

Manning Canyon Shale: Depositional Setting of an Emerging Gas Resource Play in Utah

Schamel, Steven ^{*1} (1) GeoX Consulting Inc., Salt Lake City, UT.

At the north end of the San Rafael Swell 22 exploration wells that fully penetrate the Manning Canyon Shale (Upper Mississippian-lowermost Pennsylvanian) delineate a 600-square-mile area of an emerging gas resource play. In this region, the formation is 400-1,200 feet thick. Approximately two-thirds of the section is dark gray, organic-rich silty limestone and mudstone. Organic matter content of the carbonaceous rocks is typically 1% to 10%, but it is even greater in thin coal beds. The rocks have measured vitrinite reflectance in the range 1.3% to 1.8%, putting them well within the gas generative window. Gas tests and shows are reported from many of the exploration wells. The stratigraphy and rock properties of the Manning Canyon Shale have been determined from well logs, cuttings and cores, including an 800 foot continuous core. The lithotypes within this heterogeneous formation are comprised of mixtures of four components: (1) calcite microbioclasts and shelly debris, largely thin-shelled brachiopods and thick-shelled pelecypods, (2) eolian coarse silt to fine-grained quartz sand, (3) an assemblage of mature clays (illite, smectite-illite, kaolinite and chlorite) derived from an intensely leached regolith on adjacent Mississippian-age limestone, and (4) degraded fragments of terrestrial plants occurring as disseminated micron-size grains or as discrete plant parts. These four components combine to form a range of lithotypes: organic-rich or organic-poor, silty or non-silty packstones, wackestones, and dark gray or varicolored, calcareous or non-calcareous mudstones. The several lithotypes are interbedded at a scale of feet to at most a few tens of feet. The continuous core exhibits a weak vertical cyclicity indicating possible flooding surfaces and parasequences, but stratal cyclicity not detected in well logs. On the whole, the formation lacks lateral continuity of strata, even between close-spaced wells. In the gas-play area, the unit was deposited in a broad structural depression adjacent to the nascent Uncompaghre uplift. The fresh-water marshes of the Everglades together with the shallow water brackish to marine carbonate factory of Florida Bay may serve as a conceptual model for the depositional setting of the Manning Canyon Shale. Hummocks and marshes formed on the carbonate mud mounds in the bay are an additional source of terrestrial and algal organic matter. A robust stratigraphic model is essential for effective future exploitation of this gas resource.