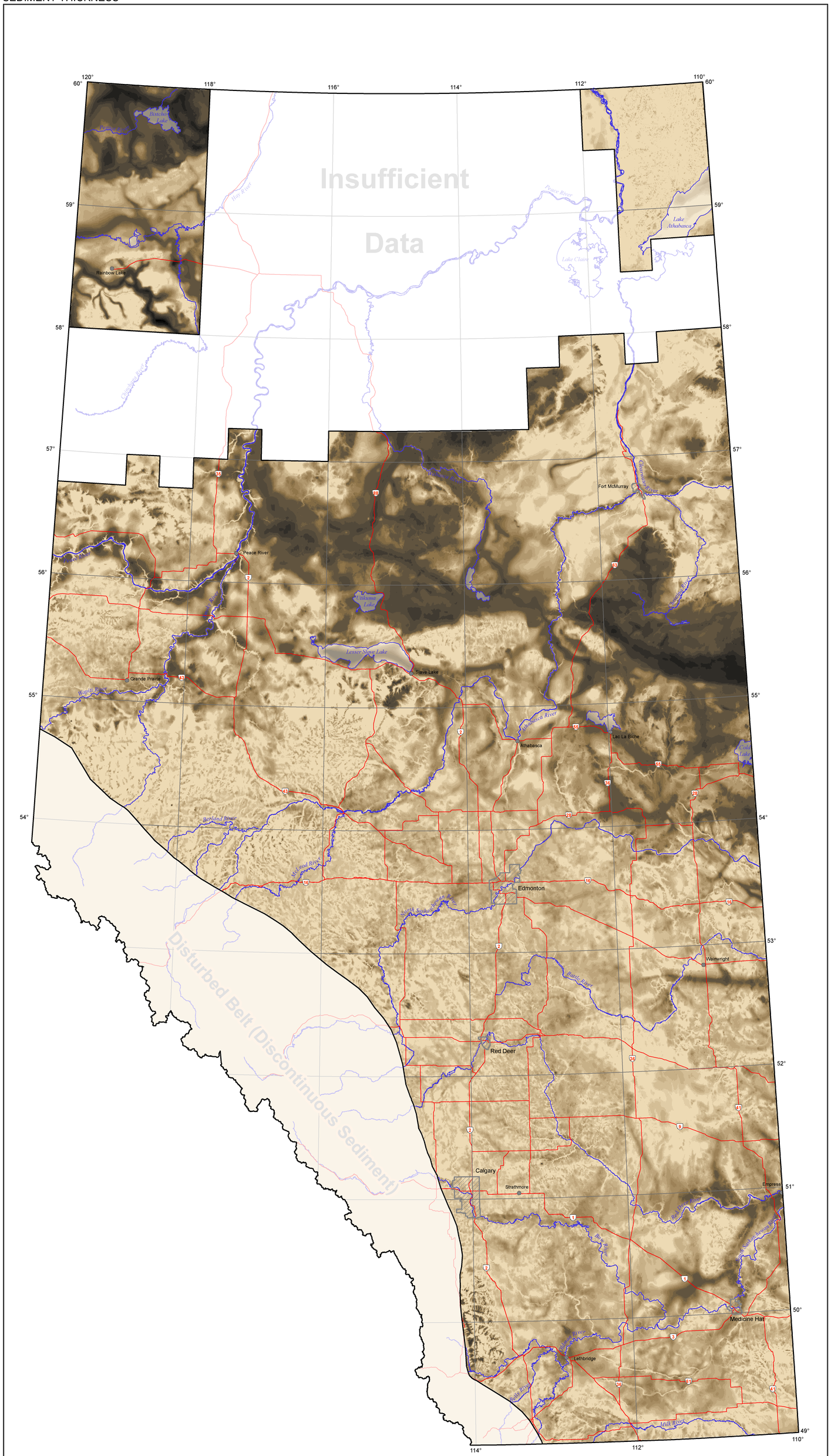
ALBERTA
SEDIMENT THICKNESS



Sediment Thickness (metres)

0 - 5	30 - 40	70 - 80	150 - 200
5 - 10	40 - 50	80 - 90	200 - 250
10 - 20	50 - 60	90 - 100	250 - 300
20 - 30	60 - 70	100 - 150	300 - 450

Introduction
This map is a rendering of a computer-generated geostatistical model of the thickness and distribution of sediment overlying bedrock in Alberta using a newly revised bedrock topography model of the province (Atkinson and Lyster, 2010). This map updates an earlier reconstruction of the sediment isopach map of Alberta (Pawlowicz and Fenton, 1995a).The incompleteness of this map reflects the absence of sufficient data to interpret part of northern Alberta.

Map Area
Alberta covers an area of approximately 662 000 km^2 and occupies the Interior Plains of Western Canada, with small components of the Canadian Shield and Western Cordillera in the northeast and southwest parts of the province respectively. To the south, Alberta borders the 49th parallel, separating it from Montana. To the north Alberta borders the Northwest Territories along the 60th parallel. To the east, Alberta is separated from Saskatchewan along the 110th meridian. To the west Alberta borders British Columbia following the 120th meridian until the Continental Divide, which the Alberta border follows to Montana.

Data Sources
This map was derived by subtracting the computer-generated geostatistical model of the bedrock topography of Alberta (Atkinson and Lyster, 2010) from the 60 m grid-spaced Shuttle Radar Topography Mission (SRTM) digital elevation model (DEM) of the present-day land surface. Data used to construct the bedrock topography model were derived from a number of sources (Atkinson and Lyster, 2010). These include stratigraphic picks made from oil and gas petrophysical logs maintained by the Energy Resources Conservation Board, lithological picks made from water-well litholog records obtained from Alberta Environment, and data derived from digitized contour interpretations from bedrock topography maps previously published by the Alberta Geological Survey.

Interpretation
The thickness and distribution of sediments overlying the bedrock surface in Alberta is highly varied, ranging from less than 1 m to as much as 445 m. These sediments include Neogene fluvial deposits, glaciogenic materials deposited during Quaternary glaciation, as well as postglacial sediments. In general, sediment thickness is greatest in the eastern and northern parts of the province, progressively thinning toward the Rocky Mountains in the southwest. The areas of thickest sediment occur along the axes of large, regionally integrated paleovalley systems, which are incised into the bedrock surface (Figure 1). These paleovalleys are infilled with 30 to 445 m thick deposits that compise stratified and nonstratified sediment, including clay, silt, sand, gravel and diamict (Andriashek, 2000; Andriashek and Atkinson, 2006; Slattery et al., 2010). The largest of these infilled paleovalley systems spans north-central Alberta and comprises two northwest-southeast–trending trunk paleovalleys (the Wiau and High Prairie-Helina), with subsidiary paleovalleys (the Red Earth and Wabasca) extending to the north. Additional subsidiary paleovalleys within this regional system extend subparallel to the trunk paleovalleys and include the Leismer, Christina and Imperial Mills. Sediment thickness along the thalwegs of paleovalleys in north-central Alberta ranges from approximately 140 to 340 m.

In northwestern Alberta, the thickest sediments are above the thalwegs of deeply incised paleovalleys (the Rainbow, Moody, Bistcho) and in the Cameron Hills (H1), Birch Mountains (H5) and Firebag Hills (D2) uplands (Pawlowicz et al., 2005; Figures 1 and 2). The thickness ranges from 100 m to as much as 445 m. In central and southern Alberta, the thickest sequences of sediment occur along two major paleovalley systems. In central Alberta, sediment thickness above the thalweg of the Wainwright paleovalley system ranges from 60 to 180 m. In southern Alberta, the deepest parts of the Lethbridge and Calgary paleovalleys are infilled with 40 to 155 m of sediment.

Elsewhere in Alberta, there is a spatial relationship between sediment thickness and the physiography of the underlying bedrock. Areas of thin sediment (less than 5 m) generally occur where the bedrock surface is near to or forms the present-day land surface. These areas include the Rocky Mountains, Front Ranges, Foothills, Benchlands and Uplands physiographic regions (Pettapiece, 1986; Figure 2). Areas of thicker sediment (greater than 5 m) typically occur across the Plain and Lowland physiographic regions (Figure 2). Exceptions to this relationship between physiography and sediment thickness occur in the Cameron Hills (H1), Birch Mountains (H5) and Firebag Hills (D2) uplands and along the Sullivan Lake (F6) and Olds (G2) plains, where sediment accumulations account for the elevated topography of the modern landscape.

In the Cameron Hills (H1), Birch Mountains (H5) and Firebag Hills (D2) uplands, sediment thickness ranges from 30 to 270 m, with the thickest sediment typically occurring on the southwestern flanks of these uplands. In contrast, sediment thickness on the Sullivan Lake (F6) and Olds (G2) plains is generally less than 5 m, particularly along two prominent low-relief corridors extending between Edmonton and Calgary to the east and west of Red Deer (c.f. Shetson, 1984). Despite relatively thin sediment cover across these plains, the intervening Cooking Lake (F16) and Drumheller (G5) uplands are covered by up to 50 m of sediment. In addition to the thick sediment identified along the thalwegs of infilled paleovalleys and on the southern flanks of the Cameron Hills (H1), Birch Mountains (H5) and Firebag Hills (D2) uplands, the sediment isopach exhibits prominent thickening along a broad arc extending from Strathmore to Medicine Hat. This arc comprises sediment ranging from 30 to 100 m thick and coincides with the position of a suite of glacial landforms originally termed the Lethbridge Moraine (Stalker, 1977), which occurs at the southern limit of the central and western corridors of thin sediment (c.f. Shetson, 1984, 1987).

Acknowledgements
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Figure 1. Bedrock topography and paleovalley distribution in Alberta
(Atkinson and Lyster, 2010)

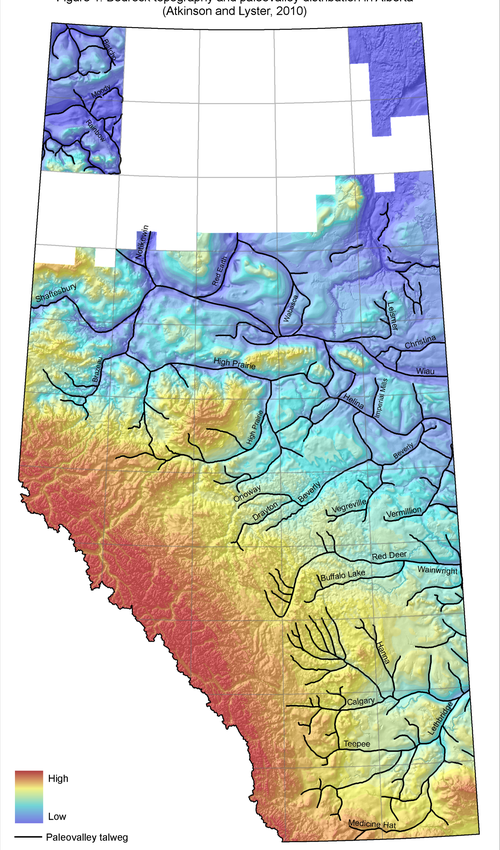
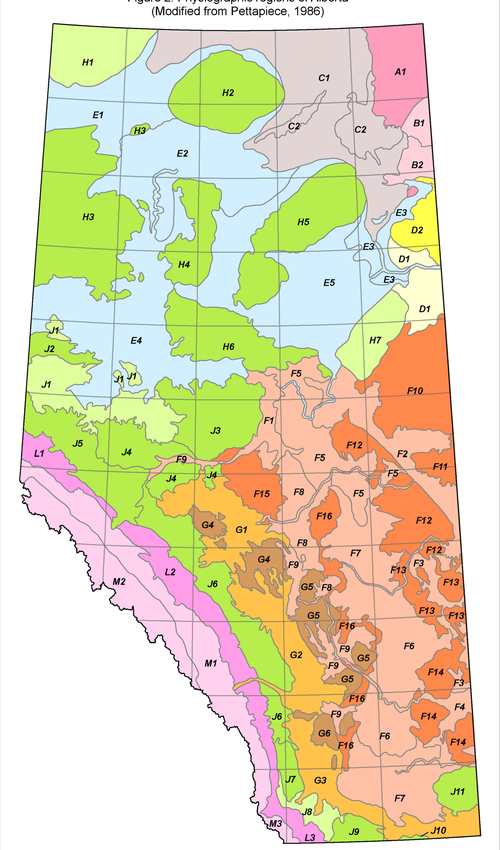


Figure 2. Physiographic regions of Alberta
(Modified from Pettapiece, 1986)



A - Kazan Upland (200 m - 400 m)
B - Athabasca Plain (210 m - 400 m)
C - Northern Plains (200 m - 350 m)
D - Saskatchewan Plains (425 m - 650 m)
E - Northern Alberta Lowlands (275 m - 750 m)
F - Eastern Alberta Plains (450 m - 950 m)
G - Western Alberta Plains (750 m - 1100 m)
H - Northern Alberta Uplands (350 m - 1050 m)
J - Southern Alberta Uplands (600 m - 1650 m)
L - Rocky Mountain Foothills (1200 m - 2000 m)
M - Rocky Mountains (1200 m - 3400 m)

A1 - Tazin River Upland
B1 - Harrison River Plain
B2 - Richardson Upland
C1 - Great Slave Plain
C2 - Delta Plains
D1 - Methy Portage Plains
D2 - Firebag Hills Uplands
E1 - Fort Nelson Lowland
E2 - Vermilion Lowland
E3 - McMurray Lowland
E4 - Peace River Lowland
E5 - Wabasca Lowland
F1 - Lesser Slave Lowland
F2 - Lac La Biche Plain
F3 - Snipe Lake Plain
F4 - Bigstick Lake Plain
F5 - Tawatinaw Plain
F6 - Sullivan Lake Plain
F7 - Coulee Plain
F8 - Edmonton Plain
F9 - Big Rivers Plains
F10 - Mostoos Hills Upland
F11 - Thickwood Hills Uplands
F12 - Vermilion Uplands
F13 - Neutral Hills Uplands
F14 - Rainy Hills Uplands
F15 - Cherhill Uplands
F16 - Cooking Lake Uplands
G1 - Drayton Plain
G2 - Olds Plain
G3 - Southwest Plains
G4 - Lodgepole Uplands
G5 - Drumheller Uplands
G6 - Blackfoot Uplands
H1 - Cameron Hills Uplands
H2 - Caribou Mountains Upland
H3 - Clear Hills Uplands
H4 - Buffalo Head Hills Upland
H5 - Birch Mountains Uplands
H6 - Utikuma Uplands
H7 - Stony Mountain Upland
J1 - Wapiti Plains
J2 - Saddle Hills Upland
J3 - Swan Hills Upland
J4 - Summit Benchlands
J5 - Grande Cache Benchlands
J6 - Western Benchlands
J7 - Porcupine Hills Upland
J8 - Cardston Plain
J9 - Milk River Upland
J10 - Sweetgrass Upland
J11 - Cypress Hills Upland
L1 - Northern Foothills
L2 - Central Foothills
L3 - Southern Foothills
M1 - Front Ranges
M2 - Park Ranges
M3 - Border Ranges

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Copies of the map may be obtained from:
Information Centre
Alberta Geological Survey
Telephone: (780) 422-1927
Website: www.ags.gov.ab.ca

Map 551

Thickness of Quaternary and Neogene Sediment in Alberta, Canada

Geology compiled by: N. Atkinson and S. Lyster

Scale 1:1 500 000

0 25 50 100 150 200 kilometres
0 12.5 25 50 75 100 miles

Projection: 10 Degree Transverse Mercator
Datum: North American Datum, 1983

ERCB Energy Resources Conservation Board | AGS Alberta Geological Survey

Recommended Reference Format
Atkinson, N. and Lyster, S. (2010): Thickness of Quaternary and Neogene sediment in Alberta, Canada; Energy Resources Conservation Board, ERCB/AGS Map 551, scale 1:1 500 000.