

COLUMBINE LOGGING

Scale: 5" / 100'
Measured Depth Log

Well Name Reliance E23-66-1HN

Location NESE 23 6N 65W 6 PM

State COLORADO

County WELD

Country UNITED STATES

Rig Number HP 326

API Number 05-123-37606

Field WATTENBERG

Region DJ BASIN

Drilling Completed 3/29/2015

Spud Date 3/23/2015

Surface Coordinates NESE 23 6N 65W 6 PM
2170 FSL 280 FEL
Lat/Long: 40.47017/-104.62185

Bottom Hole Coordinates Projected
Sec: 23 Twp: 6N 65W
Footages: 2310 FNL 535 FFWL

Ground Elevation 4695'

K.B. Elevation 4725'

Logged Interval 817' To 11285'

Total Depth 11285'

Formation NIOBRARA; A MARL

Type of Drilling Fluid LSND, WATER BASED MUD

Other Symbols

Oil Show

- DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

Porosity

- E EARTHY
- F FENESTRAL
- F FRACTURE
- INTERCRYSTALLINE
- INTEROOLITIC
- 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

MN DEPTH MN DEPTH (RIGHT)

NORMAL FAULT

OVERTURNED STRATA

REVERSE FAULT

CASING

SIDEWALL CORE (LEFT)

SIDEWALL CORE (RIGHT)

SLIDE

SURVEY

DST DRILL STEM TEST

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

Accessories

Fossils










GASTROPOD

ARGILLITE GRAIN











HEAVY MINERAL

Stringer



Fossils

 ALGAE
 AMPHIPORA
 BELEMNITE
 BIOCLASTIC
 BRACHIOPOD
 BRYOZOA
 CEPHALOPOD
 CORAL
 CRINOID
 ECHINOID
 FISH
 FORAMINIFERA
 FOSSIL














Inoceramus

 INOCERAMUS
 OOLITE
 OSTRACOD
 PELECYPOD
 PELLET
 PISOLITE
 PLANT REMAINS
 PLANT SPORES
 SCAPHOPOD
 STROMATOPOROID














Minerals

 ANHYDRITIC
 ARGILLACEOUS

Bentonite

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










Kaolin

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










Stringer

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

Rock Types

 UNKNOWN
 ANHYDRITE
 BENTONITE
 BRECCIA
 CEMENT
 CHALK
 CHERT
 CLAY CHOKE SAND
 CLAYSTONE

 COAL
 CONGLOMERATE
 DOLOMITE
 DOLOMITIC LIMESTONE
 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










Other

Well Site Logging Company Columbine Logging Inc.

Well Site Geologist (Days) Brad Wilson

Well Site Geologist (Nights) Shanna Gilbert

Zone Color Coding

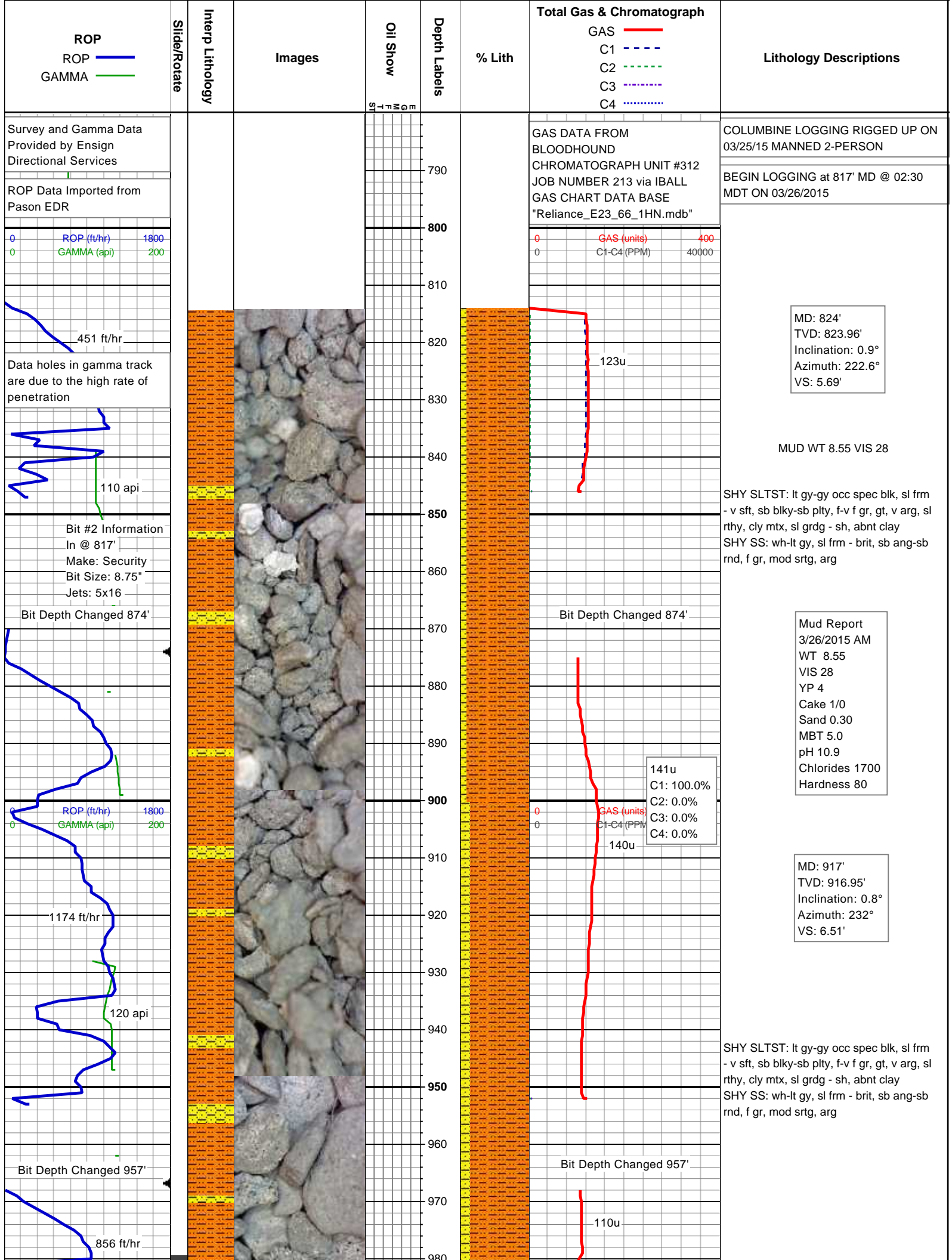
 Oil
 Note
 Error
 Condensate
 Core
 Water
 Gas
 Pressure
 Seal

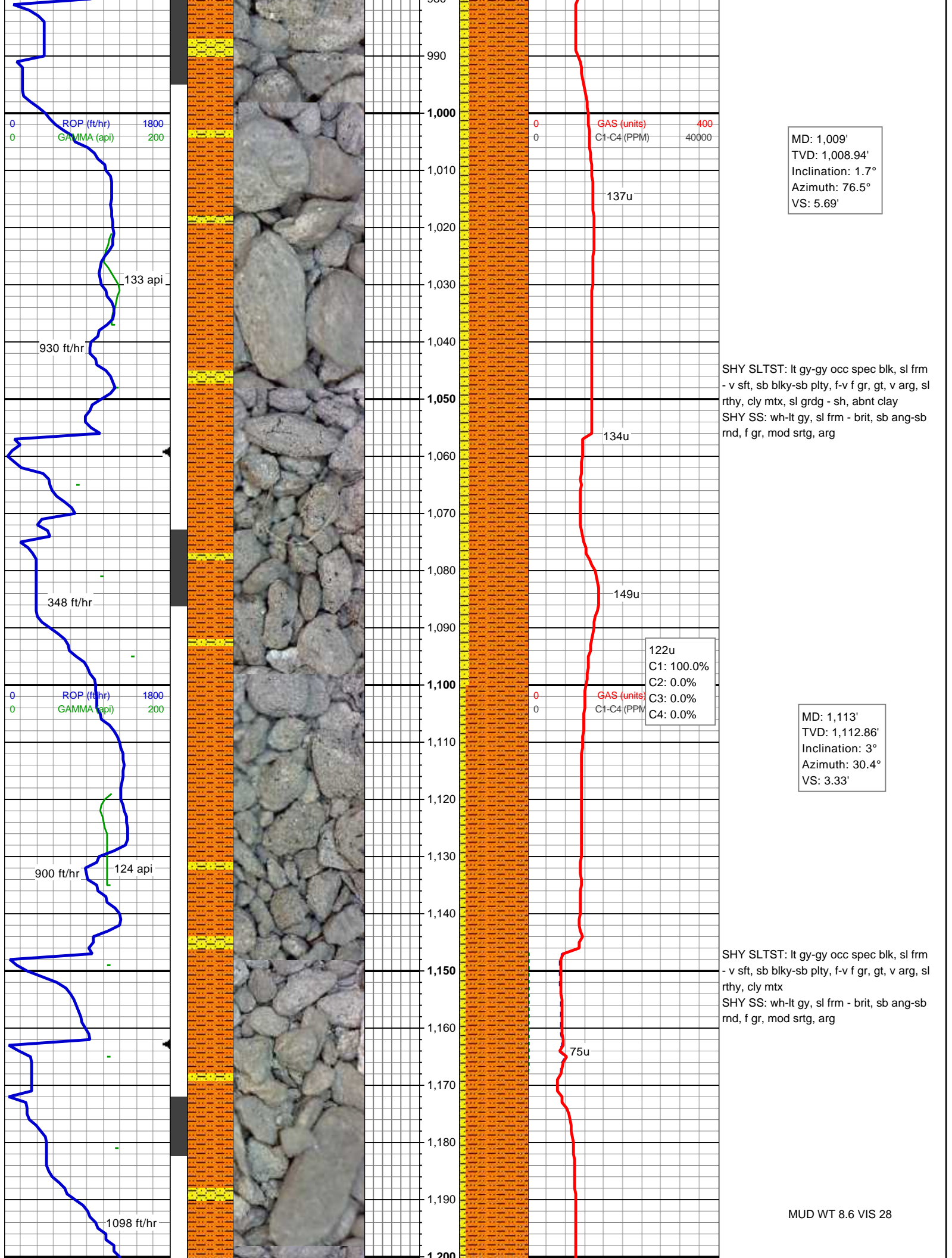
Geologist

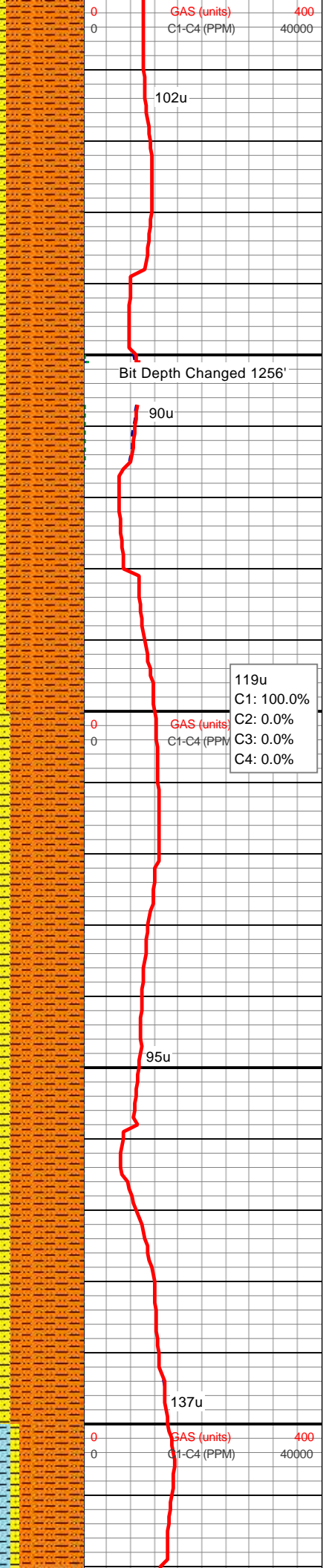
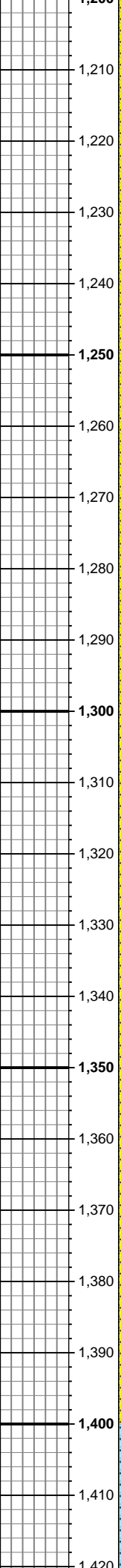
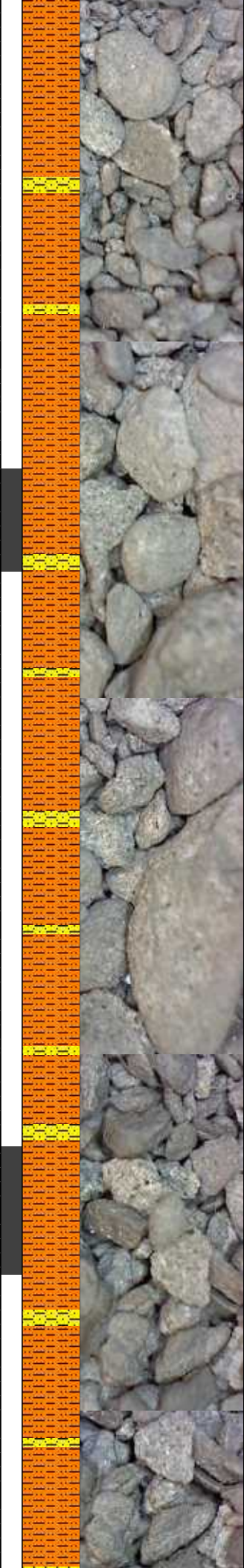
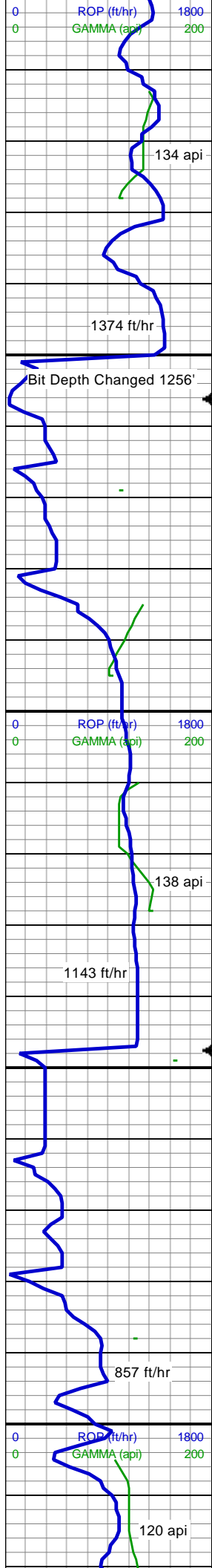
Name HOLLY DUNCAN

Company NOBLE ENERGY INC.

Address 1625 Broadway Suite 2200
Denver, CO 80202







MD: 1,206'
TVD: 1,205.67'
Inclination: 4.4°
Azimuth: 14.3°
VS: 2.21'

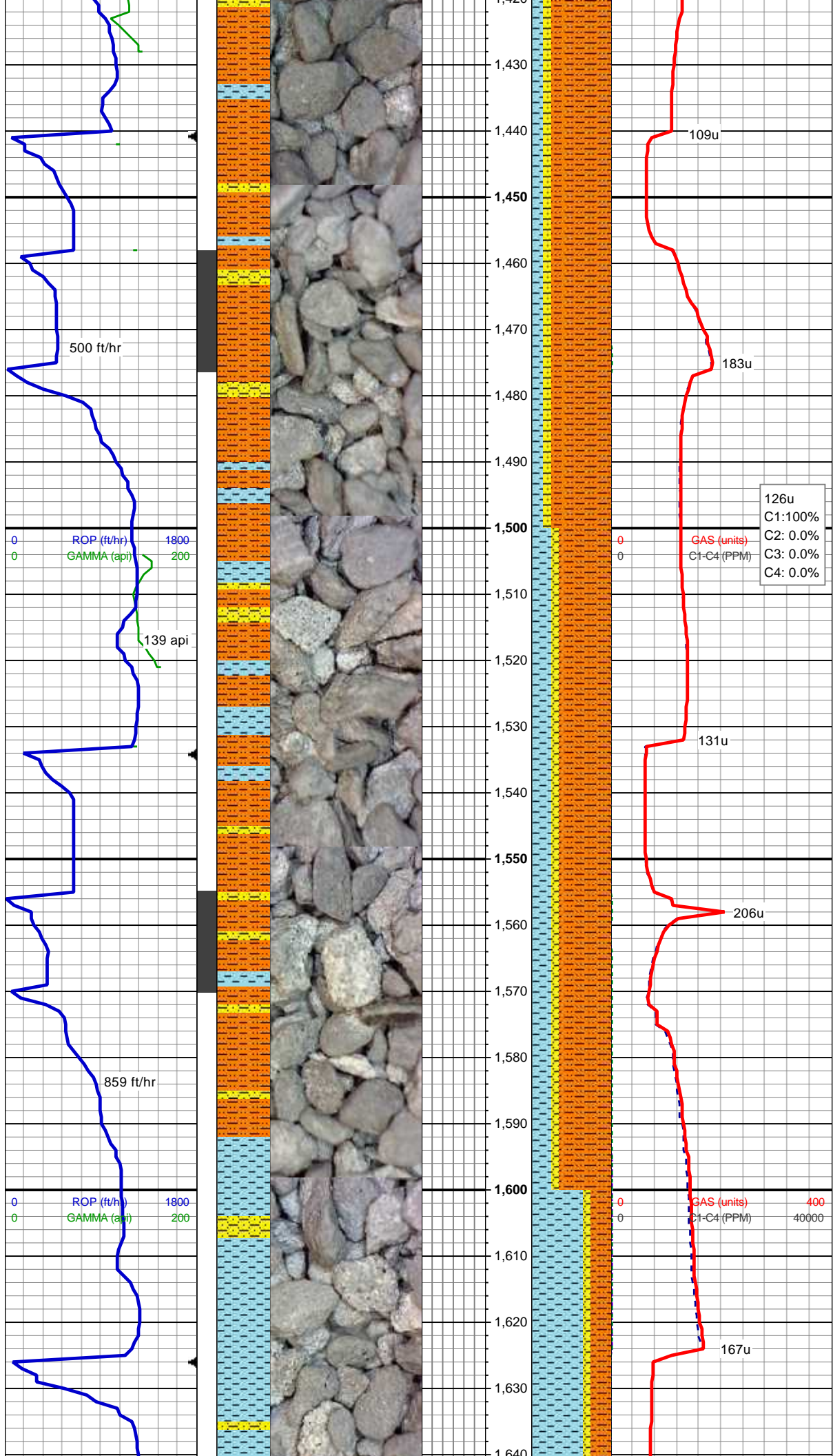
SHY SLTST: lt gy-gy occ spec blk, sl frm
- v sft, sb blk-y-sb plty, f-v f gr, gt, v arg, sl
rthy, cly mtx
SHY SS: wh-lt gy, sl frm - brit, sb ang-sb
rnd, f gr, mod srtg, arg

MD: 1,298'
TVD: 1,297.34'
Inclination: 5.3°
Azimuth: 24.9°
VS: 0.84'

MUD WT 8.45 VIS 26

SHY SLTST: lt gy-gy occ spec blk, sl frm
- v sft, sb blk-y-sb plty, f-v f gr, gt, v arg, sl
rthy, cly mtx, sl incr in slty clyst
SHY SS: wh-lt gy, sl frm - brit, sb ang-sb
rnd, f gr, mod srtg, arg

MD: 1,391'
TVD: 1,389.8'
Inclination: 7.1°
Azimuth: 12.8°
VS: -0.55'



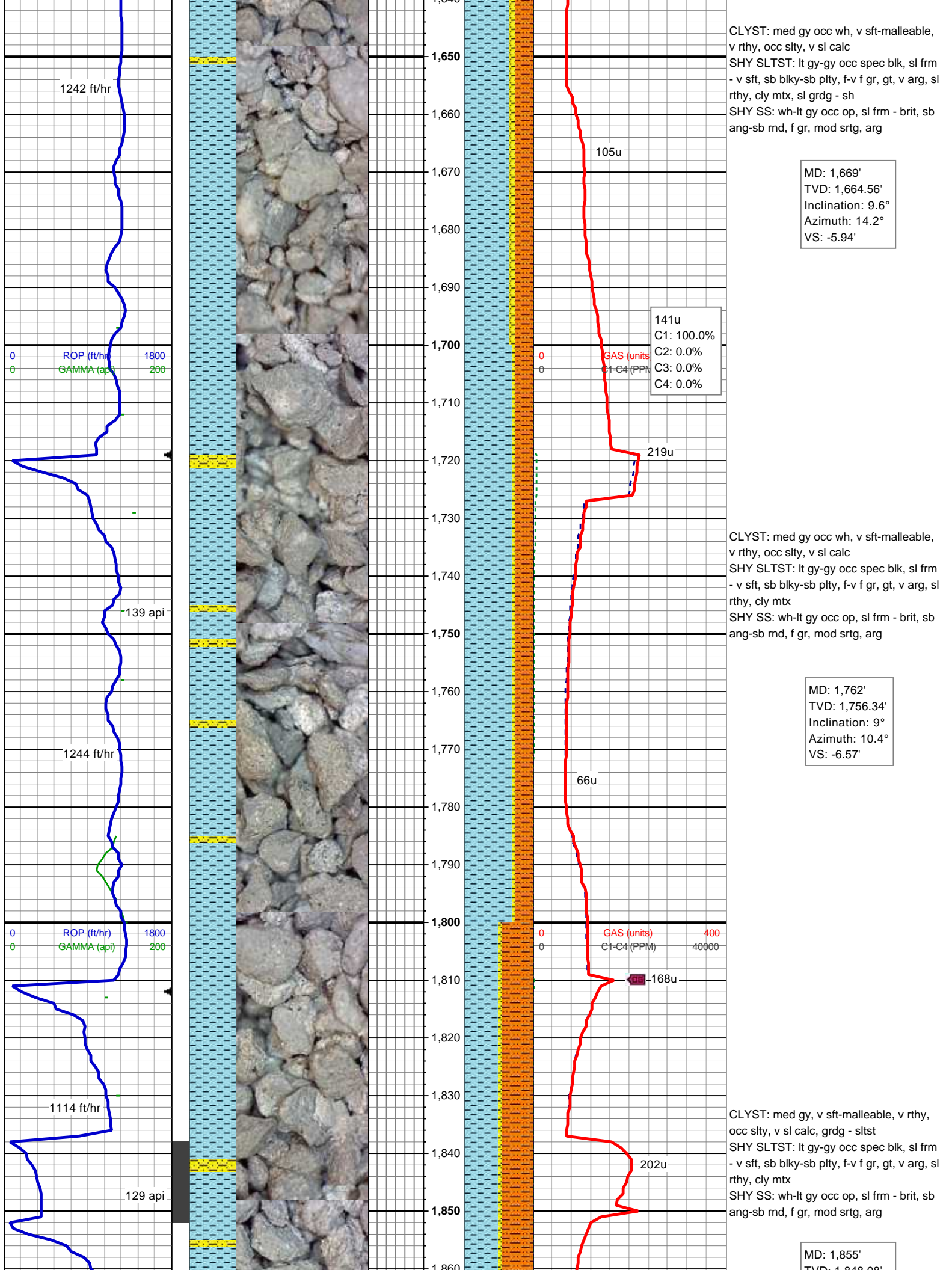
SHY SLTST: lt gy-gy occ spec blk, sl frm
- v sft, sb blkly-sb plty, f-v f gr, gt, v arg, sl
rthy, cly mtx, sl grd - sh
CLYST: med gy, v sft-malleable, v rthy,
occ slty, v sl calc, grd - sltst
SHY SS: wh-lt gy occ op, sl frm - brit, sb
ang-sb rnd, f gr, mod srtg, arg

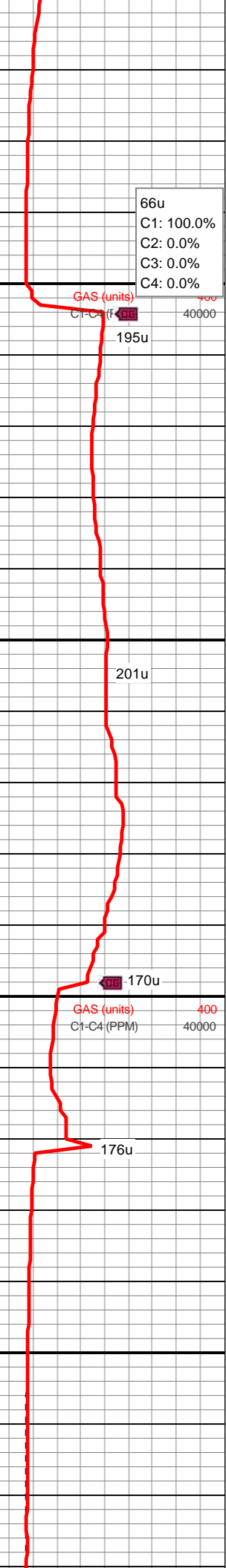
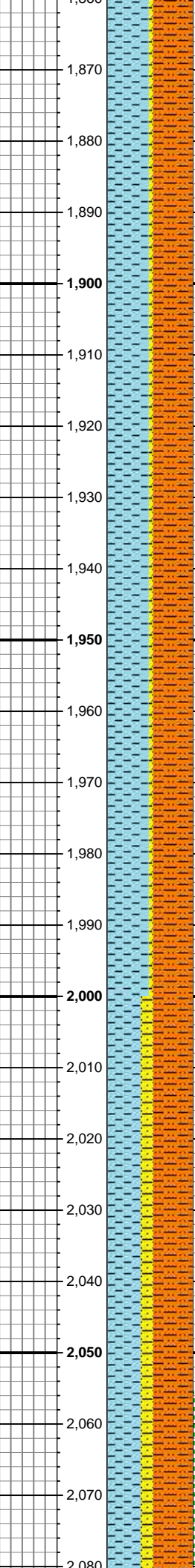
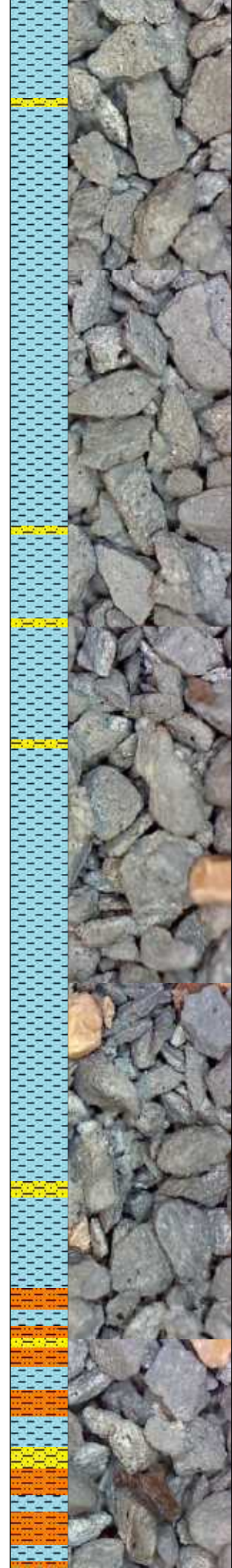
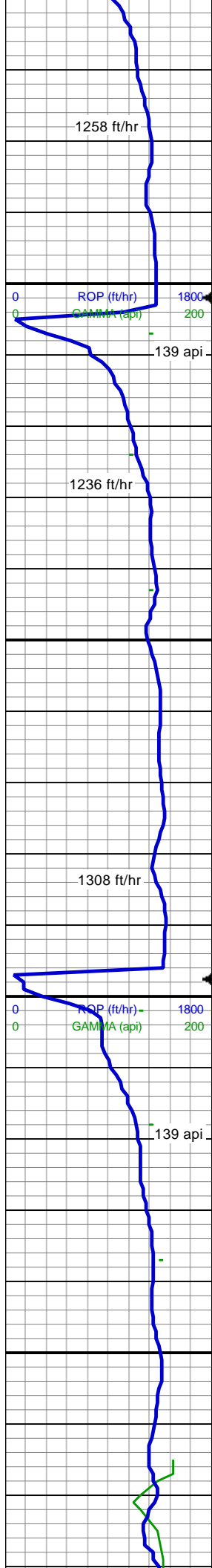
MD: 1,483'
TVD: 1,480.92'
Inclination: 8.7°
Azimuth: 20.8°
VS: -2.14'

126u
C1:100%
C2: 0.0%
C3: 0.0%
C4: 0.0%

CLYST: med gy, v sft-malleable, v rthy,
occ slty, v sl calc
SHY SLTST: lt gy-gy occ spec blk, sl frm
- v sft, sb blkly-sb plty, f-v f gr, gt, v arg, sl
rthy, cly mtx, sl grd - sh
SHY SS: wh-lt gy occ op, sl frm - brit, sb
ang-sb rnd, f gr, mod srtg, arg

GAS (units) 400
C1-C4 (PPM) 40000





TVD: 1,648.06'
Inclination: 9.9°
Azimuth: 18.3°
VS: -7.79'

MUD WT 8.7 VIS 30

66u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%

GAS (units)
C1-C4 (PPM)

195u

201u

170u

176u

MD: 1,948'
TVD: 1,939.72'
Inclination: 9.7°
Azimuth: 15.7°
VS: -9.74'

CLYST: med gy, v sft-malleable, v rthy, occ slty, v sl calc, grd - sltst
SHY SLTST: lt gy-gy occ spec blk, sl frm - v sft, sb blk-sb plty, f-v f gr, gt, v arg, sl rthy, cly mtx
SHY SS: wh-lt gy occ op, sl frm - brit, sb ang-sb rnd, f gr, mod srtg, arg

MD: 2,040'
TVD: 2,030.47'
Inclination: 9.2°
Azimuth: 11.3°
VS: -10.69'

CLYST: med gy, v sft-malleable, v rthy, occ slty, v sl calc, grd - sltst
SHY SLTST: lt gy-gy occ spec blk, sl frm - v sft, sb blk-sb plty, f-v f gr, gt, v arg, sl rthy, cly mtx
SHY SS: wh-lt gy occ op, sl frm - brit, sb ang-sb rnd, f gr, mod srtg, arg

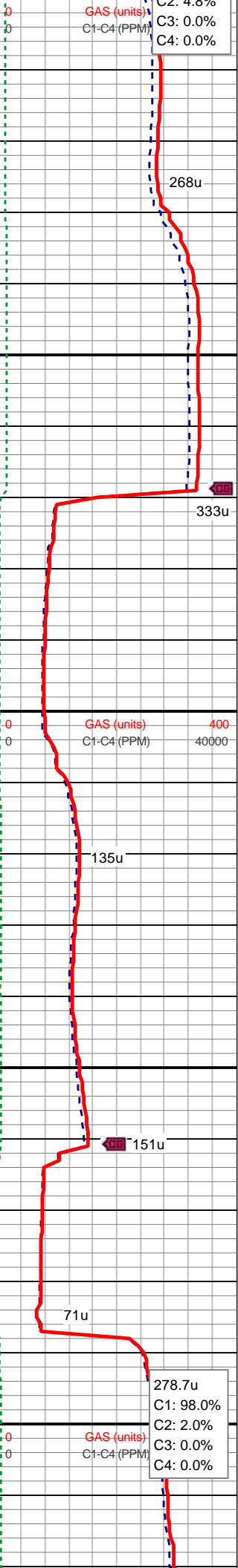
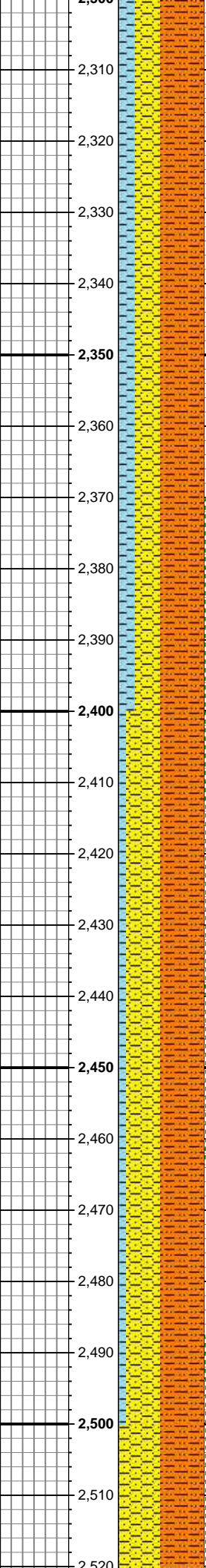
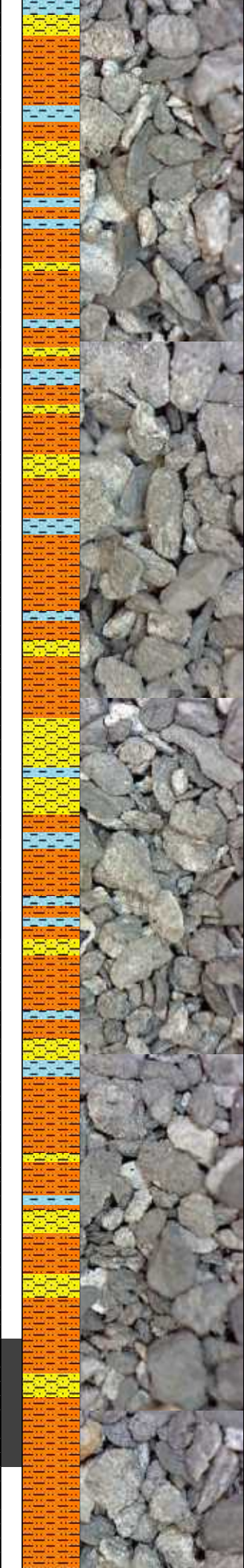
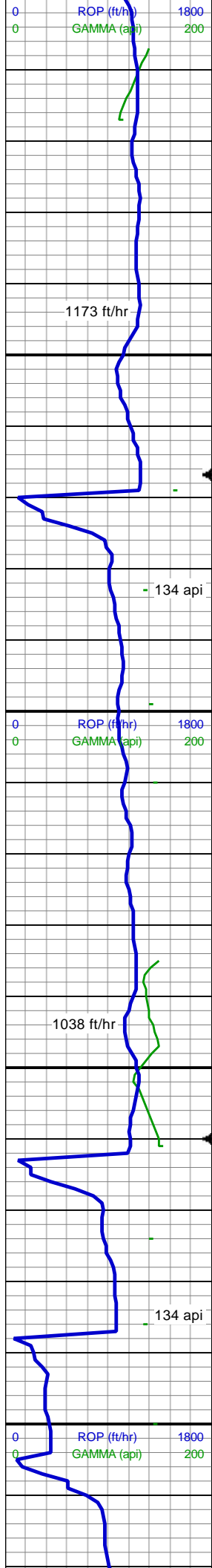


MD: 2,132'
TVD: 2,121.18'
Inclination: 10.1°
Azimuth: 20.3°
VS: -12.31'

CLYST: med gy, v sft-malleable, v rthy,
occ slty, v sl calc, grdg - sltst
SHY SLTST: lt gy-gy occ spec blk, sl frm
- v sft, sb blk-sb plty, f-v f gr, gt, v arg, sl
rthy, cly mtx
SHY SS: wh-lt gy occ op, sl frm - brit, sb
ang-sb rnd, f gr, mod srtg, arg

MD: 2,224'
TVD: 2,211.79'
Inclination: 9.8°
Azimuth: 19.6°
VS: -15.07'

SHY SLTST: lt gy-gy occ spec blk, sl frm
- v sft, sb blk-sb plty, f-v f gr, gt, v arg, sl
rthy, cly mtx
CLYST: med gy, v sft-malleable, v rthy,
occ slty, v sl calc, grdg - sltst
SHY SS: wh-lt gy occ op, sl frm - brit, sb
ang-sb rnd, f gr, mod srtg, arg

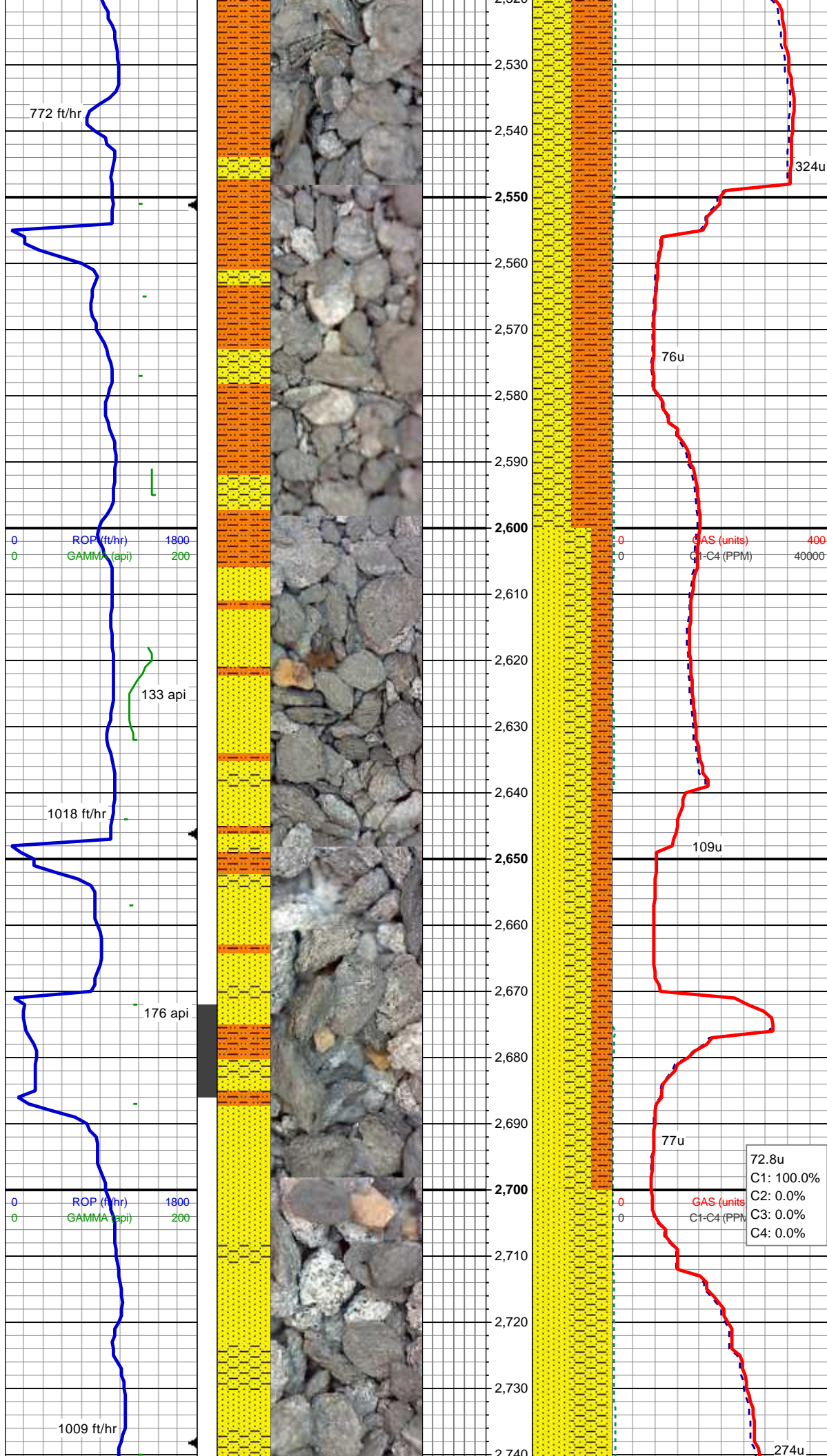


MD: 2,316'
TVD: 2,302.56'
Inclination: 9°
Azimuth: 16°
VS: -17.14'

MD: 2,410'
TVD: 2,395.46'
Inclination: 8.5°
Azimuth: 15.7°
VS: -18.61'

SHY SS: wh-lt gy occ op, sl frm - brit, sb ang-sb rnd, f gr, mod srtg, arg
SHY SLTST: lt gy-gy occ wh rr spec blk, sl frm - v sft, sb blk-sb plty, f-v f gr, gt, v arg, sl rthy, cly mtx, sl grd - sh
CLYST: med-lt occ spec blk, v sft-malleable, v rthy, occ slty, v sl calc

MD: 2,502'
TVD: 2,486.48'
Inclination: 8.3°
Azimuth: 29.8°
VS: -21.55'



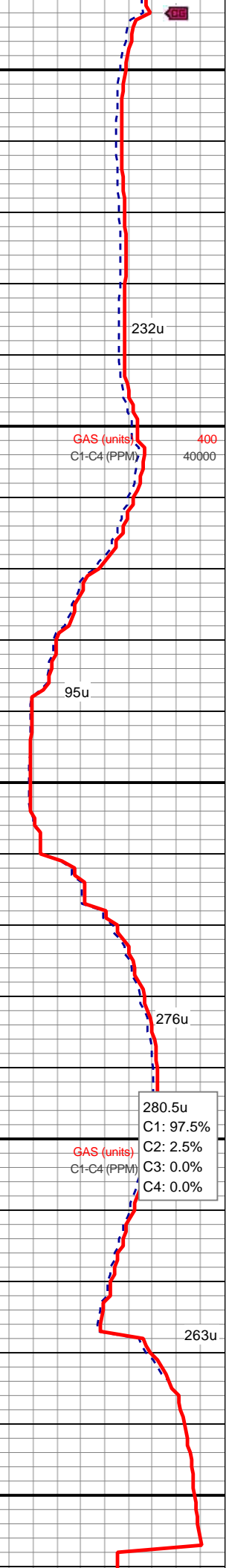
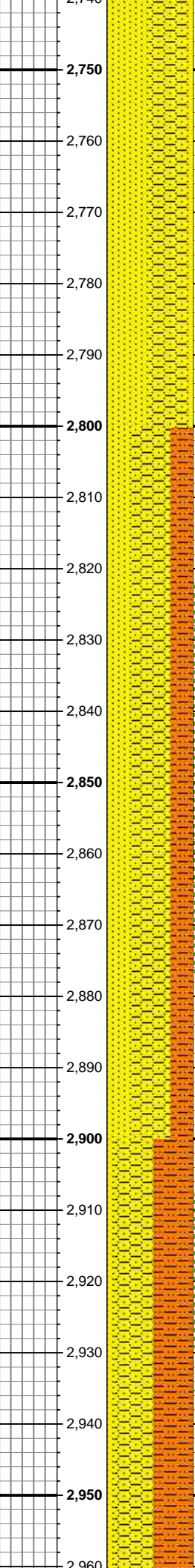
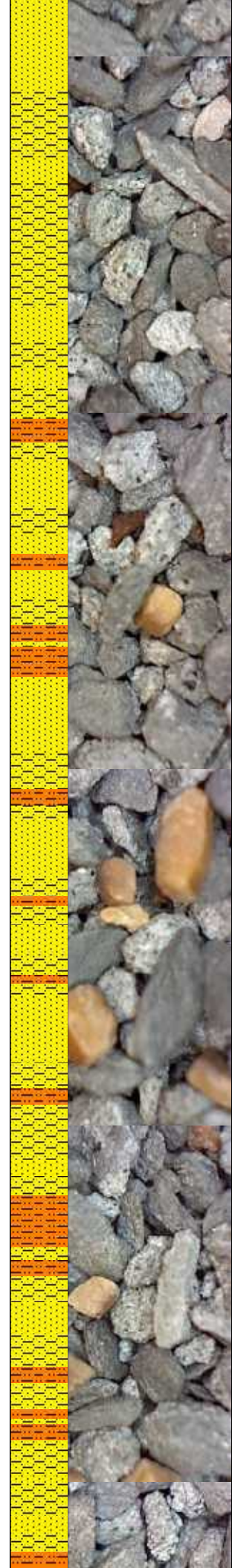
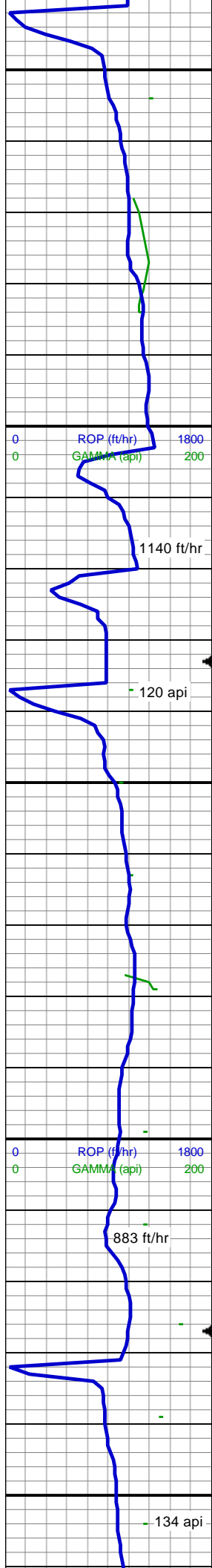
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,
sb blk-y-sb plty, f-v f gr, gt, v arg, ply srt,
decr cly
SHY SS: wh-lt gy occ lt brn, sl frm - v sft,
sb ang-sb rnd, f -v f gr, ply srtg, arg

MD: 2,596'
TVD: 2,579.54'
Inclination: 8°
Azimuth: 28.3°
VS: -25.91'

SHY SS: wh-lt gy occ lt brn, sl frm - v sft,
sb ang-sb rnd, f -v f gr, ply srtg, arg
SS: lt gy - wh, S&P, frm - brit, sb rnd, vf-f
gr, mod srt, sl arg cmt, mod calc
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,
sb blk-y-sb plty, f-v f gr, gt, v arg, ply srt,
decr cly

MD: 2,688'
TVD: 2,670.48'
Inclination: 9.4°
Azimuth: 33.5°
VS: -30.93'

72.8u
C1: 100.0%
C2: 0.0%
C3: 0.0%
C4: 0.0%



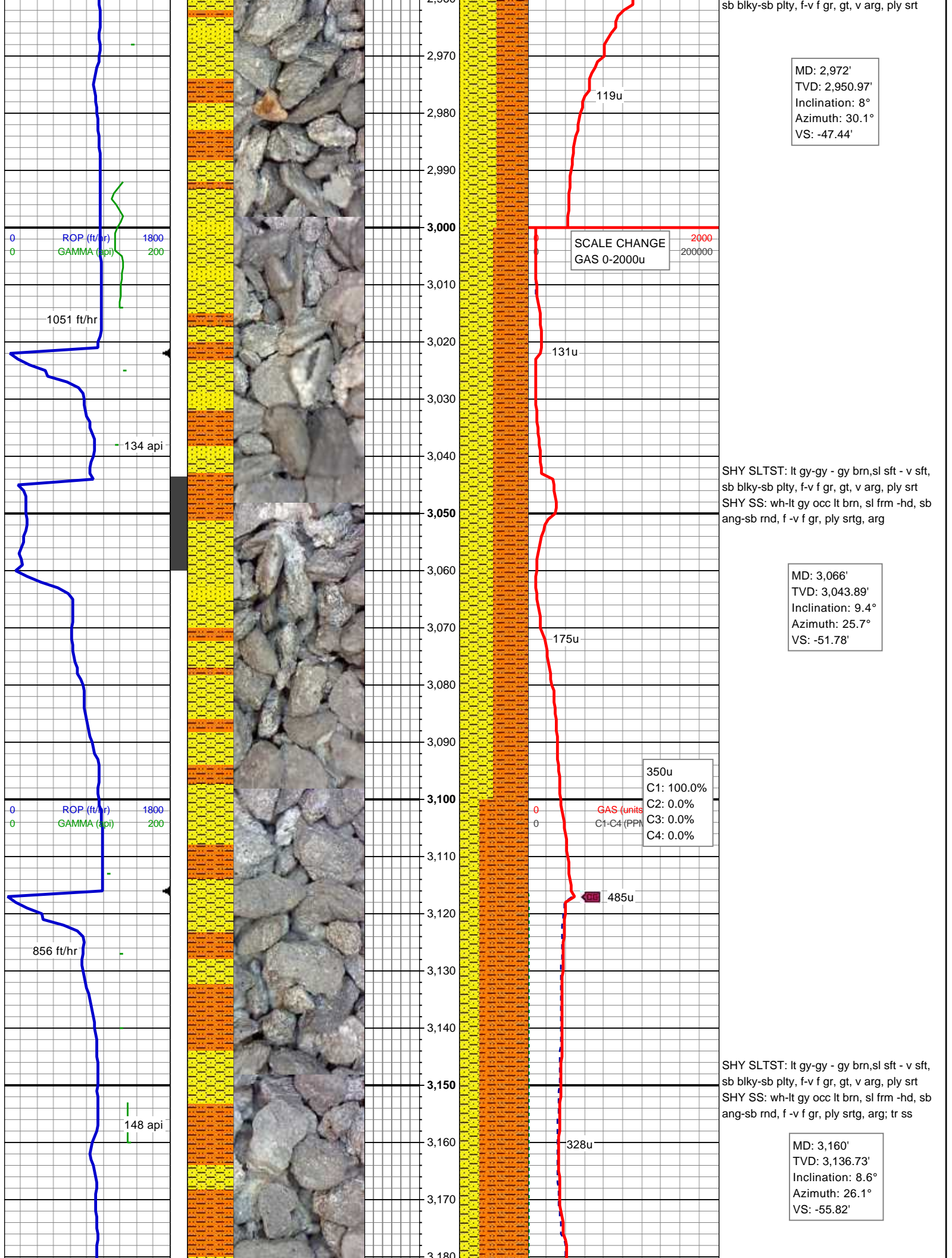
SHY SS: wh-lt gy occ lt brn, sl frm - v sft,
sb ang-sb rnd, f -v f gr, ply srtg, arg
SS: lt gy - wh, S&P, frm - brit, sb rnd, vf-f
gr, mod srt, sl arg cmt, mod calc

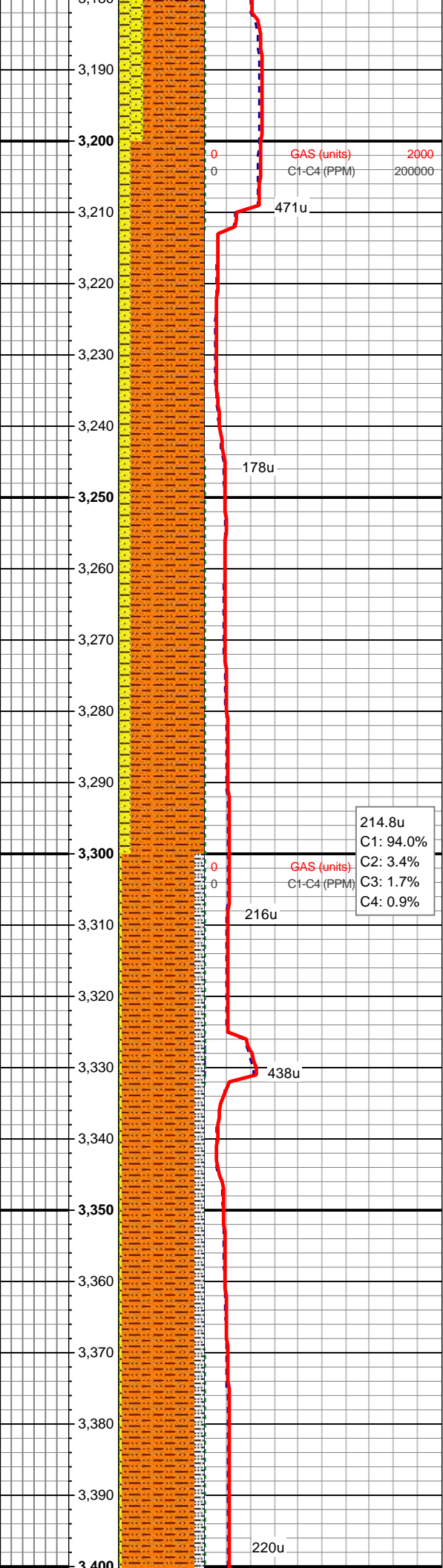
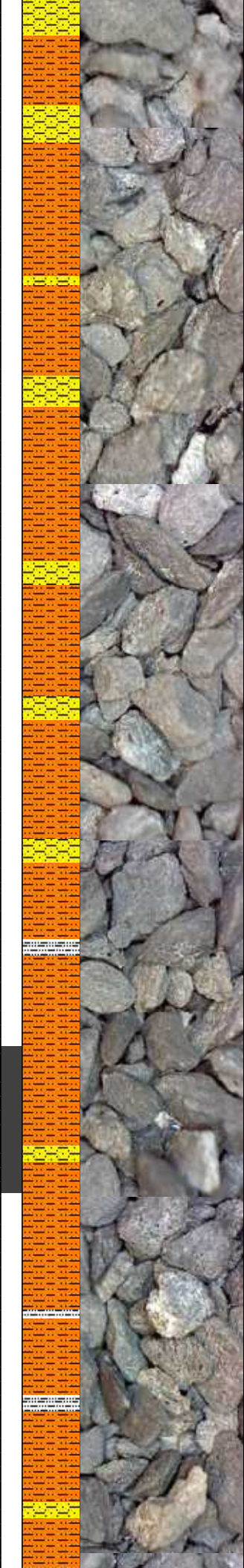
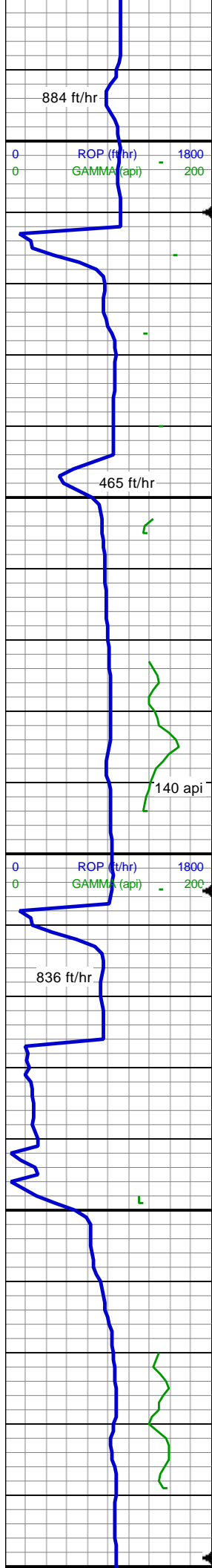
MD: 2,782'
TVD: 2,763.24'
Inclination: 9.2°
Azimuth: 32.4°
VS: -36.87'

SHY SS: wh-lt gy occ lt brn, sl frm - v sft,
sb ang-sb rnd, f -v f gr, ply srtg, arg
SS: lt gy - wh, S&P, frm - brit, sb rnd, vf-f
gr, mod srt, sl arg cmt, mod calc
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,
sb blk-sb plty, f-v f gr, gt, v arg, ply srt

MD: 2,877'
TVD: 2,857.03'
Inclination: 9.1°
Azimuth: 31°
VS: -42.47'

SHY SS: wh-lt gy occ lt brn, sl frm - v sft,
sb ang-sb rnd, f -v f gr, ply srtg, arg
SS: lt gy - wh, S&P, frm - brit, sb rnd, vf-f
gr, mod srt, sl arg cmt, mod calc
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,





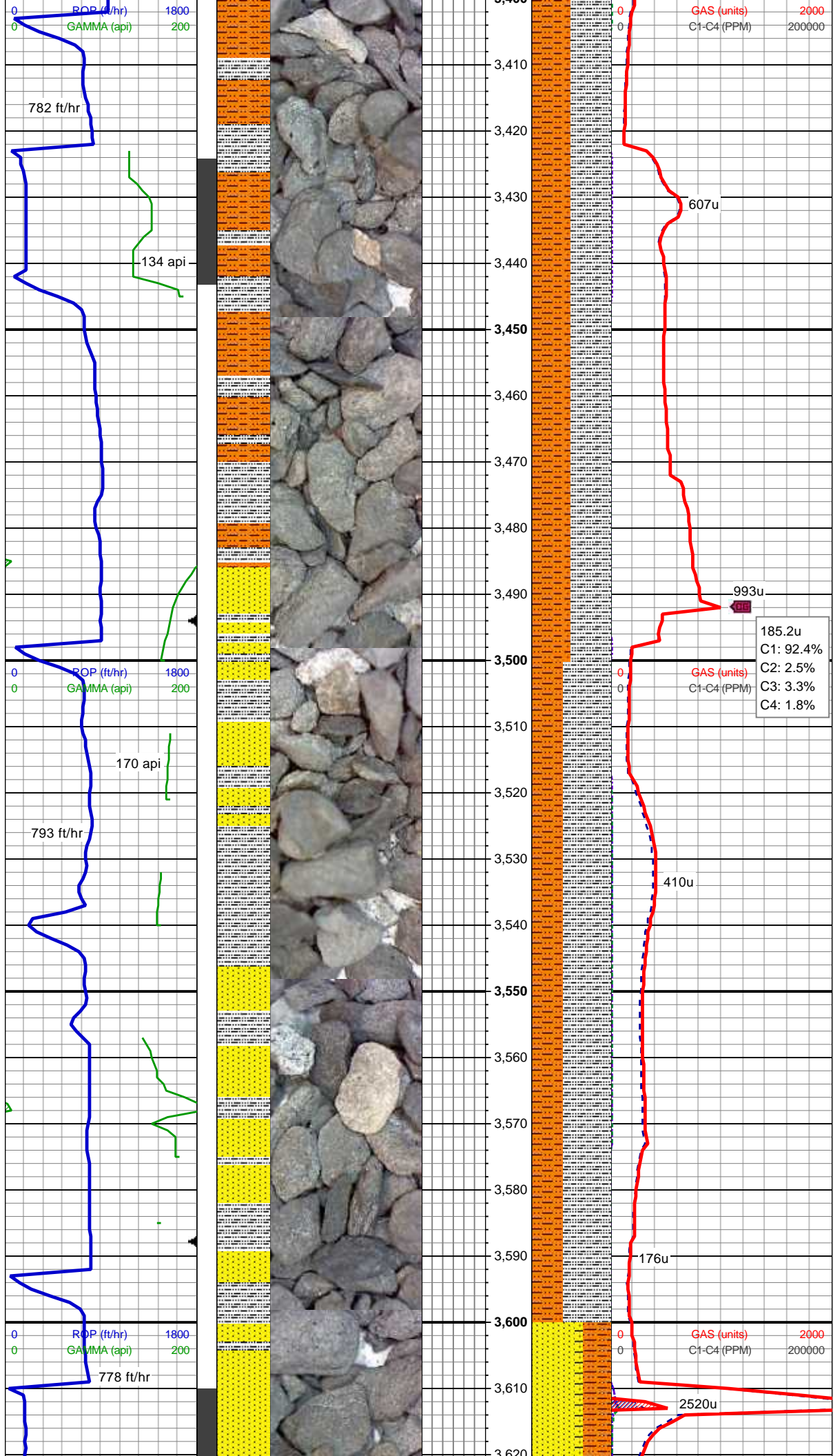
MD: 3,255'
TVD: 3,230.83'
Inclination: 7.2°
Azimuth: 22.9°
VS: -59.13'

SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,
sb blk-y-sb plty, f-v f gr, gt, v arg, ply srt
SHY SS: wh-lt gy occ lt brn, sl frm -hd, sb
ang-sb rnd, f -v f gr, ply srtg, arg; tr ss

214.8u
C1: 94.0%
C2: 3.4%
C3: 1.7%
C4: 0.9%

SHY SLTST: gy - gy brn, sl sft - v sft, sb
blk-y-sb plty, f-v f gr, sl gt - sl rthy tex, aren
SLTY SH: med gy-gr brn occ lt gy, sb
plty-plty, sft- sl frm, slt tex, sl rthy lstr, sl
sdy ip, non calc
SHY SS: wh-lt gy occ lt brn, sl frm -hd, sb
ang-sb rnd, f -v f gr, ply srtg, arg

MD: 3,349'
TVD: 3,323.94'
Inclination: 8.6°
Azimuth: 23.7°
VS: -62.12'



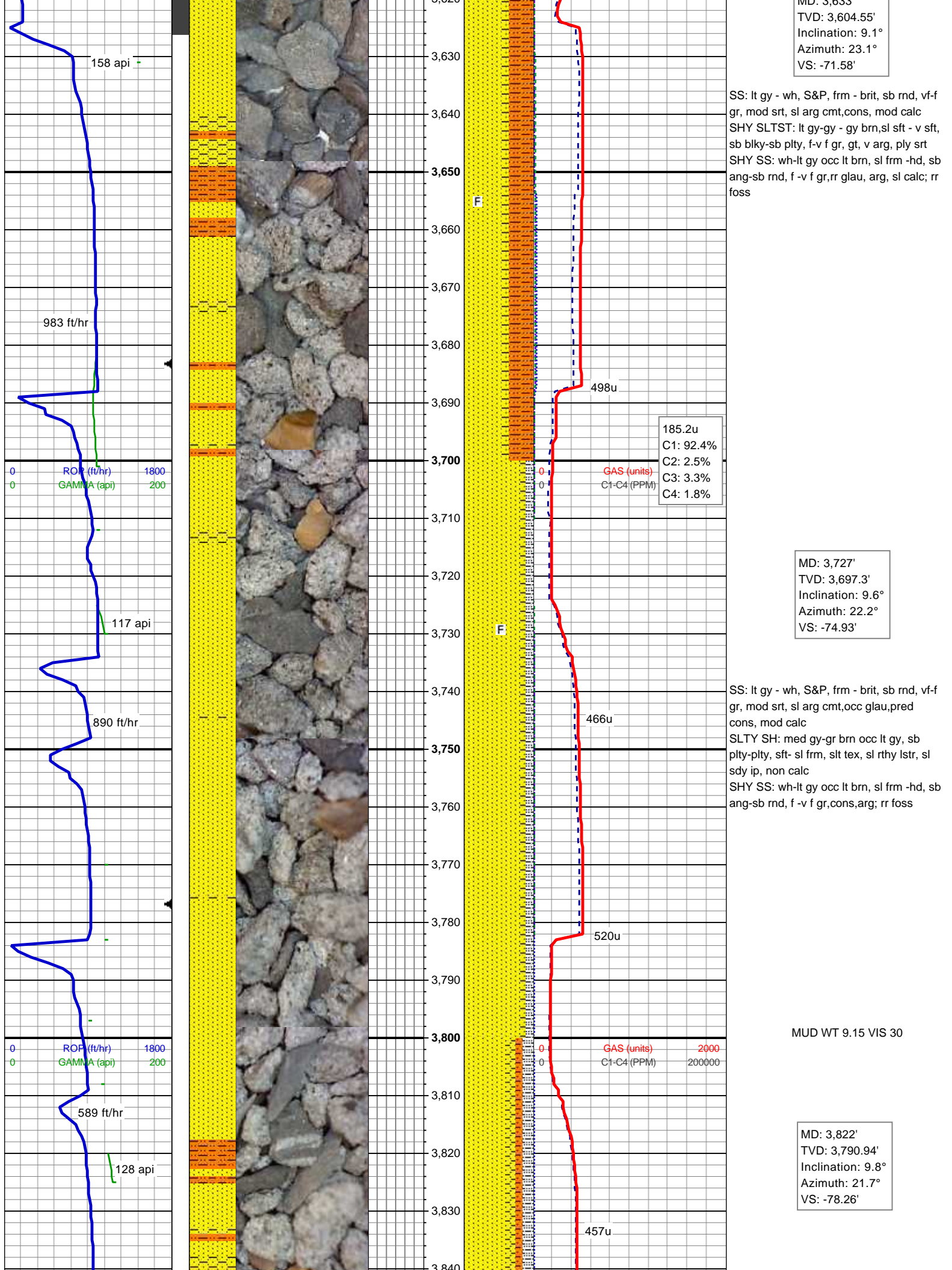
MD: 3,444'
TVD: 3,417.75'
Inclination: 9.5°
Azimuth: 22.4°
VS: -65.5'

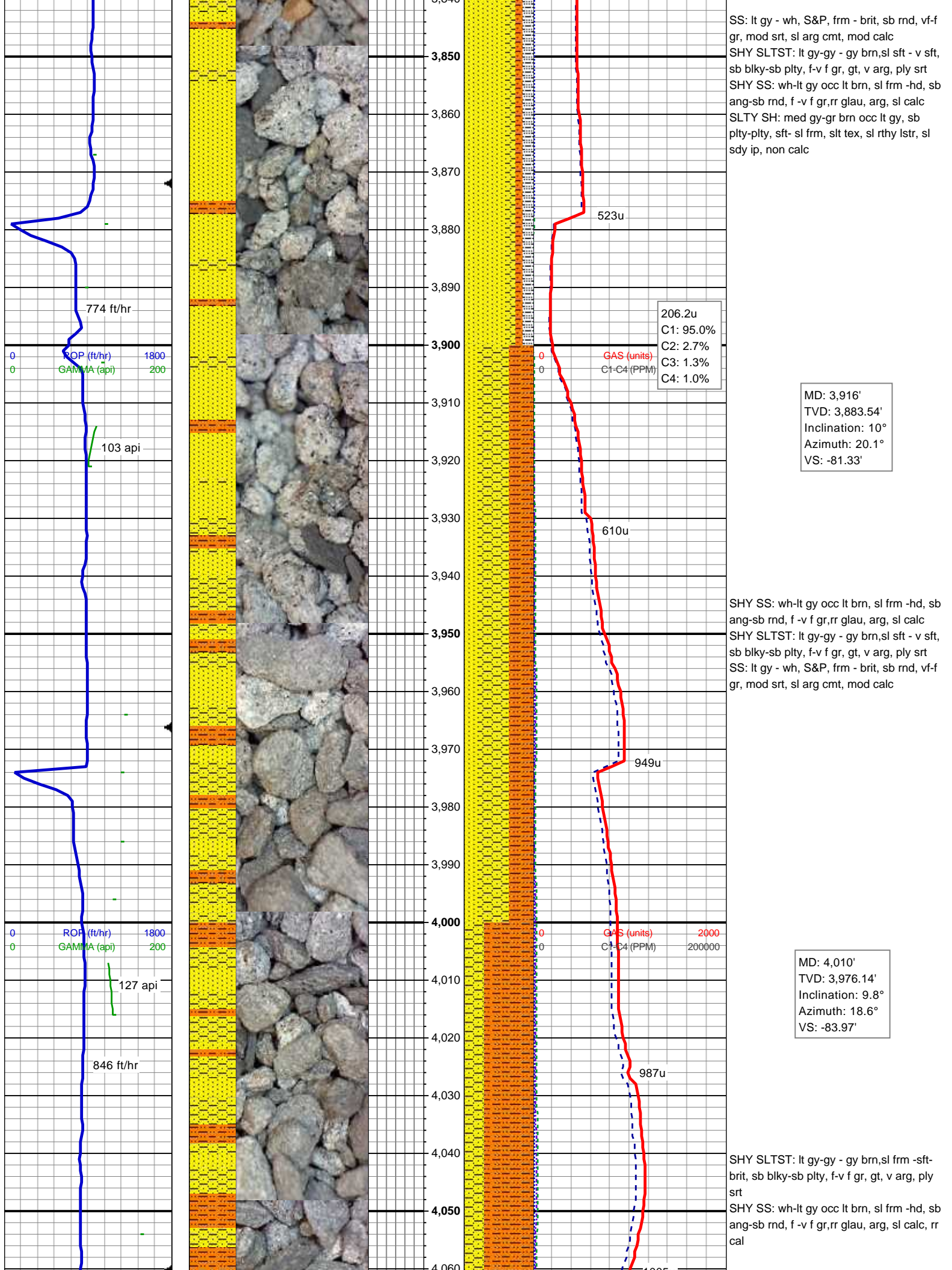
SLTY SH: med gy-gr brn occ lt gy, sb
plty-plty, sft- sl frm, slt tex, sl rthy lstr, sl
sdy ip, non calc
SHY SLTST: gy - gy brn, sl sft - v sft, sb
blky-sb plty, f-v f gr, sl gt - sl rthy tex, aren

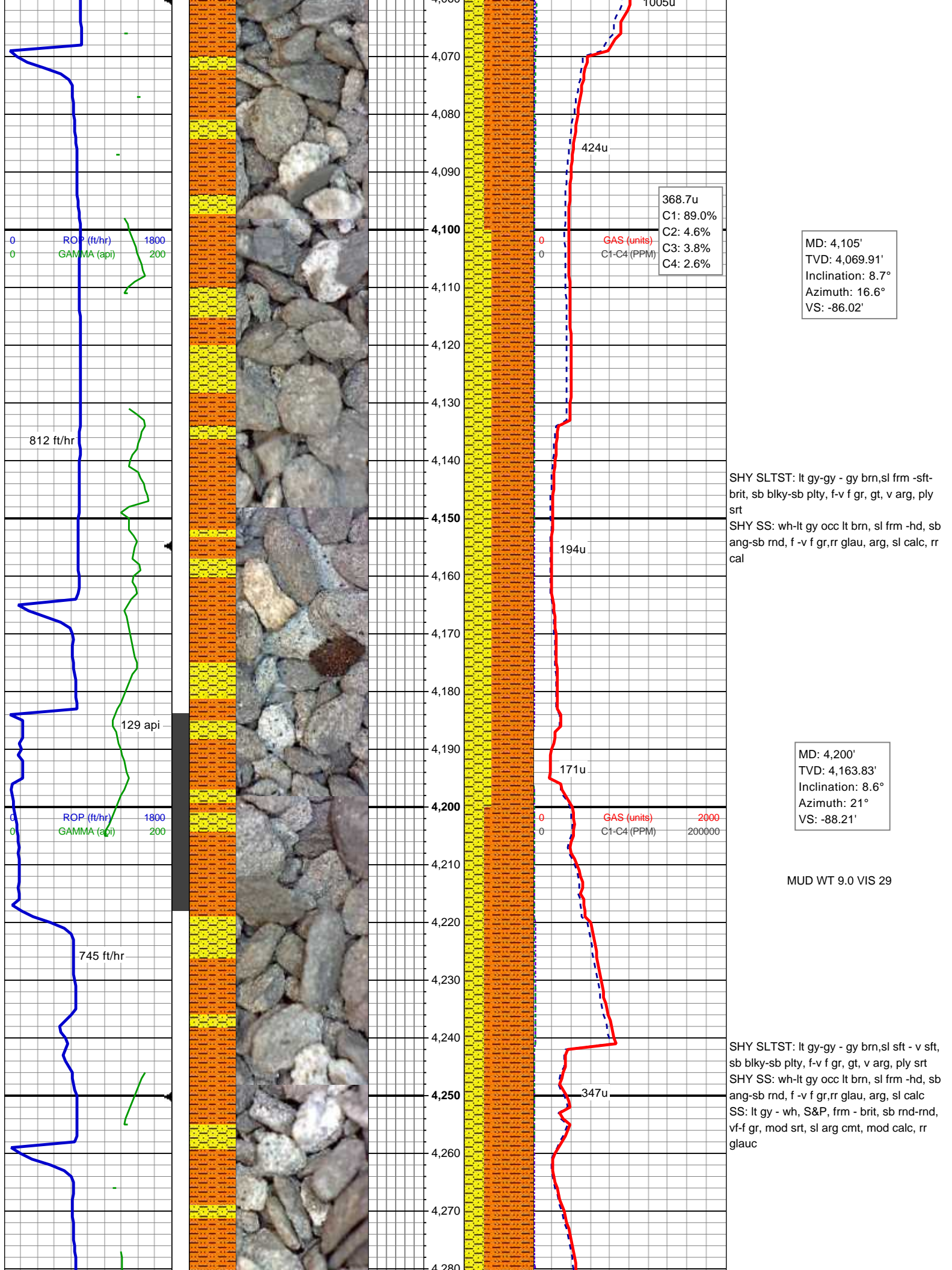
MD: 3,538'
TVD: 3,510.63'
Inclination: 8.2°
Azimuth: 21.5°
VS: -68.51'

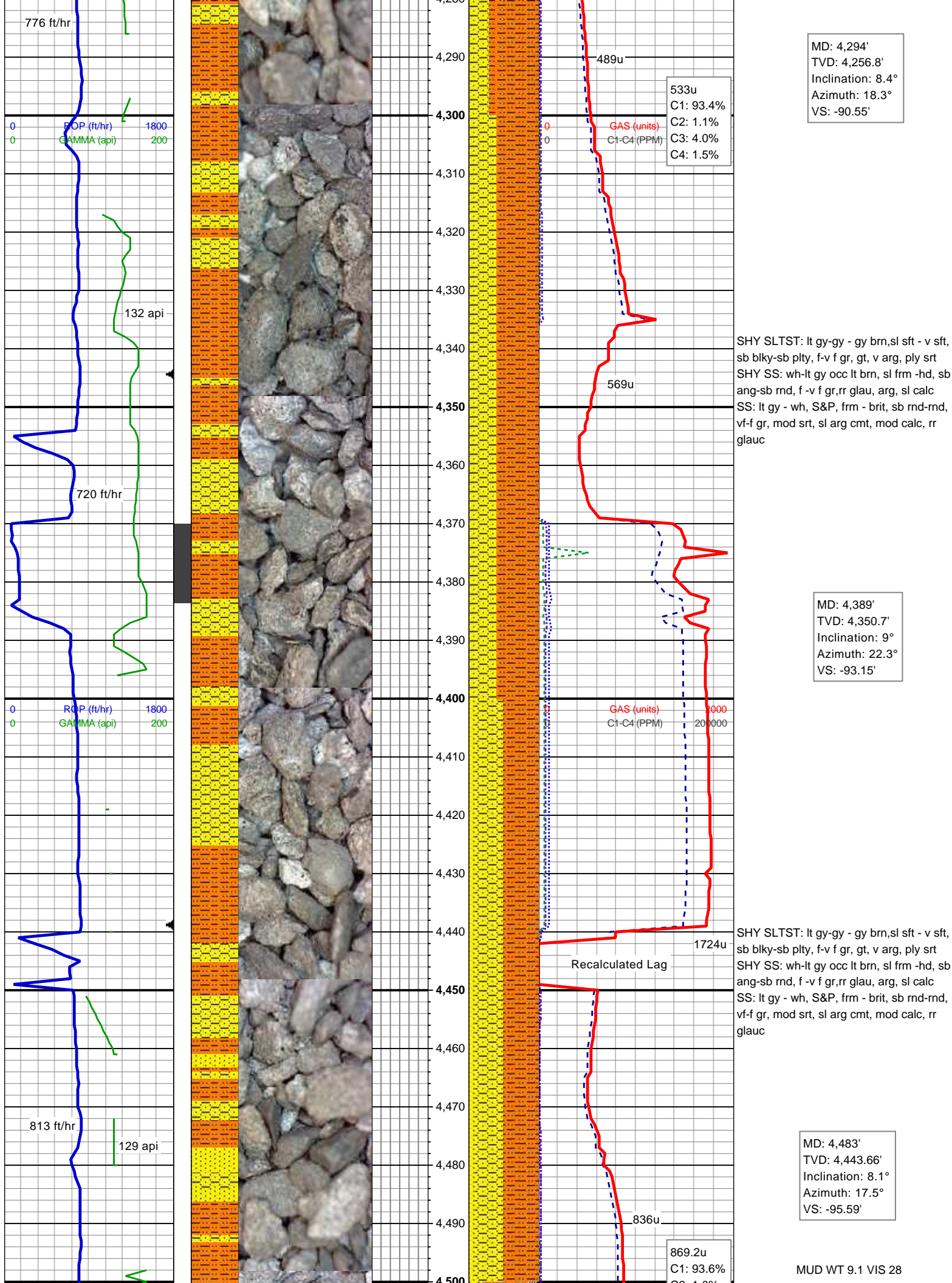
SLTY SH: med gy-gr brn occ lt gy, sb
plty-plty, sft- sl frm, slt tex, sl rthy lstr, sl
sdy ip, non calc
SHY SLTST: gy - gy brn, sl sft - v sft, sb
blky-sb plty, f-v f gr, sl gt - sl rthy tex, aren

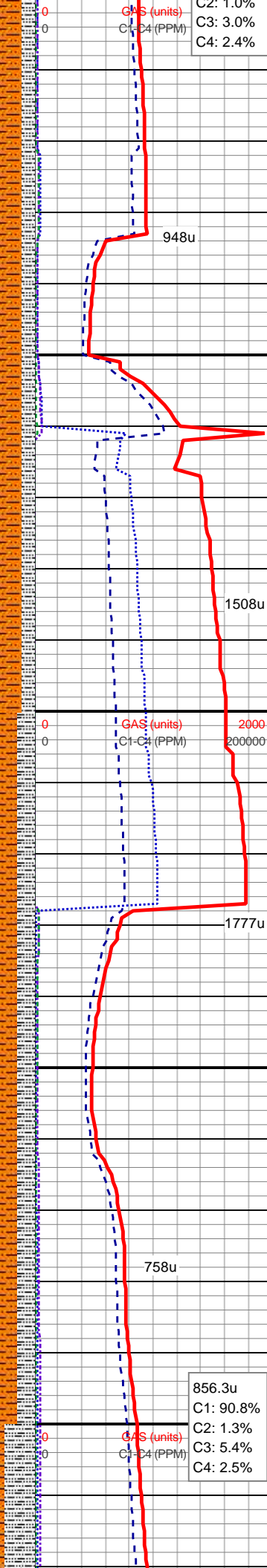
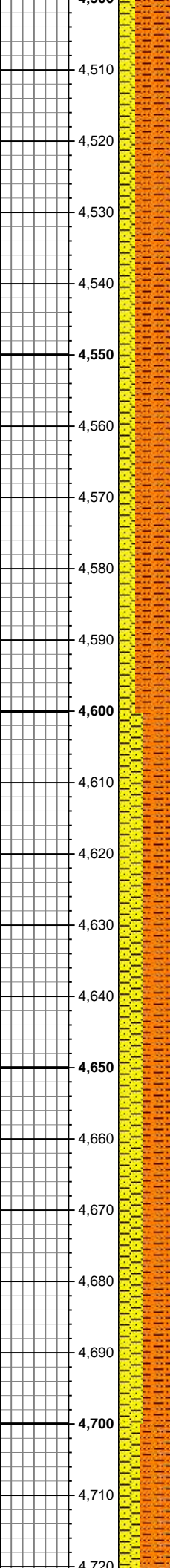
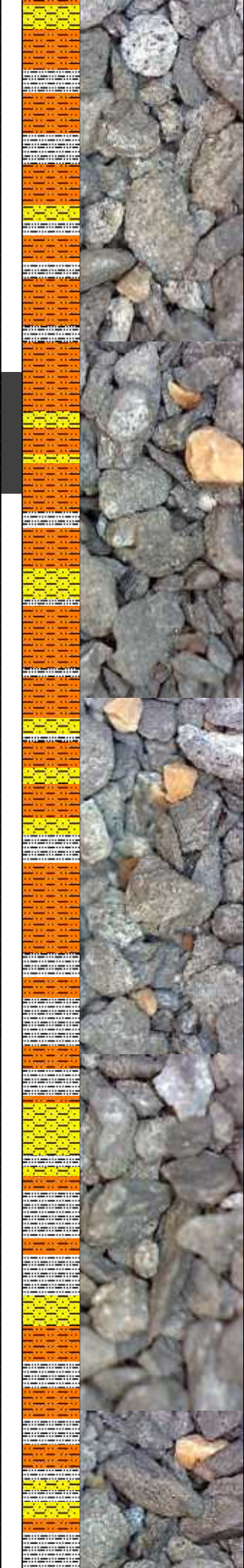
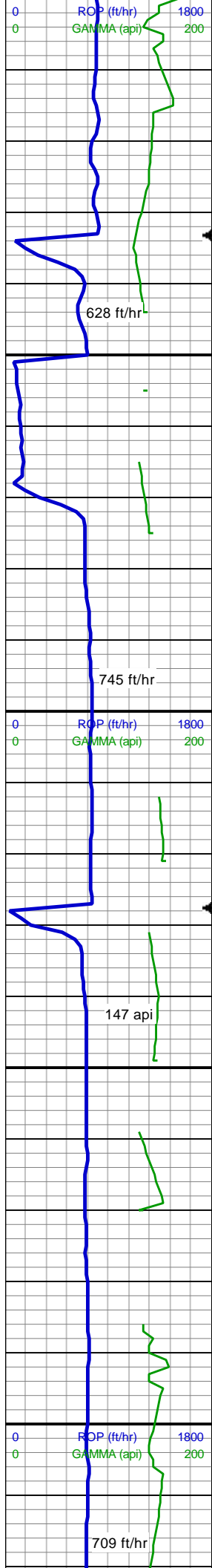
MD: 3,622'









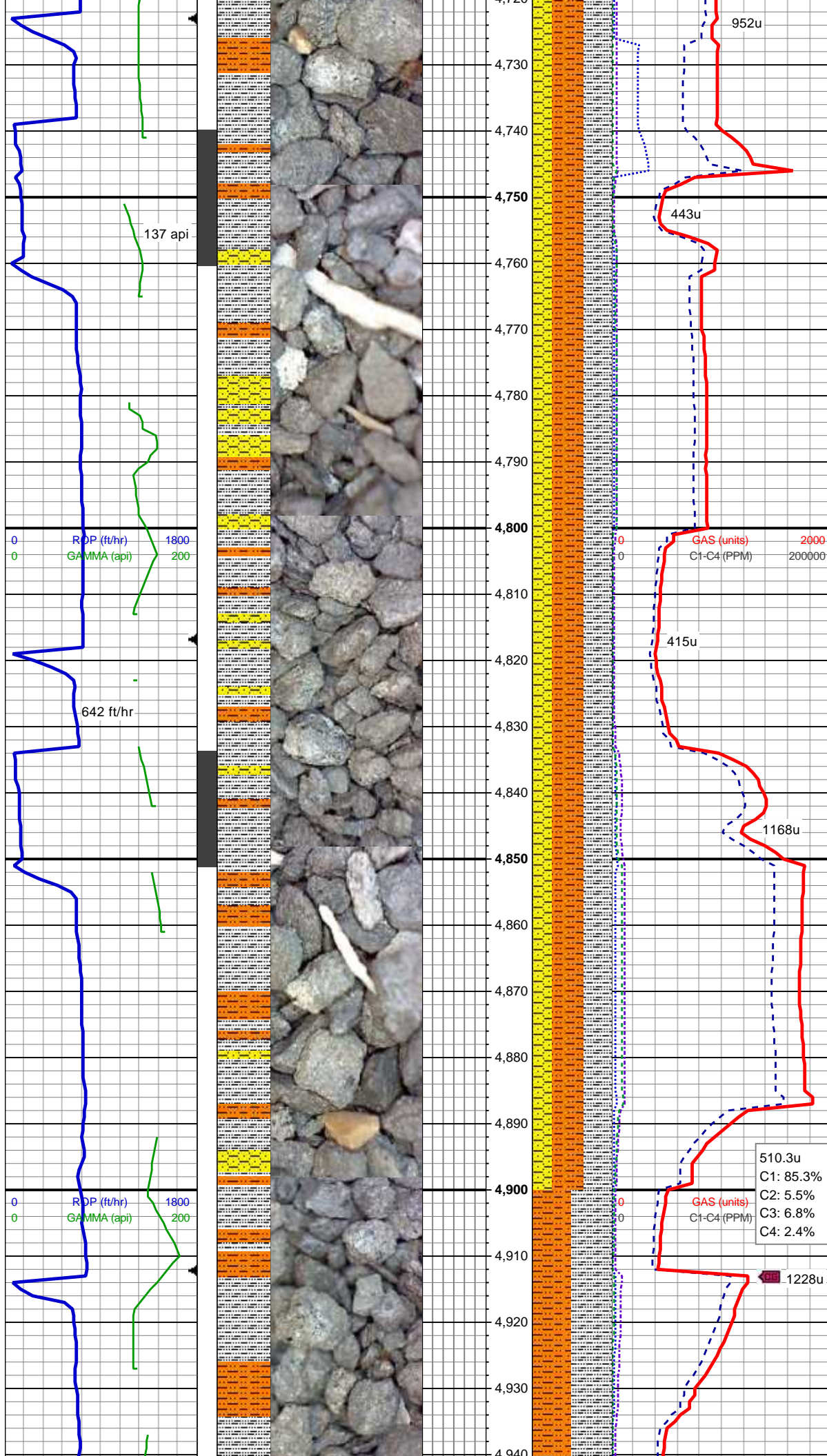


SHY SLTST: lt gy-gy - gy brn,sl sft - v sft, sb blkly-sb plty, f-v f gr, gt, v arg, ply srt, gr - slty sh
SHY SS: wh-lt gy occ lt brn, sl frm -hd, sb ang-sb rnd, f -v f gr,rr glau, arg, sl calc
SLTY SH: med gy-gr brn occ spec blk, sb plty-plty, sft- sl frm, slt tex, sl rthy lstr, non calc

MD: 4,578'
TVD: 4,537.6'
Inclination: 9°
Azimuth: 15.9°
VS: -97.24'

SHY SLTST: lt gy-gy - gy brn,sl sft - v sft, sb blkly-sb plty, f-v f gr, gt, v arg, ply srt, gr - slty sh
SHY SS: wh-lt gy occ lt brn, sl frm -hd, sb ang-sb rnd, f -v f gr,rr glau, arg, sl calc
SLTY SH: med gy-gr brn occ spec blk, sb plty-plty, sft- sl frm, slt tex, sl rthy lstr, non calc

MD: 4,672'
TVD: 4,630.57'
Inclination: 8°
Azimuth: 15°
VS: -98.58'



SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,
sb blkly-sb plty, f-v f gr, gt, v arg, ply srt, gr
- slty sh
SHY SS: wh-lt gy occ lt brn, sl frm -hd, sb
ang-sb rnd, f -v f gr,rr glau, arg, sl calc
SLTY SH: med gy-gr brn occ spec blk, sb
plty-plty, sft- sl frm, slt tex, sl rthy lstr, non
calc

MD: 4,767'
TVD: 4,724.52'
Inclination: 9°
Azimuth: 20.6°
VS: -100.54'

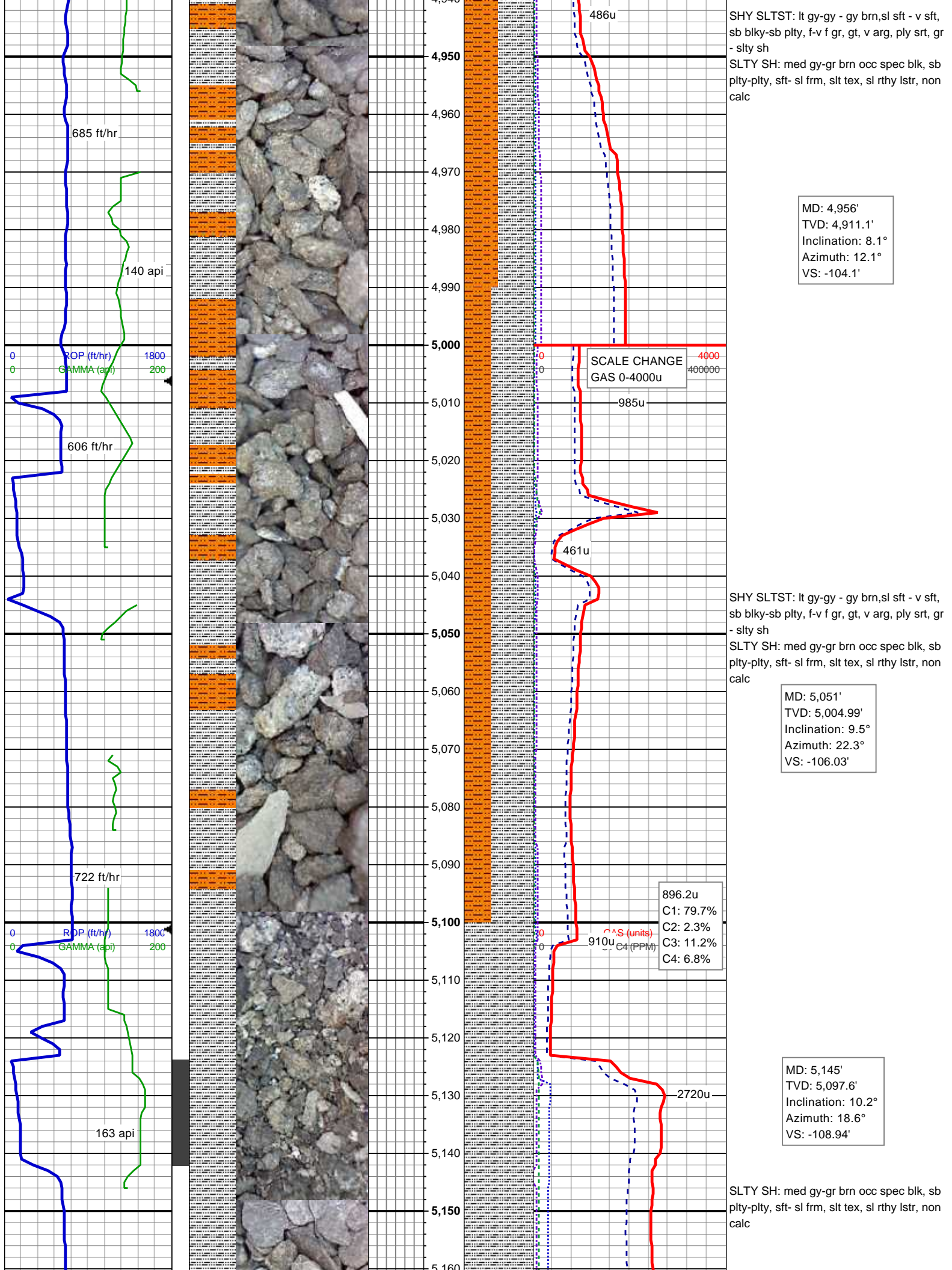
MUD WT 9.1 VIS 30

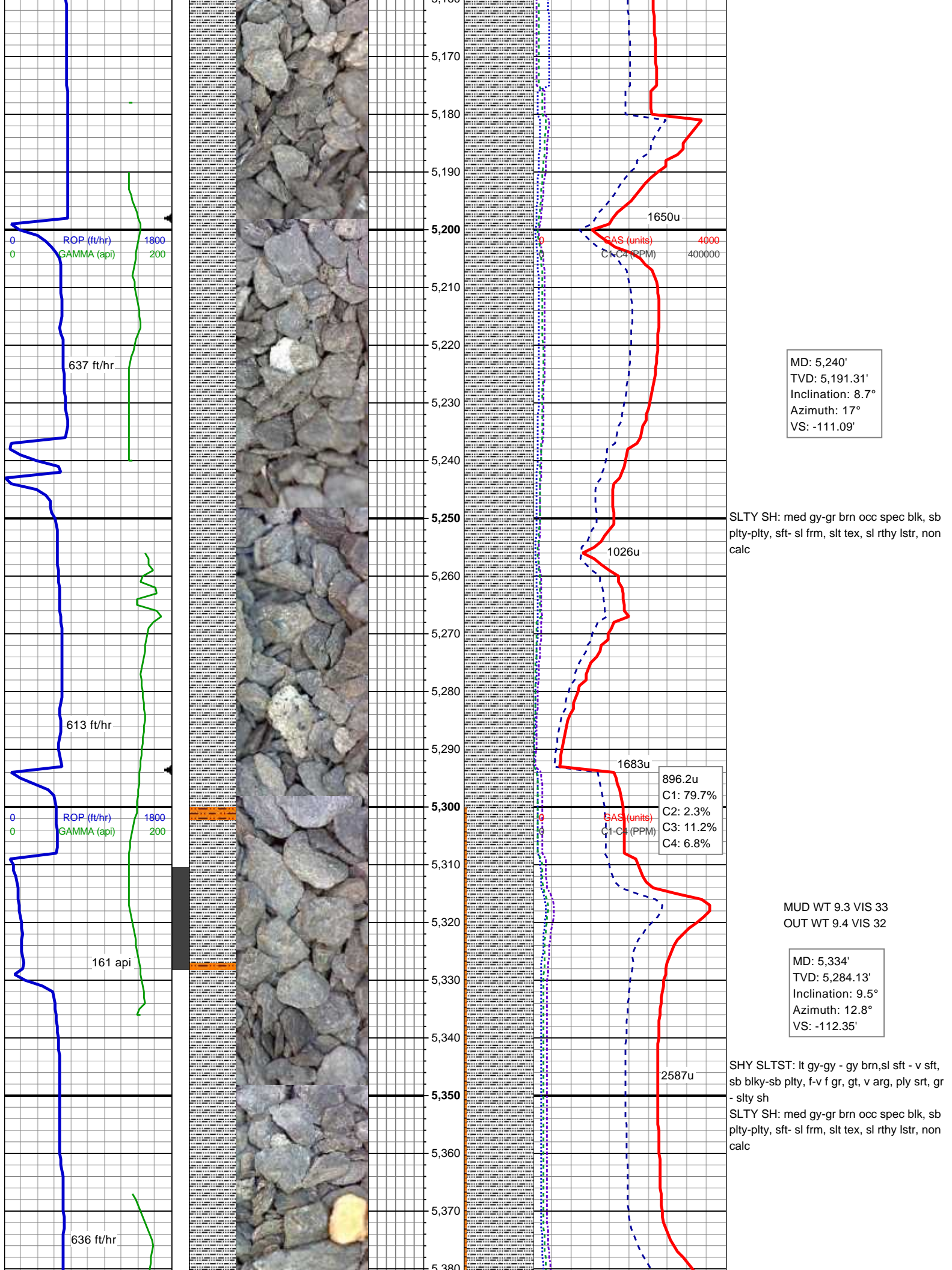
MD: 4,862'
TVD: 4,818.25'
Inclination: 9.8°
Azimuth: 16.9°
VS: -102.89'

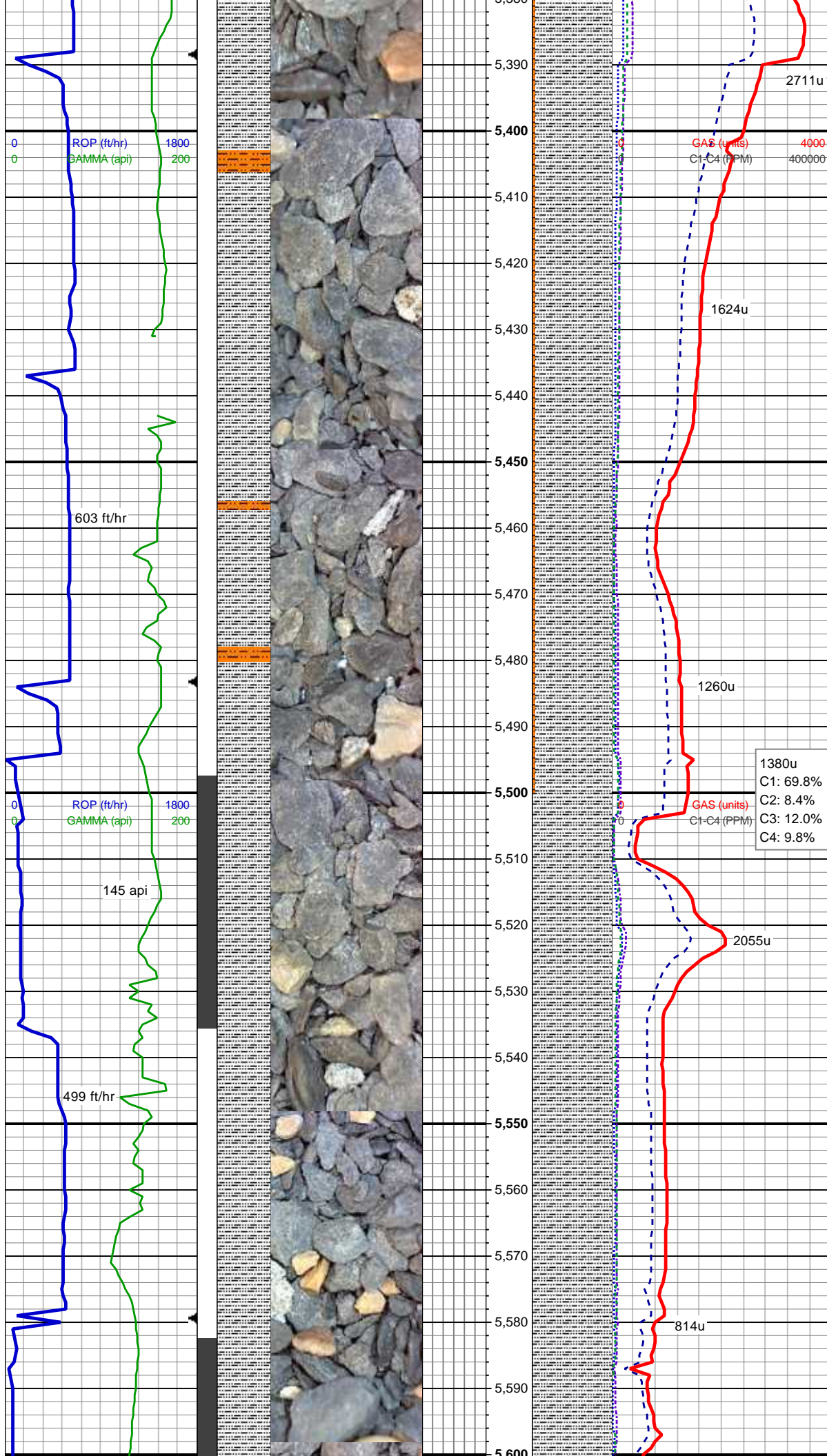
SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,
sb blkly-sb plty, f-v f gr, gt, v arg, ply srt, gr
- slty sh
SLTY SH: med gy-gr brn occ spec blk, sb
plty-plty, sft- sl frm, slt tex, sl rthy lstr, non
calc
SHY SS: wh-lt gy occ lt brn, sl frm -hd, sb
ang-sb rnd, f -v f gr, arg, sl calc

510.3u
C1: 85.3%
C2: 5.5%
C3: 6.8%
C4: 2.4%

GAS (units)
C1-C4 (PPM)







MD: 5,429'
TVD: 5,378.01'
Inclination: 8.1°
Azimuth: 9.2°
VS: -112.65'

SHY SLTST: lt gy-gy - gy brn,sl sft - v sft,
sb blkly-sb plty, f-v f gr, gt, v arg, ply srt, gr
- slty sh
SLTY SH: med gy-gr brn occ spec blk, sb
plty-plty, sft- sl frm, slt tex, sl rthy lstr, non
calc

MUD WT 9.6 VIS 33
OUT WT 9.5 VIS 33

MD: 5,524'
TVD: 5,472.01'
Inclination: 8.6°
Azimuth: 19°
VS: -113.68'

SLTY SH: med gy-gr brn occ spec blk, sb
plty-plty, sft- sl frm, slt tex, sl rthy lstr, non
calc

MUD WT 9.7 VIS 34
OUT WT 9.6 VIS 34

