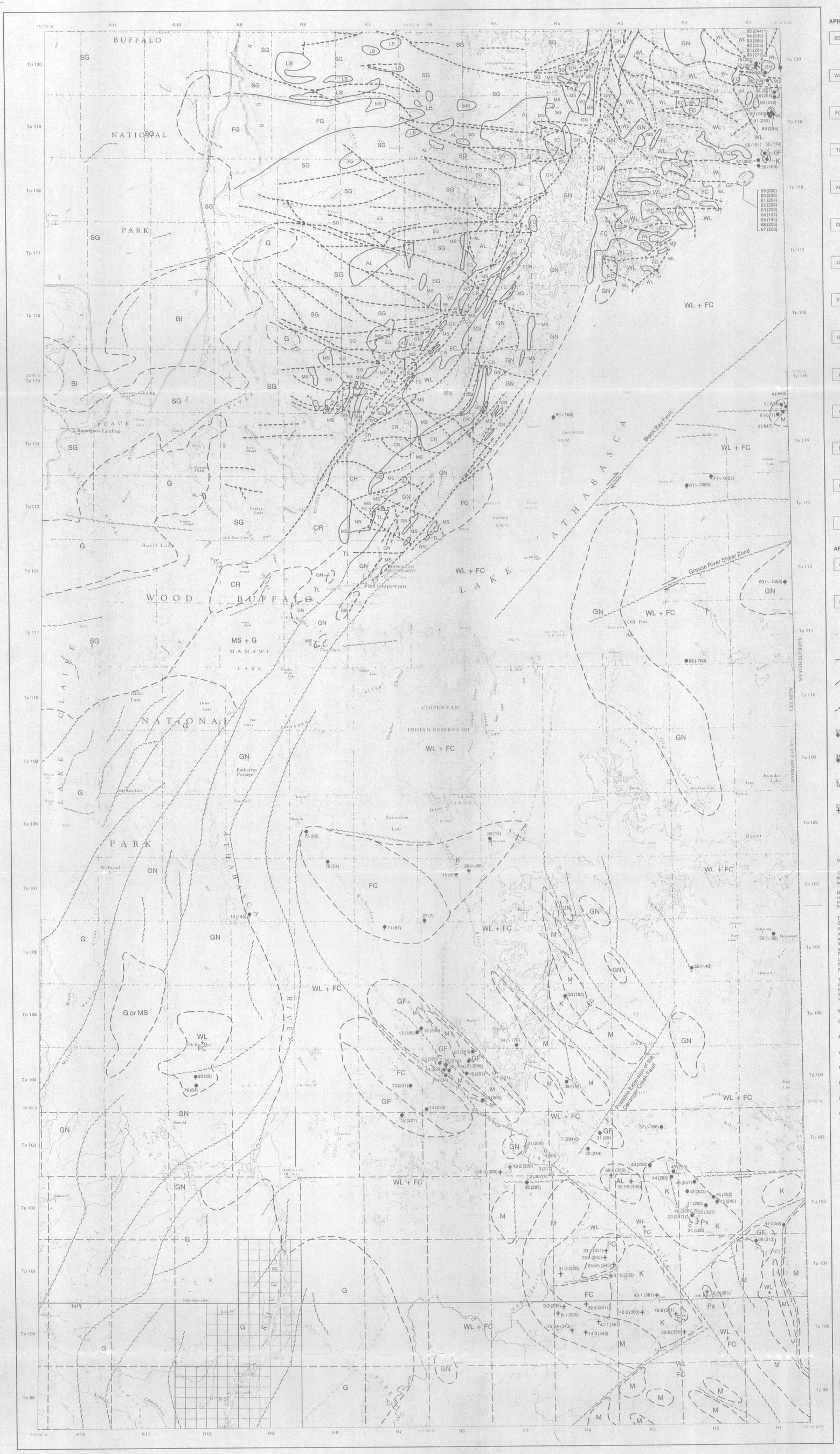








## LEGEND

### APHEBIAN

| | | |
|---|---|---|
| SG | Slave Granitoids*: | whitish grey, medium-to coarse-grained, locally megacrystic, massive to foliated; feldspar, quartz, biotite ±granodiorite |
| WL | Wylie Lake Granitoids*: | dark greenish to brownish red, medium-grained, equigranular, massive to poorly foliated; feldspar, quartz, biotite;granodiorite |
| FC | Fishing Creek Quartz Diorite*: | grey, medium-grained, megacrystic, poorly foliated; feldspar, quartz, biotite; quartz diorite |
| TL | Thesis Lake Granite*: | dark with red to pink megacrystic augen feldspars and bluish grey quartz in a medium-grained foliated matrix, biotite locally chloritized; granite |
| AL | Arch Lake Granitoids*: | reddish, medium- to coarse-grained, megacrystic, well foliated, feldspar, blue quartz, biotite;granite |
| CR | Chipewyan Red Granite*: | red to pink, medium-to fine-grained, equigranular, massive to poorly foliated, biotite locally chloritic; granite |
| LB | La Butte Granodiorite*: | light grey to brownish grey, medium-grained, rarely megacrystic, massive to poorly foliated |
| FG | Francis Granite*: | pink spots on medium grey background, medium-grained, megacrystic, massive |
| GF | Grey Foliated Granitoids: | light to medium grey, medium-grained, equigranular, moderately foliated to massive; alkali feldspar, quartz, plagioclase, biotite; granite. Possibly K feldspar -enriched Fishing Creek Quartz Diorite. |
| K | Alkali Feldspar Granitoids: | light grey to pink or reddish, medium-to fine grained, equigranular, massive to foliated; alkali feldspar, quartz, plagioclase, biotite, granite. Possibly K feldspar enriched Wylie Lake Granitoid. |
| G | Undifferentiated Granitoids: | granitoid bodies interpreted from magnetic response through cover |
| BI | Basic Intrusion: | basic intrusive body interpreted from magnetic response through cover |
| Px | Pyroxenite: | dark grey to black, fine-grained, equigranular, massive, pyroxene-rich rock |
| M | Mylonitic Rocks: | dark grey to dark green, fine-grained, massive rock, light grey felsic varieties present locally; commonly chlorite epidote rich well-foliated with streaky patches of quartz and feldspar, includes protomylonites |

### ARCHEAN

| | | |
|---|---|---|
| GN | Granite Gneiss*: | pink to reddish, fine- to medium-grained, equigranular to rarely megacrystic, well banded to foliated, granitic composition, quartz-feldspar bands interlayered with mafic-rich bands. Predominantly biotite-rich but rarely hornblende. Commonly migmatitic |
| MS | High-Grade Metasedimentary Rocks*: | various rock types which are lithologically and texturally gradational. Typically impure quartzite: dark greenish grey, fine-grained, layered with ferruginous and garnetiferous zones. Minor amphibolite. Locally fine- to medium-grained metamorphic quartzo-feldspathic phase or fine-grained retrograde phyllite and schist, and phyllonite |

* Descriptions abbreviated from published reports of rock types exposed north of Lake Athabasca by J.D. Godfrey (see References and Sources)

Geological boundary, defined

Geological boundary, assumed

Fault defined, assumed

21 (296) — Location of drill hole penetration to basement, with hole number and basement surface elevation in metres (a.s.l.)

34 (>170) — Location of drill hole which does not penetrate to basement with hole number and approximate basement surface elevation in metres (a.s.l.)

2 (307) — Location of Eldorado Nuclear Ltd. drill core not stored in the M.E.S.S. facility, with hole number and basement surface elevation in metres (a.s.l.)

23-2 (351) — Location of standard reference sample from outcrop mapping by J.D. Godfrey, with sample number and elevation in metres (a.s.l.)

NOTES

The geology of the basement beneath Helikian and Phanerozoic cover is interpreted from exploration drill core (Wilson, 1985) and regional magnetic data. The interpretation of magnetic features beneath thick cover and distant from drill holes or outcrop is necessarily speculative and is subject to revision as new drill hole data become available.

Drilling coverage is relatively dense along the southern margin of the Athabasca Basin. However, the core cannot in all cases be related to rock types defined in outcrop. Interpretation is complicated by the basement core being locally altered both hydrothermally and during the formation of a Helikian regolith. Fresh basement rock types are identified primarily by comparison of the core with standard reference samples from the Marguerite River area (Godfrey, 1970).

The entire area beneath the Athabasca Group is interpreted as being a continuation of the Wylie Lake Complex mapped by Godfrey (1980a, b, 1984; 1985) north of Lake Athabasca. The character of the complex changes between the exposed rock north of Lake Athabasca and the core from the south of the study area. Some of this variation is due to deformational events, there being a much higher proportion of mylonites and brittle deformation textures to the south. However, there are chemical variations as well. The drill core from the south is commonly richer in alkali feldspar than the Wylie Lake rock types to the north, although alkali feldspar-rich rock types are present on the north shore of Lake Athabasca. The examination of drill cores with more than one rock type present suggests that the Grey Foliated Granitoid and Alkali Feldspar Granitoids are alkali feldspar-enriched variations of the Fishing Creek and Wylie Lake Granitoids, respectively. The close relationship of the above four rock types in drill core suggests a close genetic relationship between them. The alkali feldspar - enriched varieties may result for potassium metasomatism of the Wylie Lake Complex, or differentiation of the melt during ultra-metamorphism, or they may reflect a variation of mineralogy in the protolithic materials.

The magnetic signature of the covered basement is interpreted from nearby areas where the signature can be related to outcrop data (Sprenke *et al* in press). No regional magnetic effects were separated, so the interpretation uses the total observed magnetic data and is thus qualitative. Depth estimated were not made. The basement surface topography map is based on drillhole data. The maps upon which the magnetic interpretation is based (GSC, 1964, b; 1983) show 10 gamma contour intervals. The flight elevation was 300 metres and the flight line spacings approximately 1 mile.

Many of the rock types present cannot be distinguished by magnetic signature alone; however, some have a distinctive pattern.

| | |
|---|---|
| Granite Gneiss: | Characterized by high magnetic values and many strongly linear highs and lows. Linear lows may be associated with major fault zones. |
| Metasedimentary Rocks: | Average magnetic values. Within Granite Gneiss metasediments appear as magnetic lows. |
| Wylie Lake Granitoids: | All the rock types within the Wylie Lake Pluton have a low to average magnetic value. Areas of metasediments and faults do not normally stand out against the granitoid background. |
| Mylonites: | Commonly have a high, linear signature. It is not always possible to distinguish with certainty between an area of mylonite and granite gneiss without any ground truth. |
| Basic Intrusion: | Relatively high magnetic value with circular rather than linear anomalies. One area of Basic Intrusives is interpreted as such by Sprenke *et al.* (in press). |
| Undifferentiated Granitoids: | Have "variable" signature, characterized by generally low values and local non-linear values. |

Locally the presence in core of meta-arkose, pyroxenite and garnet-rich rock indicates the presence of metasediments and perhaps metavolcanics within the Wylie Lake Complex. These minor rock types are not mappable and do not comprise complete cores. They may represent protoliths of the mafic mylonites and graphitic rocks in drillholes 19, 21, 22, 23, 24 and 25.

Comments and suggestions concerning the geology should be addressed to: J.A. Wilson, Alberta Geological Survey Department, Alberta Research Council, 4445 Calgary Trail South, Edmonton, Alberta, T6H 5R7.

REFERENCES and SOURCES


The geology of the exposed crystalline basement is taken from:

Godfrey, John D. (1970). Geology of the Marguerite River district, Alberta; Alberta Research Council map, scale 1 inch to 1 mile.

Godfrey, John D. (1980a). Geology of Alexander-Wylie Lakes district, Alberta; Alberta Research Council, Earth Sciences Report 78-1, 26 pp.

Godfrey, John D. (1980b). Geology of Fort Chipewyan district, Alberta; Alberta Research Council, Earth Sciences Report 78-3.

Godfrey, John D. (1984). Geology of the Ryan-Fletcher Lakes district, Alberta; Alberta Research Council, Earth Sciences Report 84-2, 28 pp.

Godfrey, John D. (1985). Geology of the Bocquene-Turtle Lakes district, Alberta; Alberta Research Council, Earth Sciences Report 84-5.

Cover rock boundaries are from:

Green, R. (1970). Geological map of Alberta; Alberta Research Council map, scale 1 inch to 20 miles.

Wilson, J.A. (1985). Geology of the Athabasca Group in Alberta; Alberta Research Council Bulletin 49, 78 pp.

Aeromagnetic data are from:

Geological Survey of Canada (1964a). Fitzgerald 74M Aeromagnetic map No. 7161G, scale 1:253 440.

Geological Survey of Canada (1964b). Chipewyan 74L Aeromagnetic map No. 7159G, scale 1:253 440.

Geolgoical Survey of Canada (1983). Bitumount 74E Aeromagnetic map No. 7288G, scale 1:250 000.

Sprenke, K.F., Wavra, C.S. and Godfrey, J.D. (in press): The geophysical expression of the Canadian Shield of northeastern Alberta; Alberta Research Council Bulletin.


Exploration drill core from the area is preserved in the Mineral Exploration Sample Storage (M.E.S.S.) facility in Edmonton. The facility is administered by the Geological Survey Department of the Alberta Research Council and the core may be examined on request.

Approximate magnetic declination at Fort Chipewyan is 24°16' E in 1979, decreasing 6' annually.

SCALE 1:250,000

Miles 5 0 5 10 15 Miles

Kilometres 5 0 5 10 15 20 25 Kilometres

# Basement Geology Beneath and Around the Western End of the Athabasca Basin, Alberta

NTS 74L, parts of 74E and 74M


**Compilation by J.A. Wilson**



Published 1985
Alberta Research Council open file map 1985-10

Copies of this map may be obtained from Publications and Sales at the Alberta Research Council.

Base maps provided by the Surveys and Mapping Branch, Department of Energy, Mines and Resources, Ottawa.
Cartography by Alberta Research Council Graphic Services, R.D. Hite.

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