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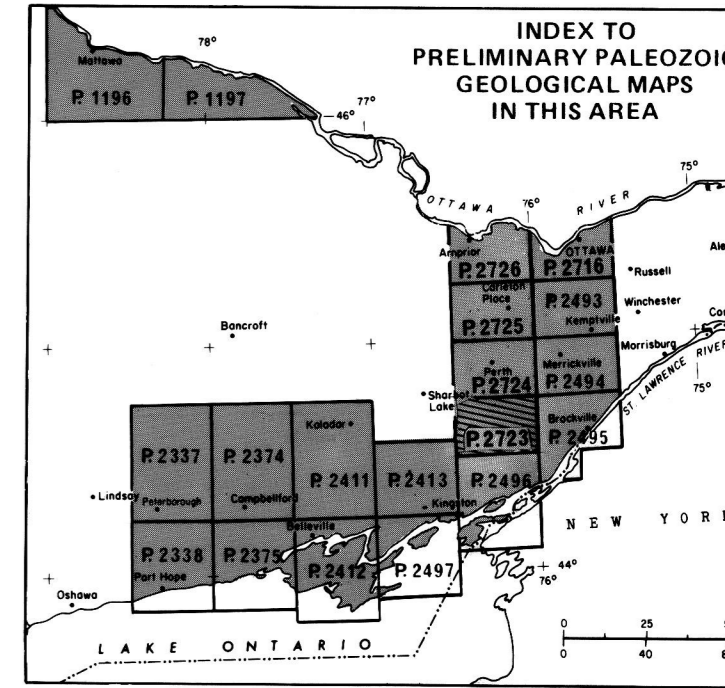
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ONTARIO GEOLOGICAL SURVEY
 MAP P. 2723
 GEOLOGICAL SERIES - PRELIMINARY MAP
 PALEOZOIC GEOLOGY
WESTPORT AREA
 SOUTHERN ONTARIO

Scale 1:50 000
 NTS Reference: 31C9
 ODM-GSC Aeromagnetic Map: 8381G
 OGS Geological Compilation Map: 2418

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LEGEND

PHANEROZOIC	
PALEOZOIC	
UPPER ORDOVICIAN	
13	Queenston Formation: red to light greenish grey siltstone and shale, with interbeds of silty bioclastic limestone in lower part
12	Carleton Place Formation: interbedded dark grey shale, fossiliferous calcareous siltstone, and silty bioclastic limestone
11	Billings Formation: dark brown to black shale, with laminations of calcareous siltstone
10	Eastview Formation: interbedded sublithographic to fine crystalline limestone and dark brown to dark grey shale
MIDDLE ORDOVICIAN	
9	Lindsay Formation: sublithographic to fine crystalline limestone, nodular in part, with interbeds of calcarenite and shale
MIDDLE ORDOVICIAN	
8	Vernam Formation: interbedded bioclastic limestone, sublithographic to fine crystalline limestone, and shale
7	Bobbycreef Formation: interbedded calcarenite and sublithographic to fine crystalline limestone
6	Gull River Formation: interbedded silty dolomite, lithographic to fine crystalline limestone, oolitic limestone, shale, and fine-grained calcareous quartz sandstone
5	Rockcliffe Formation: interbedded fine-grained light greenish grey quartz sandstone, shaly limestone, shale, locally conglomerate at base; interbeds of calcarenite (St. Martin Member, 5a) and silty dolomite in upper part
LOWER ORDOVICIAN	
4	Oxford Formation: sublithographic to fine crystalline dolomite
3	March Formation: interbedded quartz sandstone, sandy dolomite and dolomite
CAMBRO-ORDOVICIAN	
2	Nepean Formation: fine- to coarse-grained quartz sandstone, partially calcareous in upper part
1	Covey Hill Formation: noncalcareous, feldspathic, fine- to coarse-grained quartz sandstone and quartz pebble conglomerate
UNCONFORMITY	
PC	Undifferentiated metamorphic and igneous rocks

* The unit does not outcrop in this map area.

SOURCES OF INFORMATION

Base maps from Map 31C9 (Westport) of the National Topographic Series.
 Subsurface information mainly from Ontario Ministry of Natural Resources Oil and Gas Well Summary Cards, on file with Petroleum Resources Section, Ontario Geological Survey.
 Magnetic declination approximately 12°08'W in 1982.
 Contour interval: 25 feet.
 Metric Conversion Factor: 1 foot = 0.3048 m

CREDITS

Geology by D.A. Williams and R.R. Wolf, 1982.

Every possible effort has been made to ensure the accuracy of the information presented on this map; however, the Ontario Ministry of Natural Resources does not assume any liability for errors that may occur. Users may wish to verify critical information; sources include both the references listed here, and information on file at the Resident or Regional Geologist's office and the Mining Recorder's office nearest the map area.

Issued 1984

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 1984. Paleozoic Geology of the Westport Area, Southern Ontario. Ontario Geological Survey, Map P. 2723, Geological Series-Preliminary Map, scale 1:50 000. Geology 1982.



Paleozoic rock does not occur to the northwest of the fault in the Westport area, but does in the Perth map area to the north where a vertical displacement amounting to less than the maximum thickness of the Nepean Formation is indicated. The displacement along the Rideau Lake fault is therefore in the order of 30 m (southeastern side down). Fault displacements of less than a metre were noted elsewhere within the area. The Rideau Lake fault was in existence prior to deposition of the Paleozoic rock units (Wynne-Edwards 1967, p.87-88).

Bedding, normally close to horizontal, was observed to dip steeply (65° to the west) within the Nepean Formation outlier located along the shore of Opinicon Lake. The Gull River Formation is also quarried for use as aggregate, but the only presently licensed operation is the Westport quarry of Griffin Brothers Quarries Limited (North Crosby Township, concession VII, lot 15) and Newbyrne (Bastard Township, concession V, lot 6), quarries of G. Tackaberry and Sons Construction Company Limited. The Harlem quarry has been described by Hewitt (1964, p.20) and Rogers (1980, p.89). The Gull River Formation is also quarried for use as aggregate, but the only presently licensed operation is the Westport quarry of Griffin Brothers Quarries Limited (North Crosby Township, concession VII, lot 15) and Newbyrne (Bastard Township, concession V, lot 6), quarries of G. Tackaberry and Sons Construction Company Limited. The Harlem quarry has been described by Hewitt (1964, p.20) and Rogers (1980, p.89).

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The Gull River Formation is equivalent to the Pamela and Lovell Formations of the Montreal area.

STRUCTURAL GEOLOGY

The Rideau Lake fault, a steeply dipping normal fault which transects the northwestern part of the map area, constitutes the southern boundary of the Ottawa Valley fault system. The northern shore of the Rideau Lakes follows the fault trace closely, and the fault marks the southeastern boundary of the upland which occurs in the northwest part of the area.

Wynne-Edwards (1967, p.125-126) described the occurrence of small hematite concentrations, common at the base of the Nepean Formation. The hematite forms irregular discordant masses, and is concentrated along vertical joints. There has been minor production from deposits occurring on lots 23 to 25, concession X, Bastard Township.

Uranium mineralization occurs in the March Formation. Exploration work has included 13 holes drilled in the Newbyrne area during 1980 by Gull River Formation (Wynne-Edwards 1967, p.87-88).

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SYMBOLS

X	Bedrock outcrop
---	Geological boundary
---	Fault, position approximate; arrow indicates downthrown side
⊗	Quarry
⊕	Drillhole, with reference number

*Reference numbers:
 W1 ODM/LE A
 W2 ODM/LE B
 W3 ODM/LE C

MARGINAL NOTES

INTRODUCTION

Geological mapping of the Westport area involved a re-examination of an area originally mapped for the Geological Survey of Canada by M. Brownell in 1929 and M.E. Wilson in 1930, and later compiled for publication by Wynne-Edwards (1967). The area lies partially within the Ottawa-St. Lawrence Lowland, which is characterized by Paleozoic bedrock transected by a system of normal faults striking northeast to southeast.

The main physiographic features are the Rideau Lakes, headwater reservoirs for the Rideau River, which form part of the Rideau Canal waterway. The southern portion of the area forms part of the Precambrian bedrock-controlled Leeds Knots and Falls physiographic region, while the central and northeastern portions of the area form part of the Paleozoic bedrock-controlled Smiths Falls Limestone Plain (Chapman and Fulnam 1951, 1966).

Paleozoic bedrock outcrop is generally abundant within the Smiths Falls Limestone Plain, and consists of cliff and quarry sections and areas of bedrock pavement.

Surficial deposits consist of fill (which occurs as till plains, sometimes drumlined), ice-contact stratified drift, marine (Champlain Sea) clay, sand, and gravel, and recent alluvial sand and silt and organic bog deposits (Henderson 1973).

The Ontario Ministry of Natural Resources (Eastern Region) drilled the following wells within the map area: LE-A (W-1), drilled to a depth of 22.9 m in Bastard Township (concession VII, lot 28), LE-B (W-2), drilled to 23.5 m in South Crosby Township (concession I, lot 13), and LE-C (W-3), drilled to 15.2 m in North Crosby Township (concession I, lot 1) (Powell and Klugman 1979).

PRECAMBRIAN-PALEOZOIC BOUNDARY

Precambrian rock is exposed mainly in the southern and northwestern parts of the map area, but several inliers are in the northeastern part of the area, some previously mapped inliers are no longer exposed due to construction activity. Paleozoic rock unconformably overlies Precambrian rock and outcrops mainly in the central and northeastern parts of the map area, but many outliers occur in the southern part of the area. The contact between Precambrian rock to the south and Paleozoic rock to the north displays a considerable amount of induration, and the Paleozoic rock commonly forms an escarpment of up to 25 m relief adjacent to the contact. The southeastern boundary of the Precambrian outcrop area occurring in the northwestern part of the map area is coincident with the trace of the Rideau Lake fault (Wynne-Edwards 1967, p.87-88) along part of its length.

Precambrian rock occurring immediately beneath the unconformity is commonly weathered. At Jones Falls, over 10 m of weathered Precambrian rock are exposed. Precise identification of the Precambrian-Paleozoic contact is difficult at localities where weathered marble passes upwards into a friable calcareous zone with quartz cobbles and pebbles, and then into bedded conglomerate and sandstone. A good example of this occurs at Chateaufort Provincial Park. Other exposures of the weathered Precambrian material occur in roadcuts along Highway 15, 2 km north of Morton and at the Elgin exit. The weathered rock may represent a preserved regolith or paleosol formed prior to deposition of the Paleozoic units, or may be the result of subsequent groundwater leaching.

PALEOZOIC STRATIGRAPHY

The maximum thickness of Paleozoic rock intersected in a drillhole is 22.6 m (LE-B), and the maximum amount of section that exists within the map area is approximately 60 m.

The Oxford and Rockcliffe Formations, present throughout most of the Ottawa-St. Lawrence Lowland, are nonexistent in the Westport area.

The uppermost unit of the Westport area is herein referred to as the Gull River Formation (Units A to C of Williams and Wolf 1982, p.133), in accordance with Libby's (1967, 1969) recommendations. The stratigraphic nomenclature of the region to the west of the Frontenac Axis be applied to the Ottawa-St. Lawrence Lowland.

Covey Hill Formation (Cambro-Ordovician)

Scattered outcrops of a very poorly indurated conglomerate occur in several areas in the north half of the map area. The conglomerate is reddish brown and massive to poorly stratified. The clasts are cobble-sized and subangular to subrounded, and are derived from Precambrian quartzite, granite, and gneiss. Poorly sorted conglomeratic sandstone also occurs, overlying weathered Precambrian rock at Jones Falls and hydrographic conglomerate at a locality 5 km southwest of Westport. The sandstone is reddish brown, thin-bedded, and friable. These several occurrences are tentatively assigned to the Covey Hill Formation (Unit 1) as proposed by Williams, Rae and Wolf (1984).

Nepean Formation (Cambro-Ordovician)

The Nepean Formation (Unit 2) (A.E. Wilson 1946, p.10-12) outcrops in a belt of variable width following the Precambrian-Paleozoic boundary in the central and northeastern parts of the Westport map area, and occurs as outliers in the southern part of the area. Exposed thicknesses range from almost zero (over Precambrian topographic highs) to at least 25 m (measured in the Philipville and Chateaufort Lake area). The maximum thickness within the map area is probably of the order of 45 m.

The formation consists primarily of medium-grained, well-sorted quartz sandstone. Fine-grained beds predominate in the upper part of the formation, and interbeds up to a few metres thick of quartzite or quartz conglomerate occur. The quartz grains are generally well rounded. The fresh surface is white to light brown, and small silty spots are common. The weathered surface ranges from pure white to dark brown to brick red, and is usually cream to light brown. The unit is generally medium bedded, but beds range from very thin to massive (up to 2 m thick). Based on the nature of the cementing material, there are 2 common types of sandstone: a hard quartzite (resulting from secondary quartz overgrowth) and a more friable rock (resulting from calcite cement). Keith (1949) identified other cements occurring in minor amounts: dolomite, ironstone, hematite, clay, pyrite, carbon, hydrocarbon, leucosiderite, chlorite, and sericite.

Crossbedding is common, and unique cylindrical structures or "pillars" (Dietrich 1953) were observed in the roadcut along Highway 15, 2 km north of Morton. Fossils include brachiopod fragments, Lingulella, stromatolites, and various types of trace fossils.

The Nepean Formation unconformably overlies Precambrian rock and (at Jones Falls) the Covey Hill Formation. It is equivalent to the Carmaine Member of the Chateaufort Formation of the Montreal area.

March Formation (Lower Ordovician)

The March Formation (Unit 3) (A.E. Wilson 1946, p.12-14) outcrops extensively in the central and northwestern parts of the map area. Immediately north of the narrow between Upper Rideau Lake and Big Rideau Lake, the formation occurs in a fault block within the Rideau Lake fault zone. A lower Ordovician age was confirmed when a bulk sample was processed for conodonts by the Geological Survey of Canada (Report 10-GSN-1982 of the Ottawa Paleontology Section). Measured exposures of the formation are up to 8 m in thickness. The formation occurs only in the vicinity of Westport, where the total thickness is of the order of 20 m.

The formation consists of interbedded quartz sandstone, silty dolomite, and dolomite. There is a net upward decrease in sand content. Intraformational conglomerate commonly occurs in the lower part of the formation; it consists of clasts of muddy dolomite in a matrix of sandstone or sandy dolomite. The sandy beds, similar in lithology to those of the Nepean Formation, are generally fine- to medium-grained, weather light brown to grey, yellowish brown, and include both quartz and calcite-cemented types. A few thin beds of coarse-grained light green sandstone occur; the green colour being due to minor glauconite (C. Rogers, Petrographer, Ontario Ministry of Transportation and Communications, personal communication, 1982). The sandy dolomite and dolomite beds are fine crystalline and weather light grey to brownish grey. The sand grains in the sandy dolomite are coarse. All lithologies are thin to thick bedded. In the dolomite beds, algal mats and stromatolites are common, and abundant gastropod shells occur along some bedding planes.

The March Formation conformably overlies the Nepean Formation, with the contact placed at the base of the lowermost dolomite bed. The upper contact of the formation is placed at the top of the uppermost sandy bed. The Oxford and Rockcliffe Formations do not exist in the Westport map area, and the March Formation is discontinuously overlain by the Gull River Formation.

The March Formation is equivalent to the Norton Creek Member of the Chateaufort Formation of the Montreal area.

Gull River Formation (Middle Ordovician)

The Gull River Formation (Unit 6) outcrops in the west-central part of the map area, 1 km southwest of Westport. Only the lower part of the lower member of the formation exists within the area; measured sections in quarries display thicknesses of less than 16 m.

The lower member of the formation corresponds to Units A and B of Williams and Wolf (1982, p.133). The units are here combined because of their lithological similarity. The member consists of interbedded silty dolomite, lithographic to fine crystalline limestone, shale, and fine-grained calcareous quartz sandstone. A black ostracod-bearing shale approximately 1 m thick described by Raymond (1911, p.19) is the basal bed of the member.

The limestone is thin to medium bedded, and has a dark grey fresh surface and a light to medium grey weathered surface. A 40 cm thick bed of oolitic limestone occurs. The silty dolomite is sublithographic to crystalline, calcitic to noncalcitic, and medium bedded; some beds contain laminations of possible algal origin. The fresh surface of the silty dolomite is brownish grey, and the weathered surface is buff to light brown.

The Gull River Formation is equivalent to the Pamela and Lovell Formations of the Montreal area.

ECONOMIC GEOLOGY

Many small quarries in the Nepean Formation, now abandoned, were sources of stone used in buildings and in the construction of the Rideau Canal (for example, the locks at Jones Falls) (Wynne-Edwards 1967, p.89).

The Nepean Formation is a source of silica sand, presently licensed operations being the Philipville quarry of Angellstone Limited (Bastard Township, concession VII, lots 26 to 27) and the Fortin quarry of Canada Cement Lafarge Limited (Bastard Township, concession IV, lots 29 to 30). Keith (1949), Hewitt (1963), Powell and Klugman (1979), and Klugman and Yen (1980) have investigated the silica potential of southeastern Ontario, and have noted several areas as having high potential as silica sources. Hewitt (1963, p.18-23) described the exploration programs conducted within the map area during 1959 to 1962 by Rochester and Pittsburg Coal Company (Canada) Limited and Rio Tinto Canadian Exploration Limited. Areas including lot 1, concession I, North Crosby Township, and lots 25 and 26, concession I, South Crosby Township, were drilled during the exploration work, and have since been classified by Powell and Klugman (1979, p.10) as having a high silica potential.

ventures up to 3 m thick, located in Bastard Township (concession I, lot 28), has been reported by M.E. Wilson (1930, p.79). A calcite-barite vein 30 cm thick, located in North Crosby Township (concession II, lot 15), has been reported by Wynne-Edwards (1967, p.124).

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