

# **Entrenched Channels within the Midale and Frobisher Beds of Southeast Saskatchewan: Tidal influence on Reservoir Quality**

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## **Summary**

Flooding occurred within entrenched valleys in the Midale and Frobisher Beds at Innes and Huntoon Pools in southeast Saskatchewan. The valleys cross-cut regional stratigraphy in a southwesterly trend, similar to erosional trends in the Midale Beds (V-2) at Weyburn (Burrowes, 2001). The erosion occurs at the top of transgressive cycles and is masked by the highstand sequence where preserved. Reservoir quality is commonly enhanced by winnowing.

## **Introduction**

Cores from Midale Beds at Innes Pool and Frobisher Beds at Huntoon Pool are used to demonstrate entrenched channeling.

## **Theory**

The Mississippian Frobisher Beds were deposited on a shallow carbonate platform within the Williston Basin. Detailed stratigraphic mapping indicates that the carbonates were deposited in very shallow laterally aggrading sequences which resemble clastic deltaic packages. The entrenched channels cross-cut regional stratigraphy in a southwesterly trend, similar to erosional trends in the Midale Beds (V-2) at Weyburn Pool (Burrowes, 2001), Alida Beds at Handsworth Pool (Lake and Seifert, 2003) and on the Mississippian Subcrop in the Alida-Rosebank Pool Trend (Lake, 1991).

Reflooding the entrenched channels resulted in deposition of calcareous algae grainstones in which the tidal currents have winnowed away the fines. The regional stratigraphy contains a large portion of peritidal carbonates with early vuggy porosity development and anhydrite infill. They are composed of numerous metre-scale stacked cycles which aggrade laterally from fenestral muds and oncolite wackestones in the shallow end to calcareous algae grainstones in the deep end. Vertically, an ideal cycle shows transgression, highstand and regression characteristics. The proximal highstand rocks are typically argillaceous and are the markers which subdivide the informal stratigraphy used by the operators in the area (ie. Halbrite Marker, Huntoon Marker, Griffin Marker, Stoughton Marker, etc.). The deeper transgressive and regressive portions are typically winnowed near the top and base respectively due to increased tidal agitation. Erosion occurs at the top of the Transgressive cycle and is masked by the Highstand Sequence where preserved.

Exploration in the Frobisher Beds has typically focused on drilling the structural highs; this model suggests that the tidally-influenced incised valleys would tend to develop in the lows and are the preferred reservoir of choice. The similarity of these rocks to lateral accretion of clastic tidal delta facies is uncanny. The Frobisher Beds and the Williston Basin are influenced by internally generated autogenic sedimentation as a result of isolation from eustatic sea level fluctuations (i.e. Wang, et al, 2011).

## **Examples**

The present day east coast of Qatar Peninsula has a demonstratable entrenched channel similar to the Midale and Frobisher examples on display.

## **Conclusions**

Tidal bores are responsible for the winnowing of fines and enhanced reservoir quality within the entrenched channels.

## **Acknowledgements**

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