

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** Wells Ranch AA11-657

**Location** SENE 11 6N 63W

**State** COLORADO

**County** WELD

**Country** USA

**Rig Number** H&P #273

**API Number** 05-123-41255

**Field** WATTENBERG

**Region** DJ BASIN

**Drilling Completed** 6/10/2015

**Spud Date** 6/4/2015

**Surface Coordinates** LAT: 40.50302  
LONG: -104.3952  
500' FSL  
552' FEL

**Bottom Hole Coordinates** PROJECTED:  
2150' FNL  
2085' FEL

**Ground Elevation** 4869'

**K.B. Elevation** 4893'

**Logged Interval** 800' To 13791'

**Total Depth** 13791'

**Formation** NIOBRARA C CHALK

**Type of Drilling Fluid** H2O, LSND

## Other Symbols

### Oil Show

- DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

### Porosity

- E EARTHY
- F FENESTRAL
- F FRACTURE
- X INTERCRYSTALLINE
- Q INTEROOLITIC
- MOLDIC

ORGANIC

P PINPOINT

V VUGGY

### Engineering

- BIT CHANGE
- CONNECTION (LEFT)
- CONNECTION (RIGHT)
- CONNECTION GAS
- TRIP GAS
- DOWN TIME GAS
- CORE - LOST
- CORE - RECOVERED
- DST INTERVAL

FAULT

FORMATION TOP

GAS SHOW

OIL SHOW

MN DEPTH MN DEPTH

MN DEPTH MN DEPTH (RIGHT)

NORMAL FAULT

OVERTURNED STRATA

REVERSE FAULT

CASING

SIDEWALL CORE (LEFT)

SIDEWALL CORE (RIGHT)

SLIDE

SURVEY

DST DRILL STEM TEST

WIRELINE TESTED - LEFT

WIRELINE TESTED - RT

### Rounding

- ANGULAR
- ROUNDED
- SUBANG
- SUBRND

### Textures

- BOUNDSTONE
- CHALKY
- CRYPTOXLN

E EARTHY

FX FINELYXLN

GS GRAINSTONE

L LITHOGRAPHIC

MX MICROXLN

MS MUDSTONE

PS PACKSTONE

WS WACKSTONE

### Sorting


- M MODERATE
- P POOR
- W WELL











## Accessories





## Fossils


 ALGAE  
 AMPHIPORA  
 BELEMNITE  
 BIOCLASTIC  
 BRACHIOPOD  
 BRYOZOA  
 CEPHALOPOD  
 CORAL  
 CRINOID  
 ECHINOID  
 FISH  
 FORAMINIFERA  
 FOSSIL






 GASTROPOD


 INOCERAMUS  
 OOLITE  
 OSTRACOD  
 PELECYPOD  
 PELLET  
 PISOLITE  
 PLANT REMAINS  
 PLANT SPORES  
 SCAPHOPOD  
 STROMATOPOROID

## Minerals

 ANHYDRITIC  
 ARGILLACEOUS

 ARGILLITE GRAIN

 BENTONITE  
 BITUMENOUS SUBSTANCE  
 BRECCIA FRAGMENTS  
 CALCAREOUS  
 CARBONACEOUS FLAKES  
 CHTDK  
 CHTLT  
 COAL - THIN BEDS  
 DOLOMITIC  
 FELDSPAR  
 FERRUGINOUS PELLET  
 FERRUGINOUS  
 GLAUCONITE  
 GYPSIFEROUS










 HEAVY MINERAL








 KAOLIN  
 MARCASITE  
 MARLSTONE  
 MICACEOUS  
 MINERAL CRYSTALS  
 NODULES  
 PHOSPHATE PELLETS  
 PYRITE  
 SALT CAST  
 SANDY  
 SIDERITE  
 SILICEOUS  
 SILTY  
 TUFFACEOUS










## Stringer

 ANHYDRITE STRINGER  
 BENTONITE STRINGER  
 COAL STRINGER  
 DOLOMITE STRINGER  
 GYPSUM STRINGER  
 LIMESTONE STRINGER  
 MARLSTONE (CALC) STRG  
 MARLSTONE (DOL) STRG  
 SANDSTONE STRINGER  
 SHALE STRINGER  
 SILTSTONE STRINGER

## Rock Types

 UNKNOWN  
 ANHYDRITE  
 BENTONITE  
 BRECCIA  
 CEMENT  
 CHALK  
 CHERT  
 CLAY CHOKE SAND  
 CLAYSTONE

 COAL  
 CONGLOMERATE  
 DOLOMITE  
 DOLOMITIC LIMESTONE  
 GRANITE  
 GYPSUM  
 IGNEOUS  
 LIMESTONE  
 SIDERITE or LIMONITE

 MARLSTONE  
 METAMORPHIC  
 NO SAMPLE  
 SALT  
 SALT- PEPPER SAND  
 SANDSTONE  
 SHALE  
 SHALE COLORED  
 SHALE GRAY

 SHALY SANDSTONE  
 SHALY SILTSTONE  
 SILTSTONE  
 SILTY SHALE  
 TILL  
 TUFF  
 WELDED TUFF

## Operator

**Company** NOBLE ENERGY, INC.

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

## Geologist

**Name** MICHAEL ANDERSON, ANDREW MARTENS

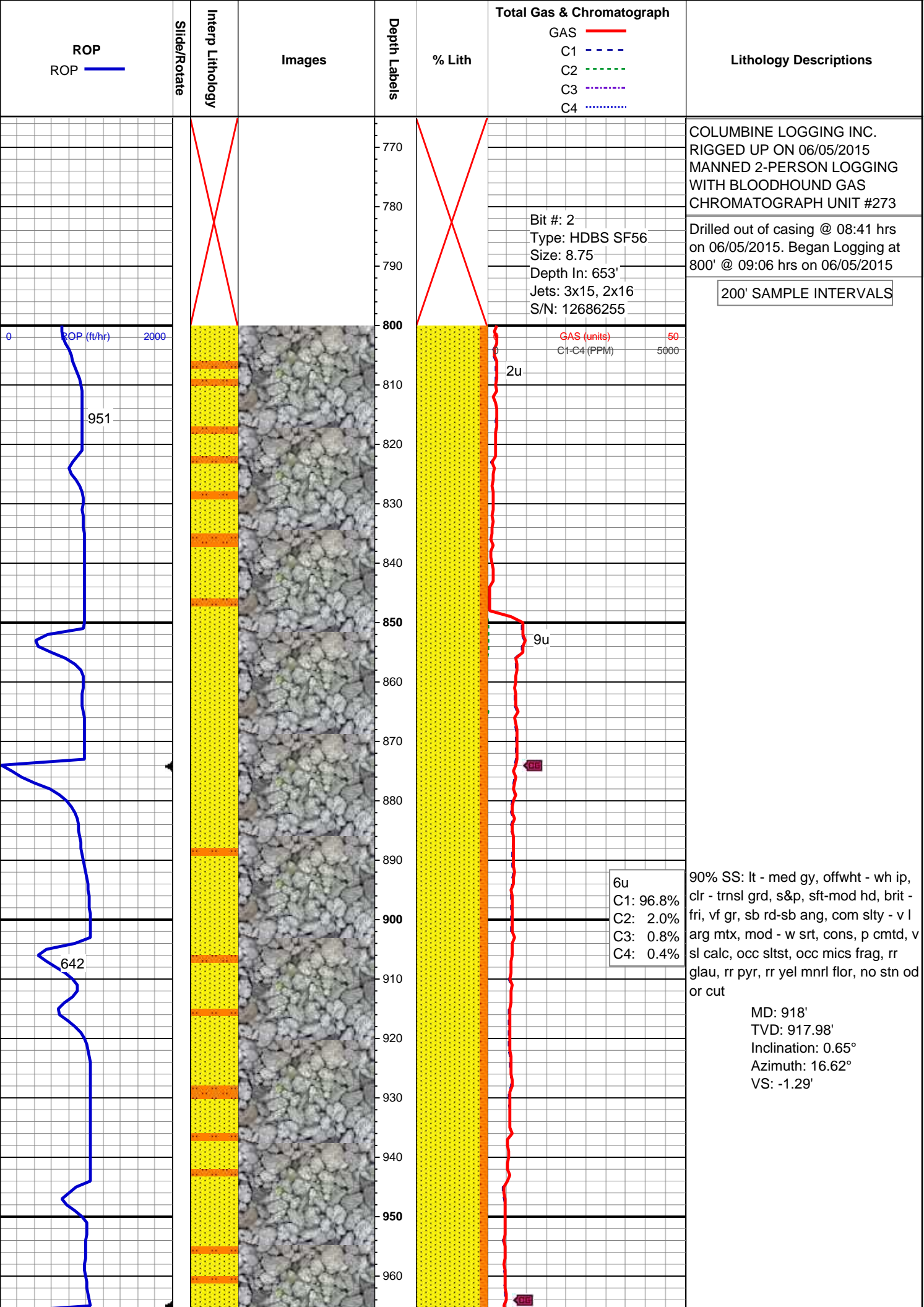
**Company** COLUMBINE LOGGING, INC.

**Address** 602 S. LIPAN ST  
DENVER, COLORADO 80223  
(303) 228-7764

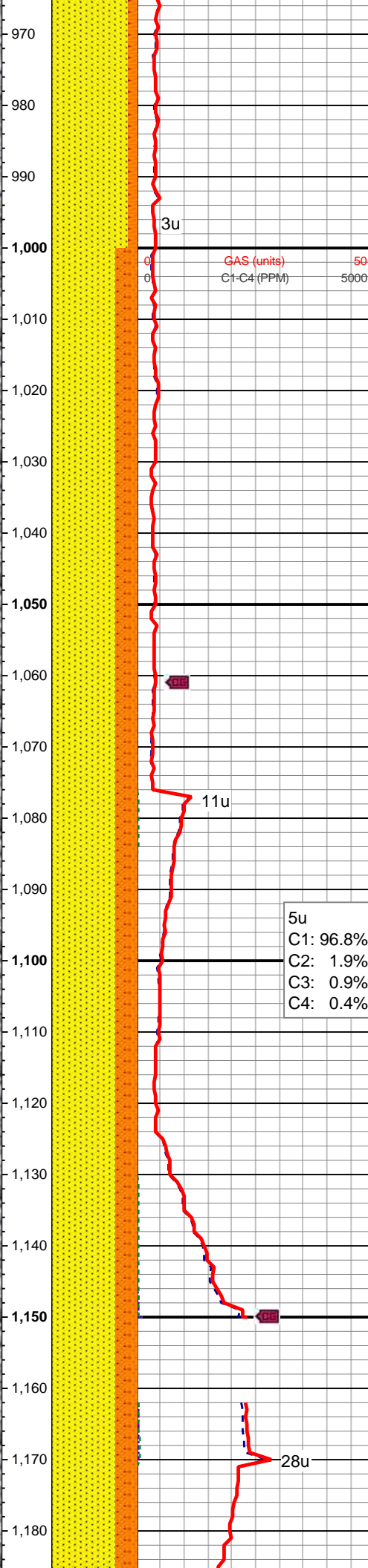
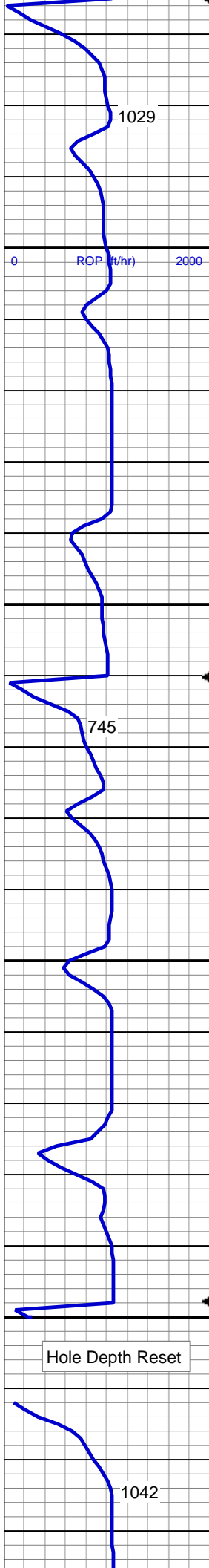
## Zone Color Coding

 Oil  
 Note  
 Error  
 Condensate  
 Core  
 Water  
 Gas  
 Pressure  
 Seal









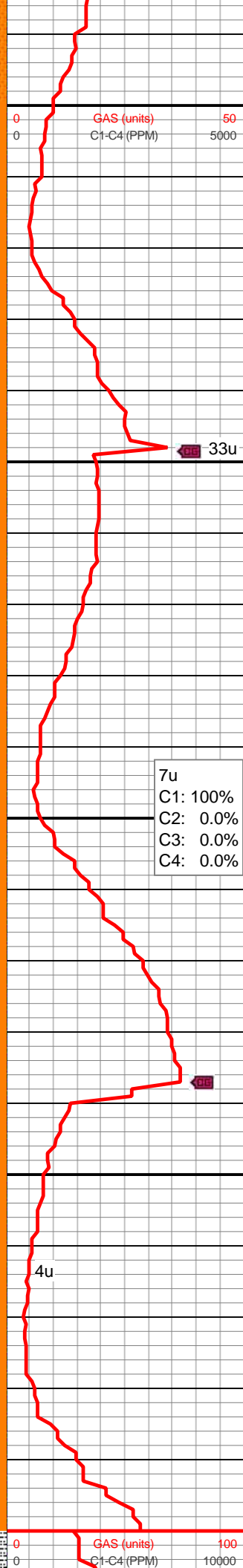
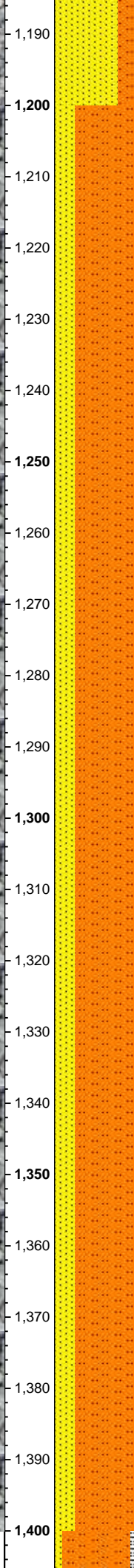
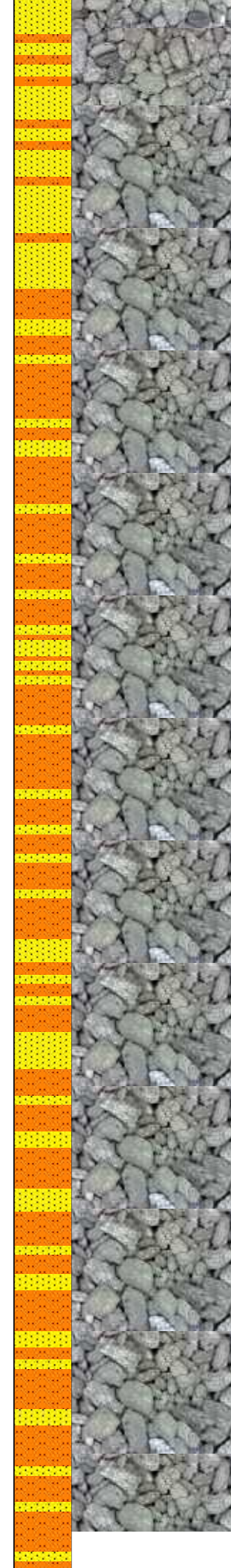
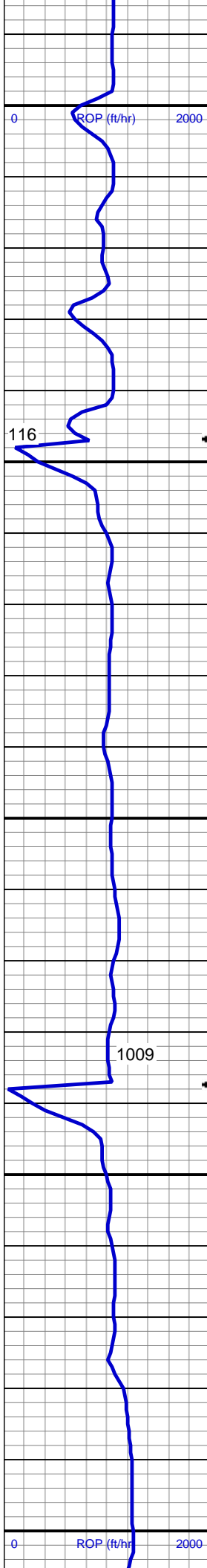
MD: 1,013'  
TVD: 1,012.98'  
Inclination: 0.65°  
Azimuth: 15.67°  
VS: -1.61'

MD: 1,108'  
TVD: 1,107.97'  
Inclination: 0.46°  
Azimuth: 40.74°  
VS: -2.02'

5u  
C1: 96.8%  
C2: 1.9%  
C3: 0.9%  
C4: 0.4%

75% SS: lt - med gy, offwht - wh ip, clr - trns l grd, s&p, sft-mod hd, brit - fri, vf gr, sb rd-sb ang, com slty - v l arg mtx, mod - w srt, cons, p cmtd, 25% SLTST: med gy, sdy ip, sft, fri, sb blk, gt tex, slty - arg mtx, v sl calc, occ mics frag, rr glau, rr pyr, rr yel mnrl flor, no stn od or cut





MD: 1,199'  
TVD: 1,198.97'  
Inclination: 0.51°  
Azimuth: 30.63°  
VS: -2.48'

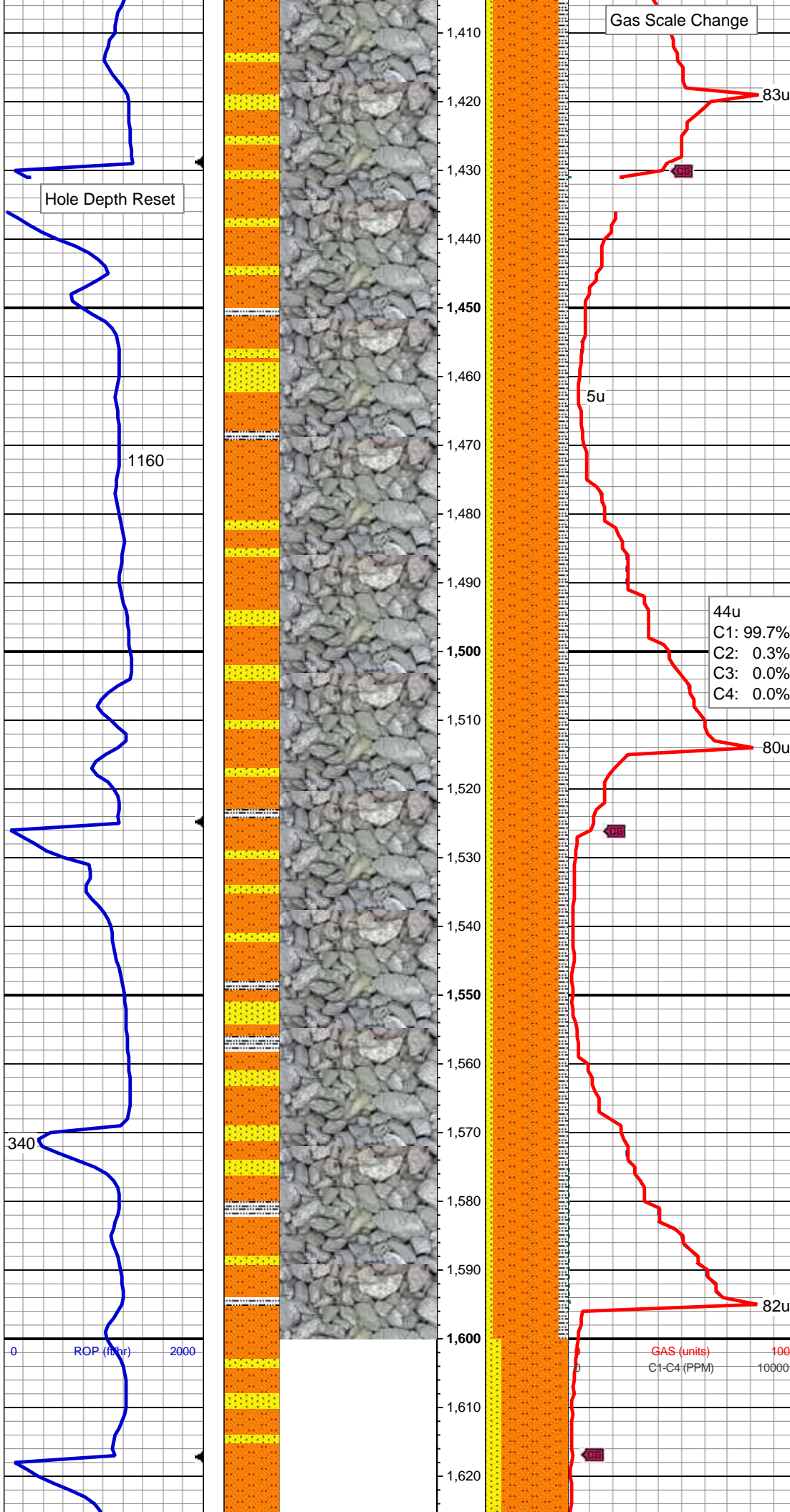
MD: 1,291'  
TVD: 1,290.97'  
Inclination: 0.32°  
Azimuth: 7.69°  
VS: -2.74'

75% SLTST: med gy, sft - mod frm, fri, sb blk, gt tex, slty - arg mt, grdg to 25% SS: offwht - wh, lt gy, clr - trnsl grd, s&p, mod - v hd, brit, vf - l f gr, sb rd-sb ang, mod - w srt, cons, w cmt, v sl calc, occ mics frag, occ glau, occ pyr, nfsoc

7u  
C1: 100%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

MD: 1,382'  
TVD: 1,381.97'  
Inclination: 0.13°  
Azimuth: 37.29°  
VS: -2.84'



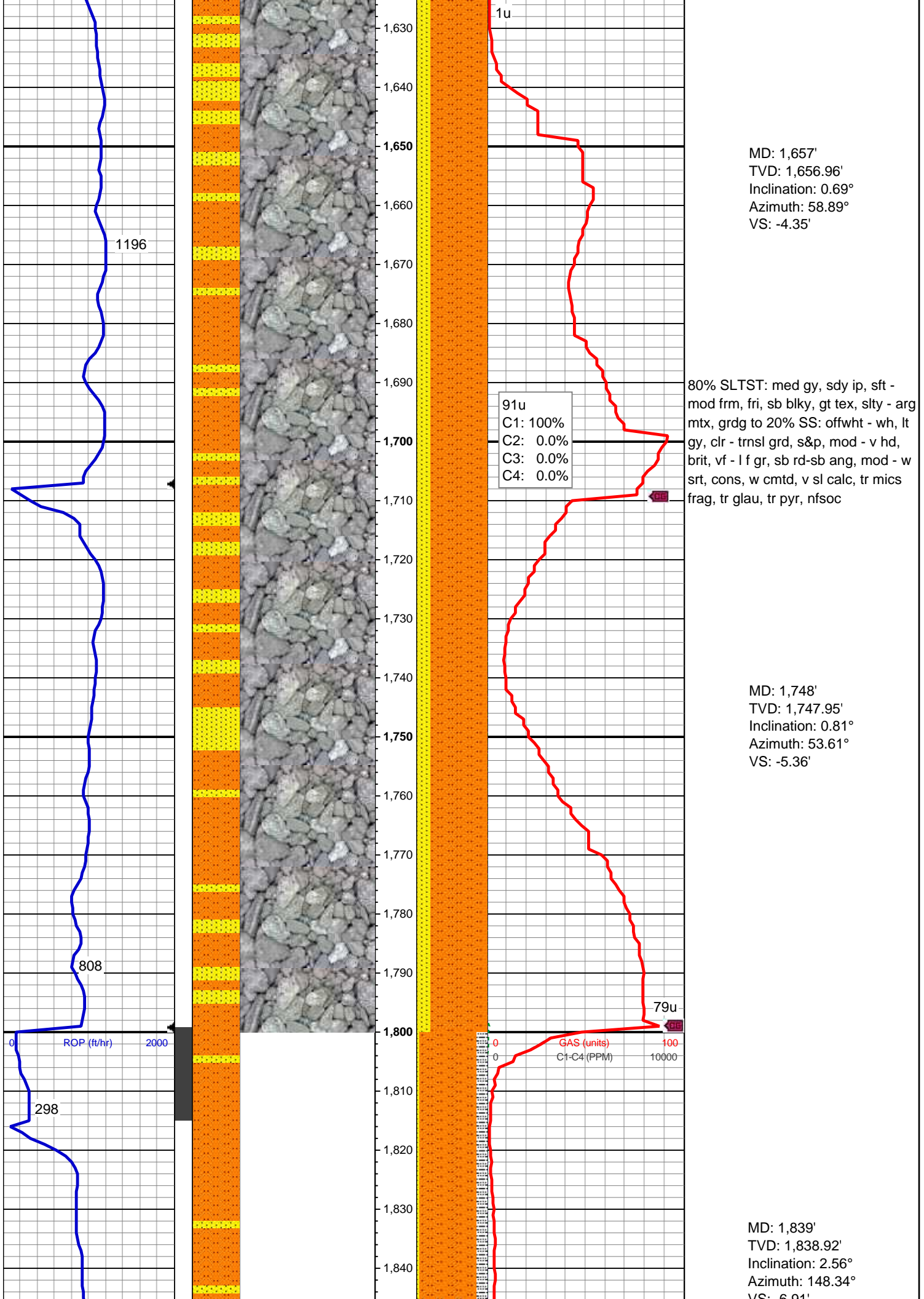


MD: 1,474'  
TVD: 1,473.97'  
Inclination: 0.4°  
Azimuth: 28.75°  
VS: -3.07'

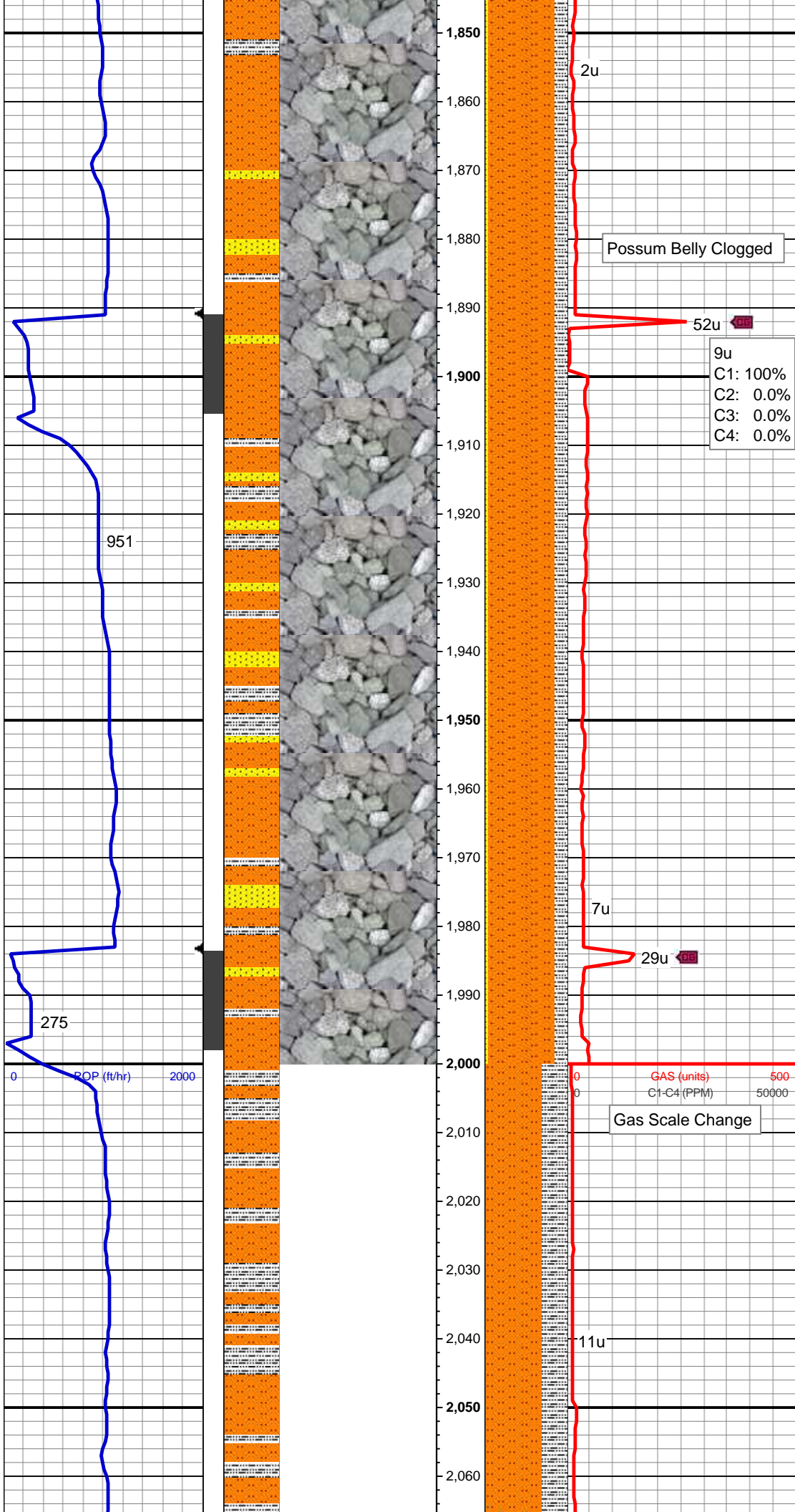
80% SLTST: med gy, sdy ip, sft -  
mod frm, fri, sb blk, gt tex, slty - arg  
mtx, mod calc, occ (10%) ss &  
(10%) slty sh, tr glau, tr pyr, nfsoc

MD: 1,565'  
TVD: 1,564.96'  
Inclination: 0.65°  
Azimuth: 36.87°  
VS: -3.55'









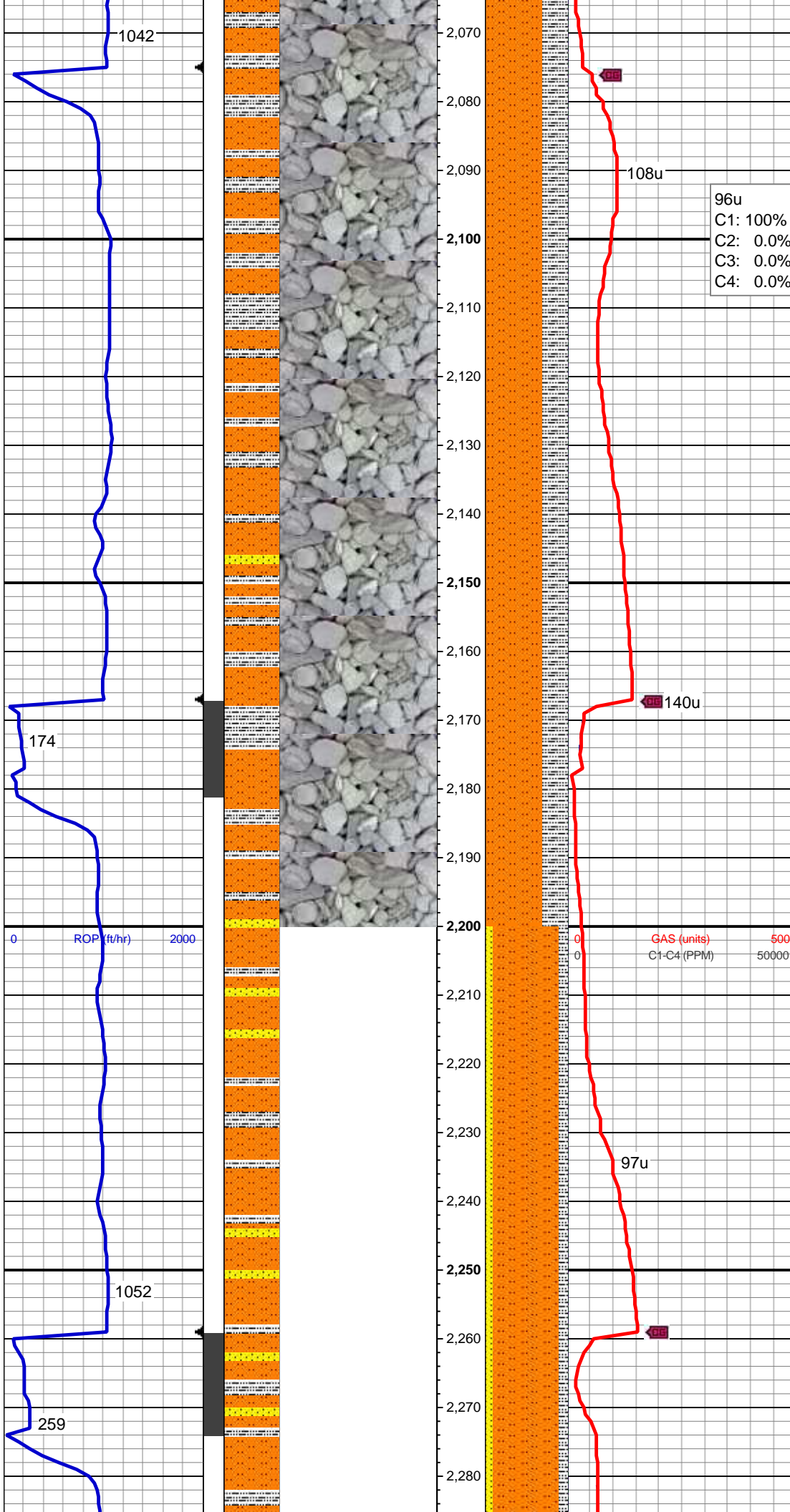
VS: -0.91'

80% SLTST: med gy, sdy ip, sft -  
mod frm, fri, sb blk, gt tex, slty - arg  
mtx, 15% SLTY SH: lt - med gy, frm,  
brit, sb plty - sb blk, sm - sb wxy  
tex, arg - slty mtx, v sl calc, tr (5%)  
ss, tr mics frag, nfsoc

MD: 1,931'  
TVD: 1,930.73'  
Inclination: 4.67°  
Azimuth: 148.09°  
VS: -9.86'

MD: 2,023'  
TVD: 2,022.3'  
Inclination: 6.38°  
Azimuth: 139.91°  
VS: -14.97'





96u  
C1: 100%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

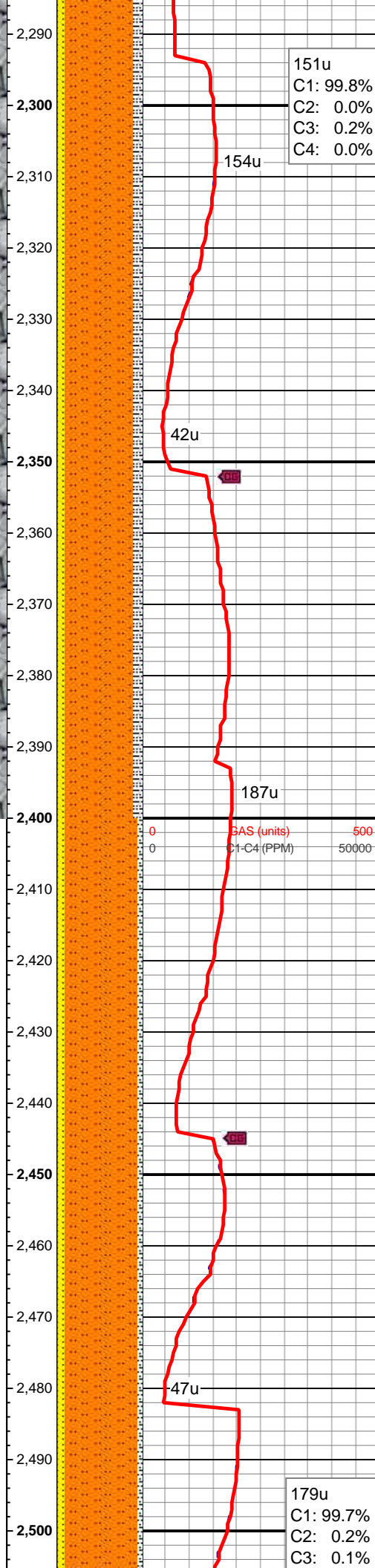
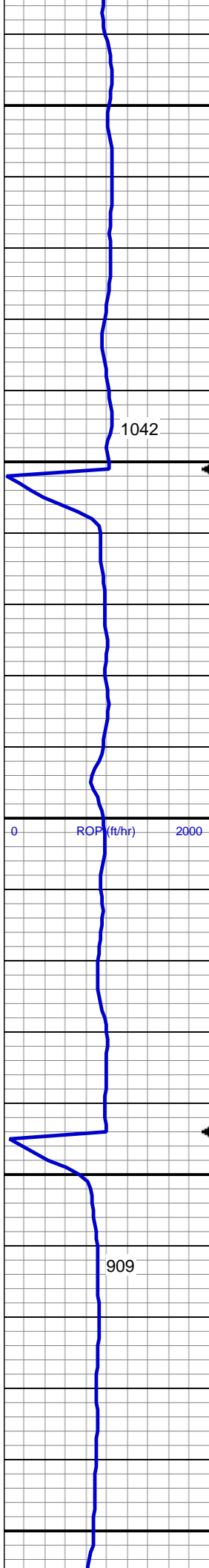
70% SLTST: med gy, sdy ip, sft -  
mod frm, fri, sb blk, gt tex, slty - arg  
mtx, 30% SLTY SH: med-dk gy,  
mod - v frm, brit fri ip, sb plty - sb  
blk, sm - sb wxy tex, arg - slty mtx,  
sl calc, rr ss, tr pyr, tr bent, nfsoc

MD: 2,114'  
TVD: 2,112.78'  
Inclination: 5.81°  
Azimuth: 137.58°  
VS: -21.17'

MD: 2,206'  
TVD: 2,204.18'  
Inclination: 7.26°  
Azimuth: 140.73°  
VS: -27.81'

MD: 2,297'  
TVD: 2,294.23'  
Inclination: 9.3°  
Azimuth: 137.96°





Azimuth: 137.86°  
VS: -36.16'

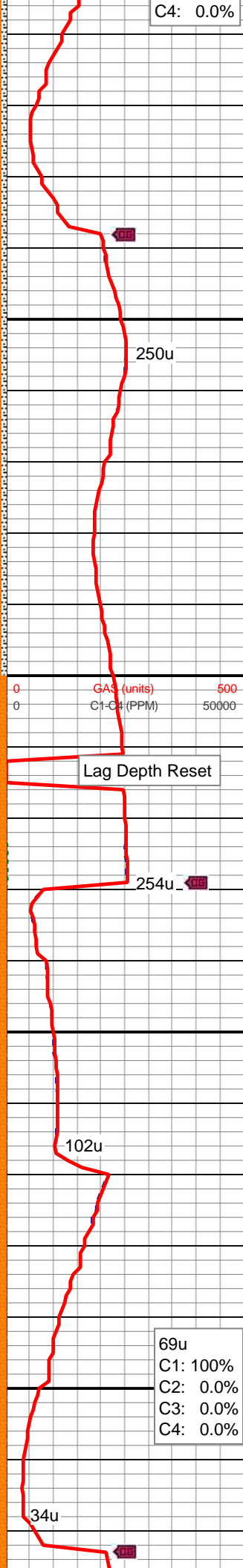
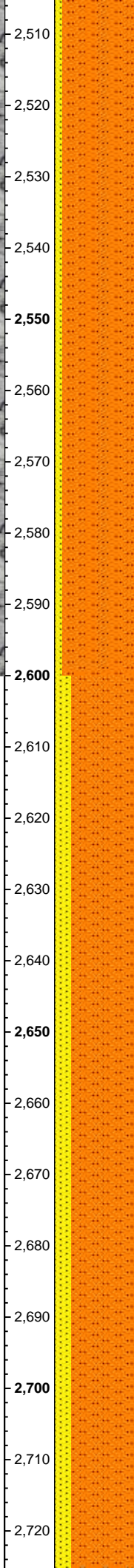
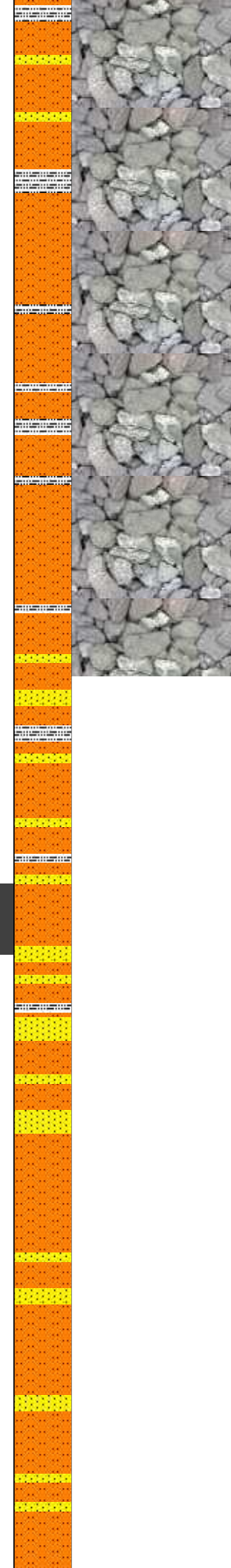
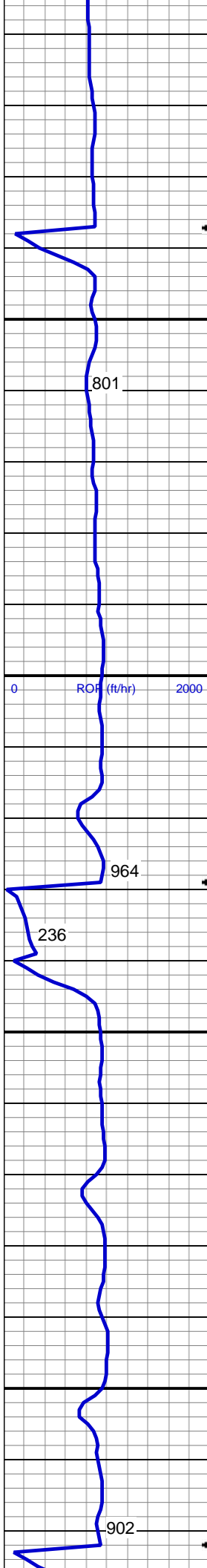
80% SLTST: med gy, med gy brn,  
sft - mod frm, fri, sb blk, gt tex, slty -  
arg mtx, sl calc, occ (10%) fy intlam  
ss strgs, occ (10%) slty sh, tr mic  
frags, nfsoc

MD: 2,388'  
TVD: 2,384.08'  
Inclination: 8.9°  
Azimuth: 138.03°  
VS: -45.56'

MD: 2,480'  
TVD: 2,475.01'  
Inclination: 8.67°  
Azimuth: 132.98°  
VS: -55.17'

85% SLTST: med gy, med gy brn,  
sft - mod frm, fri, sb blk, gt tex, slty -  
arg mtx, sl calc, occ (10%) fy intlam  
ss strgs, tr (5%) slty sh, tr mic





C4: 0.0%

frags, nfsoc

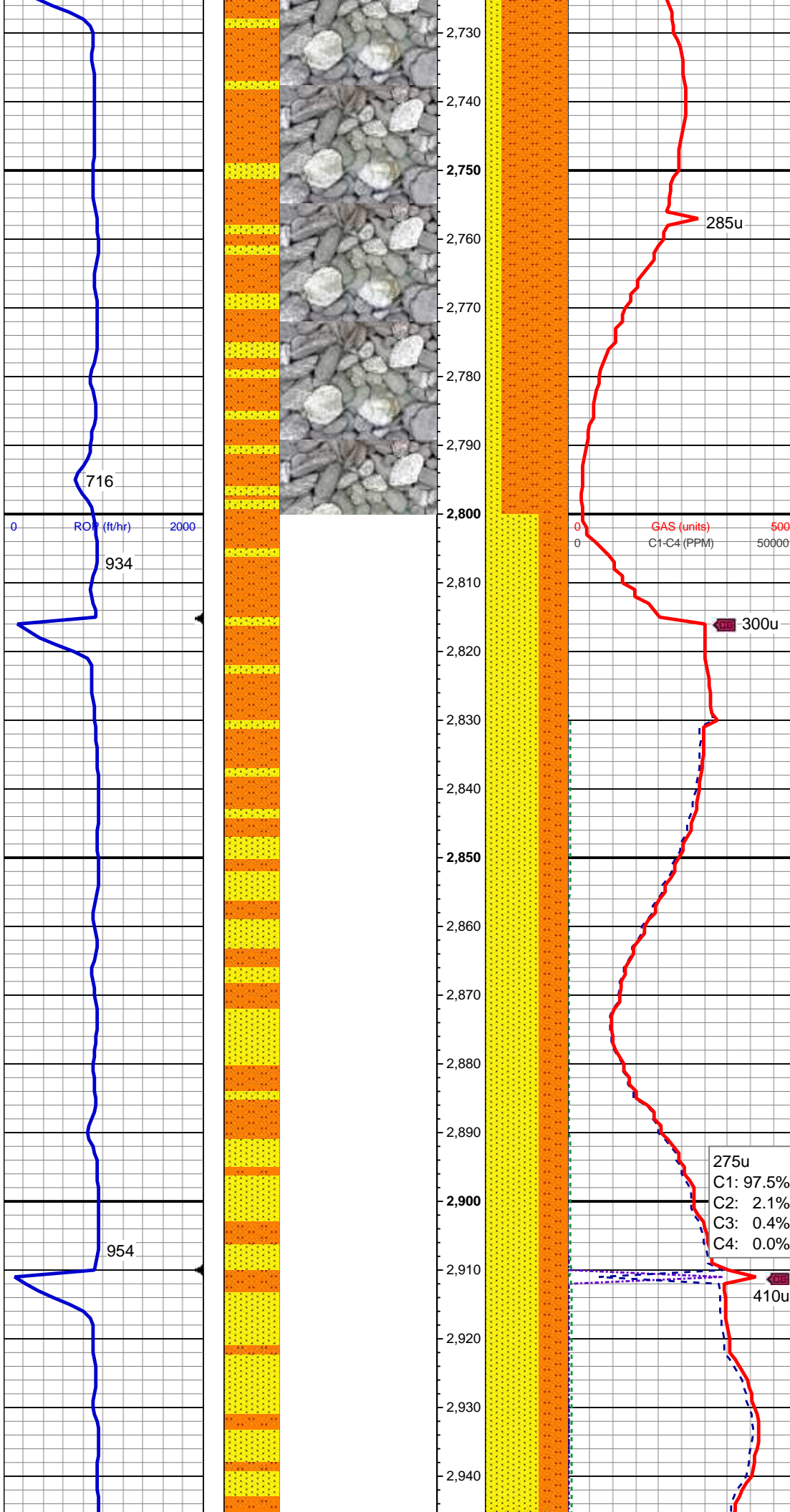
MD: 2,572'  
TVD: 2,565.99'  
Inclination: 8.35°  
Azimuth: 131.73°  
VS: -65.01'

MD: 2,664'  
TVD: 2,656.94'  
Inclination: 9.04°  
Azimuth: 134.46°  
VS: -74.94'

69u  
C1: 100%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

80% SLTST: med gy, occ dk gy,  
med gy brn, mod frm, brit, sb blk,  
gt tex, slty - arg mtx, fy intlam wi  
20% SS: offwht - wh, v lt gy, clr -  
trnsl grd, s&p ip, hd, brit, vf gr, sb  
rd-sb ang, w srt, cons, w cmtd, pred  
non calc, v sl calc ip, rr slty sh, tr  
mic frags, tr diss pyr, nfsoc



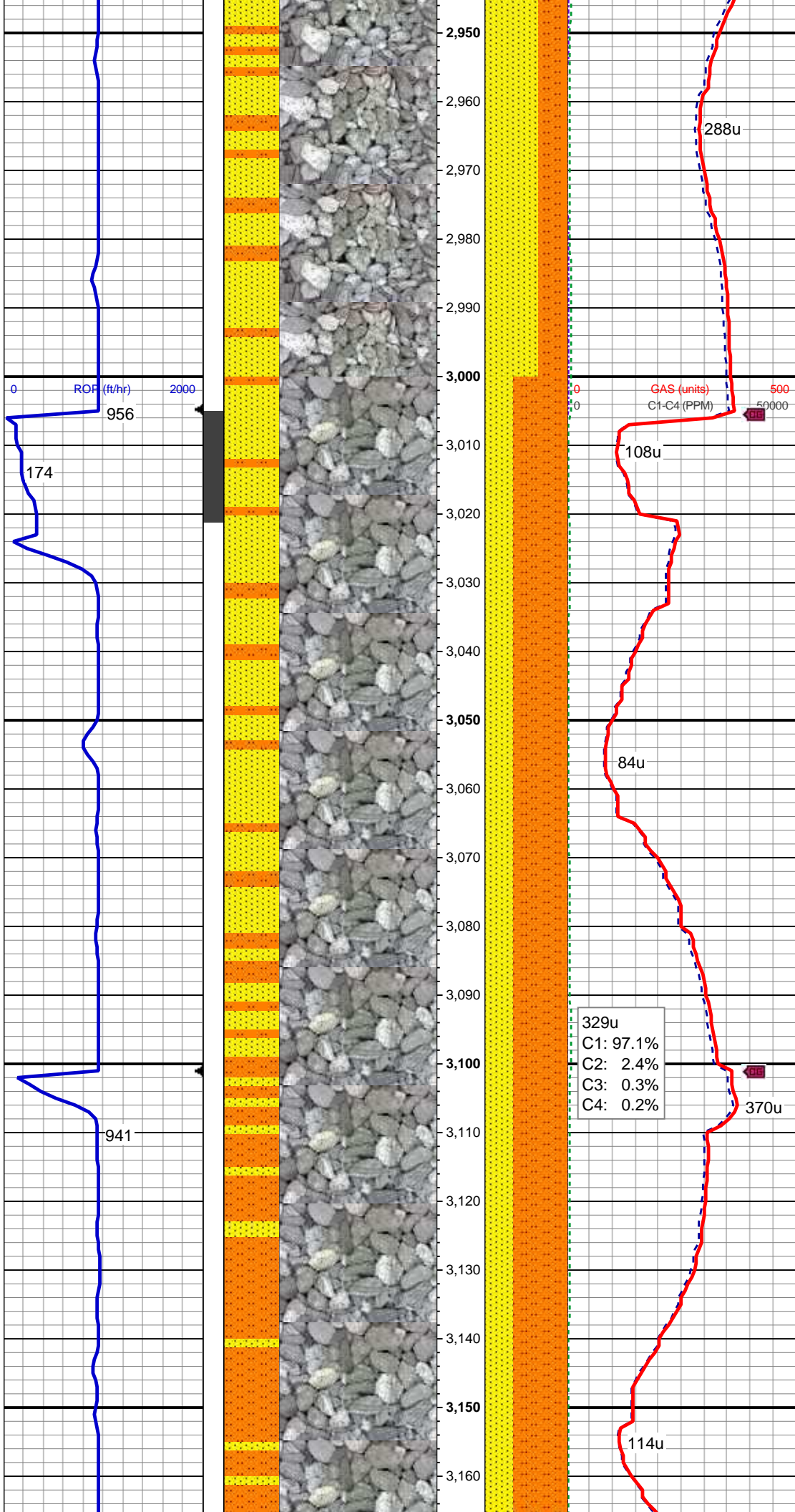


MD: 2,851'  
TVD: 2,841.73'  
Inclination: 8.59°  
Azimuth: 126.01°  
VS: -96.3'

65% SS: offwht - wh, lt gy, clr - trnsl  
grd, s&p ip, v hd, brit, vf - l f gr, sb  
rd-sb ang, w srt, cons, w cmt, 35%  
SLTST: med gy, med gy brn, sdy ip,  
mod frm, brit, sb blk, gt tex, slty -  
arg mtx, v sl calc, tr mic frags, tr  
dissm pyr, com dul yel - orng ss  
flor, no stn od or cut

MD: 2,945'  
TVD: 2,934.68'  
Inclination: 8.62°





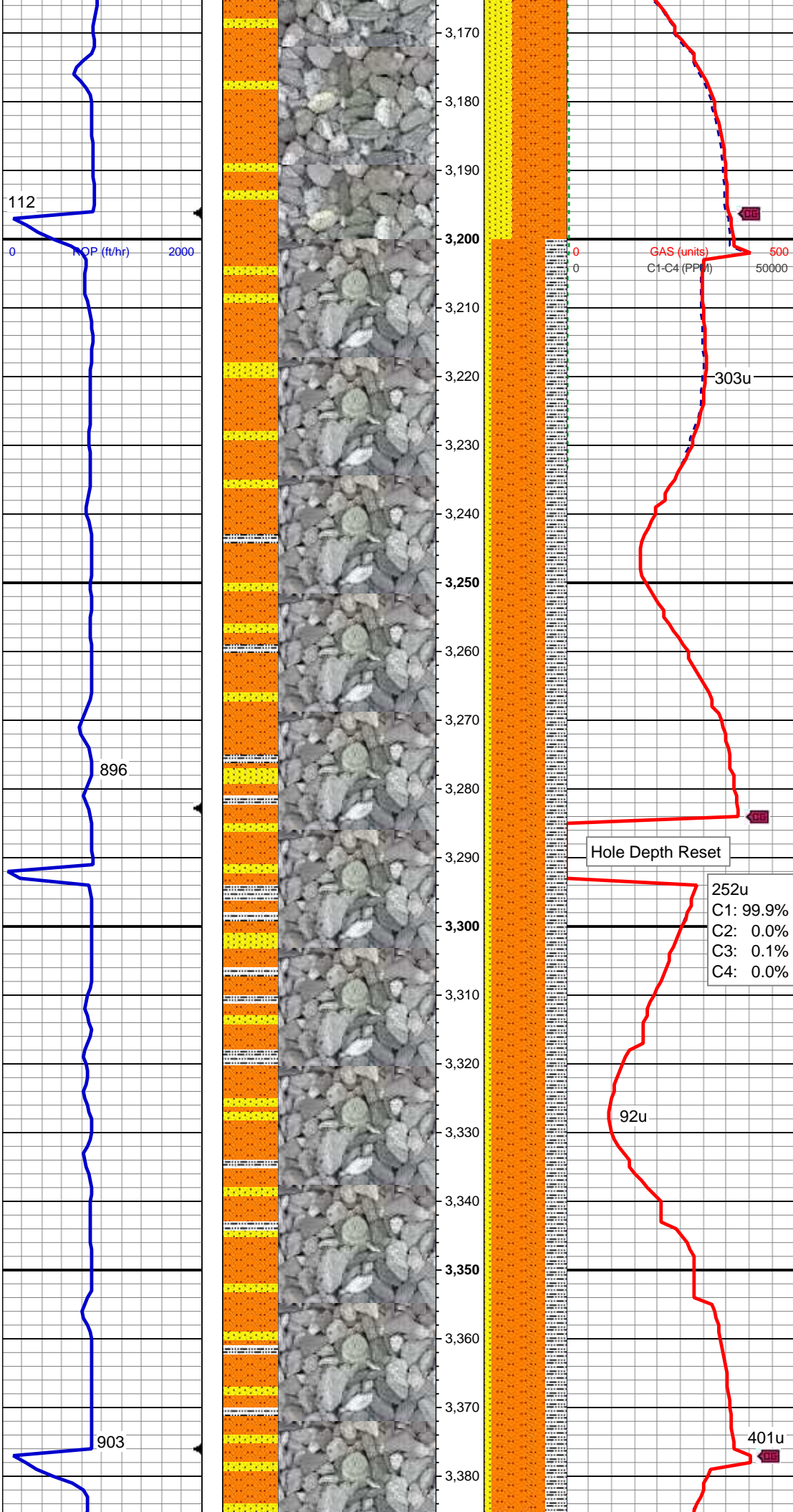
Inclination: 8.63°  
Azimuth: 124.59°  
VS: -107.6'

MD: 3,040'  
TVD: 3,028.46'  
Inclination: 9.79°  
Azimuth: 135.54°  
VS: -118.91'

65% SLTST: lt - med gy, occ dk gy, mod frm, brit, sb blk, gt tex, slty - arg mtx, fy intlam wi 35% SS: offwht - wh, lt gy, clr - trnsd grd, s&p ip, mod v hd, brit, vf gr, sb rd-sb ang, w srt, cons, mod cmtd, v sl calc, tr mic frags, nfsoc

MD: 3,135'  
TVD: 3,122.07'  
Inclination: 9.82°  
Azimuth: 133.07°  
VS: -130.23'

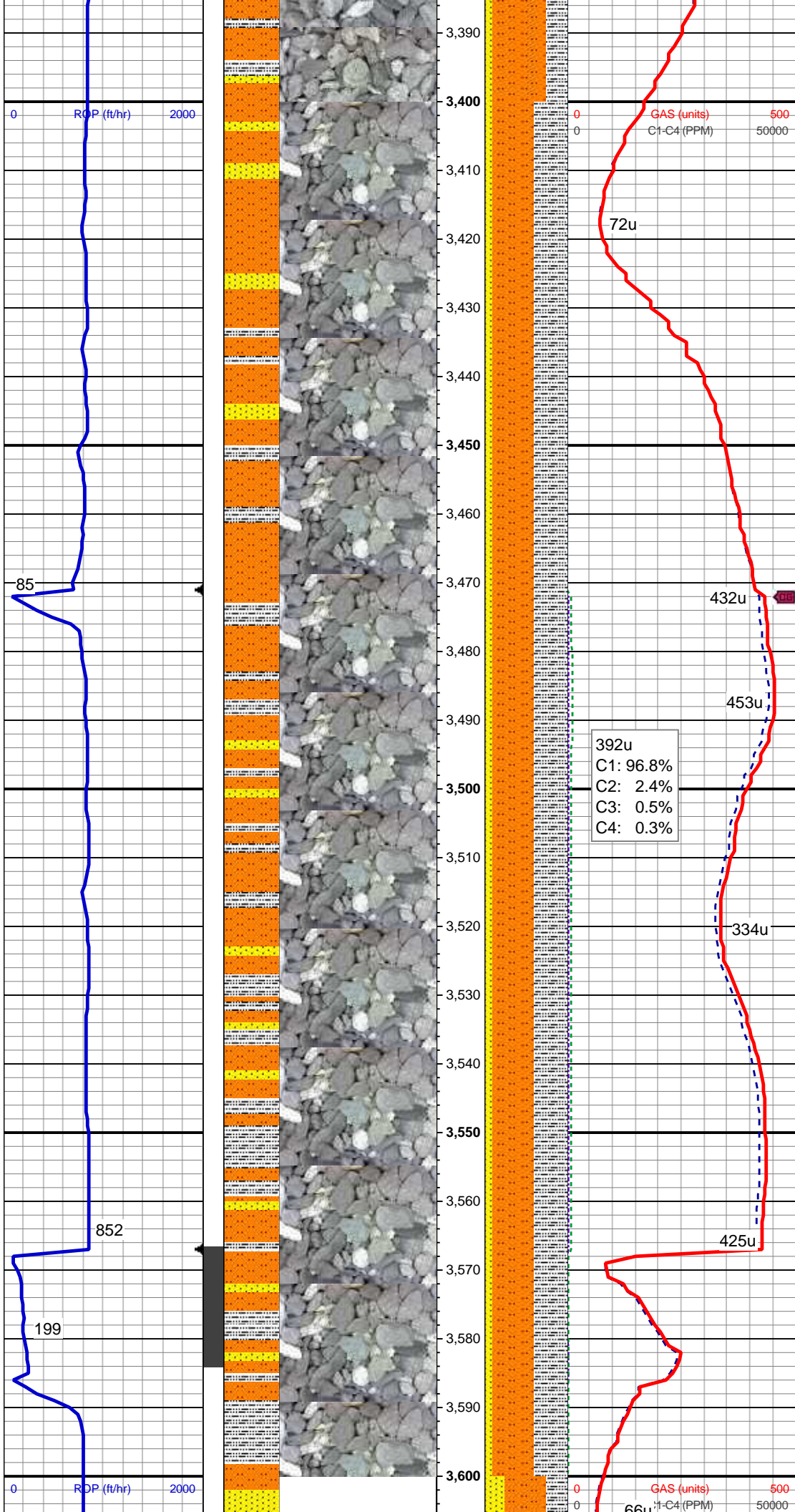




65% SLTST: lt - med gy, occ dk gy, mod frm, brit, sb plty - sb blkly, gt tex, slty - arg mtx, 25% SLTY SH: med-dk gy, mod - v frm, brit fri ip, plty - sb plty, sm - sb wxy tex, arg - slty mtx, v sl calc, occ (10%) fy intlaml ss strgs, tr dissml pyr, rr mica frags, rr bent, rr dul bl mnrl flr, no stn od or cut

MD: 3,325'  
TVD: 3,309.46'  
Inclination: 9.2°  
Azimuth: 126.84°  
VS: -153.76'





MD: 3,419'  
TVD: 3,402.26'  
Inclination: 9.15°  
Azimuth: 120.41°  
VS: -166.02'

50% SLTST: lt - med gy, occ dk gy, mod frm, brit, sb plty - sb blkly, gt tex, slty - arg mtx, 40% SLTY SH: med-dk gy, mod - v frm, brit fri ip, plty - sb plty, sm - sb wxy tex, arg - slty mtx, v sl calc, occ (10%) fy intlam ss strgs, tr dissim pyr, rr fos frag Inoc, nfsoc

MD: 3,514'  
TVD: 3,496.1'  
Inclination: 8.79°  
Azimuth: 117.85°  
VS: -178.79'

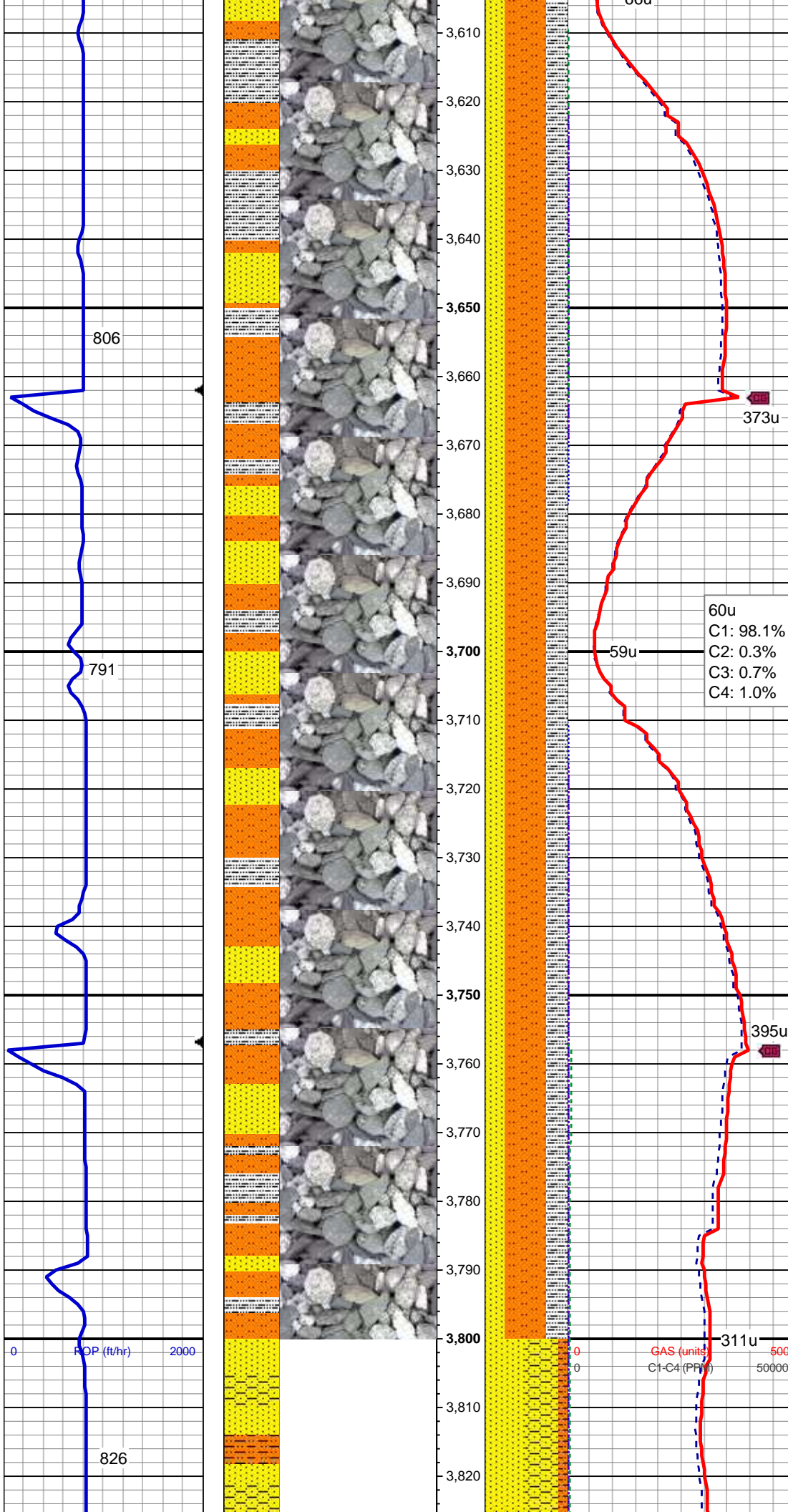
MD: 3,609'



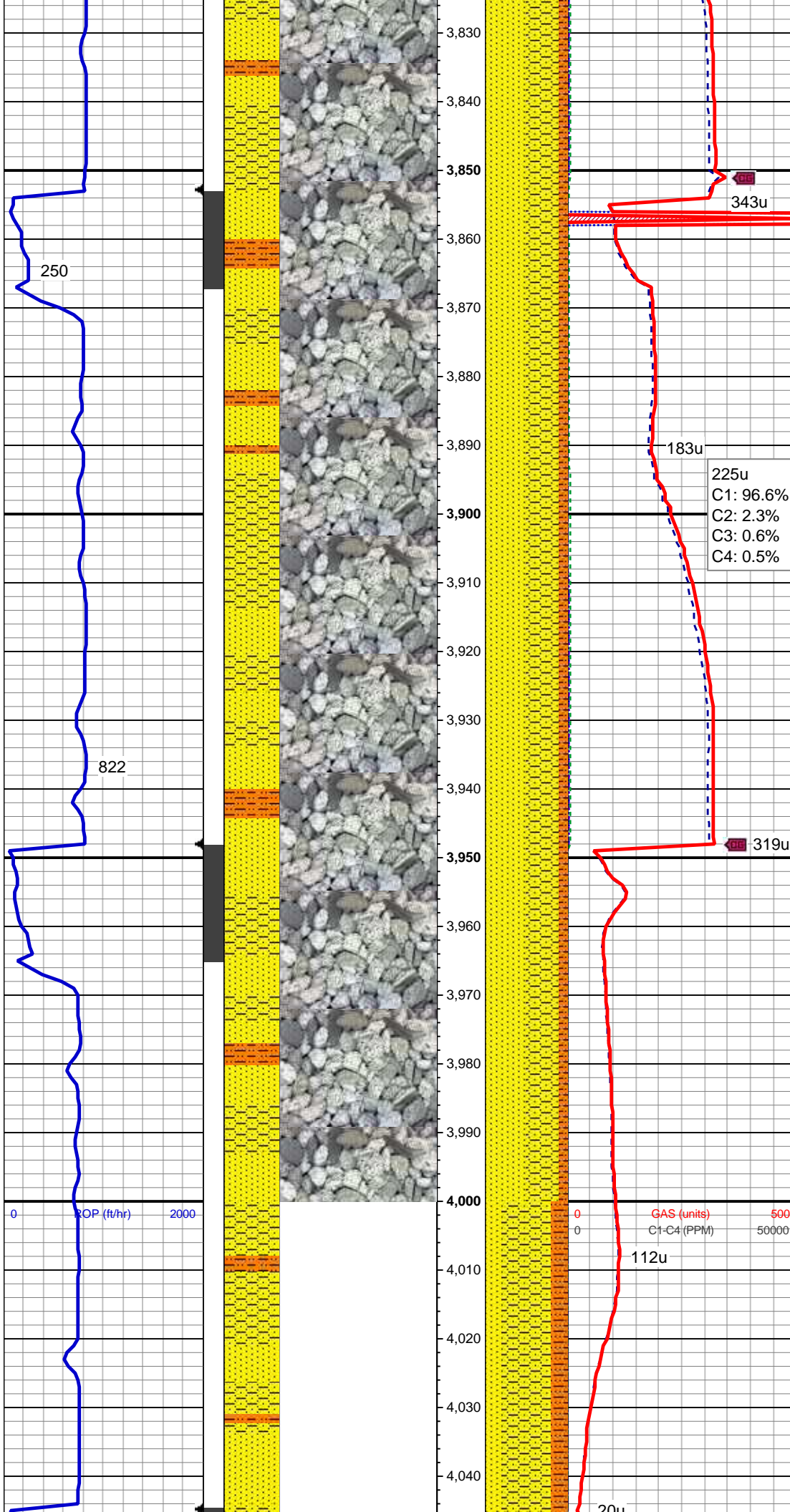
TVD: 3,590.12'  
Inclination: 7.88°  
Azimuth: 139.98°  
VS: -189.21'

50% SLTST: lt - med gy, occ dk gy,  
mod frm, brit, sb plty - sb blk, gt  
tex, slty - arg mtx, 25% SLTY SH:  
med-dk gy, mod - v frm, brit fri ip,  
plty - sb plty, sm - sb wxy tex, arg -  
slty mtx, sl calc, 25% SS: lt - med  
gy, s&p, mod firm, f - vf gr, sb rnd -  
sb ang, mod srt, cons, tr pyr nfsoc

MD: 3,703'  
TVD: 3,683.23'  
Inclination: 7.87°  
Azimuth: 136.28°  
VS: -197.58'





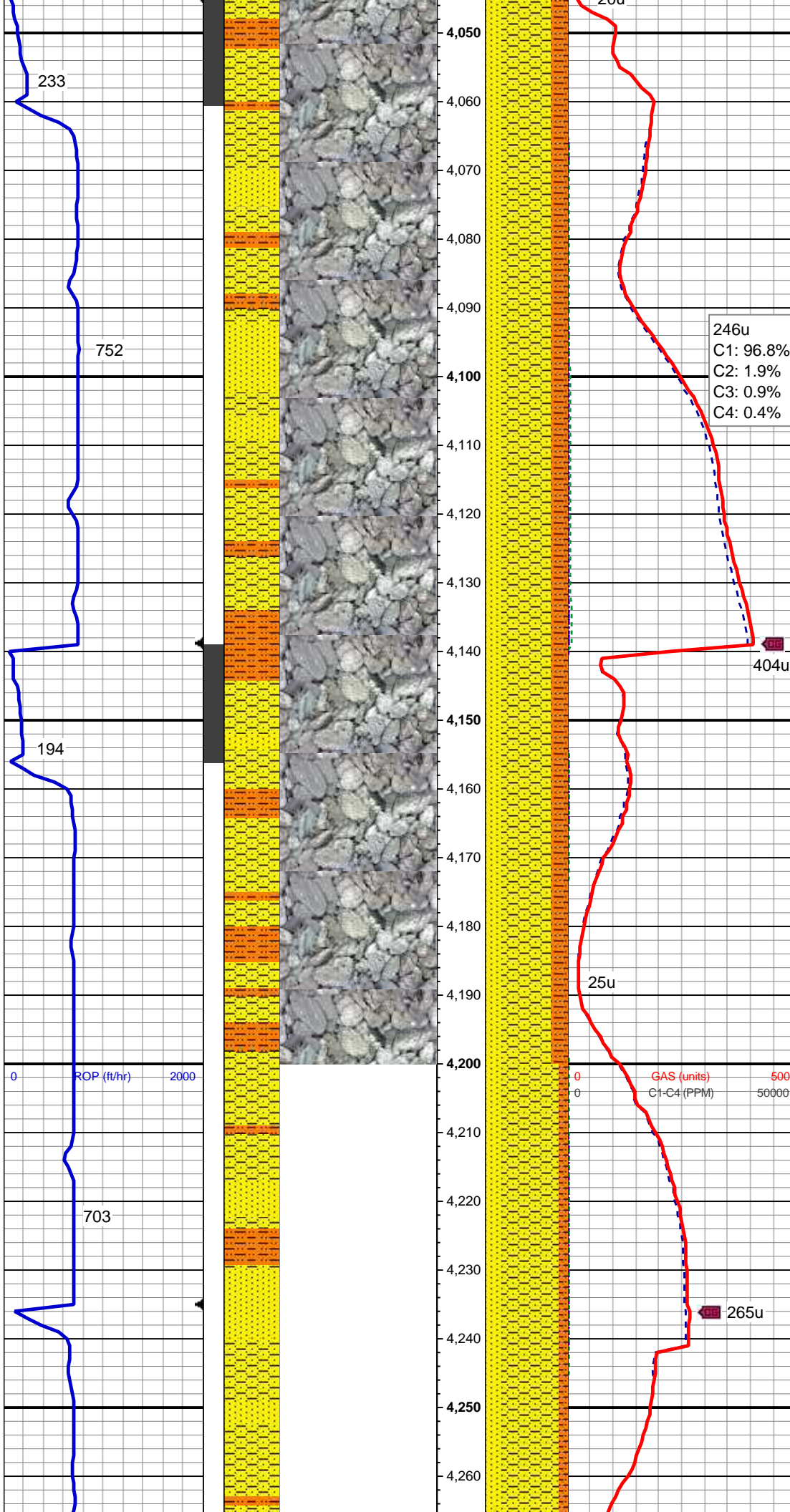


MD: 3,893'  
TVD: 3,871.73'  
Inclination: 6.56°  
Azimuth: 138.56°  
VS: -213.35'

50% SS: lt - med gy, s&p, mod firm, f - vf gr, sb rnd - sb ang, mod srt, cons, 40% SHY SS: lt - med gy, occ dk gy, mod frm, brit, f - vf gr, sb rnd - sb ang, shy - arg mtx, cons 10% SHY SLTST: lt - med gy, occ dk gy, mod frm, brit, sb plty - sb blk, gt tex, slty - arg mtx, sl calc, tr pyr, glauc ip, nfsoc

MD: 3,988'  
TVD: 3,966.26'  
Inclination: 4.73°  
Azimuth: 143.37°  
VS: -219.11'





MD: 4,082'  
TVD: 4,060.06'  
Inclination: 2.81°  
Azimuth: 163.17°  
VS: -221.97'

246u  
C1: 96.8%  
C2: 1.9%  
C3: 0.9%  
C4: 0.4%

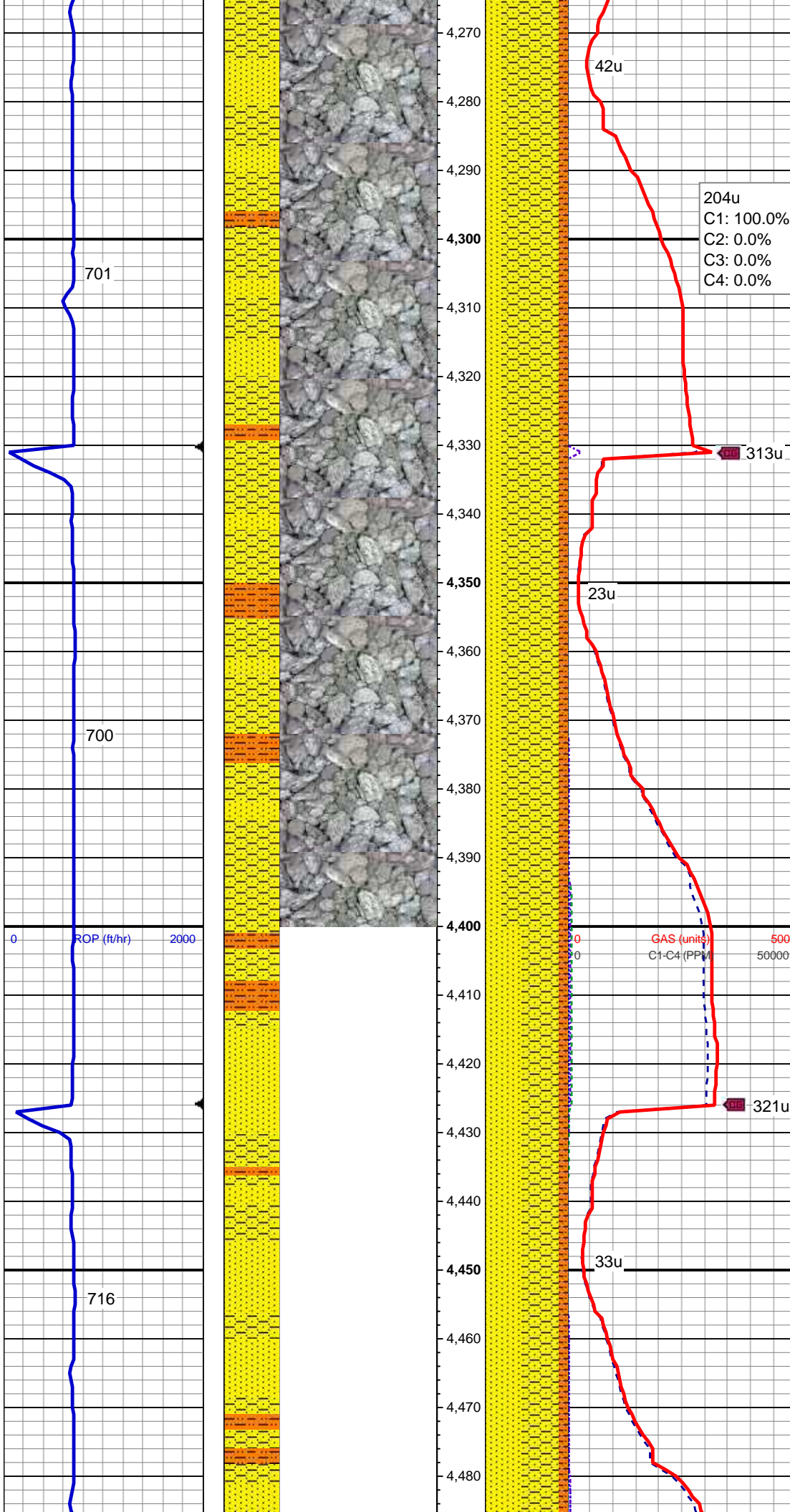
60% SHY SS: lt - med gy, occ dk gy, mod frm, brit, f - vf gr, sb rnd - sb ang, shy - arg mtx, cons, 20% SS: lt - med gy, s&p, mod firm, f - vf gr, sb rnd - sb ang, mod srt, cons, 20% SHY SLTST: lt - med gy, occ dk gy, mod frm, brit, sb plty - sb blkgy, gt tex, slty - arg mtx, sl calc, tr pyr, glauc ip, nfsoc

MD: 4,177'  
TVD: 4,155.01'  
Inclination: 1.27°  
Azimuth: 241.07°  
VS: -221.67'

GAS (units)  
C1-C4 (PPM)

265u





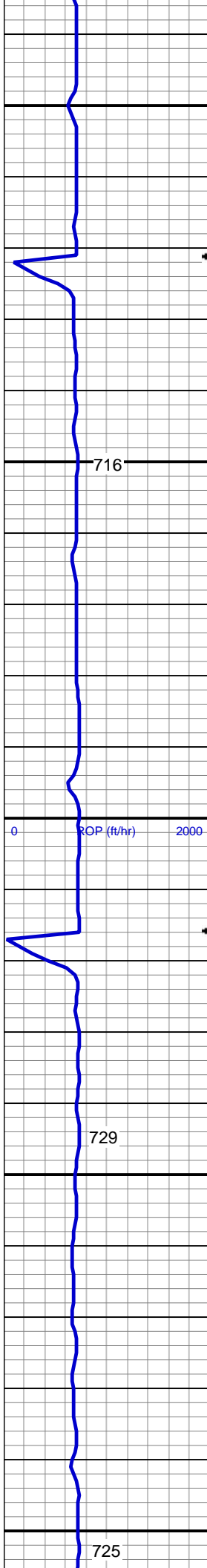
MD: 4,272'  
TVD: 4,249.99'  
Inclination: 1.37°  
Azimuth: 222.46°  
VS: -219.95'

70% SHY SS: lt - med gy, occ dk gy, mod frm, brit, f - vf gr, sb rnd - sb ang, shy - arg mtx, cons, 20% SS: lt - med gy, s&p, mod firm, f - vf gr, sb rnd - sb ang, mod srt, cons, 10% SHY SLTST: lt - med gy, occ dk gy, mod frm, brit, sb plty - sb blk, gt tex, slty - arg mtx, sl calc, tr pyr, glauc ip, nfsoc

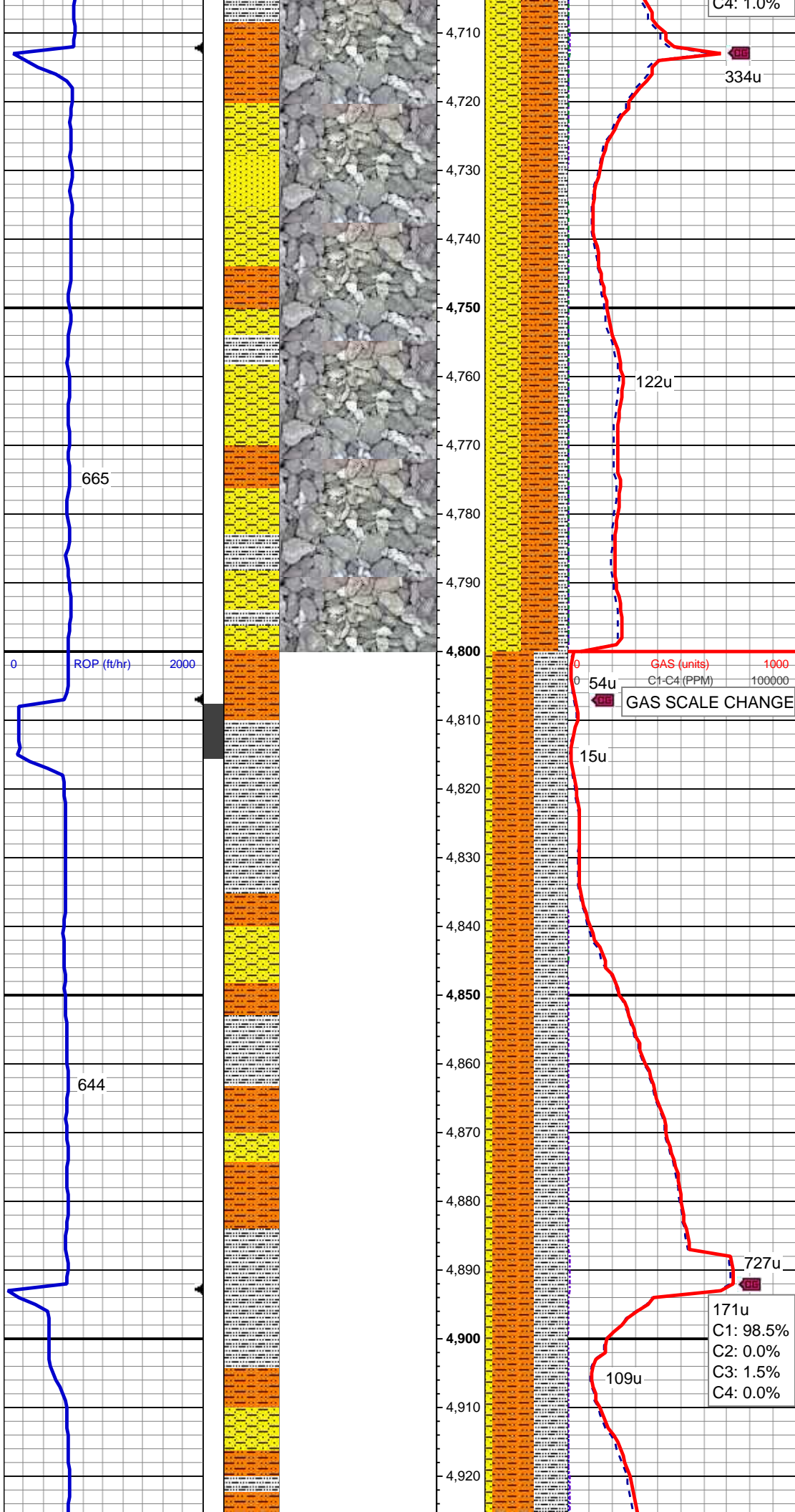
MD: 4,367'  
TVD: 4,344.96'  
Inclination: 1.38°  
Azimuth: 204.15°  
VS: -218.67'

MD: 4,461'  
TVD: 4,438.94'  
Inclination: 1.08°  
Azimuth: 211.32°  
VS: -217.71'









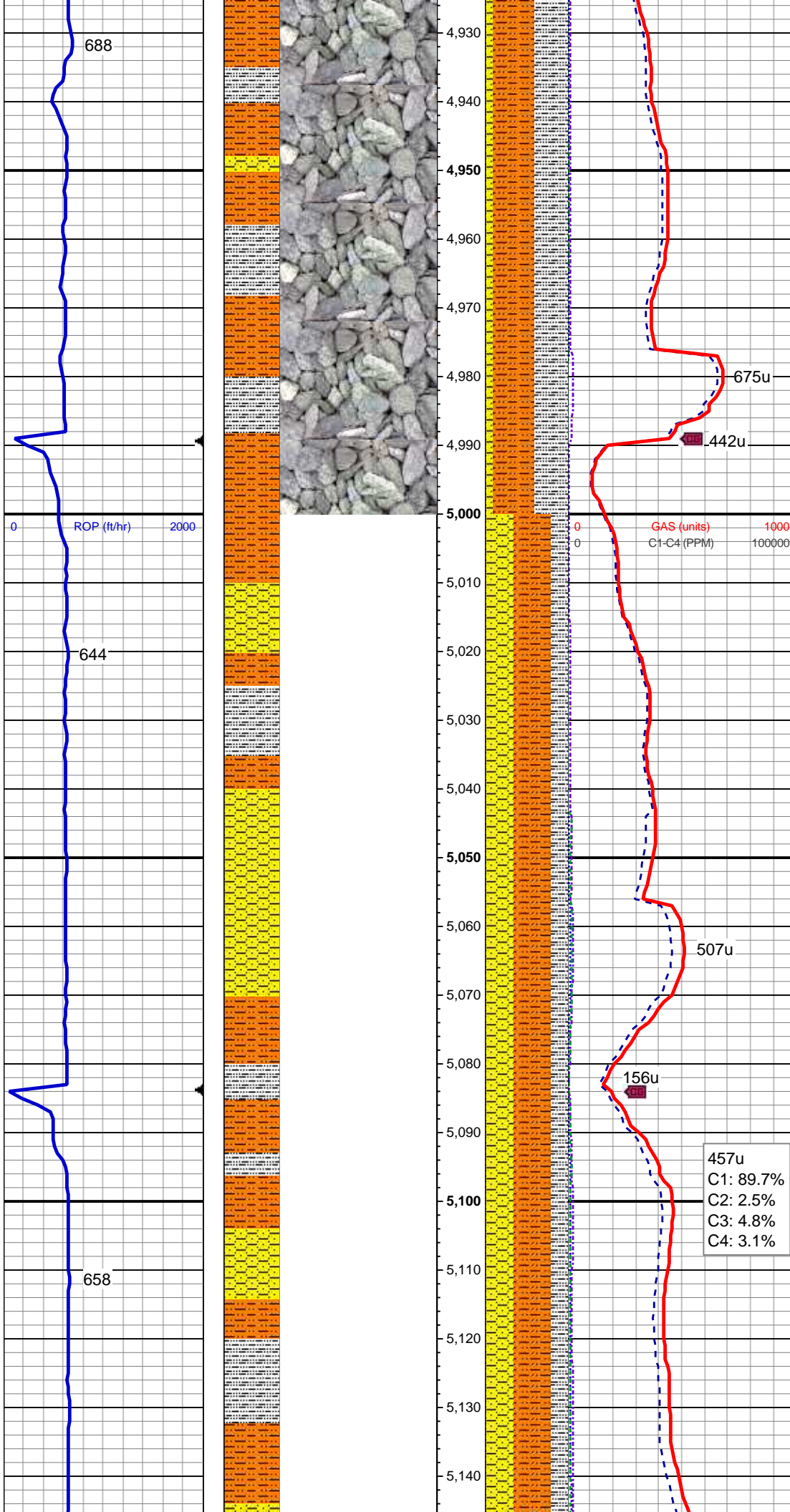
C4: 1.0%  
ang, mod srt, cons, glauc ip, 10%  
SLTY SH: med-dk gy, mod - v frm,  
brit fri ip, plty - sb plty, sm - sb wxy  
tex, arg - slty mtx, sl calc, nfsoc

MD: 4,746'  
TVD: 4,723.89'  
Inclination: 1.14°  
Azimuth: 186.01°  
VS: -216'

MD: 4,841'  
TVD: 4,818.87'  
Inclination: 2°  
Azimuth: 318.33°  
VS: -214.81'

50% SHY SLTST: lt - med gy, occ  
dk gy, mod frm, brit, sb plty - sb  
blky, gt tex, slty - arg mtx, 40% SLTY  
SH: med-dk gy, mod - v frm, brit fri  
ip, plty - sb plty, sm - sb wxy tex, arg  
- slty mtx, sl calc, 10% SHY SS: lt -  
med gy, occ dk gy, f - vf gr, mod frm,  
brit, sb rnd - sb ang, shy - arg mtx,  
cons, nfsoc





MD: 4,936'  
TVD: 4,913.83'  
Inclination: 1.52°  
Azimuth: 322.55°  
VS: -213'

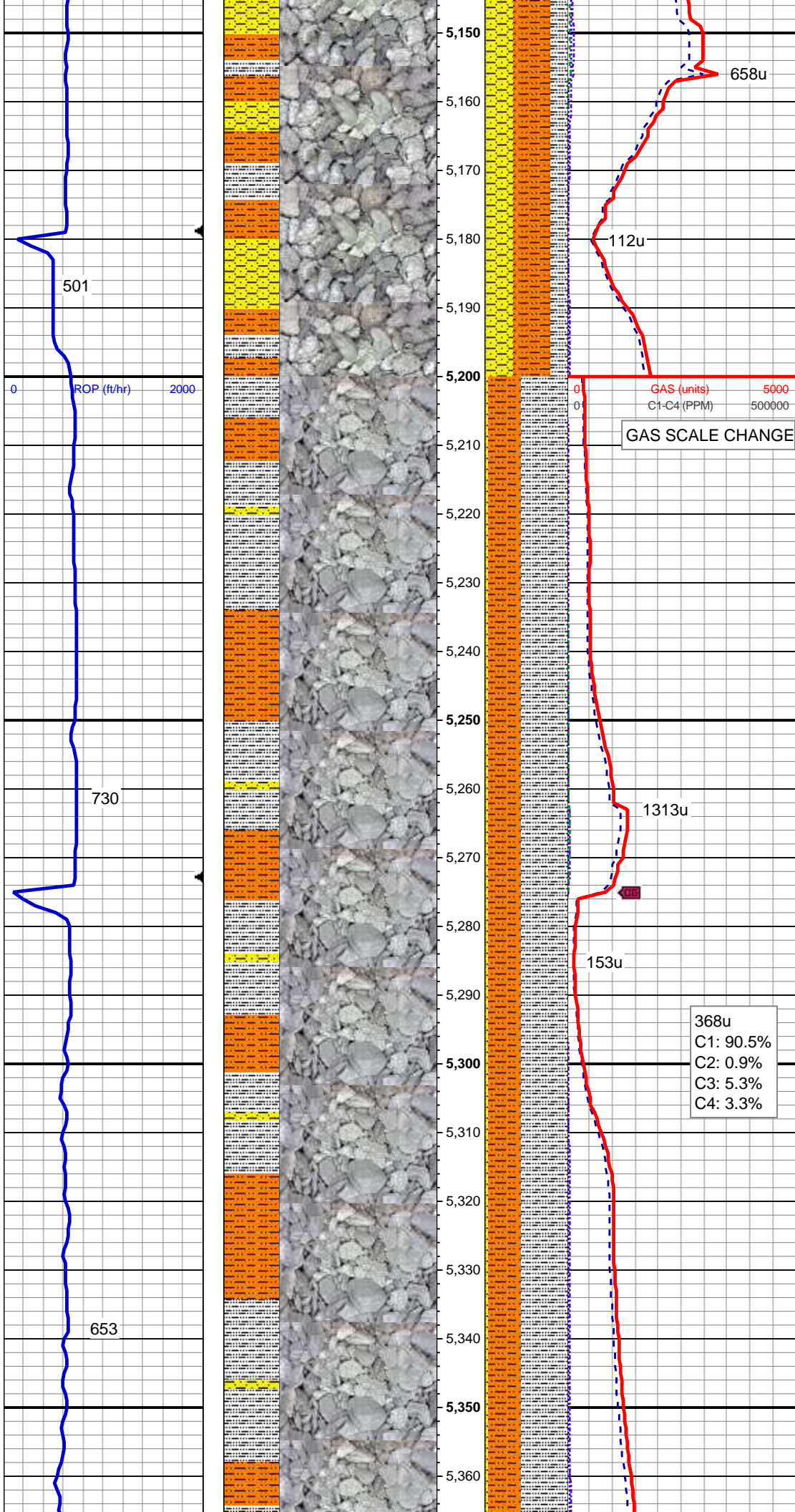
MD: 5,030'  
TVD: 5,007.79'  
Inclination: 1.67°  
Azimuth: 326.22°  
VS: -211.53'

45% SHY SLTST: lt - med gy, occ dk gy, mod frm, brit, sb plty - sb blkly, gt tex, slty - arg mtx, 35% SHY SS: lt - med gy, occ dk gy, f - vf gr, mod frm, brit, sb rnd - sb ang, shy - arg mtx, cons, 20% SLTY SH: med-dk gy, mod - v frm, brit fri ip, plty - sb plty, sm - sb wxy tex, arg - slty mtx, sl calc, nfsoc

MD: 5,125'  
TVD: 5,102.75'  
Inclination: 1.63°  
Azimuth: 325.33°  
VS: -210.04'

MW 8.8 VIS 29



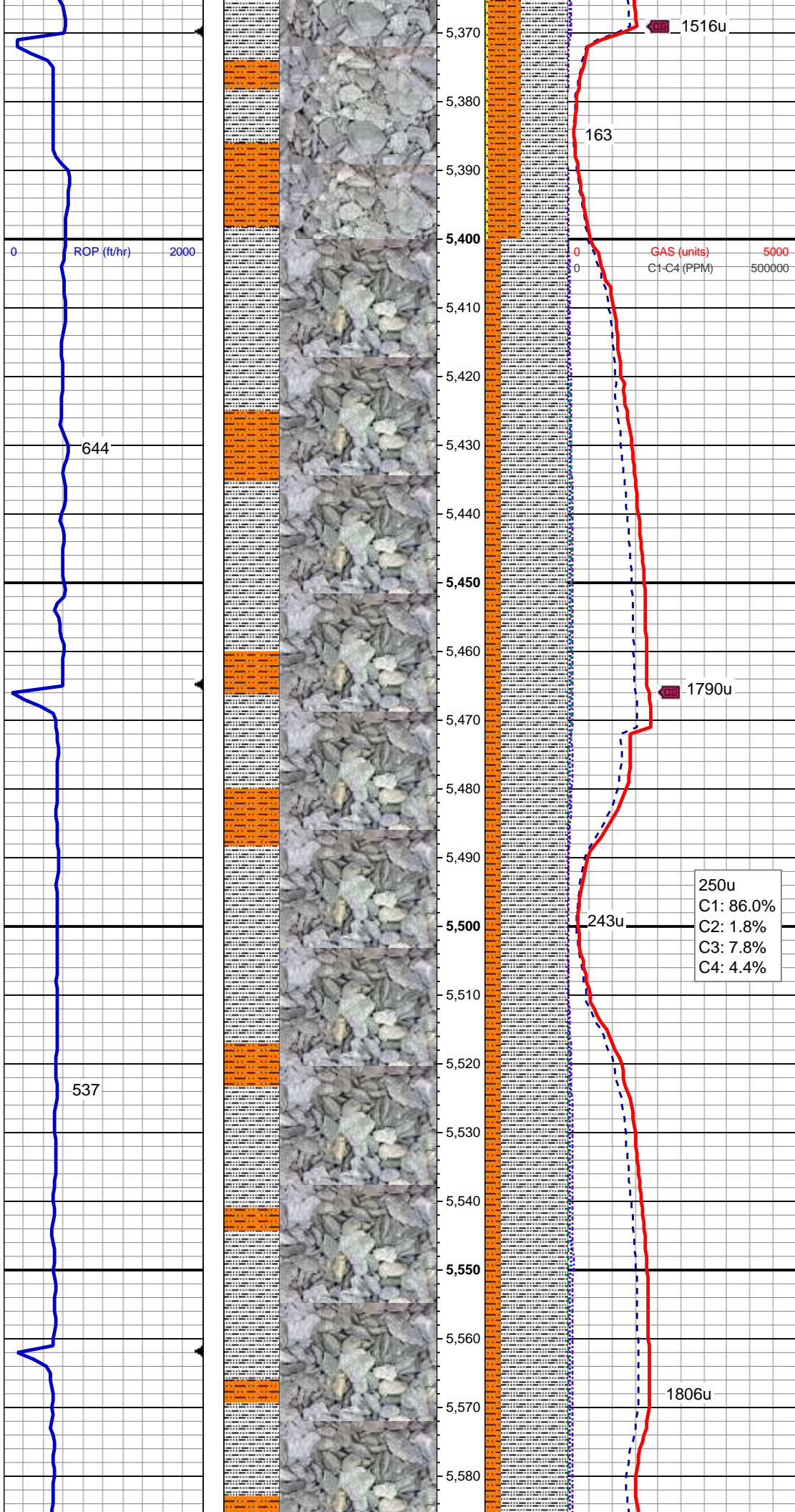


MD: 5,220'  
TVD: 5,197.72'  
Inclination: 1.51°  
Azimuth: 322.93°  
VS: -208.57'

55% SLTY SH: med-dk gy, mod - v  
frm, brit fri ip, plty - sb plty, sm - sb  
wxy tex, arg - slty mtx, sl calc, 40%  
SHY SLTST: lt - med gy, occ dk gy,  
mod frm, brit, sb plty - sb blk, gt  
tex, slty - arg mtx, 5% SHY SS: lt -  
med gy, occ dk gy, f - vf gr, mod frm,  
brit, sb rnd - sb ang, shy - arg mtx,  
cons, occ SS, nfsoc

MD: 5,315'  
TVD: 5,292.69'  
Inclination: 1.28°  
Azimuth: 299.47°  
VS: -206.92'



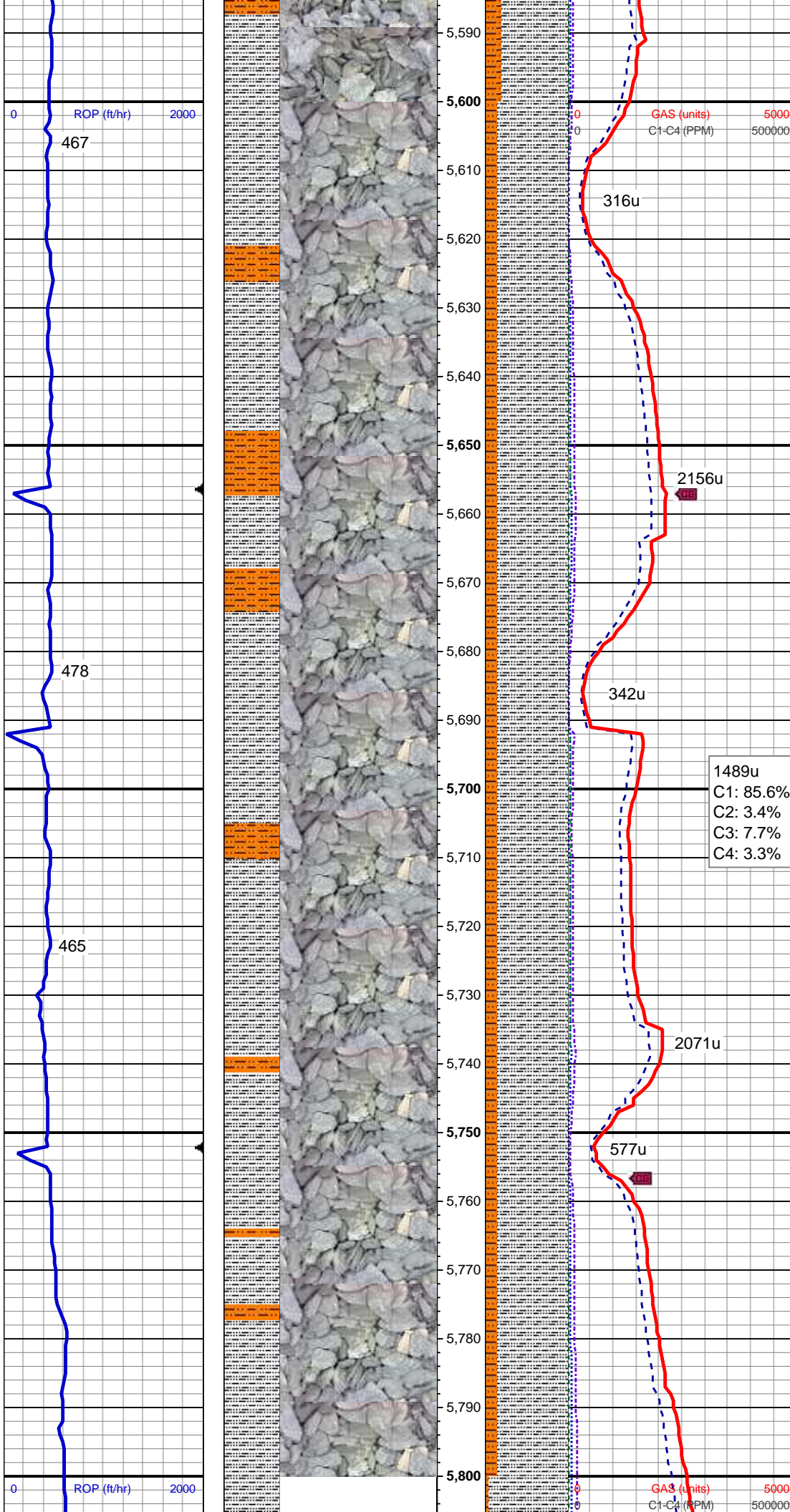


MD: 5,410'  
TVD: 5,387.67'  
Inclination: 1.23°  
Azimuth: 287.06°  
VS: -205.05'

55% SLTY SH: med-dk gy, mod - v  
frm, brit fri ip, plty - sb plty, sm - sb  
wxy tex, arg - slty mtx, sl calc, 40%  
SHY SLTST: lt - med gy, occ dk gy,  
mod frm, brit, sb plty - sb blkly, gt  
tex, slty - arg mtx, tr SHY SS, nfsoc

MD: 5,504'  
TVD: 5,481.65'  
Inclination: 1.03°  
Azimuth: 266.93°  
VS: -203.25'





MD: 5,599'  
TVD: 5,576.63'  
Inclination: 0.97°  
Azimuth: 253.23°  
VS: -201.62'

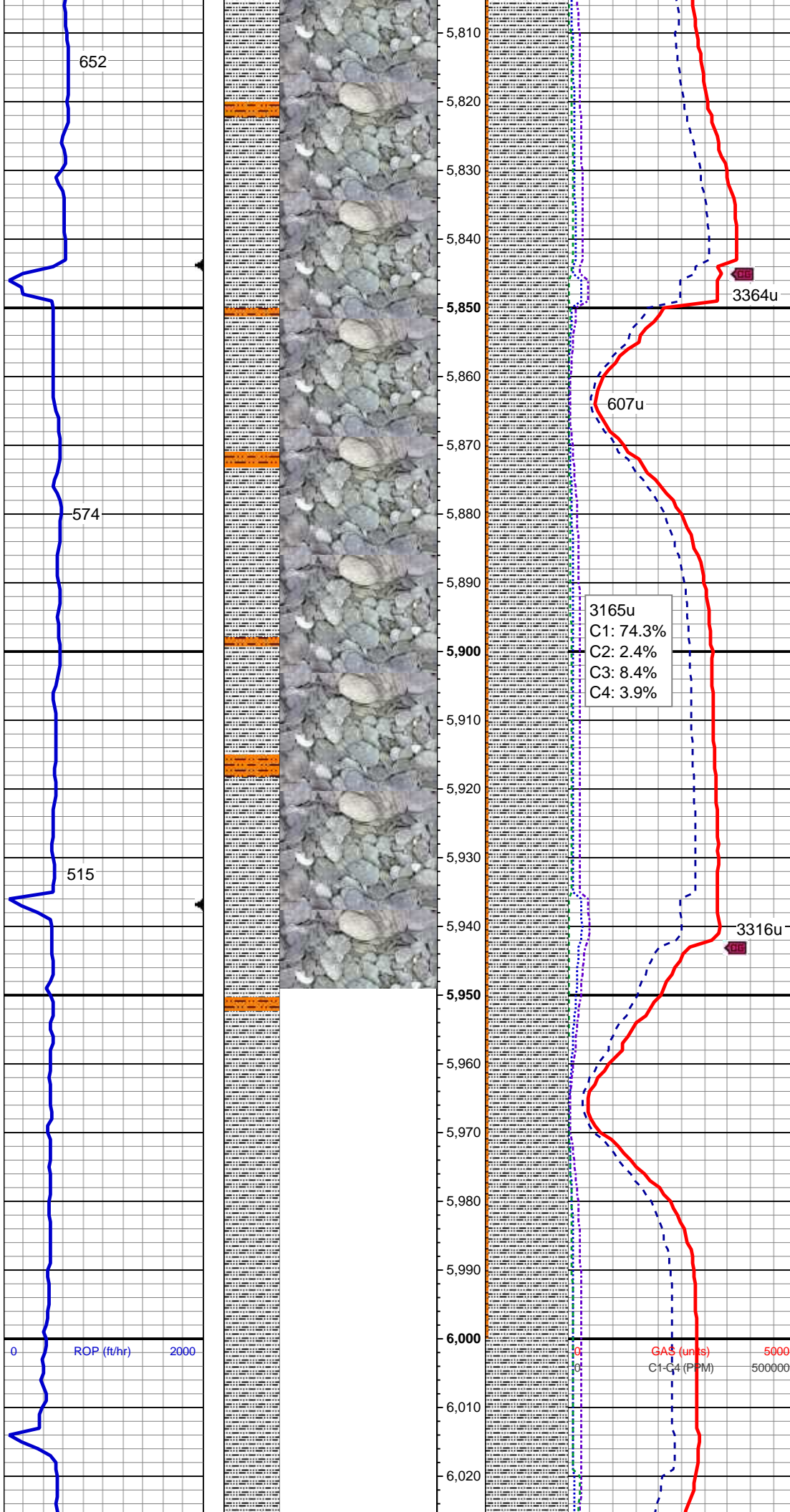
MW 9.3 VIS 32

MD: 5,694'  
TVD: 5,671.62'  
Inclination: 1.24°  
Azimuth: 231.68°  
VS: -200.03'

85% SLTY SH: med-dk gy, mod - v  
frm, brit fri ip, plty - sb plty, sm - sb  
wxy tex, arg - slty mtx, sl calc, 15%  
SHY SLTST: lt - med gy, occ dk gy,  
mod frm, brit, sb plty - sb blk, gt  
tex, slty - arg mtx, tr SHY SS, nfsoc

MD: 5,789'  
TVD: 5,766.59'  
Inclination: 1.44°  
Azimuth: 235.8°  
VS: -198.21'





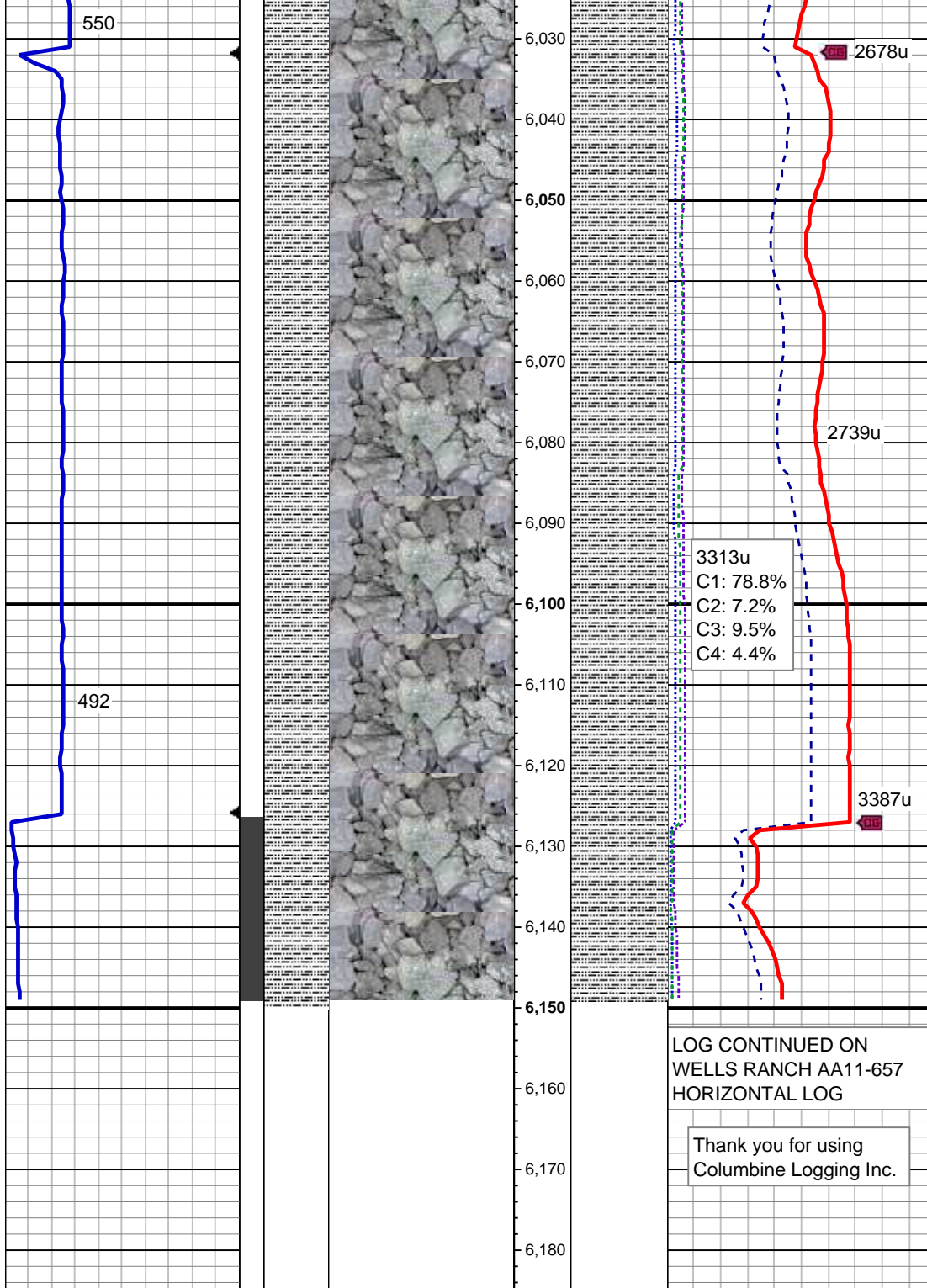
MW 9.45 VIS 35

MD: 5,884'  
TVD: 5,861.56'  
Inclination: 1.34°  
Azimuth: 233.4°  
VS: -196.31'

85% SLTY SH: med-dk gy, mod - v  
frm, brit fri ip, plty - sb plty, sm - sb  
wxy tex, arg - slty mtz, sl calc, 15%  
SHY SLTST: lt - med gy, occ dk gy,  
mod frm, brit, sb plty - sb blk, gt  
tex, slty - arg mtz, nfsoc

MD: 5,978'  
TVD: 5,955.53'  
Inclination: 1.58°  
Azimuth: 247.11°  
VS: -194.21'





MW 9.6 VIS 34 IN  
9.65/35 OUT

MD: 6,073'  
TVD: 6,050.48'  
Inclination: 2.18°  
Azimuth: 243.97°  
VS: -191.35'

100% SLTY SH: med-dk gy, mod - v  
frm, brit fri ip, plty - sb plty, sm - sb  
wxy tex, arg - slty mtz, sl calc, nfsoc

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HORIZONTAL LOG

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