Energy, Mines and Resources Canada
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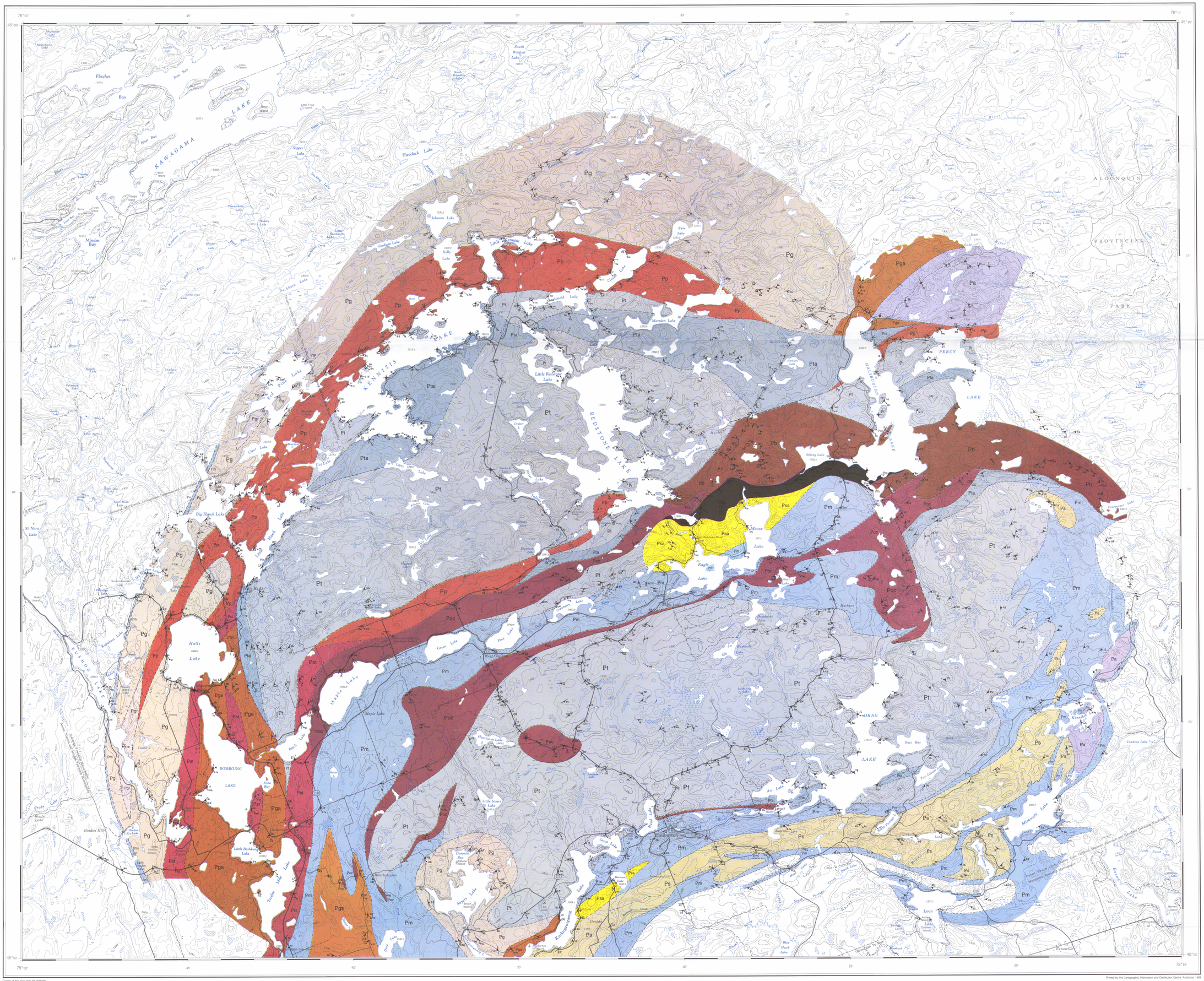
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA



LEGEND

PROTEROZOIC

- **Pt** / **Pta** — *Coarse biotite-hornblende ± orthopyroxene tonalitic orthogneiss. 1450-1300 Ma** / *Medium- to fine-grained tonalitic straight gneiss*
- **Ps** / **Psa** — *Coarse leucocratic to mesocratic clinopyroxene syenitic orthogneiss* / *Medium- to fine-grained syenitic straight gneiss*
- **Pm** — *Coarsely layered, very coarse grained phlogopite-tremolite-clinopyroxene-serpentine-apatite-hornblende-chondrodite tectonic marble breccia with non-carbonate rock inclusions.* **Pma**: *Tectonic marble breccia with inclusions of* **Ps**
- **Poc** — *Undifferentiated sillimanite-kyanite-garnet-ortho-amphibole-cordierite gneiss*
- **Pa** — *Heterogeneously deformed meta-anorthosite to metagabbro anorthosite*
- **Pgr** — *Medium grained, mildly to non-foliated leucogranite. 1060±6 Ma**
- **Pgs** — *Regular granitic to syenitic gneiss*
- **Pg** / **Pga** — *Irregular granitic gneiss* / *Regular granitic gneiss*
- **Pb** / **Pb** — *Irregular biotite-rich gneiss of beaded aspect* / *Regular gneiss equivalent*
- **Pp** — *Porphyroclastic gneiss*
- **Pst** — *Granitic straight gneiss. 1065±15 Ma**

**See van Breemen and Hanmer (1986)*

Straight gneiss: an annealed "S>L" tectonite. Continuous, rectilinear layering of granitic and amphibolitic material resulting from progressive transposition at high strains

Porphyroclastic gneiss: a rectilinear "S>L" tectonite of variable composition, often subtly banded. Contains isolated, round mono- or poly-crystalline porphyroclasts and fragments, plus elongate aggregates of feldspar aligned in the foliation

Regular gneiss: a well layered "L / S" tectonite, "X / Z" sections (perpendicular to foliation and parallel to lineation; X≥Y≥Z; Flinn, 1962) show transposition of low angle discordant features which are still preserved in "Y / Z" sections

Irregular gneiss: a tectonite wherein low angle discordant features i.e. crosscutting veins, mafic blocks or inclusions, fold inter-limb angles, fold axial planes oblique to layering, are preserved in all sections perpendicular to layering

Beaded gneiss: a coarse, biotite-rich gneiss of uncertain origin. Beaded aspect is due to clusters of coarse feldspar porphyroblasts, either evenly distributed or concentrated in isotropic quartzo/feldspathic pegmatitic layers

Lithological contact (approximate)
Fault (approximate)
Inclined foliation with extension lineation
Inclined foliation with horizontal extension lineation
Horizontal foliation with extension lineation
Vertical foliation with extension lineation
Sense of thrusting with extension lineation: barbs on upper, overriding member of shear couple
Inclined foliation, extension lineation with oblique slip and shear sense
Extension lineation

DESCRIPTIVE NOTES

This map is the result of fieldwork within the Ontario part of the northwestern boundary zone of the Central Metasedimentary Belt (CMB) of the Grenville Province (Fig. 1), completed by the Geological Survey of Canada during the summers of 1984 and 1986 (Hanmer et al., 1985; Hanmer, 1988). The map area is readily accessible via Highways 121 and 35. Bedrock exposure is excellent along the major roads and fairly good away from the road sections.

The CMB boundary zone in Ontario is a southeast-dipping, upper amphibolite facies, ductile shear zone approximately 10 km thick, characterized by a constant southeast-plunging extension lineation and widespread indicators of northwestward thrusting (Hanmer and Ciesielski, 1984; Hanmer et al., 1985; Hanmer, 1988; see also Schwerdtner and Mawer, 1982; Culshaw, 1983, 1986; Easton and Van Kranendonk, 1984; Easton, 1985, 1986a, b). In the Haliburton region, the CMB boundary zone is composed of a stack of four discrete, laterally discontinuous and overlapping crystalline thrust sheets (Fig. 2) separated one from another by high strain ductile thrust zones up to 500 m thick, which were active at circa 1060-1050 Ma (van Breemen and Hanmer, 1986). Parts of three thrust sheets lie within the map area (rock units **Pt** and **Psa**). The age of the tonalitic orthogneiss (**Pt**) comprising the Redstone and Dysart thrust sheets is approximately 1450-1300 Ma (van Breemen and Hanmer, 1986). The lower thrust zones are marked by quartzofeldspathic ductile tectonites (**Pta, Psa, Pp** and **Pst**) while the upper ones are predominantly carbonate (**Pm**). The base of the stack is defined by a particularly well developed zone of porphyroclastic gneiss (**Pp**) which truncates structures in the anorthosite (**Pa**) in the foot-wall in the area of Haliburton Lake-Percy Lake. Thrust sheets and thrust zones alike are cut by a widespread set of 10 m thick extensional ductile shears. The shears are predominantly southeast dipping, make a low angle to the layering which they cut, are internally granoblastic and show no evidence of metamorphic retrogression. They appear to represent symmetamorphic collapse of the thrust stack. A discrete 25 m thick carbonate (**Pm**) thrust zone occurs within the footwall, 500 m below the basal porphyroclastic gneiss (**Pp**). It is apparently late and has little effect on the map configuration.

The metamorphic conditions of stack assembly are determined from the complex mineralogy of the aluminous supracrustal rocks (**Poc**) which comprises a mimetically annealed syntectonic assemblage and a posttectonic assemblage. The former consists of sillimanite - garnet - cordierite - biotite - K feldspar\- quartz, aligned and enclosed in the foliation and/or the lineation, broadly indicative of the upper amphibolite facies. Ferro-aluminous hornfels in particular contain the post-foliation assemblage gedrite - cordierite ± kyanite - biotite - garnet(?). Relics of staurolite associated with sapphirine occur within cordierite, and minor sillimanite replaces kyanite. In the absence of partial melt, this assemblage suggests minimum conditions of 650°C at 6 kb (e.g. Bailes, 1980). Rare metamorphic orthopyroxene within the Redstone thrust sheet (Fig. 2) suggests that the tonalitic gneiss (**Pt**) had experienced granulite facies metamorphism prior to stack assembly.

The alternation of tonalitic (**Pt**) and syenitic (**Ps**) compositions within the stack, coupled with the gneissic character of both tonalitic (**Pt**) and syenitic (**Psa**) material within the thrust sheets prior to assembly of the present stack suggests that the ductile thrust zones may represent out-of-sequence thrusts re-stacking an older thrusted configuration (Hanmer, 1988).

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Figure 1. Location of Map 1688A in the southwest part of the Central Metasedimentary Belt (CMB) boundary zone

Figure 2. Location of four discrete thrust sheets within the Central Metasedimentary Belt boundary zone with respect to Map 1688A

Copies of this map may be obtained from the Geological Survey of Canada:
601 Booth Street, Ottawa, Ontario K1A 0E8
3303-33rd Street, N.W., Calgary, Alberta T2L 2A7

INDEX MAP

Canada

Geology by N.G. Culshaw 1980, R.H. Thivierge 1984, and S. Hanmer 1984, 1986

Compiled by S. Hanmer 1984-1988

Geological cartography by the Geological Survey of Canada

Thematic information on this map is reproduced directly from author's copy

Colour separations were obtained by camera from coloured manuscript; colour of some units may appear similar

MAP 1688A

GEOLOGY

WESTERN PART OF THE CENTRAL METASEDIMENTARY BELT BOUNDARY ZONE, GRENVILLE PROVINCE

ONTARIO

Scale 1:50 000 - Échelle 1/50 000

Kilometres 0 1 2 3 Kilomètres

Universal Transverse Mercator Projection

Projection transverse universelle de Mercator

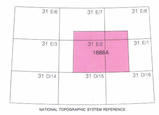
Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

Base map from parts of maps 31E/1, 31E/2, 31E/7, 31E/8 published at the same scale by the Surveys and Mapping Branch in 1986, 1986, 1986, 1987

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

Magnetic declination 1989, 11°18' West, increasing 4.0' annually

Elevations in feet above mean sea level



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

Recommended citation:
Hanmer, S.
1989: Geology, western part of the Central Metasedimentary Belt boundary zone, Grenville Province, Ontario; Geological Survey of Canada, Map 1688A; scale 1:50 000