Manitoba
Energy and Mines
Geological Services
Geological Compilation Map Series
Granville Lake, NTS 64C
1:250 000

MARGINAL NOTES

The Granville Lake region (NTS 64C) lies in the Churchill structural province and encompasses four Early Proterozoic geological domains (key map, below). From north to south these are:

(1) the southern margin of the Southern Indian domain,
(2) the Lynn Lake domain,
(3) the western part of the Leaf Rapids domain, and
(4) the northern margin of the Kisseynew domain.

Each domain has a unique stratigraphic succession of supracrustal rocks as indicated on the legend.

The **Southern Indian domain**[1] is a gneiss belt comprising abundant intrusive rocks, paragneiss, amphibolite and migmatite. The metasedimentary rocks were derived from graphitic greywacke-siltstone turbidites (**W**) and are overlain by a thin unit of amphibolite or mafic tuff (**A**) and a thick metaconglomerate formation (**C**). The conglomerate is interpreted to occupy a syncline along the north margin of the Lynn Lake domain, but a scarcity of facing criteria makes stratigraphic relationships within the Southern Indian domain uncertain (Gilbert et al., 1980). The conglomerate contains tonalite cobbles that may have been derived from 1876 Ma plutons in the Lynn Lake domain. A maximum age of the conglomerate is 1910 +15/-10 Ma determined from zircons in the underlying volcanic rocks of the Lynn Lake domain (Baldwin et al., 1985). The megacrystic granites intruded at the margin of the Chipewyan domain yield a minimum age of 1864 ±15 Ma for the Southern Indian gneisses (Zwanzig et al., 1985). The southern part of the domain is dominated by tonalite (**T**,**T**m) and granodiorite (**Gp**) which are older than the 1864 Ma granites.

The **Lynn Lake domain** comprises metamorphosed volcanic, sedimentary and plutonic rocks. It extends 130 km from west to east and lies on strike with the La Ronge domain in Saskatchewan (Sibbald et al., 1976; Lewry and Sibbald, 1977). The volcanic rocks make up the Wasekwan Group (Bateman, 1945; Campbell, 1969); rhyolites (w**V**) at location 3 yielded a zircon age of 1910 +15/-10 Ma (Baldwin et al., 1985) and a Rb-Sr metamorphic age of 1790 ±35 Ma with i = 0.7037 (Clark, 1980). The volcanic rocks have been intruded by subvolcanic plugs and were subsequently folded, faulted and later intruded by the Lynn Lake gabbros (L**B**). The gabbros contained Cu-Ni ore pipes which were exploited at mineral localities 9 and 10 (Pinsent, 1980). Large intermediate and felsic plutons of the Pool Lake intrusive suite (P**T**,P**G**,P**D**), which are the pre-Sickle intrusions of Milligan (1960), yield an U-Pb zircon age of 1876 +8/-6 Ma at localities 1 and 2 (Baldwin et al., in prep.) and a Rb-Sr age of 1855 ±85 Ma with i = 0.7025 (Clark, 1984). Unconformably overlying these rocks are metasandstone and conglomerate of the Sickle Group (Norman, 1933; Campbell, 1969). Regional upper greenschist to amphibolite facies metamorphism and further deformation and plutonism took place after deposition of the Sickle Group.

The Lynn Lake domain is divided into several metavolcanic belts separated by granitoid intrusions: the Northern Belt, the Southern Belt and smaller belts in the granitic terrane to the south (Gilbert et al., 1980). Each belt is characterized by a unique stratigraphic succession, chemistry and structure; correlations of units between the belts are uncertain. The Southern Belt extends from Fox Mine to the area east of Barrington Lake and consists of lens-shaped volcanic and sedimentary units which have been interpreted as overlapping volcanic edifices with flanking aprons of volcaniclastic rocks. The volcanic units contain tholeiitic basalt (w**Vo**) at Cockeram Lake and porphyritic, "primitive" calc-alkaline basalt (w**Vp**) at McVeigh Lake and Fox Mine. The basalts are overlain locally by felsic volcanic bodies. Fox Mine is situated on the margin of one of these felsic centres. At Hughes Lake the tholeiitic basalt is overlain by a predominantly andesitic calc-alkaline suite (w**V**) (Syme, 1985). The units in the Southern Belt form a large anticline and probably contain the oldest rocks in the Lynn Lake domain (Gilbert et al., 1980). In contrast, the structure in a large part of the Northern Belt is a north-facing homocline. The stratigraphic sequence of the Northern Belt has 1910 ±10 Ma old rhyolite (Baldwin et al., in prep.) at the base, overlain in ascending order by andesite and basalt, sedimentary rocks (w**C**,w**W**) and an upper basaltic section (w**Vr**). The mafic rocks are tholeiites which include some high-alumina varieties and subordinate high-magnesia basalt. The upper mafic section contains the MacLellan and Farley Lake gold deposits (mineral localities 15 and 16). The Northern Belt succession is tentatively correlated with the upper part of the Southern Belt section and thus may represent the upper part of the Wasekwan Group.

A thick sequence of metasandstone (s**S**) (Sickle Group) with basal conglomerate (s**C**) unconformably overlies the Pool Lake intrusions and the earlier deformed rocks of the Wasekwan Group. The angular unconformity is clearly evident on the northwest shore of Sickle Lake, where southeast-trending Wasekwan Group volcanic units are abruptly truncated by the northeast-trending Sickle conglomerate. At Hughes Lake the base of the Sickle Group cuts across the volcanic stratigraphy; a major fold closure in the Sickle Group southeast of the lake has no expression in the underlying Wasekwan Group rocks which form a southwest-facing homocline. The basal part of the Sickle conglomerate typically contains clasts derived from the directly underlying bedrock. The remainder of the conglomerate contains predominantly rhyolitic, arkosic and rare granitic clasts. These lithologies are not common in the underlying bedrock and are of uncertain provenance. The Sickle Group has characteristics of alluvial deposits: a thick basal conglomerate is overlain by thick, fining-upward sandstone successions; trough crossbedding, ripple lamination, mudcracks and mudcurls are locally abundant in the otherwise massively bedded sandstone.

Throughout the Lynn Lake domain, various phases of deformation have affected units of different ages. The following phases (from oldest to youngest) have been recognized:

(1) block faulting during development of Wasekwan volcanic edifices and tectono-sedimentary basins at 1.9 Ga;
(2) large-scale east-northeast-trending upright folding (e.g. Southern Belt anticline which is truncated by the 1876 Ma Pool Lake intrusive suite);
(3) northwest-trending folding and faulting, during and after emplacement of Pool Lake intrusions, followed by deposition of the Sickle Group and intrusion of high-level sills of Black Trout diorite (BT**D**);
(4) major north-trending folding and intrusion of younger granitic rocks;
(5) easterly trending folding producing a type I interference pattern (Ramsay, 1967) well developed between Conglomerate Lake and Hunter Lake;
(6) development of northeast- and north-trending folds and faults.

The late deformation (phases 4, 5 and 6) affected the entire Granville Lake region and was accompanied by regional metamorphism. The late deformation produced penetrative foliation, faults and steeply plunging, reactivated folds in the Wasekwan Group. The most prominent fault zone is the east-trending Johnson shear, which separates the Southern Belt from the granitoid terrane to the south. The Tod Lake-Dunphy Lakes fault system extends from the Lynn Lake domain southwest into the Kisseynew domain.

The **Leaf Rapids domain** lies east of Beaucage Lake. This domain is a predominantly intrusive terrane that contains the 1876 Ma old Rusty Lake metavolcanic belt in NTS 64B. The western part of the domain comprises the Outlaw Bay tonalite and the Eden intrusive suite. Supracrustal rocks of uncertain age occur as rafts and narrow belts within the intrusive complexes; the supracrustal rocks may include Wasekwan Group amphibolite and paragneiss in the northwest, and possibly younger rocks farther south. Metarhyolite and metasedimentary rocks (Wasekwan Group of Milligan, 1960 and Gilbert et al., 1980) extend from Black Trout Lake to Beaucage Lake and eastward to the Rusty Lake belt. These supracrustal rocks include a unique suite of felsic volcanogenic sandstones, jasper-pebble conglomerate and iron formation. At the contact with the Lynn Lake domain these units are unconformably overlain by the Sickle Group which contains clasts of the underlying iron formation and abundant rhyolite clasts (Zwanzig, 1981).

The Outlaw Bay tonalite is a strongly foliated complex, possibly correlative with the 1876 Ma Pool Lake intrusive suite in the Lynn Lake domain. The Eden intrusive suite comprises younger megacrystic granites (E**Gp**), biotite granite (E**G**b) and aegirine-augite monzonite (E**Z**) which are similar to, and possibly coeval with the 1864 Ma granites in the Chipewyan domain. The Eden intrusive suite may extend northeast into the Baldock batholith. Black Trout diorite dykes (BT**D**) occur at the western margin of the Leaf Rapids domain. This diorite-quartz diorite suite has a transitional to alkaline chemistry. The younger granites cut the diorite dykes.

The western part of the Leaf Rapids domain is interpreted as an upthrown structural block. The metamorphic grade is middle to upper amphibolite facies. Structures include phases 4, 5 and 6 folds and faults, which are also developed in the Lynn Lake domain. The northwest-trending structure in the supracrustal rocks northeast of Beaucage Lake was probably developed during phase 3.

The **Kisseynew domain** is a metasedimentary gneiss belt that flanks the Lynn Lake and Leaf Rapids domains on the south. It is composed of paragneiss, amphibolite and migmatite derived from Lower Proterozoic sedimentary and subordinate volcanic strata (Clark et al., 1974). This belt has undergone upper amphibolite facies metamorphism and polyphase deformation. The supracrustal succession consists of three divisions:

(1) the lowest division (Burntwood River Metamorphic Suite) (B**W**) is composed of quartzofeldspathic garnet-biotite gneiss ± cordierite ± sillimanite and anatectic migmatite derived from graphitic greywacke-mudstone turbidites (Gilbert et al., 1980);
(2) the middle division comprises thin conformably overlying amphibolite and paragneiss units (**A**,**C**f,**W**) derived from mafic volcanic rocks and clastic to chemical sediments;
(3) the upper division (Sickle Metamorphic Suite) conformably overlies the middle division and is composed of metaconglomerate (SM**C**) and quartz-feldspar-rich gneiss (SM**S**) ± hornblende or sillimanite derived from lithic sandstone, calcareous sandstone and arkose.

The Sickle Metamorphic Suite is stratigraphically equivalent to the Sickle Group in the Lynn Lake domain. The Burntwood River greywackes were probably deposited contemporaneously with the volcanic and sedimentary rocks of the Amisk Group in the Flin Flon domain (Bailes, 1971; McRitchie, 1974). The stratigraphic relationships between the Burntwood River greywackes, the middle division and the Wasekwan Group volcanic rocks are uncertain. Rocks of the middle division occur on the north margin of the Kisseynew domain and in the Lynn Lake domain, northwest of the Tod Lake-Dunphy Lakes fault system. They were mapped as part of the Wasekwan Group but their contacts are generally faulted (Gilbert et al., 1980). The metavolcanic and metasedimentary rocks of the middle division are locally intercalated with the Burntwood River metagreywackes and may have the same age as the Burntwood River Suite. Feldspathic metagreywacke (**W**), sedimentary breccia and local metaconglomerate (**C**) of the middle division were derived from high-energy turbidites with possible olistostromal facies on Granville Lake (Zwanzig, 1984). The coarse clastic rocks are associated with carbonates, metacherts, metabasalt and ultramafic rocks (including rare ultramafic flows). The basalts are high-iron and high-magnesia tholeiites, geochemically transitional between modern arc-related and rift-related rocks. The middle division is stratigraphically overlain by the Sickle Metamorphic Suite but locally (structurally?) underlain by Sickle rocks.

The structure of the Kisseynew domain is dominated by large recumbent folds and upright crossfolds which trend north, east and northeast. The upright folds are coeval with late structures (phases 4, 5 and 6) in the Lynn Lake domain, and the recumbent folds probably developed between phases 3 and 4. Along the Lynn Lake-Kisseynew margin thrusting and remobilization of early plutonic suites resulted in recumbent folds and domal granitic complexes (e.g., Glasspole Lake complex).

In the **Granville Lake region** deposition and metamorphism of all the rocks are Early Proterozoic (Clark, 1980). The domains are similar to Archean granite-greenstone belts and metasedimentary gneiss belts, and, like the Archean terranes, may have evolved in a tectonic environment that has no exact modern analogue (Ayres and Thurston, 1985). However, Wasekwan Group geochemistry is similar to that of Cenozoic intra-oceanic arcs (Syme, 1985). The Pool Lake intrusive suite is calc-alkaline to calcic, and also a possible product of arc magmatism. The geochemistry and structure of the volcanic rocks at the north margin of the Kisseynew domain (middle division) suggest rifting in an arc environment but other interpretations are possible (Zwanzig, 1984; Green et al., 1985). Syntectonic leucogranites (**G**l) are slightly peraluminous and apparently had an upper crustal anatectic source, possibly related to collision tectonics.

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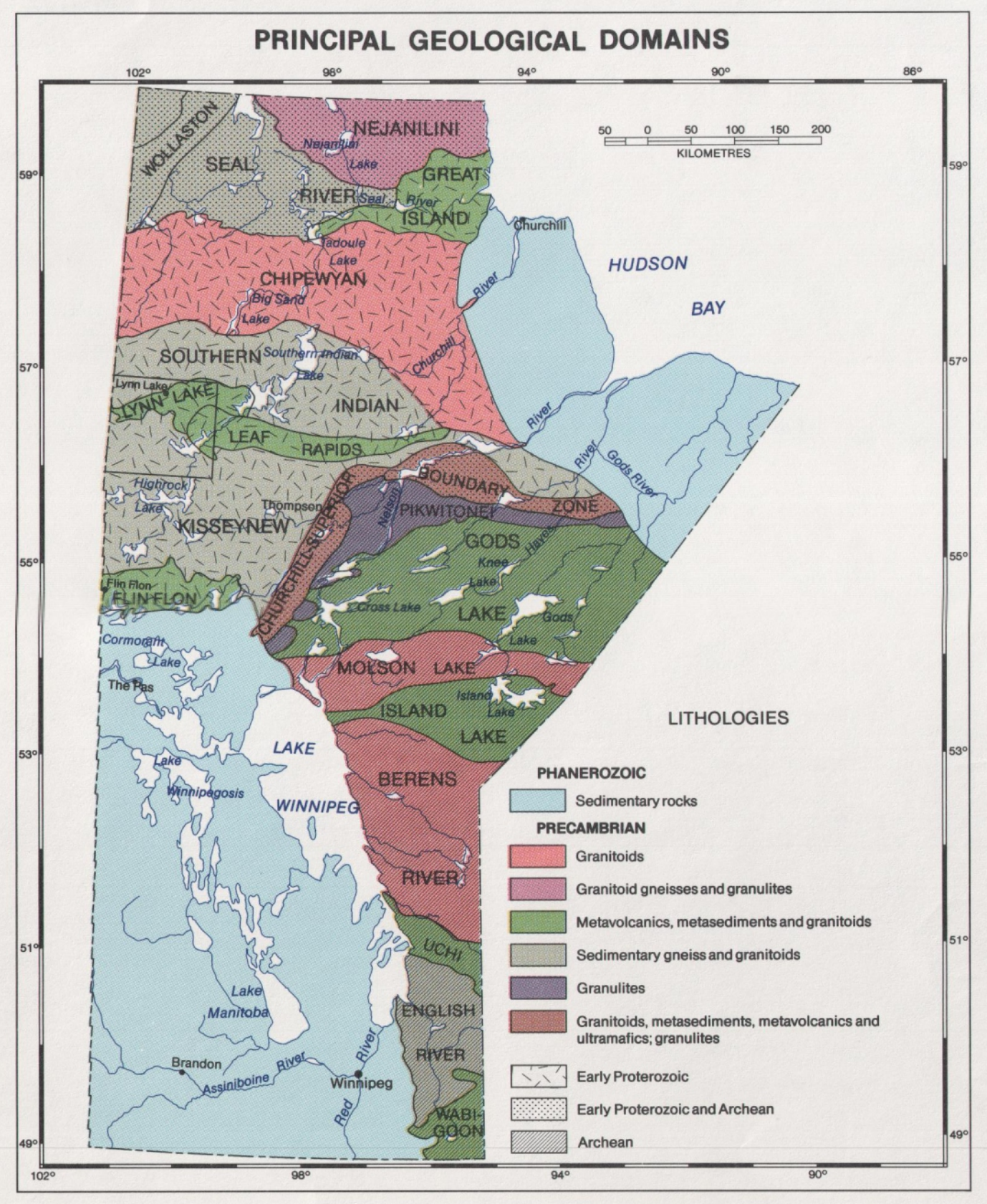
[1] Unless otherwise noted, domain descriptions are only applicable to the Granville Lake map sheet (NTS 64C).

PRINCIPAL GEOLOGICAL DOMAINS



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Scale 1:250 000

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

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Additional references for Granville Lake, NTS 64C, are available in Manitoba Energy and Mines, Open File Report OF86-1.

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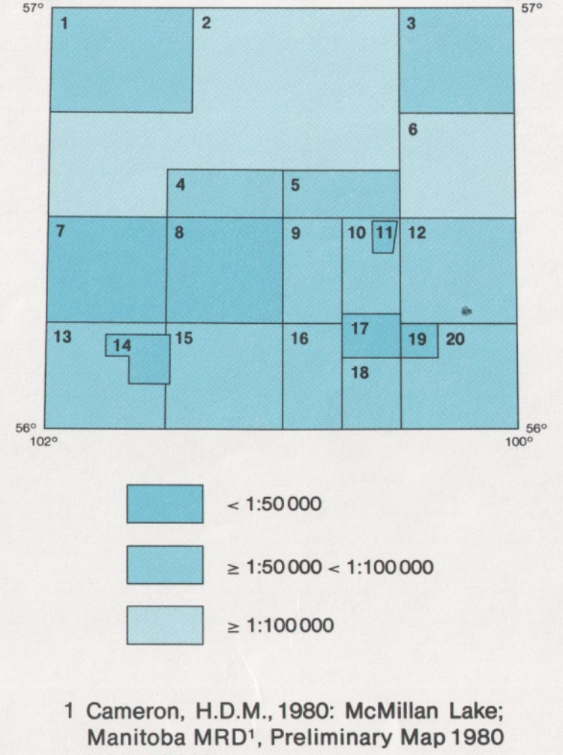
SOURCES OF INFORMATION



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In addition, recent unpublished data have been incorporated.

[1] Mineral Resources Division

MINERAL DEPOSITS AND IMPORTANT OCCURRENCES

	Name	UTM Northing / Easting	Commodities	References
1 ▲	Gran	6231200 / 396300	Cu, Pb, Zn, Ag	MI 64C/2 CU 1[1]
2 ▲	Lasthope	6282700 / 387300	Au	R.F.A.[2] 1983 (p. 84)
3 ▲	Gemmell Lake	6289700 / 364200	Au, Ag, Cu, Ni	92193[3]
4 ●	Fox Lake	6278600 / 342900	cs, gr	Manitoba MRD[4] Map 80-1
5 ●	Fox Mine	6279000 / 338000	Cu, Zn	MI 64C/12 CU 1
6 ▲	Lar	6279700 / 322700	Cu, Zn	91713; MI 64C/12 CU2
7 ▲	FL and DH Groups	6300400 / 377500	Cu, Zn	91023; 91024; MI 64C/14 CU1
8 ▲	Z Deposit	6299700 / 376000	Zn, Cu	MI 64C/14 CU2
9 ●	"EL" Mine	6299200 / 376000	Ni, Cu	Milligan, 1960; 91024; MI 64C/14 NI2
10 ●	"A" Mine	6302700 / 375900	Ni, Cu, Co	Milligan, 1960; MI 64C/14 NI1
11 ▲	Nicoba	6299000 / 373800	Zn, Cu	R.F.A. 1982 (p. 44)
12 ▲	Frances Lake	6299800 / 371300	Cu, Zn	N.M.[5] June 2, 1977; MI 64C/14 ZN1
13 ▲	Sherlynn (Goodenough)	6307600 / 374800	Cu	MI 64C/14 CU 3
14 ▲	Y Deposit	6302200 / 378300	Zn, Cu	R.F.A. 1982 (p. 44)
15 ▲	MacLellan (Agassiz)	6307600 / 380700	Au, Ag, Zn, Pb	MI 64C/15 AU1
16 ▲	Farley Lake	6307800 / 412500	Au, Ag	91836; 91041; N.M. October 7, 1985
17 ▲	Brooks Bay (Barrington Lake)	6313600 / 421200	Cu, Au	N.M. April 13, 1974; MI 64C/16 AU1

PROPERTY STATUS

Metals

Past producer . . . . . ●
Important mineral property . . . . . ▲

Industrial Minerals

Past producer . . . . . ●

COMMODITIES

Metals

Ag	silver
Au	gold
Co	cobalt
Cu	copper
Ni	nickel
Pb	lead
Zn	zinc

Industrial Minerals

cs	crushed stone
gr	granite

[1] Mineral inventory card, Exploration Services, Manitoba Energy and Mines.
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[3] Numbers refer to Open Assessment Files, Exploration Services, Manitoba Energy and Mines.
[4] Mineral Resources Division.
[5] Northern Miner.

LEGEND

PRECAMBRIAN

Early Proterozoic

Younger Plutonic Rocks

X	Pegmatite
Z	Monzonite, monzogranite; E**Z** - aegirine-augite monzonite - Eden intrusive suite
Z	Syenite, syenogranite
G	Granite; **Gp** - megacrystic granite; **G**m - magnetite granite; **G**l - leucogranite- granodiorite; G**G** - granite (within the Glasspole Lake complex); E**G**b-biotite granite; E**Gp**-megacrystic granite } Eden intrusive suite
G	Granodiorite; **Gr** - seriate-porphyritic granodiorite; **G**h - hornblende granodiorite; **Gp** - porphyroblastic granodiorite-tonalite E**Gr** - seriate-porphyritic granodiorite; E**G** - granodiorite } Eden intrusive suite
BT**D**	Diorite, quartz diorite - Black Trout diorite
B	Gabbro

Plutonic Rocks of Uncertain Age

G	Granite
G	Granodiorite, granite; **Gn** - gneissic granodiorite; **Gp** - porphyroblastic granodiorite-tonalite
T	Tonalite, granodiorite; **T**x - clinopyroxene tonalite; **Tn** - gneissic tonalite-granodiorite; O**T** - Outlaw Bay tonalite; **T**m - magnetite tonalite G**T** - tonalite; G**Tn** - gneissic tonalite-granodiorite } within the Glasspole Lake Complex
Z	Monzodiorite
D	Diorite, quartz diorite; **Dp** - porphyroblastic quartz diorite
B	Gabbro, diorite, quartz diorite

KISSEYNEW DOMAIN

Sickle Metamorphic Suite

SM**S**s	Quartz-rich sillimanite gneiss derived from arkose; migmatite (patterned)
SM**S**	Quartzofeldspathic gneiss derived from sandstone (undivided); SM**S**b - feldspar-rich biotite gneiss; migmatite (patterned)
SM**S**h	Hornblende-bearing quartzofeldspathic gneiss ± diopside; migmatite (patterned)
SM**C** / SM**C**h	SM**C** - polymictic conglomerate; SM**C**h - hornblende-bearing polymictic metaconglomerate

Burntwood River and/or Sickle Metamorphic Suite

U	Ultramafic and ultrabasic rocks	•
A	**A** - layered amphibolite, minor ultramafic rock, marble and felsic gneiss; **Ao** - amphibolite derived from pillowed and massive basalt	Ao
Cf	**C** - conglomerate; **C**f - feldspathic sandstone-cobble conglomerate	C
W	Feldspathic greywacke, conglomerate, paragneiss, amphibolite; migmatite (patterned); **W**h - hornblende-bearing greywacke gneiss, amphibolite, felsic gneiss	W

Burntwood River Metamorphic Suite

B**W**	Greywacke-mudstone gneiss; migmatite (patterned); B**W**f - potassium feldspar-bearing gneiss derived from arkosic wacke	W

LYNN LAKE DOMAIN

Sickle Group (low to high metamorphic grade)

s**S**	Sandstone, quartzofeldspathic gneiss
s**S**h	Calcareous sandstone, hornblende-bearing quartzofeldspathic gneiss
s**C** / s**C**h	s**C** - polymictic conglomerate; s**C**h - hornblende-bearing polymictic metaconglomerate

Older Plutonic Rocks

	P**G**	Granite, granodiorite } Pool Lake intrusive suite
1,2 ⊛	P**T**	Tonalite, granodiorite *1: 1876 +8/−6 Ma, 2: 1876 +8/−7 Ma; (1855 ±85 Ma[1])* } Pool Lake intrusive suite
	P**D**	Diorite, quartz diorite } Pool Lake intrusive suite
	L**B**	Gabbro, peridotite, norite, quartz diorite } Lynn Lake intrusions
	B	Gabbro, diorite

Wasekwan Group (low to high metamorphic grade)

	w**W**	Volcanic sandstone, siltstone and mafic mudstone, iron formation (dotted line)
	w**C**	Volcanic conglomerate, sandstone and siltstone
	w**A**	Wasekwan Group, undivided (mainly amphibolite)
3 ⊛	w**V**	Rhyolite and dacite (including pyroclastic rocks) *3: 1910 +15/−10 Ma; (1790 ±35 Ma[2])*
	w**V**	Andesite; w**Vr** - porphyritic and aphyric basalt and andesite; w**Vt** - intermediate tuff
	w**V**	w**Vr** - porphyritic and aphyric basalt (undivided volcaniclastic rocks and flows), iron formation (dotted line); w**Vp** - porphyritic basalt, massive flows and breccia; w**Vt** - mafic tuff
	w**V**	Basalt; w**Vo** - pillow basalt; w**Vp** - basalt (mainly porphyritic breccia); w**Vr** - aphyric and porphyritic basalt; w**Vt** - mafic tuff

SOUTHERN INDIAN DOMAIN

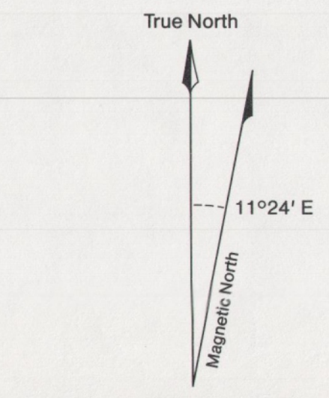
Metamorphic Rocks of Uncertain Age

C	Polymictic conglomerate, iron formation (dotted line)
A	Amphibolite; **Ar** - amphibolite derived from basalt, mafic tuff and volcanic breccia
W	Greywacke, biotite gneiss, migmatite

LEAF RAPIDS DOMAIN

Metamorphic Rocks of Uncertain Age

W	Greywacke, arkosic wacke, volcanic rocks
K	Chemical sedimentary rocks (multi-facies iron formation)
V	Volcaniclastic sedimentary rocks
V	Rhyolite
A	Amphibolite (includes gabbro, sedimentary and volcanic rocks)



Approximate mean declination (1986) for centre of map.
Decreasing 22.7' annually.

Reference for U-Pb zircon ages:
1,2,3 ⊛ *Baldwin et al., 1985*

References for Rb-Sr whole-rock ages:
[1] *Clark, 1984*
[2] *Clark, 1980*

STRATIGRAPHIC NOTE

The lithologies within the major stratigraphic divisions are in approximate stratigraphic order.

SYMBOLS

Geological boundary (approximate)
Geological boundary (inferred from aeromagnetic signature and trend)
Stratigraphic top (inclined, overturned)
Bedding, layering (dip unknown, 0°-29°, 30°-59°, 60°-79°, 80°-90°)
Foliation, or foliation and parallel layering (dip unknown, 0°-29°, 30°-59°, 60°-79°, 80°-90°)
Syncline (upright, overturned)
Anticline (upright, overturned)
Fault
Domain boundary
Area of little or no outcrop
2 ⊛ Sample locality for U-Pb zircon age determination

Synoptic geology by H.V. Zwanzig with contributions by D.A. Baldwin, H.D.M. Cameron, H.P. Gilbert, P.G. Lenton, D.C.P. Schledewitz and E.C. Syme

Compilation by J.S.D. Parker and D. Kowerchuk

Cartography by D.L. McShane

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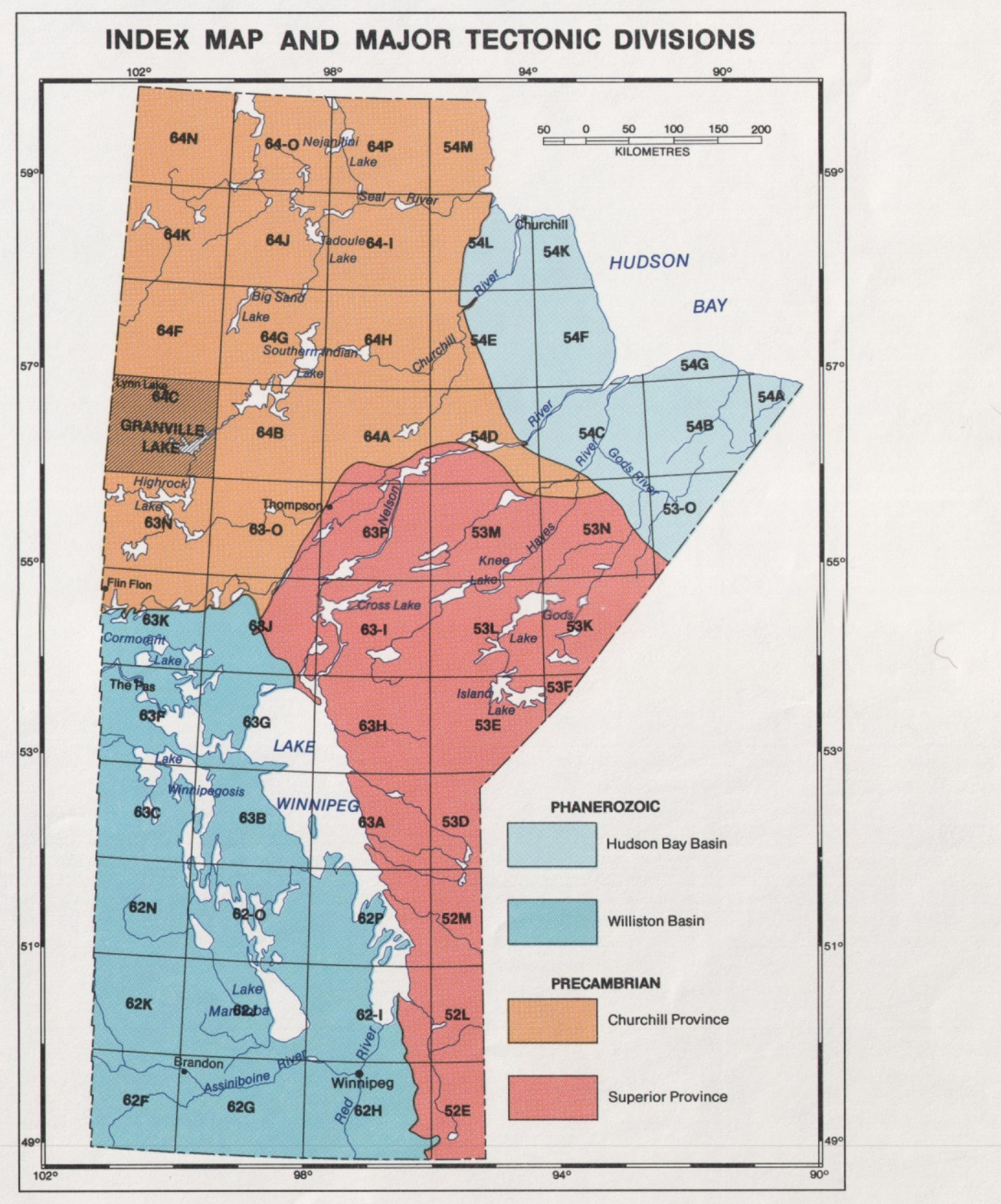
BEDROCK GEOLOGY COMPILATION MAP SERIES

GRANVILLE LAKE

NTS 64C

INDEX MAP AND MAJOR TECTONIC DIVISIONS



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