



**Scale 1:240 (5"=100') Imperial
Measured Depth Log**

Well Name: Horsetail 19N-1924M
Well Id:
Location: SWSE 19-T10N-R57W Weld County, Colorado
License Number: 05-123-3988500
Spud Date: 8/3/2014
Surface Coordinates: Lat.: 40.818861 Long.: -103.794250
Region: Redtail
Drilling Completed: 8/12/2014

Bottom Hole Coordinates: Lat.: 40.818861 Long.: -103.794250
Ground Elevation (ft): 4748
Logged Interval (ft): 1585
Formation: Pierre, Hygiene, Niobrara, Bridge Creek, Entrada, Lyons and Cherokee
Type of Drilling Fluid: Water Based Mud
K.B. Elevation (ft): 4771
Total Depth (ft): 9370
To: 9370
Printed by WellSight Log Manager from WellSight Systems 1-800-447-1534 www.WellSight.com

OPERATOR

Company: Whiting Oil & Gas Corporation
Address: 1700 Broadway Suite 2300
Denver, CO 80290
303-837-1661

GEOLOGIST

Name: Mark Denler, Jim Wenger
Company: Acme Geologic Consulting
Address: 108 Berry Street
Little Rock, AR 72205
www.acmegeo.com

Drilling Company

Pioneer Rig #54

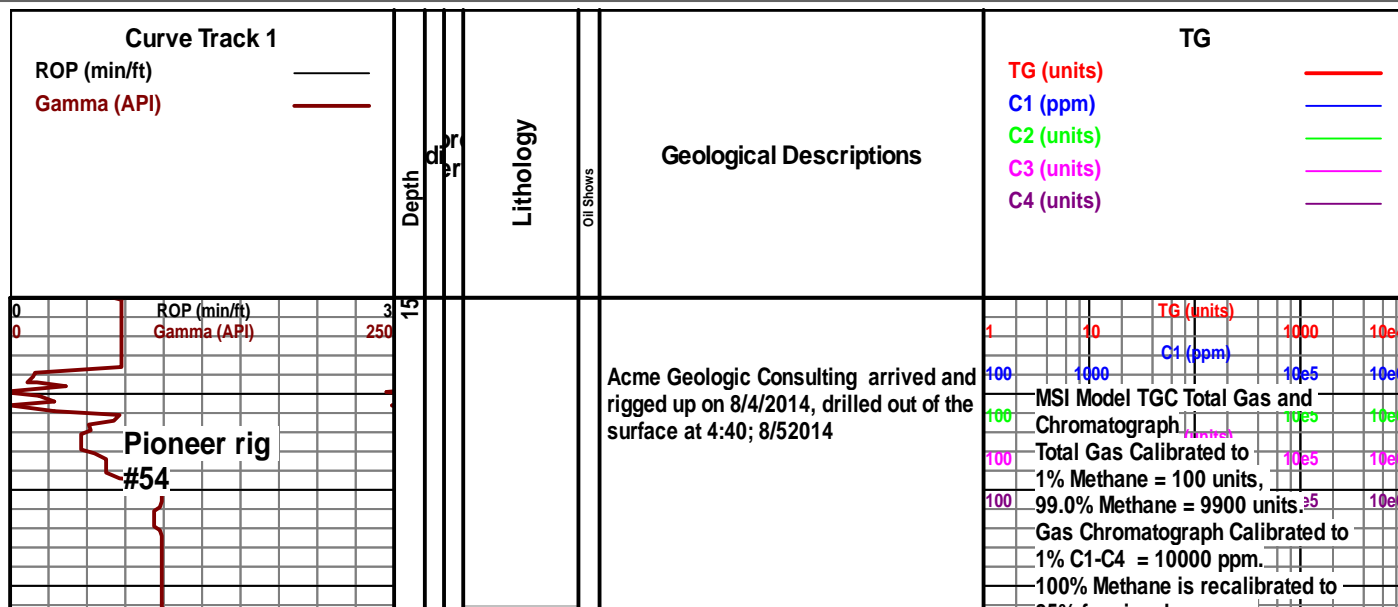
Comments

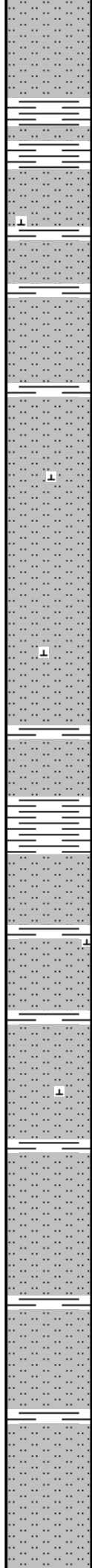
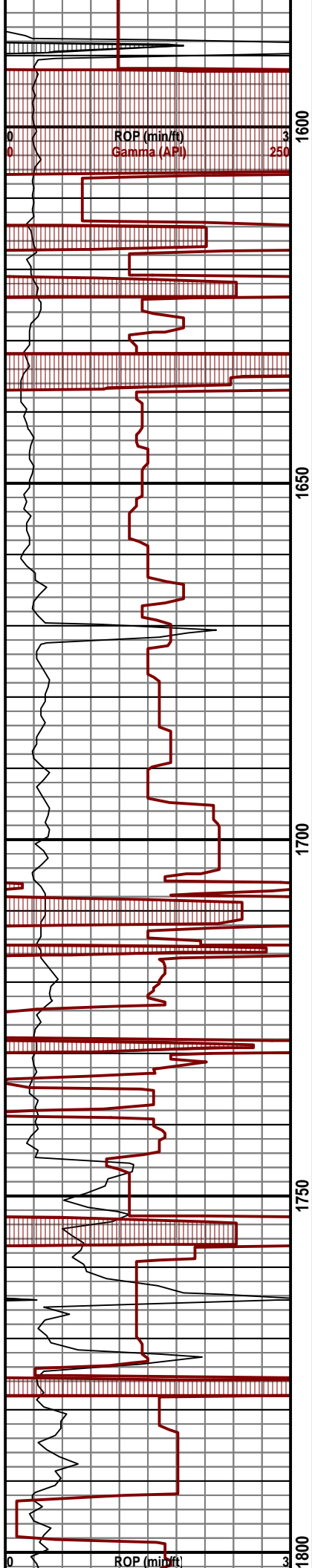
Lithologies and tops at drilled depths, not corrected to elogs. Where the well bore gas is 100% methane, the C1 line is moved to 85% for graphical purposes only.

	Anhy		Congl		Mrlst		Ss
	Bent		Dol		Salt		Till
	Brec		Gyp		Shale		Cyan mrlst
	Cht		Igne		Shcol		Cyan chk
	Clyst		Lmst		Shgy		Grnt wsh
	Coal		Meta		Siltst		

MINERAL		Minxl		Crin		Gyp
Anhy		Nodule		Echin		Ls
Arggrn		Phos		Fish		Mrst
Arg		Pyr		Foram		Sltstrg
Bent		Salt		Fossil		Ssstrg
Bit		Sandy		Gastro		
Brecfrag		Silt		Oolite		TEXTURE
Calc		Sil		Ostra		Boundst
Carb		Sulphur		Pelec		Chalky
Chtdk		Tuff		Pellet		Cryxln
Chtlt				Pisolite		Earthy
Dol	FOSSIL			Plant		Finexln
Feldspar		Algae		Strom		Grainst
Ferrpel		Amph				Lithogr
Ferr		Belm		STRINGER		Microxln
Glau		Bioclst		Anhy		Mudst
Gyp		Brach		Shstrg		Packst
Hvymin		Bryozoa		Bent		Wackest
Kaol		Cephal		Coal		
Marl		Coral		Dol		

POROSITY TYPE	SORTING	OIL SHOWS	
Earthy	Well	Good	Cv-v
Fenest	Moderate	Fair	Cv-c
Fracture	Poor	Poor	Conductor
Inter		Dead	
Moldic	ROUNDING	INTERVALS	EVENTS
Organic	Rounded	Core	Rft
Pinpoint	Subrnd	Dst	Sidewall
Vuggy	Subang	Srfcsg	Srfcsg
	Angular		

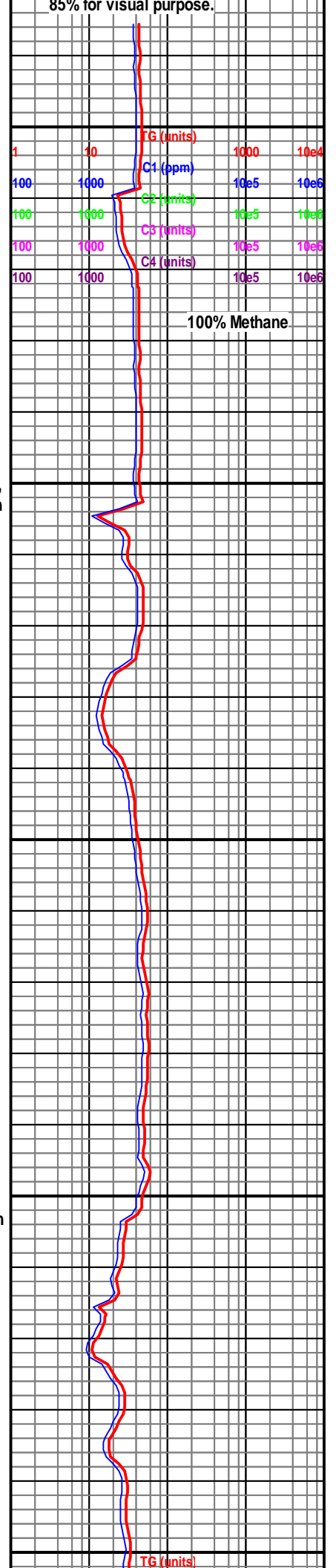


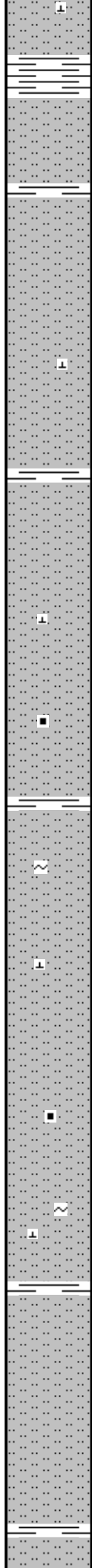
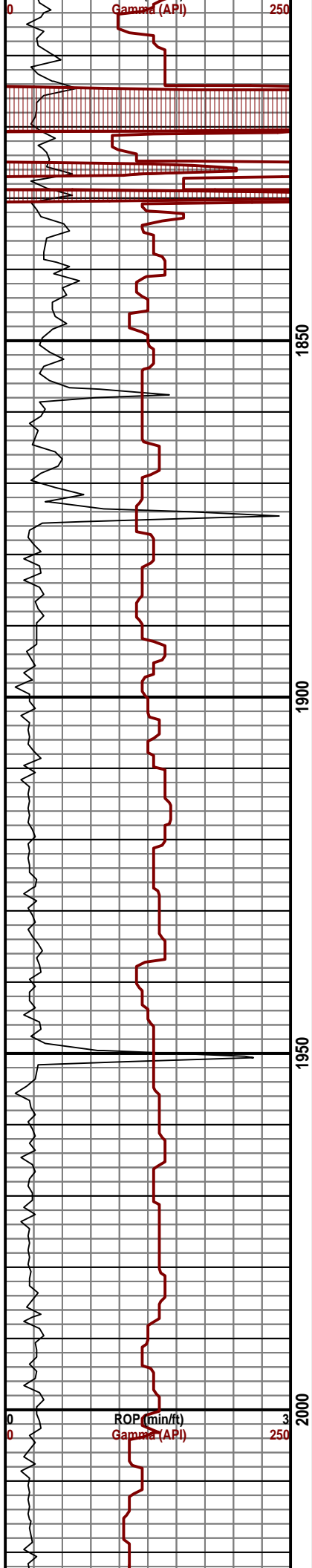


1585-1600 Siltst lt-med gy, sb plty-sb
blky, occ blky, sft-mod frm, sl calc,
arg, grdg to Sh ip, nsfoc, 85% Siltst,

1600-1700 Siltst lt-med gy, sb plty-sb
blky, mod frm, sdy ip, arg, sl-mod calc,
grdg to Sh ip, nsfoc, 90% Siltst, 10% Sh

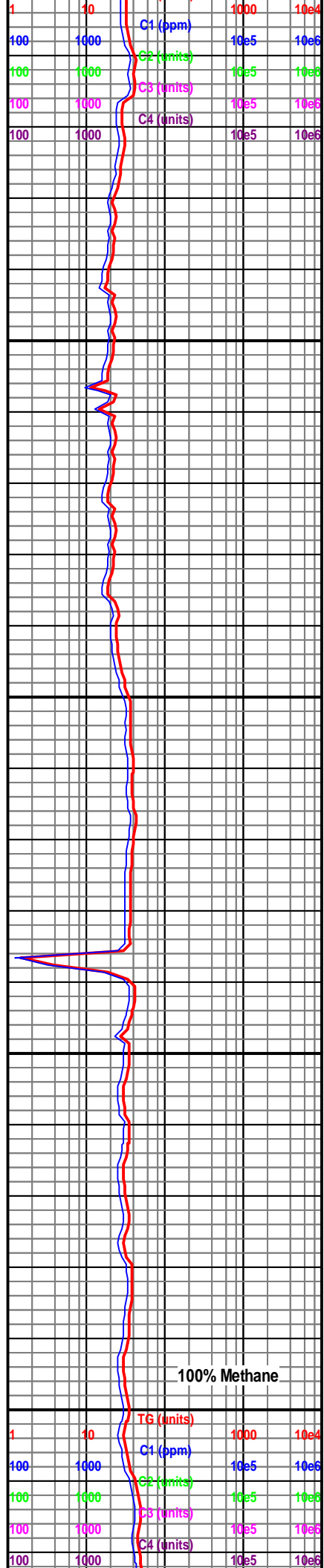
1700-1800 Siltst lt-med gy, sb plty-sb
blky, sft-mod frm, arg, sl calc, grdg to
Sh, rr min flor, nsoc, 90% Siltst, 10% Sh

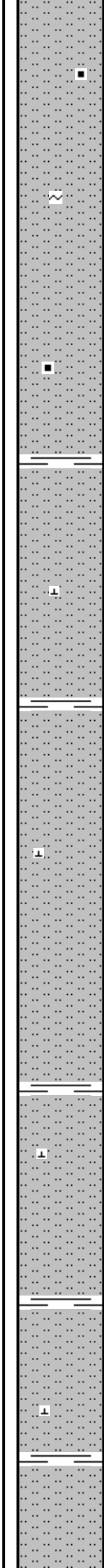
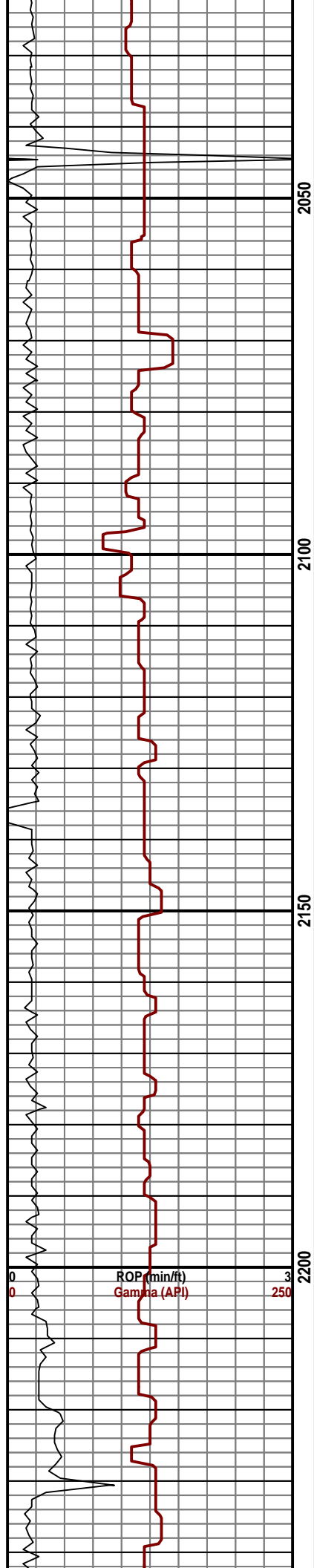




1800-1900 Slstst lt-med gy, sb plty-sb blk, occ blk, arg, sl-non calc, predy sft, grdg to Sh, rr min flor, nsoc, 95% Slstst, 5% Sh

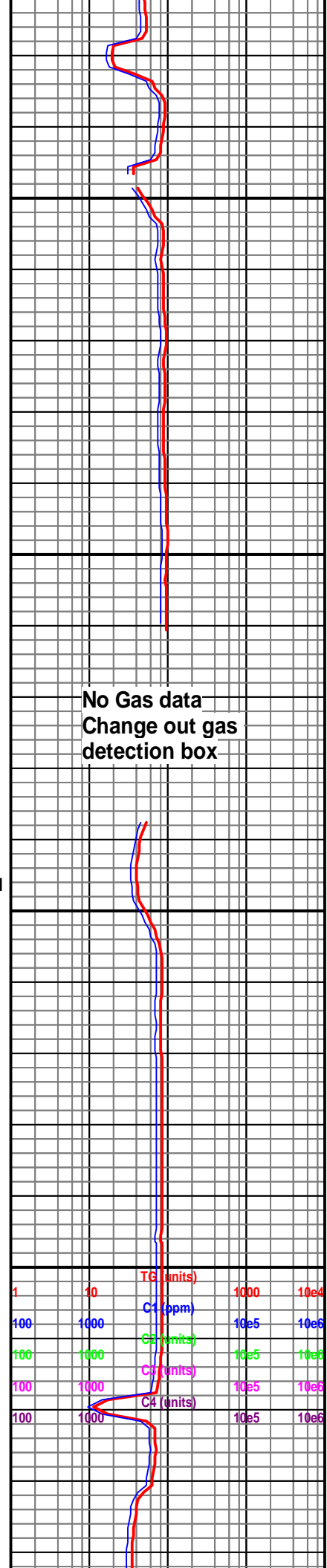
1900-2000 Slstst lt-med gy, sb plty-sb blk, mod frm, sdy, tr carb & glau in mtx, sl calc, tr Sh med gy, sb blk-bly, occ plty, mod frm, non calc, slty ip, nsfoc, 90% Slstst, 10% Sh

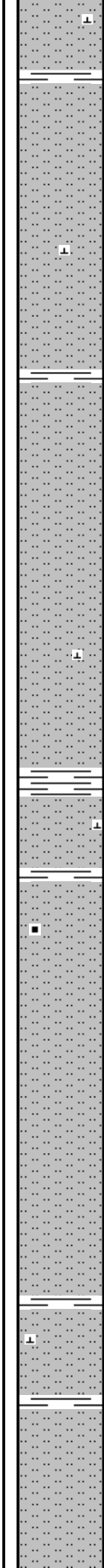




2000-2100 Slstst lt-med gy, sb plty-sb
blky, mod frm, sdy, tr carb & glau in
mtx, sl calc, tr Sh med gy aa, nsfoc,
90% Slstst, 10% Sh

2100-2200 Slstst lt-med gy, sb plty-sb
blky, sft, sdy ip, sl-mod calc, arg ip,
grdg ip to Sh med gy, sb plty-blky, mod
frm, non calc, slty ip, nsfoc, 85% Slstst,
15% Sh

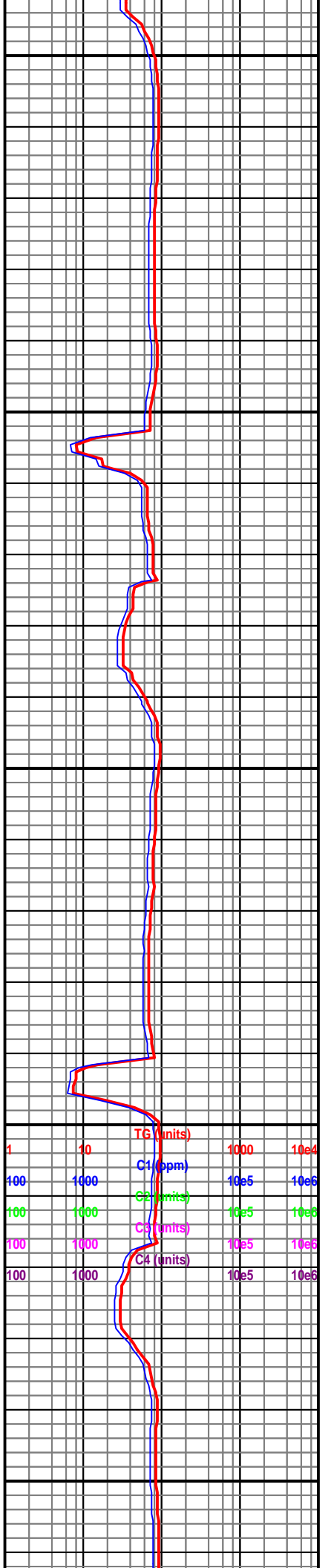




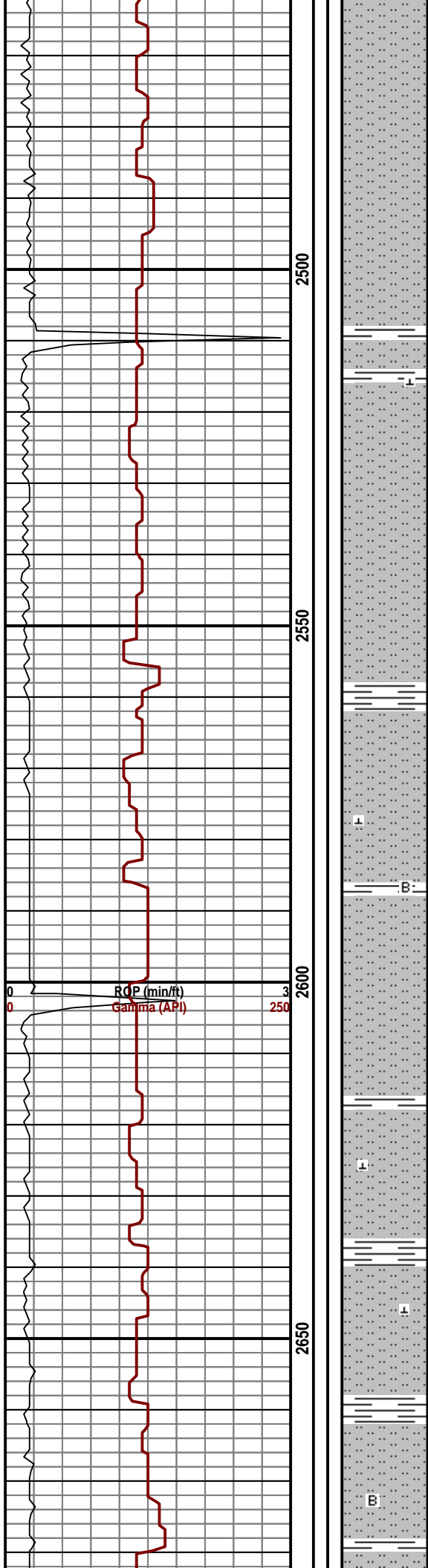
2200-2300 Sltst-lt med gy, sb plty-sb
blky, sdy ip, mod frm, arg ip, grdg ip to
Sh med gy, sb plty-blky, mod frm, slty
ip, sl-mod calc, nsfoc, 90% Sltst, 10%
arg

2300-2400 Sltst-lt med gy, sb plty-sb
blky, sdy ip, sft-mod frm, rr carb matt,
grdg ip to Sh med gy, sb plty-blky, mod
frm, slty ip, sl calc, nsfoc, 90% Sltst,
10% arg

2400-2500 Sltst-lt med gy, sb plty-sb
blky, sdy ip, sft-mod frm, grdg ip to Sh
med gy, sb plty-blky, mod frm, slty ip,
sl calc, nsfoc, 90% Sltst, 10% Sh

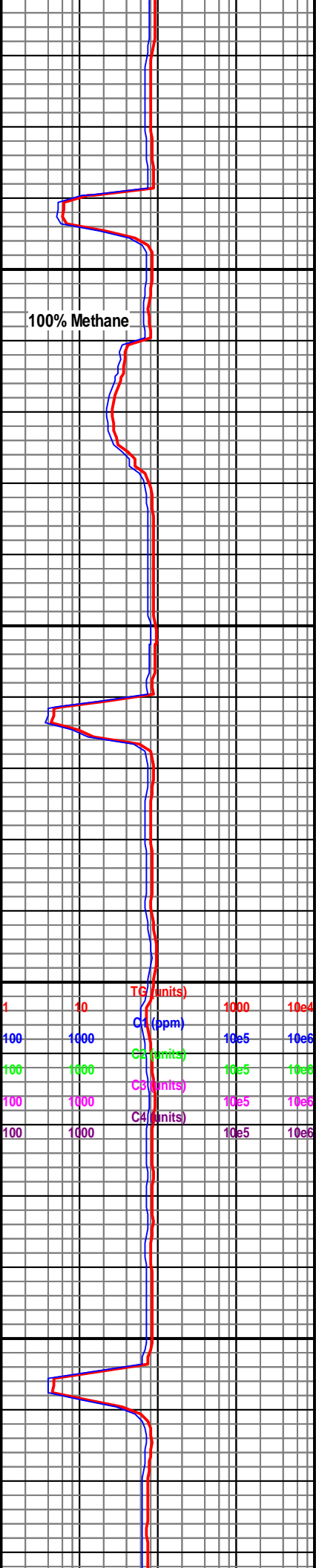


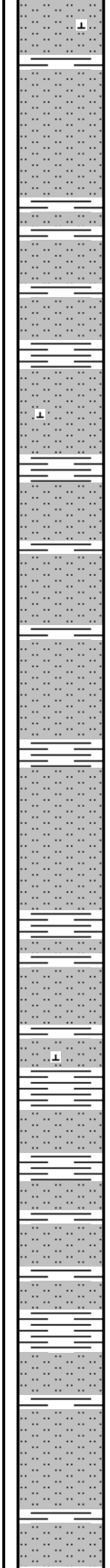
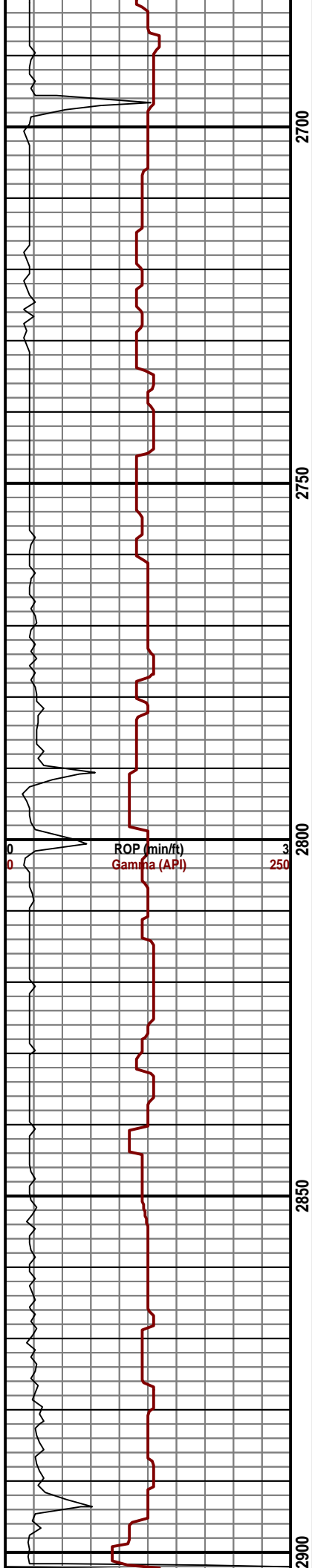
1	10	TG (units)	1000	10e4
100	1000	C1 (ppm)	10e5	10e6
100	1000	C2 (units)	10e5	10e6
100	1000	C3 (units)	10e5	10e6
100	1000	C4 (units)	10e5	10e6



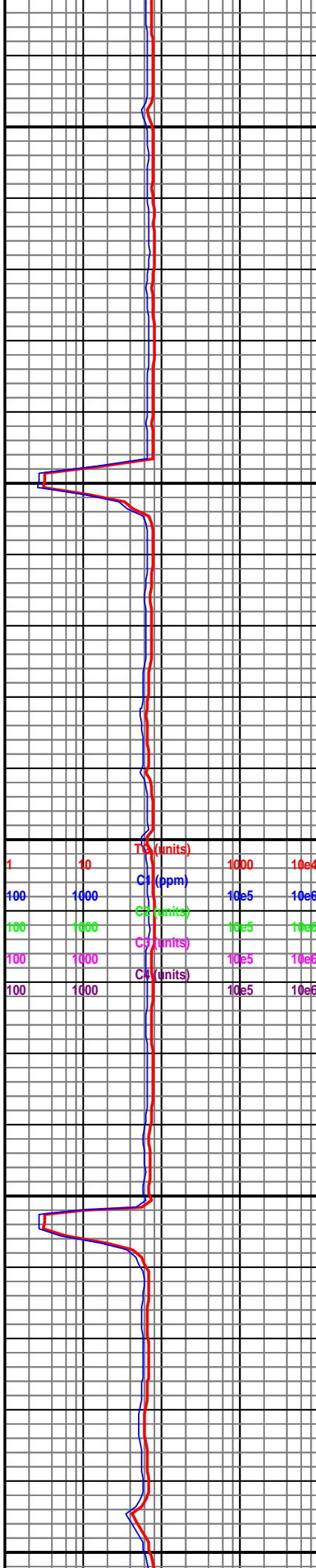
2500-2600 Sltst-lt med gy, sb plty-sb
blky, sdy ip, sft-mod frm, rr off-wht
bent, grdg ip to Sh med gy, sb
plty-blky, mod frm, slty ip, sl calc,
nsfoc, 85% Sltst, 15% Sh

2600-2700 Sltst-lt med gy, sb plty-sb
blky, sdy ip, sft-mod frm, rr off-wht
bent, grdg ip to Sh med gy, sb
plty-blky, mod frm, slty ip, sl-mod calc,
nsfoc, 80% Sltst, 20% Sh





2700-2800 Siltst-lt med gy, sb plty-sb
blky, sdy ip, sft-mod frm, grdg ip to Sh
med gy, sb plty-blky, mod frm, slty ip,
sl calc, nsfoc, 70% Siltst, 30% Sh



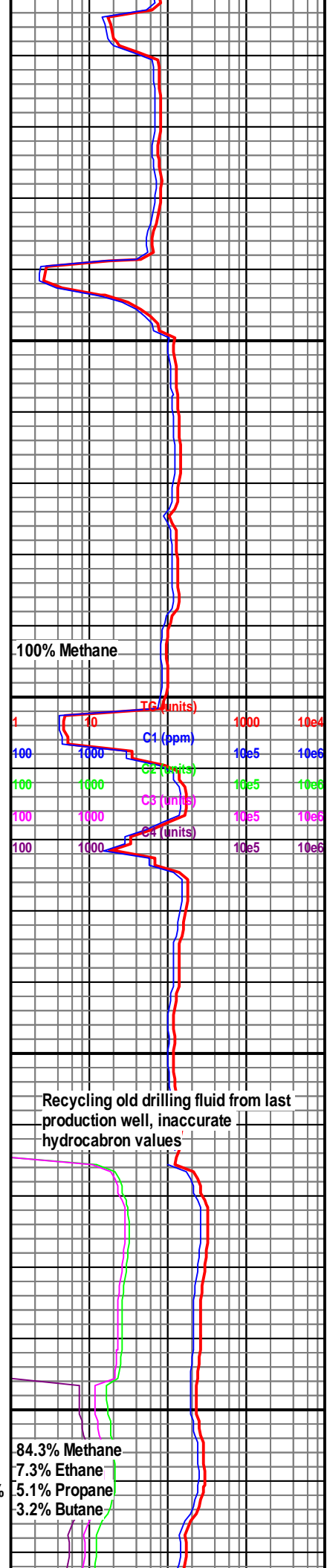
2800-2900 Siltst-lt med gy, sb plty-sb
blky, sdy ip, sft-mod frm, grdg ip to Sh
med gy, sb plty-blky, mod frm, slty ip,
sl calc, nsfoc, 65% Siltst, 35% Sh



2900-3000 Sh med gy-bn, sb plty-blky, mod frm, Sltst-lt med gy, sb plty-sb blky, sdy ip, sl calc, nsfoc, 60% Sh, 40% Sltst

3000-3100 Sh med gy, sb plty-blky, mod frm, Sltst-lt med gy, sb plty-sb blky, sdy ip, no calc, nsfoc, 50% Sh, 50% Sltst

3100-3120 Sltst lt med gy, sb plty-sb blky, sdy ip, Sh med gy, sb plty-blky, mod frm, sl calc, nsfoc, 80% Sltst, 20% Sh

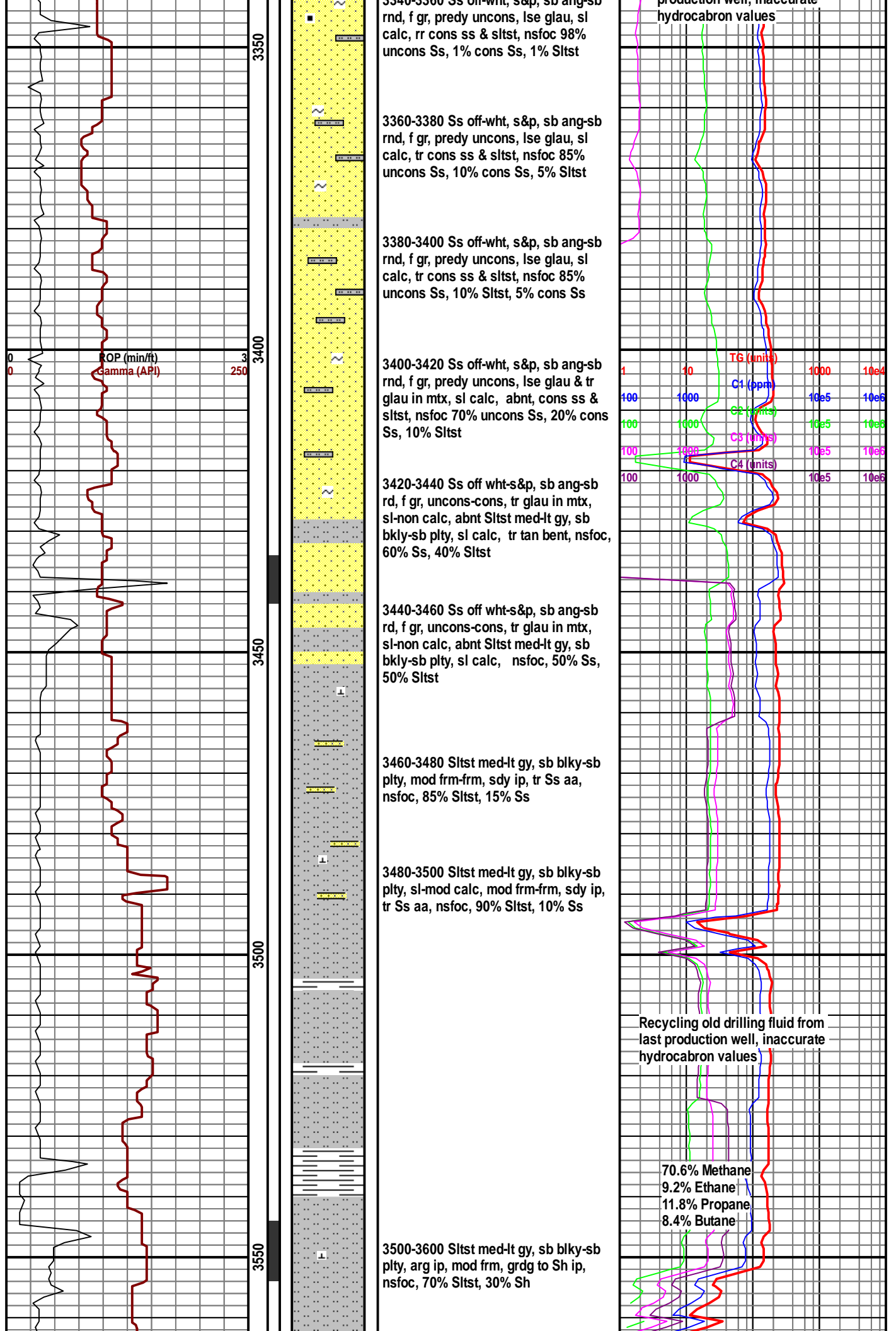


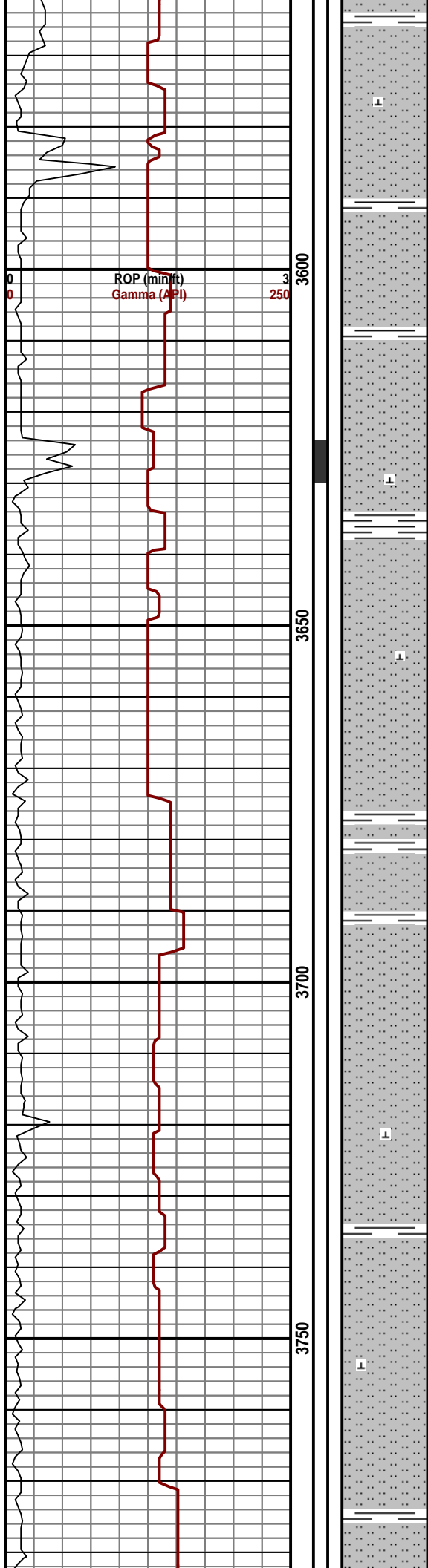
100% Methane

	TG (units)	C1 (ppm)	C2 (units)	C3 (units)	C4 (units)
1	10	1000	1000	1000	1000
100	1000	1000	1000	1000	1000
100	1000	1000	1000	1000	1000
100	1000	1000	1000	1000	1000
100	1000	1000	1000	1000	1000

Recycling old drilling fluid from last production well, inaccurate hydrocarbon values

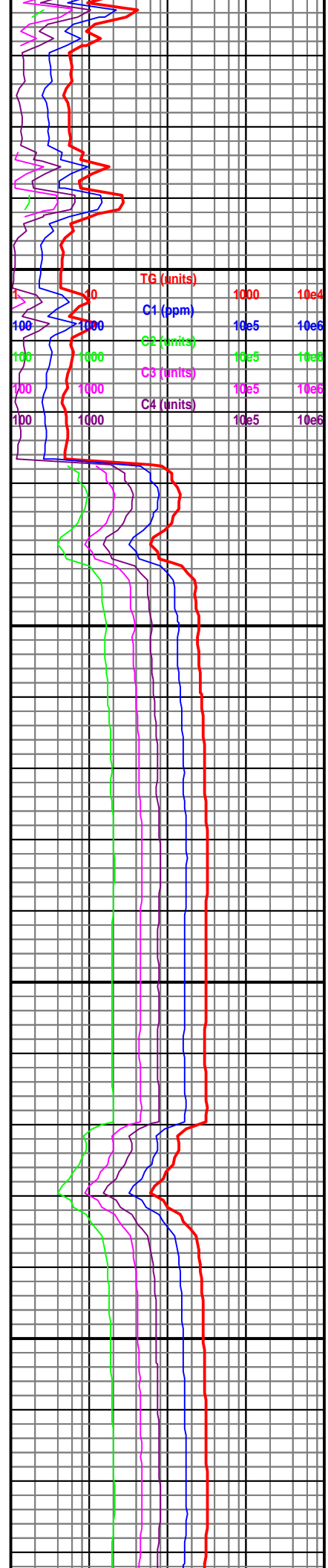
84.3% Methane
7.3% Ethane
5.1% Propane
3.2% Butane

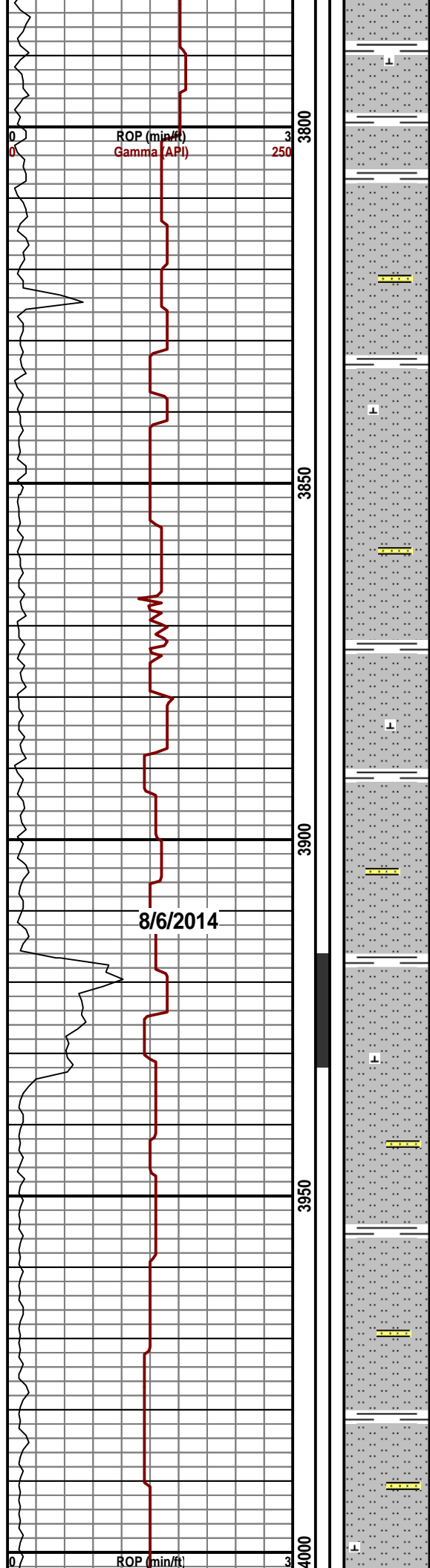




3600-3700 Sltst med-lt gy, sb plty-sb
blky, plty ip, mod frm, arg ip, tr calc
filled frac, grdg to Sh ip, nsfoc, 80%
Sltst, 20% Sh

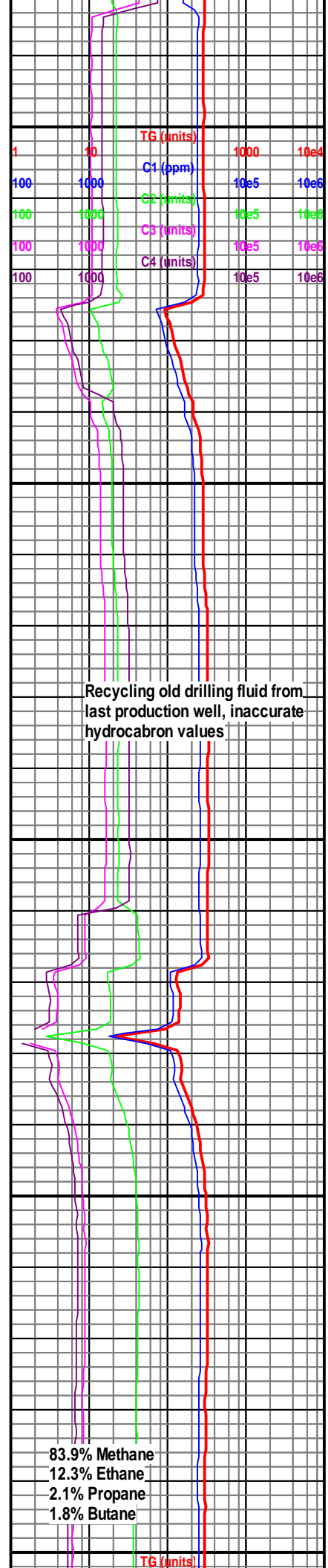
3700-3800 Sltst med-lt gy, sb plty-sb
blky, mod frm, arg, non-sl calc, grdg to
Sh ip, 75% Sltst, 25% Sh





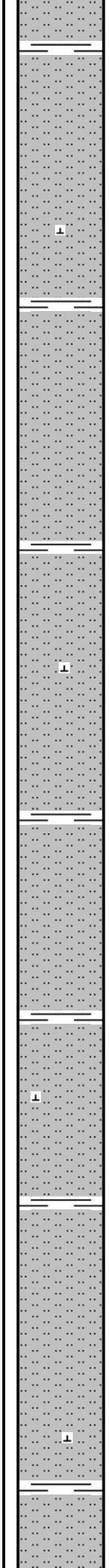
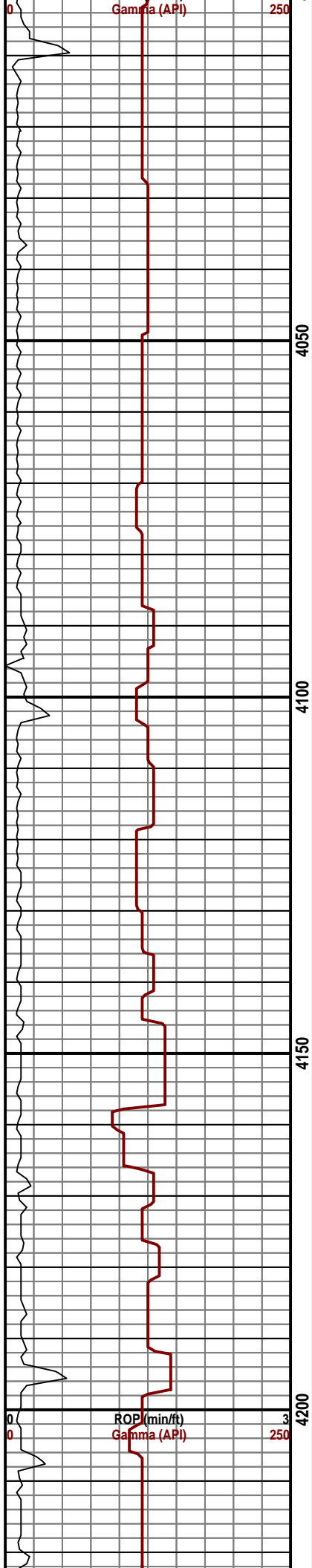
3800-3900 Sltst med-lt gy, sb plty-sb
blky, mod frm-frm, sdy, grdg to vf gr ip,
tr Sh med gy, sb blky-sb plty, mod frm,
silty tex, sl calc, nsfoc, 75% Sltst, 15%
Sh, 10% Ss

3900-4000 Sltst med-lt gy, sb plty-sb
blky, sdy tex, sl calc, grdg to Ss ip, tr
Sh aa, nsfoc, 85% Sltst, 10% Ss, 5%



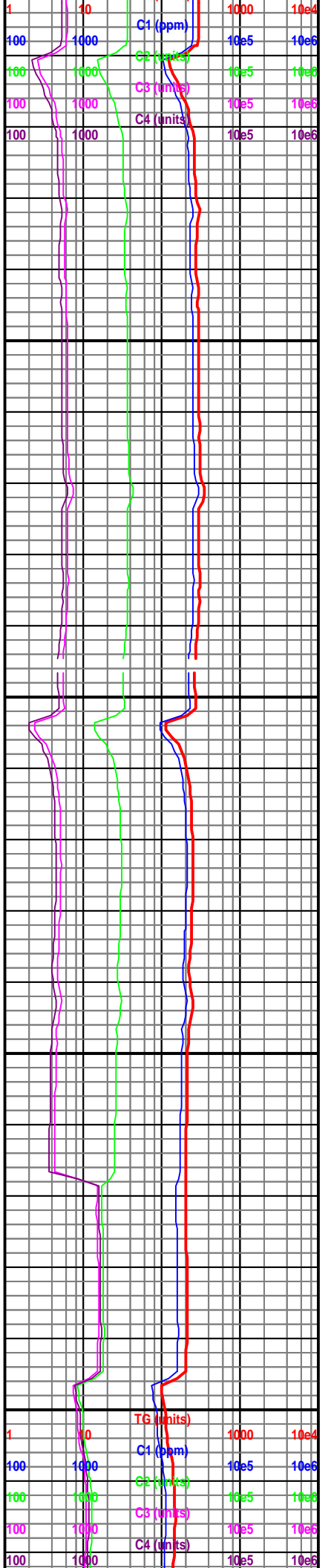
Recycling old drilling fluid from
last production well, inaccurate
hydrocabron values

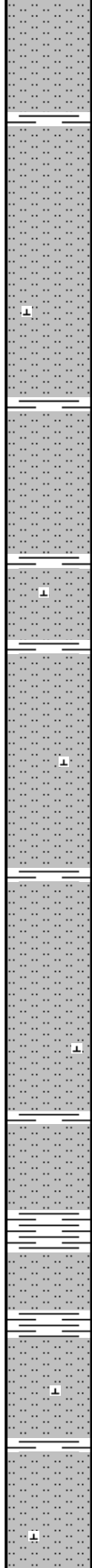
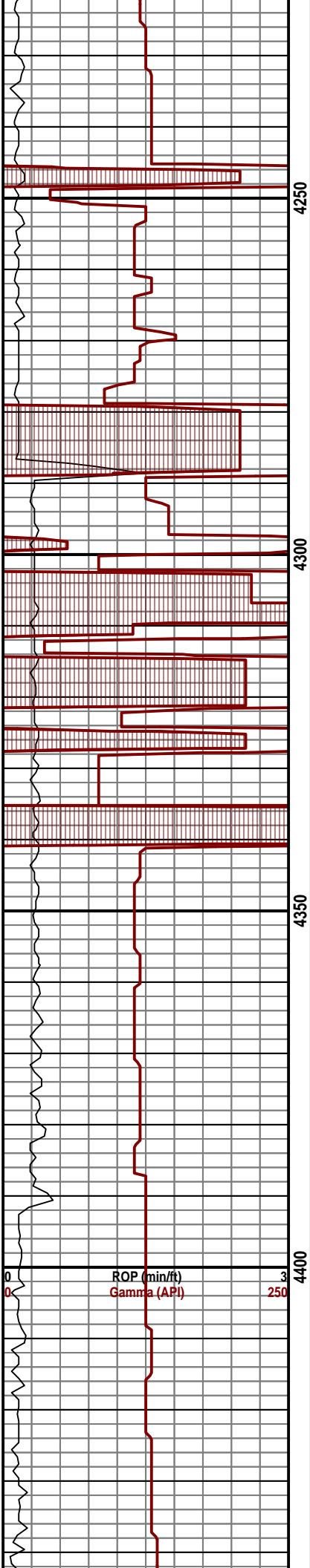
83.9% Methane
12.3% Ethane
2.1% Propane
1.8% Butane



4000-4100 Sltst lt-med gy, predy sb
blky, occ sb plty, mod frm, sl calc, arg
ip, grdg to Sh ip nsfoc, 85% Sltst, 15%

4100-4200 Sltst med-lt gy, sb blk-y-sb
plty, mod frm-frn ip, sl calc, arg ip,
grdg to Sh ip, nsfoc, 80% Sltst, 20% Sh

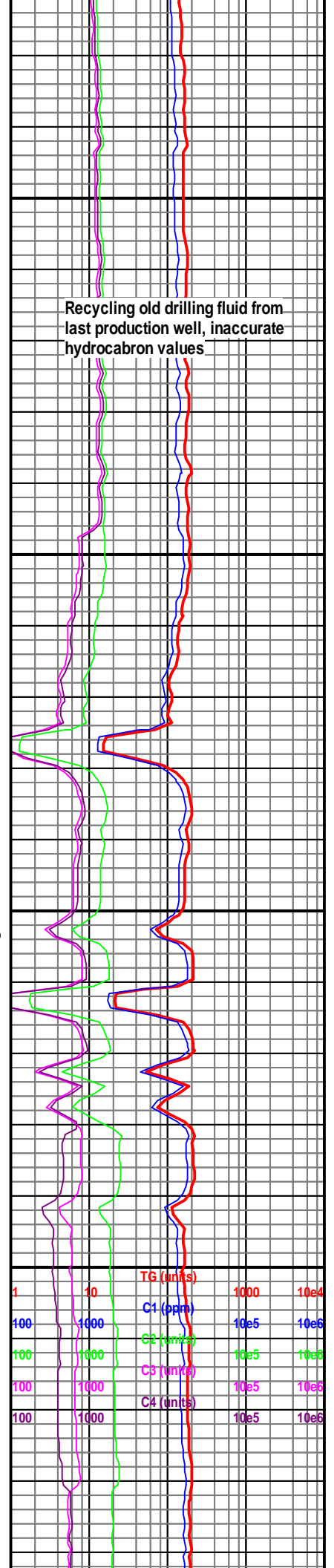




4200-4300 Sltst med-lt gy, sb plty-sb
blky, mod frm, sdy tex ip, sl calc,
nsfoc, arg ip, grdg to Sh, nsfoc, 90%
Sltst, 10% Sh

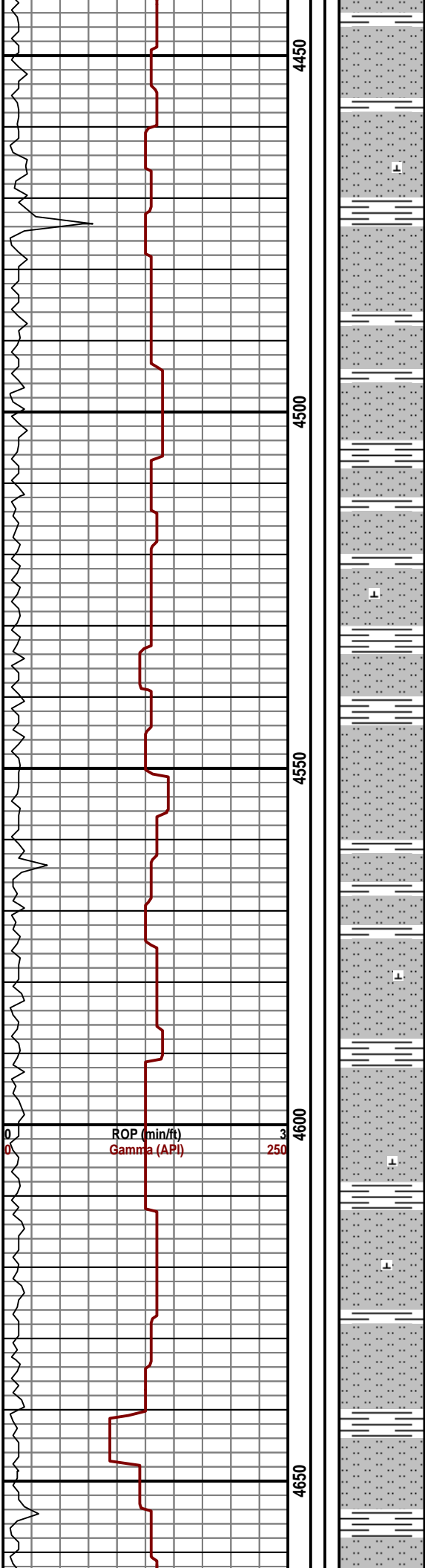
4300-4400 Sltst med-lt gy, sb plty-sb
blky, mod frm-frn, tr carb, sl calc, arg
ip, grdg to Sh ip, nsfoc, 85% Sltst, 15%

4400-4500 Sltst med-lt gy, sb plty-plty,



Recycling old drilling fluid from
last production well, inaccurate
hydrocabron values

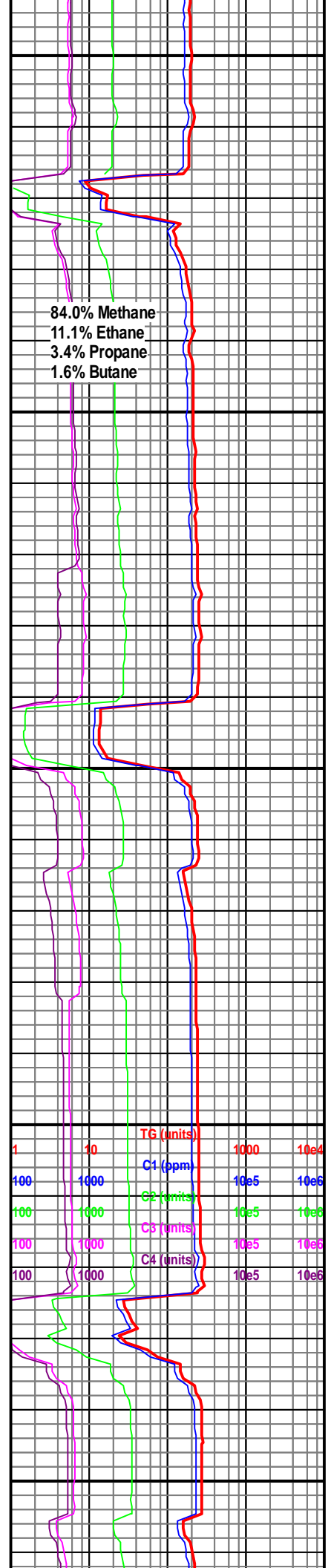
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100	1000	C1 (ppm)	10e5	10e6
100	1000	C2 (nmol/g)	10e5	10e6
100	1000	C3 (nmol/g)	10e5	10e6
100	1000	C4 (units)	10e5	10e6

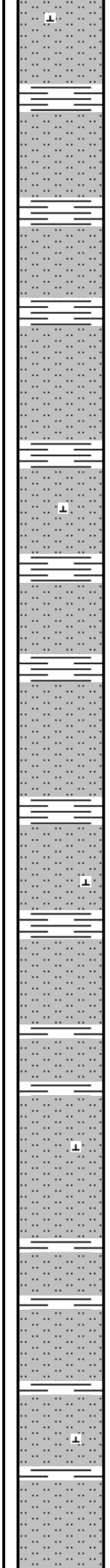
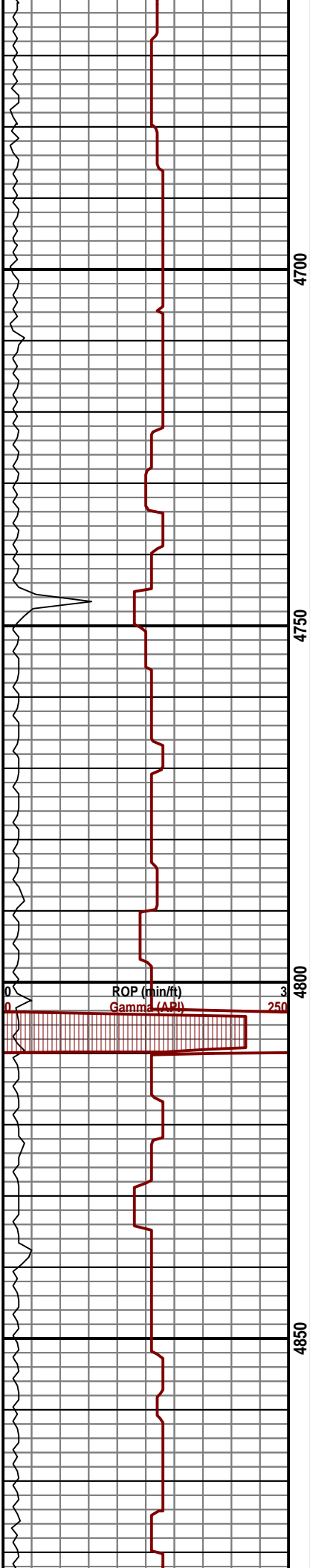


occ sb blkly, mod frm, sl calc, v arg, grdg to Sh, nsfoc, 65% Sltst, 35% Sh

4500-4600 Sltst med-lt gy, sb plty-plty, tr sb blkly-blky, mod frm-sft, sl calc, arg, grdg to Sh, nsfoc, 70% Sltst, 30% Sh

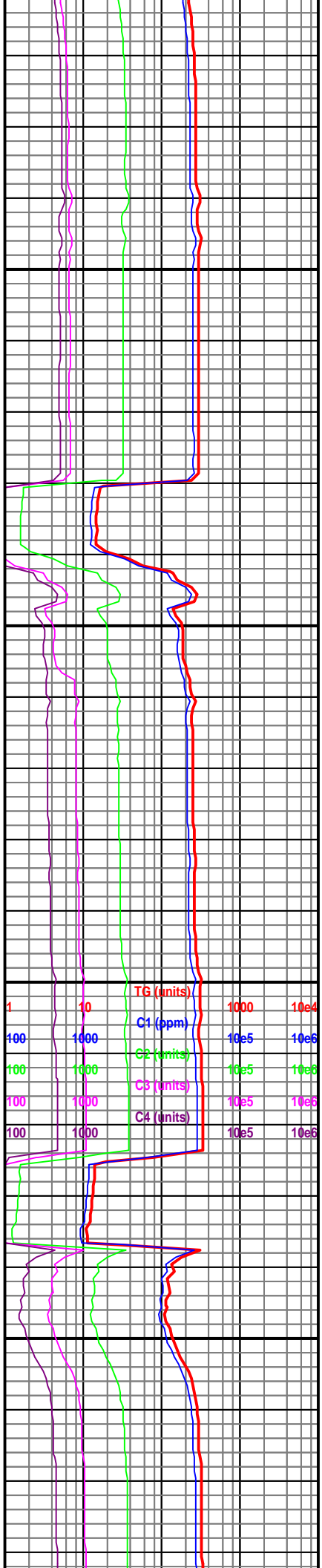
4600-4700 Sltst med-lt gy, sb plty-plty, occ sb blkly-blky, mod frm-frn, sl calc, v arg, grdg to Sh, nsfoc, 70% Sltst, 30% Sh

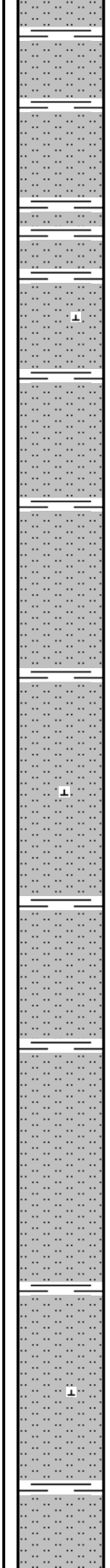
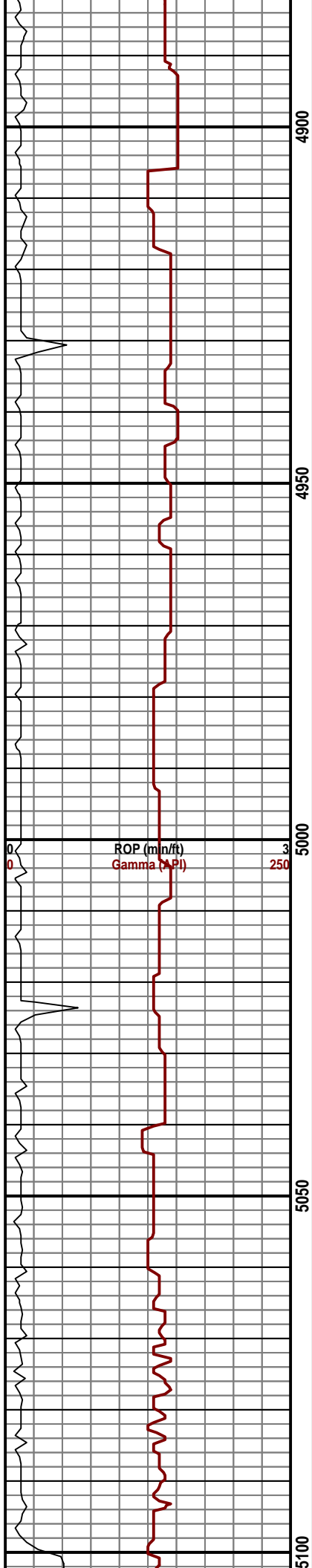




4700-4800 Sltst med-lt gy, sb plty-plty,
occ sb blkyl-blky, mod frm-frm, sl calc,
v arg, grdg to Sh, nsfoc, 65% Sltst,
35% Sh

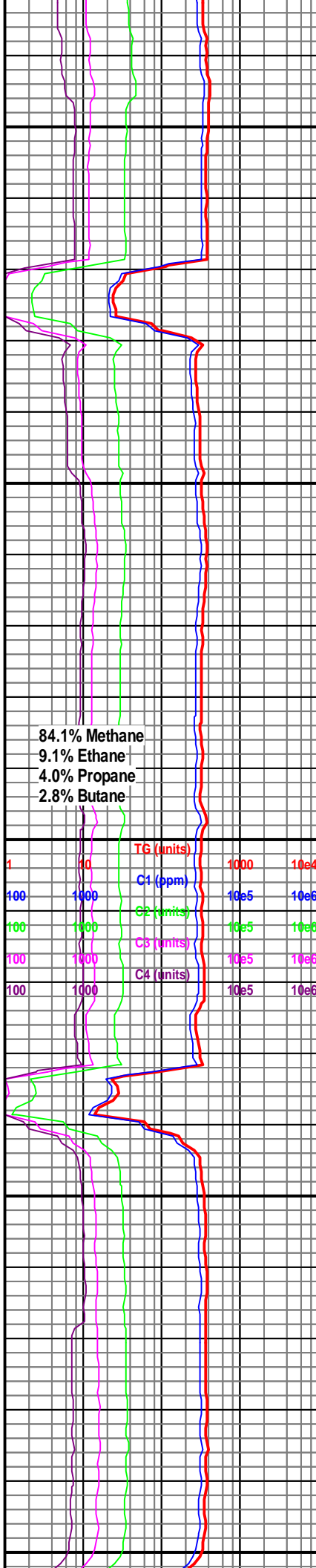
4800-4900 Sltst med-lt gy, sb plty-plty,
occ sb blkyl-blky, mod frm-frm, sl calc,
arg, grdg to Sh, nsfoc 70% Sltst, 30%
Sh

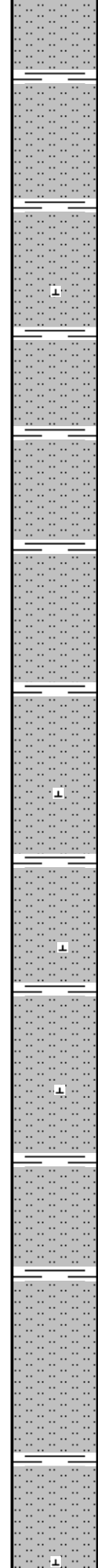
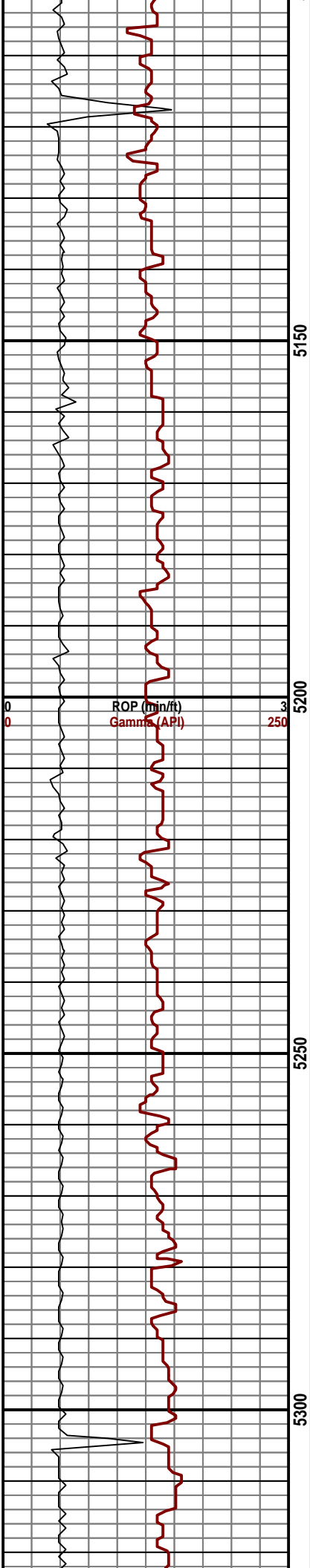




4900-5000 Sltst med-lt gy, sb plty-sb
blky, frm-mod frm, arg, sl calc, grdg to
Sh ip, nsfoc, 75% Sltst, Sh 25%

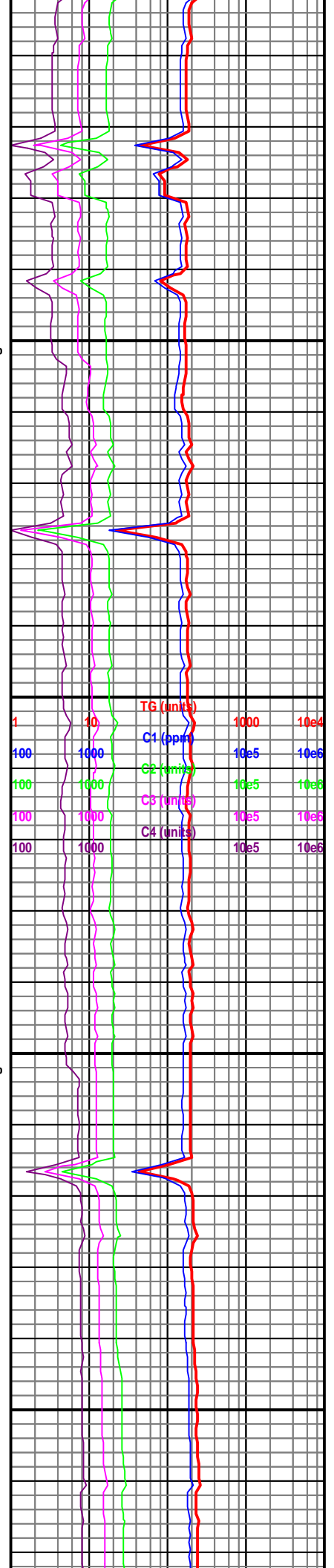
5000-5100 Sltst med-lt gy, sb plty-sb
blky, frm-mod frm, arg, tr bent, sl calc,
grdg to Sh ip, nsfoc, 85% Sltst, Sh 15%

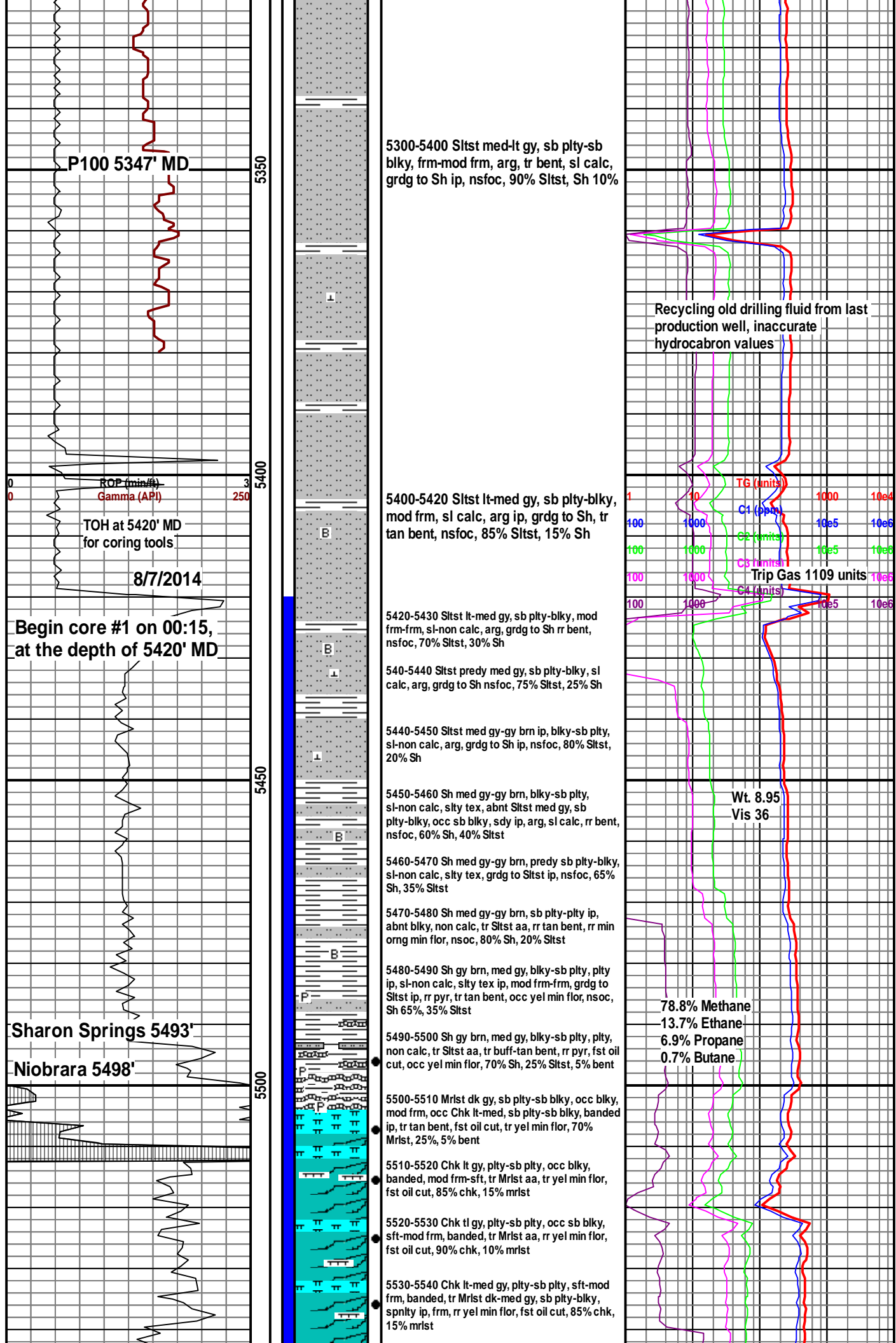


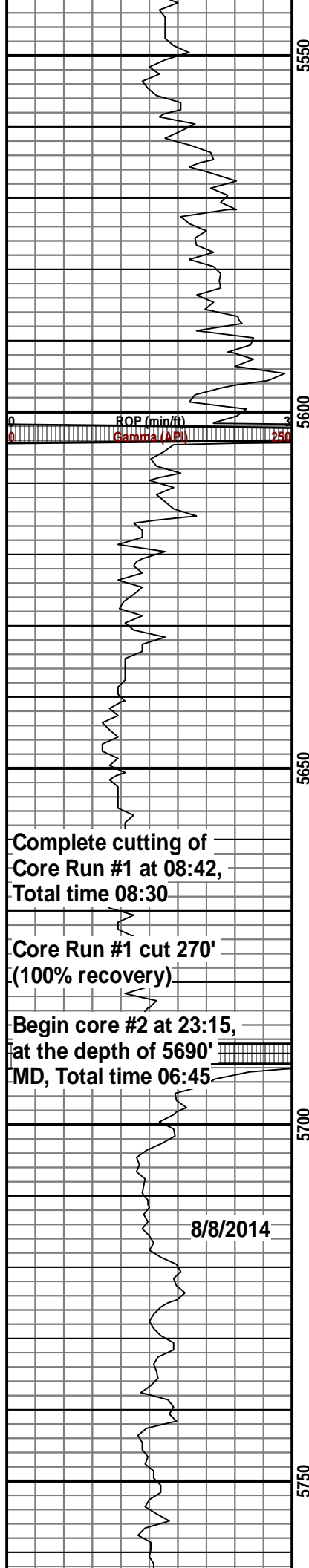


5100-5200 Slstst med-lt gy, sb plty-sb
blky, frm-mod frm, arg, tr bent, sl calc,
grdg to Sh ip, nsfoc, 85% Slstst, Sh 15%

5200-5300 Slstst med-lt gy, sb plty-sb
blky, frm-mod frm, arg, tr bent, sl calc,
grdg to Sh ip, nsfoc, 80% Slstst, Sh 20%





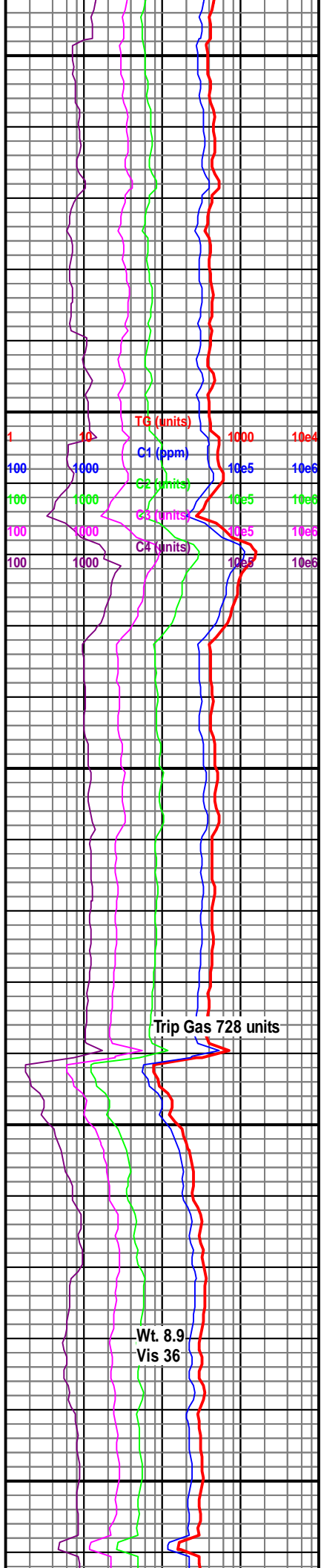
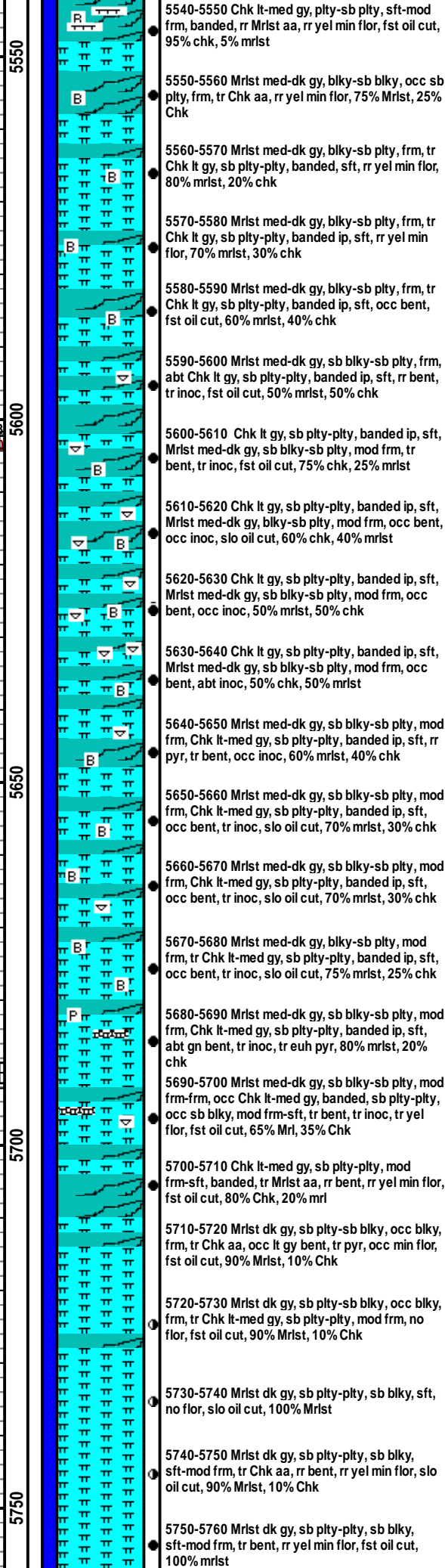


Complete cutting of
Core Run #1 at 08:42,
Total time 08:30

Core Run #1 cut 270'
(100% recovery)

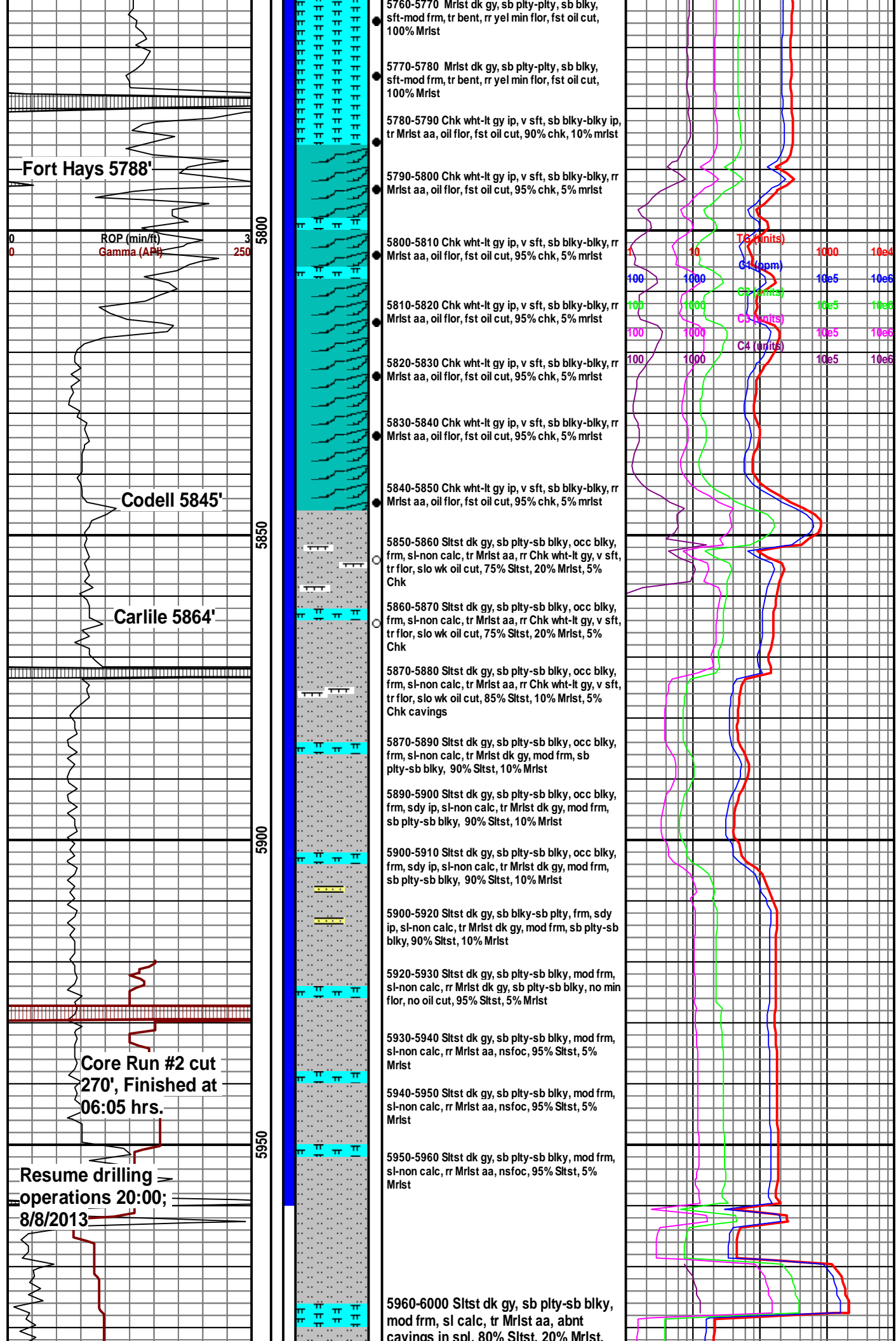
Begin core #2 at 23:15,
at the depth of 5690'
MD, Total time 06:45

8/8/2014

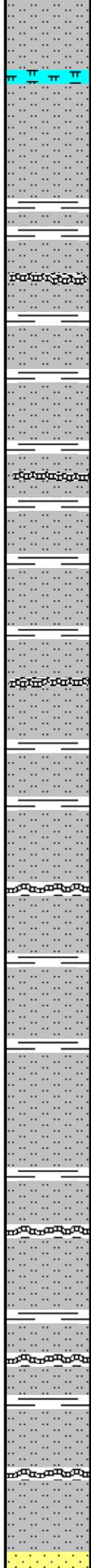
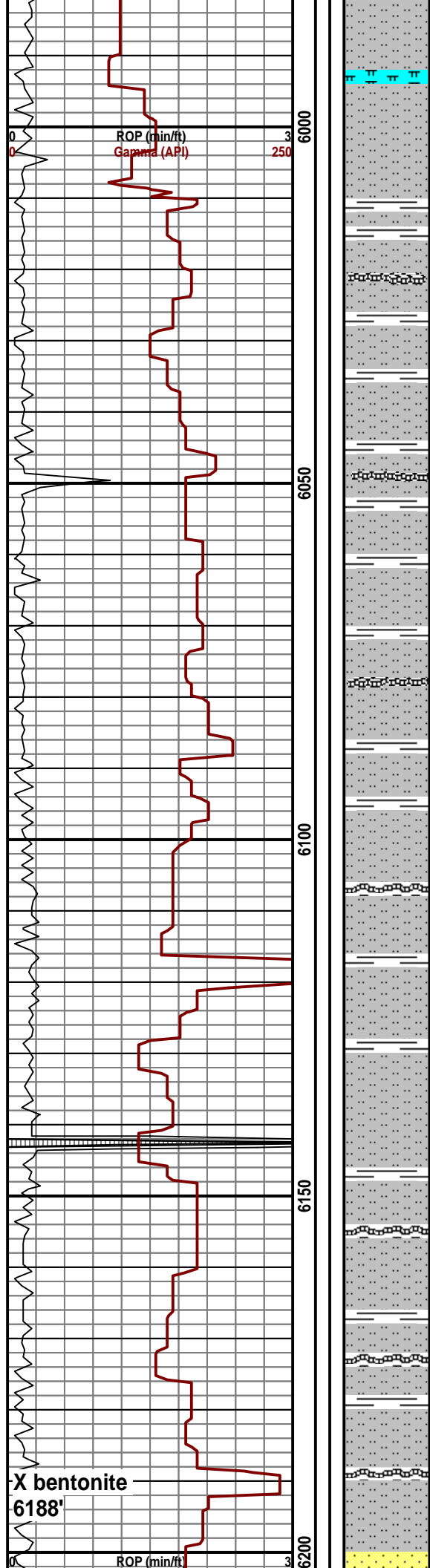


Trip Gas 728 units

Wt. 8.9
Vis 36

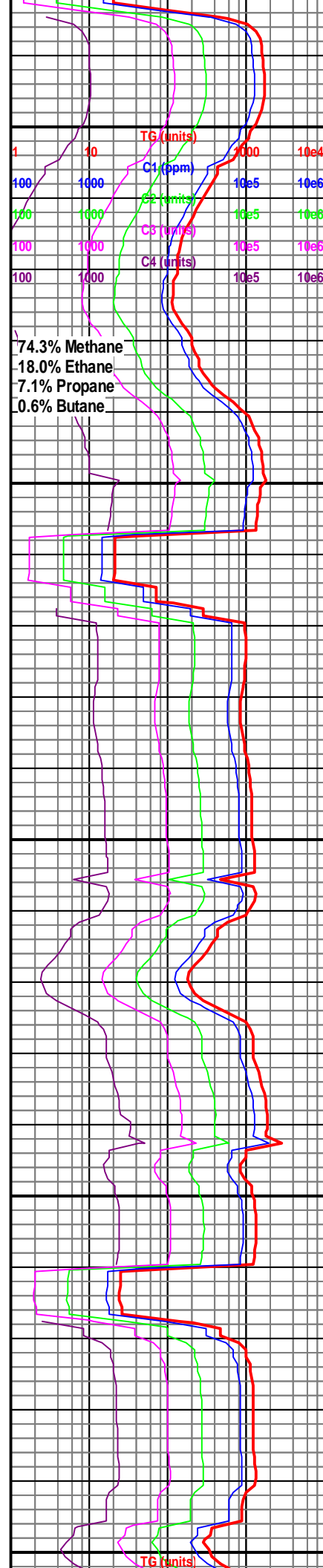


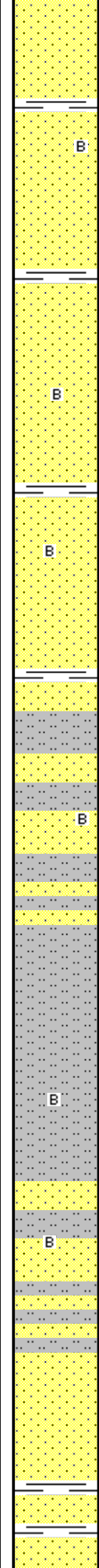
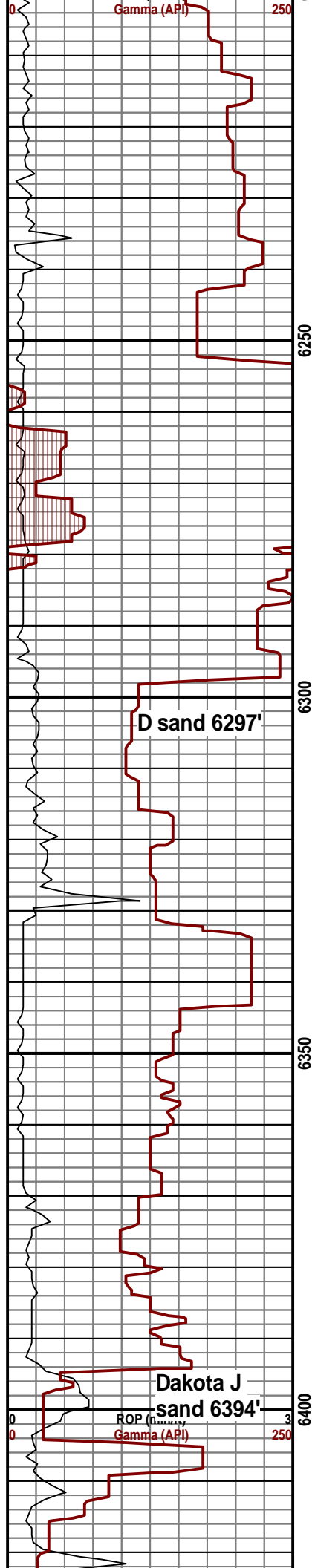
average in sp, 65% GRC, 10% mlt, nsfoc



6000-6100 Sltst dk gy, sb plty-plty, sft-mod frm, mod-v calc, mrlly ip, rthy tex, occ Sh dk gy-gy brn, sb plty-plty, mod frm, mod calc, tr bent lt gy, occ min flor, nsoc, 70% sltst, 30% sh

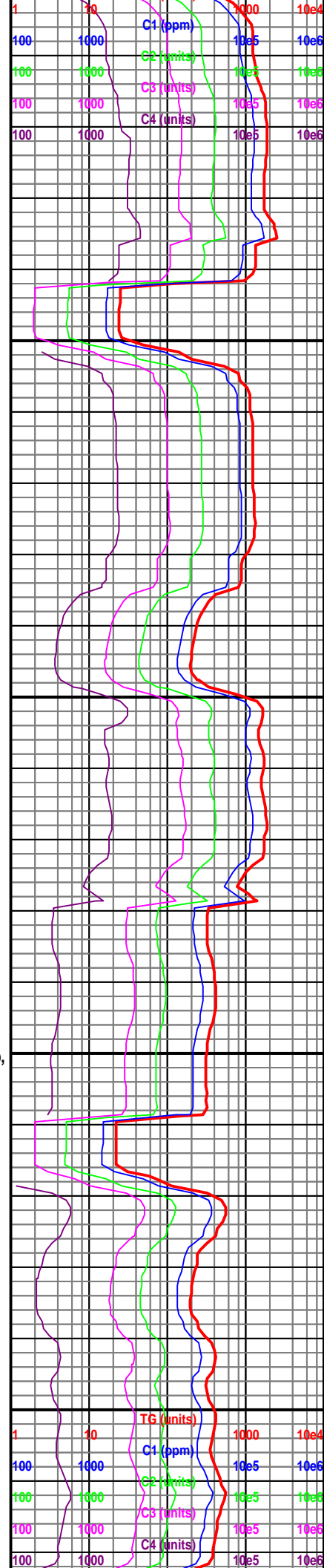
6100-6200 Sh dk gy, sb plty-sb blk, frm, slty ip, Bent lt grn-dk brn, sb blk, sft, mrlst dk gy, sb plty-sb blk, frm, orng-yel min flor, 80% sh, 10% bent, 10% sh

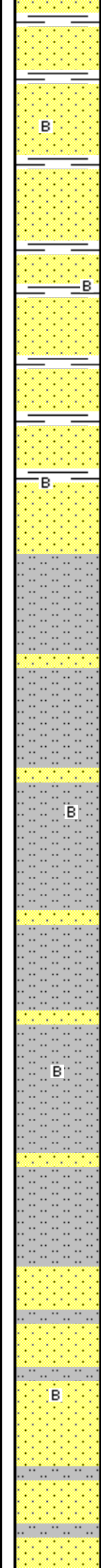




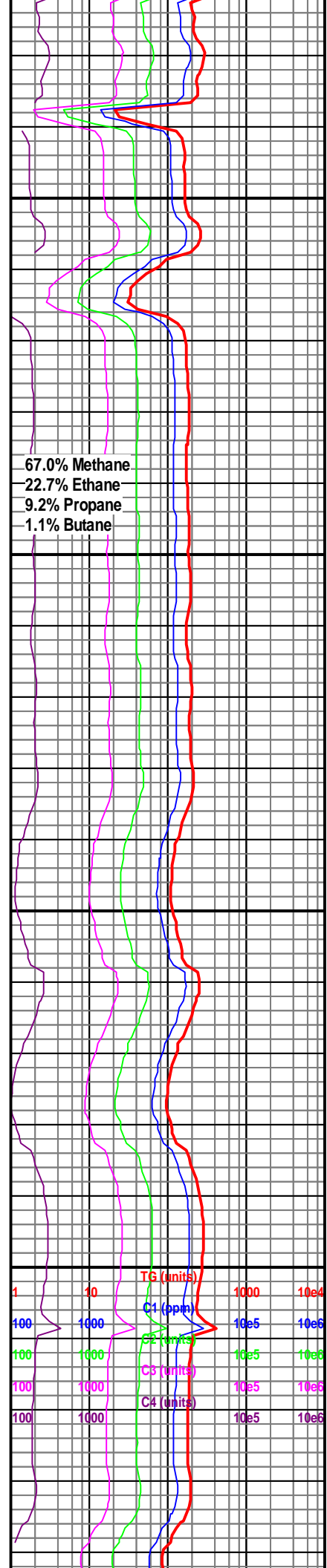
6200-6300 Ss wht-crm-lt gy, sb
blky-blky, frm, mott ip, sh med-dk gy,
frm, rr bent lt grn, frm, 90% ss, 10% sh

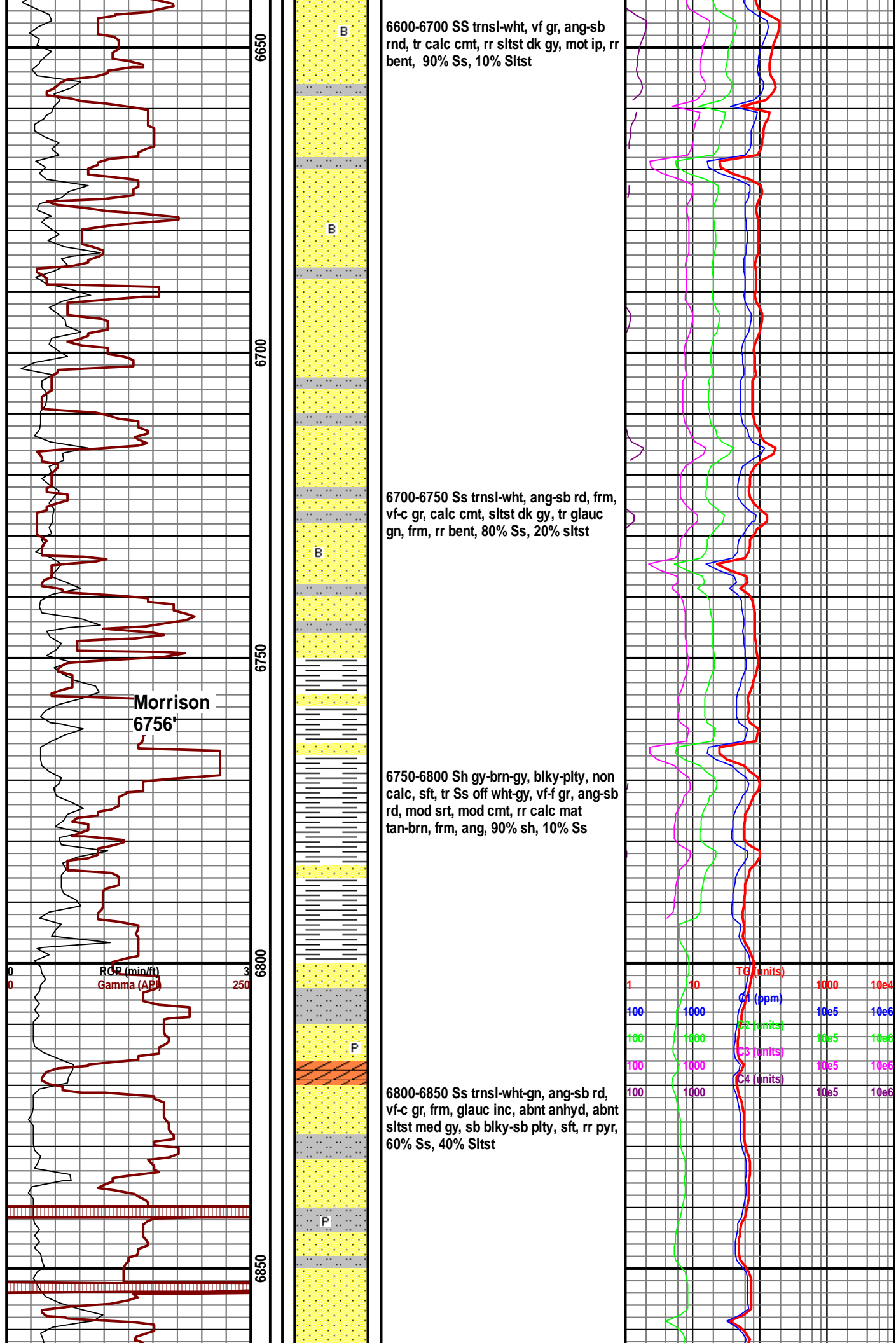
6300-6400 Sltst med-dk gy, sft, Ss
wht-crm-lt gy, sb blky-blky, frm, mott ip,
rr bent lt grn, frm, 80% sh, 20% ss

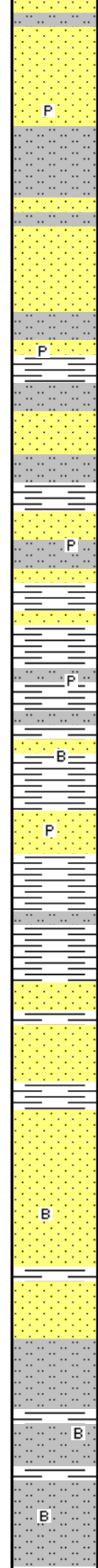
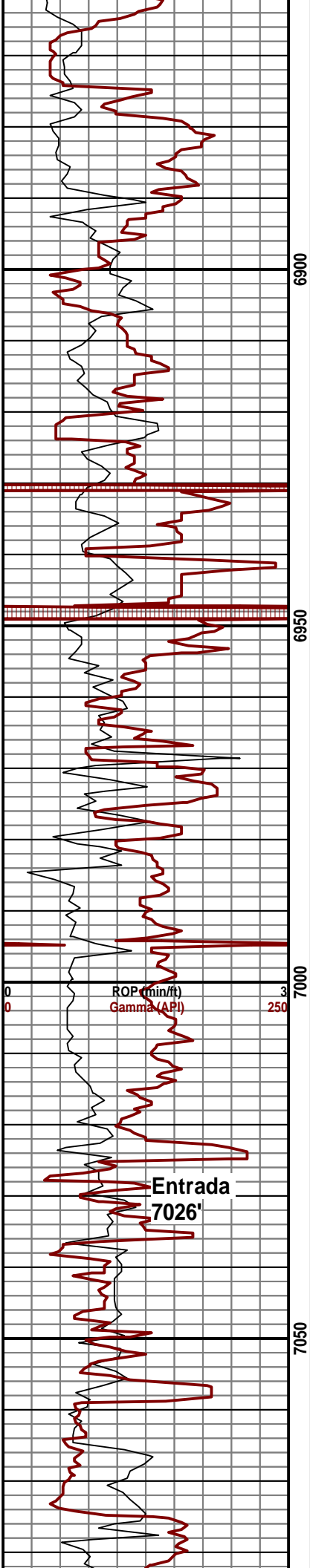




**6500-6600 Slttst med-dk gy, sft, sb
plty-sb blk, rr ss wit-crm, vf, hd, rr
bent, 90% slttst, 10% ss**







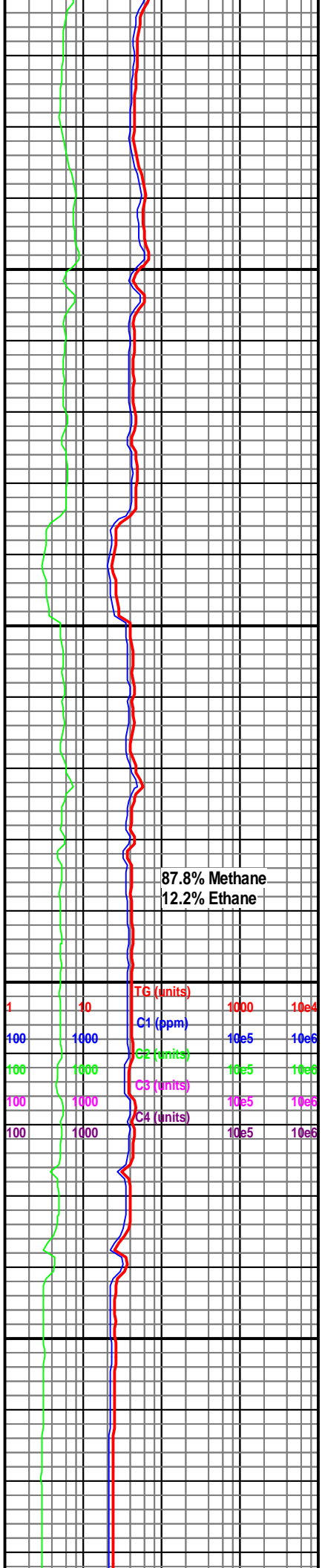
6850-6900 Ss trnsI-wht-gn, ang-sb rd, vf-c gr, frm, glauc inc, rr sltst med gy, sb blkY-sb plty, sft, rr pyr, 80% Ss, 20% Sltst

6900-6950 Sltst med-lt gy, sb blkY-plty, sft-frm, interbed with ss a/a & gy sh, tr anhyd, 50% sltst, 30% ss, 20% sh

6950-7000 Sh med-lt gy, sft-frm, plty-splty, v calc, grdg to arg ls ip, g tr sltst & ss a/a, 10% ss, 10% sltst

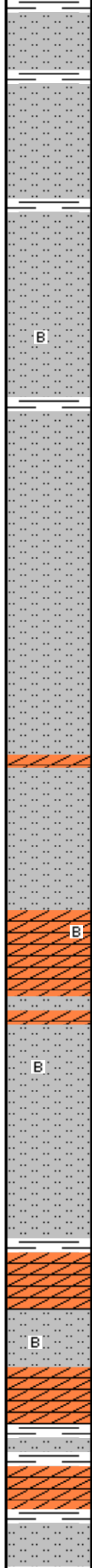
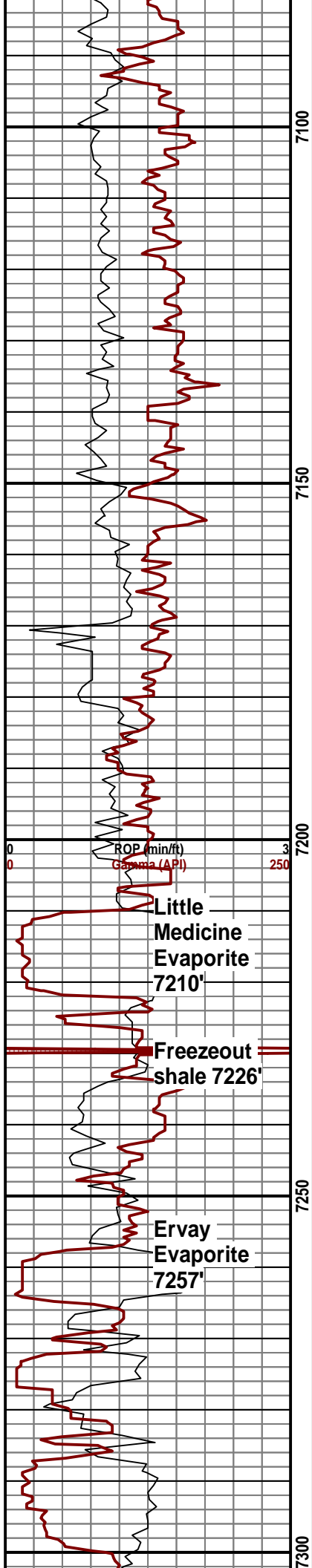
7000-7050 Ss wht-tan/gn, frm, ang-sb rd, vf-c gr, glauc inc, abnt calc cmt, rr sh lt-dk gy, plty-sb ang, mot ip, rr bent, rr pyr, 50% Ss, 50% Sh

7050-7100 Sltst orng-red-dk gy, sb blkY-blky, frm, sh dk gy, sft, plty-sb



87.8% Methane
12.2% Ethane

1	10	TG (units)	1000	10e4
100	1000	C1 (ppm)	10e5	10e6
100	1000	C2 (units)	10e5	10e6
100	1000	C3 (units)	10e5	10e6
100	1000	C4 (units)	10e5	10e6



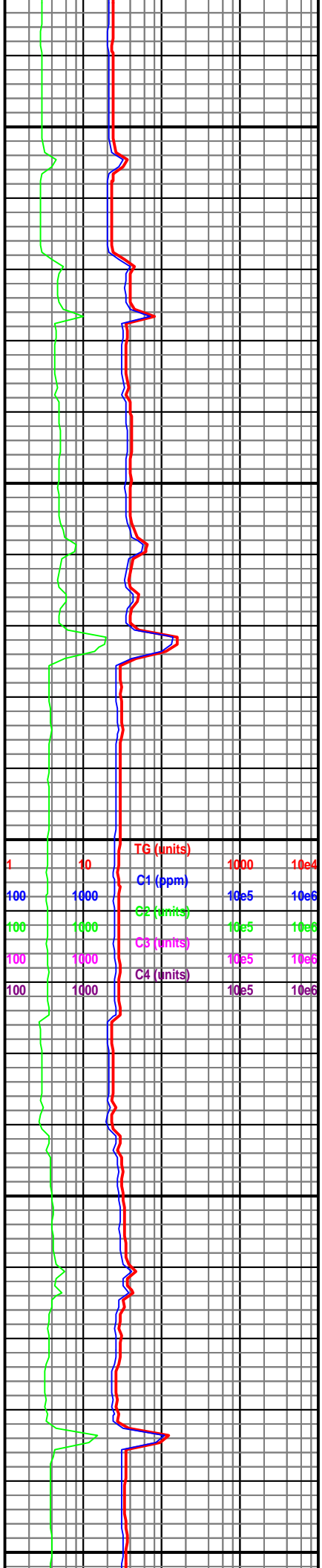
plty, rr bent, rr Ss wht, frm, sb ang-sb rd, 90% sltst, 10% sh

7100-7150 Sltst orng-red-dk gy, sb blky-blky, frm, sh dk gy, sft, plty-sb plty, rr bent, rr Ss wht, frm, sb ang-sb rd, 95% sltst, 5%sh

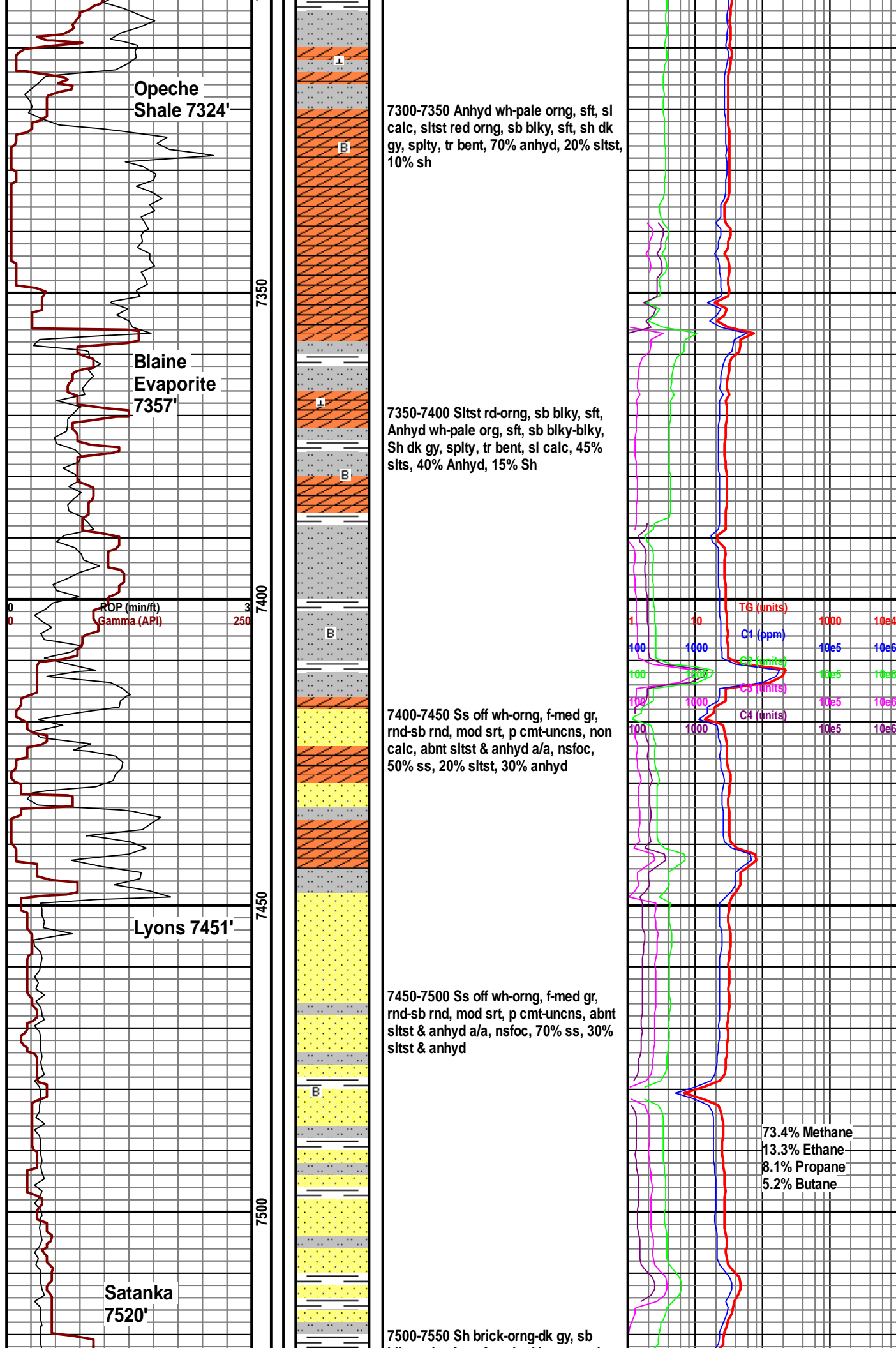
7150-7200 Sltst brick, sb blky-blky, frm-sft, non calc, tr dk gy blky hd sltst, tr anhyd wh-pnk, 95% sltst, 5% anhyd

7200-7250 Sltst brick, sb blky-blky, frm-v sft, gummy ip, non calc, g tr dk gy sltst a/a, abnt anhyd, tr bent, 90% sltst, 10% anhyd

7250-7300 Anhyd wh-pale orng, sft, sh dk gy, splty, frm, rr bent, 80% anhyd, 20% sh & sltst



1	10	TG (units)	1000	10e4
100	1000	C1 (ppm)	10e5	10e6
100	1000	C2 (units)	10e5	10e6
100	1000	C3 (units)	10e5	10e6
100	1000	C4 (units)	10e5	10e6



TOH for MWD failure at 17:00 on 8/9/2014, resume drilling at 04:30

Lower Lyons
7538'

7550

7600

ROP (min/ft)
Gamma (API)

Sumner
7638'

7650

7700

blky-spty, frm-sft, anhyd ip, non calc, ss trnsf-off wh, vf-f gr, rnd-sb rnd, w srt, uncns-p cmt, nsfoc tr tan bent, 70% sh, 20% ss, 210% sltst

7550-7600 Ss pale orng-off wh, vf gr-slty, grdg to sltst ip, abnt interbed brick sltst, sb rnd-sb ang, p cmt-mod cmt, non calc, tr bent, tr anhyd, 60% ss, 40% sltst

7600-7650 Sltst red-brick, sft, sb blky-plty, occ sh med-dk gy, sply-plty, frm, non calc, occ ss pale orng-red a/a, rr bent, 65% sltst, 15% sh, 20% ss

7650-7700 Sltst red-brick, sft, sb blky-plty, ss pale orng-red a/a, occ sh med-dk gy, sply-plty, frm, non calc, rr bent, 65% sltst, 15% ss, 20% sh

7700-7750 Anhyd wht, sb blky-amrphs, v sft, Sltst red-brick, sft, sb blky-plty, occ ss pale orng-red a/a, occ sh med-dk gy, sply-plty, frm, non calc, rr bent, 70%Anhyd, 15% sltst, 10% ss, 20% sh

TG (units)

C1 (ppm)

C2 (units)

C3 (units)

C4 (units)

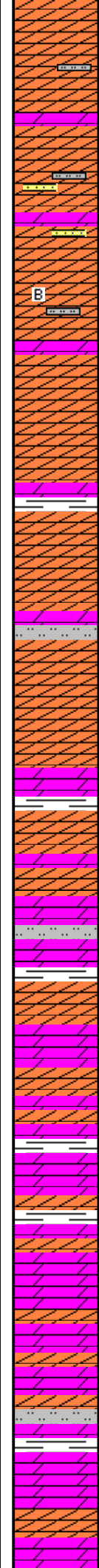
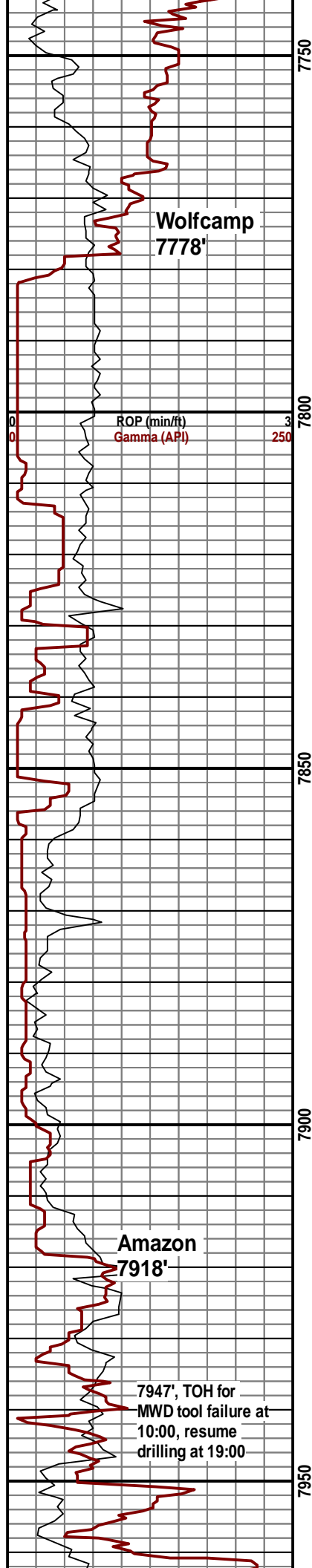
1000 10e4

10e5 10e6

10e5 10e6

10e5 10e6

10e5 10e6

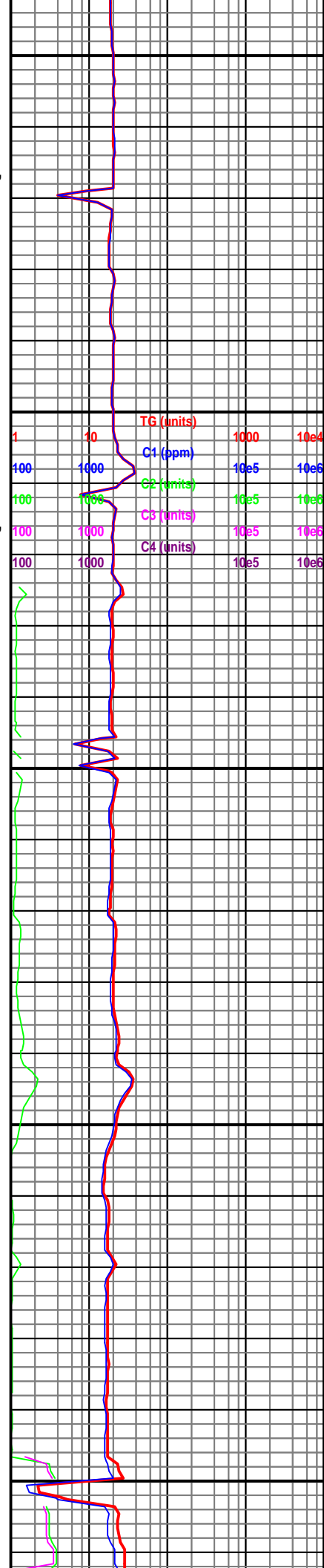


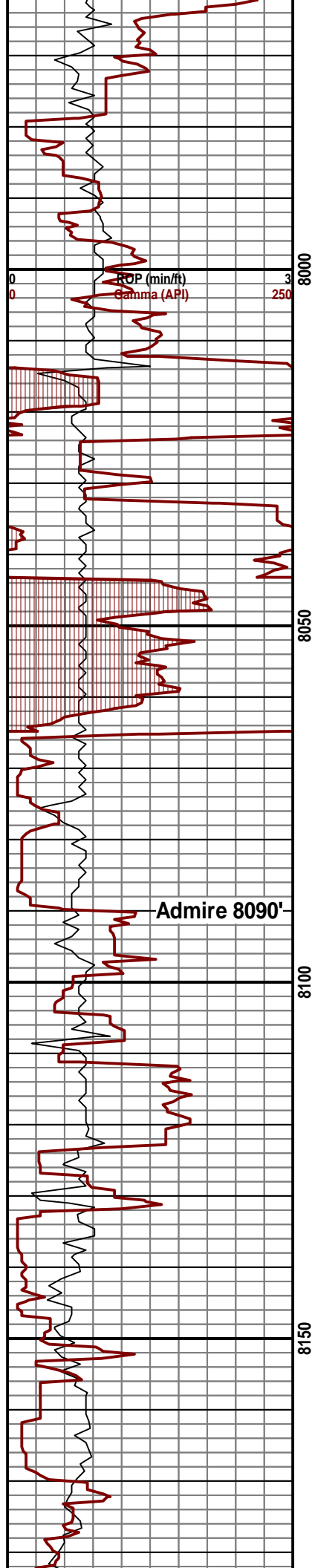
7750-7800 Anhyd wht, sb blkly-amrphs, v sft, occ dol off wht-tan, v frm, suc, tr Sltst red-brick, sft, sb blkly-plty, tr sh med-dk gy, splty-plty, frm, non calc, rr bent, 82% Anhyd, 10% dol, 5% sltst, 3% sh

7800-7850 Anhyd wht, sb blkly-amrphs, v sft, tr dol off wht-tan, v frm, suc, tr Sltst red-brick, sft, sb blkly-plty, tr sh med-dk gy, splty-plty, frm, non calc, 90% Anhyd, 6% dol, 2% sltst, 2% sh

7850-7900 Dol off wht-tan, v frm, suc, abnt anhyd wht, sb blkly-amrphs, v sft, occ sh med-dk gy, splty-plty, frm, tr Sltst red-brick, sft, sb blkly-plty, non calc, abnt bri yel flor, fnt yel cut, 50% dol, 35% anhyd, 10% sh, 5% sltst

7900-7950 Dol off wht-tan, v frm, suc, abnt anhyd wht, sb blkly-amrphs, v sft, occ sh med-dk gy, splty-plty, frm, tr Sltst red-brick, sft, sb blkly-plty, non calc, abnt bri yel flor, fnt yel cut, 50% dol, 35% anhyd, 10% sh, 5% sltst





7950-8000 Dol off wh-tan, hd frm, suc-mic suc, abnt anhyd, wh, sb blkly-amorph, v sft-sl frm, tr sltst & sh, tr bri yel flor, v fnt slo cut, 60% dol, 30% anhyd, 10% sltst

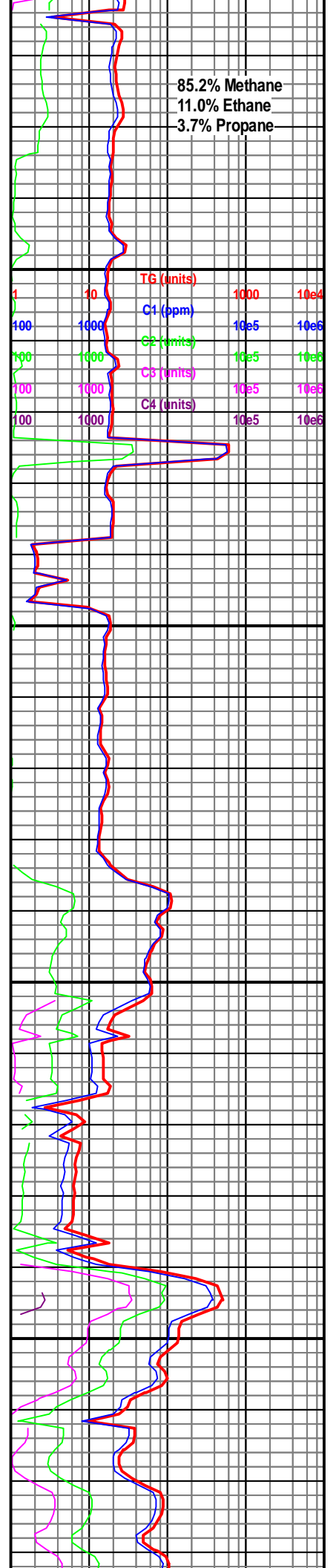
8000-8050 Anhyd wh, sb blkly, amorph, sft, non calc, tr dol a/a, tr sltst a/a

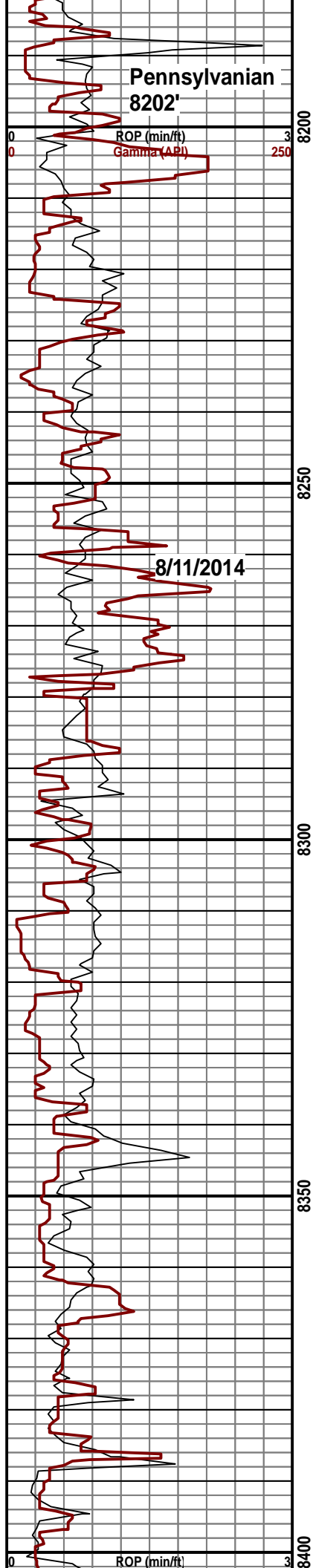
8050-8100 Dol brn-tan-off wh, sb blkly, suc ip, sdy ip, grdg to dol ss ip, dull yel flor, abnt anhyd a/a, 80% dol, 20% anhyd

8100-8150 Dol brn-tan-off wh, sb blkly, suc-f xln, dull yel flor, abnt anhyd wh, sft, non calc, 90% dol, 10% anhyd

8150-8200 Dol tan-brn-off wh, sb blkly-blky, frm-hd, suc-vf xln, anhyd, wh-pale orng, sft, sl-mod calc, g tr bri vel flor, nsoc, 45% dol, 40% anhyd

85.2% Methane
11.0% Ethane
3.7% Propane



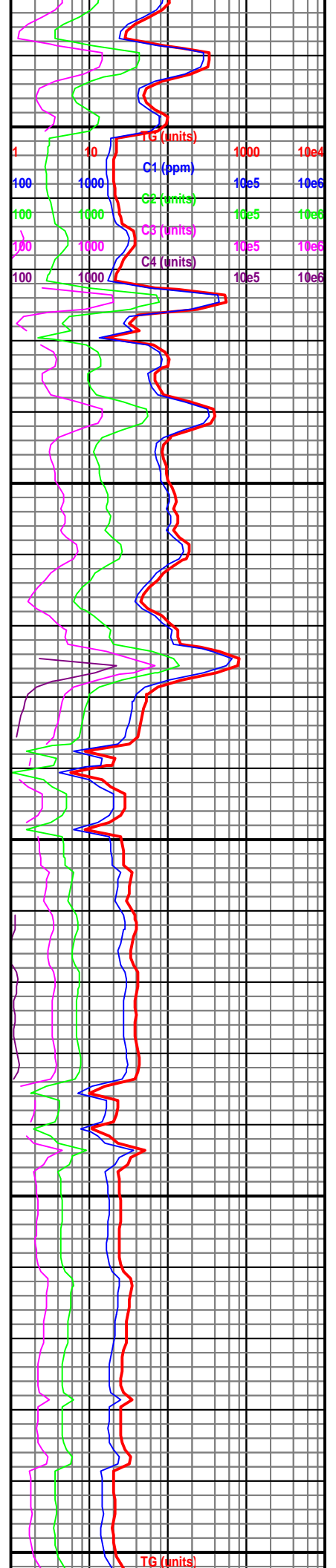


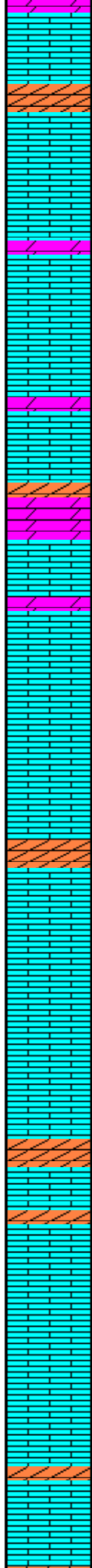
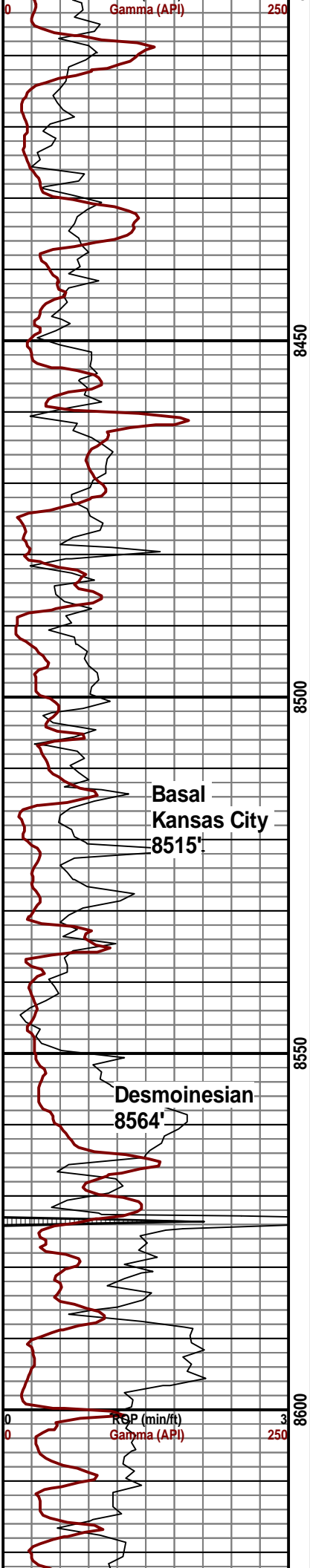
15% sltst

**8200-8250 Ls gy brn, blk-y-sb blk-y-pty,
frm-sl sft, vf xln-chky, cln, tr dol,
tan-brn, frm, suc-vf xln, tr anhyd, 90%
ls, 10% dol**

8250-8300 Ls brn-tan, blk, frm, abnt
anhyd, sb blk, sft, amorph, non calc,
occ dol, tan, frm, suc, 50% ls, 40%
anhyd, 10% dol

8300-8350 Ls brn-tan, blk, frm, abnt
anhyd, sb blk, sft, amorph, non calc,
occ dol, tan, frm, suc, rr yel flor, nsoc,
50% ls, 40% anhyd, 10% dol



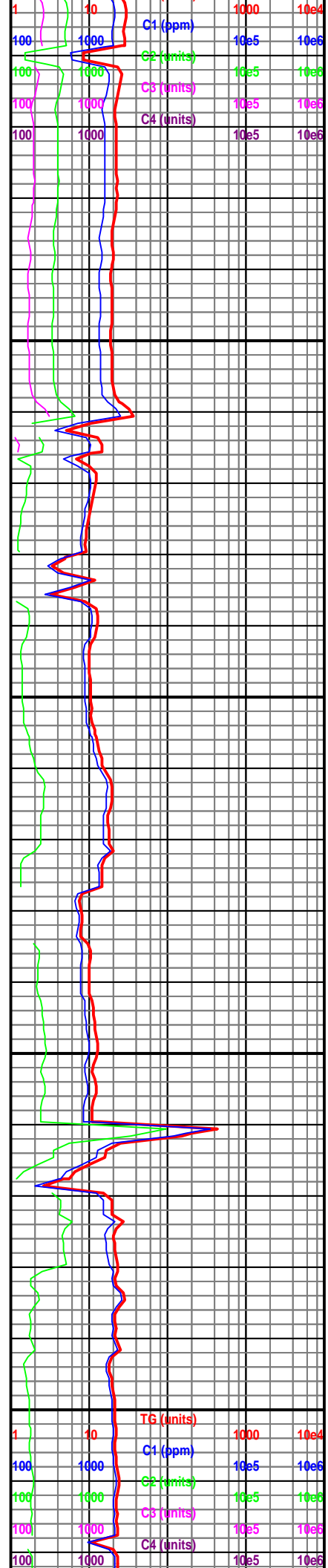


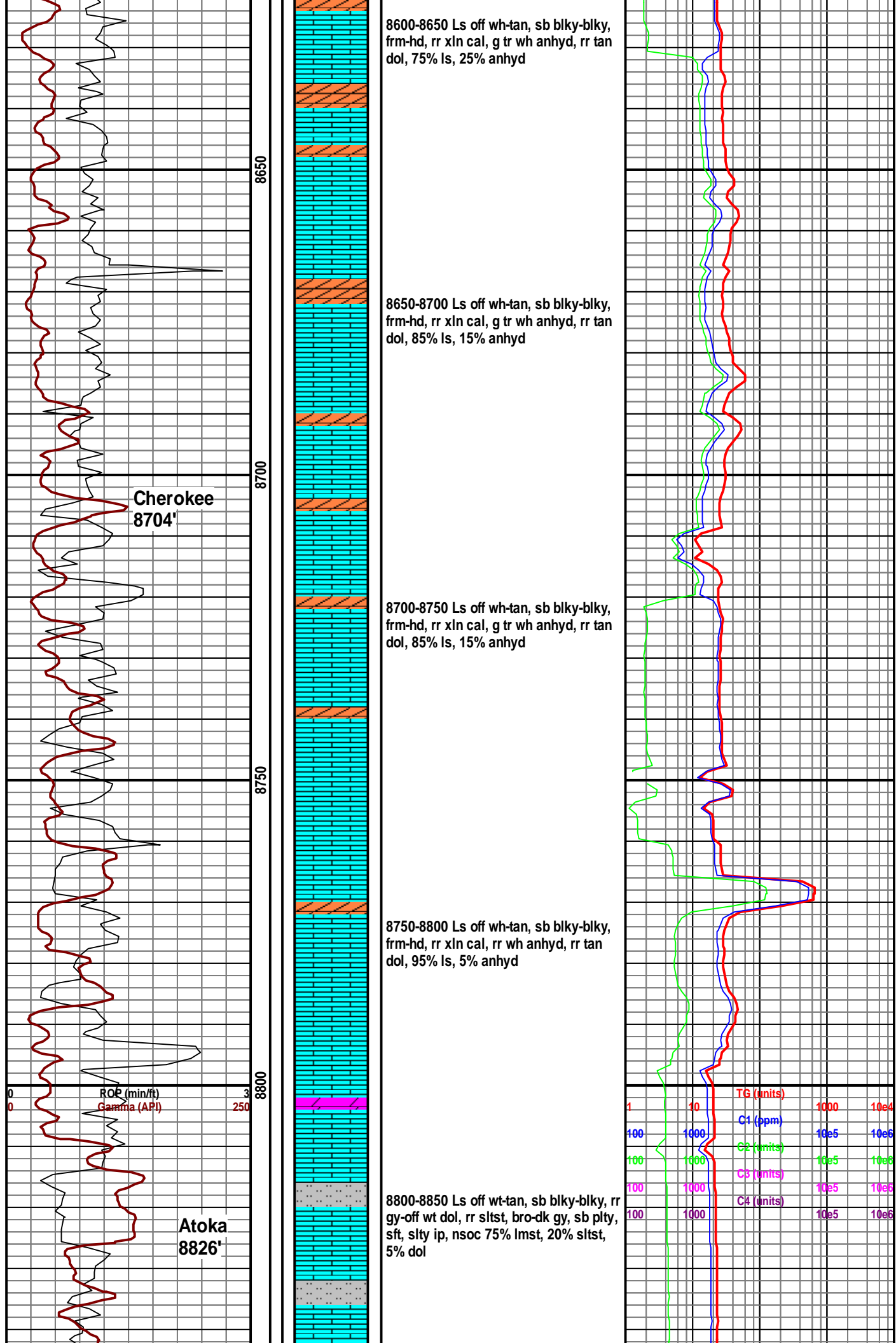
8400-8450 Ls off wh-tan, sb blkly-blky, frm-sl hd, g tr amorph anhyd, occ tan dol, tr yel flor, nsoc, 80% ls, 10% anhyd, 10% dol

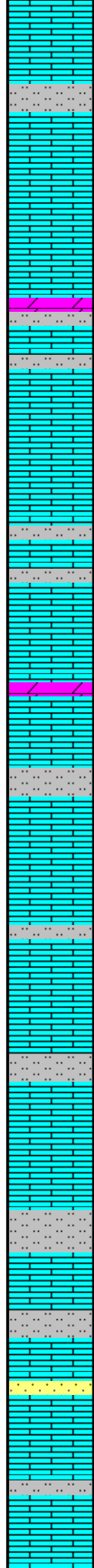
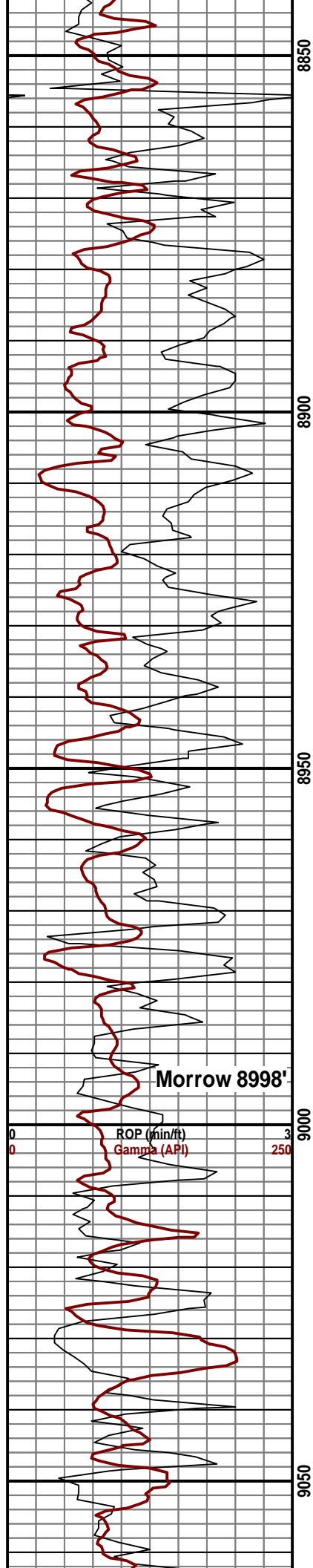
8450-8500 Ls off wh-tan, sb blkly-blky, frm-hd, rr xln cal, g tr wh anhyd, occ tan dol, 85% ls, 10% anhyd, 5% dol

8500-8550 Ls off wh-tan, sb blkly-blky, frm-hd, rr xln cal, g tr wh anhyd, rr tan dol, 90% ls, 10% anhyd

8550-8600 Ls off wh-tan, sb blkly-blky, frm-hd, rr xln cal, g tr wh anhyd, rr tan dol, 85% ls, 15% anhyd







8850-8900 Ls off wt-tan, sb blkly-blky, rr gy-off wt dol, rr sltst, bro-dk gy, sb plty, sft, slty ip, nsoc 75% lmst, 20% sltst, 5% dol

8900-8950 Ls off wh-tan, sb blkly-blky, hd, rr tan suc dol, rr fos frags, g tr gy-red sltst & slty sh, nsfoc 90% ls, 10% sltst

8950-9000 Ls off wh-tan-dk brn, occ mottled, vf xln, hd, blkly-plty, rr vuggy por, rr blk tarry oil, fst strmg cut, 90% ls, 10% sltst

9000-9050 Ls off wh-tan, vf xln, occ sl sd, g tr med gy sltst, occ grd to slty sh, rr c gr unconcs sd, nsfoc, 80% ls, 20% sltst

