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GEOLOGICAL SURVEY OF CANADA | COMMISSION GÉOLOGIQUE DU CANADA

DESCRIPTIVE NOTES

Introduction:

This open file consists of three 1:250 000 scale preliminary geological maps (Amer Lake, 66H; Deep Rose Lake, 66G; Parts of Pelly Lake, 66F) . Field mapping in the Amer Lake map area was undertaken by Heywood, Tippett, Tella, and Annesly during 1976, 1978, and 1979; in the Deep Rose Lake and Pelly Lake map areas by Tella, Thompson, Ashton, and James during 1982 and 1983 field seasons. Preliminary results of mapping were reported previously (Heywood, 1977; Tella, 1983, 1984; Tella and Heywood, 1978, 1983; Tella et al., 1983, 1984; Tippett and Heywood, 1978). This compilation of bedrock geology incorporates additional data (published and unpublished) from topical studies undertaken in the region by several other workers (Annesley, 1981a,b, 1989; Ashton, 1981, 1982, 1987, 1988; Barrett et al., 1978; Goff, 1992; Henderson and Henderson, 1994; Jackson, 1983; Knox, 1980; Mudry, 1990, Patterson, 1980a,b, 1981; Patterson and Barrett, 1979; Roddick et al. 1992, Smith, 1984). Persons interested in detailed aspects of geology and structure should consult the references supplied. Pertinent references for adjoining map areas are included for an overview of outstanding geological problems. (Armitage, 1992; Curtis and Miller, 1980; Fraser, 1988; Frisch and Patterson, 1983; Geological Survey of Canada, 1974a,b,c; Goff, 1992; Henderson et al., 1991; Heywood and Schau, 1978, 1981; LeCheminant et al., 1984; Wanless et al., 1977; Wright, 1955). Several mineral exploration assessment reports on this region are available from the DIAND office, NWT Geology Division, Yellowknife, NT.

Regional Geology, Structure, and Metamorphism:

Granulite, garnet-biotite paragneiss, mafic schist and minor amphibolite (unit **Agn**) appear to be the oldest rocks in the Amer Lake (66H) region. Unit **Am, Ama**, structurally above unit **Agn**, consists of migmatite, layered or banded orthogneiss, garnet-biotite paragneiss, and minor amphibolite. Rocks within the Garry Lake complex (**APm**), exposed in the northwestern part of the Deep Rose Lake map area (66G), are in part correlative with the rocks of unit **Am, Ama**. The oldest supracrustal rocks in the region (66H) consist of metamorphosed layered rocks, commonly intermediate to mafic volcanic rocks (**Amv**), greywacke, chlorite schist, auriferous banded iron formation, and minor chert and carbonate (**Agk**), and quartzite (**Aq**). Zircon fractions from a dacite porphyry (**Amv**) in the Amer Lake map area yielded a U-Pb upper concordia intercept age of 2798+24/-21 Ma., suggesting an Archean age for some of the supracrustal rocks in the region. Considerable controversy exists among geologists as to the age of quartzites (**Aq**) in the southeastern part of the Amer Lake area (66H) and similar rocks exposed farther to the south and southeast (Schultz Lake, 66A; Baker Lake, 56D). Although Wright (1967) assigned an early Proterozoic age to the above rocks, Schau et al., (1982) and Taylor (1985) assigned an Archean age to the quartzites in the adjoining Baker Lake and Schultz Lake map areas partly on the basis of their lithological similarities to the Archean Prince Albert Group (Schau and Hulbert, 1977). More recent studies in the Amer Lake map area confirmed an Archean age for these quartzites (Ashton,1988; Roddick et al. 1992; Tella et al. 1985a). There the zircon fractions from a granite (**APg**) that apparently intrudes the quartzite (**Aq**) yielded late Archean ages (2629 +/- 2 Ma, Aston, 1988; 2627 +14/-10 Ma, Roddick et al. 1992). Associated with these supracrustal rocks are spinifex textured komatiitic rocks (**Au**) which are in part known to be extrusive in origin. The komatiites form relatively thick units that are both underlain and overlain by tholeiitic rocks (Annesley, 1981a). These rocks are now considered to be Archean on the basis of their field, petrographic, and chemical characteristics, and geochronolgy (Annesley, 1981a, b, 1989; Ashton, 1988). Annesley (1989) favoured a continental margin-arc type environment for the origin of the komatiitic suite, although an ensialic rifting model has not been ruled out completely.

Deformed supracrustal rocks of uncertain age (**APgk,c**), in part consisting of stromatolite bearing units (**APc**), occur in the northern parts of the Deep Rose Lake map area (66G). Deformed and metamorphosed supracrustal rocks ranging in composition from diorite to granite (**APgn** to **APg**) occur throughout the region, and in part, represent a basement complex to the deformed and metamorphosed Early Proterozoic supracrustal rocks of the Amer group (**PAs** to **PAfs**). Adjacent to the Amer group strata, zircon fractions from a granite (**APg**; 35 km northeast of Sand Lake, NTS 66G) in this basement complex yielded a U-Pb upper concordia intercept age of 2617 +/- 20 Ma (Tella, 1984; subsequently revised to 2610 +13/-12, LeCheminant and Roddick, 1991). Biotite schist, paragneiss, and quartzo-feldspathic metasedimentary gneiss (**APs**), and metavolcanic rocks and minor amphibolite (**APv,a**) mostly occur structurally below the Amer group in the central portions of the Amer Lake map area (66H) and to a lesser extent structurally above the quartzite (**PAq**). Although Barrett et al. (1978) and Patterson (1981) consider the metavolcanic rocks (**APv**) to be part of the Amer group, Heywood (personal communication) and Tella and Heywood (1983) favour a pre Amer group age for these rocks. The Early Proterozoic Amer group strata are dominately made up of two clastic sequences-a lower conglomerate-orthoquartzite (**PAcg,PAq**) and an upper feldspathic sandstone-arkose-siltstone (**PAfq**), carbonate (**PAc**), and mudstone-siltstone-sandstone rhythmite (**PAms**). These transitional lithologies are, in part, hornfelsed near gabbro sills (**PAgb**) in the Deep Rose Lake map area (66G). Stratabound uranium mineralization occurs within the upper parts of the transitional sequence. The intensity of deformation within the rocks of the Amer group increases from southwest to northeast with a corresponding increase in metamorphic grade from subgreenschist to lower amphibolite facies. Several north-northwesterly transported thrust sheets have been mapped within the lower Amer group strata. Patterson (1981,1986) interpreted the Amer group strata as a remnant of a once extensive Early Proterozoic foreland fold and thrust belt with a hinterland to the southeast. However, more recent work by Ashton (1988) and Henderson et al. (1991) in the southeastern parts of the Amer Lake map-sheet (66H) do not support this interpretation.

The Amer group was intruded by a younger suite of Early Proterozoic granite/syenite plutons (Py,Lp - Pqm). Zircon fractions form a syenite intrusion (Py in 66H) yielded a U-Pb upper concordia intercept age of 1849 +/- 18 Ma (Tella, 1984; Tella et al. 1985b). Proterozoic clastic rocks of the Thelon Formation (**PT**) unconformably overlie the granitoid basement complex and the Amer group. Northwest trending diabase and gabbro dykes (**PD**) record the youngest intrusive activity in the region.

Northeast trending cataclastic and mylonitic zones, and northwest trending brittle faults affect both the basement and the cover rocks. Deformed and regionally metamorphosed granitoid and sedimentary rocks within the Amer and Chantrey mylonite zones exhibit deformation textures characteristic of both ductile and brittle deformation modes (Tella and Heywood, 1978; Tella, 1983; Tella et al., 1983). Field relations and textural aspects indicate at least two periods of movement along the Amer mylonite zone, and K-Ar mineral dates (Table 1) across the zone suggest that the latest movement (with a dextral sense of displacement) may be as young as 1.7 Ga (Tella, 1983, 1984; J.C. Roddick, personal communication, 1994). These movements post date the emplacement of Early Proterozoic granite-syenite plutons (**Pqm**). The latest movement on the Chantrey mylonite zone (66G,F) was one of low angle oblique-slip with an apparent dextral sense of shear (Tella, 1984; Tella et al. 1984).

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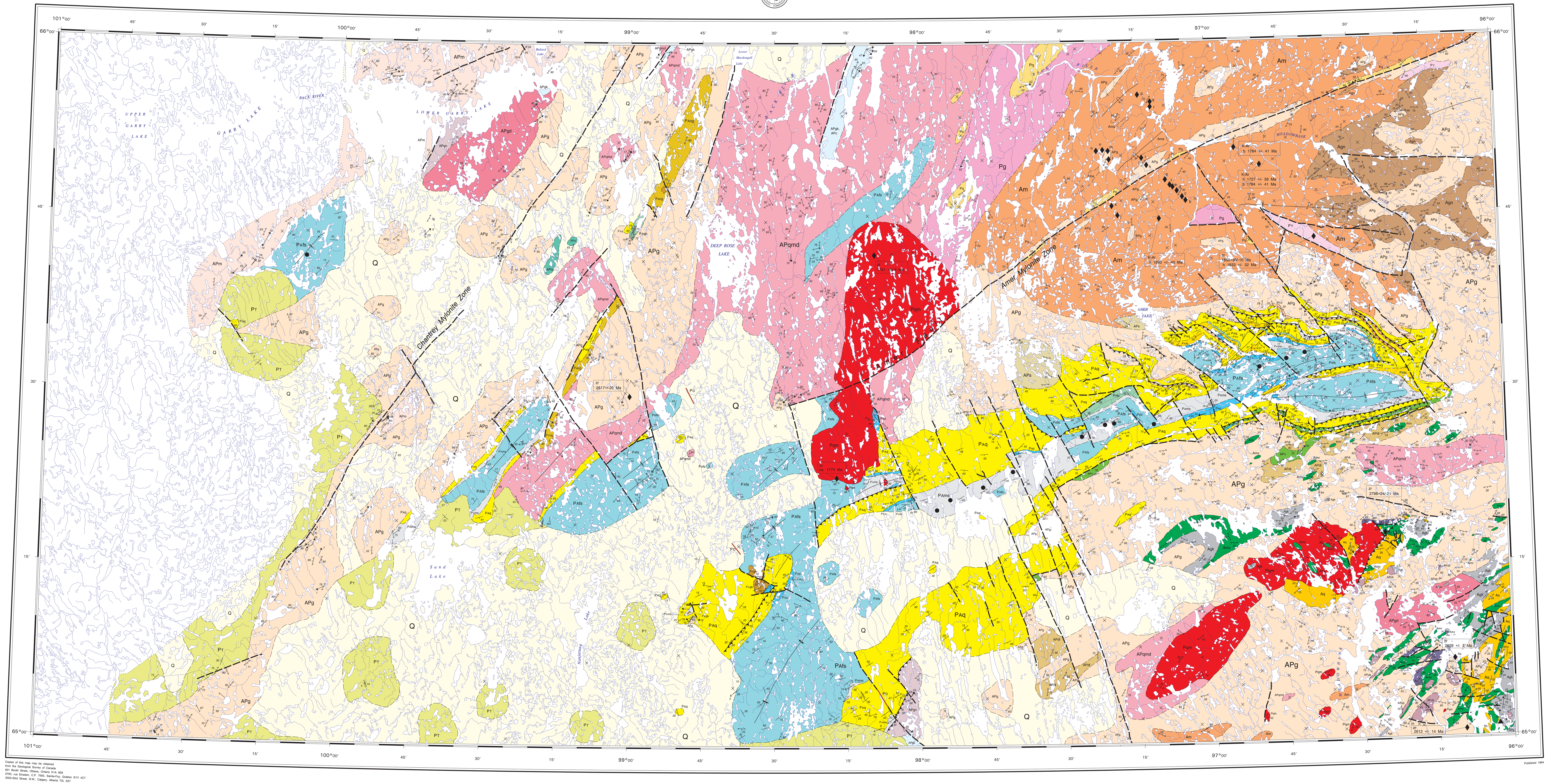
Canada



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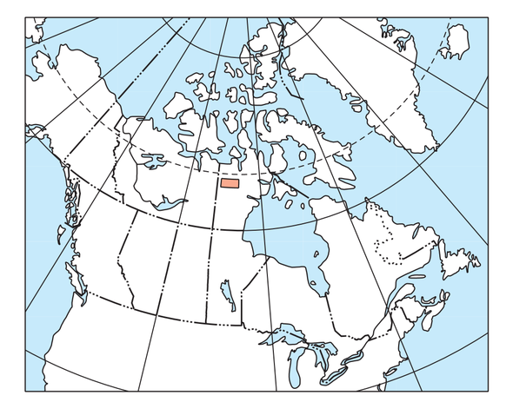
LOCATION MAP - LOCALISATION DE LA CARTE

Geology in NTS 66F,G by S. Tella, D.L. Thompson, and D.T. James (1983), S. Tella, K.E. Ashton, D.L. Thompson, A.R. Miller, J.C.M. Roddick (1982), Geological Survey of Canada; in NTS 66H by W.W. Heywood, S. Tella, and C.R. Tippett (1976), W.W. Heywood, S. Tella, and I.R. Annesley (1978), I.R. Annesley (1980,1981),K.E. Ashton (1981,1982), J.G. Patterson (1980,1981) J.G. Patterson and K.R. Barrett (1979), K.R. Barrett, P.J. Laporte, and P. Schaub (1978), A.W. Knox (1980), Geological Survey of Canada

Digital map compilation by S. Tella, Geological Survey of Canada

Digital cartography by R.L. Allard, Geological Survey of Canada

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OPEN FILE 2969

GEOLOGY

AMER LAKE (66H), DEEP ROSE LAKE (66G) AND PARTS OF PELLY LAKE (66F)

DISTRICT OF KEEWATIN
NORTHWEST TERRITORIES

Scale 1:250 000 - Échelle 1/250 000

Kilometres 5 0 5 10 15 20 Kilomètres

Transverse Mercator Projection
CM 93°30′, Scale Factor 1

Projection transverse de Mercator
M.C. 93°30′, facteur d'échelle 1

Fieldlog and AutoCAD consultations by B. Brodaric, K. Baker, Geological Survey of Canada

Any revisions or additional information known to the user would be welcomed by the Geological Survey of Canada

Digital base map assembled and modified by the Geological Survey of Canada from digital bases compiled by the Surveys, Mapping and Remote Sensing Branch

Copies of the topographical editions covering this map area may be obtained from the Canada Map Office, Department of Natural Resources Canada, Ottawa, Ontario, K1A 0E9

Mean magnetic declination 1994, 5° 38′ West, decreasing 15.2′ annually. Readings vary from 11° 36′ E in the NW corner to 1° 28′ W in the SE corner of the map

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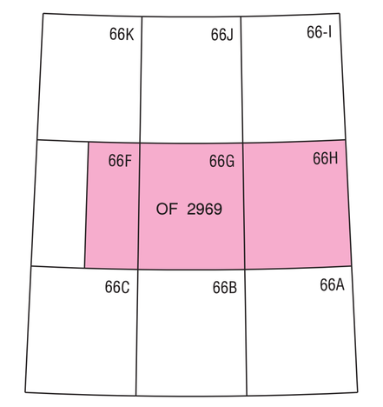
2969
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
OTTAWA
11/1994



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

LEGEND

QUATERNARY

- **Q** — Glacial, fluvial, and marine deposits

PROTEROZOIC

- **PD** — Diabase and gabbro dykes (Mackenzie swarm)
- **PT** — THELON FORMATION: Polymictic conglomerate, pebbly sandstone, quartz arenite
- **Pqm** — Quartz monzonite to granite; equigranular to porphyritic, titanite and fluorite-bearing
- **Pg** — Porphyritic granite; white to pink, coarse grained; in part includes white pegmatite dykes
- **PY** — Mafic syenite, quartz syenite; massive, medium- to coarse-grained; lamprophyre dykes and sills (PLP)
- **Pq** — Metasedimentary rocks (probable equivalents of the Amer Group; fine- to medium-grained and well foliated: q - quartzite; m - muscovite

AMER GROUP (PAs - PAfs)

- **PAfs** — Feldspathic sandstone, calcareous arkose, interbedded arkose-siltstone-slate-mudstone
- **PAgb** — Gabbro
- **PAms** — Mudstone-slate-phyllite: grey to black, in part pyrite- and graphite-bearing
- **PAc** — Carbonate: dolomitic limestone, intercalated with chert; tremolite-phlogopite schist, and wacke
- **PAfq** — Feldspathic quartzite: cross-bedded and brecciated
- **PAic** — Impure clastic rocks: lithic arenite, quartz-muscovite-, quartz-biotite-, quartz-graphite-schists, iron-rich mudstone, siltstone (Pcs: mafic schist; PAp: phyllite)
- **PAq** — PAq,b Orthoquartzite: white-, red-, and green quartzite; minor sanstone, quartzite pebble-to cobble conglomerate, and intercalated micaceous quartzite (PAb: hematitic breccia)
- **PAcg** — Polymictic pebble-to-cobble conglomerate
- **PAs** — Phyllite, muscovite schist, and feldspathic sandstone

ARCHEAN AND/OR EARLY PROTEROZOIC

- **APv** — Metavolcanic rocks: intermediate to basic (APv), minor felsic volcanic rocks, and amphibolite (APa)
- **APs** — Biotite schist, paragneiss; minor quartzo-feldspathic metasedimentary rocks and gneisses
- **APub** — Mafic to ultramafic rocks; gabbro, peridotite, locally deformed and altered to chlorite schist; in part older than APg
- **APg** — Granite: massive to well foliated, homogeneous, coarse grained; commonly cataclastic at the margins
- **APgd** — Granodiorite: medium grained, well foliated and cataclastic; contain inclusions of mafic rocks and quartzite
- **APqmd** — (K-feldspar) augen gneiss; quartz-diorite to quartz-monzonite composition
- **APdi** — Undifferentiated foliated granitoid rocks; quartz diorite to granite composition, porphyritic to aplitic
- **APgn** — K-feldspar augen gneiss
- **APa** — Mafic schist and amphibolite
- **APgk** — Metasedimentary rocks; actinolite-chlorite schist, metagreywacke, and intercalated slates and dolomite (APgk); stromatolitic dolomite, interbedded chert, siltstone (APc)
- **APm** — Garry Lake Complex: Layered gneiss complex consisting of quartz-feldspar-biotite gneiss, granodiorite, tonalite, and granite gneiss; mino amphibolite and metagabbro

ARCHEAN

- **Aq** — Orthoquartzite: fine grained and recrystallized, some quartz-pebble conglomerate, quartz-mica schist at the base; intercalated with black phyllite and schist horizons
- **Agk** — Greywacke, chlorite schist, banded iron formation, and minor laminated chert and carbonate
- **Au** — Ultramafic rocks: Basaltic and peridotitic komatiites, spinifex-textured flows; minor felsic metavolcanic and layered volcanogenic sedimentary rocks towards the top of the sequence
- **Amv** — Metavolcanic rocks: Rhyolite porphyry, felsic-to-intermediate tuffs and flows
- **Am** — Migmatite, layered and/or banded gneiss, tonalite gneiss, garnet-biotite paragneiss, amphibolite (Ama)
- **Agn** — Granulite, garnet-biotite paragneiss, mafic schist, minor amphibolite

Outcrop (observed) . . . . ×
Lithological boundary (approximate) . . . .
Limit of geology . . . .
Bedding (tops known, unknown) . . . .
Regional Foliation (generation: unknown, S1, S2) . . . .
Mineral Lineation (generation: unknown) . . . .
Intersection Lineation (generation: unknown) . . . .
Fold Axis (generation: unknown, 1st, 2nd) . . . .
Fault (approximate) . . . .
Thrust Fault (approximate, overturned) . . . .
Axial trace of major fold (anticline, overturned) . . . .
Axial trace of major fold (syncline, overturned) . . . .
Mineral occurrence (uranium, gold) . . . . ● ▲
Location where age has been determined (m-muscovite; b-biotite; h-hornblende; z-zircon). a to r: Refer to location of samples collected across the Amer Mylonite Zone for K-Ar dating (NTS 66H; see Table-1) . . . . ◆

Table-1: Summary of Isotopic Ages from Amer Lake (66H) and Deep Rose Lake (66G) map areas:

Rock Unit	Sample Number	Age (Ma)				Remarks
		K-Ar			U-Pb	
		biotite	hornblende	muscovite	zircon	
Amer Lake map area (66H)						
Amv	WN503-78				2798+24/-21	Tella et al., 1985a
Am	W512-54	1690±40				
Am	WN228-76	1665±41				
Am	WN501-78*		2018±73			
Am	WN502-78*	1784±41	1727±56			
APg	HF-T649-76*			1729±41		
APg					2627+14/-10	Roddick et al., 1992
APg					2612±14	
APg					2629±2	Ashton, 1988
APg	HF-T170-76*			1619±40		
Py	WN227-76		1833±32		1850+30/-10	Tella et al., 1985b
Py	HF524-76*	1828±42				
Am	HF500-78(b)*	1786±42				Isotopic ages across the Amer Mylonite Zone (66H). Letters (b) to (r) refer to map location of samples
Am	HF501-78(c)*	1985±52				
Am	HF503-78(d)*	1773±41				
Am	HF504-78(e)*	1785±42				
Am	HF505-78(f)*	1852±42				
Am	HF506-78(g)*	1726±41	1879±44			
APg	HF509-78(h)*	1836±42	1732±98			
Am	HF511-78(i)*	1887±41				
Am	HF513-78(j)*	1778±41	1918±71			
Am	HF514-78(k)*	1830±43	1737±68			
APg	HF516-78(l)*	1742±41	1877±63			
Am	HF517-78(m)*	1822±33				
Am	HF518-78(n)*	2002±111				
Am	HF519-78(o)*	1964±92				
Am	HF520-78(p)*	1839±42				
Am	HF522-78(q)*	1744±41				
Am	HF523-78(r)*	1728±41				
Deep Rose Lake map area (66G)						
APg	TX-S100-82				2617±20	(Tella, 1984)

* Stevens et al. 1982

Recommended citation:
Tella, S.
1994: Geology, Amer Lake(66H), Deep Rose Lake(66G), and parts of Pelly Lake(66F), District of Keewatin, Northwest Territories, Open File 2969, scale 1:250 000