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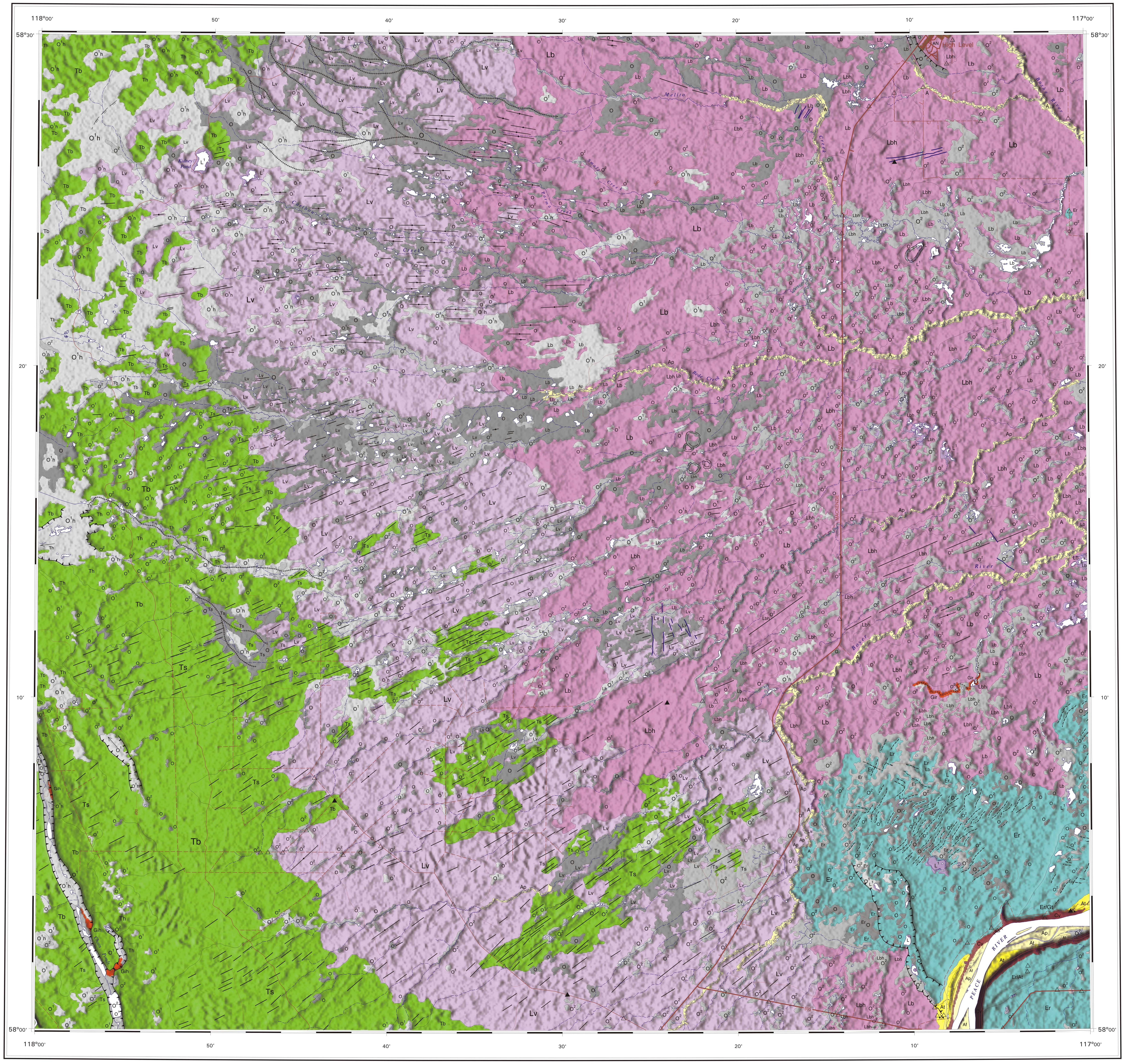
GEOLOGICAL SURVEY OF CANADA | COMMISSION GÉOLOGIQUE DU CANADA



LEGEND

This legend is common to maps OF5460 and OF5461. Coloured legend blocks indicate map units that appear on this map. Not all map symbols shown in the legend appear on this map.

Note: In areas where the surficial cover forms a complex pattern, the area is coloured according to the dominant unit and labelled in descending order of cover (e.g. O-Tr). Where buried aggregate deposits (sand and gravel–commonly associated with Gt surficial units) are known, or suspected, areas are coloured according to the overlying unit and labelled in the following manner: Lv/Gt.

QUATERNARY
SURFICIAL DEPOSITS
POST LAST GLACIATION

NONGLACIAL ENVIRONMENTS

AN — ***ANTHROPOGENIC DEPOSITS:*** *culturally-made or modified geological materials such that their original physical properties (e.g. structure, cohesion, compaction) have been drastically altered; >2 m thick.*

ORGANIC DEPOSITS: *peat and muck; 1 to 3 m thick on average; formed by the accumulation of plant material in various stages of decomposition; generally occurs as flat, wet terrain (swamps and bogs) over poorly drained substrates.*

O¹ — ***Bog peat:*** *sphagnum or forest peat formed in an ombrotrophic environment; wet terrain; may be treed or treeless;* O¹h, *hummocky, mounds and plateaus; area may be underlain by ground ice or shallow permafrost conditions.*

O² — ***Fen peat:*** *peat derived from sedges and partially decayed shrubs in a eutrophic environment; forms relatively open peatlands with a mineral-rich water table that persists seasonally near the surface; generally covered with low shrubs and an occasional sparse cover of trees.*

O — *Undifferentiated hummocky bog and fen deposits.*

COLLUVIAL DEPOSITS: *mass wasting debris; poorly sorted, massive to stratified debris deposited by direct, gravity-induced movement; composition dependant on source material.*

Ch — ***Landslide and slump debris:*** *active and inactive landslides; hummocky topography; diamicton, generally 1 to 10 m thick, but may exceed 10 m near the toe of large landslides.*

Cv — ***Colluvial veneer:*** *thin and discontinuous cover of slumped and/or soliflucted material <1 m thick; overlies bedrock or till.*

ALLUVIAL DEPOSITS: *sorted gravel, sand, minor silt, and organic detritus deposited by streams; commonly stratified.*

Ap — ***Floodplain deposits:*** *sorted gravel, sand, silt, and organic detritus >1 m thick; forming active floodplains close to river level with meander channels and scroll marks.*

At — ***Fluvial terrace deposits:*** *inactive terraces above modern floodplain; >2 m thick; represents a potential aggregate source.*

Af — ***Alluvial fan deposits:*** *poorly sorted gravel, sand, and organic detritus >1 m thick.*

A — *Undifferentiated fluvial deposits.*

L¹ — ***LACUSTRINE DEPOSITS:*** *sand, silt, and minor clay deposited in a former lake; >1 m thick; generally overlain by organic deposits; exposed by recent fluctuations in lake levels.*

NONGLACIAL AND PROGLACIAL ENVIRONMENTS

EOLIAN DEPOSITS: *wind-deposited medium to fine sand; derived from deltaic or glaciolacustrine deposits; in some areas eolian sediments are thin or absent between dunes.*

Er — ***Ridged eolian deposits:*** *forming dunes; generally >2 m thick.*

POSTGLACIAL OR LATE WISCONSINAN

PROGLACIAL AND GLACIAL ENVIRONMENTS

GLACIOLACUSTRINE DEPOSITS: *fine sand, silt, and clay, with minor debris-flow diamicton, deposited in glacier-dammed lakes in valleys and along the margin of the retreating Laurentide Ice Sheet; usually overlain by organic deposits in lowlands.*

Lb — ***Glaciolacustrine blanket:*** *>1 m thick;* Lbh, *hummocky glaciolacustrine sediments, >1 m thick; forming circular hummocks and hills surrounded by depressions with a relief usually >2 m; interspersed with minor fens.*

Lv — ***Glaciolacustrine veneer:*** *thin and discontinuous; <1 m thick.*

GLACIOFLUVIAL DEPOSITS: *well to poorly stratified sand and gravel; minor diamicton; deposited behind, at, or in front of the ice margin by glacial meltwater; represents a potential aggregate source.*

G — ***Proglacial outwash:*** *cross-stratified gravel and sand deposited in front of the ice margin;* Gp, *outwash plain deposits, generally 1 to 5 m thick, generally mantle valley floors and surfaces adjacent to glacial meltwater channel margins;* Gt, *outwash terrace deposits, generally associated with meltwater channels and canyons; 1 to 10 m thick.*

Gi — ***Ice-contact stratified drift:*** *poorly-sorted sand and gravel with minor diamictons; deposited in contact with the retreating glacier; 1 to >20 m thick;* Gih, *hummocky topography relating to melting of underlying ice;* Gir, *esker ridges.*

TILL: *diamicton deposited directly by the Laurentide Ice Sheet; sandy to clayey matrix with striated clasts of various lithologies, including many Canadian Shield, carbonate, and sandstone erratics; clast content is typically low (<10 %).*

Tb — ***Till blanket:*** *>1 m thick, continuous till cover forming undulating topography that locally obscures underlying units.*

Ts — ***Streamlined and fluted till:*** *>1 m thick, till surface marked by streamlined landforms including flutes and drumlins.*

Th — ***Hummocky till:*** *>1 m thick; hummocky till surface.*

Tr — ***Ridged till deposits:*** *>1 m thick, moraines or crevasse fillings forming a ridged topography.*

Tv — ***Till veneer:*** *<1 m thick, discontinuous till cover, underlying bedrock topography is discernible.*

PRE-QUATERNARY
BEDROCK

R — ***Sedimentary bedrock:*** *Cretaceous Fort St. John Group shales (including the Shaftesbury Formation) and Dunvegan Formation sandstone exposed in highlands and along meltwater channel and canyon walls.*

Geological boundary (defined)
Major landslide
Minor landslide
Paleoshorelines
Meltwater channel or underfit channel, small (paleoflow direction known)
Meltwater channel or underfit channel, small (paleoflow direction unknown)
Meltwater channel, large (paleoflow direction known)
Dunes
Abandoned fluvial channel
Major moraine
Minor moraine and crevasse filling
Esker
Drumlinoid ridge parallel to ice flow (direction unknown)
Fluting
Unknown circular feature
Outcrop
Gravel pit
Field observation site (with, without sample)

DESCRIPTIVE NOTES

The Caribou Creek map area is located in northwestern Alberta within the Fort Nelson and Peace River lowlands (Bostock, 1967). The Fort Nelson Lowlands is a region of flat relief with an elevation varying from 300 to 500 m above sea level (asl) and is incised by the Peace River, forming the Peace River Lowlands. The region drains to the east into the Peace River which is part of the Mackenzie River drainage. The main economic activities in the map area include gas exploitation and logging and to a lesser extent agriculture.

The surficial geology of the map area was interpreted from 1:60 000 scale black and white air photographs dating to 1983, 1993, and 1994 and produced by the Alberta Sustainable Resource Development. In addition and to a lesser extent, the surficial geology was interpreted from the shuttle radar topography mission (SRTM) imagery (SRTM 3-arc second; 90 m resolution). Field work was conducted during a 3 week period in the summer of 2005 and included the collection of field observations necessary for the mapping of the surficial geology, the logging of stratigraphy exposed in borrow pits and river bank exposures, and the collection of bulk glacial sediment samples (approx. 30 kg per sample). Access to the region was by truck, all terrain vehicle, and foot traverses. A hand auger was utilized to identify the sediment type within the upper one meter from surface due to the paucity of natural and man-made sediment exposures. The surficial geology was interpreted on air photographs and was subsequently digitized by a consultant using a digital visual plotter (DVP) system.

The bedrock of the map area consists of horizontally bedded, poorly indurated shale of the Shaftesbury Formation underlain by grey shale of the Loon River Formation (Green et al., 1970; Okulitch, 2006). The only bedrock exposures in the map area are located along the north shore of the Peace River and consist of horizontally bedded, poorly indurated shale of the Loon River Formation (Okulitch, 2006).

Till in the Caribou Creek map area consists of a clayey diamicton (10 to 40% clay) with a clast content varying from 5 to 20 %. Clast lithologies in till consist of locally derived shale and ironstone intermixed with Canadian Shield and Proterozoic to Paleozoic sedimentary bedrock transported from the northeast.

Glaciofluvial sediments are rare. One esker was mapped in the south east part of the map area, from air photo interpretation with no ground evaluation. The esker formed during glacial conditions and subsequently, was submerged in a glacial lake early during deglaciation. This esker was mapped as an ice-contact glaciofluvial deposit, but it may be overlain by a veneer of glacial lake sediments.

Glacial lake sediments are dominantly massive and rarely bedded. Because of the low clast content of till and poor sediment exposures the distinction between till and glacial lake sediments was difficult in several places. Glacial lake sediments generally thin to the west with respect to present surface elevation. The maximum elevation reached by glacial lake sediments is estimated at 410 m asl based on field observations made immediately to the north (Plouffe et al., in press) and in the southwest sector of the map area. Therefore, the glacial lake which formed in the region reached a minimum elevation of 410 m asl. Glacial lake sediment cover is discontinuous near the contact zone with till. Certain regions below the maximum extent of glacial lake sediment have been mapped as till, as opposed to glacial lake sediments, because of the high density and good definition of the glacial flutings. In certain areas underlain by a blanket of glaciolacustrine sediments, the surface topography is characterized by a field of circular mounds hundreds of meters in diameter with a relief >2 m (unit **Lbh**). These landforms are interpreted to result from periglacial processes whereby local upheaval occurred because of freezing of thawed layers immediately following rapid glacial lake drainage. Similar features were observed in the surrounding regions and to the south, within the Sturgeon Lake map area (Henderson, 1959).

Eolian sediments composed of well sorted fine sand and minor silt are confined to the vicinity of the Peace River valley. Two dominant wind directions are recorded from the dune orientations. One dominant set of dunes is oriented NE-SW suggesting a wind direction from the SE (David, 1977; Pfeiffer and Wolfe, 2002). A less dominant second set of dunes is oriented WNW-ESE suggests a wind direction from the NNE (David, 1977; Pfeiffer and Wolfe, 2002). The contact between eolian and glacial lake sediments is gradational due to the thinning and discontinuous distribution of eolian sediments at the western edge of this large eolian deposit.

Fluvial sediments are restricted in extent except along the Peace River where well developed terraces occur at up to 60 m above present river level. The terraces are composed of moderately to poorly sorted, crudely bedded, sand and bouldery, cobbly and pebbly gravel.

Organic deposits in the form of fens and bogs are omnipresent in the Caribou Creek map area. Permafrost is still present in the hummocky bogs (unit **O¹h**).

Flutings and drumlinoid ridges are well developed in the region. Within the Caribou Creek map area, fluting morphologies are apparent through the cover of glacial lake sediments and organic deposits. In other words, the flutings are draped by a veneer of glacial lake sediments or organic deposits but are still visible on air photographs. Flutings are a key indicator of ice-flow directions in this region where bedrock striations are absent because of the poorly indurated nature of the bedrock. Only minor moraines have been mapped in the region suggesting an ice-front retreat to the east-northeast. Circular landforms of unknown origin were observed in the central and east central part of the map area. Some of these features are composed of multiple, tightly spaced and very-low relief circular ridges. Their origin glacial, or periglacial is still unclear. Similar features are present to the north (Plouffe et al., in press).

During the Late Wisconsinan glaciation, glaciers derived from the Keewatin Sector of the Laurentide Ice Sheet advanced westerly to southwesterly over the Caribou Creek map area. At glacial maximum, ice was generally flowing to the west and southwest as evidenced by the orientation of flutings and drumlinoid ridges. Retreat of ice from the area occurred between 11 500 and 11 000 radiocarbon years BP (13 450 to 13 000 calendar years BP) (Dyke, 2004). The southwestern sector of the map area was deglaciated first, at which time an ice-contact meltwater channel was eroded in the underlying sediments and served as the outlet of the Keg River stage of glacial lake Peace (Mathews, 1980). Glacial lake Peace expended into the map area as ice retreated easterly and impounded the eastward drainage. The extent and elevation of this glacial lake diminished as ice retreated easterly. At some point, the level of glacial lake Peace was controlled by an outlet through the Meander River spillway at an elevation of 330 m asl, immediately north of the map area (Plouffe et al., in press). The Peace River drainage within the Caribou Creek map area was established following the eastward migration of glacial lake Peace along the retreating ice front. The river went through a cycle of aggradation and degradation leaving thick accumulation of sand and gravel in the form of paired terraces. During early post-glacial time, and prior to the development of an extensive vegetation cover, katabatic winds reworked part of the sandy sediments into eolian dunes. Following deglaciation, vegetation invaded the region and organic material accumulated. Conditions became cool enough at about 3700 radiocarbon years BP to allow for the development of permafrost in northwest Alberta (Zoltai,1993). Permafrost is still present in the hummocky bogs (unit **O¹h**). Because of the generally flat topography of the region and the continuous damming of small streams by beavers, the energy of secondary streams is low and little fluvial incision has occurred.

Granular resources are limited in this region. Granular aggregate resources extraction has already taken place in the fluvial terraces of the Peace River. Other fluvial deposits in the area are unlikely to represent potential aggregate resources as they are composed generally of sand and silt, are limited in extent, and are located near modern river level where the water table is high. The esker identified in the south east part of the map area represents a prospect for aggregate resources. For information on aggregate resources in the region, the reader should consult Edwards et al. (2004). Bedrock and sediment landslides have occurred in the escarpments of the Peace River terraces and represent natural hazards in this region.

This map represents a product of the project Shallow Gas and Diamond Opportunities in Northern Alberta and British Columbia of the Northern Resources Development Program of the Geological Survey of Canada. The project is conducted in collaboration with the Alberta Geological Survey and the British Columbia Ministry of Energy, Mines and Petroleum Resources. Surficial geology maps adjacent to the Caribou Creek map sheet include to the west (Plouffe et al., 2004), to the northwest (Paulen et al., 2005), to the north (Plouffe et al., 2007), to the northeast (Paulen and Plouffe, 2007a), and to the east (Paulen and Plouffe, 2007b). Capable field assistance was provided by Thomas Ahkimnachie, Erwin Fournier, Chris Kowalchuk, Thomas Talley, and Nicky-Lee Wasp Colin.

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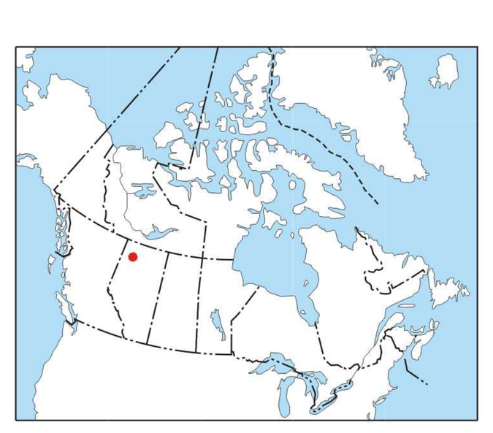


LOCATION MAP

Authors: A. Plouffe and R.C. Paulen

Geology by A. Plouffe, 2005–2006

Airphoto interpretation by A. Plouffe, 2005–2006

Digitizing and digital cartography by Géotech, Geomatic services

Digital map compilation by L. Robertson, Northern Canada Division, 2006

Digital cartography by J.D. Narraway, Data Dissemination Division (DDD)

GSC OPEN FILE 5460

EUB/AGS MAP 415

SURFICIAL GEOLOGY

CARIBOU CREEK

ALBERTA

Scale 1:100 000/Échelle 1/100 000

kilometres 2 0 2 4 6 8 kilomètres

Universal Transverse Mercator Projection
North American Datum 1983

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983

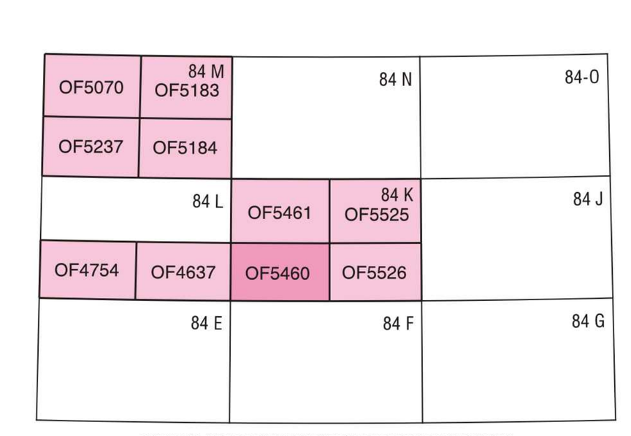
This map was produced from processes that conform to the Scientific and Technical Publishing Services Subdivision (DDD) Quality Management System, registered to the ISO 9001: 2000 standard

Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

Digital base map from data compiled by Alberta Sustainable Resource Development, modified by DDD

Mean magnetic declination 2007, 20°03'E, decreasing 21.7' annually. Readings vary from 20°25'E in the NW corner to 19°41'E in the SE corner of the map

Elevations in metres above sea level



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

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GEOLOGICAL SURVEY OF CANADA
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2007

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2007: Surficial geology, Caribou Creek, Alberta; Geological Survey of Canada, Open File 5460; Alberta Energy and Utilities Board, Alberta Geological Survey, Map 415, scale 1:100 000.