

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

Well Name 3D 16N-21HZ

Location SEC 21 T2N R66W

State COLORADO

Country USA

API Number 0512338099

Region DJ BASIN

Spud Date 11/27/2013

Surface Coordinates 250' FNL, 949' FEL  
LAT 40.130206  
LON -104.776218

Bottom Hole Coordinates 460' FSL, 410' FEL

County WELD

Rig Number XTREME 8

AFE # 2086763

Field WATTENBERG

Drilling Completed 12/01/2013

Ground Elevation 4991'

K.B. Elevation 5008'

Logged Interval 7050' To 11811'

Total Depth 11811'

Formation NIOBRARA B MARL

Type of Drilling Fluid FW LSND

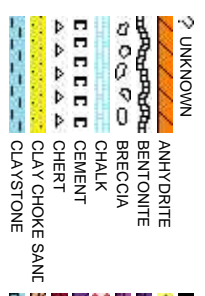
Company Anadarko

Address 1099 18th, Suite

Name JOSH GARRET

Company ANADARKO

Address 1099 18th, Suite



Operator

1800 Denver, CO 80202

Geologist

1800 Denver, CO 80202

Rock Types

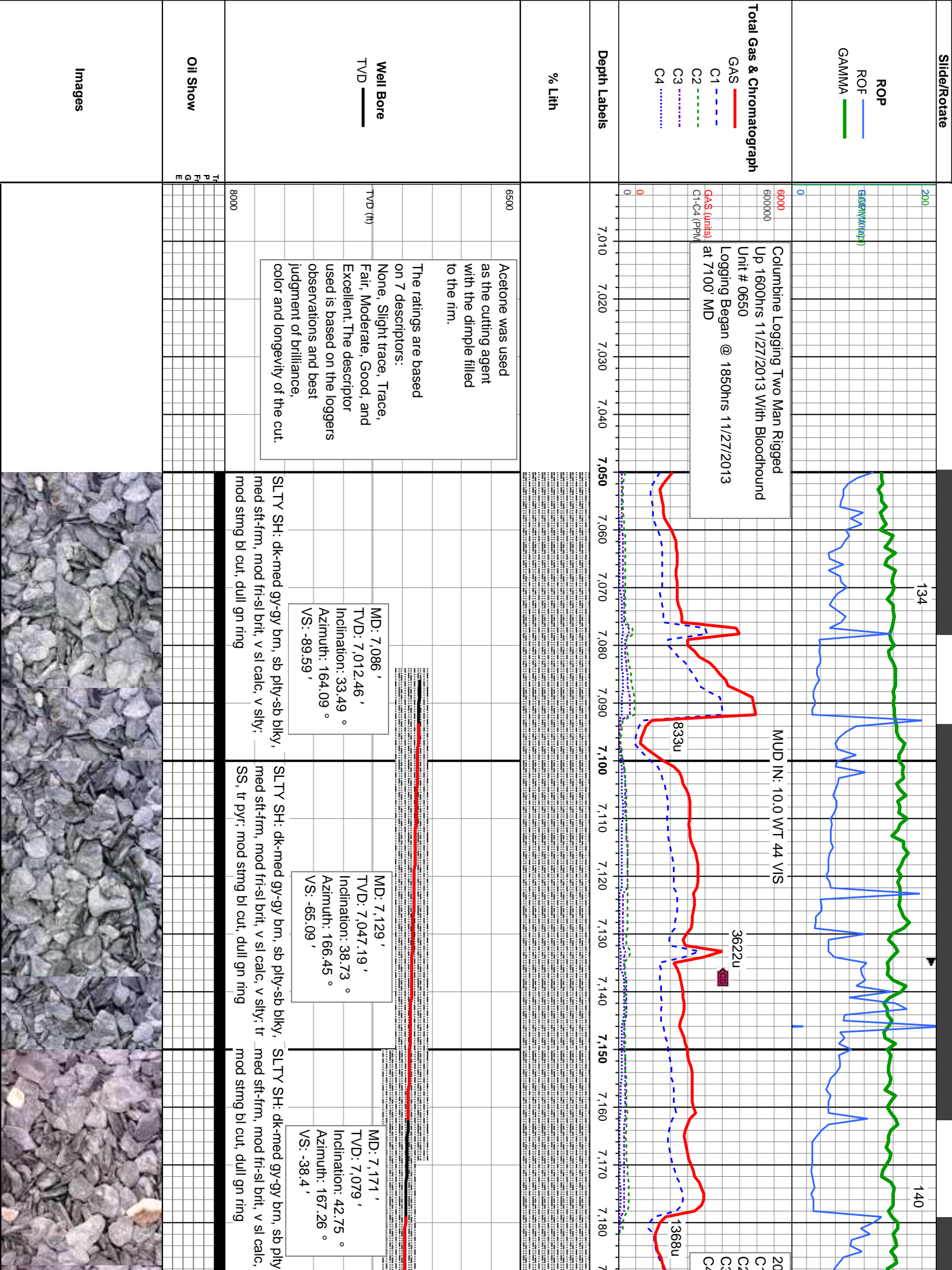
CONGLOMERATE	MARLSTONE	SHALY SANDSTONE
DOLOMITE	METAMORPHIC	SHALY SILTSTONE
DOLOMITIC LIMESTONE	NO SAMPLE	SILTY SHALE
GRANITE	SALT	SILTSTONE
GYPSUM	SANDSTONE	TILL
IGNEOUS	SALT-PEPPER SAND	TUFF
SIDERITE or LIMONITE	SHALE	WELDED TUFF
LIMESTONE	SHALE COLORED	
	SHALE GRAY	

Accessories

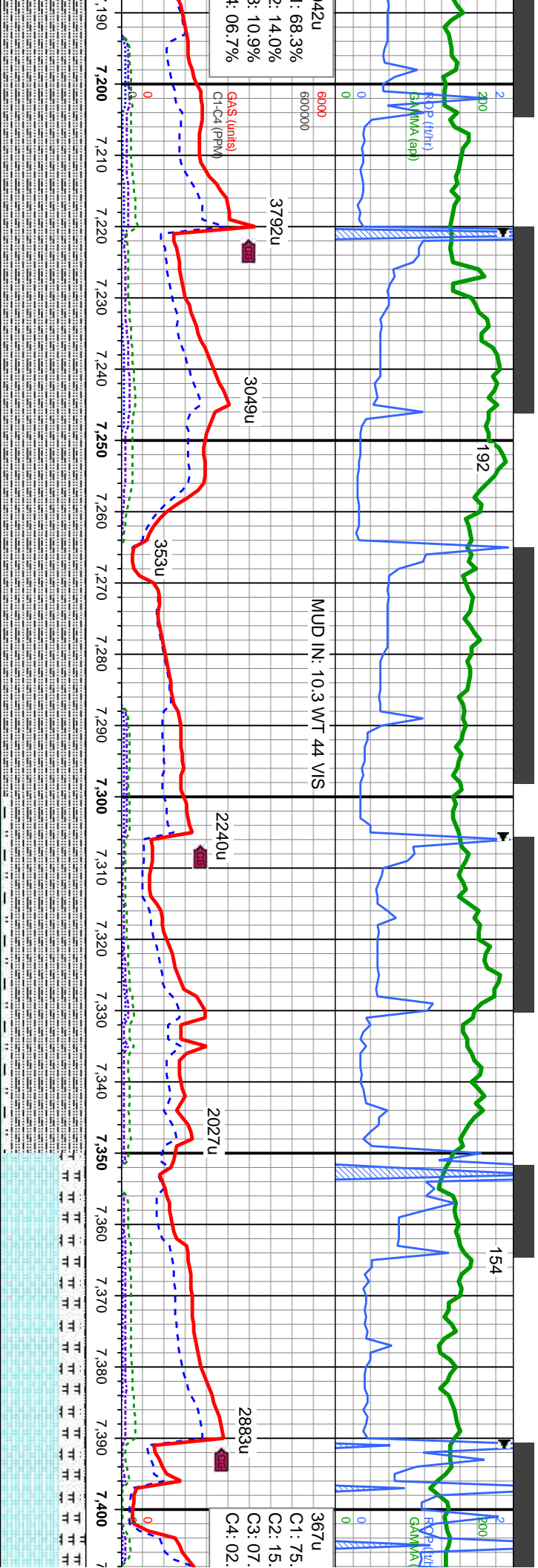
<b>Fossils</b>	GASTROPOD	ARGILLITE GRAIN	HEAVY MINERAL
INOCERAMUS	B BENTONITE	K KAOLIN	ANHYDRITE STRINGER
ALGAE	O OOLITE	BIT BITUMENOUS SUBSTANCE	B BENTONITE STRINGER
AMPHIPORA	O OSTRACOD	B BRECCIA FRAGMENTS	COAL STRINGER
BELEMNITE	P PELECYPOD	C CALCAREOUS	DOLOMITE STRINGER
BIOCLASTIC	P PELLET	C CARBONACEOUS FLAKES	GYPSUM STRINGER
BRACHIOPOD	P PISOLITE	CHT CHERT	LIMESTONE STRINGER
BRYOZOA	P PLANT REMAINS	CHT CHERT	MARLSTONE (CALC) STRG
CEPHALOPOD	S PLANT SPORES	COAL - THIN BEDS	MARLSTONE (DOL) STRG
CORAL	S SCAPHOPOD	DOLOMITIC	SANDSTONE STRINGER
CRINOID	S STROMATOPOROID	F FELDSPAR	SHALE STRINGER
ECHINOID	F FERRUGINOUS PELLET	F FERRUGINOUS	S SILTY
FISH	<b>Minerals</b>	G GLAUCONITE	T TUFACEOUS
FORAMINIFERA	A ANHYDRITIC	G GYPSIFEROUS	<b>Stringer</b>
F FOSSIL	A ARGILLACEOUS		

Other Symbols

<b>Oil Show</b>	P PINPOINT	DST INTERVAL	WIRELINE TESTED - LEFT	E EARTHY
V VUGGY	FAULT	WIRELINE TESTED - RT	Fx FINELYXLN	
D DEAD	FORMATION TOP	DRILL STEM TEST	Gs GRAINSTONE	
E EVEN	GAS SHOW	MN DEPTH	L LITHOGRAPHIC	
Q QUESTIONABLE	BIT	OIL SHOW	Mx MICROXLN	
S SPOTTED STAINING	C CONNECTION (UP)	MN DEPTH UP	Ms MUDSTONE	
C CONNECTION (DOWN)	MN DEPTH (DOWN)	A ANGULAR	Ps PACKSTONE	
<b>Porosity</b>	C CONNECTION GAS	N NORMAL FAULT	R ROUNDED	Ws WACKESTONE
E EARTHY	C CONNECTION GAS (LEFT)	O OVERTURNED STRATA	a SUBANG	
F FENESTRAL	T TRIP GAS	R REVERSE FAULT	F SUBRND	
F FRACTURE	C TRIP GAS (LEFT)	C CASING	<b>Textures</b>	M MODERATE
X INTERCRYSTALLINE	D DOWN TIME GAS	S SIDEWALL CORE (LEFT)	P POOR	
I INTERCRYSTALLINE	D DOWN TIME GAS (LEFT)	S SIDEWALL CORE (RIGHT)	W WELL	
M MOLDIC	L CORE - LOST	S SLIDE	C CHALKY	
O ORGANIC	C CORE - RECOVERED	S SURVEY	Cx CRYPTOXLN	







MD: 7,384 '  
TV D: 7,207.38 '  
Inclination: 61.84 °  
Azimuth: 172.63 °  
VS: 128.13 '

CHK:it-med gy, occ dk gy, sb biky, stf, v  
calc, reth-wwy tex;MRLST: med-dk gy, sb  
biky, med stf-firm, stly tex, v calc;SLTY SH:  
dk-med gy, occ gy brn, sb pily -sb biky,  
mod stf - firm, mod frt - sl brt, v sl calc, v stly,  
tr pyr; mod stmg bl cut, dull gn ring

CHK:1  
reth-w  
med s  
mod s  
εuuu

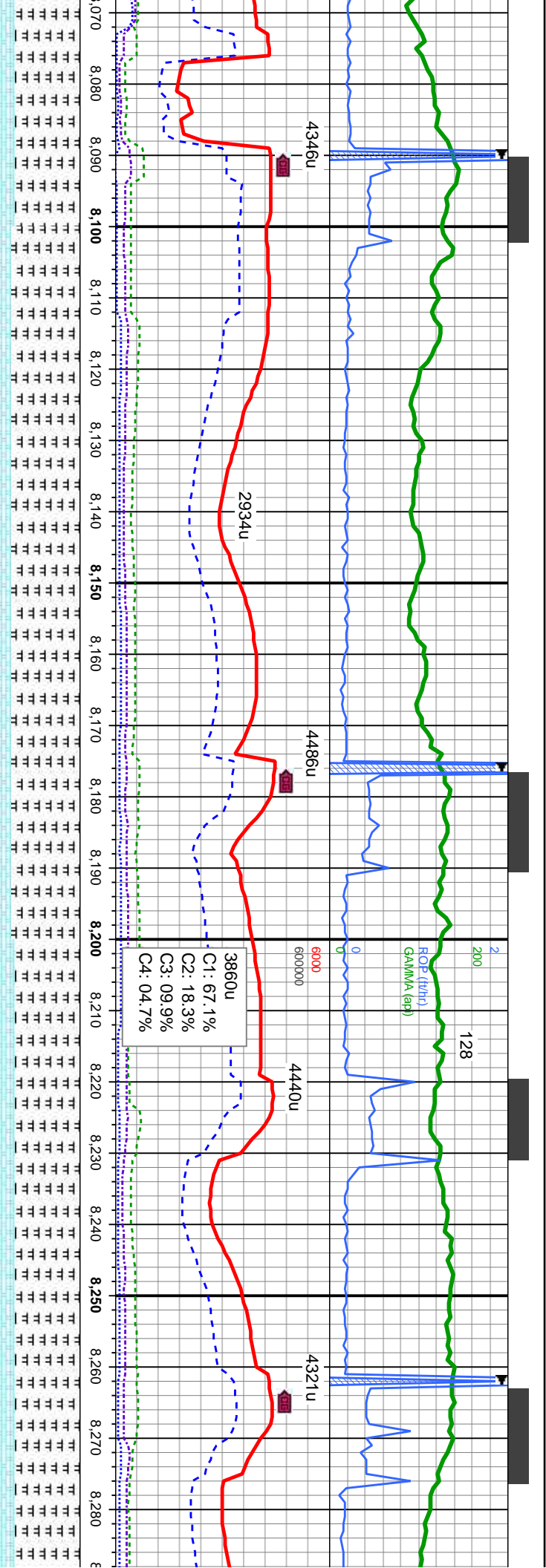












MD: 8,119 '  
TVD: 7,277.39 '  
Inclination: 91.78 °  
Azimuth: 180.23 °  
VS: 850.1 '

3860u  
C1: 67.1%  
C2: 18.3%  
C3: 09.9%  
C4: 04.7%

MD: 8,204 '  
TVD: 7,274.86 '  
Inclination: 91.63 °  
Azimuth: 179.59 °  
VS: 935.06 '

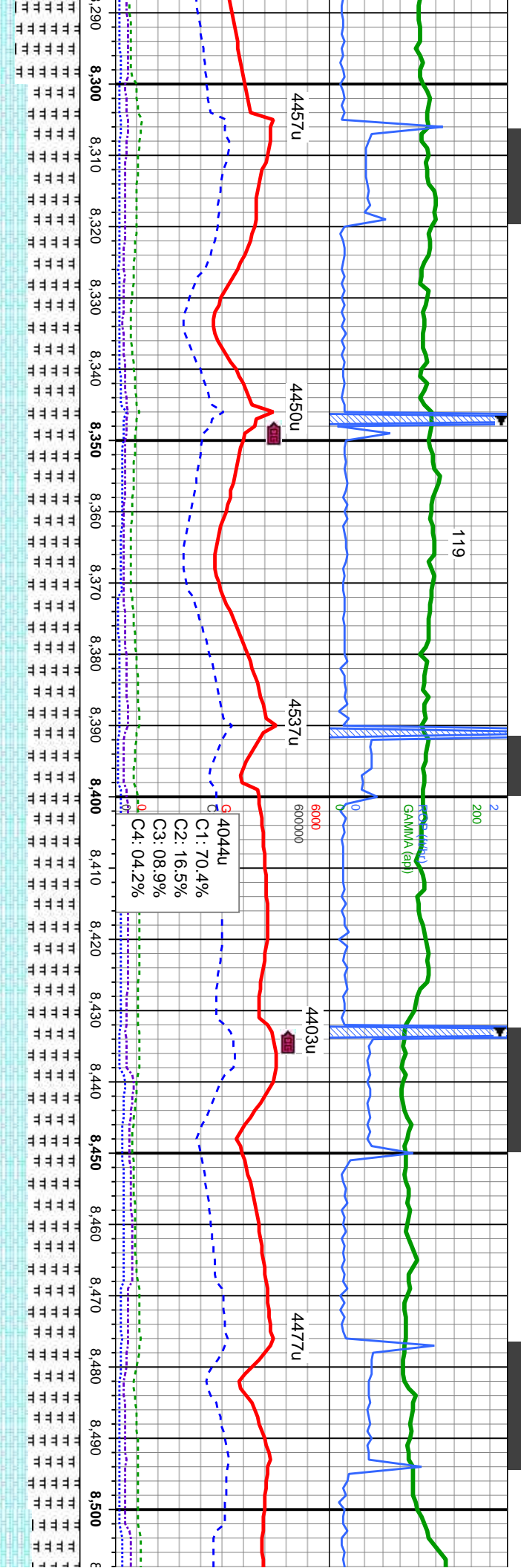
MD: 8,28  
TVD: 7.2  
Inclination:  
Azimuth:  
VS: 1.02

-shy tex, v calc;  
pfty-wxy tex, v calc, tr  
MRLST: med-dk gy, sb blk-y-sb pty, mod sft-fm, slty-shy tex, v calc;  
CHK:lt-med gy, occ dk brn, sb blk-y-sb pty, mod sft, rthy-wxy tex, v calc, tr pyr,  
scat bent, tr lse fos frags; mod string bl cut, pale yel ring  
8000

MRLST: med-dk gy, sb blk-y-sb pty, mod sft-fm, slty-shy tex, v calc;  
CHK:lt-med gy, occ dk brn, sb blk-y-sb pty, mod sft, rthy-wxy tex, v calc, t  
scat bent, tr lse fos frags; fast string bl cut, bright bl-wh ring







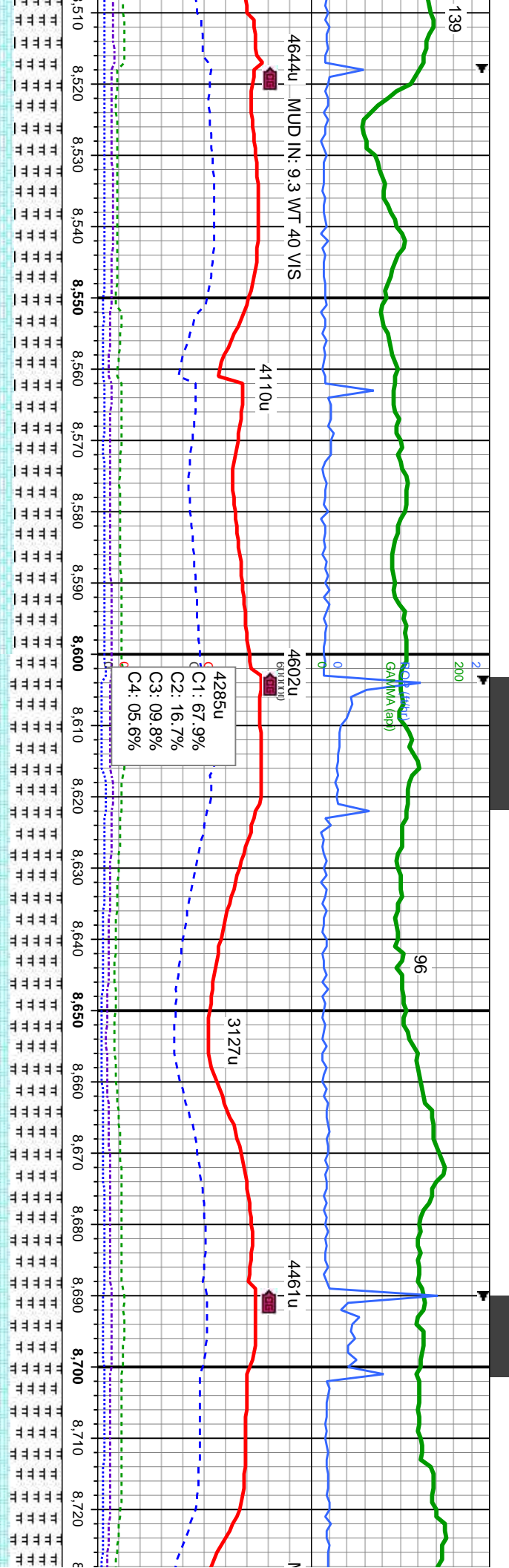
MD: 8,374' TVD: 7,271.95' Inclination: 91.01° Azimuth: 179.38° VS: 1,105.03'

MD: 8,460' TVD: 7,271.36' Inclination: 89.78° Azimuth: 179.16° VS: 1,191.02'

pyr, tr pyr, MRLST: med-dk gy, sb blk-y-sb pily, mod sft-firm, silty-shy tex, v calc; CHK:lt-med gy, occ dk brn, sb blk-y-sb pily, mod sft, rthy-wxy tex, v calc, tr pyr, scat bent, tr lse fos frags, fast string bl cut, bright bl-wh ring

MRLST: med-dk gy, sb blk-y-sb pily, mod sft-firm, silty-shy tex, v calc; CHK:lt-med gy, occ dk brn, sb blk-y-sb pily, mod sft, rthy-wxy tex, v calc, scat bent, tr lse fos frags, fast string bl cut, bright bl-wh ring





MD: 8,545 '  
TVD: 7,271.82 '  
Inclination: 89.59 °  
Azimuth: 178.77 °  
VS: 1,276 '

MD: 8,630 '  
TVD: 7,272.65 '  
Inclination: 89.29 °  
Azimuth: 179.36 °  
VS: 1,360.99 '

MD: 8,715 '  
TVD: 7,273.49 '  
Inclination: 89.59 °  
Azimuth: 179.36 °  
VS: 1,445.97 '

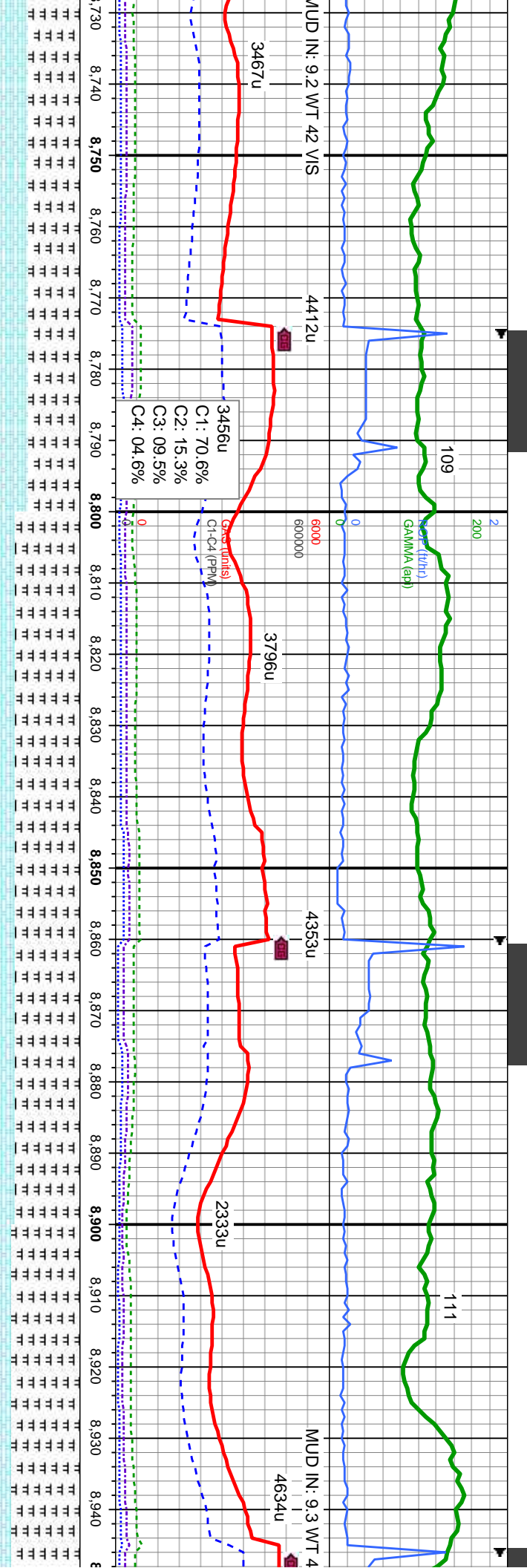
MRSLST: med-dk gy, sb blk-y-sb ply, mod sft-frn, silty-shy tex, v calc;  
CHK:lt-med gy, occ dk brn, sb blk-y-sb ply, mod sft, rthy-wxy tex, v calc, scat  
frags; tr lse tos frags; mod sting bl cut, pale yel ring

MRSLST: med-dk gy, sb blk-y-sb ply, mod sft-frn, silty-shy tex, v calc; CHK:lt-med  
gy, occ dk brn, sb blk-y-sb ply, mod sft, rthy-wxy tex, v calc, scat bent, tr lse tos  
frags; fast sting bl cut, bright yel-wh ring

MRSLST: med  
CHK:lt-med g  
scat bent, tr l



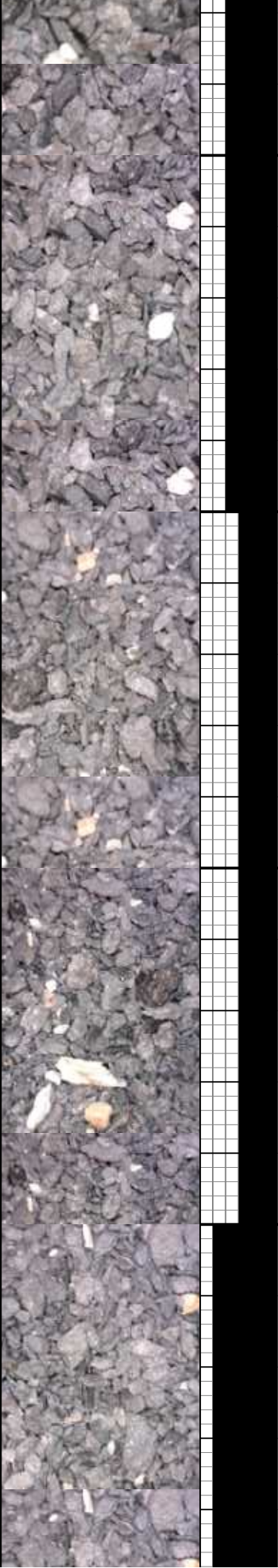


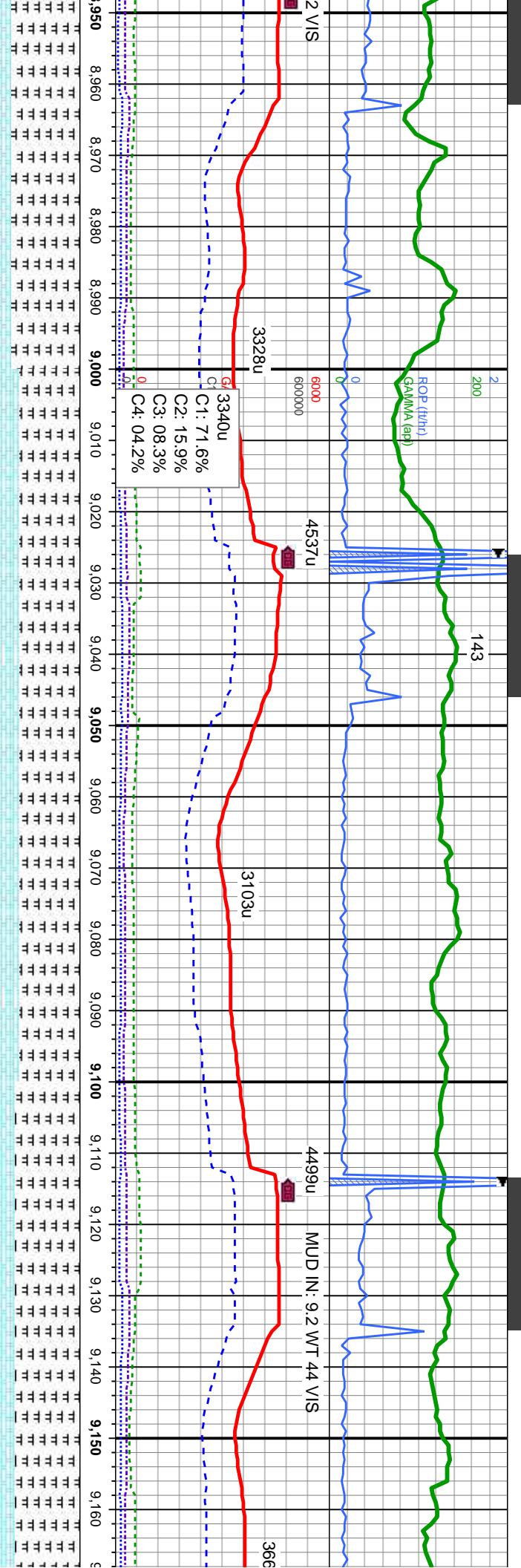


MUD IN: 9.2 WT 42 V/S	
3467u	
4412u	
3456u	
C1: 70.6%	
C2: 15.3%	
C3: 09.5%	
C4: 04.6%	
3796u	
4353u	
2333u	
4634u	
MUD IN: 9.3 WT 4	

MD: 8,801'	MD: 8,886'
TVD: 7,274.12'	TVD: 7,274.86'
Inclination: 89.56°	Inclination: 89.44°
Azimuth: 179.93°	Azimuth: 179.95°
VS: 1,531.97'	VS: 1,616.97'

dk gy, sb blk-y-sb ply, mod sft-frm, silty-shy tex, v calc;	MRLST: med-dk gy, sb blk-y-sb ply, mod sft-frm, silty-shy tex, v calc;
y, occ dk brn, sb blk-y-sb ply, mod sft, rthy-wxy tex, v calc;	CHK:lt-med gy, occ dk brn, sb blk-y-sb ply, mod sft, rthy-wxy tex, v calc, scat
fos frags; fast sting bl cut, bright yel-wh ring	bent, tr lse fos frags; mod sting bl cut, pale yel ring





MD: 8,971 '  
TVD: 7,275.35 '  
Inclination: 89.9 °  
Azimuth: 180.85 °  
VS: 1,701.96 '

MD: 9,056 '  
TVD: 7,275.3 '  
Inclination: 90.18 °  
Azimuth: 181.24 °  
VS: 1,786.95 '

MD: 9,141 '  
TVD: 7,275.87 '  
Inclination: 89.04 °  
Azimuth: 180.64 °  
VS: 1,871.94 '

MD (ft)	VS (ft)	Log Description
8,950	1,701.96	mod sft-firm, silty-shy tex, v calc;
8,960	1,701.96	sb ply, mod sft, rthy-wxy tex, v calc, scat
8,970	1,701.96	ut, bright bl-wh ring
8,980	1,701.96	
8,990	1,701.96	
9,000	1,701.96	
9,010	1,701.96	
9,020	1,701.96	
9,030	1,701.96	
9,040	1,701.96	
9,050	1,701.96	
9,060	1,701.96	
9,070	1,701.96	
9,080	1,701.96	
9,090	1,701.96	
9,100	1,701.96	
9,110	1,701.96	
9,120	1,701.96	
9,130	1,701.96	
9,140	1,701.96	
9,150	1,701.96	
9,160	1,701.96	

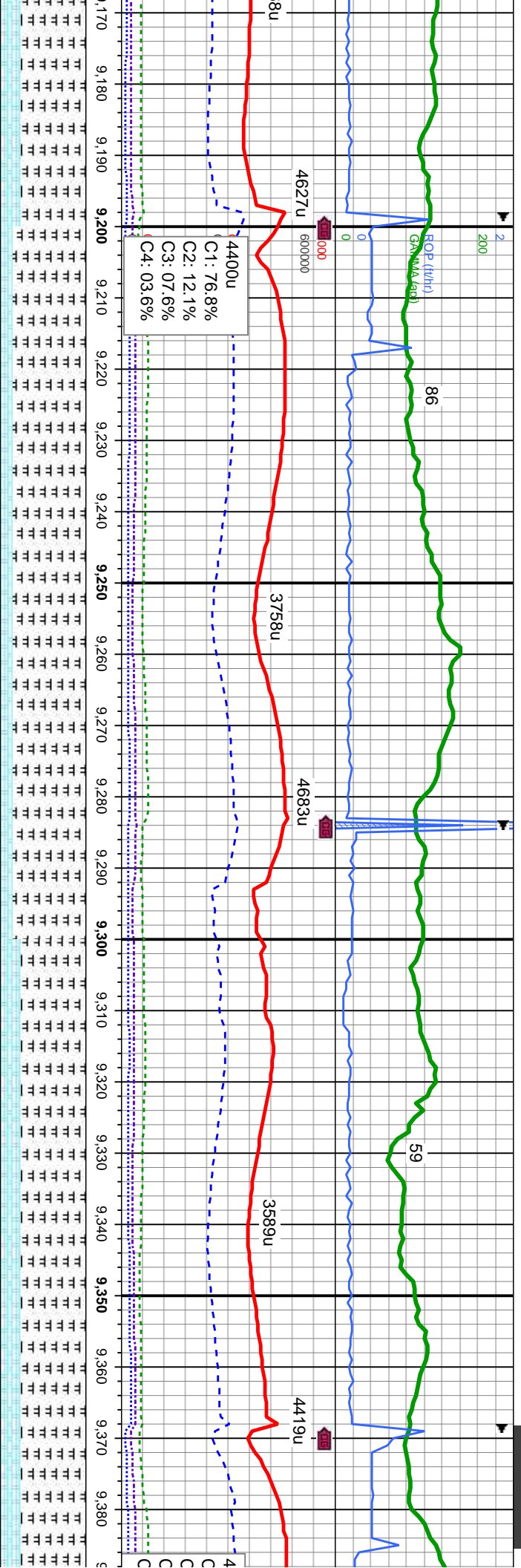
MD (ft)	VS (ft)	Log Description
9,050	1,786.95	MDLST: med-dk gy, sb blkly-sb ply, mod sft-firm, silty-shy tex, v calc;
9,060	1,786.95	CHK:lt-med gy, occ dk brn, sb blkly-sb ply, mod sft, rthy-wxy tex, v calc,
9,070	1,786.95	scat bent, tr lse fos frags, fast sting bl cut, bright yel-wh ring
9,080	1,786.95	
9,090	1,786.95	
9,100	1,786.95	
9,110	1,786.95	
9,120	1,786.95	
9,130	1,786.95	
9,140	1,786.95	
9,150	1,786.95	
9,160	1,786.95	

MD (ft)	VS (ft)	Log Description
9,140	1,871.94	MDLST: med-dk gy, sb blkly-sb ply, mod sft-firm, silty-shy tex, v calc;
9,150	1,871.94	CHK:lt-med gy, occ dk brn, sb blkly-sb ply, mod sft, rthy-wxy tex, v calc,
9,160	1,871.94	bent, tr lse fos frags, fast sting bl cut, bright yel-wh ring
9,170	1,871.94	
9,180	1,871.94	
9,190	1,871.94	
9,200	1,871.94	







MD: 9,227 '  
TVD: 7,277.64 '  
Inclination: 88.61 °  
Azimuth: 180.85 °  
VS: 1,957.91 '

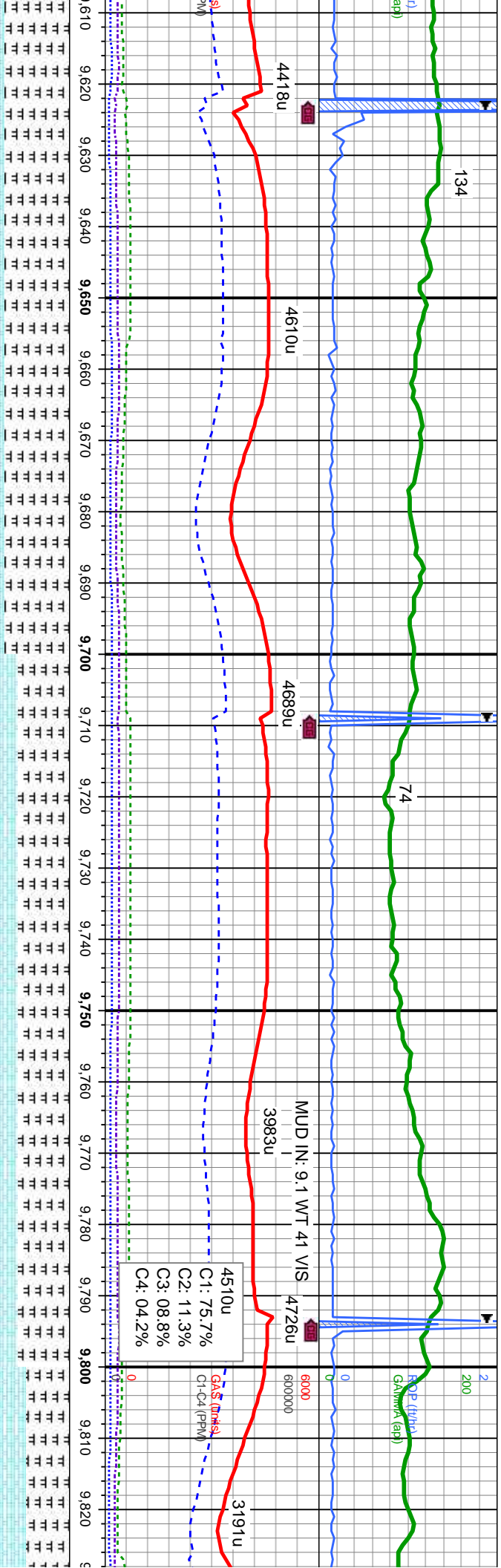
MD: 9,312 '  
TVD: 7,278.97 '  
Inclination: 89.59 °  
Azimuth: 180.94 °  
VS: 2,042.89 '

ly-shly tex, v calc;	MR LST: med-dk gy, sb blkly-sb pily, mod sft-fm, silty-shly tex, v calc; CHK:lt-med gy,
thy-wxy tex, v calc, scat	brn, sb blkly-sb pily, mod sft, rthy-wxy tex, v calc, scat bent, tr use fos frags;
ring	cut, bright yel-wh ring









MD: 9,651 '  
TVD: 7,281.93 '  
Inclination: 89.69 °  
Azimuth: 179.97 °  
VS: 2,381.85 '

MD: 9,736 '  
TVD: 7,281.77 '  
Inclination: 90.52 °  
Azimuth: 179.72 °  
VS: 2,466.85 '

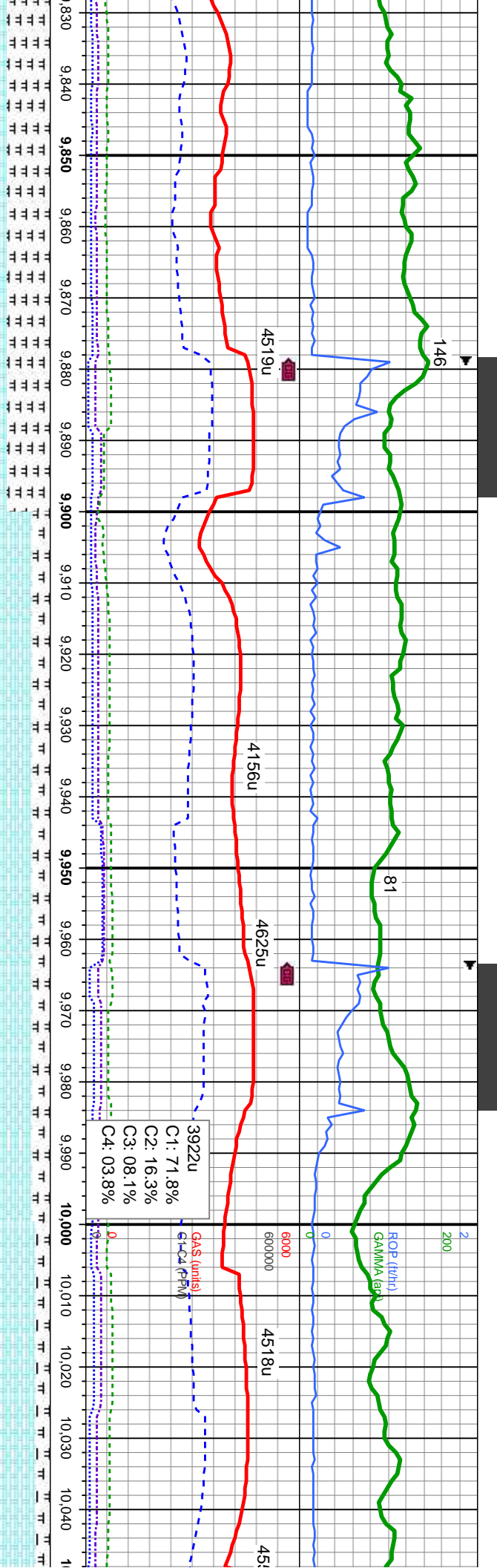
4510u  
C1: 75.7%  
C2: 11.3%  
C3: 08.8%  
C4: 04.2%

MRLST: med-dk gy, sb blk-y-sb pty, mod sft-frm, silty-shy tex, v calc; CHK:lt-med gy, occ dk brn, sb blk-y-sb pty, mod sft, rthy-wxy tex, v calc, scat lse fos frags; fast string bl cut, bright bl-wh ring

MRLST: med-dk gy, sb blk-y-sb pty, mod sft-frm, silty-shy tex, v calc; CHK:lt-med gy, occ dk brn, sb blk-y-sb pty, mod sft, rthy-wxy tex, v calc, scat lse fos frags; fast string bl cut, bright bl-wh ring

MRLST: med-dk gy, sb blk-y-sb pty, mod sft-frm, silty-shy tex, v calc; CHK:lt-med gy, occ dk brn, sb blk-y-sb pty, mod sft, rthy-wxy tex, v calc, scat lse fos frags; fast string bl cut, bright bl-wh ring

MD: 9,822 '  
TVD: 7,280.2 '  
Inclination: 91.5 °  
Azimuth: 179.9 °  
VS: 2,552.83 '



7 °  
2 °

MD: 9.907 '  
TVD: 7,277.76 '  
Inclination: 91.72 °  
Azimuth: 179.68 °  
VS: 2,637.8 '

MD: 9.992 '  
TVD: 7,275.21 '  
Inclination: 91.72 °  
Azimuth: 180.66 °  
VS: 2,722.76 '

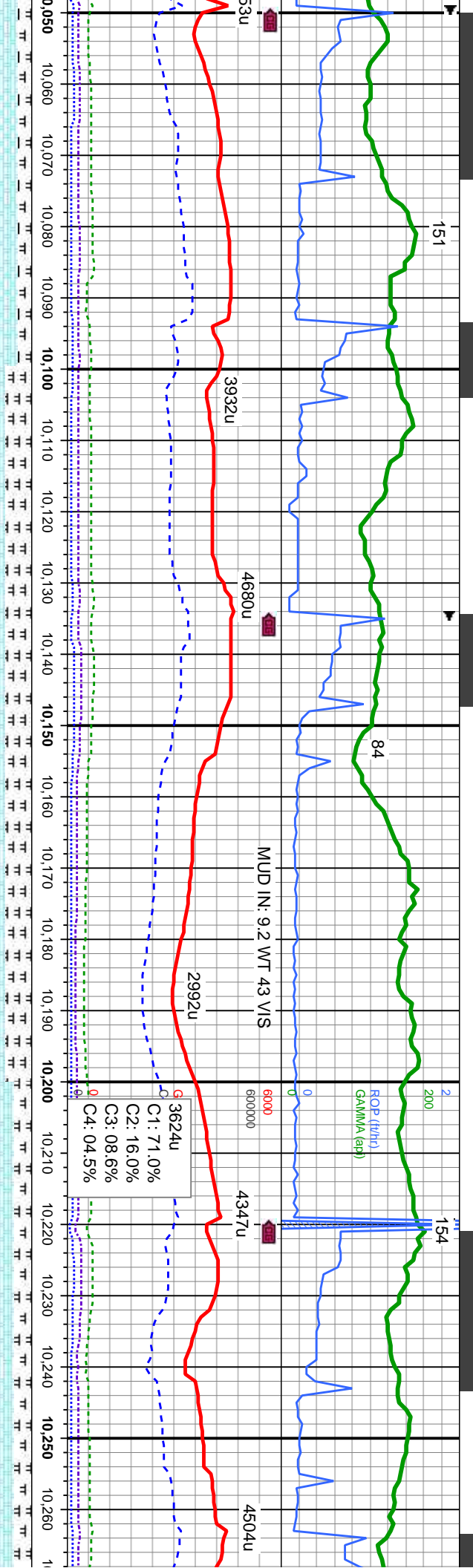
blky-sb plty, mod sft-frm, slty-shy tex, v calc; CHK:lt-med gy, occ dk  
sft, rthy-wxy tex, v calc; scat lse los frags; fast stmg bl cut, bright

CHK:lt-med gy, occ dk brn, sb blk-y-sb plty, mod sft, rthy-wxy tex; MRLST: med-dk gy,  
sb blk-y-sb plty, mod sft-frm, slty-shy tex, v calc; v calc; fast stmg bl cut, bright  
yel-wh ring

CHK:lt-med gy, occ dk brn, sb blk-y-sb plty,  
blk-y-sb plty, mod sft-frm, slty-shy tex, v calc







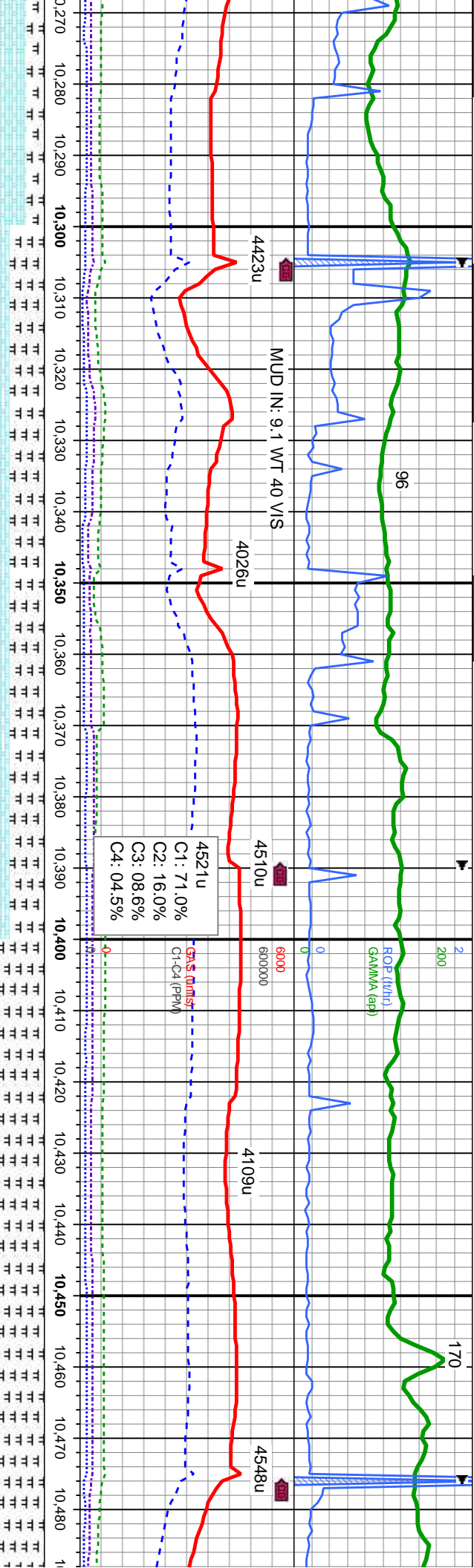
MD: 10,077 '  
TVD: 7,273.09 '  
Inclination: 91.14 °  
Azimuth: 180.48 °  
VS: 2,807.73 '

MD: 10,163 '  
TVD: 7,271.38 '  
Inclination: 91.14 °  
Azimuth: 179.33 °  
VS: 2,893.71 '

MD: 10,248 '  
TVD: 7,270.24 '  
Inclination: 90.4 °  
Azimuth: 179.01 °  
VS: 2,978.69 '

mod sft, rthy-wxy tex; MRLST: med-dk gy, sb	CHK:med-dk gy, occ dk brn & lt gy, sb biky-sb pty, mod sft, rthy-wxy tex; MRLST: med-dk gy, sb biky-sb pty, mod sft-fm, silty-sily tex, v calc; fast stmg bl cut, bright bl-wh ring	CHK:lt-med gy, occ dk brn & dk gy, sb biky-sb pty, mod s med-dk gy, sb biky-sb pty, mod sft-fm, silty-shy tex, v cal
v calc; fast stmg bl cut, bright bl-wh ring	bl-wh ring	bl-wh ring





ft, rthy-wxy tex; MRLST: c; fast stmg bl cut, bright ring	CHK: med-dk gy, occ dk brn & lt gy, sb blk-y-sb pily, mod sft, rthy-wxy tex; MRLST: med-dk gy, sb blk-y-sb pily, mod sft-frn, slty-shy tex, v calc, tr bent; fast stmg bl cut, bright bl-wh ring
MD (ft)	MD (ft)
6500	8000
MD: 10,418' TVD: 7,272.4' Inclination: 88.67° Azimuth: 178.99° VS: 3,148.62'	MRLST: med-dk gy, sb blk-y-sb pily, mod sft-frn, slty-shy tex, v calc; CHK: lt-mec dk brn, sb blk-y-sb pily, mod sft, rthy-wxy tex, v calc; fast stmg bl cut, bright yel-l





DEPTH 12/01/13

ROP (ft/hr)  
GAMMA (api)

133

4413u

3982u

MUD IN: 9.2 WT 41 VIS

4195u

4351u

3004u

3822u  
C1: 70.5%  
C2: 16.2%  
C3: 08.7%  
C4: 04.6%

GAS (units)  
C-G4 (PPM)

MD: 10,503 '  
TVD: 7,273.84 '  
Inclination: 89.38 °  
Azimuth: 178.6 °  
VS: 3,233.59 '

MD: 10,589 '  
TVD: 7,275.05 '  
Inclination: 89.01 °  
Azimuth: 178.72 °  
VS: 3,319.57 '

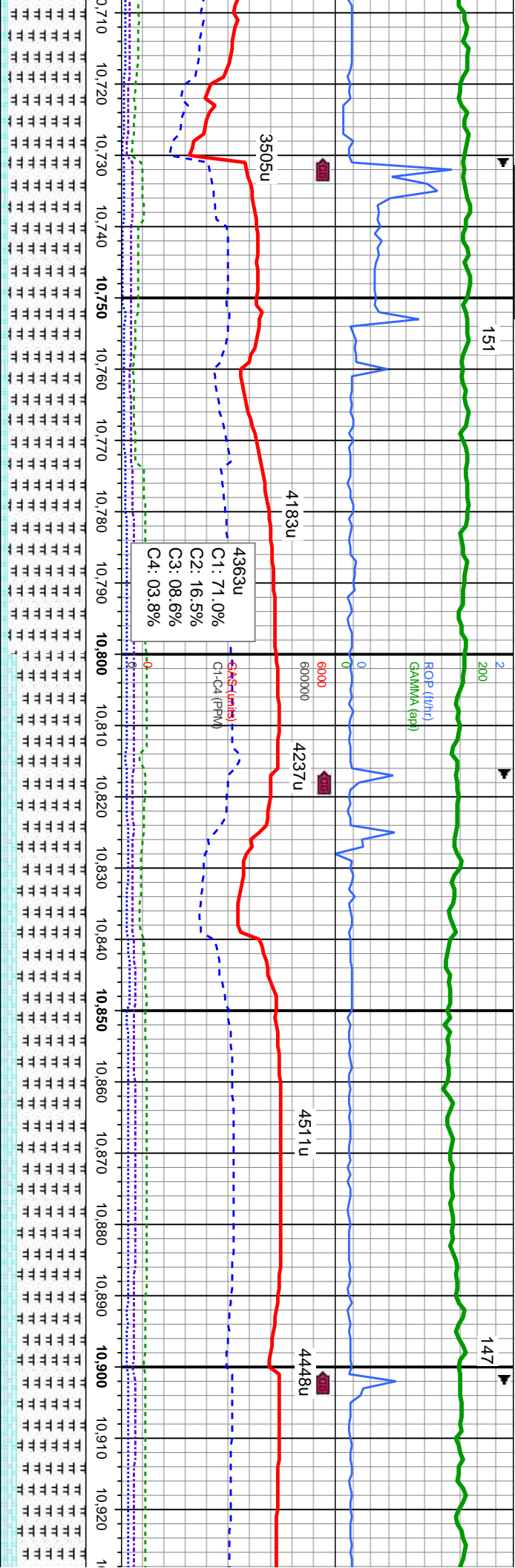
MD: 10,674 '  
TVD: 7,276.61 '  
Inclination: 88.89 °  
Azimuth: 178.87 °  
VS: 3,404.53 '

MRSLT: med-dk gy, sb blk-y-sb pily, mod sft-firm, slty-shy tex, v calc; CHK: med-dk gy, occ dk brn & occ lt gy, sb blk-y-sb pily, mod sft, rthy-wxy tex, v calc; fast sting bl cut, bright yel-wh ring

MRSLT: med-dk gy, sb blk-y-sb pily, mod sft-firm, slty-shy tex, v calc; CHK: med-dk gy, occ dk brn & occ lt gy, sb blk-y-sb pily, mod sft, rthy-wxy tex, v calc; fast sting bl cut, bright yel-wh ring

MRSLT: med-dk gy, sb blk-y-sb pily, mod sft-firm, slty-shy tex, v calc; CHK: med-dk gy, occ dk brn & occ lt gy, sb blk-y-sb pily, mod sft, rthy-wxy tex, v calc; fast sting bl cut, bright yel-wh ring





T: med-dk gy, sb blkly-sb pily, mod sft-firm, silty-shy tex, v calc; CHK: med-dk gy, mod sft, rthy-wxy tex, v calc, scat bent, tr pyr, scat

MD: 10,759 '  
TVD: 7,278.65 '  
Inclination: 88.36 °  
Azimuth: 180.48 °  
VS: 3,489.51 '

MD: 10,844 '  
TVD: 7,280.78 '  
Inclination: 88.76 °  
Azimuth: 179.94 °  
VS: 3,574.48 '

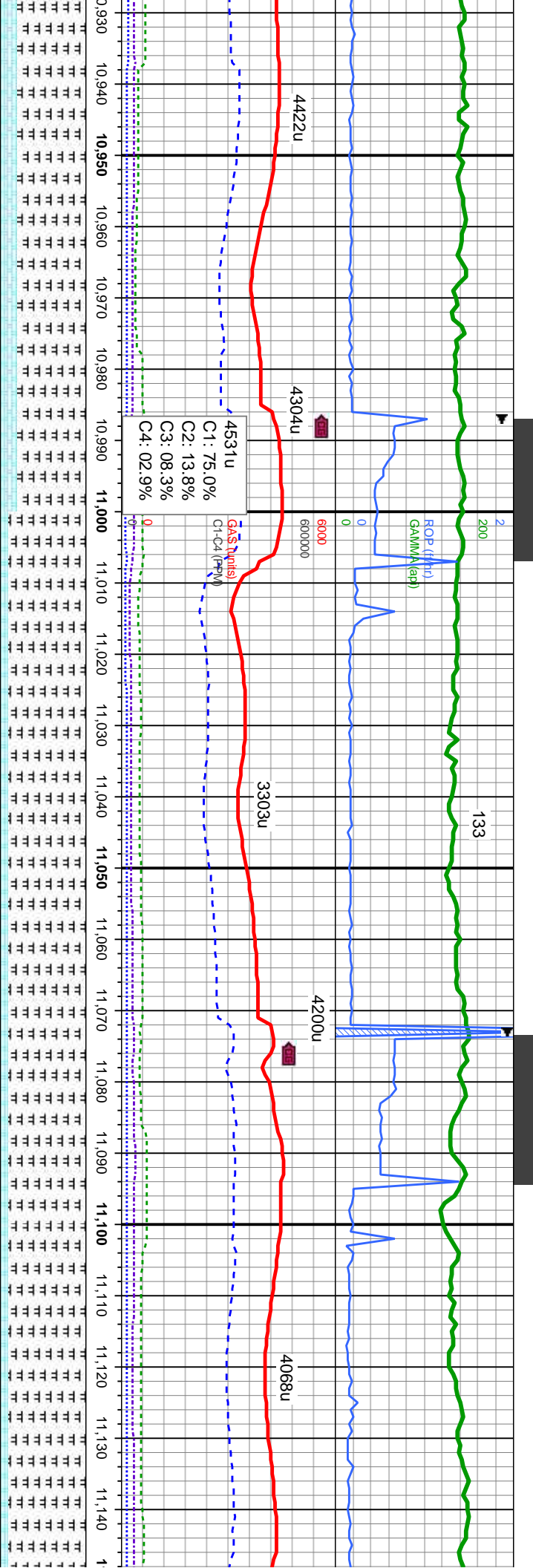
MD: 10,900 '  
TVD: 7,280.78 '  
Inclination: 88.76 °  
Azimuth: 179.94 °  
VS: 3,574.48 '

MRLST: med-dk gy, sb blkly-sb pily, mod sft-firm, silty-shy tex, v calc; CHK: med-dk gy, occ dk brn & occ lt gy, sb blkly-sb pily, mod sft, rthy-wxy tex, v calc, scat bent, tr pyr, scat lse fos frags; fast stmg bl cut, bright bl-wh ring

MRLST: med-dk gy, occ dk brn & occ pyr, scat lse fos frags







3330 ' TVD: 7,282.11 ' Inclination: 89.47 ° Azimuth: 180.21 ° VS: 3,700.47 '

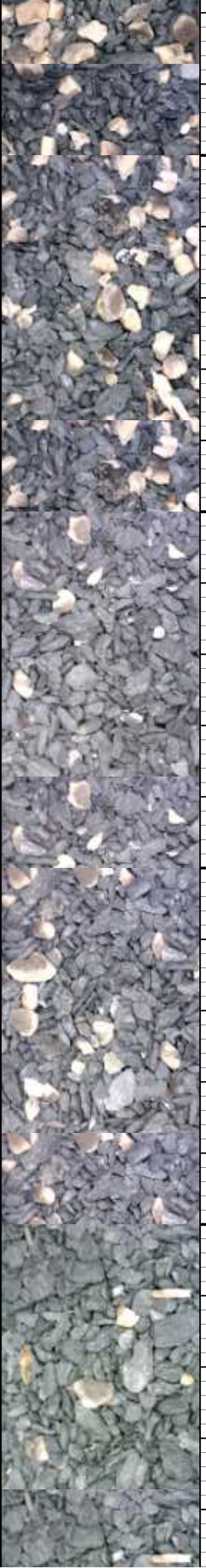
MD: 11,015 ' TVD: 7,282.6 ' Inclination: 89.87 ° Azimuth: 181.12 ° VS: 3,745.46 '

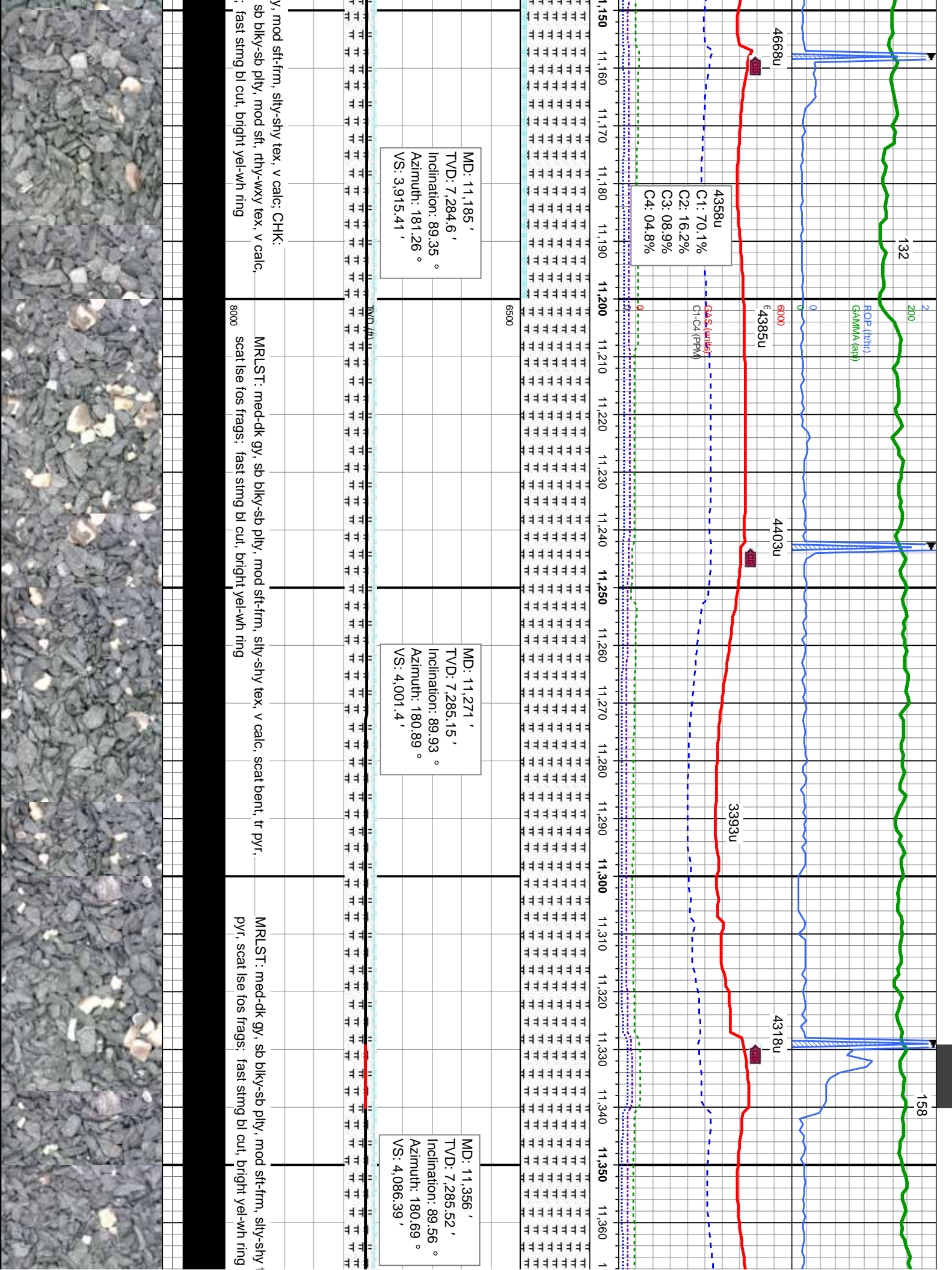
MD: 11,100 ' TVD: 7,283.41 ' Inclination: 89.04 ° Azimuth: 181.18 ° VS: 3,830.44 '

sb blk-y-sb pily, mod sft-frn, silty-shy tex, v calc; CHK: med-dk gy, occ lt gy, sb blk-y-sb pily, mod sft, rthy-wxy tex, v calc, scat bent, tr pyr, scat lse fos frags; fast stmg bl cut, bright yel-wh ring

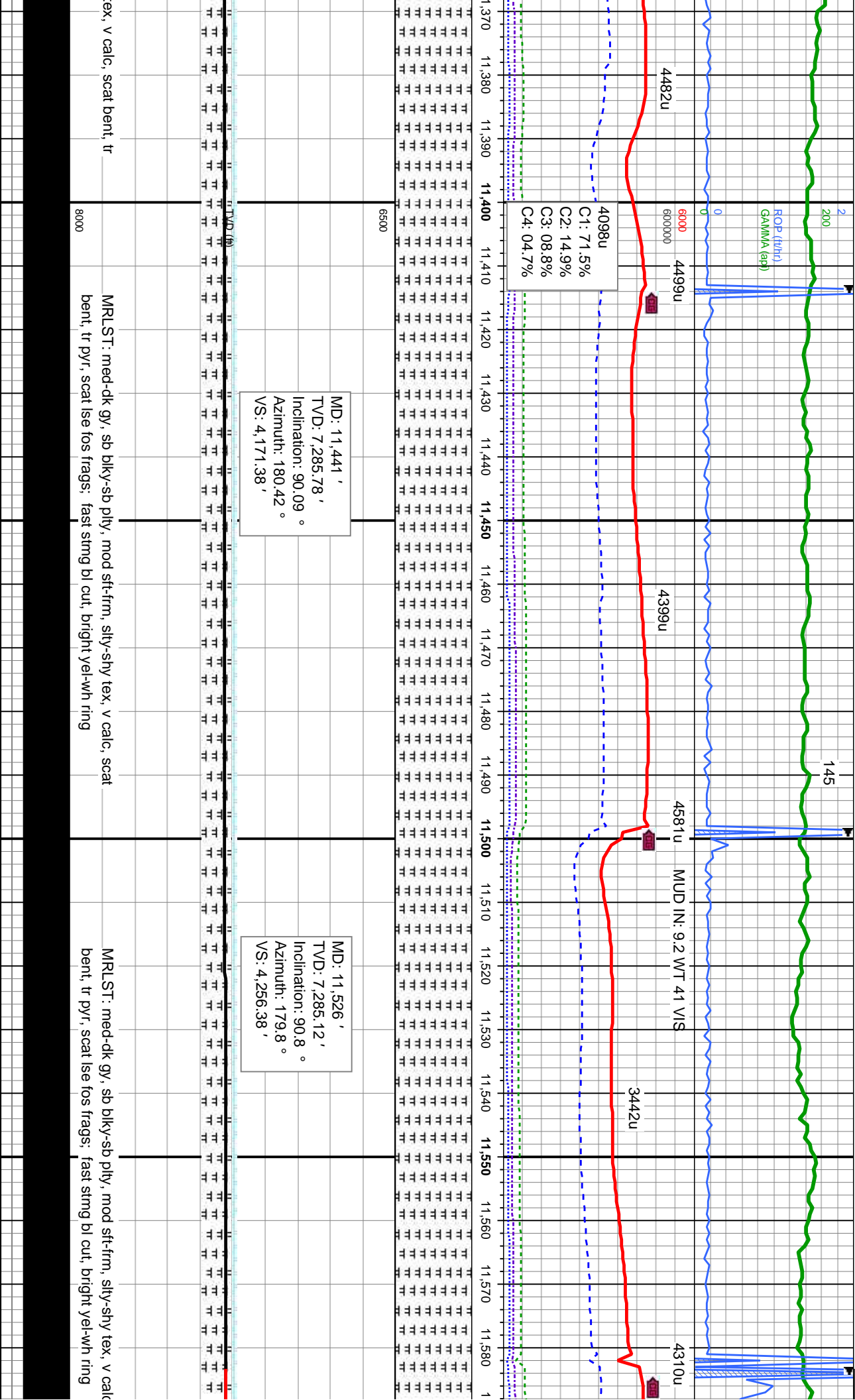
MRSLST: med-dk gy, sb blk-y-sb pily, mod sft-frn, silty-shy tex, v calc; CHK: med-dk gy, occ dk brn & occ lt gy, sb blk-y-sb pily, mod sft, rthy-wxy tex, v calc, scat bent, tr pyr, scat lse fos frags; fast stmg bl cut, bright yel-wh ring

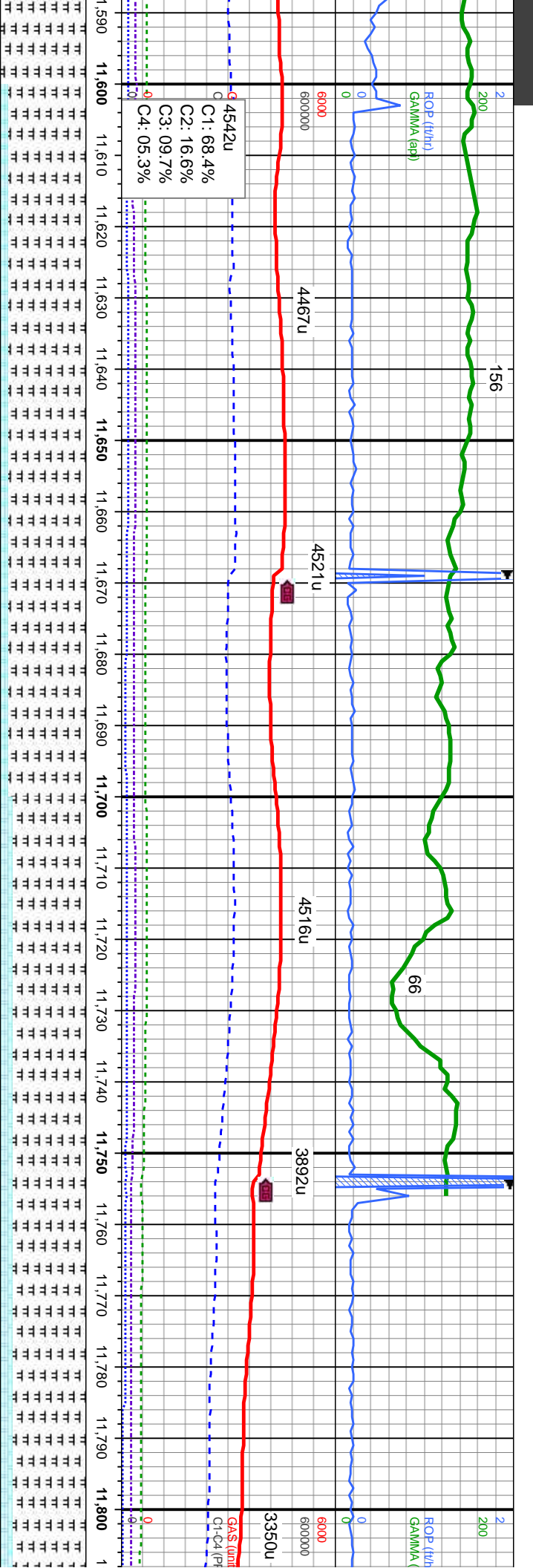
MRSLST: med-dk gy, sb blk-y-sb pily, mod sft-frn, silty-shy tex, v calc; CHK: med-dk gy, occ dk brn & occ lt gy, sb blk-y-sb pily, mod sft, rthy-wxy tex, v calc, scat bent, tr pyr, scat lse fos frags











MD: 11,697 '  
TVD: 7,282.78 '  
Inclination: 90.77 °  
Azimuth: 178.64 °  
VS: 4,427.34 '

MD: 11,754 '  
TVD: 7,281.56 '  
Inclination: 91.69 °  
Azimuth: 178.81 °  
VS: 4,484.32 '

8000	MRSLST: med-dk gy, sb blkly-sb pily, mod sft-firm, silty-shy tex, v calc; CHK: med-dk gy, occ dk brn & occ lt gy, sb blkly-sb pily, mod sft, rthy-wxy tex, v calc, scat bent, tr pyr, scat	8000	MRSLST: med-dk gy, sb blkly-sb pily, mod sft-firm, silty-shy tex, v calc; CHK: med-dk gy, occ dk brn & occ lt gy, sb blkly-sb pily, mod sft, rthy-wxy tex, v calc, scat bent, tr pyr, scat ise fms frags; fast sting bl cut, bright yel-wh ring	8000
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