Energy, Mines and Resources Canada / Énergie, Mines et Ressources Canada

Geological Survey of Canada
Commission géologique du Canada

DESCRIPTIVE NOTES

The surficial deposits of the Island Lake-Opasquia Lake map area are characterized by thick glaciolacustrine sediments deposited during inundation by glacial Lake Agassiz. The region is covered by dense boreal forest and numerous low bog and fen areas. Over most of the study area, the topography is flat but greater relief is found in the area of bedrock-controlled topography around Island Lake. The area slopes gently from maximum elevations of about 300 m a.s.l. in the south to 228 m a.s.l. at Island Lake. Drainage is poor and flow is through Island Lake towards Hudson Bay. Gunisao River and its tributaries in the western part of the study area are an exception, as they drain westward into Lake Winnipeg

Three small communities are situated on the shores of Island Lake; Island Lake (Garden Hill), St. Theresa Point, and Waasagomach are accessible only by air or winter road, but transportation between these three is possible by boat

The study area is situated within the Superior Province of the Canadian Shield. Most bedrock outcrops consist of granite and granodiorite but several belts of other Precambrian rocks also are present. These most commonly are volcanic rocks, predominantly basalt and andesite, which commonly are associated with greywackes and complexes of granitized gneiss and schist of sedimentary origin. East-west trending belts of this type are found in the vicinity of Island Lake, in a long belt extending from east of Island Lake to beyond Stevenson Lake, and east of Hudwin Lake through the Gorman Lake area. Volcanic rocks are also found around and east of Bigstone Lake and south east of Benson Bay. Smaller belts of arkose, feldspathic quartzite, and quartzite dominated rocks are situated north of Island Lake. A more detailed description of the bedrock geology is given in Herd et al. (1987). Evidence of ice flow direction is rare on the weathered outcrops, but a few striations have been identified indicating that the main ice flow direction was towards 200° (Nielsen, 1980)

Field investigations were conducted at 32 sites and were primarily concerned with either the lateral extent of one of three end moraine systems in the area or with establishing the thickness of glaciolacustrine silt and clay found throughout the region. Low gradients limit the erosional capabilities of the rivers and sections are rare. Information on surficial materials at all but one of the sites investigated was obtained through hand-digging of pits

Ice contact sediments play a particularly vital role in understanding the behavior of the last ice sheet in this area. While esker ridges are found only in the northern part of the area and are generally small, three major systems of end and interlobate moraines representing temporary pauses in ice retreat are situated here. These moraine complexes have been named, from south to north: Hudwin Moraine, Cantin Lake Moraine, and Bigstone Lake Moraine (Nielsen, 1980). The surfaces of these moraines have been modified by lacustrine processes and are now veneered by nearshore lacustrine deposits. Unfortunately, no sections which would allow detailed investigation of these moraines could be located and analysis was restricted to hand-dug pits.

Hudwin Moraine, thus named because of its proximity to Hudwin Lake, can be correlated with the Hargrave Moraine to the west and the Ponask and Sachigo moraines to the east. Its aerial extent in the study area has been largely reduced by lacustrine processes. The moraine was deposited in an area that subsequently became part of the Sandy Lake sedimentation basin. The great thicknesses of fine grained offshore lacustrine sediments deposited in this basin, combined with the reworking of the ice contact sediments during inundation of glacial Lake Agassiz, has greatly reduced the surface exposures of this moraine

A further pause in ice retreat is evidenced by Cantin Lake Moraine situated to the north of, and extending east and west from, Cantin Lake. The moraine protrudes an average of 8-10 m above the adjacent land and has irregular widths reaching up to 5 km. At the same time as Cantin Lake Moraine was laid down Dussault Bay Moraine was deposited perpendicular to it in ice front meltwater crevasses. Located on the east side of Dussault Bay, this moraine represents the highest elevation of any of the ice contact deposits in the area. The top of the moraine has been measured at 99 m above the water level of Island Lake (Nielsen, 1980). He also identified bedrock outcrops at 35 m above Island Lake water level and attributed part of this 99 m elevation to the presence of a bedrock core

A third pause in ice retreat is recorded by the Bigstone Lake Moraine. Exposures of this moraine are found to the east of Island Lake, extending north of Bigstone Lake. Similar to the Dussault Bay Moraine, the Dobbs Lake Moraine was deposited parallel to the ice flow direction in ice front meltwater crevasses. The elevation above the local topography is characteristic of the other moraines in the map area and has been measured at 11 m (Nielsen, 1980). The Bigstone Lake Moraine can be correlated with the Sipiwesk Moraine to the northwest

Offshore, fine grained glaciolacustrine deposits are extensive, particularly in the eastern half of the study area which lies at the western end of the Sandy Lake sedimentation basin of glacial Lake Agassiz (Elson, 1967). Varved clay deposits were noted on the south shore Cobham River where the river widens at 95°06′W. The section studied contained varves averaging 2 cm thick throughout a 3.5 m section. The varves grade from silty clay at the top of the section to clay at the river level. Varves also have been reported in the Sandy Lake sedimentary basin by Derry and Mackenzie (1931), and by Elson (1967) who noted deposits of varved clay as thick as 25 m where Cobham River valley crosses the provincial boundary. It is unlikely that 25 m-thick deposits of glaciolacustrine clay are characteristic of the entire region, particularly in those areas which are not situated within the Sandy Lake sedimentation basin. However, a number of hand-dug pits showed that glaciolacustrine clays are greater than 1 m thick throughout most of the study area. Because of this, the surface exposures (predominantly sandy till) are minimal and have been found only in a few places north and east of Island Lake

The numerous end moraines in the area offer good potential for use as aggregate resources. However, the absence of a suitable road network and the limited local requirement for these resources outweighs their economic potential at the present time

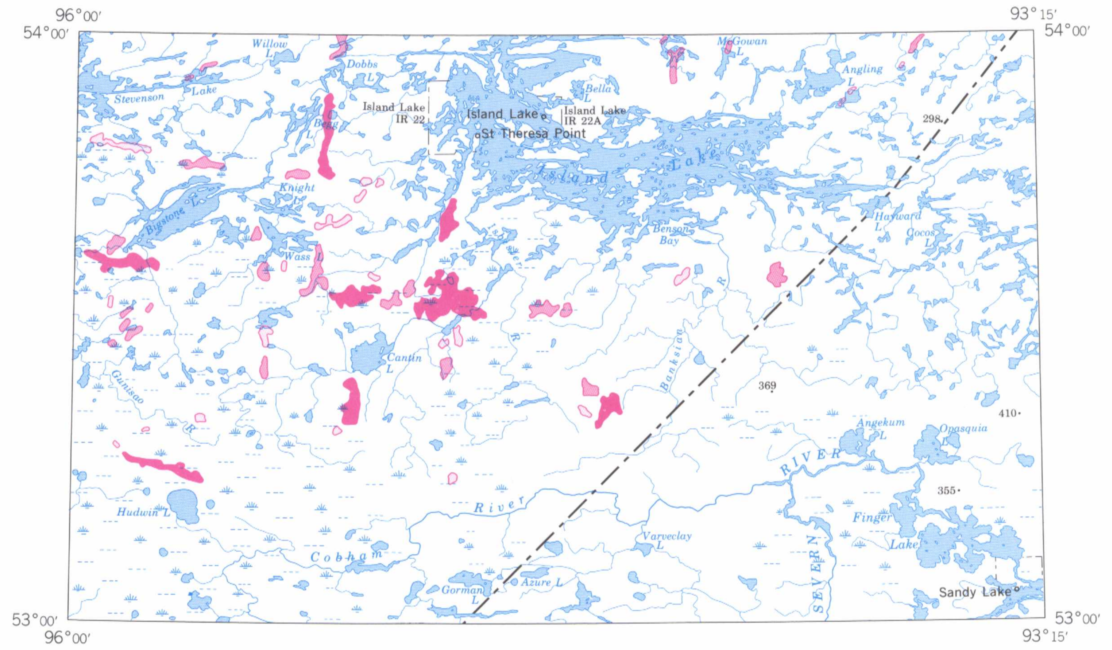
REFERENCES

Derry, D.R. and Mackenzie, G.S.
1931: Geology of the Ontario-Manitoba Boundary (12th Base Line to Latitude 54); Ontario Department of Mines, Annual Report, Vol. XL

Elson, J.A.
1967: Geology of glacial Lake Agassiz; *in* Life, Land and Water, Mayer-Oakes, P.J. (ed.); University of Manitoba Press, Winnipeg, p. 36-96

Herd, R.K., Currie, K.L., and Ermanovics, I.F.
1987: Geology, Island Lake, Manitoba-Ontario; Geological Survey of Canada, Map 1646A, scale 1:250 000

Nielsen, E.
1980: Quaternary geology and gravel resources of the Island Lake-Red Sucker Lake area; Manitoba Department of Energy and Mines, Geological Report GR80-3



POTENTIAL AGGREGATE RESOURCES

SAND AND GRAVEL DEPOSITS

High potential for economic feasibility: large volume of 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 kept to a minimum

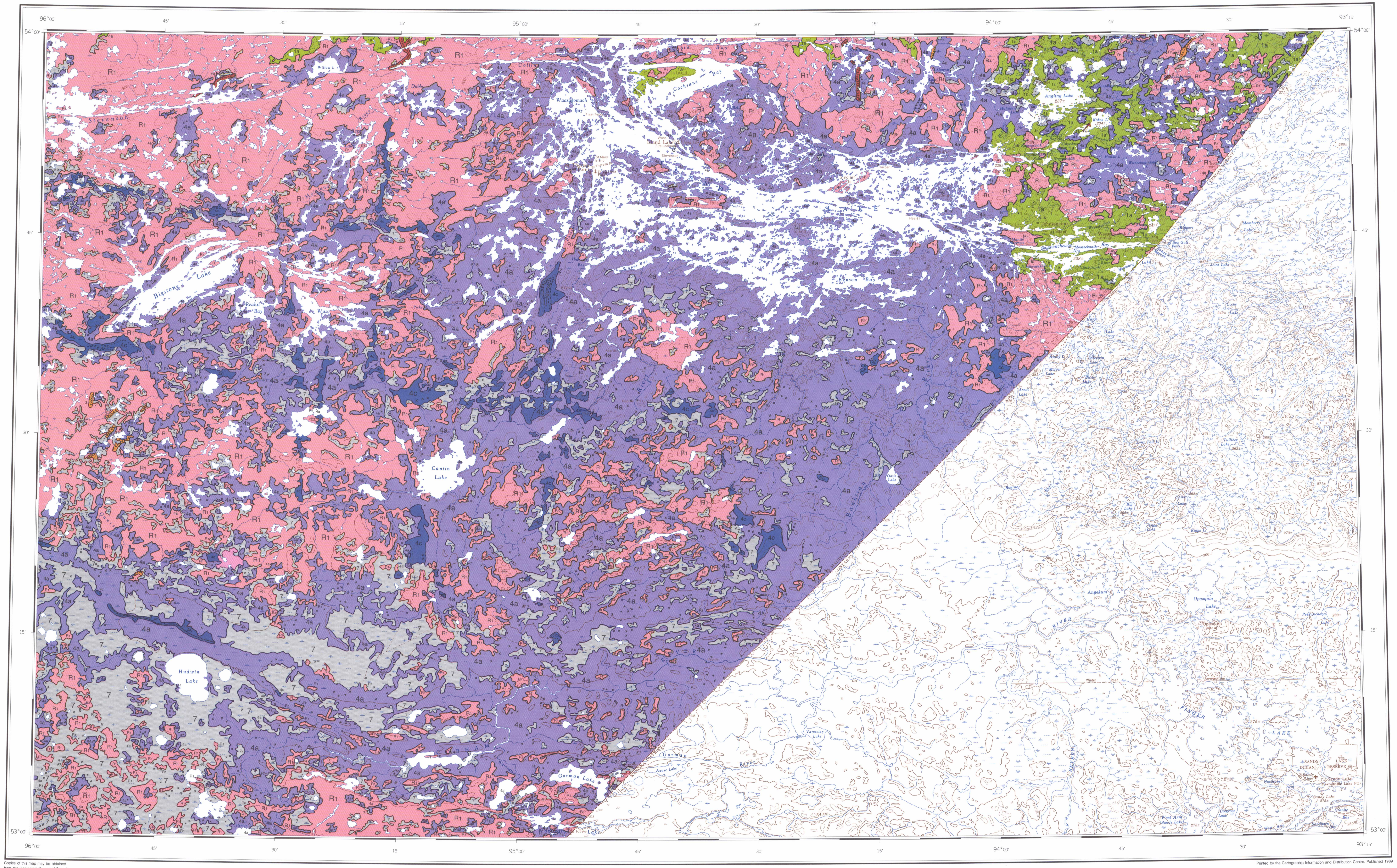
Medium potential for economic feasibility: small volume of ice contact and esker deposits and large volume of nearshore lacustrine and nearshore marine deposits. Deposit lacks either in volume or in quality of aggregate to be considered of high potential

Low potential for economic feasibility: small volume of nearshore lacustrine or nearshore marine deposits and very small volume of 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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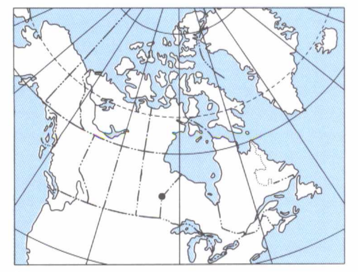


INDEX MAP

MAP 1683A

SURFICIAL GEOLOGY

ISLAND LAKE-OPASQUIA LAKE

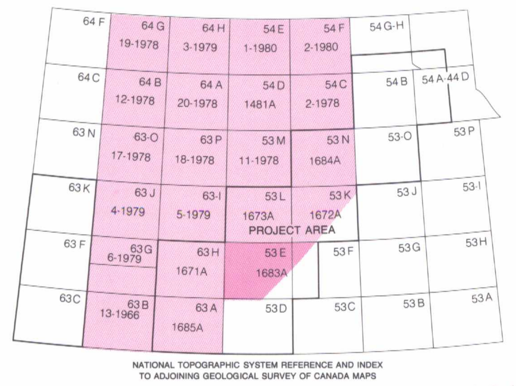
MANITOBA-ONTARIO

Scale 1:250 000 - Échelle 1/250 000

Kilometres 5 0 5 10 15 20 Kilomètres

Universal Transverse Mercator Projection / Projection transverse universelle de Mercator

Printed by the Cartographic Information and Distribution Centre. Published 1989



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 and is 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 of relief on wave washed glaciofluvial deposits pre-dating glacial Lake Agassiz*

4b — *Nearshore sediments: well sorted sand and gravel; occurs as a ridge or series of ridges with 1 to 4 m of 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 of the western side of the province are sandy to silty sand and have a high percentage of clasts derived from granitic terrain; the tills of the eastern side are generally silty and highly calcareous

1b — *Till blanket: silty to sandy, 1 to 10 m thick; masks most of the 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)
Drumlin
Fluting
Esker (direction of flow known)
Meltwater channel (large)
Beach ridge

Geology by M.D. Clarke, 1986

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 from map 53 E and part of map 53 F published by the Surveys and Mapping Branch in 1965, 1980. Base map at 1:1 000 000 published by the Surveys and Mapping Branch in 1970

Copies of the topographical editions covering this map may be obtained from the Canada Map Office, Department of Energy, Mines and Resources, Ottawa, Ontario, K1A 0E9

Mean magnetic declination 1988, 03°39′ East, decreasing 8.9′ annually. Readings vary from 05°21′E in the SW corner to 01°47′E in the NE corner of the map

Elevations in feet above mean sea level for map 53 E and in metres for map 53 F

Recommended citation:
Clarke, M.D.
1989: Surficial geology, **Island Lake-Opasquia Lake**, Manitoba-Ontario; Geological Survey of Canada, Map 1683A, scale 1:250 000