

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** LeeRoy B11-79HNM VERT

**Location** SEC 11 T5N R64W

**State** COLORADO

**County** WELD

**Country** USA

**Rig Number** H&P 315

**API Number** 05-123-37192

**AFE #** 136851

**Field** WATTENBERG

**Spud Date** 6/10/2013

**Drilling Completed** 6/12/2013

**Surface Coordinates** LAT/LON 40.411750, -104.526260

SEC 11 T5N R64W  
1,928' FSL, 220' FWL

**Bottom Hole Coordinates** SEC 2 T5N R64W  
75' FWL, 535' FNL

**Ground Elevation** 4603'

**K.B. Elevation** 4627'

**Logged Interval** 2000' **To** 5976'

**Total Depth** 5976'

**Formation** NIOBRARA

**Type of Drilling Fluid** LSND

## Operator

**Company** Noble Energy Inc

## Geologist

**Name** MARK COLE, NATHAN MURPHY

**Company** COLUMBINE LOGGING, INC

**Address** 2385 S Lipan St  
Denver, CO 80223

## Rock Types

## Rock Types

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

## 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
MNDEPTH 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

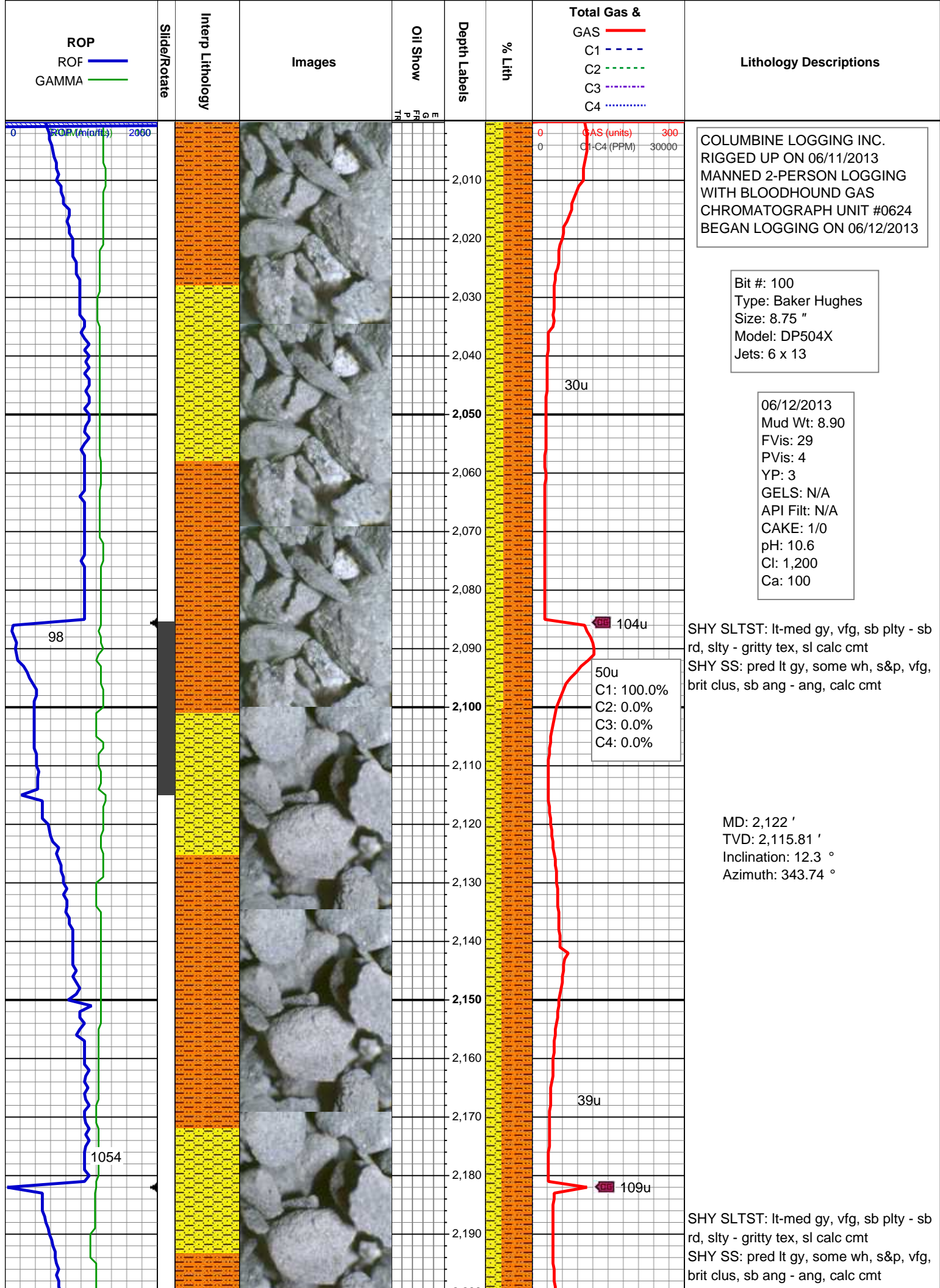
BOUNDSTONE
CHALKY
CRYPTOXLN

### Earthy

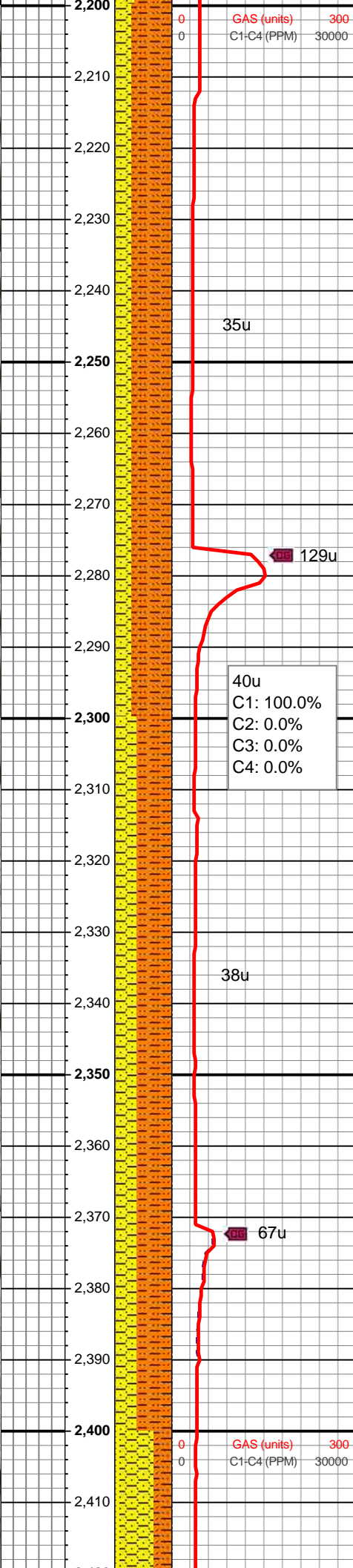
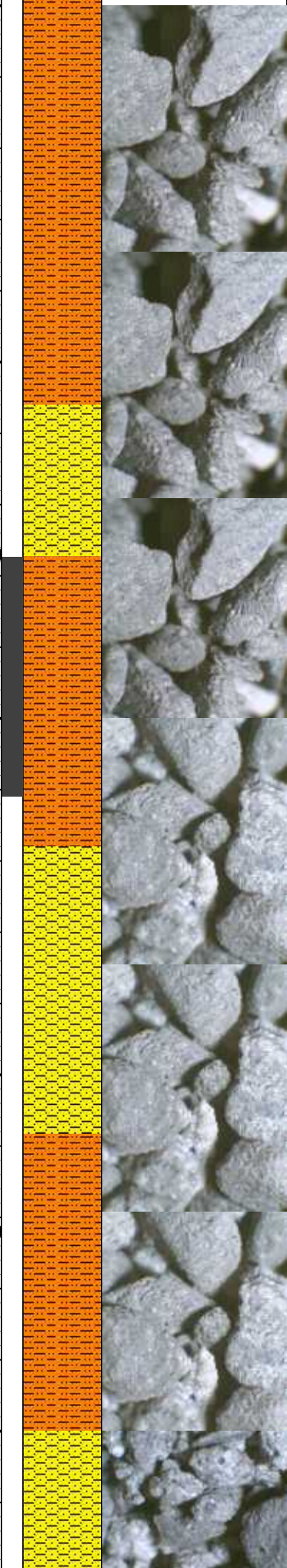
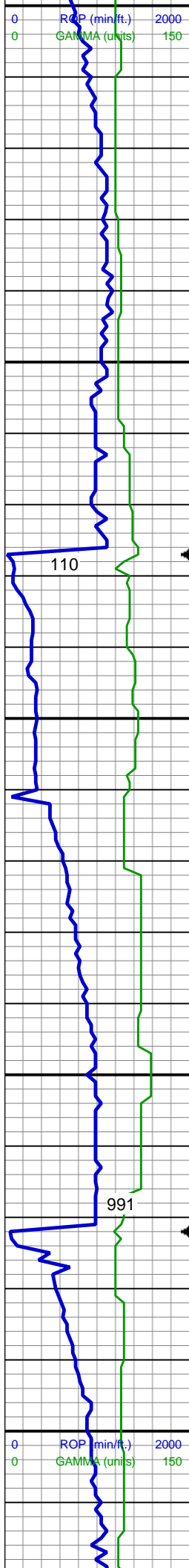
FINELYXLN
GRAINSTONE
LITHOGRAPHIC
MICROXLN
MUDSTONE
PACKSTONE
WACKESTONE

### Sorting

MODERATE
POOR
WELL







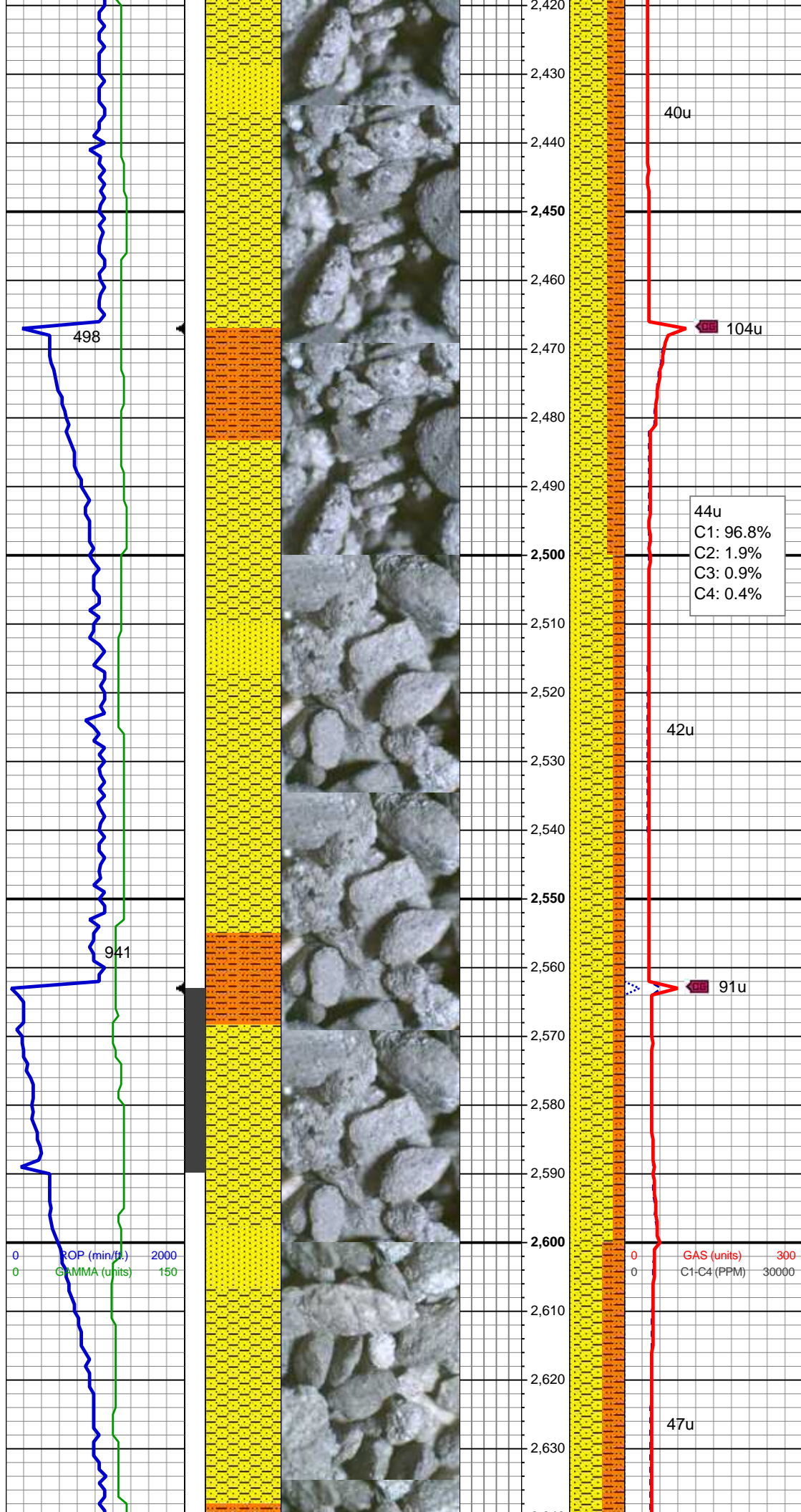
MD: 2,217 '  
TVD: 2,208.91 '  
Inclination: 10.64 °  
Azimuth: 342.32 °

SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, sl calc cmt  
SHY SS: pred lt gy, some wh, s&p, vfg,  
brit clus, sb ang - ang, calc cmt

MD: 2,312 '  
TVD: 2,301.84 '  
Inclination: 13.3 °  
Azimuth: 339.43 °

SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, sl calc cmt  
SHY SS: pred lt gy, some wh, s&p, vfg,  
brit clus, sb ang - ang, calc cmt

MD: 2,407 '  
TVD: 2,394.29 '  
Inclination: 13.3 °  
Azimuth: 340.18 °



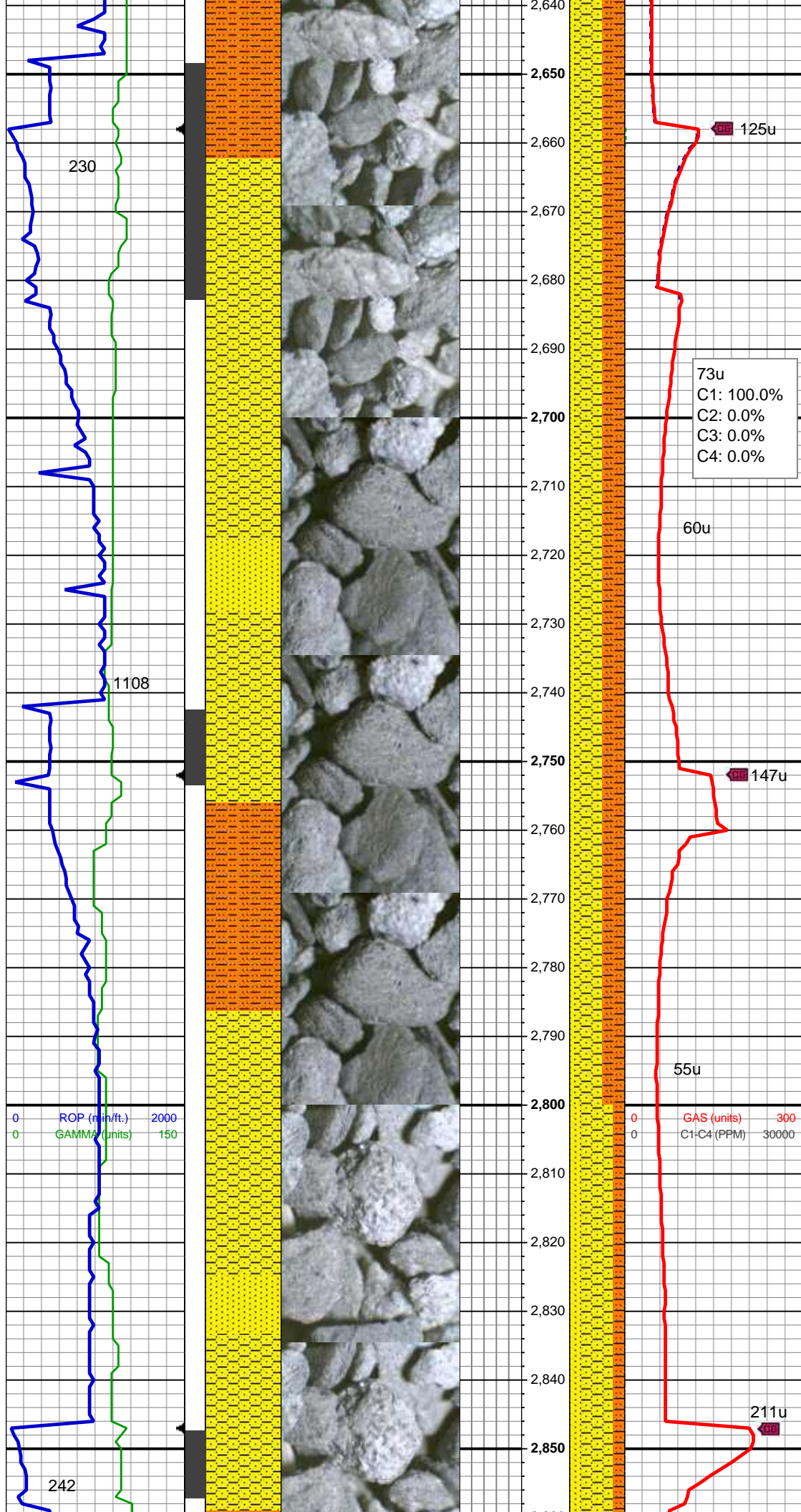
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brit clus, sb ang - ang, calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, sl calc cmt  
SS: wh, lt gy, pred trnsl, sme clr, spec  
wi mica & phlog, tr dk gn xl glau, hd, v  
brit clus, sb ang - ang, v calc cmt

MD: 2,501 '  
TVD: 2,486.16 '  
Inclination: 11.12 °  
Azimuth: 338.48 °

SHY SS: pred lt gy, some wh, s&p, vfg,  
brit clus, sb ang - ang, calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, sl calc cmt  
SS: wh, lt gy, pred trnsl, sme clr, spec  
wi mica & phlog, tr dk gn xl glau, hd, v  
brit clus, sb ang - ang, v calc cmt

MD: 2,596 '  
TVD: 2,579.28 '  
Inclination: 11.71 °  
Azimuth: 344.99 °



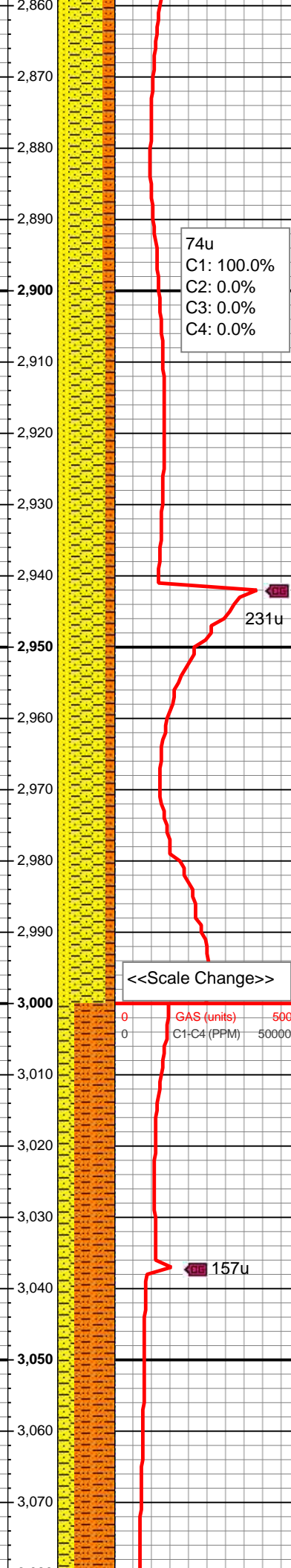
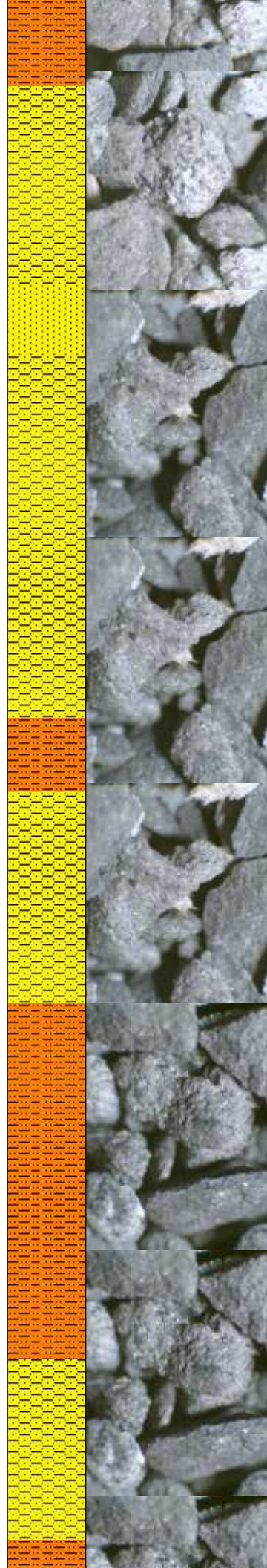
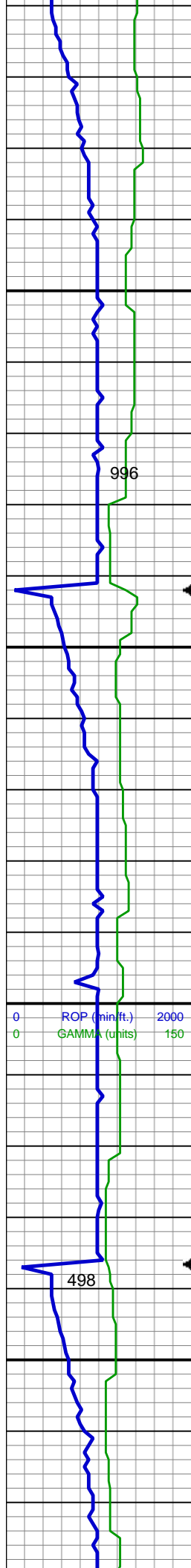


SHY SS: pred lt gy, some wh, s&p, vfg, brit clus, sb ang - ang, calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb rd, slty - gritty tex, sl calc cmt  
SS: wh, lt gy, pred trnsl, sme clr, spec wi mica & phlog, tr dk gn xl glau, hd, v brit clus, sb ang - ang, v calc cmt

MD: 2,691 '  
TVD: 2,671.78 '  
Inclination: 14.63 °  
Azimuth: 347.35 °

MD: 2,786 '  
TVD: 2,763.43 '  
Inclination: 15.86 °  
Azimuth: 347.43 °

SHY SS: pred lt gy, some wh, s&p, vfg, brit clus, sb ang - ang, calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb rd, slty - gritty tex, sl calc cmt  
SS: wh, lt gy, pred trnsl, sme clr, spec wi mica & phlog, tr dk gn xl glau, hd, v brit clus, sb ang - ang, v calc cmt



MD: 2,881 '  
TVD: 2,855.28 '  
Inclination: 13.7 °  
Azimuth: 349.87 °

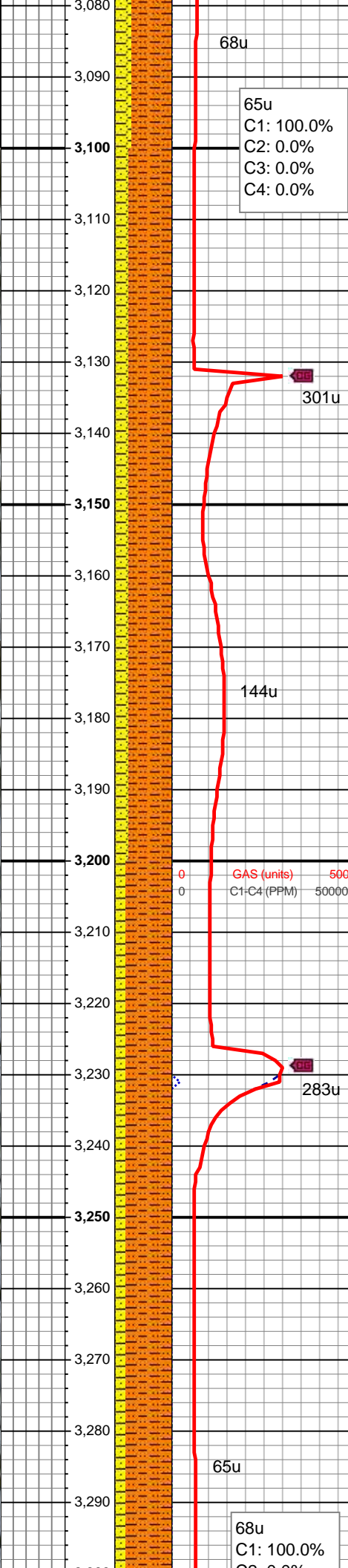
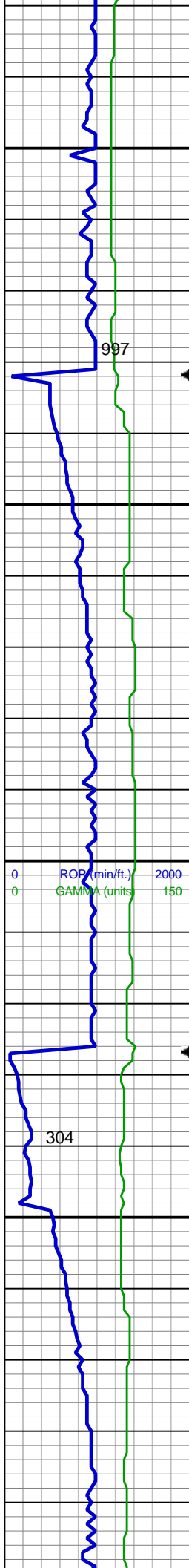
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SHY SLTST: lt-med gy, vfg, sb plty - sb rd, slty - gritty tex, sl calc cmt  
SS: wh, lt gy, pred trnsl, sme clr, spec wi mica & phlog, tr dk gn xl glau, hd, v brit clus, sb ang - ang, v calc cmt

MD: 2,976 '  
TVD: 2,947.48 '  
Inclination: 14.23 °  
Azimuth: 349.25 °

SHY SS: pred lt gy, some wh, s&p, vfg, brit clus, sb ang - ang, calc cmt  
SS: wh, lt gy, pred trnsl, sme clr, spec wi mica & phlog, tr dk gn xl glau, hd, v brit clus, sb ang - ang, v calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb rd, slty - gritty tex, sl calc cmt

MD: 3,071 '  
TVD: 3,039.72 '  
Inclination: 13.44 °  
Azimuth: 349.48 °





SHY SLTST: lt-med gy, vfg, sb plty - sb rd, slty - gritty tex, sl calc cmt  
SHY SS: pred lt gy, some wh, s&p, vfg, brit clus, sb ang - ang, calc cmt

MD: 3,166 '  
TVD: 3,132.48 '  
Inclination: 11.44 °  
Azimuth: 351.1 °

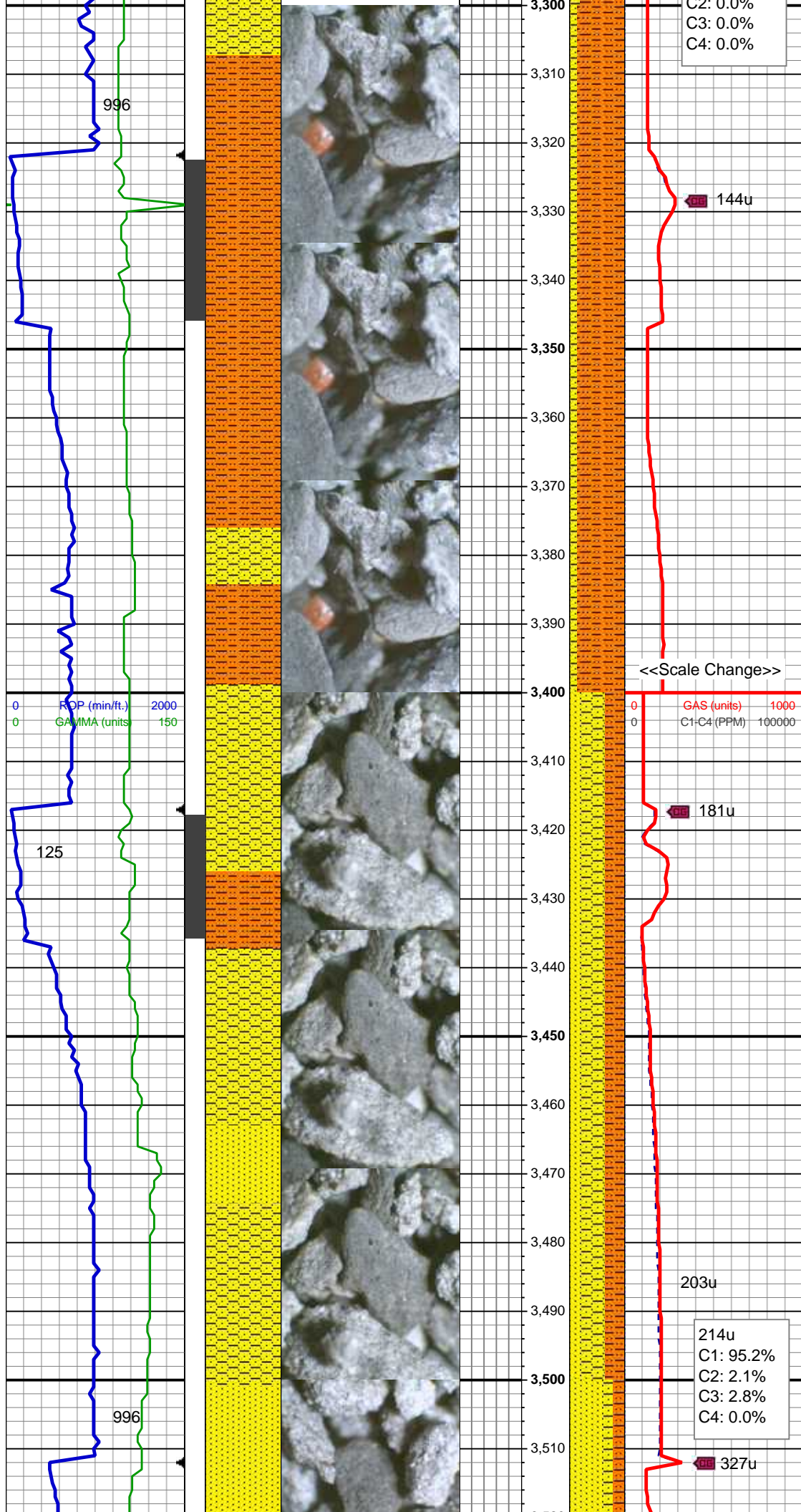
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SHY SS: pred lt gy, some wh, s&p, vfg, brit clus, sb ang - ang, calc cmt

MUD WT: 8.65/8.70  
VIS: 25/25 IN/OUT

MD: 3,261 '  
TVD: 3,225.82 '  
Inclination: 10.09 °  
Azimuth: 342.65 °

SHY SLTST: lt-med gy, vfg, sb plty - sb rd, slty - gritty tex, sl calc cmt  
SHY SS: pred lt gy, some wh, s&p, vfg, brit clus, sb ang - ang, calc cmt





C2: 0.0%  
C3: 0.0%  
C4: 0.0%

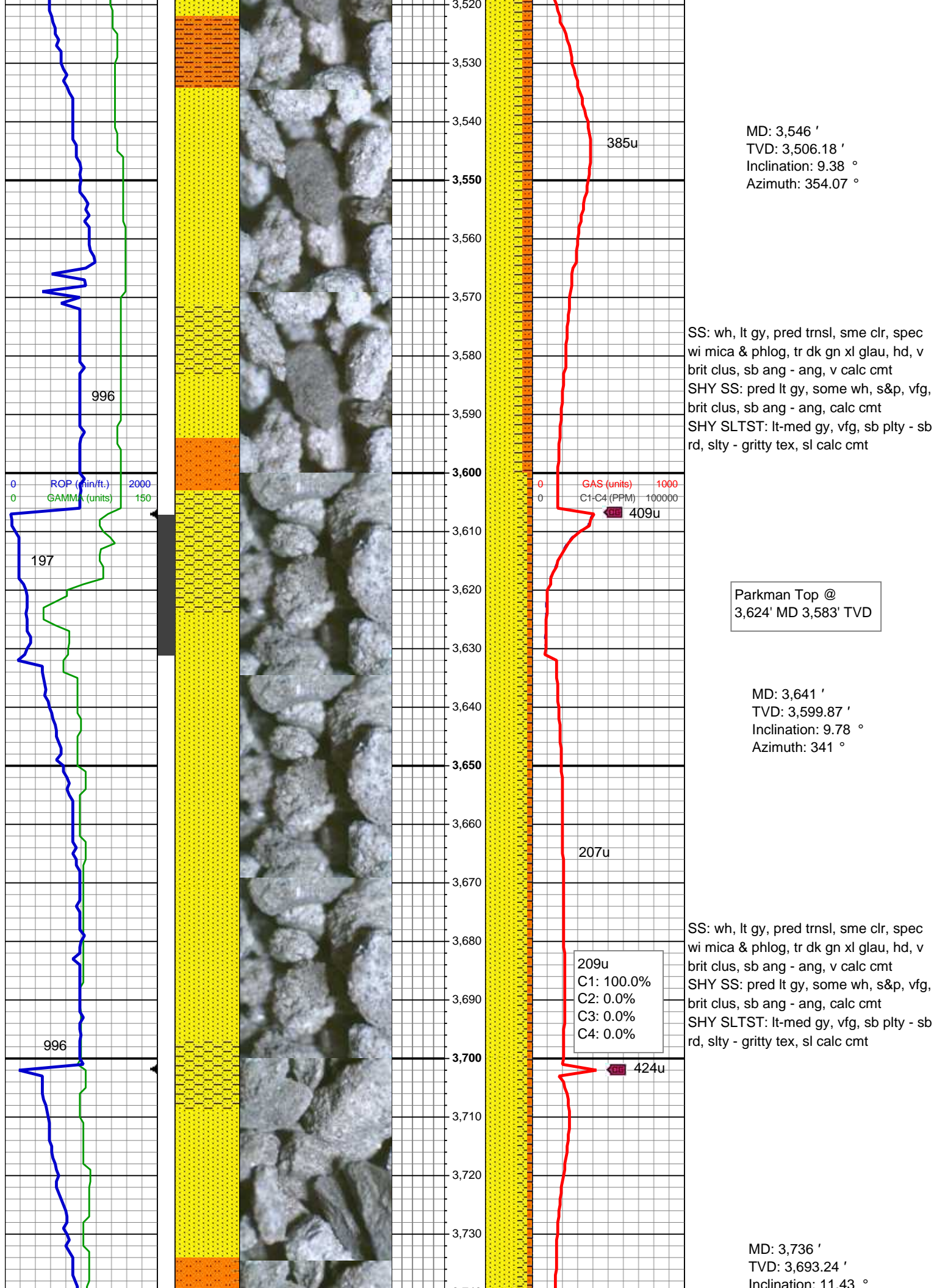
MD: 3,356 '  
TVD: 3,319.26 '  
Inclination: 10.7 °  
Azimuth: 348.14 °

SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, sl calc cmt  
SHY SS: pred lt gy, some wh, s&p, vfg,  
brit clus, sb ang - ang, calc cmt

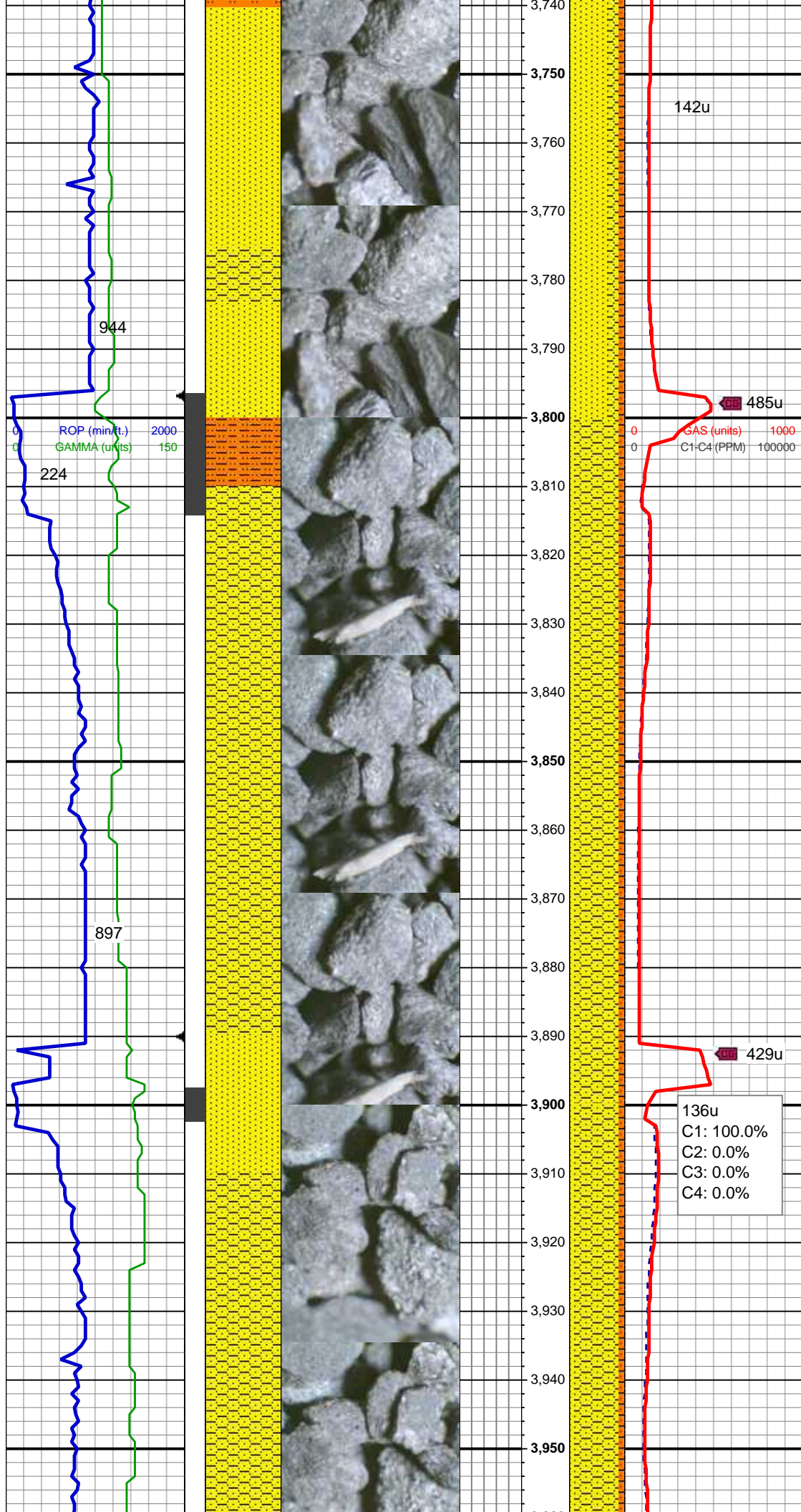
MD: 3,451 '  
TVD: 3,412.62 '  
Inclination: 10.61 °  
Azimuth: 349.6 °

SHY SS: pred lt gy, some wh, s&p, vfg,  
brit clus, sb ang - ang, calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, sl calc cmt  
SS: wh, lt gy, pred trnsl, sme clr, spec  
wi mica & phlog, tr dk gn xl glau, hd, v  
brit clus, sb ang - ang, v calc cmt

214u  
C1: 95.2%  
C2: 2.1%  
C3: 2.8%  
C4: 0.0%







Information: 142u  
Azimuth: 342.14 °

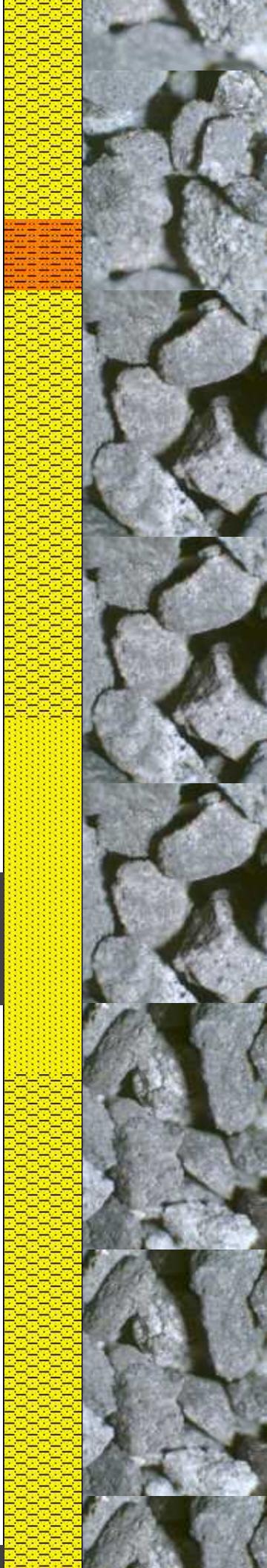
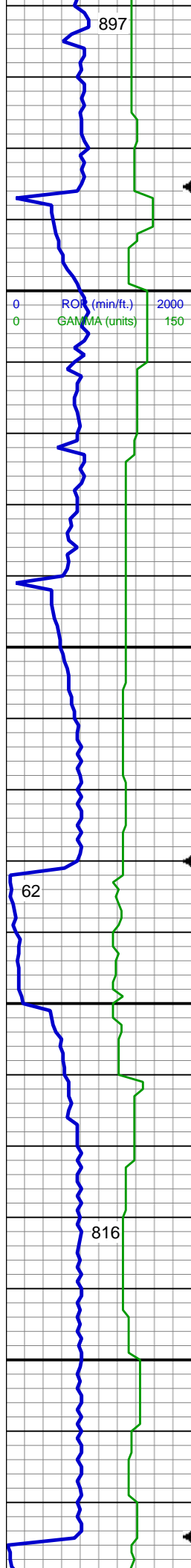
SS: wh, lt gy, pred trnsl, sme clr, spec  
wi mica & phlog, tr dk gn xl glau, hd, v  
brit clus, sb ang - ang, v calc cmt  
SHY SS: pred lt gy, some wh, s&p, vfg,  
brit clus, sb ang - ang, calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, sl calc cmt

MD: 3,831 '  
TVD: 3,786.45 '  
Inclination: 10.87 °  
Azimuth: 343.36 °

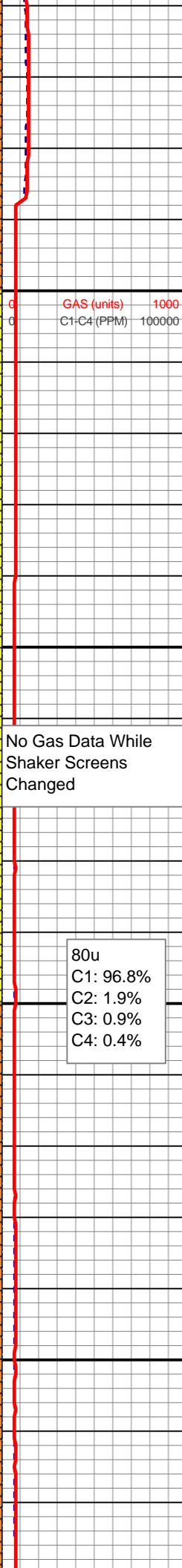
06/12/2013  
Mud Wt: 8.70  
FVis: 27  
PVis: 2  
YP: 3  
GELS: 2/3/4  
API Filt: N/A  
CAKE: 1/0  
pH: 9.5  
Cl: 1,300  
Ca: 40

SHY SS: pred lt gy, some wh, s&p, vfg,  
brit clus, sb ang - ang, calc cmt  
SS: wh, lt gy, pred trnsl, sme clr, spec  
wi mica & phlog, tr dk gn xl glau, hd, v  
brit clus, sb ang - ang, v calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, sl calc cmt

MD: 3,926 '  
TVD: 3,879.91 '  
Inclination: 9.74 °  
Azimuth: 338.85 °



3,960  
3,970  
3,980  
3,990  
4,000  
4,010  
4,020  
4,030  
4,040  
4,050  
4,060  
4,070  
4,080  
4,090  
4,100  
4,110  
4,120  
4,130  
4,140  
4,150  
4,160  
4,170



SHY SS: pred lt gy, some wh, s&p, vfg, brit clus, sb ang - ang, calc cmt  
SS: wh, lt gy, pred trnsI, sme clr, spec wi mica & phlog, tr dk gn xl glau, hd, v brit clus, sb ang - ang, v calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb rd, slty - gritty tex, sl calc cmt

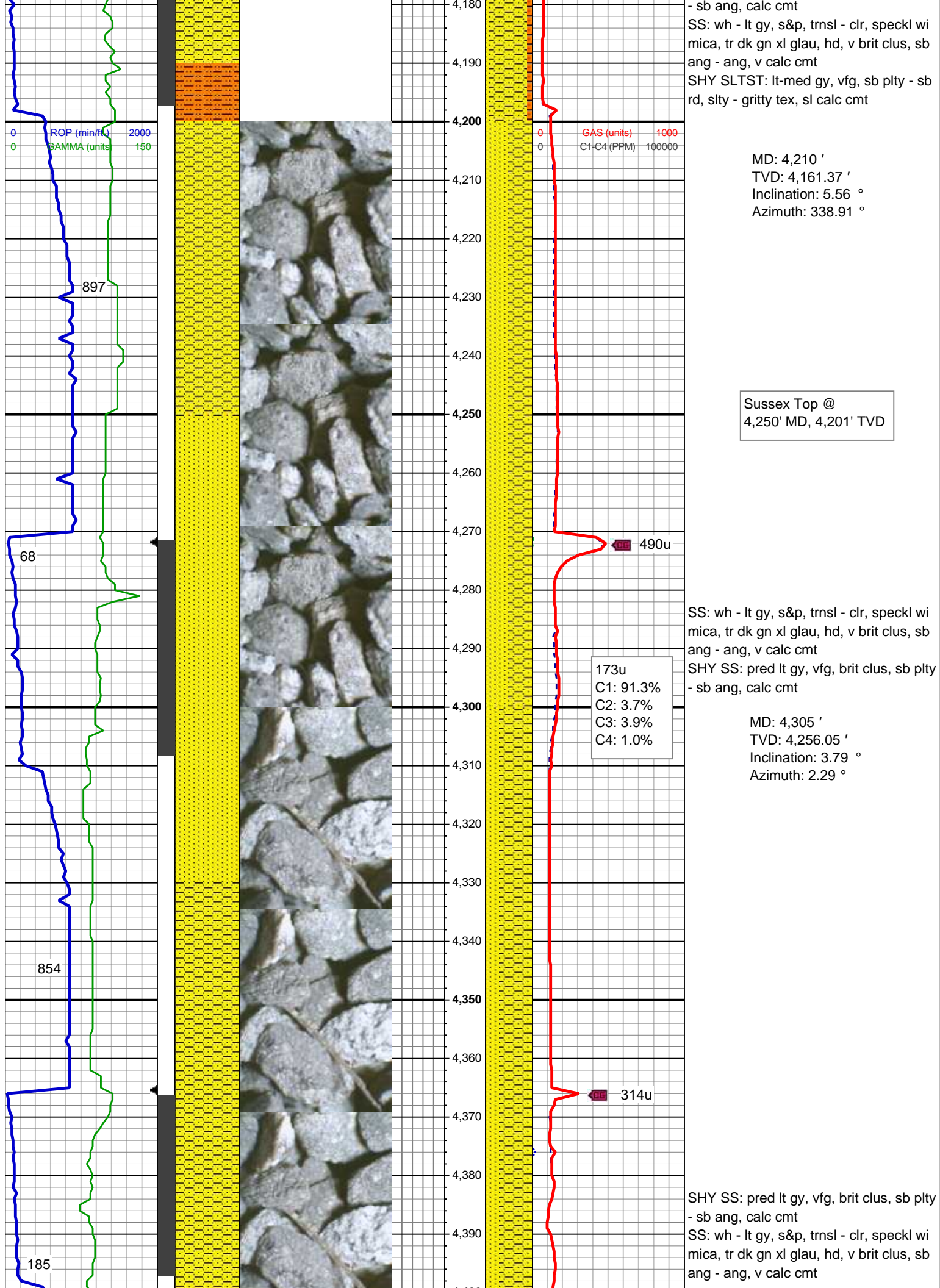
MD: 4,020 '  
TVD: 3,972.78 '  
Inclination: 8.09 °  
Azimuth: 331.67 °

SHY SS: pred lt gy, vfg, brit clus, sb plty - sb ang, calc cmt  
SS: wh - lt gy, s&p, trnsI - clr, speckl wi mica, tr dk gn xl glau, hd, v brit clus, sb ang - ang, v calc cmt

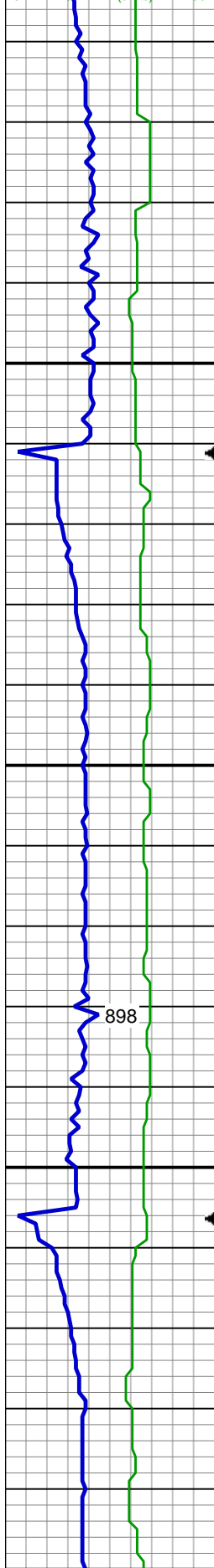
MD: 4,115 '  
TVD: 4,066.95 '  
Inclination: 7.08 °  
Azimuth: 334.66 °

SHY SS: pred lt gy, vfg, brit clus, sb plty

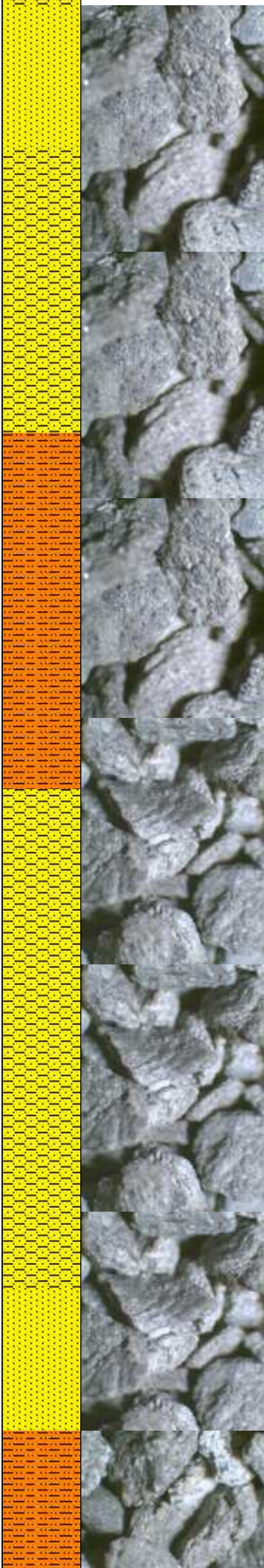




ROP (min/ft.) 2000  
GAMMA (units) 150

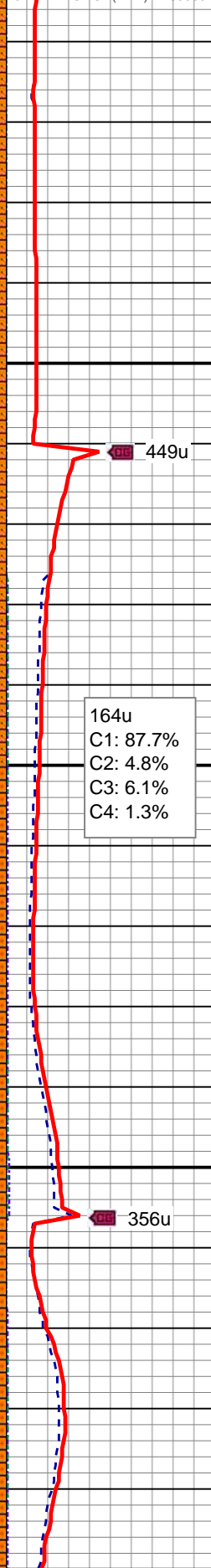


ROP (min/ft.) 2000  
GAMMA (units) 150



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  
4,570  
4,580  
4,590  
4,600  
4,610

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



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

MD: 4,400 '  
TVD: 4,350.96 '  
Inclination: 1.55 °  
Azimuth: 53.08 °

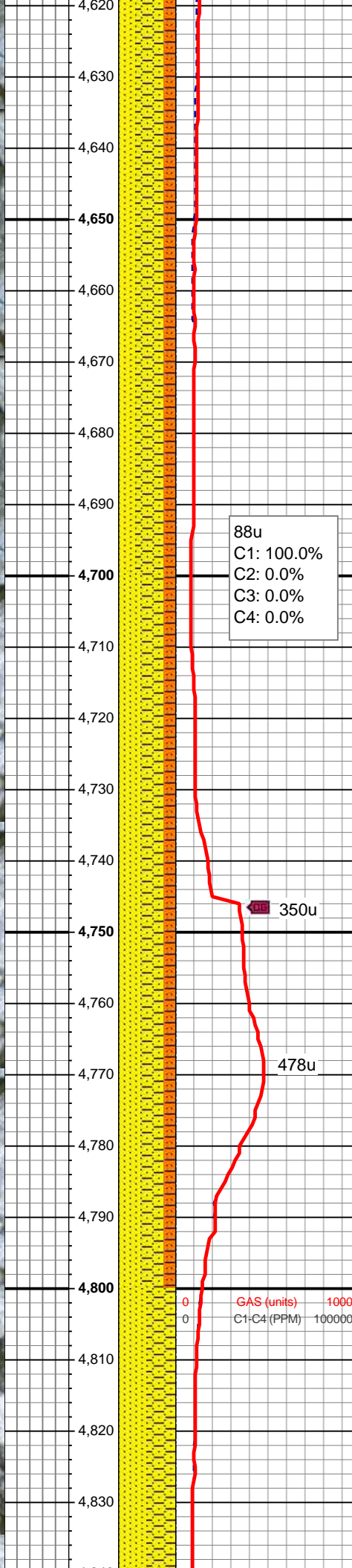
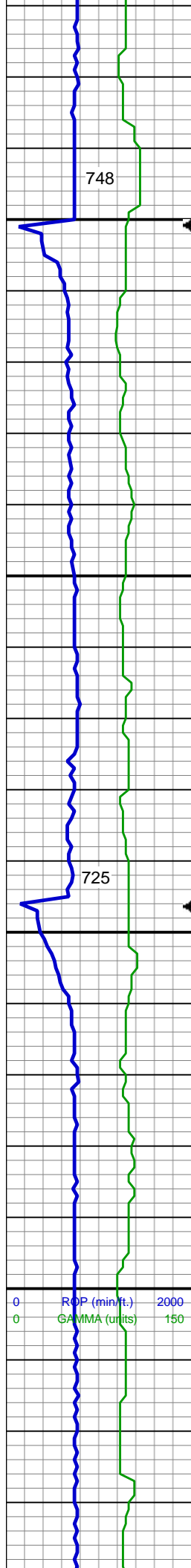
SHY SS: pred lt gy, vfg, brit clus, sb plty  
- sb ang, calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, sl calc cmt  
SS: wh - lt gy, s&p, trns l - clr, speckl wi  
mica, tr dk gn xl glau, hd, v brit clus, sb  
ang - ang, v calc cmt

MD: 4,495 '  
TVD: 4,445.93 '  
Inclination: 1.34 °  
Azimuth: 81.71 °

SHY SS: pred lt gy, vfg, brit clus, sb plty  
- sb ang, calc cmt  
SS: wh - lt gy, s&p, trns l - clr, speckl wi  
mica, tr dk gn xl glau, hd, v brit clus, sb  
ang - ang, v calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, sl calc cmt

MUD WT: 8.55/8.60  
VIS: 27/27 IN/OUT





SHY SS: pred lt gy, vfg, brit clus, sb plty  
- sb ang, calc cmt

SS: wh - lt gy, s&p, trns l - clr, speckl wi  
mica, tr dk gn xl glau, hd, v brit clus, sb  
ang - ang, v calc cmt

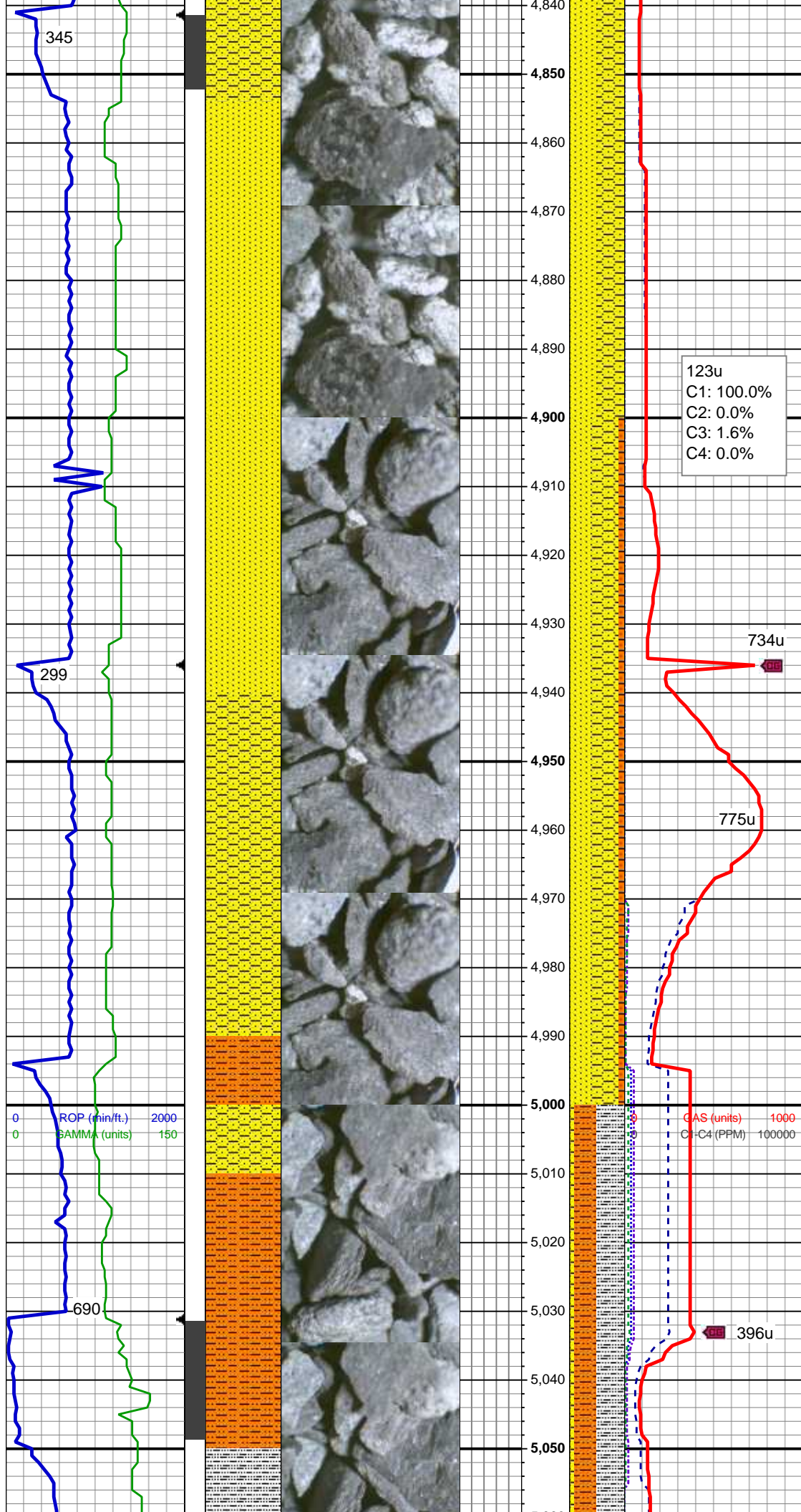
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, frm, sl calc cmt

MD: 4,780 '  
TVD: 4,730.89 '  
Inclination: 1.65 °  
Azimuth: 280.24 °

SHY SS: pred lt gy, vfg, brit clus, sb plty  
- sb ang, calc cmt

SS: wh - lt gy, s&p, trns l - clr, speckl wi  
mica, tr dk gn xl glau, hd, v brit clus, sb  
ang - ang, v calc cmt

SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, frm, sl calc cmt



Shannon Top @  
4,854' MD, 4,805' TVD

MD: 4,875 '  
TVD: 4,825.84 '  
Inclination: 1.98 °  
Azimuth: 281.14 °

SHY SS: pred lt gy, vfg, brit clus, sb plty  
- sb ang, calc cmt  
SS: wh - lt gy, s&p, trns l - clr, speckl wi  
mica, tr dk gn xl glau, hd, v brit clus, sb  
ang - ang, v calc cmt

MUD WT: 8.60/8.60  
VIS: 37/37 IN/OUT

MD: 4,970 '  
TVD: 4,920.78 '  
Inclination: 2.1 °  
Azimuth: 279.61 °

SHY SS: pred lt gy, vfg, brit clus, sb plty  
- sb ang, calc cmt  
SS: wh - lt gy, s&p, trns l - clr, speckl wi  
mica, tr dk gn xl glau, hd, v brit clus, sb  
ang - ang, v calc cmt  
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, frm, sl calc cmt



MD: 5,065 '  
TVD: 5,015.72 '  
Inclination: 2.16 °  
Azimuth: 253.87 °

SLTY SH: lt - med gy, frm - mod hd, sb  
plty - sb blk, slty - gritty tex, v sl calc  
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, frm, sl calc cmt  
SHY SS: pred lt gy, vfg, brit clus, sb plty  
- sb ang, calc cmt

83u  
C1: 96.8%  
C2: 1.9%  
C3: 0.9%  
C4: 0.4%

793u

MD: 5,160 '  
TVD: 5,110.68 '  
Inclination: 1.18 °  
Azimuth: 260.87 °

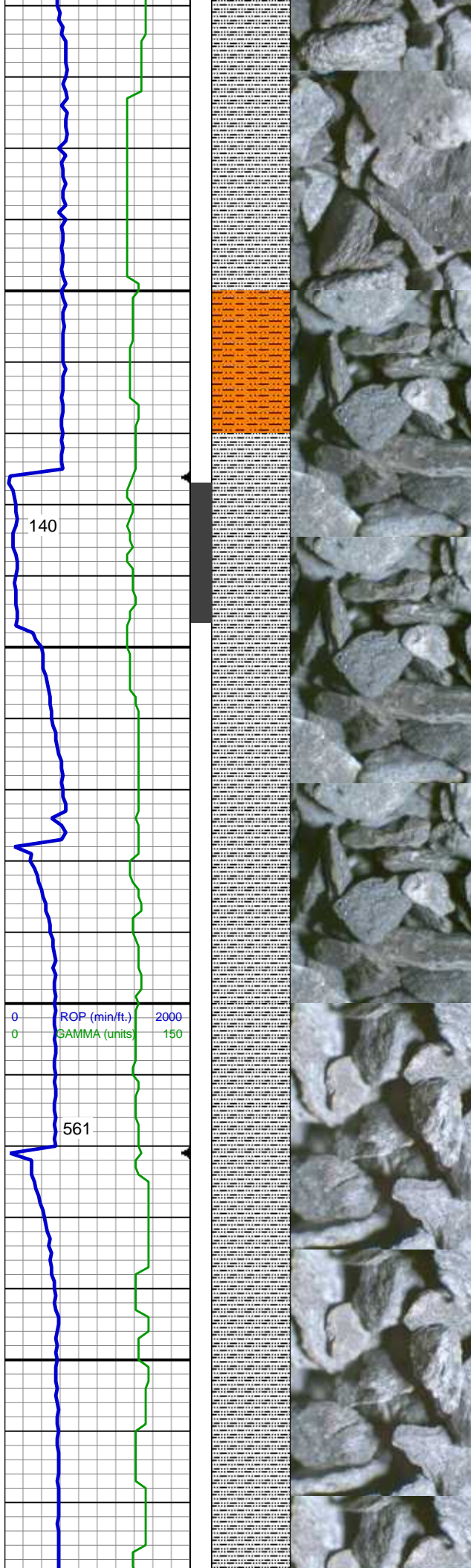
SLTY SH: lt - med gy, frm - mod hd, sb  
plty - sb blk, slty - gritty tex, v sl calc,  
some Inoc frag  
SHY SLTST: lt-med gy, vfg, sb plty - sb  
rd, slty - gritty tex, frm, sl calc cmt

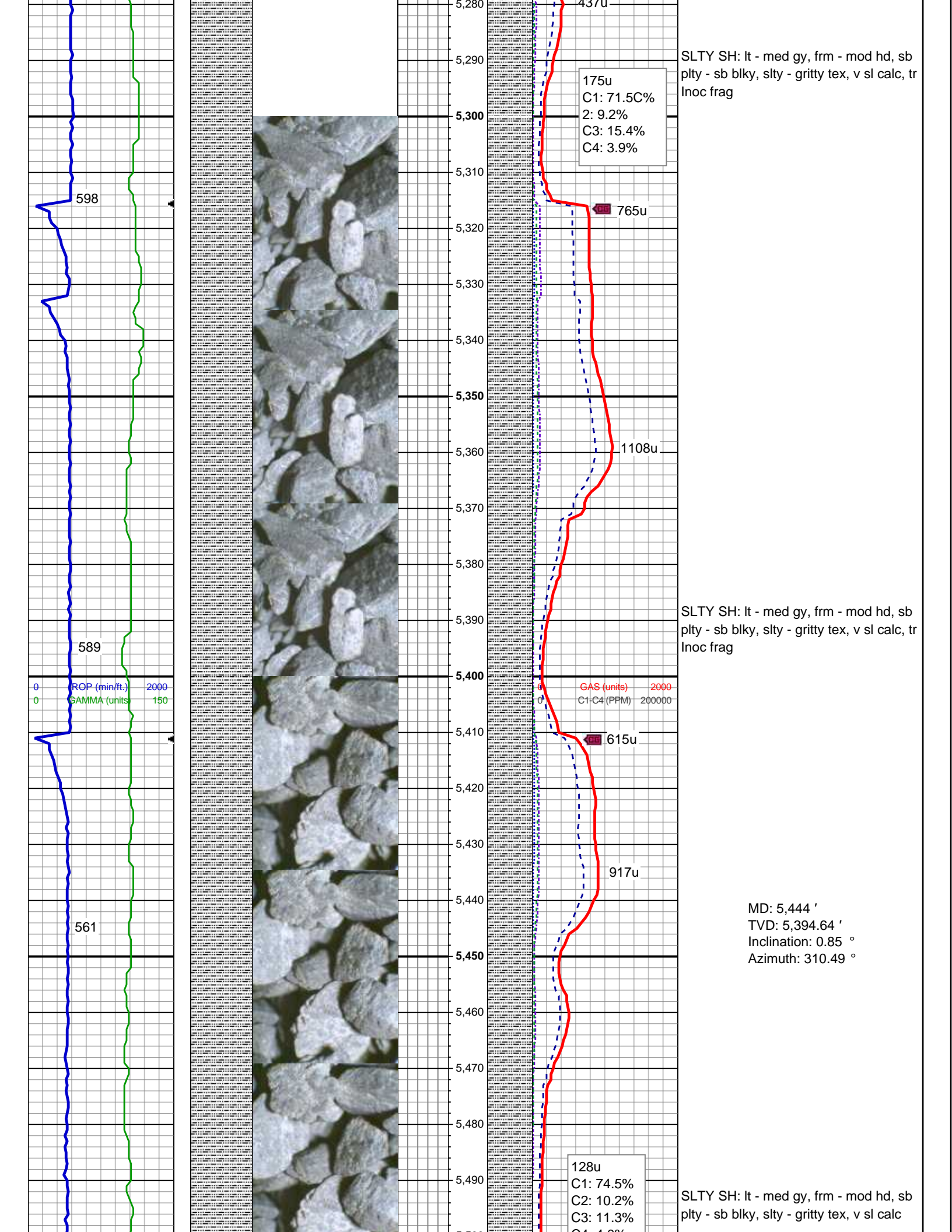
<<Scale Change>>

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

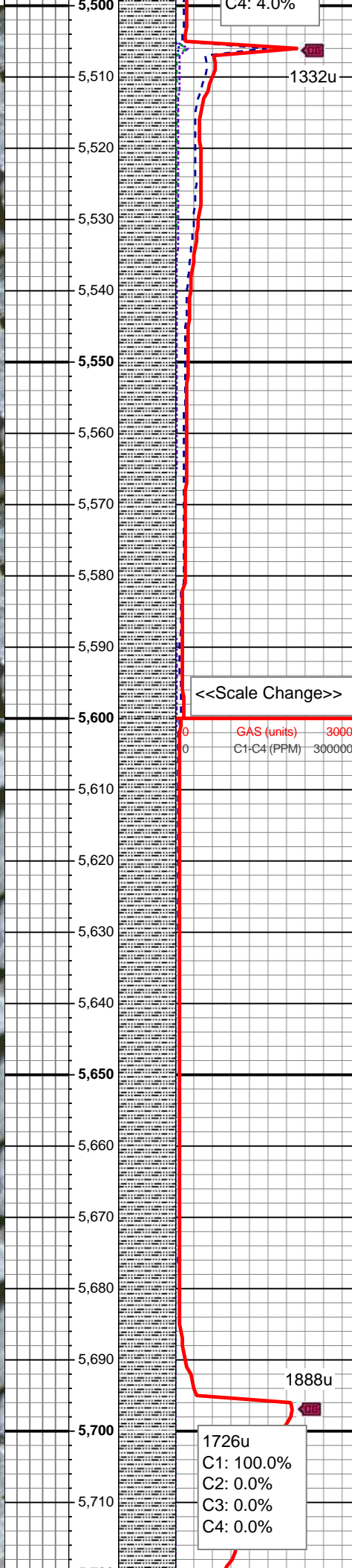
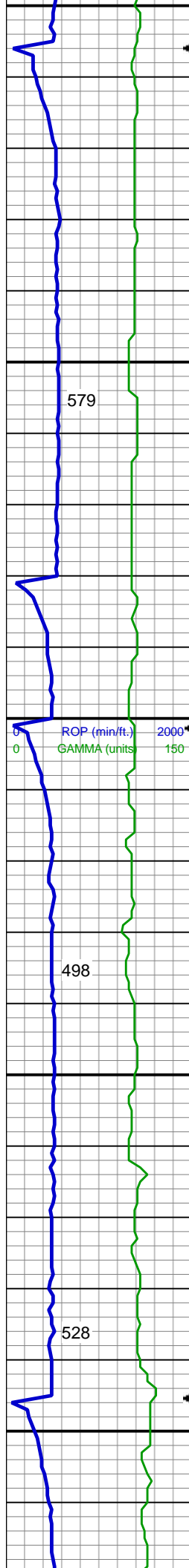
730u

407









SLTY SH: lt - med gy, frm - mod hd, sb  
ply - sb blk, slty - gritty tex, v sl calc

MUD WT: 9.00/9.05  
VIS: 33/33 IN/OUT

SLTY SH: lt - med gy, frm - mod hd, sb  
ply - sb blk, slty - gritty tex, v sl calc

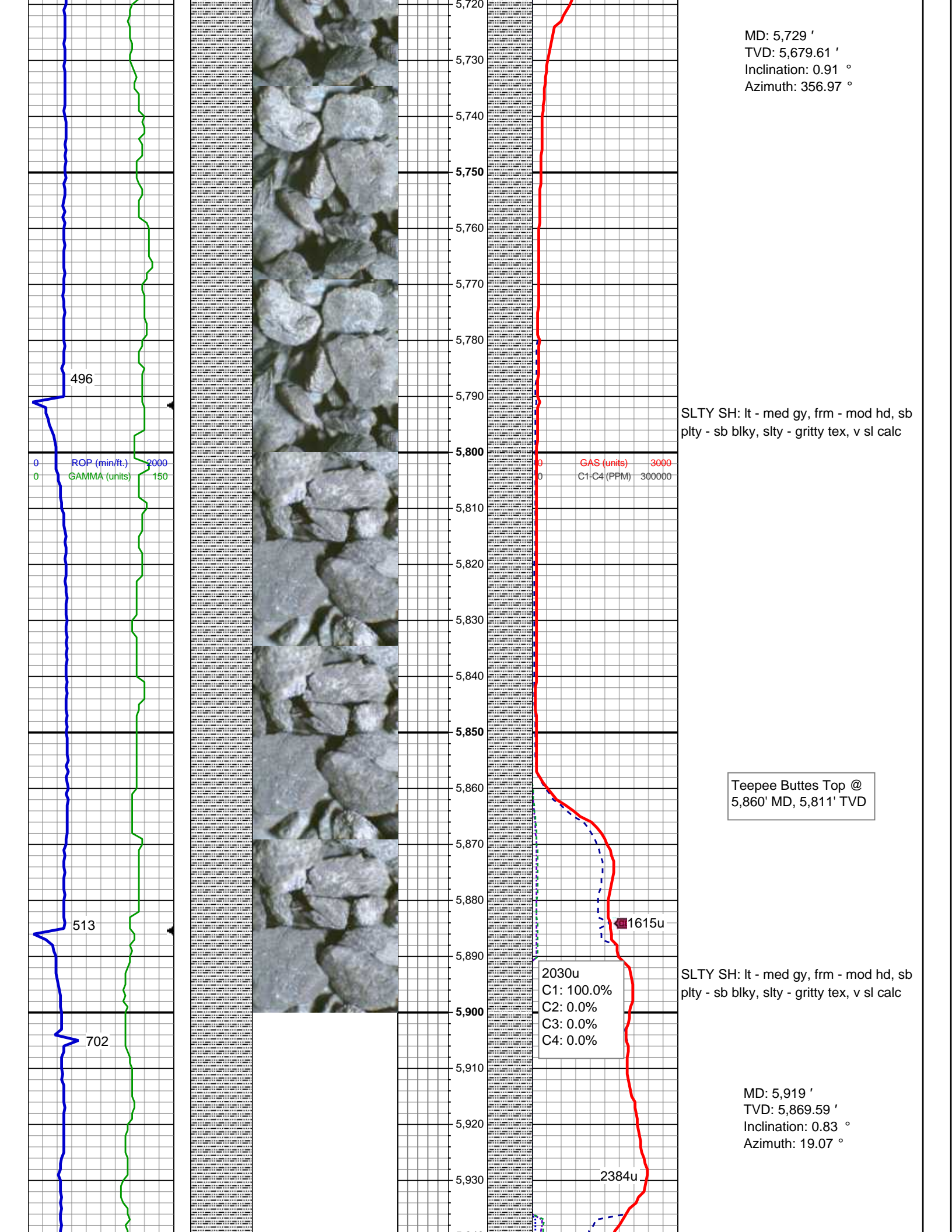
MD: 5,729 '  
TVD: 5,679.61 '  
Inclination: 0.91 °  
Azimuth: 356.97 °

SLTY SH: lt - med gy, frm - mod hd, sb  
ply - sb blkly, slty - gritty tex, v sl calc

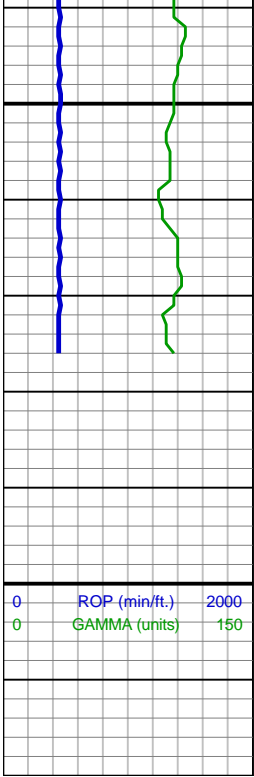
Teepee Buttes Top @  
5,860' MD, 5,811' TVD

SLTY SH: lt - med gy, frm - mod hd, sb  
ply - sb blkly, slty - gritty tex, v sl calc

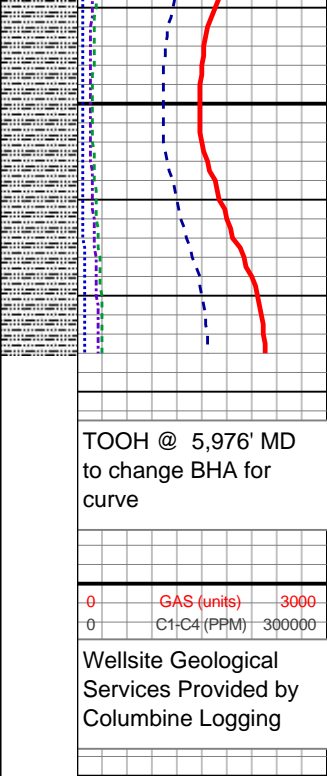
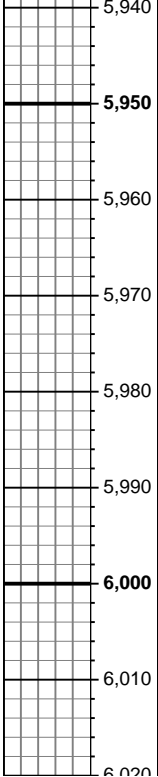
MD: 5,919 '  
TVD: 5,869.59 '  
Inclination: 0.83 °  
Azimuth: 19.07 °







ROP (min/ft.)	2000
GAMMA (units)	150



MD: 5,976 '
TVD: 5,926.58 '
Inclination: 0.83 °
Azimuth: 19.07 °
SLTY SH: lt - med gy, frm - mod hd, sb plty - sb blkly, slty - gritty tex, v sl calc
TOOH @ 5,976' MD to change BHA for curve
See Corresponding Horizontal Log LeeRoy B11-79HNM HORZ
0 GAS (units) 3000
0 C1-C4 (PPM) 300000
Wellsite Geological Services Provided by Columbine Logging