

Exploration significance of healing phase deposits in the Triassic Doig Formation, Hythe, Alberta.

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Introduction

The Middle Triassic Doig and Halfway Formations in the Hythe area of west-central Alberta (Township 73, Range 9, west of the sixth meridian) consist of a siliciclastic progradational parasequence. Parasequences in the lower part of this interval (the Doig Formation) are shale-prone and represent deposition in distal shoreface and offshore environments. Typically, only the uppermost parasequence coarsens upward into shallow marine sandstone and this is referred to the Halfway Formation.

Parasequence Boundaries

Most parasequence boundaries in the stratigraphically lower part of the Middle Triassic progradational parasequence set (i.e. Doig Formation) are marked by a simple non-erosional marine flooding surface representing transgression in water depths below fair-weather wave-base. Well log and core correlations demonstrate that these marine flooding surfaces pass depositionally up-dip (i.e. northeast) into ravinement surfaces with thin (<1m) bioclastic sandstone lags formed during transgression in water depths less than fair-weather wave-base. In the Hythe area, however, the parasequence boundary corresponding to the contact between the Doig and Halfway Formations is marked by a 0-25m thick anomalous silty sandstone unit sandwiched between the regressive portion of the parasequence below and the marine flooding surface at the base of the overlying parasequence.

Sedimentology and Distribution

This silty sandstone unit at the top of the Doig Formation displays an upward-fining grainsize trend and contains plane lamination, soft-sediment deformation features and rare hummocky cross stratification. The unit was deposited in a marine shoreface below mean storm wave-base and forms a palaeoseaward-thickening wedge which partly infills or "heals over" the bathymetry of the underlying parasequence.

Healing Phase Origin

The facies, geometry and palaeogeographic distribution of this silty sandstone unit indicate an origin as a transgressive healing phase deposit. Development of significant sand-prone healing phase deposits at this parasequence boundary in the Hythe area is interpreted to be due to the presence of a thick growth faulted sandbody in the underlying regressive shoreface parasequence. This thick Doig Formation sandbody formed a local source of sandy sediment which was reworked during the transgression and transported both seaward to form the healing phase wedge and landward to form a backstepping barrier island shoreface now preserved at the up-dip limit of the marine flooding surface in the Wembley oilfield to the east of Hythe. Where such a source of sand was unavailable for reworking during transgression, the healing phase deposits are shale prone and indistinguishable from the underlying regressive parasequence.

Exploration Implications

Although the healing phase deposits in the Hythe area are gas bearing and have been tested or completed in a number of wells, they have poor reservoir characteristics and do not form an attractive exploration target. However, the presence of such sand-prone healing phase deposits at parasequence boundaries in the Middle Triassic interval in Alberta may prove a useful indicator of the proximity up-dip of thick sandstones in the Doig Formation, which are a more attractive but difficult to locate reservoir.