

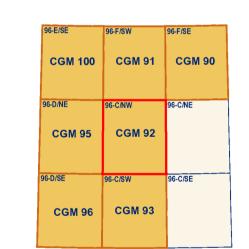
Figure 1. Northwest Fort Norman map area (NTS 96-C/NW) showing seismic lines on record with the National Energy Board (NEB) that were used to augment the bedrock geology interpretation. Line names are provided in the digital data

The northwest quadrant of the Fort Norman map area (NTS 96-C) occupies part of the Mackenzie Plain, Northwest Territories, featuring relatively flat, low-lying plains on either side of the Mackenzie River. Rising out of these plains are the isolated MacKay Range, and the southern termination of the Norman Range, south and west of the Hamlet of Tulita, respectively. Bedrock exposures are typically limited to stream banks in lowlying areas, but are quite abundant at higher elevations. Both the MacKay Range and the Norman Range are underlain by Paleozoic strata, dominated by carbonate, which has been uplifted by folding and contractional faulting. The surrounding plains are underlain by Cretaceous to Paleocene siliciclastic strata. The presence of the Keele Arch, a paleotopographic high, is revealed along the Police Island anticline, where Ordovician and younger strata are absent beneath the

domain seismic-reflection profiles, archived with the National Energy Board, reveal the presence of numerous folds and some faults that lack a topographic expression due to the involvement at surface of easily eroded lithologies, combined with variable thicknesses of overlying, unconsolidated, Quaternary sediment. Exploration by private industry in the area targets both coal seams in the Summit Creek Formation and petroleum in buried Cambrian, Devonian, and Cretaceous strata.

Le quadrant nord-ouest de la région cartographique de

Fort Norman (SNRC 96-C) occupe une partie de la plaine du Mackenzie (Territoires du Nord-Ouest) et se caractérise par de basses plaines relativement planes de part et d'autre du fleuve Mackenzie. Surplombant ces plaines, on peut observer le chaînon isolé MacKay, au sud du hameau de Tulita, ainsi que l'extrémité sud du chaînon Norman, à l'ouest du même hameau. Les affleurements du socle rocheux sont typiquement restreints aux berges des ruisseaux dans les secteurs à basse altitude, mais sont plutôt abondants aux plus hautes altitudes. Aussi bien le chaînon MacKay que le chaînon Norman renferment des strates du Paléozoïque, à dominante carbonatée, qui ont été soulevées par des plis et des failles de compression. Le sous-sol des plaines environnantes est constitué de strates silicoclastiques du Crétacé au Paléocène. paléotopographique, est révélée le long de l'anticlinal de Police Island par l'absence de strates de discordance à la base du Crétacé. Des profils de sismique-réflexion du domaine public, archivés par l'Office national de l'énergie, révèlent la présence de nombreux plis et de failles dépourvus d'expression topographique en raison de l'existence en surface de lithologies sensibles à l'érosion, combinée à la présence d'une couche sus-jacente d'épaisseur variable de sédiments meubles du Quaternaire. Les travaux d'exploration effectués par l'industrie dans la région ont ciblé des filons de charbon dans la Formation de Summit Creek et des hydrocarbures dans les strates enfouies du Cambrien, du Dévonien et du



National Topographic System reference and index to adjoining published Geological Survey of Canada maps

Cover illustration View looking northwest at folded and faulted Cambrian to Devonian carbonate strata exposed along the sinuous trace of the MacKay Range, Northwest Territories. Photograph by K.M. Fallas.

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Natural Resources Ressources naturelles du Canada

CANADIAN GEOSCIENCE MAP 92 GEOLOGY

FORT NORMAN (NORTHWEST) Northwest Territories 1:100 000

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Canadian **Geoscience Maps**

Canada

LATE CRETACEOUS TO PALEOCENE LATE CRETACEOUS **DEVONIAN** CAMBRIAN TO ORDOVICIAN CAMBRIAN €FM-m Defined / Inferred Concealed / Approximate Defined ---- Approximate ----- Inferred Concealed **─— ·** Approximate ---- Inferred Concealed → Defined — → — · Approximate - Inferred ····▼ Concealed — ‡ Defined —— Approximate ----- Inferred ···------Concealed --\\ \frac{1}{2} - - - - − Inferred ····‡----- Concealed - - Inferred Defined Visited outcrop, no measurements Fossil locality coal X Mineral locality with commodity MQ-3 Measured stratigraphic section with name of section MacKay I-78 Petroleum well with well name 3**58**000m. E. 92 94 _____Oil pipeline 84 86 90 126°00' **CANADIAN GEOSCIENCE MAP 92**

NOTES

The authors have updated and revised map unit terminology from the Operation Norman map (Cook and Aitken, 1977). In general, terminology for Cambrian units is that of Dixon and Stasiuk (1998), Silurian and Devonian usage follows that of Morrow (1991), and Cretaceous to Paleocene formation names are those of Dixon (1999). Cambrian to Ordovician units have recently undergone revision to their terminology, as outlined below.

Previous work by the Geological Survey of Canada in the Fort Norman map area (Cook and Aitken, 1977) subdivided the Cambro-Ordovician Franklin Mountain Formation into three informal units. In ascending order they are: Cyclic member, Rhythmic member, and Cherty member (Norford and Macqueen, 1975). On the present maps, these older unit names correspond, in ascending order, to informal lower, middle, and upper members of the Franklin Mountain Formation. These lower, middle, and upper members correspond to the units 1, 2, and 3 of the Franklin Mountain Formation described by Turner (2011).

For detailed information on surficial deposits, here shown as "Quaternary sediment", see Duk-Rodkin and Couch (2004).

The names Norman Range Thrust, MacKay Range Fault, Police Island Fault, East Little Bear syncline, Brackett River syncline, Police Island anticline, Police Island syncline, Flint Stone syncline, North MacKay anticline, East MacKay syncline, East MacKay anticline, and Rusty Lake anticline have been introduced to facilitate discussion of these structural features. The name Gambill Fault has been extended from the adjoining Carcajou Canyon map (Aitken et al., 1974). Cordilleran deformation in this map area has generated two major types of faults: thrust faults which are interpreted to be detached within the Cambrian Saline River Formation, and reverse faults which are interpreted to be inverted normal faults with steep dips at depth, in Proterozoic strata. Seismic-reflection data are the basis for interpreting the Norman Range Thrust and MacKay Range Fault as thrust faults, and the others as reverse faults.

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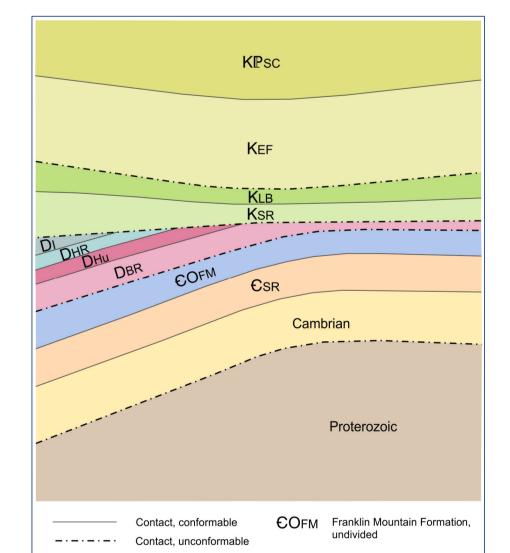


Figure 2. Schematic stratigraphic relationship diagram for northwest Fort Norman map area (NTS 96-C/NW). Changes in thickness and preservation of map units across the map area are an expression of a paleotopographic high, the Keele Arch, which was active in Paleozoic to

> Fallas, K.M., MacLean, B.C., and Proks, T., 2013. Geology, Fort Norman (northwest), Northwest Territories; Geological Survey of Canada, Canadian Geoscience Map 92, scale 1:100 000.

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GEOLOGY FORT NORMAN (NORTHWEST)

Northwest Territories 1:100 000

Authors: K.M. Fallas, B.C. MacLean, and T. Proks

Geological compilation by K.M. Fallas, B.C. MacLean, and T. Proks, 2011–2012

Geological field observations by K.M. Fallas, T. Proks, K. Montgomery

T. Hadlari, J. Powell, 2010-2011, C.J. Yorath, D.G. Cook, H.R. Balkwill,

Seismic data interpretation by B.C. MacLean, 2010–2012. Stratigraphic

sections measured by R.W. Macqueen, C.J. Yorath, 1968–1969, D.W. Morrow, 1980, B.D. Ricketts, D.K. Norris, 1983, and A.R. Sweet, 1985–1986.

Geomatics by K.M. Fallas, S.D. Orzeck, and N. Raska

Cartography by S.D. Orzeck

Scientific editing by E. Inglis

1969-1973, D.K. Norris, 1983, and J. Davison, 2008

Joint initiative of the Geological Survey of Canada and Brock University, conducted under the auspices of the Mackenzie Delta and Corridor Project as part of Natural Resources Canada's Geo-mapping for Energy and Minerals (GEM) Program.

Logistical support provided by the Polar Continental Shelf Program as part of its mandate to promote scientific research in the Canadian North. PCSP 01310, 00411, and 00912

Map projection Universal Tranverse Mercator, zone 10. North America Datum 1983 Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications. Elevations in feet above mean sea level

Some geographic names on this map are not official. Mean magnetic declination 2013, 23°1'E, decreasing 30' annually. Readings vary from 23°11'E in the NW corner of the map to 22°49'E in the SE

QUATERNARY

Quaternary sediment: mud, sand, and gravel: unconsolidated.

and dinosaur fossils in the lower part of the unit.

Summit Creek Formation: sandstone: lithic arenite, very friable; interbedded with conglomerate: polymict, granules to cobbles, poorly cemented; minor shale: carbonaceous; coal; and ash tuff. Unit locally contains plant remains,

East Fork Formation: mudstone and shale: locally silty or carbonaceous, dark brown to dark grey or black, soft and crumbly, contains sideritic concretions; interbedded with minor sandstone: lithic wacke, grey to brown, very thin- to thin-bedded, friable, laminated, ripple marks, rip-up clasts, and minor trace fossils; and pebble conglomerate: locally occurs at base of unit. Little Bear Formation: sandstone: lithic wacke to quartz arenite and chert arenite, mottled grey, greenish-grey, brown, or rusty, thin- to thick-bedded, typically friable and porous, crossbedded, laminated, ripple marks, graded bedding, locally bioturbated; interbedded with mudstone and shale; somewhat silty, dark grey to brown or black, crumbly and soft, minor sideritic concretions;

Slater River Formation: shale and mudstone: dark brown to dark grey, black,

or rusty-brown, soft, crumbly, and fissile, sideritic concretions common, rare fish scales; minor bentonite and ash tuff: white to yellow, pale green, or

orange-brown; and minor sandstone: lithic wacke, brown, grey, or rusty, very

Imperial Formation: shale: locally silty, dark grey to greenish-grey, fissile;

interbedded with siltstone: locally micaceous or calcareous, greenish-grey to purplish-brown, laminated, bioturbated; and sandstone: lithic wacke to quartz

arenite, micaceous, locally calcareous or glauconitic, grey to greenish-grey or

brown, very thin- to medium-bedded, laminated and crosslaminated, abundant and diverse trace fossils; and minor limestone: bioclastic, grey to brown or

orange, diverse fossil assemblage. Includes Jungle Ridge Member, comprising

limestone: lime mudstone, silty, grey, weathers light yellow, very thin- to

Horn River Group: shale: carbonaceous or petroliferous, calcareous to

siliceous, locally silty, dark grey or black, weathers grey, black, brown, or rusty, locally fossiliferous; minor limestone: dark grey with tentaculitids, interbedded

Hume Formation: limestone: wackestone to grainstone, floatstone, medium

abundant and diverse assemblage. Unit is thicker bedded and cliff-forming in

Bear Rock Formation: limestone breccia: variably dolomitic and petroliferous,

angular clasts range from granule- to boulder-sized, greyish-brown to grey,

weathers light grey, vuggy, massive and rubbly with rare bedded intervals of

Franklin Mountain Formation, upper member: dolostone: crystalline

white to light grey, very thin- to thick-bedded, vuggy and nodular, locally

dolostone, commonly cherty and siliceous, cream to beige or grey, weathers

Franklin Mountain Formation, middle member: dolostone: dolomudstone to dolograinstone, rarely calcareous or cherty, light grey to cream or beige,

weathers light yellowish-grey to orange-brown, thin- to thick-bedded, typically recrystallized obliterating primary textures, locally vuggy, stromatolitic or thrombolitic, bioturbated, oolitic, crossbedded, or intraclast-bearing; rare shale

Franklin Mountain Formation, lower member: dolostone: dolomudstone,

locally calcareous or silty, rare detrital chert grains, grey to greenish-grey or

medium-bedded, parallel-laminated, locally includes intraclast rudstone, locally

partings. Alternation, at 1-2 m intervals, of ooid dolograinstone with dolomudstone produces a locally prominent striped appearance.

brown, weathers pale yellow to grey or orange-brown, very thin- to

stromatolitic or bioturbated; interbedded with shale; dolomitic and silty.

casts, desiccation cracks, and horizontal burrows; evaporite: gypsum,

Saline River Formation: shale: silty, grey, red, or green, fissile, minor salt

anhydrite, or halite, white and grey to pink or red, very thin- to thin-bedded,

bedding typically disturbed and chaotic, dominates middle part of unit; minor

dolostone: dolomudstone to dolograinstone, grey to yellow, green, or orange,

locally intraclast-bearing, oolitic, stromatolitic; and sandstone: lithic wacke to

quartz arenite, calcareous or dolomitic, can be conglomeratic, varicoloured,

parallel- and crosslaminated, ripple marks, rip-up clasts, and possible trace

to dark grey or brownish-grey, typically weathers light grey, thin- to very

thick-bedded, parallel to irregular or nodular bedded, fossiliferous with

thin- to thin-bedded, crosslaminated, and bioturbated.

thin-bedded, laminated, shale partings, and rare fossils.

aminated carbonate, tends to form hoodoos.

varicoloured, laminated, and fissile.

Drift contact

Fault, motion undefined

Normal fault, symbol on hanging-wall side

Reverse fault, symbol on hanging-wall side

Thrust fault, symbol on hanging-wall side

Inclined anticline, upright, shorter arrow on steeper limb

Outcrop observed remotely from ground or air

No evidence for younging direction, estimated measurement

Bedding strike and dip, inclined, upright Evidence for younging direction known No evidence for younging direction

Bedding strike and dip, inclined, overturned Evidence for younging direction known

Anticline, upright

Syncline, upright

Anticline, overturned

Bedding, horizontal

Dry and abandoned

Unknown status

stromatolitic, bioturbated, intraclast-bearing, or oolitic.

with shale at base of unit.

The Geological Survey of Canada welcomes corrections or additional information from users.

corner of the map.

Data may include additional features not portrayed on this map. See documentation accompanying the data. Additional references are included in the map information document This publication is available for free download through GEOSCAN (http://geoscan.ess.nrcan.gc.ca/).

CANADIAN GEOSCIENCE MAP 92 GEOLOGY FORT NORMAN (NORTHWEST)

Northwest Territories