Depositional Architecture of a Turbiditic Sandstone Complex, Lower Green River Formation, Uinta Basin, Utah

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Abstract

The Green River Formation of Utah records multiple episodes of Eocene lacustrine deposition within the Uinta Basin. Numerous members of the Lower Green River formation (LGR) have been successfully exploited for oil production utilizing horizontal drilling and hydraulic fracturing techniques over the last decade. One such member is the informal Castle Peak member of the LGR. The Castle Peak member produces from over 50 laterals within the Uinta Basin with Estimated Ultimate Recoveries (EURs) from these lateral ranging from 50,000 to 1,000,000 barrels of oil. The most prolific Castle Peak laterals are located within the Central Basin subregion, where a series of sand-dominated turbidites, informally referred to as the Bar F sandstone, have been identified. Due to a relatively limited number of legacy wellbore penetrations within the Central Basin subregion, the lateral extent and aspect ratio of individual turbiditic beds and bedsets within the Bar F sandstone are relatively poorly understood. This study attempts to utilize well logs, cuttings, and geosteering profiles from a high-density development drilling pattern to resolve the depositional architecture of the Bar F sandstone. To conduct this analysis, bedset-scale correlations were made across numerous clastic depositional bodies for every well drilled within a development cube. These high-resolution log correlations were combined with lateral geosteering profiles to develop a 3D framework for individual bedsets. To further confirm correlations and interpretations, drill cuttings were analyzed to compare elemental concentrations across the numerous bodies encountered during development drilling with the intent of evaluating changes in provenance. Additional evidence for compartmentalization was evaluated utilizing high-resolution mud gas ratios from vertical and lateral wellbores. This study distinguishes multiple lenticular, turbiditic complexes within the Bar F sandstone depositional fairway and proposes a generalized relationship between Bar F sandstone thickness and Castle Peak lateral productivity.

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