

PS Depositional Environment and Sedimentary Structures of the Grayburg Formation, Midland Basin*

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Search and Discovery Article #51550 (2019)**

Posted February 11, 2019

*Adapted from poster presentation given at AAPG Southwest Section Meeting, El Paso, TX, United States, April 7-10, 2018

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Abstract

The core of the Grayburg Formation was drilled in the Midland Basin between Andrews and Midland to prove the oil and gas fields of West Texas. The target of this well is to locate oil seeps for production and exploratory purposes. The core taken from the well from 4620 feet to 5081 feet was used to make thin sections and provide an overall description of the different lithologies, sedimentary structures, and textures for that specific depth in the area. Bedding boundaries and facies are identified using core analysis through hands-on and microscopic views. All grains were identified and described at each interval of bedding boundaries which included beds of various shales, sandstones, carbonates, evaporites, and oil stains. The core is composed of mostly sands and carbonates. General trends are found going from sands and carbonates to sands and evaporites which suggested a shallowing sequence or a shallowing cycle. Rocks from shallow marine environments along with exposure surfaces at the top of the core also proved this sequence true. The primary sedimentary structures found are anhydrite nodules, lamination, clasts, bioturbation, and a mixture of fossils. Dolomite is found to be the primary cement type, sealing much of the porosity. Intervals of quartz cement are also seen and are generally located where there are no carbonates. Oil stains are found through a large consecutive interval ranging from 5010 feet through to 4932 feet. The heavy oil stains found in these intervals contained vuggy sandstones and fenestral porosities with interbedded clasts and bioturbation. These are mostly heavily cemented by dolomite. Fossils such as crinoids and bivalves are also seen throughout the core, predominately where sand is dominant. The core is also believed to have originated from the Permian period of the Palaeozoic era which places it at 275 million years old.



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GEOLOGY OF THE STUDY AREA

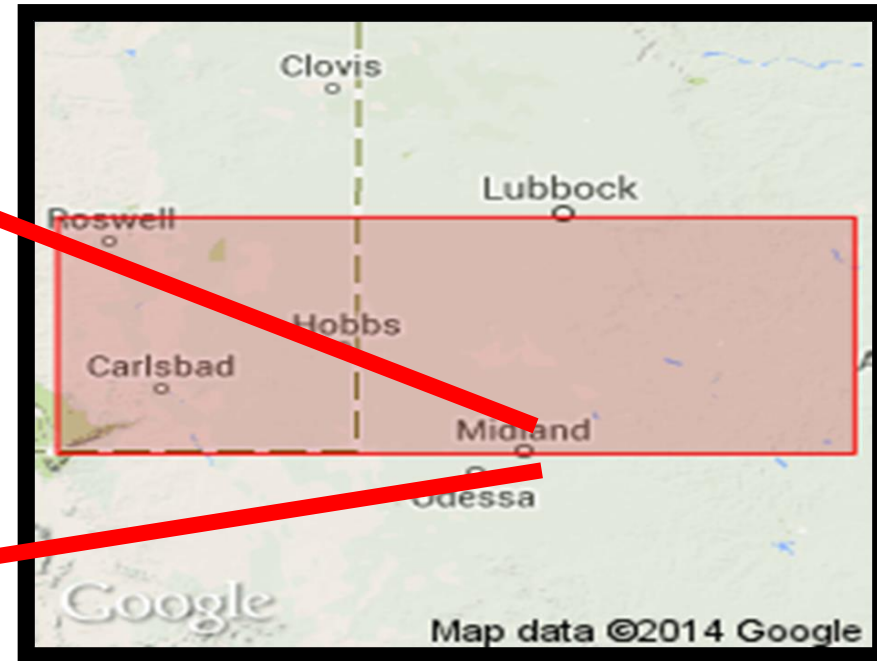
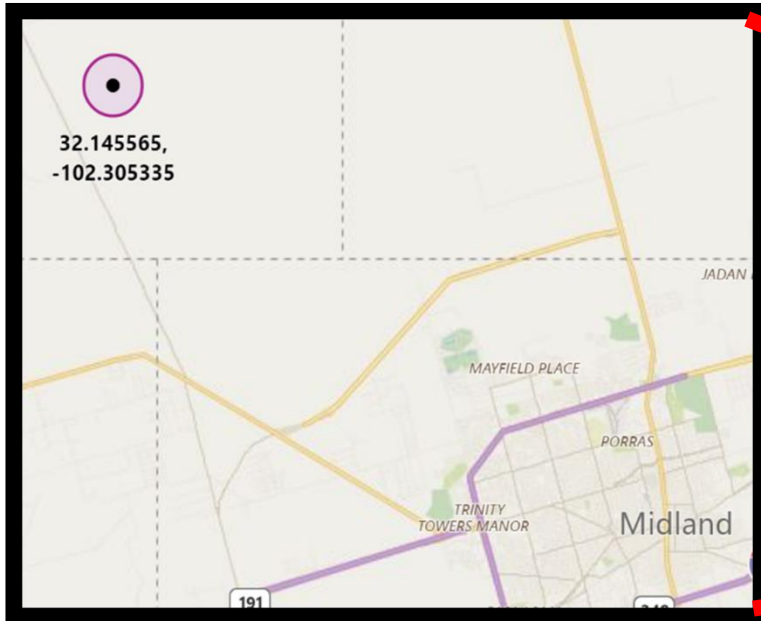


Figure 1(a). Location map of the study area (Google Earth Maps). The Grayburg formation is highlighted in red.

Figure 1(b). The exact location of the well is displayed below

Stratigraphy



Figure 2. Stratigraphic column of the study area in the Midland Basin. The first track indicates the time period (in years). The second track indicates the series. The third track indicates the formations.

“File:Midland Basin Stratigraphy.png.” *Wikipedia*, Wikimedia Foundation, 2 Apr. 2018, [en.wikipedia.org/wiki/Permian_Basin_\(North_America\)#/media/File:Midland_Basin_Stratigraphy.png](https://en.wikipedia.org/wiki/Permian_Basin_(North_America)#/media/File:Midland_Basin_Stratigraphy.png).

Midland Basin Stratigraphic Formations		
Period	Series	Formations
Guadalupian (271-260 mya)	White Horse	Yansil Yates Seven Rivers Queen Grayburg
	Ward	San Andreas Glorietta
Leonardian (280-271 mya)	Clear Fork	Upper Leonard
	Upper Spraberry	
	Lower Spraberry	
	Dean	
Wolfcampian (299-280 mya)	Wolfcamp	
Pennsylvanian (323-299 mya)	Pennsylvanian	

W

E

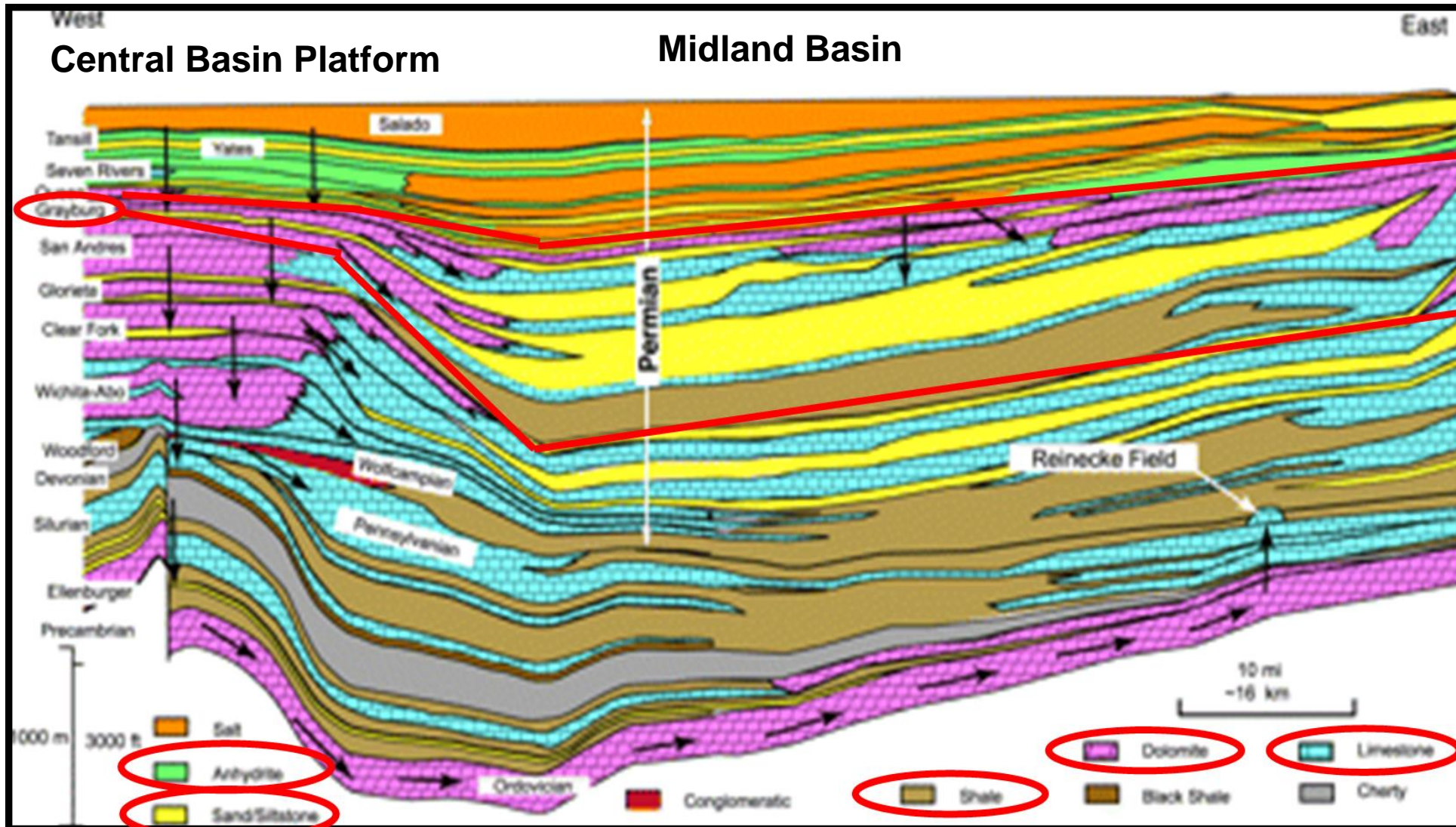
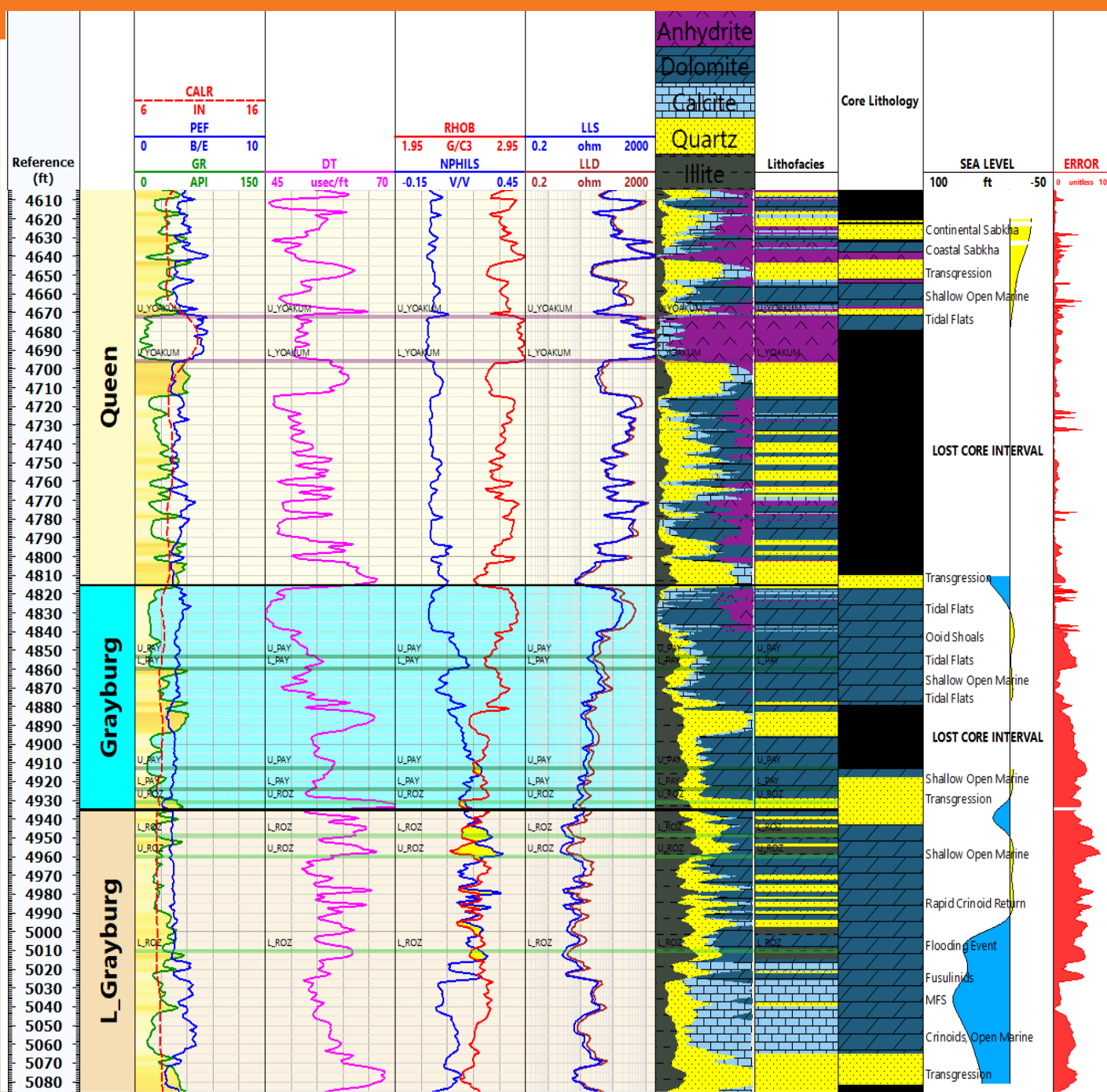


Figure 4. Highlighted in red is the stratigraphy of the Grayburg Formation. The core contains Anhydrite (Green), Sandstone (Yellow), Shale (Light brown), Dolomite (Pink), and Limestone (Blue). The core is composed of mostly sands and carbonates as seen in figure 3. from: <http://aapgbull.geoscienceworld.org/content/95/10/1745/F9.expansion.html>



API: 420033429400
Well: MFE Unit 101
Field: Midland Farms E



Depth : 4610 ft to 5080ft

Petrophysical Analysis

Figure 3. Petrophysical Analysis. The first track is the Depth. The second track is the Formation. The third track is the Gamma Ray. The fourth track is the Sonic Velocity. The fifth track is the Bulk Density. The sixth track is the Restivity. The seventh, eighth, and ninth tracks are the Lithofacies, Lithology, and Sedimentary.

Conclusions



- **Fossils such as crinoids and bivalves are also seen throughout the core, predominately where sand is dominant. General trends are found going from sands and carbonates to sands and evaporites which suggest a shallowing sequence. Rocks from shallow marine environments along with exposure surfaces at the top of the core also prove this sequence true. Also, oil stains provide possibilities for oil production. These Oil stains are found through large consecutive Intervals which contain Vuggy sandstones and Finestral porosities along with interbedded clasts and bioturbation. These are mostly heavily cemented by dolomite.**

ACKNOWLEDGEMENTS



- We would like to thank Schlumberger for Techlog licenses at UTPB. The data set was provided by Faskin Oil and Ranch. For questions, please email Brandon. Leebr.94@hotmail.com