusion and a narrow belt of marble that strikes in a northeasterly direction. The metagabbro in the vicinity of the deposit is a gneissic, black rock composed essentially of hornblende and plagioclase. The marble is a well-layered, white, coarse-grained rock composed essentially of dolomite.

MINERALIZATION: Mineralization consists of magnetite disseminated within an amphibolite schist that forms a series of discontinous lenses along the contact between the marble and metagabbro. The rock is very dark in colour, is very friable, and is composed essentially of fine-grained amphibole, calcite, and disseminated pyrite, pyrrhotite, and magnetite. According to Ingall (1901, p. 63) "the ore zone" exposed in the shaft is at least 6 feet thick, but he does not describe the nature of the mineralization. Samples of massive magnetite are present on the dumps of the old workings, however, and this may constitute the ore zone.

MICROSCOPY: Two thin sections were prepared from rock samples collected by the writer. Fe-3-4 is a thin section of a metagabbro like that cuts the marble and Fe-3-6 is a sample of metagabbro collected near the shaft at working No. 2 (see Figure 4A) Fe-3-4 is composed essentially of a granoblastic intergrowth of equigranular, fine-grained (0.4mm) plagioclase, hornblende, biotite, and minor sphene and apatite. The hornblende grains are ragged and commonly intergrown with biotite. The plagioclase occurs as anhedral grains that are commonly somewhat altered to carbonate, and the sphene occurs as small, rounded grains. Fe-3-6 is essentially similar except for the presence of anthophyllite instead of hornblende, less plagioclase, and no sphene (see Table 4A).

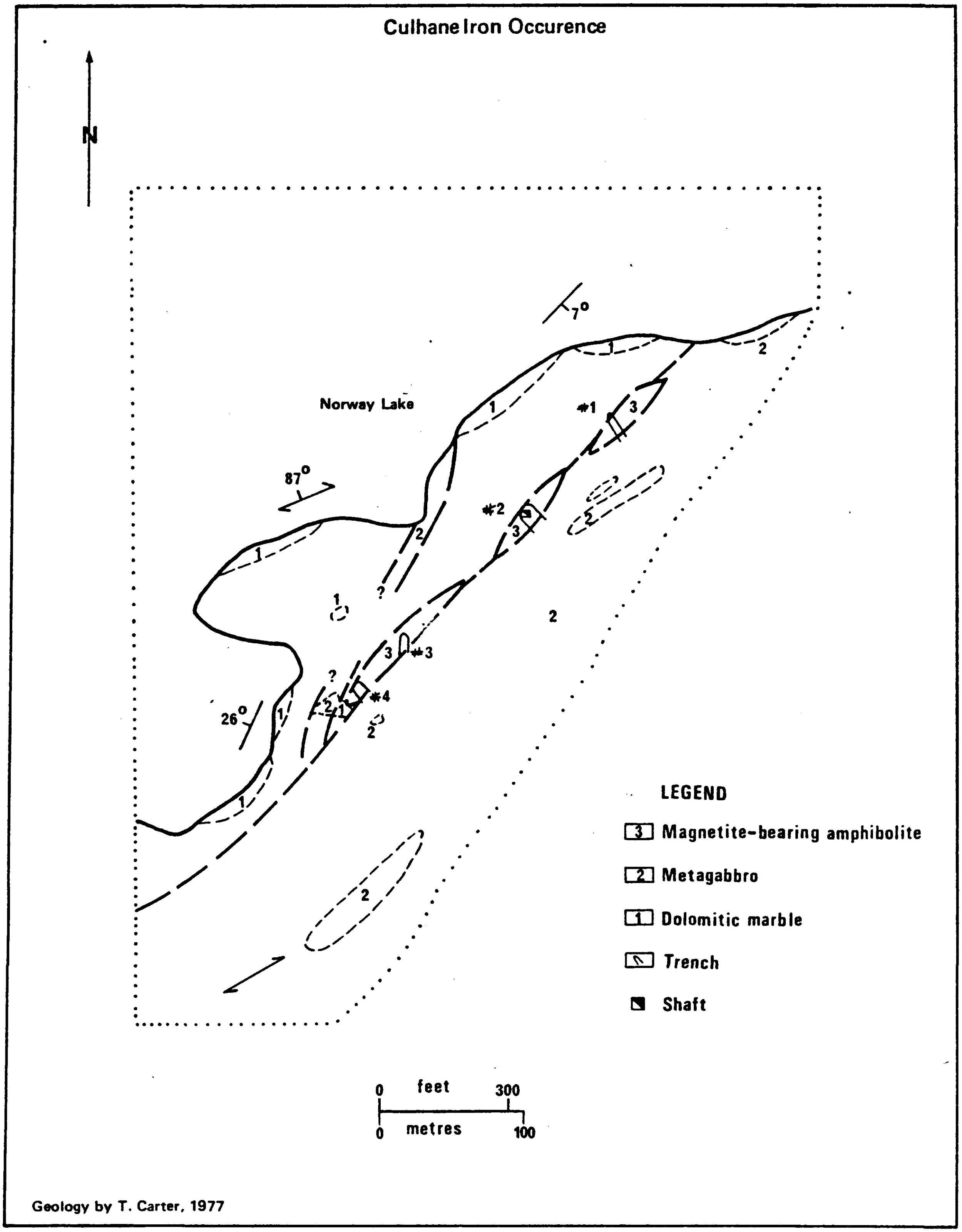

Figure 4A — Geology of the Culhane iron deposit.

	Fe-3-4	Fe-3-6
plagioclase	65	40-45
hornblende	15-20	-
anthophyllite	-	35
biotite	5-10	10-15
opaques	-	5
sphene	5	-
apatite	2	2

TABLE 4A: Estimated modal compositions (in percent) of two thin sections of metagabbro.

GEOCHEMISTRY: The whole rock chemical composition and trace element content of a sample of metagabbro collected by the writer is presented in Table 4B.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-3-4	60.0	17.9	1.00	1.70	2.80	4.54	8.80	0.53

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-3-4	0.55	0.27	1.42	1.01	0.22	$<$0.01	0.05	100.8

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-3-4	5	17	24	$<$5	14	29	50	3

TABLE 4B: Whole rock chemical composition and trace element content of a sample of metagabbro.

DISCUSSION: The Culhane deposit is similar to many other iron deposits in the Pembroke-Renfrew area that occur as stratabound bodies at or near the contacts of intrusions with carbonate rocks. The mineralization at the Culhane deposit probably was deposited as a result of contact metasomatic effects of the gabbroic intrusion .

DEVELOPMENT HISTORY

1880-1890: 3 open cuts excavated, 2 with shafts 15 and 70 feet deep by unknown operators.

REFERENCE MAP

GSC 1046A, Renfrew, 1956

REFERENCES

Ingall, E. D.
1901: Iron Ore Deposits along the Kingston and Pembroke Railway in Eastern Ontario; Geological Survey of Canada, Ann. Rept. Vol. 12, part 1, 1899.

Lindeman, E.
1914: Magnetite Occurrences near Calabogie, Renfrew County, Ontario; Canada Department of Mines, Rept. No. 254.

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27.

Rose, E. R.
1958: Iron Deposits of Eastern Ontario and adjoining Quebec: Geological Survey of Canada, Bulletin 45.

Satterley, J.
1945: Mineral Deposits in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, part 3, 1944.

Shklanka, R.
1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11.

SMDR Files (Culhane Mine); Geoscience Data Centre, Ontario Geological Survey, Toronto.

5. FRECHETTE

COMMODITY	Iron
ROCK ASSOCIATION	No bedrock exposure
CLASSIFICATION	IF. Geological relationships unclear
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5017120 N, 364170 E. LAT. 45° 17' 47"N; LONG. 76° 43' 56" W Con. 11, Lot 18
ACCESS	The deposit is located near Highway 508 on the north shore of Calabogie Lake.
SIZE AND GRADE	Magnetometer anomaly 183m (600 feet) in length.
DESCRIPTION	The geology at the reported location of the deposit consists of a northeasterly-striking succession of interlayered marbles and calcareous sandstones and mudstones. However, the deposit is not exposed and is known only as a magnetometer anomaly. Consequently, its mode of formation is problematical.
DEVELOPMENT HISTORY	1909: Discovered in magnetometer survey by Frechette.
REFERENCES	Frechette, H. 1910: On a Number of Iron Ore Properties in North-eastern Ontario; Canada Department of Mines, Sum. Rept. 1909, Pub. No. 63. Satterley, J. 1945: Mineral Occurrences in the Renfrew Ontario Area; Department of Mines. Ann. Rept. Vol. 53, 1944.

6. HIGHWAY 508

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: dolomite marble OTHER: calcareous mudstone
CLASSIFICATION	1B. Stratiform, carbonate hosted
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5018070 N, 365060 E, LAT. 45° 18' 18"N; LONG. 76° 43' 16" W. Con. 10, Lot 18
ACCESS	The deposit is exposed in a rock cut on an abandoned railroad line 60m (200 feet) north of Highway 508.
SIZE AND GRADE	Mineralization consists of several narrow layers of disseminated magnetite over a width of about 0.6m. There are no workings.

DESCRIPTION

GENERAL GEOLOGY: The Highway 508 deposit occurs within a north-east striking succession of interlayered marbles and calcareous metasediments that dip shallowly (10 - 20°) to the southeast. The succession in the vicinity of the deposit consists of thin, conformable beds of, from bottom to top; dolomitic marble, calcareous sandstone, interbedded dolomitic marble and calcareous sandstone, and dolomitic marble (Figure 6A). Mineralization consists of magnetite disseminated within the calcareous sandstone and several thin layers of disseminated magnetite in the dolomitic marble beneath the sandstone.

MICROSCOPY: Two thin sections were prepared from samples collected by the writer. Fe-52-1 is a thin section of calcareous sandstone and is composed of a granoblastic intergrowth of fine-grained (0.2mm) carbonate, plagioclase, quartz, serpentine, and minor opaque minerals, apatite, and sphene. There are some indistinct quartz-rich layers. The plagioclase is largely altered to carbonate, and the serpentine forms amorphous, interlocking, granular aggregates (Table 6A).

Fe-52-3 is a thin section of marble and is composed essentially of a massive, granoblastic, equigranular mosaic of coarse-grained (2mm) carbonate and minor quartz and serpentine (Table 6A).

	Fe-52-1	Fe-52-3
plagioclase	30 - 40	-
quartz	15 - 20	minor
serpentine	20	1
carbonate	20 - 25	98
opaques	5	-
apatite	minor	-
sphene	minor	

TABLE 6A: Estimated modal compositions (in percent) of two thin sections of selected rock types.

GEOCHEMISTRY: The whole rock chemical compositions and trace element contents of three rock samples collected by the writer are presented in Table 6B.

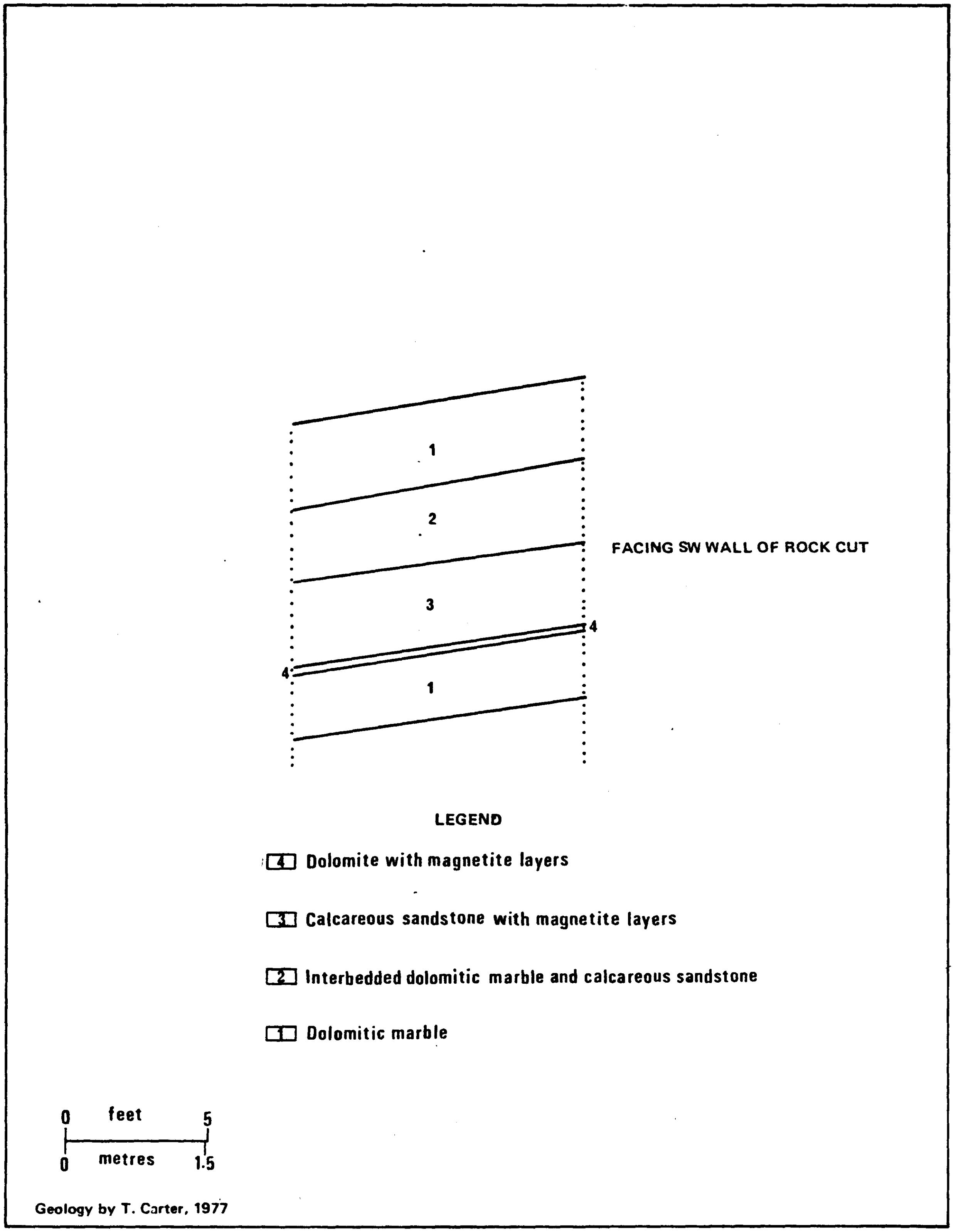

Figure 6A — Geological cross-section in rock-cut at Hwy. 508 occurrence.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-52-2	49.9	9.82	4.40	4.67	10.8	6.66	2.84	0.10
Fe-52-3	1.38	0.01	0.24	1.56	20.3	30.5	0.00	0.00
Fe-52-4	2.53	0.09	0.50	2.74	19.2	30.2	0.00	0.00

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-52-2	4.01	0.86	4.18	0.51	0.12	0.10	0.04	99.5
Fe-52-3	n.f.	0.38	45.5	0.00	0.07	0.03	0.12	99.9
Fe-52-4	n.f.	0.48	44.8	0.00	0.15	0.02	0.16	100.9

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-52-2	89	58	14	28	25	41	120	47
Fe-52-3	<5	14	<5	<5	30	6	30	<3
Fe-52-4	9	16	<5	<5	162	<5	50	<3

TABLE 6B: Whole rock chemical compositions (in percent) and trace element content (in ppm) of selected rock types

DISCUSSION: The Highway 508 deposit is very similar to the Murphy Road deposit and may form part of a continuous zone. The mineralization probably was deposited syngenetically with its host rocks as a chemical precipitate.

DEVELOPMENT HISTORY None, new deposit

REFERENCE MAP GSC 1046 A, Renfrew, 1956

REFERENCES No previous reference

7. LEROND

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: marble OTHER: gabbro
CLASSIFICATION	1A. Stratabound, carbonate-skarn hosted, at intrusive contact
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5020635 N, 363410 E. LAT. 45° 19' 40" N; LONG. 76° 44' 35" W. Con. 9, Lot 23
ACCESS	The deposit is located 38m (125 feet) south of the southwest shore of Norway Lake and 107m (350 feet) northeast of an abandoned railroad line. It is accessible by foot 670m (2,200 feet) north from Murphy Road along the railroad line.
SIZE AND GRADE	Mineralization consists of massive magnetite contained within a small lens of unknown dimensions. There is a small, water-filled shaft on the deposit.

DESCRIPTION

GENERAL GEOLOGY: The Lerond iron deposit occurs at the contact between a gabbroic intrusion and a narrow northeast-striking succession of interlayered calcitic and dolomitic marbles. The metagabbro is a weakly foliated, grey rock composed essentially of hornblende and plagioclase. The marbles are well-layered and contain abundant tremolite in addition to calcite and dolomite. Mineralization consists of a small lens of fine-grained magnetite that is intergrown with minor amounts of calcite and actinolite.

MICROSCOPY: One thin section of metagabbro was prepared from a sample collected by the writer. It is composed essentially of a massive granoblastic, equigranular intergrowth of coarse-grained (0.8mm) plagioclase, hornblende, sphene, and carbonate (Table 7A). The plagioclase occurs as anhedral grains that are considerably altered to carbonate. The hornblende occurs as unaltered subhedral to euhedral grains, and the sphene forms rounded grains that are evenly dispersed throughout the section.

	Fe-4-3
plagioclase	35 - 40
hornblende	30 - 35
sphene	15
carbonate	10
apatite	5
opaques	2 - 3

TABLE 7A: Estimated modal composition (in percent) of a thin section of metagabbro

GEOCHEMISTRY: An analysis of a sample of metagabbro is presented in Table 7B.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-4-3	51.7	14.7	2.42	4.15	4.19	10.5	5.28	0.18

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-4-3	0.90	0.31	1.06	3.03	1.03	<0.01	0.08	99.5

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-4-3	7	36	<5	11	<10	7	30	6

TABLE 7B: Whole rock chemical composition (in percent) and trace element content (in ppm) of a sample of metagabbro

DISCUSSION: The Lerond iron deposit is a member of a large group of similar iron deposits in the Pembroke-Renfrew area that occur as stratabound lenses at or near the contacts of intrusions with carbonate rocks. The mineralization probably was emplaced as a result of contact metasomatic effects of the intrusions.

DEVELOPMENT HISTORY — before 1890: small shaft sunk by unknown operators

REFERENCE MAP — GSC 1046A, Renfrew, 1956

REFERENCES

Quinn, H. A.
1952: Renfrew Map Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, part 3, 1944.

Shklanka, R.
1968: Iron Deposits of Ontario; Department of Mines, MRC No. 11.

8. MARTEL

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: amphibolite OTHER: syenite
CLASSIFICATION	IF. Geological relationships unclear
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5015630 N, 366840 E LAT. 45^{o} 17' 01" N; LONG. 76^{o} 41' 52"W Con. 10, Lots 13 and 14
ACCESS	The deposit is located in a heavily wooded swampy area east of Calabogie Lake. One pit is accessible by foot at an azimuth of 315^{o} for a distance of 396m (1,300 feet) from a farmhouse located 1.12km (0.7 miles) southwest of Highway 511, along the Barryvale Road.

SIZE AND GRADE

Mineralization consists of massive magnetite in a lens estimated to be 20 feet (6.1m) thick, and dipping at 60^{o} to the southeast (Ingall, 1901, p.61). Its extent is unknown. A sample of iron ore collected by Lindeman (1914, p. 11) contained 58.71 percent Fe, 0.056 percent P_2O_5, 0.230 percent S, 7.10 percent SiO_2, 1.55 percent Al_2O_3, 2.05 percent CaO, and 5.70 percent MgO. A sample collected by the writer contained 54.7 percent Fe, 24.2 percent FeO, 0.11 percent TiO_2, 0.16 percent P_2O_5, 0.01 percent S, and 0.01 percent V.

There are two pits on the deposit. The main pit is 16.8 x 9.1m (55 x 30 feet) and is reported to be 18.3 (60 feet) deep, (Satterly, 1944, p. 56). The other pit is 18.3 x 4.6m (60 x 15 feet) and is about 6m (20 feet) deep. Both pits are water-filled.

DESCRIPTION

GENERAL GEOLOGY: The Martel iron deposit is located near the southwest end of a small syenite intrusion within amphibolite of unknown origin. The amphibolite and the accompanying mineralization is only exposed in the pits on the deposit. The amphibolite is a black, very compact, medium-grained rock composed essentially of hornblende and minor clinopyroxene. Mineralization consists of magnetite as disseminated grains within the amphibolite and as rare massive lenses.

MICROSCOPY: A thin section was prepared from a sample of amphibolite collected by the writer. It is composed of a granoblastic inhomogeneous intergrowth of inequigranular hornblende, hedenbergite, and magnetite (Table 8A). There are some distinct layers composed solely of hedenbergite and magnetite but both minerals are intergrown with hornblende in the rest of the section. The hedenbergite forms anhedral, irregular grains that are often fractured and partially altered to carbonate. The hornblende occurs as subhedral grains that often contain inclusions of magnetite.

	Fe-9-3
hornblende	60 - 70
hedenbergite	15 - 20
magnetite	15 - 20

TABLE 8A: Estimated modal composition (in percent) of a thin section of amphibolite

DISCUSSION: The origin of this deposit is unknown due to uncertainties about its geological setting. However, it is somewhat similar to the 1A- group of stratabound, carbonate-cal-silicate hosted iron deposits that occur at intrusive contacts.

DEVELOPMENT HISTORY before 1890: Total production was about 4,000 tons. The main working was pit No. 1, situated on the boundary between

Lots 13 and 14, which measures 55 feet by 30 feet, and 60 feet deep. No. 2 pit, which was mainly a prospect hole, was about 400 feet east of No. 1 and is 15 feet by 60 feet and about 20 feet deep.

1911: Magnetometer survey by E. Lindeman.

REFERENCE MAP Geological Survey of Canada 1046A, Renfrew, 1956.

REFERENCES

Ingall, E. D.
1901: Report on the Iron Ore Deposits along the Kingston and Pembroke Railway in Eastern Ontario; Geological Survey of Canada, Ann. Rept. Vol. 12, part I, 1899, p. 61-62.

Lindeman, E.
1914: Magnetite Occurrences near Calabogie, Renfrew County, Ontario; Canada Department of Mines, Pub. No. 254, p. 15.

Lindeman, E. and Bolton, L. L.
1917: Iron Ore Occurrences in Canada; Volume II Canada Department of Mines, Pub. No. 217.

National Mineral Inventory (File Fe, 31F/7, Wilson or Martel Mine, Dec. 11, 1951); Department of Energy, Mines, and Resources, Ottawa.

Ontario Iron Ore Committee
1924: Report of the Ontario Iron Ore Committee, 1923; Ontario Department of Mines.

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties; Ontario Geological Survey of Canada, Paper 51-27.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, part 3, 1944.

Shklanka, R.
1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11.

SMDR Files (Martel Mine); Geoscience Data Centre, Ontario Geological Survey, Toronto.

9. MURPHY ROAD

COMMODITY: Iron (magnetite)

ROCK ASSOCIATION: HOST: calcite marble
OTHER: calcareous dolomitic marble

CLASSIFICATION: 1B. Stratiform, carbonate hosted

LOCATION: Bagot Township, Renfrew County
NTS 31F/7, UTM Zone 18, 5018750 N, 365700 E
LAT. 45^o 18' 41" N; LONG. 76^o 42' 48"W
Con. 9, Lot 18

ACCESS: The deposit is located in the northeast corner of the west half of the lot. It is accessible by foot 335m (1,100 feet) northwest of Highway 508 at a point 0.8km. (0.5 miles) west of the wurphy Road.

SIZE AND GRADE: Mineralization consists of diseminated magnetite contained in a conformable layer about 1m (3 feet) thick and of unknown extent. Workings consist of (Satterly, 1945 p.55), "a shaft, 10 by 10 feet, now filled in part with water, and stated to be more than 50 feet deep; an open cut, 35 feet northwest of the shaft, which is 15 by 15 with a 9-foot face towards the northwest; and a curving trench, extending southwest from a point 15 feet west of the open cut, which is 50 feet long and 6 feet". According to Frechette (1910, p. 86), there are some additional workings, "about one-third of the distance along this lot another shaft had been sunk".

DESCRIPTION: The Murphy Road iron deposit is hosted by calcitic marble within a northeast-trending succession of intercalated marble and calcareous mudstones and sandstones that dip moderately to the south. Mineralization consists of granular, medium-grained magnetite which is disseminated throughout a 1m (3 feet) thick layer of calcitic marble within well-layered calcareous dolomitic marble.

At the other shaft described by Frechette (1910, p. 86), "the ore to be hematite, containing a little magnetite. The ore is much intermixed with rock and is only 2 or 3 feet in thickness. The ore is in crystalline limestone, underlain by quartzite and fine-grained hornblende schist." The hematite is probably a result of alteration of magnetite.

The mineralization at these locations was probably deposited syngenetically with the carbonate host rocks as a chemical precipitate.

DEVELOPMENT HISTORY: before 1909: a shaft, an open cut, and a trench excavated by unknown operators.

REFERENCE MAP: GSC 1046A, Renfrew, 1956.

REFERENCES

Frechette, H.
1910: On a Number of Iron Ore Properties in Northeastern Ontario; Canada Department of Mines, Sum. Rept. for 1909, Pub. No. 63, p. 85-86.

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, p. 48.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area: Ontario Department of Mines, Ann. Rept. Vol. 53, part 3, 1944, p. 55.

SMDR Files (Con. 9, Lot 18); Geoscience Data Centre, Ontario Geological Survey, Toronto.

10. STUFKOS LAKE

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: Gabbro OTHER: Calcitic marble
CLASSIFICATION	1D. Intrusion hosted (gabbro)
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5026240 N, 365050 E. LAT. 45° 22' 43" N; LONG. 76° 43' 25" W. Con. 6, Lot 28
ACCESS	The deposit is accessible via a gravelled road that passes through the settlement of Ashdad. It is located 200m (650 feet) east of the road at a point approximately 4.4km (2.75 miles) northeast of Ashdad.
SIZE AND GRADE	Mineralization consists of disseminated-to-massive magnetite in several narrow, conformable layers of unknown extent within meta-gabbro. A sample collected by Fréchette (1910, p. 86) contained 42.81 percent Fe, 38.00 percent insoluble, 0.006 percent P, 0.068 percent S, and 1.37 percent TiO_2. Workings consist of a pit 3 x 3m (10 by 10 feet) and 5.5m (18 feet) deep, and an open cut 3 x 6m (10 x 20 feet) and 3m (10 feet) deep.

DESCRIPTION

GENERAL GEOLOGY: Stufkos Lake deposit occurs within a gabbroic intrusion near its contact with a unit of dolomitic marble. All the rock units generally strike southeasterly and dip shallowly (30°) to the southwest.

The marble in the vicinity of the deposit is a white, massive, medium-grained rock composed mostly of calcite, rather than dolomite. The gabbro is a rusty, friable, gneissic rock composed essentially of fine-grained amphibole and plagiclase. Mineralization consists of disseminated grains and thin massive layers of magnetite within the metagabbro near the marble contact.

MICROSCOPY: One thin section was prepared from a sample of metagabbro collected by the writer. It is composed of an inequigranular intergrowth of fine-grained (0.35 mm) hornblende, and plagioclase, minor biotite, and accessory sericite, carbonate, and opaque minerals. The hornblende occurs as euhedral grains with a strongly preferred orientation that are often largely replaced by biotite within the boundaries. The plagioclase occurs as anhedral grains that are often partially altered to carbonate and sericite.

	Fe-8-1
plagioclase	45
hornblende	30 - 35
biotite	10 - 15
opaques	3 - 5
sericite	1 - 2
carbonate	1 - 2

TABLE 10A: Estimated modal composition (in percent) of a thin section of metagabbro

DISCUSSION: There are several other similar iron deposits in the Pembroke-Renfrew area. The mineralization in all these deposits probably was a primary constituent of gabbroic intrusions.

DEVELOPMENT HISTORY	before 1909: a small shaft and open cut excavated by unknown operators
REFERENCE MAP	GSC 1046A, Renfrew, 1956

REFERENCES

Frechette, H.
1910: On a Number of Iron Ore Properties in North-eastern Ontario; Canada Department of Mines, Sum. Rept. 1909, Pub. No. 63, p. 86.

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, p. 46.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, part 3, 1944, p. 52.

11. WILLIAMS

COMMODITY — Iron (magnetite)

ROCK ASSOCIATION — HOST: Calcitic marble
OTHER: Gabbro

CLASSIFICATION — 1A. Stratabound, carbonate-skarn hosted, at intrusive contact

LOCATION — Bagot Township, Renfrew County
NTS 31F/7, UTM Zone 18, 5018940 N, 361990 E
LAT. 45° 18' 44" N; LONG. 76° 45' 38" W.
Con. 11, Lot 22

ACCESS — The deposit is accessible by foot 1830m (6,000 feet) southwest of Murphy Road along an overgrown bush road. The bush road intersects Murphy Road at a point 3km (1.9 miles) by road north of Highway 508. The workings are located 30m (100 feet) southeast of the bush road along the edge of a large clearing.

SIZE AND GRADE — Mineralization consists of disseminated to massive magnetite contained in two conformable lenses 183m (600 feet) apart. The main lens is about 91m (300 feet) long and up to 6m (20 feet) thick and the second lens is less than 61m (200 feet) long and is about 3m (10 feet) thick. A sample of iron ore collected by Lindeman (1914, p. 11) contained 51.60 percent Fe and 15.85 percent insoluble material. A sample collected by the writer contained 52.8 percent Fe, 10.1 percent FeO, 0.04 percent TiO_2, 0.22 percent P_2O_5, 0.11 percent S, and 0.01 percent V.

Workings on the deposit consist of an open cut, five inclines, and a small shaft on the main overbody and two small pits on the secondary ore body. The open cut is 76m (250 feet) long with a 3 to 6m (10 to 20 feet) face along which five inclines of variable sizes and depths are cut back into the orebody. The inclines have been numbered 1 to 5 from northeast to southwest by the writer. The shaft, above incline No. 5 is 2 x 2m (6 x 6 feet) and is 6m (20 feet) deep.

DESCRIPTION — GENERAL GEOLOGY: The Williams iron deposit is hosted by siliceous calcite marble, within a sequence of intercalcated siliceous marble and calcareous mudstones and sandstones, at a contact with a large gabbroic intrusion. The intrusion is apparently conformable and overlies the marble in the vicinity of the orebody. All the rock units generally strike southwesterly and dip shallowly (25°) to the northwest.

The gabbro is a dark, medium-grained, poorly foliated rock composed essentially of plagioclase and amphibole, with locally abundant garnet. The siliceous marble is a massive, coarse-grained (3mm) rock composed essentially of calcite and contains abundant angular blocks composed of fine-grained quartz and tremolite. These silicate blocks are probably broken interbeds of quartzite.

MINERALIZATION: Mineralization consists of essentially massive magnetite contained in two separate orebodies that occur as stratabound lenses within the marble at its contact with the overlying metagabbro (see Figure 11A, 11C, 11D). The magnetite is usually intimately intergrown with clinopyroxene and calcite to form a massive, homogeneous, black rock. Magnetite also occurs as disseminated grains within the marble, especially near the ends of the main ore zone (Figure 11B).

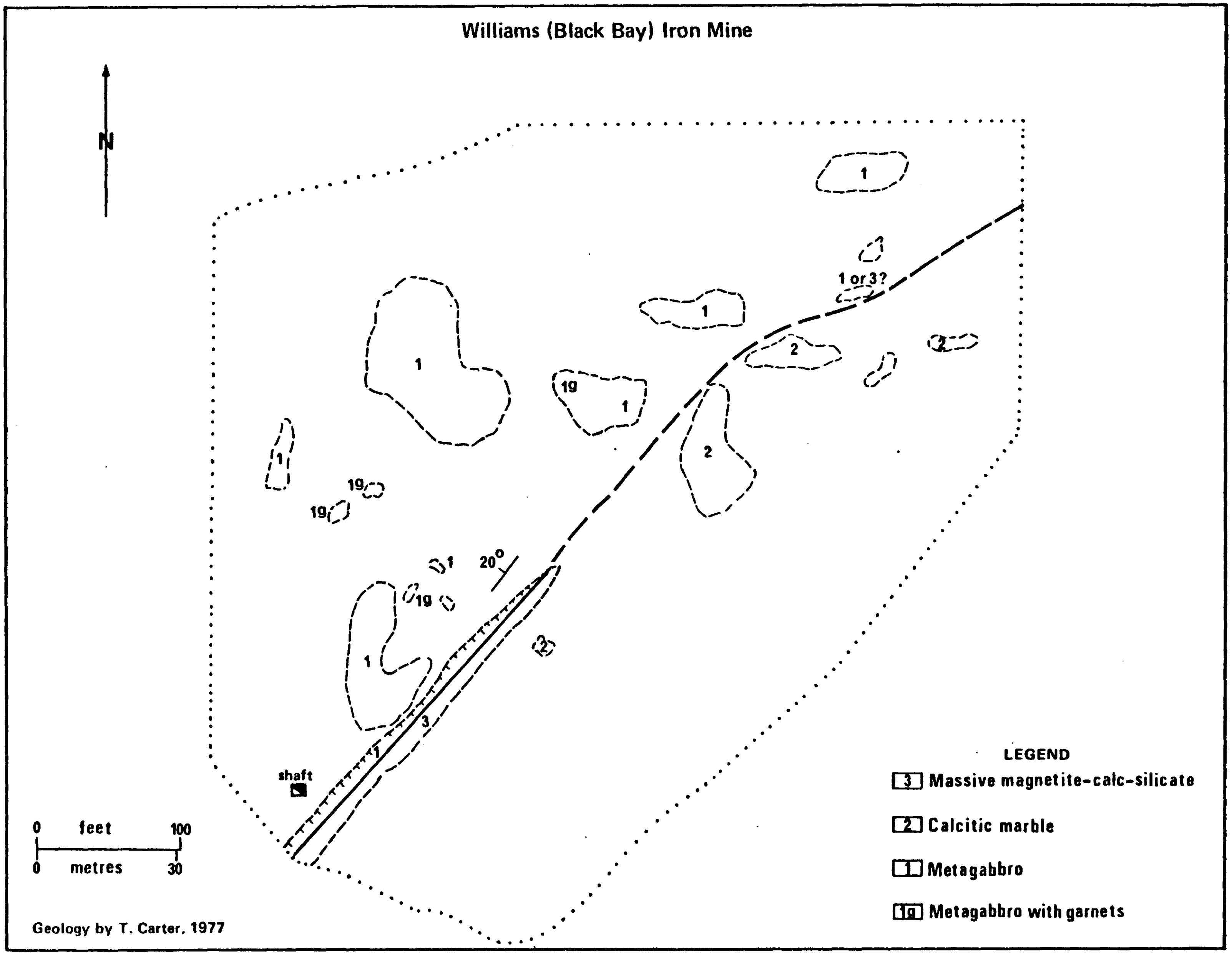

Figure 11A — Geology of the Williams iron deposit.

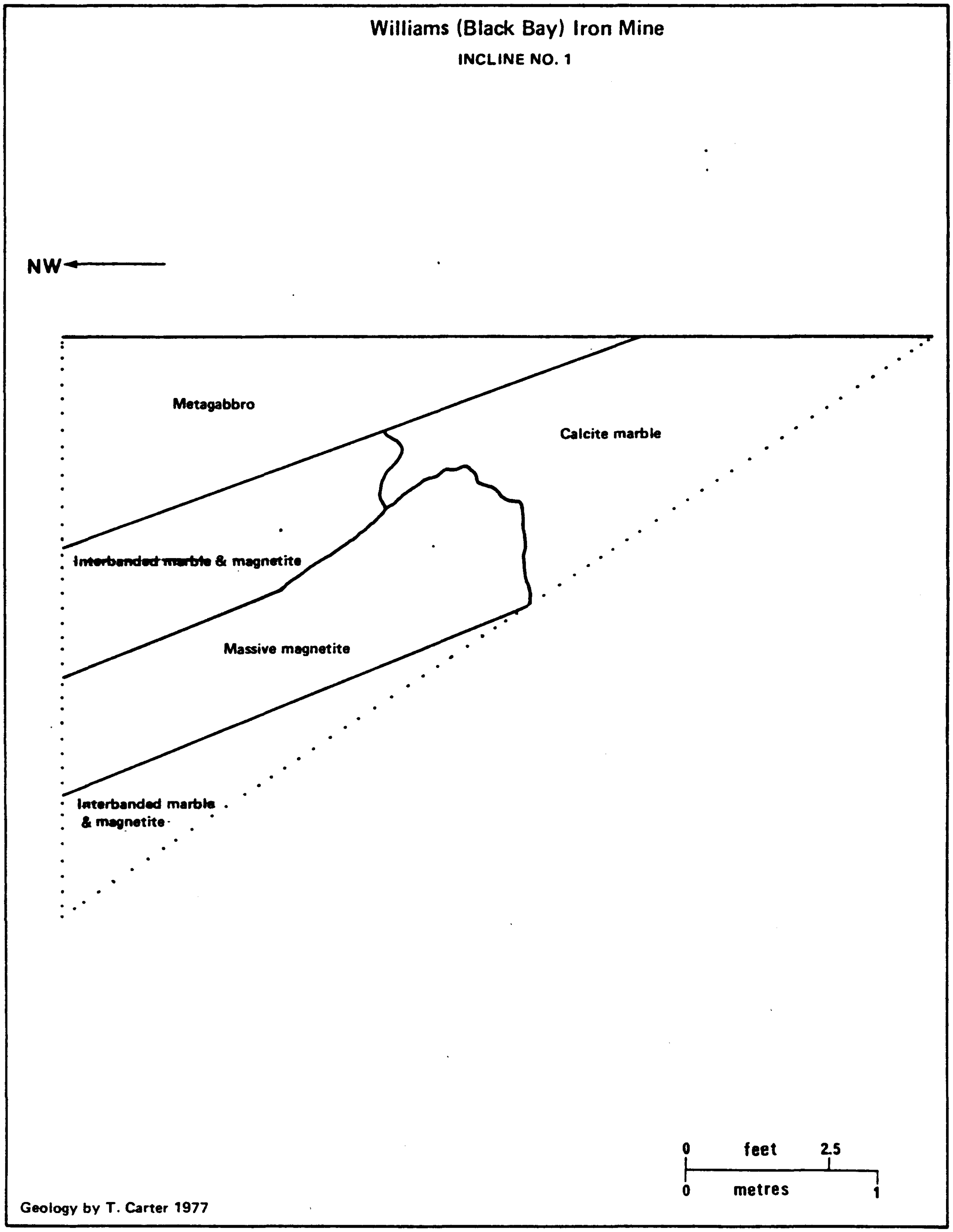

Figure 11B — Geology exposed in wall of incline No.1 at the Williams deposit.

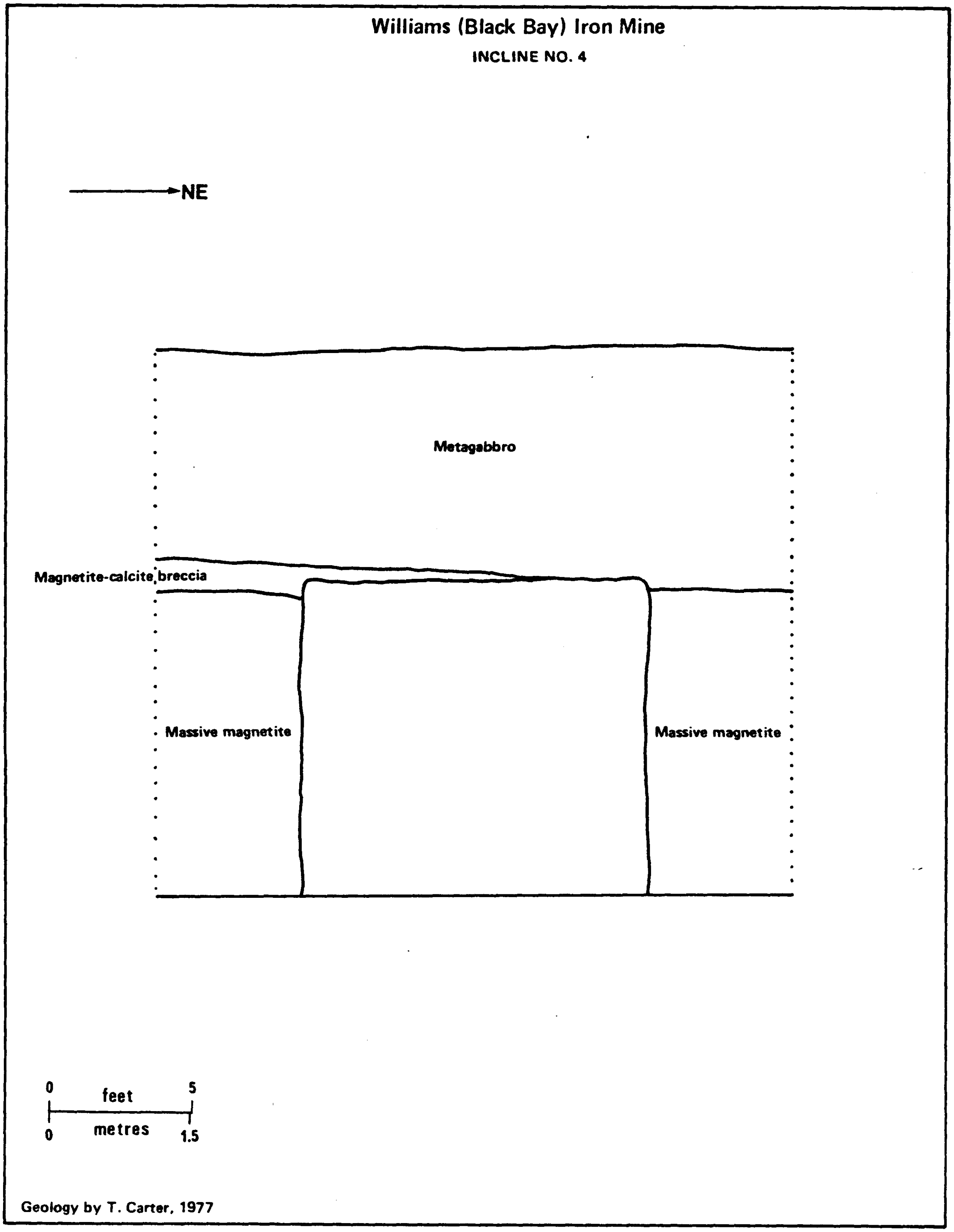

Figure 11C — Geology on open cut face at incline No.4, Williams iron deposit.

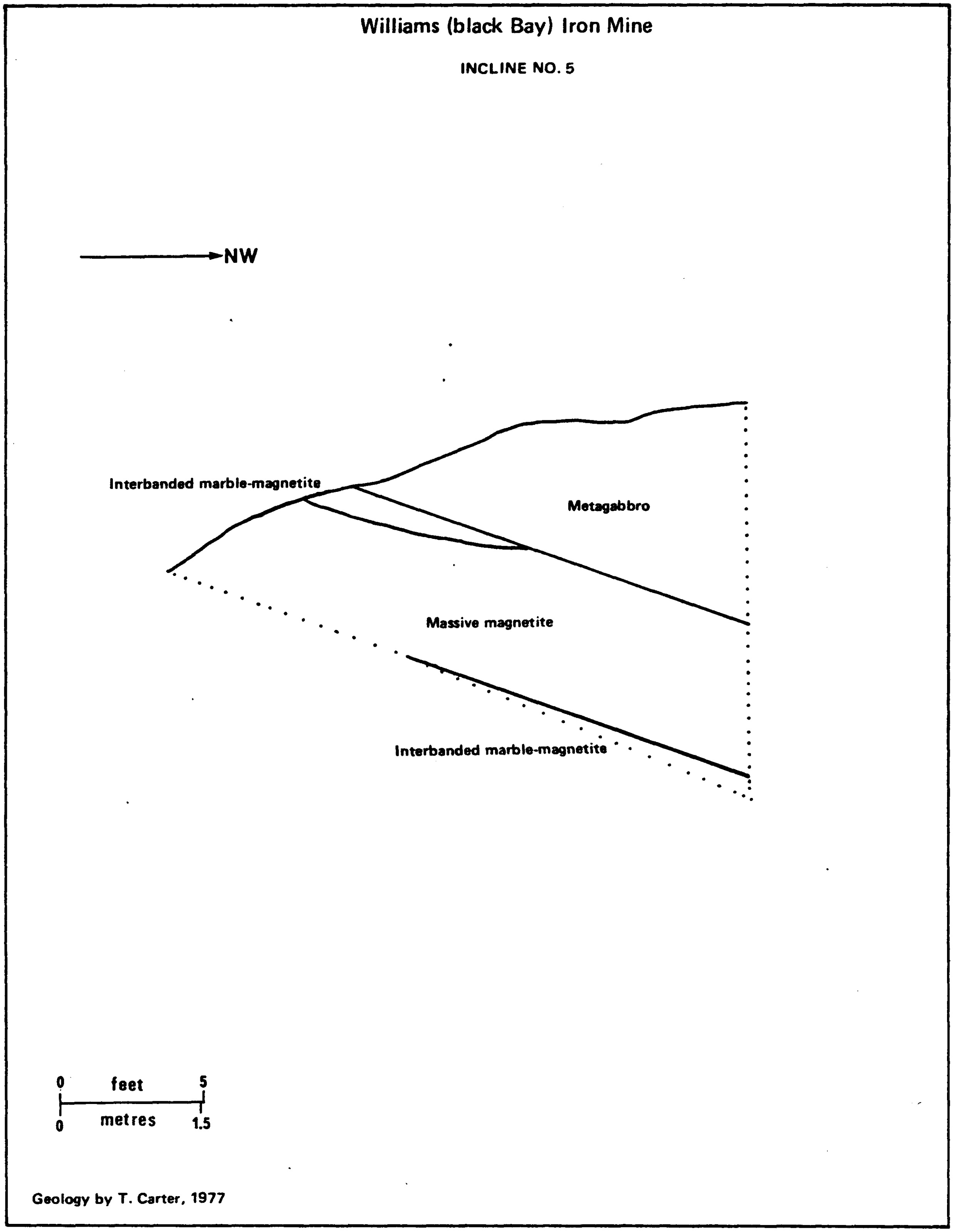

Figure 11D — Geology on open cut face at incline No.5, Williams iron deposit.

MICROSCOPY: Two thin sections and one polished thin section were prepared from samples collected by the writer. Fe-10-1 is a thin section of typical metagabbro at least 50 feet from the contact with marble. Fe-10-2 is a thin section of bleached metagabbro two feet from the contact with the magnetite lense exposed in incline No. 1. Fe-10-3 is a polished thin section of the inter-layered marble and magnetite at incline No. 1.

There are significant differences between the two thin sections of metagabbro, both texturally and mineralogically (Table 11 A). The mafic mineral content of section Fe-10-2 is less than half that of section Fe-10-1; the plagioclase content is correspondingly higher and it contains twice as much magnetite as Fe-10-1. There is also a significant content of carbonate in section Fe-10-2.

The mineral grains in both sections are fine-grained (0.2mm) and anhedral, and most of the grains in Fe-10-2 are largely broken down to their alteration products.

Polished thin section Fe-10-3 straddles the contact between massive marble and gneissic iron ore. The marble is composed of a massive, medium-grained (0.5mm) mosaic of carbonate grains that contains scattered grains or grain aggregates of quartz, and minor amounts of diopside and magnetite as scattered grains. The iron ore is composed of alternating magnetite-diopside and carbonate-diopside layers. The magnetite layers are commonly finer grained (0.1mm) than the carbonate layers and are composed of a granoblastic intergrowth of magnetite and ragged grains of diopside.

	Fe-10-1	Fe-10-2	Fe-10-3	
			marble	iron ore
plagioclase	30 - 35	55 - 65	-	-
hornblende	45 - 50	20	-	-
clino amphibole	10 - 15	-	-	-
magnetite	5	10	3 - 4	40 - 45
carbonate	-	5 - 10	60 - 65	25 - 30
apatite	3 - 4	3 - 4	-	-
biotite	1 - 2	-	-	-
quartz	-	-	30 - 35	-
diopside	-	-	3	25 - 30

TABLE 11A: Estimated modal compositions (in percent) of some thin sections of selected rock types.

GEOCHEMISTRY: Whole rock chemical compositions and trace element contents of three samples of selected rock types collected by the writer are presented in Table 11B. Fe-10-7 and Fe-10-8 are both metagabbro and Fe-10-9 is marble. Sample Fe-10-7 was collected about 15.2 (50 feet) from the iron ore-body and sample Fe-10-8 was collected about 1m (3 feet) from the contact with the orebody. Comparison of these two samples reveals a significant decrease in iron content in Fe-10-8 as compared to Fe-10-7.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-10-7	47.4	13.3	3.00	12.7	5.00	8.05	3.90	0.41
Fe-10-8	46.9	12.1	1.08	5.79	4.00	12.5	5.83	0.01
Fe-10-9	7.44	0.09	0.00	1.26	0.84	51.4	0.00	0.00

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-10-7	0.60	0.29	0.36	3.14	0.80	0.02	0.27	99.2
Fe-10-8	0.50	0.16	6.84	2.47	0.98	0.01	0.33	99.9
Fe-10-9	0.20	0.18	39.9	0.00	0.01	0.03	0.09	101.3

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-10-7	17	127	10	32	15	26	110	6
Fe-10-8	< 5	24	6	22	47	35	50	4
Fe-10-9	< 5	8	< 5	5	16	5	90	< 3

TABLE 11B: Whole rock chemical compositions (in percent) and trace element contents (in ppm) of 3 samples of selected rock types.

DISCUSSION: The Williams iron deposit is a member of a large group of similar iron deposits in the Pembroke-Renfrew area that occur as stratabound lenses of disseminated-to-massive magnetite at the contacts of intrusions with carbonate rocks. The close spatial relationship of the Williams deposit to the metagabbro, the 'skarn' mineralogy of the orebody and the lack of primary sedimentary structures indicate that the mineralization is probably genetically related to the intrusion. There is also a significant decrease in iron in the metagabbro near the orebody. Consequently, the mineralization was probably emplaced as a result of contact metasomatism of the marble by the metagabbro.

DEVELOPMENT HISTORY

1888: About 300 feet of the main zone was opened up to a depth of 15 - 20 feet by the Kingston and Pembroke Iron Mining Company.

1888 - 1890: About 25,000 tons of ore shipped by the above company; two test pits excavated on second ore zone, but no ore mined; four inclined drifts were sunk, varying from 10 - 80 feet in depth and a small prospect shaft 22 feet deep was dug.

1911: Magnetometer survey by Lindeman.

REFERENCE MAP

GSC 1045A, Renfrew, 1956.

REFERENCES

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1890: Report of the Royal Commission on the Mineral Resources of Ontario, p. 135-136.

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1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, part 3, p. 57-58.

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1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 318

SMDR Files (Williams or Black Bay Mine): Geoscience Data Centre, Ontario Geological Survey, Toronto.

12. BARRYVALE

COMMODITY — Iron (magnetite)

ROCK ASSOCIATION — HOST: gabbro
OTHER: calcitic marble, calc-silicate schist

CLASSIFICATION — ID. Intrusion hosted (gabbro)

LOCATION — Blithfield Township, Renfrew County
NTS 31F/7, UTM Zone 18, 5012670 N, 364050 E.
LAT. 45° 15' 23" N; LONG. 76° 43' 57" W.
Con. 1, Lot 13

ACCESS — The deposit is exposed in a rock cut on an abandoned railroad line 3.2km (2 miles) south of the Calabogie Lake causeway in the village of Barryvale. It is accessible by car along the railroad right-of-way.

SIZE AND GRADE — Mineralization consists of disseminated magnetite and minor ilmenite in a conformable, shallowly dipping lens approximately 4.6m (15 feet) thick and at least 22.9m (75 feet) long. A sample of mineralized rock collected by Frechette (1910 p. 87) contained 38.80 percent Fe, 0.013 percent P_2O_5, 0.179 percent S, 4.96 percent TiO_2, and 37.40 percent insoluble material.

DESCRIPTION — GENERAL GEOLOGY: The Barryvale iron deposit is contained within a gabbroic intrusion near its contact with calcite marble. There is a well-developed calc-silicate schist zone developed in the marble along the contact. All the rock units strike northwesterly and dip moderately (60°) to the northeast (see Figure 12A).

The marble is a fine-grained, white rock composed essentially of calcite and abundant fine-grained muscovite. It grades rapidly into the calc-silicate schist which is a fine-grained, light green rock composed essentially of tremolite, muscovite and calcite. The schist has a sharp contact with the overlying gabbro which forms a very fine-grained, black rock composed essentially of amphibole and plagioclase, and minor biotite.

MINERALIZATION: Mineralization consists of disseminated to massive magnetite in a conformable lens approximately 4.6m (15 feet) thick that lies within the metagabbro just above its contact with the calc-silicate schist. The magnetite is usually intimately intergrown with amphibole and plagioclase but there are some layers of massive magnetite up to 1.2m (4 feet) thick.

MICROSCOPY: Two thin sections and one polished thin section were prepared from samples collected by the writer. Fe-11-1 is a polished thin section of layered magnetite in the metagabbro. Fe-11-7 is a thin section of metagabbro and Fe-11-4 is a thin section of the calc-silicate schist that underlies the metagabbro.

Polished thin section Fe-11-1 consists of alternating layers of mineralized and unmineralized metagabbro. The unmineralized metababbro is composed essentially of a granoblastic equigranular inter-growth of fine-grained (0.3mm), subhedral-to-euhedral hornblende and altered, anhedral plagioclase. The plagioclase grains are essentially intergrowths of sericite, quartz, and plagioclase. The mineralized layers are composed of a granoblastic intergrowth of fine-grained (0.3mm) hornblende, magnetite and ilmenite, and minor amounts of muscovite-phlogopite, sphene, hematite, and titanhematite. The magnetite and ilmenite usually occur together as fine (0.15mm), euhedral grains that are often intergrown. The titanhematite occurs as small exsolved blebs along the crystallographic planes within ilmenite grains. These blebs are often absent near contacts with magnetite grains. Hematite occurs as small grains on the edges of some magnetite grains and is probably the result of oxidation of the magnetite.

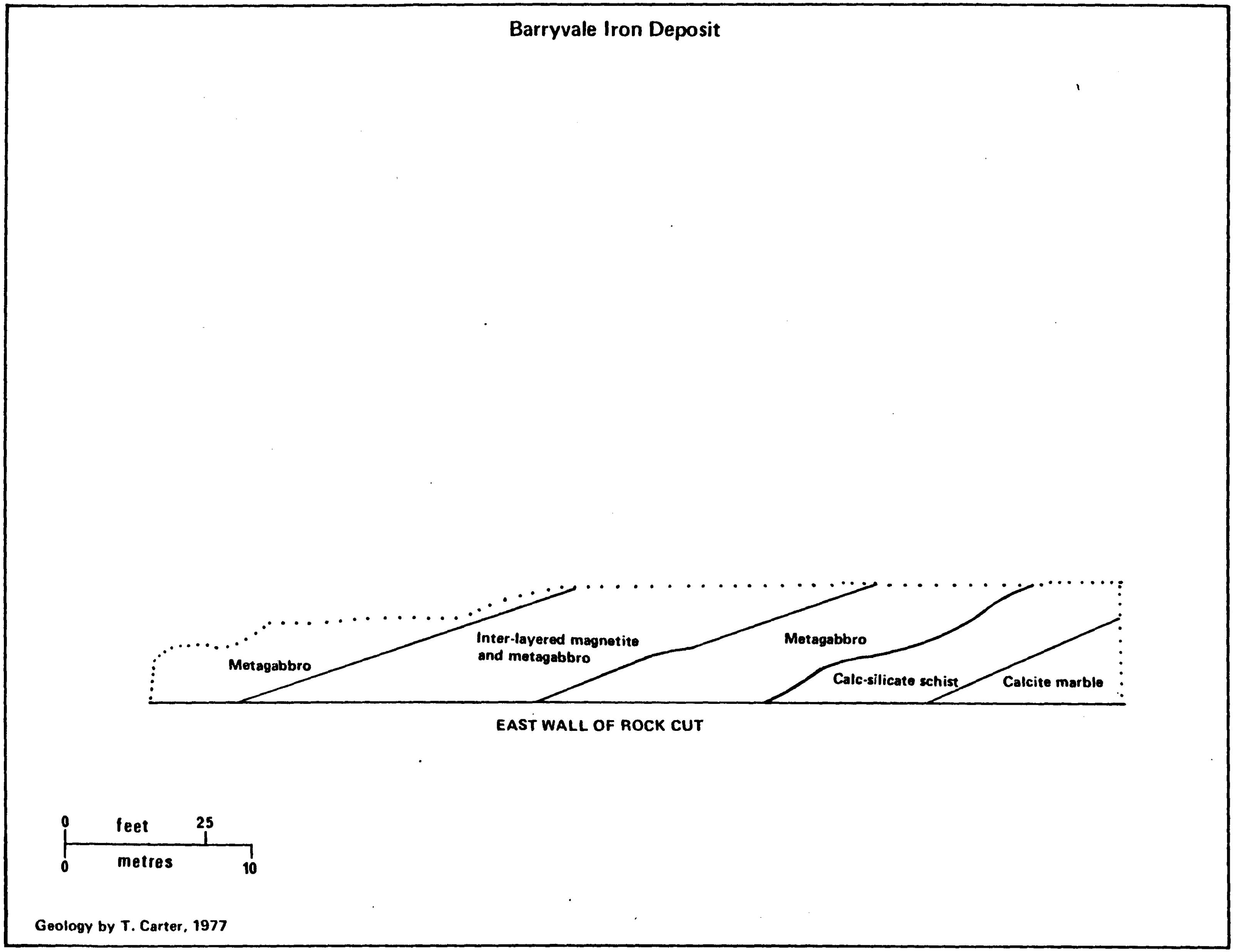

Figure 12A — Cross-sectional geology of the Barryvale iron deposit.

Thin section Fe-11-4 is composed of an idiotopic intergrowth of tremolite with minor amounts of carbonate and plagioclase. The tremolite grains are idioblastic and have a strongly preferred orientation. The plagioclase and carbonate occur as a scattered anhedral grains.

Thin section Fe-11-7 is composed of a granoblastic, inequigranular, intergrowth of fine-grained plagioclase and hornblende, and minor amounts of sphene, opaque minerals, biotite, carbonate, and apatite, with a poorly developed gneissosity. Most of the mineral grains are anhedral-to-subhedral.

			Fe-11-1	
	Fe-11-4	Fe-11-7	mineralized	unmineralized
hornblende	-	30	40 - 50	55 - 60
plagioclase	5	50	-	40
magnetite	minor	2 - 3	20	2
ilmenite	minor	2 - 3	20	1 - 2
carbonate	5	2 - 3	-	-
tremolite	90	-	-	-
muscovite	-	-	5 - 10	-
biotite	-	4 - 5	-	-
sphene	-	10	3 - 4	-
apatite	-	1 - 2	-	-

TABLE 12A: Estimated modal compositions (in percent) of some thin sections of selected rock types.

GEOCHEMISTRY: The whole rock chemical compositions and trace element contents of two rock samples collected by the writer are presented in Table 12B. Fe-11-2 is a sample of calc-silicate schist and Fe-11-8 is a sample of metagabbro.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-11-2	16.8	1.55	0.24	0.59	7.62	41.0	0.04	0.48
Fe-11-8	50.7	15.6	5.25	8.15	3.60	5.51	5.33	1.36

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-11-2	0.30	0.57	31.0	0.08	0.00	0.22	0.13	100.6
Fe-11-8	0.42	0.29	0.12	2.19	0.38	<0.01	0.17	99.1

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-11-2	11	58	5	<5	36	12	100	<3
Fe-11-8	20	66	11	27	27	38	130	8

TABLE 12B: Whole rock compositions (in percent) and trace element contents (in ppm) of two samples of selected rock types.

DISCUSSION: The Barryvale deposit is a member of a small group of similar iron deposits in the Pembroke-Renfrew area that occur as lenses of disseminated to massive magnetite within gabbroic intrusions. The magnetite is believed to have been a primary constituent of the intrusions.

DEVELOPMENT HISTORY 1952: Unspecified amount of diamond drilling Algoma Ore Properties Limited.

REFERENCE MAP G.S.C. 1046A, Renfrew, 1956.

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1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, p. 45.

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1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, part 3, 1944, p. 58.

Shklanka, R.
1968: Iron Deposits of Ontario; Ontario Department of Mines. MRC No. 11, p. 319

SMDR Files (Blithfield): Geoscience Data Centre, Ontario Geological Survey, Toronto.

13. BLITHFIELD PYRITE

COMMODITY	Iron (pyrite), sulfur
ROCK ASSOCIATION	HOST: mudstone* OTHER: sandstone
CLASSIFICATION	3A. Pyrite deposit, no consistent geological association
LOCATION	Blithfield Township, Renfrew County NTS 31F/2, UTM Zone 18, 5007870 N, 368560 E. LAT. 45° 12' 50" N; LONG. 76° 40' 26" W. Con. 1, Lots 1 and 2
ACCESS	The deposit is located 2km (1.25 miles) east of the abandoned Kingston and Pembroke railroad along a narrow bush road that intersects the railroad right-of-way at the north end of Clyde Lake, 9.7km (6 miles) south of Barryvale. The railroad is passable by car and the deposit is accessible by foot along the bush road.
SIZE AND GRADE	Mineralization consists of disseminated-to-massive pyrite contained in 3 en echelon lenses (Fig 13A) that form a continuous zone over 366m (1,200 feet) long and up to 30m (100 feet) in width. Workings on the deposit consist of two shafts an- a large number of small pits, most of which are water and debris-filled. There is a large pile of crushed pyrite ore near shaft No. 2.

DESCRIPTION

GENERAL GEOLOGY: The Blithfield pyrite deposit forms a conformable orebody that is contained within mudstones in a sequence of sandstones and mudstones. The sandstones have been intruded by a small body of granitic rock just to the west of the pyrite deposit.

All the layered rock units strike northwesterly and dip shallowly to moderately to the northeast (see Figure 13B)

The mudstone is a black, well-layered rock composed essentially of fine-grained (0.5mm) hornblende and plagioclase with locally abundant garnet. The sandstone is also a well-layered rock and is composed essentially of fine-grained quartz, feldspar, and biotite. The granitic rock is strongly foliated with a well-developed augen texture and is composed essentially of quartz, feldspar, and biotite.

MINERALIZATION: Mineralization consists of a massive intergrowth of pyrite and quartz that is often gradational into the mudstones such that the mudstones sometimes contain abundant disseminated pyrite. Within the massive ore the pyrite usually forms medium to coarse-grained (1-10mm) subhedral to euhedral crystals disseminated within a rock composed of aphanitic greyish-white quartz. Wilson (1921, p. 31-32) visited the mine while it was in operation and describes the ore as follows:

"The ore composing the pyrite deposits at the Caldwell mine consists partly of pyrite associated with quartz or quartz and calcite and partly of pyrite mingled with various proportions of the hornblende or hornblende-biotite schist that forms the country rock. The ore of the first type has the appearance of a breccia, the pyrite occurring as broken fragments enclosed in a matrix of quartz or of quartz and calcite; and it is owing to this relationship of the pyrite and quartz that where the ore outcrops at the surface the quartz from which the pyrite has been weathered away has a honey-comb or sponge-like appearance. he ore of the second type is merely a phase of the hornblende schist in which pyrite is included in all proportions ranging from schist in which the pyrite is sparsely disseminated or present in small aggregates extending along the planes of foliation, to ore in which the schist is present in only scattered masses throughout thicknesses of several feet. Since there are thus considerable masses of rock in association with the pyrite deposits, which, although although containing a considerable proportion of ore present in the mineralized zone would vary greatly according to the grade of the material classed as ore. In preparing the

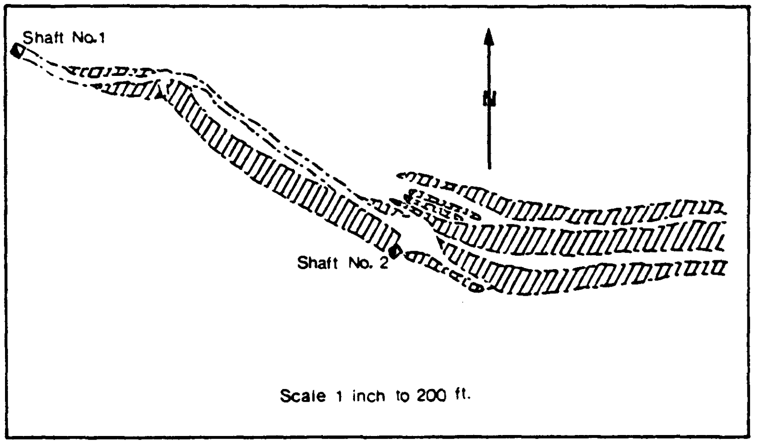

Figure 13A — En echelon nature of pyrite ore-bodies of the Blithfield pyrite deposit (adapted from Satterly, 1945, p.66).

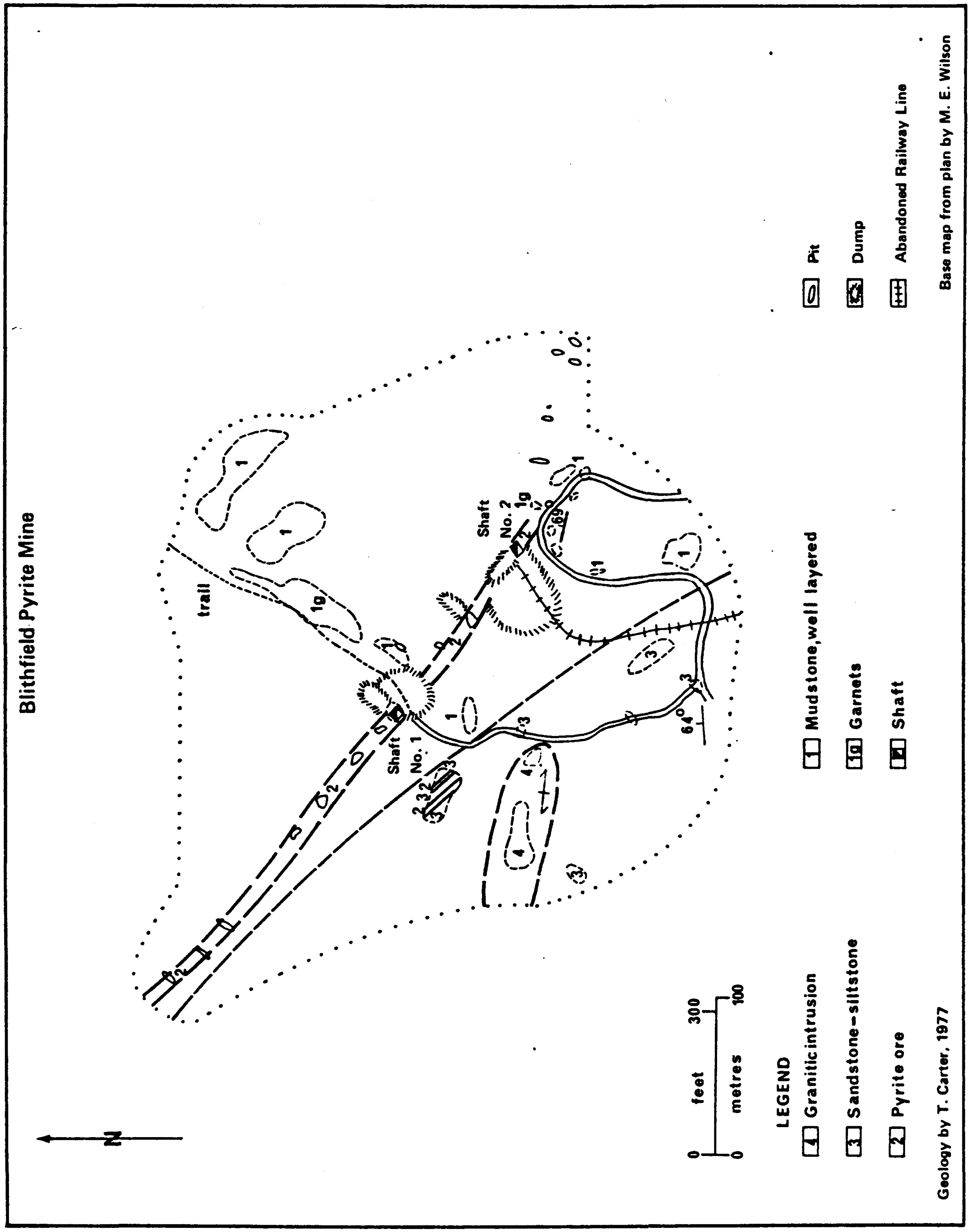

Figure 13B — Geology of the Blithfield pyrite deposit.

accompanying diagrams (Figures 4, 5 and 6), therefore, only those parts of the zone were classed as ore which in practice would be mined either for shipment as taken from the mine or for shipment after concentration in the mill. In addition to the quartz, calcite, and pyrite composing the ore the only other mineral observed to be present was pyrrhotite, which occurs here and there in the ore but is not an abundant constituent.

As indicated in the preceding description of the character of the deposits, the relationship of the ore and the enclosing hornblende-biotite schist is most indefinite, the ore generally passing into the schist transitionally. The deposits appear to have in the main an approximatley lenticular form and trend parallel to the strike of the foliation of the enclosing schist".

According to Wilson (1921, p. 32) underground development of the deposit indicates that the pyrite occurs in several en echelon orebodies (Figures 13B), although this relationship is not obvious at the surface. The orebodies appear to be completely conformable within the mudstones.

DISCUSSION: There is one other significant pyrite deposit in the Pembroke-Renfrew area, but its geological setting is different so the two cannot be compared. The mineralization at the Blithfield pyrite deposit appears to be completely conformable within the mudstone host rocks, and consequently probably was deposited syngenetically as a chemical precipitate.

DEVELOPMENT HISTORY

1915-1917: inclined shaft sunk 95 feet, 250 feet of cross-cutting and drifting from bottom of shaft by T.B. Caldwell.

1917-1918: 2,500 feet of diamond drilling by the Grasselli Chemical Company

1918-1920: mining and development carried on by Grasselli Chemical Company

- shaft No. 2 sunk 234 feet on a 54^{o} incline.
- shaft No. 1 and shaft No. 2 connected by drift 460 feet long on first level - some additional drifting and raising, some drifting on second level.
- mining ceased in 1920.

1918-1928: ore shipped continuously from the property by the Grasselli Chemical Company.

1929-1930: property acquired by Canadian Pyrties Limited, shipments continued.

PRODUCTION STATISTICS (Satterly, 1945, p. 95)

Year	Ore Mined	Ore Shipped	Value
	tons	tons	$
1918	not stated	213.5	972.06
1919	4,239	1,111	4,156.73
1920	4,592	1,109	4,205.13
1921	none	25.5	13.00
1922	none	144	2,100.00
1923	none	156.21	1,948.50
1924	none	250.72	3,316.76
1925	none	685	8,799.47
1926	none	370.75	4,912.25
1927	none	463.35	6,076.95
1928	none	463.88	6,117.98
1929	none	677.34	8,505.69
1930	none	140.61	1,645.20
Total		5,810.86	$52,769.72

REFERENCE MAP — ODM 53b, Renfrew Area, 1945.

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1967: Pyrite Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 5, p. 16.

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1920: Statistical Review of the Mining Industry of Ontario for 1919; Ontario Bureau of Mines, Ann. Rept., Vol. 29, part I, p. 120-121.

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Wilson, M. E.
1921: Mineral Deposits in the Ottawa Valley; Geological Survey of Canada, Summary Report 1919, Part E, p. 30-35.

14. BLACKBIRD

COMMODITY Iron (magnetite)

ROCK ASSOCIATION Feldspar-hornblende gneiss, feldspar-pyroxene gneiss

CLASSIFICATION IF. Geological relationships unclear

LOCATION Brougham Township, Renfrew County
NTS 31F/7, UTM Zone 18, 5017085 N, 345489 E
LAT. 45° 17' 32" N; LONG. 76° 58' 13" W.
Con. 12, Lot 22

ACCESS The deposit is located approximately 300m (1,000 feet) southwest of Blackbird Lake. Access is unknown as the author did not visit the deposit.

SIZE AND GRADE Mineralization consists of "lightly disseminated to nearly massive magnetite and pyrrhotite in a zone up to 8 feet wide and 400 feet or more long" (Quinn, 1952 p. 50). The workings "consist of two pits and two adjacent shallow strippings. Pit No. 1 is 8 feet wide, 10 feet long, and 8 feet deep, and pit No. 2 is 8 feet wide, 12 feet long, and 15 feet deep. One stripping is 20 feet by 20 feet; the other is 10 feet by 50 feet. Three additional shallow strippings are found 250 feet northwest of the above workings", (Quinn, 1952, p.49)

DESCRIPTION The Blackbird iron deposit occurs in a succession of marbles and calcareous mudstones with a few intrusive mafic and felsic sills that strike in a northerly direction and dip moderately to the east. According to Quinn (1952, p.50): "The iron-bearing rocks, mainly hybrid gneisses with some conformable granitic bands, strike north 50 degress west and dip northeast at low to moderate angles. The gneiss, consisting mainly of feldspar-hornblende and feldspar-pyroxene types, contain an average of 75 percent feldspar. Their rounded and fine to medium sized grains were probably derived in part from clastic sediments and limestone. They are cut by pink, massive, fine-and-coarse grained granite.

The metallic minerals consist of lightly disseminated to nearly massive magnetite and pyrrhotite in a zone up to 8 feet wide and 400 feet or more long conforming with the attitude of the enclosing gneisses. They are most abundant in a band of feldspar-pyroxene rock containing considerable interstitial residual calcite and probably derived, in part at least, from crystalline limestone. Some of this rock is almost solid garnet. Magnetite is most plentiful in what appear to have been the more limy parts of the original paragneiss, whereas pyrrhotite is most plentiful in the less limy parts. Some fine-grained parts, as in Pit No. 2, contain so much disseminated magnetite that they are almost iron ore. Original banding is preserved in the pyrrhotite-rich rock due to preferential replacement, this feature being well shown in Pit No. 1 where pyrrhotite is particularly abundant. Mineralization in the northwestern strippings is represented almost entirely by pyrrhotite. Where traced farther northwest along strike it gradually decreases in amount and grades into typical rusty paragneiss."

DEVELOPMENT HISTORY before 1951: 2 pits and 5 trenches excavated by unknown operators

REFERENCE MAP GSC 1046A, Renfrew, 1956

REFERENCES

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1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, p. 49-50.

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1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 319.

SMDR Files (Blackbird); Geoscience Data Centre, Ontario Geological Survey, Toronto.

15. DACRE

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	Quartz-feldspar gneiss
CLASSIFICATION	IF. Geological relationships unclear
LOCATION	Brougham Township, Renfrew County NTS 31F/7, UTM Zone 18, 5025280 N, 346000 E. LAT. 45° 21' 57" N; LONG. 76° 57' 56" W Range D South, Lot 25
ACCESS	The deposit is located 46m (150 feet) west of a gravel road at a point 0.4km (0.25 miles) south of the village of Dacre.
SIZE AND GRADE	Mineralization consists of disseminated magnetite in a small lens of unknown dimensions. No mineralization was observed in place. Workings consist of a water-filled pit 7.6m (25 feet) in diameter.
DESCRIPTION	The Dacre iron deposit occurs in a northeast-trending succession of interlayered calcareous mudstones, marbles, minor sandstones, and narrow sills of granitic rocks. Mineralization consists of disseminated magnetite contained within quartzo-feldspathic paragneiss. There is also a unit of calcareous mudstone in the vicinity of the deposit. Due to uncertainties about the geological setting and nature of the mineralization, the origin of this deposit is unknown.
DEVELOPMENT HISTORY	1901: Excavation of a pit by Canada Iron Furnace Company
REFERENCE MAP	G.S.C. 1046A, Renfrew, 1956

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1903: Mines of EAstern Ontario; Ontario Bureau of Mines, Ann. Rept. Vol. 12, p. 114

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Satterly, J.
1945: Mineral Occurrences in the Renfrew Area: Ontario Department of Mines, Ann. Rept. Vol. 53, Part 3, 1944, p. 59.

16. KENNELLY LAKE

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: amphibolite gneiss OTHER: granitic gneiss, marble
CLASSIFICATION	1A. Stratabound, carbonate, skarn hosted, at intrusive contact.
LOCATION	Brougham Township, Renfrew County NTS 31F/7, UTM Zone 18, 5017285 N, 351510 E LAT. 45° 17' 43" N; LONG. 76° 53' 37" W. Con. 10, Lot 7.
ACCESS	The deposit is located on the northeast bay of Kennelly Lake and is accessible by foot 335m (1,100 feet) north from a gravelled road between Con. 9 and Con. 10.
SIZE AND GRADE	Mineralization is reported to consist of "some six-inch seams of granular magnetite" (Lindeman and Bolton, 1917, p. 125). Workings consist of one small debris-filled pit.
DESCRIPTION	The Kennelly Lake iron deposit is covered by Pleistocene overburden but the geology in the general vicinity consists of interlayered siliceous marbles and calcareous mudstones and sandstones along the northwestern contact of an intrusion of gneissic diorite and tonalite. The rock units all strike northwesterly and dip shallowly to the northeast. Mineralization, as exposed in broken rock in a pit on the deposit, consists of disseminated magnetite and pyrite in an amphibolite gneiss, and according to Lindeman and Bolton (1917, p. 125), "there are some six-inch seams of granular magnetite in a contact zone between granitic gneiss and crystalline Limestone". Judging from its proximity to an intrusion the Kennelly Lake deposit is a member of the 1A group of stratabound, carbonate-calc-silicate hosted iron deposits that occur near intrusive contacts. It was probably formed as a result of contact metasomatic effects of the intrusion.
DEVELOPMENT HISTORY	before 1917: small pit excavated by unknown operators
REFERENCE MAP	GSC 1046A, Renfrew, 1956.
REFERENCES	Lindeman, E. and Bolton, L.L. 1917: Iron Ore Occurrences in Canada, Vol. II; Canada Department of Mines, Rept. No. 217, p. 125 Quinn, H. A. 1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario: 1952, Geological Survey of Canada, paper 51-27, p. 49 Satterly, J. 1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, 1944, p. 58-59.

17. BOULTER

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: Syenite OTHER: Gabbro
CLASSIFICATION	1D. Intrusion hosted (syenite)
LOCATION	Carlow Township, Hastings County NTS 31F/7, UTM Zone 18, 5009125 N, 291590 E. LAT. 45° 12' 24" N; LONG. 77° 39' 14" W. Con. 6, Lot 7
ACCESS	The deposit is accessible via a farm road 335m (1,100 feet) south from a gravelled concession road about 1.6km (1 mile) west-south-west of the village of Boulter.
SIZE AND GRADE	Mineralization consists of disseminated to massive magnetite in a lens 61m (200 feet) long and 11.6m (38 feet) wide. A sample of iron ore collected by Thomson (1943, p. 38) contained 44.2 percent Fe, 2.88 percent TiO_2, 0.27 percent P_2O_5, 0.11 percent S, trace V, and 10.77 percent SiO_2. A sample collected by the writer contained 49.4 percent Fe, 22.7 percent FeO, 1.97 percent TiO_2 0.10 percent P_2O_5, 0.03 percent, S, 0.10 percent MnO, and 0.11 percent V. Workings consist of one small pit.
DESCRIPTION	The Boulter iron deposit occurs as a small lens within an ellipsoidal body of syenite that is contained within a large gabbroic intrusion. The syenite is a massive, medium-grained, pink rock composed essentially of feldspar, hornblende, and minor biotite. The gabbro is a fine-grained foliated rock composed of approximately equal proportions of amphibole and plagioclase in the vicinity of the Boulter deposit. Mineralization consists of a lens of disseminated to massive magnetite 200 feet long and 38 feet wide. (Rose, 1958, p. 25) that is contained within the syenite. The deposit is similar to several other iron deposits in the Pembroke-Renfrew area and was probably deposited as a primary constituent of the syenite intrusion.
DEVELOPMENT HISTORY	1950: one diamond drill hole for 81.1 feet by unknown operators.
REFERENCE MAP	ODM 1954-3, Monteagle and Carlow Townships, 1955.
REFERENCES	Hewitt, D. F. 1955: Geology of Monteagle and Carlow Townships; Ontario Department of Mines, Ann. Rept. Vol. 63 part 6, 1954, p. 57-58. Rose, E. R. 1958: Iron Deposits of Eastern Ontario and Adjoining Quebec; Geological Survey of Canada, Bulletin 45, p. 25-26. SMDR Files: (Boulter); Geoscience Data Centre, Ontario Geological Survey, Toronto. Thomson, J. E. 1943: Mineral Occurrences in the North Hastings Area; Ontario Department of Mines, Ann. Rept. Vol. 52, Part 3, 1943, p. 38.

18. FRASER LAKE

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	Syenite
CLASSIFICATION	ID. Intrusion hosted (syenite)
LOCATION	Carlow Township, Hastings County NTS 31F/4, UTM Zone 18, 5008220 N, 291380 E. LAT. 45^{o} 11' 55" N; LONG. 77^{o} 39' 22" W, Con. 5, Lot 17
ACCESS	The deposit is accessible by foot 107m (350 feet) south of a gravel concession road 1.6km (1 mile) southwest of the village of Boulter.
SIZE AND GRADE	Mineralization consists of disseminated to massive magnetite in several parallel, narrow layers up to 2.1m (7 feet) wide over a length of 67m (220 feet). An average sample of iron ore collected by Lindeman (1913, p. 21) contained 43.70 percent Fe 0.020 percent S, 0.118 percent P, and 10.50 percent insoluble material. There are no surface excavations on the deposit.
DESCRIPTION	The Fraser Lake iron deposit occurs as a small lens within an ellipsoidal body of syenite which is contained within a gabbroic intrusion. The syenite is a massive, medium-grained, pink rock composed essentially of feldspar and hornblende. Mineralization consists of regular layers of disseminated to massive magnetite associated with hornblende-rich layers in the syenite. A magnetometer survey indicates that this mineralization trends N25°W for a length of 220 feet, and revealed a smaller orebody a short distance farther north (Lindeman and Bolton, 1917, p. 115) on concession 7, lot 17. This deposit is similar to several other iron deposits in the Pembroke-Renfrew area and the iron mineralization probably was a primary constituent in a syenite intrusion.
DEVELOPMENT HISTORY	1950: unspecified amount of diamond drilling by unknown operators.
REFERENCE MAP	ODM 1954-3, Monteagle and Carlow Townships, 1955.
REFERENCES	Hewitt, D. F. 1955: Geology of Monteagle and Carlow Townships; Ontario Department of Mines, part 6, 1954, p. 56-57. Lindeman, E. and Bolton, L. L. 1917: Iron Ore Occurrences in Canada, Volume II; Canada Department of Mines, Ann. Rept., Vol. 63, part 6, 1954, p. 56-57. Lindeman, E. 1913: Magnetite Occurrences Occurrences along the Central Ontario Railway, Canada Department of Mines, Pub. No. 184, p. 21. Ontario Iron Ore Committee 1924: Report of the Ontario Iron Ore Committee, 1923, Ontario Department of Mines, p. 217 SMDR Files (Fraser Lake); Geoscience Data Centre, Ontario Geological Survey, Toronto.

19. DARLING

COMMODITY — Iron (magnetite)

ROCK ASSOCIATION — Mafic volcanics

CLASSIFICATION — 1E. Stratabound, volcanic hosted

LOCATION — Darling Township, Lanark County
NTS 31F/2, UTM Zone 18, 5006960N; 374170 E,
LAT. 45^{o} 12' 25"N; LONG. 76^{o} 36' 08"W.
Con. 4, Lots 20 and 22
Con. 5, Lots 20 and 22
Con. 3, Lots 21 and 22

ACCESS — The deposits are located on both sides of Highway 511 in southwestern Darling Township about 14.5km (9 miles) south of the village of Calabogie. Only two of the deposits were visited by the writer.

SIZE AND GRADE — Mineralization consists of disseminated magnetite contained in several small, widely separated lenses. Workings consist of small pits on each of the deposits. A picked sample collected by Fréchette (1909, p. 86) on Lot 22, Concession 5, contained 61.17 percent Fe, 8.34 percent insoluble material, 0.046 percent P, and 0.042 percent S.

Two general samples were collected on Lot 20, Concessions 4 and 5, by Fréchette (1910, p. 85) and contained 24.21 percent Fe, 0.468 percent P, 0.031 percent S, and 53.00 percent insoluble; and, 23.70 percent Fe, 0.437 percent P, 0.091 percent S, 0.60 percent TiO_2 and 54.11 percent insoluble.

DESCRIPTION — The Darling iron deposit consists of several small, widely separated zones of magnetite mineralization that are contained within a northeast-trending succession of mafic volcanics and minor marble. The mafic volcanics are dark greenish-black foliated rocks composed essentially of fine to medium grained amphibole and plagioclase. Mineralization consists of fine-grained magnetite disseminated within the mafic volcanic. The deposit is similar to the Yuill iron deposit.

Mineralization probably is volcanogenic in origin and could have been deposited as a chemical sediment synchronously with deposition of mafic tuffs, or it may have been a primary constituent in "mafic flows".

DEVELOPMENT HISTORY — before 1909: numerous pits excavated by unknown operators.

REFERENCE MAP — ODM 1956-4, Clarendon-Dalhousie Area, 1958

REFERENCES

Fréchette, H.
1910: On a Number of Iron Ore Properties in Northeastern Ontario; Sum. Rept. 1909, p. 85-86.
Canada Department of Mines, Summary Report for 1909, Pub. No. 63, p. 85-86.

Ontario Iron Ore Committee
1924: Report of the Ontario Iron Ore Committee, 1923; Ontario Department of Mines, p. 230.

Peach, P. A.
1958: The Geology of Darling Township and Part of Lavant Township; Ontario Department of Mines, Ann. Rept. Vol. 65, part 7, 1956, p. 57-58.

SMDR Files (Darling Township); Geoscience Data Centre, Ontario. Geological Survey, Toronto.

20. FAHEY

COMMODITY: Iron (hematite)

ROCK ASSOCIATION: Dolomitic marble

CLASSIFICATION: 2A. Carbonate hosted, Fault related, hematite deposit

LOCATION: Darling Township, Lanark County
NTS 31F/7, UTM Zone 18, 5015560 N; 382360 E.
LAT. 45° 17' 08" N; LONG. 76° 30' 00" W.
Con. 11, Lot 26

ACCESS: The deposit is located 61m (200 feet) east of a private road on the southern edge of a large clearing. It is accessible by car along this road at a point 0.8km (0.5 miles) north from the gravel access road to Bennett Bay on White Lake.

SIZE AND GRADE: Mineralization consists of massive hematite in a zone reported to be about 4.5m wide (15 feet) (Frechette, 1910, p. 82) and appears to be at least 60 to 90m (200 to 300 feet) long, although its actual extent is unknown. A sample collected by Frechette (1910, p. 82) contained 34.73 percent Fe, 0.029 percent P_2O_5, 0.054 percent S, 20.30 percent CaO, 3.44 percent MgO, 0.32 percent Mn, and 2.44 percent insoluble material.

A sample collected by the writer contained 63.6 percent Fe, 6.67 percent FeO, 0.04 percent TiO_2, 0.32 percent P_2O_5, 0.01 percent V, and 0.01 percent S. Workings consist of several small overgrown pits and Frechette (1910, p. 82) reports a water-filled shaft 6m (20 feet) deep.

DESCRIPTION: GENERAL GEOLOGY: The Fahey iron deposit occurs within brecciated dolomitic marble within an extensive succession of marbles that are cut by several major faults. The marble breccia that hosts the orebody is probably a result of faulting and strikes at an azimuth of 40 degrees, and dips vertically.

The marble breccia consists of coarse (1 to 3cm) angular fragments of white or pink dolomite marble set in a red matrix of very fine-grained, hematite-rich dolomite. This breccia grades outwards from the orebody into massive, very fine-grained dolomitic marble identical to the breccia fragments except for colour. The marble usually is light bluish-grey colour that becomes bleached white or reddish as the orebody is approached and it is cut by several narrow veins of marble breccia about 35m (110 feet) north of the mineralized zone.

MINERALIZATION: Mineralization consists of massive hematite in a lens reported to be about 4.5m (15 feet) wide (Frechette, 1910 p. 82) and is exposed in pits over a strike length of at least 60m (200 feet). Abundant disseminated hematite also occurs through-out the marble breccia in a zone of unknown width and length.

The massive hematite forms a solid, dark bluish-grey rock that crushes to a bright, red powder. Close examination reveals faint indistinct 'ghosts' in the shape of breccia fragments. The hematite disseminated in the breccia generally consists of aphanitic grains ubiquitous throughout the matrix material but often occurs as small earth-like clumps, also in the matrix. There are also occasional massive pods a few centimetres in diameter.

MICROSCOPY: One thin section and one polished thin section were prepared from samples collected by the writer. Fe-18-3 is a polished thin section of massive hematite, and Fe-18-2 is a thin section of marble breccia (see Table 20A).

Section Fe-18-3 consists of a massive, irregular intergrowth of hematite and minor quartz. The hematite occurs as cell-like growths that generally have amorphous, poorly-polished cores and well-polished, crystalline borders. Scattered quartz grains and fine hematite occupy the interstices between the hematite 'cells'.

Section Fe-18-2 is composed essentially of carbonate with minor amounts of hematite. The section has a well-developed breccia texture consisting of large, angular fragments of very fine-grained carbonate set in a matrix composed of slightly finer-grained carbonate and abundant hematite as fine, disseminated grains. The matrix also contains some scattered, earth-like clumps of hematite.

	Fe-18-2	Fe-18-3
hematite	5	90 - 95
carbonate	95	-
quartz	-	5 - 10

TABLE 20A: Estimated modal composition (in percent) of two thin sections of selected rock types.

DISCUSSION: The Fahey deposit is very similar to the White Lake iron deposit and the two deposits may even be part of a single continuous zone of hematite mineralization. The hematite probably was emplaced as a result of supergene replacement and open space filling along what was probably a fault breccia in the marble. The iron probably was carried by meteoric water that percolated downward through the breccia.

DEVELOPMENT HISTORY

before 1909: excavation of 20-foot shaft and 2 trenches by unknown operators

REFERENCE MAP

ODM 1956-4, Clarendon-Darling Area, 1958

REFERENCES

Frechette, H.
1910: On a Number of Iron Properties in Northeastern Ontario; Canada Department of Mines, Sum. Rept. for 1909, Pub. No. 63, p. 82-83.

Peach, P. A.
1958: The Geology of Darling Township and Part of Lavant Township; Ontario Department of Mines, Ann. Rept. Vol. 65, part 7, 1956, p. 55-56.

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, p. 38

Rose, E. R.
1958: Iron Deposits of Eastern Ontario and Adjoining Quebec; Geological Survey of Canada, Bulletin 45, p. 66

Shklanka, R.
1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 248.

SMDR Files (Fahey); Geoscience Data Centre, Ont. Geol. Survey, Toronto.

21. McILWRAITH

COMMODITY	Iron (pyrite), sulpher
ROCK ASSOCIATION	HOST: calcitic marble OTHER: gabbro
CLASSIFICATION	3. Pyrite deposit of no consistent geological association.
LOCATION	Darling Township, Lanark County NTS 31F/2, UTM Zone 18, 5001260N, 381100 E LAT. 45° 09' 24"N; LONG. 76° 30' 46" W Con. 4, Lot 5.
ACCESS	The deposit is located at the base of a hill 91m (300 feet) east of Highway 511, west of a microwave tower.
SIZE AND GRADE	Mineralization consists of disseminated to massive pyrite in a lens 4m wide (12 feet) and 27m (90 feet) long. Workings consist of a single shaft 23m (75 feet) deep.
DESCRIPTION	The McIlwraith pyrite deposit occurs along the contact of calcitic marble with an amphibolite unit that is either a gabbro sill or mafic volcanic. Mineralization consists of clean pyrite enclosing lenses of quartz in a lens estimated to be about 90 feet long (27 m) and at least 12 feet (4 m) wide (Fraleck, 1907, p. 153). The orebody trends northeasterly and dips steeply to the southeast with amphibolite to the southeast and marble to the northwest. The origin of the mineralization is uncertain.
DEVELOPMENT HISTORY	before 1899; 35-foot shaft sunk by W.H. Wylie and Wm. Hall. 1899: property optioned by Nichols Chemical Company - shaft deepened to 75 feet, tunnel driven 150 feet along length of deposit, 12-foot cross-cut - 3 carloads of ore shipped
REFERENCE MAP	ODM 1956-4, Clarendon-Darling Area, 1958

REFERENCES

Fraleck, E. L.
1907: Iron Pyrites in Ontario; Ontario Bureau of Mines, Ann. Rept. Vol. 16, part I, p. 153-154.

Frechette, H.
1910: On a number of Iron Ore Properties in Northeastern Ontario; Canada Department of Mines, Summary Report for 1909, Pub. No. 63, p. 87.

Hewitt, D. F.
1967: Pyrite Deposits of Ontario, Ontario Department of Mines, MRC No. 5, p. 13

Hopkins, P. E.
1916: Iron Pyrites Deposits in Southeastern Ontario; Bureau of Mines, Ann. Rept. Vol. 25, part I, p. 195.

Peach, P. A.
1958: Geology of Darling Township and Part of Lavant Township; Ontario Department of Mines, Ann. Rept. Vol. 65, part 7, 1956, p. 59-60.

Wilson, A.W.G.
1912: Pyrites in Canada; Canada Department of Mines, Report 167, p. 61.

22. WHITE LAKE

COMMODITY — Iron (hematite)

ROCK ASSOCIATION — Dolomitic marble

CLASSIFICATION — 2A. Carbonate hosted, fault related, hematite deposit

LOCATION — Darling Township, Lanark County
NTS 31F/7, UTM Zone 18, 5015080 N, 381380 E,
LAT. 45° 16' 52" N; LONG. 76° 30' 45" W
Con. 11, Lot 23

ACCESS — The deposit is thought to be located on a peninsula at the north-eastern end of Bennett Bay on White Lake. It is accessible via a cottage road or by boat. The reported workings were not located by the writer.

SIZE AND GRADE — Mineralization consists of disseminated hematite in an extensive zone at least 90m wide (300 feet) and of unknown length. A "vein of massive blue hematite 5 to 6 feet wide" is reported by Quinn (1952, p. 37). A sample collected by Peach (1958, p. 56) contained 62.29 percent Fe, 0.09 percent SiO_2, 0.10 percent TiO_2, 0.25 percent Mn, and 0.10 percent P.

According to Quinn (1952, p. 37), workings consist of a pit 35 feet (11m) long, 4 to 15 feet (1 to 5m) wide and 1 to 6 feet (0.3 to 2m) deep, and nine other nearby pits.

GENERAL GEOLOGY: The White Lake iron deposit is hosted by brecciated dolomitic marble within an extensive succession of marble that is cut by several major faults. The marble generally strikes northeasterly and dips steeply to the southeast.

The marble in the vicinity of the deposit is a very fine-grained massive rock that varies from bluish-grey to slightly reddish in colour. This massive marble grades into the brecciated marble which forms a complex zone up to 90m (300 ft.) in width and of unknown length. Several types of breccia are present, all of which are gradational into each other and into unbrecciated marble. In the middle of the zone the breccia consists of sand to pebble sized angular fragments of white quartz set in a matrix of reddish dolomitic marble. This grades into a pink dolomitic marble that contains numerous discontinuous veins and segregations of quartz, often with associated hemitite. There are often breccia zones within this pink marble consisting of angular fragments of pink marble set in a matrix of white dolomitic marble. This grades outwards into the massive bluish-grey marble.

MINERALIZATION: Hematite is disseminated throughout the breccia zone described above but Quinn (1952, p. 37) reports that "a vein of massive blue hematite 5 to 6 feet wide striking north 65 degrees west" is exposed in a pit in Lot 23, Con. 11 that was not located by the writer. Also, according to Fréchette (1910, p. 83), from the above pit "Following in a direction S35°W small veins of hematite are found at several points for a distance of 1,400 feet, and also along the same line on the opposite side of a small bay of White Lake.

MICROSCOPY: One thin section was prepared from a sample of typical hematized, quartz-rich marble from the breccia zone. The section is composed largely of quartz and carbonate with minor hematite (Table 22A). Some of the quartz grains and one large mosaic of carbonate from fragments that are set in a matrix of carbonate, fine-grained quartz, and very fine-grained hematite. The hematite forms very fine grains scattered between carbonate and quartz grains in the matrix and sometimes occurs as coarse clumps.

	Fe-19-2
quartz	60
carbonate	35 - 40
hematite	2 - 3

TABLE 22A: Estimated modal composition (in percent) of a thin section of hematized, quartzose marble.

DISCUSSION: The White Lake deposit is very similar to the Fahey iron deposit and the two deposits may be part of a single continuous zone of hematite mineralization. The hematite probably was emplaced as a result of supergene replacement and open space filling along what was probably a fault breccia in the marble. The mineralizing solution was probably meteroric water rich in dissolved iron and silica.

DEVELOPMENT HISTORY: before 1909: excavation of several small pits by unknown operators

REFERENCE MAP ODM 1956-4, Clarendon Dalhousie-Darling Area, 1958

REFERENCES

Frechette, H.
1910: On a Number of Iron Ore Properties in North-eastern Ontario; Canada Department of Mines, Summary Report 1909, Pub. 63, p. 86

Peach, P. A.
1958: The Geology of Darling Township and Part of Lavant Township; Ontario Department of Mines, Ann. Rept. Vol. 65, part 7, 1956, p. 57-58

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, p. 37.

Rose, E. R.
1958: Iron Deposits of Eastern Ontario and Adjoining Quebec: Geological Survey of Canada, Bulletin 45, p. 56.

Shklanka, R.
1968: Iron Ore Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 249

SMDR Files (Con. 11, Lot 23); Geoscience Data Centre, Ontario Geological Survey, Toronto.

23. YUILL

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: mafic volcanic OTHER: calcitic marble
CLASSIFICATION	1E. Stratabound, volcanic hosted
LOCATION	Darling Township, Lanark County NTS 31F/2, UTM Zone 18, 5010330 N, 374790 E LAT. 45° 14' 14" N; LONG. 76° 35' 43" W. Con. 5, Lot 25 (E½)
ACCESS	The deposit is located approximately 1.6km (1 mile) east of Highway 511 and 137m (450 feet) southeast of Broad Creek. It is accessible only by foot.
SIZE AND GRADE	Mineralization consisted of massive to disseminated magnetite in a small lens 30m (100 feet) long and about 9m (30 feet) wide that has been mined to a depth of 21m (70 feet). A sample of ore collected by Frechette (1910, p. 84) contained 63.00 percent Fe, 0.025 percent P_2O_5, 0.006 percent S, and 10.08 insoluble material. A sample collected by the writer from the dumps contained 33.8 percent Fe, 21.7 percent FeO 2.11 percent TiO_2, 0.26 percent P_2O_5, 0.05 percent S, 0.05 percent V, and 115 ppm Cu. Workings consist of a single, water-filled pit about 30m (110 feet) long, and about 9m (30 feet) wide. It is reported to be 21 m. (70 feet) deep (Frechette, 1910, p. 83).

DESCRIPTION

GENERAL GEOLOGY: The Yuill iron deposit occurs within mafic volcanics at its contact with calcitic marble within a sequence of interlayered mafic volcanics and marble. The rock units generally strike easterly to northeasterly and dip steeply to the south (Fig. 23A).

The mafic volcanic is a dark green, massive, medium grained rock composed largely of green amphibole, plagioclase, and sphene. The marble is a white, fine-grained (0.5 - 1mm) rock composed essentially of calcite that is well layered and contains abundant fine needles of hornblende.

MINERALIZATION: Mineralization consists of massive magnetite in a lens-shaped orebody 30m (100 feet) long and about 9m (30 feet) wide. The orebody has essentially been mined out and does not extend past the ends of the pit on the deposit. At the west end of the pit (Figure 23B) a 0.6m (2 feet) thick layer of massive magnetite is exposed at the contact between the marble and mafic volcanics. The magnetite has a very sharp, irregular contact with the marble, and grades rapidly into the mafic volcanics (now altered to a mafic schist cut by numerous quartz and calcite veins near the contact). Along the south wall of the pit, a grey rock composed essentially of plagioclase, quartz, and biotite forms the contact between the marble and the orebody in some places.

MICROSCOPY: Two thin sections and two polished thin sections were prepared from samples collected by the writer. Fe-20-2 is a polished thin section of typical iron ore, and Fe-20-3 is a polished thin section of a contact between iron ore and marble. Fe-20-4 is a thin section of amphibolite, and Fe-20-6 is a thin section of rock peculiar to the contact zone between the marble and the iron ore-body (see Table 23A).

Section Fe-20-2 is essentially composed of a foliated intergrowth of hornblende and opaque minerals, and minor amounts of serpentine, chlorite, and epidote. The section contains pseudo-pillow structures set in a 'matrix' composed largely of opaque minerals. Within the 'pillows' the rock is composed of a very fine-grained (0.05mm), granoblastic intergrowth of hornblende with minor amounts of epidote, chlorite, and serpentine. This grades outwards into an 'interpillow matrix' composed largely of opaque minerals, intergrown with minor amounts of the silicate minerals. Magnetite is the principal

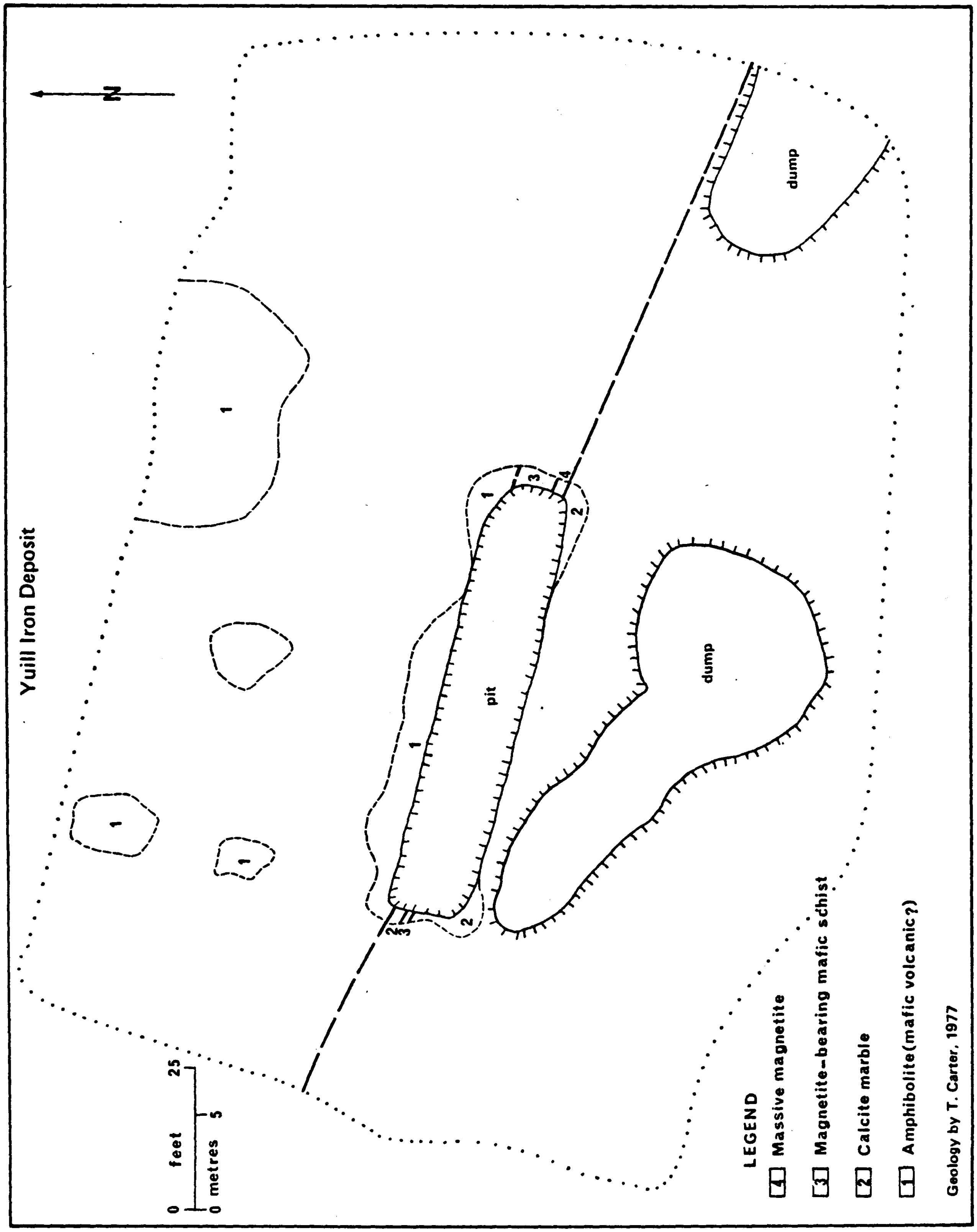
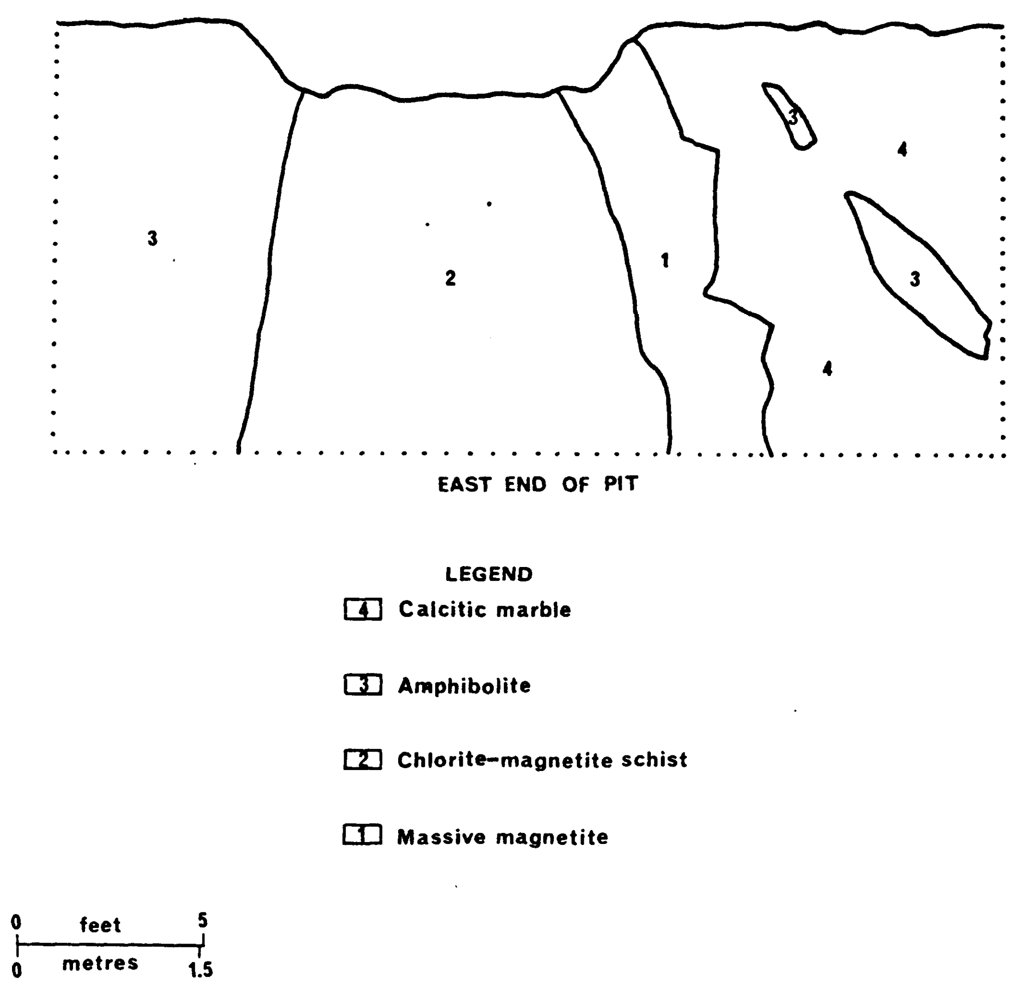


Figure 23A — Geology of the Yuill iron deposit.

Yuill Iron Mine



Geology by T. Carter, 1977

Figure 23B — Geological cross-section, east end of pit at Yuill iron deposit.

opaque mineral and occurs as fine to very fine (0.2mm - 0.2mm), anhedral to subhedral grains. Minor amounts of pyrite and marcasite form large, scattered, anhedral grains that contain abundant inclusions of unidentified silicate minerals. Chalcopyrite is also present in very minor amounts, usually associated with pyrite.

There is a sharp, broken contact between marble and iron ore in section Fe-20-3. There is a thin layer of very fine-grained (0.05mm) hornblende along the contact. The marble is composed of a massive, granoblastic intergrowth of medium-sized (0.8mm) carbonate grains with minor amounts of tremolite. The iron ore consists of a massive, granoblastic intergrowth of fine (0.25mm) grains of magnetite, carbonate, and hornblende, and very minor amounts of pyrrhotite and hematite. The magnetite occurs as disseminated, fine (0.15mm), subhedral grains that often contain abundant inclusions of silicate minerals. The magnetite grains also sometimes contain inclusions of pyrrhotite and often are partially altered to hematite.

Section Fe-20-4 is composed essentially of a massive, fine-grained intergrowth of plagioclase, hornblende, and sphene. The sphene grains form rounded, anhedral, randomly distributed grains. The hornblende and plagioclase grains are anhedral.

Section Fe-20-6 is composed of large (1-2mm), altered subhedral crystals of plagioclase set in a well-foliated matrix of fine-grained plagioclase, quartz and mica. The plagioclase crystals have uneven, broken borders, are generally well-twinned, and are in various stages of alteration to muscovite, biotite and chlorite.

	Fe-20-2	Fe-20-3		Fe-20-4	Fe-20-6
		marble	iron-ore		
carbonate	-	98	30 - 35	-	1 - 2
hornblende	70	-	15	65 - 70	-
plagioclase	-	-	-	10 - 15	75
opaques	25	-	50	-	-
sphene	-	-	-	15 - 20	-
muscovite	-	-	-	-	5 - 10
biotite	-	-	-	-	5 - 10
epidote	2 - 3	-	-	minor	-
serpentine	1 - 2	-	-	-	-
chlorite	2 - 3	-	-	minor	2 - 3
quartz	minor	-	-	-	3 - 4
tremolite	-	1 - 2	-	-	-

TABLE 23A: Estimated modal compositions (in percent) of sections of selected rock types.

DISCUSSION: The field and petrographic relations of the Yuill iron deposit indicate that it is hosted by mafic volcanic rocks, and in this respect is similar to the Darling iron deposit. The mineralization in these deposits is probably volcanogenic in origin and could have been deposited as a chemical sediment synchronously with deposition of mafic tuffs, or it may have been a primary constituent in a mafic flow.

DEVELOPMENT HISTORY

1889 - 1890: workings started by unknown operators

1898: magnetite contracted for and moved overland by wagon to Mile Lake Siding and shipped to Hamilton

REFERENCE MAP

ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958

REFERENCE

Frechette, H.
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Ingall, E. D.
1901: Report on the Iron Ore Deposits Along the Kingston and Pembroke Railway in Eastern Ontario; Geological Survey of Canada, Ann. Rept. Vol. 12, part 1, 1899 p. 54

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Ontario Iron Ore Committee
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Peach, P. A.
1958: The Geology of Darling Township and Part of Lavant Township; Ontario Department of Mines, Ann. Rept. Vol. 65, part 7, 1956, p. 57.

Rose, E. R.
1958: Iron Deposits of Eastern Ontario and Adjoining Quebec; Geological Survey of Canada, Bulletin 45, p. 59.

Shklanka, R.
1968: Iron Ore Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 250.

24. COLSTON LAKE

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: Syenite pegmatite OTHER: Nepheline syenite
CLASSIFICATION	1D. Intrusion hosted (syenite)
LOCATION	Dungannon Township, Hastings County NTS 31F/4, UTM Zone 18, 4994050 N, 277940 E. LAT. 45° 04' 01" N; LONG. 77° 49' 14" W. Con. 13, Lot 28
ACCESS	The deposit is exposed in a rock cut on Highway 500 opposite Coltson Lake
SIZE AND GRADE	Mineralization consists of a narrow lens of disseminated-to-massive magnetite up to 3m (10 feet) in length and about 0.3m (1 foot) wide within a syenite pegmatite dike. There is also a large area of unknown extent of nepheline syenite that contains disseminated magnetite. A sample of massive magnetite collected by the authors from the dike contained 66.3 percent Fe, 22.1 percent FeO, 2.34 percent TiO_2, 0.38 percent P_2O_5, 0.03 percent S, and 0.05 percent V.
DESCRIPTION	The Coltson Lake deposit occurs within a syenite pegmatite dike that cuts nepheline syenite in a northeast-trending belt of syenite and nepheline syenite. Mineralization consists of a long narrow lens of intergrown coarse-grained magnetite, calcite, biotite, and hornblende near one contact with the nepheline syenite. There is also disseminated, coarse-grained magnetite in the nepheline syenite. The magnetite in the dike was probably emplaced syngenetically as a primary constituent of the syenite pegmatite. The origin of the magnetite in the nepheline syenite is uncertain.
DEVELOPMENT HISTORY	No available records
REFERENCE MAP	ODM 1955-8, Dungannon and Mayo Townships, 1956.
REFERENCES	Newly discovered deposit

25. COPPER LAKE

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	Nepheline syenite
CLASSIFICATION	IF. Geological relationships unclear
LOCATION	Dungannon Township, Hastings County NTS 31F/4, UTM Zone 18, 4993820 N, 277080 E LAT. 45° 03' 53" N; LONG. 77° 49' 53" W. Con. 13, Lot 30
ACCESS	The deposit is reported to be located in the southern part of Con. 13, Lot 30 (Adams and Barlow, p. 351) and is probably about 100m (300 feet) north of Highway 500 about 1.6m (1 mile) east of Bancroft.
SIZE AND GRADE	Mineralization is reported to consist of several small patches of massive magnetite not more than six or seven inches in width (Adams and Barlow, p. 352). A typical sample of iron ore from this deposit contained 67.27 percent Fe, 1.20 percent SiO_2, 0.011 percent S, and 0.042 percent P (Lindeman, 1913, p. 22)
DESCRIPTION	The reported location of the Copper Lake iron deposit lies within a succession of interlayered syenite and nepheline syenite gneiss that forms a belt extending in a generally northeasterly direction through Dungannon and Faraday Townships. According to Adams and Barlow (1910, p. 351-352), the deposit consists of irregular patches of magnetite contained in nepheline syenite and exposed in a small pit. The origin of the mineralization is unknown due to uncertainties regarding the origin of nepheline gneisses in the Bancroft area.
DEVELOPMENT HISTORY	before 1910: a few tons extracted from a small pit by unknown operators
REFERENCE MAP	ODM 1955-8, Dungannon and Mayo Townships, 1956
REFERENCES	Adams, F. D. and Barlow, A. E. 1910: Geology of the Haliburton and Bancroft Areas, Province of Ontario; Geological Survey of Canada, Memoir 6, p. 351-352. Lindeman, E. 1913: Magnetite Occurrences Along the Central Ontario Railway ; Canada Department of Mines, Pub. No. 184. SMDR Files (Con. 13, Lot 30); Geoscience Data Centre, Ontario Geological Survey, Toronto.

26. HASTINGS ROAD EAST

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	Biotite schist
CLASSIFICATION	1F. Geological relationships unclear
LOCATION	Dungannon Township, Hastings County NTS 31F/4, UTM Zone 18, 4991000 N, 277740 E. LAT. 45° 02' 22" N; LONG. 77° 49' 19" W. Con. 10, Lots 48 and 49
ACCESS	The deposit is located "¼ mile east of Highway No. 62, just north of the Concession 10 - Concession 11 side-road north of Quarry Lake" (Hewitt and James, 1956, p. 47)
SIZE AND GRADE	The deposit consists of a strong magnetitic anomaly 366m x 183 m (1,200 x 600 feet) that "has an intensity of 4,600 gammas and a magnetic relief of 2,500 gammas" (Hewitt and James, 1956, p. 47). Workings on the deposit are reported to consist of " a test pit with a small dump about 500 feet north of the road. Material on the dump is a magnetite-bearing biotite schist. An analysis of material from the dump ran 37.2 percent iron", (Hewitt and James, 1956, p. 47).
DESCRIPTION	The deposit is not exposed but occurs in a succession of east-west trending marbles and greywacke. According to Hewitt and James (1956, p. 47) "Rock outcrop is sparse, but there is one small outcrop of serpentinite and several outcrops of marble and mica schist". The deposit has not been classified due to this lack of information on the geological setting, and its mode of formation is unknown.
DEVELOPMENT HISTORY	1950: magnetic survey by Frobisher Limited, small amount of diamond drilling
REFERENCE MAP	ODM 1955-8, Dungannon and Mayo Townships, 1956
REFERENCES	Abraham, E. M. 1951: Preliminary Report on the Geology in the Vicinity of Aeromagnetic Anomalies on the Bancroft and Coe Hill Sheets, Ontario Department of Mines, Preliminary Report 1951-2, p. 10 Hewitt, D. F. and James, W. 1956: Geology of Dungannon and Mayo Townships; Ontario Department of Mines, Ann. Rept. Vol. 64, part 8, 1955, p. 47. SMDR Files (Hastings Road East); Geoscience Data Centre, Ontario Geological Survey, Toronto

27. BOW LAKE

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: Syenite OTHER: marble, amphibolite
CLASSIFICATION	1D. Intrusion hosted (syenite)
LOCATION	Faraday Township, Hastings County NTS 31F/4, UTM Zone 18, 4987630, 268025 E. LAT. 45^{o} 00' 22" N; LONG. 77^{o} 56' 37"W. Concession 10 and 11, Lot 21
ACCESS	The deposit is located 425m (1,400 feet) north of Highway 28 and about 215m (700 feet) west of Bow Lake and is accessible by foot.
SIZE AND GRADE	Mineralization consists of several small lenses of massive magnetite no more than several metres in length. An average sample of massive magnetite collected by Lindeman (1913, p.22) contained 51.0 percent Fe, 0.07 percent S, 9.03 percent SiO_2, and 1.94 percent P. A sample of massive magnetite collected by the writer contained 69.6 percent Fe, 30.8 percent FeO, 1.53 percent TiO_2, 0.22 percent P_2O_5, 0.04 percent S, and 0.18 percent V. Workings consist of several small, scattered test pits.
DESCRIPTION	The Bow Lake deposit is contained within a small lens of syenite within a northeast-trending succession of interlayered gneissic granite, gabbro, pegmatite, greywacke, and minor calcareous mudstones and marbles. The syenite contains xenolithic inclusions of amphibolite, marble, and biotite schist in the vicinity of the deposit and generally is a medium to fine-grained rock, with some pegmatitic portions and occasional coarse-grained aggregates of hornblende and quartz. Mineralization consists of several isolated lenses of very coarse-grained magnetite within the syenite. The deposit is similar to several other iron deposits in the Pembroke-Renfrew area and probably was emplaced syngenetically as a primary constituent in a syenitic intrusion.
DEVELOPMENT HISTORY	before 1917: several test pits excavated by unknown operators
REFERENCE MAPS	ODM 1957-11, Cardiff and Faraday Townships, 1959

REFERENCES

Hewitt, D. F.
1959: Geology of Cardiff and Faraday Townships; Ontario Department of Mines, Ann. Rept. Vol. 66, part 3, 1957, p. 46-47

Lindeman, E.
1913: Magnetite Occurrences along the Central Ontario Railways; Canada Department of Mines, Pub. No. 184 p. 22

Lindeman, E. and Bolton, L. L.
1917: Iron Ore Occurrences in Canada, Volume II; Canada Department of Mines, Rept. No. 217, p. 115-116

Rose, E. R.
1958: Iron Deposits of Eastern Ontario and Adjoining Quebec; Geological Survey of Canada, Bulletin 45 p. 27.

SMDR Files (Faraday Township); Geoscience Data Centre, Ontario Geological Survey, Toronto

28. CARFRAE

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: dolomitic marble OTHER: gabbro
CLASSIFICATION:	1A. Stratabound, carbonate-skarn hosted, at intrusive contact
LOCATION	Faraday Township, Hastings County NTS 31F/4, UTM Zone 18, 4990950 N, 274485 E. LAT. 45^{o} 02' 17"N; LONG. 77^{o} 51' 47" W. Con. 12, Lot 3
ACCESS	The deposit is located along the southern slope of a steep ridge 60m (200 feet) north of a gravel road about 1.6m (1 mile) south of Bancroft.
SIZE AND GRADE	Mineralization consists of disseminated-to-massive magnetite in a lens 4.5m (15 feet) wide and about 75m (250 feet) in length. A sample of iron mineralization collected by Thomson (1943, p. 39) contained 60.90 percent Fe, 0.52 percent TiO_2, 0.02 percent P_2O_5, 0.03 percent S, 2.13 percent SiO_2 and no V. A sample of iron mineralization collected by the writer contained 51.3 percent Fe, 22.4 percent FeO, 0.24 percent TiO_2, 0.18 percent P_2O_5, 0.01 percent S, 0.09 percent Mn, and 0.07 percent V. Workings on the deposit consist of two parallel trenches that are both about 18m (60 feet) long and 1m (3 feet) wide.
DESCRIPTION	The Carfrae deposit occurs within a skarn zone along the contact between dolomitic marble and a gabbro sill in an area of interlayered marble and clastic sedimentary rocks. All the rock units strike northeasterly and dip steeply (80^{o}) to the southeast. The gabbro is a fine-grained (0.5mm), well-foliated rock composed of approximately equal amounts of hornblende and plagioclase. The skarn is a very coarse-grained (3cm) rock composed of a massive, granoblastic intergrowth of hornblende, clinopyroxene, and minor calcite. Mineralization consists of fine to medium-grained magnetite that is disseminated within the skarn rock and commonly is associated with minor calcite, tremolite, and chloride. The mineralized zone is about 4.5m (15 feet) wide and 75m (250 feet) long. The deposit is similar to several other iron deposits in the Pembroke-Renfrew area that occur as stratabound lenses at or near the contacts of carbonates and intrusive rocks. It probably was emplaced as a result of contact metasomatic effects of the gabbroic intrusion on the marble.
DEVELOPMENT HISTORY	before 1943: some trenching by unknown operators
REFERENCE MAP	ODM 1957-1, Cardiff and Faraday Townships, 1959
REFERENCES	Hewitt, D. F. 1959: Geology of Cardiff and Faraday Townships; Ontario Department of Mines, Ann. Rept. Vol. 66, part 3, 1957, p. 47 SMDR Files (Carfrae); Geoscience Data Centre, Ontario Geological Survey, Toronto Thomson, J. E. 1943: Mineral Occurrences in the North Hastings Area: Ontario Department of Mines, Ann. Rept. Vol 52, part 3, 1943, p. 39

29. TRENT RIVER

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	Syenite, nepheline syenite, marble
CLASSIFICATION	1D. Intrusion hosted (syenite)
LOCATION	Faraday Township, Hastings County NTS 31F/4, UTM Zone 18, 4992500 N, 272500 E LAT. 45° 03' 05" N; LONG 77° 53' 20" W. Concession A and B, Lots 7 and 8
ACCESS	The deposit is located about 425m (1,400 feet) northwest of Highway 500 and about 2km (1.25 miles) west of Bancroft.
SIZE AND GRADE	Mineralization consists of disseminated magnetite in a large zone of undisclosed extent. Two samples or iron mineralization collected by Trent River Iron Limited, (SMDR Files, O.G.S.) contained: (1) 27.98 percent Fe(sol), 54.00 percent insoluble, 4.25 percent TiO_2, and 28.30 percent SiO_2, and (2) 17.5 percent Fe(tot), 11.7 percent Fe(sol), 74.3 percent insoluble, 3.12 percent TiO_2, 36.9 percent SiO_2, 0.80 percent S, and 0.01 percent P.
DESCRIPTION	The reported location of the deposit is within a belt of syenite that strikes northeasterly through Faraday and a Dungannon Townships. By analogy with other similar iron deposits in the Pembroke-Renfrew area the deposit probably was emplaced syngenetically as a primary constituent of a syenitic intrusion.
DEVELOPMENT HISTORY	1953: surface exploration and sampling by Trent River Limited.
REFERENCE MAP	ODM 1957-1, Cardiff and Faraday Townships, 1959
REFERENCES	SMDR Files (Trent River); Geoscience Data Centre, Ontario Geological Survey, Toronto

30. WHITEFOOT LAKE

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	Syenite
CLASSIFICATION	1D. Intrusion hosted (syenite)
LOCATION	Faraday Township, Hastings County NTS 31F/4, UTM Zone 18, 4992180 N, 273710 E. LAT. 45^{o} 02' 56" N; LONG. 77^{o} 52' 25" W. Con. and Lot - uncertain
ACCESS	The deposit is reported to be located midway between Whitefoot Lake and Bancroft (Abraham, 1951, p. 10) and is accessible by foot.
SIZE AND GRADE	Mineralization consists of "disseminations and veins of magnetite is syenite gneiss within a zone 2,000 feet long and 25 to 50 feet wide." A sample assayed 10.91% Fe, (Shklanka, 1968, p. 154).
DESCRIPTION	The reported location of the deposit is within a syenite intrusion midway between Whitefoot Lake and Bancroft. According to Shklanka (1968, p. 154), the mineralization consists of "disseminations and veins of magnetite in syenite gneiss within a zone 2,000 feet long and 25 to 50 feet wide". The deposit is similar to several other deposits in the Pembroke-Renfrew area that occur within syenites, and probably was emplaced syngenetically as a primary constituent of a syenitic intrusion.
DEVELOPMENT HISTORY	No available data
REFERENCE MAP	ODM 1957-1, Cardiff and Faraday Townships, 1959
REFERENCES	Abraham, E. M. 1951: Preliminary Report on the Geology in the Vicinity of Aeromagnetic Anomalies on the Bancroft and Coe Hill Sheets; Ontario Department of Mines, Preliminary Report 1951-2, p. 10 Shklanka, R. 1968: Iron Ore Deposits of Ontario; Ontario Department of Mines, MCR No. 11, p. 154 SMDR Files (Whitefoot Lake); Geoscience Data Centre, Ontario Geological Survey, Toronto

31. FITZROY HARBOUR

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	Gabbro
CLASSIFICATION	1D. Intrusion hosted (gabbro)
LOCATION	Fitzroy Township, Carleton County NTS 31F/8, UTM Zone 18, 5032065 N, 406745 E. LAT. 45^{o} 26' 16" N; LONG. 76^{o} 11' 32"W Con. 9, Lot 17
ACCESS	The deposit is located about 3.2km (2 miles) southeast of Fitzroy Harbour and is accessible via a gravel road.
SIZE AND GRADE	Mineralization is reported to consist of a segregated mass of magnetite of undisclosed size (Wilson, p. 112) that was exposed during excavation of a cellar for a house.
DESCRIPTION	The Fitzroy Harbour iron deposit is not exposed but is reported to consist of a segregated mass of magnetite in gabbro (Wilson, 1924, p. 112). Surrounding rock types include gneissic diorite, trondhjemite, tonalite and minor marble. It is believed to have been emplaced syngenetically as a primary constituent in a gabbroic-dioritic intrusion.
DEVELOPMENT HISTORY	before 1924: deposit exposed during excavation of cellar for a house.
REFERENCE MAP	GSC 1363A, Arnprior, 1974
REFERENCES	Wilson, M. E. 1924: Arnprior-Quyon and Maniwaki Areas, Ontario and Quebec; Geological Survey of Canada, Memoir 136, p. 112

32. GRATTAN

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: Amphibolite OTHER: 'Granite", syenite
CLASSIFICATION	1D. Intrusion hosted
LOCATION	Grattan Township, Renfrew County NTS 31F/6, UTM Zone 18, 5033185 N, 341925 E LAT. 45° 26' 11" N; LONG. 77° 01' 15"W Concessions 8 and 9, Lots 16 and 17 Concession 10, Lots 17 and 18
ACCESS	The deposit includes three properties previously described as the Parks Property (Con. 8, Lot 16), the Big Jim property (Con. 10, Lot 17) and the former Radnor mine (Con. 9, Lot 16). The deposit is located about 1460m (4,800 feet) east of Highway 41 and is accessible by truck along a bush road to the Radnor mine.
SIZE AND GRADE	Mineralization consists of disseminated magnetite contained within three ore bodies that form a nearly continuous, narrow zone approximately 2440m (8,000 feet) in length and varying from 4.6 to 10.4m (15 to 34 feet) in width. The largest of the three orebodies, the "A" orebody, is about 915m (3,000 feet) in length and has an average width of 10.3m (33.7 feet). Diamond drilling has proven reserves of 3,639,600 tons to a vein depth of 110.6m (363 feet) and indicated reserves of 9,099,000 tons to a vertical depth of 183m (600 feet) with an average grade of 27.74 percent Fe, (Gilbert, 1951). The ore-body fades out between 183 and 305m (600 to 1,000 feet).

A summary of the results of an evaluation program conducted by Algoma Ore Properties Limited in 1951 (Gilbert, 1951) is presented in Table 32A.

	Length Feet	Width Feet	Head Assay Fe	Mag. Head Fe
A	3,000	33.7	27.74	23.89
B	900	18.0	20.54	16.27
C	2,100	15	21.79	18.37
Weighted Average	3,900	29.2	26.47	22.54

Concentrate (35 mesh)

	Fe	SiO_2	S	P	Mn	TiO_2	Ration	Recovery
A	68.24	2.67	1.13	.015	.14	1.33	2.86-1	86.1%
B	67.82	2.94	3.12	.016	.14	0.94	4.16-1	79.2%
C	68.72	2.33	-	-	-	0.84	3.71-1	84.3%
Weighted Average	68.17	2.72	1.59	.015	.14	1.24	3-1	85.2%

TABLE 32A: Average chemical analyses (in percent) of the Grattan orebodies.

Partial analyses of four grab samples of iron ore from the Grattan deposit are presented in Table 32B. No. 1 is a sample of typical iron ore collected by the writer from the dump of the former Big Jim Property (orebody C in Figure 32A). Numbers 2 and 3 are both samples collected by the writer from the former Radnor mine (orebody A in Figure 32A). Number 4 is a sample collected by Mackenzie (1908, p. 221) from the Radnor mine workings.

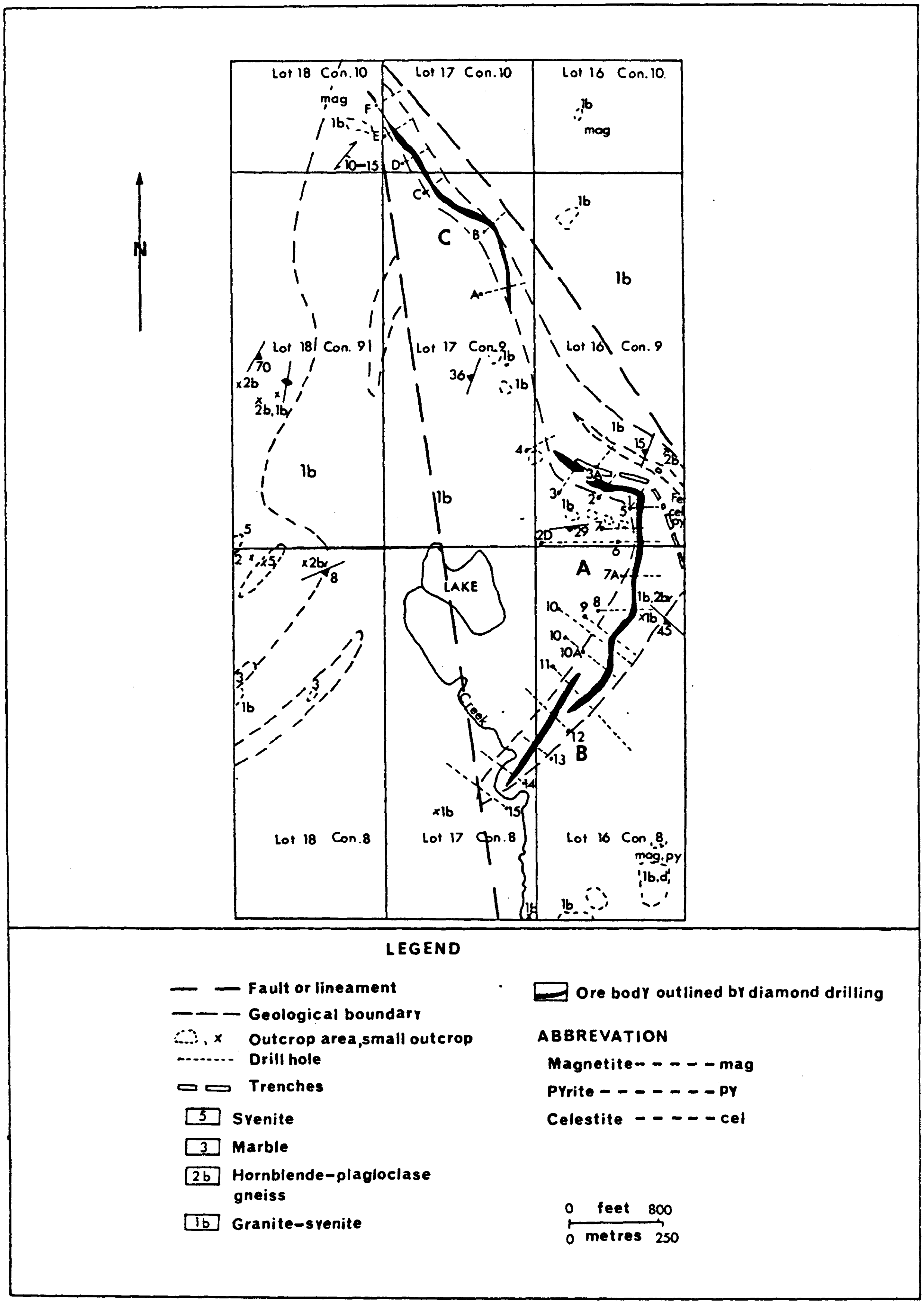

Figure 32A — Geology of the Grattan iron deposit. Adapted from Themistocleus (1977), revisions as suggested by S. B. Lumbers.

	Fe(tot)	Fe(sol)	FeO	TiO_2	P_2O_5	S	Mn	V	SiO_2
1	44.2	42.5	20.8	1.84	0.14	<0.01	0.12	0.11	-
2	41.9	39.9	21.3	1.34	0.46	1.49	-	0.07	-
3	30.4	22.9	19.8	0.78	1.30	9.98	-	0.03	-
4	47.5	-	-	-	-	0.25	-	-	19.5

TABLE 32B: Partial analyses (in percent) of selected samples of iron ore.

Workings on the deposit are very extensive and consist of one pit 15m (50 feet) in diameter at the former Big Jim property and at least 9 pits of various sizes at the former Radnor mine site. The Radnor workings form a large semicircle over a length of about 425m (1,400 feet). The pits vary in size from 9m by 6m (30 by 20 feet) and 4.5m (15 feet) deep, up to a large pit about 91m (300 feet) long, 3 to 7.5m (10 to 25 feet) wide and varying from 1.5 to 9m (5 to 30 feet) in depth.

DESCRIPTION

GENERAL GEOLOGY: The Grattan iron deposit is hosted by a conformable layer of amphibolite contained within a large intrusive complex of granitic to syenite composition (Lumbers, Royal Ontario Museum, personal communication, 1978). The strike of the rock units varies from southeast to southwest and they generally dip shallowly to moderately to the west. (Figure 32A).

The amphibolite is a medium-grained, greyish-green, well-layered rock and is composed of variable proportions of hornblende, diopside, and plagioclase. The rock has a distinctly granular texture and is quite friable. The granite is a pink, fine-grained (1mm) rock that is composed essentially of variable amounts of pink feldspar, quartz, and minor amounts of biotite, and magnetite. It is characterized by the presence of coarse, angular quartz grains set in a finer-grained feldspar matrix. No structure other than a foliation parallel to the strike of the amphibolite layer is present.

MINERALIZATION: Mineralization consists of fine-grained magnetite that occurs as disseminated-to-massive layers within the amphibolite. The mienralization is completely conformable within the amphibolite and forms a series of three stratiform orebodies that are nearly continuous laterally over an aggregate strike length of about 2440m (8,000 feet), and that vary in width from 4.6 to 10.4m (15 to 34 feet). The A orebody dips at about 35 degrees to the west.

PETROGRAPHY: Three polished thin sections and four thin sections were prepared from samples collected by the writer. The three polished thin sections, Fe-30-1, Fe-30-5 and Fe-30-9, are samples of typical mineralization collected in the old workings of the former Radnor iron mine. Fe-30-10 and Fe-29-1 are thin sections of 'granite' exposed at the old Radnor iron mine, and several hundred feet east of the mine, respectively. Fe-30-7 is a thin section of amphibolite from the old Radnor mine. Fe-29-2 is a thin section of amphibolite several hundred feet east of the Radnor mine workings (see Table 32C).

The two thin sections of 'granite' are texturally and mineralogically quite similar. Both consist of coarse (1mm) angular quartz grains set in a finer-grained (0.2-0.5mm) 'matrix' composed of variable proportions of plagioclase, perthite, microline, quartz, and minor amounts of biotite and opaque minerals. The quartz grains are strained and form isolated, granular mosaics that 'float' in the matrix. The plagioclase grains are anhedral and are altered, in varying degrees, to anti-perthite, or carbonate, biotite, and sericite. The perthite and microline from scattered anhedral grains and the opaque minerals occur as rare, coarse (0.8mm) grains in the 'granite' 'matrix'.

Section Fe-29-2 is composed essentially of a granoblastic, massive intergrowth of anhedral, coarse-grained (1mm) hornblende, plagioclase, biotite, and opaque minerals. The plagioclase grains generally have perthitic cores and contain abundant quartz inclusions.

Section Fe-30-7 is composed principally of a granoblastic, medium-grained intergrowth of anhedral diopside and plagioclase with minor amounts of quartz, sphene, chlorite, carbonate, apatite, and opaque minerals. The diopside and opaques form some poorly defined layers and the chlorite forms a vein that cuts the section parallel to the layering. The opaque minerals and sphene are usually closely associated with mafic minerals.

The three polished thin sections of iron mineralization are very similar to thin section Fe-30-7. They consist essentially of a granoblastic, medium-grained (0.8mm) intergrowth of anhedral plagioclase, hornblende, diopside, magnetite and minor biotite, sphene, and pyrite. The sections are generally poorly foliated. Section Fe-30-9 has layers that consist of diopside-sphene-magnetite, plagioclase-hornblende-biotite-magnetite, and plagioclase-hornblende-magnetite. The magnetite occurs as anhedral, medium-sized (0.6mm) grains that have rounded contacts with silicate minerals, and are often rimmed by thin layers of epidote. The pyrite occurs as fine, anhedral grains that are generally associated with the magnetite as inclusions or overgrowths on grain boundaries.

	Fe-29-1	Fe-29-2	Fe-30-1	Fe-30-5	Fe-30-7	Fe-30-9	Fe-30-10
hornblende	-	35	15 - 20	15 - 20	-	20	-
plagioclase	25 - 30	40 - 45	35 - 40	35	65 - 70	10	40
opaques	2	10	20 - 25	30	5	45 - 50	3 - 4
diopside	-	-	15 - 20	15 - 20	20	20	-
biotite	3	10	2 - 3	3	-	1 - 2	5
sphene	-	-	-	-	2 - 3	2 - 3	-
perthite	25 - 30	-	-	-	-	-	-
anti-perthite	-	3	-	-	-	-	4 - 5
quartz	40	1	-	-	3 - 5	-	30 - 40
microcline	1 - 2	-	-	-	-	-	5 - 10
carbonate	-	-	-	-	2	-	-
apatite	-	-	-	-	1 - 2	-	2 - 3
chlorite	-	-	-	-	4 - 5	-	-

TABLE 32C: Estimated modal compositions (in percent) of thin sections of selected rock types

GEOCHEMISTRY: Whole rock chemical compositions and trace element contents of four samples of selected rock types collected by the writer are presented in Table 32D. Fe-30-5 is typical mineralized amphibolite and Fe-30-6, Fe-30-8, and Fe-30-10 are all typical 'granite'. All four samples were collected from the workings of the former Radnor iron mine.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-30-5	35.1	7.43	26.7	14.0	2.98	4.97	3.57	0.36
Fe-30-6	70.8	14.3	1.13	0.96	0.48	1.29	7.04	1.37
Fe-30-8	74.4	13.5	1.06	0.67	0.33	1.08	6.24	1.94
Fe-30-10	67.6	15.3	3.01	1.19	0.64	0.77	4.63	5.14

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-30-5	0.21	0.77	0.26	1.31	0.06	0.05	0.17	97.9
Fe-30-6	0.10	0.30	0.16	0.63	0.00	0.02	0.02	98.6
Fe-30-8	n.f.	0.32	0.12	0.44	0.00	<0.01	0.02	100.1
Fe-30-10	0.20	0.41	0.24	0.23	0.10	0.04	0.03	99.5

	Ba	Be	Co	Cr	Cu	Ga	Li	Ni
Fe-30-5	40	15	26	21	12	20	18	15
Fe-30-6	90	-	<5	8	<5	-	10	<5
Fe-30-8	123	-	<5	7	5	-	6	<5
Fe-30-10	950	-	<5	<5	17	-	9	<5

	Pb	Sc	Sn	Sr	V	Y	Zn	Zr
Fe-30-5	11	20	25	40	500	100	290	200
Fe-30-6	14	-	-	-	-	-	12	-
Fe-30-8	13	-	-	-	-	-	18	-
Fe-30-10	<10	-	-	-	-	-	35	-

TABLE 32D: Whole rock chemical compositions (in percent) and trace element contents (in ppm) of four samples of selected rock types.

DISCUSSION:

There are several similar iron deposits in the Pembroke-Renfrew area that occur as small bodies of disseminated to massive magnetite within syenitic intrusions. But the Grattan deposit is unique on account of its size, its continuity along strike, and its pronounced stratiform nature. The Fraser Lake deposit also consists of conformable, mafic-rich layers within a syenitic intrusion but the relationship is not as pronounced. Both deposits probably formed as a result of segregation and precipitation of magnetite and mafic minerals in discrete layers within the host intrusions.

DEVELOPMENT HISTORY

All the work performed at the Radnor Mine unless otherwise noted.

1900: some diamond drilling by Canada Iron Furnace Company

1901-1907: Canada Iron Furnace Company shipped 18,824 tons of ore

1901-1902: some diamond drilling and stockpiling of 180 tons of ore from open pit on Big Jim property.

1902: the main pit increased to 40 feet in depth, and 150 feet in length, with the width remaining 35-40 feet. In the botton of the west end, a development shaft was put down 80 feet, on an incline of 35^{o}S. An incline sunk here which was 8 feet high by 18 feet wide and 115 feet long. At 20 foot depth, a drift runs 20 feet in good ore. The main pit produced about 7,000 tons.

- extensive stripping 30 feet west of main pit. At the west end of this stripping, another pit opened measuring 30 feet by 20 feet by 18 feet, from which 500 tons was removed.

- six remaining pits - varying in length from 30-340 feet, in width from 10-40 feet, and in depth from 15-40 feet.

1904: some diamond drilling, 2,500 tons of ore shipped by Canada Iron Furnace Company.

- No. 8 pit worked but closed for winter.

1905: No. 7 pit being worked. The open pits are in a semi-circular form from north to south, beginning at No. 7 which is the most northerly and following in rotation, Nos. 8, 5, 6, 1, 2 and 3.

1950: property optioned by Algoma Steel Corp., dip needle survey completed.

1951: 26 diamond drill holes totalling 10,719.7 feet by Algoma Steel. All dip needle anomalies shallow-drilled to 150 feet in depth with 2 holes cutting the ore at 600 feet. Two holes at 1,000 feet in depth did not intersect ore. Three orebodies outlined.

REFERENCE — OGS Preliminary Map 1560, Clontarf Area, Renfrew County, 1978.

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33. OTTAWA RIVER

COMMODITY	Iron (magnetite), titanium (ilmenite)
ROCK ASSOCIATION	Gabbro
CLASSIFICATION	1D. Intrusion hosted (gabbro)
LOCATION	Horton Township, Renfrew County NTS 31F/10, UTM Zone 18 Location uncertain Con. 6 just west of Ottawa River
ACCESS	The exact location of the deposit is unknown
SIZE AND GRADE	Mineralization consists of a small body of disseminated to massive magnetite of unknown size. A sample of typical mineralization collected by Pope (1900 p. 380) contained 43.72 percent Fe, 17.23 percent TiO_2 7.82 percent SiO_2, 3.20 percent Al_2O_3, 5.67 percent MgO, 3.42 percent CaO, 0.61 percent Na_2O, 0.17 percent K_2O, 0.63 percent V_2O_5, 0.22 percent MnO, 0.43 percent NiO, 0.10 percent and 0.38 percent moisture.
DESCRIPTION	According to Pope (1900, p.379) "In the township of Horton, county of Renfrew, just west of the Ottawa River, there is a considerable area of a dark gray gabbro, containing several small deposits of titaniferous magnetite. One of these is situated in the sixth range of Horton. Here, the magnetite is homogeneous throughout and presents a fairly well defined booundary with the gabbro wall-rock. The gabbro is of uniform texture, the feldspar and augite being in about equal proportions. The feldspar is broadly twinned, presents the extinction angles of anorthite, and has the dusted appearance so characteristic of the plagioclase in anorthosite." The Ottawa River deposit is a member of a small group of similar iron deposits in the Pembroke-Renfrew area that occur as lenses of disseminated to massive magnetite within gabbro intrusions. It is unique, however, in its unusually high content of TiO_2, and ilmenite may be the primary ore mineral rather than titaniferous magnetite. The mineralization was probably a primary constituent of the gabbro.
DEVELOPMENT HISTORY	No available records
REFERENCE MAP	ODM 53b, Renfrew County, 1945
REFERENCES	Pope, F. J. 1900: Investigation of Magnetite Iron-Ores from Eastern Ontario; Trans Am. Instit. Min. Eng., Vol. 29, 1899, p. 379-380. Robinson, A. H. A. 1922: Titanium; Canada Dept. of Mines, Pub. No. 579, p. 76 Satterly, J. 1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, part 3, 1944, p. 60

34. LAVANT

COMMODITY Iron (magnetite)

ROCK ASSOCIATION Gabbro

CLASSIFICATION 1D. Intrusion hosted (gabbro)

LOCATION Lavant Township, Lanark County
NTS 31F/2, UTM Zone 18, 4999450 N, 374950 E.
LAT. 45^{o} 08' 22" N; LONG. 76^{o} 35' 26" W.
Con. 1, Lot 11

ACCESS The deposit is located less than 30m (100 feet) north of the gravel road connecting the settlements of Brightside and Flower Station at a point 9.2km (5.7 miles) west of Brightside.

SIZE AND GRADE Mineralization consists of disseminated magnetite erratically distributed within a zone about 900m (3,000 feet) long and up to 90m (300 feet) wide. Exploration work by Lavant Iron Mines Ltd. (SMDR Files, O.G.S.) indicated the largest single deposit contained 50,000 tons and the average iron content was 41.29 percent. A composite sample of iron mineralization from the pits collected by Peach (1958, p. 59) contained 65.07 percent Fe, 0.14 percent TiO_2, 0.02 percent P_2O_5, and 1.84 percent S. A typical sample collected by the writer contained 40.8 percent Fe, 25.8 percent FeO, 2.73 percent TiO_2, 1.16 percent P_2O_5 , 0.02 percent S, and $<$0.01 percent V.

Workings consist of three small pits.

DESCRIPTION GENERAL GEOLOGY: The Lavant iron deposit occurs within a large, heterogeneous, apparently conformable gabbroic intrusion approximately 40km (25 miles) long and up to 8km (5 miles) wide that contains several small bodies of trondhjemite that apparently are intrusive into the gabbro. The gabbro strikes northerly and dips moderately (40 to 50^{o}) to the east.

The gabbro is generally massive or weakly foliated and is composed essentially of variable proportions of fine-to-coarse-grained hornblende and plagioclase. Primary graded layering is present in at least two places and strikes northerly, dips shallowly to the east, and indicates top directions to the east in conformity with the attitude of the layering.

MINERALIZATION: Mineralization consists of fine-grained magnetite and pyrrhotite disseminated within metagabbro in a zone reported to be 900m (3,000 feet) long and 90m (300 feet) wide (SMDR Files, Lavant Iron Mines Limited). The gabbro in the vicinity of the deposit is generally a massive, medium-grained (1mm) rock composed of almost equal proportions of hornblende and plagioclase, with local anorthositic portions.

MICROSCOPY: Two thin sections and two polished thin sections were prepared from samples collected by the writer. Fe-31-2 and Fe-31-6 are thin sections of metagabbro, and Fe-31-3 and Fe-31-5 are polished thin sections of mineralized gabbro (see Table 34A).

Fe-31-2, Fe-31-6, and Fe-31-3 are all very similar. They are composed of granoblastic, massive intergrowths of variable proportions of coarse-grained (1-3mm), inequigranular plagioclase, hornblende, quartz, magnetite, ilmenite, and minor amounts of apatite, biotite, zircon, carbonate, pyrite, and sericite. All the mineral grains are anhedral except for isolated euhedral crystals of apatite and zircon. The quartz is badly strained, and the plagioclase is often largely altered to masses of carbonate, sericite, quartz, and plagioclase. The ilmenite and magnetite occur together as fine, anhedral, intergrown grains and often contain inclusions of silicate minerals. The pyrite occurs as rare, isolated, anhedral grains.

Polished thin section Fe-31-5 consists of a granoblastic, massive intergrowth of coarse-grained (1-2mm) diopside, plagioclase, opaque minerals, hornblende, and minor biotite. The diopside occurs as large, rounded porphyroblasts rimmed by hornblende with abundant inclusions of hornblende. Magnetite is the principle opaque mineral with less abundant pyrrhotite and minor ilmenite, chalcopyrite, and marcasite. The ilmenite usually is intergrown with magnetite and pyrrhotite is associated with these intergrown grains. The chalcopyrite occurs as small blebs and anhedral grains within, and is associated with the pyrrhotite. The marcasite occurs as an alteration product along fractures and grain boundaries of the pyrrhotite.

	Fe-31-2	Fe-31-3	Fe-31-5	Fe-31-6
plagioclase	50	40 - 50	35 - 40	25 - 30
hornblende	10 - 15	10	10 - 15	25 - 30
opaques	10	15 - 20	20	20
quartz	25 - 30	25 - 30	-	15
diopside	-	-	25 - 30	-
biotite	1 - 2	-	-	-
apatite	3 - 5	2	-	5
zircon	minor	minor	-	-
carbonate	2 - 3	2 - 3	-	<5
sericite	2 - 3	2 - 3	-	<5

TABLE 34A: Estimated modal compositions (in percent) of some sections of metagabbro

DISCUSSION: The Lavant iron deposit is a member of a small group of similar iron deposits in the Pembroke-Renfrew area that occur as lenses of disseminated to massive magnetite within gabbroic intrusions. The magnetite in these deposits is believed to have been a primary constituent of the gabbros.

DEVELOPMENT HISTORY 1957-1958: Two prospect pits inspected, some diamond drilling (unspecified amount), stripping, aeromagnetic, magnometer, and geologic surveys by Lavant Iron Mines Limited

REFERENCE MAP ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958

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35. RADENHURST-CALDWELL

COMMODITY — Iron (magnetite)

ROCK ASSOCIATION — HOST: amphibolite schist
OTHER: dolomitic marble

CLASSIFICATION — IF. Geological relationships unclear

LOCATION — Lavant Township, Lanark County
NTS 31F/2, UTM Zone 18, 5002750 N, 368410 E
LAT. 45° 10' 05" N; LONG. 76° 40' 28"W.
Con. 3, Lot 22

ACCESS — The deposit is accessible via a combination of gravel and dirt roads about 1.6km (1 mile) northeast of the settlement of Flower Station

SIZE AND GRADE — Mineralization consists of disseminated magnetite and minor pyrite and chalcopyrite in four separate lenses. The main lens or orebody is 610m (2,000 feet) long, has an average width of 9.5m (31.3 feet), and contains 6,500 tons or ore per slope foot, grading 32.77 percent Fe as indicated by diamond drilling. The three additional zones total 490m (1,600 feet) in length and contain 17.08 percent, 16.71 percent, and 25.50 percent Fe respectively (SMDR Files, O.G.S.)

Partial analyses of iron ore from the Radenhurst-Caldwell deposit are presented in Table 35A. Samples 1 and 2 both grab samples collected by the writer. Sample 3 is taken from Peach (1956, p.59) and represents the average grade of the main orebody.

	Fe(tot)	Fe(sol)	FeO	TiO_2	P_2O_5	S	V	SiO_2	Cu
1	53.1	52.2	22.5	0.45	0.09	0.19	0.02	-	-
2	55.8	54.8	26.1	0.15	0.06	2.14	<0.01	-	0.05
3	-	32.77	-	-	0.07	1.64	-	26.44	-

TABLE 35A: Partial analyses (in percent) of samples of iron ore

Workings consist of three large pits, four small test pits, and two shafts.

DESCRIPTION — GENERAL GEOLOGY: The Radenhurst-Caldwell iron deposit consists of several en echelon lenses of disseminated to massive magnetite contained within an extensive unit of amphibolite schist. The schist is bounded to the west by a unit of siliceous dolomitic and minor calcitic marble. All the rock units strike northeasterly and dip moderately (60°) to the southeast.

The amphibolite schist is a fine-grained (0.5mm) massive to foliated rock composed essentially of amphibole, plagioclase, biotite, and clinopyroxene. It is sometimes well-layered in the vicinity of the orebodies. Its origin is uncertain but it may be a metamorphosed volcanic, or possibly a metagabbro. The marble is a white rock composed essentially of dolomite and locally abundant calcite with abundant large, broken fragments of fine grained tremolite and minor diopside. The calc-silicate fragments probably represent broken interbeds of quartzose sandstone.

MINERALIZATION: Mineralization consists of disseminated to massive magnetite contained in four en echelon, lens-shaped orebodies (see Figure 35A). The magnetite is intergrown with variable amounts of hornblende, clinopyroxene, calcite and dolomite, and often contains thin interlayered lenses of tremolite-actinolite. Pyrite and chalcopyrite are common as accessory minerals. Garnet (andradite-grossularite) is also locally abundant, especially in pit A (Figure 35A) where it forms a massive lens about 2.5m (8 feet) thick.

In the interest of rapid dissemination of the results contained in this Report, some of the data may not have been meticulously checked. Thus the OGS does not guarantee the accuracy of these figures and suggests the reader check original sources.

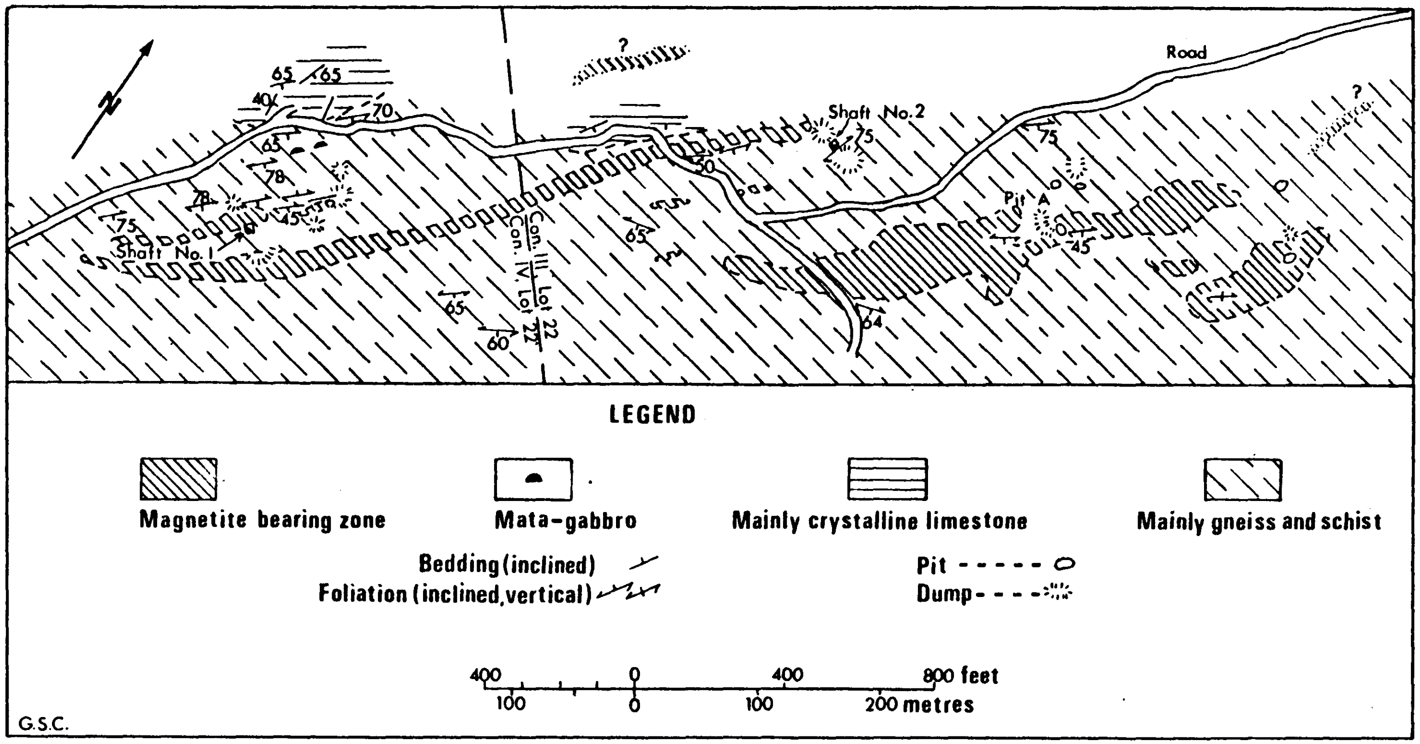

Figure 35A — Geology of the Radenhurst-Caldwell iron deposit (Rose, 1958, p.48).

PETROGRAPHY: One polished thin section and one thin section were prepared from samples collected by the writer. Fe-32-2 is a thin section of garnet-rich rock from pit A. Fe-32-10 is a polished thin section of mineralized amphibolite schist from the vicinity of shaft No. 1

Thin section Fe-32-2 consists essentially of a massive intergrowth of grossular garnet, identified by X-ray diffraction, with dispersed grains of carbonate and hornblende.

Section Fe-32-10 is gneissic and consists of a granoblastic intergrowth of opaque minerals, clinopyroxene, plagioclase, and hornblende. The clinopyroxene is probably diopside. Most of the minerals are fine grained (0.3mm), but some of the clinopyroxene grains measure as much as 2mm in diameter. Magnetite and pyrrhotite are the most abundant opaque minerals and there are minor amounts of chalcopyrite, pyrite, and marcasite. The magnetite and pyrrhotite form a massive intergrowth of fine to medium sized grains. The magnetite sometimes contains inclusions of silicate minerals. The chalcopyrite and pyrite are usually associated with pyrrhotite, and the marcasite occurs along fractures and on grain boundaries of the pyrrhotite as an alteration product.

	Fe-32-2	Fe-32-10
garnet	90 - 95	-
carbonate	5	-
hornblende	minor	5
opaques	-	40 - 45
clinopyroxene	-	35 - 40
plagioclase	-	10

TABLE 35B: Estimated modal compositions (in percent) of two sections of selected rock types

GEOCHEMISTRY: The whole rock chemical composition and trace element content of three samples collected by the writer are presented in Table 35C. Fe-32-1 and Fe-32-6 are samples of the amphibolite schist host rock and Fe-32-4 is a sample of the garnet-rich rock exposed in pit A.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-32-1	59.8	17.0	2.07	3.19	2.74	4.21	7.46	0.59
Fe-32-4	37.5	7.13	17.0	4.00	0.56	29.5	0.99	0.00
Fe-32-6	50.3	16.4	3.79	6.67	5.00	7.57	5.84	0.52

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-32-1	0.47	0.31	0.30	0.77	0.13	0.02	0.05	99.1
Fe-32-4	0.13	0.15	0.68	0.19	0.04	n.f.	0.43	98.3
Fe-32-6	0.55	0.24	0.20	1.82	0.28	0.01	0.13	99.3

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-32-1	6	29	21	10	10	27	70	3
Fe-32-4	6	20	9	6	20	20	50	4
Fe-32-6	10	86	36	30	11	70	40	3

TABLE 35C: Whole rock chemical compositions (in percent) and trace element contents (in ppm) of selected rock types.

DISCUSSION: The Radenhurst-Caldwell deposit cannot be confidently classified due to uncertainties about its geological setting, particularly the nature of the amphibolite schist. Thus, it must be included in the IE group of iron deposits at which the geological relationships are unclear.

DEVELOPMENT HISTORY

before 1899: several pits ranging in depth from 20 feet to 80 feet (6m to 25m) and in surface area from 900 feet square to 3,600 feet square.

- two shafts present; one which is 108 feet (32.9m) deep with a 20 foot (6m) drift to the east and the other 200 feet (60m) deep.
- a number of diamond drill holes present with the longest being 200 feet (60m) deep.

1941-1942: 14 shallow diamond drill holes were sunk in zone "A" at 150 feet (46m) intervals and indicated a magnetite lens 2,000 feet (610m) long by 31.3 fee (9.5m) wide.

- 13 diamond drill holes were drilled in Zones "B", "C" and "D" which indicated an aggregate length of 1,500 feet (457m).
- also, a magnetite survey was carried out by Frobisher Exploration Company Limited.

REFERENCE MAP

ODM 1956-4, Clarendon Dalhousie-Darling Area, 1958.

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SMDR Files (Radenhurst and Caldwell); Geoscience Data Centre, Ontario Geological Survey, Toronto.

36. WILBUR

COMMODITY — Iron (magnetite)

ROCK ASSOCIATION — HOST: Skarn
OTHER: 'Granite', dolomitic marble

CLASSIFICATION — 1A. Stratabound, carbonate-skarn hosted, at intrusive contact

LOCATION — Lavant Township, Lanark County
NTS 31F/2, UTM Zone 18, 4986077 N, 366460 E.
LAT. 45^{o} 01' 03"N; LONG. 76^{o} 41' 41" W.
Cons. 12 and 13, Lot 4

ACCESS — The deposit is accessible via a private dirt road at a point 2.4km (1.5 miles) east of Lavant Station along a gravel road. The deposit is loated 4.2km (2.6 miles) south of the gravel road along the dirt road.

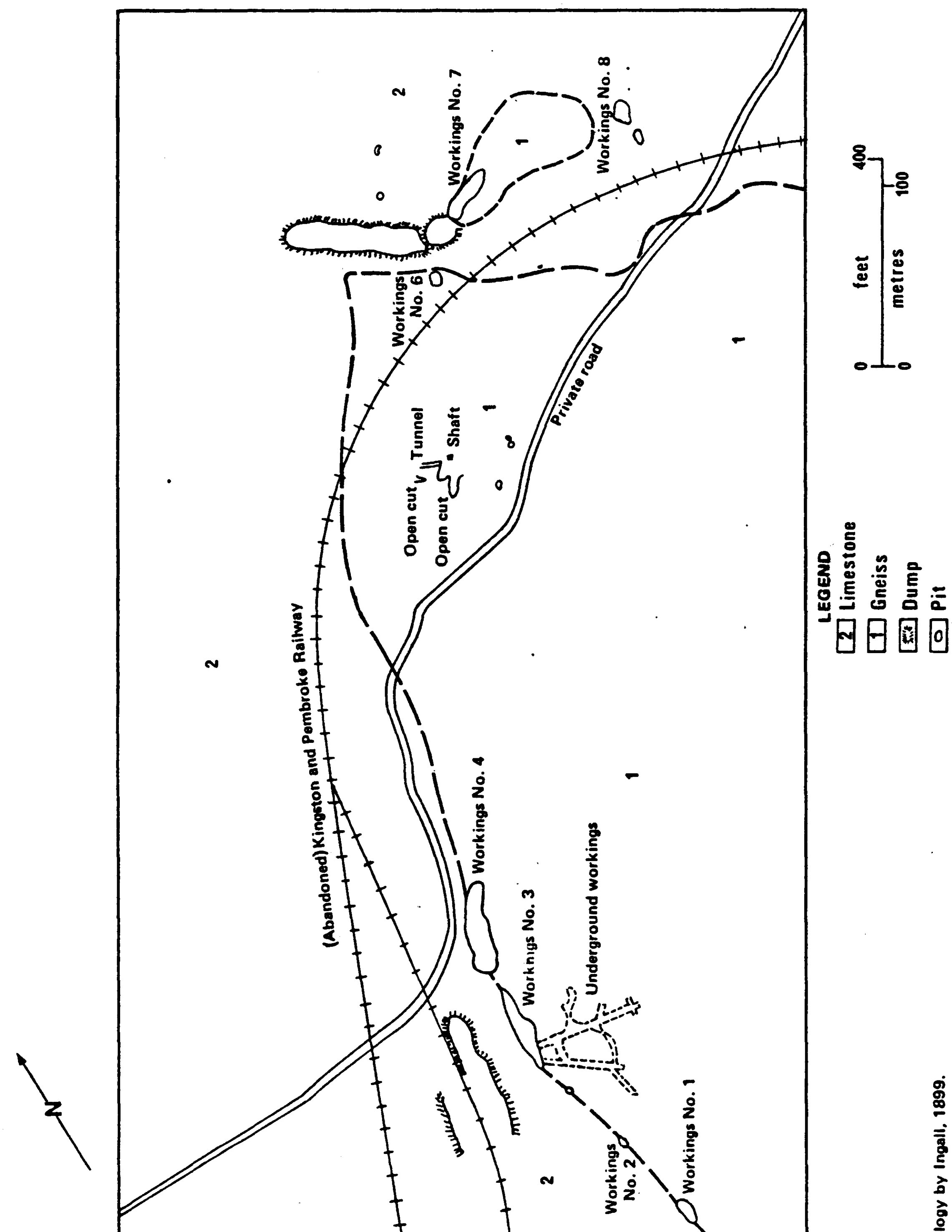
SIZE AND GRADE — Mineralization consists of massive magnetite contained in a series of small isolated orebodies scattered over a strike length of about 762m (2,500 feet). Approximately 150,000 tons of iron ore were shipped from these orebodies during mining activities. One carload of iron ore had an average grade of 56.69 percent Fe, 6.20 percent SiO_2, 0.01 percent P, 0.01 percent S, 2.56 percent Al_2O_3, 2.00 percent CaO, 6.84 percent MgO, and 0.20 percent MnO (Ont. Iron Ore Committee, 1924, p. 229). A selected sample of iron ore collected by the writer contained 48.9 percent Fe, 21.2 percent FeO, 0.19 percent TiO_2, 0.09 percent P_2O_5, 0.01 percent S, and 0.01 percent V.

Eight workings are present on the deposit (Ingall, 1901) as indicated in Figure 36A. Working No. 1 is a shallow, water-filled pit; No. 2 consists of two adjacent pits 9m (30 feet) in diameter; No. 3 is a water-filled pit 30m by 18m (100 by 60 feet) that contains two inclines at the western end. No. 4 is an open cut 48.6m (160 feet) long, up to 12m (40 feet) wide, and 4.6m to 6m (15 to 20 feet) deep; No. 5 is a small tunnel with a couple of test pits; No. 6 is a large pit; No. 7 is a large pit stated to be 90m (300 feet) deep. (Ingall, 1901, p.48) and No. 8 is another water-filled pit.

DESCRIPTION — GENERAL GEOLOGY: The Wilbur iron deposit occurs as several detached orebodies hosted by skarn contained within a gneissic granitic intrusion at its contact with siliceous dolomitic marble. The 'granite' forms a lobe that projects into the marble and is part of a large sill of quartz monzonite that lies to the east of the deposit. Dikes and large conformable masses of pegmatite are common within the intrusive body. All the rock units strike in a northerly direction and dip shallowly (20 to 40^{o}) to the east (Fig. 36A, 36B).

According to Ingall (1901, p. 51), the contact of the 'granite' and the marble is"fairly sharply defined at places, as shown in the western workings, but, in the vicinity of the eastern pits the two series of rocks seem to be separated by an alteration zone of greater or less thickness. In this are to be chlorite, epidote, etc., evidently the products of decomposition of the mineral constituents of the gneiss". This alteration zone was not observed by the writer in the vicinity of the western-most workings (see Figure 36B). The marble is a white, medium-grained rock composed essentially of calcite, dolomite, tremolite, and muscovite. The tremolite and muscovite commonly form separate layers and lenses within the marble and probably represent sandy interbeds.

The 'granite' is a fine-grained rock composed essentially of quartz, feldspar, and minor biotite. It is well-foliated to gneissic in the vicinity of the iron deposit.



Geology by Ingall, 1899.

Figure 36A — Geology and workings of Wilbur iron deposit.

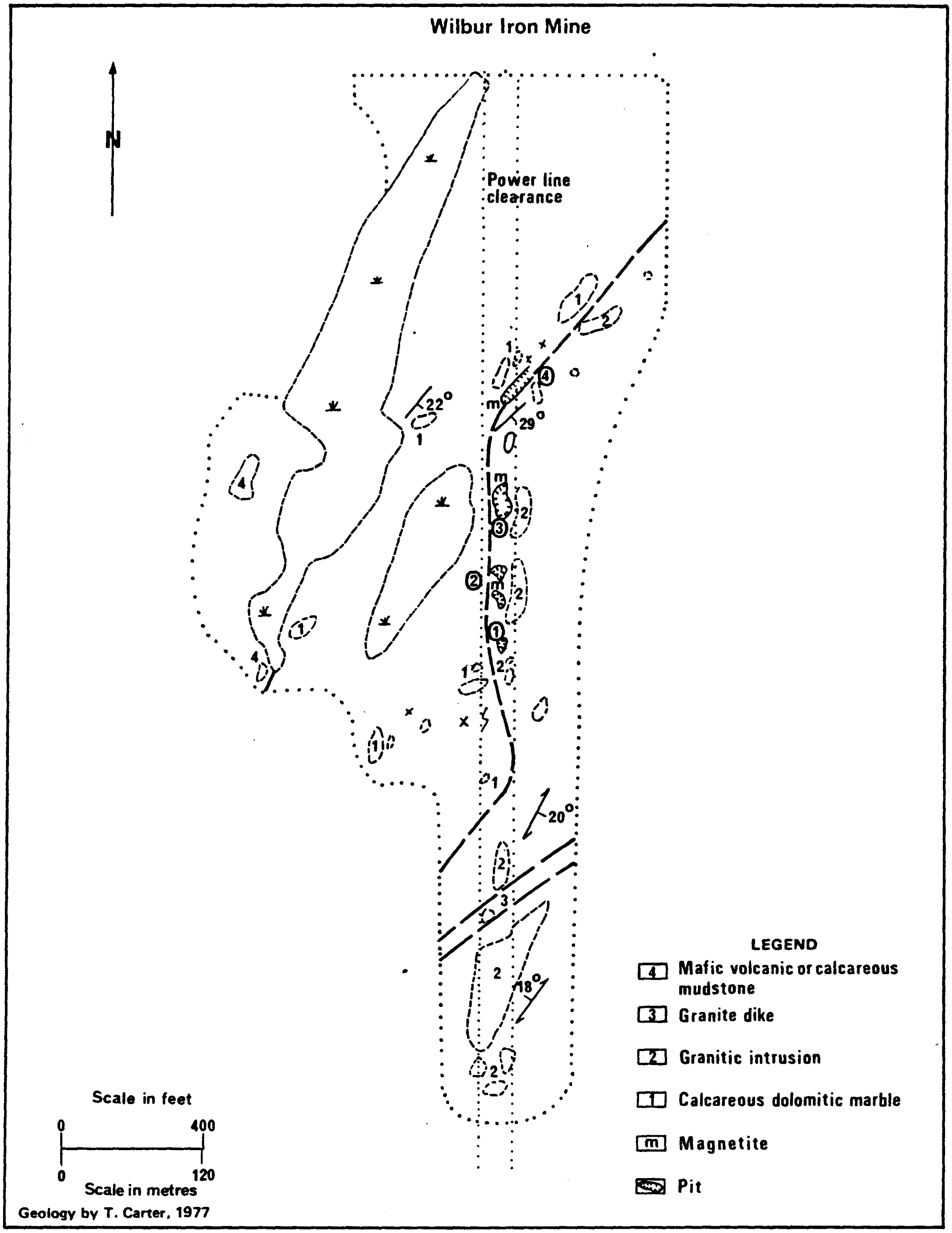


Figure 36B — Geology in vicinity of westernmost workings, Wilbur iron deposit.

MINERALIZATION: Mineralization consists of fine-grained, massive magnetite that forms "a series of detached ore bodies" (Iron Ore Committee, 1924, p. 91), just within the granitic intrusion along its contact with the marble. Although the ore bodies are generally within the intrusion, the host rock is often a skarn composed of variable proportions of epidote, chlorite, carbonate, tremolite, and biotite. The skarn is best developed near the eastern workings.

MICROSCOPY: One thin section (Fe-33-7) and one polished thin section (Fe-33-6) were prepared from samples collected by the authors. Fe-33-7 is a thin section of 'granite' and Fe-33-6 is a polished thin section of interlayered marble and magnetite (see Table 36A).

The granitic rock consists of a granoblastic inequigranular intergrowth of fine-grained (0.4mm) quartz, orthoclase, biotite, and minor plagioclase, chlorite, hornblende, and epidote. The biotite is often associated with felted masses of fine-grained chlorite. The section has a well-developed foliation defined by preferentially oriented biotite grains.

Section Fe-33-6 consists of a layered, poorly foliated intergrowth of carbonate, magnetite, and minor serpentine and tremolite. Carbonate and magnetite occur as separate layers and the tremolite has a preferred orientation. The carbonate layer is a granoblastic intergrowth of carbonate grains and the magnetite layer is composed of a granoblastic intergrowth of anhedral, fine (0.2mm) grains and grain aggregates of magnetite. Serpentine occurs as amorphous, felted masses usually associated with magnetite.

	Fe-33-7	Fe-33-6
quartz	40 - 45	-
orthoclase	20 - 25	-
biotite	15	-
plagioclase	5	-
chlorite	3 - 4	-
hornblende	2	-
epidote	minor	-
carbonate	-	50 - 55
magnetite	-	30 - 35
serpentine	-	10
tremolite	-	5

TABLE 36A: Estimated modal compositions (in percent) of two thin sections of selected rock types

GEOCHEMISTRY: The whole rock chemical composition and trace element content of two samples collected by the authors are presented in Table 36B. Fe-33-1 is a sample of the 'granite' and Fe-33-2 is a sample of chloritic schist from the waste dumps at the mine site.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-33-1	61.6	16.2	1.69	3.41	2.89	4.01	4.07	2.48
Fe-33-2	32.7	7.05	5.35	2.59	27.7	8.08	0.00	0.07
	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-33-1	0.86	0.27	0.70	0.75	0.18	<0.01	0.08	99.2
Fe-33-2	5.25	0.75	11.0	0.42	0.11	0.06	0.33	101.5
	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-33-1	14	82	28	14	36	74	210	14
Fe-33-1	5	570	21	21	<10	38	30	8

TABLE 36B: Whole rock chemical compositions (in percent) and trace element contents (in ppm) of two samples of selected rock types.

DISCUSSION: The Wilbur deposit is a member of a large group of iron deposits in the Pembroke-Renfrew area that occur as strata-bound lenses at the contacts between intrusive rocks and marbles. The geological relationships of the Wilbur deposit, in analogy with similar relationships observed at the other deposits of the group, indicate that the mineralization probably is genetically related to the granitic intrusion and resulted from contact metasomatic reactions with the marble.

DEVELOPMENT HISTORY

before 1900: 125,000 of ore shipped by the Kingston and Pembroke Mining Company from eight workings (see Figure 36B) and an unspecified amount of diamond drilling was completed. The drill holes intersected ore zones that varied from 1 to 8.5 metres (3 to 28 feet) in thickness.

1907-1908: Mine operated by the Wilbur Iron Ore Company who shipped 21,892 tons of ore to the Algoma Steel Company at the rate of about 200 tons per day. An inclined shaft (38°) was put down to a depth of 90 feet south-southeast from the bottom of the No. 3 pit and a limited amount of underground development was completed.

1910: Mine reopened by Hawthorne Silver and Iron Mine Company with no shipments being made.

1911: Exploration Syndicate of America operated the mine for a short time.

REFERENCE MAP

ODM 1956-4, Claundon-Dalhousie-Darling Area, 1958.

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37. BESSMER

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: skarn OTHER: tonalite, marble, gabbro
CLASSIFICATION	1A. Stratabound, carbonate-skarn hosted, at intrusive contact
LOCATION	Mayo Township, Hastings County NTS 31F/4, UTM Zone 18, 4991515 N, 292130 E. LAT. 45° 02' 55"N; LONG. 77° 38' 22"W Con. 6, Lots 2, 4 and 5 Con. 7, Lot 1
ACCESS	The deposit is accessible via a gravel road that trends south from Highway 500 from the settlement of Hermon. The Bessemer No. 4 deposit is located on Con. 6, Lots 4 and 5, 183m (600 feet) north of the road at a point about 7.2km (4.5 miles) from Highway 500. The No. 1 deposit is located about 1220m (4,000 feet) west of the No. 4 deposit and 305m (1,100 feet) north of the gravel road. The No. 2 and No. 3 deposits are located on Con. 6, Lot 2 about 455m (1,500 feet) southwest of Little Mullet Lake, near the road. The No. 3 deposit is 244m (800 feet) east of the No. 2 deposit.

SIZE AND GRADE

Mineralization consists of disseminated magnetite contained within four separate lenses. The No. 1 deposit is 61m by 15.2m (200 feet by 50 feet) and the No. 2 and No. 3 deposits are en echelon lenses each about 210m (700 feet) long and less than 30.5m (100 feet) in width. The No. 4 deposit is the largest and is 427m (1,400 feet) long, 15.2m (50 feet) wide and contains estimated reserves of 2,480,819 tons averaging 28.62 percent recoverable iron (Giblin, 1960, p. 100, 102, 103). A summary of the amounts and average grades of ore mined from each of the four deposits is presented in Table 37A. The data were supplied by Canada Iron Mines Limited to the Ontario Iron Ore Committee (1923, p. 166).

Deposit	Tonnage	Condition	Fe	SiO_2	Sulfur	P
No. 1	480	hand-sorted	49.30	13.30	nil	0.071
No. 2	1,500	hand-sorted	56.00	7.20	nil	0.004
No. 3	5,000	hand-sorted	61.30	8.91	0.042	0.008
No. 4	28,000	crude	49.30	-	0.465	0.020

TABLE 37A: Partial analyses (in percent) of ore mined from the Bessemer iron deposits

Several analyses of selected samples of iron ore are presented in Table 37B. Sample 1 was collected by the writer from the ore dump at the No. 4 deposit. Samples 2 and 3 are analyses samples of ore collected by Lindeman (1913, p. 18). Sample No. 4 is an analysis of an average sample or ore shipped from the mine in 1907 and sample No. 5 is the average composition of a 25-car shipment made in 1908 (Lindeman, 1913, p. 17-18).

Sample	Fe(tot)	Fe(sol)	FeO	TiO_2	P_2O_5	S
1	49.0	47.2	23.4	0.27	0.07	0.66
2	47.70	-	-	-	0.01	0.63
3	42.5	-	-	-	0.69	0.30
4	54.29	-	-	-	0.04	0.062
5	54.00	-	-	-	0.05	0.075

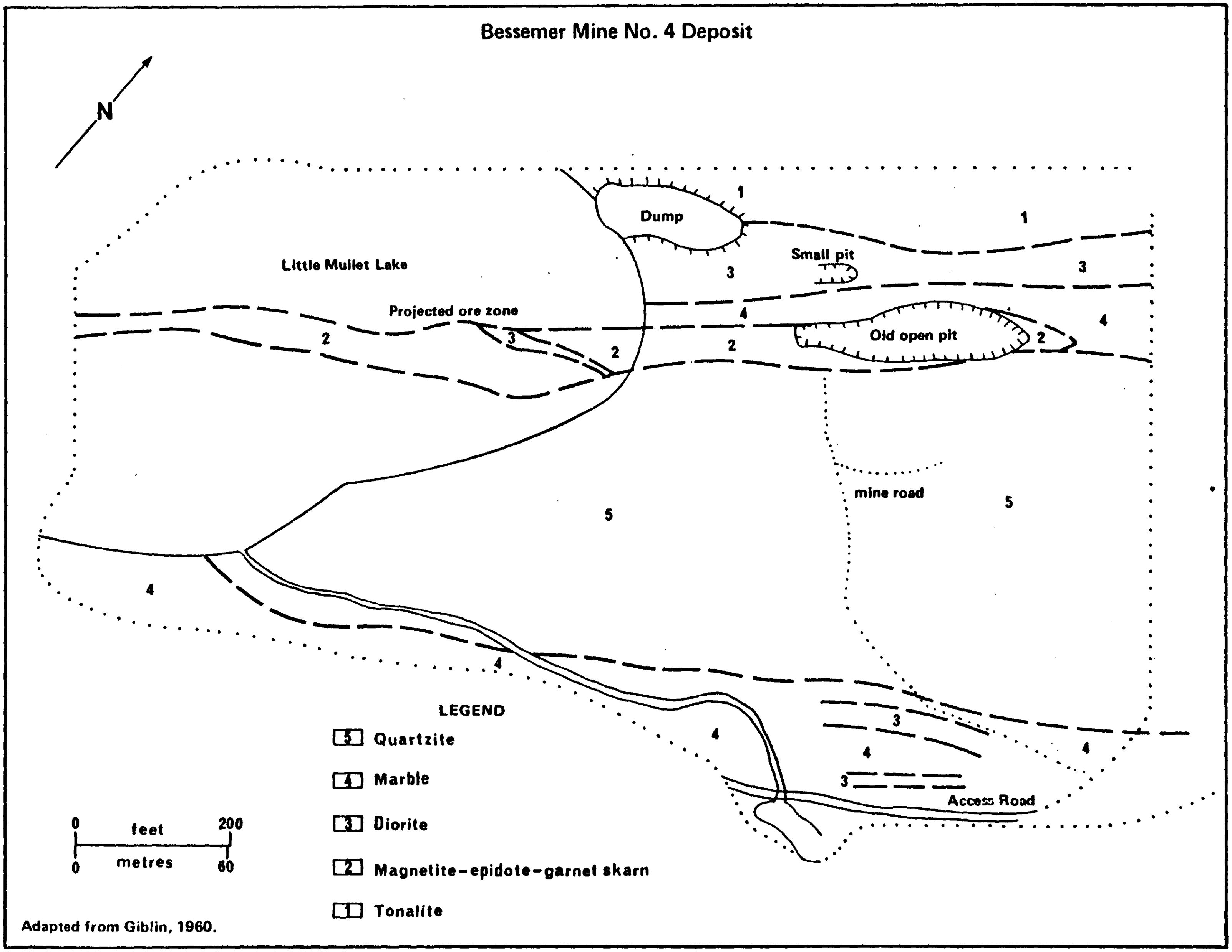

Figure 37A — Geology of the No.4 deposit of the Bessemer iron deposit.

	V	SiO_2	Al_2O_3	MgO	CaO	Mn
1	0.03	-	-	-	-	-
2	-	15.3	2.34	4.07	8.75	-
3	-	19.20	2.79	2.80	13.05	-
4	-	9.84	2.02	1.35	6.86	0.35
5	-	-	-	-	-	-

TABLE 37B: Partial analyses (in percent) of selected samples of iron ore

Workings on the deposit are fairly extensive and consist of two small pits on the No. 1 deposit (Giblin, 1960, p. 102) a small open cut on the No. 2 deposit (Lindeman and Bolton, p. 48, 49), and two pits on the No. 3 deposit (Lindeman and Bolton, p. 49). The workings on the No. 4 deposit consist of a large pit 97.5m (320 feet) long and 12 to 24m (40 to 80 feet) wide and a smaller pit nearby. There is also reported (Rose, 1958, p. 20) to be an inclined shaft on the No. 4 deposit with levels at 55, 101, 161, and 236 feet, located at the western end of the large pit.

DESCRIPTION

GENERAL GEOLOGY: The Bessemer iron deposit consists of four separate deposits that occupy several small calc-silicate skarn zones within a calcitic marble unit structurally above a nearby tonalite intrusion. The marble is cut by several small bodies of diorite and narrow granitic dikes and contains interbeds of 'quartzite' (Giblin, 1960) that are probably, at least in part, volcanic tuffs. All the rock units strike northeasterly and dip steeply (70-85^{o}) to the southeast (Figure 37A).

The skarn zones consist of a massive, fine to coarse-grained, dark-coloured rock composed of extremely variable amounts of carbonate, clinopyroxene, epidote, hornblende, garnet, and minor biotite. Mineralization consists of medium-grained magnetite dissemianted within this rock. The marble is a white rock composed essentially of fine-grained calcite and locally abundant tremolite. The tonalite is a well-foliated rock composed of fine-grained quartz, plagioclase and biotite.

MINERALIZATION: The Bessemer No. 1 deposit (Giblin, 1960, p. 102) "occurs as an inclusion within the tonalite, and... is about 200 feet long and is probably less than 50 feet wide".

The Bessemer No. 2 and No. 3 deposits (Giblin, 1960, p. 102, 103) "occur outside the tonalite pluton, from which they are separated by about 200 feet of silicated limestone. They form en echelon deposits, both striking northeasterly, parallel to the tonalite-limestone contact, and dip steeply to the south....both deposits are about 700 feet long, with average widths of less than 100 feet".

The Bessemer No. 4 deposit (Giblin, 1960, p. 103, 104) "lies parallel to and about 100 feet south of the southern margin of the Bessemer tonalite....The deposit is approximately 1,400 feet long and 50 feet wide, and consists of an erratically mineralized skarn which lies conformably between a hanging wall of quartzite and a footwall of silicated limestone. A diorite dike cuts across the skarn zone. There is a poorly defined tendency for the magnetite mineralization to be concentrated in the central portion of the skarn zone.

The ore zone is separated from the Bessemer tonalite by the foot-wall silicated limestone, which is about 25 feet thick, and by a band of foliated diorite which has an approximate average thickness of 75 feet".

MICROSCOPY: Two thin sections and two polished thin sections were prepared from samples collected by the authors. Fe-34-2 is a polished thin section of a contact between massive magnetite and calc-silicate skarn; Fe-34-5 is a thin section of calc-silicate skarn from the northwest wall of the pit at deposit No. 4;
Fe-34-6 is a thin section of gabbro from a dike northwest of the Bessemer No. 4 pit; and Fe-34-9 is a polished thin section of interlayered magnetite and calc-silicate skarn from the No. 4 deposit.

Section Fe-34-2 has a fairly sharp contact between massive iron ore and calc-silicate skarn. The skarn is composed of a granoblastic intergrowth of fine-grained (0.2mm) diopside, hornblende, and pyrite. The iron ore consists of a massive, granoblastic intergrowth of magnetite, diopside, carbonate, hornblende, and minor pyrite and chalcopyrite. The magnetite occurs as anhedral grains that often contain abundant inclusions and blebs of silicate minerals. The diopside in both layers contains small inclusions of hornblende. Polished thin section Fe-34-9 is essentially similar except that it contains abundant porphyroblasts of garnet and contains no hornblende.

Section Fe-34-5 is composed of a massive intergrowth of tremolite, epidote and carbonate. Section Fe-34-6 consists of a granoblastic, massive, inequigranular intergrowth of anhedral ragged grains of hornblende, plagioclase, and minor magnetite, sphene, and apatite (see Table 37C).

	Fe-34-2		Fe-34-5	Fe-34-6	Fe-34-9
	iron ore	skarn			
opaques	60 - 65	5 - 10	-	3 - 4	15 - 20
diopside	20 - 25	80 - 85	-	-	35
garnet	-	-	-	-	40 - 45
carbonate	10	-	-	-	5
hornblende	10	10	-	75	-
tremolite	-	-	65 - 75	-	-
epidote	-	-	5 - 10	-	-
plagioclase	-	-	-	15	-
apatite	-	-	-	minor	-
sphene	-	-	-	3 - 4	-

TABLE 37C: Estimated modal compositions (in percent) of thin sections of selected rock types.

GEOCHEMISTRY: The whole rock chemical compositions and selected element content of three samples collected by the writer are presented in Table 37D. Fe-34-4 is calc-silicate skarn from the northwest wall of the main pit at the No. 4 deposit; Fe-34-8 is an analysis of a sample of a gabbro dike, and Fe-34-14 is an analysis of a sample of typical tonalite.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-34-4	54.5	1.14	1.09	5.19	18.1	18.1	0.10	0.03
Fe-34-8	47.2	12.5	3.50	11.8	5.03	8.06	3.32	0.98
Fe-34-14	64.7	15.5	1.36	3.85	1.66	2.47	5.10	2.12

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-34-4	0.30	0.22	0.30	0.04	0.03	0.02	0.07	99.2
Fe-34-8	0.71	0.23	0.36	3.38	1.30	0.27	0.29	98.9
Fe-34-14	0.52	0.17	0.56	0.66	0.06	0.01	0.05	98.8

In the interest of rapid dissemination of the results contained in this Report, some of the data may not have been meticulously checked. Thus the OGS does not guarantee the accuracy of these figures and suggests the reader check original sources.

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-34-4	5	37	5	10	21	13	30	3
Fe-34-8	32	174	23	39	11	33	290	6
Fe-34-14	5	46	11	12	10	18	130	7

TABLE 37D: Whole rock chemical compositions (in percent) and trace element contents (in ppm) of some selected rock types

DISCUSSION: The Bessemer iron deposit is a member of a large group of similar iron deposits in the Pembroke-Renfrew area that occur as stratabound lenses at or near the contacts of carbonates and intrusive rocks. On a more local scale the deposit is part of a group of very similar deposits located in Mayo Twonship that are all closely related spatially to the "Bessemer" tonalite intrusion (Giblin, 1960). This group includes the Bessemer, Rankin, Childs, Hamlyn, and Stevens iron deposits.

P. E. Giblin conducted a detailed study of this group of iron deposits as part of a Ph.D. thesis completed at the University of Toronto in 1960. He concluded that the magnetite deposits probably were formed as a result of contact metasomatic action of the Bessemer tonalite (Giblin, 1960), p. 179). He also noted that, alternatively, the deposits may have formed through:

(1) recrystallization in situ of a sedimentary iron deposit, or
(2) migration of iron-bearing solutions towards the pluton, induced by intrusion of the tonalite into wet sediments, and consequent alteration of the chemically reactive marble and deposition of the iron magnetite. The writer considers the deposit most likely to be contact metasomatic in origin.

DEVELOPMENT HISTORY 1901: Mine opened by H.C. Farnum for Mineral Range Iron Mining Company. No. 2 open-cut was excavated to the dimensions 20 feet by 32 feet by 20 feet deep, with surface stripping and trenching of outcropping. Operations were hampered in the winter and at No. 2 mine, work was terminated. No. 3 mine was opened up at a point 800 feet from No. 2 mine. Shipments totalled 3,000 tons of ore for the year.

1902: Combined production from Nos. 1 and 3 mines was 1,396 tons. The No. 4 property was extensively prospected on the surface by stripping.

1903: A number of test holes were sunk and 50 tons of ore shipped.

1904-1905: Properties lay idle

1906: No. 3 orebody was stripped for a width of about 50 feet, and a length of 300 feet; No. 4 orebody was opened up for about 30 feet in width by 40 feet in length and 20 feet in depth and 2,500 tons of ore were shipped. Also a dip needle survey was carried out on the two orebodies.

1907: No. 4 mine was worked back from the shaft a distance 100 feet. No work was done at No. 1. Production was about 20,660 tons.

1908: Three d.d. holes put down on No. 4 deposit by Canada Iron Furnace Company; At No. 4, a 3-component shaft was sunk to a depth of 75 feet. A station was cut at the 50 foot level and drifts were run west on the orebody 25 feet and east 20 feet. From the 50-foot level, the shaft was sunk vertically. The open cut was continued from the shaft for 250 feet with the face of the open cut being 50 feet wide and 30 feet high. At

No. 3 orebody, a shaft was sunk to a depth of 25 feet. The west body was opened up to an area 35 feet wide by 40 feet long and 25 feet in depth, and the east body, about 65 feet east of the west body, was opened up for 40 feet in length by 20 feet in width. All the work was done on Nos. 3 and 4 and total production was 28,956 tons.

1909: Work was done only on No. 4. The work of raising the shaft had just begun. On the 50 foot level west, the ore was taken out by open cutting. A winze was sunk to 50 feet, in the east drift. The amount of ore shipped was 19,635 tons.

1910: No. 4 shaft was sunk to a depth of 120 feet where drifts were driven 75 feet east and 100 feet west, with stoping being carried on from both sides of the shaft. The open cut east of the shaft was carried down below the first level to 150 feet. Production was 7,356 tons.

1911: Mine closed.

1912: Work was begun again by the Canada Iron Mines Company, with No. 4 being dewatered, a shaft being sunk and drifting being done on the 110-foot level.

1913: Stoping was carried on only at the second level. The shaft was, at this time, 250 feet deep with levels at 60, 115, 175 and 250 feet. The station was being cut on the lowest level, while on the third level, drifts were run NE 155 feet, and SW 215 feet. Two raises were being driven from this level and up 40 feet on the second level, the main drifts NE and SW of the shaft were run 125 feet and 375 feet respectively.

1912-1913: A total of 16,060 tons of ore were shipped.

1914: Work was confined to No. 4 shaft. The first and second level drifts were carried to their limits and abondoned. No further work was done.

1941-1942: Frobisher Exploration Company Limited drilled 27 holes on No. 4 working which showed 35.4% Fe over 50 feet.

1957-1958: Magnetometer survey by Frobisher Limited.

REFERENCE MAP — ODM 1955-8, Dungannon and Mayo Townships, 1956

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38. BULPIT LAKE

COMMODITY — Iron (magnetite)

ROCK ASSOCIATION — Syenite gneiss, marble amphibolite

CLASSIFICATION — IF. Geological relationships unclear

LOCATION — Mayo Township, Hastings County
NTS 31F/4, UTM Zone 18, 4997890 N, 291800 E
LAT. 45^{o} 06' 21" N; LONG. 77^{o} 38' 47" W
Con. and lot uncertain

ACCESS — The deposit is reported to be located about 1.6km (1 mile) east of Bulpit Lake, north of Highway 500 (Abraham, 1951, p. 7). It was not located by the authors.

SIZE AND GRADE — Mineralization is reported to consist of streaks and disseminations of magnetite in a zone measuring 9m by 90m (30 by 300 feet), (Abraham, 1951, p. 7). A sample collected by Abraham contained 25.30 percent Fe, 0.64 percent S, 0.98 percent $Ti0_2$, 0.62 percent P_20_5, and 20.55 percent $Si0_2$.

DESCRIPTION — The rocks in the vicinity of the reported location of the deposit consist of quartz-feldspar-biotite paragneisses of volcanic origin and minor marble that have been intruded by a large basic intrusion that lies a few hundred metres to the north. The rock units trend northeasterly and dip steeply to the southeast.

According to Abraham (1951, p. 7) the rocks in the vicinity of the deposit consist of syenite gneiss, paragneiss, amphibolite, and silicated marble and the mineralization consists of dissemianted magnetite in syenite gneiss that strikes N50°E.

Classification of this deposit is uncertain

DEVELOPMENT HISTORY — None

REFERENCE MAP — ODM 1955-8, Dungannon and Mayo Townships, 1956

REFERENCES

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1951: Preliminary Report on the Geology in the Vicinity of Aeromagnetic Anomalies on the Bancroft and Coe Hill Sheets; Ontario Department of Mines, P.R. 1951-2, p. 7

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39. CHILDS

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: Skarn OTHER: Tonalite, diorite, siliceous calcite marble
CLASSIFICATION	1A. Stratabound, carbonate-skarn hosted, at intrusive contact
LOCATION	Mayo Township, Hastings County NTS 31F/4, UTM Zone 18, 4994690N, 294130E LAT. 45^{o} 04' 40"N; LONG. 77^{o} 36' 56" W Con. 9, Lots 10 and 11
ACCESS	The deposit is accessible via a gravel road that trends south from Highway 500 at the settlement of Hermon. The deposit is located 3.2km (2 miles) south of the highway along this road and is about 244m (800 feet) east of the road on the south-eastern edge of a large beaver swamp.

SIZE AND GRADE

Mineralization consists of disseminated magnetite in an ore-body 400m (1,300 feet) long and 75m (250 feet) wide that contains reserves of 6,193,330 tons grading 19.25 percent recoverable iron (Giblin, 1960, p. 100, 105).

A sample of iron ore collected by Lindeman (1913, p.20) contained 42.00 percent Fe, 0.10 percent TiO_2, 0.151 percent P_2O_5, 0.160 percent S, 12.53 percent SiO_2, 7.75 percent CaO, and 2.00 percent MgO. A composite sample from two drill holes (Giblin, 1960, Table XIV) contained 27.93 percent Fe, 0.45 percent TiO_2, 0.23 percent P_2O_5, 0.31 percent S, 25.04 percent SiO_2, 7.09 percent Al_2O_3, 16.25 percent CaO, and 3.39 percent MgO. A sample of iron ore collected by the writer contained 44.9 percent Fe, 20.8 percent FeO, 0.06 percent P_2O_5, <0.04 percent TiO_2, <0.01 percent S, 0.24 percent Mn, and percent V.

Workings on the deposit consist of 3 open cuts and numerous trenches of various sizes (see Figure 39A).

DESCRIPTION

GENERAL GEOLOGY: The Childs iron deposit occurs as an isolated, magnetite-rich portion of a large heterogenous skarn zone that extends from Con. 8, Lot 9 northeasterly through Lot 9, Con 13 and has a known strike length of 2000m (6,600 feet) and an average width of 180m (600 feet). The skarn lies within a succession of paragneisses of probable volcanic origin, and calcitic and dolomitic marbles in the hanging wall of the north-eastern lobe of a tonalite intrusion. The skarn zone is bounded to the south by a small intrusive body of diorite and is cut by dikes of diorite and tonalite. All the rock units strike northeasterly and dip steeply southeast (Figure 39A).

The skarn zone consists of a massive, dark rock composed of extremely variable propotions of carbonate, clinopyroxene, epidote, hornblende, garnet, and biotite.

The marble is a white rock composed essentially of fine-grained calcite and locally abundant tremolite. The tonalite is a well-foliated rock composed of fine-grained quartz, plagioclase, and biotite.

MINERALIZATION: The Childs deposit lies along the margin of the skarn zone, in its hanging wall, and according to Giblin (1960, p. 105-107) "is about 1,300 feet long and has an average width of about 250 feet. It strikes northeasterly and dips to the south at approximately 70^{o}. Diamond drill results indicate the deposit plunges to the northeast. The angle of plunge is.... of the order of 45^{o}".

"Magnetite-bearing skarn occurs intercalated with amphibolite gneiss, with the former greatly predominating. The thickness of individual bands varies from a few feet to a few tens of feet. It has not been possible to correlate individual bands from hole to hole on neighbouring cross-sections, and rarely has it been possible to correlate individual bands between drill holes on the same cross-section."

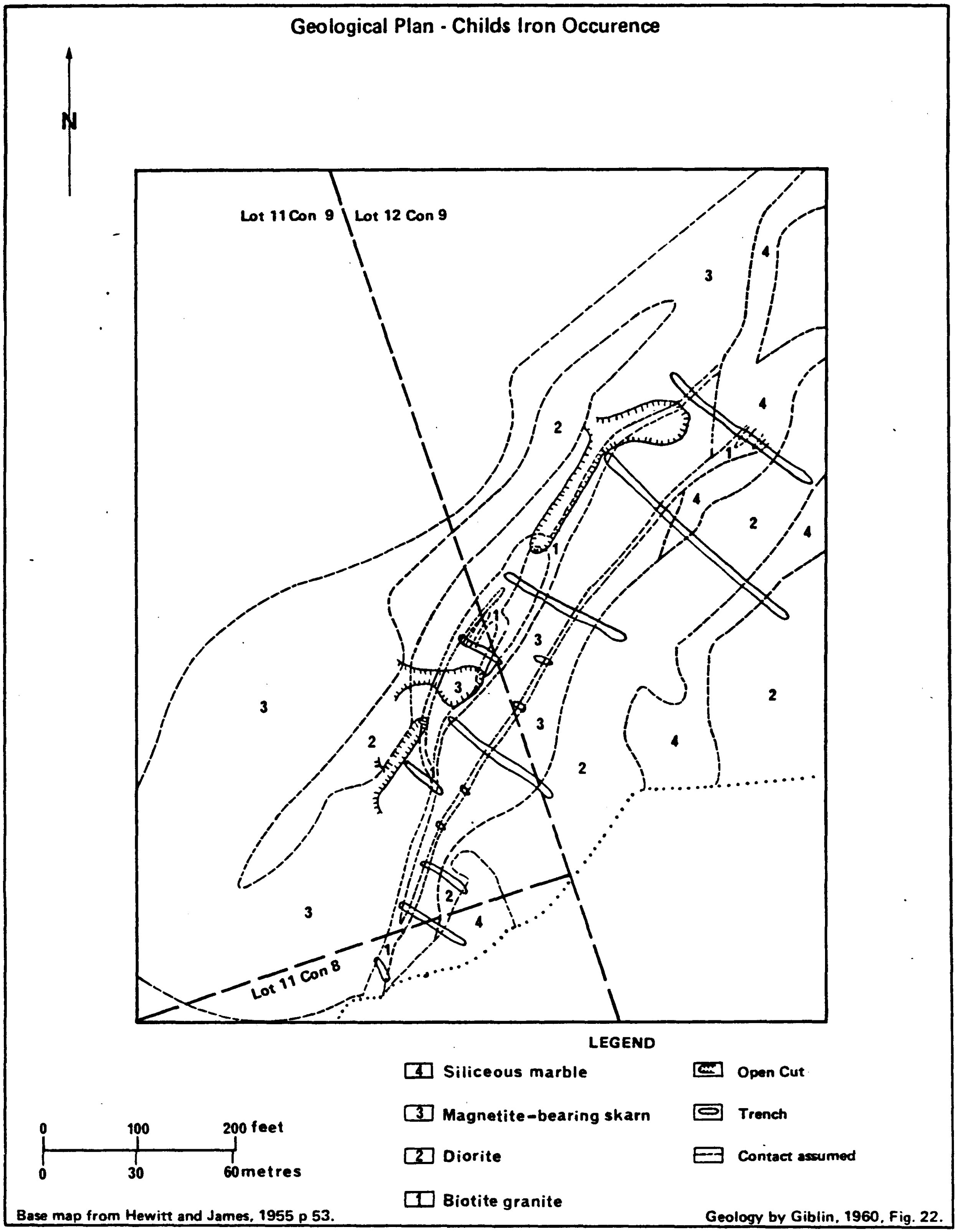

Figure 39A — Geology and workings of the Childs iron deposit.

"The distribution of magnetite within the ore zone is most erratic in detail, but in general the deposit possesses a high-grade central portion, with the intensity of magnetite mineralization gradually decreasing towards each wall....

"The hanging wall of the deposit consists of silicated limestones, which are cut by granite dikes and diorite..."

".....The footwall of the Childs deposit consists of inter-calculated silicated limestone, amphibolite gneiss, and skarn which carries little or no magnetite. Granite and diortite dikes occur in the metasediments."

MICROSCOPY: One thin section and one polished thin section were prepared from samples collected by the authors. Fe-37-0 is a thin section of a diorite dike. Fe-37-10 is a polished thin section of poorly mineralized skarn from the northeast pit (see Table 39A).

The diorite in section Fe-37-9 consists of a granoblastic, massive, equingranular intergrowth of anhedral, ragged grains of hornblende, plagioclase, and minor sphene, apatite, and opaque minerals. Section Fe-37-10 is weakly foliated and consists of fine-grained (0.2mm) hornblende, epidote, carbonate, plagioclase, and minor magnetite and pyrite. The magnetite occurs as anhedral, medium-sized grains with abundant silicate inclusions. Pyrite occurs as scattered, subhedral grains.

	Fe-37-9	Fe-37-10
hornblende	55 - 60	25 - 30
epidote	-	25
carbonate	-	35 - 40
plagioclase	20 - 25	10
biotite	5 - 10	-
sphene	10	-
opaques	-	3

TABLE 39A: Estimated modal compositions (in percent) of two sections of selected rock types.

GEOCHEMISTRY: The whole rock chemical compositions and trace element contents of four samples collected by the writers were determined and the results are presented in Table 39B. Fe-37-5 is a sample of a granitic dike, Fe-37-8 is diorite, Fe-37-12 is interlayered magnetite, carbonate, and skarn, and Fe-37-13 is interlayered magnetite and skarn.

	SiO_2	Al_2O_3	Fe_2O_3	Fe	MgO	CaO	Na_2O	K_2O
Fe-37-5	70.8	14.5	0.44	0.89	1.08	1.49	8.76	0.41
Fe-37-8	47.5	14.1	3.50	10.0	6.45	9.12	3.10	1.29
Fe-37-12	24.4	1.03	0.01	0.37	0.33	50.3	0.01	0.00
Fe-37-13	48.4	13.8	3.13	3.93	4.26	16.4	3.96	0.35

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-37-2	0.41	0.32	0.40	0.42	0.04	<0.01	0.04	100.0
Fe-37-8	0.38	0.45	0.10	2.13	0.19	0.08	0.19	98.6
Fe-37-12	n.f.	0.37	23.1	0.00	0.01	0.03	0.45	100.4
Fe-37-13	0.15	0.46	2.20	1.45	0.16	0.03	0.46	99.1

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-37-5	6	20	5	<5	<10	8	120	<3
Fe-37-8	38	154	32	44	<10	109	470	8
Fe-37-12	<5	169	6	<4	11	<5	800	<3
Fe-37-13	10	270	13	21	41	30	1,540	4

TABLE 39B: Whole rock chemical compositions (in percent) and trace element contents (in ppm) of selected rock types.

DISCUSSION: The Childs deposit is a member of a large group of similar iron deposits in the Pembroke-Renfrew area that occur as stratabound lenses at or near the contacts of carbonates and intrusive rocks. On a more local scale, the deposit is part of a small group of very similar deposits located in Mayo Township that are all closely related spatially to the "Bessemer tonalite" intrusion (Giblin, 1960). This group includes the Bessemer, Childs, Hamlyn, Rankin, and Stevens iron deposits.

P.E. Giblin conducted a detailed study of this group of iron deposits as part of a Ph.D. thesis completed at the University of Toronto in 1960. He concluded that the magnetite deposits probably were formed as a result of contact metasomatic action of the Bessemer tonalite (Giblin, 1960, p. 179). He also noted that, alternatively, the deposits may have formed through:

(1) recrystallization in situ of a sedimentary iron deposit, or,

(2) migration of iron-bearing solutions towards the pluton, induced by intrusion of the tonalite into wet sediments, and consequent alteration of the chemically reactive marble and deposition of the iron as magnetite.

Of the alternatives, the writer considers the Childs deposit most likely to be contact metasomatic in origin.

DEVELOPMENT HISTORY

before 1902: property first exploited by H.C. Farnum for the Mineral Range Iron Mining Company; stockpiles of ore was accumulated from 2 open pits 50 feet apart, with the westerly one being 20 feet by 30 feet, and 12 feet deep, and the easterly one being 72 feet by 10-18 feet deep. Also, considerable surface trenching was done.

1911: Magnetometer survey of the area by Lindeman and Bolton.

1913: Canada Iron Mines Limited explored the property and commenced open-pit mining; 9,649 tons were shipped and operations ceased the same year.

1941-1958: Frobisher Limited carried out diamond drilling, geological and geophysical surveys.

REFERENCE MAP

ODM 1955-8, Dungannon and Mayo Townships, 1956.

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40. HAMLYN

COMMODITY: Iron (magnetite)

ROCK ASSOCIATION: HOST: skarn
OTHER: tonalite

CLASSIFICATION: 1A. Stratabound, carbonate-skarn hosted, at intrusive contact.

LOCATION: Mayo Township, Hastings County
NTS 31F/4/, UTM Zone 18, 4993065N, 293530E
LAT. 45° 03' 46"N; LONG. 77° 37' 21"W
Con. 7, Lot 8

ACCESS: The deposit is accessible via a gravel road that trends south from Highway 500 at the settlement of Hermon. It is located at a point 4.8km (3 miles) south of the highway, 210m (700 feet) northeast of the road.

SIZE AND GRADE: Mineralization consists of disseminated magnetite in a small lens 15 by 30m (50 by 100 feet), (Giblin, 1960, p. 104).

DESCRIPTION: The Hamlyn iron deposit consists of a small xenolith of magnetite-bearing skarn contained within a tonalite intrusion, near its southeastern contact. The tonalite is intruded into a succession of paragneisses, of probable volcanic origin, and marbles. The rock units strike northeasterly and dip steeply (70-85°) to the southeast.

The skarn is a massive, dark rock composed of variable proportions of carbonate, clinopyroxene, epidote, hornblende, garnet, and minor biotite. The tonalite is a well-foliated rock composed of quartz, plagioclase, and biotite.

The Hamlyn iron deposit is a member of a large group of similar iron deposits in the Pembroke-Renfrew area that occur as stratabound lenses at or near the contacts of carbonates and intrusive rocks. On a more local scale the deposit is part of a group of very similar deposits located in Mayo Township that are all closely related to the "Bessemer tonalite" intrusion (Giblin, 1960). This group includes the Bessemer, Childs, Hamlyn, Rankin, and Stevens iron deposits.

P.E. Giblin conducted a detailed study of this group of iron deposits as part of a PhD thesis completed at the University of Toronto in 1960. He concluded that these deposits probably were formed as a result of contact metasomatic action of the Bessemer tonalite (Giblin, 1960, p. 179). Alternatively, however, he noted that the deposits may have formed through:

(1) recrystallization in situ of a sedimentary iron deposit or,
(2) migration of iron-bearing solutions towards the pluton, induced by intrusion of the tonalite into wet sediments, and consequent alteration of the chemically reactive marble and deposition of the iron magnetite.

The writer believes these deposits probably formed as a result of contact metasomatic effects of the Bessemer tonalite.

DEVELOPMENT HISTORY: 1956: Geological and magnetometer surveys on Frobisher Exploration Ltd.

REFERENCE MAP: ODM 1955-8, Dungannon and Mayo Townships, 1956

REFERENCES:

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SMDR Files (Hamlyn); Geoscience Data Centre, Ont. Geol. Survey, Toronto.

41. RANKIN

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: skarn OTHER: amphibolite gneiss, paragneiss, siliceous marble, tonalite, diorite
CLASSIFICATION:	1A. Stratabound, carbonate-skarn hosted, at intrusive contact.
LOCATION:	Mayo Township, Hastings County NTS 31F/4, UTM Zone 18, 4994515N, 293690E LAT. 45° 04' 34"N; LONG. 77° 37' 16"W Con. 9, Lot 10
ACCESS	The deposit is located about 300m (1,000 feet) west of a gravel road that trends south from Highway 500 at the settlement of Hermon, at a point about 3.2km (2 miles) south of the highway.
SIZE AND GRADE	Mineralization consists of erratically disseminated magnetite in an orebody 580m (1,900 feet) long and 60m (200 feet) wide that contains reserves at 15,691,599 tons grading 15.32 percent recoverable iron (Giblin, 1960, p. 100, 107). An average sample of iron ore collected by Lindeman (1913, p.20) contained 42.70 percent Fe, 0.13 percent TiO_2, 0.24 percent P_2O_5, 0.215 percent S, 15.87 percent SiO_2, 8.08 percent CaO, and 1.74 percent MgO. A composite sample of 5 diamond drill holes (Giblin, 1960, Table XIV) contained 29.27 percent Fe, 0.27 percent TiO_2, 0.71 percent P_2O_5, 1.44 percent S, 20.75 percent SiO_2, 4.43 percent Al_2O_3, 21.40 percent CaO, and 5.55 percent MgO. Two samples collected by the authors contained: (1) 22.0 percent Fe, 12.2 percent FeO, 0.23 percent TiO_2, 0.18 percent P_2O_5 0.04 percent S, 0.014 percent V; (2) 60.5 percent Fe, 24.6 percent FeO, and 0.04 percent Cu. Workings on the deposit consist of an open cut and two trenches within a stripped area 90m (300 feet) long and 27m (90 feet) wide.
DESCRIPTION	GENERAL GEOLOGY: The Rankin iron deposit occurs as an isolated, magnetite-rich portion of a large heterogeneous skarn zone that extends from Con. 8, Lot 9, northeasterly through Con. 13, Lot 9, and has a known strike length of 2,000m (6,600 feet) and an average width of 180m (600 feet). The skarn lies within a succession of paragneisses, of probable valcanic origin, and marbles in the hanging wall of the northeastern lobe of a tonalite intrusion. The skarn zone is bounded to the south by a small intrusive body of diorite and is cut by dikes of diorite and tonalite. All the rock units strike northeasterly and dip steeply to the southeast. The skarn zone consists of a massive, dark rock composed of extremely variable proportions of carbonate, clinopyroxene, epidote, hornblende, garnet, and minor biotite. The marble is a white rock composed essentially of fine-grained calcite and dolomite, and locally abundant tremolite. The tonalite is a well-foliated rock composed of fine-grained quartz, plagioclase, and biotite. MINERALIZATION: The Rankin deposit lies along the footwall of the skarn zone and, according to Giblin (1960, p.107-109), "has a strike length of approximately 1,900 feet. The width ....averages about 200 feet. The deposit strikes northeasterly and dips to the south at about 80°. At its eastern end it lies about 200 feet north of the western portion of the Childs deposit."

"The ore zone consists predominantly of magnetite-bearing skarn and amphibolite gneiss, intercalated with paragneiss, amphibolite gneiss which carries only trace amounts of magnetite, and rare silicated limestone. The bands vary in width from a few inches to a few tens of feet. This ore zone differs from the Childs in that it is more heterogenous, with very frequent transitions in lithology being encountered in the drill holes. Correlation of individual bands from hole to hole, even upon the same cross-section is rarely possible."

"Narrow diorite and granite dikes occur in the metasediments."....

"The distribution of magnetite within the Rankin deposit, as in the Childs orebody, is exceedingly erratic in detail, both in horizontal and vertical section. In general, though, a relatively high-grade central core persists throughout the body, with the magnetite content gradually decreasing towards the walls."

"Both walls of this orebody consist of rocks similar to those comprising the orebody, and differing only in that they contain little or no magnetite."

MICROSCOPY: One thin section and one polished thin section were prepared from samples collected by the authors. Fe-40-4 is a thin section of skarn, and Fe-40-8 is a polished thin section of mineralized skarn (see Table 41A).

Section Fe-40-4 is essentially composed of a massive, granoblastic intergrowth of fine-grained epidote with dispersed grains of carbonate, quartz, and actinolite. Diopside is also present as several medium-sized, poikiloblastic grains.

Section Fe-40-8 is composed of a massive, granoblastic intergrowth of fine-grained (0.2mm) diopside, garnet, carbonate, magnetite, and minor hornblende, pyrite, and rare chalcopyrite. The magnetite usually occurs as large anhedral, apparently porphyroblastic grains that that contain abundant inclusions. The pyrite occurs as dispersed, medium-sized, anhedral grains with minor associated chalcopyrite.

	Fe-40-4	Fe-40-4
diopside	5 - 10	35 - 40
garnet	-	35 - 40
epidote	60	-
carbonate	15	5 - 10
actinolite	5 - 10	-
magnetite	-	10 - 15
pyrite	-	1 - 2
chalcopyrite	-	minor
hornblende	-	minor
quartz	5	-

TABLE 41A: Estimated modal composition (in percent) of two sections of selected rock types.

GEOCHEMISTRY: The whole rock chemical composition and trace element content of a sample of skarn collected by the writer is presented in Table 41B.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-40-3	46.6	13.7	7.86	4.45	5.39	17.6	0.21	0.04

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-40-3	0.33	0.47	0.30	1.22	0.10	0.04	0.38	98.7

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-40-3	20	310	4	38	40	11	60	3

TABLE 41B: Whole rock chemical composition (in percent) and trace element content (in ppm) of a sample of skarn.

DISCUSSION: The Rankin deposit is a member of a large group of similar iron deposits in the Pembroke-Renfrew area that occur as stratabound lenses at or near the contacts of carbonates and intrusive rocks. On a more local scale, the deposit is part of a small group of very similar deposits located in Mayo Township that are all closely related spatially to the "Bessemer tonalite" intrusion (Giblin, 1960). This group includes the Bessemer, Childs, Hamlyn, Rankin, and Stevens iron deposits.

P. E. Giblin conducted a detailed study of this group of iron deposits as part of a PhD thesis completed at the University of Toronto in 1960. He concluded that the magnetite deposits probably were foremd as a result of contact metasomatic action of the Bessemer tonalite (Giblin, 1960, p. 179). He also noted that, alternatively, the deposits may have formed through:-
(1) recrystallization in situ of a sedimentary iron deposit, or,
(2) migration of iron-bearing solutions towards the pluton, induced by intrusion of the tonalite into wet sediments, and consequent alteration of the chemically reactive marble and deposition of the iron as magnetite.
Of the alternatives, the writer considers these deposits most likely to be contact metasomatic in origin.

DEVELOPMENT HISTORY

1909: Test pits, stripping and magnetic survey carried out

1913: Orebody was stripped for a distance of 300 feet by 68 feet by Canada Iron Mines Limited; one open cut measuring 75 feet by 20 feet and 15 feet deep was dug. About 100 feet to the west of the open cut, a trench 70 feet by 6 feet was dug, and 120 feet further west, another trench measuring 45 feet by 6 feet and 4 feet deep.

- mine then abandoned

before 1914: 5,000 tons of ore were shipped

1941: Frobisher Explorations Co. Ltd. put down 9 diamond drill holes to intersect the magnetite body, in the vicinity of the main workings.

before 1954: Trent River Iron Ltd. conducted a magnetite survey and drilled 2 holes.

1956-1958: Further diamond drilling by Frobisher Co. Ltd.

REFERENCE MAP ODM 1955-8, Dungannon and Mayo Townsips, 1956

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1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 170.

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Thomson, J. E.
1943: Mineral Occurrences in the North Hastings Area; Ontario Department of Mines, Ann. Rept. Vol. 52, Part 3, 1943, p. 44-45.

42. STEVENS

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	HOST: Skarn OTHER: Paragneiss
CLASSIFICATION	1A. Stratabound, carbonate-skarn hosted, at intrusive contact.
LOCATION	Mayo Township, Hastings County NTS 31F/4, UTM Zone 18, 4995295N, 294360E LAT. 45° 05' 00"N; LONG. 77° 36' 46"W Con. 9, Lot 13
ACCESS	The deposit is located about 0.8km (0.5 miles) east of a gravel road that trends south from Highway 500 at the settlement of Hermon, at a point about 2.8km (1.75 miles) south of the highway.
SIZE AND GRADE	Mineralization consists of disseminated magnetite in an orebody about 120m (400 feet) long and less than 30m (100 feet) wide. (Giblin, 1960, p. 109). A sample collected by Lindeman (1913, p. 20) contained 30.70 percent Fe, 0.080 percent P, 0.015 percent S, and 23.00 percent insoluble matter. Workings consist of several small test pits.

DESCRIPTION

GENERAL GEOLOGY: The Stevens iron deposit occurs as an isolated, magnetite-rich portion of a large heterogeneous skarn zone that extends from Con. 8, Lot 9, northeasterly through Con. 13, Lot 9 and has a known strike length of 2,000m (6,600 feet) and an average width of 180m (600 feet). The skarn lies within a succession of paragneisses of probable volcanic origin, and marbles in the hanging wall of the northeastern lobe of a tonalite intrusion. The skarn zone is bounded to the south by a small intrusive body of diorite and is cut by diorite and granitic dikes. All the rock units strike northeasterly and dip steeply to the southeast.

The skarn zone consists of a massive, dark rock composed extremely variable proportions of carbonate, clino-pyroxene, epidote, hornblende garnet, and minor biotite. The marble is a white rock composed essentially of fine-grained calcite and dolomite and locally abundant tremolite. The tonalite is a well-foliated rock composed of fine-grained quartz, plagioclase, and biotite.

MINERALIZATION: The Stevens orebody lies along the margin of the skarn zone, in its footwall, and according to Giblin (1960, p. 109-110), "is about 400 feet long. The width...is apparently less than 100 feet. The body strikes northeasterly but the dip is not accurately known."

"As presently known, the Stevens body consists largely of magnetite-bearing skarn, with very few, thin, intercalations of paragneiss. Magnetometric surveys indicate that the distribution of magnetite within the body is most irregular."

"The deposit is flanked on the south by skarn which carries little or no magnetite. The wallrock to the north is not exposed."

DISCUSSION: The Stevens deposit is a member of a large group of similar iron deposits in the Pembroke-Renfrew area that occur as stratabound lenses at or near the contacts of carbonates and intrusive rocks. On a more local scale, the deposit is part of a small group of very similar deposits located in Mayo Township that are all closely related spatially to the "Bessemer tonalite" intrusion (Giblin, 1960). This group includes the Bessemer, Childs, Hamlyn, Rankin, and Stevens iron deposits.

P. E. Giblin conducted a detailed study of this group of iron deposits as part of a PhD thesis completed at the University of Toronto in 1960. He concluded that the magnetite deposits probably were formed as a result of contact metasomatic action of the Bessemer tonalite (Giblin, 1960, p. 179). He also noted that, alternatively, the deposits may have formed through:-

(1) recrystallization in situ of a sedimentary iron formation or,

(2) migration of iron-bearing solutions towards the pluton, induced by intrusion of the tonalite into wet sediments, and consequent alteration of the chemically reactive marble and deposition of the iron as magnetite.

Of the alternatives, the writer considers the deposits most likely to be contact metasomatic in origin.

DEVELOPMENT HISTORY

before 1914: Stripping and test pitting by unknown operators.

1957: Magnetometer survey by Dunmayo Iron Mines Ltd.

REFERENCE MAP

ODM 1955-8, Dungannon and Mayo Townships, 1956.

REFERENCES

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Lindeman, E., and Bolton, L. L.
1917: Iron Ore Occurrences in Canada, Vol. II; Canada Department of Mines, Report No. 217, p. 117.

SMDR Files (Stevens); Geoscience Data Centre, Ont. Geol. Survey, Toronto.

43. SWORDFINGAL

COMMODITY — Iron (magnetite)

ROCK ASSOCIATION — Siliceous marble, amphibolite

CLASSIFICATION — 1A. Stratabound, carbonate-skarn hosted, at intrusive contact.

LOCATION — Mayo Township, Hastings County
NTS 31F/4, UTM Zone 18, 4990280N, 293230E
LAT. 45° 02' 16"N; LONG. 77° 37' 30"W
Con. 5, Lots 4, 5 and 6

ACCESS — The deposit consists of three small occurrences referred to as A, B, and C. Occurrence C is located about 670 m (2,200 ft.) southwest of Swordfingal Lake on the edge of a small lake and is accessible via a forest access road.

SIZE AND GRADE — Mineralization consists of disseminated magnetite in three deposits that occur over a strike length of about 610m (2,000 feet). The two largest deposits are both about 180m (600 feet) long and less than 30m (100 feet) wide (Giblin, 1960, p. 110, 111). A sample of iron mineralization collected by Abraham (1951, p. 11) contained 42.69 percent TiO_2, 0.10 percent P_2O_5, 0.30 percent S, and 16.43 percent SiO_2. A trench sample across seven feet of the ore zone (Giblin, 1960, Table XIV) contained 47.23 percent Fe, 0.027 percent P_2O_5, and 0.122 percent S. A grab sample collected by the writer contained 40.1 percent Fe, 19.6 percent FeO, 0.04 percent TiO_2, 0.09 percent P_2O_5, 0.01 percent S, and 0.01 percent V.

Workings consist of a small pit on each of deposits B and C.

DESCRIPTION — GENERAL GEOLOGY: The Swordfingal iron deposit within a succession of siliceous calcitic and minor dolomitic marbles that are intruded by numerous mafic dikes and sills. There is also a narrow sill of albite granite from the Wendsley Lake Albite Granite (Lumbers, S.B., Royal Ontario Museum, personal communication, 1978) along the southern contact of the deposit. All the rock units strike northeasterly and dip vertically or steeply to the southwest.

MINERALIZATION: According to Giblin (1960, p. 110-111), "The Sword-fingal Lake deposit consists of three small magnetite occurrences, designated below as A, B and C. The three showings lie on strike with one another, and occur over a strike length of about 2,000 feet. The deposits are poorly exposed."

"Deposit A is the smallest of the three, and outcrops on a narrow point at the northwest corner of the small lake which lies 0.4 miles west of: Swordfingal Lake. A band of tremolite limestone carries minor magnetite over a maximum width of five feet. The wall rocks are not exposed."

"Occurrence B lies about 500 feet southwest of A, while C lies 1200 feet southwest of B...."

"A small pit in occurrence B reveals a magnetite-hornblende-quartz skarn, with a footwall of silicated limestone. The contact is gradational over a few inches. A granite dike, less than 2 feet thick, lies in the limestone about 2 feet from the skarn. The hanging wall is not exposed."

"Occurrences C does not outcrop, but a shallow trench has exposed a hornblende-magnetite skarn zone, 5 feet wide, lying between diorite bands. A narrow granite dike occurs in the footwall diorite, 15 feet away from the skarn."

GEOCHEMISTRY: The whole rock chemical composition and trace element content of two samples collected by the writer are presented in TABLE 43A. Fe-42-3 is a sample of diorite from a mafic sill and Fe-42-5 is feldspathic paragneiss from the mineralized zone.

DISCUSSION: The Swordfingal deposit is a member of a large group of similar iron deposits in the Pembroke-Renfrew area that occurs as stratabound lenses at or near the contacts of carbonates and intrusive rocks. These deposits probably formed as a result of contact metasomatic effects of the intrusive rocks on the carbonates.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
Fe-42-3	46.6	13.2	3.90	11.5	5.83	9.02	4.02	0.40
Fe-42-5	56.5	9.72	1.30	1.84	4.69	10.7	1.46	2.76

	H_2O+	H_2O-	CO_2	TiO_2	P_2O_5	S	MnO	Total
Fe-42-3	0.52	0.37	0.34	2.64	0.27	0.11	0.21	98.9
Fe-42-5	0.11	0.37	9.40	0.37	0.07	0.43	0.44	100.2

	Cu	Zn	Ni	Co	Pb	Cr	Ba	Li
Fe-42-3	68	92	32	48	<10	81	50	4
Fe-42-5	7	10	13	29	<10	29	410	7

TABLE 43A: Whole rock chemical composition (in percent) and trace element content (in ppm) of two selected rock types.

DEVELOPMENT HISTORY 1951: Dip-needle survey and 71-foot trench by Frobisher Exploration Ltd.

1962: 3 diamond drill holes totalling 177 feet by A. B. Thomas.

REFERENCE MAP ODM 1955-8, Dungannon and Mayo Townships, 1956.

REFERENCES

Giblin, P. E.
1960: A Study of the Magnetite Deposits of Mayo Township, Ontario; unpub. PhD thesis, Univ. of Toronto, Toronto.

SMDR Files (Swordfingal); Geoscience Data Centre, Ont. Geol. Survey, Toronto.

44. McNAB

COMMODITY	Iron (hematite)
ROCK ASSOCIATION	Marble, dolostone
CLASSIFICATION	2A. Carbonate hosted, Fault related
LOCATION	McNab Township, Renfrew County NTS 31F/8, UTM Zone 18, 5032890N, 392540E LAT. 45^o 26' 36"N; LONG. 76^o 22' 26" Con. 13, Lot 7; and Con. 14, Lot 6
ACCESS	The orebodies that comprise the deposit are located on both sides of, and within 90m (300 feet) of County Road 3 in the town of Arnprior.
SIZE AND GRADE	Mineralization consists of massive hematite in several small bodies, the largest measuring 76m (250 feet) by 4m (12 feet). Ore mined from this deposit is reported to have had an average grade of 68 percent Fe with no TiO_2 or S (Royal Commission, 1890, p. 142). A sample collected by Hunt (1869, p. 260) contained 59.09 percent Fe, 0.07 percent P_2O_5, and 0.065 percent S. A sample collected by the writer contained 23.5 percent Fe, 0.50 percent FeO, 0.15 percent TiO_2, 0.49 percent V. Workings consist of two trenches. The larger of these is nearly (200 feet) long and up to 7.6m. (25 feet) wide and is located 90m (300 feet) east of a street corner on County Road 3 on Con. 14, Lot 6. About 330m (1,100 feet) to the west, on Con. 13, Lot 7, there is a completely water-filled trench 18m (60 feet) long and about 3m (10 feet) wide. Four other trenches reported by Wilson (1924, p. 113) no longer exist.
DESCRIPTION	The McNab iron deposit consists of several small deposits that occupy a fault that cuts Late Precambrian marble and flat-lying Beekmantown dolostone of Lower Ordivician age. The deposit is reported (Wilson, 1924, p. 113) to "consist of hematite, or hematite and calcite, filling fractures, joint fractures, joint planes and fault fissures either in Beekmantown dolomite just above its contact with the Bristol limestone phase of the Grenville series, or in the Bristol limestone itself....Those on Lot 6, Con. 14, occur chiefly in two veins having an en echelon relationship to one another. One of these veins, that in pit 4, evidently occupies a fault fissure, for the vein walls are straited and slickensided at an angle of about 20 degrees from the vertical." There are two other deposits of this type in the Pembroke-Renfrew area located near White Lake. All three deposits consist of disseminated-to-massive hematite that occupies fault-related fractures and/or breccia zones in carbonate rocks. The mineralization was probably emplaced as a result of supergene replacement and open space filling by iron-rich meteoric water along the fault fractures and breccia zones.
DEVELOPMENT HISTORY	1868-71: 2,110 tons of ore shipped from pit No. 1-3. 1873-74: Peter Bell Iron Co. mined 10,000 - 15,000 tons. after 1874: An Ohio company put a few men on the property, but no ore shipped. openings made by James Bell to 10 feet - about 300 tons removed.
REFERENCE MAP	GSC 1363A, Arnprior, 1974.

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1917: Iron ore Occurrences in Canada; Volume II, Mines Branch, Canada Department of Mines, Pub. No. 217, p. 131.

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1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, Part 3, 1944, p. 61.

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Wilson, M. E.
1924: Arnprior-Quyon and Maniwaki Areas, Ontario and Quebec; Geological Survey of Canada, Memoir 136, p. 112-114.

45. LAVANT STATION

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	'Granite', calcitic marble
CLASSIFICATION	1A. Stratabound, carbonate-skarn hosted, at intrusive contact.
LOCATION	Palmerston Township, Frontenac County NTS 31F/2, UTM Zone 18, 4988515N, 364820E LAT. 45° 02' 21"N; LONG. 76° 42' 59"W Con. 11, Lot 27
ACCESS	The deposit is located 30m (100 feet) north of a gravel road at a point 0.8km (0.5 miles) west of Lavant Station.
SIZE AND GRADE	Mineralization consists of narrow, discontinuous lenses of massive magnetite in a zone up to 3m (10 feet) wide and of unknown length. A sample of massive magnetite collected by the writer contained 60.8 percent Fe, 20.8 percent FeO, 0.10 percent TiO_2, 0.04 percent P_2O_5, 0.04 percent S, 0.04 percent Cu, and <0.05 percent V. Workings consist of 2 small water-filled pits located 90 m. (300 feet) apart in a north-south direction.
DESCRIPTION	The Lavant Station iron deposit is contained with a lensoid xenolith of calcitic marble with a small felsic intrusion. The intrusion is elongate in a northeasterly direction, is about 4km (2.5 miles) long and 1.6km (1 mile) wide, and consists of fine-grained quartz and potassic feldspar with minor biotite. It is cut by numerous dikes and irregular masses of white granite pegmatite. Along the southern contact the granite grades into a grey oligoclase-quartz-biotite paragneiss (Smith, 1958, p. 21). The marble is composed of a granoblastic intergrowth of coarse-grained calcite and minor silicate minerals. Mineralization consists of narrow discontinuous lenses of massive magnetite up to 1 metre (3 feet) in width contained within the marble. The deposit is a member of a large group of similar iron deposits in the Pembroke-Renfrew area that occur as strata-bound lenses of disseminated-to-massive magnetite at or near the contacts of carbonates with intrusive rocks. These deposits probably formed as a result of contact metasomatic effects of the intrusions.
DEVELOPMENT HISTORY	Prior to 1899: 2 pits excavated by unknown operators.
REFERENCE MAPS	ODM 1956-4, Clarendon-Darling Area, 1958.
REFERENCES	Ingall, E. D. 1901: Report on the Iron Deposits along the Kingston and Pembroke Railway in Eastern Ontario. Geological Survey of Canada, Ann. Rept. Vol. 12, Part I, 1899, p. 32. Shklanka, R. 1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 141. SMDR Files (Con. 11, Lot 27); Geoscience Data Centre, Ontario Geological Survey, Toronto. Smith, B. L. 1958: Geology of the Carendon-Dalhousie Area; Ontario Department of Mines, Ann. Rept., Vol. 65, Part 7, 1956, p. 45.

46. KELLER

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	Gabbro
CLASSIFICATION	1D. Intrusion hosted (gabbro)
LOCATION	Raglan Township, Renfrew County NTS 31F, UTM Zone 18, 5011925N, 307205E LAT. 45° 14' 11"N; LONG. 77° 27' 22"W Con. 7, Lot 26
ACCESS	The deposit is located about 150m (500 feet) south of a gravel road, 240m (800 feet) southwest of Highway 514.
SIZE AND GRADE	Mineralization consists of disseminated magnetite in a zone of unknown, but limited extent.
DESCRIPTION	The Keller iron deposit occurs within the Raglan Hills Metagabbro Complex, (Hewitt, 1954), which is a large gabbroic sill 14km (9 miles) long and up to 5.5km (3.5 miles) long and up to 5.5km (3.5 miles) wide within a metavolcanic-metasedimentary succession. The complex consists of a complicated mixture of diorite, gabbro, pyroxenite, and hornblendite. Mineralization consists of disseminated magnetite that occurs within metagabbro in a zone of unknown but limited extent. There are several other deposits of this type hosted by other gabbroic intrusions in the area and in all cases, the magnetite is believed to have been a primary constituent of the intrusion.
DEVELOPMENT HISTORY	None
REFERENCE MAPS	ODM 1953-2, Brudenell-Raglan Area, 1954
REFERENCES	Hewitt, D. F. 1954: Geology of the Brudenell-Raglan Area; Ontario Department of Mines, Ann. Rept. Vol. 62, Part 5, 1953, p. 71. Shklanka, R. 1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 323. SMDR Files (Keller); Geoscience Data Centre, Ontario Geological Survey, Toronto.

47. ROSS

COMMODITY	Iron (magnetite, hematite)
ROCK ASSOCIATION	HOST: Marble OTHER: Syenite gneiss
CLASSIFICATION	1F. Geological relationships unclear
LOCATION	Ross Township, Renfrew County NTS 31F/10, UTM Zone 18, 5049930N, 369000E; LAT. 45° 35' 33"N, LONG. 76° 40' 46"W. Con. and Lot uncertain
ACCESS	The deposit is reported to be located opposite Portage du Fort, midway between the Half Portage and Poupards Slide (National Mineral Inventory, Ottawa). It was not located by the writer.
SIZE AND GRADE	Mineralization consists of a small vein of magnetite and specular hematite of unknown dimensions.
DESCRIPTION	The deposit was not visited by the author but the geology at the reported location consists of marble that is cut by a late, massive intrus ion of gabbro. The deposit is described (National Mineral Inventory) as "Magnetite and specular oxides of iron occur in a vein which cuts white granular limestone, and is underlain by dark coloured syenitic gneiss". Its mode of origin is unclear.
DEVELOPMENT HISTORY	None
REFERENCE MAPS	Lumbers, S. B. (in preparation); Geology of Pembroke-Renfrew Area, Ontario.
REFERENCES	Logan, W. E. 1847: Report of Progress for the Year 1845-6, Geological Survey of Canada, p. 77. National Mineral Inventory Geological Survey (File No. 43); Sector, Dept. of Energy, Mines and Resources, Ottawa.

48. LONGSTONE LAKE

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	Marble, sedimentary gneiss, gneissic "granite'
CLASSIFICATION	IC. Stratiform, skarn hosted
LOCATION	South Canonto Township, Frontenac County NTS 31F/2, UTM Zone 18, 4993950N, 358410E LAT. 45° 05' 12"N; LONG. 76° 47' 57"W Con. 6, Lot 26
ACCESS	A single lane gravel road passes 1.6km (1 mile) to the southwest of the deposit. It was not visited by the authors.
SIZE AND GRADE	Mineralization consists of disseminated-to-massive magnetite in a layer 76m (250 feet) long and about 3m (10 feet) wide. A sample collected by Frechette (1910, p. 87) contained 44.00 percent Fe, 31.60 percent insoluble, 0.045 percent P, 0.436 percent S, 0.70 percent CaO, 0.10 percent Mn, and trace amounts of TiO_2. Workings consist of a single small pit.
DESCRIPTION	The Longstone Lake deposit occurs in the same sequence of northeast-trending marbles and metamorphosed sandstones and mudstones as the Summit Lake iron deposit, and lies immediately to the east of a small intrusion of gneissic granite. Smith (1958, p. 46) reports finding a small prospect pit on the deposit "on a contact between limestone and sedimentary gneiss". On this basis the deposit is believed to be similar to the Summit Lake iron deposit and a member of the IC group of stratiform, skarn hosted magnetite deposits.
DEVELOPMENT HISTORY	Before 1909: small prospect pit excavated by unknown operators.
REFERENCE MAPS	ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958

REFERENCES

Frechette, H.
1910: On a Number of Iron Ore Properties in North-eastern Ontario; Mines Branch, Canada Department of Mines, Summary Report for 1909, Pub. No. 63.

Ontario Iron Ore Committee
1924: Report of the Ontario Iron Ore Committee, 1923; Ontario Department of Mines.

Shklanka, R.
1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 142.

SMDR Files (Longstone Lake); Geoscience Data Centre, Ontario Geological Survey, Toronto.

Smith, B.L.
1958: Geology of the Clarendon-Dalhousie Area; Ontario Department of Mines, Ann. Rept. Vol. 65, Pt. 7, 1956, p. 46.

49. SUMMIT LAKE

COMMODITY — Iron (magnetite)

ROCK ASSOCIATION — HOST: Skarn
OTHER: Sandstone, diorite

CLASSIFICATION — 1C. Stratiform, calc-silicate hosted

LOCATION — S. Canonto Township, Frontenac County
NTS 31F/2, UTM Zone 18, 4990106N, 355064E
LAT. 45° 03' 06"N; LONG. 76° 50' 26"W
Con. 3, Lot 14.

ACCESS — The deposit is accessible via a gravel road from the highway at a point 0.8km (½ mile) east of the village of Ompah. It is located about 6.4km (4 miles) north of the Highway along the road.

SIZE AND GRADE — Mineralization consists of disseminated magnetite in an orebody about 300m (1,000 feet) long and 30m (100 feet) wide that is estimated to con-ain 1,200,000 tons of ore to a depth of 30m (100 feet), as indicated by gravity and magnetic surveys (Assessment Files). Two grab samples collected by Shklanka (1968, p. 143) are reported to have contained 52 percent and 60 percent Fe.

Workings at the deposit consist of a single pit about 60m (200 feet) long, 12m (40 feet) wide and up to 7.5m. (25 feet) deep. There is also a very extensive area that has been stripped of vegetation and soil.

DESCRIPTION — GENERAL GEOLOGY: The Summit Lake iron deposit is hosted by a thin layer of skarn contained within a sequence of interbedded mudstone, marble, and quartz-feldspar paragneiss. The paragneiss probably represents metamorphosed sandstones but alternatively, may be felsic volcanic in origin. The calc-silicate layer is probably a metamorphosed calcareous mudstone. There is a large intrusion of gabbro immediately to the west within 100 metres (300 feet) of the iron deposit. All the rock units strike northeast and dip steeply to the southeast.

The skarn unit is a massive, dark green rock composed of fine-grained actinolite, epidote, and minor carbonate and often contains small, segregated masses of coarse-grained calcite, biotite, and hornblende. The skarn forms sharp contacts with the quartz-feldspar paragneiss which is a fine-grained (0.25mm), white to pink rock composed of quartz, white feldspar, and minor biotite. The gabbro forms a black, foliated, medium-grained rock composed essentially of hornblende and plagioclase (60%) and locally abundant garnet. No marble is present in the vicinity of the deposit.

MINERALIZATION: Mineralization consists of heavily disseminated magnetite contained with a layer of skarn which forms a bed about 12m (40 feet) wide in the vicinity of the open cut. The layer pinches out to the southwest, but continues along strike to the northeast for about 300m (1,000 feet).

DISCUSSION: The summit Lake deposit is unique in the Pembroke -Renfrew area with the possible exception of the Longstone Lake deposit. If the succession of host rocks has been correctly identified as intercalated sandstones and calcareous mudstones then the deposit probably formed as a result of syngenetic chemical precipitation of iron in a clastic depositional environment.

DEVELOPMENT HISTORY	1957-58:	Magnetometer and gravity surveys by L.G.D. Thompson
	1962 :	Six diamond drill holes by L.G.D. Thompson and Tomclid Iron Mines Limited
	1977 :	Mining operations commenced by TMF Mineral Resources in July from open cut. Magnetite concentrate in form of aggregate and powder produced and sold to Ontario Hydro for use as high density aggregate in concrete containment shields for nuclear reactors. Crushed waste rock sold as road-fill. Magnetite concentrate had average specific gravity of 4.4.
	1978 :	Mining, milling operations ceased.

REFERENCE MAP ODM 1956-4, Clarendon-Dalhousie-Darling Area, 1958.

REFERENCES

Assessment Files Research Office; Ont. Geol. Survey, Toronto: Technical File No. 63-973.

Shklanka, R.
1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 143.

SMDR Files (Summit Lake); Geoscience Data Centre, Ont. Geol. Survey, Toronto.

50. TORBOLTON

COMMODITY	Iron (magnetite)
ROCK ASSOCIATION	Gabbro
CLASSIFICATION	1D. Intrusion hosted (gabbro)
LOCATION	Torbolton Township, Carleton County NTS 31F/8, UTM Zone 18, 5035383N, 420796E LAT. 45° 28' 10"N; LONG. 76° 00' 47"W Con. 6 and 7, Lots 6, 7, and 8.
ACCESS	The deposit is located about 0.8km (½ mile) south of the Ottawa River. It was not visited by the authors.
SIZE AND GRADE	Mineralization consists of disseminated magnetite in a zone of unknown extent. A sample of magnetite separated from core samples contained 64.34 percent Fe_2O_3, 29.25 percent FeO, and 0.73 percent TiO_2 (Shklanka, 1968, p. 101).
DESCRIPTION	According to Shklanka (1968, p. 101) this deposit consists of a "Mineralized gabbro body overlain by approximately 400 feet of Ordivician rocks". There are several similar iron deposits in the Pembroke-Renfrew area that occur as lenses of disseminated to massive magnetite within gabbroic intrusions. The magnetite in these deposits is believed to have been a primary constituent of the gabbros.
DEVELOPMENT HISTORY	No recorded activity
REFERENCE MAP	GSC 1363A, Arnprior, 1974
REFERENCES	Shklanka, R. 1968: Iron Deposits of Ontario; Ontario Department of Mines, MRC No. 11, p. 101.

APPENDIX III

Detailed Descriptions of Individual Molybdenum Deposits

MOLYBDENUM DEPOSITS

TOWNSHIP	DEPOSIT NUMBER	DEPOSIT NAME
Admaston	1	Gorman
	2	Kiley
	3	Lafleurs Lake
Bagot	4	Bagot Molybdenite
	5	Belangers Corners
	6	Blimkies Mountain
	7	Buckhorn
	8	Culhane
	9	Hond Lake
	10	Hunter
	11	Morin
	12	Stones Lake
	13	Zenith
Blithfield	14	Quilty
Bromley	15	Cole
Brougham	16	Box
	17	Charron
	18	Guiney
	19	Hunt
	20	Maloney
	21	Ross-O'Brien
	22	Sunset
Burns	23	Brotton
Dungannon	24	Bronson
	25	Stoughton
Faraday	26	Keller
Grattan	27	Wren
Griffith	28	Legree
	29	Lepine
	30	Spain
Lyndoch	31	Bruceton
	32	Jamieson
	33	Lyndoch
	34	McCoy
	35	Mining River
	36	Wolfe Fire Tower
Matawatchan	37	Wilson
McNab	38	Burnston
Monteagle	39	York River
Raglan	40	Craigmont
	41	Liedtke
Ross	42	Elliot
	43	Rose
Sebastopol	44	Felhaber
	45	Opeongo Road

TABLE III-1: List of molybdenum deposits in the Pembroke-Renfrew area.

1. MOLYBDENUM DEPOSITS

A. Stratabound, skarn hosted

1.	Gorman	Admaston Township
5.	Belangers Corners	Bagot Township
7.	Buckhorn	Bagot Township
8.	Culhane	Bagot Township
9.	Hond Lake	Bagot Township
11.	Morin	Bagot Township
13.	Zenith	Bagot Township
14.	Quilty	Blithfield Township
15.	Cole	Bromley Township
16.	Box	Brougham Township
19.	Hunt	Brougham Township
22.	Sunset	Brougham Township
26.	Keller	Faraday Township
29.	Lepine	Griffith Township
30.	Spain	Griffith Township
31.	Bruceton	Lyndoch Township
32.	Jamieson	Lyndoch Township
37.	Wilson	Matawatchan Township

B. Unconformable to conformable, pegmatite hosted

2.	Kiley	Admaston Township
4.	Bagot Molybdenite	Bagot Township
10.	Hunter	Bagot Township
12.	Stones Lake	Bagot Township
17.	Charron	Brougham Township
23.	Brotton	Burns Township
27.	Wren	Grattan Township
33.	Lyndoch	Lyndoch Township
34.	McCoy	Lyndoch Township
38.	Burnstown	McNab Township
43.	Rose	Ross Township
44.	Felhaber	Sebastopol Township
45.	Opeongo Road	Sebastopol Township

C. Stratiform, amphibole paragneiss hosted

6.	Blimkies Mountain	Bagot Township
21.	Ross-O'Brien	Brougham Township

D. Geological relationships unclear

3.	Lafleurs Lake	Admaston Township
18.	Guiney	Brougham Township
20.	Maloney	Brougham Township
24.	Bronson	Dungannon Township
25.	Stoughton	Dungannon Township
28.	Legree	Griffith Township
35.	Mining Mountain	Lyndoch Township
36.	Wolfe Fire Tower	Lyndoch Township
39.	York River	Monteagle Township
40.	Craigmont	Raglan Township
41.	Liedtke	Raglan Township
42.	Elliot	Ross Township

TABLE III-2: Classification of molybdenum deposits in the Pembroke-Renfrew area.

1. GORMAN

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Sulfide-pyroxenite skarn OTHER: Calcitic marble, arkosic sandstone, pegmatite
CLASSIFICATION	1A. Stratabound, skarn-hosted
LOCATION	Admaston Township, Renfrew County NTS 31F/7, UTM Zone 18,5028310N, 357280E LAT. 45° 23' 45"N; LONG. 76° 49' 24"W Con. 9, Lot 9
ACCESS	The Gorman deposit is located less than 30m (100 feet) south of Hwy. 132 about 3km (1.9 miles) southwest of the Whelan Road (see Fig. 1A).
SIZE AND GRADE	Mineralization consists of sparse, scattered flakes of coarse molybdenite in an orebody whose dimensions are not known, but it does not appear to be extensive nor of very high grade. Workings consist of a single trench about 122m (400 feet) long, up to 6m (20 feet) wide, and usually less than 1.5m (5 feet) deep. The trench is in a low, swampy area and may actually be two small pits joined by a natural depression.
DESCRIPTION	According to Quinn (1952, p. 55), the Gorman molybdenum deposit occurs "in a body of coarse-grained, dark green pyroxenite situated along the contact between a red granite-gneiss and a northeasterly trending band of crystalline limestone". The "granite gneiss" is probably a metamorphosed arkosic sandstone and contains numerous dikes of pegmatite, some of which cut the marble in the vicinity of the workings. Mineralization consists of rare erratically distributed coarse flakes of molybdenite associated with pyrrhotite scattered throughout the pyroxenite skarn. The Gorman deposit is a member of a large group of similar molybdenum deposits in the Pembroke-Renfrew area. These deposits occur as stratabound lenses of molybdenite-bearing pyroxenite skarn within sequences of intercalated carbonates and clastic sedimentary rocks. The deposits are believed to be metamorphogenic in origin.
DEVELOPMENT HISTORY	1865: Deposit discovered 1915: Molybdenite recognized in deposit by unknown persons 1917: J. O. Gorman optioned the property to A.J. Gravelle who, with others, formed the Opeongo Mining Syndicate, worked two pits and shipped 21.72 tons of 0.38 percent ore to the Mines Branch in Ottawa; 117 pounds of pure molybdenite were recovered from this.
REFERENCE MAP	G.S.C. 1046A, Renfrew, 1956
REFERENCES	Eardley-Wilmot, V.L. 1925: Molybdenum; Canada Department of Mines, Pub No. 592, P. 82-83 Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, Mineral Resource Circular No. 7, P. 55 Quinn, H.A.Q. 1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-57, P. 55-56 Satterly, J. 1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Vol. 53, part 3, 1944, P.70

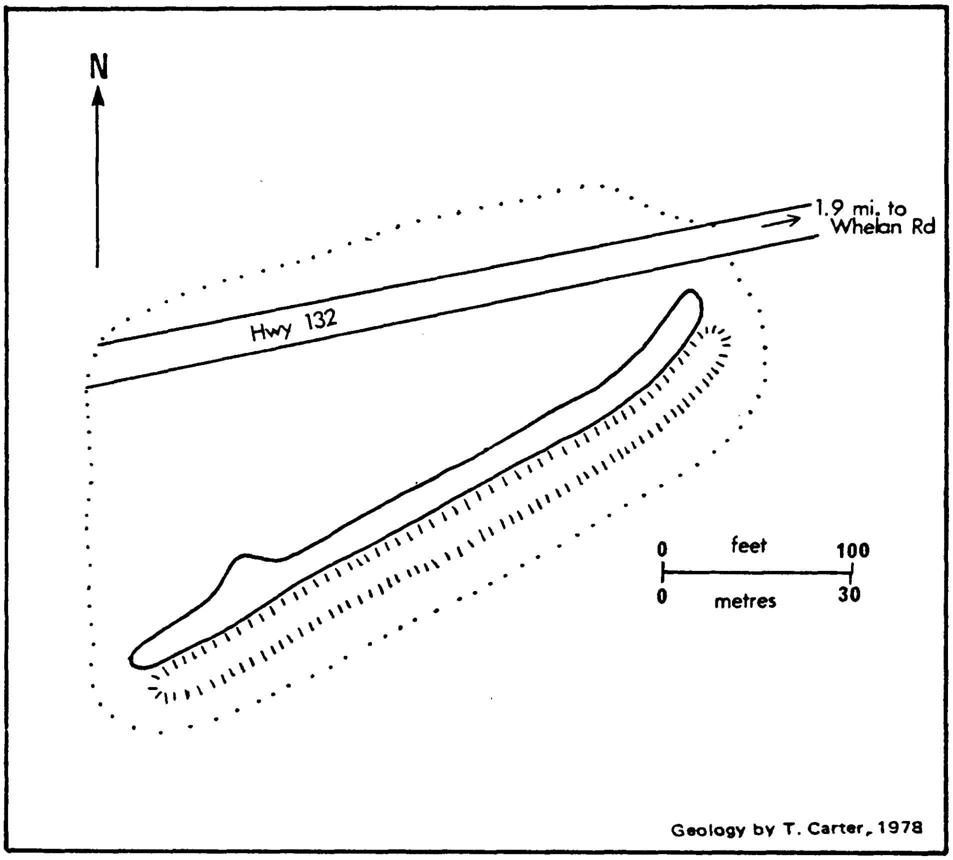

Figure 1A — Workings and location of the Gorman molybdenum deposit.

Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 20, P. 163

Meyn, H.D. and Howarth, J. R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing. Ontario Geological Survey, Prelim. Map. P.1247 Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976

2. KILEY

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pegmatite OTHER: Metamorphosed mudstones, sandstones, marble
CLASSIFICATION	1B. Unconformable-to-conformable, pegmatite hosted
LOCATION	Admaston Township, Renfrew County NTS 31F/7, UTM Zone 18,5024680N, 353785E LAT. 45° 21' 44"N; LONG. 76° 52' 01"W Con. 13, Lot 8
ACCESS	The deposit is accessible via an old farm road from a township gravel road.
SIZE AND GRADE	Mineralization consists of sparse, scattered, coarse flakes of molybdenite disseminated within a pegmatite dike about 1m (3.3 feet) in width which apparently is discontinuous along strike. Workings consist of a single pit 1m (3.3 feet) in diameter and about 1m (3.3 feet) deep.
DESCRIPTION	The Kiley deposit is hosted by a rusty pegmatite dike that cuts a sequence of interlayered granitic and amphibolitic paragneisses and marbles that are probably metamorphosed sandstones, mudstones, and limestones respectively. The rock units of the layered sequence strike northeasterly and dip moderately to the southeast. Mineralization consists of sparse, scattered, coarse flakes of molybdenite disseminated within the pegmatite, especially in finer-grained, rusty portions of the pegmatites. The Kiley deposit is a member of a large group of similar deposits in the Pembroke-Renfrew area that are probably metamorphogenic in origin.
DEVELOPMENT HISTORY	before 1918: Molybdenite discovered accidentally when a well was dug. 1918: A small pit was dug by unknown operators 1943: The pit was cleaned out by persons unknown, but no other work was done.
REFERENCE MAPS	GSC 1046A, Renfrew, 1956 ODM 53b, Renfrew Area, 1945.
REFERENCES	Eardley-Wilmot, V.L. 1925: Molybdenum; Canada Department of Mines, Pub. No. 592, P. 82, 83 Johnston, F. J. 1968: Molybdenum Deposits of Ontario; Department of Mines, M.R.C. No. 7, P. 55 Quinn, H. A. 1952: Renfrew Map-Area, Renfrew and Lanark Counties Ontario; Geological Survey of Canada, Paper 51-27, P.56 Satterly, J. 1945: Mineral Occurrences in the Renfrew Area: Ontario Department of Mines, Annual Report, Vol. 53, part 3, 1944, P. 70. Vokes, F.M. 1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology, Series No. 20, P.163

Meyn, H.D., and Howarth, J. R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P.1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

3. LAFLEURS LAKE

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Uncertain OTHER: Syenite gneiss, marble
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Adamston Township, Renfrew County NTS 31F/7, UTM Zone 18, 5028410N, 351900E LAT. 45° 23' 49"N; LONG. 76° 53' 31"W Con. 12, Lots 12 and 15
ACCESS	A gravel road passes through the reported location of the deposit.
SIZE AND GRADE	There is no available data but the amount of mineralization present is probably insignificant.
DESCRIPTION	The reported location of the LaFleurs Lake molybdenum deposit is within a sequence of interlayered marble and syenite gneiss that strikes northeasterly and dips moderately (40-50°) to the southeast. The nature of the mineralization is unknown, however, as the authors were unable to locate the deposit and Freeman (1936, p. 14) lists, but does not describe two occurrences; one in Lot 15 and the other in Lot 12 of Adamston Township.
DEVELOPMENT HISTORY	No recorded activity
REFERENCE MAPS	GSC 1046A, Renfrew, 1956
REFERENCES	Freeman, B.C. 1936: Mineral Occurences in Renfrew County and Vicinity; Geological Survey of Canada, Memoir 195, p. 14. Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines M.R.C. No. 7, P. 65

4. BAGOT MOLYBDENITE

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pegmatite OTHER: 'Granite', marble, calcareous metasediments
CLASSIFICATION	1B. Unconformable-to-conformable, pegmatite hosted
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5028370N, 366835E LAT. 45° 23' 53"N; LONG. 76° 42' 05"W Con. 4, Lot 29
ACCESS	A cottage access road passes within 400m (1,300 feet) of the deposit.
SIZE AND GRADE	Mineralization is reported to consist of very minor amounts of coarse molybdenite associated with pyrite in a fracture zone a few inches wide (Satterly, 1945, p. 75). Workings consist of a pit "which is 15 by 8 feet and 6 feet deep, is 185 feet northeast of the No. 3 pit of Buckhorn Mines, Limited, on Lot 28" (Satterly, 1945, p. 75). There is also a trench "which trends northwest and is 40 by 4 feet and from 1 to 4 feet deep", located 12 feet northwest of the above pit (Satterly, 1945, p. 75).
DESCRIPTION	The Bagot molybdenite deposit lies within a narrow belt of intercalated marble and metamorphosed calcareous mudstones and sandstones that is contained as a xenolithic layer within a large granitic intrusion. The rocks are cut by numerous pegmatite dikes. All the rock units strike northeasterly and dip moderately to the southeast. Mineralization consists of pyrite and associated molybdenite contained within narrow fractures in one of the pegmatite dikes. The Bagot molybdenite deposit is a member of a large group of similar molybdenum deposits in the Pembroke-Renfrew area and is probably metamorphogenic in origin. 1939-1940: A small pit and trench were excavated by the Bagot Molybdenite Mining Syndicate Limited.
REFERENCE MAP	GSC 1046A, Renfrew, 1956

REFERENCE

Johnston, F.J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, Mineral Resource Circular No. 7, P.65

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Quinn, H.A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties Ontario; Geological Survey of Canada, Paper 51-27, P.59

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Vol. 55, part 3, 1944, P.73

Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 20, P. 162-163

5. BELANGERS CORNERS

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Marble, pegmatite, calcareous mudstone-sandstone
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5029100N, 366000E LAT. 45° 24' 16"N; LONG. 76° 42' 44"W Con. 4, Lot 30
ACCESS	The deposit is easily accessible via gravel road. Workings are located north and south of a gravel road along the north boundary of the Lot and also east and west of a gravel road in the western part of the Lot (Fig. 5A).
SIZE AND GRADE	Mineralization consists of a few scattered flakes of molybdenite in a zone of unknown, but very limited extent. Workings consist of "Ten trenches trending at various angles...put down adjacent to outcrops north and south of the road along the north boundary of Lot 30, Concession IV....Two other workings occur east and west of the road in the western part of the Lot. A trench east of this road is 240 feet long ... On the west isde of the road (is) a pit 25 by 30 feet and from 4 to 6 feet deep" (Satterly, 1945, p. 76).
DESCRIPTION	The Belangers Corners deposit occurs in a succession of interlayered marbles, calcareous mudstones, and sandstones cut by numerous pegmatite dikes. The rock units strike northeasterly and dip moderately to the southeast. In the north part of the Lot mineralization consists of a few scattered, coarse flakes of molybdenite associated with disseminated pyrite and pyrrhotite in a pyroxenite skarn. No mineralization is exposed in the western part of the Lot. The Belangers Corners deposit is very similar to a large number of other molybdenum deposits in the Pembroke-Renfrew area and is probably metamorphogenic in origin.
DEVELOPMENT HISTORY	before 1944: Numberous pits and trenches excavated by unknown operators
REFERENCE MAP	GSC 1046A, Renfrew, 1956

REFERENCES

Johnston, F.J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 65

Quinn, H.A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, P.59.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report, Vol. 53, Part 3, 1944, P.76

Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 20, P.162.

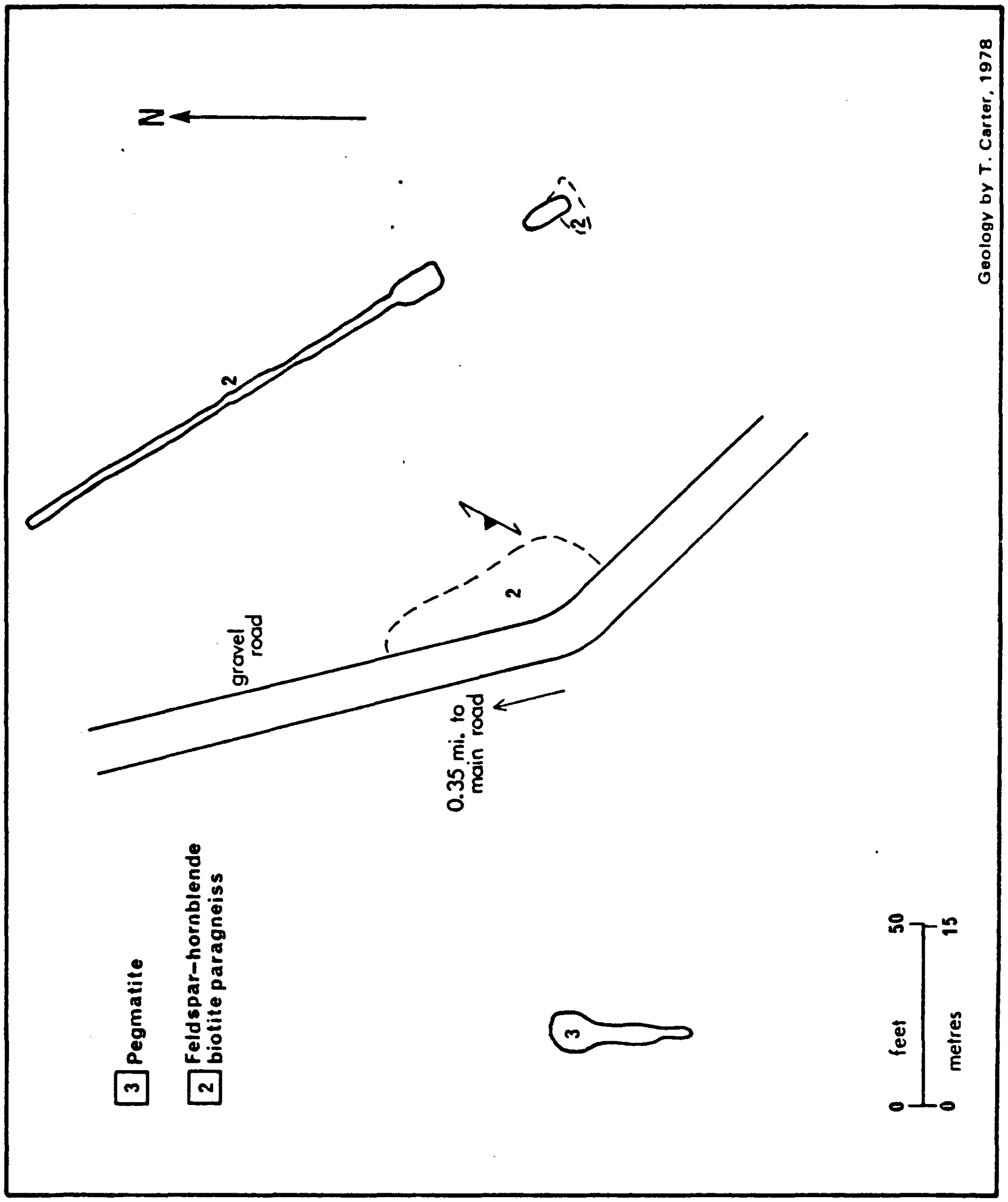

Figure 5A — Workings and rock types in the west part of lot 30, Con. 4.

6. BLIMKIES MOUNTAIN

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: 'Amphibolite gneiss' OTHER: Marble, 'biotite gneiss', granite pegmatite
CLASSIFICATION	1C. Stratiform, amphibole paragneiss hosted.
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5031200N, 369870E LAT. 45^{o} 25' 27"N; LONG. 76^{o} 39' 48"W Con. 1, Lot 29
ACCESS	According to Satterly (1945, p. 71) the deposit is located on the farm of Joe Kluck and is "about 2,000 feet in a direction of S 25^{o}W, from the farm-house." The farm, whose present owners is not known, is accessible via a gravel road.
SIZE AND GRADE	Mineralization is reported to consist of sparesely disseminated pyrrhotite and pyrite with rare molybdenite in a band of 'amphibolite' 6 feet wide and of unspecified length (Satterly, 1945, p. 71). Workings consist of two pits; the first pit 16 by 18 feet and 7 feet deep and the other pit, located 110 feet at S.75^{o}W from the first, is 35 feet by 17 feet and 6 feet deep on the sides to 12 feet deep in the centre (Satterly, 1945, p. 71).
DESCRIPTION	The Blimkies Mountain deposit lies within a narrow, north-east striking belt of intercalated marble and metamorphosed calcareous mudstones and sandstones that is contained as a xenolithic layer within a large granitic intrusion. All the rocks are cut by numerous pegmatite dikes. According to Satterly (1945, p. 71) the pits on the deposit expose interlayered diopside-phlogopite bearing marble, biotite gneiss, and hornblende gneiss that are cut by dikes of granite pegmatite. Mineralization consists of pyrrhotite and pyrite with some associated molybdenite disseminated within the 'amphibolite gneiss'. The gneiss is believed to represent a metamorphosed mudstone. The mineralization may be a primary, sedimentary constituent of the gneiss or alternatively, it may be metamorphogenic in origin.
DEVELOPMENT HISTORY	1939-1940: two pits excavated by the Buckhorn Mining Syndicate Limited
REFERENCE MAP	GSC 1046A, Renfrew, 1956

REFERENCES

Johnston, F.J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7 P. 65

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, P.56

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Vol. 53, Part 3, 1944, P.71

Vokes, F.M.
1963: Molybdenum Deposits of Canada, Geological Survey of Canada, Economic Geology Series No. 20, P. 163

7. BUCKHORN

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: 'Granite', calcareous mudstone, marble
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5028230 N, 366870E LAT. 45° 23' 49"N; LONG. 76° 42' 03"W, Con. 4, Lot 28
ACCESS	The main set of workings on the deposit are located about 75 metres northeast of a cottage road that provides access to Hurd Lake from a gravel road.
SIZE AND GRADE	Mineralization consists of erratically disseminated molybdenite, associated with pyrite in numerous small isolated lenses up to a couple of metres in width and of unknown length. The largest single orebody contains about 1,500 tons of ore, averaging about 1 percent MoS_2, as indicated by diamond drilling (Satterly, 1945, p. 73). Workings consist of several pits and trenches widely scattered across the property. The main workings are a series of small pits connected by a narrow trench over a length of about 150 metres (Figure 7A) that cuts across the strike of the rock units. The pits vary in size from about 2 metres in diameter and 1 metre deep to a water-filled pit that measures 11m by 5m. Two other pits are described by Satterly and are located respectively about 103m (340 feet) west and 400m (1,300 feet) northeast of the large pit described above.
DESCRIPTION	The Buckhorn deposit is located within several northeast-striking belts of intercalated marble and metamorphosed calcareous mudstones and sandstones that are contained as xenolithic layers within a large granitic intrusion. All the rocks are cut by numerous pegmatite dikes. According to Satterly (1945, p. 72) the pits on the deposit expose hornblende gneiss, marble, pyroxenite gneiss and granite pegmatite. Mineralization consists of a few flakes of molybdenite in a "3-foot band of rusty pyroxenite" in "pit No. 1", and "a series of pyrite-molybdenite stringers...across a width of 10 feet" in "pit No. 3". All the mineralization is probably metamorphogenic in origin.
DEVELOPMENT HISTORY	1939-1942: A total of seven pits excavated by Buckhorn Mines Limited. 1943: Seven diamond drill holes of unspecified length put down by Buckhorn Mines Limited.
REFERENCE MAP	GSC 1046A, Renfrew, 1956
REFERENCES	Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 57 Meyn, H.D., and Howarth, J.R. 1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976. Quinn, H.A. 1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, P. 57.

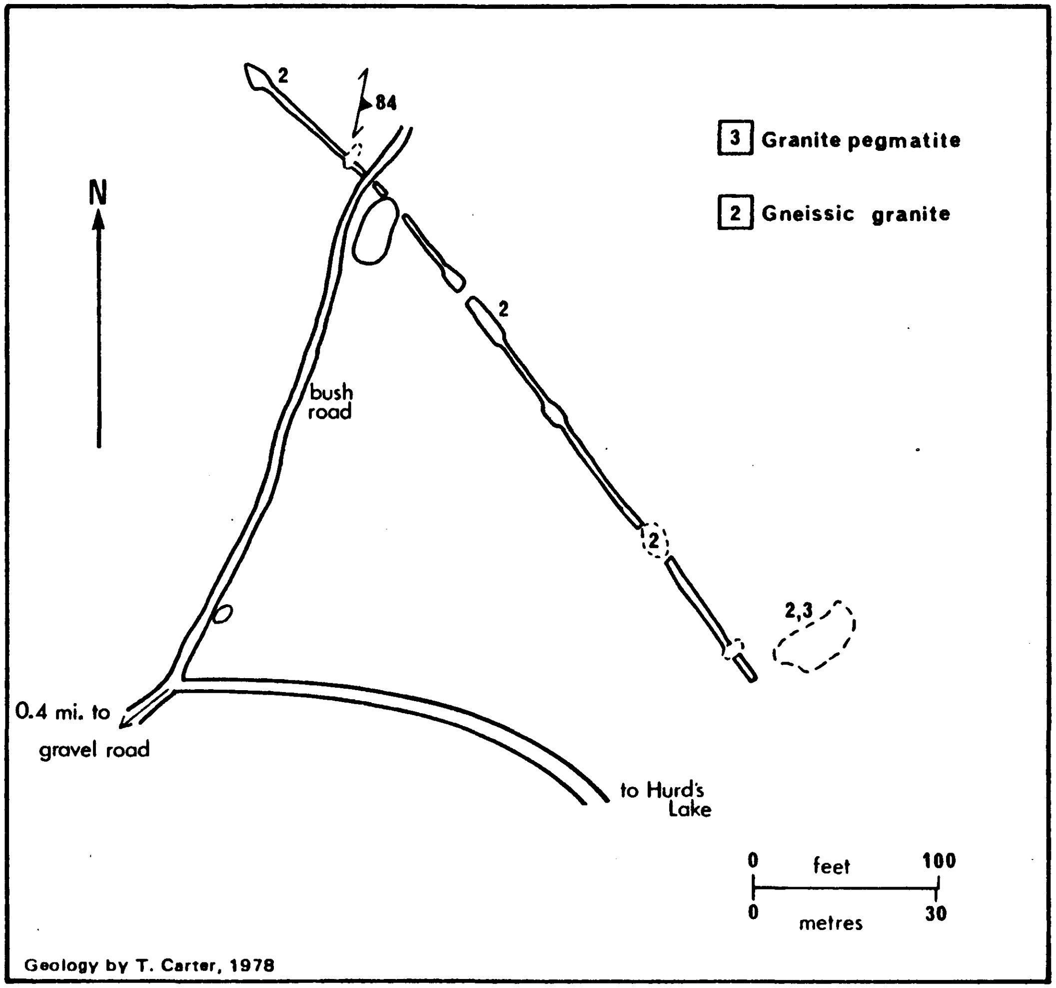

Figure 7A — Workings and geology of the Buckhorn molybdenum deposit.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Vol. 53, part 3, 1944, P.72-73.

Tower, W.O., et al
1941: Mines of Ontario in 1939; Ontario Department of Mines, Annual Report, Vol. 49, part 1, 1940, P.224.

Vokes, F.M.
1963: Molybdenum Deposits of Canada, Geological Survey of Canada, Economic Geology Series No. 20, P. 161-162

8. CULHANE

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Marble, granitic gneiss granite, biotite gneiss
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5020415N, 358575E LAT. 45° 19' 30"N; LONG. 76° 48' 16"W Con. 12, Lot 28
ACCESS	The deposit is located about 1000 metres west of a gravel road near the shore of Culhanes or Snake Lake..
SIZE AND GRADE	Mineralization consists of sparsely disseminated coarse flakes of molybdenite in an orebody of unknown dimensions. About 200 pounds of picked flake are reported to have been recovered from ore mined from the main pit and 35 pounds of 35 percent ore were shipped to the Mines Branch, Ottawa (Eardley-Wilmot, 1925, p.87). Workings are reported to consist of four pits, the largest of which is 75 feet by 7 feet and 5 feet deep (Eardley-Wilmot, 1925, p. 87).
DESCRIPTION	The Culhane deposit is located in a sequence of intercalated sandstones, calcareous mudstones, marble and minor granite that strikes northeasterly and dips moderately to the east. According to Eardley-Wilmot (1925, p. 87) the country rock in the vicinity of the workings is red granite gneiss, and pyroxenite, and mineralization consists of large flakes of molybdenite sparsely disseminated throughout the pyroxenite (see Figure 8A). The deposit is very similar in nature to many other molybdenum deposits in the Pembroke-Renfrew area and is probably metamorphogenic in origin.
DEVELOPMENT HISTORY	1915: Four small pits excavated by R. R. Gamey under the direction of W.J. Urquhart. Approximately 200 lb. of picked flake molybdenite were removed and 35% ore was shipped to the Mines Branch, Ottawa.
REFERENCE MAPS	GSC 1046A, Renfrew, 1956.

REFERENCES

Eardley - Wilmot, V.L.
1925: Molybdenum; Canada Department of Mines, Pub. No. 592, P. 87-88

Johnston, F. J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 65

Meyn, H.D., and Howarth, J. R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247 Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Parsons, A. L.
1917: Molybdenite Deposits of Ontario Ontario Bureau of Mines, Annual Report Vol. 26, 1917, P. 289

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada Paper 51-27, P. 60

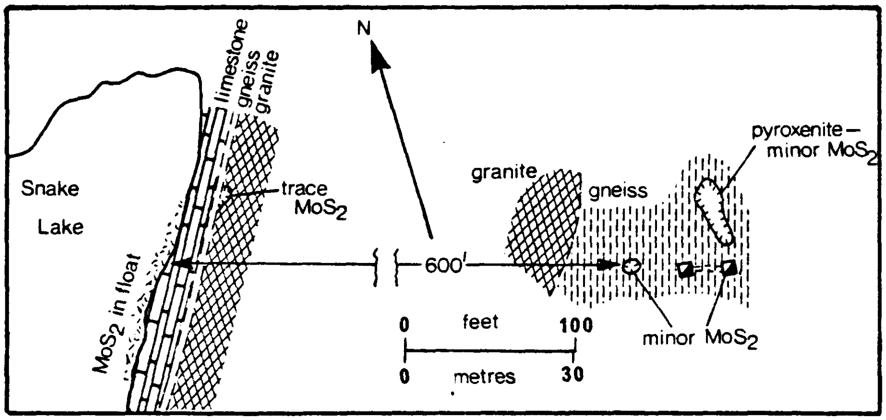

Figure 8A — Culhane prospect. Adapted from Eardley-Wilmot (1925, Fig.19).

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Vol. 53, Part 3, 1944, P. 76-77

Vokes, F. M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 20, P. 164

9. HOND LAKE

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Marble, pegmatite
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5027330N, 367285E LAT. 45° 23' 20"N: LONG. 76° 41' 43"W Con. 4, Lot 26
ACCESS	The exact location of the deposit is unknown as it was not located by the authors, but it is less than 1000 metres southeast of a gravel road.
SIZE AND GRADE	Mineralization consists of a few scattered coarse flakes of molybdenite in a pyroxenite layer no more than 2 metres thick. Workings consist of a single pit 10 to 20 feet wide, 40 feet long, and from 2 to 7 feet deep (Satterly, 1945, p. 71-72).
DESCRIPTION	The Hond Lake deposit occurs within a narrow, northwest-striking belt of intercalated marble and metamorphosed calcareous mudstones and sandstones that is contained as a xenolithic layer within a large granitic intrusion. All of the rocks are cut by pegmatite dikes and sills. According to Satterly (1945, p. 72) "the southern part of the pit stripping exposes a 5-foot sill of granite-pegmatite trending N35°W and dipping 40°S.W. Overlying the pegmatite is a small patch of crystalline limestone; underlying it is a pale-green pyroxenite carrying a few scattered coarse flakes of molybdenite. The pyroxenite band is not more than 6 feet thick". The deposit is very similar to many other molybdenum deposits in the Pembroke-Renfrew area and is probably metamorphogenic in origin.
DEVELOPMENT HISTORY	1940: A pit excavated by unknown operators
REFERENCE MAPS	GSC 1046A, Renfrew, 1956.
REFERENCE	Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7 P. 65 Meyn, H.D., and Howarth, J.R. 1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing, Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976. Quinn, H.A. 1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, P. 56-57 Satterly, J. 1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report, Vol. 55, Part 3, 1944, P. 71-72. Vokes, F.M. 1963: Molybdenum Deposits of Canada, Economic Geology Series No. 20, P. 162

10. HUNTER

COMMODITY: Molybdenum

ROCK ASSOCIATION: HOST: Pegmatite
OTHER: Marble

CLASSIFICATION: 1B. Unconformable-to-conformable, pegmatite hosted

LOCATION: Bagot Township, Renfrew County
NTS 31F/7, UTM Zone 18, 5016410N, 366280E
LAT. 45° 17' 26"N; LONG. 76° 42' 19"W
Con. 10, Lot 15

ACCESS: The exact location of the deposit is unknown, but it is probably less than 500m southwest of Hwy. 511.

SIZE AND GRADE: Mineralization consists of a few scattered coarse flakes of molybdenite associated with pyrite and tourmaline in a zone about 1 foot wide.

Workings consist of several small pits "the largest of which is 300 yards west of Calabogie road, and is 20 by 10 feet and 8 feet deep". There is also a small pit on the east side of the road (Eardley-Wilmot, 1925, p.87).

DESCRIPTION: The Hunter molybdenum deposit occurs within a northeast-striking sequence of intercalated marble and amphibolite of possible volcanic or sedimentary origin. According to Parsons (1917, p. 289) the principal pit on the deposit "is sunk on a pyroxenite pegmatite dike in crystalline limestone. The molybdenite-bearing portion is about a foot wide, and carries also, some pyrite and tourmaline."

The deposit is very similar to many other molybdenum deposits in the Pembroke-Renfrew area and is believed to be metamorphogenic in origin.

DEVELOPMENT HISTORY: 1890: A pit 20 by 10 feet and 8 feet deep was sunk by S. Hunter. About 100 pounds of pure flake molybdenite were removed.

REFERENCE MAPS: GSC 1046A, Renfrew, 1956

ODM 53b, Renfrew Area, 1945

REFERENCES

Eardley - Wilmot, V.L.
1925: Molybdenum; Canada Department of Mines, Pub. No. 592, P.86-87

Johnston, F.J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Volume 53, part 3, 1944, P.76

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing, Ontario Geological Survey Prelim. Map P.1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Parsons, A.L.
1917: Molybdenite Deposits of Ontario Ontario Bureau of Mines, Annual Report, Vol. 26, 1917, P. 288-289

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada Paper 51-27, P. 60

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area;
Ontario Department of Mines,
Annual Report, Vol. 53, Part 3, 1944, P.76

11. MORIN

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Uncertain
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5026490N, 366690E LAT. 45° 22' 52"N; LONG. 76° 42' 10"W Con. 4, Lot 25
ACCESS	The exact location of the deposit is unknown as it was not visited by the authors, but is probably no more than 2000m southeast of a gravel road and is up to several hundred feet west of the shore of Hurd Lake.
SIZE AND GRADE	No data on the size and grade are available other than that some molybdenite mineralization is reported to be present. No workings other than a small amount of blasting are reported (Parsons, 1917, p. 289).
DESCRIPTION	The reported location of the Morin deposit places it within a narrow, northwest-striking belt of intercalated marble and meta-mudstones and sandstones that is contained within the margin of a large granitic intrusion. Parsons reports that "Mr. Morin of Springtown showed samples of molybdenite, which he said came from his farm on the above location... this location was not seen. The samples, however, were of the typical molybdenite-pyrrhotite-pyroxenite association". The mineralization is probably metamorphogenic in origin, similar to many other molybdenum deposits in the Pembroke-Renfrew area.
DEVELOPMENT HISTORY	before 1917: Minor amount of blasting by Mr. Morin of Springtown.
REFERENCE MAPS	GSC 1046A, Renfrew, 1956 ODM 53b, Rnefrew Area, 1945

REFERENCES

Johnston, F.J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 65

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Parsons, A.L.
1917: Molybdenite Deposits of Ontario; Ontario Bureau of Mines, Annual Report, Vol. 26, 1917, P. 289

12. STONES LAKE

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pegmatite OTHER: Biotite granite gneiss, amphibole gneiss
CLASSIFICATION	1B. Unconformable-to-conformable, pegmatite hosted
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5019000N, 372510E LAT. 45° 18' 54"N; LONG. 76° 37' 35"W Con. 5, Lot 11
ACCESS	The exact location of the deposit is unknown as it was not visited by the authors, but it probably occurs less than 500 metres east of a dirt access road to Stones Lake, 1 km northeast of the lake.
SIZE AND GRADE	Mineralization consists of rare, disseminated flakes of molybdenite contained in narrow pegmatite stringers in a zone of unknown extent. Workings consist of a single water-filled pit measuring 10 feet by 10 feet and 6 feet deep (Satterly, 1945, p. 76).
DESCRIPTION	The Stones Lake deposit occurs within a northeast-striking assemblage of intercalated marble and calcareous mudstone near the margin of a large granitic intrusion. In the vicinity of the pit, Satterly (1945, p. 76) reports that "material on the dump consists of a grey biotite granite gneiss containing narrow pegmatite stringers rarely mineralized with flakes of molybdenite an eighth of an inch in diameter. Some rusty unmineralized quartz and a hornblende gneiss were also seen. The strike of the gneissic structure is N20° E., with a vertical dip". The nature of the gneisses described by Satterly is uncertain, but the deposit is similar to a large number of other molybdenum deposits in the Pembroke-Renfrew area and is probably metamorphogenic in origin.
DEVELOPMENT HISTORY	1917-1939: Parts of the lot were staked and restaked at various times, and a pit was excavated by unknown operators.
REFERENCE MAPS	GSC 1046A, Renfrew, 1956 ODM 53B, Renfrew, 1944
REFERENCES	Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 65 Meyn, H. D., and Howarth, J. R. 1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing, Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976. Quinn, H. A. 1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Vol. 53, Part 3, 1944, P. 76 Satterly, J. 1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report, Vol. 53, Part 3, 1944, P.76

13. ZENITH

COMMODITY	Molybdenum, uranium
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: 'Granite', amphibole gneiss (calcareous mudstone), scapolite gneiss (sandstone), marble, pegmatite
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Bagot Township, Renfrew County NTS 31F/7, UTM Zone 18, 5027640N, 366560E LAT. 45° 23' 29"N; LONG. 76° 42' 17"W Con. 4, Lots 27 and 28
ACCESS	The deposit is accessible from a gravel road via a dirt road that leads to the main workings near the shaft.
SIZE AND GRADE	Mineralization consists of erratically distributed coarse flakes of molybdenite disseminated within several discontinuous lenses of pyroxenite skarn that individually vary in length 'from 30 to 210 feet and in width from 2 to 5 feet. A typical ore shoot mined in 204 north drift was 50 feet long and 5 feet wide" (Quinn, 1952, p. 59). No estimates of average grade or tonnage are available. Workings consist of very numerous and widespread pits and trenches of variable sizes and dimensions. At the main mineralized zone the workings consist of a shaft reported to be 205 feet deep, a large water-filled pit 30m (100 feet) long and 5m (16 feet) wide, and 3 small pits of various sizes (see Figure 13B).

DESCRIPTION

GENERAL GEOLOGY: The Zenith molybdenum deposit occurs with a narrow belt of intercalated marble, mudstone, and sandstone, that is contained within the margins of a large granitic intrusion. The rock units all strike northeasterly and dip steeply to the southeast and they are cut by numerous dikes of granite pegmatite. (Fig. 13A).

In the vicinity of the main workings the rocks consist of thinly interlayered beds of calcitic marble, feldspar-amphibole paragneiss and minor pyroxenite skarn that are cut by a small body of granite pegmatite (Figure 13B). The calcitic marble is a coarse-grained (2-3mm), white to pink rock that is well-layered in places and consists mainly of calcite with minor biotite. The paragneiss is a well-layered rock composed of alternating layers of dominantly feldspathic rock that are either amphibole-rich or amphibole free and contain minor amounts of quartz and biotite. These paragneisses are probably metamorphosed mudstones and sandstones. The paragneiss is somewhat gradational into a mass of granite pegmatite composed of pink feldspar and quartz that occurs as a small layer within the main pit and as abundant broken samples on the waste dumps and consists of a massive intergrowth of very coarse-grained, dark green pyroxene with minor calcite, scapolite, pyrrhotite, pyrite and rare molybdenite.

MINERALIZATION: According to Quinn (1952, p. 59), "molybdenite occurs in the pyroxenite as disseminated flakes up to 2 inches across, and as bunches, seams, or bands, commonly associated with irregular stringers of pyrite. Most of the ore is composed of pyroxene, calcite, quartz, pyrite, and molybdenite. A little disseminated molybdenite also occurs in some of the granite-pegmatite, in the paragneiss or hybrid gneiss adjacent to contacts with pegmatite or pyroxenite, and in veins up to 4 feet wide composed of pink calcite, pyroxene, and some feldspar". Most of the mineralization is hosted by the pyroxenite units and according to Karvinen (1973, Appendix A), the ore-bearing bodies of pyroxenite skarn appear to be developed within the marble layers. Characteristic features of the skarn, as determined by Karvinen (1973, Appendix A) from dump samples are:

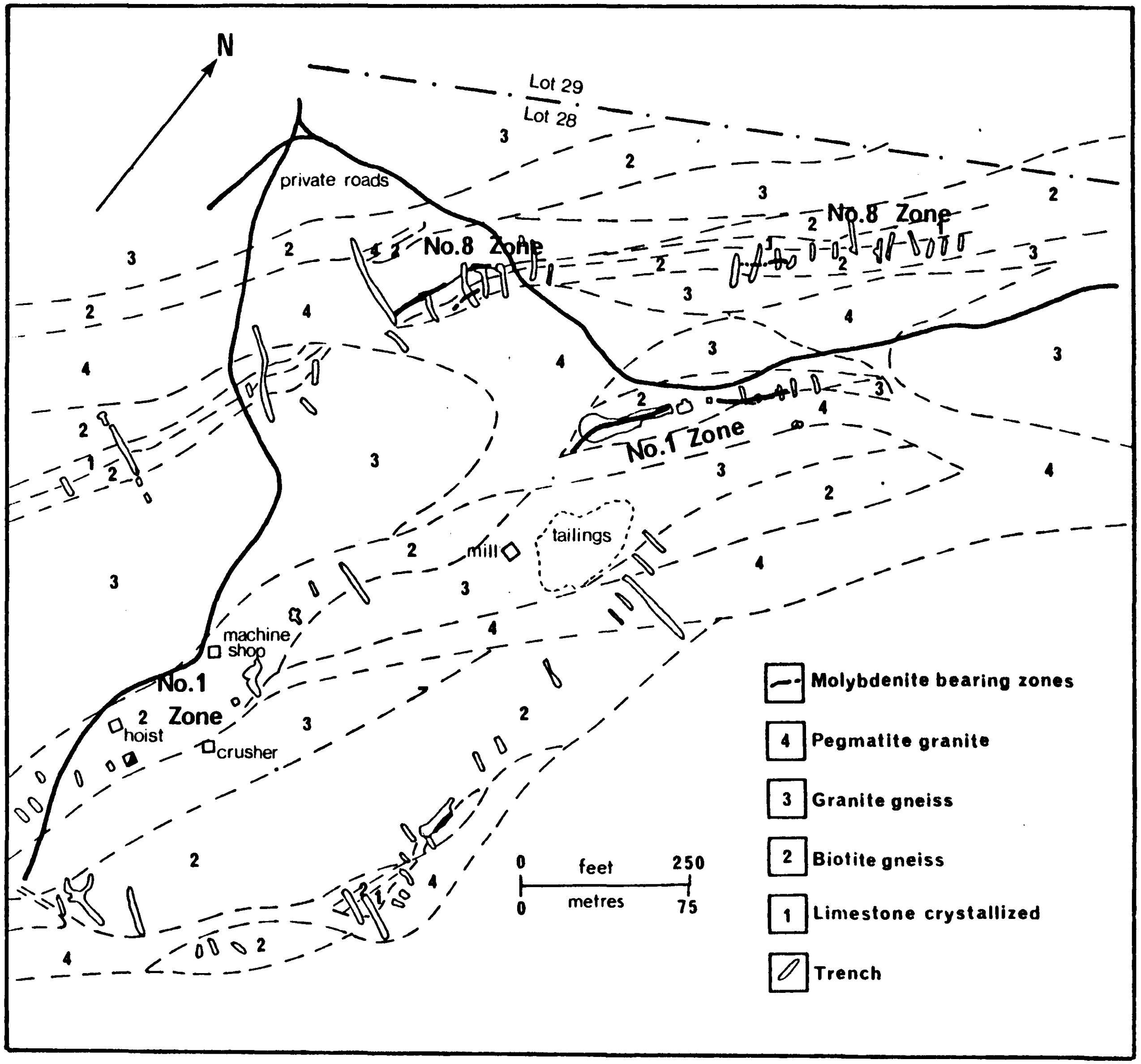

Figure 13A – Geology and workings of the Zenith molybdenum deposit. Adapted from a map by H.C. Horwood (1940), published in Satterly (1945).

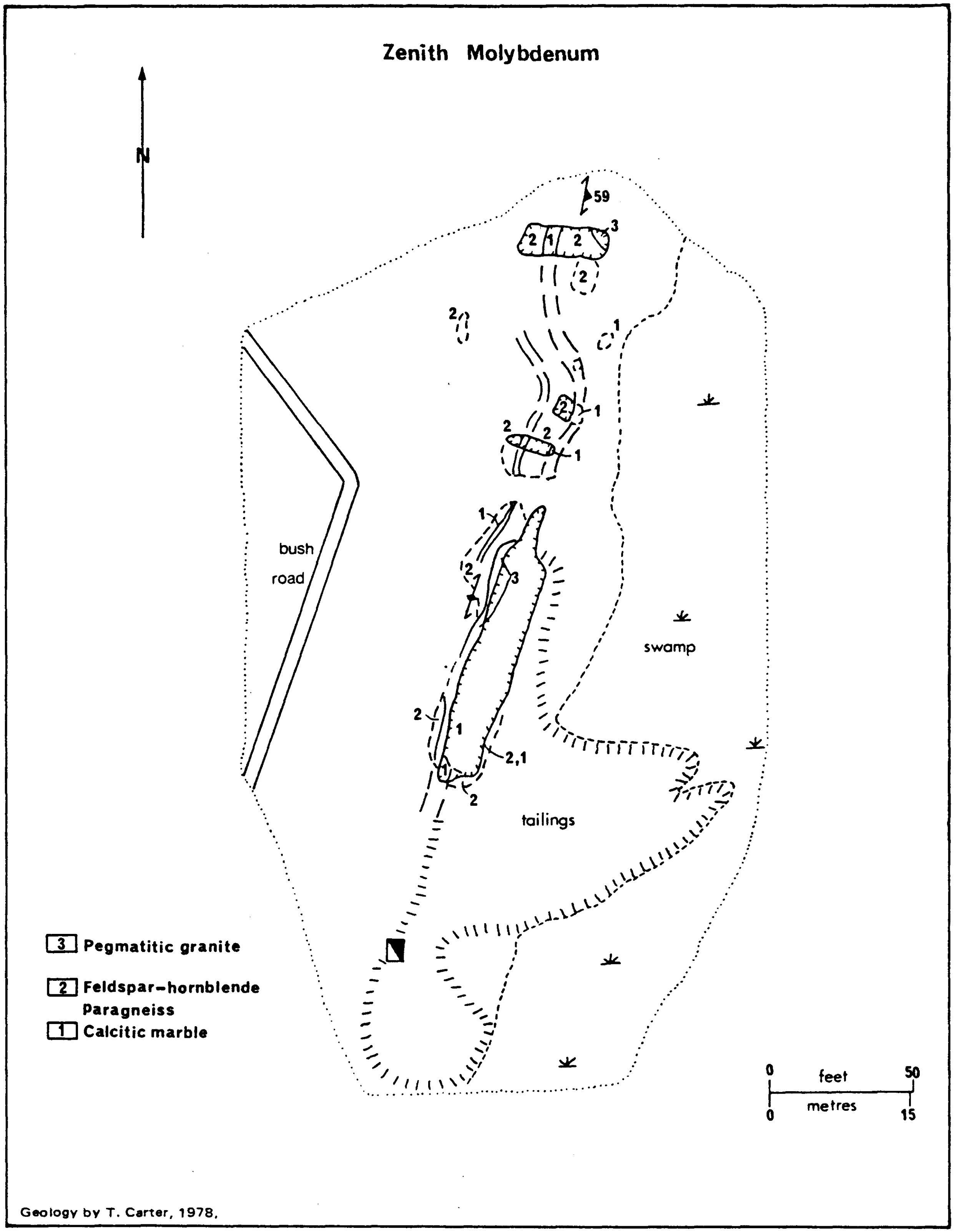

Figure 13B — Geology in the vicinity of the main workings of the Zenith molybdenum deposit.

"1. the rock consists almost entirely of diopside with only small amounts of scapolite (-10%), tremolite (0-3%), biotite (0-4%), sphene (1/2%), and calcite (1-3%).

Microcline is present in small amounts only, usually replacing scapolite;

2. the skarn is inequigranular, normally coarse-grained (1/2"-2"), inhomogeneous, massive, and in places vuggy;

3. sulphide-rich parts, consisting of up to 60% pyrrhotite with some pyrite are common;

4. molybdenite occurs mainly with the iron sulphides and is normally erratically distributed in large (1/2"-1") flakes".

MICROSCOPY: One polished thin section (MO-12-2) was prepared from a sample of pyroxenite skarn collected from the dump by the writer. It consists essentially of a granoblastic, massive intergrowth of coarse-grained, anhedral to subhedral diopside and minor carbonate, and opaque minerals, (Table 13A). Pyrite is the most abundant opaque mineral and occurs as large subhedral grains scattered throughout the section. Minor pyrrhotite and and chalcopyrite form blebs within pyrite grains and rare grains of magnetite are present. Seven thin sections of selected rock types were prepared by Karvinen (1973, Appendix A) from samples collected at the former mine-site and the results of modal analyses are presented in Table 13A.

3-4-31 is a section of marble, 3-4-84 and 3-4-85 are skarn, 3-4-8 and 3-4-21 are hornblende gneiss, 3-4-15 is scapolite gneiss, and 3-4 is granitic gneiss (granitic intrusion).

	MO-12-2	4-31	4-84	4-85	4-8	4-21	4-15	4
calcite	5	93	3	4	-	-	-	-
dolomite	-	1	-	-	-	-	-	-
diopside	90	4	90	94	-	-	-	-
scapolite	-	-	1/2	tr	-	-	20	-
hornblende	-	-	-	-	34	10	-	6
plagioclase	-	-	-	-	60	45	5	33
microcline	-	-	2	-	-	20	15	45
quartz	-	-	-	-	-	20	45	25
biotite	-	2	2	-	3	2	-	tr
phlogopite	-	-	-	-	-	-	12	-
tremolite	-	-	3	2	-	-	-	-
sphene	-	-	tr	tr	2	2	-	tr
apatite	-	-	-	-	1/2	1/2	-	-
graphite	-	tr	-	-	-	-	-	-
opaques	5	-	-	-	-	-	3	-

TABLE 13A: Estimated modal compositions (in percent) of some thin sections of selected rock types. Sections-4-31 to 4 are taken from Karvinen (1973, Table AlV) and the prefix 3- has been omitted from the sample numbers (e.g. 4-31 is 3-4-31).

GEOCHEMISTRY: The results of several whole rock and trace element analyses of selected rock types and minerals performed by Karvinen (1973) are presented in Table 13B.

	1	2	3	4
SiO_2	54.5	53.5	71.1	53.9
TiO_2	0.1	1.2	0.5	0.0
Al_2O_3	1.0	15.0	11.6	1.2
$*Fe_2O_3$	6.5	10.6	7.0	1.7**
MgO	15.8	4.5	1.6	17.7
CaO	22.0	6.8	1.7	24.1
Na_2O	1.4	5.3	3.1	1.3
K_2O	0.1	1.9	2.2	0.1
MnO	-	-	-	0.1
Cr_2O_3	-	-	-	0.0
Total	99.4	98.8	-	100.1

	5	6
Cu	34	41
Mo	400	10
Ni	20	25
V	54	100
Mn	865	1090
Co	0	20
Sr	132	200
Cr	88	60
Pb	29	12
Zn	108	128
Sn	1	2

1. scapolite skarn (pyroxenite) - Table X111
2. biotite-hornblende gneiss - av. of 2 samples- Table XX
3. scapolite quartzite - Table XX
4. diopside grain from skarn - Table 1V
5. skarn - Table XV
6. hornblende gneiss - Table XX1

* total iron as Fe_2O_3

** total iron as FeO

TABLE 13B: Whole rock chemical compositions (in percent) and trace element contents (in ppm) of selected samples of rock types and minerals from the Zenith molybdenum deposit. The analyses are all taken from Karvinen (1973, Appendix A). Analysis 4 was performed with an electron microprobe

DISCUSSION: The deposit is a member of a large group of very similar molybdenum deposits that occur in the Pembroke-Renfrew area. Analogy with these deposits suggests that the Zenith molybdenum deposit is probably metamorphogenic in origin.

DEVELOPMENT HISTORY

Development work proceeded separately on Lots 27 and 28 until 1924.

Con. 4 Lot 28

1914: deposit discovered by William Warren, mining rights sold to Sir Henry Pellatt

1915-1916: property worked by M. J. Paterson

1917: work continued by A. W. Taylor. Development work from 1915-1917 consisted of stripping and excavation of a shaft and test pits. In 1917, 81 tons of ore were mined from which 7800 pounds of pure molybdenite and 472 pounds of flake containing 65% MoS_2 were produced.

Con. 4 Lot 27

1914: work commenced by R. R. Gamey under direction of W. J. Urquhart

1916-1917: mining rights sold to Canadian Molybdenite Co. Ltd. 86 pounds of ore carrying 45.5 percent MoS_2 and 1435 pounds containing 2.1 percent MoS_2 were shipped to the Mines Branch, Ottawa, and about 60 pounds of pure molybdenite were recovered

1919: Eureka Molybdenite Corp. formed- no work done

1923: mining rights sold to F. L. Stinson who formed Phoenix Molybdenite Corp.

Con. 4 Lots 27 and 28

1924: Phoenix Molybdenite Corp. purchased mining rights to Lot 28

1924-1937: Phoenix Molybdenite Corp. sank a shaft 205 feet in depth with levels at 95 and 175 feet. A mill of 100 tons per day capacity was erected and operated intermittently from 1934 to 1937. During this time a total

of 8,579 tons of ore were hoisted. In 1934, 3,300 pounds of concentrates were produced, while 7.5 tons and 6.5 tons were produced in 1936 and 1937 respectively. The concentrate contained between 80 and 85 percent MoS_2.

1938: Zenith Molybdenite Corp. acquired assets of Phoenix Molybdenite Corp. 4,800 feet of surface trenched performed.

1939-1940: Some diamond drilling from the 175-foot level of the shaft performed by Zenith Molybdenite Corp.

1942-1943: Wartime Metals Corp. drained the mine and completed 836 feet of underground diamond drilling and 874 feet of drifting and cross-cutting. During this period 400 tons or ore grading 0.85 percent MoS_2 were produced.

1955: Goldyke Mines completed 11 diamond drill holes totalling 336 feet on the 175-foot level in search for uranium.

REFERENCE MAPS

GSC 1046A, Renfrew, 1956

ODM 53b, Renfrew Area, 1945

REFERENCES

Eardley-Wilmot, V.L.
1925: Molybdenum; Canada Department of Mines, Pub. No. 592, P. 83-86

Freeman, B. C.
1936: Mineral Occurrences in Renfrew County and Vicinity; Geological Survey of Canada, Memoir 195, P. 16-20

Hewitt, D. F.
1967: Uranium and Thorium Deposits of Southern Ontario; Ontario Department of Mines, M.R.C. No. 4, P. 65

Johnston, F. H.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P.56

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1973: Metamorphogenic Molybdenite Deposits in the Grenville Province; unpubl. PhD thesis, Queen's University, Kingston, Ontario

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1952: Canadian Deposits of Uranium and Thorium (Interim Account); Geological Survey of Canada, Economic Geology, Series No. 16, P. 248

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1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P.1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Parsons, A.R.
1917: Molybdenite Deposits of Ontario; Ontario Bureau of Mines, Annual Report Vol. 26, 1917, P. 289

Quinn, H.A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada Paper 51-27, P. 58-59

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report, Vol. 53, Part 3, 1944, P. 73-75

Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 20, P. 160-161

14. QUILTY

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Marble, granite pegmatite
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Blithfield Township, Renfrew County NTS 31F/7, UTM Zone 18, 5020340N, 356970E LAT. 45^{o} 19' 26"N; LONG. 76^{o} 49' 30"W Con. 1, Lot 29
ACCESS	The deposit is located about 600 metres west of a power transmission line and about 1,600 metres southwest of a gravel road.
SIZE AND GRADE	Mineralization consists of disseminated molybdenite associated with pyrite and pyrrhotite in a stratabound lens about 3.66m (12 feet) wide and of unknown length. Workings consist of six pits "sunk at various places along the strike, five being merely prospect pits. The main pit or quarry is 50 by 70 feet, and 10 to 12 feet deep" (Eardley-Wilmot, 1925, p. 88)
DESCRIPTION	The Quilty molybdenum deposit occurs within a northeast-trending succession of marble and minor sandstone that dips moderately to the southeast. According to Satterly (1945, p. 77) "the country rock is a white crystalline limestone intruded by a will or dike of pink granite or granite-pegmatite about 40 feet....the mineralized zone is a pyroxenite containing disseminated pyrrhotite, pyrite, and scattered large flakes of molybdenite. Cutting the pyroxenite are a number of stringers, which fill vertical joints from a quarter of an inch to half an inch in width and are composed of coarse pyrite and scattered flakes of molybdenite. The pyroxenite occurs between the granite-pegmatite and overlying pink crystalline limestone". The units are reported to dip to the southeast at between 10 and 45 degrees (see Figure 14A). The Quilty deposit is very similar to many other of the molybdenum deposits in the Pembroke-Renfrew area and is probably metamorphogenic in origin.
DEVELOPMENT HISTORY	1917: The owner, Mr. Quilty, sold 500 acres of mining rights through Mr. Christopher of Pittsburg to Schutz, Schreiner, and Clyde Company, also of Pittsburg. A total of six pits were excavated, five being merely exploratory. The main pit yielded 19 tons of 0.45 percent ore which was shipped to the Mines Branch, Ottawa, and from which 120 pounds of molybdenum were obtained.
REFERENCE MAPS	GSC 1046A, Renfrew, 1956 ODM 53b, Renfrew Area, 1945
REFERENCES	Eardley-Wilmot, V.L. 1925: Molybdenum; Canada Department of Mines, Pub. No. 592, P.88 - 89. Johnson, F.H. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.O. No. 7, P.57 Parsons, A.L. 1917: Molybdenite Deposits of Ontario; Ontario Bureau of Mines, Annual Report Vol. 26, 1917, P. 290

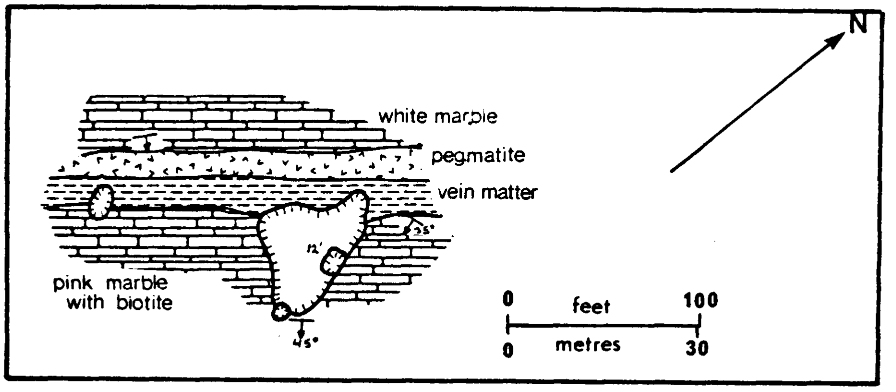

Figure 14A — Geology of the Quilty deposit. Adapted from Eardley-Wilmot (1925, Fig.20).

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, P.60

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Vol. 53, Part 3, 1944, P.77

Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 20, P. 164

15. COLE

COMMODITY — Molybdenum

ROCK ASSOCIATION — HOST: Pyroxenite skarn
OTHER: Calcitic marble, pegmatite, felspathic sandstone

CLASSIFICATION — 1A Stratabound, skarn hosted

LOCATION — Bromley Township, Renfrew County
NTS 31F/10, UTM Zone 18, 5053560N, 344280E
LAT. 45° 37' 12"N; LONG. 76° 59' 51"W
Con. 5, Lot 24

ACCESS — The deposit is located about 670m (2,200 feet) northwest of a gravel road and 640m (2,100 feet) southwest of a dirt side-road.

SIZE AND GRADE — Mineralization consists of erratically distributed coarse flakes of molybdenite associated with pyrrhotite and pyrite sparsely disseminated within an orebody of unknown dimensions. Workings consist of at least fourteen pits and trenches of varying sizes and an adit 92m (300 feet) long that extends in an east-west direction underneath the pits (see Figure 15A).

DESCRIPTION — The Cole molybdenum deposit occurs within a northwest-trending succession of intercalated marble and sandstones that are cut by numerous dikes and sills of pegmatite. The mineralization consists of erratically distributed coarse flakes of molybdenite associated with pyrrhotite and pyrite that is contained within a pyroxenite skarn zone that has developed within the intercalated marbles and sandstones. The skarn is a coarse-grained dark green rock that is composed essentially of diopside with variable amounts of actinolite, calcite, and plagioclase and which is cut by numerous veinlets and dikes of white plagioclase and pegmatite.

Marble occurs as large broken lenses and layers within the pyroxenite and is a medium-grained white rock composed essentially of calcite with abundant diopside, quartz, plagioclase, and biotite.

There are also numerous preserved layers of sandstone which forms a well-layered rock composed of fine-grained plagioclase and variable amounts of diopside, quartz, and biotite.

The Cole deposit is very similar to many of the other molybdenum deposits in the Pembroke-Renfrew area and is probably metamorphogenic in origin.

DEVELOPMENT HISTORY

1914-1918: Some pits were dug during this period, and 1½ tons of ore were removed by unknown operators.

1939-1940 H. Edelstein did some surface work in the summer of 1939, and in October of that same year Puritan Mines, Ltd. took over the property and worked it until Mar. 15, 1940. During this time a 300 foot adit was driven.

1942: The property was owned by Ajax Tungsten and Molybdenum Mines, Ltd. and was acquired by Buckhorn Mines, Ltd. in December of this year. No development work was carried out.

REFERENCE MAP — ODM 53b, Renfrew Area, 1945

REFERENCES

Johnston, F. J.
1917: Molybdenite Deposits of Ontario; Ontario Bureau of Mines, Annual Report, Vol. 26, 1917, P. 290

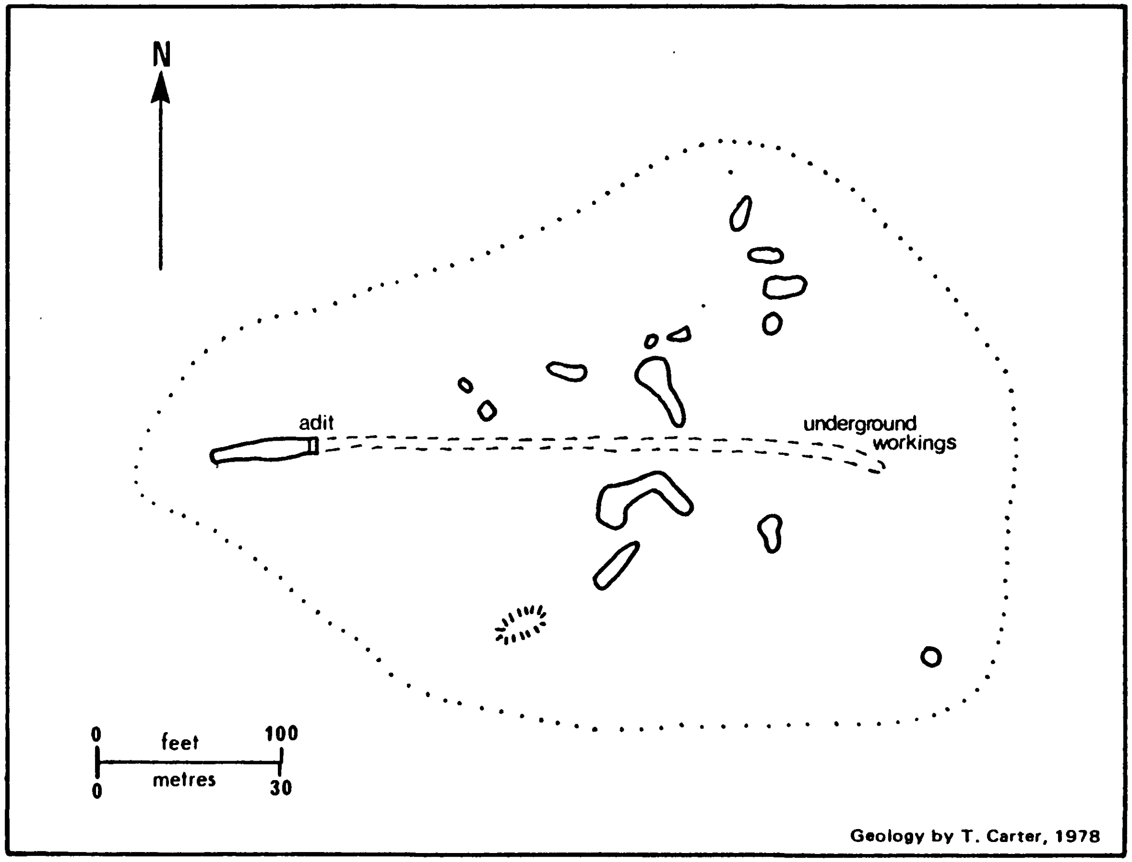

Figure 15A — Geology and workings of the Cole molybdenum deposit.

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Parsons, A.L.
1917: Molybdenite Deposits of Ontario; Ontario Bureau of Mines, Annual Report, Vol. 26, 1917, P. 290

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Vol. 55, part 3, 1944, P. 77-78

Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 20, P. 164-165

16. BOX

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Marble, pegmatite, quartzite
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Brougham Township, Renfrew County NTS 31F/2, UTM Zone 18, 5006320N, 350350E LAT. 45° 11' 47"N; LONG. 76° 54' 19"W Con. 1, Lot 18
ACCESS	The deposit is reported to be located a few tens of metres north of a gravel road just north of the Madawaska River.. The exact location is uncertain as it was not visited by the authors.
SIZE AND GRADE	Mineralization consists of sparsely disseminated molybdenite in a zone of unknown, but limited dimensions. Satterly (1945, p. 78) describes a pit, a trench, a covered shaft, and two prospect pits at the location.
DESCRIPTION	The deposit occurs within a northeast trending succession of intercalated marble and amphibolitic metasedimentary rocks near the margin of a large granitic intrusion. According to Satterly (1945, p. 78), "the main showing is exposed in a pit 10 by 12 feet and 12 feet deep about 130 feet up the slope of a hill from a road at the Madawaska river. The pit is old and the rocks are heavily stained with rust. The rocks dip 45°S.E. and from southeast to northwest are found crumbly crystalline limestone, underlain in turn by 12 inches of pyroxenite, 18 inches of pegmatite, 60 inches of pyroxenite, and lastly, crystalline limestone. The pyroxenite is heavily mineralized with pyrite and pyrrhotite and more rarely with coarse flakes of molybdenite. "At the road and to the northwest of the possible extension of the pyroxenite bands is a trench across the strike, 50 feet long, 6 feet wide, and 5 feet deep. At its south end is a covered shaft, 8 by 6 feet. The trench exposes crystalline limestone, serpentinized crystalline limestone, and narrow interbeds of grey biotite quartzite. The bedding strikes N40°E and dips 55°S.E. A little scattered pyrrhotite was observed, but no molybdenite". "Up the hill, there are two other shallow prospect pits at 275 and 340 feet northeast of the road. These expose banded crystalline limestone containing a little disseminated graphite and a few grains of pyrrhotite." "The small amount of molybdenite seen in the main showing is not encouraging, and no further exploration would appear to be justified. The deposit is very similar to many of the other molybdenum deposits in the Pembroke-Renfrew area and is probably metamorphogenic in origin.
DEVELOPMENT HISTORY	before 1944: one pit, a trench, a shaft, and two small prospect pits excavated by unknown operators.
REFERENCE MAPS	GSC 1046A, Renfrew, 1956 ODM 53b, Renfrew Area, 1945

REFERENCES

Freeman, B. C.
1936: Mineral Occurrences in Renfrew County and Vicinity; Geological Survey of Canada, Memoir 195, P.12

Johnston, F.J.
(1968): Molybdenum Deposits of Canada, Geological Survey of Canada, Economic Geology Series No. 20, P. 154-155.

Satterly, J.
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Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 20, P. 154-155

17. CHARRON

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pegmatite OTHER: Marble, calcareous mudstones (hornblende-biotite paragneisses)
CLASSIFICATION	1B. Unconformable-to-conformable, pegmatite hosted
LOCATION	Brougham Township, Renfrew County NTS 31F/7, UTM Zone 18, 5016980N, 348090E LAT. 45° 17' 31"N; LONG. 76° 56' 14"W Con. 11, Lot 15
ACCESS	The deposit is located about 300m east of a disused dirt road. It was not visited by the authors.
SIZE AND GRADE	Mineralization consists of sparesely disseminated flakes of molybdenite with associated pyrite and pyrrhotite in a zone of unknown extent. The workings have been described by Satterly (1945, p. 80) as follows: "a number of workings occur on the hill slope, the main open cut being 450 feet southwest of the creek outlet at the south side of Jacktar Lake." "The open cut is 30 feet long in a S65°W direction, 6 to 10 feet wide, and 10 feet deep. From the open cut a stripping extends 65 feet in a N60°W direction, ending in a pit 28 feet long, 10 feet wide and 3 feet deep. In the same direction at 118 feet and 52 feet southwest is a pit 8 by 10 feet and 5 feet deep. At 188 feet, N60°W from the open cut, is another pit 15 by 10 feet and 5 feet deep, with shallow trenching and stripping to the northwest for 50 feet".
DESCRIPTION	The Charron molybdenum deposit occurs within a northwest-striking succession of interbedded marble and calcareous mudstones near the margin of a large granitic intrusion. According to Satterly (1945, p. 80), "the open cut exposes biotite and hornblende paragneisses, containing a narrow interbed of limestone, cut by an irregular mass of rusty-weathering granite-pegmatite containing coarse pyrrhotite, some pyrite, and more rarely flakes of molybdenite. The gneisses strike N30°W and dip 35° to 45°E. In the stripping northwest of the open cut are two bands of rusty pegmatite, 3 feet apart, ranging from 1 to 3 feet in width. Little molybdenite could be seen. The bands of pegmatite appear to dip west, although in the open cut they appear to lens out downwards. In the far pit there is a 2-foot band of pegmatite in rusty paragneiss; limestone outcrops just west of the pit and would dip beneath it. In none of the workings is there much molybdenite to be seen, although the rocks are heavily rust-stained." "Below the workings on the slope of the hill and to the south crystalline limestone is exposed striking N25°W. To the west of and above the workings, paragneiss or granitized paragneiss outcrops. The gneisses dip beneath the limestone". The deposit is very similar to many other molybdenum deposits of this type in the Pembroke-Renfrew area and is probably metamorphogenic in origin.
DEVELOPMENT HISTORY	1910- 1916: Considerable trenching and pitting by J. Charron 1965: A.C.A. Howe sampled and mapped the property for Ciglen Investments Ltd.
REFERENCE MAPS	GSC 1046A, Renfrew, 1956 ODM 53b, Renfrew Area, 1945

REFERENCES

Johnston, F. J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7 P. 59.

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario; Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247 Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Parsons, A.L.
1917: Molybdenite Deposits of Ontario; Ontario Bureau of Mines, Annual Report, Vol. 26, 1917 P. 294.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report Vol. 55, part 3, 1944, P. 79-80.

Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 20, P. 154.

18. GUINEY

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Uncertain OTHER: Marble pegmatite
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Brougham Township, Renfrew County NTS 31F/7, UTM Zone 18, 5018930N, 350190E LAT. 45^{o} 18' 35"N; LONG. 76^{o} 54' 40"W Con. 12, Lot 8
ACCESS	The deposit is reported to be located "about 1,500 feet north 40 degrees west from the fire tower on Mount St. Patrick" (Quinn, 1952, p. 64). It was not located by the authors.
SIZE AND GRADE	Mineralization consists of disseminated molybdenite in a zone of unknown dimensions. A sample collected by Walker from this deposit contained 0.98 percent Mo and no copper (Walker, 1911, p. 47). There is no record of any workings on this property.
DESCRIPTION	The reported location of the deposit is within marble near the contact of a small body of pegmatitic granodiorite. The deposit was not visited by the authors and there is no published description of the geological relationships of the deposit.
DEVELOPMENT HISTORY	before 1911: minor amount of development work by unknown operators
REFERENCE MAPS	GSC 1046A, Renfrew, 1956 ODM 53b, Renfrew area, 1945

REFERENCES

Eardley-Wilmot, V.L.
1925: Molybdenum; Canada Department of Mines, Pub. No. 592, P. 89

Johnston, F.J.
1968: Molybdenum Deposits of Ontario. Ontario Department of Mines M.R.C. No. 7, P. 65

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties, Ontario; Geological Survey of Canada, Paper 51-27, P. 64

Walker, T. L.
1911: Report on the Molybdenum Ores of Canada; Canada Department of Mines, Pub. No. 93, P. 47

19. HUNT

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Marble, pegmatitic granodiorite, biotite and amphibole parageisses
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Brougham Township, Renfrew County NTS 31F/7, UTM Zone 18, 5018380N, 350620E LAT. 45^{o} 18' 18"N; LONG. 76^{o} 54' 19"W Con. 11, Lots 8 and 9
ACCESS	The deposit is accessible via a single-lane dirt road that leads to the workings of the former mine-site.

SIZE AND GRADE

Mineralization consists of erratically disseminated coarse flakes of molybdenite associated with pyrite and pyrrhotite disseminated within two stratabound orebodies. The upper orebody "averages 6 feet wide....and has been traced along the hillside by open cuts and stippings for about 400 feet; and has been proved for a depth of 150 feet along its dip by shafts and tunnels "(Eardley-Wilmot, 1925, p. 89). The dimensions of the lower orebody are not known. According to Eardley-Wilmot (1925, p. 93) the lower zone was the richest and he reports that good ore was still in sight when mining operations ceased, but no estimates of grade or tonnage are available. Estimates of the average grade of the ore mined by Renfrew Molybdenum Mines Ltd. from 1916 to 1918 are presented in Table 19A.

Year	Ore mined	Ore milled	MoS_2
	tons	tons	
1916...	1,200	100.0	1.29
1917...	4,500	3,656.0	0.75 (approximately)
1918...	3,449	3,155.0	0.50 (calculated from mill recovery figures)

TABLE 19A: Mine production from 1916 to 1918 by Renfrew Molybdenum Mines Ltd., from M. E. Wilson (1921, p. 94)

Workings are extensive, both underground and on the surface. The surface workings consist of a series of open cuts, trenches, and strippings that extend along the strike of the deposit for about 180 metres (600 feet) (see Figure 19A), in addition to three shafts and an adit that provide access to the underground workings. The work done underground "consists approximately of 1,800 to 2,000 feet of cross-cuts and drifts on four levels between the depths of 40 and 150 feet, and they are connected by about 230 feet of shafts and raises. Besides this, about 400 feet of drifts have been widened out into stopes from 20 to 25 feet wide". (Wilson, 1921, p. 89) (see Figure 19B).

DESCRIPTION

GENERAL GEOLOGY: The Hunt molybdenum deposit occurs within a sequence of northwesterly-trending marbles and minor mudstones along the contact with a large sill-like mass of granitic pegmatite. Pyroxenite skarn zones are developed in the marble along the contact with the pegmatite and a few metres away from the contact (see Figures 19A, 19C, 19D).

Rock types exposed in the vicinity of the deposit include clacitic and dolomitic marble, pegmatite, biotite gneiss, amphibole gneiss, hedenbergite gneiss and pyroxenite skarn. The marbles are coarse-grained white rocks composed essentially of calcite and/or dolomite with variable amount of white mica, quartz, and diopside. The pegmatite is a massive, coarse-grained, (3mm), pink rock composed of a mixture of quartz,

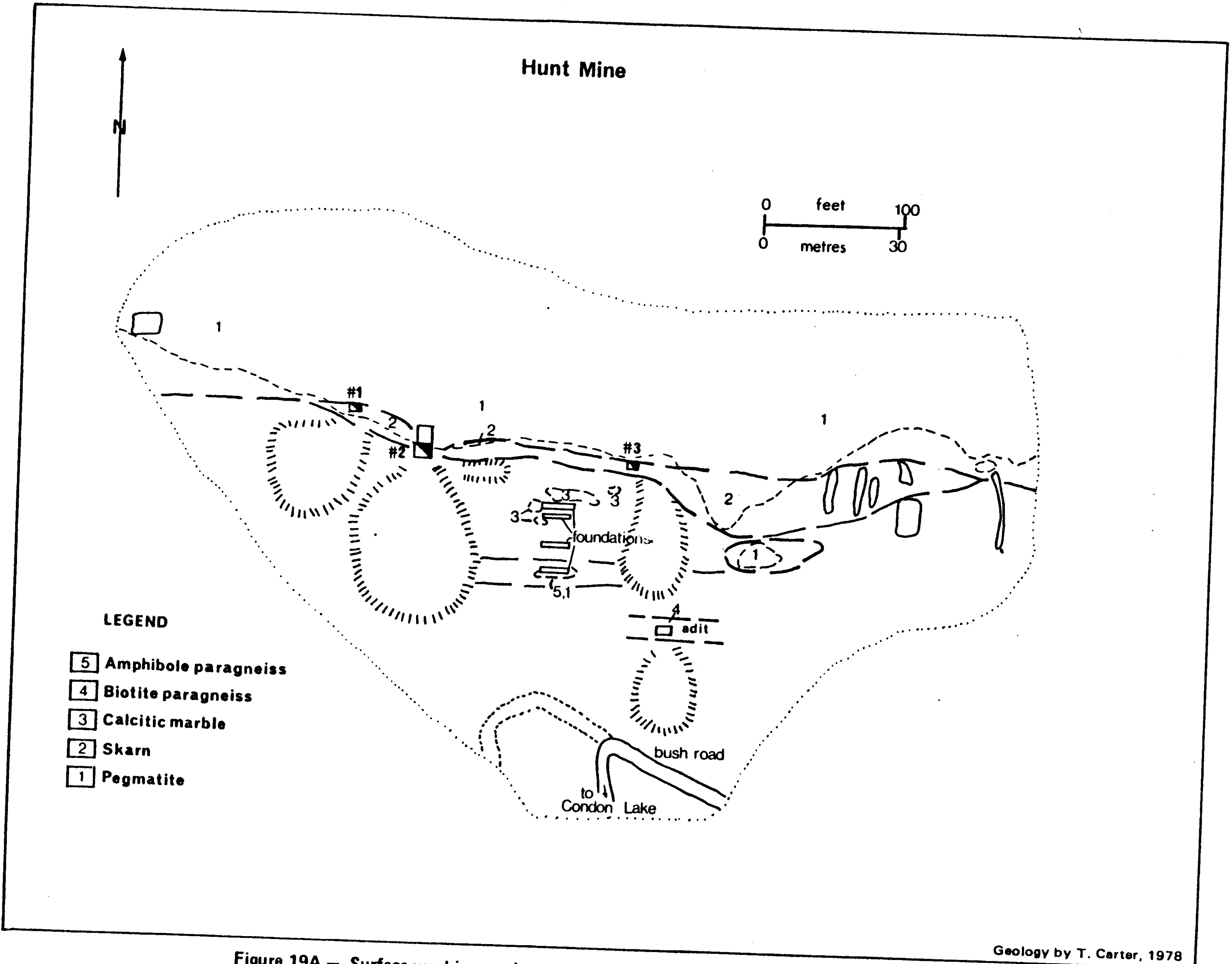

Figure 19A — Surface workings and geology of the Hunt molybdenum deposit.

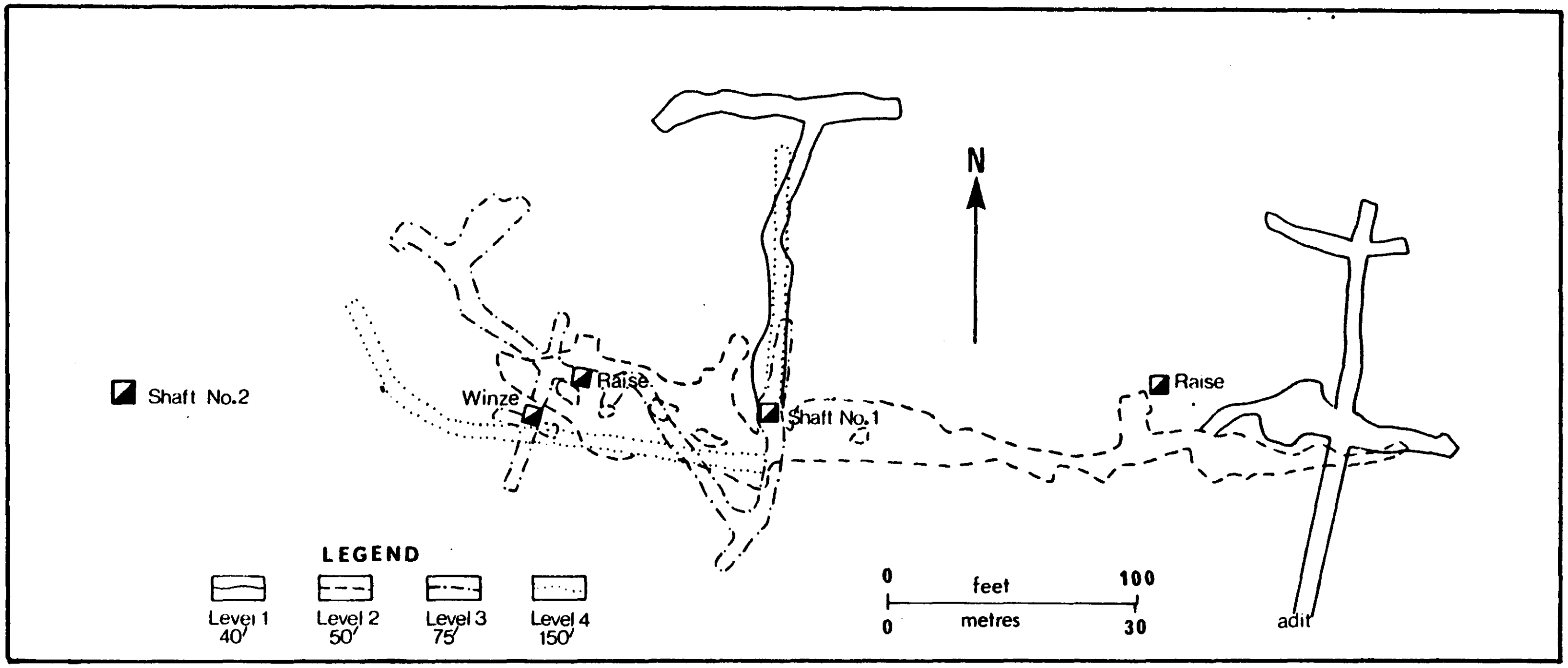

Figure 19B — Plan of underground workings, Hunt molybdenum mine. Adapted from Wilson (1921, p.40).

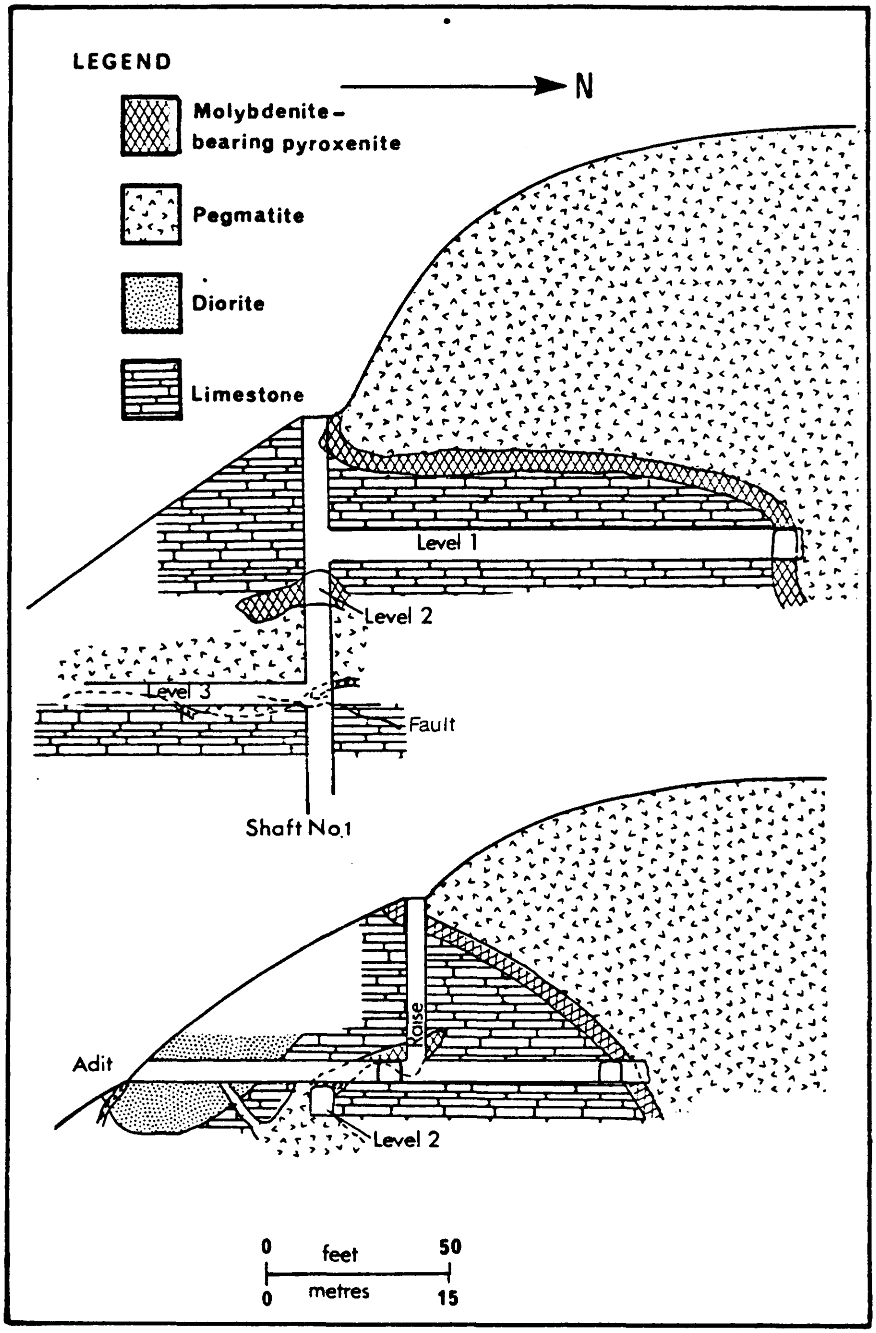

Figure 19C — North-south cross-sections showing contact relationships of molybdenum ore-bodies at the Hunt mine. Adapted from Wilson (1921, p.38).

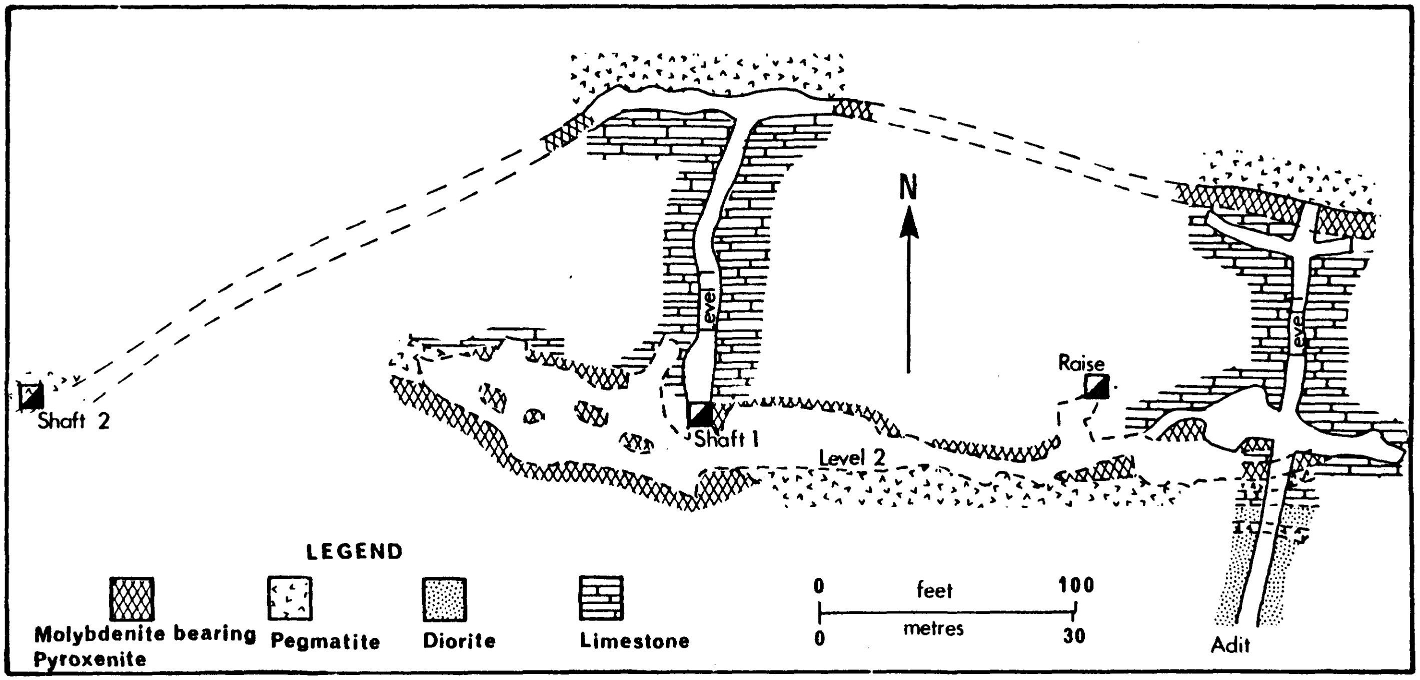

Figure 19D — Plan of No.1 and No.2 levels of the Hunt molybdenum mine. Adapted from Wilson (1921, p.39).

microcline, plagioclase, and minor magnetite. The biotite gneiss is a strongly foliated rock composed of fine-grained biotite, quartz, and feldspar, and the amphibole gneiss is similar, except for the presence of amphibole. The hedenbergite gneiss is reported to be exposed on top of the ridge and is "a well-foliated, medium-to-fine-grained, dark-green rock which consists entirely of scapolite (mizzonite) and hedenbergite, with only small amounts of sphene, pyrrhotite, and apatite", (Karvinen, 1973, Appendix A). The pyroxenite skarn is a massive, coarse-grained, dark green rock that consists essentially of diopside and minor scapolite, tremolite, and microcline, and locally abundant pyrite and pyrrhotite.

MINERALIZATION: Mineralization consists of erratically disseminated coarse flakes of molybdenite associated with masses of pyrite and pyrrhotite in two stratabound bodies of pyroxenite skarn. The upper orebody forms a stratiform layer along the contact between the pegmatite and marble that is reported to average 6 feet in width and is continuous along strike for at least 400 feet and down dip for 150 feet (Eardley-Wilmot, 1925, p. 89), (see Figures 19C, 19D).

A second orebody is located within marble near a tongue of pegmatite a few metres below the upper orebody, and is reported to be richer of the two.

MICROSCOPY: Karvinen (1973) prepared several thin sections from samples collected at the former mine-site. Modal analyses of some of these sections are presented in Table 19B.

	Skarn			Hedenbergite gneiss	
	3-3-10	3-3-20		3-3-56	3-3-57
diopside	92	38	hedenbergite	50	50
scapolite	3	45	scapolite	38	43
tremolite	tr	0	calcite	4	1
po-py	4	1	hornblende	0	3
microcline	0	15	sphene	2	3
phlogopite	tr	0	microcline	4	0
calcite	1	0	chlorite	1/2	0
sphene	tr	1/2	quartz	0	0
chlorite	1	0	apatite	tr	tr
			po-py	1	tr

	Pegmatite		Marble	
	3-3-17		3-3-80	3-3
quartz	40	calcite	7	87½
microcline	35	dolomite	92	10
plagioclase (An_{23})	25	muscovite	1	tr
magnetite	tr	quartz	0	2
		graphite	tr	1/2
		pyrite	tr	0

TABLE 19B: Modal analyses of some thin sections of selected rock types. Taken from Karvinen, 1973, Table AIII

GEOCHEMISTRY: The results of several whole rock and trace element analyses of selected rock types and minerals performed by Karvinen (1973) are presented in Table 19C.

	1	2	3		4	5
SiO_2	53.5.	54.2	48.3	Cu	6	8
TiO_2	0.0	0.1	1.1	Mo	10	12
Al_2O_3	1.0	10.9	11.0	Ni	6	48
Fe_2O_3*	6.2**	5.3	8.7	V	52	117
MnO	0.2	-	-	Mn	1425	1000
MgO	14.2	7.8	6.0	Co	3	22
Ca	23.2	15.7	18.6	Sr	250	310
Na_2O	1.2	3.9	3.1	Cr	17	60
K_2O	0.0	1.2	0.3	Pb	13	11
Cr_2O_3	0.0	-	-	Zn	210	295
Cl***	-	-	1.7	Sn	2	2
CO_2***	-	-	1.1			
Total	99.5	99.1	99.9			

1. diopside grain from skarn - Table IV
2. skarn - Table XIII
3. hedenbergite gneiss - av. of 2 samples - Table XVI
4. skarn - av. of 2 samples - Table XV.
5. hedenbergite gneiss - av. of 3 samples

* total iron as Fe_2O_3

** total iron as FeO

*** calculated from average modal percent and composition of scapolites

TABLE 19C: Whole rock chemical compositions (in percent) and trace element contents (in ppm) of selected samples of rock types and minerals from the Hunt deposit. The results are taken from Karvinen (1973). Analysis #1 was performed with an electron microprobe

DISCUSSION: The geological setting and nature of the orebody of the Hunt molybdenum deposit appear to indicate that it formed as a result of contact metasomatic effects of the pegmatite on the marble. But Karvinen (1973, Appendix A) cites evidence that the pegmatite formed after the skarn and notes that the pegmatite is unmineralized and contains only iron oxides and no sulfides. Consequently, the molybdenite mineralization is not related to intrusion of the pegmatite but rather is probably metamorphogenic in origin.

This conclusion is supported by the close similarity of the rock types at the Hunt deposit, with the exception of the pegmatite, to other similar molybdenum deposits in the Pembroke-Renfrew area, all of which are believed to have a common mode of formation.

DEVELOPMENT HISTORY

before 1912: Cornelius Hunt discovered molybdenite on the farm of Daniel Hunt, his father. The property was optioned to some American businessmen but was soon dropped.

1912-1914: property optioned by F.R. Aufhammer in late 1912 who sold the option to Algunican Development Company, a Belgian syndicate. After some diamond drilling and development work, the company closed down due to the outbreak of war.

1915-1918: Renfrew Molybdenum Mines Ltd. was formed in about 1915 and operated the property as a mine from 1915 to 1918. The work done consisted of approximately 1,800 to 2,000 feet of cross-cuts and drifts on four levels between depths of 10 and 150 feet, connected by about 230 feet of raises and shafts. In addition, abut 400 feet of drifts were widened

into stopes from 20 to 25 feet wide. Total production amounted to 96,660 pounds of concentrates, 85 percent of which averaged about 95 percent MoS_2. All the ore, except 55 tons sent to Ottawa, was treated in a 30 ton per day concentrator at the site.

1965: self-potential survey by New Far North Exploration Ltd.

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ODM 53b, Renfrew Area, 1945

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20. MALONEY

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Uncertain OTHER: Marble, calcareous mudstone
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Brougham Township, Renfrew County NTS 31F/7, UTM Zone 18, 5019770N, 347120E LAT. 45° 19' 00"N; LONG. 76° 57' 02"W Con. 13, Lot 13; Con. 14, Lot 14.
ACCESS	The deposit is located within 400 metres of a single-lane dirt road. It was not visited by the authors, however, so its exact location is unknown.
SIZE AND GRADE	Mineralization is reported to consist of disseminated molybdenite in small bodies that "are patchy and ill-defined; the mineralization is diffused over a large and on many small contacts, none of which is likely to produce an ore-body of sufficient magnetide and grade to justify development" (Eardley-Wilmot, 1925, p. 99). Workings are reported to consist of three or four small test pits.
DESCRIPTION	The Maloney molybdenum deposit is situated within a sequence of interbedded marbleand calcareous mudstones near the contact of a syenite intrusion. According to Eardley-Wilmot (1925, p. 99) "the granite-limestone contacts are molybdenite bearers" ... but the ore is lean and occurs in a similar manner to that found on the O'Brien property. However, this description is too vague to permit classification of the deposit and the origin of the mineralization is uncertain.
DEVELOPMENT HISTORY	before 1925: three of four small test pits excavated by unknown operators.
REFERENCE MAPS	GSC 1046A, Renfrew, 1956 ODM 53b, Renfrew Area, 1945
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21. ROSS-O'BRIEN

COMMODITY — Molybdenum

ROCK ASSOCIATION — HOST: Hedenbergite gneiss
OTHER: Marble, gneissic 'granite', paragneiss

CLASSIFICATION — 1C. Stratiform, amphibole paragneiss hosted

LOCATION — Brougham Township, Renfrew County
NTS 31F/7, UTM Zone 18, 5016270N, 347885E
LAT. 45° 17' 08"N; LONG. 76° 56' 23"W
Con. 11, Lots 16 and 17
Con. 12, Lot 18

ACCESS — The property is accessible by foot 2,134m (7,000 feet) south of a gate on a single-lane dirt road that passes through the property.

SIZE AND GRADE — Mineralization consists of coarse flakes of molybdenite associated with masses of pyrite and pyrrhotite that occur as erratically distributed, narrow, concordant seams and veins contained within a stratabound zone of uncertain dimensions. Diamond drilling on the former O'Brien property on Con. 9, Lot 17 by Major Molybdenite Mines Ltd. indicates mineralization "at shallow depths over an area 75 feet wide and 200 feet long in the vicinity of the old workings.... possibly 2,000 tons of ore, which might average 1 percent MoS_2 could be recovered" (Satterly, 1945, p. 81).

In 1965, A. C. A. Howe and Associates performed some work on the property for Ciglen Investments Ltd. during which they took representative samples of mineralization from the pits and analysed them for their MoS_2 content. The results are presented in Table 21A.

Workings on the property are extensive and consist of a varied assortment of pits, trenches, shafts, and stippings (Figure 21A). There is another pit, not indicated, on Figure 21A which is located 152m (500 feet) north-northeast of pit No. 5.

	% MoS_2	Type of Sample
pit 1	0.122	dump .... 15 lb.
pit 2	0.076	veinlet ...... 3 feet
pit 4	0.065	dump . ...10 lb.
pit 5	0.135	dump .... 5 lb.
pit 6	0.191	dump ....10 lb.
	0.170	veinlet......2.5 feet
pit 8	0.361	veinlets ......6 feet
	2.986	veinlet .....0.25 feet
	0.327	veinlets......3.5 feet
	0.324	veinlets......3.5 feet
pit 9	0.797	veinlet.......3.0 feet
	0.858	dump ....20 lb.

TABLE 21A: MoS_2 content of some samples collected by A.C.A. Howe Associates for Ciglen Investments from the workings on the Ross-O'Brien deposit (Assessment Files, Technical File No. 63A-468),

DESCRIPTION — GENERAL GEOLOGY: The Ross-O'Brien deposit occurs within a sequence of intercalated marbles and calcareous mudstones and sandstones near the northern end of a small granitic intrusion. The rock units generally strike northwesterly and dip moderately to the north.

Biotite gneiss, hedenbergite gneiss, and minor marble are exposed in the workings on the deposit.

The biotite gneiss is a medium-grained, black rock composed essentially of oligoclase (An_{23}), quartz, biotite, and hornblende

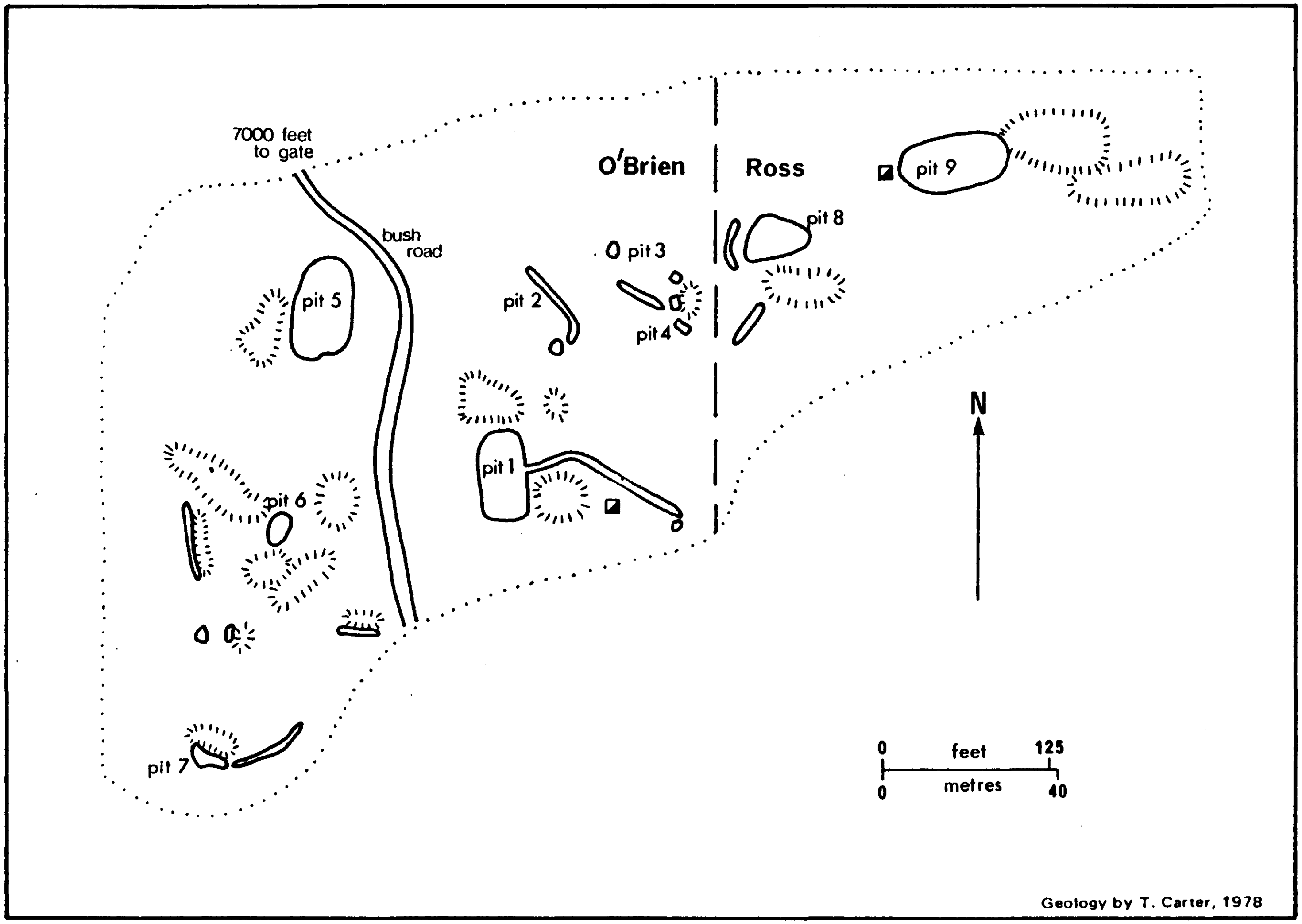

Figure 21A — Workings of the Ross-O'Brien molybdenum deposit.

with minor microcline, sphene, apatite, and calcite. The biotite gneiss is gradational into the hedenbergite gneiss which is rusty-weathering, partly-layered rock composed of scapolite (mizzonite), oligoclase (An_{23}), and hedenbergite with minor quartz, sphene, apatite, hornblende, calcite, pyrite, and pyrrhotite. The scapolite is only locally abundant (Karvinen, 1973, Appendix A).

MINERALIZATION: Mineralization consists mainly of coarse flakes of molybdenite contained in narrow (1 to 15cm) conformable vuggy, pegmatitic layers and lenses of quartz, microcline, pyrite, and pyrrhotite. The layers and lenses occur only in the hedenbergite gneiss. There is also a small amount of disseminated molybdenite in the hedenbergite gneiss, (Karvinen, 1973, Appendix A).

MICROSCOPY: Karvinen (1973, Appendix A) prepared several thin sections from samples of biotite gneiss and hedenbergite gneiss collected at the deposit. Modal analyses of these sections are presented in Table 21B. The biotite gneiss consists of oligolase (An_{23}), quartz, biotite, hornblende, and minor microcline, sphene, apatite, and calcite. "The oligoclase is poorly zoned and has partly altered cores. The hornblende is pleochroic from pale-green to dark-green, and is associated with biotite in thin layers. Quartz occurs in large, elongated grains which are parallel to the main foliation" (Karvinen, 1973, Appendix A).

The hedenbergite gneiss consists of scapolite (mizzonite), oligoclase (An_{23}), hedenbergite, and minor quartz, sphene, apatite, hornblende, calcite, pyrite and pyrrhotite. "The grains of scapolite are clear and colourless, and some contain needle-like crystals of an opaque mineral. The oligoclase is poorly zoned, well-twinned and unaltered. Hedenbergite is medium-green in colour and is normally partly altered to an amphibole which is optically identical to the hornblende in the biotite gneiss. Microcline is common near quartz grains, but does not occur in contact with or near scapolite". (Karvinen, 1973, Appendix A).

Hedenbergite gneiss

	3-5-4	3-5-7	3-5-8*	3-5-11	3-5-26
plagioclase	52	0	37	0	43
hedenbergite	30	45	20	45	23
scapolite	7	51	0	48	0
microcline	2	0	2	0	25
quartz	7	0	5	5	0
sphene	2	2	0	2	1
apatite	0	1/2	tr	0	0
po-py	0	1	0	0	0
hornblende	0	0	35	0	8
calcite	0	0	1/2	0	0

Biotite gneiss

	3-5-18	3-5-19	3-5-22
plagioclase	64	63	52
quartz	15	20	30
hornblende	10	5	3
biotite	10	10	8
microcline	0	1	0
sphene	0	1/2	tr
apatite	1/2	tr	1/2
calcite	0	tr	0

TABLE 21B: Modal analyses of several thin sections of selected rock types. Taken from Karvinen, 1973, Table AXXI

GEOCHEMISTRY: The results of some analytical work completed by Karvinen (1973) are presented in Table 21C.

	1	2		3
SiO_2	59.1	53.4	Cu	55
TiO_2	1.0	0.6	Mo	30
Al_2O_3	15.6	10.0	Ni	75
Fe_2O_3*	5.9	8.2	V	135
MgO	2.3	5.7	Mn	950
CaO	5.8	15.1	Co	25
Na_2O	5.1	3.2	Sr	495
K_2O	2.6	0.3	Cr	100
Cl**	-	1.0	Pb	13
CO_2**	-	1.6	Zn	88
			Sn	2
Total	96.8	99.1		

1. hornblende gneiss- average of 2 samples (Table XX)
2. hedenbergite gneiss- average of 3 samples (Table XVI)
3. hedenbergite gneiss- average of 3 samples (Table XIX)

* total Fe as Fe_2O_3

** calculated from average compositions of scapolite

TABLE 21C: Whole rock chemical compositions and trace elements contents of some selected rock types. Results taken from Karvinen, 1973

DISCUSSION: The Ross O'Brien deposit is somewhat dissimilar to the majority of the other skarn hosted, molybdenite deposits in the Pembroke-Renfrew area in that the host rock is not a pyroxenite skarn. But the geological setting is similar and the amphibole paragneiss host rocks are texturally and mineralogically very similar to the pyroxenites.

Consequently, the Ross-O'Brien deposit is believed to be similar in origin and probably formed as a result of metasomatic processes induced by regional metamorphism.

DEVELOPMENT HISTORY

Development of the Ross and O'Brien portions of the deposit are described separately-

O'Brien Property:

1908: discovery of mineralization on property owned by Austin Morin.

1908-1915: the property was acquired and worked by M. J. O'Brien

1916: O'Brien organized the International Molybdenum Company Ltd. This company shipped over 300 tons of hand cobbed ore which contained 3 to 6 percent MoS_2 to Ottawa and Orillia (see Table 21D).

1942-1943: property acquired by Mount St. Patrick Molybdenite Syndicate. Some surface work completed and 20 tons of ore were shipped to Quyan, yielding 423 pounds of MoS_2. The property was acquired by Major Molybdenite Mines Ltd. in October of 1942 and in 1943 they completed 18 diamond drill holes for a total of 1,000 feet. Minor surface work was carried out under the direction of Mining Research Corporation Ltd. The diamond drilling indicated possible reserves of 2,000

tons of ore grading 1 percent MoS_2.

1965: property was evaluated by A.C.A. Howe and Associates Ltd. for Ciglen Investments Ltd.

Ross Property

1908: property purchased by B.G. Connolly from Austin Morin

1914: mining rights sold to G. Ross of the Ashfield Mining Syndicate who did some prospecting work

1915-1916: property purchased by Molybdenum Ltd. and was subsequently optioned to F.G. Todd of Montreal

1917: property leased to the International Molybdenum Co. for six months. Several carloads of ore were shipped to Ottawa and to Renfrew (see Table 21D).

1965: evaluation of the property performed by A.C.A. Howe and Associates Ltd. for Ciglen Investments Ltd.

Date	Where sent	Tonnage	MoS_2	Remarks
1916	Dept. of Mines, Ottawa	25.2	1.45	O'Brien claim, selected ore
	Orillia	126.5	-)	O'Brien claim, selected ore
		10.4	7.00)	
		110.3	2.00)	
1917	Renfrew	285.9	0.91	150 tons from the Ross claim; remainder from Morin
	Dept. of Mines, Ottawa	26.2	1.96	Morin and Ross
		24.6	1.81	Crushed fines from the Ross property
		27.5	1.57	
		44.7	1.84	

TABLE 21D: Records of ore shipments from the Ross, O'Brien, and Morin properties. Taken from Eardley-Wilmot, 1925, p. 99

REFERENCE MAPS

GSC 1046A, Renfrew, 1956

ODM 53b, Renfrew Area, 1945

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22. SUNSET

COMMODITY: Molybdenum

ROCK ASSOCIATION: HOST: Calc-silicate 'skarn'
OTHER: Paragneiss, calcitic marble

CLASSIFICATION: 1A. Stratabound, skarn hosted

LOCATION: Brougham Township, Renfrew County
NTS 31F/6, UTM Zone 18, 5017510N, 339130E
LAT. 45° 17' 41"N; LONG. 77° 03' 06"W
Con. 14, Lot 36

ACCESS: The deposit is accessible via a dirt bush road from a point 11.6km (7.2 miles) north of the Griffith bridge on Hwy. 41. The workings are on both sides of the road at a point 1.1km (0.7 miles) east of the highway.

SIZE AND GRADE: Mineralization consists of coarse flakes of molybdenite associated with pyrite and pyrrhotite sparsely disseminated in a zone of unknown extent. Workings consist of two pits and a covered shaft reported to be 70 feet deep (Eardley-Wilmot, 1925, p. 99) (see Figure 22A).

DESCRIPTION: GENERAL GEOLOGY: The Sunset Molybdenum deposit is contained within a sequence of intercalated metasedimentary paragneisses and marbles that strikes in a northerly direction and dips shallowly to the east. The paragneisses include granitic gneiss, scapolitic quartzite, and hornblende gneiss (Karvinen, 1973) that probably represent metamorphosed sandstones and mudstones. The marble is calcitic and is gradational into and is contained as lenses within a clac-silicate skarn that appears to have developed as a replacement or alteration of the marble.

According to Karvinen (1973, Appendix A), "the skarn consists of varying amounts of diopside, scapolite (dipyre), microcline and oligoclase (An_{27}), with lesser amounts of sphene, muscovite, biotite, tremolite, apatite, calcite, pyrrhotite, and pyrite... Molybdenite occurs as large (¼"-1") disseminated flakes erratically distributed, but mostly confined to diopside-rich parts of the skarn where pyrite and pyrrhotite are also abundant."

MICROSCOPY: Karvinen (1973) examined eight thin sections of rock samples collected at the deposit. Estimated modal analyses of some of the sections are presented in Table 22A. Sections-3-2-3, 3-2-5, and 3-2-6 are samples of skarn, and 3-2-25 is scapolite quartzite.

	3-2-3	3-2-5	3-2-6	3-2-25
diopside	24	95	28	15
microcline	57	0	1	5
plagioclase (An_{27})	15	0	1	-
scapolite	1	0	68	25
tremolite	0	5	tr	-
calcite	tr	0	1	3
biotite	0.5	0	tr	1
muscovite	tr	0	0	-
sphene	0.5	0	0.5	0.5
apatite	1.5	0	1	-
po-py	0	0	0	4
quartz	-	-	-	50

TABLE 22A: Estimated modal compositions of some thin sections of selected rock types. Taken from Karvinen, 1973, Table AXIII

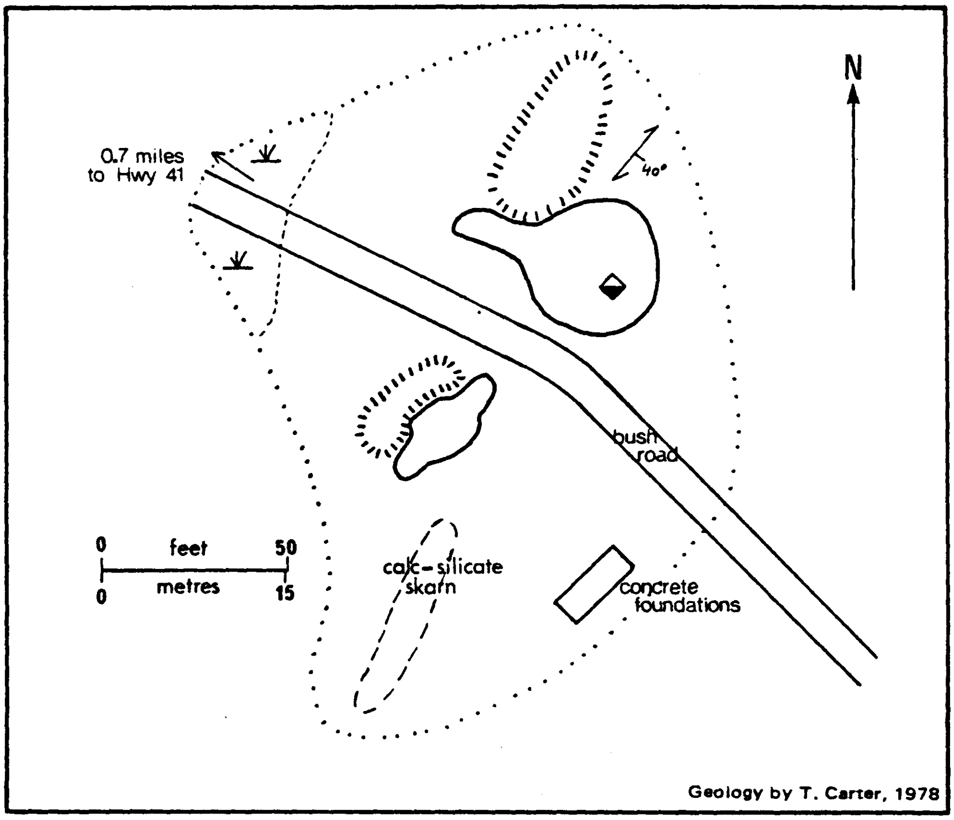

Figure 22A — Workings of the Sunset molybdenum deposit.

GEOCHEMISTRY: Analytical results obtained by Karvinen (1973) are presented in Table 22B:

SiO_2	56.0	57.0	Cu	3
TiO_2	0.1	0.9	Mo	10
Al_2O_3	13.1	12.5	Ni	13
Fe_2O_3	2.6	6.2	V	20
MgO	6.8	2.7	Mn	910
CaO	15.5	13.3	Co	3
Na_2O	5.3	1.8	Sr	260
K_2O	0.4	2.8	Cr	15
Total	99.8	97.2	Pb	20
			Zn	72
			Sn	2

1. skarn (Karvinen, Table XIV)

2. scapolite quartzite, average of 3 samples (Karvinen, Table XX)

3. skarn (Karvinen, Table XV)

* total iron as Fe_2O_3

TABLE 22B: Whole rock chemical compositions (in percent) and trace element content (in ppm) of some samples of selected rock types.

DISCUSSION: The Sunset deposit is very similar to many of other calc-silicate hosted molybdenum deposits in the Pembroke-Renfrew area. It probably formed as a result of metasomatic processes activated by the high temperatures and pressures of regional metamorphism in the area.

DEVELOPMENT HISTORY

1915: an open cut measuring 10 by 70 feet was excavated by unknown operators

1916: the property was purchased by Steel Alloys Corporation who worked it in conjunction with the Spain Mine. A pit 70 feet long, 30 feet wide, and 6 feet deep was excavated and a 70-foot deep vertical shaft was sunk from the bottom of the pit.

1917: 8 tons of 3 percent ore and 300 pounds of flake estimated to be on the dumps (Parsons, 1917, p. 29)

1918: approximately 20 tons of ore containing 5.47 to 0.65 percent MoS_2 were shipped to the Mines Branch, Ottawa from which 936 pounds of pure molybdenite were recovered. Shipment was made by the Steel Alloys Corp.

REFERENCE MAP

GSC 1046A, Renfrew, 1956

OGS Preliminary map, Khartum Area, in preparation

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23. BROTTON

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pegmatite dike OTHER: Garnet-biotite paragneiss
CLASSIFICATION	Unconformable-to-conformable, pegmatite hosted
LOCATION	Burns Township, Renfrew County NTS 31F/12, UTM Zone 18, 5051940N, 291800E LAT. 45° 35' 30"N; LONG. 77° 40' 09"W Con. 2, Lot 13
ACCESS	The deposit is located less than 210m (700 feet) from a gravelled road and, according to Satterly (1945, p. 82), it is located "on the slope of a hill 750 feet at N30°E, from a house near the north shore of Burns (Long) Lake.
SIZE AND GRADE	According to Satterly (1945, p. 82), the mineralized body "consists mainly of a mass of glassy white quartz containing very rarely, scattered flakes of MoS_2 from a quarter of an inch to one inch in width" within a pegmatite dike. "The main working is a trench, stripping, and pit, which trends N75°W and is 50 feet long and 7 feet wide. The pit at the east end of the trench is 12 feet across and 8 feet deep. At N35°E and 175 feet from the main working is a small pit, and to the south of the main working are several other small test pits at 45, 90 and 150 feet".
DESCRIPTION	The deposit was not visited by authors but has been described by Satterly (1945, p. 82) as follows: "the workings expose a granite-pegmatite dike trending approximately N35°E. It cuts garnet-biotite paragneiss, which strikes N15°E and dips 45°W. The red garnets in the gneiss are from a quarter of an inch to 1½ inches across. In the pit at the east end of the main working, the pegmatite consists mainly of a mass of glassy white quartz containing, very rarely, scattered flakes of MoS_2 from a quarter of an inch to 1 inch in width. The quartz mass is flanked by crushed granite-pegmatite. No quartz or pegmatite is exposed in the trench and stripping." "In the pit 175 feet to the north, quartz and biotite granite-pegmatite is exposed across a width of 20 feet. No molybdenite was found".
DEVELOPMENT HISTORY	1940: the property was staked by J. Brotton. Several pits were excavated on the property but the operators responsible are unknown.
REFERENCE MAP	ODM 53b, Renfrew Area, 1945
REFERENCES	Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines M.R.C. No. 7, P. 65. Meyn, H.D., and Howarth, J.R. 1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976. Satterly, J. 1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Report, Vol. 53, Part 3, 1944, p.82.

24. BRONSON

COMMODITY	Molybdenum
ROCK ASSOCIATION	Uncertain
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Dungannon Township, Hastings County NTS 31F/4, UTM Zone 18, 4994510N, 279070E LAT. 45^{o} 03' 17"N; LONG. 77^{o} 48' 23"W Concessions 13 and 14, Lot 25
ACCESS	The exact location of the deposit is unknown but it probably is located within a few hundred metres of Highway 500.
SIZE AND GRADE	Mineralization is simply reported to consist of a few flakes of molybdenite in a zone of unknown dimensions. There are no workings.
DESCRIPTION	The reported location of the deposit lies within a sequence of intercalated nepheline and syenite gneisses. Adams and Barlow (1910, p. 254) state simply that "two locations where it might be found without any great difficulty are Lots 25, Concessions XIII and XIV of Dungannon". Parsons (1917, p. 259) was unable to locate any mineralization or workings.
DEVELOPMENT HISTORY	None reported
REFERENCE MAP	ODM 1955-8, Dungannon and Mayo Townships, 1956
REFERENCES	Adams, F.D. and Barlow, A.E. 1910: Geology of the Haliburton and Bancroft Areas, Province of Ontario; Geological Survey of Canada, Memoir No. 6 p. 254 Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7 p. 36. Parsons, A. L. 1917: Molybdenite Deposits of Ontario; Ontario Bureau of Mines, Ann. Rept. Vol. 26, 1917, p. 295

25. STOUGHTON

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Uncertain OTHER: Pegmatite, marble, 'gneiss'
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Dungannon Township, Hastings County NTS 31F/4, UTM Zone 18, 5000440N, 285430E LAT. 45° 07' 36"N; LONG. 77° 43' 42"W Con. 16, Lot 5
ACCESS	The exact location of the deposit is unknown as it was not located by the authors but it is believed to be located within 300 metres of a bush road of unknown quality.
SIZE AND GRADE	Mineralization consists of disseminated molybdenite in a body of unknown size and grade. Workings are reported to consist of two trenches 30 and 20 feet long and 2 to 3 feet deep (Eardley-Wilmot, 1925, p. 76).
DESCRIPTION	The Stoughton deposit lies within a northeasterly-striking succession of intercalated marble, calcareous mudstone, sandstone, and nepheline syenite. According to Eardley-Wilmot (1925, p. 76) "a few shallow pits were sunk on the exposed main pegmatite ridges that intrude crystalline limestone and gneiss," but the nature of the mineralization is not indicated. Due to these uncertainties on the nature of the deposit, its origin is also uncertain.
DEVELOPMENT HISTORY	1917-1920: the property was worked for short periods during this this time by J. Waring of Madoc and A.A. Stoughton of Bessemer who sunk a few shallow pits. In 1917, the property was optioned by the Bancroft Mining Company and in 1918, 694 pounds of hand-picked ore containing 4.19 percent MoS_2 were shipped to the Mines Branch, Ottawa, from which 28 pounds of molybdenite were recovered.
REFERENCE MAP	ODM 1955-8, Dungannon and Mayo Townships, 1956

REFERENCES

Eardley-Wilmot, V.L.
1925: Molybdenum; Canada Department of Mines, Pub. No. 592, pp. 76-77

Johnston, F.J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 36

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Thomson, J. E.
1943: Mineral Occurrences in the North Hastings Area; Ontario Department of Mines, Ann. Rept. Vol. 52, part 3, 1943, p. 61

Vokes, F.M.
1963: Molybdenum Deposits of Canada Geological Survey of Canada, Econ. Geol. Series No. 20, p. 144

26. KELLER

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Gabbro, marble, sandstone
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Faraday Township, Hastings County NTS 31F/4, UTM Zone 18, 4989155N, 267080E LAT. 45° 01', 10"N; LONG. 77° 57' 22"W Con. A, Lot 21.
ACCESS	The deposit is located about 460 metres (1,500 feet) south of a gravel road and is accessible on foot from an abandoned farm south of the road.
SIZE AND GRADE	Mineralization consists of coarse disseminated flakes of molybdenite in a zone of unknown dimensions. Workings consist of a single overgrown pit 4.6 by 3 metres (15 by 10 feet) and about 1 metre (3 feet) deep.
DESCRIPTION	The Keller molybdenum deposit is located within a sequence of intercalated calcareous and clastic siliceous meta-sedimentary rocks near the margin of a gabbroic intrusion. The workings expose a rock composed of variable amounts of plagioclase and diopside and the mineralization consisting of fine-to-coarse disseminated flakes of molybdenite, is contained within this rock. This host rock probably represents an altered metamorphosed calcareous mudstone and the mineralization probably was introduced by metasomatic fluids mobilized during regional metamorphism with some consequent alteration of the host rock.
DEVELOPMENT HISTORY	before 1943: a small pit excavated by unknown operators
REFERENCE MAP	ODM 1957-1, Cardiff and Faraday Townships, 1959

REFERENCES

Hewitt, D.F.
1959: Geology of Cardiff and Faraday Townships; Ontario Department of Mines, Annual Report Vol. 66, part 3, 1957, p. 50.

Johnston, F.J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 36

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing, Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Thomson, J.E.
1943: Mineral Occurrences in the North Hastings Area; Ontario Department of Mines, Annual Report, Vol 52, part 3, 1943, p. 61.

Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series, No. 20, p. 144

27. WREN

COMMODITY: Molybdenum

ROCK ASSOCIATION: HOST: Pegmatite
OTHER: Biotite hornblende gneiss

CLASSIFICATION: 1B. Unconformable-to-conformable, pegmatite hosted

LOCATION: Grattan Township, Renfrew County
NTS 31F/6, UTM Zone 18, 5036640N, 342700E
LAT. 45^{o} 28' 03"N; LONG. 77^{o} 00' 44"W
Con. 11, Lot 11

ACCESS: The exact location of the deposit is uncertain as it was not visited by the authors, but it is probably located within 300 or 400 metres of a farm road.

SIZE AND GRADE: Mineralization is reported to consist of "scattered flakes of molybdenite usually accompanied by pyrite" (Satterly, 1945, p. 82), in a pegmatite sill 1 to 5 feet thick and extending along strike for 275 feet. Workings consist of "5 pits, from 4 by 10 feet to 6 by 15 feet and from 3 to 5 feet deep", (Satterly, 1945, p. 82).

DESCRIPTION: The Wren deposit is reported to consist of minor disseminated molybdenite and pyrite in a "flat-dipping granite-pegmatite occurring as a sill in hybrid biotite hornblende gneiss, which strikes approximately east and west and dips about 10^{o}N". The pegmatite sill is from 1 to 5 feet thick (Satterly, 1945, p. 82). The original nature of the gneiss is uncertain.

The deposit is similar to the other pegmatite-hosted molybdenum deposits in the Pembroke-Renfrew area and probably formed as a result of metasomatic processes active during the high-grade regional metamorphism that affected the area.

DEVELOPMENT HISTORY: 1918: five small pits excavated by unknown operators

REFERENCE MAP: Ontario Geological Survey, Preliminary Map, P1560, Clontarf Area, Renfrew County, 1978.

REFERENCES

Freeman, B.C.
1936: Mineral Deposits in Renfrew County and Vicinity; Geological Survey of Canada, Memoir 195, p. 14

Johnston, F.J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 65

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario; Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, pt. 3, 1944, p. 82

28. LEGREE

COMMODITY
Molybdenum

ROCK ASSOCIATION
HOST: Uncertain
OTHER: Pegmatite

CLASSIFICATION
1D. Geological relationship unclear

LOCATION
Griffith Township, Renfrew County
NTS 31F/6, UTM Zone 18, 5015680N, 338820E
LAT. 45° 16' 41"N; LONG. 77° 03' 18"W
Con. 4, Lots 33 and 34

ACCESS
The exact location of the deposit is uncertain as it was not visited by the authors, but it is probably located within 600 metres (1,970 feet) of a single-lane gravelled road about 1.5km (0.93 miles) east of Hwy. 41.

DESCRIPTION
The Legree molybdenum deposit occurs within a northerly trending sequence of intercalated and clastic siliceous metasedimentary rocks. It is described by Eardley-Wilmot (1925, p. 103) as follows:

> "In 1915, two prospect pits about 5 feet wide and 3 feet deep were dug on a pegmatite ridge striking east and west...The occurrence is similar to that of the Sunset mine in Brougham Township".

The origin of the mineralization is uncertain.

DEVELOPMENT HISTORY
1915: two prospect pits excavated and about 2 tons of milling ore were extracted and left on a dump by unknown operators.

REFERENCE MAP
Ontario Geological Survey Preliminary map (in preparation) Khartum Area, Renfrew County

REFERENCES

Eardley-Wilmot, V. L.
1925: Molybdenum; Canada Department of Mines, Pub. No. 592, p. 103

Freeman, B. C.
1936: Mineral Occurrences in Renfrew County and Vicinity; Geological Survey of Canada, Memoir 195, p. 13

Johnston, F. J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines M.R.C. No. 7, P. 65

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, pt. 3, 1944, p. 83-84.

29. LEPINE

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Pegmatite, marble
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Griffith Township, Renfrew County NTS 31F/6, UTM Zone 18, 5016860N, 331930E LAT. 45° 17' 14"N; LONG. 77° 08' 35"W Con. 7, Lot 19
ACCESS	According to Satterly (1945, p. 84), "The occurrence is reached by turning off highway No. 41 to the farm of T. Haley, in Lot 25, Concession V, Griffith Township, and then following a wagon road to Haley Lake and around its north shore to the northwest corner is a trail leading to Godin Lake. From the farm to the workings is 2 miles.
SIZE AND GRADE	Mineralization consists of disseminated molybdenite in a small body of unknown extent. Satterly (1945, p. 84) states that "the very minor amount of molybdenite present in the first showing indicates that the prospect is of no value". Workings consist of a trench and three small pits. The trench is "about 1,350 feet southwest of Haley Lake and 115 feet northwest of the trail....50 feet long, from 3 to 5 feet wide, and from 1 to 3 feet deep". Two small pits are also reported on the northwest side of the dike exposed by the first pit. "Another working on the same ridge is 400 feet northwest of the trail at a point 725 feet southwest of Haley Lake. A small stripping and a pit, 4 by 5 feet deep..."(Satterly, 1945, p. 84).
DESCRIPTION	The Lepine molybdenum deposit occurs within a narrow, northeast trending belt of calcareous metasedimentary rocks contained within a granitic intrusion. The rocks are cut by pegmatite dikes. According to Satterly (1945, p. 84), the trench "exposes the contact between a diopside-phlogopite limestone and a granite-pegmatite dike, which forms the face of the ridge slope. The dike trends N30°E and is 75 feet wide. At the northeast end of the pit the pegmatite is cut by two veinlets of pyrite. The weathering of these veinlets has caused much brown and black staining on the rock. A small dump shows a few large flakes of molybdenite in rusty pegmatite and in a pale-green pyroxenite presumably from the contact zone. No mineralization was seen in place". "Two small pits occur in rusty gneiss on the northwest side of the dike but shows only negligible molybdenite and sulphide mineralization". The third pit exposes "a rusty-weathering graphite-mica gneiss, striking N25°W and dipping 35°N.E. which is mineralized with finely disseminated pyrrhotite. No molybdenite was observed." As described by Satterly, the Lepine deposit is similar to many of the other molybdenum deposits in the Pembroke-Renfrew area and is probably metamorphogenic in origin.
DEVELOPMENT HISTORY	1939: a trench and 3 small pits were excavated by Nelson Lepine of Griffith
REFERENCE MAP	Ontario Geological Survey Preliminary Map, Khartum Area, Renfrew County, (in preparation).
REFERENCES	Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 65

Meyn, H.D., and Howarth, J.R.,
1977: Molybdenum Deposits of Ontario; Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247 Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, part 3, 1944, p. 84.

Vokes, F. M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Econ. Geol. Rept. No. 20, p. 165

30. SPAIN

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite, skarn, hedenbergite gneiss OTHER: Calcitic marble, quartz-feldspar paragneiss, amphibole paragneiss
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Griffith Township, Renfrew County NTS 31F/6, UTM Zone 18, 5016455N, 337450E LAT. 45° 17' 05"N; LONG. 77° 04' 22"W Con. 4, Lot 31
ACCESS	The deposit is located about 200 metres east of Hwy. 41.

SIZE AND GRADE

Mineralization consists of large, erratically distributed flakes of molybdenite associated with pyrite and pyrrhotite, disseminated within a stratabound lens measuring 61 by 16.8 metres (200 by 55 feet), with an average thickness of 1.5m (5 feet), located just east of the old workings (see Figure 30A). This orebody contains about 5,200 tons of ore of unknown grade (Horwood, 1940) indicated by diamond drilling. A second orebody was mined out in the original workings of the former Spain mine and was essentially similar to the first orebody described above.

Workings consist of a large water-filled pit, two smaller pits, a shaft reported to be 50 feet deep, a trench, and a shallow test shaft (see Figure 30B).

DESCRIPTION

GENERAL GEOLOGY: The Spain molybdenum deposit occurs within a northerly-trending sequence of intercalated marble, quartzose sandstones, and calcareous metasedimentary rocks that are cut by numerous dikes of pegmatite. The rock units generally dip shallowly to moderately to the east.

Calcitic marble, quartz-feldspar paragneiss (sandstone), amphibole paragneiss (mudstone?), hedenbergite paragneiss (calcareous mudstone?) and granite pegmatite are exposed in the vicinity of the workings on the deposit (see Figure 30B). The quartz-feldspar paragneiss is the lower most unit and is a well-foliated rock composed essentially of quartz, feldspar and biotite that contains minor interlayers of migmatitic and pegmatitic granite. It grades into the overlying hedenbergite gneiss which is a well-foliated, medium-grained, homogeneous rock composed essentially of hedenbergite, microcline, oligoclase, and quartz (Karvinen, 1973, Appendix A). Amphibole paragneiss overlies the hedenbergite gneiss and is a black, fine-grained, massive rock composed essentially of hornblende and plagioclase. The marble is the uppermost unit and contains coarse-grained white-to-pink calcite and less abundant dolomite with minor diopside and phlogopite (see Figure 30C).

According to Karvinen (1973, Appendix A) there are two types of pegmatite at the deposit. The mineralized pegmatites are white-to-pink, very coarse-grained rocks composed essentially of smoky quartz, microcline, and plagioclase. The mineralized pegmatites are rusty-weathering rocks composed of smoky quartz, hedenbergite, microcline, plagioclase, pyrite, pyrrhotite, and molybdenite and occur only in the hedenbergite gneiss.

MINERALIZATION: Mineralization consists of molybdenite, pyrite, and pyrrhotite that is reported to be disseminated within three different rock types in two separate orebodies. The first orebody supplied all the ore produced by the former Spain mine and consists of coarse flakes of molybdenite associated with masses of pyrite and pyrrhotite within pegmatite dikes and less commonly within hedenbergite gneiss cut by these dikes (Karvinen, 1973, Appendix A). Karvinen notes that the mineralized pegmatites occur only within mineralized hedenbergite gneiss. The authors observed molybdenite in place within some pegmatite dikes but not any other rock types. The extent of this mineralized zone is unknown.

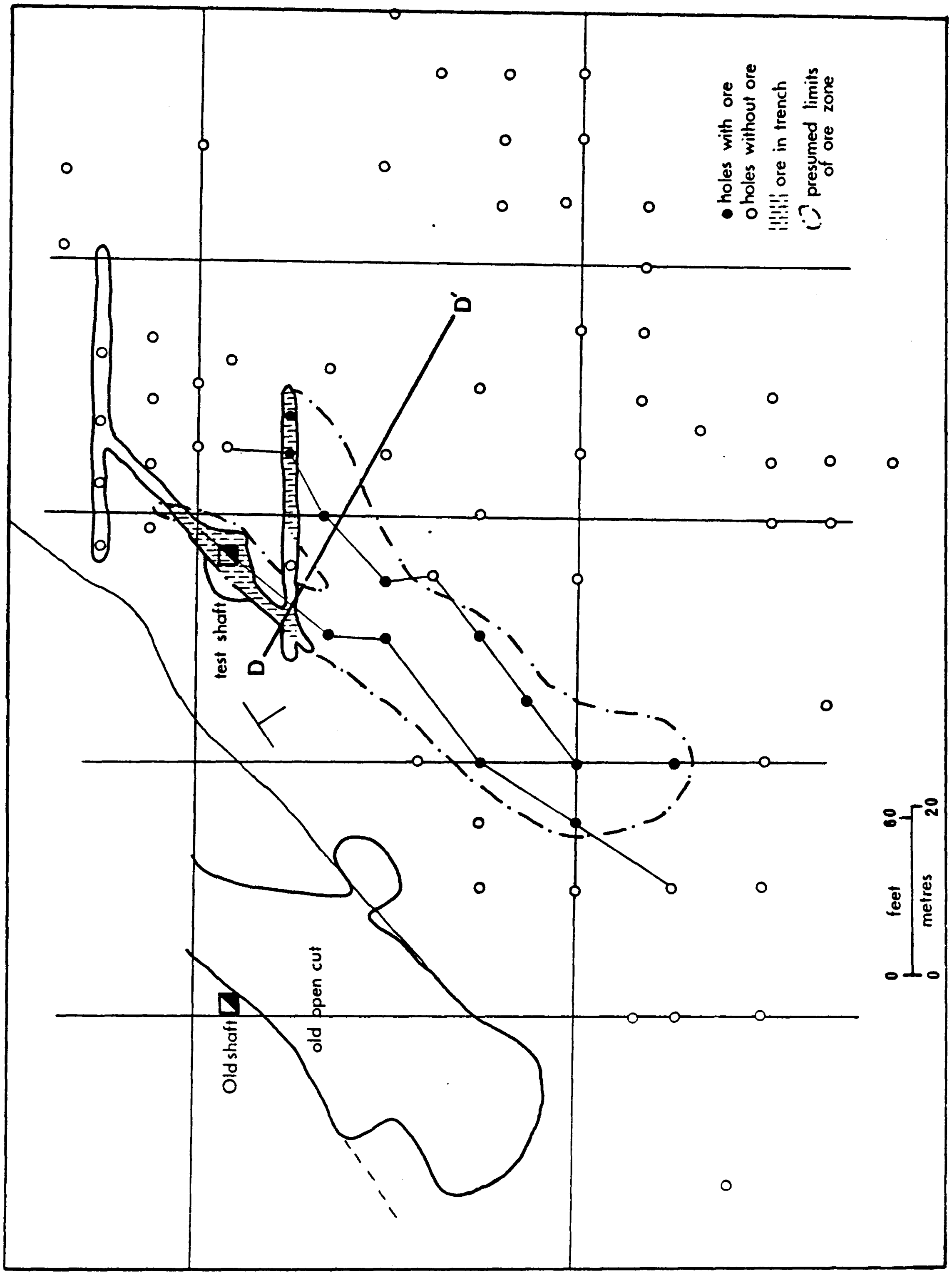

Figure 30A — Location of Spain orebody as indicated by diamond drilling. Adapted from a map by Horwood (1940).

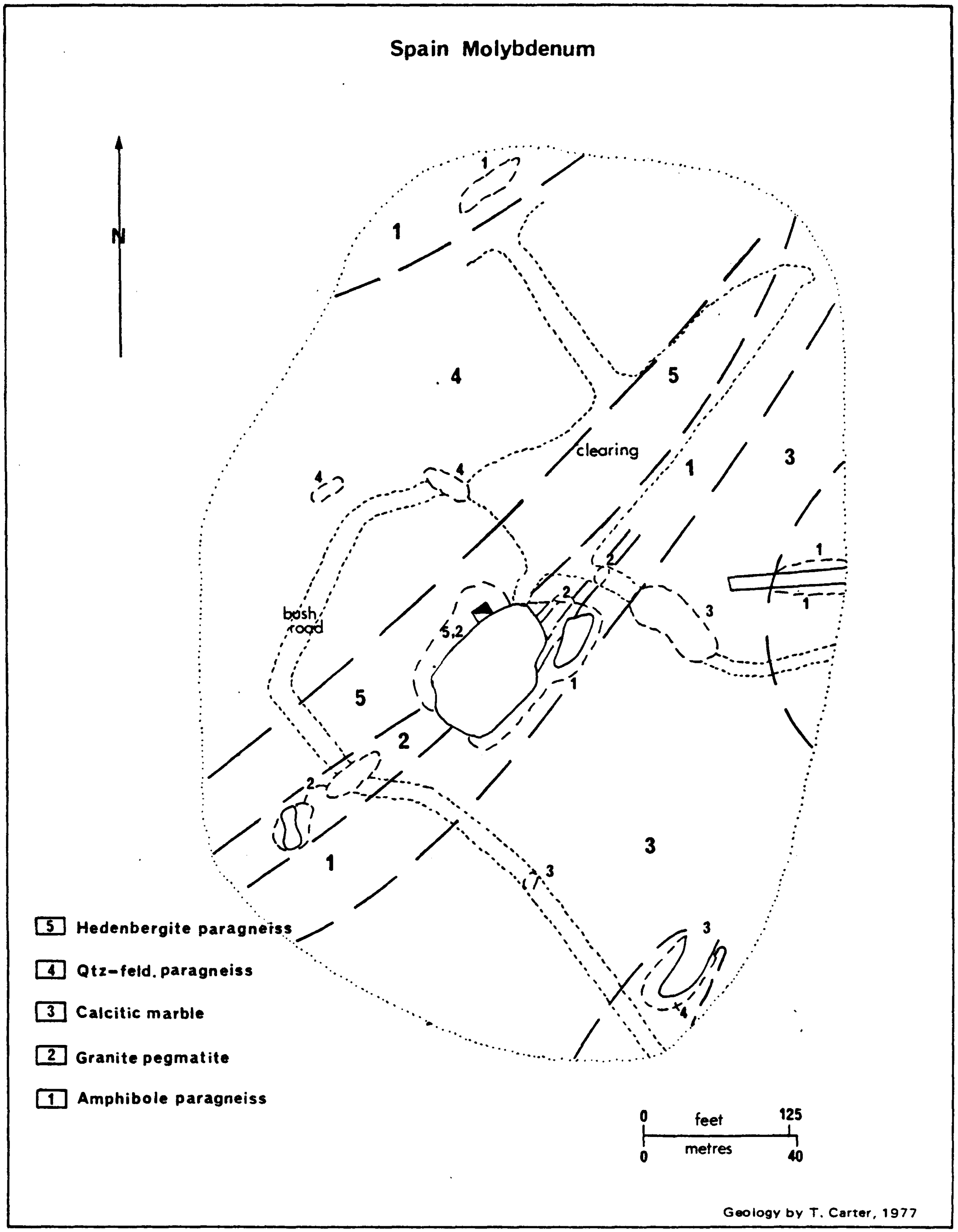

Figure 30B — Geology of the Spain molybdenum deposit.

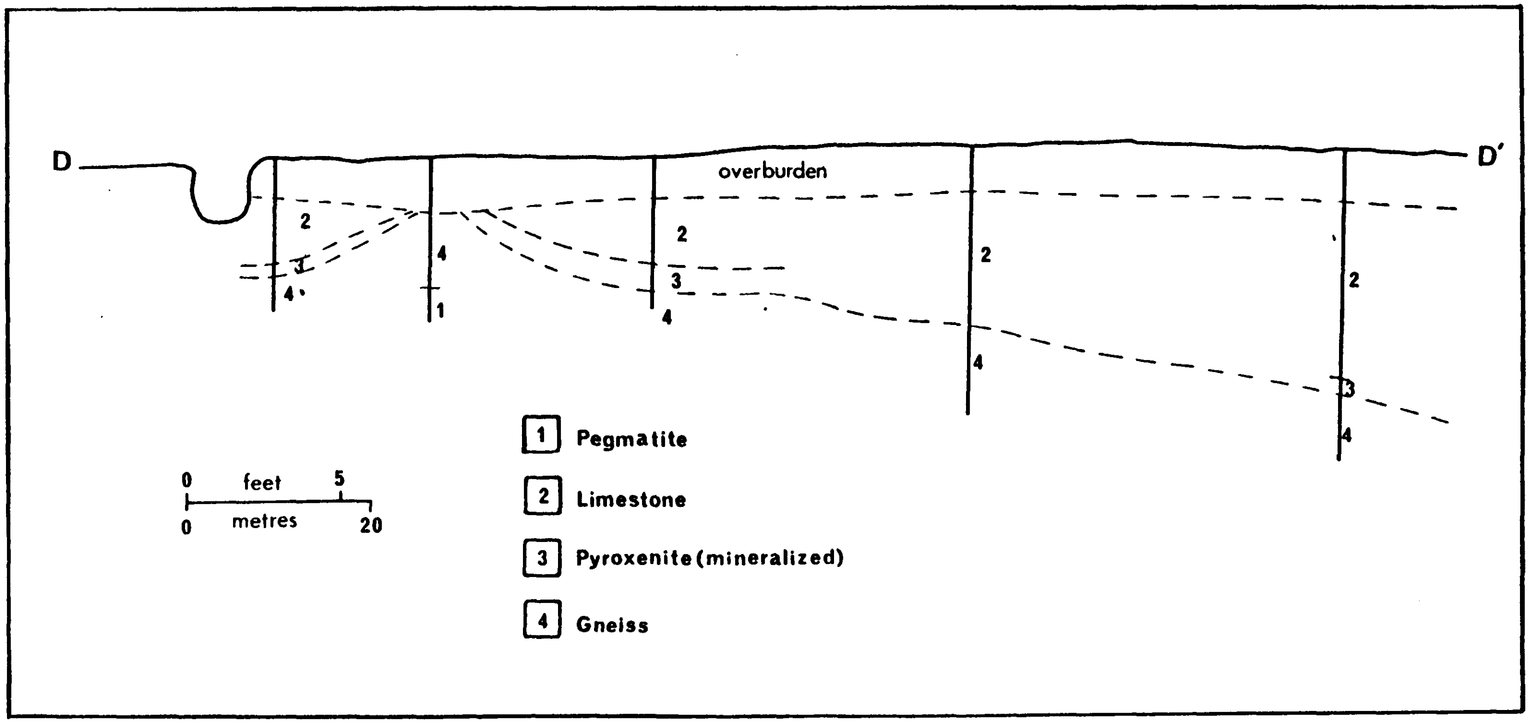

Figure 30C — Geological cross-section through the Spain molybdenum deposit. Adapted from Horwood (1940).

The second orebody was outlined by a diamond-drilling program completed by North American Molybdenite Corp. Ltd. Mineralization consists of disseminated molybdenite and pyrite contained within a stratiform lens of "pyroxene limestone" (Horwood, 1940), or metamorphic pyroxenite, that lies along the contact between the marble and the amphibole paragneiss (see Figure 30C).

MICROSCOPY: Several thin sections of representative rock types were prepared and examined by Karvinen (1973). Modal analyses of some of these sections are presented in Table 30A. 3-1-11 and 3-1-24 are sections of hedenbergite gneiss and 3-1-16 is amphibole paragneiss. The hedenbergite gneiss "consists predominantly of zoned oligoclase (An_{27}-An_{17}), hedenbergite, microcline and quartz with lesser amounts of sphene, calcite, hornblende, scapolite, apatite, epidote, chlorite, pyrite, and pyrrhotite. The oligoclase grains commonly contain cores of scapolite (mizzonite) which also occurs along feldspar grain boundaries....Microcline is present only in layers containing quartz, and textures seen in thin sections suggest that the microcline has partly replaced plagioclase where it occurs near quartz grains. The thin layers in the gneiss consist mainly of microcline-quartz-oligoclase-hedenbergite and of oligoclase-hedenbergite-scapolite. The hedenbergite is normally partly altered to a pleochroic (pale-to-dark-green-brown) hornblende. Pyrite and pyrrhotite occur as small, rounded grains disseminated throughout the gneiss".

The amphibole gneiss, according to Karvinen, "consists mainly of hornblende and zoned oligoclase (An_{30}-An_{25}) with small amounts of scapolite, biotite, sphene, chlorite and pyrrhotite... The hornblende is pleochroic from pale-green-brown to dark-green-brown, and is optically identical to the hornblende which rims the hedenbergite in the hedenbergite gneiss. The oligoclase is slightly altered; small irregular grains of scapolite (mizzonite) occur interstitial to the plagioclase. Quartz and microcline are absent".

	3-1-11	3-1-24	3-1-16
plagioclase	52	30	53
microcline	5	40	-
hedenbergite	22	10	-
quartz	17	15	-
sphene	1	1	1
calcite	1	1	-
hornblende	0	2	40
scapolite	2	0	2
apatite	0.5	0.5	-
pyrrhotite (py)	tr	tr	0.5
biotite	-	-	0.5
chlorite	-	-	3

TABLE 30A: Estimated modal compositions (in percent) of some thin sections of selected rock types. Taken from Karvinen, 1973, Table AXIX.

GEOCHEMISTRY: Some of the results of analytical work performed by Karvinen (1973) are presented in Table 30B.

	1	2		3
SiO_2	61.3	48.6	Cu	40
TiO_2	0.3	1.8	Mo	120
Al_2O_3	12.9	15.4	Ni	13
Fe_2O_3*	6.9	12.2	V	45
MgO	1.3	4.4	Mn	440
CaO	6.4	8.5	Co	13
Na_2O	3.3	4.7	Sr	565
K_2O	5.0	1.5	Cr	48
Total	97.4	97.1	Pb	22
			Zn	74
			Sn	2

* total Fe as Fe_2O_3

1. hedenbergite gneiss- 5 samples (Karvinen, Table XVI)
2. hornblende gneiss- 4 samples (Karvinen, Table XX)
3. hedenbergite gneiss- 5 samples (Karvinen, Table XIX)

TABLE 30B: Whole rock chemical analyses (in percent) and trace element contents (in ppm) of selected rock types

DISCUSSION: The Spain deposit has features in common with all three types of molybdenum deposits that occur in the Pembroke-Renfrew area which suggests that the modes of formation of the three types are related in some way. The mineralization contained in the hedenbergite gneiss at the deposit appears to be stratiform and may have been deposited synchronously with the host rocks in a mixed clastic-carbonate depositional environment. The pegmatites and the pyroxenite are believed to be products of the high-grade regional metamorphism and consequently the contained mineralization may also be a result of this metamorphic episode. Fluids mobilized as a result of the metamorphism may have leached the metals from suitable host rocks, such as the hedenbergite gneiss, and redeposited it in the pegmatite and pyroxenite bodies. Alternately, all the mineralization may be related to a nearby granitic batholith intrusion situated a few hundred metres to the west (see Map Reference).

DEVELOPMENT HISTORY

1912-1915: the mine was opened and owned by Mr. Joseph Legree. No production is reported in this period.

1915-1916: W.J. Spain acquired the property and did considerable work including excavation of a large open cut, a shaft (6 by 9 feet, sunk to a depth of 50 feet) and about half a dozen small pits. In 1916, Mr. Spain built a 50 ton concentrator using a Hooper pneumatic machine, and a few months later a Wood water-film flotation unit was introduced and ran intermittently for 2½ months. Six tons of ore were shipped to the U.S. in 1915, and in 1916, 68,482 pounds were shipped to the Mines Branch, Ottawa, and from this 16,269 pounds of concentrates were recovered.

1918: the mine was acquired by the Steel Alloys Corporation

1919: Mr. Spain's wood machine was discarded and a Callow oil-flotation system was installed. Operations ceased in December of this year.

1939- stripping, trenching and 4,000 feet of diamond drilling
1940: was done by North American Molybdenite Corp. Ltd.

1965- the deposit was sampled and diamond drilled by New Far
1966: North Exploration Ltd.

MAP REFERENCE — Ontario Geological Survey Preliminary Map, Khartum Area, Renfrew County, in preparation

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Karvinen, W.O.
1973: Metamorphogenic Molybdenite Deposits in the Grenville Province; unpub. PhD thesis, Queen's University, Kingston, Ontario

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Parsons, A.L.
1917: Molybdenite Deposits of Ontario; Ontario Bureau of Mines, Annual Report Vol. 26, 1977, p.297.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Annual Rept. Vol. 53, part 3, 1944, p.83.

Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Economic Geology Series No. 20, p.155-158.

Wilson, M.E.
1921: Mineral Deposits in the Ottawa Valley; Geological Survey of Canada, Summary Report 1919, part E, p. 41-43.

31. BRUCETON

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Marble
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Lyndoch Township, Renfrew County NTS 31F/3, UTM Zone 18, 5011640N, 312000E LAT. 45° 14' 06"N; LONG. 77° 23' 42"W Con. 5, Lot 33
ACCESS	The exact location of the deposit is unknown as it was not visited by the author, but it is probably located within 1km of a gravelled road, about 2 km west-southwest of the Snake Rapids on the Madawaska River.
SIZE AND GRADE	Mineralization is reported to consist of disseminated pyrrhotite and molybdenite that is "sparse and erratic" in a zone of unspecified extent. Workings consist of a "small pit and some trenches" (Hewitt, 1954, p. 74).
DESCRIPTION	The deposit has been described by Hewitt (1954, p. 74) as follows: "the country rock is crystalline limestone, which is cut by medium-grained, pale-green pyroxenite containing stringers of calcite that carry molybdenite and pyrrhotite. The mineralization is sparse and erratic. A quarter of a mile to the north there is a wide band of biotite paragneiss that contains sparse pyrrhotite and molybdenite. The paragneiss is cut by abundant quartz stringers. Some small pits and trenches have been sunk on this occurrence, which is on Lot 33, Concession VI".
DEVELOPMENT HISTORY	before 1944: a small pit and some trenches excavated by unknown operators
REFERENCE MAP	ODM 1953-2, Brudenell-Raglan Area, 1954
REFERENCES	Hewitt, D. F. 1954: Geology of the Brudenell-Raglan Area; Ontario Department of Mines, Ann. Rept. Vol. 62, part 5, 1953, p. 74 Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 65 Satterly, J. 1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, 1944, p. 85.

32. JAMIESON

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Biotite-pyroxenite, skarn OTHER: Calcitic marble, amphibolite, 'granite'
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Lyndoch Township, Renfrew County NTS 31F/6, UTM Zone 18, 5018200N, 321525E LAT. 45° 17' 48"N; LONG. 77° 16' 34"W Con. 8, Lots 5 and 6.
ACCESS	The Jamieson deposit is accessible on foot from a single lane dirt road along an overgrown bush road up the side of Mining Mountain from a farmhouse at the base of the mountain.
SIZE AND GRADE	Mineralization consists of erratically distributed coarse masses of pyrite, pyrrhotite, and molybdenite contained within a zone estimated to be at least 60 metres (200 feet) in length, but having an average thickness of less than 1 metre. Workings consists of several small pits and trenches and a large excavation about 64m (210 feet) long, averages 3m (10 feet) wide and about 1.5m (5 feet) deep with a large, water-filled pit at the east end which is at least 4.6m (15 feet) deep, above water level. Eardley-Wilmot (1925, p. 104) reports an inclined shaft midway along the length of the excavation but this was not seen by the authors.
DESCRIPTION	The Jamieson deposit is contained within a small granitic intrusion that forms an elongate body within a northeast trending sequence of calcareous metasedimentary rocks. The deposit is associated with a thin layer of calcitic marble that dips shallowly to the southeast, and which is contained within the 'granite'. There is also a thin layer of amphibolite within the marble (see Figure 32A). The 'granite' in the vicinity of the deposit is a pink, coarse-grained rock composed essentially of feldspar and quartz. Near its contact with the marble it is reddish in colour, crumbly, and is somewhat depleted in quartz. The mable is very coarse-grained (15mm), layered, pink-to-orange rock composed essentially of calcite and minor biotite. Thin zones of biotite-rich pyroxenite occur along its contacts with the 'granite'. The amphibolite is a black, foliated, fine-grained rock composed essentially of amphibole and plagioclase. Mineralization consists of very erratically distributed masses of coarse-grained pyrite, pyrrhotite, and molybdenite that are contained within the biotite-pyroxenite zones along the marble-granite contacts. The molybdenite occurs as very coarse flakes up to several centimetres in diameter. The pyrrhotite is often very closely associated with coarse biotite and sometimes appears to have replaced the biotite. The mineralized zone is very erratic and probably does not extend past the ends of the main pit. In addition, Hewitt (1954, p. 75) reports that "apatite, galena, sphalerite, and chalcopyrite occur on the dump" and Satterly (1945, p. 86) reports finding samples of a "late breccia and vug-filling mineralization on the dump that may have come from a galena vein noted by Eardley-Wilmot (1925, p. 104, Fig. 28). The nature of the calcite layer in the granite is uncertain. It may represent a xenolithic layer assimilated by the granitic intrusion, or alternatively it may be a vein that is intrusive into granite. The origin and mode of deposition of the mineralization is also uncertain. It may represent a primary constituent in an intrusive calcite vein, it may be the result of contact metasomatic reaction between the granitic intrusion and a marble xenolith, or it could have formed as a result of reaction of the calcite layer, of whatever origin, with metal-bearing fluids mobilized as a consequence of regional metamorphism. The deposit is somewhat similar to many of the other pyroxenite hosted deposits in the Pembroke-Renfrew area.

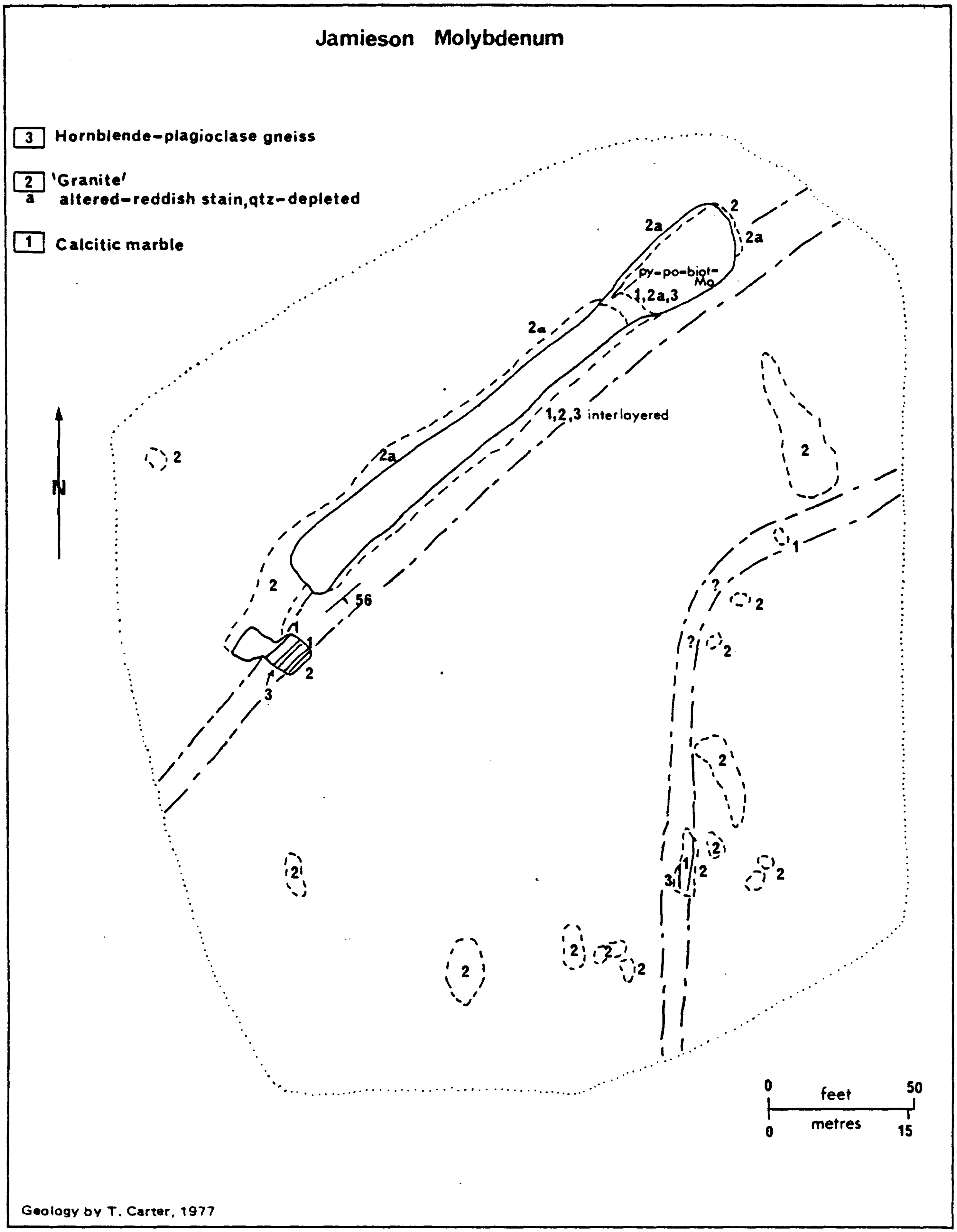

Figure 32A — Geology and workings of the Jamieson molybdenum deposit.

DEVELOPMENT HISTORY

1907: property opened up by R. A. Jamieson. Several pits excavated and an unknown amount of ore was removed

1915: property leased to Orillia Molybdenum Mines Ltd. Work resulted in shipment of 73.1 tons of 3 percent ore and 12.15 tons of 18 percent ore to Orillia

REFERENCE MAP

ODM 1953-2, Brudenell-Raglan Area, 1954

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1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Parsons, A.L.
1917: Molybdenite Deposits of Ontario; Ontario Bureau of Mines, Ann. Rept. Vol. 26, p. 303, 304.

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1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, part 3, 1944, p. 86.

Shklanka, R.
1969: Copper, Nickel, Lead, and Zinc Deposits of Ontario; Ontario Department of Mines, Min. Res. Circular No. 12, p. 228

Sutherland, T.F. et al
1919: Mines of Ontario; Ontario Bureau of Mines, Ann. Rept. Vol. 28, pt. 1, 1919, p. 160

Vokes, F.M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Econ. Geol. Series No. 20, p. 166

Walker, T.L.
1911: Report on the Molybdenum Ores of Canada; Canada Department of Mines, Pub. No. 93, p. 45.

33. LYNDOCH

COMMODITY	Molybdenum
• ROCK ASSOCIATION	HOST: Pyroxenite pegmatite OTHER: Granite, marble
CLASSIFICATION	1B. Unconformable to conformable, pegmatite hosted
LOCATION	Lyndoch Township, Renfrew County NTS 31F/6, UTM Zone 18, 5017690N, 322320E LAT. 45° 17' 32"N; LONG. 77° 15' 57"W Con. 8, Lot 4
ACCESS	The deposit was not visited by the authors but it is believed to be located within 400 feet of a dirt road at the base of Mining Mountain.
SIZE AND GRADE	Mineralization consists of sparse, scattered flakes of molybdenite in a body 35m (110 feet) long and of unknown width. Workings consist of three small pits, the largest measuring 20 by 6 by 4 feet deep (Hewitt, 1954, p. 74).
DESCRIPTION	The deposit occurs near the contact of marble with a granitic body that has intruded a northeasterly trending sequence of calcareous, metasedimentary rocks. It is described by Hewitt (1954, p. 74) as a "pyroxenite pegmatite consisting of pyroxene, hornblende, smoky quartz, black mica, and calcite. The pegmatite strikes N70°E and cuts pink granite gneiss and crystalline limestone. Flakes of molybdenite up to 1 inch in size occur sparsely in the quartz of the pegmatite....The dike has a length of 110 feet and pinches out at both ends." The deposit is similar to the Jamieson molybdenite deposit on top of Mining Mountain.
DEVELOPMENT HISTORY	before 1953: three small pits excavated by unknown operators.
REFERENCE MAP	ODM 1953-2, Brudenell-Raglan Area, 1954
REFERENCES	Hewitt, D.F. 1954: Geology of the Brudenell-Raglan Area; Ontario Department of Mines, Ann. Rept. Vol. 62, part 5, 1953, p. 74. Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7 p. 65.

34. McCOY

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Hornblende syenite-pegmatite OTHER: Marble, biotite paragneiss
CLASSIFICATION	1B. Unconformable to conformable, pegmatite hosted
LOCATION	Lyndoch Township, Renfrew County NTS 31F/3, UTM Zone 18, 5007970N, 313000E LAT. 45° 12' 09"N; LONG. 77° 22' 51"W Con. 2, Lot 34
ACCESS	The deposit is accessible by foot along an overgrown old wagon-road about 1.6km (1 mile) south from Bruceton
SIZE AND GRADE	Mineralization consists of erratically disseminated coarse flakes of molybdenite contained within a shallowly dipping pegmatite sheet reported to be 35 feet thick (Satterly, 1945, p. 85). The grade and tonnage of the orebody is unknown. Workings consist of a shaft 40 feet deep, a pit 10 by 50 feet and 6 feet deep, an open cut 45 feet long, 5 to 8 feet wide and 5 feet deep at the face, and an overgrown stripping and trench 40 feet long, 4 to 8 feet wide and 5 feet deep at its southwest end (Satterly, 1945, p. 85), (see Figure 34A).
DESCRIPTION	The McCoy molybdenum deposit cocurs within a complex northwest trending succession of interlayered marble, amphibolite, gabbro and possible clastic metasedimentary rocks. Mineralization consists of erratically disseminated coarse flakes of molybdenite contained within a shallowly dipping sheet of hornblende syenite pegmatite. The pegmatite overlies marble and is overlain by biotite paragneiss. The pegmatite is a pink, massive, very coarse-grained rock composed essentially of feldspar with abundant hornblende and minor biotite. It also contains scattered concentrations of quartz. The paragneiss is a fine-grained, well-layered rock composed essentially of hornblende, biotite, and feldspar. The deposit is similar to the other pegmatite hosted molybdenum deposits in the Pembroke-Renfrew area, but the only one hosted by a <u>syenite</u> pegmatite. The pegmatite and its accompanying mineralization probably formed as a result of the high grade regional metamorphism of the rocks in the area.
DEVELOPMENT HISTORY	1916-1917: one four-foot pit and some prospecting and trenching completed by unknown operators. In 1916, one ton of 0.4 percent ore and 8 tons of 93 percent picked flake were shipped to Ottawa. In 1917, one ton of 0.89 percent ore was shipped to Renfrew. 1937-1938: property was acquired by McCoy Molybdenite Ltd. in 1937 and in 1938 a 2-compartment shaft was sunk to a depth of 40 feet, and 260 feet of trenching was carried out.
REFERENCE MAP	ODM 1953-2, Brudenell-Raglan Area, 1954.

REFERENCES

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1925: Molybdenum; Canada Department of Mines, Pub. No. 592, p. 103

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1954: Geology of the Brudenell-Raglan Area; Ontario Department of Mines, Ann. Rept. Vol. 62, pt. 5, 1953, p. 73.

Johnston, F. H.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, Min. Res. Circular No. 7, p. 62

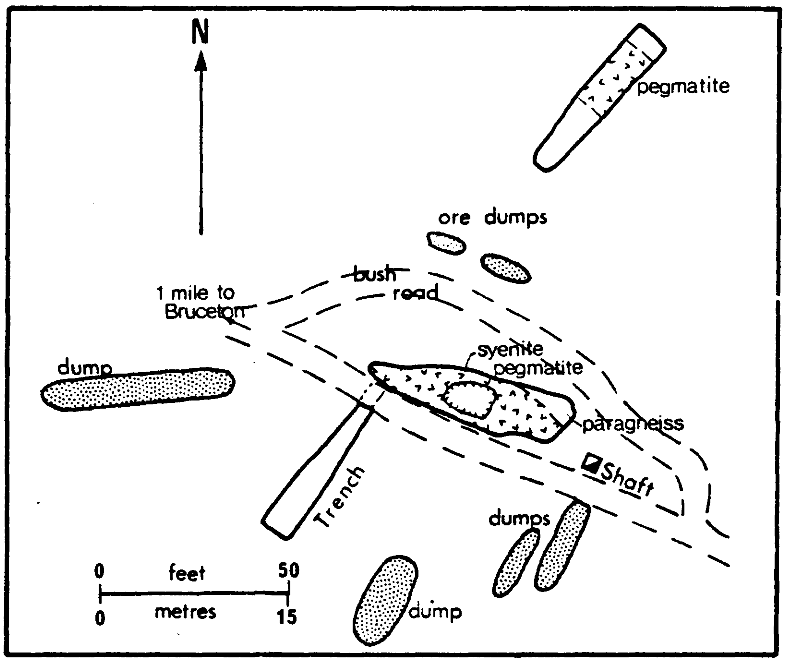

Figure 34A — Geology and workings of the McCoy molybdenum deposit. Adapted from Satterly (1945, Fig.7).

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, pt. 3, 1944, p. 84-85

Vokes, F. M.
1963: Molybdenum Deposits of Canada; Geological Survey of Canada, Econ. Geol. Series No. 20, p. 165-166

35. MINING MOUNTAIN

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Uncertain OTHER: Granite, pegmatite, marble, paragneiss
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Lyndoch Township, Renfrew County NTS 31F/6, UTM Zone 18, 5018100N, 321200E LAT. 45° 17' 44"N; LONG. 77° 16' 49"W Con. 8, Lot 7
ACCESS	The deposit was not visited by the authors but is probably located about 1,300m west of a single lane dirt road on the western slope of Mining Mountain.
SIZE AND GRADE	Mineralization consists of scattered patches of molybdenite and pyrrhotite in a zone of unspecified dimensions. According to Hewitt (1954, p. 76), "the prospect does not look promising due to the low grade and erratic distribution of the molybdenite". Workings are reported to consist of 3 small pits and strippings.
DESCRIPTION	The deposit occurs near the contact of a small granitic intrusion with a unit of amphibolite and minor marble. According to Hewitt (1954, p. 76), "the main outcrop on the property is pink leuco-granite gneiss, cut by granite pegmatite, which is cut by a strong shear zone trending S.80°E. To the northwest there is a second outcrop consisting of pink leuco-granite gneiss, granite pegmatite, limestone, and paragneiss. The rocks strike N80°E and dip 25°S. Molybdenite and pyrrhotite occur erratically distributed in patches along the contacts of the granite gneiss and sediments."
DEVELOPMENT HISTORY	before 1925: three pits and stripping excavated by unknown operators. Five tons of milling ore extracted and 150 pounds of cobbed ore were shipped.
REFERENCE MAP	ODM 1953-2, Brudenell-Raglan Area, 1954
REFERENCES	Eardley-Wilmot, V. L. 1925: Molybdenum; Canada Department of Mines, Pub. No. 592, p. 119 Hewitt, D. F. 1954: Geology of the Brudenell-Raglan Area; Ontario Department of Mines, Ann. Rept. Vol. 62, pt. 5, 1953, p. 76. Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, p. 65. Meyn, H.D., and Howarth, J.R. 1977: Molybdenum Deposits of Ontario, Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976. Satterly, J. 1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53 pt. 3, 1944, p. 86.

36. WOLFE FIRE TOWER

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Granite gneiss OTHER: Amphibolite
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Lyndoch Township, Renfrew County NTS 31F/6, UTM Zone 18, 5023775N, 320170E LAT. 45° 20' 47"N; LONG. 77° 17' 44"W Con. 14, Lot 4
ACCESS	The deposit was not visited by the authors but it is believed to be located less than 400 metres south of a gravelled road, east of the old Wolfe Fire Tower.
SIZE AND GRADE	Mineralization consists of "molybdenite flakes up to 1/8 inch in size...in small irregular patches, which might run 2 percent" (Hewitt, 1954, p. 76). The extent of the mineralized zone is not known. There are no workings.
DESCRIPTION	The deposit occurs within a succession of intercalated calcareous and siliceous clastic metasedimentary rocks. According to Hewitt, "on Lot 4, Concession XIV, east of the Wolfe fire tower, there is a low ridge of pink leuco-granite gneiss interlayered with pink biotite granite gneiss and granitized amphibolite. Molybendite flakes up to 1/8 inch in size were noted in the pink leuco-granite in small irregular patches, which might run 2 percent".
DEVELOPMENT HISTORY	No recorded development
REFERENCE MAP	ODM 1953-2, Brudenell-Raglan Area, 1954

REFERENCES

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1954: Geology of the Brudenell-Raglan Area; Ontario Department of Mines, Ann. Rept. Vol. 62 1953, p. 76.

Johnston, F. J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7 P. 65

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario; Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits er., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

37. WILSON

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pyroxenite skarn OTHER: Pegmatite
CLASSIFICATION	1A. Stratabound, skarn hosted
LOCATION	Matawatchan Township, Renfrew County NTS 31F/3, UTM Zone 18, 4998740N, 336610E LAT. 45° 07' 31"N; LONG. 77° 04' 39"W Con. 6, Lot 3
ACCESS	The deposit was not visited by the authors but is believed to be located less than 500 metres west of a dirt access road to Montserrat Lake, south of Aird Lake.
SIZE AND GRADE	Mineralization consists of scattered flakes of molybdenite in a zone of unknown extent. Workings consist of a small blasted area.
DESCRIPTION	The deposit has been described by Eardley-Wilmot (1925, p.105) as follows: "the outcrop consists of a mass of pyroxenite on the margin of a ridge of pegmatite from 40 to 50 feet wide. The molybdenite, which has been exposed by a few shots, occurs in small flakes scattered throughout the pyroxenite". Satterly (1945, p. 87) reports that he made an intensive search of Con. 6, Lot 3 but was unable to find any workings or molybdenite mineralization.
DEVELOPMENT HISTORY	before 1925: some blasting by unknown operators. Two or three pounds of molybdenite is reported to have been removed.
REFERENCE MAP	ODM 53b, Renfrew Area, 1945

REFERENCES

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1925: Molybdenum; Canada Department of Mines, Pub. No. 592, p. 105

Johnston, F. J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P.65

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario; Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P.1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Parsons, A. L.
1917: Molybdenite Deposits of Ontario; Ontario Bureau Mines, Ann. Rept. Vol. 26, p. 305

Satterly, J.
1945: Mineral Occurrences in the Renfrew Area; Ontario Department of Mines, Ann. Rept. Vol. 53, pt. 3, 1944, p. 86, 87.

38. BURNSTOWN

COMMODITY — Molybdenum

ROCK ASSOCIATION — HOST: Granite pegmatite
OTHER: 'Granite', paragneiss

CLASSIFICATION — 1B. Unconformable-to-conformable, pegmatite hosted

LOCATION — McNab Township, Renfrew County
NTS 31F/7, UTM Zone 18, 5031135N, 379600E
LAT. 45^{o} 25' 31"N; LONG. 76^{o} 32' 20"W
Con. 4, Lot 19

ACCESS — The deposit was not visited by the authors but is reported by Quinn (1952, p. 65) to be located "in a small, low cut at the east side of the road in Lot 19, Con. IV, McNab township, about 2 miles northeast of Burnstown".

SIZE AND GRADE — Mineralization consists of erratically distributed coarse flakes of molybdenite in a zone 30 feet wide and of unknown extent. Workings consist of a "small, low cut", (Quinn, 1952).

DESCRIPTION — The Burnstown deposit is described by Quinn (1952, p. 65) as follows:

> "Molybdenite occurs in a sill of granite-pegmatite exposed in a small, low cut at the east side of the road in Lot 19, Con. IV, McNab township, about 2 miles northeast of Burnstown. The sill strikes approximately north, dips to the east at 35 degrees, is 30 feet or more wide, and lies in fine-grained, pink granite along the western contact of a band of paragneiss. The texture of the sill varies from fine to coarse grained to graphic. The coarser grained parts of the sill contain several per ent molybdenite in books up to one inch by one inch by 1½ inches".

The deposit is probably similar to the other pegmatite hosted molybdenite deposits in the Pembroke-Renfrew area. The pegmatite and its contained mineralization may be magmatic in origin and thus related to the granitic intrusion or they may be a product of high grade regional metamorphism.

DEVELOPMENT HISTORY — before 1951: molybdenite exposed in a small cut by unknown operators.

REFERENCE MAP — GSC 1046A, Renfrew, 1956

Johnston, F. J.
1968: Molybdenum Deposits of Ontario; Ontario Department of Mines; M.R.C. No. 7, P.65

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario; Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Quinn, H. A.
1952: Renfrew Map-Area, Renfrew and Lanark Counties; Geological Survey of Canada, Paper 51-27, p. 65

39. YORK RIVER

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Quartz vein OTHER: Uncertain
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Monteagle Township, Hastings County NTS 31F/4, UTM Zone 18, 5001590N, 284880E LAT. 45° 08' 13"N; LONG. 77° 44' 09"W Con. 1, Lot 6
ACCESS	The deposit was not visited by the authors but is located within 2km of a gravelled road.
SIZE AND GRADE	Mineralization consists of a few flakes of molybdenite in a narrow vein. There are no workings.
DESCRIPTION	The deposit occurs within a northeast-trending sequence of intercalated marbles, and calcareous and siliceous clastic metasedimentary rocks. According to Adams and Barlow (1910, p. 351) "on Lot 6, Concession 1, of Monteagle, a few shots have been put in on a narrow vein of quartz and fibrous hornblende containing scattered scales of molybdenite. The occurrence does not seem to be of any economic value".
DEVELOPMENT WORK	None reported
REFERENCE MAP	ODM 1954-3, Monteagle and Carlow Townships, 1955.
REFERENCES	Adams, F. D. and Barlow, A. E. 1910: Geology of the Haliburton and Bancroft Areas, Province of Ontario; Geological Survey of Canada, Memoir No. 6, p. 295 Johnston, F.J. 1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7, P. 36. Meyn, H.D., and Howarth, J.R. 1977: Molybdenum Deposits of Ontario; Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

40. CRAIGMONT

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Alkalic dikes OTHER: Granite
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Raglan Township, Renfrew County NTS 31F/5, UTM Zone 18, 5019500N, 295390E LAT. 45^{o} 18' 04"N; LONG. 77^{o} 36' 35"W Con. 18, Lot 6
ACCESS	A single lane access road leads to the former Craigmont corrundum mine-site east from Highway 517.
SIZE AND GRADE	Mineralization consists of scattered flakes of molybdenite in an area of unknown extent. Workings are very numerous and wide-spread.
DESCRIPTION	The molybdenum occurs as an accessory mineral in the rocks that host the former Craigmont mine, a past producer of corundum. According to Walker (1911, p. 46), "in the northwestern part of the township of Raglan the gneissic granites have been intersected by intrusive alkali dikes which frequently carry corundum. The corundum -bearing rocks show numerous seams in which minerals, apparently later, have been deposited. These bands of younger minerals are made up of the following in order of their abundance: pyrite, pyrrhotite, calcite, quartz, feldspar, scapolite, reddish muscovite, diopside, and molybdenite. The last mentioned mineral forms thin foliated sheets which rarely attain 5 inches across and ½ inch thickness. Usually the plates are not more than 1/8 inch thick, and less than 2 inches diameter. Although the corundum quarries have been extensively operated for about 10 years, during which time molybdenite has been frequently observed, yet it has never been abundant enough to be regarded as an economic mineral, and the total amount, if saved, would have represented not more than a few hundred weight. Fine specimens of molybdenite are frequent but not in economic proportions".
DEVELOPMENT HISTORY	1899-1946: the property was operated intermittently as a corundum mine. Work included excavation of numerous pits, trenches, etc., operation of a mill.

REFERENCES

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1968: Molybdenum Deposits of Ontario; Ontario Department of Mines, M.R.C. No. 7 P. 65

Meyn, H.D., and Howarth, J.R.
1977: Molybdenum Deposits of Ontario; Southern Sheet, Southern Ontario and District of Nipissing; Ontario Geological Survey Prelim. Map P. 1247, Mineral Deposits Ser., scale 1:1,013,760 or 1 inch to 16 miles. Compilation 1975, 1976.

Walker, T. L.
1911: Report on the Molybdenum Ores of Canada; Canada Department of Miens, Pub. No. 93, p. 46.

41. LIEDTKE

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Granite pegmatite, pyroxenite skarn OTHER: Calcitic marble, sandstone
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Raglan Township, Renfrew County NTS 31F/6, UTM Zone 18, 5014020N, 307080E LAT. 45º 15' 19"N; LONG. 77º 27' 31"W Concessions 9 and 10, Lot 27.
ACCESS	The deposit is located about 400 metres east of Hwy. 514, and is accessible by foot along an overgrown bush road.
SIZE AND GRADE	Mineralization consists of disseminated molybdenite contained in fractures within a dike that varies from 1.5 to 10.7 metres wide (5 to 35 feet) and has a known length of 311 metres (1,010 feet). Tonnage and average grade are unknown. Workings consist of numerous pits and trenches of variable sizes and a shaft reported to be 40 feet deep (Hewitt, 1954, p. 76).
DESCRIPTION	The Liedtke molybdenum deposit is hosted by a granite pegmatite dike that is contained within a succession of intercalated calcareous and siliceous clastic metasedimentary rocks, and marbles. Calcitic marble, amphibolite, and quartz-feldspar paragneiss are exposed in the vicinity of the dike. There is also a thin zone of metamorphic pyroxenite along the borders of the pegmatite dike in some places (see Figure 41A). The pegmatite is a pink, coarse-grained (5mm) rock composed essentially of feldspar and both white and smoky quartz, and minor biotite. The marble is a white, coarse-grained rock composed essentially of calcite, with abundant biotite. The quartz-feldspar paragneiss forms thin interbeds up to 1 metre thick within the marble and consists of variable amounts of quartz, feldspar, and biotite. The amphibolite occurs as very thin interbeds less than half a metre wide within the marble and consists essentially of amphibole and plagioclase. Mineralization consists of coarse flakes of molybdenite that are contained within narrow zones of pyroxenite along the contacts of the pegmatite dike, or within narrow fractures within the pegmatite. The fractures usually "carry molybdenite, calcite, hornblende, magnetite, pyrite and pyrrhotite" according to Hewitt (1954, p. 77). The mineralized fractures and pyroxenite zones are very erratic in distribution over the length of the pegmatite dike. The nature of the mineralization is somewhat similar to the metamorphic pyroxenite hosted molybdenite deposits, and also to the pegmatite hosted deposits, although the mineralized fractures and pyroxenite zones must have formed after formation and intrusion of the pegmatite dike. It seems likely, however, that the mineralization and the pegmatite have a similar mode of origin.
DEVELOPMENT HISTORY	about 1917: sometime during World War 1 adjoining claims were owned and prospected by Herman Liedtke (Con. 10) and John Windle (Con. 9). Thirty to forty tons of rock were removed from one or two pits. 1913: Liedtke property acquired by Edgemont Molybdenite Mines Ltd. They extended the old workings, sunk a shaft to 40 feet in depth and performed 1,000 feet of diamond drilling in an unspecified number of holes. 1942: 27 tons of hand-cobbed ore containing 0.75 percent MoS_2 were shipped to Cleveland, Ohio, by Edgemont Molybdenite Mines Ltd. They also excavated several more pits and trenches.
REFERENCE MAP	ODM 1953-2, Brudenell-Raglan Area, 1954

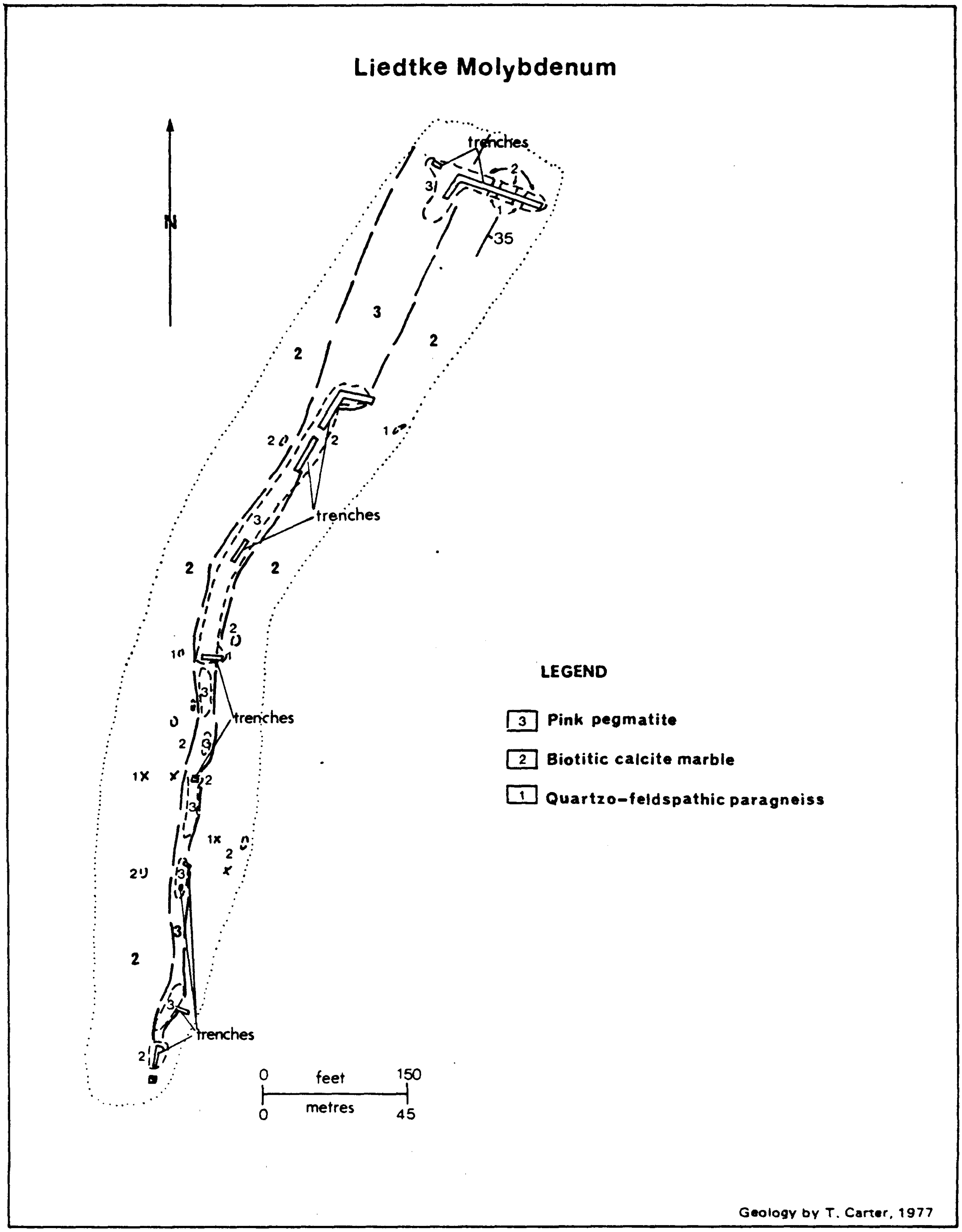

Figure 41A — Geology and workings of the Liedtke molybdenum deposit.

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42. ELLIOT

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Marble
CLASSIFICATION	1D. Geological relationships unclear
LOCATION	Ross Township, Renfrew County NTS 31F/10, UTM Zone 18, 5059670N, 362110E LAT. 45° 40' 44"N; LONG. 76° 46' 14"W Con. 9, Lot 7
ACCESS	The authors could not locate the deposit after an intensive search of the entire Lot. A railroad, paved road, and a gravelled road all pass through or near the boundaries of the Lot.
SIZE AND GRADE	Mineralization consits of a few scattered flakes of molybdenite in a zone of unknown extent. Workings are reported to consist of some "excavations", (Walker, 1911, p. 47).
DESCRIPTION	The Elliott deposit, according to Willmot (1885, p. 8), "consists of a vein or bed, probably the latter, of limestone, holding bright polished masses of molybdenite, apatite, scapolite, titanite, and pyrite". No further descriptions are available as the authors were unable to locate the deposit. There is, however, a small lens of metamorphic pyroxenite containing disseminated molybdenite that is exposed in a rock-cut on the railroad that passes through the Lot.
DEVELOPMENT HISTORY	before 1883: some excavations completed by unknown operators on the farm of Mr. John J. Elliott.
REFERENCE MAP	ODM 53b, Renfrew Area, 1945

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43. ROSE

COMMODITY	Molybdenum
ROCK ASSOCIATON	HOST: Pegmatite OTHER: Marble, elastic metasedimentary paragneiss
CLASSIFICATION	1B. Unconformable-to-conformable, pegmatite hosted
LOCATION	Ross Township, Renfrew County NTS 31F/10, UTM Zone 18, 5046190N, 360060E LAT. 45^{o} 33' 26"N; LONG. 76^{o} 47' 35"W. Con. 2, Lot 22
ACCESS	The deposit is accessible on foot 457m (1,500 feet) due west from a point on a disused concession road between Lots 23 and 24, 610m (2,000 feet) west from the town of Haley Station.
SIZE AND GRADE	Mineralization consists of dispersed coarse flakes of molybdenite with associated pyrite in a dike that is exposed for a length of about 24.4 metres (80 feet), and is about 1m (3 feet) wide. A sample of typical mineralized rock assayed by Walker (1911, p.47), contained 1.61 percent MoS_2 and no copper. Workings consist of a single long water-filled pit that is about 30m (100 feet) long, up to 4.6m (15 feet) wide and about 2.1m (7 feet) deep. A shaft 12.2 metres (40 feet) deep is reported to have been sunk in the middle of this pit (Eardley-Wilmot, 1925, p. 106).
DESCRIPTION	The Rose molybdenum deposit occurs within a sequence of intercalated marble and calcareous clastic metasedimentary rocks. The mineralization occurs within a granitic pegmatite dike that strikes at an azimuth of 210 degrees and dips at 55 degrees to the north. It cuts unconformably across a sequence of well-layered hornblende-quartz-feldspar paragneisses that strike in a northerly direction and dips at about 30 degrees to the east. The paragneisses are fine-grained, gneissic rocks composed essentially of hornblende, plagioclase, and minor quartz and probably represent metamorphosed calcareous and siliceous clastic metasedimentary rocks. The pegmatite is a very coarse-grained rock composed of a very inhomogenous intergrowth of quartz and feldspar and large books of biotite. As exposed in the workings, the dike is about 24.4m (80 feet) long and 1m (3 feet) wide but does not extend past the ends of the pit. Mineralization consists of erratically distributed coarse flakes of molybdenite and coarse pyrite contained within the pegmatite. The pegmatite dike probably is a product of the high grade regional metamorphism of the area. Consequently, the mineralization contained within it is probably also a product of the regional metamorphism.
DEVELOPMENT HISTORY	before 1911: excavation of a pit by unknown operators. 250 pounds of ore sent to Professor J.B. Porter of McGill University for concentration experiments 1916: 10 tons of ore containing 3.64 percent MoS_2 shipped by unknown operators 1917: Maple Leaf Exploration Company obtained the property and continued sinking a shaft previously started. 6.2 tons of ore containing 2.19 percent MoS_2 shipped to the Mines Branch in Ottawa, by M.L. Foley. 1.3 tons of ore containing 1.08 percent MoS_2 shipped to the Mines Branch in Ottawa by J.F. Day for Maple Leaf Exploration Company. About 316 pounds of pure MoS_2 were recovered from these shipments.

REFERENCE MAP ODM 53b, Renfrew Area, 1945

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44. FELHABER

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pegmatite OTHER: Hornblende gneiss, feldspar gneiss
CLASSIFICATION	1B. Unconformable-to-conformable, pegmatite hosted
LOCATION	Sebastopol Township, Renfrew County NTS 31F/6, UTM Zone 18, 5025180N, 327225E LAT. 45° 21' 39"N; LONG. 77° 12' 22"W Con. 2, Lots 14 and 15
ACCESS	The deposit was not visited but is reported by Satterly (1945, p. 88) to "lie just north of a wagon road and is 1,100 and 2,500 feet west of a farmhouse on Lot 16".
SIZE AND GRADE	Mineralization consists of a few scattered flakes of molybdenite contained in a few narrow dikes up to half a metre in width and discontinuous along strike. Workings consist of two small pits.

DESCRIPTION

The deposit is described by Satterly (1945, p.p. 88, 89) as follows:

"On Lot 15, 1,100 feet west of the farmhouse, a pit 4 by 10 feet and from 2 to 4 feet deep exposes rusty hornblende gneiss with bands of pink feldspar gneiss, which strikes N85°W, dips 40°S, and is cut by irregular stringers or dikelets of pegmatite. On the east wall of the pit rusty pegmatite contains disseminated pyrite and a few flakes of molybdenite. The main band of mineralized pegmatite, which is parallel to the gneissic structure, is about 18 inches wide.

"On Lot 14, 2,500 feet west of the farmhouse, a shallow test pit 10 by 10 feet and from 3 to 4 feet deep is now filled with leaves and water. The outcrop is a brown to pink granite gneiss containing a rusty stringer of pegmatite mineralized with fine to coarse pyrite, some pyrrhotite, and chalcopyrite. No molybdenite was observed, although Mr. Felhaber reports a little was found in this pit".

"The occurrences are of no importance".

The deposit, as described by Satterly, is similar to several of the other molybdenum deposits in the Pembroke-Renfrew area.

DEVELOPMENT HISTORY	before 1944: two small pits excavated by unknown operators on land owned by Mr. W. Felhaber
REFERENCE MAP	OGS Preliminary Map, Khartum Area, in preparation

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45. OPEONGO ROAD

COMMODITY	Molybdenum
ROCK ASSOCIATION	HOST: Pegmatite OTHER: Marble, gneiss
CLASSIFICATION	1B. Unconformable-to-conformable, pegmatite hosted
LOCATION	Sebastopol Township, Renfrew County NTS 31F/6, UTM Zone 18, 5030605N, 326860E LAT. 45° 24' 34"N; LONG. 77° 12' 45"W Range C, Lots 36, 37 and 38.
ACCESS	The deposit was not visited by the authors, but is reported to be south of the Opeongo Road.
SIZE AND GRADE	Mineralization consists of a minor amount of molybdenite contained in 2 narrow dikes up to 0.6 metres (2 feet) in width. There is no record of any workings on the deposit.
DESCRIPTION	The deposit is described by Parsons (1917, p. 310) as follows: "On the farm of Edward Ziebarth, Lots 36, 37 and 38, Range C, South, are two small dikes in gneiss and crystalline limestone in which some molybdenite has been found, but the development up to date has not exposed a deposit of commercial importance. The width of the dikes is about two feet and 18 inches, respectively, and they consist of pyritic pyroxenite and pegmatite".
DEVELOPMENT HISTORY	No recorded development
REFERENCE MAP	OGS P1560, Clontarf Area, Renfrew County, 1978

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APPENDIX IV

Symbols List for all Figures in Appendices I,II, and III

SYMBOLS LIST

Symbols apply to all figures accompanying Appendices I,II, and III, unless otherwise indicated.

	outcrop area, small outcrop
	swamp
	map boundaries
	geological contact (assumed, observed)
	parasitic folds
	foliation (inclined, vertical)
	bedding (inclined, vertical)
	gneissosity (inclined, vertical)
	road
	pit, trench
	open cut
	shaft
	dump

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LIST OF DEPOSITS

Base and Precious Metals

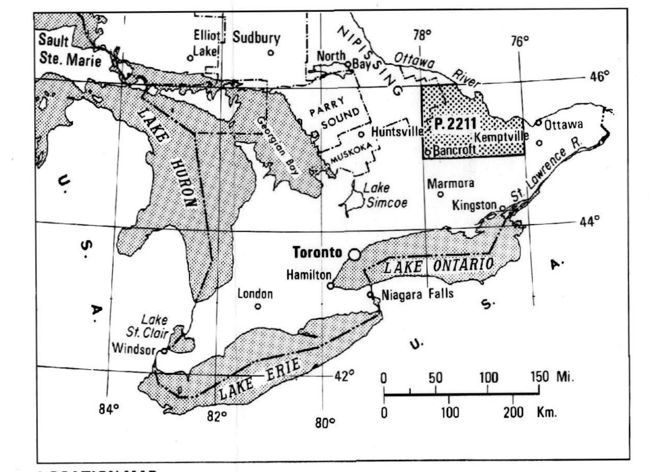
	Deposit	Township
1.	Renprior	Admaston
2.	Bradfords Creek	Darling
3.	Darling	Darling
4.	Green Lake	Darling
5.	Bowen Corner	Dungannon
6.	Jefrey	Faraday
7.	Campbell Lead	Fitzroy
8.	Kingdon Mine	Fitzroy
9.	Stanton	Fitzroy
10.	Pharoah	Lanark
11.	Begin	Lavant
12.	Clyde Forks	Lavant
13.	Joes Lake	Lavant
14.	Lavant	Lavant
15.	Lavant Creek	Lavant
16.	Lynx-Canada	Lavant
17.	Nelson Lakes	Lavant
18.	Robertson	Lavant
19.	Simon	Lyndoch
20.	McNab	McNab
21.	Ameranium	Raglan
22.	Genricks Lake	Raglan
23.	Landolac	Raglan
24.	Raglan	Raglan
25.	Carleton Place	Ramsay
26.	Lynch	Ramsay
27.	Ramsay	Ramsay

Iron

	Deposit	Township
1.	Ashdad	Bagot
2.	Bluff Point	Bagot
3.	Calabogie	Bagot
4.	Culhane	Bagot
5.	Frechette	Bagot
6.	Highway 508	Bagot
7.	Lerond	Bagot
8.	Martel	Bagot
9.	Murphy Road	Bagot
10.	Stufkos Lake	Bagot
11.	Williams	Bagot
12.	Barryvale	Blithfield
13.	Blithfield Pyrite	Blithfield
14.	Blackbird	Brougham
15.	Dacre	Brougham
16.	Kennelly Lake	Brougham
17.	Boulter	Carlow
18.	Fraser Lake	Carlow
19.	Darling	Darling
20.	Fahey	Darling
21.	McIlwraith Pyrite	Darling
22.	White Lake	Darling
23.	Yuill	Darling
24.	Coltson Lake	Dungannon
25.	Copper Lake	Dungannon
26.	Hastings Road East	Dungannon
27.	Bow Lake	Faraday
28.	Carfrae	Faraday
29.	Trent River	Faraday
30.	Whitefoot Lake	Faraday
31.	Fitzroy Harbour	Fitzroy
32.	Grattan	Grattan
33.	Ottawa River	Horton
34.	Lavant	Lavant
35.	Radenhurst-Caldwell	Lavant
36.	Wilbur	Lavant
37.	Bessemer	Mayo
38.	Bulpit Lake	Mayo
39.	Childs	Mayo
40.	Hamlyn	Mayo
41.	Rankin	Mayo
42.	Stevens	Mayo
43.	Swordfingal	Mayo
44.	McNab	McNab
45.	Lavant Station	Palmerston
46.	Keller	Raglan
47.	Ross	Ross
48.	Longstone Lake	South Canonto
49.	Summit Lake	South Canonto
50.	Torbolton	Torbolton

Molybdenum

	Deposit	Township
1.	Gorman	Admaston
2.	Kiley	Admaston
3.	Lafleurs Lake	Admaston
4.	Bagot Molybdenite	Bagot
5.	Belangers Corners	Bagot
6.	Blimkies Mountain	Bagot
7.	Buckhorn	Bagot
8.	Culhane	Bagot
9.	Hond Lake	Bagot
10.	Hunter	Bagot
11.	Morin	Bagot
12.	Stones Lake	Bagot
13.	Zenith	Bagot
14.	Quilty	Blithfield
15.	Cole	Bromley
16.	Box	Brougham
17.	Charron	Brougham
18.	Guiney	Brougham
19.	Hunt	Brougham
20.	Maloney	Brougham
21.	Ross-O'Brien	Brougham
22.	Sunset	Brougham
23.	Brotton	Burns
24.	Bronson	Dungannon
25.	Stoughton	Dungannon
26.	Keller	Faraday
27.	Wren	Grattan
28.	Legree	Griffith
29.	Lepine	Griffith
30.	Spain	Griffith
31.	Bruceton	Lyndoch
32.	Jamieson	Lyndoch
33.	Lyndoch	Lyndoch
34.	McCoy	Lyndoch
35.	Mining Mountain	Lyndoch
36.	Wolfe Fire Tower	Lyndoch
37.	Wilson	Matawatchan
38.	Burnstown	McNab
39.	York River	Monteagle
40.	Craigmont	Raglan
41.	Liedtke	Raglan
42.	Elliot	Ross
43.	Rose	Ross
44.	Felhaber	Sebastopol
45.	Opeongo Road	Sebastopol



LOCATION MAP

Ministry of Natural Resources
Ontario
Hon. James A.C. Auld, Minister
Dr. J.K. Reynolds, Deputy Minister

ONTARIO GEOLOGICAL SURVEY
PRELIMINARY MAP P. 2211
GEOLOGICAL SERIES

Stock No. 11968

BASE AND PRECIOUS METALS, IRON AND MOLYBDENUM DEPOSITS OF THE PEMBROKE-RENFREW AREA

SOUTHERN ONTARIO

Scale: 1:126 720

Miles 1 0 1 2 3 4 5 6 Miles

Metres 2500 0 5 Kilometres

NTS Reference: 31F

METAL AND MINERAL ABBREVIATIONS

Ag	Silver	Mo	Molybdenum
As	Arsenic	Ni.	Nickel
Au	Gold	Pb	Lead
Bi.	Bismuth	py	Pyrite
Cu	Copper	Sb	Antimony
Fe	Iron	U	Uranium
hem	Hematite	Zn	Zinc

LEGEND

■ Pb	Base and Precious Metals
▼Mo10	Molybdenum
●Fe36	Iron
	Marble belt — well known
	Marble belt — poorly known
	Paleozoic cover
	Limit of Late Precambrian supracrustal sequence

SOURCES OF INFORMATION

The geological information on this map has been compiled by C. C. Storey from published and unpublished maps of the Ontario Geological Survey. It is of a provisional nature as the geology is currently under review. Marble belts are shown in general outline only; they may contain intercalated clastic metasedimentary rocks. Some small marble units outside the major belts are not shown due to the scale of the map.

A 'deposit' is defined as any natural concentration of metallic minerals, however small. The locations of most of the mineral deposits are based on field work conducted by T. R. Carter and assistants in 1977 and 1978. Some deposits were not visited and locations are based on published maps and reports of the Ontario Geological Survey, and the Geological Survey of Canada, or on information obtained from the Assessment Files Research Office of the Ontario Geological Survey.

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Carter, T. R.
1979: Base and Precious Metals, Iron and Molybdenum Deposits of the Pembroke-Renfrew Area, Southern Ontario; Ontario Geological Survey Prelim. Map P.2211, Geological Ser., Scale 1:126 720 or 1 inch to 2 miles. Geology 1977, 1978.