

Slope and submarine fan depositional system of the Frasnian-Famennian Imperial Formation, Mackenzie Mountains

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The Frasnian-Famennian Imperial Formation consists of siliciclastic strata more than 500 m thick that were deposited upon the drowned Mackenzie Platform (Braman and Hills, 1992; Hadlari et al., 2009b). In the Mackenzie Mountains west of Imperial River, Imperial Formation comprises shale and fine to very fine grained sandstone. West of Imperial River, clinofolds visible through the full thickness of Imperial Formation indicate southwestward progradation of a submarine fan and slope system.

It has been proposed that, in the area between the type section at Imperial River and Norman Wells, Imperial Formation can be subdivided into a lower interval containing relatively shallow water facies and an upper interval of deeper water facies (Hadlari et al., 2009a). Lower and upper intervals are separated by a distinct flooding surface (Tylosky et al., 2009).

The lower interval of Imperial Formation at Imperial River is interpreted to have been analogous to a small scale shelf, dominated by siliciclastic sediment, that was established near the eastern margin of the basin, and includes carbonates of the Jungle Ridge member. Transgression recorded at the base of the upper interval established the deep water setting that hosted the more typical Imperial Formation submarine fan and slope facies that are found west of Imperial River.

The significance of the shallow water facies lies in the reservoir potential of the sandstones. Deeper water sandstones of Imperial Formation are fine to very fine grained and have very low porosity (3-10%; Gal et al., 2009). Sandstones from relatively shallow water facies at Imperial River are fine to medium grained and have good porosity (10-22%; Gal et al., 2009). Ongoing work in the Mackenzie Plain as part of the Geological Survey of Canada Geomapping for Energy and Minerals program will better characterize the shallow and deep water facies through sedimentology, ichnology, palynology, and seismic stratigraphy.

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