

**SEISMIC SEQUENCE STRATIGRAPHY OF
THE INTRA-BARROW GROUP, BARROW
SUB-BASIN, NORTHWEST SHELF,
AUSTRALIA**

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ABSTRACT

Regional exploration in the Barrow Sub-basin has dominantly focused on structural traps in the Top Barrow Group. A lack of recent discoveries has focused attention more towards the economic potential of the Early Cretaceous intra-Barrow Group plays. The aim of this study was to interpret the seismic sequence stratigraphy and depositional history of the intra-Barrow Group within the Barrow Sub-basin, with emphasis on the identification of stratigraphic traps and potential locations of economic seal/reservoir couplets within the study area.

The study area lies south of Barrow Island, and contains the topsets, foresets and toesets of the 'Barrow delta', which are an amalgamation of Mesozoic sand-prone fluvial, coastal deltaic and deepwater successions. The final stages of the break-up of Gondwana impacted on the structural development of the Barrow Sub-basin, when a large shelf-margin fluvial/deltaic system built out toward the north to northeast, contributing to northerly shelf margin accretion, with large-scale clinoform features and associated depositional environments.

The dataset comprises the Flinders 3D seismic survey 1267 km² and 35 well logs. Eleven seismic sequences are identified and a seismic sequence stratigraphic framework tied to the wells has been developed, via detailed sequence stratigraphic mapping, integrated with 3D visualisation techniques with the use of Petrel. These eleven second-order sequences are further subdivided into lowstand, transgressive and highstand systems tracts. The movement of the palaeo-shelf break, slope and base of slope can be traced throughout each sequence, displaying an overall trend of building out in a north to northeast direction. A series of palaeo-geographic maps for each sequence has been developed to illustrate the basin's evolution. The seismic sequences identified display progradation, followed by aggradation, then downstepping, concluding with progradation and aggradation.

A high-resolution sequence stratigraphic study of Seismic Sequence 1 showed that several higher-order sequences can be identified, including numerous lowstand systems wedges, along with associated channel features, which could be targeted as new plays. The sequence stratigraphic framework developed, palaeo-geographic reconstructions and all other interpretations made for this project have been integrated to assess the prospectivity of the intra-Barrow Group over the study area, resulting in the identification of a number of leads and prospectivity summaries for each of the 11 Seismic Sequences identified within the intra-Barrow Group.