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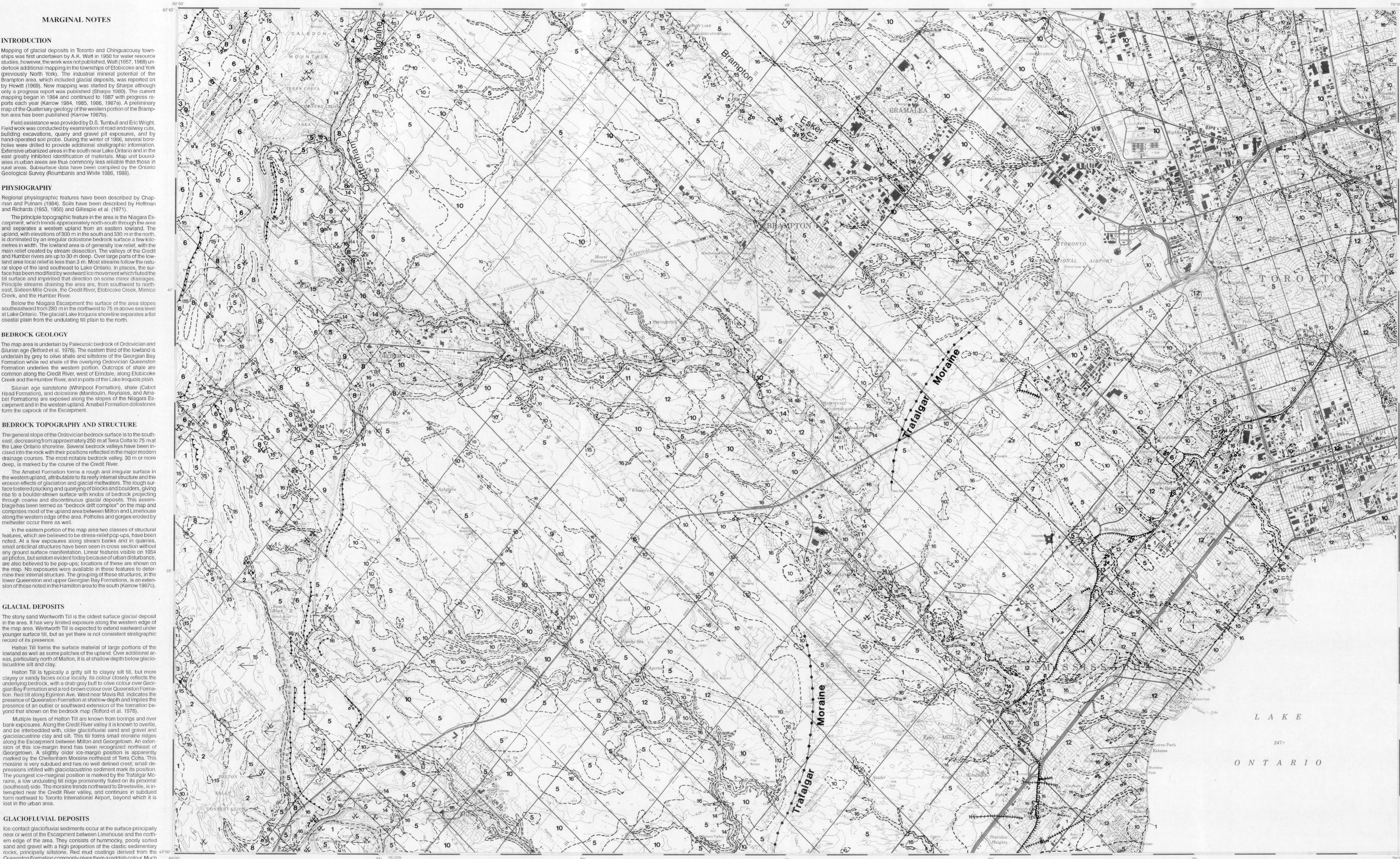
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MARGINAL NOTES

INTRODUCTION

Mapping of glacial deposits in Toronto and Chinguacousy townships was first undertaken by A.K. Watt in 1950 for water resource studies, however, the work was not published. Watt (1957, 1968) undertook additional mapping in the townships of Etobicoke and York (previously North York). The industrial mineral potential of the Brampton area, which included glacial deposits, was reported on by Hewitt (1969). New mapping was started by Sharpe although only a progress report was published (Sharpe 1989). The current mapping began in 1984 and continued to 1987 with progress reports each year (Karrow 1984, 1985, 1986, 1987a). A preliminary map of the Quaternary geology of the western portion of the Brampton area has been published (Karrow 1987b).

Field assistance was provided by D.S. Turnbull and Eric Wright. Field work was conducted by examination of road and railway cuts, building excavations, quarry and gravel pit exposures, and by hand-operated soil probe. During the winter of 1986, several boreholes were drilled to provide additional stratigraphic information. Extensive urbanized areas in the south near Lake Ontario and in the east greatly inhibited identification of materials. Map unit boundaries in urban areas are thus commonly less reliable than those in rural areas. Subsurface data have been compiled by the Ontario Geological Survey (Roumbanis and White 1986, 1988).

PHYSIOGRAPHY

Regional physiographic features have been described by Chapman and Putnam (1964). Soils have been described by Hoffman and Richards (1963, 1965) and Gillespie et al. (1971).

The principle topographic feature in the area is the Niagara Escarpment, which trends approximately north-south through the area and separates a western upland from an eastern lowland. The upland, with elevations of 200 m in the south and 130 m in the north is dominated by an irregular dolostone bedrock surface a few kilometres in width. The lowland area is of generally low relief, with the main relief created by stream dissection. The valleys of the Credit and Humber rivers are up to 30 m deep. Over large parts of the lowland area local relief is less than 5 m. Most streams follow the natural slope of the land southeast to Lake Ontario. In places, the surface has been modified by westward ice movement which fluted the till surface and imparted that direction on some minor drainages. Principle streams draining the area, from southwest to northeast, are Sixteen Mile Creek, the Credit River, Etobicoke Creek, Mimico Creek, and the Humber River.

Below the Niagara Escarpment the surface of the area slopes southeastward from 280 m in the northwest to 75 m above sea level at Lake Ontario. The glacial Lake Iroquois shoreline separates a flat coastal plain from the undulating till plain to the north.

BEDROCK GEOLOGY

The map area is underlain by Paleozoic bedrock of Ordovician and Silurian age (Telford et al. 1976). The eastern third of the lowland is underlain by grey to olive shale and siltstone of the Georgian Bay Formation while rest shale of the overlying Ordovician Queenston Formation underlies the western portion. Outcrops of shale are common along the Credit River, west of Erindale, along Etobicoke Creek and the Humber River, and in parts of the Lake Iroquois plain.

Silurian age sandstone (Whirlpool Formation), shale (Cable Head Formation), and dolostone (Mantoulin, Reynales, and Amabel Formations) are exposed along the slopes of the Niagara Escarpment and in the western upland. Amabel Formation dolostones form the caprock of the Escarpment.

BEDROCK TOPOGRAPHY AND STRUCTURE

The general slope of the Ordovician bedrock surface is to the south-east, decreasing from approximately 250 m at Terra Cotta to 75 m at the Lake Ontario shoreline. Several bedrock valleys have been incised into the rock with their positions reflected in the major modern drainage courses. The most notable bedrock valley, 30 m or more deep, is marked by the course of the Credit River.

The Amabel Formation forms a rough and irregular surface in the western upland, attributable to its reefy internal structure and the erosion effects of glaciation and glacial meltwaters. The rough surface fostered plucking and quarrying of blocks and boulders, giving rise to a boulder-strewn surface with knobs of bedrock projecting through coarse and discontinuous glacial deposits. This assemblage has been termed as "bedrock drift complex" on the map and comprises most of the upland area between Milton and Limehouse along the western edge of the area. Potatoes and grapes eroded by meltwater occur there as well.

In the eastern portion of the map area two classes of structural features, which are believed to be stress-relief pop-ups, have been noted. At a few exposures along stream banks and in quarries, small anticlinal structures have been seen in cross section without any ground surface manifestation. Linear features visible on 1954 air photos, but seldom evident today because of urban disturbance, are also believed to be pop-ups; locations of these are shown on the map. No exposures were available in these features to determine their internal structure. The grouping of these structures, in the lower Queenston and upper Georgian Bay Formations, is an extension of those noted in the Hamilton area to the south (Karrow 1987c).

GLACIAL DEPOSITS

The stony sand Wentworth Till is the oldest surface glacial deposit in the area. It has very limited exposure along the western edge of the map area. Wentworth Till is expected to extend eastward under younger surface till, but as yet there is not consistent stratigraphic record of its presence.

Halton Till forms the surface material of large portions of the lowland as well as some patches of the upland. Over additional areas, particularly north of Milton, it is at shallow depth below glacio-lacustrine silt and clay.

Halton Till is typically a gritty silt to clayey silt till, but more clayey or sandy facies occur locally. Its colour closely reflects the underlying bedrock, with a straw grey buff to olive colour over Georgian Bay Formation and a red-brown colour over Queenston Formation. Red till along Eglinton Ave. West near Mavis Rd. indicates the presence of Queenston Formation at shallow depth and implies the presence of an outlier or southward extension of the formation beyond that shown on the bedrock map (Telford et al. 1976).

Multiple layers of Halton Till are known from bridge and river bank exposures. Along the Credit River valley it is known to overlie, and be interbedded with, older glaciofluvial sand and gravel and glacio-lacustrine clay and silt. This till forms small moraine ridges along the Escarpment between Milton and Georgetown. An extension of this ice-margin trend has been recognized northeast of Georgetown. A slightly older ice-margin position is apparently marked by the Cheltenham Moraine northeast of Terra Cotta. This moraine is very subdued and has no well defined crest; small depressions infilled with glacio-lacustrine sediment mark its position. The youngest ice-marginal position is marked by the Trafalgar Moraine, a low undulating till ridge prominently fluted on its proximal (southeast) side. The moraine trends northward to Streetsville, is interrupted near the Credit River valley, and continues in subdued form northeast to Toronto International Airport, beyond which it is lost in the urban area.

GLACIOFLUVIAL DEPOSITS

Ice-contact glaciofluvial sediments occur at the surface principally near or west of the Escarpment between Limehouse and the northern edge of the area. They consist of hummocky, poorly sorted sand and gravel with a high proportion of the clastic sedimentary rocks, principally siltstones. Red mud coatings derived from the Queenston Formation commonly gives them a reddish colour. Much of this material originated during the retreat of Wentworth ice. One small esker ridge trends north-west at the western edge of the area west of Terra Cotta. Some ill-defined, esker-like ridges of sand occur in the Credit River valley near Huttonville.

GLACIO-LACUSTRINE DEPOSITS

Along the Credit River valley near Cheltenham fine-grained glacio-lacustrine sediments several metres thick underlie Halton Till. These deposits apparently were deposited in a glacial lake formed along an earlier Credit River valley prior to an advance of the Halton ice.

As the Halton ice front retreated eastward into the Lake Ontario basin, a shallow meltwater body, Lake Peel, was dammed to the northwest. Mappable deposits of glacial lake sediments are concentrated in broad shallow depressions along Sixteen Mile Creek, the Credit and Humber River valleys. Glacio-lacustrine sediments consisting of silt and clay are sometimes laminated, and commonly interbedded with grits and pebbles (crossstones), and diamicton layers. Indeed, separation from till is often difficult. Extensive areas of the mapped deposits are only 1 to 2 m in depth, and their distribution can only be shown in general at the present mapping scale. Areas shown as till often have patches of silt and clay on top, and areas mapped as lacustrine include small till knolls.

Shallow water deposits, up to 3 m thick, include sand and gravel deposited in meandering positions as deltaic deposits and, in the Sixteen Mile Creek valley east of Milton, as beach sand bars. The largest delta formed in the Credit River valley, near Huttonville, with several water plane elevations of about 216, 207, and 201 m, a

and Kennedy Rd. This much disturbed deposit is over 2 m deep. A piece of wood about 1 m below the present surface yielded a radiocarbon age of 8280 ± 160 (Wat-1753).

Flood plains are evident along most medium and larger streams. Low slopes and numerous bedrock outcrops have inhibited downcutting and fostered lateral erosion. Nevertheless, flood plains are usually narrow. Modern floodplain sediments consist of undifferentiated alluvial gravel, sand, silt, clay, and muck.

ECONOMIC GEOLOGY

The Whirlpool Formation (sandstone) and the Amabel Formation (dolostone) have been exploited in several active and abandoned quarries along the Niagara Escarpment. Shale quarries at Streetsville in Queenston Formation and at Cooksville in Georgian Bay Formation are the basis of brick manufacturing. The Acton gas field, located south of Limehouse, taps Middle Ordovician carbonates at a depth of about 550 m (Santoro 1961).

Sand and gravel have been exploited in several pits along the Credit River, west of the Escarpment north of Limehouse, along terraces of the Credit River near Huttonville, and in the Brampton Esker. Heart Lake is the most prominent of these depressions. Another notable deposit is at Eglinton Ave. West

pits and shallow water sand was exploited in several pits near Clarkson. Few of these are still active. Urban environment is rapidly sterilizing large aggregate deposits in the Brampton Esker. Remaining deposits of all types are significant for local use but are commonly of inferior quality because of the presence of clay and siltstone.

Aggregate Resources Inventories (Ontario Geological Survey, 1980, 1981, 1982, 1983) are available for portions of this area.

The peat deposits on Eglinton Ave. have supplied horticultural peat moss to individual householders in recent years but is being destroyed by urban development.

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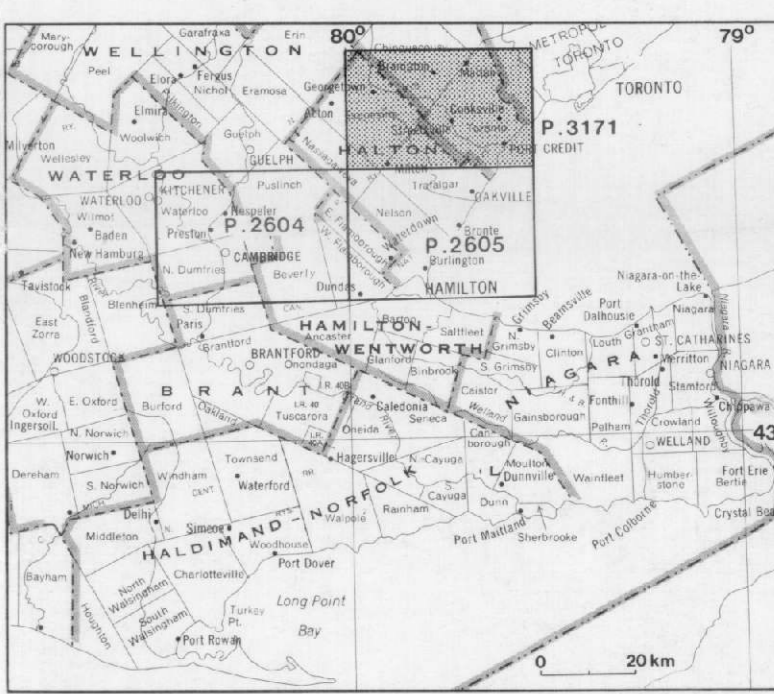
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LOCATION MAP

LEGEND

CENOZOIC QUATERNARY

- RECENT**
- 16 Modern alluvium: undifferentiated gravel, sand, silt, clay, muck
 - 15 Organic deposits: peat, muck

PLEISTOCENE LATE WISCONSINAN

- 14 Older terrace alluvium: poorly sorted, dirty, sand and gravel
- 13 Lake Iroquois deposits: beach gravel
- 12 Deltaic and lacustrine deposits: predominantly gravely sand and silty sand
- 11 Deltaic and lacustrine deposits: gravel to gravely sand
- 10 Glacio-lacustrine deposits: massive to laminated silt and clay, may contain poorly sorted diamicton layers
- 9 Outwash deposits: predominantly sand
- 8 Outwash deposits: predominantly gravel
- 7 Ice-contact deposits: predominantly poorly sorted sand
- 6 Ice-contact deposits: predominantly poorly sorted gravel
- 5 Halton Till: red to brown gritty silt to clayey silt till
- 4 Lacustrine deposits: interstadial silt and clay
- 3 Wentworth Till: stony sand till
- 2 Bedrock drift complex: extensive but discontinuous thin boundary till, in places sufficiently thick to subsume bedrock topography

PALEOZOIC

- 1 Bedrock: exposed or thin drift covered shale and dolostone

SYMBOLS

- Crest of small moraine
- Trend of subdued moraine
- Ice-contact face
- Sand and gravel pit
- Rock quarry
- Esker
- Glacial striae
- Abandoned shoreline
- Bedrock stress release feature

SOURCES OF INFORMATION

Base map derived from Map 31 M/12 of the National Topographic System, scale 1:50 000.
Contour interval: 50 feet (15.24 m).

CREDITS

Geology by P.F. Karrow, J. Easton and D.S. Turnbull, 1984 to 1987. To enable rapid dissemination of data, this map has received only a cursory edit. Discrepancies may occur for which the Ontario Geological Survey does not assume liability. Issued 1990.
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