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Outcrop-to-Basin Stratigraphy and Structure of Glen Rose Limestone of Central Texas

The Glen Rose Limestone is a proven oil and gas producer in south Texas along the Stuart City reef trend. However, it has not been productive, except in minor occurrences, in the East Texas basin, even though it is present in an area of approximately 75,000 mi^2 (195,00 km^2) and attains a maximum thickness of 3,500 ft (1,067 m). This absence of production is believed to result from a lack of exploration rather than a lack of potential. Therefore, a regional study of the outcrop-to-basin stratigraphy and structure of the Glen Rose in central Texas was undertaken to correlate existing stratigraphic nomenclature and to determine the depositional and diagenetic history. Be relating these to known production, it should be possible to identify potential exploration fairways.

Cross sections were used in establishing stratigraphic correlations, resulting in a division of the Trinity Group different from that commonly seen in literature. The group is divided into the Glen Rose and Travis Peak subgroups, with the division at the outcrop placed at the Hensel-lower Glen Rose contact. However, in the basin, the Pearsall-Rodessa contact is used as it is time-equivalent to the division adopted at the outcrop.

Examination of cores, cuttings, and sample logs defined the depositional and diagenetic environments of Glen Rose strata. Isopach maps and seismic sections were used to map distribution of facies tracts related to production. Facies and structure of known production areas were compared to those of untested areas to define possible exploration fairways and to map recommended exploration trends. Principal of these is the Stuart City reef trend.

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Continental Shelf Topography: Possible Key to Understanding Distribution of Shelf-Bar Sandstones from Cretaceous Western Interior Seaway

A comparison of Holocene shelf sand ridges on the Georges Bank-Nova Scotia-Newfoundland-Labrador shelf system and the Texas shelf with Cretaceous shelf-bar sandstones from the Western Interior seaway provides new insights into the possible role shelf topography may have in controlling shelf-bar distribution, as well as providing a possible sand source on an otherwise muddy Cretaceous shelf. The Holocene ridges are elongate, asymmetric in cross section, 2 to 20 m (6.6 to 66 ft) in height, up to several kilometers in length, and are spaced from 90 m to 3 km (295 ft to 1.9 mi) apart in parallel sets. They occur up to a maximum of 300 km (186 mi) from the present shoreline, and in different areas appear to be actively influenced by tidal, storm, and/or oceanic currents. The shelves upon which the ridges sit are up to 400 km (250 mi) wide, and 100,000 km^2 (39,000 mi^2) in area, with water depths of 50 to 200 m (165 to 660 ft).

The commonly prolific hydrocarbon-bearing Cretaceous shelf-bar sandstones (e.g., Shannon, Sussex, Gallup, Hygiene, Viking, Cardium, etc) exhibit similar geometries and dimensions to these Holocene ridges and are thought to have been deposited tens to hundreds of kilometers from the paleoshoreline in comparable water depths. Material for these sandstones is commonly thought to have been transported long distances across a flat, muddy shelf, since the sandstones are usually associated with thick shale sections.

All of the Holocene ridges sit atop topographic highs on the shelf surface. They are generally part of a Holocene transgressive sand sheet derived by reworking of underlying substrate while contemporaneous mud is deposited in adjacent low areas. The above comparisons suggest the Cretaceous shelf-bar sandstones may have been deposited upon similar shelf highs. Such topographic highs could develop on the Cretaceous shelf surface by (1) recurrent folding or faulting, as has been proposed for some Wyoming sandstones, (2) fluvial erosion and sculpturing during lowered sea level, as on the Texas shelf, (3) deposition of thick accumulations of sediment (e.g., deltas), as on some Holocene Atlantic shelves, and (4) preservation of paleotopography from stratigraphically lower unconformity surfaces, as has been suggested for the Cretaceous of Alberta.

A sequence of events is proposed for the evolution shelf-bar sandstones which considers the role of shelf topographic highs coupled with fluctuations in water depth in providing the source, development and burial of shelf sand ridges. The initial stage is development of the topographic high on the shelf. With shallowing of water, sediment derived by erosion on the high forms a sediment sheet which later is molded into sand ridges by shelf hydrodynamic processes; during this stage mud is winnowed and