

Sequence Stratigraphic Approach Using Architectural Element Analysis on a Prograding Shoreline Sequence of the Pictured Cliffs Sandstone, Northern San Juan Basin

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The Pictured Cliffs Sandstone (Upper Cretaceous) of the northern San Juan basin (southwestern Colorado) shows multiple transgression-regression cycles. The stratigraphic section shows seven sets of parasequences within a mega-sequence. These parasequences are up to 25 m thick and are identified mostly as prograding storm-dominated shoreface. These parasequences consists of three meso-scale sequences: a) offshore turbidite sequence b) offshore transition zone distal tempestite sequence and flood deposits c) shoreface swaly stratified sandstone or amalgamated tempestites and cross-bedded sandstone. The meso-scale sequences consist of 11 different architectural elements, which can be further classified into 4 distal tempestite elements, 3 proximal tempestite elements, 4 turbidite elements, 1 flood deposit element, and 1 tidalite element.

The sand bodies in each of these parasequences show coarsening- and thickening-upward sequences representing shift in environment from deep-water to shallow-water environment representing high-frequency transgressive episodes. These are identified by systems tracts and stratal surfaces recognized in the outcrop section. The Pictured Cliffs Sandstone mostly represents HST, which are recognized by overall shallowing-upward sequence. TST (recognized by deepening-upward sequence) and LST (recognized by reworked delta platform) are also identified in the outcrop section.

Four well data (2 well core and 3 well log data) were analyzed to determine the subsurface lithofacies. Gamma-ray and density log from Well-1 were calibrated using well core data. Log patterns and trends were determined for gamma-ray logs to provide insights on facies assemblages and depositional environments. The well logs and outcrop section were correlated using pattern matching technique. Similar parasequences found in the outcrop study were also identified in the gamma-ray logs. In general, these well data show good correspondence with outcrop section with the exception of 1 well data. This suggests variations in thickness and continuity of sand bodies both parallel and perpendicular to the transgressive shoreline.