Petroleum Geology of the Lake Kickapoo East (Caddo) Field Archer County, Texas

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Abstract

The Lake Kickapoo East (Caddo) Field is located in west Archer County, Texas in a multi-pay area that has produced from the Mississippian Lime, Bend Conglomerate, Caddo Limestone, Strawn Sandstone and Gunsight Sandstone reservoirs. The Caddo Limestone is the focus of this presentation and provides an example for exploration for Caddo Limestone reservoirs in western Archer County and eastern Baylor County.

The Lake Kickapoo East (Caddo) Field is an area where multiple Caddo buildups or mud mounds have been identified, drilled and produced. The reservoirs are isolated deposits located on a wide spread Caddo Limestone shelf. Seismic surveys combined with subsurface mapping have assisted in identifying potential mud mound buildups.

The Caddo Limestone reservoirs contain a chalky limestone with excellent porosity, but due to microporosity in the chalky portion the Archie water saturation calculations indicate the oil productive reservoirs should be water productive.

Excellent potential exists for the discovery of additional Caddo reservoirs in western Archer and eastern Baylor Counties.

Acknowledgements

Caddo Lime Reservoirs in the Bend Arch Area, North Central Texas, Jack L. Crabtree, SW Section 1987 Convention Transactions

Jack L. Crabtree - Robinson #1 – thin section and analysis

Jeff Ritchie – personal communication

ENVERUS – production data

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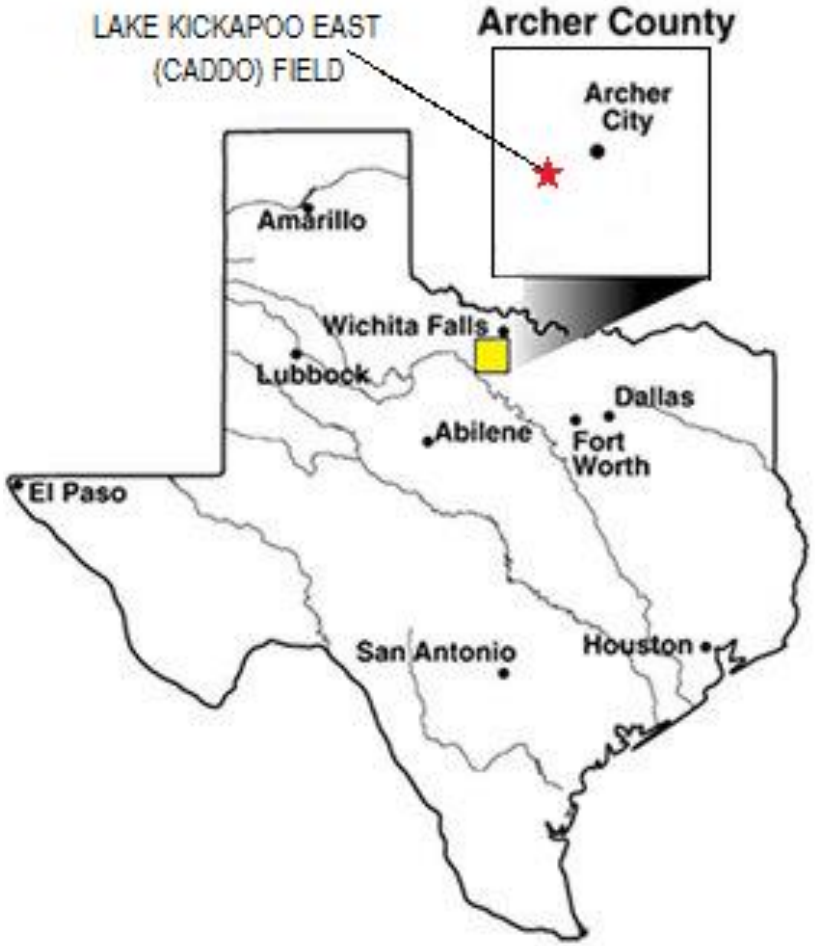
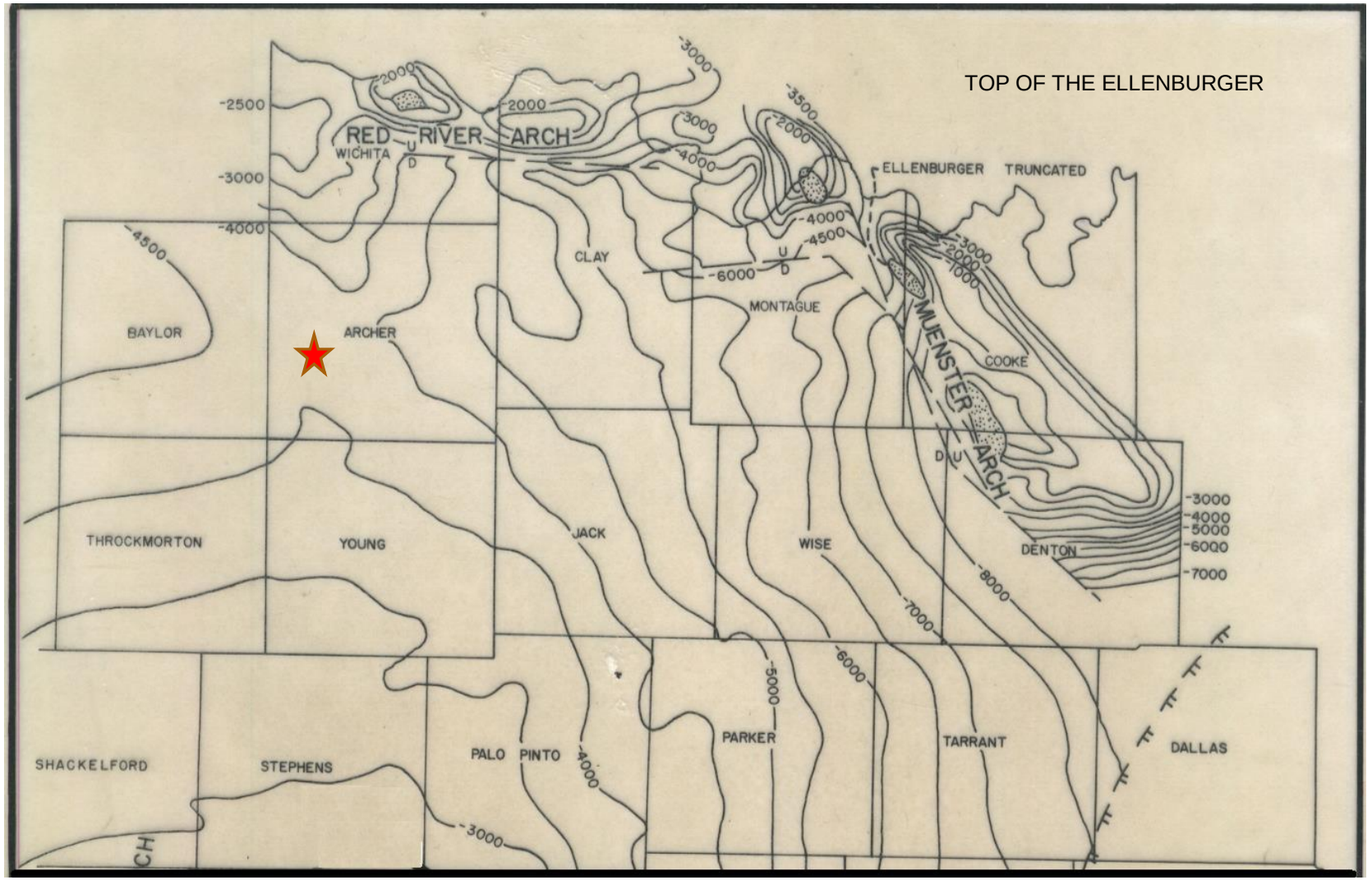
NORTH TEXAS 100th Anniversary 1923 2023 GEOLOGICAL SOCIETY WICHITA FALLS, TEXAS

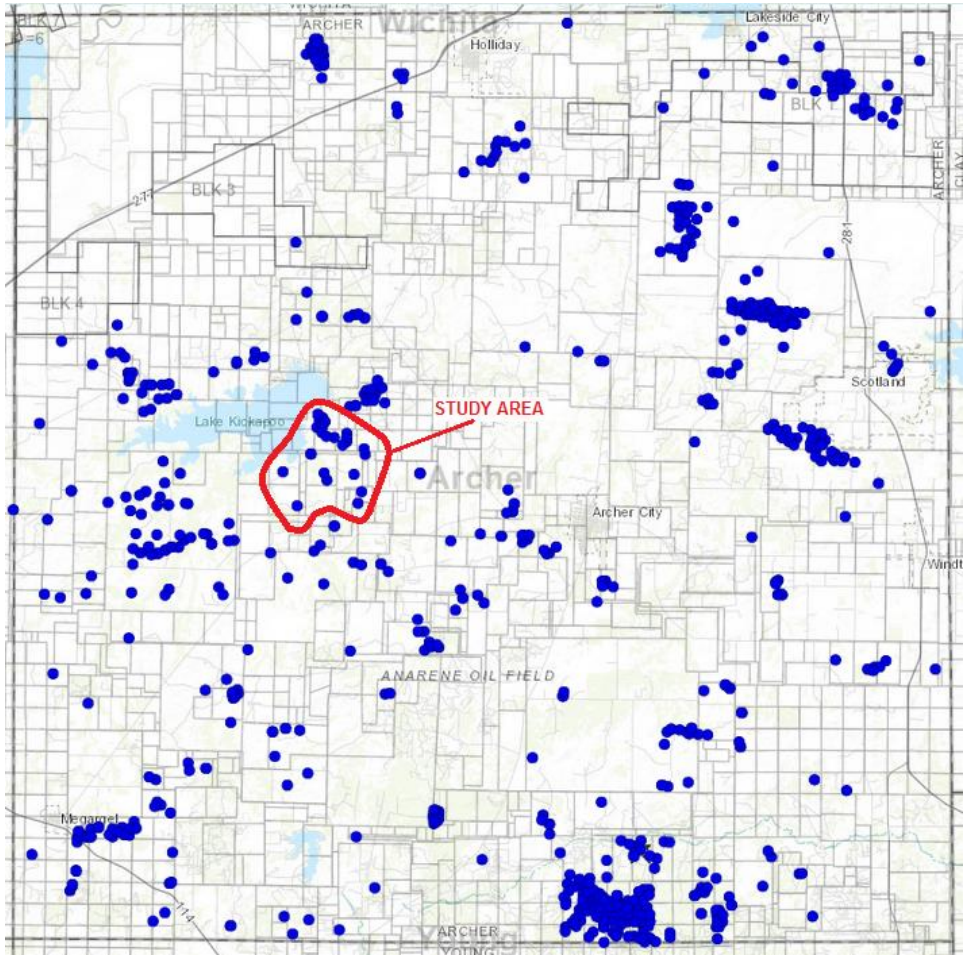
SOUTHWEST SECTION of the American Association of Petroleum Geologists


LAKE KICKAPOO EAST
(CADDO) FIELD
Archer County
Archer City
Amarillo
Wichita Falls
Lubbock
Dallas
Abilene
Fort Worth
El Paso
San Antonio
Houston

REGIONAL STRUCTURE



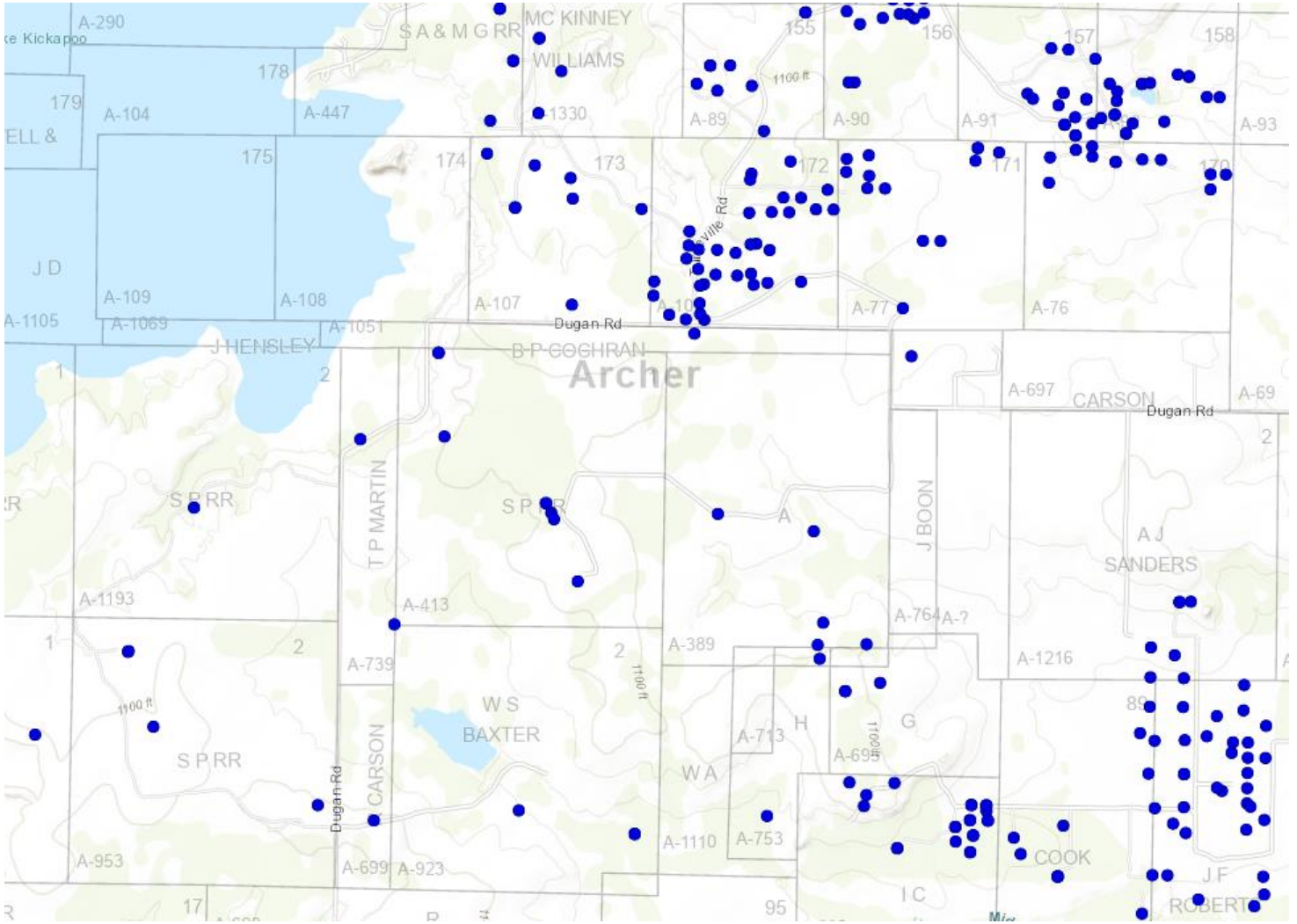
CADDO LIMESTONE PRODUCTION
ARCHER COUNTY, TEXAS



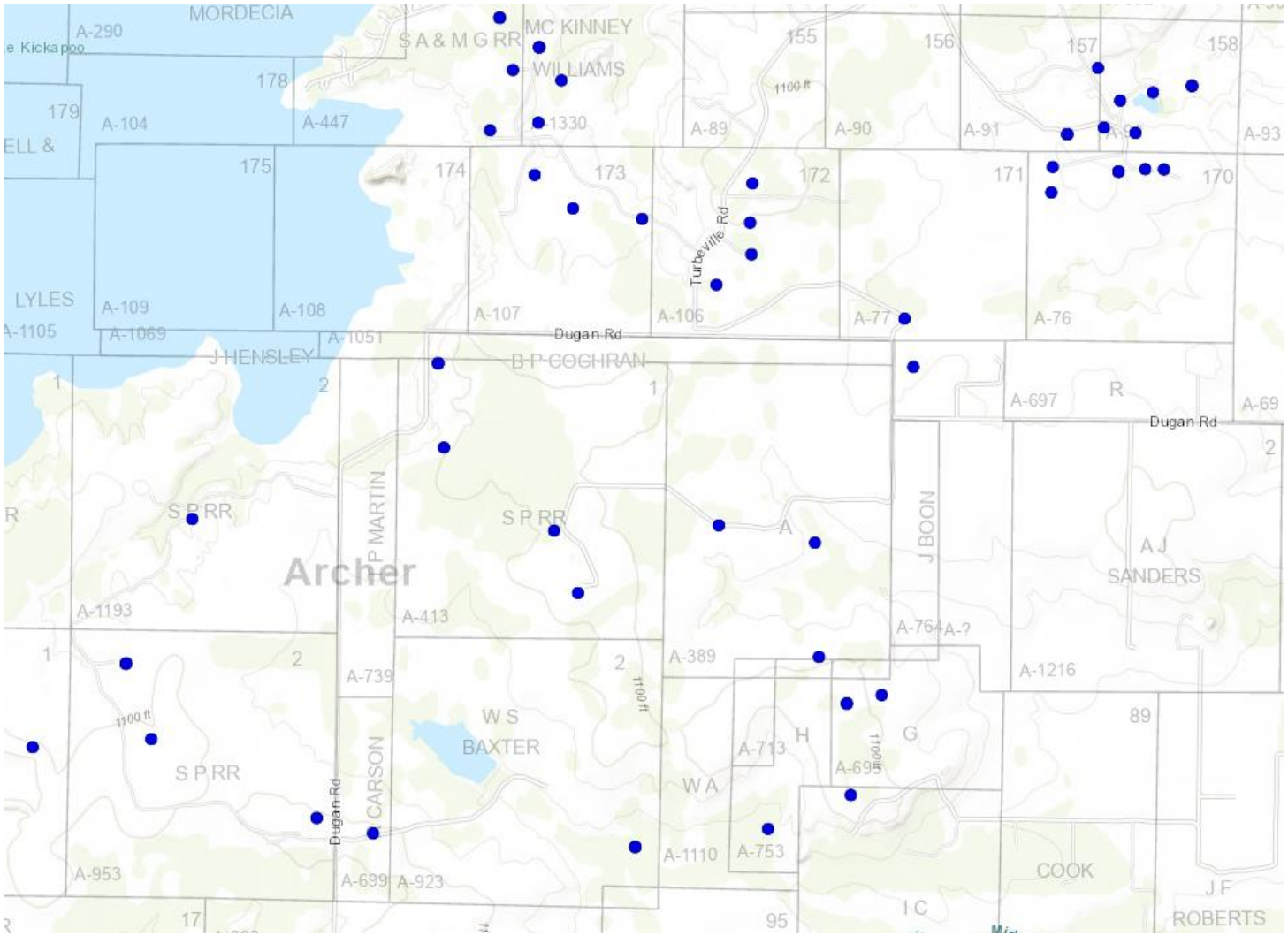
Lake Kickapoo East Field

Multi-pay field with production from the Gunsight Sand, Strawn Sand, Palo Pinto Limestone, Caddo Limestone, Conglomerate and the Mississippian Limestone.

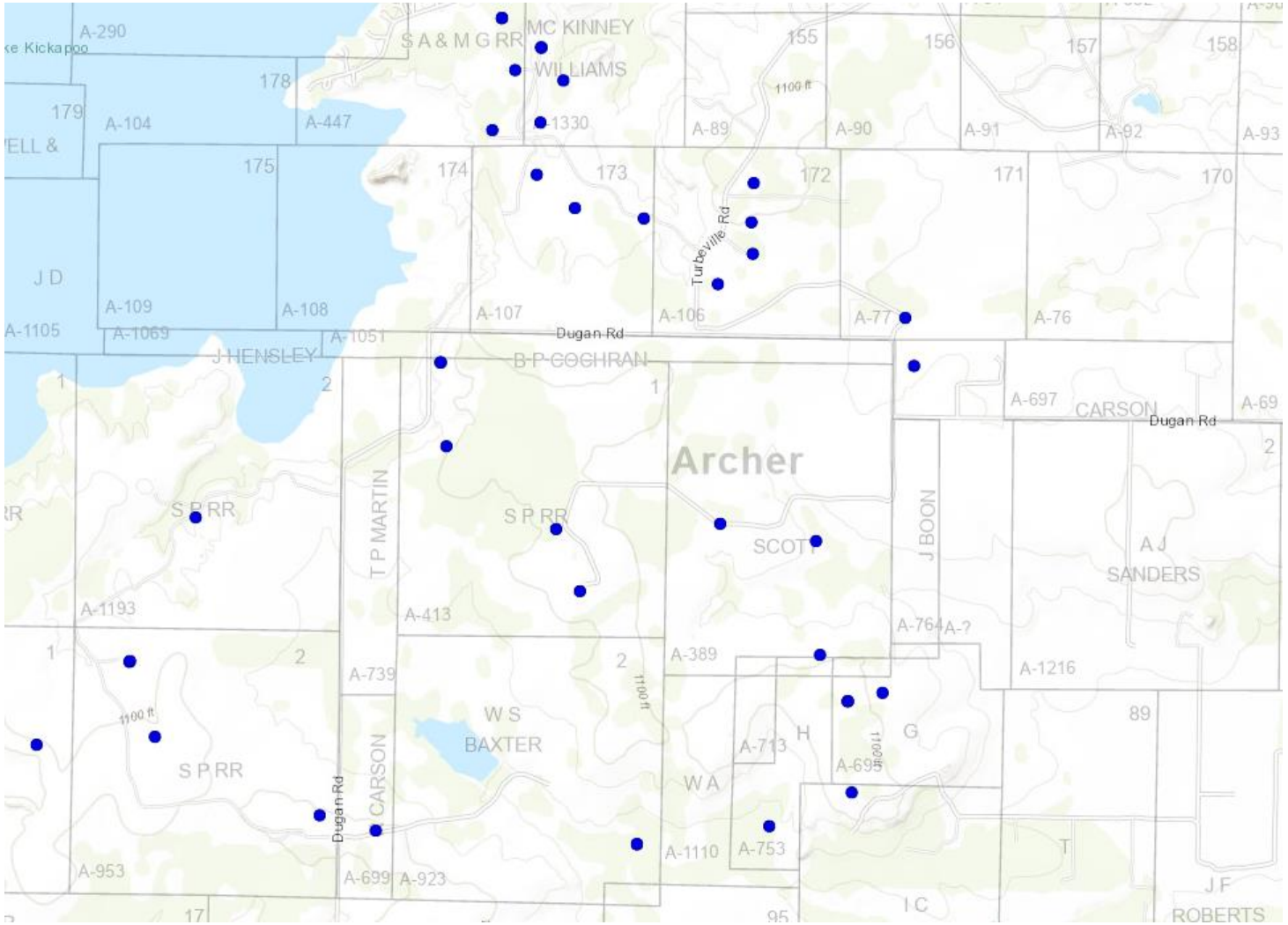
GUNSIGHT SAND, PALO PINTO LIME, STRAWN SAND, CADDO LIME, CONGLOMERATE & MISS REEF- PRODUCTION
ARCHER COUNTY, TEXAS



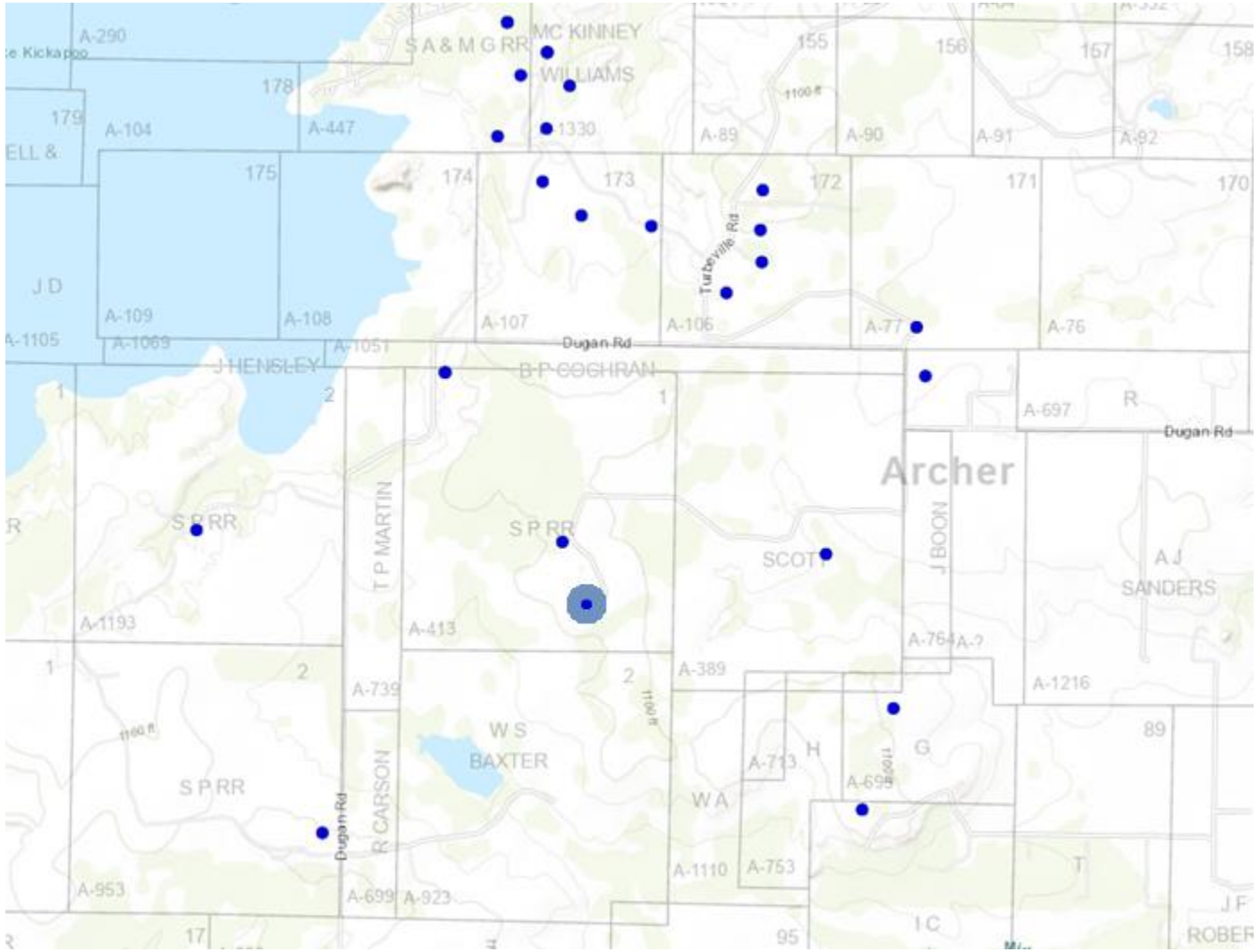
PALO PINTO LIME, STRAWN SAND, CADDO LIME, CONGLOMERATE & MISS REEF- PRODUCTION ARCHER COUNTY, TEXAS



CADDO LIME, CONGLOMERATE & MISS REEF- PRODUCTION
ARCHER COUNTY, TEXAS



CADDO LIME - PRODUCTION
ARCHER COUNTY, TEXAS



STRATIGRAPHY

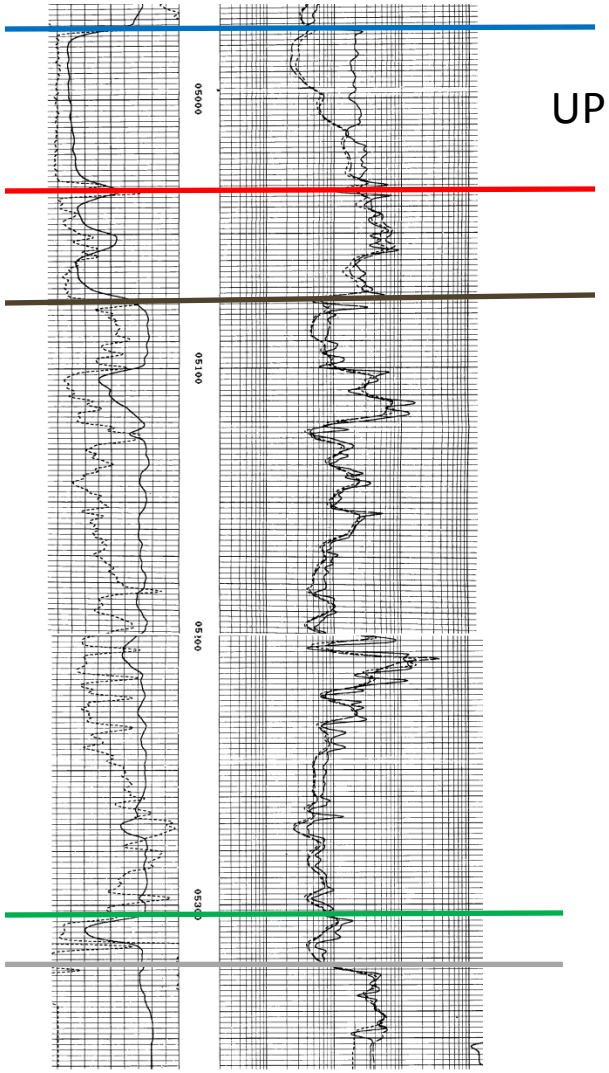
TOP OF THE CADDO LIMESTONE

CADDO MARKER

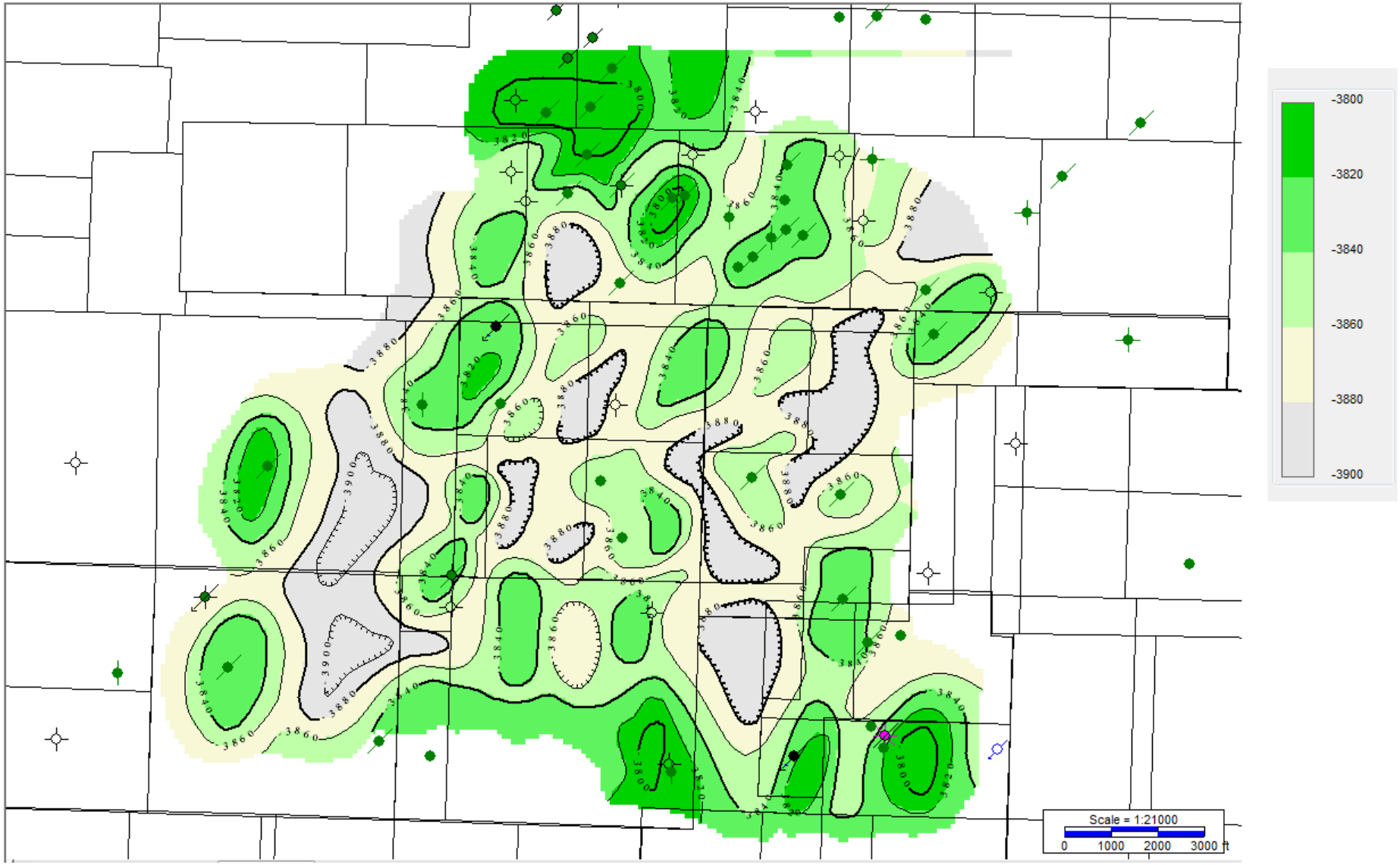
BASE OF THE CADDO LIMESTONE

CONGLOMERATE

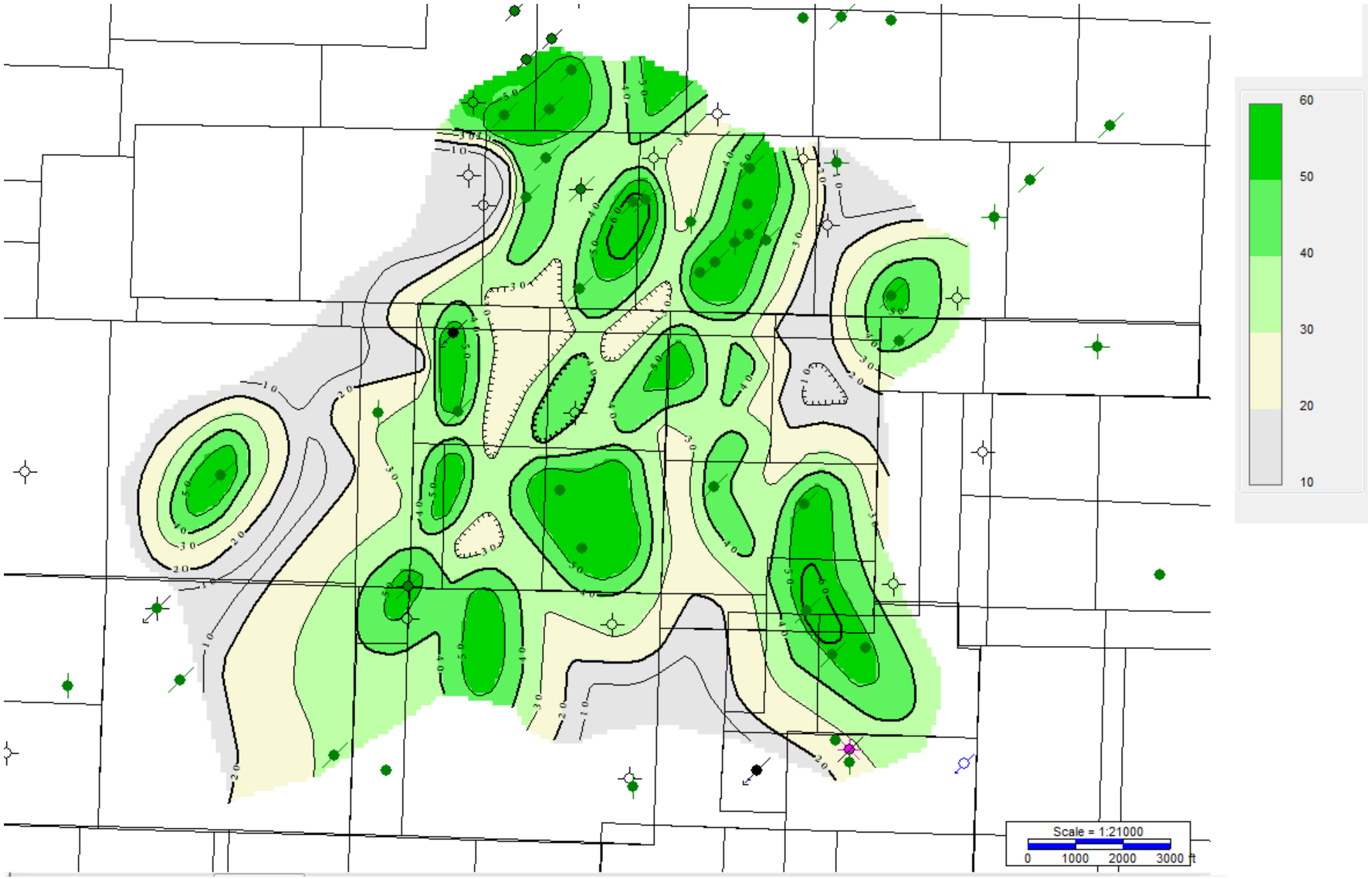
BARNETT SHALE



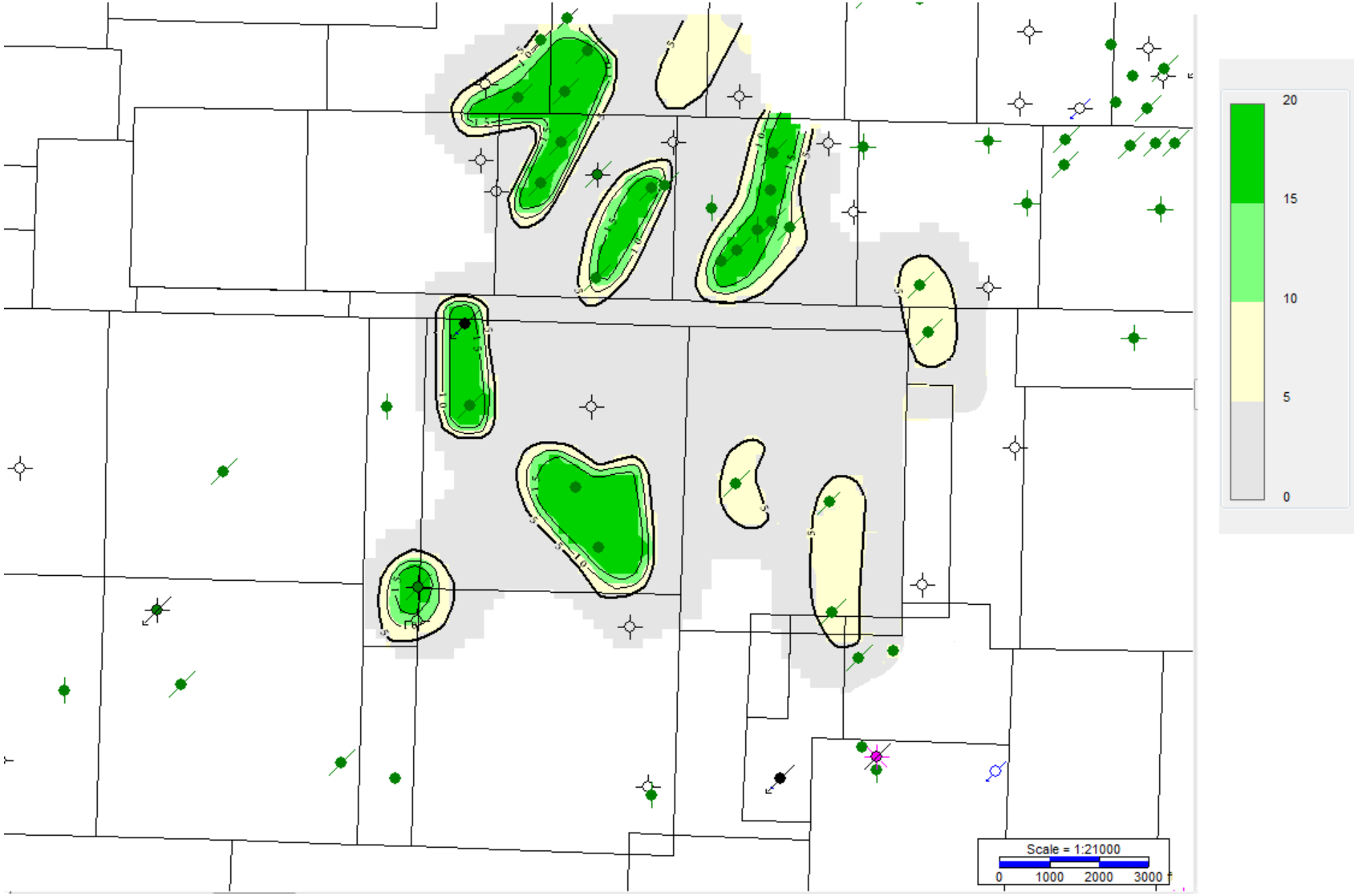
STRUCTURE CADDO LIMESTONE



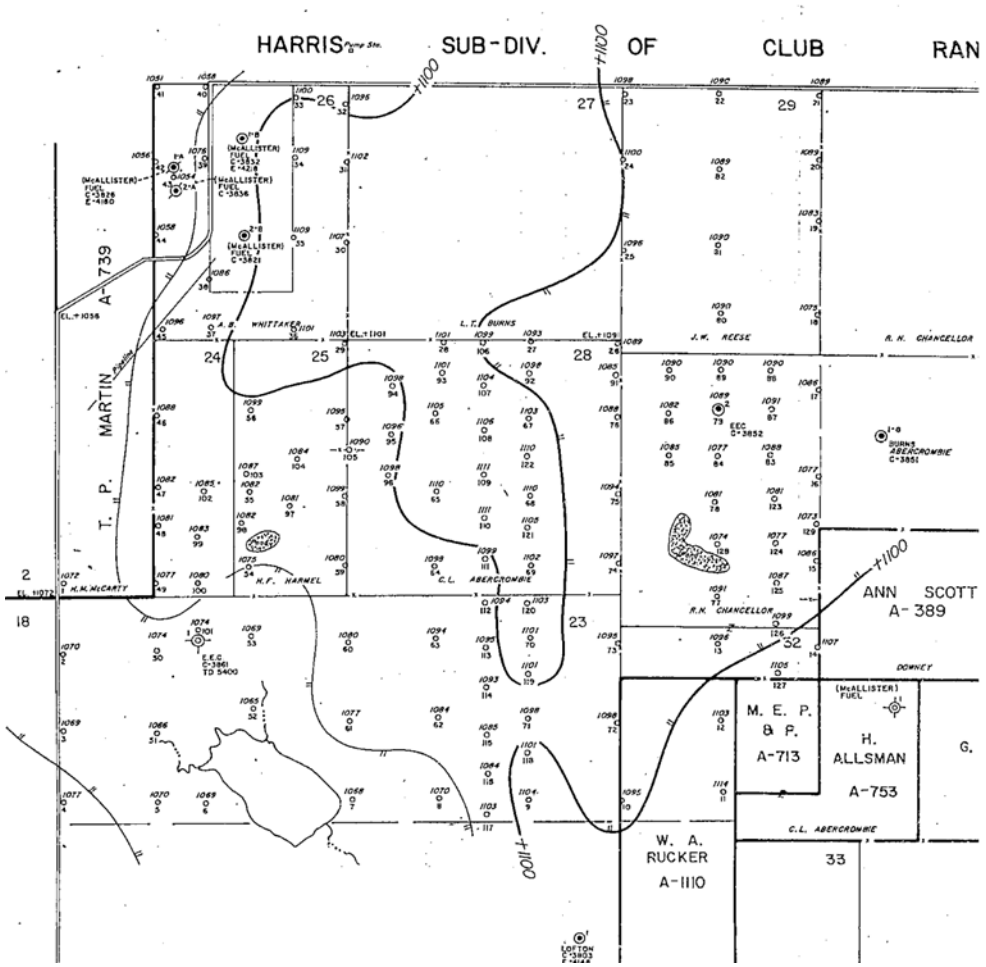
ISOPACH OF THE UPPER CADDO LIMESTONE



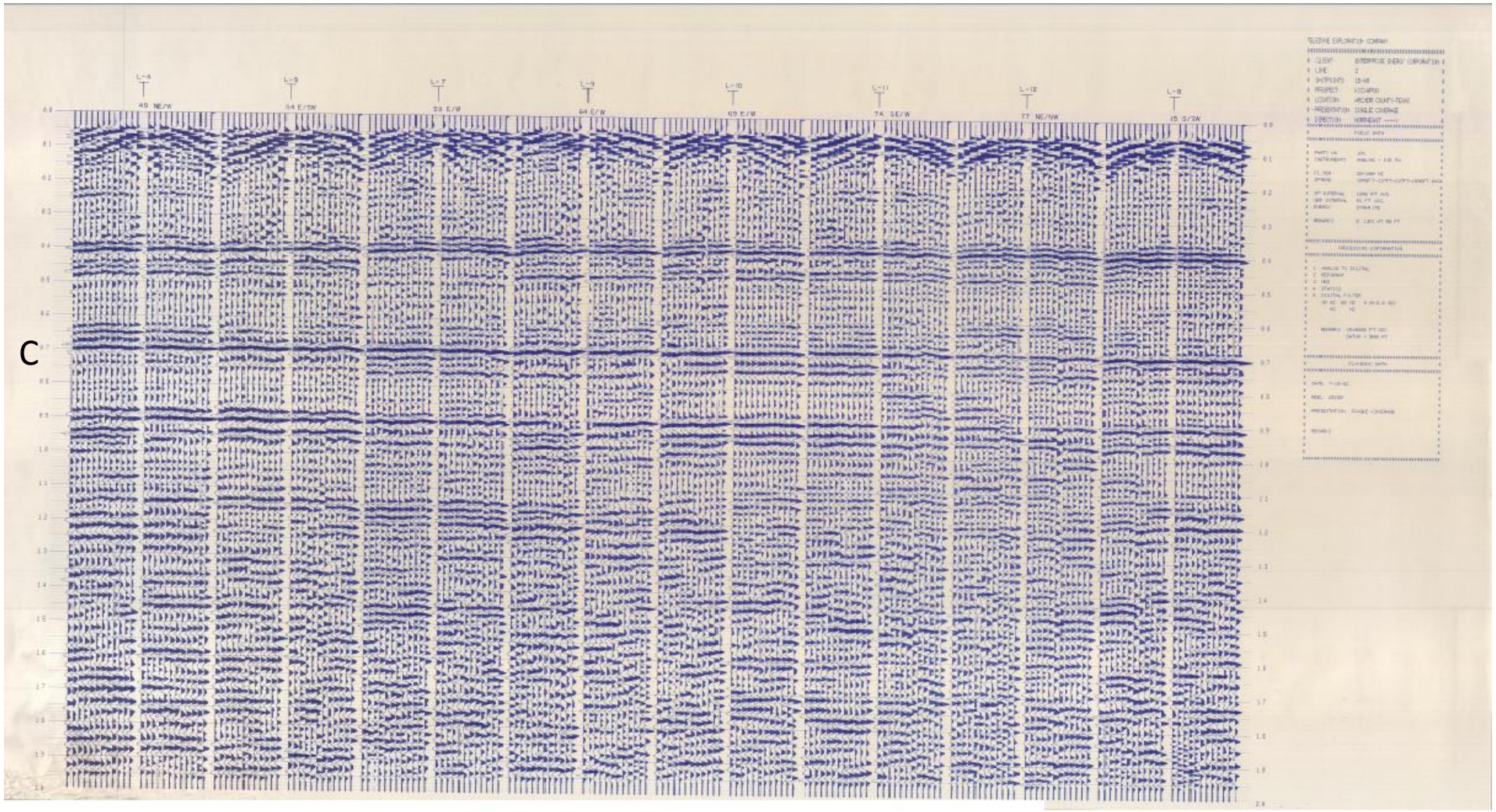
AVERAGE EFFECTIVE POROSITY DISTRIBUTION – UPPER CADDO



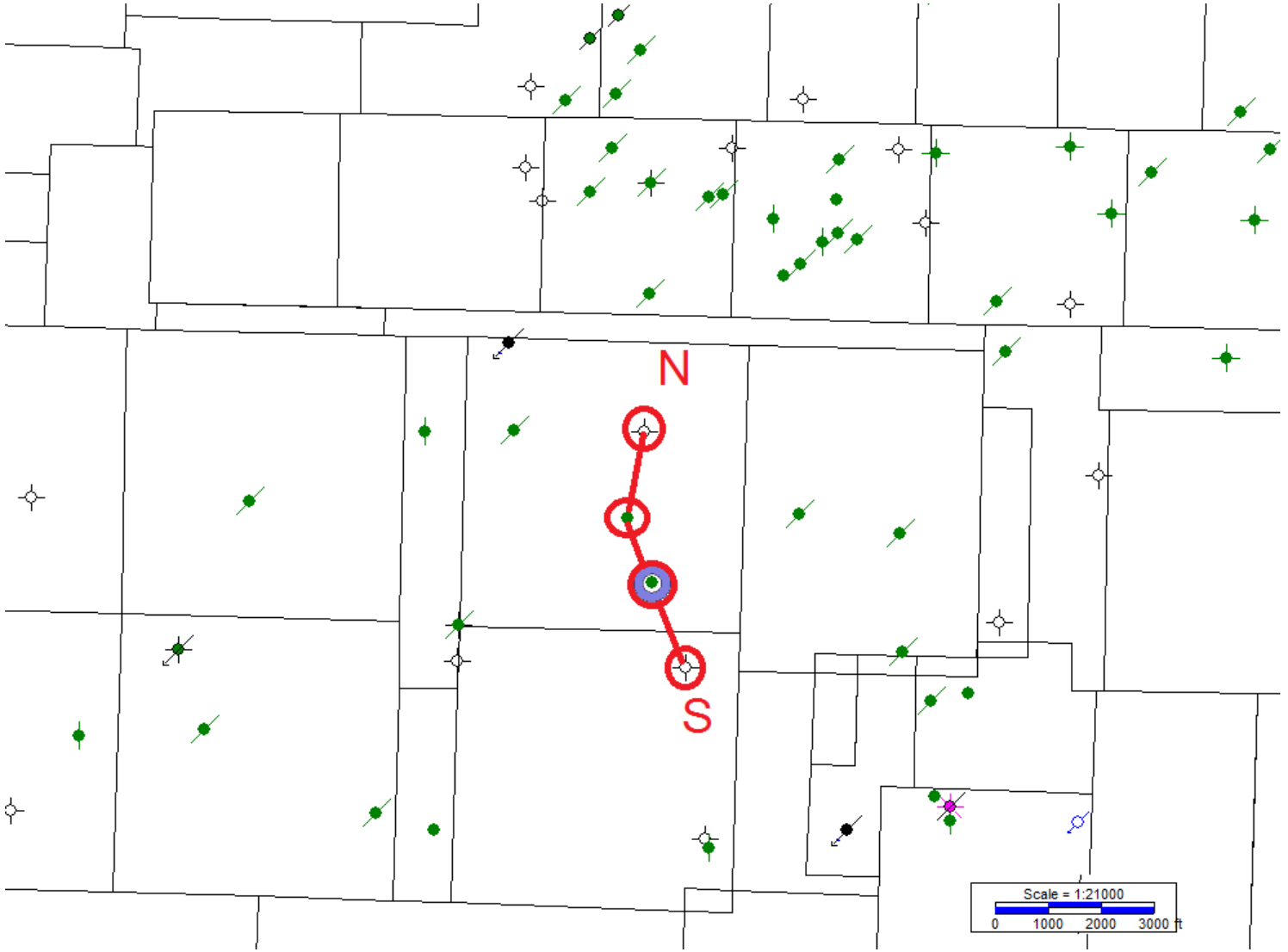
SINGLE FOLD SEISMIC GRID



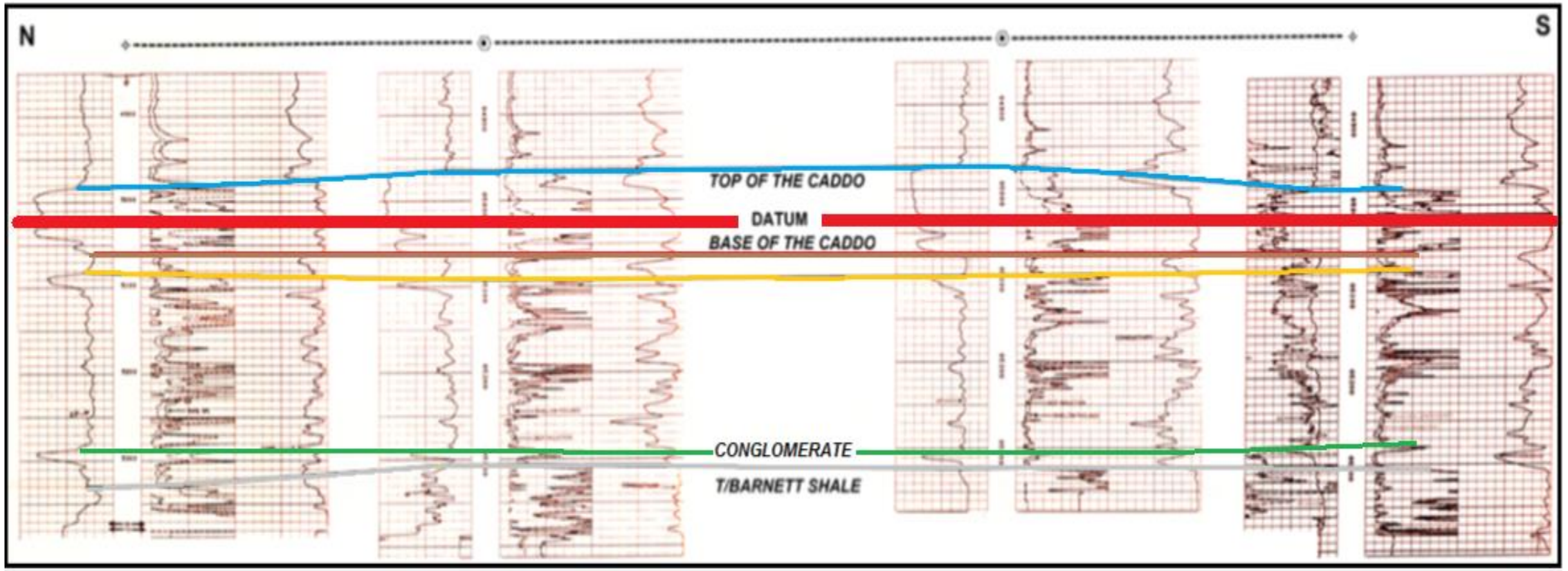
SINGLE-FOLD SEISMIC

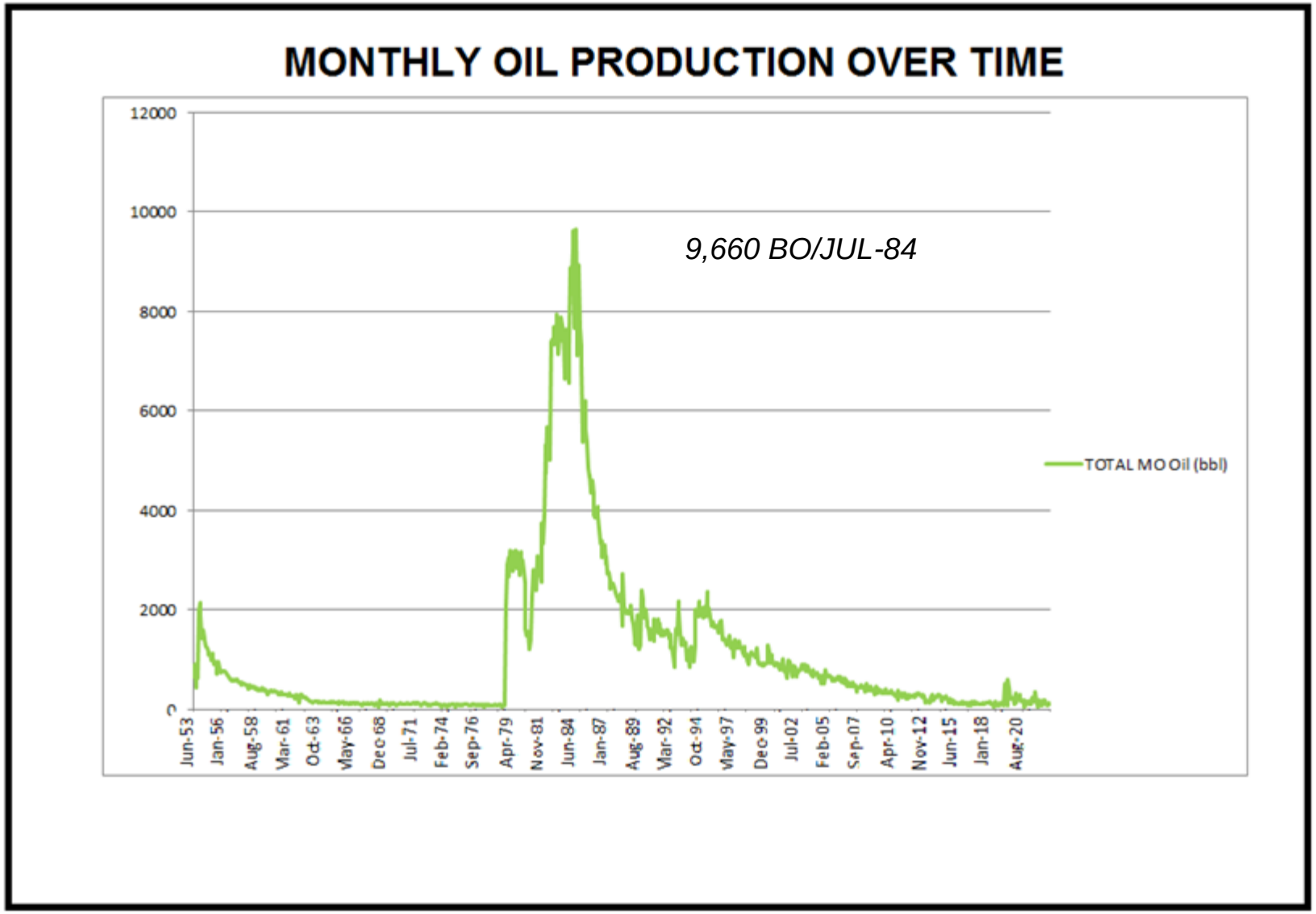


NORTH TO SOUTH STRATIGRAPHIC CROSS SECTION INDEX MAP

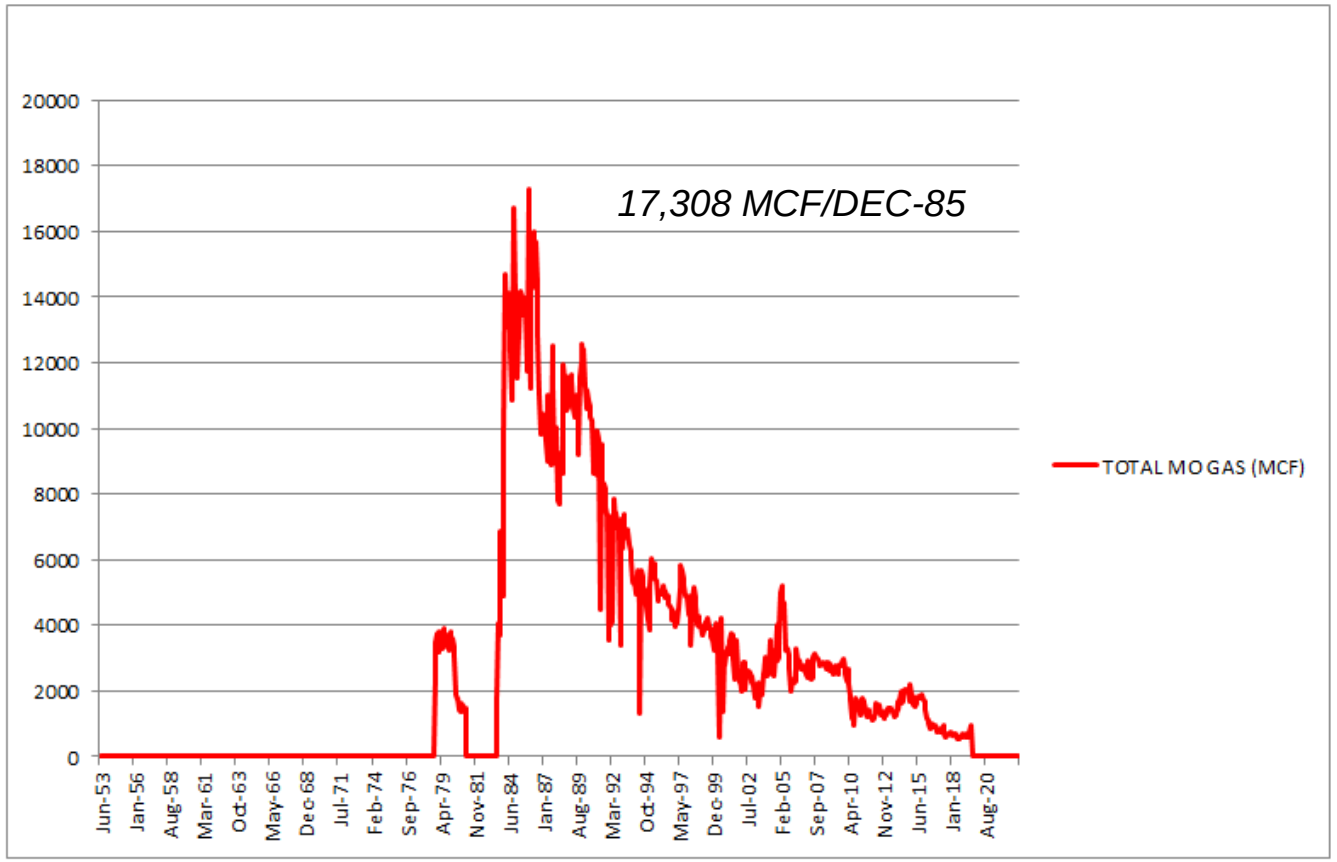


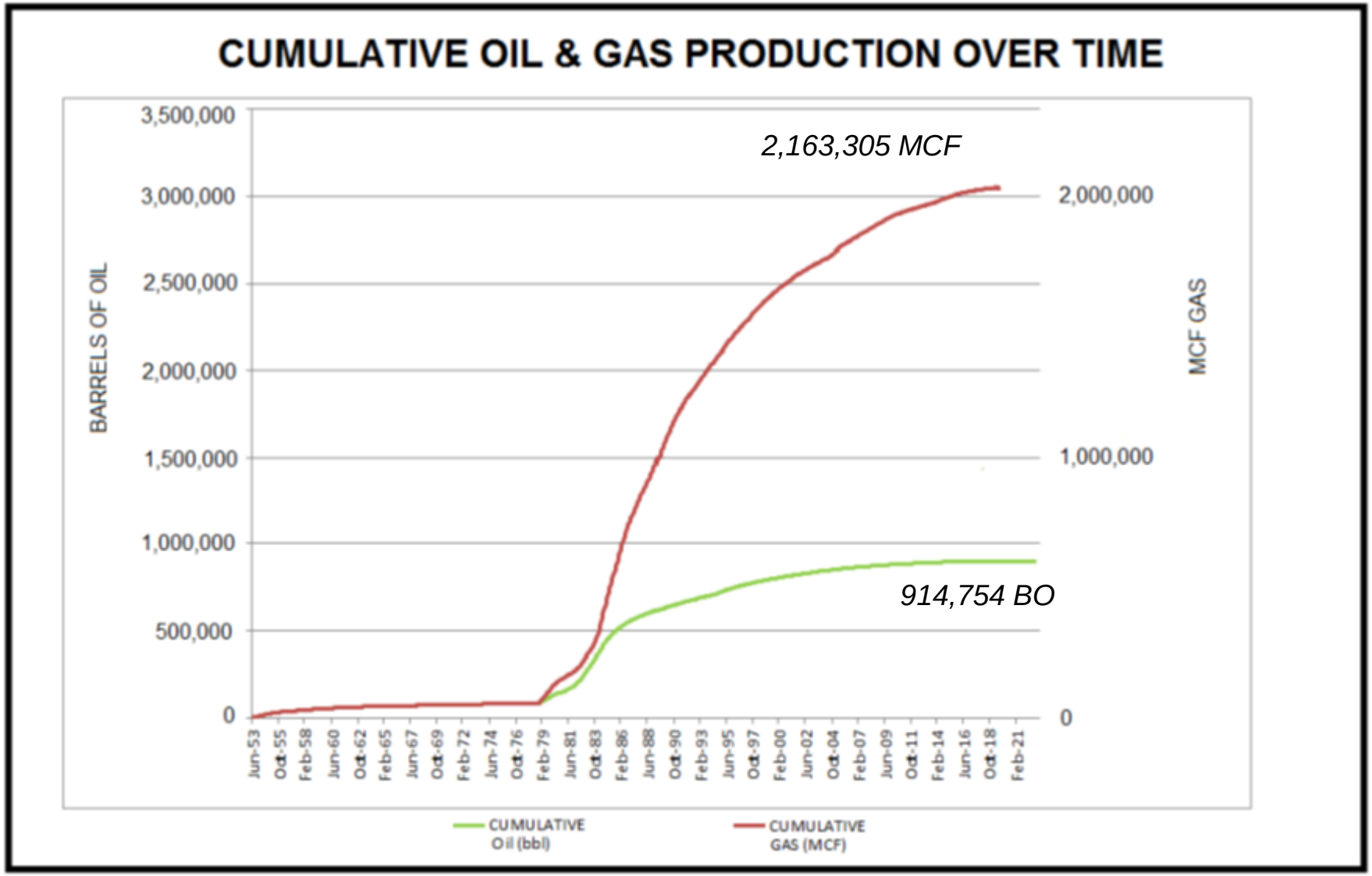
NORTH TO SOUTH STRATIGRAPHIC CROSS SECTION



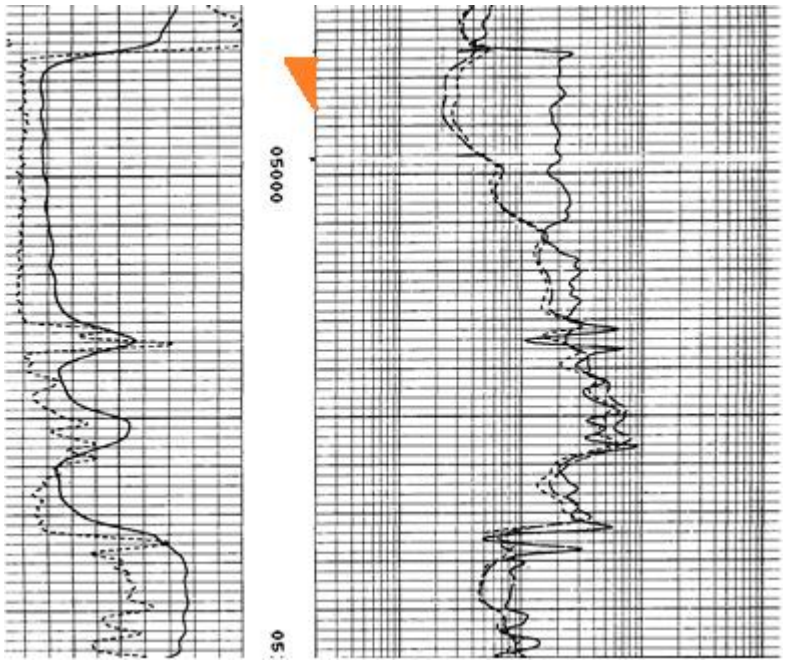

MONTHLY OIL PRODUCTION OVER TIME
12000
10000
8000
6000
4000
2000
0
9,660 BO/JUL-84
TOTAL MO Oil (bbl)
Jun-53
Jan-56
Aug-58
Mar-61
Oct-63
May-66
Dec-68
Jul-71
Feb-74
Sep-76
Apr-79
Nov-81
Jun-84
Jan-87
Aug-89
Mar-92
Oct-94
May-97
Dec-99
Jul-02
Feb-05
Sep-07
Apr-10
Nov-12
Jun-15
Jan-18
Aug-20

MONTHLY GAS PRODUCTION OVER TIME

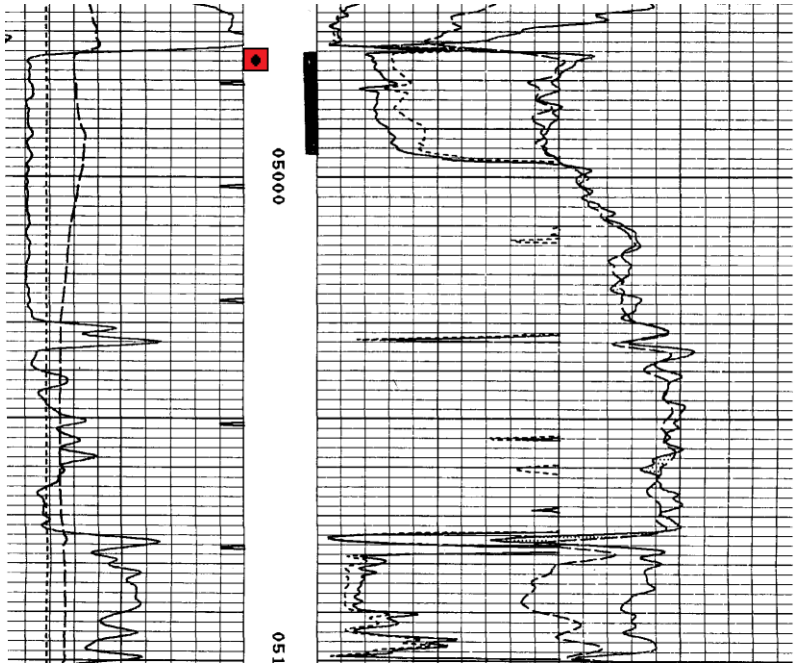



CUMULATIVE OIL & GAS PRODUCTION OVER TIME
2,163,305 MCF
914,754 BO
BARRELS OF OIL
MCF GAS
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
2,000,000
1,000,000
0
Jun-53
Oct-55
Feb-58
Jun-60
Oct-62
Feb-65
Jun-67
Oct-69
Feb-72
Jun-74
Oct-76
Feb-79
Jun-81
Oct-83
Feb-86
Jun-88
Oct-90
Feb-93
Jun-95
Oct-97
Feb-00
Jun-02
Oct-04
Feb-07
Jun-09
Oct-11
Feb-14
Jun-16
Oct-18
Feb-21
CUMULATIVE Oil (bbl)
CUMULATIVE GAS (MCF)

UPPER CADDO LIME – PAY SECTION



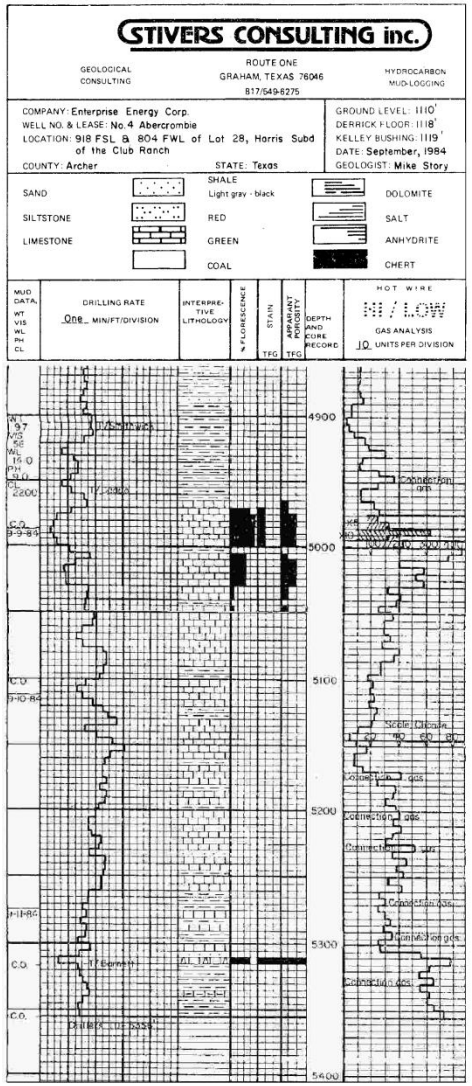
DST 4976-4986’
Open with fair to good blow
Reopen tool with GTS in 10 min.
Recovered 210’ free oil, 180’ heavy O&G cut mud, 10’ SW
FP – 163 PSI
BHP – 2273 PSI



Resistivity = 2.3 ohms; Porosity = 16%; Rw = 0.035 ohms; Sw = 77%

Initial Potential Pumping – 82 BOPD, 44 BWPD, Trace of Gas 4974-78’
Cumulative Oil Production =15,137 BO 10/1984-1/2023 (hole in casing)

UPPER CADDO LIME – MUD LOG



Sample Description

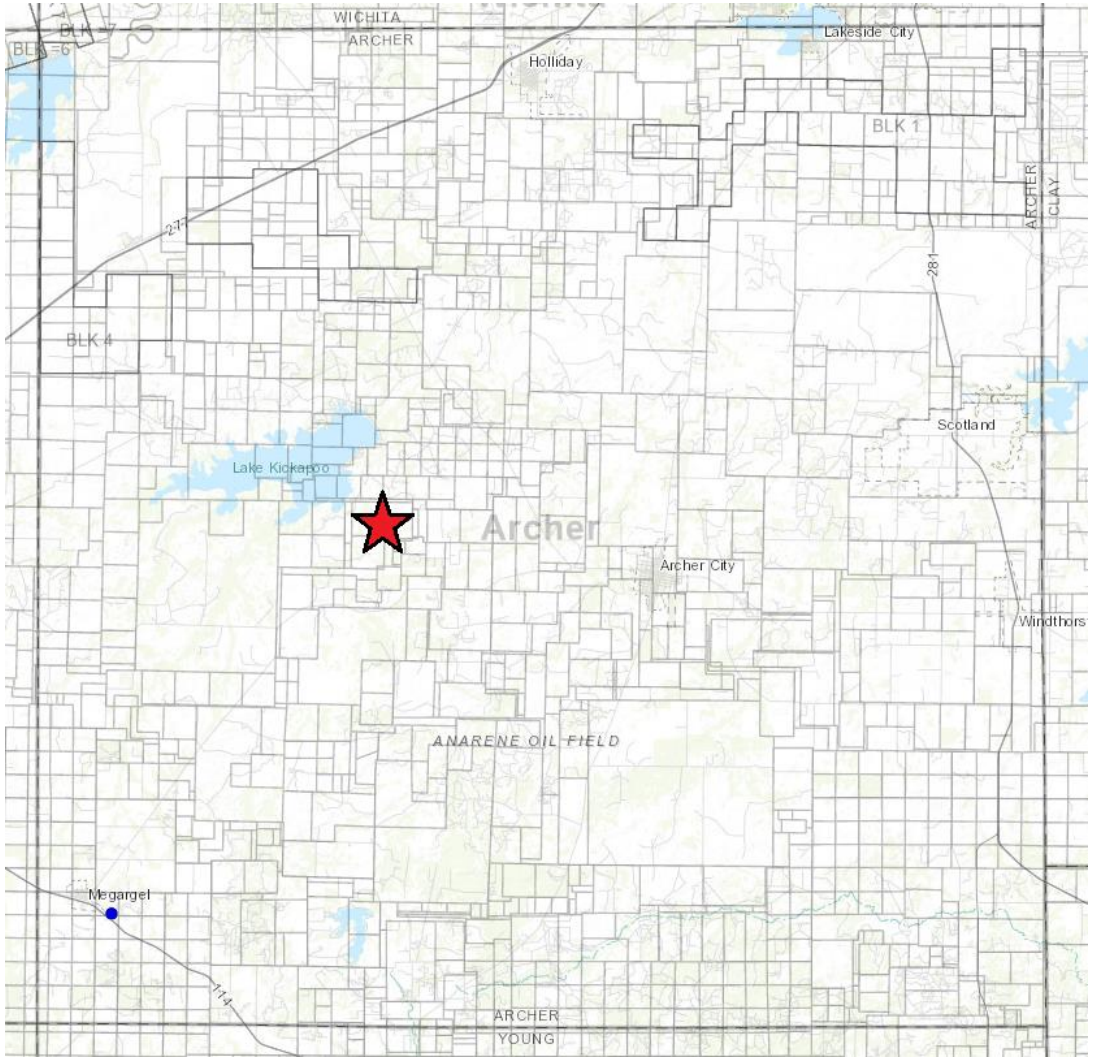
LS (60%) White-Buff-Light Brown dense-chalky, microsucrosic, microcrystalline, fossiliferous

Excellent yellow to bright yellow fluorescence, trace of stain
fair visible porosity

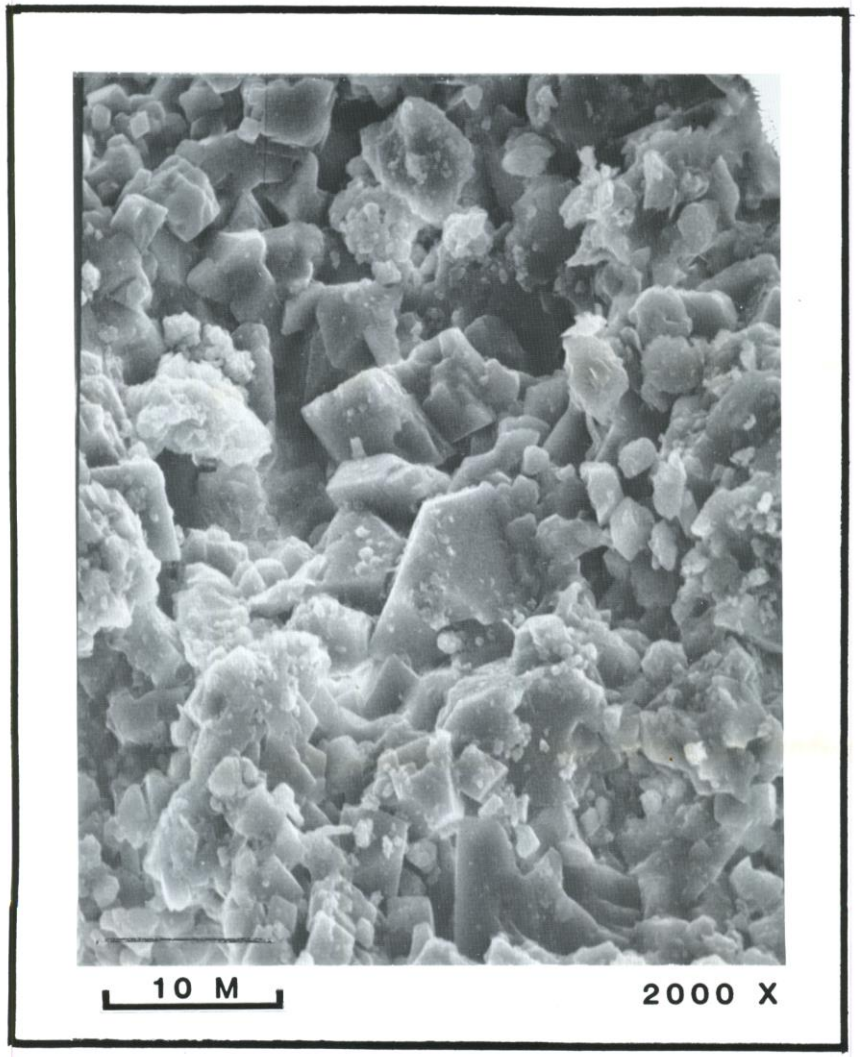
Good streaming cut, with fair to good residual cut.

Hot wire 170 Units/15 Units baseline
Drilling break – 2 min/ft – 5-6 min/ft

BETTIS BOYLE & STOVALL_RICHARDSON NO. 1 - LOCATION



2,000X THIN SECTION
UPPER CADDO LIMESTONE



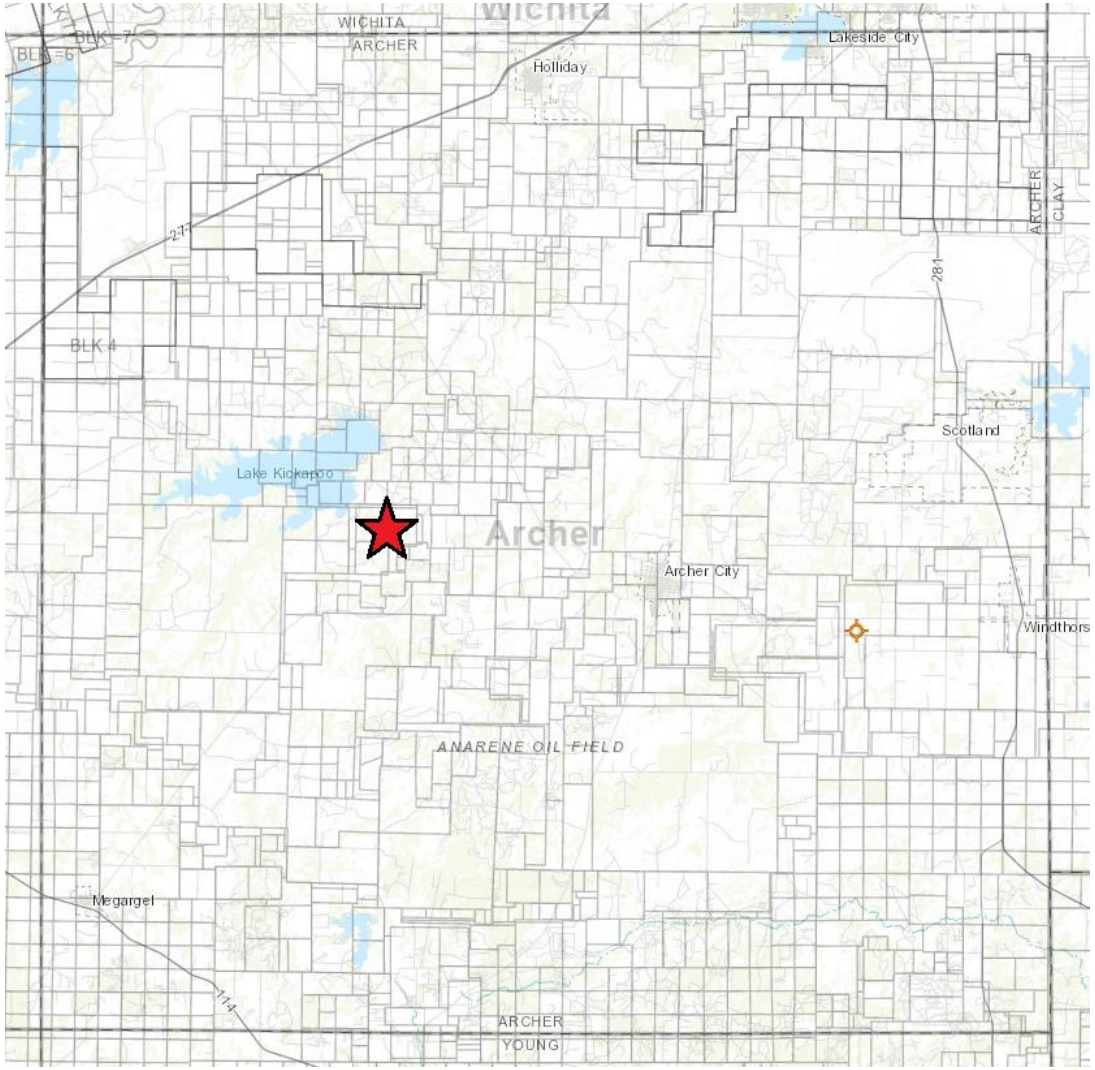
BETTIS, BOYLE & STOVALL – RICHARDSON NO. 1

Initial Potential – 40 BOPD & 30 BWPD, Natural

Chalky Limestone – result of recrystallization of the original micritic texture.

This recrystallization forms a mosaic of euhedral calcite crystals. Presence of secondary microporosity (1-3 microns) and the associated minute pore throat openings present in this type of reservoir. (A.J. Ehlmann).

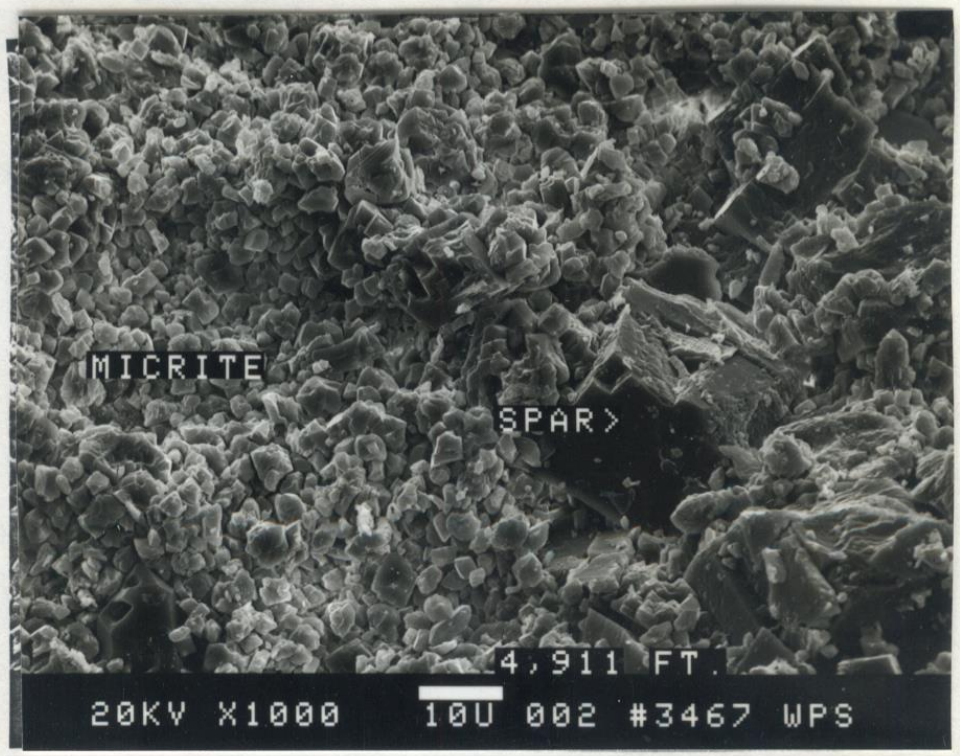
ENTERPRISE ENERGY CORP._CARPENTER NO. 2 - LOCATION



51X SEM THIN SECTION
CADDO LIMESTONE

51 X - 4,911' - The surface of this micritc lime displays little porosity or textural differentiation.

1000X SEM THIN SECTION CADDO LIMESTONE



1000X - 4,911' - High magnification reveals the difference between calcite spar infill and micritic calcite. Note the intergranular microporosity within the micrite. This type of porosity could generate matrix flow.

TAKEAWAY:

Potential bypassed Caddo Lime producers due to water saturation calculation indicating water production.

Possible negative bias for Caddo Lime even with good hydrocarbon shows.

ACKNOWLEDGEMENTS

Caddo Lime Reservoirs in the Bend Arch Area, North Central Texas, *Jack L. Crabtree, SW Section 1987 Convention Transactions*

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