GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

85 N/7

LEGEND

PALAEOZOIC

ORDOVICIAN

11 — *Dolomite, sandy dolomite, conglomerate*

PROTEROZOIC

APHEBIAN (LOWER PROTEROZOIC)

10 — *Quartz stockwork ("giant quartz vein")*

9 — *Aplite; pink, fine-grained granite*

8 — *Feldspar-quartz porphyry, feldspar porphyry*

7 — *Plagioclase-quartz-biotite gneisses with many inclusions of sediments; derived by granitization of sediments (1-3)*

6 — *Even-grained granodiorite and quartz monzonite* **6a,** *porphyroblastic feldspar-quartz-biotite gneiss, minor even-grained granodiorite;* **6b,** *diorite, quartz diorite;* **6c,** *diorite*

5 — *Feldspar-quartz-biotite gneiss; derived by granitization of sediments*

4 — *Gneissic feldspar porphyry or porphyroblastic gneiss with composition of granodiorite and quartz monzonite*

SNARE GROUP (1-3)

3 — *White to light grey quartzite, pink quartzite, minor calc-silicate and metamorphosed argillite*

2 — *Dolomite, metamorphosed dolomite, calc-silicates, calcareous argillite*

1 — *Dark grey, metamorphosed argillite, quartzite, metamorphosed calcareous argillite*

Palaeozoic rock outcrop ..... *Iron formation, epidote, and iron* ..... ×
Geological boundary (defined, approximate, assumed) .....
Bedding, tops known (inclined, vertical) .....
Bedding, tops unknown (inclined, dip unknown) .....
Schistosity, gneissosity (inclined, vertical, dip unknown) .....
Lineation (direction and amount of plunge determined from linear elements) .....
Drag-fold (arrow indicates plunge) .....
Fault, fracture zone (defined, approximate) .....
Fault, fracture zone (inclined, vertical) .....
Syncline .....
Glacial striae (direction of ice-movement known) .....
Mineral prospect or occurrence ..... ×3

MINERAL OCCURRENCES

1. Rayrock Mines Ltd.
2. New Alger Mines Ltd.
3. Riverridge Mines Ltd.
4. Yellowknife Uranium Corporation
5. Rossing occurrences
6. Starlight Mines Ltd.
7. Altomac Uranium Mines Ltd.

Geology by J. C. McGlynn, 1955

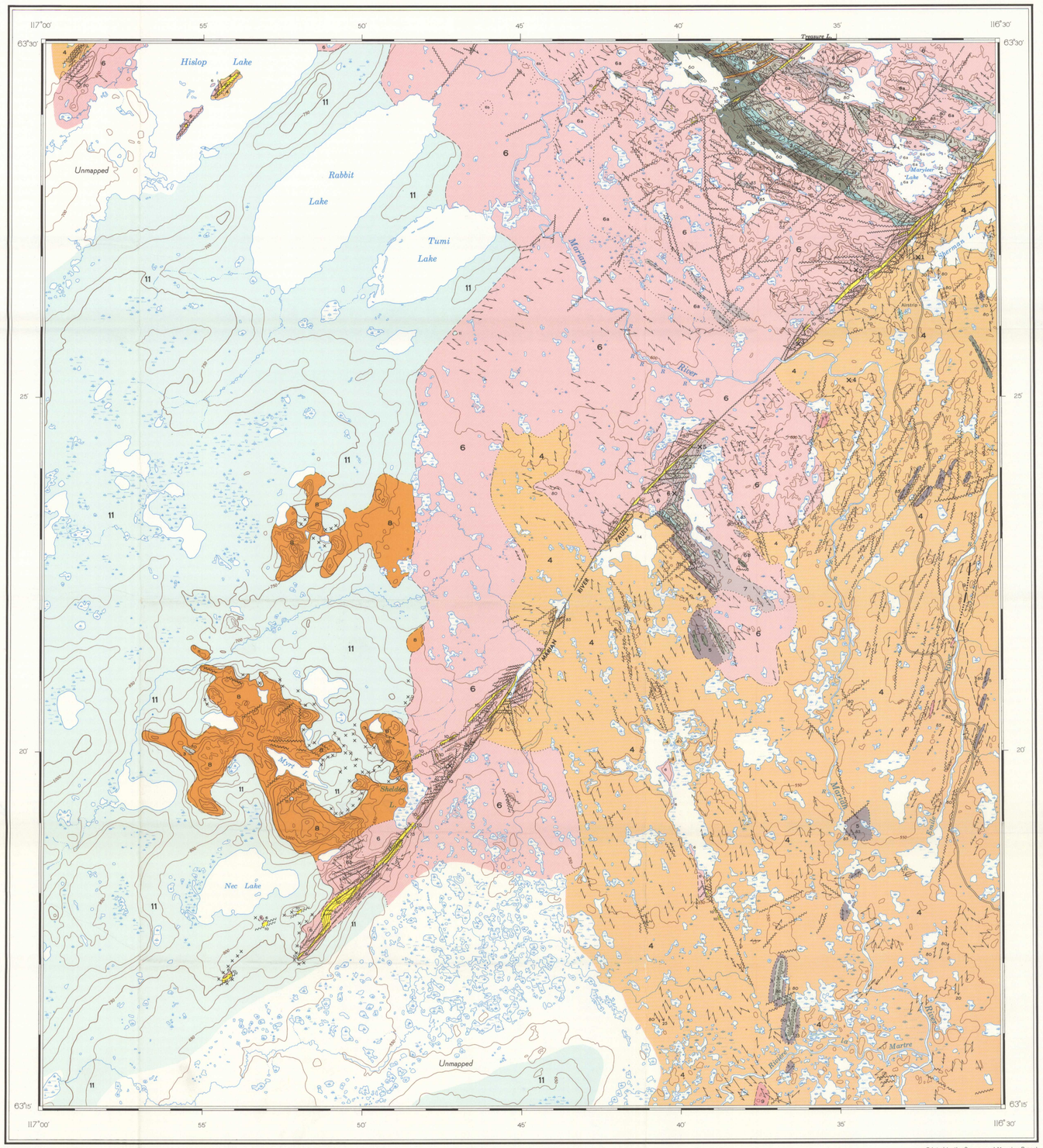
Geological cartography by the Geological Survey of Canada, 1968

Road, all weather .....
Cart track .....
Trail .....
Power transmission line .....
Intermittent stream .....
Rapids .....
Marsh .....
Contours (interval 50 feet) .....

Base-map compiled and drawn by the Surveys and Mapping Branch, 1964

Approximate magnetic declination 1966, 34°32' East decreasing 7.8' annually.

INDEX MAP



Published, 1968
Copies of this map may be obtained from the Director, Geological Survey of Canada, Ottawa

Printed by the Surveys and Mapping Branch

MAP 1230A

GEOLOGY

TUMI LAKE

DISTRICT OF MACKENZIE

Scale 1:63,360
1 inch to 1 mile

Miles 1 0 1 2 3 Miles
Kilometres 1 0 1 2 3 4 5 Kilometres

DESCRIPTIVE NOTES

Maximum relief in the area is about 600 feet. Areas underlain by granitic rocks (4-7) are generally low, with little relief. The belts of sedimentary rocks (1-3) in the northern and central parts of the area form high continuous ridges that trend parallel to the strike of the beds. The Marian River fault and its associated quartz stockworks (10) are marked by a range of hills that is the dominant topographic feature in the map-area. The younger porphyries (8) express themselves as high rugged hills. The contact between Palaeozoic and Precambrian rocks is marked by a low east-facing scarp. Areas underlain by Palaeozoic rocks are flat and featureless and contain lakes with round or smooth shorelines.

The oldest rocks in the map-area are sedimentary strata (1-3) of the Snare Group[1]. In the northern part the oldest rocks (1) consist predominantly of metamorphosed argillites or banded shales with a few thin interbeds of quartzite and, toward the top of the unit, interbeds of limy shales and dolomites that now form bands of calc-silicate rocks. The metamorphosed argillites are very fine grained rocks consisting of tiny, well-oriented books of biotite and locally muscovite in a mosaic of quartz and plagioclase. Locally, fine banding is evident and is caused by a variation of biotite content resulting in dark- and light-coloured bands. Beds of metamorphosed limy shales and dolomites that are common near the top of the unit are lime-silicate rocks of variable composition. For the most part they are finely banded rocks with alternating bands of the following mineral assemblages: epidote, plagioclase, quartz, iron ore, sphene; diopside, iron-rich epidote, plagioclase, minor quartz and sphene; plagioclase, quartz, minor zoisite and epidote; and hornblende plagioclase, epidote, minor zoisite, iron ore, and sphene. Locally, scapolite and tourmaline occur in small amounts in these rocks. Except in bands containing hornblende or pyroxene the grain size is very fine. In the latter bands, the minerals are of medium grain size. In places these rocks are cut by numerous narrow quartz veins and lenses, some of which contain hematite, and by quartz-epidote veins. Towards the top of the unit the rocks are more calcareous and finally grade into the overlying metamorphosed dolomites (2).

In general the metamorphosed dolomites (2) are thin bedded with individual beds up to 2 inches thick, but near the top of the unit the beds thicken to about 8 inches. The outcrops are deeply ribbed owing to differential weathering of layers of different composition. Compositional variations in the original rocks are emphasized by metamorphism. Some beds are light grey to pale green, others are medium green or a mottled greenish brown. The lighter-coloured rocks commonly consist of one of the following two mineral assemblages: diopside, basic plagioclase, minor amounts of quartz and sphene, and variable amounts of carbonate; and epidote, zoisite, plagioclase, quartz, minor sphene, and variable amounts of carbonate. Where these rocks are finely banded, alternating bands are rich in epidote or pyroxene. The dark mottled greenish brown rocks consist of fine- to medium-grained aggregates of diopside, poikilitic garnet, epidote, and carbonate, with variable amounts of plagioclase, quartz, and sphene. The pyroxene is locally partly altered to serpentine. Carbonate rarely forms more than 10 per cent of any of these rocks.

In the northern part of the map-area, the metamorphosed dolomites are overlain by quartzites (3), which for the most part consist of coarse-bedded, white to light pink or grey, fine-grained rocks. A few thin beds of altered dolomite and narrow discontinuous bands and lenses of calc-silicates are found near the base of the unit. South of Treasure Lake, pink to light red quartzites appear to overlie the white quartzites. Throughout the quartzites a few thin beds of dark grey metamorphosed argillites were observed. Poorly preserved crossbedding that suggests tops facing north occurs in the most southerly band of quartzites north of Marian River. In thin section, these rocks are seen to consist essentially of quartz with less than 3 per cent muscovite and biotite occurring as small books. Minor amounts of hornblende, carbonate, epidote, and iron ore were observed in some sections. Quartz grains are locally partly crushed at their boundaries and narrow zones of crushed material cutting across grain boundaries are found in some thin sections.

The band of sediments east of the Marian River fault in the central part of the map-area is lithologically similar to the rocks described above. Isolated small bands of similar sedimentary rocks occur scattered through granitic rocks in other parts of the area. The total thickness of the Snare sediments in the area cannot be determined but slightly more than 3,000 feet of sediments is exposed in the area south of Treasure Lake.

All granitic rocks in the map-area are later than the Snare sediments. The most widespread type is a porphyritic rock (4) that varies in composition from granodiorite to quartz monzonite. It is buff weathering, faintly to strongly gneissic, medium to coarse grained, and contains phenocrysts of grey to flesh-coloured plagioclase (oligoclase-andesine) and/or pink to red microcline, which vary in size from ¼ inch to 3 inches. Other essential minerals are quartz, biotite, and hornblende. The mafic minerals form up to 10 per cent of the rock; biotite is most abundant. These minerals are commonly partly altered to chlorite. Quartz forms from 10 to 25 per cent of the rock. The ratio of plagioclase to microcline varies considerably both in the groundmass and phenocrysts. The microcline is commonly perthitic, and myrmekitic intergrowths are found in plagioclase near grains of microcline. Evidence of plagioclase replaced by microcline was found in all thin sections examined. Plagioclase grains are commonly zoned and are generally somewhat altered to white mica. Epidote, iron ore, and zircons occur in minor amounts in the rock. Alignment of feldspar phenocrysts and mafic minerals impart a gneissosity to the rock. Granitized gneisses (5) are found in the contact area, between the porphyries (4) and sediments (1-3). The gneisses consist of variable amounts of plagioclase, microcline, quartz, biotite, and hornblende. They are biotite-rich where associated with metamorphosed argillaceous rocks, and quartz-rich near quartzites. Inclusions or bands of partly replaced sediments are common in the gneisses. Towards the porphyry contact, porphyroblasts of feldspar occur along foliation planes and increase in number so that the granitized gneisses can be said to grade into the porphyries (4).

Even-grained granitic rocks of various compositions (6) form the bulk of the granites west of the Marian River fault. Typically, these rocks are buff weathering, faintly gneissic, fine to medium grained, and consist of quartz, plagioclase (oligoclase), biotite, and hornblende, with minor amounts of sphene, epidote, iron ore, and zircon. Biotite is more abundant than hornblende and together they form up to 10 per cent of the rock. Relative amounts of plagioclase and microcline vary, but in general the rock is a granodiorite. Microcline is commonly perthitic and evidence that it replaces plagioclase to some extent has been observed. More basic or acidic variations of these rocks occur in small amounts throughout the mass and were not mapped as distinct units. However, some masses of diorites and quartz diorites (6b) were mapped near Marian River in the north-central part of the map-area and southeast of Sheldon Lake. These rocks are gneissic, fine grained, red weathering, and contain up to 50 per cent hornblende and actinolite together with plagioclase that is much altered to zoisite. South of Treasure Lake a body of diorite (6c) was outlined that consists of pyroxene, hornblende, plagioclase, and minor amounts of biotite and quartz. Pyroxene occurs as cores in larger grains of hornblende. Hornblende also has developed along cleavages in the pyroxene, suggesting that much of the original pyroxene was converted to hornblende. These rocks are locally banded, with alternating bands being rich in mafic minerals. The diorite is fine grained and faintly gneissic. Porphyroblastic gneiss (6a) is most commonly associated with sedimentary rocks, and grades into both granitized sediments (7) and the even-grained granodiorites (6). The gneiss is fine grained, buff weathering, and is about the same composition as the granodiorite (6), but plagioclase and microcline occur as small porphyroblasts (up to ½ inch long) along the foliation planes. Granitized rocks (7) occur mostly in the northern part of the map-area near the Snare sedimentary rocks (1-3). These rocks (7) are gneissic, commonly compositionally banded, and vary greatly in mineral composition, depending on the completeness of granitization and on the type of rock being replaced. The gneisses grade into both sedimentary rocks and granodiorites of unit 6 or 6a. Partly replaced bands of sediment, particularly quartzite, are found in the gneisses.

The granitic rocks (4-7) appear to be interrelated, formed at about the same time. In places, the more basic rocks (6b and 6c) seem to be cut by granodiorites. Locally, the porphyritic rocks (4) seem to grade to the even-grained rocks, whereas in other places they appear to be cut by granodiorites (6).

Feldspar-quartz porphyries (8) occur both as large masses and as dykes that cut the Snare sediments and granitic rocks of unit 6. The rocks are grey or maroon weathering and typically consist of well-defined phenocrysts (up to ¼ inch long) of grey, creamy, or light green plagioclase and small eyes of quartz in a hard, splintery, very fine-grained, maroon, dark grey, or brownish matrix. In the interior of the larger masses the matrix is slightly coarser grained. In thin section, minor amounts of hornblende and biotite, both partly altered to chlorite, are seen to occur along with oligoclase and quartz phenocrysts in a very fine mosaic of quartz and feldspar in which tiny books of biotite and needles of hornblende can be identified. The plagioclase in the phenocrysts is altered to white mica and zoisite. The degree of this alteration varies, accounting for the colour changes of the phenocrysts seen in hand specimens. These rocks have the composition of quartz latites. Although these rocks obviously cut the granitic rocks in the area and appear to be formed in a different geological environment, potassium-argon dates of micas from similar porphyries collected in the region indicate that they are about the same age as the other granitic rocks.

Aplite dykes (9) cut all the above-mentioned rocks. They are pink, massive, fine-grained rocks consisting of microcline, quartz, plagioclase, and very small amounts of biotite. They occur chiefly as dykes but also as small irregularly shaped masses that are widely scattered throughout the granitic rocks and to a lesser extent the sediments. The aplites appear to be most numerous along the Marian River fault zone.

A few basic dykes, too small to show on the map, were found in the granitic rocks. They are dark grey, fine-grained rocks consisting of plagioclase, hornblende, pyroxene, and minor amounts of quartz and iron ore.

Palaeozoic rocks (11) underlie about one quarter of the map-area. These rocks, which were not divided by the author, have since been mapped and briefly described by Douglas and Norris[2] who divided them into three units; only the middle unit is exposed in Tumi Lake map-area but the other two units may lie beneath the glacial cover. The oldest unit is a light grey to whitish yellow, fine- to medium-grained sandstone, with some beds of shale and possibly gypsum. Its maximum thickness is about 135 feet and it appears to occupy depressions on the Precambrian surface — locally, overlying strata rests directly on the Precambrian rocks. The middle unit consists mostly of thinly bedded, fine-grained, orange-weathering dolomite that contains thin argillaceous or silty beds. Its basal beds are sandy; locally, however, boulder-conglomerates are found at its base where it overlies Precambrian rocks directly. The conglomerates grade laterally and upwards to sandy dolomite. The youngest unit in the map-area consists of a sequence of thinly bedded, yellowish grey, fine-grained sandstone. Beds of laminated light grey and greenish grey sandstones with interbedded red shale, and purplish red shales with interbeds of pinkish red sandy dolomite, are also included in this unit. The uppermost unit is considered to be Middle Ordovician by Douglas and Norris whereas the lower and middle units are presumed to be Middle Ordovician or older.

The Snare strata (1-3) have been folded. In the large band of sediments in the northern part of the map-area, dips vary between 40 and 90° but average about 60° N. Near the Marian River fault the dips are nearly vertical. Crossbedding suggests that the most southerly band of sediments north of Marian River face north. The more northerly band of quartzite generally dips steeply to the south, but lack of reliable top determinations makes it difficult to decide which direction it faces. If it is south facing, as some evidence suggests, then a synclinal axis trends northwest through Maryleer Lake. The structure of small bodies of sediments scattered in the granitic rocks is unknown, but bedding where observed is steeply dipping.

Many faults occur in the map-area, particularly in or near the northwest-trending bands of Proterozoic strata. The major structural feature is the Marian River fault, which trends northeasterly and more of less bisects the map-area. The stratigraphic similarity between the band of sediments in the central part of the map-area and the band south of Maryleer Lake suggests that one is the faulted extension of the other, giving horizontal displacement along the fault of about 6 miles. The history of this fault is complicated in that movement along it took place at different times; three periods of movement can be distinguished with certainty, and it is probable that movement occurred over a considerable period of time. Parallel faults of shorter length and less horizontal displacement cut the bedded rocks both east and west of the Marian River fault; probably all these faults are related in time and origin. Still other parallel faults are numerous in the sedimentary rocks but are shorter and have small displacement (as low as 10 to 15 feet). The dip of the Marian River fault varies between 70 and 85° SE. All other faults in the area are steeply dipping. Many cut the granitic rocks. They trend both northeast (parallel to the Marian River fault) and approximately northwest. Lack of marker horizons makes it impossible to map displacements but their presence is indicated by crush zones, fracture zones, hematite staining in the granitic rocks, and in places by alteration of mafic minerals to chlorite and slickensides where the actual fault planes are visible. Associated with the Marian River fault are numerous small subsidiary faults that extend a short distance from the main fault. Horizontal movement on such faults, measured on quartz veins is small, rarely more than 50 feet and commonly about 10 feet. Such faults seem to be most numerous where the Marian River fault changes slightly in strike.

'Giant' quartz veins (10) occur in the Marian River fault and, to a lesser extent, in other similar faults. These are not simple veins but stockworks of milky-white quartz. The country rock, where it is not in fault contact with the quartz veins, is silicified to the extent that in many places there is a gradation between granite and quartz veins. At least three ages of quartz can be distinguished in the stockwork. Metallic minerals are sparse, occurring generally where the quartz has been fractured. Hematite is the most common of these; copper minerals and, rarely pitchblende have also been observed. In the central parts of many veins, quartz is banded, displaying a comb structure, and here and there large vugs have zoned quartz crystals projecting into the open spaces. There is some evidence that localization of stockworks in the faults is partly controlled by slight variation in the strike and possibly in the dip of the faults.

Space does not permit detailed descriptions of mineral occurrences. Pitchblende deposits are the only ones of economic interest so far found. A study of the many showings demonstrates that all are in fault zones or fracture zones. The mineral-bearing structures occur in granitic rocks, granitized sediments, quartz stockworks, and sedimentary rocks. The most promising occurrences so far discovered (e.g. Rayrock Mines) are found in subsidiary faults or fracture zones within ½ mile of the Marian River fault. Prospectors working in this or nearby areas should, therefore, direct their attention to faults, particularly long major faults, and special attention to those parts containing quartz stockworks and having many associated subsidiary faults. The subsidiary faults are commonly marked topographically by well-defined depressions, curving off from or trending parallel to the main fault. However, all suspected faults and their immediate vicinity should be examined carefully for radioactivity.

Rayrock Mines Ltd. began production at about 125 tons per day in June 1957, and closed in July 1959, when the ore-bodies had been mined out. More than 70,000 tons was mined and the total value of production to the end of April, 1959, was about $4,200,000. Pitchblende in the main No. 6 zone occurs in veins and fractures in a quartz stockwork in a fault that is an offshoot of the Marian River fault. The ore-bearing section of the structure is about 900 feet west of the Marian River fault. The stockwork is separated from the brecciated granitic host rock by a siliceous, fine-grained rock containing epidote and hematite. Ore-bearing fractures strike both parallel to the vein and across it at various orientations. Most are steeply dipping. Ore shoots occur where the fracturing is most intense. The fractures and, therefore, pitchblende mineralization, may have been localized in the stockwork at places where the dip and possibly the strike of the quartz stockwork and containing faults changed slightly. The ore structure was developed on eight levels, the deepest being at about 1,000 feet below surface. Most of the ore was mined above the 625-foot level.

1 Lord, C. S.: Snare River and Ingray Lake map-areas, Northwest Territories; Geol. Surv., Canada, Mem. 235 (1942).
2 Douglas, R. J. W., and Norris, A. W.: Horn River map-area, Northwest Territories; Geol. Surv., Canada, Paper 59-11 (1959).

N.W.T. Tumi Lake
1 inch to 1 mile
Map 1230A
1968

1230A