Energy, Mines and Resources Canada
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Geological Survey of Canada
Commission géologique du Canada

DESCRIPTIVE NOTES

The Cormorant Lake, Manitoba-Saskatchewan map area is situated along the contact between Precambrian and Paleozoic rock, which results in a marked difference in topography between the northern and southern zones. The northern part of the map area is controlled by the Precambrian rocks of the Flin Flon greenstone belt. This belt is rich in mineral deposits with mines currently operating at Flin Flon, Embury Lake, Westarm (Athapapuskow Lake), White Lake, Spruce Point (Reed Lake), Chisel Lake, Ghost Lake, and Namew Lake. Hudson Bay Mining and Smelting Company operates a smelter at Flin Flon

The physiography of the map area is primarily determined by the bedrock. The area north of the Precambrian-Paleozoic contact consists of irregular topography with numerous bedrock outcrops. Relief is about 30 m north of Flin Flon but towards File and Reed lakes the topography becomes more subdued and outcrops are less common. Drainage in this area is northeast towards Hudson Bay. In the area underlain by Paleozoic rocks, in the southern half of the map area, the topography is considerably flatter with fewer outcrops than in the north. This area drains southwards to Lake Winnipeg

The bedrock in the north half of the map area consists of a complex assortment of intrusive and metavolcanic rocks which make up the Flin Flon greenstone belt. In the southern half, the Precambrian rocks are overlain by Ordovician dolomite and limestone (Manitoba Mineral Resources Division, 1979)

Three tills have been described in the study area. Wanless Till (Nielsen and Groom, 1987) is found predominantly in the western part of the map area. It is grey, composed of primarily sand and silt sized sediments, has an abundance of Precambrian clasts, and contains a varying amount of local source carbonate clasts that increases with distance from the Precambrian-Paleozoic contact. The abundance of Precambrian clasts indicates a Keewatin provenance. Clearwater Till (Nielsen and Groom, 1987) is found throughout the eastern half of the map area. It is a brown, silt and clay dominated till with a high percentage of carbonate clasts. There is generally an absence of granitic clasts but it contains Omarolluk greywacke derived from eastern Hudson Bay, indicating a Hudson ice provenance. Crossing striae in the Reed Lake, Simonhouse Lake, and Goose Lake areas indicate that the Keewatin ice advance from the north predated the final Hudson ice advance from the east. Striae trending between 282° and 289° have been measured between Goose Lake and Reed Lake, in the Naosap Lake area, and south of the map area near the town of Moose Lake. These westerly trending striae predate the Keewatin ice advance. Exposures of an older till that might have been deposited during this advance were not identified. Arran Till (Klassen, 1979), which occurs in the southeast part of the map area, has a distinct reddish colour, silty texture, and composition that is dominated by a high percentage of local carbonate clasts. This till was deposited over Clearwater Till by a readvance of Hudson ice

The main ice contact deposit is the Reed Lake moraine. The moraine is composed primarily of light brown sand with a minor gravel component and is veneered by horizontally bedded beach sands over most of its length. The flat topped nature of the ridge, combined with its large lateral extent, suggests extensive modification by glacial Lake Agassiz. In addition, small pockets of dark brown to grey lacustrine clay are found in places within the reworked materials. The Reed Lake moraine appears to be a southward extension of the Leaf Rapids interlobate moraine (Kaszycki and DiLabio, 1986) but it has not been possible to correlate it with The Pas moraine to the south. The only sand and gravel deposit between the Reed Lake and The Pas moraine is bouldery outwash, about 1.5 m thick, located near Cowan Bay. These outwash sediments appear to have been deposited against a bedrock ridge, possibly as a subaqueous fan, during an ice advance from the north.

The northern limit of The Pas moraine lies about 18 km northeast of the town of Wanless. From here it extends some 300 km south to Long Point in Lake Winnipeg. The moraine reaches 335 m elevation east of Wanless (Nielsen and Groom, 1987). The Pas moraine is composed predominantly of Clearwater Till, although large deposits of sandy and gravelly Lake Agassiz beach sediments are found on it

The other main sand and gravel deposits in the area are subaqueous outwash fans around Naosap Lake (Groom, 1986) and pebbly outwash trains, possibly related to meltwater channel deposition, near Saskoba Lake

Glaciolacustrine clay deposits occur in the northeastern part of the map area where dark brown to grey, fine grained sediments overlie till and bedrock. Elson (1967) mapped this area as the western end of Grass River sedimentary basin. Thickness of clay sediments could not be established because of a lack of stratigraphic sections. Another glaciolacustrine clay belt, which occurs in the Rocky Lake area, is composed of a light brown to grey, weakly calcareous clay and silty clay, which was probably transported by the Saskatchewan River from a sediment source to the west. This deposit is 60 to 80 cm thick (Singhroy and Werstler, 1980)

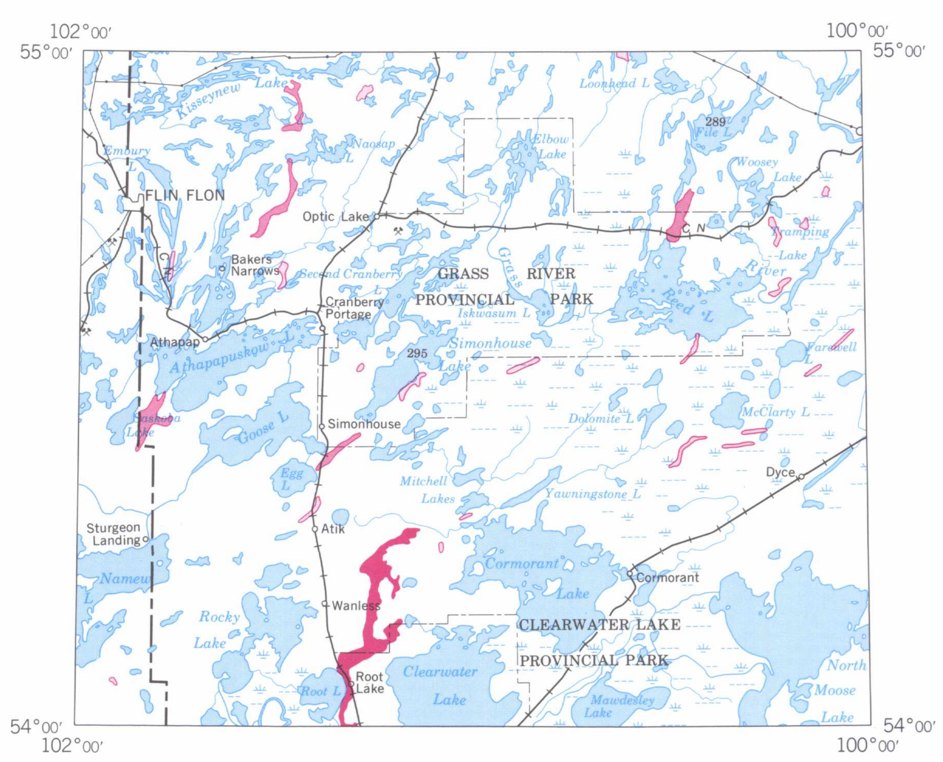
Nearshore glaciolacustrine deposits are found sporadically in the eastern part of the study area as minor beach ridges, but the major nearshore deposits in the region occur on the western flanks of The Pas moraine. Six separate beach levels, ranging from 340 to 290 m a.s.l. and documenting the retreat of Lake Agassiz, have been recorded on the moraine north of The Pas (Nielsen and Groom, 1987). The beach sediments are horizontally bedded with a highly variable sand to gravel content ratio

Alluvial sediments constitute a minor component of the surface deposits but are most prevalent along streams in the Moose Lake - Mawdesley Lake region. These sediments are much more abundant directly south of the study area in the Saskatchewan River delta

Bog and fen deposits are widespread in the region, particularly south of the Paleozoic-Precambrian boundary. The organic deposits commonly mantle the till and clay deposits

The oldest ice flow in the region is recorded by striations oriented toward the west-nrothwest; however, no till in the study area could be attributed to this ice flow. Striations of similar relative age and orientation have also been found as far east as northern Ontario (Thorliefson and Wyatt, 1988) and as far west as Saskatchewan (Johnston, 1978). This event was followed by an ice advance of Keewatin provenance toward the south-southeast resulting in the deposition of the Wanless Till. Hudson ice then invaded the area from the northeast, depositing the Clearwater Till. Reed Lake moraine possibly formed at the confluence of the Keewatin and Hudson ice masses. Evidence of this confluence is found in crossing striae in the Wanless and Simonhouse Lake area (Nielsen and Groom, 1987). During a pause in the retreat of Hudson ice, The Pas moraine was formed. The recession of the Keewatin and Hudson ice masses was followed by a readvance of Hudson ice over The Pas moraine which resulted in a series of parallel flutes on top of, and perpendicular to the orientation of, the moraine. Arran Till is found in these flutes and as far west as the Pasquia basin, west of the town of The Pas, to the south of the study area. Reworking of this till by a later minor readvance of Keewatin ice has resulted in a series of south-southeasterly trending drumlins composed of Arran Till in the Pasquia basin. The recession of these youngest ice masses then allowed the incursion of glacial Lake Agassiz into the area, permitting the depostion of the glaciolacustrine silt and clay, and the formation of the beach deposits

Werstler (1980) and Groom (1986) studied the quality and availability of aggregate resources in the map area and have established various sources of sand and gravel that could meet local requirements for many years. The quality of the presently accessible resources has not always been suitable, however, and bedrock quarries have often been used as a source for aggregate material



POTENTIAL AGGREGATE RESOURCES

SAND AND GRAVEL DEPOSITS

High potential for economic feasibility: large volume ice contact and esker deposits. Ideally, gravel content is greater than 35%, oversize gravel (>10 cm diameter) content is less than 20%, and lithological deficiencies (i.e., chert, shale, mica, etc.) are minimal

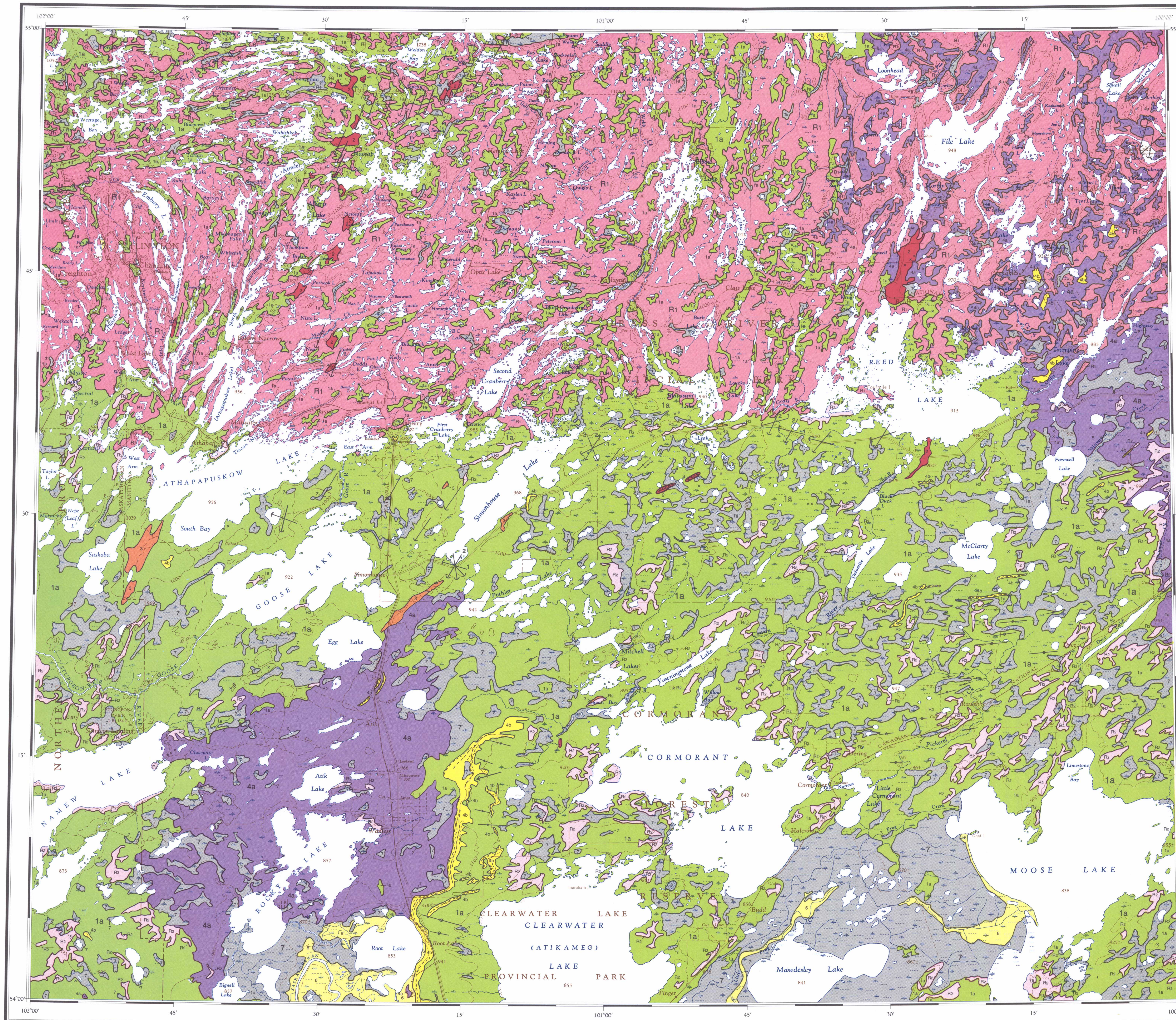
Medium potential for economic feasibility: small volume ice contact and esker deposits and large volume nearshore lacustrine and nearshore marine deposits. Deposit lacks either in volume or quality of aggregate to be considered of high potential

Low potential for economic feasibility: small volume nearshore lacustrine or nearshore marine deposits and small volume ice contact and esker deposits

Contribution to Canada-Manitoba Mineral Development Agreement 1984-89, a subsidiary agreement under the Economic and Regional Development Agreement. Project funded by the Geological Survey of Canada

Manitoba Energy and Mines

Canada



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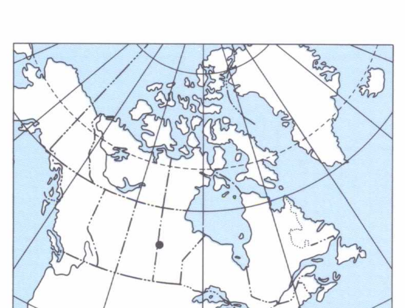

INDEX MAP

Geology by M.D. Clarke, 1987

Thematic information on this map is reproduced directly from author's copy

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

Base map at 1:250 000 published by the Surveys and Mapping Branch in 1965
Base map at 1:1 000 000 published by the Surveys and Mapping Branch in 1972

MAP 1699A

SURFICIAL GEOLOGY

CORMORANT LAKE

MANITOBA-SASKATCHEWAN

Scale 1:250 000 - Échelle 1/250 000

Kilometres 5 0 5 10 15 20 Kilomètres

Universal Transverse Mercator Projection
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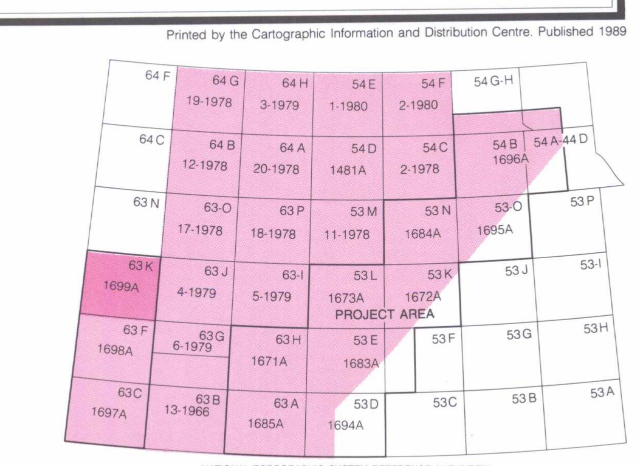
Mean magnetic declination 1989′ 11°05′ East, decreasing 10.1′ annually. Readings vary from 09°54′E in the SE corner to 12°18′E in the NW corner of the map

Elevations in feet above mean sea level



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

LEGEND

Coloured legend blocks indicate map units that appear on this map

SURFICIAL DEPOSITS
QUATERNARY

HOLOCENE

NONGLACIAL ENVIRONMENT

8 — *LACUSTRINE DEPOSITS: sand, muddy sand and pebbly sand; up to 2 m thick; occurs as sloping or gently undulating plain; nearshore sediments associated with modern lakes*

7 — *ORGANIC DEPOSITS: lichen-moss, sedge, and woody peat; 1.5 to 3 m thick; may occur at or up to 3 m above the water table; includes both bog peat and fen peat; peat mantles most geological features*

6 — *ALLUVIAL DEPOSITS: silt, sand and rounded gravel, commonly terraced; thicknesses range from a thin veneer up to 30 m; deposited by streams within active drainage systems since the retreat of the sea, proglacial lakes, or glacial ice as floodplains, spits, point bars, and deltas*

NONGLACIAL AND GLACIAL ENVIRONMENT

MARINE/GLACIOMARINE DEPOSITS: well sorted, stratified sand to stony silt deposited in Tyrrell Sea, and glacial deposits modified by marine processes during offlap; commonly overlain by peat

5b — *Nearshore sediments: well sorted silt, sand, and gravel; up to 3 m thick; occurs as a series of ridges in the form of beaches, bars, spits, and ice-pushed ridges, or as a flat plain*

5a — *Offshore sediments: poorly sorted clayey silt, stony silt, and sand with pockets of nearshore sand and gravel and windblown sand; probably a till plain levelled by filling of depressions and planation by wave action; thicknesses of up to 2 m near marine limit and increasing towards Hudson Bay to a maximum of 7 m; may contain marine fossils; commonly overlain by organic materials*

LACUSTRINE/GLACIOLACUSTRINE DEPOSITS: massive to bedded silt-clay with granules, overlain by a veneer of sand. Deposited in glacial Lake Agassiz; where deposits are thin, they mirror the underlying glacial and bedrock structures, and where thick, they form a flat plain

4d — *Littoral sediments: blanket of sand grading basinward into undifferentiated silt and clay*

4c — *Nearshore sediment veneer: well sorted sand and gravel; occurs as a ridge or series of ridges with 1 to 4 m relief on wave washed glaciofluvial deposits predating glacial Lake Agassiz*

4b — *Nearshore sediments: well sorted sand and gravel; occurs as a ridge or series of ridges with 1 to 4 m relief; includes beaches, bars, spits, and ice-pushed ridges*

4a — *Offshore sediments: well sorted clay, silt, and sand; thickness ranges from a thin veneer up to 20 m; surface characterized by iceberg scours and extensive areas of peat*

LATE PLEISTOCENE

GLACIAL ENVIRONMENT

GLACIOFLUVIAL DEPOSITS: water sorted, stratified sand and gravelly sand deposited in, around, or near a glacier, largely as a result of meltwater flow

3 — *Outwash sediments: well rounded, cross-stratified sands and gravels, 3 to 20 m thick, characterized by braided channels and kettle depressions; occurs along the flanks of eskers or in the bottom of subglacial and proglacial meltwater channels; surfaces are commonly terraced and hummocky*

2 — *Ice contact stratified drift: well sorted, poorly stratified sand and gravel kame deposits, 10 to 30 m high, stratified sand and minor gravel esker deposits, 5 to 20 m high, and recessional, end, or interlobate moraines; kames occur as irregular mounds flanking eskers; eskers occur as elongate ridges generally parallel to the direction of ice movement*

GLACIAL DEPOSITS (TILL): poorly sorted debris deposited at the front of or beneath glaciers or under ice shelves. The tills in the western part of the province are sandy to silty sand and have a high percentage of clasts derived from granitic terrain; the tills in the eastern part are generally silty and highly calcareous

1b — *Till blanket: silty to sandy, 1 to 10 m thick; masks most bedrock features; surface features include drumlins, fluting, ribbed moraine, and hummocks*

1a — *Till veneer: sandy, usually less than 1 m thick, interspersed with areas of thicker till, bedrock, marine, or lacustrine sediments; surface reflects the underlying bedrock structure*

BEDROCK
PRE-QUATERNARY

R_2 — *Paleozoic rock: sedimentary carbonate rocks; dolomitic limestone and dolomite*

R_1 — *Precambrian rock: largely massive granitic and gneissic rock with isolated bands of volcanic rock*

Geological boundary
Small bedrock outcrop
Striae (ice flow direction known)
Crossed striae (1 being the oldest)
Drumlin
Fluting
Crag and tail (direction of ice flow known)
Roche moutonnée
Esker (direction of flow known)
Beach ridge

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