

# COLUMBINE LOGGING

Scale: 5" / 100'  
Measured Depth Log

**Well Name** Moses State LD11-77-1AHN

**Location** SESW SEC2, T9N, R58W, 6PM

**State** COLORADO

**County** WELD

**Country** USA

**Rig Number** H&P 326

**API Number** 05-123-39844

**Field** WILDCAT

**Region** DJ BASIN

**Drilling Completed** 1/12/2015

**Spud Date** 1/6/2015

**Surface Coordinates** 465' FSL, 1567' FWL  
40.77456/-103.83534

**Bottom Hole Coordinates** (PROJ)  
330' FFSLL, 1540' FFWLL

**Ground Elevation** 4741'

**K.B. Elevation** 4771'

**Logged Interval** 1243' To 4962'

**Total Depth** 10911'

**Formation** NIOBRARA B-CHALK

**Type of Drilling Fluid** LSND

## Other Symbols

### Oil Show

- DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

### Porosity

- E EARTHY
- F FENESTRAL
- F FRACTURE
- X 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
- MINDEPTH 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
- 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

- F FOSSIL
- GASTROPOD
- INOCERAMUS
- OOLITE

- ANHYDRITIC
- ARGILLACEOUS
- ARGILLITE GRAIN
- BENTONITE

- FERRUGINOUS
- GLAUCONITE
- GYPSIFEROUS
- HEAVY MINERAL

- TUFFACEOUS

### Stringer

- ANHYDRITE STRINGER

BELEMNITE  
 BIOCLASTIC  
 BRACHIOPOD  
 BRYOZOA  
 CEPHALOPOD  
 CORAL  
 CRINOID  
 ECHINOID  
 FISH  
 FORAMINIFERA

OSTRACOD  
 PELECYPOD  
 PELLET  
 PISOLITE  
 PLANT REMAINS  
 PLANT SPORES  
 SCAPHOPOD  
 STROMATOPOROID

## Minerals

BITUMENOUS SUBSTANCE  
 BRECCIA FRAGMENTS  
 CALCAREOUS  
 CARBONACEOUS FLAKES  
 CHTDK  
 CHTLT  
 COAL - THIN BEDS  
 DOLOMITIC  
 FELDSPAR  
 FERRUGINOUS PELLET

KAOLIN  
 MARLSTONE  
 MINERAL CRYSTALS  
 NODULES  
 PHOSPHATE PELLETS  
 PYRITE  
 SALT CAST  
 SANDY  
 SILICEOUS  
 SILTY

BENTONITE STRINGER  
 COAL STRINGER  
 DOLOMITE STRINGER  
 GYPSUM STRINGER  
 LIMESTONE STRINGER  
 MARLSTONE (CALC) STRG  
 MARLSTONE (DOL) STRG  
 SANDSTONE STRINGER  
 SHALE STRINGER  
 SILTSTONE STRINGER

## Rock Types

UNKNOWN  
 ANHYDRITE  
 BENTONITE  
 BRECCIA  
 CEMENT  
 CHALK  
 CHERT  
 CLAY CHOKE SAND  
 CLAYSTONE

COAL  
 CONGLOMERATE  
 DOLOMITE  
 GRANITE  
 GYPSUM  
 IGNEOUS  
 LIMESTONE  
 SIDERITE or LIMONITE  
 MARLSTONE

METAMORPHIC  
 NO SAMPLE  
 SALT  
 SALT- PEPPER SAND  
 SANDSTONE  
 SHALE  
 SHALE COLORED  
 SHALE GRAY  
 SHALY SANDSTONE

SHALY SILTSTONE  
 SILTSTONE  
 SILTY SHALE  
 TILL  
 TUFF  
 WELDED TUFF

## Operator

**Company** NOBLE ENERGY INC.

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

## Geologist

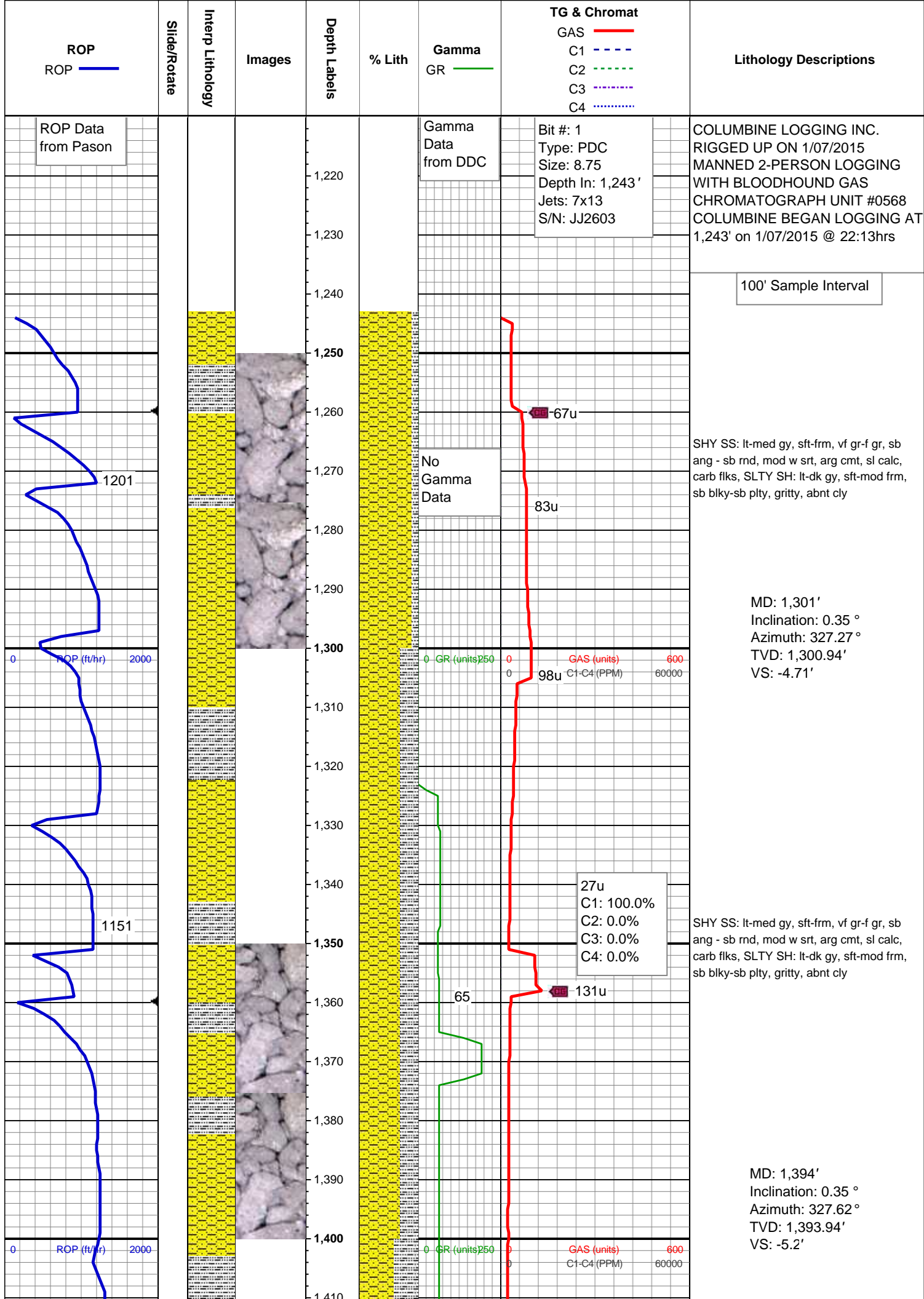
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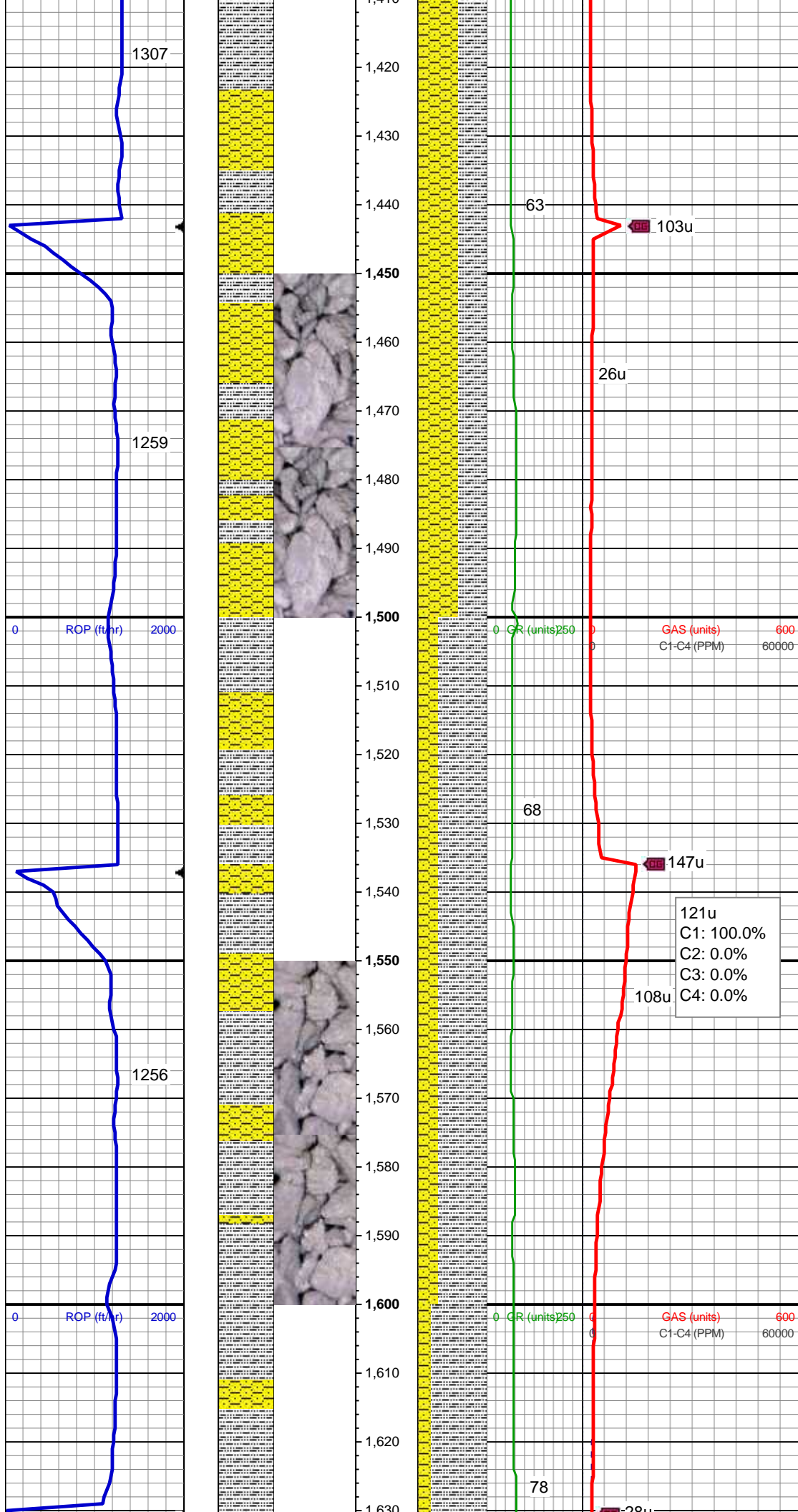
**Company** NOBLE ENERGY INC.

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

## Other

**COLUMBINE LOGGING** MATT HOPKINS  
ANDREW MARTENS





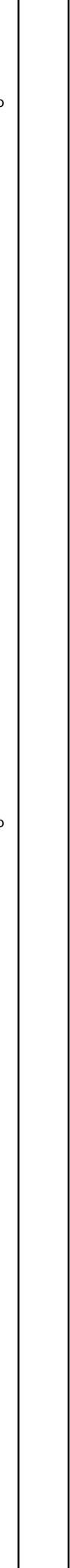
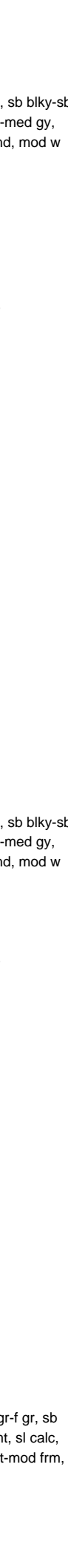
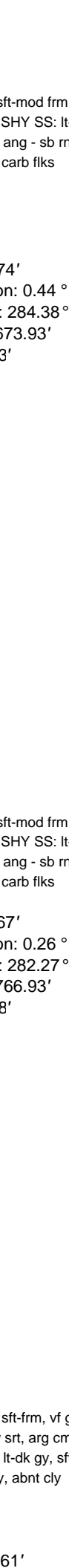
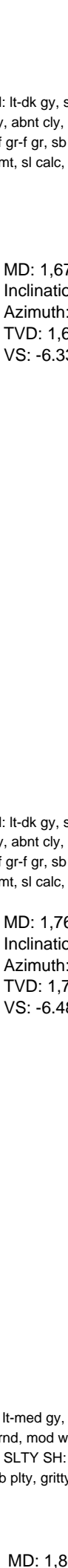
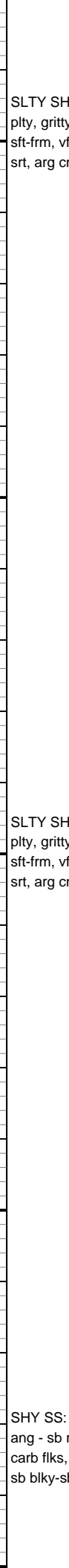
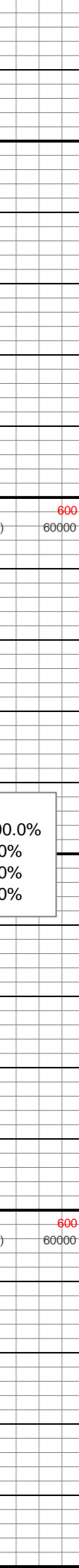
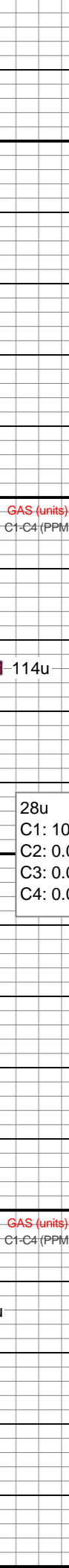
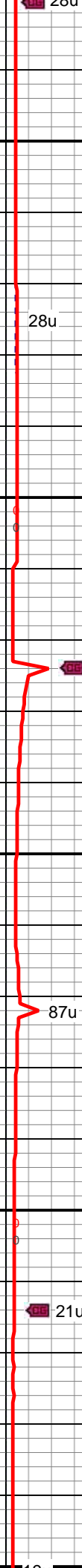
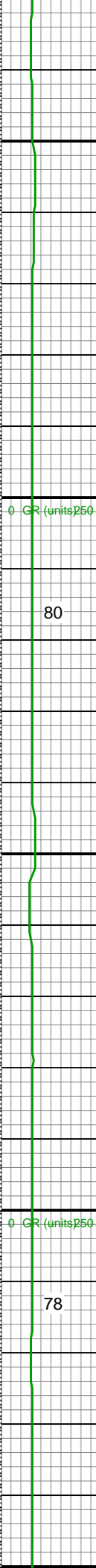
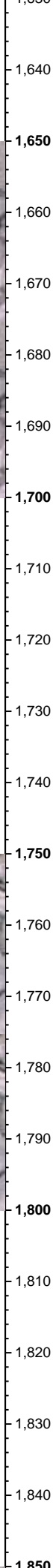
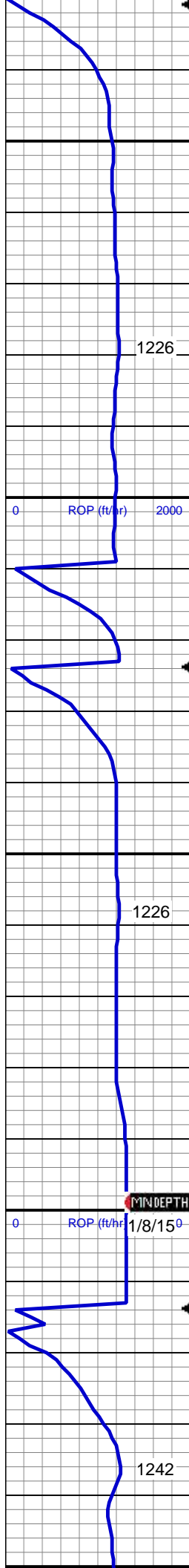
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MD: 1,488'  
Inclination: 0.53 °  
Azimuth: 326.04 °  
TVD: 1,487.93'  
VS: -5.81'

SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty, abnt cly, SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, carb flks

MD: 1,581'  
Inclination: 0.35 °  
Azimuth: 274.89 °  
TVD: 1,580.93'  
VS: -6.2'





SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb  
plty, gritty, abnt cly, SHY SS: lt-med gy,  
sft-frm, vf gr-f gr, sb ang - sb rnd, mod w  
srt, arg cmt, sl calc, carb flks

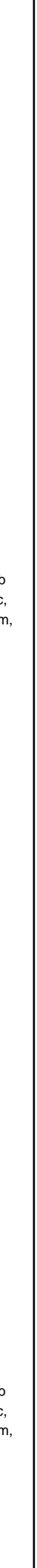
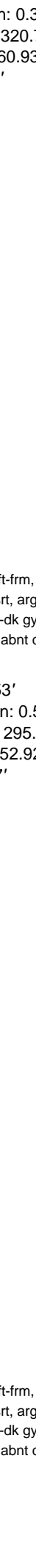
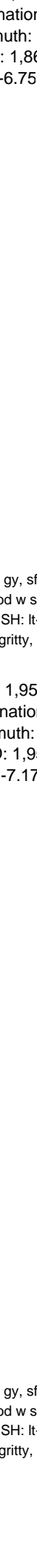
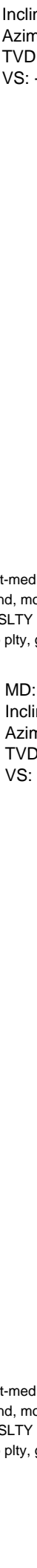
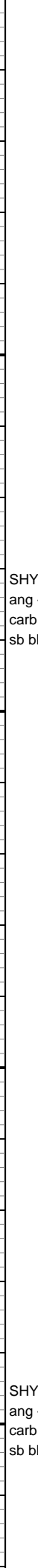
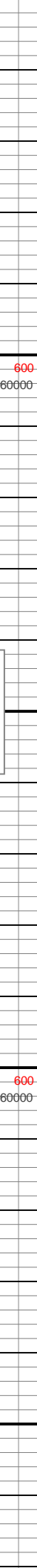
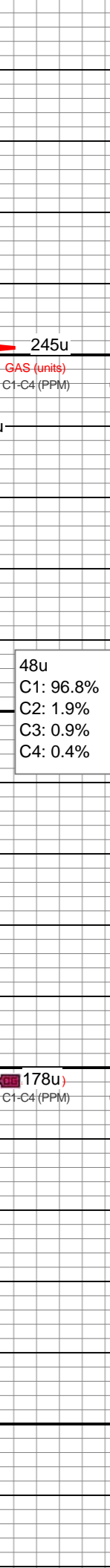
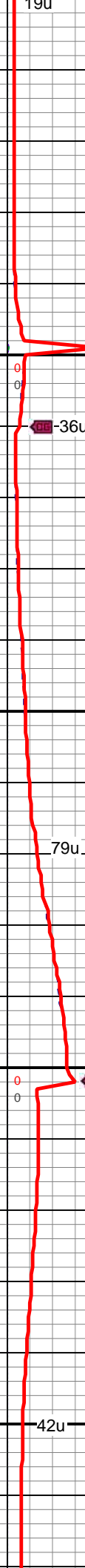
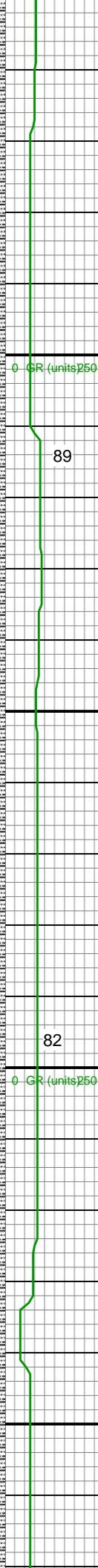
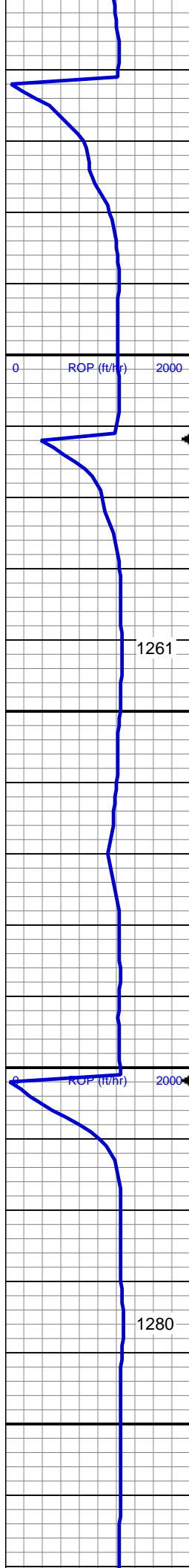
MD: 1,674'  
Inclination: 0.44 °  
Azimuth: 284.38 °  
TVD: 1,673.93'  
VS: -6.33'

SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb  
plty, gritty, abnt cly, SHY SS: lt-med gy,  
sft-frm, vf gr-f gr, sb ang - sb rnd, mod w  
srt, arg cmt, sl calc, carb flks

MD: 1,767'  
Inclination: 0.26 °  
Azimuth: 282.27 °  
TVD: 1,766.93'  
VS: -6.48'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc,  
carb flks, SLTY SH: lt-dk gy, sft-mod frm,  
sb blkly-sb plty, gritty, abnt cly

MD: 1,861'

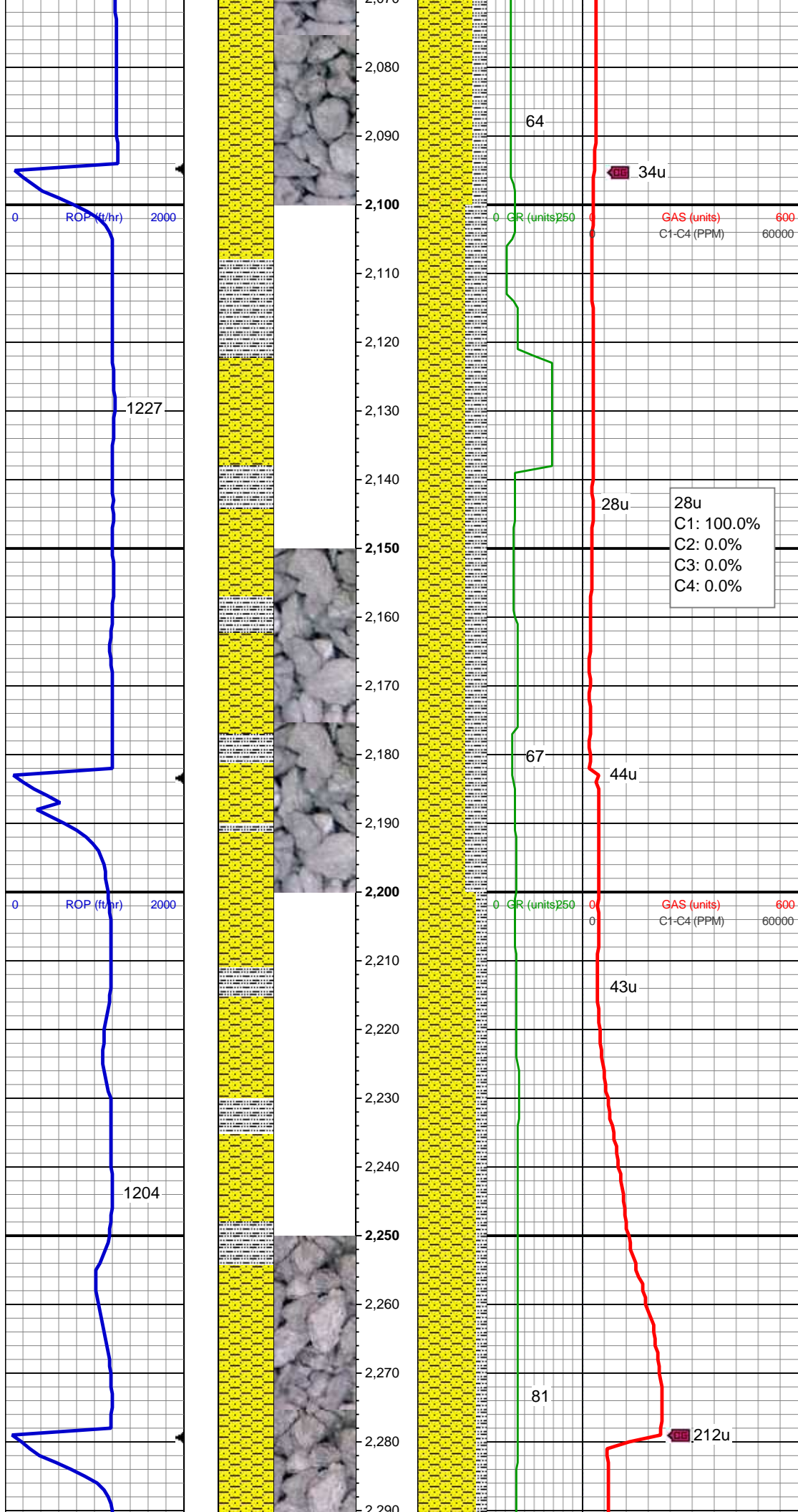


Inclination: 0.35 °  
Azimuth: 320.77 °  
TVD: 1,860.93'  
VS: -6.75'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc,  
carb flks, SLTY SH: lt-dk gy, sft-mod frm,  
sb blk-y-sb plty, gritty, abnt cly

MD: 1,953'  
Inclination: 0.53 °  
Azimuth: 295.98 °  
TVD: 1,952.92'  
VS: -7.17'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc,  
carb flks, SLTY SH: lt-dk gy, sft-mod frm,  
sb blk-y-sb plty, gritty, abnt cly



MD: 2,137'  
Inclination: 0.35 °  
Azimuth: 256.96 °  
TVD: 2,136.92'  
VS: -7.44'

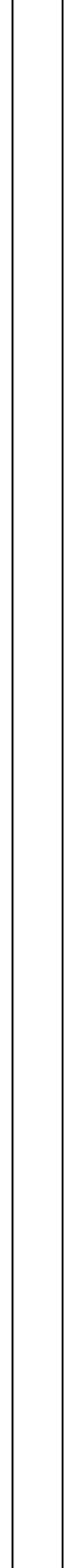
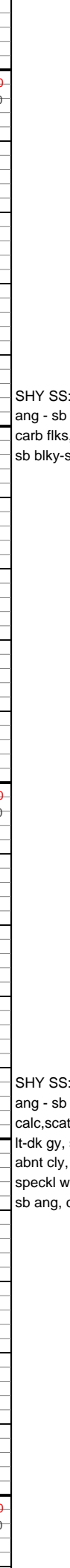
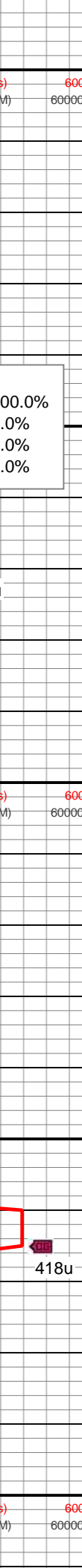
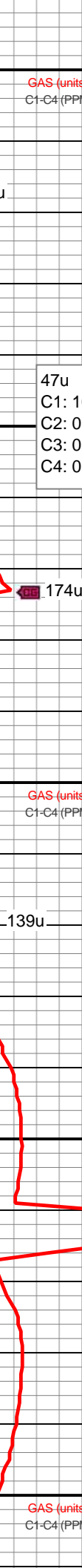
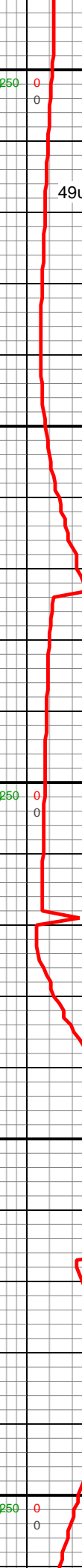
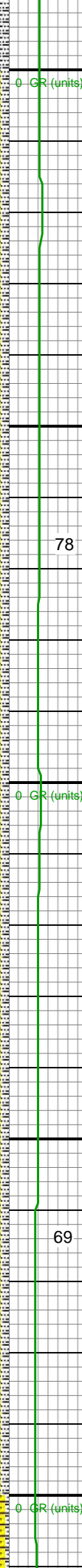
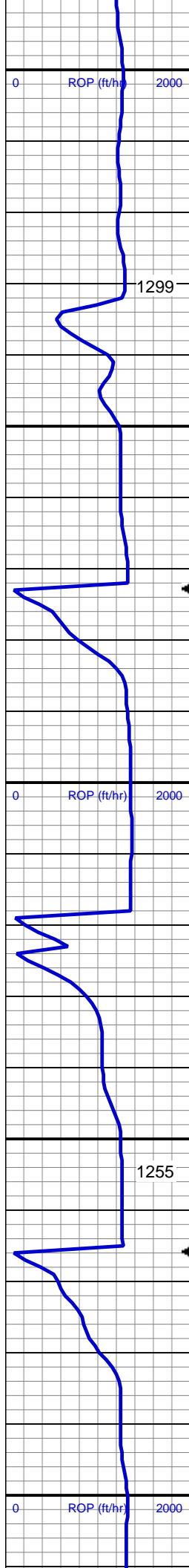
SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc,  
carb flks, SLTY SH: lt-dk gy, sft-mod frm,  
sb blk-y-sb plty, gritty, abnt cly

Mud Wt: 8.75 / 29 Vis

MD: 2,230'  
Inclination: 0.26 °  
Azimuth: 262.41 °  
TVD: 2,229.92'  
VS: -7.36'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc,  
carb flks, SLTY SH: lt-dk gy, sft-mod frm,  
sb blk-y-sb plty, gritty, abnt cly





MD: 2,324'  
Inclination: 0.18 °  
Azimuth: 222.5 °  
TVD: 2,323.92'  
VS: -7.23'

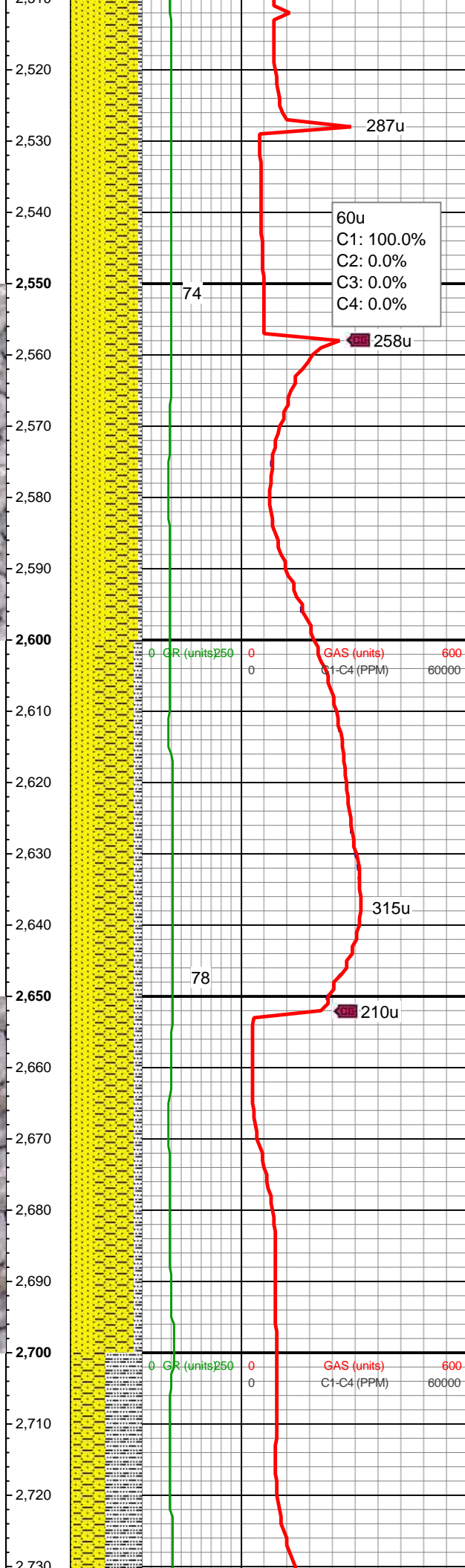
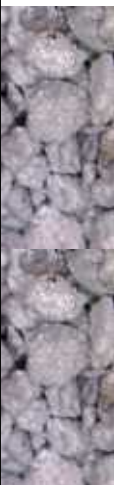
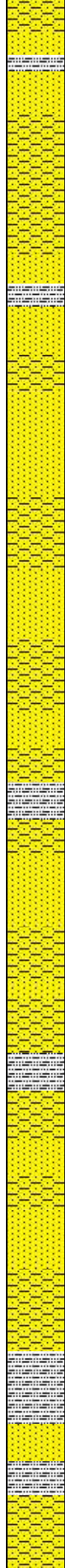
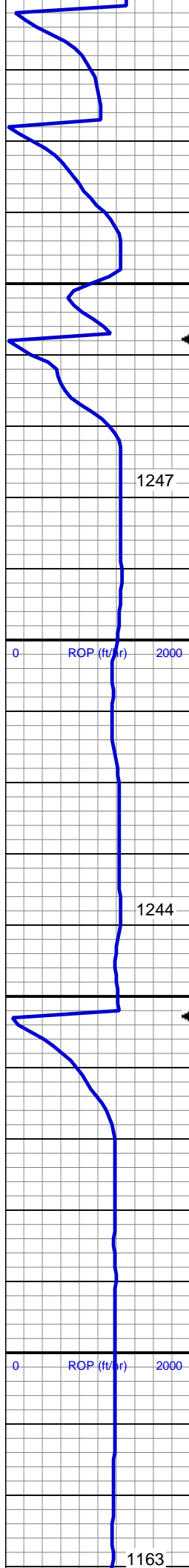
SHY SS: lt-med gy, sft frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, carb flks, SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty, abnt cly

MD: 2,416'  
Inclination: 0.35 °  
Azimuth: 208.27 °  
TVD: 2,415.92'  
VS: -6.88'

SHY SS: lt-med gy, sft frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, scat glauc grns, carb flks, SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty, abnt cly, SS: med - lt gy, s&P ip, uncon, speckl wi glau, f gr, hd brit clus, sb rnd - sb ang, calc cmt

MD: 2,508'  
Inclination: 0.26 °  
Azimuth: 229.71 °  
TVD: 2,507.24'

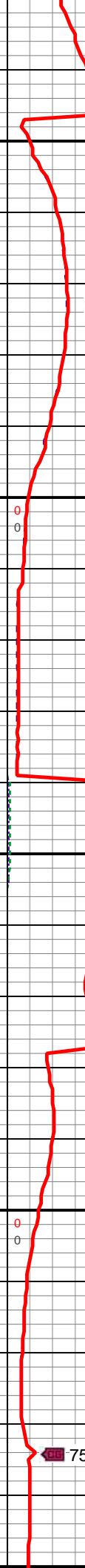
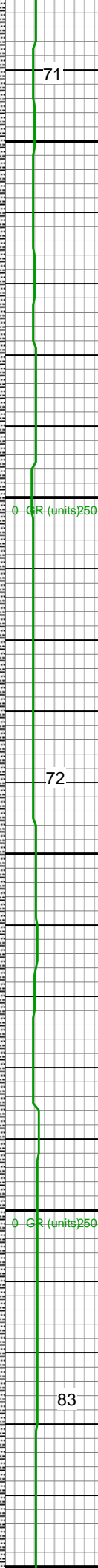
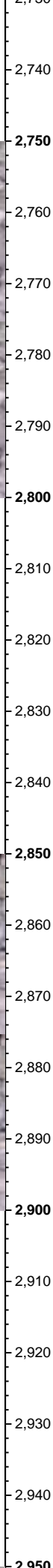
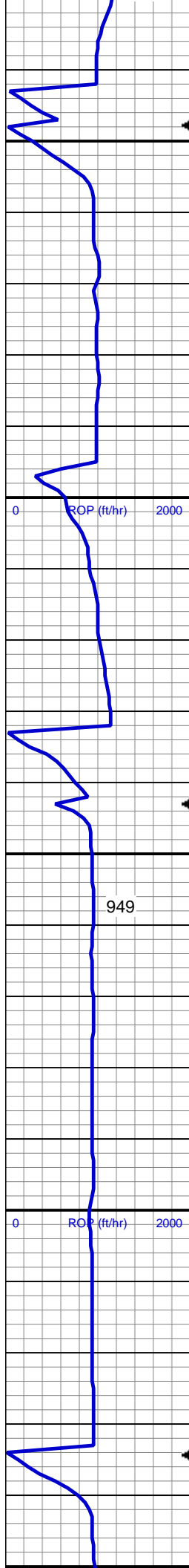




SS: med - lt gy, s&P ip, uncon, speckl wi glau, f gr, hd brit clus, sb rnd - sb ang, calc cmt, SHY SS: lt-med gy, sft frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, scat glauc grns, carb flks, SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb pty, gritty, abnt cly

SHY SS: lt-med gy, sft frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, scat glauc grns, carb flks, SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb pty, gritty, abnt cly, SS: med - lt gy, s&P ip, uncon, speckl wi glau, f gr, hd brit clus, sb rnd - sb ang, calc cmt

MD: 2,697'  
Inclination: 0.26 °  
Azimuth: 212.84 °  
TVD: 2,696.91'  
VS: -5.88'



59u  
C1: 99.7%  
C2: 0.3%  
C3: 0.0%  
C4: 0.0%

160u

305u

260u

75u

56u  
C1: 99.4%  
C2: 0.4%

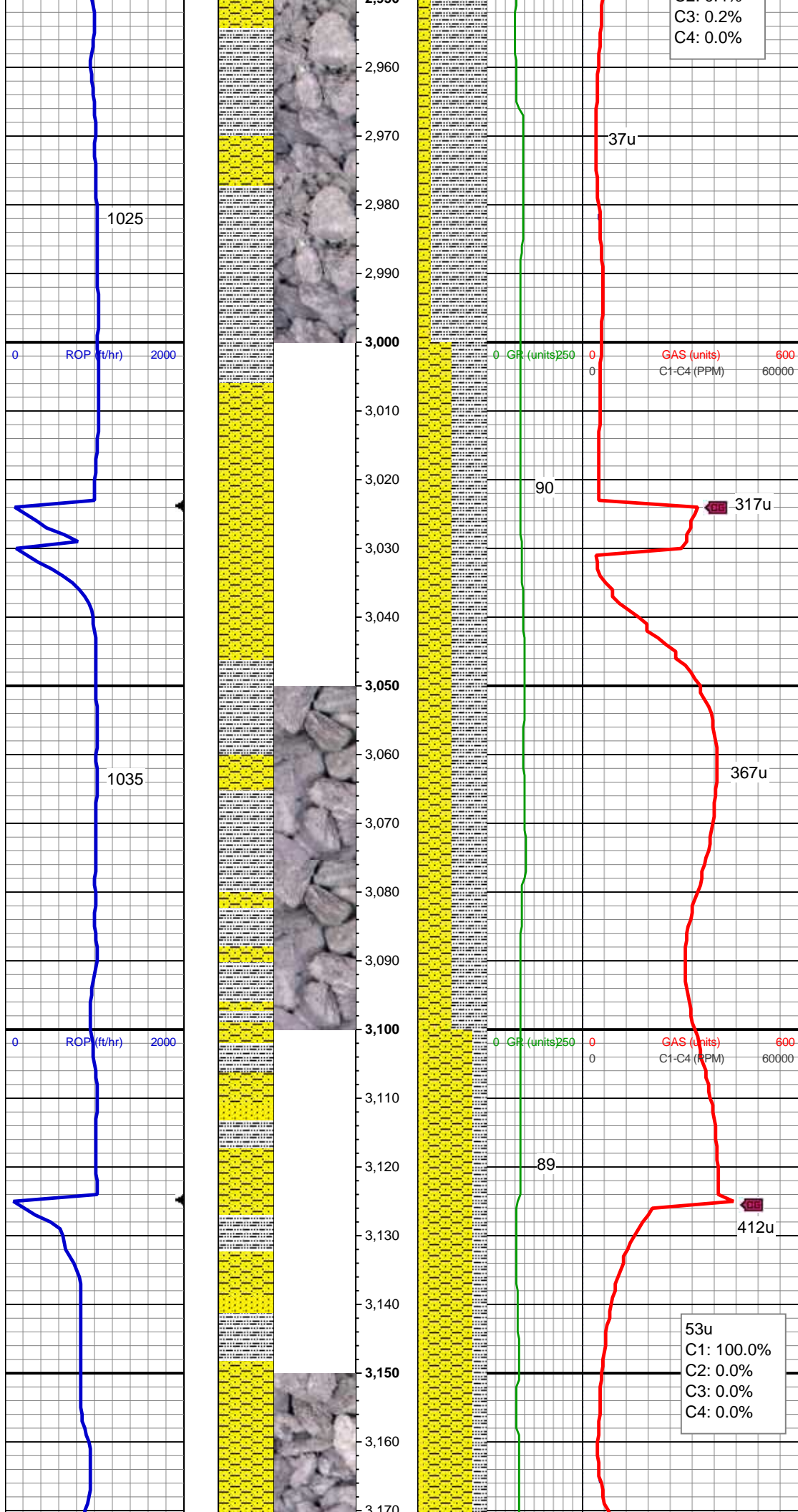
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MD: 2,791'  
Inclination: 0.35 °  
Azimuth: 196.14 °  
TVD: 2,790.91'  
VS: -5.43'

SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty, abnt cly, SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, scat glauc grns, carb flks

MD: 2,886'  
Inclination: 0.09 °  
Azimuth: 233.75 °  
TVD: 2,885.91'  
VS: -5.11'

SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty, abnt cly, SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w



srt, arg cmt, sl calc, scat glauc grns, carb flks

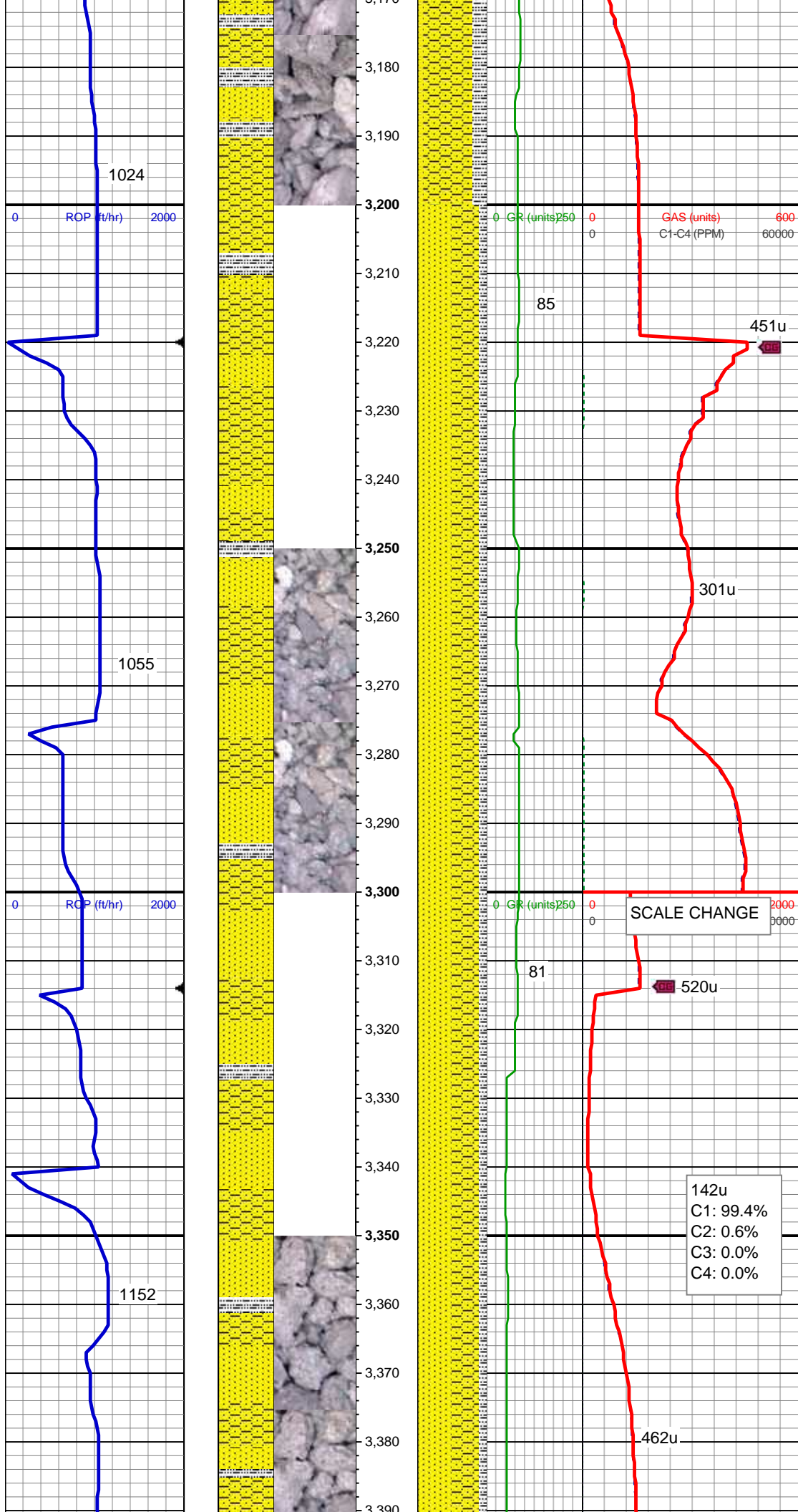
MD: 2,980'  
Inclination: 0.35 °  
Azimuth: 225.49 °  
TVD: 2,979.91'  
VS: -4.88'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, scat glauc grns, carb flks, SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb plty, gritty, abnt cly

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb plty, gritty SS: med - lt gy, s&P ip, uncons, speckl wi mica & glau, f gr, hd brit clus, ang - sb ang, calc cmt

MD: 3,170'  
Inclination: 0.79 °  
Azimuth: 209.67 °  
TVD: 3,169.91'





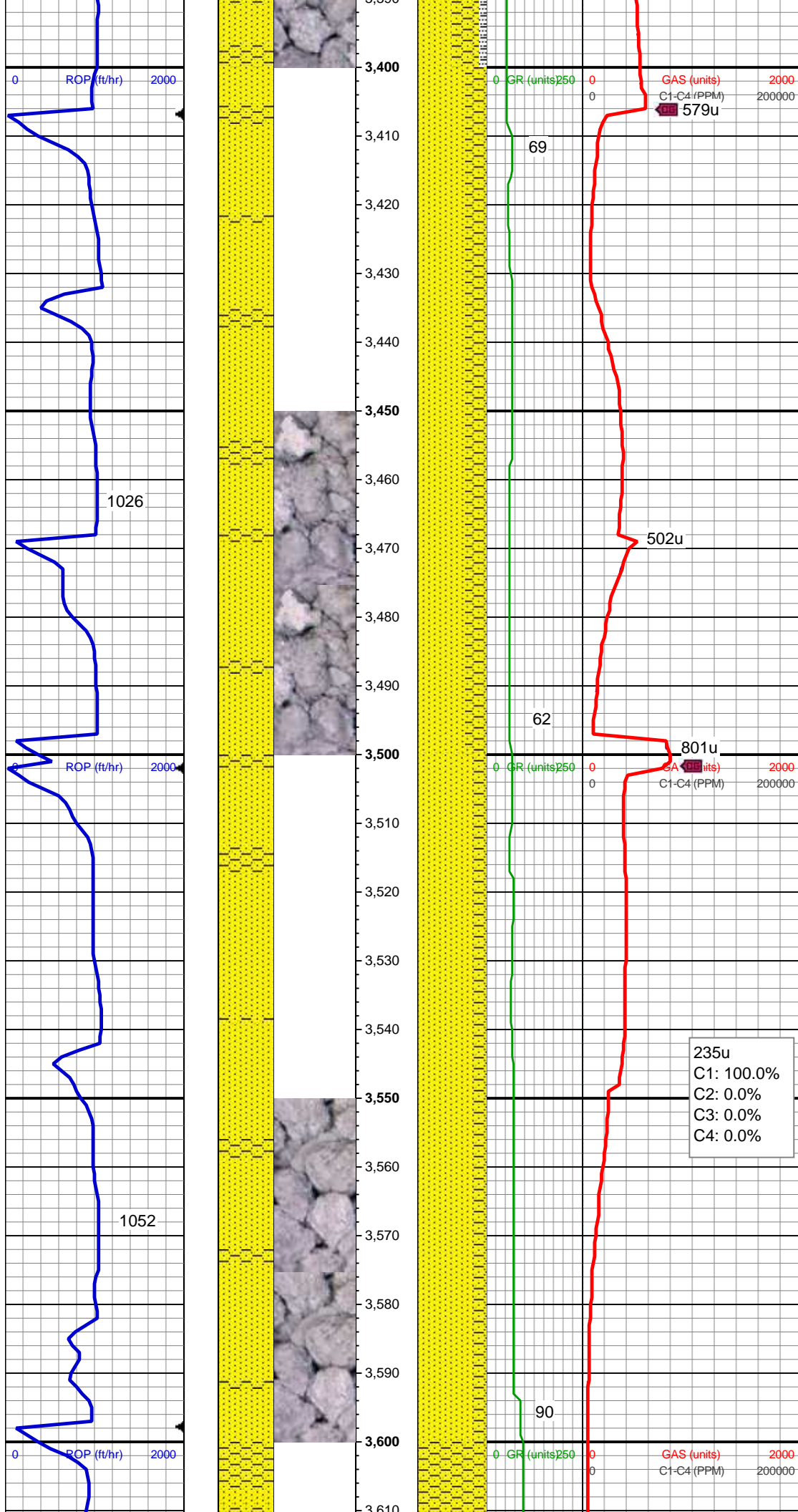
TVD: 3,169.9'  
VS: -3.35'

SS: med - lt gy, s&P ip, uncon, speckl wi glau, f gr, hd brit clus, ang - sb ang, calc cmt, SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty

MD: 3,264'  
Inclination: 0.79 °  
Azimuth: 218.11 °  
TVD: 3,263.89'  
VS: -2.3'

SS: med - lt gy, s&P ip, uncon, speckl wi glau, f gr, hd brit clus, ang - sb ang, calc cmt, SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty

MD: 3,358'  
Inclination: 0.88 °  
Azimuth: 203.52 °  
TVD: 3,357.88'  
VS: -1.14'



Mud Wt: 8.85 / 30 Vis

MD: 3,453'  
Inclination: 0.79 °  
Azimuth: 197.89 °  
TVD: 3,452.87'  
VS: 0.14'

SS: med - lt gy, s&P ip, uncons, speckl wi glau, f gr, hd brit clus, ang - sb ang, calc cmt, SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc

MD: 3,549'  
Inclination: 1.06 °  
Azimuth: 198.6 °  
TVD: 3,548.86'  
VS: 1.6'

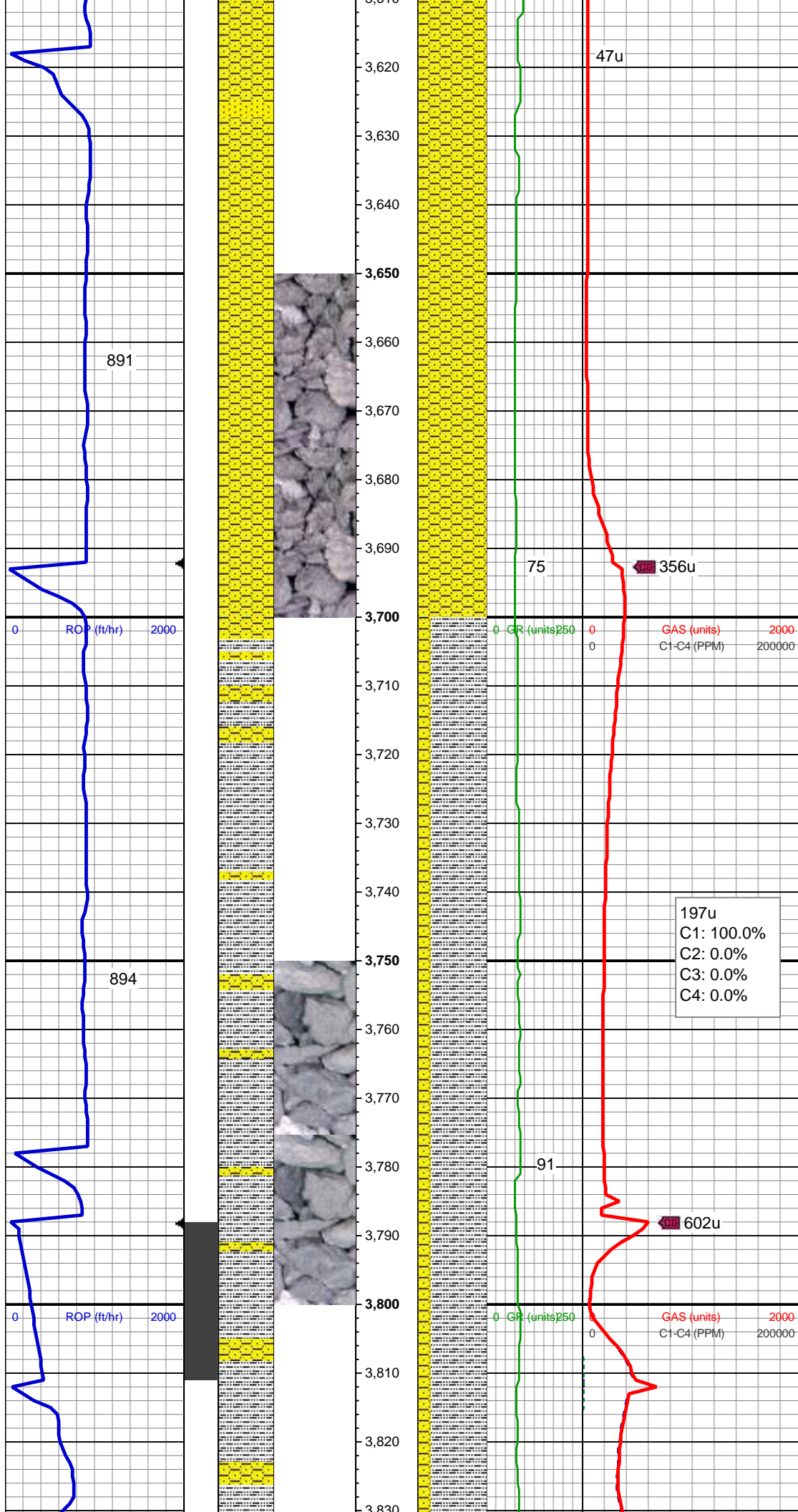
SS: med - lt gy, s&P ip, uncons, speckl wi glau, f gr, hd brit clus, ang - sb ang, calc cmt, SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc

579u

502u

801u

235u  
C1: 100.0%  
C2: 0.0%  
C3: 0.0%  
C4: 0.0%



MD: 3,643'  
Inclination: 1.32 °  
Azimuth: 195.08 °  
TVD: 3,642.84'  
VS: 3.46'

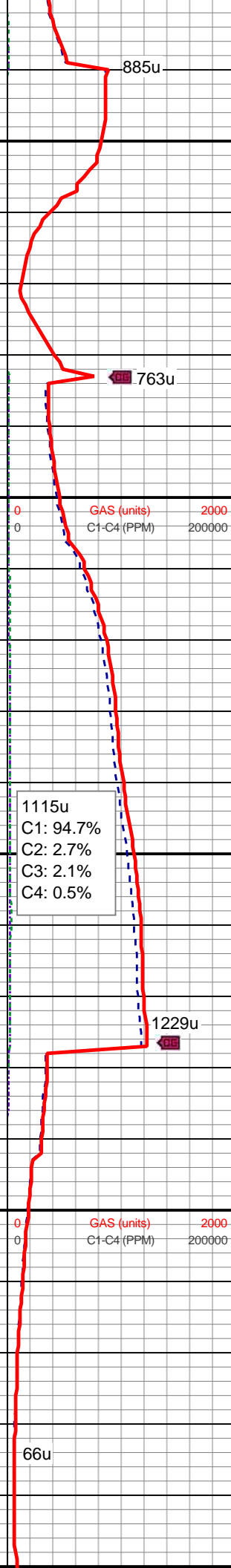
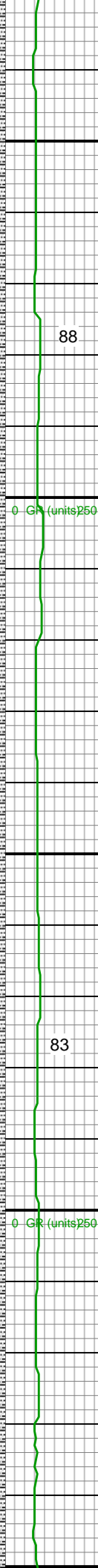
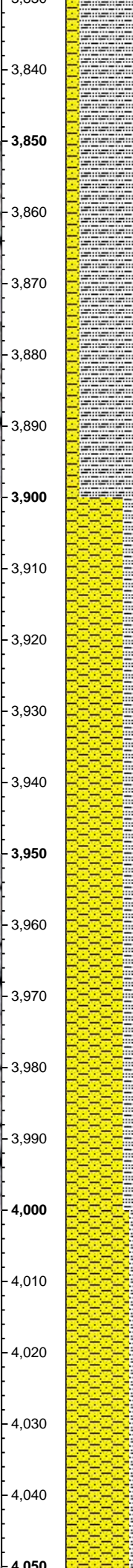
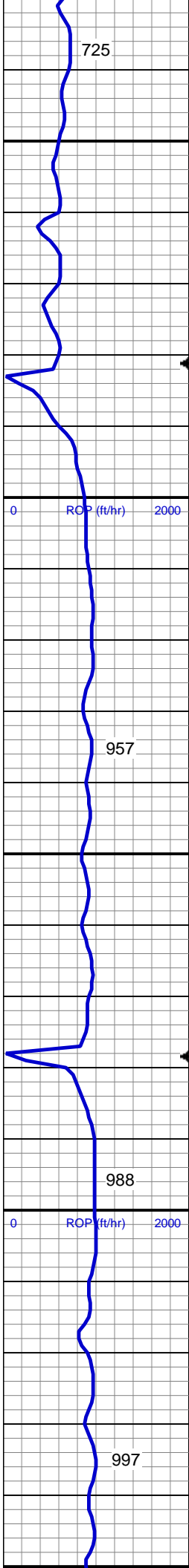
SHY SS: lt-med gy, sft-firm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc

MD: 3,738'  
Inclination: 1.58 °  
Azimuth: 196.31 °  
TVD: 3,737.81'  
VS: 5.75'

SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb  
ply, gritty, SHY SS: lt-med gy, sft-firm, vf  
gr-f gr, sb ang - sb rnd, mod w srt, arg  
cmt, sl calc

MD: 3,832'  
Inclination: 1.67 °  
Azimuth: 195.41 °  
TVD: 3,831.81'





Azimuth: 359.44 °  
TVD: 3,831.79'  
VS: 5.62'

SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb  
ppty, gritty, SHY SS: lt-med gy, sft-frm, vf  
gr-f gr, sb ang - sb rnd, mod w srt, arg  
cmt, sl calc

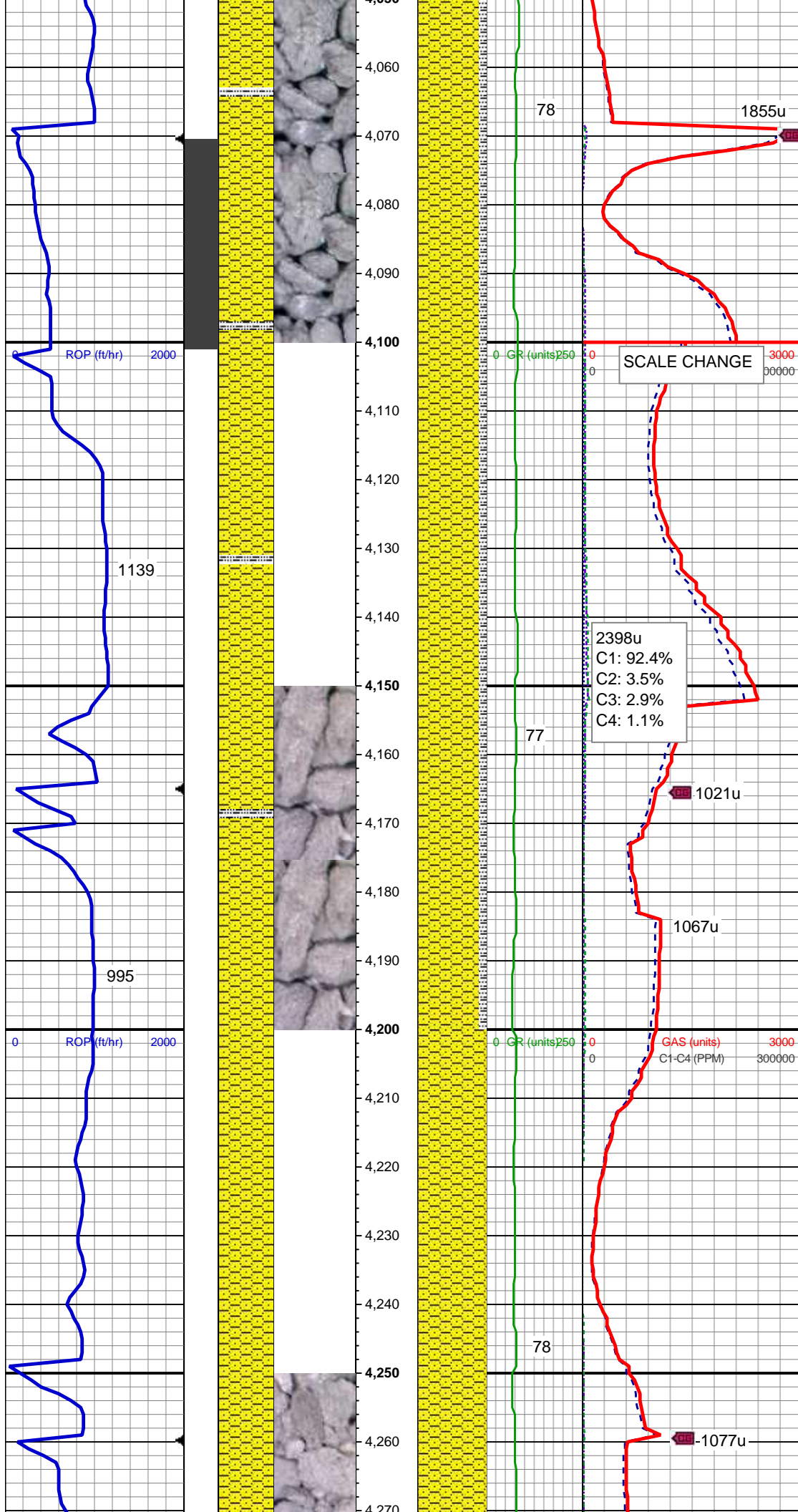
Mud Wt: 9.15 / 32 Vis

MD: 3,927'  
Inclination: 1.41 °  
Azimuth: 349.77 °  
TVD: 3,926.76'  
VS: 3.08'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc,  
SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb  
ppty, gritty

MD: 4,021'  
Inclination: 1.23 °  
Azimuth: 328.5 °  
TVD: 4,020.74'  
VS: 1.07'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc



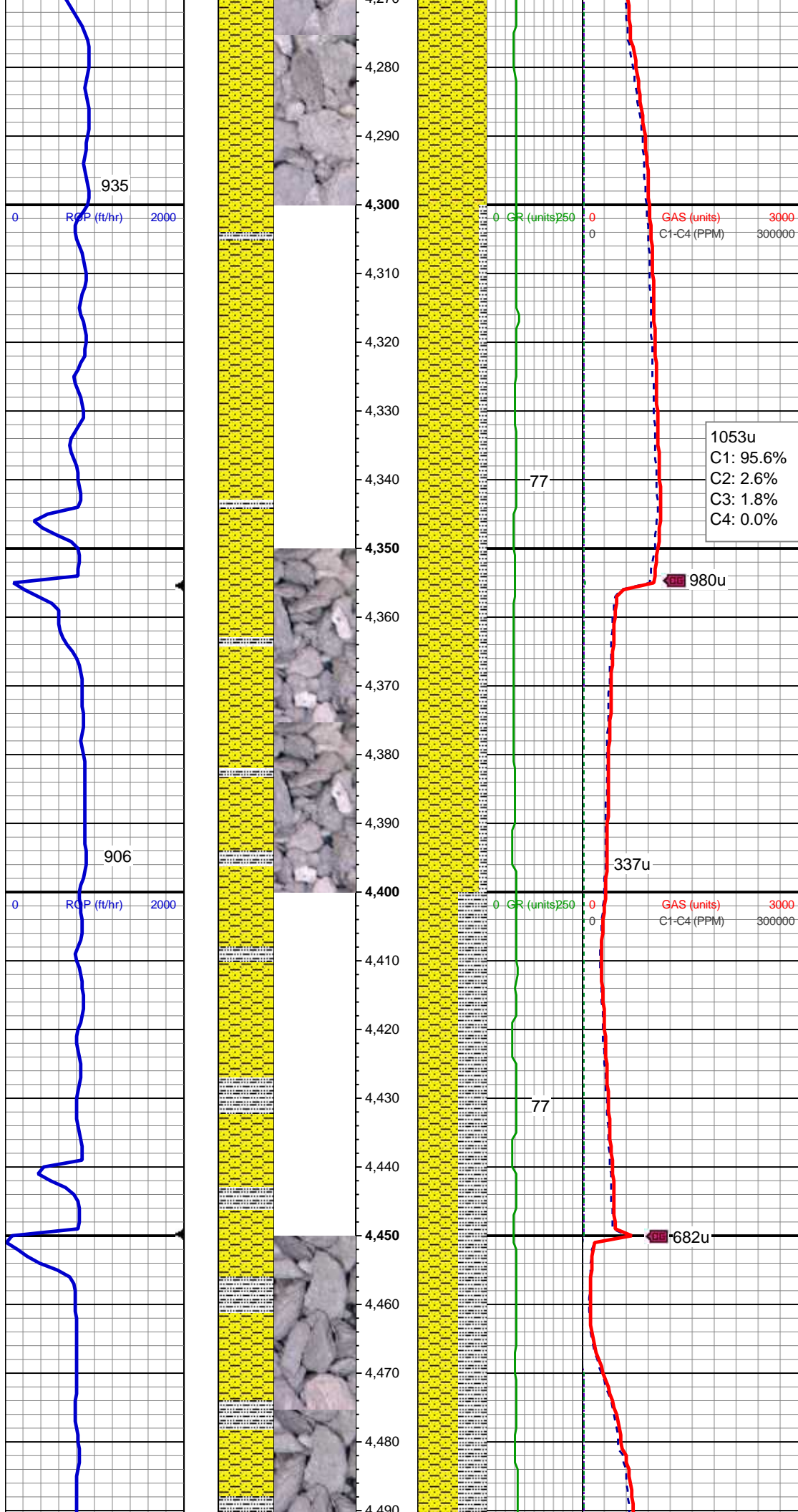
ang - sb md, mod w srt, arg cmt, sl calc,  
SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb  
pity, gritty

MD: 4,116'  
Inclination: 4.57 °  
Azimuth: 41.27 °  
TVD: 4,115.62'  
VS: -2.6'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc,  
SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb  
pity, gritty

MD: 4,211'  
Inclination: 4.84 °  
Azimuth: 37.58 °  
TVD: 4,210.3'  
VS: -8.51'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb  
ang - sb rnd, mod w srt, arg cmt, sl calc



MD: 4,305'  
Inclination: 4.92 °  
Azimuth: 31.25 °  
TVD: 4,303.96'  
VS: -15'

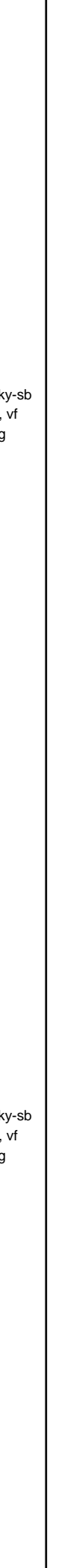
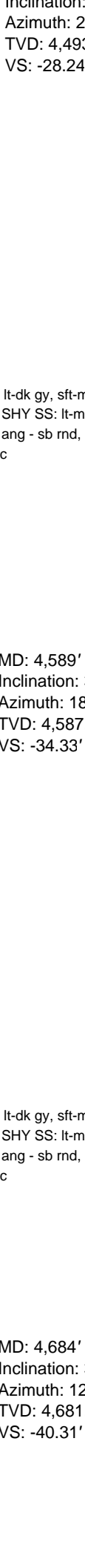
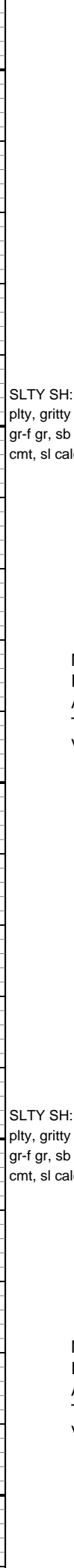
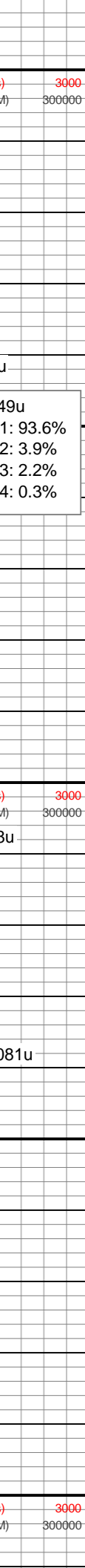
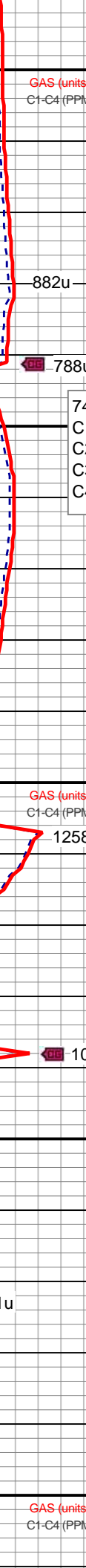
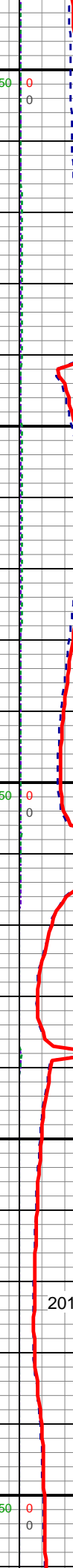
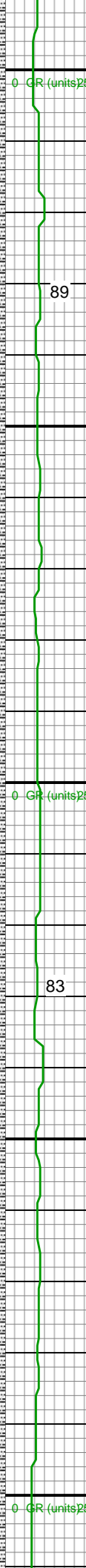
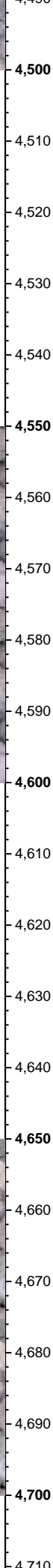
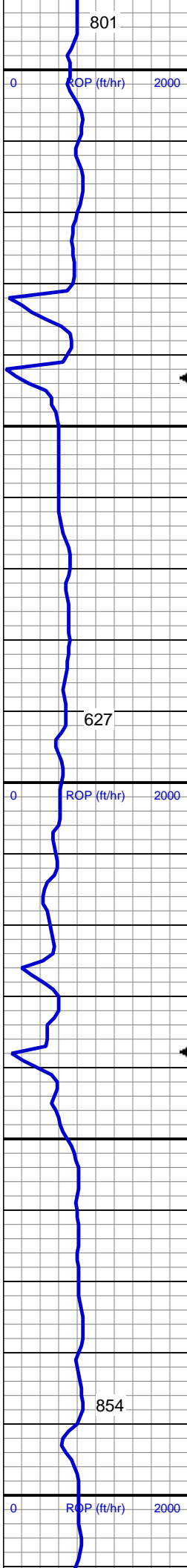
SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty

MD: 4,400'  
Inclination: 4.66 °  
Azimuth: 27.74 °  
TVD: 4,398.63'  
VS: -21.81'

SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc, SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty

MD: 4,495'  
Inclination: 4.12 °





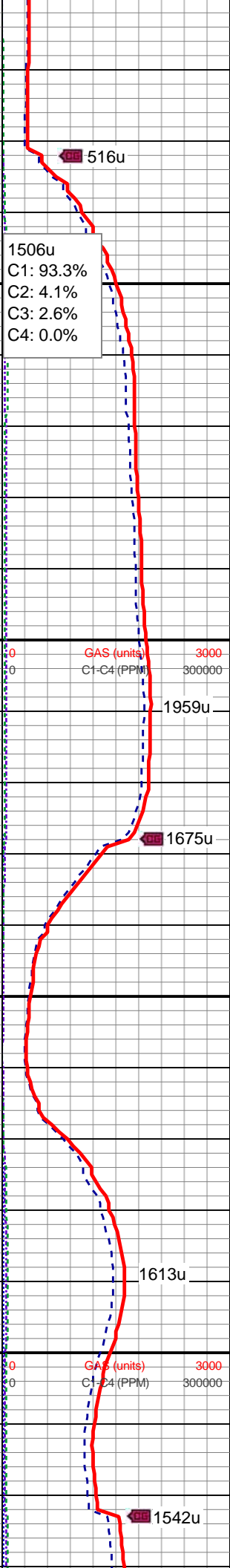
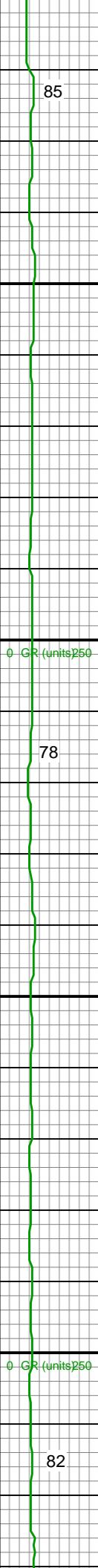
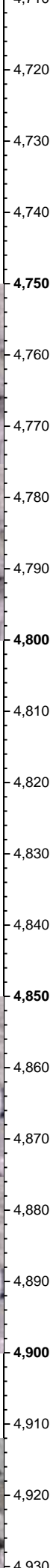
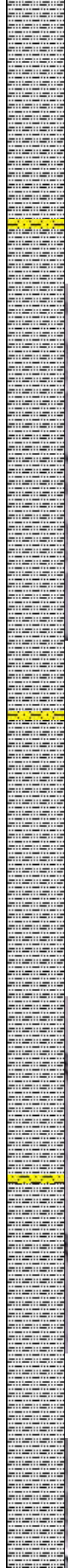
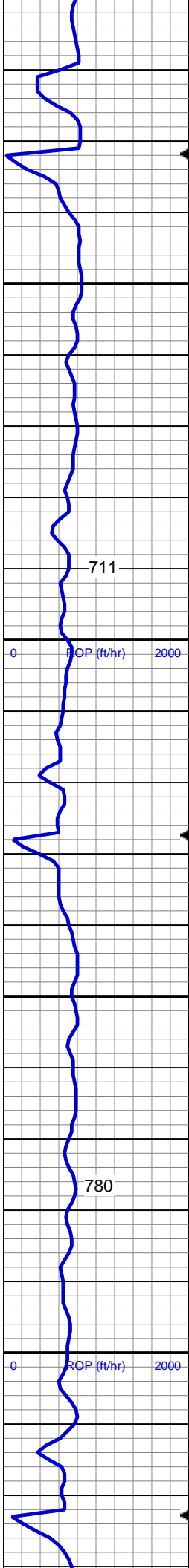
Inclination: 4.13°  
Azimuth: 25.28°  
TVD: 4,493.35'  
VS: -28.24'

SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc

MD: 4,589'  
Inclination: 3.96°  
Azimuth: 18.42°  
TVD: 4,587.12'  
VS: -34.33'

SLTY SH: lt-dk gy, sft-mod frm, sb blk-y-sb plty, gritty SHY SS: lt-med gy, sft-frm, vf gr-f gr, sb ang - sb rnd, mod w srt, arg cmt, sl calc

MD: 4,684'  
Inclination: 3.61°  
Azimuth: 12.97°  
TVD: 4,681.91'  
VS: -40.31'



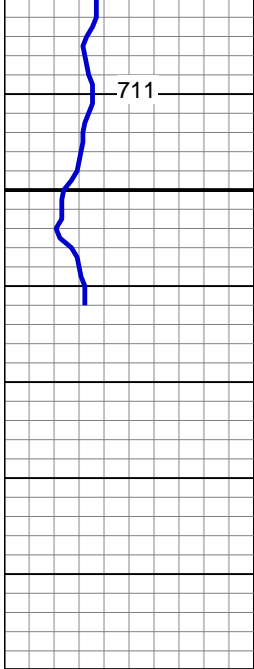
SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb pty, gritty, tr shly ss

MD: 4,778'  
Inclination: 2.81 °  
Azimuth: 13.68 °  
TVD: 4,775.76'  
VS: -45.41'

SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb pty, gritty, tr shly ss

MD: 4,873'  
Inclination: 2.55 °  
Azimuth: 16.66 °  
TVD: 4,870.66'  
VS: -49.67'

SLTY SH: lt-dk gy, sft-mod frm, sb blkly-sb pty, gritty, tr shly ss

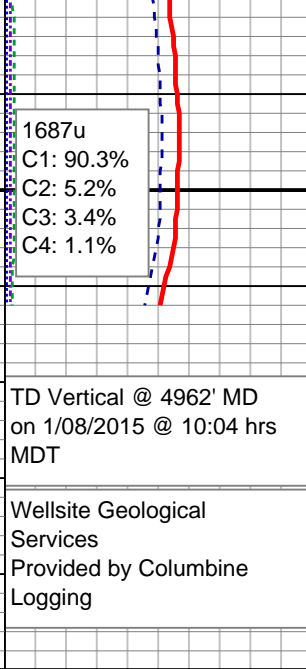
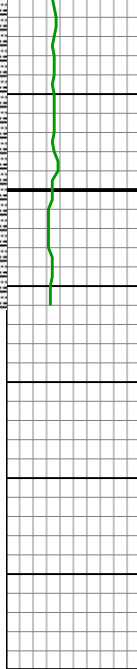


1687u  
C1: 90.3%  
C2: 5.2%  
C3: 3.4%  
C4: 1.1%



4,930  
4,940  
4,950  
4,960  
4,970  
4,980  
4,990  
5,000

4,930  
4,940  
4,950  
4,960  
4,970  
4,980  
4,990  
5,000



Mud Wt: 9.95 / 34 Vis

TD Vertical @ 4962' MD  
on 1/08/2015 @ 10:04 hrs  
MDT

See Corresponding Horizontal Log  
Moses State  
LD11-77-1AHN(HORZ)

Wellsite Geological  
Services  
Provided by Columbine  
Logging