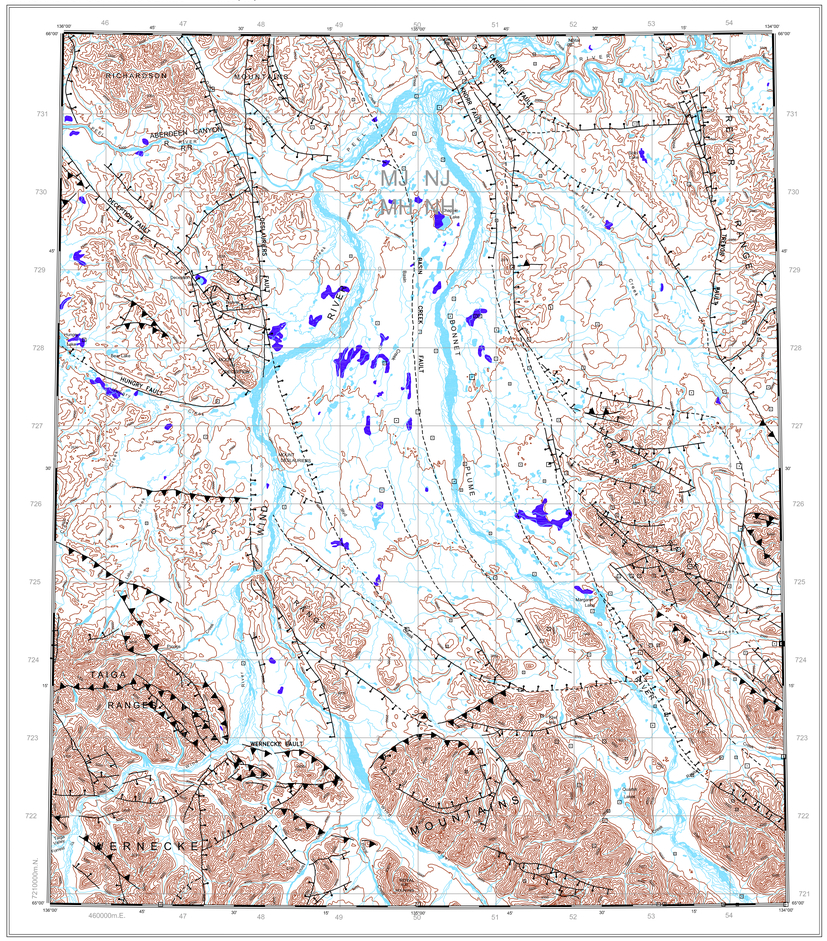
NATIONAL TOPOGRAPHIC SERIES NTDB (1995) D.I.A.N.D. N.A.P. LAND RESOURCES CANADA SHEET 106E



NOTE: THIS MAP HAS BEEN PRODUCED BY THE COMPILATION OF DATA FROM VARIOUS SOURCES. IT IS NOT TO BE USED TO DEFINE LEGAL BOUNDARIES.

THIS MAP IS ISSUED AS A PRELIMINARY GUIDE FOR WHICH THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT WILL ACCEPT NO RESPONSIBILITY FOR ANY ERRORS, INACCURACIES OR OMISSIONS WHATSOEVER.

EDITION: 2 PRINT DATE: 99/07/22

WIND RIVER

YUKON TERRITORY

106 E

Scale

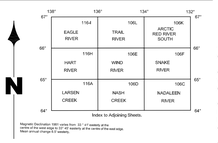
10 0 10 20 30 km

5 0 5 10 15 miles

CONTOUR INTERVAL 100 METRE Elevations in metres above Mean Sea Level

North American Datum 1983 Transverse Mercator Projection

Universal Transvers Mercator Grid ZONE 8



GEOPROCESS FILE - SUMMARY REPORT

WIND RIVER MAP AREA - NTS 106E

INTRODUCTION

The GEOPROCESS File is a compilation of information and knowledge on geological processes and terrain hazards, including mass movement processes, permafrost, flooding risks, faults, seismic activity and recent volcanism, etc. Please refer to the GEOPROCESS File User Guide for more in-depth information on how the maps were developed, which other GEOPROCESS File maps are available, how to utilize this inventory and how to interpret the legend. Special interest should be taken in the detailed description of the terrain hazard map units. Appendices in the User Guide include summary papers on the geological framework, permafrost distribution, and Quaternary geology in Yukon and a list of comprehensive GEOPROCESS File references.

This report includes a brief discussion of the scope and limitations of the GEOPROCESS File compilation maps followed by summaries of the bedrock geology, surficial geology and terrain hazards for this NTS map area, and a list of references.

Geological Processes and Terrain Hazard Compilation Maps

The GEOPROCESS File map units were drafted on the 1:250 000 topographic base maps through interpretation from bedrock geology maps, surficial geology maps and in some cases terrain hazard maps at various scales. The compilation maps have a confidence level reflecting the original source material. All materials used to produce the maps are listed in the references on each map. A file containing the documentation used to construct these maps is available at the Indian and Northern Affairs library in Whitehorse, Yukon. Areas for which no surficial geology or terrain hazard information is published were left blank. Summary reports on surficial geology and terrain hazards for these map sheets were written by extrapolating the data from adjacent map sheets or smaller scale maps. Information from small scale (e.g., 1:1 000 000) maps was used for the summary reports, but not redrafted onto the 1:250 000 GEOPROCESS File maps.

The GEOPROCESS File compilation maps are intended as a first cut planning tool; the legend on the maps describes the general aspects of terrain hazards (also see below) and associated geological processes. **These maps should never replace individual site investigations for planning of site specific features, such as buildings, roads, pits, etc.**

Bedrock Geology Summaries

Each 1:250 000 NTS map area is described according to morphogeological belts and terranes defined by Gabrielse et al, (1991) and Wheeler et al. (1991). Bedrock geology (including structure) and mineral occurrences are briefly described and taken largely from the referenced, most recent 1:250 000 geological map with additional contributions from Wheeler and McFeely (1991), and Yukon MINFILE (1993). A summary paper ("A Geological Framework for Yukon") in Appendix A of the User Guide provides a framework and context for each of the bedrock summaries.

The level of knowledge and understanding of Yukon geology is constantly evolving with more detailed mapping and development of geological models. Names, ages and terrane affinities of rock units on the most recent 1:250 000 geological maps may, in some cases, now be considered incorrect. Thus information contained within some of the bedrock geology summaries may be out of date. Although much of the information reflects the knowledge at the time that the source map was published, additional information has been inserted whenever possible to assist the user in merging the information with current geological maps, concepts and understanding. The age ranges for similar packages of rocks may also vary between map areas since the actual rocks, or at least the constraints on their age, may vary between map areas.

BEDROCK GEOLOGY

The Wind River map area is entirely within the Foreland Belt. The Richardson and Wernecke mountains dominate in the northwest and southern regions of the map area, respectively, but the central region is characterized by the low-lying Bonnet Plume Basin.

The entire map area is underlain by sedimentary rocks. The mountainous regions are largely composed of marine sedimentary rocks older than 300 million years whereas the low-lying regions are composed of non-marine sedimentary rocks younger than 140 million years of age.

The southern part of the map area (Wernecke Mountain area) is dominated by Precambrian (older than 570 million years old) Quartet Group argillite and quartzite; Gillespie Lake Group dolomite; minor Pinguicula Group siltstone, sandstone, dolomite and limestone; Rapitan Group diamictite, conglomerate and sandstone. These rocks are overlain by 560 million year old Ilityd Formation limestone, and 570-530 million year old Slats Creek Formation siltstone, conglomerate, sandstone and limestone. This succession is unconformably overlain by 530-390 million year old Gull Lake limestone and dolomite, and Road River Formation limestone, brecciia and shale.

The Knorr Range in the eastern part of the map area is underlain by the pre-570 million year old Tsezotene Formation shale, sandstone and dolomite; Katherine Group quartzite, dolomite and shale; Little Dal Formation dolomite, limestone and shale; and Knorr Range Succession limestone, dolomite and siltstone. These packages are overlain by Ilityd Formation limestone, and Road River Formation limestone and shale.

The Richardson Mountains is mainly underlain by Road River Formation shale and limestone, but the area south of the Richardson Mountains and northeast of the Knorr Range is underlain by a thick succession of 400 to 300 million year old Michelle Formation shale, limestone and dolomite; Ogilvie Formation limestone; Canol Formation shale; Imperial Formation siltstone, sandstone and shale; Ford Lake shale and sandstone; Hart River Formation limestone, dolomite and chert; Ettrain Formation limestone, shale and sandstone; and Jungle Creek Formation sandstone, mudstone and limestone.

Unconformably overlying the aforementioned units and making up the Bonnet Plume Basin are the 140-100 million year old Arctic Red Formation shale and siltstone in the northeastern part of the map area; and 140-70 million year old Bonnet Plume Formation sandstone, conglomerate, shale and coal in the central part of the map area.

The pre-570 million year old rocks have undergone numerous phases of deformation including extensive block faulting previous to the deposition of the younger rock packages. This has resulted in a large number of vertical north-northwest-trending faults cutting these rocks. A series of enigmatic breccia bodies (areas of shattered rock), some of which are enormous, outline a significant arcuate, west to west-northwest-trending zone of structural weakness in these ancient rocks and are known as the Wernecke Breccias. The western part of this arc occurs in the southern part of the map area. Rocks older than 300 million years old have been folded along east and northeast-trending synclines and anticlines. Both short vertical and large, through-going, probably strike-slip faults affect all the rock packages.

Mineral Deposits and Occurrences

Yukon MINFILE lists 40 prospects for the Wind River map area. Approximately 20 are uranium-copper-iron deposits associated with Wernecke Breccias. Although these occurrences are currently (1995) receiving extensive exploration attention, defined tonnages have not been documented. Most of the remainder of the mineral occurrences in the area are coal deposits in 80 million year old strata in the Bonnet Plume Basin. Combined inferred reserves from seven of these deposits, including the largest - the Ilityd, indicate more than 660 million tonnes of bituminous coal. In addition, there are a few, small lead-zinc-silver Mississippi Valley Type occurrences and lead-silver-zinc veins.

SURFICIAL GEOLOGY

There is no published information on this area, except for a general surface geology map at the 1:500 000 scale (Hughes, 1971). This information was not transferred onto the 1:250 000 Geoprocess File map accompanying this file because of the scale and general nature of the map.

According to Hughes (1969), most of the Wind River map area was affected by the Laurentide Glaciation. Limits of this glaciation are located along the south and east portion of the map, at around elevations of approximately 2000 ft. The Wernecke Mountains south of the Bonnet Plume Basin were therefore affected by local, small alpine glaciers. In the northwest portion of the map, west of the Little Wind River, the upper ice limit along the valley wall ranges from slightly less than 3000 ft. to 2000 ft.

Moralinal deposits are limited to blankets of till over rock. Glaciofluvial deposits are concentrated along Bonnet Plume River valley at elevations lower than 2000 feet in the south and 1000 feet close to Chappie Lake. No large glaciolacustrine deposits were identified.

Valley floors are occupied by recent fluvial deposits.

TERRAIN HAZARDS.

There is no published information on hazards in this area. The following comments are based on conditions present in adjoining map sheets and on Hughes (1969).

Seismicity

There are 132 recorded seismic events within the Wind River map area. Most of the events are located in the east side of the map area in the Knorr Range and Bonnet Plume Basin. The seismic events are 5.0 to 5.999 or less in magnitute.

Mass Movement Processes

The steeper topography of the Richardson and Wernecke Mountains may present avalanches or rock fall hazards. A few landslides were identified on the map at 1:500 000 scale, concentrated along the east side of the Bonnet Plume River valley, directly north and south of Noisy Creek. Slow mass movement related to permafrost processes can be expected on valley walls covered with colluvial, residual or moralinal deposits. Soil creep, solifluction lobes and detachment slides are most probably present on most slopes covered by martrix-rich deposits.

Permafrost

This area lies within the extensive discontinuous permafrost zone (Heginbottom and Radburn, 1992). There is low to moderate ice content in moralinal and colluvial deposits with organic cover, and in fine-grained fluvial and alluvial deposits located on terraces above stream level. Permafrost is assumed to have a higher ice content in north- to northeast-facing slopes covered by fine-grained poorly drained deposits overlain by thick organic material. Permafrost is assumed to be absent, or to have a very low ice content in coarse well-drained sediments. Only one glacier was identified in Hughes (1969), along the south side of Prongs Creek.

Flooding

There is no information available on flooding. The braided nature of the Bonnet Plume and Little Wind Rivers suggests seasonal flooding in the lower reaches and interchannel areas of the valley floor.

References: Wind River Map Area - NTS 106E

To be thorough, check the references for adjacent NTS map sheets and the General Reference List (See User Guide).

Most of the following references should be available for viewing in the DIAND library on the third floor of the Elijah Smith Building in Whitehorse.

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Dixon, J., 1992. A review of Cretaceous and Tertiary stratigraphy in the northern Yukon and adjacent Northwest Territories. Geological Survey of Canada, Paper 92-9, 79 p. (NTS 106E, 106F, 106K, 106L, 116F/G, 116H, 116I, 116J/K, 116N/O, 116P, 117)

Eisbacher, G.H., 1978. Two major Proterozoic unconformities, Northern Cordillera. In: Current Research, Part A, Paper 78-1A, Geological Survey of Canada, p. 53-58.

Gabrielse, H. and Yorath, C.J. (eds), 1991. Geology of the Cordilleran Orogen in Canada. Geological Survey of Canada, No. 4, 844 p. (Contains summary of Yukon geology)

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Williams, G.K., 1988. A review of the Bonnet Plume area, east-central Yukon Territory (including Snake River, Solo Creek, Noisy Creek and Royal Creek areas), Geological Survey of Canada, Open File Report 1742. (NTS 106C, 106D, 106E, 106F)

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* References used in compiling this map

LEGEND

LEGEND TERRAIN HAZARDS

MAP SYMBOL	TERRAIN HAZARDS	ASSOCIATED RISK LEVELS, COMMENTS
	Mass Movement Processes	
A	Snow Avalanched.	high
F	Extremely slow to moderate rates of failure in soil and bedrock, including soil creep, rock creep, earthflow, soil or rock slump, debris or rock slide.	low to intermediate
R	Moderate to extremely rapid rates of failure in soil and bedrock (1.5 m/d to >3 m/s), including rock slump, debris slide, rock slide, debris flow, debris torrent, debris avalanche, rockfall, rock avalanche.	high
	Arctic, Alpine and Periglacial Processes	
X	Permafrost present,	low
K	Thermokarst present,	low
S	Soliflucted,	low to intermediate
Z	Grouped, cryoturbated, soliflucted, nivated.	low to intermediate
	Fluvial Processes	
B	Braided, unstable channels, risk of flooding.	intermediate to high
E	Fluvial erosion, deposition and low risk of flooding.	low to intermediate
J	Anastomosing,	intermediate to high
U	Flooded regularly.	intermediate to high
	Miscellaneous Erosion Processes	
T	Karst.	intermediate
P	Piping.	intermediate to high
V	Gullied.	low to intermediate
	On Site Symbols	Risk Level
	Unit boundary (defined, approximate).	
	Erosional escarpment.	high
	Landslide escarpment.	high
	Landslide (includes source and runout areas),	high
	Pingo,	high
	Rock glacier.	high
	Spring or saline seep.	low
	Observation of frozen soil or ground ice.	low
	Rapid mass movements (debris torrent) with known point source. Limits of runout not implied by symbol.	high
	Slow mass movement (earth flow) with landslide, escarpment source. Limits of landslide runout not implied by symbol.	Intermediate to high

LEGEND SEISMIC EVENTS

SYMBOL	MAGNITUDE REPRESENTED	SYMBOL	MAGNITUDE REPRESENTED
	<2.0		4.0 to 4.999
	2.0 to 2.999		5.0 to 5.999
	3.0 to 3.999		>6.0

LEGEND GEOLOGICAL PROCESSES

MAP SYMBOL	DESCRIPTION	INFERRED HAZARDS
cf	Talus fan or apron, moderate to steep slope, coarse angular bedrock fragments, sources are often areas of rapidly disintegrating bedrock.	Rock fall and debris flows common on active fans, steep slopes generally unstable to traffic.
cl	Landslide, moderate slope, varies from large blocks of bedrock to finer material.	Landslides generally are recurrent in susceptible areas and may be become active if disturbed.
cs	Colluvium covered slope, gentle to moderate slope, underlain by unsorted rubble, solifluction and other periglacial features common.	Areas of fine textured materials and gentle slopes at high elevations, where there is ground ice will be susceptible to high solifluction rates and thermokarst if disturbed.
fa	Alluvial fan, active.	Subject to shifts in channel and bar positions, occasionally subject to flooding.
fp	Floodplain.	Subject to shift in channel and bar positions, occasionally subject to flooding.
gle	Glacier ice.	Crevasses.
lm	Mountain ice caps.	Avalanches, ice and rock falls, and crevasses.
lv	Cliff glacier.	Avalanches, ice and rock falls.
l	Lacustrine or glaciolacustrine sediments.	Silt and clay, usually susceptible to frost heaving and, if permafrost present, to thermokarsting when disturbed.
mi	Rock glacier, debris covered glacier.	Ice at depth make surface susceptible to thermokarst, unstable slopes.
o	Organic.	Thick organic matter is often underlain by permafrost. Disturbance of permafrost may cause poor drainage and thermokarsting.

LEGEND FAULTS

Fault defined, approximate, assumed, extrapolated beneath overburden

Fault Solid circle indicates downthrown side Arrows indicate relative movement

Thrust Fault (teeth indicate upthrust side)

Airphoto Lineament

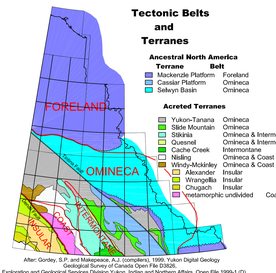
LEGEND QUATERNARY VOLCANISM

No known recent volcanism in map area 106E

OTHER FEATURES

Roads, Streams, Lakes, Marsh

NOTE: Where areas have more than one identified process or hazard, the colour of the encompassing polygon is assigned based on a hierarchical scheme relating to the severity of the hazard. The relative order of severity is: Terrain Hazards (Mass Movement Processes then Fluvial Processes then Arctic, Alpine and Periglacial Processes) followed by Geological Processes.



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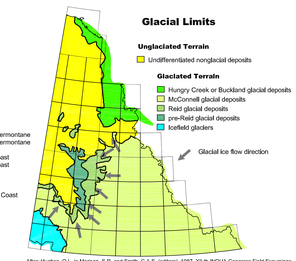

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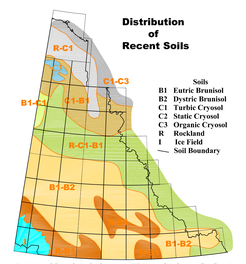

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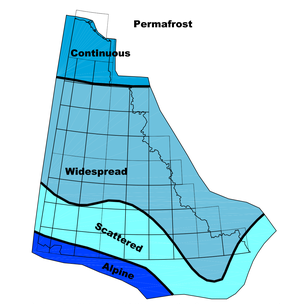
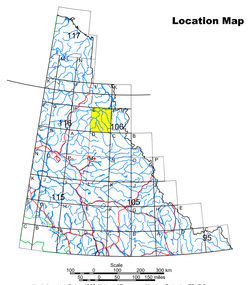


After: Brown, R.J.E., 1978, Permafrost: Plate 32, Hydrological Atlas of Canada, Fisheries and Environment, Canada. 34 plates



Exploration and Geological Services Division
Yukon Region
Indian and Northern Affairs Canada

Yukon GEOPROCESS File

Geological Processes and Terrain Hazards of Wind River 106E

by

Mougeot, C.M. and Walton, L.A.

Copies of this map may be obtained from Geoscience and Information Sales c/o Whitehorse Mining Recorder, Indian and Northern Affairs Canada, Room 102, 300 Main Street, Whitehorse, Yukon Y1A 2B5 (867) 667-3266; FAX: (867) 667-3267

Recommended citation: Mougeot, C.M. and Walton, L.A., 1996, Yukon GEOPROCESS File (2002), Geological Processes and Terrain Hazards of Wind River, 106E Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada, 1:250 000 scale.