

Lower Triassic Stratigraphy and Petroleum Potential, Sverdrup Basin, Arctic Canada

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Lower Triassic strata are very widespread in the subsurface of the Sverdrup Basin and are assigned to two formations - the sandstone-dominant Bjorne Formation and the shale and siltstone-dominant Blind Fiord Formation. The source terrains, consisting mainly of Devonian siliciclastics, lay mainly to the south and east of the basin. A small source terrain (Crockerland) lay to the northwest and the Sverdrup Basin was connected to the Chukchi/North Slope area of Arctic Alaska by a relatively narrow strait. Sediment supply to the basin was very high and the succession exceeds 2000m in thickness in the depocenters.

The strata comprise a single 2nd order depositional sequence which is bound by the latest Permian 1st order sequence boundary at the base and a 2nd order boundary at the top. Both boundaries consist of major unconformities (unconformable shoreline ravinements) which penetrate into the basin and adjoin with prominent maximum regressive surfaces which can be correlated over the entire basin. The 2nd order sequence can be subdivided into three 3rd order sequences and the approximate ages of these are Griesbachian- Dienerian, Smithian and Spathian. Numerous fourth order sequences occur within each 3rd order sequence.

Each 3rd order sequence consists of braided to meandering stream strata on the southern and eastern basin flanks and these change facies to sand –dominated delta front deposits. Farther basinward, mid-outer shelf deposits consist of interbedded fine to very fine grained sandstone, siltstone and shale of storm origin. Slope deposits consist mainly of shale and siltstone and thick submarine fan deposits occur in the basin center. Because of high subsidence rates, the Lower Triassic facies belts remained relatively stationary without much basinward progradation in spite of the high sediment supply.

Porous sandstone is common in the braided stream and delta front facies and may also occur in the turbidites faces. Potential traps include Tertiary anticlines, salt structures and stratigraphic traps associated with sequence boundaries. The main potential source rocks are bituminous shales of the directly overlying Middle Triassic succession and possibly organic rich shales in the Spathian sequence. An extensive oil sand deposit, representing an exhumed oil field on the basin flank, occurs on Melville Island. Gas and oil shows occur in the uppermost sandstones of the succession in wells on Melville and Ellesmere islands.