



Scale: 5" / 100'
Measured Depth Log

Well Name Wells Ranch AE32-620 (Horz)

Location SWSW 32 6N 62W

State COLORADO

County WELD

Country USA

Rig Number H&P #273

API Number 05-123-41785

Field WATTENBERG

Region DJ BASIN

Drilling Completed 9/25/2015

Spud Date 9/17/2015

Surface Coordinates Lat: 40.43785

Long: -104.35449

690' FSL

650' FWL

Bottom Hole Coordinates 660' FSL
535' FEL

Ground Elevation 4719'

K.B. Elevation 4743'

Logged Interval 800' To 16116'

Total Depth 16116'

Formation CODELL SANDSTONE

Type of Drilling Fluid H2O, LSND

Operator

Company Noble Energy Inc.

Address 1625 BROADWAY
DENVER, CO 80202
(303) 228-4000

Geologist

Name Bryan Kaproth-Gerecht

Company Noble Energy Inc.

Address 1625 BROADWAY
DENVER, CO 80202
(303) 228-4000



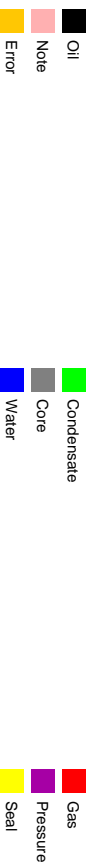
Other

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

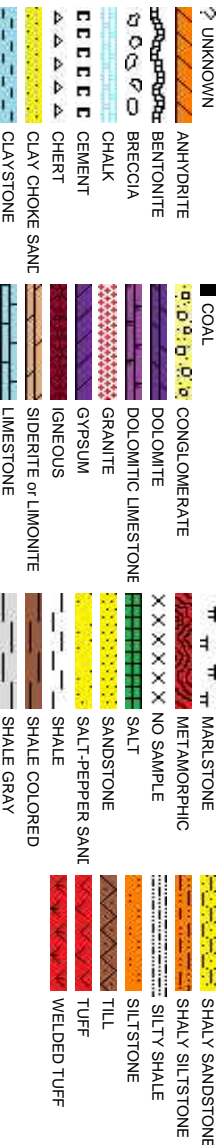
Loggers on location Michael Anderson
Andrew Martens

Equipment on Location Bloodhound #331
Computer #72A

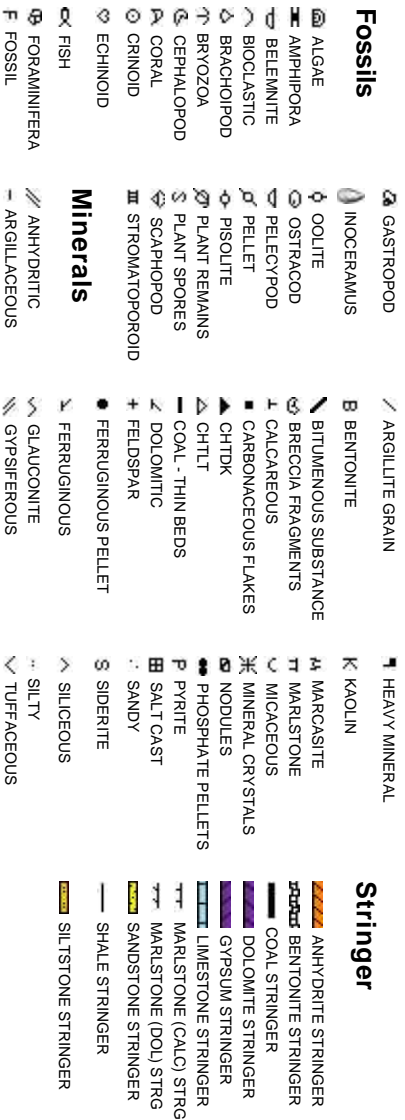
Zone Color Coding



Rock Types



Accessories



Engineering

Oil Show
PINPOINT
VUGGY

Porosity
CONNECTION (DOWN)
CONNECTION GAS
CONNECTION GAS (LEFT)
FENESTRAL
FRACTURE
INTERCRYSTALLINE
INTEROOLITIC
MOLDIC
ORGANIC

DEAD
EVEN
QUESTIONABLE
SPOTTED STAINING
CONNECTION (UP)
CONNECTION GAS (LEFT)
CONNECTION GAS (RIGHT)
FENESTRAL
FRACTURE
INTERCRYSTALLINE
INTEROOLITIC
MOLDIC
ORGANIC

Other Symbols

 DST INTERVAL  WIRELINE TESTED - LEFT **E** EARTHY

 FAULT  WIRELINE TESTED - RT **FX** FINELYXLN

 FORMATION TOP  DRILL STEM TEST **GS** GRAINSTONE

 GAS SHOW  **MINDEPTH** MN DEPTH **L** LITHOGRAPHIC


 OIL SHOW **MX** MICROXLN


 **MINDEPTH** MN DEPTH UP **MS** MUDSTONE

Rounding

 **MINDEPTH** MN DEPTH (DOWN) **A** ANGULAR **PS** PACKSTONE

 NORMAL FAULT **R** ROUNDED **WS** WACKSTONE

 OVERTURNED STRATA **B** SUBANG

 REVERSE FAULT **rn** SUBRND

Sorting


 CASING **M** MODERATE

Textures

 SIDEWALL CORE (LEFT) **P** POOR

 SIDEWALL CORE (RIGHT) **BS** BOUNDSTONE **W** WELL

 SLIDE **C** CHALKY

 SURVEY **CX** CRYPTOXLN

Slide/Rotate

ROP
ROP

ROP From Pason

144

MUD WT: 10.45 VIS: 34

523

ROP (ft/hr)

229

Total Gas & Chromatograph

Gas F from Bloodhound Total
& Gas Chromatograph

Reset Log Calculation

Generator Power Down

Begin 100' Sample Interval

Gas (units)
C1-C4 (ppm)

1072u

C1

C2

C3

C4

Depth Labels

% Lith

GAMMA
GR

Gamma Data From Sperry MWD

107

200 114
GR (api)

6000

Well Bore
TVD

LOG CONTINUED FROM:
WELLS RANCH AE32-620 (VERT), mplot
Logging of the Curve/Horizontal
by Columbine Logging Inc.

MD: 6,182'
TVD: 6,151.5'
Inclination: 16.49°
Azimuth: 93.71°
VS: -349.12'

TVD (ft)

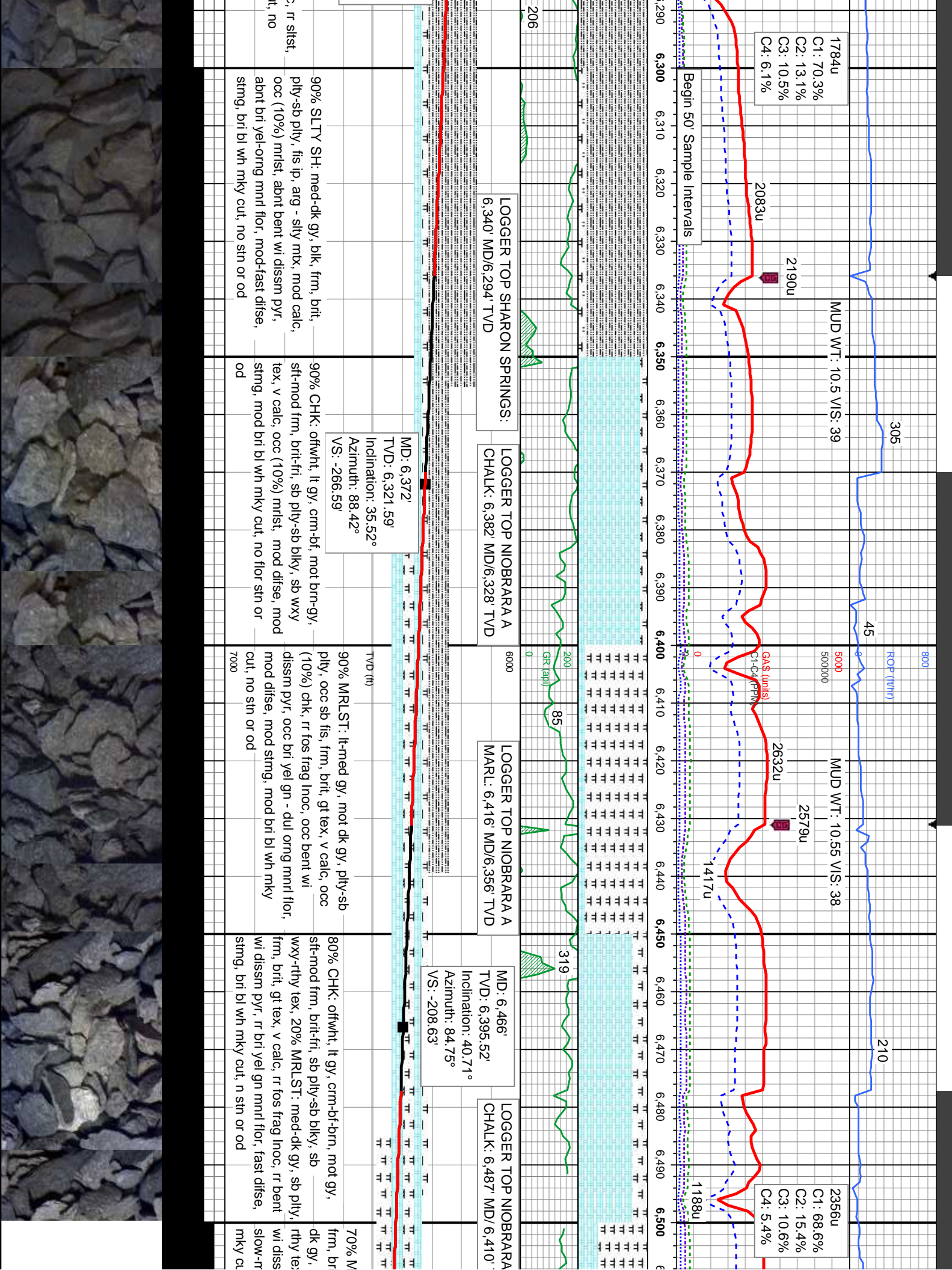
MD: 6,277'
TVD: 6,239.98'
Inclination: 25.87°
Azimuth: 92.92°
VS: -314.97'

Oil Show

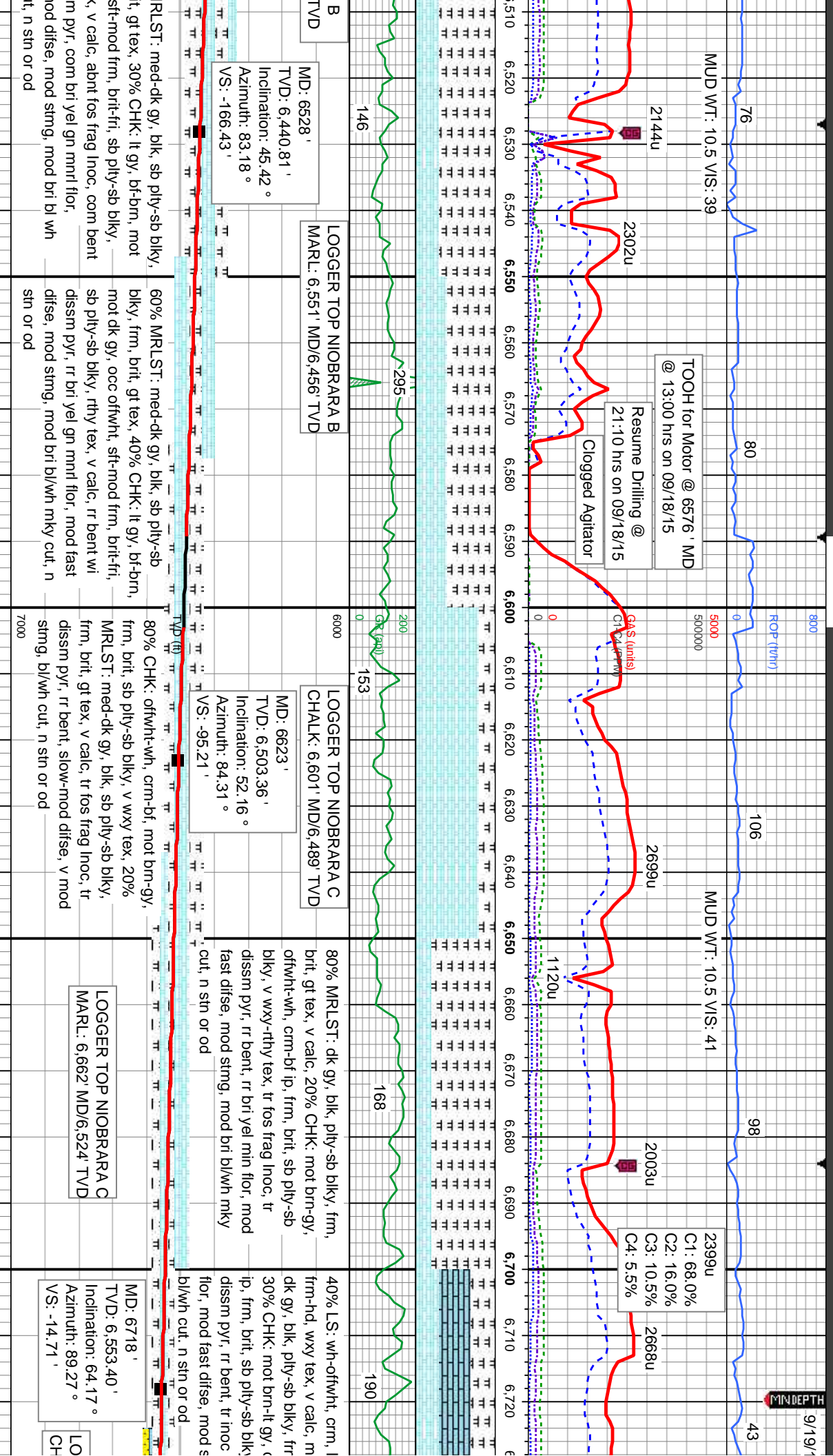
Oil Show

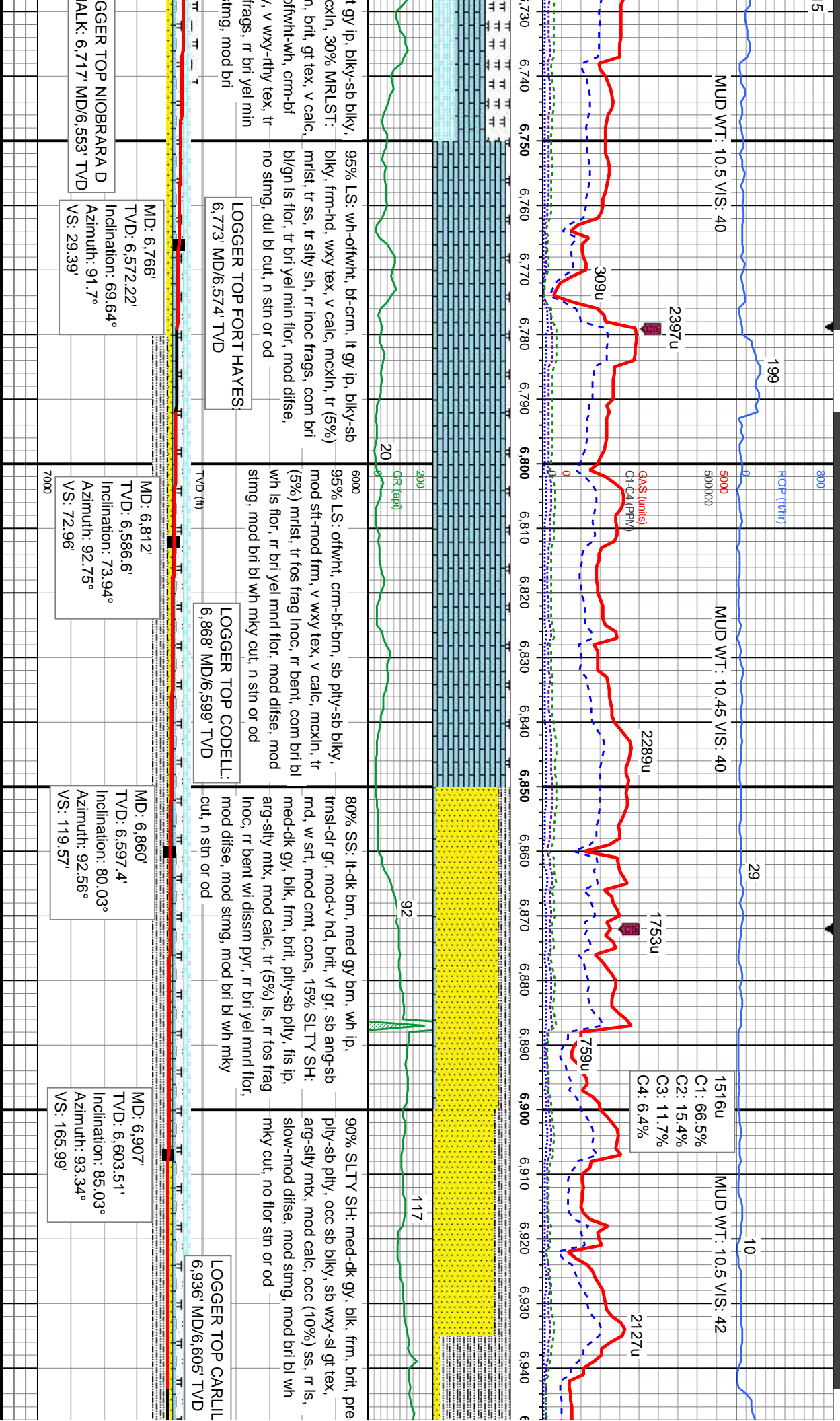
Images

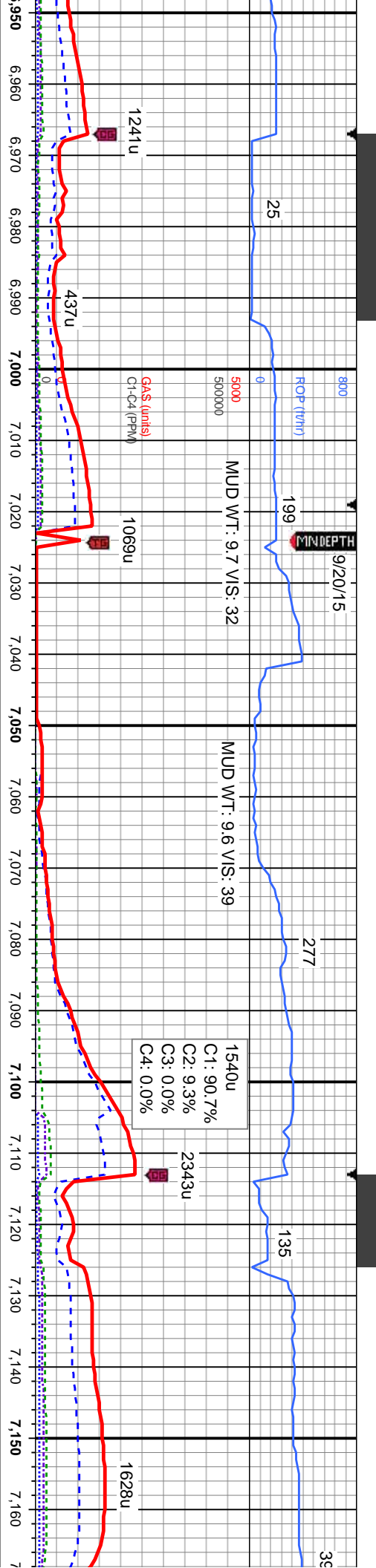




MINDEPTH







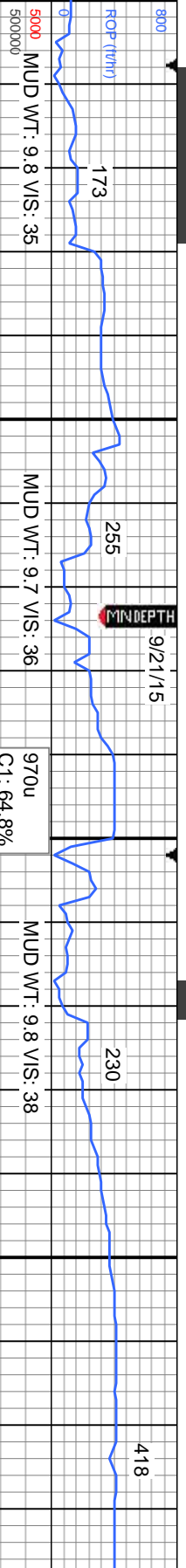
100% SLTY SH: med-dk gy, blk, frm, brit, pred pty-sb pty, occ sb blk, sb wxy-sl gt tex, arg-sly mtx, mod calc, rr ss, slow-mod difse, mod stmg, mod bri bl wh mky cut, no flr sin or od	6500	146	0	86	131	122	80% SS: lt-dk bl trns-clr gr, mod rmd, w srt, mod med-dk gy, blk, frm, brit, pty-sb pty, arg-sly mtx, mod calc, mod stmg, mod bri bl wh mky cut, n sin or od
100% SLTY SH: med-dk gy, blk, frm, brit, pred pty-sb pty, occ sb blk, sb wxy-sl gt tex, arg-sly mtx, mod calc, rr ss, rr ls, com dissim pyr, rr bent, slow-mod difse, mod stmg, mod bri bl wh mky cut, no flr sin or od	6500	86	0	86	131	122	80% SS: lt-dk bl trns-clr gr, mod rmd, w srt, mod med-dk gy, blk, frm, brit, pty-sb pty, arg-sly mtx, mod calc, mod stmg, mod bri bl wh mky cut, n sin or od
65% SLTY SH: med-dk gy, blk, frm, brit, pred pty-sb pty, occ sb blk, sb wxy-sl gt tex, arg-sly mtx, mod calc, 35% SS: lt-dk brn, med gy brn, wh ip, trns-clr gr, mod-v hd, brit, vf gr, sb ang-sb rmd, w srt, mod cons,slow-mod difse, mod stmg, mod bri bl wh mky cut, no flr sin or od	6500	131	0	131	131	122	70% SS: lt-dk brn, med gy brn, wh ip, trns-clr gr, mod-v hd, brit, vf gr, sb ang-sb rmd, w srt, mod cons, 30% SLTY SH: med-dk gy, blk, frm, brit, pty-sb pty, arg-sly mtx, mod calc, mod stmg, mod bri bl wh mky cut, n sin or od

MD: 6,963' TVD: 6,606.46' Inclination: 88.92° Azimuth: 93.6° VS: 221.67'	Bit #: 3 Type: HDBS SFD55 Size: 6.12 Depth In: 7.024' Jets: 5x13 S/N: 12728426	TD Intermediate @ 7024' MD @ 12:06 hrs on 09/19/15	MD: 7045' TVD: 6,606.00' Inclination: 91.72° Azimuth: 89.49° VS: 398.48'	MD: 7140' TVD: 6,604.83' Inclination: 89.69° Azimuth: 88.22° VS: 398.48'
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9/21/15

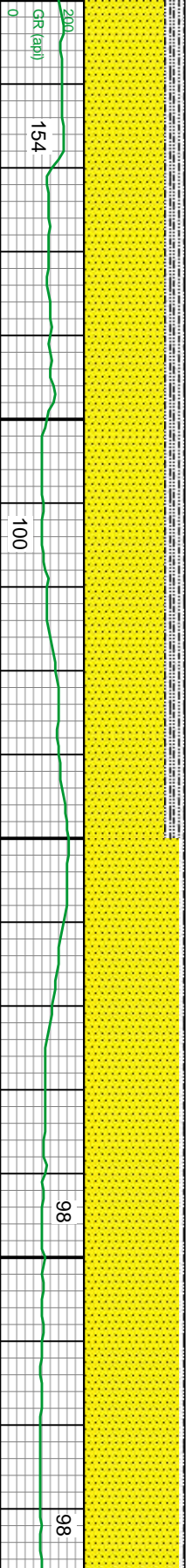
MINDEPTH



ROP (ft/hr)
5000
500000
MUD WT: 9.8 VIS: 35
MUD WT: 9.7 VIS: 36
MUD WT: 9.8 VIS: 38

GAS (units)
C1-C4 (PPM)
217u
165u
1053u

970u
C1: 64.8%
C2: 16.2%
C3: 12.6%
C4: 6.4%

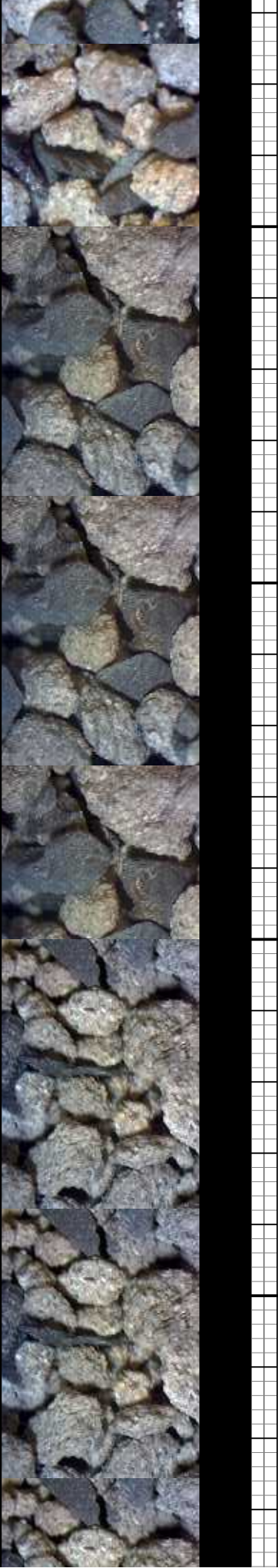


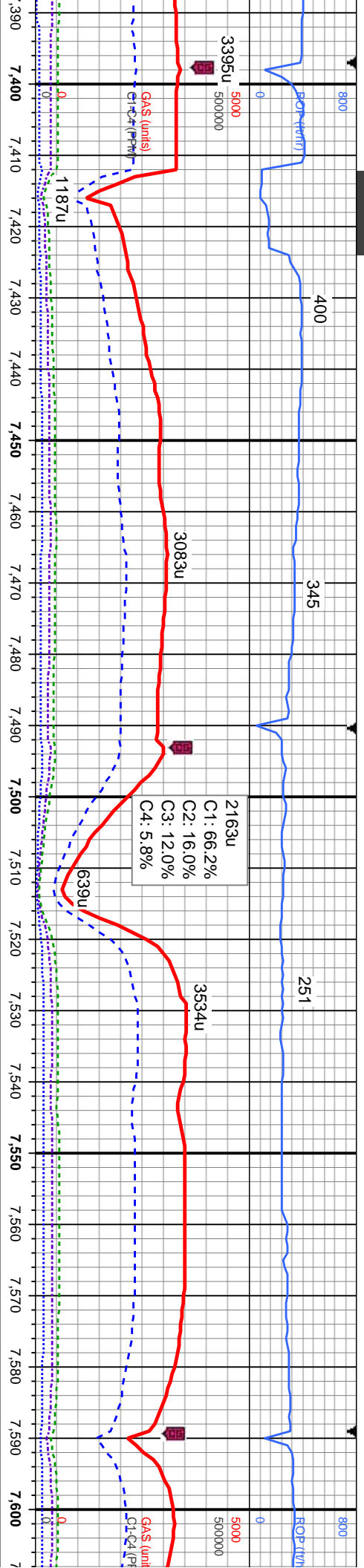
GR (api)
200
154
100
98
98

6500
80% SS: lt-dk brn, med gy brn, wh ip, trns-l-clr gr, mod-v hd, brit, vf gr, sb ang-sb md, w srt, mod cnt, cons, 20% SLTY SH: med-dk gy, blk, frm, brit, ply-sb ply, fis ip, arg-sily mtx, tr
dissm pyr, mod calc, mod difse, mod stmg, mod bri bl wh mky cut, n stn or
95% SS: lt-dk brn, med gy brn, wh ip, trns-l-clr gr, mod-v hd, brit, vf gr, sb ang-sb r
mod cnt, cons, tr (5%) sily sh, tr dissm pyr, mod calc, mod difse, mod stmg, mod
wh mky cut, n sin or

MD: 7,235'
TVD: 6,603.66'
Inclination: 91.73°
Azimuth: 88.22°
VS: 493.47'

MD: 7,329'
TVD: 6,599.84'
Inclination: 92.93°
Azimuth: 88.60°
VS: 587.39'





2163u
C1: 66.2%
C2: 16.0%
C3: 12.0%
C4: 5.8%

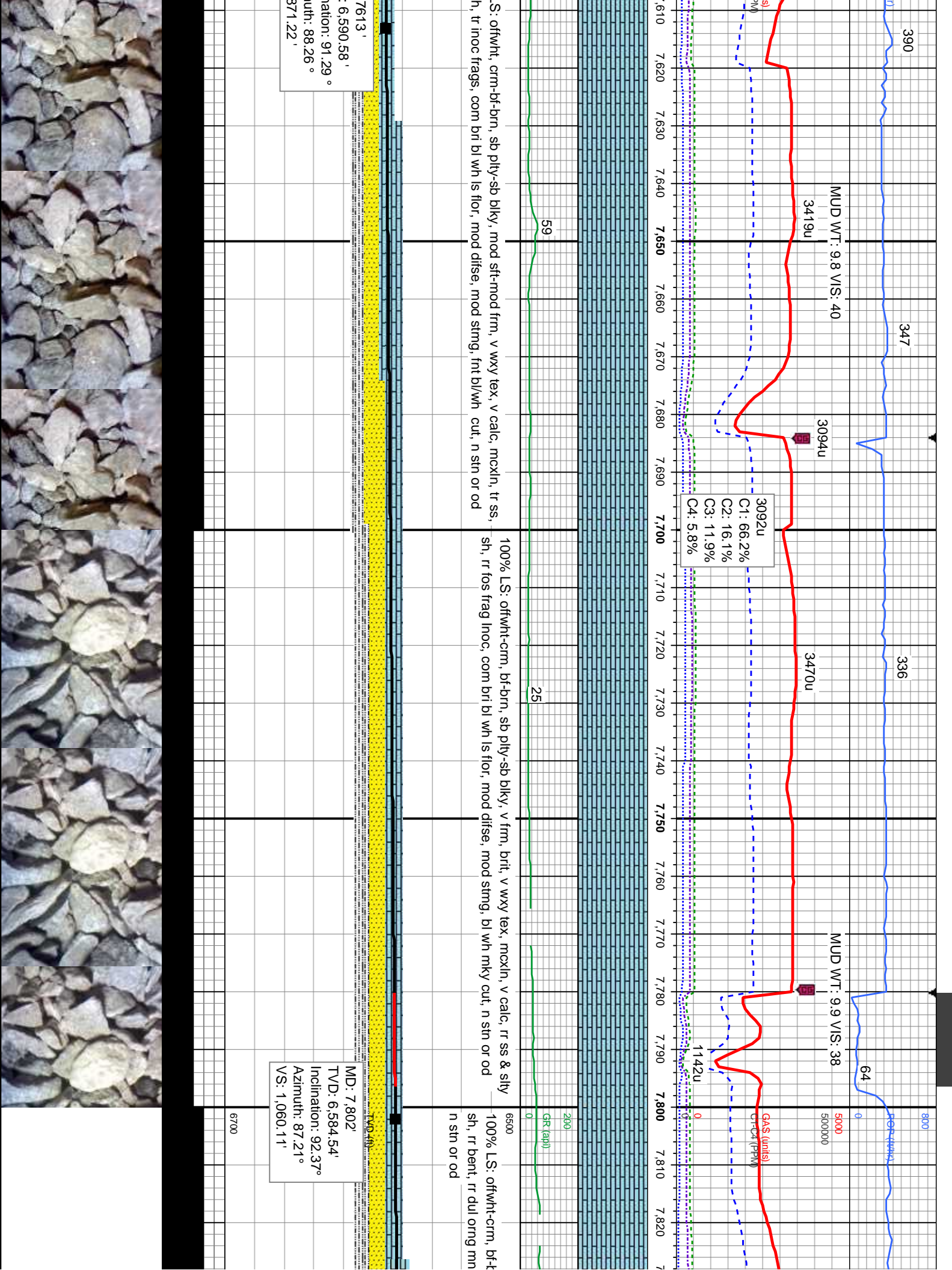
85% SS: lt-dk brn, bf, med gy brn, wh ip, trns-l-clr gr, mod-v hd, brit, vf gr, sb ang-sb mdl, w
srt, mod cmt, cons, tr (10%) ls, tr (5%) silty sh, tr dissim pyr, mod calc, mod fast difse, v mod
stmg, mod bri bl wh mky cut, n stn or

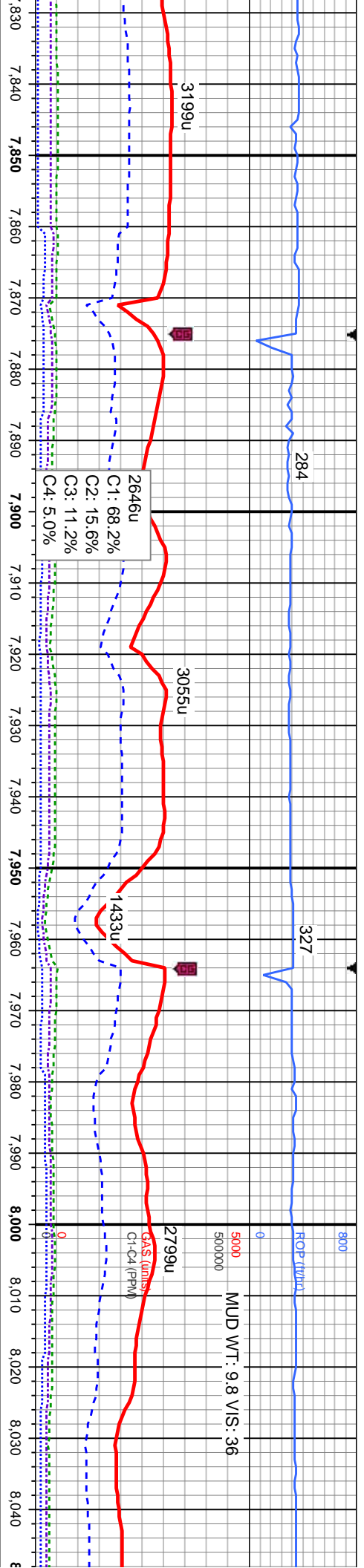
90% LS: offwht, crm-bl-brn, sb ply-sb blkly, mod sft-mod frm, v wxy tex, v calc, mckln, tr
(5%) ss, tr (5%) silty sh, tr inoc frags, com bri bl wh ls flur, mod difse, mod stmg, mod bri bl
wh mky cut, n sin or od

MD: 7519'
TVD: 6,592.74'
Inclination: 91.35°
Azimuth: 88.39°
VS: 777.25'

MD: 7519'
TVD: 6,592.74'
Inclination: 91.35°
Azimuth: 88.39°
VS: 777.25'







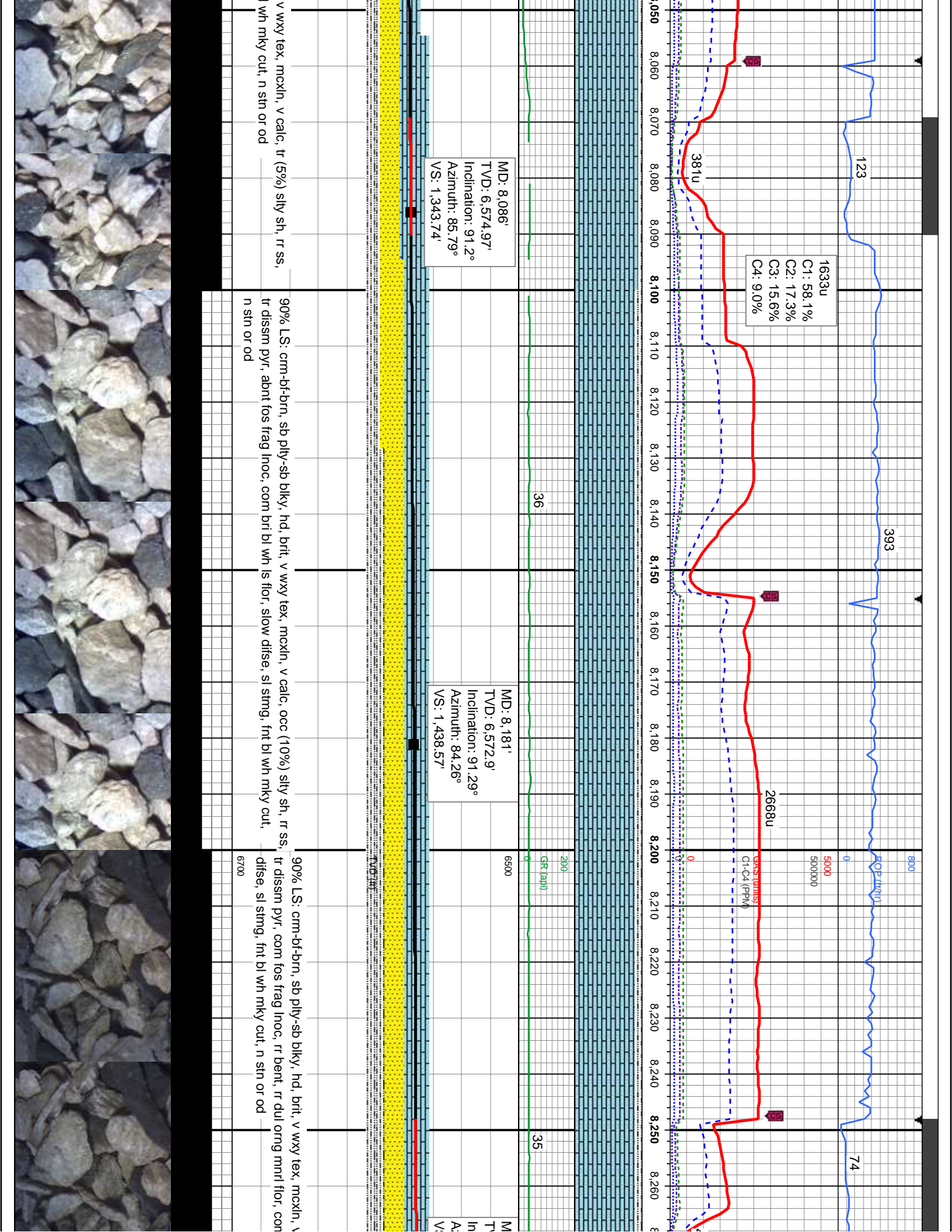
95% LS: offwhit-crm, bf-brn, sb pily-sb blkly, v frm, brit, v wxy tex, mckln, v calc, tr (5%) silty sh, r ss, r bent, r dul onng mnrl flor, com bri bl wh ls flor, mod difse, mod string, bl wh mky cut, n sin or od

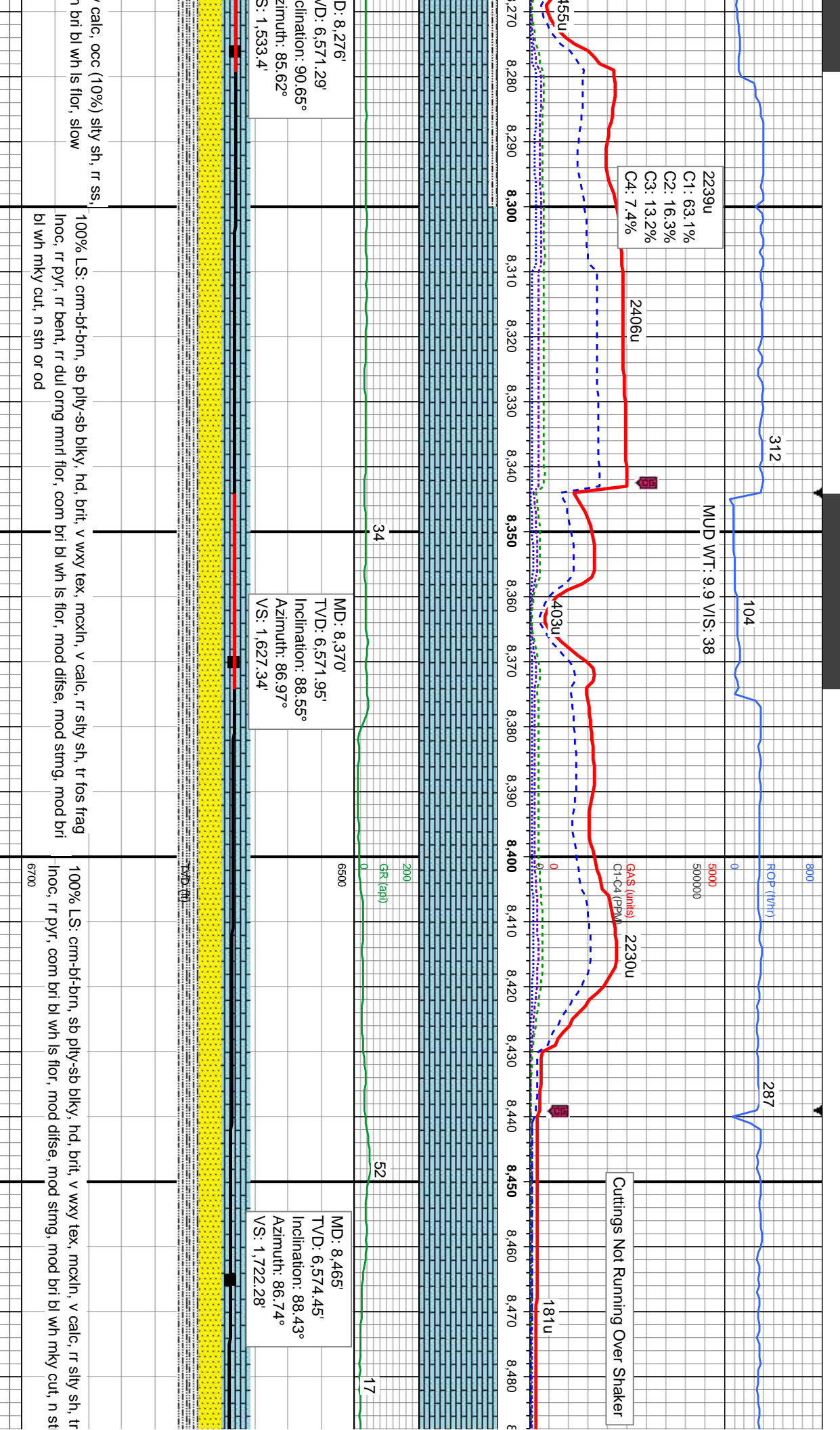
MD: 7,897'
TVD: 6,581.35'
Inclination: 91.48°
Azimuth: 85.8°
VS: 1,155.01'

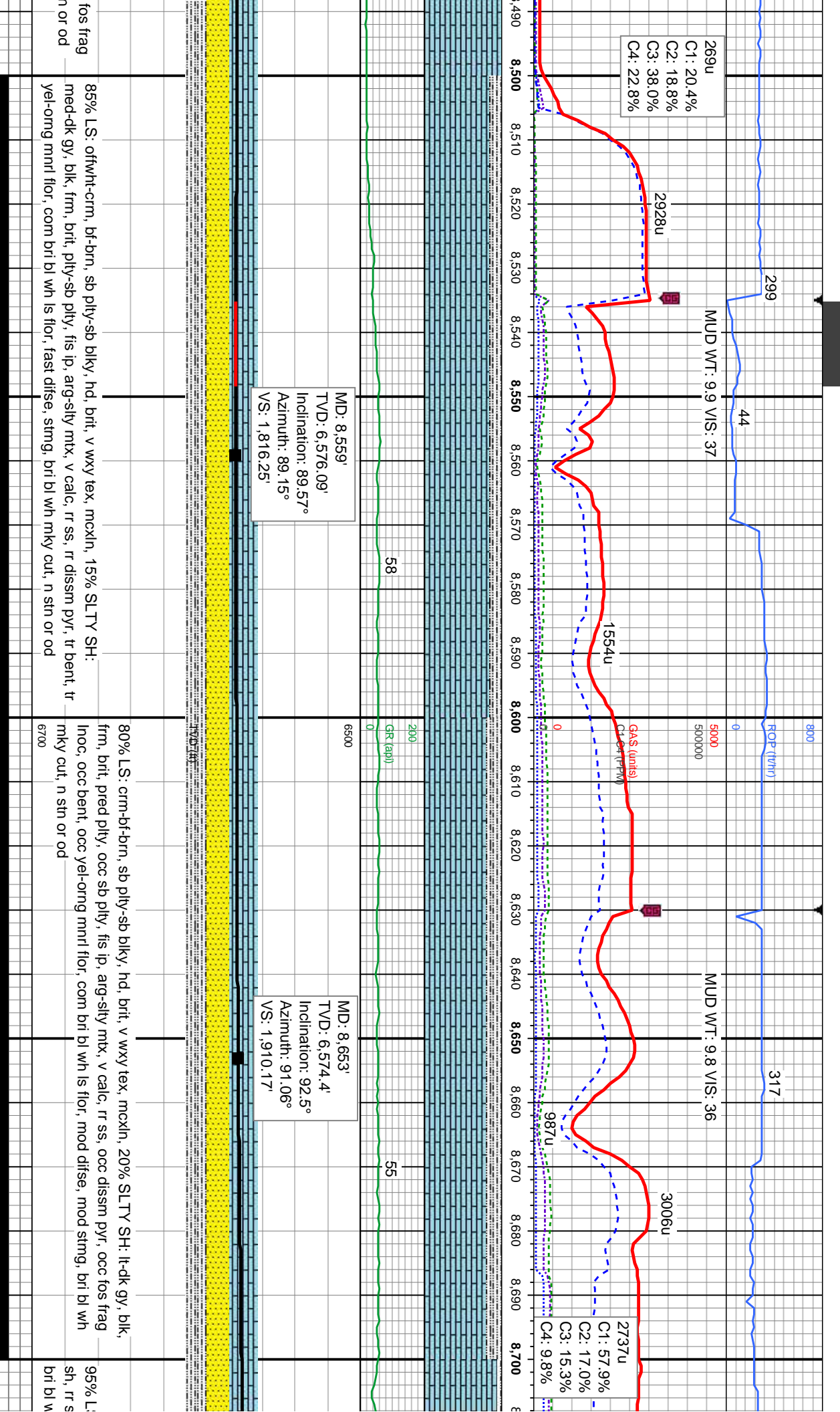
MD: 7,992'
TVD: 6,578.03'
Inclination: 92.53°
Azimuth: 85.82°
VS: 1,249.87'

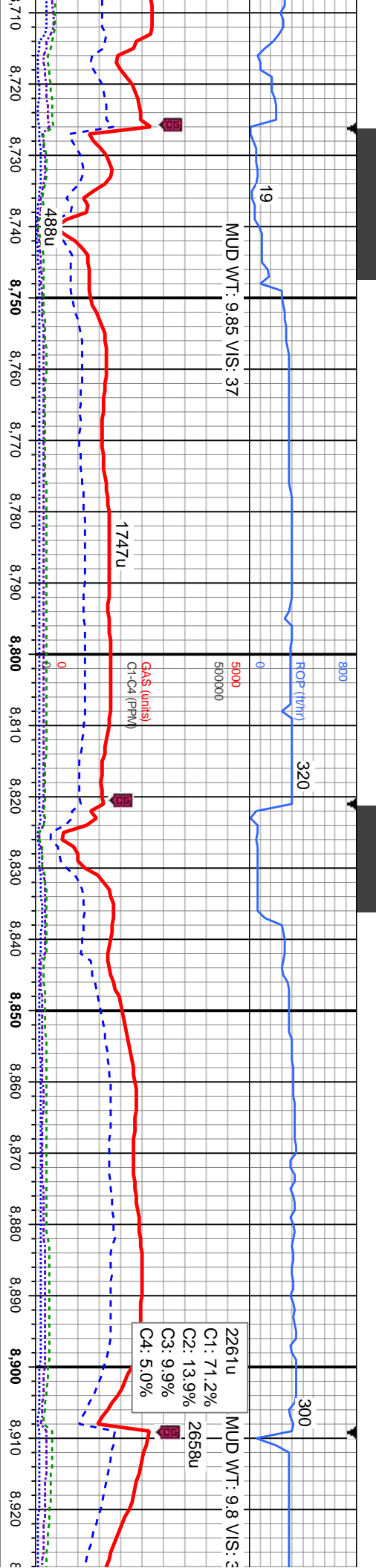
95% LS: crm-bf-brn, sb pily-sb blkly, hd, brit, com bri bl wh ls flor, mod difse, mod string, b











MD: 8,748'
TVD: 6,570.05'
Inclination: 92.74°
Azimuth: 90.39°
VS: 2,004.98'

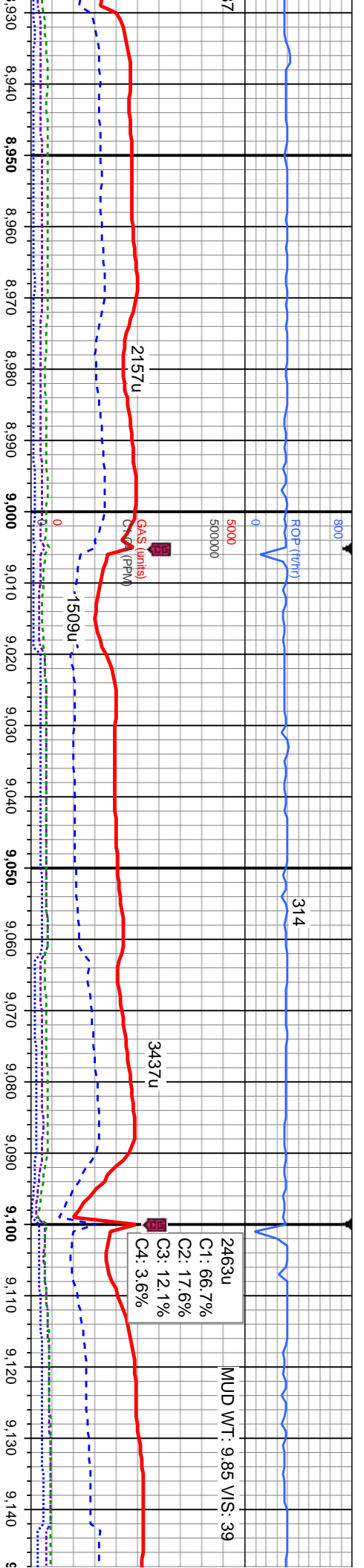
MD: 8,842'
TVD: 6,568.59'
Inclination: 89.05°
Azimuth: 89.6°
VS: 2,098.9'

S: wh-offwht, crm-bf-bm, sb pily-sb blkly, hd, brit, v wxy tex, mckln, v calc, tr (5%) slty
s, occ dissm pyr, occ fos frag lnoc, abnt bent, abnt bri yel - dul orng mnrl flr, com
hls flr, slow dfse, sl string, fnt bl wh cut, n stn or od

100% LS: wh-offwht, crm-bf, sb pily-sb blkly, hd, brit, v wxy tex, mckln, v calc, rr slty sh & ss,
tr fos frag lnoc, rr bent, rr dul orng mnrl flr, com bri bl wh ls flr, slow dfse, sl string, bl wh
cut, n stn or od

100% LS: wh-offwht, crm
frag lnoc, rr bent w/ dissr
string, bl wh cut, n stn or c





MD: 8,937'
VD: 6,570.6'
Inclination: 88.52°
Azimuth: 89.32°
S: 2,193.86'

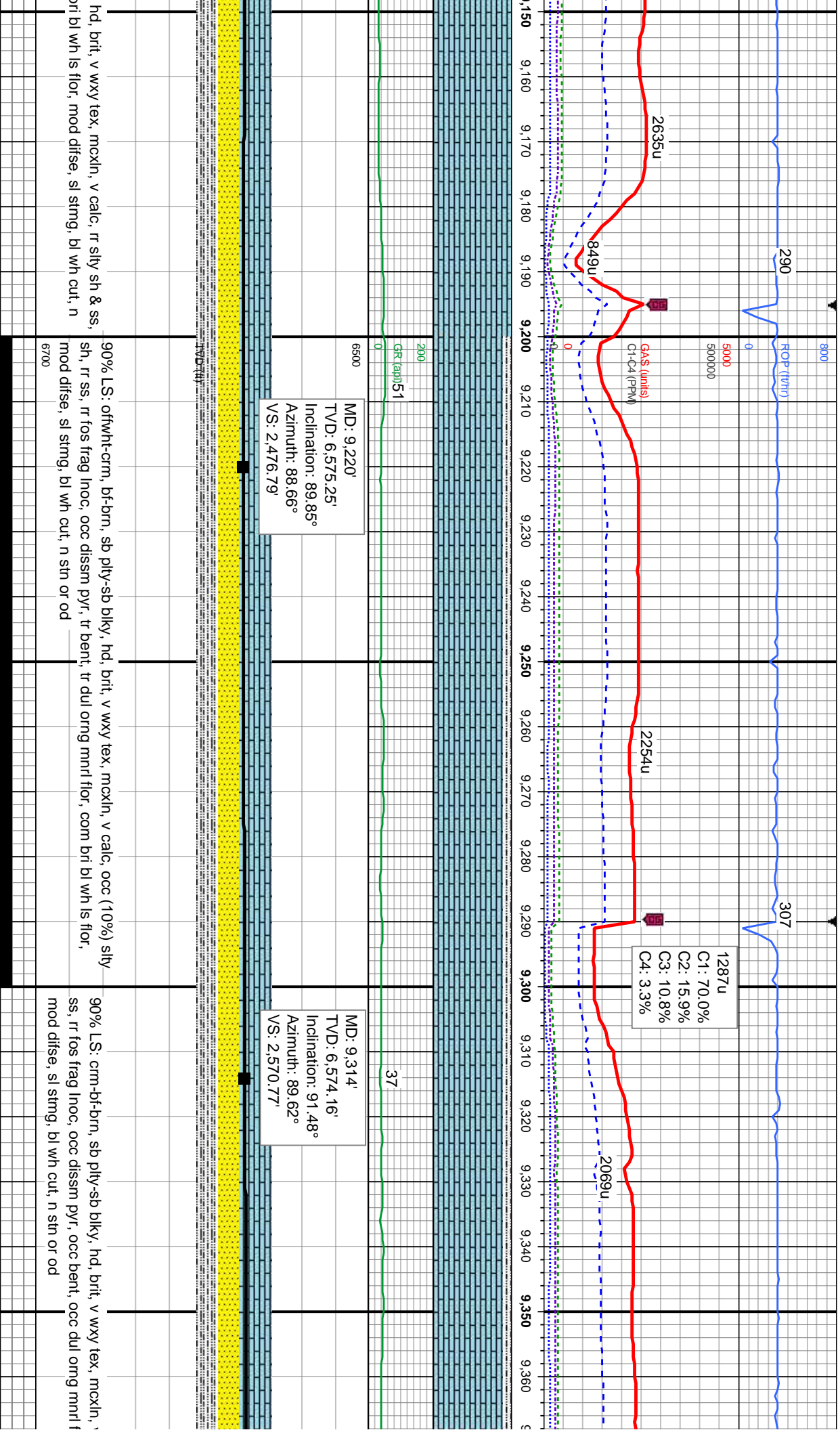
MD: 9,031'
VD: 6,572.87'
Inclination: 88.71°
Azimuth: 89.03°
VS: 2,287.82'

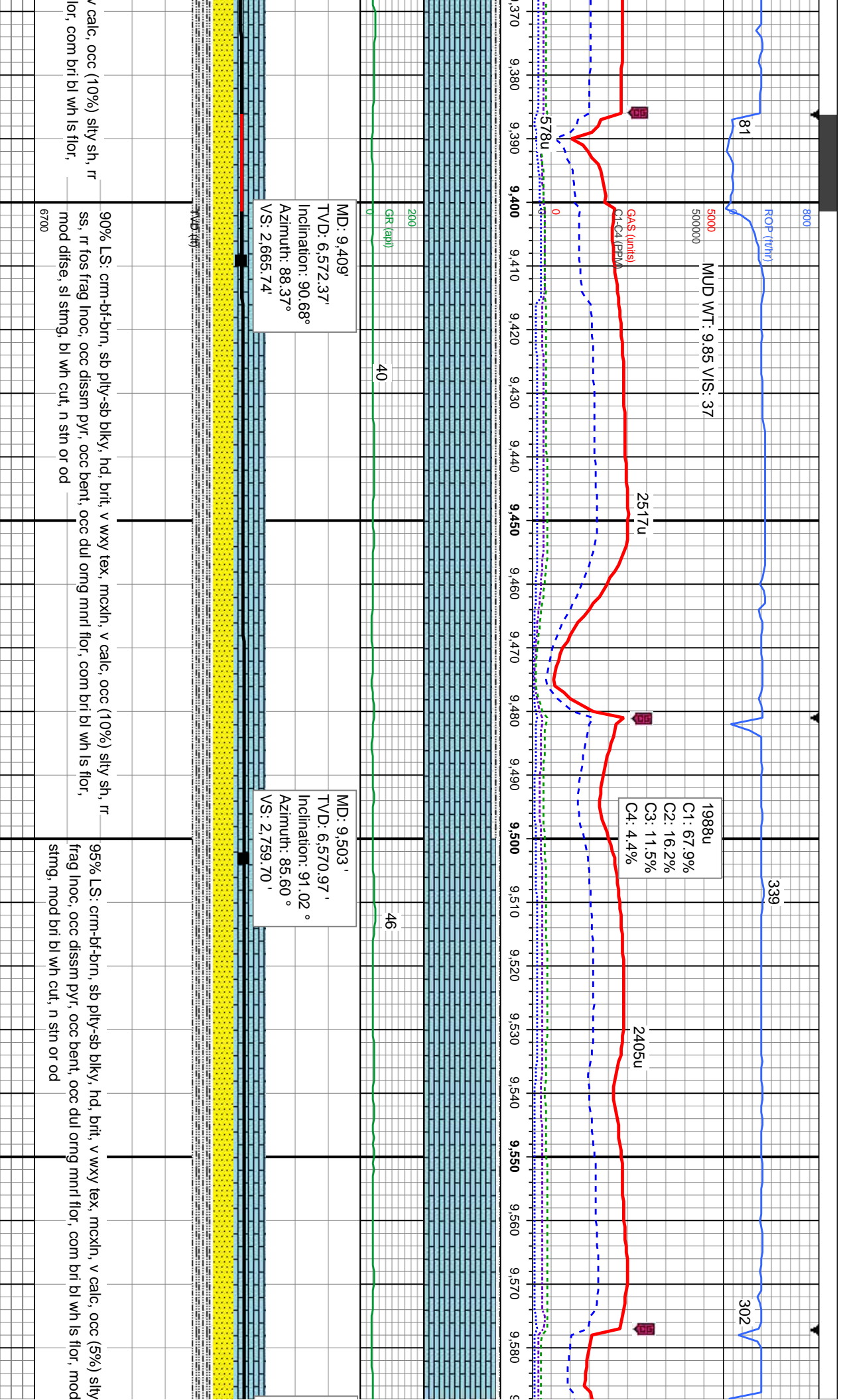


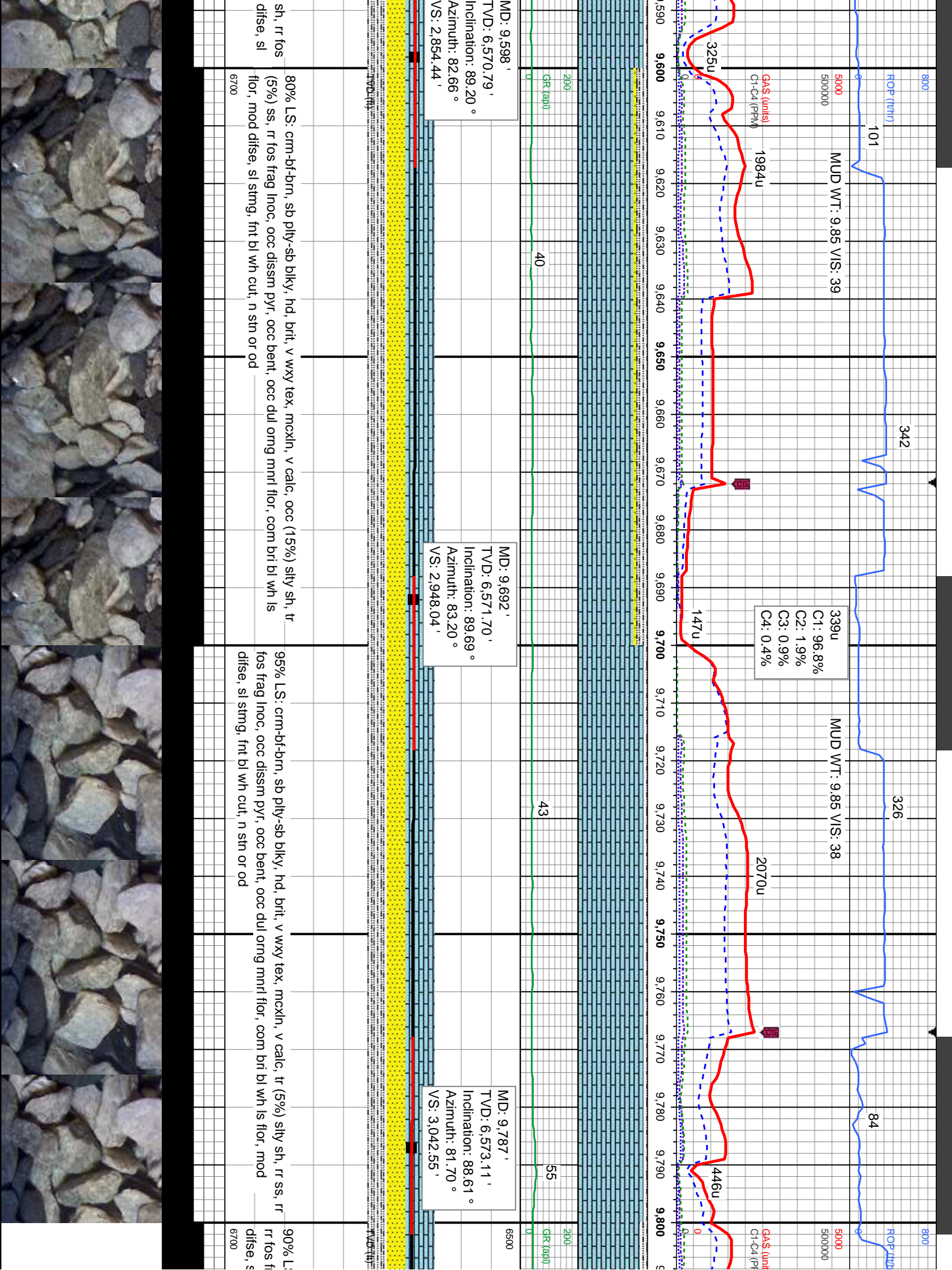
100% L.S: offwht-crm, bf-brn, sb pty-sb blk, hd, brit, v wxy tex, mckln, v calc, rr slty sh, tr fos
frag Inoc, rr calcite, com bri bl wh ls flr, mod disse, sl stmg, bl wh cut, n str or od

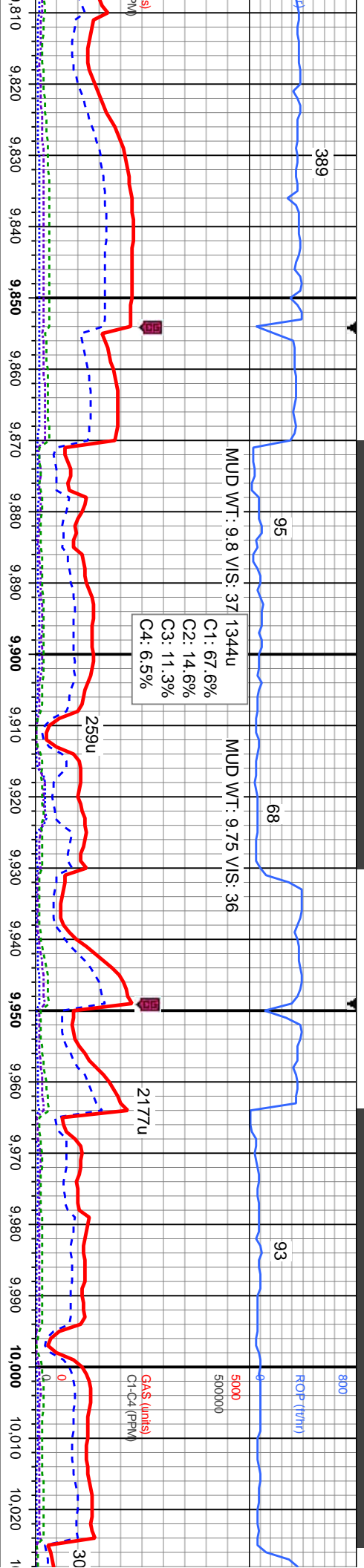
100% L.S: offwht-crm, bf-brn, sb pty-sb blk, hd, brit, v wxy tex, mckln, v calc, rr slty sh, tr fos
frag Inoc, occ diss pyr, rr bent, com t











MD: 9,881'
TVD: 6,574.32'
Inclination: 89.91°
Azimuth: 82.74°
VS: 3,136.02'

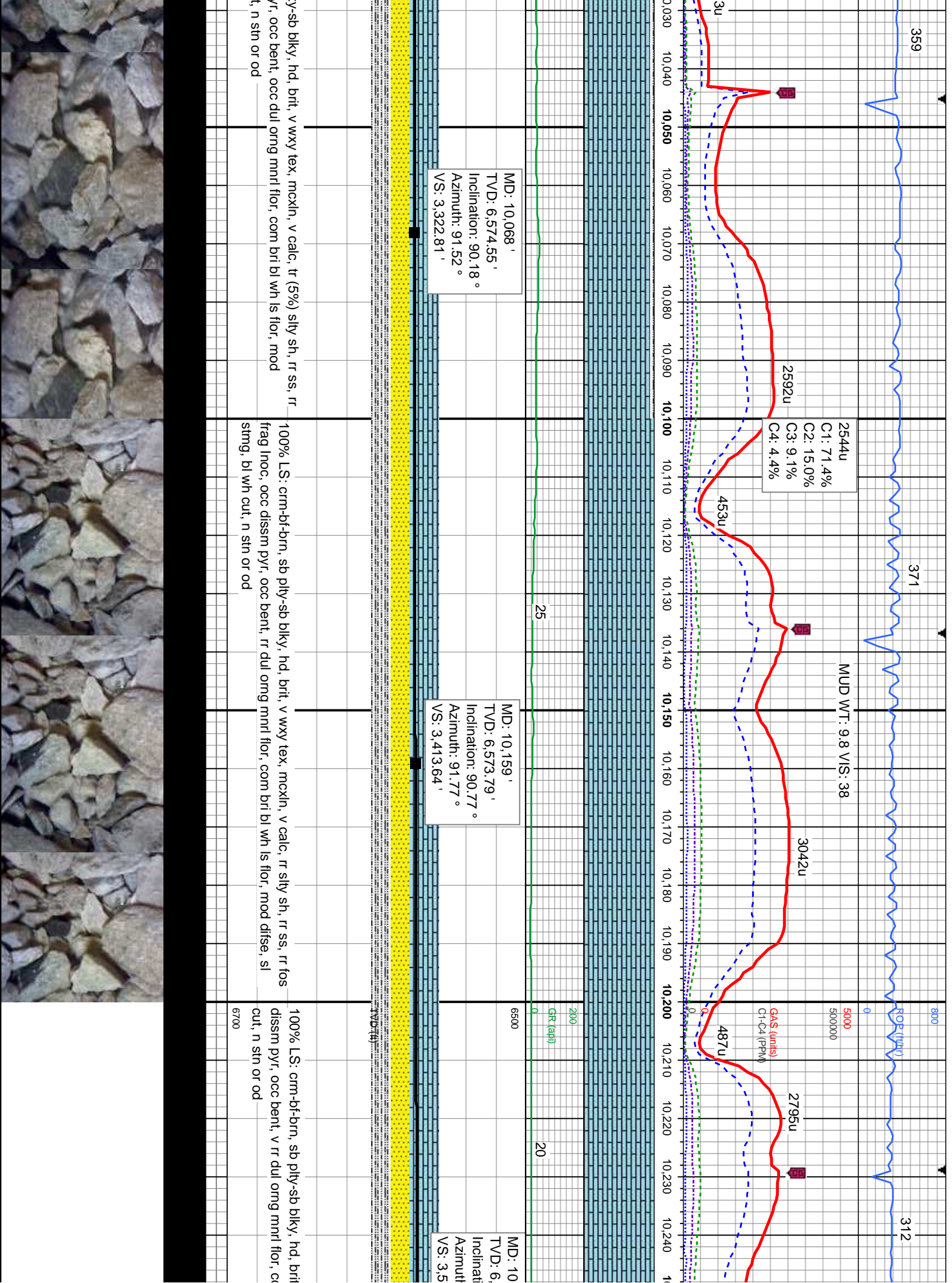
MD: 9,976'
TVD: 6,574.55'
Inclination: 89.82°
Azimuth: 87.23°
VS: 3,230.85'

S: crm-bf-brn, sb pily-sb blkly, hd, brit, v wxy tex, mcxln, v calc, occ (10%) silty sh, rr ss, frag lnoc, occ dissim pyr, occ bent, occ dui org mntl flor, com bri bl wh ls flor, mod sl stmg, fnt bl wh cut, n stn or od

95% LS: crm-bf-brn, sb pily-sb blkly, hd, brit, v wxy tex, mcxln, v calc, tr (5%) silty sh, rr ss, r fos frag lnoc, occ dissim pyr, occ bent, occ dui org mntl flor, com bri bl wh ls flor, mod difse, sl stmg, fnt bl wh cut, n stn or od

95% LS: crm-bf-brn, sb pily-sb blkly, hd, brit, v wxy tex, mcxln, v calc, tr (5%) silty sh, rr ss, r fos frag lnoc, occ dissim pyr, occ bent, occ dui org mntl flor, com bri bl wh ls flor, mod difse, sl stmg, fnt bl wh cut, n stn or od





9/22/15

MINDEPTH

1893u

C1: 67.7%
C2: 17.0%
C3: 10.8%
C4: 4.4%

320

350

ROP (ft/hr)

5000

MUD WT: 9.8 V/S: 39

2938u

GA\$ (units)
C1-C4 (PPM)

2667u

10,250 10,260 10,270 10,280 10,290 10,300 10,310 10,320 10,330 10,340 10,350 10,360 10,370 10,380 10,390 10,400 10,410 10,420 10,430 10,440 10,450 10,460 10,470

17

47

250'
572.64'
on: 90.68°
t: 91.72°
04.46'

MD: 10,342'
TVD: 6,571.11'
Inclination: 91.23°
Azimuth: 91.56°
VS: 3,596.28'

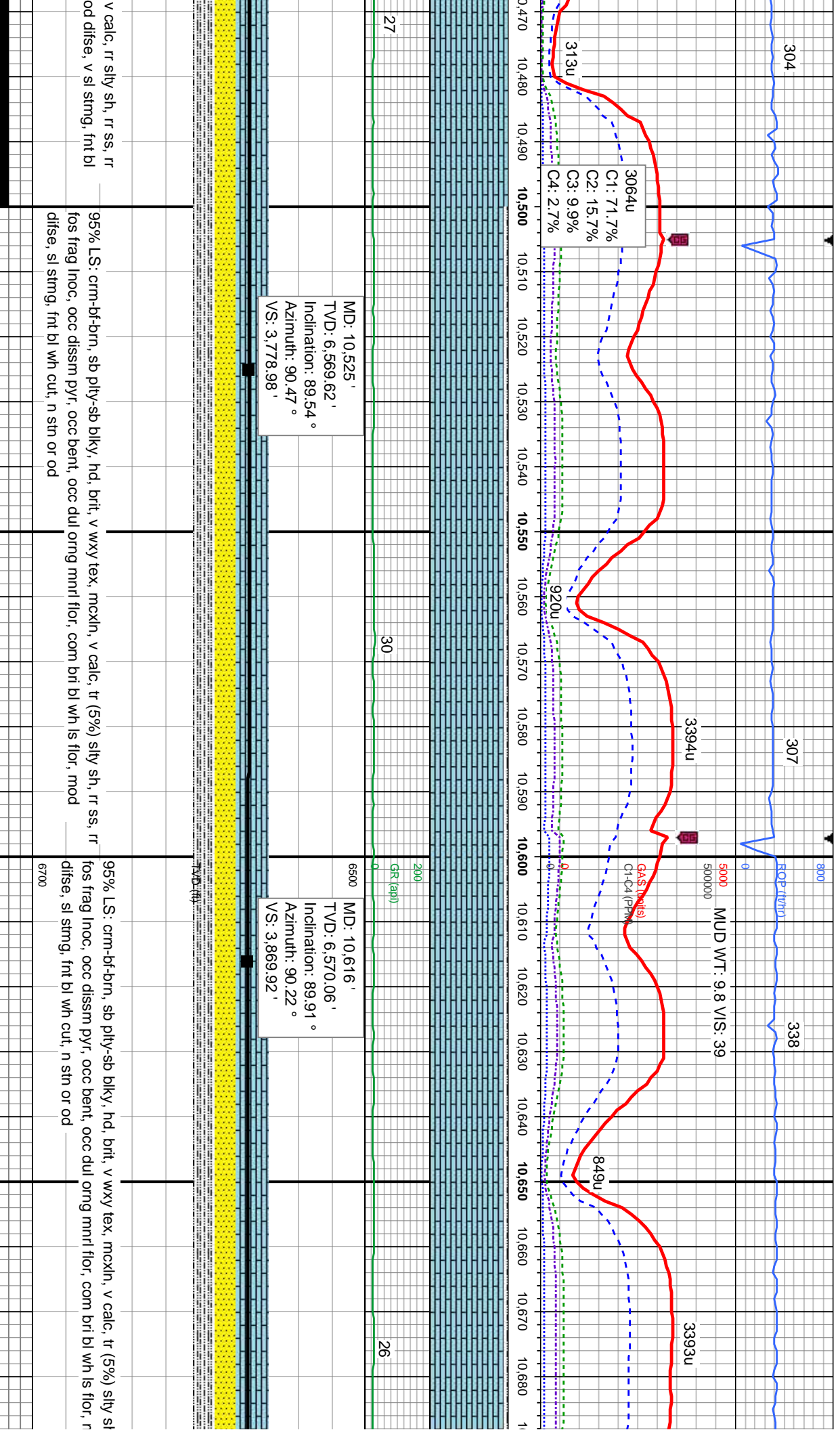
MD: 10,433'
TVD: 6,569.69'
Inclination: 90.55°
Azimuth: 91.75°
VS: 3,687.10'

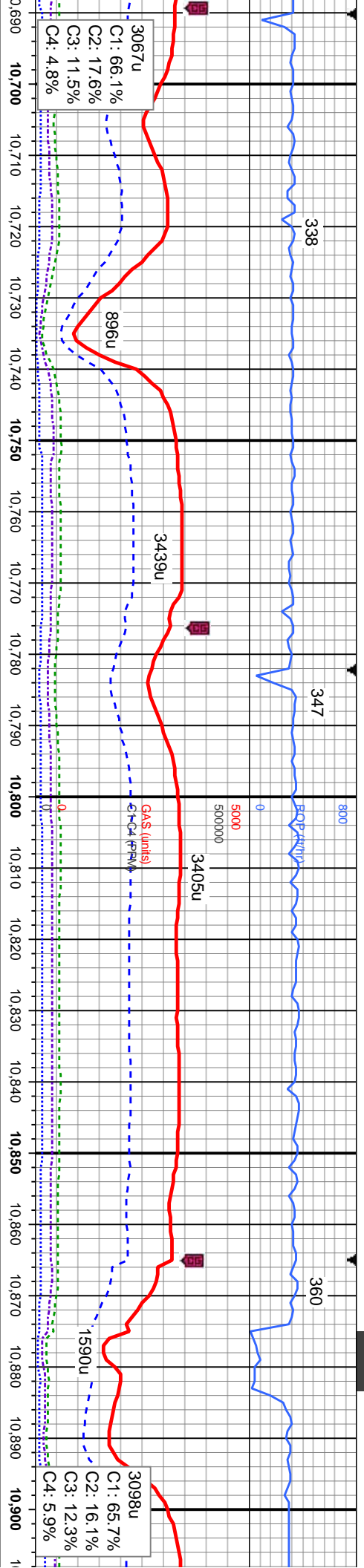
, v wxy tex, mckln, v calc, rr silty sh, rr ss, rr
com bri bl wh ls flor, mod difse, sl string, bl wh

100% LS: cm-bf-brn, sb ply-sb blkly, hd, brit, v wxy tex, mckln, v calc, rr silty sh, rr ss, rr
dissm pyr, rr bent, v rr dul orng mnrl flor, com bri bl wh ls flor, mod difse, sl string, bl wh cut,
n sin or od

100% LS: cm-bf-brn, sb ply-sb blkly, hd, brit, v wxy tex, mckln,
dissm pyr, rr bent, v rr dul orng mnrl flor, com bri bl wh ls flor, m
wh cut, n sin or od







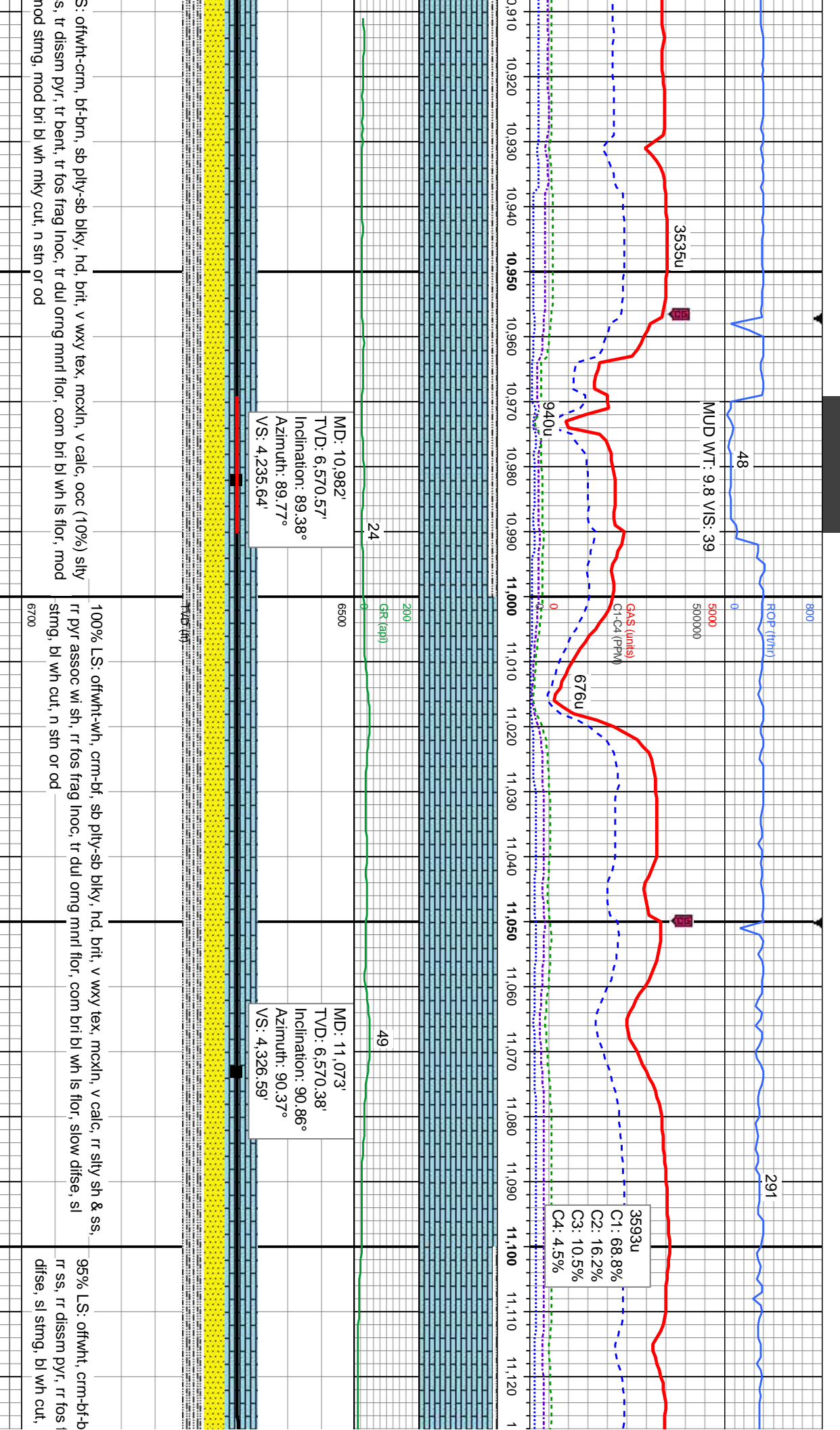
MD: 10,707'
TVD: 6,570.30'
Inclination: 89.78°
Azimuth: 89.98°
VS: 3,960.87'

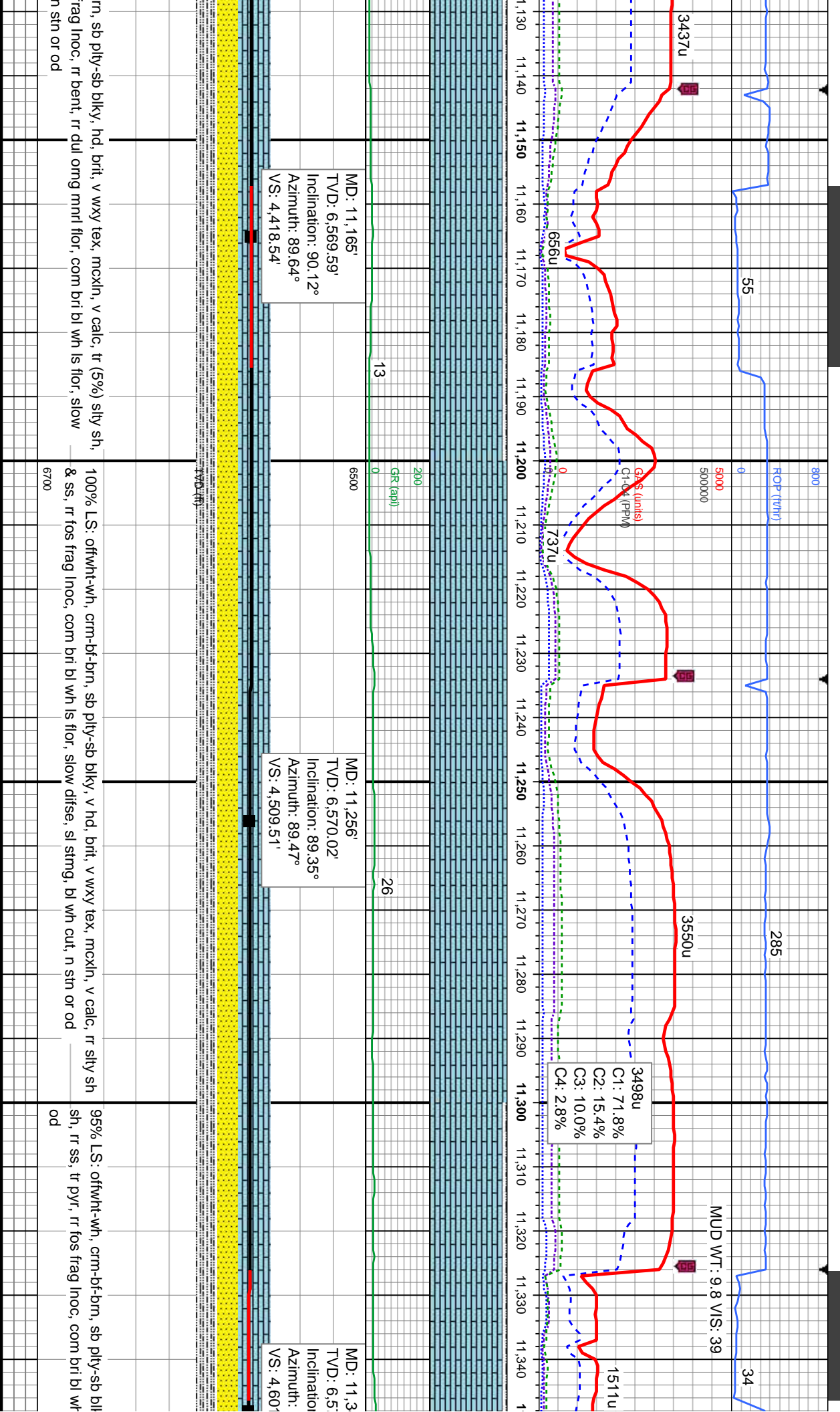
MD: 10,799'
TVD: 6,570.21'
Inclination: 90.34°
Azimuth: 90.44°
VS: 4,052.81'

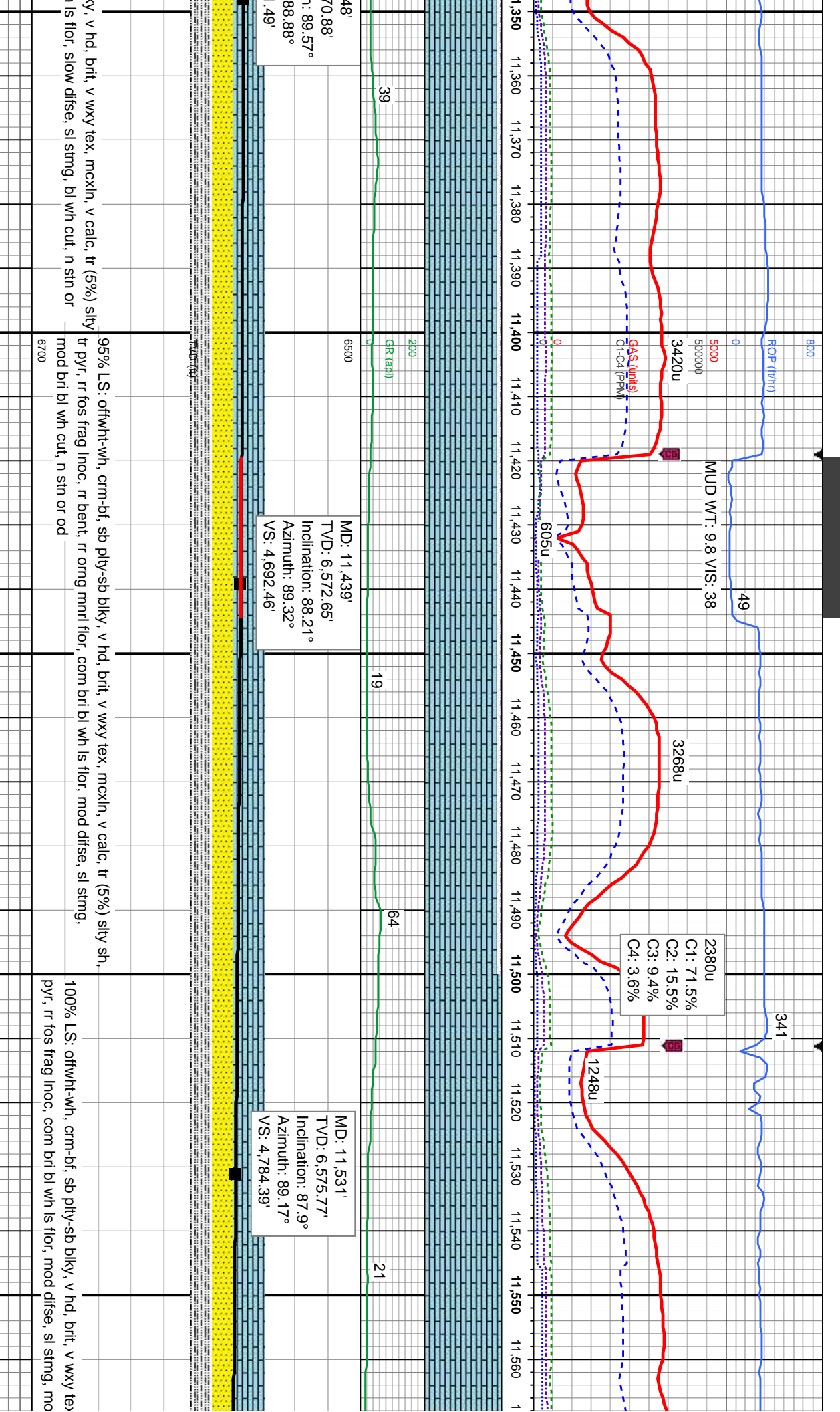
MD: 10,891'
TVD: 6,570.01'
Inclination: 89.91°
Azimuth: 91.13°
VS: 4,144.71'

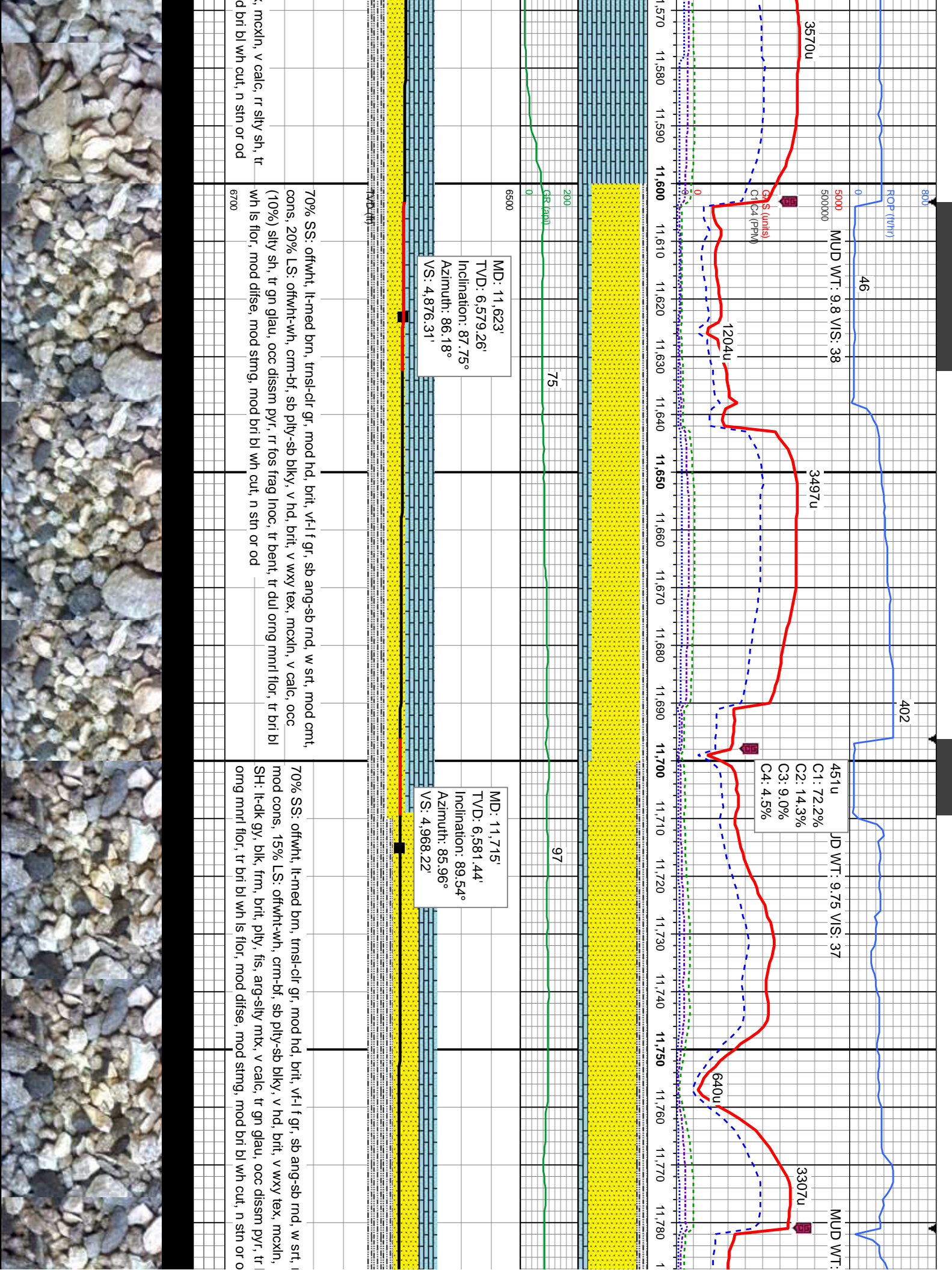
100% LS: crm-bl-bm, sb pily-sb blkly, hnd, brit, v wxy tex, mckln, v calc, rr silty sh, rr dissn pyr, rr bent, rr inoc frags, rr dul orgn mnrl flor, com bri bl wh ls flor, mod difse, v sl stmg, fnt bl wh cut, n stn or od	95% LS: oftwht, crm-bl-brn, sb pily-sb blkly, hd, brit, v wxy tex, mckln, v calc, tr (5%) silty sh, tr dissn pyr, rr bent, rr fos frag inoc, rr dul orgn mnrl flor, com bri bl wh ls flor, mod difse, sl stmg, bl wh mky cut, n stn or od	90% L.S. sh, rr s difse, r
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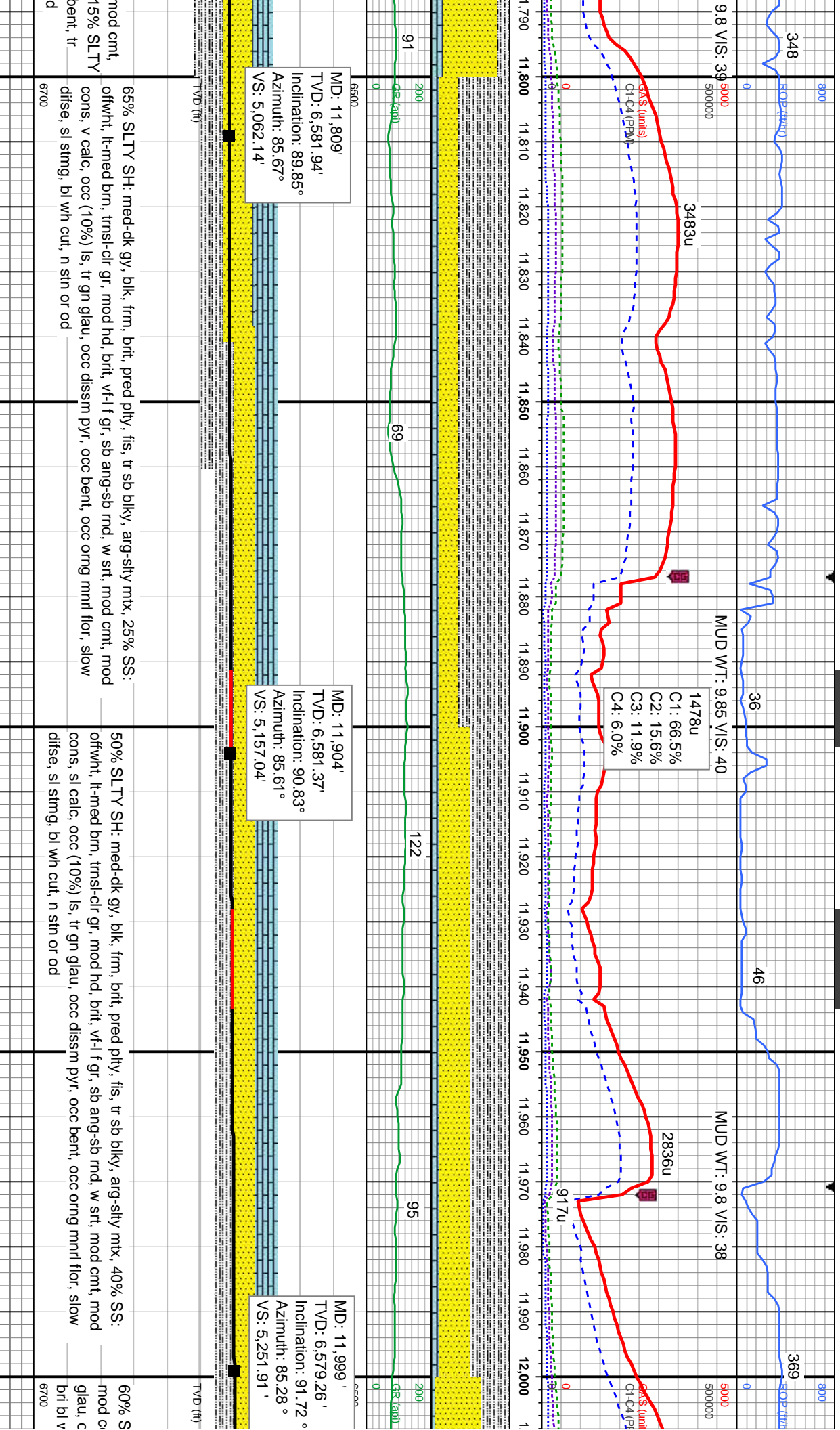


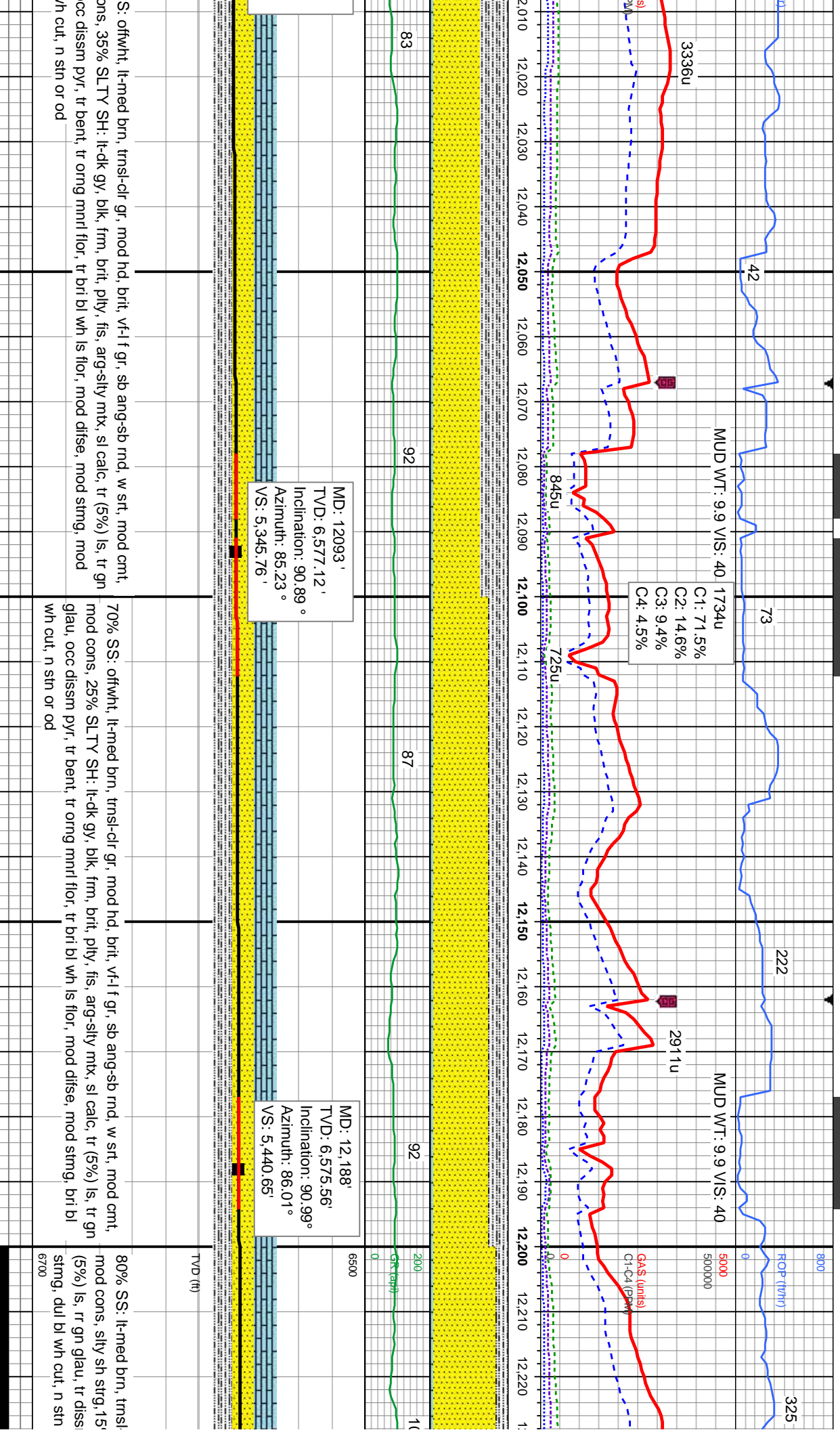


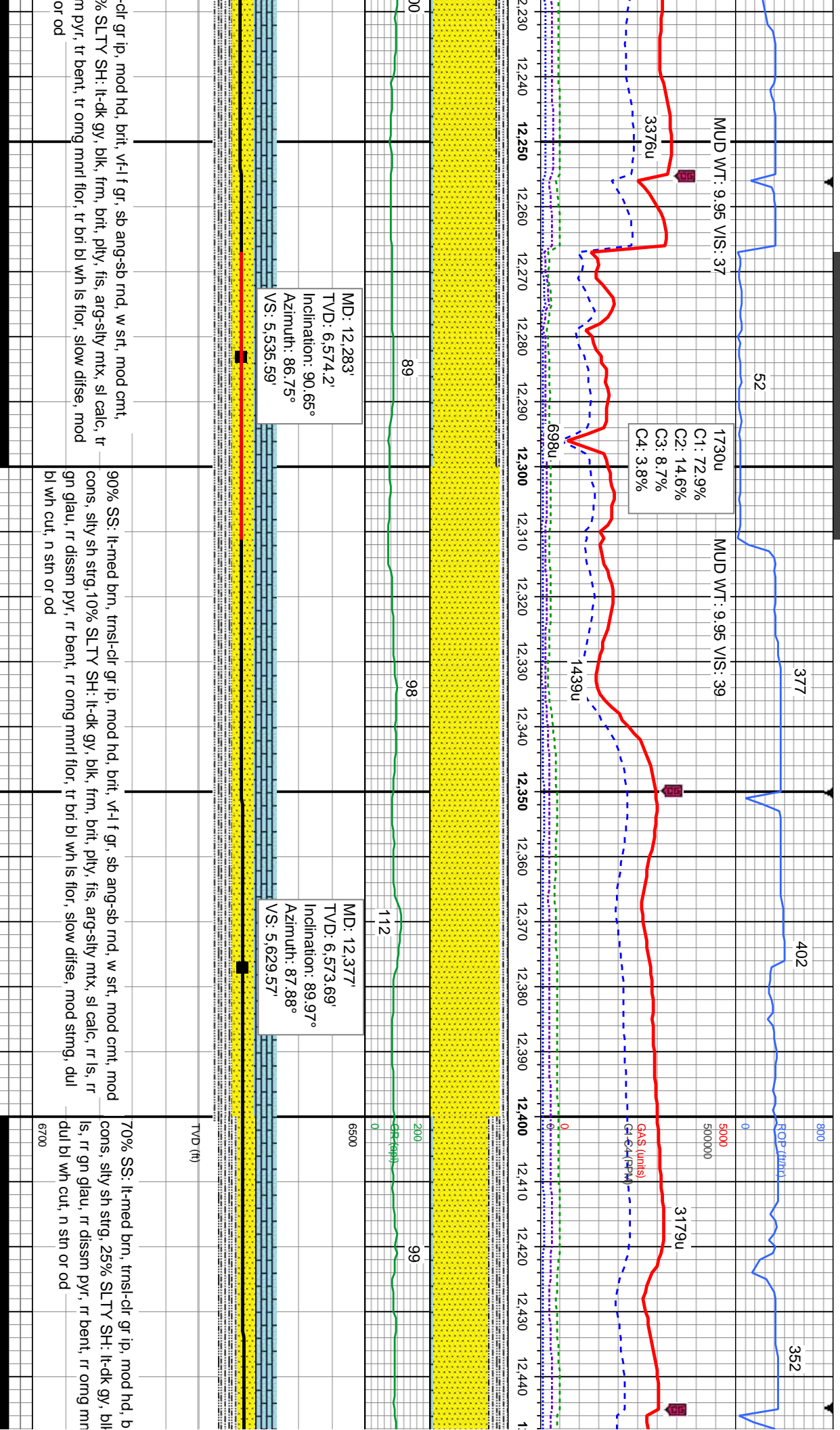


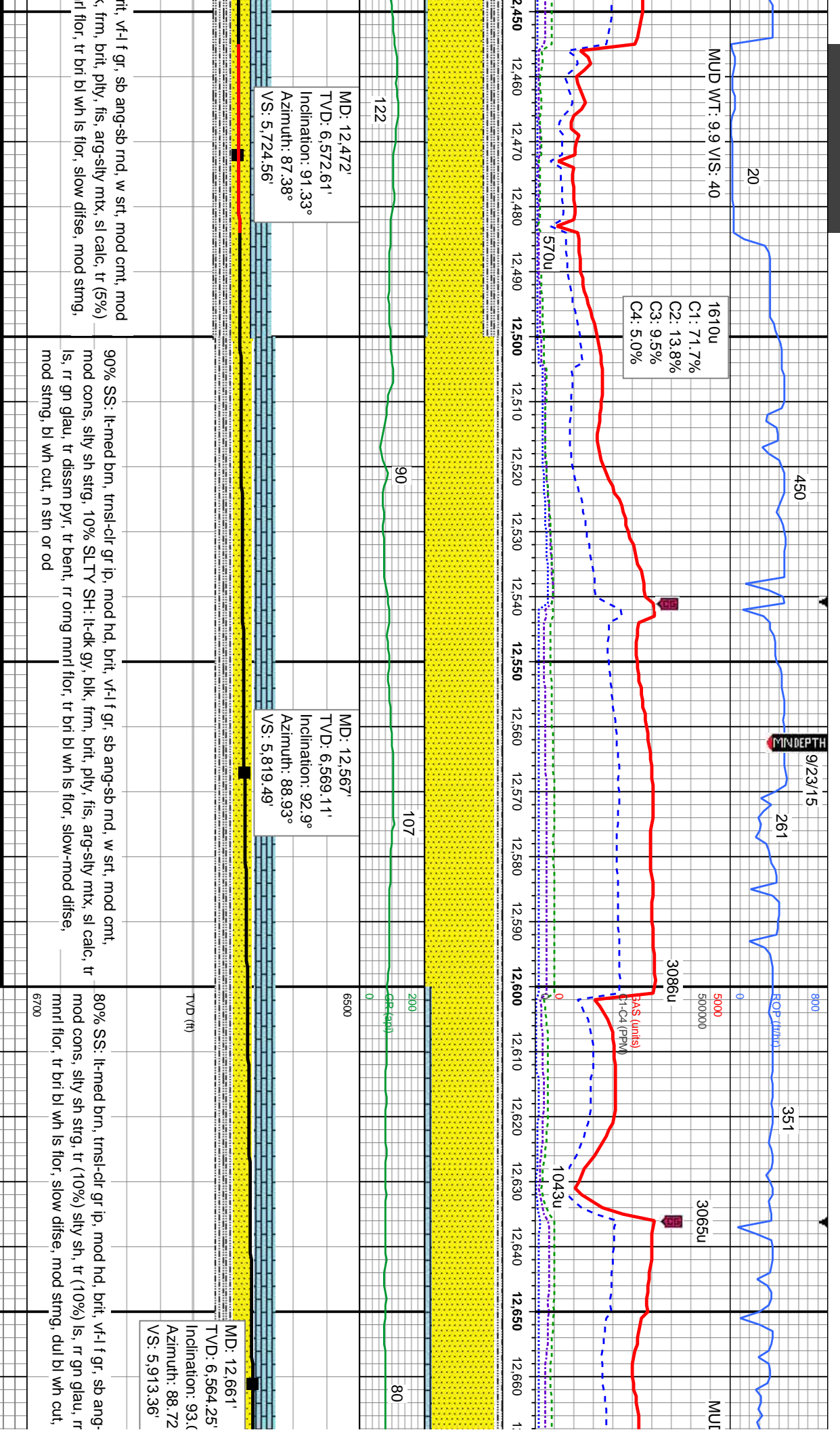


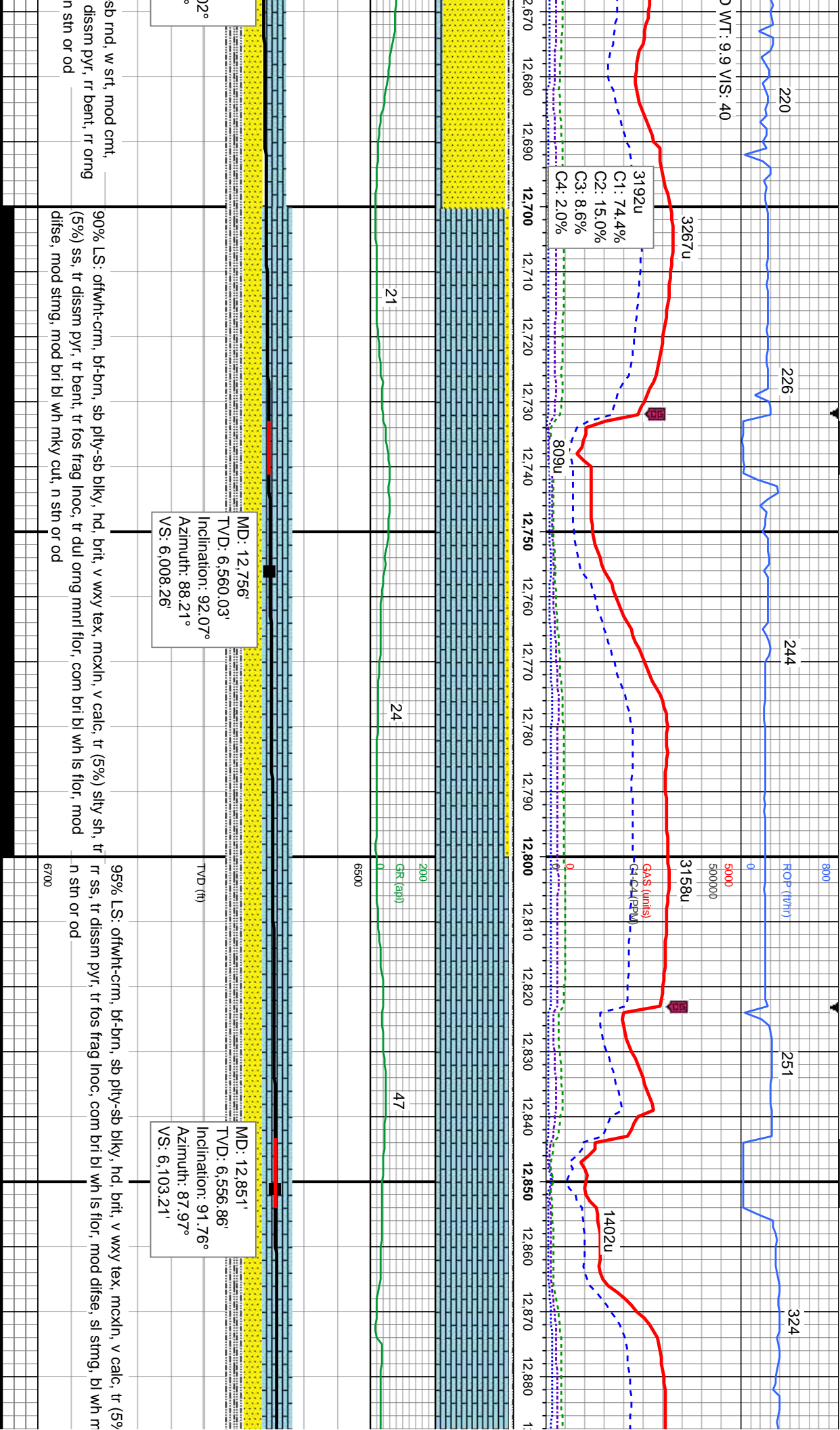


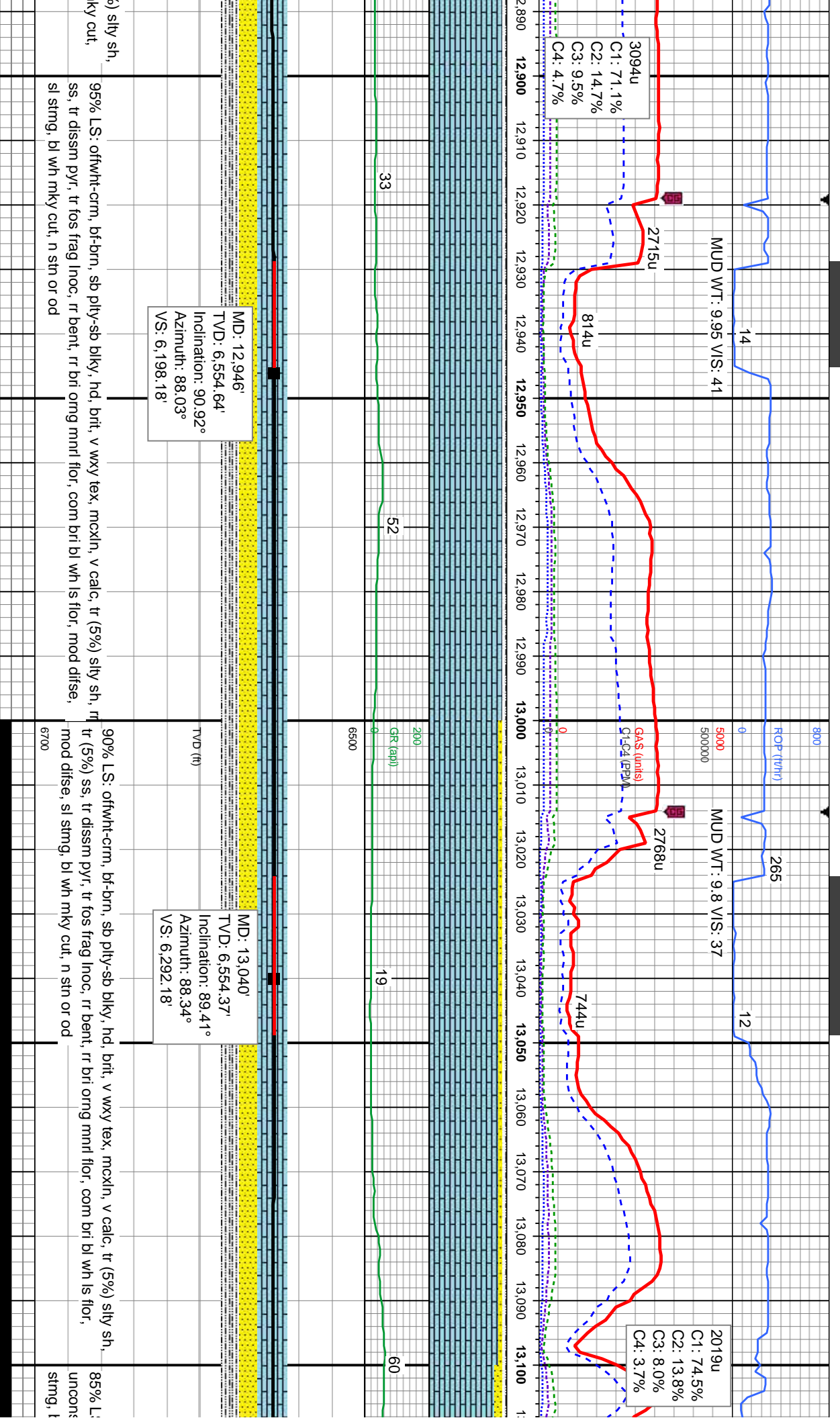










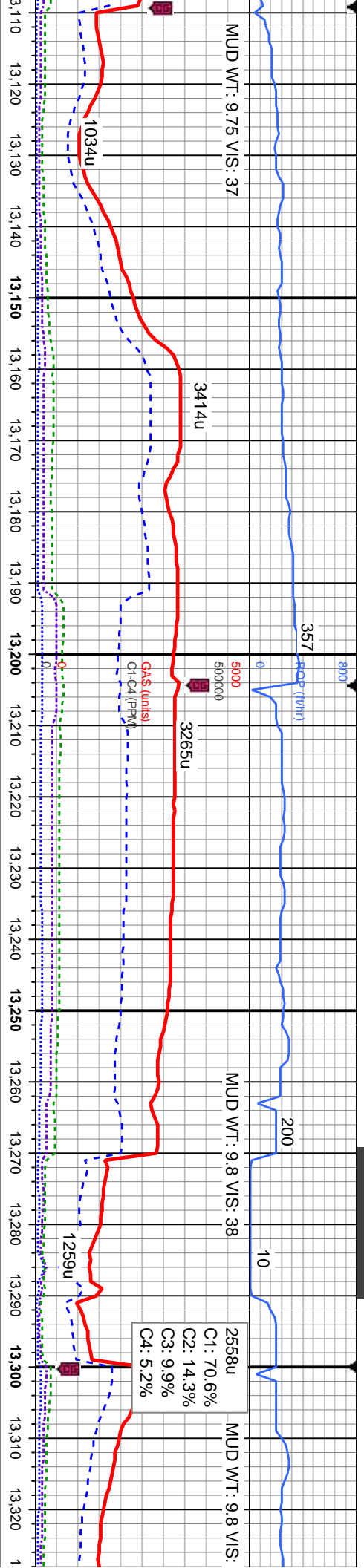


6) silty sh,
fky cut,

95% L.S.: offwh-ccrm, bf-brn, sb pily-sb blkq, hd, bit, v wxy tex, mxcin, v calc, tr (5%) sily sh, ss, tr dissim pyr, tr fos frag hoc, rr bent, rr bri omg mnr flor, com bri bl wh ls flor, mod diffe, sl string, bl wh mky cut, n sin or od

90% LS: oftwh-crm, bf-brn, sb ply-sb blk, hd, brit, v wxy tex, mcxln, v calc, tr (5%) silty stn, tr (5%) ss, tr dissim pyr, tr fos frag inoc, rr bent, rr bri orng mnfl flor, com bri bl wh ls flor, mod difse, sl stmng, bl wh mky cut, n stn or od

85% L
uncon
stmg, k



MD: 13,135'
TVD: 6,556.32'
Inclination: 88.24°
Azimuth: 87.8°
VS: 6,387.16'

MD: 13,230'
TVD: 6,559.64'
Inclination: 87.75°
Azimuth: 86.72°
VS: 6,482.08'

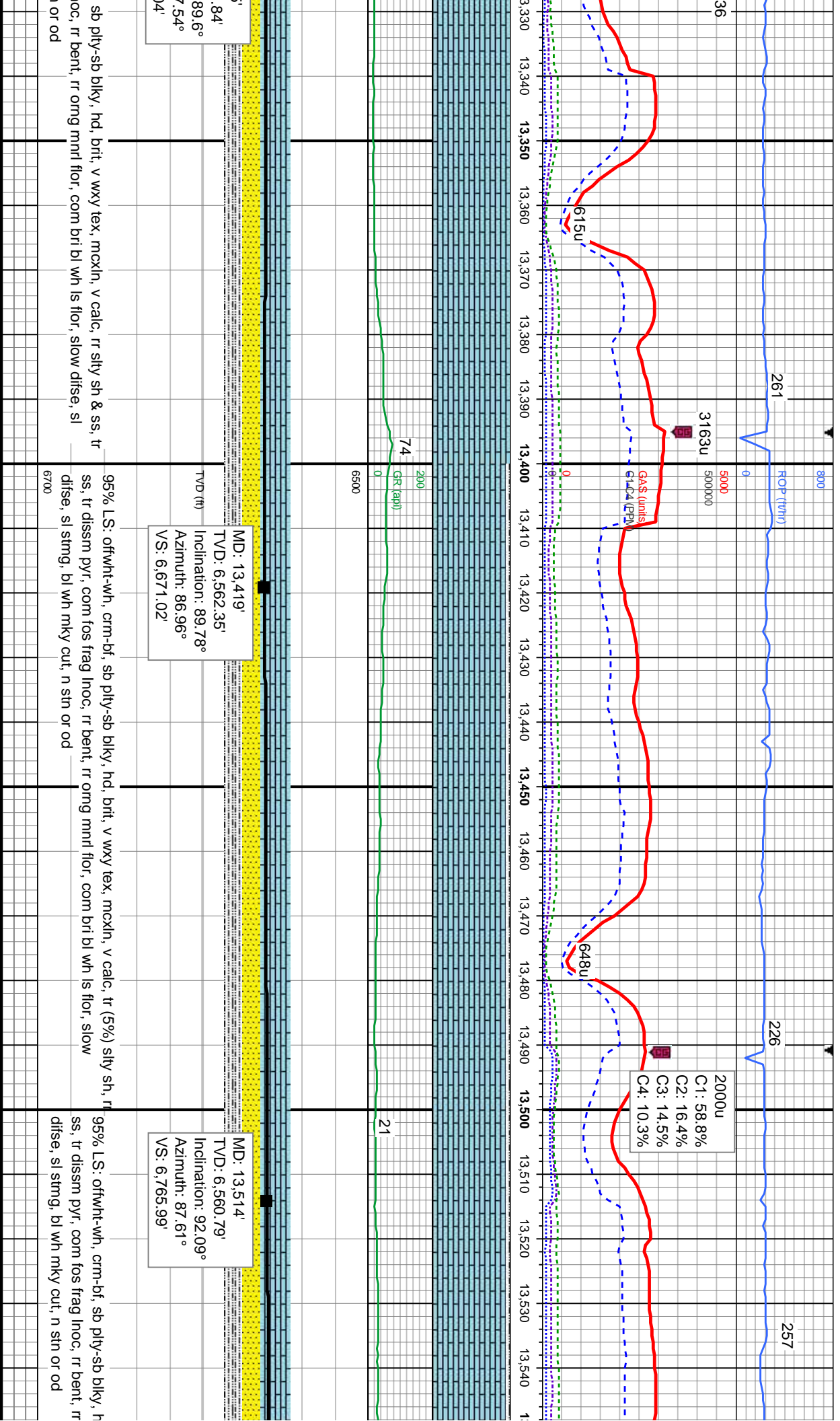
MD: 13,325'
TVD: 6,561'
Inclination: 87.7°
Azimuth: 87.7°
VS: 6,577.0'

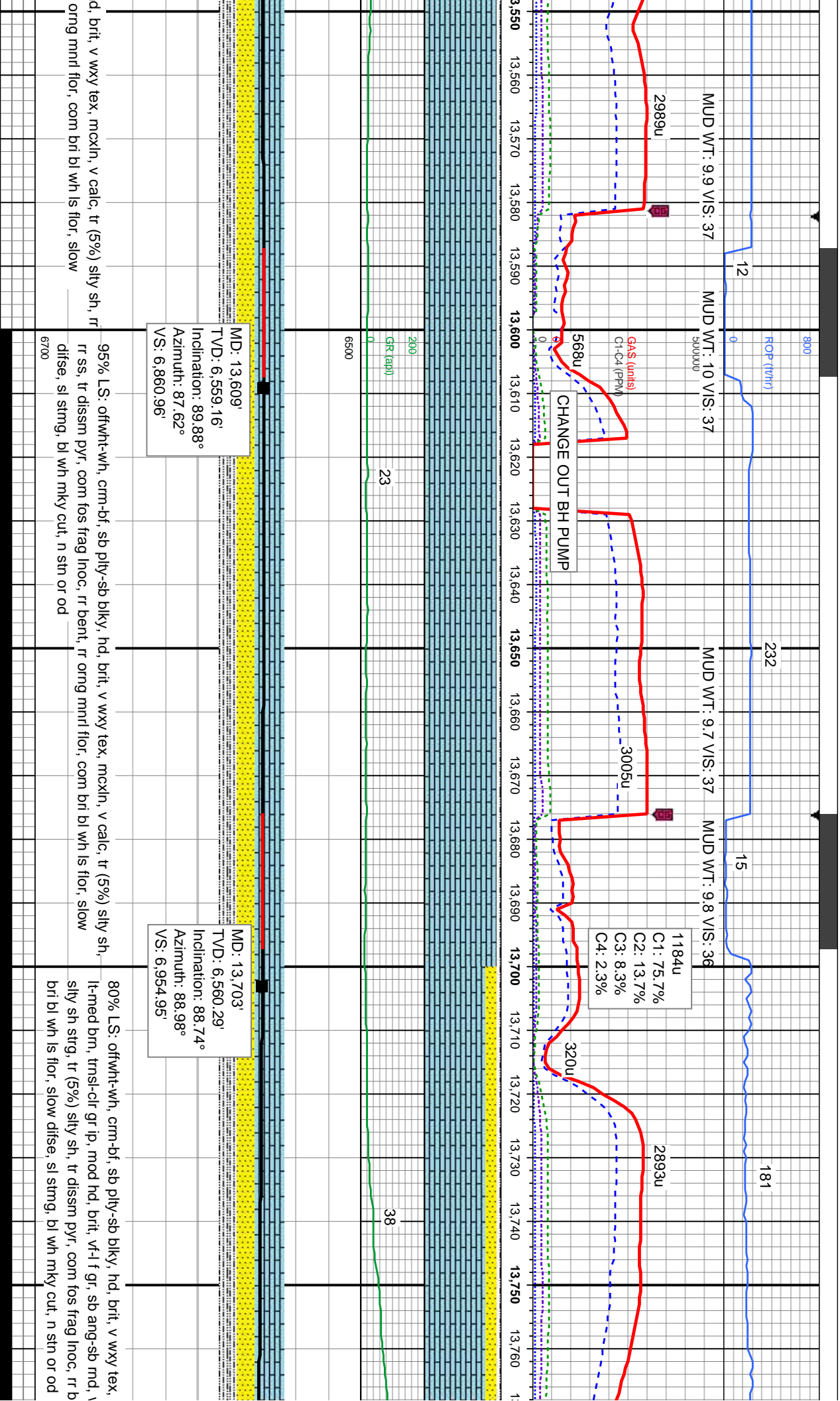
S: offwht-crm, br-brn, sb pty-sb blk, hd, brit, v wxy tex, mckln, v calc, occ (10%)
s ss, tr (5%) silty sh, tr dissn pyr, rr fos frag lnoc, com bri bl wh ls flor, mod difse, sl
bl wh mky cut, n stn or od

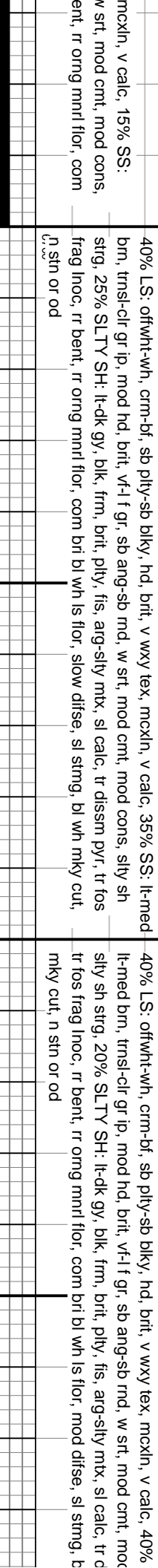
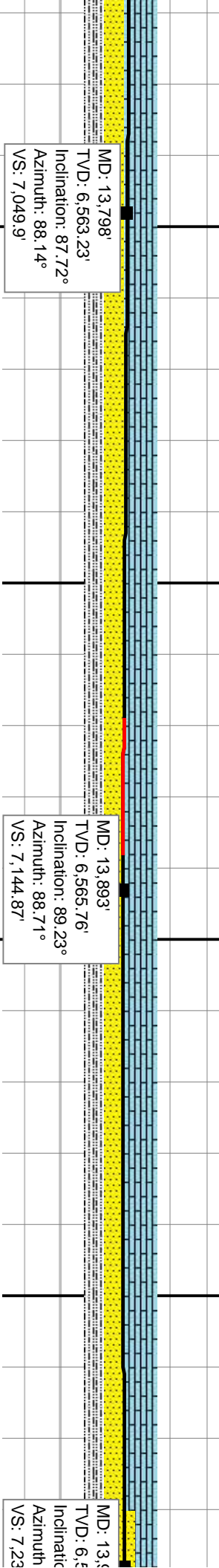
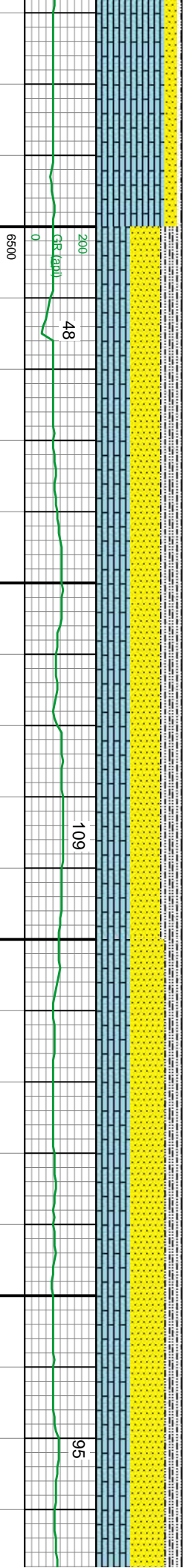
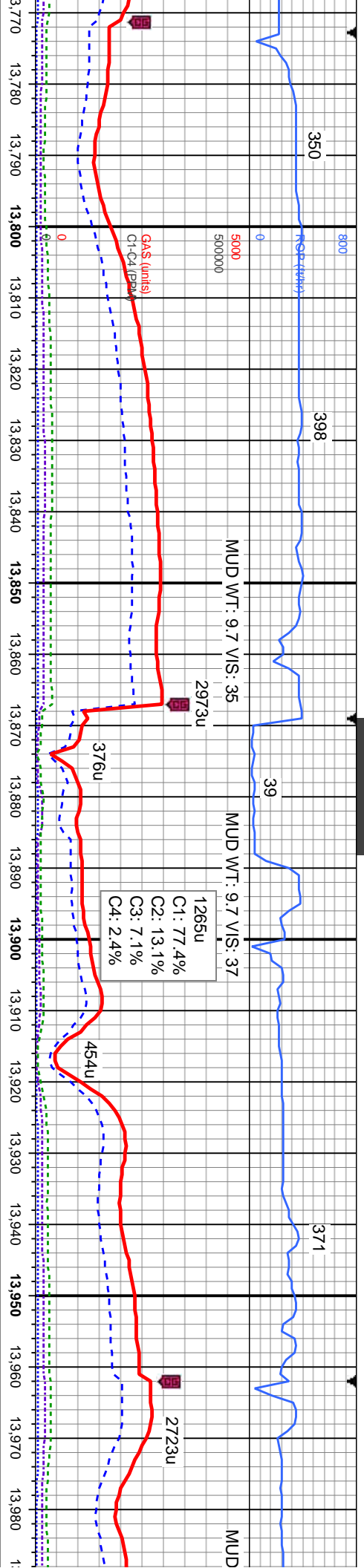
90% LS: offwht-wh, crm-bl, sb pty-sb blk, hd, brit, v wxy tex, mckln, v calc, occ (10%) silty
sh, rr ss, tr dissn pyr, com fos frag lnoc, rr bent, rr orng mnfl flor, com bri bl wh ls flor, slow
difse, sl stmg, bl wh mky cut, n stn or od

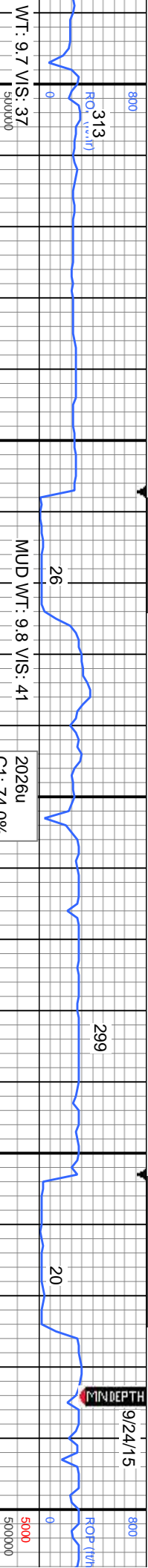
100% LS: offwht-wh, crm,
dissn pyr, com fos frag lr
stmg, bl wh mky cut, n st











GAS (units)
C1-C4 (PPM)

2548u

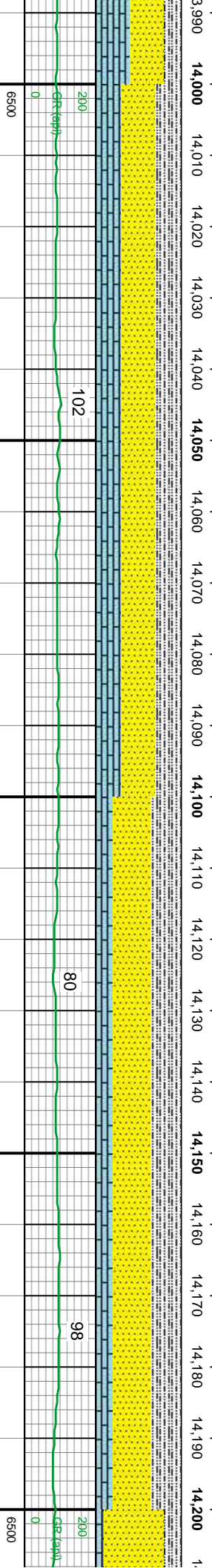
466u

2026u
C1: 74.0%
C2: 13.7%
C3: 8.8%
C4: 3.4%

2439u

356u

GAS (units)
C1-C4 (PPM)



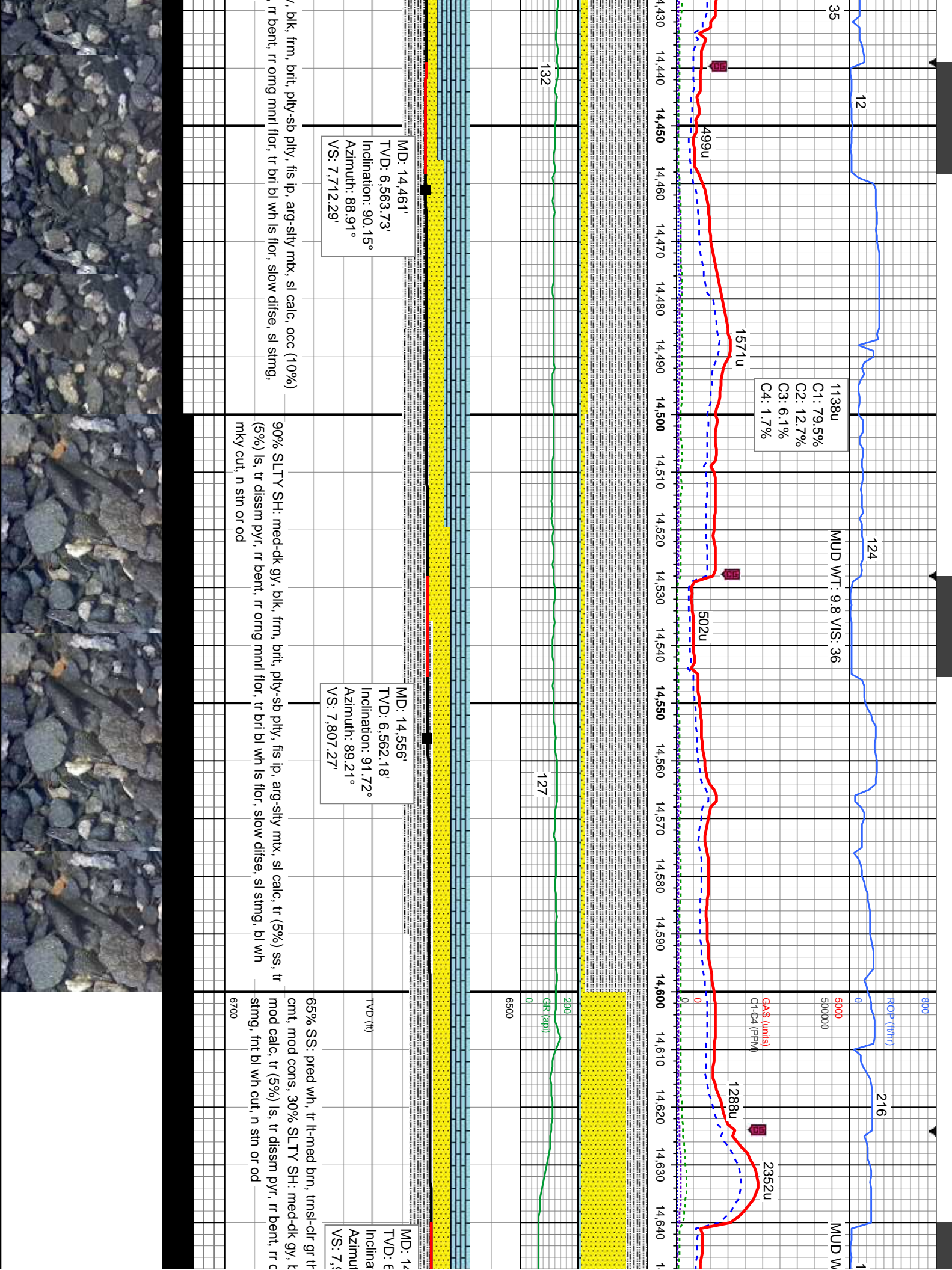
MD: 14,082'
TVD: 6,562.82'
Inclination: 91.02°
Azimuth: 91.43°
VS: 7.333.64'

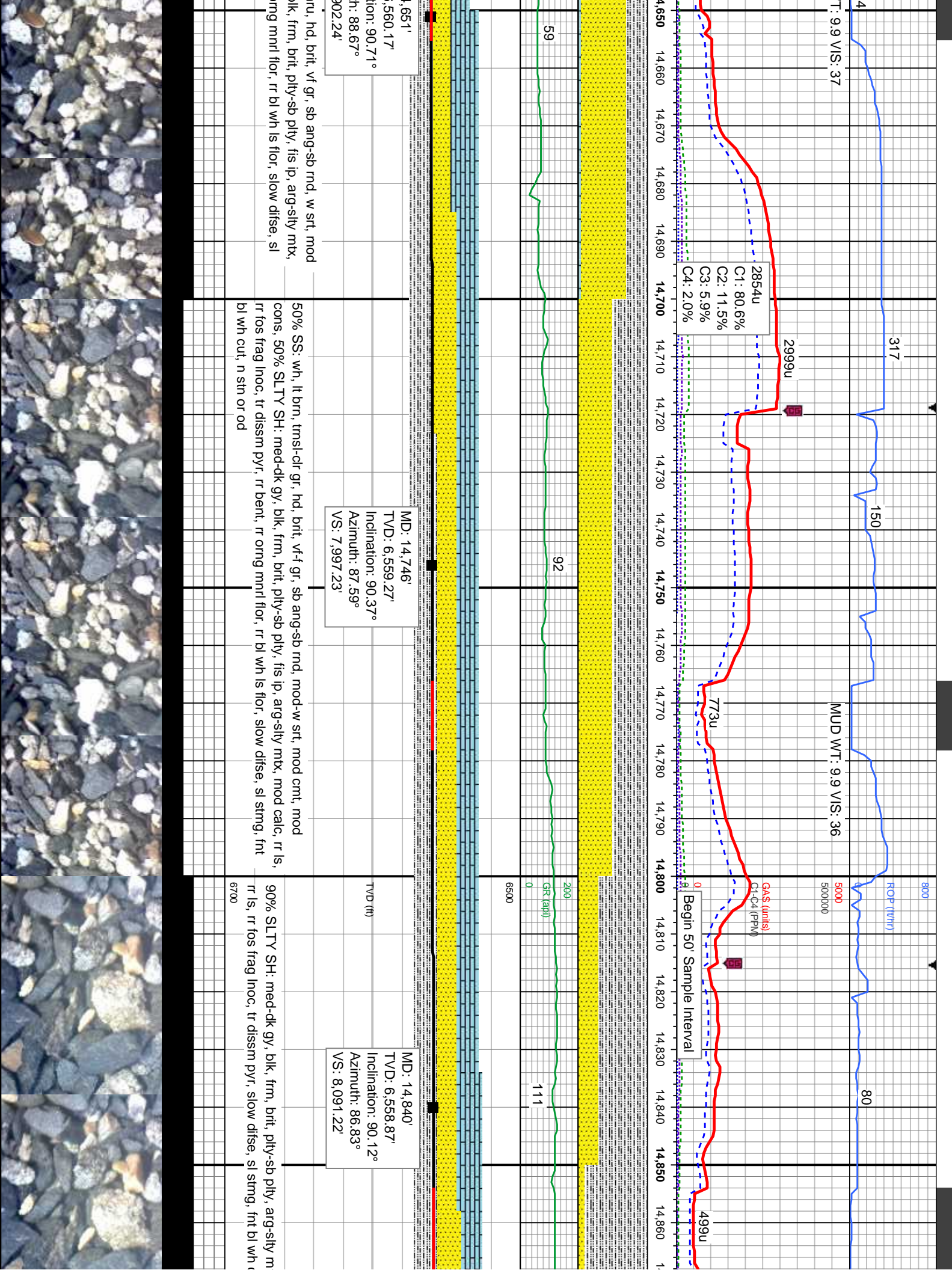
MD: 14,177'
TVD: 6,562.02'
Inclination: 89.94°
Azimuth: 91.21°
VS: 7.428.5'

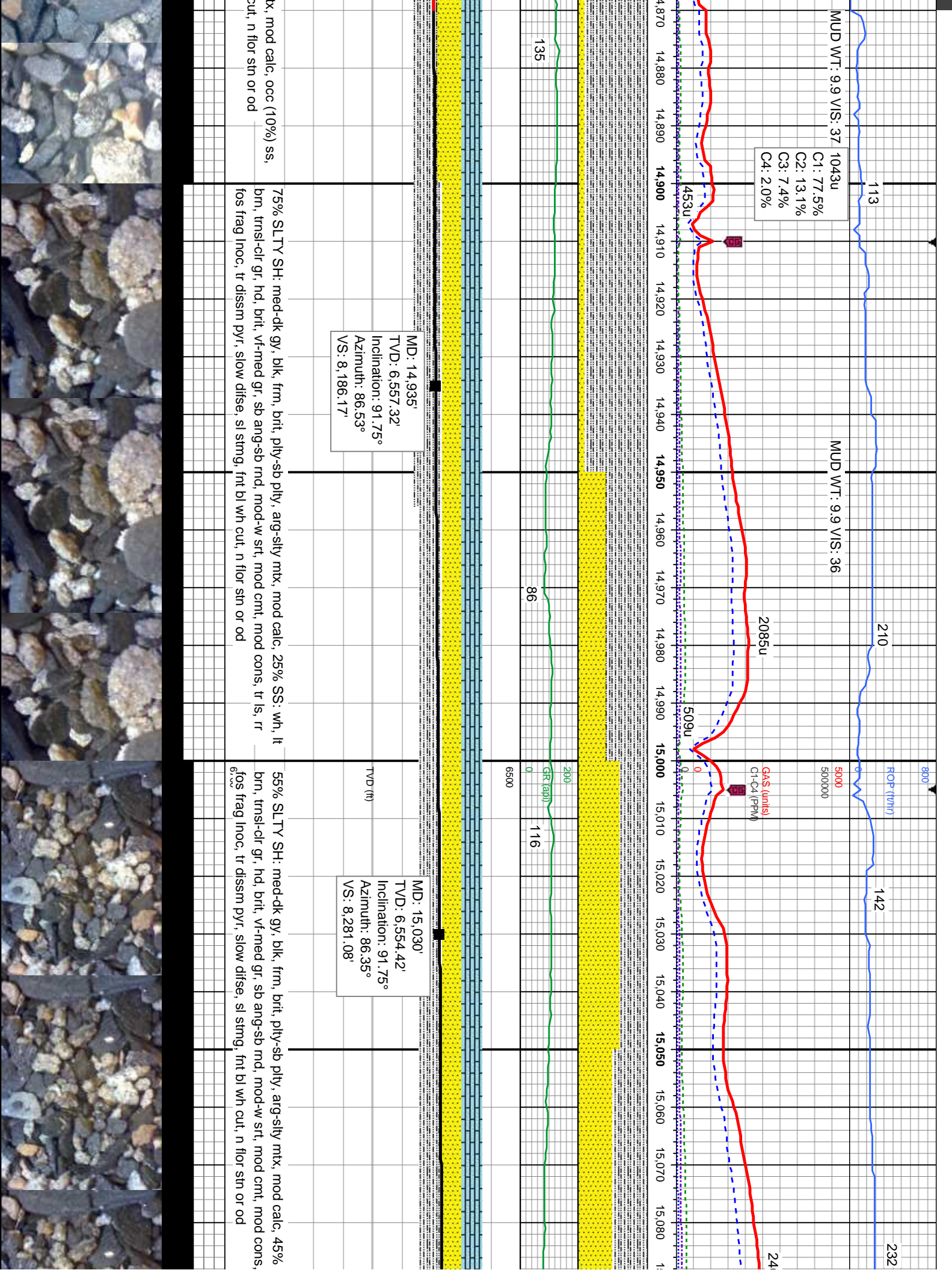
SS: 40% SS: lt-med brn, trns-l-cl gr ip, mod hd, brit, v-l f gr, sb ang-sb md, w srt, mod cnt, mod cons, silty sh strg, 30% LS: offwht-wh, crm-bf, sb ply-sb blkly, hd, brit, v wxy tex, mxxn, v calc, 30% SLTY SH: lt-dk gy, blk, frm, brit, ply, fis, arg-silty mtx, sl calc, tr dissn pyr, tr fos frag inoc, rr bent, rr org mnt flr, com bri bl wh ls flr, mod difse, sl string, bl wh mky cut, n sin or od

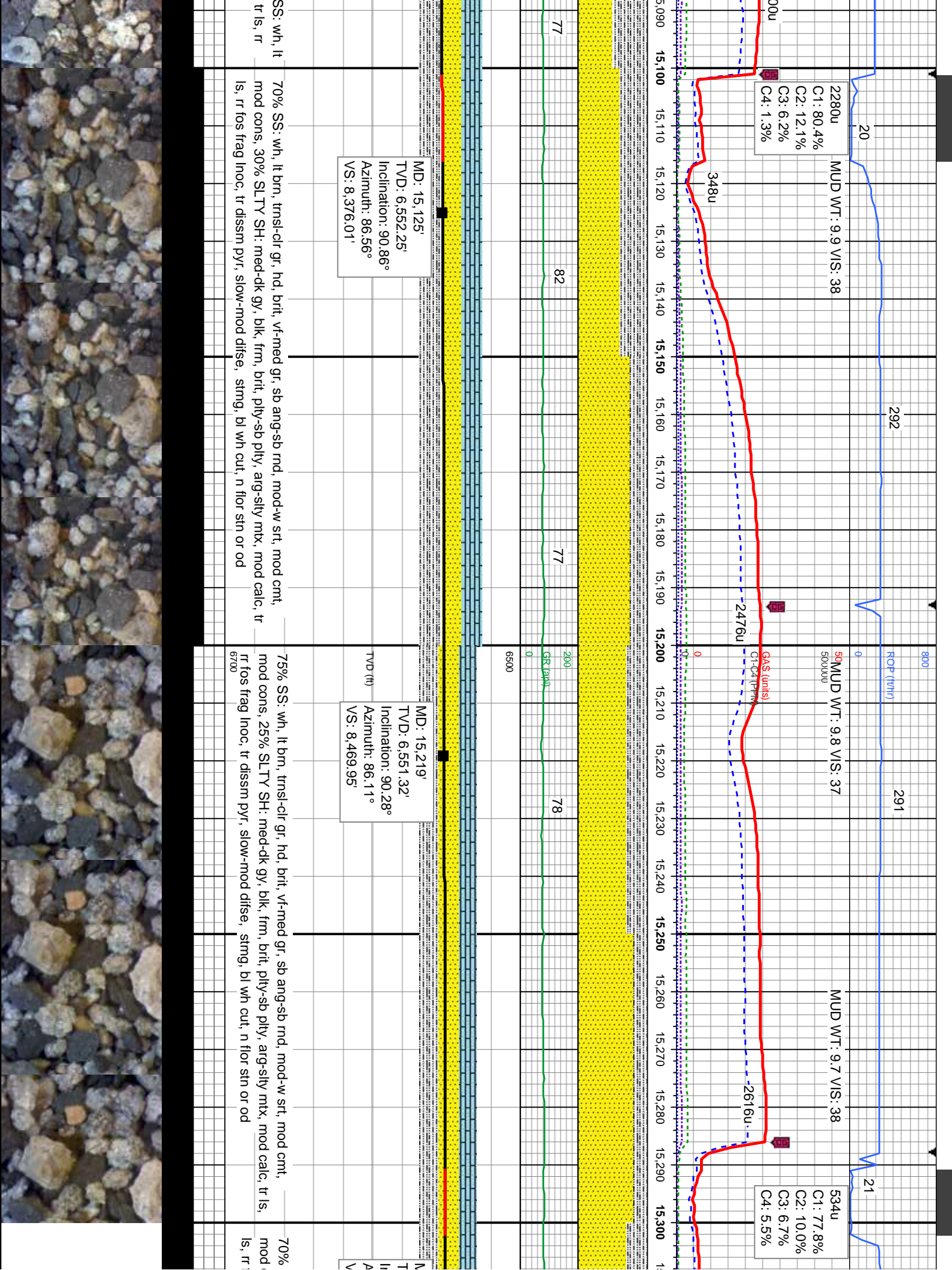
SS: 45% SS: lt-med brn, trns-l-cl gr ip, mod hd, brit, v-l f gr, sb ang-sb md, w srt, mod cnt, mod cons, silty sh strg, 35% SLTY SH: lt-dk gy, blk, frm, brit, ply, fis, arg-silty mtx, sl calc, 20% LS: offwht-wh, crm-bf, sb ply-sb blkly, hd, brit, v wxy tex, mxxn, v calc, tr dissn pyr, tr fos frag inoc, rr bent, rr org mnt flr, com bri bl wh ls flr, slow- mod difse, sl string, bl wh mky cut, n sin or od

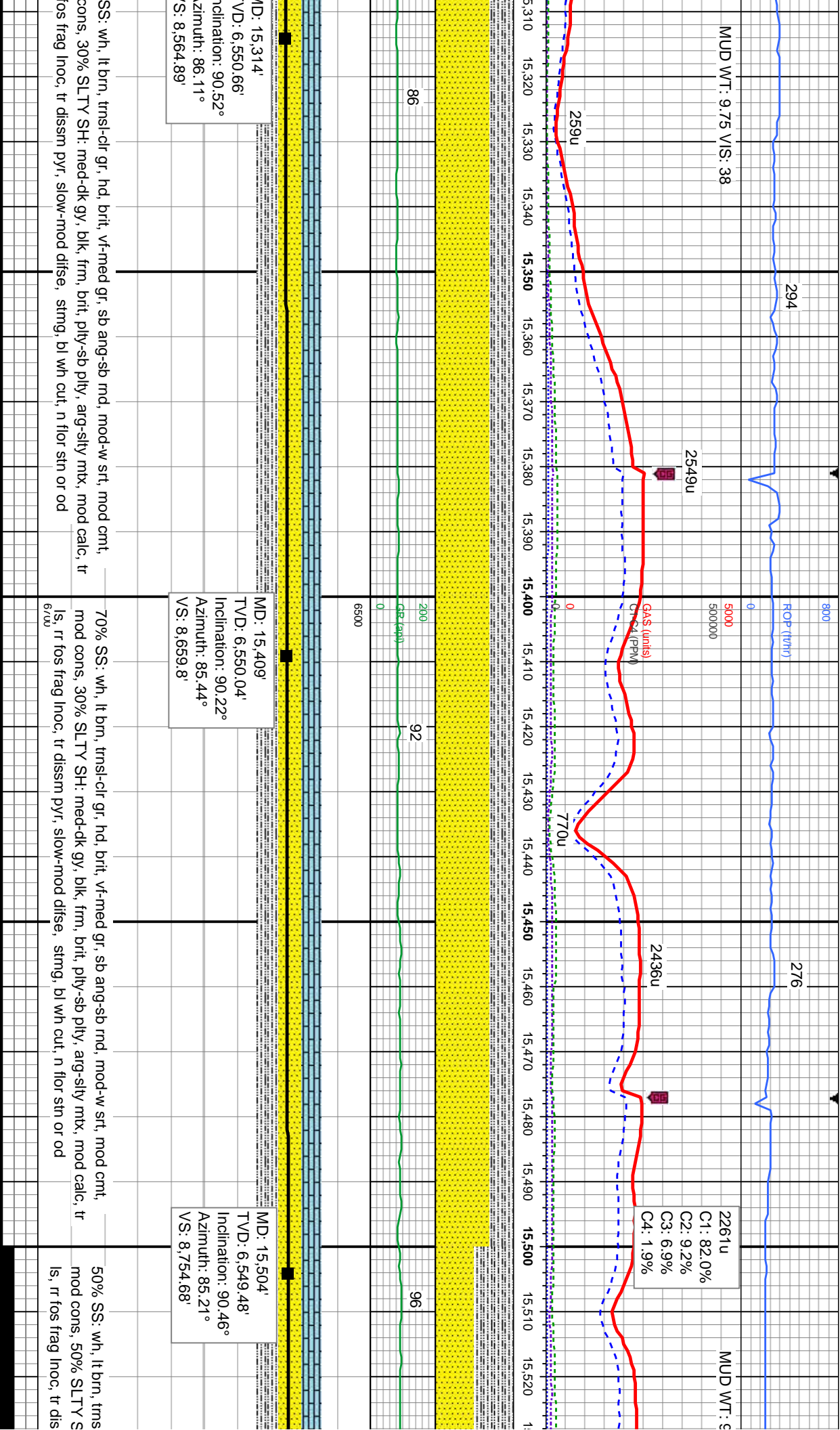


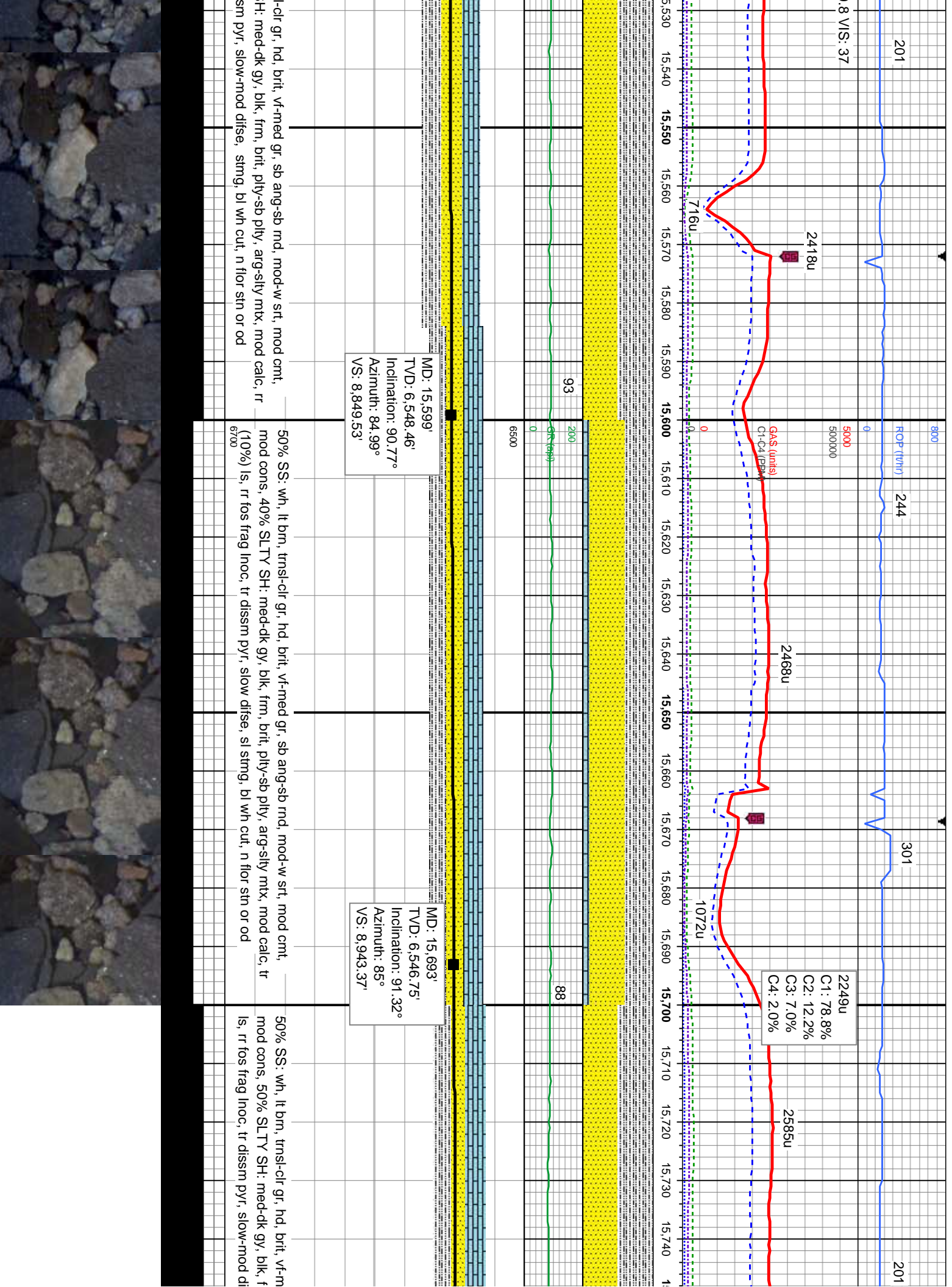












9/25/15

MINDEPTH

16

MUD WT: 9.85 VIS: 42

800

330

2791u

MUD WT: 9.75 VIS: 42

151

14

MUD WT

ROP (in/hr)

GA\$ (units)

CI-C4 (PPM)

2604u

C1: 79.2%

C2: 12.1%

C3: 7.2%

C4: 1.4%

110

200

82

0

6500

MD: 15,788'

TVD: 6,545.55'

Inclination: 90.12°

Azimuth: 85.09°

VS: 9,038.22'

TVD (ft)

MD: 15,883'

TVD: 6,545.35'

Inclination: 90.12°

Azimuth: 85.21°

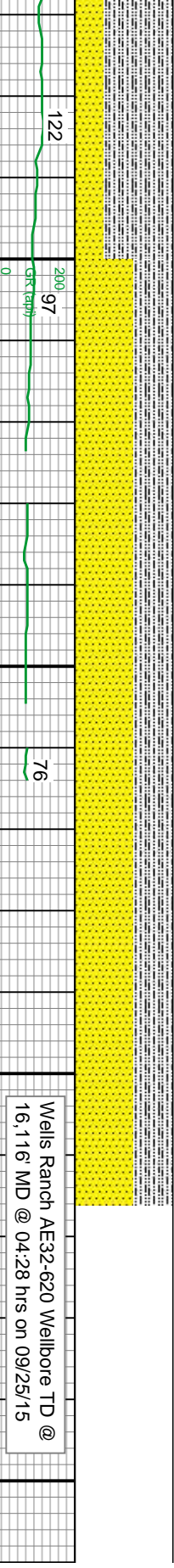
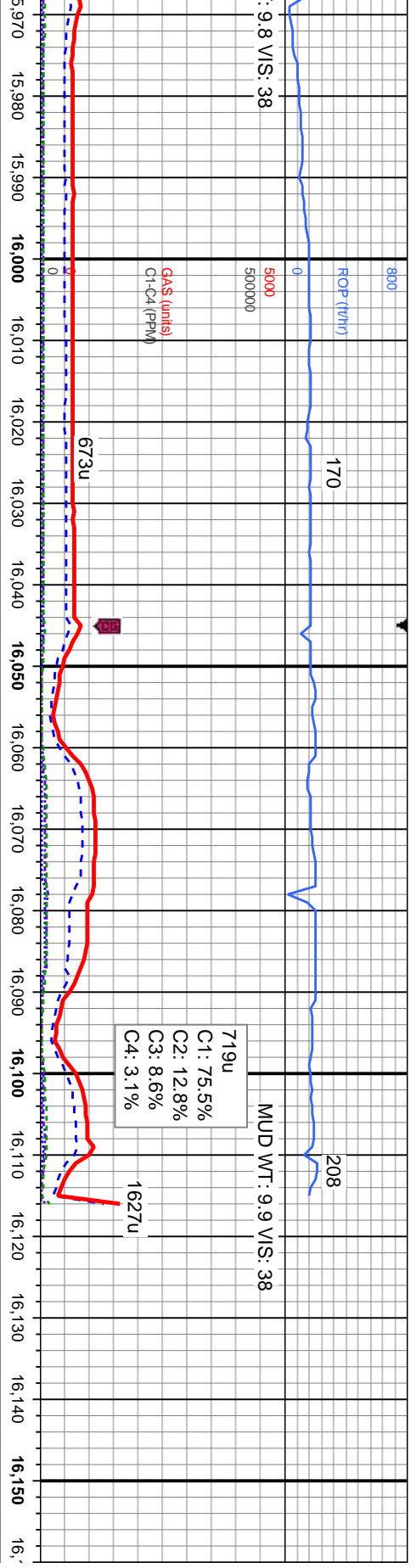
VS: 9,133.08'

ed gr, sb ang-sb rnd, mod-w srt, mod cmt,
mm, brit, ply-sb ply, arg-sily mtx, mod calc, rr
fse, string, bl wh cut, n flor sin or od

60% SS: wh, lt brn, trns-clr gr, hd, brit, vf-med gr, sb ang-sb rnd, mod-w srt, mod cmt,
mod cons, 40% SLTY SH: med-dk gy, blk, frm, brit, ply-sb ply, arg-sily mtx, mod calc, rr
ls, v rr fos frag Inoc, tr dissim pyr, slow-mod difse, sl string, bl wh cut, n flor sin or od

70% SLTY SH: med-dk gy, blk, frm, brit, ply-sb ply, arg-sily m
trns-clr gr, hd, brit, vf-l f gr, sb ang-sb rnd, mod-w srt, mod cmt,
dissim pyr, tr bri orng mnrl flor, slow-mod difse, sl string,





Thank you for using
Columbine Logging Inc.

Wells Ranch AE32-620 Wellbore TD @
16,116' MD @ 04:28 hrs on 09/25/15

MD: 15,978'
TVD: 6,543.67'
Inclination: 91.91°
Azimuth: 84.91°
VS: 9,227.92'

MD: 16,048'
TVD: 6,540.94'
Inclination: 92.56°
Azimuth: 84.51°
VS: 9,297.74'

MD: 16,116'
TVD: 6,537.9'
Inclination: 92.56°
Azimuth: 84.51°
VS: 9,365.53'

PROJECTION TO BIT

x: 30% SS: wh, lt-med brn,
mod cons, mod calc, tr
bl wh cut, n stn or od

60% SS: wh, lt-med brn, tmsl-clr gr, hd, brit, vf-med gr, rr c grnd sd, sb ang-sb md, mod-w srt, mod cmt,
p-mod cons, 40% SLTY SH: med-dk gy, blk, frm, brit, plty-sb plty, arg-sltly mtb, mod calc, rr ls, tr dissim pyr, tr
bent, tr bri omg mnrl flor, slow-mod difse, sl sting, bl wh cut, n stn or od

