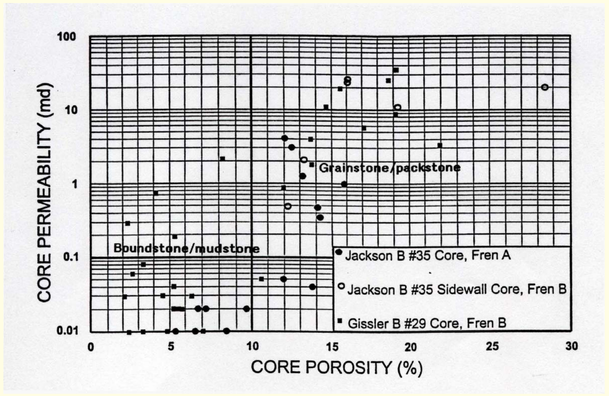
Core Porosity and Permeability



Plot of porosity vs. permeability for dolomite core plugs and sidewall cores from Jackson B #35 and Gissler B #29 wells. Only samples with permeability equal or greater than 0.01 md are included. Due to low permeability, “pay” porosity threshold is approximately 10%.

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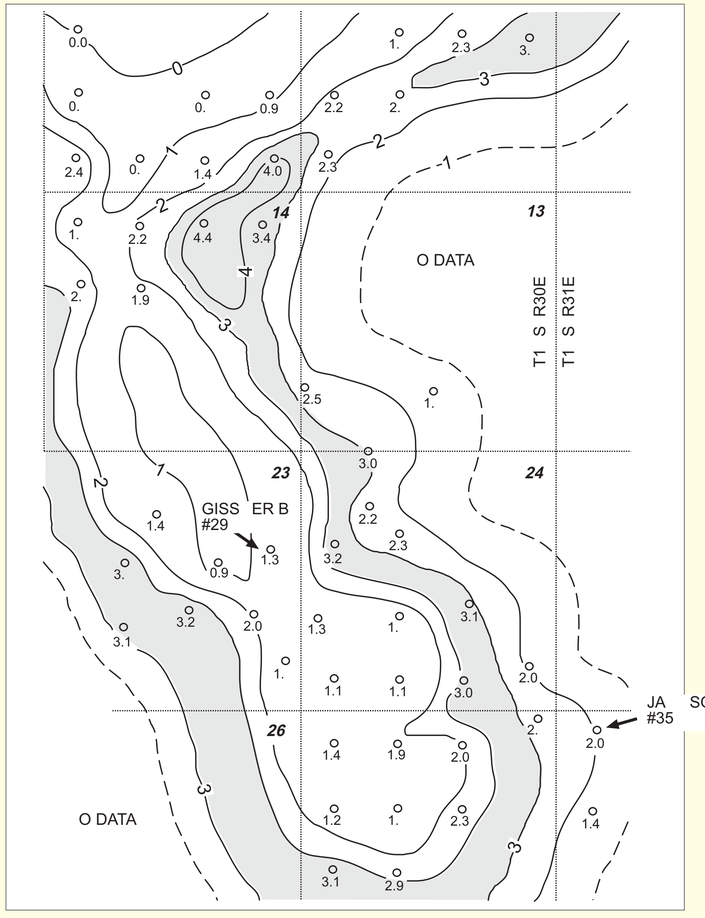
Porosity Volume Map: Depositional Environment Implications

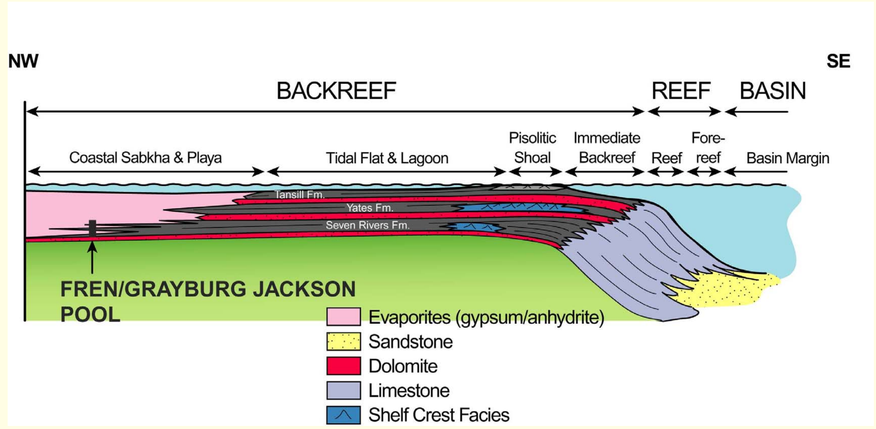
Isopach of upper Seven Rivers dolomite “net porosity volume” (porosity x feet of thickness). Pore volumes were estimated from gamma ray/neutron logs of various vintages (1950’s to 1990’s). A conservative method of estimating pore volume was utilized that ignored porosity less than 4% and tended to focus on the probable grainstone/packstone higher-energy facies.

The shaded area is maximum pore volume (phi x ft >3). Although this is a “net pore volume” map for the entire upper Seven Rivers, the map illustrates distinct shore-perpendicular (northwest-oriented) linear trends interpreted to be indicative of tidal channels. This would suggest that the depositional environment for porous units was probably intertidal.



Depositional Environments

Schematic cross-section showing regional depositional relationships of Upper Permian strata along the western margin of the Delaware Basin and the general location of the Fren/Grayburg Jackson Seven Rivers Pool (modified from Esteban and Pray, 19 3). The predominance of thick units of massive to nodular chicken-wire anhydrite interbedded with algally laminated carbonates indicates that evaporative, supratidal, coastal sabkha conditions dominated this area. Thin porous tidal channel carbonate units represent intermittent episodes of higher stands of base level such that intertidal depositional conditions shifted temporarily landward.



Conclusions

1) Upper Seven Rivers Formation carbonates span a range of depositional environments from tidal channels to intertidal algal mats. The evaporites are interpreted to be supratidal sabkha deposits.

2) The pinchout of dolomite units into sabkha sulfate evaporites, combined with drape over the underlying Artesia-Vacuum Abo reef, provided excellent stratigraphic and structural conditions for trapping petroleum.

3) Shoreline-perpendicular packstone/grainstone tidal channel facies were extensively dolomitized creating secondary porosity that may have been preserved by early oil migration or by later dissolution of gypsum/anhydrite.

4) Although porosity is potentially as high as 30% in the tidal channel facies, permeabilities are relatively low and the thin porous units are preferentially oriented, making the Seven Rivers a challenging reservoir for effective secondary recovery.

Acknowledgments

e wish to thank Burnett Oil o. Inc., Fort orth, Texas, for providing the cores and thin sections studied.

Reference

Brister, B. S., and Ulmer-Scholle, D., 2000, Interpretation of depositional environments of upper Seven Rivers Formation from core and well logs, Grayburg Jackson Pool, Eddy ounty, ew Mexico *in* est Texas Geological Society Publication #00-109, p. 5- 2.