EXECUTIVE SUMMARY

Offeror: Utah Geological Survey, Salt Lake City, Utah
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Major Participants (Partners):
Energy & Geoscience Institute, University of Utah
Halliburton Energy Services

Cretaceous Mancos Shale, Uinta Basin, Utah: Resource Potential and Best Practices for an Emerging Shale-Gas Play

Successful development of shale-gas plays requires integration of accurate geologic characterization and reservoir-specific engineering practices. Existing gas production in Utah's Uinta Basin could be greatly enhanced by the addition of recoverable gas reserves in the Upper Cretaceous Mancos Shale. While the Mancos is an emerging shale-gas play, both the geologic and engineering insights are still relatively immature compared to better-established shale-gas plays. The thickness of the Mancos (averaging 4000 ft in the Uinta Basin) and the variable lithology present drillers with a wide range of potential stimulation targets. Identifying and mapping favorable reservoir units within the Mancos will allow development of completion strategies based on appropriate geologic models.

The Mancos was deposited in the Western Interior Seaway in the foredeep basin east of the Sevier orogenic belt, and the Mancos intertongues westward with coarser-grained clastic sediments shed from the belt. At least four members of the Mancos have shale-gas potential: the Prairie Canyon (Mancos B), the Lower Blue Gate Shale, the Juana Lopez, and the Tropic-Tununk Shale. Organic matter in the shales has a large fraction of terrigenous material derived from the shorelines of the Sevier belt. Thicknesses of organic-rich zones within individual highstand system tracts exceed 12 ft. Vitrinite

reflectance values from a limited number of samples at the top of the Mancos range from 0.65% at the Uinta Basin margins to >1.5% in the central basin. As some wells produce from depths greater than 13,000 ft, Mancos exploration can entail considerable financial risk. The main objective of this project is to reduce that risk, particularly for independent operators, by providing the industry with an integrated compilation of geologic and engineering data relevant for Mancos exploration and production.

The proposed **tasks** include:

- data compilation from existing wells and publications,
- description and petrophysical, geochemical, and rock mechanical analysis of cores and cuttings from the Utah Geological Survey (UGS) collection and samples provided by industry partners,
- outcrop examination and sampling,
- log evaluation of geochemical and petrophysical properties,
- seismic reflection attribute analysis of 3-D data supplied by industry partners,
- discrete fracture network modeling,
- development of regional maps and cross sections that show structure, thickness, thermal maturity, and depositional facies of key reservoirs, and
- design, description, and recommendation of the best completion practices (drilling, fracturing, acidization, perforation, etc.) for the Mancos gas reservoirs based on parameters defined by our study.

Thus, the overall **objectives and/or benefits** of this study are to (1) identify and map the major trends for target shale intervals and identify areas with the greatest gas potential, (2) characterize the geologic, geochemical, and petrophysical properties of

those reservoirs, (3) reduce exploration costs and drilling risk, especially in environmentally sensitive areas, and (4) recommend the best practices to complete and stimulate Mancos gas shales to reduce development costs and maximize gas recovery. All project maps, data reports, and results will be publicly available and presented to the petroleum industry (both small and large operators) through a proven technology transfer plan that includes exhibits and presentations at national and regional conferences, meetings with industry partners, workshops, Web site postings, and UGS publications.

This project began activities in November 2010 and will conclude in June 2014. Reports and presentations will be posted on the project Web site as they become available.