

# **Sequence Stratigraphy of an Eolian Gas Sand: Layering in the Permian Unayzah, a Reservoir at South Ghawar, Eastern Saudi Arabia**

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In the Unayzah A reservoir in subsurface Saudi Arabia, conventional wireline log correlations have historically failed to provide a geologically robust lithostratigraphy. Recent core studies, augmented by image logs, have successfully evolved a sequence stratigraphic model that has considerable applicability to geocellular modeling. Thus, a basal Sequence Boundary is marked by a Significant Desiccation Surface (SDS), overlain by a thin sheet of eolian sand. It is superseded by extensive, irregularly laminated and locally desiccated very fine-grained sandstones with rare thin siltstones. These reflect shallow water deposition with periodic desiccation in an ephemeral lake environment. They terminate in a thin, widespread upward-fining unit that represents the Maximum Extent of the Lake (MEL). Above that horizon, varying facies associations are seen, including eolian erg-centre, cross-bedded sandstones; erg margin dune and interdune deposits (with paleosols); deflation plain; ephemeral lake. Depositional cycles are recognized within each of these major facies associations that are regionally correlatable within and between the various facies tracts. When hung from the MEL as a Datum, these correlatable cycles are seen to be essentially flat-lying 'parasequences' that are demonstrably related to fluctuating water table within the regional Unayzah setting. This stratigraphy is clearly quasi-chronostratigraphic in character, i.e. it is founded on Sequence Stratigraphic principles. This clarifies the distribution of reservoir bodies within the Unayzah A, and predicts the occurrence of intra-reservoir variability and potential compartmentalization. Reservoir characterization and modeling of these deposits is thus optimised. Outcrop analogs occur in the Cedar Mesa and Entrada sandstones of Utah.