

UNIT SYMBOL	UNIT NAME	DESCRIPTION AND GENESIS
QUATERNARY		
Holococene		
O	ORGANIC DEPOSITS:	Undifferentiated bog, fen, swamp and marsh deposits; woody to fibrous to mucky peat; commonly underlain by fine glacial lake deposits.
Op	patterned fen, string bogs	
Oh	palisad	
Opk	organic terrain with thermokarst features	
C	COLLUVIAL DEPOSITS:	Massive to stratified silt to clayey sand and silt; slope and slump deposits formed by gravity-induced movement; confined to valley slopes and floors.
Cf	talus cone, debris flow	
Cs	landslide blocks, slumps	
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.
Eh	blowout and remnant sand dune ridges	
Er	longitudinal and parabolic dunes	
A	ALLUVIAL DEPOSITS:	Sand, silt, clay, gravel and organic sediments deposited by modern streams; commonly well sorted and stratified.
Af	alluvial fan	
L	LACUSTRINE DEPOSITS:	Sediments deposited in and adjacent to recent lakes; offshore sand, silt and clay, and minor organic deposits; littoral (nearshore) sand and silt and minor gravel
Lr	modern beach deposits and lake ice push ridges	
PLEISTOCENE		
GL	GLACIOLACUSTRINE DEPOSITS:	Sediments deposited in glacial lakes; massive to stratified clay, silt, sand and minor gravel; thickness varies from <1 to >5 m; lake sediments may form a discontinuous cover; sediments reworked by wave action of glacial lake or carried into the lake basin mainly by glacial meltwater and deposited offshore in deep water, predominantly silts and clays; commonly flat to gently rolling plain
GLh	glaciolacustrine sediments with irregular hummocky topography resulting from deposition in ponded water on stagnant ice (supraglacial); generally silt with minor sand, clay and diamicton; moderate relief	
GLb	circular hummocks with a central depression, plateau mounds and/or irregular chaotic ridges composed of supraglacial lake silts and clays; low to moderate relief	
GLp	Offshore (distal): Fine-grained sediments, predominantly clay and silt, minor sand and diamicton, deposited in a deep water environment (i.e., GLv, GLp). May include ice rafted dropstones and diamicton inclusions.	
GLl	Nearshore and littoral: Sand, silty sand and gravel, moderately well sorted and commonly horizontally bedded; occurs as a blanket of sand grading basinward into finer sediments, or as foreset deltaic deposits (GLx), or as isolated or series of ridges including beaches, bars and spits. Sandy or gravely nearshore and littoral lake sediments are prefixed with a textural modifier (i.e., sGLx, sGLk).	
GLr	strandlines, raised beaches; sand and minor gravel ridges marking paleoshorelines of glacial lakes; commonly <1 m to 3 m in height, includes cobble beaches	
GF	GLACIOLUVIAL DEPOSITS:	Stratified gravel and sand, minor silt, clay deposited by glacial meltwater in contact with or near the glacier (colour indicates undifferentiated glacioluvial sediments)
GFd	Distal (proglacial): Predominantly well-sorted sand with minor gravel and silt; deposited subaerially in front of the ice (outwash) within meltwater channels in front of or beneath the glacier (i.e., GFp, GFv); flat to gently undulating plain that may be marked by channel scars and kettle holes (K).	
GFp	Proximal (ice-contact): Coarse-grained sediments (predominantly gravel and sand; locally till) deposited in contact with the ice; irregular undulating to hummocky (barne and kettle) topography; may also have associated ice crevasse ridges and eskers; moderately to poorly sorted; stratified to massive; may exhibit features related to slumping and faulting.	
GFv	eskers and esker systems	
GFh	stagnant ice hummocky stratified deposits	
GFc	crevasse ridges composed of stratified drift; appear very similar to small-scale eskers	
GFs	previously deposited sands and gravels overridden and remolded into streamine features by glacial ice; landforms oriented parallel to ice flow	
GFx	ice-contact delta; silt, sand, gravel and diamicton deposited in contact with the ice by outflow of meltwater at the ice margin into a glacial lake	
M	GLACIAL DEPOSITS/MORAINES:	Unsorted to poorly sorted diamictons deposited as till (a mixture of clay, silt, sand, minor pebbles, cobbles and boulders) at the ice margin or beneath a glacier; locally may include blocks of shale, siltstone, sandstone, or pre-existing stratified drift and till. Moraine may also include beds of glaciolacustrine and/or glacioluvial sediments. The regional till is predominantly clay rich; locally the texture of the till may vary depending on the local source material. Thickness may exceed 150 m in buried valleys.
Md, Mpd, Mvd	drumlin, drumlinoid and/flushed terrain composed of ground moraine	
Mr	DeGeer, Rogen, ribbed moraines; undivided morainal ridges including end moraine	
MS	Stagnant ice moraine: Terrain resulting from the collapse and lateral movement of englacial and supraglacial sediment in response to melting of buried stagnant ice at the ice margin; sediment is mainly till but locally includes stratified sediments of glaciolacustrine or glacioluvial origin. Characterized by low- to high-relief hummocky topography.	
MSr	commonly end and recessional moraines	
MSrK	crevasse fillings; subparallel to intersecting ridges believed to have formed under stagnant ice conditions by infilling of ice crevasses with glacial debris by either seeping up from the base of the ice or flowing/slumping into open crevasses; till and stratified sediments; > 2 m high, low to moderate relief	
MT	Ice-thrust moraine: Terrain resulting from glaciotectionic transport of originally subglacial sediment and deposited by the glacier more or less intact; deposits may include syngenetic till as well as masses of pre-existing till, stratified drift and/or bedrock; topography generally moderate to high relief	
MTh	'rubber' moraine, 'hill-hole pairs'; high to moderate relief	
MTr	glaciotectionic moraine ridges; moderate to high relief	
PRE-QUATERNARY		
R	BEDROCK:	Undivided; may include crystalline (Shield), carbonates, clastic sediments and/or coal.
Rd, sRkG	fluted or drumlinized bedrock; undetermined if bedrock has been glacially eroded, transported, or deformed in situ	
Rw	feiselermer (frost-shattered bedrock)	
gRT	Tertiary gravels:	Predominantly quartzite and chert gravel and cobbles; preglacial age
RK	Crevasse filling:	Sandstone (S), siltstone (S) and shale (C), minor coal; bedrock often glacially deformed with the bedding folded and faulted
NOTE: Where necessary genetic specific geomorphic landform notations are given under unit description.		
FEATURES LEGEND		
Bedrock outcrop	x	
Kettle hole/lake	⊗	
Thermokarst depression	⊖	
Drumlin, drumlinoid, ispatnow	•	
Drumlin, drumlinoid, ispatnow, weakly defined	•	
Flutings	—	
Flutings, weakly defined	—	
Esker ridge, direction known	—>>>>	
Esker ridge, direction unknown	<<<<—	
Dunes, singular ridges	—	
Dunes; hummocky, blow outs, dune field, wind direction indicated	—	
Strandlines; raised beaches, terraces	—	
Meltwater channel, major	—	
Meltwater channel, minor	—	
Ice-walled channel, depression, buried valley	—	
Escarpment-ice contact, bedrock	—	
Ice thrust ridge	—	
Glacial thrust quarry depression boundary, direction of transport indicated	—	
Ribbed, De Geer (washboard) or Rogen, moraine	—	
Major moraine ridge; end moraine, recessional moraine	—	
Minor moraine ridge undefined	—	
Crevasse filling	xxxxxx	
Surface lineament; source unknown	—	
FIELD SITES LEGEND		
Observation only	○	
Observation + sample taken	●	
Observation + diamond indicator sample	◆	
Borehole, auger	★	
Borehole, rotary	★	
Site/Borehole Name	JCOO-041	
ROADS		
Paved	—	
Gravel	—	
Unimproved	—	
Truck-trail	—	
UTM, Zone 12 Grid Contour intervals 10 metres		

GEOMORPHIC MODIFIER	DESCRIPTION
m ridges and rings	circular hummocks with a central depression (doughnut ridges), plateau mounds and brain pattern ridges; low to moderate relief
c channelled	channelled or dissected by former streams of glacial meltwater
d drumlinoid	glacial streamine longitudinal elements parallel to ice flow; drumlins, ispatnows, flutings, crag and tail, Roche Moutonnée
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 hummocky	assemblage of approximately equi-dimensional hills and hollows; moderate to high relief (commonly greater than 2 m)
k collapse	depressions; kettles, pitted outwash, thermokarst depressions, karst sinkholes
l linear structures or features	soffication lines, meander scars, bedrock lineaments, patterned fen
r ridged	one or more parallel or subparallel, convex, linear morphological elements with a width-to-length ratio greater than 2 m; low to high relief
p plain	greater than 2 m thick; commonly masks geomorphic pattern of underlying deposits; flat to gently rolling topography (commonly less than 2 m relief)
s slumped	landslide blocks; slope failure debris
t terrace	terrace bench cut by either meltwater or wave action; antiplation terrace, kame terrace
u undulating	low-relief rolling terrain; swell and swale topography
v veneer	this deposit less than 2 m thick; may be discontinuous; commonly occurs as a drape revealing geomorphic pattern of underlying deposits
w winnowed	sediments have been washed, winnowed and/or reworked by wave action; a boulder lag with associated sand and gravel may cap underlying sediments
x delta	lake deltas; ice-contact delta

UNIT NOTATION
Example: GLACIOLACUSTRINE plain

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
g = gravel
s = silt
c = clay

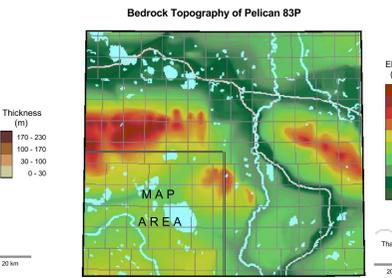
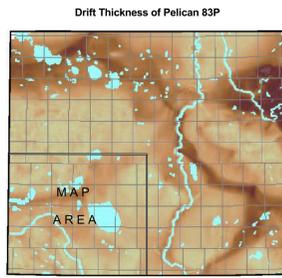
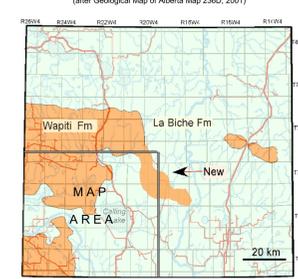
Complex
Where two or more classes of terrain are interspersed in a mosaic or repeating pattern on a scale too small to warrant meaningful differentiation, the proportion of each component in the combination is given in a two or three position designating set off by slashes denoting arbitrary percentage limits. For example:
Mp/GLv means that the area is underlain by approximately 60% morainal plain and up to 40% glaciolacustrine veneer
Mv/GLvGFp means that at least 60% of the area is underlain by morainal veneer, with up to 40% glaciolacustrine veneer and less than 15% glacioluvial plain
GLp/IM means that more than 80% of the area is underlain by a glaciolacustrine plain, with less than 15% moraine

Stratigraphic Sequence
Where materials of different origin or texture are known to be superimposed or can be reasonably confidently inferred, the sequence is indicated in conventional order using vertical separators. For example:
Mh/Md indicates thin hummocky moraine deposited on drumlinoid moraine

Transitional Association
Locally, two or more terrain units are juxtaposed by reason of related origin, temporal sequence, or ambiguous geomorphic distinction. In the case of the latter, both components may or may not be present. Such situations are identified by a compound designation marked by a hyphen. Examples are: *GFp-GLv* indicating ice-contact delta indistinguishable from glaciolacustrine delta; *GFh-MSr* indicating ice-contact kame and kettle topography that blends with hummocky stagnant ice moraine.

Morphologic Overprint
Where a sequence of geomorphic processes has produced a multi-aspect or compound terrain fabric, the geomorphic modifier suffixes are appended in the inferred order of super position. *Mvd* means that a veneer of till has been moulded into a drumlinoid form and finally channelled by former meltwater streams. *GFp* means that a glacioluvial plain has been discontinuously covered by ice-contact hummocks and ridges.

Generalized Bedrock Geology NTS 83P (after Geological Map of Alberta Map 256D, 2001)



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EUB Alberta Energy and Utilities Board
AGS Alberta Geological Survey

Map 240
Surficial Geology of the Calling Lake Area, Alberta (NTS 83P/SW)
Geology by: J.E. Campbell, M.M. Fenton and J.G. Pawlowicz, 2001.

Scale 1:100 000
Projection: Universal Transverse Mercator
Datum: North American Datum, 1983

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Digital base produced by the Resource Data Division, Alberta Environment, supplied by Spatial Data Warehouse Ltd.

References:
Scafe, D.W., Edwards, W.A.D., and Boisvert, D.R., 1989. Sand and gravel resources of the Wandering River Area, Alberta. Alberta Research Council Open File Report 91-01.
Scafe, D.W., Sham, P.C., and Ray, C.M., 1987. Sand and gravel resources of the Pelican (west central portion of 83P) map area, Alberta. Alberta Research Council Open File Report 87-02.

This is a common map legend. Not all units may be present on this map.