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Geology of the  
Kabinakagami Lake Area  
District of Algoma

By

G.M. Siragusa

Geoscience Report 159

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### Geological Map

(Back Pocket)

Map 2355 (coloured)-Kabinakagami Lake, Algoma District.

Scale 1:63,360 or 1 inch to 1 mile.

## ABSTRACT

The eastern half of the map-area covers part of an Early Precambrian metavolcanic-metasedimentary belt, the main section of which consists of a northeast-trending metabasaltic series with subordinate felsic metavolcanic and metasedimentary units. Metagabbro, metapyroxenite, and minor metaperidotite, which are thought to be of intrusive origin, are locally associated with the mafic metavolcanics. All these rocks were intruded, metamorphosed under amphibolite facies conditions, and locally assimilated, by trondhjemitic intrusions. At least two potassic-rich granitic phases post-date the trondhjemite, and the youngest phase is post-tectonic. Subsequently, both the supracrustal and the granitic rocks were intruded by numerous northwest-trending and some northeast-trending and north-trending diabase dikes. Minor amphibolite and lamprophyre dikes of uncertain age are locally found in the area.

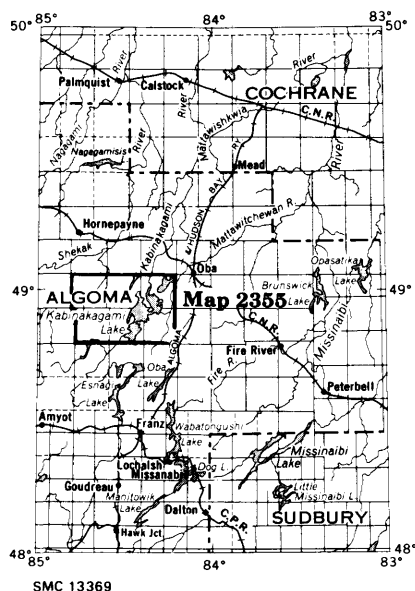


Figure 1—Key map showing location of the Kabinakagami Lake area. Scale 1:3,168,000 or 1 inch to 50 miles.

The metavolcanics of the main belt are exposed along, and inland from, the west side of Kabinakagami Lake. Tops are apparently to the east, and the metavolcanics dip to the southeast opposite to the northwestward dip of the metasediments found on some of the islands and along the eastern shore of Kabinakagami Lake in Lizar Township. The main structure of the belt appears to be a northeast-trending syncline, the western limb of which consists essentially of metavolcanics, whereas metasediments interbedded with lesser metavolcanic units are the dominant rocks in the eastern limb of the structure.

The rocks of the Kabinakagami Lake area are the hosts of two types of mineralization: 1) titaniferous magnetite associated with ultramafic intrusions of metapyroxenite, and 2) gold associated with pyrite and minor base metal sulphides in quartz veins occurring in silicified mafic and felsic volcanics, and at the contacts of intercalated mafic and felsic metavolcanics. Prospecting for gold is recommended in the volcanics particularly in southwestern Lizar, and southeastern Breckenridge Townships.



Geology  
of the  
Kabinakagami Lake Area  
District of Algoma

by  
G.M. Siragusa<sup>1</sup>

INTRODUCTION

Location and Access

The Kabinakagami Lake area is in the northern part of the Algoma District and is bounded by Latitudes 48°48'00" and 49°03'30"N and Longitudes 84°13'00" and 84°48'00"W. It includes the six contiguous townships of Beaton, Lipton, Derry, Ermine, Lizar, and Breckenridge for a total of approximately 1,258 km<sup>2</sup> (486 square miles). The area is within the Sault Ste. Marie Mining Division. Between 1937 and 1940, 179 ounces of gold, and 31 ounces of silver were produced from one locality in central Lizar Township (Toronto Mineral Deposits File, District of Algoma, Lizar Township, Hiawatha Mine).

The only practical access to the area is by float-equipped aircraft from White River, approximately 60 km (40 miles) southwest of the southern end of Kabinakagami Lake, or from Wawa approximately 100 km (60 miles) south-southwest of the lake. The Algoma Central Railway crosses central Irving and Hawkins Townships outside the map-area, at a distance of about 1.6 to 8 km (1 to 5 miles) from the eastern boundary of the latter. Highway 631 connects White River to Hornepayne and provides access to the western half of Beaton Township.

Kabinakagami Lake, Kabinakagamis Lake, Cameron Lake, and segments of the Oba and Kabinakagami Rivers provide internal communication routes in the eastern part of the map-area; northern Nameigos Lake and segments of the Nameigos River are useful for the same purpose in the southwestern part of the area.

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<sup>1</sup>Geologist, Precambrian Geology Section, Geological Branch, Ontario Division of Mines. Manuscript accepted for publication by the Chief Geologist, 13 March 1975.

## Kabinakagami Lake Area

Narrow waterways such as Lipton Creek and Breckenridge Creek provide limited access by light-weight canoe to a relatively large area of poor drainage west of Kabinakagami Lake. Unfortunately these waterways are shallow during most of the summer and this considerably reduces their usefulness.

The map-area is shown at the scale of 1:50,000 on the Hornpayne, Oba, Gourlay Lake, and Kabinakagami Lake topographic sheets; at the scale of 1:126,720 or about 1 inch to 2 miles on the Kabinakagami Lake and Hornepayne topographic sheets; and at the scale of 1:250,000 by the White River and Hornepayne topographic sheets. GSC-ODM Aeromagnetic Maps 2195G, 2196G, 2209G, and 2210G (ODM-GSC 1963a, b, c, d) cover the area at the scale 1:63,360 or 1 inch to 1 mile.

### Physiography

Different physiographic features characterize the northern, southeastern, and southwestern parts of the map-area.

The northern part comprises approximately the northern halves of Beaton, Lipton, and Derry Townships; swamps are typical landforms of this area which is mostly flat and has an elevation varying between 320 and 335 m (1,050 and 1,100 feet) above sea level. Elevations in excess of 350 m (1,150 feet) are exceptional in this area and rock exposures are very scarce even on the shorelines of relatively large bodies of water such as Cameron and Kabinakagamis Lakes. A noticeable exception is the area drained by the northern segment of the Kabinakagami River where numerous bedrock exposures are found west of the first set of rapids north of Kabinakagami Lake.

In the southeastern part of the map-area, i.e., Ermine Township, the general elevation varies from 350 to 365 m (1,150 to 1,200 feet) above sea level. The landforms typical of the area are several small, lobate-shaped, lakes separated by drift ridges with low relief. Rock exposures are generally scarce and mostly restricted to hilltops.

The southwestern part of the map-area includes most of Breckenridge Township, and part of western Lizar Township. Approximately one third of this area has an elevation of 380 m (1,250 feet) or more above sea level, and up to 457 m (1,500 feet) at a granitic hill located 1.6 km (1 mile) southeast of Beaton Lake in western Breckenridge Township. The high ground consists of northeast-trending ridges of granitic rocks near the western boundary of the map-area, and of mafic metavolcanics in southeastern Breckenridge and western Lizar Townships. The granitic high ground is separated from the metavolcanic high ground by a strip of low and partially swampy land which is 1.6 to 4.8 km (1 to 3 miles) wide, and stretches across central Breckenridge Township from Nameigos to Little Lipton Lake. Rock exposures are numerous in the high ground areas, and commonly the higher exposures are outcrops of diabase dikes. As noted by J.E. Maynard (1929) the lakes of the area are of three general types: (1) those occupying unfilled parts of swamps in drift-covered areas, (2) those occupying depressions in drift-covered areas, and (3) those with rock rims. Sixty-eight ponds and small lakes of the first type are scattered throughout the map-area; they are generally a few hundred feet (about 100 m or less) to 1.2 km ( $\frac{3}{4}$  mile) in length and,

as a rule, are not accessible by fixed-wing aircraft. About 120 lakes of the second type are found in the map-area. They are generally lobate in shape, commonly are 1.2 to 2.4 km ( $\frac{3}{4}$  mile to 1.5 miles) in long dimension, and some are accessible by bush plane. A few small bedrock exposures are found on the shorelines of these lakes. Kabinakagamis Lake and Cameron Lake are both approximately 8 km (5 miles) long and are the largest bodies of water in this category. Only ten lakes of the first type and one of the second type are located in areas underlain by metavolcanics. Beaton Lake, Nameigos Lake, and Kabinakagami Lake are the lakes of the third type. Beaton Lake is at the foot of granitic hills in western Breckenridge Township and its shape is controlled by northeast-trending and northwest-trending fractures and lineaments typical of that area. Nameigos Lake is narrow, about 11 km (7 miles) long, and probably represents a preglacial valley which was deepened by glacial action. Kabinakagami is a beautiful lake about 25 km (15 miles) long and 1.6 to 8 km (1 to 5 miles) wide, with many islands and bays. The lake drains into the northern segment of the Kabinakagami River and receives the drainage of the Oba River and the southern segment of the Kabinakagami River; Nameigos Lake drains into the latter via the Nameigos River. Kabinakagami River, the main waterway of the area, flows to the north, and the map-area, as a whole, is approximately at the boundary between the Albany River and the Moose River watersheds. The Kabinakagami, Oba, and Nameigos Rivers occupy channels filled by glacial drift, and, generally, bedrock exposures are found only where the water has cut through the drift at the sites of rapids and waterfalls.

### Natural Resources

The trees of the area are white and black spruce, white birch, jack pine, tamarac, balsam, poplar, and rarely, minor red pine. Spruce and cedar swamps have locally developed along the rivers and at the foot of the rocky high ground. Spruce trees are commonly 10 to 20 cm (4 to 8 inches) in diameter, but may be 30 to 35 cm (12 to 14 inches). A few of their trunks have prominent abnormal growths of nearly spherical shape. Stands of straight birch and poplar 20 to 35 cm (12 to 14 inches) in diameter are locally found in drift-covered and gently rolling ground in the western half of the map-area.

During the construction of the railways many jack pine trees were cut to make railroad ties and, subsequently, spruce was used for pulp (Maynard 1929). No evidence of recent logging was seen in the visited parts of the area during the summer of 1972.

The map-area is within the zone of highest moose density in Ontario; several moose either lone or in groups of two or three were seen by the crew members during the summer. Rabbit, partridge, bear, and beaver were often seen during the 1972 summer, and fox, mink, otter, and muskrat are reported to live in the area. The lakes are populated mostly by pike, pickerel, and white fish, the first being particularly abundant; ducks were often encountered along the rivers and in the bays on the western side of Kabinakagami Lake.

Although the waterfalls of the Oba River in southeastern Ermine Township, and those of the Kabinakagami River in northwestern Mosambik Township

## Kabinakagami Lake Area

(just outside the southern boundary of the map-area) are too small for the production of significant quantities of hydroelectric power, they could be utilized if the need for limited amounts of energy for local use were to arise. Kabinakagami Lake could serve as a good storage basin.

Maynard (1929) pointed out that the extensive lacustrine and fluvio-glacial deposits in the northern part of the area form soils suitable for agriculture, because the clay underlying the large undrained swamps is covered by a peat layer which is very shallow. Data compiled by the Ministry of Natural Resources (1963) show that the area has an annual snowfall of 2.28 to 2.54 m (90 to 100 inches), an annual rainfall of 63 to 75 cm (25 to 30 inches), and an average July temperature of 17 to 18 degrees Celsius (61 to 64 degrees F.); the regional frost hazard is classified as moderately high.

The natural beauty of Kabinakagami Lake attracts many tourists particularly from the large cities of the northern United States. In the summer of 1972, two tourist lodges were fully operational, one at Windy Point and another at Pine Portage; a third lodge was being built on the western shoreline of Kabinakagami Lake not far from the inlet of the homonymous river into the lake. In addition, individual cabins and/or cottages are found on the shorelines of most of the lakes of medium and large size in the general area. The movement of tourists and supplies generates considerable air traffic with Wawa and White River during most of the summer. The distance between the western shore of Kabinakagami Lake and Highway 631 along a line crossing southern Breckenridge Township is approximately 21 km (13 miles).

### Previous Geological Work

In 1916, T.L. Tanton (1916) carried out reconnaissance mapping along the Canadian National Railway between Gogama and Oba and visited Kabinakagami Lake. In 1926, R.L. Gledhill (1927) visited Hawkins and Walls Townships, and, presumably, the northern part of Kabinakagami Lake. In 1928, most of Derry Township and parts of Lipton, Lizar, and Ermine Townships were mapped by Maynard (1929) at the scale of 1:126,720 or 1 inch to 2 miles as part of a geological reconnaissance survey of twelve townships in the general Oba area. Parts of the Beaton Lake area (western Breckenridge Township) were mapped by K.G. Fenwick in 1963 (1964), and the whole map-area is included in a preliminary map at the scale of 1:126,720 or 1 inch to 2 miles compiled by P.E. Giblin (1968). Detailed information on local geological features is available as a result of prospecting in the map-area, and prospecting and mining in Lizar Township (see 'Economic Geology' section).

### Present Geological Work

The 1972 mapping method varied depending upon the lithology, the outcrop density, and the aeromagnetic relief in the map-area.

The volcanic terrain was mapped from the lakeshore and by pace-and-com-

pass traverses at intervals of approximately 800 m or ½ mile or less where this was warranted by sufficient outcrop density. In planning of tie-lines among outcrop areas, the criteria were the size, the expected quality of exposure, and the aeromagnetic expression of the latter.

Areas peripheral to the metavolcanic-metasedimentary belt but showing aeromagnetic expressions which departed in shape, trend, or both, from those considered typical of diabase dikes, were covered by reconnaissance traverses even when the estimated probabilities of finding outcrops were low.

Areas of problematic access and where only granitic rocks were expected to be present were covered by helicopter reconnaissance runs at 2.4 to 3.2 km or 1.5 to 2 mile intervals.

Acetates overlain on air photographs supplied by the Air Photo Library of the Ministry of Natural Resources, at the scale of 1:15,840 or 1 inch to ¼ mile flown in 1961 were used to record geological data which were then transferred to a 1:15,840 or 1 inch to ¼ mile base map supplied by the Cartographic Unit of the Surveys and Mapping Branch.

In the map-area, as a whole, the outcrop areas are few and scattered; in general traversing proved to be less efficient than shoreline mapping particularly with regard to observation of detailed features in the metavolcanics. This was because most of the prominent outcrop areas encountered in traversing were hills with weathered or moderately forested tops, and with steep nearly barren sides parallel to layering so that, beyond lithology, little information could be gathered from the best exposed parts of the outcrops. The small size of the openings in the forest at, or close to, the sites of bedrock exposures was also a limiting factor in helicopter mapping. Where the ground conditions did not permit landing but the rocks could be examined at hovering distance, they were coded with the symbol of the pertinent unsubdivided rock-unit.

### Acknowledgments

Assistance in the 1972 field season was provided by D.H. Mills as senior assistant and M. Spazier, P. Simard, and E.B. Eggertson as junior assistants; D.H. Mills carried out independent mapping in various parts of the map-area. The help offered by D. Watson of Pine Portage in facilitating communications, equipment repairs, and hauling of helicopter fuel is gratefully acknowledged.

## GENERAL GEOLOGY

The eastern half of the map-area includes parts of a northeast-trending Early Precambrian belt consisting dominantly of mafic metavolcanics and subordinately of metasediments which include sandstone and conglomerate. These rocks were intruded, metamorphosed under amphibolite facies conditions, and partially assimilated, by granitic rocks. Subsequently, both the supracrustal and the granitic rocks were intruded by numerous northwest-trending, and some northeast-trending and north-trending diabase dikes.

## Kabinakagami Lake Area

Within the map-area the main segment of the metavolcanic-metasedimentary belt consists of a dominantly mafic metavolcanic series which trends northeast and extends widening from southern Derry Township to southern Lizar and Breckenridge Townships. At one locality in northeastern Lizar Township the belt reduces to a band which is probably 90 m (300 feet) wide at its narrowest point, but owing to scarcity of exposures this estimate of minimum width is largely based on interpretation. At the prominent southwest-pointing peninsula of Kabinakagami Lake south of Pine Portage (Derry Township), the belt has an exposed minimum width of about 490 m (1,600 feet) and in southern Lizar and Breckenridge Townships it reaches a maximum width of approximately 8 km (5 miles); metavolcanics and metasediments account for an estimated four-fifths and one-fifth of this width respectively. In this area, the belt is considerably wider than indicated by previous mapping. The metavolcanics of the main belt are exposed along and inland of the west shore of Kabinakagami Lake in Lizar Township, northeast of Nameigos Lake in Breckenridge Township, and along parts of the northern shore of Kabinakagami Lake in southern Derry Township.

Sandstones, derived from rocks which were probably greywacke and quartz arenites, and subordinate paragneiss flank the east side of the metavolcanic series of the main belt. Metasediments are exposed on the main island of Kabinakagami Lake, on some of the small islands close to the main one, and at various localities along the eastern shore. Minor occurrences of pyrite-bearing biotite-rich paragneiss and hornblende-biotite paragneiss are found at a few localities on the eastern lakeshore characterized by marked linear aeromagnetic relief. Most of the magnetically anomalous areas are concealed by the lake water. They are interpreted as the exposed tips of lean sulphide facies iron formation bands. Close to the southern boundary of the map-area, the fine- and medium-grained metasediments give place along strike to conglomerate.

In general, the metasediments were previously considered to be batholithic felsic intrusive rocks (Maynard 1929).

Narrow northeast-trending bands of mafic metavolcanics are interbedded with metasediments and trondhjemitic gneiss in northern Ermine Township along and inland of the eastern and southern shores of Kabinakagami Lake. The geological boundaries delimiting these bands are approximate and were inferred from interpretation of aeromagnetic data and the scanty field evidence found in the area.

Equigranular, medium-grained, massive, hornblende gabbro and hornblende pyroxenite, and minor peridotite which are probably of intrusive origin are locally found associated with the mafic metavolcanics.

A mafic metavolcanic belt trending west-northwest and approximately 3.2 km (2 miles) wide underlies central and eastern Derry Township. In western Derry Township the belt bifurcates into two narrow diverging bands. One pinches off near the northern boundary of the township, and the other extends into eastern Lipton Township where it ends. Previous mapping indicated that this belt is separated from the main northeast-trending belt. However, close to the boundary between Ermine and Derry Townships the trend of the metavolcanics changes progressively from northeast to west-northwest. In addition, mafic metavolcanics were found by the writer's senior assistant east of the Oba River in southeastern Derry Townships. This evidence suggests that the belt trending west-northwest is a divergent northern lobe of the main northeast-trending belt.

**TABLE 1** | Table of Lithologic Units for the Kabinakagami Lake Area

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CENOZOIC	
QUATERNARY	
RECENT	Fluvial, lacustrine, and swamp deposits
PLEISTOCENE	Silt and sandy till containing some clay and variable proportions of pebbles and boulders; fluvioglacial deposits of sand and gravel (eskers); stratified clay deposits
<i>UNCONFORMITY</i>	
PRECAMBRIAN	
MIDDLE TO LATE PRECAMBRIAN (PROTEROZOIC)	
MAFIC INTRUSIVE ROCKS	Diabase dikes, porphyritic diabase dikes, minor amphibolite and lamprophyre dikes <sup>1</sup>
<i>INTRUSIVE CONTACT</i>	
EARLY PRECAMBRIAN (ARCHEAN)	
FELSIC INTRUSIVE AND METAMORPHIC ROCKS	Biotite trondhjemite and trondhjemite to granodiorite; associated dioritic rocks derived from contamination; biotite granodiorite, quartz monzonite, minor muscovite-bearing granitic rocks
<i>INTRUSIVE CONTACT</i>	
MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS	Metagabbro, metapyroxenite, metaperidotite
<i>INTRUSIVE CONTACT (ASSUMED)</i>	
METASEDIMENTS	Sandstone, paragneiss, and lesser mafic schists interpreted as lean sulphide facies iron formation bands
METAVOLCANICS	
Felsic Metavolcanics	
Mafic to Intermediate Metavolcanics	

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<sup>1</sup>The Middle to Late Precambrian age of amphibolite and lamprophyre dikes is tentative.

## Kabinakagami Lake Area

Two outcrop areas of mafic metavolcanics occur in Beaton Township. One of these was located by helicopter approximately at the centre of the township in an area where the aeromagnetic expression is complicated by the presence of a prominent northeast-trending diabase dike. The other is on Highway 631. Mafic metavolcanics were also found along strike of this second occurrence approximately 1.6 km (1 mile) east of the highway. These occurrences are interpreted as parts of an isolated east-trending body of mafic metavolcanics with length and width of about 4.8 km and 550 m (3 miles and 1,800 feet) respectively. A body of mafic metavolcanics of similar size is thought to occur in east-central Ermine Township approximately 3.2 km (2 miles) east of Little Ermine Lake. The area is underlain by an east-trending aeromagnetic anomaly which is about 3.2 km (2 miles) long and has a central core slightly in excess of 63,000 gammas (ODM-GSC 1963c); two reconnaissance traverses across this anomaly located very little outcrop and only one outcrop of granitized mafic metavolcanics.

### Early Precambrian (Archean)

#### METAVOLCANICS

##### Mafic to Intermediate Metavolcanics

Mafic to intermediate metavolcanics are the dominant extrusive rock type, are green to dark green, weather to grey and grey-green hues, are mostly fine grained, but may be medium to coarse grained. These rocks are almost invariably foliated and were metamorphosed under amphibolite facies conditions; retrograde greenschist facies metamorphism has locally developed in association with shearing. Quartz veins and quartz pods of irregular shape are found within these rocks and can be locally abundant.

Mineralogically and in order of decreasing abundance the mafic to intermediate metavolcanics consist of hornblende, plagioclase, and quartz. Variable amounts of epidote and carbonates were seen in about one-third of the 41 thin sections that were examined; minor chlorite, penninite, and biotite are occasionally present, and clinopyroxene, garnet, muscovite, actinolite, and zircon (as inclusions in hornblende) are rare occurrences. Hematite, iron-titanium oxides, and pyrite are common accessory minerals.

Hornblende accounts for 50 to 70 percent of the composition of the mafic to intermediate metavolcanics regardless of their fabric or grain size. It has pleochroic colours ranging from light green and tan to intense green and has two general modes of occurrence, i.e., (1) as euhedral strongly pleochroic equigranular crystals which are elongated or prismatic in habit, subparallel in fabric, and are uniformly distributed throughout the rock, and (2) as irregularly shaped patchy aggregates of grains which are heterogeneous in shape, size, and orientation. In the fine-grained metavolcanics the size of the individual hornblende crystals generally ranges between 0.09 and 0.02 mm. Part of the amphibole clustered in the aggregates may show noticeably less dichroism than does the am-

phibole of prismatic habit. The patchy aggregate texture is more common than the prismatic texture and it is suggested that it indicates a slight shift of metamorphism toward higher rank conditions; by further increase in metamorphic rank the heterogeneous aggregates give place to euhedral hornblende phenocrysts of large size found in the coarse-grained mafic metavolcanics described further on. Hornblende commonly shows segregations of iron oxides and only rarely is seen to be pseudomorphous after clinopyroxene.

Plagioclase in the mafic metavolcanics is replaced to variable extent by saussurite, zoisite, and carbonates, so that determination of the original composition is for the most part impossible. However, the extent and type of the alteration products and the length-slow character of albite twinning observed suggest that the plagioclase was fairly calcic in composition. The amounts of plagioclase and quartz vary between 15 to 40 percent and 5 to 12 percent, respectively. Both these minerals occur essentially as groundmass component but quartz may also be present as fracture filling material.

The fine-grained mafic metavolcanics locally grade into medium and coarse grained dark green rocks in which foliation is either poorly developed or absent. Equigranular texture with grain size of 2 to 4 mm and up to 6 and 7 mm is commonly seen in these rocks which might be interpreted as metamorphosed inner parts of thick lava flows. In thin section these rocks show a porphyritic texture which is very seldom detectable in hand specimen. The porphyritic texture results from large euhedral hornblende phenocrysts separated by fine-grained interstitial and recrystallized feldspars and quartz. Minute poikilitic inclusions of feldspars and quartz occur within the hornblende phenocrysts, and this together with the euhedral habit and freshness of the amphibole, indicate that the phenocrysts are porphyroblasts derived from metamorphic growth.

Evidence of primary structures in the metavolcanics is scarce. Pillowed metavolcanics were found at two localities in the Hiawatha Mine area in Lizar Township, and at a distance of 800 m ( $\frac{1}{2}$  mile) from each other. At one of these localities the pillows are relatively well preserved, are few in number, and their sections on the plane normal to bedding vary in size between 61 x 25 cm (24 x 10 inches) and 15 x 30 cm (6 x 12 inches) (Photo 1). In the other Hiawatha Mine locality and a third locality in Lizar Township and along strike from the first two (approximately 5.6 km [3.5 miles] southwest of the Hiawatha Mine), the pillows are much flattened and their long axes are parallel to layering.

Fragmental metavolcanics are rare; thin horizons of light greenish grey rock containing intensely stretched tiny fragments of felsic metavolcanics were seen in a few places interbedded with the mafic metavolcanics. These horizons are generally less than 15 cm (6 inches) thick and are probably metamorphosed interflow tuff. Mafic agglomerate, containing 3 to 20 percent flattened felsic to intermediate volcanic clasts up to 18 cm (7 inches) in length, was found at three localities on the western shore of Kabinakagami Lake in Lizar Township. The width to length ratio of the clast sections in the plane normal to bedding is variable, but at least in the larger clasts, it is mostly 1 to 3 (Photo 2). Owing to lack of exposure it is not known whether the agglomerate outcrops are all parts of the same unit; if it is a continuous unit it could have a maximum thickness of 75 to 90 m (250 to 300 feet). Banded tuff, interlayered with tuff-breccia containing angular volcanic fragments of variable composition and up to 6.3 cm (2.5 inches) in size, was also found at one locality slightly inland from the western shore of Ka-

Kabinakagami Lake Area



ODM9528

Photo 1—Pillowed mafic metavolcanics; tops in direction of knife tip. Western shore of Kabinakagami Lake, central Lizar Township.



ODM9529

Photo 2—Stretched felsic volcanic fragments in mafic meta-agglomerate. Western shore of Kabinakagami Lake, Lizar Township.

binakagami Lake in south-central Lizar Township. In the visited part of the outcrop area the unit has an exposed width of about 7.5 m (25 feet) and grades westward into fine-grained mafic metavolcanics.

### Felsic Metavolcanics

The mafic metavolcanics contain interbeds and lens-shaped bodies of felsic metavolcanics which are fine grained to aphanitic in texture, white, light grey to light tan in colour, and weather mostly to dull white occasionally mottled by light pink or light green hues. Mineralogically these rocks consist of quartz, variably altered feldspars, muscovite, and subordinate amounts of one or more of biotite, epidote, and carbonates, and accessory iron oxides, pyrite, and zircon (as inclusions in biotite); they may commonly be porphyritic owing to the presence of ellipsoidal or nearly circular inclusions of opalescent quartz ranging in size from 1.58 to 6.32 mm (0.06 to ¼ inch). Although the felsic interbeds are more numerous than shown on Map 2355 (back pocket), they represent only an estimated 3 to 4 percent of the metavolcanics. The felsic interbeds are in sharp contact with the mafic metavolcanics and commonly have thickness of about 1 decimeter (a few inches) to 0.6 or 1 m (2 or 3 feet). Thicknesses of 2.4 to 3 m (8 to 10 feet) occur rarely and one felsic interbed with a thickness of at least 10.5 m (35 feet) was seen approximately 450 m (1,500 feet) due southwest of the Hiawatha Mine. In general, it is difficult to determine the lateral extent of the felsic metavolcanic interbeds because considerable stripping would be necessary, but there is evidence that they can thin and pinch off rather abruptly.

### Chemical Composition

Whole rock chemical analyses (Mineral Research Branch, Ontario Division of Mines) of seven samples of mafic metavolcanics and three samples of felsic metavolcanics are shown in Table 2. The analyzed mafic and felsic samples represent typical fine-grained rocks of green to grey-green colour, and of white to light tan colour, respectively, which did not show evidence of alteration or mineralization. The chemical data were used as input data in a computer program developed by T.N. Irvine and W.R.A. Baragar (1971), and currently used by the Mineral Research Branch, Ontario Division of Mines. The program is useful in that it provides a basis for the comparison of chemical trends in the metavolcanics and relates nomenclature to chemical composition. The AFM plot, and the plot of the normative plagioclase composition versus normative colour index (Figure 2 and Figure 3), show that all the analyzed mafic metavolcanics lie in the tholeiitic basalt field and that two of the three analyzed felsic metavolcanics are rhyolite, the third being dacite. As for the apparent scarcity of rocks of intermediate composition, these chemical data although they are very few in number, could reflect a true gap in the compositional range of the metavolcanics present in the map-area. This phenomenon exists in many volcanic areas throughout the world and has been dealt with by several workers (Yoder 1973).

**TABLE 2** Whole rock chemical analyses of typical metavolcanics. (Analyses by Mineral Research Branch, Ontario Ministry of Natural Resources, Division of Mines)

	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	S	MnO	CO <sub>2</sub>	H <sub>2</sub> O <sup>+</sup>	H <sub>2</sub> O <sup>-</sup>	TOTAL
1	48.60	12.30	2.02	9.75	8.89	12.60	1.62	0.10	0.93	0.06	0.01	0.23	0.25	1.81	0.91	100.08
2	50.20	14.60	2.38	13.60	2.67	8.25	2.72	0.46	1.71	0.14	0.05	0.37	0.10	1.54	0.23	99.02
3	49.40	14.50	1.60	9.35	9.81	9.30	2.40	0.29	0.73	0.06	0.01	0.20	0.10	1.47	0.22	99.44
4	53.20	15.00	1.42	9.75	5.50	9.88	1.98	0.31	1.10	0.13	0.01	0.32	0.15	0.87	0.16	99.78
5	50.20	13.70	1.50	9.00	9.20	11.00	1.87	0.07	0.77	0.07	0.01	0.20	1.10	1.10	0.14	99.93
6	47.80	10.70	1.85	8.85	16.20	11.10	1.16	0.07	0.52	0.04	0.01	2.25	0.10	1.88	0.13	102.66
7	49.20	14.60	1.75	9.50	7.65	12.00	1.64	0.13	0.98	0.10	0.06	0.21	0.10	1.11	0.10	99.13
8	74.00	14.60	0.44	1.11	0.10	2.27	6.04	0.48	0.16	0.05	0.02	0.03	0.10	0.53	0.09	100.02
9	73.20	16.30	1.17	0.29	0.45	0.39	1.75	3.88	0.27	0.06	0.41	0.02	0.05	1.66	0.11	100.01
10	70.60	15.20	0.73	1.40	0.91	2.90	3.88	2.58	0.24	0.07	0.31	0.05	0.85	0.91	0.10	100.73

Samples 1 to 7 are mafic metavolcanics from Derry Township, and samples 8 to 10 are felsic metavolcanic interbeds from Lizar Township.

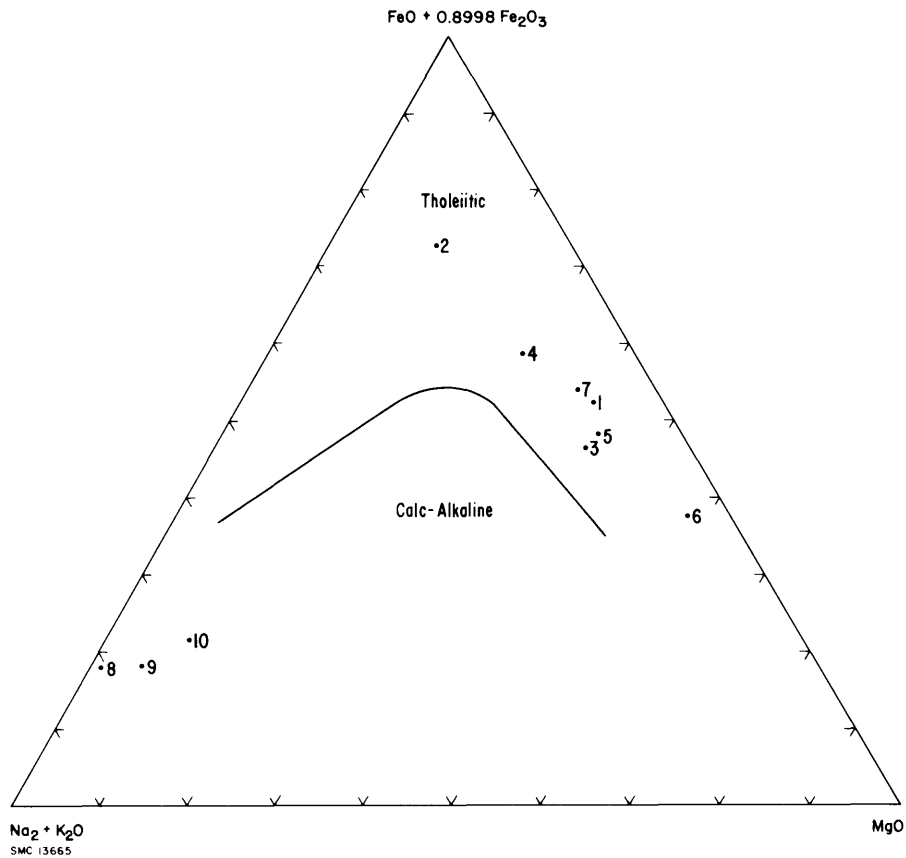


Figure 2—AFM Plot of analyzed metavolcanics (after Irvine and Baragar 1971).

### Contact Relationships with Granitic Rocks

Owing to the scarcity and unfavourable distribution of outcrops the contacts of the metavolcanics with the granitic rocks are largely unexposed. In a few outcrops where the granitic rocks are potassic (i.e. quartz monzonite, quartz monzonitic pegmatite, granodiorite) the contacts are sharp and the intrusive relationships are discordant. Apart from epidotization which can be locally conspicuous, little mineralogical change and no significant deformation was brought about in the metavolcanics by these late or post-tectonic epizonal intrusions. Migmatitic<sup>1</sup> contact relationships are also present and are characterized

<sup>1</sup>Migmatite is a mixed rock in which fragments (or xenoliths) of old country rock (paleosome) are embedded in a younger rock (neosome) of intrusive or metamorphic origin.

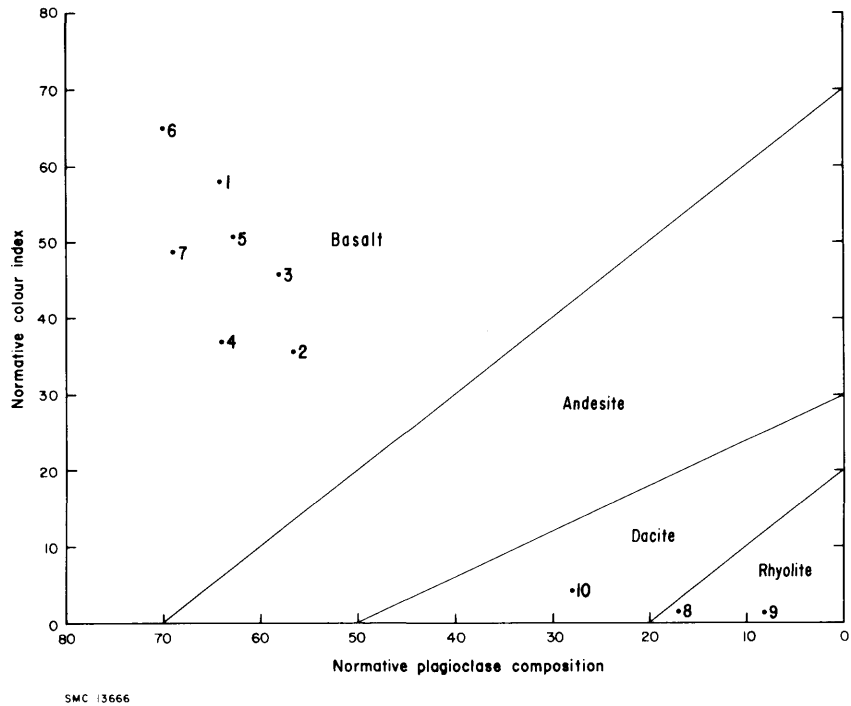


Figure 3—Plot of analyzed metavolcanics normative colour index versus normative plagioclase composition.

by overall parallelism of the foliation in the volcanics to the gneissosity in the migmatitic neosome, and to the fabric of the metavolcanic xenoliths within the latter. The migmatitic neosome although contaminated to variable extent by assimilation of volcanic rock appears to be essentially trondhjemitic in composition. Typical features of the migmatitic contact zones are the development of recrystallization in the volcanic xenoliths which may become quite similar to intrusive rocks such as diorite and gabbro, and the evidence of a wide range of deformational processes in the volcanics including remobilization (Photo 3).

## METASEDIMENTS

These rocks are interbedded with the metavolcanics, are poorly exposed, and are best recognized along the lakeshores where they tend to occur as small flat, horizontal outcrops.

Because of the scattered distribution of the exposures the geological boundaries delimiting the metasediments rely largely on interpretation.

With few exceptions the metasediments are sandstones (i.e. grains size be-



ODM9530

Photo 3—Plastically deformed mafic metavolcanics close to volcanic-granite contact, southern Derry Township.

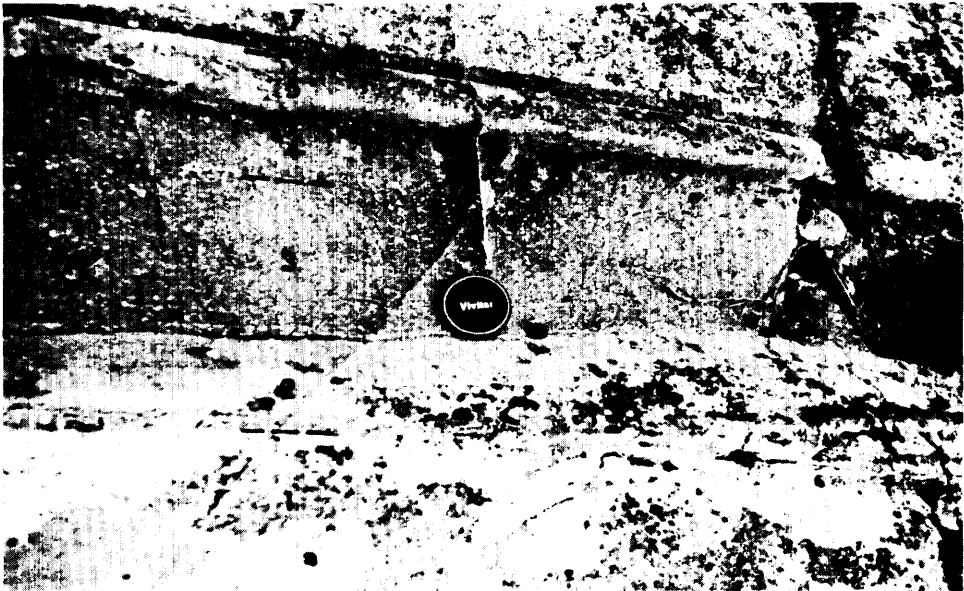
tween 0.06 and 2.0 mm) in which the amount of metamorphic recrystallization is variable but is mostly sufficient to prevent distinction of the original framework from the void-filling material.

### Sandstone

The colour of these rocks is dominantly grey but greenish grey, tan, and off-white varieties are also present; in these rocks there is little, or, no significant difference between the colours of the weathered and fresh surfaces.

The major components of the grey and greenish grey sandstones are dominant feldspars, quartz, and biotite; the feldspar and quartz occurs as nearly equant to slightly elongated grains in the moderately to well sorted rocks, and both as framework and void-filling material in the few rocks showing evidence of the original clastic texture. Biotite, generally in amounts of 12 to 15 percent, is present as fresh euhedral crystals of tabular habit and as aggregates of subparallel small flakes defining the metamorphic foliation. Feldspars occur in the most part as altered patches distinguishable from quartz because of their cloudy appearance. Microcline was recognized in five of the thirteen thin sections examined, and labradorite (An 52) was found in one thin section.

Five to fifteen percent green hornblende was seen in six thin sections, and one or more of carbonate, clinozoisite, saussurite, iron oxides, pyrite, and rarely garnet and zircon (in biotite) are the accessory minerals.



ODM9531

Photo 4—Thin sequence of (1) "metaquartzite", (2) fine-grained "metagreywacke", (3) biotite paragneiss containing porphyroblastic feldspar phenocrysts, (4) medium-grained "metagreywacke", (5) "metaquartzite", (6) biotite paragneiss, and (7) "metaquartzite" underlying mafic metavolcanics (not shown in picture) in southern Derry Township. Note prominent silicified joints oblique to bedding.

Because of the crystallization and alteration undergone by these rocks their classification is uncertain. The grey and grey-green varieties are the metamorphic derivatives of rock which were probably feldspathic greywacke (Pettijohn 1957); the tan and off-white varieties contain 70 to 80 percent quartz, about 4 to 6 percent biotite, are locally associated with felsic volcanic interbeds (e.g. main island of Kabinakagami Lake, Lizar Township) and are probably the metamorphic derivative of impure quartz arenite. Both types of sandstone appear to have originated from reworking of the volcanic rocks with which they are associated.

### Paragneiss

This rock is mineralogically similar to "metagreywacke" but is coarser and may contain porphyroblasts of microcline and albitic plagioclase with poikilitic inclusions of fine-grained groundmass components.

Little evidence of primary features were seen in the sandstone and paragneiss; bedding indicative of cyclic sedimentation was noted at one locality in southern Derry Township (Photo 4). Variations in grain size which could reflect graded bedding were observed over an exposed width of about 2.4 m (8 feet) of sandstone and paragneiss at one locality in Lizar Township.



ODM9532

Photo 5—Conglomerate exposed slightly inland and on the north side of the first set of rapids of Kabinakagami River in northwestern Mosambik Township (outside map-area). Note prominent silicified joints.

### Mafic Schist and Paragneiss

One banded outcrop found on the eastern shore of Kabinakagami Lake in Lizar Township consists of dark green, locally rusty, hornblende-rich schist containing minor pyrite disseminations and a few fine-grained garnets, interbedded with biotite-rich paragneiss and felsic bands of hornblende-biotite trondhjemite gneiss. This area is characterized by a marked linear aeromagnetic trend (ODM-GSC 1963c); a similar occurrence with abundant massive pyrite and pyrrhotite stringers was found on the southern shore of the lake in northern Ermine Township (see "Economic Geology" section, Kabinakagami Lake sulphide occurrence (Ermine Township), No. 7. Both these occurrences are interpreted as the exposed tips of metamorphosed lean, sulphide facies iron formation bands, the bulk of which is covered by the lake water.

To the southwest of Kabinakagami Lake sandstone and paragneiss give place to conglomerate found outside the present map-area in northeastern Mosambik Township (Photo 5). Small prominent rib-like ridges, oblique or subnormal to bedding are common in the outcrops of metasediments. These ridges are caused by differential erosion (see Photos 4 and 5) of the rock adjacent to silicified joint planes which are left standing in relief. Only seldom do these ridges extend from a metasedimentary unit into the adjacent metavolcanics.



ODM9533

Photo 6—Close-up of conglomerate in Photo 5 showing felsic volcanic fragments standing in relief owing to stronger erosion of the gritty softer matrix of the rock.

## MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS

Massive dark green hornblende metagabbro, hornblende metapyroxenite, and metaperidotite are locally associated with the mafic metavolcanics. Since neither gradual textural changes of these coarse-grained rocks into finer grained types, nor evidence of intrusive relationships were found in the visited outcrops, the true origin of these rocks is problematic. However, the intrusive origin is favoured by the present writer. The mineralogical descriptions of these rocks are based on examination on nine thin sections.

### Metagabbro

The metagabbro is massive, essentially equigranular dark green to nearly black, and medium to coarse grained. It consists of 60 to 70 percent subhedral green hornblende pseudomorphous after uralitized clinopyroxene (diopside ?) and calcic plagioclase strongly altered and replaced by epidote and saussurite. Metagabbro differs from the coarse-grained porphyroblastic mafic metavolcanics (see section on "Mafic to Intermediate Metavolcanics") in the interlocking texture of plagioclase and amphibole, the lack of poikilitic inclusions within hornblende, and the presence of clinopyroxene relics; it also differs from the gabbroic metavolcanics in the migmatitic contact zones (see subsection on "Contact

Relationships with Granitic Rocks” under section on “Felsic Metavolcanics”) in that it lacks the hybrid assemblages found in the latter, i.e., albitic plagioclase and microcline (neosome) associated with abundant hornblende (paleosome).

### Metapyroxenite

Texturally similar to metagabbro, but darker in colour, this rock consists of 80 to 90 percent green hornblende with iron-titanium oxide segregations which can be locally abundant, and one or more of clinopyroxene in the form of relict aggregates and inclusions within hornblende, extremely altered plagioclase, and fan-shaped aggregates of chlorite which is probably prochlorite. A variety of metapyroxenite containing approximately 50 percent titaniferous magnetite and small amounts of an unidentified colourless mineral with one good cleavage and low first-order birefringence, occurs at one locality of Lizar Township (see “Economic Geology” section, property No. 14). Metapyroxenite is also thought to underlie an area approximately 230 m (750 feet) long and 90 m (300 feet) wide in northern Ermine Township. In the marginal parts of this area, the rock is fine grained, foliated, and not much different in appearance from the surrounding basalt. In the central part of the area the rock is medium to coarse grained, massive, and may contain up to 20 percent fine-grained titaniferous magnetite (see “Economic Geology” section, Property No. 8).

### Metaperidotite

Metaperidotite was found only in one locality of Lizar Township and is a soft, light grey-green to rusty weathering rock consisting of fine-grained fibrous aggregates of actinolite, talc, carbonate, antigorite; euhedral carbonate phenocrysts and tremolite needles up to 5 mm in length are common. Owing to the presence of fine-grained magnetite as groundmass component the rock is weakly magnetic.

## FELSIC INTRUSIVE AND METAMORPHIC ROCKS

In general granitic outcrops in the map-area are scarce and scattered. Good to excellent exposures are found on hills in the Beaton Lake area at the boundary between Breckenridge and Gourlay Townships; this area was previously mapped by Fenwick (1964, 1967).

Moderately well exposed granitic rocks are found in parts of western Beaton and Lipton Townships, and southeastern Ermine Township. These areas are peripheral to, or far from, the metavolcanic-metasedimentary belts, and except for a granitic area in southeastern Beaton Township, they are characterized by low topographic relief compared with the metavolcanic terrain.

Biotite trondhjemite, biotite granodiorite, and leucocratic quartz monzonite

## Kabinakagami Lake Area

are the main granitic types found in the map-area. Trondhjemite, granodiorite, and quartz monzonite are rocks containing more than 10 percent quartz, in which the ratio of potassic feldspar to total feldspars is less than 0.12, between 0.12 and 0.33, and between 0.33 and 0.66, respectively.

Twenty-seven samples of granitic rocks were slabbed and stained for potassic feldspar but as no thin sections of these rocks were examined, the composition of the plagioclase is unknown and thus rocks hereafter referred to granodiorite and trondhjemite may include some tonalite.

### **Biotite Trondhjemite and Biotite Trondhjemite to Granodiorite**

Biotite trondhjemite is the dominant granitic rock in the exposed contact zones of the granitic and supracrustal rocks; it also occurs as syntectonic intrusive sheets which are concordant to the foliations of the metavolcanics intruded by them (e.g. Hiawatha Mines area, Lizar Township). These sheets can be moderately to pronouncedly cataclastic in texture and their emplacement appears to have been controlled by regional deformation. Biotite trondhjemite is grey to brownish grey, medium grained, commonly contains 8 to 15 percent biotite, is locally porphyritic owing to the presence of eye-shaped quartz and feldspar porphyroblasts (flaser structure), and is almost invariably strongly gneissic. In the migmatitic contact zones the biotite trondhjemite may grade into hornblende biotite diorite, hornblende diorite, or tonalite containing a little garnet as the result of assimilation of supracrustal rocks (e.g. eastern shoreline of prominent peninsula east of Boot Bay, western Lizar Township).

Biotite trondhjemite and biotite granodiorite may commonly be intimately associated owing to nearly complete obliteration and digestion of the former by part of the latter, the granodiorite being a younger, less gneissic, and more potassic, granitic intrusive phase. Because of these conditions, composition may vary from trondhjemite to granodiorite within a few feet, and where xenoliths of mafic metavolcanics are present within the trondhjemite, variations from biotite-hornblende diorite, to hornblende-biotite trondhjemite, and hornblende-biotite granodiorite are common (e.g. east side of the long island, and some of the small southern islands of Kabinakagami Lake).

Biotite trondhjemite was never observed to intrude other granitic rocks and thus is regarded as the oldest granitic rock which was emplaced during, or possibly, even before, regional deformation.

### **Biotite Granodiorite**

Biotite granodiorite is the dominant granitic rock in the areas outside the contact zones of granitic and supracrustal rocks. The biotite granodiorite is medium to coarse grained, light grey to pink and rarely dull white in colour, and is generally massive to weakly foliated, although gneissic varieties do occur. Locally inclusions of gneissic biotite trondhjemite were recognized. Biotite comprises 4 to 7 percent by volume of the granodiorite and is variably altered to chlorite.

## Quartz Monzonite

Leucocratic quartz monzonite although not abundant in the visited outcrop areas is quite likely a major granitic rock in the areas with higher topographic relief such as the Beaton Lake area of Breckenridge and Gourlay Townships, and the granitic area of southeast Beaton Township. Several outcrops are in the second locality which is heavily forested, but none of them could be visited owing to lack of suitable landing places for the helicopter. The quartz monzonite is massive and it intrudes the granodioritic and trondhjemitic rocks in the form of medium-grained dikes which are pink to red in colour and are very homogeneous in texture, and as pegmatitic dikes, small sills and irregular bodies; in general, both the medium-grained and the pegmatitic quartz monzonite contain 3 percent or less of biotite, hornblende, and rarely muscovite. Locally the pegmatite contains 5 to 6 percent biotite books up to 2.5 cm (1 inch) in size and 3 percent magnetite nodules up to 0.6 cm (¼ inch) in diameter. Epidotization along fractures and joint planes is not uncommon and can be locally conspicuous in quartz monzonite.

## Muscovite-Bearing Granitic Rocks

Muscovite-bearing granitic rocks are rare; at one locality in southern Lizar Township 3 to 5 percent combined muscovite and biotite occur in a medium-grained granitic rock which has been contaminated to a variable extent by assimilation of basalt and sandstone. At another locality in the southeastern part of the same township an outcrop of biotite granodiorite is cut by a white dike of pegmatitic muscovite granite containing approximately 5 percent muscovite booklets up to 6.2 cm (2.5 inches) in size.

## Time-Space Relationships of the Granitic Rocks

The ubiquity of gneissosity in trondhjemite, its erratic development in granodiorite, and its absence in quartz monzonite suggest that trondhjemite was emplaced during or possibly before regional deformation, that granodiorite was probably emplaced toward the end of it, and that the emplacement of quartz monzonite postdated regional deformation. It is also apparent that, in broad terms, successive granitic intrusions were characterized by increasing potassic content. Although from the field evidence one may infer these general time relationships, this evidence is much too meagre to permit inference of space relationships between the granitic phases and the supracrustal rocks.

Thus, although the granitic rocks in contact with the metavolcanic rocks on the east side of the main belt are mostly trondhjemite, granitic rocks other than trondhjemite could flank the west side of the main belt. On the west side of the belt granitic exposures are virtually nonexistent adjacent to the whole length of the inferred metavolcanic-granite contact.

## Middle to Late Precambrian (Proterozoic)

### MAFIC INTRUSIVE ROCKS

#### Amphibolite and Lamprophyre Dikes

At one locality in Lizar Township an amphibolite dike cuts metavolcanics. In thin section the dike is seen to consist almost entirely of slightly discoloured subhedral crystals of green hornblende, and lesser very fine grained and extremely altered interstitial material. The writer's senior assistant reported six dikelets of amphibolite cutting granitic rocks at another locality in western Derry Township.

Near the Hiawatha Mine (Lizar Township) a 10 to 12.5 cm (4 to 5 inch) thick lamprophyre dike was traced intermittently for approximately 12 m (40 feet) in metavolcanics; the rocks consist of a grey-green biotite-rich fine-grained matrix containing black biotite books up to 0.95 cm ( $\frac{3}{8}$  inch) in size. The age relationships between the amphibolite, the lamprophyre, and the diabase dikes are unknown.

#### Diabase Dikes

The youngest Precambrian rocks are numerous northwest-trending and minor northeast-trending and north-trending diabase dikes. Diabase dikes were observed to cut all the previously described rocks except lamprophyre and amphibolite dikes. The diabase dikes are commonly vertical or nearly so, are generally a metre to 30 m (a few feet to 100 feet) wide, but may be up to 75 m (250 feet) thick, and have glassy chill margins which in the larger dikes can be up to 0.76 m (2.5 feet) wide and may contain fragments of rocks intruded by the diabase. The dikes may contain traces of pyrite and may be porphyritic owing to the presence of feldspar phenocrysts up to 6.2 cm (2.5 inches) in size; the size, frequency, and distribution of the phenocrysts may vary considerably within different segments of the same dike. The diabase is essentially a massive, fresh looking, intense green to dark green rock weathering to a characteristic reddish brown which hardly penetrates the rock for more than one to two millimetres. Most dikes are homogeneous in texture and have grain size of 1 to 2.5 mm but dikes wider than about 10 m (30 feet) or thinner than approximately 2.5 m (8 feet) may depart from these limits, the thinner the dike the finer the grain size, and vice versa. No thin section of diabase dikes were studied by the writer and the following description is from Maynard (1929, p.121):

As in other pre-Cambrian areas these dikes can be divided into two types: a slightly schisted and considerably altered type containing quartz; and exceptionally fresh, massive type, which may or may not contain olivine...the younger diabase is by far the more common. Under the microscope it is seen to consist of lath-shaped plagioclase, embedded in augite, some brown mica, and black iron ore. Occasionally olivine is present....

Under the microscope the quartz diabase shows augite and plagioclase some black iron ore, and a few patches of quartz.

The present writer's observations confirm that the fresh-looking diabase is by far the more common.

During present mapping no attempt was made to differentiate dikes on the basis of trend or mineralogical composition; at one locality in southern Derry Township a northeast-trending diabase dike about 5.5 m (18 feet) thick and exhibiting chilled margins cuts a northwest-trending porphyritic diabase dike approximately 20 m (70 feet) thick. This was the only exposure of intersecting diabase dikes found in the map-area.

## Cenozoic

### QUATERNARY

#### Pleistocene and Recent

The Quaternary deposits consist primarily of silty to sandy till containing some lime-rich clay and variable proportions of pebbles and boulders. Pebbles of Paleozoic limestone and dolostone are found mixed with the predominantly coarse granitic fraction of the till, and erratic boulders of granitic and metavolcanics are found from hilltop to water edge. In local areas of the southeastern shore of Kabinakagami Lake, the thickness of the till sheet varies between 2.4 to 3.6 m (8 to 12 feet).

Deposits of sand are found in a small esker system in the northwestern part of the map-area and a prominent esker in the Pine Portage area of southern Derry and northern Ermine Townships.

Lacustrine deposits of clay, silt, and lesser sand cover small areas of eastern Derry and Ermine Townships, about a third of Lipton Township, and half of Beaton Township. These deposits are part of a northwest-trending segment of the Ontario clay belt formed by glacial Lake Ojibway-Barlow about 9,000 to 10,000 years ago (Prest 1970, p.714-725).

Four of the six eskers found in the map-area trend southwest and two trend south-southwest; the trend of glacial striae in four exposures of *roches moutonnées* in the map-area is north-northwest at one locality but is southwest at the other three localities. The predominance of southwest trends in the eskers and glacial striae agrees with the results of A.N. Boissonneau's (1966) work on the direction of ice movement in the Cochrane-Hearst area. He observed that the trend of glacial features changes from southwest in the western part of the area (which includes the present map-area) to southeast in the eastern part of the area, thus indicating a regional fan-shaped ice movement over the Cochrane-Hearst area.

## STRUCTURAL GEOLOGY

Metamorphic foliation is well developed in the metavolcanics, in the metasediments, and in the syntectonic (or pre-tectonic) trondhjemitic gneisses intruding the metavolcanics. It is locally present in the granodiorite, but absent in the quartz monzonite.

In the metavolcanics the strike of the foliation parallels the overall trend of the belts and of their associated aeromagnetic expressions. Also, where metasediments or felsic metavolcanics were found interbedded with the mafic metavolcanics, the bedding and foliation planes were always seen to be parallel. Thus, where bedding evidence was lacking in the mafic metavolcanics, as was most often the case, the foliation and bedding planes were assumed to be parallel. If this assumption is correct, then the metavolcanics of the main northeast-trending belt on the west of Kabinakagami Lake dip dominantly to the southeast opposite the northwest dip of the metasediments and metavolcanics along the eastern shore and some of the islands of Kabinakagami Lake in Lizar Township. As previously mentioned (see section on "Mafic to Intermediate Metavolcanics") pillowed metavolcanics are scarce, and in addition, the location of the three pillowed outcrops found in Lizar Township, suggest that these structures are restricted to a northeast-trending sequence of basaltic flows on the west side of Kabinakagami Lake having a maximum thickness of less than 600 m (2,000 feet). The packing arrangement of the pillows indicates that tops are east, and therefore in the volcanic series of the main belt on the west side of Kabinakagami Lake progressively younger rocks are found from west to east.

The main structure of the northeast-trending belt appears to be a syncline with northeast-trending axis; the western limb of the syncline dips to the southeast and is essentially metavolcanic, whereas metasediments interbedded with lesser metavolcanics are the dominant rocks in the northwest-dipping eastern limb of the structure. Since the dip angles of the foliation in the metasediments in the eastern limb are generally smaller than the dip angles of the foliation of the metavolcanics in the western limb of the syncline, the interpreted fold may be asymmetrical, or alternatively symmetrical with the axial plane dipping to the northwest. Kabinakagami Lake occupies the trough of the syncline, and the contrast between the relatively rugged character of part of the western shore and the gently rolling eastern shore, reflects primarily the shallower dips, and secondarily the stronger erosion of the sediments in the eastern limb of the fold.

The physiographic character of the narrow valley to the north of the inlet of Kabinakagami River into the homonymous lake indicates that the valley is the locus of a northeast-trending fault; data from assessment work records (Regional Geologist's Files, Ontario Ministry of Natural Resources, Sault Ste. Marie) suggest that this structure is probably a strike-slip fault with horizontal displacement of 240 m (800 feet) (see "Economic Geology" section, Property 13).

Shearing accompanied by silicification and development of retrograde mineral assemblages has locally occurred in the metavolcanics and these sheared metavolcanics may have acted as host of sulphide and gold mineralization (see "Economic Geology" section, Properties 11, 13, 16). At one locality on a headland of the eastern shore of Kabinakagami Lake south of Windy Point in Lizar Township, displaced rhyolite boudins are embedded in soft chlorite schists of a

northeast-trending shear zone having an exposed width of about 3 m (10 feet). Strong shearing and silicification were noted in the large felsic metavolcanic interbed found southwest of the Hiawatha Mine (see section on "Felsic Metavolcanics"), and as a result of these processes much of the rock has been reduced to pyrite-bearing sericite schists interbedded with thin subvertical sheeted quartz veins.

Shearing has also affected, to variable extent, some of the syntectonic (or pre-tectonic) trondhjemitic intrusions which show evidence of incipient to moderate mylonitization. Sheared concordant trondhjemitic sills are found along the shores of Kabinakagami Lake and in the Hiawatha Mine area.

The occurrence of prominent joints subnormal or oblique to bedding in the metasediments has already been mentioned (see section on "Mafic Schist and Paragneiss" under "Metasediments"). Joints and incipient shear fractures are also commonly found in the potassic granitic rocks, although not in the pegmatites, and may be found in the metavolcanics; subvertical jointing parallel to the strike was noted in a few diabase dikes.

Cleavage is rare. Three subvertical cleavages were observed in a small outcrop of mafic metavolcanics at one locality in southern Derry Township; the strongest cleavage set trends north-south, another trends N40E, and the third is parallel to foliation which trends east-west. A lineation plunging 50 degrees in a N80E direction was seen in another metavolcanic outcrop of the same general area. A west-trending closely spaced cleavage dipping to the north was noted in northeast-trending and southeast-dipping metavolcanics on the north side of the previously mentioned fault in Lizar Township. At this locality the cleavage is emphasized by ochraceous stains resulting from leaching of minor pyrite disseminations along the cleavage planes.

In the Agamapashik-Bullmoose Lakes area in southeastern Derry Township, the trend of foliation in the metavolcanics changes progressively from northeast to west-northwest. This latter trend and subvertical to north-dipping foliation are typical of the mafic metavolcanics underlying central Derry Township, but owing to a lack of felsic metavolcanic and metasedimentary interbeds in these rocks, the relationship between bedding and metamorphic foliation in the northwest-trending belt is obscure. The northwest-trending belt is thought by the writer to be a divergent lobe of the main belt, which was deflected, tilted northward, and partially detached from the latter by the intrusion of a west-trending body of granitic rocks underlying southern Derry Township.

## ECONOMIC GEOLOGY

Most of the known mineral occurrences in the map-area are associated with the mafic metavolcanics of western Lizar Township. Data on location, development, and geological setting of these occurrences were compiled by P.E. Giblin (1968b); this publication has been out of print since 1971 and for the reader's convenience much of the data contained therein are given in the present report. Data obtained from more recent sources and present mapping are added where relevant. The numbers defining each of the following occurrences correspond to those on the coloured geological map (see back pocket); the list includes some

## Kabinakagami Lake Area

mineral occurrences which were either unknown or unrecorded previous to present mapping.

Quartz is the host of both the gold and sulphide mineralization reported in the area, and sulphide- and gold-bearing quartz occurs in: (1) silicified and sheared mafic metavolcanics, (2) silicified and sheared "quartz porphyry" (i.e. subjacent felsic metavolcanics), and (3) at the contact of "quartz porphyry" with mafic metavolcanics.

The information on ownership status for all the properties and mineral occurrences described in this report is valid as of September 9, 1974.

## Description of Properties

### BOOT BAY OCCURRENCE (LIZAR TOWNSHIP) (9)

The following description is from Maynard (1929, p.124-125):

John Douchamai has staked a claim in the schist complex close to the granite contact of the toe of Boot Bay on the west side of the lake. The mineralization occurs in a narrow zone and consists of quartz, pyrite, pyrrhotite, chalcopyrite, and galena.

The area was visited in the 1972 field season during routine mapping but the showing could not be located during the available time presumably because of unfavourable water level. There were no recorded claims in this area.

### CHARPENTIER GOLD-SILVER OCCURRENCE (LIZAR TOWNSHIP) (10)

The following description is from Giblin (1968b, p.9):

Location: Southwest part of township; the gold-silver occurrence is located 1.0 miles north, 2.2 miles east of the southwest corner of the township, on former claim S.S.M. 14683...

Mineral Present: Gold, pyrite, minor galena, and pyrrhotite.

Development: Stripping and trenching.

Geology: Visible gold occurs in a banded granular quartz vein. The vein strikes N55°E to N60°E. It has an average width of less than 1 foot, and has been exposed on strike for a length of 100 feet.

Wallrocks are hornblende-chlorite schists, locally striking N70°W and dipping vertically. Quartz porphyry dikes and sills cut the schists.

The auriferous vein occupies a fracture in the schists. For about a foot on each side of the vein the schists carry abundant seams of pyrite which strike parallel to the strike of the vein.

Assay results show that the pyrite-rich wallrocks of the vein carry little or no gold.

As might be expected from the occurrence of visible gold, assays of the vein material are very erratic.

Assessment work records indicate that the development work was carried out in, or prior to 1946 (Regional Geologist's Files, Ontario Ministry of Natural Resources, Sault Ste. Marie, files SSM131, SSM 132). This occurrence is open for staking; owing to insufficient location data it could not be located in the summer of 1972.

## CHARPENTIER LEAD-ZINC OCCURRENCE (LIZAR TOWNSHIP) (11)

The following description is from Giblin (1968b, p.9, 10):

'Location: The lead-zinc occurrence is 1.4 miles north, 2.1 miles east of this corner [the southwest corner of Lizar Township] on former claim S.S.M. 13964.

Minerals Present: Pyrite, galena, and sphalerite.

Development: Stripping and trenching.

Geology: Sulphide-rich veins and lenses occur in a shear zone which follows the contact of a felsic dike with granitic gneisses and mafic schists. The shear zone strikes N80°W, and dips vertically. The mineralized areas are distributed erratically along the shear zone and the greatest width is about 6 feet. The zone has been exposed over a strike length of 150 feet.

No assays are recorded.

Assessment work records indicate that the development work was carried out in, or prior to 1946 (Regional Geologist's Files, Ontario Ministry of Natural Resources, Sault Ste. Marie, Files SSM131, SSM 132). This occurrence is open for staking, owing to insufficient location data it could not be located in the summer of 1972.

## DERRY TOWNSHIP OCCURRENCE (3)

The following description is from Maynard (1929, p.124):

A 12-inch quartz vein containing some chalcopyrite and galena occurs in the schist complex three-quarters of a mile northwest from the portage at this outlet of the lake.

This occurrence is open for staking.

The area was visited during the 1972 summer but neither the showing nor evidence of development work were found.

## KABINAKAGAMI LAKE GALENA OCCURRENCE (ERMINE TOWNSHIP) (5)

The following description is from J.E. Maynard (1929, p.124):

A 4-inch quartz vein containing a little galena and chalcopyrite occurs in the schist complex on the north side of the large island opposite the main northern peninsula.

The locality was visited during present mapping but no mineralization was found. However, minor pyrite stringers occur within mafic metavolcanics containing felsic volcanic interbeds about halfway between the northern and southern tips of this island, on its western side. A grab sample of the pyritized mafic metavolcanics from this locality taken by the writer and analyzed by the Mineral Research Branch of the Ontario Division of Mines assayed 0.04 percent copper, and traces of gold. There were no recorded claims on the island at the time of the mapping.

## Kabinakagami Lake Area

### KABINAKAGAMI LAKE MAGNETITE OCCURRENCE (ERMINE TOWNSHIP) (6)

This occurrence was found on the east side of the prominent, narrow, south-east-pointing bay of Kabinakagami Lake in north-central Ermine Township.

The occurrence consists of a fine-grained massive magnetite vein 2.5 to 3 cm (1 to 2.5 inches) thick which occurs within hornblende-biotite trondhjemite gneiss. The magnetite vein is exposed along a length of about 1.2 m (4 feet), dips vertically, and strikes S10E concordant with the gneissosity of the host trondhjemite gneiss. A grab sample of the magnetite vein material taken by the writer and analyzed by the Mineral Research Branch of the Ontario Division of Mines gave the following results in percent:

Fe:48.8; TiO<sub>2</sub>:0.30; Cr:0.01; V:0.02; Ni:0.01.

### KABINAKAGAMI LAKE MOLYBDENITE OCCURRENCE (DERRY TOWNSHIP) (4)

The following description is from Maynard (1929, p.125):

The only molybdenite seen in the vicinity of Kabinakagami Lake occurs in 3-inch pegmatite dikelet cutting the schist complex on the northeast point of the main northern peninsula.

In 1972, the area was visited and although pegmatitic and granitic veins were found no molybdenite was observed.

### KABINAKAGAMI LAKE SULPHIDE OCCURRENCE (ERMINE TOWNSHIP) (7)

A pyrite-pyrrhotite occurrence is exposed on the west side of the northern most point of the southern shore of Kabinakagami Lake in north Ermine Township.

The showing consists of a strongly hematized amphibolite layer 95 cm (18 inches) thick which contains 20 to 70 percent pyrite-pyrrhotite as disseminations and massive stringers. The mineralized layer is interbedded with hornblende-biotite trondhjemite gneiss, the gneissosity of which trends S18E and dips 28 degrees to the northeast; the mineralization was traced for about 6 m (20 feet) along the strike of gneissosity. Pyrite disseminations and stringers are also found in the barren rock on the small island just west of the shoreline. This occurrence is interpreted on the exposed tip of a metamorphosed thin, and lean sulphide iron formation band, the bulk of which is covered by the lake water. A composite sample of sulphide mineralization from this locality taken by the writer and analyzed by the Mineral Research Branch of the Ontario Division of Mines assayed 0.02 percent copper and traces of gold. The area is open for staking.

## KABINAKAGAMI LAKE SULPHIDE OCCURRENCE (LIZAR TOWNSHIP) (12)

A sulphide showing was found during the present survey on the western shore of Kabinakagami Lake in central Lizar Township approximately 1.6 km (1 mile) southeast of the southeast tip of Boot Bay. The showing consists of 6 to 8 percent pyrite and pyrrhotite as disseminations and thin massive stringers occurring over an exposed width and strike-length of about 0.6 m (2 feet) and 1.5 m (5 feet) respectively, in silicified mafic metavolcanics, trending N40E and dipping steeply to the southeast. A grab sample of sulphide minerals from this locality taken by the writer and analyzed by the Mineral Research branch of the Ontario Division of Mines analyzed the following metal contents (in percent):

Fe:13.7; TiO<sub>2</sub>:0.47; Cr:0.04; V:0.03; Ni:0.01.

## KELTIC MINING CORPORATION LIMITED (LIZAR TOWNSHIP) (13)

As from information filed at the Timmins Mining Recorder's Office the former Hiawatha gold mine in central Lizar Township and a large portion of the terrain underlain by mafic metavolcanics along strike and to the southwest of the old mine shaft, have been controlled since April 3, 1974, by Keltic Mining Corporation Limited. As of September 9, 1974, the mine area was covered by a group of 11 unpatented claims of this company numbered as follows: SSM82981 to SSM82985, SSM82987 to SSM82989, and SSM83323 to SSM83325. The metavolcanics to the southwest of the mine, and as far south as the northwest side of the bay where Kabinakagami River enters the homonymous lake, are covered by a group of 53 unpatented claims numbered as follows: SSM359640 to SSM359658 inclusive, SSM359690 to SSM359698 inclusive, and SSM359705 to SSM359729 inclusive.

In addition to the former Hiawatha gold property, Keltic Mining Corporation Limited holds two properties referred to as "Kalibak North Showing" and "Kalibak South Showing", and a fourth occurrence here described as "Kabinakagami Lake Sulphide Occurrence". No record or description of the latter was found by the writer in the assessment records.

### Hiawatha Gold Mines Limited

The following description is from Giblin (1968b, p. 10, 11):

Location: Central part of [Lizar] Township, west shore of Kabinakagami Lake, 4.1 miles north and 5.4 miles east of southwest corner of township.

Minerals Present: Gold, pyrite, chalcopyrite, galena, molybdenite.

Development: Vertical 3-compartment shaft to a depth of 299 feet, levels at 150 feet and 275 feet. On 150-foot level, 847 feet of drifting, 967 feet of cross-cutting. On 275-foot level, 2,547 feet of drifting, 1,750 feet of cross-cutting, 250 feet of raising.

13,034 feet of surface, and 534 feet of underground diamond-drilling.

Work performed 1937-1939.

## Kabinakagami Lake Area

**Geology:** An auriferous quartz vein occurs along the north edge of a narrow quartz porphyry dike, which has intruded mafic metavolcanics. The vein and dike strike N60°E to N70°E, and dip vertically.

The vein ranges in width from 2 to 14 inches. In the vicinity of the shaft, it has been traced over a strike length of 1,500 feet.

1,300 feet west of the shaft, a fault striking N35°E apparently displaced the western part of the vein 800 feet to the southwest. The displaced western part of the vein has been traced on strike for 1,400 feet.

No ore reserve data are available.

**Production:** A 25-ton per day amalgamation mill operated intermittently in 1937, 1939, and 1940. Total tons milled were 1,931, and gold having a total value of \$6,826 was produced.

In the summer of 1972 the mine area was visited during routine mapping but the underground workings could not be inspected. Some equipment and fuel drums were on the property which, at that time, was apparently controlled by Primrock Mining and Exploration Limited, but no evidence of recent mining activity was apparent. It was noted that the mining dumps forming the escarpment on the west side of the shaft consist mostly of diabase and trondhjemite gneiss, and that the shaft is sunk through a subvertical northwest-trending diabase dike cutting northeast-trending mafic metavolcanics containing a sheared felsic metavolcanic interbed a few feet in thickness. Currently no information is available on development work which Keltic Mining Corporation Limited might have undertaken on this property and/or on the other three properties they hold in the area.

## Kalibak "North Showing"

The following description is from Giblin (1968b, p.12):

**Location:** Central part of [Lizar] township; 4.0 miles north and 3.8 miles east of southwest corner of township claim SSM9560.

**Minerals Present:** Pyrrhotite, pyrite, chalcopyrite, sphalerite, and galena.

**Development:** Stripping, trenching; some diamond-drilling of which no accurate record is available. Apparently at least 3 holes drilled under Pit No. 1, located in northwest part of claim.

**Geology:** Mineralized quartz occurs intermittently along a porphyry-amphibolite contact zone, which strikes in general N70°E.

At No.1 Pit the contact is folded, and core of the fold is occupied by a mass of blue, cherty, sulphide-rich quartz, which is exposed for a width of 10 feet. The quartz cannot be traced along strike of the contact beyond the pit.

The occurrence was sampled in 1937 (File SSM135); of 12 chip samples, 7 assayed trace Au, the remainder assayed \$0.40, \$0.80, \$2.40, \$3.20, and \$5.20 per ton.

Three drill holes under the pit were reputed to have yielded low gold values over widths up to 12 feet. The best intersection reported occurred in hole No. 2, where a length of 1 foot 3 inches (between 44 feet and 45 feet, 3 inches) assayed \$9.80 per ton (File SSM136).

Other pits have been dug to the northeast of No. 1 Pit, exposing the porphyry-amphibolite contact. Close to the contact the porphyry is banded and silicified over widths of a few feet. Narrow seams of sulphides, reputed to carry gold, are found in this silicified zone.

During the summer of 1972 the area of the occurrence was traversed but the only evidence of the prospect was approximately 4.5 m (15 feet) of drill core of fine-grained mafic metavolcanics abandoned on the ground. Several boxes of drill core in complete disarray were also found in the remnants of a collapsed

core shack on the northwest side of the southwest-pointing blind channel to the west of the former Hiawatha property. The core consists mostly of fine-grained mafic metavolcanics containing local minor pyrite desiminations and some felsic metavolcanic interbeds. The source of this core is unknown to the writer, however, the closeness of the core shack to the former claim SSM8560 suggests that it came from drilling of the Kalibak "North Showing". Most of the area of the former claim SSM9560 is now covered by Keltic Mining Corporation Limited unpatented claims 359643 to 359645.

### Kalibak 'South Showing'

The following description is from Giblin (1968b, p.13):

Location: Southwest part of [Lizar] township; 2.7 miles north and 3.1 miles east of southwest corner of township; claim SSM9540.

Minerals Present: Pyrite, sphalerite.

Development: Stripping, trenching; some shallow diamond-drilling, details not recorded.

Geology: The principal showing consists of an auriferous lenticular quartz vein which occurs in a shear zone in mafic metavolcanics. The shear zone strikes N60°E.

The vein has been exposed continuously for a length of 150 feet on claims SSM9540. Pits and trenches along the projected strike suggest that the vein may have a strike length of up to ½ mile.

Where it has been exposed on claim SSM9540, the vein pinches and swells along strike, and ranges in width from 0 feet to 2 feet.

About 200 feet north of the principal showing on claim SSM 9540, gold occurs in a narrow quartz-filled shear zone, in quartz porphyry. This shear zone strikes N60°E, dips 85°S, and is exposed for a length of 30 feet. The width ranges from 3 inches to 6 inches. At the west end of the exposure a north-striking lamprophyre dike cuts off the vein.

During the summer of 1972, the area was traversed during routine mapping but the former claim SSM9540 could not be located. Most of the area of the former claim SSM9540 is now covered by Keltic Mining Corporation Limited unpatented claim SSM359717.

### Sulphide Occurrence

The occurrence includes two pyrite showings which were found in close proximity, approximately 12 m (40 feet) S60E of the Ontario Ministry of Natural Resources cabin on the western shore of Kabinakagami Lake in central Lizar Township. Minor specks of chalcopyrite were noted associated with the pyrite of both showings.

The first showing consists of a strongly hematized semi-massive pyrite vein about 20 cm (8 inches) thick and exposed for a length of approximately 0.6 m (2 feet); the vein strikes S43E, dips vertically and cuts northeast-trending mafic metavolcanics dipping 50 to 60 degrees southeast.

The second showing is slightly east of the first and consists of disseminations and concordant massive stringers of pyrite up to 1.3 cm (½ inch) thick in a vertically dipping foliated northeast-trending felsic metavolcanic interbed. The interbed has an exposed thickness of approximately 3 m (10 feet) and an exposed

## Kabinakagami Lake Area

strike-length of about 6 m (20 feet) and was partially submerged in the lake water at the time of the visit to the locality. The concentrations of the pyrite dissemination and stringers are 15 to 20 percent over a width of 0.9 to 1.5 m (3 to 5 feet).

A composite sample of pyrite from the vein and two composite samples of pyrite from the felsic metavolcanic interbed were taken by the writer and were analyzed by the Mineral Research Branch, Ontario Division of Mines; they analyzed 0.13, 0.02, and 0.05 percent copper, respectively, and all three assayed traces of gold.

The occurrence is covered by Keltic Mining Corporation Limited unpatented claim SSM82988.

## LITTLE ERMINE LAKE OCCURRENCE (ERMINE TOWNSHIP) (8)

A titaniferous magnetite showing occurs 1.6 km (1 mile) and 2.88 km (4,200 feet) due S25W of the Kabinakagami Lake Magnetite Occurrence (6) in Ermine Township. A relatively high aeromagnetic response is indicated over the area of this occurrence on Aeromagnetic Map 2209G; the magnetically high zone is 1.2 by 0.8 km ( $\frac{3}{4}$  by  $\frac{1}{2}$  miles), and its central part exceeds the magnetic relief of the terrain by 200 gammas or more. This anomaly is explained by the presence of the magnetite-bearing metapyroxenite previously described (see section on "Mafic and Ultramafic Intrusive Rocks"). A grab sample taken by the writer and analyzed by the Mineral Resources Branch of the Ontario Division of Mines gave the following results in percent: Fe: 22.5; TiO<sub>2</sub>: 2.74; Cr: 0.02; V: 0.13; NiO: 0.1. The author could find no record of exploration work on this occurrence.

## J. PERKIN (LIZAR TOWNSHIP) (14)

The following description is from Giblin (1968b, p.13, 14):

Location: North-central part of [Lizar] township, near west shore of Kabinakagami Lake; on claims S.S.M 54530-54531.

Minerals Present: Magnetite, minor pyrite.

Development: Diamond-drilling, 1957, 6 holes, total length 2,998.0 feet.

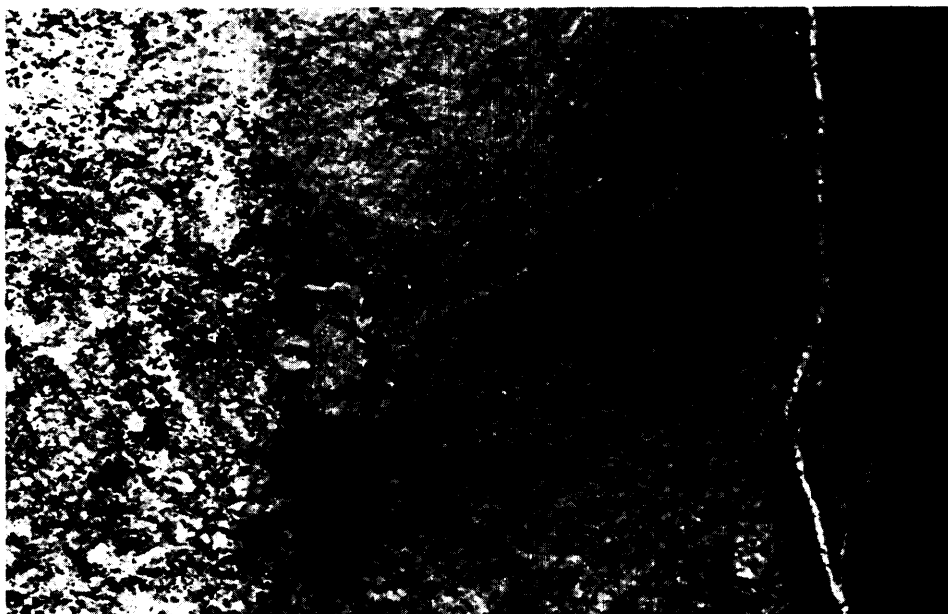
Geology: Published aeromagnetic data (O.D.M. 1963) show a small anomaly, having a magnetic relief of about 200 gammas, at the site of the occurrence.

Bands of disseminated to massive magnetite occur in granite gneiss and a mafic rock logged as lamprophyre.

R.Shklanka (1968, p.31) reported that:

Preliminary work suggests approx. 10 million tons of ore grading 66.5% Fe. A 300 pound sample gave a concentrate of better than 70% Fe.

The results of metallurgical testing carried out by Sand River Gold Mining Company Limited in 1957 (and apparently on the same sample referred to by R. Shklanka) are reported by R.J. Rupert (1972, p.102) as follows:



ODM9534

Photo 7—Contact between iron ore (black) and granodiorite (mottled grey-white); although the granodiorite has assimilated a little metapyroxenite, the contact is quite sharp. Prominent Peninsula to the east of Boot Bay, northwestern side of Kabinakagami Lake, Lizar Township.

Heads analysis in percent:

Fe	45.6	Ca	3.1	TiO <sub>2</sub>	5.6
Ni	0.222	Cr	2.03	Al <sub>2</sub> O <sub>3</sub>	6.1
S	0.021	SiO <sub>2</sub>	13.9	MgO	3.89
P	0.023				

Magnetic Separation at - 48 mesh in percent:

	Weight	Fe	SiO <sub>2</sub>	Ni	Cr	TiO <sub>2</sub>
Magnetic concentrate	66.5	63.0	2.3	0.022	2.03	5.6
Tails	33.5	12.7	32.6	0.020	2.03	5.5
Calc. Heads	100.0	46.2	12.4	0.022	2.03	5.6

Two diamond-drill holes and very little exposures were found by the writer during a brief visit paid to the area in the summer of 1972. No drill core was found in the area.

The host rock of the magnetite mineralization is metapyroxenite which is thought to have intruded the metavolcanics, and which was locally seen to be in sharp contact with granodiorite (Photo 7); the mineralogical character of meta-

## Kabinakagami Lake Area

pyroxenite is described under Metapyroxenite in the section on "Mafic and Ultramafic Rocks". A grab sample of the iron ore collected by the writer and analyzed by the Mineral Research Branch of the Ontario Division of Mines gave the following metal contents in percent:

Fe: 48.9; TiO<sub>2</sub>: 6.36; Cr: 0.07; V: 0.32; Ni: 0.01.

The iron prospect and much of the surrounding area is covered by a group of 30 unpatented claims numbered SSM369010 to SSM369039 held by Joseph Perkin of Toronto.

### RIO TINTO CANADIAN EXPLORATION LIMITED (LIZAR AND BRECKENRIDGE TOWNSHIPS)(1,2, 15)

In the summer of 1972 a mapping crew of this company was in the area, and in January 1974, Rio Tinto Canadian Exploration Limited staked a group of 19 claims numbered P388488 to P388506 inclusive in southwestern Lizar Township; the same company staked 18 claims numbered P388507 to P388524 inclusive in southeastern Breckenridge Township. Adjacent to, and to the northwest of the Rio Tinto claims in Breckenridge Township a group of 20 claims numbered P400852 to P400871 were staked by Lionel Levere in March 1974, presumably on behalf of Rio Tinto Canadian Exploration Limited (Timmins, Mining Recorder's Office, personal communication). At the time of writing no information was available to the writer as to the activity which might have followed claim staking in these areas.

### VASEY-STENABOUGH OCCURRENCE (LIZAR TOWNSHIP)(16)

The following description is from Giblin (1968b, p.14):

Location: Southwest part of Lizar township; 2.0 miles north, 1.5 miles east of southwest part of township; claim S.S.M 8957.

Minerals Present: Gold, pyrite, chalcopyrite, galena, and sphalerite.

Development: Stripping, and trenching.

Geology: Auriferous quartz veins occur in a shear zone within a quartz porphyry dike. The dike is intrusive into metavolcanics and metasediments.

The Shear zone strikes N55°E, and has been traced over a strike length of 300 feet. Within the shear zone numerous quartz veins occur, and range in width from 1 inch to 4 inches, and in length from 50 feet to 150 feet.

Northwest-striking diabase dikes interrupt the vein.

The property was sampled in 1937 by Erie Canadian Mines Limited, when 18 chip and 10 grab samples were collected. The results are briefly summarized herewith: 7 samples assayed trace Au; the results from the other samples were \$0.40 (5 cases); \$0.80 (3 cases); \$1.20; \$2.00 (5 cases); \$2.80; \$3.20; \$4.00; \$5.20; \$9.60; \$14.00; \$15.60 per ton. (File SSM-139).

In the summer of 1972 an old trench almost completely filled by overburden was found by the writer during a routine bush traverse. The recognizable part of the trench was about 2.4 m (8 feet) long and 0.9 to 1.5 m (3 to 5 feet) wide and is believed to be part of the old development works of the Vasey-Stenabough showing. Subvertical chloritized and silicified mafic metavolcanics trending N60E and containing pyrite disseminations and small massive stringers are exposed over

an area of approximately 0.9m<sup>2</sup> (10 square feet) on the northeastern side of the trench. Two grab samples of pyrite-bearing quartz taken by the writer from the central part of the northwestern side of the trench and analyzed by the Mineral Research Branch of the Division of Mines assayed 0.02 and 0.04 ounces of gold per ton (0.566 and 7.73 gr per 907 kg), respectively. The area of the occurrence is open for staking.

## Recommendations to Prospectors

The rocks of the Kabinakagami Lake belt are the hosts of two types of mineralization, one being magnetite associated with the ultramafic intrusions of metapyroxenite, and the other being gold associated with pyrite and minor base metal sulphide minerals in quartz veins in the metavolcanics. Quartz veins occurring within silicified and/or sheared mafic and felsic metavolcanics, and at the contact between mafic metavolcanics and felsic metavolcanic interbeds appear to be the host of the best gold mineralization known to occur in the area. Because quartz veins and felsic interbeds are both commonly found in the mafic metavolcanics, and because a past gold producer exists in the area, the metavolcanics may contain significant gold concentrations as yet unknown.

The scarcity of recorded information in large areas underlain by metavolcanics in southwestern Lizar Township and southeastern Breckenridge Township shows that these areas have not yet received the attention they deserve presumably because most of the past exploration activity was attracted by the areas adjacent to the old Hiawatha Mine. In the writer's opinion these areas should be prospected for gold; in fact there is no reason to assume that gold is restricted to the narrow section of volcanic stratigraphy represented by the rocks at the site of the Hiawatha Mine.

No analysis data are available on the copper, zinc, and lead content of the base metal sulphide occurrences formerly reported in the area; the sulphide occurrences found by present mapping contain only minor copper and no zinc or lead (e.g., see "Economic Geology" section, Properties 12, 5, and 7). However, these data are insufficient to assess the base metal potential of the metavolcanics in the map-area.



## REFERENCES

- Boissonneau, A.N.  
1965: Algoma, Sudbury, Timiskaming and Nipissing, Surficial Geology; Ontario Dept. Lands and Forests, Map No. S465, scale 1 inch to 8 miles. Surficial Geology 1962 to 1963.  
1966: Glacial History of Northeastern Ontario: the Cochrane-Hearst Area, Canadian J. Earth Sci., Vol.3, p.559-578.
- Fenwick, K.G.  
1964: Gourlay Lake Area, District of Algoma; Ontario Dept. Mines, Prelim. Geol. Map P.228, scale 1 inch to ½ mile. Geology 1963.  
1967: Geology of the Dayohessarah Lake Area; Ontario Dept. Mines, GR49, 16p. Accompanied by Map 2129, scale 1 inch to 2 miles.
- Giblin, P.E.  
1968a: Hornpayne Sheet, Districts of Algoma and Cochrane; Ontario Dept. Mines. Prelim. Geol. Map P.476, Geol. Comp. Ser., Scale 1 inch to 2 miles. Geological compilation 1967-1968.  
1968b: Notes on Mineral Occurrences in Hornpayne Sheet Map P.476. Geological Compilation Series, Ontario Dept. Mines, MP20, 19p.
- Gledhill, R.L.  
1927: Goudreau-Lochalsh Gold Area, District of Algoma; p.50-86 in Ontario Dept. Mines, Vol.36, Pt.2, 115p. Accompanied by Map 36B, scale 1 inch to 1 mile.
- Irvine, T.N., and Baragar, W.R.A.  
1971: A Guide to the Chemical Classification of Common Volcanic Rocks; Canadian J. Earth Sci., Vol.8, p.523-548.
- Maynard, J.E.  
1929: Oba Area, District of Algoma; p.114-125 in Ontario Dept. Mines, Vol.38, Pt.6, 135 p. (Published 1930). Accompanied by Map 38c, scale 1 inch to 2 miles.
- Ontario Dept. Lands and Forests  
1963: Ontario Resources Atlas; Operational Branch, 4th Edition, 33p.
- ODM-GSC  
1963a: Gourlay Lake Sheet, Algoma District, Ontario; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Series, Map 2195G, scale 1:63,360 or 1 inch to 1 mile. Survey flown 1962 to 1963.  
1963b: Hornepayne Sheet, Algoma District, Ontario; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Series, Map 2196G, scale 1:63,360 or 1 inch to 1 mile. Survey flown 1962 to 1963.  
1963c: Kabinakagami Lake Sheet, Algoma District, Ontario; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Series, Map 2209G, scale 1:63,360 or 1 inch to 1 mile. Survey flown 1962 to 1963.
- Pettijohn, F.J.  
1957: Sedimentary Rocks; Harper & Row, Publishers, New York, 718p. Second Edition.
- Prest, V.K.  
1969: Quaternary Geology; p.675-764 in Geology and Economic Minerals of Canada, edited by R.J Douglas, Geol. Serv. Canada, Econ. Geol. Rept. No.1, 838 p. Accompanied by maps.
- Rupert, R.J.  
1972: Sault Ste. Marie District; p.93 to 118 in Annual Report and Resident Geologists' Section, Geological Branch 1971, edited by Shirley J. Gibson, Ontario Division of Mines MP50, 195p.

## Kabinakagami Lake Area

Shklanka, R.

1968: Iron Deposits of Ontario; Ontario Dept. Mines, MRC11, 489p.

Tanton, T.L.

1916: Reconnaissance along Canadian Northern Railway between Gogama and Oba, Sudbury and Algoma Districts; Geol. Surv. Canada, Summ. Report 1916, p. 179-182 (published 1917).

Yoder, H.S.

1973: Contemporaneous Basaltic and Rhyolitic Magmas; American Miner, Vol.58, p.153-171.

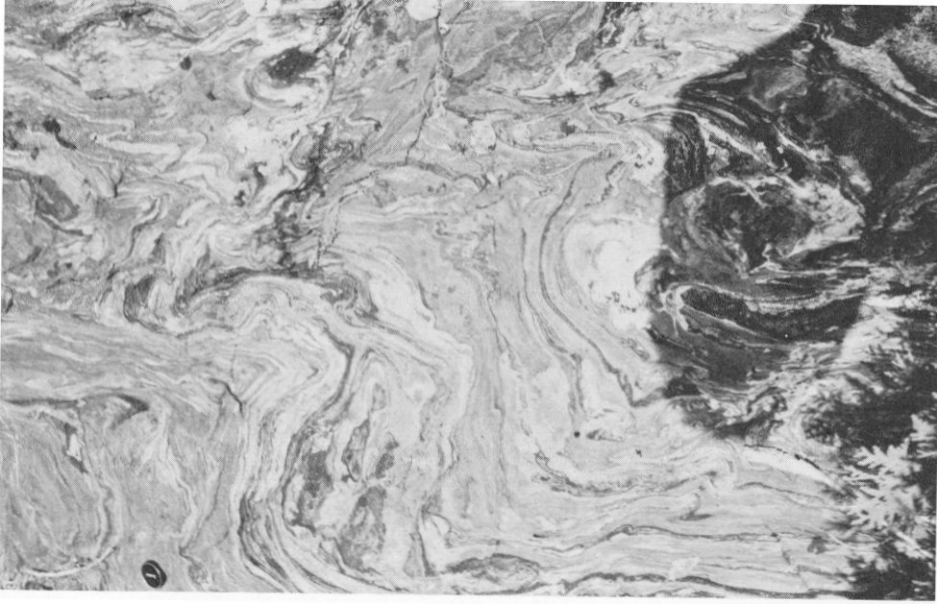
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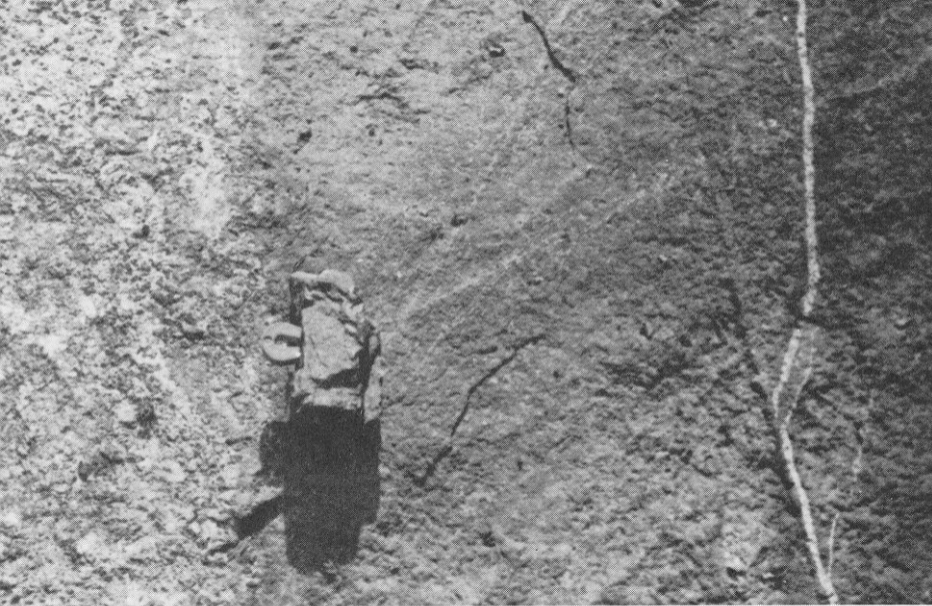
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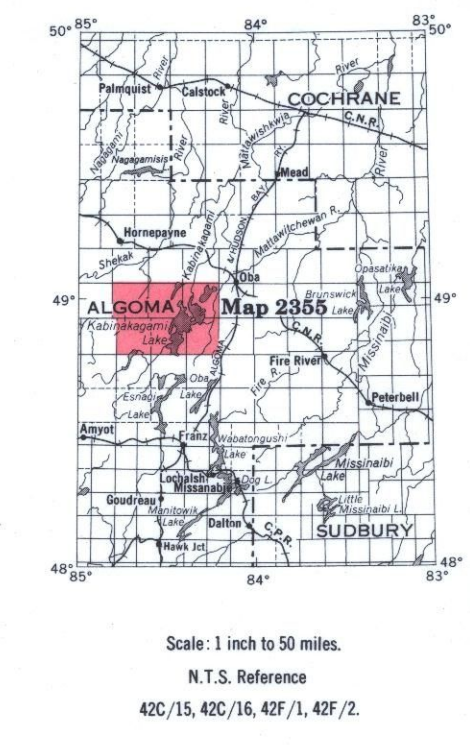
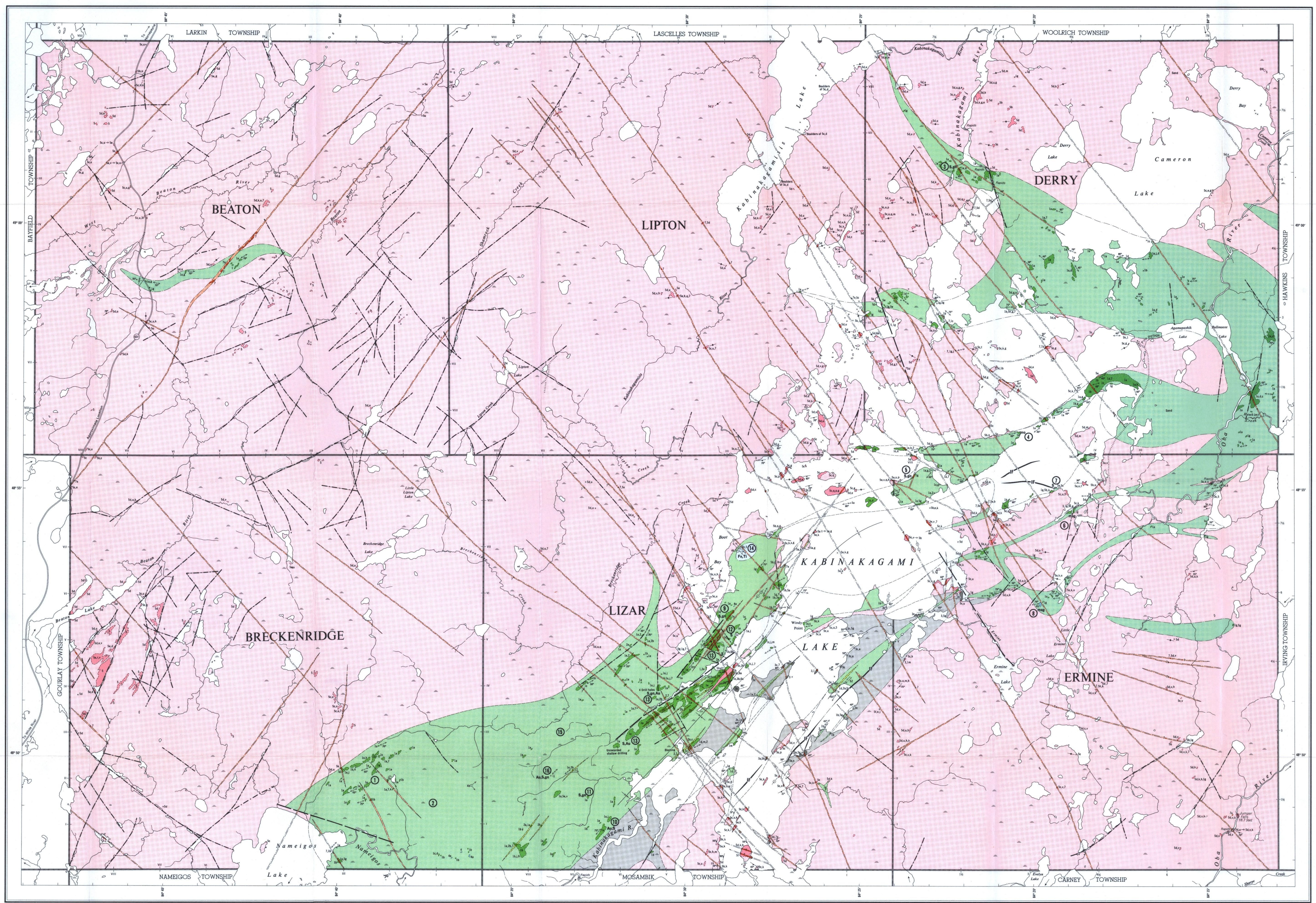
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- SYMBOLS**
- Glacial striae.
  - Esker.
  - Small bedrock outcrop.
  - Area of bedrock outcrop.
  - Bedding, top unknown; (inclined, vertical).
  - Lava flow; top (arrow) from pillows shape and packing.
  - Schistosity; (horizontal, inclined, vertical).
  - Gneissosity; (horizontal, inclined, vertical).
  - Geological boundary, position interpreted.
  - Geological boundary, deduced from geophysics.
  - Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.
  - Lineament.
  - Anticline, syncline, with plunge.
  - Drill hole; (vertical, inclined).
  - Swamp.
  - Motor road, provincial highway number encircled where applicable.
  - Trail, portage, winter road.
  - Township boundary, with milepost, approximate position only.
  - Mineral deposit; mining property, unsurveyed, approximate position only.

- PROPERTIES, MINERAL DEPOSITS**
- BRECKENRIDGE TOWNSHIP**
- Levere, L.
  - Rio Tinto Canadian Exploration Ltd.
- DERRY TOWNSHIP**
- Curry Township occurrence.
  - Kabinakagami Lake molybdenite occurrence.
- ERMINE TOWNSHIP**
- Kabinakagami Lake galena occurrence.
  - Kabinakagami Lake magnetite occurrence.
  - Kabinakagami Lake sulphide occurrence.
  - Little Ermine Lake occurrence.
- LIZAR TOWNSHIP**
- Boof Bay occurrence.
  - Charpentier gold-silver occurrence.
  - Charpentier lead-zinc occurrence.
  - Kabinakagami Lake sulphide occurrence.
  - Kellic Mining and Exploration Ltd.
  - Parlin, J.
  - Rio Tinto Canadian Exploration Ltd.
  - Vasey-Stenabaugh occurrence.
- Information current to September 9th, 1975.  
For further information see report.

- SOURCES OF INFORMATION**
- Geology by G. M. Siragusa and assistants, Geological Branch, 1977.  
Geology is not tied to surveyed lines.  
Assessment files, Ontario Division of Mines.  
Aeromagnetic maps, 2195G, 2196G, 2199G, 2210G, QDM-GSC.  
Ministry of Natural Resources (ODM).  
Volume 47, part 1, 1938.  
Volume 48, part 1, 1939.  
Volume 49, part 1, 1940.  
Volume 50, part 1, 1941.  
Volume 51, part 1, 1942.  
Volume 52, part 1, 1943.  
Volume 53, part 1, 1944.  
Volume 54, part 1, 1945.  
Volume 55, part 1, 1946.  
Volume 56, part 1, 1947.  
Volume 57, part 1, 1948.  
Volume 58, part 1, 1949.  
Volume 59, part 1, 1950.  
Volume 60, part 1, 1951.  
Volume 61, part 1, 1952.  
Volume 62, part 1, 1953.  
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Volume 77, part 1, 1968.  
Volume 78, part 1, 1969.  
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Volume 81, part 1, 1972.  
Volume 82, part 1, 1973.  
Volume 83, part 1, 1974.  
Volume 84, part 1, 1975.  
Volume 85, part 1, 1976.  
Volume 86, part 1, 1977.  
Volume 87, part 1, 1978.  
Volume 88, part 1, 1979.  
Volume 89, part 1, 1980.  
Volume 90, part 1, 1981.  
Volume 91, part 1, 1982.  
Volume 92, part 1, 1983.  
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Volume 94, part 1, 1985.  
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Volume 96, part 1, 1987.  
Volume 97, part 1, 1988.  
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Volume 99, part 1, 1990.  
Volume 100, part 1, 1991.  
Volume 101, part 1, 1992.  
Volume 102, part 1, 1993.  
Volume 103, part 1, 1994.  
Volume 104, part 1, 1995.  
Volume 105, part 1, 1996.  
Volume 106, part 1, 1997.  
Volume 107, part 1, 1998.  
Volume 108, part 1, 1999.  
Volume 109, part 1, 2000.

- LEGEND**
- CENOZOIC\***
- QUATERNARY**
- RECENT**
- Fluvial, lacustrine, and swamp deposits; silt, clay, peat.
- PLEISTOCENE**
- Silty and sandy till; fluvio-glacial deposits of sand and gravel (eskers); stratified clay deposits.
- UNCONFORMITY**
- PRECAMBRIAN\***
- MIDDLE TO LATE PRECAMBRIAN (PROTEROZOIC)**
- MAFIC INTRUSIVE ROCKS**
- 1 Diabase dikes.  
2a Amphibolite dikes.  
2b Lamprophyre dikes.  
2c Porphyritic diabase dikes.
- INTRUSIVE CONTACT**
- EARLY PRECAMBRIAN (ARCHEAN)**
- FELSIC INTRUSIVE AND METAMORPHIC ROCKS**
- 1 Unsubdivided.  
2a Hornblende diorite and biotite-hornblende diorite.  
2b Biotite-hornblende quartz diorite.  
2c Biotite hornblende to granodiorite.  
2d Biotite granodiorite.  
2e Quartz monzonite.  
2f Muscovite-bearing granitic rocks.  
2g Potash-bearing quartz pegmatite veins and pods.  
2h Biotite pegmatite.  
2i Muscovite pegmatite.  
2j Granitic rocks containing hornblende-rich xenoliths.  
2k Granitic rocks containing biotite-rich xenoliths.  
2l Apatite veins and dikes.  
2m Granitic rocks containing quartz veins.  
2n Porphyritic (feldspar phenocrysts) granitic rocks.  
2o Porphyritic (quartz phenocrysts) granitic rocks.  
2p Porphyritic (calcic phenocrysts) granitic rocks.  
2q Garnetiferous granitic rocks.  
2r Foliated granitic rocks.  
2s Massive granitic rocks.
- INTRUSIVE CONTACT**
- MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS\***
- 1 Unsubdivided.  
2a Hornblende metagabbro.  
2b Hornblende metabasaltite.  
2c Metaperidotite.
- INTRUSIVE CONTACT**
- METAVOLCANICS AND METASEDIMENTS**
- 1 Unsubdivided.  
2a Mafic schist and paragneiss.  
2b Feldspar-quartz-cordierite paragneiss.  
2c Feldspathic and quartz-rich metasediments.  
2d Quartz-chlorite-sericite schist.  
2e Carphenterous.  
2f Metasediments with interbeds of possible volcanic origin.
- IF Iron formation.**
- FELSIC METAVOLCANICS**
- 1 Unsubdivided.  
2a Foliated to medium-grained foliated amphibolite.  
2b Medium to coarse-grained foliated amphibolite.  
2c Mafic metavolcanics containing felsic metavolcanic interbeds 3 feet or less in thickness.  
2d Mafic metavolcanics containing metasedimentary horizons.  
2e Plagioclase.  
2f Migmatitic.  
2g Carphenterous.  
2h Metavolcanics containing quartz veins and/or quartz pods.  
2i Porphyritic.  
2j Fragmental.
- MAFIC TO INTERMEDIATE METAVOLCANICS**
- 1 Unsubdivided.  
2a Foliated to medium-grained, fine to medium-grained.  
2b Medium to coarse-grained foliated amphibolite.  
2c Mafic metavolcanics containing felsic metavolcanic interbeds 3 feet or less in thickness.  
2d Mafic metavolcanics containing metasedimentary horizons.  
2e Plagioclase.  
2f Migmatitic.  
2g Carphenterous.  
2h Metavolcanics containing quartz veins and/or quartz pods.  
2i Porphyritic.  
2j Fragmental.
- Au Gold.**  
**Fe Iron.**  
**gn Gneiss.**  
**mag Magnetite.**  
**mo Molybdenite.**  
**s Sulphide mineralization.**  
**Ti Titanium.**

\*Unconsolidated deposits. Cenozoic deposits are represented by the lighter colored parts of the map.  
\*Bedrock geology. Outcrops and inferred extensions of each rock unit are shown respectively in deep and light tones of the same colour. Where in places a formation is too narrow to show in colour and must appear in black, a short black bar appears in the appropriate block.  
\*The Middle to Late Precambrian age of the amphibolite and lamprophyre dikes is tentative.  
\*Unit 5k includes minor ill-par-tilt gneisses.  
\*The observed evidence does not exclude the possibility of an extrusive origin for some of these rocks.  
\*The existence of iron formation is suggested on the basis of geophysical interpretation only. The bulk of the inferred iron formation bands is covered by the water of Kabinakagami Lake and unit 5k is interpreted as exposed marginal segments of such bands.

Map 2355  
**KABINAKAGAMI LAKE**  
 ALGOMA DISTRICT  
 Scale 1: 63,360 or 1 inch to 1 Mile

