

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** CUTTHROAT LC28-79HNB VERT

**Location** SEC 28 T9N R59W

**State** COLORADO

**County** WELD

**Country** USA

**Rig Number** HP 326

**API Number** 05-123-38855

**AFE #** 140276

**Region** DJ BASIN

**Field** DJ BASIN

**Spud Date** 8/5/2014

**Drilling Completed** 8/11/2014

**Surface Coordinates** 40° 42' 52.295 N  
103° 58' 58.302 W

**Ground Elevation** 4862'

**K.B. Elevation** 4892'

**Logged Interval** 644' **To** 10325'

**Total Depth** 10325'

**Formation** NIOBRARA B MARL

**Type of Drilling Fl...** LSND

## Operator

**Company** NOBLE ENERGY INC.

**Address** 1625 Broadway Suite 2200  
Denver, CO 80202

## Geologist

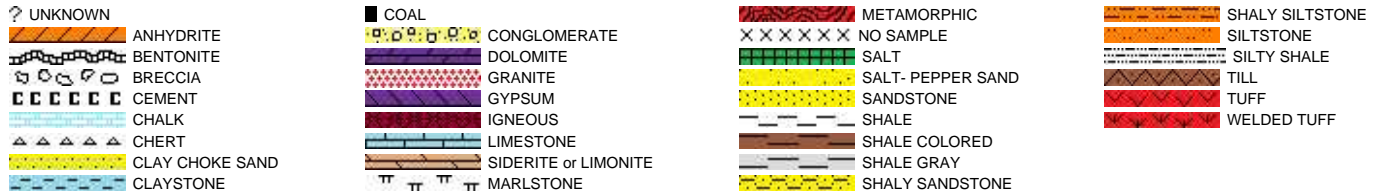
**Name** EVAN HOWELL

**Company** NOBLE ENERGY INC.

**Address** 1625 Broadway Suite 2200  
Denver, CO 80202

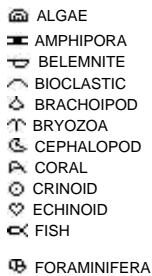
## Other

## Rock Types

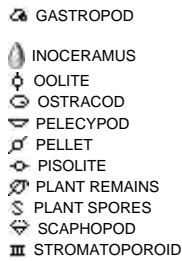


## Accessories

## Fossils

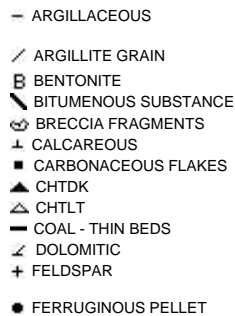


## FOSSIL



## Minerals

## ANHYDRITIC



## FERRUGINOUS



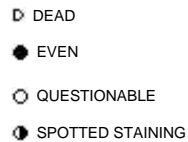
## TUFFACEOUS

## Stringer

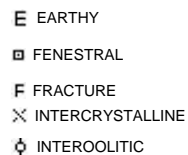


## Other Symbols

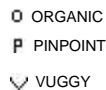
## Oil Show



## Porosity



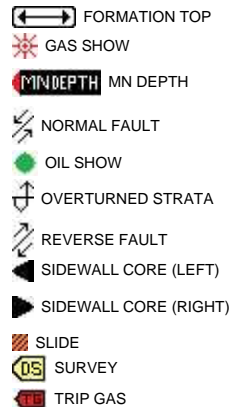
## MOLDIC



## Engineering



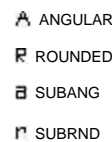
## FAULT



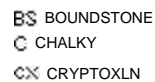
## WIRELINE TESTED - LEFT



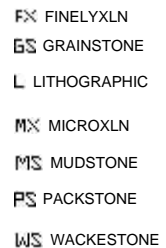
## Rounding



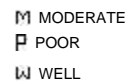
## Textures

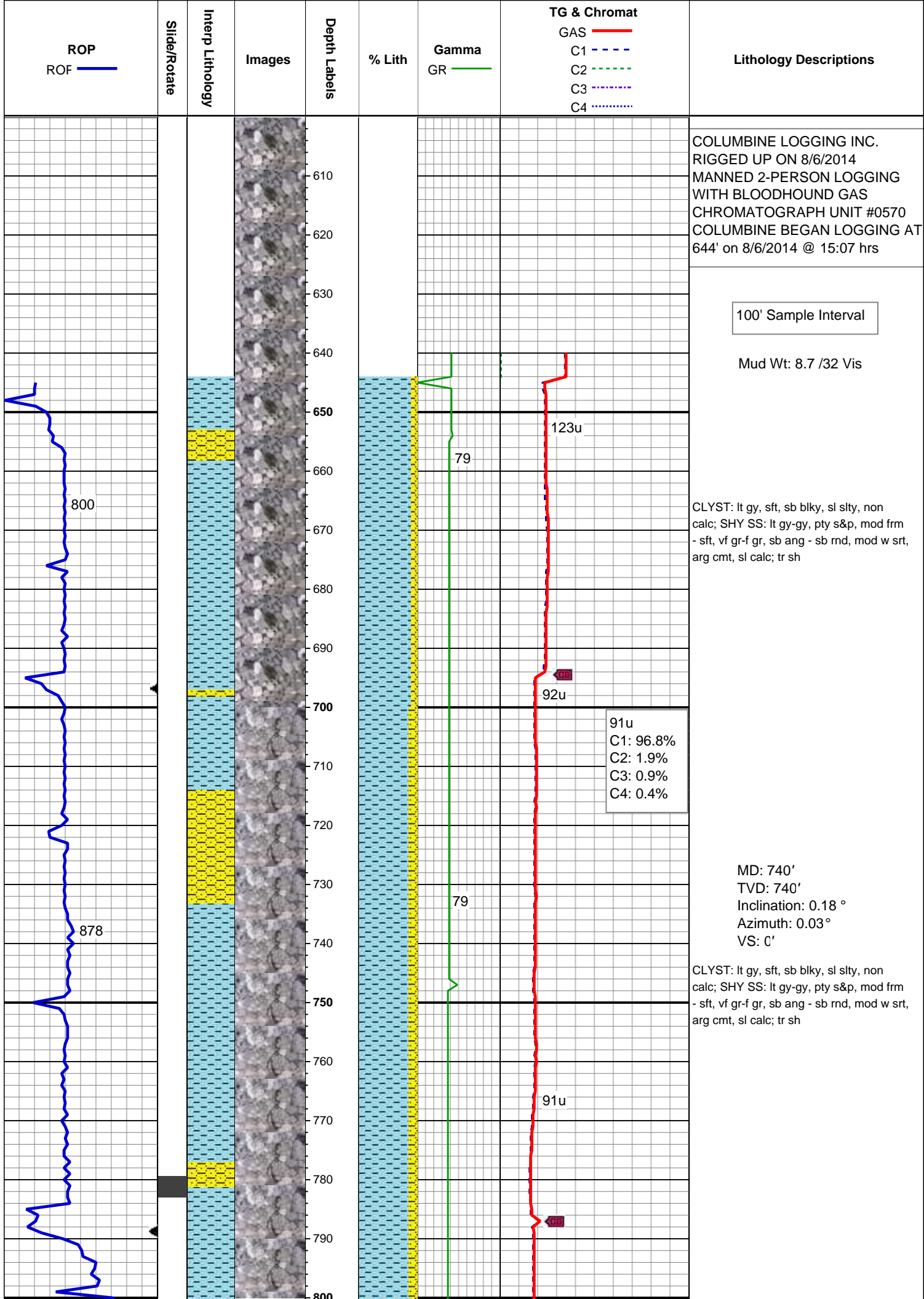


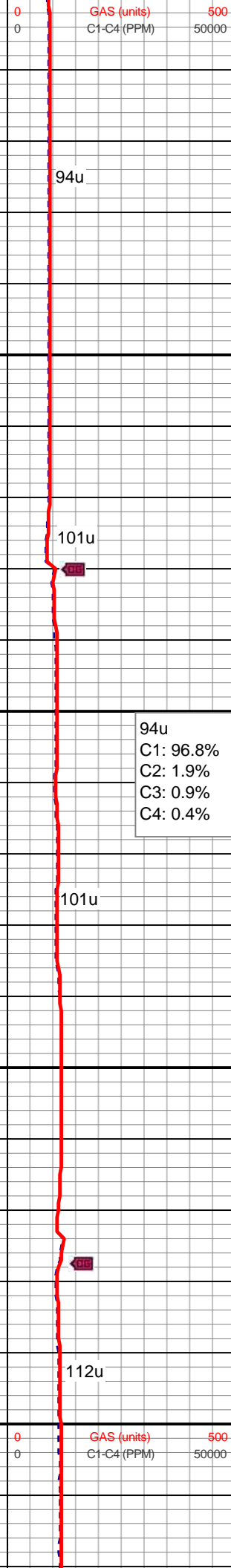
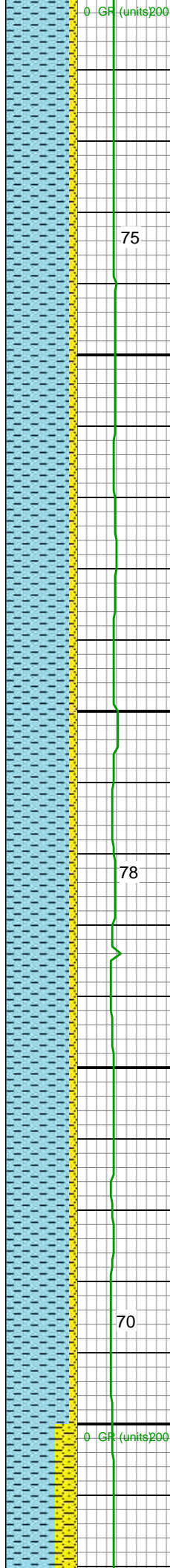
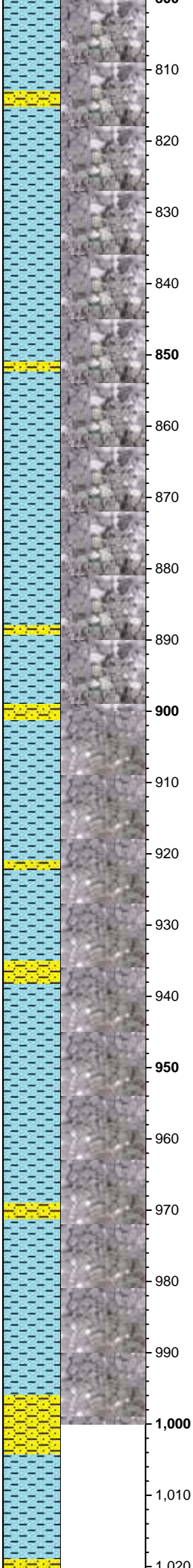
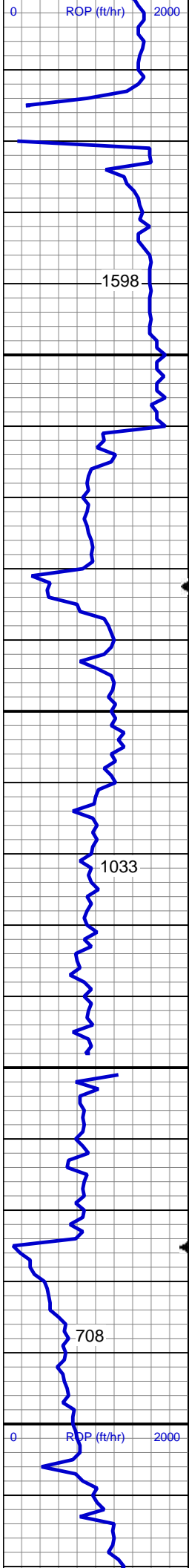
## EARTHY



## Sorting







Mud Wt: 8.7 /32 Vis

MD: 834'  
TVD: 834'  
Inclination: 0.18 °  
Azimuth: 276.36 °  
VS: -0.15'

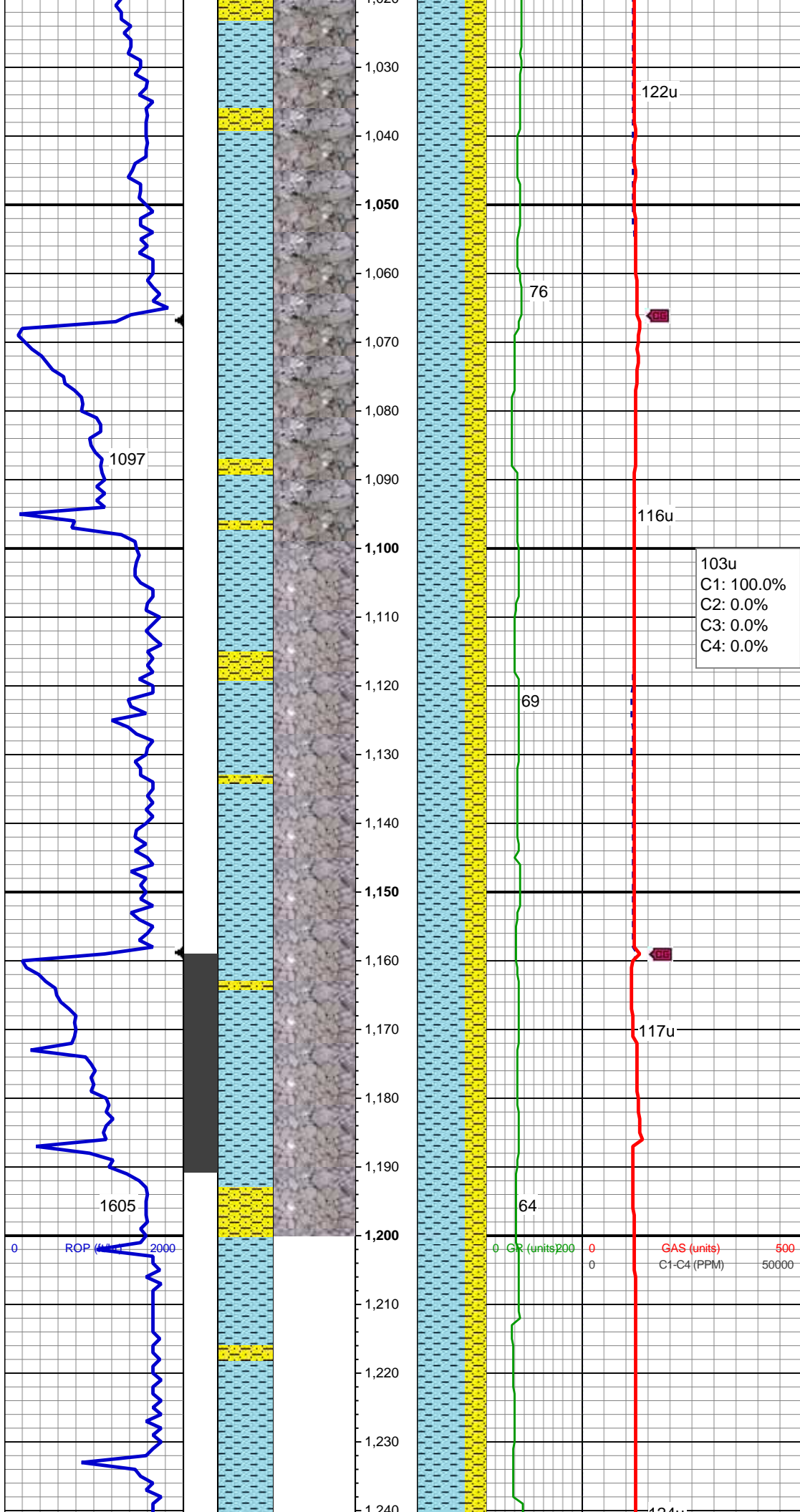
CLYST: lt gy, sft, sb blk, sl slty, non calc; SHY SS: lt gy-gy, pty s&p, mod frm - sft, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc; tr sh

94u  
C1: 96.8%  
C2: 1.9%  
C3: 0.9%  
C4: 0.4%

MD: 927'  
TVD: 927'  
Inclination: 0.18 °  
Azimuth: 261.1 °  
VS: -0.44'

CLYST: lt gy, sft, sb blk, sl slty, non calc; SHY SS: lt gy-gy, pty s&p, mod frm - sft, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc; tr sh





MD: 1,019'  
TVD: 1,018.96'  
Inclination: 2.73 °  
Azimuth: 273.54 °  
VS: -2.77'

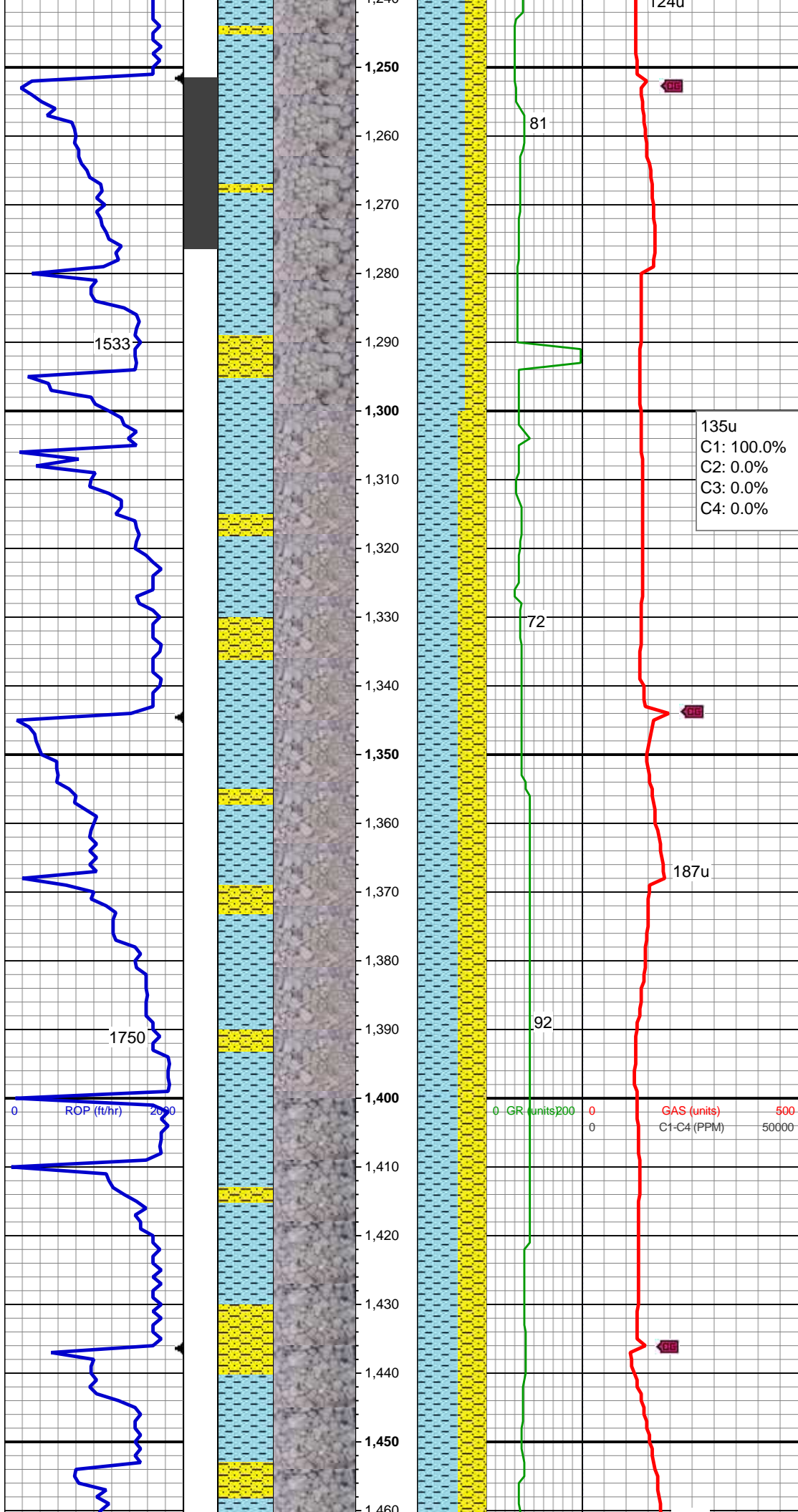
CLYST: lt gy, sft, sb blkly, sl slty, non  
calc; SHY SS: lt gy-gy, pty s&p, mod frm  
- sft, vf gr-f gr, sb ang - sb rnd, mod w srt,  
arg cmt, sl calc; tr sh

Mud Wt: 8.6 /36 Vis

MD: 1,111'  
TVD: 1,110.76'  
Inclination: 4.84 °  
Azimuth: 274.07 °  
VS: -8.82'

SHY SS: lt-med gy, hrd - sft, vf gr-f gr,  
occ med grns, sb ang - sb rnd, mod w srt,  
arg cmt, sl calc CLYST: lt gy, sft, sb  
blkly-blky, sl slty, non calc

MD: 1,203'  
TVD: 1,202.22'  
Inclination: 7.47 °  
Azimuth: 273.54 °  
VS: -18.67'



SHY SS: lt-med gy, hrd - sft, vf gr-f gr,  
occ med grns, sb ang - sb rnd, mod w srt,  
arg cmt, sl calc CLYST: lt gy, sft, sb  
blky-blky, sl slty, non calc

MD: 1,295'  
TVD: 1,293.18'  
Inclination: 9.76 °  
Azimuth: 261.94 °  
VS: -32.36'

135u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

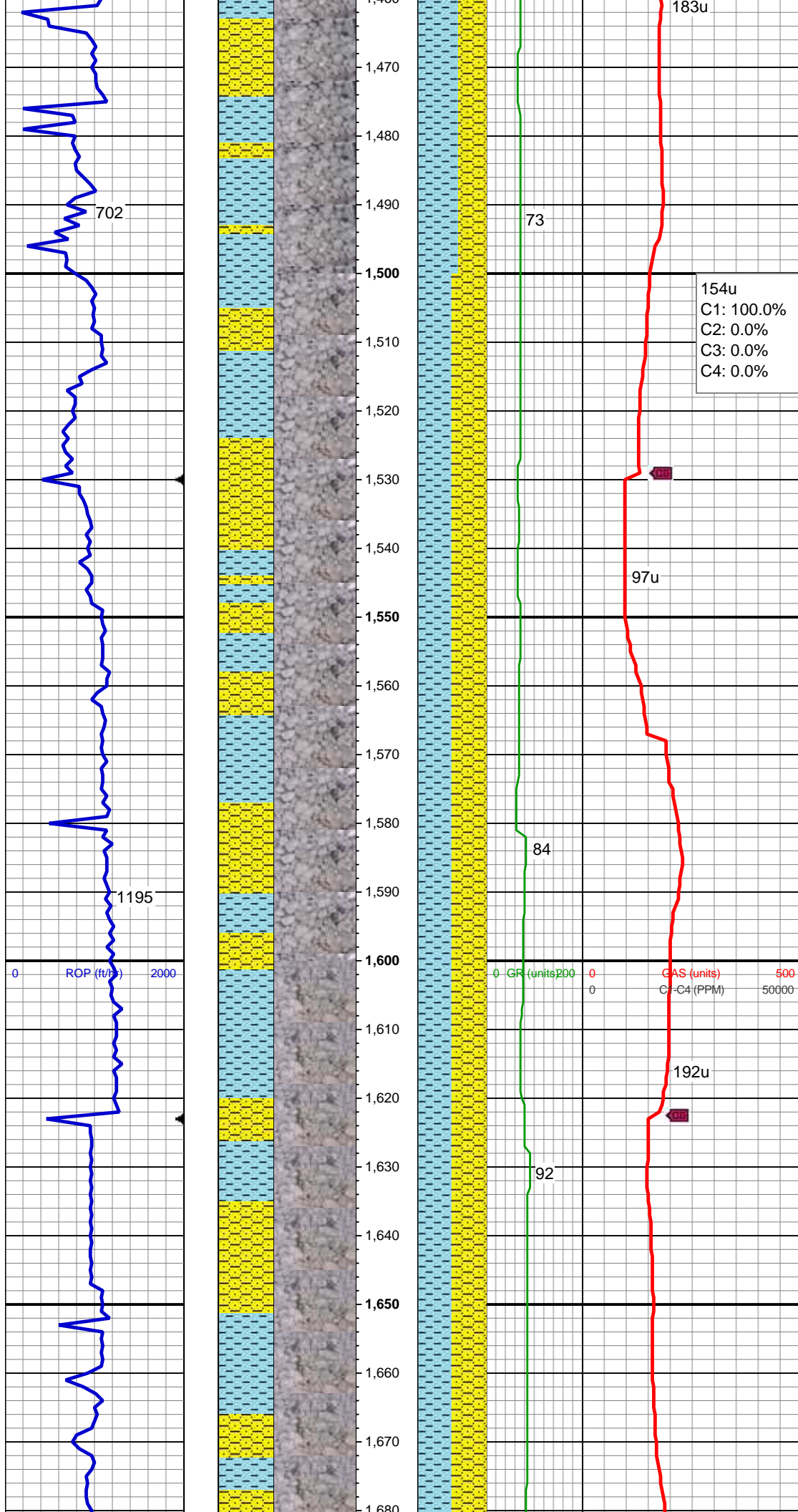
SHY SS: lt-med gy, sft - frm, vf gr-f gr,  
occ med grns, sb ang - sb rnd, mod w srt,  
arg cmt, sl calc CLYST: lt gy, sft, sb blky,  
sl slty, non calc

MD: 1,387'  
TVD: 1,383.57'  
Inclination: 11.7 °  
Azimuth: 262.12 °  
VS: -49.32'

Mud Wt: 8.65 / 36 Vis

SHY SS: lt-med gy, sft-frm, vf gr-f gr, occ  
med grns, sb ang - sb rnd, mod w srt, arg  
cmt, sl calc CLYST: lt gy, sft, sb blky, sl  
slty, non calc





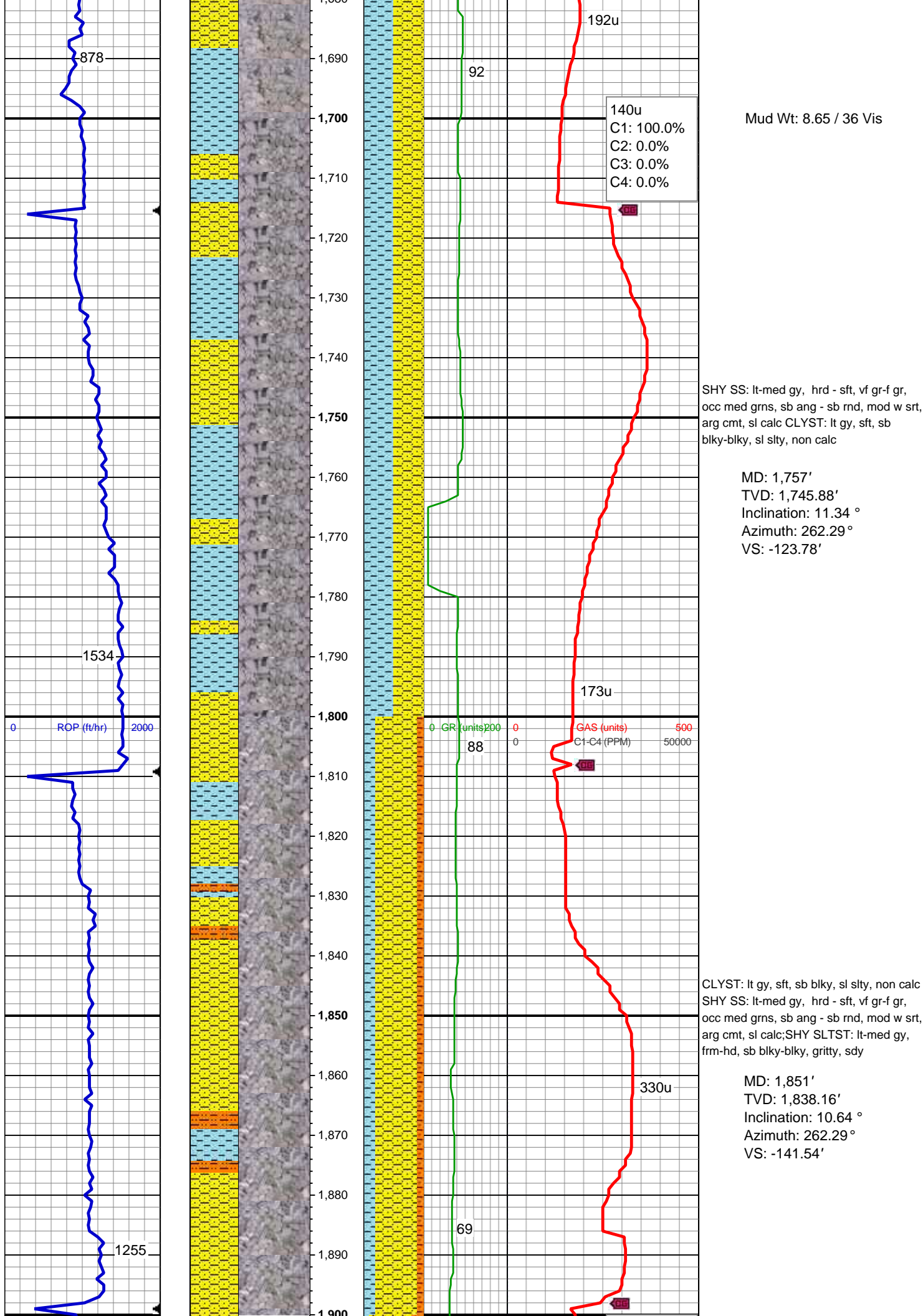
MD: 1,481'  
TVD: 1,475.54'  
Inclination: 12.13 °  
Azimuth: 263 °  
VS: -68.57'

SHY SS: lt-med gy, frm, vf gr-f gr, occ  
med grns, sb ang - sb rnd, mod w srt, arg  
cmt, sl calc CLYST: lt gy, sft, blk, sl slty,  
non calc

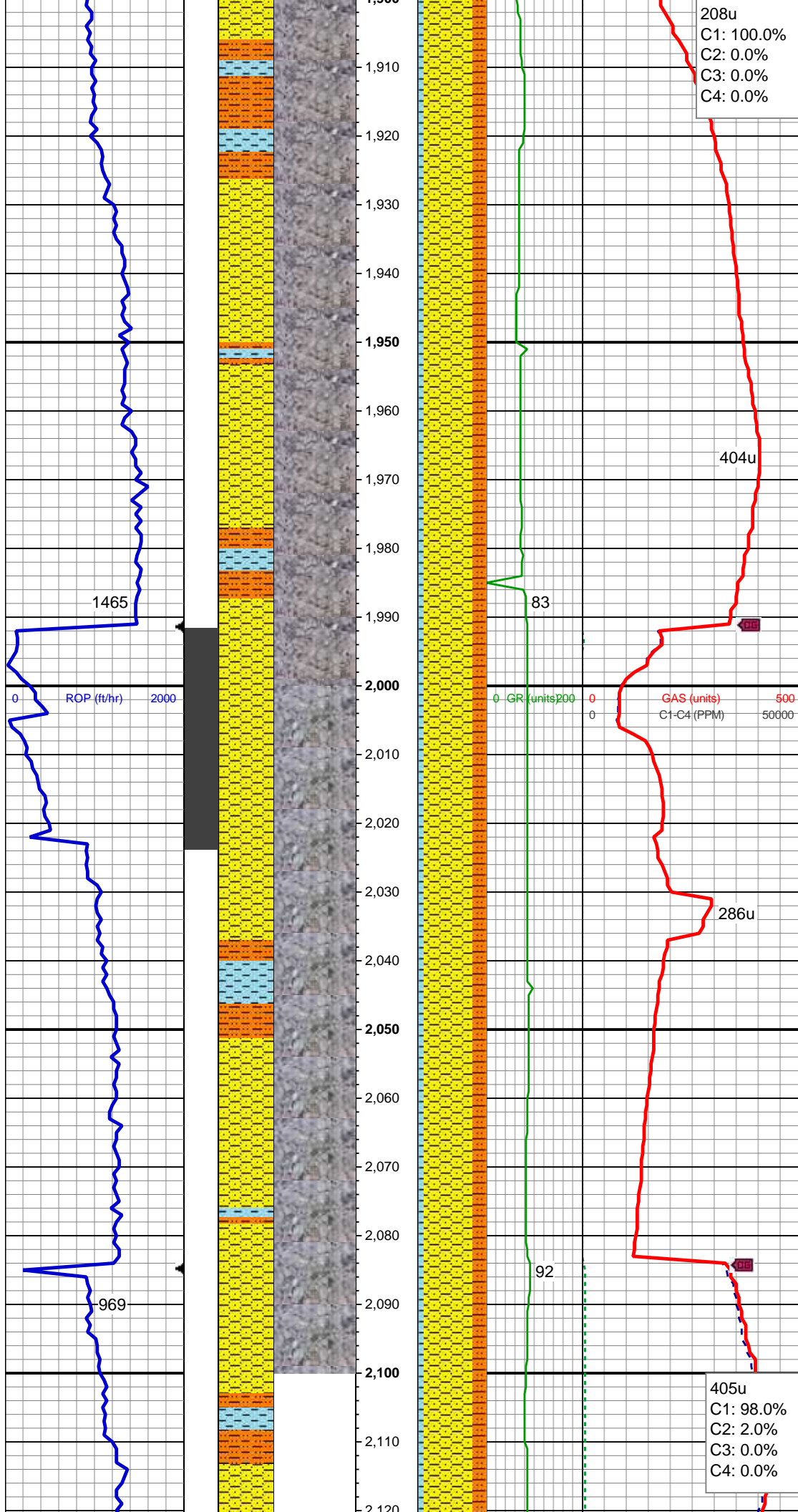
MD: 1,574'  
TVD: 1,566.55'  
Inclination: 11.61 °  
Azimuth: 263.7 °  
VS: -87.57'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, occ  
med grns, sb ang - sb rnd, mod w srt, arg  
cmt, sl calc CLYST: lt gy, sft, sb  
blk, blk, sl slty, non calc

MD: 1,666'  
TVD: 1,656.69'  
Inclination: 11.52 °  
Azimuth: 263.35 °  
VS: -105.89'







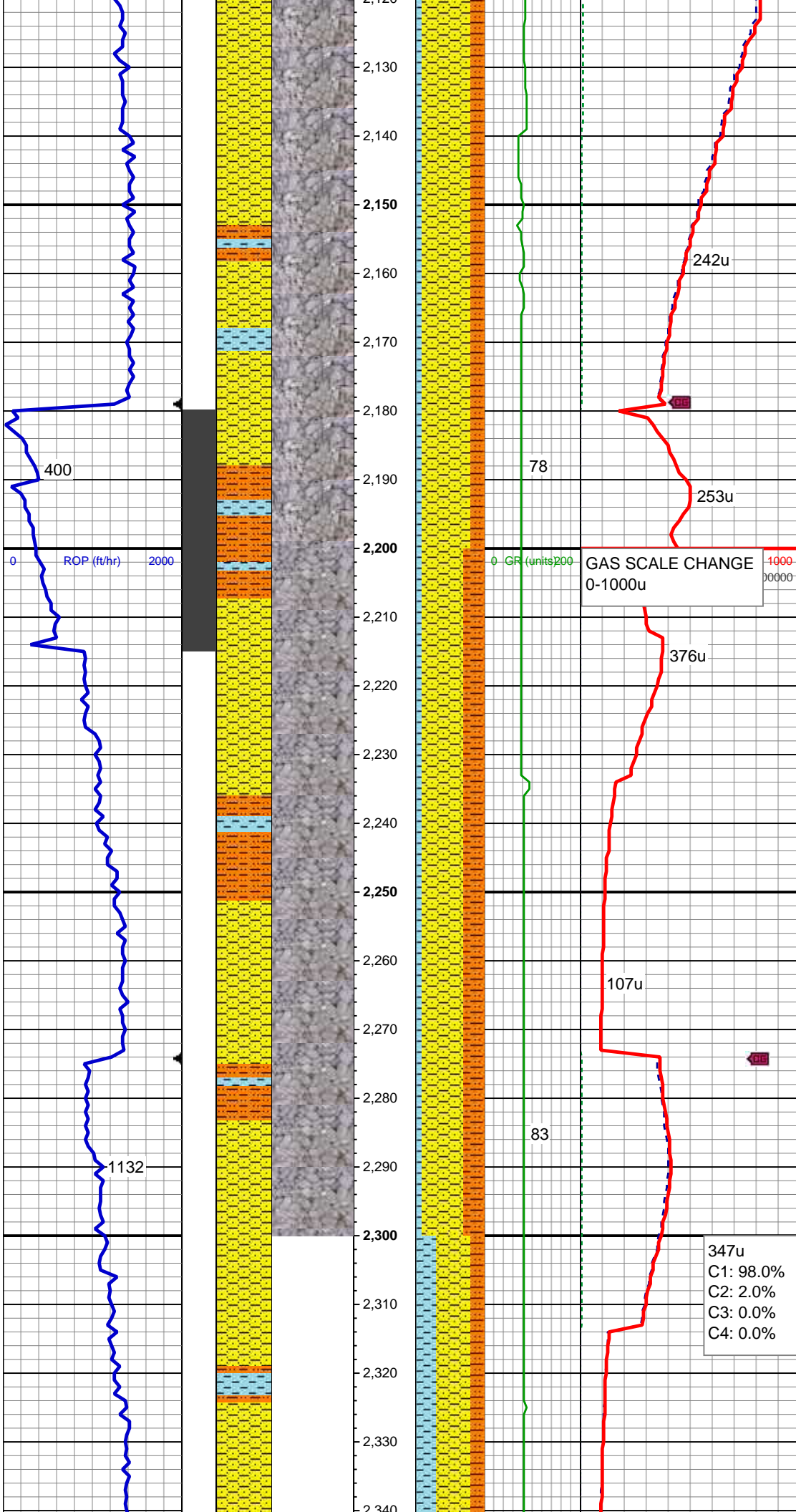
MD: 1,943'  
TVD: 1,928.55'  
Inclination: 10.82 °  
Azimuth: 261.94 °  
VS: -158.51'

CLYST: lt gy, sft, sb blk, sl slty, non calc  
SHY SS: lt-med gy, sft-frm, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc; SHY SLTST: lt-med gy, frm-hd, sb blk, gritty, sdy

Mud Wt: 8.85 / 35 Vis

MD: 2,035'  
TVD: 2,018.82'  
Inclination: 11.43 °  
Azimuth: 267.92 °  
VS: -176.17'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc; SHY SLTST: lt-med gy, frm, sb blk, gritty, sdy CLYST: lt gy, sft, sb blk-blky, sl slty, non calc



MD: 2,128'  
TVD: 2,110.02'  
Inclination: 11.17 °  
Azimuth: 267.92 °  
VS: -194.38'

SHY SS: lt-med gy, sft frm, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc; SHY SLTST: lt-med gy, frm, sb blk, gritty, sdy CLYST: lt gy, sft, sb blk, blk, sl slty, non calc

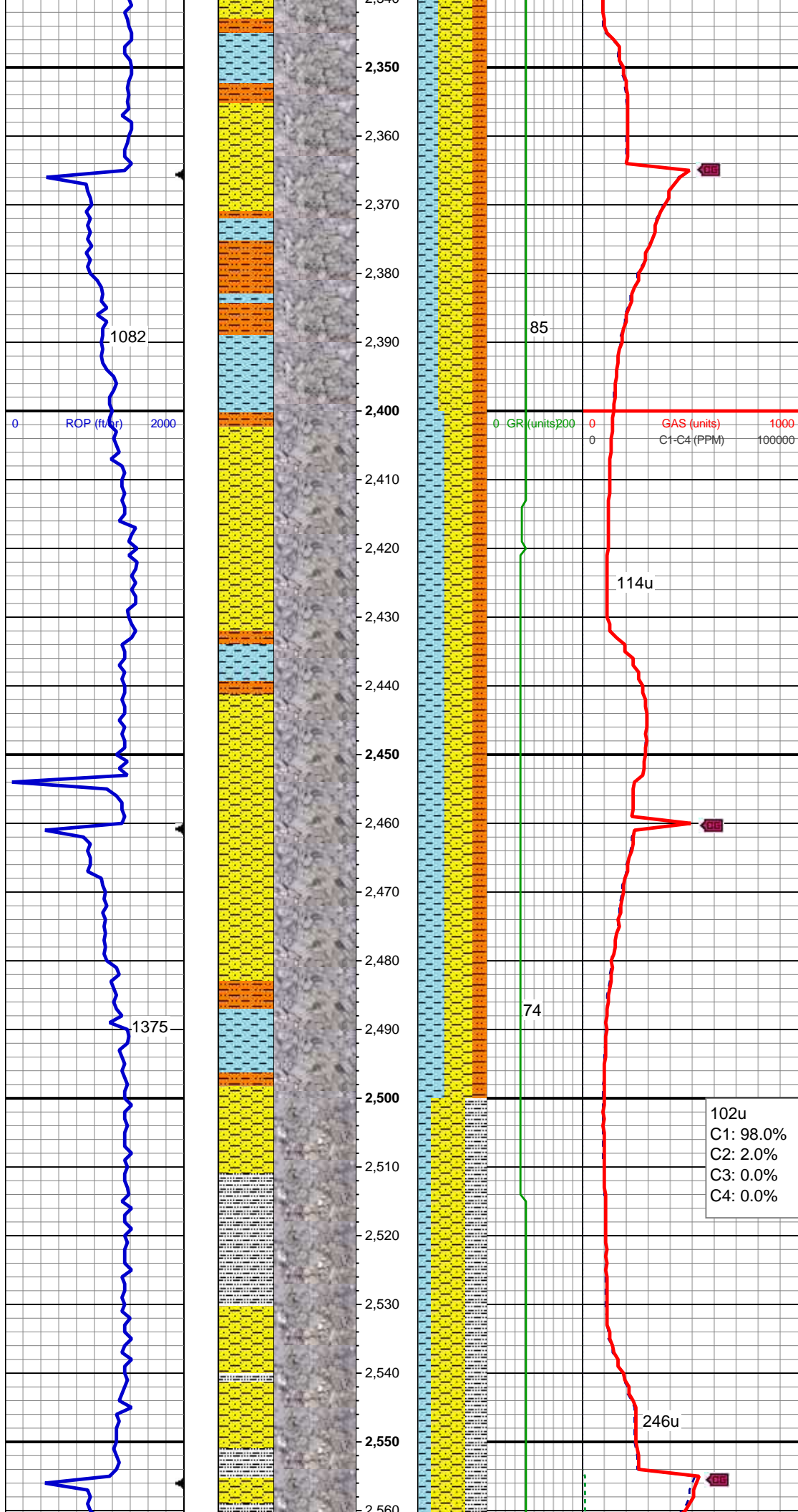
MD: 2,222'  
TVD: 2,201.93'  
Inclination: 13.01 °  
Azimuth: 272.67 °  
VS: -214.05'

SHY SS: lt-med gy, sft-hd, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc; SHY SLTST: lt-med gy, frm-hd, sb blk, blk, gritty, sdy CLYST: lt gy, sft, blk, sl slty, non calc

Mud Wt: 8.75 / 33 Vis

MD: 2,317'  
TVD: 2,294.46'  
Inclination: 13.19 °  
Azimuth: 272.67 °  
VS: -235.56'





SHY SS: lt-med gy, frm, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc; SHY SLTST: lt-med gy, frm-hd, sb blkly-blky, gritty, sdy CLYST: lt gy, sft, sb blkly, sl slty, non calc

MD: 2,412'  
TVD: 2,387.04'  
Inclination: 12.75 °  
Azimuth: 271.79 °  
VS: -256.86'

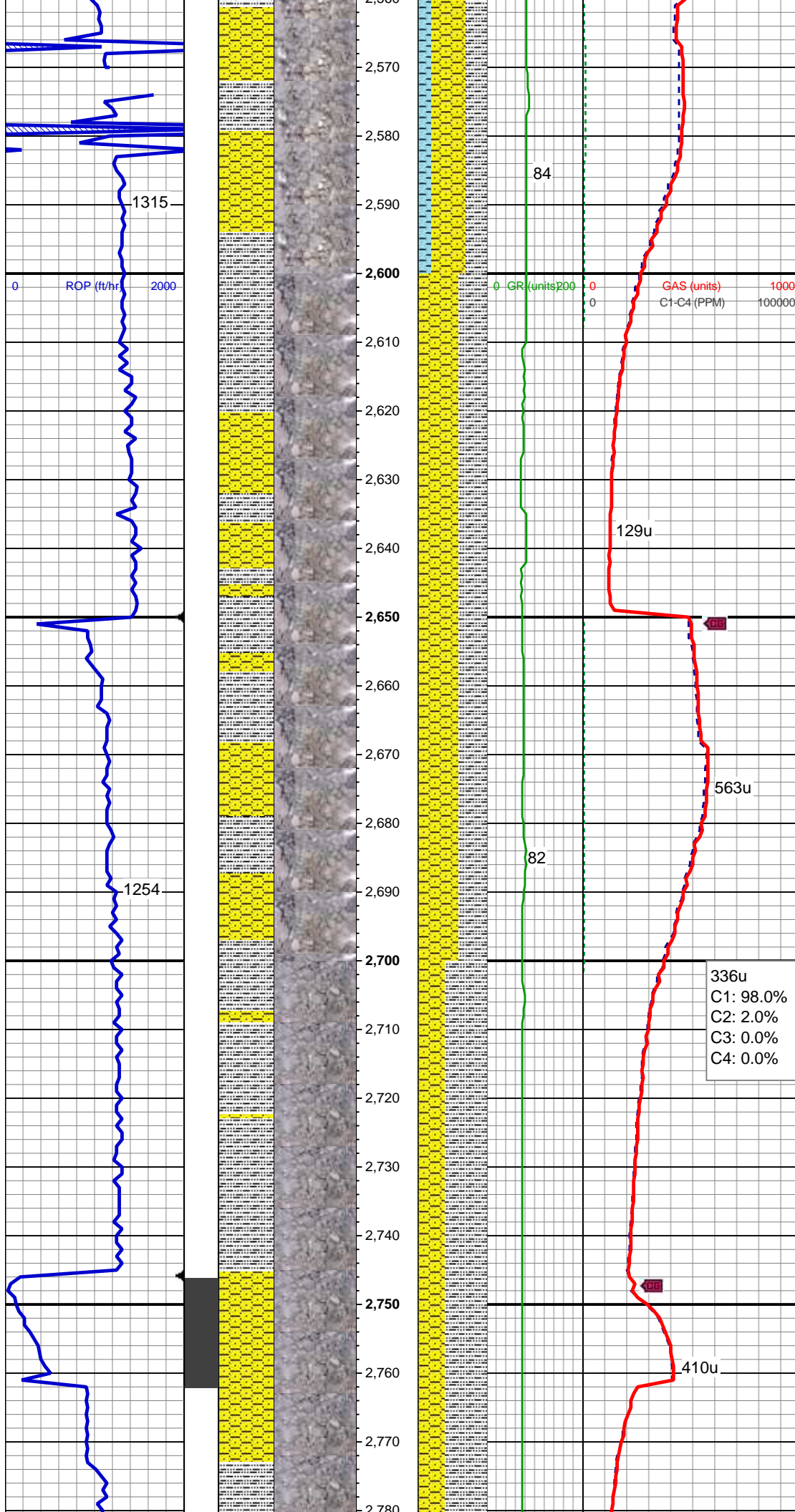
SHY SS: lt-med gy, frm, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc; SHY SLTST: lt-med gy, frm-hd, sb blkly-blky, gritty, sdy CLYST: lt gy, sft, sb blkly, sl slty, non calc

102u  
C1: 98.0%  
C2: 2.0%  
C3: 0.0%  
C4: 0.0%

MD: 2,506'  
TVD: 2,478.83'  
Inclination: 12.13 °  
Azimuth: 271.79 °  
VS: -277.1'

SHY SS: lt-med gy, mod frm - sft, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc CLYST: lt gry, sft, sub-blky, non calc SLTY SH: lt-dk gy, sft-frm, sb blkly-sb plty, gritty





Mud Wt: 8.75 / 36 Vis

MD: 2,600'

TVD: 2,570.73'

Inclination: 12.13 °

Azimuth: 272.14 °

VS: -296.84'

SHY SS: lt-med gy, mod frm - sft, vf gr-f  
gr, sb ang - sb rnd, mod w srt, arg cmt, sl  
calc SLTY SH: lt-dk gy, sft-frm, sb blk-y-sb  
plty, gritty

MD: 2,695'

TVD: 2,663.56'

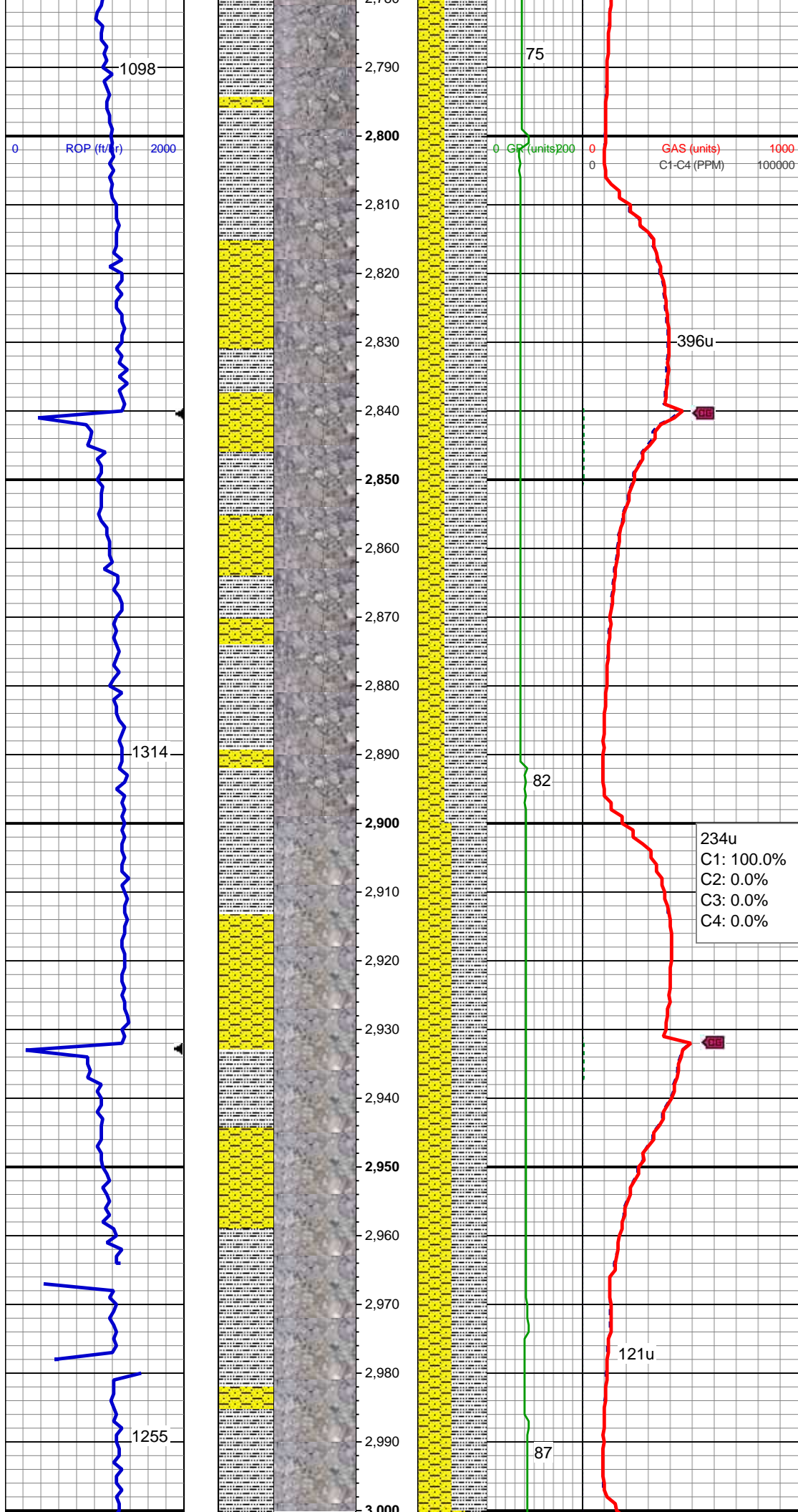
Inclination: 12.4 °

Azimuth: 273.02 °

VS: -317'

SHY SS: lt-med gy, mod frm - sft, vf gr-f  
gr, occ med grns, sb ang - sb rnd, mod w  
srt, arg cmt, sl calc SLTY SH: lt-dk gy,  
sft-frm, sb blk-y-sb plty, gritty

MD: 2,700'



MD: 2,789'  
TVD: 2,755.4'  
Inclination: 12.22 °  
Azimuth: 267.74 °  
VS: -337.02'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc  
SLTY SH: lt-dk gy, sft-hd, sb blkly-sb plty,  
gritty

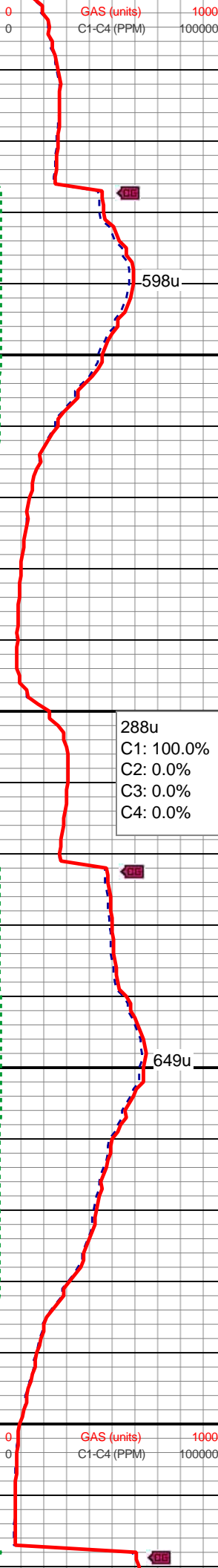
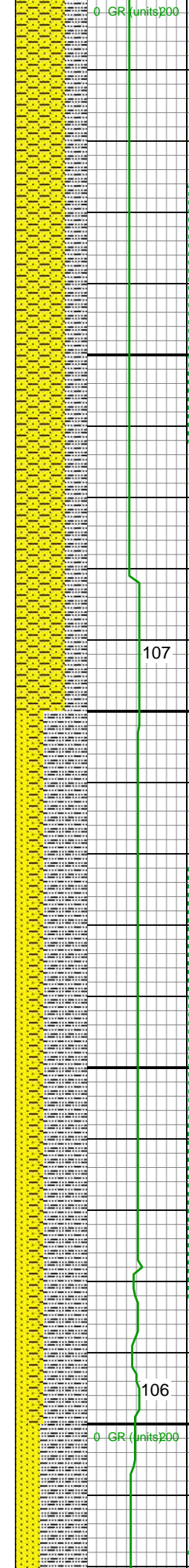
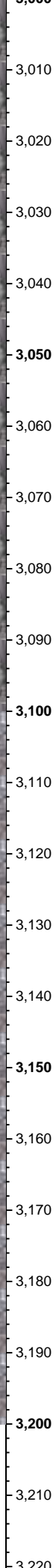
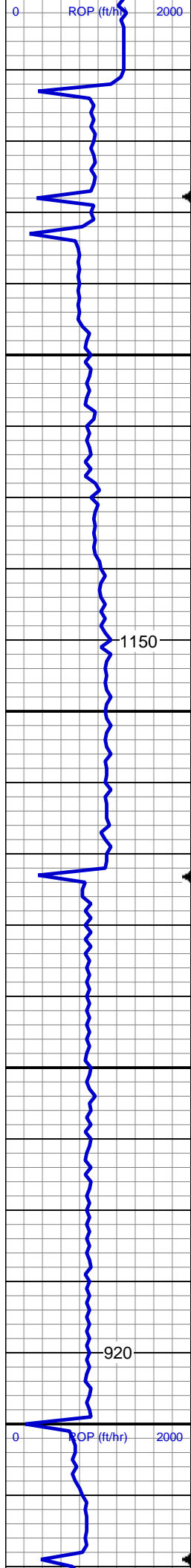
MD: 2,884'  
TVD: 2,848.22'  
Inclination: 12.4 °  
Azimuth: 267.39 °  
VS: -357.26'

Mud Wt: 8.75 / 36 Vis

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc  
SLTY SH: lt-dk gy, sft-hd, sb blkly-sb plty,  
gritty

MD: 2,979'  
TVD: 2,941.02'  
Inclination: 12.31 °  
Azimuth: 267.74 °  
VS: -377.57'





SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc  
SLTY SH: lt-dk gy, sft-hd, sb blkly-sb plty, gritty

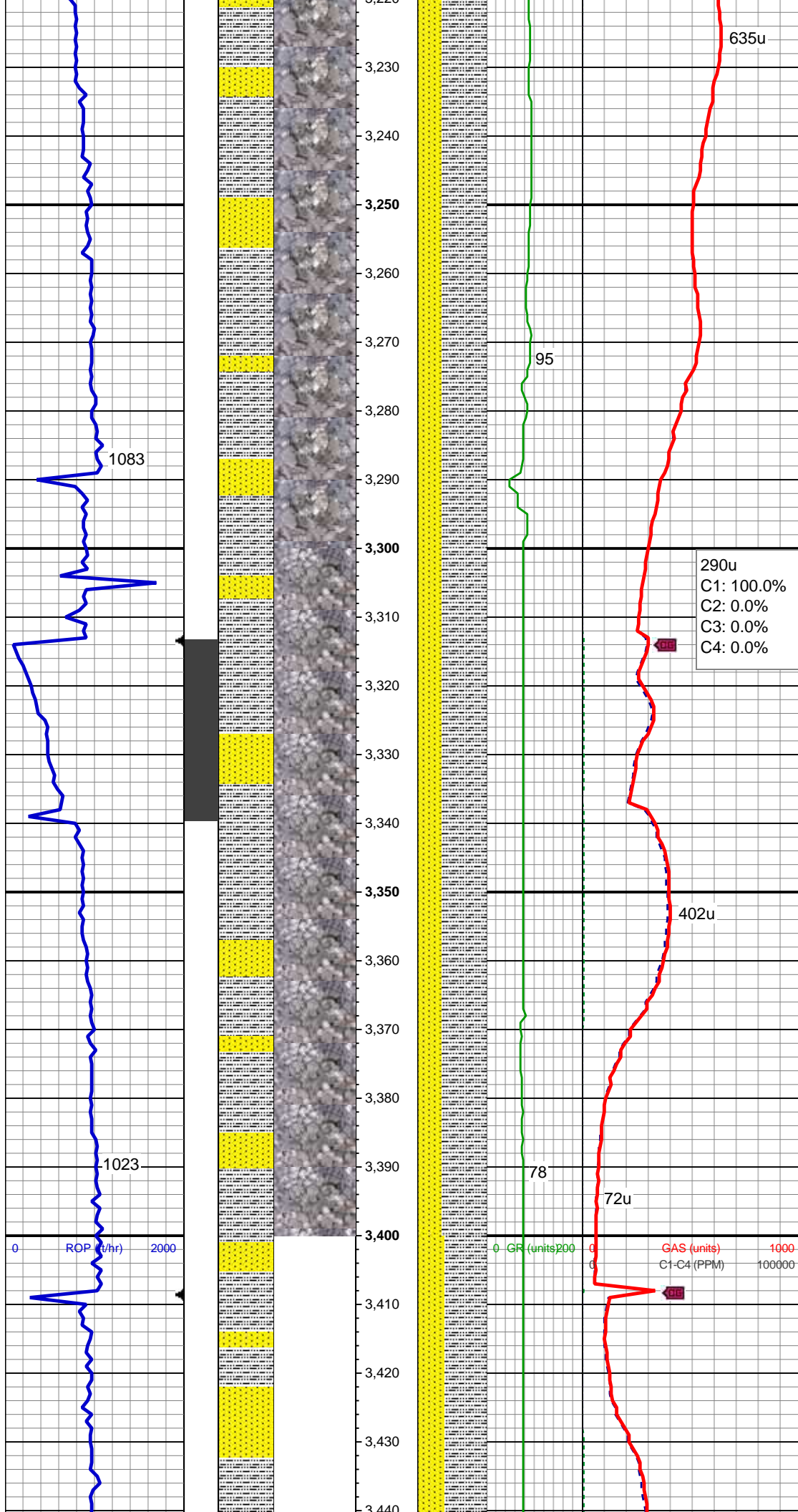
MD: 3,073'  
TVD: 3,032.9'  
Inclination: 12.05 °  
Azimuth: 267.92 °  
VS: -397.39'

SHY SS: lt-med gy, mod frm - sft, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc  
SLTY SH: lt-dk gy, sft-frm, sb blkly-sb plty, gritty  
SS:lt-gy, frm,vf gr-f gr, rare med grns, sb ang-sb rnd, mod w srt, tr pyr

MD: 3,168'  
TVD: 3,126.03'  
Inclination: 10.73 °  
Azimuth: 267.04 °  
VS: -416.13'

Mud Wt: 8.85 / 38 Vis



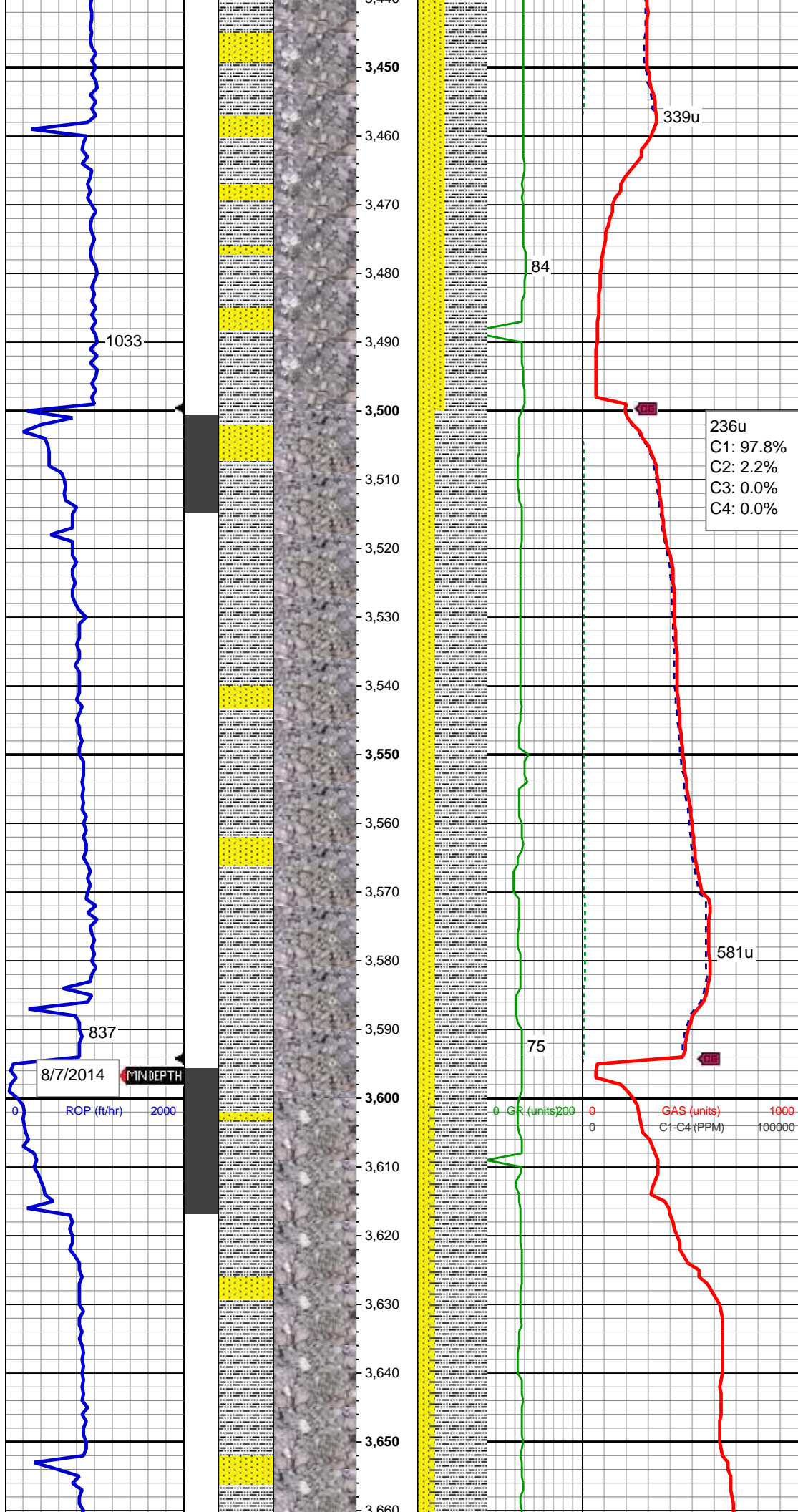


SLTY SH: lt-dk gy, sft frm, sb blk-y-sb plty,  
gritty SS:lt-gy, frm,vf gr-f gr, occ med  
grns, sb ang-sb rnd, mod w srt, tr pyr

MD: 3,262'  
TVD: 3,218.59'  
Inclination: 9.32 °  
Azimuth: 265.11 °  
VS: -432.45'

SLTY SH: lt-dk gy, sft frm, sb blk-y-sb plty,  
gritty SS:lt-gy, frm,vf gr-f gr, occ med  
grns, sb ang-sb rnd, mod w srt, tr pyr

MD: 3,357'  
TVD: 3,312.1'  
Inclination: 10.99 °  
Azimuth: 268.8 °  
VS: -449.17'



SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty SS:lt-med gy, frm,vf gr-f gr, occ med grns, sb ang-sb rnd, mod w srt, tr pyr

MD: 3,452'  
TVD: 3,405.2'  
Inclination: 11.96 °  
Azimuth: 269.33 °  
VS: -468.07'

Mud Wt: 8.8 / 41 Vis

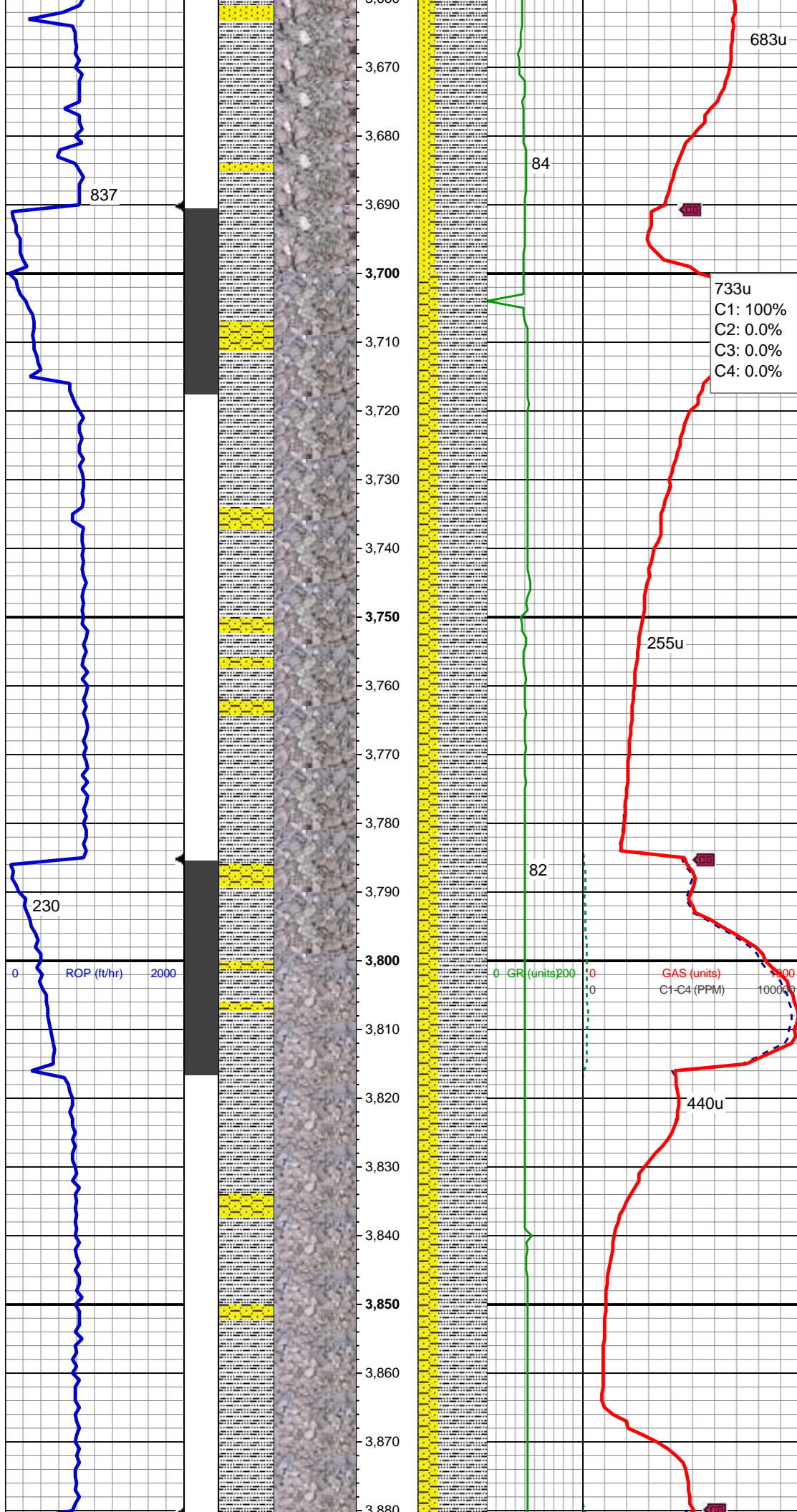
MD: 3,546'  
TVD: 3,497.04'  
Inclination: 12.66 °  
Azimuth: 268.97 °  
VS: -488.11'

SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty SS:lt-med gy, frm,vf gr-f gr, occ med grns, sb ang-sb rnd, mod w srt, tr pyr

MD: 3,641'  
TVD: 3,589.57'  
Inclination: 13.54 °  
Azimuth: 266.34 °  
VS: -509.61'

SHY SS: lt-med gy, mod frm - sft, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc SLTY SH: lt-dk gy, sft-frm, sb blk-y-sb plty, gritty SS:lt-gy, frm,vf gr-f gr, rare med grns, sb ang-sb rnd, mod w srt, tr pyr





MD: 3,735'  
TVD: 3,681.07'  
Inclination: 12.93 °  
Azimuth: 262.82 °  
VS: -531.03'

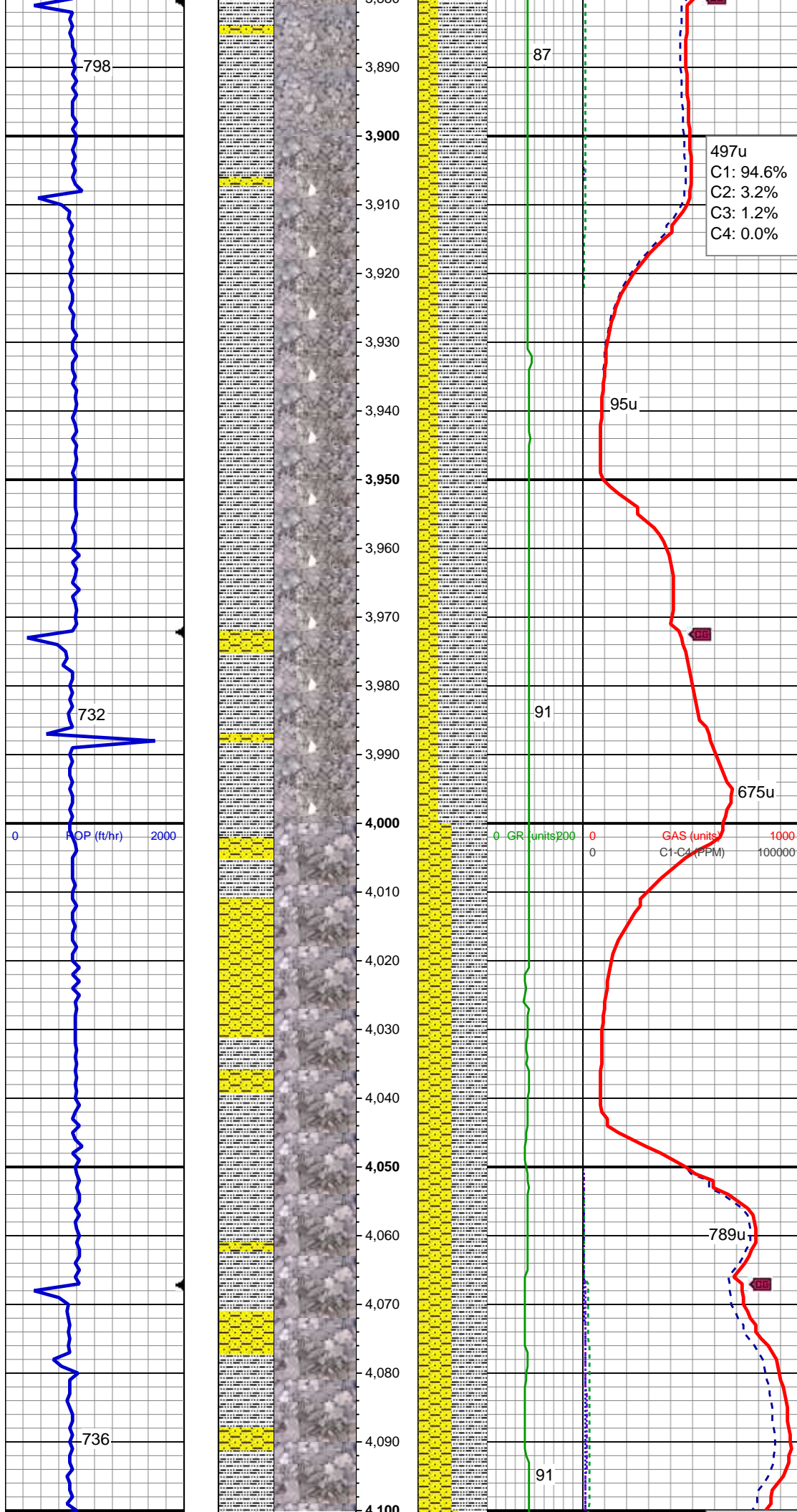
SHY SS: lt-med gy, mod frm - sft, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc SLTY SH: lt-dk gy, sft-frm, sb blkly-sb plty, gritty

Mud Wt: 8.9 / 37 Vis

MD: 3,830'  
TVD: 3,774.09'  
Inclination: 10.46 °  
Azimuth: 258.6 °  
VS: -550.03'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb plty, gritty





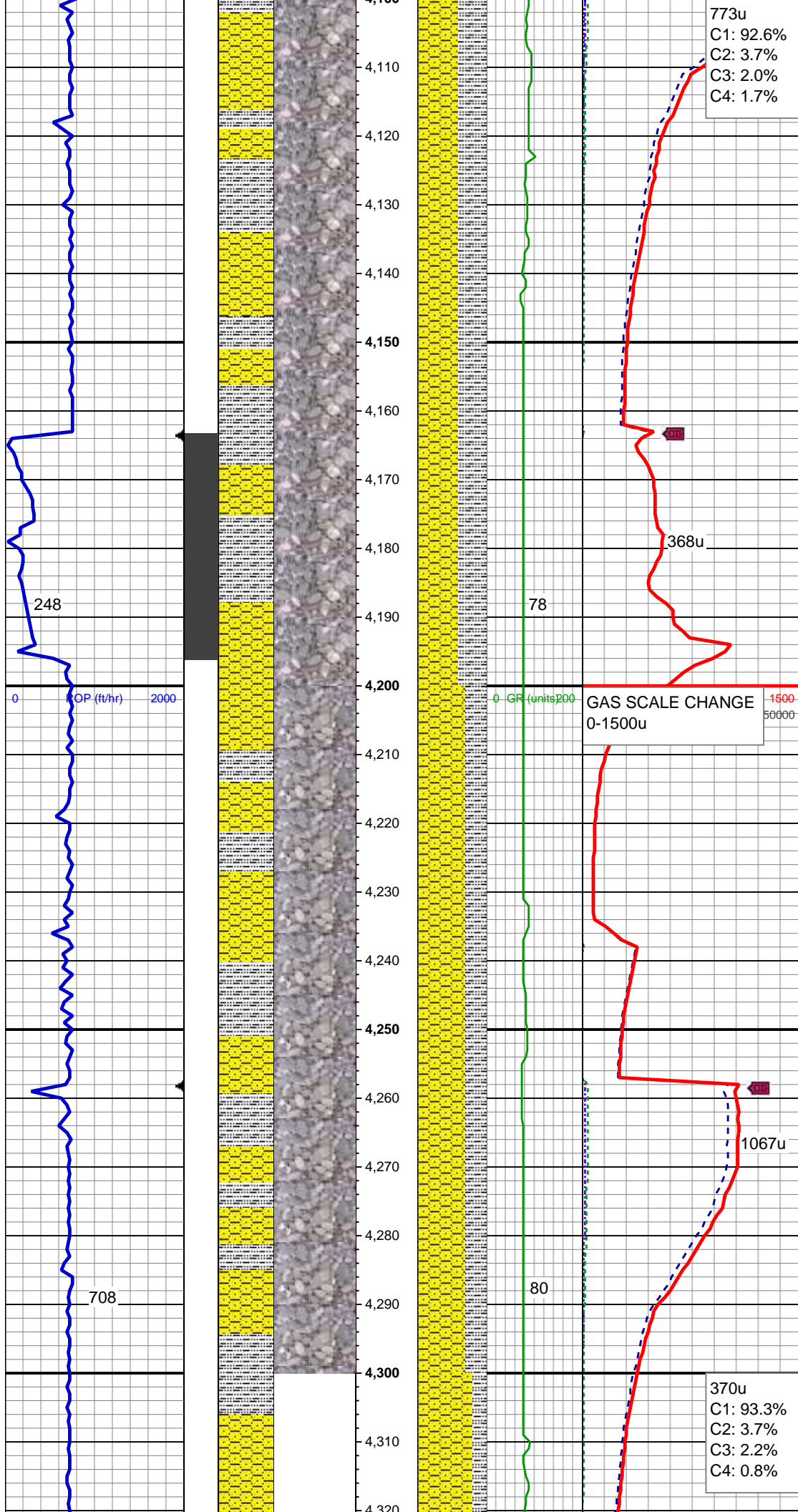
MD: 3,924'  
TVD: 3,866.56'  
Inclination: 10.29 °  
Azimuth: 259.48 °  
VS: -566.65'

SHY SS: lt-med gy, sft frm, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc  
SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty

MD: 4,019'  
TVD: 3,960.08'  
Inclination: 9.94 °  
Azimuth: 259.66 °  
VS: -583.06'

SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty  
SHY SS: lt-med gy, mod frm - sft, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc

Mud Wt: 8.95 / 36 Vis



MD: 4,114'  
TVD: 4,053.8'  
Inclination: 8.88 °  
Azimuth: 262.82 °  
VS: -598.4'

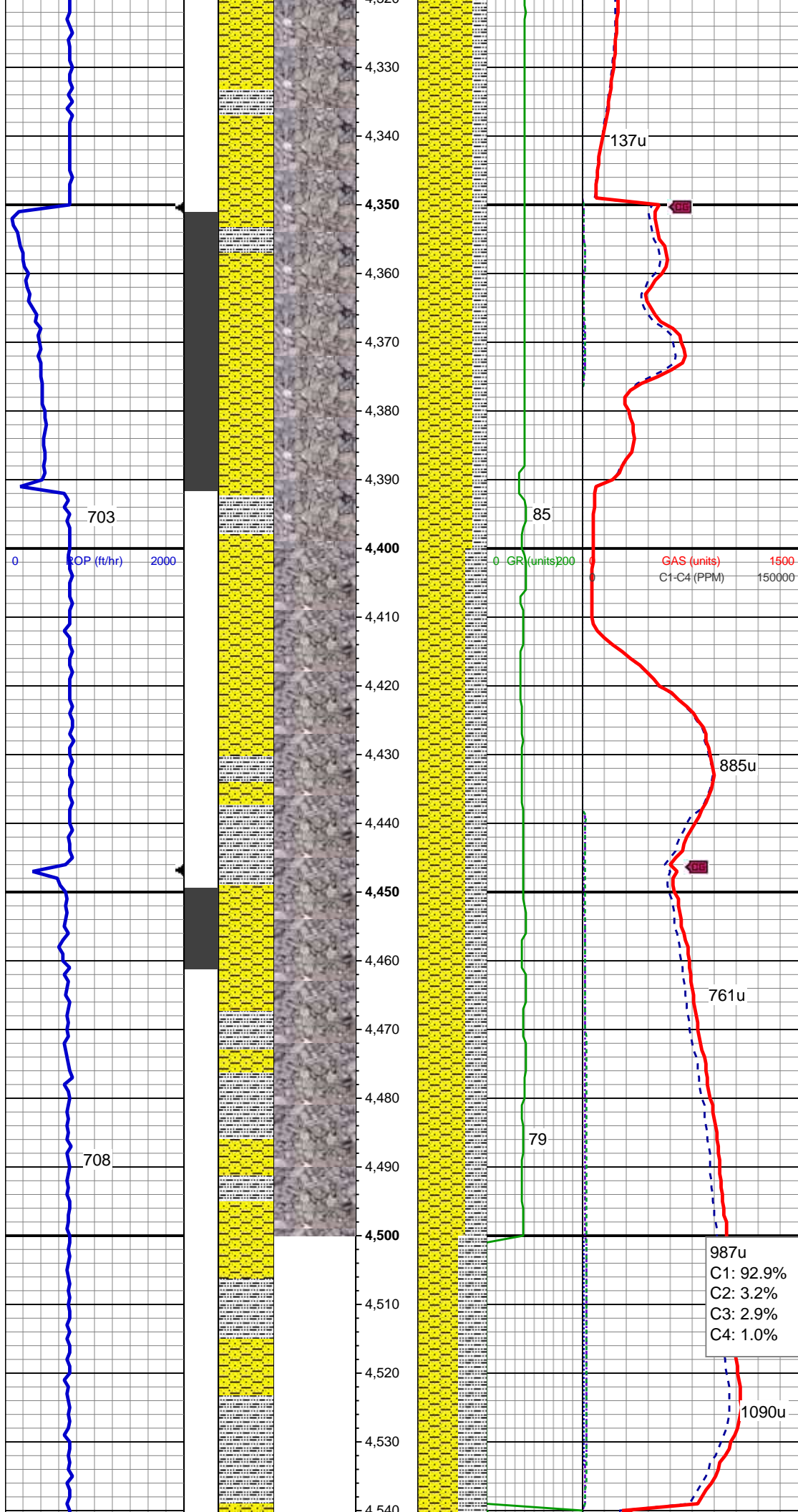
SHY SS: lt-med gy, mod frm - sft, vf gr-f  
gr, occ med grns, sb ang - sb rnd, mod w  
srt, arg cmt, sl calc SLTY SH: lt-dk gy,  
sft-frm, sb blk-y-sb plty, gritty

MD: 4,208'  
TVD: 4,146.56'  
Inclination: 9.76 °  
Azimuth: 265.63 °  
VS: -613.54'

SHY SS: lt-med gy, mod frm - sft, vf gr-f  
gr, occ med grns, sb ang - sb rnd, mod w  
srt, arg cmt, sl calc SLTY SH: lt-dk gy,  
sft-frm, sb blk-y-sb plty, gritty

MD: 4,302'  
TVD: 4,239.28'  
Inclination: 9.15 °  
Azimuth: 264.76 °  
VS: -628.93'





SHY SS: lt-med gy, mod frm - sft, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc  
SLTY SH: lt-dk gy, sft-frm, sb blkly-sb plty, gritty

Mud Wt: 9.2 / 39 Vis

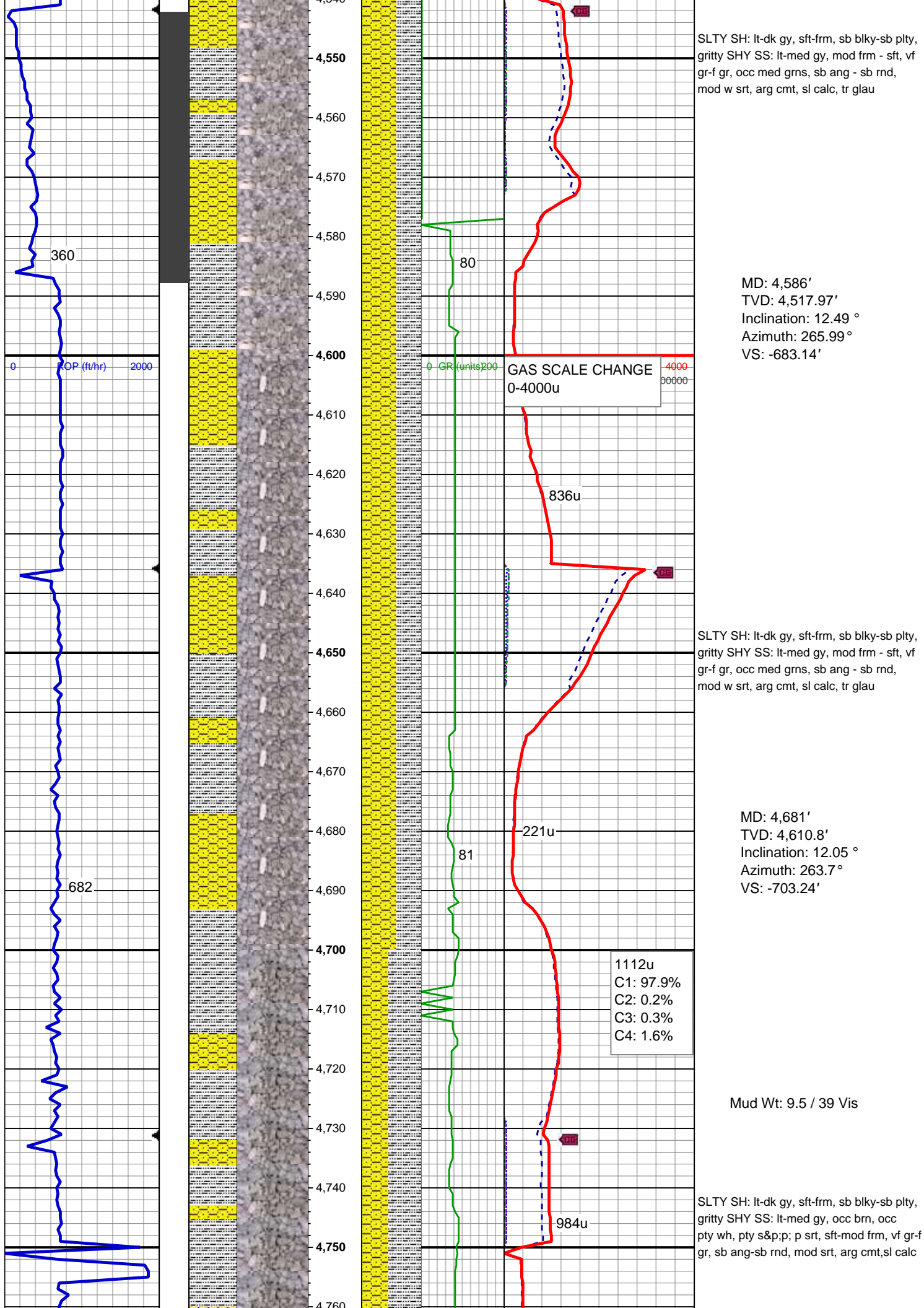
Mud Wt: 9.25 / 38 Vis  
MD: 4,397'  
TVD: 4,332.74'  
Inclination: 11.52 °  
Azimuth: 262.12 °  
VS: -645.85'

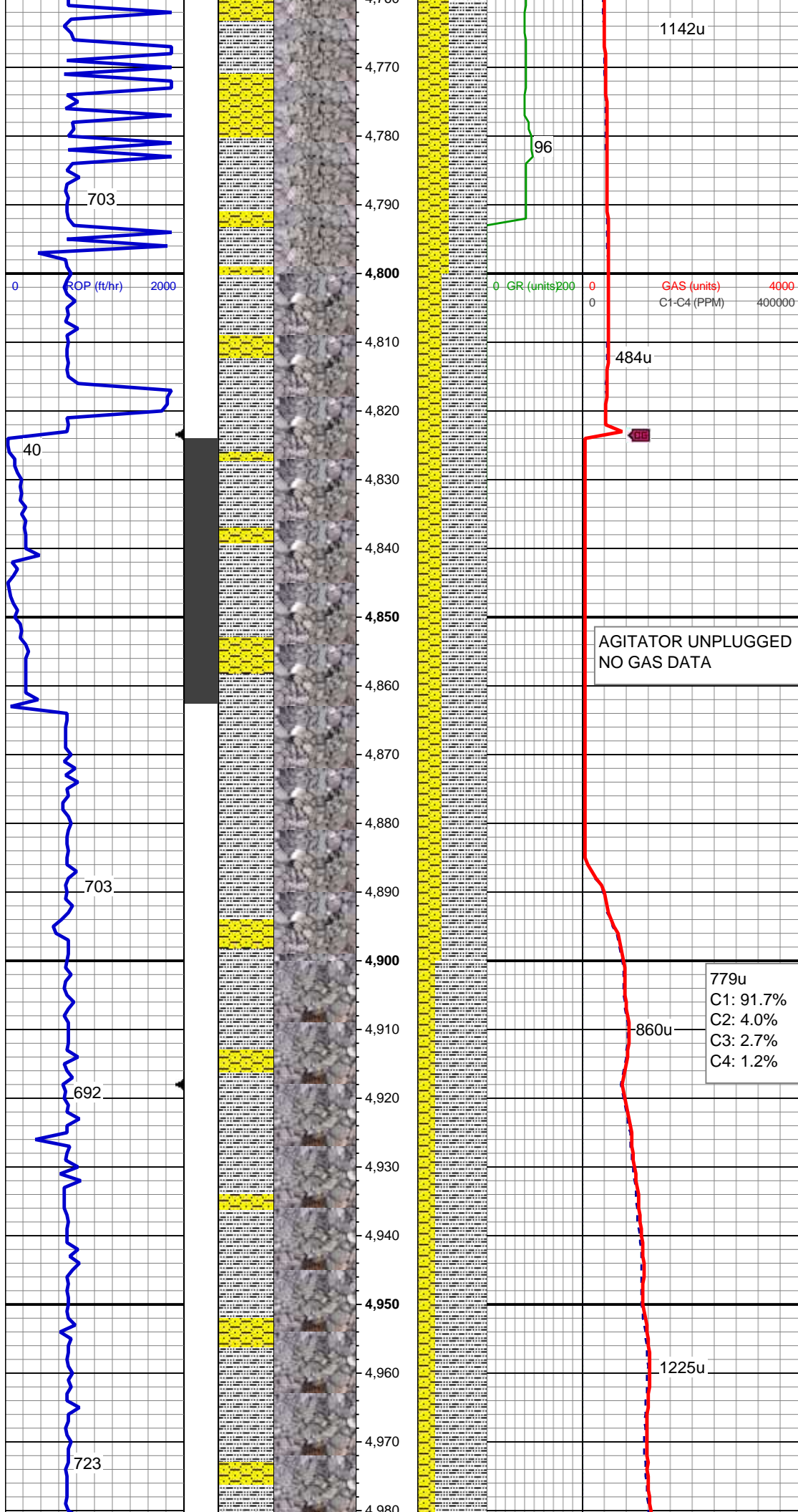
SLTY SH: lt-dk gy, sft-frm, sb blkly-sb plty, gritty  
SHY SS: lt-med gy, mod frm - sft, vf gr-f gr, occ med grns, sb ang - sb rnd, mod w srt, arg cmt, sl calc

MD: 4,492'  
TVD: 4,425.92'  
Inclination: 10.9 °  
Azimuth: 263.35 °  
VS: -664.17'

987u  
C1: 92.9%  
C2: 3.2%  
C3: 2.9%  
C4: 1.0%







MD: 4,775'  
TVD: 4,702.91'  
Inclination: 10.99 °  
Azimuth: 267.39 °  
VS: -721.95'

SLTY SH: lt-dk gy, sft frm, sb blk-y-sb plty,  
gritty SHY SS: lt-med gy, occ brn, occ  
pty wh, pty s&p;p; p srt, sft-mod frm, vf gr-f  
gr, sb ang-sb rnd, mod srt, arg cmt,sl calc

Mud Wt: 9.5 / 39 Vis

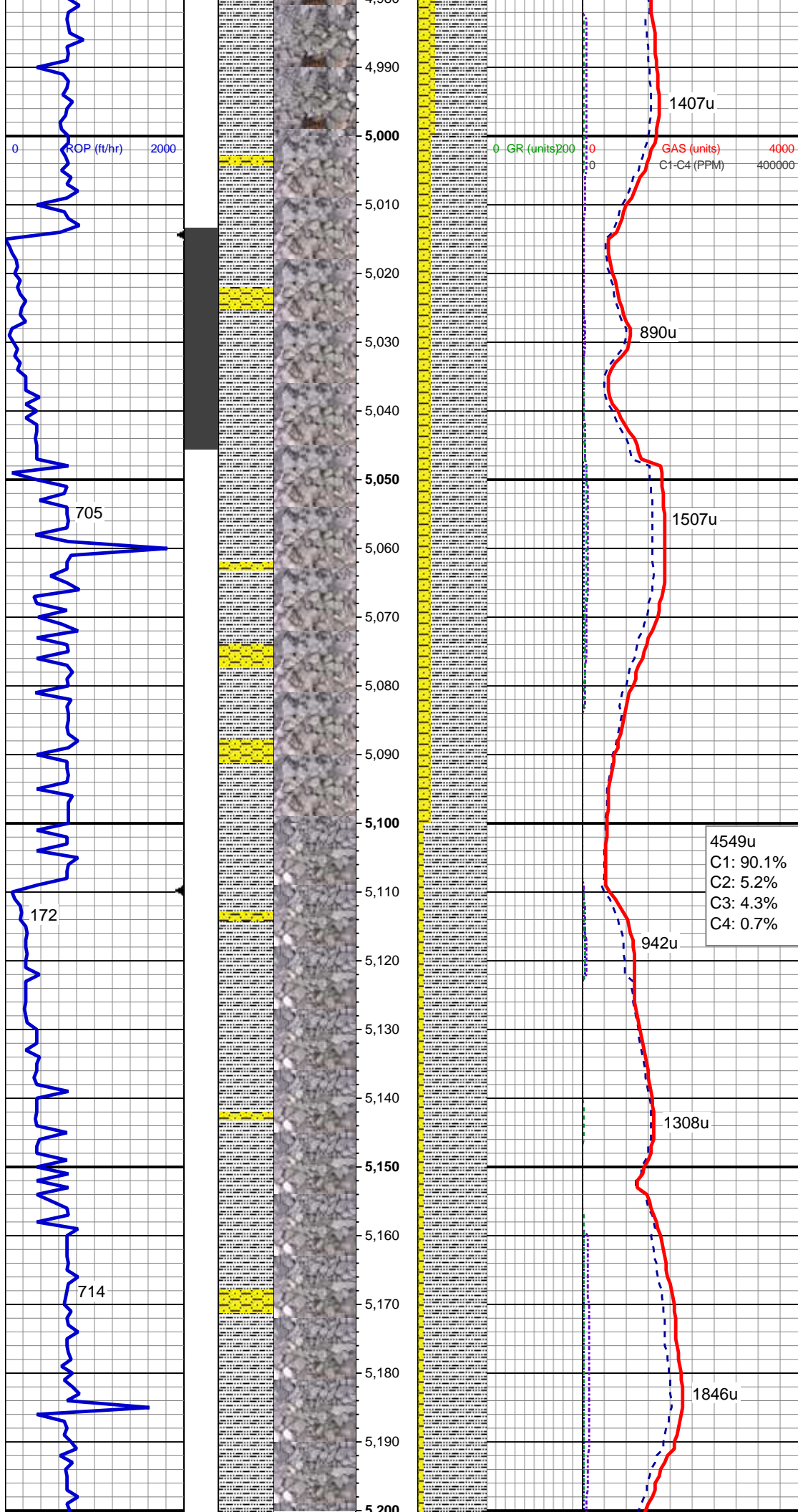
MD: 4,870'  
TVD: 4,795.89'  
Inclination: 12.66 °  
Azimuth: 265.28 °  
VS: -741.37'

779u  
C1: 91.7%  
C2: 4.0%  
C3: 2.7%  
C4: 1.2%

SLTY SH: lt-dk gy, sft frm, sb blk-y-sb plty,  
gritty SHY SS: lt-med gy, occ brn, occ  
pty wh, pty s&p;p; p srt, sft-mod frm, vf gr-f  
gr, sb ang-sb rnd, mod srt, arg cmt,sl calc

MD: 4,965'  
TVD: 4,889'  
Inclination: 10.2 °  
Azimuth: 264.05 °  
VS: -760.11'





SLTY SH: lt-dk gy, sft-frm, sb blk-y-sb plty,  
gritty SHY SS: lt-med gy, occ brn, occ  
pty wh, pty s&p;p; p srt, sft-mod frm, vf gr-f  
gr, sb ang-sb rnd, mod srt, arg cmt,sl calc

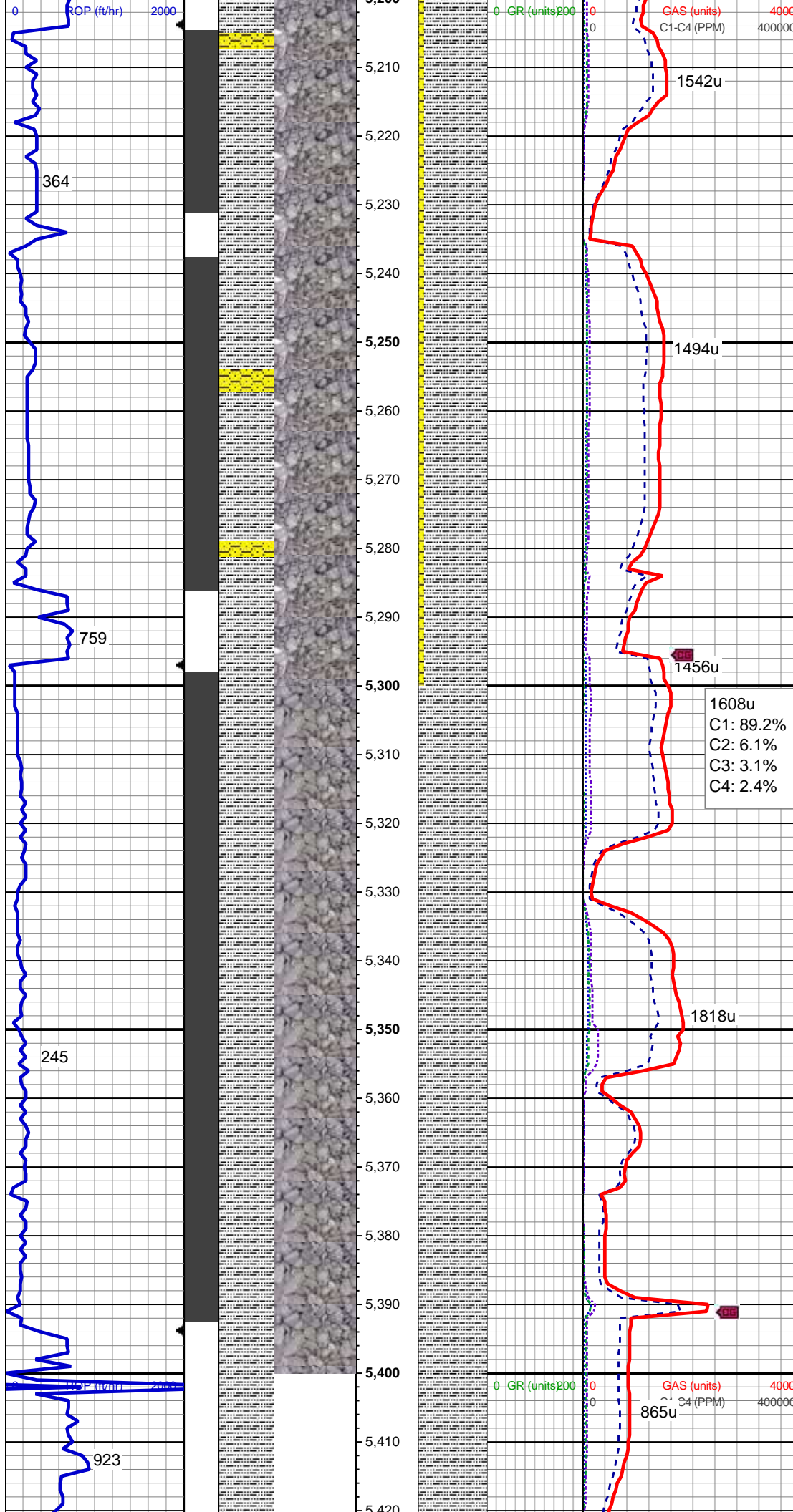
MD: 5,059'  
TVD: 4,981.6'  
Inclination: 9.58 °  
Azimuth: 257.02 °  
VS: -776.02'

Mud Wt: 9.35 / 34 Vis

SLTY SH: lt-dk gy, sft-frm, sb blk-y-sb plty,  
gritty SHY SS: lt-med gy, occ brn, occ  
pty wh, pty s&p;p; p srt, sft-mod frm, vf gr-f  
gr, sb ang-sb rnd, mod srt, arg cmt,sl calc

MD: 5,154'  
TVD: 5,075.29'  
Inclination: 9.5 °  
Azimuth: 255.26 °  
VS: -791.3'





MD: 5,248'  
TVD: 5,168.1'  
Inclination: 8.71 °  
Azimuth: 261.42 °  
VS: -805.84'

SLTY SH: lt-dk gy, sft frm, sb blk-y-sb plty,  
gritty SHY SS: lt-med gy, occ brn, occ  
pty wh, pty s&p;p; p srt, sft-mod frm, vf gr-f  
gr, sb ang-sb rnd, mod srt, arg cmt,sl calc

Mud Wt: 9.25 / 34 Vis

MD: 5,343'  
TVD: 5,261.88'  
Inclination: 9.94 °  
Azimuth: 283.92 °  
VS: -820.92'

SLTY SH: med-dk gy, sft frm, sb blk-y-sb  
plty, sl fri, rthy gty tex, arg, non calc

MD: 5,411'  
TVD: 5,328.83'  
Inclination: 10.2 °  
Azimuth: 282.12 °  
VS: -820.92'

Azimuth: 292.18°  
VS: -832.19'

SLTY SH: med-dk gy, sft frm, sb blk-y-sb  
pity, sl fri, rthy gty tex, arg, non calc

Mud Wt: 9.25 / 34 Vis

TOOH FOR BHA #2 @ 5459' MD  
LOG CONTINUES ON MPLLOT  
Cutthroat LC28-79HNB Horz

