

Preliminary results of the geology of late Devonian Imperial Formation, southern Peel Plateau and Plain, NWT

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Field work conducted in 2006 consisted of measuring four stratigraphic sections (see map). Samples were collected from Imperial Formation for analysis of permeability, porosity, palynology, and Rock-Eval/TOC. Imperial Formation is interpreted as a turbidite sequence that can be coarsely described as three, thick (>200 m) resistant cliff-forming sandstone units, which are separated by less resistant to recessive thick silty shale packages. The sandstones are very fine to fine-grained and show abundant bioturbation near the base of beds including both horizontal tracks and traces as well as vertical burrows (figure at top right). Bioturbation decreases up section, where sedimentary structures are better preserved. Imperial Formation sandstones are locally fossiliferous containing rugose horn corals, colonial corals, and brachiopods. Sandstone units within the Imperial River section are locally petroliferous.

The sandstones of Imperial Formation are medium grey, green grey, and olive green in colour. The greyer sandstones occur in the basal sand unit in the Elbow Creek tributary and Arctic Red River tributary section to the west. In these two sections there is a distinct lack of green sand in the basal member. The western sections also exhibit a notable decrease in coral and shell abundances. Initial results from 2006 field season yielded porosity values between 14% and 25% on sandstones from Imperial River Section. One sample of Imperial Formation at Powell Creek yielded TOC 3.6%, HI 262, S1 0.83 and S2 9.42. These Rock-Eval results are well within the oil window and are excellent indicators of potential source rock.



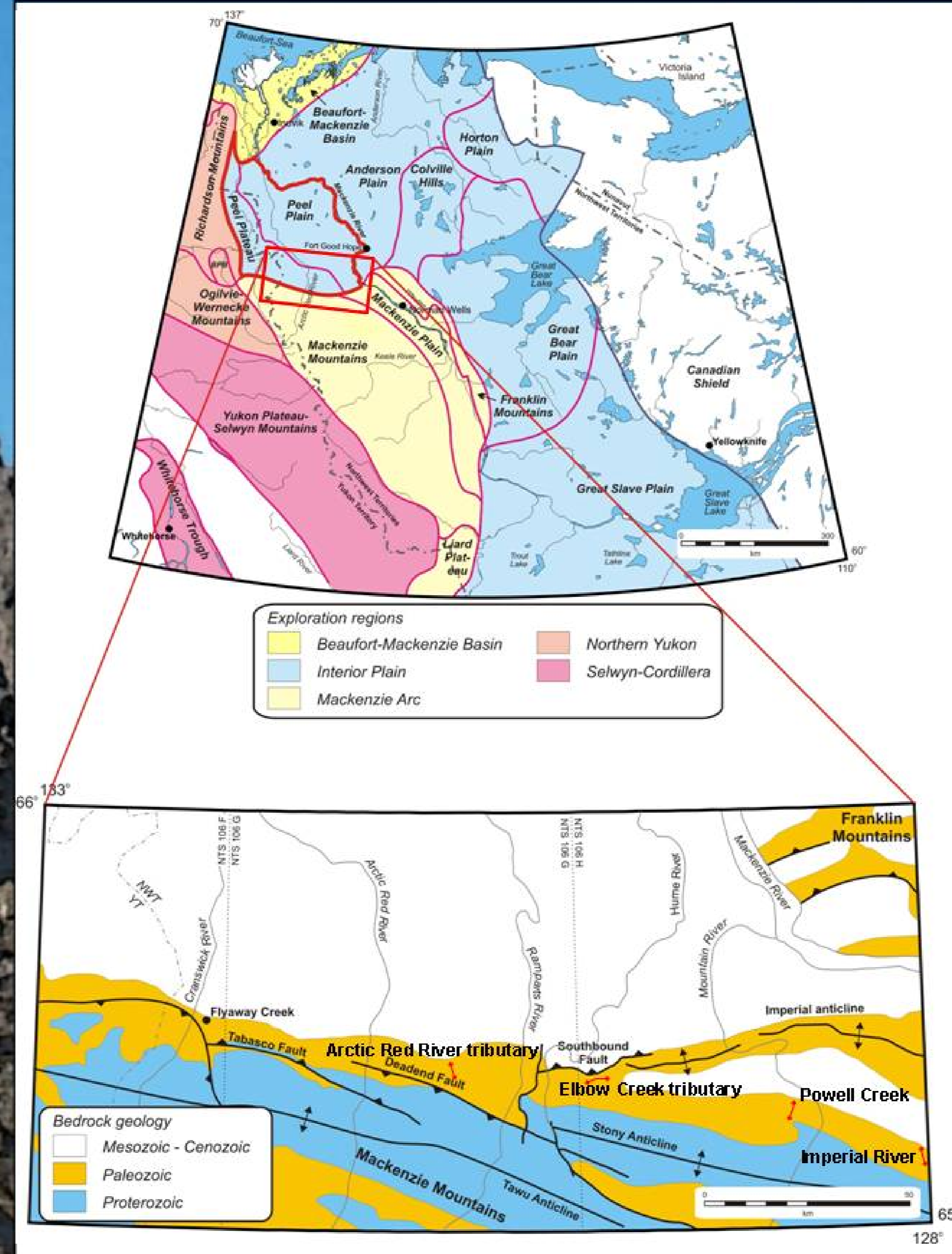
Upper sandstone at Arctic Red River tributary. Approximately 200 m of vertical section is shown. View to east.



Contact between lower, light coloured sandstone and dark coloured silty mudstone within Imperial Formation on a tributary to the Arctic Red River. Flooding surface was sampled for Rock-Eval/TOC, palynology, and Sm-ND.



Unconformable contact between dark grey brown Imperial Formation and light coloured Cretaceous Martin House Formation. Elbow Creek tributary.



Geology and exploration regions of northern mainland NWT. Section locations are marked by red lines on detail map. Modified from Morrow et al., 2006 and Cook and MacLean, 1999.



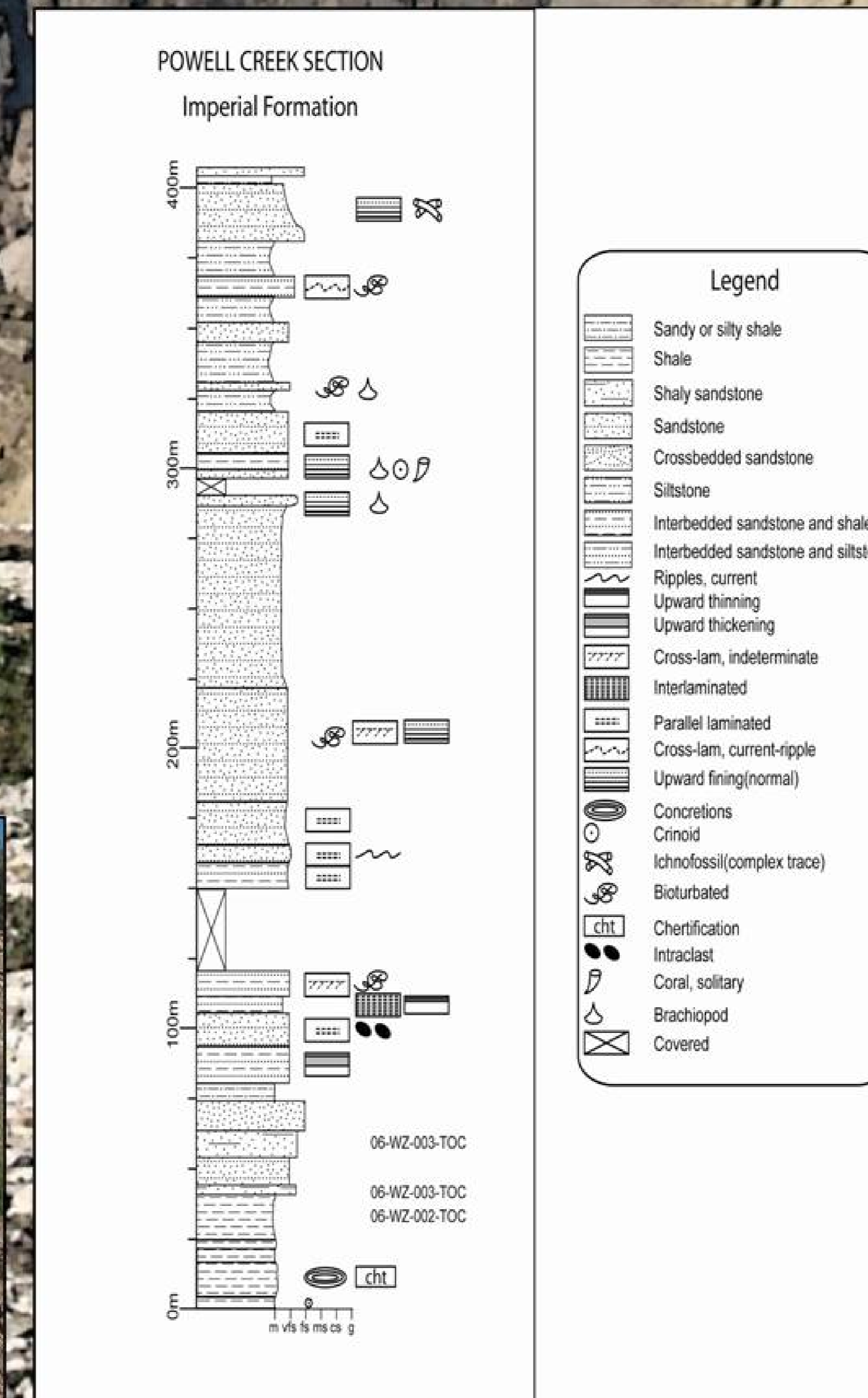
Conformable contact between Ganol Formation (left) and Imperial Formation. Location is on the west side of Powell Creek. See stratigraphic section. Approximately 50 m of section is shown here.



10-15 cm horizon of solitary rugose and colonial corals at Imperial River section.



Extensive bioturbation at base of sandstone bed. Imperial River section.



Measured stratigraphic section at Powell Creek.



Approximately five m thick fine grained sandstone bed at Imperial River section. Porosity values range from 17.3% to 24.7%, samples are from outcrop and are potentially subject to leaching, sediment infill, and cementation.



Coral and shell debris, occurs in lenses up to 20 cm. Usually angular showing little transport weathering. Imperial River.

References:
Morrow, D.W., Jones, A.L., and Dixon, J. 2006. Infrastructure and resources of the Northern Canadian Mainland Sedimentary Basin. Geological Survey of Canada, Open File 5152, 1 CD-ROM.
Cook, D.G., and MacLean, B.C., 1999. The Imperial anticline, a fault-bend fold above a bedding-parallel thrust ramp, Northwest Territories, Canada; Journal of Structural Geology, v. 21, p. 215-228.