



Scale: 5" / 100'
Measured Depth Log

Well Name Mahalo State AA09_75_1HNB

Location SWSE, Sec. 4, T6N, R63W, 6 PM

State Colorado County Weld

Country United States Rig Number Precision 829

API Number 05-123-39013 Field Wattenberg

Region DJ Basin Drilling Completed 1/30/2015

Spud Date 1/14/2015

Surface Coordinates 573FNL & 2348FEL

Bottom Hole Coordinates 301FNL & 2345FEL

Ground Elevation 4694' K.B. Elevation 4710'

Logged Interval 5986' To 11740' Total Depth 11740'

Formation Niobrara B Chalk

Type of Drilling Fluid FW LSND

Operator

Company Noble Energy Inc

Address 1625 BROADWAY
DENVER, CO 80202

Geologist

Name Holly Duncan

Company Noble Energy, Inc.

Address 1625 BROADWAY
DENVER, CO 80202

Other

Columbine Logging, Inc. 602 S. Lipan St.
Denver CO, 80223

Wellsite Geologist David Hensley
Flora Sperberg

Zone Color Coding

Oil
Note
Error

Condensate
Core
Water

Gas
Pres
Sea

Rock Types

UNKNOWN	COAL	MARLSTONE	SHALY SANDSTONE
ANHYDRITE	CONGLOMERATE	METAMORPHIC	SHALY SILTSTONE
BENTONITE	DOLOMITE	NO SAMPLE	SILTY SHALE
BRECCIA	DOLOMITIC LIMESTONE	SALT	SILTSTONE
CHALK	GRANITE	SANDSTONE	TILL
CEMENT	GYPSUM	SALT-PEPPER SANC	TUFF
CHERT	IGNEOUS	SHALE	WELDED TUFF
CLAY CHOKE SANC	SIDERITE or LIMONITE	SHALE COLORED	
CLAYSTONE	LIMESTONE	SHALE GRAY	

Accessories

GASTROPOD	ARGILLITE GRAIN	HEAVY MINERAL	ANHYDRITE STRINGER
INOCERAMUS	B BENTONITE	K KAOLIN	BENTONITE STRINGER
ALGAE	BITUMENOUS SUBSTANCE	M MARLSTONE	COAL STRINGER
AMPHIPORA	BRECCIA FRAGMENTS	M MICACEOUS	DOLOMITE STRINGER
BELENINITE	C CALCAREOUS	M MINERAL CRYSTALS	GYPSUM STRINGER
BIOCLASTIC	P PELLET	N NODULES	LIMESTONE STRINGER
BRACHIOPOD	P PISOLITE	P PHOSPHATE PELLETS	MARLSTONE (CALC) STRIG
BRYOZOA	P PLANT REMAINS	P PYRITE	MARLSTONE (DOL) STRIG
CEPHALOPOD	P PLANT SPORES	S SALT CAST	SANDSTONE STRINGER
CORAL	D DOLOMITIC	S SANDY	SHALE STRINGER
CRINOID	S STROMATOPOROID	S SILICEOUS	SILTSTONE STRINGER
ECHINOID	F FERRUGINOUS PELLET	S SILTY	
FISH	F FERRUGINOUS	T TUFFACEOUS	
FORAMINIFERA	A ANHYDRITIC	G GLAUCONITE	
F FOSSIL	A ARGILLACEOUS	G GYPSIFEROUS	

Stringer

Oil Show

- P PINPOINT
V VUGGY






































Engineering

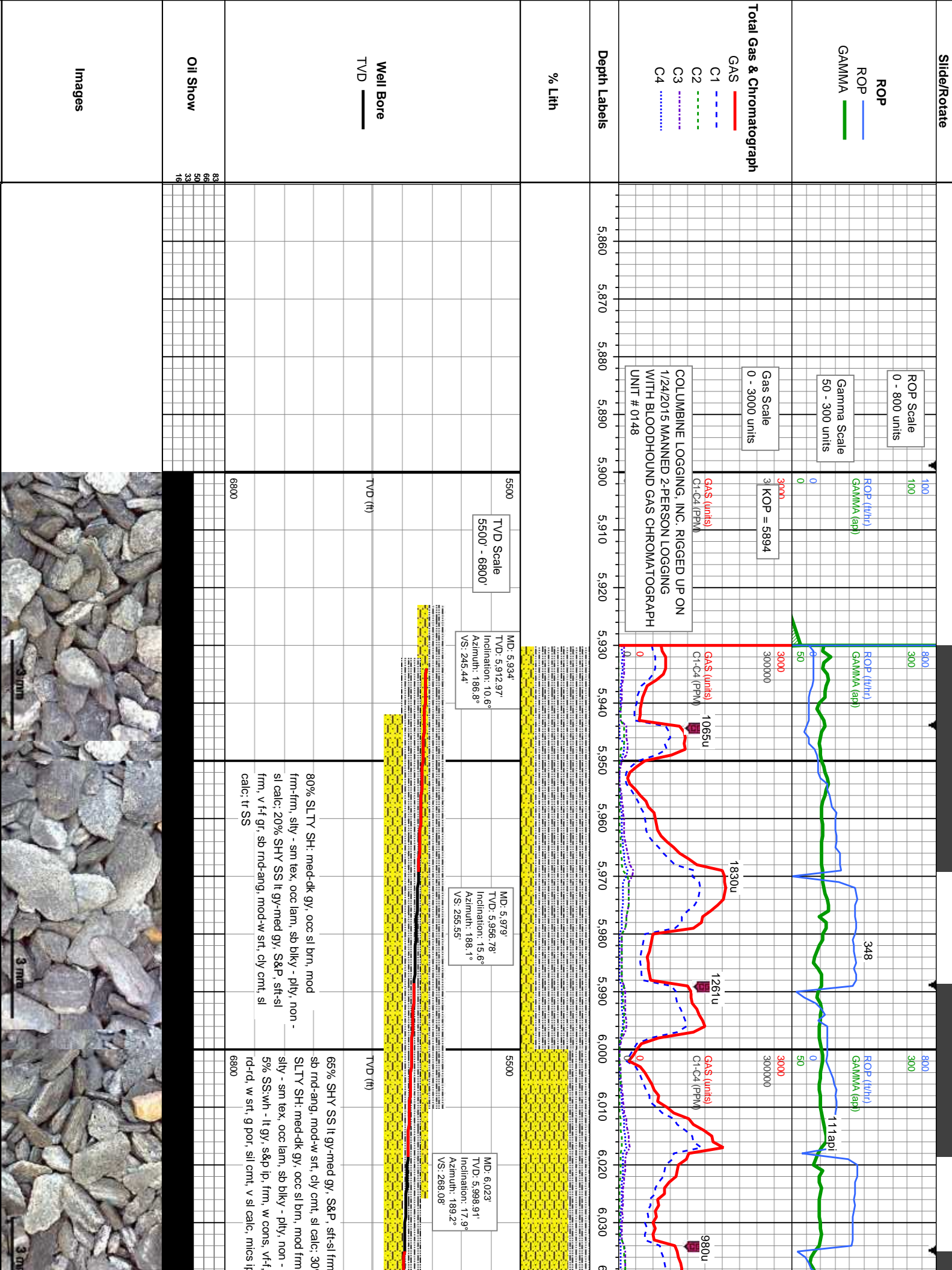
- D DEAD
EVEN
QUESTIONABLE
BIT
SPOTTED STAINING
CONNECTION (UP)

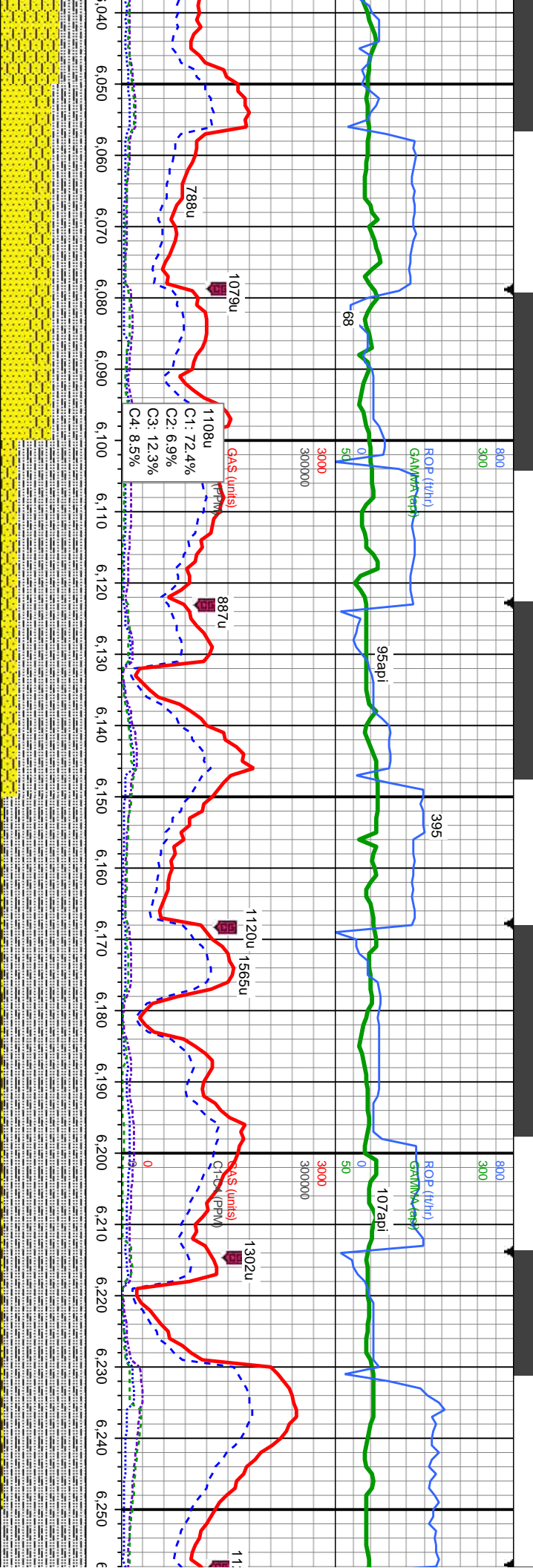
Porosity

- CONNECTION (DOWN)
CONNECTION GAS
CONNECTION GAS
TRIP GAS
TRIP GAS (LEFT)
INTERCRYSTALLINE
DOWN TIME GAS
INTEROOULTIC
DOWN TIME GAS
MOLDIC
CORE - LOST
CORE - RECOVERED

Other Symbols

	DST INTERVAL		WIRELINE TESTED - LEFT		E EARTHY
	FAULT		WIRELINE TESTED - RT		FX FINELYXLN
	FORMATION TOP		DRILL STEM TEST		BS GRAINSTONE
	GAS SHOW		MN DEPTH		L LITHOGRAPHIC
	OIL SHOW				MX MICROXLN
	MN DEPTH UP	Rounding			
					MX MUDSTONE
	MN DEPTH (DOWN)		A ANGULAR		PS PACKSTONE
	NORMAL FAULT		R ROUNDED		WS WACKESTONE
	OVERTURNED STRATA		B SUBANG		
	REVERSE FAULT		P SUBRND	Sorting	
	CASING				M MODERATE
Textures					
	SIDEWALL CORE (LEFT)				P POOR
	SIDEWALL CORE (RIGHT)		BS BOUNDSTONE		W WELL
	SLIDE		C CHALKY		
	SURVEY		CX CRYPTOXLN		





MD: 6.068'
TVD: 6.041.48'
Inclination: 20°
Azimuth: 182.6°
VS: 282.6

MD: 6.113'
TVD: 6.083.49'
Inclination: 22°
Azimuth: 182.3°
VS: 288.71'

MD: 6.158'
TVD: 6.124.83'
Inclination: 24.5°
Azimuth: 183.9°
VS: 316.44'

MD: 6.203'
TVD: 6.165.41'
Inclination: 26.7°
Azimuth: 185.7°
VS: 335.81'

MD: 6.247'
TVD: 6.204.42'
Inclination: 28.4°
Azimuth: 184.6°
VS: 356.08'

60% SLTY SH: med-dk gy - bnshgy, mod frm-frm, silty - sm tex, occ lam, sb blkly - pily, non - sl calc; 30% SHY SS lt gy-med gy, S&P, sft-sil frm, v f-f gr, sb rnd-ang, mod-w srt, cly cnt, sl calc; 30% SS, wh - lt gy, s&lp ip, frm, w cons, v f-f, sb rd-rd, w srt, g por, sil cnt, v sl calc, mics ip

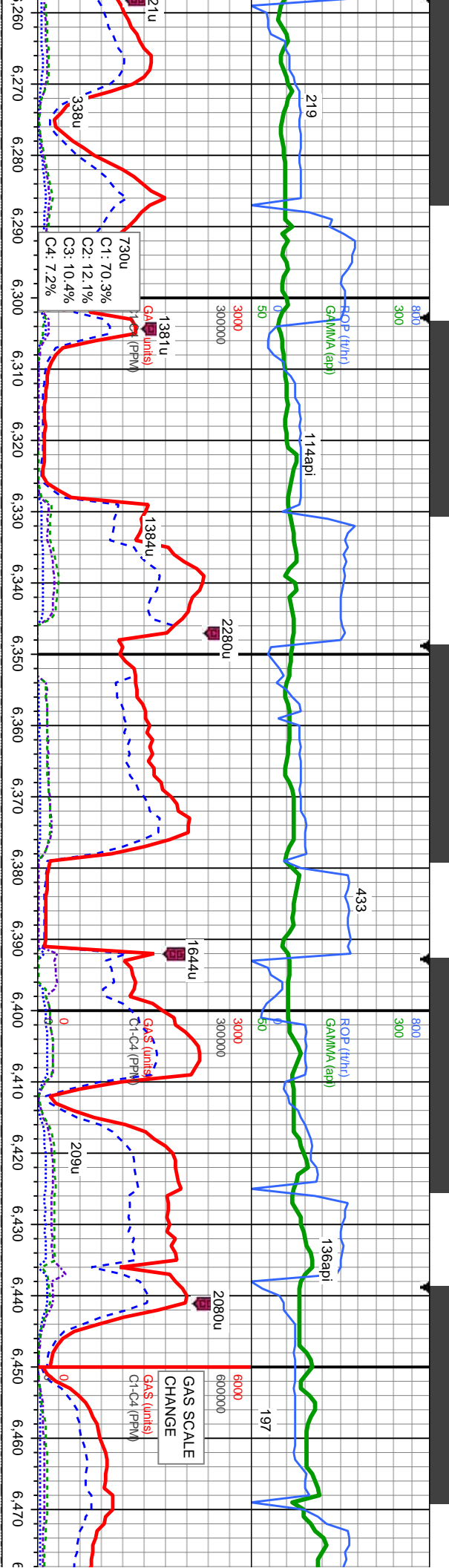
80% SLTY SH: med-dk gy - bnshgy, mod frm-frm, silty - sm tex, occ lam, sb blkly - pily, non - sl calc; 20% SHY SS lt gy-med gy, S&P, sft-sil frm, v f-f gr, sb rnd-ang, mod-w srt, cly cnt, sl calc;

95% SLTY SH: med-dk gy - bnshgy, mod frm-frm, silty - sm tex, occ lam, sb blkly - pily, non - sl calc; 5% SHY SS lt gy-med gy, S&P, sft-sil frm, v f-f gr, sb md-ang, mod-w srt, cly cnt, sl calc;

95% SLTY SH: med-dk gy - bnshgy, mod frm-frm, silty - sm tex, occ lam, sb blkly - pily, non - sl calc; 5% SHY SS lt gy-med gy, S&P, sft-sil frm, v f-f gr, sb rnd-ang, mod-w srt, cly cnt, sl calc;

100% SLTY SH: med-dk gy - bnshgy, mod frm-frm, silty - sm tex, occ lam, sb blkly - pily, non - sl calc;





MD: 6.292'
TVD: 6,243.41'
Inclination: 31.5°
Azimuth: 183.2°
VS: 378.49'

TVD (ft)

MD: 6.337'
TVD: 6,280.92'
Inclination: 35.5°
Azimuth: 183.1°
VS: 403.28'

MD: 6.382'
TVD: 6,317.03'
Inclination: 37.8°
Azimuth: 185.3°
VS: 430.06'

TVD (ft)

MD: 6.427'
TVD: 6,351.7'
Inclination: 41.4°
Azimuth: 182.4°
VS: 458.67'

SLTY SH: med-dk gy - bnshgy, mod frm-frm,
n tex, occ lam, sb blkly - plty, non - sl calc;
/ SS

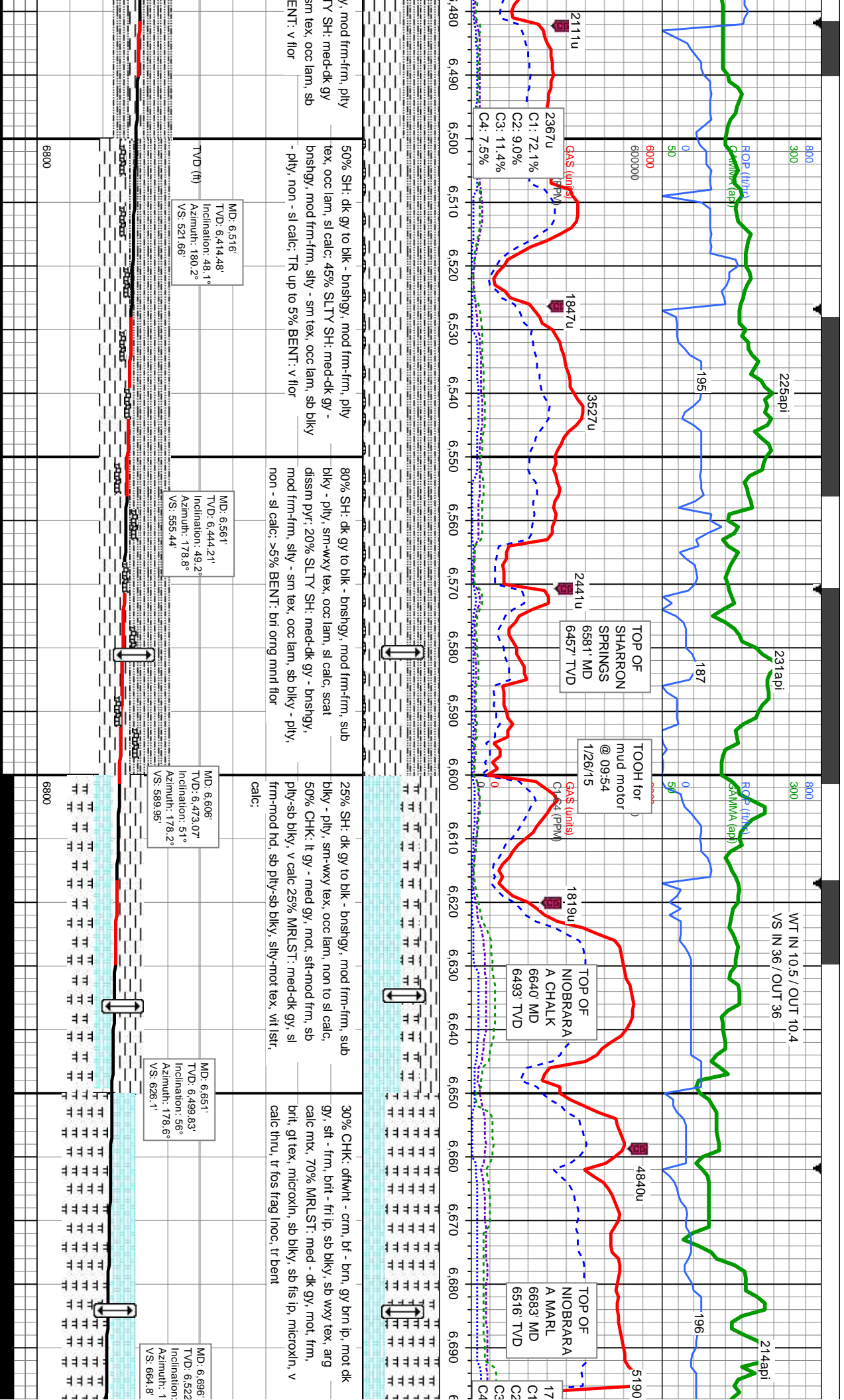
100% SLTY SH: med gy-dk gy, occ sl tan, sft-sl
frm, sb plty-sb blkly, silty tex, sl sdy ip

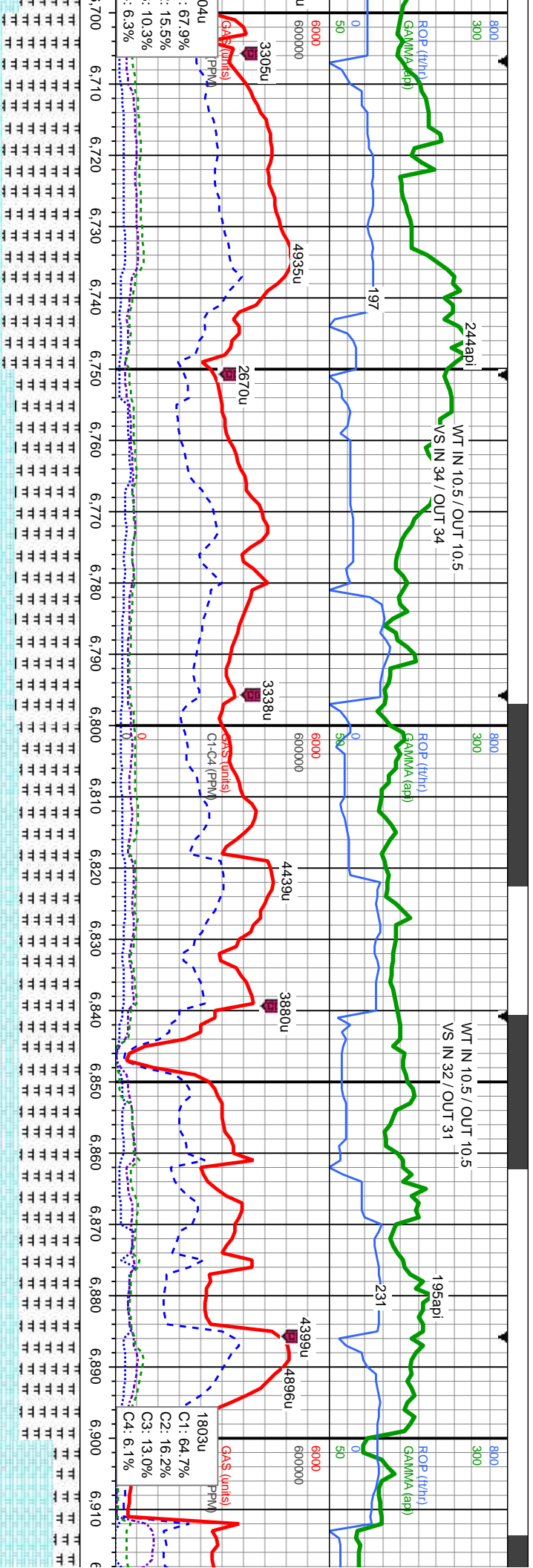
100% SLTY SH: med gy-dk gy, occ sl tan, sft-sl
frm, sb plty-sb blkly, silty tex, sl sdy ip

100% SLTY SH: med gy-dk gy, occ sl tan, sft-sl frm,
sb plty-sb blkly, silty tex, sl sdy ip

50% SH: dk gy to blk - bnshg
tex, occ lam, sl calc; 50% SL
- bnshgy, mod frm-frm, silty -
blkly - plty, non - sl calc; TR B







10% CHK: ofwht - crm, bf - brn, gy brn ip, mot dk gy, sft - frm, brit - fri ip, sb blk, sb wxy tex, arg calc mx, 90% MRLST: med - dk gy, mot, frm, brit, gt tex, microxn, sb blk, sb fis ip, microxn, v calc thru, tr fos frag inoc

25% CHK: ofwht - crm, bf - brn, gy brn ip, mot dk gy, sft - frm, brit - fri ip, sb blk, sb wxy tex, arg calc mx, 75% MRLST: med - dk gy, mot, frm, brit, gt tex, microxn, sb blk, sb fis ip, microxn, v calc thru

5% CHK: ofwht - crm, bf - brn, gy brn ip, mot dk gy, sft - frm, brit - fri ip, sb blk, sb wxy tex, arg calc mx, 70% MRLST: med - dk gy, mot, frm, brit, gt tex, microxn, sb blk, sb fis ip, microxn, v calc thru

70% CHK: lt gy - med gy, mot, sft-mod frm, sb ply-sb blk, v calc 30% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, silty-mot tex, vit istr, calc:

70% CHK: ofwht - hd, r sft, brit, sb blk mx, v calc, 30% M hd, sb ply-sb blk,

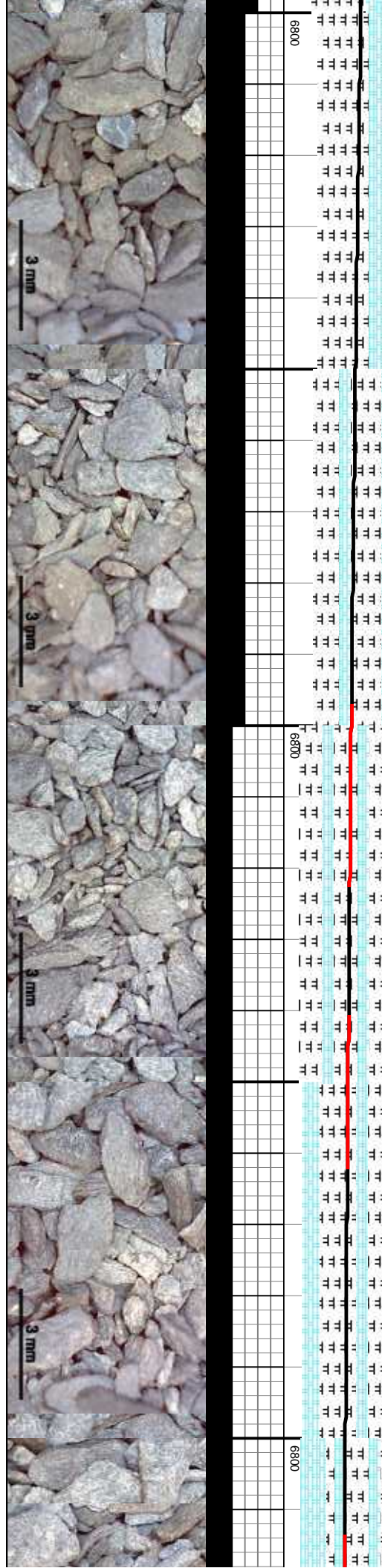
D (ft) MD: 6,741' TVD: 6,540.95' Inclination: 69.4° Azimuth: 181.5° VS: 705.92

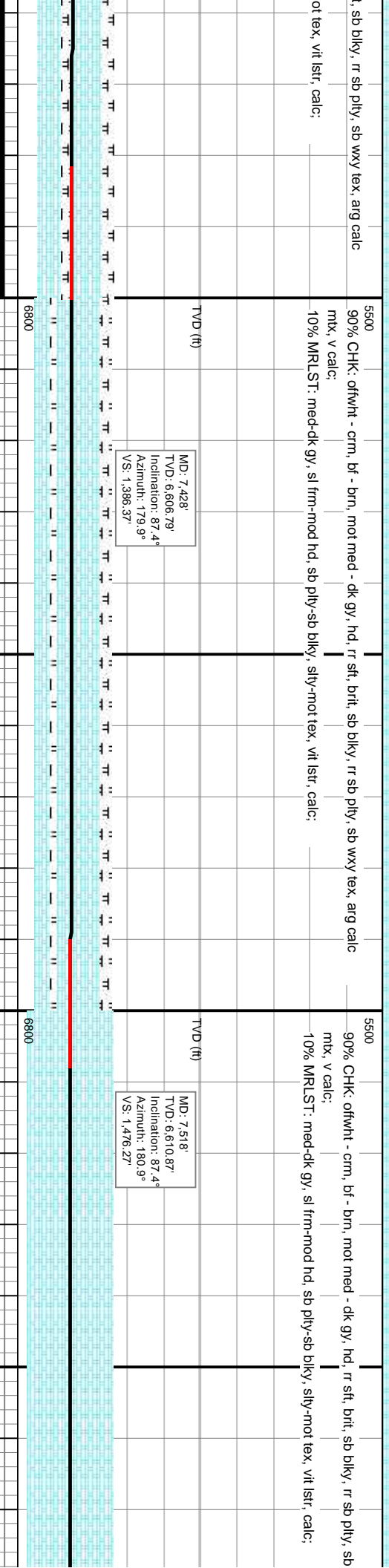
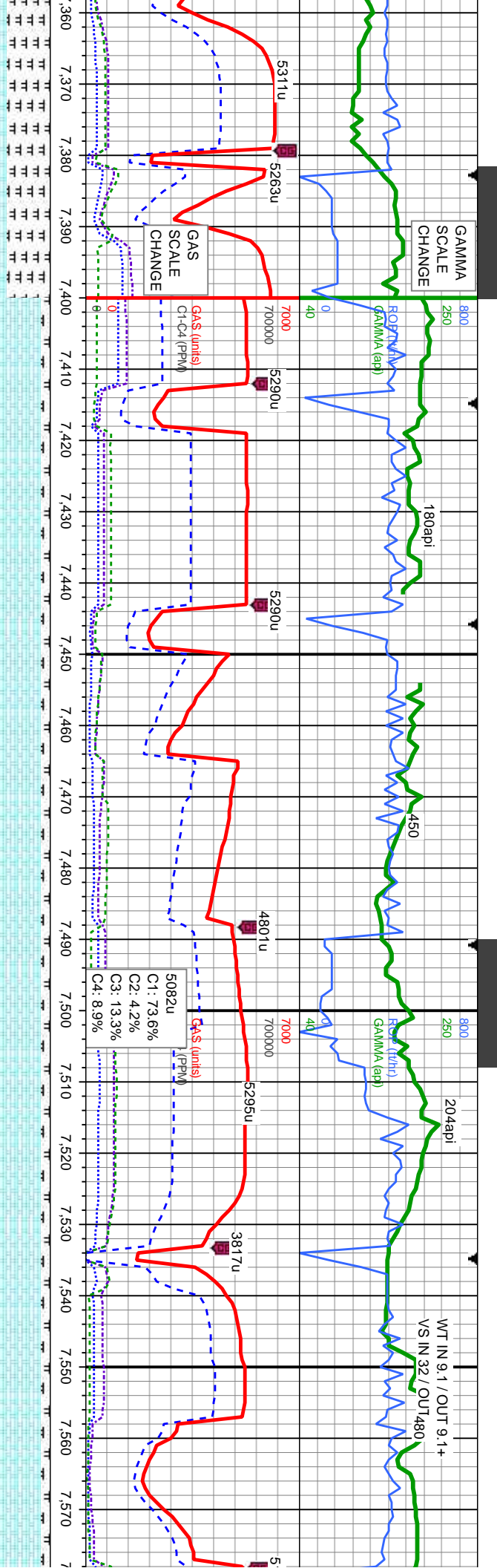
MD: 6,785' TVD: 6,554.83' Inclination: 73.8° Azimuth: 181.7° VS: 747.64

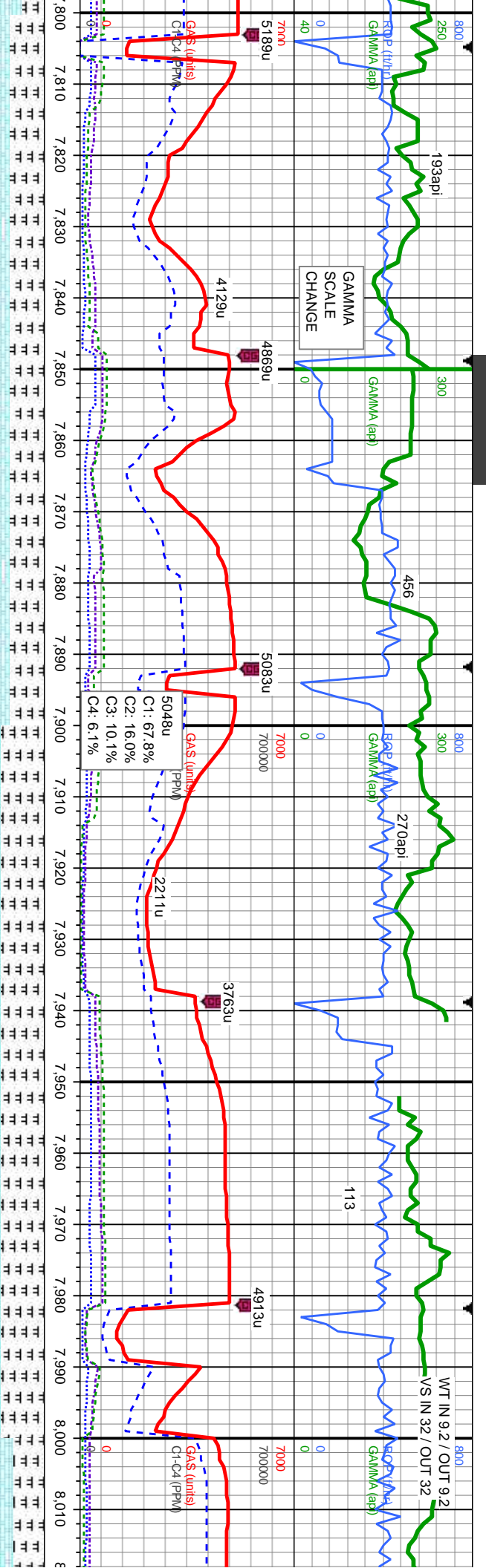
TVD (ft) MD: 6,830' TVD: 6,586.02' Inclination: 77.4° Azimuth: 180.8° VS: 791.21

MD: 6,875' TVD: 6,575.11' Inclination: 79.3° Azimuth: 179.2° VS: 835.28

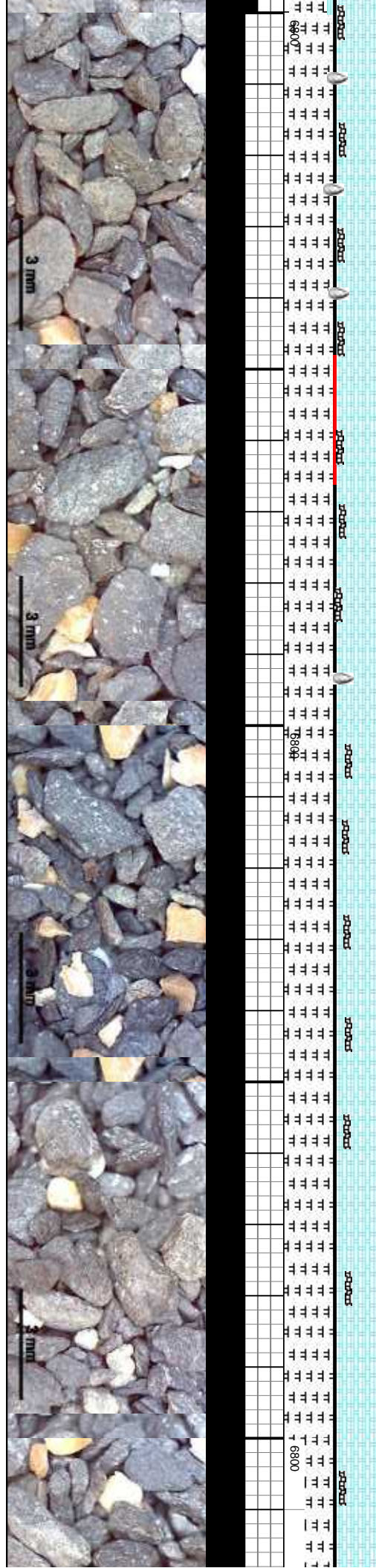
MD: 6,904' TVD: 6,580.37' Inclination: 79.8° Azimuth: 178.9° VS: 863.79

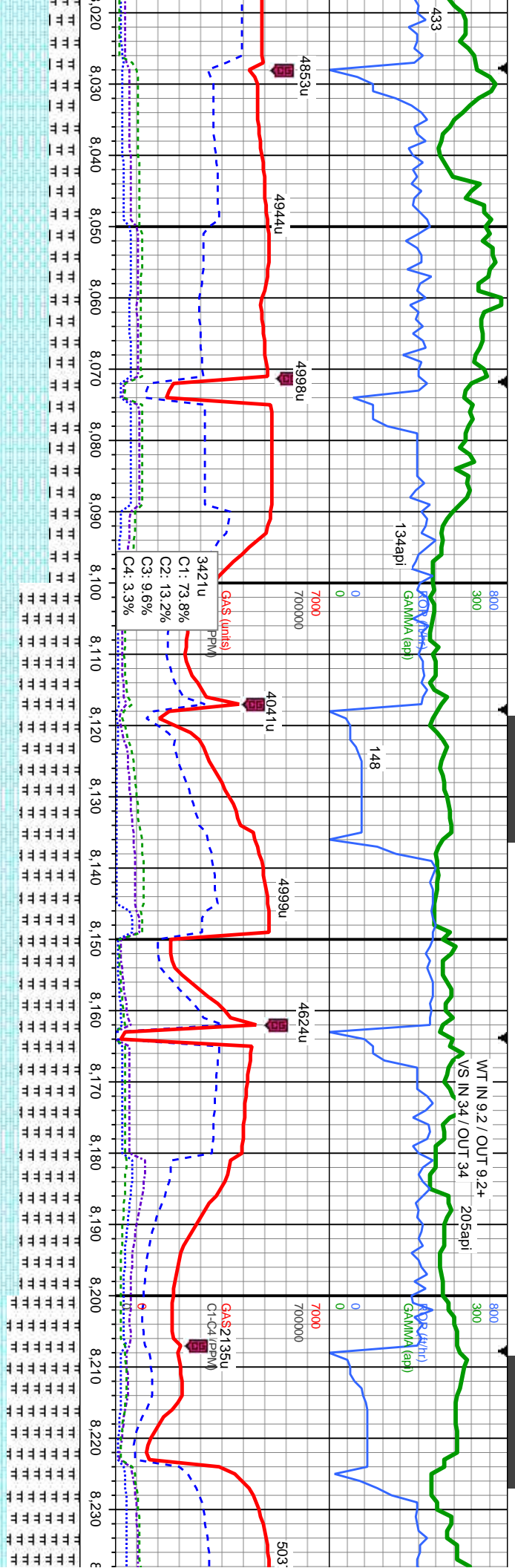




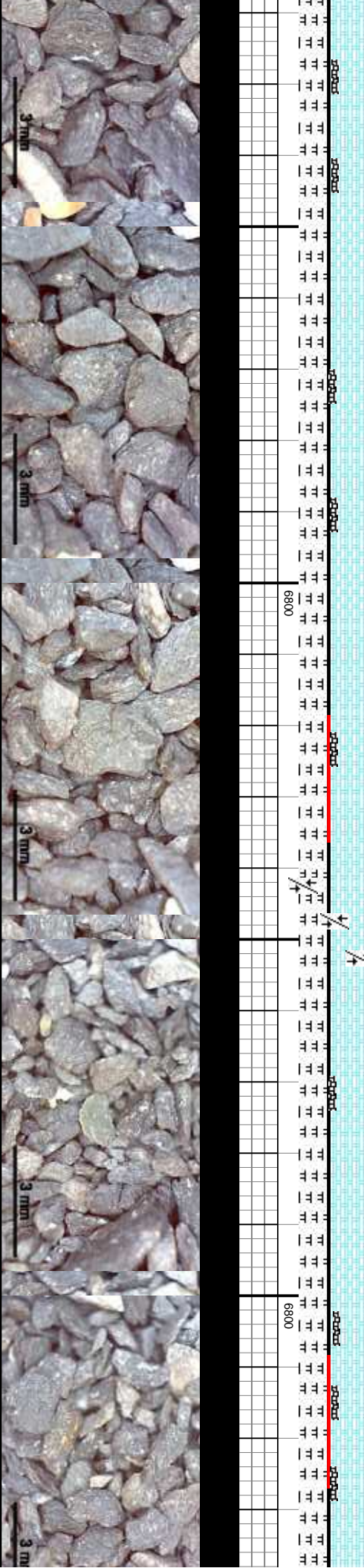


5500	55%	CHK: dk gy - lt brn, bf - brn, mot med - dk gy, hd, rr sft, brlt, sb blkly, rr sb ply, sb wxy tex, arg calc mtx, v calc;	5500	45%	CHK: dk gy - lt brn, bf - brn, mot med - dk gy, hd, rr sft, brlt, sb blkly, rr sb ply, sb wxy tex, arg calc mtx, v calc, abnt inoc;	5500	60%	CHK: dk g
	40%	MR.LST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, silty-mot tex, vit lsfr, calc; TR to 5% Bent		50%	MR.LST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, silty-mot tex, vit lsfr, calc; TR to 5% Bent		35%	MR.LST: n
TVD (ft)			TVD (ft)			TVD (ft)		
		MD: 7.877 TVD: 6.618.01' Inclination: 90.7° Azimuth: 183° VS: 1.834.91'			MD: 7.967 TVD: 6.617.14' Inclination: 90.4° Azimuth: 181.9° VS: 1.924.82'			

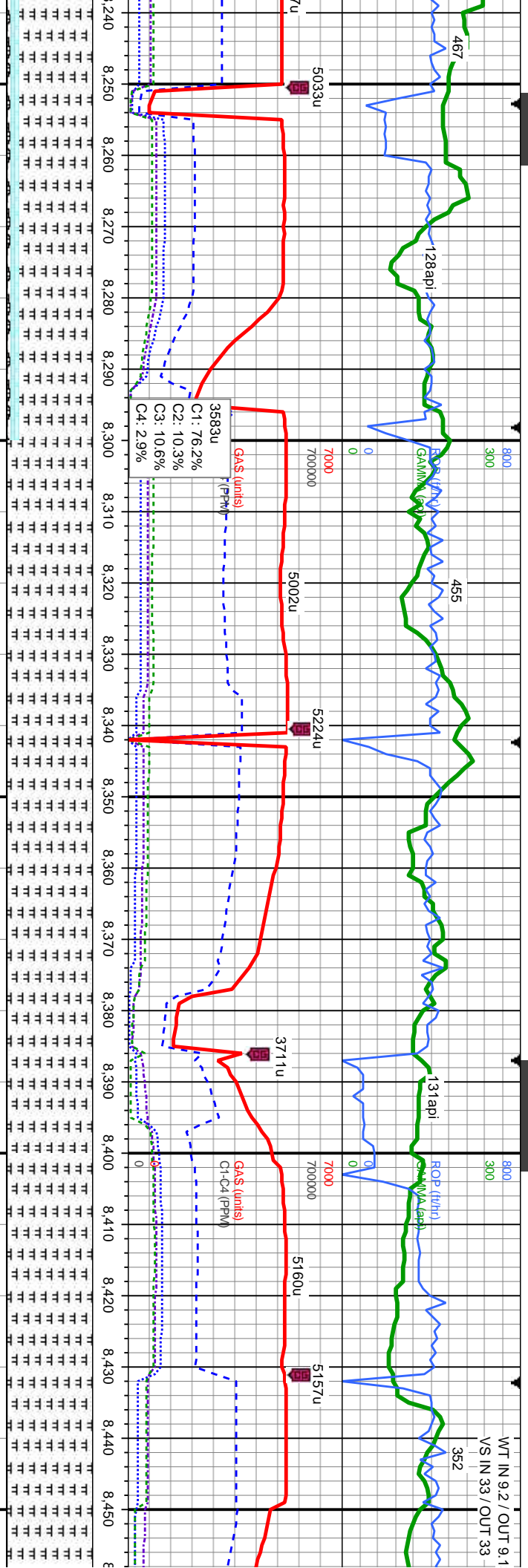


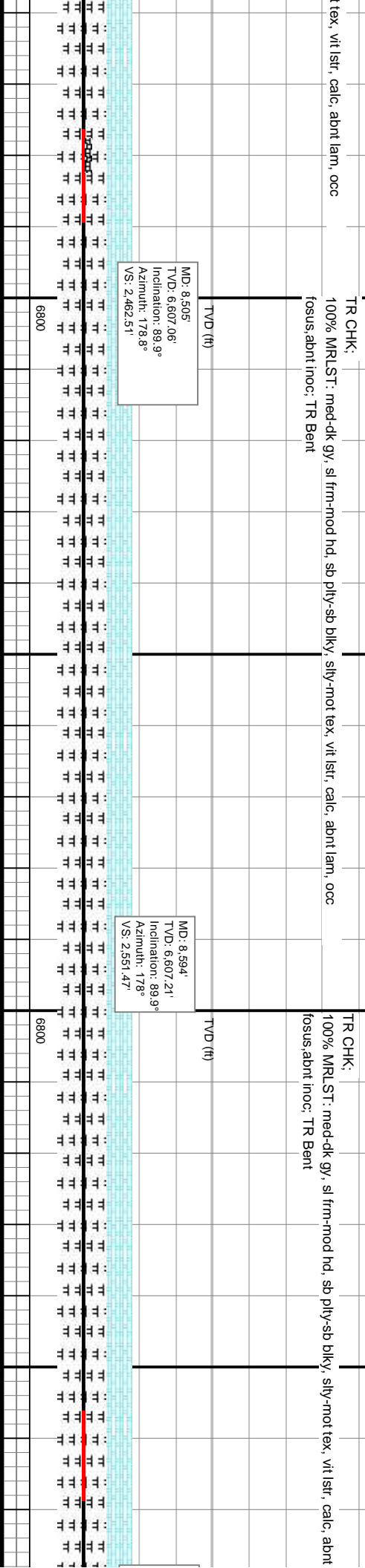
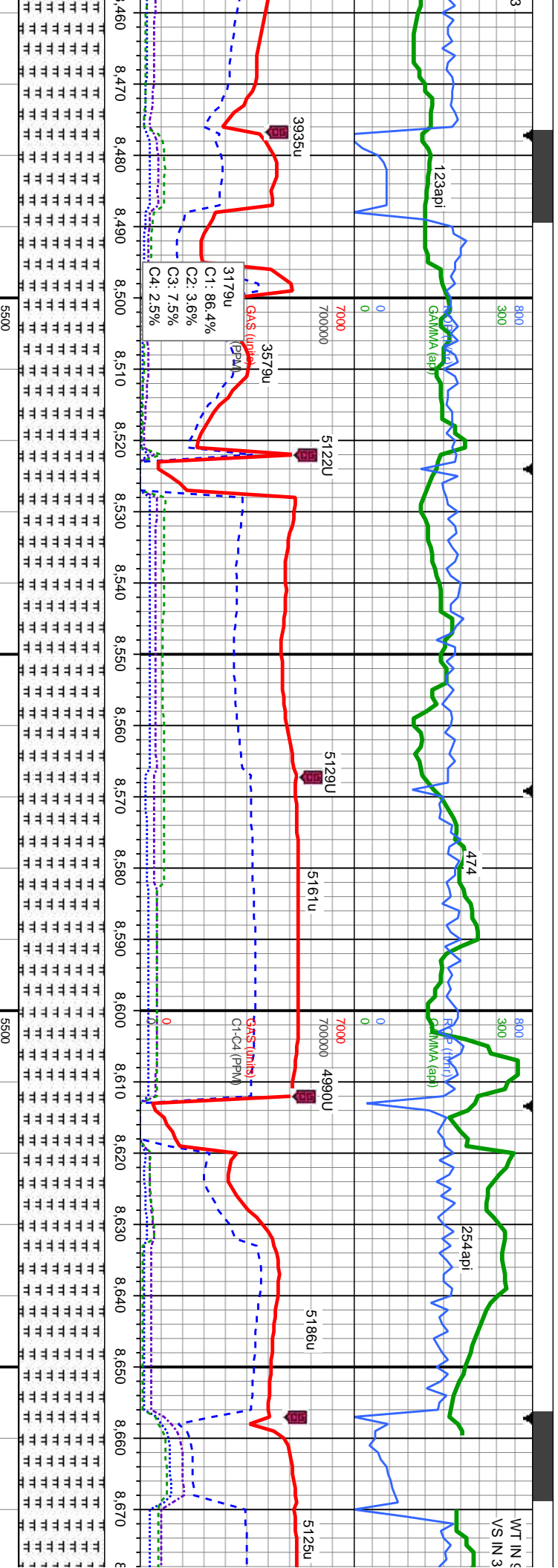


30% CHK: dk gy - lt brn, bf - brn, mod med - dk gy, hd, rr sft, brt, sb blk, rr sb pty, sb wxy tex, arg mtx, v calc, abnt inoc.	70% MRLST: med-dk gy, sl frm-mod hd, sb pty-sb blk, silty-mot tex, vit lstr, calc, TR to 5% Bent	MD: 8.057' TVD: 6.617.3' Inclination: 89.4° Azimuth: 180.7° VS: 2.014.8'	TVD (ft)
5000	10% CHK: dk gy - lt brn, bf - brn, mod med mtx, v calc, abnt inoc.	MD: 8.146' TVD: 6.617.76' Inclination: 90° Azimuth: 180.9° VS: 2.103.78'	TVD (ft)
5500	85% MRLST: med-dk gy, sl frm-mod hd, s up to 5% Bent, rr dissn pyr	MD: 8.23' TVD: 6.6' Inclination: 90° Azimuth: 180.9° VS: 2.19'	TVD (ft)

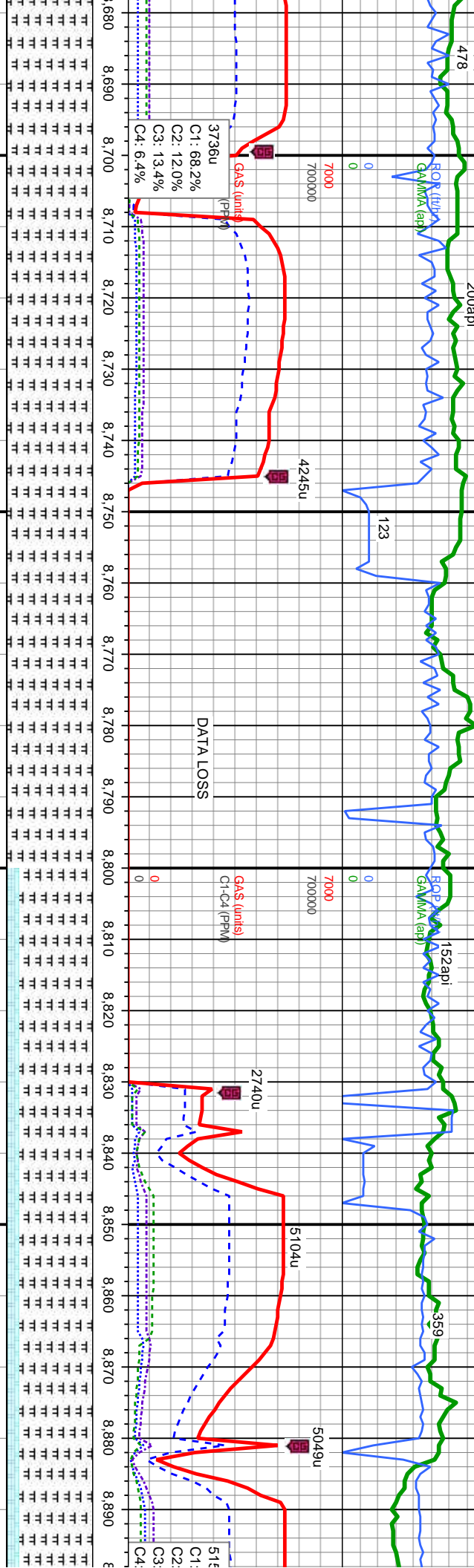


WT IN 9.2 / OUT 9.1
VS IN 33 / OUT 33





2 / OUT 9.2
4 / OUT 34
WT IN 9.2 / OUT 9.2
VS IN 35 / OUT 35



3736u
C1: 68.2%
C2: 12.0%
C3: 13.4%
C4: 6.4%

DATA LOSS

Gas (units)
C1-C4 (PPM)

5111u
C1:
C2:
C3:
C4:

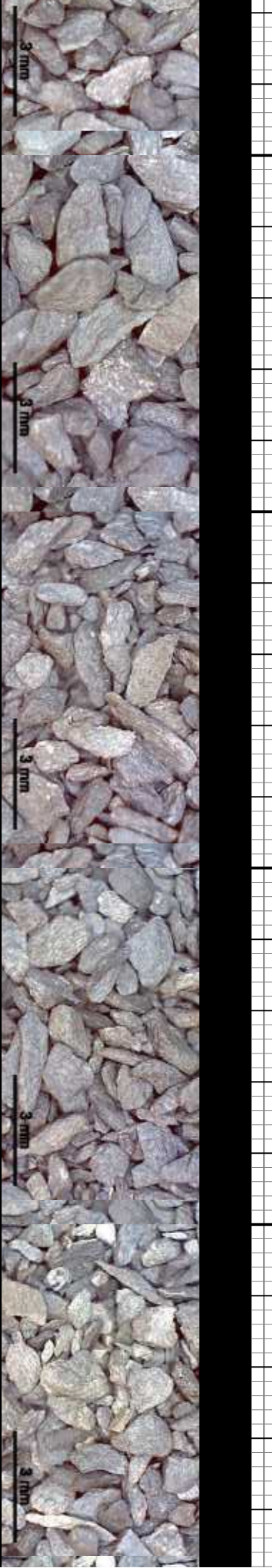
TR CHK:
100% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, silty-mot tex, vit lst, calc, thin lam, occ
lam, occ
fous,abnt inoc: TR Ben

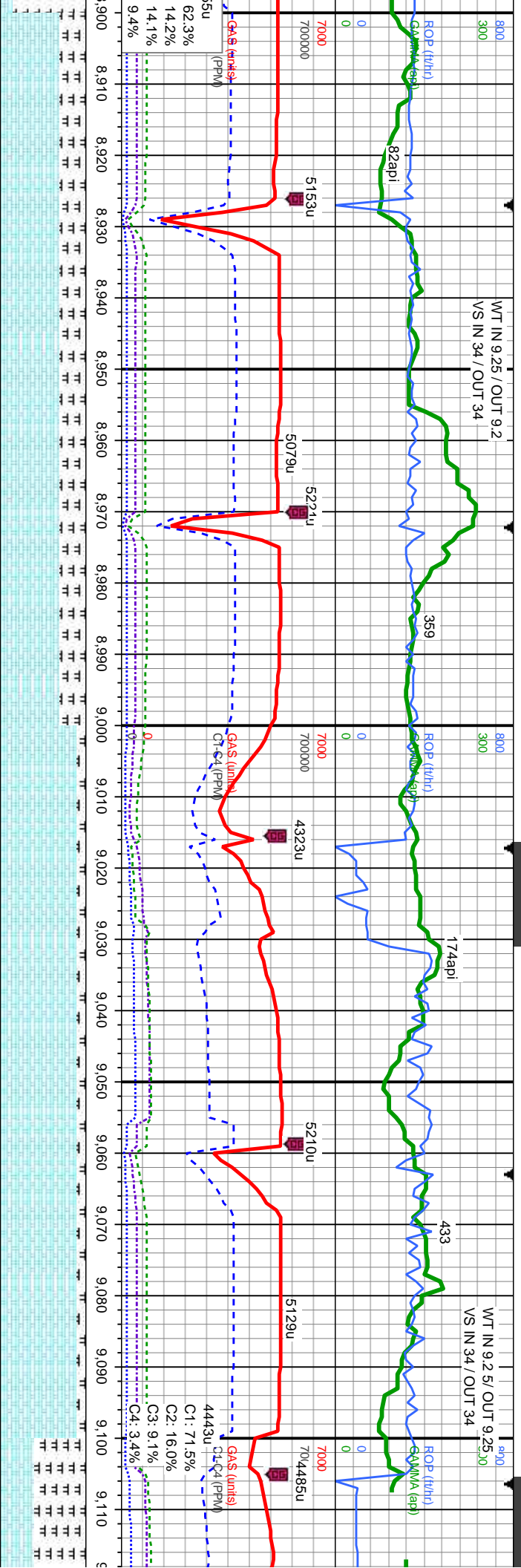
MD: 8.664'
TVD: 6.608'
Inclination: 89.1°
Azimuth: 179.3°
VS: 2.641.44

MD: 8.774'
TVD: 6.609.33'
Inclination: 89.2°
Azimuth: 180.8°
VS: 2.731.43

MD: 8.864'
TVD: 6.610.43'
Inclination: 89.4°
Azimuth: 181.7°
VS: 2.821.41

15% CHK: dk gy - lt gy, bf - brn, mot med - dk gy, hd, rr sft, brlt, sb blk, rr sb ply, sb wxy tex, arg calc mix, v calc:
85% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, silty-mot tex, vit lst, calc, thin lam, occ fous,abnt inoc: TR Bent





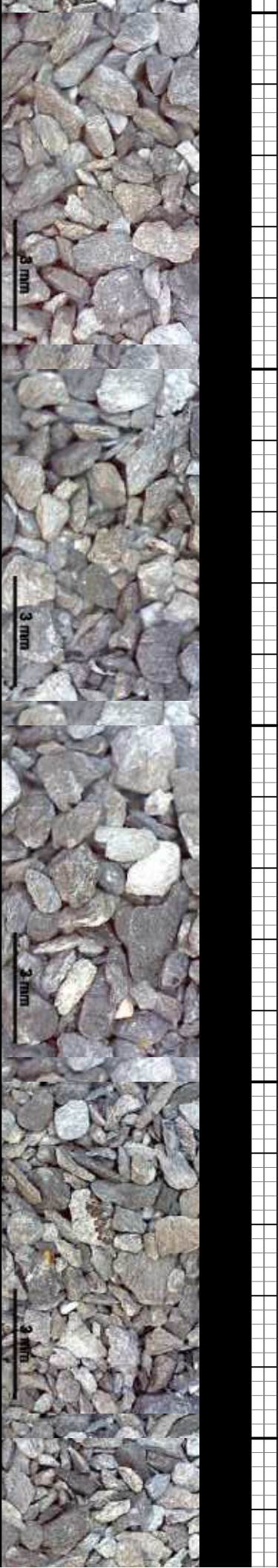
70% CHK: lt gy - gy - bnshtgy, bf - brn, hd, rr sft, brlt, sb blkly, rr sb ply, pred mot - sb wxy tex, arg calc mix, v calc, abnt intbdd fos:
30% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, silty-mot tex, vit lstr, calc, thn lam, occ fousus,abnt ls inoc frags, TR Bent

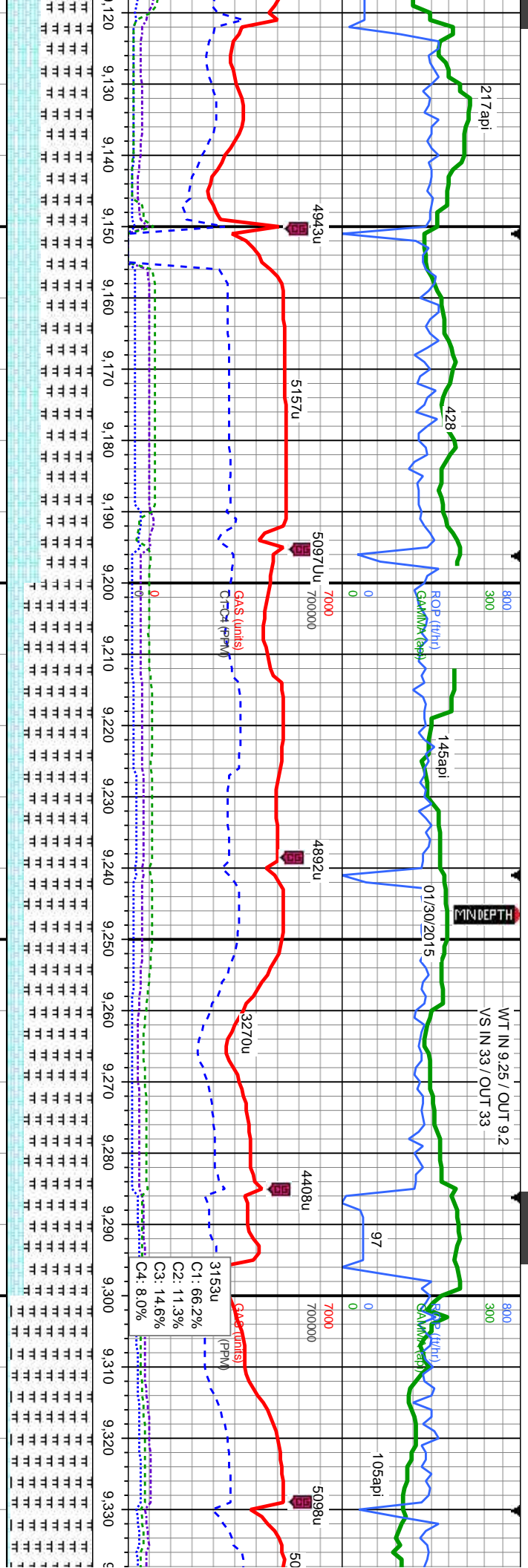
TVD (ft) 8800 8900 9000 9100 9200 9300 9400 9500 9600 9700 9800 9900 10000 10100 10200 10300 10400 10500 10600 10700 10800 10900 11000 11100

MD: 8.963'
TVD: 6,611.91'
Inclination: 88.7°
Azimuth: 181.3°
VS: 2.910.36'

MD: 9.043'
TVD: 6,613.25'
Inclination: 89.6°
Azimuth: 181°
VS: 3.000.33'

40% CHK: lt gy -
mix, v calc, abnt
60% MRLST: me
fousus,abnt ls ino





gy - bnshgy, bf - brn, hd, rr sft, brlt, sb blk, rr sb ply, pred mot - sb wxy tex, arg calc
inbdd fos;
med-dk gy, sl frm-mod hd, sb ply-sb blk, silty-mot tex, vit lstr, calc, thn lam, occ
c frags: TR Ben

20% CHK: lt gy - gy - bnshgy, bf - brn, hd, rr sft, brlt, sb blk, rr sb ply, pred mot - sb wxy tex, arg calc
mix, v calc, abnt inbdd fos;
80% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, silty-mot tex, vit lstr, calc, thn lam, occ
fusus, abnt is inoc frags: TR Bent

5% CHK: lt gy - gy - bnshgy, bf - brn, hd, rr sft, brlt, sb blk, rr sb ply, pred mot - sb wxy tex, arg calc
v calc, abnt inbdd fos;
95% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, silty-mot tex, vit lstr, calc, thn lam, occ
fusus, abnt is inoc frags: TR Bent

MD: 9.133'
TVD: 6.613.01'
Inclination: 90.7°
Azimuth: 180.8°
VS: 3.090.31'

MD: 9.223'
TVD: 6.612.07'
Inclination: 90.5°
Azimuth: 179.5°
VS: 3.180.3'

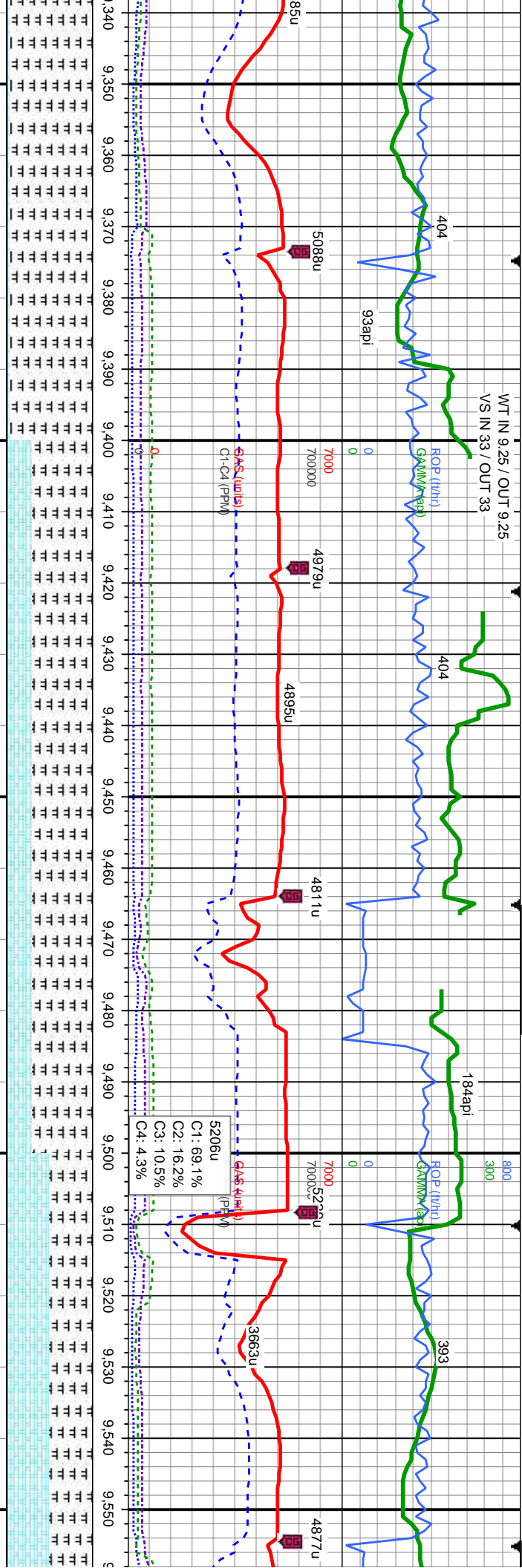
MD: 9.312'
TVD: 6.611.91'
Inclination: 89.7°
Azimuth: 180.8°
VS: 3.269.3'

6800

6800

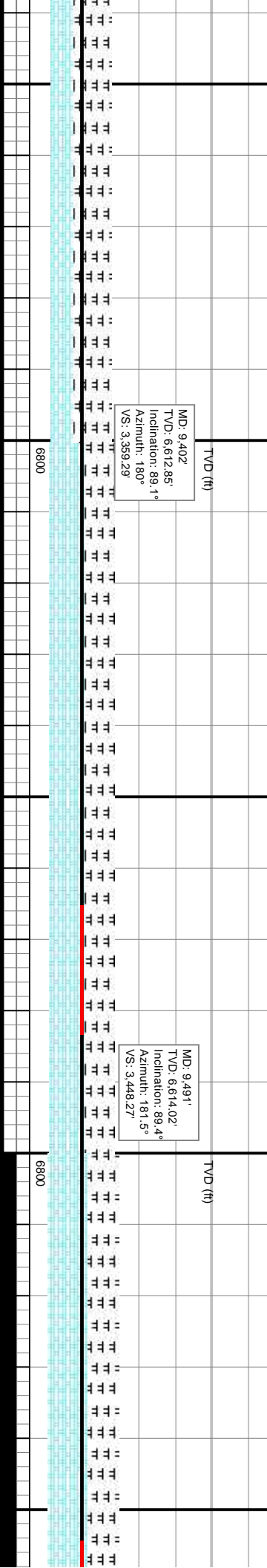


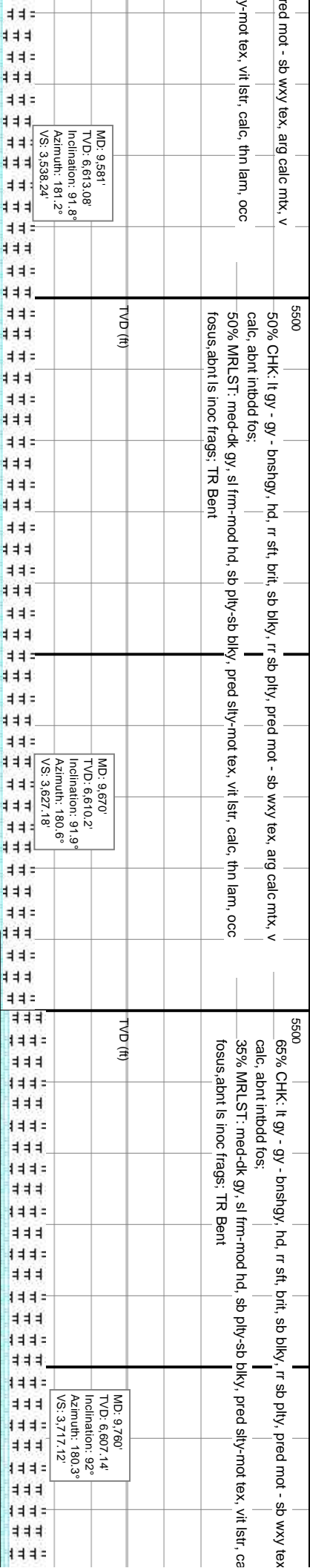
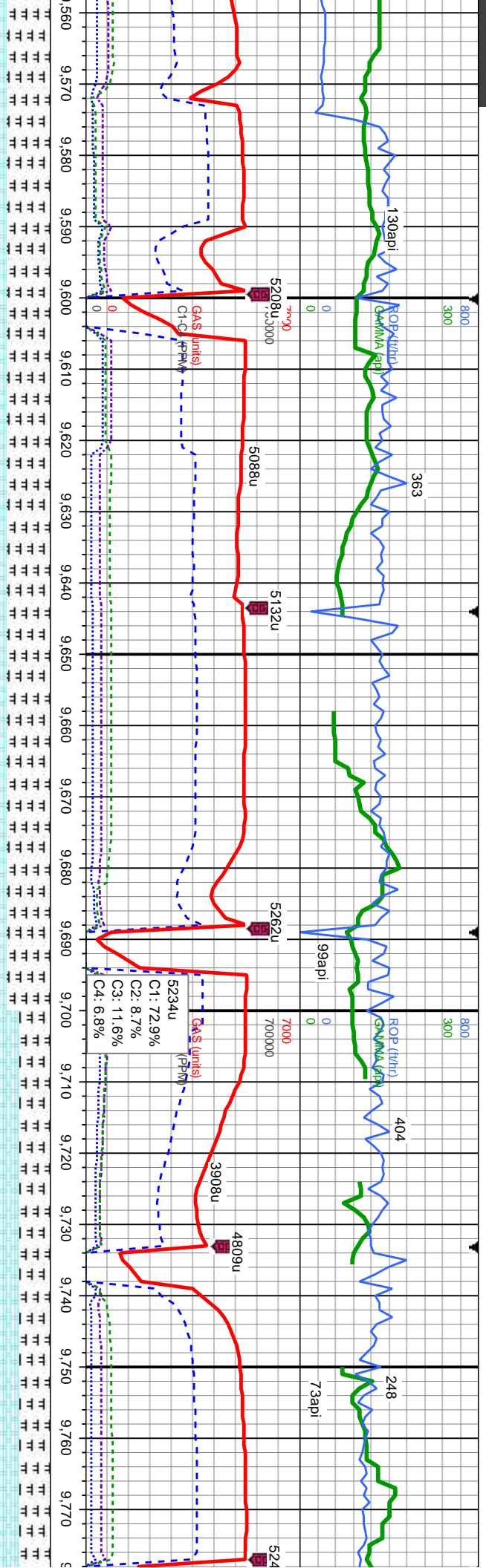
WT IN 9.25 / OUT 9.25
VS IN 33 / OUT 33

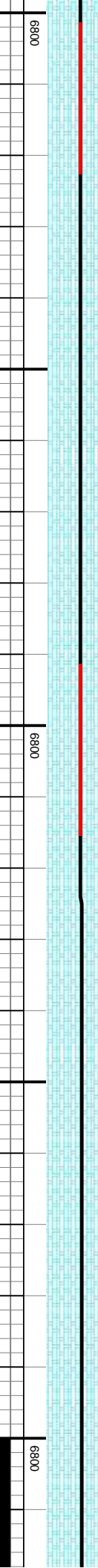
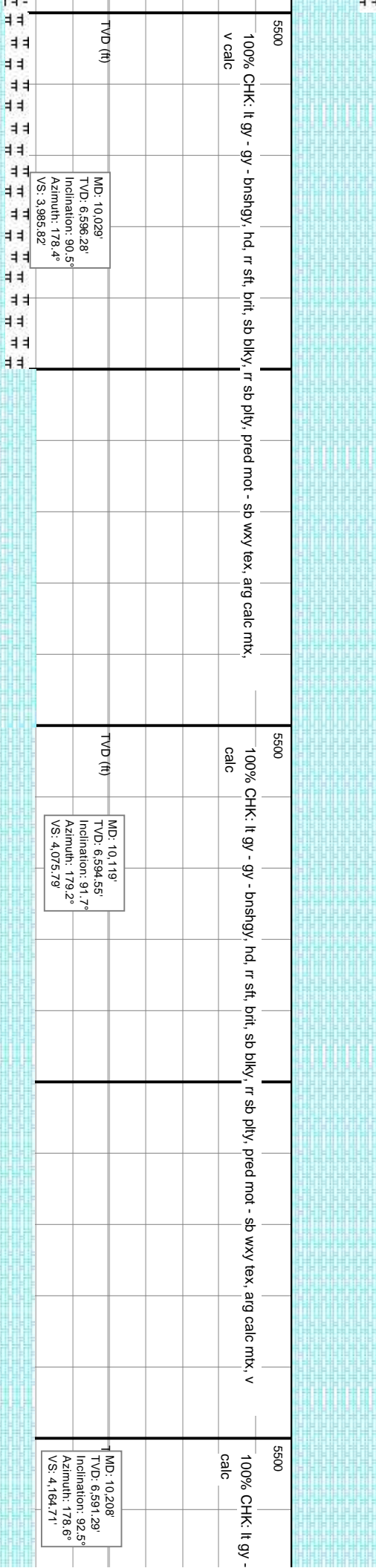
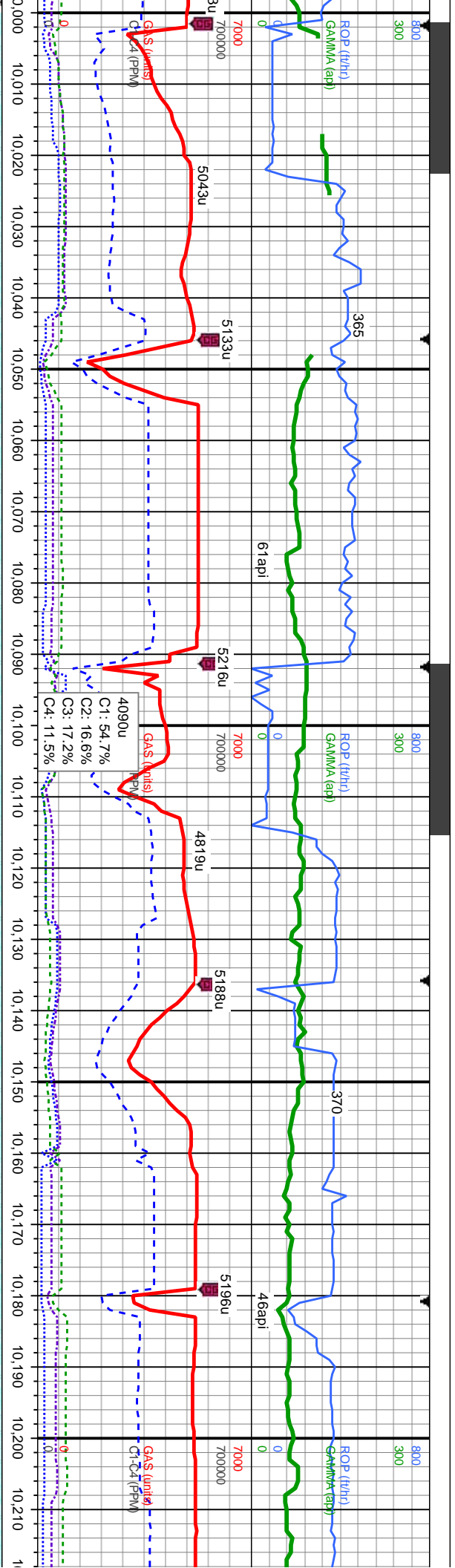


sft, brlt, sb blkly, rr sb ply, pred mot - sb wxy tex, arg calc mtz, 30% CHK: lt gy - gy - bnsngy, hd, rr sft, brlt, sb blkly, rr sb ply, pred mot - sb wxy tex, arg calc mtz, v calc, abnt intbnd fos;

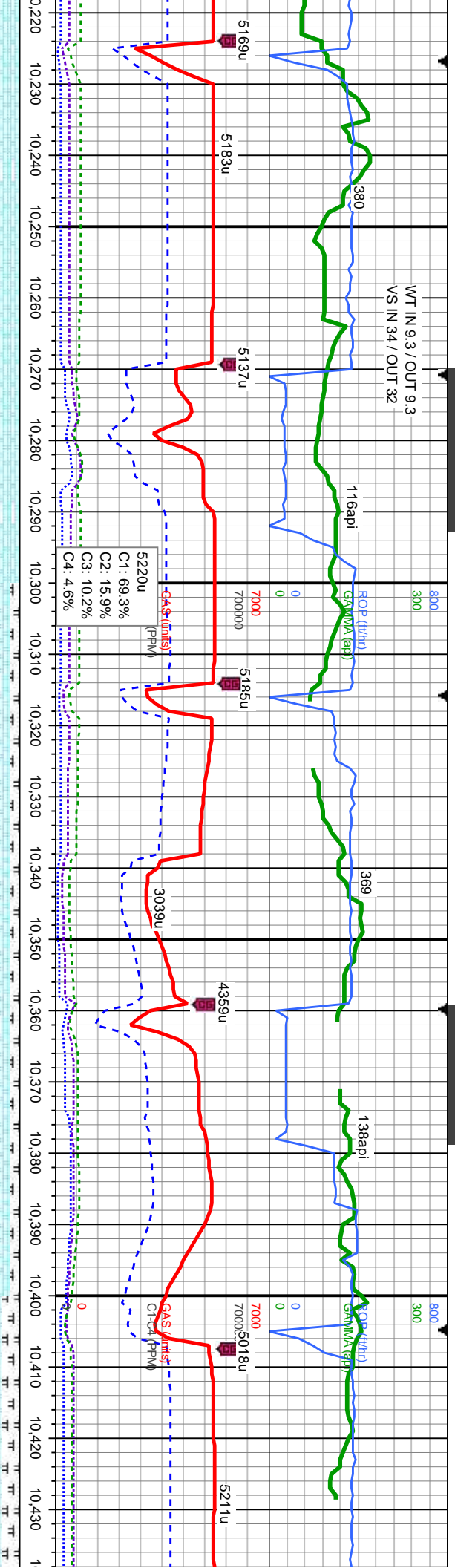
b ply-sb blkly, pred silty-mot tex, vit lstr, calc, thn lam, occ 70% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, pred silty-mot tex, vit lstr, calc, thn lam, occ fosus, abnt is inoc frags; TR Bent







WT IN 9.3 / OUT 9.3
VS IN 34 / OUT 32



gy - bnshgy, hd, rr sft, brlt, sb blk, rr sb ply, pred mot - sb wxy tex, arg calc mtx, v

90% CHK: lt gy - gy - bnshgy, hd, rr sft, brlt, sb blk, rr sb ply, pred mot - sb wxy tex, arg calc mtx, v calc, abnt inbndd fos;
10% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blk, pred silty-mot tex, vit lstr, calc, thn lam, occ fosus, inoc frags

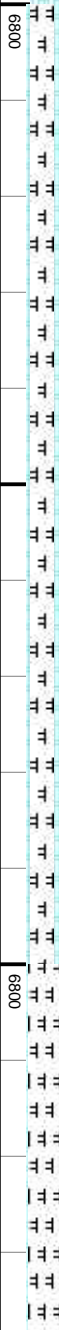
80% CHK: lt gy - gy - bnshgy, hd, rr sft, l
calc, abnt inbndd fos;
20% MRLST: med-dk gy, sl frm-mod hd, fosus, inoc frags

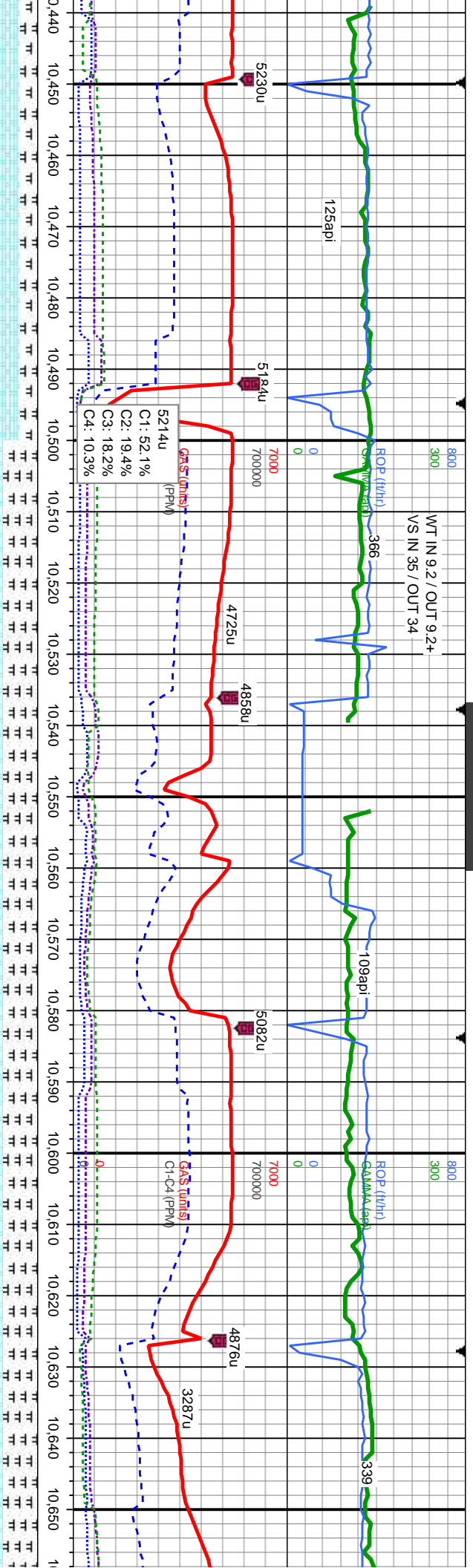
MD: 10.297
TVD: 6.588.34°
Inclination: 91.3°
Azimuth: 179.5°
VS: 4.253.65

D (ft)

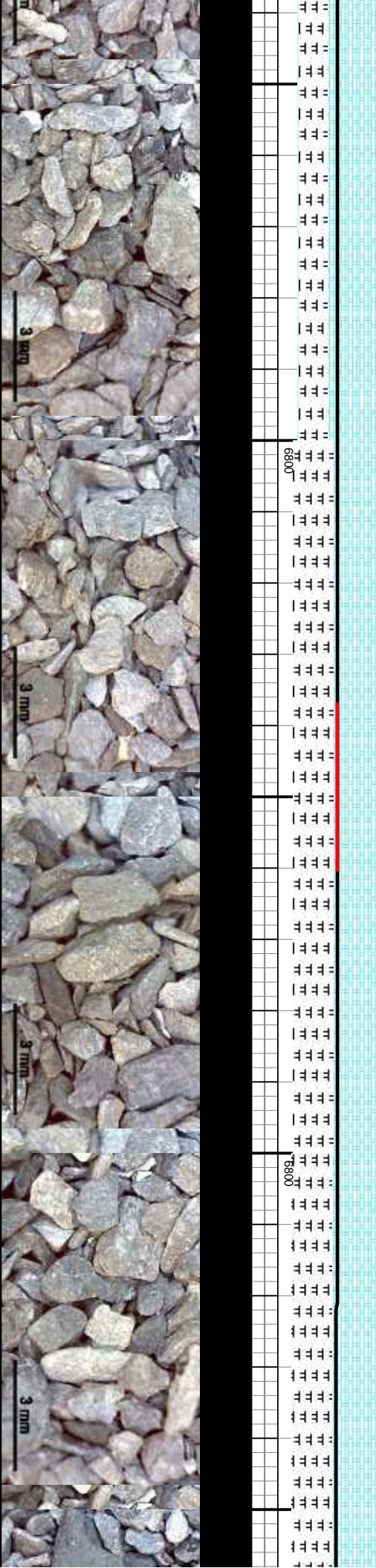
MD: 10.387
TVD: 6.587.32°
Inclination: 90°
Azimuth: 180.7°
VS: 4.343.64

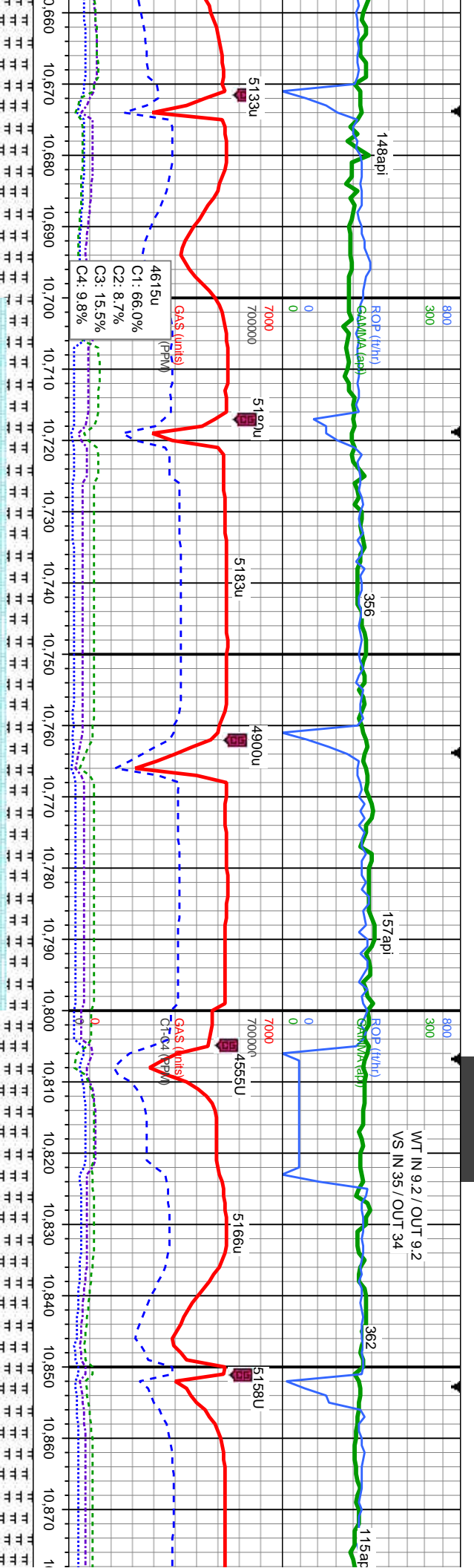
TVD (ft)





brt, sb blkly, rr sb ply, pred mot - sb wxy tex, arg calc mtx, v	5200	MD: 10.476 TVD: 6.587.08 Inclination: 90.3° Azimuth: 179.5° VS: 4.432.64	TVD (ft)
sb ply-sb blkly, pred silty-mot tex, vit lst, calc, thin lam, occ	5200	MD: 10.566 TVD: 6.587.95 Inclination: 88.6° Azimuth: 180.7° VS: 4.522.63	TVD (ft)
60% CHK: lt gy - gy - bnshgy, hd, rr sft, brt, sb blkly, rr sb ply, pred mot - sb wxy tex, arg calc mtx, v	5200	MD: 10.656 TVD: 6.590.0 Inclination: 88.6° Azimuth: 179.5° VS: 4.612.6	TVD (ft)
calc, abnt inbddd fos:	5200		
40% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, pred silty-mot tex, vit lst, calc, thin lam, occ	5200		
fusus, inoc frags	5200		
60% CHK: lt gy - gy - bnshgy, hd, rr sft, brt, sb blkly, rr sb ply, pred mot - sb wxy tex, arg calc mtx, v	5200		
calc, abnt inbddd fos:	5200		
40% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, pred silty-mot tex, vit lst, calc, thin lam, occ	5200		
fusus, inoc frags	5200		
60% CHK: lt gy - gy - bnshgy, hd, rr sft, brt, sb blkly, rr sb ply, pred mot - sb wxy tex, arg calc mtx, v	5200		
calc, abnt inbddd fos:	5200		
40% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, pred silty-mot tex, vit lst, calc, thin lam, occ	5200		
fusus, inoc frags	5200		



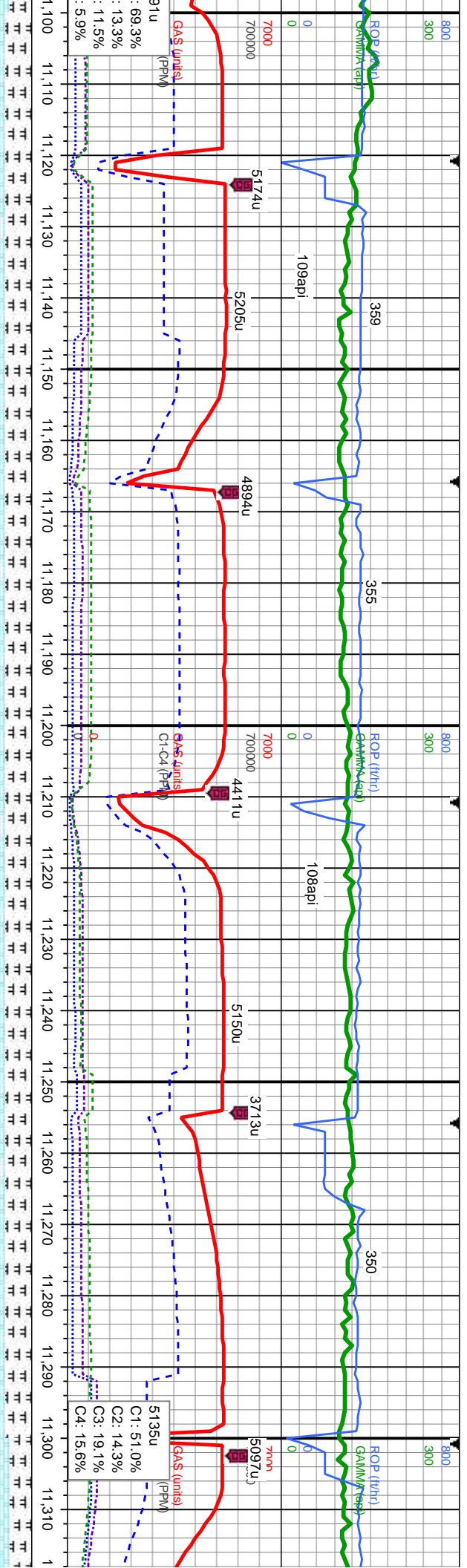


ly, pred mot - sb wxy tex, arg calc
sily-mot tex, vit lstr, calc, thn lam, occ
70% CHK: gy - med gy - bnshgy, hd, rr stf, brlt, sb blk, rr sb ply, pred mot - sb wxy tex, v
calc, abnt inbdd fos,
30% MRLST: med-dk gy, sl frm-nod hd, sb ply-sb blk, pred sily-mot tex, vit lstr, calc, thn lam, occ
fosus, inoc frags

MD: 10.745'
TVD: 6.592.09'
Inclination: 88.7°
Azimuth: 179.5°
VS: 4.701.58'

MD: 10.835'
TVD: 6.593.34'
Inclination: 89.7°
Azimuth: 180.5°
VS: 4.791.56'





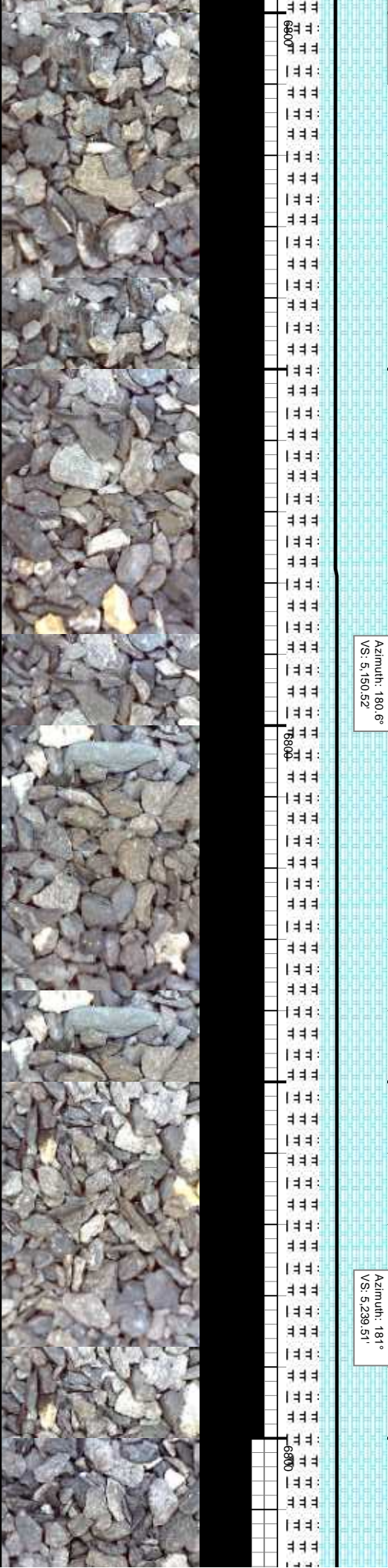
70% CHK: gy - med gy - bnshgy, hd, rr sft, brit, sb blkly, rr sb plty, pred mot - sb wxy tex, arg calc mtx, v calc, inoc;
30% MRLST: med-dk gy, sl frm-mod hd, sb plty-sb blkly, pred silty-mot tex, vit lstr, calc, thin lam, occ fousus, inoc frags

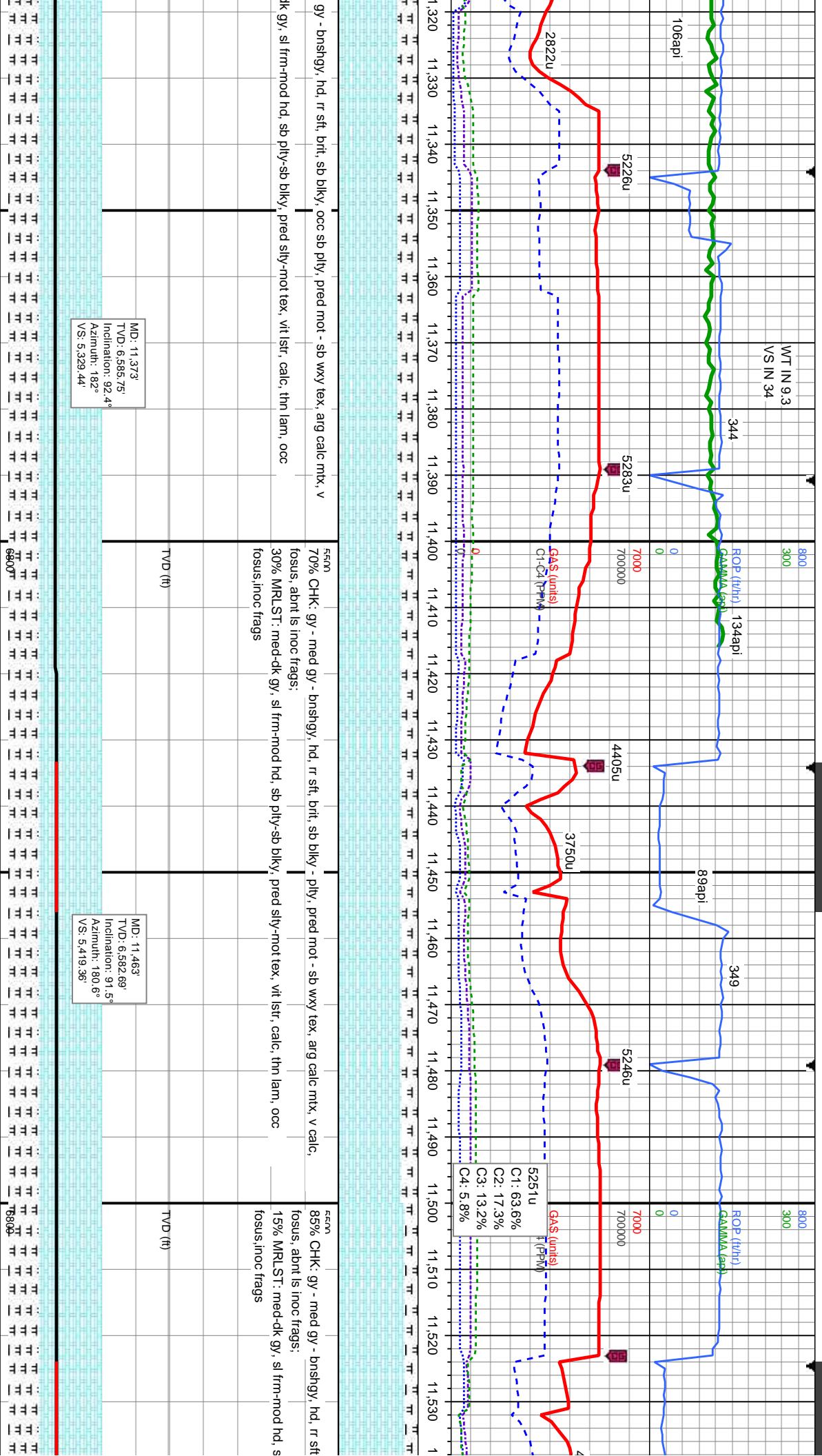
75% CHK: gy - med calc, fousus, inoc;
25% MRLST: med-dk fousus, inoc frags

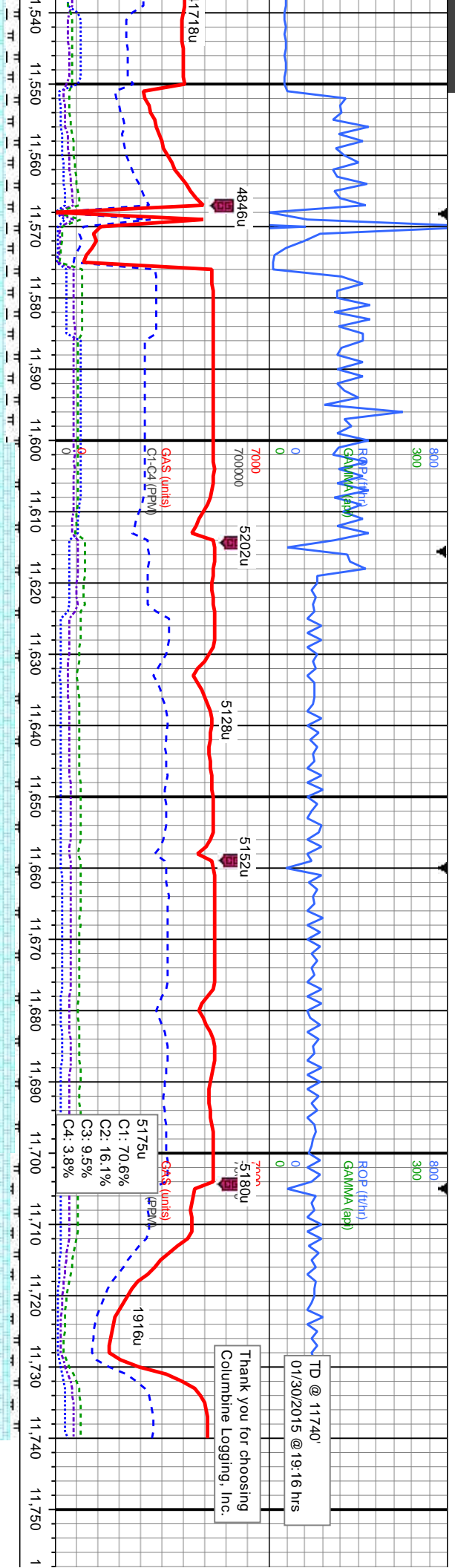
MD: 11,104'
VD: 6,589.98'
Inclination: 90.6°
Azimuth: 180.5°
VS: 5,060.53'

MD: 11,194'
TVD: 6,589.11'
Inclination: 90.5°
Azimuth: 180.6°
VS: 5,150.52'

MD: 11,283'
TVD: 6,588.18'
Inclination: 90.7°
Azimuth: 181°
VS: 5,239.51'







brit, sb blkly - ply, pred mot - sb wxy tex, arg calc mtx, v calc.

b ply-sb blkly, pred sily-mot tex, vit islr, calc, thn lam, occ

95% CHK: gy - med gy - bnshgy, hd, rr sft, brit, sb blkly - ply, pred mot - sb wxy tex, arg calc mtx, v calc.
fusus, abnt is inoc frags;
5% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, pred sily-mot tex, vit islr, calc, thn lam, occ
fusus, inoc frags

90% CHK: gy - med gy - bnshgy, hd, rr sft, brit, sb blkly - ply, pred mot - sb wxy tex, arg calc mtx, v calc, fusus, abnt is inoc frags;
10% MRLST: med-dk gy, sl frm-mod hd, sb ply-sb blkly, pred sily-mot tex, vit islr, calc, thn lam, occ fusus, inoc frags

MD: 11.562'
TVD: 6.583.63'
Inclination: 89.3°
Azimuth: 181°
VS: 5.508.37

MD: 11.642'
TVD: 6.584.57'
Inclination: 89.5°
Azimuth: 180°
VS: 57.46'

MD: 11.678'
TVD: 6.584.76'
Inclination: 89.9°
Azimuth: 179.9°
VS: 11.49'

MD: 11.740'
TVD: 6.584.86'
Inclination: 89.9°
Azimuth: 179.9°
VS: 11.49'



