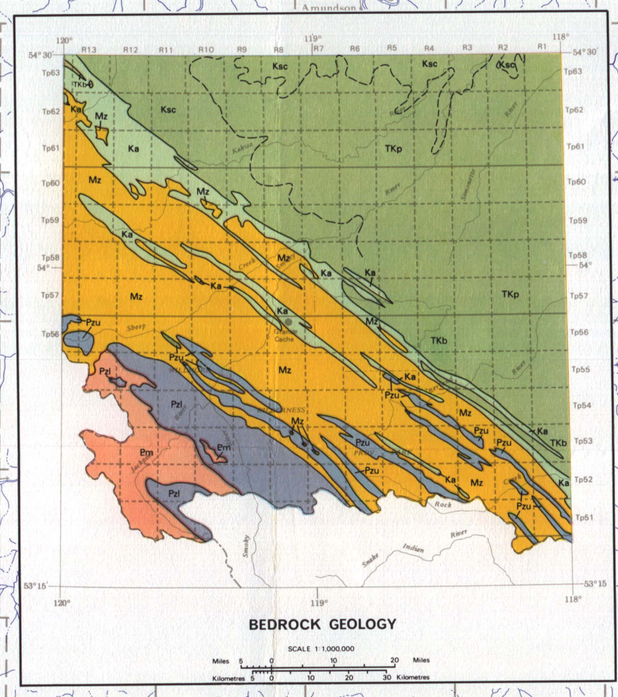

SCALE 1 250 000

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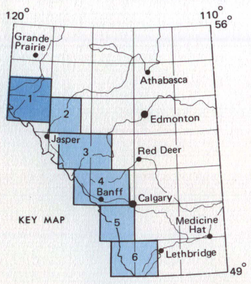
Kilometres 5 0 5 10 15 20 25 30 Kilometres

SURFICIAL GEOLOGY ALBERTA FOOTHILLS AND ROCKY MOUNTAINS

SHEET NO. 1



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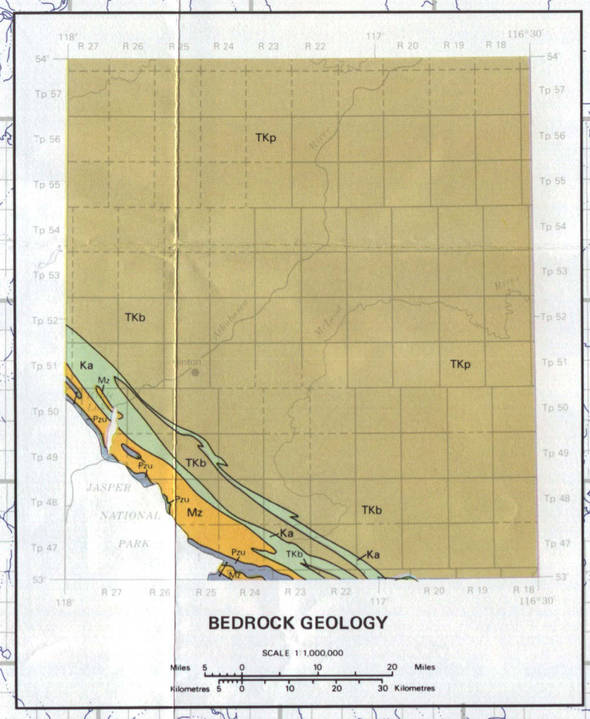

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Kilometres 5 0 5 10 15 20 25 30 Kilometres

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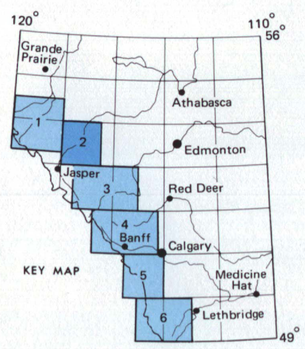
SURFICIAL GEOLOGY ALBERTA FOOTHILLS AND ROCKY MOUNTAINS

SHEET NO. 2

Alberta ENVIRONMENT

Alberta RESEARCH COUNCIL



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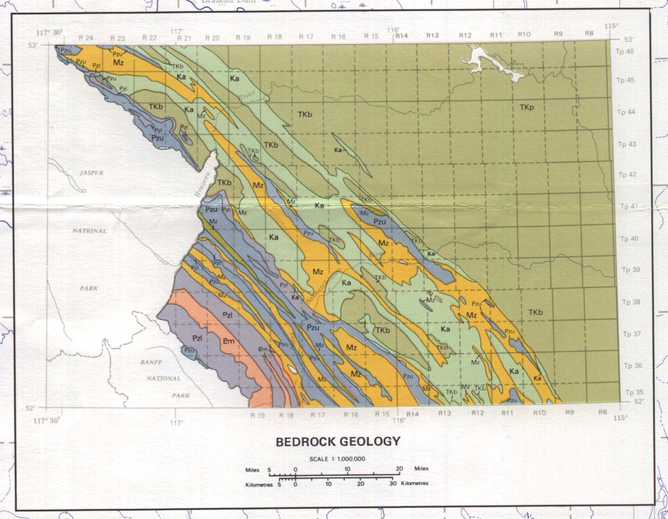
Published in 1980



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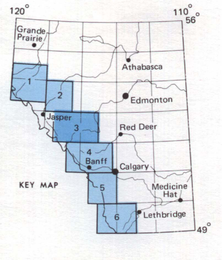
Kilometres 5 0 5 10 15 20 25 30 Kilometres

SURFICIAL GEOLOGY ALBERTA FOOTHILLS AND ROCKY MOUNTAINS

SHEET NO. 3



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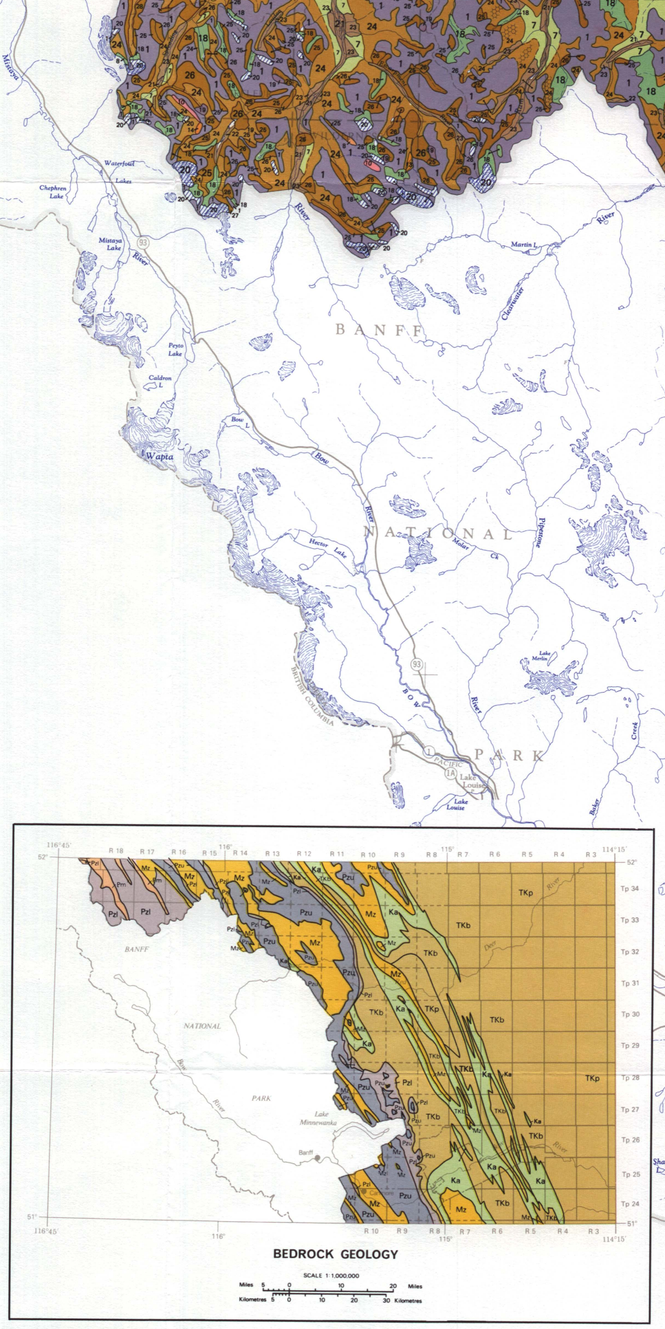

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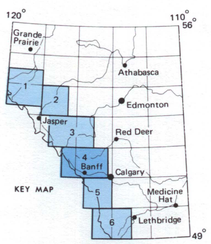
SURFICIAL GEOLOGY ALBERTA FOOTHILLS AND ROCKY MOUNTAINS

SHEET NO. 4



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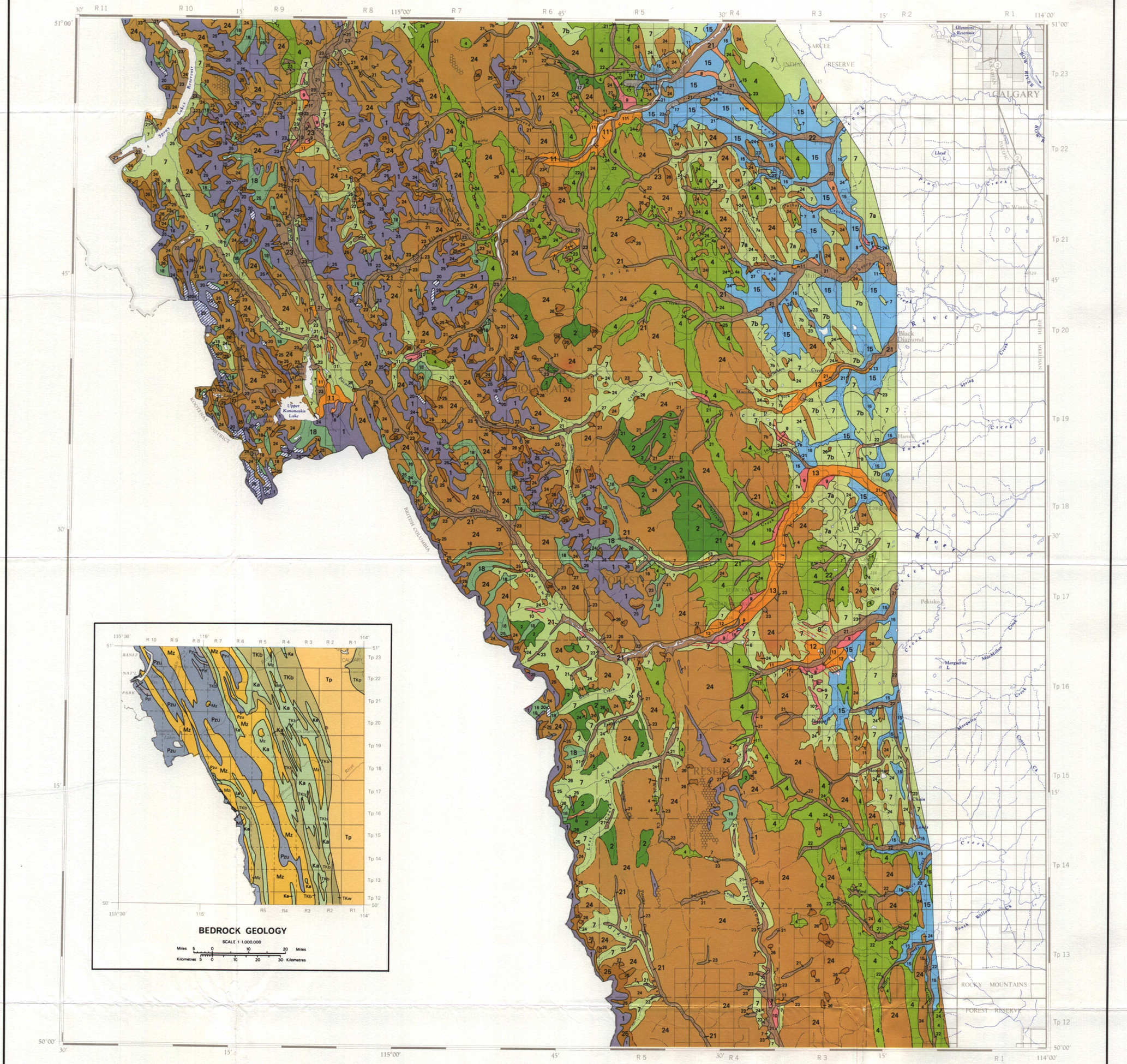

BEDROCK GEOLOGY

SCALE 1:1,000,000

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Kilometres 5 0 10 20 30 Kilometres

SCALE 1:250,000

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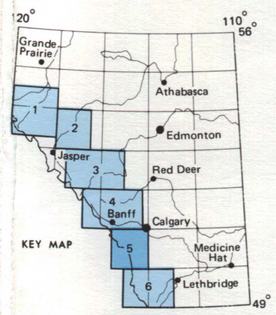
Kilometres 5 0 5 10 15 20 25 30 Kilometres



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SURFICIAL GEOLOGY ALBERTA FOOTHILLS AND ROCKY MOUNTAINS

SHEET NO. 5

Alberta ENVIRONMENT

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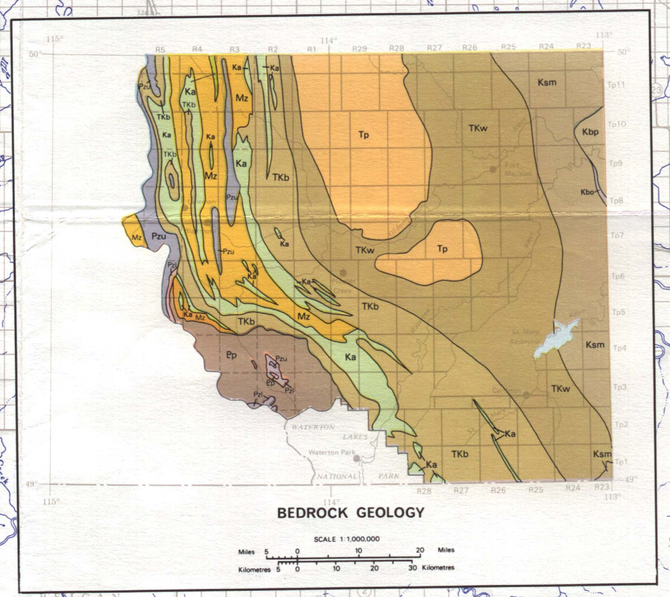

SCALE 1:250,000

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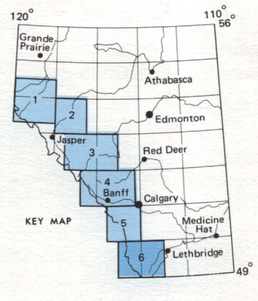
SURFICIAL GEOLOGY ALBERTA FOOTHILLS AND ROCKY MOUNTAINS

SHEET NO. 6



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SURFICIAL GEOLOGY

UNIT NUMBER	UNIT NAME	DESCRIPTION	TOPOGRAPHY		THICKNESS	COMMENTS AND LABORATORY DATA
			Morphology	Relief		
27	Landslide deposits	(a) slumping of the unconsolidated sediment along the river banks; (b) sliding of bedrock in the eastern Foothills; sediment is generally Mesozoic clastics and/or Quaternary sediment. (not shown are numerous small slides in the areas underlain by glaciolacustrine sediment)	step-like in the upper part and hummocky at base of slide	variable	thin upper part but may be greater than 6 m near base	unsuitable for construction as may fail again
26	Rockslide deposits	accumulations of extremely coarse rubble produced by rapid downslope movement of large portions of the bedrock on steep mountain slopes; confined mainly to the Rocky Mountains; only a few in the Foothills	hummocky	high; generally greater than 3 m	thin upper part but may be greater than 6 m near base	sediment may be susceptible to further movement if disturbed
25	Talus	accumulations of coarse rock debris on the lower portions of steep cliffs; present mainly in the Rocky Mountains; unit is restricted to active talus deposits with forest covered slopes classified as colluvium; composition is a reflection of the source bedrock with carbonate rock predominant and quartzite or schist in only a few areas	cones, or aprons if the cones coalesce	greater than 30 m	thin upper part but may be greater than 30 m near base	sediment may be susceptible to further movement if disturbed
24	Colluvium	soil and rock creep material overlying bedrock; composition is determined by the underlying bedrock and ranges from predominantly weathered carbonates in the Rocky Mountains to weathered sandstone, siltstone, and shale in the Foothills; often has poor to well defined layering parallel to slope; term is here restricted to bedrock-derived sediment; colluvium derived from surficial materials is grouped with that sediment	reflects underlying bedrock	low	1.5 m on 15-45 percent slopes, but may exceed 3 m at the base of long slopes	matrix texture: sand 60 percent (S=20, N=108); clay 10 percent (S=8); liquid limit 31.4 (S=9, N=82); plastic limit 23.5 (S=5)(1)
	Patterned ground	terrain, usually bedrock, that has been subjected to periglacial processes producing stone stripes, polygons and related features; confined to the alpine regions above tree line and high elevation plateaus; small areas relatively common but only large areas mapped	reflects underlying bedrock	generally less than 1 m		periglacial processes thought to be inactive
23	Alluvial fans and aprons	accumulations of sediment where steep gradient streams emerge from mountainous terrain; generally deposited along the sides of major valleys in the Rocky Mountains, forming high slopes, and adjacent areas of the Foothills, forming lower slopes; sediment varies from large blocks to sand and minor fine material	cone or apron	greater than 30 m	greater than 30 m	matrix texture: sand 61 percent (S=29, N=11); clay 10 percent (S=7)
22	Fine stream alluvium	non-glacial sediment deposited along the banks of the small streams and, in places, overlying the coarser alluvium on the larger streams; generally sand to clay with local minor gravel or organic material	flat to rolling low relief	generally less than 2 m	2 to 7 m	generally unsuitable for aggregate because of low proportion of gravel
21	Coarse stream alluvium	non-glacial fluvial sediment deposited along most streams in the Rocky Mountains and major streams in the Foothills; forms terrace and valley bottom deposits; sediment consists of gravelly sand to gravel; in places overlain by 0.25 to 2 m of fine alluvium; clasts are generally well rounded carbonates and quartzites in the mountains but in the Foothills contain some clasts derived from Mesozoic clastics	flat to rolling low relief	generally less than 2 m	greater than 3 m and may locally be considerably thicker along the Athabasca, North Saskatchewan, Red Deer, Bow and Oldman Rivers	most important source of construction aggregate throughout the area matrix texture: sand 75 percent (S=18, N=8); clay 5 percent (S=5)
20	Glaciers	small cirque glaciers, with ice-cored moraine in front	variable	variable	variable	
19	Rock glaciers	accumulations of angular talus subject to slow glacier-like movement; all are vegetation free and active with evidence of recent movement (inactive rock glaciers are classified with the talus); sediment varies from large blocks to sand size	rolling to hummocky	moderate	variable, generally greater than 3 m	
18	Cirque tills	till deposited throughout the basin or at the threshold of cirques and in front of the existing large glaciers; till is extremely coarse grained – approaching rubble – and composed almost entirely of carbonate or quartzite depending on the local bedrock; sediment is believed to have been deposited since Altithermal time	rolling to hummocky	variable, generally less than 10 m	variable	
17	Organic deposits	fens and bogs containing mainly peat with minor fine lacustrine at the base; generally confined to the valley bottom	flat to rolling	generally less than 1 m	generally greater than 4 m	
16	Eolian deposits	sand to loess; relatively rare; present only south of Lake Brule, south of Castle River, north of Waterton Park, and adjacent to the Bow River near Seebe	hummocky or reflects underlying topography	generally less than 2 m	variable, generally less than 2 m	texture of sand: sand 66 percent; clay 8 percent

(1) S = standard deviation, N = number of samples

SURFICIAL GEOLOGY

UNIT NUMBER	UNIT NAME	DESCRIPTION	TOPOGRAPHY		THICKNESS	COMMENTS AND LABORATORY DATA
			Morphology	Relief		
15	Glaciolacustrine deposits	sediment deposited in glacial lakes; generally clayey silt with minor sand; majority of deposits are in the eastern Foothills	15 - flat to low relief 15a hummocky to pitted	less than 1 m variable, locally greater than 10 m	3 to 6 m greater than 20 m	matrix texture: sand 18 percent (S=8, N=34); clay 35 percent (S=20); liquid limit 44.7 (S=13, N=31); plastic limit 24.8 (S=5)
14	Lag gravel	thin and discontinuous gravel lying on some of the river terraces in both the Foothills and Mountains 14a rock defended terrace: terrace composed almost entirely of bedrock with a lag cover	level to rolling level to rolling	less than 2 m less than 2 m	1 to 2 m 1 to 2 m	of little economic importance because thin and discontinuous
13	Valley train	glaciofluvial sediment confined within a valley; generally well rounded boulders and cobbles composed chiefly of carbonate rocks	flat to rolling	less than 2 m	variable, greater than 16 m in places	excellent source of aggregate and good groundwater potential
12	Pitted outwash deposits	well sorted and rounded glaciofluvial gravel	pitted	variable	generally greater than 3 m	
11	Outwash plains	well sorted and rounded glaciofluvial gravel confined to broad major valleys	relatively level plain not bounded by topography	generally less than 2 m	generally greater than 15 m	source of aggregate but may contain a high proportion of sand in many places
10	Eskers	sinuous ridges of glaciofluvial sediment composed of rounded pebbles and cobbles with minor sand; width 100 to 150 m; rare, present mainly along major valleys	ridge or a complex of ridges	generally 15 m but locally greater than 30 m	generally 15 m but locally greater than 30 m	source of aggregate but may contain a high proportion of sand and or silt and clay in places
9	Kames, kame terraces and kame moraines	ice contact glaciofluvial deposits; composed of well rounded glaciofluvial gravel with locally, large proportions of silt, till or rubble; often poorly sorted; relatively common throughout the area but confined mainly to the major valleys	isolated hills to hummocky terrain	variable, generally greater than 2 m	variable	often a source of low quality aggregate due to the poor sorting
8	Meltwater channel deposits	short and discontinuous channels cut into the bedrock; deposits are mainly gravel with minor sand; generally confined to the channel floor and covered by lacustrine and/or organic material	flat to rolling	generally less than 1 m	2 to 3 m	of limited economic importance because deposits are relatively thin and often covered by lakes or wetland
	Till units	unsorted sediment deposited by the glacier; contain clay to boulder size material; composition generally reflects underlying bedrock				
7	Slightly leached till, Cordilleran provenance	silty sand till; clasts-carbonate and clastic rocks; leached 15-45 cm; 7 ground moraine and lateral moraine, 7a hummocky moraine; 7b undifferentiated moraine, leached 45-90 cm; unit is present along the major valleys; likely late Wisconsin age	fresh; 7 flat to rolling, 7a hummocky, 7b variable	7 generally less than 3 m; 7a and 7b variable	variable for all subunits	matrix texture: sand 50 percent (S=19, N=180); clay 17 (S=11.1)
6	Schist till, Cordilleran provenance	fine grained till containing over 50 percent schist with no carbonates; present only in the headwater region of Sheep Creek, Willmore Wilderness Park; believed to be of late Wisconsin age	fresh; variable	variable	unknown less than 1 m	matrix texture: sand 50 percent (S=19, N=180); clay 17 (S=11.1)
5	Slightly leached till, Continental provenance	silty till, leached 45 to 90 cm, clasts include granitic rock	fresh; variable	variable	variable	matrix texture: sand 50 percent (S=19, N=180); clay 17 (S=11.1)
4	Moderately leached till, Cordilleran provenance	silty sand till, leached 0.5 to 1.5 m, clasts are carbonate and clastics, 4 ground moraine, 4a hummocky moraine	subdued; (4) flat to rolling, (4a) hummocky	4 generally less than 3 m; 4a variable, generally greater than 3 m	variable for all subunits	matrix texture: sand 49 percent (S=17, N=64); clay = 19 (S=10); liquid limit (S=30, N=61); plastic limit 19.3 (S=3.8)
3	Moderately leached till, Continental provenance	sandy silt to silty sand till, leached 0.5 to 1.5 m; clasts include granitic rocks; 3 ground moraine, 3a hummocky moraine; present mainly on level to gently sloping ground in the broad valleys of the Foothills; pre late Wisconsin age	subdued; 3 flat to rolling, 3a hummocky	3 generally less than 3 m; 3a variable, generally greater than 3 m	variable for all subunits	matrix texture: sand 49 percent (S=17, N=64); clay = 19 (S=10); liquid limit (S=30, N=61); plastic limit 19.3 (S=3.8)
2	Deeply leached till, Cordilleran provenance	silty sand till; till reflects composition of the underlying bedrock, high proportions of quartzite cobble on the Tertiary plateau, abundant fine-grained material where overlying shales, siltstones, and sandstones; leached more than 1.5 m; where unleached, till contains 20 to 50 percent carbonate pebbles and resembles the slightly leached till (in a few places till contains granitic clasts providing evidence of early advance of a Continental glacier); present on the relatively flat uplands above 1500 m; Paleozic erratics representing the erosional remnants of these early tills have been found on cols at elevations up to 2600 m; likely pre-Wisconsin age	glacial-type topography absent, blends with the non-glacial topography of area	reflects underlying material	greater than 2 m	matrix texture: sand 49 percent (S=15, N=120); clay 18 percent (S=9); liquid limit 30.3 (S=7.2, N=105); plastic limit 10.4 (S =6.06)
1	Bedrock	in the Rocky Mountains predominantly Paleozoic age carbonates and quartzites; in the Foothills Mesozoic age shale, siltstone, and sandstone with minor coal and limestone	variable: flat to rolling plateaus to mountains	variable: high in Mountains, moderate in Foothills		

BEDROCK GEOLOGY

For description of units see Green, R. (1972): Geological map of Alberta; Research Council of Alberta map, scale 1 inch to 20 miles

TERTIARY AND CRETACEOUS

- Tp — Porcupine Hills Formation
- TKp — Paskapoo Formation
- Ksc — Scollard Member
- TKw — Willow Creek Formation
- TKb — Brazeau Formation

CRETACEOUS

- Ksm — St. Mary River Formation
- Kbo — Blood Reserve Formation
- Khc — Horseshoe Canyon Formation
- Kbp — Bearpaw Formation
- Ka — Alberta Group

MESOZOIC

- Mz — Lower Cretaceous, Jurassic and Triassic undifferentiated units

PALEOZOIC

- Pzu — Upper Paleozoic undifferentiated units
- Pzl — Lower Paleozoic undifferentiated units

PRECAMBRIAN

- Pm — Miette Group
- Pp — Purcell Group

LEGEND: SURFICIAL GEOLOGY ALBERTA FOOTHILLS AND ROCKY MOUNTAINS

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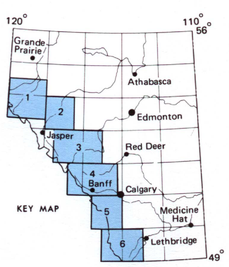
- Geological boundary: defined
- approximate
- assumed
- Glacial feature indicating ice movement:
- direction known
- direction unknown
- River or stream
- Intermittent river or stream
- Lake
- Intermittent lake
- Glacier
- Road, hard surface, all weather
- Railway
- Township boundary
- Section line
- Provincial boundary
- National boundary