

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Crow Creek AA01-776 VERT

Location SEC 1 T6N R63W

State COLORADO

County WELD

Country USA

Rig Number H&P 315

API Number 05-123-40157

AFE # 200438

Region DJ BASIN

Field WATTENBERG

Spud Date 1/9/2015

Drilling Completed 1/15/2015

Surface Coordinates NWNW SEC 1 T6N R63W
290' FNL; 575' FWL

LAT/LON: 40.52203/-104.39221

Bottom Hole Coordinates SEC 12 T6N R63W
30' FNL; 950' FWL

Ground Elevation 4,798'

K.B. Elevation 4,822'

Logged Interval 2,000' To 6,090'

Total Depth 11,647'

Formation NIOBRARA C CHALK

Type of Drilling Fluid LSND

Other Symbols

Oil Show

- DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

Porosity

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

- ORGANIC
- PINPOINT
- VUGGY

Engineering

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

- 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
- WIRELINE TESTED - LEFT

- WIRELINE TESTED - RT

Rounding

- ANGULAR
- ROUNDED
- SUBANG
- SUBRND

Textures

- BOUNDSTONE
- CHALKY
- CRYPTOXLN
- E EARTHY
- FINELYXLN













- GRAINSTONE
- L LITHOGRAPHIC
- MIX MICROXLN
- MS MUDSTONE
- PS PACKSTONE
- WS WACKSTONE

Sorting












- M MODERATE
- P POOR
- W WELL

Accessories

Fossils







-  ALGAE
-  AMPHIPORA
-  BELEMNITE
-  BIOCLASTIC
-  BRACHIOIPOD
-  BRYOZOA
-  CEPHALOPOD
-  CORAL
-  CRINOID
-  ECHINOID
-  FISH
-  FORAMINIFERA

F 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
-  MARLSTONE
-  MINERAL CRYSTALS
-  NODULES
-  PHOSPHATE PELLETS
-  PYRITE
-  SALT CAST
-  SANDY
-  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

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

Operator

Company Noble Energy Inc

Address 1625 BROADWAY SUITE 2200
DENVER, CO 80202



Geologist

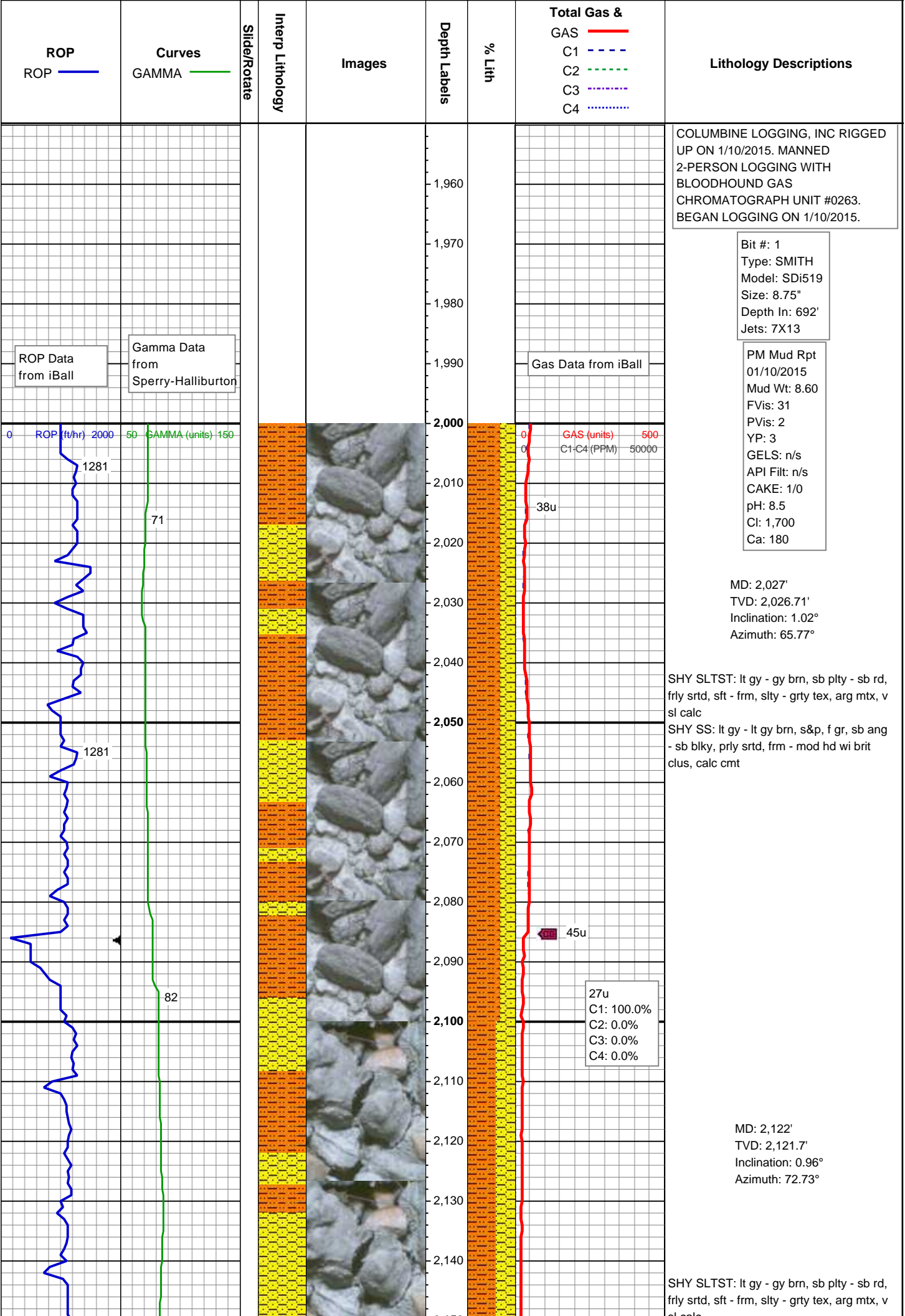
Name MARK COLE; ZACH UBER

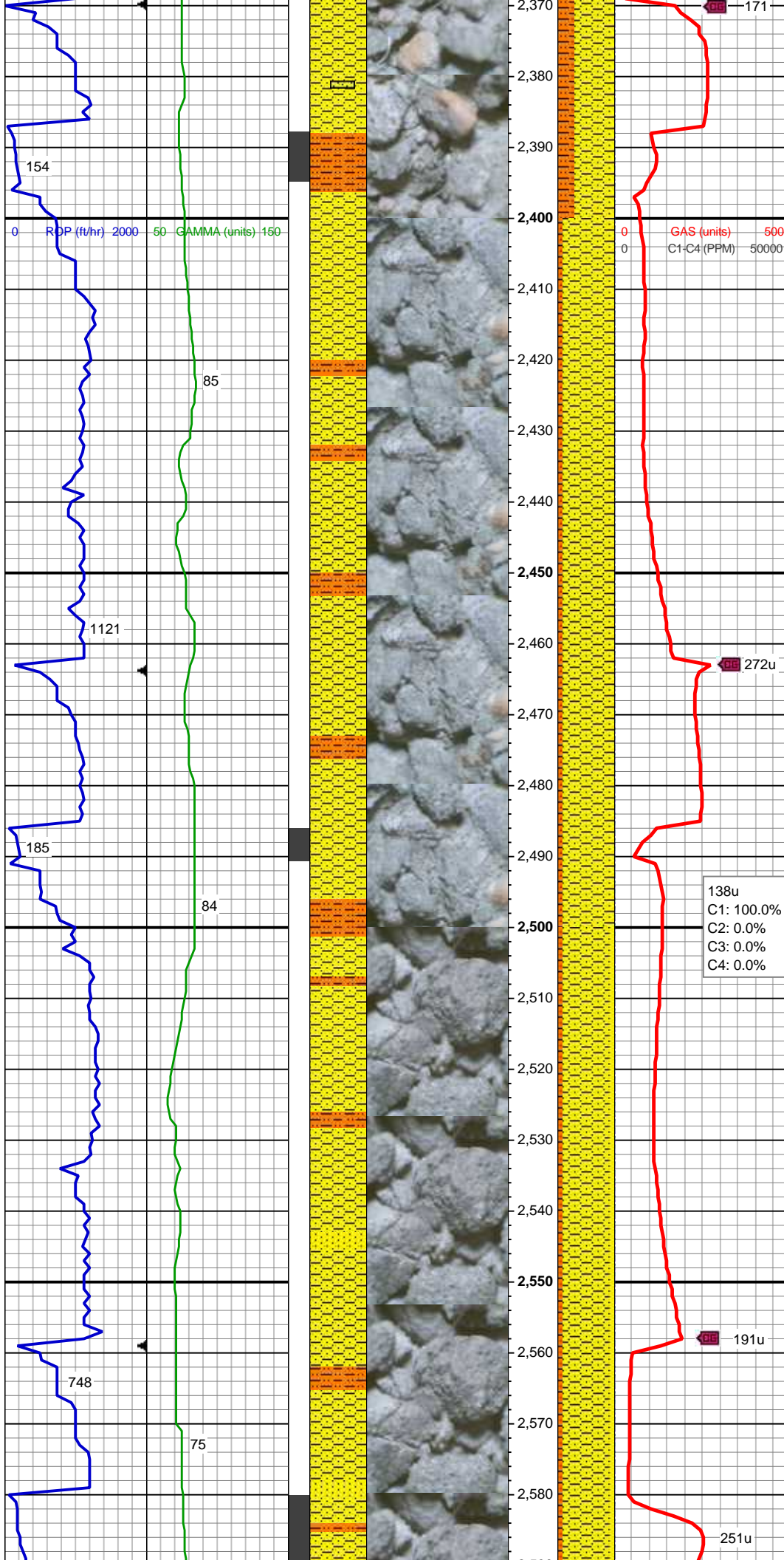
Company COLUMBINE LOGGING, INC

Address 602 S LIPAN ST
DENVER, CO 80223

Zone Color Coding

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



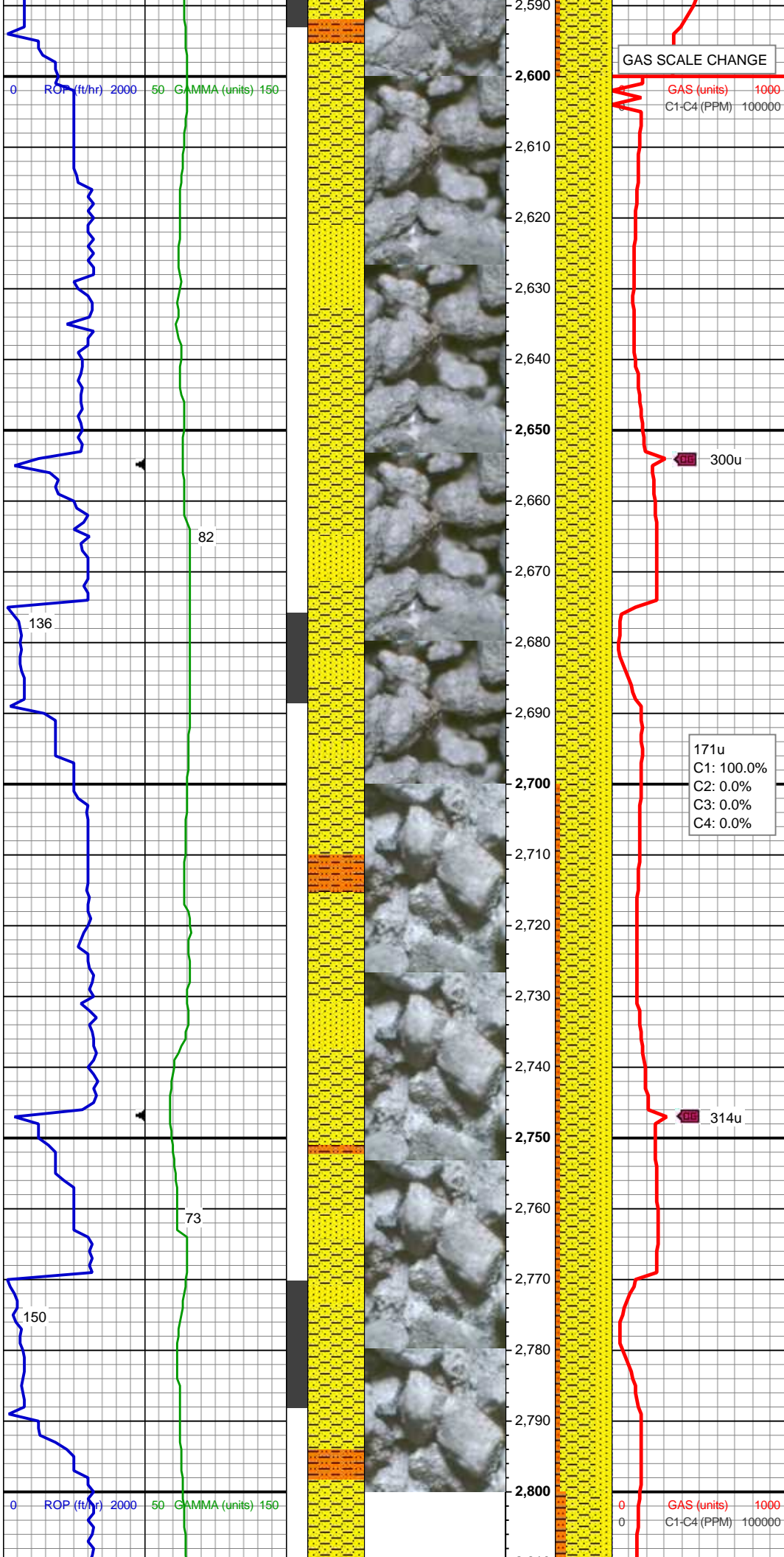


MD: 2,406'
TVD: 2,405.64'
Inclination: 2.1°
Azimuth: 46.45°

SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srt, frm - mod hd wi brit
clus, calc cmt, tr SSSHY SLTST: lt gy -
gy brn, sb plty - sb rd, frly srt, sft - frm,
sly - grty tex, arg mtx, v sl calc

MD: 2,501'
TVD: 2,500.56'
Inclination: 2.65°
Azimuth: 57.5°

SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srt, frm - mod hd wi brit
clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srt, sft - frm, sly - grty tex, arg mtx, v
sl calc
SS: wh - lt gy, fros - trns, speckl wi mica,
f gr, hd brit clus, ang - sb ang, v calc cmt



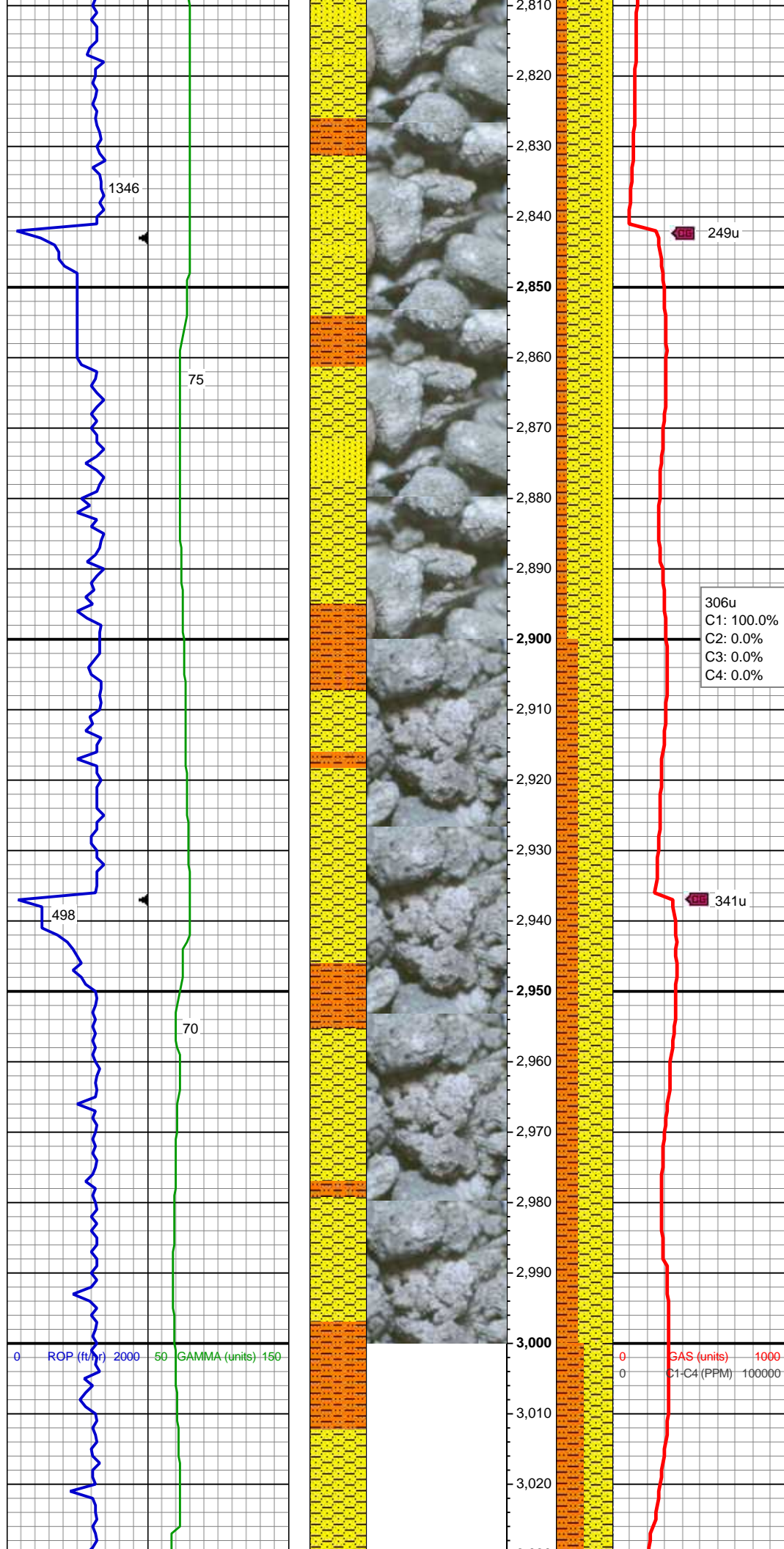
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srt, frm - mod hd wi brit
clus, calc cmt;
SS: wh - lt gy, fros - trnsl, speckl wi mica,
f gr, hd brit clus, ang - sb ang, v calc cmt

MD: 2,691'
TVD: 2,689.97'
Inclination: 6.22°
Azimuth: 69.1°

SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt;
SS: wh - lt gy, fros - trnsl, speckl wi mica,
f gr, hd brit clus, ang - sb ang, v calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
fry srt, sft - frm, slty - grty tex, v sl calc

MD: 2,786'
TVD: 2,784.2'
Inclination: 8.41°
Azimuth: 54.66°

MUD WT: 8.7/8.7

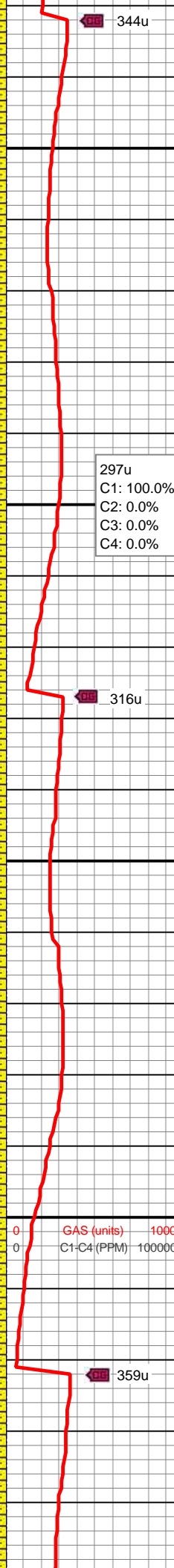
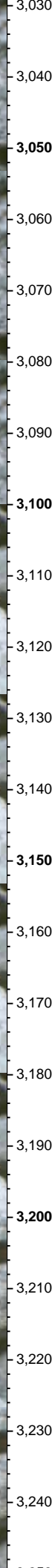
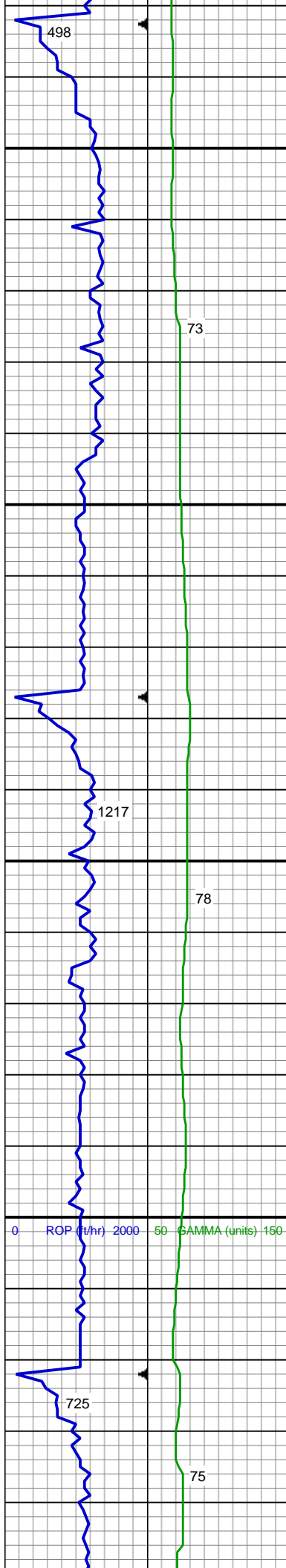


SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srt, sft - frm, slty - grty tex, v sl calc
SS: wh - lt gy, fros - trnsl, speckl wi mica,
f gr, hd brit clus, ang - sb ang, v calc cmt

MD: 2,881'
TVD: 2,878.17'
Inclination: 8.41°
Azimuth: 53.6°

SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srt, sft - frm, slty - grty tex, v sl calc

MD: 2,976'
TVD: 2,972.18'
Inclination: 8.19°
Azimuth: 51.23°



SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srted, sft - frm, slty - grty tex, arg mtx, v
sl calc

SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srted, frm - mod hd wi brit
clus, calc cmt

MD: 3,070'

TVD: 3,065.22'

Inclination: 8.2°

Azimuth: 50.39°

SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srted, sft - frm, slty - grty tex, v sl calc

SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srted, frm - mod hd wi brit
clus, calc cmt

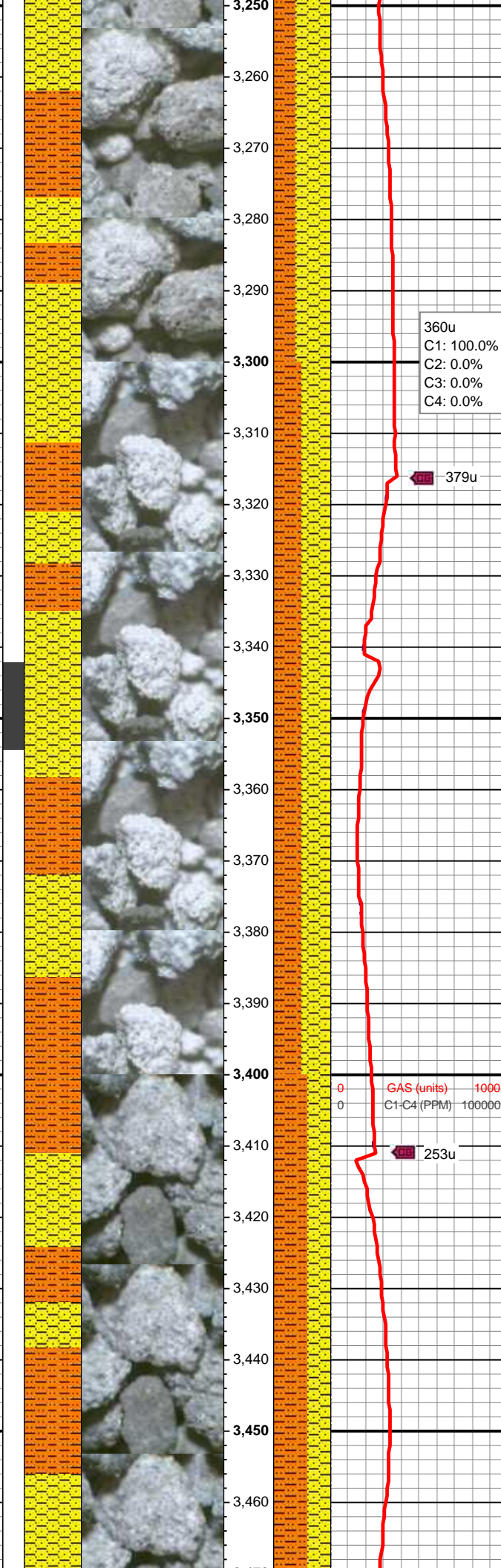
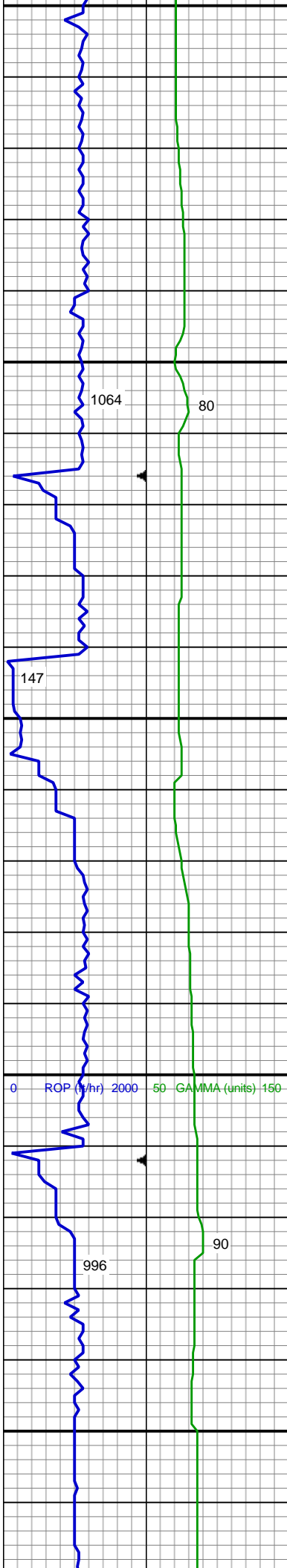
MD: 3,165'

TVD: 3,159.28'

Inclination: 7.91°

Azimuth: 48.05°

SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srted, frm - mod hd wi
brit clus, calc cmt



SHY SLTST: lt gy - gy brn, sb plty - sb rd, frly srted, sft - frm, slty - grty tex, v sl calc

MD: 3,259'
TVD: 3,252.43'
Inclination: 7.52°
Azimuth: 46.98°

SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb ang - sb blk, prly srted, frm - mod hd wi brit clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd, frly srted, sft - frm, slty - grty tex, arg mtx, v sl calc

MD: 3,354'
TVD: 3,346.58'
Inclination: 7.91°
Azimuth: 55.35°

0
0

GAS (units)
C1-C4 (PPM)

1000
100000

MD: 3,448'
TVD: 3,439.78'
Inclination: 6.99°
Azimuth: 55.75°

SHY SLTST: lt gy - gy brn, sb plty - sb rd, frly srted, sft - frm, slty - grty tex, arg mtx, v sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang - sb blk, prly srted, frm - mod hd wi brit clus, calc cmt



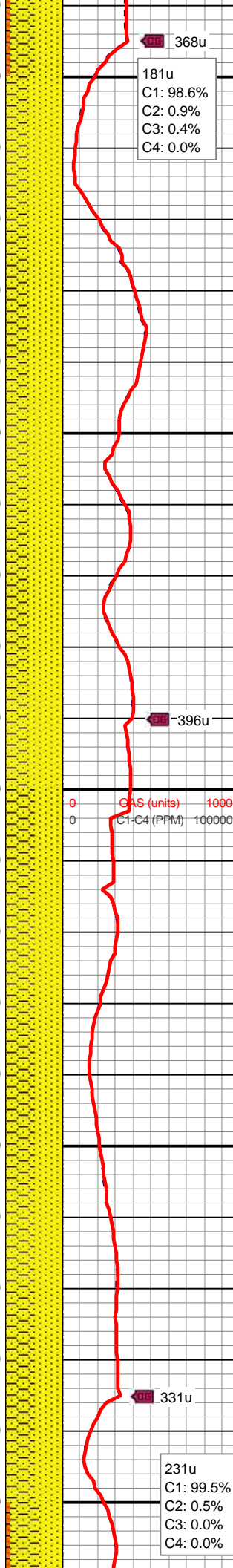
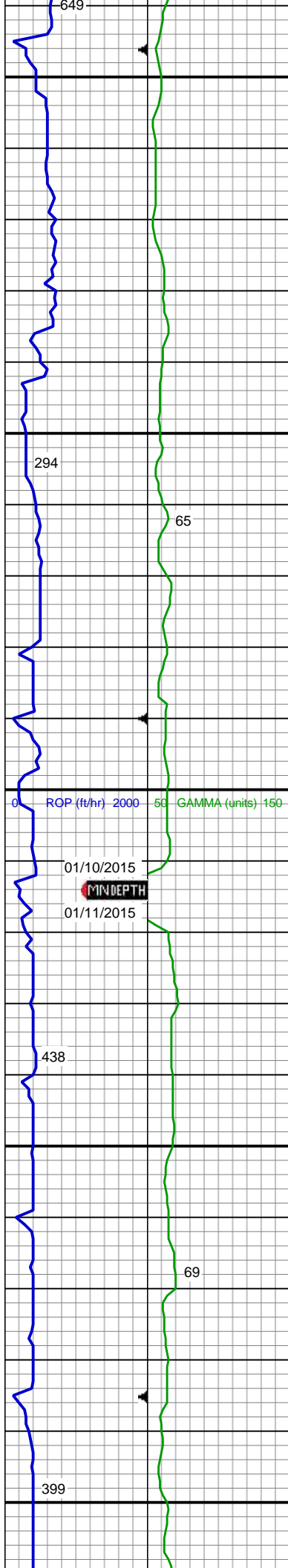
MUD WT: 8.9/8.9
VIS: 37/35 IN/OUT

SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srted, sft - frm, slty - grty tex, arg mtx, v
sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blkly, prly srted, frm - mod hd wi brit
clus, calc cmt

**PARKMAN TOP @
3,622' MD; 3,612' TVD**

MD: 3,638'
TVD: 3,628.17'
Inclination: 8.01°
Azimuth: 71.43°

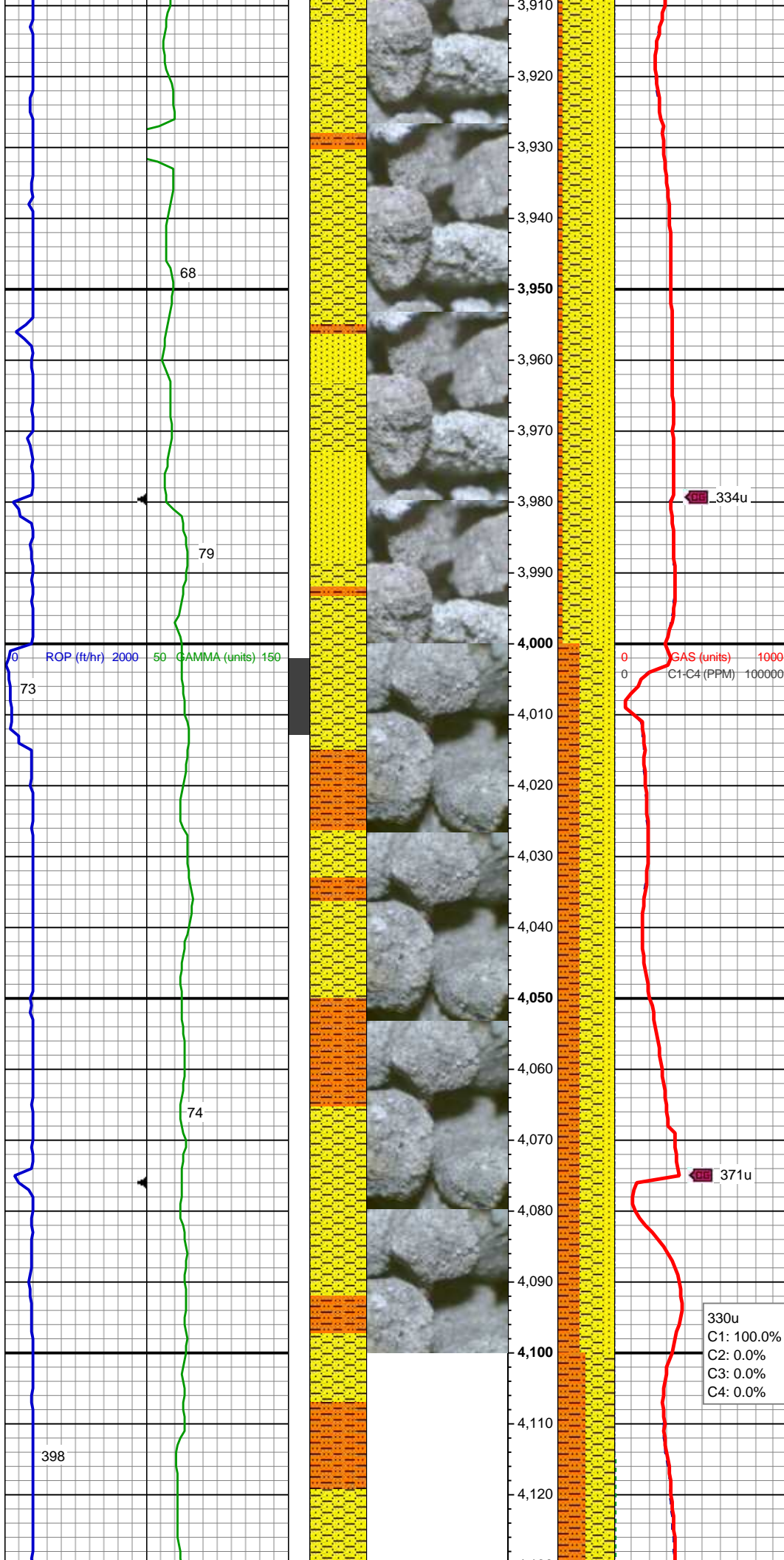
SS: wh - lt gy, fros - trnsf, speckl wi mica,
f gr, hd brit clus, ang - sb ang, calc cmt
SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blkly, prly srted, frm - mod hd wi
brit clus, calc cmt;
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srted, sft - frm, slty - grty tex, v sl calc



MD: 3,733'
TVD: 3,722.19'
Inclination: 8.52°
Azimuth: 71.05°

SS: wh, fros - trnsl, f gr, hd brit clus, ang
- sb ang, calc cmt
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srted, frm - mod hd wi brit
clus, calc cmt

SS: wh, fros - trnsl, f gr, hd brit clus, ang
- sb ang, calc cmt
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srted, frm - mod hd wi brit
clus, calc cmt



MD: 3,923'
TVD: 3,909.8'
Inclination: 9.63°
Azimuth: 70.63°

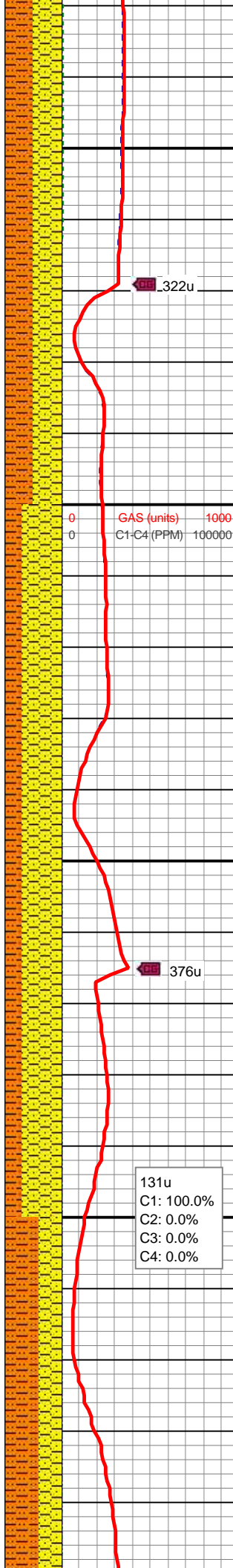
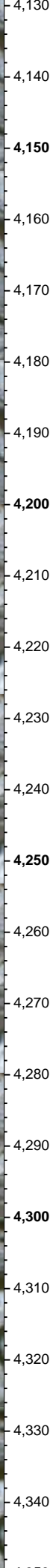
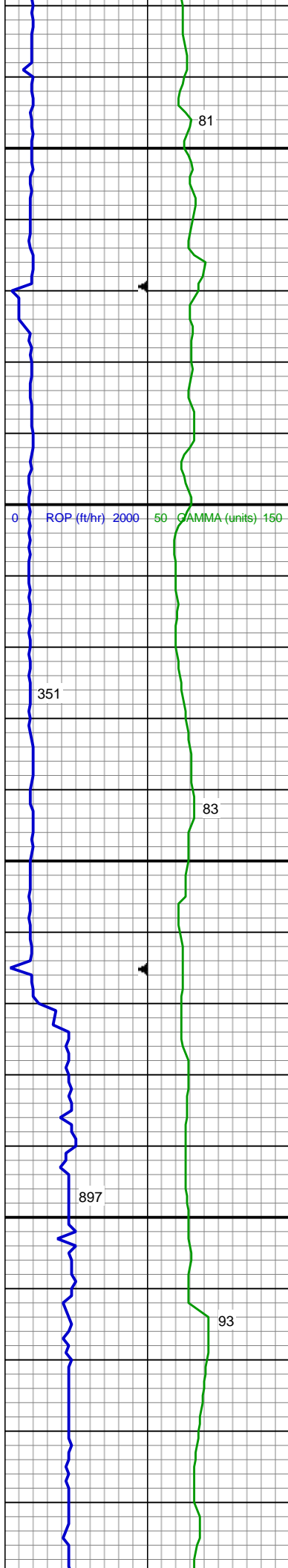
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srt, frm - mod hd wi brit
clus, calc cmt
SS: wh, fros - trnsl, f gr, hd brit clus, ang -
sb ang, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
fryl srt, sft - frm, slty - grty tex, sl calc

MD: 4,018'
TVD: 4,003.56'
Inclination: 8.93°
Azimuth: 68.29°

SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt;
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
fryl srt, sft - frm, slty - grty tex, v sl calc
SS: wh - lt gy, fros - trnsl, speckl wi mica,
f gr, hd brit clus, ang - sb ang, calc cmt

| |
|------------|
| 330u |
| C1: 100.0% |
| C2: 0.0% |
| C3: 0.0% |
| C4: 0.0% |

MD: 4,113'
TVD: 4,097.46'
Inclination: 8.51°
Azimuth: 66.71°



SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
fry srt, sft - frm, slty - grty tex, sl calc

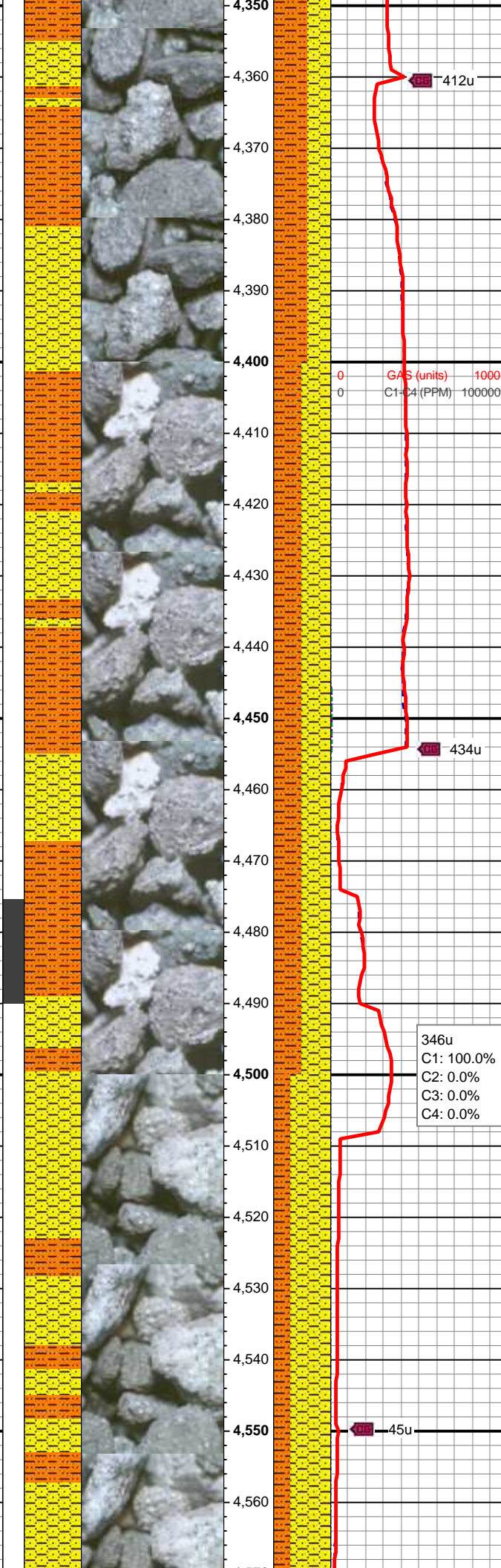
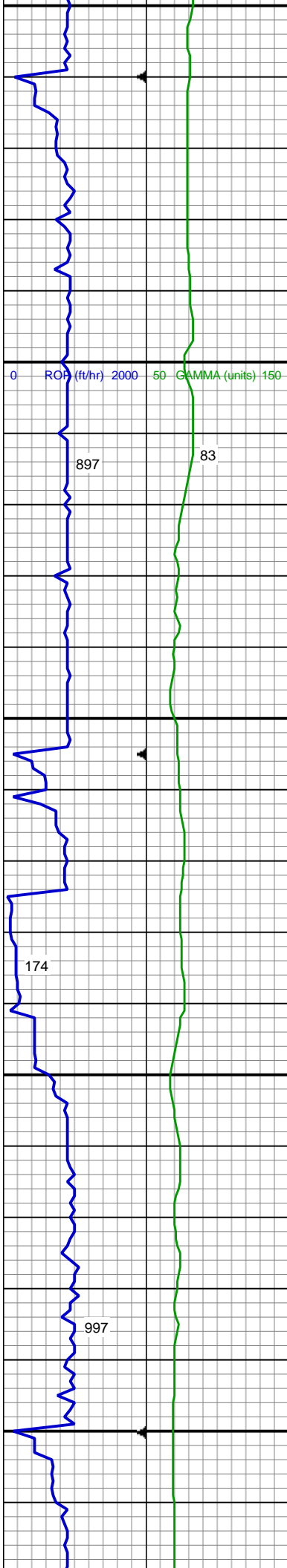
MD: 4,207'
TVD: 4,190.47'
Inclination: 8.13°
Azimuth: 67.14°

SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
fry srt, sft - frm, slty - grty tex, v sl calc

MUD WT: 8.9/9.1
VIS: 33/35 IN/OUT

MD: 4,302'
TVD: 4,284.57'
Inclination: 7.73°
Azimuth: 63.42°

SHY SLTST: lt gy - gy brn, sb plty - sb rd,
fry srt, sft - frm, slty - grty tex, v sl calc



SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt

MD: 4,397'
TVD: 4,378.8'
Inclination: 6.86°
Azimuth: 58.92°

**SUSSEX TOP @
4,437' MD; 4,418' TVD**

SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt

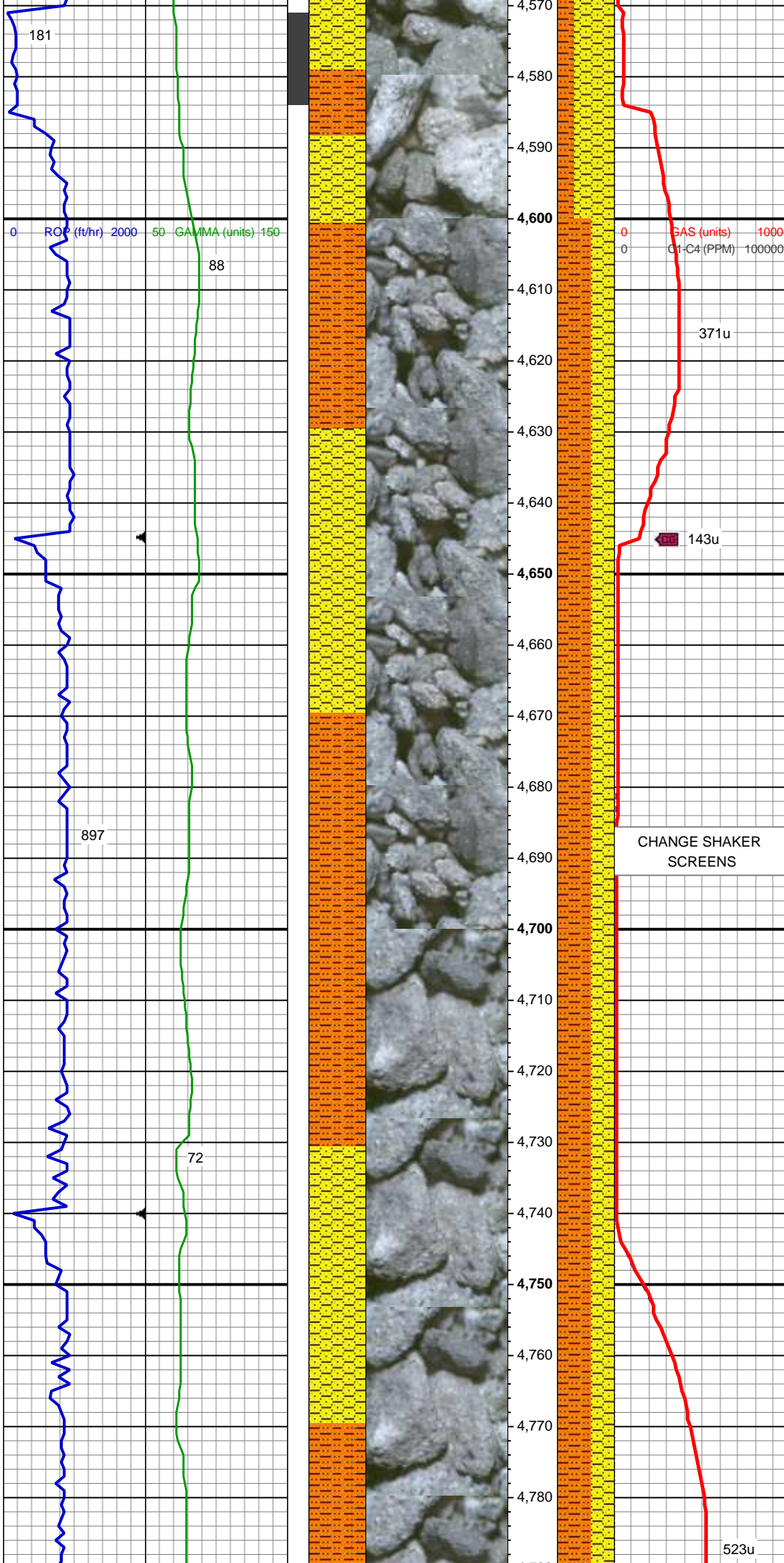
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srt, sft - frm, slty - grty tex, v sl calc

MD: 4,492'
TVD: 4,473.01'
Inclination: 7.86°
Azimuth: 53.66°

346u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

SHY SS: wh - lt gy - lt gy, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd, brit
clus, calc cmt

SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srt, sft - frm, slty - grty tex, arg mtx, v
sl calc

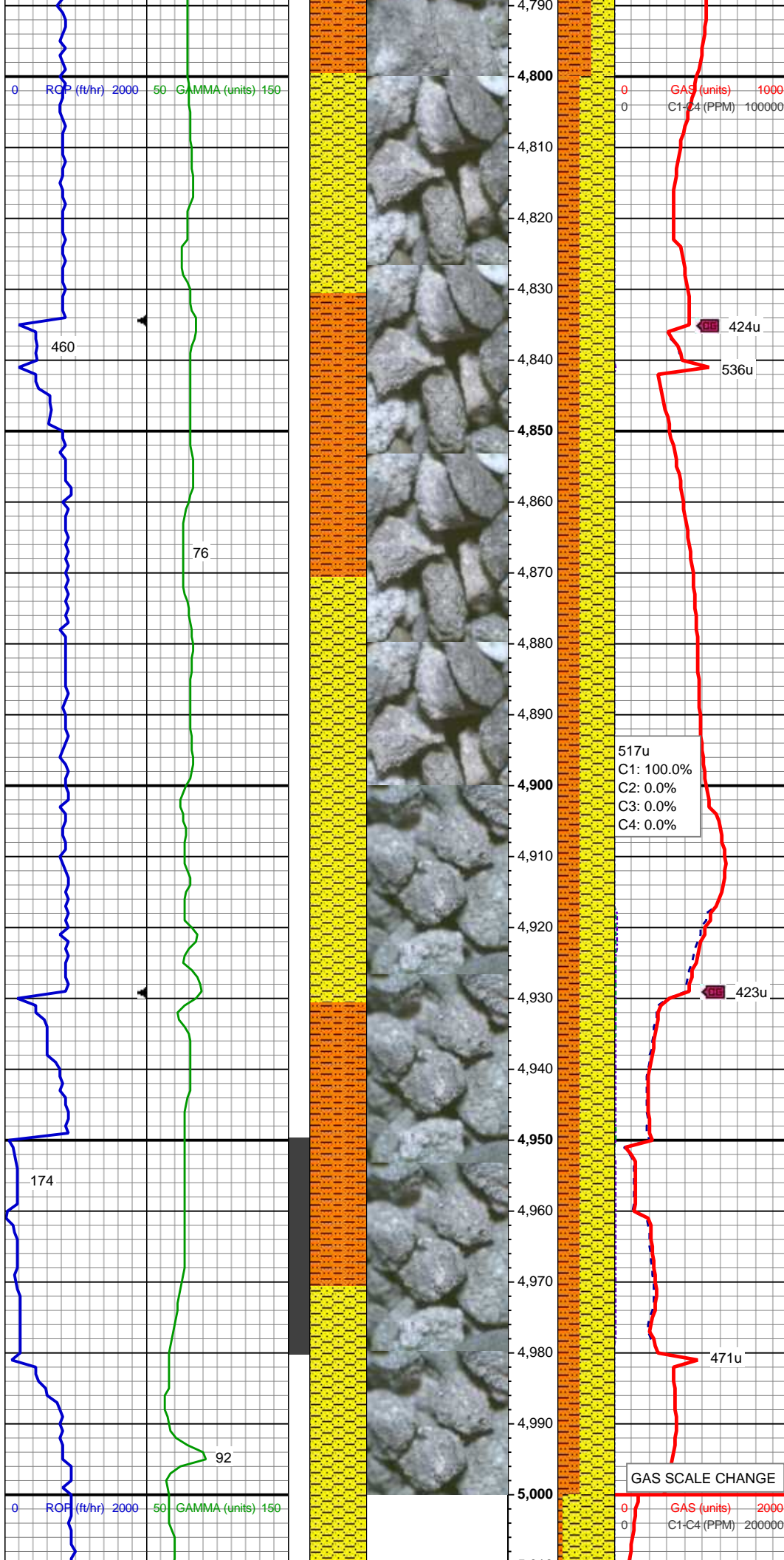


MD: 4,587'
TVD: 4,567.02'
Inclination: 8.7°
Azimuth: 55.22°

SHY SLTST: lt gy - gy, sb plty - sb rd, frly
srted, sft - frm, slty - grty tex, sl calc
SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srted, frm - mod hd wi
brit clus, calc cmt

MD: 4,681'
TVD: 4,660.05'
Inclination: 7.81°
Azimuth: 64.17°

SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srted, sft - frm, slty - grty tex, v sl calc
SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srted, frm - mod hd wi
brit clus, calc cmt



MUD WT: 9.05/9.15
VIS: 32/35 IN/OUT

SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srt, sft - frm, slty - grty tex, v sl calc

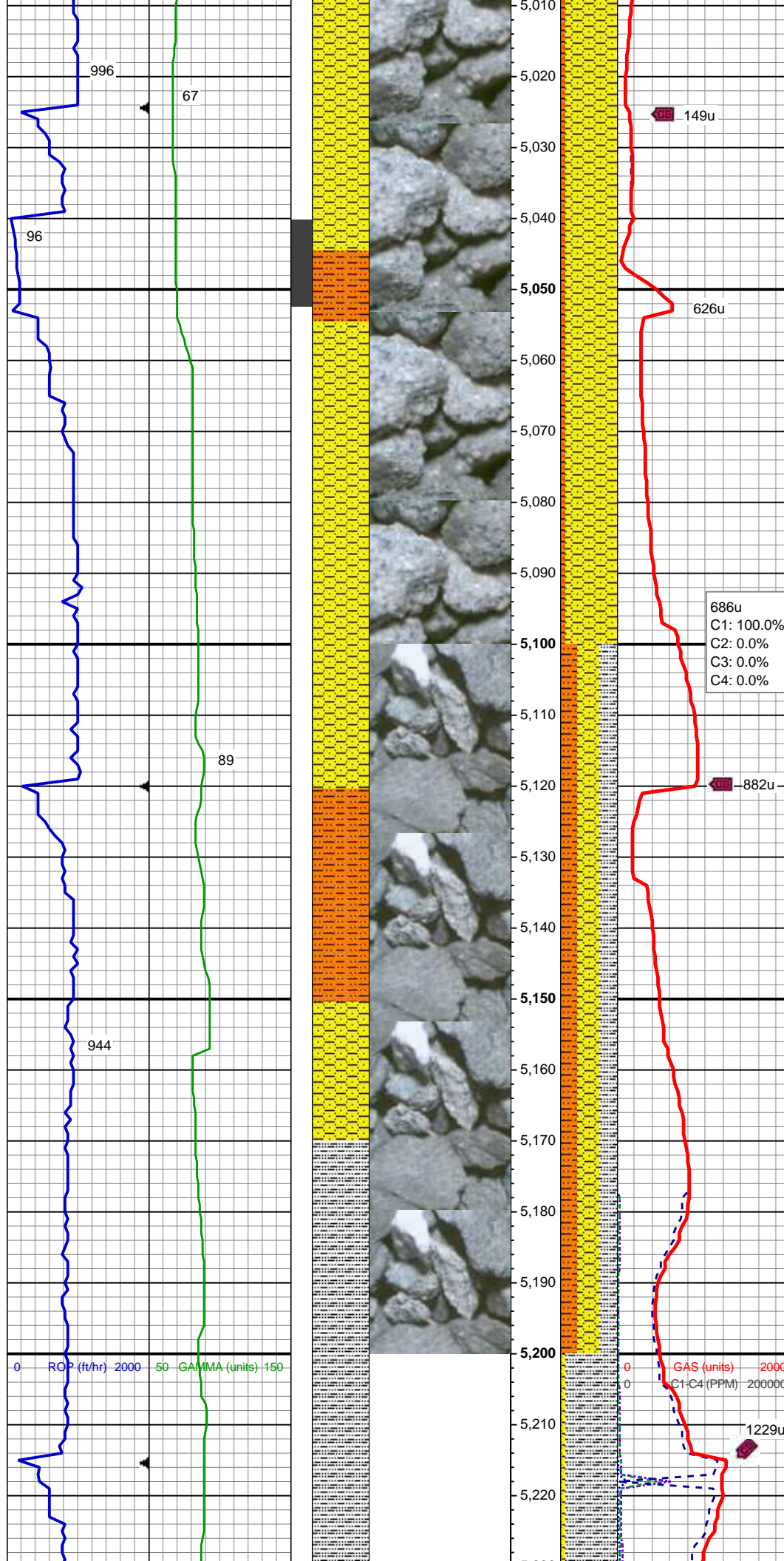
MD: 4,871'
TVD: 4,848.49'
Inclination: 6.93°
Azimuth: 74.27°

AM Mud Rpt
01/11/2015
Mud Wt: 9.15
FVis: 35
PVis: 5
YP: 4
GELS: 2/7/9
API Filt: n/s
CAKE: 1/0
pH: 9.1
Cl: 1,800
Ca: 200

SHANNON TOP @
4,943' MD; 4,919' TVD

SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srt, sft - frm, slty - grty tex, v sl calc

MD: 4,966'
TVD: 4,942.91'
Inclination: 5.73°
Azimuth: 64.39°



SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srt, sft - frm, slty - grty tex, v sl calc

MD: 5,061'
TVD: 5,037.22'
Inclination: 8.14°
Azimuth: 49.66°

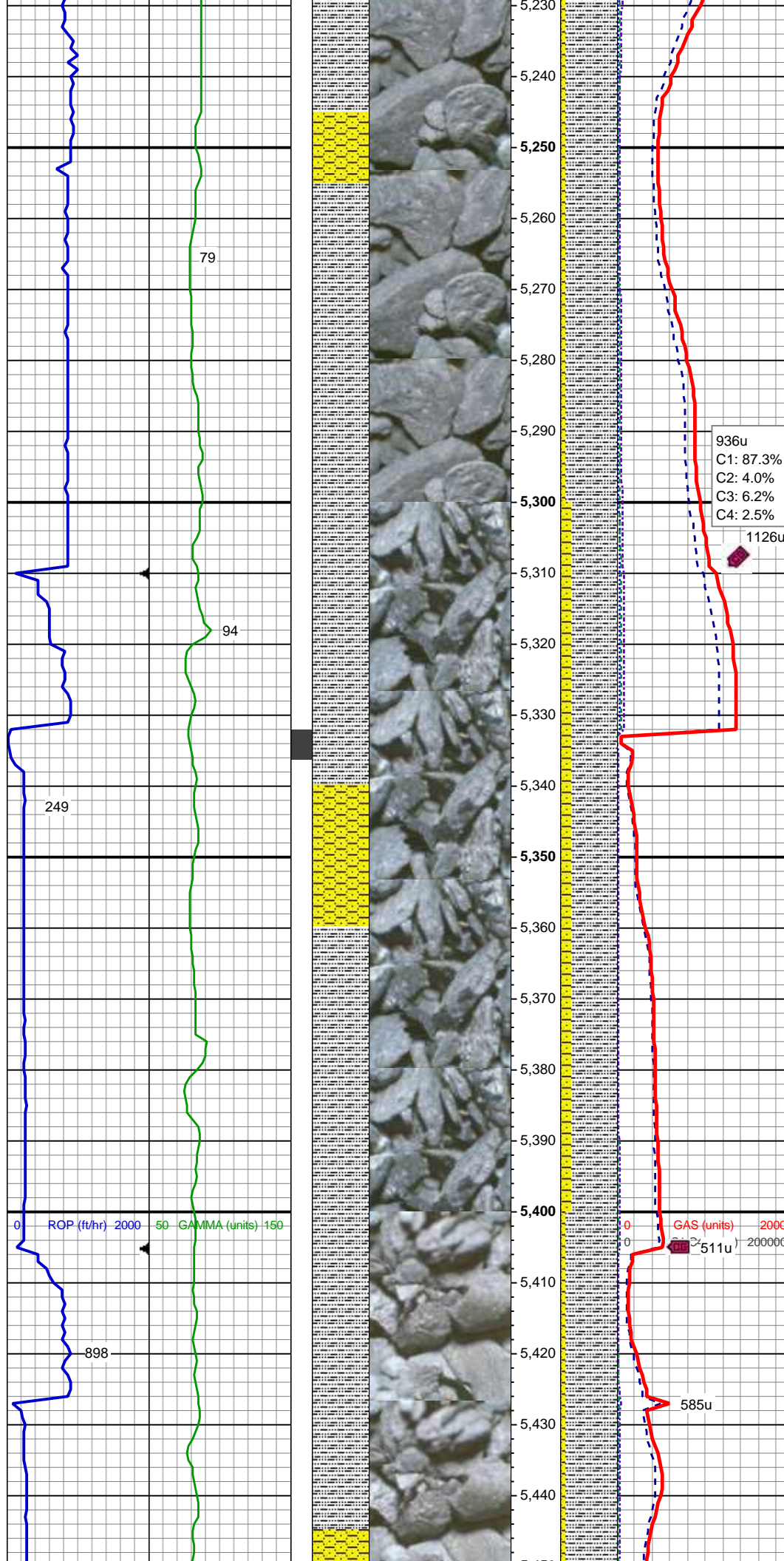
686u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srt, frm - mod hd wi
brit clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srt, sft - frm, slty - grty tex, v sl calc
SLTY SH: lt - med gy, frm, plty - sb plty,
occ sb blk, slty - grty tex, v sl calc

MD: 5,156'
TVD: 5,131.44'
Inclination: 6.45°
Azimuth: 51.62°

0 GAS (units) 2000
0 C1-C4 (PPM) 200000

MD: 5,250'



MD: 5,230'
TVD: 5,224.94'
Inclination: 5.43°
Azimuth: 46.47°

SLTY SH: lt - med gy brn, frm, plty - sb
plty, occ sb blk, slty - grty tex, v sl calc
SHY SS: wh - lt gy - lt gy brn, s&p, f gr, sb
ang - sb blk, prly srted, frm - mod hd wi
brit clus, calc cmt

936u
C1: 87.3%
C2: 4.0%
C3: 6.2%
C4: 2.5%

1126u

MD: 5,345'
TVD: 5,319.57'
Inclination: 4.66°
Azimuth: 42.77°

SLTY SH: lt - med gy brn, frm, plty - sb
plty, occ sb blk, slty - grty tex, v sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srted, frm - mod hd wi
brit clus, calc cmt

0 ROP (ft/hr) 2000 50 GAMMA (units) 150

898

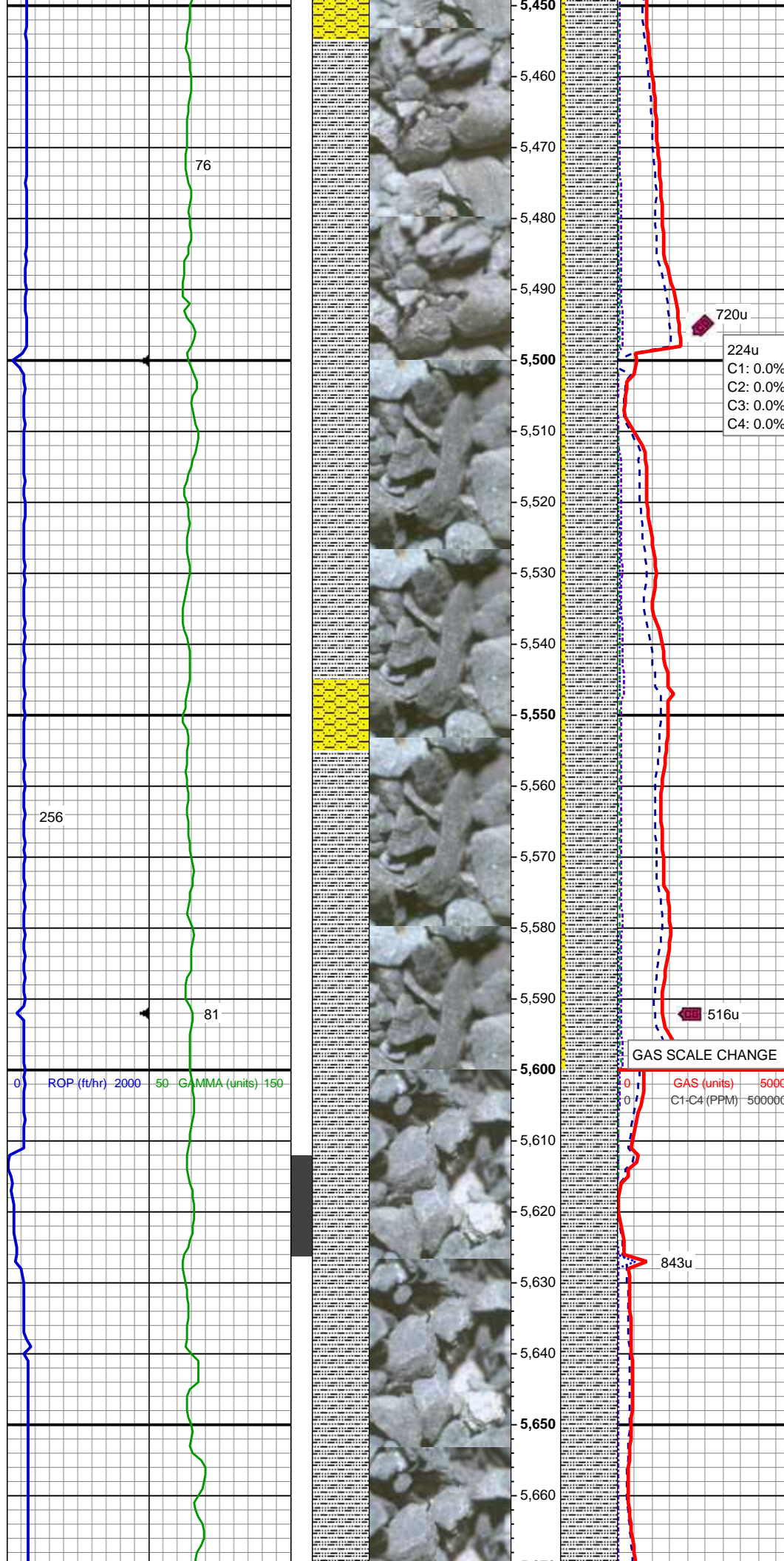
0 GAS (units) 2000 200000

511u

585u

MD: 5,440'
TVD: 5,414.28'
Inclination: 4.27°
Azimuth: 37.77°

SLTY SH: lt - med gy brn, frm, plty - sb
plty, occ sb blk, slty - grty tex, v sl calc



SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srtd, frm - mod hd wi brit
clus, calc cmt

720u
224u
C1: 0.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

MD: 5,535'
TVD: 5,509.05'
Inclination: 3.73°
Azimuth: 37.62°

SLTY SH: lt - med gy brn, frm, plty - sb
plty, occ sb blk, slty - grty tex, v sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srtd, frm - mod hd wi brit
clus, calc cmt

516u

GAS SCALE CHANGE
GAS (units) 5000
C1-C4 (PPM) 500000

MD: 5,630'
TVD: 5,603.91'
Inclination: 2.55°
Azimuth: 53.69°

SLTY SH: lt - med gy brn, frm, plty - sb
plty, occ sb blk, slty - grty tex, v sl calc

