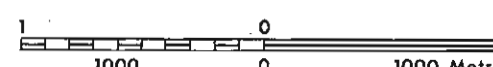




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PRELIMINARY MAP P. 981
GEOLOGICAL SERIES
**QUATERNARY GEOLOGY
DUNNVILLE AREA**
SOUTHERN ONTARIO

Scale: 1:50,000
1.25 inches to 1 mile approximately



NTS Reference: 30 L/13

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LEGEND	
GEOLOGIC	
QUATERNARY	
14	Recent
13	Cultural Features: settling basins, gravel, sand, concrete, etc.
12	Lake Erie shore dune sand
11	Lake Erie beach gravel and sand
10	Stream deposits: predominantly silt and clay, some gravel and sand
PLEISTOCENE	
9	Late Wisconsinan
8	Inland dune sand
7	Stream terrace and deltaic sand
6	Shallow water lacustrine sand and silt
5	Glaciolacustrine beach gravel and sand
4	Glaciolacustrine sand and silt
3	Glaciolacustrine clay and silt
2	Halton Till: clay till, clayey silt till
1	Wentworth Till: gravelly silt till (3d in drumlins)
UNCONFORMITY	
PALEOZOIC	
DEVONIAN	
2	Dundee } Onondaga } Formations: cherty limestone (Bois Blanc)
DISCONFORMITY	
ORISKANY	
DISCONFORMITY	
PALEOZOIC	
SILURIAN	
1	Bertie Formation: dolostone
Note: Only that part of a mappable unit with thickness equal to or greater than 3 feet is outlined.	

SYMBOLS	
X	Bedrock outcrop
—	Geological boundary (actual or approximate)
—	Glacial striae on bedrock (direction of ice movement known)
—	Moraine crest
—	Rock quarry
X	Sand and gravel pit
—	Bedrock escarpment (relatively large)
—	Bluff marking abandoned shoreline

SOURCES OF INFORMATION

Geology by B.N. Feenstra and assistants, 1973.
Topography from Map 30 L/13E, and 30 L/13W of the National Topographic Series.
Aerial Photography: Ontario Division of Lands.

Issued 1974

Parts of this publication may be quoted if credit is given to the Ontario Division of Mines. It is recommended that reference to this map be made in the following form:

Feenstra, B.N.
1974: Quaternary Geology of the Dunnville Area, Southern Ontario; Ontario Div. Mines, Prelim. Map P. 981, Geol. Ser., scale 1:50,000. Geology 1973.

MARGINAL NOTES

Geological mapping of the Dunnville area was initiated and completed during the summer of 1973 under the supervision of B. Feenstra. P. Barrett, who mapped the largest part of the area, C. Baker, and P. Pinmore gave competent assistance in the field. The map-area lies within the Haldimand-Norfolk Planning Area except for its extreme northeastern corner which forms part of the Regional Municipality of Niagara. Dunnville and Cayuga, located along the Grand River, are the largest population centres, while Highways 3 and 26 form the major access routes.

Field techniques included the use of a sampling tube driven into the deposits with a sledge hammer, hand augering, and the examination of natural and man-made exposures.

Bedrock Geology: The north-facing Onondaga Escarpment crosses the map-area from the Grand River near Port Maitland, in a west to northeast direction. Numerous Paleozoic bedrock outcrops occur along the escarpment, along the shore of Lake Erie, and in the area between the escarpment and Lake Erie. They consist predominantly of Silurian dolostone (Bertie Formation, map-unit 1) and overlying Devonian cherty limestone (map-unit 2). The dolostone is only exposed along the escarpment and in particular from the southern bank of the Grand River, southeast of Cayuga, northwest to the boundary of the map-area west of Clabgrass. The cherty limestone is exposed along the escarpment, along the shore of Lake Erie, and along stream courses in the area between the escarpment and Lake Erie where it also forms subsidiary scarpes and mounds. It comprises in ascending order of succession the Bois Blanc, Ashurstburg, and Dundee Formations according to Sanford (1969), while Milford (1974) calls Sanford's Ashurstburg the Onondaga Formation in the Niagara Peninsula. Basal Devonian sandstone (Oriskany Formation, map-unit 3) outcrops near the escarpment in the area between Belles Corners and Clabgrass.

Bedrock Topography and Drift Thickness: Preliminary maps at a scale of 1 inch to 2 miles (1:125,000) showing bedrock and drift thickness contours based on oil and gas wells in the area have been published by the Geological Survey of Canada (Sanford 1954).

Quaternary Geology: The oldest, mappable, unconsolidated Quaternary deposit of the map-area is the Late Wisconsinan Wentworth Till (map-units 3 and 3d). It is a gravelly silt till exposed only in the western half of the map-area and there almost exclusively in the form of drumlins (map-unit 3d). They protrude through a cover of glaciolacustrine clay and silt (map-unit 5) and extend from a point 6 miles (9.6 km) southeast of Cayuga in a northeast direction across the area, while their southern limit coincides with the Onondaga Escarpment as well as the few occur south of it. The Wentworth Till was deposited by the Ontario-Erie glacial lobe, locally advancing mainly over bedrock. The orientation of striae on bedrock and of long axes of drumlins indicates that glacial movement was predominantly towards the SW-NW, across the map-area.

The younger Halton Till (map-unit 4) is a clay to clayey silt till and contains incorporated glaciolacustrine clay and silt. It is generally also covered by glaciolacustrine clay and silt (map-unit 5) and younger deposits, and is exposed only in the southeastern part of the map-area. The best exposures of this till are formed by the bluffs along the shore of Lake Erie. The bluff along Nottawa Bay, 3 miles (4.8 km) east of Port Maitland, provides a section through the Port Maitland Moraine. The hummocky surface of the thick Halton Till in this moraine is dissected by glaciolacustrine fine sand and silt (map-unit 6). The Halton Till was also deposited by the Ontario-Erie glacial lobe, moving generally in a southeast direction across the Niagara Peninsula. This glacial lobe advanced to a position somewhat west of the Grand River east of Cayuga, extended southward to the vicinity of Dundee Point, and probably farther westward. The area now occupied by Lake Erie (lobate ice margin). The Port Maitland Moraine probably forms part of a series of recessional moraines in the Niagara Peninsula (Feenstra 1972a,b) constructed during general glacial retreat.

Various pits located south and west of the Grand River expose sand and gravel deposits which are capped by glaciolacustrine clay and silt (map-unit 5). These deposits, in some pits, are definitely of ice-contact origin.

Glaciolacustrine clay and silt (map-unit 5), fine sand and silt (map-unit 6), and coarser beach sand and gravel (map-unit 7) form the most younger Late Wisconsinan deposits. Clay (and silt) covers the area most extensively, while sand and silt covers only the Port Maitland Moraine. The surficial beach deposits are small and rest predominantly on till and in a few places on bedrock or clay. Till in the higher drumlins and in the Port Maitland Moraine formed the main local source of their material. The beach deposits were found at the following approximate elevations (in feet (metres) above mean sea level): 750 (228) (Clabgrass), 710 to 715 (216 to 217) (Belles Corners), and 650 to 670 (199 to 204) (Grumline, Port Maitland Moraine). According to Calkin (1970, Fig. 4) they represent respectively the levels of proglacial lakes Wayne, Grassmere or Lundy, and Lundy or Early Algonquin.

Later, when water level had dropped to 600-610 feet (182 to 186 m) an ancestral Grand River entered a lake from the west and northeast near present Dunnville. Part of the shoreline of this lake was found as a small bluff in Halton Till. This lake was shallow in the eastern half of the map-area, in the Welland map-area (Feenstra 1972b), and in the southern part of the Niagara map-area (Feenstra 1972a). A thin apron of predominantly very fine- and fine-grained sand and silt (map-unit 8), carried by the river, was deposited on top of glaciolacustrine clay (map-unit 5) in part of the shallow lake area north and east of Dunnville, and farther eastward as far as Ferry Station and Winger in the Welland map-area (Feenstra 1972b, map-unit 3d/3b). A thin but much smaller apron of generally coarser grained sand (map-unit 9) was deposited in the form of a delta at the mouth of the river at Dunnville, and in an upstream direction in the form of older alluvial terraces. When the lake level dropped probably more than 20 feet (6 m) these deposits (map-units 8 and 9) dried, and mainly the very fine- and fine-grained sand from the sand-silt unit (map-unit 8) was blown by prevailing westerly winds into the form of longitudinal and parabolic dunes covering the area between Dunnville and Winger (map-unit 10; Feenstra 1972b, map-unit 3d).

Mappable recent Quaternary deposits consist of stream deposits (map-unit 11), predominantly those along the present Grand River, beach deposits (map-unit 12) and dune sand (map-unit 13) along the shore of Lake Erie, and of settling beds of gypsum and other fill (map-unit 14) at Port Maitland.

Industrial Mineral Resources: The Bertie, Bois Blanc, and Oriskany Formations are presently being quarried 3.5 miles (5.6 km) west of Cayuga by Cayuga Materials and Construction Company Limited, and 4 miles (6.4 km) south of Winger by Dunnville Rock Products Limited. Products are Granular "W" and "P" for road construction, aggregate for concrete and asphalt plants, railroad ballast, agricultural lime, and silica sand for use in cement production.

Sand and gravel are intermittently extracted in small quantities from such deposits capped by clay and silt at various locations south and west of the Grand River. These resources are rather limited in the Niagara and mainly used locally in road construction and as backfill. Sand from inland dunes east of Dunnville is also extracted in small quantities.

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