

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Noble Crow Creek State AC36-77-1HN VERT

Location SEC 36 T7N R63W

State Colorado

County Weld

Country USA

Rig Number H&P 315

API Number 05-123-37133

AFE # 139140

Region DJ Basin

Field Wattenberg

Spud Date 10/6/2013

Drilling Completed 10/8/2013

Surface Coordinates SESW SEC 36 T7N R63W
270' FSL; 1,793' FWL

LAT/LON 40.52358000/-104.38780000

Bottom Hole Coordinates NENW SEC 36 T7N R63W
1,650' FWL; 535' FNL

Ground Elevation 4789'

K.B. Elevation 4813'

Logged Interval 2000' **To** 6036'

Total Depth 6036'

Formation Niobrara C Chalk

Type of Drilling Fluid LSND

Operator

Company Noble Energy Inc

Address 1625 Broadway Suite 2200
Denver, CO 80202

Geologist

Name MARK COLE, JACK WEINERTH

Company COLUMBINE LOGGING, INC

Address 2385 S Lipan St
Denver, CO 80223

Rock Types

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

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

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

Other Symbols

Oil Show

DEAD
 EVEN
 QUESTIONABLE
 SPOTTED STAINING

Porosity

EARTHY
 FENESTRAL
 FRACTURE
 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
 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

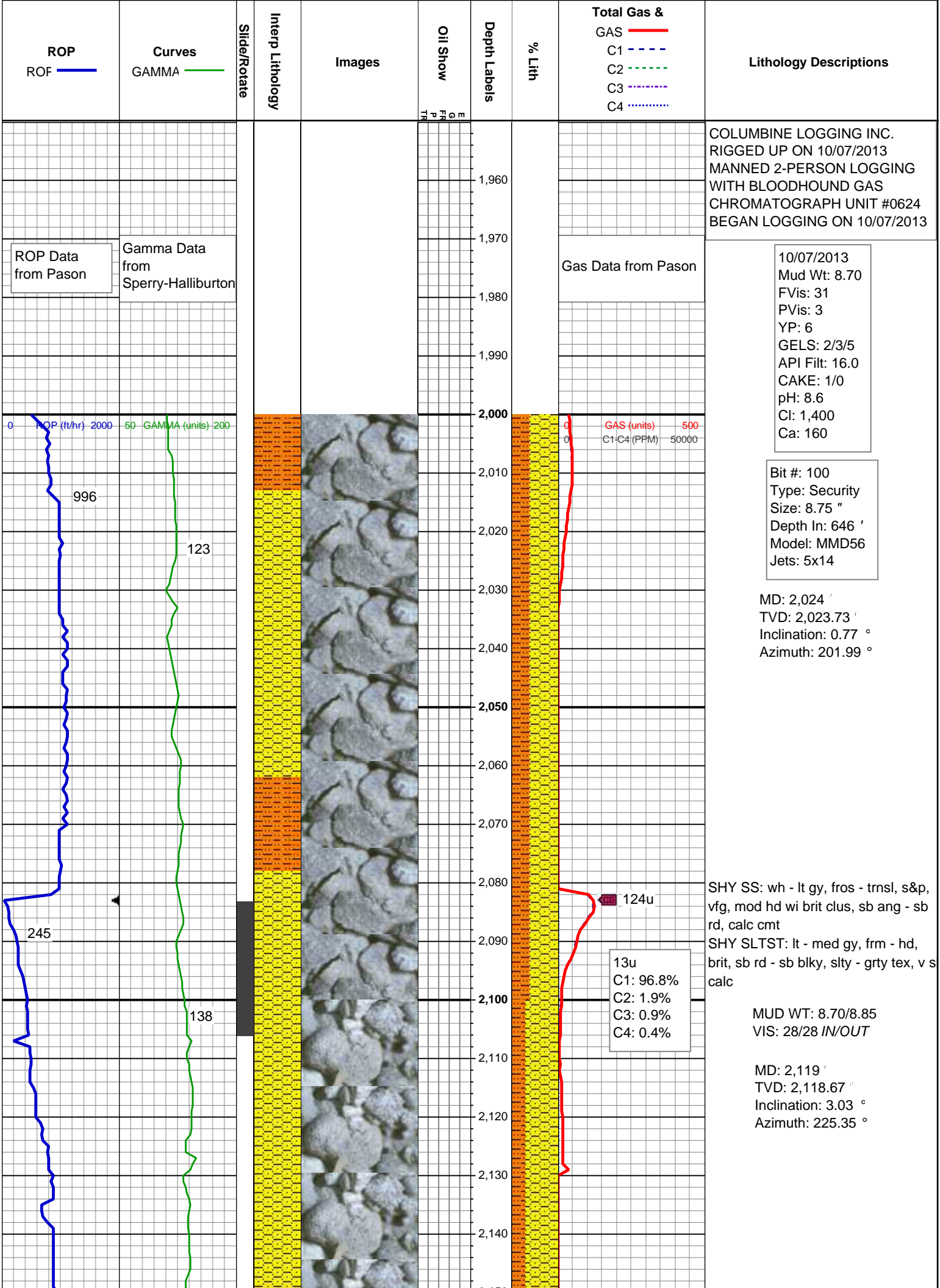
Textures

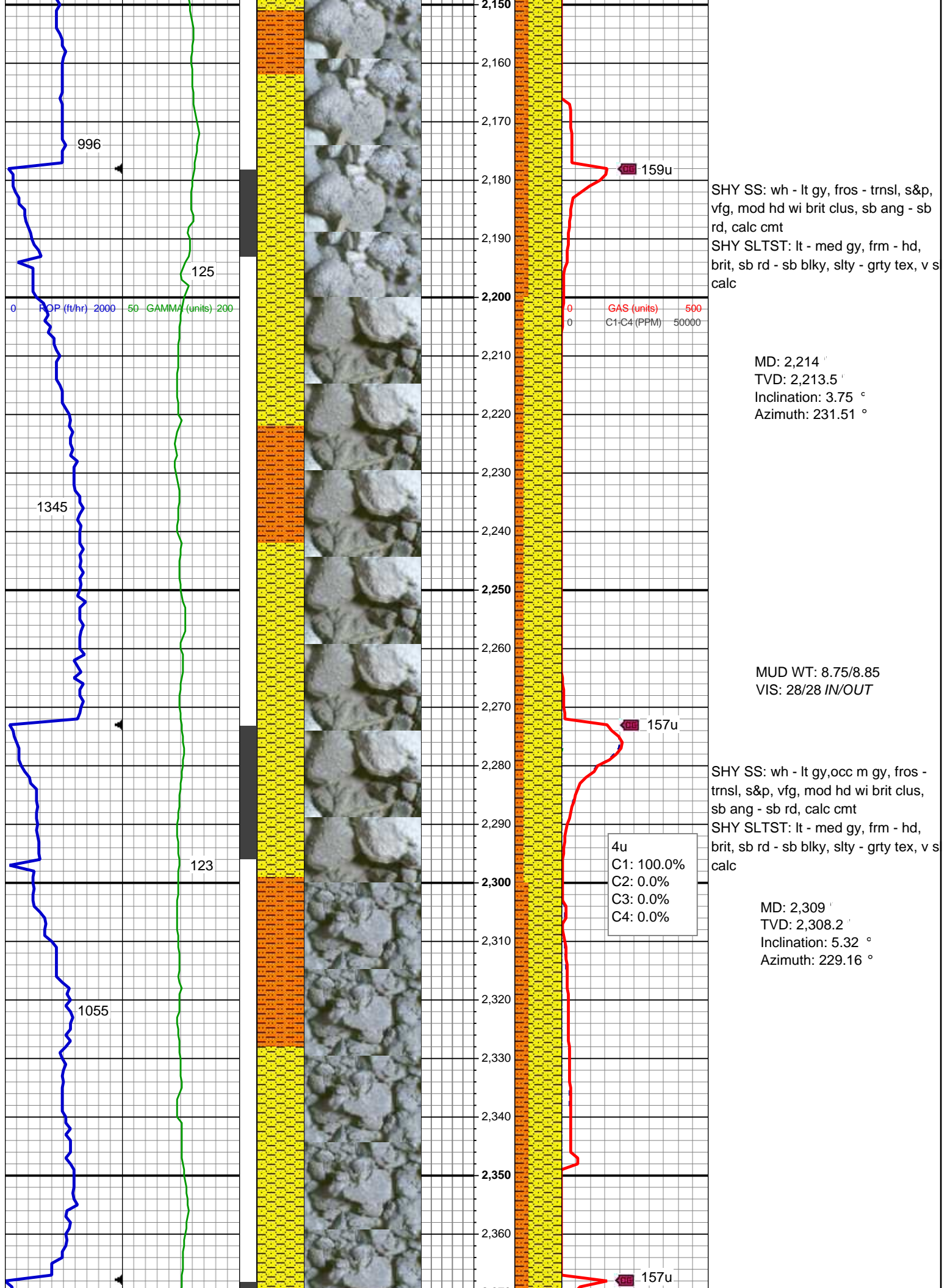
BOUNDSTONE
 CHALKY
 CRYPTOXLN

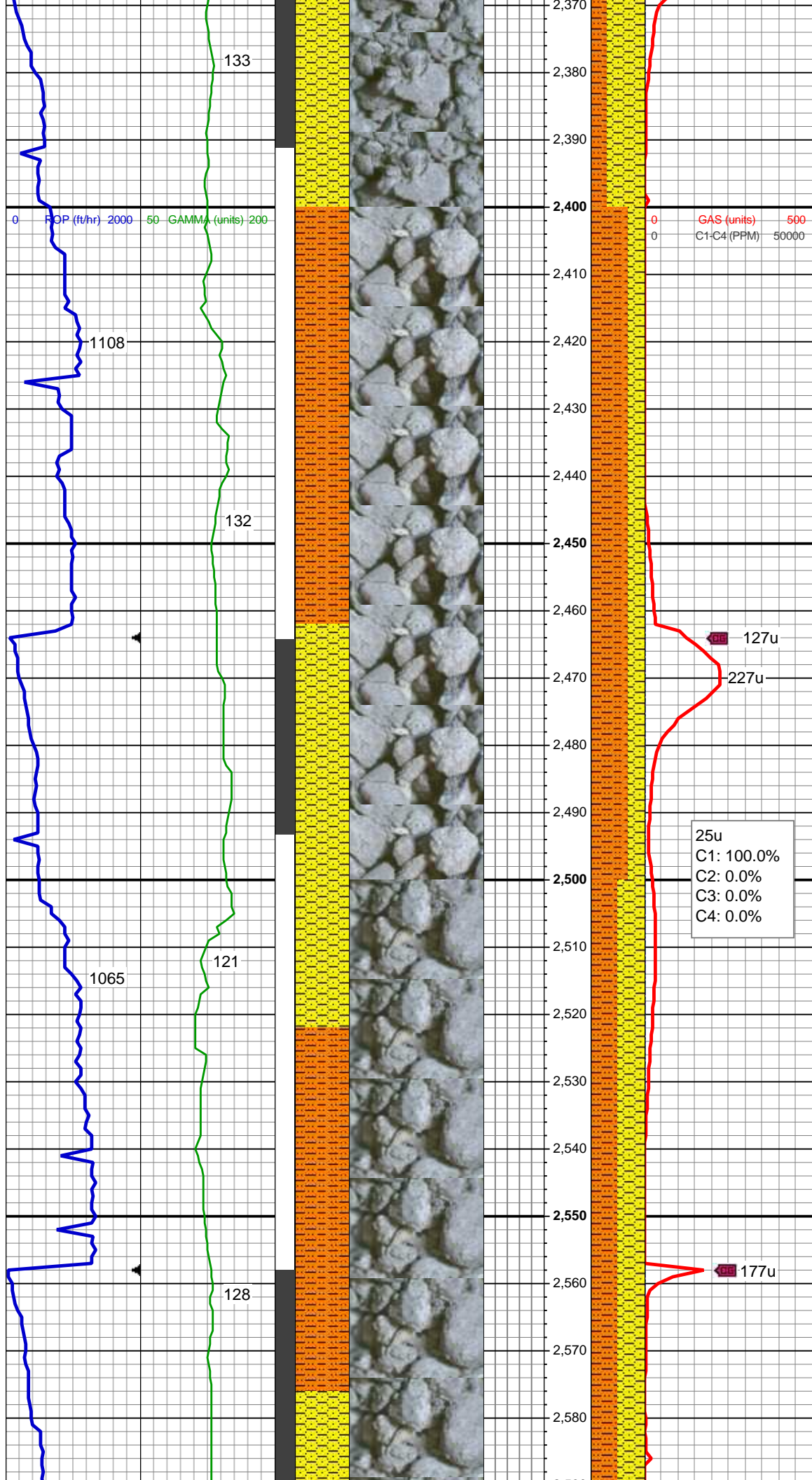
EARTHY
 FINELYXLN
 GRAINSTONE
 LITHOGRAPHIC
 MICROXLN
 MUDSTONE
 PACKSTONE
 WACKESTONE

Sorting

MODERATE
 POOR
 WELL







SHY SS: wh - lt gy, fros - trnsl, s&p, vfg, mod hd wi brit clus, sb ang - sb rd, calc cmt
SHY SLTST: lt - med gy, frm - hd, brit, sb rd - sb blk, slty - grty tex, v s calc

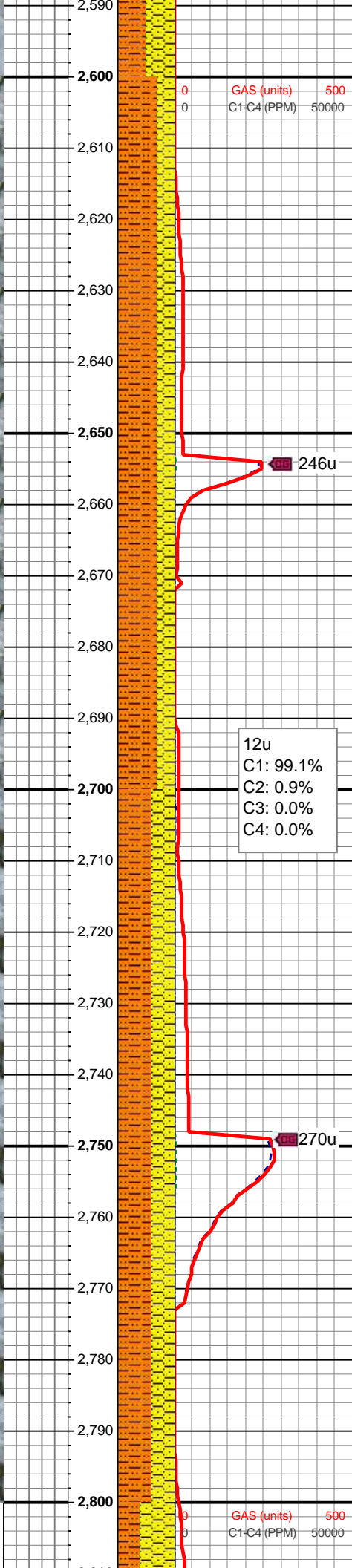
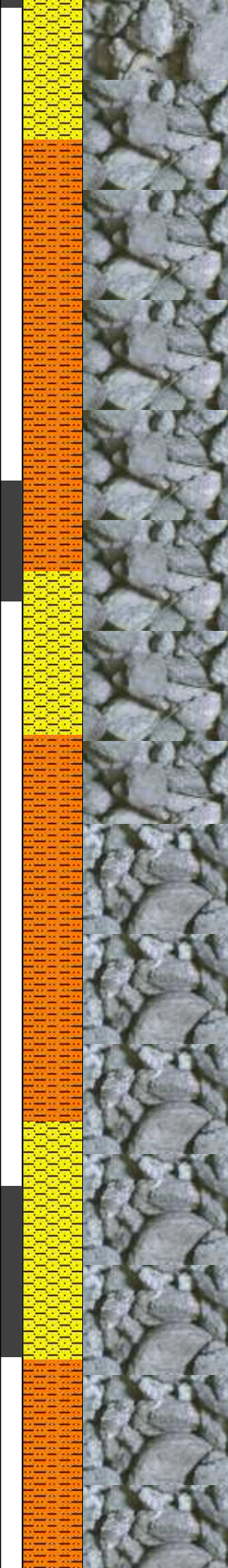
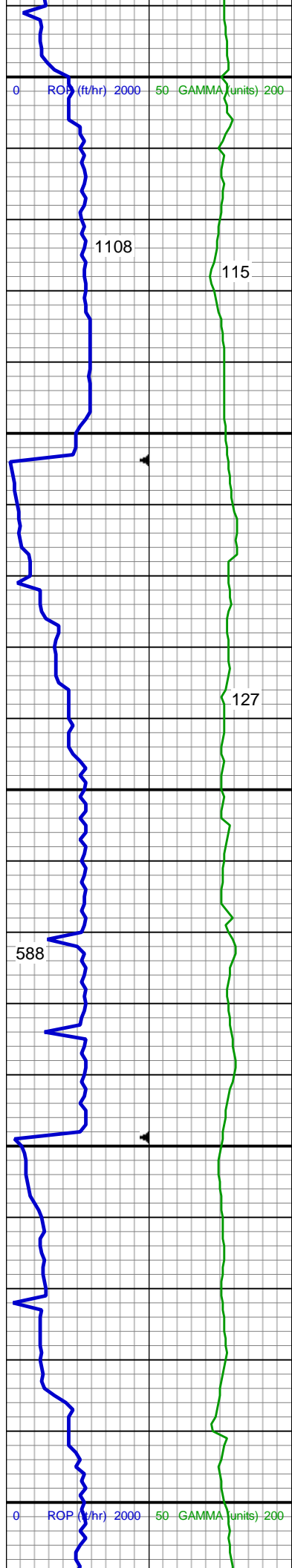
MD: 2,404 '
TVD: 2,402.73 '
Inclination: 6.09 °
Azimuth: 215.72 °

SHY SLTST: lt - med gy, frm - hd, brit, sb rd - sb blk, slty - grty tex, v s calc
SHY SS: wh - lt gy, fros - trnsl, s&p, vfg, mod hd wi brit clus, sb ang - sb rd, calc cmt

MD: 2,498 '
TVD: 2,496.1 '
Inclination: 7.18 °
Azimuth: 212.18 °

SHY SS: wh - lt gy, fros - trnsl, s&p, vfg, mod hd wi brit clus, sb ang - sb rd, calc cmt

MD: 2,593 '
TVD: 2,589.99 '
Inclination: 10.31 °
Azimuth: 207.97 °



SHY SLTST: lt - med gy, frm - hd,
brit, sb rd - sb blkly, slty - grty tex, v s
calc

MD: 2,688 '
TVD: 2,683.45 '
Inclination: 10.34 °
Azimuth: 210.35 °

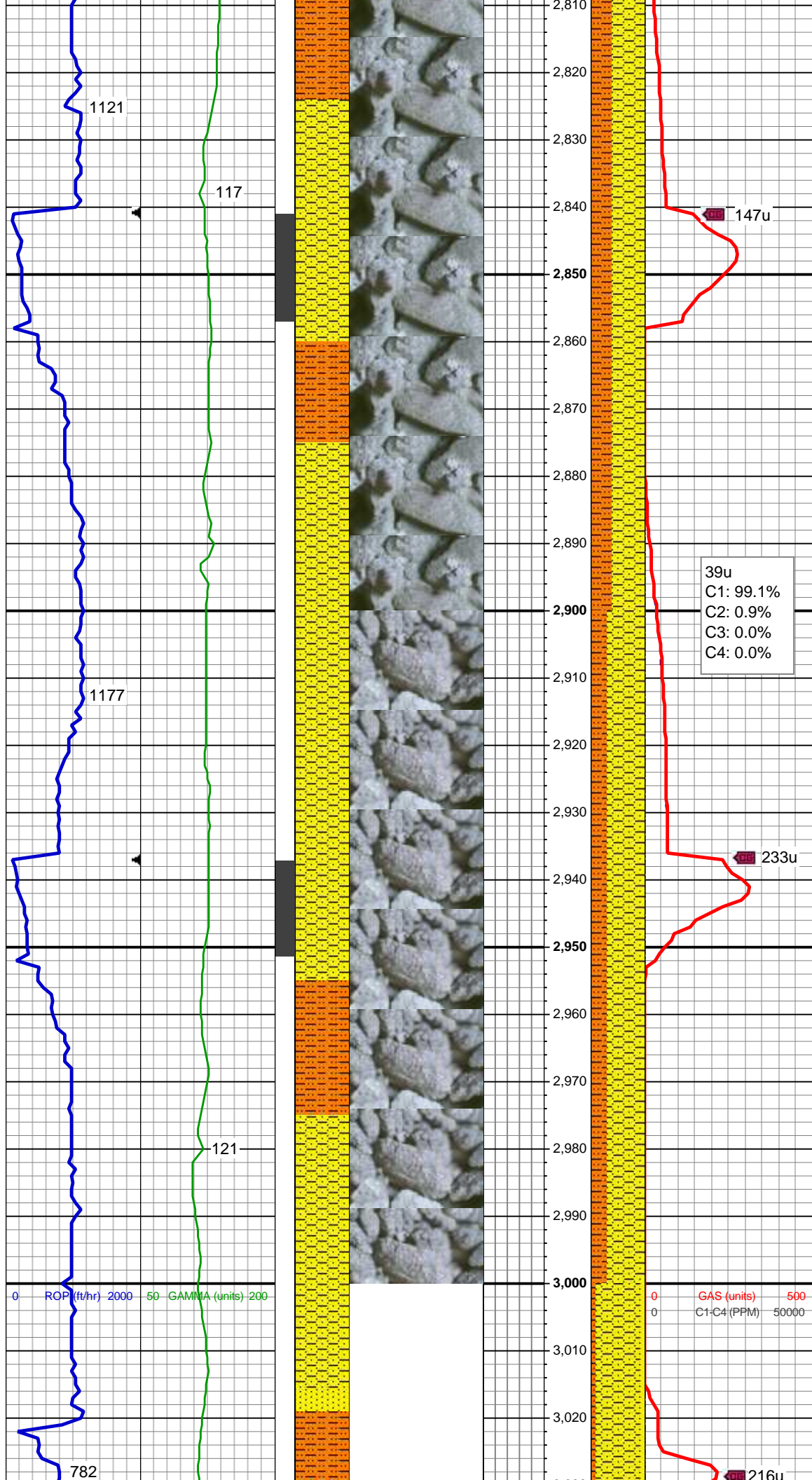
SHY SLTST: lt - med gy, frm - hd,
brit, sb rd - sb blkly, slty - grty tex, v s
calc

SHY SS: wh - lt gy, some med gy,
fros - trnsl, s&p, vfg, mod hd wi brit
clus, sb ang - sb rd, calc cmt

MD: 2,783 '
TVD: 2,776.81 '
Inclination: 10.99 °
Azimuth: 212.96 °

SHY SLTST: lt - med gy, frm - hd,
brit, sb rd - sb blkly, slty - grty tex, v s
calc

SHY SS: lt gy, wh, fros - trnsl, s&p,
vfg, mod hd wi brit clus, sb ang - sb
rd, calc cmt



MD: 2,878 '
TVD: 2,870.1 '
Inclination: 10.83 °
Azimuth: 219.7 °

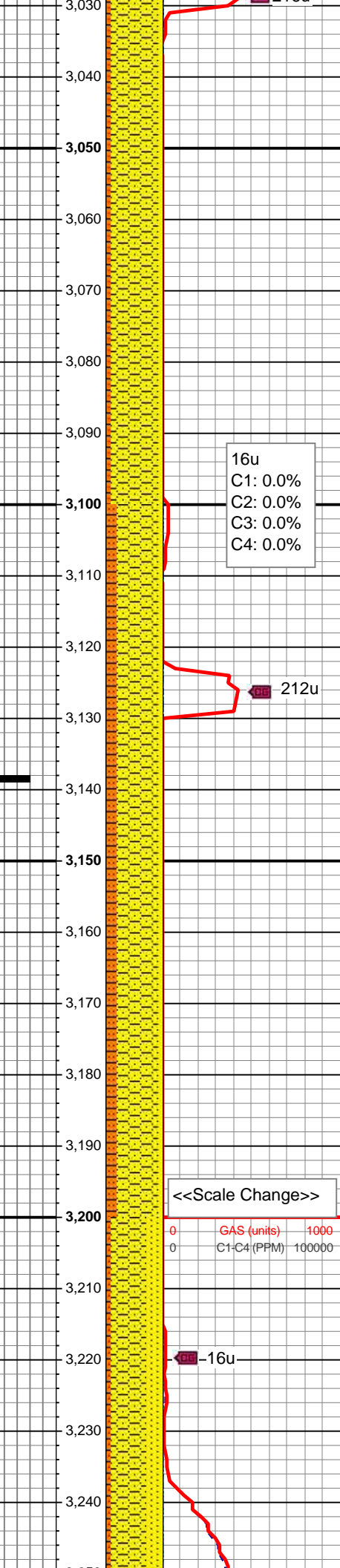
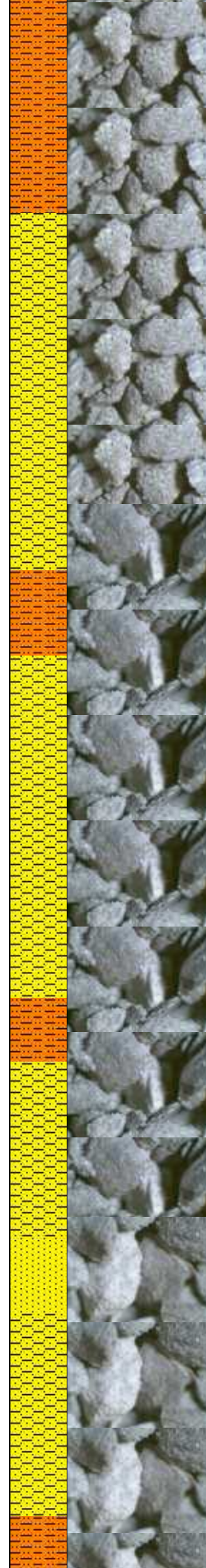
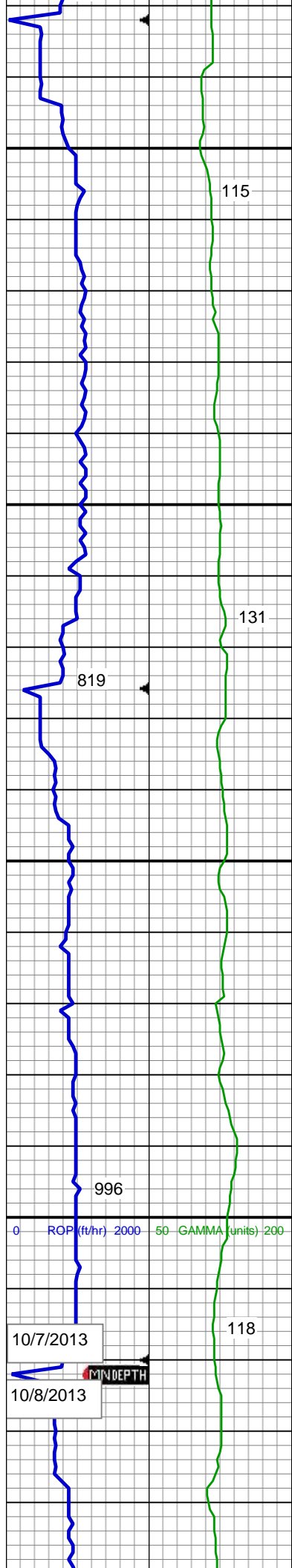
SHY SS: wh - lt gy, fros - trns, s&p,
vfg-fg, mod hd wi brit clus, sb ang -
sb rd, calc cmt
SHY SLTST: lt - med gy, frm - hd,
brit, sb rd - sb blk, slty - grty tex, v s
calc

39u
C1: 99.1%
C2: 0.9%
C3: 0.0%
C4: 0.0%

MD: 2,973 '
TVD: 2,963.37 '
Inclination: 11.02 °
Azimuth: 219.29 °

SHY SS: wh - lt gy, fros - trns, s&p,
vfg, mod hd wi brit clus, sb ang - sb
rd, calc cmt
SHY SLTST: lt - med gy, frm - hd,
brit, sb rd - sb blk, slty - grty tex, v s
calc

0 GAS (units) 500
0 C1-C4 (PPM) 50000

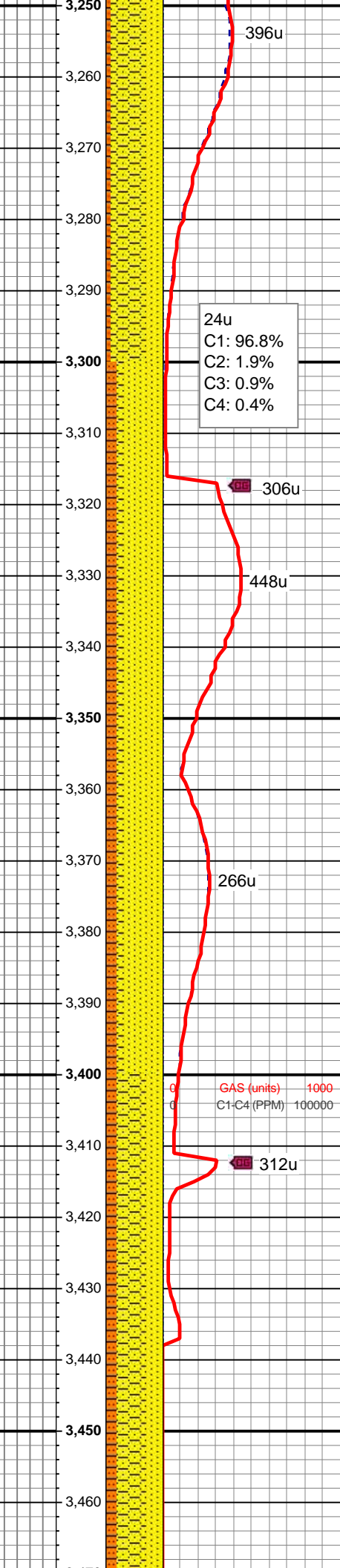
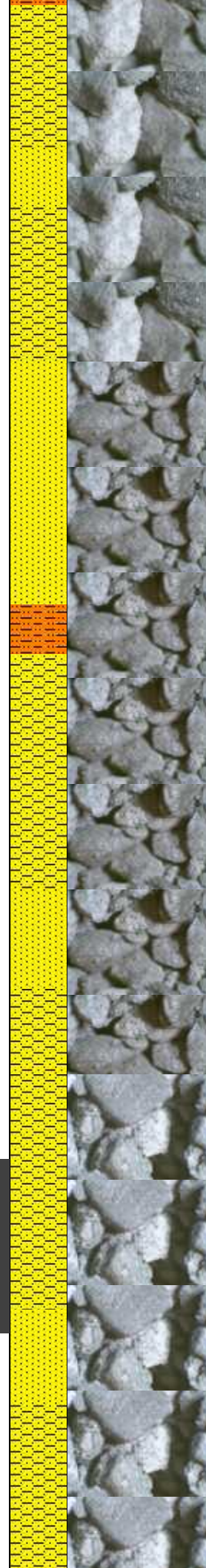
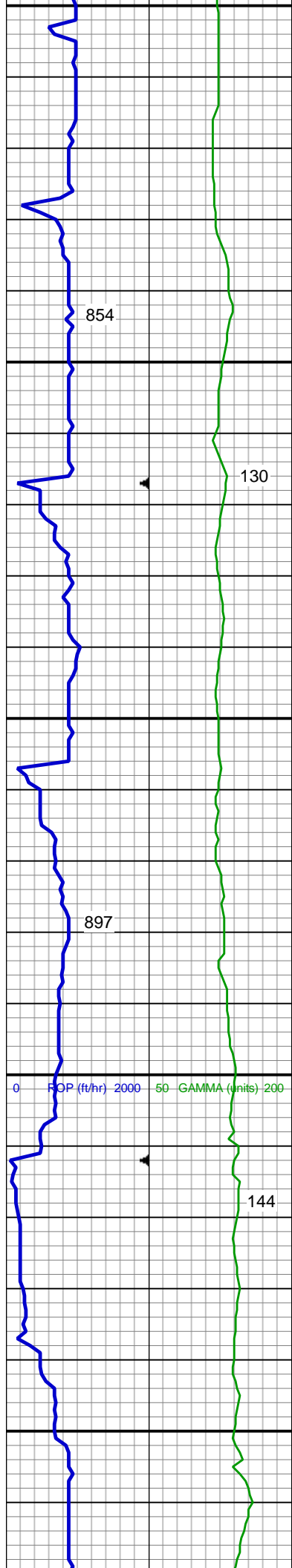


MD: 3,068 '
TVD: 3,056.61 '
Inclination: 11.11 °
Azimuth: 217.87 °

SHY SS: wh - lt gy, fros - trnsl, s&p, vfg-fg, mod hd wi brit clus, sb ang - sb rd, calc cmt
SHY SLTST: lt - med gy, frm - hd, brit, sb rd - sb blk, slty - grty tex, v s calc

MD: 3,162 '
TVD: 3,149.11 '
Inclination: 9.38 °
Azimuth: 218.22 °

SHY SS: lt gy, s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt
SHY SLTST: lt - med gy, frm - hd, sb rd - sb blk, 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: 3,257 '
TVD: 3,242.96 '
Inclination: 8.41 °
Azimuth: 214.97 °

SHY SS: lt gy, s&p, vfg, frm - mod
hd, wh brit clus, sb ang - sb rd, calc
cmt
SHY SLTST: lt gy, frm - hd, sb rd -
sb blk, slty - grty tex, v sl calc
SS: wh - lt gy, fros - trns, speckl wi
mica, f gr, hd brit clus, ang - sb ang,
v calc cmt

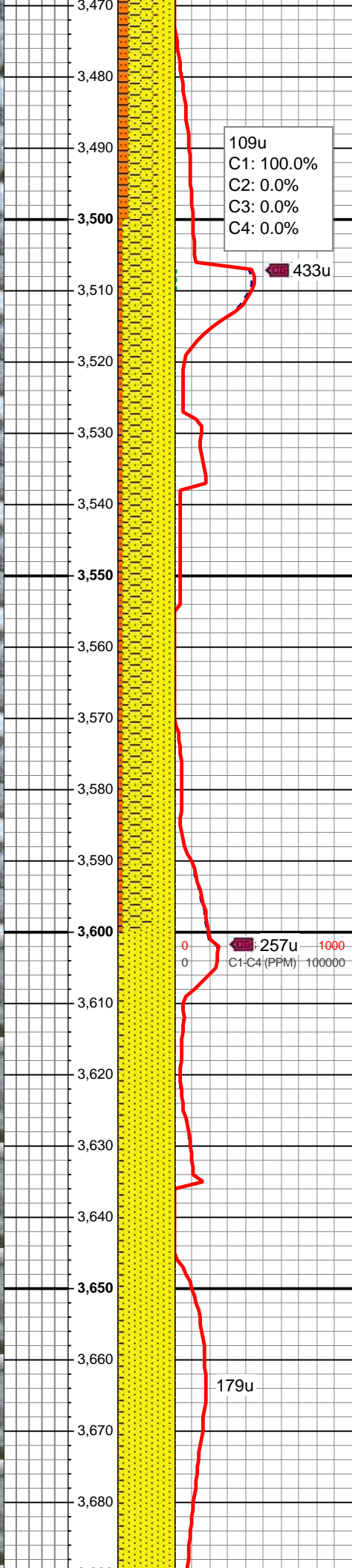
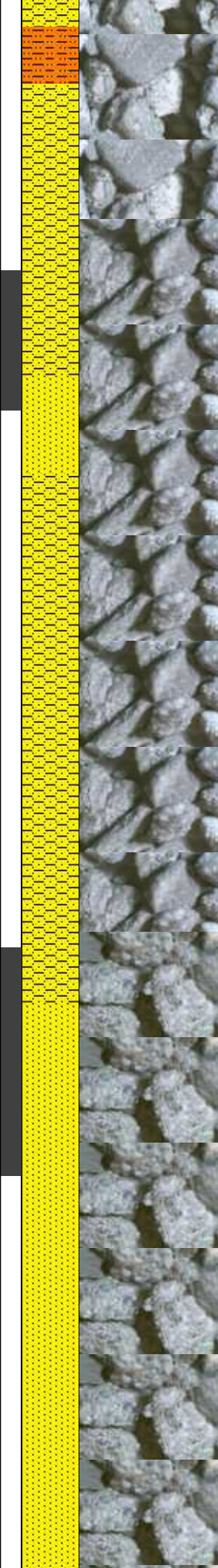
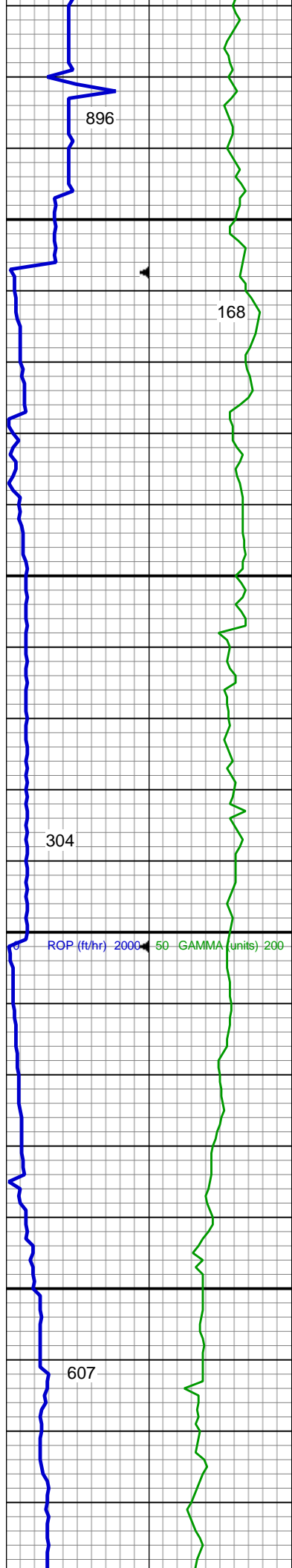
24u
C1: 96.8%
C2: 1.9%
C3: 0.9%
C4: 0.4%

MD: 3,352 '
TVD: 3,337.01 '
Inclination: 7.81 °
Azimuth: 214.44 °

SS: wh - lt gy, fros - trns, speckl wi
mica, f gr, hd brit clus, ang - sb ang,
v calc cmt
SHY SLTST: lt - med gy, frm - hd, sb
rd - sb blk, slty - grty tex, v sl calc
SHY SS: lt gy, s&p, vfg, frm - mod
hd wi brit clus, sb ang - sb rd, calc
cmt

GAS (units) 1000
C1-C4 (PPM) 100000

MD: 3,447 '
TVD: 3,431.32 '
Inclination: 6.01 °
Azimuth: 214.23 °



SHY SS: lt gy, wh, s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt
SS: wh - lt gy, fros - trns, speckl wi mica, f gr, hd brit clus, ang - sb ang, v calc cmt
SHY SLTST: lt - med gy, frm - hd, sb rd - sb blk, slty - grty tex, v sl calc

MUD WT: 8.70/8.90
VIS: 29/33 IN/OUT

MD: 3,542 '
TVD: 3,525.87 '
Inclination: 5.12 °
Azimuth: 215.96 °

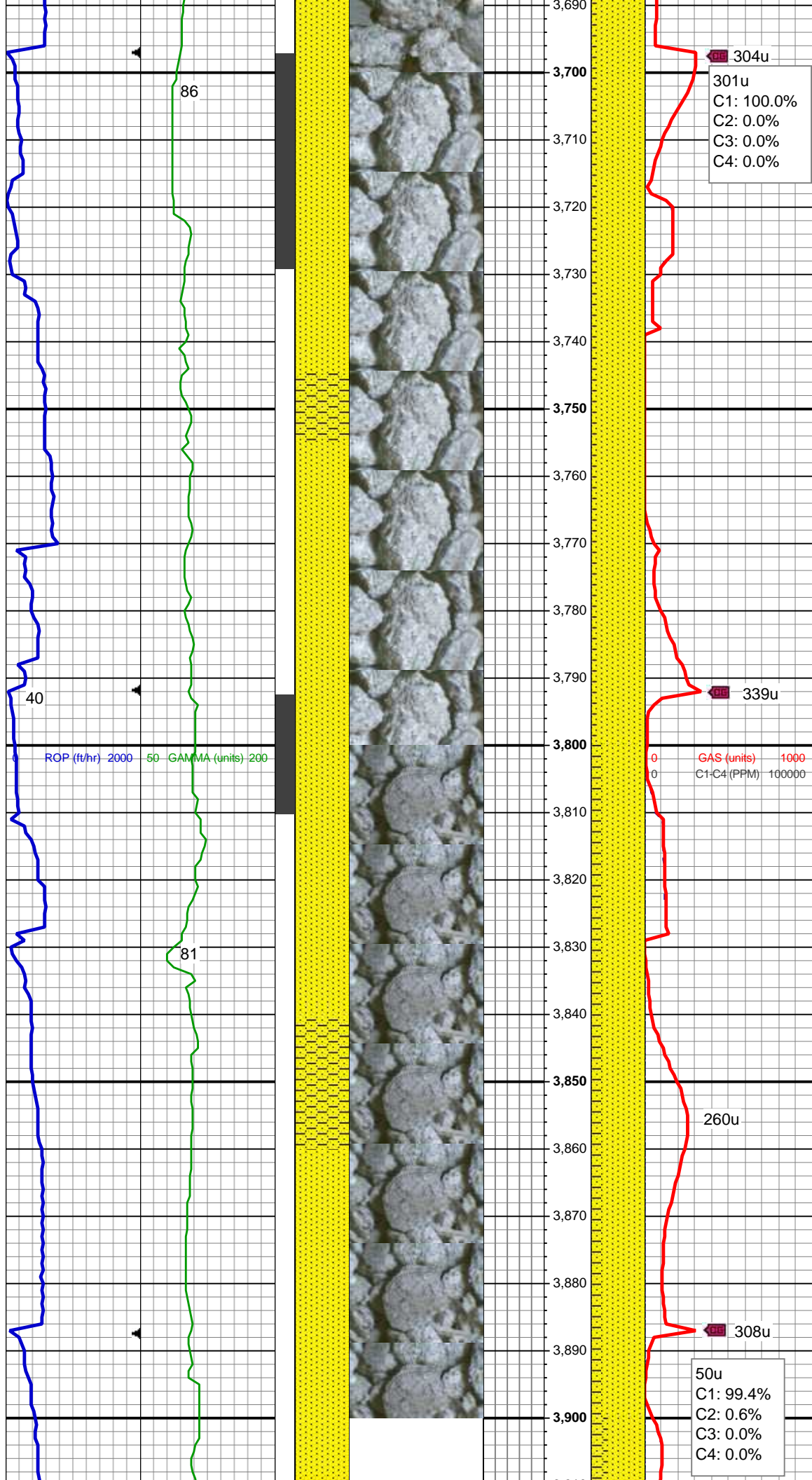
SHY SS: lt gy, s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt
SS: wh - lt gy, fros - trns, speckl wi mica, f gr, hd brit clus, ang - sb ang, v calc cmt
SHY SLTST: lt - med gy, frm - hd, sb rd - sb blk, slty - grty tex, v sl calc

Parkman Top @
3,610' MD; 3,594' TVD

MD: 3,637 '
TVD: 3,620.63 '
Inclination: 2.94 °
Azimuth: 202.28 °

10/08/2013
Mud Wt: 8.90
FVis: 33
PVis: 4
YP: 4
GELS: 4/7/11
API Filt: 16.0
CAKE: 1/0
pH: 8.6
Cl: 1,500
Ca: 120

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



SHY SS: pred lt gy, sme s&p, vfg,
frm - mod hd wi brit clus, sb ang -
sb rd, calc cmt

MD: 3,732 '
TVD: 3,715.56 '
Inclination: 1.35 °
Azimuth: 178.03 °

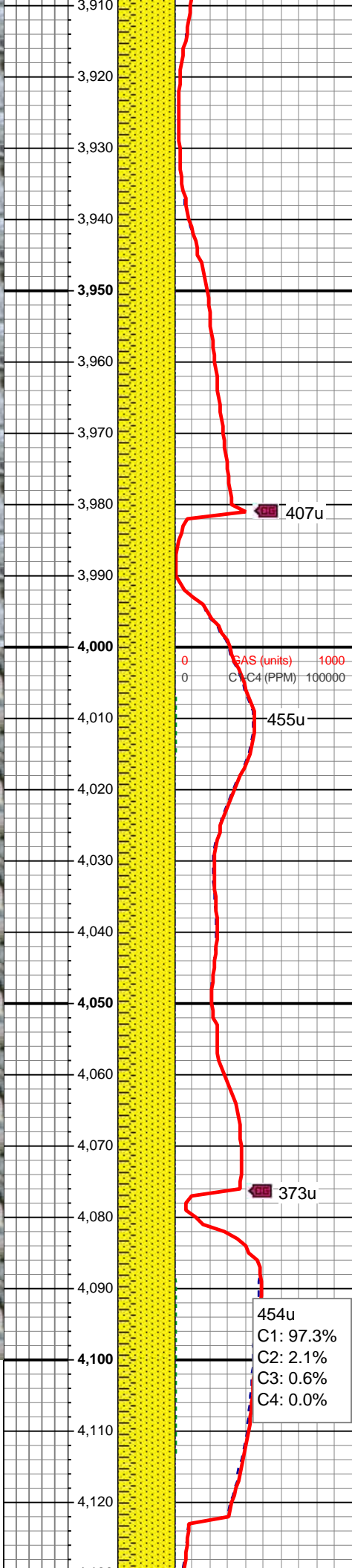
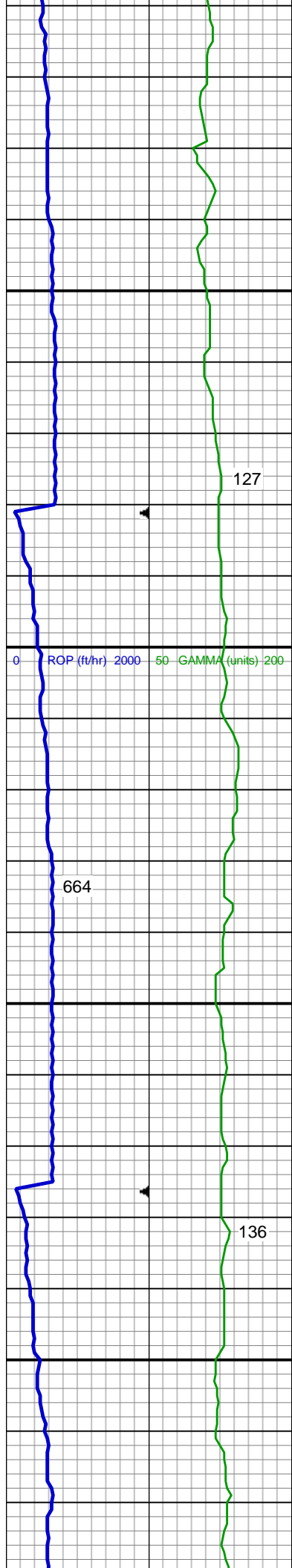
SS: wh - lt gy, fros - trnsl, speckl wi
mica, f gr, hd brit clus, ang - sb ang
- sb rd, v calc cmt

SHY SS: pred lt gy, sme s&p, vfg,
frm - mod hd wi brit clus, sb ang -
sb rd, calc cmt

MD: 3,827 '
TVD: 3,810.55 '
Inclination: 0.25 °
Azimuth: 53.67 °

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

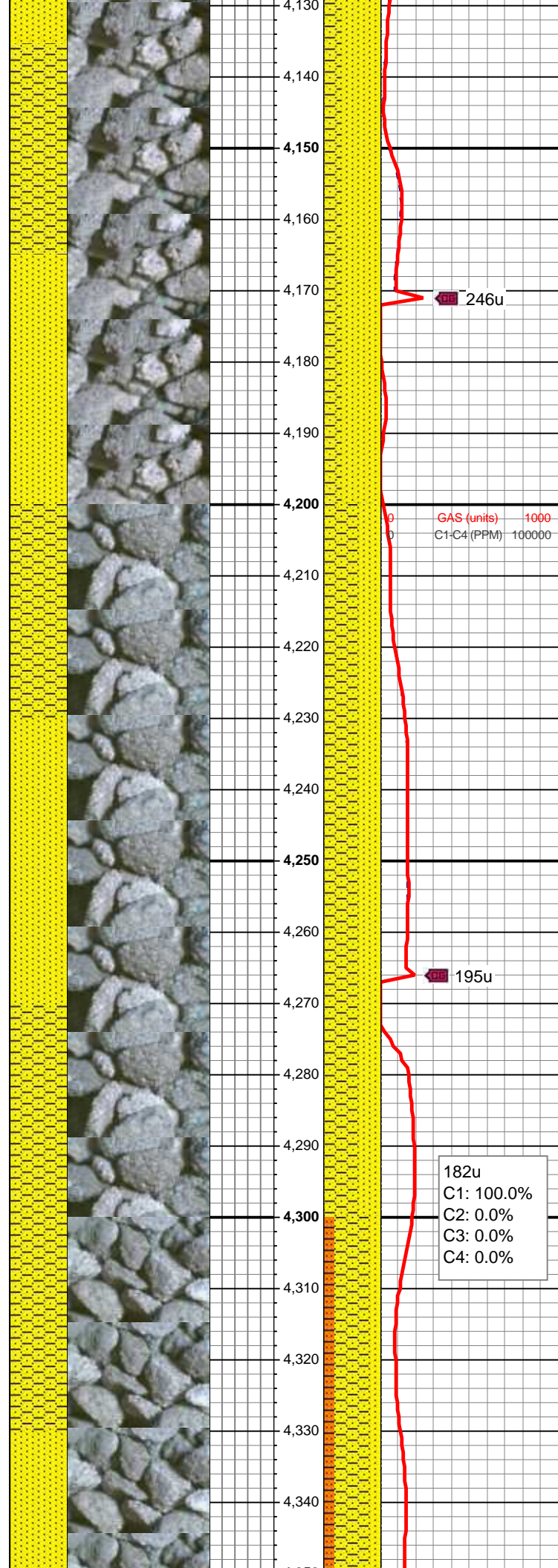
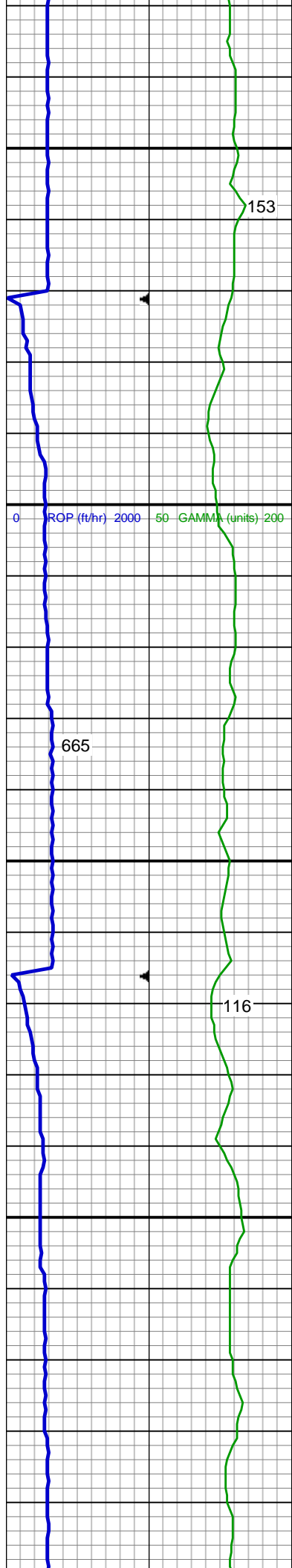
SHY SS: pred lt gy, sme s&p, vfg,
frm - mod hd wi brit clus, sb ang -
sb rd, calc cmt



SS: wh - lt gy, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang - sb rd, v calc cmt
SHY SS: pred lt gy, sme s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt

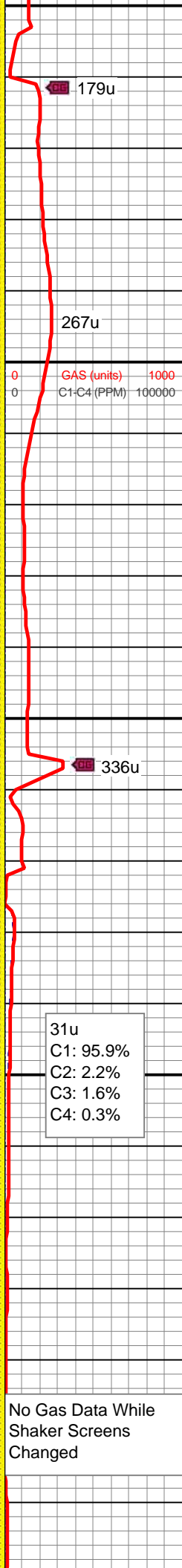
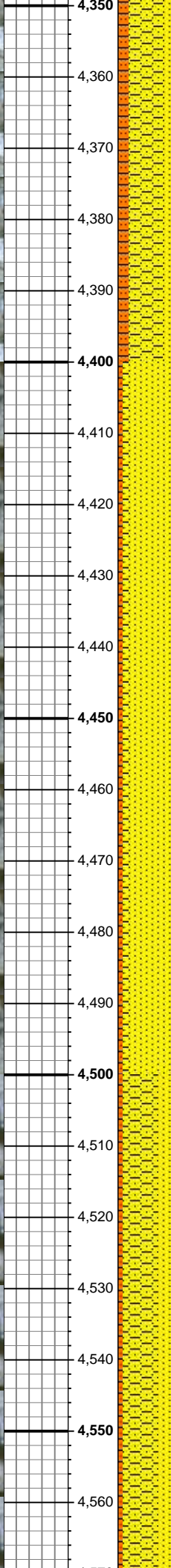
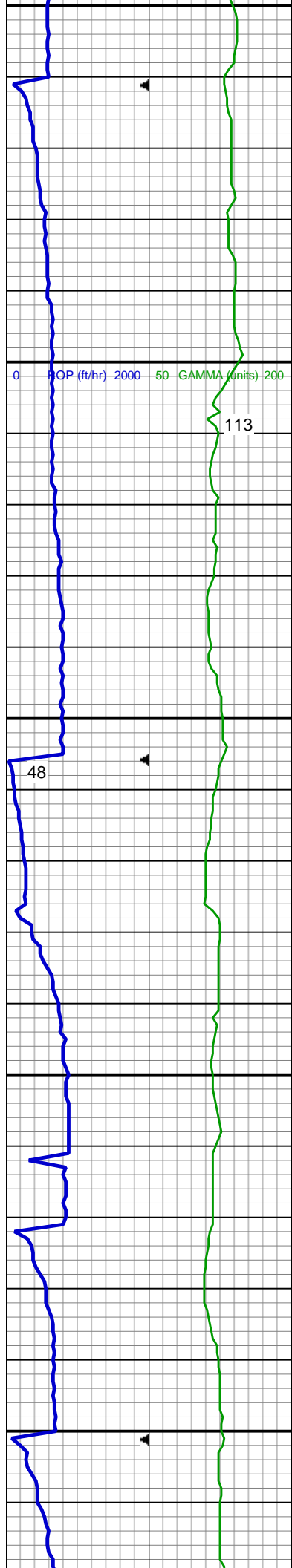
SS: pred lt gy, occ wh, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang - sb rd, v calc cmt
SHY SS: pred lt gy, sme s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt

MD: 4,112 '
TVD: 4,095.55 '
Inclination: 0.22 °
Azimuth: 135.08 °



SS: pred lt gy, occ wh, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang - sb rd, v calc cmt
SHY SS: pred lt gy, sme s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt

SHY SS: pred lt gy, sme s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt
SS: pred lt gy, occ wh, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang - sb rd, v calc cmt



SHY SS: pred lt gy, sme s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt
SS: pred lt gy, occ wh, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang - sb rd, v calc cmt
SHY SLTST: lt - med gy, frm - hd, sb plty - sb rd - sb blkly, slty - grty tex, v sl calc

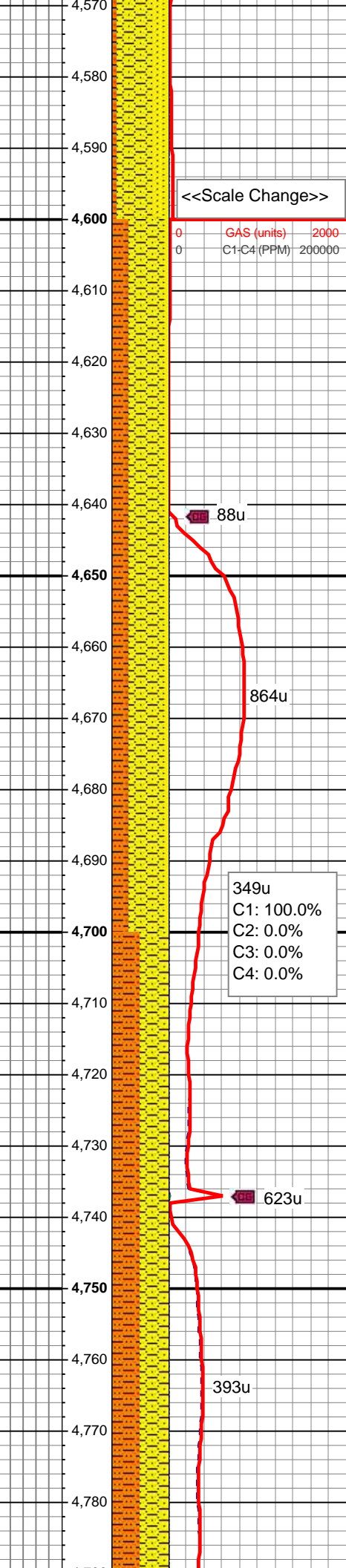
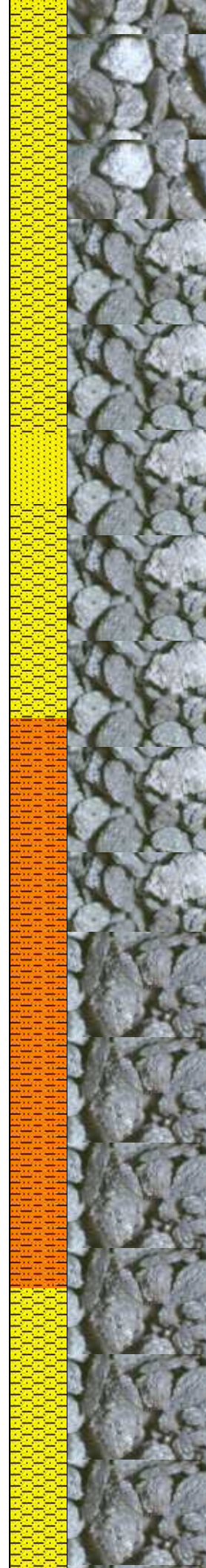
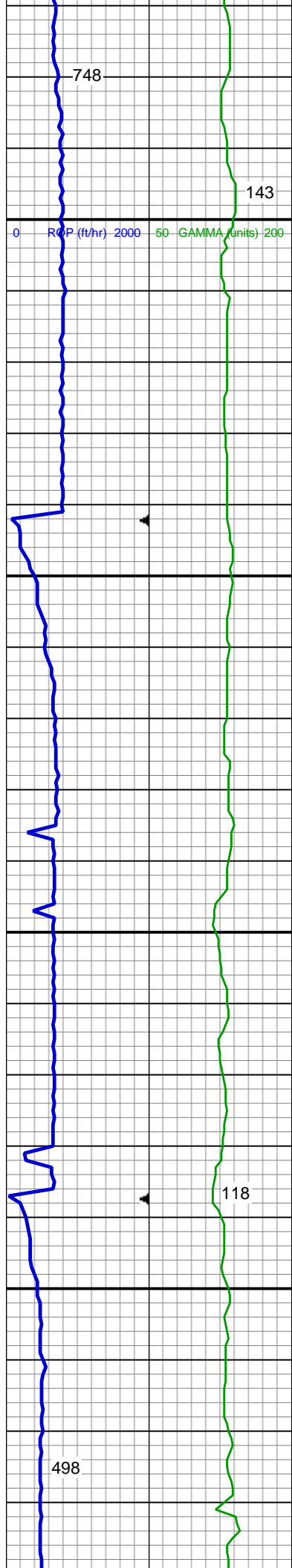
MD: 4,397 '
TVD: 4,380.47 '
Inclination: 2.23 °
Azimuth: 135.09 °

Sussex Top @
4,410' MD; 4,393' TVD

SS: wh - lt gy, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang - sb rd, v calc cmt
SHY SS: pred lt gy, sme s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt
SHY SLTST: lt - med gy, frm - hd, sb plty - sb rd - sb blkly, slty - grty tex, v sl calc

MD: 4,492 '
TVD: 4,475.45 '
Inclination: 0.26 °
Azimuth: 40.8 °

MUD WT: 8.60/8.80
VIS: 28/30 IN/OUT



SHY SS: pred lt gy, sme s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt
SS: wh - lt gy, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang - sb rd, v calc cmt
SHY SLTST: lt - med gy, frm - hd, sb plty - sb rd - sb blkly, slty - grty tex, v sl calc

<<Scale Change>>

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

88u

864u

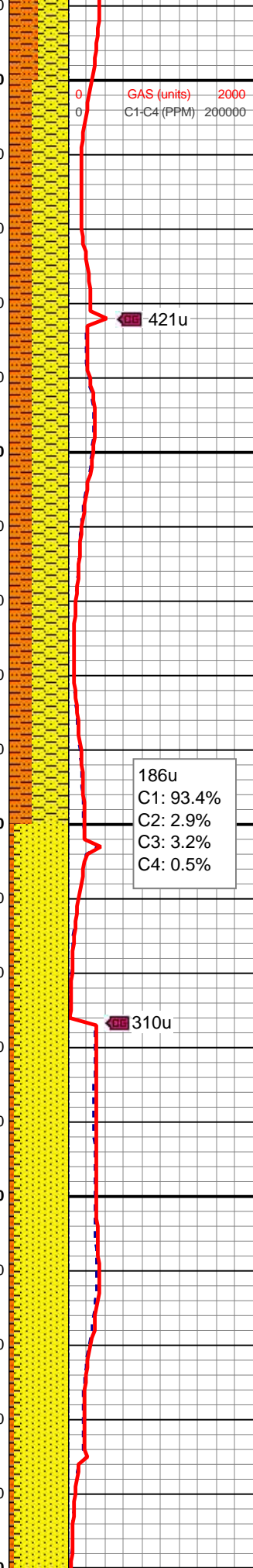
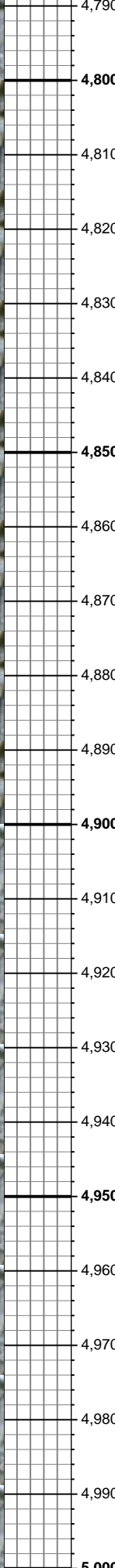
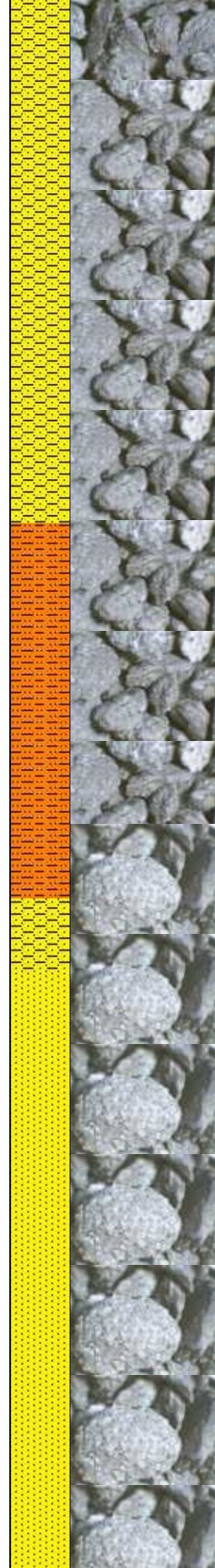
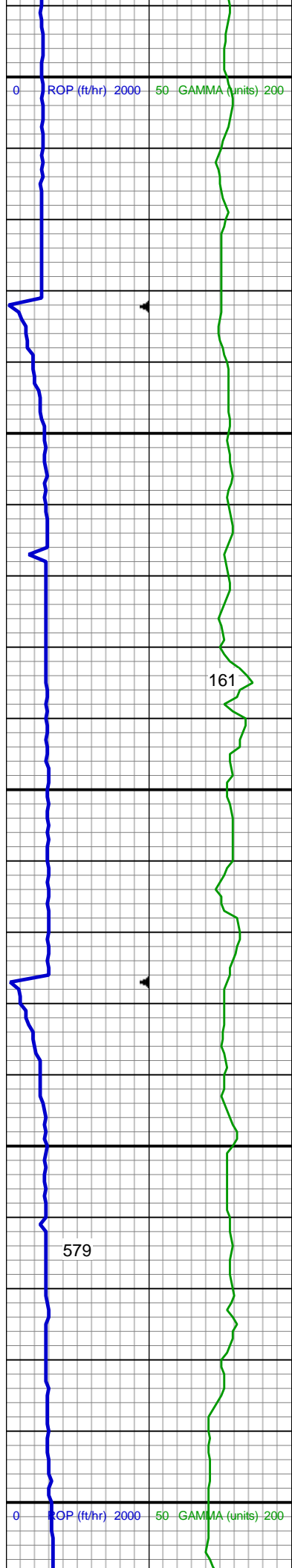
349u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

623u

393u

MD: 4,776 '
TVD: 4,759.4 '
Inclination: 1.66 °
Azimuth: 328.45 °

SHY SS: pred lt gy, sme s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt



SHY SLTST: lt - med gy, frm - hd, sb
plty - sb rd - sb blk, slty - grty tex, v
sl calc

MUD WT: 8.70/9.00
VIS: 28/31 IN/OUT

SHY SS: pred lt gy, sme s&p, vfg,
frm - mod hd wi brit clus, sb ang -
sb rd, calc cmt

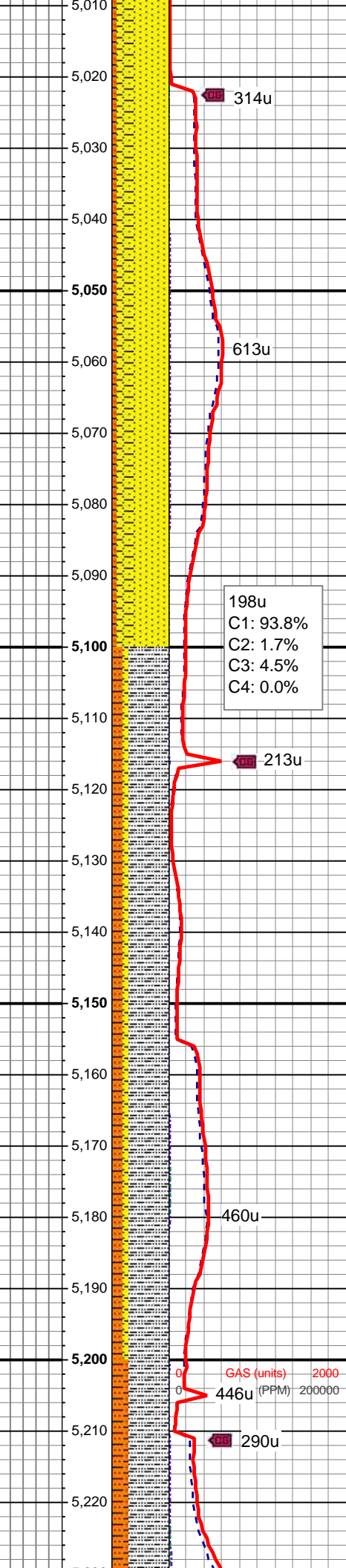
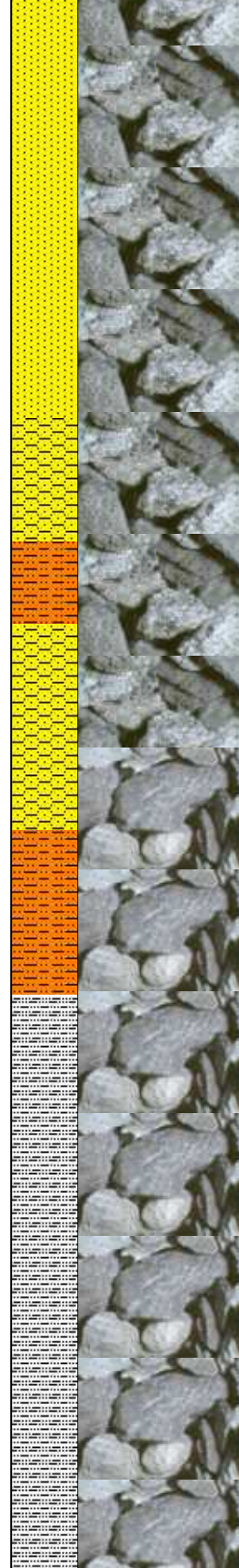
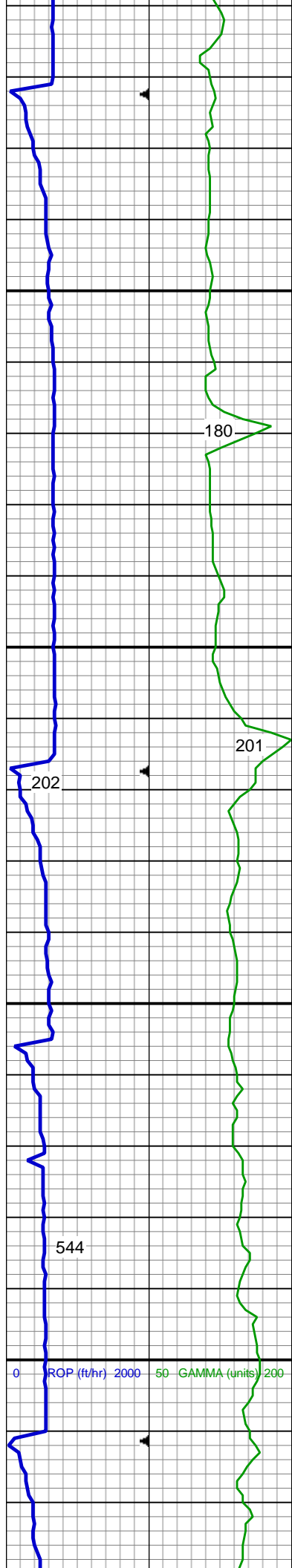
SHY SLTST: lt - med gy, frm - hd, sb
plty - sb rd - sb blk, slty - grty tex, v
sl calc

Shannon Top @
4,920' MD; 4,903' TVD

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

SHY SS: pred lt gy, sme s&p, vfg,
frm - mod hd wi brit clus, sb ang -
sb rd, calc cmt

SHY SLTST: lt - med gy, frm - hd, sb
plty - sb rd - sb blk, slty - grty tex, v
sl calc



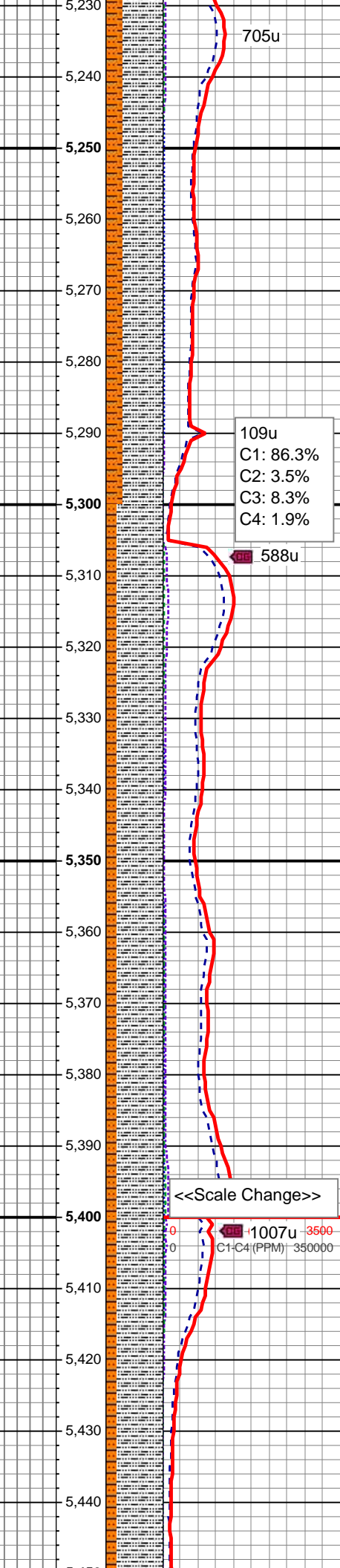
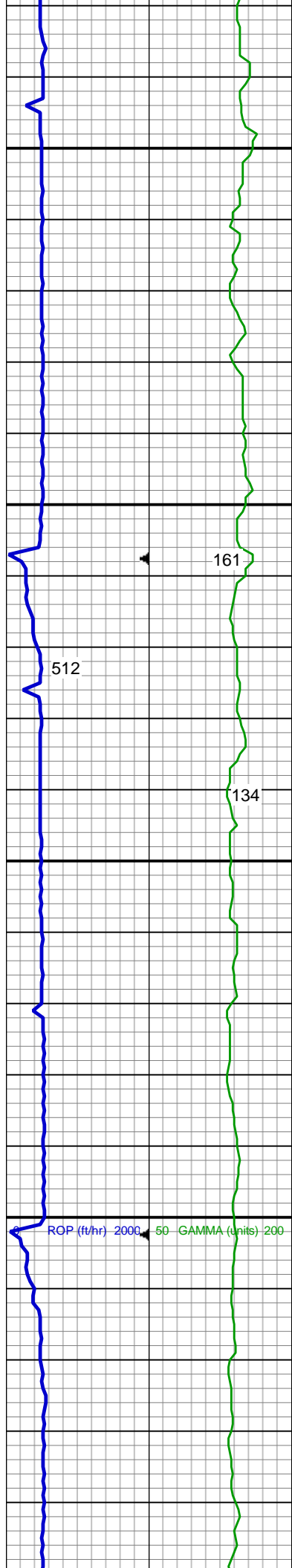
MD: 5,061 '
TVD: 5,044.31 '
Inclination: 1.34 °
Azimuth: 347.04 °

SS: wh - lt gy, fros - trnsl, speckl wi mica, f gr, hd brit clus, ang - sb ang - sb rd, v calc cmt
SHY SS: pred lt gy, sme s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt
SHY SLTST: lt - med gy, frm - hd, sb plty - sb rd - sb blkly, slty - grty tex, v sl calc

SLTY SH: lt - med gy brn, occ dk gy, frm - hd, plty - sb plty - sb blkly, slty - grty tex, v sl calc
SHY SLTST: lt - med gy, frm - hd, sb plty - sb rd - sb blkly, slty - grty tex, v sl calc
SHY SS: pred lt gy, sme s&p, vfg, frm - mod hd wi brit clus, sb ang - sb rd, calc cmt

198u
C1: 93.8%
C2: 1.7%
C3: 4.5%
C4: 0.0%

GAS (units) - 2000
446u (PPM) - 200000

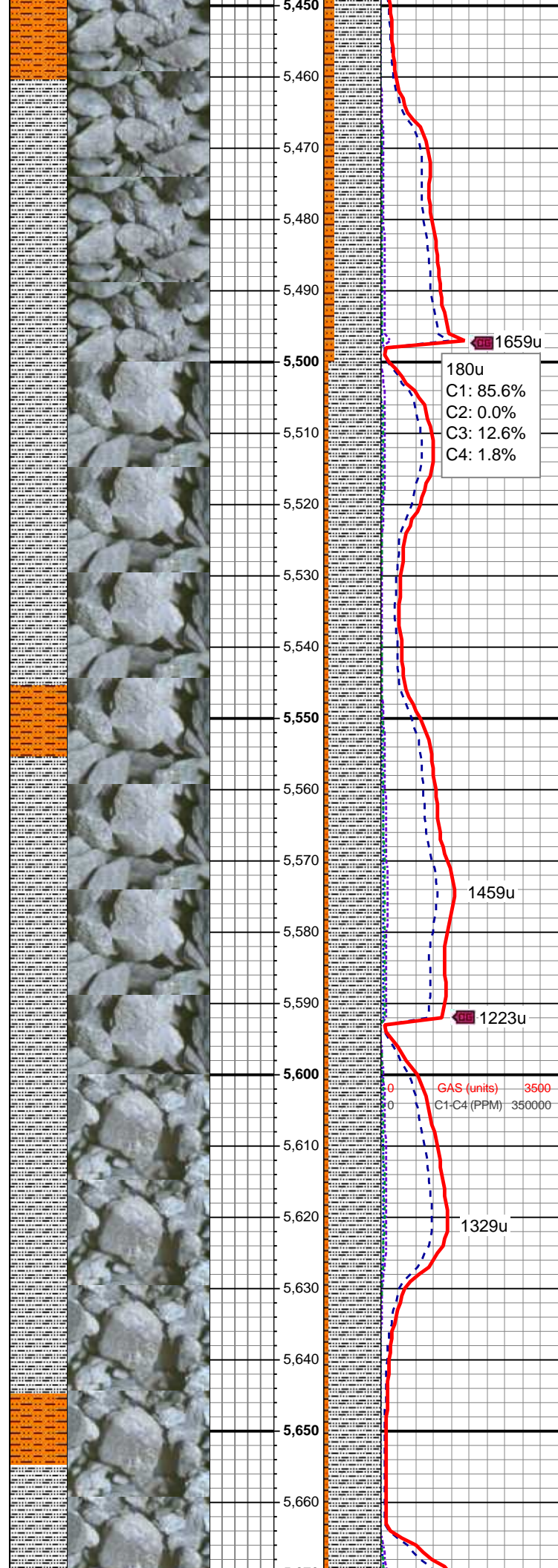
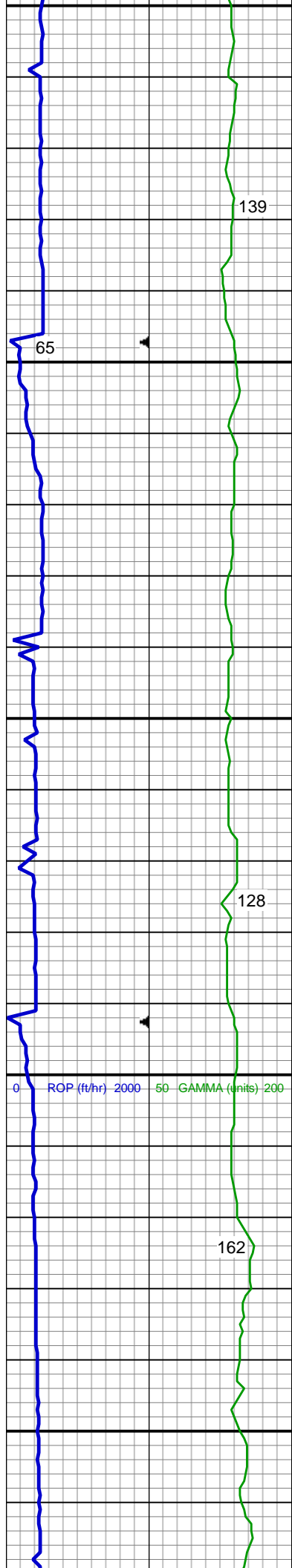


SLTY SH: lt - med gy brn, occ dk gy, frm - hd, plty - sb plty - sb blkly, slty - grty tex, v sl calc
SHY SLTST: lt - med gy, frm - hd, sb plty - sb rd - sb blkly, slty - grty tex, v sl calc

MD: 5,346 '
TVD: 5,329.27 '
Inclination: 1.77 °
Azimuth: 151.53 °

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

MUD WT: 9.10/9.30
VIS: 30/31 IN/OUT



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

180u
C1: 85.6%
C2: 0.0%
C3: 12.6%
C4: 1.8%

1459u

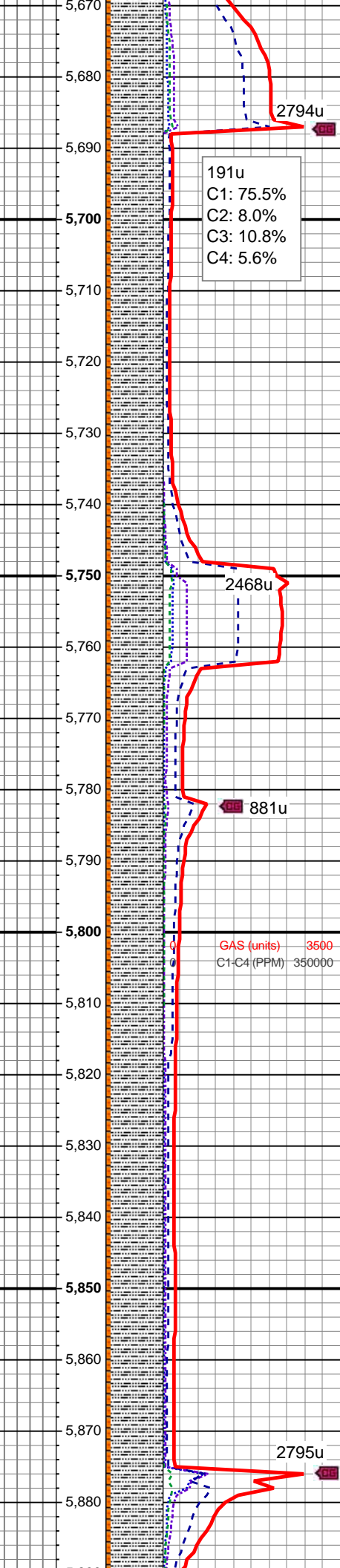
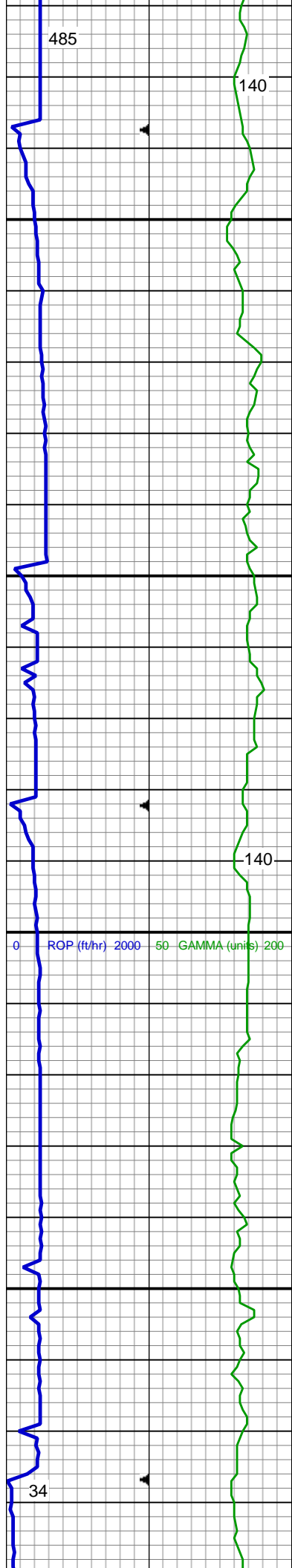
1223u

GAS (units) 3500
C1-C4 (PPM) 350000

1329u

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

MD: 5,631 '
TVD: 5,614.17 '
Inclination: 1.27 °
Azimuth: 130.69 °



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

SHY SLTST: lt - med gy, frm - hd, sb plty - sb rd - sb blk, slty - grty tex, v sl calc

MUD WT: 9.20/9.15

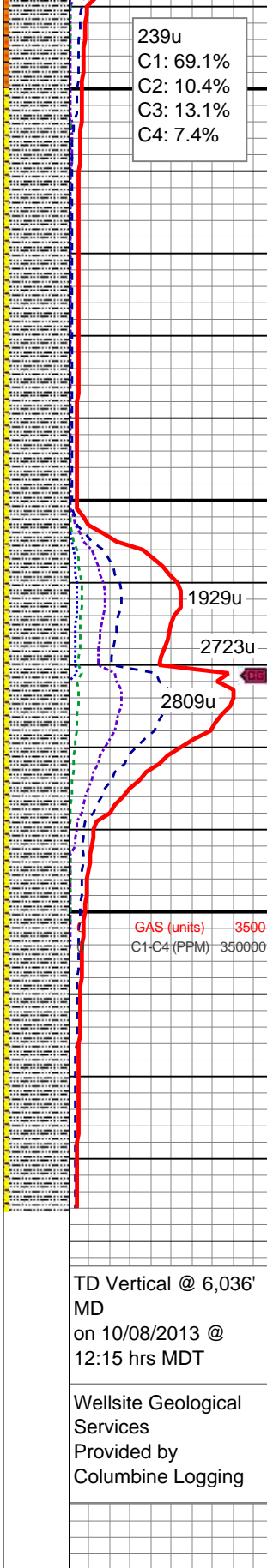
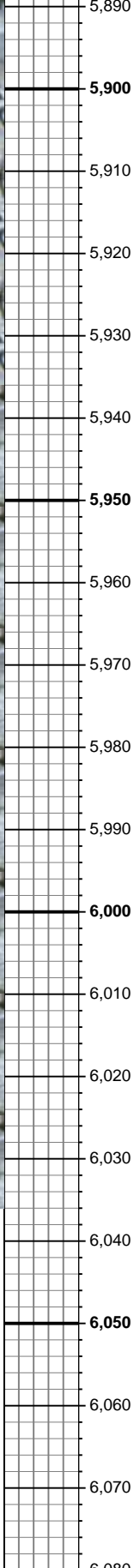
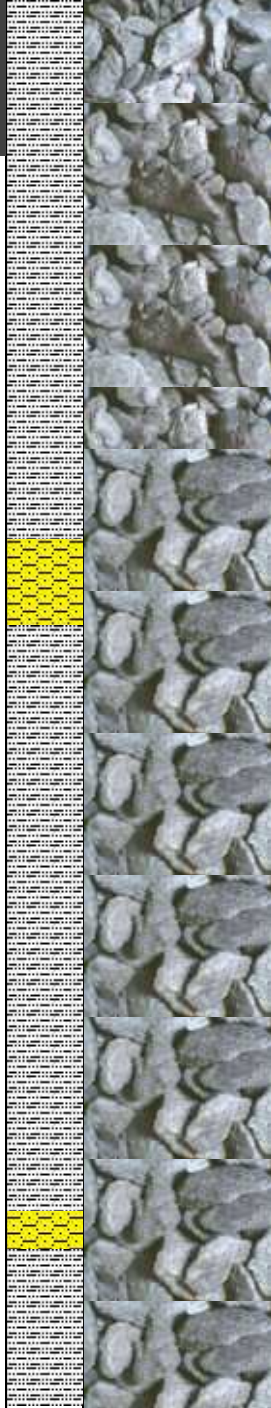
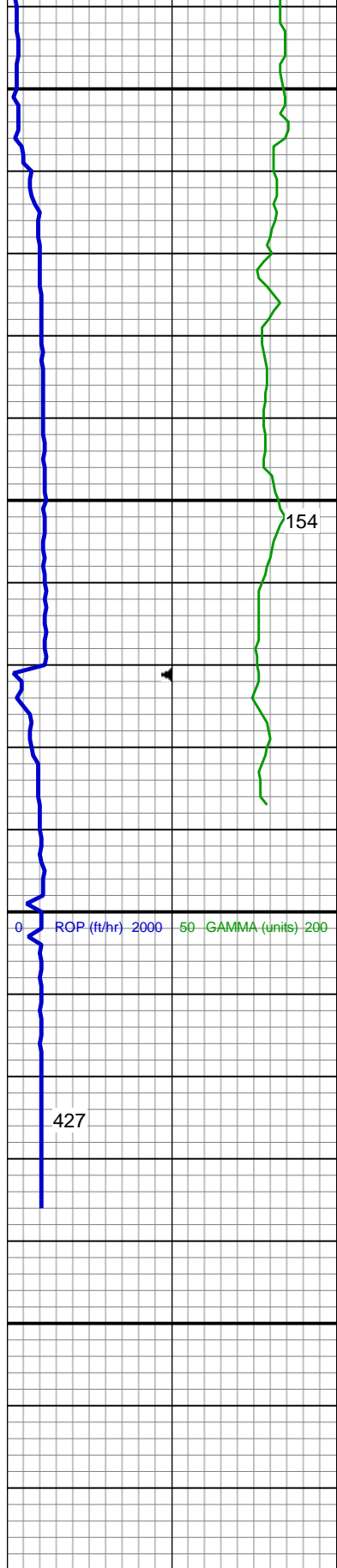
VIS: 31/31 IN/OUT

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

SHY SLTST: lt - med gy, frm - hd, sb plty - sb rd - sb blk, slty - grty tex, v sl calc

TeePee Buttes Top @ 5,815' MD; 5,798' TVD

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



SHY SLTST: lt - med gy, frm - hd, sb
plty - sb rd - sb blk, slty - grty tex, v
sl calc

MD: 5,916 '
TVD: 5,899.14 '
Inclination: 0.61 °
Azimuth: 38.28 °

SLTY SH: lt - med gy brn, occ dk gy,
frm - hd, pred plty - sb plty, occ sb
blk, slty - grty tex, v sl calc
SHY SS: pred lt gy, sme s&p, vfg,
frm - mod hd wi brit clus, sb ang -
sb rd, calc cmt

SLTY SH: lt - med gy brn, occ dk gy,
frm - hd, pred plty - sb plty, occ sb
blk, slty - grty tex, v sl calc
SHY SS: pred lt gy, sme s&p, vfg,
frm - mod hd wi brit clus, sb ang -
sb rd, calc cmt

See Corresponding Horizontal Log
Crow Creek State AC36-77-1HN
HORZ