

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Loeffler K1-65HN

Location SEC. 1, T4N, R66W

State COLORADO

County WELD

Country USA

Rig Number PRECISION 829

API Number 05-123-37739

Region DJ BASIN

Field WATTENBERG

Spud Date 9/27/2013

Surface Coordinates 1650' FNL, 288' FWL

Ground Elevation 4666'

K.B. Elevation 4682'

Logged Interval 645' To 6300'

Total Depth 6300'

Formation PIERRE SHALE

Type of Drilling Fl... LSND

Operator

Company Noble Energy

Address 1625 BROADWAY, SUITE 2200
DENVER, COLORADO 80202

Geologist

Name Holly Duncan

Company Noble Energy

Address 1626 BROADWAY, SUITE 2200
DENVER, COLORADO 80202
303.389.3600

Other

Wellsite Geologists

Eli Smith

Rock Types

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

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
STROMATOPOROÏD

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
MICACEOUS
MINERAL CRYSTALS
NODULES
PHOSPHATE PELLETS
PYRITE
SALT CAST
SANDY
SILICEOUS
SILTY
TUFFACEOUS

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

Stringer

Other Symbols

Oil Show

DEAD
EVEN
QUESTIONABLE
SPOTTED STAINING

Porosity

E EARTHY
F FENESTRAL
F FRACTURE
X INTERCRYSTALLINE
O INTEROOLITIC
M MOLDIC

ORGANIC
P PINPOINT
V VUGGY

Engineering

BIT CHANGE
CONNECTION (LEFT)
CONNECTION (RIGHT)
CONNECTION GAS
TRIP GAS
DOWN TIME GAS
CORE - LOST
CORE - RECOVERED
DST INTERVAL

FAULT
FORMATION TOP
GAS SHOW
OIL SHOW
MN DEPTH
MN DEPTH (RIGHT)
NORMAL FAULT
OVERTURNED STRATA
REVERSE FAULT
CASING
SIDEWALL CORE (LEFT)
SIDEWALL CORE (RIGHT)
SLIDE
SURVEY

DRILL STEM TEST
WIRELINE TESTED - LEFT
WIRELINE TESTED - RT

Rounding

A ANGULAR
R ROUNDED
S SUBANG
S SUBRND

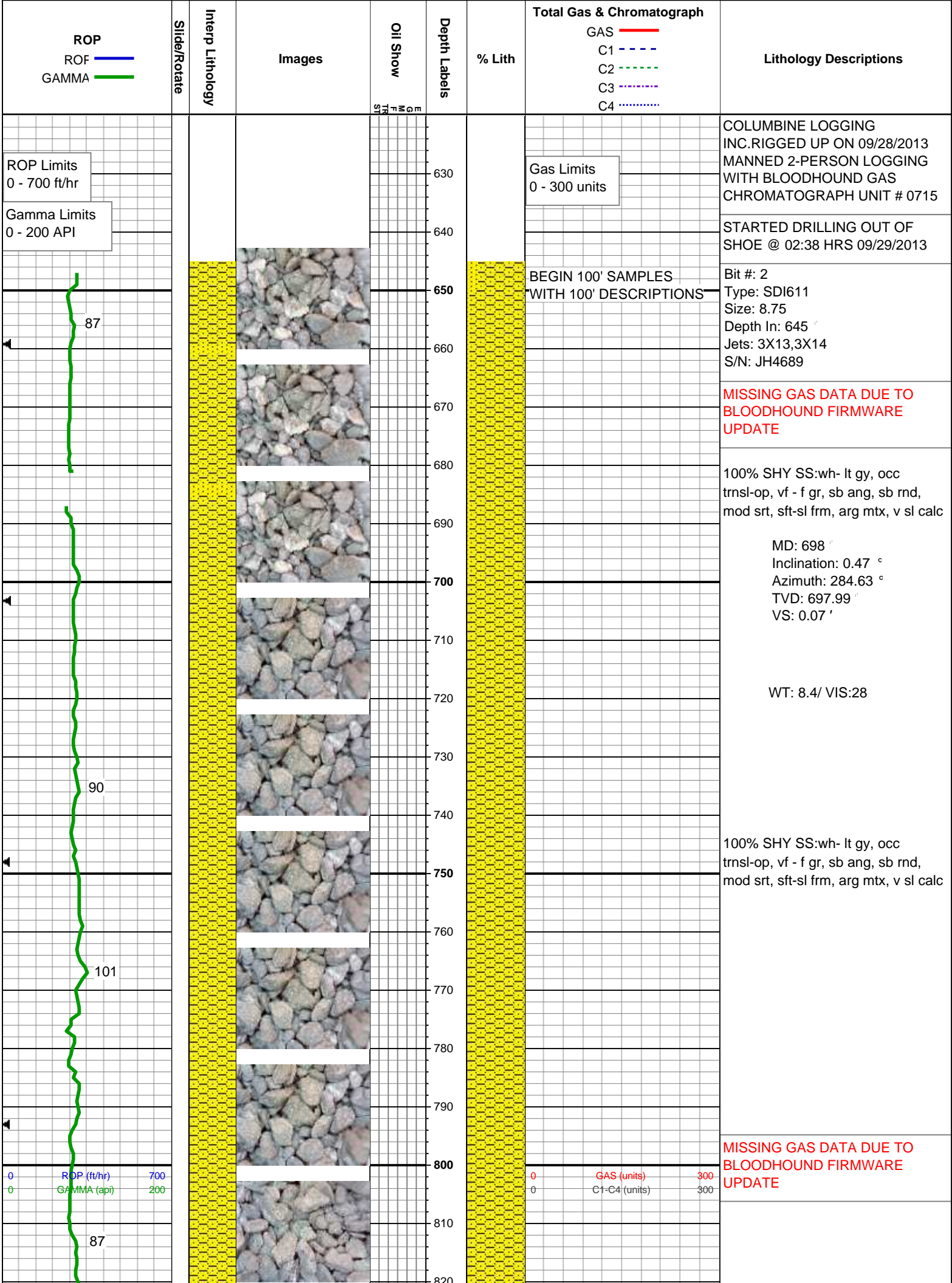
Textures

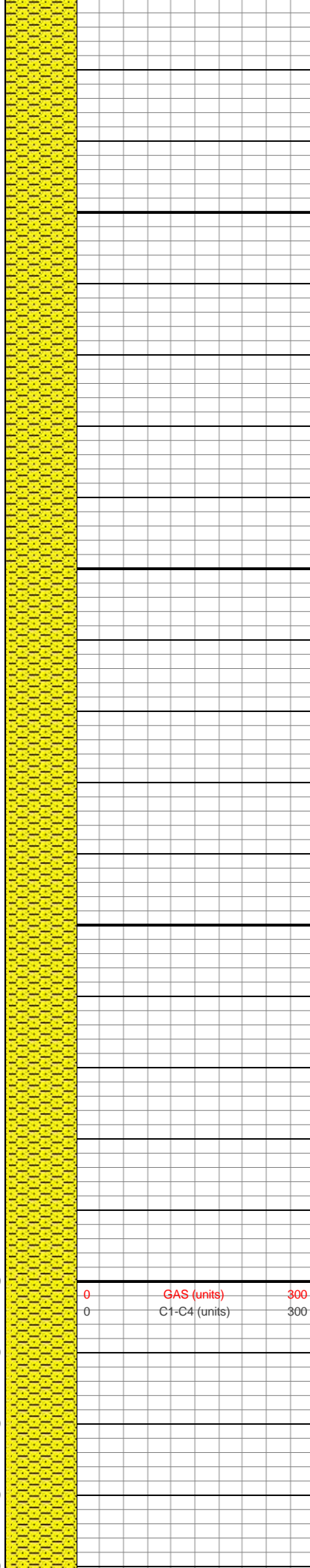
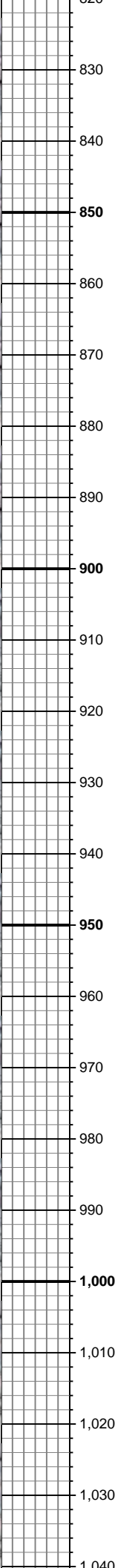
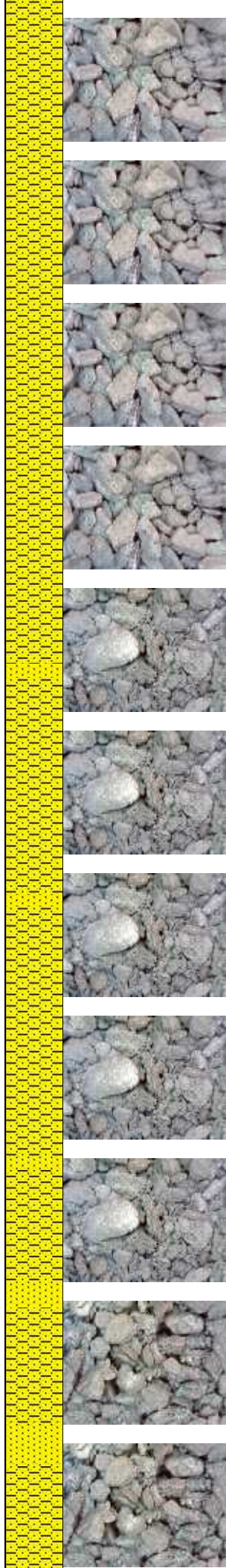
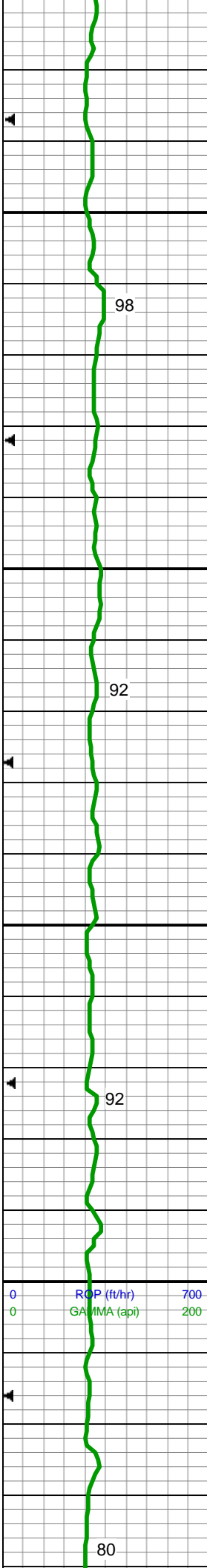
B BOUNDSTONE
C CHALKY
C CRYPTOXLN

E EARTHY
F FINELYXLN
G GRAINSTONE
L LITHOGRAPHIC
M MICROXLN
M MUDSTONE
P PACKSTONE
W WACKESTONE

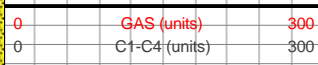
Sorting

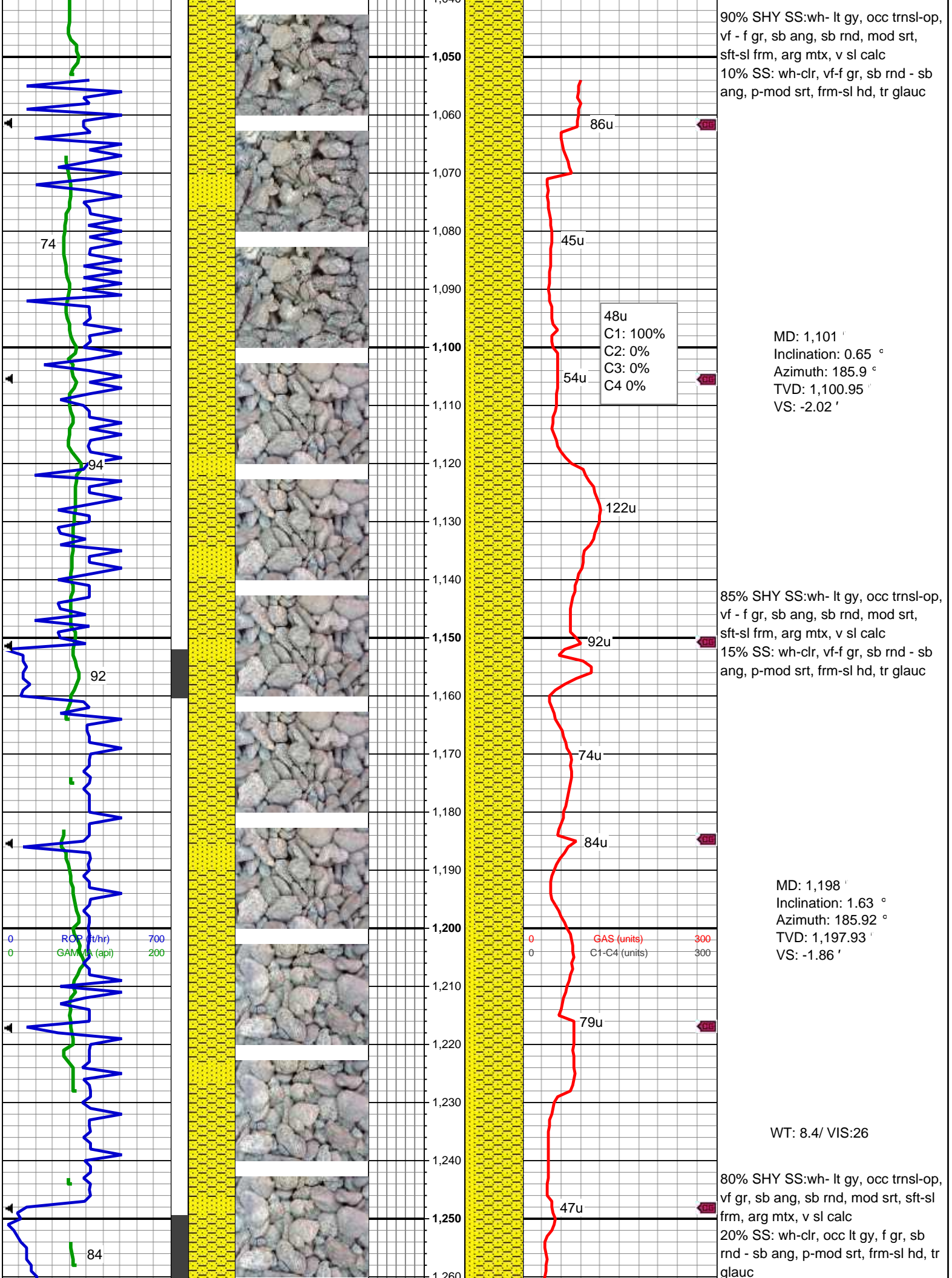
M MODERATE
P POOR
W WELL

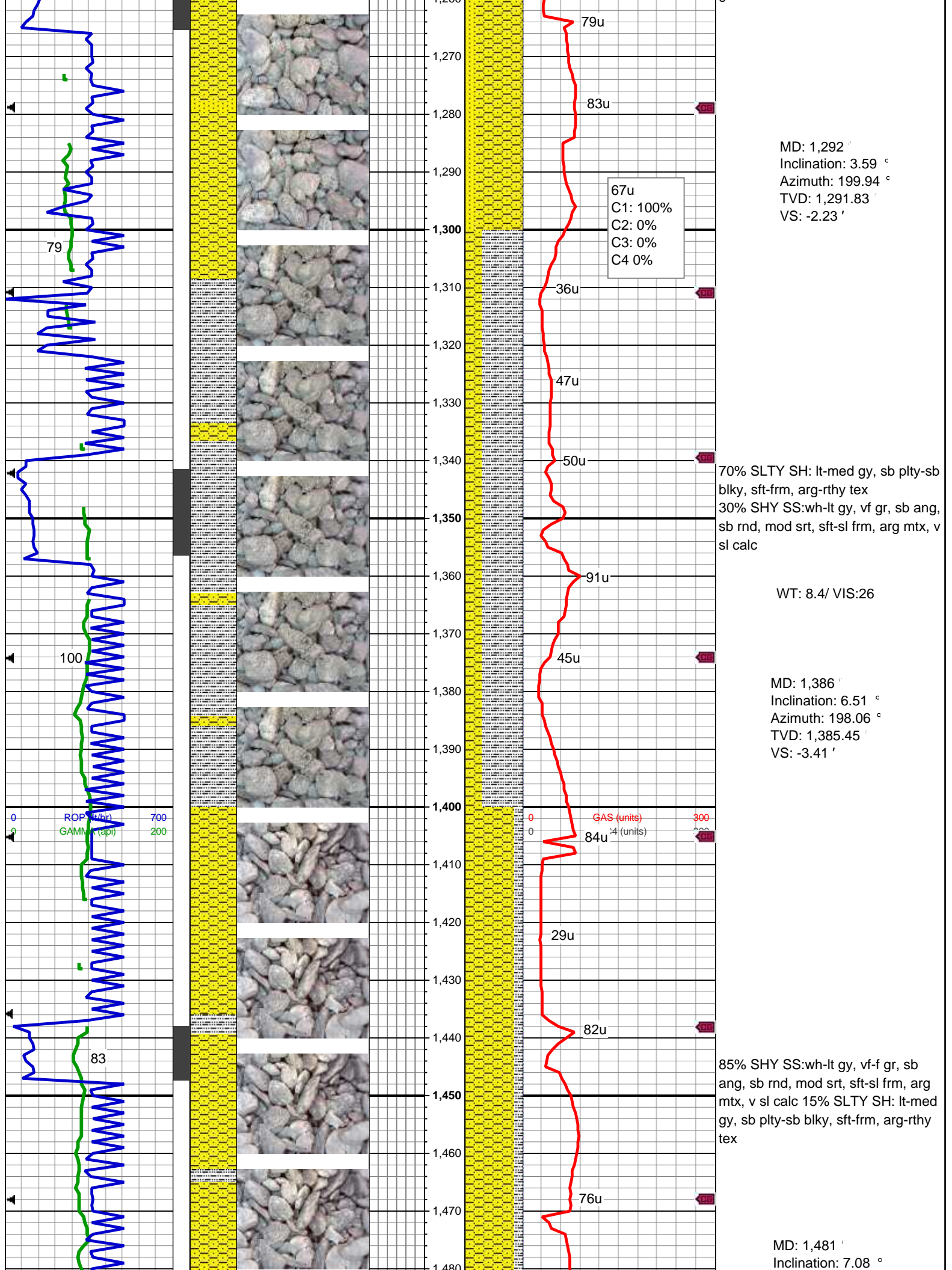


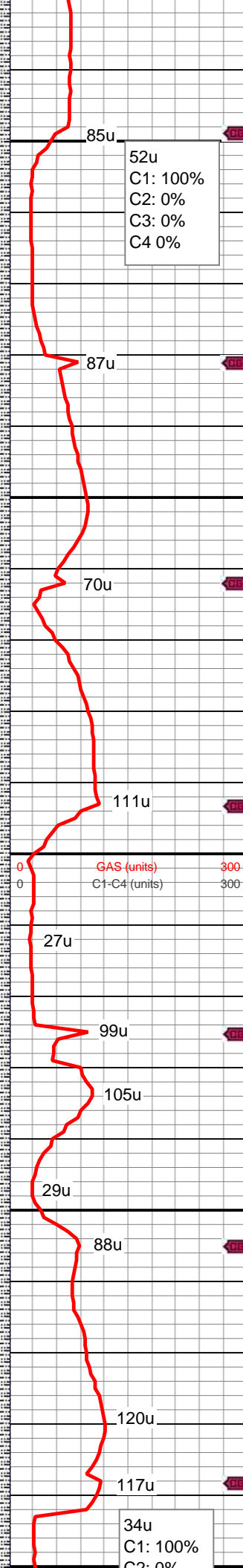
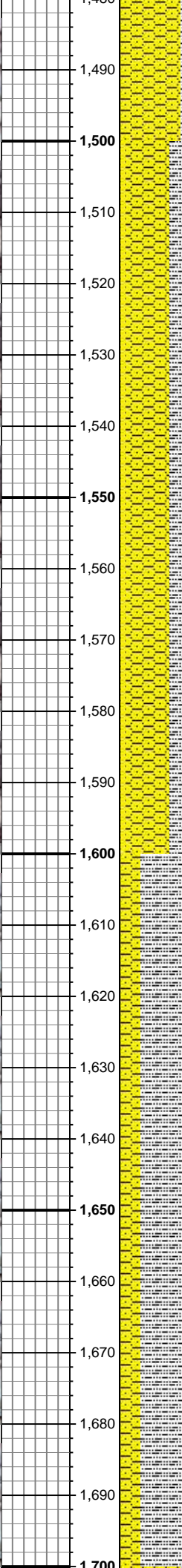
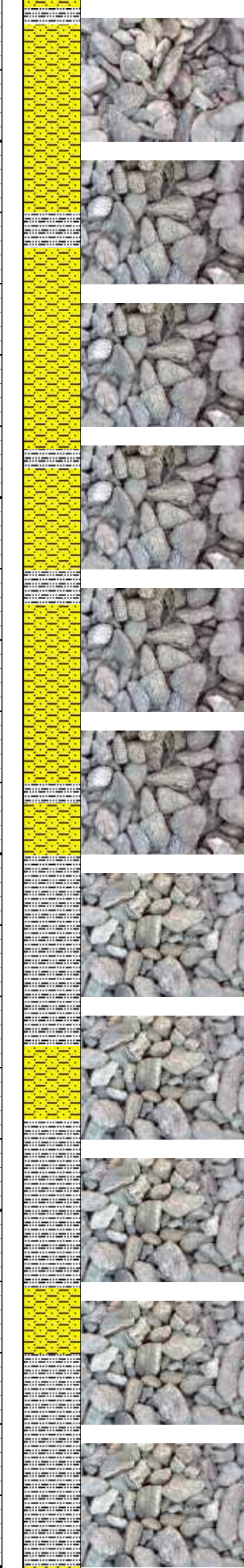
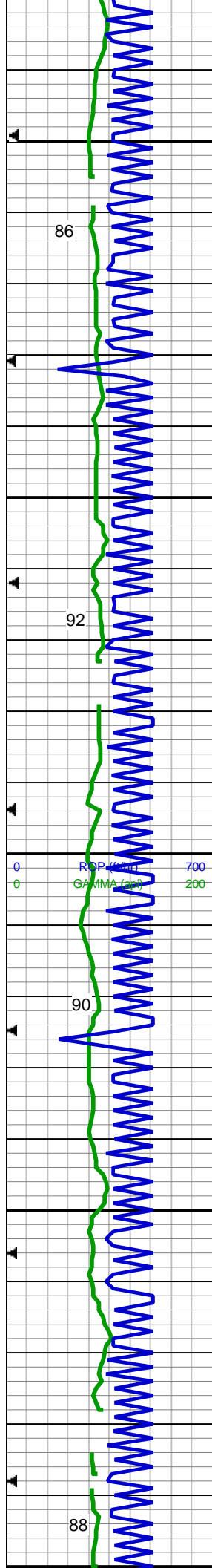


MD: 832 ' Inclination: 0.68 ° Azimuth: 280.06 ° TVD: 831.98 ' VS: -1.27 '	
100% SHY SS:wh- lt gy, occ trnsl-op, vf - f gr, sb ang, sb rnd, mod srt, sft-sl frm, arg mtx, v sl calc	
MISSING GAS DATA DUE TO BLOODHOUND FIRMWARE UPDATE	
95% SHY SS:wh- lt gy, occ trnsl-op, vf - f gr, sb ang, sb rnd, mod srt, sft-sl frm, arg mtx, v sl calc 5% SS: wh-clr, vf-f gr, sb rnd - sb ang, p-mod srt, frm-sl hd, tr glauc	
MD: 966 ' Inclination: 1.28 ° Azimuth: 190.85 ° TVD: 965.97 ' VS: -2.07 '	
MISSING GAS DATA DUE TO BLOODHOUND FIRMWARE UPDATE	
WT: 8.4/ VIS:28	









Azimuth: 198.47 °
TVD: 1,479.79 '
VS: -4.91 '

52u
C1: 100%
C2: 0%
C3: 0%
C4 0%

60% SHY SS:wh-lt gy, vf-f gr, sb ang, sb rnd, mod srt, sft-sl frm, arg mtx, v sl calc 30% SLTY SH: lt-med gy, sb plty-sb blkly, sft-frm, arg-rthy tex 10% SS: wh-clr, f gr, sb rnd - sb ang, p-mod srt, frm-sl hd, tr glauc

MD: 1,575 '
Inclination: 7.68 °
Azimuth: 191.75 °
TVD: 1,573.01 '
VS: -5.84 '

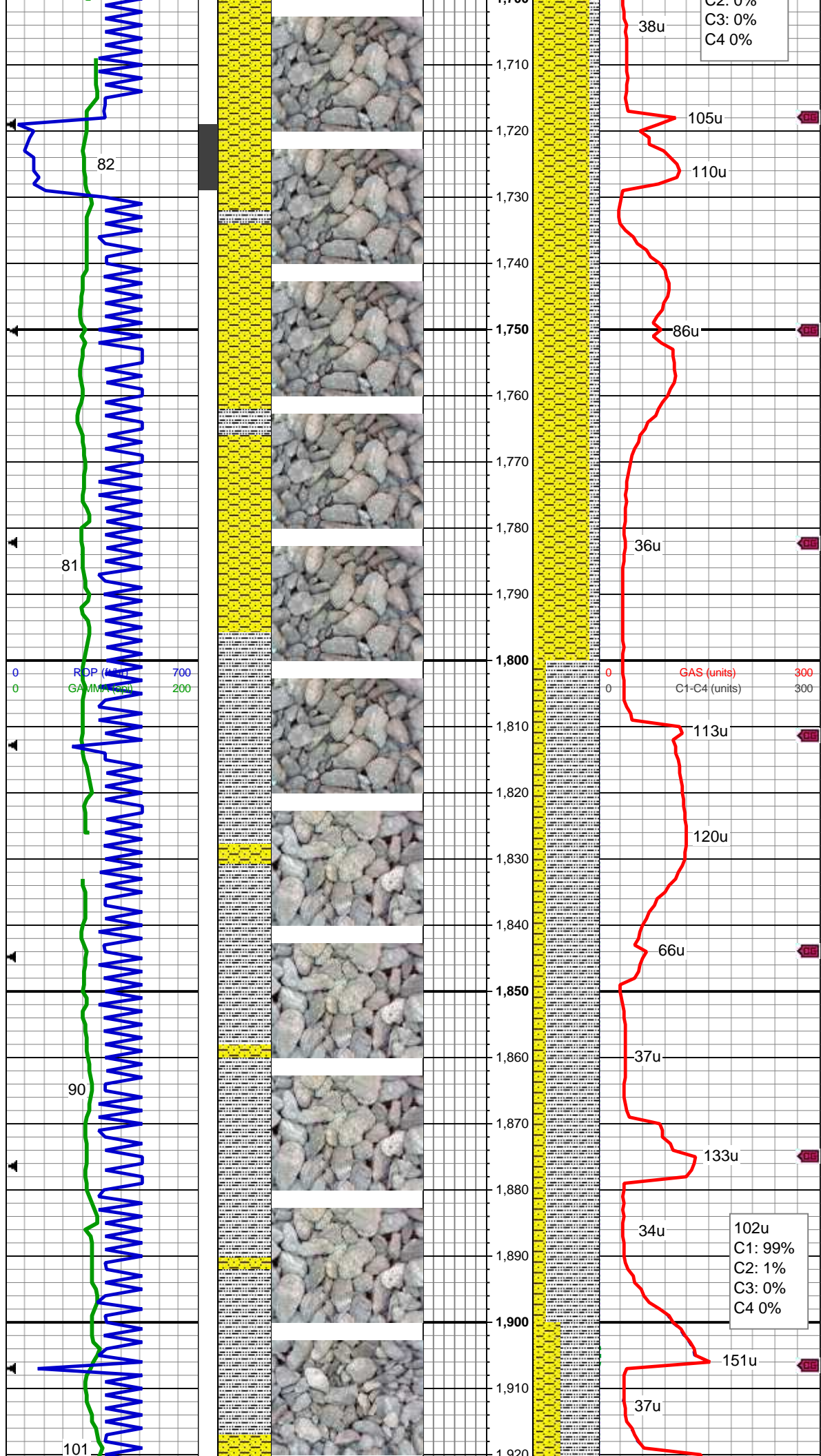
0 GAS (units) 300
0 C1-C4 (units) 300

27u
99u
105u
29u
88u
120u
117u

34u
C1: 100%
C2: 0%

70% SLTY SH: lt-med gy, sb plty-sb blkly, sft-frm, arg-rthy tex
30% SHY SS:wh-lt gy, vf-f gr, sb ang, sb rnd, mod srt, sft-sl frm, arg mtx, v sl calc

MD: 1,669 '
Inclination: 6.89 °
Azimuth: 182.55 °
TVD: 1,666.25 '
VS: -5.18 '



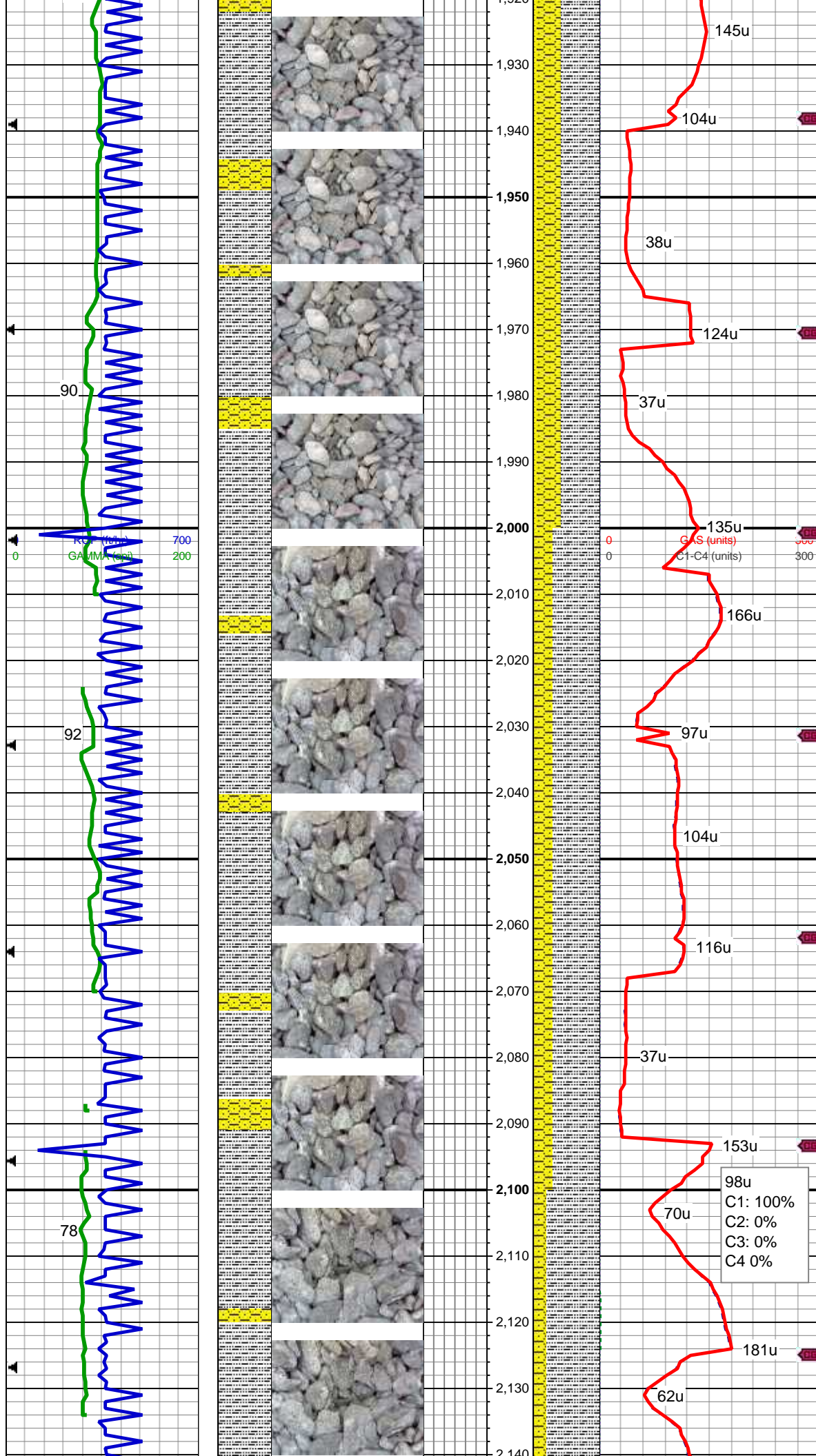
WT: 8.45/ VIS:26

75% SHY SS:wh-lt gy, vf-f gr, sb ang, sb rnd, mod srt, sft-sl frm, arg mtx, v sl calc 15% SLTY SH: lt-med gy, sb plty-sb blkly, sft-frm, arg-rthy tex 10% SS: wh-clr, f gr, sb rnd - sb ang, p-mod srt, frm-sl hd, tr glauc

MD: 1,763 '
Inclination: 8.03 °
Azimuth: 190.89 °
TVD: 1,759.46 '
VS: -4.43 '

80% SLTY SH: lt-med gy, sb plty-sb blkly, sft-frm, arg-rthy tex 20% SHY SS:wh-lt gy, vf-f gr, sb ang, sb rnd, mod srt, sft-sl frm, arg mtx, v sl calc

MD: 1,857 '
Inclination: 7.22 °
Azimuth: 196.98 °
TVD: 1,852.63 '
VS: -5.13 '



60% SLTY SH: lt-med gy, sb plty-sb blkly, sft-frm, arg-rthy tex
35% SHY SS:wh-lt gy, vf-f gr, sb ang, sb rnd, mod srt, sft-sl frm, arg mtx, v sl calc 5% SS:wh, lt gy ip, f gr, sb rnd - sb ang, p-mod srt, frm-sl hd, tr glauc

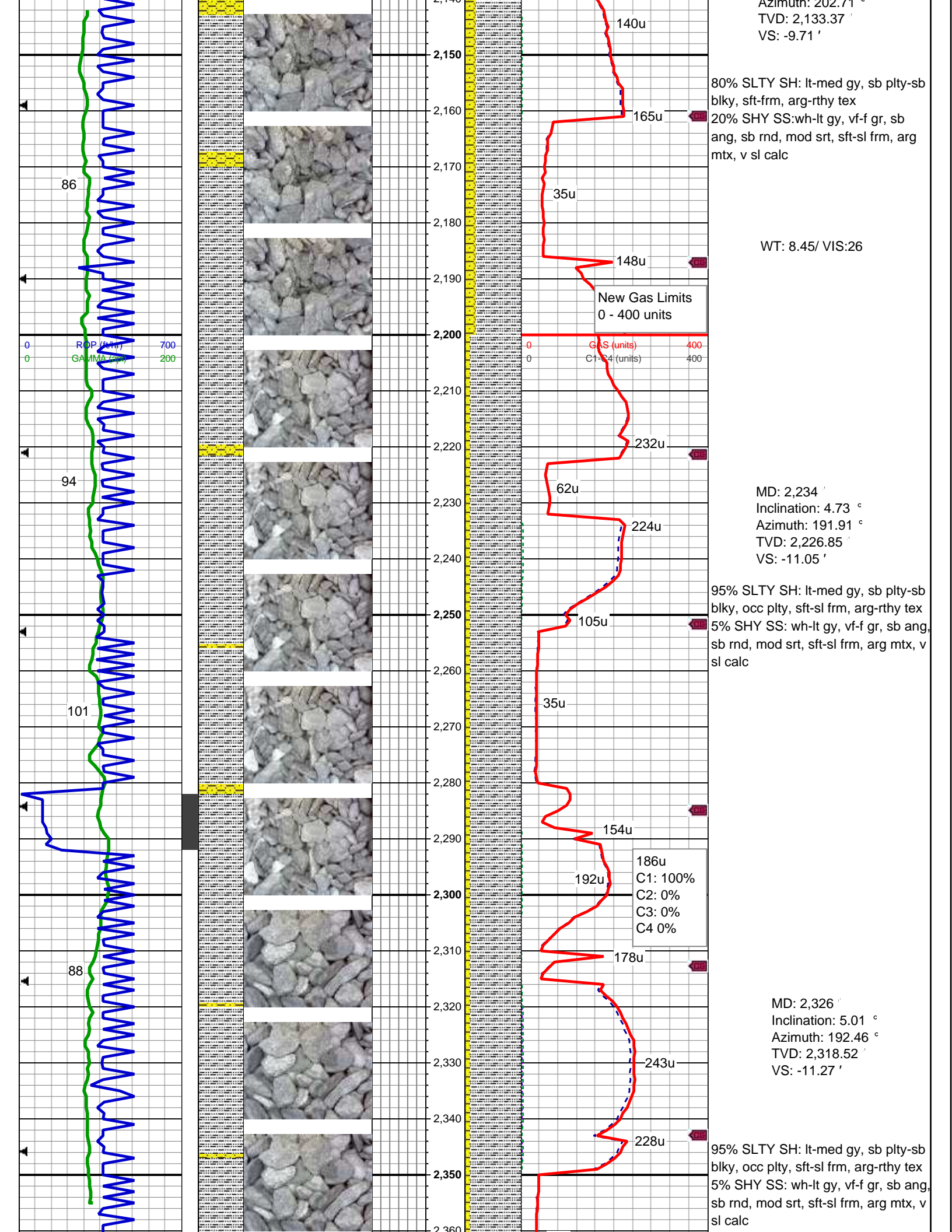
MD: 1,952 '
Inclination: 7.96 °
Azimuth: 196.56 °
TVD: 1,946.79 '
VS: -6.48 '

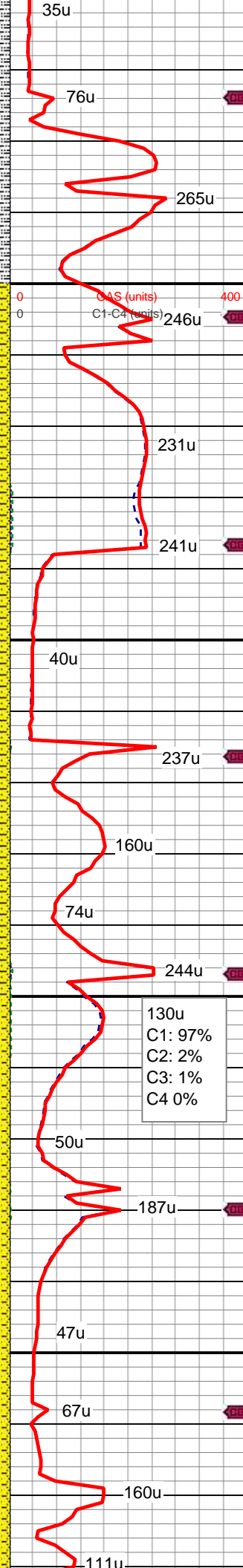
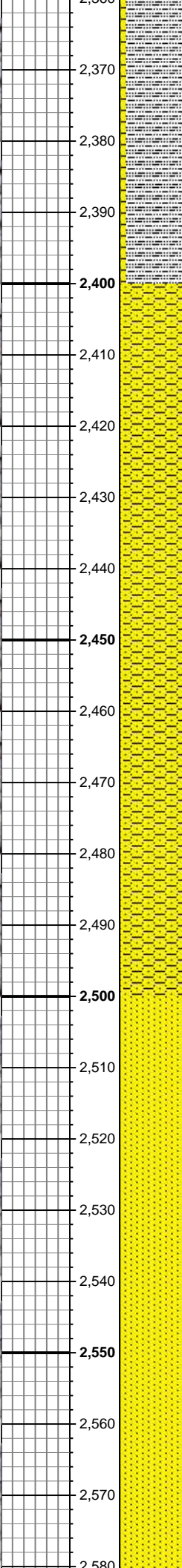
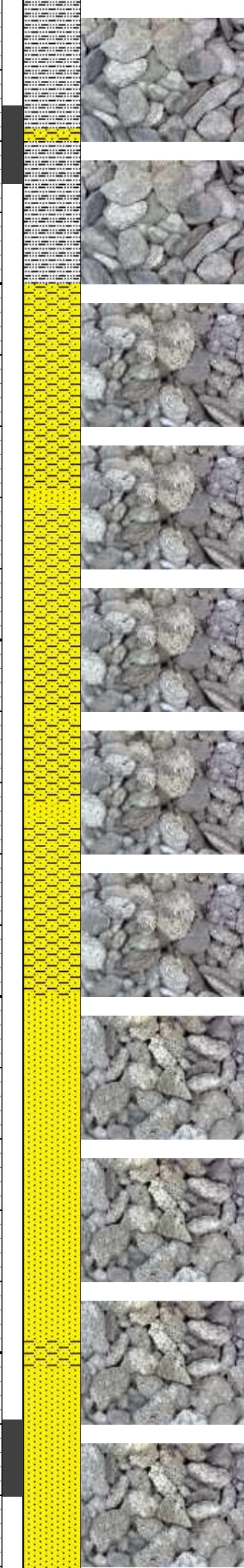
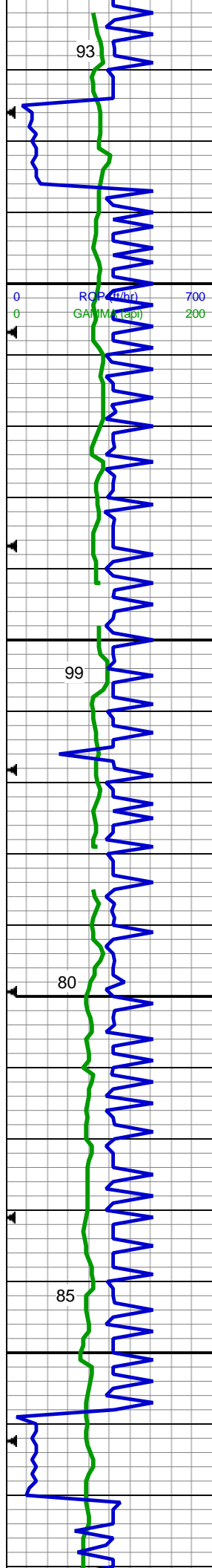
WT: 8.45/ VIS:26

MD: 2,046 '
Inclination: 6.46 °
Azimuth: 197.62 °
TVD: 2,040.05 '
VS: -7.81 '

70% SLTY SH: lt-med gy, sb plty-sb blkly, sft-frm, arg-rthy tex
30% SHY SS:wh-lt gy, vf-f gr, sb ang, sb rnd, mod srt, sft-sl frm, arg mtx, v sl calc

MD: 2,140 '
Inclination: 7.27 °
Azimuth: 199.71 °





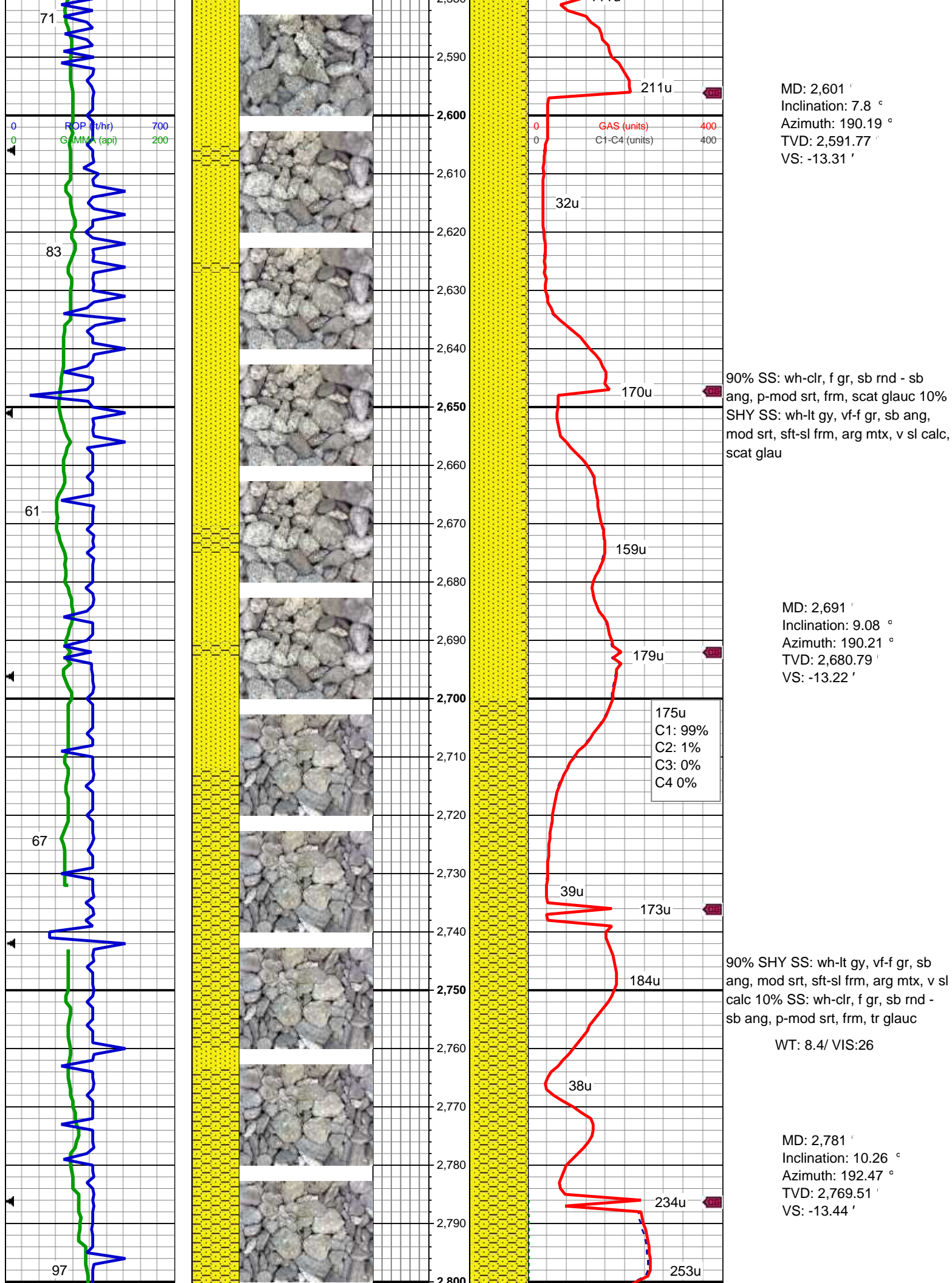
WT: 8.4/ VIS:26

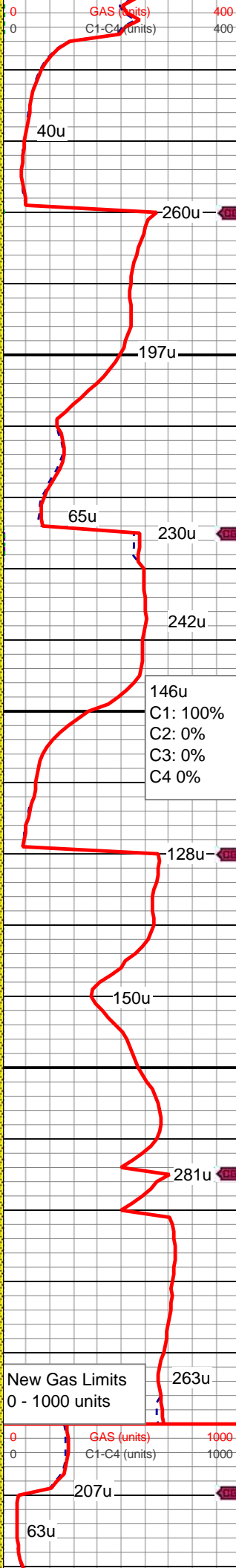
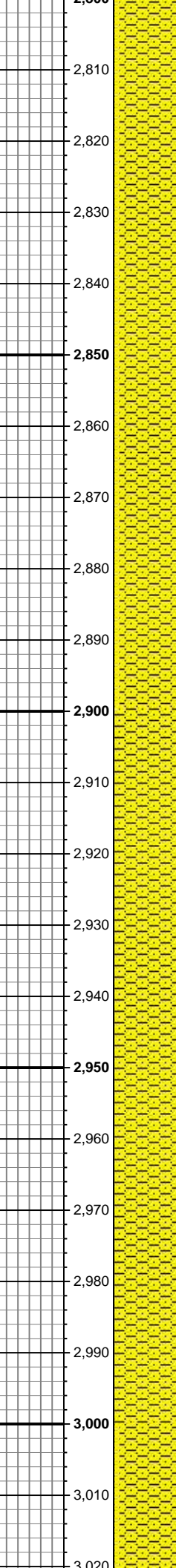
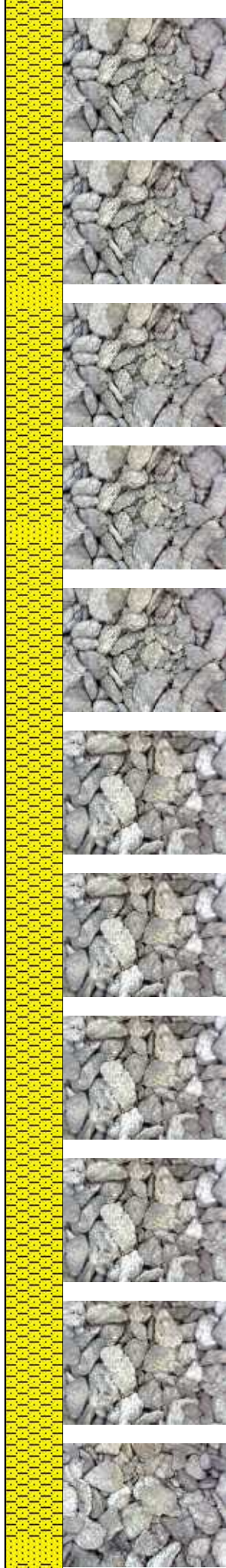
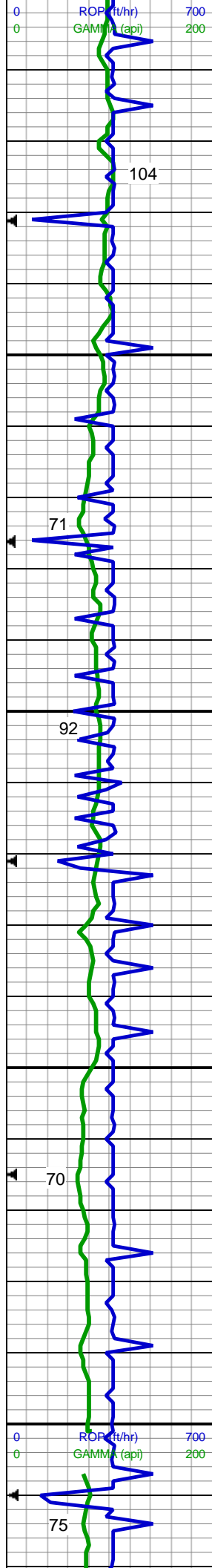
MD: 2,418 '
Inclination: 6.79 °
Azimuth: 199.19 °
TVD: 2,410.03 '
VS: -12.22 '

95% SHY SS: wh-lt gy, vf-f gr, sb ang, mod srt, sft-sl frm, arg mtx, v sl calc 5% SS: wh-clr, f gr, sb rnd - sb ang, p-mod srt, frm, tr glauc

MD: 2,512 '
Inclination: 6.19 °
Azimuth: 192.29 °
TVD: 2,503.43 '
VS: -13.2 '

90% SS: wh-clr, f gr, sb rnd - sb ang, p-mod srt, frm, tr glauc 10% SHY SS: wh-lt gy, vf-f gr, sb ang, mod srt, sft-sl frm, arg mtx, v sl calc



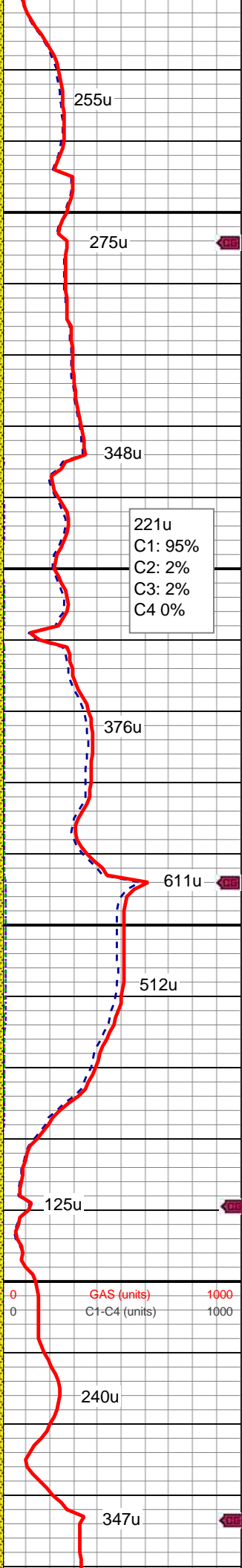
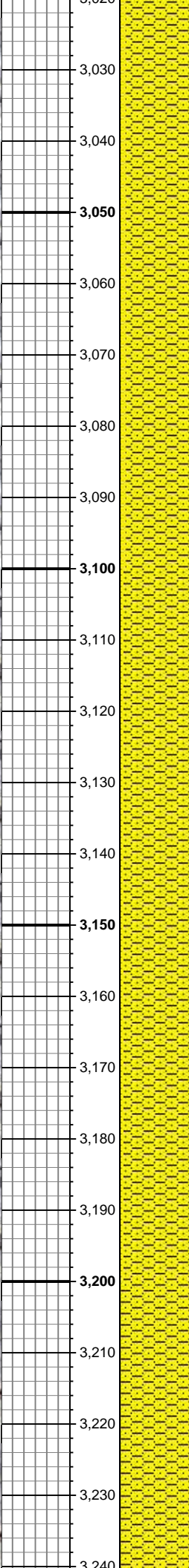
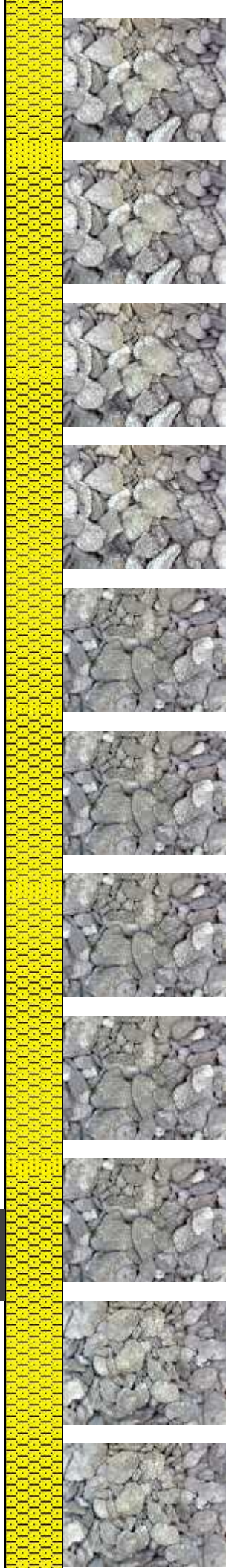
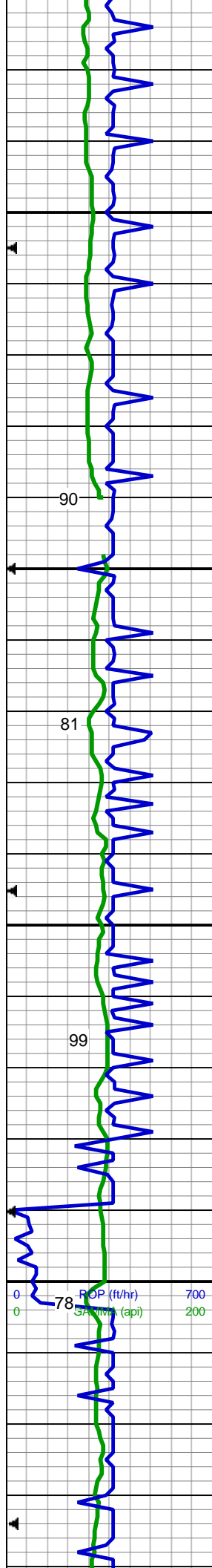


90% SHY SS: wh-lt gy, vf-f gr, sb
ang, mod srt, sft-sl frm, arg mtx, v sl
calc 10% SS: wh-clr, f gr, sb rnd -
sb ang, p-mod srt, frm, tr glauc, rr
fos frag

MD: 2,870 '
Inclination: 8.72 °
Azimuth: 194.41 °
TVD: 2,857.29 '
VS: -14.16 '

100% SHY SS: wh-lt gy, vf-f gr, sb
ang, mod srt, sft-sl frm, arg mtx, v sl
calc, tr glauc, rr fos frag

MD: 2,960 '
Inclination: 8.96 °
Azimuth: 192.78 °
TVD: 2,946.22 '
VS: -14.88 '



MD: 3,050 '
Inclination: 7.75 °
Azimuth: 202.45 °
TVD: 3,035.27 '
VS: -16.4 '

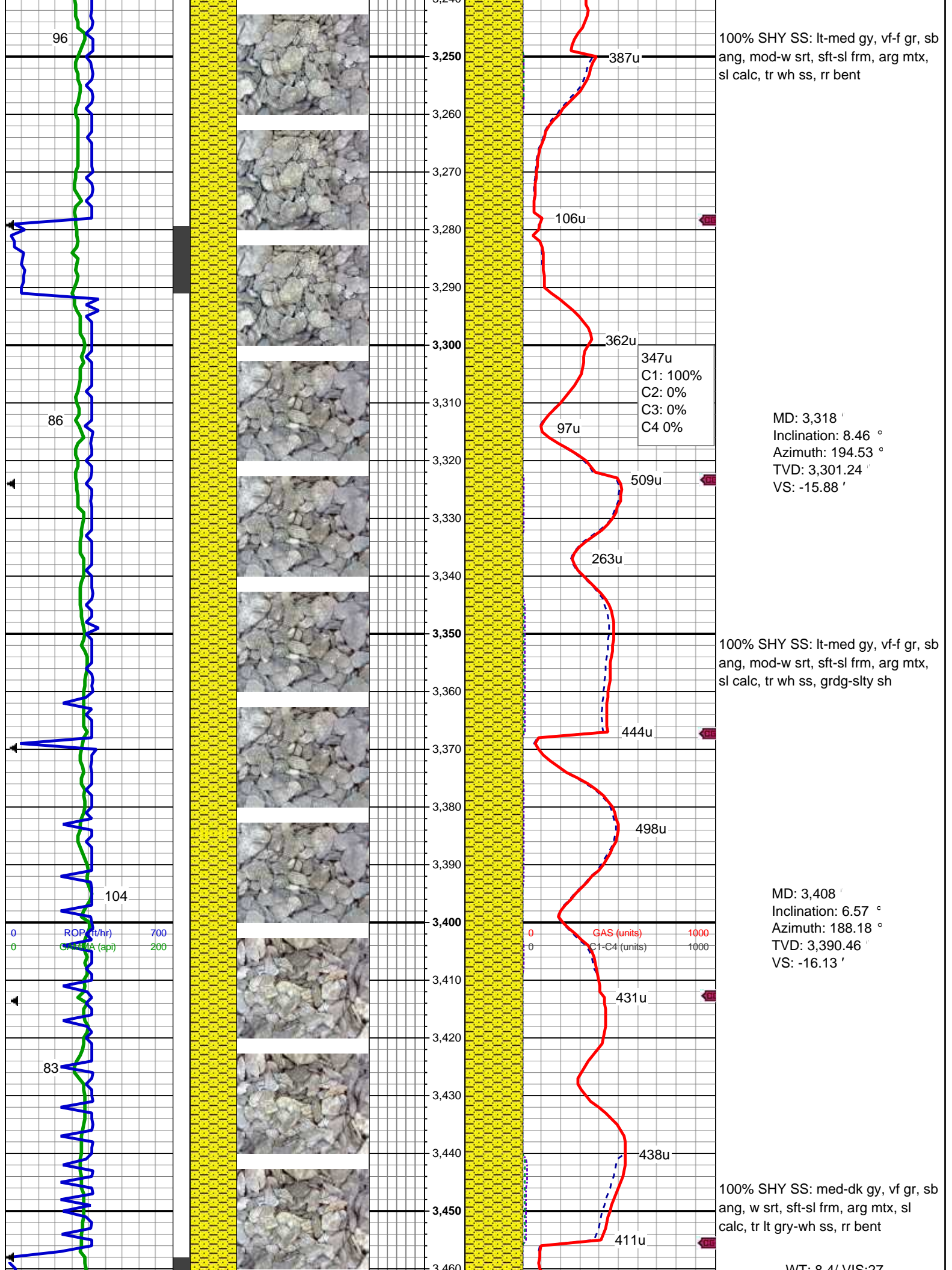
90% SHY SS: wh-lt gy, vf-f gr, sb
ang, mod srt, sft-sl frm, arg mtx, v sl
calc 10% SS: wh-clr, f gr, sb rnd -
sb ang, p-mod srt, frm, tr glauc

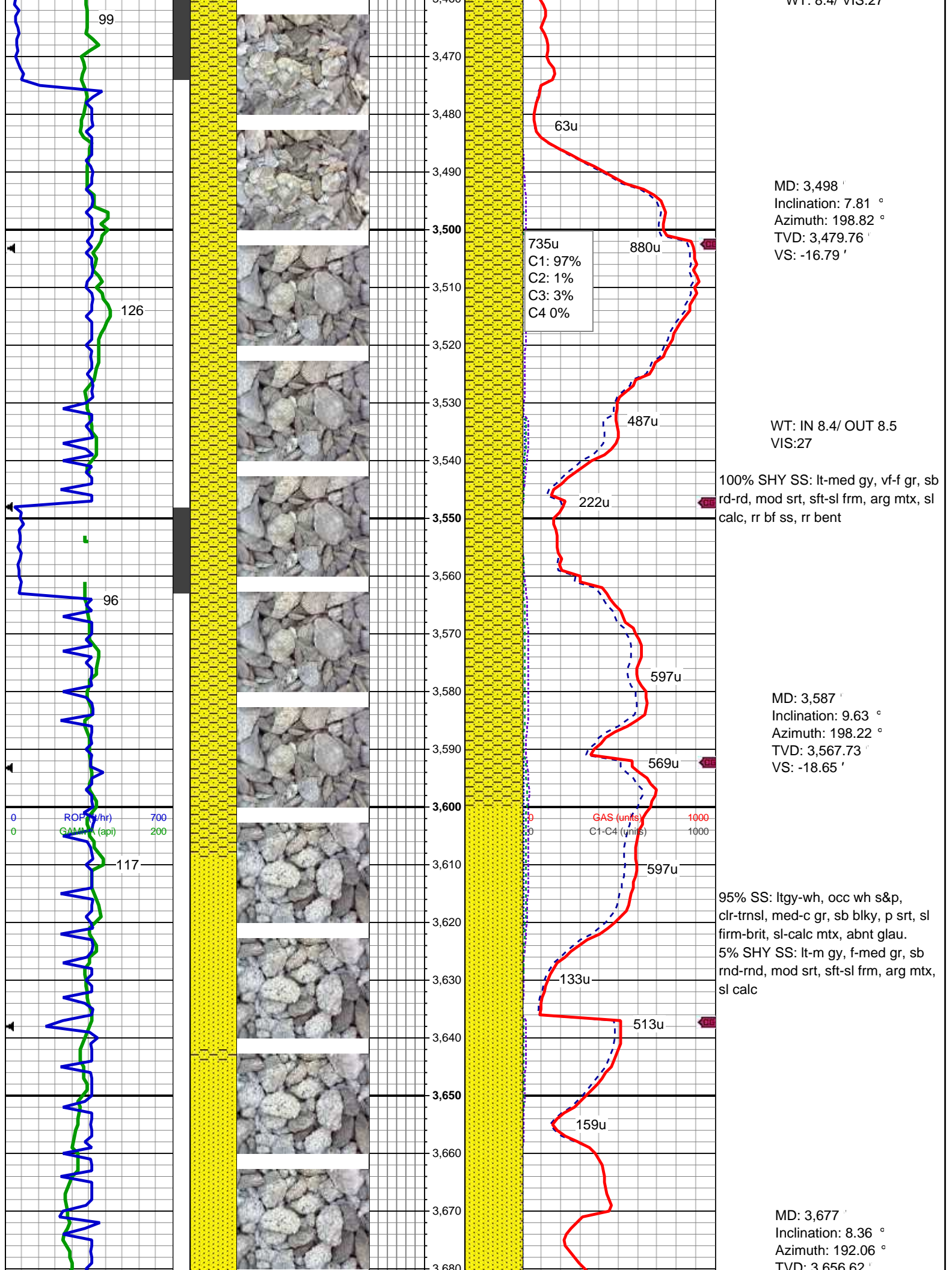
WT: 8.4/ VIS:28

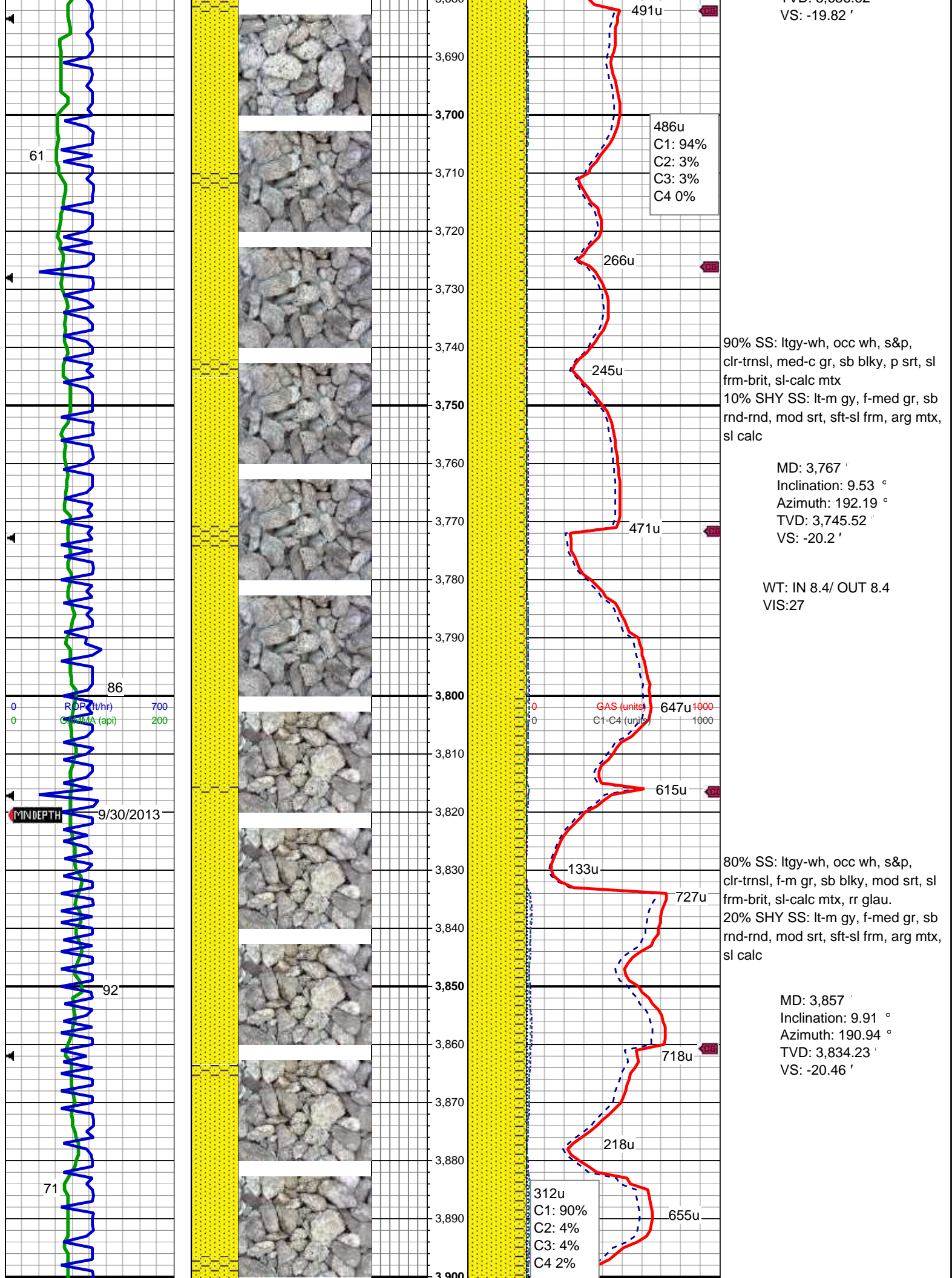
MD: 3,139 '
Inclination: 6.38 °
Azimuth: 184.82 °
TVD: 3,123.6 '
VS: -17.14 '

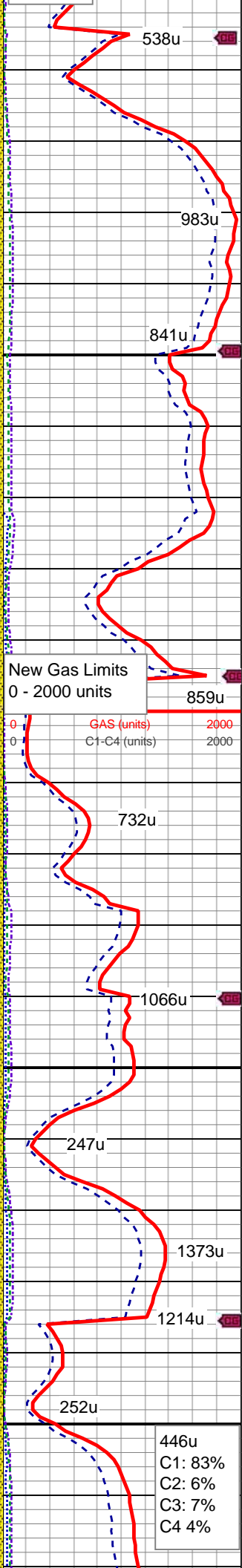
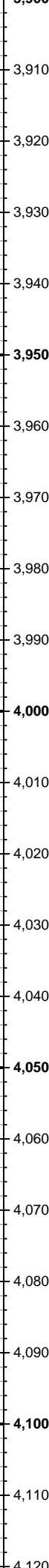
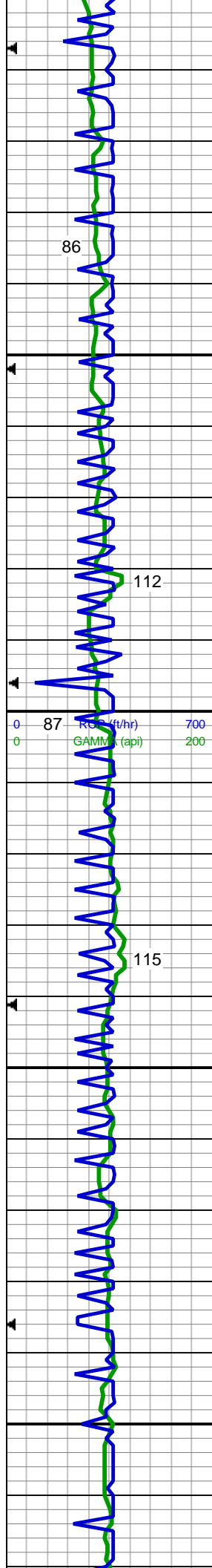
95% SHY SS: wh-lt gy, vf-f gr, sb
ang, mod srt, sft-sl frm, arg mtx, v sl
calc 5% SS: wh-clr, f gr, sb rnd - sb
ang, p-mod srt, frm, tr glauc

MD: 3,229 '
Inclination: 6.69 °
Azimuth: 183.89 °
TVD: 3,213.01 '
VS: -16.03 '









WT: IN 8.4/ OUT 8.5
VIS:27

MD: 3,946 '
Inclination: 9.11 °
Azimuth: 189.76 °
TVD: 3,922.01 '
VS: -20.41 '

80% SHY SS: med-dk gy, f-med gr,
sb rnd-rnd, mod srt, sft-sl frm, arg
mtx, sl calc 20% SS: ltgy-wh,
clr-trnsl, f-m gr, sb blkly, mod srt, sl
frm-brit, sl-calc mtx

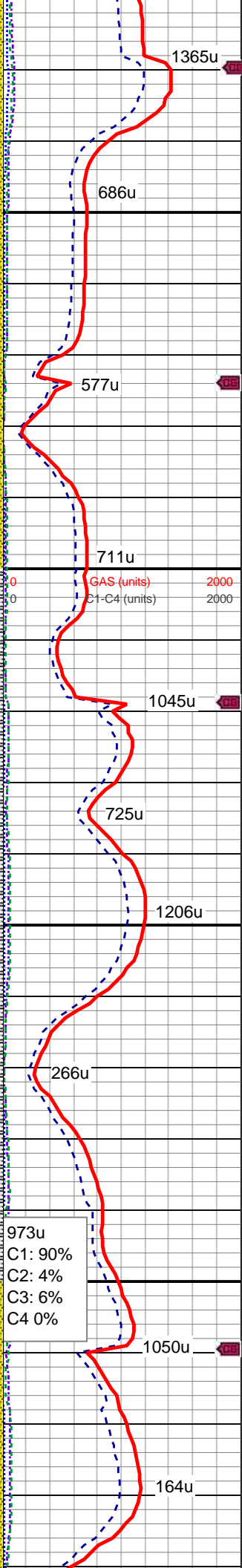
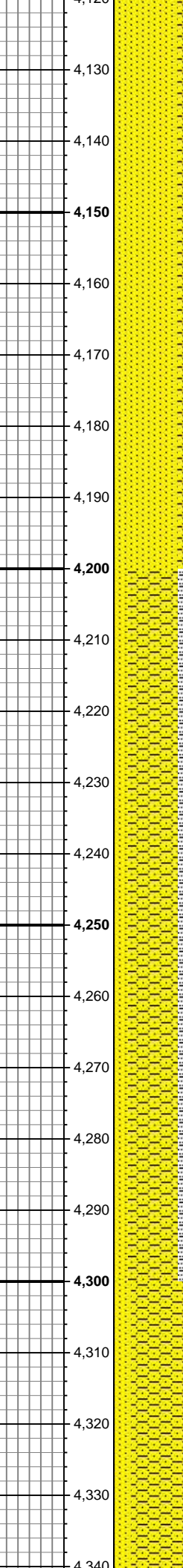
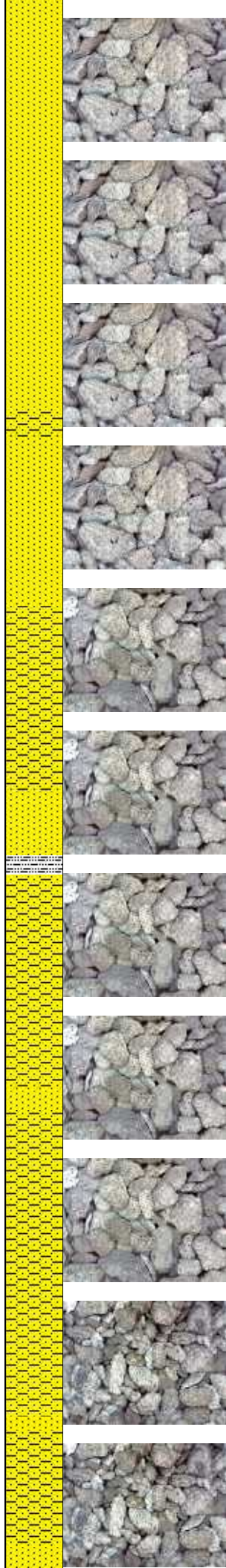
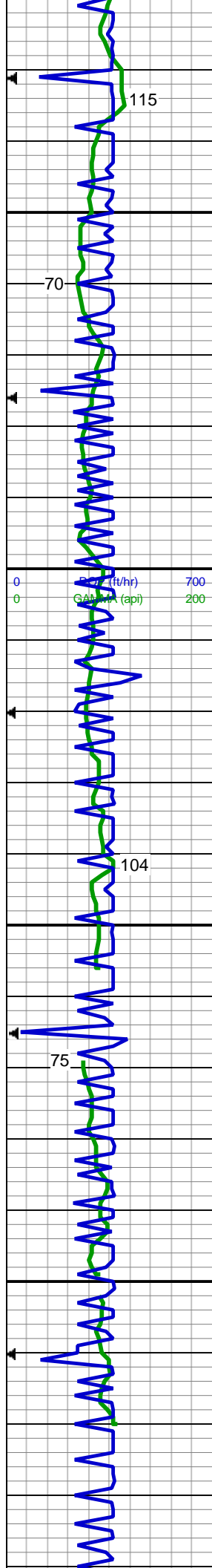
New Gas Limits
0 - 2000 units

MD: 4,036 '
Inclination: 9.08 °
Azimuth: 197.21 °
TVD: 4,010.88 '
VS: -21.13 '

100% SHY SS: lt-m gy, f-med gr,
rnd-w rnd, mod-w srt, sft-sl frm, arg
mtx, sl calc, rr lt gry ss

WT: IN 8.4/ OUT 8.5
VIS:28

MD: 4,125 '



Inclination: 7.04 °
Azimuth: 187.63 °
TVD: 4,099 '
VS: -21.66 '

90% SS: ltgy-wh, clr-trnsl, f-m gr, sb blk, mod srt, sl frm-brit, sl-calc mtx, abnt glau.
10% SHY SS: lt-m gy, f-med gr, sb rnd-rnd, mod srt, sft-sl frm, arg mtx, sl calc, tr dk gry slty sh

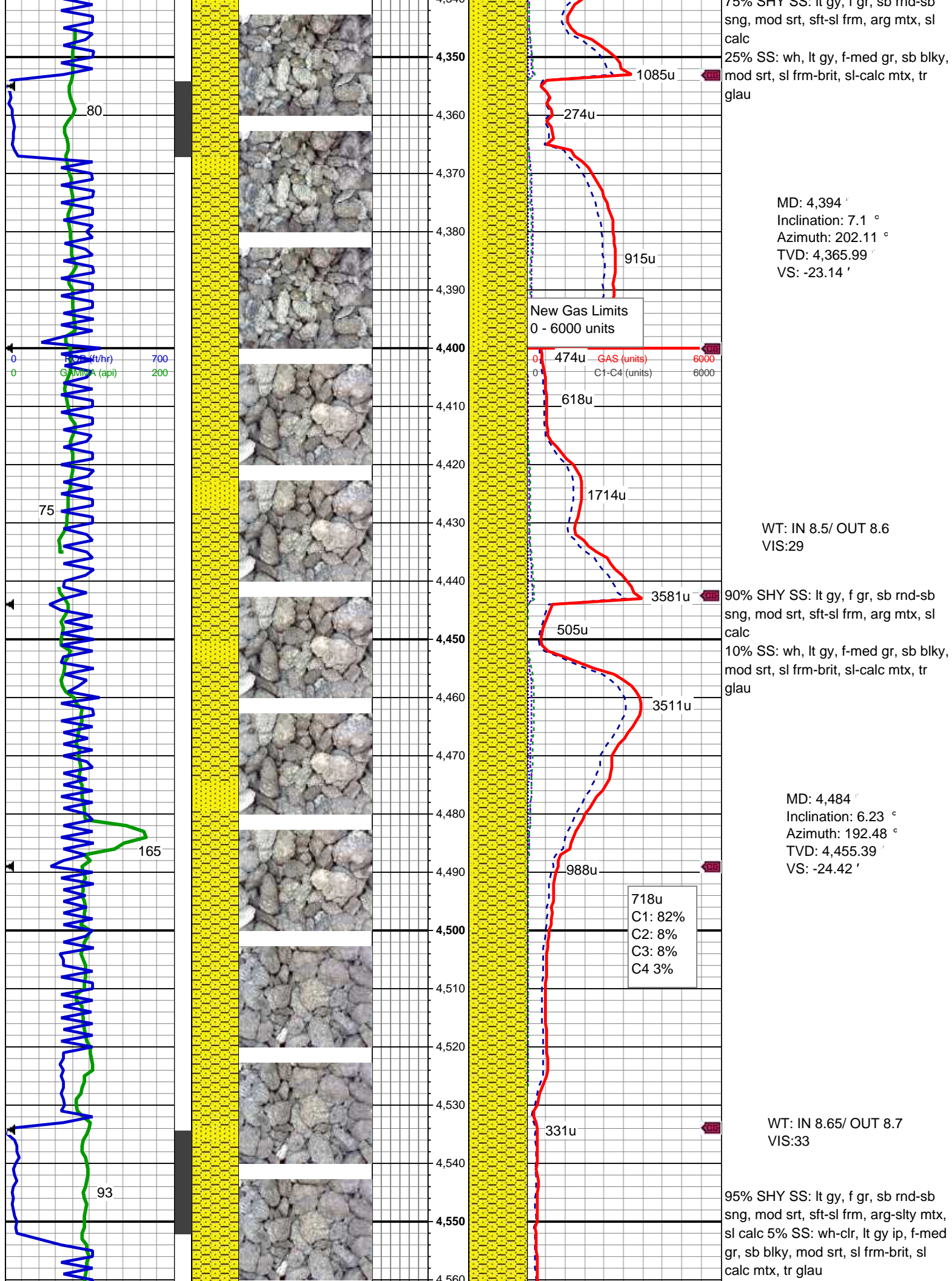
MD: 4,215 '
Inclination: 7.91 °
Azimuth: 197.35 °
TVD: 4,188.24 '
VS: -22.11 '

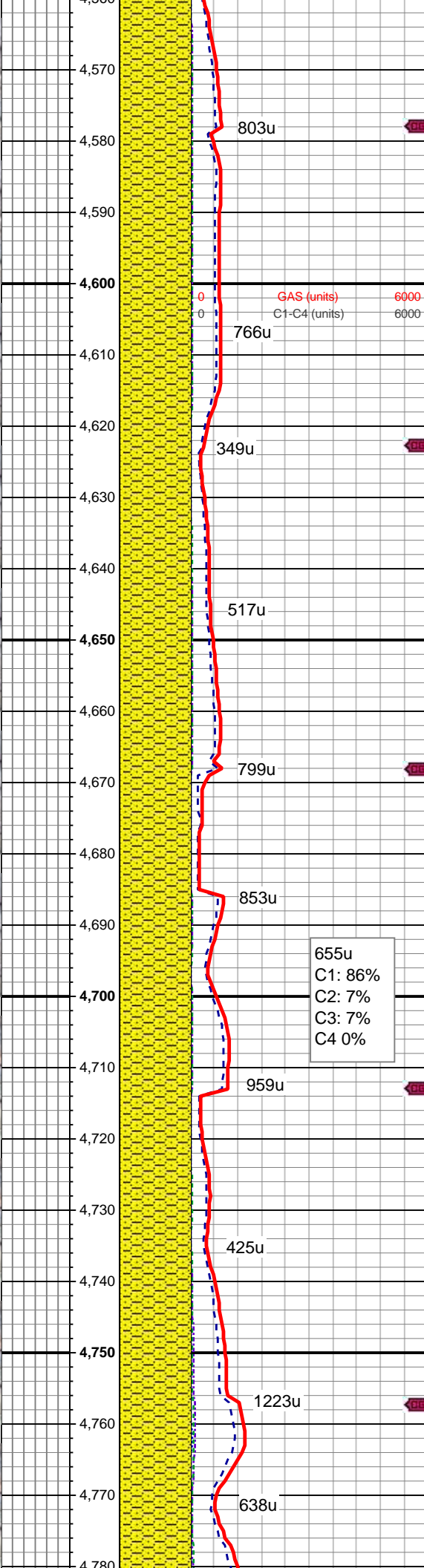
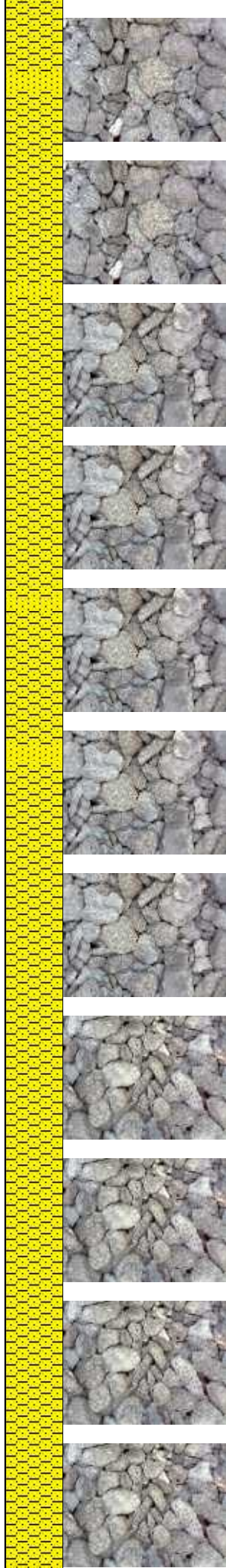
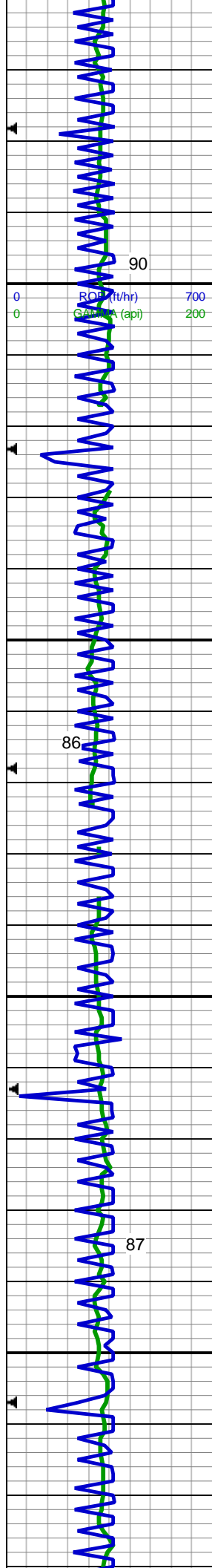
80% SHY SS: lt-m gy, f-med gr, rnd-w rnd, mod srt, sft-sl frm, arg mtx, sl calc
20% SS: lt-med gy, occ s&p, clr-trnsl, f-med gr, sb blk, mod srt, sl frm-brit, sl-calc mtx, abnt glau.
10% SLTY SH: dk gry, sft-frm, plty-sb plty, sl calc

MD: 4,304 '
Inclination: 6.04 °
Azimuth: 185.67 °
TVD: 4,276.58 '
VS: -22.43 '

WT: IN 8.5/ OUT 8.5
VIS:28

75% SHY SS: lt gy, f med gr, sb rnd sh





MD: 4,573 '
Inclination: 9.09 °
Azimuth: 197.39 °
TVD: 4,543.59 '
VS: -25.41 '

WT: IN 8.7/ OUT 8.8
VIS:35

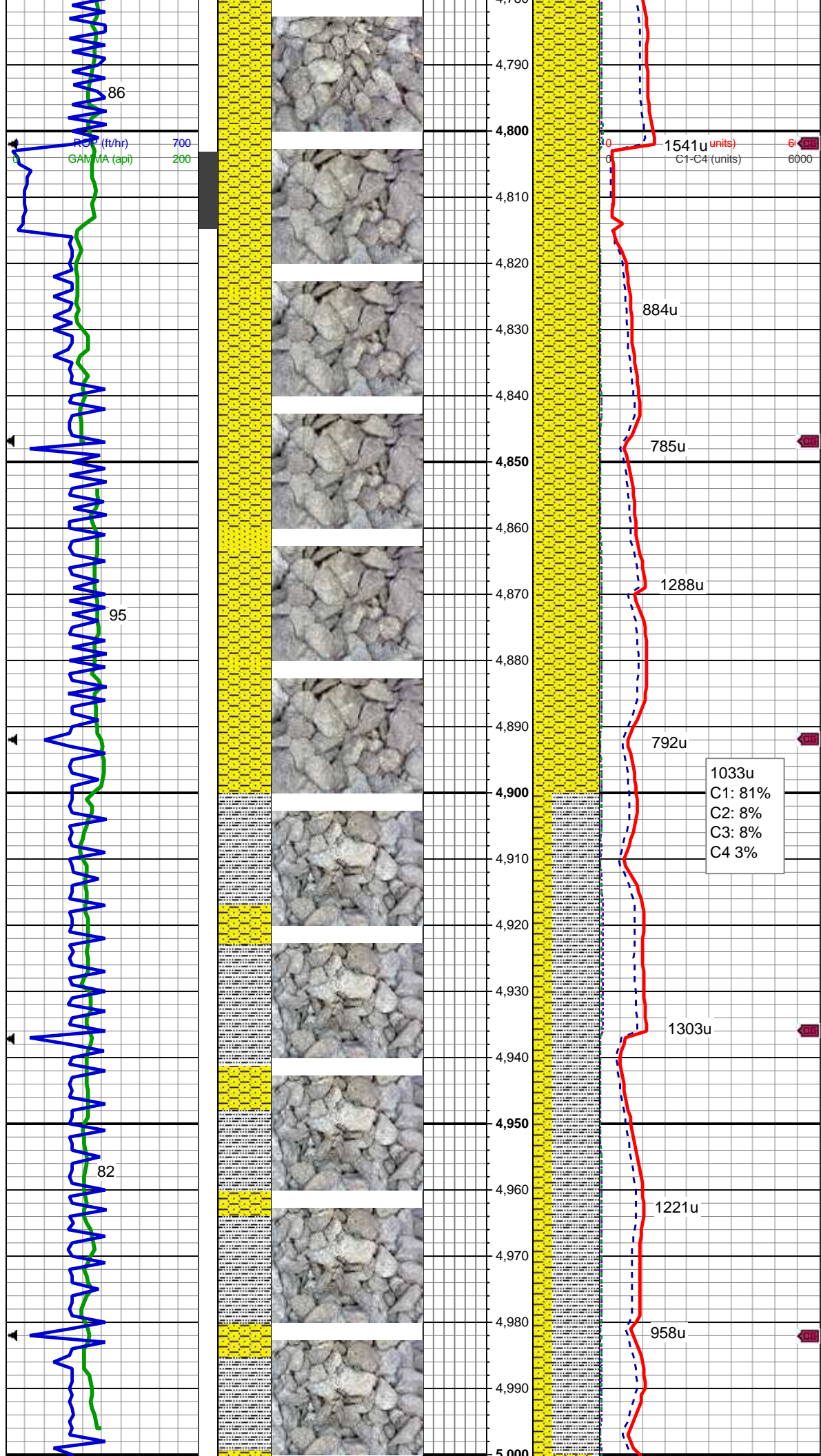
95% SHY SS: lt gy, f gr, sb rnd-sb
sng, mod srt, sft-sl frm, arg-sltly mtx,
sl calc 5% SS: wh-clr, lt gy ip, f-med
gr, sb blkly, mod srt, sl frm-brit, sl
calc mtx, tr glau

MD: 4,663 '
Inclination: 8.21 °
Azimuth: 198.89 °
TVD: 4,632.56 '
VS: -27.19 '

WT: IN 8.85/ OUT 8.9
VIS:36

95% SHY SS: lt gy, f gr, sb rnd-sb
sng, mod srt, sft-sl frm, arg-sltly mtx,
sl calc 5% SS: wh-clr, lt gy ip, f-med
gr, sb blkly, p-mod srt, sl frm-brit, sl
calc mtx, tr glau

MD: 4,752 '
Inclination: 7.3 °
Azimuth: 199.01 °
TVD: 4,720.75 '
VS: -28.94 '



WT: 9.0 / VIS: 36

MD: 4,842 '
Inclination: 8.5 °
Azimuth: 198.81 °
TVD: 4,809.89 '
VS: -30.73 '

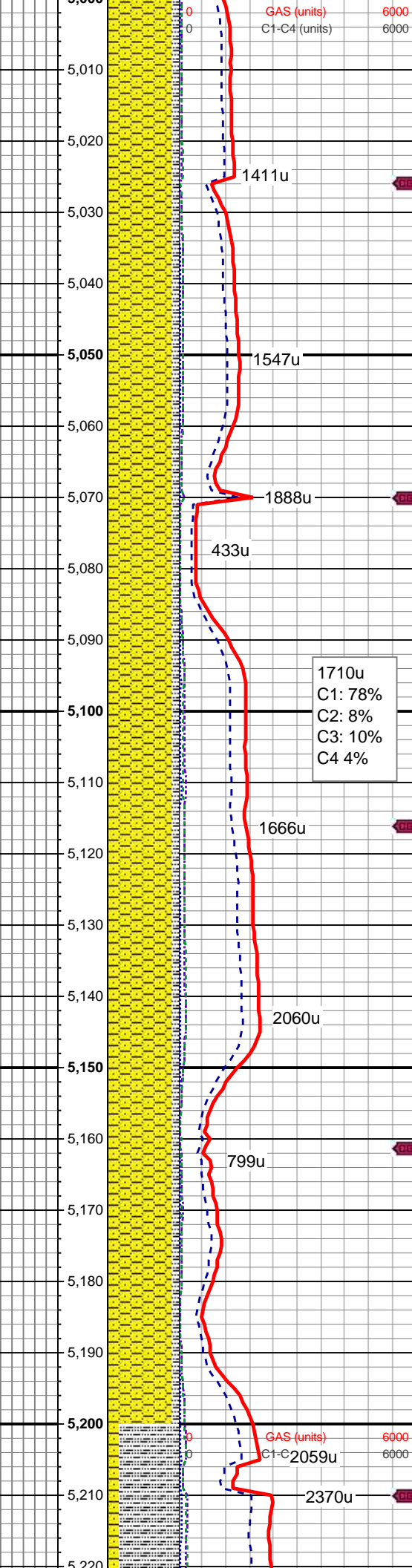
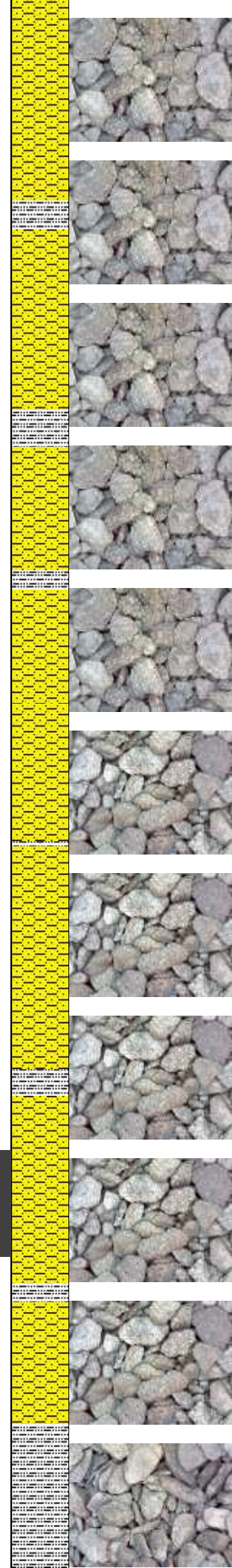
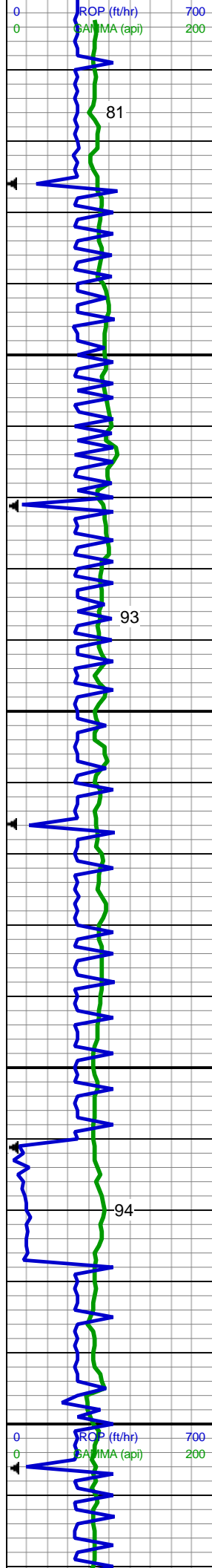
95% SHY SS: lt gy, f gr, sb rnd-sb
sng, mod srt, sft-sl frm, arg-sltly mtx,
sl calc 5% SS: wh-clr, lt gy ip, f-med
gr, sb blkly, p-mod srt, sl frm-brit, sl
calc mtx, tr glau

1033u
C1: 81%
C2: 8%
C3: 8%
C4 3%

MD: 4,932 '
Inclination: 8.1 °
Azimuth: 191.38 °
TVD: 4,898.95 '
VS: -31.77 '

70% SLTY SH: lt-med gy, sb plty-sb
blkly, pred frm, slty-aren, non calc
30% SHY SS: lt gy, f gr, sb rnd-sb
sng, mod srt, sft-sl frm, arg-sltly mtx,
sl calc, tr ss

WT: 9.2 / VIS: 36



MD: 5,021 '
Inclination: 7.86 °
Azimuth: 191.88 °
TVD: 4,987.09 '
VS: -32 '

90% SHY SS: lt gy, f gr, sb rnd-sb
sng, mod srt, sft-sl frm, arg-sltly mtx,
sl calc 10% SLTY SH: lt-med gy, sb
plty-sb blkly, sl frm-sl hd, slty-aren,
non calc

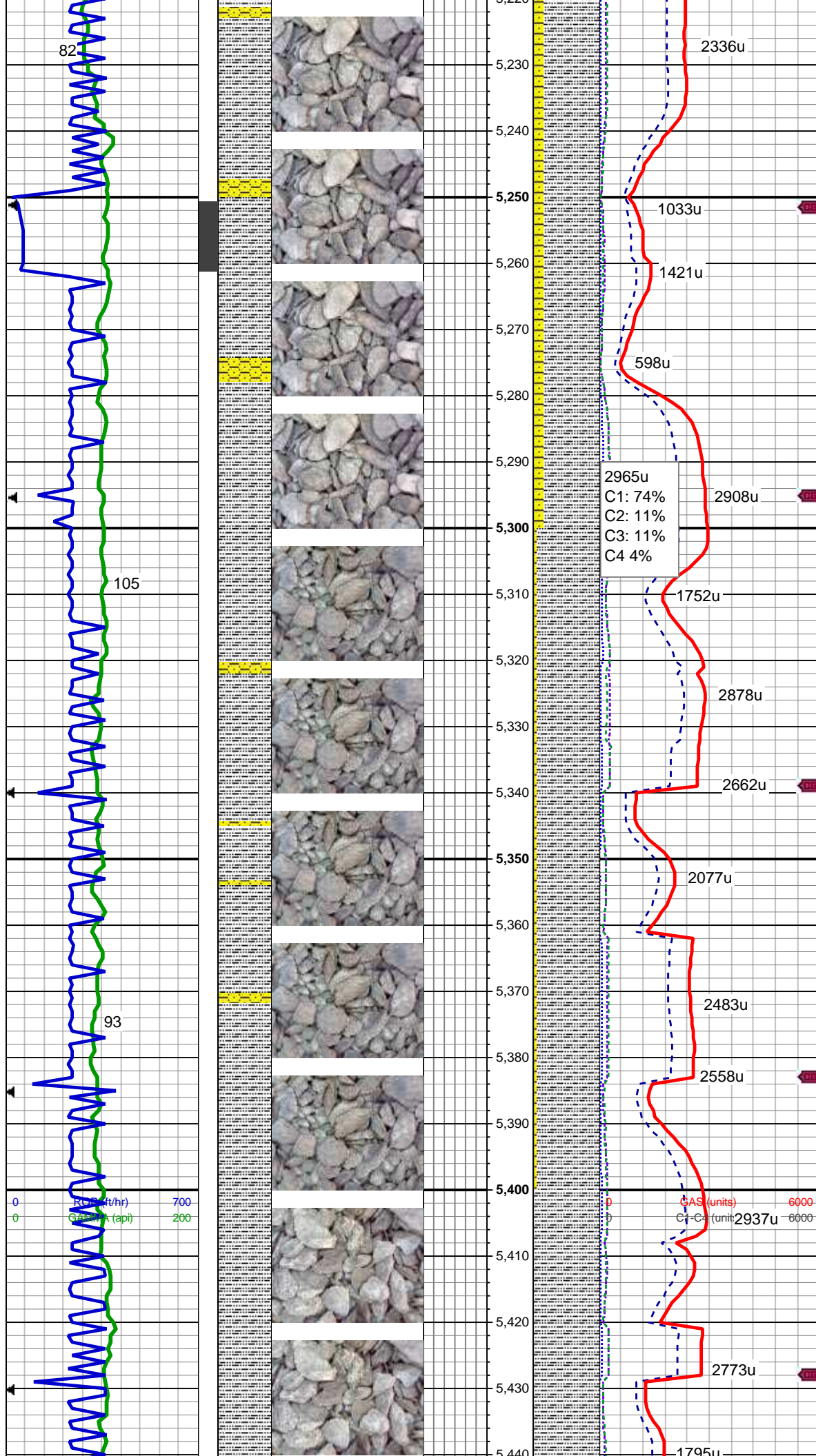
WT: 9.3 / VIS: 36

MD: 5,111 '
Inclination: 6.47 °
Azimuth: 196.65 °
TVD: 5,076.38 '
VS: -32.68 '

90% SHY SS: lt gy, f gr, sb rnd-sb
sng, mod srt, sft-sl frm, arg-sltly mtx,
sl calc 10% SLTY SH: lt-med gy, sb
plty-sb blkly, sl frm-sl hd, slty-aren,
non calc

WT: 9.4 / VIS: 35

MD: 5,201 '
Inclination: 7.91 °
Azimuth: 191.06 °
TVD: 5,165.68 '
VS: -33.27 '



85% SLTY SH: lt-med gy, sb plty-sb
blky, sl frm, slty-aren, non calc 15%
SHY SS: lt gy-wh, vf-f gr, sb rnd-sb
sng, p-mod srt, sl frm, arg-sltly mtx,
sl calc

MD: 5,290 '
Inclination: 9.44 °
Azimuth: 189.24 °
TVD: 5,253.65 '
VS: -33.15 '

95% SLTY SH: lt-med gy, sb plty-sb
blky, sl frm, slty-aren, rthy lstr, non
calc 5% SHY SS: lt gy, occ wh, vf-f
gr, sb rnd-sb sng, p-mod srt, sl
frm-mod hd, arg-sltly mtx, sl calc

MD: 5,380 '
Inclination: 8.2 °
Azimuth: 191.97 °
TVD: 5,342.59 '
VS: -33.14 '

WT: 9.4 / VIS: 35

GAS (units) 6000
C1-C4 (units) 2937u

2937u

2937u

2937u

2937u

2937u

2937u

2937u

2937u

2937u

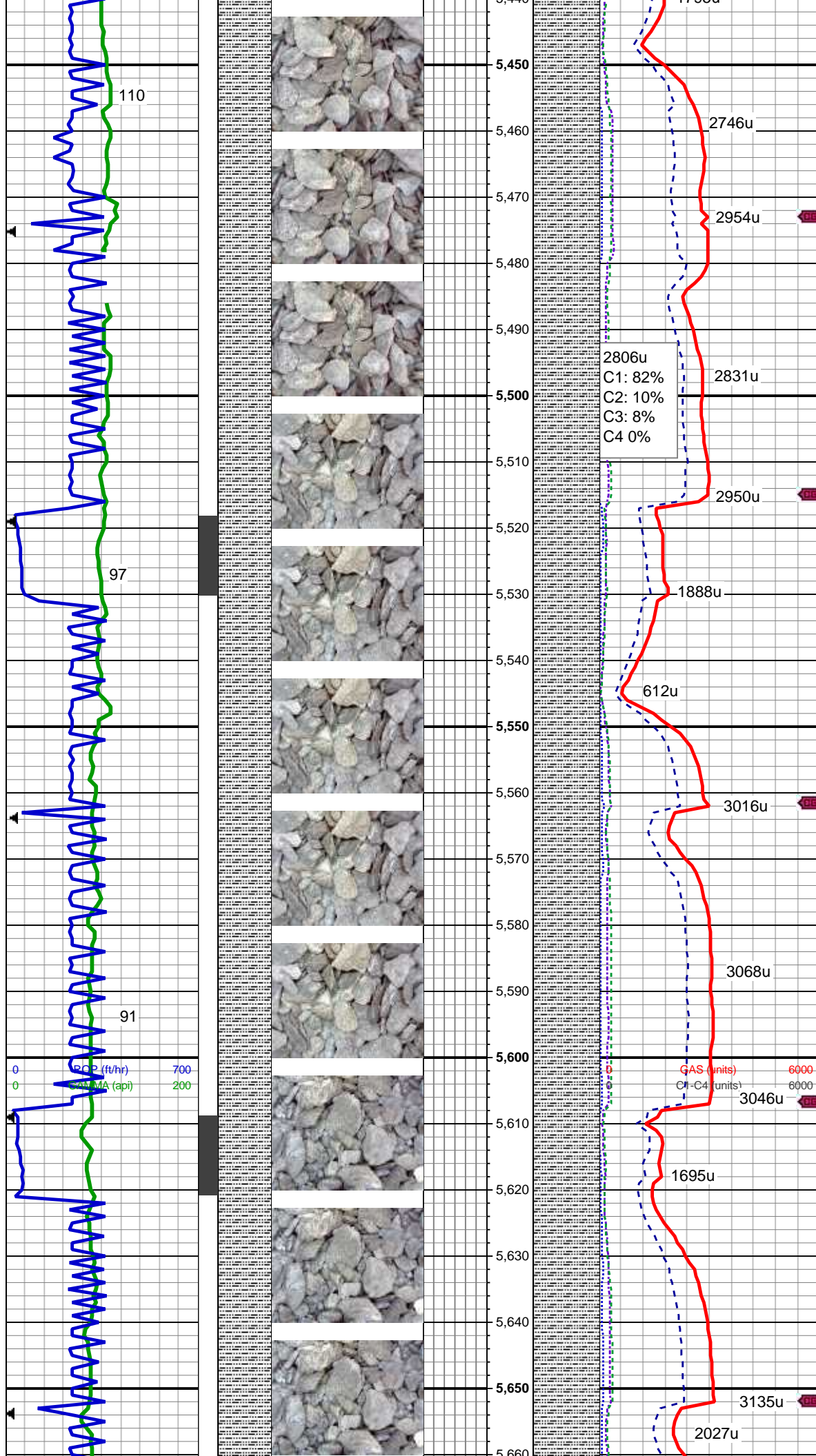
2937u

2937u

2937u

2937u

2937u



100% SLTY SH: med gy, occ lt gy,
plty-sb blk, sl frm-mod hd,
slty-aren, rthy lstr, tr shy ss

MD: 5,469 '
Inclination: 6.29 °
Azimuth: 194.47 °
TVD: 5,430.87 '
VS: -33.62 '

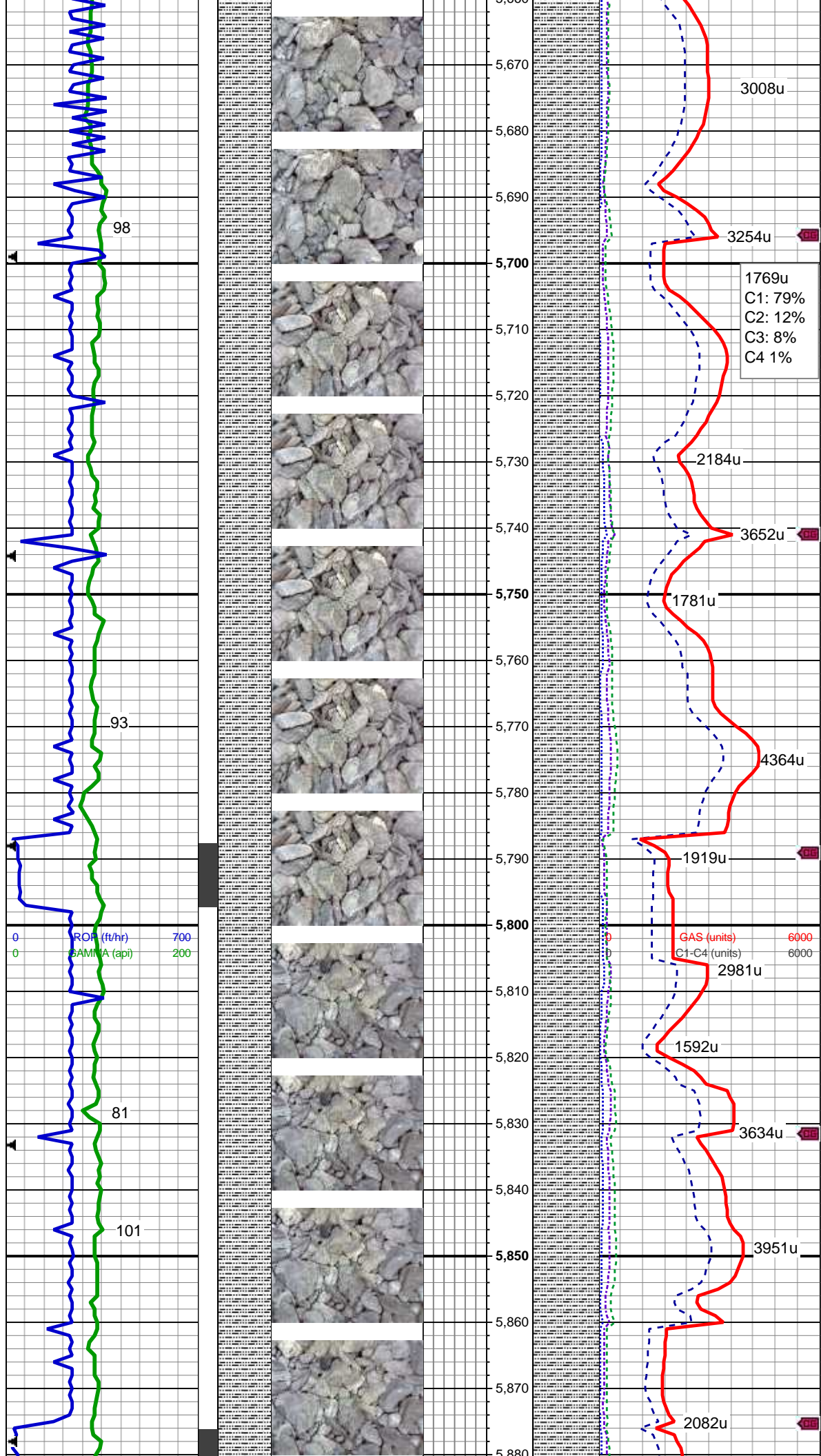
100% SLTY SH: med gy, occ lt gy,
plty-sb blk, sl frm-mod hd,
slty-aren, rthy lstr, tr shy ss, rr
dissm pyr

MD: 5,559 '
Inclination: 7.18 °
Azimuth: 185.53 °
TVD: 5,520.25 '
VS: -33.47 '

100% SLTY SH: lt-med gy, plty-sb
blk, fiss ip, sl frm-mod hd,
slty-aren, rthy lstr, rr diss pyr

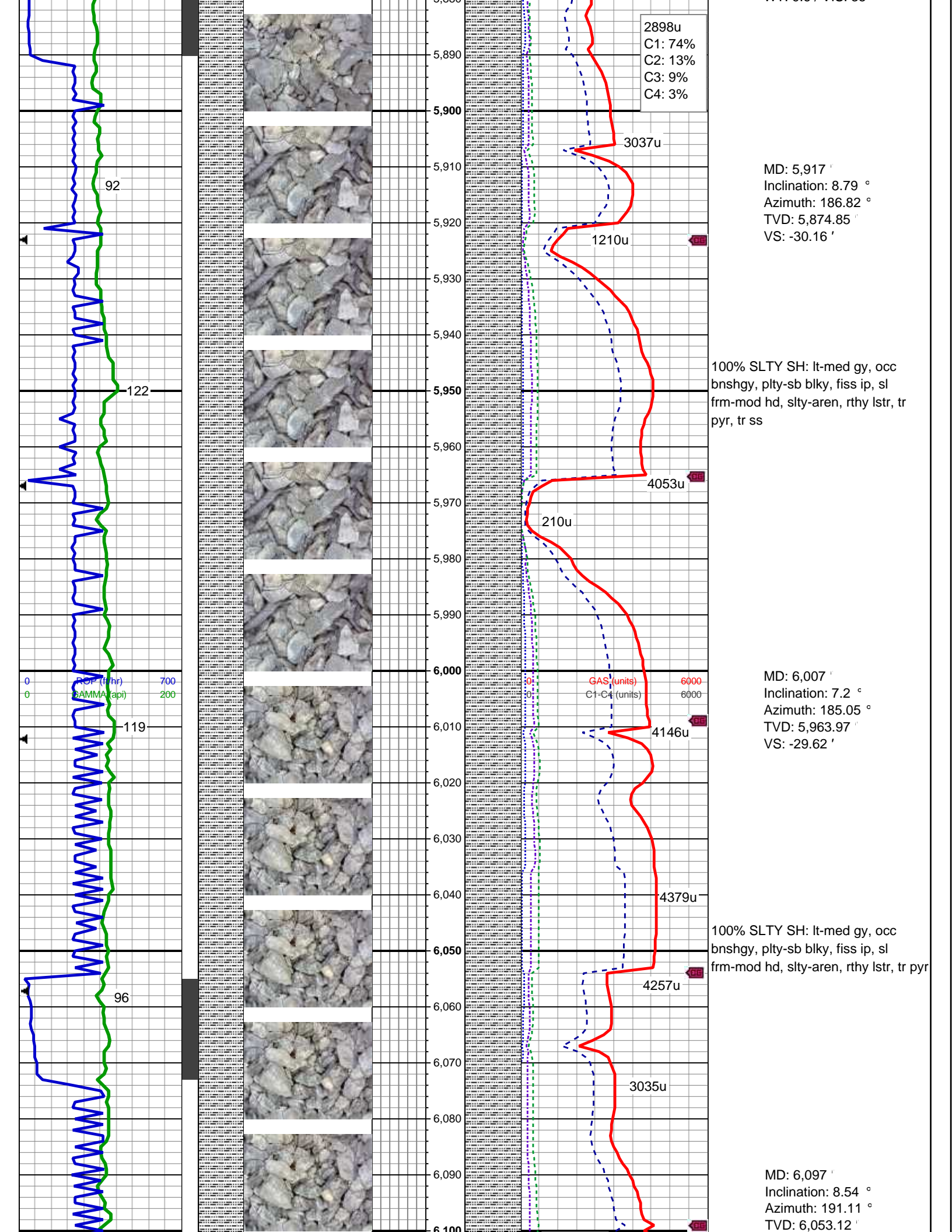
MD: 5,649 '
Inclination: 8.7 °
Azimuth: 188.06 °
TVD: 5,609.39 '
VS: -32.67 '

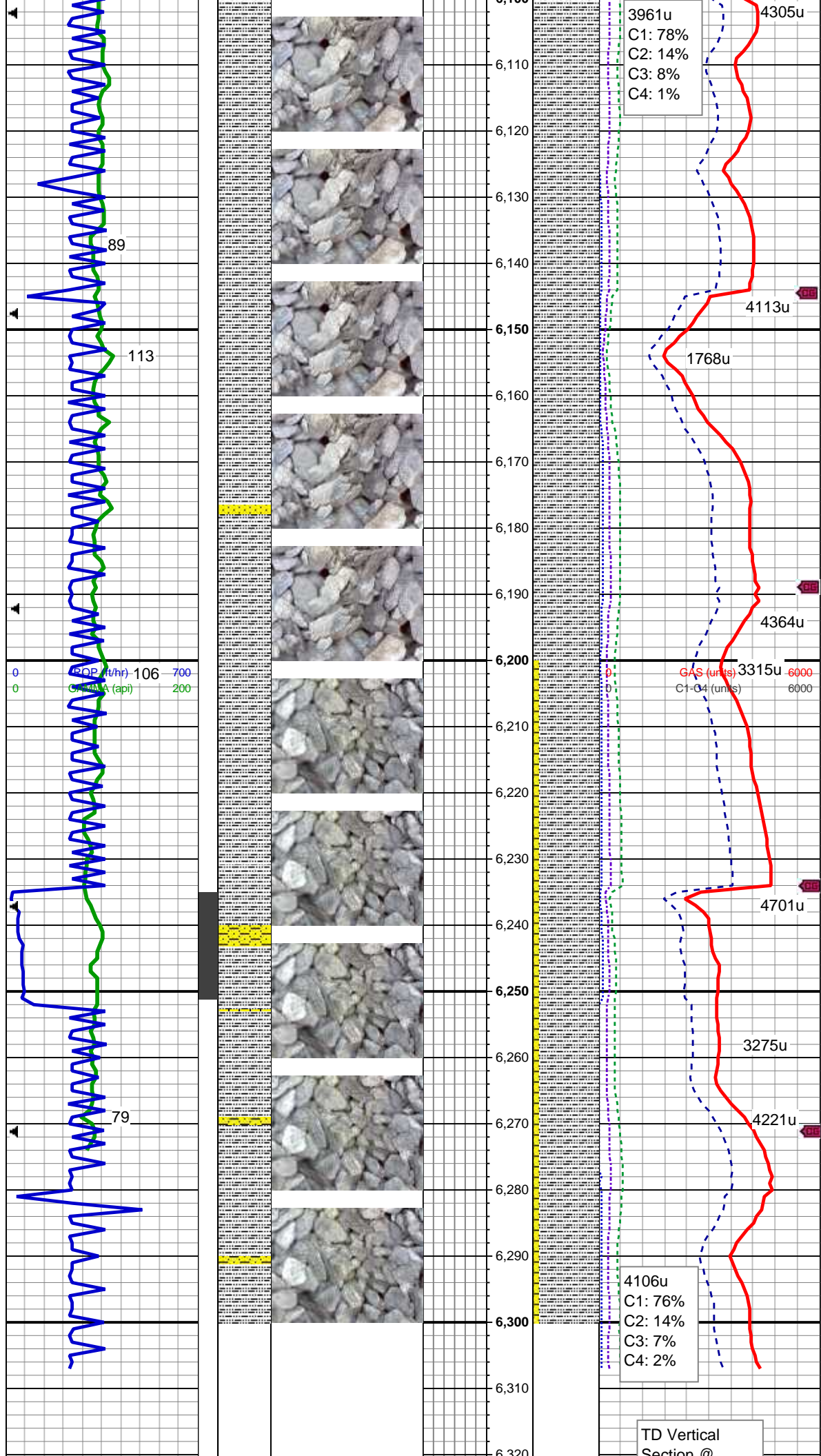
WT: 9.45 / VIS: 35



MD: 5,738 '
Inclination: 7.44 °
Azimuth: 187.85 °
TVD: 5,697.51 '
VS: -32.11 '
100% SLTY SH: lt-med gy, occ
bnshgy, plty-sb blk, fiss ip, sl
frm-mod hd, slty-aren, rthy lstr, tr pyr

MD: 5,828 '
Inclination: 7.48 °
Azimuth: 184.53 °
TVD: 5,786.75 '
VS: -31.21 '
100% SLTY SH: lt-med gy, occ
bnshgy, plty-sb blk, fiss ip, sl
frm-mod hd, slty-aren, rthy lstr, tr
pyr, tr ss





VS: -29.14 '

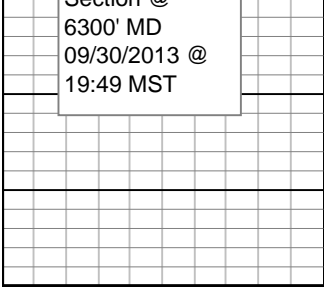
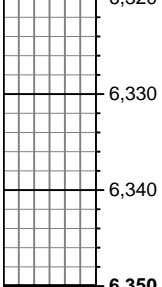
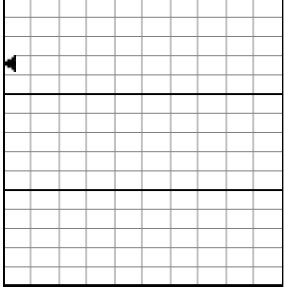
100% SLTY SH: lt-med gy, bnshgy, plty-sb blk, fiss ip, sl frm-mod hd, slty-aren, rthy lstr, tr pyr, tr ss

MD: 6,186 '
Inclination: 6.82 °
Azimuth: 187.63 °
TVD: 6,141.32 '
VS: -28.93 '

90% SLTY SH: lt-med gy, bnshgy, plty-sb blk, fiss ip, sl frm-mod hd, slty-aren, rthy lstr, tr pyr
10% SHY SS: wh-lt gry, occ trnsl-op, vf-f gr,sb ang, sb rnd, mod srt, frm, arg mtx, v sl calc

WT: 9.9 / VIS: 35

TD Vertical Section @



Section @
6300' MD
09/30/2013 @
19:49 MST

LOG CONTINUES ON FILE :
LOEFFLER K1-65HN_Horiz.mplot

THANK YOU FOR CHOOSING
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