Schlumberger

Sonic Scanner

Geomechanical Properties Advisor

Isotropic Mechanical Properties

Processed Interval:3800.00 ft - 5900.00 ft

COMPANY:	Whitetail Operators LLC.
WELL:	Louisiana Green Fuels #1
FIELD:	Riverton
COUNTY:	Caldwell
STATE:	Louisiana
COUNTRY:	USA

API :17-021-88018

Location	
of SE corner of Section 44, T 14N, R4E;	
Longitude: -92.09220889;	Latitude: 32.17501111

Elevations:
K.B. 79 ft
D.F. 77.99999 ft
G.L. 64.4 ft

Date	02-May-2021
Run No.	2B
Bottom Log Interval	5900.00 ft
Top Log Interval	3800.00 ft
Casing-Logger	7.625 in @3903 ft
Bit Size	6.75 in
Drilling Fluid Type	WBM
Mud Resistivity @ BHT	0.4015034 @ 147.06 degF
Drilling Fluid Density | Viscosity	9.7 lbm/gal | 43 s
Drilling Fluid pH | Loss	-999.25 | 4 in3
Maximum Recorded Temperature	147.06 deg F
Equipment | Location	2377 | New Iberia
Recorded by	J. Hahn
Witnessed by	Steve Walkinshaw

FOLD HERE

The well name, location and borehole reference data were furnished by the customer

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SIS Software:Techlog 2019.2.3	Process Date: 5/14/2021	SIS Center: Houston	Log Analyst: N. Ortiz

Processing Parameters:

GENERAL - Parameters are assumed to be Default Parameters unless otherwise noted

HOLE DIAMETER: 6.75 in

BOTTOM HOLE TEMPERATURE: 147.06 deg F

MECHPRO PARAMETERS:

Dynamic-Static YME model used = Modified Morales

Pore Pressure Gradient of 0.465 psi/ft (provided by client) and Overburden Pressure Gradient of 0.9736 psi/ft (extrapolated from RHOZ) used for calculations

Hor. Strain Min = 0.00005

Hor. Strain Max = 0.0001

Alpha =0.85

SPHI is a sonic porosity computed using DTmatrix = 56 us/ft and DTfluid = 189 us/ft on Raymer-Hunt..

Track Descriptions

Track 1: Gamma Ray
GR_EDTC - gamma ray
INCL - inclination from GPIT in Sonic Scanner run

Track 2: Depth
MD - measured depth
TENS - tension from Sonic Scanner

Track 3: Borehole
HCAL - caliper
BS - bit size
shading for washout/mudcake

Track 4: Resistivities
AT10-AT90 - unreconstructed AIT resistivities
with corresponding Depth of Investigation

Track 6: Delta-T
DTCO_MF_R - delta-t compressional monopole from receiver
DTSH_YD_R - delta-t shear from Y-Dipole receiver

Track 7: QELAN
Unflushed Elemental Analysis

Track 8: Formation Tops
Formation Tops provided by client

Track 9: Isotropic Properties
SMG_DYN - shear modulus (dynamic)
BMK_DYN - bulk modulus (dynamic)

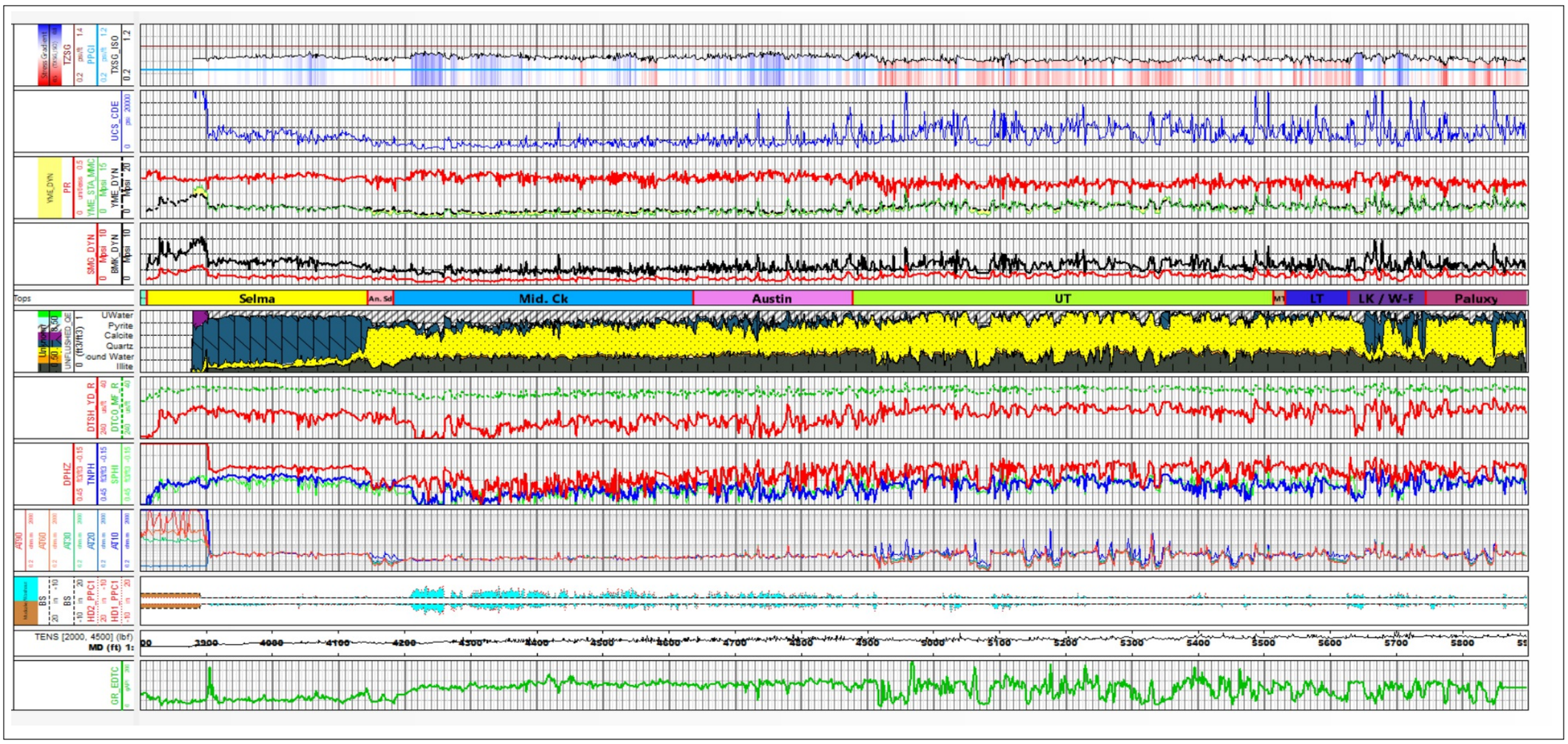
Track 10: Young's Modulus and Poisson's Ratio
YME_STA_MMC - static Young's modulus using Modified Morales correlation
YME_DYN- dynamic Young's modulus
PR_STA - static Poisson's ratio

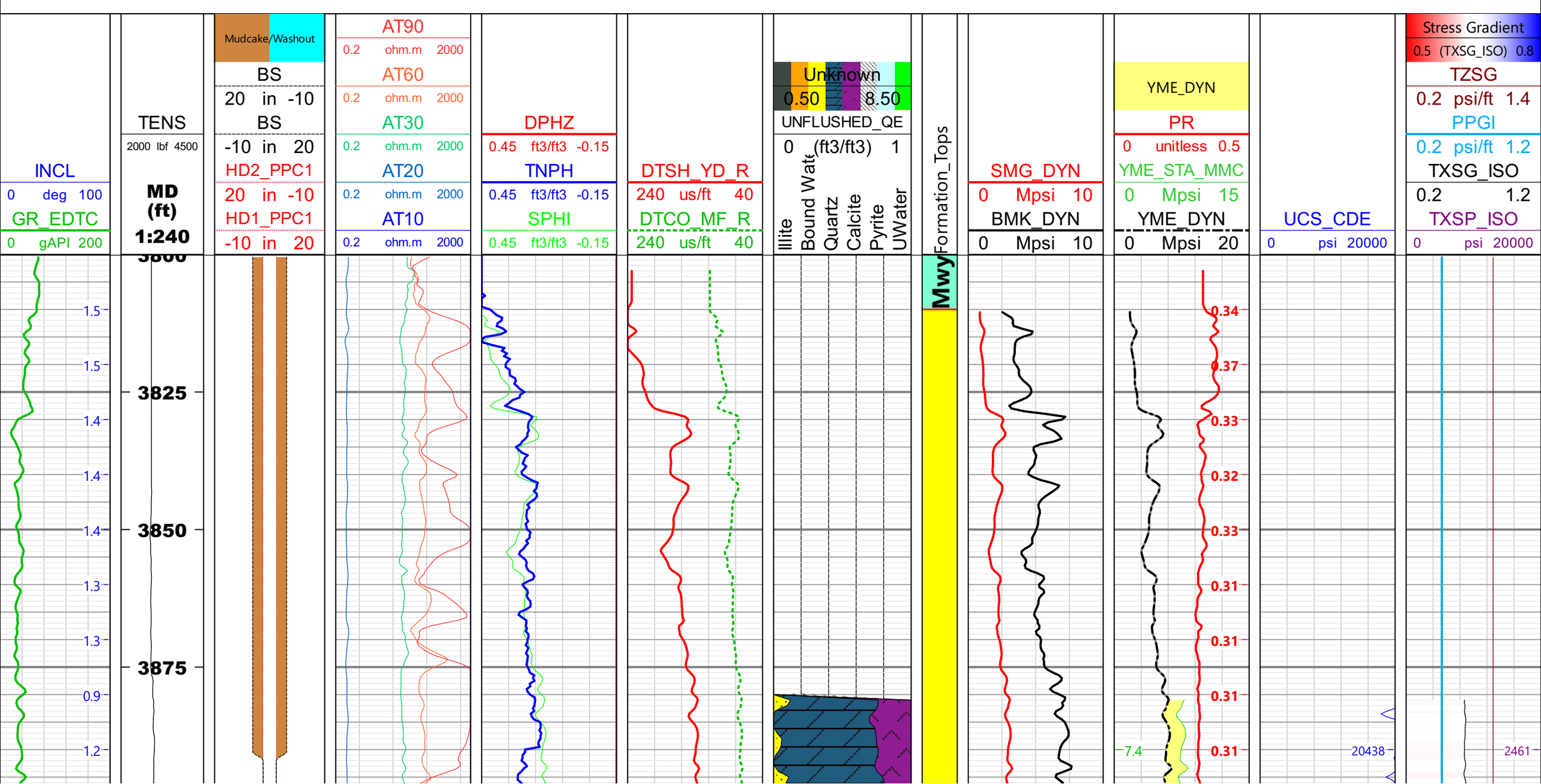
Track 11: Rock Properties

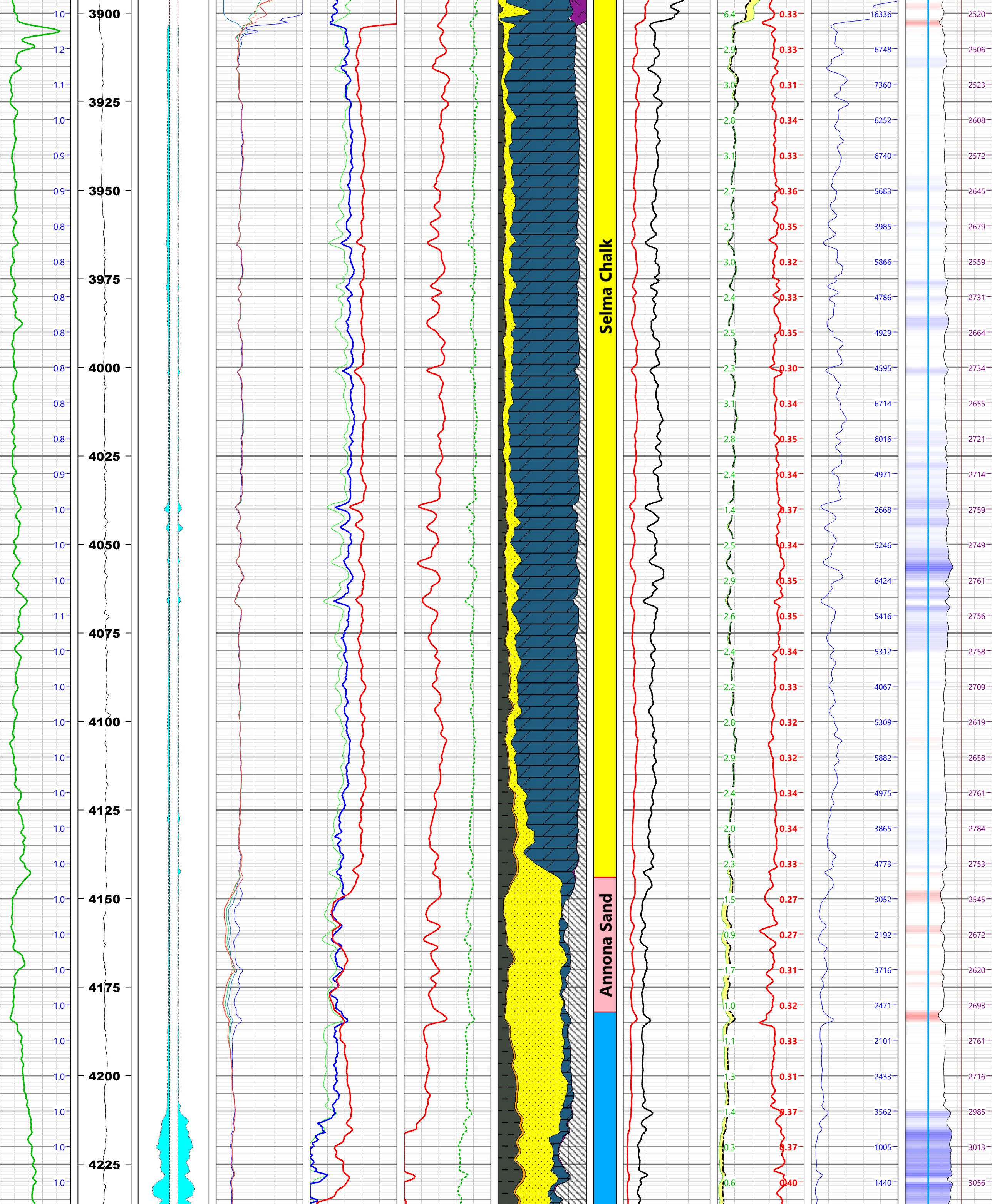
Track 5: Porosity
SPHI - sonic porosity
DPHZ - density porosity using sandstone matrix
TNPH- thermal neutron porosity using sandstone matrix

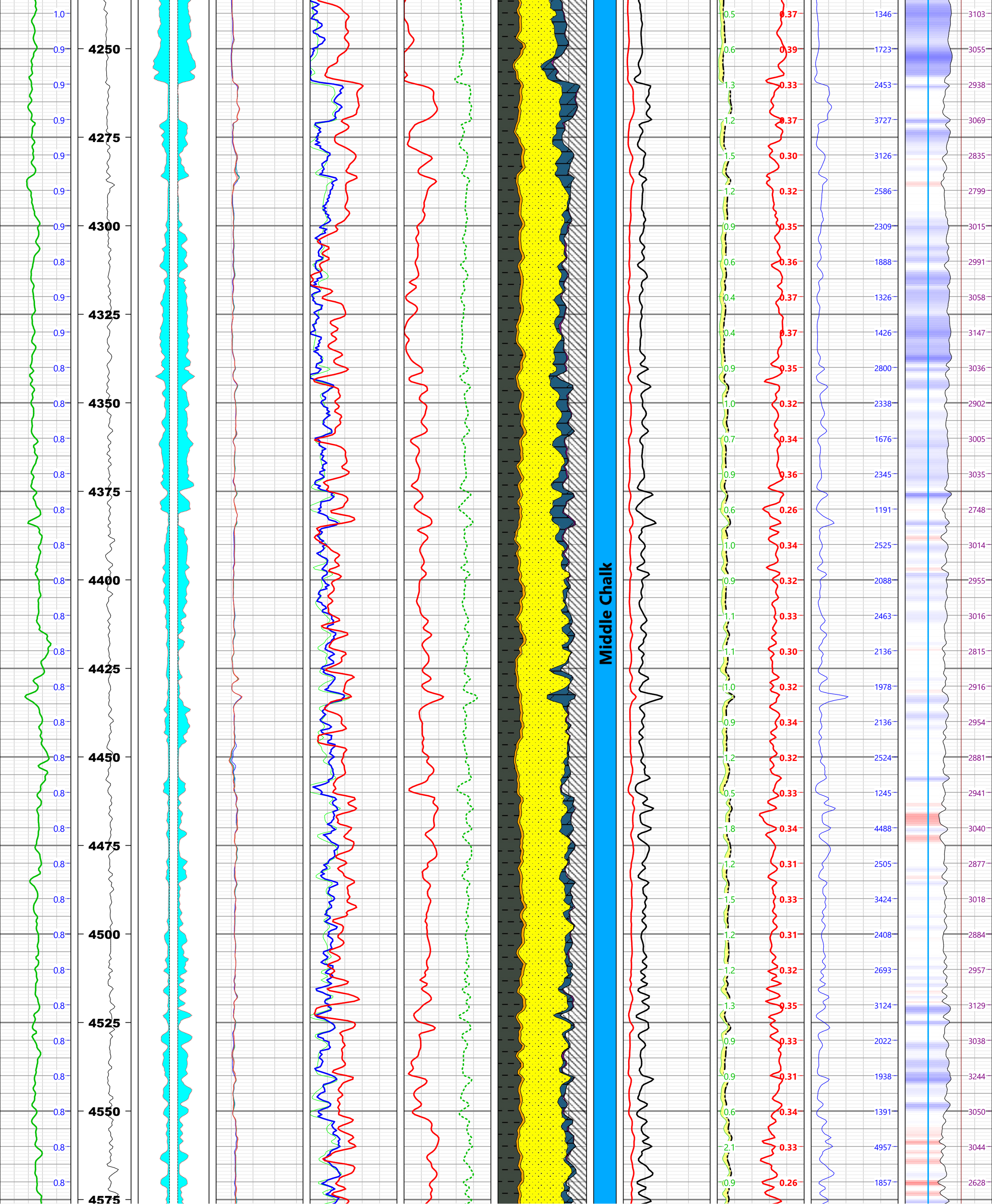
UCS- Unconfined compressive strength

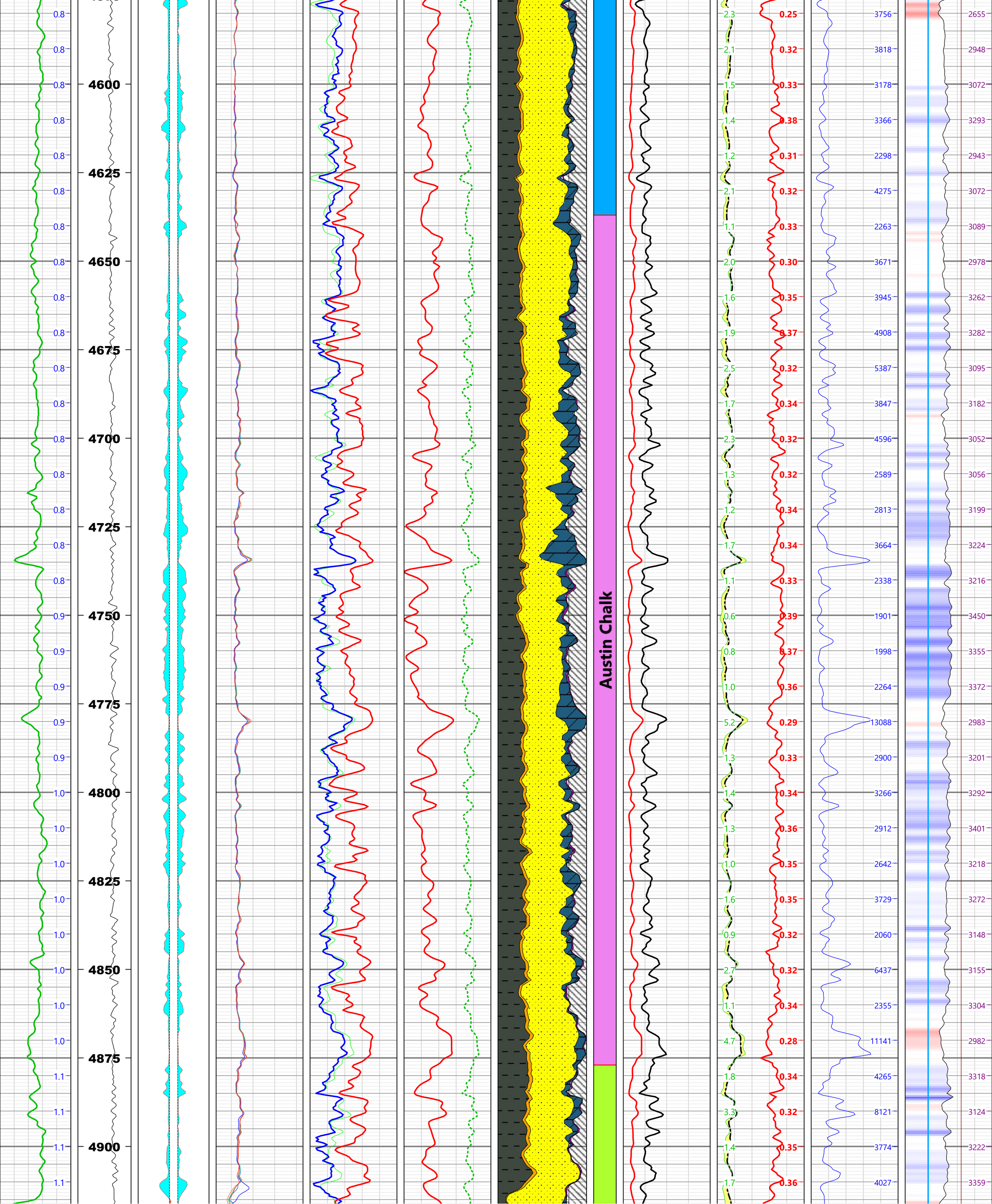
Track 12: Horizontal Stress
TXSP_ISO - minimum horizontal stress from isotropic model
TXSG_ISO - minimum horizontal stress gradient from isotropic model
PPGI - pore pressure gradient
TZSG - overburden (vertical stress) gradient
Stress gradient pallette

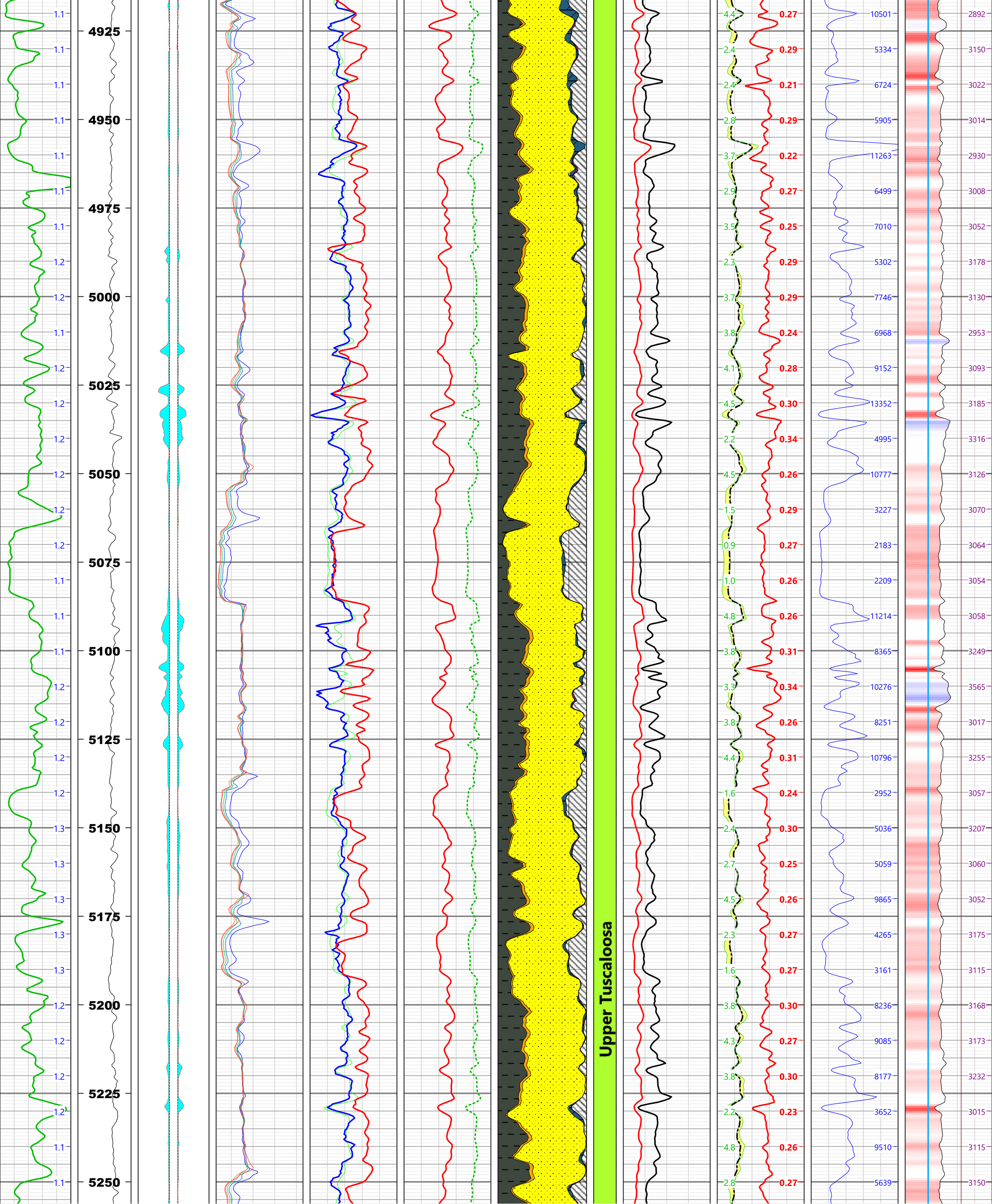


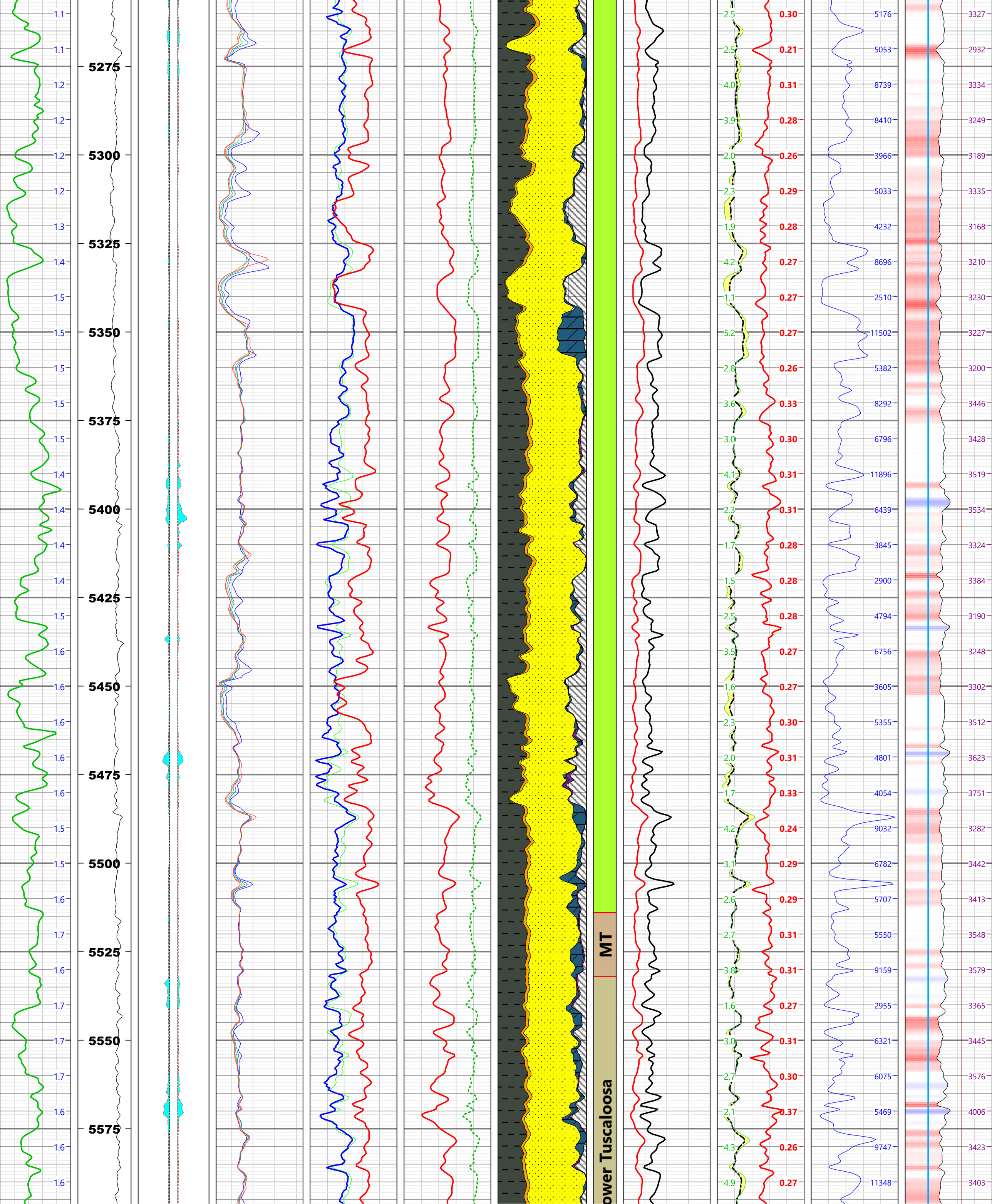


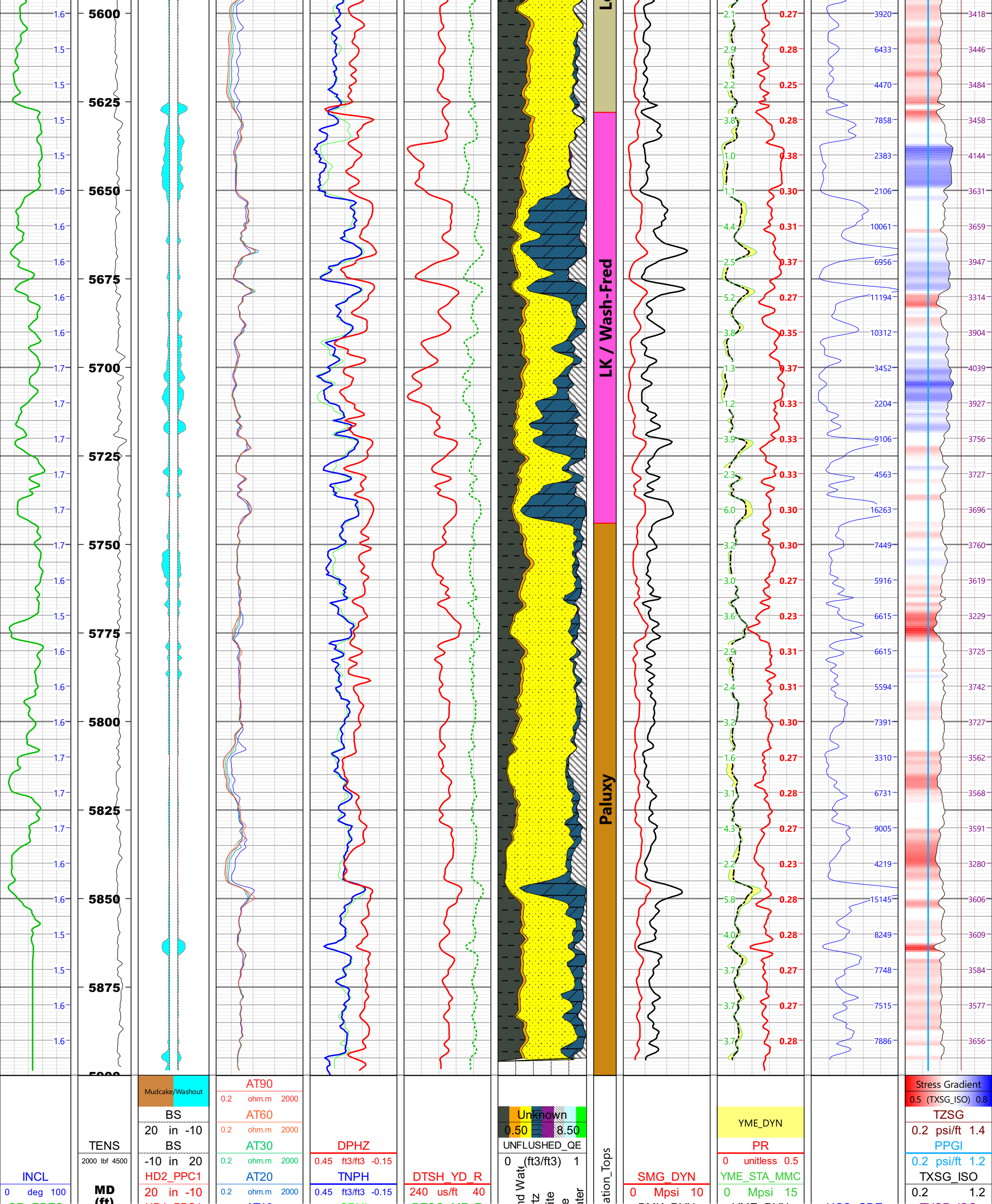

3900
3925
3950
3975
4000
4025
4050
4075
4100
4125
4150
4175
4200
4225
Selma Chalk
Annona Sand


Middle Chalk
4250
4275
4300
4325
4350
4375
4400
4425
4450
4475
4500
4525
4550
4575


4600
4625
4650
4675
4700
4725
4750
4775
4800
4825
4850
4875
4900
Austin Chalk

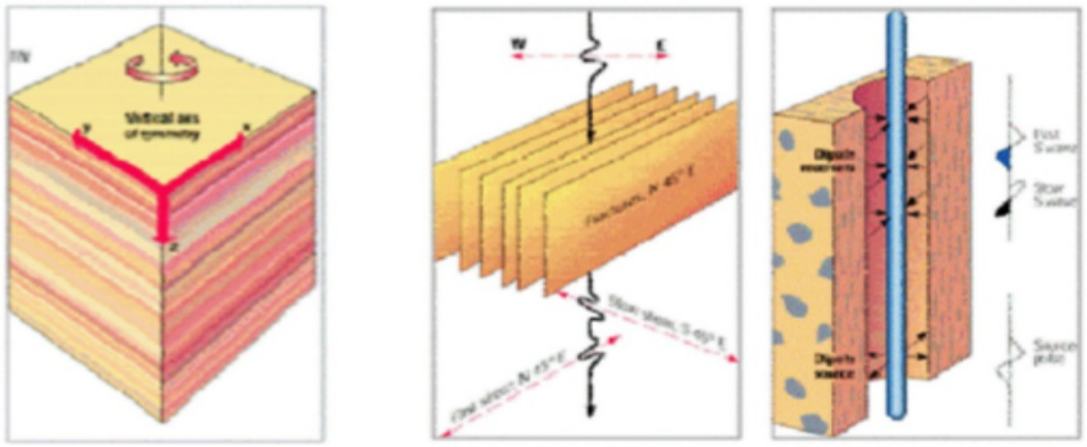

4925
4950
4975
5000
5025
5050
5075
5100
5125
5150
5175
5200
5225
5250
Upper Tuscaloosa


5275
5300
5325
5350
5375
5400
5425
5450
5475
5500
5525
5550
5575
MT
Lower Tuscaloosa


Lo
LK / Wash-Fred
Paluxy
Mudcake/Washout
BS
20 in -10
TENS
2000 lbf 4500
INCL
0 deg 100
MD (ft)
AT90
0.2 ohm.m 2000
AT60
0.2 ohm.m 2000
AT30
0.2 ohm.m 2000
AT20
0.2 ohm.m 2000
HD2_PPC1
20 in -10
DPHZ
0.45 ft3/ft3 -0.15
TNPH
0.45 ft3/ft3 -0.15
DTSH_YD_R
240 us/ft 40
Unknown
0.50 8.50
UNFLUSHED_QE
0 (ft3/ft3) 1
SMG_DYN
0 Mpsi 10
YME_DYN
PR
0 unitless 0.5
YME_STA_MMC
0 Mpsi 15
Stress Gradient
0.5 (TXSG_ISO) 0.8
TZSG
0.2 psi/ft 1.4
PPGI
0.2 psi/ft 1.2
TXSG_ISO
0.2 1.2

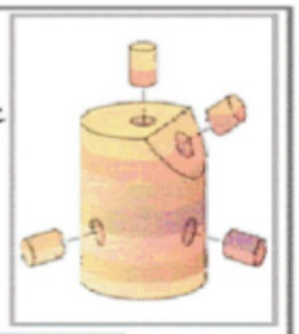
GR_EDTC	(ft) 1:240	HD1_PPC1	AT10	SPHI	DTCO_MF_R	Illite Bour Quar Calc Pyrit UWa	Form	BMK_DYN	YME_DYN	UCS_CDE	TXSP_ISO
0 gAPI 200		-10 in 20	0.2 ohm.m 2000	0.45 ft3/ft3 -0.15	240 us/ft 40			0 Mpsi 10	0 Mpsi 20	0 psi 20000	0 psi 20000

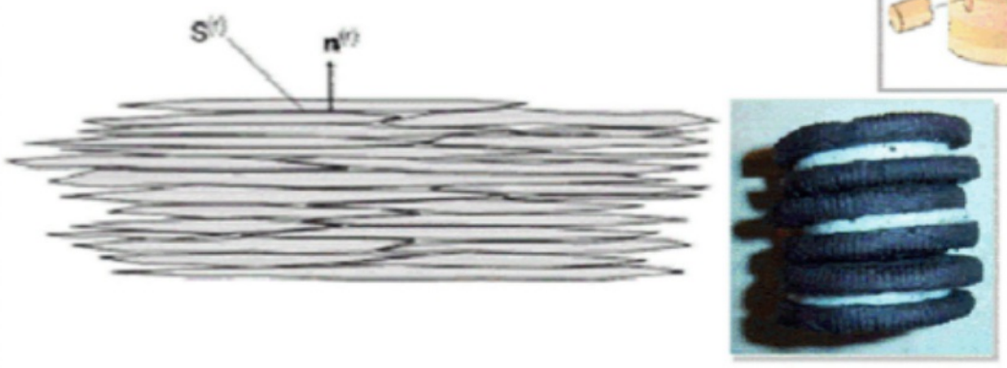
TIV ANISOTROPY **TIH ANISOTROPY**



From the Promise of Elastic Anisotropy, Schlumberger Oilfield Review, Oct 1994

Layered media often exhibts TIV anisotropy. Properties measured in the vertical direction are different than properties measured in the horizontal direction.





Figures courtesy of Sayers and Suarez-Rivera

Poro Elastic Horizontal Strain Model with isotropy

$$\sigma_h - \alpha\sigma_{PP} = \frac{\nu}{1-\nu}\left(\sigma_V - \alpha\sigma_{pp}\right) + tectonics$$

Poro Elastic Horizontal Strain Model for TIV anisotropy

$$\sigma_h - \alpha\sigma_{PP} = \frac{E_h}{E_v}\frac{\nu_v}{1-\nu_h}\left(\sigma_V - \alpha\sigma_{pp}\right) + tectonics$$

σ_h = *Minimum horizontal stress*

σ_{PP} = *Pore Pressure*

σ_V = *Overburden stress*

α = *Poro – Elastic constant*

E_h = *Horizontal Young's Modulus*

E_V = *Vertical Young's Modulus*

ν_H = *Horizontal Poisson's Ratio*

ν_V = *Vertical Poisson's Ratio*

From Thiercelin and Plumb, SPE 21847

Schlumberger

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STATE:	Louisiana
COUNTRY:	USA

API No.: 17-021-88018

Date Processed: 5/14/2021