

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name EWS-3A

Location NW, NW, Sec 23, T4N, R66W

State Colorado

County Weld

Country USA

Rig Number Ensign 121

API Number 05-123-43880-00

Field Wattenberg

Geographic Region DJ

Drilling Completed 1/6/2017

Spud Date 12/18/2016

Surface Coordinates NW, NW, Sec 23, T4N, R66W
2528' FNL/1045' FWL
40.29771/-104.75023

Bottom Hole Coordinates NE, NE, Sec 26, T4N, R66W
2556' FNL/512' FWL
40.28317/-104.73671

Ground Elevation 4726'

K.B. Elevation 4739'

Logged Interval 111' **To** 12265'

Total Depth 12265'

Formation Pierre to Fountain

Type of Drilling Fluid Water Based Mud

Operator

Company Petrotek

Address 5935 S Zang St Ste 200
Littleton, CO 80127


Geologist

Name Arron Payne

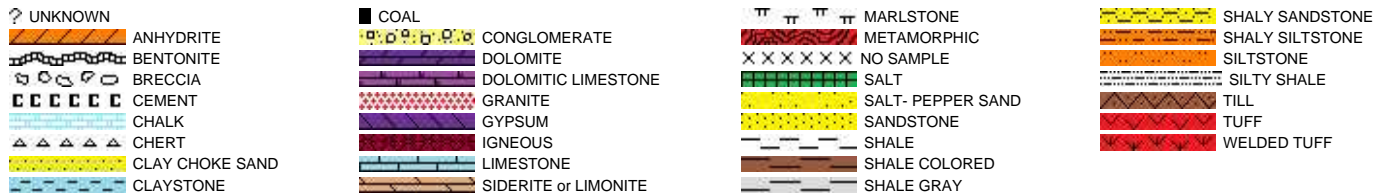
Company Petrotek

Address 5935 S Zang St Ste 200
Littleton, CO 80127

Zone Color Coding

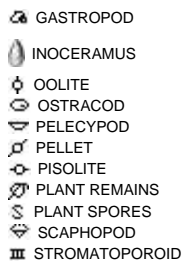
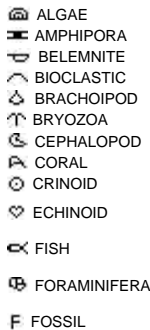
 Oil	 Condensate	 Gas
 Note	 Core	 Pressure
 Error	 Water	 Seal

Rock Types

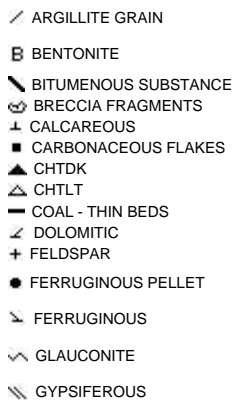
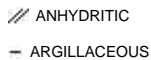


Accessories

Fossils



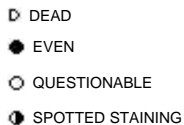
Minerals



Stringer

Other Symbols

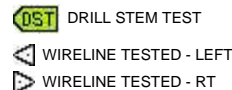
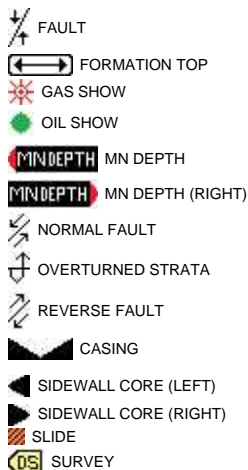
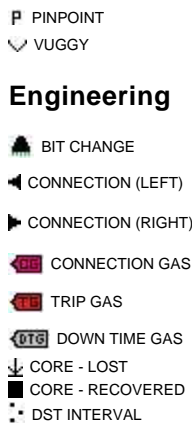
Oil Show



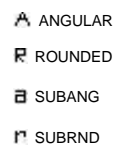
Porosity



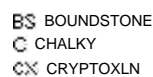
Engineering



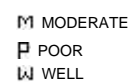
Rounding



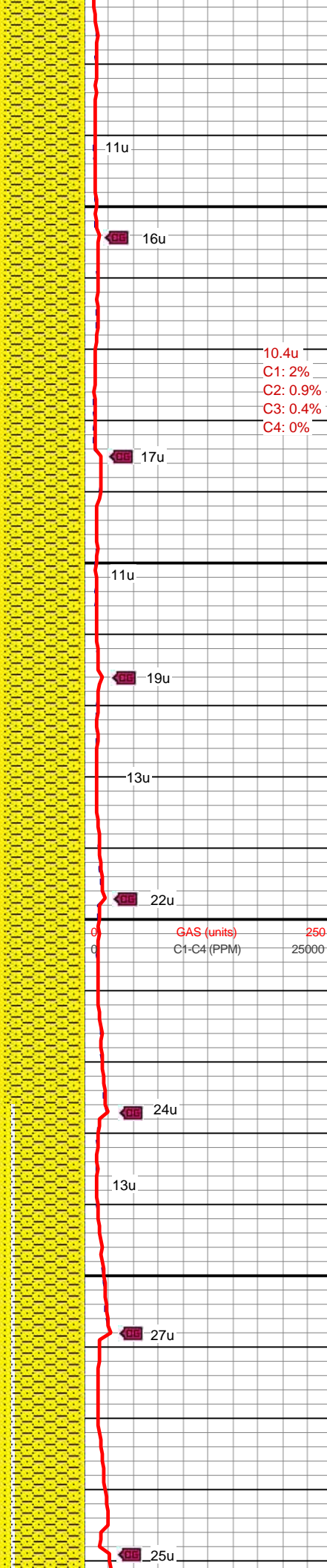
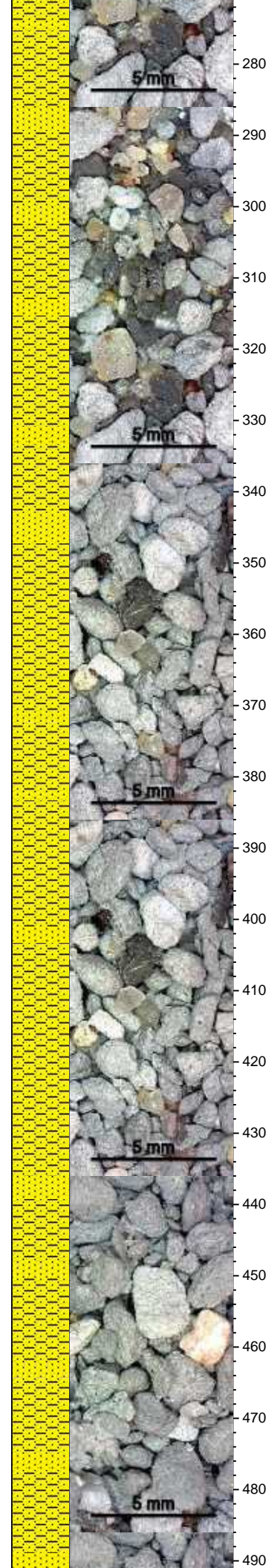
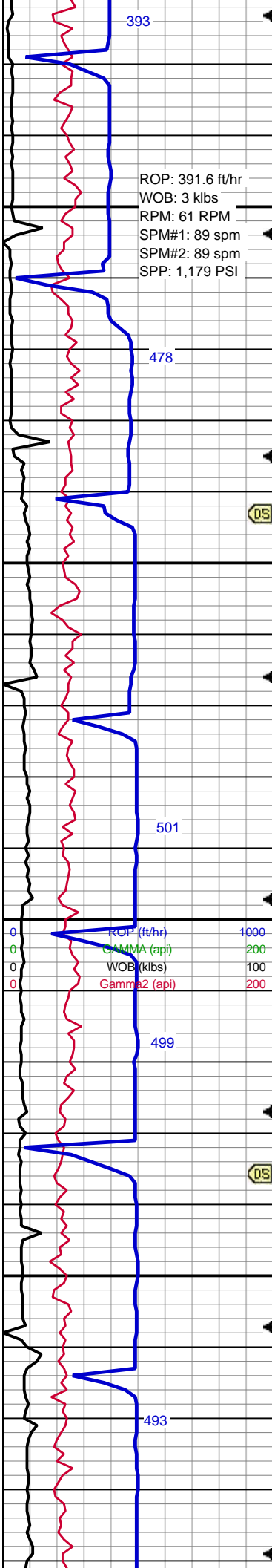
Textures



Sorting



ROP		Slide/Rotate	Interp Lithology	Images	Depth Labels	% Lith	Total Gas & Chromatograph	Lithology Descriptions
ROP							GAS	
DRILLING DATA IMPORTED FROM PASON								COLUMBINE LOGGING INC. RIGGED UP ON 12/16/2016, 2-MAN LOGGING WITH BLOODHOUND UNIT #313, BEGAN LOGGING @ 18:14 MST, ON 12/18/16
DRILLING IN THE QUATERNARY								
Bit #: 1 Type: Smith Mi616 Size: 12.25 Depth In: 111' Depth Out: 1,041' Hours: 2.6 hrs Jets: 4X18 S/N: JJ8187								
198								GAS DATA IMPORTED FROM IBALL GAS CHART
167								
DEPTH CORRECTION								0 250 0 25000 GAS (units) C1-C4 (PPM)
ROP (ft/hr) 1000 GAMMA (api) 200 WOB (klbs) 100 Gamma2 (api) 200								
301								10u 8u 15u 10u 16u
DS								
DS								SHY SS: lt-med gy, rr clr-trnsl, s&p ip, com dk spec, vf- f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty mtx, occ gr sup mtx, p- mod p por SS: clr- trnsl, occ s&p, occ lse c qtz/ fld grs, pred f-med gr clus, mod frm, ch ang- ang, ply srt, mod g r
DS								



MD: 254'
Inclination: 0.3°
Azimuth: 195°
TVD: 254'
VS: 0.55'

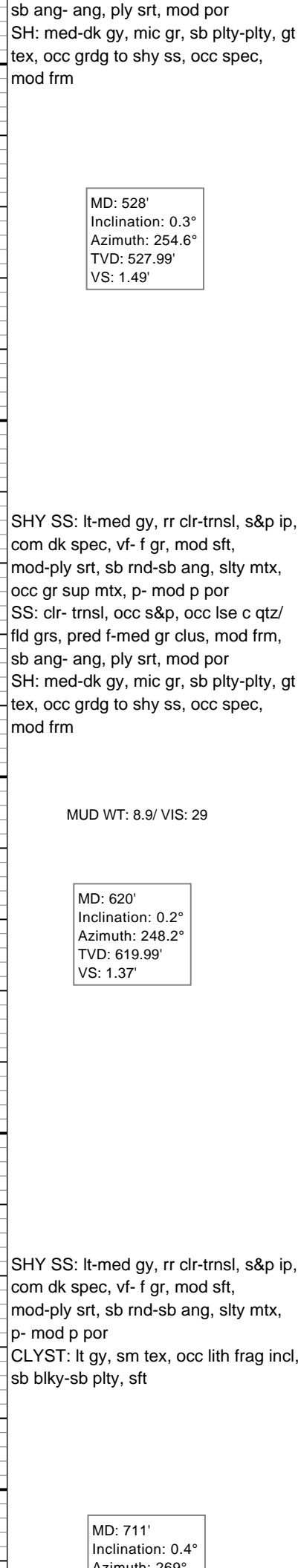
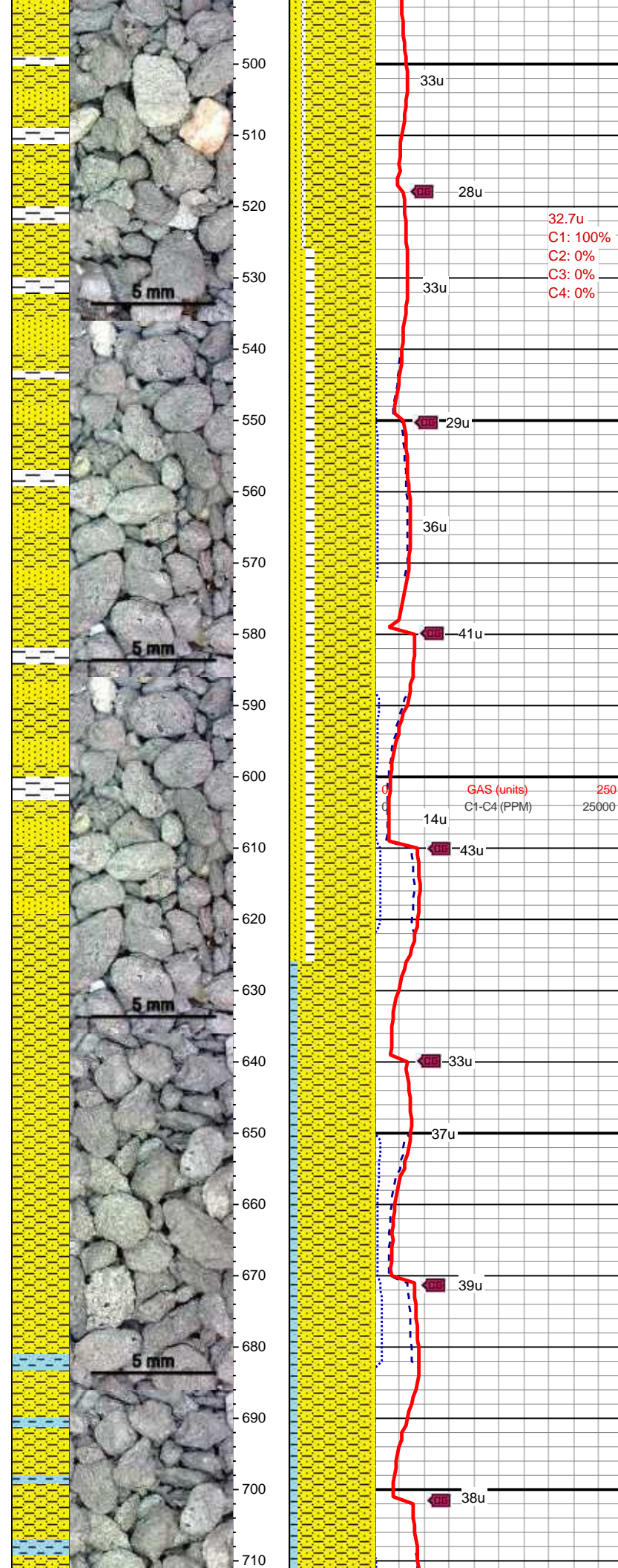
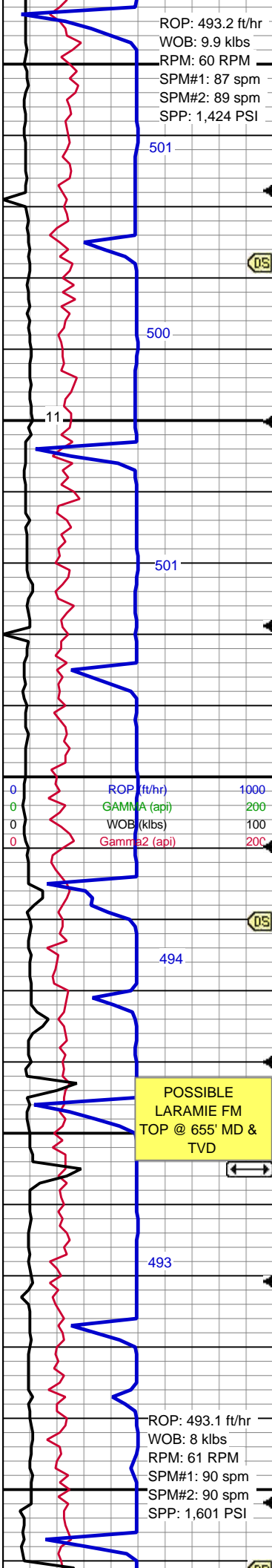
MUD WT: 8.7/ VIS: 27

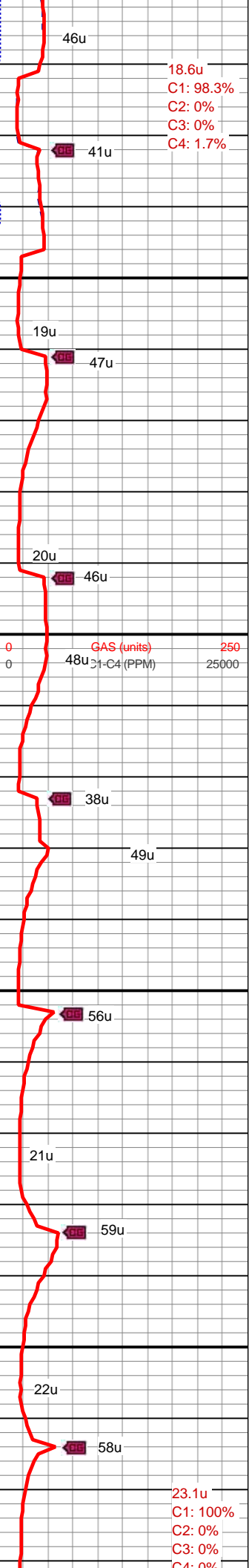
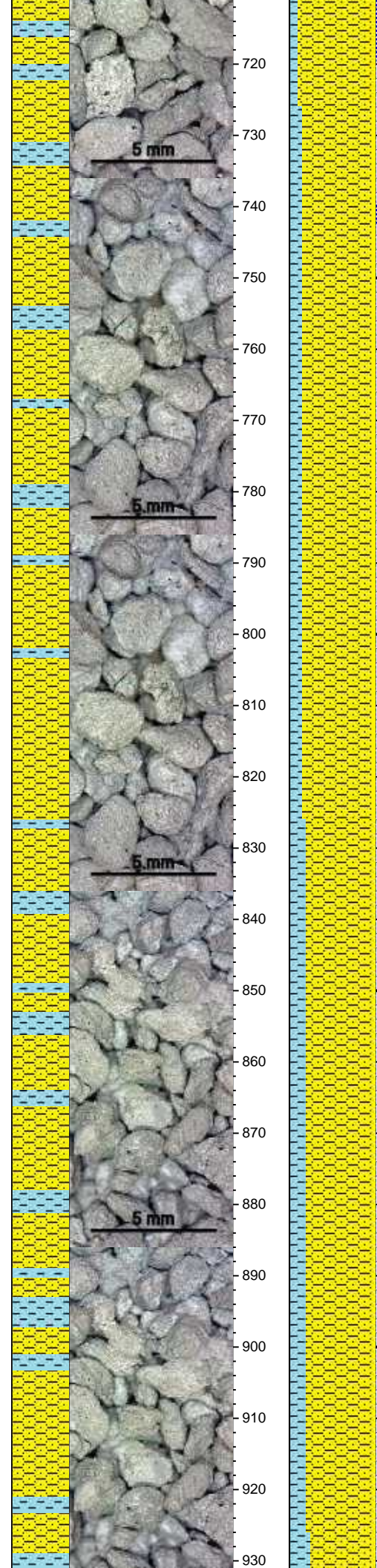
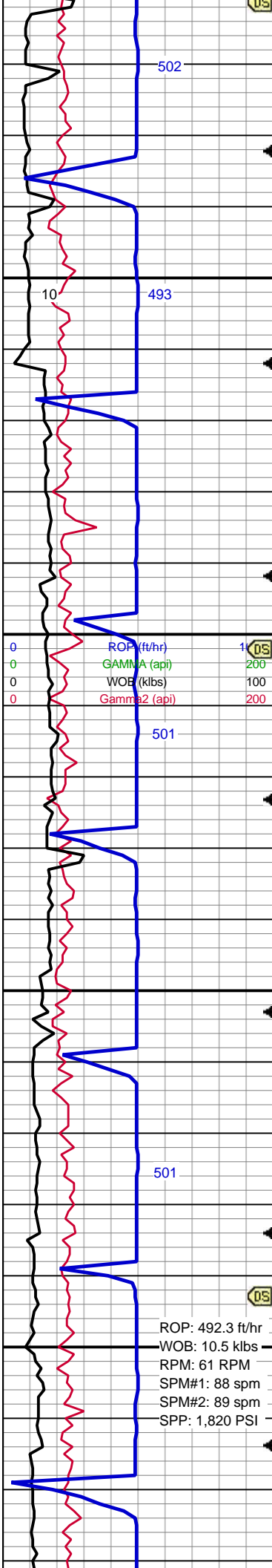
MD: 345'
Inclination: 0.4°
Azimuth: 176.9°
TVD: 345'
VS: 0.97'

SHY SS: lt-med gy, rr clr-trnsl, s&p ip, com dk spec, vf- f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty mtx, occ gr sup mtx, p- mod p por
SS: clr- trnsl, occ s&p, occ lse c qtz/ fld grs, pred f-med gr clus, mod frm, sb ang- ang, ply srt, mod por

MD: 437'
Inclination: 0.3°
Azimuth: 190.1°
TVD: 437'
VS: 1.41'

SHY SS: lt-med gy, rr clr-trnsl, s&p ip, com dk spec, vf- f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty mtx, occ gr sup mtx, p- mod p por
SS: clr- trnsl, occ s&p, occ lse c qtz/ fld grs, pred f-med gr clus, mod frm,





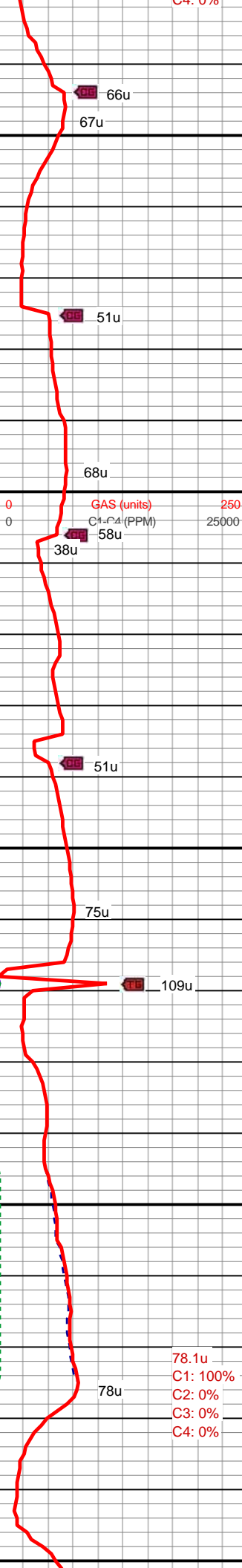
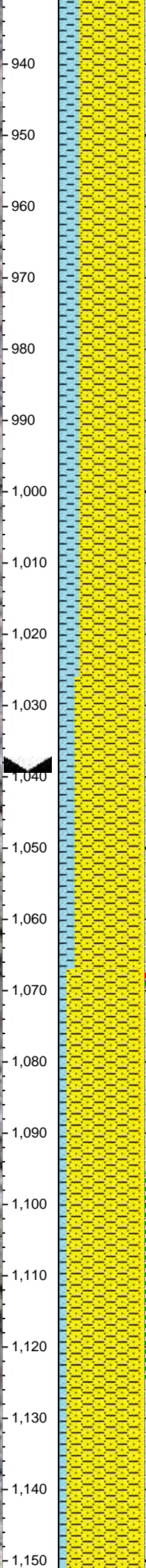
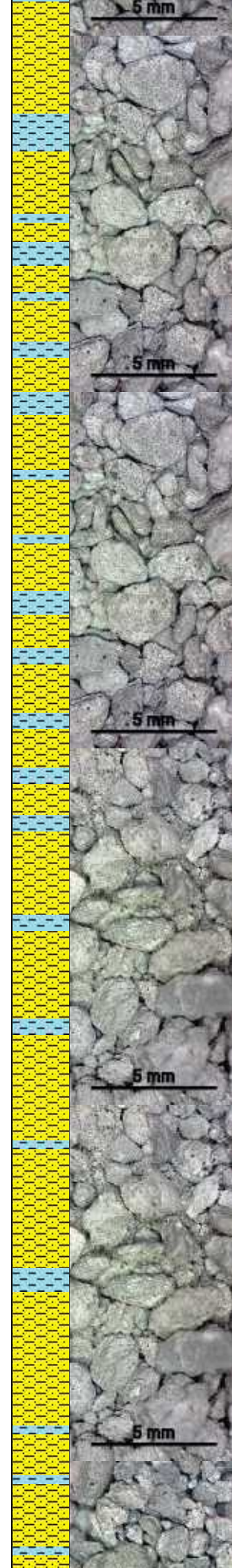
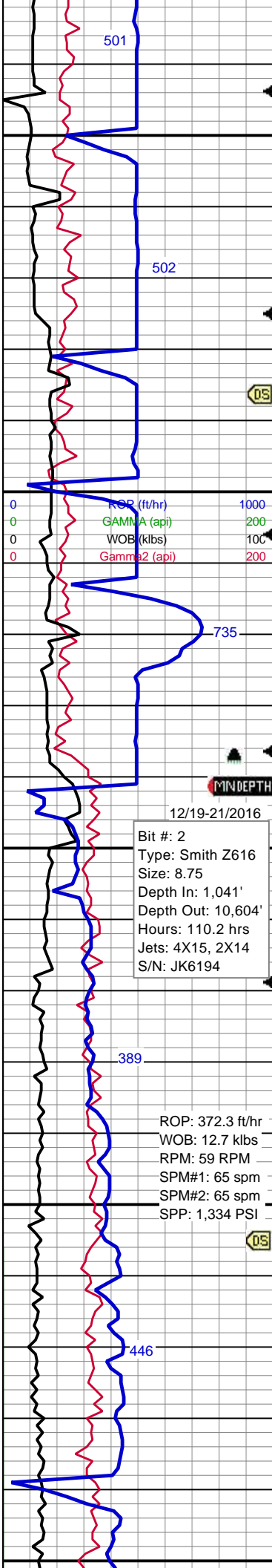
SHY SS: lt-med gy, rr clr-trnsl, s&p ip, com dk spec, vf- f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty mtx, p- mod p por
CLYST: lt gy, sm-slty tex, occ lith frag incl, sb blkly-sb plty, sft

MD: 802'
Inclination: 0.4°
Azimuth: 269.7°
TVD: 801.99'
VS: 0.79'

MUD WT: 9.1/ VIS: 30

SHY SS: lt-med gy, rr clr-trnsl, s&p ip, com dk spec, vf- f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty mtx, p- mod p por, occ grdgd to slty sh
CLYST: lt gy, sm-slty tex, occ lith frag incl, sb blkly-sb plty, sft

MD: 893'
Inclination: 0.4°
Azimuth: 243°
TVD: 892.99'
VS: 0.56'



SHY SS: lt-med gy, rr clr-trnsl, s&p ip, com dk spec, vf-f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty mtz, p- mod p por, occ grdng to slty sh, calc ip;
CLYST: lt gy, sm-slty tex, occ lith frag incl, sb blkly-sb plty, sft

MD: 986'
Inclination: 0.7°
Azimuth: 266.5°
TVD: 985.98'
VS: 0.21'

MUD WT: 9.3/ VIS: 32

Depth: 1,041
Mud Weight: 9.1
Viscosity: 37
Yield Pt: 13
Filter Cake: 24
Solids: 4%
pH: 7.7
Chlorides: 700 mg/l

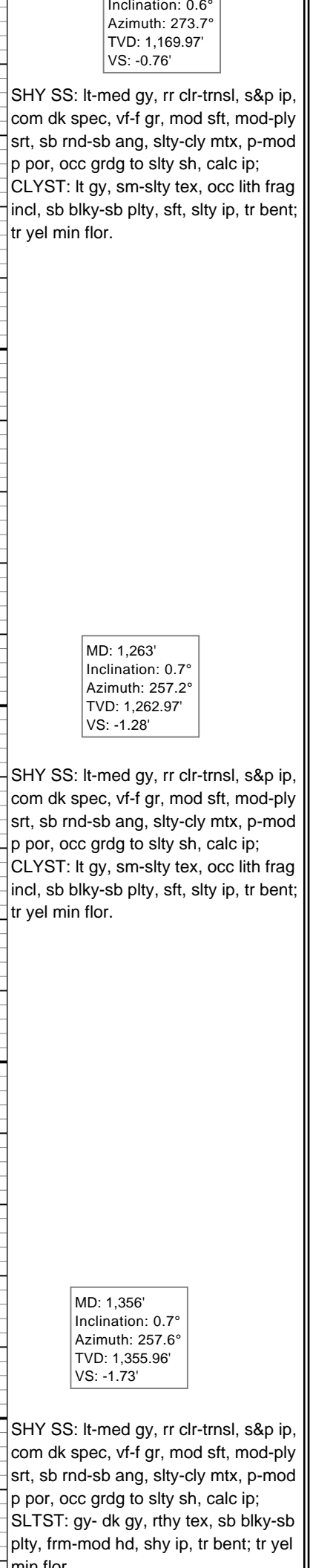
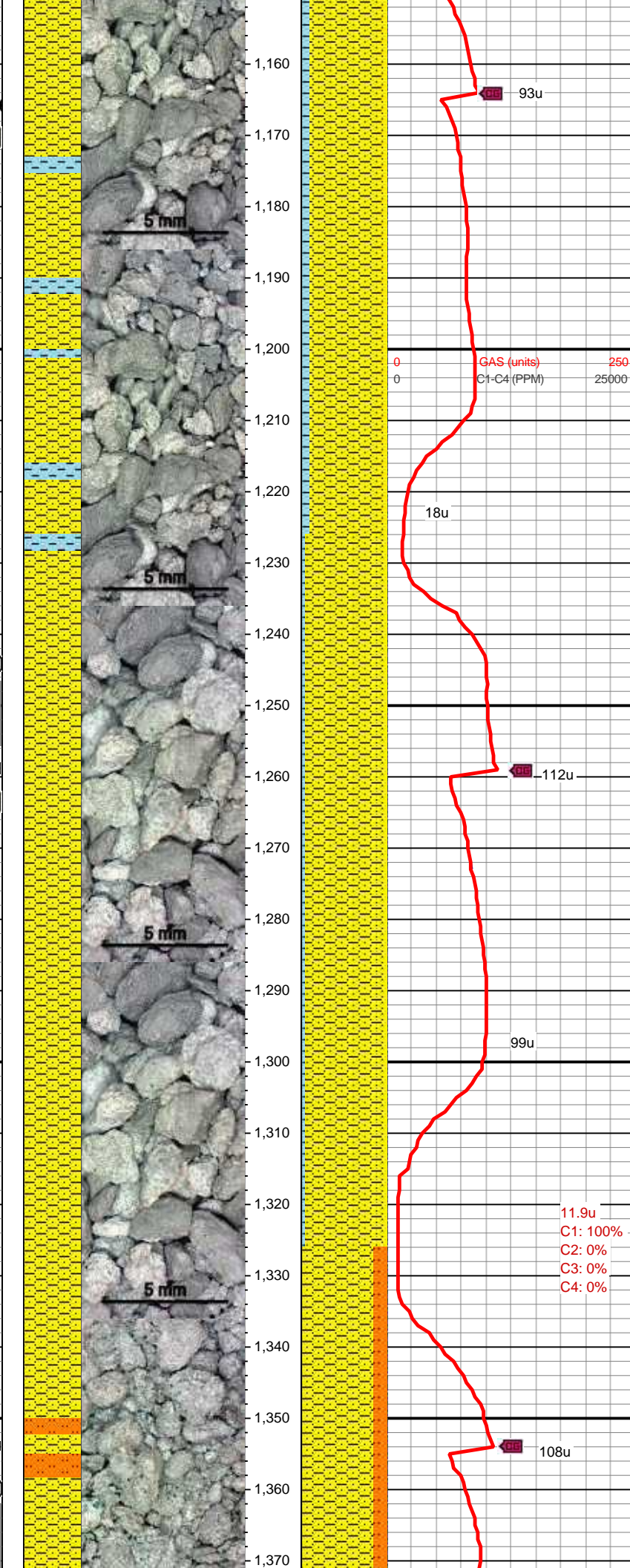
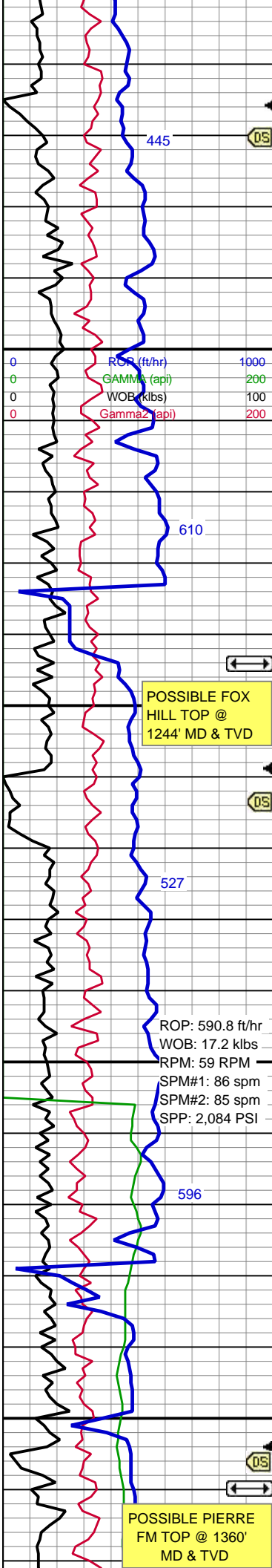
TD SURFACE 1041'MD @ 23:22 MST ON 12/18/2016. RAN 1039' OF 9 5/8" CASING, CEMENTED, TESTED BOP, MADE UP 6000' OF STANDS, RESUMED DRILLING OF INTERMEDIATE @ 15:33 MST ON 12/21/016.

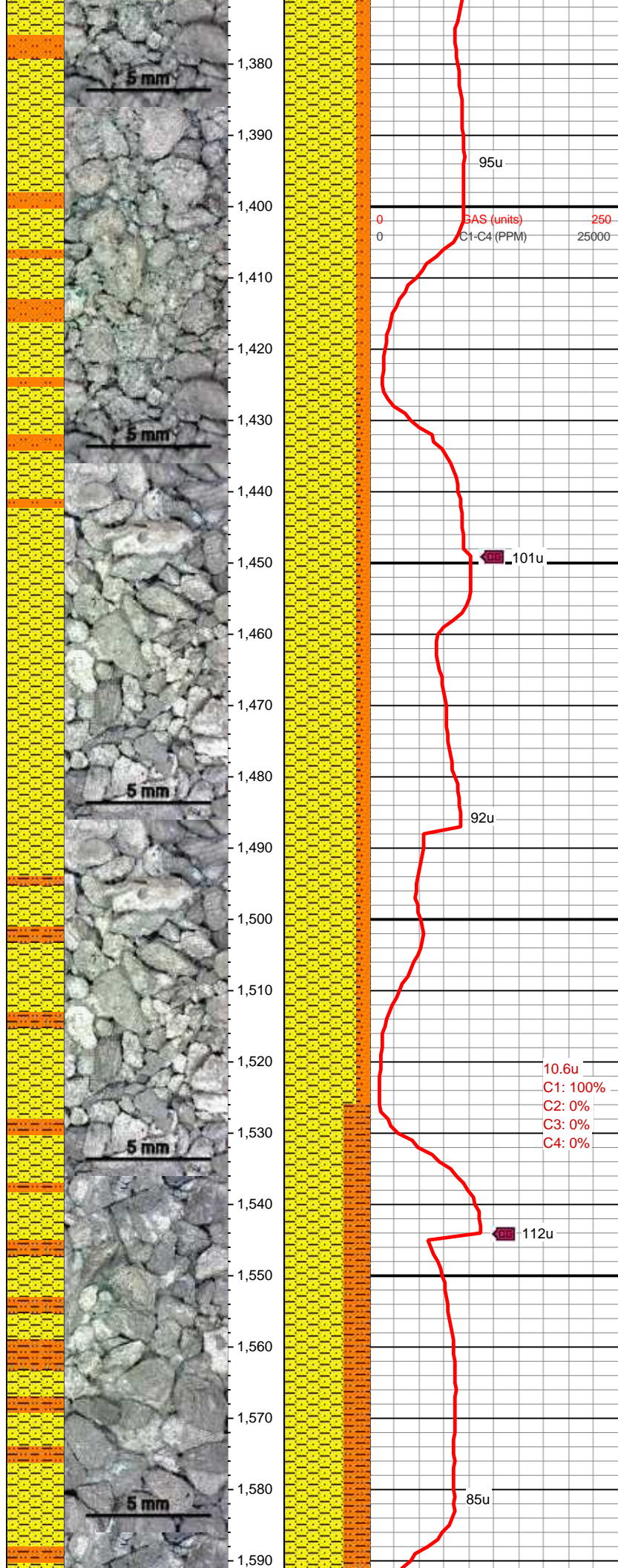
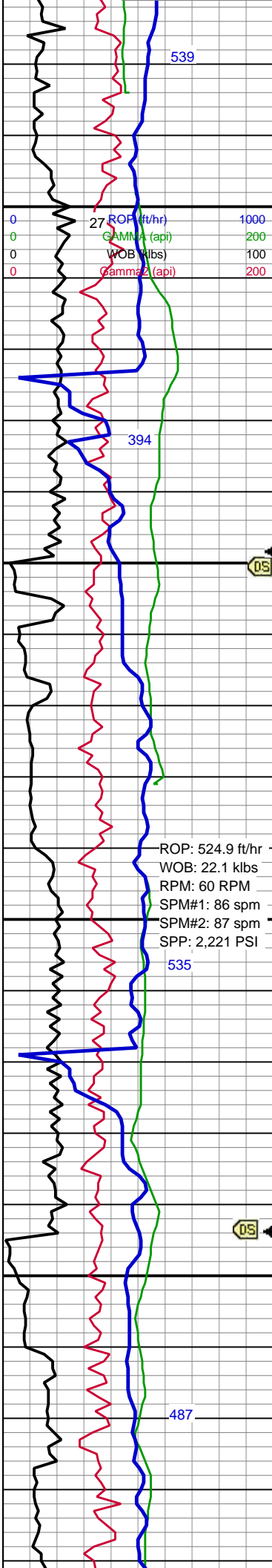
Drilling with gel based mud
MUD WT: 8.8/ VIS: 32
SHY SS: lt-med gy, rr clr-trnsl, s&p ip, com dk spec, vf-f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty-clt mtz, p-mod p por, occ grdng to slty sh, calc ip;
CLYST: lt gy, sm-slty tex, occ lith frag incl, sb blkly-sb plty, sft, slty ip, tr bent; tr yel min flor.

MD: 1,079'
Inclination: 0.6°
Azimuth: 257.2°
TVD: 1,078.98'
VS: -0.27'

MUD WT: 8.8/ VIS: 35

MD: 1,170'





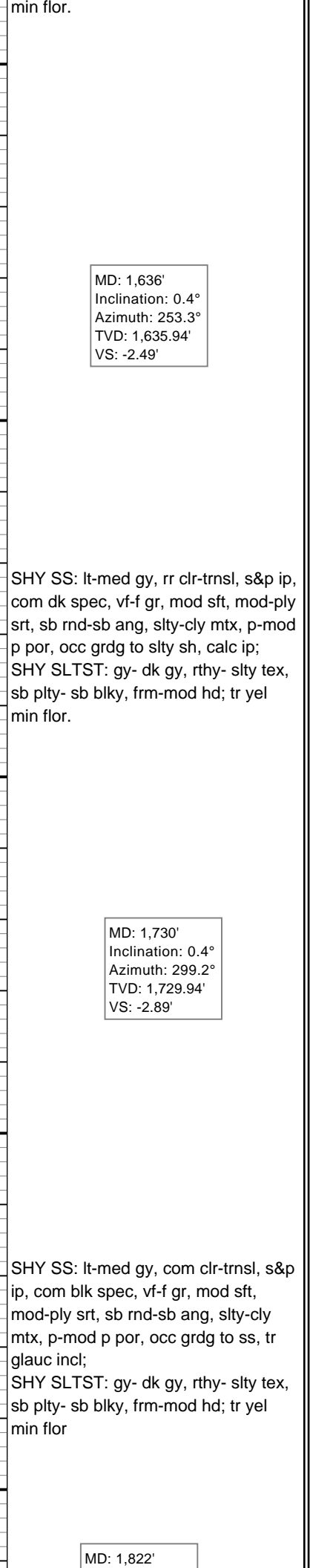
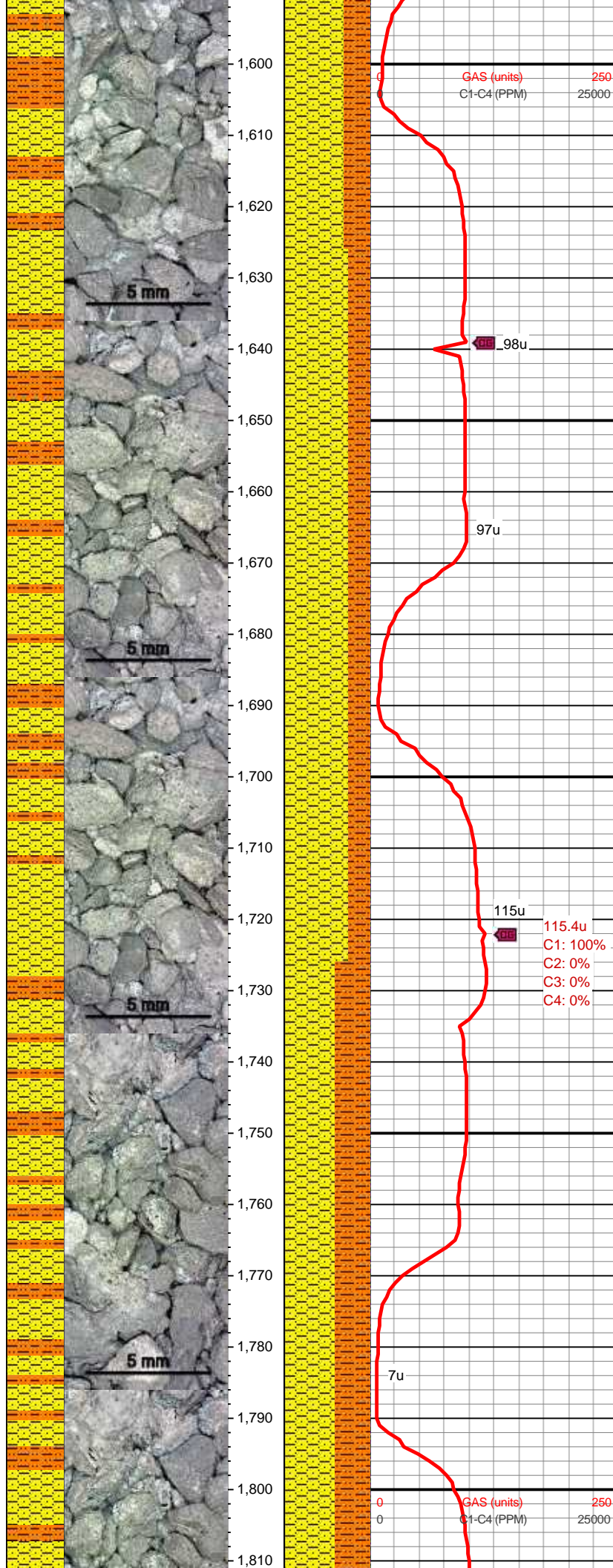
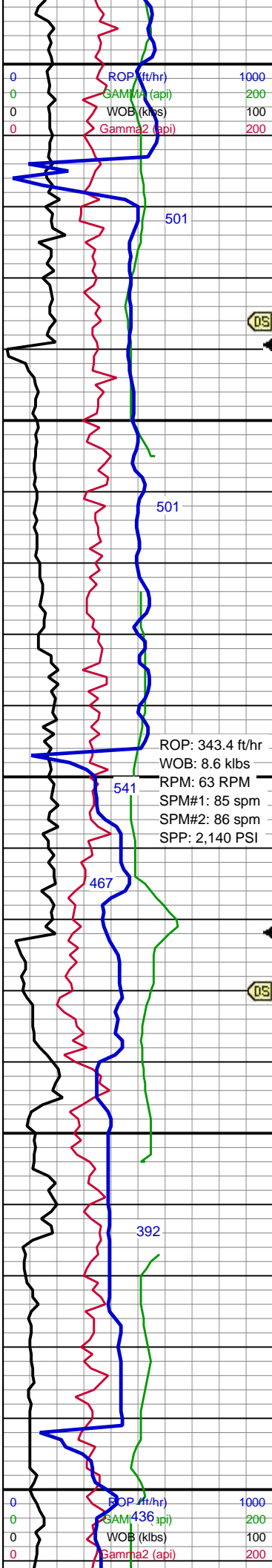
MD: 1,450'
Inclination: 0.8°
Azimuth: 246.7°
TVD: 1,449.95'
VS: -2.09'

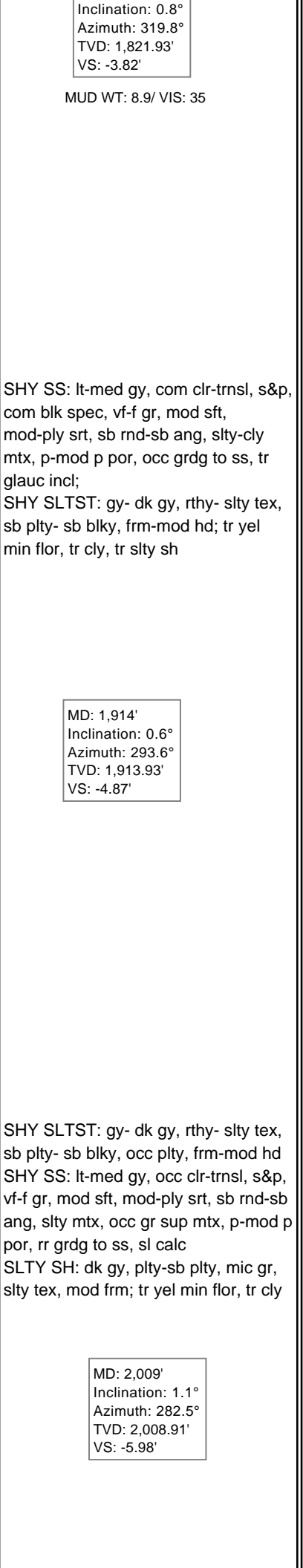
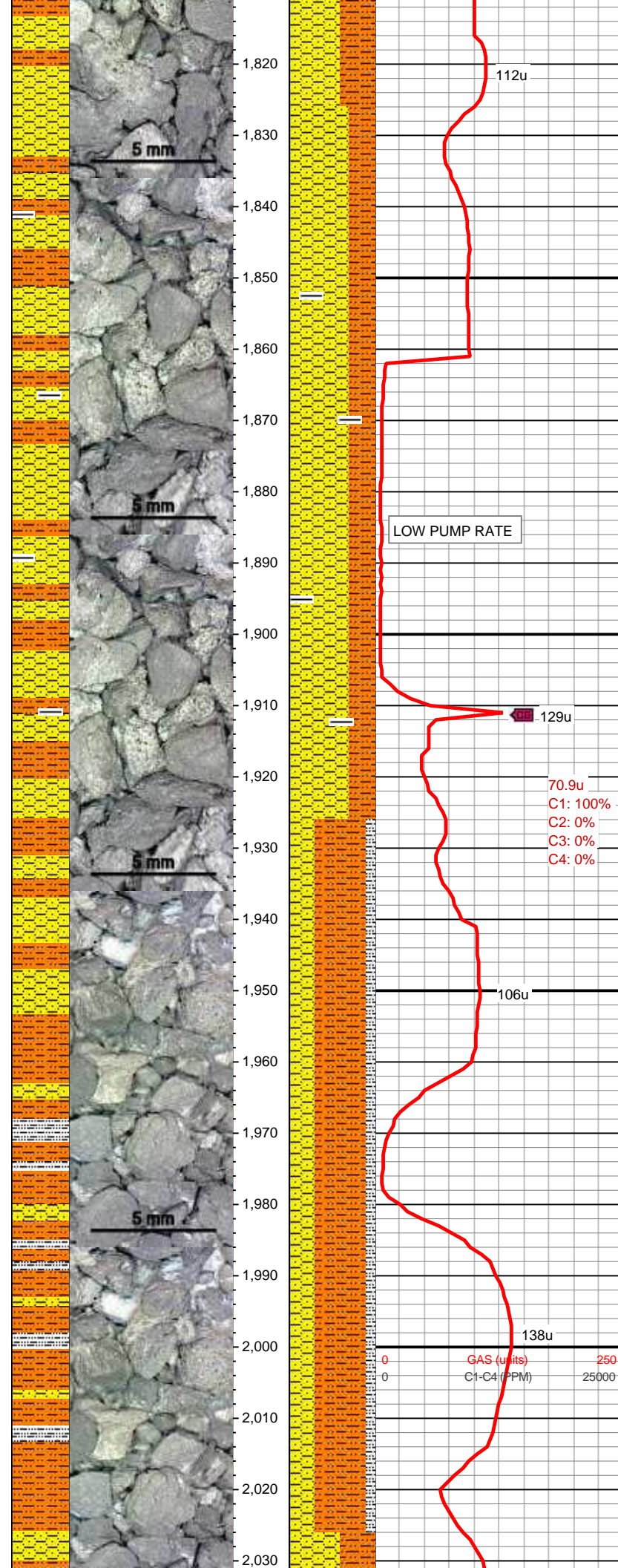
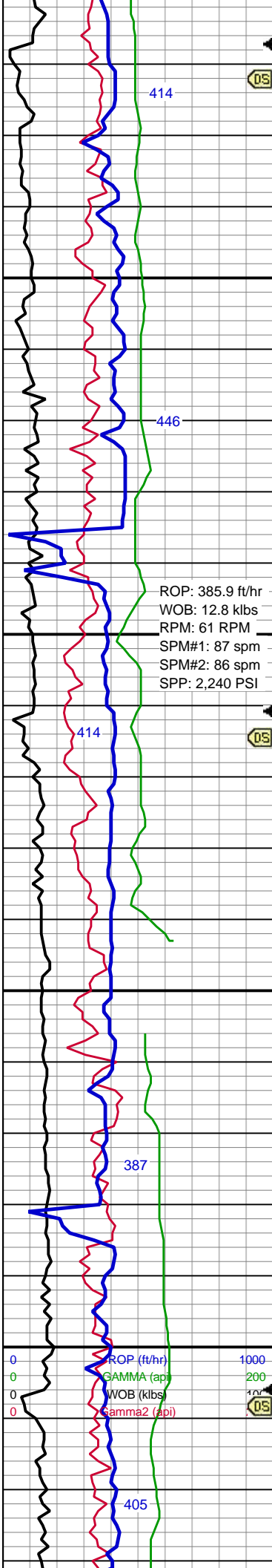
SHY SS: lt-med gy, rr clr-trnsl, s&p ip,
com dk spec, vf-f gr, mod sft, mod-ply
srt, sb rnd-sb ang, slty-cly mtz, p-mod
p por, occ grdg to slty sh, calc ip;
SLTST: gy- dk gy, rthy tex, sb blk-y-sb
ply, frm-mod hd, shy ip, tr bent
SHY SLTST: dk gy, slty tex, sb ply,
frm-mod hd; tr yel min flor.

MUD WT: 8.8/ VIS: 35

MD: 1,543'
Inclination: 0.7°
Azimuth: 242.4°
TVD: 1,542.94'
VS: -2.3'

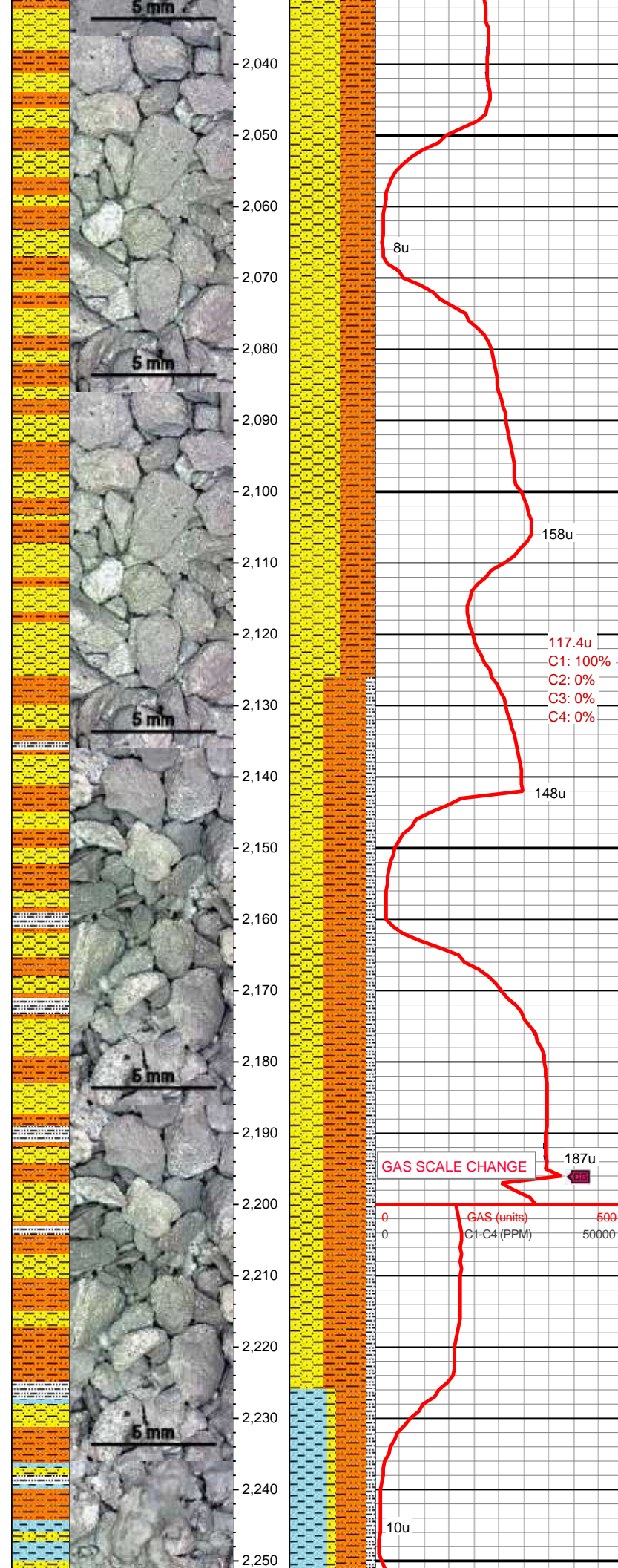
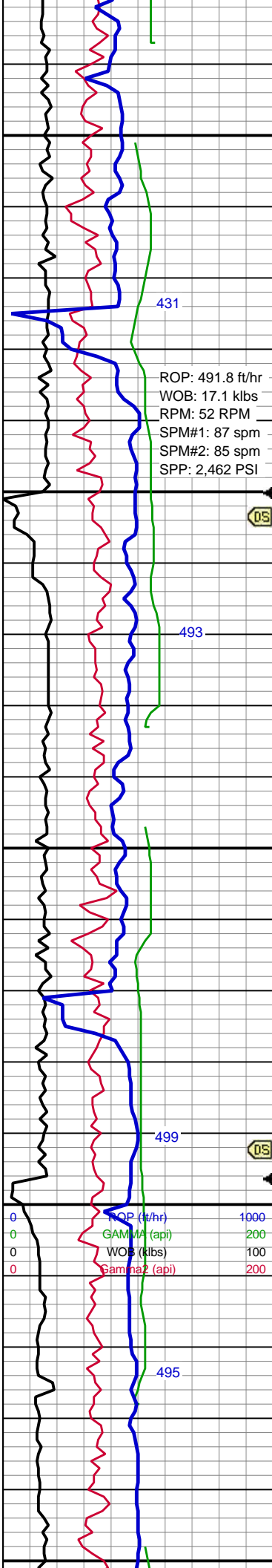
SHY SS: lt-med gy, rr clr-trnsl, s&p ip,
com dk spec, vf-f gr, mod sft, mod-ply
srt, sb rnd-sb ang, slty-cly mtz, p-mod
p por, occ grdg to slty sh, calc ip;
SHY SLTST: gy- dk gy, rthy- slty tex,
sb ply- sb blkly, frm-mod hd; tr yel





SHY SS: lt-med gy, com clr-trnsl, s&p, com blk spec, vf-f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty-clt mxt, p-mod p por, occ grdg to ss, tr glauc incl;
SHY SLTST: gy- dk gy, rthy- slty tex, sb plty- sb blkly, frm-mod hd; tr yel min flor, tr cly, tr slty sh

SHY SLTST: gy- dk gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm-mod hd
SHY SS: lt-med gy, occ clr-trnsl, s&p, vf-f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty mxt, occ gr sup mxt, p-mod p por, rr grdg to ss, sl calc
SLTY SH: dk gy, plty-sb plty, mic gr, slty tex, mod frm; tr yel min flor, tr cly



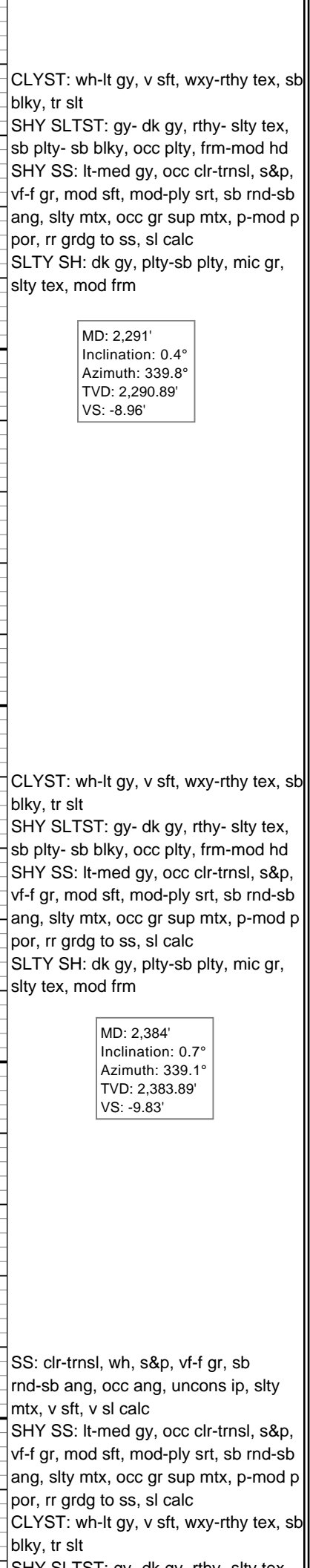
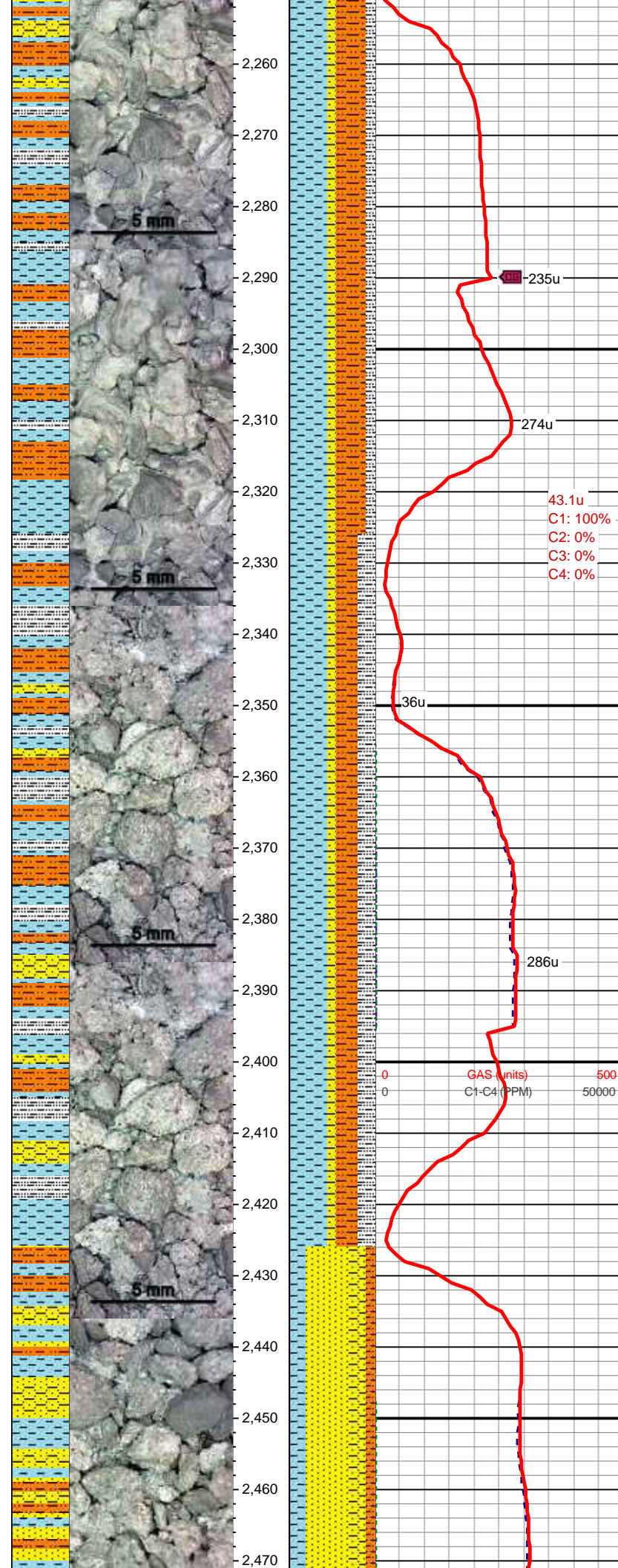
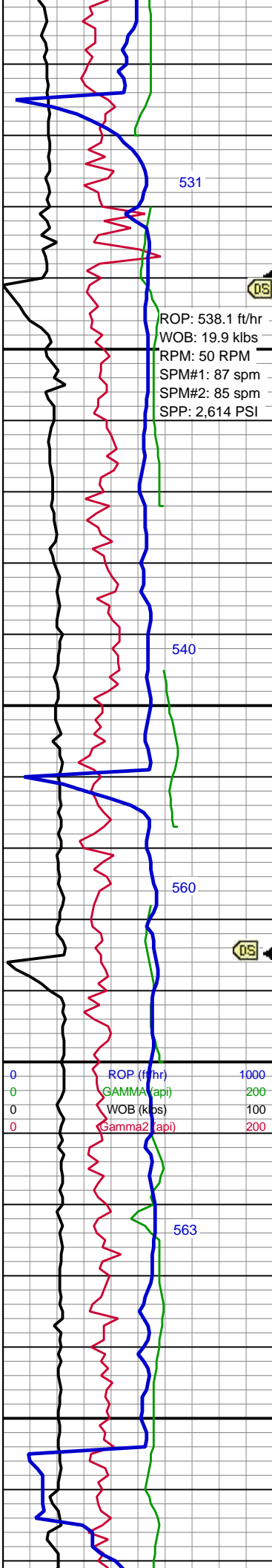
SHY SS: lt-med gy, com clr-trnsl, s&p, com blk spec, vf-f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty-clly mtz, p-mod p por, occ grdng to ss, tr glauc incl;
SHY SLTST: gy- dk gy, rthy- slty tex, sb plty- sb blkly, frm-mod hd; tr yel min flor

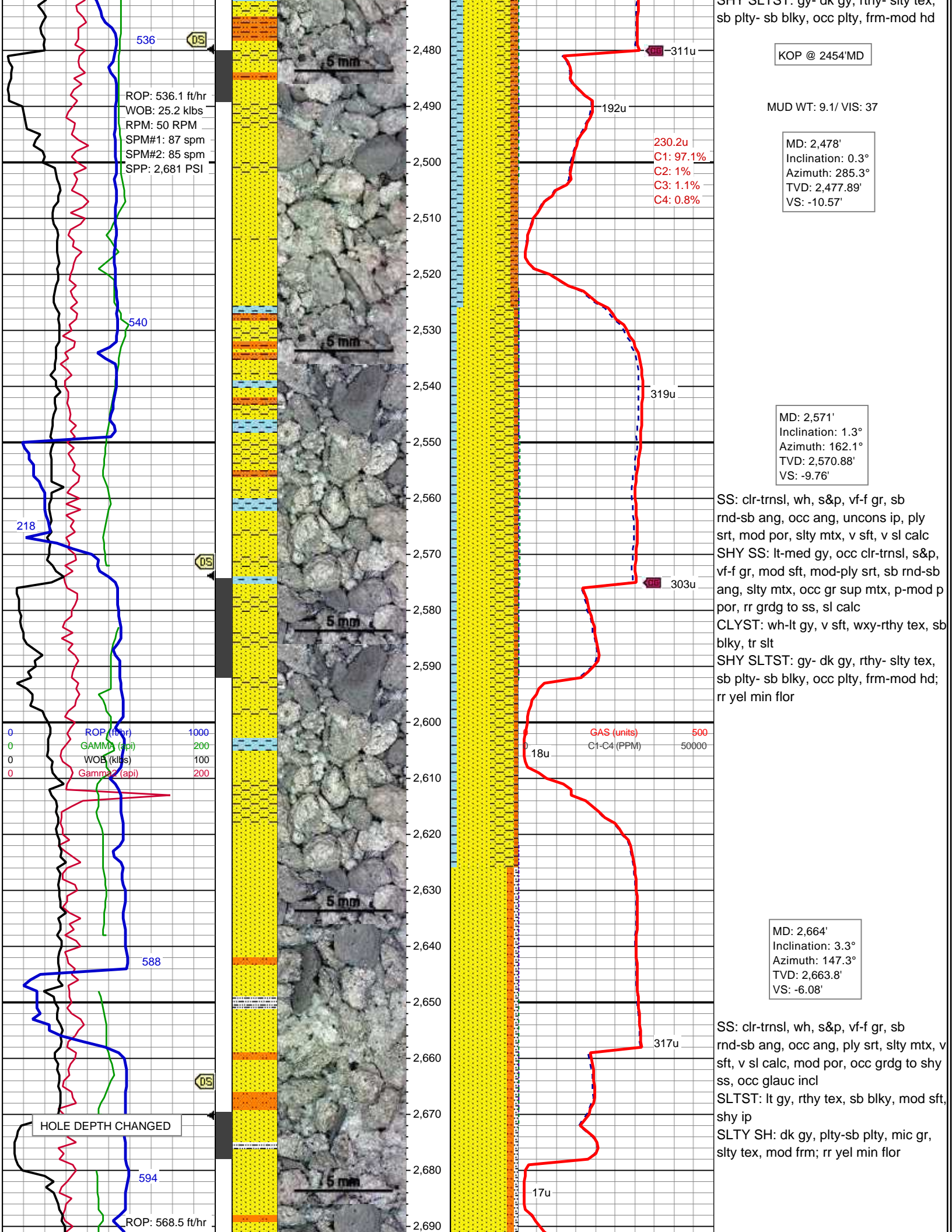
MD: 2,103'
Inclination: 0.7°
Azimuth: 303.6°
TVD: 2,102.9'
VS: -7.18'

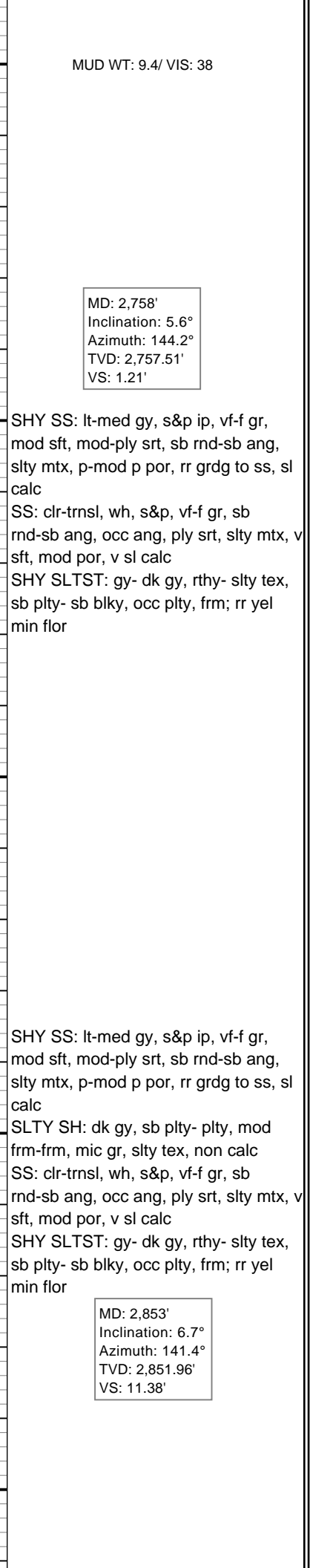
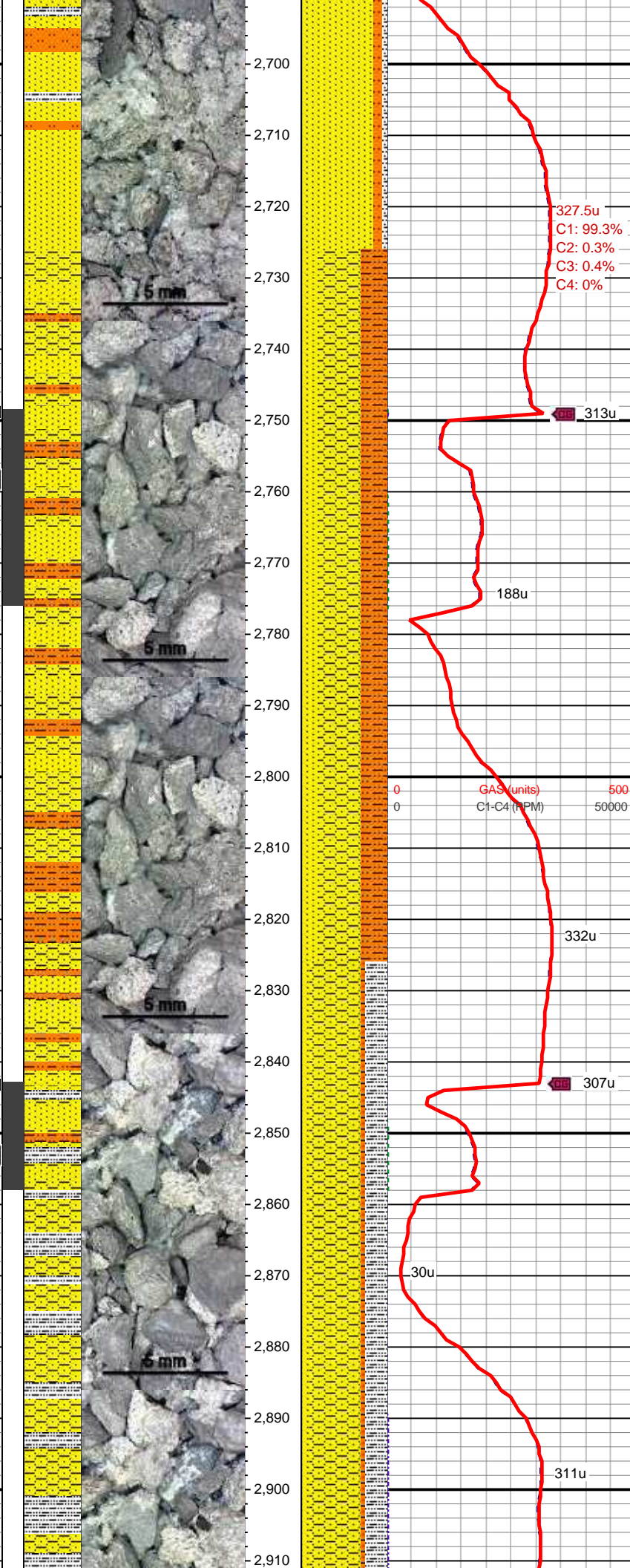
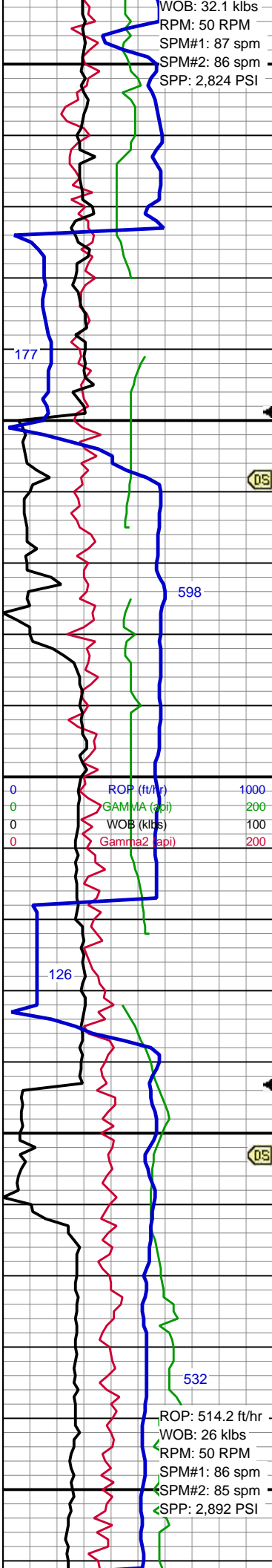
SHY SLTST: gy- dk gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm-mod hd
SHY SS: lt-med gy, occ clr-trnsl, s&p, vf-f gr, mod sft, mod-ply srt, sb rnd-sb ang, slty mtz, occ gr sup mtz, p-mod p por, rr grdng to ss, sl calc
SLTY SH: dk gy, plty-sb plty, mic gr, slty tex, mod frm; com cly, rr yel min flor

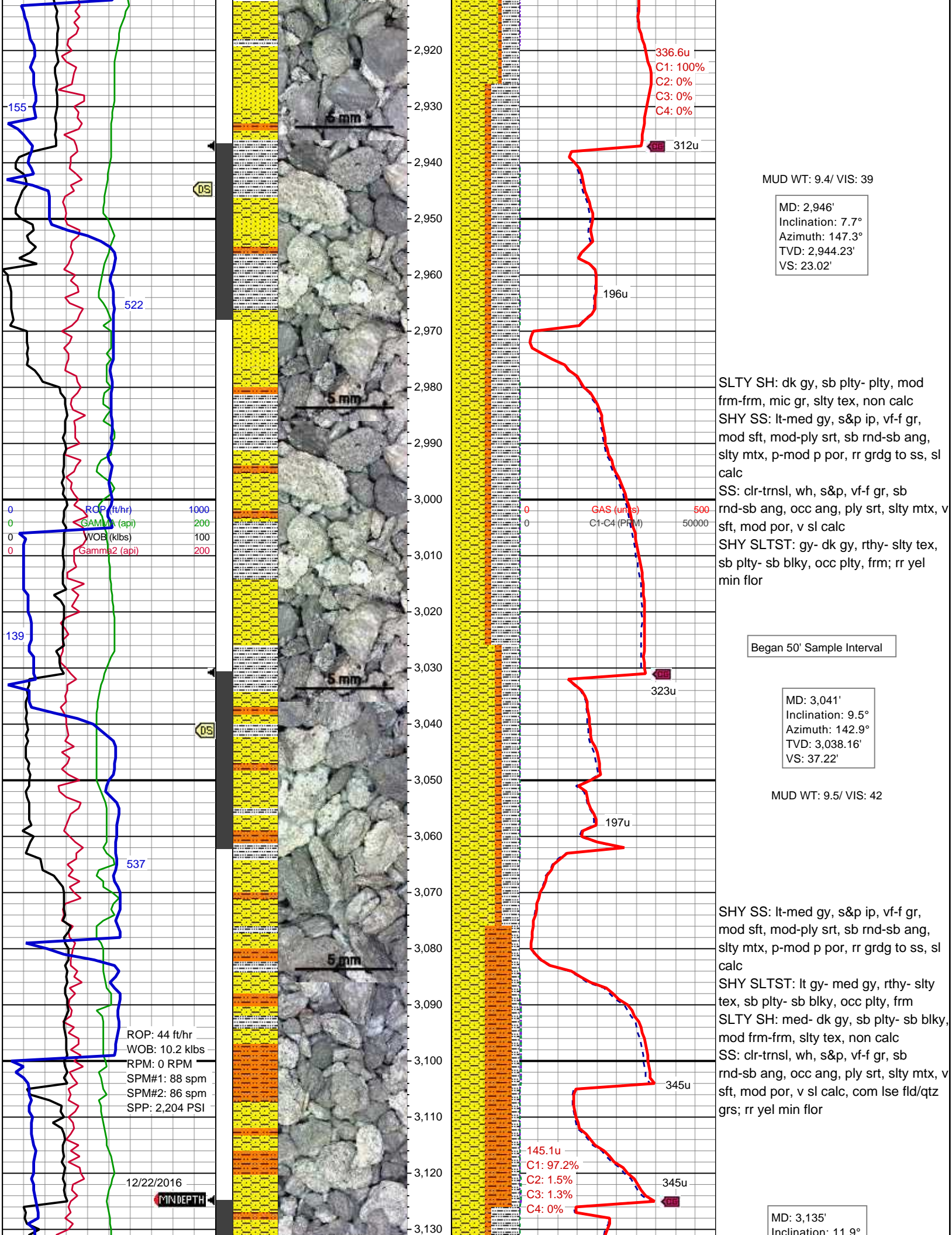
MD: 2,192'
Inclination: 0.6°
Azimuth: 307.5°
TVD: 2,191.9'
VS: -8.13'

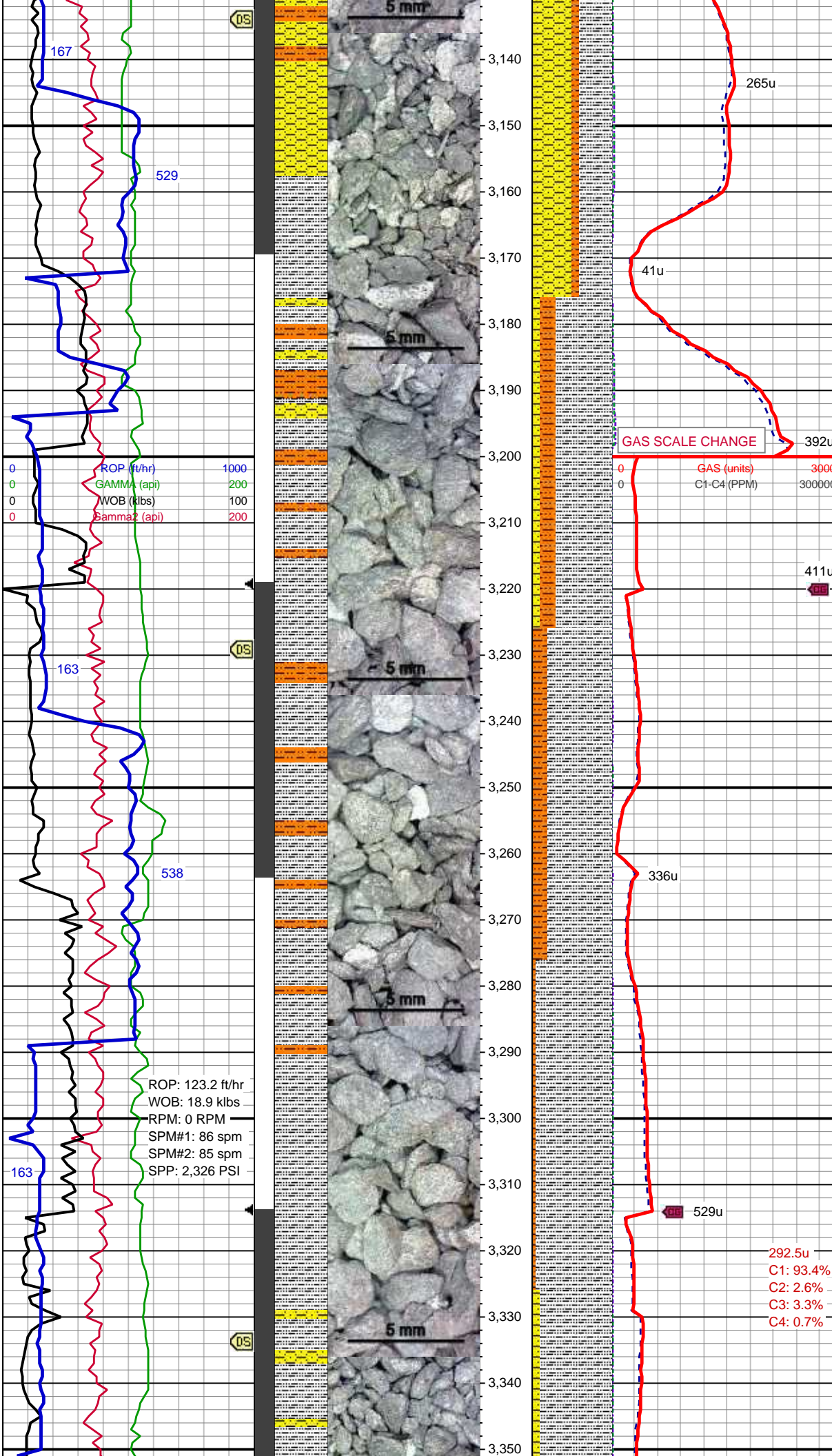
MUD WT: 8.9/ VIS: 36











WOB: 18.9 klbs
Azimuth: 143.1°
TVD: 3,130.52'
VS: 54.66'

SLTY SH: med- dk gy, sb plty- sb blkly,
mod frm-frm, slty tex, non calc
SHY SS: lt-med gy, s&p ip, vf-f gr,
mod sft, mod-ply srt, sb rnd-sb ang,
slty mtz, p-mod p por, rr grd to ss,
occ glauc incl, sl calc
SHY SLTST: lt gy- med gy, rthy- slty
tex, sb plty- sb blkly, occ plty, frm

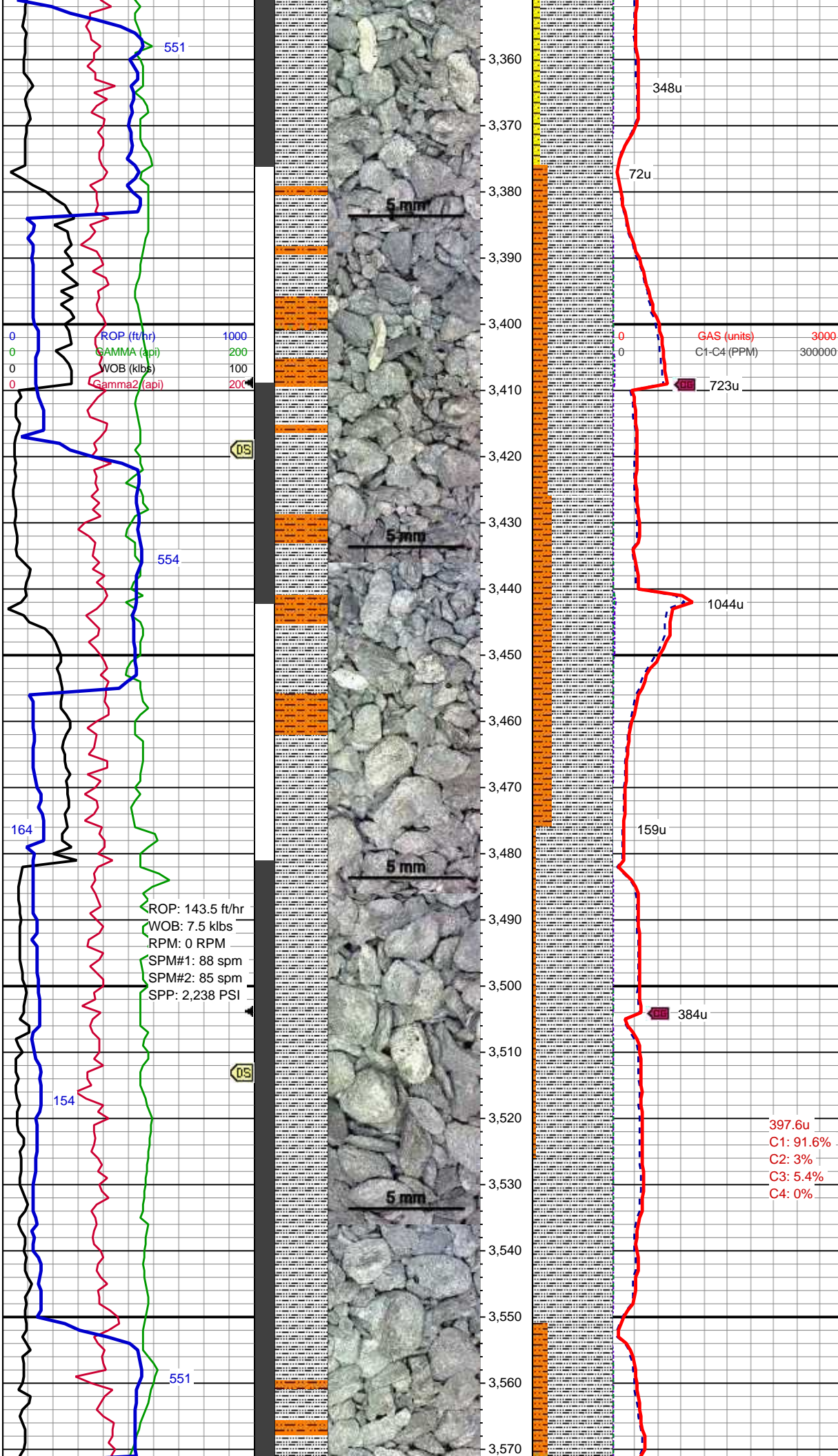
MUD WT: 9.2/ VIS: 38

MD: 3,229'
Inclination: 13.6°
Azimuth: 138.4°
TVD: 3,222.2'
VS: 75.34'

SLTY SH: med- dk gy, sb plty- sb blkly,
mod frm-frm, slty tex, non calc
SHY SLTST: lt gy- med gy, rthy- slty
tex, sb plty- sb blkly, occ plty, frm; rr
grdg to shy ss

MD: 3,324'
Inclination: 15.7°
Azimuth: 141.9°
TVD: 3,314.11'
VS: 99.29'

292.5u
C1: 93.4%
C2: 2.6%
C3: 3.3%
C4: 0.7%



MUD WT: 9.0/ VIS: 38

SLTY SH: med- dk gy, sb plty- sb blkly,
mod frm-frm, slty tex, non calc
SHY SLTST: lt gy- med gy, rthy- slty
tex, sb plty- sb blkly, occ plty, frm
SHY SS: lt gy, occ clr-s&p, vf gr, sb
ang-sb rnd, mod srt,pred gr sup mtx,
v sl calc

MD: 3,419'
Inclination: 17.4°
Azimuth: 141.5°
TVD: 3,405.17'
VS: 126.32'

MUD WT: 8.9/ VIS: 37

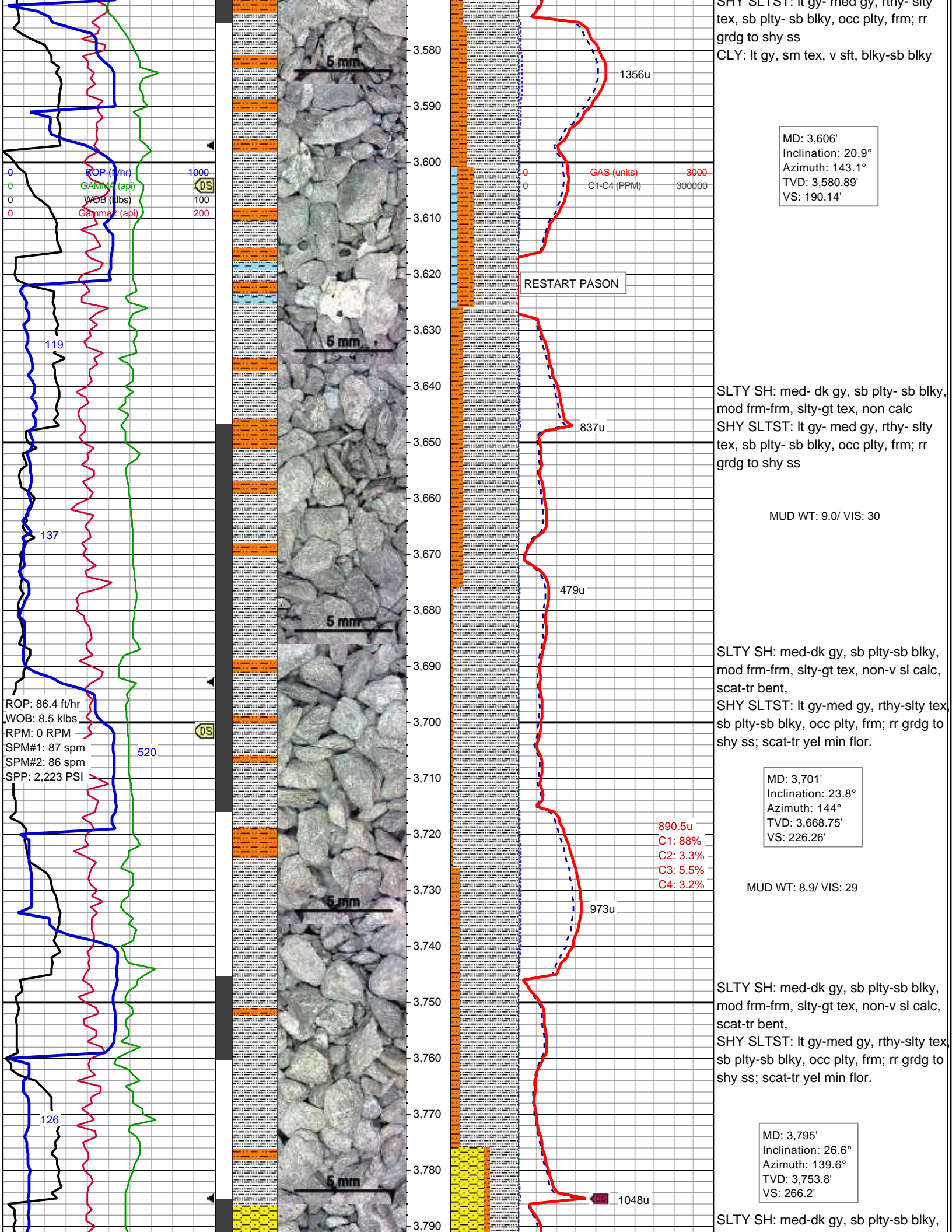
SLTY SH: med- dk gy, sb plty- sb blkly,
mod frm-frm, slty-gt tex, non calc
SHY SLTST: lt gy- med gy, rthy- slty
tex, sb plty- sb blkly, occ plty, frm; rr
grdg to shy ss

MD: 3,513'
Inclination: 20.8°
Azimuth: 143.8°
TVD: 3,493.98'
VS: 157.05'

Depth: 3,500
Mud Weight: 8.8
Viscosity: 30
Yield Pt: 4
Filter Cake: 32
Solids: 4%
pH: 8.9
Chlorides: 800 mg/l

MUD WT: 8.8/ VIS: 30

SLTY SH: med- dk gy, sb plty- sb blkly,
mod frm-frm, slty-gt tex, non calc
SHY SLTST: lt gy- med gy, rthy- slty



SLTY SLTST: lt gy- med gy, rthy- slty
tex, sb plty- sb blkly, occ plty, frm; rr
grdg to shy ss
CLY: lt gy, sm tex, v sft, blkly-sb blkly

MD: 3,606'
Inclination: 20.9°
Azimuth: 143.1°
TVD: 3,580.89'
VS: 190.14'

SLTY SH: med- dk gy, sb plty- sb blkly,
mod frm-frm, slty-gt tex, non calc
SHY SLTST: lt gy- med gy, rthy- slty
tex, sb plty- sb blkly, occ plty, frm; rr
grdg to shy ss

MUD WT: 9.0/ VIS: 30

SLTY SH: med-dk gy, sb plty-sb blkly,
mod frm-frm, slty-gt tex, non-v sl calc,
scat-tr bent,
SHY SLTST: lt gy-med gy, rthy-slty tex,
sb plty-sb blkly, occ plty, frm; rr grdg to
shy ss; scat-tr yel min flor.

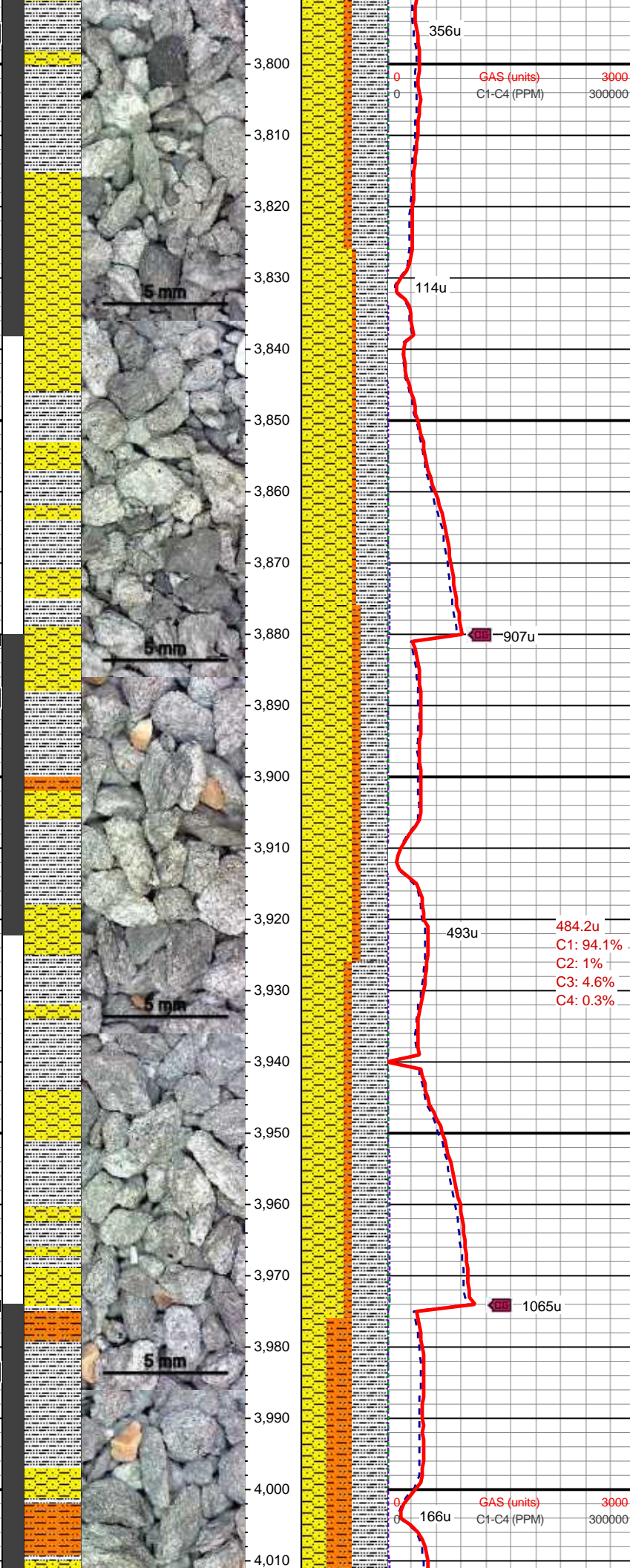
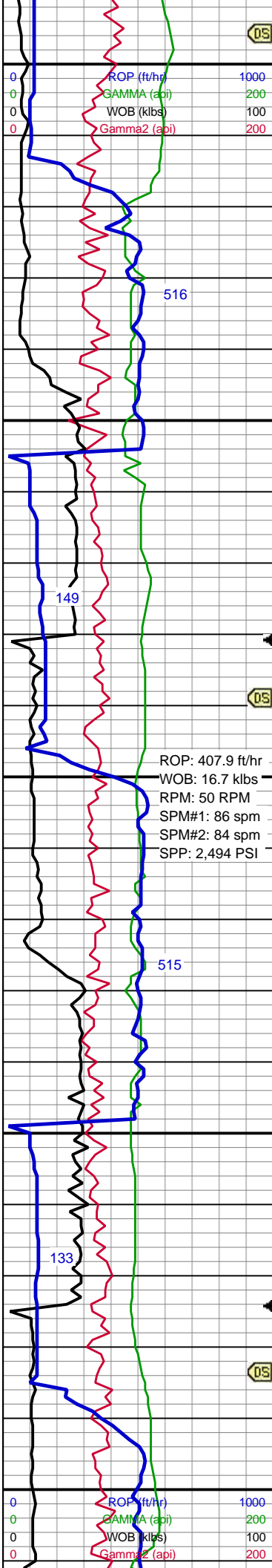
MD: 3,701'
Inclination: 23.8°
Azimuth: 144°
TVD: 3,668.75'
VS: 226.26'

MUD WT: 8.9/ VIS: 29

SLTY SH: med-dk gy, sb plty-sb blkly,
mod frm-frm, slty-gt tex, non-v sl calc,
scat-tr bent,
SHY SLTST: lt gy-med gy, rthy-slty tex,
sb plty-sb blkly, occ plty, frm; rr grdg to
shy ss; scat-tr yel min flor.

MD: 3,795'
Inclination: 26.6°
Azimuth: 139.6°
TVD: 3,753.8'
VS: 266.2'

SLTY SH: med-dk gy, sb plty-sb blkly,



mod frm-frm, slty-gt tex, non-v sl calc, tr bent,
SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm
SHY SS: lt gy-wh, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmtd, cly mtx, p-mod p por, v sl calc; tr yel min flor.

MUD WT: 8.9/ VIS: 30

SLTY SH: med-dk gy, sb plty-sb blkly, mod frm-frm, slty-gt tex, non-v sl calc, tr bent,
SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm
SHY SS: lt gy-wh, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmtd, cly mtx, p-mod p por, v sl calc; rr yel min flor.

MUD WT: 8.9/ VIS: 30

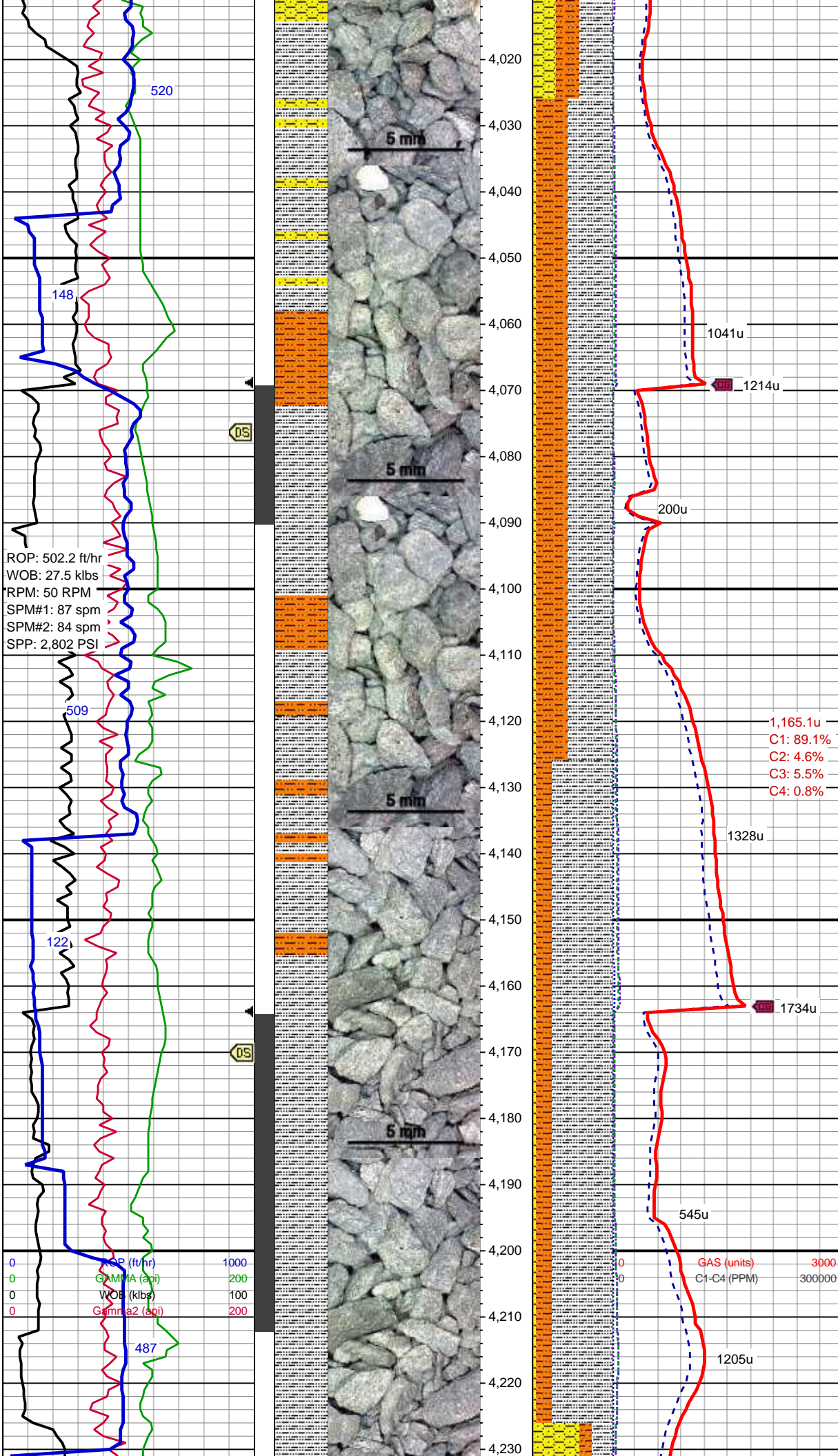
SLTY SH: med-dk gy, sb plty-sb blkly, mod frm-frm, slty-gt tex, non-v sl calc, tr bent,
SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm
SHY SS: lt gy-wh, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmtd, cly mtx, p-mod p por, v sl calc; rr yel min flor.

MD: 3,889'
Inclination: 29.2°
Azimuth: 140.5°
TVD: 3,836.87'
VS: 310.05'

SLTY SH: med-dk gy, sb plty-sb blkly, mod frm-frm, slty-gt tex, non-v sl calc, tr bent,
SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm
SHY SS: lt gy-wh, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmtd, cly mtx, p-mod p por, v sl calc; rr yel min flor.

SLTY SH: med-dk gy, sb plty-sb blkly, mod frm-frm, slty-gt tex, non-v sl calc, tr bent,
SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm
SHY SS: lt gy-wh, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmtd, cly mtx, p-mod p por, v sl calc; rr yel min flor.

MUD WT: 8.9/ VIS: 28



MD: 3,983'
Inclination: 32.6°
Azimuth: 142.1°
TVD: 3,917.51'
VS: 358.24'

Resumed 100' Sample Interval

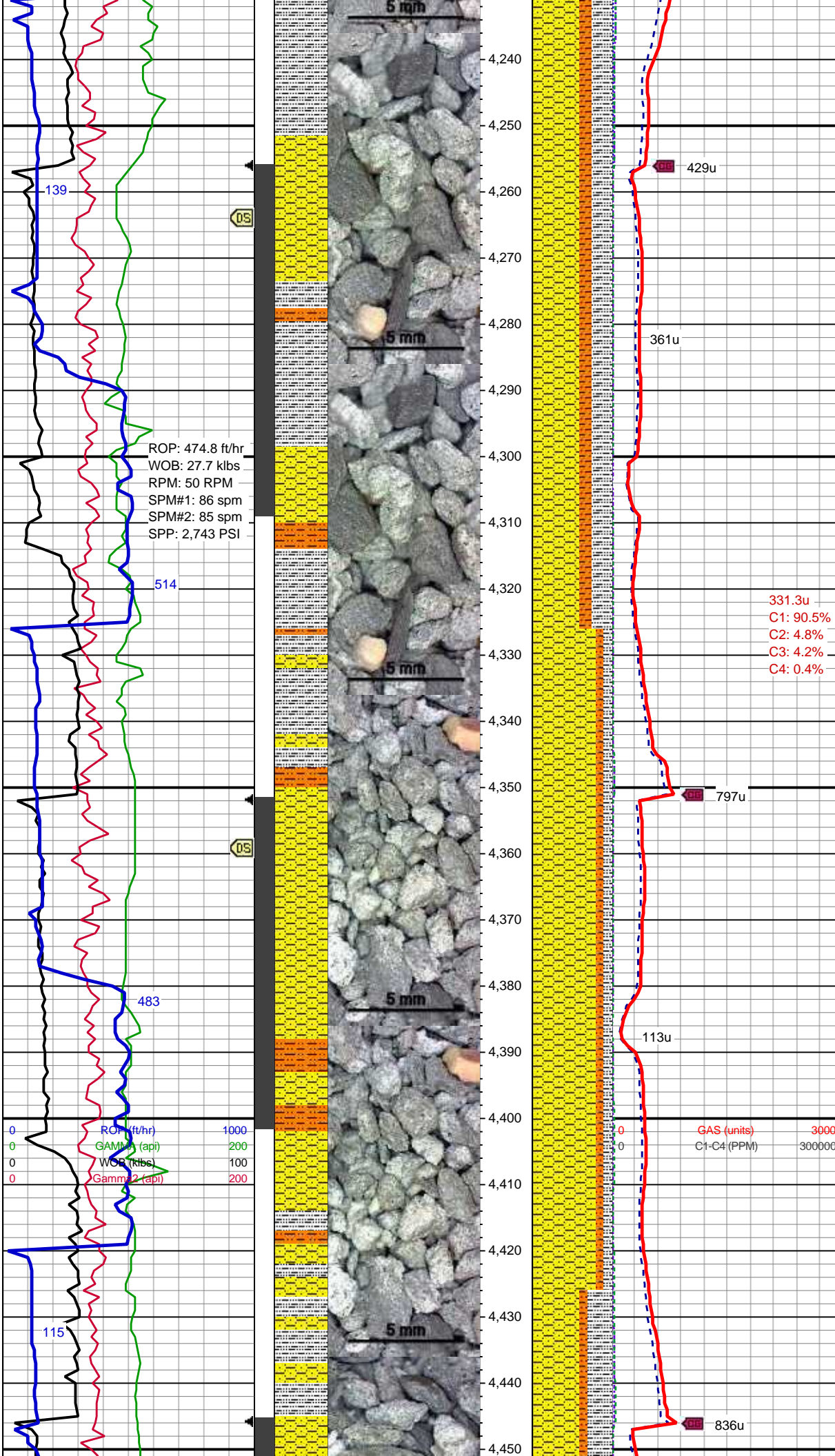
SLTY SH: med-dk gy, sb plty-sb blkly, mod frm-frm, slty-gt tex, non-v sl calc, tr bent,
SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm
SHY SS: lt gy-wh, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmted, cly mtx, p-mod p por, v sl calc; rr yel min flor, v lt bl difse cut, no visable show or od.

MD: 4,076'
Inclination: 31.9°
Azimuth: 143.1°
TVD: 3,996.17'
VS: 407.83'

MUD WT: 8.8/ VIS: 28

MD: 4,170'
Inclination: 32°
Azimuth: 143.5°
TVD: 4,075.93'
VS: 457.56'

SLTY SH: med-dk gy, sb plty-sb blkly, mod frm-frm, slty-gt tex, non-v sl calc, tr bent,
SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blkly, occ plty, frm
SHY SS: lt gy-wh, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmted, cly mtx, p-mod p por, v sl calc; rr yel min flor, v lt bl difse cut, no visable show or od.



MD: 4,264'
Inclination: 34.1°
Azimuth: 144.4°
TVD: 4,154.71'
VS: 508.82'

SLTY SH: med-dk gy, sb plty-sb blk, mod frm-frm, slty-gt tex, non-v sl calc, tr bent,
SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blk, occ plty, frm
SHY SS: lt gy-wh-lt brn, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmt, cly mtx, p-mod p por, v sl calc; rr yel min flor, v lt yel bl difse cut, no visable show or od.

MUD WT: 8.8/ VIS: 28

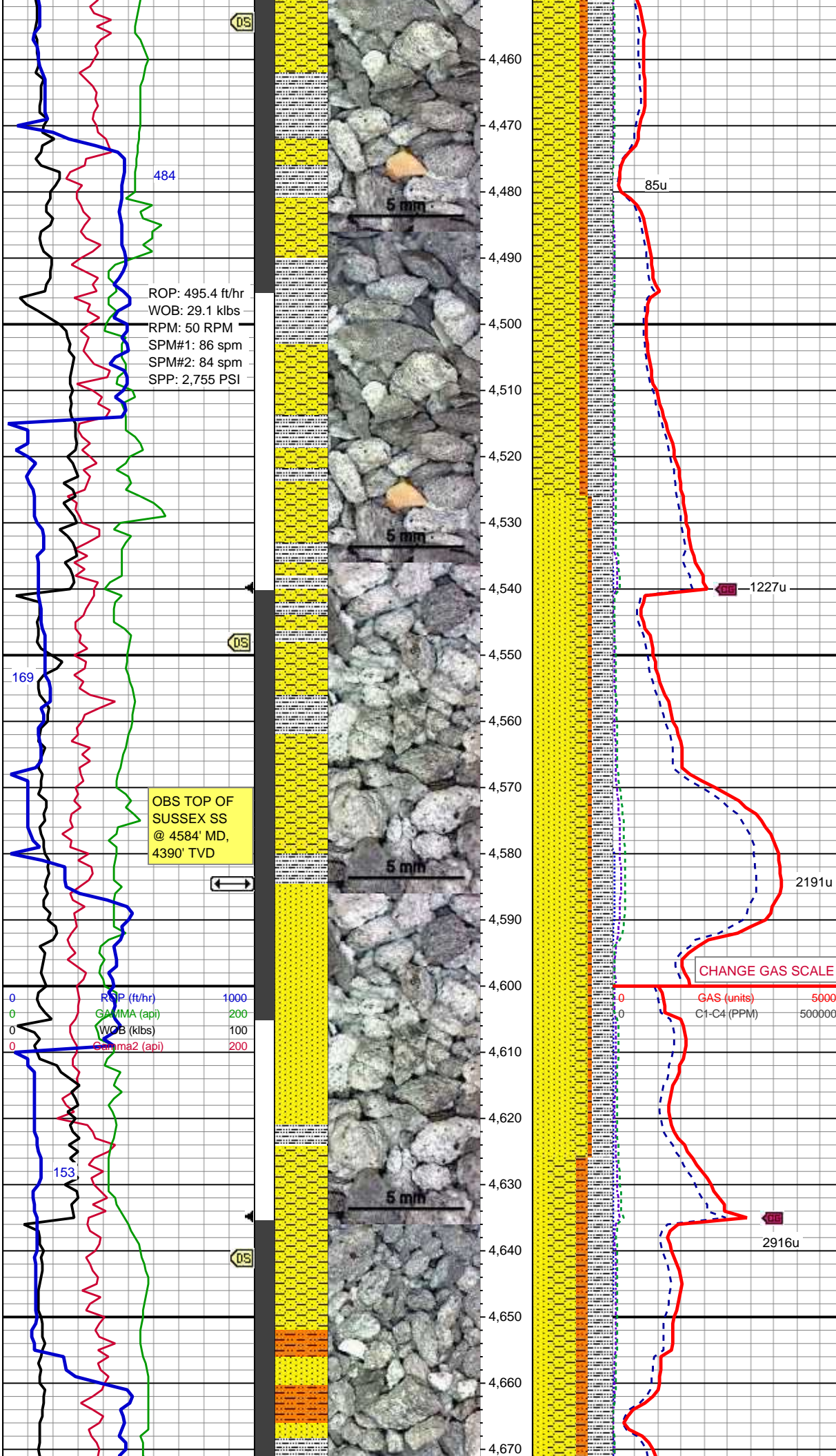
MD: 4,359'
Inclination: 36.1°
Azimuth: 144.7°
TVD: 4,232.43'
VS: 563.44'

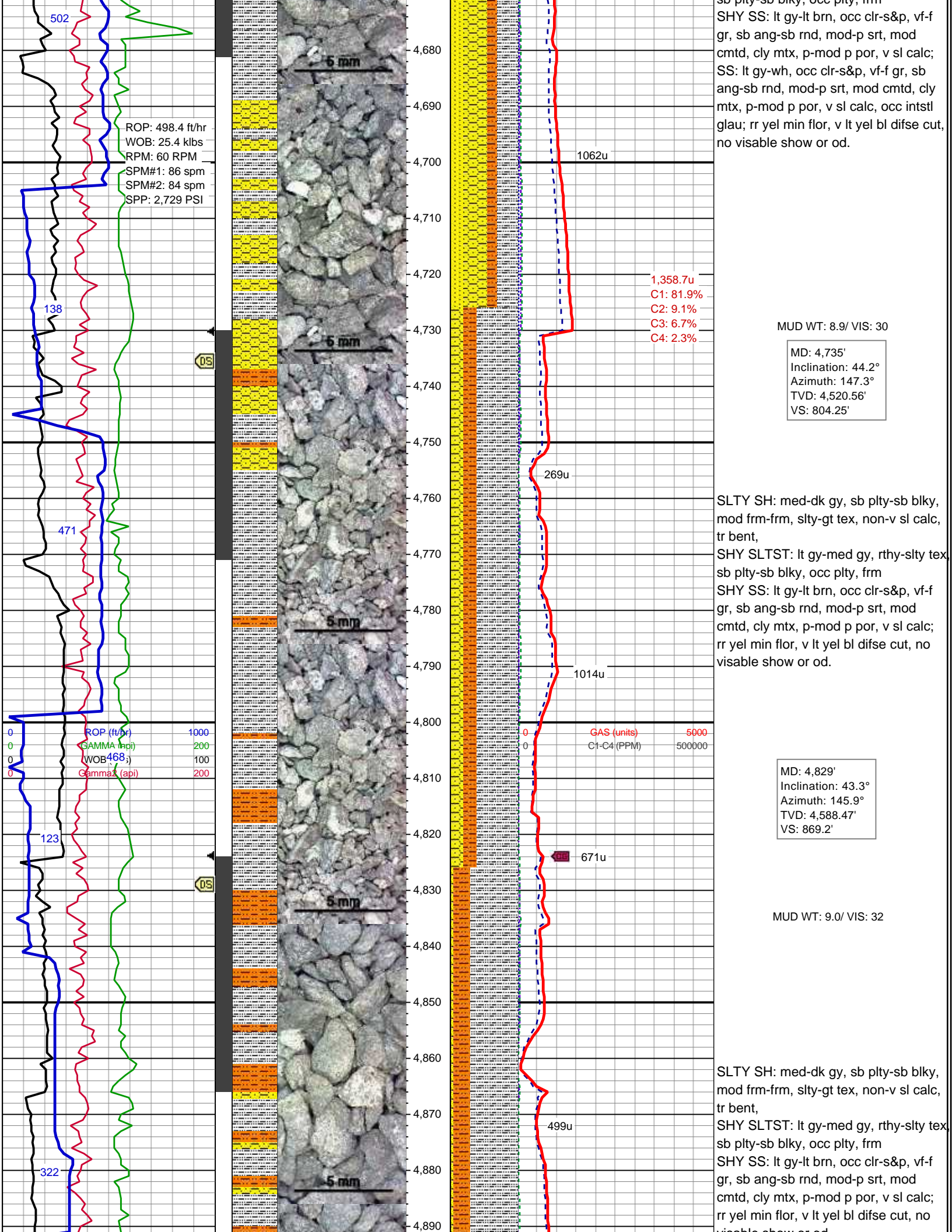
SLTY SH: med-dk gy, sb plty-sb blk, mod frm-frm, slty-gt tex, non-v sl calc, tr bent,
SHY SLTST: lt gy- med gy, rthy- slty tex, sb plty- sb blk, occ plty, frm
SHY SS: lt gy-wh-lt brn, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmt, cly mtx, p-mod p por, v sl calc; rr yel min flor, v lt yel bl difse cut, no visable show or od.

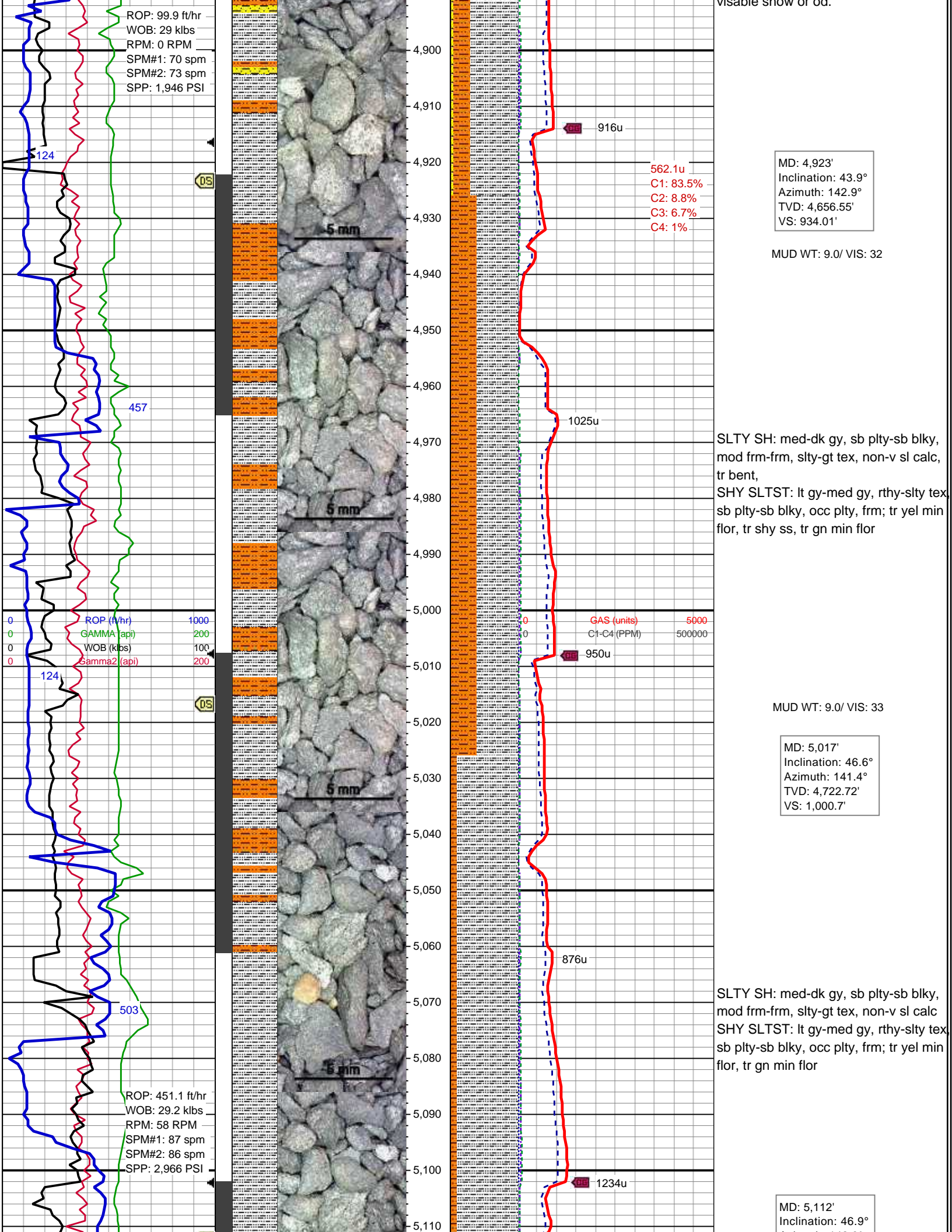
MD: 4,454'
Inclination: 37.2°
Azimuth: 144.5°
TVD: 4,308.65'

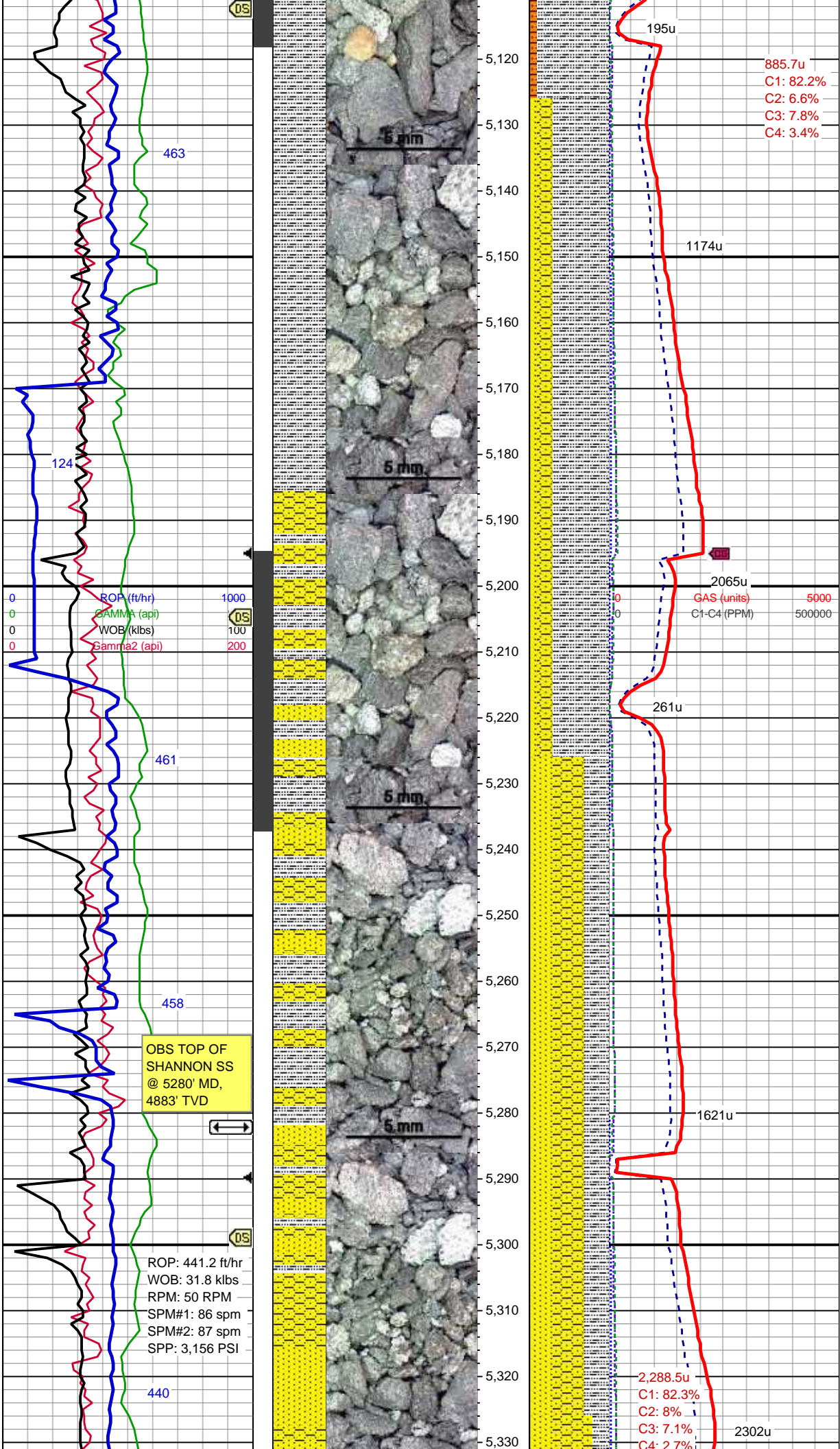
MD: 4,641'
Inclination: 42.9°
Azimuth: 146.3°
TVD: 4,452.44'
VS: 739.54'

SLTY SH: med-dk gy, sb plty-sb blkly,
mod frm-frm, slty-gt tex, non-v sl calc,
tr bent,
SHY SLTST: lt gy-med gy, rthy-sltly tex,
sb plty-sb blkly, ooc plty frm









Azimuth: 142.9°
TVD: 4,787.81'
VS: 1,069.83'

885.7u
C1: 82.2%
C2: 6.6%
C3: 7.8%
C4: 3.4%

SLTY SH: med-dk gy, sb plty-sb blk, mod frm-frm, slty-gt tex, non-v sl calc, tr bent
SHY SS: lt gy-brn, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmt, cly mtx, p-mod p por, v sl calc
SS: lt gy-wh, occ clr-s&p, vf-f gr, sb ang-sb rnd, p srt, mod cmt, cly mtx, occ gr sup mtx, abnt uncon grs, mod p-mod por, v sl calc; yel min flor, tr gn min flor

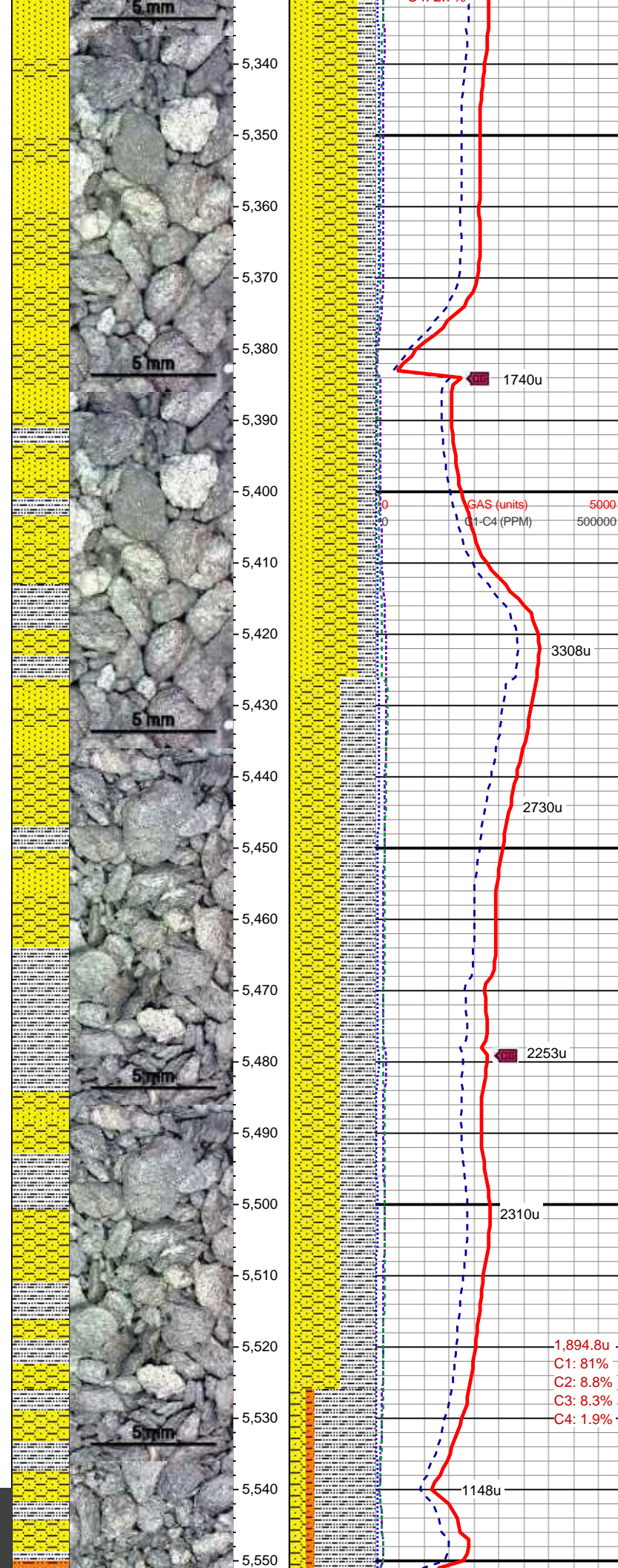
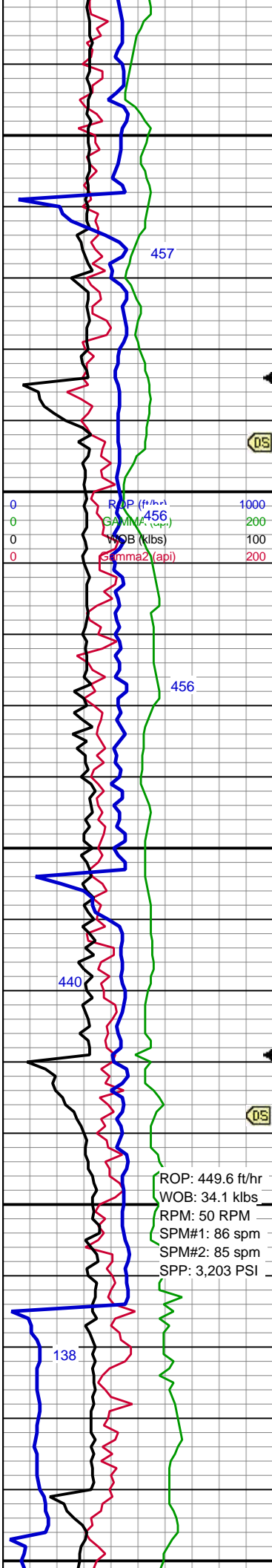
MUD WT: 9.05 / VIS: 36 IN
9.2 / 37 OUT

MD: 5,205'
Inclination: 49.4°
Azimuth: 144°
TVD: 4,849.86'
VS: 1,139.09'

SHY SS: lt gy-gy/brn, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, mod cmt, cly mtx, p-mod p por, v sl calc
SS: clr-trns, occ lt gy-wh, vf-f gr, sb ang-sb rnd, p srt, mod cmt, cly mtx, occ gr sup mtx, abnt uncon grs, mod p-mod por, v sl calc
SLTY SH: med-dk gy, sb plty-sb blk, mod frm-frm, slty-gt tex, non-v sl calc, tr bent; tr yel min flor, tr gn min flor

MD: 5,299'
Inclination: 48.4°
Azimuth: 144.9°
TVD: 4,911.65'
VS: 1,209.92'

2,288.5u
C1: 82.3%
C2: 8%
C3: 7.1%
C4: 2.7%



SHY SS: lt gy-gy/brn, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, cly mtx, p por, v sl calc
SS: lt gy-wh, occ clr- s&p, vf-f gr, sb ang-sb rnd, p srt, cly mtx, occ gr sup mtx, mod p-p por, v sl calc, occ glauc incl
SLTY SH: med-dk gy, sb plty-sb blk, mod frm-frm, slty-gt tex, non-v sl calc

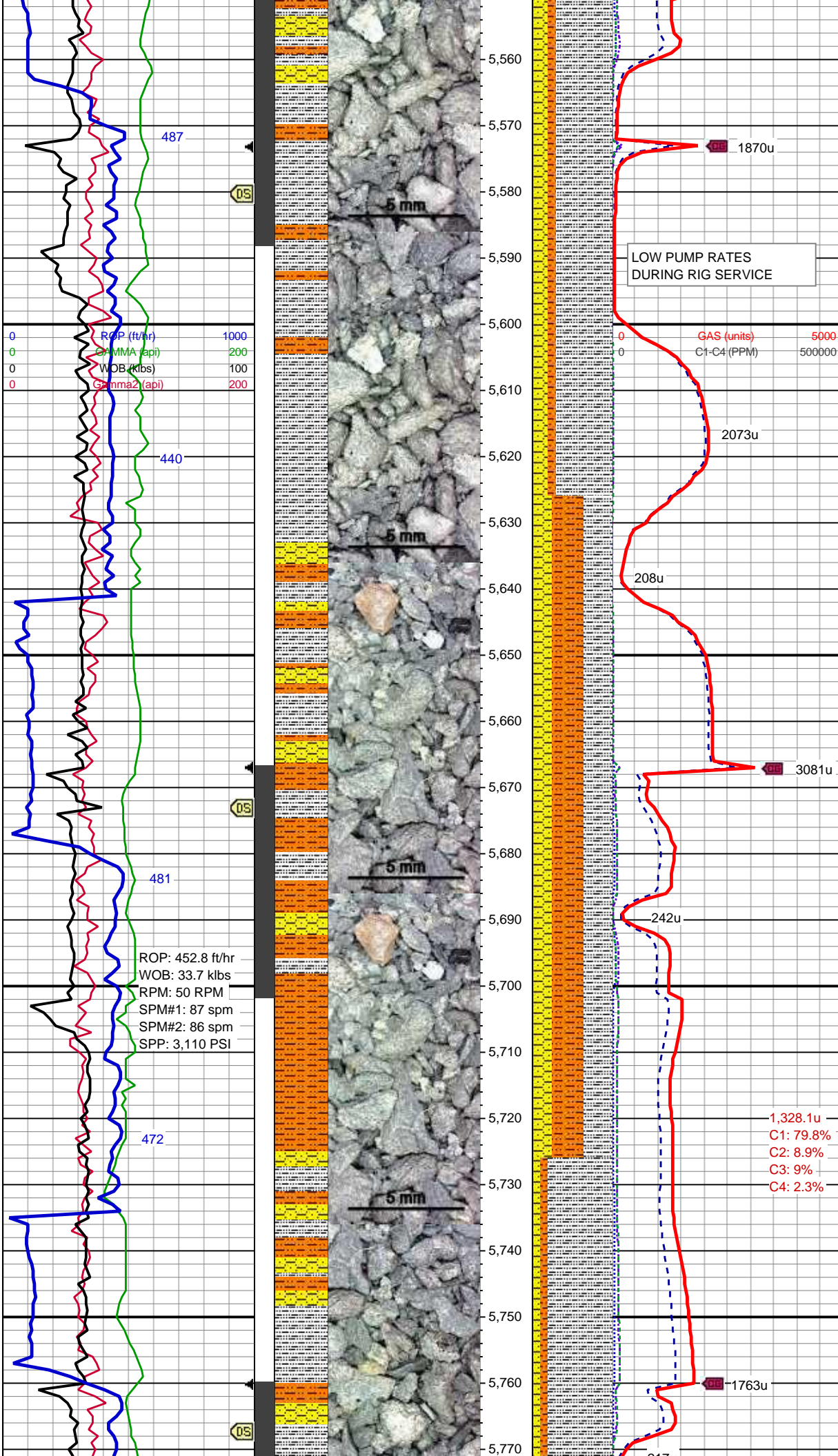
MD: 5,393'
Inclination: 47°
Azimuth: 145.4°
TVD: 4,974.91'
VS: 1,279.44'

MUD WT: 9.2/ VIS: 38/ PH: 9.1

SHY SS: lt gy-gy/brn, occ clr-s&p, vf-f gr, sb ang-sb rnd, mod-p srt, cly mtx, p por, v sl calc
SLTY SH: med-dk gy, sb plty-sb blk, mod frm-frm, slty-gt tex, non-v sl calc, occ grdg to shy sltst
SS: lt gy-wh, occ clr- s&p, vf-f gr, sb ang-sb rnd, p srt, cly mtx, occ gr sup mtx, mod p-p por, v sl calc, occ glauc incl

MD: 5,487'
Inclination: 43.9°
Azimuth: 145.1°
TVD: 5,040.85'
VS: 1,346.41'

1,894.8u
C1: 81%
C2: 8.8%
C3: 8.3%
C4: 1.9%



SLTY SH: med-dk gy, sb plty-sb blkly, occ blkly, mod frm-frm, slty-gt tex, non-v sl calc
SHY SS: lt gy-gy/brn, vf-f gr, sb ang-sb rnd, mod-p srt, cly mtx, p por, v sl calc
SHY SLTST: med gy, sb blkly, slty gr, occ blk spec, mod frm, slty tex, non calc; tr yel/orng min flor

MD: 5,580'
Inclination: 45.4°
Azimuth: 144°
TVD: 5,107.01'
VS: 1,411.77'

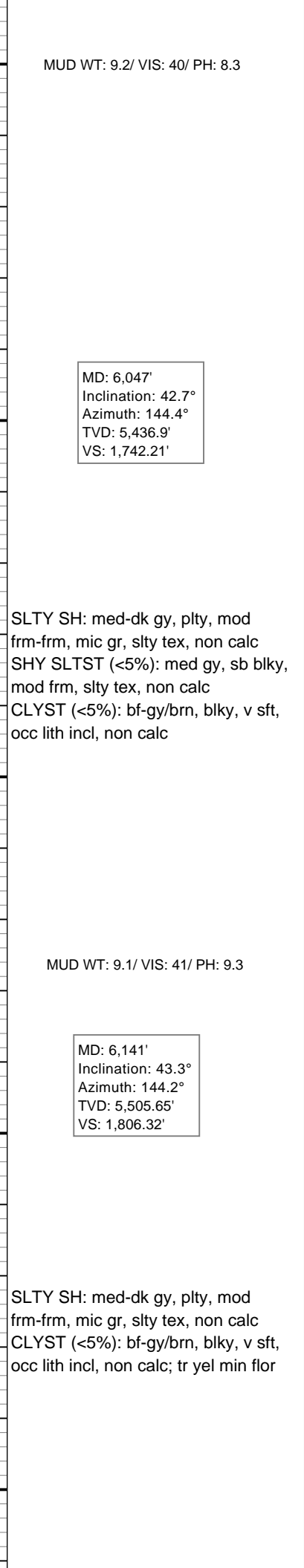
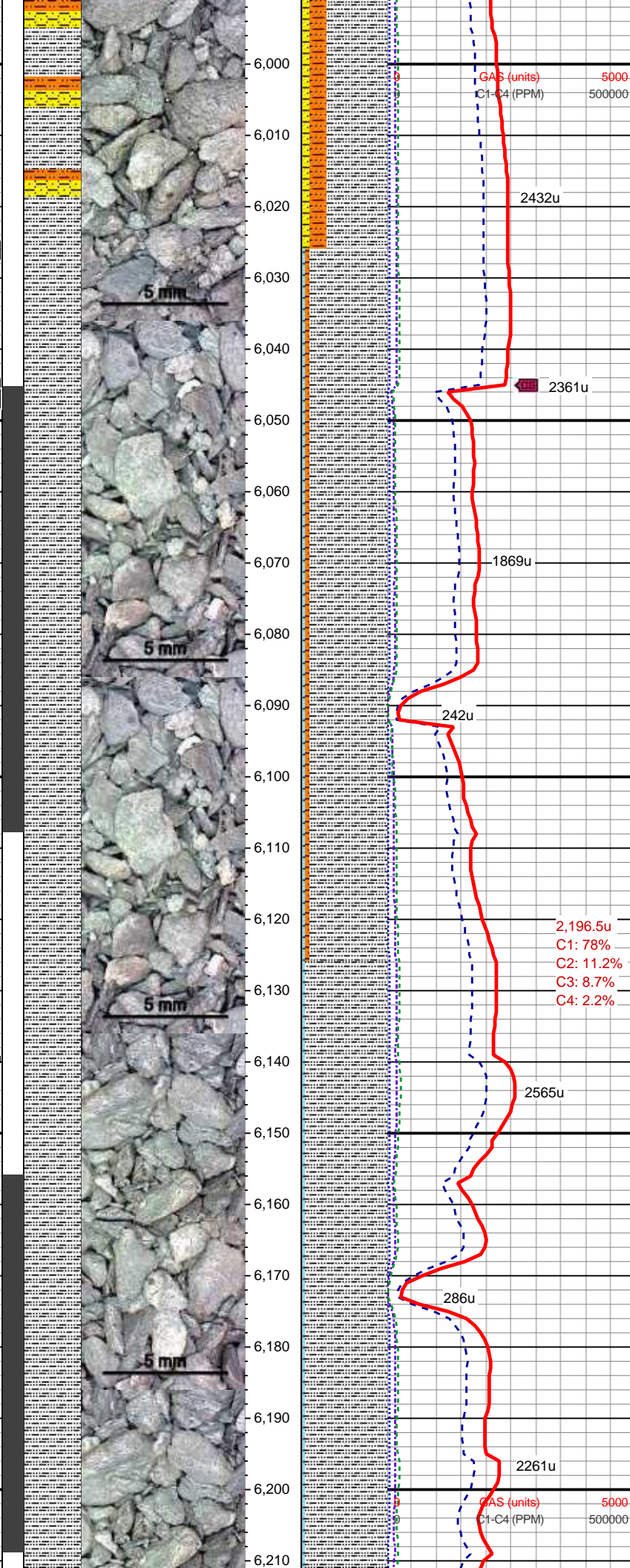
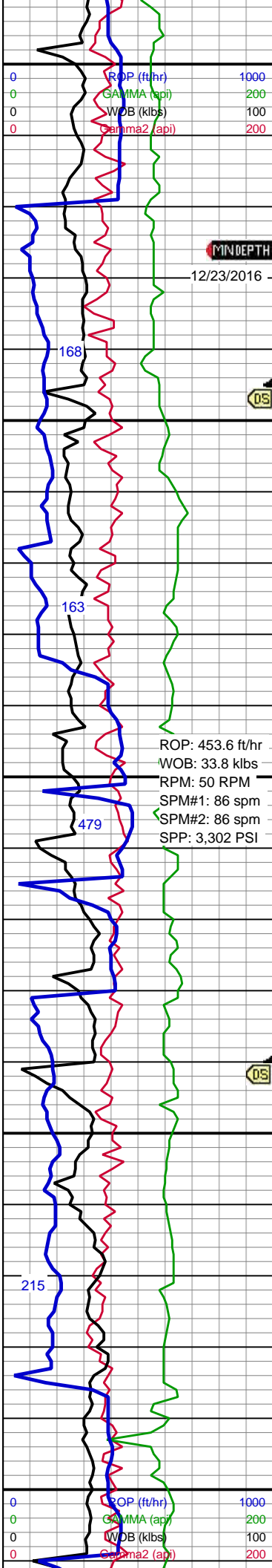
MUD WT: 9.2/ VIS: 36/ PH: 9.1

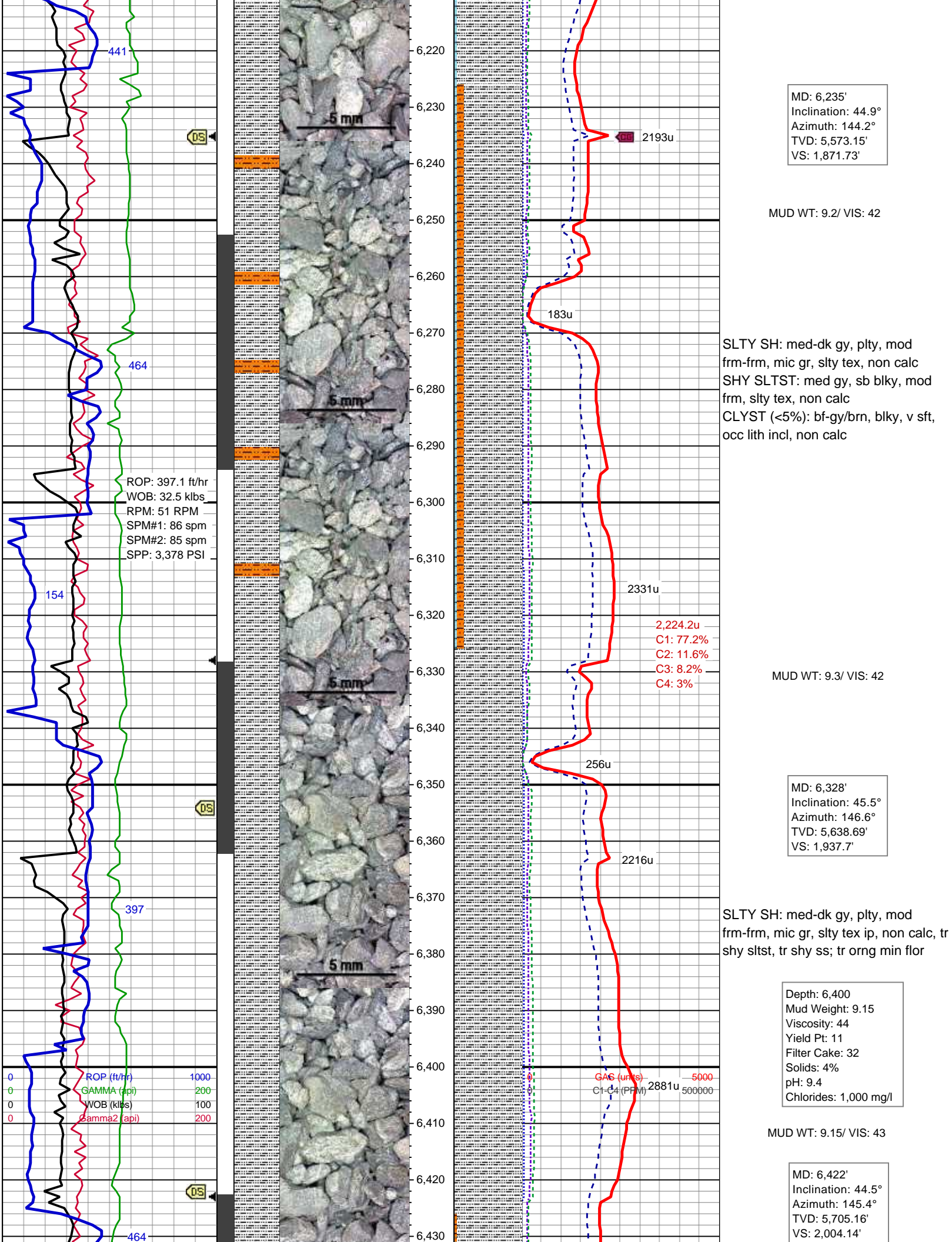
RIG SERVICE @5641'MD

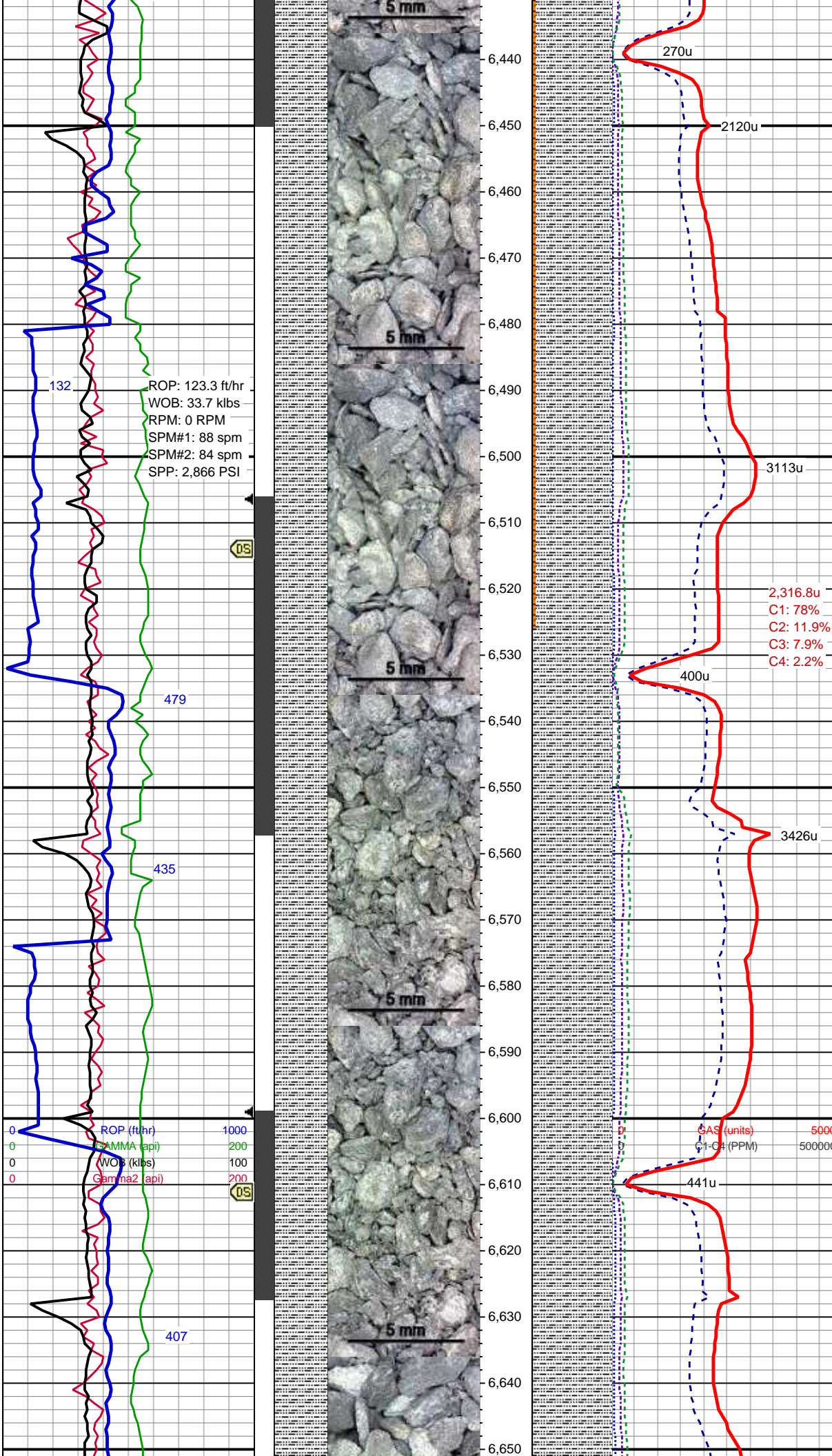
MD: 5,673'
Inclination: 45.7°
Azimuth: 143.6°
TVD: 5,172.14'
VS: 1,478.15'

SHY SLTST: med gy, sb blkly, slty gr, mod frm, slty tex, non calc
SLTY SH: med-dk gy, sb plty- plty, occ sb blkly, mod frm-frm, slty-gt tex, non-v sl calc
SHY SS: lt gy-gy/brn, occ wh-clr, vf-f gr, sb ang-sb rnd, mod-p srt, cly mtx, p por, sl calc

SLTY SH: med-dk gy, sb plty- plty, occ sb blkly, mod frm-frm, slty-gt tex, non-v sl calc
SHY SLTST: med gy, sb blkly, slty gr, mod frm, slty tex, non calc







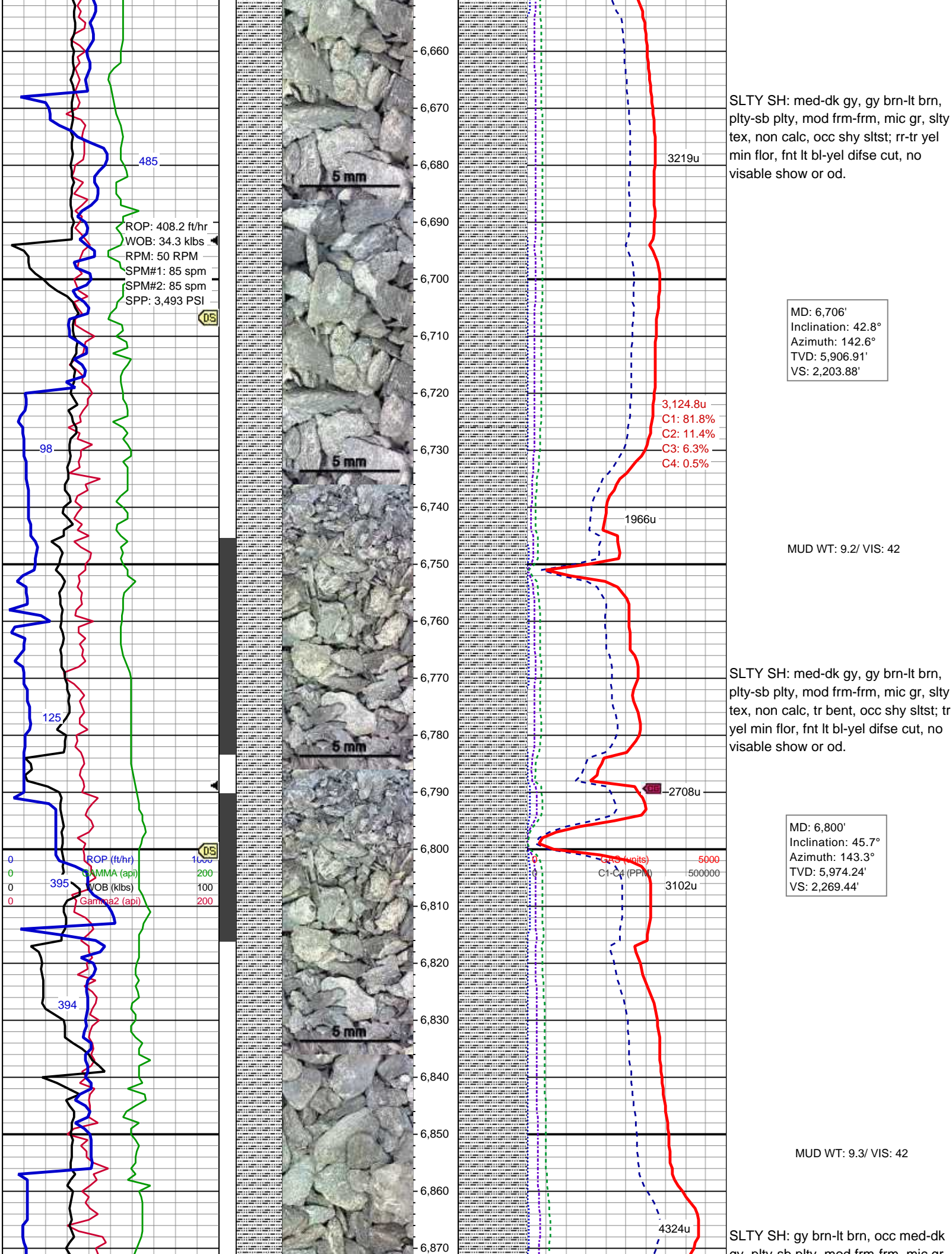
SLTY SH: med-dk gy, plty, mod
frm-frm, mic gr, slty tex, non calc
SHY SLTST (<5%): med gy, sb blkly,
mod frm, slty tex, non calc

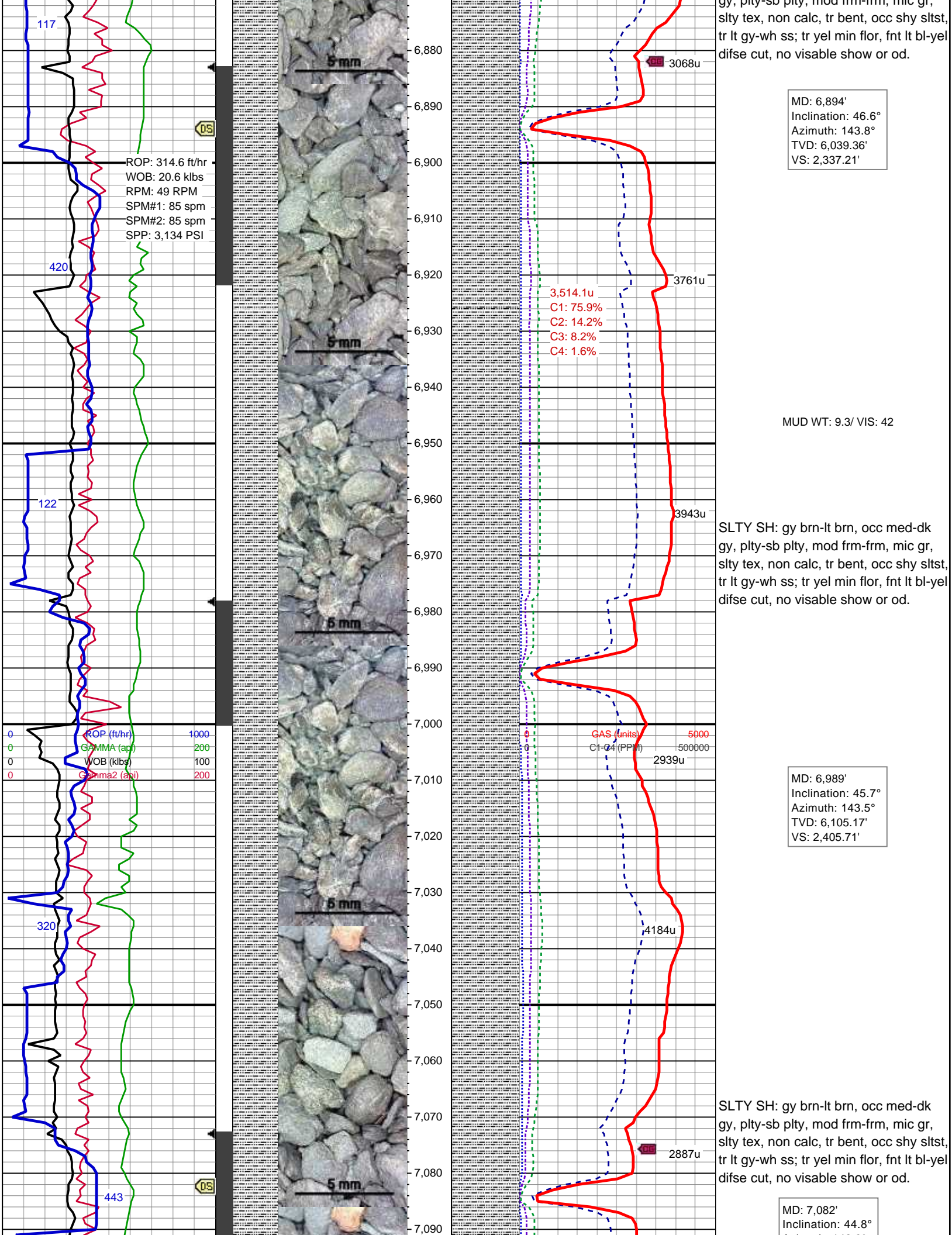
MD: 6,514'
Inclination: 45.5°
Azimuth: 145.4°
TVD: 5,770.36'
VS: 2,069.34'

MUD WT: 9.1/ VIS: 44

SLTY SH: med-dk gy, gy brn-lt brn,
plty-sb plty, mod frm-frm, mic gr, slty
tex, non calc, occ shy sltst; rr-tr yel
min flor, fnt lt bl-yel difse cut, no
visable show or od.

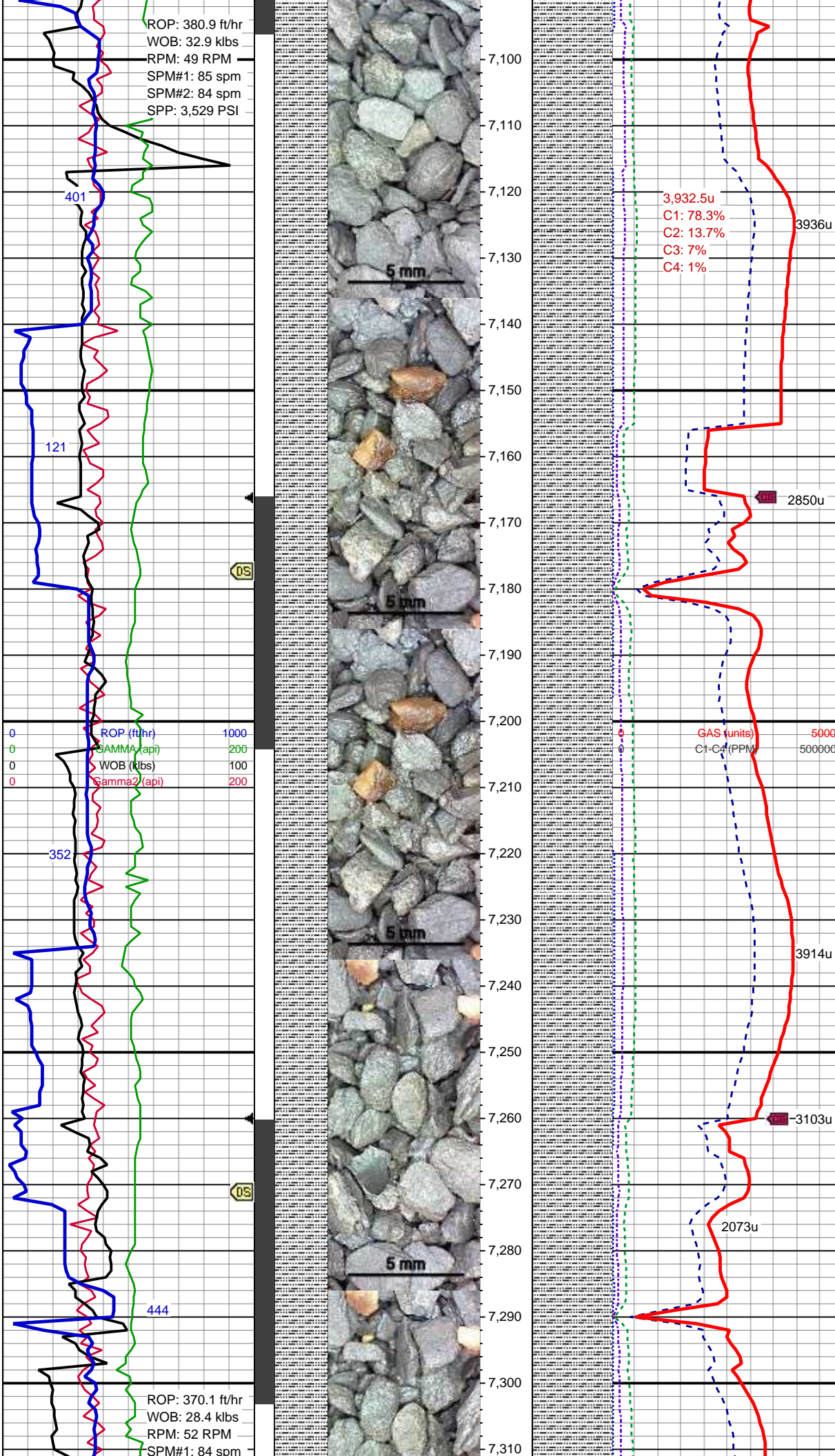
MD: 6,611'
Inclination: 46.4°
Azimuth: 142.9°
TVD: 5,839.28'
VS: 2,137.22'

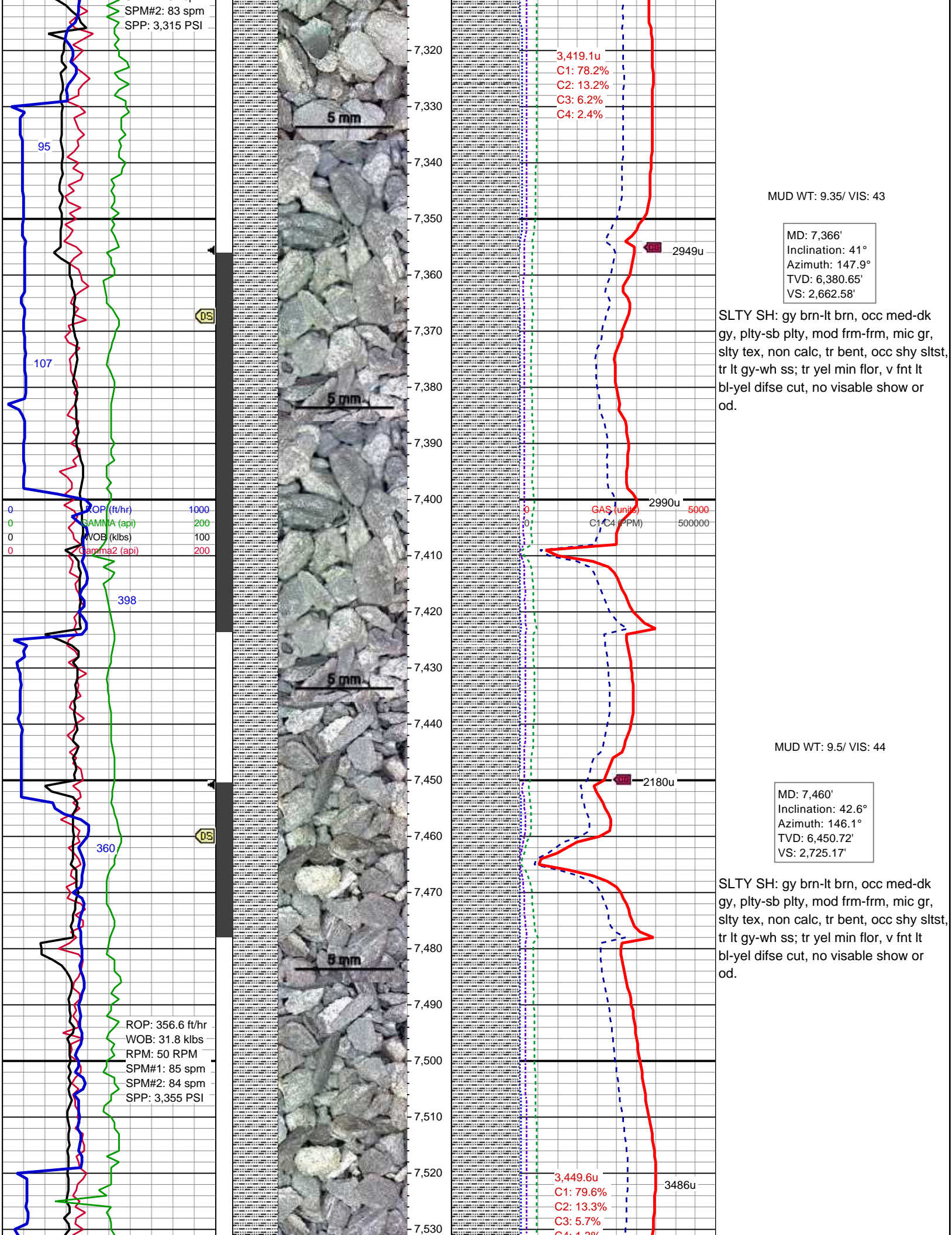


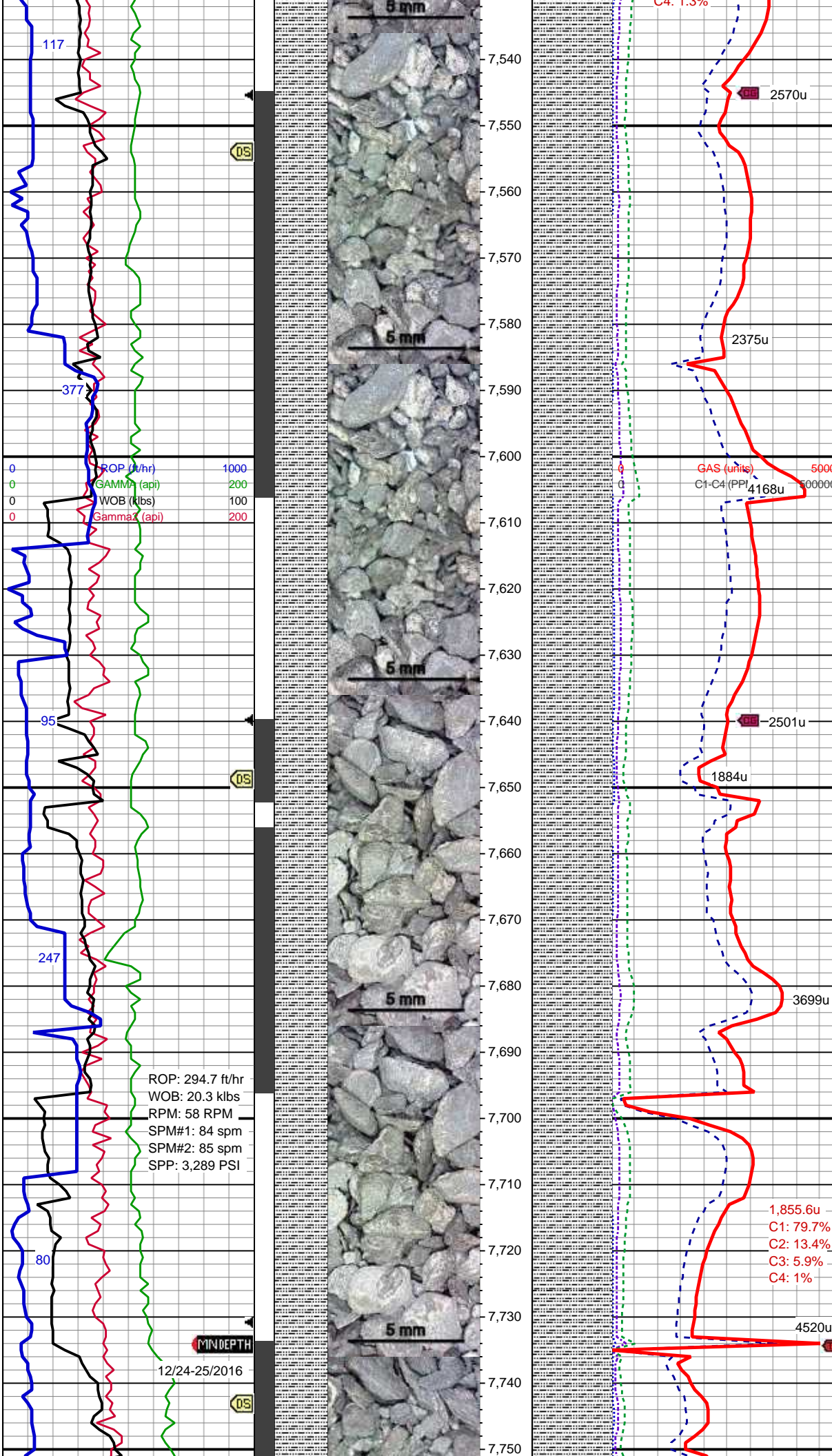


Azimuth: 142.9°
TVD: 6,170.64'
VS: 2,471.74'

ROP: 380.9 ft/hr
WOB: 32.9 klbs
RPM: 49 RPM
SPM#1: 85 spm
SPM#2: 84 spm
SPP: 3,529 PSI







MD: 7,554'
Inclination: 41.2°
Azimuth: 147.2°
TVD: 6,520.69'
VS: 2,787.9'

SLTY SH: gy brn-lt brn, occ med-dk gy, plty-sb plty, mod frm-frm, mic gr, slty tex, non calc, tr bent, occ shy sltst, tr lt gy-wh ss; tr yel min flor, v fnt lt bl-yel difse cut, no visable show or od.

MUD WT: 9.6/ VIS: 44

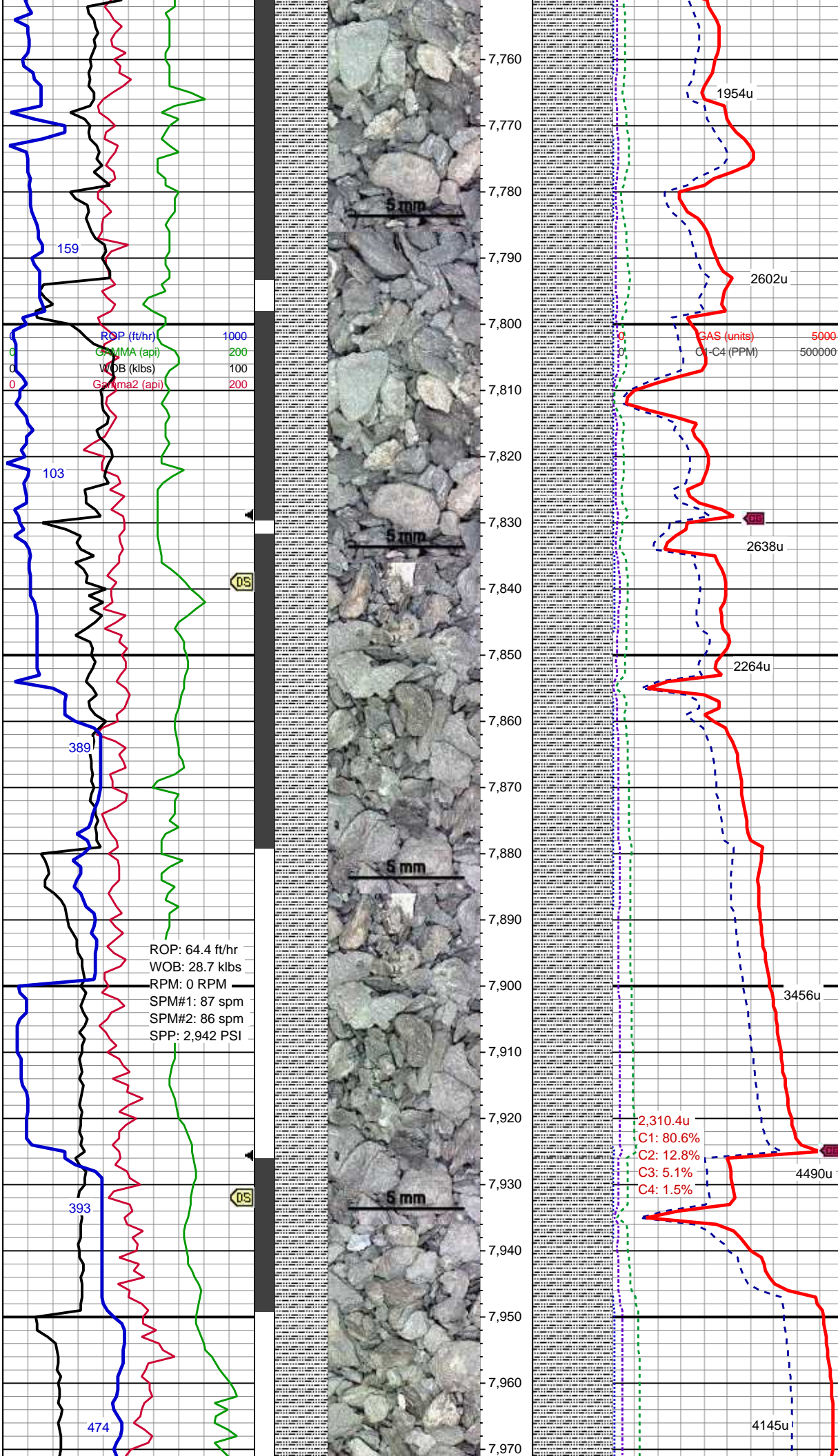
MD: 7,649'
Inclination: 42.4°
Azimuth: 146.1°
TVD: 6,591.51'
VS: 2,851.17'

SLTY SH: gy brn-lt brn, occ med-dk gy, plty-sb plty, mod frm-frm, mic gr, slty tex, non calc, tr bent, occ shy sltst, tr lt gy-wh ss; tr yel min flor, v fnt lt bl-yel difse cut, no visable show or od.

Depth: 7,708
Mud Weight: 9.85
Viscosity: 45
Yield Pt: 19
Filter Cake: 6.8
Solids: 8%
pH: 8.8
Chlorides: 1,100 mg/l

TOOH TO REPAIR TOP DRIVE AND CONDION HOLE AT 7708' MD, @ 15:02 MST on 12/23/16, INCOUNTERED SEVERAL TIGHT SPOTS ON TOOH, REPLACE TOP DRIVE, TIH TO TIGHT SPOTS STARTING AT 4595' MD, REAMED TO BOTTOM, SHORT TRIPPED, REAMED TO BOTTOM, RESUMED DRILLING @ 08:36 MST, ON 12/25/16

MD: 7,743'



Inclination: 43.3°
Azimuth: 146.1°
TVD: 6,660.42'
VS: 2,915.08'

SLTY SH: gy brn-brn, occ med-dk gy, plty-sb plty, mod frm-frm, mic gr, slty tex, non calc, tr bent, occ shy sltst; tr yel min flor, v fnt lt bl-yel difse cut, no visable show or od.

MUD WT: 10.0/ VIS: 50

MUD WT: 10.0/ VIS: 51

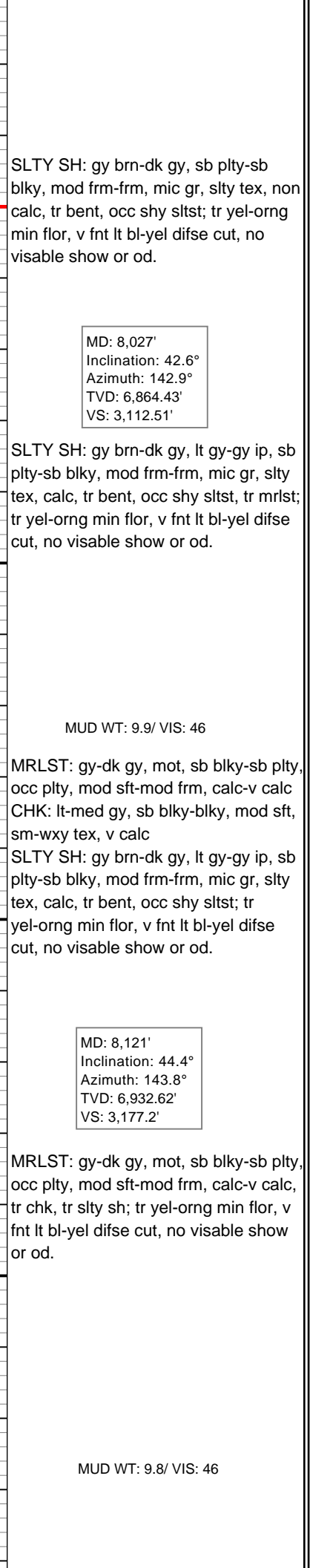
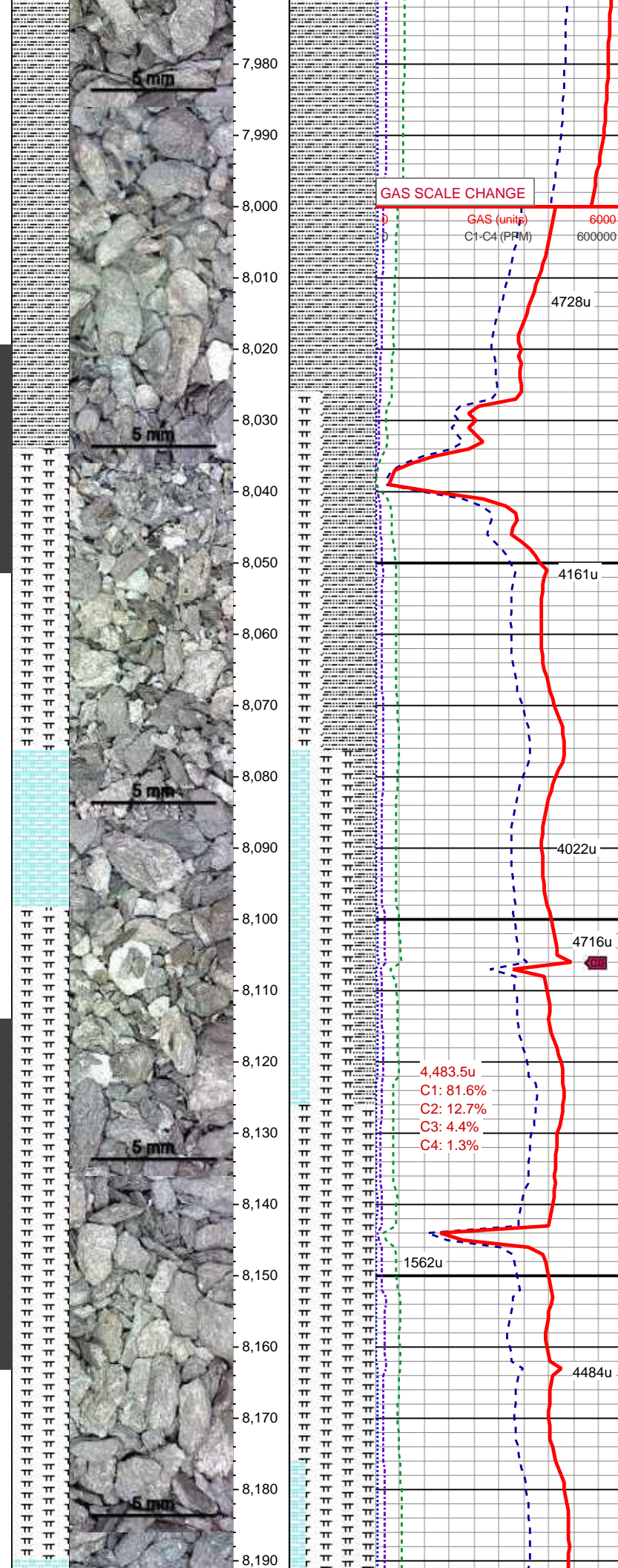
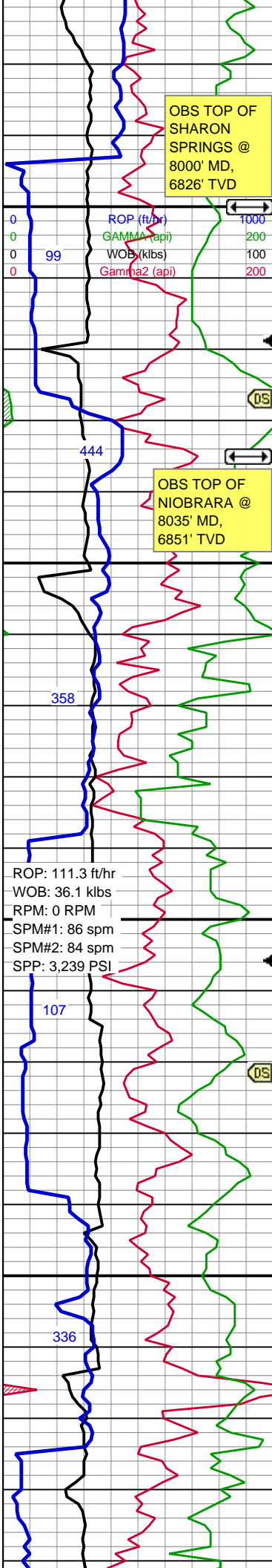
MD: 7,838'
Inclination: 45.5°
Azimuth: 147.5°
TVD: 6,728.29'
VS: 2,981.49'

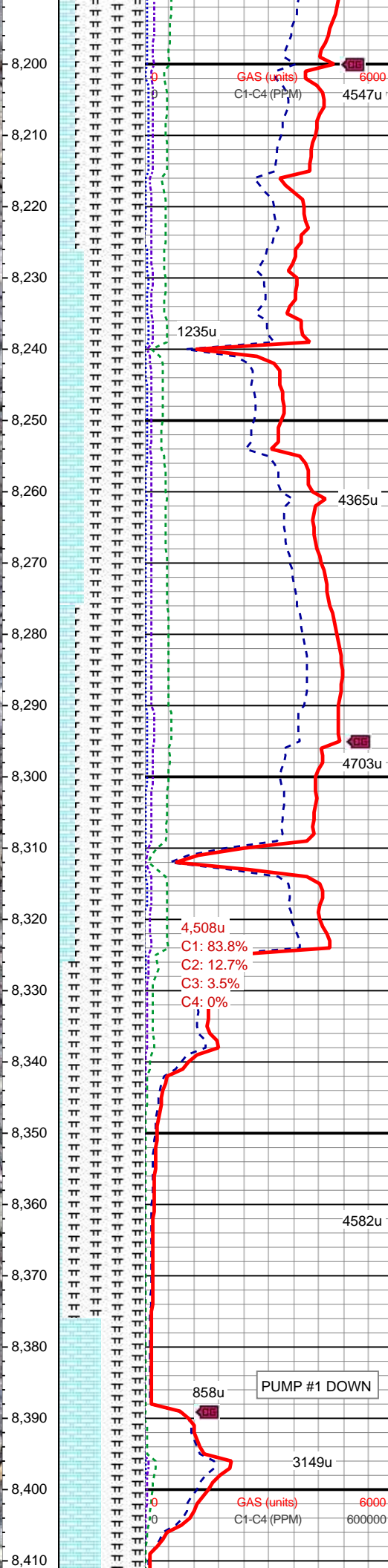
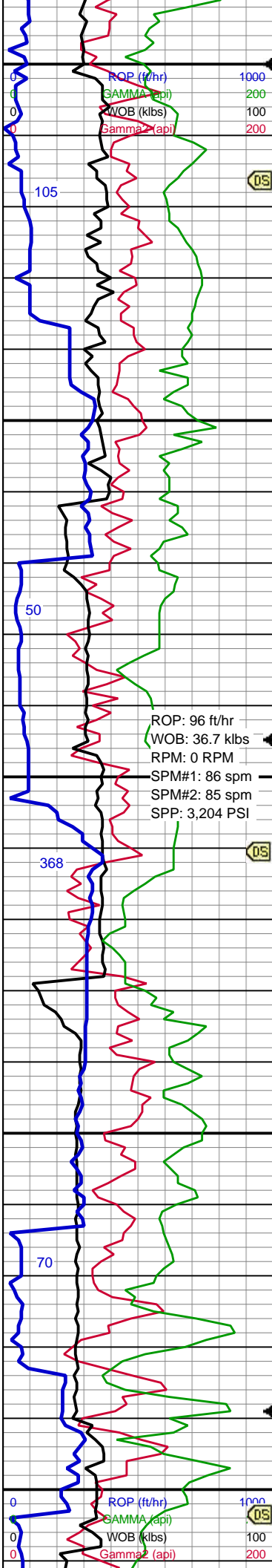
SLTY SH: gy brn-dk gy, sb plty-sb blkly, mod frm-frm, mic gr, slty tex, non calc, tr bent, occ shy sltst; tr yel min flor, v fnt lt bl-yel difse cut, no visable show or od.

Began 50' Sample Interval

MD: 7,932'
Inclination: 43.8°
Azimuth: 143.1°
TVD: 6,795.18'
VS: 3,047.5'

SLTY SH: gy brn-dk gy, sb plty-sb blkly, mod frm-frm, mic gr, slty tex, non calc, tr bent, occ shy sltst; tr yel min flor, v fnt lt bl-yel difse cut, no visable show or od.





MRLST: gy-dk gy, blk ip, mot, sb
blky-blky, frm-mod frm, calc-v calc,
occ plty, tr-scat bent, abnt cal, mod
abnt inoc fos frags
CHK: lt-med gy, sb blky-blky, mod sft,
sm-wxy tex, v calc; tr yel-orng min flor,
v fnt lt bl-yel difse cut, no visable
show or od.

MD: 8,216'
Inclination: 45.4°
Azimuth: 143.8°
TVD: 6,999.24'
VS: 3,242.66'

MUD WT: 9.8/ VIS: 46

CHK: lt-med gy, sb blky-blky, mod
frm- mod sft, sm-wxy tex, v calc
MRLST: gy-dk gy, blk ip, mot, sb
blky-blky, frm-mod frm, calc-v calc,
occ plty, tr bent, rr inoc fos frags; tr yel
min flor, tr gn min flor, mod bri bl
difse cut, mod show

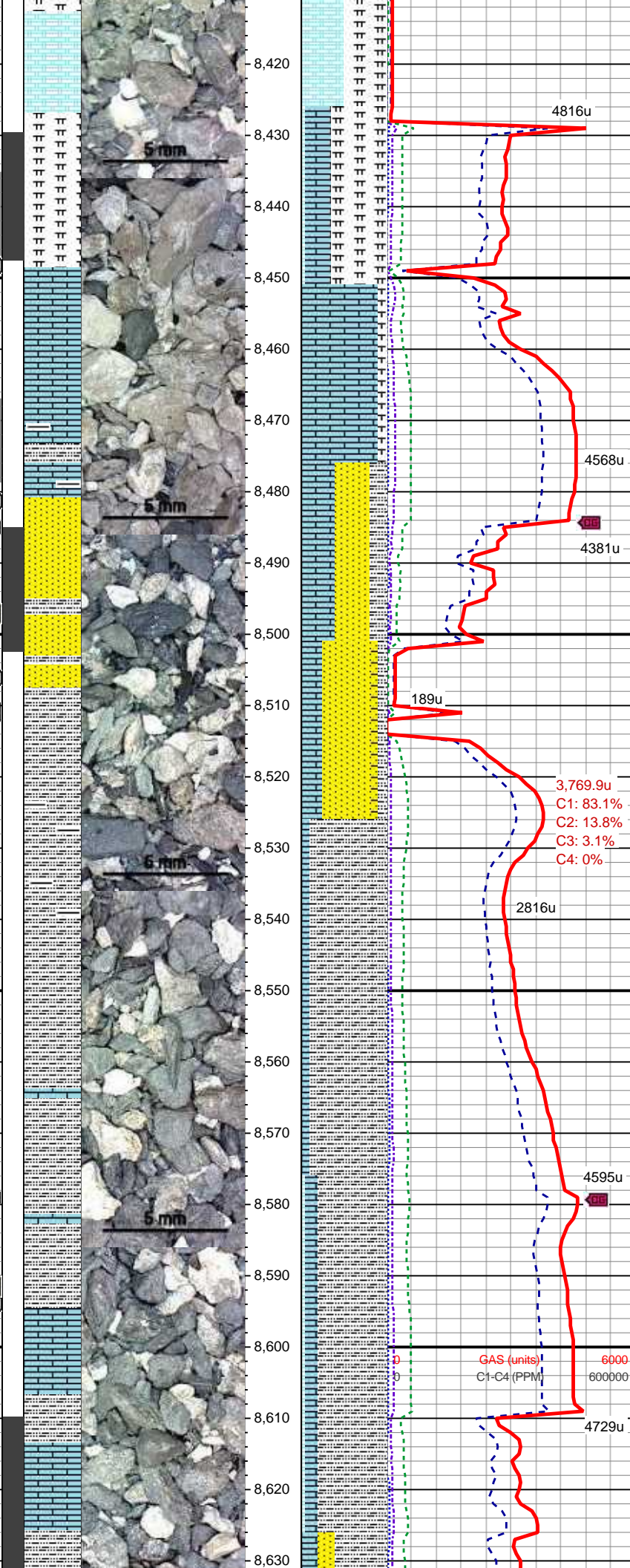
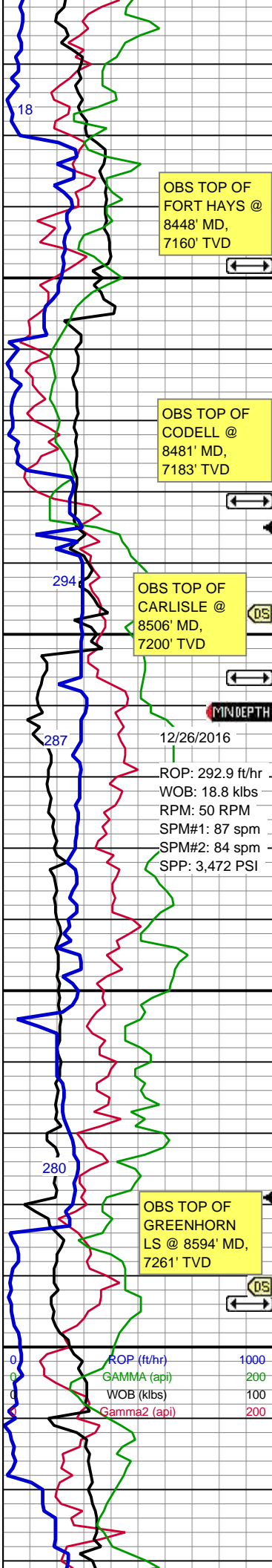
MRLST: gy-dk gy, blk ip, mot, sb
blky-blky, frm-mod frm, calc-v calc,
occ plty
CHK: med gy, occ lt gy, sb blky-blky,
mod frm- mod sft, occ v sft, sm-wxy
tex, v calc, tr bent, rr inoc fos frags; tr
gn min flor, mod bri bl difse cut, mod
show

MD: 8,310'
Inclination: 46.7°
Azimuth: 143.8°
TVD: 7,065.3'
VS: 3,311.19'

MRLST: gy-dk gy, blk ip, mot, sb
blky-blky, frm-mod frm, calc-v calc,
occ plty
CHK: med gy, occ lt gy, sb blky-blky,
mod frm- mod sft, occ v sft, sm-wxy
tex, v calc, tr bent, rr inoc fos frags; tr
gn min flor, tr yel min flor, fnt- mod bri
bl difse cut, no show

MUD WT: 9.9/ VIS: 47

MRLST: gy-dk gy, blk ip, mot, sb
plty-plty, frm-mod frm, calc-v calc
CHK: lt gy- med gy, sb blky-blky, occ
sb plty, mod frm- mod sft, sm-wxy tex,
v calc, occ grdg to ls, abnt inoc fos
frags, tr bent; tr gn min flor, tr yel min
flor, mod bri bl difse cut, mod show



MD: 8,403'
Inclination: 46°
Azimuth: 144.2°
TVD: 7,129.34'
VS: 3,379.2'

LS: wh-lt gy -gy, occ bf, sb blk-occ sb pty, mod frm-frm, rr sft, wxy- mcxln tex, rr sm, v calc
MRLST: gy-dk gy, blk ip, mot, sb pty-pty, frm-mod frm, calc-v calc
CHK: med gy, sb blk-blk, occ sb pty, mod frm- mod sft, sm-wxy tex, v calc, tr slty sh; mod bri bl difse cut, mod show

MUD WT: 9.8/ VIS: 38

LS: lt gy -gy, brn- bf, sb blk-sb pty, mod frm-frm, wxy- mcxln tex, v calc
SS: gy- brn, v f-f gr, sb rnd- sb ang, ply srt, pred cons, unconsl ip, brit clus, mod g - g por, occ grdg to shy ss, sl calc
SLTY SH: med- dk gy, sb pty- pty, fis ip, slty tex, mod frm-frm, sl calc; mod bri bl difse cut, mod show

MD: 8,497'
Inclination: 47.2°
Azimuth: 143.5°
TVD: 7,193.93'
VS: 3,447.49'

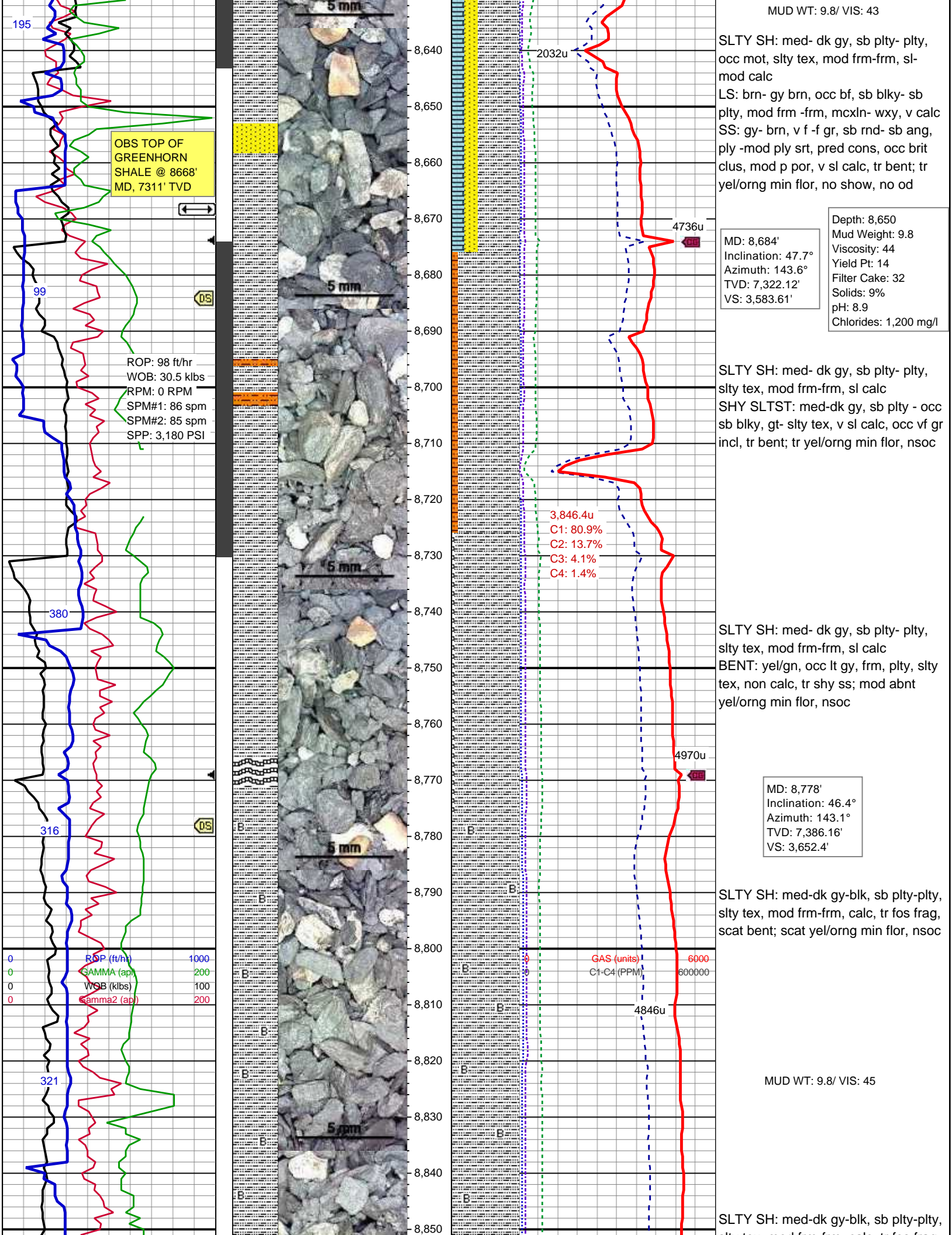
MUD WT: 9.8/ VIS: 39

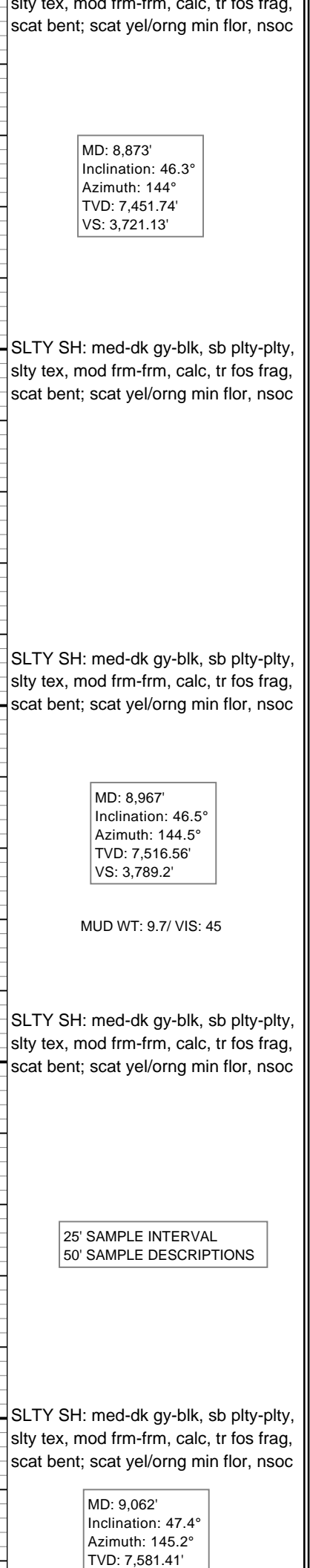
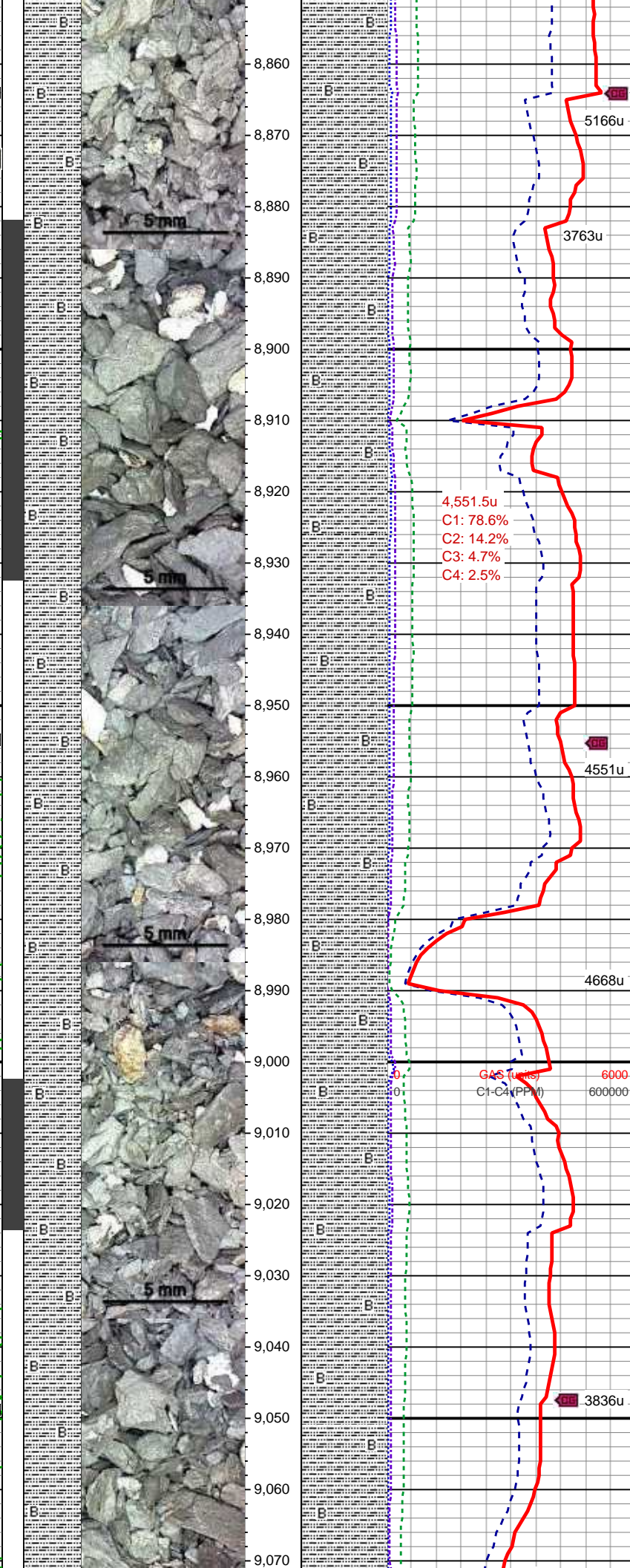
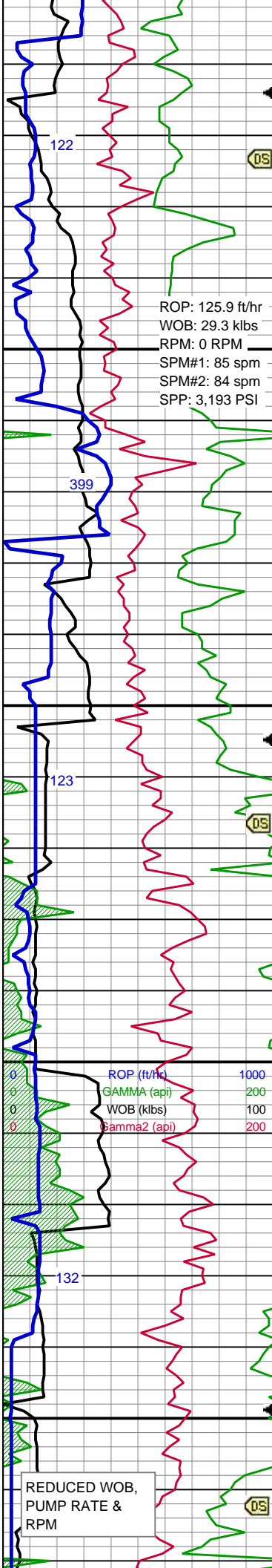
SLTY SH: med- dk gy, sb pty- pty, fis ip, slty tex, mod frm-frm, sl calc
SS: gy- brn, v f-f gr, sb rnd- sb ang, ply -mod ply srt, pred cons, brit clus, mod g por, occ grdg to shy ss, sl calc, tr bf- brn ls, tr bent; tr yel min flor, fnt- mod bri bl difse cut, v mod show

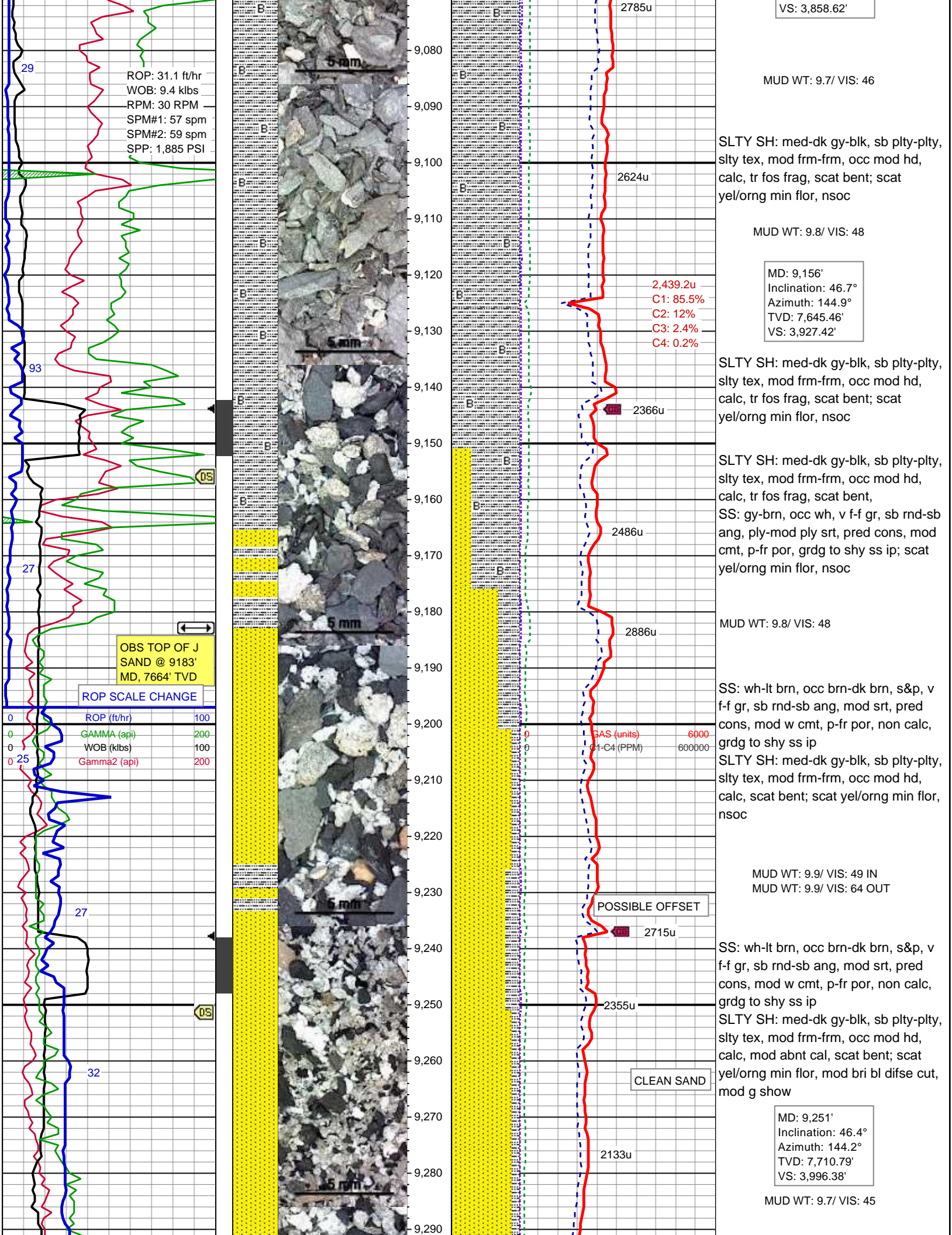
MD: 8,591'
Inclination: 46°
Azimuth: 143.5°
TVD: 7,258.51'
VS: 3,515.78'

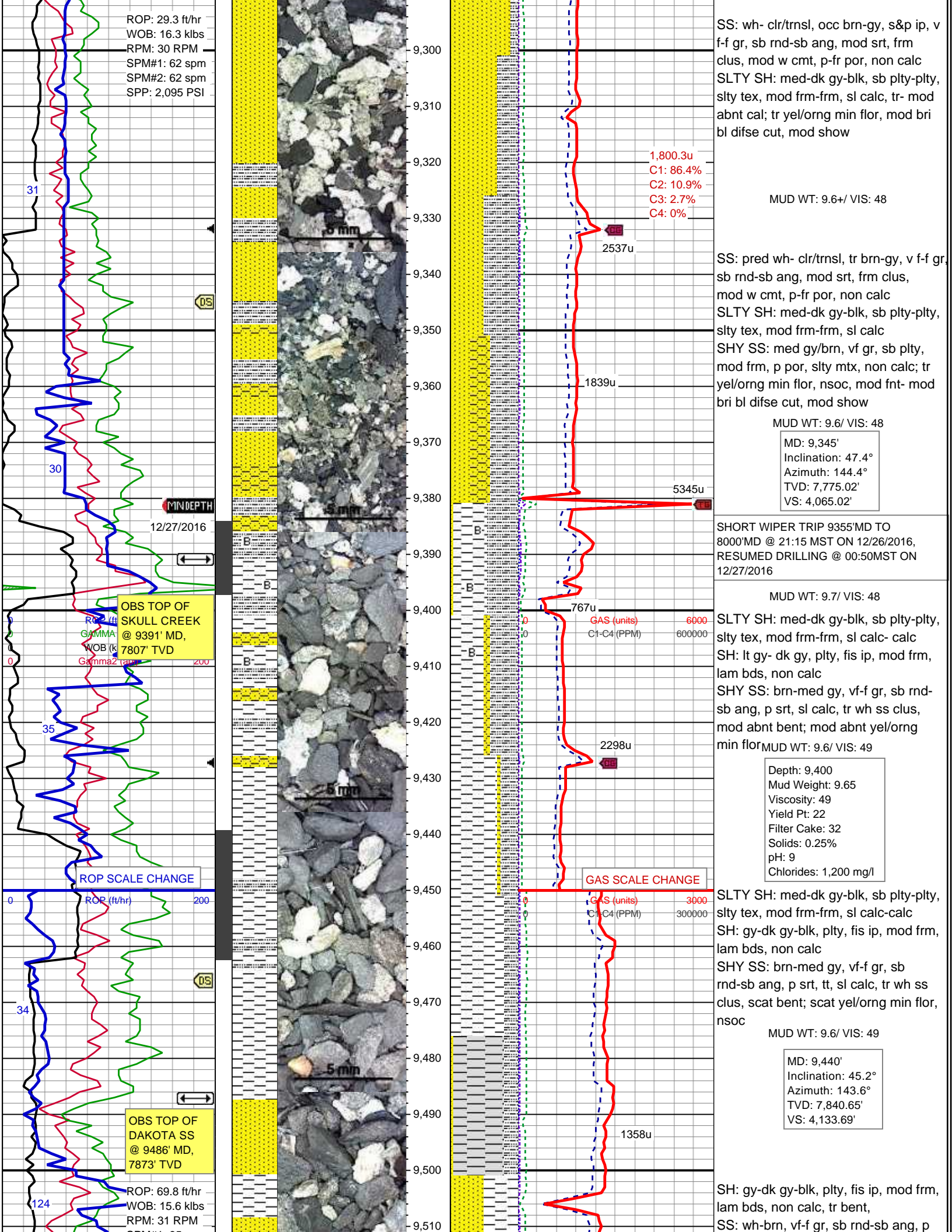
MUD WT: 9.8/ VIS: 42

SLTY SH: med- dk gy, sb pty- pty, occ mot, slty tex, mod frm-frm, sl- mod calc, mod abnt cal incl
LS: brn- gy brn, occ bf, sb blk, mod frm - v sft, mcxln- wxy - sm tex, occ grdg to chk, v calc, tr inoc frags; tr yel/orng min flor, no show, no od

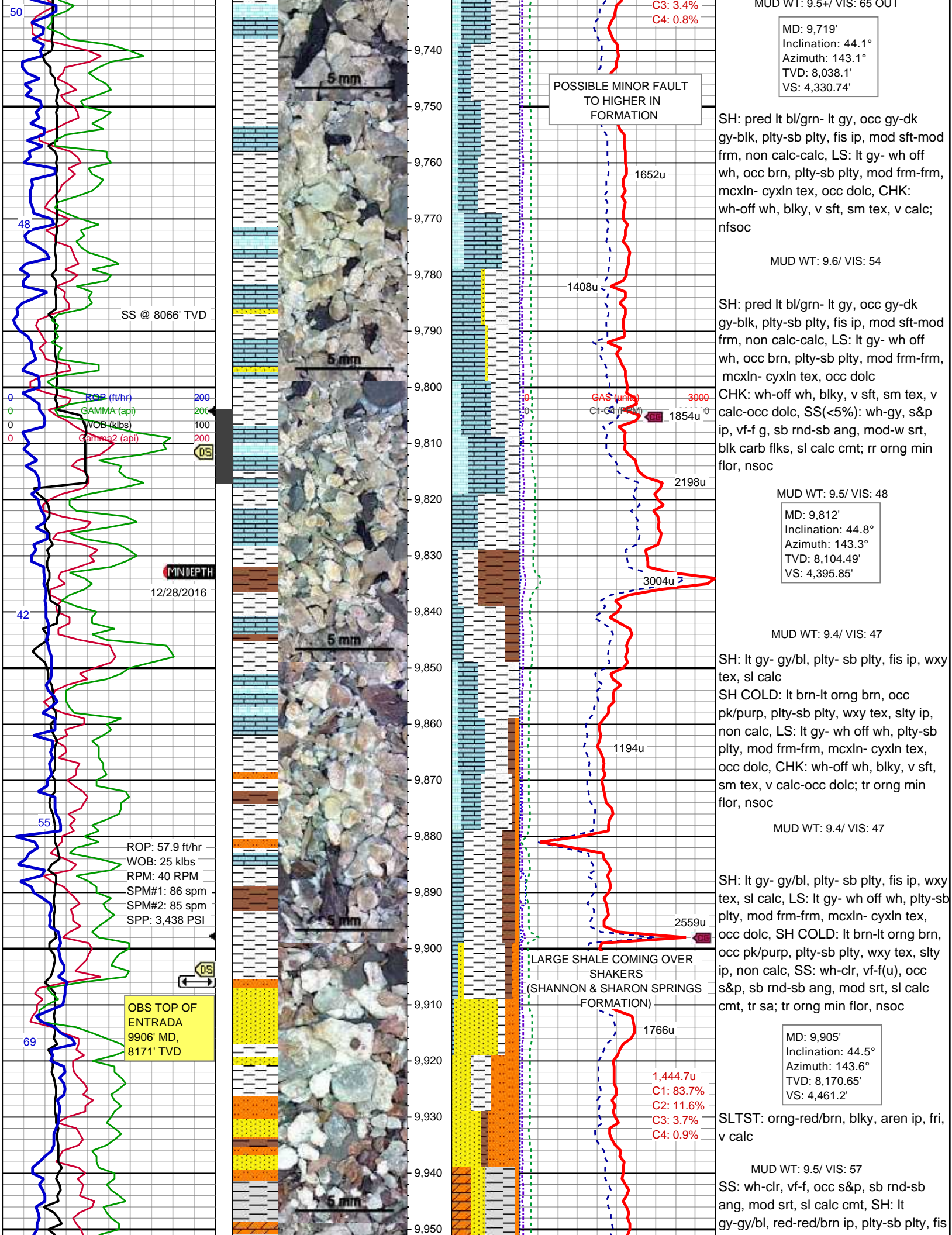


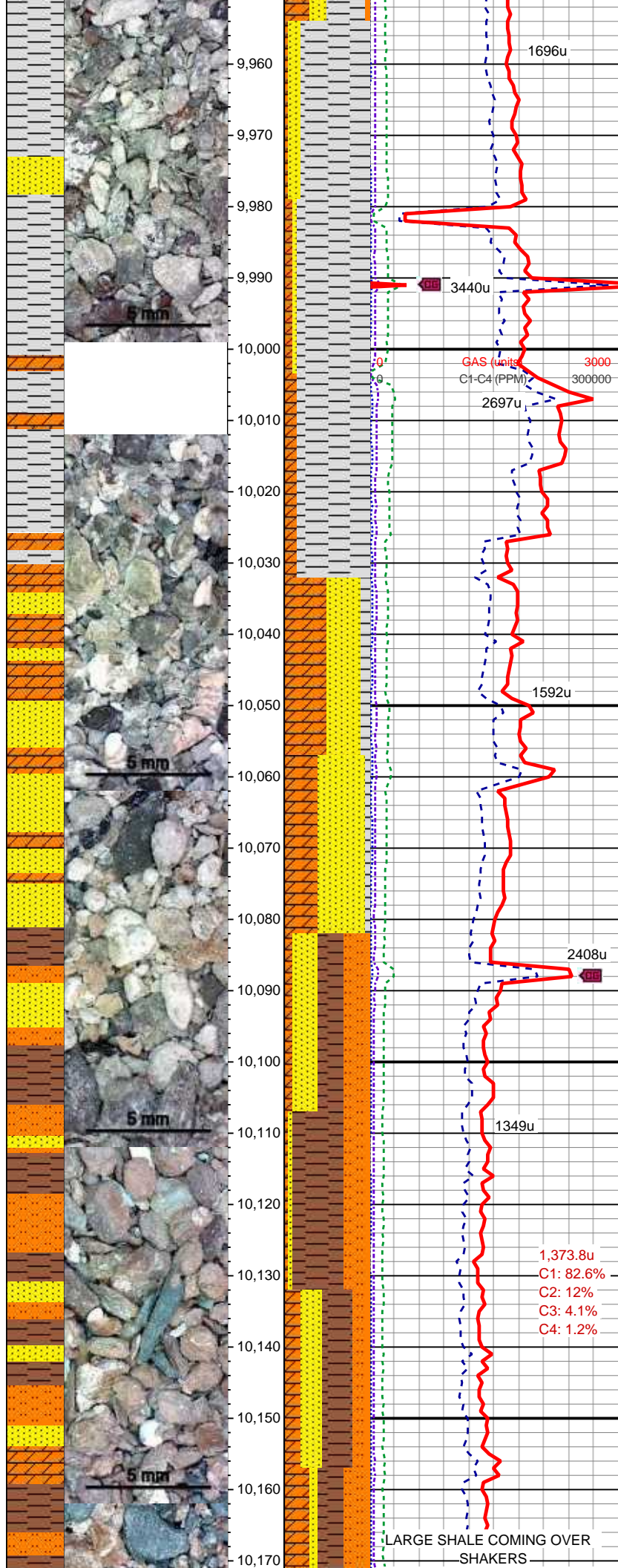
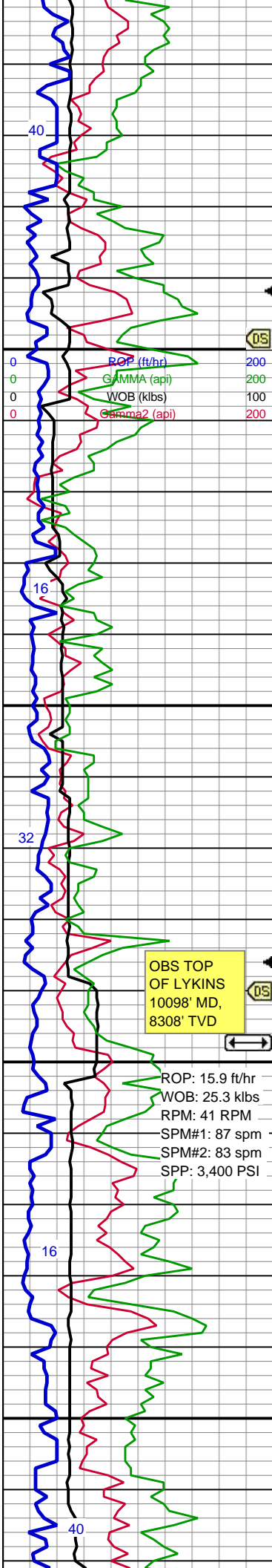






MUD WT: 9.6 / VIS: 65 IN





ip, wxy tex, sl calc, tr bent, ANHY: orng/brn, occ pnk, mas, blk, v sft, tr sa, SLTST: orng-red/brn, blk, aren ip, fri, v calc; tr yel min flor, nsoc

MUD WT: 9.5+/ VIS: 48

Depth: 9,896
Mud Weight: 9.5
Viscosity: 57
Yield Pt: 12
Filter Cake: 32
Solids: 8%
pH: 8.8
Chlorides: 1,200 mg/l

SS: wh-clr, vf-f, occ s&p, sb rnd-sb ang, mod srt, sl calc cmt, tt, SH: lt gy-gy/bl, red-red/brn ip, plty-sb plty, fis ip, wxy tex, sl calc, tr bent, ANHY: wh, occ pnk, sb blk, v sft; tr SLTST, tr yel min flor, nsoc

ALL DATA WAS SHIFTED DOWN AN ADDITIONAL 3' TO MATCH THE WIRE LINE GAMMA FROM 10020' MD TO 10550' MD.

MD: 9,998'
Inclination: 44.5°
Azimuth: 143.8°
TVD: 8,236.98'
VS: 4,526.38'

MUD WT: 9.6/ VIS: 47

SS: wh-lt gy-gy, vf-f grnd, sb rnd-rnd, mod srt, sl calc, arg mtx, p-fr cmt, tt, SH: lt gy-gy/bl, plty-sb plty, fis ip, wxy tex, sl calc, tr bent, ANHY: wh-crm, lt red-orng, sb blk, v sft; tr bri yel min flor, abnt fnt yel flor, nsoc

MUD WT: 9.6/ VIS: 58

MUD WT: 9.6/ VIS: 50

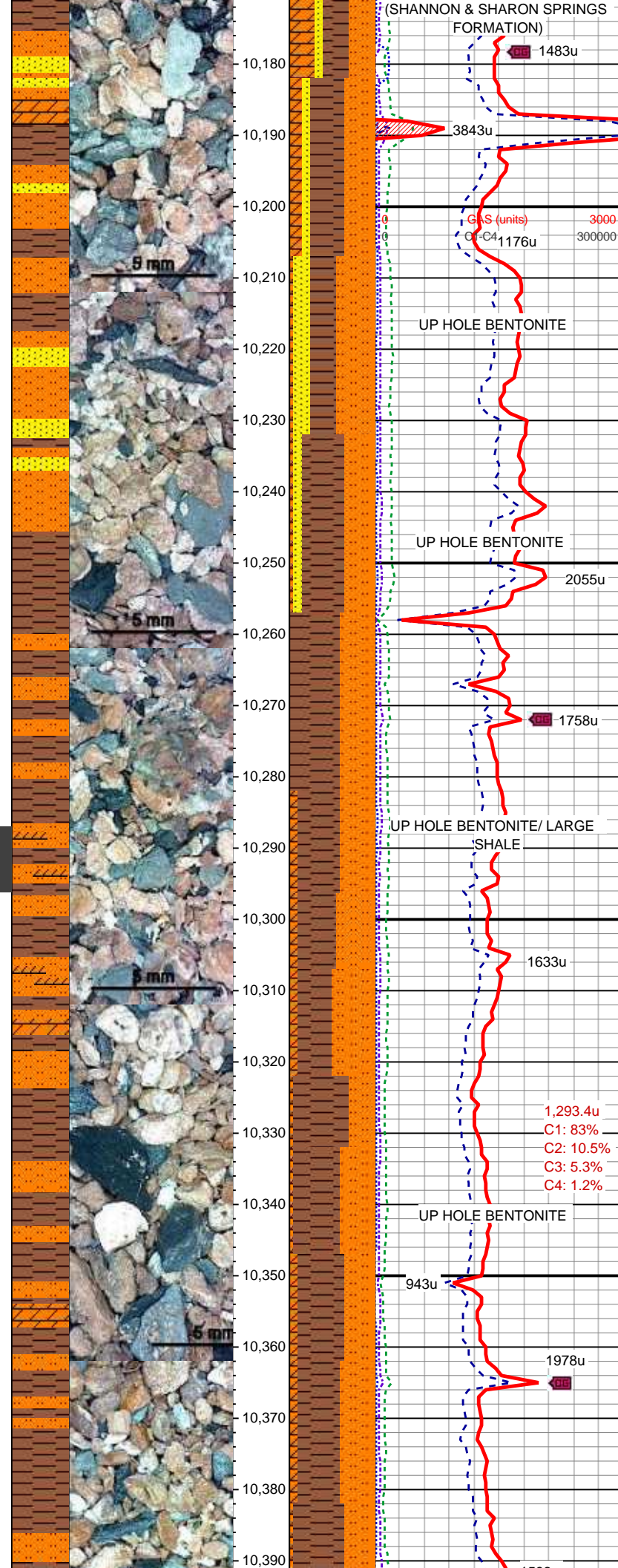
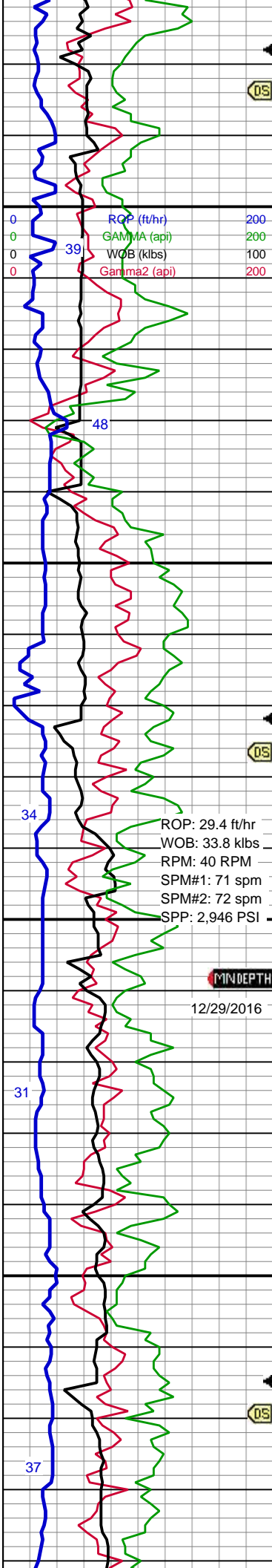
SS: red-orng, vf-f grnd, sb rnd-sb ang, mod srt, sl calc, arg mtx, p-mod cmt, tt, fr por ip, slty ip, SH: red-orng, plty-sb blk, rthy tex, sl calc, slty ip, tr bent, ANHY: lt red-orng, wh ip, sb blk, v sft, SLTST: orng-red/brn, sb plty-sb blk, aren ip, sl calc, arg ip; tr yel min flor, nsoc

MUD WT: 9.5+/ VIS: 56

MD: 10,090'
Inclination: 45°
Azimuth: 143.6°
TVD: 8,302.32'
VS: 4,591.14'

MUD WT: 9.6/ VIS: 67

SS: red-orng, vf-f grnd, rnd-sb rnd, p srt, v sl calc, arg mtx, p-mod cmt, tt, slty ip, SH: red-orng, plty-sb blk, rthy tex, sl calc, slty ip, tr bent, ANHY: lt red-orng, wh ip, sb blk, v sft, SLTST: orng-red/brn, sb plty-sb blk, aren ip, sl calc, arg ip; tr yel min flor, nsoc



MD: 10,183'
Inclination: 44.3°
Azimuth: 144°
TVD: 8,368.48'
VS: 4,656.49'

MUD WT: 9.6/ VIS: 59

ANHY: lt red/orng, wh ip, mas, amor, v sft, SLTST: orng-red/brn, mic gr-vf l, slty tex, sb blkly-occ sb plty, aren, occ grdg to slty sh, SH: red/orng, plty-sb plty, slty-rthy tex, sl calc, occ grdg to shy ss, SS: red/orng, vf-f gr, sb rnd, sb ang, mod srt, sl calc cmt, p por; mod abnt yel min flor, nsoc

MUD WT: 9.6/ VIS: 66 IN
MUD WT: 9.5/ VIS: 49 OUT

MUD WT: 9.6/ VIS: 63 IN
MUD WT: 9.5/ VIS: 46 OUT

SH: red/orng, plty-sb plty, slty- rthy tex, non - v sl calc, occ grdg to slty sh
SLTST: orng- red/brn, mic gr-vf l, slty tex, sb blkly-occ sb plty, aren, occ grdg to shy ss; mod abnt yel min flor, nsoc

MUD WT: 9.7/ VIS: 43 IN
MUD WT: 9.7/ VIS: 45 OUT

MD: 10,276'
Inclination: 43.4°
Azimuth: 144.7°
TVD: 8,435.55'
VS: 4,720.91'

MUD WT: 9.7/ VIS: 48 IN
MUD WT: 9.7/ VIS: 45 OUT

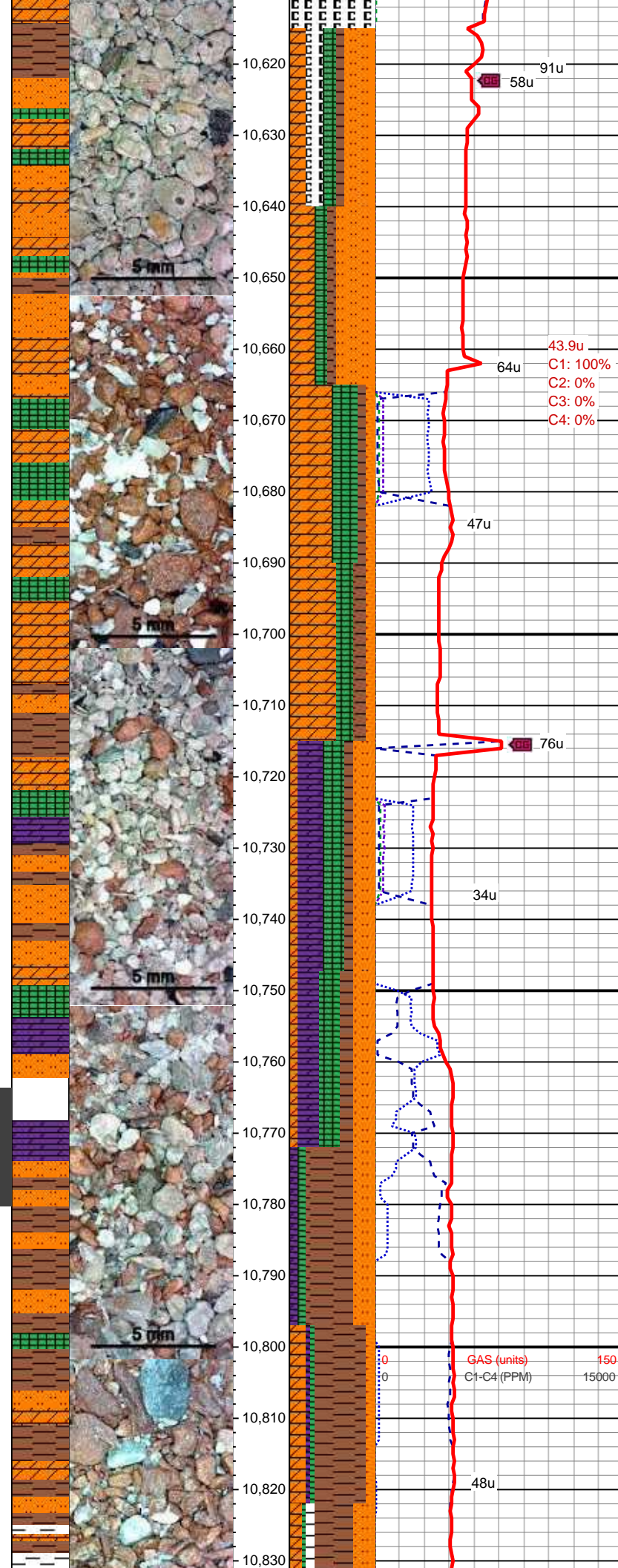
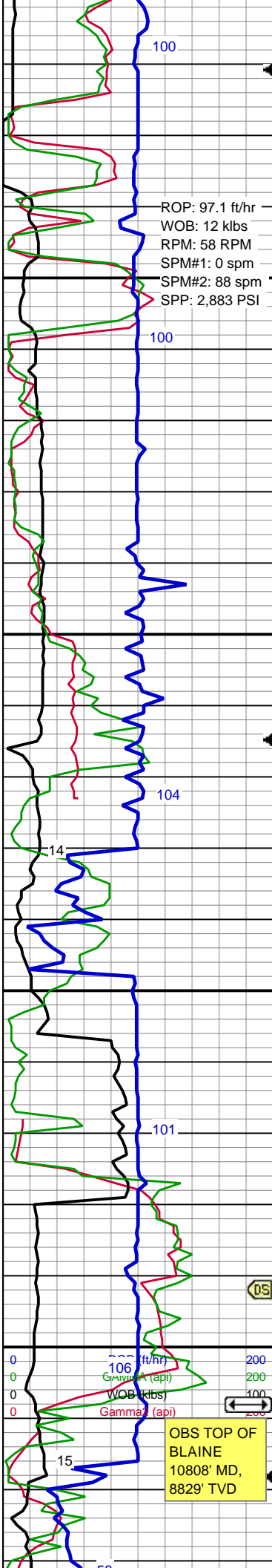
SH: red/orng, plty-sb plty, slty- rthy tex, non - v sl calc, v sft, anhyc ip
SLTST: orng- red/brn, slty tex, sb blkly-occ sb plty, aren ip, fri- sft, non calc, intbd anhy, com wh anhy; mod abnt yel/orng min flor, nsoc

MUD WT: 9.8/ VIS: 45 IN
MUD WT: 9.7+/ VIS: 47 OUT

MUD WT: 9.8/ VIS: 44 IN
MUD WT: 9.8/ VIS: 46 OUT

SH:red/orng, plty-sb plty, slty- rthy tex, non-v sl calc, mod sft(plty)-v sft, anhyc ip, SLTST: orng-red/brn, slty tex, sb blkly-occ sb plty, aren ip, fri- sft, non calc, intbd anhy, ANHY: wh- off wh, mas, blkly, sm tex, v sft,non calc; mod abnt yel min flor, nsoc

Depth: 10,347
Mud Weight: 9.85
Viscosity: 50
Yield Pt: 17
Filter Cake: 32
Solids: 11%
pH: 8.3
Chlorides: 1,500 mg/l



ALL DATA WAS SHIFTED UP 37' TO MATCH THE WIRE LINE GAMMA FROM 10550' MD TO 10763' MD.

MUD WT: 8.7/ VIS: 27 pH IN 9.0/Out 9.2

ANHY: wh-clr, amor-sb plty, pred sl frm, occ sft, non calc
SLTST: red/orng, slty tex, sb blkly-sb plty, fri-sft, non calc
SH: red-orng/brn, occ gy, gt tex, sb plty-plty, mod sft, non calc; nfsoc

MUD WT: 8.7/ VIS: 27

ANHY: wh-clr, amor-sb plty, pred sl frm, occ sft, non calc, SA: lt pnk-clr, brit-fri clus, suc tex, cyxln, v sl calc, SLTST: red/orng, slty tex, sb blkly-sb plty, fri-sft, non calc, SH: red-orng/brn, occ gy, gt tex, sb plty-plty, mod sft, non calc; nfsoc

MUD WT: 8.7/ VIS: 27

DOL:gn-lt gy, cyxln, suc tex ip, v sft-fri, non calc, SA: pred clr, occ lt pnk, brit-fri, suc tex, cyxln, v sl calc, SLTST: red/orng, slty tex, sb blkly-sb plty, fri-sft, non calc, ANHY: wh-clr, amor-sb plty, pred sl frm, rr sft, non calc, SH: red-orng/brn, occ gy, gt tex, sb plty-plty, mod sft, non calc; nfsoc

MUD WT: 8.7/ VIS: 27

ALL DATA WAS SHIFTED DOWN AN 7' TO MATCH THE RERUN OF THE LWD GAMMA FROM 10763' MD TO TD MD. THE RED LINE IS THE RERUN GAMMA AND THE GREEN LINE IS THE ORGINIAL LWD GAMMA.

MD: 10,792'
Inclination: 41.2°
Azimuth: 146.3°
TVD: 8,817.55'
VS: 5,067.67'

SH: red-orng/brn, occ slt gy, gt-sltly tex, sb plty-plty, mod sft, non calc
SLTST: red/orng, slty tex, sb blkly-sb plty, fri-sft, aren ip, non calc
SA: pred clr, brit, occ suc tex, v sl calc
DOL: gn-lt gy, cyxln, v sft-fri, non calc
ANHY: wh-lt pnk, amor, mas, v sft, non calc; nfsoc

MUD WT: 8.7/ VIS: 29

SH: red-orng/brn, occ lt gy-gy/bl, gt-sltly tex, sb plty-plty, mod sft, dolc ip (qv-qv/bl), non calc

