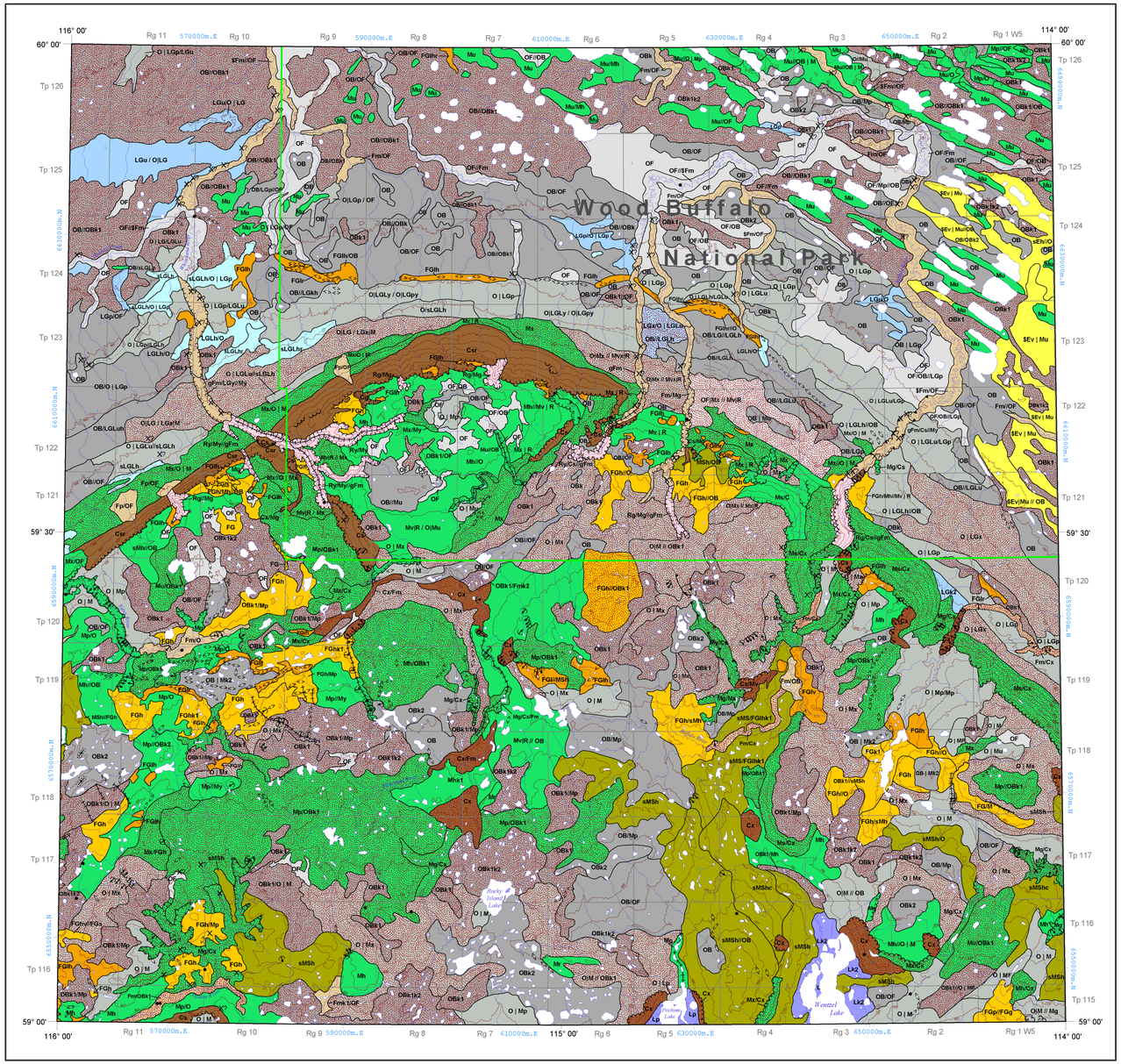
NTS 84O
SURFICIAL GEOLOGY



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Map 541

Surficial Geology of the Whitesand River Area, Alberta (NTS 84O)

Geology by: C. Mougeot and M.M. Fenton

Scale 1:250 000

2 0 2 4 6 8 10 kilometres
1 0 1 2 3 4 5 miles

Projection: Universal Transverse Mercator
Datum: North American Datum, 1983

This is a common map legend for the surficial geology of northern Alberta. Coloured legend blocks indicate map units that appear on this map. Not all map symbols shown in the legend necessarily appear on this map.

UNIT	UNIT NAME	DESCRIPTION AND GENESIS
QUATERNARY		
	HOLOCENE	
A		**ANTHROPOGENIC MATERIALS:** Culturally made or modified geological materials such that their physical properties (e.g., structure, cohesion, compaction) have been drastically altered.
O		**ORGANIC DEPOSITS:** Undifferentiated peat (woody to fibrous muck) occurring in undifferentiated wetlands; commonly underlain by fine-grained, poorly drained glaciolacustrine or fine-grained moraine deposits; includes marshes, swamps, bogs and fens.
	OB	**Bog peat:** Occurs in a peatland with a fluctuating water table and commonly a raised surface; peatland surface is dominated by sphagnum mosses, heath shrubs and short, stunted trees.
	OF	**Fen peat:** Occurs in a peatland with water table at surface and slow internal drainage; peatland surface is dominated by sedges, with grasses and reeds near local pools, and is sparsely treed.
C		**COLLUVIAL DEPOSITS:** Materials that have reached their present position as a result of direct, gravity-induced movement; commonly occurs as slope and slump deposits confined to valley slopes and floors; may include pre-existing bedrock, till, glaciolacustrine, glaciofluvial and eolian sediments, generally poorly sorted.
F		**FLUVIAL DEPOSITS:** Sediments transported and deposited by streams and rivers; synonymous with alluvium. Includes well-sorted stratified sand, gravel, silt, clay and organic sediments occurring in channel and overbank deposits (e.g., postglacial floodplains, terraces, fans and deltas).
L		**LACUSTRINE DEPOSITS:** Sediments deposited in and adjacent to recent and modern lakes; offshore sand, silt and clay, minor organic deposits; may include minor littoral (nearshore) beaches and bars; sand, silt and minor gravel.
E		**EOLIAN DEPOSITS:** Wind-deposited sediments; well-sorted, medium to fine-grained sand and minor silt (loess); generally massive to locally cross bedded or ripple laminated; includes both active and vegetated deposits.
	PLEISTOCENE	
LG		**GLACIOLACUSTRINE DEPOSITS:** Primarily fine-grained, distal sediments deposited in or along the margins of glacial lakes, including sediments released by the melting of floating ice. Includes laminated (rhythmically bedded) to massive fine sand, silt and clay, and may contain ice-rafted stones.
LGL		**Littoral and nearshore sediments:** Massive to stratified, well-sorted silty sand, pebbly sand and minor gravel; occurs as beaches, bars, spits and deltaic foresets deposited during regression and lowering of glacial lakes.
FG		**GLACIOFLUVIAL DEPOSITS:** Sediments deposited by glacial meltwater streams as subaerial or subaqueous outwash. Includes sand and gravel, often stratified, minor silt, and may show evidence of ice melting (slumped structures). Features may include meltwater channels, kettle holes, terraces and minor ice-contact sediments.
FGI		**Ice-contact sediments:** Sediments deposited by meltwater streams flowing either in direct contact with the ice margin (kame terraces) or within and/or under glacial ice (eskers, crevasse ridges). Includes massive to stratified, poor to moderately sorted, coarse sediments (predominantly pebble gravel and coarse sand, locally till) and may show evidence of ice melting (slumped structures).
M		**MORAINE:** Nonsorted diamicton (till) deposited directly by glacial ice consisting of a mixture of clay, silt, sand and minor pebbles, cobbles and boulders. Locally, this unit may contain blocks of bedrock, pre-existing stratified sediment and till, and lenses of glaciolacustrine and/or glaciofluvial sediment.
MS		**Stagnant ice moraine:** Material resulting from the collapse and lateral movement of englacial and supraglacial sediment in response to melting (ablation) of buried stagnant ice at the ice margin; sediment is mainly diamicton, but locally includes stratified sediments of glaciolacustrine or glaciofluvial origin. Characterized by low to high-relief hummocky topography.
MT		**Ice-thrust moraine:** Terrain formed from the glaciotectonic displacement of materials as blocks or rafts in a more or less intact state. Materials may include syngenetic till, as well as masses of pre-existing till, stratified drift and/or bedrock. Characterized by high to moderate relief and features include hill-hole pairs and glaciotectonic moraine ridges.
MF		**Fluted moraine:** Glacially streamlined terrain; varies from alternating furrows and ridges to nearly equidimensional smoothed hills; all landforms parallel the local ice flow direction; includes flutes, drumlins and drumlinoids.
FP		**PREGLACIAL FLUVIAL DEPOSITS:** Sediments transported and deposited by streams and rivers prior to glaciation. This includes sand and gravel deposits occurring in paleovalleys (i.e., preglacial floodplains, terraces, fans and deltas) ranging from late Tertiary to middle Wisconsin.
PRE-QUATERNARY		
RT		**UNCONSOLIDATED FLUVIAL GRAVELS:** Predominately well-sorted, quartzite and chert gravel and cobbles; Cordilleran source, Paleogene (Tertiary) to early Quaternary.
R		**BEDROCK**

SYMBOL LEGEND

- Permafrost; relict and/or active
- Thermokarst depression
- Landslide and active layer failure scar (small) Symbol may represent more than one slide
- Landslide and active layer failure scar (large)
- Eolian forms; dune ridges
- Beach or strandline
- Wave-cut bench
- Escarpment
- Meltwater channel (minor)
- Meltwater channel (minor, paleoflow direction known)
- Meltwater channel (major)
- Meltwater channel (major, paleoflow direction known)
- Crevasse filling
- Ice-contact slope
- Kettle
- Esker (paleoflow direction unknown)
- Esker (paleoflow direction known)
- Drumlinoid or streamlined landform
- Drumlinoid (ice flow direction known)
- Buried drumlinoid or streamlined landform
- Minor moraine ridge
- Major moraine ridge
- Iceberg scour
- Ice thrust ridge
- Striation (ice flow direction unknown)
- Striation (ice flow direction known)
- Bedrock outcrop
- Possible bedrock outcrop
- Gravel and/or sand pit
- Section of stratigraphic interest
- Field stop

BASEMAP LEGEND

- Road-paved-primary
- Road-gravel-primary
- Road-paved-secondary
- Road-improved
- Road-unimproved
- Trail-truck
- River
- Lake
- UTM, Zone 11 Grid — 430000m.E
- Contour, intervals 50 metres
- Town
- National park boundary

UNIT NOTATION

Example: sandy GLACIOLACUSTRINE plain

s GL p
Textural modifier ↑ Genetic unit ↑ Geomorphic modifier

Textural Modifier

Textural characteristics may be applied to the terrain classification as a prefix based on field observations or by inference from distinctive genesis and/or morphology. When two modifiers are given, the second letter is the dominant texture, with the first letter indicating the secondary texture; i.e., sc for sandy clay.
p = pebble
g = gravel
s = sand
$ = silt
c = clay
a = sand-silt-clay

GENETIC & GEOMORPHOLOGICAL MODIFIERS

c	**crevasse fill**	ice-contact ridges formed by the slumping of sediment into crevasses on the ice surface or the squeezing of till into fractures at the ice base
d	**doughnut rings and ridges**	circular hummocks with a central depression, plateau mounds and brain-like pattern ridges, low to moderate relief
e	**eroded**	planar surface eroded by glacial meltwater, often capped by a boulder lag deposit and/or thin deposit of sand and gravel
f	**fan**	gently sloping fan-shaped mass of detrital debris
g	**gullied**	slopes dissected by modern ravines created by intermittent runoff
h	**hummock**	assemblage of approximately equidimensional hills and hollows; moderate to high relief (commonly greater than 2 m)
k	**collapse**	depression, including kettle holes, pitted morphology, thermokarst depressions, karst sinkholes
k1	**thermokarst**	topography consists of mounds and circular, poorly drained lowlands; local melting of ground ice and the subsequent settling of the ground creates this uneven topography; it is often associated with ice rich permafrost occurring in thick peat blankets which overlie fine grained moraine
k2	**kettled**	topography contains circular depressions caused by the melting of glacial ice
m	**meander**	sinuous curves, loops and oxbows produced as meltwater and modern streams shift their channels over time
p	**plain**	deposit greater than 2 m thick; commonly masks geomorphic pattern of underlying deposits; flat to gently rolling topography (commonly less than 2 m relief)
r	**ridged**	one or more parallel or subparallel, convex, linear morphological elements with a length-to-width ratio greater than 2; low to high relief
s	**slumped**	landslide blocks, slope failure debris
t	**terrace**	bench cut by either meltwater or wave action; antiplanation terrace, kame terrace
u	**undulating**	low-relief rolling terrain; swell and swale topography
v	**veneer**	thin mantle of unconsolidated material too thin to mask the minor irregularities of the surface of the underlying material; it ranges in thickness from 10 cm to 1 metre and may be discontinuous
w	**washboard**	low-relief transverse moraine ridges, usually formed from basal ice shearing
x	**frost creep**	indicates slow mass movement, frost creep and solifluction related to permafrost, may occur on slopes as gentle as three degrees
y	**dissected**	channelled or dissected by glacial meltwater flow and/or Holocene fluvial activity
z	**delta**	lake delta; ice-contact delta

Complex

Where two or more classes of terrain are interspersed in a mosaic or repeating pattern on a scale too small to warrant meaningful differentiation, the proportion of each component in the combination is given in a two or three-position designation set off by slashes denoting arbitrary percentage limits. Examples are:

- **'Mp/LGv'** indicates the area is underlain by approximately 60% morainal plain and up to 40% glaciolacustrine veneer
- **'Mv/LGv/FGp'** indicates at least 60% of the area is underlain by morainal veneer, with up to 40% glaciolacustrine veneer and less than 15% glaciofluvial plain
- **'LGp//M'** indicates more than 60% of the area is underlain by a glaciolacustrine plain, with less than 15% moraine

Stratigraphic Sequence

Where materials of different origins or textures are known to be superimposed or can be confidently inferred, the sequence is indicated in conventional order using vertical separators, such as:

- **'sLGv | Mp'** indicates sandy glaciolacustrine veneer deposited on morainal plain
- **'Mv|R / O|Mu'** indicates at least 60% of the area is underlain by morainal veneer over bedrock and up to 40% of the area is underlain by organic deposits overlying undulating moraine.

Transitional Association

Locally, two or more terrain units are juxtaposed by reason of related origin, temporal sequence or ambiguous geomorphological distinction. In the last case, both components may or may not be present. Such situations are identified by a compound designation marked by a hyphen. Examples are:

- **'FGz-LGz'** indicates ice-contact delta indistinguishable from glaciolacustrine delta
- **'LG-LGL'** indicates glaciolacustrine indistinguishable from littoral and nearshore glaciolacustrine sediment

Morphological Overprint

Where a sequence of geomorphological processes has produced a multi-aspect or compound terrain fabric, the geomorphological modifier suffixes are appended in the inferred order of superposition. 'Mpry' indicates a morainal plain has been moulded into ridges and finally dissected by streams. 'FGphr' indicates a glaciofluvial plain that includes discontinuous hummocks and ridges.

Notes

This map was prepared by airphoto interpretation supplemented by a limited number of ground observations. The airphotos within Wood Buffalo National Park were flown in 1975 (scale 1:54 000). The airphotos from outside the park were flown in 1994 (scale 1:60 000).

The brown stippled pattern on the map indicates permafrost. However, this pattern is the minimum distribution.

Possible outcrops are indicated on the map with the symbol "X?." These are outcrops that were identified only on airphotos.

This map replaces ERCB/AGS Map 423, which presented the surficial geology of only the south half of NTS 84O. The geology in that area was updated with new field information.

Acknowledgements

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Recommended reference format

Mougeot, C. and Fenton, M.M. (2010): Surficial geology of the Whitesand River area, Alberta (NTS 84O); Energy Resources Conservation Board, ERCB/AGS Map 541, scale 1:250 000.