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Andrew W. Taylor¹, Bradley D. Ritts¹ (1) Utah State University, Logan, UT

Detailed Facies Architecture, Sedimentology, and Reservoir Characterization of Lacustrine Rocks, Eocene Green River and Colton Formations, Uinta Basin, Utah

Outcrop and petrographic studies of Eocene strata in the Uinta Basin provide a better understanding of the three-dimensional geometry, facies architecture, and internal heterogeneity in lacustrine reservoirs. These reservoir properties are a product of depositional environment, and control fluid migration and compartmentalization in other deposystems. A southwest-northeast transect of Eocene strata in the Uinta Basin records three main depositional environments: fluvial, deltaic, and wave-dominated. The fluvial facies is characterized by both 10-30 meter-thick laterally extensive sandstone bodies and 10-40 meter-thick erosive lenticular sandstone units that are partially compartmentalized by thick mudstones. Trough cross-stratification is the dominant sedimentary structure, and can reach amplitudes of 1-2 meters. Grain size is fine-medium sand, and mud chips are abundant and sometimes concentrated along erosive contacts. The deltaic facies exhibits similar characteristics as the fluvial facies, however all features are at a smaller scale. Sandstone body thickness is 10-20 meters in the laterally extensive units and 10-15 meters in the lenticular units. Trough cross-stratification is 50 centimeters to 1 meter in amplitude, and grain size is fine-medium sand. Mud chips are restricted to the basal portion of erosive units. The wave-dominated lacustrine facies is a distinctive unit that is characterized by 5 meter-thick laterally extensive sandstone bodies that are compartmentalized by mudstone units. Most contacts are sharp. Grain size is fine-medium sand, and sedimentary structures are typically not well-preserved due to bioturbation and soft sediment deformation. These sedimentological characteristics control fluid migration and compartmentalization in lacustrine reservoirs, and can be utilized in geostatistical fluid flow models to improve efficiency in the exploration and production of oil in lacustrine basins.