

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Wells State Ranch AA28-69HN(VERT)

Location SEC 21-T6N-R63W

State COLORADO

County WELD

Country USA

Rig Number H&P 322

API Number 05-123-38140-00

AFE # 139118

Region DJ BASIN

Field WATTENBERG

Spud Date 12/29/2013

Surface Coordinates LAT: 40.46737°N
LONG: 104.43414°W
913' FSL
530' FEL

Bottom Hole Coordinates LAT: 40.46483°N
LONG: 104.44884°W
1' FSL
535' FWL

Ground Elevation 4731'

K.B. Elevation 4755'

Logged Interval 1000' **To** 6000'

Total Depth 10964'

Formation NIOBRARA "B"

Type of Drilling Fluid MUD;WATER;POLY

Operator

Company Noble Energy Inc

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

Geologist

Name TERRY ACOMB, MIKE GREENE

Company COLUMBINE LOGGING, INC.

Address 2385 S. LIPAN ST
DENVER, COLORADO 80223
(303) 289-7764

Rock Types

UNKNOWN	COAL	METAMORPHIC	SHALY SILTSTONE
ANHYDRITE	CONGLOMERATE	NO SAMPLE	SILTSTONE
BENTONITE	DOLOMITE	SALT	SILTY SHALE
BRECCIA	GRANITE	SALT- PEPPER SAND	TILL
CEMENT	GYPSUM	SANDSTONE	TUFF
CHALK	IGNEOUS	SHALE	WELDED TUFF
CHERT	LIMESTONE	SHALE COLORED	
CLAY CHOKE SAND	SIDERITE or LIMONITE	SHALE GRAY	
CLAYSTONE	MARLSTONE	SHALY SANDSTONE	

Accessories

Fossils

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

Fossils

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

Minerals

Minerals

ANHYDRITIC
ARGILLACEOUS
ARGILLITE GRAIN
BENTONITE
BITUMENOUS SUBSTANCE
BRECCIA FRAGMENTS
CALCAREOUS
CARBONACEOUS FLAKES
CHTDK
CHTLT
COAL - THIN BEDS
DOLOMITIC
FELDSPAR
FERRUGINOUS PELLETT

Minerals

FERRUGINOUS
GLAUCONITE
GYPSIFEROUS
HEAVY MINERAL
KAOLIN
MARLSTONE
MINERAL CRYSTALS
NODULES
PHOSPHATE PELLETS
PYRITE
SALT CAST
SANDY
SILICEOUS
SILTY

Minerals

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

Other Symbols

Oil Show

DEAD
EVEN
QUESTIONABLE
SPOTTED STAINING

Porosity

E EARTHY
FENESTRAL
FRACTURE
INTERCRYSTALLINE
INTEROOLITIC

Oil Show

MOLDIC
ORGANIC
PINPOINT
VUGGY

Engineering

BIT
CONNECTION (LEFT)
CONNECTION (RIGHT)
CONNECTION GAS
CORE - LOST
CORE - RECOVERED
DST INTERVAL

Other Symbols

FAULT
FORMATION TOP
GAS SHOW
MN DEPTH
NORMAL FAULT
OIL SHOW
OVERTURNED STRATA
REVERSE FAULT
SIDEWALL CORE (LEFT)
SIDEWALL CORE (RIGHT)
SLIDE
SURVEY
TRIP GAS

Other Symbols

WIRELINE TESTED - LEFT

WIRELINE TESTED - RT

Rounding

ANGULAR
ROUNDED
SUBANG
SUBRND

Textures

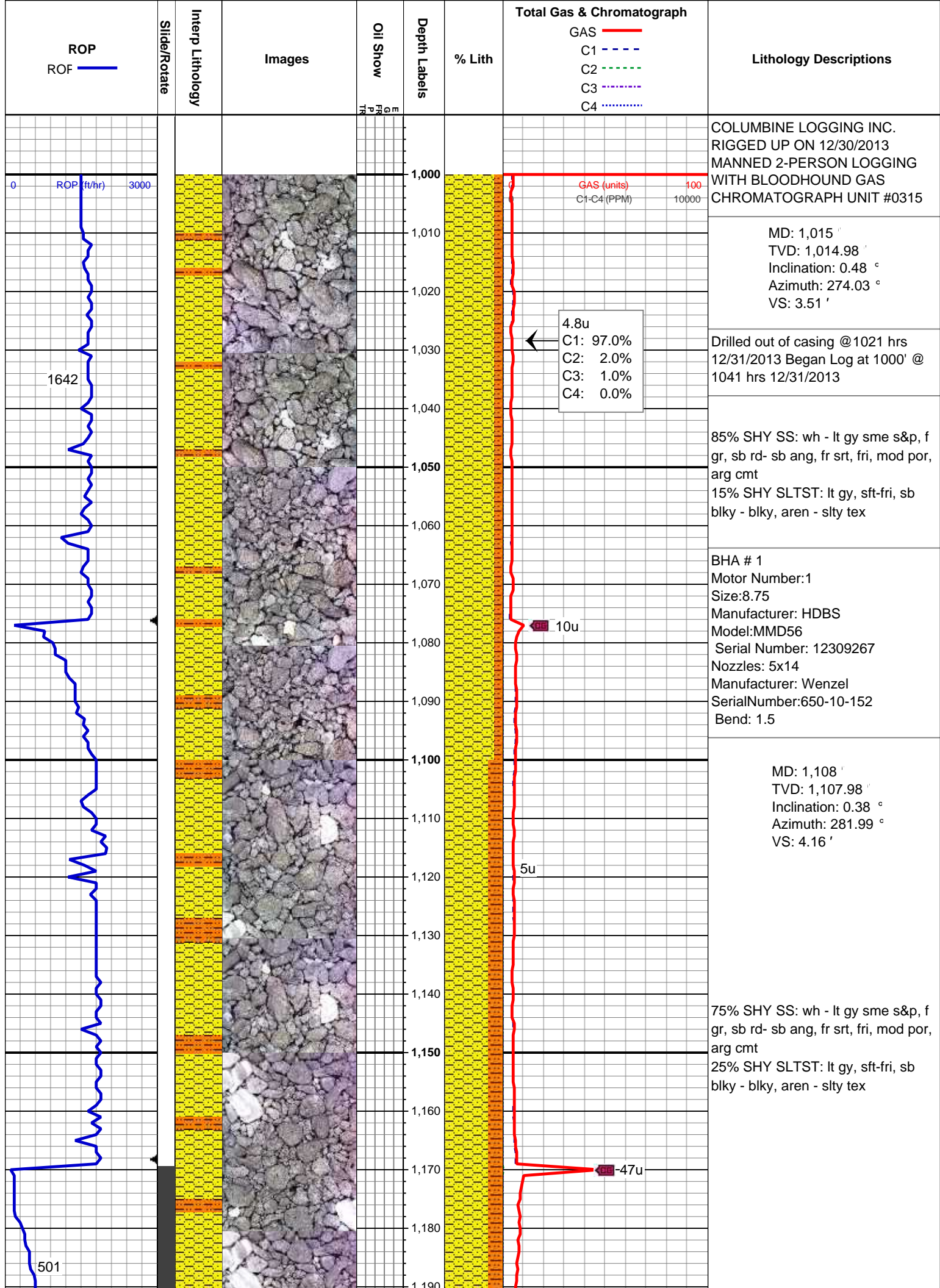
BOUNDSTONE
CHALKY
CRYPTOXLN

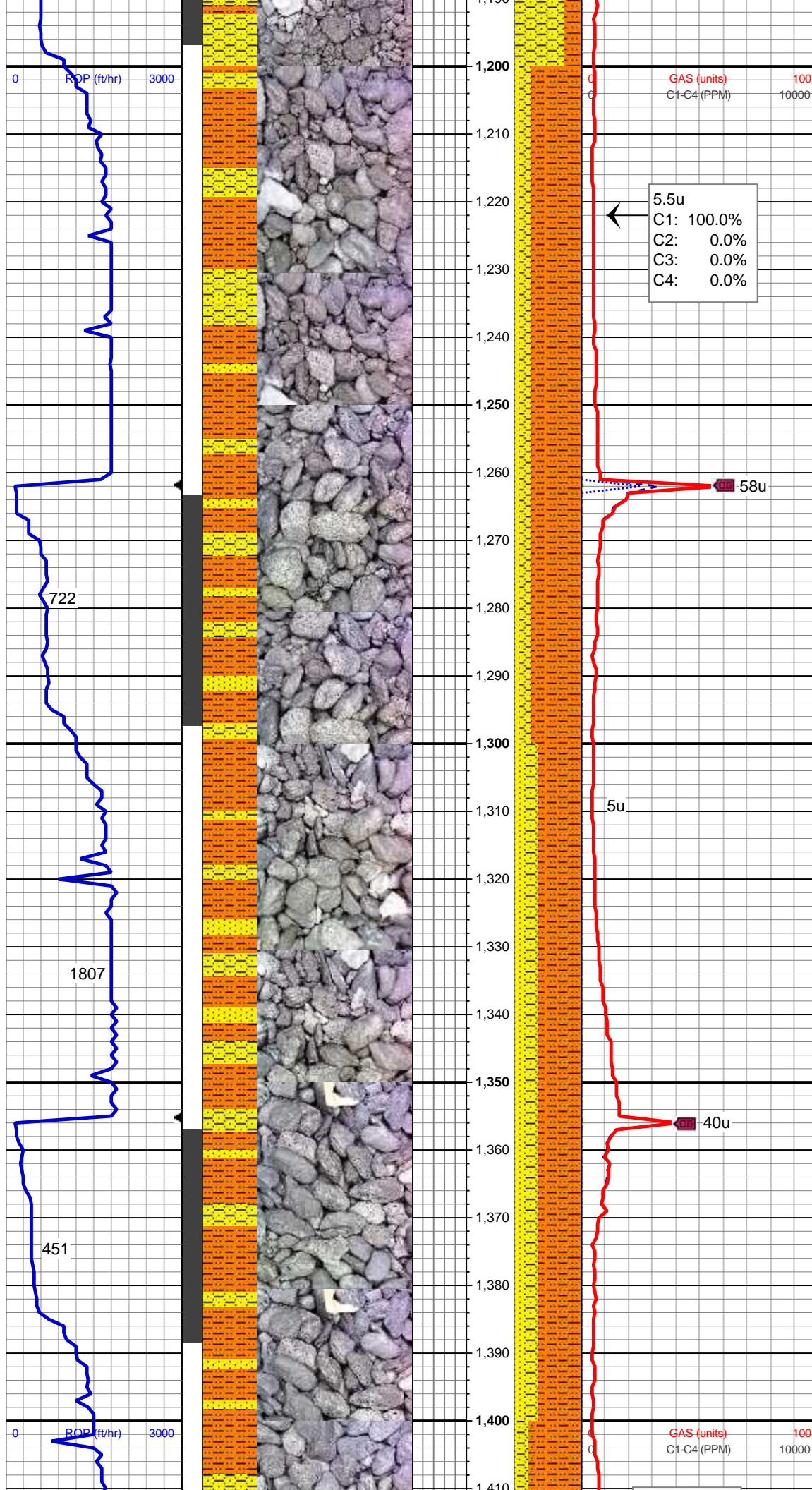
Other Symbols

E EARTHY
FX FINELYXLN
GS GRAINSTONE
L LITHOGRAPHIC
MX MICROXLN
MS MUDSTONE
PS PACKSTONE
WS WACKESTONE

Sorting

M MODERATE
P POOR
W WELL





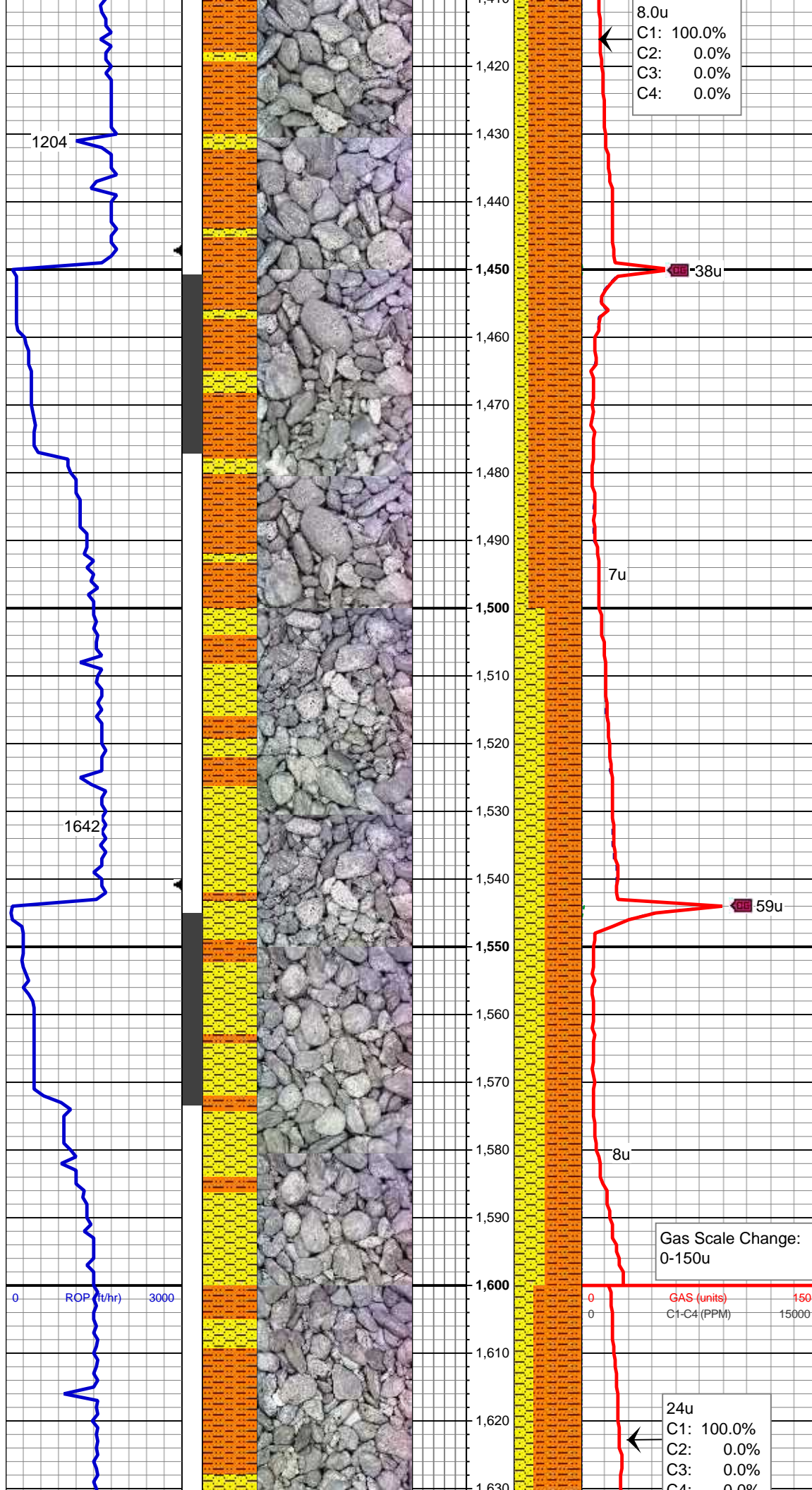
MD: 1,201 '
TVD: 1,200.96 '
Inclination: 2.25 °
Azimuth: 171.86 °
VS: 4.6 '

75% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
15% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
10% SS: lt gy - wh, sme s&p, f gr,
sbrd-sbang, mod srt

MD: 1,295 '
TVD: 1,294.79 '
Inclination: 4.62 °
Azimuth: 150.27 °
VS: 3.71 '

65% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
20% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
15% SS: lt gy - wh, sme s&p, f gr,
sbrd-sbang, mod srt

MD: 1,387 '
TVD: 1,386.27 '
Inclination: 7.37 °
Azimuth: 148.41 °
VS: 0.83 '



8.0u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

80% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
15% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
5% SS: lt gy - wh, sme s&p, f gr,
sbrd-sbang, mod srt

MD: 1,480 '
TVD: 1,478.32 '
Inclination: 9.02 °
Azimuth: 145.6 °
VS: -3.64 '

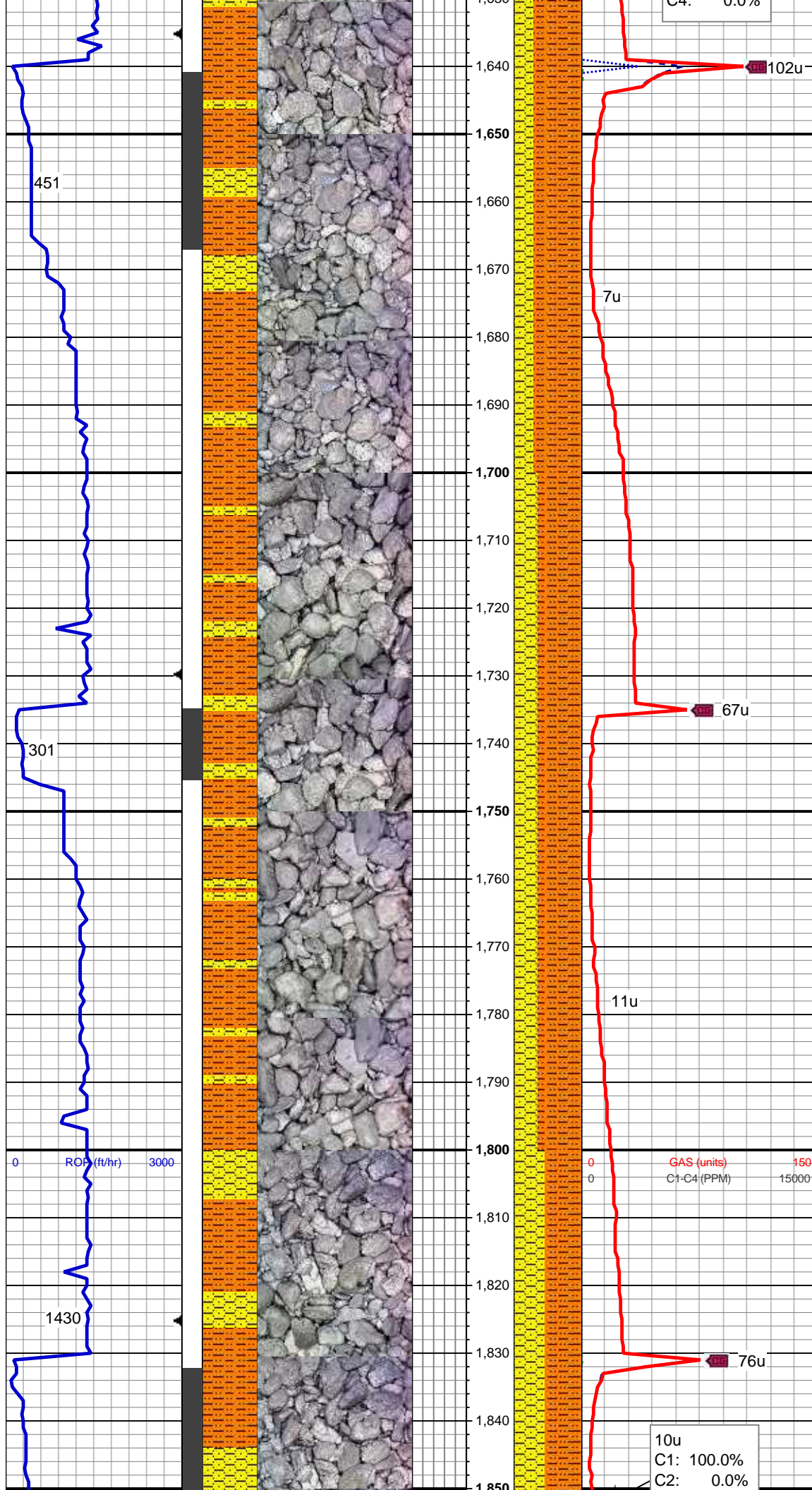
55% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
45% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt, occ biot

MD: 1,575 '
TVD: 1,571.79 '
Inclination: 11.55 °
Azimuth: 146.49 °
VS: -9.56 '

Gas Scale Change:
0-150u

GAS (units)
C1-C4 (PPM)

24u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%



70% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
30% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt, occ biot

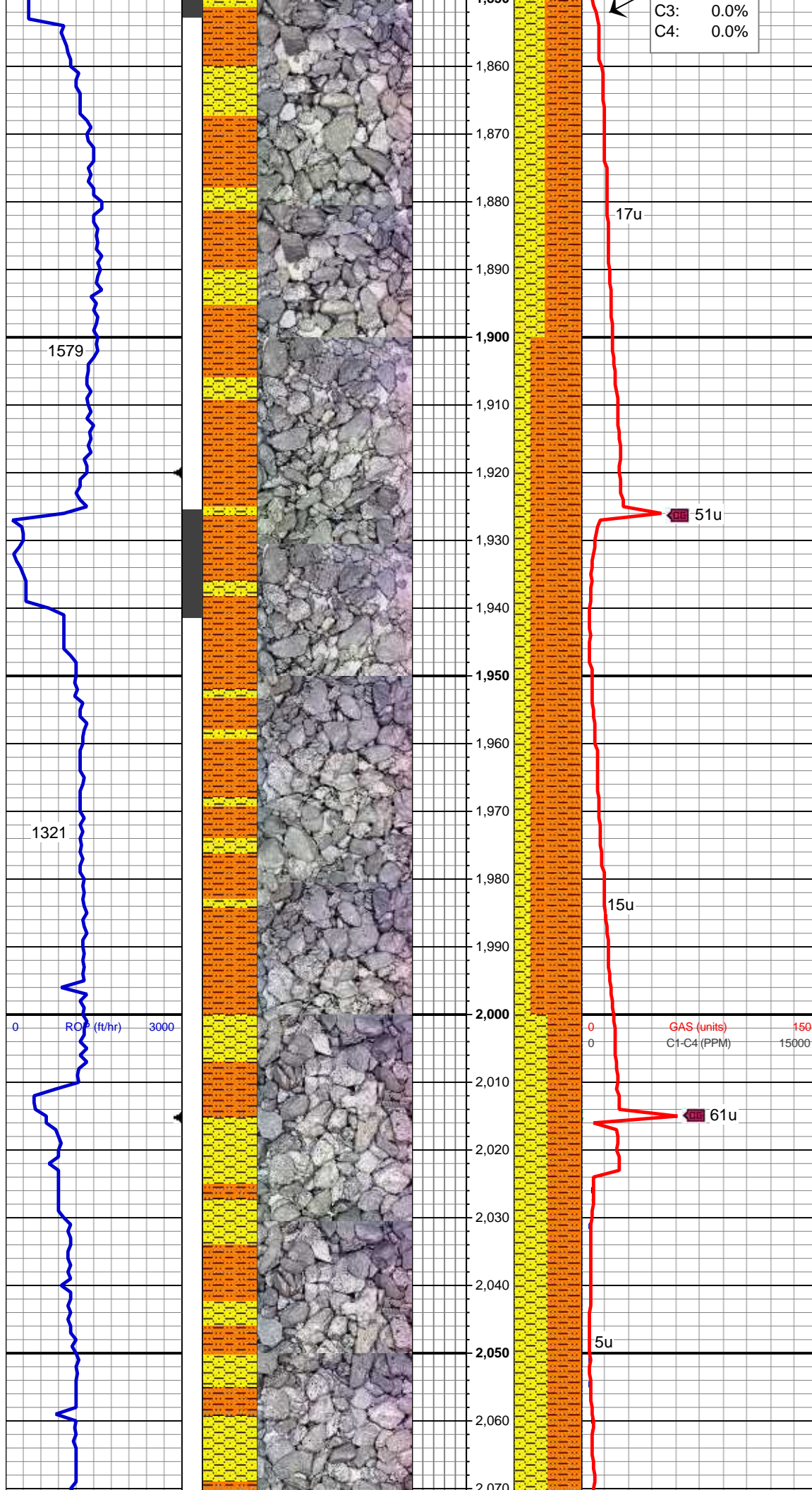
MD: 1,670 '
TVD: 1,664.6 '
Inclination: 13.07 °
Azimuth: 149.11 °
VS: -16.05 '

65% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
35% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 1,765 '
TVD: 1,757.17 '
Inclination: 12.95 °
Azimuth: 146.97 °
VS: -22.84 '

MUD WT 8.8 VIS 29

55% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex



45% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt, occ biot

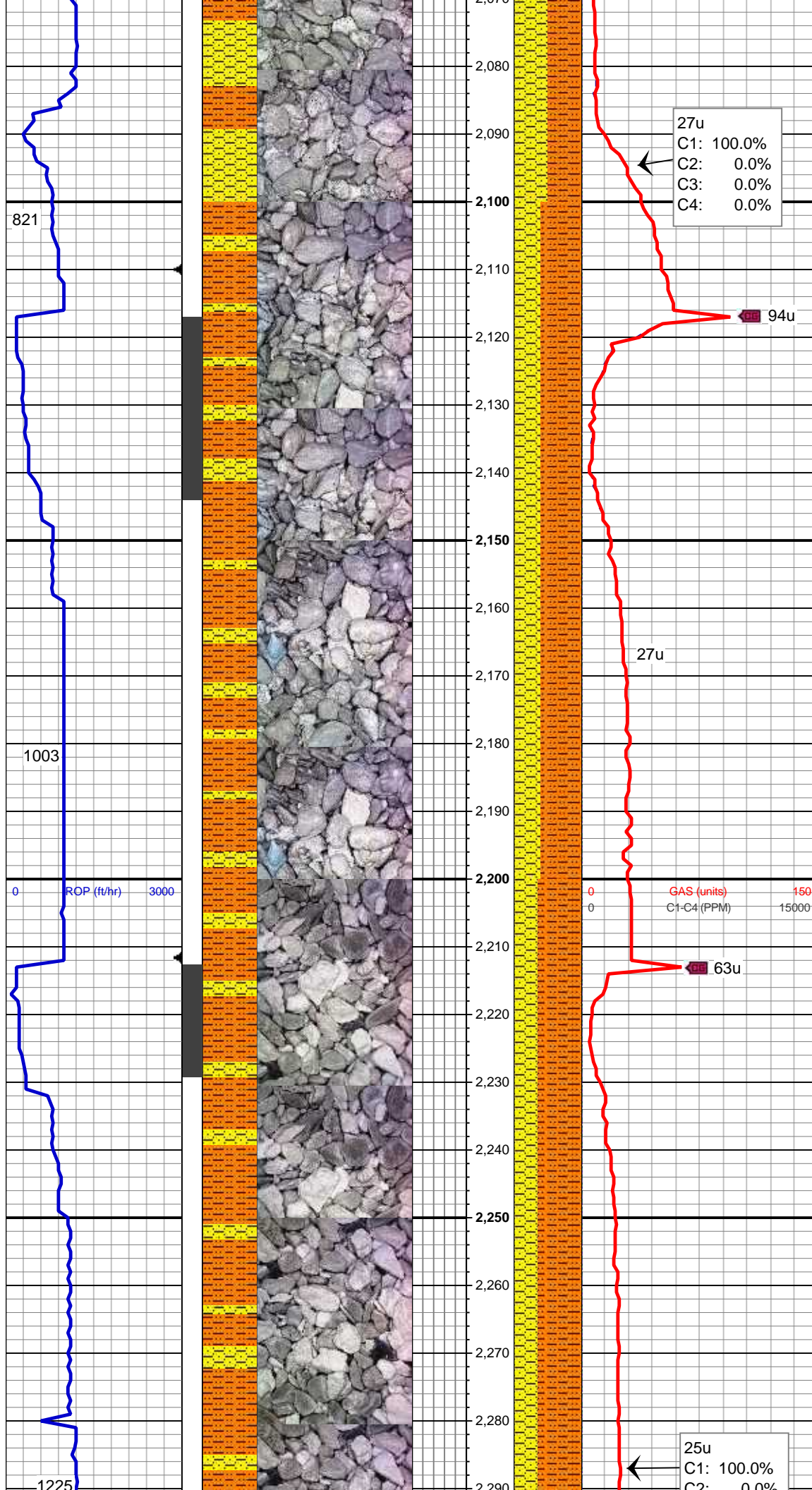
MD: 1,860 '
TVD: 1,849.65 '
Inclination: 13.49 °
Azimuth: 148.73 °
VS: -29.81 '

75% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
25% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 1,955 '
TVD: 1,942 '
Inclination: 13.62 °
Azimuth: 150.57 °
VS: -36.28 '

50% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
50% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 2,050 '
TVD: 2,034.71 '
Inclination: 11.59 °
Azimuth: 148.39 °



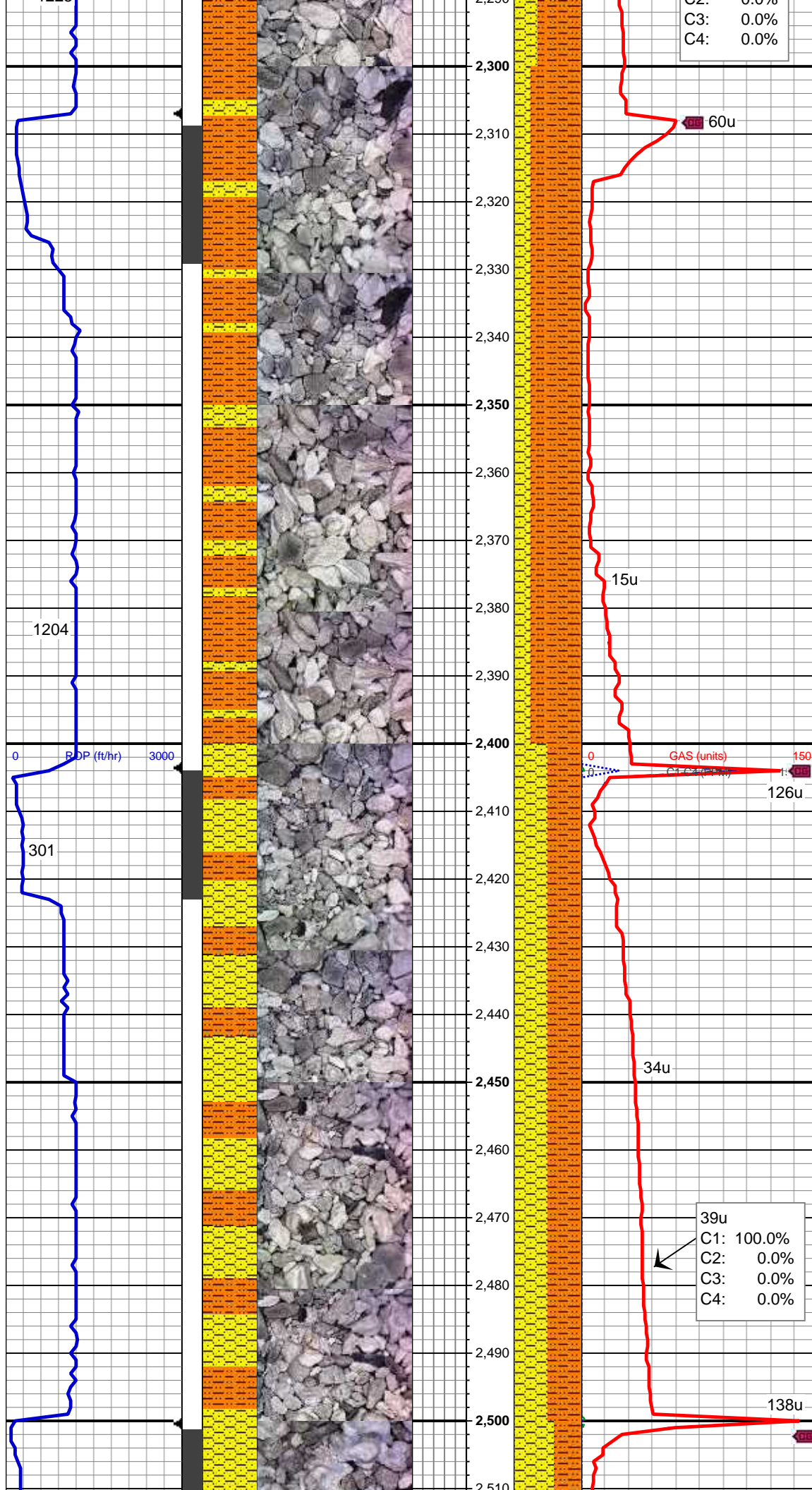
VS: -42.34 '

MD: 2,144 '
TVD: 2,126.58 '
Inclination: 12.82 °
Azimuth: 146.55 °
VS: -48.86 '

60% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
40% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 2,239 '
TVD: 2,219.13 '
Inclination: 13.3 °
Azimuth: 147.5 °
VS: -56.04 '

65% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
35% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt



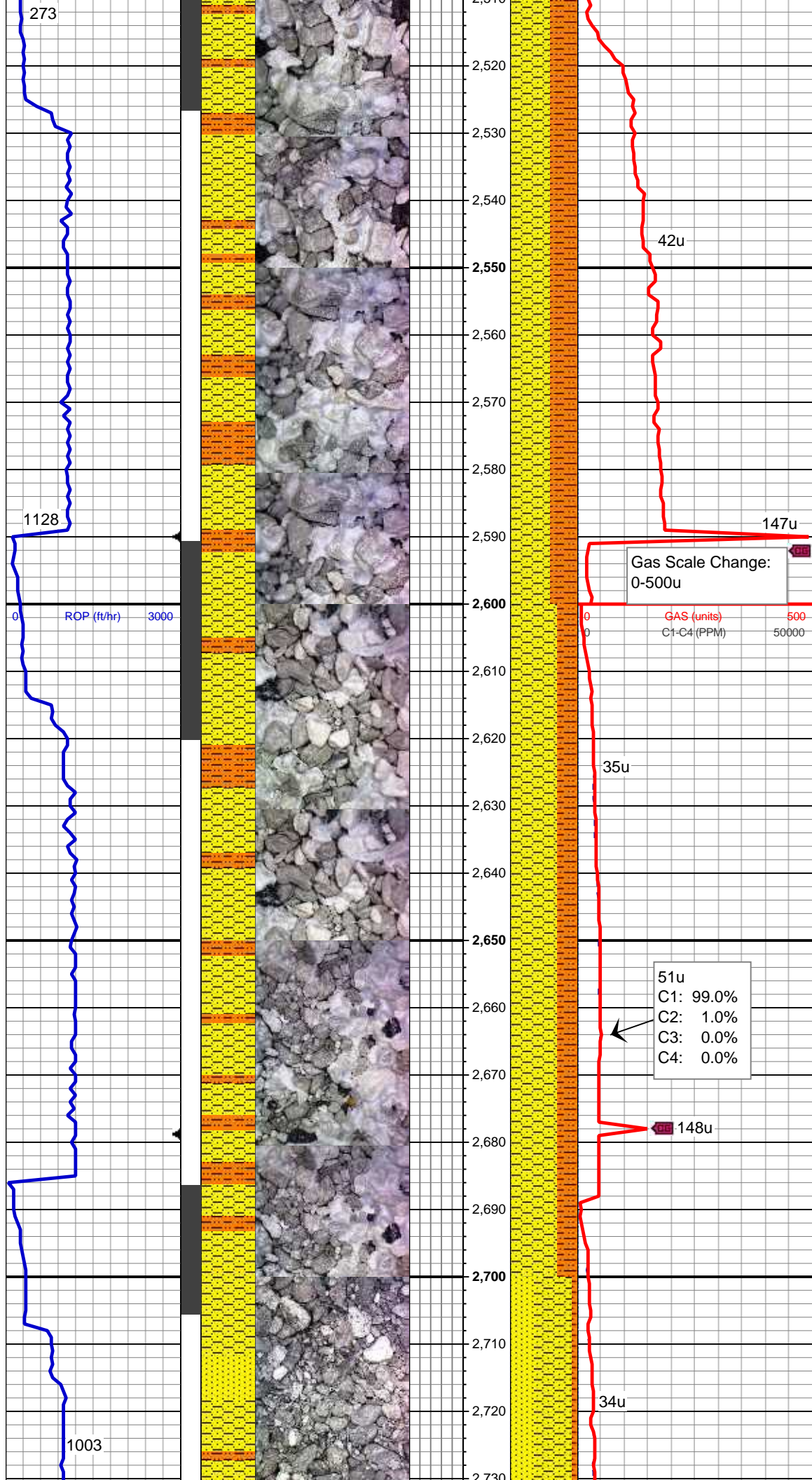
MD: 2,334 '
TVD: 2,311.65 '
Inclination: 12.91 °
Azimuth: 150.67 °
VS: -62.52 '

75% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
25% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MUD WT 9.0 VIS 28

MD: 2,429 '
TVD: 2,404.38 '
Inclination: 12.21 °
Azimuth: 153.68 °
VS: -67.66 '

50% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
50% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt



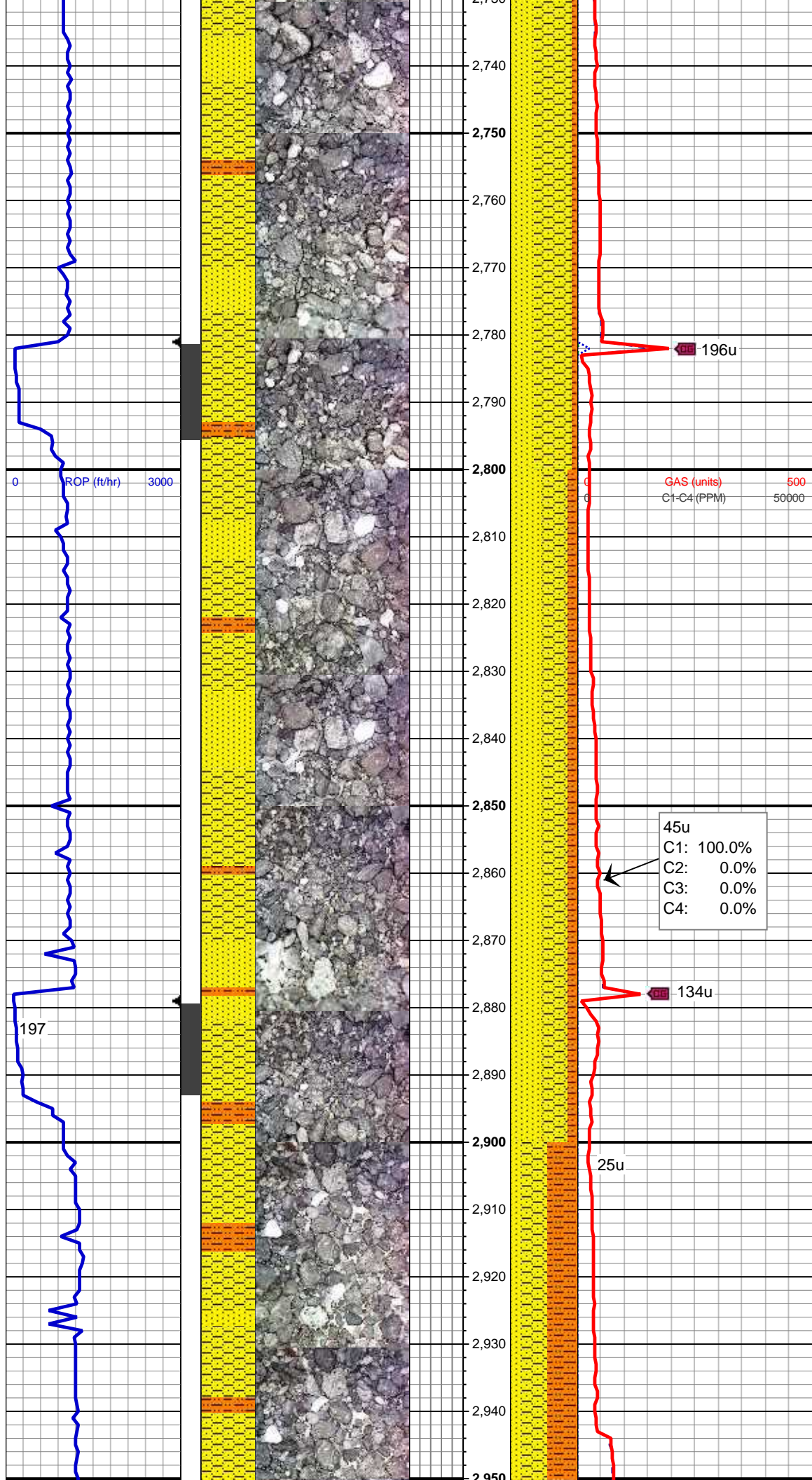
MD: 2,524 '
TVD: 2,497.03 '
Inclination: 13.32 °
Azimuth: 154.59 °
VS: -72.18 '

60% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
40% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex

MD: 2,619 '
TVD: 2,589.45 '
Inclination: 13.49 °
Azimuth: 150.33 °
VS: -77.55 '

70% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
30% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex

MD: 2,714 '
TVD: 2,681.77 '
Inclination: 13.8 °
Azimuth: 154.31 °
VS: -83.05 '



55% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
35% SS: wh, clr, trnsl, vf-fgr, sb
rnd-sb ang,m cmt, tr unconc,
10% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex

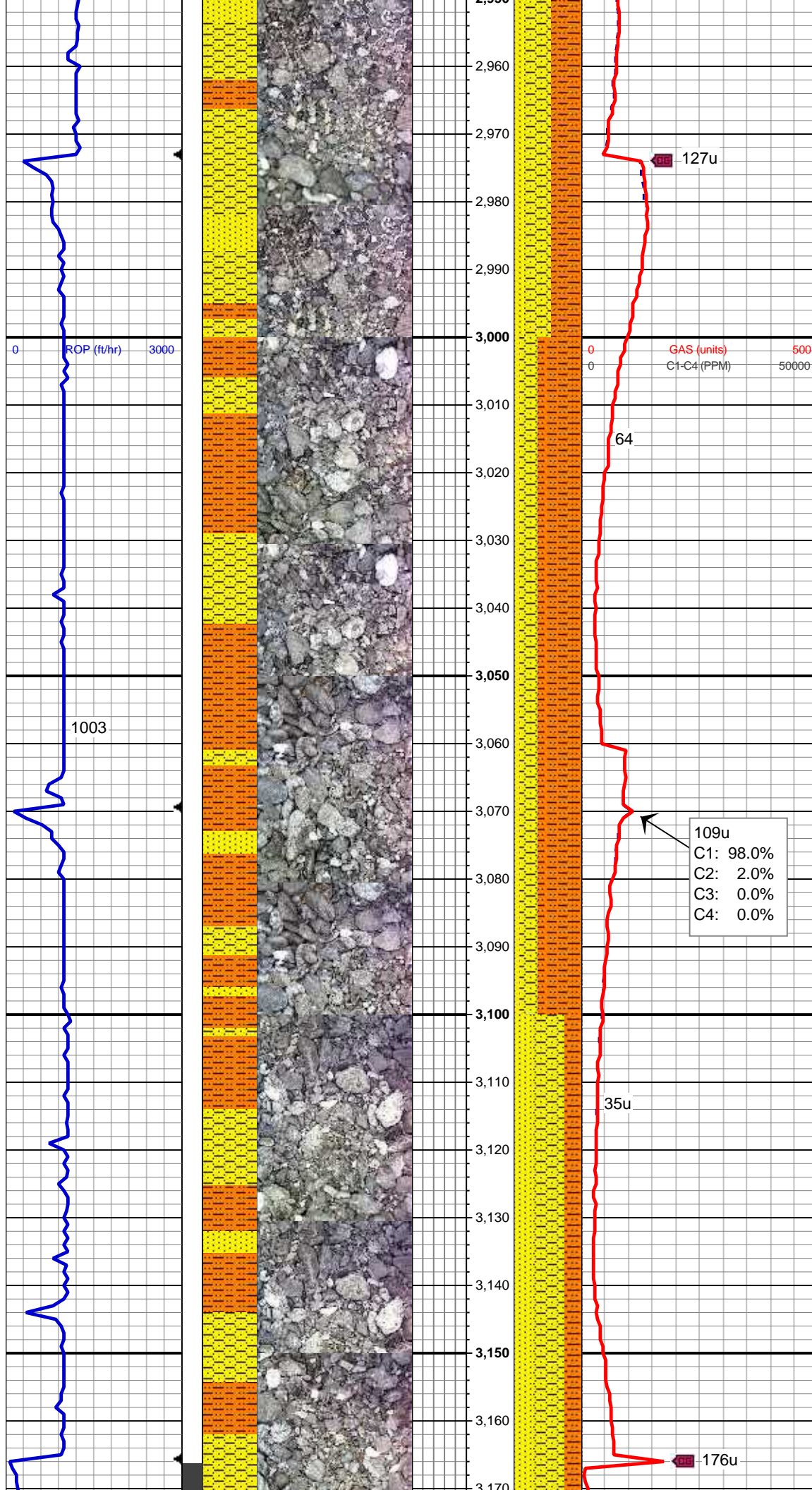
MD: 2,809 '
TVD: 2,774.08 '
Inclination: 13.51 °
Azimuth: 150.6 °
VS: -88.51 '

45% SS: wh, clr, trnsl, vf-fgr, sb
rnd-sb ang,m cmt, tr unconc, occ
arg
40% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
15% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex

45u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

MD: 2,904 '
TVD: 2,866.23 '
Inclination: 14.65 °
Azimuth: 151.31 °
VS: -94.73 '

45% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
40% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt



arg cmt
15% SS: wh, clr, trnsl, vf-fgr, sb
rnd-sb ang,m cmt, tr uncon, occ
arg

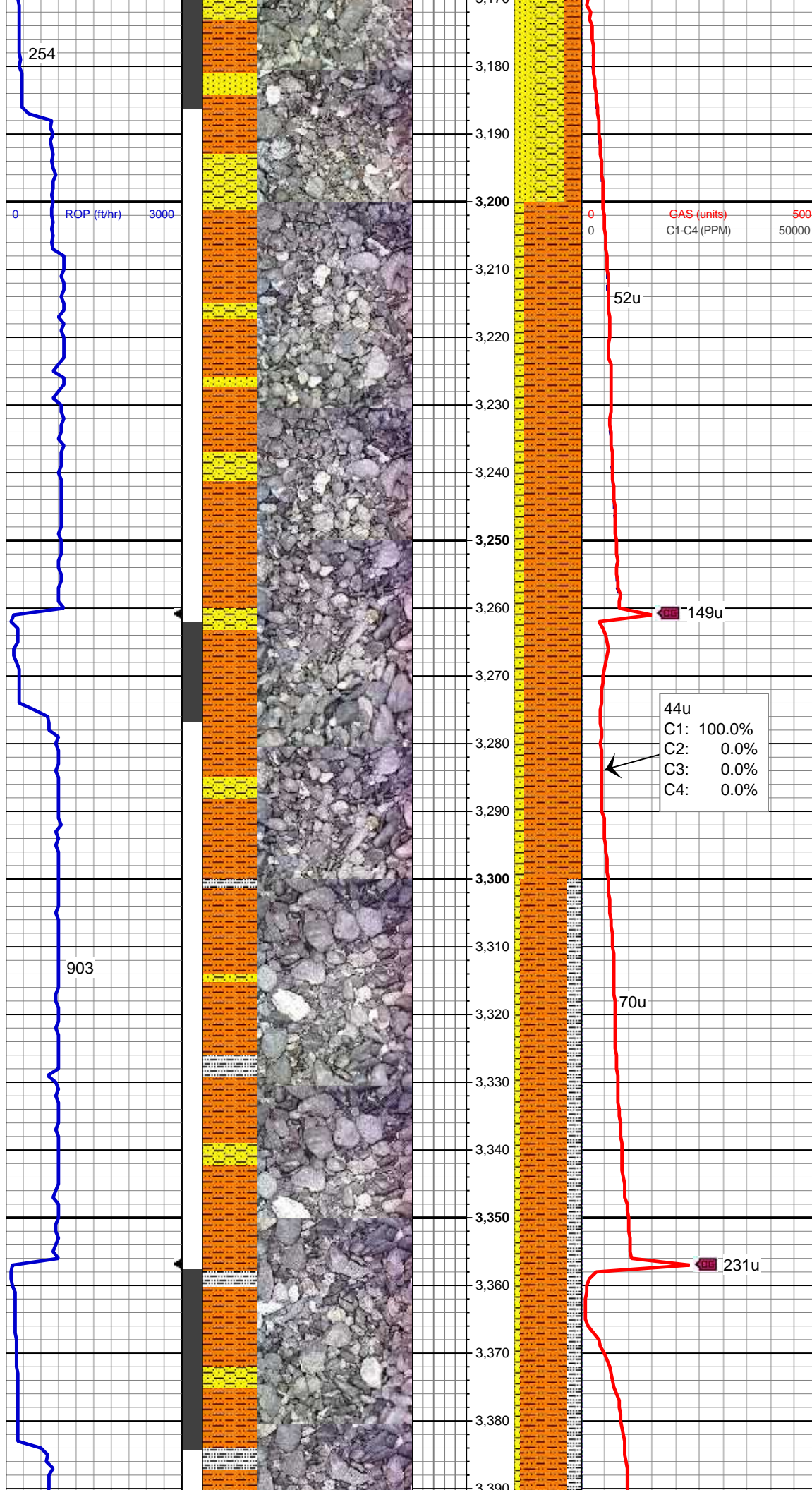
MD: 2,999 '
TVD: 2,958.32 '
Inclination: 13.79 °
Azimuth: 150.41 °
VS: -101.04 '

65% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
25% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
10% SS: wh, clr, trnsl, vf-fgr, sb
rnd-sb ang,m cmt, occ arg

MD: 3,093 '
TVD: 3,049.88 '
Inclination: 12.38 °
Azimuth: 148.91 °
VS: -107.22 '

MUD WT 9.1 VIS 29

45% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
30% SS: wh, clr, trnsl, vf-fgr, sb
rnd-sb ang,m cmt, tr uncon,
25% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex



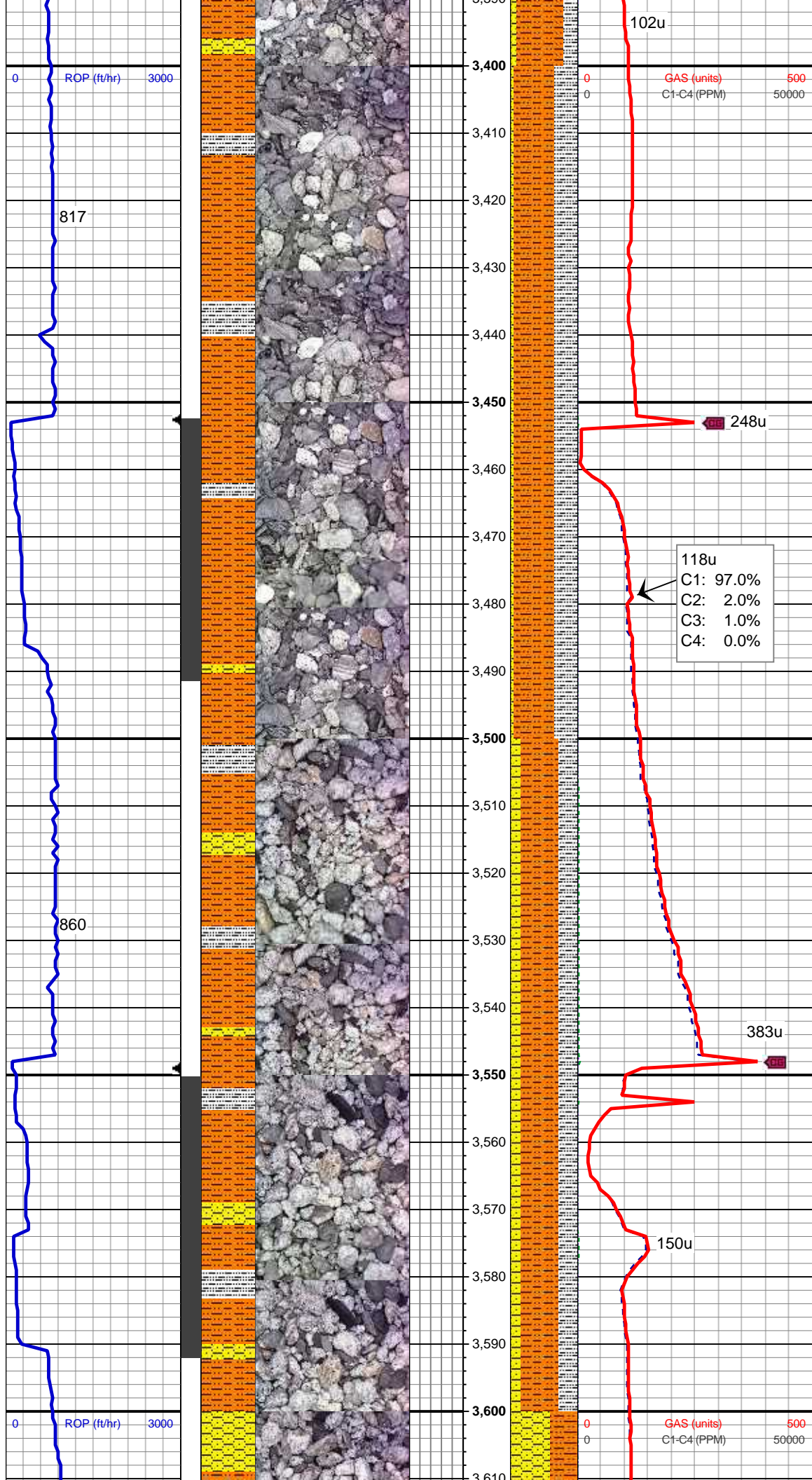
MD: 3,189 '
TVD: 3,143.49 '
Inclination: 13.21 °
Azimuth: 149.08 °
VS: -113.63 '

85% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
15% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt, tr SS

MD: 3,283 '
TVD: 3,235.29 '
Inclination: 11.61 °
Azimuth: 148.34 °
VS: -119.82 '

70% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
20% SLTY SH: m-dk gy occ gy brn,
ply - sb ply firm-sl sft, rthy-sl slty
10% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 3,378 '
TVD: 3,328.38 '
Inclination: 11.41 °
Azimuth: 150.77 °
VS: -125.37 '



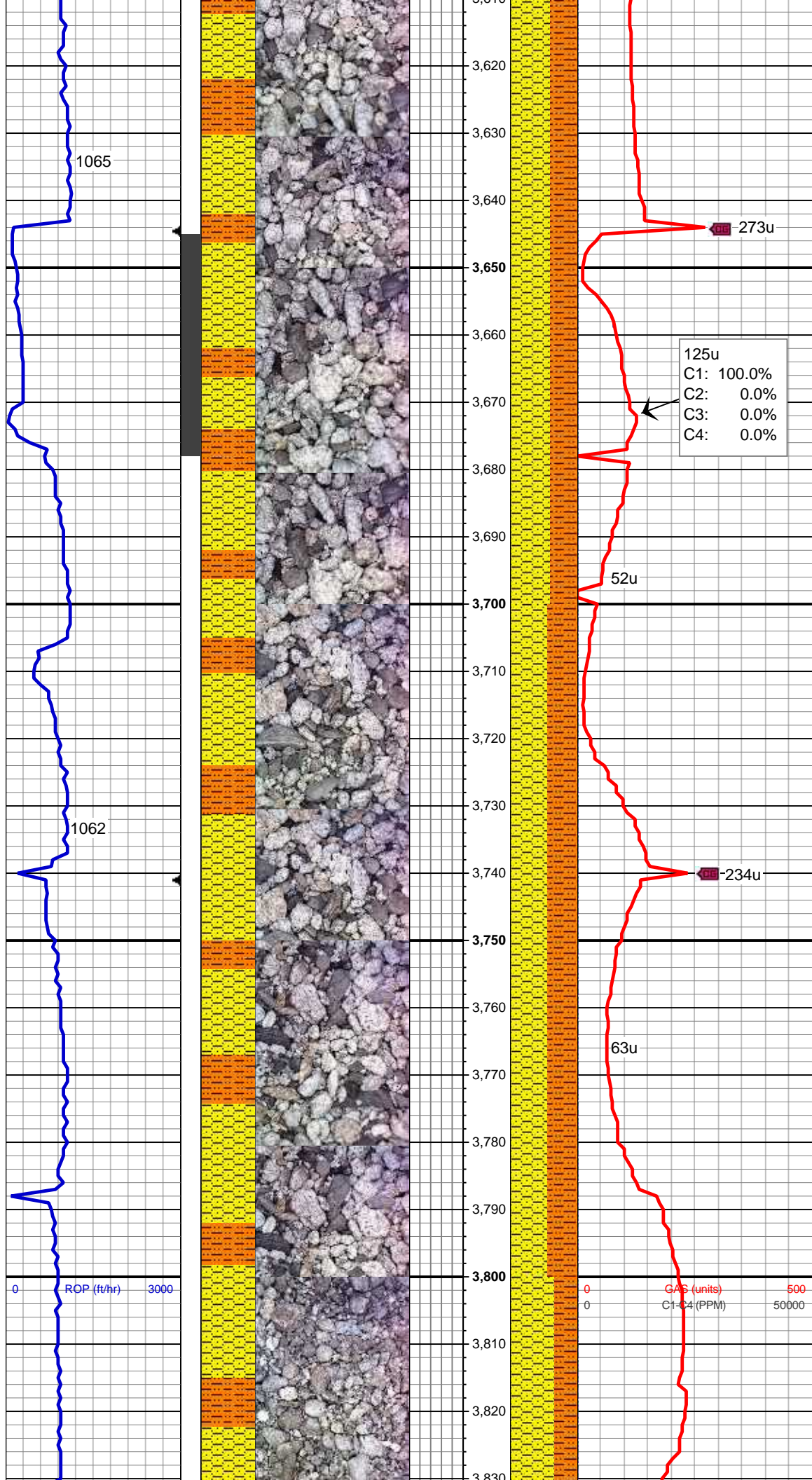
MUD WT 9.2 VIS 30

60% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
35% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty
5% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 3,473 '
TVD: 3,421.5 '
Inclination: 11.43 °
Azimuth: 150.87 °
VS: -130.48 '

55% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
30% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty
15% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 3,568 '
TVD: 3,514.5 '
Inclination: 12.11 °
Azimuth: 147.33 °
VS: -136.31 '



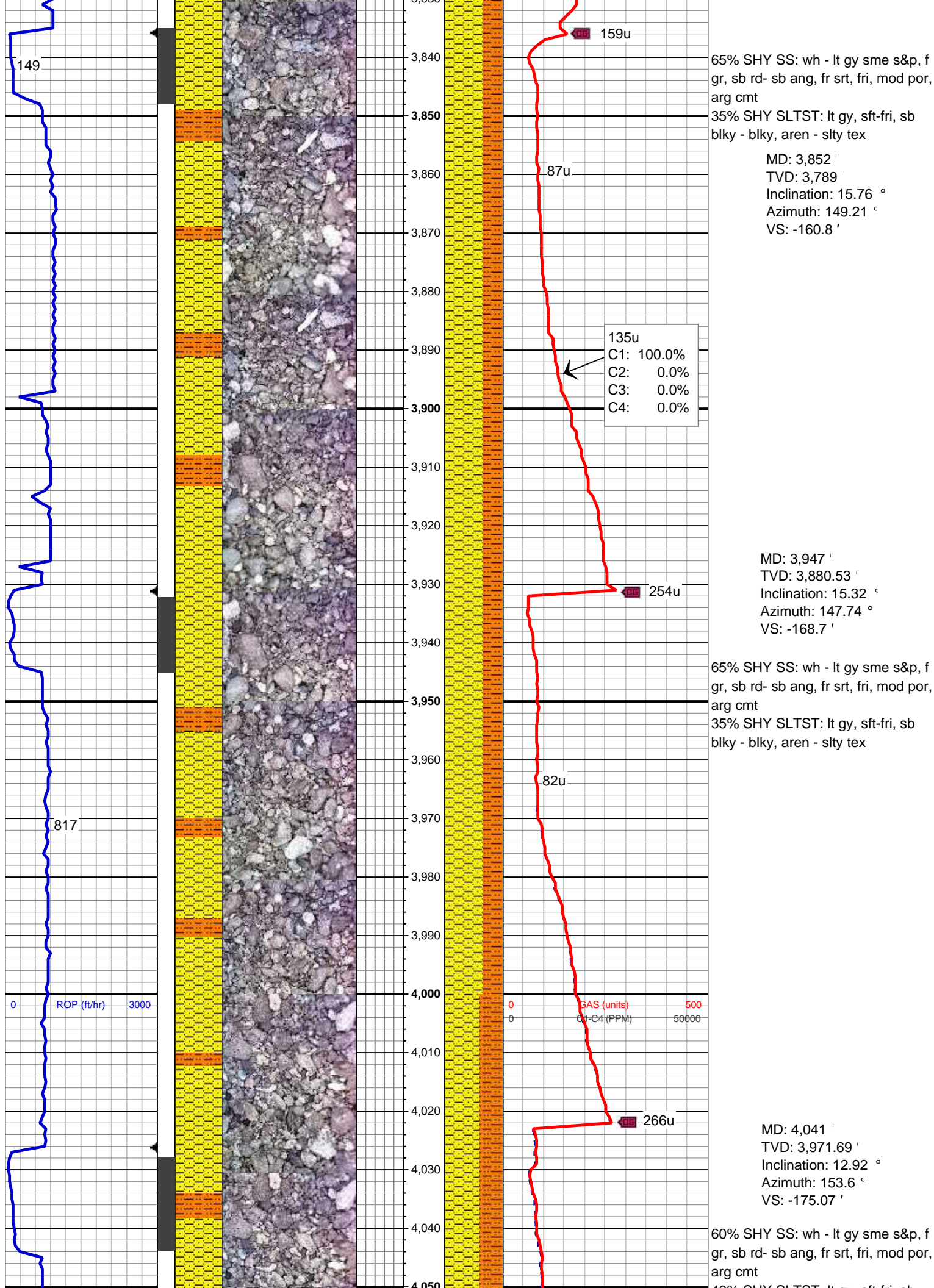
60% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
40% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex

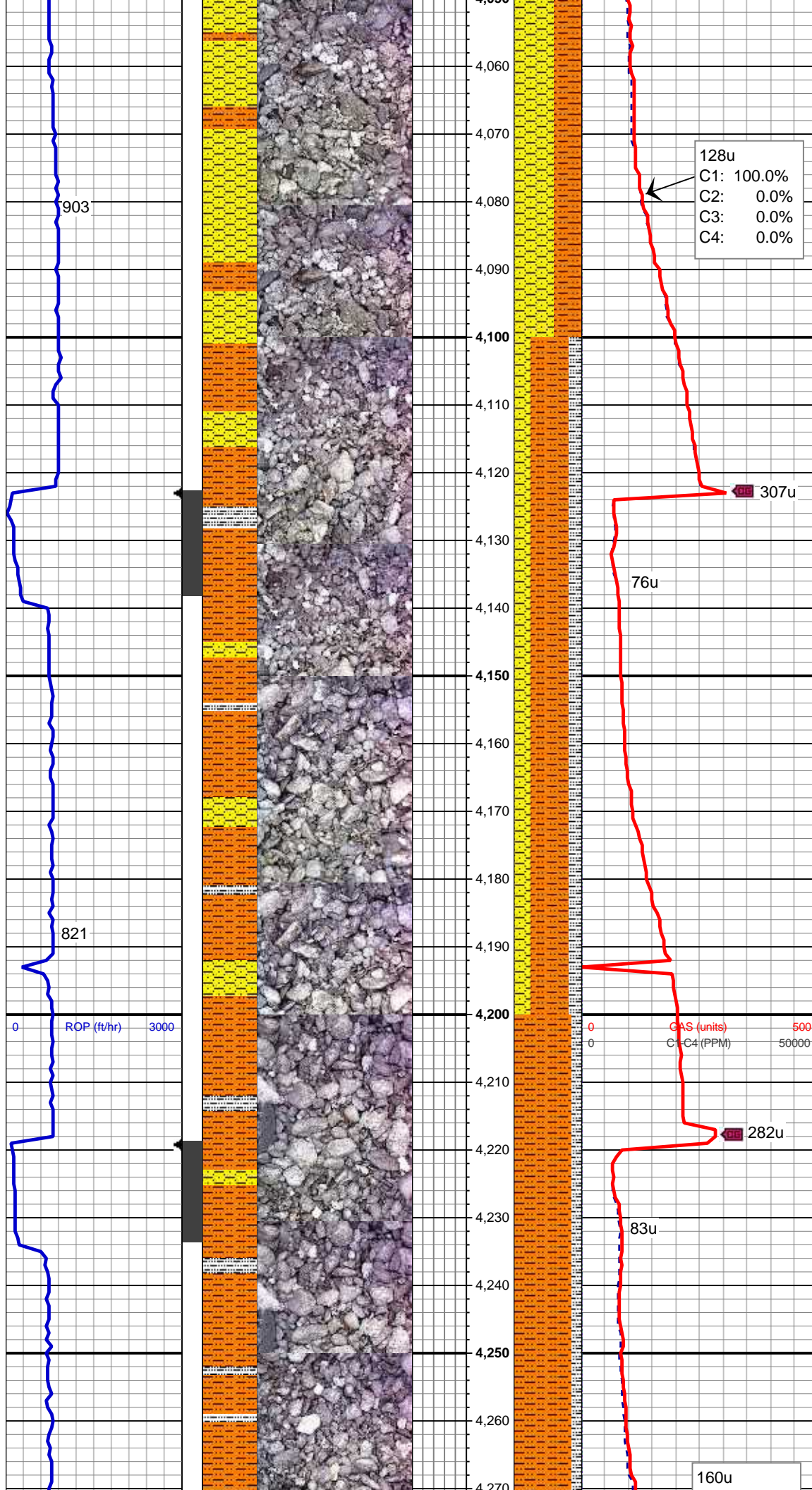
MD: 3,663 '
TVD: 3,606.94 '
Inclination: 14.54 °
Azimuth: 146.46 °
VS: -143.69 '

55% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
45% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex

MD: 3,757 '
TVD: 3,697.62 '
Inclination: 15.99 °
Azimuth: 145.86 °
VS: -152.33 '

MUD WT 9.15 VIS 30





40% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex

MUD WT 9.15 VIS 30

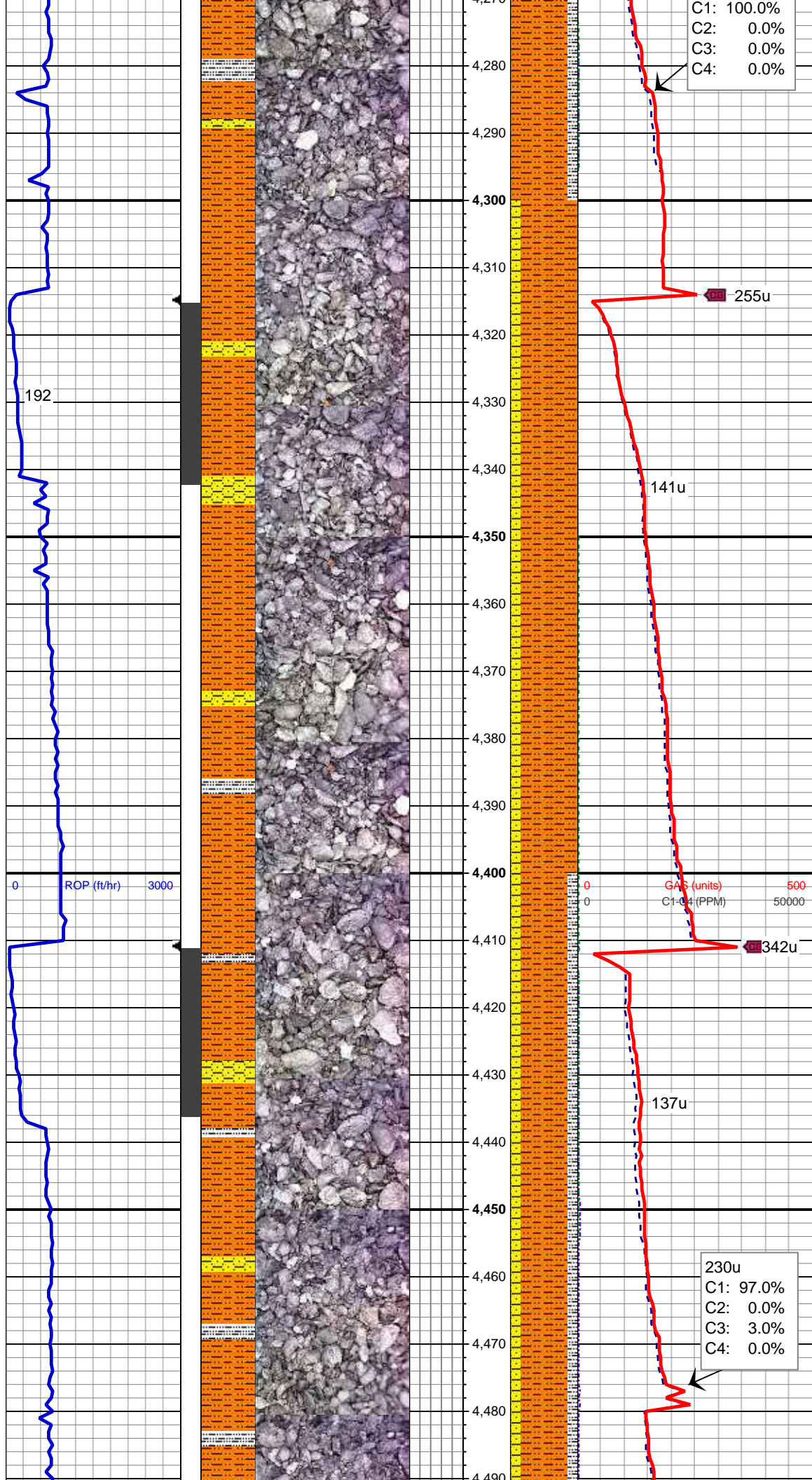
MD: 4,136 '
TVD: 4,064.31 '
Inclination: 12.76 °
Azimuth: 153.35 °
VS: -179.86 '

55% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
25% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty
20% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MUD WT 9.2 VIS 30

MD: 4,231 '
TVD: 4,157.06 '
Inclination: 12.23 °
Azimuth: 153.72 °
VS: -184.49 '

85% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
15% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty



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

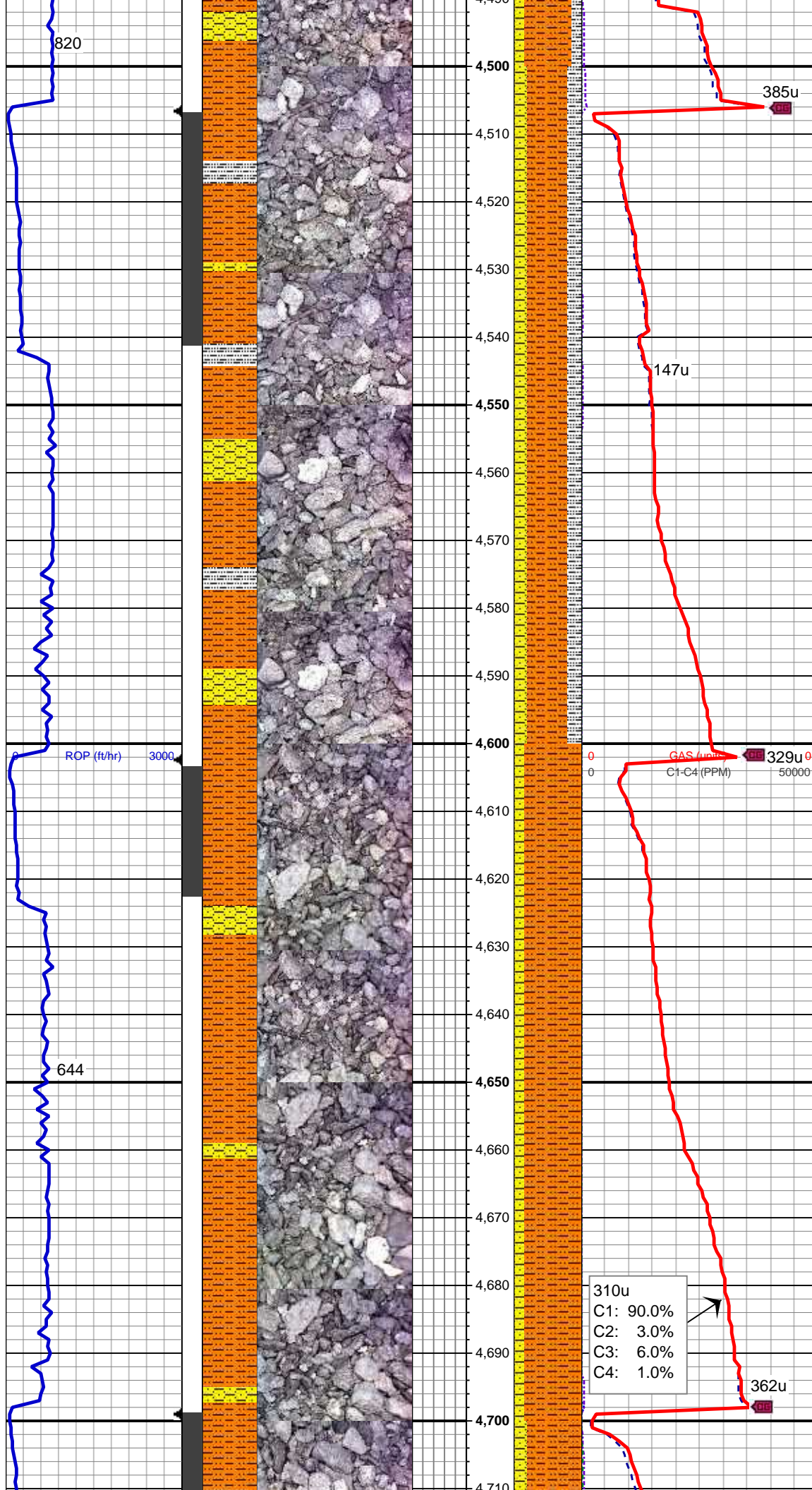
MD: 4,326 '
TVD: 4,249.92 '
Inclination: 12.18 °
Azimuth: 160.16 °
VS: -187.85 '

85% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
15% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 4,421 '
TVD: 4,342.82 '
Inclination: 11.95 °
Azimuth: 157.83 °
VS: -190.46 '

70% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
15% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty
15% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

230u
C1: 97.0%
C2: 0.0%
C3: 3.0%
C4: 0.0%



MUD WT 9.1 VIS 29

MD: 4,516 '
TVD: 4,435.53 '
Inclination: 13.3 °
Azimuth: 152.8 °
VS: -194.55 '

60% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
20% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty
20% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

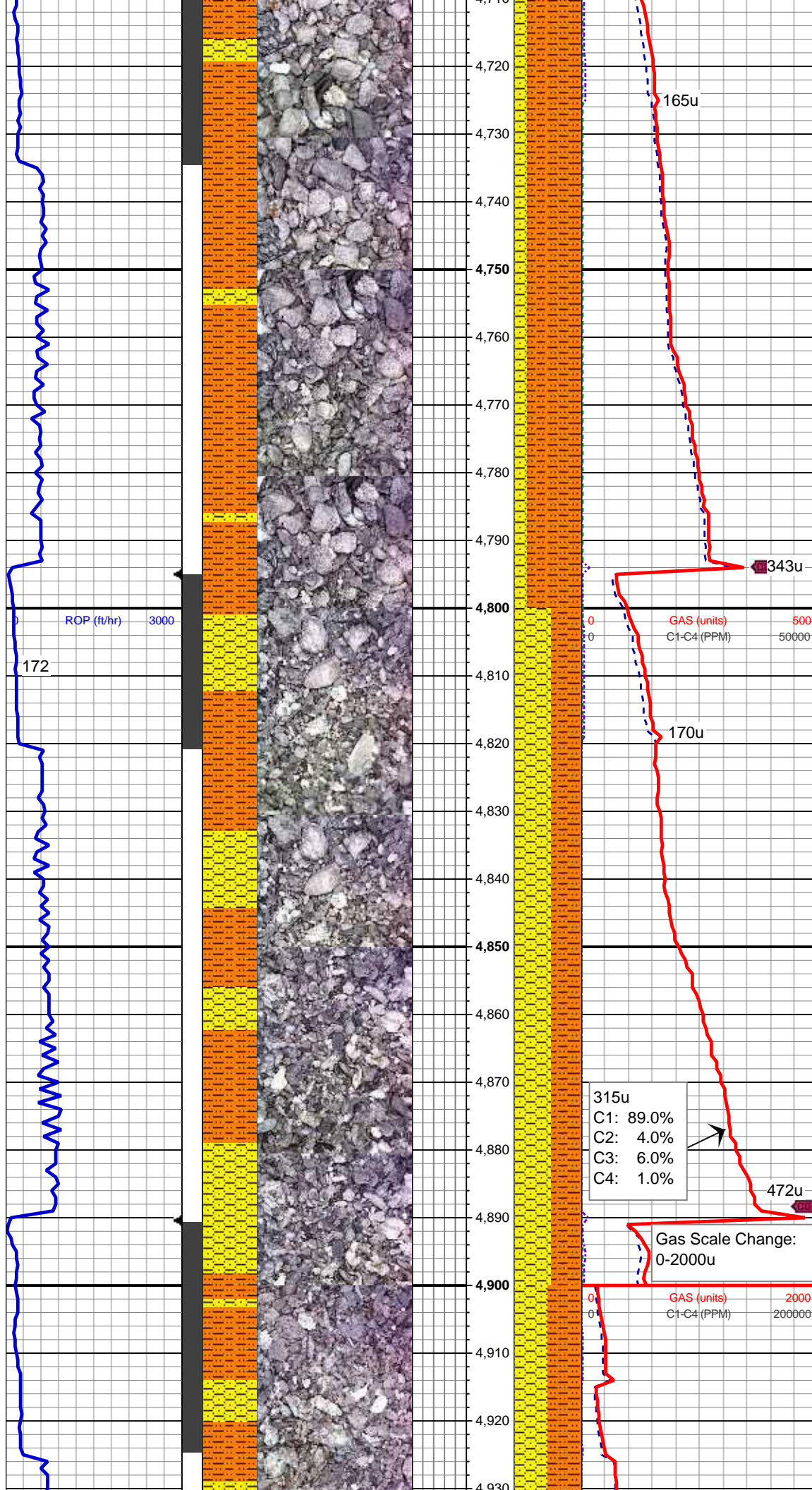
MD: 4,611 '
TVD: 4,528.1 '
Inclination: 12.66 °
Azimuth: 154.78 °
VS: -199.28 '

85% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
15% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MUD WT 9.1 VIS 30

MD: 4,706 '
TVD: 4,620.75 '
Inclination: 12.91 °
Azimuth: 151.4 °
VS: -204.19 '

310u
C1: 90.0%
C2: 3.0%
C3: 6.0%
C4: 1.0%

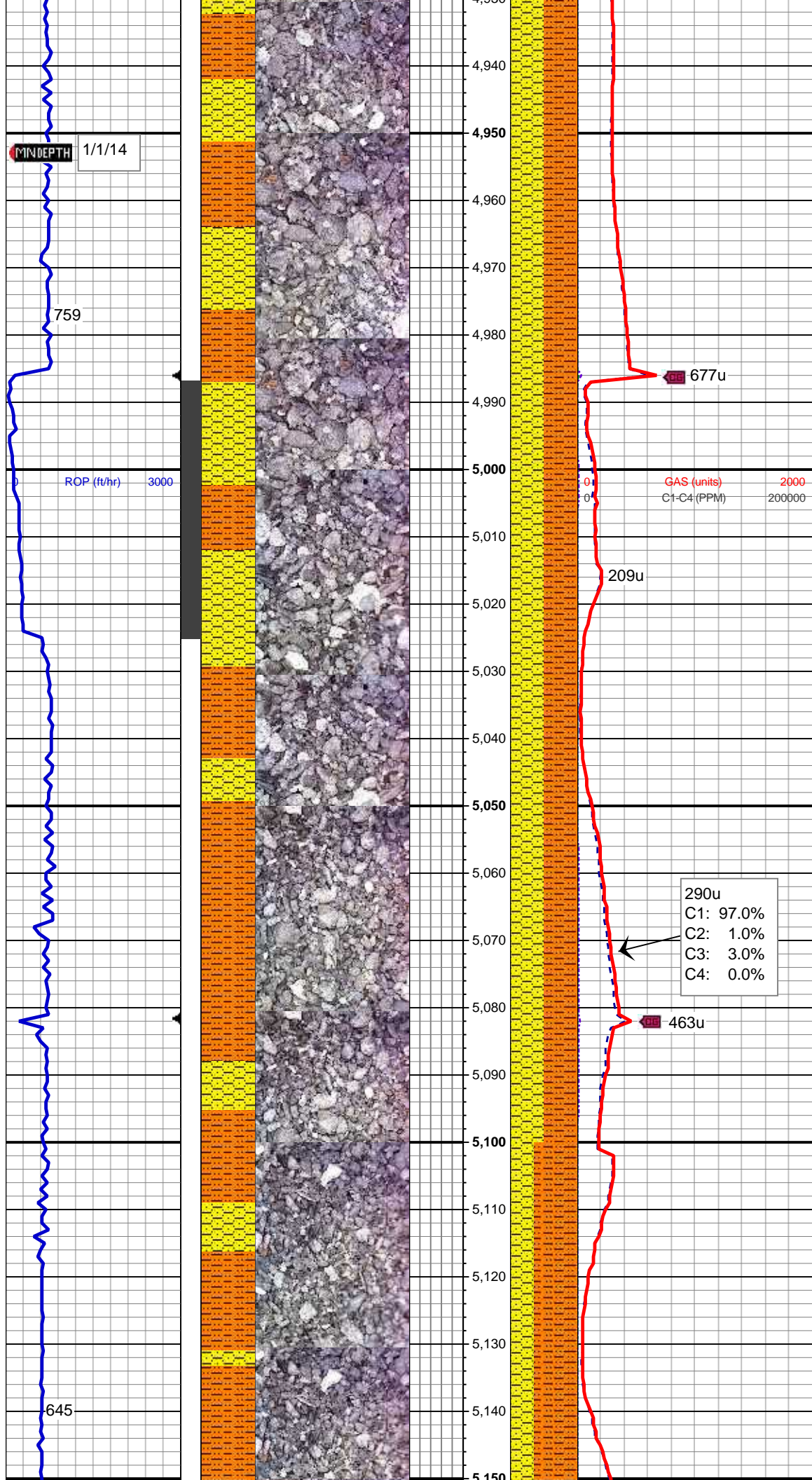


80% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex
20% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt

MD: 4,801 '
TVD: 4,713.51 '
Inclination: 12 °
Azimuth: 146.53 °
VS: -210.35 '

55% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
45% SHY SLTST: lt gy, sft-fri, sb
blky - blky, aren - slty tex

MD: 4,895 '
TVD: 4,805.58 '
Inclination: 11.26 °
Azimuth: 141.51 °
VS: -217.58 '



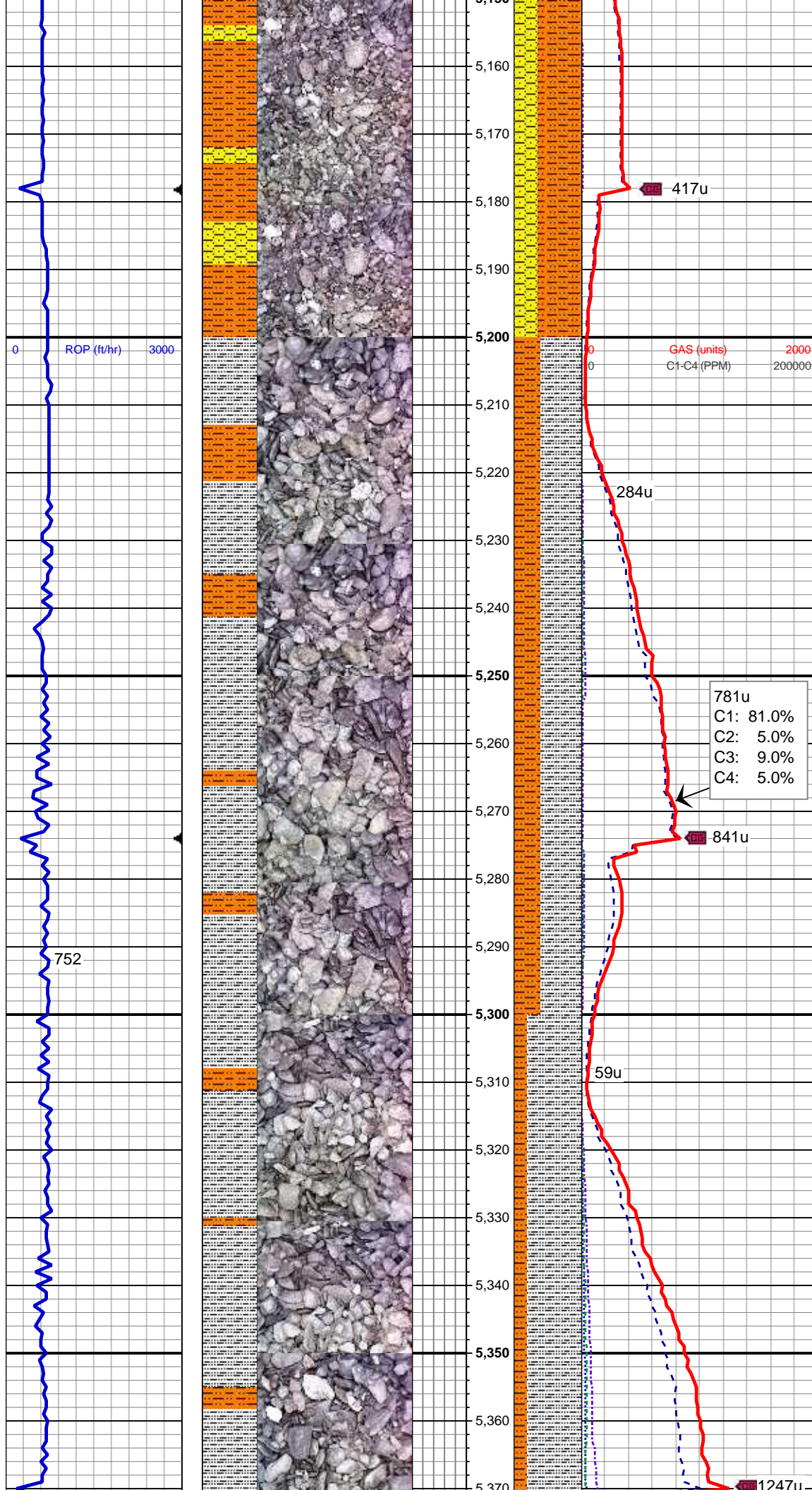
50% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
50% SHY SLTST: lt gy, sft-fri, sb
blkly - blkly, aren - slty tex

MD: 4,990 '
TVD: 4,898.66 '
Inclination: 11.86 °
Azimuth: 138.52 °
VS: -226.1 '

50% SHY SS: wh - lt gy sme s&p, f
gr, sb rd- sb ang, fr srt, fri, mod por,
arg cmt
50% SHY SLTST: lt gy, sft-fri, sb
blkly - blkly, aren - slty tex

MD: 5,085 '
TVD: 4,991.73 '
Inclination: 11.25 °
Azimuth: 138.66 °
VS: -235.03 '

65% SHY SLTST: lt gy, sft-fri, sb
blkly - blkly, aren - slty tex
35% SHY SS: wh - lt gy sme s&p, f



gr, sb rd- sb ang, fr srt, fri, mod por, arg cmt

MD: 5,180 '
TVD: 5,085.29 '
Inclination: 8.68 °
Azimuth: 137.96 °
VS: -242.8 '

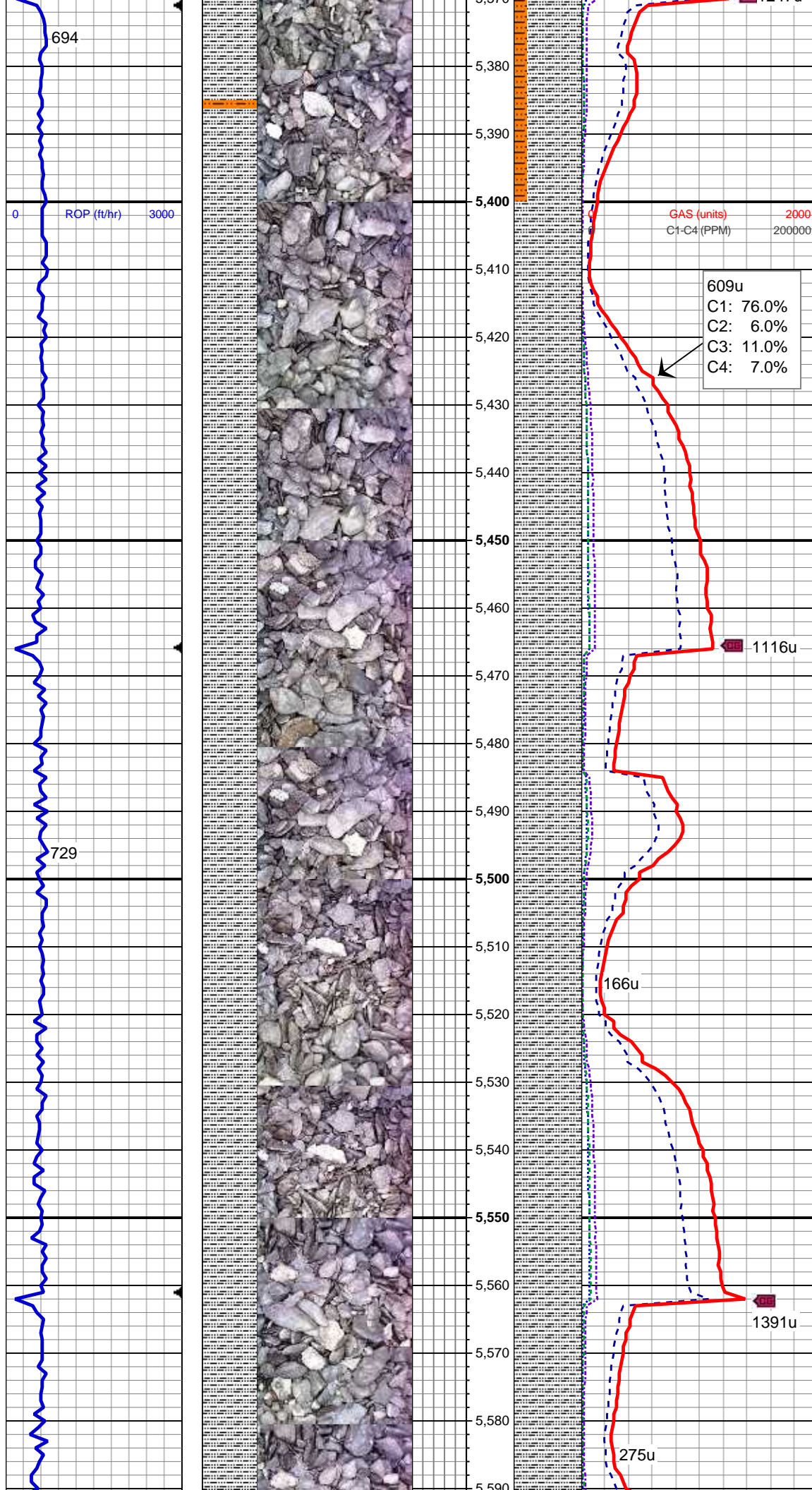
60% SLTY SH: m-dk gy occ gy brn, plty - sb plty firm-sl sft, rthy-sl slty
40% SHY SLTST: lt gy, sft-fri, sb blkly - blkly, aren - slty tex

MD: 5,275 '
TVD: 5,179.42 '
Inclination: 6.79 °
Azimuth: 139.98 °
VS: -248.75 '

MUD WT 9.1 VIS 29

80% SLTY SH: m-dk gy occ gy brn, plty - sb plty firm-sl sft, rthy-sl slty
20% SHY SLTST: lt gy, sft-fri, sb blkly - blkly, aren - slty tex

MD: 5,370 '
TVD: 5,273.89 '



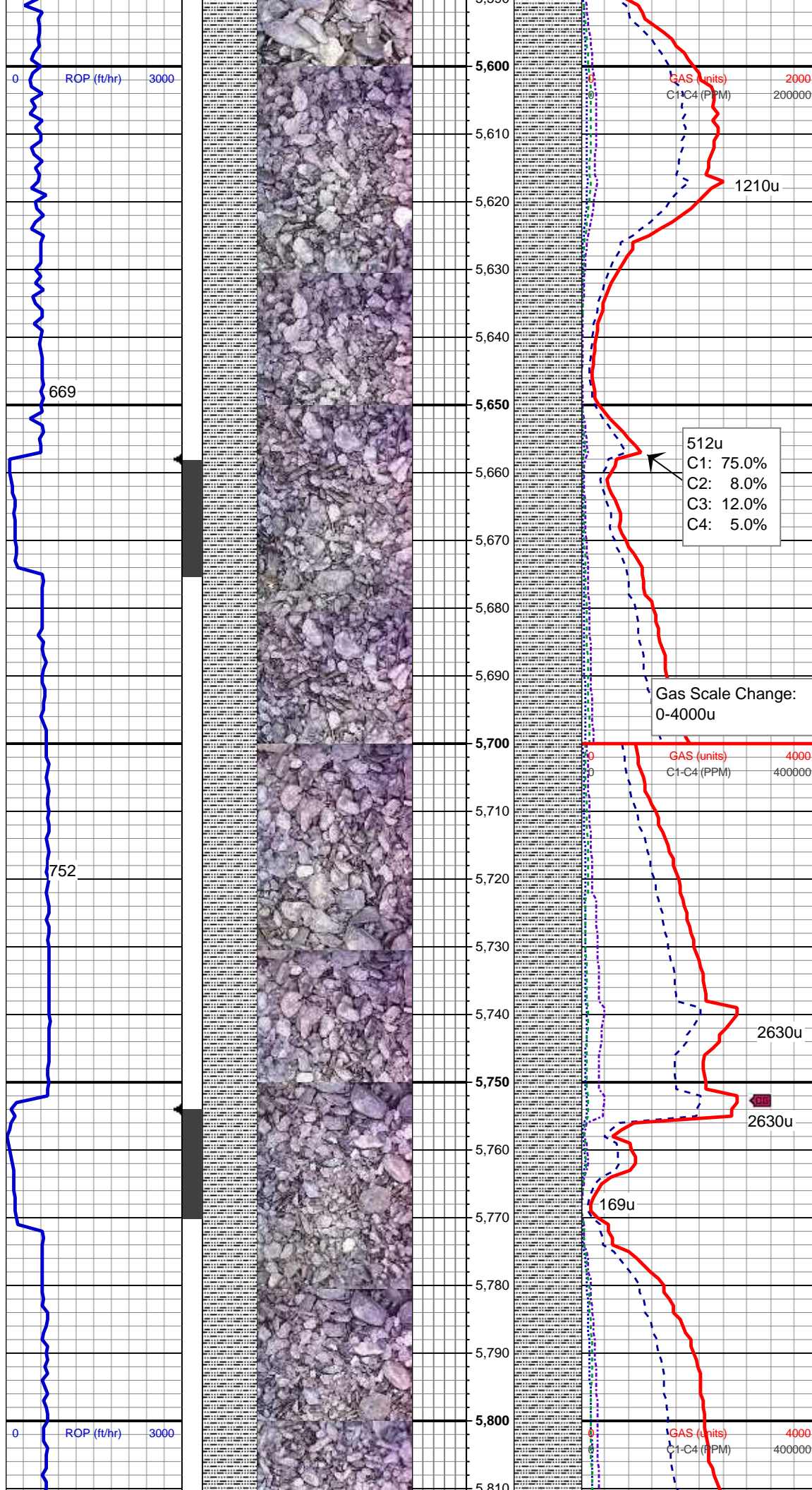
Inclination: 5.32 °
Azimuth: 139.52 °
VS: -253.27 '

100% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty

MD: 5,464 '
TVD: 5,367.58 '
Inclination: 4.02 °
Azimuth: 139.12 °
VS: -256.77 '

100% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty

MD: 5,559 '
TVD: 5,462.39 '
Inclination: 3.23 °
Azimuth: 144.73 °
VS: -259.3 '



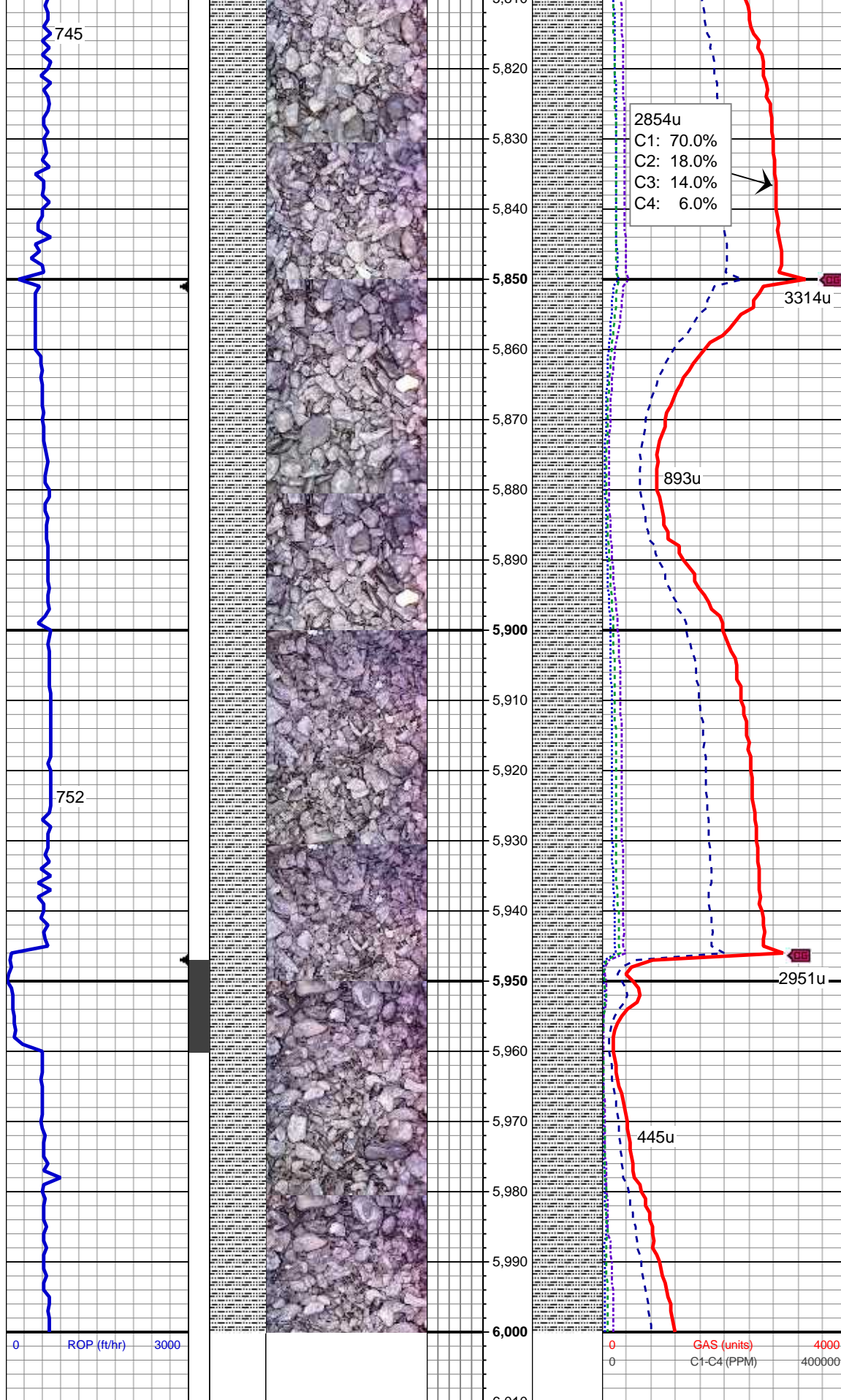
100% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty

MD: 5,654 '
TVD: 5,557.3 '
Inclination: 1.43 °
Azimuth: 143.27 °
VS: -260.76 '

MUD WT 9.1 VIS 29

100% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty

MD: 5,750 '
TVD: 5,653.29 '
Inclination: 0.34 °
Azimuth: 175.18 °
VS: -261.19 '



100% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty

MD: 5,845 '
TVD: 5,748.28 '
Inclination: 1.17 °
Azimuth: 222.26 °
VS: -260.35 '

MD: 5,940 '
TVD: 5,843.27 '
Inclination: 0.19 °
Azimuth: 239.96 °
VS: -259.39 '

100% SLTY SH: m-dk gy occ gy brn,
plty - sb plty firm-sl sft, rthy-sl slty

MUD WT 9.0+ VIS 28

TD Vertical @ 6000'
MD 0324 hrs 1/01/2014

TOOH For Directional BHA

Thank You For Choosing
Columbine Logging Inc.