LEGEND

1	External Paragneiss. Rhythmically layered pelitic and silicious metasediments, amphibolite schists and calc-silicate.
2	Internal Paragneiss. Rhythmically layered pelitic and silicious metasediments, banded amphibolite and calc-silicate.
3	Calc-Silicate.
4	Amphibolite.
5	Undifferentiated, mildly foliated to isotropic, two-mica leucogranite. Circa 2.55 Ga.
6	Clinopyroxene meta-tonalite, mylonitised to mildly foliated.
7	Garnet leucogranite, moderately foliated to mylonitised. Circa 1.96 Ga.
8	Biotite - hornblende megacrystic granitoid, isotropic to mildly foliated. Very locally mylonitised. Circa. 1.92 Ga.
9	Biotite - hornblende megacrystic granitoid, strongly foliated. Circa 1.925 Ga in belt No. 3.
10	Biotite - hornblende equigranular granitoid, isotropic to mildly foliated. Mylonitised on SE margin.
11	Biotite - hornblende equigranular granitoid, isotropic to mildly foliated, folded and locally mylonitised.
12	Biotite - hornblende equigranular granitoid, isotropic. Circa 1.925 Ga.
13	Injection Zone. Veins of 12 intimately intruded into mylonite wall-rocks.
14	Undifferentiated, orthopyroxene - garnet - biotite - hornblende annealed mylonites after megacrystic granitic (circa 1.98 Ga) and paragneiss protoliths. Strongly disrupted by later deformation in Laloche segment.
15	Homoclastic Protomylonite, mainly derived from biotite - hornblende megacrystic granite protolith.
16	Heteroclastic Mylonite, mainly derived from biotite - hornblende megacrystic granite protolith.
17	Homoclastic Mylonite, mainly derived from biotite - hornblende megacrystic granite protolith.
18	Ultramylonite, mainly derived from biotite - hornblende megacrystic granite protolith.
19	Mesh Structure, 10-50 m lenses of disrupted mylonite wrapped around by anastomosing greenschist facies mylonite zones.
20	Ultramylonite and mylonite, chlorite-bearing.
21	Sosan Group?, trough cross-bedded quartz arenites, feldspathic quartz arenites and polymictic channel conglomerates.

S.A. Bowring, pers. comm. 1987.
Hanmer (1987).

SYMBOLS

— — —— Lithological Contact (approximate, observed).

ᔕᔕᔕᔕᔕ Fault (undifferentiated).

Bedding (Inclined facing known, unknown).

Foliation (inclined, vertical).

Extension Lineation. (strike parallel)

(oblique)

(dip-parallel)

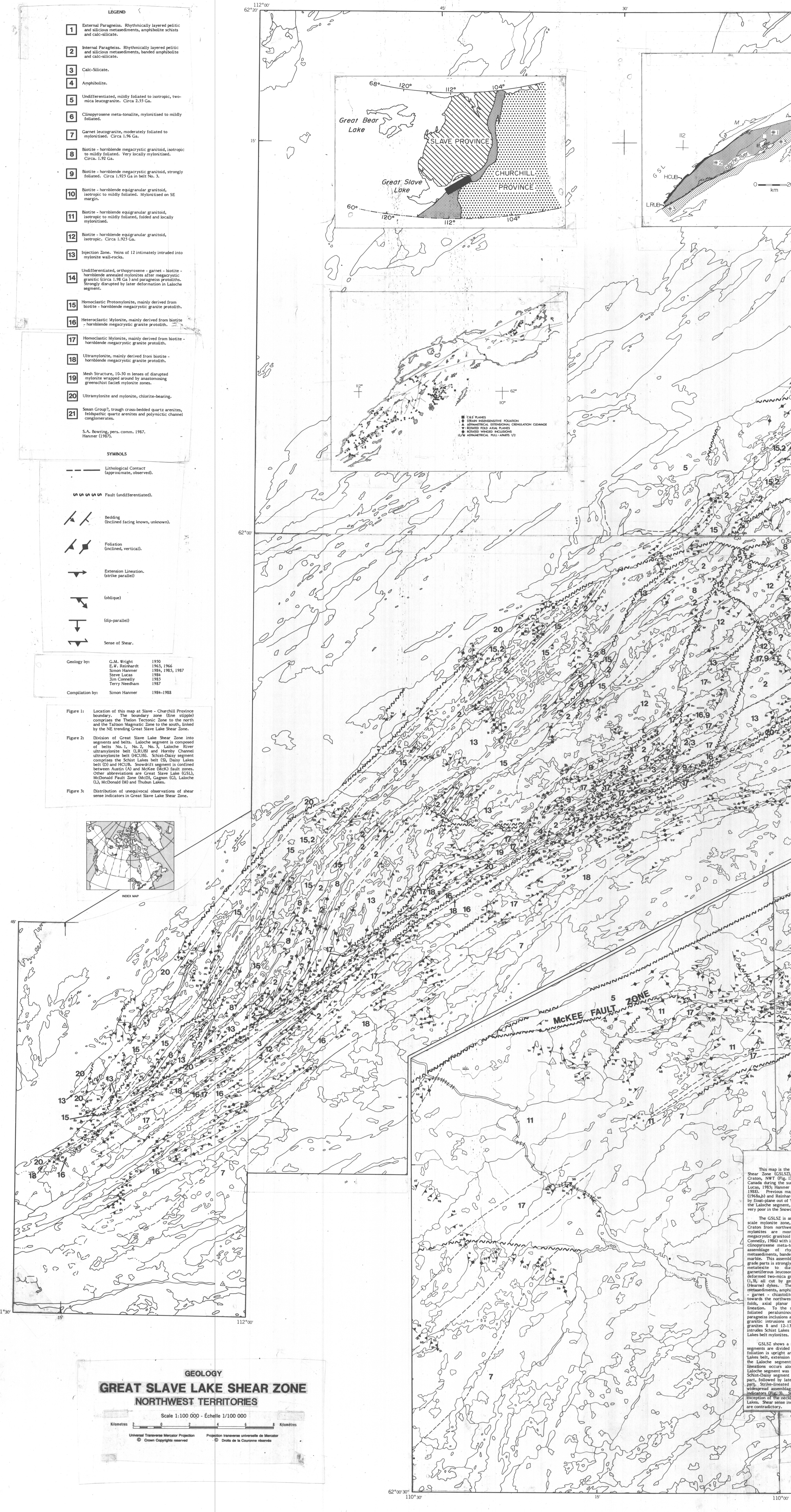
Sense of Shear.

Geology by:	G.M. Wright	1950
	E.W. Reinhardt	1965, 1966
	Simon Hanmer	1984, 1985, 1987
	Steve Lucas	1984
	Jim Connelly	1985
	Terry Needham	1987
Compilation by:	Simon Hanmer	1984-1988

Figure 1: Location of this map at Slave - Churchill Province boundary. The boundary zone (fine stipple) comprises the Thelon Tectonic Zone to the north and the Taltson Magmatic Zone to the south, linked by the NE trending Great Slave Lake Shear Zone.

Figure 2: Division of Great Slave Lake Shear Zone into segments and belts. Laloche segment is composed of belts No. 1, No. 2, No. 3, Laloche River ultramylonite belt (LRUB) and Hornby Channel ultramylonite belt (HCUB). Schist-Daisy segment comprises the Schist Lakes belt (S), Daisy Lakes belt (D) and HCUB. Snowdrift segment is confined between Austin (A) and McKee (McK) fault zones. Other abbreviations are Great Slave Lake (GSL), McDonald Fault Zone (McD), Gagnon (G), Laloche (L), McDonald (M) and Thubun Lakes.

Figure 3: Distribution of unequivocal observations of shear sense indicators in Great Slave Lake Shear Zone.



DESCRIPTIVE NOTES

This map is the result of fieldwork in the Great Slave Lake Shear Zone (GSLSZ), along the southeastern margin of Slave Craton, NWT (Fig. 1), completed by the Geological Survey of Canada during the summers of 1984, 1985 and 1987 (Hanmer and Lucas, 1985; Hanmer and Connelly, 1986; Hanmer and Needham, 1988). Previous mapping in the area was undertaken by Wright (1968a,b) and Reinhardt (1966, 1969). The map area is accessible by float-plane out of Yellowknife. Bedrock exposure is excellent in the Laloche segment, very good in the Schist-Daisy segment but very poor in the Snowdrift segment (Fig. 2).

The GSLSZ is an upright, predominantly strike-slip, crustal-scale mylonite zone, up to 25 km wide, which separates Slave Craton from northwest Churchill (Rae) Province (Fig. 1). The mylonites are mostly derived from biotite - hornblende megacrystic granitoid (9) protolith (Laloche batholith; Hanmer and Connelly, 1986) with inclusions and screens of paragneiss (2,3), plus clinopyroxene meta-tonalite (6). The paragneisses comprise an assemblage of rhythmically layered pelitic to silicious metasediments, banded amphibolite, calc-silicate and rare calcite marble. This assemblage occurs througout GSLSZ and in the high grade parts is strongly migmatitic (sillimanite - garnet - cordierite metatexite to diatexite) and associated with abundant garnetiferous leucosome. To the northwest, wall-rock is mildly deformed two-mica granite (5) intruded into folded metasediments (1,3), all cut by generally northeast trending, upright mafic (Hearne) dykes. The rhythmically layered pelitic and silicious metasediments, amphibolite schist and calc-silicate are sillimanite - garnet - chiastolite - staurolite bearing and are migmatitic towards the northwest. They are deformed by upright, vertical folds, axial planar cleavage and an axis-parallel extension lineation. To the southeast, wall-rock comprises moderately foliated peraluminous leucogranite with locally abundant paragneiss inclusions and rafts. Four discrete biotite - hornblende granitic intrusions strongly influence the GSLSZ map pattern; granites 8 and 12-13 intrude belt No. 2 mylonites, granite 10 intrudes Schist Lakes belt mylonites and granite 11 intrudes Daisy Lakes belt mylonites.

GSLSZ shows a simple geometry. Laloche and Schist-Daisy segments are divided into belts (Fig. 2). Except for belt No. 1, foliation is upright and northeast trending; except for the Daisy Lakes belt, extension lineations are sub-horizontal. However, in the Laloche segment, a corridor of mixed steep and shallow lineations occurs along the northwestern side of belt No. 3. Laloche segment was the locus of strike-slip movement, while the Schist-Daisy segment was initially strike-slip in its northwestern part, followed by later dip-slip displacements in its southeastern part. Strike-lineated strike-slip mylonites in all segments carry a widespread assemblage of mechanically independent shear sense indicators (Fig. 3). Shear sense is consistently dextral, with the exception of the necking of belt No. 3 south-southwest of Laloche Lakes. Shear sense indicators in the dip-lineated Daisy Lakes belt are contradictory.

From cross-cutting, transposition and reworking relations, the age and metamorphic grade of preserved mylonites in the Laloche segment decreases in the sequence belt No. 1 (granulite), belt No. 2 (upper amphibolite), belt No. 3 (lower amphibolite), followed by HCUB and LRUB (greenschist). With time, metamorphic pressure and the width of the active shear zone also decrease (Hanmer, 1988). In the Schist-Daisy segment, metamorphic grade ranges from granulite facies (Daisy Lakes belt), via upper amphibolite (Schist Lakes belt) to greenschist facies mylonites on the northwest side of the segment. Microstructure, metamorphism and context suggest that chlorite-bearing mylonites on the northwest side of the Laloche and Schist-Daisy segments are parts of the same HCUB. Similarly, the Schist Lakes belt and belt No. 2 are indistinguishable. The southeastern sides of both segments represent different kinematic frameworks and the granulite mylonites of each segment are only similar in metamorphic grade. The decrease in shear zone width and crustal depth with time continued through the brittle-ductile transition. HCUB and LRUB were extensively reworked by non-dilational penetrative brecciation, discrete, east-west, metre to kilometre spaced dextral faults, dilational pseudotachylite and quartz veining (stockworks), in that order. The Laloche segment thus represents a series of preserved depth sections through a crustal-scale fault zone profile in accord with the model of Sibson (1977). In the Schist-Daisy segment, granite (10) cuts the Schist Lakes belt but is deformed with the mylonites of the Daisy Lakes belt, demonstrating that the latter tectonites are younger than the former. Both of these belts are truncated to the northwest by the younger HCUB.

Three important discrete transcurrent fault zones strongly influence the GSLSZ outcrop; Austin fault and McKee fault zone delimit the segment boundaries of GSLSZ (Fig. 2). McDonald fault zone truncates the shear zone in several places. McKee fault zone has a complex structure and history, comprising a number of discrete strands lined by up to several hundred metres thickness of biotite-bearing mylonite, cut by well developed penetrative chlorite-bearing cataclasite, cut by dilational quartz veins. A similarly well developed zone of cataclasis represents the northeastward continuation of HCUB in the Laloche segment. Both zones of cataclasis are truncated by McDonald fault zone and may represent the structural link between the two sections of HCUB.

Mylonites of the Schist Lakes belt are unconformably overlain by an upward coarsening, 250 m thick succession of arenites and polymictic conglomerates. These sediments strongly resemble and are probably an outlier of the Sosan Group (lower Great Slave Supergroup; Hoffman et al., 1977). The outlier is gently folded into a horizontal, upright, doubly plunging syncline with very mild axial-planar cleavage. The cleavage is locally cut by a dilatant breccia zone filled with leucocratic intrusive material and resembling the diatremes cutting the Sosan Group in Great Slave Lake (Reinhardt, 1972).

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GEOLOGY
GREAT SLAVE LAKE SHEAR ZONE
NORTHWEST TERRITORIES

Scale 1:100 000 - Échelle 1/100 000
Kilometres 2 0 2 4 6 8 Kilomètres

Universal Transverse Mercator Projection
Projection transverse universelle de Mercator

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