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UPPER ORDOVICIAN STRATA OF THE OTTAWA EMBAYMENT: SUMMARY OF LITERATURE

By

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Although every effort has been made to ensure accuracy, this Open File Report has not been edited for conformity with Geological Survey of Canada standards.

TECTONIC AND STRATIGRAPHIC SETTING

The Appalachian Orogen was created by collision of various terranes, and ultimately Africa, beginning in Middle Ordovician time (Armstrong, 1992). Compression of the passive margin by collision with an island arc system in the Middle Ordovician Taconian Orogeny led to the foundering of the platform carbonates of the Trenton/Ottawa Group and produced the down-warped Appalachian Foreland Basin (Brett *et al.*, 1990; Kerr and Eyles, 1991). Thrust loading and subsequent subsidence led to progressive westward inundation of that drowned platform by Upper Ordovician deep water sediments, followed by shallower water clastics, derived from the Taconian uplift (Kerr and Eyles, 1991). These rocks represent part of the Tippecanoe Sequence of Sloss (1963) (Fig. 1).

STRATIGRAPHY

Lindsay Formation (*Eastview Member*)

The Eastview Member of the Lindsay Formation, originally termed the Eastview Formation by Wilson (1964), is a succession of interbedded limestone and shale at the top of the carbonate platform shelf sequence represented by the Middle Ordovician Trenton/Ottawa Group (Williams and Telford, 1986). The lower contact is nowhere exposed, although Wilson (1964) suggested it may be a disconformity, and the upper contact is conformable. There is a maximum thickness of about 6 m, thinning to the east (Wilson, 1964), and the unit is likely of Edenian (Caradocian) age (ie. earliest Upper Ordovician) (Williams and Telford, 1986).

The unit consists, at the base, of thick bedded dark grey petroliferous finely crystalline limestone which weathers a rusty colour, with upward increase of interbeds of dark grey to dark brown friable calcareous shale (Wilson, 1964; Williams and Telford, 1986). According to Williams and Telford (1986), the Eastview is essentially correlative to the Collingwood Member of south-central Ontario.

Billings Formation

The Billings Formation, originally named by Wilson (1937), is a predominantly shale unit up to about 90 m thick, which conformably overlies the Eastview and is conformably overlain by the Carlsbad Formation (Wilson, 1964). The top contact is taken as the base of the lowest limestone/siltstone bed greater than 2 cm thick (Williams and Telford, 1986). The unit likely originally covered a larger area although outcrops are uncommon (Wilson, 1964). Wilson (1937) stated that there was an (unidentified) type section near Ottawa, but designated a major reference section on Rouge River, just north of Hwy 2 near Toronto (Winder, 1961). Therefore, the Billings Formation is essentially correlative to the Blue Mountain Formation of south-central Ontario, and likely of Edenian (Caradocian) age (Williams and Telford, 1986).

The Billings comprises dark brown to black, noncalcareous, fissile, pyritiferous shale with a few thin laminated limestone beds near the base and a few thin calcareous siltstone beds near the top (Wilson, 1964; Williams and Telford, 1986). Cephalopods, brachiopods, trilobites and graptolites are present (Williams and Telford, 1986), with a distinct boreal affinity (Wilson, 1964). The sediments were probably deposited in a marine shelf setting, below storm wave base (Williams and Telford, 1986).

Carlsbad Formation (*incl. former Russell Formation*)

Wilson (1964) described the Carlsbad and Russell formations as a conformable sequence of interbedded grey shale and rusty weathering limestone of limited preserved extent and rare outcrops. Williams and Wolf (1982) stated that there were insufficient lithological differences between the two units to map them separately, and Williams and Telford (1986) suggested that the original Russell should now be considered to be included in a revised Carlsbad Formation. The lower and upper contacts are nowhere exposed, but are likely conformable (Wilson, 1964; Williams and Telford, 1986). The Carlsbad was assigned a thickness, based on limited outcrop work, of about 190 m (Wilson, 1964; Williams and Telford, 1986), but Kerr and Eyles (1991) measured 259 m in the Russell Co. Core hole, with a distinct thinning trend to the west.

Wilson (1964) suggested that the Carlsbad and Russell were correlative to the original Dundas and Meaford formations, respectively, of southwestern Ontario, and Williams and Telford (1986) concur that their revised Carlsbad Formation is correlative to the modern Georgian Bay Formation of southwestern Ontario. The unit is Maysvillian to Richmondian (Caradocian to Ashgillian) in age (Williams and Telford, 1986). Wilson (1964) commented that the Carlsbad fauna was related to southern-derived faunas, rather than the boreal faunas of the underlying Billings Formation.

The Carlsbad Formation comprises grey to dark grey, noncalcareous to calcareous shale with interbedded thin greenish to greyish siltstone and dolomitic limestone beds, and minor sandstone (Wilson, 1964; Williams and Telford, 1986). Kerr and Eyles (1991) found that the "hard bands" were not true limestones, but rather composed of a mixture of equal parts of rounded quartz/feldspar grains and detrital angular fossil fragments of coarse silt to fine sand size, set in a sparry calcite cement. Wilson (1964) noted that the concentration of "hard bands" varied vertically, with an upward sequence of a) predominantly shaley to b) more interbedded to c) predominantly shaley to d) more interbedded, from base to top of the formation. Kerr and Eyles (1991) noted a general upward increase in number and thickness of sandstone beds, in the Russell Co. Cored drill hole. Williams and Telford (1986) and Kerr and Eyles (1991) noted the abundance of cross bedding, ripples, flute casts and gutter casts.

Williams and Telford (1986) suggested deposition occurred in a marine shelf setting, and Kerr and Eyles (1991) interpreted the sandstone beds as tempestite deposits resulting from tropical storms transporting shallow marine sediment westward onto a muddy shelf.

Queenston Formation

The Queenston Formation, of Richmondian (Ashgillian) age, is preserved as a 30-50 m remnant beneath Quaternary cover in one small fault-bounded area (Wilson, 1964; Williams and Telford, 1986). The interbedded red siltstone and shale, characteristic of this unit in southwestern Ontario, lies conformably over the Carlsbad Formation (Wilson, 1964) and was likely deposited in a marine shelf setting (Williams and Telford, 1986).

The Queenston is characterized by thinly to thickly bedded, red to greenish mottled, slightly calcareous siltstone and shale (Wilson, 1964; Williams and Telford, 1986). Minor interbeds of silty bioclastic limestone are present in the lower part (Williams and Telford, 1986). The red colour is considered to represent post-depositional regional oxidation of iron-bearing minerals, and the greenish colours, concentrated in spots and along fractures, is the result of later localized reduction (Wilson, 1964; Williams and Telford, 1986).

ECONOMIC POTENTIAL

Wilson (1964) reviewed the various commercial commodities present in the Paleozoic rocks of the Ottawa Embayment. She mentioned the popular mineral springs which issue from the Carlsbad Formation (correlative to the Georgian Bay Formation), just above the contact with the Billings, at the village of Carlsbad Springs, and the quarrying of red Queenston shale for the making of brick and tile. In addition, Wilson (1964) stated that traces of oil are known from fossils in the Eastview Member (correlative to the Collingwood Member), and that natural gas was recovered from 12 shallow wells in the area. The gas was considered to represent local pockets in the Billings Formation (correlative to the Blue Mountain Formation) and underlying Trenton/Ottawa Group limestones, but no commercial flows were obtained (Wilson, 1964).

LIST OF FIGURES

1. Schematic stratigraphic column for Upper Ordovician of the Ottawa Embayment.

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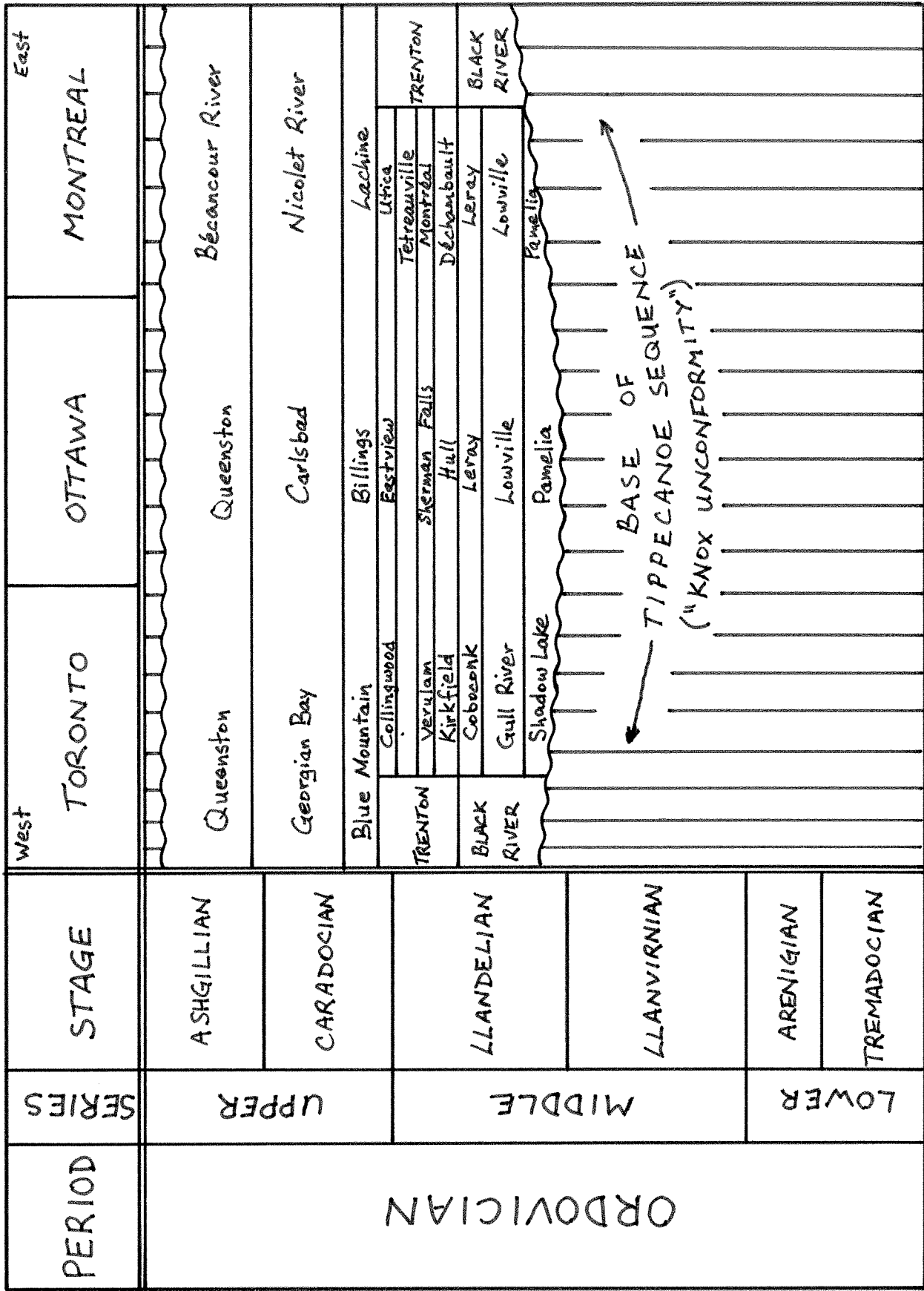


FIGURE 1.