

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** Atwater State LD01-76-1AHN

**Location** SESW SEC 1 T9N R58W

**State** COLORADO

**County** WELD

**Country** USA

**Rig Number** H&P 273

**API Number** 05-123-39761

**Field** WILDCAT

**Region** DJ BASIN

**Drilling Completed** 11/2/2014

**Spud Date** 10/31/2014

**Surface Coordinates** 400' FSL; 1450' FWL

**Bottom Hole Coordinates** 810' FFNLL; 2200' FFWLL

**Ground Elevation** 4648'

**K.B. Elevation** 4672'

**Logged Interval** 1235' To 4830'

**Total Depth** 4830'

**Formation** NIOBRARA

**Type of Drilling Fluid** 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

CONNECTION (LEFT)

CONNECTION (RIGHT)

CONNECTION GAS

CORE - LOST

CORE - RECOVERED

DST INTERVAL

FAULT

FORMATION TOP

GAS SHOW

MINDEPTH 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

FINELYXLN

GRAINSTONE

L LITHOGRAPHIC

MX MICROXLN

MS MUDSTONE

PS PACKSTONE

WS WACKESTONE

### Rounding

ANGULAR

ROUNDED

SUBANG

SUBRND

### Textures

BOUNDSTONE

CHALKY

CRYPTOXLN

E EARTHY

FINELYXLN

GRAINSTONE

L LITHOGRAPHIC

MX MICROXLN

MS MUDSTONE

PS PACKSTONE

WS WACKESTONE

### Sorting

M MODERATE

P POOR

W WELL

## Zone Color Coding

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

## Accessories

### Fossils

- ALGAE
- AMPHIPORA
- BELEMNITE
- BIOCLASTIC
- BRACHIOPOD

F FOSSIL

GASTROPOD

INOCERAMUS

OOLITE

OSTRACOD

PELECYPOD

PELLET

ANHYDRITIC

ARGILLACEOUS

ARGILLITE GRAIN

BENTONITE

BITUMENOUS SUBSTANCE

BRECCIA FRAGMENTS

CAL CAREOUS

FERRUGINOUS

GLAUCONITE

GYPSIFEROUS

HEAVY MINERAL

KAOLIN

MARLSTONE

MINERAL CRYSTALS

TUFFACEOUS

### Stringer

- ANHYDRITE STRINGER
- BENTONITE STRINGER
- COAL STRINGER
- DOLOMITE STRINGER

↑ BRYOZOA  
🐙 CEPHALOPOD  
🪸 CORAL  
🪼 CRINOID  
🐚 ECHINOID  
🐟 FISH  
🔍 FORAMINIFERA

🔍 PISOLITE  
🌿 PLANT REMAINS  
🍄 PLANT SPORES  
🐚 SCAPHOPOD  
🪸 STROMATOPOROID

## Minerals

■ CARBONACEOUS FLAKES  
▲ CHTDK  
△ CHTLT  
— COAL - THIN BEDS  
🔍 DOLOMITIC  
+ FELDSPAR  
● FERRUGINOUS PELLET

🔍 NODULES  
● PHOSPHATE PELLETS  
🔍 PYRITE  
🔍 SALT CAST  
· SANDY  
🔍 SILICEOUS  
+ SILTY

🔍 GYPSUM STRINGER  
🔍 LIMESTONE STRINGER  
🔍 MARLSTONE (CALC) STRG  
🔍 MARLSTONE (DOL) STRG  
🔍 SANDSTONE STRINGER  
— SHALE STRINGER  
🔍 SILTSTONE STRINGER

## Rock Types

🔍 UNKNOWN  
🔍 CHALK  
🔍 MARLSTONE  
🔍 SANDSTONE  
🔍 SHALY SANDSTONE  
🔍 SILTY SHALE  
🔍 ANHYDRITE  
🔍 BENTONITE  
🔍 BRECCIA

🔍 CEMENT  
🔍 CHERT  
🔍 CLAY CHOKE SAND  
🔍 CLAYSTONE  
🔍 COAL  
🔍 CONGLOMERATE  
🔍 DOLOMITE  
🔍 GRANITE  
🔍 GYPSUM

🔍 IGNEOUS  
🔍 LIMESTONE  
🔍 SIDERITE or LIMONITE  
🔍 METAMORPHIC  
X X X X X X NO SAMPLE  
🔍 SALT  
🔍 SALT- PEPPER SAND  
🔍 SHALE  
🔍 SHALE COLORED

🔍 SHALE GRAY  
🔍 SHALY SILTSTONE  
🔍 SILTSTONE  
🔍 TILL  
🔍 TUFF  
🔍 WELDED TUFF

## Operator

**Company** NOBLE ENERGY INC.

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

## Other

**Wellsite Geologist #1** Laura Kellogg

**Wellsite Geologist #2** Nick Kopiasz

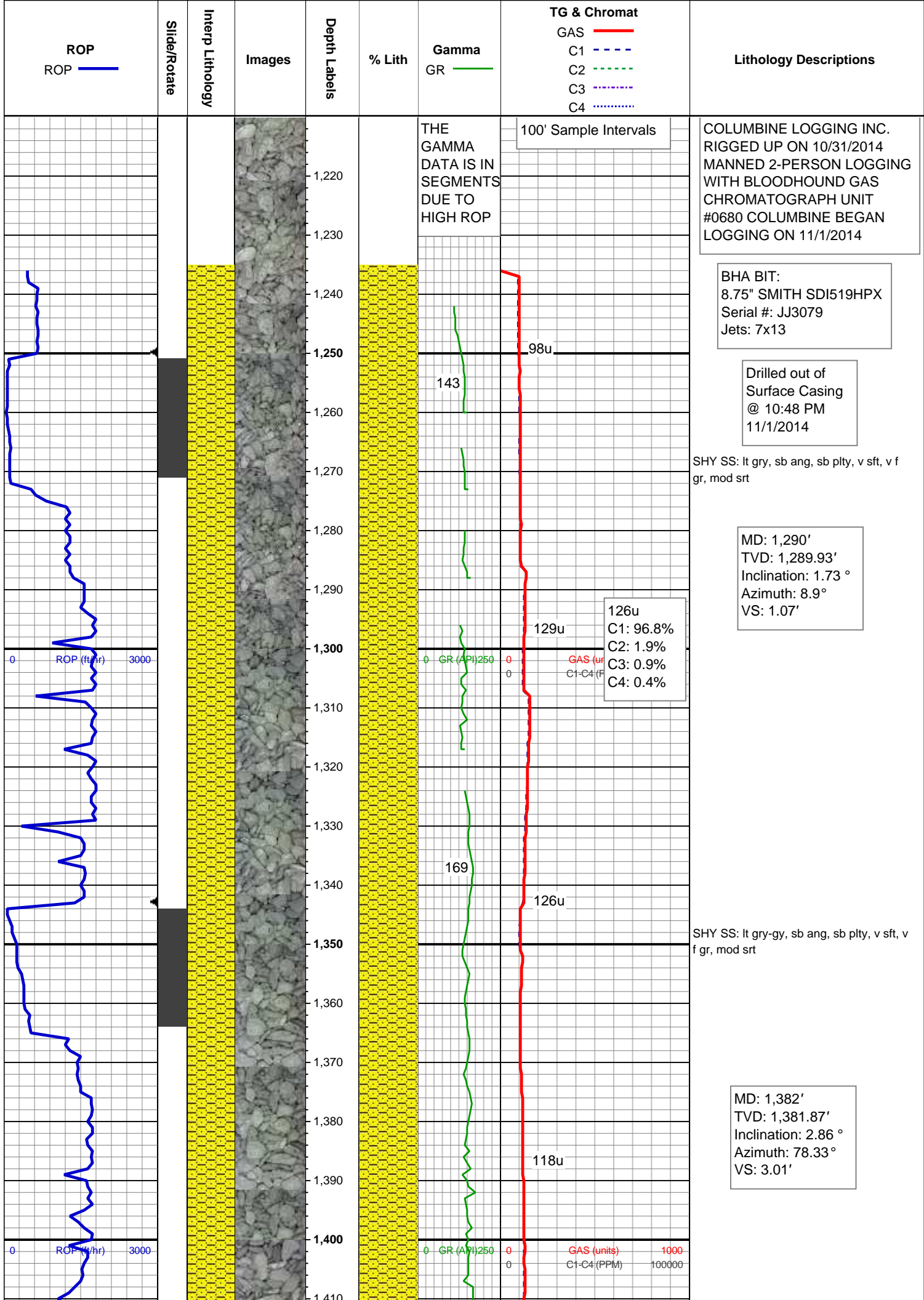
**Wellsite Geological Services Provided By** Columbine Logging Inc.

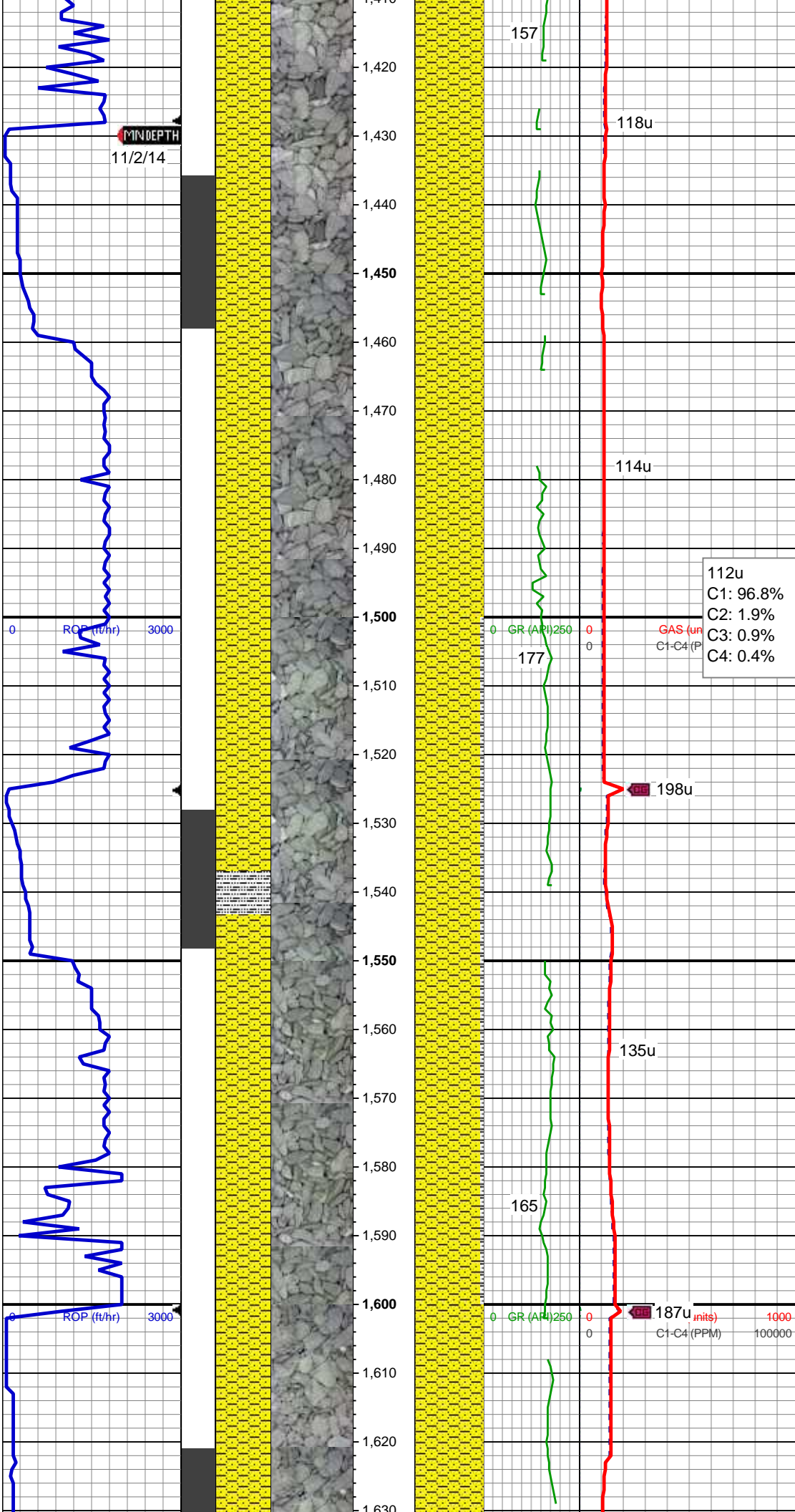
## Geologist

**Name** RENEE CLACKER

**Company** NOBLE ENERGY INC.

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





MINDEPTH  
11/2/14

SHY SS: lt gry-gy, sb ang, sb plty, v sft, v f gr, mod srt

MD: 1,474'  
TVD: 1,473.62'  
Inclination: 5.48 °  
Azimuth: 103.54 °  
VS: 2.7'

112u  
C1: 96.8%  
C2: 1.9%  
C3: 0.9%  
C4: 0.4%

198u

SHY SS: lt gry, sb ang, sb plty, v sft, v f gr, mod srt

SLTY SH: gry-dkr gry, rnd, sb plty, v sft, slty tex

MD: 1,567'  
TVD: 1,565.84'  
Inclination: 9.21 °  
Azimuth: 106.69 °  
VS: -0.01'

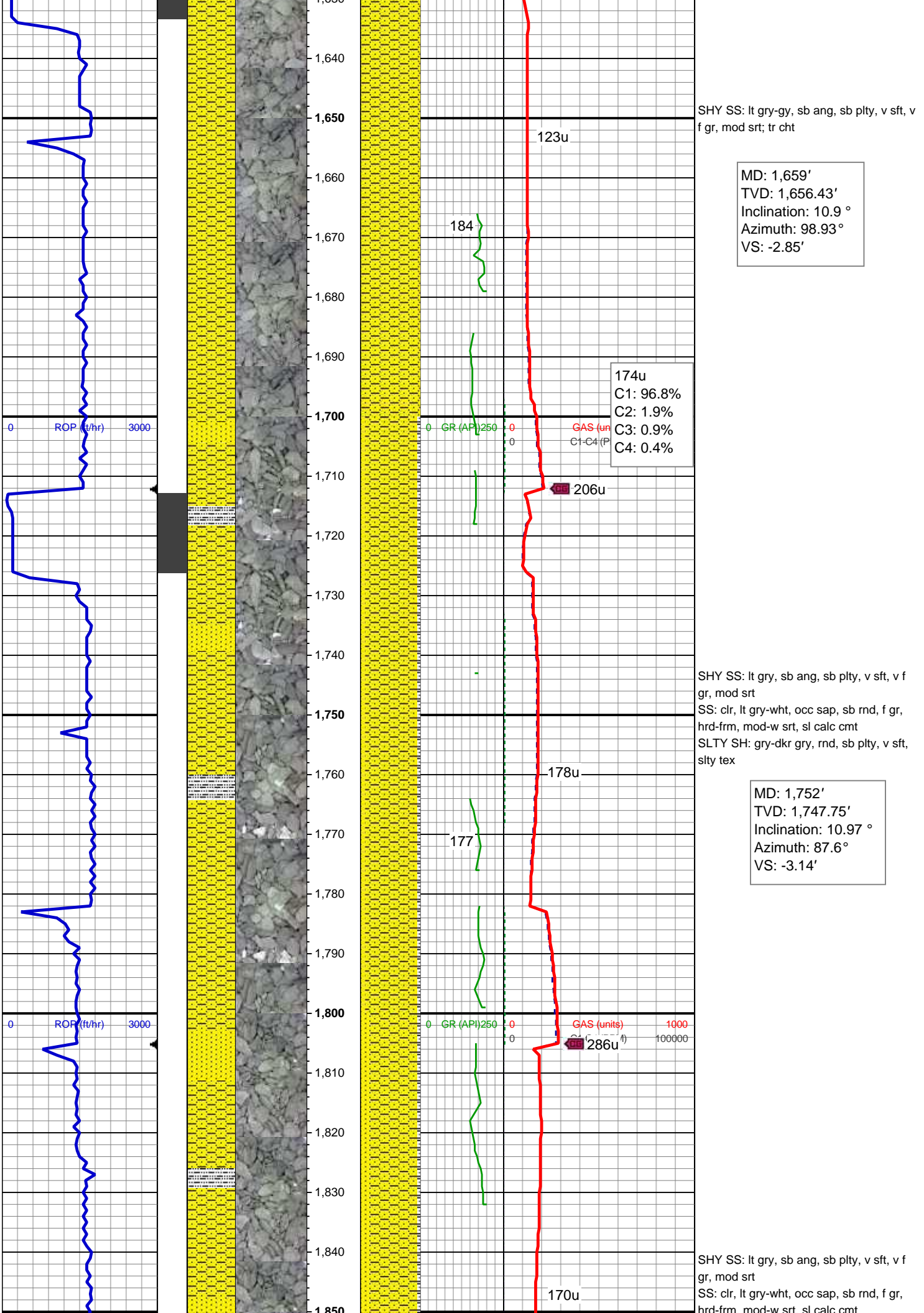
135u

165

187u

inits  
C1-C4 (PPM)





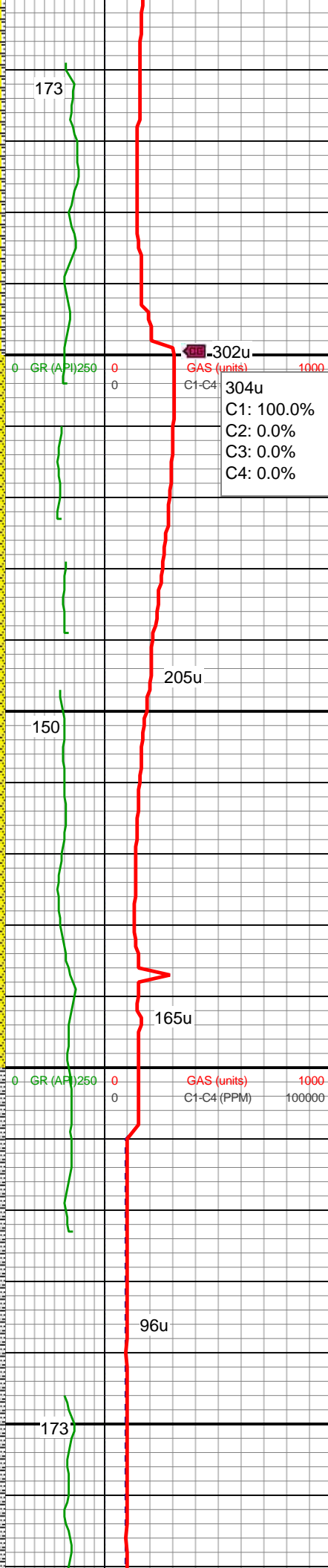
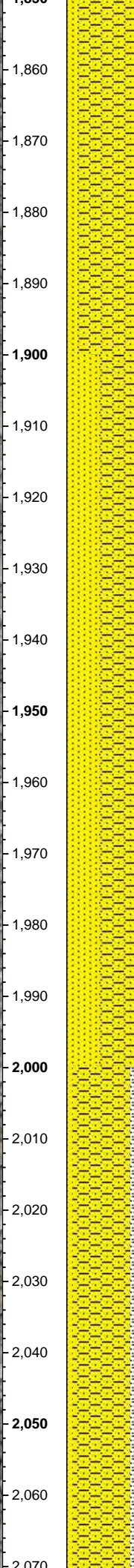
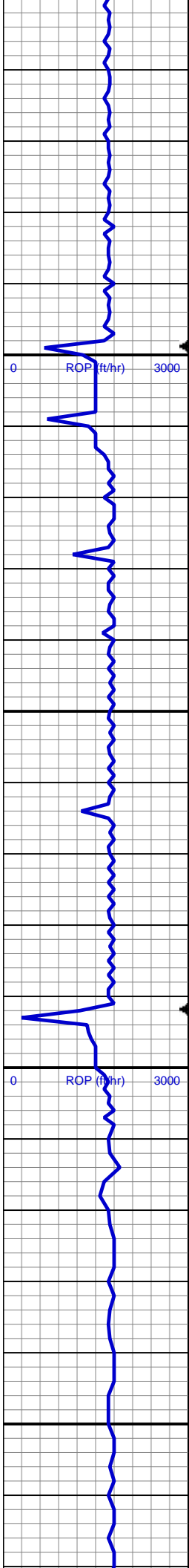
SHY SS: lt gry-gy, sb ang, sb plty, v sft, v f gr, mod srt; tr cht

MD: 1,659'  
TVD: 1,656.43'  
Inclination: 10.9 °  
Azimuth: 98.93 °  
VS: -2.85'

SHY SS: lt gry, sb ang, sb plty, v sft, v f gr, mod srt  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr, hrd frm, mod-w srt, sl calc cmt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft, slty tex

MD: 1,752'  
TVD: 1,747.75'  
Inclination: 10.97 °  
Azimuth: 87.6 °  
VS: -3.14'

SHY SS: lt gry, sb ang, sb plty, v sft, v f gr, mod srt  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr, hrd frm, mod-w srt, sl calc cmt



SLTY SH: gry-dkr gry, rnd, sb plty, v sft, slty tex

MD: 1,938'

TVD: 1,930.38'

Inclination: 10.91 °

Azimuth: 84.66 °

VS: 0.65'

SHY SS: lt gry, sb ang, sb plty, v sft, v f gr, mod srt

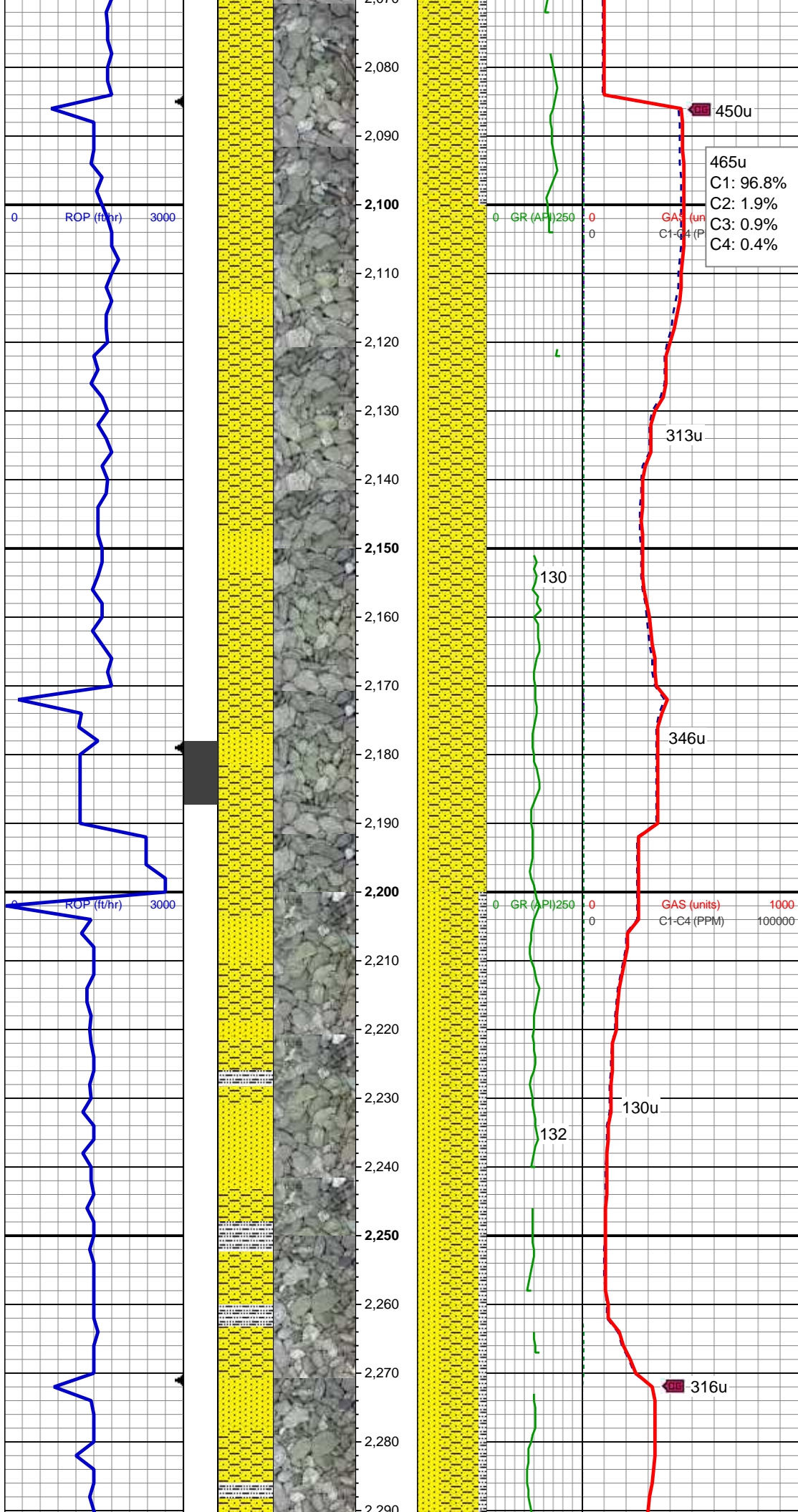
SS: clr, lt gry-wht, occ sap, sb rnd, f gr, hrd frm, mod-w srt, sl calc cmt

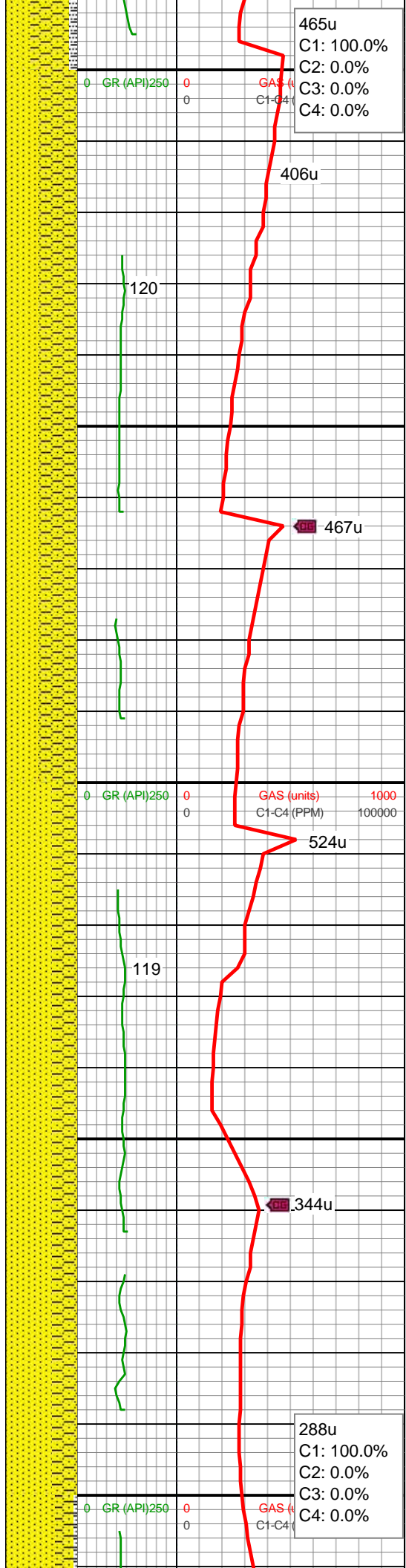
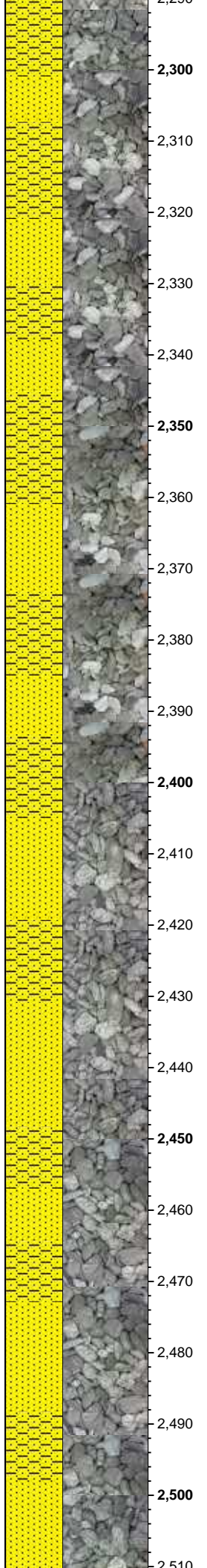
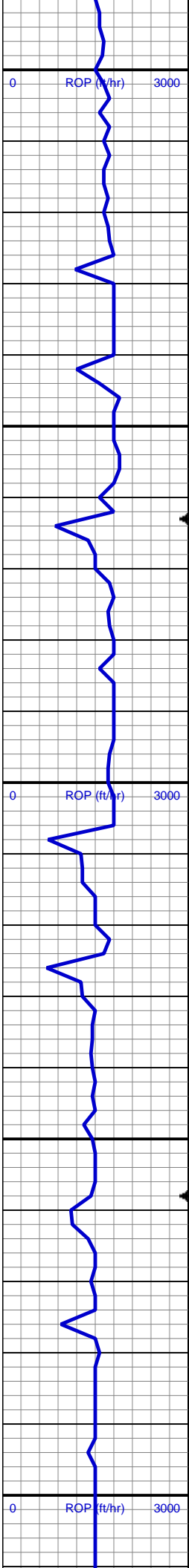
SHY SS: lt gry, sb ang, sb plty, v sft, v f gr, mod srt

SS: clr, lt gry-wht, occ sap, sb rnd, f gr, hrd frm, mod-w srt, sl calc cmt

SLTY SH: gry-dkr gry, rnd, sb plty, v sft, slty tex





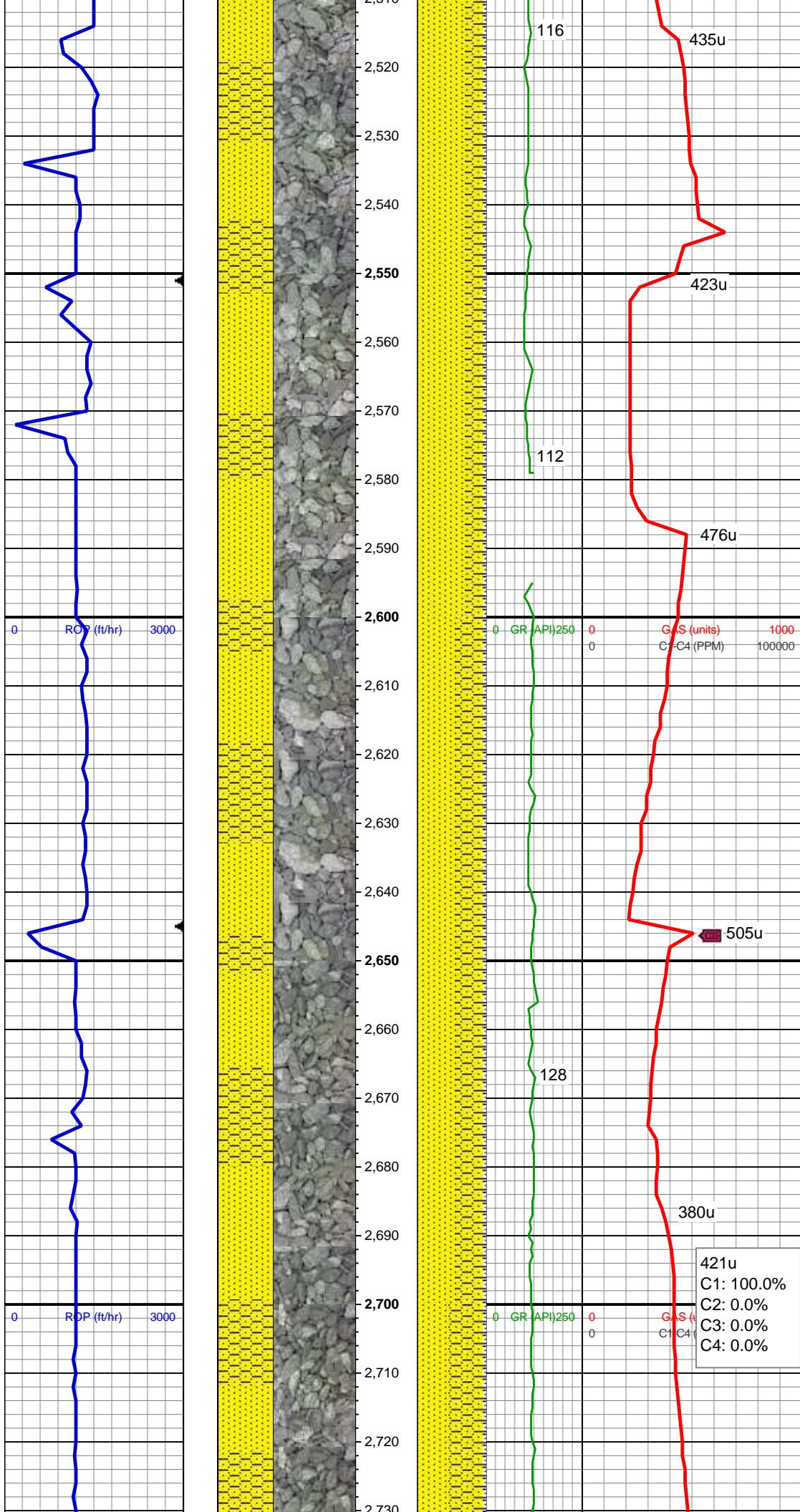


SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd-frn, mod-w srt, sl calc cmt

SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd-frn, mod-w srt, sl calc cmt  
SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt

MD: 2,495'  
TVD: 2,478.21'  
Inclination: 10.34 °  
Azimuth: 85.04 °  
VS: 12.65'





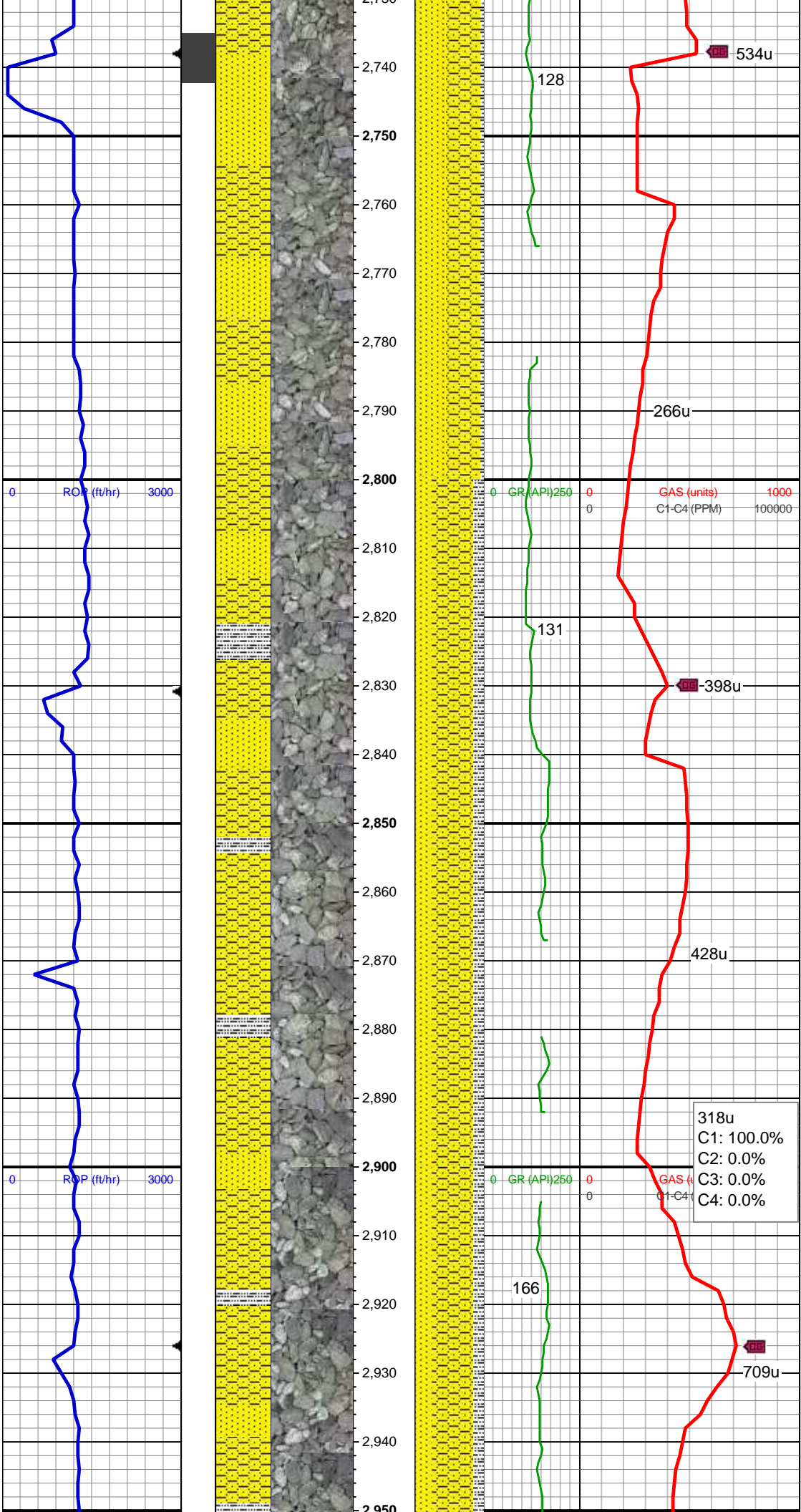
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hrd frm, mod-w srt, sl calc cmt  
SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
slty tex

MD: 2,588'  
TVD: 2,569.67'  
Inclination: 10.5 °  
Azimuth: 83.87 °  
VS: 14.95'

SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd frm, mod-w srt, sl calc cmt  
SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
slty tex

MD: 2,681'  
TVD: 2,661.11'  
Inclination: 10.51 °  
Azimuth: 80.17 °  
VS: 17.97'

421u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%



SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd frm, mod-w srt, sl calc cmt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
sly tex

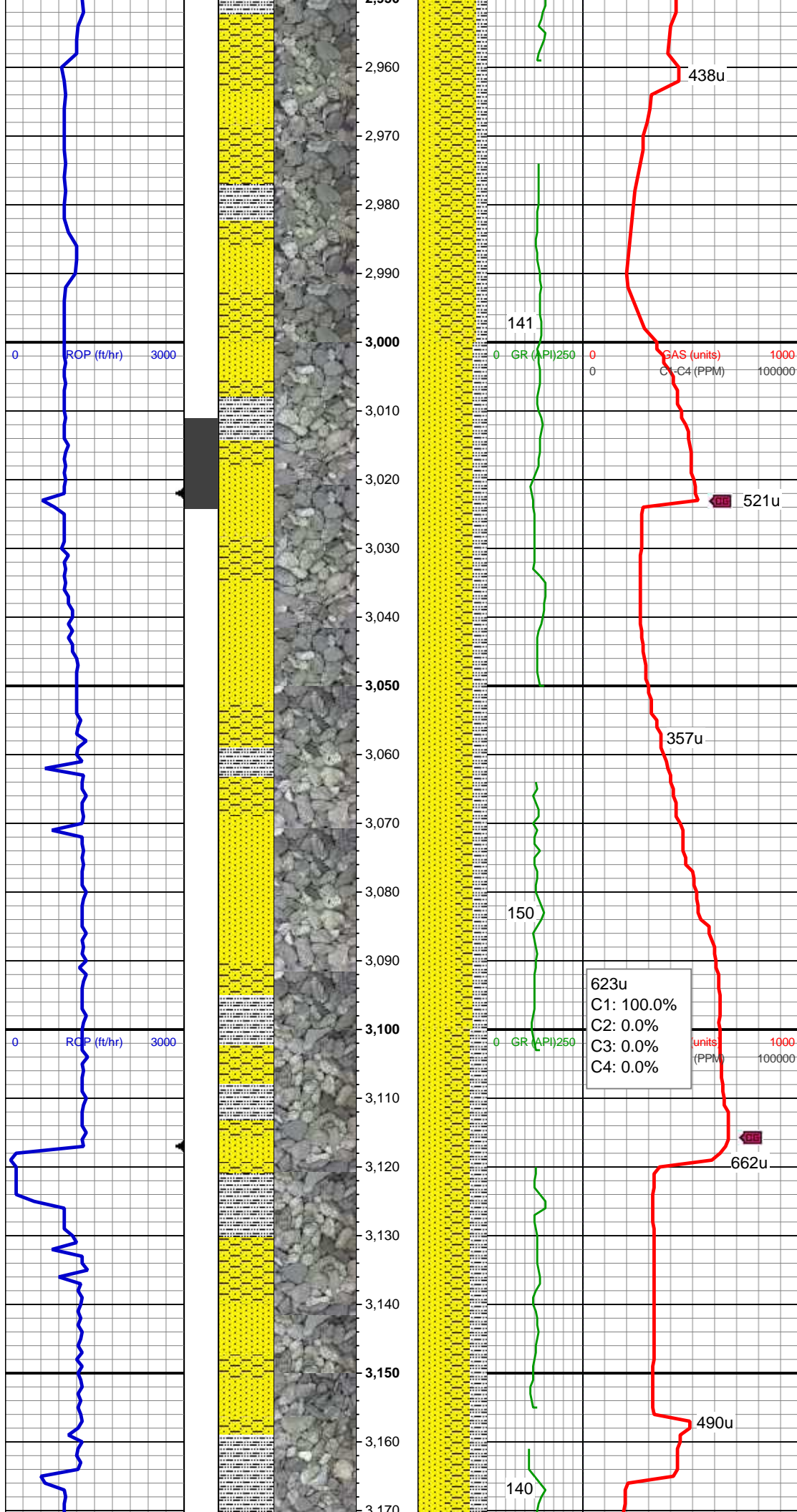
MD: 2,773'  
TVD: 2,751.63'  
Inclination: 10.11 °  
Azimuth: 86.23 °  
VS: 20.59'

SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd frm, mod-w srt, sl calc cmt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
sly tex

318u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,





hrd-frm, mod-w srt, sl calc cmt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
sfty tex

MD: 2,963'  
TVD: 2,938.81'  
Inclination: 9.68 °  
Azimuth: 83.42 °  
VS: 24.82'

SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd-frm, mod-w srt, sl calc cmt, occ  
uncons  
SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
sfty tex

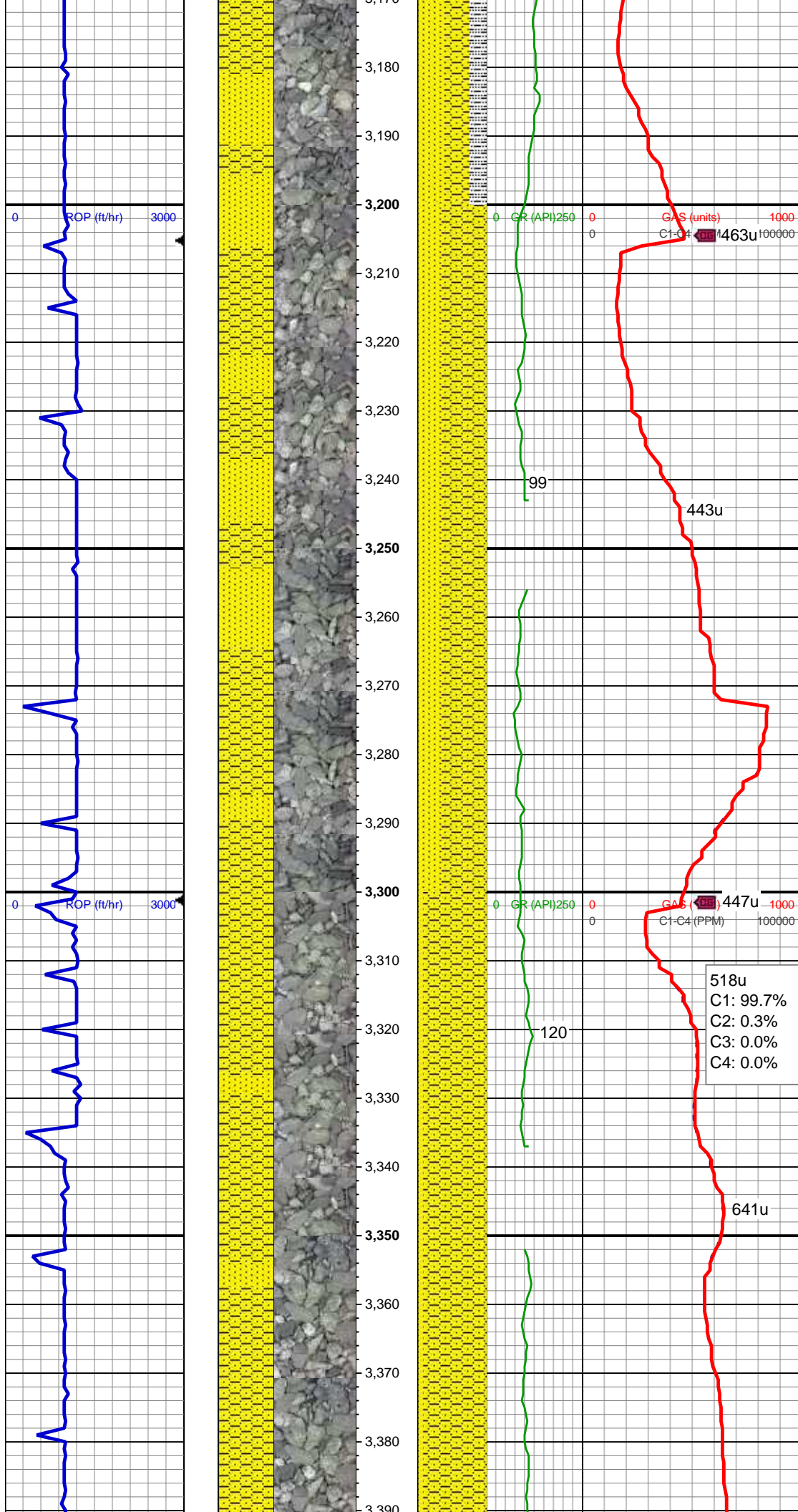
MD: 3,057'  
TVD: 3,031.51'  
Inclination: 9.4 °  
Azimuth: 81.02 °  
VS: 27.54'

SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd-frm, mod-w srt, sl calc cmt, occ  
uncons  
SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
sfty tex

MD: 3,152'  
TVD: 3,125.06'  
Inclination: 10.63 °  
Azimuth: 80.22 °



Azimuth: 89.23  
VS: 29.53'

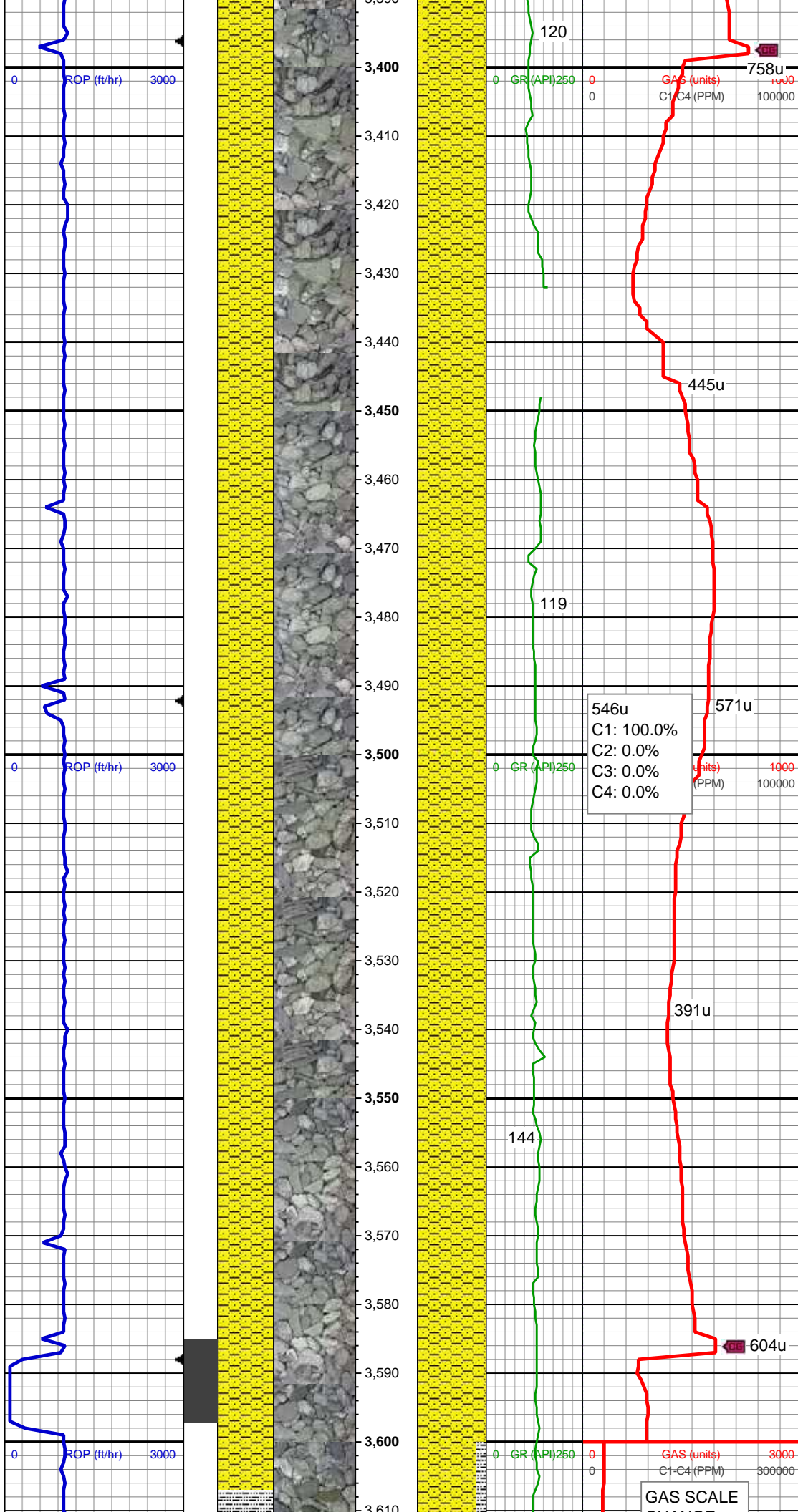


SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd frm, mod-w srt, sl calc cmt

518u  
C1: 99.7%  
C2: 0.3%  
C3: 0.0%  
C4: 0.0%

MD: 3,342'  
TVD: 3,311.53'  
Inclination: 11.51 °  
Azimuth: 89.37 °  
VS: 31.43'

SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd frm, mod-w srt, sl calc cmt



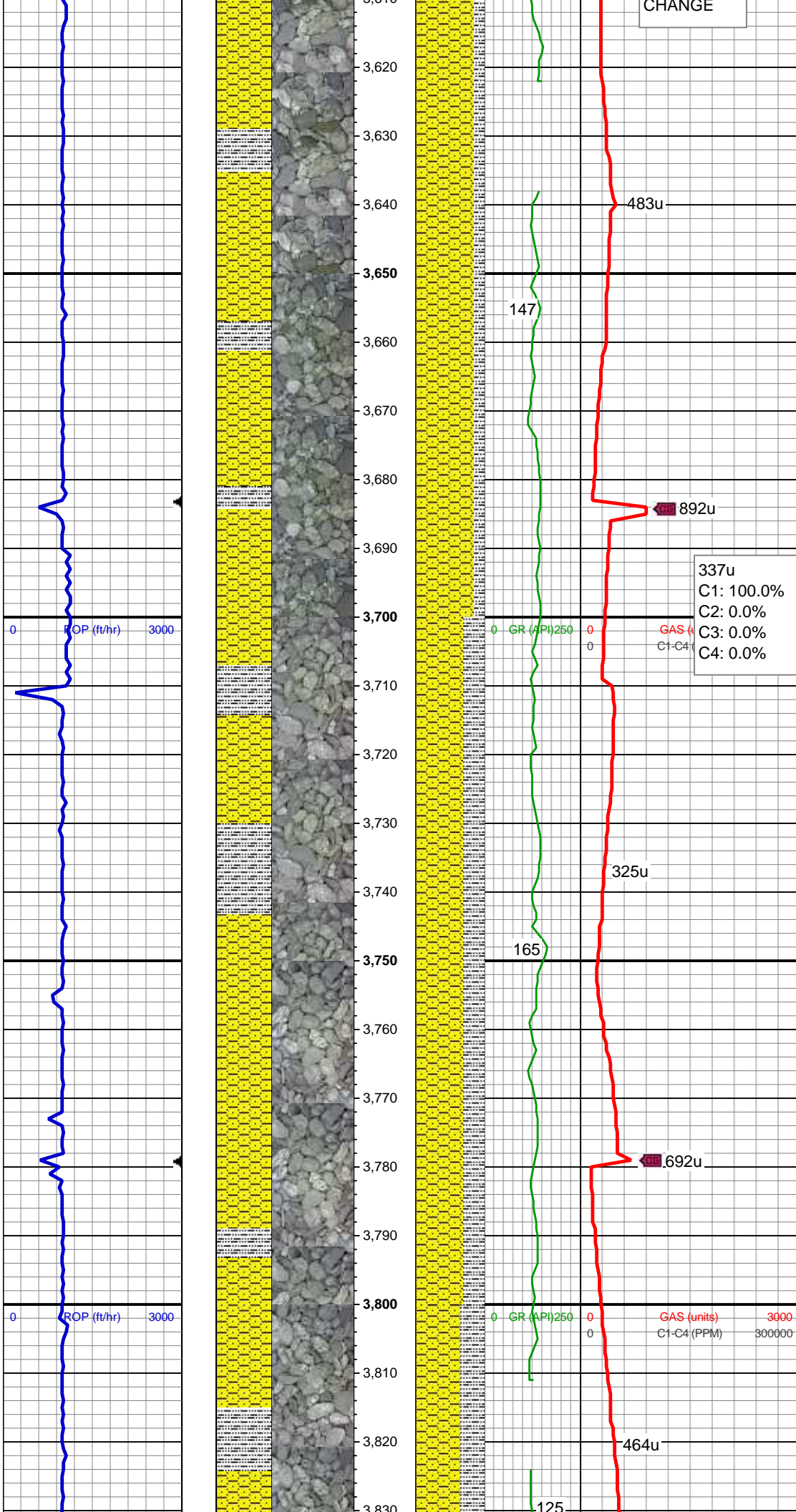
MD: 3,437'  
TVD: 3,404.52'  
Inclination: 12.06 °  
Azimuth: 88.9°  
VS: 32.51'

SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt

MD: 3,531'  
TVD: 3,496.45'  
Inclination: 12.02 °  
Azimuth: 89.04 °  
VS: 33.65'

SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt





MD: 3,626'  
TVD: 3,589.55'  
Inclination: 10.99 °  
Azimuth: 80.92 °  
VS: 36'

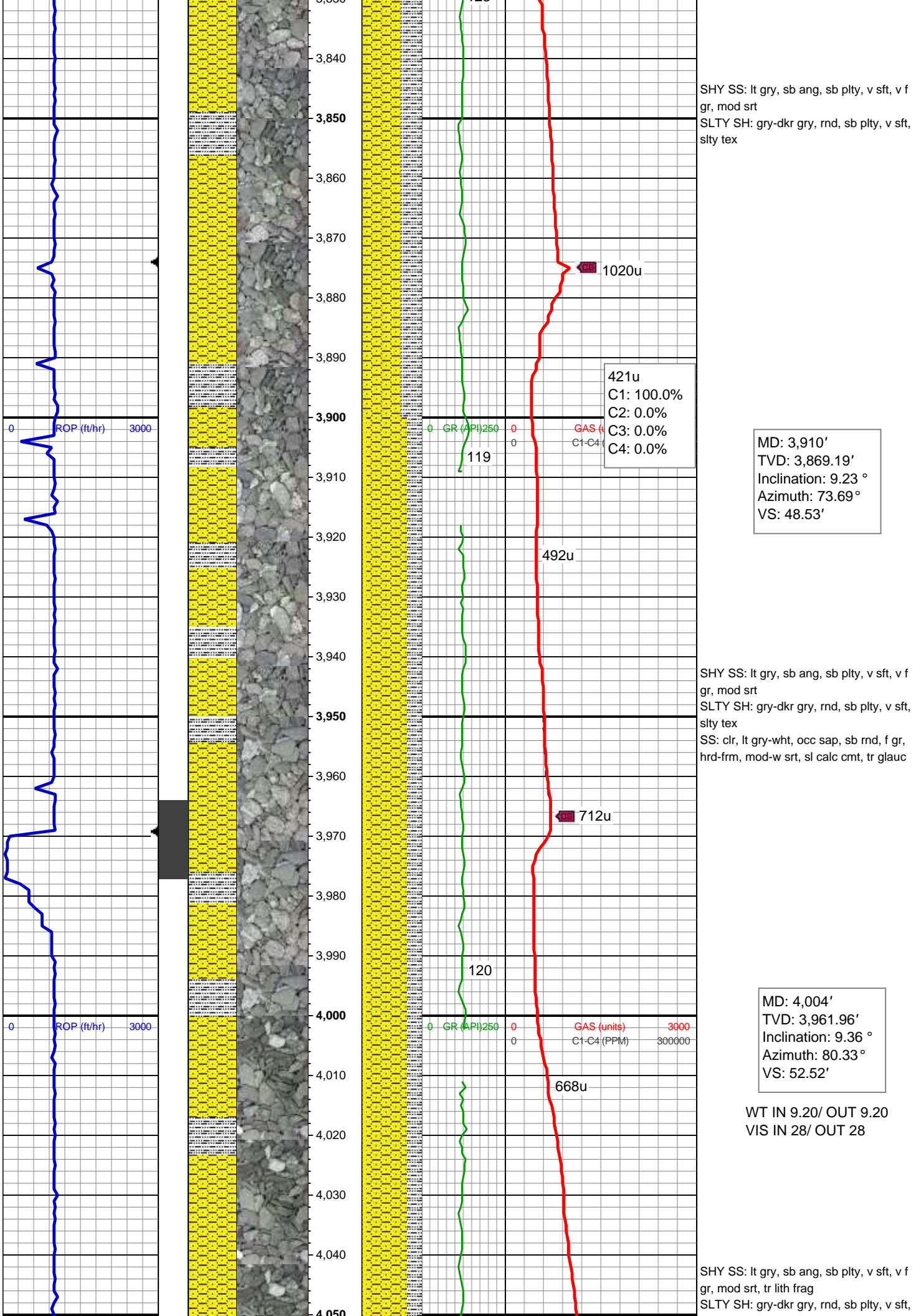
SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
sly tex

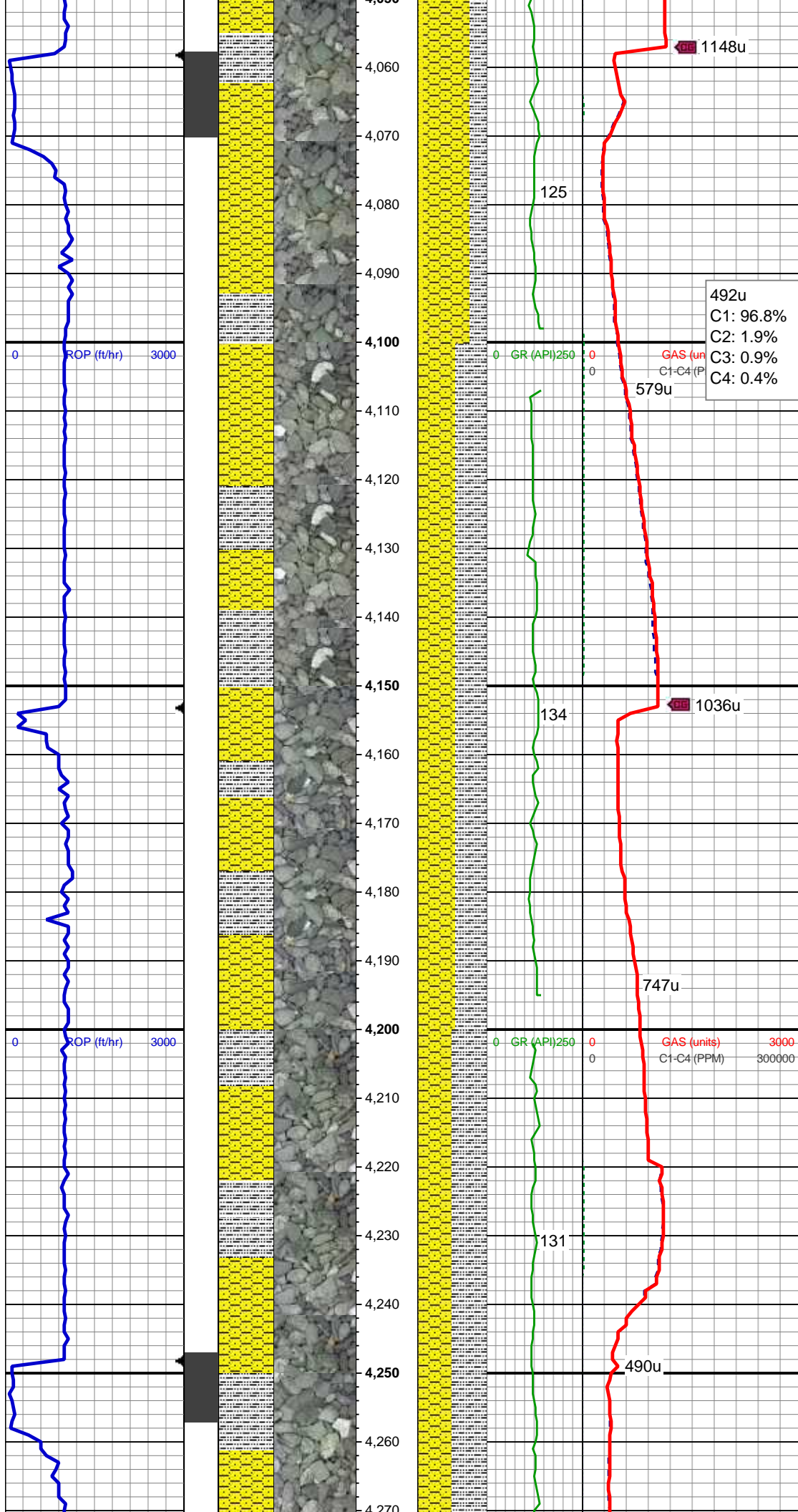
MD: 3,721'  
TVD: 3,682.93'  
Inclination: 10.17 °  
Azimuth: 78.25 °  
VS: 39.82'

SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
sly tex

MD: 3,816'  
TVD: 3,776.49'  
Inclination: 9.83 °  
Azimuth: 76.97 °  
VS: 44'







slty tex  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd-frm, mod-w srt, sl calc cmt, tr glauc

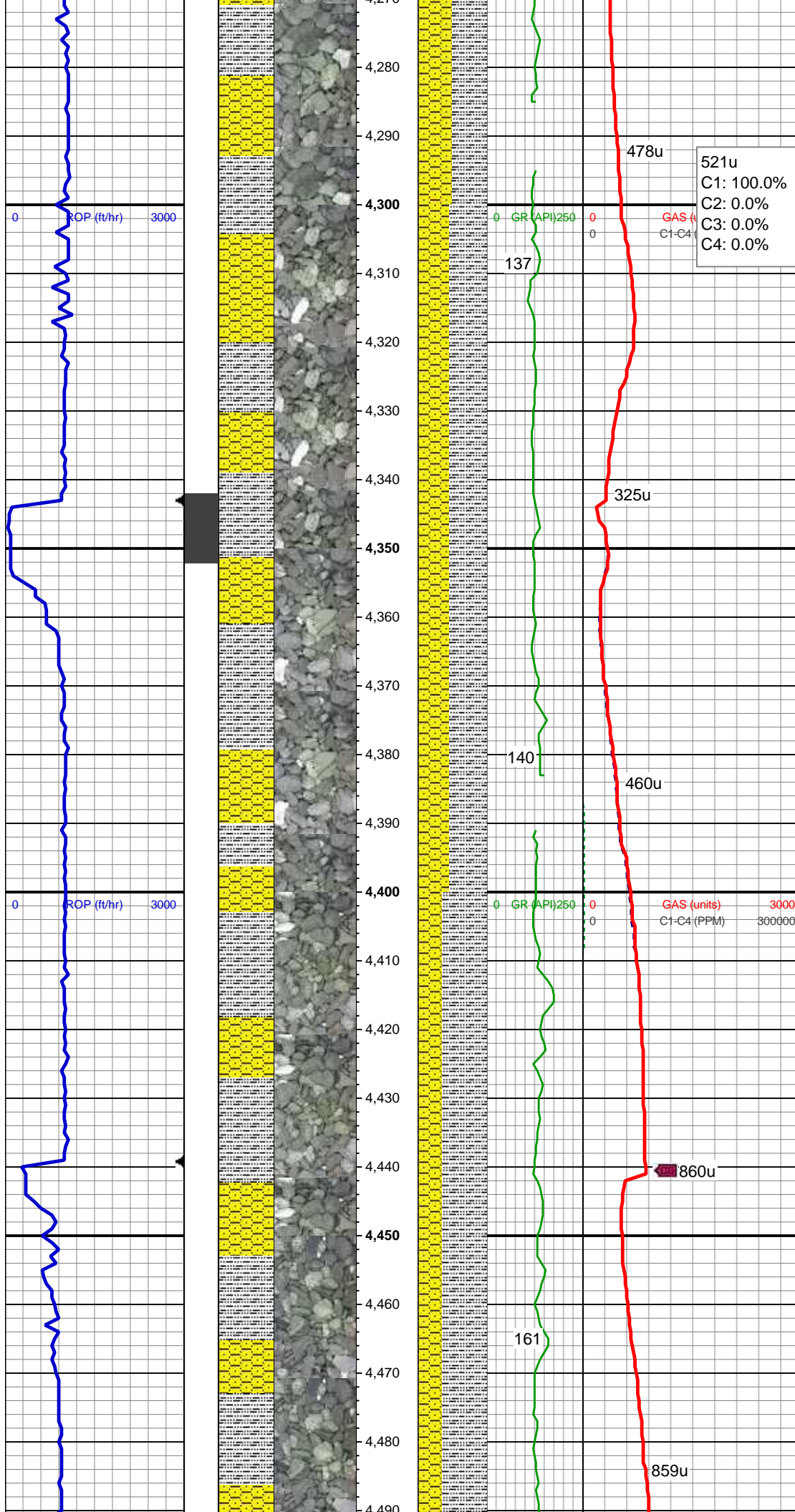
MD: 4,099'  
TVD: 4,055.65'  
Inclination: 9.75 °  
Azimuth: 88.18 °  
VS: 54.7'

SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
slty tex

MD: 4,193'  
TVD: 4,148.33'  
Inclination: 9.46 °  
Azimuth: 87.5 °  
VS: 55.92'

SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
slty tex





MD: 4,288'  
TVD: 4,242'  
Inclination: 9.71 °  
Azimuth: 87.42 °  
VS: 57.25'

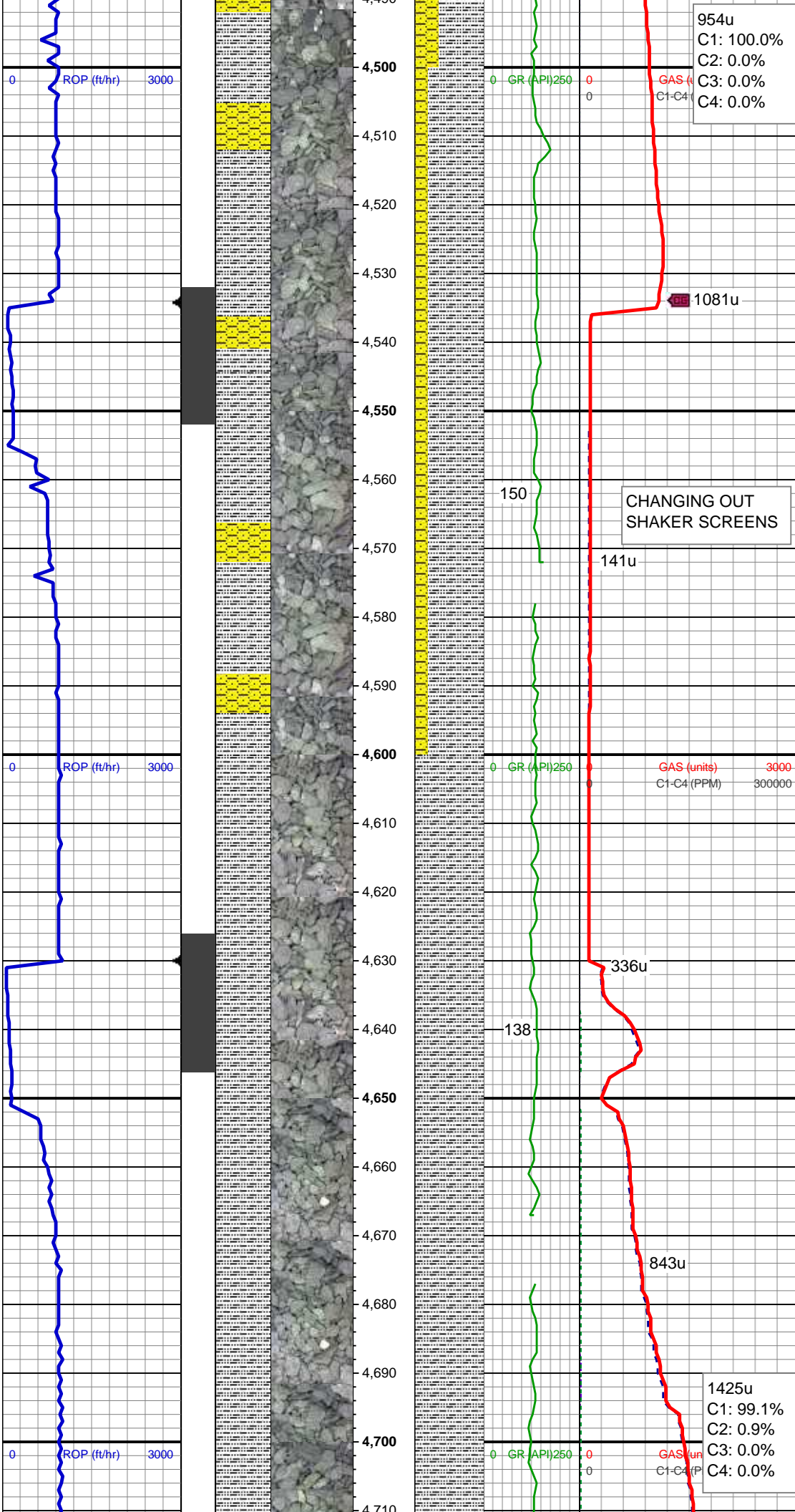
SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt, tr lith frag  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
slyt tex

MD: 4,383'  
TVD: 4,335.61'  
Inclination: 9.93 °  
Azimuth: 88.53 °  
VS: 58.47'

SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
slyt tex  
SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt, tr lith frag

MD: 4,478'  
TVD: 4,429.4'  
Inclination: 8.42 °  
Azimuth: 84.49 °  
VS: 59.95'





954u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

WT IN 9.40/ OUT 9.50  
VIS IN 37/ OUT 39

SLTY SH: gry-dkr gry, rnd, sb plty, v sft, slty tex  
SHY SS: lt gry, sb ang, sb plty, v sft, v f gr, mod srt

CHANGING OUT SHAKER SCREENS

MD: 4,572'  
TVD: 4,522.31'  
Inclination: 9.05 °  
Azimuth: 98.29 °  
VS: 60.12'

3000  
300000

SLTY SH: gry-dkr gry, rnd, sb plty, v sft, slty tex

MD: 4,667'  
TVD: 4,615.9'  
Inclination: 10.75 °  
Azimuth: 97.03 °  
VS: 58.61'

1425u  
C1: 99.1%  
C2: 0.9%  
C3: 0.0%  
C4: 0.0%

