

Finding the Dorchester Fault

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The Maritimes Basin of Atlantic Canada is a 148 000 km² basin, filled from the Late Devonian to the Permian; it contains smaller depocentres or subbasins, usually less than 4000 km², separated by fault-controlled basement uplifts. The Sackville and Moncton subbasins are located in southeastern New Brunswick. The Moncton subbasin extends westward over a large area that lies to the north of the Caledonia Highlands basement uplift, whereas the Sackville subbasin terminates to the west against the uplift. The two are separated by the Dorchester Fault, a major structure identified in surface geologic maps, extending from the Caledonia Highlands in the southwest through Albert Mines to Upper Dorchester and farther northeast. The Dorchester Fault juxtaposes Horton Group and basement rocks to the northwest against Windsor Group to the southeast. East of the Petitcodiac River the fault has been previously interpreted as moderately south-dipping.

Seismic data suggest that the mapped Dorchester Fault includes two distinct structures. Near Upper Dorchester, a south-dipping boundary visible on seismic profiles separates Mabou and Windsor Group rocks from basement and Horton Group. This SE-dipping boundary is interpreted as the northeast part of the mapped Dorchester Fault, which we distinguish as the Upper Dorchester Fault. Traced downdip, the boundary meets another surface interpreted as a major NW-dipping fault which we distinguish as the Lower Dorchester Fault. The intersection point of the Upper and Lower Dorchester Faults forms the tip of a tectonic wedge that has been inserted southward into Windsor Group evaporites. Traced to the southwest, the tip of this wedge progressively shallows in the subsurface, reaching the surface near the Memramcook estuary. Farther southwest, only the Lower Dorchester Fault is preserved. Its geometry in seismic profile better matches the mapped Dorchester Fault seen near Albert Mines, where a splay in the hanging wall has previously been identified as the Edgetts Landing fault.

The Lower Dorchester Fault meets a steep NE-SW boundary at depth. This boundary is a near vertical strike-slip fault, yet unnamed, that bounds the Stoney Creek oil and gas field along its southeast edge. Traced updip, this boundary is truncated by Windsor Group reflectors, indicating that movement was pre-Viséan. Localized unconformities within the Horton Group indicate a complex history of Tournaisian movement. When the seismic data are artificially flattened along Windsor Group reflectors, restoring the pre-Viséan geometry, the two faults are seen to define a flower structure, further supporting the strike-slip interpretation.