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## **Depositional Environment of the Upper Swan Sandstones, Caswell Sub Basin, Australia**

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### **Abstract**

The Upper Swan sandstones represent a key exploration target in the Caswell Sub-basin and are the main reservoir units for the large Ichthys-Prelude gas-condensate field. The sandstones are present west of the Yampi Shelf margin from Leveque-1 in the southwest to Maret-1 in the northeast, and in the central portion of the Caswell Sub-basin extend to the northwest as far as Caswell-2.

Within the Caswell Sub-basin the Upper Swan sandstones are best understood in the Ichthys-Prelude gas-condensate field where twelve wells have been drilled to date. Interpretation of nearly 600m of conventional core, wireline logs, image logs and 3D seismic surveys have contributed significantly to the understanding of the depositional environment.

The Upper Swan sandstones is a lithostratigraphic term for sandstones that range in age from Latest Jurassic (Tithonian) to early Cretaceous (Berriasian) and are calibrated to the *P. iehiense*, *K. wisemaniae* and *C. delicata* Biozones. These sandstones are sourced from the Yampi Shelf and typically onlap and overstep Tithonian-aged mudstones. The sandstones are quartz rich, dominantly fine – medium grained with occasional very fine to coarse grained units present. Individual sandstone units range in thickness from centimetre scale up to several metres and are typically relatively featureless, homogeneous beds with occasional dewatering structures. Thin claystones typically centimetre to tens of centimetres thick, but up to 15m thick locally, are interbedded with the sandstones.

Core data suggests they were deposited as a series of stacked sand-rich gravity flows comprising repeated massive suspension (S3) and thin traction flows (T1 and T2) (dense flows of Lowe, 1982) in a shallowing Outer to Middle shelf characterised by vertically shallowing ichnofossil associations of Chondrites, Phycosiphon/Chondrites to Zoophycus/Phycosiphon.

In the Prelude Field, the Tithonian and Berriasian-aged sandstones are mineralogically similar, with a complex diagenetic history consisting of compaction, quartz cementation, framework grain dissolution, precipitation of kaolinite/dickite, and the formation of authigenic illite. Authigenic clays appear to be of the greatest importance in the Upper Swan Sandstone in terms of reservoir quality with the data indicating the older sandstones tend to have higher total clay content and these are typically tight.