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Current Understanding of the Sedimentology, Stratigraphy, and Liquid-Oil Potential of the Pennsylvanian Cane Creek Shale of the Paradox Formation, Southeastern Utah

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The Utah Geological Survey recently received a three-year, U.S. Department of Energy grant to examine the liquid-oil potential of the Cane Creek shale in the Pennsylvanian Paradox Formation of the Paradox Basin, southeastern Utah. Examination of the depositional environment, stratigraphy and lateral extent, geochemistry and mineralogy, fracture spacing, thermal maturity and burial history, and geomechanical properties will help maximize liquid-oil production through the determination of "sweet spots" and help define optimal completion strategies. The Cane Creek shale records an early stage of a transgressive-regressive sequence (cycle 21) in the Paradox Formation. The Cane Creek is informally divided into three zones, in ascending order the C, B, and A. The thickness of the Cane Creek varies from 0 to 160 feet within the basin. Depositional thickening occurred on downthrown fault blocks, and thinning on upthrown blocks. Extreme thickness variations are also caused by diapiric salt movement and reverse faults associated with salt-diapiric anticlines and synclines. The unit has a northwest-southeast depositional strike and generally thins towards the southwest. The B zone is considered the source and reservoir and has an average TOC of 15%. Production from the Cane Creek shale is generally related to traps caused by diapiric anticlines or to high positions on fault blocks. The Cane Creek is highly overpressured, ranging between 5000 and 6200 psi, which is probably the result of hydrocarbon generation between very impermeable upper and lower anhydrite and halite seals. The unit generally has a porosity of 1–2% and matrix/fracture permeability between 39 and 400 mD. Oriented cores from the Cane Creek show that generally the B zone fracture system trends northeast-southwest, matching the regional trend. The U.S. Geological Survey estimates the total undiscovered oil at 103 MMB and gas at 2473 BCF in the Cane Creek shale. The most successful vertical well, 1 Long Canyon, encountered a thick section of highly fractured Cane Creek and has produced over 1.1 million barrels oil to date. The Kane Springs Federal 27-1 was the first horizontal well drilled in the Paradox Basin and has produced over 50,000 BO from the Cane Creek. Several other vertical and horizontal wells have been drilled or are scheduled to be drilled.