

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Crow Creek AA01-766 VERT

Location SEC 1 T6N R63W

State COLORADO

County WELD

Country USA

Rig Number H&P 315

API Number 05-123-40158

AFE # 200439

Region DJ BASIN

Field WATTENBERG

Spud Date 1/16/2015

Drilling Completed 1/20/2015

Surface Coordinates NWNW SEC 1 T6N R63W
290' FNL; 613' FWL

LAT/LON: 40.52203/-104.39208

Bottom Hole Coordinates SEC 12 T6N R63W
30' FNL; 1610' FWL

Ground Elevation 4,799'

K.B. Elevation 4,823'

Logged Interval 2,000' To 6,012'

Total Depth 11,662'

Formation NIO 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
 BRACHIOPOD
 BRYOZOA
 CEPHALOPOD
 CORAL
 CRINOID
 ECHINOID
 FISH
 FORAMINIFERA

 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

 HEAVY MINERAL

 GLAUCONITE

 GYPSIFEROUS

 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





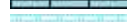




 MARLSTONE (DOL) STRG

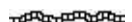





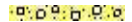


 SANDSTONE STRINGER

 SHALE STRINGER

 SILTSTONE STRINGER

Rock Types

 SHALY SILTSTONE
 SHALY SANDSTONE
 SANDSTONE
 SILTY SHALE
 LIMESTONE
 CHALK
 MARLSTONE
 UNKNOWN
 ANHYDRITE

 BENTONITE
 BRECCIA
 CEMENT
 CHERT
 CLAY CHOKESAND
 CLAYSTONE
 COAL
 CONGLOMERATE
 DOLOMITE

 GRANITE
 GYPSUM
 IGNEOUS
 SIDERITE or LIMONITE
 METAMORPHIC
 NO SAMPLE
 SALT
 SALT- PEPPER SAND
 SHALE

 SHALE COLORED
 SHALE GRAY
 SILTSTONE
 TILL
 TUFF
 WELDED TUFF

Operator

Company Noble Energy Inc

Address 1625 BROADWAY SUITE 2200
DENVER, CO 80202

Geologist

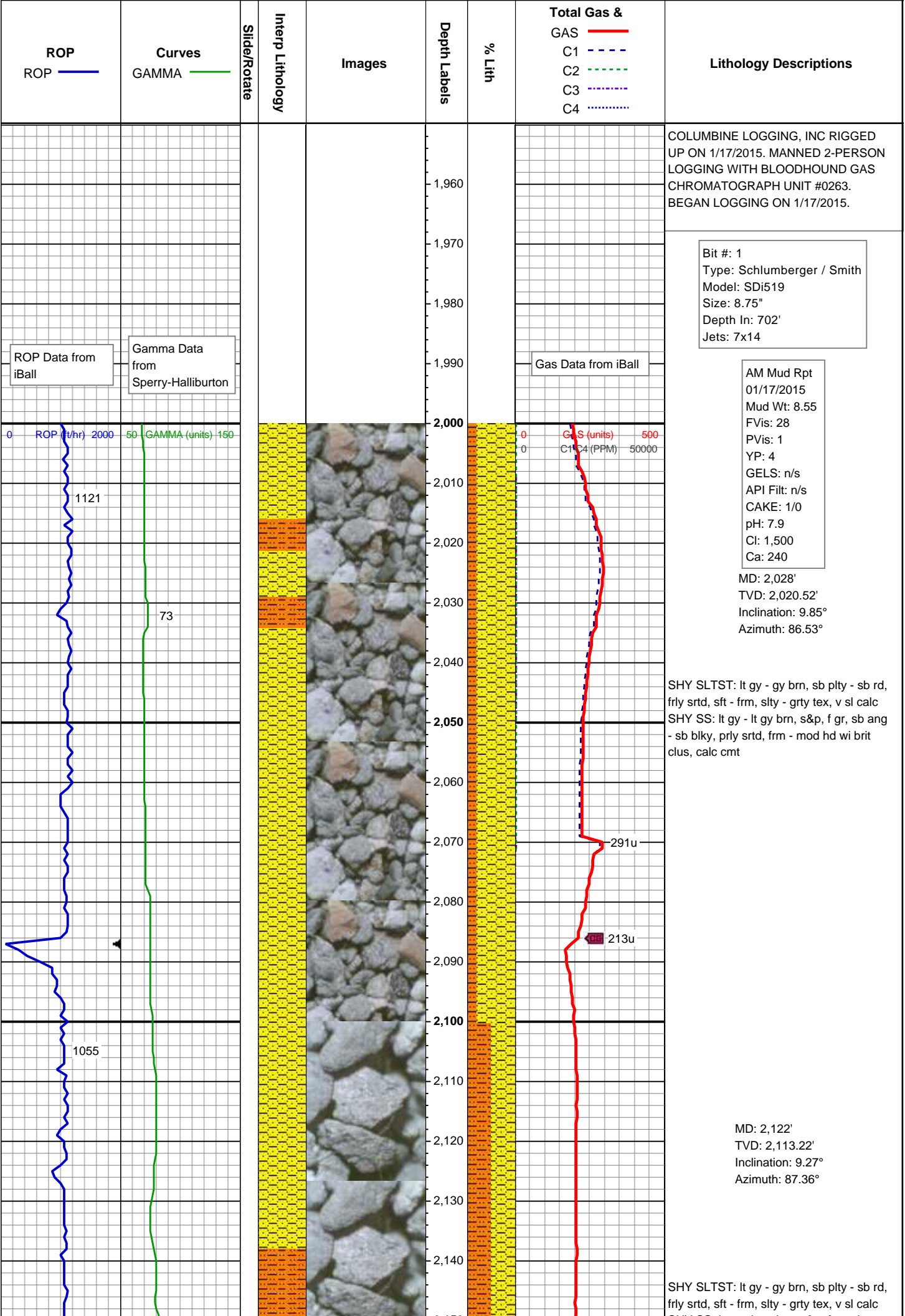
Name NATHAN MURPHY; ZACH UBER

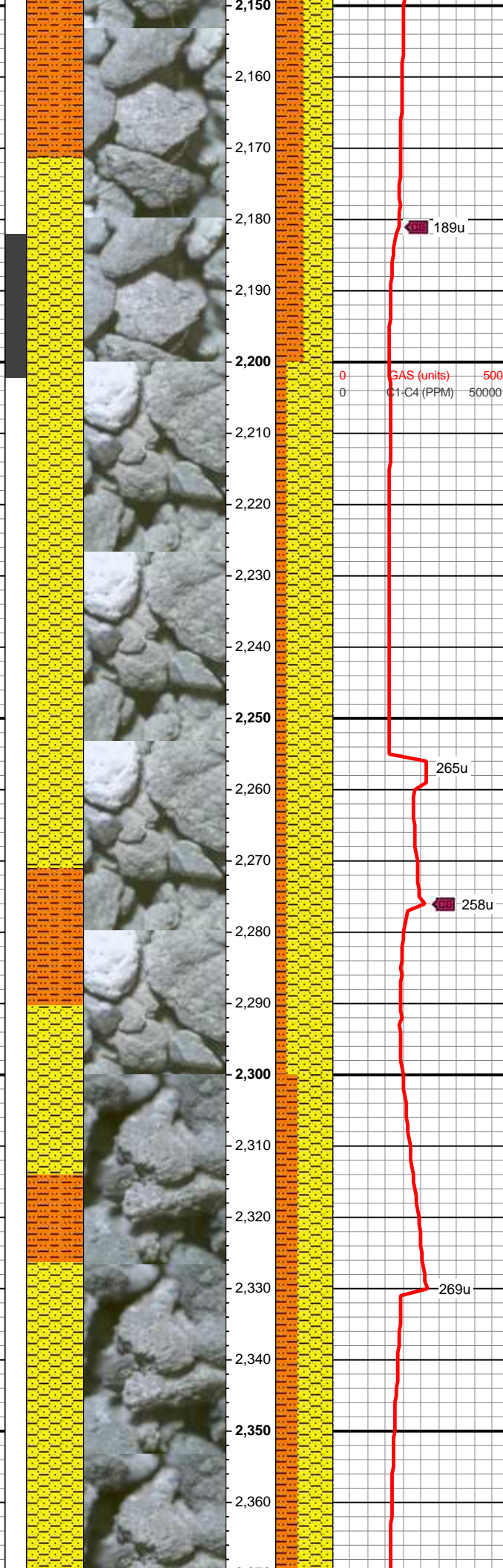
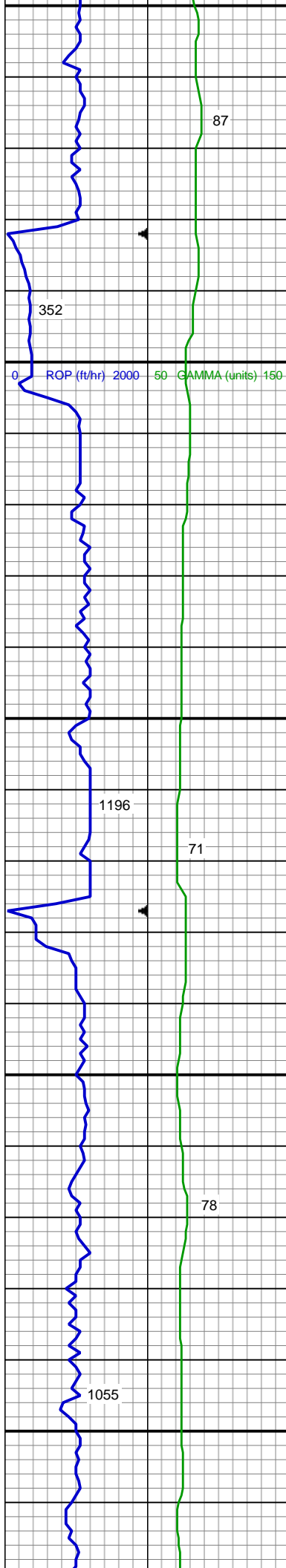
Company COLUMBINE LOGGING, INC

Address 602 S LIPAN ST
DENVER, CO 80223

Zone Color Coding

 Oil	 Condensate	 Gas
 Note	 Core	 Pressure
 Error	 Water	 Seal





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

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

SHY SLTST: lt gy - gy brn, sb plty - sb rd,
fryl 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

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

MD: 2,217'
TVD: 2,206.8'
Inclination: 10.55°
Azimuth: 86.57°

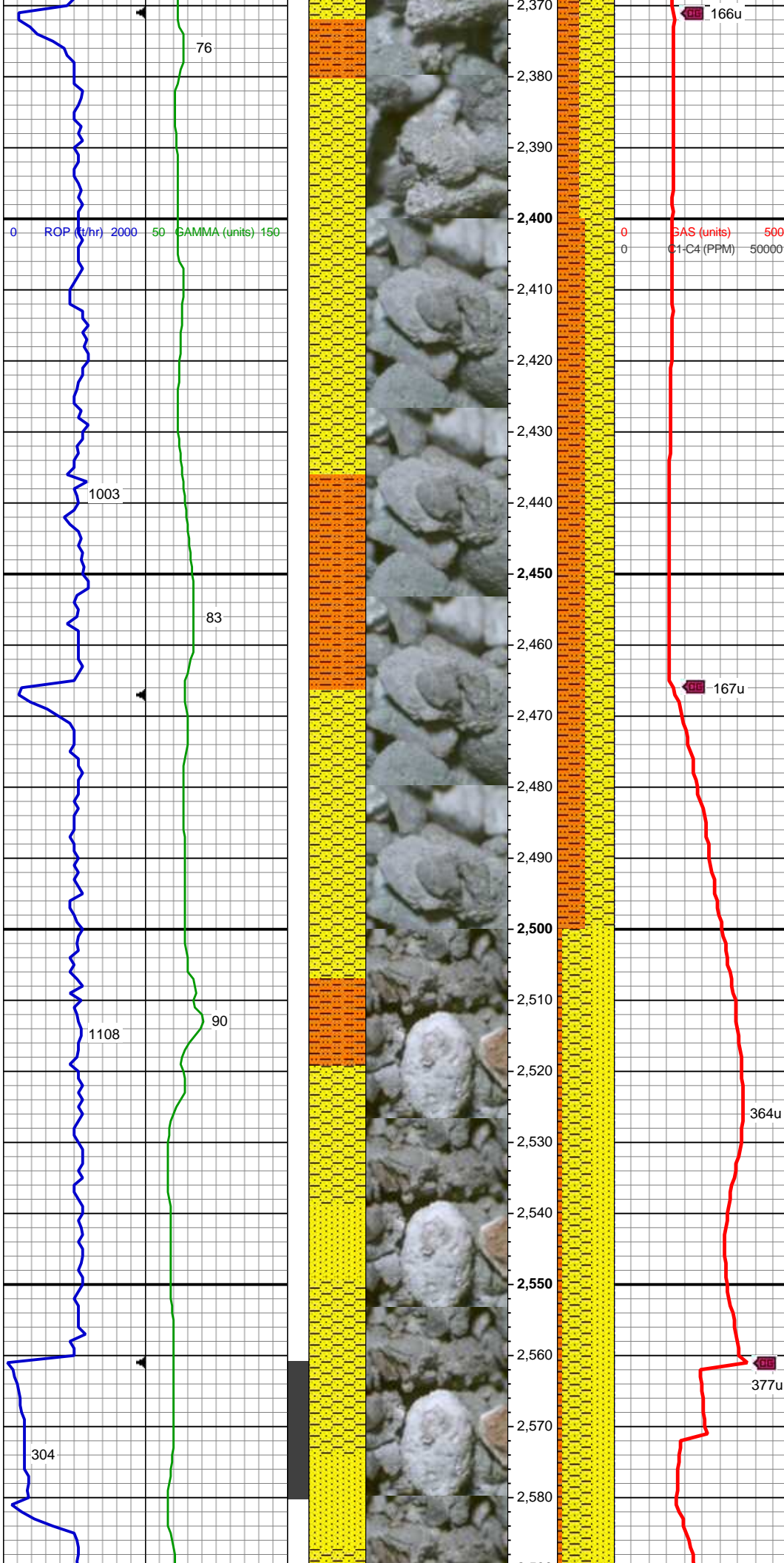
MD: 2,312'
TVD: 2,300.27'
Inclination: 10.02°
Azimuth: 87.35°

189u

265u

258u

269u

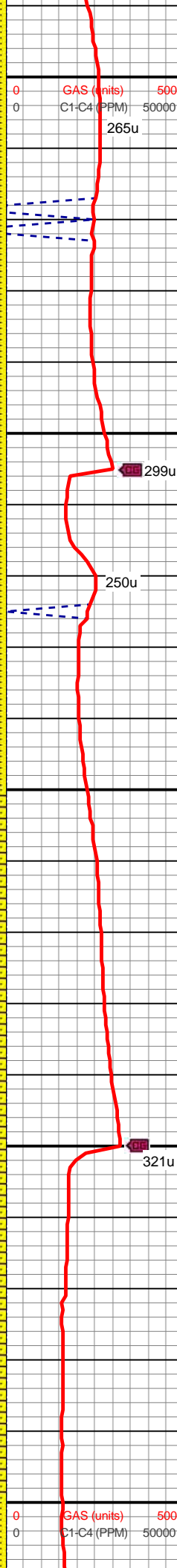
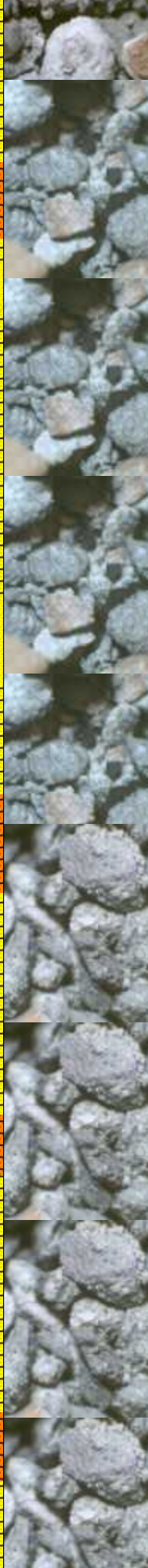
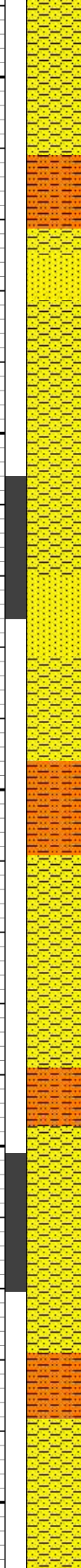
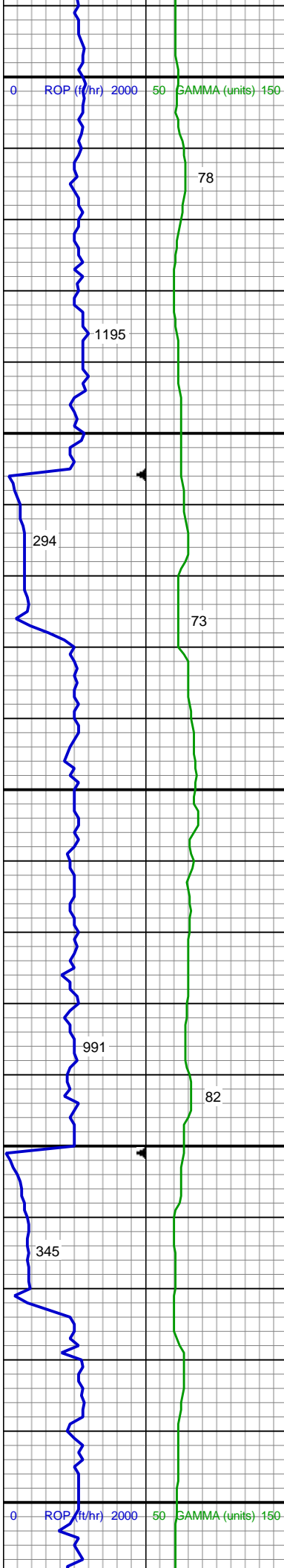


MD: 2,407'
TVD: 2,394.02'
Inclination: 8.59°
Azimuth: 87.66°

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

MD: 2,501'
TVD: 2,487.1'
Inclination: 7.46°
Azimuth: 87.65°

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 - 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,
fryl srted, sft - frm, slty - grty tex, arg mtx, v
sl calc



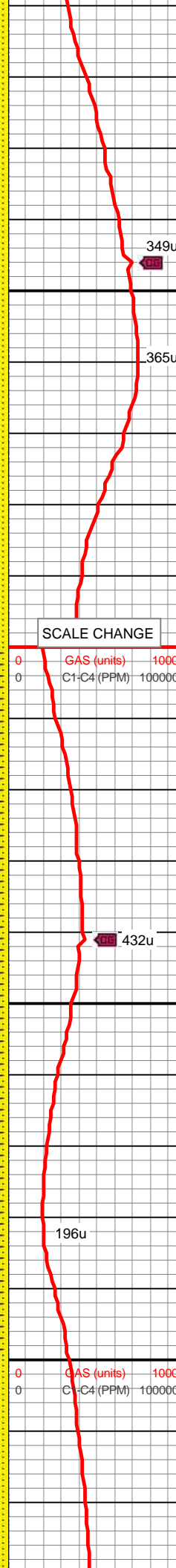
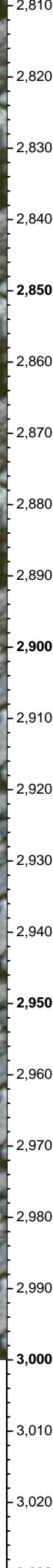
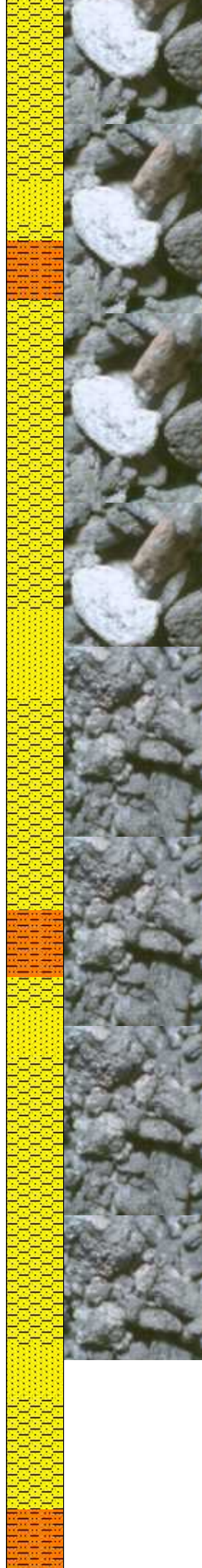
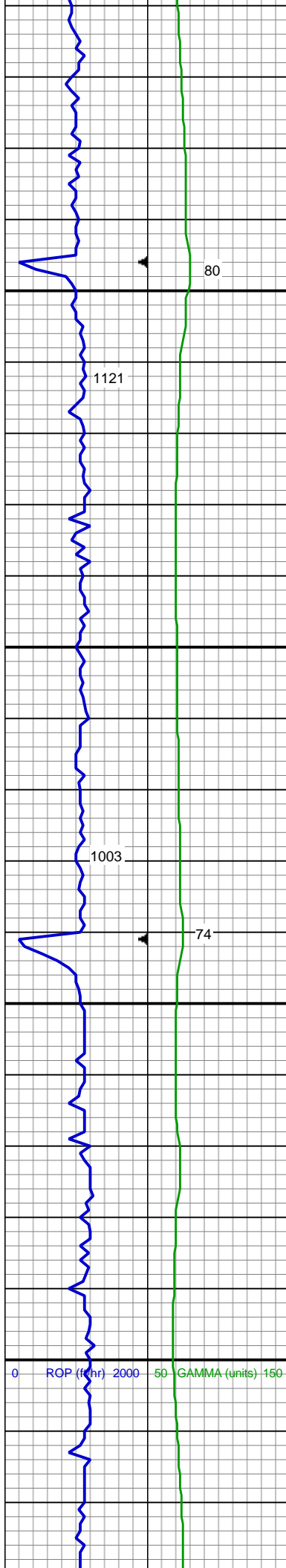
MD: 2,596'
TVD: 2,581.07'
Inclination: 9.37°
Azimuth: 79.01°

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
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
fryl srted, sft - frm, slty - grty tex, arg mtx, v
sl calc
SS: wh - lt gy, fros - trnsl, speckl wi mica,
f gr, hd brit clus, ang - sb ang, v calc cmt

MD: 2,691'
TVD: 2,674.68'
Inclination: 10.26°
Azimuth: 75.83°

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

MD: 2,786'
TVD: 2,767.86'
Inclination: 12.22°
Azimuth: 78.67°

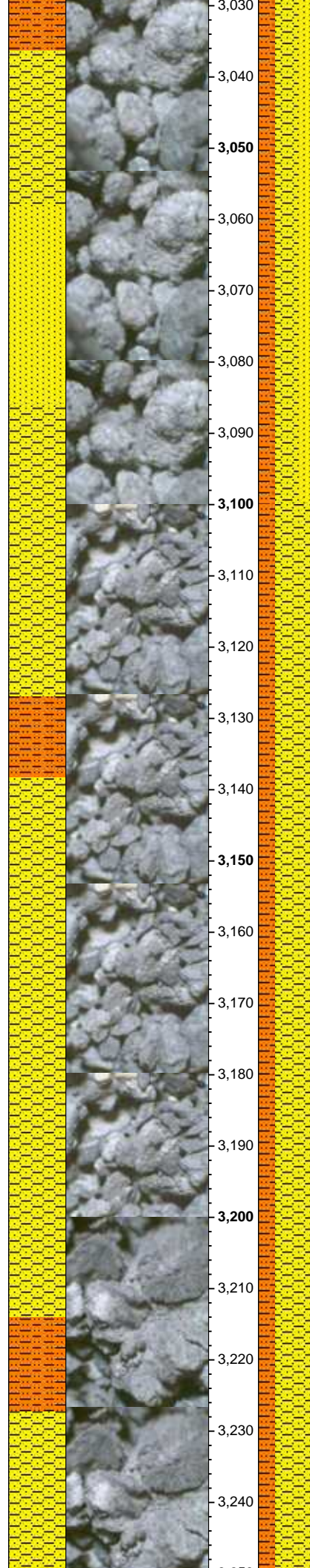
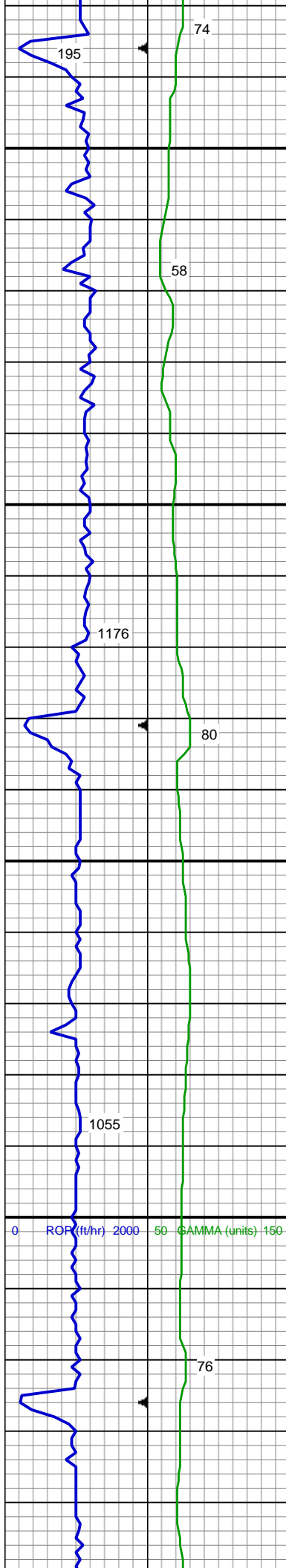


SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blk, prly srted, frm - mod hd wi brit
clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srted, sft - frm, slty - grty tex, arg mtx, v
sl calc
SS: wh - lt gy, fros - trnsl, speckl wi mica,
f gr, hd brit clus, ang - sb ang, v calc cmt

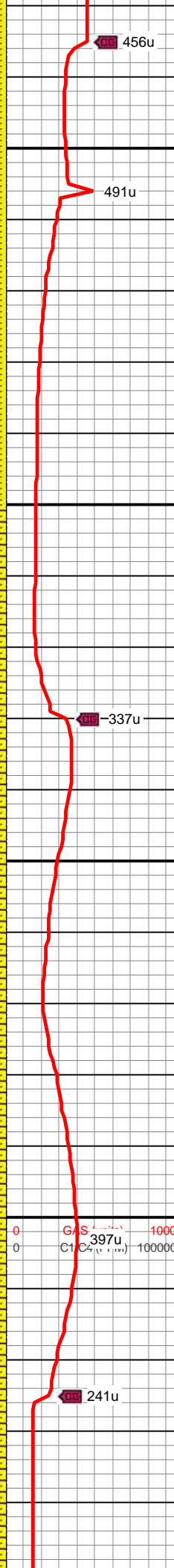
MD: 2,881'
TVD: 2,860.8'
Inclination: 11.66°
Azimuth: 78.37°

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
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srted, sft - frm, slty - grty tex, arg mtx, v
sl calc
SS: wh - lt gy, fros - trnsl, speckl wi mica,
f gr, hd brit clus, ang - sb ang, v calc cmt

MD: 2,976'
TVD: 2,953.95'
Inclination: 10.97°
Azimuth: 76.96°



3,030
3,040
3,050
3,060
3,070
3,080
3,090
3,100
3,110
3,120
3,130
3,140
3,150
3,160
3,170
3,180
3,190
3,200
3,210
3,220
3,230
3,240



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
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srted, sft - frm, slty - 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

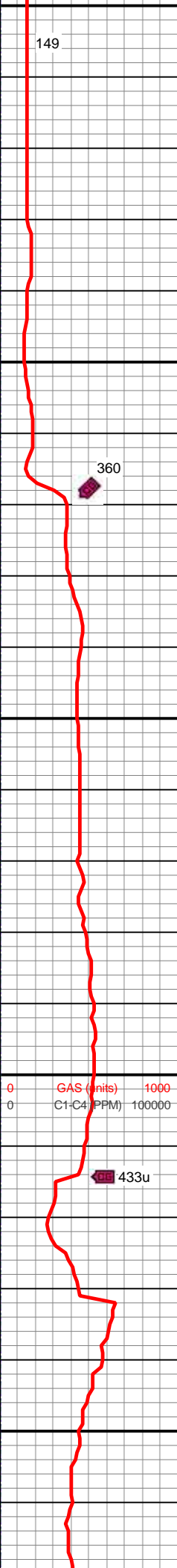
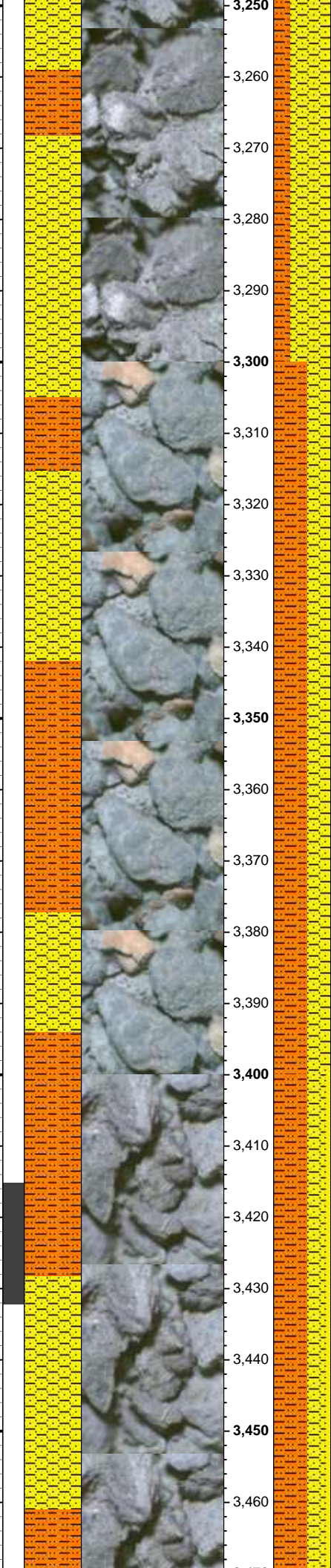
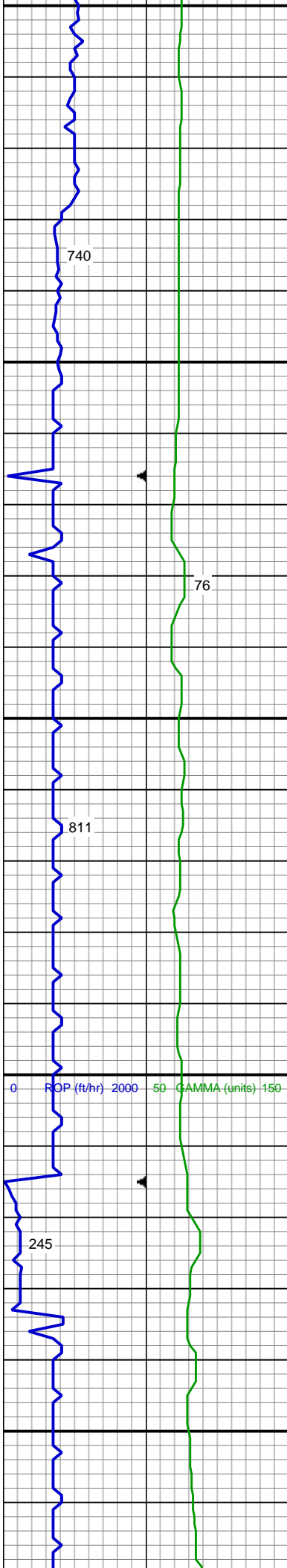
MD: 3,070'
TVD: 3,046.24'
Inclination: 10.95°
Azimuth: 76.04°

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

MD: 3,165'
TVD: 3,139.64'
Inclination: 10.13°
Azimuth: 76.59°

0 GAS 1000
0 C1C2 100000

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



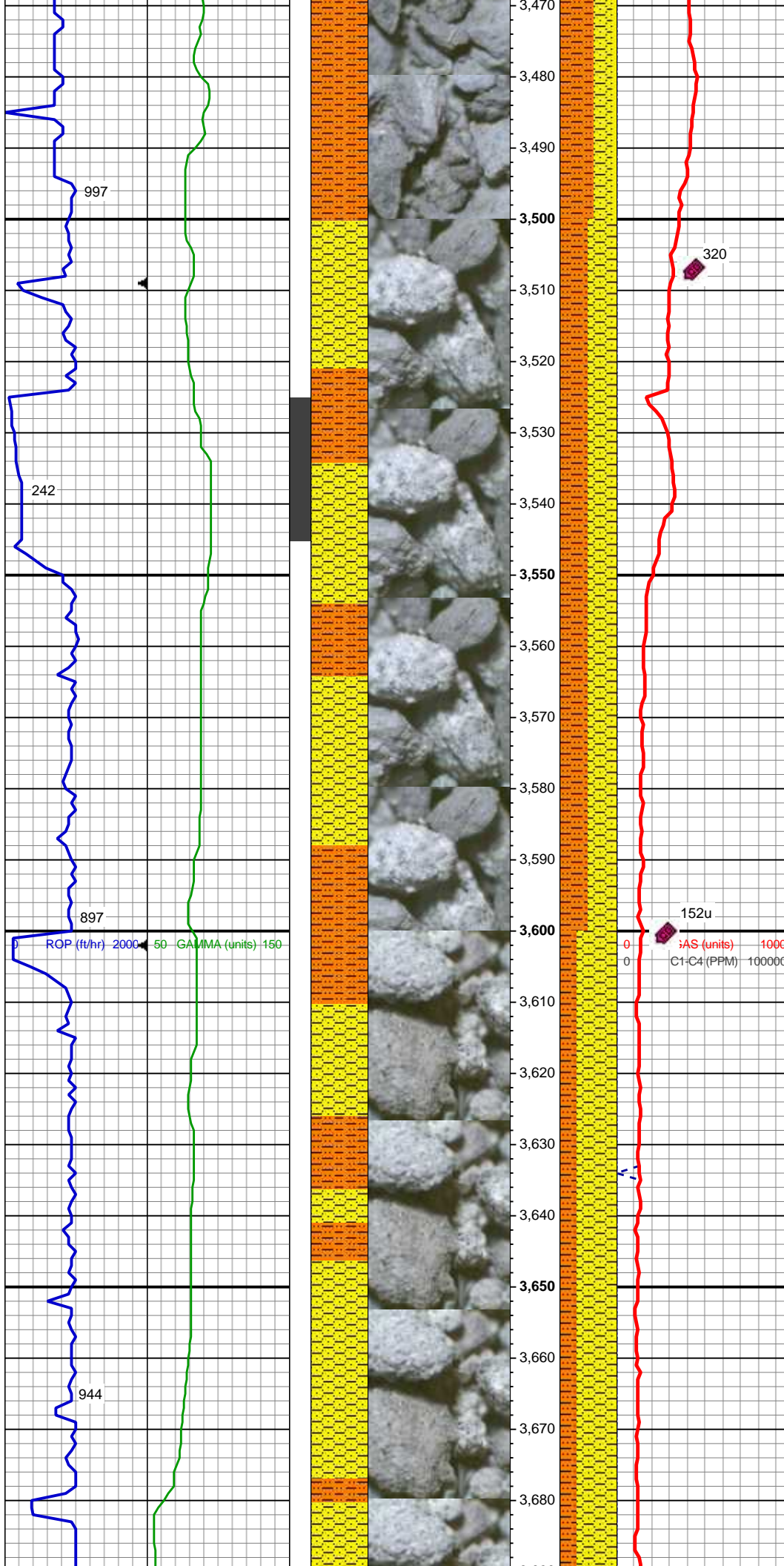
clus, calc cmt
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srted, sft - frm, slty - grty tex, v sl calc

MD: 3,259'
TVD: 3,232.27'
Inclination: 9.4°
Azimuth: 75.59°

MUD WT: 8.90/9.05
VIS: 36/36 IN/OUT

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

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
SS: wh - lt gy, fros - trns, speckl wi mica,
f gr, hd brit clus, ang - sb ang, v calc cmt



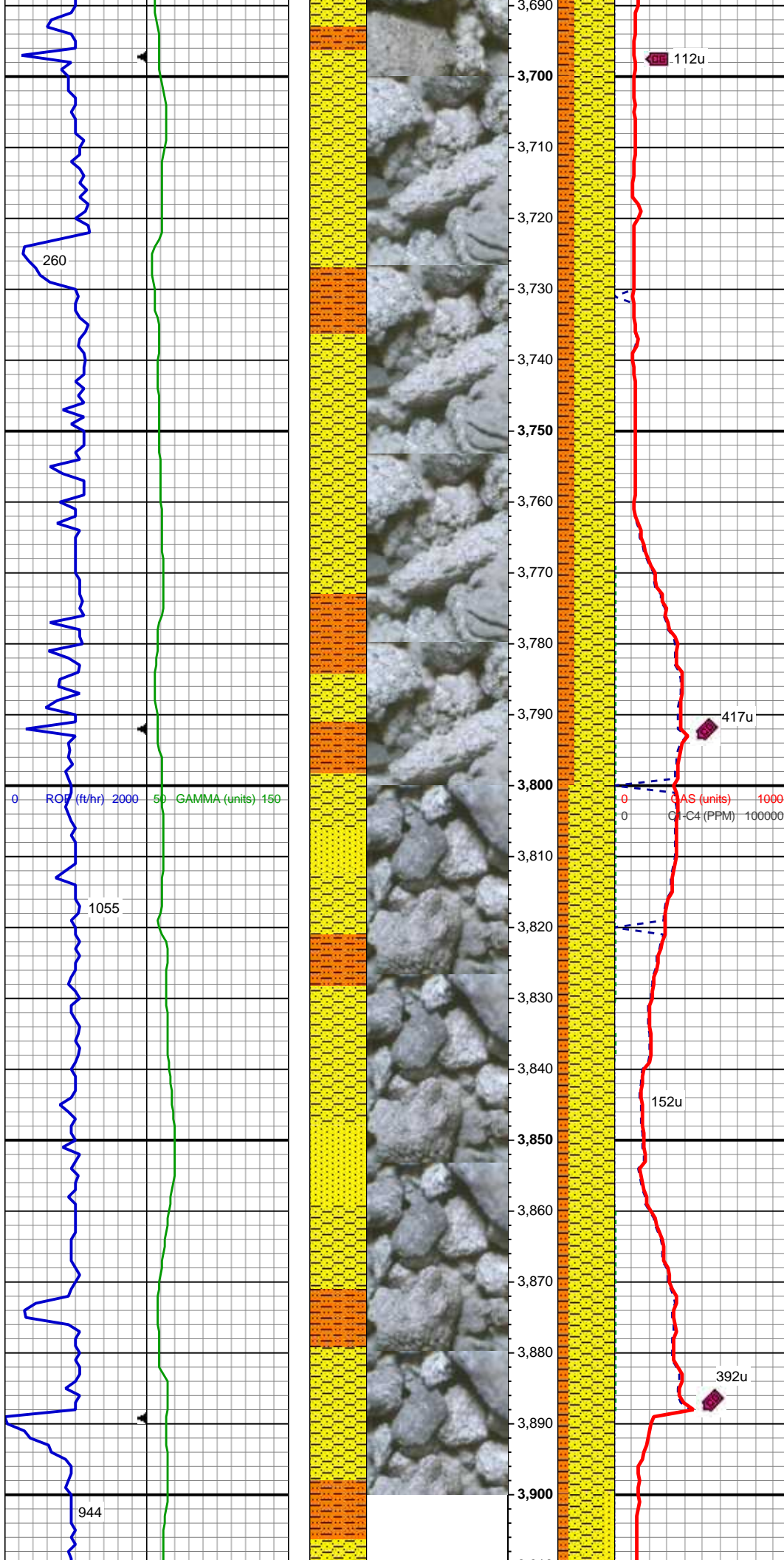
PM Mud Rpt
01/17/2015
Mud Wt: 8.85
FVis: 30
PVis: 3
YP: 2
GELS: 1/2/2
API Filt: n/s
CAKE: 1/0
pH: 9.6
Cl: 1,400
Ca: 200

MD: 3,544'
TVD: 3,513.5'
Inclination: 11.03°
Azimuth: 72.52°

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 blkly, prly srted, frm - mod hd wi brit
clus, calc cmt, tr SS

MD: 3,639'
TVD: 3,606.88'
Inclination: 10.16°
Azimuth: 71.64°

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 blkly, prly srted, frm - mod hd wi brit
clus, calc cmt, tr SS

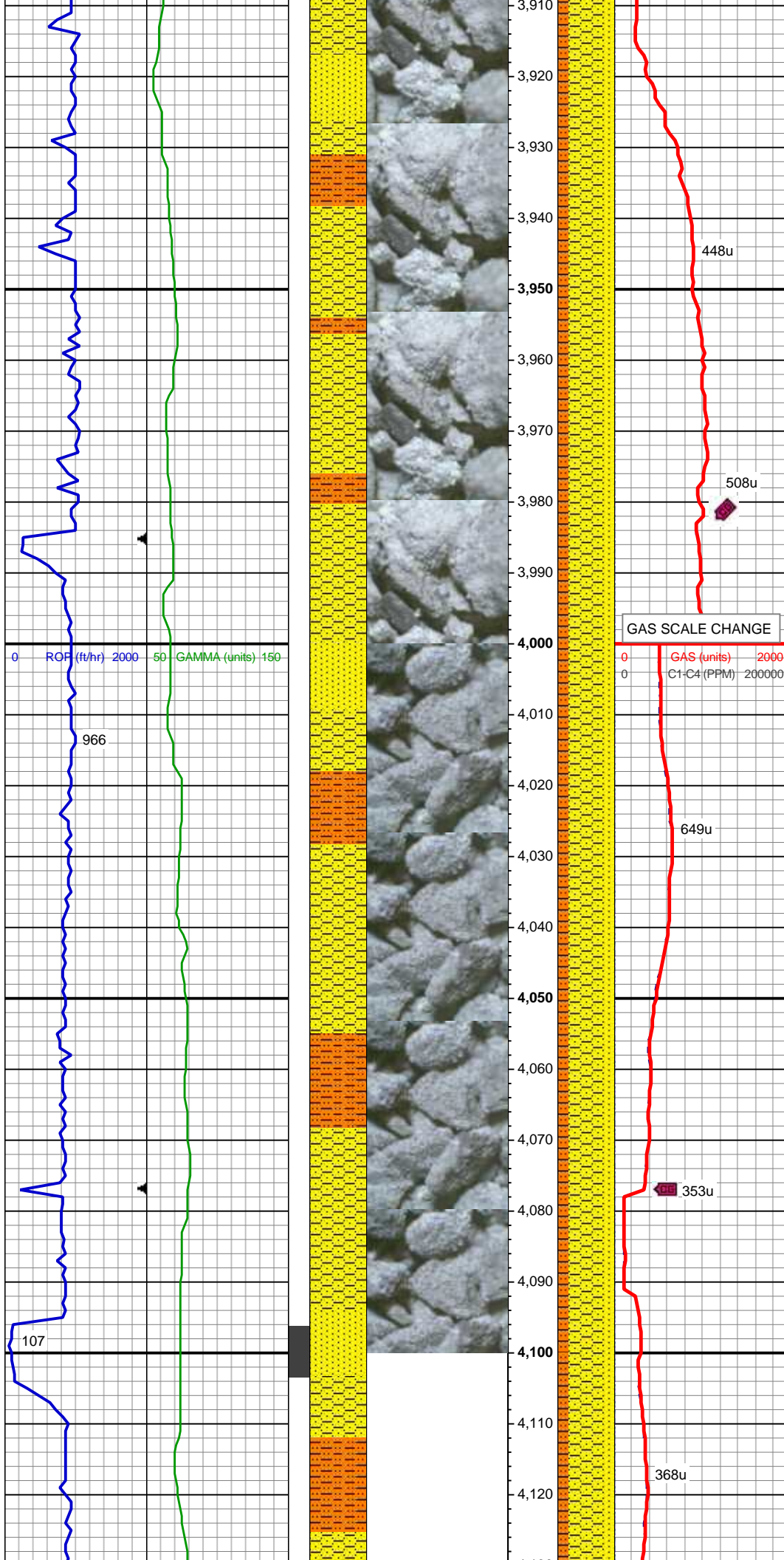


MD: 3,733'
TVD: 3,699.28'
Inclination: 10.98°
Azimuth: 70.51°

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 blkly, prly srted, frm - mod hd wi brit
clus, calc cmt, tr SS

MD: 3,828'
TVD: 3,792.41'
Inclination: 11.81°
Azimuth: 71.59°

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 blkly, prly srted, frm - mod hd wi brit
clus, calc cmt, tr SS



MD: 3,923'
TVD: 3,885.2'
Inclination: 12.9°
Azimuth: 71.64°

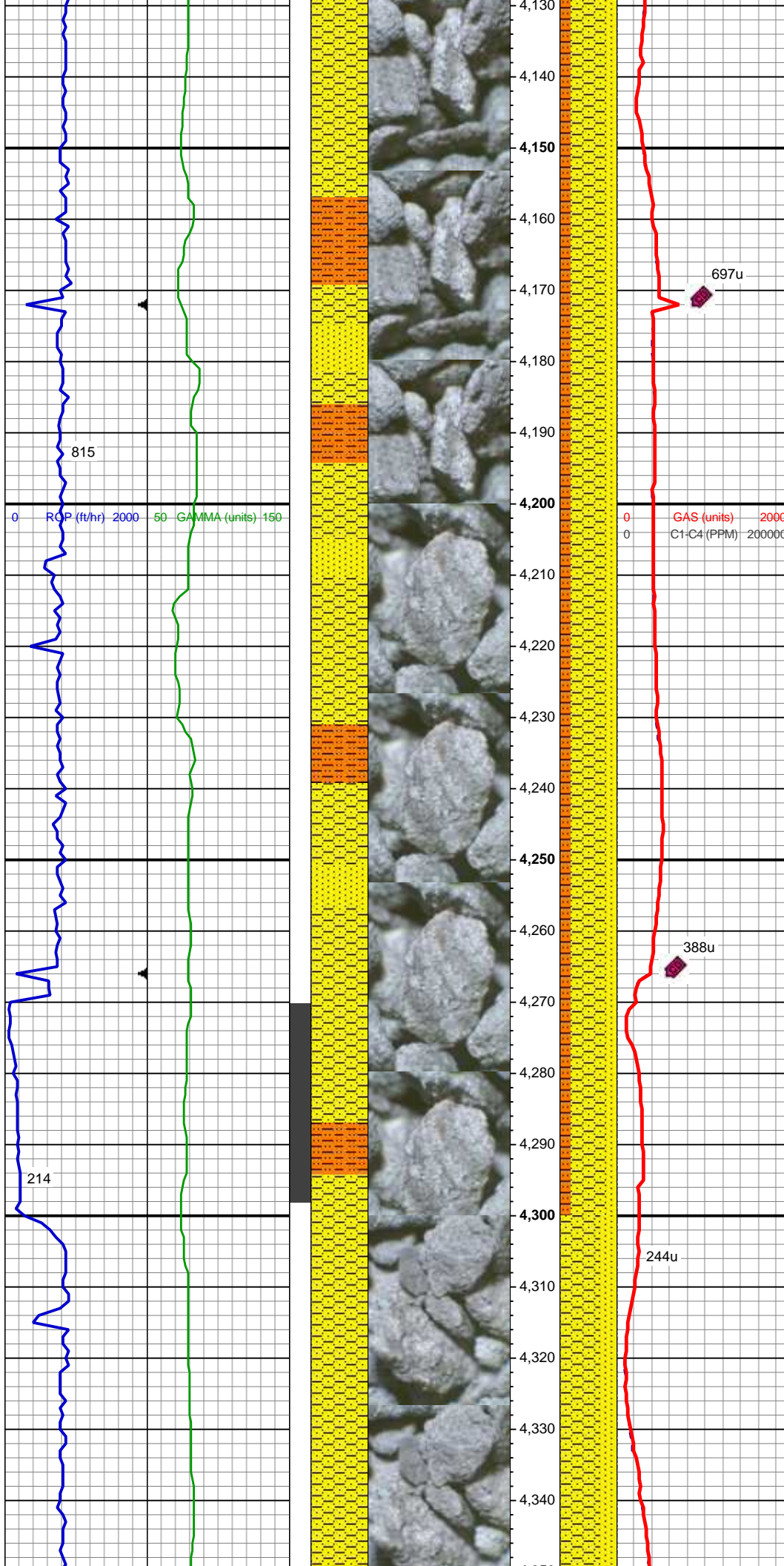
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sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blkly, prly srted, frm - mod hd wi brit
clus, calc cmt
SS: wh - lt gy, fros - trnsd, speckl wi mica,
f gr, hd brit clus, ang - sb ang, v calc cmt

MD: 4,018'
TVD: 3,977.65'
Inclination: 13.71°
Azimuth: 71.08°

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
SS: wh - lt gy, fros - trnsd, speckl wi mica,
f gr, hd brit clus, ang - sb ang, v calc cmt

MUD WT: 9.15/9.30
VIS: 33/38 IN/OUT

MD: 4,113'
TVD: 4,070.07'
Inclination: 13.08°
Azimuth: 69.62°



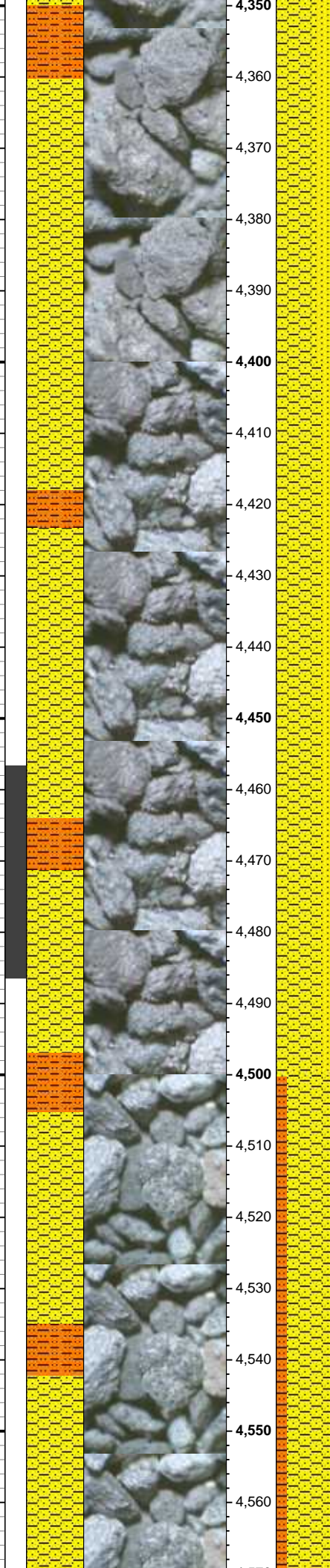
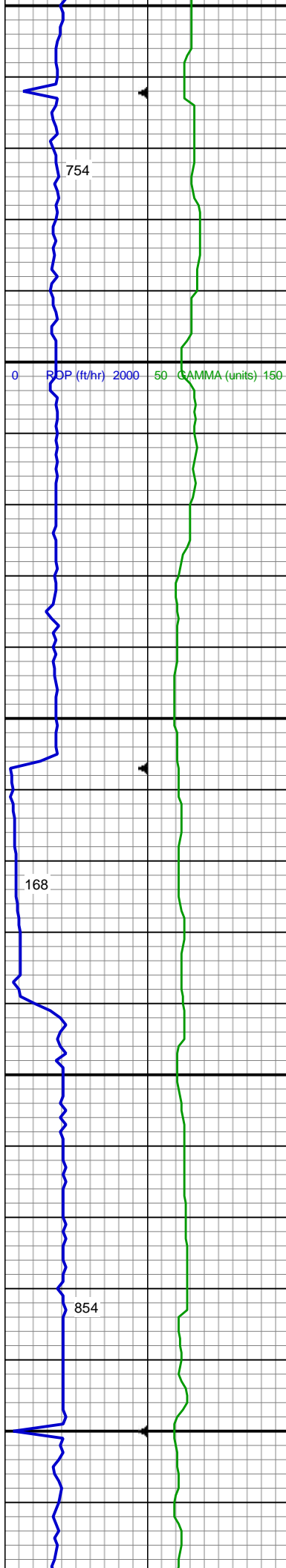
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SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang - sb blkly, prly srted, frm - mod hd wi brit clus, calc cmt
SS: wh - lt gy, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang, v calc cmt

MD: 4,207'
TVD: 4,161.76'
Inclination: 12.35°
Azimuth: 68.12°

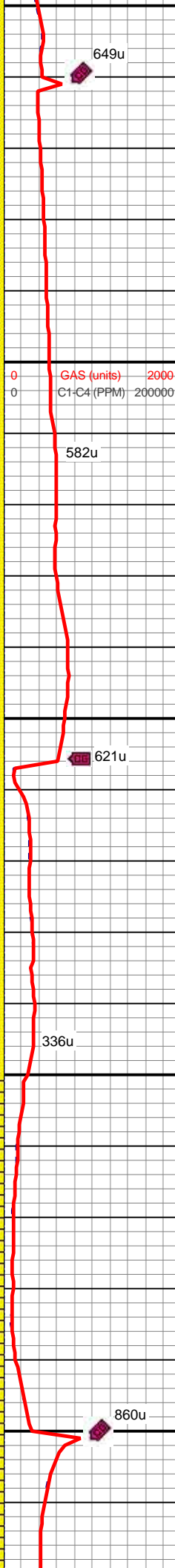
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SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang - sb blkly, prly srted, frm - mod hd wi brit clus, calc cmt
SS: wh - lt gy, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang, v calc cmt

MD: 4,302'
TVD: 4,254.57'
Inclination: 12.38°
Azimuth: 76.79°

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
SS: wh - lt gy, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang, v calc cmt



4,350
4,360
4,370
4,380
4,390
4,400
4,410
4,420
4,430
4,440
4,450
4,460
4,470
4,480
4,490
4,500
4,510
4,520
4,530
4,540
4,550
4,560



- 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

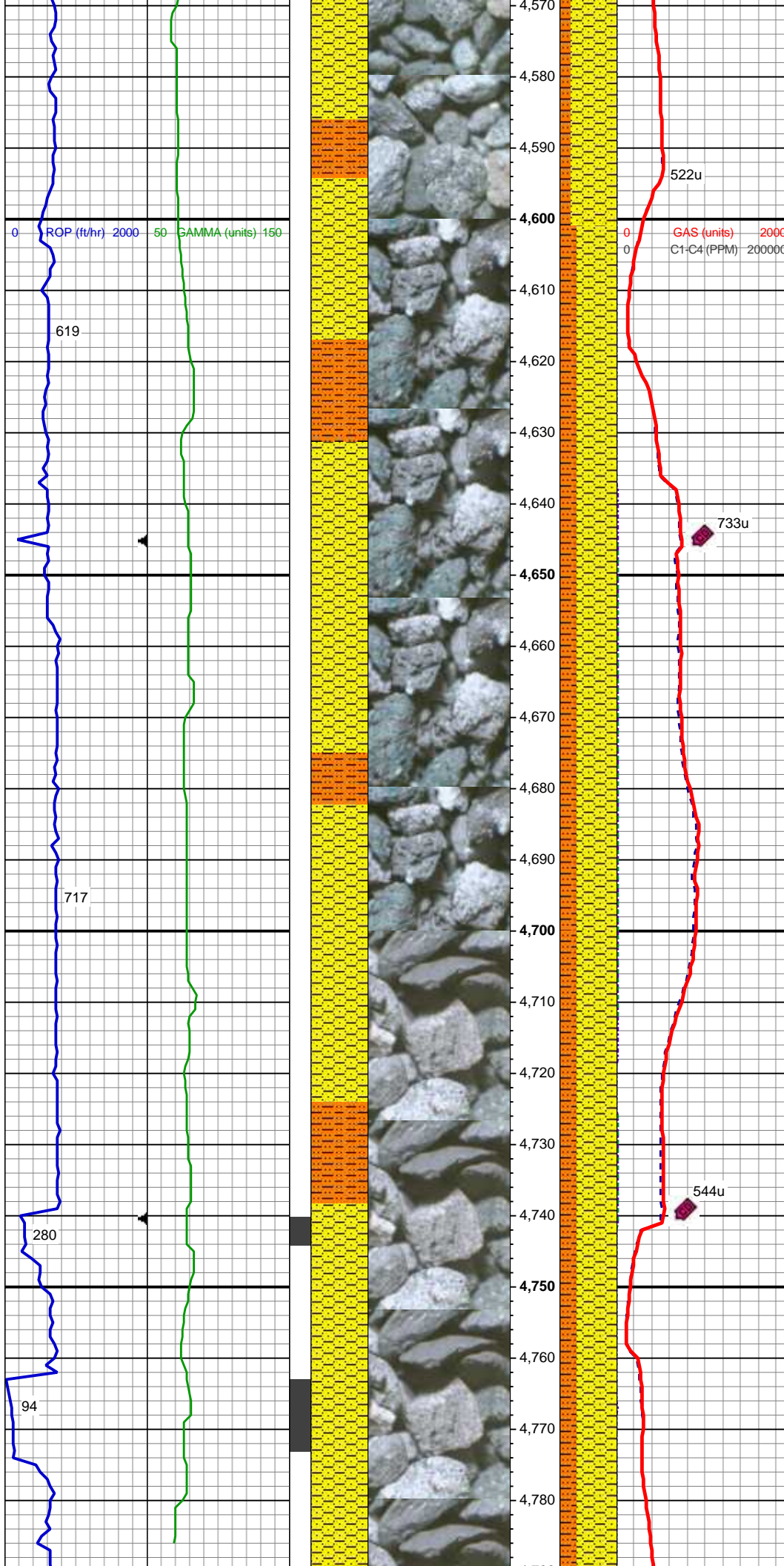
MD: 4,397'
TVD: 4,347.75'
Inclination: 10.04°
Azimuth: 73.65°

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 srt, frm - mod hd wi brit
clus, calc cmt

MD: 4,492'
TVD: 4,441.08'
Inclination: 11.56°
Azimuth: 85.31°

SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srt, 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 srt, frm - mod hd wi brit
clus, calc cmt



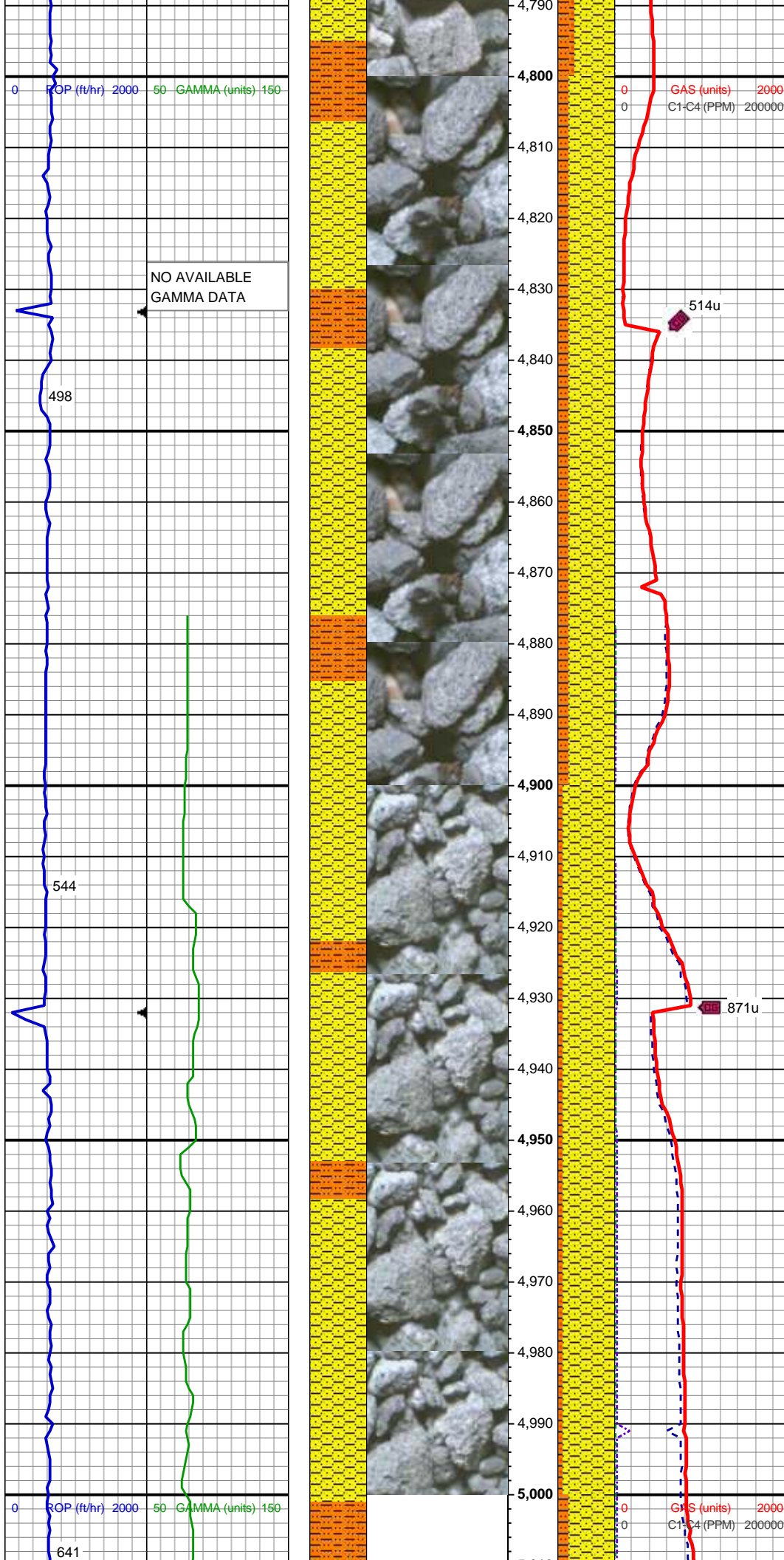
MD: 4,587'
TVD: 4,534.36'
Inclination: 10.27°
Azimuth: 86.08°

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

MD: 4,682'
TVD: 4,627.96'
Inclination: 9.43°
Azimuth: 82.04°

MUD WT: 9.20/9.30
VIS: 31/34 IN/OUT

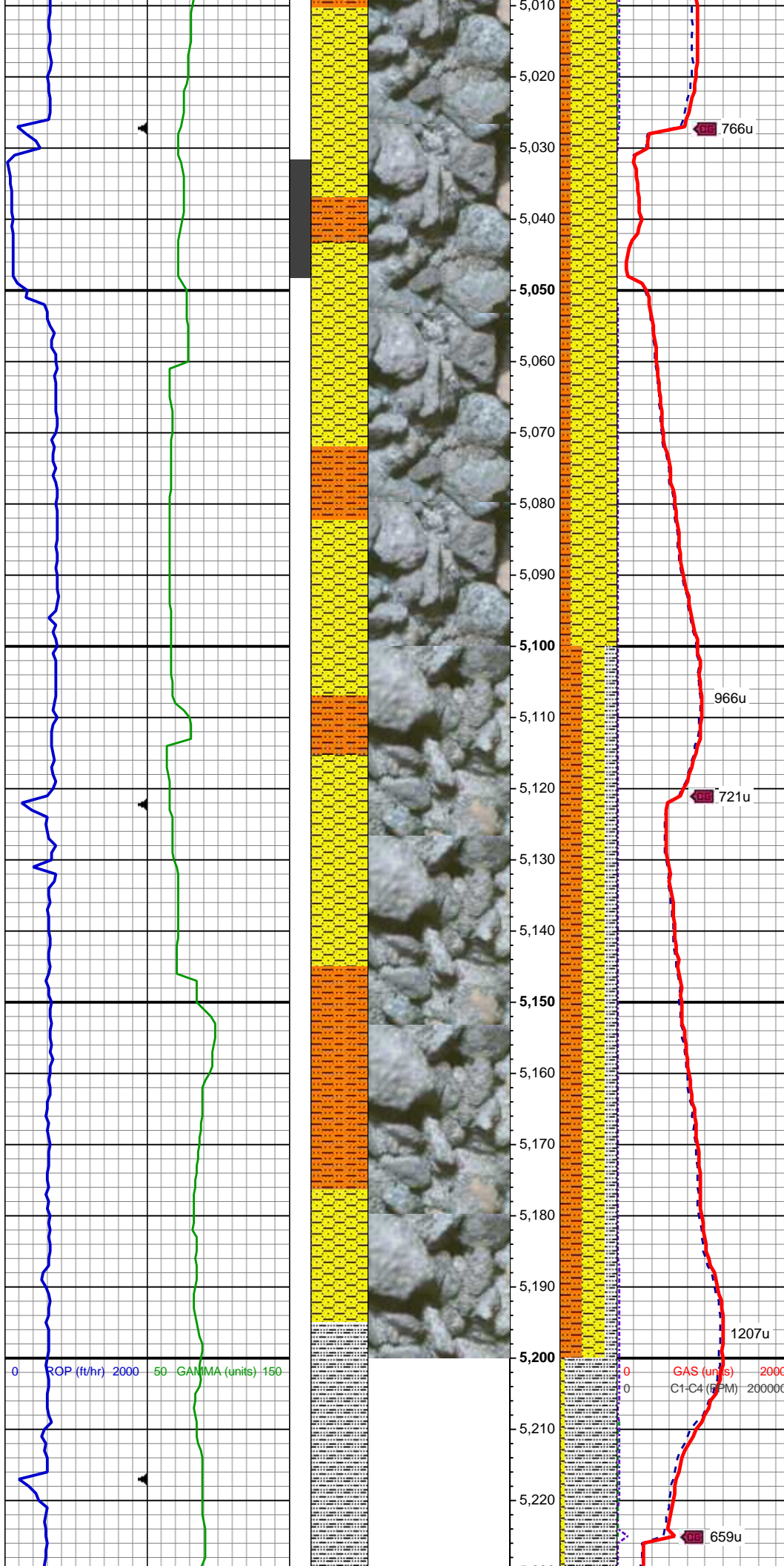
SHY SLTST: lt gy - gy brn, sb plty - sb rd,
frly srted, sft - frm, slty - grty tex, arg mtx, v
sl calc
SHY SS: lt gy - lt gy brn, s&p, f gr, sb ang
- sb blkly, prly srted, frm - mod hd wi brit
clus, calc cmt



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: 4,871'
TVD: 4,814.49'
Inclination: 9.13°
Azimuth: 88.84°

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, tr SS grs
MD: 4,966'
TVD: 4,908.45'
Inclination: 7.88°
Azimuth: 98.49°



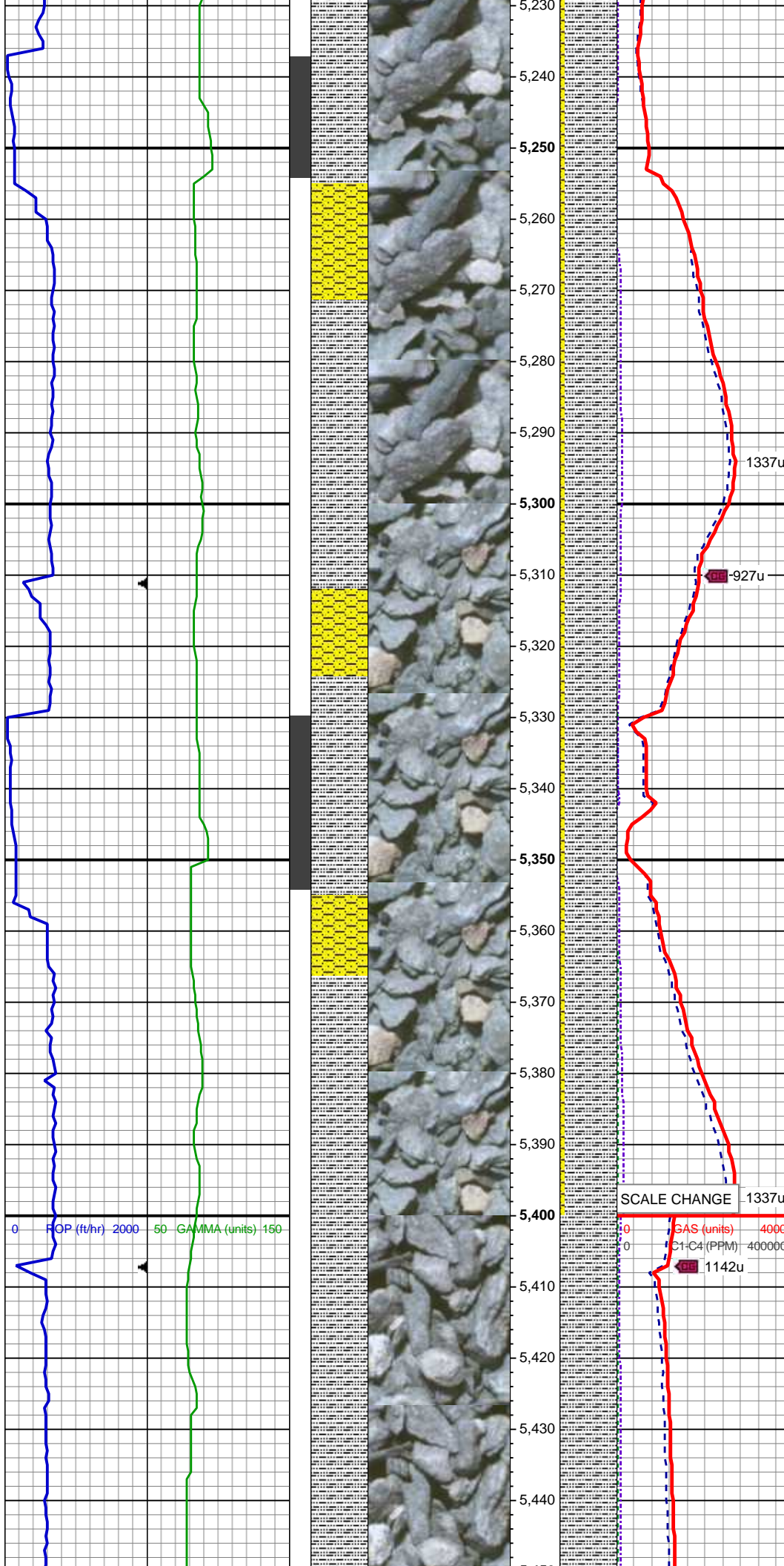
MUD WT: 9.20/9.35
VIS: 35/34 IN/OUT

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 blk, prly srted, frm - mod hd wi brit
clus, calc cmt

MD: 5,061'
TVD: 5,002.34'
Inclination: 9.63°
Azimuth: 95.27°

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

MD: 5,156'
TVD: 5,096.08'
Inclination: 9.06°
Azimuth: 97.25°



MD: 5,251'
TVD: 5,189.98'
Inclination: 8.37°
Azimuth: 89.53°

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 srtd, frm - mod hd wi
brit clus, calc cmt

MD: 5,345'
TVD: 5,282.96'
Inclination: 8.66°
Azimuth: 75.13°

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 srtd, frm - mod hd wi
brit clus, calc cmt

MUD WT: 9.15/9.30
VIS: 33/34 IN/OUT

SCALE CHANGE

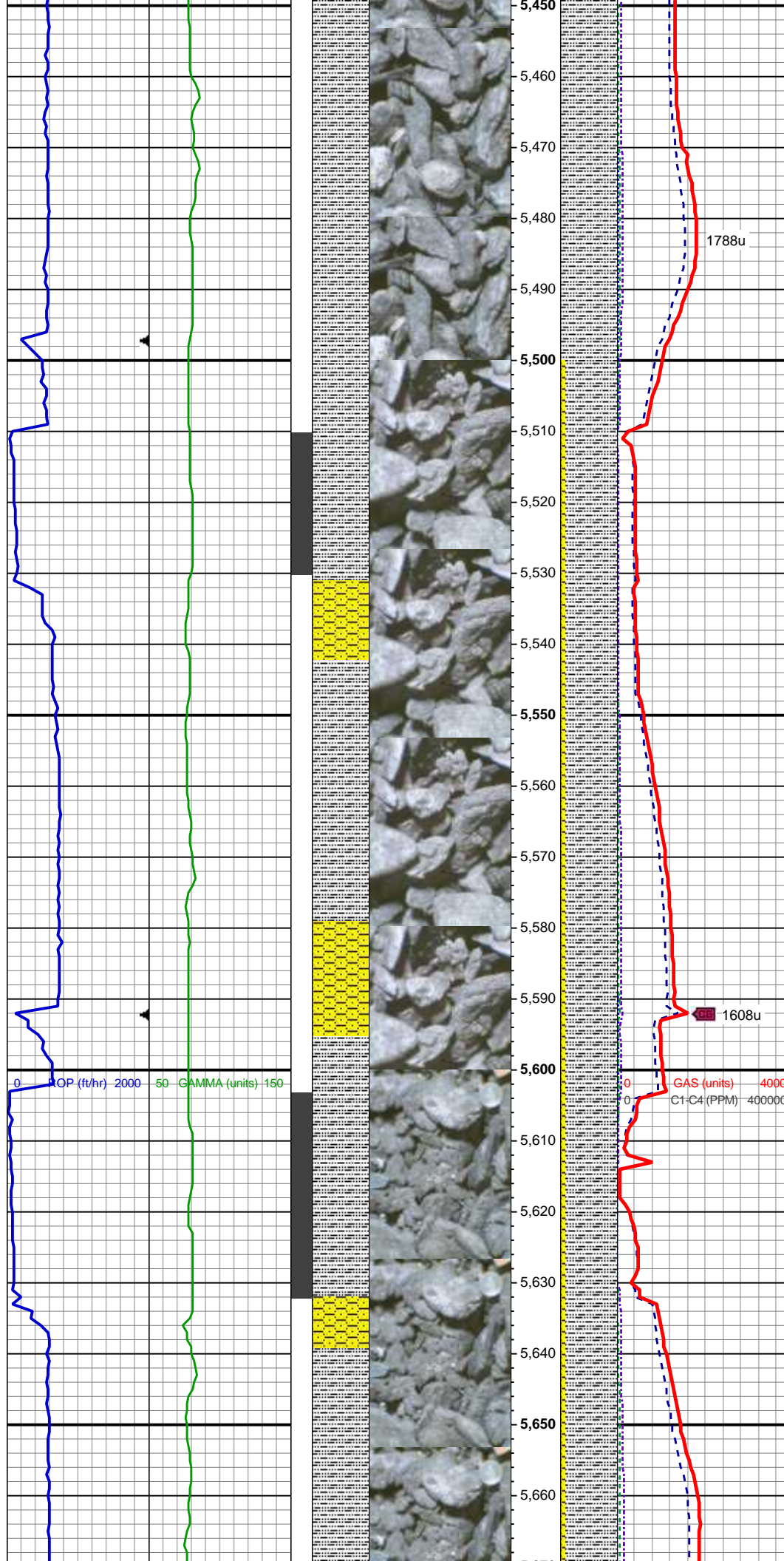
GAS (units) 4000
C1-C4 (PPM) 400000
1142u

1337u

927u

1142u

1337u



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

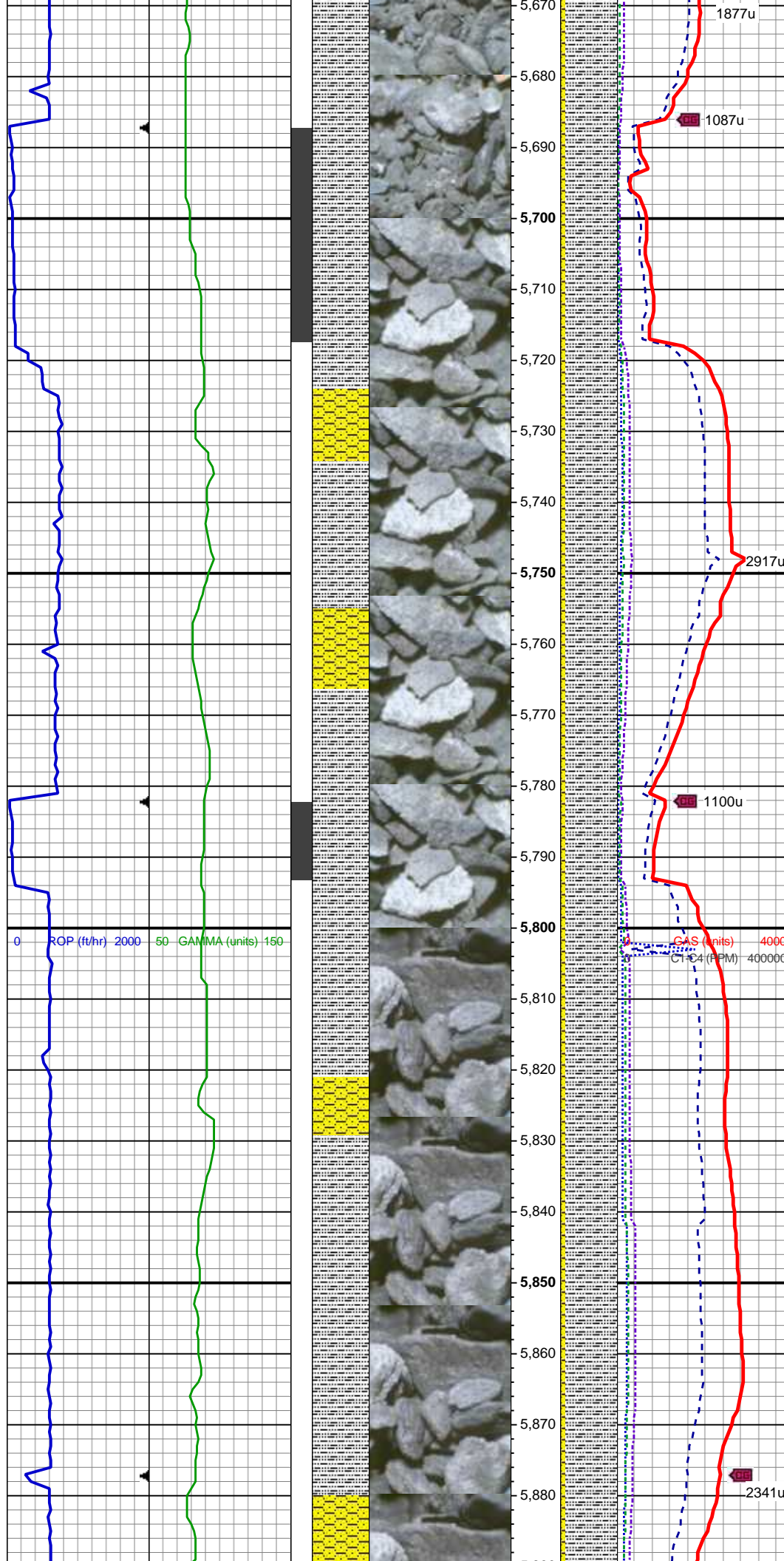
MD: 5,535'
TVD: 5,470.8'
Inclination: 8.61°
Azimuth: 71.98°

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

MUD WT: 9.20/9.20
VIS: 31/31 IN/OUT

MD: 5,630'
TVD: 5,564.59'
Inclination: 9.76°
Azimuth: 68.09°

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

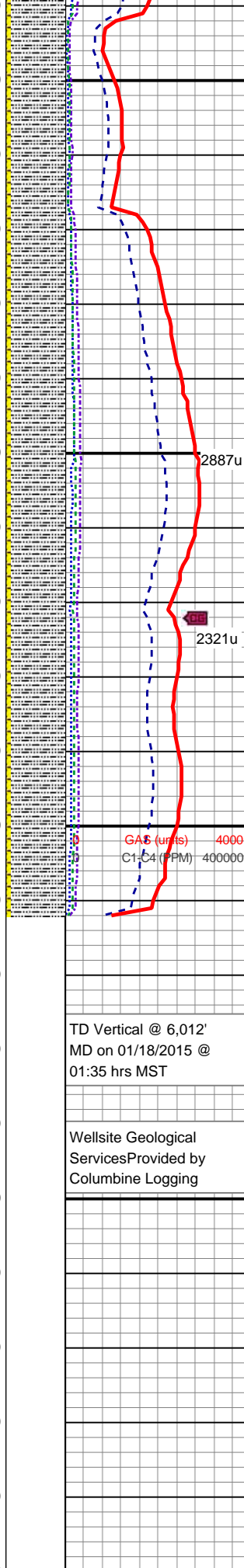
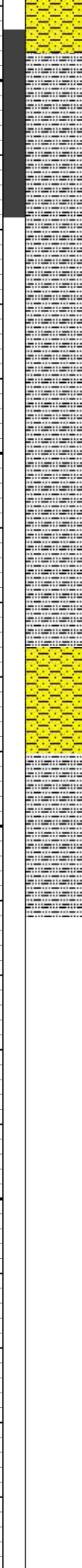
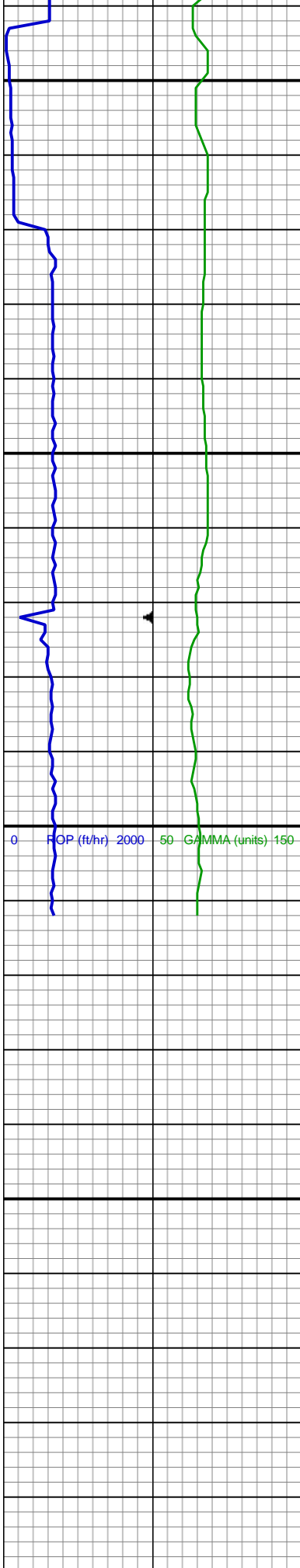


MD: 5,725'
TVD: 5,658'
Inclination: 11.24°
Azimuth: 73.44°

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

MD: 5,819'
TVD: 5,750.38'
Inclination: 10.02°
Azimuth: 74.58°

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



MD: 5,914'
TVD: 5,843.89'
Inclination: 10.3°
Azimuth: 71.87°

SLTY SH: lt - med gy brn, frm, pty - sb
pty, 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 srtd, frm - mod hd wi
brit clus, calc cmt

MUD WT: 9.50/9.05
VIS: 30/30 IN/OUT

MD: 6,009'
TVD: 5,937.69'
Inclination: 7.88°
Azimuth: 73.55°

See Corresponding Horizontal Log Crow
Creek AA01-766 HORZ