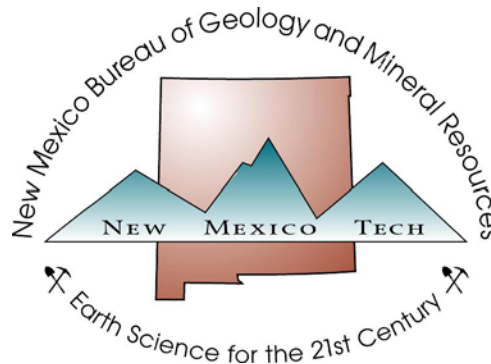


New Regional Structural Log Cross Sections, Permian Basin, New Mexico

By

Willis W. Tyrrell, Jr.

Consulting Geologist
Charlotte, North Carolina 28226



Open File Report No. 522

New Mexico Bureau of Geology and Mineral Resources

A Division of New Mexico Tech

Socorro, NM 87801

Dr. Peter A. Scholle, Director

December 2009

This report consists of scanned images of a poster presentation made at the
West Texas Geological Society Fall Symposium, Midland, TX October 28-30, 2009

New regional structural log cross sections, Permian Basin, New Mexico

Willis W. Tyrrell, Jr. (wtyrrell@Carrollina.rr.com), 5718 Bentway Dr., Charlotte, NC 28226

Abstract

Five regional structural wireline log cross sections are being prepared for the New Mexico Bureau of Geology and Mineral Resources to summarize stratigraphy and tie key subsurface and surface sections. Emphasis is on Permian stratigraphy but

the entire stratigraphic column in Eddy and Lea counties is correlated. Four of the cross sections will pass through the Shell # 1 James Ranch (Eddy Co., NM: API 30 -015 - 04735), a Lower Ordovician (Ellenburger) test which is selected as a "type section" for the northern Delaware Basin. Although it is an older well, it is near numerous modern logged wells; has been well studied; and is on several published classic cross sections.

The five planned cross sections include:

1. NW – SE section A –B –C from the flank of the Pedernal Uplift (Chaves Co., NM) to the southeastern corner of Lea Co., NM on the Central Basin Platform.
2. N – S section D –B –E extending from the Pecos Slope (Chaves Co., NM) through the Artesia Group type section; the Chevron (Gulf) PDB 04 cored research well in the Capitan Reef complex; a Precambrian test in Reeves Co., TX and to the Chevron (Gulf) PDB 03 cored research well in Loving Co., TX.
3. W – E section F –B –G from the Algerita Escarpment (Guadalupe Mountains) through the Capitan Reef complex in the Dark Canyon area just south of Carlsbad and eastward to the New Mexico portion of the WTGS (1992) cross section which crosses the Central Basin Platform.
4. SW –NE section H –B –I from the Sierra Diablo (Hudspeth Co., TX) to the San Simon Channel (central east Lea Co., NM). This section summarizes a cross section presented at the 2007 WTGS Fall Symposium and included on the CD (Pub. 07 -119) for that meeting.
5. N – S outcrop (classic Guadalupe Mountains) to subsurface. This section J –K extends from the Algerita Escarpment through the McKittrick Canyon area and ties section H –B –I above.

Only the N –S regional cross section (2 above) and a supplementary section in Vacuum Field are presented as "work in progress" posters at this (2009) symposium. The latter is included to show possible San Andres –Brushy Canyon relationships based on the published seismic section in Pranter, Hurley and Davis (2004, AAPG Mem. 81).

Regional structural North – South log cross section D –B –E, northern Delaware Basin area NM and TX

By Willis Tyrrell, 5718 Bentway Dr., Charlotte, NC 28226
(wtyrrell@carolina.rr.com)

Cross section D –B –E extends from the Pecos Slope Abo Field, Chaves County, NM approximately 150 miles southward to the Dimmitt oil field, Loving County, TX.

It includes Grant and Foster's (1989) Northwest Shelf type well, the Artesia Group type well, and the Chevron (Gulf) PDB 04 and PDB 03 cored research wells. It also ties the 1964 WTGS and 1984 WTGS regional cross sections and Meissner's (1972) regional Guadalupian cross section.

A variety of wireline logs – some old and some new - are used; although each has a Gamma Ray curve.

It has not benefited from seismic data which could improve the interpretations.

wtyrrell@carolina.rr.com

Some NW Shelf Questions

- Shattuck Mbr. of Queen Fm.- Does it extend down slope into Basin anywhere?
- Does Manzanita have a shelf margin?
Unlike in outcrop it thickens at northern Delaware Basin edge.
- Outcrop erosional margin of the Grayburg – is it local or is it also recognized in subsurface?
- Is the Brushy Canyon Fm. related to a Lovington ss. bypass surface or to a bypass surface in the “lower” San Andres?
- Is the “lower” San Andres shelf margin in the Vacuum Field area also recognized regionally?
- Is top Wolfcamp pick (dol. – ls. boundary) at base of Abo a facies change rather than Leonardian – Wolfcamp boundary.
- How to recognize base of Fletcher Anhydrite from Tansill anhydrite on wireline logs?

Each of my planned cross sections pass through the Shell # 1 James Ranch Unit (API 30 - 015 - 04735 sec. 36 -22s -30e, Eddy Co., NM), a lower Ordovician test centrally located in the northern Delaware Basin. It is near Grant and Foster's (1989) Delaware Basin type well as well as several wells with modern wireline logs in the Quahada Ridge SE Field (Broadhead. et al., 1998). I have a detailed sample log and the well's Guadalupian stratigraphy is shown in Meissner (1972) and the generalized lithology of the entire column in well # 6 on the WTGS 1964 regional N - S cross section.

Vertically the cross section extends from the surface to the Precambrian. The 1" = 800' vertical scale does not permit detailed facies analysis or sequence stratigraphy. Emphasis is on the Permian Cisuralian and Guadalupian Series and on wireline log defined marker beds. I used the well accepted correlation of the Tubb and 3rd Bone Spring sandstone (Dean sandstone), and our work on the Manzanita and other units previously presented at WTGS Fall Symposiums.

The horizontal scale is variable and uneven as shown on the index map. It is expanded in the Capitan Reef margin area and in the shelf margin area of the San Andres Formation and the Brushy Canyon pinch out.

Where possible thin marker beds are shown and include the:

Cowden Anhydrite in the Salado Fm.

Ocotillo silt in the Tansill Fm.

Base of the Bowers sand interval in the Seven Rivers Fm.

Lovington sand in the upper San Andres Fm.

Reef Trail and Lamar Members of the Bell Canyon Fm.

Hegler Limestone Member (two finger limestone) of the Bell Canyon Fm.

Manzanita Mbr. (and contained BCB bentonite marker), U. Cherry Canyon Fm.

Pipeline Shale

Cutoff sandstone (but I cannot pick a Cutoff Fm. - Bone Spring Fm. contact).

Following the research of numerous workers and in part shown on the 1991 WTGS regional cross section, the following shelf to basin correlations are followed;

Ocotillo Silt and upper Tansill = Reef Trail Member (uppermost Guadalupian)
which makes up most of what is called Lamar in central Delaware Basin

Lower Seven Rivers (below Bowers sand) = Hegler Ls. Mbr. ("two finger ls.")

Shattuck Mbr. of Queen Fm. = (approx.) Manzanita Mbr, Cherry Canyon Fm.

Lovington sand (u. San Andres Fm.) = lower Cherry Canyon sandstone tongue

Lovington sand bypass surface = (?) Brushy Canyon Formation

**This may cause controversy but I did not force the BC to
be equivalent to Kearn's middle San Andres bypass surface**

**which I cannot identify regionally on wireline logs. The Lovington
bypass surface = BC is supported by Vacumm Field modern seismic
(Pranter et al., 2004)**

"Upper Glorieta" or its bypass surface = 1st Bone Spring sand

"Lower Glorieta" or its bypass surface = 2nd Bone Spring sand

Tubb Formation or its bypass surface = 3rd Bone Spring sand

The Pi marker and San Andres porosity zones of the Cato Field area are shown between wells D 2 and D 3.

Note the regional parallelism of the Pipeline Shale, uppermost Cutoff limestone (Williams Ranch Mbr.?), and Cutoff sandstone. Is it possible that the Cutoff sandstone is equivalent to Kearn's middle San Andres bypass surface?

In wells E 3 and E 4, the thick lower Wolfcamp conglomeratic shaly sandstone (as shown on WTGS 1964 cross section) or conglomeratic sandy shale (as shown on WTGS 1984 cross section) was sourced from southern uplifts.

The thin bedded, highly cyclic basinal limy shale unit above the Strawn limestone in the central Delaware Basin is commonly thought to be mostly upper Pennsylvanian and probably represents deep water turbidite deposition during late Carboniferous and early Permian (?) tectonism and sea level changes due to Gondwana glaciation.

Some Delaware Basin Questions

- Can the McKittrick Canyon, McComb and Rader Ls. Mbrs. be recognized along the northern and eastern Basin margins?
 - Is the thick sand below the Manzanita equivalent to a Shattuck Mbr. bypass surface?
 - Can the Getaway Ls. Mbr. (Cherry Canyon Fm.) be mapped regionally?
-
- Is a consistent wireline log pick for the top of Brushy Canyon Fm. possible?
 - G. Wilde wondered about presence of shallow water fusulinids in Brushy Canyon Fm. Were there local lowstand shelf margins?
 - Does Pipeline Shale represent a major highstand in lower San Andres Fm.?
 - Wireline log criteria for recognizing the Bone Spring – Wolfcamp boundary? a mid Wolfcamp unconformity?
-
- What is source of the “Cutoff Sand”? Is it equivalent to Kerans’ bypass surface at top of San Andres HFS G 4?
 - Can a Cutoff Fm. – Bone Spring Fm. boundary be recognized on wireline logs?
 - Is 2nd Bone Spring ss. equivalent to basal “Glorieta” Mbr. or to bypass surfaces in the Paddock Mbr. of Yeso Fm.?
 - Can a 4th Bone Spring carbonate (equivalent to the Abo Fm.) always be recognized in the Delaware Basin?