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Geology of Catharine and Marter Townships
District of Timiskaming

By
JAMES A. GRANT

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TABLE OF CONTENTS

Geological Report No. 18

PHOTOGRAPHS

FIGURE

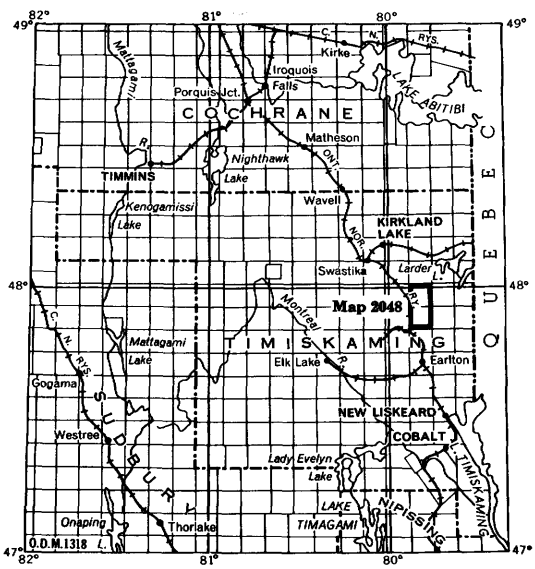
GEOLOGICAL MAP

ABSTRACT

The map-area lies about 15 miles southeast of Kirkland Lake, partly within the Boston-Skead gold area. The peak of mineral exploration was in the late 1920's, when several small mines were active.

Keewatin volcanic rocks underlie most of the area; immediately to the west is the Round Lake granitic pluton, with its margin convex to the east. In general conformity with this margin are: (a) banded tuff, (b) basic to intermediate lavas and intrusions, (c) intermediate to acid fragmental rocks, and (d) coarse-grained volcanic rocks.

The Keewatin rocks were intruded first by ultrabasic to intermediate dikes and sills, and than by numerous, small, acid to intermediate, and lamprophyric dikes—probably associated with the emplacement of the Round Lake pluton.



Key map showing location of Catharine and Marter townships. Scale, 1 inch to 50 miles.

In the southeastern part of Marter township the older rocks are overlain unconformably by Gowganda sedimentary rocks, which are intruded by late diabase. Glaciofluvial deposits blanket much of eastern Catharine and southern Marter townships.

The Keewatin rocks form part of a steep-limbed anticline, plunging steeply to the east. Several faults are found, some arranged radially with respect to the pluton. Strong shearing is found intermittently in a zone extending north and south from the junction of the Misema and Blanche rivers.

Gold is present, usually in quartz or quartz-carbonate-sulphide veins associated with shearing in the volcanic rocks, notably in a zone extending southeast from the northwest corner of Catharine township. Magnetite is found in iron formation associated with the banded tuff next to the pluton, and also in a thick gabbro sill (?) about ¾ mile west of the Misema River in Catharine township. Traces of asbestos are present in serpentinized peridotite in northeastern Catharine township.

Geology of Catharine and Marter Townships

By

James A. Grant[1]

INTRODUCTION

Catharine and Marter townships lie immediately north of Englehart, about 15 miles southeast of Kirkland Lake.

Catharine township lies within the Boston-Skead gold area and has been extensively prospected since the turn of the century. The peak of mineral exploration was in the late 1920's when several occurrences were investigated. The Cathroy Larder mine, located near the north boundary of the township, was active from 1938 to 1948. Marter, the adjoining township to the south, is largely underlain by glaciofluvial deposits, and thus prospecting has been limited.

The present survey was carried out in the summer of 1961. Mapping was done on air photographs, using pace-and-compass traverses approximately ¼ mile apart. A senior geologist did the mapping, the line of traverse being kept by a junior. The scale of mapping was 1 inch to ¼ mile. Traverses were tied in as far as possible to topographic features, and the necessary control was supplied by existing surveys.

Acknowledgments

The author wishes to acknowledge the assistance of K. G. Fenwick, R. D. Todd, D. K. Draper, and B. L. Stevens. Mr. Fenwick is responsible for about half the mapping. To W. S. Savage, resident geologist at Kirkland Lake and his staff who assisted the survey in many ways, the author is grateful.

Means of Access

Highway No. 11 lies west of Catharine and Marter townships, both of which may be reached from this highway by several roads, mainly by highway No. 112 through Tarzwell to its junction with highway No. 564, and thence along highway No. 564 through the hamlet of Boston Creek. Highway No. 624 traverses the area from south-central Marter township to northeastern Catharine township.

There is also a network of roads in southern Marter township, a road along most of the west boundary of Catharine township, and several lumber and old mine-access "roads." Neither the Misema River nor the Larder River is useful as a canoe route within the map-area. The former is no longer served by a bridge in northwest Catharine township and has to be crossed by boat—a major disadvantage to the prospector in Catharine township, but one that is easily overcome.

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Previous Geological Work

After several early reconnaissance surveys, the major geological divisions and the structure in Catharine township were described in the report by Burrows and Hopkins (1922) on the Boston-Skead gold area. A portion of northwestern Catharine township was mapped in some detail by L. V. Bell (1930). A compilation of early work in the region was published as Map No. 1934a of the Ontario Department of Mines. Since 1947, the Department has published reports dealing with the surrounding townships: Pacaud (Lawton 1959); Boston (Abraham 1951: Lawton 1959); McElroy (Abraham 1951); Hearst (Thomson 1949); and Skead (Hewitt 1951).

Topography

The area lies just south of the height-of-land between the Great Lakes and Hudson Bay. It is drained mainly by the Misema and Larder rivers. Relief is rarely greater than 200 feet and is most pronounced adjacent to the two rivers, which have deeply incised courses in the thick overburden. In Catharine township, the Misema River has partially re-excavated a glacial valley. Both rivers are controlled in part by north-south and east-west fracture systems.

The prominent west-facing scarp in western Catharine township is due to a resistant diorite-gabbro intrusion, which also forms the falls close to the junction of the Misema and Blanche rivers. In general, the basic to intermediate volcanic rocks form higher ground than do the intermediate to acid rocks. Only in southeastern Marter township do the latter form high hills. There, Gowganda quartzite and Keweenawan diabase also form high ground.

Rolling ridges of sand and gravel are prominent in the eastern part of the area, and most of central and southern Marter township is underlain by thick glaciofluvial deposits.

Outcrops are abundant in the west half of Catharine township and numerous in northern and eastern Marter township; elsewhere they are very sporadic.

Natural Resources

Lumbering, mainly for pulpwood, is still carried out extensively, especially in the eastern part of the map-area. Poplar, birch, jackpine, spruce, and balsam are abundant, and alder swamps are very widespread in parts of the area. Occasionally tamarack is found. No recently burned-over areas were found.

Gravel for roads is obtained from the large deposits in the east half of the area.

GENERAL GEOLOGY

The Keewatin volcanic rocks, the oldest rocks in the area, appear in a steep anticlinal belt around the eastern margin of the Round Lake pluton. The volcanic rocks were intruded first by ultrabasic to intermediate dikes and sills and, later, by the Round Lake pluton and by numerous small, acid to intermediate and lamprophyric dikes.

Sedimentary rocks of the Gowganda Formation overlie the volcanic rocks unconformably in southeastern Marter township.

The latest intrusions were of Keweenawan diabase; these are best developed in southeastern Marter township.

Thick Pleistocene glaciofluvial deposits form an effective blanket over much of the area.

TABLE OF FORMATIONS

CENOZOIC	
PLEISTOCENE:	Clay, sand, and gravel.
	Great Unconformity
PRECAMBRIAN	
KEWEENAWAN:	Diabase.
	Intrusive Contact
COBALT GROUP:	
Gowganda Formation:	Conglomerate; greywacke; arkose, quartzite; argillite.
	Unconformity
ALGOMAN?:	Syenite; granodiorite; Round Lake granodiorite gneiss; albite porphyry; quartz-albite porphyry; lamprophyre; felsite.
	Intrusive Contact
POST-KEEWATIN:	Diorite; gabbro; serpentinized peridotite; diorite porphyry; dacite porphyry.
	Intrusive Contact
KEEWATIN ROCKS:	
Basic to Intermediate Volcanic Rocks (predominantly lavas);	Dacite and andesite, including pillow lavas; diabase, diorite, and gabbro; sheared volcanic rocks; fragmental lavas; variolitic lavas.
Intermediate to Acid Volcanic Rocks (predominately pyroclastic):	Porphyritic dacite and andesite, crystal tuff; dacite and andesite, mostly aphanitic tuff; banded tuff and tuffaceous sedimentary rocks with minor iron formation; sheared volcanic rocks; agglomerate; rhyolite.

Keewatin Rocks

The Keewatin rocks may be subdivided into four stratigraphic divisions (A, B, C, D) in this area. From west to east, and from oldest to youngest, these are:

A. Interbedded tuff and tuffaceous sedimentary rocks; with minor iron formation. This division lies next to the Round Lake pluton and is traversed by numerous small dikes and sills. The total thickness is unknown, but is about 1,300 feet here.

B. Dioritic, dacitic, and andesitic lavas. Pillowed lavas are common in this division, which has a thickness of about 10,000 feet.

C. Porphyritic and aphanitic, intermediate to acid volcanic rocks, largely pyroclastic, and agglomerate. The thickness of this division is also about 10,000 feet.

D. Dioritic to gabbroic rocks with minor dacite and andesite. This division appears in northeastern Catharine township, where exposures are too limited to permit better definition. The thickness of the division is more than 6,000 feet.

The division of the Keewatin rocks into two major units, for mapping purposes, is based on lithology and not on stratigraphy.

These rocks have been metamorphosed to the lower greenschist facies; but although recrystallization has taken place, especially in the finer-grained material, the gross textures and structures such as phenocrysts, variolites, pillows, fragments in agglomerate, and bedding in some of the tuffs are well preserved.

Intermediate to Acid Volcanic Rocks

These rocks, predominantly fragmental, are largely restricted to the divisions A and C mentioned earlier. In the latter, exposures tend to be poor and the terrain low.

The porphyritic members of this class (1a on map No. 2043) are porphyritic-aphanitic rocks with grey phenocrysts of altered plagioclase, and sometimes amphibole, in a waxy greenish-grey matrix composed of plagioclase and epidote with or without chlorite, white mica, quartz, carbonate, and opaque minerals. The tuffaceous nature (upper photo, p. 5) is best demonstrated on the hill north of the west end of Wendigo Lake, where graded bedding can be seen—porphyritic rocks (1a) at the base grading upwards into the aphantic tuff (1b). Difficulty was sometimes experienced in distinguishing these porphyritic rocks (1a) from the porphyries (3d) where exposures did not show the relation to the surrounding rocks.

The aphanitic volcanic rocks of this class (1b) are waxy greenish-grey in colour, and range from andesite to dacite in composition. It may be noted that to distinguish between these two rocks generally requires thin-section examination; rarely is there over 5 percent quartz. The mineralogy is similar to that of (1a) rocks.

Close to the Round Lake pluton there appear banded tuff and tuffaceous sedimentary rocks (1d). These are dark to light grey, aphanitic, slaty rocks, largely composed of chlorite, epidote, quartz, carbonate, and opaque minerals; the individual bands are about one millimetre thick. The light grey varieties are more acidic than the dark. Many dikes and sills of Post-Keewatin and Algoman(?) types cut these rocks, but they are usually too small and too numerous to be shown on the map. Iron formation within this division has been reported from just west of the junction of the Misema and Blanche rivers (*see* pp. 10, 16).

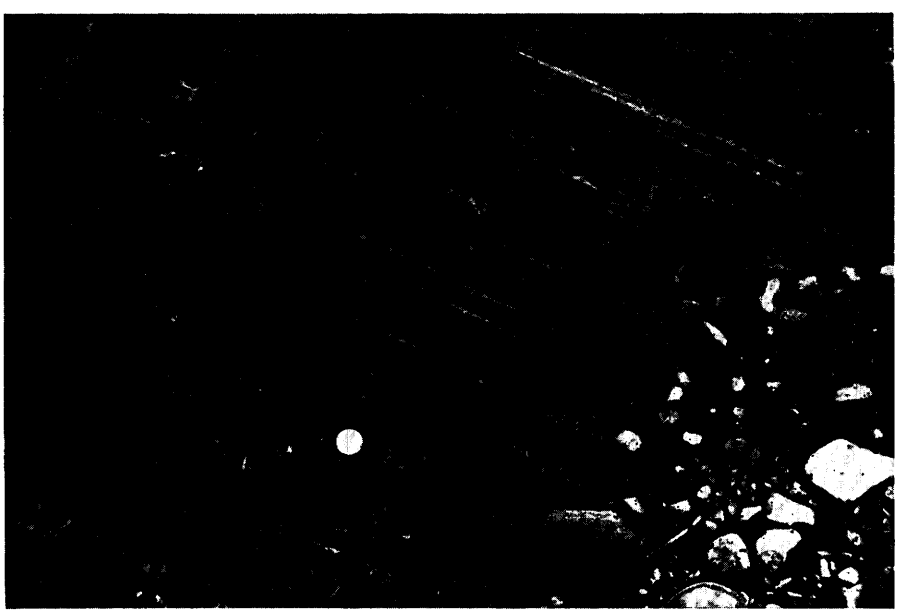
One of the most spectacular rocks in the area is the agglomerate (1g). This is well exposed at the sides of highway No. 624 in east-central Catharine township (lower photo, p. 5). Angular to subrounded fragments, chiefly of andesite and dacite porphyries, lie in a matrix similar to the crystal tuff (1a). The rock fragments range in size from more than one foot wide to small particles in the matrix.

The "rhyolite" (1r) is a light grey aphanitic rock, composed largely of albite and quartz, often carbonatized.

Basic to Intermediate Volcanic Rocks

These are mainly developed in division B shown on Map No. 2043; they are well exposed, forming high, relatively rugged ground. In contrast to the rocks described above, these are predominantly flows. A single flow may be about 300 feet thick, medium-grained in the lower portion, often pillowed near the top.

Bedded tuff (1a) and (1b); graded bedding indicates top in the direction of the hammer point. Lot 1, concession II, Catharine township, on the road to the New Telluride mine.



Agglomerate (1g); showing angular to subrounded fragments. Note the excellent glacial striae. Lot 2, concession IV, Catharine township, on highway No. 624.

Flow breccia and variolitic lavas are occasionally found, the former being well developed in the southern part of lot 8, concession V, Marter township, and the latter at the roadside in lot 12, concession VI, Catharine township.

The fine-grained to aphanitic lavas (2b) range from dacite to andesite in composition and are commonly pillowed. They are greyish-green rocks consisting mainly of plagioclase with or without quartz, amphibole, chlorite, epidote, carbonate, and opaque minerals. Generally, they have a greater content of ferromagnesian minerals than the similar rocks of (1b)—about 40 percent as opposed to less than 20 percent.

The fine- to medium-grained members of this class (2c) range from diorite to gabbro or diabase in composition. They are dark to greyish-green, sometimes with phenocrysts of altered amphibole, and are composed of plagioclase and amphibole with or without chlorite, epidote, quartz, sphene, opaque minerals, and carbonate. Where the outcrops do not show the relations to the surrounding rocks, it is often difficult to be sure whether such rocks are parts of lava flows or are intrusions. Some of the rocks mapped as (2c) may well be sills or dikes.

The fragmental lavas (2g) represent flow breccias, not agglomerates. The variolitic lavas (2v) may be useful marker flows for detailed mapping, but were identified in very few places.

Post-Keewatin

As noted above, it is often difficult to distinguish coarser phases of the Keewatin volcanic rocks from intrusive gabbro and diorite. A further difficulty in dealing with this group is the lack of Timiskaming sedimentary rocks in the area, hence the group has not been further subdivided into Post-Keewatin and Haileyburian.

The diorite (3a) is a pinkish-weathering, grey, medium-grained, highly altered rock. It consists of about 40 percent fibrous tremolite, 40 percent highly epidotized plagioclase (sometimes completely pseudomorphed), and 8 percent quartz with or without chlorite, sphene, and opaque minerals.

The gabbro (3b) ranges from diabase to amphibolite. Commonly it is dark grey, medium-grained, quartz gabbro with conspicuous bladed actinolite, epidote, epidotized plagioclase, and quartz as the major constituents. The accessories are chlorite, sphene, opaque minerals, and carbonate. Occasionally, quartz is absent, and olivine or pyroxene appear.

Serpentinized peridotite (3c) is found at the base of two sills (?). It is a blue-black to dark grey rock with a rather granular texture, crossed by serpentine veinlets. It consists of over 60 percent serpentine after olivine, relict hornblende, magnetite, and sphene, secondary tremolite, talc, and chlorite.

The porphyries (3d) are usually grey porphyritic rocks with a fine-grained to aphanitic groundmass. The phenocrysts, which rarely form over 50 percent of the rock, are altered plagioclase with or without quartz and hornblende (the latter highly chloritized). The groundmass is feldspathic, with epidote, chlorite, quartz, opaque minerals, and carbonate.

There are four large sills (?) in the area. The largest, and most persistent, parallels the eastern margin of the Round Lake pluton and lies just within division B. In a general way, it has a dual nature, with quartz diorite to the west and quartz gabbro to the east, but with many complicating details. From meagre evidence, such as the appearance of xenoliths and definite crosscutting of

the diorite by finer-grained phases of the gabbro (as seen at the falls on the Misema River above and below the junction with the Blanche River), this seems to be a multiple intrusion with the diorite preceding the gabbro.

The "sill" lying between this and the Misema River in Catharine township was largely mapped as a variety of (2c), until the discovery of serpentinized peridotite at the base or west edge of the "sill" suggested that this should be separated from the volcanic rocks. Thus the contact shown on the map is largely assumed. Therefore, the "sill" is largely amphibolite or gabbro with abundant magnetite, which causes compass aberrations, and occasional serpentinized peridotite at the base.

In northeastern Catharine township a thick "sill" of serpentinized peridotite crosses from McElroy township to Skead township. The pyroxene-bearing diabase (2c) immediately northeast of this may be part of the same intrusion.

In southeastern Catharine township, there is a "sill" similar in composition to that described above, and again diorite lies west of gabbro.

Algoman ?

Apart from the Round Lake pluton, the rocks of Algoman (?) age appear as numerous narrow dikes and sills.

Only the eastern margin of the Round Lake pluton appears in this area. Here it is typically a pink to grey, medium-grained, augen gneiss (4c) with 30–40 percent albite to albitic-oligoclase, 30–40 percent quartz, and variable minor amounts of microcline, white mica, chlorite, and epidote with or without biotite, apatite, opaque minerals, and carbonates. The plagioclase is usually saussuritized. Cataclasis may be marked.

Small intrusions of aplitic syenite (4a), albite granodiorite (4b), and felsite (4f) are found, but commonly the dikes and sills are albite porphyry and quartz-albite porphyry (4d). These are grey to pink porphyritic-aphanitic rocks with up to about 30 percent plagioclase phenocrysts, and occasionally quartz or perthite, in a quartz-plagioclase groundmass with potash feldspar, chlorite, white mica, etc.

Several lamprophyre dikes (4e) were noted: dark grey, fine-grained rocks showing extensive alteration to chlorite, carbonate, and white mica.

Carbonatization, thought to be a hydrothermal alteration associated with the Algoman intrusions (Thomson 1949), has radically altered the older rocks in several places. The carbonate is probably ferrodolomite, giving the altered rock a light buff colour. It is often accompanied by a bright green mica, when the original rock may be converted to so-called "green carbonate."

Cobalt Group

Gowganda Formation

Gowganda sedimentary rocks are found in eastern Marter township, where they overlie Keewatin volcanic rocks with marked angular unconformity.

The conglomerate (5a) is unbedded, with a high ratio of pebbles to matrix. The pebbles are largely round to subangular and are up to about two feet in diameter; they are mainly of granitic or Keewatin volcanic rocks. The matrix is greywacke.

Grey greywacke (5b), arkose (with about 40 percent plagioclase), and quartzite (5c) dominate the sequence, but thinly laminated argillite (5d) is found, especially close to the base of the sequence. At the base, and close to it, the conglomerate is found.

The contact close to the Larder River, west of Wendigo Lake, is of interest. At the falls, ¾ mile downstream from the lake, the contact between the Gowganda Formation and the Keewatin volcanic rocks of division B is well exposed. Here the Keewatin is represented by agglomerate (1g). This passes upward without a readily definable contact into conglomerate (5a) as "foreign" pebbles increase in abundance, i.e., here the basal conglomerate is more or less reworked agglomerate. On the hill to the west, the unconformity between pillow lavas (2b) and the conglomerate is seen. About ⅓ mile northwest of Wendigo Lake an excellent unconformity appears between interbanded tuff (1a, b) and agglomerate, dipping steeply east, and conglomerate, dipping gently south.

Keweenawan

Keweenawan-type diabase is widespread as a flat intrusion in the Gowganda rocks of southeastern Marter township. It is also found in a few other places as dikes cutting Keewatin volcanic rocks and the margin of the Round Lake pluton.

The diabase is a grey-black, fine- to medium-grained, massive rock, composed of pyroxene (partly altered to amphibole) and plagioclase, in a poor ophitic texture. Interstitial granophyric quartz and feldspar, epidote, and opaque minerals are the chief accessories.

Pleistocene

As mentioned previously, rolling ridges of sand and gravel are widespread in the eastern part of the area. Also, much of Marter township and parts of Catharine township are covered by a thick blanket of glaciofluvial clay, sand, and gravel. Varved clays are well exposed, especially along the Blanche River and lower Misema River.

As indicated by glacial striae and grooves, the direction of movement of the ice in this area was approximately S.20°E.

STRUCTURAL GEOLOGY

Folding

The Keewatin rocks occur as part of a steep anticline. In northwestern Catharine township the strike of these rocks is southeast, the dip is vertical or steep to the northeast. In east-central Marter township, the strike is approximately N.20°E., the dip is steep to the southeast. Thus the plunge of the fold is steep in a direction slightly south of east. Top determinations by means of pillows in the lavas, flow-top observations, and graded bedding in the tuffs indicate that the rocks are progressively younger to the east.

The Round Lake pluton appears at the core of this major fold, and the volcanic rocks tend to parallel the margin of the pluton. Unfortunately, the considerable cataclasis evident in the marginal augen gneiss does not permit the

observer to be certain of the relation between the intrusion and the development of the fold.

Minor folding in the Keewatin is rare, except in the tuffaceous zone next to the pluton where the plunge is steeply southeast.

The Gowganda rocks, south of Wendigo Lake, form a shallow synclinal structure, whose axis plunges gently to the east; this structure may be part of an original basin.

Shearing

Shearing is common in a zone extending from the northwest corner of Catharine township towards the centre of the township; the trend is south-easterly; the dip steep to vertical. It extends approximately from the contact of divisions B and C on map No. 2043 to ½ mile southwest into the lavas. The shafts of the old Gold Hill and Hilltop mines are within this zone.

Considerable shearing is found on the old Cathroy Larder property, now Mirado Nickel Mines Limited (*see* page 15); here it trends about N.75°W. and dips about 80°N.

In several places in the vicinity of the sill forming the prominent scarp overlooking the west boundary of Catharine township, there are wide but apparently discontinuous shear zones. In the northeast corner of lot 11, concession VI, Marter township, a shear zone about 50 feet wide appears in the lavas; the schist strikes N.20°W. and dips vertically. In the falls on the Misema River, east of the junction with the Blanche River, a 30-foot shear zone is found. Here, the schist strikes N.12°W., and dips 72°E., while the trend of the zone as a whole is about N.15°E. Immediately southeast of the junction there is a vertical shear zone trending north-south, in the former Sawka Allard claims (*see* p. 16). Finally, about ¾ mile downstream from the junction, strong shearing is again seen, striking N.12°W. with vertical dip. It is possible that the first two and the last shear zones, at least, are parts of a complex *en échelon* system trending N.-N.15°E. close to the eastern margin of the sill.

Strong shearing in the marginal phase of the Round Lake pluton has given rise to the augen gneiss found there.

Faulting

Several faults have been inferred in western Catharine township, approximately radial to the pluton and with steep dips. These show apparent left lateral movement of about 5 chains, as indicated mainly by displacements of the two "sills." Close to one of these faults is the old Mindoka mine.

Another left-lateral fault with steep dip is inferred in northwestern Catharine township from evidence of shearing and termination of one of the "sills." This fault trends southeast.

In northeastern Catharine township, the serpentinized peridotite is apparently displaced along a right-lateral fault trending southwest. In the same general area, it has not been possible to extend the Benson Creek faults (Hewitt 1951) from Skead township into Catharine township owing to extensive drift cover. A steep fault, ¾ mile west of Wendigo Lake, trends southeast and displaces the Keewatin-Gowganda unconformity about 5 chains, with apparent left-lateral movement.

ECONOMIC GEOLOGY

Gold

The occurrence of gold in the area has been described by Burrows and Hopkins (1922 pp. 9–10), as follows:

> Gold . . . occurs, usually native, but occasionally combined with tellurium, in quartz veins and veinlets in the Keewatin greenstone and later intrusions of granite and porphyry. The veins, which have various strikes and dips, are well mineralized with varying quantities of pyrite and molybdenite, and sometimes with chalcopyrite, galena, specular hematite, cosalite, native bismuth, gold and tellurides. The gangue consists largely of quartz of several generations, with considerable calcite and chlorite. The gold is found along the dark streaks of chlorite and calcite.
>
> There are many types of gold deposits, viz:
>
> (a) Fissure quartz veins in the greenstone, granite, and porphyry, with well defined walls . . .
>
> (b) Replacement veins. The country rock, including altered greenstone and porphyry, has been brecciated and partly replaced by vein-forming solutions of quartz of several generations, and by calcite and other carbonates . . .
>
> (c) A stockwork in granite and porphyry . . .

It should be noted that the "rhyolite" and acid tuffs often show sulphide mineralization, largely pyrite, and occasionally low gold values. In addition to the minerals listed above, sphalerite may be found associated with gold, as at the Cathroy Larder mine.

Iron

Iron formation occurs in Boston and Pacaud townships within the tuffaceous division adjacent to the Round Lake pluton (Lawton 1959, p. 29). The outcrop reported west of the junction of the Misema and Blanche rivers (*see* p. 16) is the only evidence that this iron formation extended into Catharine and Marter townships. Drift obscures most of the outcrop within this division (1).

Magnetite is also concentrated in the peridotite-gabbro "sill" west of the Misema River (*see* p. 7).

Copper

In 1926 copper was found within the iron formation at its contacts with acid tuff in the vicinity of Boston Creek. The mineralized zones are small there, but of good grade (Lawton 1959, pp. 24–25). As mentioned previously, this tuffaceous division extends into the present map-area, but is largely drift-covered.

Asbestos

Cross-fibre asbestos forms veinlets in the serpentinized peridotite. The width of the veinlets is rarely over ½ inch.

Suggestions to Prospectors

It has been mentioned already that considerable shearing occurs in a zone extending southeast from the northwest corner of Catharine township (p. 9). The majority of the old shafts and workings in northern Catharine township lie within this zone. The lavas found here tend to be more acid and hence more frangible than those lower in the series. Faulting is most marked in the lavas and tends to be disposed roughly radially around the Round Lake pluton. Thus there

is a possible source—the intrusion, route—the fault system, and site—the frangible lavas of mineralization. Stratigraphically this favourable zone of more acid lavas extends into southeastern Catharine township and around the nose of the major anticline into east-central Marter township.

DESCRIPTION OF PROPERTIES

Because of the scale of the mapping and the period of time allotted for the work, examination of individual properties and claims was not made. Descriptions of the old properties from Burrows and Hopkins (1922) and Bell (1930) have been reprinted below, since both these reports are now out of print. Property descriptions have also been taken from information on file with the resident geologist, Ontario Department of Mines, Kirkland Lake. Bracketted numbers, following property names, refer to numbered locations on the geological map No. 2043 (in back pocket).

Burnand-Gzowski—(1)

South Half of Lot 10, Concession V, Catharine Township

The following is from Burrows and Hopkins (1922, p. 19):

The porphyry dike and probably the gold-bearing quartz veinlets which the Catharine Gold is working extend to the adjoining property, the Burnand-Gzowski, which comprises the south half of lot 10 in the fifth concession of Catharine township.

Campbell—(2)

North Half of North Half of Lot 12, Concession VI, Catharine Township

The following description is given by Burrows and Hopkins (1922, p. 18):

The Campbell property consists of two claims in the north part of lot 12 in the sixth concession of Catharine township. A well defined narrow fracture has been traced by means of trenches from near the northwest corner of the property in a southeasterly direction across the claims. Along the strike several pits have been sunk, revealing narrow, sometimes parallel veins of quartz, averaging one or two inches in width, with the basalt along the veins showing alteration with iron pyrites a few inches from the wall. A small amount of copper pyrites occurs in the veins. Native gold was found in several pits by D. Campbell while samples over a width of four inches, taken by the writers, showed values in gold. The strike of the fracture is roughly that of the volcanic flows of the area.

Canoro (Ostrom)—(3)

Lots 6, 7, and 8, Concessions III and IV, Catharine Township

Bell (1930, pp. 107, 108) gives the following description:

A group of 19 claims, most of which are in lots 6 and 7, concessions III and IV, Catharine township, is owned by Canoro Gold Copper Mines, Limited (formerly the Ostrom Gold Mines). The rocks are Keewatin pillow lavas, basalts, and diabase, with minor intrusions of diorite, feldspar porphyry, and felsite dikes. Surface exploration has revealed over thirty veins with various dips and strikes, but a northwest-southeast strike predominates. Some of the veins are very wide; others are just fractures with a little quartz. The commonest type are massive, usually milky quartz veins. Some of the veins are well mineralized and others contain only barren quartz. Pyrite is the commonest mineral; chalcopyrite and specularite occur in smaller amounts. Visible gold is common in No. 12 vein, and a spectacular occurrence of gold was seen on the margin of vein No. 14. Crossing the two northern claims in the south half of lot 7, concession IV, is a wide mineralized zone striking northwest. The rock is much altered to rusty-weathering carbonate and is cut by numerous quartz stringers. The walls of some of the veins show extreme alteration to carbonate, the iron in which is oxidized on the surface to rusty-weathering material. The altered zone adjacent to the veins has an average width of 12 to 15 feet. The altered rock is grey

or reddish in colour and may be mistaken for porphyry. Alteration is very marked on the margins of veins No. 12, 14, and 4, but several other veins show relatively little alteration of the wall rocks.

An inclined shaft has been sunk to a vertical depth of 500 feet on No. 12 vein, which dips 65°S. and strikes N. 50° E. Some 1,200 feet of drifting and crosscutting has been done on this level. The vein dipped below the shaft at a depth of 110 feet. Crosscutting to the north on the 500-foot level failed to intersect it, although a fault which may represent the vein was found a short distance to the north of the shaft. A crosscut was driven 270 feet to the south on the same level to No. 14 vein, which was drifted on for a short distance. This wide vein is made up chiefly of massive milky quartz. It strikes east and dips 50°S. On the surface it is seen to be intruded by narrow dikes of pink felsite.

Several veins on the property have been explored by diamond-drilling, which usually indicated a dip to the south; considerable trenching has been done, and several pits have been sunk. . . . . Operations were suspended, and the shaft was full of water when visited in August 1928 . . . .

Catharine Gold—(4)

North Half of Lot 10, Concession IV, Catharine Township

The following is taken from Burrows and Hopkins (1922, p. 19):

This property, which is controlled by Geo. and J. Tough, is situated in the north half of lot 10, concession IV, Catharine township. On the north boundary a 12-foot pit is sunk on an altered grey feldspar-porphyry dike about 13 feet wide and striking N.E.-S.W. The porphyry contains a network of quartz stringers some of which carry quite coarse gold showings. Iron pyrites and tourmaline occur in the narrow quartz stringers. The Keewatin pillow lavas adjoining the porphyry are impregnated with carbonate.

Connell-McDonough—(5)

South Half of Lot 12, Concession VI, Catharine Township

The following is from Burrows and Hopkins (1922, p. 18):

The nearly flat vein on the Miller-Independence extends easterly to the Connell-McDonough where there has been considerable trenching along the strike of the vein. Native gold can be observed at several places along the footwall of the vein.

Cotter—(6)

South Half of North Half of Lot 12, Concession VI, Catharine Township

Bell (1930, p. 103) gives the following description:

The Cotter property consists of the two southern claims in the north half of lot 12, concession VI, Catharine township. A quartz vein dipping 80°S. can be traced in an easterly direction from the Bennett Pacaud claims on to the Cotter property 400 feet north of the south boundary; it is apparently not well mineralized. Nine chains north of the south boundary of the claims, a well-defined fracture can be traced from the Bennett Pacaud east for some distance on the Cotter claims. There is little quartz in the fracture, and the adjoining walls are altered to carbonate. Near the north-south line separating the two claims there is a well-defined fault, of which the east side has apparently moved to the north. The fault has a strike of N.10°E. and lies along the east contact of a feldspar porphyry dike with Keewatin diabase interbanded with pillow lava; the porphyry is at some points highly sheared. The fracture contains no quartz and is not mineralized. Diamond-drilling near the south boundary of the western claim was done during the summer of 1928.

Daley—(7)

Southwest Quarter of South Half of Lot 6, Concession IV, Catharine Township

The following is taken from Burrows and Hopkins (1922, p. 19):

The claim comprises the S.W. ¼ S. ½, lot 6, concession IV, Catharine township. Work has been done on a mineralized zone 250 feet southeasterly from No. 4 post. The rock is rusty weathering carbonate cut by numerous reticulated quartz stringers. The general strike is N.40°W. and dip 80° N.E. A pit has been sunk to a depth of 12 feet and a long cut made in the mineralized deposit. Iron pyrites occurs abundantly together with some specularite in the deposit.

Gold Hill—(8)
(Kordol Explorations Limited)

Lots 7, 8, and 9, Concession V, Catharine Township

Bell (1930, pp. 105, 106) gives the following description:

Adjoining the Hilltop on the east but lying chiefly on the east side of the Misema river are nine claims in lots 9, 8, and 7, concession V, Catharine township, which comprise the property of the Gold Hill Mines, Limited. Mine workings and buildings are confined to the central part of the north half of lot 9. In September, 1928, a two-compartment shaft had been sunk to a depth of 1,000 feet, and in January, 1929, the 1,200-foot horizon had been reached. In addition, a total of 6,000 feet of crosscutting and drifting has been done. A 100-ton mill was installed in the fall of 1927 and was operated during the winter of 1927-28. From this period of mill operation a small production is recorded.

Intruding the Keewatin lavas and diabase is a complex series of intrusions classed as Algoman but differing considerably in form, composition, and age relationships. These rocks, which are particularly abundant in the vicinity of the mine, occur usually as narrow dikes and as irregular stock-like masses, and range from diorites and hornblende syenites to syenite and feldspar porphyries. Some of them are highly altered and sheared along veins and fractures, while others are relatively fresh and unaltered and frequently intersect the veins, and are thus clearly younger in age. The mine shaft and drifts are in Keewatin basic lavas. Keewatin diabase was encountered in a crosscut to the north on the 800-foot level, and two Keweenawan diabase dikes were intersected in crosscuts to the north and south of the main vein on the same level. On all levels, a diorite dike, at some points altered along the vein to chlorite schist, forms in part the hanging wall of the No. 1 or south vein. Outcrops of this dike may be seen on the surface to the west of the shaft. On the 700-foot level the vein was cut off by a sill of feldspar porphyry near the shaft, and it was found necessary to cut a raise for a short distance in order to drift on the vein above the sill. A pegmatite dike outcrops on the surface to the southeast of the shaft, and was encountered in a crosscut to the south on the 800-foot level. The crosscut was driven as a result of diamond-drilling, which indicated values in or near the dike.

The major development has been confined to No. 1 vein, which strikes N.60°W. and near the shaft has a steep dip to the north. West of the shaft, however, the dip tends to become vertical. No. 1 vein can be traced on the surface for a distance of only about 500 feet, chiefly to the west of the shaft. It has been drifted on underground for a maximum distance of 900 feet. No. 2 vein is 70 feet northeast of No. 1 vein on the surface and has the same general strike and a similar steep dip to the north. Drifting on this vein has been done only on the 300- and 800-foot levels. It occupies a fairly well-defined fracture on the surface, which can be traced for some distance, principally to the east of the shaft. There have been a few minor displacements of both veins due to faulting but not sufficient to cause any serious difficulty in tracing them underground. No. 1 vein carries good values over narrow widths, averaging about 14 inches, with the result that stopes were made as narrow as possible to avoid dilution of the ore. It has not been found commercially possible to mill ore of the grade obtained from the narrow shoots in the veins, even with the practice of hand-sorting which has been employed at the mine. A certain amount of stoping of No. 1 vein has been done on all levels, and a very small stope was opened up on No. 2 vein on the 800-foot horizon. No. 1 vein has been stoped over a total distance of 250 feet on this level.It is the hope of the management that the veins will widen, or possibly converge at greater depth.

The enriched vein matter consists of banded quartz and sulphides with parallel bands of green chloritic schist, which is in part replaced by quartz and sulphides; pyrite, which is the most abundant; chalcopyrite, molybdenite, and smaller amounts of galena. Gold is usually associated with chalcopyrite, and is occasionally visible in fine grains. Gold values are largely restricted to the quartz, although the wall rock shows a certain amount of mineralization, chiefly of pyrite. Calcite occurs sparingly with the quartz as gangue, and epidote was noted in a drift on the 500-foot level.

Hounslow—(9)

South Half of Lot 4, Concession I, Catharine Township

The following is from Burrows and Hopkins (1922, p. 21):

On the Hounslow location, S. ½, lot 4, concession I, Catharine township, is a deposit quite similar in appearance to the Roger-Barnett. Coarse gold occurs in four quartz stringers. Between each two stringers is about a foot of basalt altering to a grey rusty weathering carbonate. The veins strike north and south and dip 60° E. About 20 feet east is a parallel vein system in which is a quartz vein 100 feet long and 6 inches in width.

Kalyniuk—(10)

South Half of Lot 8, Concession II, Catharine Township

The following is from Bell (1930, p. 108):

On the south half of lot 8, concession II, Catharine township, a test pit has been sunk by D. Kalyniuk on two closely spaced mineralized veins in Keewatin diabase, which strike east. Both veins are exposed about 4 feet apart in the one pit; the southern vein consists of about 1 foot of banded dark quartz, heavily mineralized with pyrite and a little chalcopyrite. The other vein is somewhat narrower. A sample from the wider vein yielded, on assay, $4.80 in gold per ton.

Kennedy-Boston—(11)
(*See* Turzone Explorations Limited *in part*)

South Half of Lot 11, Concession VI, Catharine Township

This property is described by Burrows and Hopkins (1922, pp. 18, 19):

The Kennedy-Boston Gold Mines includes the south half of lot 11, con. VI, Catharine township. The rocks are pillow and coarse-grained basic lavas together with narrow bands of felsitic and porphyritic acid rocks with a general N.W.-S.E. strike. A fracture has been traced 1,200 feet on the surface from near the northwest corner to the southeast. It is along the contact of a basic lava, with a light-coloured felsitic or porphyritic rock which lies to the southwest. A shaft, 600 feet from the west line, has been sunk on the fracture, the northeast wall of the shaft being on the contact which is nearly vertical. The mineralization occurs chiefly near the contact. At a depth of 50 feet in the shaft (Sept., 1919), there is reddish greyish silicified vein material carrying pyrite and copper pyrites in fine grains with occasional showings of finely disseminated gold. Two faults, 3½ feet apart, were observed in the shaft to the south of the silicified zone, together with a narrow vein of reddish quartz carrying pyrites. The shaft was later sunk to the 150-foot level and 130 feet of drifting was done northwest and 80 feet southeast of the shaft. A strong fault was encountered 80 feet west of the shaft that displaced the vein to the south.

Kordol Explorations Limited

In 1960 this company held eight claims in the south half of lot 7, concession VI and the north half of lot 7, concession V, Catharine township. The northern part is the old Gold Bank property, the southern part the old Gold Ridge. From north to south and west to east, the claims are T.44360 and T.44361, T.44264 and T.44265, T.44262 and T.44357, T.44355 and T.44356. In the southeastern part of claim T.44264 a 30-foot east-west shear zone has associated quartz-pyrite-chalcopyrite-molybdenite veinlets. In claim T.44356 a trench has been made in a quartz vein striking N.60°E., and from this, and from a porphyry dike cut by it, gold is reported.

GOLD BANK—(12)

South Half of Lot 7, Concession VI, Catharine Township

Bell (1930, p. 107) gives the following description:

The south half of lot 7, concession VI, Catharine township, has been optioned from the staker, H. Bedford, by the Gold Bank syndicate. The rocks, exposed only by stripping, are Keewatin andesites. There is a well-defined shear zone in the south central part of the property which has a width of approximately 30 feet and strikes N. 58° W. It is apparently not well mineralized. Near it, however, at one point are a series of narrow, irregular veinlets made up largely of massive sulphides with a little quartz. The chief sulphide is pyrite, and there is considerable molybdenite and a smaller amount of chalcopyrite. Some of these little sulphide stringers tend to merge into the main sheared zone. The country rock is mineralized to some extent in the vicinity, and there is much rusty-weathering material. Samples of massive sulphides from some of the narrow stringers yielded on assay $2.40 in gold per ton. Considerable trenching and stripping have been done, and several pits have been sunk on the property.

GOLD RIDGE—(13)

North Half of Lot 7, Concession V, Catharine Township

Bell (1930, pp. 106, 107) gives the following description:

The Gold Ridge syndicate controls the north half of lot 7, concession V, Catharine township. Very little rock is exposed on the claims except where stripped of overburden, and since these claims lie within the belt of Keewatin andesite and agglomerate little else is to be seen in the trenches. Near the centre of the north half of the lot there is a narrow east-west shear zone in the andesite which can be traced for 400 feet. A pit has been sunk to a depth of 9 feet on this fracture, but was full of water when visited. Very little quartz was to be seen in the material from the pit, although native gold may be panned from the oxidized and rusty-weathering material on the surface. Pyrite with molybdenite was noted in some of the fresher specimens. A short distance southeast of the main pit is a second narrow shear zone striking N. 60° E., with a 3-inch quartz vein dipping 70° N. Apart from the erection of splendid camp buildings, very little work has been done on the property.

Mindoka Mines Limited—(14)

South Half of Lot 11, Concession IV, Catharine Township

The following is taken from the files of the resident geologist, Ontario Department of Mines, Kirkland Lake:

In 1929, Mindoka Mines Limited sunk a two-compartment shaft in the south half of lot 11, concession IV, Catharine township. The country rock is basic to intermediate lava with pyrite, chalcopyrite and galena. [The showing lies close to an inferred fault as mentioned on page 9].

Mirado Nickel Mines Limited—(15)

North Half of Lot 7, Concession VI, Catharine Township

In 1960, Mirado Nickel Mines Limited optioned the property of Cathroy Larder Mines Limited on the boundary of McElroy and Catharine townships. As of April 1962, the property consisted of nine claims in McElroy township: L.26272, L.26273, L.27303, L.31257, L.31377–31379, L.31238, and L.73404; and six in Catharine township: L.24690, L.24691, L.34750, L.34751, and also T.50924 and T.50925, the last two being cancelled.

For a description of the early history of development, mine geology, and mineralization, the reader should consult Abraham (1951, pp. 39–44).

The work done by Mirado Nickel Mines Limited has involved re-mapping and about 15,000 feet of underground, and 14,000 feet of surface, diamond-drilling. In a report to the company, dated 11 April 1962, James M. Baker, mining geologist, suggests that:

. . . . there are several flat or gently dipping fracture zones en echelon contained in an area 400 feet (north-south) and 200–250 feet (east-west). The zones are lying in a cross structure with a southerly dip, essentially in the fragmentals, which appear to be conforming to the regional strike of the formations (north-westerly). There is also some suggestion of a cross-folding in the regional anticline . . . .

In the same report, Mr. Baker listed some of the gold values obtained from drilling. From the northern part of the property an over-all uncut average of 0.29 ounce per ton over 6.1 feet was reported. From the southern part, the reported values (uncut average) range from 0.10 ounce per ton over 20 feet. to 5.7 ounces per ton over 5 feet.

Ostrom—(16)

Northwest Quarter of North Half of Lot 8, Concession III, Catharine Township

The following is taken from Burrows and Hopkins (1922, p. 19):

Gold to the value of $1 and $2 per ton can be obtained on assay from quartz veins carrying pyrites and calcite in a light-coloured greenstone cut by a narrow quartz-porphyry dike.

Roger–Barnett—(17)

Western Part of North Half, Lot 4, Concession II and North Half of Lot 5, Concession II, Catharine Township

The following is from Burrows and Hopkins (1922, pp. 19, 20):

W. G. Roger and F. Barnett are prospecting a group of claims consisting of the N. ½ lot 5 and the west part of the N. ½ lot 4 in the second concession of Catharine township. The country rock is basalt and diabase with a few narrow feldspar-porphyry dikes. The basalt shows pillow structure and, at times, is spherulitic. In places the basalt and diabase have been replaced by carbonate, a grey rock which is rusty weathering on the surface. Through the altered rock there are a number of quartz veins on most of which work has been done.

The main workings are in the westerly part of the property on lot 5, where a mineralized zone has been trenched in a direction of N. 25° E. for 500 feet. In this zone, which averages 10 feet in width there are numerous stringers of quartz from half an inch to a foot in width running diagonally in a direction N. 18° W. across the altered basalt, now rusty carbonate. The cross stringers of quartz in many places show visible gold, while iron pyrites are present in the quartz and altered rock near the veins. The veinlets are not sufficiently close together in most of the deposit to be mined in one large mass. In one part of the deposit there are irregular quartz veins which are roughly parallel with the general strike, and from these there are narrow quartz veinlets running toward the walls. Some coarse gold was observed in the quartz veinlets. Several pits and cross-cuts have been made on the deposit which generally resembles a stockwork.

A strong quartz vein from 3 to 10 feet wide strikes N.E. and S.W. across the line between 4 and 5. It occurs in the spherulitic lava and, as far as explained, has shown only low gold content.

In the vicinity of this vein some spherulitic lava contains stringers of quartz, while the lava contains spots of iron pyrites. A sample of the mineralized lava showed some gold on assay.

Sawka Allard—(18)

Lot 12, Concession V, Marter Township

On the right bank of the Blanche river, 200 feet upstream from the junction with the Misema River and about 30 feet above water-level, an old shaft apparently intersected "greenstone" and iron formation with pyrite. On the opposite side of the river and about 600 feet from the junction, an exposure of banded iron formation was reported. It contains pyrite and jasper and may well be a continuation of the formation on which the shaft was sunk. The strike of the banding is N.15°E.

Turzone Explorations Limited (Hilltop)—(19)

North Half of Lot 10, Concession V, and South Halves of Lots 10 and 11, Concession VI, Catharine Township

In 1960 this company held eight claims, T.47290–95, T.47653, and T.47295, constituting the south half of lot 10, concession VI, the north half of the north half of lot 10, concession V, and the north half of the south half of lot 9, concession VI, Catharine township. It thus includes part of the old Hilltop property. A series of narrow, lenticular quartz veins strike N.60°W., for over 3,000 feet through the three southwestern claims. A 6-inch intersection on drillhole No. 4 assayed 13.39 ounces of gold per ton. Pyrite, chalcopyrite, and rarely sphalerite are associated with the quartz.

Bell (1930, pp. 103–5) gives the following description of the Hilltop property:

The property of the Hilltop Gold Mines, Limited, is made up of a group of twelve claims situated in the south halves of lots 10 and 11, concession VI, and the north half of lot 10, concession V, and includes the former Kennedy-Boston property. The rocks consist chiefly of interbanded Keewatin lavas, basalt, diabase, agglomerate, and andesite, the last two being exposed on the northern part of the claims. Intruding the Keewatin rocks are diorite and feldspar porphyry dikes in addition to a dike of lamprophyre and one of Keweenawan diabase. The strike of the intrusive dikes is usually northwest, corresponding roughly to that of the bands of Keewatin rocks.

A shaft, which is in part three-compartment, has been sunk to a depth of over 600 feet in Keewatin diabase on a narrow quartz lens that closely parallels a well-defined fracture, which can be traced from the shaft in a northwesterly direction diagonally across the south half of lot 11. This fracture was formerly explored to a depth of at least 150 feet by a shaft on the Kennedy-Boston property. East of the Hilltop shaft the fracture may be definitely traced for 400 feet. Beyond this there are a number of fractures and shear zones with the same general strike as the vein, but there is not a sufficiently satisfactory correspondence in position to identify any one of them as the extension of the vein to the west. Near the shaft the fracture, which dips vertically, is along the north contact of a highly sheared diorite dike, while on the 390-foot level it intersects the dike which has widened considerably. There is very little quartz present, but some pink calcite was noted along with pyrite.

The lens on which the shaft is sunk can be traced for only a short distance on the surface and shows local variations in strike. The dip is practically vertical, as shown by its intersection with the shaft. The lens is within the shaft on surface and on the 390-foot level. Below this level the lens leaves the shaft to the north, but at 612 feet it is again in the shaft, and is therefore practically vertical for 612 feet. Where encountered it had a width of 14 inches and consisted of banded quartz with pyrite and chalcopyrite, sometimes with enclosed bands of green Keewatin country rock. Very fine visible gold with plentiful chalcopyrite was noted in one specimen.

The shaft was sunk to a depth of 680 feet before operations were suspended late in the fall of 1928.

Walsh–Taylor—(20)

Northeast Quarter of South Half of Lot 5, Concession III, Catharine Township

The following is from Burrows and Hopkins (1922, p. 19):

An inclined shaft has been sunk to a depth of 30 feet on rusty carbonate containing quartz veins. The deposit, which contains considerable iron pyrites and brown and green iron carbonates, strikes 30° south of east and dips about 45° to the northeast. A sample of selected material from the dump yielded $4.80 in gold per ton. During 1921, a rich showing of gold was reported to have been made on the southern part of the claim.

Wojcieszyn—(21)

Lots 11 and 12, Concessions IV and V, Marter Township

Close to the common corner of lots 11 and 12, concessions IV and V, Marter township, several pits and trenches have been opened in the carbonatized shear zone mentioned (on page 9) southeast of the river junction. Quartz veins striking N.20°E. are mineralized with pyrite and chalcopyrite. Two grab samples, from a pit 200 feet downstream from the junction, were reported to have assayed $3.80 and $1.40 in gold per ton.

OTHER MINERAL OCCURRENCES

The information on mineral occurrences is taken mainly from the files of the resident geologist, Ontario Department of Mines, Kirkland Lake.

Catharine Township

Concession I, Lot 6, South Half

In the south half of lot 6, concession I, Catharine township, a shear zone was reported in 1948 striking N.5°W. and dipping 65°E. Quartz, pyrite, chalcopyrite, and sometimes sphalerite are present in the sheared lavas. Several grab samples were reported to have assayed 0.05 ounce gold per ton.

Concession VI, Lots 10 and 11, North Halves

In the north halves of lots 10 and 11, concession VI, Catharine township, a narrow mineralized quartz vein in agglomerate and greenstone was reported, in 1939, to have been traced over 600 feet. The vein strikes N.75°E., and dips 65°N.

Marter Township

Concessions II and III, Lots 3

In lots 3, concessions II and III, Marter township, the unconformity between Keewatin-type lavas and Gowganda sedimentary rocks is well exposed at the line between the two concessions on the Larder River. Here, narrow tension fractures dipping at a shallow angle to the northwest cut both Keewatin-type and Gowganda rocks and are mineralized with pyrite, chalcopyrite, and galena in a quartz-carbonate gangue.

Concession V, Lot 12, North Half

In the north half of lot 12, concession V, Marter township, quartz veins, associated with deformed lamprophyre (?) in granitic gneiss, are mineralized with pyrite and chalcopyrite.

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INDEX

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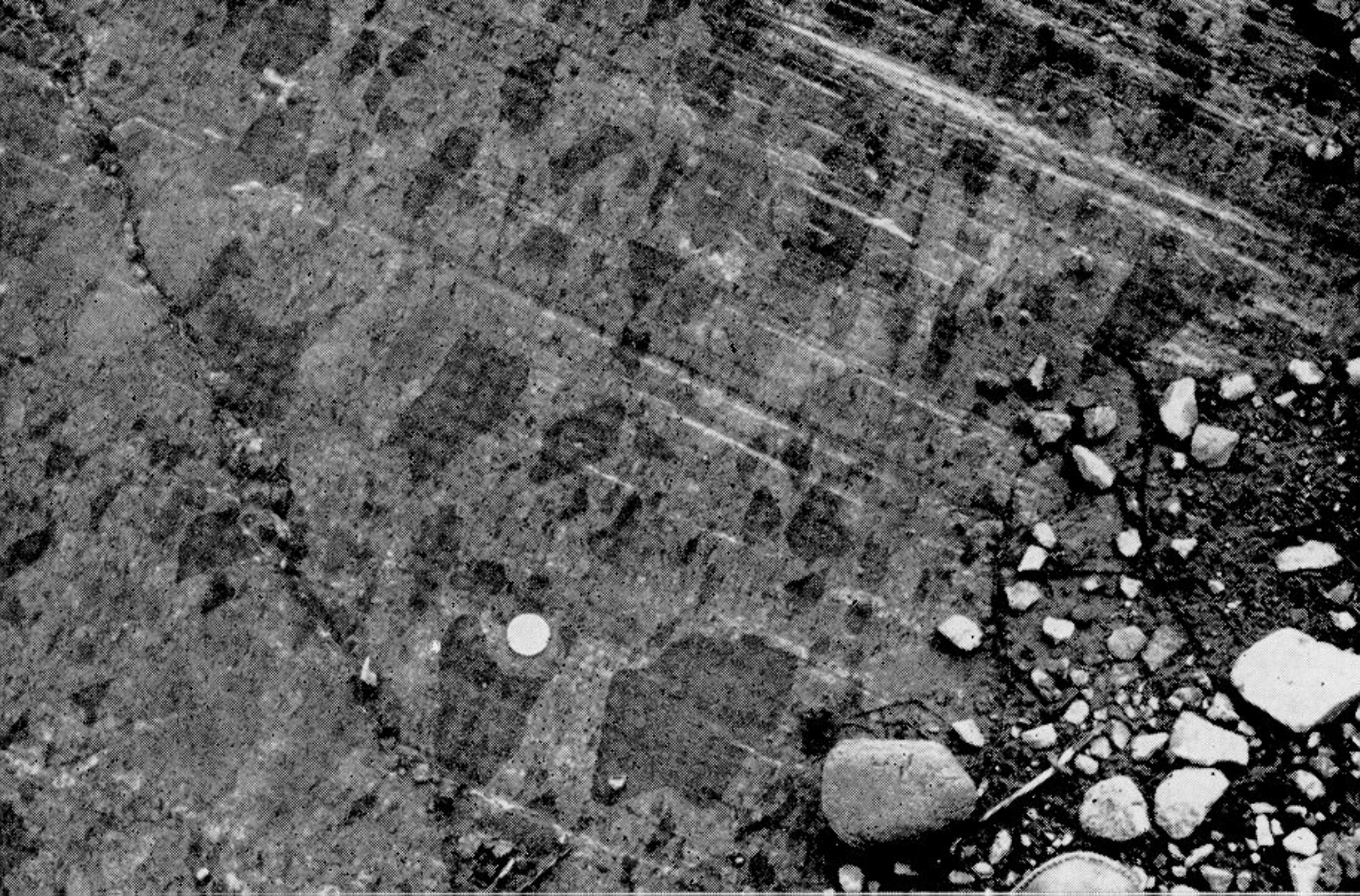


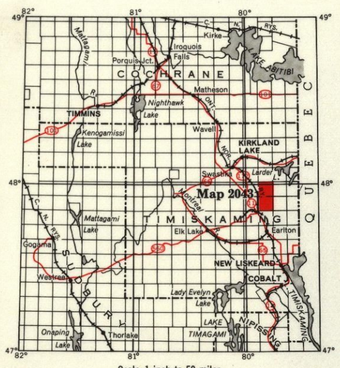
ONTARIO

DEPARTMENT OF MINES

HON. G. C. WARDROPE, *Minister of Mines*

D. P. Douglass, *Deputy Minister* — M. E. Hurst, *Director, Geological Branch*

Map 2043
Catharine and Marter Townships



Scale, 1 inch to 50 miles

N.T.S. reference 31 M/13, 32 D/4

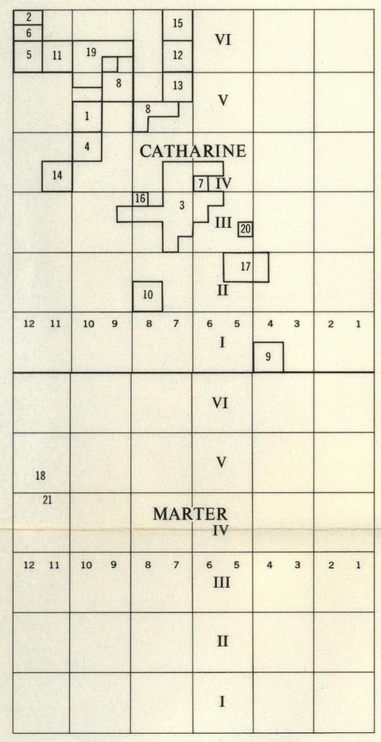
SYMBOLS

- Glacial striae.
- Small rock outcrop.
- Boundary of rock outcrop.
- Geological boundary, defined.
- Geological boundary, approximate.
- Geological boundary, assumed.
- 70° Strike and dip, direction of top unknown.
- Strike and vertical dip, direction of top unknown.
- 55° Strike and dip, top in direction of arrow.
- Direction in which lava flows face as indicated by shape of pillows.
- 80° Strike and dip of schistosity.
- Strike of vertical schistosity.
- 65° Strike and dip of gneissosity.
- Strike of vertical gneissosity.
- 45° Jointing, inclined.
- Jointing, vertical.
- Drag-folds (Arrow indicates direction of plunge).
- Fault, indicated or assumed.
- Building.
- Shaft.
- Pit — Test pit.
- Higher ground.
- Motor road.
- Other road.
- Trail, portage, winter road.
- Township boundary, approximate position only.
- Surveyed line, approximate position only.
- Au — Mineral occurrence. Refer to mineral occurrences reference.

MINERAL OCCURRENCES

REFERENCE

- Au Gold
- Cu Copper
- Fe Iron

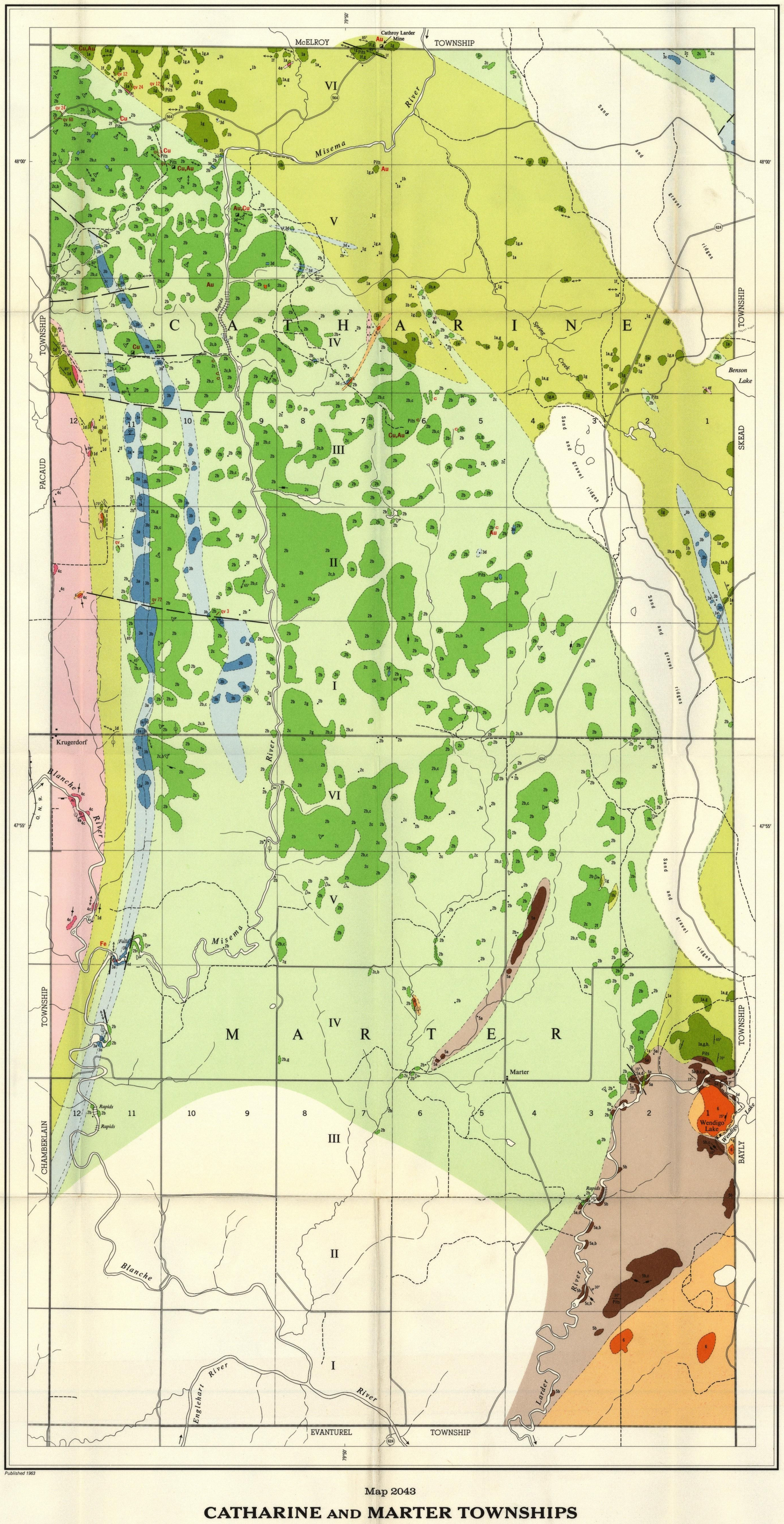


LOCATION PLAN OF MINING PROPERTIES

Scale, 1 inch to 2 miles

LIST OF PROPERTIES

1. Burnand-Gzowski.
2. Campbell.
3. Canoro (Ostrom).
4. Catharine Gold.
5. Connell-McDonough.
6. Cotter.
7. Daley.
8. Gold Hill.
9. Hounslow.
10. Kalyniuk.
11. Kennedy-Boston.
12. Kordol Explorations Ltd. (Gold Bank).
13. Kordol Explorations Ltd. (Gold Ridge).
14. Mindoka.
15. Mirado Nickel Mines Ltd. (Cathroy Larder).
16. Ostrom.
17. Roger-Barnett.
18. Sawka Allard.
19. Turzone Explorations Ltd. (Hilltop).
20. Walsh-Taylor.
21. Wojcieszyn.



Published 1963

LEGEND

CENOZOIC*

PLEISTOCENE

Clay, sand and gravel.

GREAT UNCONFORMITY

PRECAMBRIAN**

PROTEROZOIC

KEWEENAWAN

- 6 *6 Diabase.*

INTRUSIVE CONTACT

HURONIAN

COBALT GROUP

GOWGANDA FORMATION

- 5 *5a Conglomerate. 5b Greywacke. 5c Arkose, quartzite. 5d Argillite.*

UNCONFORMITY

ARCHEAN

ALGOMAN?

- 4 *4a Syenite. 4b Granodiorite. 4c Granodiorite gneiss (Round Lake pluton). 4d Albite porphyry, quartz-albite porphyry. 4e Lamprophyre. 4f Felsite.*

INTRUSIVE CONTACT

POST-KEEWATIN

- 3 *3a Diorite. 3b Gabbro. 3c Serpentinized peridotite. 3d Diorite porphyry, dacite porphyry.*

INTRUSIVE CONTACT

KEEWATIN

BASIC TO INTERMEDIATE VOLCANIC ROCKS (predominantly lavas)

- 2 *2b Dacite and andesite, including pillow lavas. 2c Diabase, diorite and gabbro. 2f Sheared volcanic rocks. 2g Fragmental lavas. 2v Variolitic lavas.*

INTERMEDIATE TO ACID VOLCANIC ROCKS (predominantly pyroclastic)

- 1 *1a Porphyritic dacite and andesite, mostly crystal tuff. 1b Dacite and andesite, mostly aphanitic tuff. 1d Banded tuff and tuffaceous sedimentary rocks with minor iron formation. 1f Sheared volcanic rocks. 1g Agglomerate. 1r Rhyolite.*

- qv 9 — *Quartz veins, width in inches.*
- c — *Carbonatized rock.*

**Unconsolidated deposits. Cenozoic deposits are not differentiated on the map. For the most part they coincide with the lighter coloured and uncoloured 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.*

SOURCES OF INFORMATION

Geology by J. A. Grant and assistants 1961. Geology not tied to surveyed lines.

Cartography by R. G. Curtis and E. Davis, Ontario Department of Mines, 1963.

Base map compiled from Ontario Forest Resources Inventory maps, with additional information by J. A. Grant.

Magnetic declination approximately 10° W, 1962.

Map 2043

CATHARINE AND MARTER TOWNSHIPS

TIMISKAMING DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles

Metres 1000 0 1 2 3 Kilometres

Feet 1000 0 5,000 10,000 Feet