

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** WELLS RANCH A36-655

**Location** NESE 31 6N 63W

**State** COLORADO

**County** WELD

**Country** USA

**Rig Number** H&P #273

**API Number** 05-123-41516

**AFE #** 201409

**Region** DJ BASIN

**Field** WATTENBERG

**Spud Date** 6/20/2015

**Drilling Completed** 6/29/2015

**Surface Coordinates** LAT: 40.4421  
LONG: -104.47162  
2323' FSL  
390' FEL

**Bottom Hole Coordinates** PROJECTED:  
2310' FNL  
50' FWL

**Ground Elevation** 4656'

**K.B. Elevation** 4680

**Logged Interval** 800' To 16730'

**Total Depth** 16730'

**Formation** NIOBRARA

**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

DRILL STEM TEST

WIRELINE TESTED - LEFT

WIRELINE TESTED - RT

### Rounding

- ANGULAR
- ROUNDED
- SUBANG
- SUBRND

### Textures

- BOUNDSTONE
- CHALKY
- CRYPTOXLN

E EARTHY

FINELYXLN

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

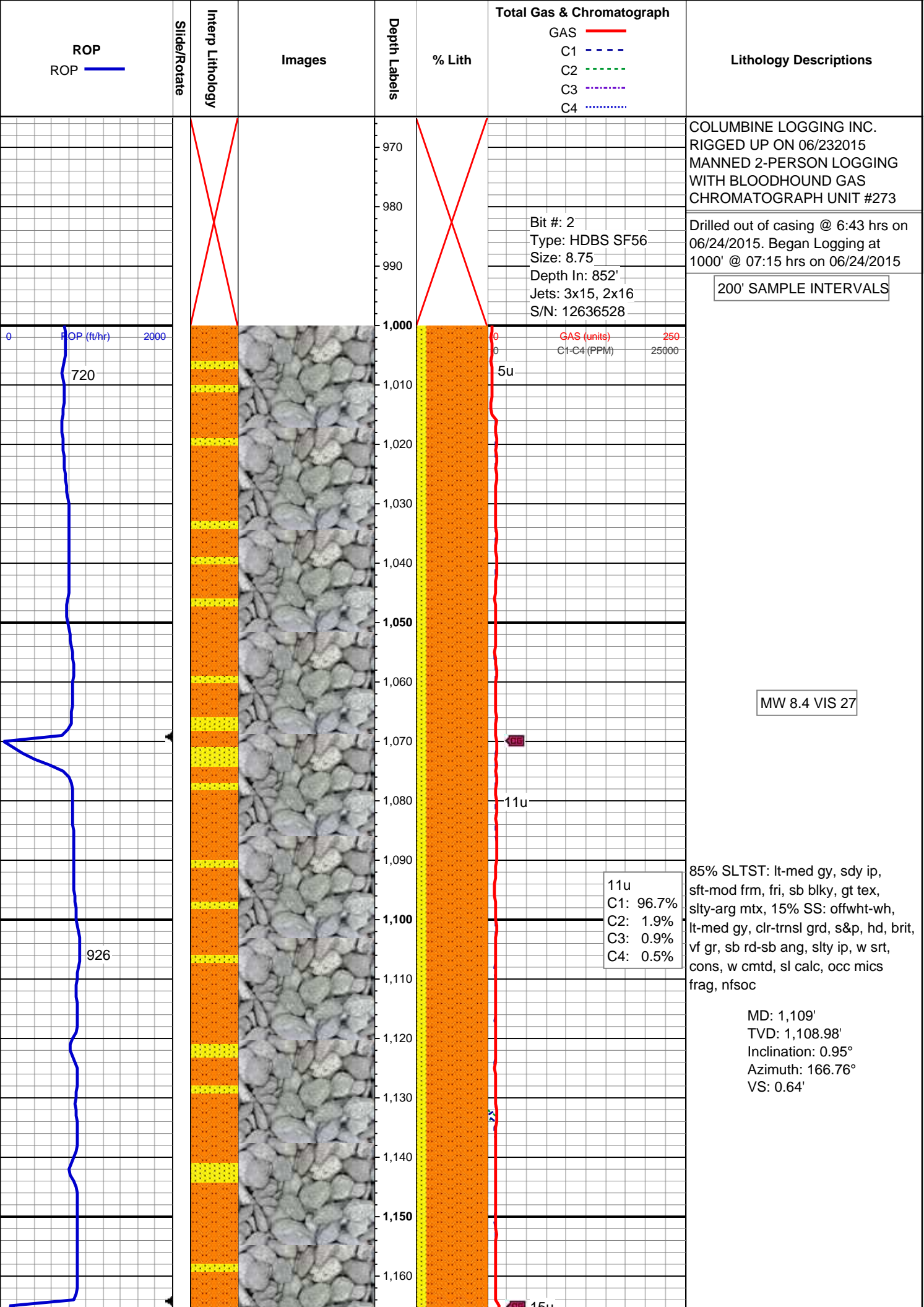
**Name** MICHAEL ANDERSON, SHANNA GILBERT

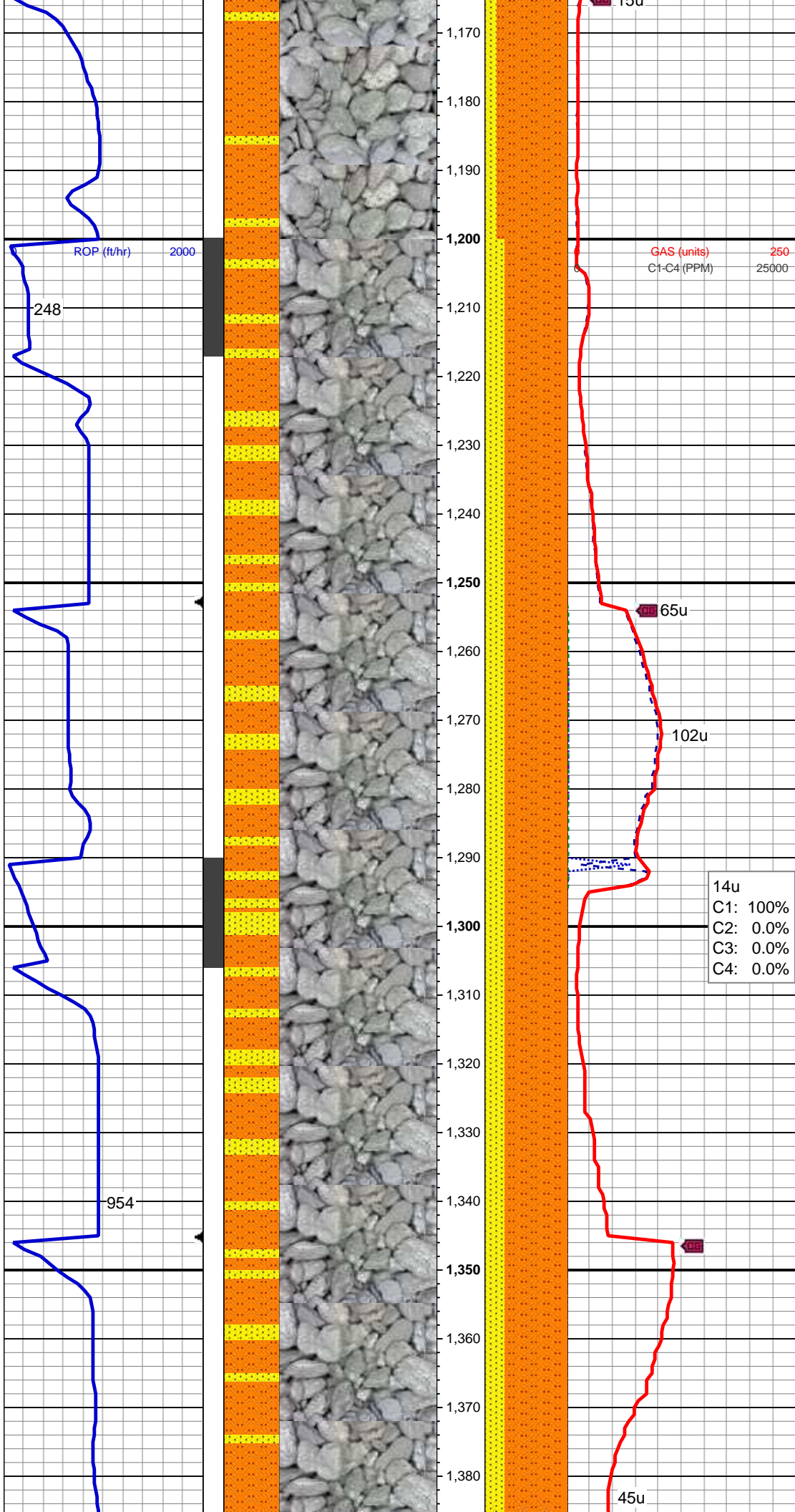
**Company** COLUMBINE LOGGING, INC.

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

## Zone Color Coding

Oil  
 Note  
 Error  
 Condensate  
 Core  
 Water  
 Gas  
 Pressure  
 Seal





MD: 1,200'  
TVD: 1,199.97'  
Inclination: 0.62°  
Azimuth: 89.5°  
VS: -0.07'

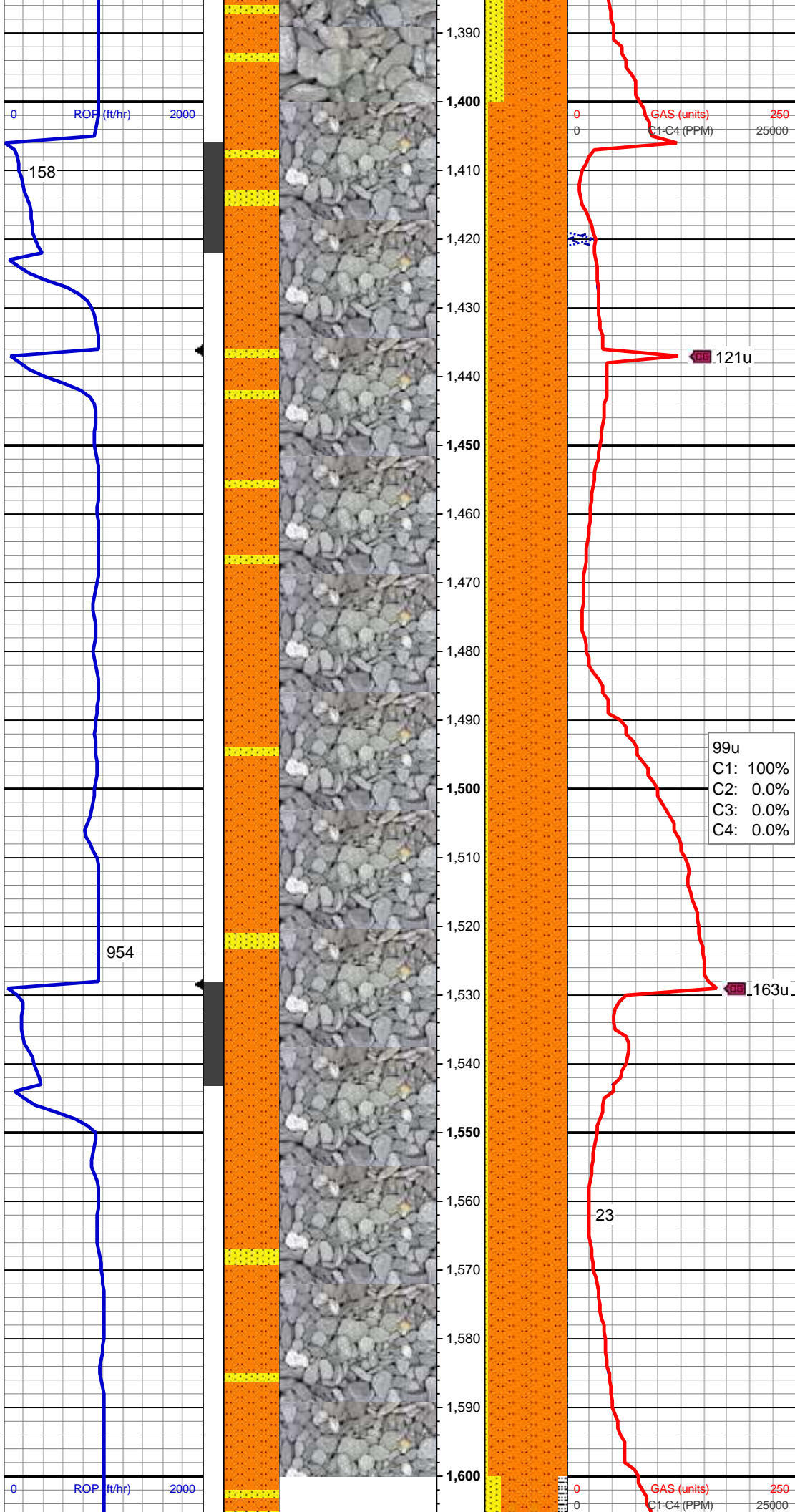
MD: 1,292'  
TVD: 1,291.93'  
Inclination: 2.68°  
Azimuth: 44.03°  
VS: -1.98'

75% SLTST: lt-med gy, sdy ip, sft-mod frm, fri, sb blk, gt tex, slty-arg mtx, fy intlam wi 25% SS: offwht-wh, lt-med gy, clr-trns grd, s&p, hd, brit, vf gr, sb rd-sb ang, slty ip, w srt, cons, w cmt, sl calc, occ mics frag, nfsoc

MD: 1,383'  
TVD: 1,382.78'  
Inclination: 4°



Azimuth: 49.19°  
VS: -5.68'

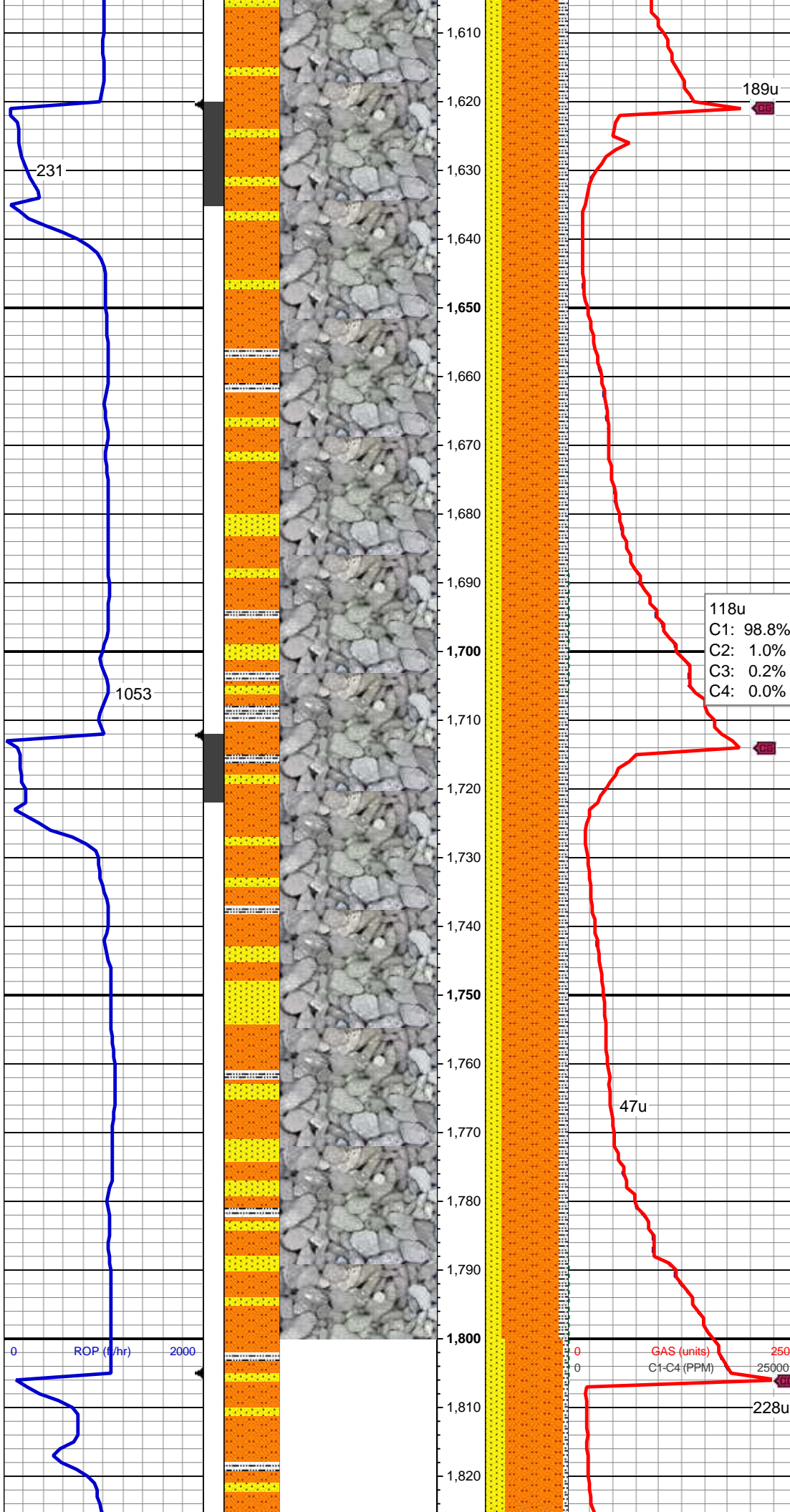


MD: 1,474'  
TVD: 1,473.41'  
Inclination: 6.27°  
Azimuth: 37.9°  
VS: -10.82'

99u  
C1: 100%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

95% SLTST: lt-med gy, sdy ip, mod  
sft-mod frm, brit-fri, sb blk, gt tex,  
sly-arg mtx, sl calc, tr (5%) ss, tr  
dissm pyr, rr mics frag, nfsoc

MD: 1,565'  
TVD: 1,563.73'  
Inclination: 7.73°  
Azimuth: 36.31°  
VS: -17.05'



MD: 1,657'  
TVD: 1,654.64'  
Inclination: 9.87°  
Azimuth: 29.07°  
VS: -23.94'

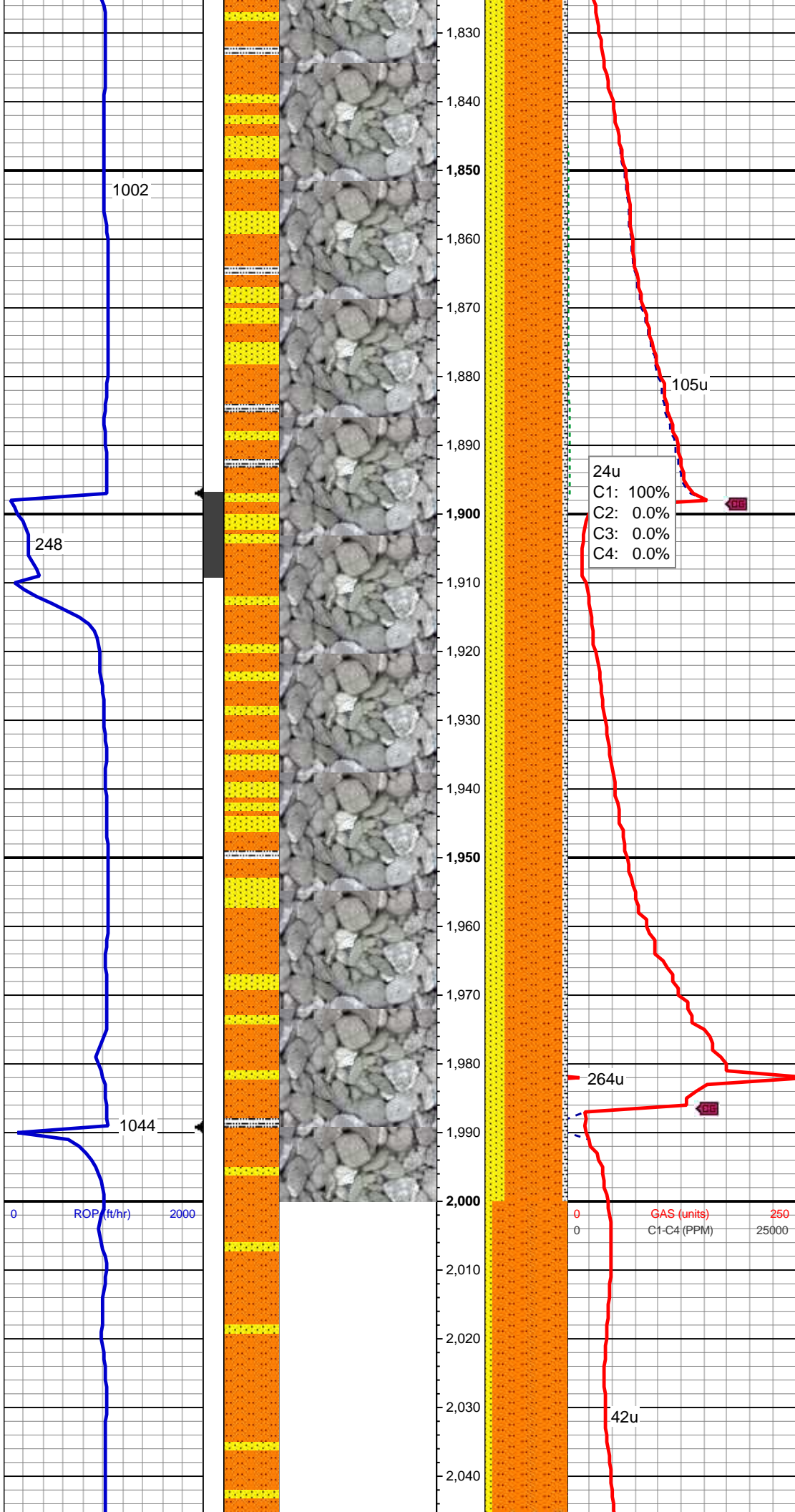
118u  
C1: 98.8%  
C2: 1.0%  
C3: 0.2%  
C4: 0.0%

70% SLTST: lt-med gy, sdy ip, mod  
sft-mod frm, brit-fri, sb blk, gt tex,  
sly-arg mtx, fy intlam wi 20% SS:  
offwht-wh, lt-med gy, clr-trnsl grd,  
s&p, hd, brit, vf gr, sb rd-sb ang, sly  
ip, w srt, cons, w cmtd, sl calc, occ  
(10%) sly sh, tr mics frag, rr bent, rr  
dul orgn mnrl flor, n stn od or cut

MD: 1,749'  
TVD: 1,745.14'  
Inclination: 10.82°  
Azimuth: 31.67°  
VS: -31.57'

MW 8.35 VIS 27



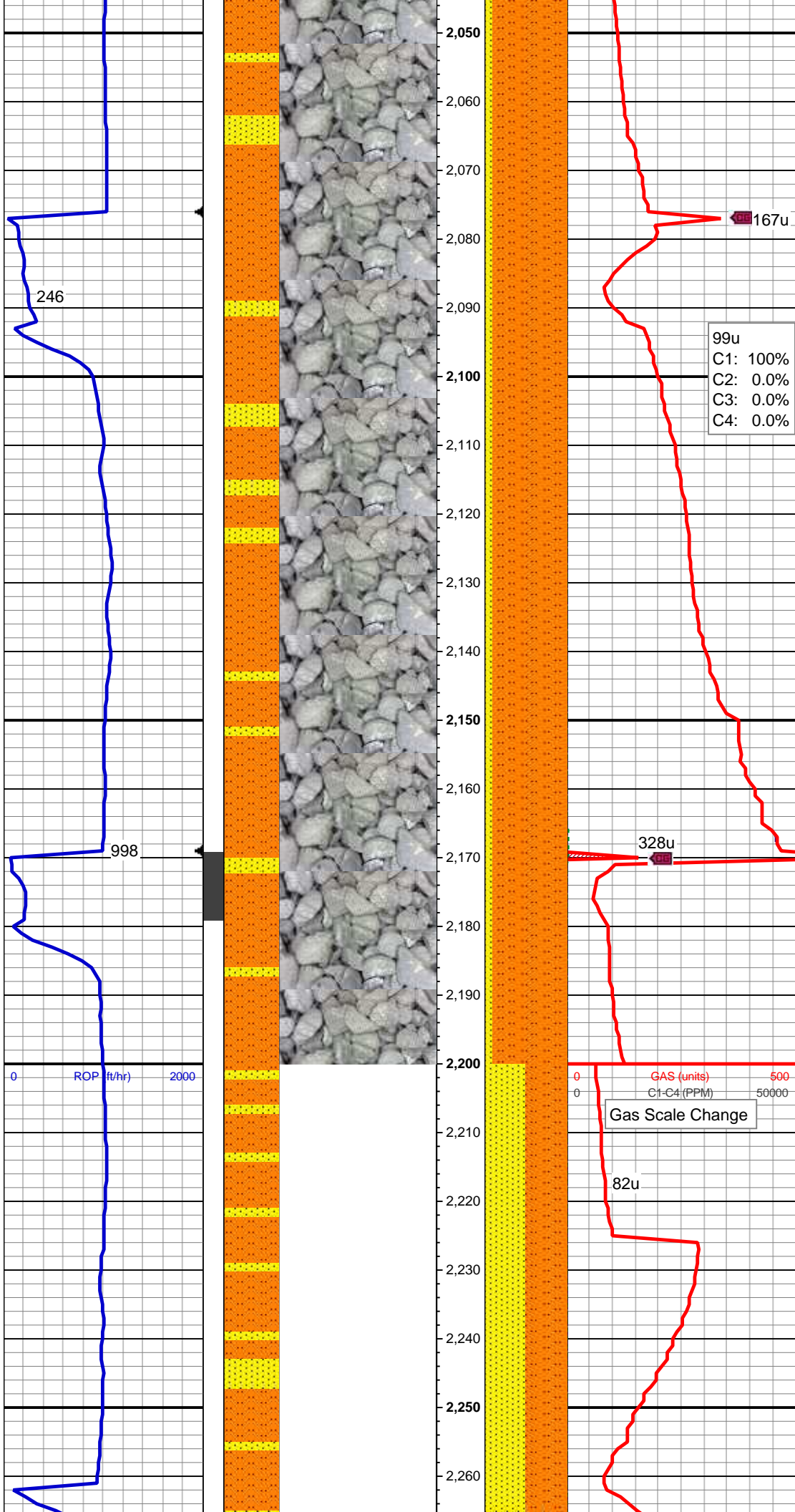


MD: 1,841'  
TVD: 1,835.64'  
Inclination: 9.92°  
Azimuth: 27.03°  
VS: -38.97'

70% SLTST: lt-med gy, sdy ip, sft-mod frm, fri, sb blk, gt tex, slty-arg mt, fy intlam wi 25% SS: offwht-wh, lt-med gy, clr-trns grd, s&p, hd, brit, vf gr, sb rd-sb ang, slty ip, w srt, cons, w cmd, v sl calc, tr (5%) slty sh, tr mics frag, rr glau, nfsoc

MD: 1,932'  
TVD: 1,925.16'  
Inclination: 10.77°  
Azimuth: 23.45°  
VS: -45.17'

MD: 2,023'  
TVD: 2,014.64'  
Inclination: 10.24°  
Azimuth: 18.26°  
VS: -50.3'

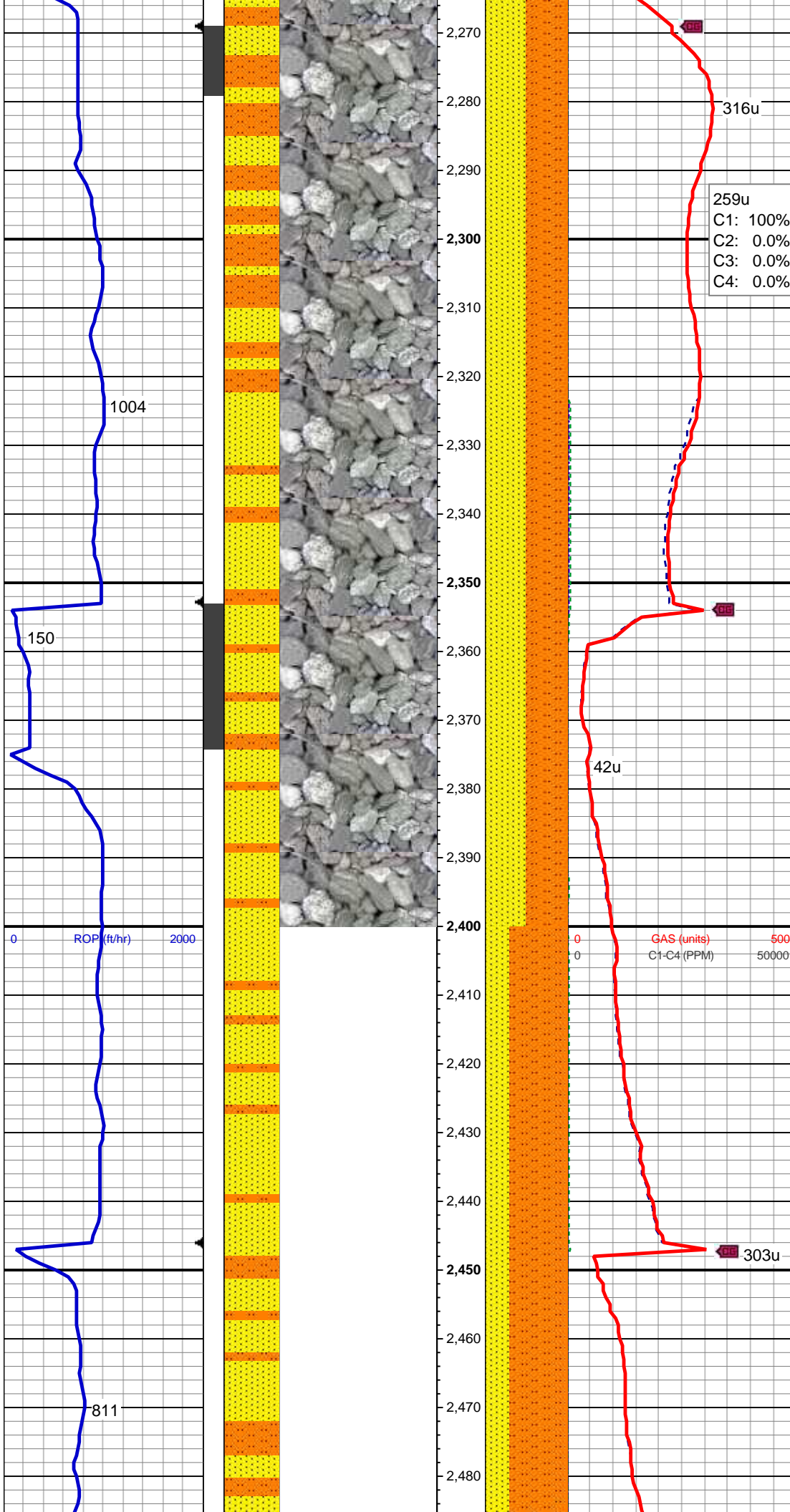


90% SLTST: lt-med gy, sdy ip, mod  
sft-mod frm, brit-fri, sb blk, gt tex,  
silty-arg mtx, v sl calc, occ (10%) fy  
intlam ss strgs, rr mics frags, nfsoc

MD: 2,115'  
TVD: 2,105.17'  
Inclination: 10.35°  
Azimuth: 29.58°  
VS: -56.18'

MD: 2,207'  
TVD: 2,195.58'  
Inclination: 10.96°  
Azimuth: 23.14°  
VS: -62.93'



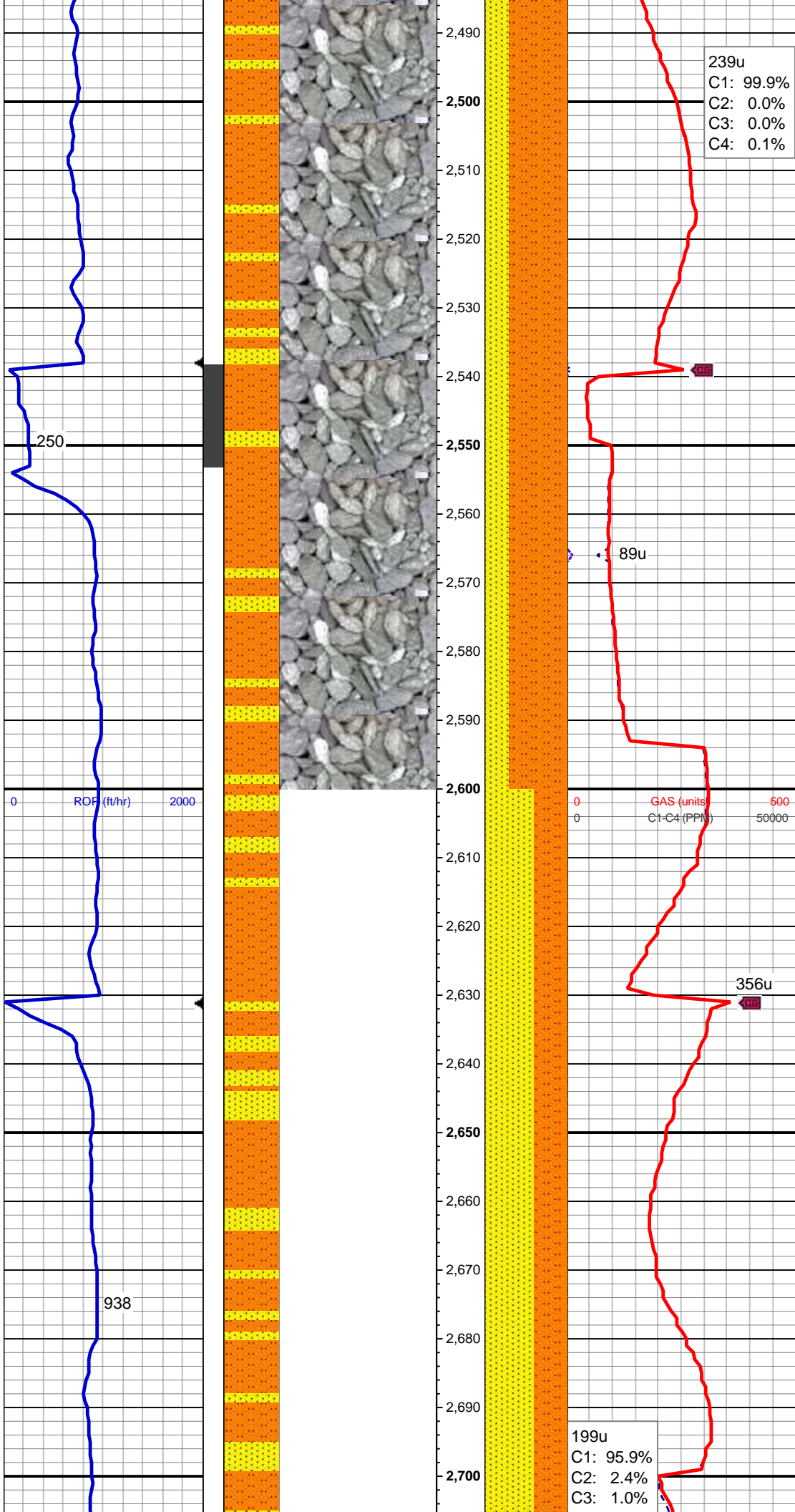


MD: 2,299'  
TVD: 2,286.07'  
Inclination: 9.81°  
Azimuth: 15.65°  
VS: -67.71'

50% SS: offwht-wh, lt-med gy,  
clr-trnsl grd, s&p, v hd, brit, vf-l f gr,  
sb rd-sb ang, slty ip, mod-w srt,  
cons, w cmted, 50% SLTST: lt-med  
gy, sdy ip, sft-mod frm, fri, sb blk,  
gt tex, slty-arg mttx, v sl calc, tr mics  
frag, nfsoc

MD: 2,391'  
TVD: 2,376.56'  
Inclination: 11.09°  
Azimuth: 28.33°  
VS: -73.24'

MD: 2,483'  
TVD: 2,466.95'  
Inclination: 10.38°  
Azimuth: 20.42°  
VS: -73.24'



VS: -79.55'

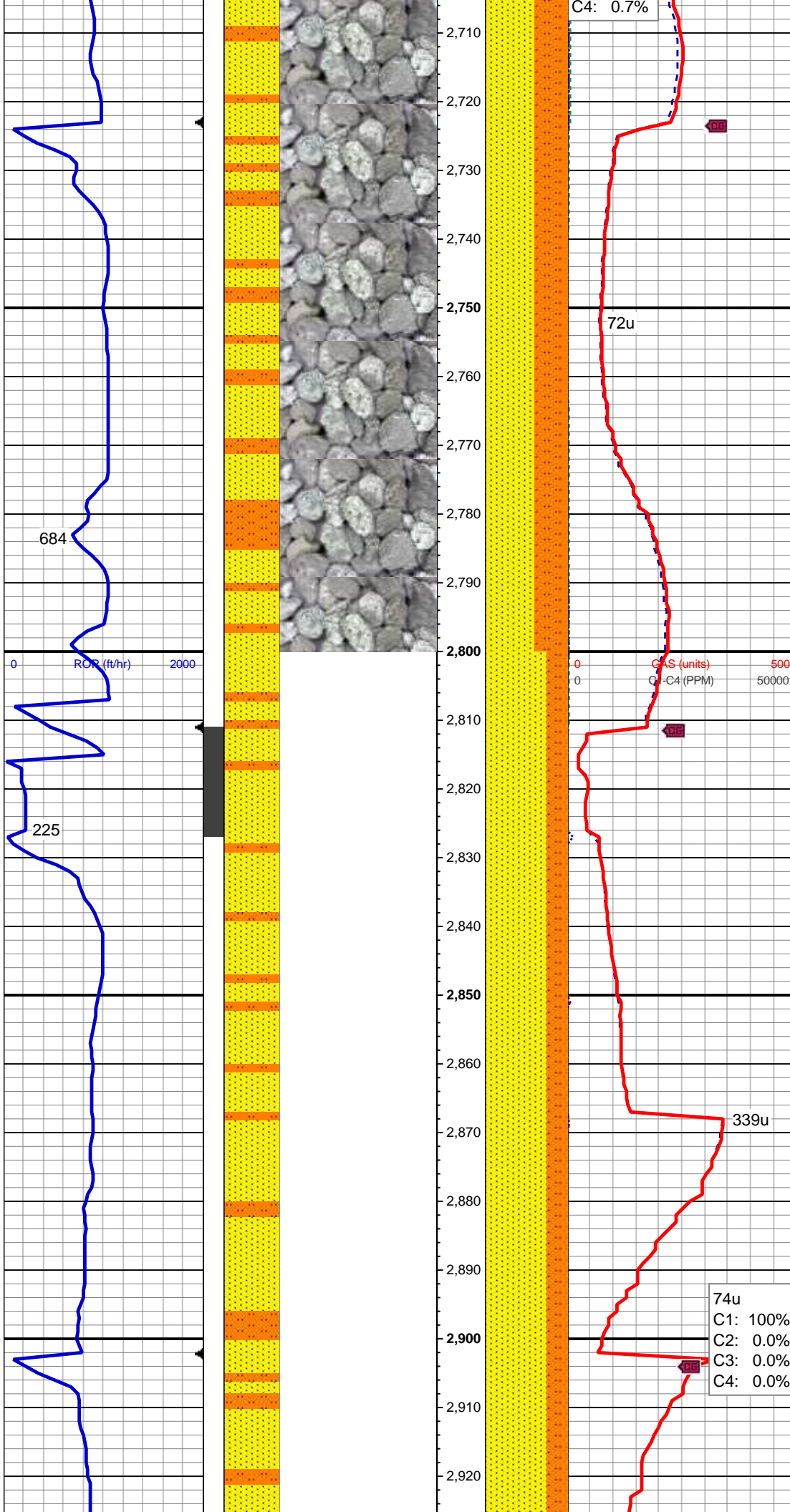
70% SLTST: lt-med gy, sdy ip, sft-mod frm, fri, sb blk, gt tex, slty-arg mtx, fy intlaml wi 30% SS: wh-offwht, lt gy, clr-trnsl grd, s&p, v hd, brit, vf gr, sb rd-sb ang, w srt, cons, w cmt, v sl calc, rr fos frag, rr pyr, nfsoc

MD: 2,574'  
TVD: 2,556.37'  
Inclination: 11.1°  
Azimuth: 29.93°  
VS: -86'

MD: 2,666'  
TVD: 2,646.75'  
Inclination: 10.43°  
Azimuth: 24.13°  
VS: -93.04'

60% SS: wh-offwht, lt gy, clr-trnsl grd, s&p, v hd, brit, vf-l f gr, sb rd-sb ang, mod-w srt, cons, w cmt, 40% SLTST: lt-med gy, sdy ip, mod frm, brit, sb blk, gt tex, slty-arg mtx, v sl calc, occ clay, tr mics frags, rr dul





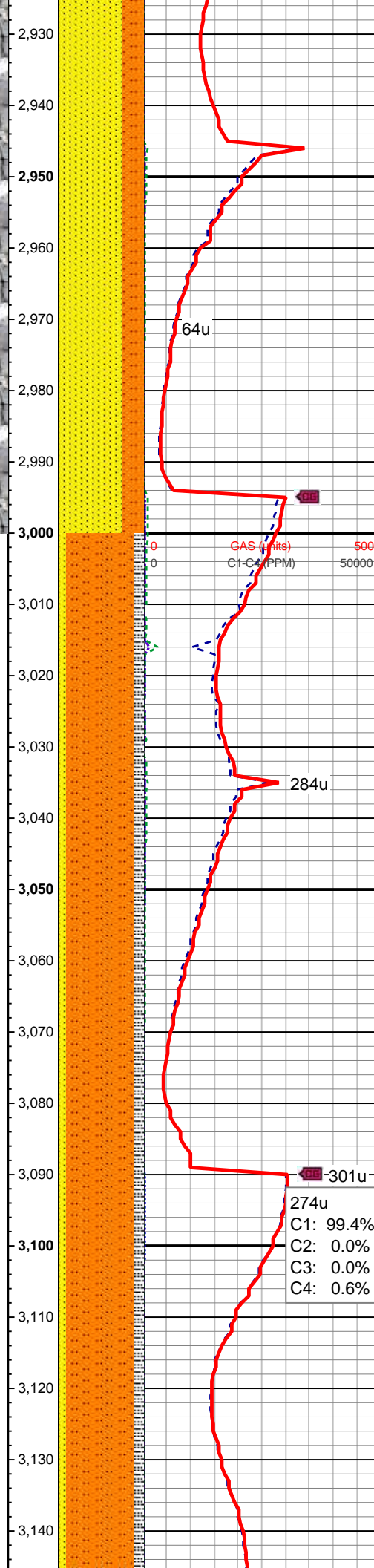
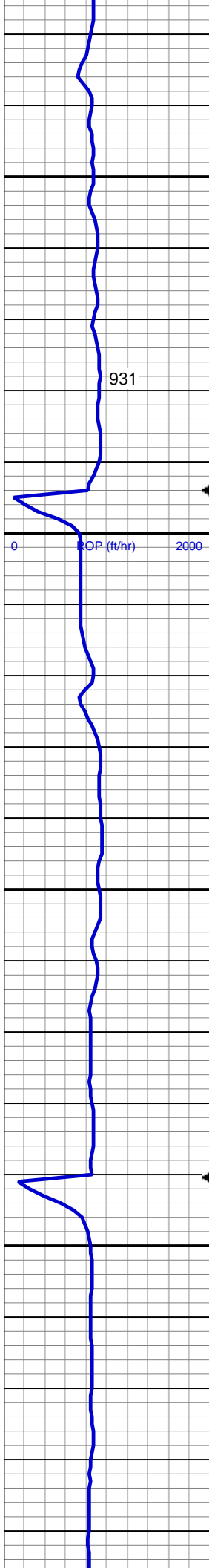
calc, ool grad, tr mics frags, n dui  
yel org ss flor, rr lt brn std ss, n  
od or cut

MD: 2,757'  
TVD: 2,736.25'  
Inclination: 10.38°  
Azimuth: 22.62°  
VS: -98.8'

MD: 2,849'  
TVD: 2,826.56'  
Inclination: 11.65°  
Azimuth: 32.46°  
VS: -106.18'

75% SS: wh-offwht, lt gy, clr-trnsl  
grd, s&p, mod-v hd, brit, vf gr, slty ip,  
sb rd-sb ang, w srt, cons, w cmted, fy  
intlam wi 25% SLTST: lt-med gy,  
sdy ip, mod sft-mod frm, brit, sb  
blky, gt tex, slty-arg mtx, sl calc, rr  
fos frag lnoc, rr glau, nfsoc



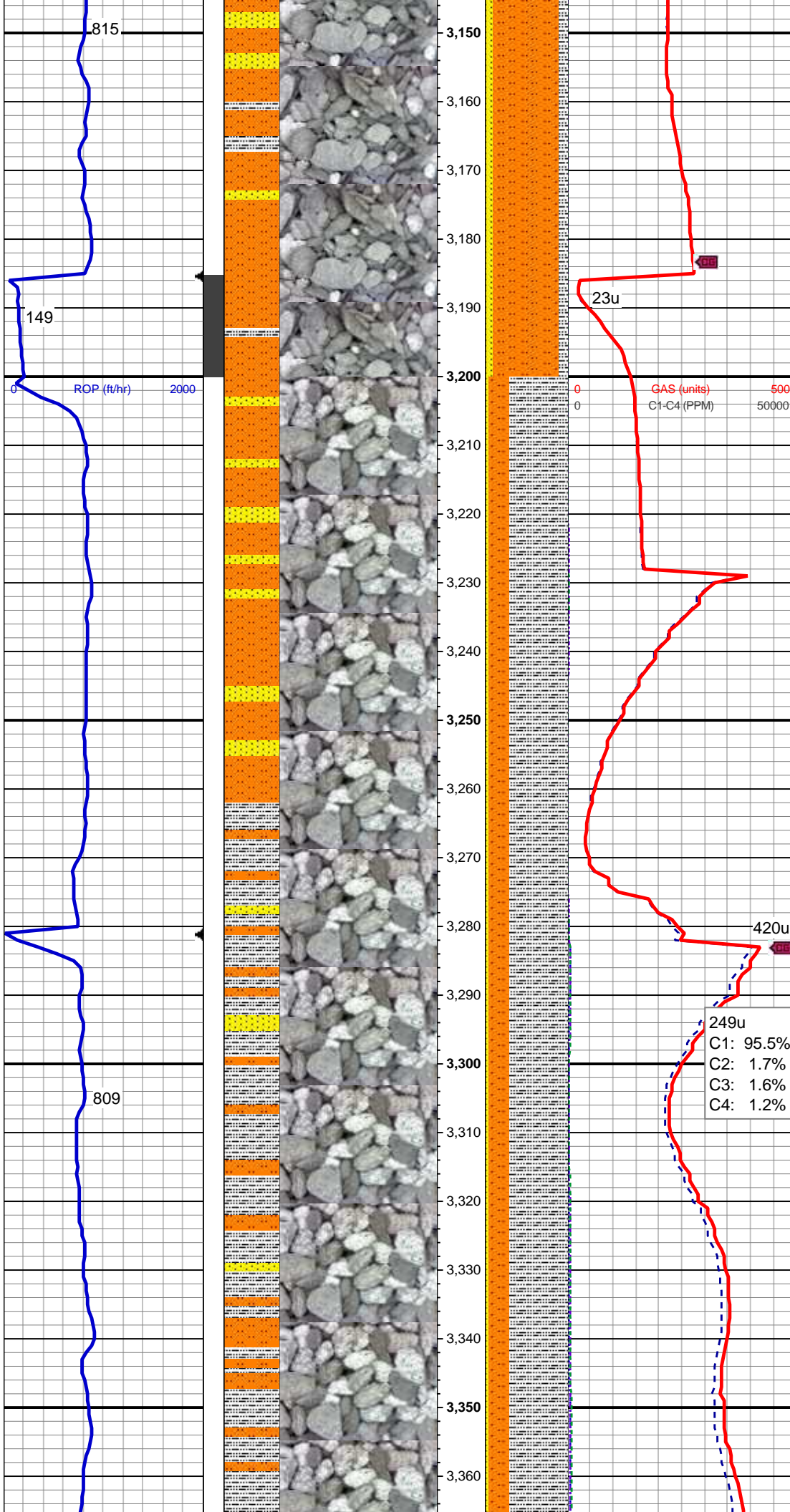


MD: 2,941'  
TVD: 2,916.81'  
Inclination: 10.81°  
Azimuth: 27.4°  
VS: -114.35'

MD: 3,036'  
TVD: 3,010.16'  
Inclination: 10.54°  
Azimuth: 26.01°  
VS: -121.46'

80% SLTST: pred med gy, occ lt gy,  
mod frm, brit, sb plty-sb blk, gt tex,  
slyt-arg mtx, non calc, tr (10%) ss, tr  
(10%) sly sh, nfsoc

MD: 3,131'  
TVD: 3,103.69'  
Inclination: 9.67°  
Azimuth: 21.7°  
VS: -127.44'



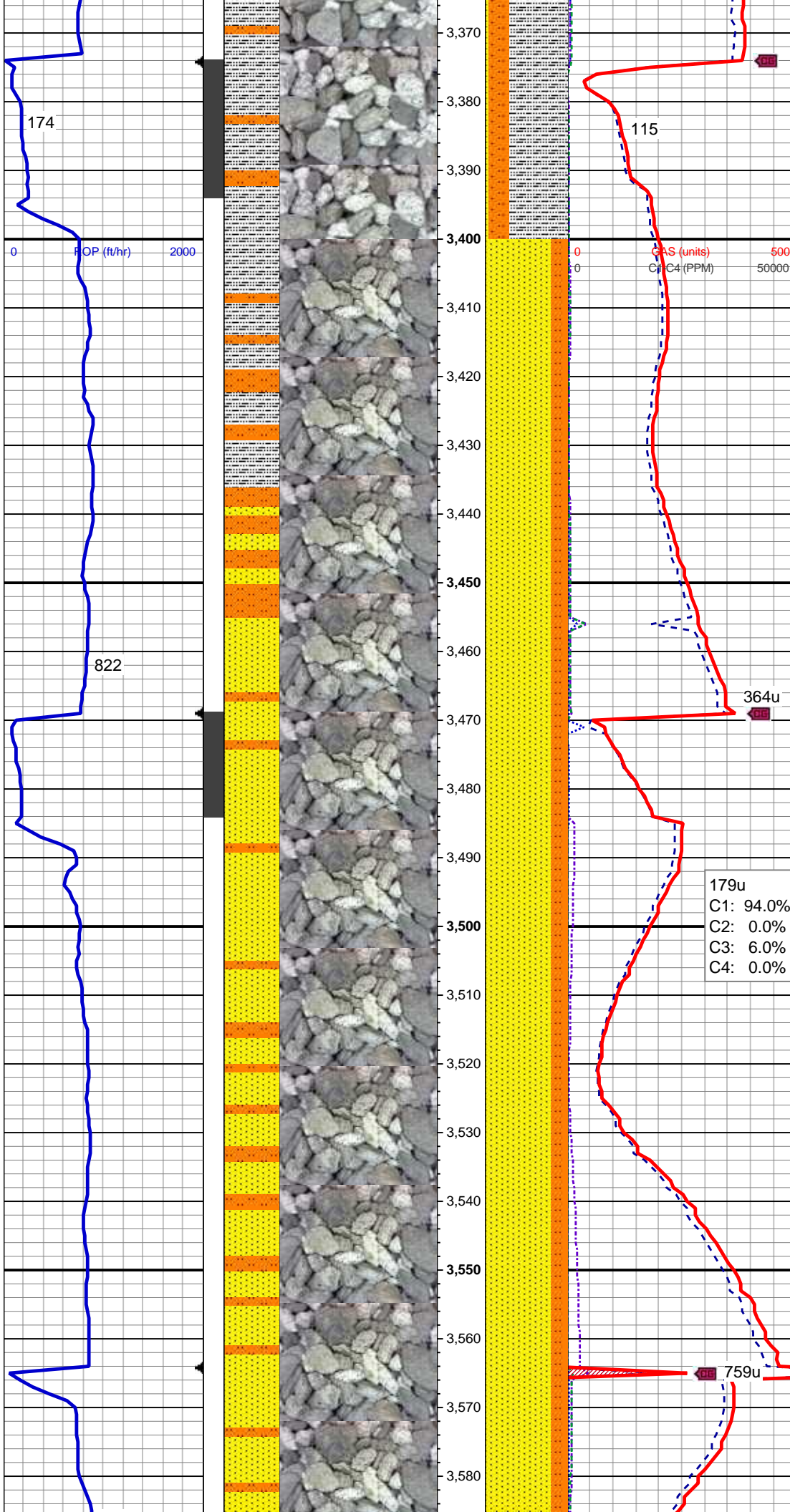
MW 8.4 VIS 27

MD: 3,225'  
TVD: 3,196.24'  
Inclination: 10.47°  
Azimuth: 27.26°  
VS: -133.51'

70% SLTY SH: med-dk gy, frm, brit,  
plty - sb plty, occ sb blkly, sm - sb  
wxy tex, arg - slty mtx, 25% SLTST:  
lt-med gy, mod sft-mod frm, brit, sb  
blkly, gt tex, slty-arg mtx, v sl calc, tr  
(5%) ss, tr fos frag Inoc, rr pyr, rr  
bent, rr yel mnrl flor, no stn od or cut

MD: 3,320'  
TVD: 3,289.93'  
Inclination: 8.58°  
Azimuth: 17.75°  
VS: -138.9'





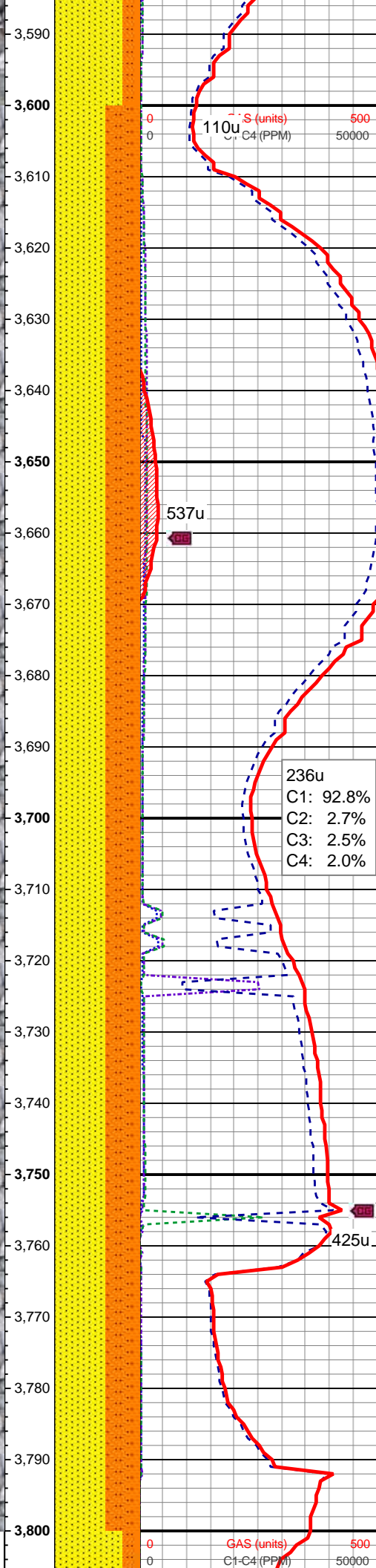
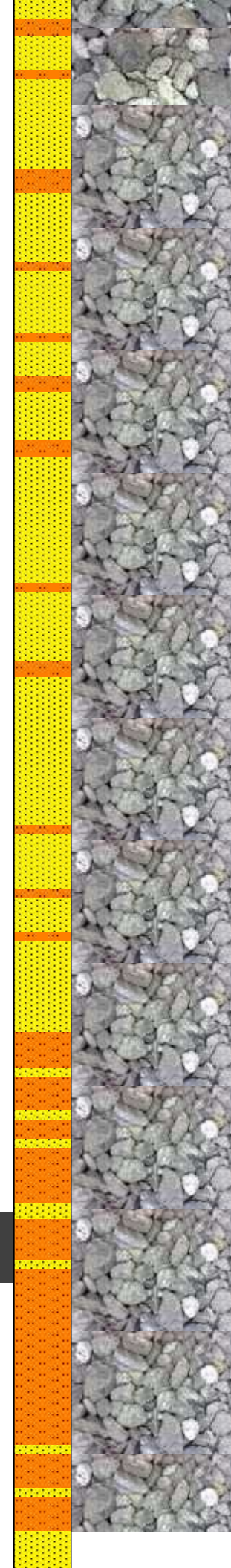
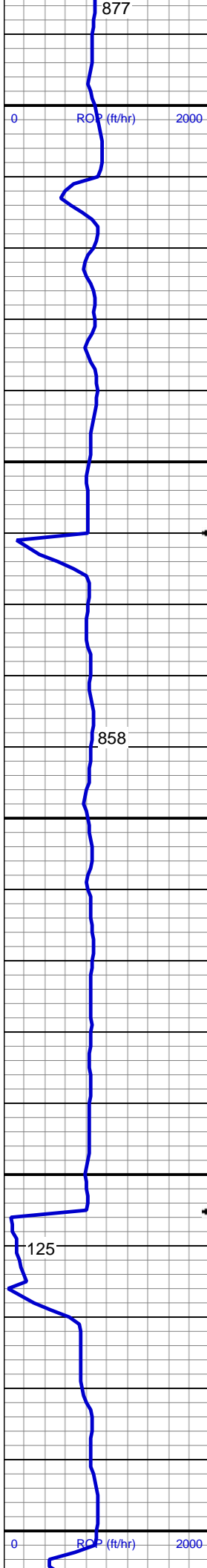
MD: 3,415'  
TVD: 3,383.59'  
Inclination: 10.68°  
Azimuth: 25.22°  
VS: -144.06'

179u  
C1: 94.0%  
C2: 0.0%  
C3: 6.0%  
C4: 0.0%

80% SS: wh-offwht, lt gy, clr-trnsl  
grd, s&p, hd, brit, vf-l f gr, slty ip, sb  
rd-sb ang, mod-w srt, cons, w  
cmted, 20% SLTST: lt-med gy, frm,  
brit, sb blkty, gt tex, slty-arg mtx, non  
calc, tr mics frags, rr bent, nfsoc

MD: 3,510'  
TVD: 3,476.75'  
Inclination: 11.95°  
Azimuth: 22.55°  
VS: -150.72'



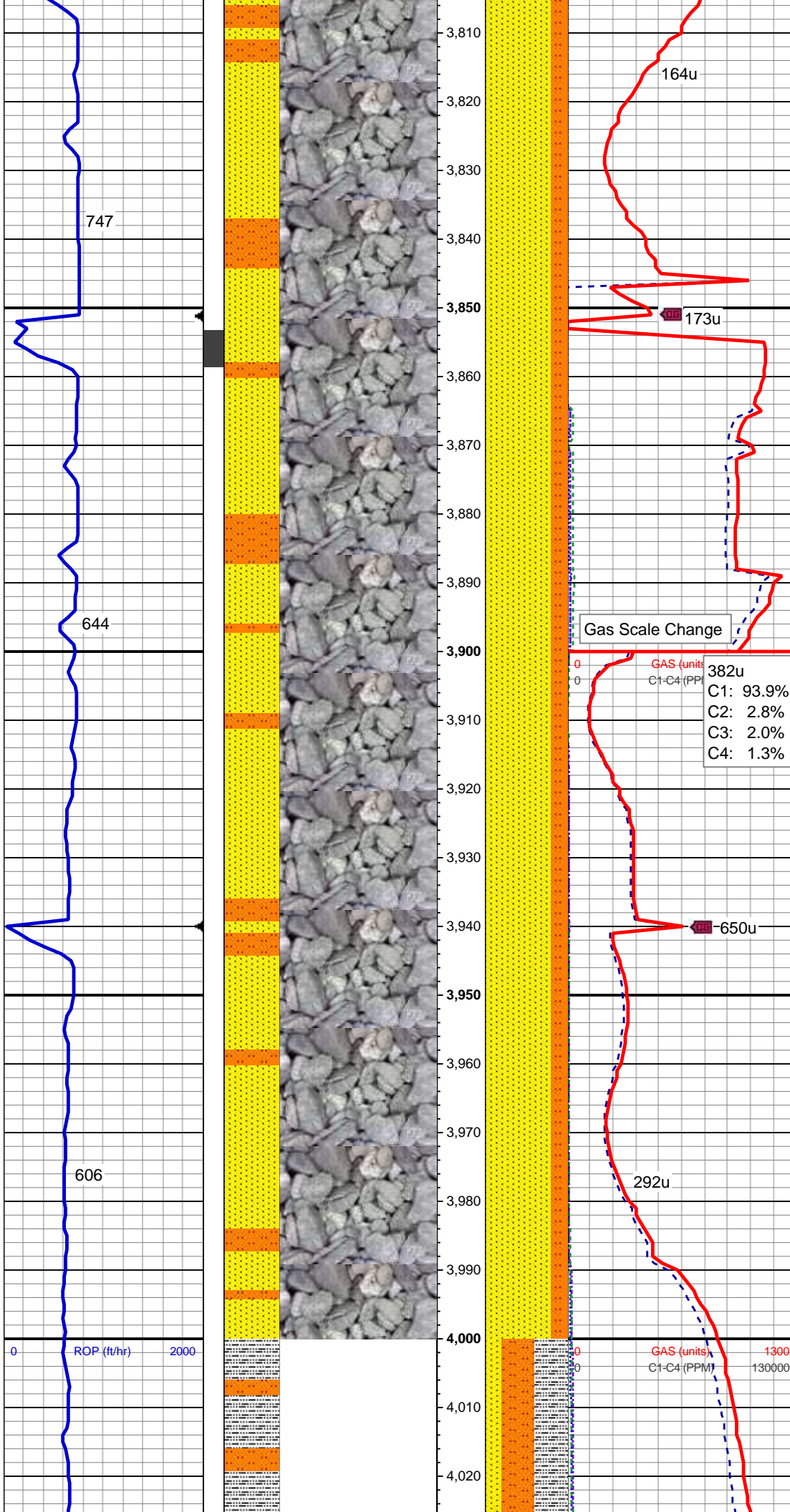


MD: 3,604'  
TVD: 3,568.78'  
Inclination: 11.55°  
Azimuth: 18.64°  
VS: -156.55'

MD: 3,699'  
TVD: 3,661.82'  
Inclination: 11.77°  
Azimuth: 18.21°  
VS: -161.69'

60% SS: wh-offwht, lt gy, clr-trnsl  
grd, s&p, hd, brit, vf-l f gr, slty ip, sb  
rd-sb ang, mod-w srt, cons, w  
cmted, 40% SLTST: lt-med gy, frm,  
brit, sb blk, gt tex, slty-arg mt, non  
calc, tr mics frags, rr bent, nrsoc

MD: 3,794'  
TVD: 3,754.7'  
Inclination: 12.51°  
Azimuth: 27.19°  
VS: -168.49'

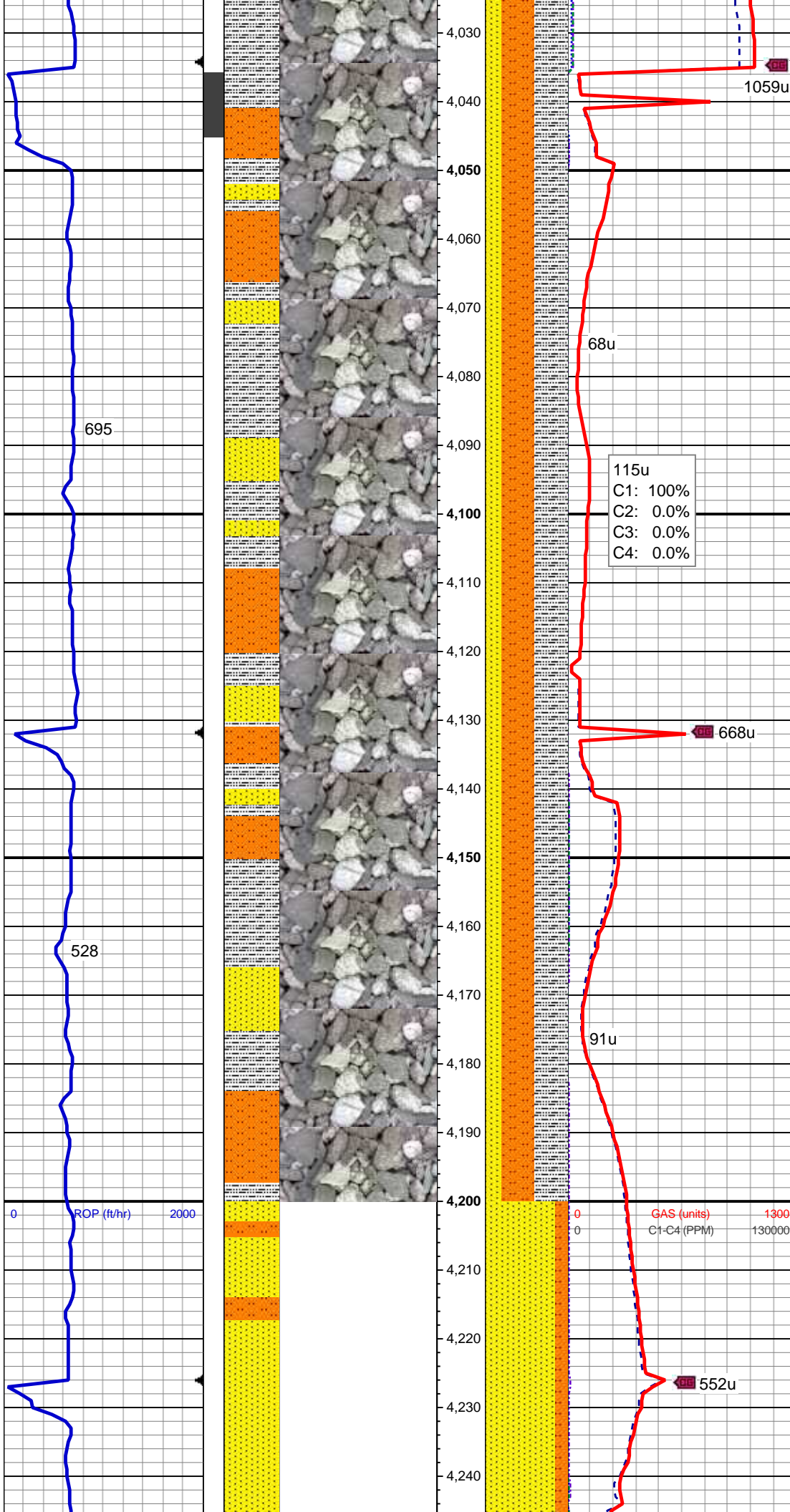


MD: 3,889'  
TVD: 3,847.41'  
Inclination: 12.72°  
Azimuth: 24.97°  
VS: -176.66'

80% SS: wh-offwht, lt gy, clr-trnsl  
grd, s&p, hd, brit, vf-l f gr, slty ip, sb  
rd-sb ang, mod-w srt, cons, w  
cmtd, 20% SLTST: lt-med gy, frm,  
brit, sb blkly, gt tex, slty-arg mtx, v sl  
calc, nfsoc

MD: 3,983'  
TVD: 3,939.12'  
Inclination: 12.64°  
Azimuth: 23.91°  
VS: -184.25'





MD: 4,078'  
TVD: 4,032.15'  
Inclination: 10.7°  
Azimuth: 29.76°  
VS: -191.97'

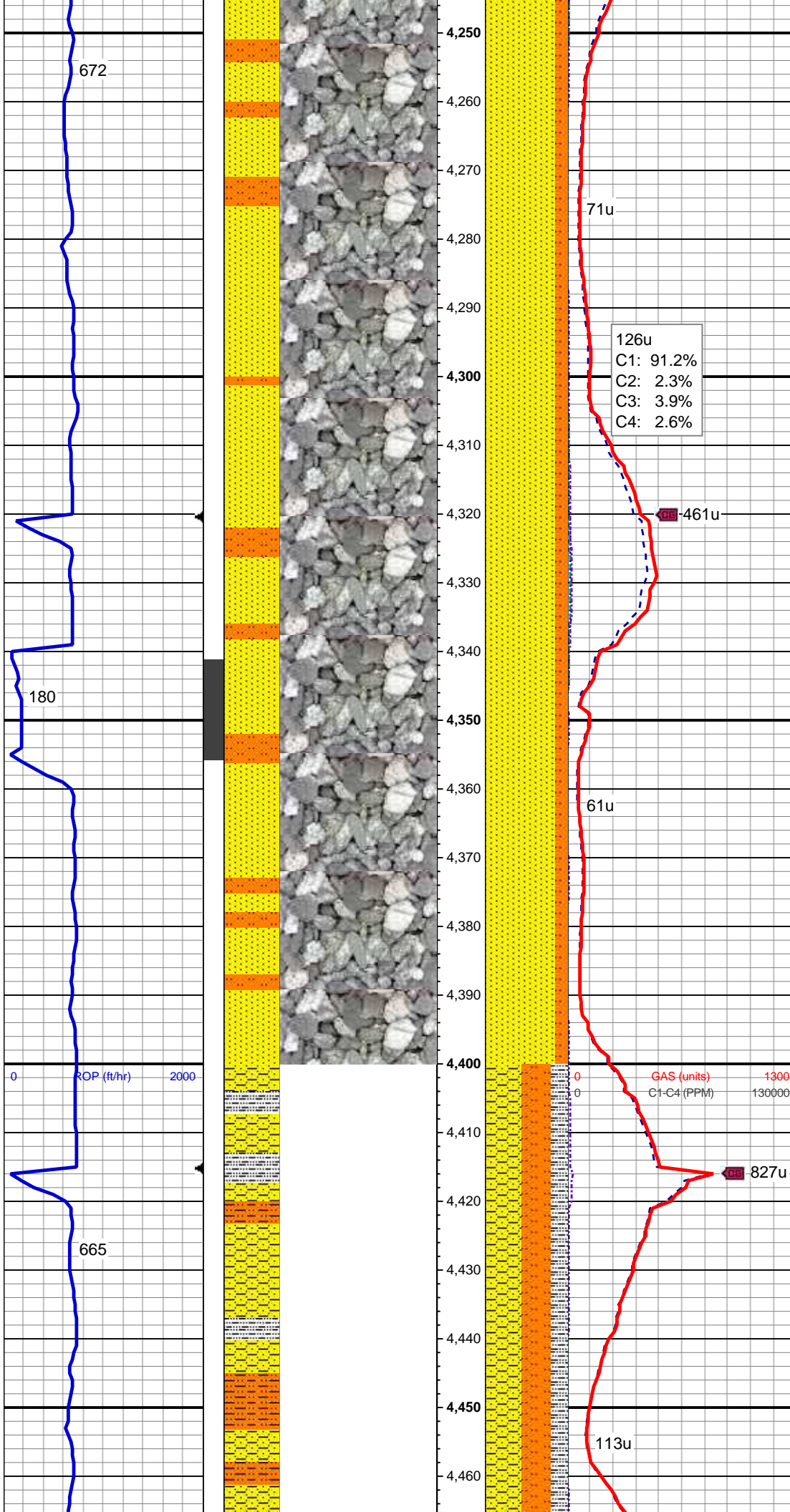
40% SLTST: lt-med gy, frm, brit, sb  
blky, gt tex, slty-arg mtx, 40% SLTY  
SH: med-dk gy, mod - v frm, fri ip,  
plty - sb plty, sm - sb wxy tex, arg -  
slty mtx, 20% SS: wh-offwht, lt gy,  
clr-trnsl grd, s&p, hd, brit, vf-l f gr,  
slty ip, sb rd-sb ang, mod-w srt,  
cons, w cmted, v sl calc, nfsoc

MD: 4,173'  
TVD: 4,125.6'  
Inclination: 10.02°  
Azimuth: 27.73°  
VS: -199.43'

115u  
C1: 100%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

GAS (units) 1300  
C1-C4 (PPM) 130000





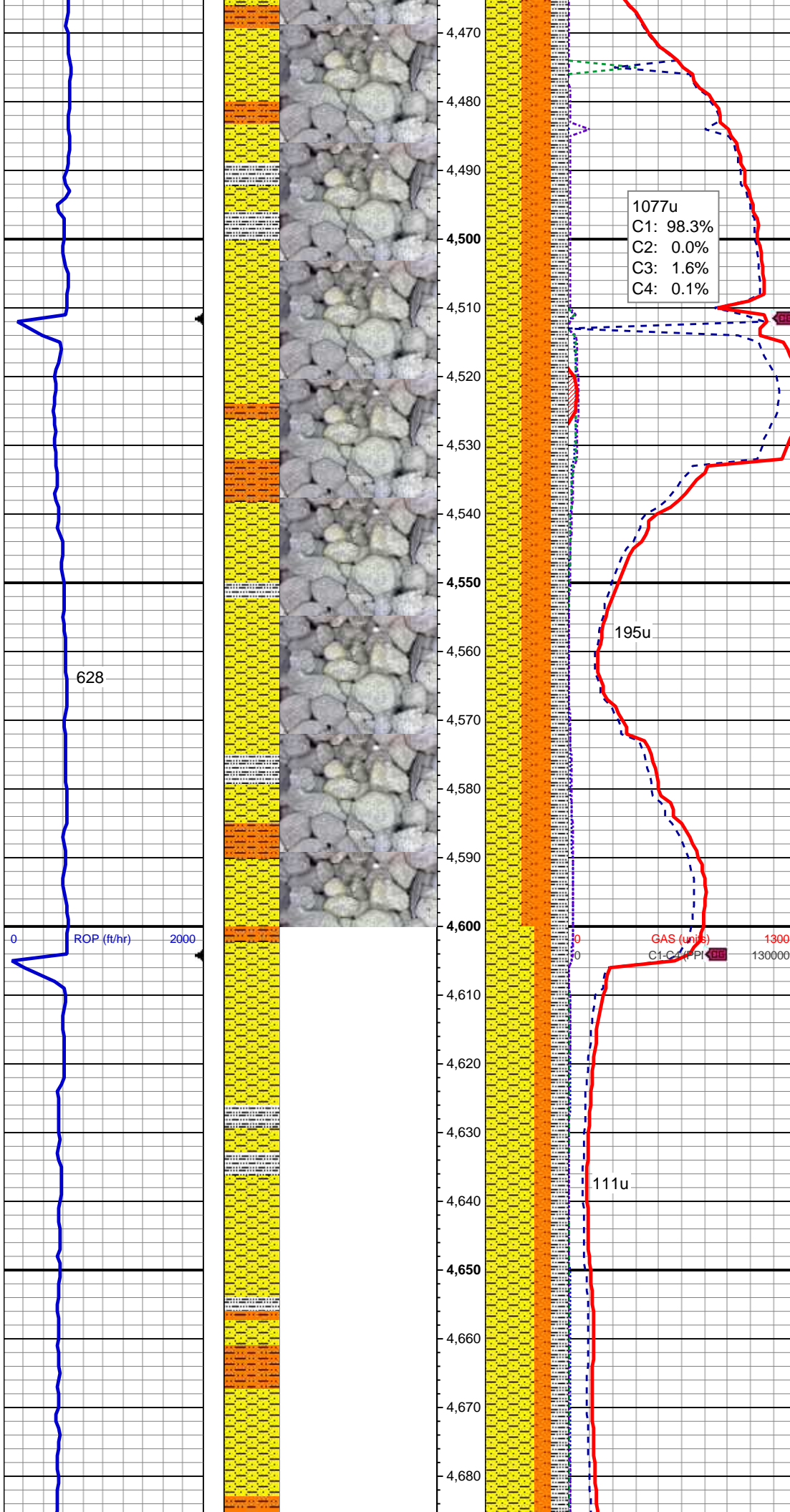
MD: 4,268'  
TVD: 4,219.27'  
Inclination: 9.18°  
Azimuth: 28.82°  
VS: -206.22'

126u  
C1: 91.2%  
C2: 2.3%  
C3: 3.9%  
C4: 2.6%

85% SS: wh-offwht, lt gy, clr-trnsl  
grd, s&p, hd, brit, vf-l f gr, slty ip, sb  
rd-sb ang, mod-w srt, cons, w  
cmted, 15% SLTST: lt-med gy, frm,  
brit, sb blk, gt tex, slty-arg mtx, rr  
pyr, v sl calc, nfsoc

MD: 4,362'  
TVD: 4,311.84'  
Inclination: 10.81°  
Azimuth: 26.77°  
VS: -213.07'

MD: 4,457'  
TVD: 4,405.23'  
Inclination: 10.35°  
Azimuth: 26.78°  
VS: -220.13'



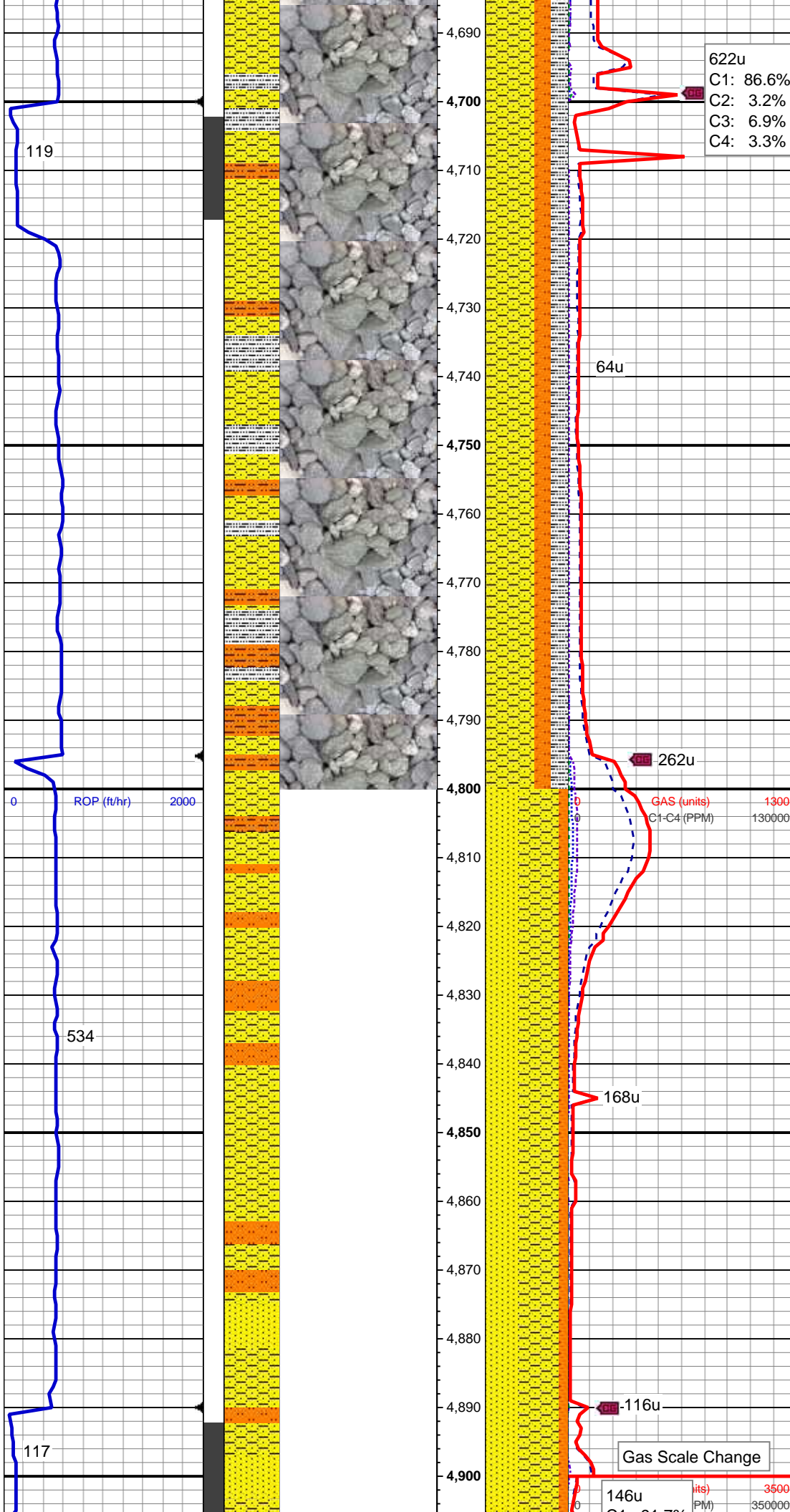
45% SHY SS: lt - med gy, occ dk gy, f - vf gr, mod frm, brit, sb rnd - sb ang, shy - arg mtx, cons, 35% SLTST: lt - med gy, occ dk gy, mod frm, sb plty - sb blk, gt tex, slty - arg mtx, 20% SLTY SH: med-dk gy, mod - v frm, brit fri ip, plty - sb plty, sm - sb wxy tex, arg - slty mtx, sl calc, nfsoc

MD: 4,552'  
TVD: 4,498.81'  
Inclination: 9.43°  
Azimuth: 27.83°  
VS: -226.87'

MD: 4,647'  
TVD: 4,592.68'  
Inclination: 8.3°  
Azimuth: 26.53°  
VS: -232.91'

60% SHY SS: lt - med gy, occ dk gy





622u  
C1: 86.6%  
C2: 3.2%  
C3: 6.9%  
C4: 3.3%

60% SHY SS: lt - med gy, occ dk gy,  
f - vf gr, mod frm, brit, sb rnd - sb  
ang, shy - arg mtx, cons, 20%  
SLTST: lt - med gy, occ dk gy, mod  
frm, sb plty - sb blk, gt tex, slty - arg  
mtx, 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: 4,741'  
TVD: 4,685.45'  
Inclination: 10.18°  
Azimuth: 25.56°  
VS: -238.83'

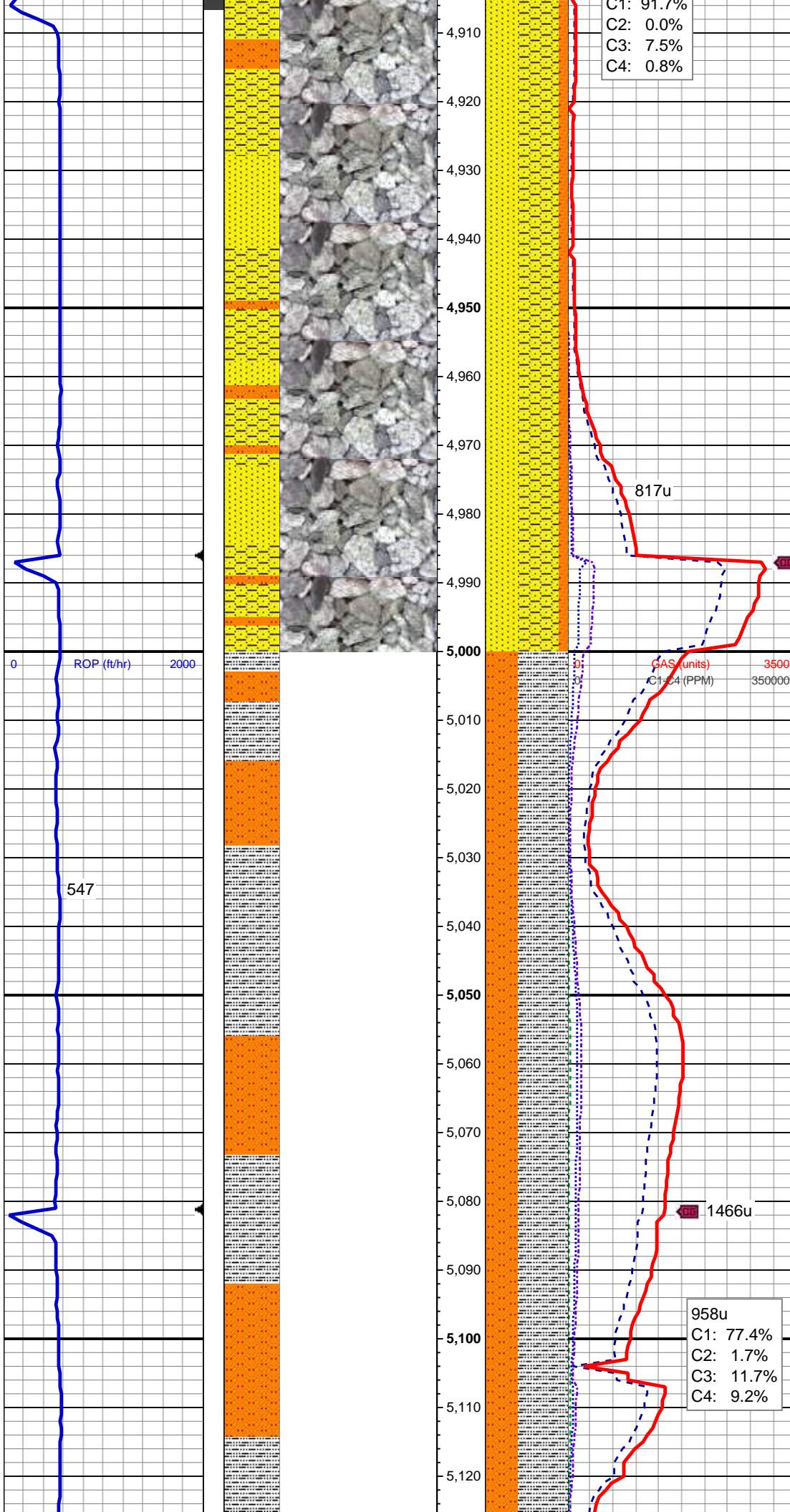
MD: 4,836'  
TVD: 4,779.18'  
Inclination: 8.61°  
Azimuth: 24.97°  
VS: -244.74'

50% SHY SS: lt - med gy, occ dk gy,  
f - vf gr, mod frm, brit, sb rnd - sb  
ang, shy - arg mtx, cons, 40% SS:  
wh-offwht, lt gy, clr-trnsl grd, s&p,  
hd, brit, vf-l f gr, slty ip, sb rd-sb ang,  
mod-w srt, cons, w cmt, 10%  
SLTST: lt - med gy, occ dk gy, mod  
frm, sb plty - sb blk, gt tex, slty - arg  
mtx, 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

Gas Scale Change

146u  
C1: 81.7%  
C2: 3.2%  
C3: 6.9%  
C4: 3.3%





SLTST: lt - med gy, occ dk gy, mod frm, sb plty - sb blkly, gt tex, slty - arg mtx, v sl calc, nfsoc

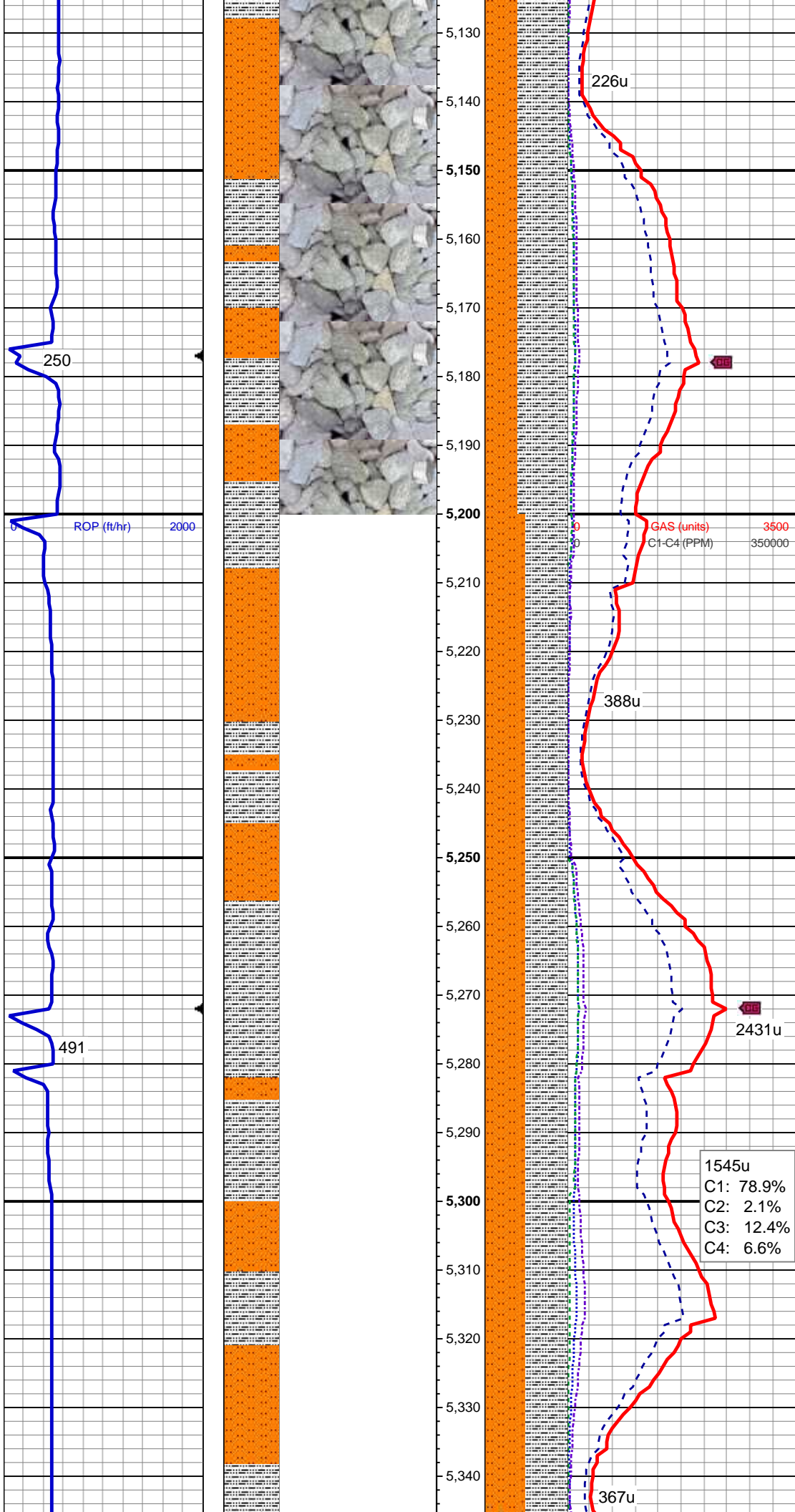
MD: 4,931'  
TVD: 4,872.88'  
Inclination: 10.29°  
Azimuth: 23.08°  
VS: -250.34'

MD: 5,025'  
TVD: 4,965.49'  
Inclination: 9.48°  
Azimuth: 22.24°  
VS: -255.81'

60% SLTY SH: med-dk gy, mod - v frm, fri ip, plty - sb plty, sm - sb wxy tex, arg - slty mtx, 40% SLTST: lt - med gy, occ dk gy, mod frm, brit, sb plty - sb blkly, gt tex, slty - arg mtx, tr shy ss, rr pyr, v sl calc, nfsoc

MD: 5,120'  
TVD: 5,059.31'  
Inclination: 8.57°

Azimuth: 19.3°  
VS: -260.4'



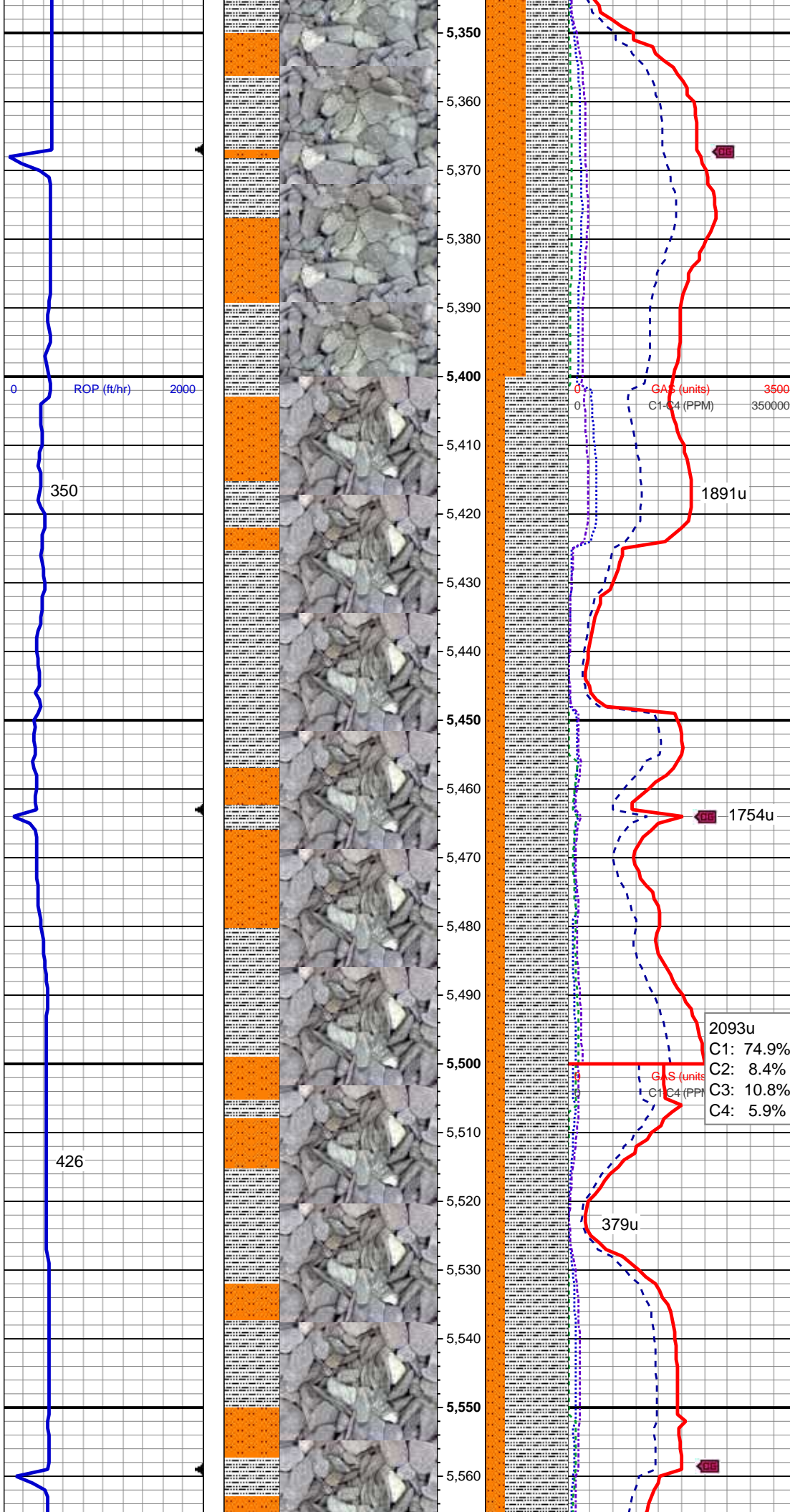
MD: 5,215'  
TVD: 5,153.43'  
Inclination: 7.02°  
Azimuth: 17.42°  
VS: -263.86'

1545u  
C1: 78.9%  
C2: 2.1%  
C3: 12.4%  
C4: 6.6%

50% SLTY SH: med-dk gy, mod - v  
frm, fri ip, plty - sb plty, sm - sb wxy  
tex, arg - slty mtx, 50% SLTST: lt -  
med gy, occ dk gy, mod frm, brit, sb  
plty - sb blkly, gt tex, slty - arg mtx, tr  
shy ss, rr pyr, v sl calc, nfsoc

MD: 5,309'  
TVD: 5,246.86'  
Inclination: 5.62°  
Azimuth: 17.1°  
VS: -266.43'

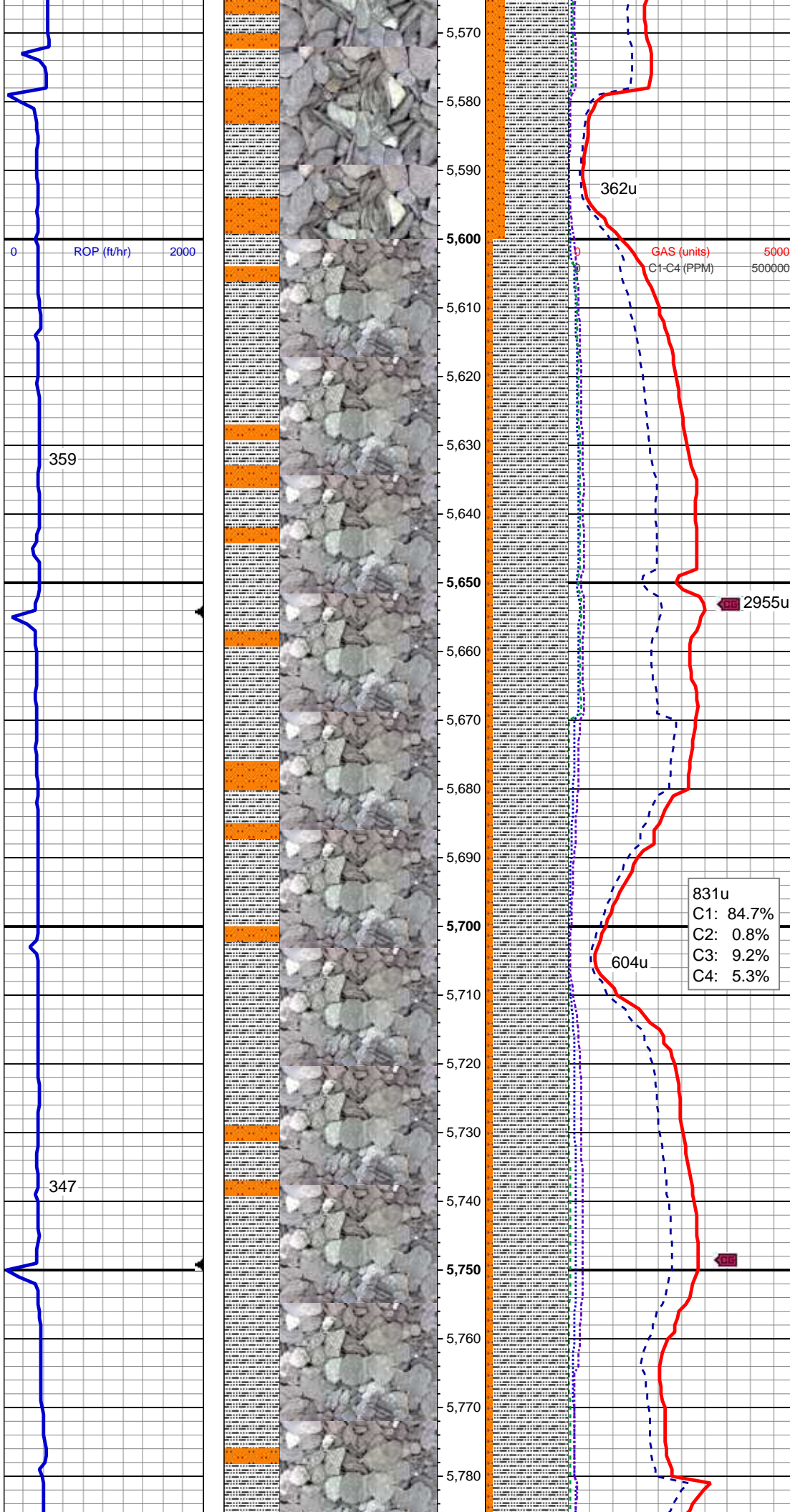




MD: 5,404'  
TVD: 5,341.5'  
Inclination: 4.27°  
Azimuth: 19.23°  
VS: -268.57'

75% SLTY SH: med-dk gy, mod - v  
frm, fri ip, plty - sb plty, sm - sb wxy  
tex, arg - slty mtx, 25% SLTST: lt -  
med gy, occ dk gy, mod frm, brit, sb  
plty - sb blkly, gt tex, slty - arg mtx, rr  
pyr, v sl calc, nfsoc

MD: 5,499'  
TVD: 5,436.3'  
Inclination: 3.27°  
Azimuth: 15.24°  
VS: -270.15'



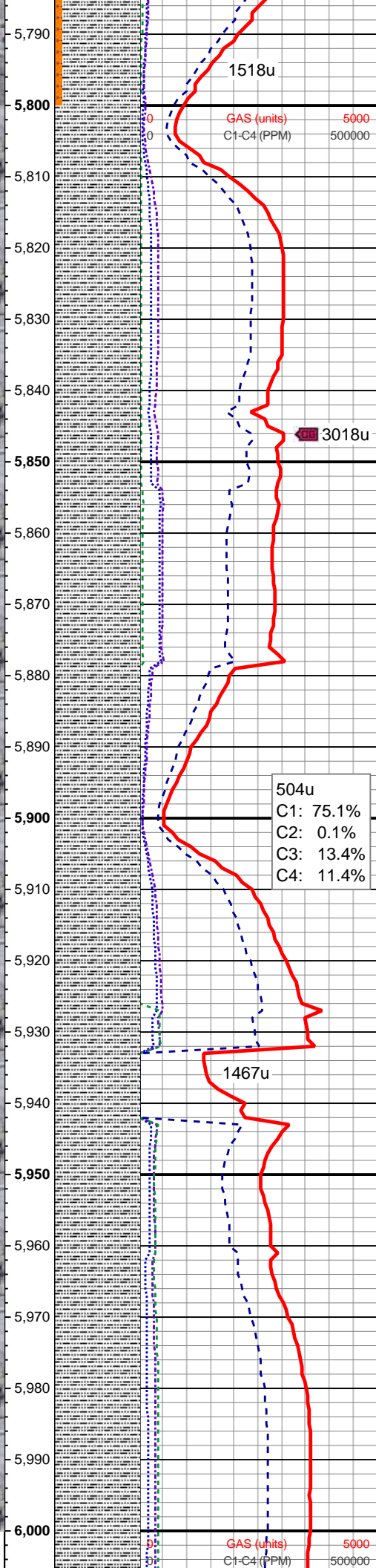
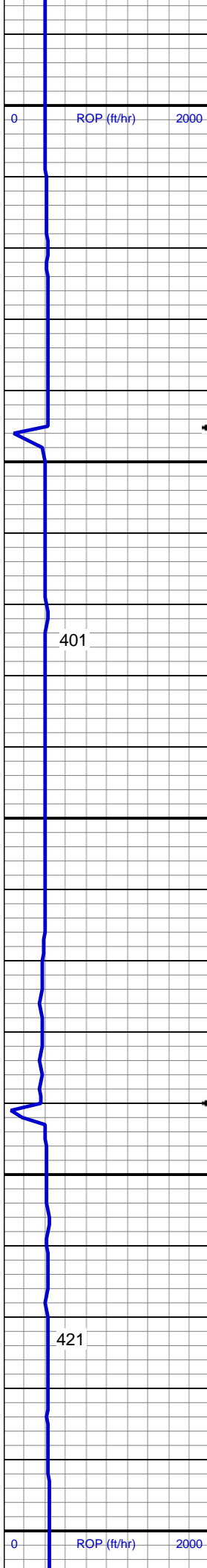
MD: 5,594'  
TVD: 5,531.17'  
Inclination: 2.53°  
Azimuth: 13.89°  
VS: -271.13'

MD: 5,688'  
TVD: 5,625.11'  
Inclination: 1.79°  
Azimuth: 16.76°  
VS: -271.88'

90% SLTY SH: med-dk gy, mod - v  
frm, fri ip, plty - sb plty, sm - sb wxy  
tex, arg - slty mtx, 10% SLTST: lt -  
med gy, occ dk gy, mod frm, brit, sb  
plty - sb blkly, gt tex, slty - arg mtx, rr  
pyr, rr shy ss, v sl calc, v sl difse, v  
sl strmg, dul bl-wh mky cut, no strn  
or od

MD: 5,783'  
TVD: 5,720.07'  
Inclination: 1.46°





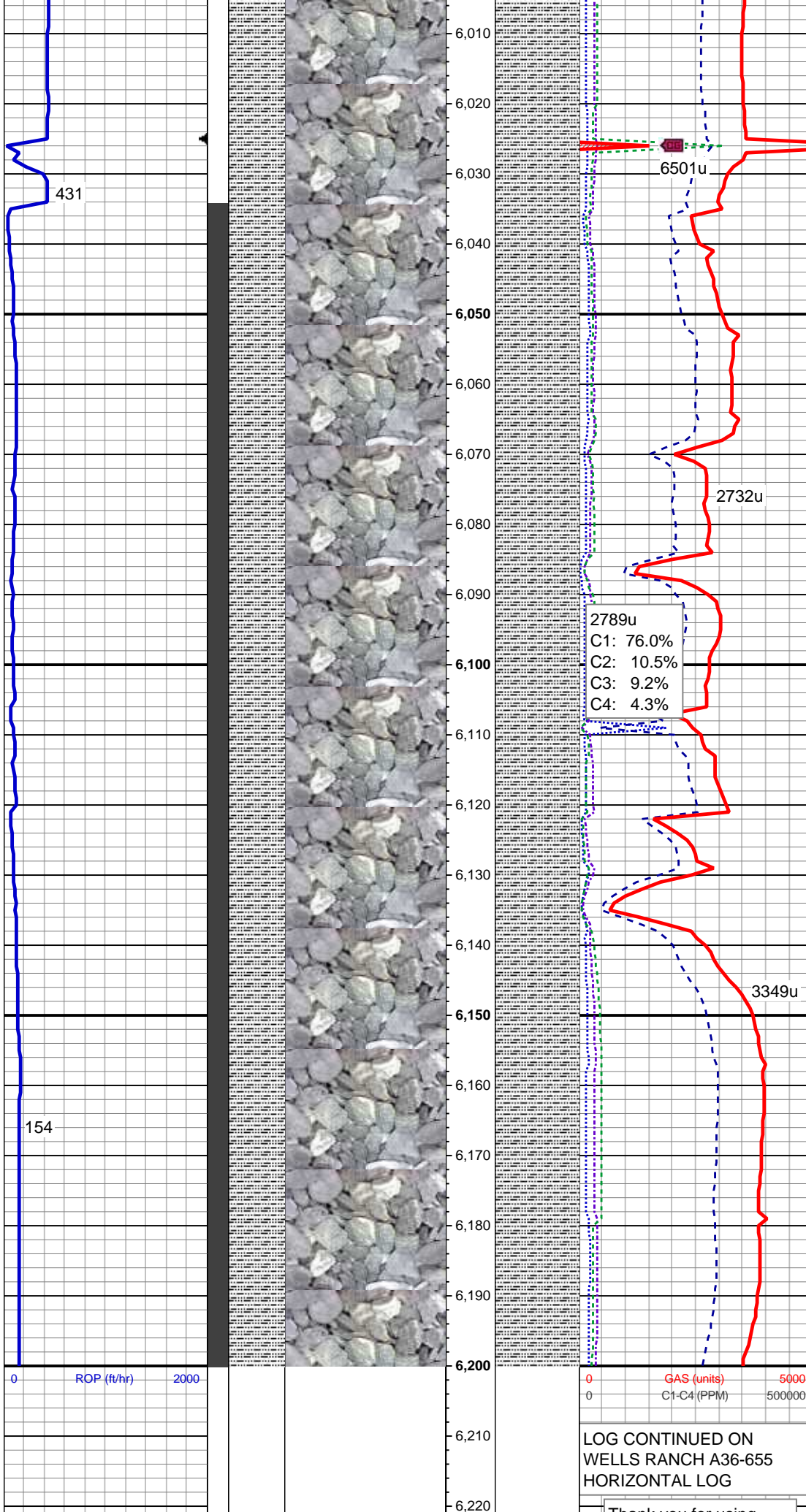
Inclination: 1.46°  
Azimuth: 7.85°  
VS: -272.34'

MW 9.6 VIS 33

MD: 5,877'  
TVD: 5,814.04'  
Inclination: 1.13°  
Azimuth: 351.01°  
VS: -272.25'

90% SLTY SH: med-dk gy, mod - v  
frm, fri ip, plty - sb plty, sm - sb wxy  
tex, arg - slty mtx, rr shy ss, v sl calc,  
v sl difse, v sl stmg, dul bl-wh mky  
cut, no stn or od

MD: 5,972'  
TVD: 5,909.03'  
Inclination: 1.18°  
Azimuth: 6.38°  
VS: -272.12'



MW 9.95 VIS 33

KOP @ 6033' MD

MD: 6,067'  
TVD: 6,003.94'  
Inclination: 3.99°  
Azimuth: 280.43°  
VS: -268.9'

MW 10.35 VIS 32

90% SLTY SH: med-dk gy, mod - v  
frm, fri ip, plty - sb plty, sm - sb wxy  
tex, arg - slty mtz, rr shy ss, v sl calc,  
v sl difse, v sl stmg, dul bl-wh mky  
cut, no stn or od

MD: 6,162'  
TVD: 6,097.75'  
Inclination: 13.41°  
Azimuth: 264.49°  
VS: -254.7'

LOG CONTINUED ON  
WELLS RANCH A36-655  
HORIZONTAL LOG

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