

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Rainbow LC28-78-1HNA(VERT)

Location SESW SEC 28, T9N, R59W

State COLORADO

County WELD

Country USA

Rig Number H&P 326

API Number 05-123-38848

Field WILDCAT

Region DJ BASIN

Drilling Completed 8/26/2014

Spud Date 8/21/2014

Surface Coordinates SESW SEC 28, T9N, R59W
340' FSL, 1430'FWL
40.71499
-103.98724

Ground Elevation 4853

K.B. Elevation 4883

Logged Interval 640' **To** 10339'

Total Depth 10339'

Formation NIOBRARA-A MARL

Type of Drilling Fluid LSND

Other Symbols

Oil Show

- DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

Porosity

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

- MOLDIC
- ORGANIC
- PINPOINT
- VUGGY

Engineering

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

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

- WIRELINE TESTED - LEFT
- WIRELINE TESTED - RT

Rounding

- ANGULAR
- ROUNDED
- SUBANG
- SUBRND

Textures

- BOUNDSTONE
- CHALKY
- CRYPTOXLN

- E EARTHY
- FINELYXLN
- GRAINSTONE
- L LITHOGRAPHIC
- MICROXLN
- MUDSTONE
- PACKSTONE
- WACKESTONE

Sorting

- MODERATE
- POOR
- WELL

Zone Color Coding

- Oil
- Condensate
- Gas
- Note
- Core
- Pressure
- Error
- Water
- Seal

Accessories

Fossils

- ALGAE
- AMPHIPORA
- BELEMNITE

- FOSSIL
- GASTROPOD
- INOCERAMUS
- OOLITE
- OSTRACOD

- ANHYDRITIC
- ARGILLACEOUS
- ARGILLITE GRAIN
- BENTONITE
- BITUMENOUS SUBSTANCE

- FERRUGINOUS
- GLAUCONITE
- GYPSEFEROUS
- HEAVY MINERAL
- KAOLIN

- TUFFACEOUS

Stringer

- ANHYDRITE STRINGER
- BENTONITE STRINGER

🐚 BIOCLASTIC
🐙 BRACHIOPOD
🐙 BRYOZOA
🐙 CEPHALOPOD
🐙 CORAL
🐙 CRINOID
🐙 ECHINOID
🐙 FISH
🐙 FORAMINIFERA

🐙 PELECYPOD
🐙 PELLET
🐙 PISOLITE
🐙 PLANT REMAINS
🐙 PLANT SPORES
🐙 SCAPHOPOD
🐙 STROMATOPOROID

Minerals

🐙 BRECCIA FRAGMENTS
⬇️ CALCAREOUS
■ CARBONACEOUS FLAKES
⬆️ CHTDK
⬆️ CHTLT
— COAL - THIN BEDS
⬆️ DOLOMITIC
+ FELDSPAR
● FERRUGINOUS PELLET

⌘ MARLSTONE
✂️ MINERAL CRYSTALS
🐙 NODULES
🐙 PHOSPHATE PELLETS
P PYRITE
🐙 SALT CAST
+ SANDY
⬆️ SILICEOUS
+ SILTY

— 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
🐙 GRANITE
🐙 GYPSUM
🐙 IGNEOUS
🐙 LIMESTONE
🐙 SIDERITE or LIMONITE
🐙 MARLSTONE

🐙 METAMORPHIC
X X X X X X 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 Suite 2200
Denver, CO 80202

Geologist

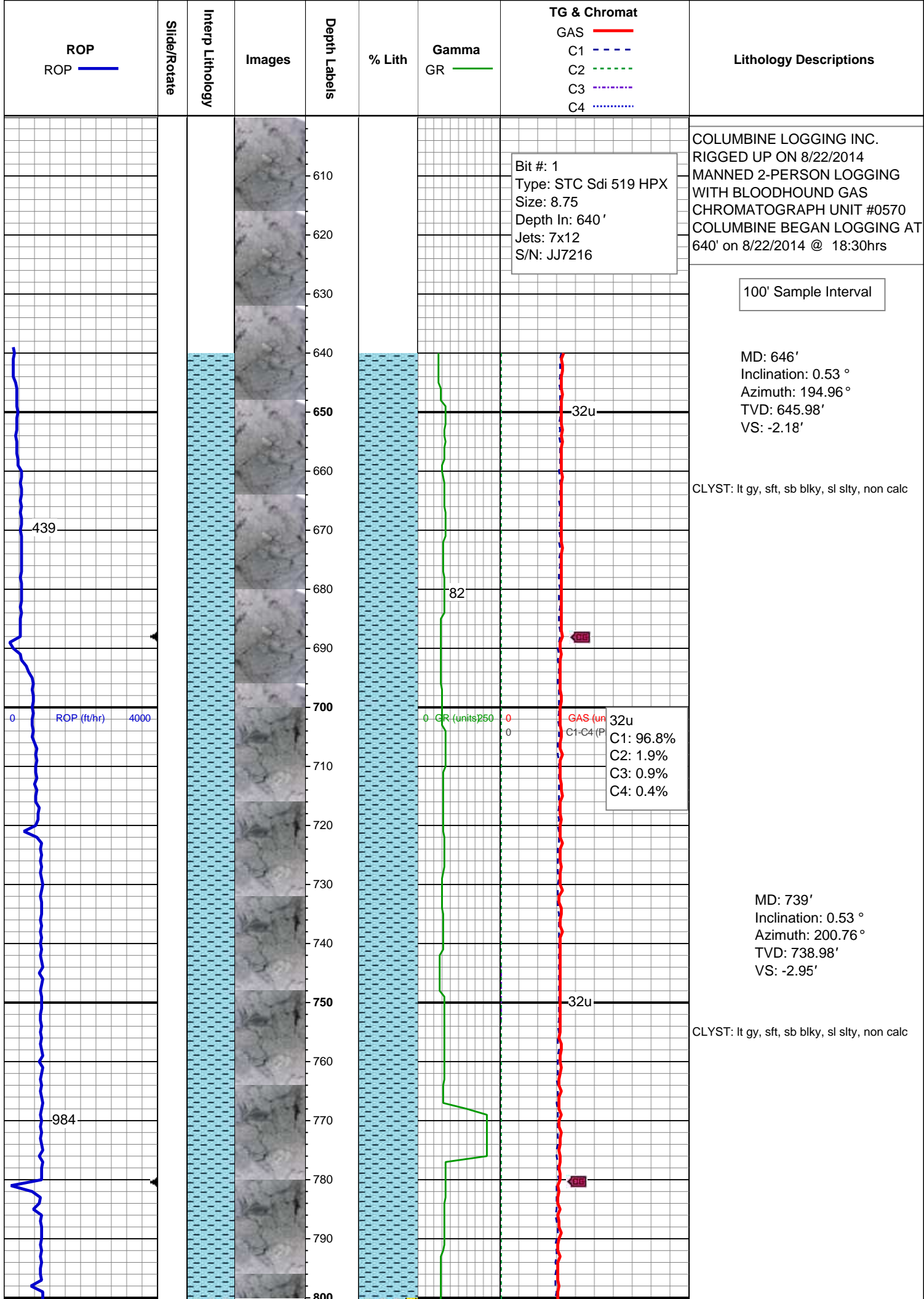
Name EVAN HOWELL

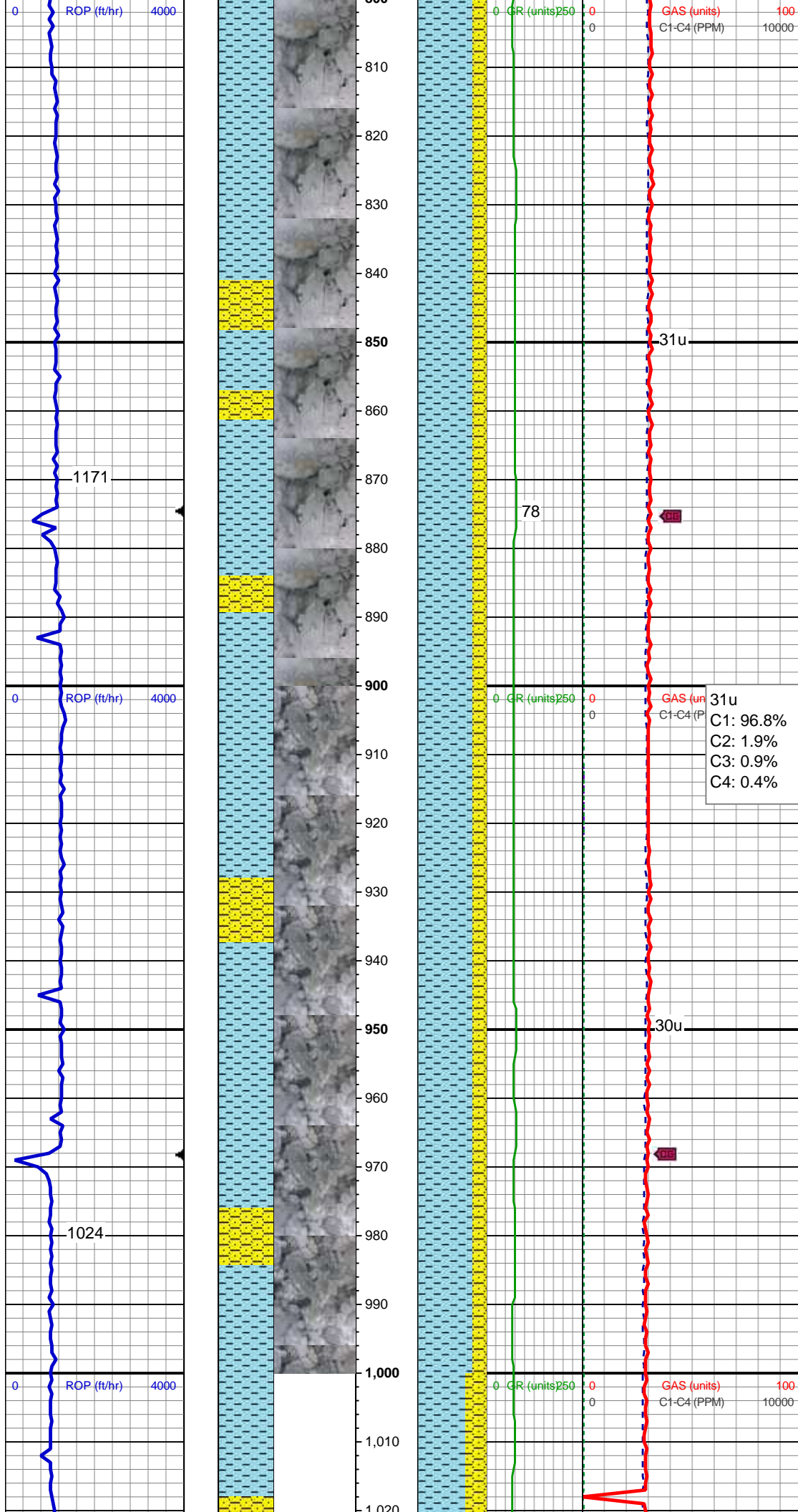
Company NOBLE ENERGY INC.

Address 1625 Broadway Suite 2200
Denver, CO 80202

Other

COLUMBINE LOGGING INC. MIKE KERSCHEN





MD: 832'
Inclination: 0.44 °
Azimuth: 218.69 °
TVD: 831.98'
VS: -3.58'

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

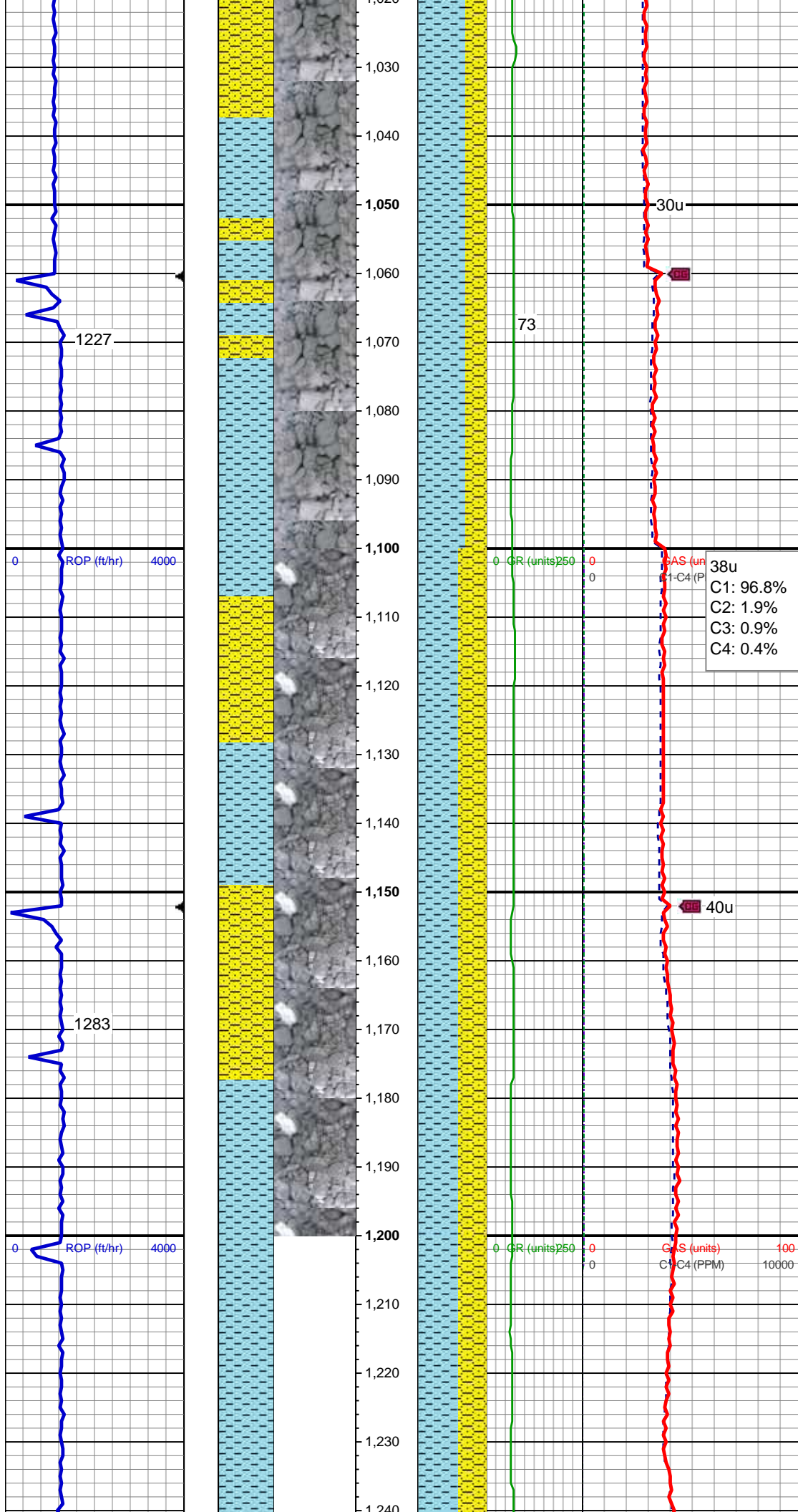
31u
C1: 96.8%
C2: 1.9%
C3: 0.9%
C4: 0.4%

MD: 926'
Inclination: 0.35 °
Azimuth: 206.74 °
TVD: 925.97'
VS: -4.07'

Mud Wt: 8.6 / 29 Vis

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

MD: 1,017'
Inclination: 0.18 °
Azimuth: 191.44 °
TVD: 1,016.97'



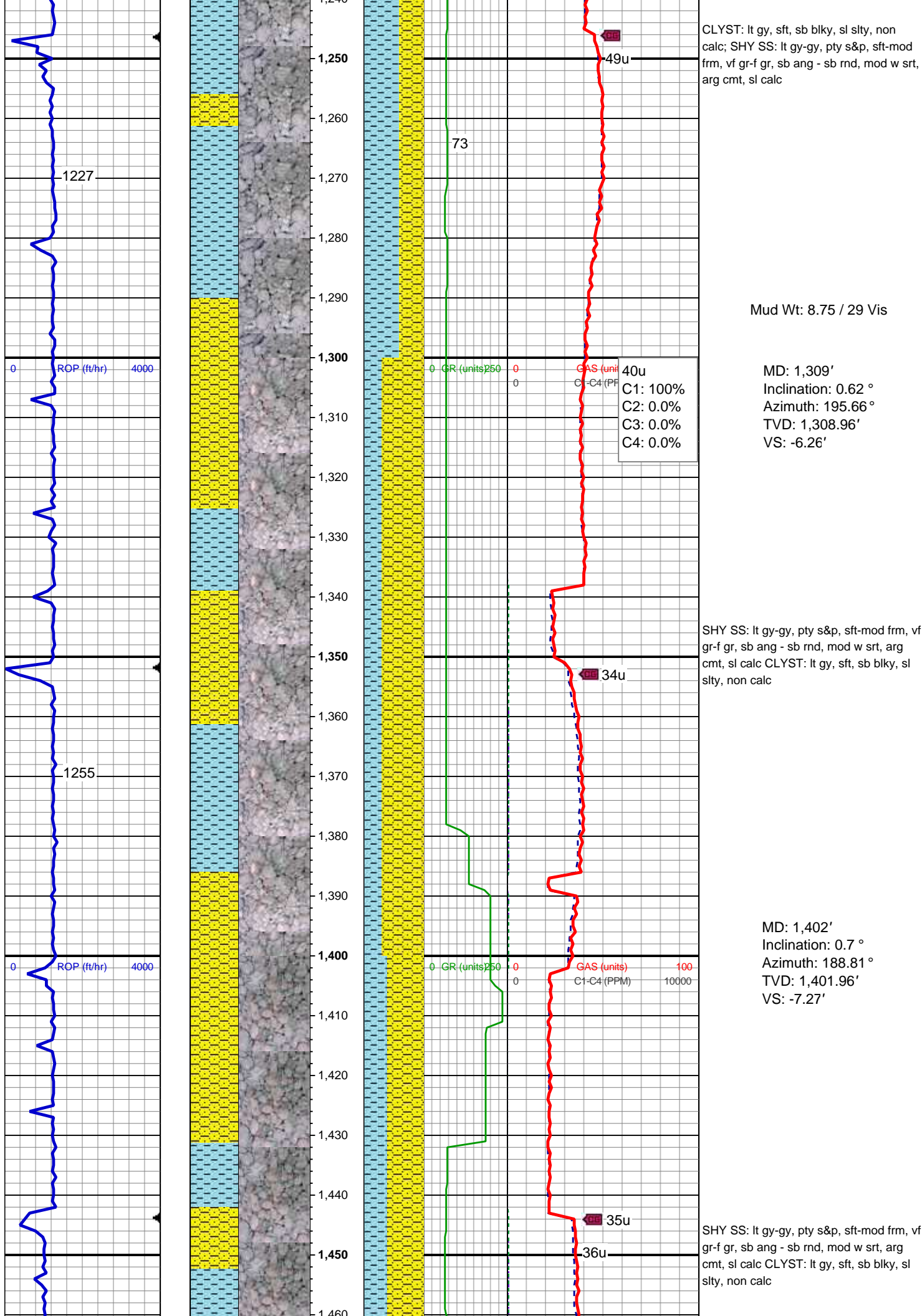
VS: -4.44'

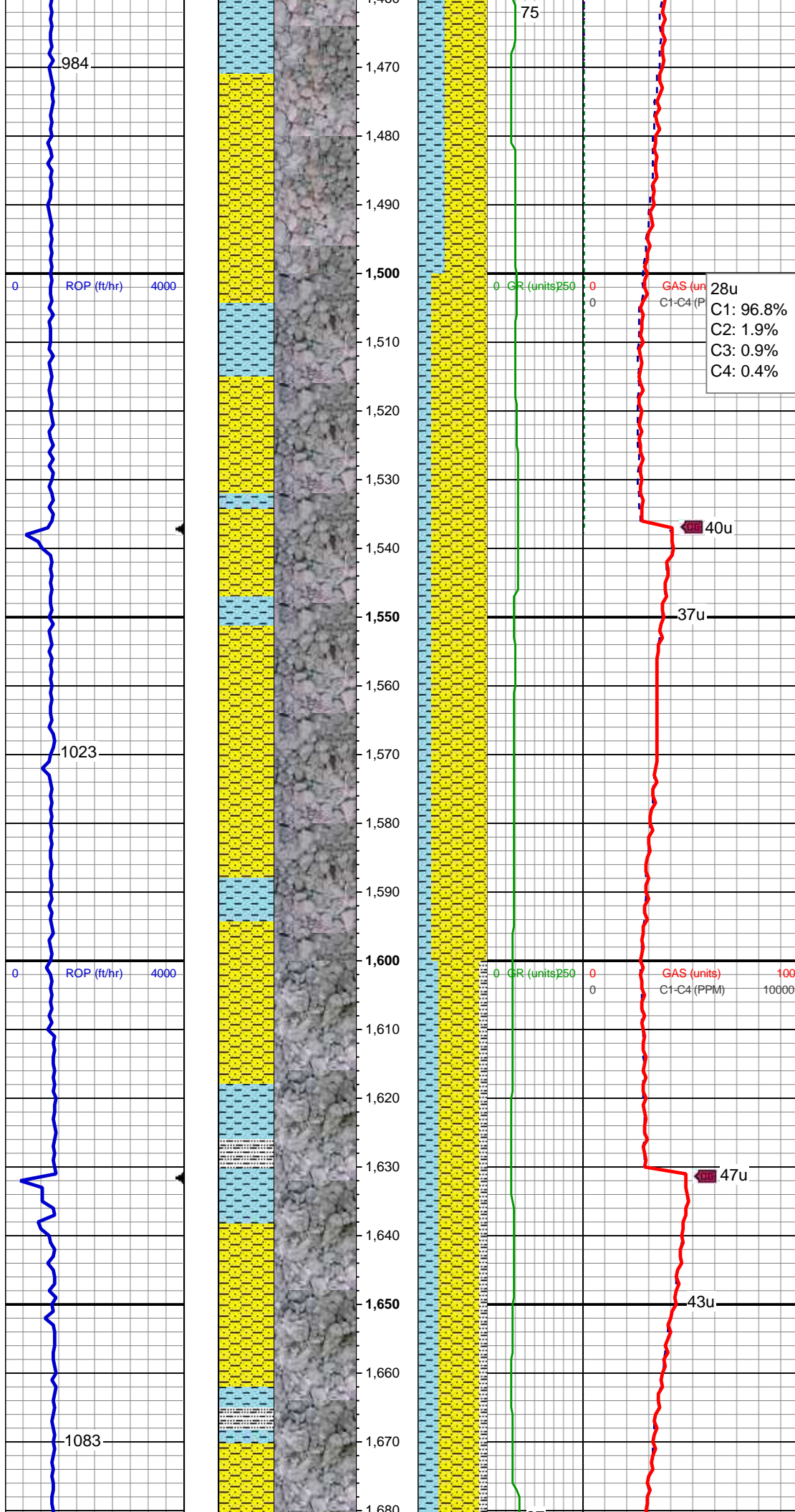
CLYST: lt gy, sft, sb blkly, sl slty, non
calc; SHY SS: lt gy-gy, pty s&p, sft-mod
frm, vf gr-f gr, sb ang - sb rnd, mod w srt,
arg cmt, sl calc

MD: 1,110'
Inclination: 0.7 °
Azimuth: 231.35 °
TVD: 1,109.97'
VS: -4.88'

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

MD: 1,201'
Inclination: 0.44 °
Azimuth: 216.05 °
TVD: 1,200.97'
VS: -5.42'





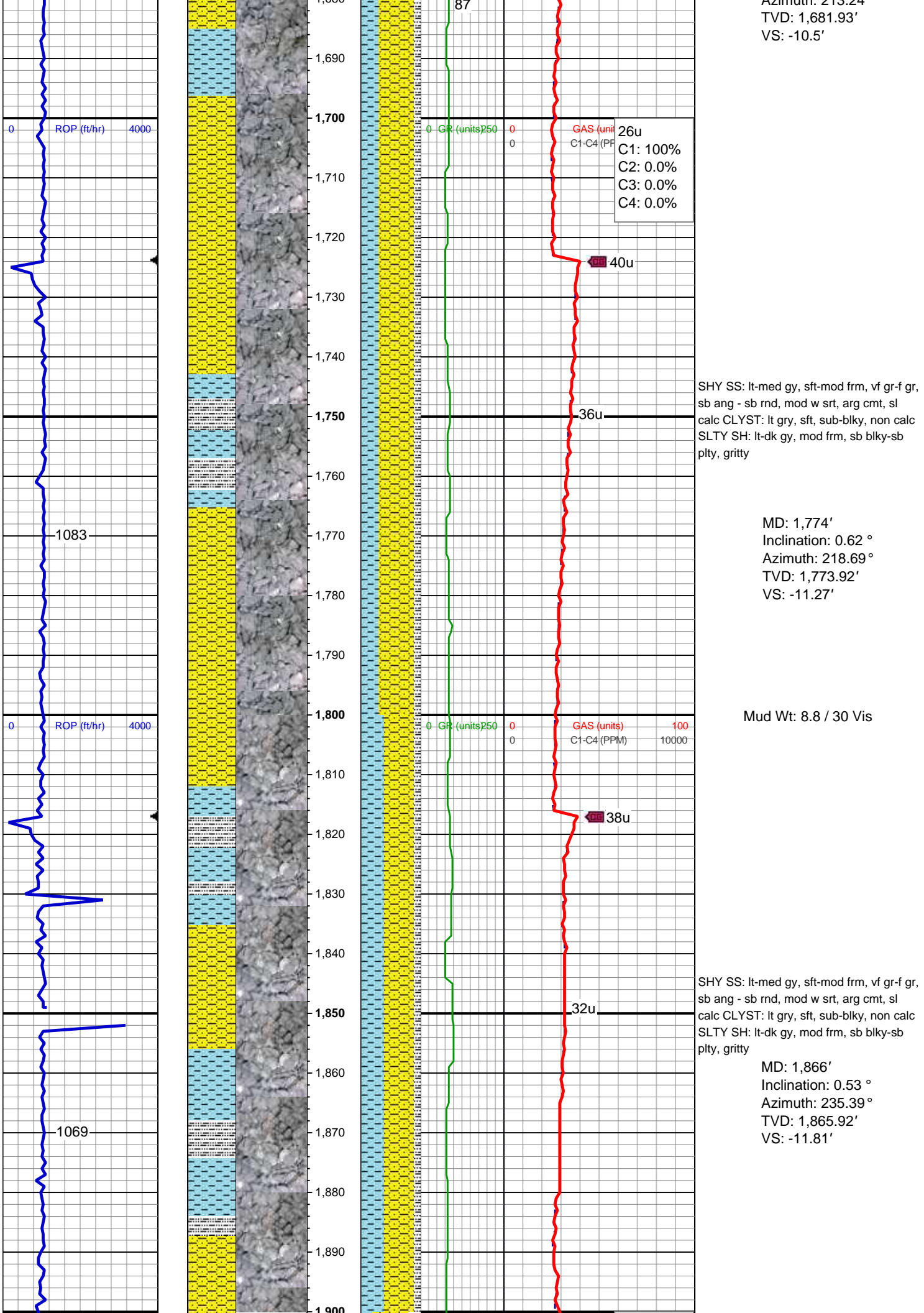
MD: 1,495'
Inclination: 0.7 °
Azimuth: 197.77 °
TVD: 1,494.95'
VS: -8.34'

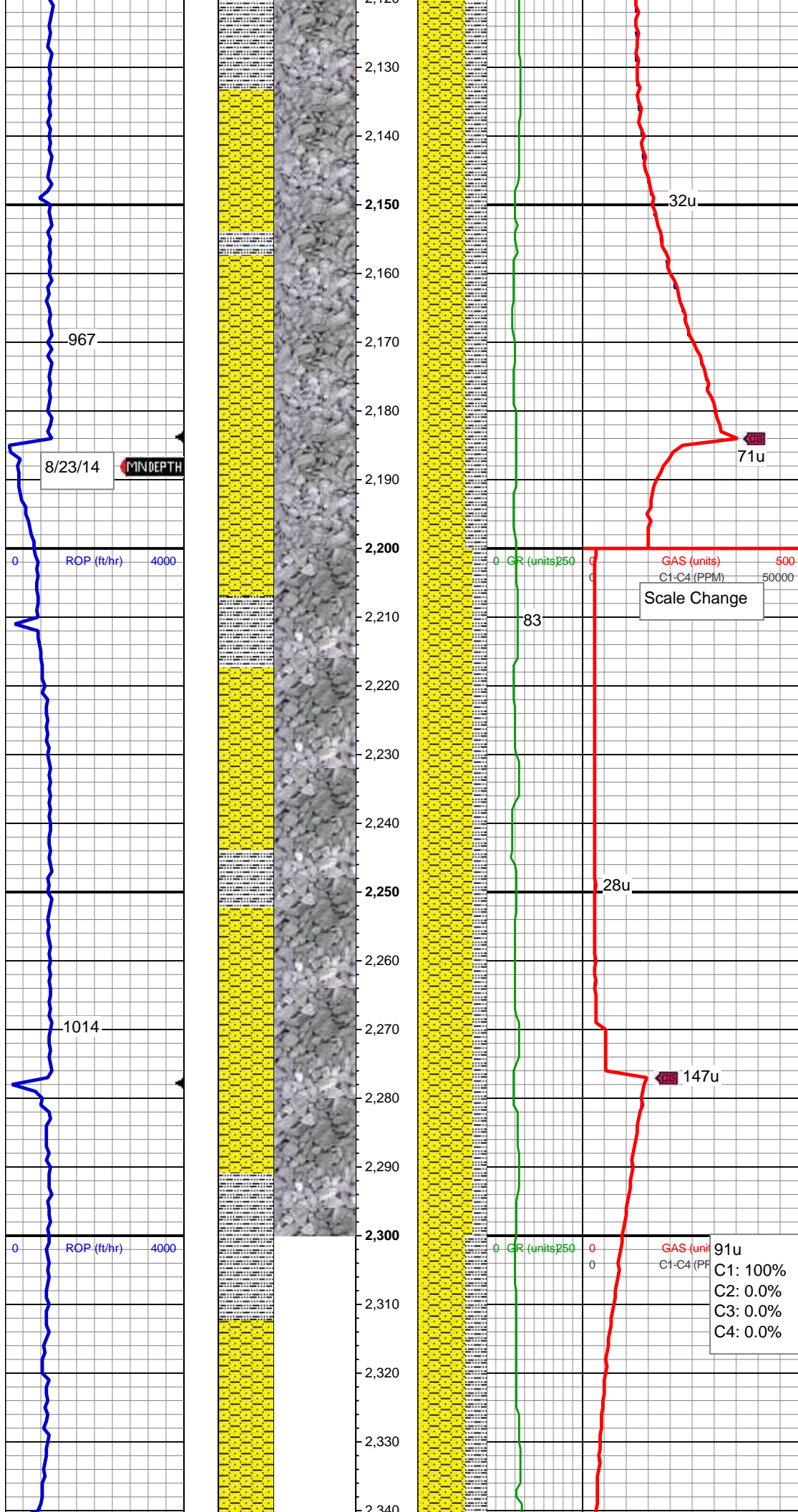
SHY SS: lt gy-gy, pty s&p, sft-mod frm, vf
gr-f gr, sb ang - sb rnd, mod w srt, arg
cmt, sl calc CLYST: lt gy, sft, sb blkly, sl
silty, non calc

MD: 1,588'
Inclination: 0.88 °
Azimuth: 205.68 °
TVD: 1,587.94'
VS: -9.45'

SHY SS: lt-med gy, sft-mod frm, 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, mod frm, sb blkly-sb
plty, gritty

MD: 1,682'
Inclination: 0.7 °
Azimuth: 212.24 °





MD: 2,142'
Inclination: 0.7 °
Azimuth: 260.17 °
TVD: 2,141.9'
VS: -11.94'

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-mod 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

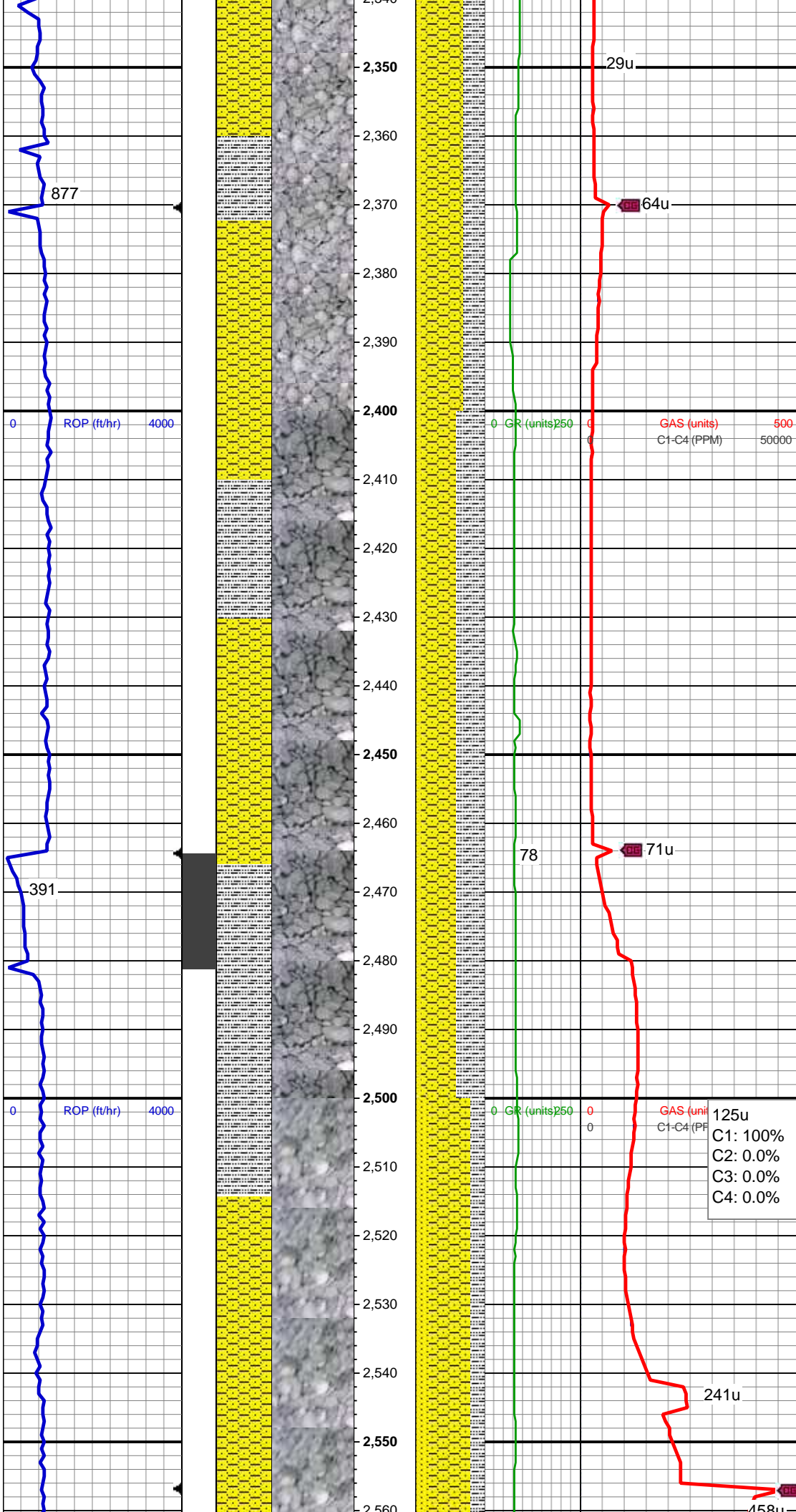
MD: 2,236'
Inclination: 4.92 °
Azimuth: 238.73 °
TVD: 2,235.77'
VS: -13.62'

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-mod 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

MD: 2,328'
Inclination: 4.66 °
Azimuth: 235.92 °
TVD: 2,327.44'
VS: -16.93'

Scale Change

91u
C1: 100%
C2: 0.0%
C3: 0.0%
C4: 0.0%



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-mod 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

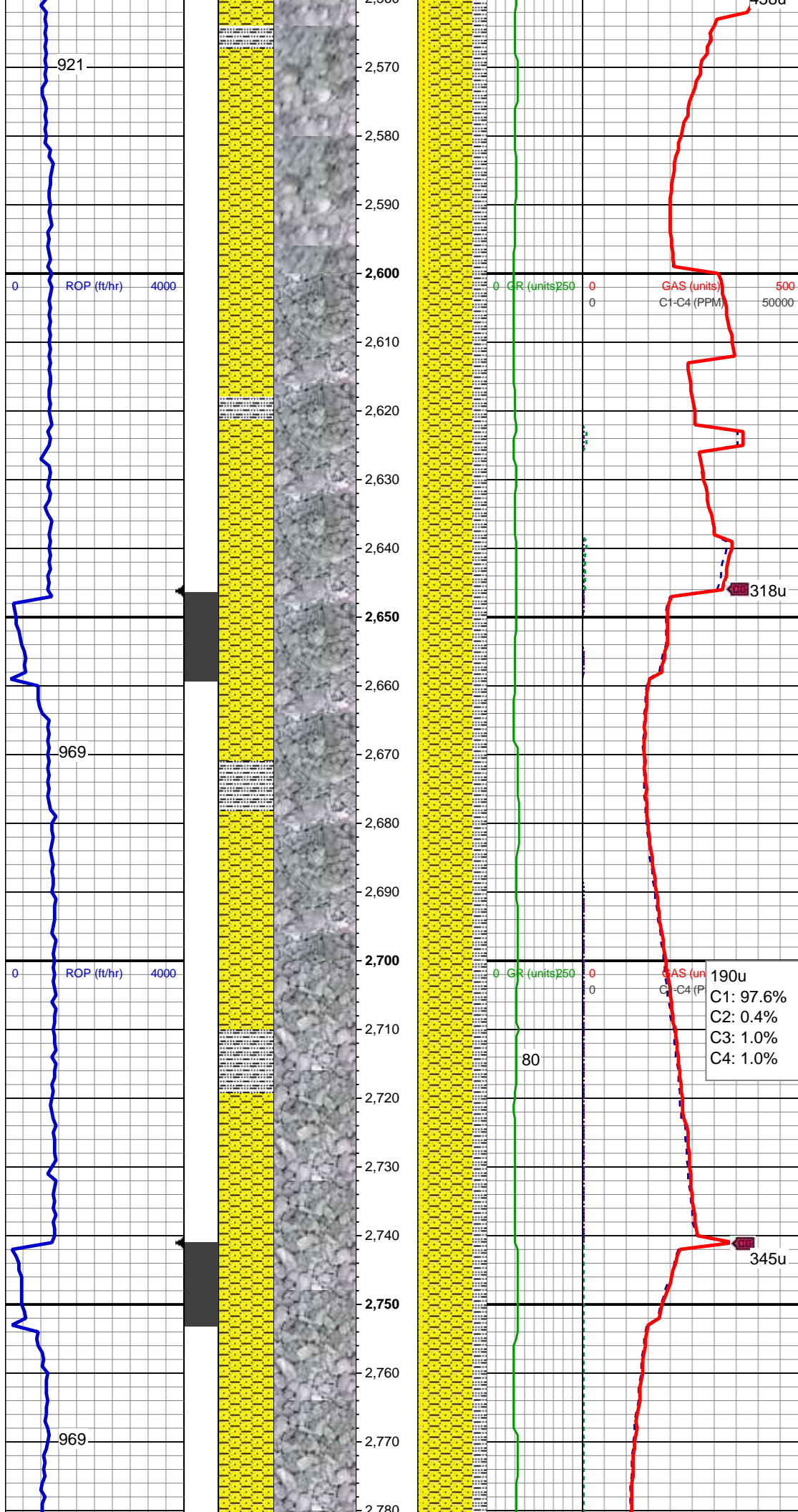
Mud Wt: 8.85 /30 Vis

MD: 2,421'
Inclination: 4.57 °
Azimuth: 233.46 °
TVD: 2,420.14'
VS: -20.47'

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-mod 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

MD: 2,512'
Inclination: 6.77 °
Azimuth: 247.17 °
TVD: 2,510.7'
VS: -36.4'

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-mod 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



MD: 2,605'
Inclination: 7.12 °
Azimuth: 245.76 °
TVD: 2,603.01'
VS: -46.71'

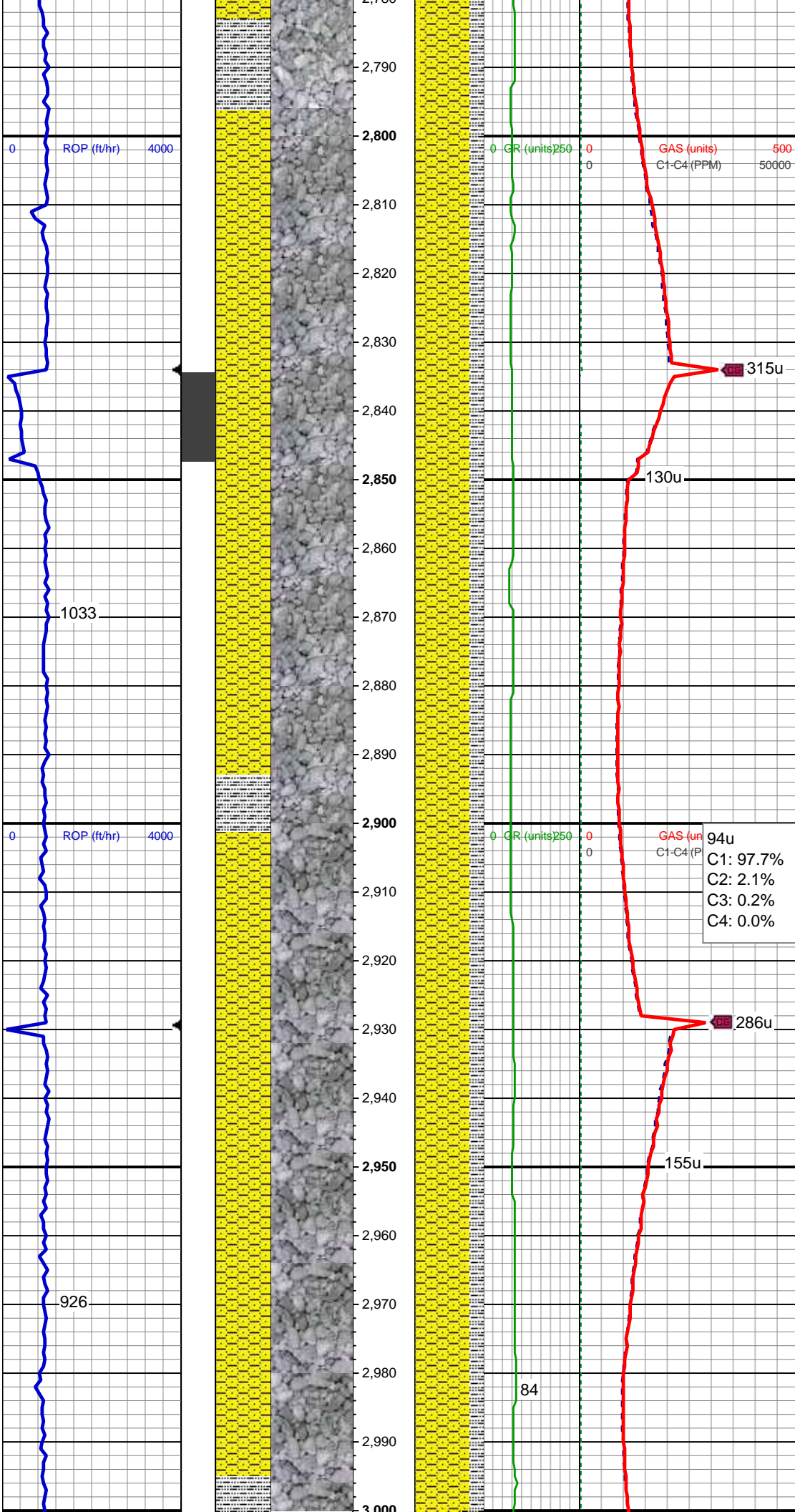
Mud Wt: 9.0 / 30 Vis

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-mod frm, sb blkly-sb
plty, gritty SS:lt-gy, frm,vf gr-f gr, rare
med grns, sb ang-sb rnd, mod w srt

MD: 2,698'
Inclination: 8.71 °
Azimuth: 245.59 °
TVD: 2,695.12'
VS: -58.38'

C1: 97.6%
C2: 0.4%
C3: 1.0%
C4: 1.0%

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-mod frm, sb blkly-sb
plty, gritty SS:lt-gy, frm,vf gr-f gr, rare
med grns, sb ang-sb rnd, mod w srt



MD: 2,790'
Inclination: 10.2 °
Azimuth: 236.27 °
TVD: 2,785.88'
VS: -71.5'

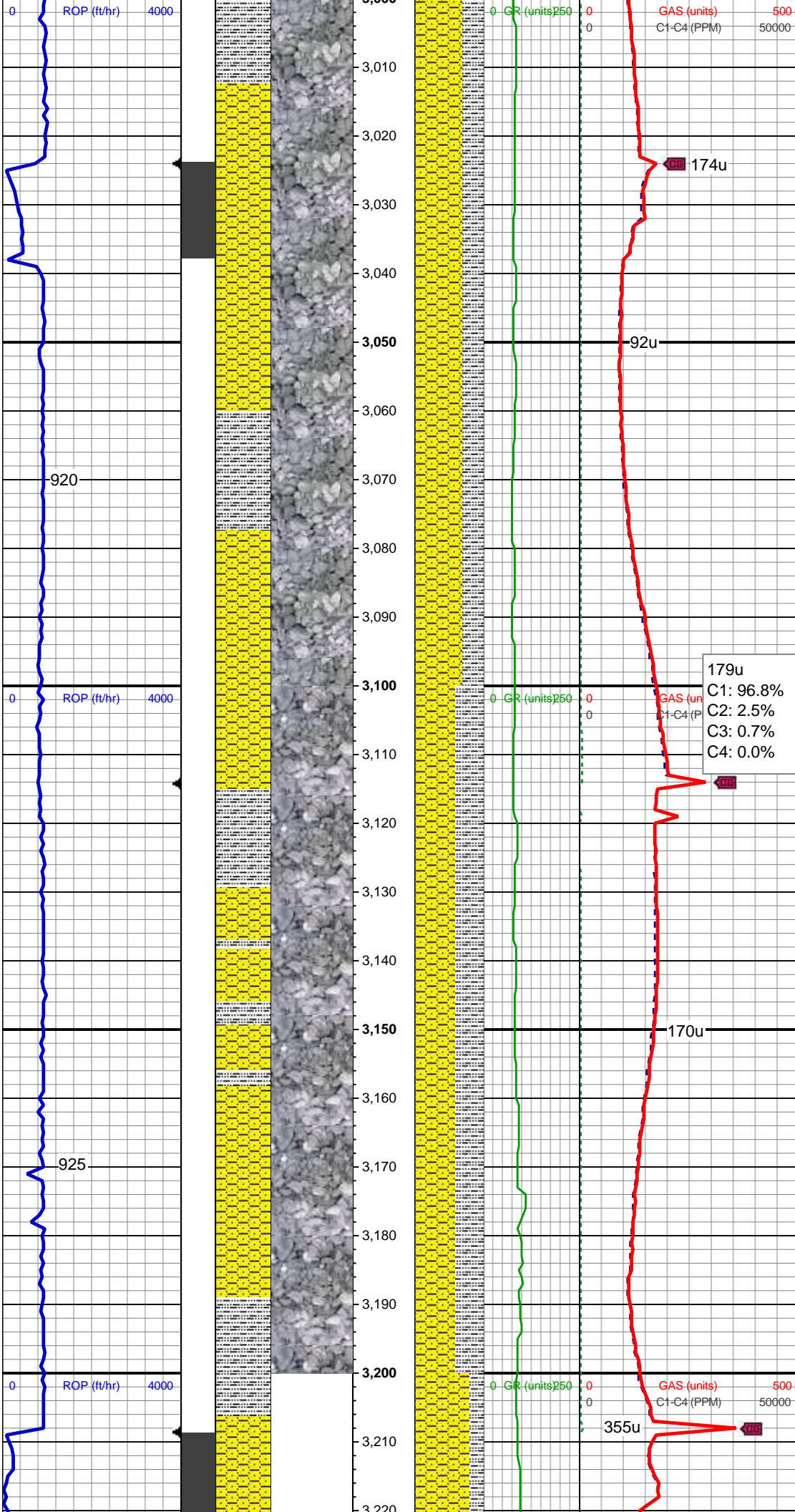
SHY SS: lt-med gy, sft frm, vf gr-f gr, sb
ang - sb rnd, mod w srt, arg cmt, sl calc
SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb
pity, gritty

MD: 2,883'
Inclination: 11.78 °
Azimuth: 234.69 °
TVD: 2,877.17'
VS: -86.1'

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-mod frm, sb blk-y-sb
pity, gritty

MD: 2,977'
Inclination: 11.52 °
Azimuth: 232.58 °
TVD: 2,969.23'
VS: -101.38'

Mud Wt: 9.2 / 22 Vic



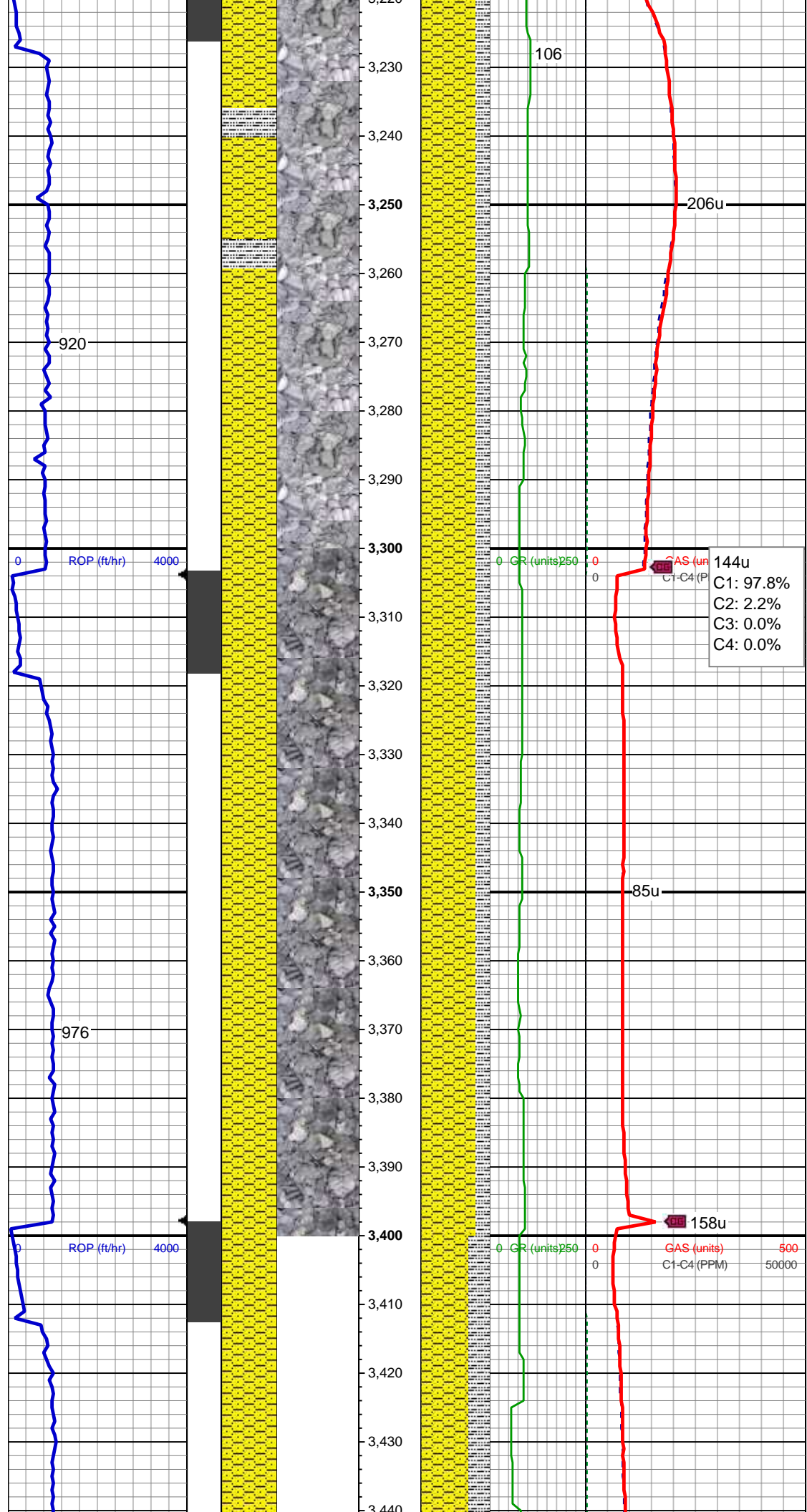
SHY SS: lt-med gy, sft frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc
SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty

MD: 3,072'
Inclination: 13.37 °
Azimuth: 226.07 °
TVD: 3,062'
VS: -116.83'

179u
C1: 96.8%
C2: 2.5%
C3: 0.7%
C4: 0.0%

SHY SS: lt-med gy, sft-mod frm, 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: 3,166'
Inclination: 12.4 °
Azimuth: 225.72 °
TVD: 3,153.63'
VS: -131.88'



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-mod frm, sb blk-y-sb pty, gritty

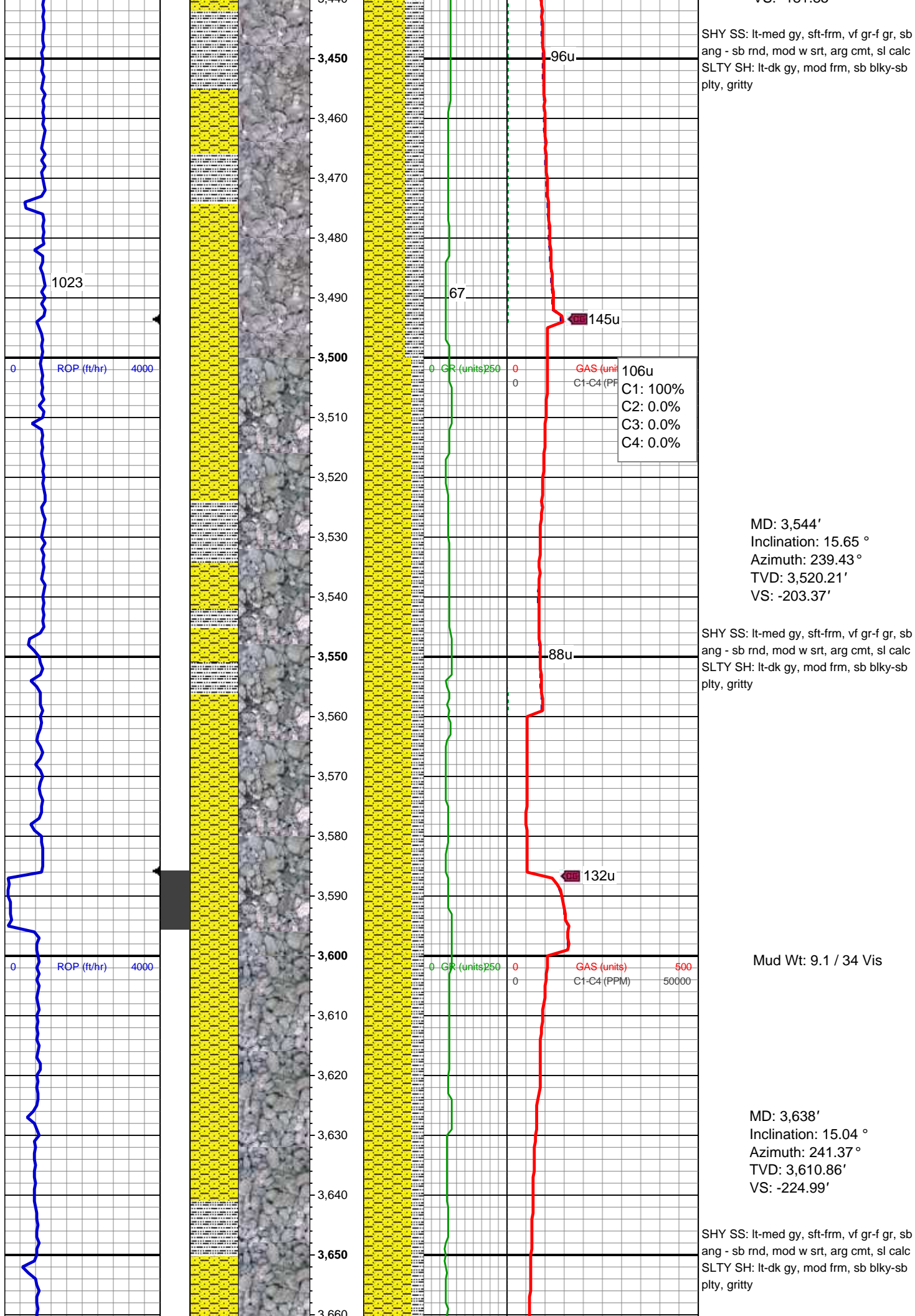
MD: 3,260'
Inclination: 13.37 °
Azimuth: 221.68 °
TVD: 3,245.27'
VS: -146.33'

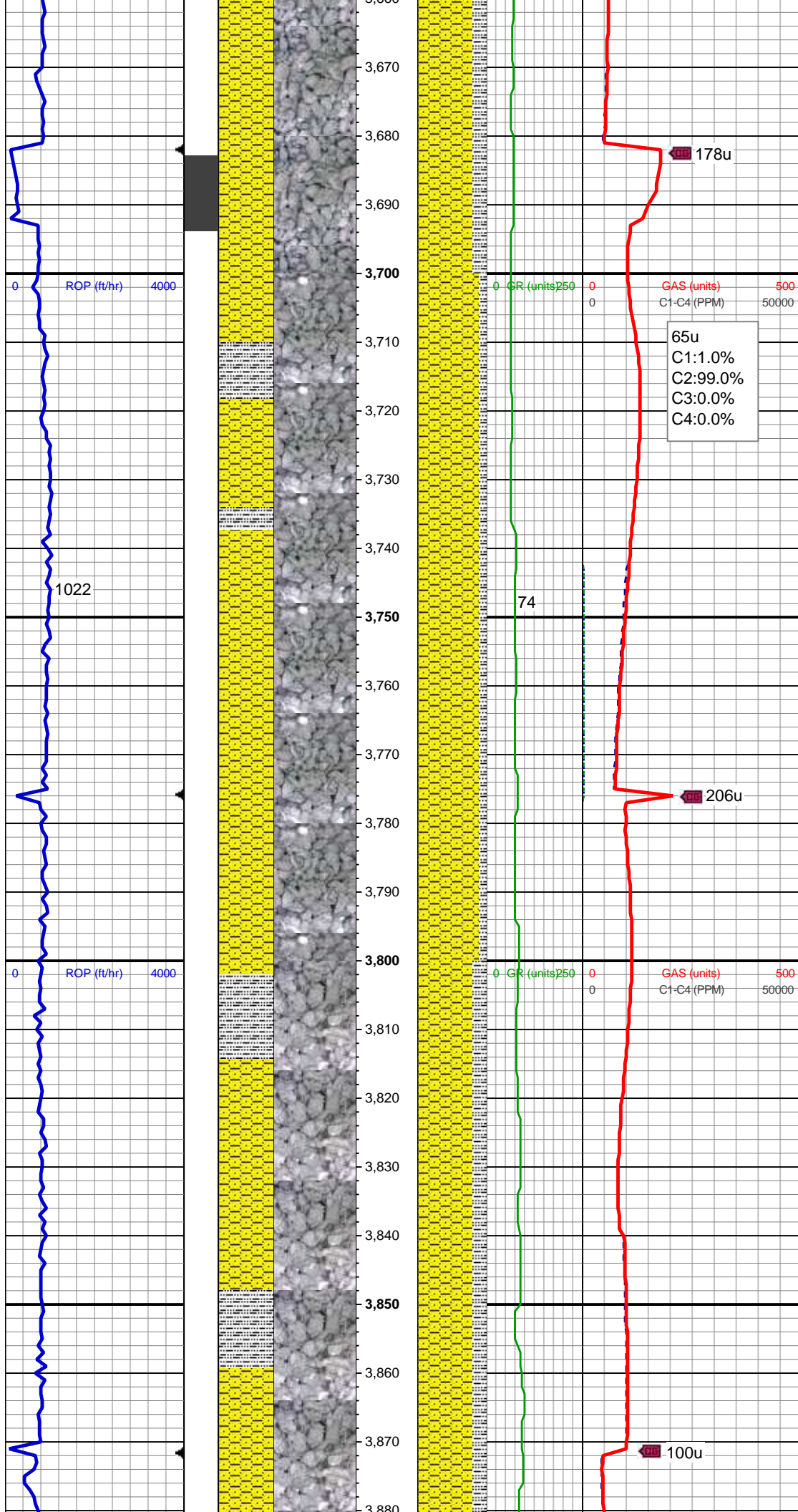
Mud Wt: 9.3 / 33 Vis

SHY SS: lt-med gy, sft-mod frm, 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 pty, gritty

MD: 3,355'
Inclination: 14.16 °
Azimuth: 230.47 °
TVD: 3,337.55'
VS: -162.6'

MD: 3,449'
Inclination: 14.86 °
Azimuth: 239.43 °
TVD: 3,428.56'
VS: -181.85'



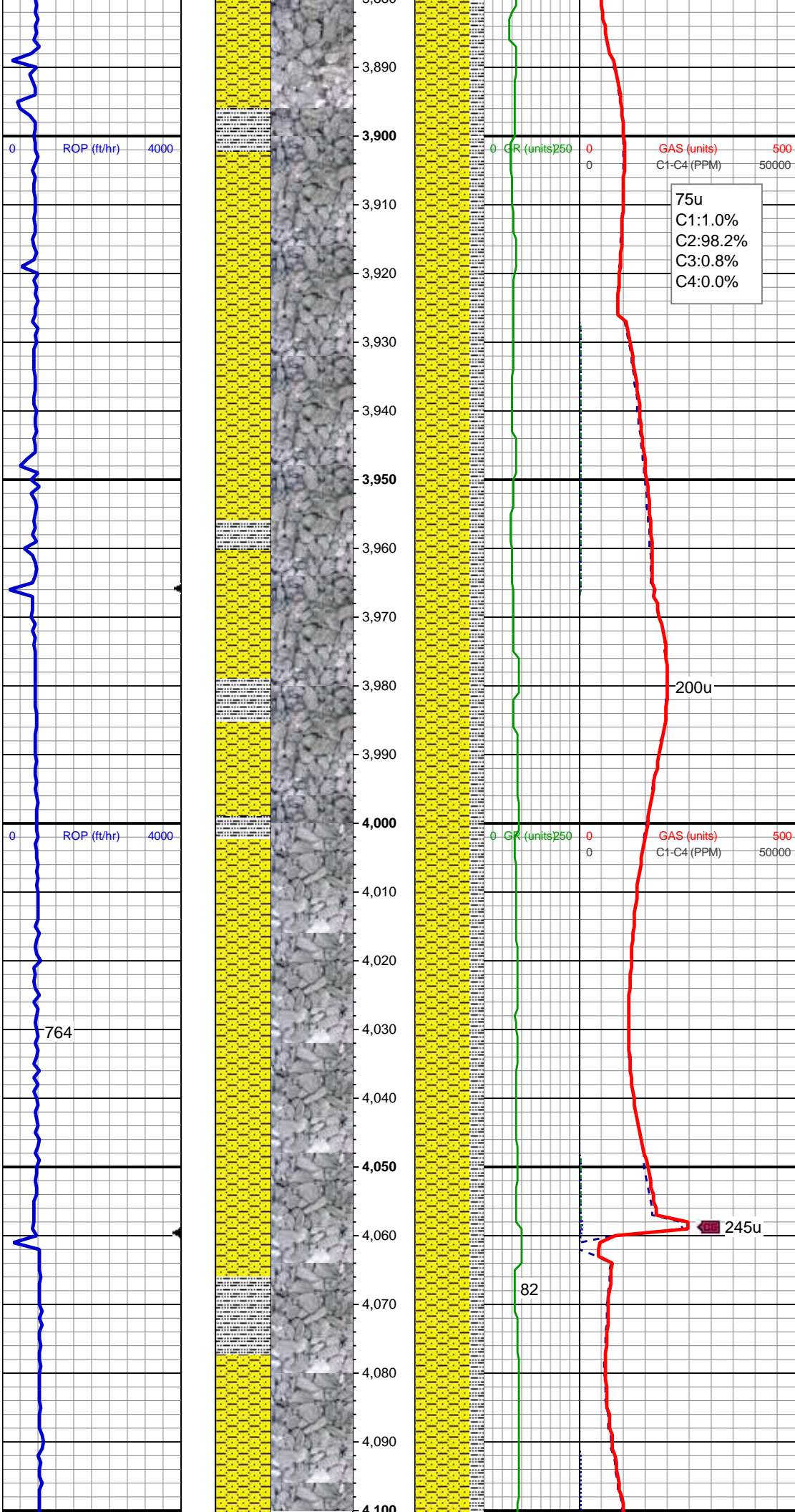


MD: 3,733'
Inclination: 13.63 °
Azimuth: 245.23 °
TVD: 3,702.9'
VS: -245.98'

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, mod frm, sb blk-y-sb
ply, gritty

MD: 3,827'
Inclination: 13.81 °
Azimuth: 245.23 °
TVD: 3,794.22'
VS: -266.22'

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, mod frm, sb blk-y-sb
ply, gritty



MD: 3,922'
Inclination: 13.98 °
Azimuth: 243.65 °
TVD: 3,886.44'
VS: -286.8'

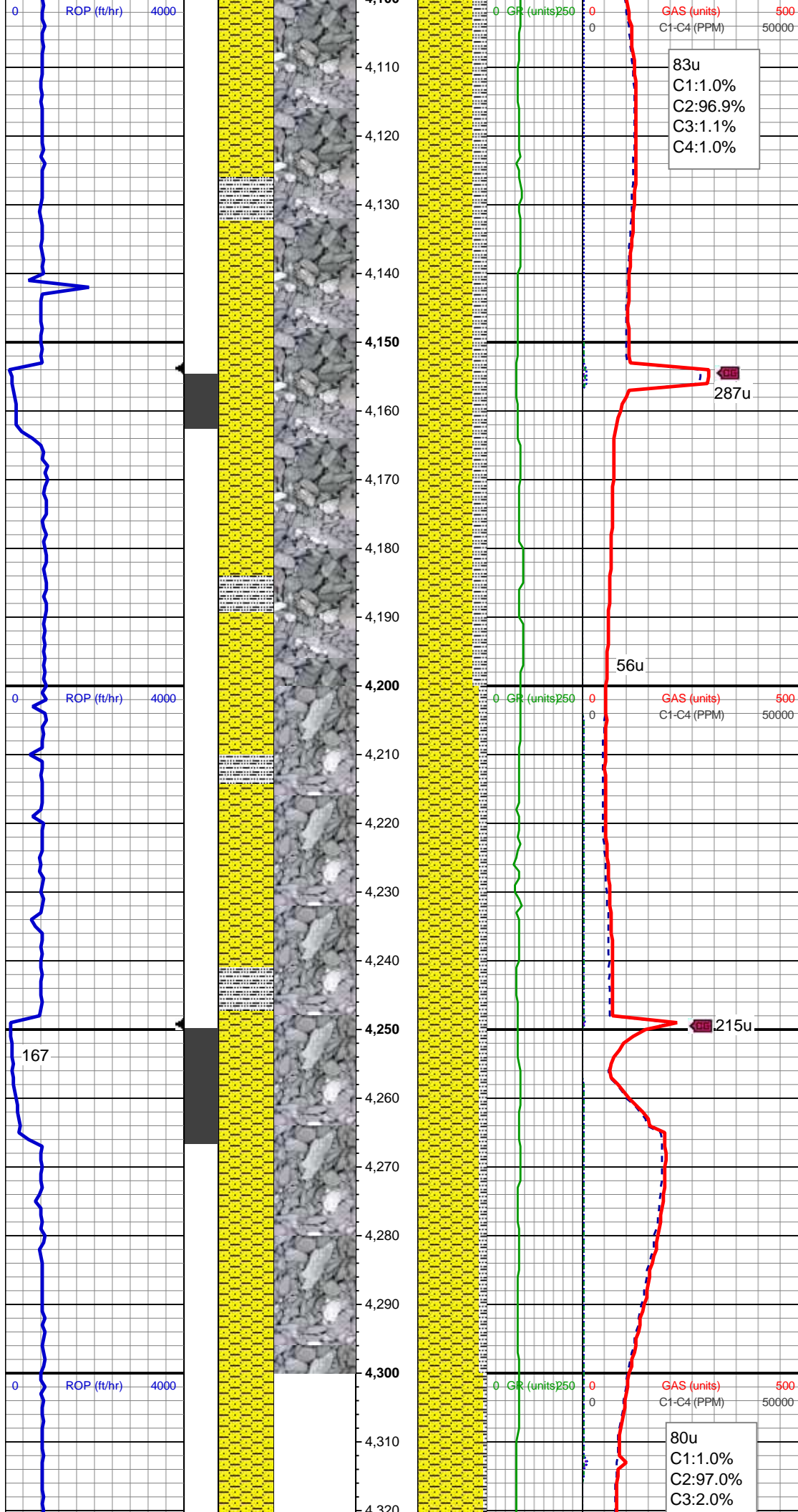
Mud Wt: 9.1 / 34 Vis

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, mod frm, sb blk-y-sb
ppty, gritty

MD: 4,016'
Inclination: 14.16 °
Azimuth: 244.35 °
TVD: 3,977.62'
VS: -307.34'

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, mod frm, sb blk-y-sb
ppty, gritty

Mud Wt: 8.8 / 30 Vis



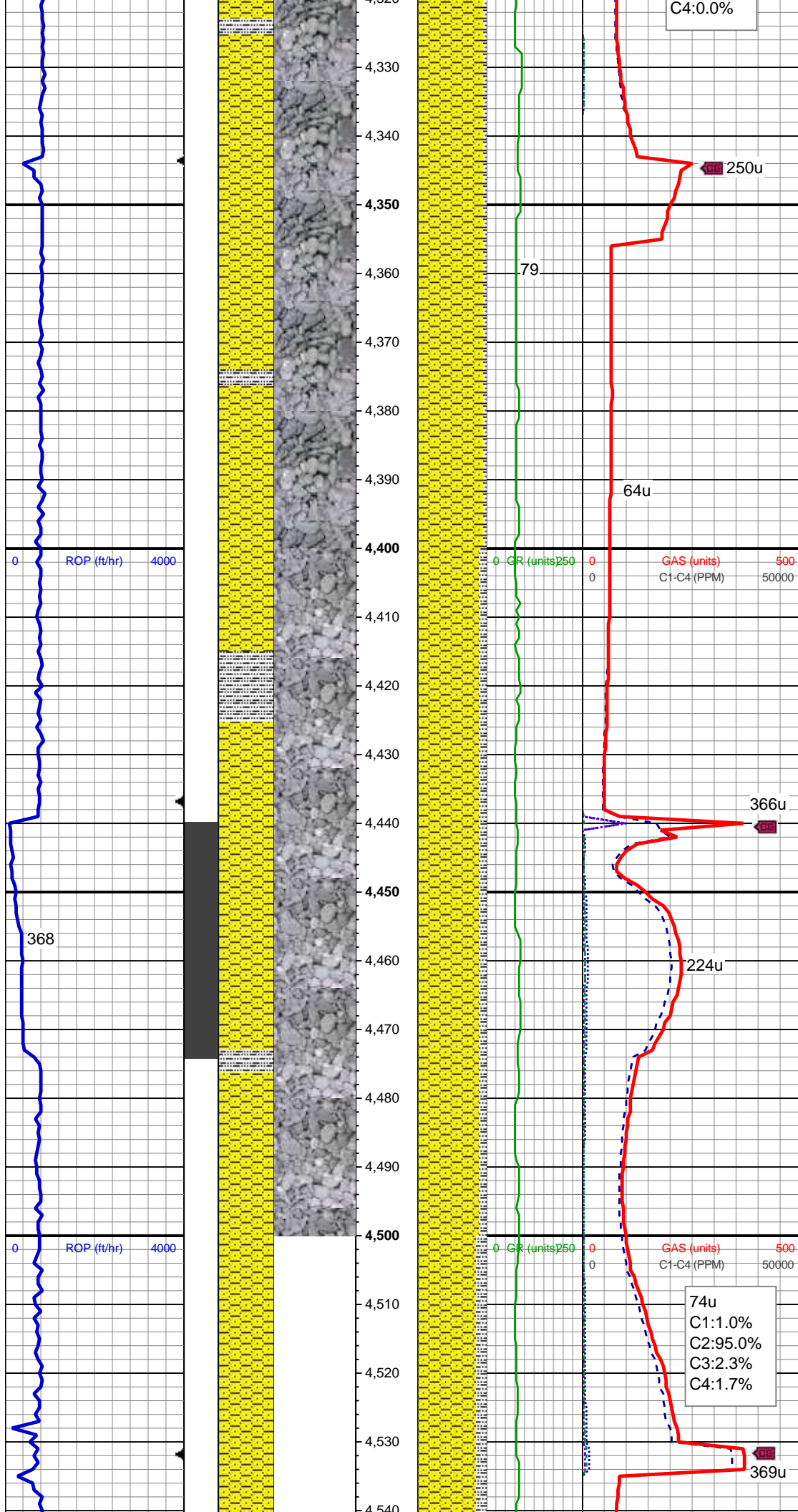
MD: 4,110'
Inclination: 13.1 °
Azimuth: 244.18 °
TVD: 4,068.97'
VS: -327.29'

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, mod frm, sb blk-y-sb
pity, gritty

MD: 4,205'
Inclination: 12.93 °
Azimuth: 240.84 °
TVD: 4,161.53'
VS: -346.27'

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, mod frm, sb blk-y-sb
pity, gritty

MD: 4,299'
Inclination: 10.82 °
Azimuth: 230.29 °
TVD: 4,253.53'
VS: -362.24'

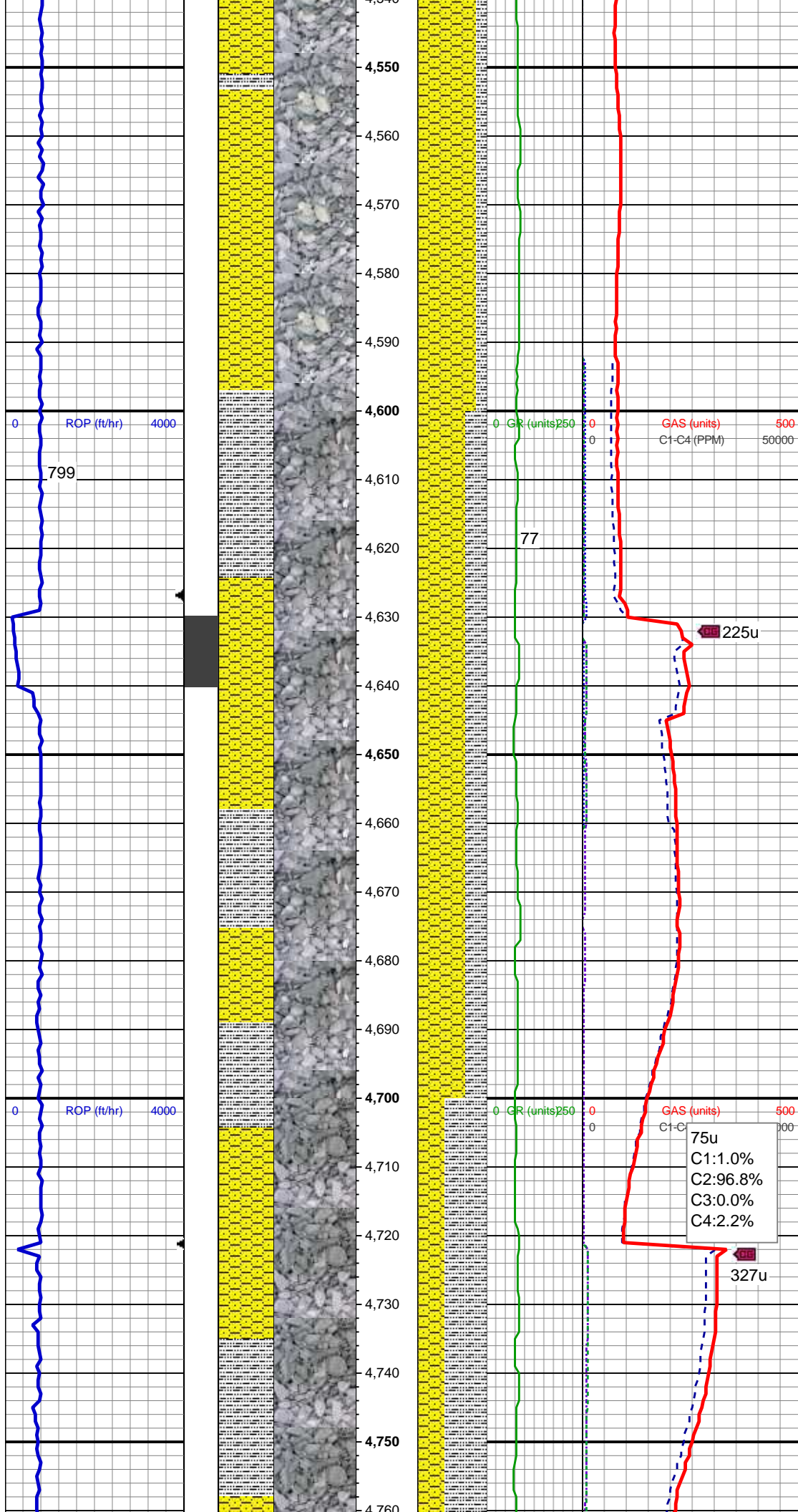


SHY SS: lt-med gy, sft frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc
SLTY SH: lt-dk gy, mod frm, sb blk-y-sb pty, gritty

MD: 4,394'
Inclination: 10.29 °
Azimuth: 229.94 °
TVD: 4,346.92'
VS: -375.6'

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, mod frm, sb blk-y-sb pty, gritty

MD: 4,488'
Inclination: 7.65 °
Azimuth: 229.06 °
TVD: 4,439.76'
VS: -386.75'



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, mod frm, sb blk-y-sb
plty, gritty

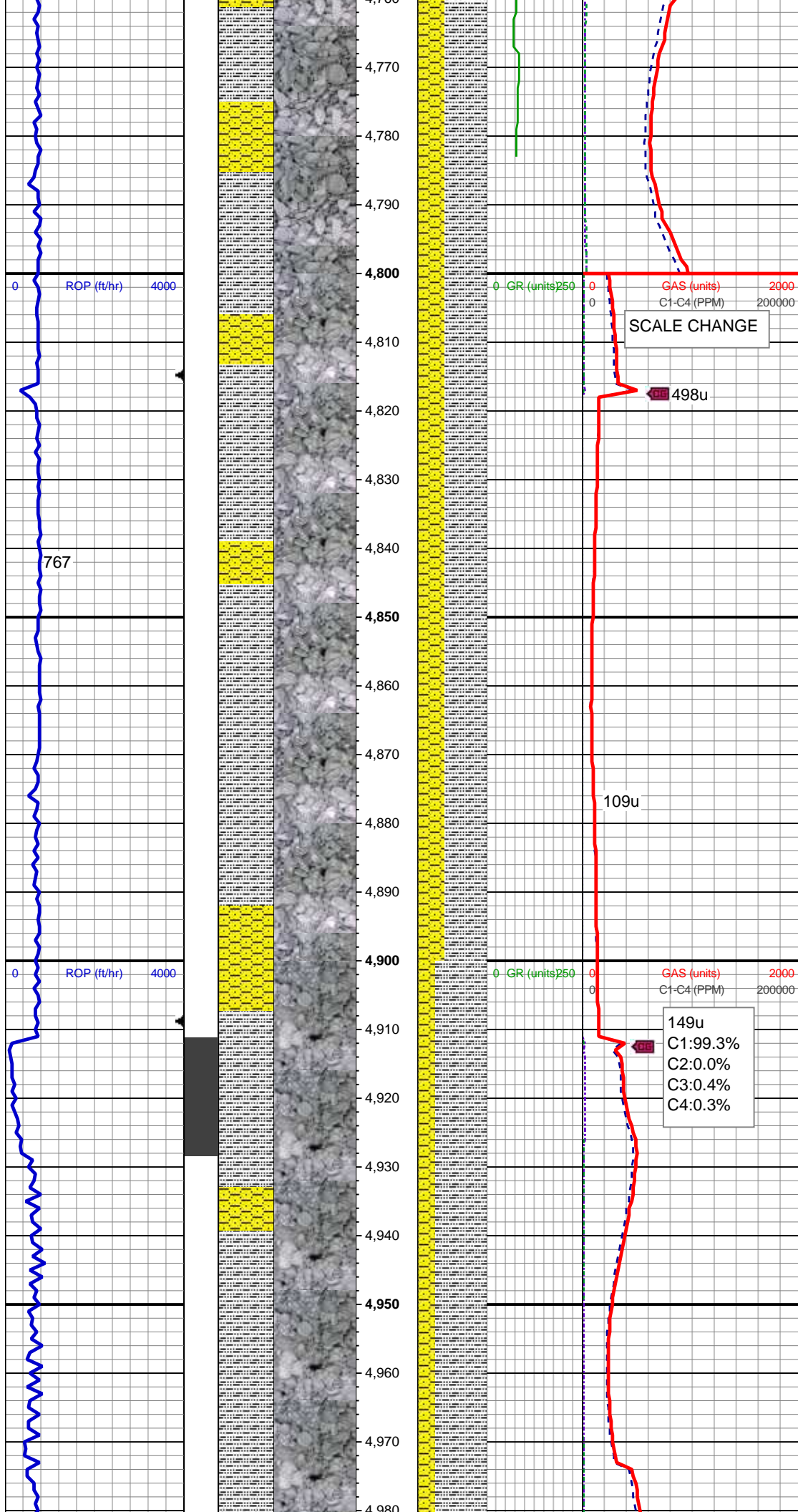
Mud Wt: 8.9 / 30 Vis

MD: 4,583'
Inclination: 6.42 °
Azimuth: 231.87 °
TVD: 4,534.05'
VS: -395.7'

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, mod frm, sb blk-y-sb
plty, gritty

MD: 4,677'
Inclination: 4.57 °
Azimuth: 243.48 °
TVD: 4,627.61'
VS: -403.19'

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



MD: 4,772'
Inclination: 3.78 °
Azimuth: 248.75 °
TVD: 4,722.36'
VS: -409.49'

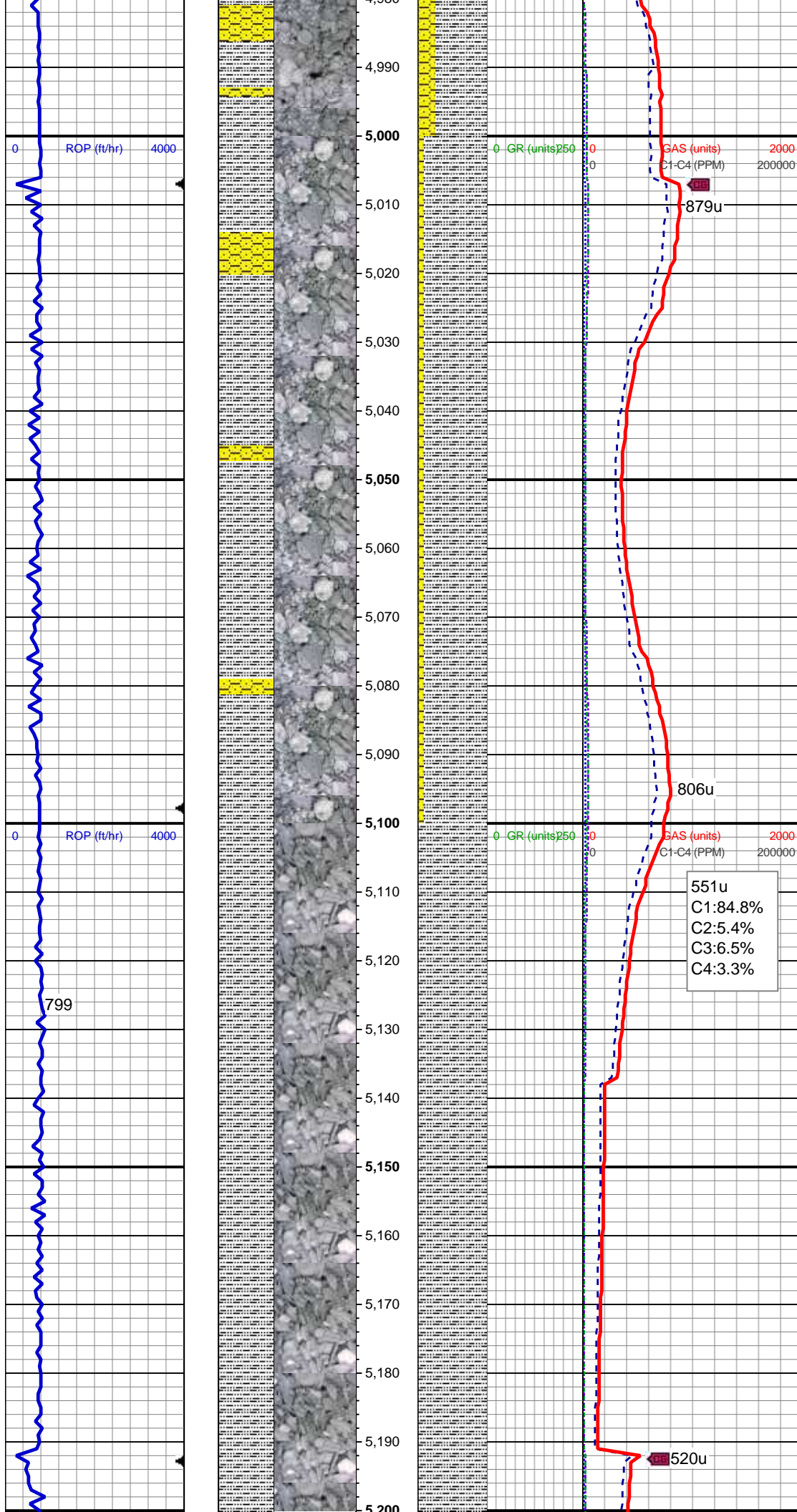
SLTY SH: lt-dk gy, mod frm, sb blk-y-sb
ply, gritty SHY SS: lt-med gy, sft-frm, vf
gr-f gr, sb ang - sb rnd, mod w srt, arg
cmt, sl calc

MD: 4,866'
Inclination: 3.43 °
Azimuth: 250.68 °
TVD: 4,816.17'
VS: -415.04'

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

MD: 4,960'
Inclination: 1.85 °
Azimuth: 251.21 °
TVD: 4,910.07'
VS: -419.13'

Mud Wt: 9.5 / 35 Vis

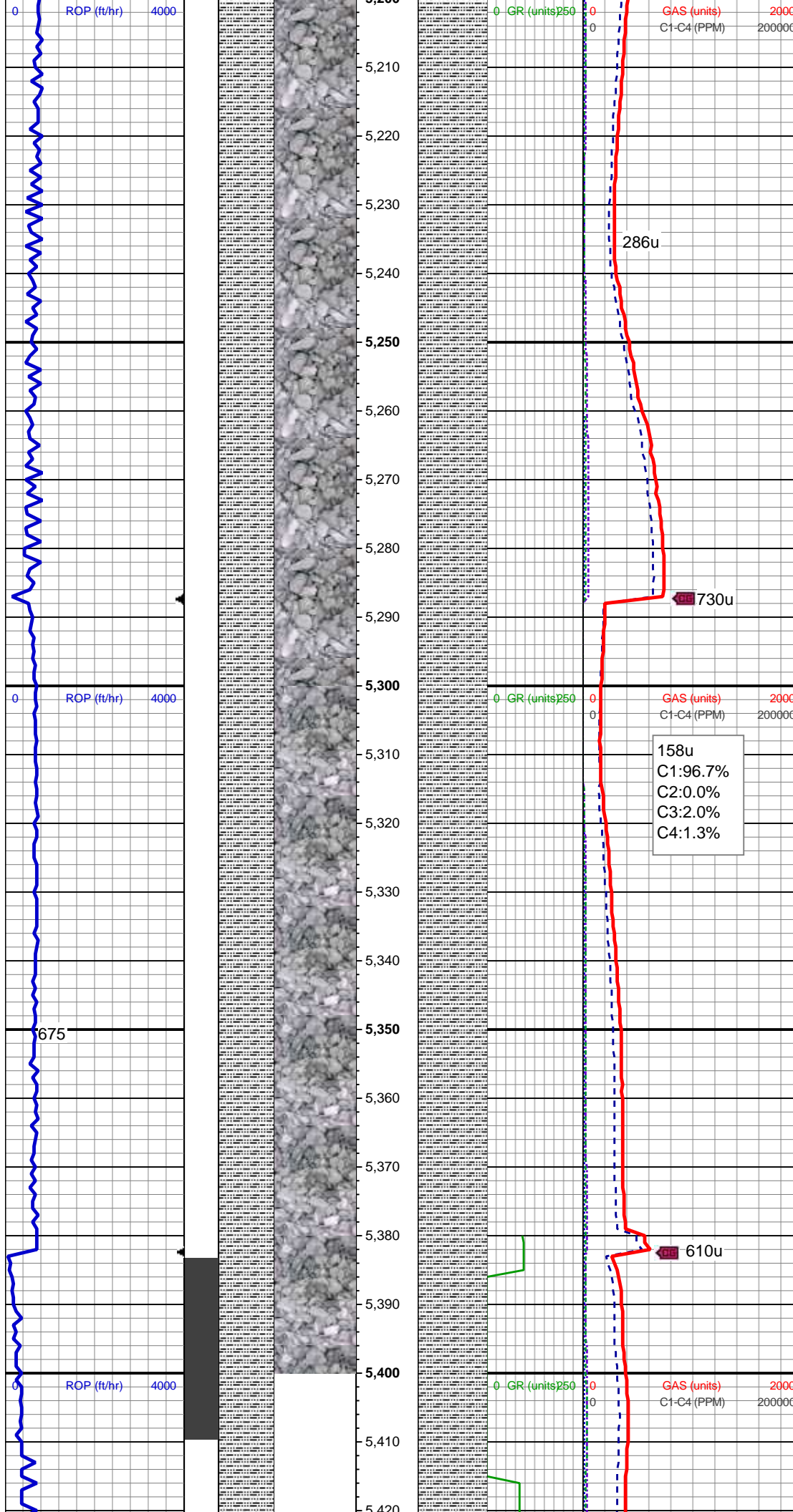


SLTY SH: lt-dk gy, mod frm, sb blkly-sb
plty, gritty SHY SS: lt-med gy, sft-frm, vf
gr-f gr, sb ang - sb rnd, mod w srt, arg
cmt, sl calc

MD: 5,054'
Inclination: 1.76 °
Azimuth: 246.11 °
TVD: 5,004.03'
VS: -421.88'

MD: 5,149'
Inclination: 2.02 °
Azimuth: 243.65 °
TVD: 5,098.97'
VS: -424.72'

SLTY SH: lt-dk gy, mod frm, sb blkly-sb
plty, gritty, rthy, silky, tr pyr

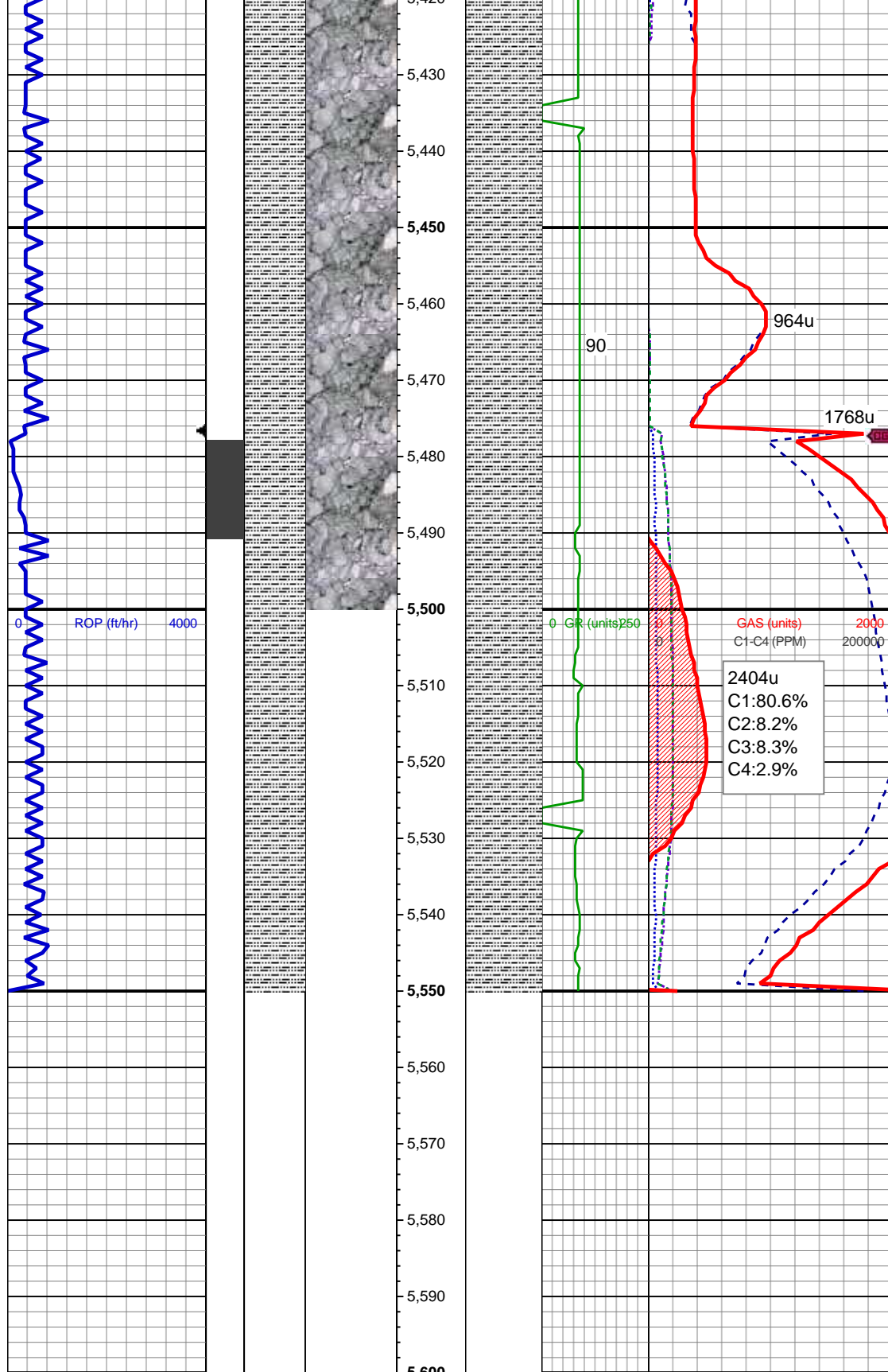


MD: 5,244'
Inclination: 1.85 °
Azimuth: 239.26 °
TVD: 5,193.92'
VS: -427.54'

SLTY SH: lt-dk gy, mod frm, sb blkly-sb
ply, gritty, rthy, silky, tr pyr

MD: 5,338'
Inclination: 1.32 °
Azimuth: 227.83 °
TVD: 5,287.88'
VS: -429.64'

SLTY SH: lt-dk gy, mod frm, sb blkly-sb
ply, gritty, rthy, silky, tr pyr



MD: 5,433'
Inclination: 5.72 °
Azimuth: 359.49 °
TVD: 5,382.74'
VS: -430.5'

MD: 5,527'
Inclination: 17.76 °
Azimuth: 345.43 °
TVD: 5,474.62'
VS: -434.16'