

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** Nalen State LD12-77-1BHN

**Location** SESW SEC 1 T9N R58W

**State** COLORADO

**County** WELD

**Country** USA

**Rig Number** H&P 273

**API Number** 05-123-39765

**Field** WILDCAT

**Region** DJ BASIN

**Drilling Completed** 12/12/2014

**Spud Date** 12/11/2014

**Surface Coordinates** 250' FSL; 1412' FWL

**Bottom Hole Coordinates** 330' FFSLL; 1760' FFWLL

**Ground Elevation** 4647'

**K.B. Elevation** 4671'

**Logged Interval** 1239' To 4757'

**Total Depth** 4757'

**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
- PINPOINT
- 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

### Rounding

- ANGULAR
- ROUNDED
- SUBANG
- SUBRND

### Textures

- BOUNDSTONE
- CHALKY
- CRYPTOXLN

- WIRELINE TESTED - LEFT
- WIRELINE TESTED - RT
- 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

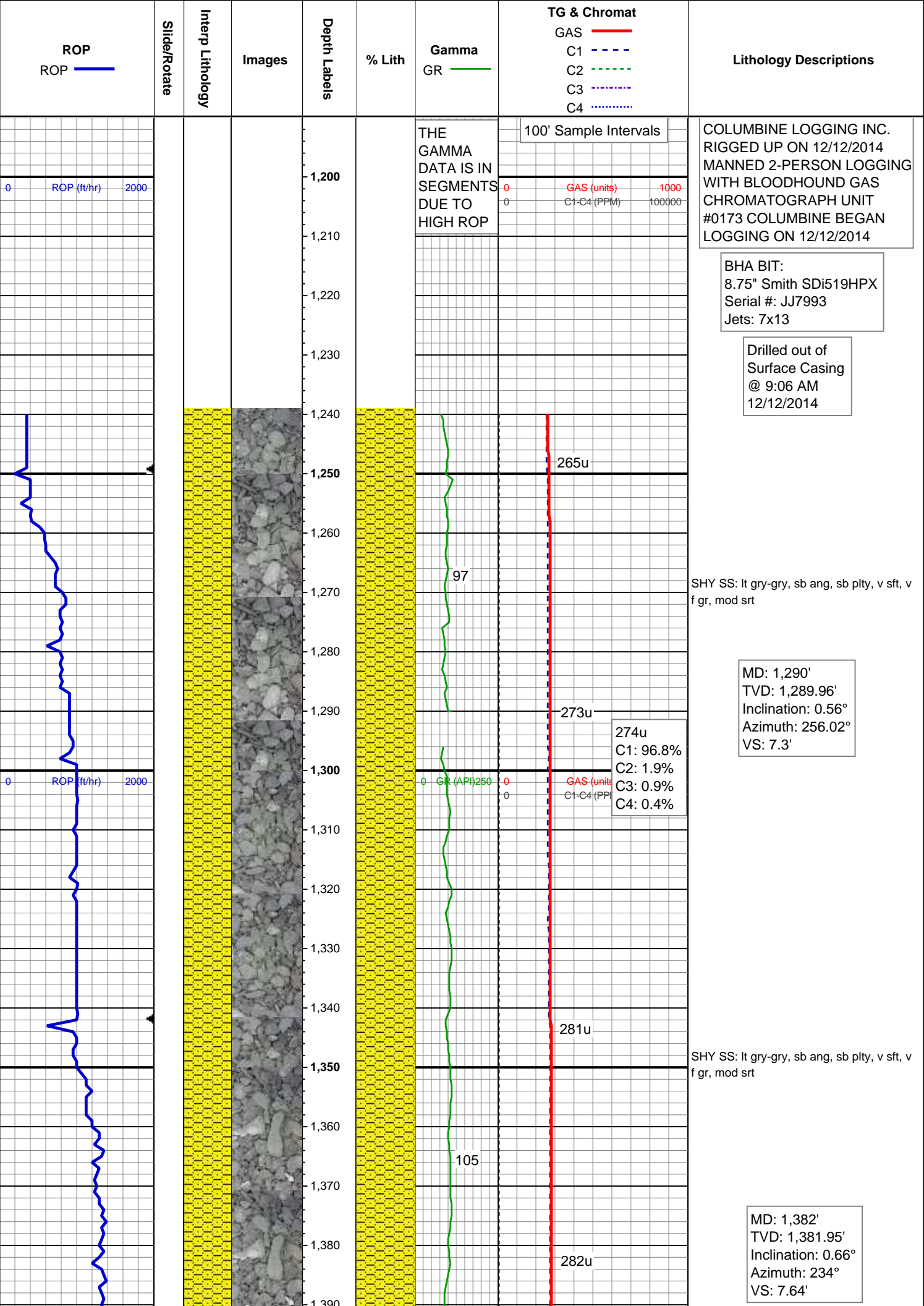
**Wellsite Geological Services Provided By** Columbine Logging Inc.

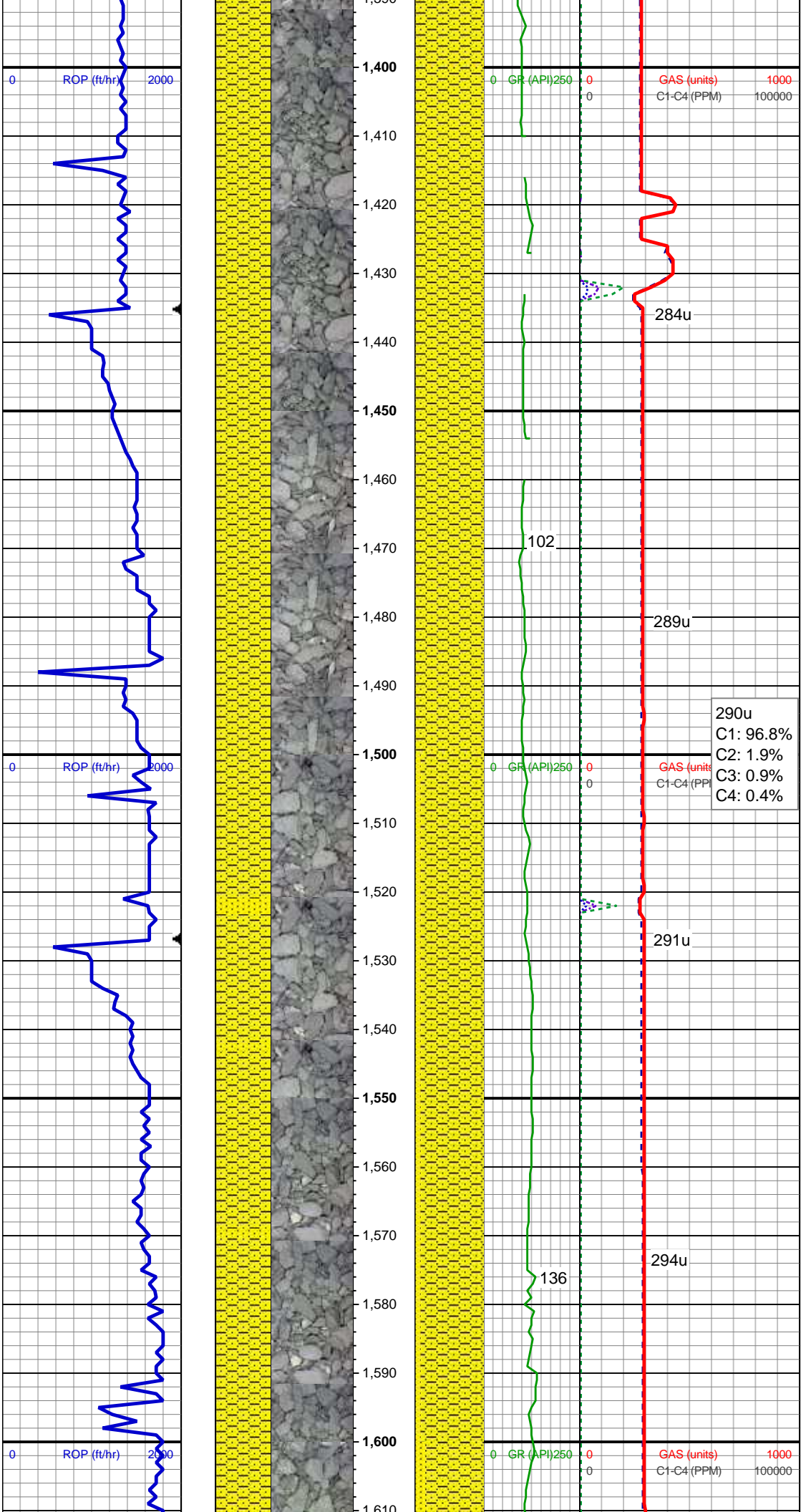
## Geologist

**Name** RENEE CLACKER

**Company** NOBLE ENERGY INC.

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





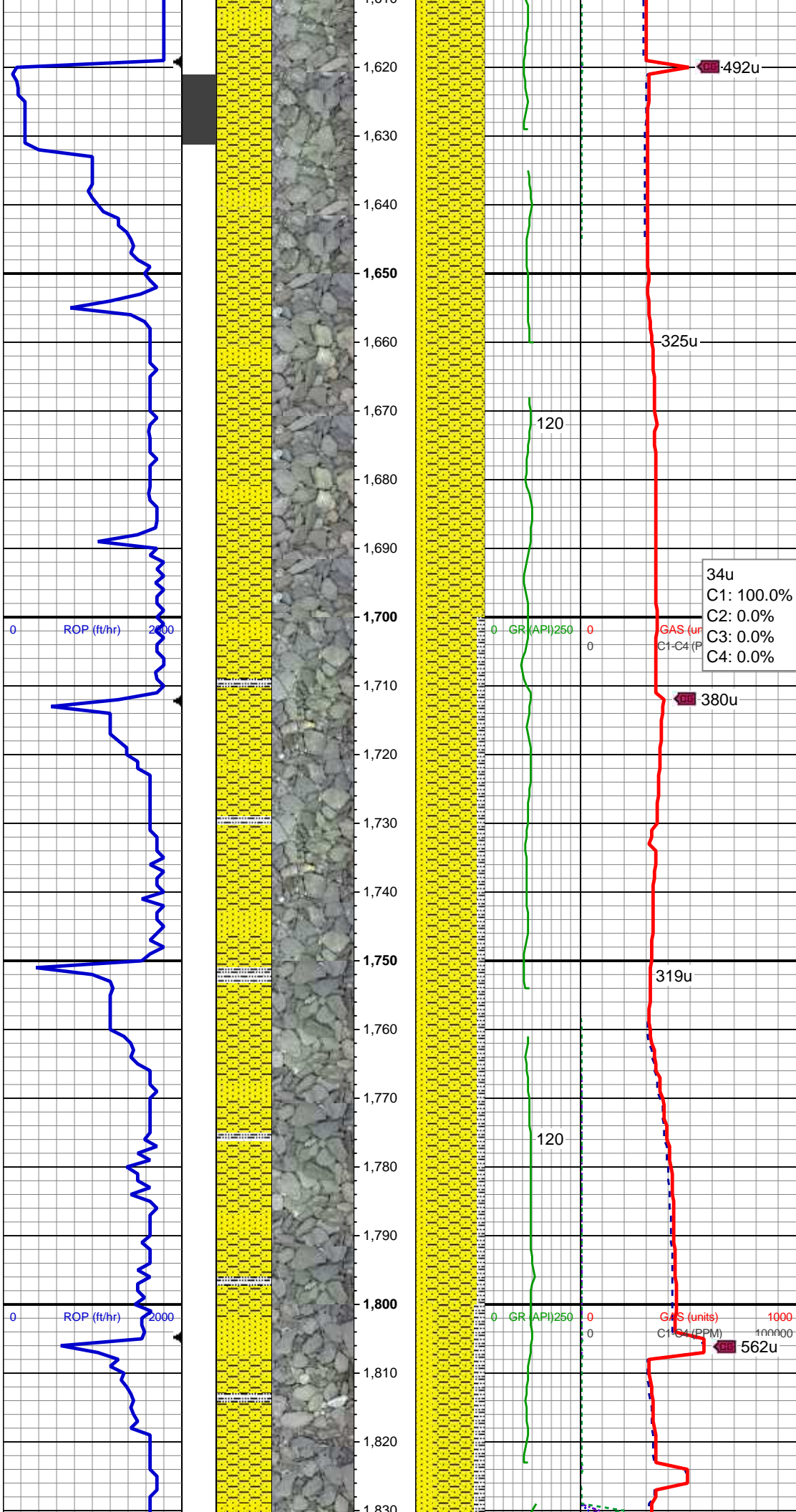
SHY SS: lt gry-gry, sb ang, sb plty, v sft, v f gr, mod srt

MD: 1,474'  
TVD: 1,473.95'  
Inclination: 0.5°  
Azimuth: 238.51°  
VS: 8.1'

SHY SS: lt gry-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

MD: 1,567'  
TVD: 1,566.94'  
Inclination: 0.49°  
Azimuth: 285.8°  
VS: 8.14'





SHY SS: lt gry-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: 1,659'  
TVD: 1,658.94'  
Inclination: 1.56°  
Azimuth: 70.22°  
VS: 7.68'

34u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

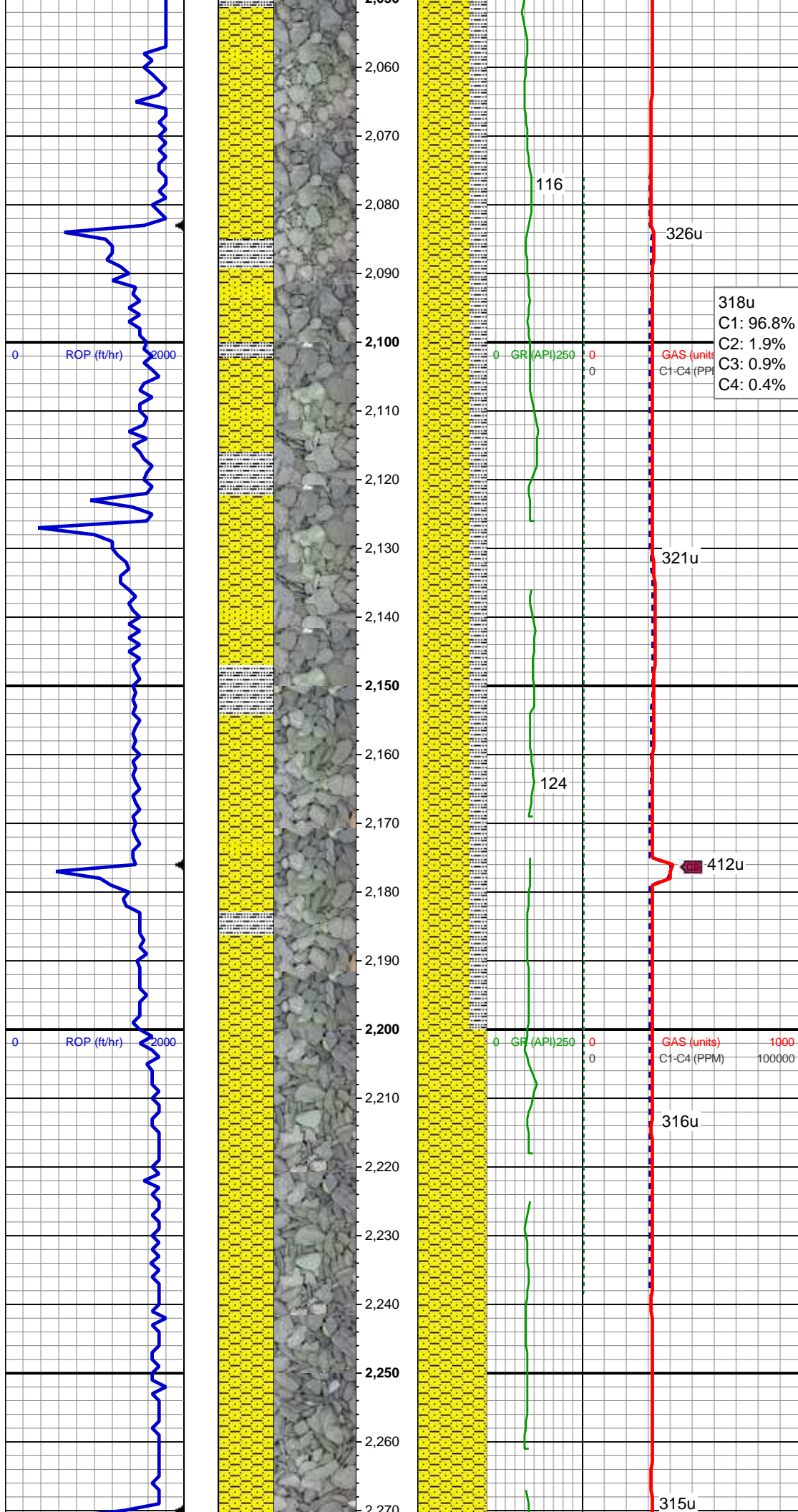
SHY SS: lt gry, sb ang, sb plty, v sft, v f gr, mod srt, abnt lith frag

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

MD: 1,844'  
TVD: 1,843.87'







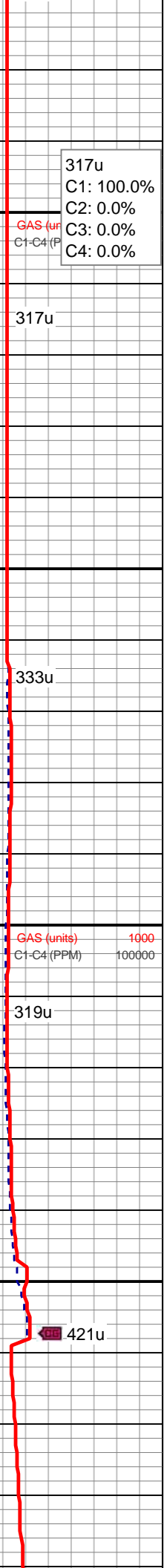
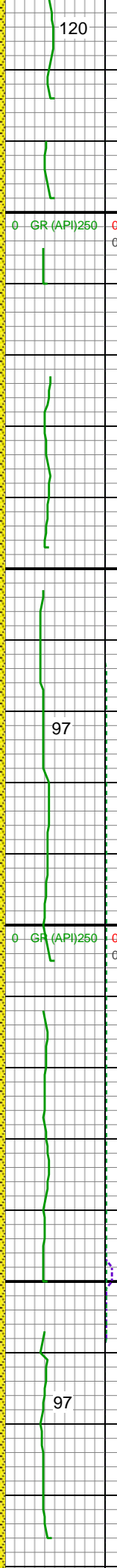
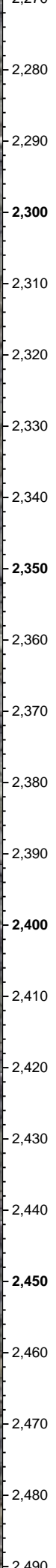
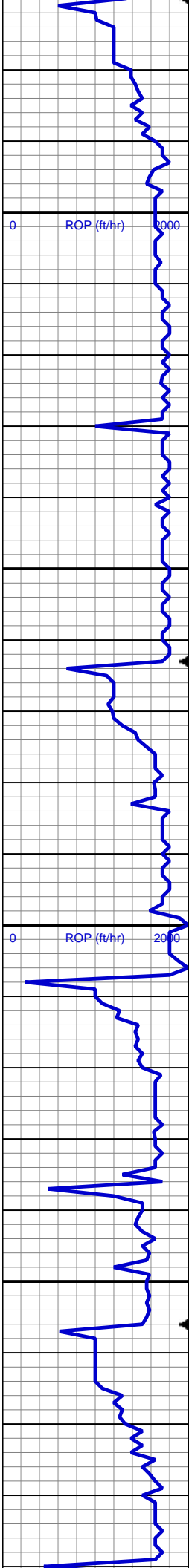
sity tex  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd-frm, mod-w srt, sl calc cmt, tr glauc

MD: 2,124'  
TVD: 2,123.8'  
Inclination: 1.07°  
Azimuth: 56.25°  
VS: 3.01'

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

MD: 2,217'  
TVD: 2,216.78'  
Inclination: 1.4°  
Azimuth: 47.93°  
VS: 1.89'

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



317u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

317u

333u

319u

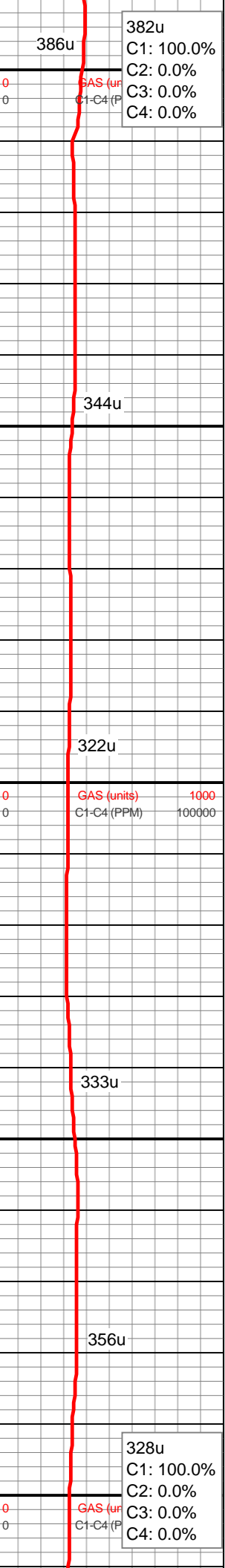
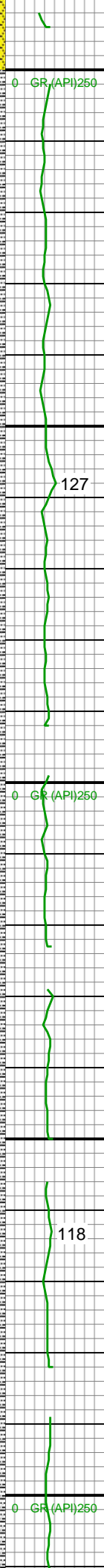
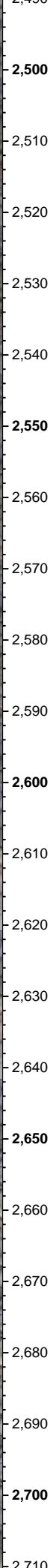
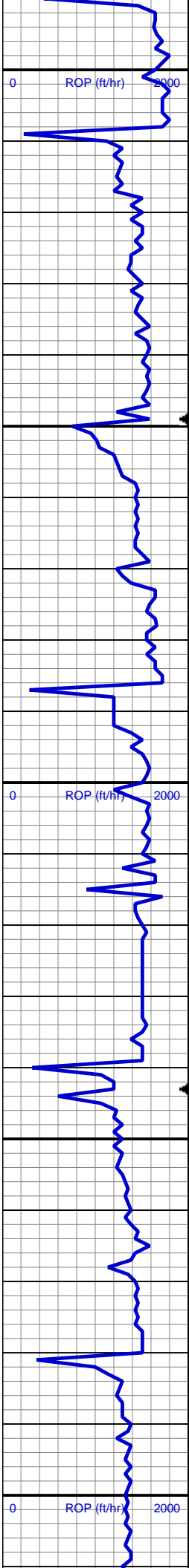
421u

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

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

MD: 2,495'



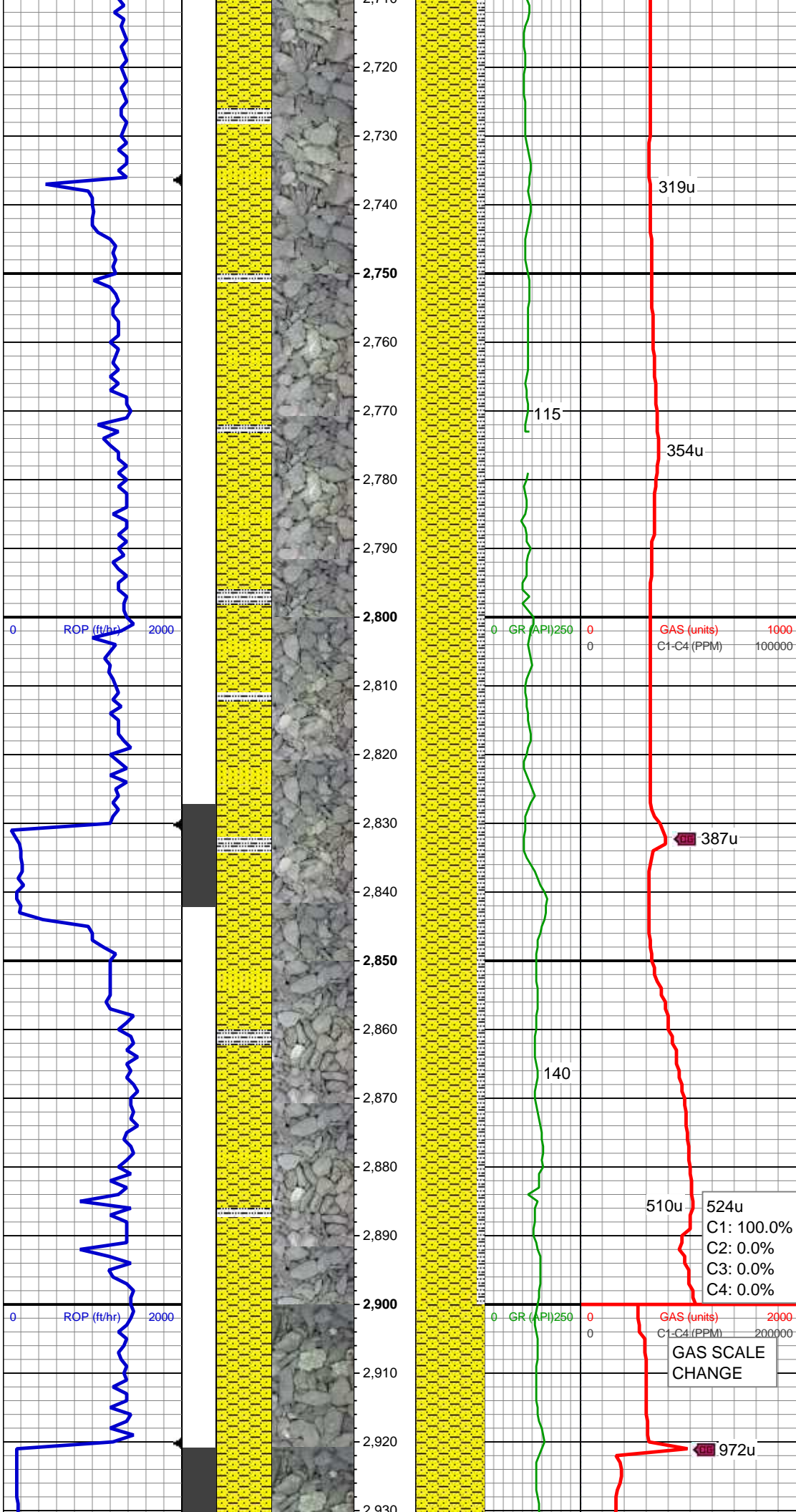


TVD: 2,494.69'  
Inclination: 1.55°  
Azimuth: 45.54°  
VS: -2.58'

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

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

MD: 2,681'  
TVD: 2,680.61'  
Inclination: 1.63°  
Azimuth: 43.67°  
VS: -5.95'



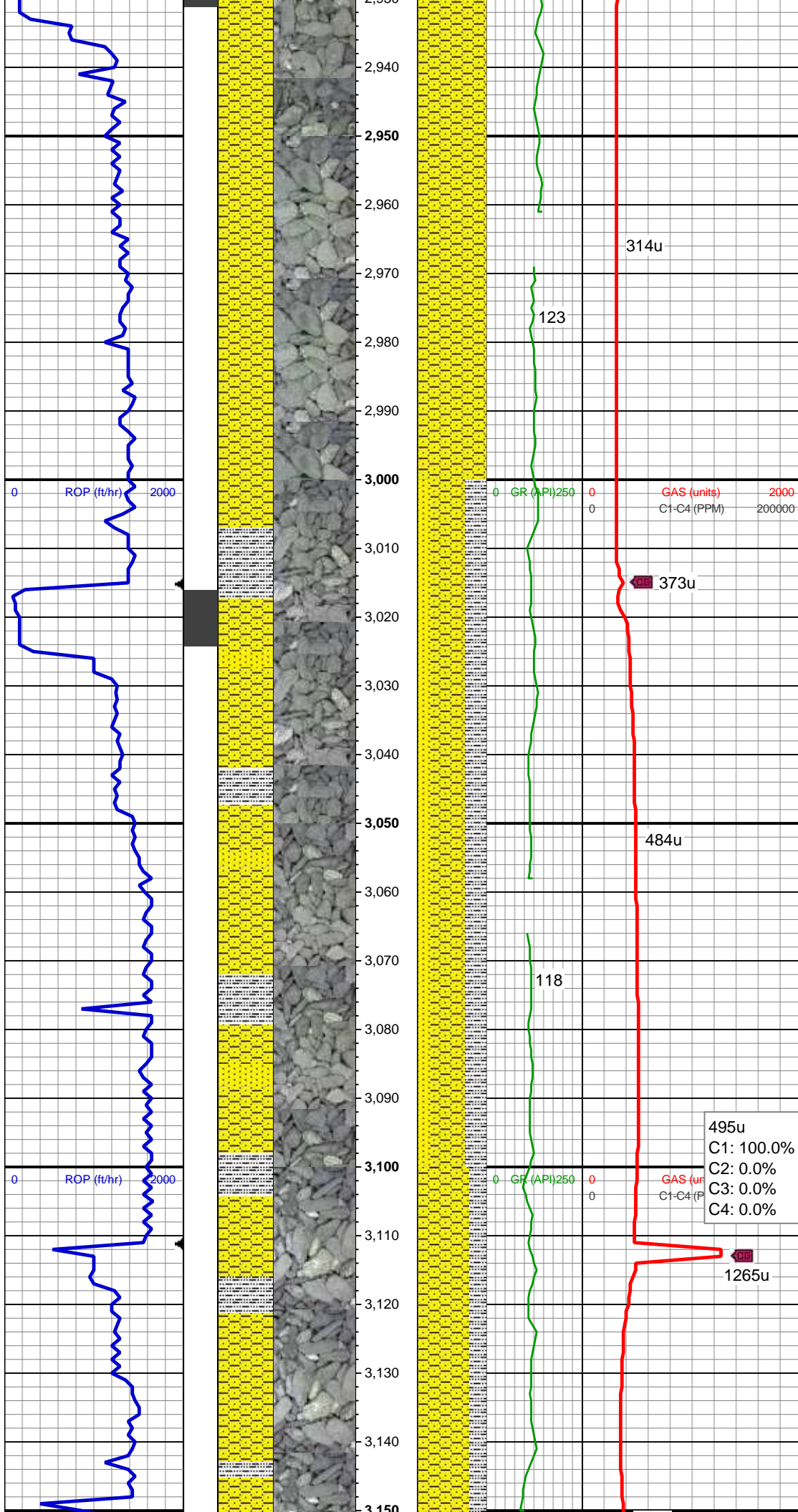
SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt, abnt lith frag  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
slyt tex  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd-frm, mod-w srt, sl calc cmt, tr glauc

MD: 2,773'  
TVD: 2,772.58'  
Inclination: 1.52°  
Azimuth: 46.03°  
VS: -7.6'

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

MD: 2,867'  
TVD: 2,866.49'  
Inclination: 3.38°  
Azimuth: 69.9°  
VS: -9.13'





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

MD: 2,962'  
TVD: 2,961.25'  
Inclination: 4.72°  
Azimuth: 83.52°  
VS: -10'

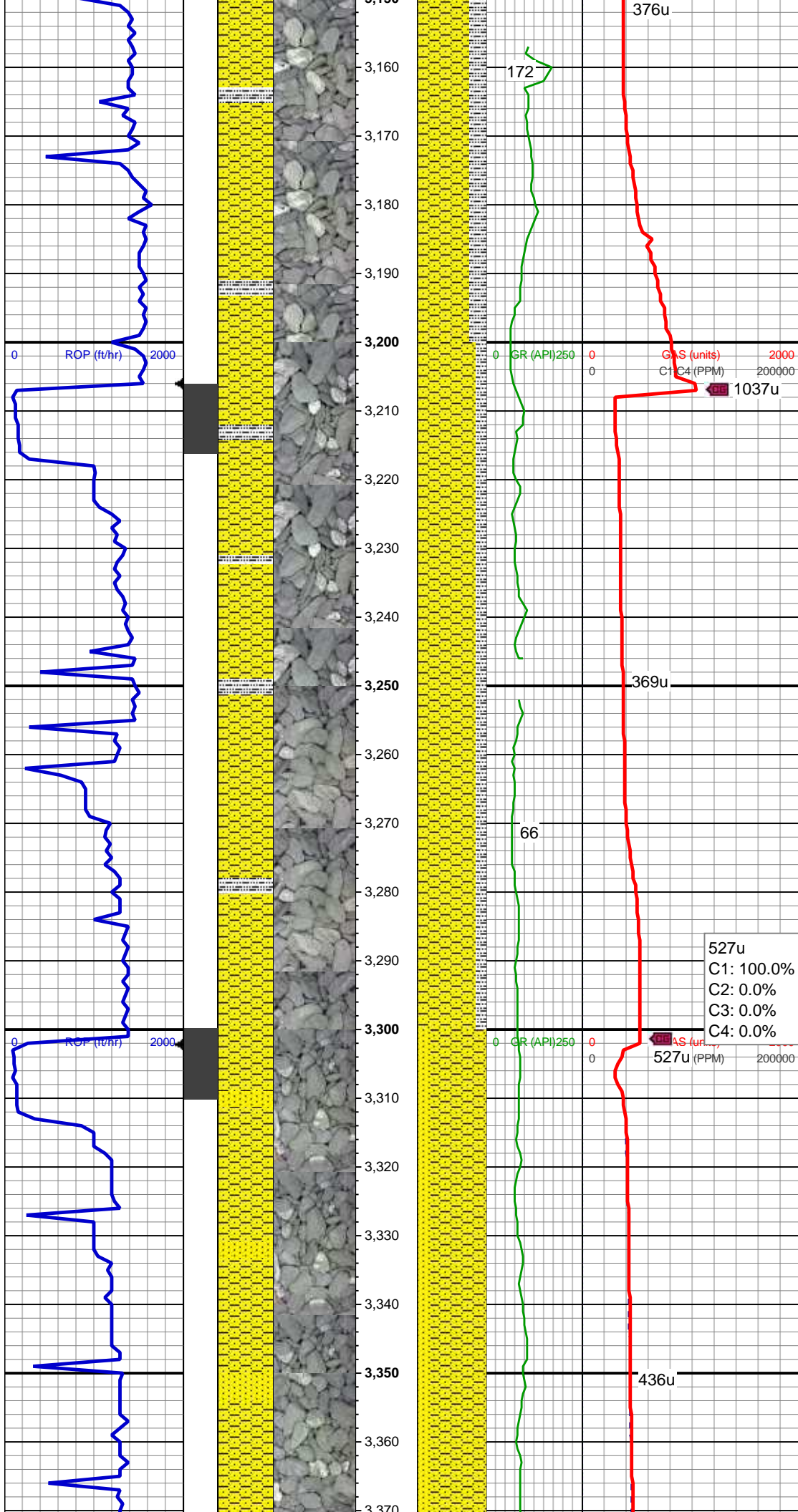
SHY SS: lt gry, sb ang, sb plty, v sft, v f  
gr, mod srt, abnt lith frag  
SLTY SH: gry-dkr gry, rnd, sb plty, v sft,  
sfty tex  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd-frn, mod-w srt, sl calc cmt, tr glauc

MD: 3,057'  
TVD: 3,055.84'  
Inclination: 5.9°  
Azimuth: 88.19°  
VS: -9.89'

495u  
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, abnt lith frag





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

MD: 3,152'  
TVD: 3,150.32'  
Inclination: 6.14°  
Azimuth: 87.46°  
VS: -9.46'

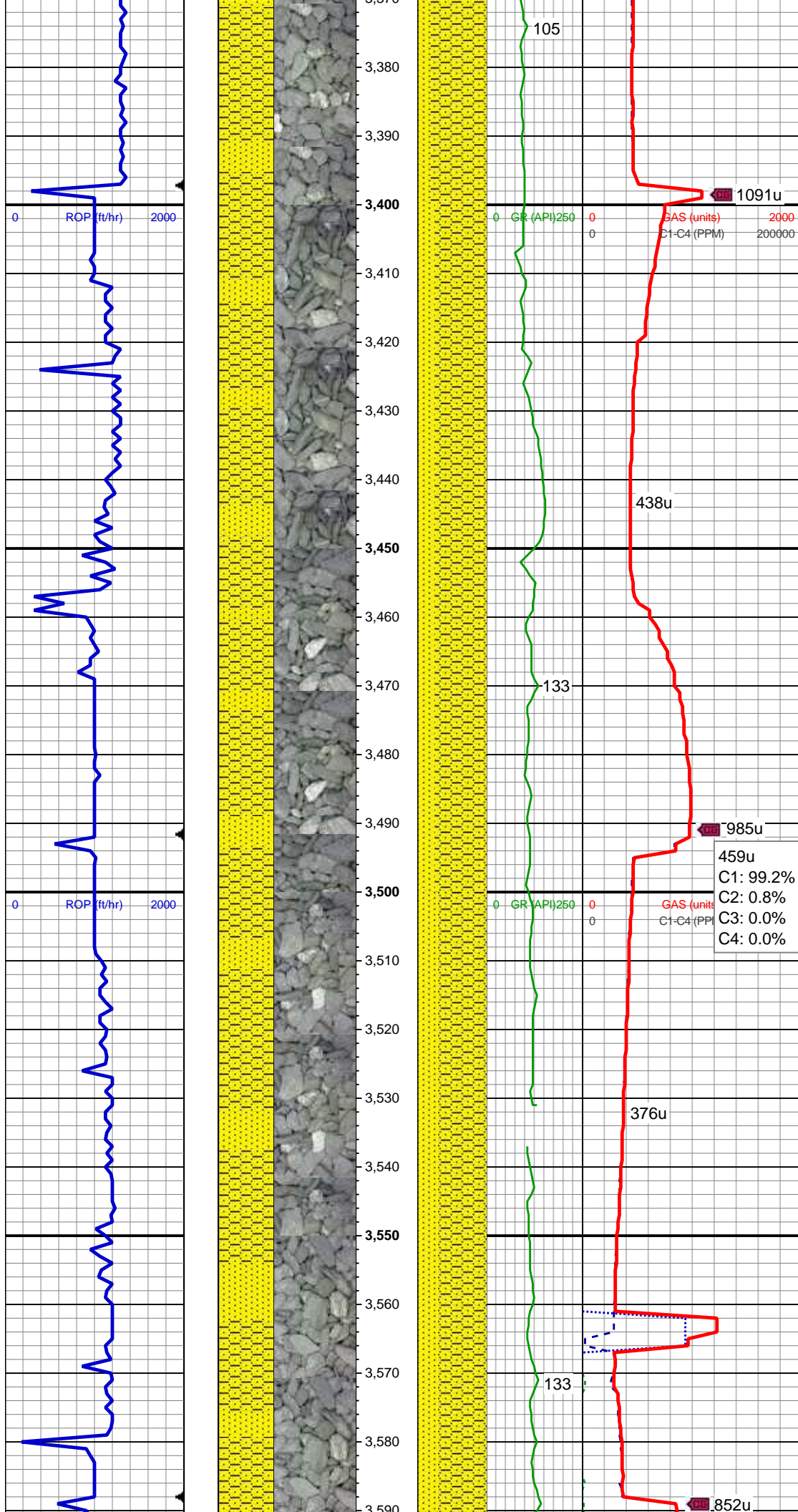
MD: 3,246'  
TVD: 3,243.73'  
Inclination: 6.78°  
Azimuth: 94.1°  
VS: -8.43'

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

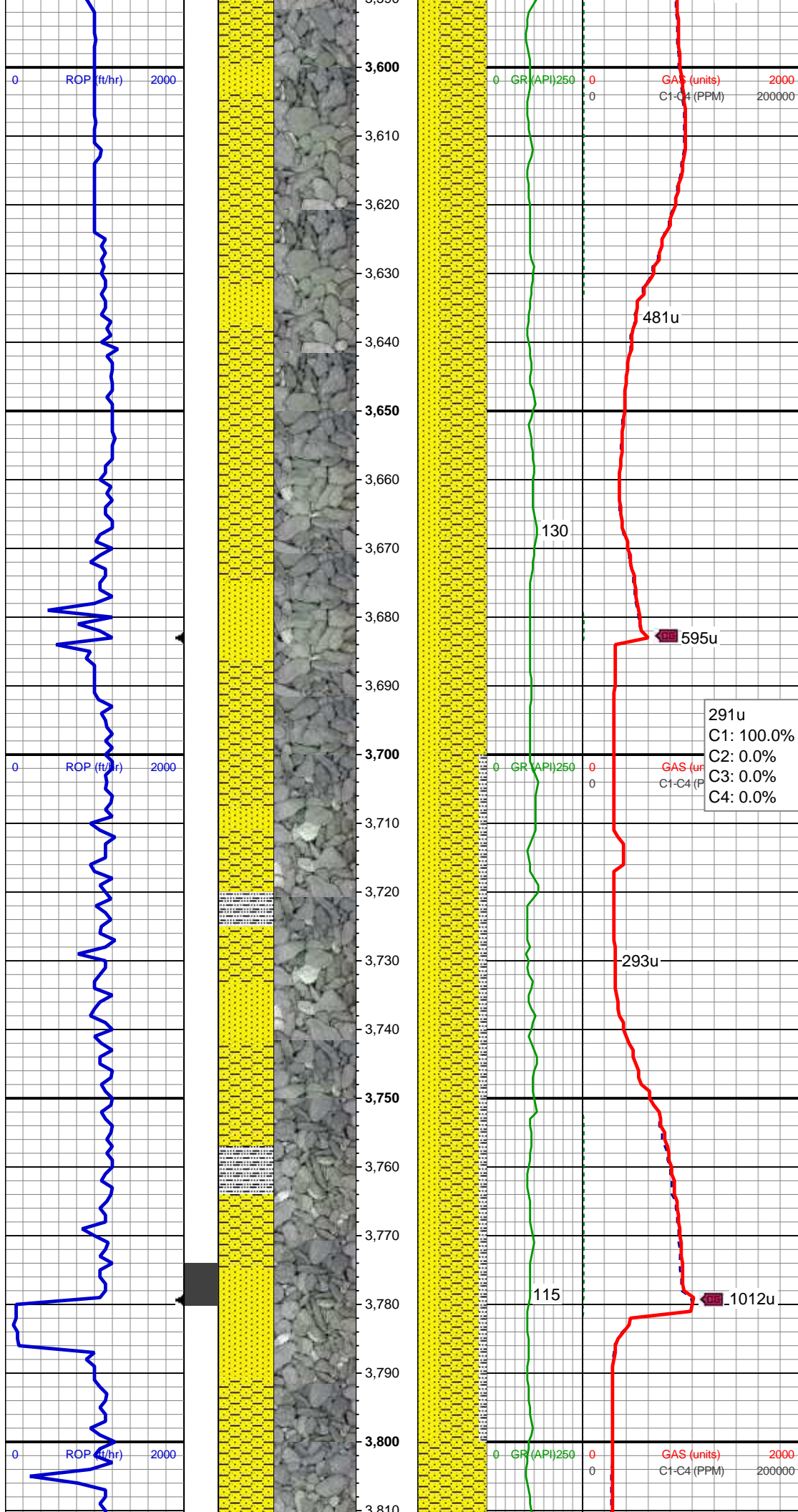
527u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

MD: 3,341'  
TVD: 3,337.92'  
Inclination: 8.1°  
Azimuth: 95.82°  
VS: -6.37'

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







MD: 3,625'  
TVD: 3,618.85'  
Inclination: 8.1°  
Azimuth: 97.04°  
VS: 1.02'

SHY SS: lt gry, sb ang, sb pty, v sft, v f  
gr, mod srt, abnt lith frag  
SS: clr, lt gry-wht, occ sap, sb rnd, f gr,  
hrd frm, mod-w srt, sl calc cmt, tr unconcs,  
abnt glauc

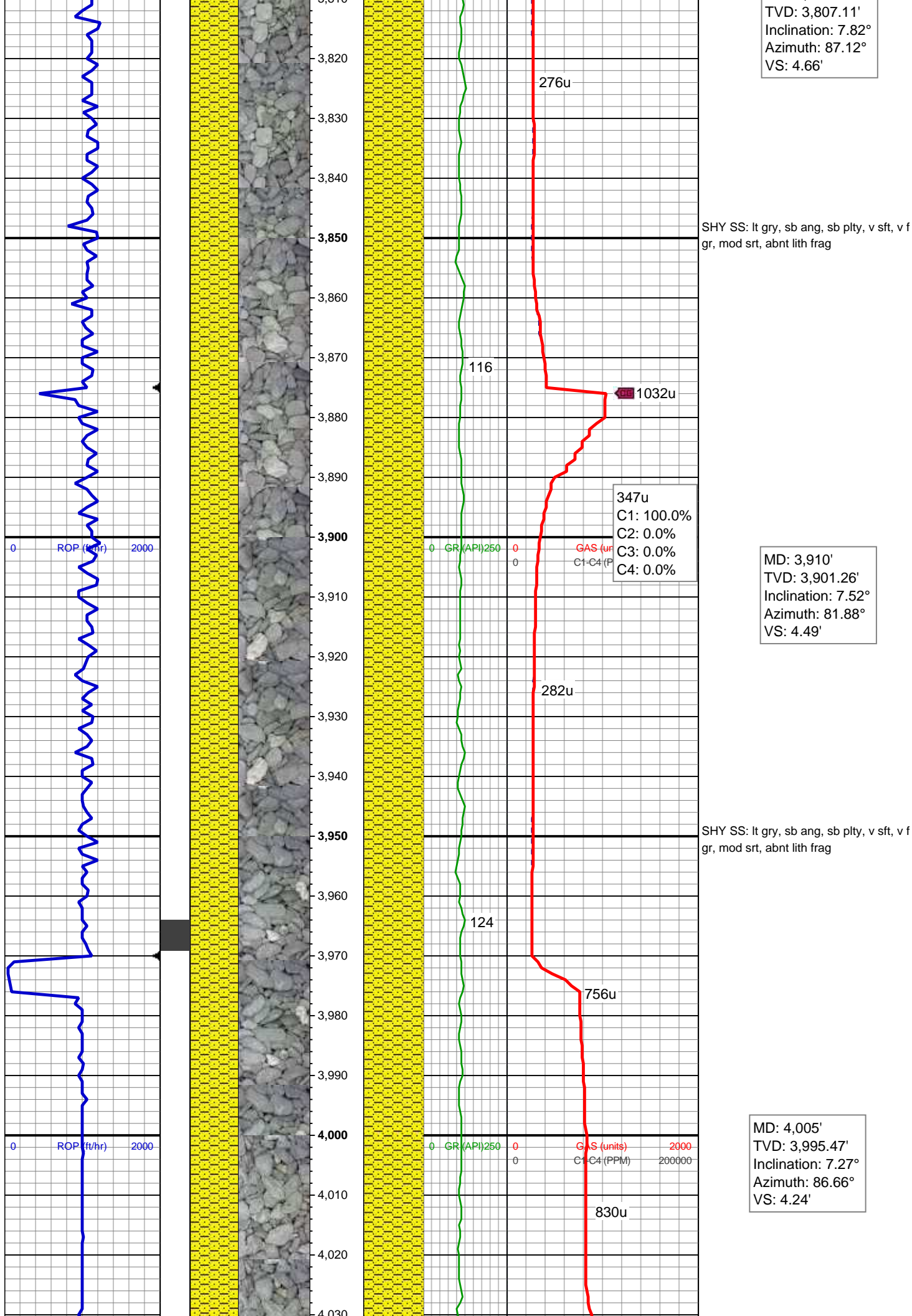
291u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%

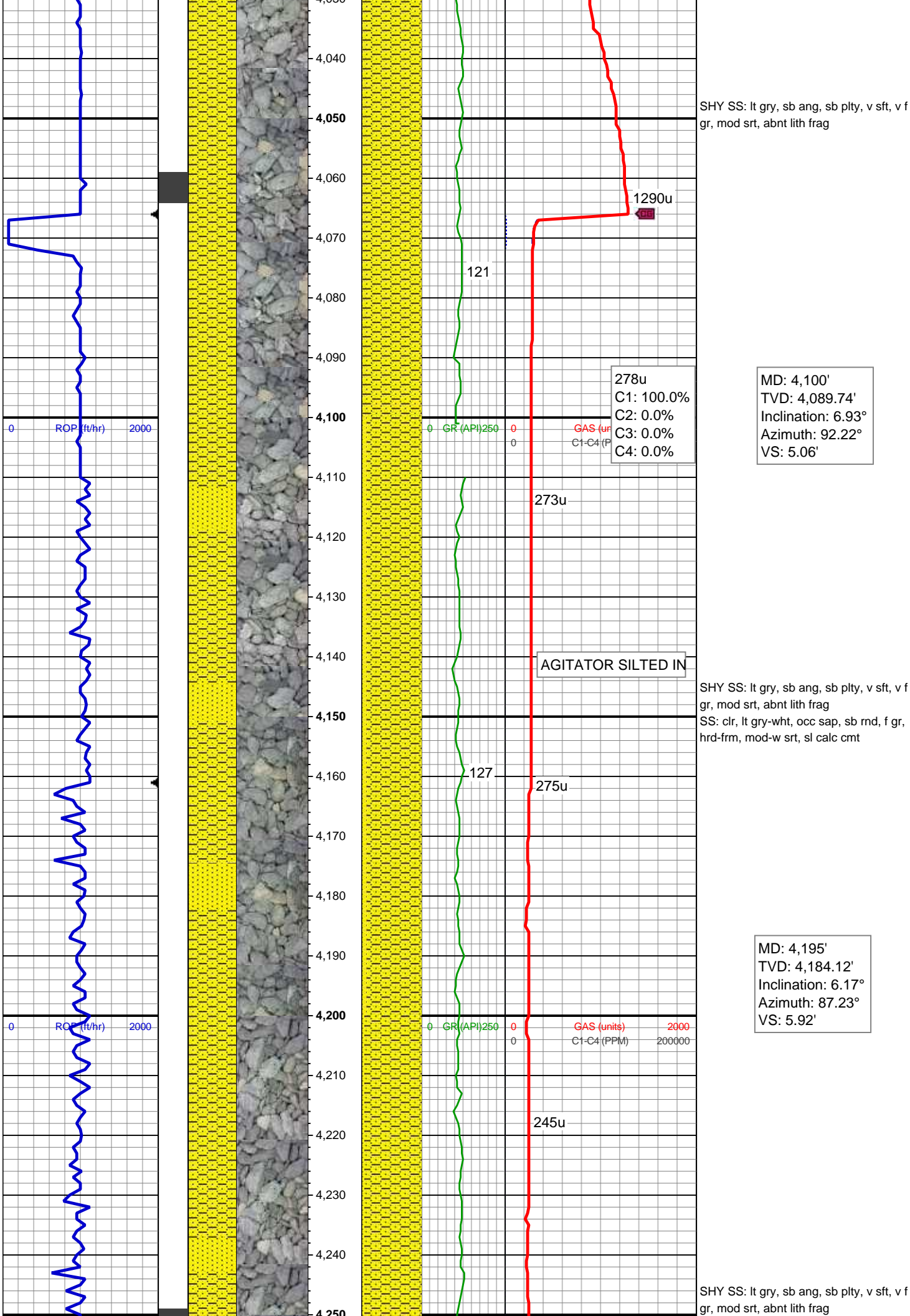
MD: 3,720'  
TVD: 3,712.96'  
Inclination: 7.57°  
Azimuth: 94.99°  
VS: 3.42'

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

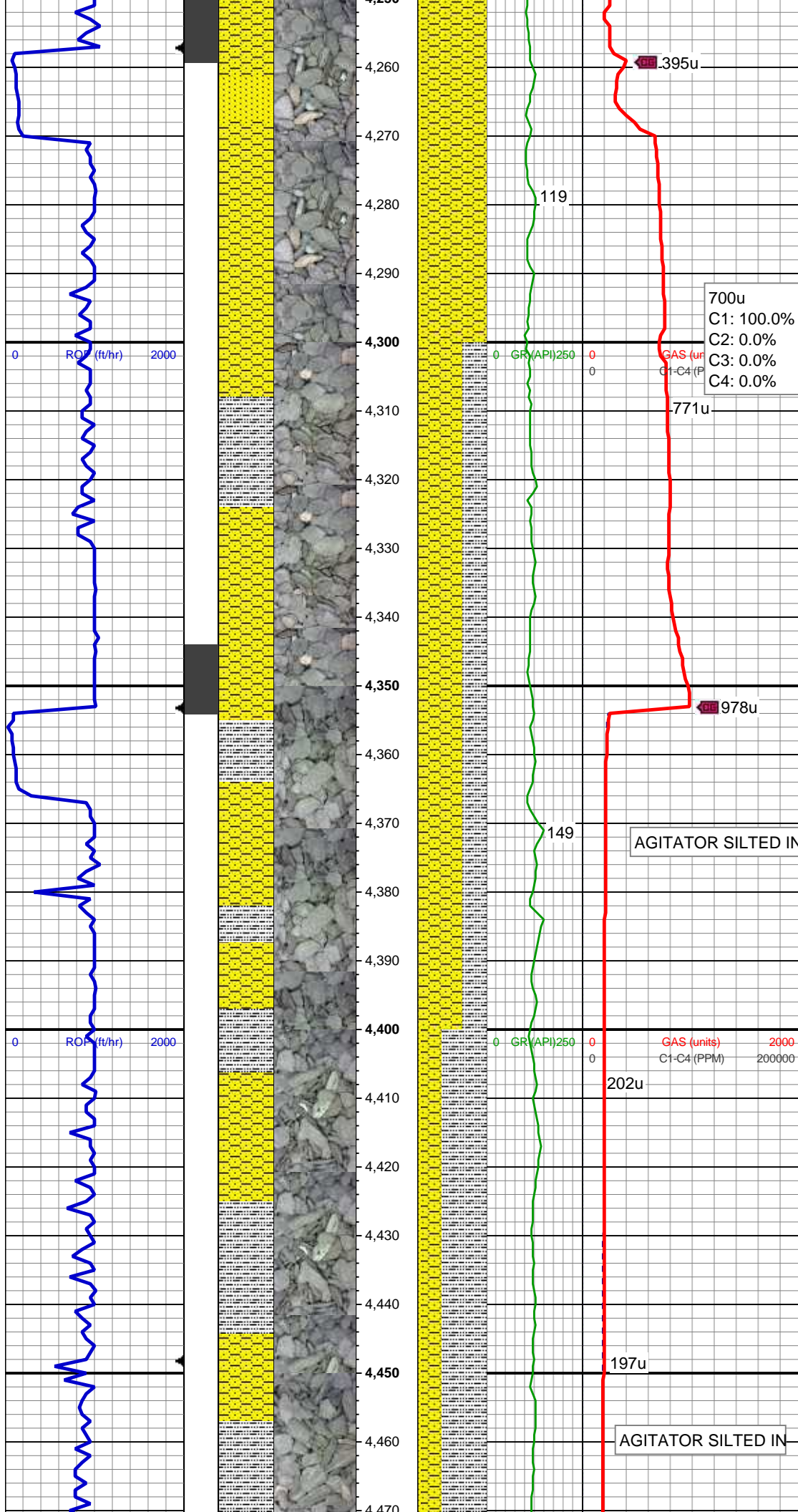
MD: 3,815'











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

WT IN 9.95/ OUT 9.95  
VIS IN 33/ OUT 33

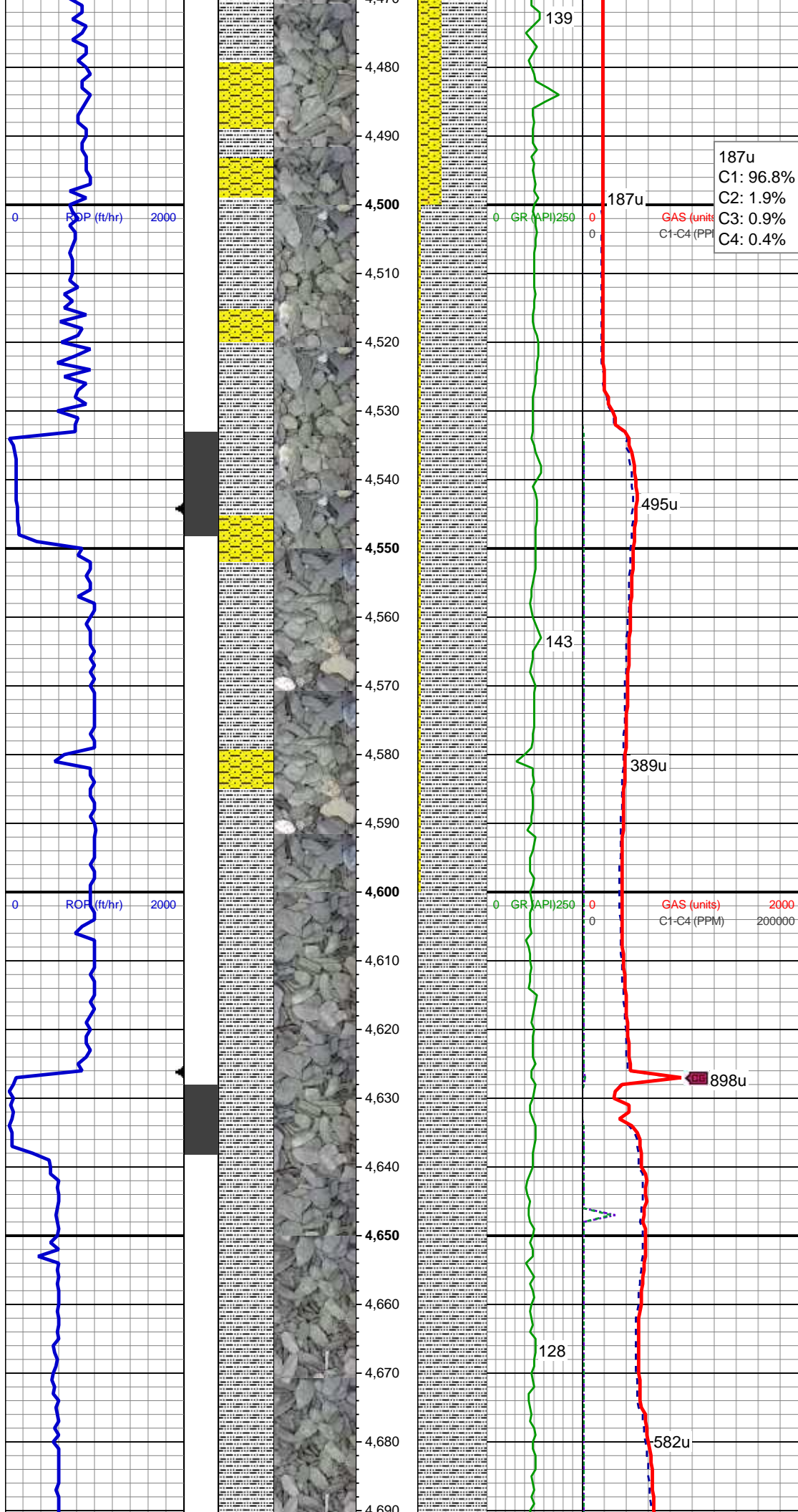
MD: 4,290'  
TVD: 4,278.49'  
Inclination: 7.02°  
Azimuth: 88.01°  
VS: 6.35'

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

MD: 4,384'  
TVD: 4,371.71'  
Inclination: 7.81°  
Azimuth: 94.18°  
VS: 7.6'

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





MD: 4,479'  
TVD: 4,465.94'  
Inclination: 6.77°  
Azimuth: 90.08°  
VS: 9.04'

187u  
C1: 96.8%  
C2: 1.9%  
C3: 0.9%  
C4: 0.4%

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, abnt lith frag; tr cht, rr pyr

MD: 4,574'  
TVD: 4,560.17'  
Inclination: 7.76°  
Azimuth: 91.08°  
VS: 10.14'

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

MD: 4,668'  
TVD: 4,653.29'  
Inclination: 7.94°  
Azimuth: 91.47°  
VS: 11.47'

