



Scale: 5" / 100'
Measured Depth Log

Well Name Noble Hullahaloo State Y21-716

Location SEC 16 T2N R64W

State COLORADO

Country UNITED STATES

API Number 05-123-45232

Geographic Region DENVER-JULESBURG BASIN

Spud Date 10/7/2017

Surface Coordinates 44S/FNL x 892' FEL, SEC. 16
LAT: 40.14452, LONG: -104.55058

Bottom Hole Coordinates 100' FSL x 415' FEL, SEC. 21

Ground Elevation 4946'

Logged Interval 6500' To 17414'

Formation CODELL

Type of Drilling Fluid OBM

K.B. Elevation 4976'

Total Depth 17436'

AFE # 204822

Rig Number H&P 524

County WELD

Drilling Completed 10/11/2017

Field WATTENBERG

Operator

Company NOBLE ENERGY, INC

Address 1625 Broadway,
Denver, CO 80223



Geologist

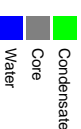
Name GARY MYERS, ALEC WALKER

Company Terra Guidance









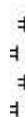




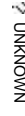















Address 1298 O Road
Loma CO 81524
(970) 260-5408




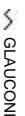
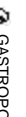
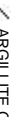
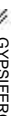


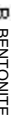
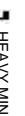

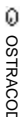


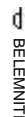


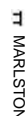
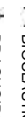

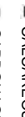
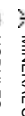
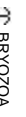
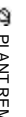

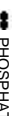
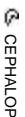
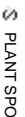
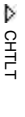
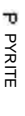
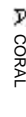

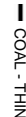

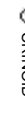
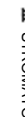
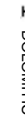
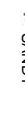
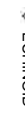

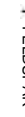
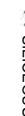
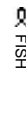
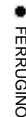


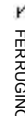
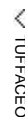





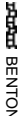
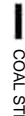
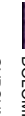

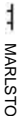
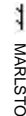
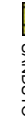
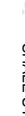
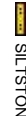

Color Coding



Rock Types

 LIMESTONE	 SANDSTONE	 DOLOMITE	 BRECCIA
 Chalk	 BENTONITE	 CHERT	 TILL
 Marl	 CEMENT	 COAL	 TUFF
 SHALE	 UNKNOWN	 MARLSTONE	 IGNEOUS
 Silty Shale	 ANHYDRITE	 CLAYSTONE	 METAMORPHIC
 Shaly Siltstone	 GYPSUM	 SHALE GRAY	
 SILTSTONE	 SALT	 SHALE COLORED	
 Shaly Sandstone	 SIDERITE or LIMONITE	 CONGLOMERATE	







Accessories

Fossils	F FOSSIL	 ARGILLACEOUS	 GLAUCONITE
 GASTROPOD	 ARGILLITE GRAIN	 GYPSIFEROUS	
 ALGAE	 OOLITE	 B BENTONITE	 H HEAVY MINERAL
 AMPHIPORA	 OSTRACOD	 BITUMENOUS SUBSTANCE	 K KAOLIN
 BELEMNITE	 PELECYPOD	 BRECCIA FRAGMENTS	 M MARLSTONE
 BIOCLASTIC	 PELLET	 CALCAREOUS	 M MINERAL CRYSTALS
 BRACHIOIPOD	 PISOLITE	 CARBONACEOUS FLAKES	 N NODULES
 BRYOZOA	 PLANT REMAINS	 CHTDK	 P PHOSPHATE PELLETS
 CEPHALOPOD	 PLANT SPORES	 CHTLT	 P PYRITE
 CORAL	 SCAPHOPOD	 COAL - THIN BEDS	 S SALT CAST
 CRINOID	 STROMATOPOROID	 DOLOMITIC	 S SANDY
 ECHINOID		 + FELDSPAR	 S SILICEOUS
 FISH	Minerals	 FERRUGINOUS PELLET	 S SILTY
 FORAMINIFERA	 ANHYDRITIC	 F FERRUGINOUS	 T 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













Oil Show

-  ORGANIC
-  PINPOINT

Engineering

-  DEAD
-  VUGGY
-  EVEN
-  QUESTIONABLE
-  SPOTTED STAINING
-  BIT

Porosity


-  CASING
-  CONNECTION (LEFT)
-  CONNECTION (DOG)
-  CONNECTION GAP
-  FRACTURE
-  CORE - LOST
-  INTERCRYSTALLINE
-  CORE - RECOVER
-  INTEROOLITIC
-  DST INTERVAL
-  MOLDIC
-  FAULT

Other Symbols

 FORMATION TOP

L LITHOGRAPHIC

Rounding

 GAS SHOW

MX MICROXLN



MIN DEPTH


A ANGULAR

MS MUDSTONE

 NORMAL FAULT


R ROUNDED

PS PACKSTONE

 OIL SHOW

a SUBANG

WS WACKESTONE


 OVERTURNED STRATA

n SUBRND


Sorting

 REVERSE FAULT

Textures

 SIDEWALL CORE (LEFT)

M MODERATE

 SIDEWALL CORE (RIGHT)


BS BOUNDSTONE

P POOR


 SLIDE

C CHALKY

W WELL

 SURVEY

CX CRYPTOXLN


 TRIP GAS

E EARTHY

ConnectionGas(Vert)

 WIRELINE TESTED - LEFT

FX FINELYXLN

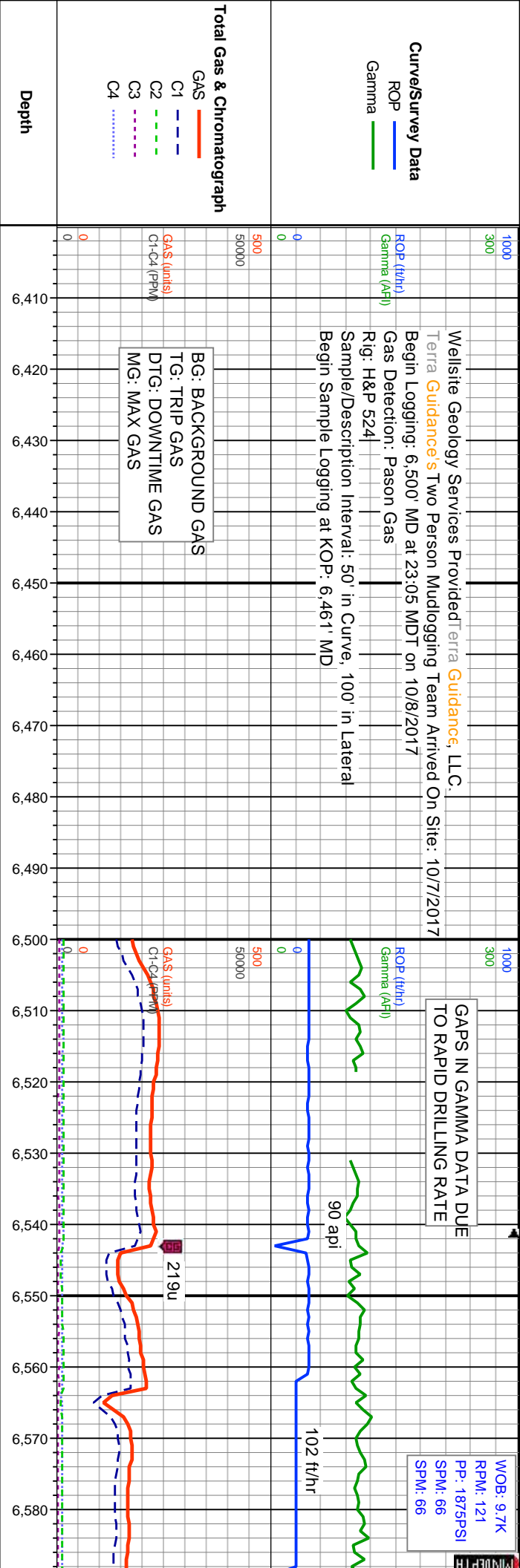
 WIRELINE TESTED - RT

GS GRAINSTONE

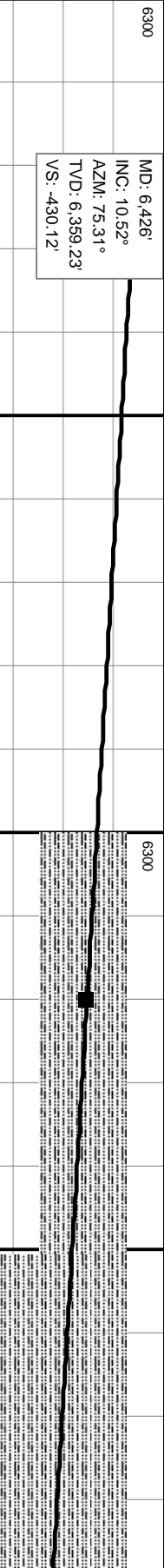
Wellsite Geology Services Provided Terra Guidance, LLC.
Terra Guidance's Two Person Mudlogging Team Arrived On Site: 10/7/2017
Begin Logging: 6,500' MD at 23:05 MDT on 10/8/2017
Gas Detection: Pason Gas
Rig: H&P 524
Sample/Description Interval: 50' in Curve, 100' in Lateral
Begin Sample Logging at KOP: 6,461' MD

GAPS IN GAMMA DATA DUE
TO RAPID DRILLING RATE

WOB: 9.7K
RPM: 121
PP: 1875PSI
SPM: 66
SPM: 66



% Lithology



Well Bore
TVD (ft)

Bit #: 2
Type: ATD505X
Size: 8.5
Depth In: 2,029
Jets: 5X15
S/N: 5275284

KOP at 6461' MD
Begin 50' Sample Collection

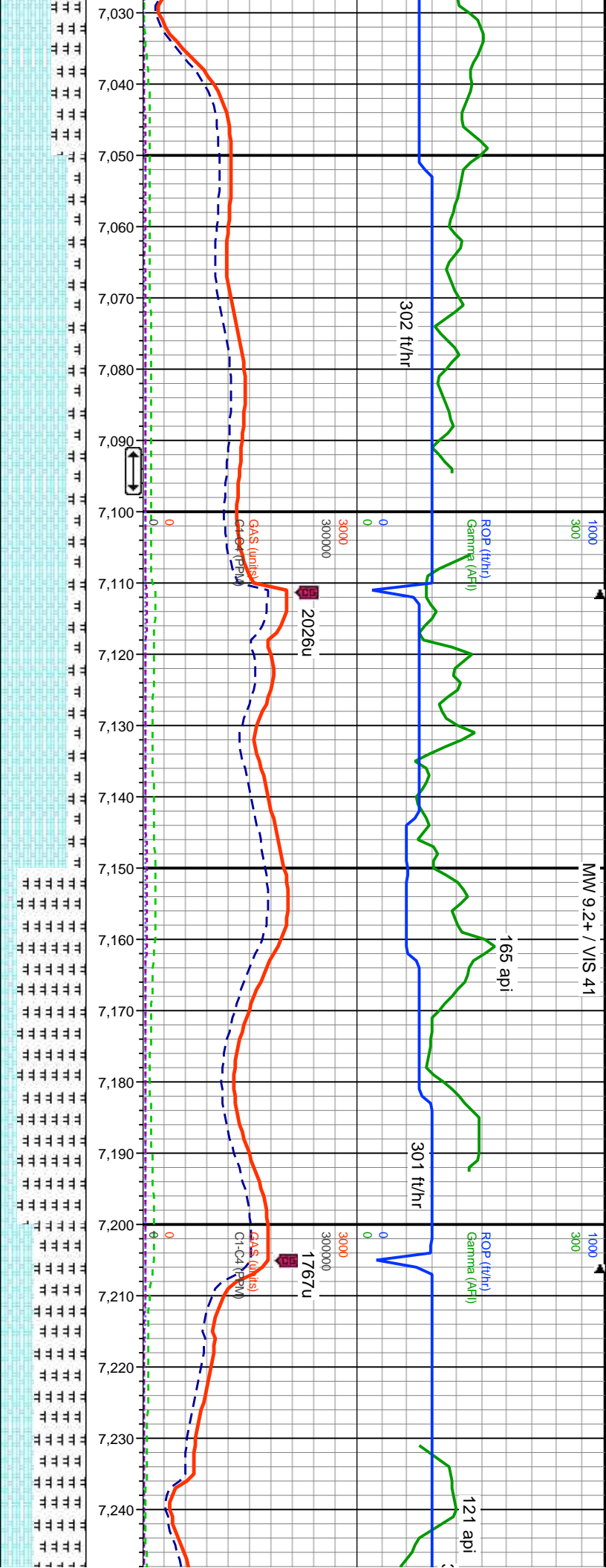
MD: 6,520'
INC: 6.7°
AZM: 75.26°
TVD: 6,452.16'
VS: -432.82'

100% SLTY SH: med dk gy-dk gy brn, sb
biky-sb rnd, hd-firm, arg, silty tex, rthy, sl calc

100% SLTY SH: med dk gy-dk gy t
biky-sb rnd, hd-firm, arg, silty tex, rth

Images





Niobrara C Chalk Top
7094' MD / 6966' TVD

MD: 7.088'
INC: 47.55°
AZM: 178.16°
TVD: 6.961.72'
VS: -227.85'

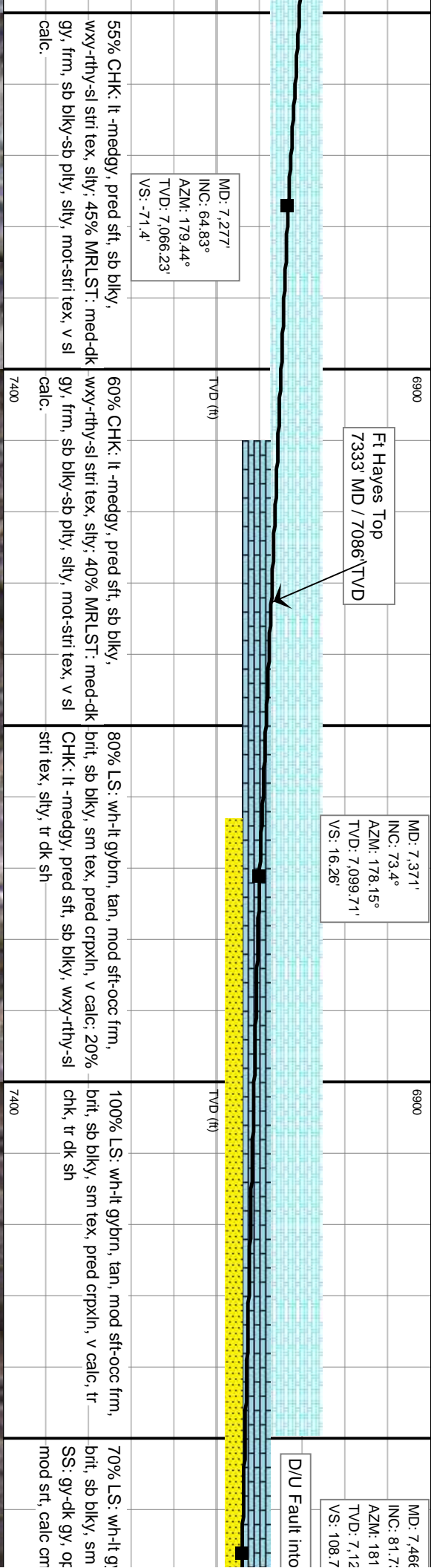
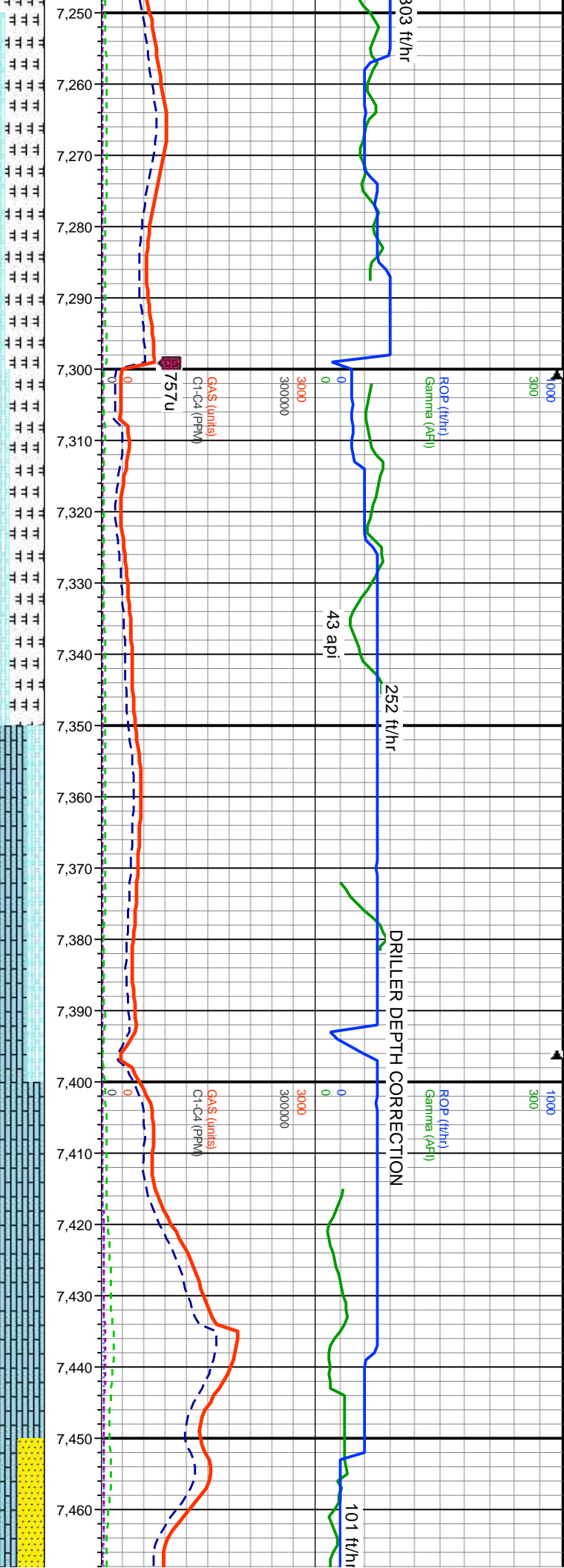
Niobrara D Chalk Top
7199' MD / 7029' TVD

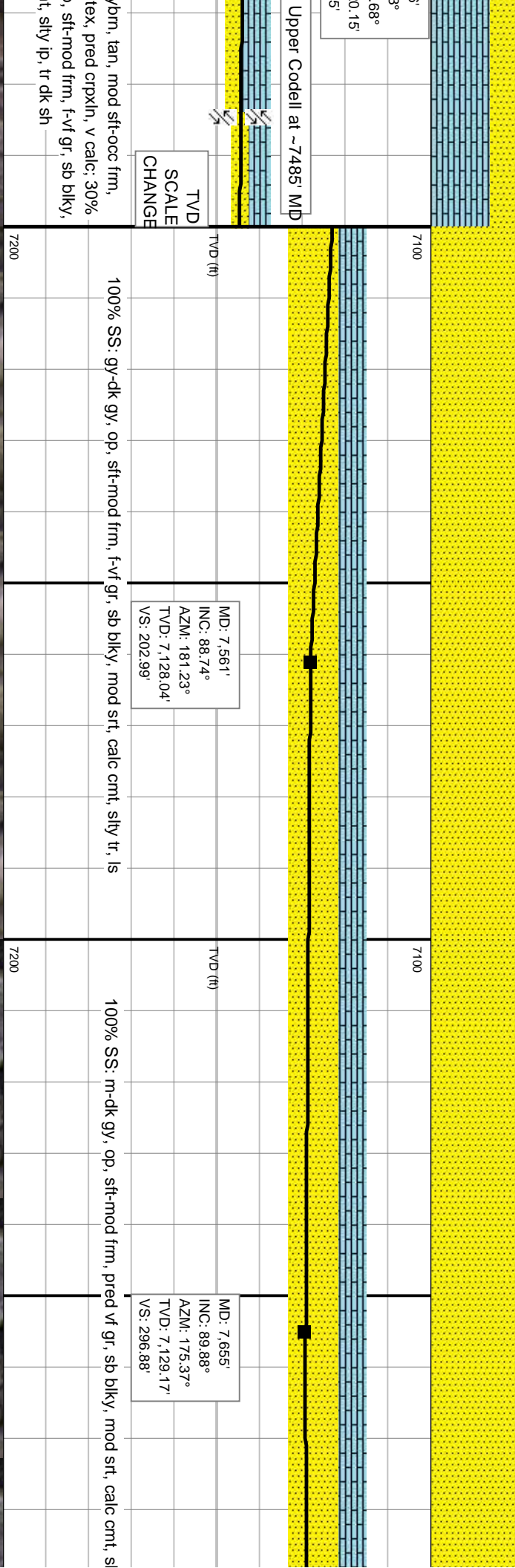
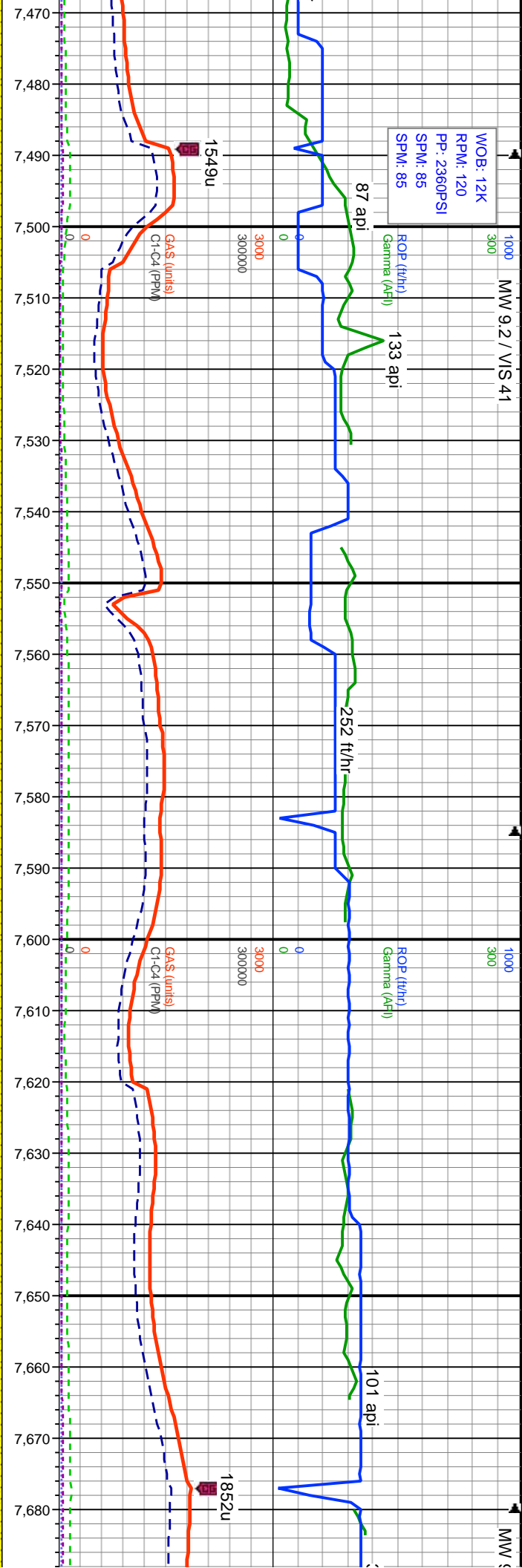
MD: 7.183'
INC: 56.43°
AZM: 179.23°
TVD: 7.020.17'
VS: -153.14'

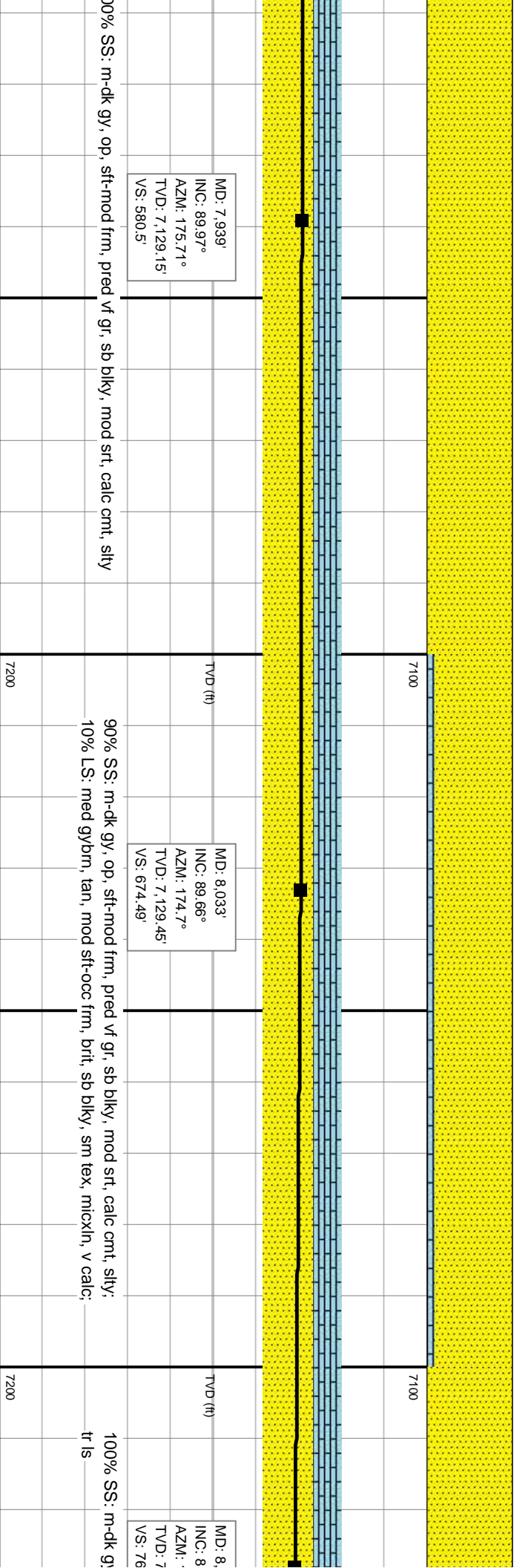
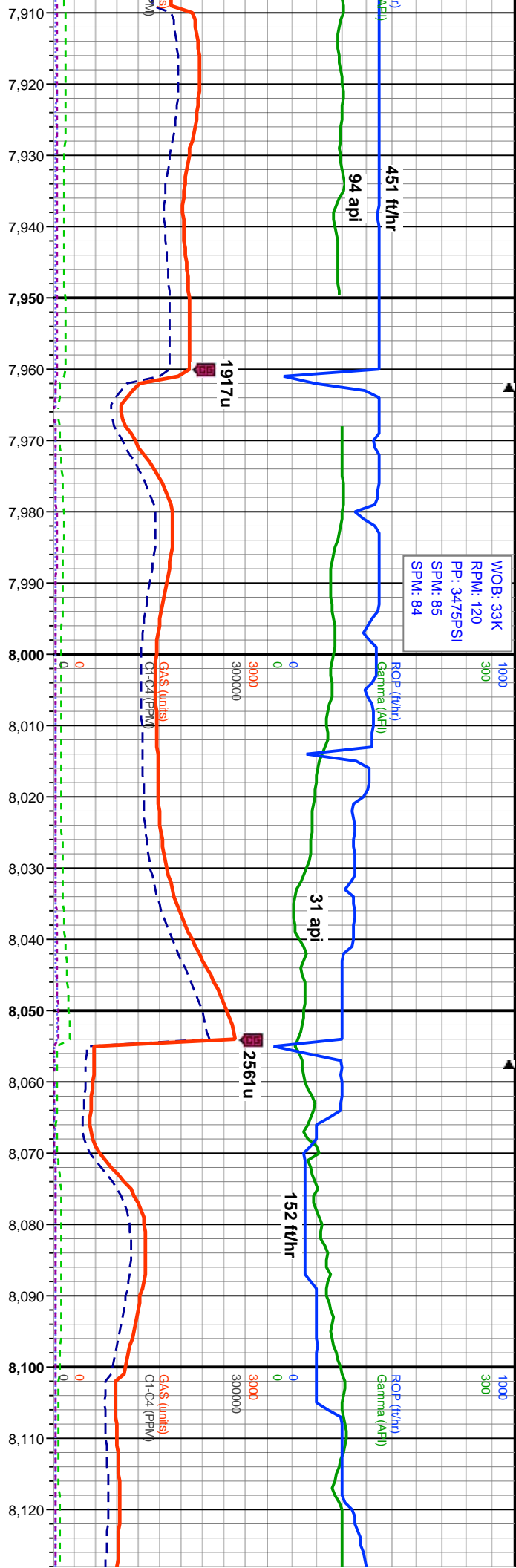
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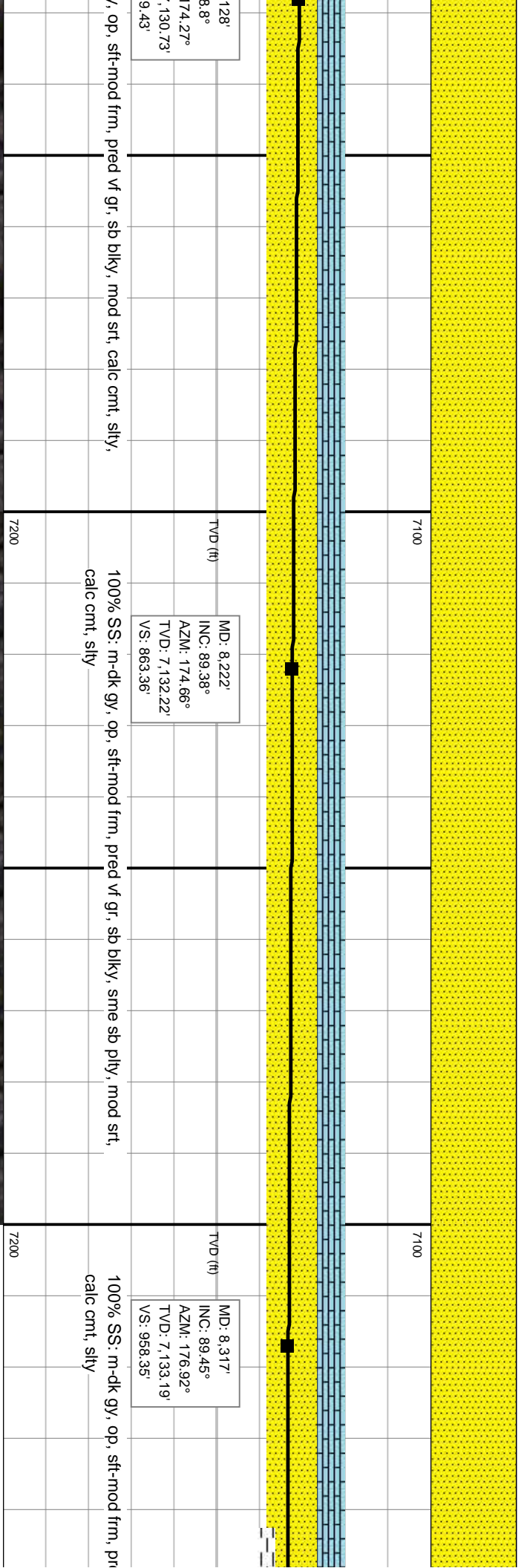
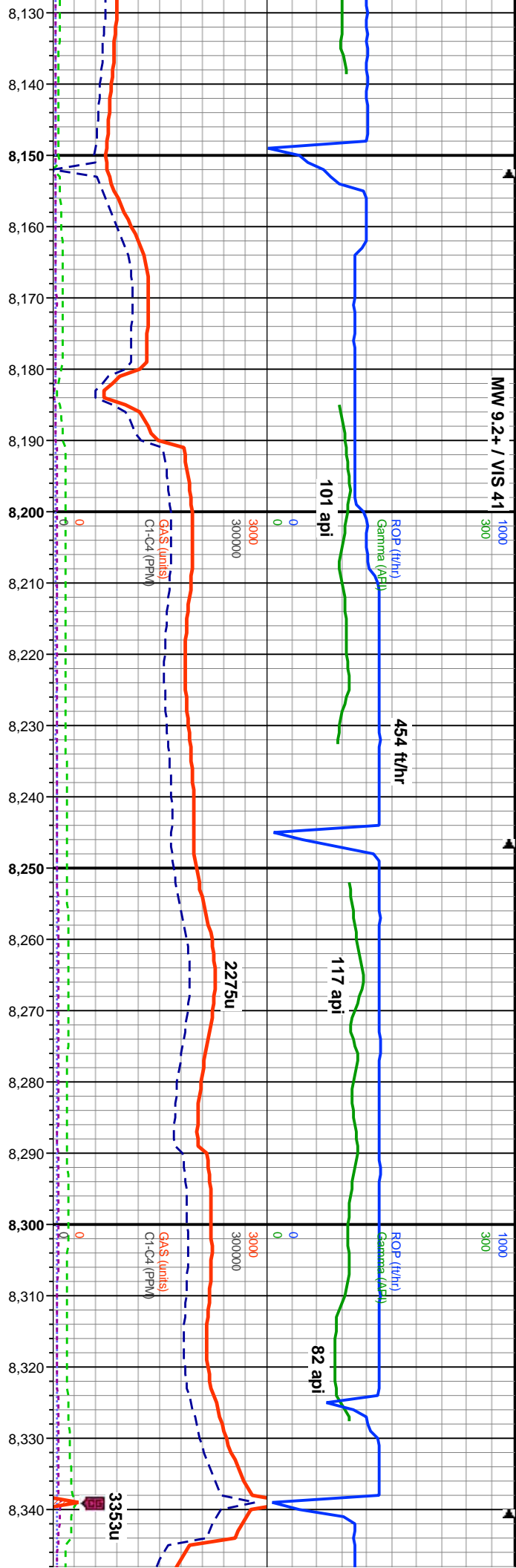
80% CHK: lt gy-medgy, pred sft, sb blk, wxy-rthy-si stri tex, sily, 20% MRLST: med-dk ply, sily, mot-stri tex, cal, 20% CHK: lt -medgy, pred sft, sb blk, wxy-rthy-si stri tex, sily

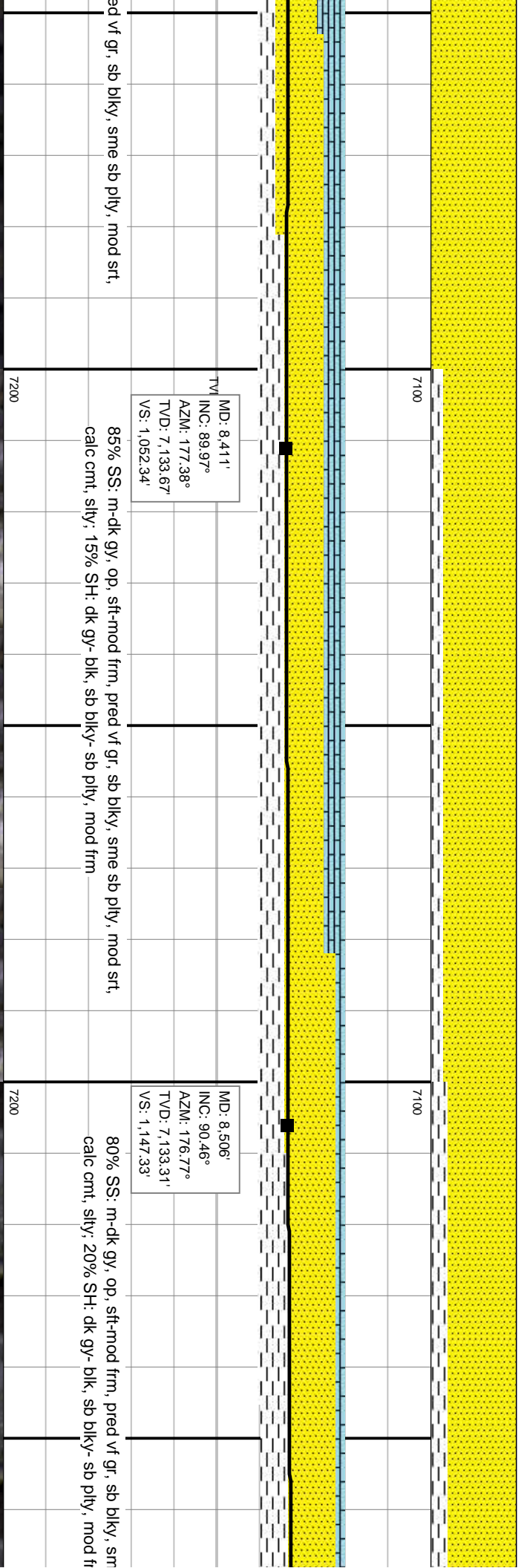
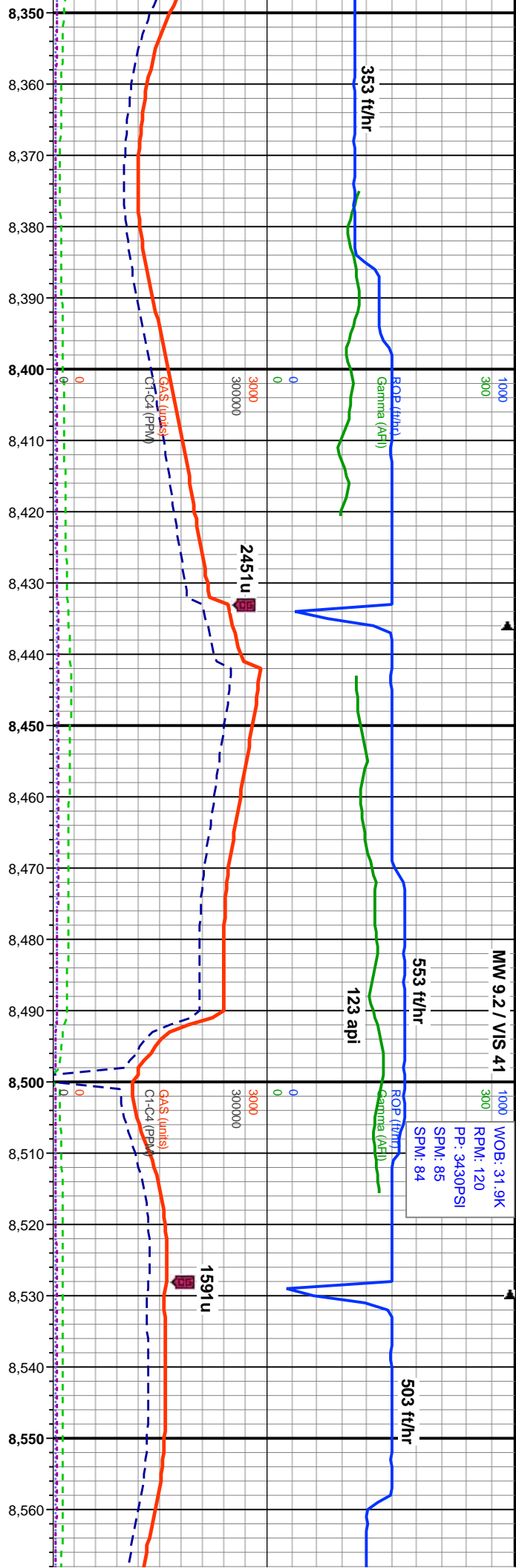
60% MRLST: med-dk gy, frm, sb blk-sb ply, sily, mot-stri tex, cal, 40% CHK: lt -medgy, pred sft, sb blk, wxy-rthy-si stri tex, sily

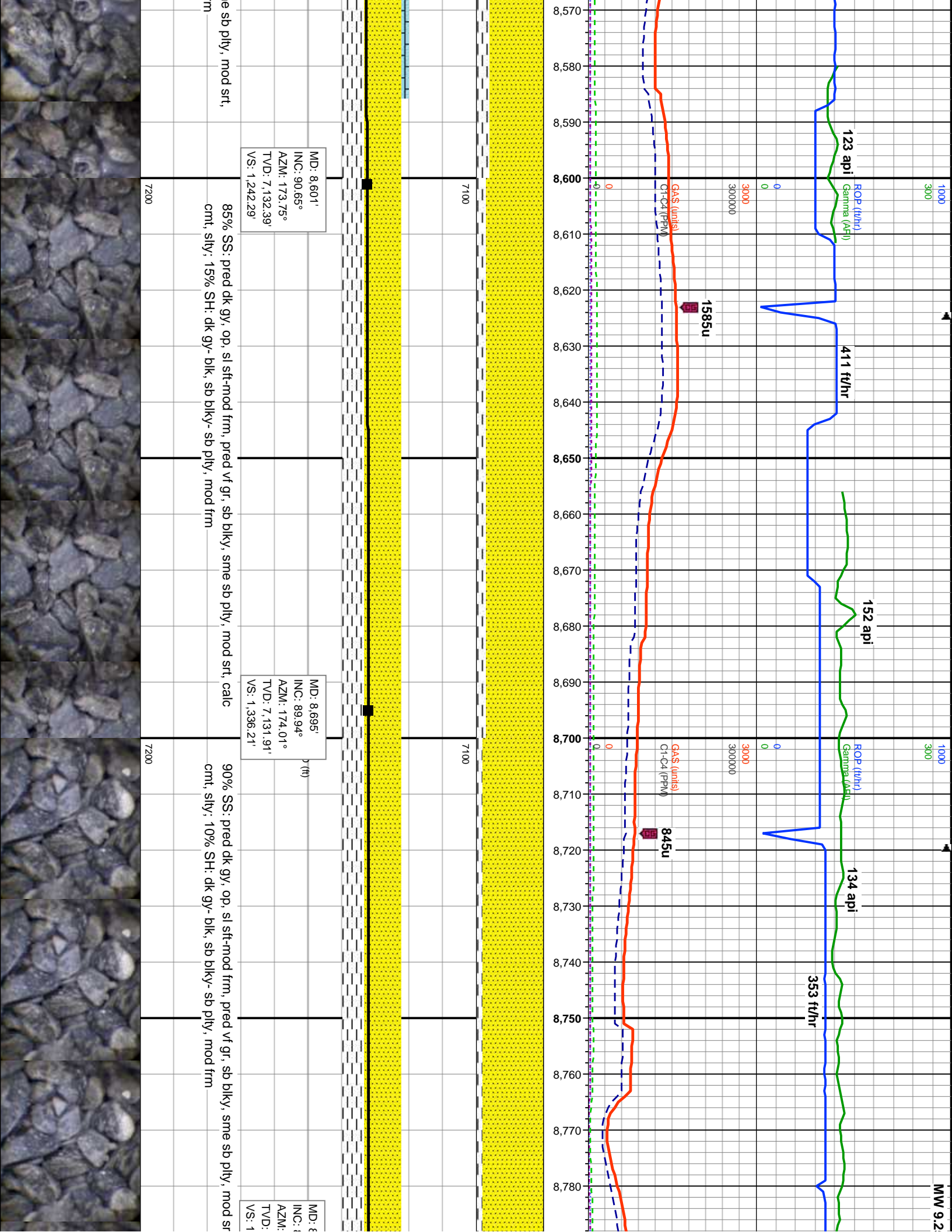


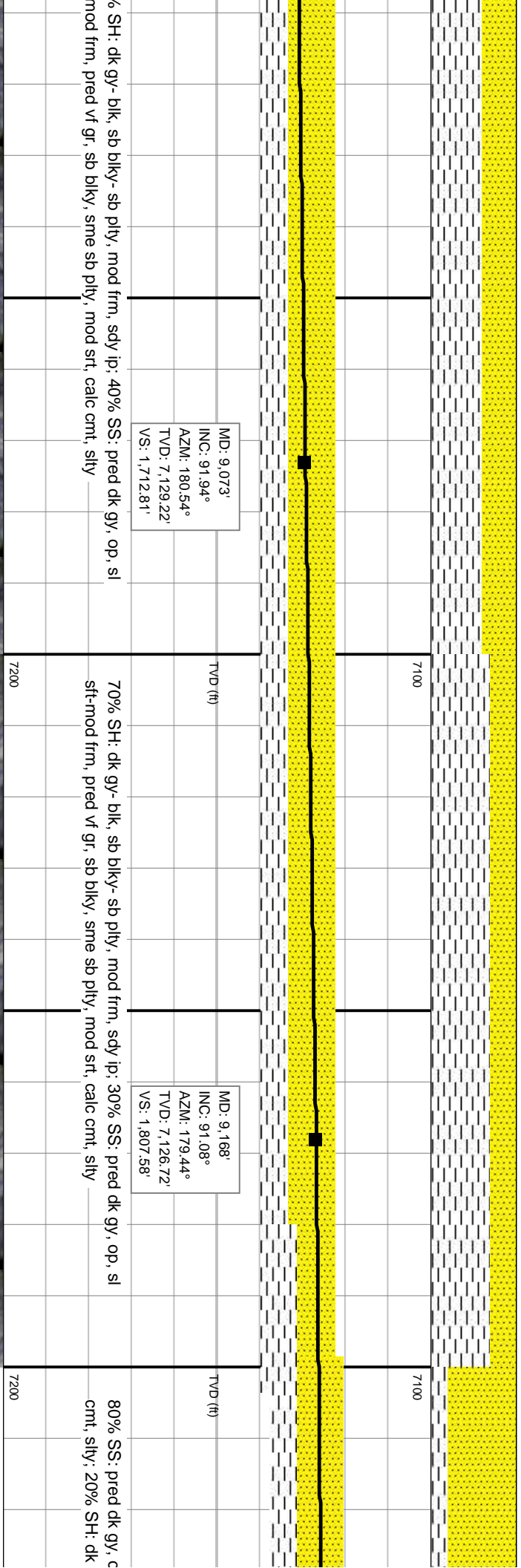
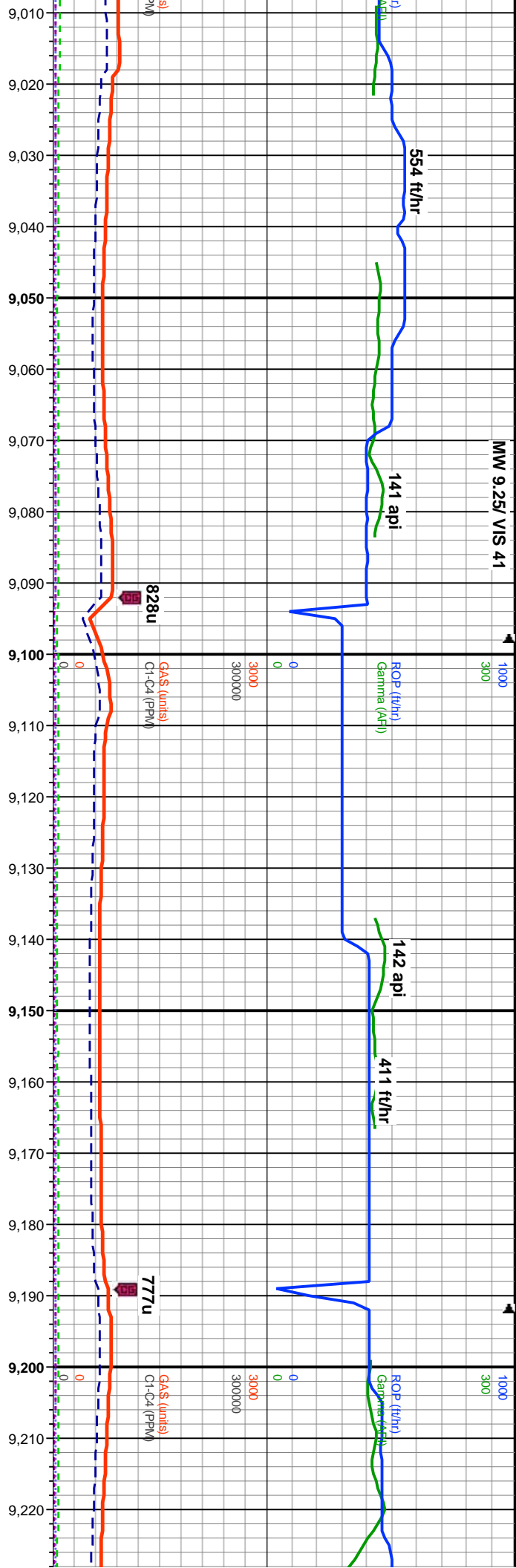


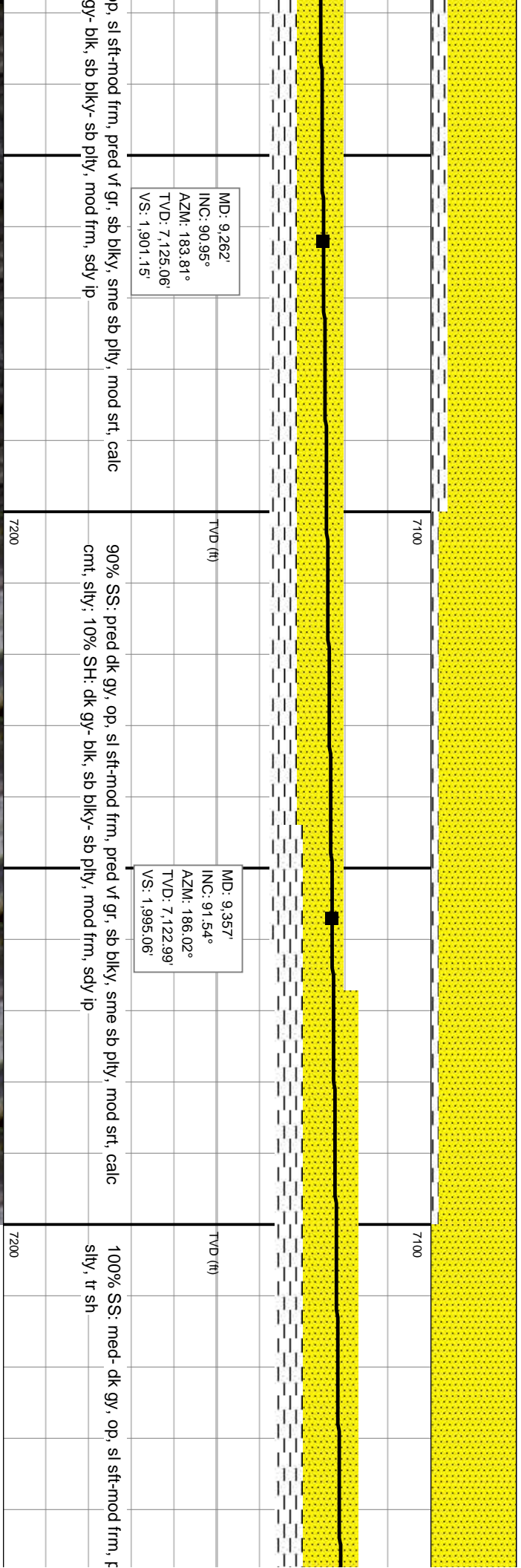
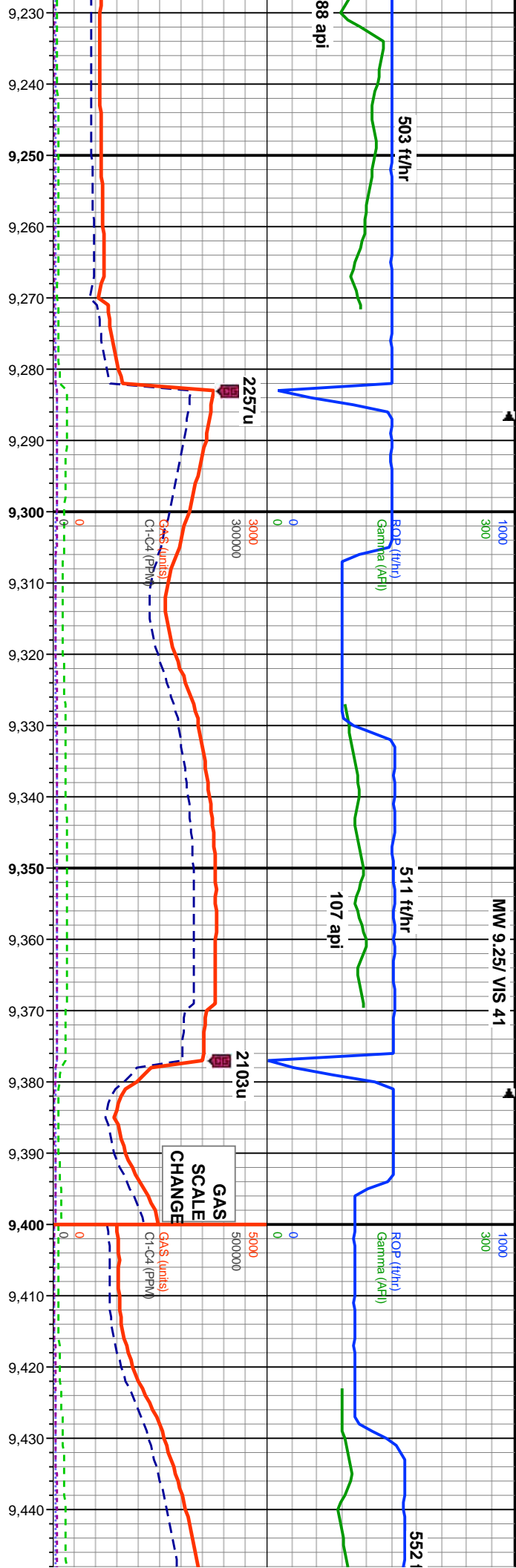


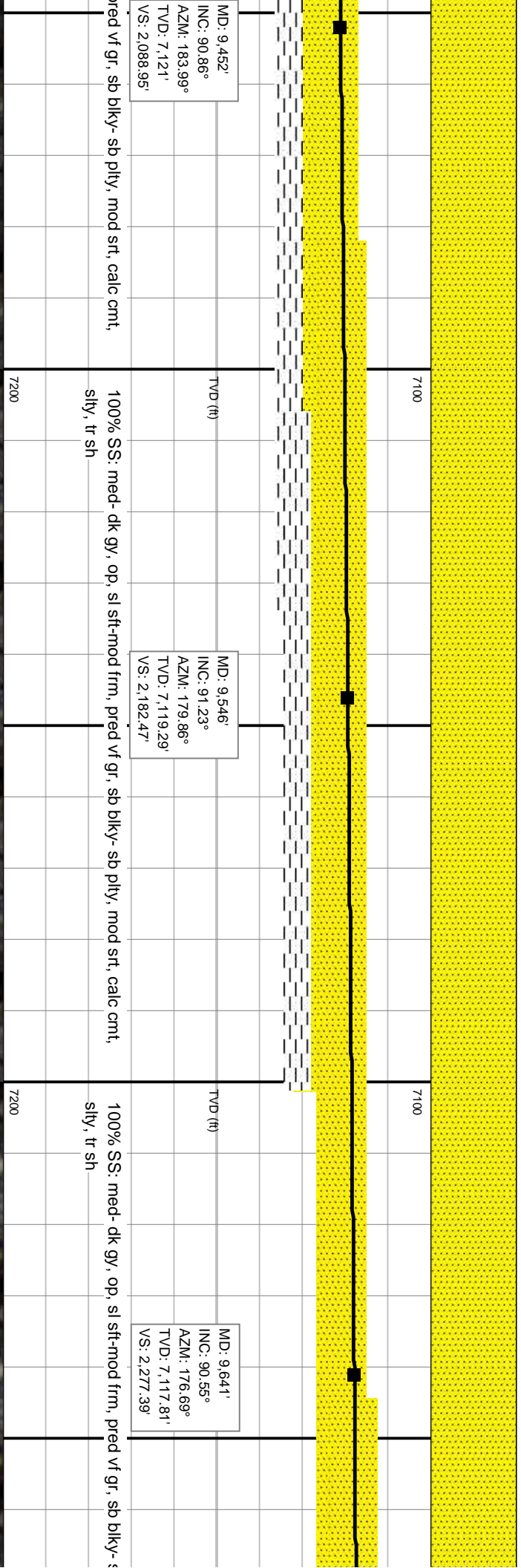
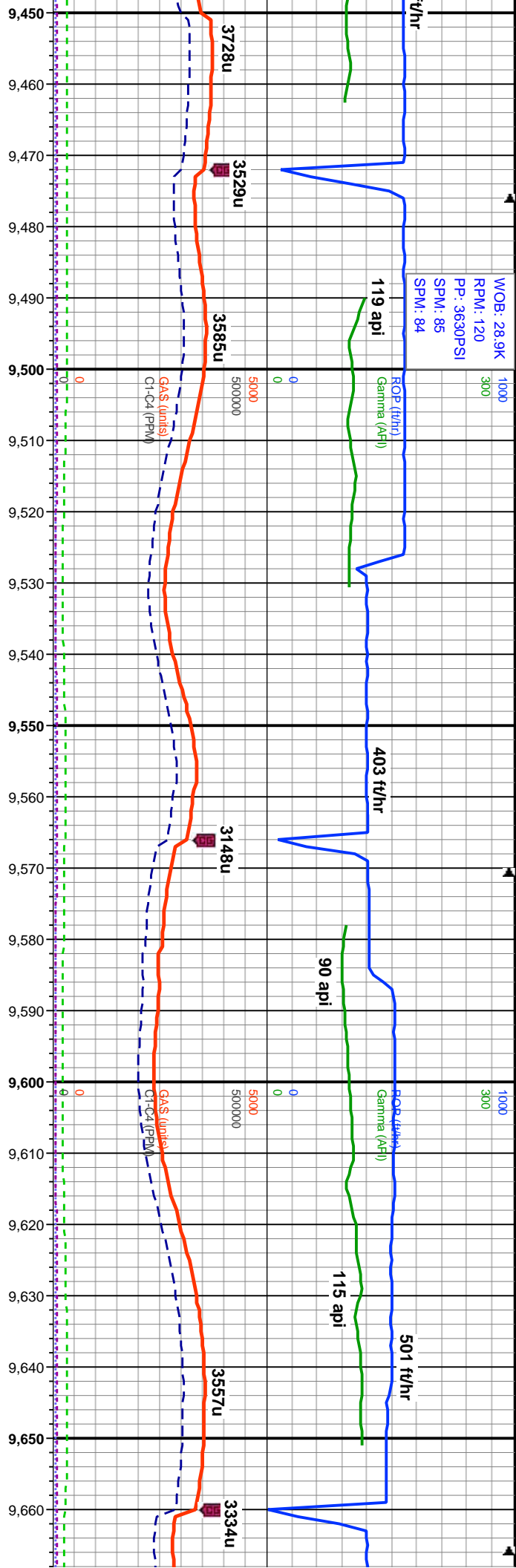


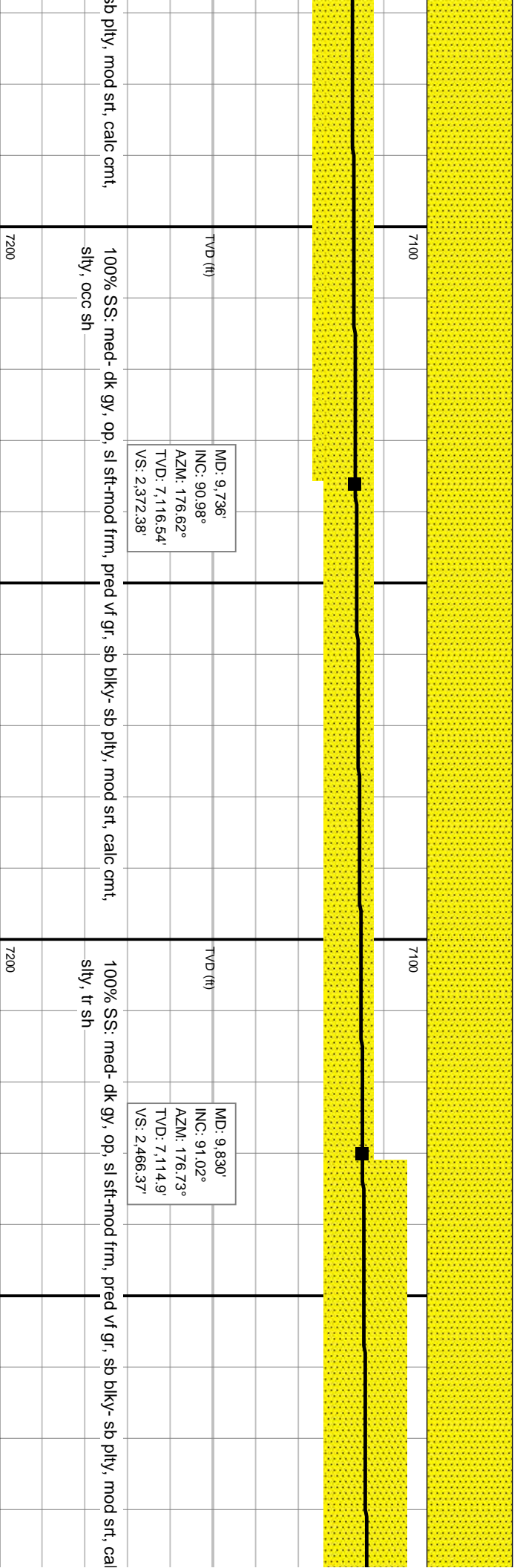
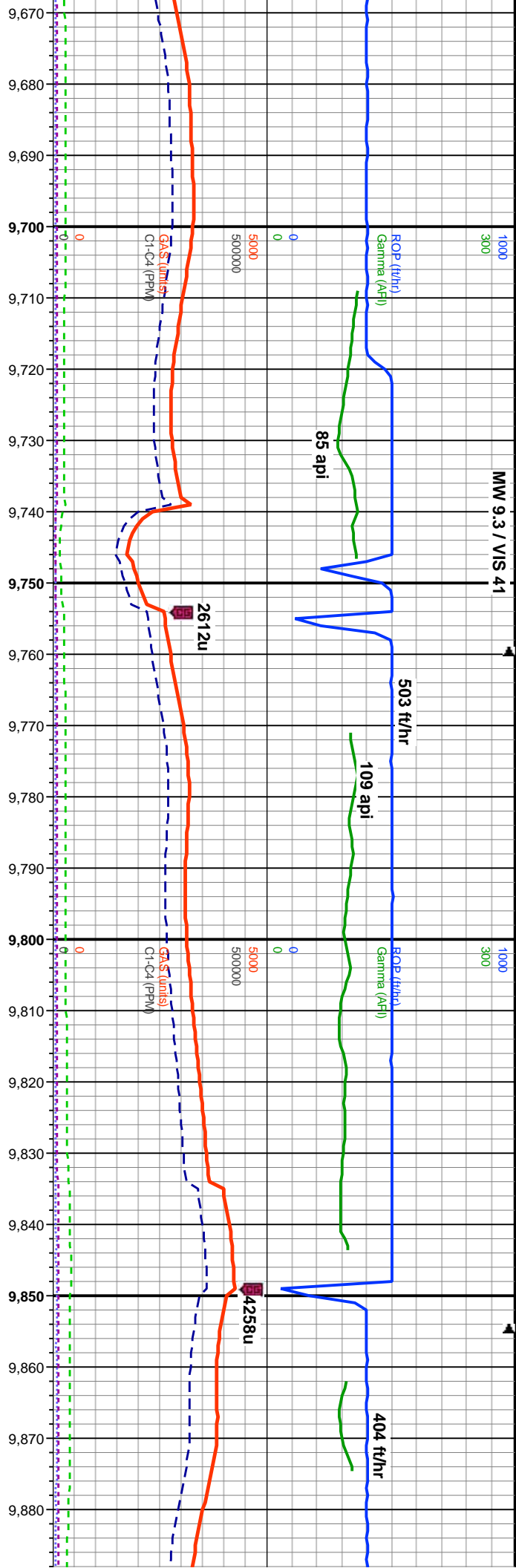


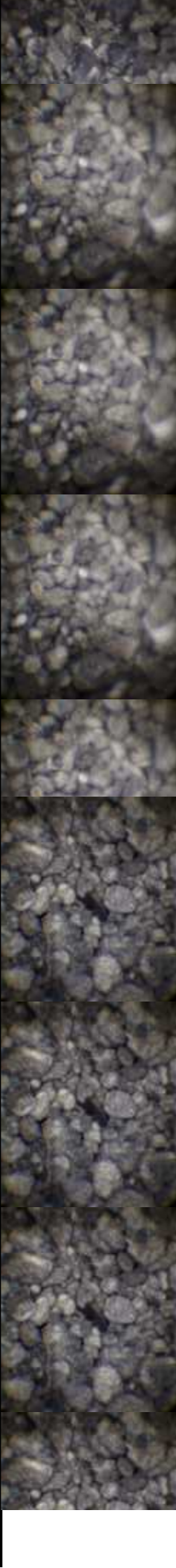
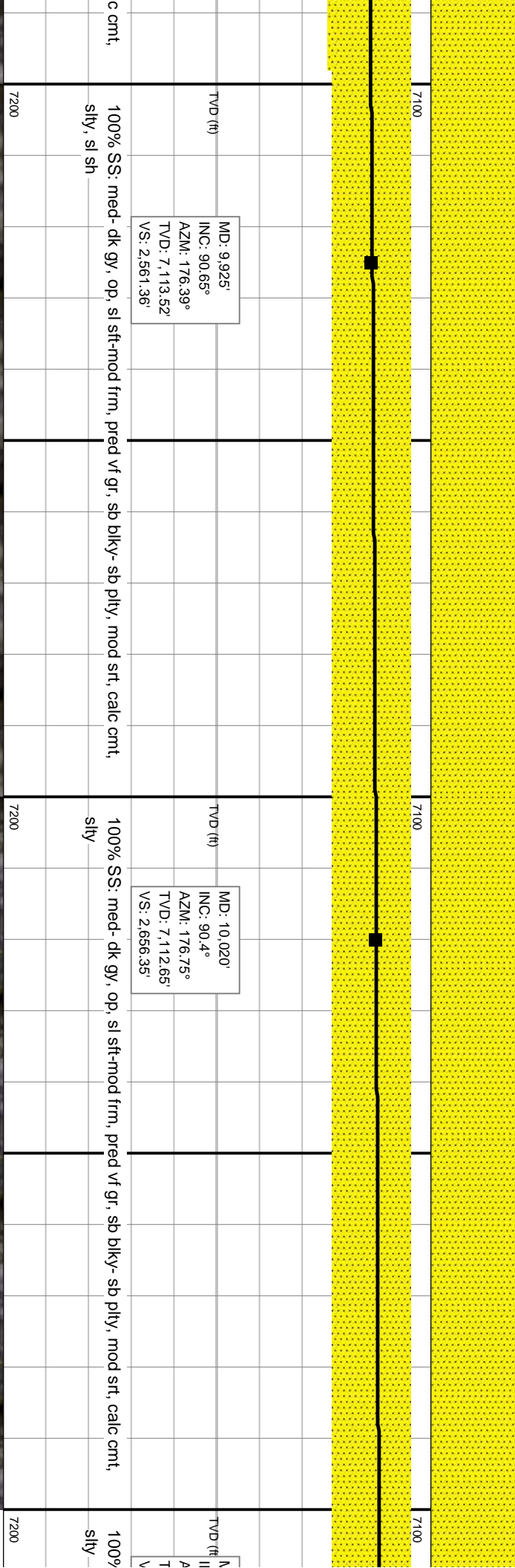
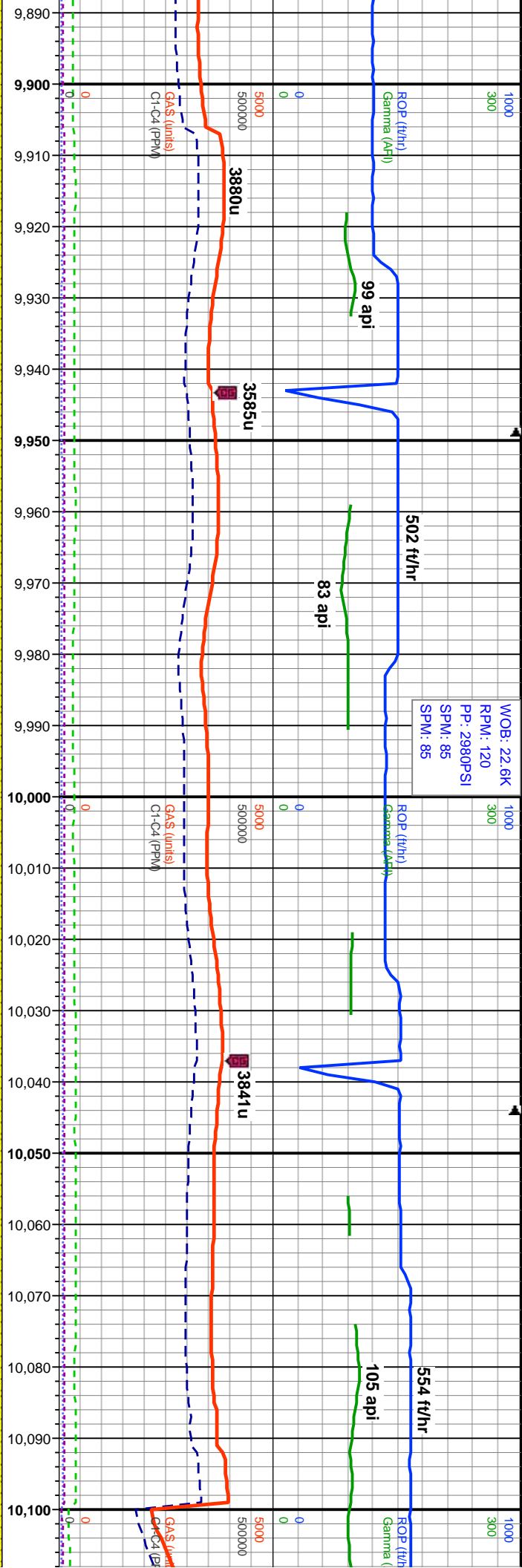


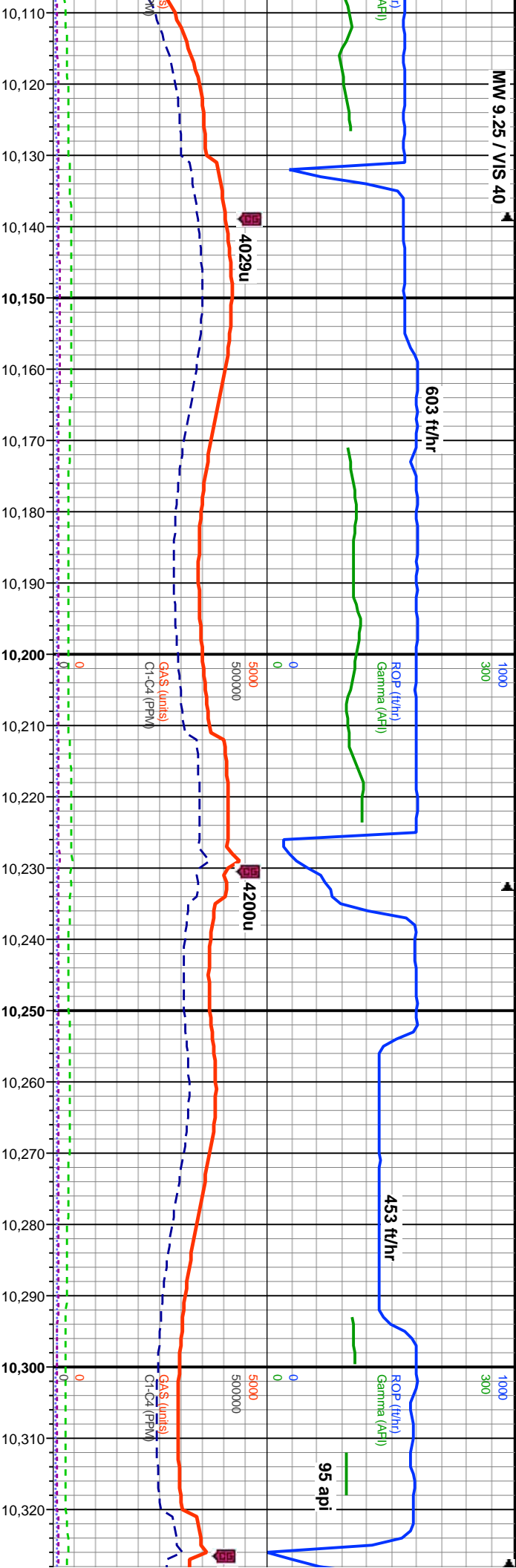












7100

7100

ID: 10.114'
INC: 90.4°
AZM: 178.67°
VD: 7.111.99'
S: 2.750.32'

MD: 10.209'
INC: 90°
AZM: 181.87°
TVD: 7.111.66'
VS: 2.845.08'

TVD (ft)
MD: 10.315.1'
INC: 90.62°
AZM: 185.99°
TVD: 7.111.08'
VS: 2.950.23'

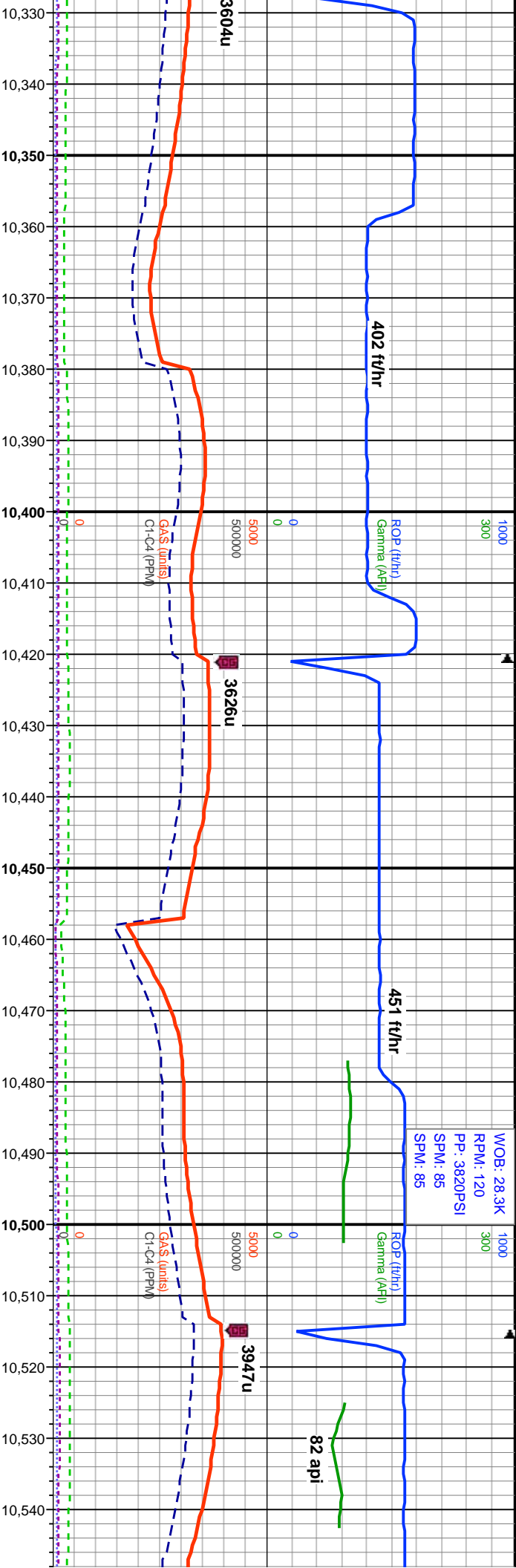
100% SS: med- dk gy, op, sl sft-mod frm, pred vf gr, sb blk- sb ply, mod srt, calc cmt, silty

100% SS: med- dk gy, c silty

7200

7200





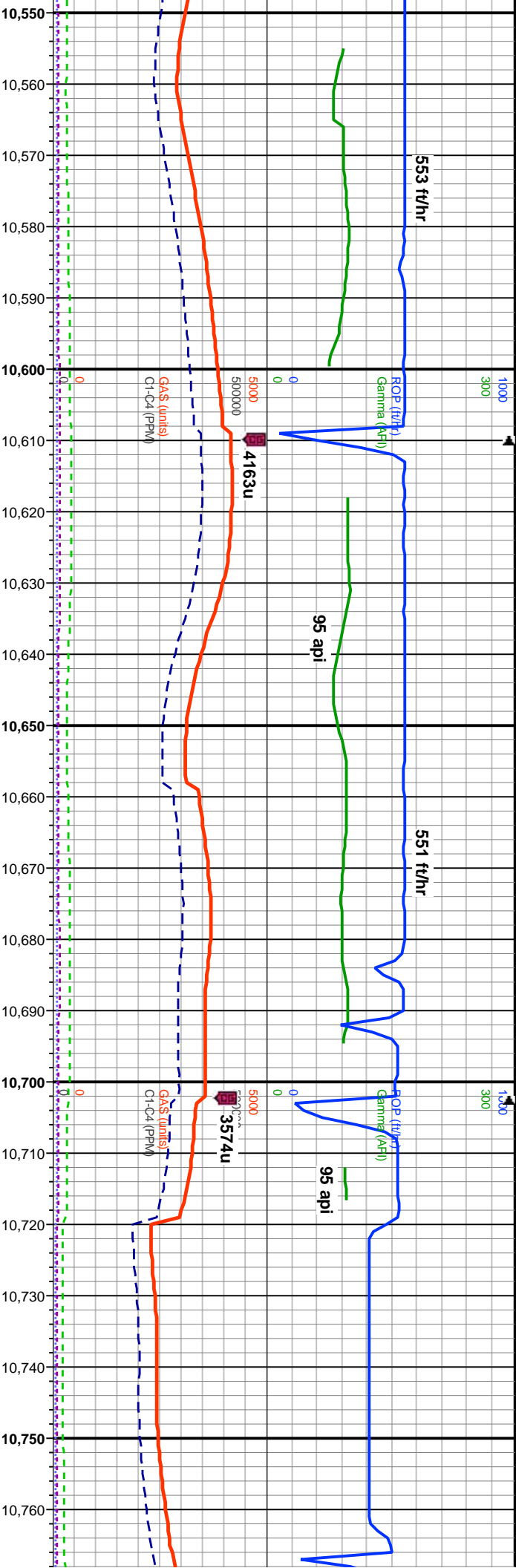
MD: 10.398'
INC: 90.68°
AZM: 184.67°
TVD: 7.110.14'
VS: 3.032.11'

MD: 10.493'
INC: 90.65°
AZM: 181.26°
TVD: 7.109.04'
VS: 3.126.45'

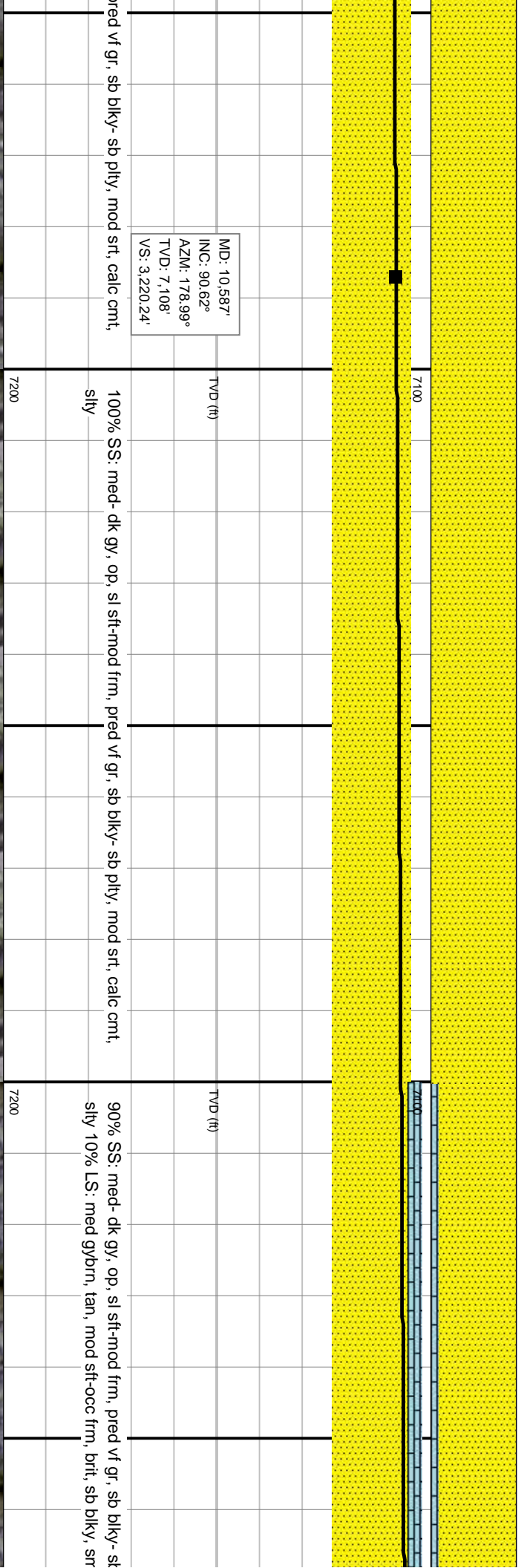
100% SS, med- dk gy, op, sl sft-mod frm, pred vf gr, sb blk- sb ply, mod srt, calc cmt, silty

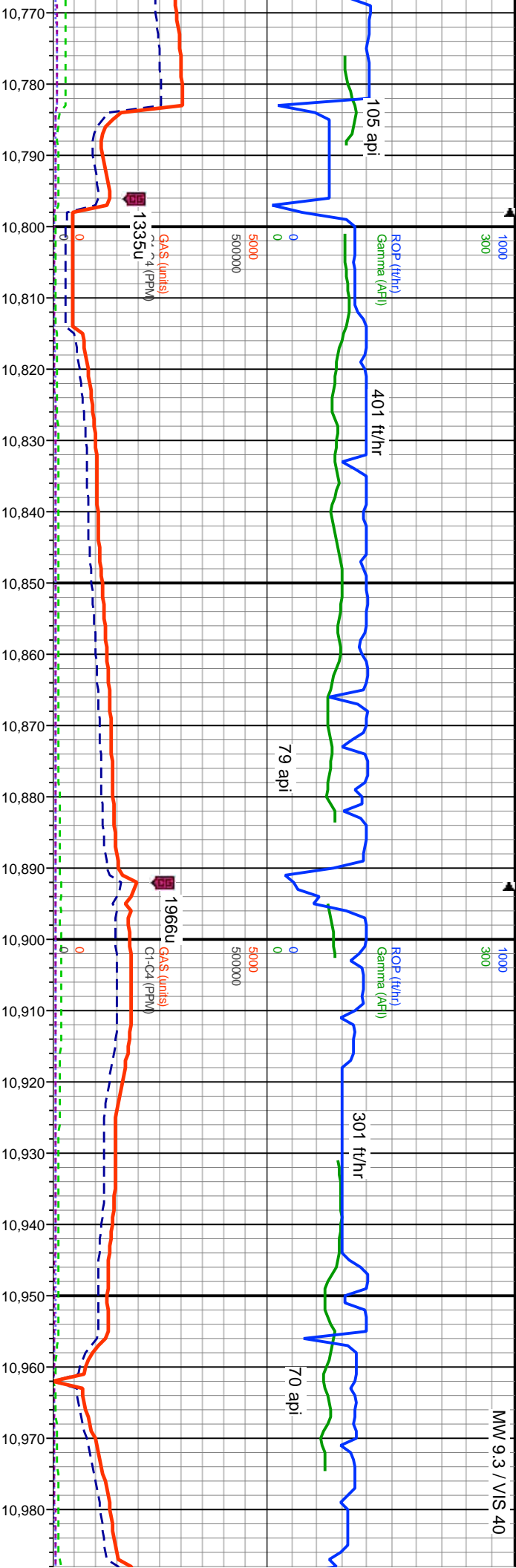
100% SS, med- dk gy, op, sl sft-mod frm, pred vf gr, sb blk- sb ply, mod srt, calc cmt, silty





MD: 10,587'
INC: 90.62°
AZM: 178.99°
TVD: 7,108'
VS: 3,220.24'





TVD SCALE CHANGE

MD: 10.777'
INC: 90.55°
AZM: 173.83°
TVD: 7.106.06'
VS: 3.410.16'

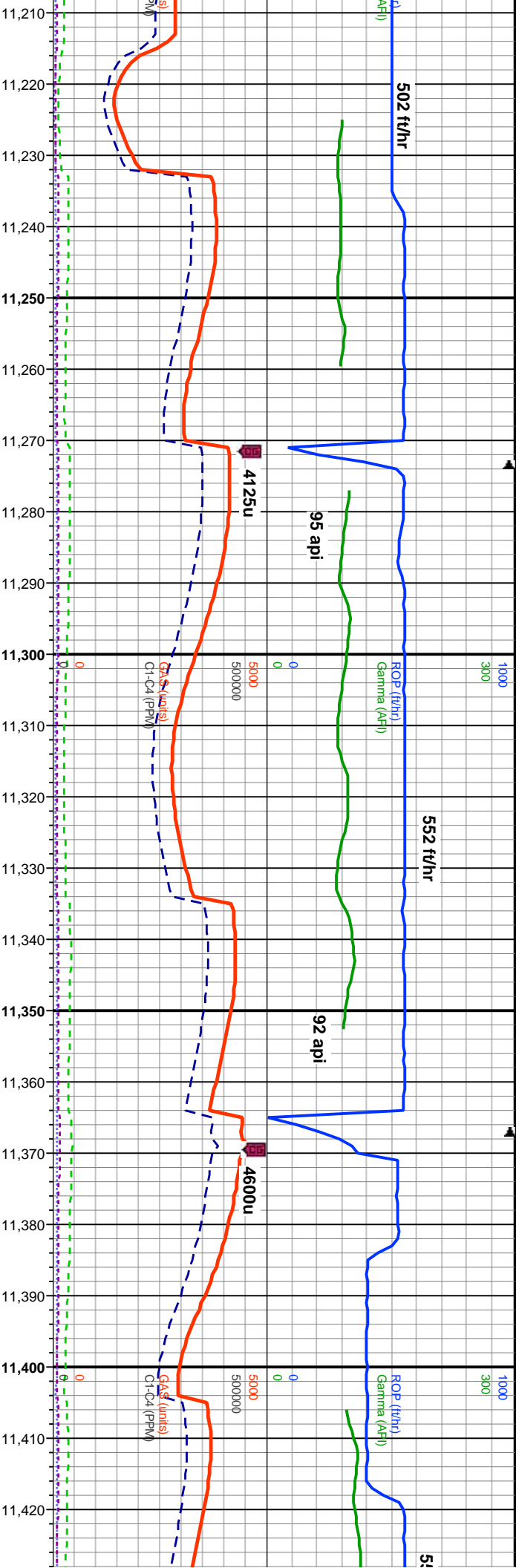
MD: 10.871'
INC: 90°
AZM: 172.81°
TVD: 7.105.61'
VS: 3.504.03'

MD: 10.966'
INC: 90.18°
AZM: 173.93°
TVD: 7.105.46'
VS: 3.598.9'

70% SS: med-dk gy, op, si sft-mod frm, pred vt gr, sb blkyl-sb ply, mod srt, calc cmt, silty 30% LS: med gybrn, tan, mod sft-occ frm, brit, sb blkyl, sm tex, micxln, v calc

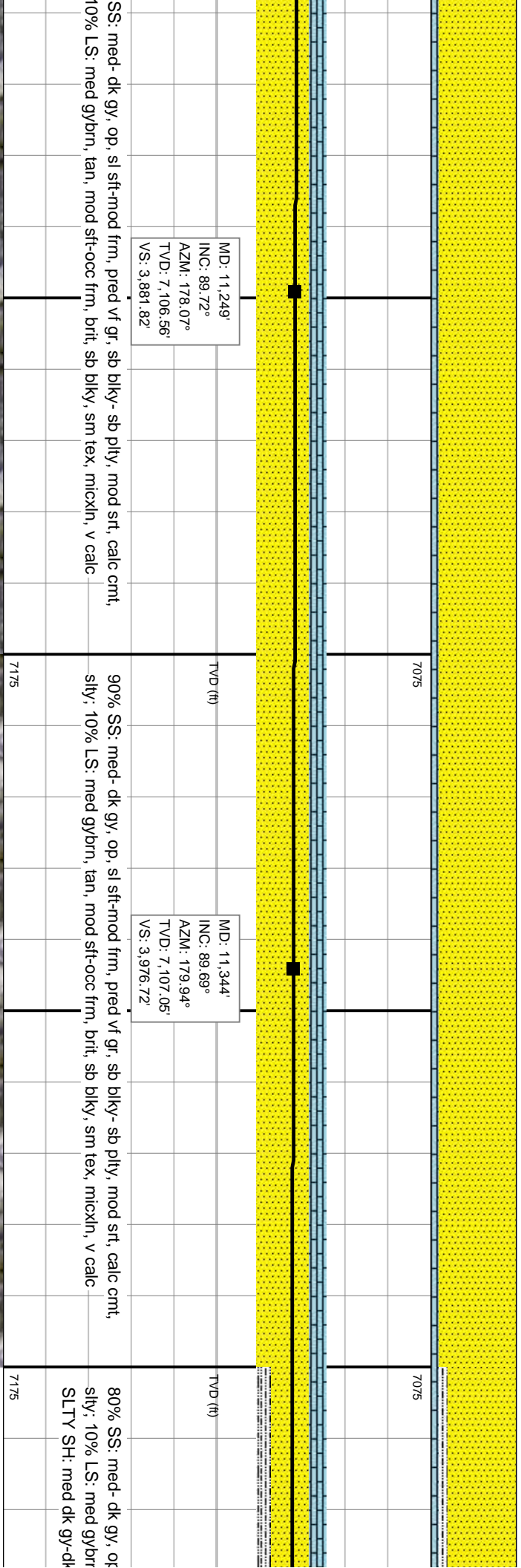
70% SS: med-dk gy, op, si sft-mod frm, pred vt gr, sb blkyl-sb ply, mod srt, calc cmt, silty 30% LS: med gybrn, tan, mod sft-occ frm, brit, sb blkyl, sm tex, micxln, v calc

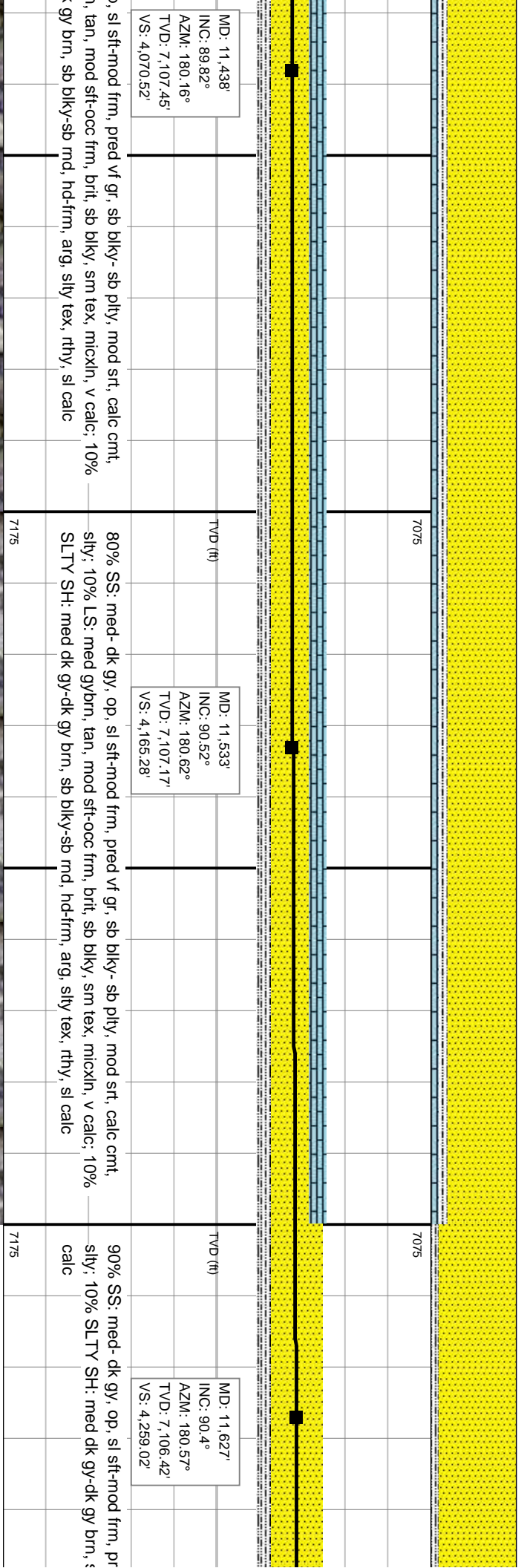
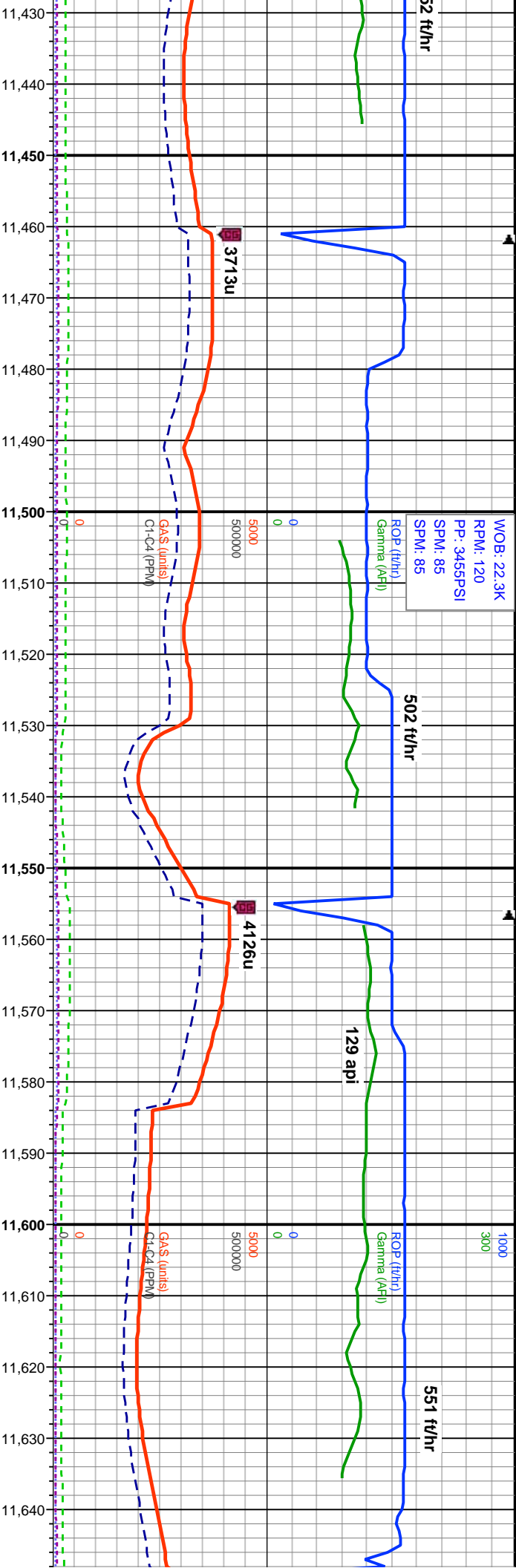
70% SS: med-dk gy, op, si sft-mod frm, pred vt gr, sb blkyl-sb ply, mod srt, calc cmt, silty 30% LS: med gybrn, tan, mod sft-occ frm, brit, sb blkyl, sm tex, micxln, v calc

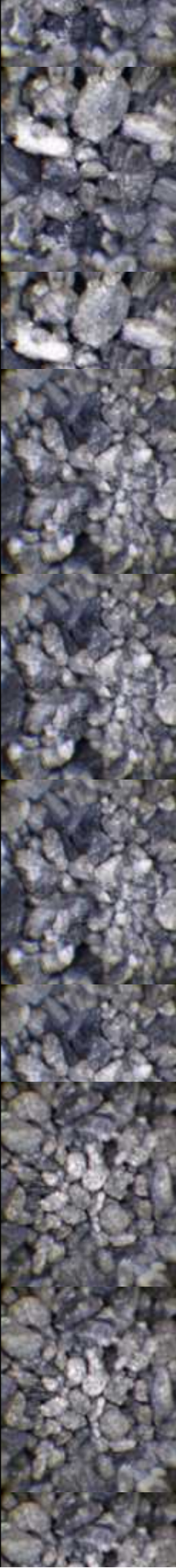
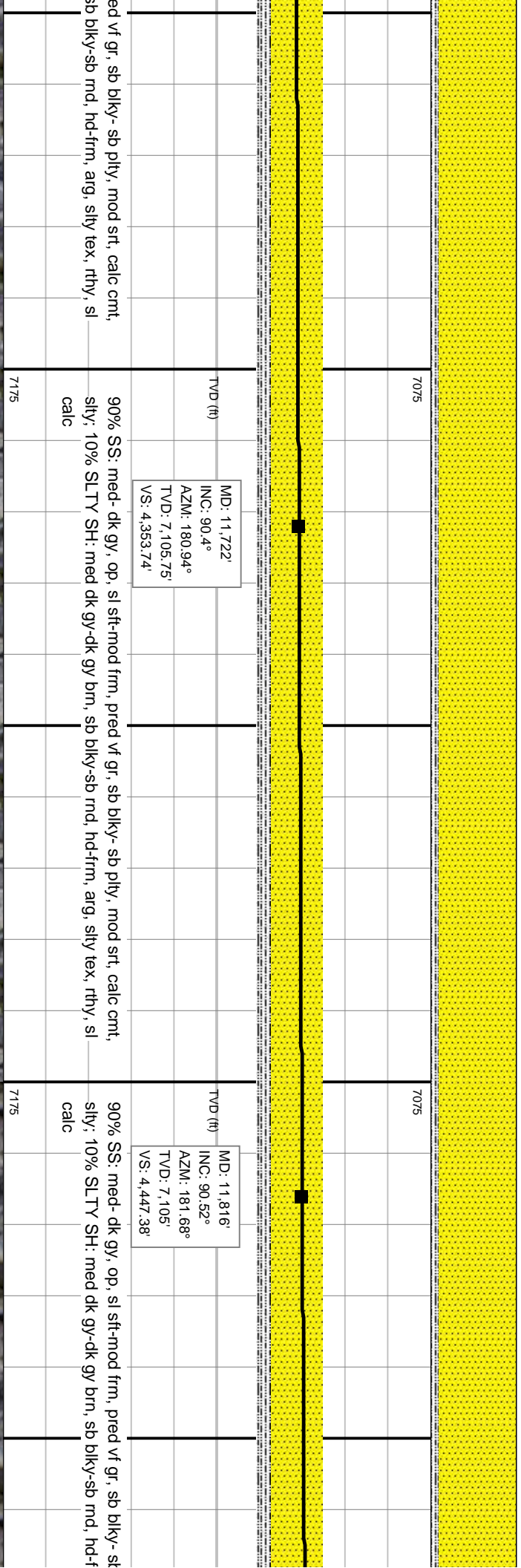
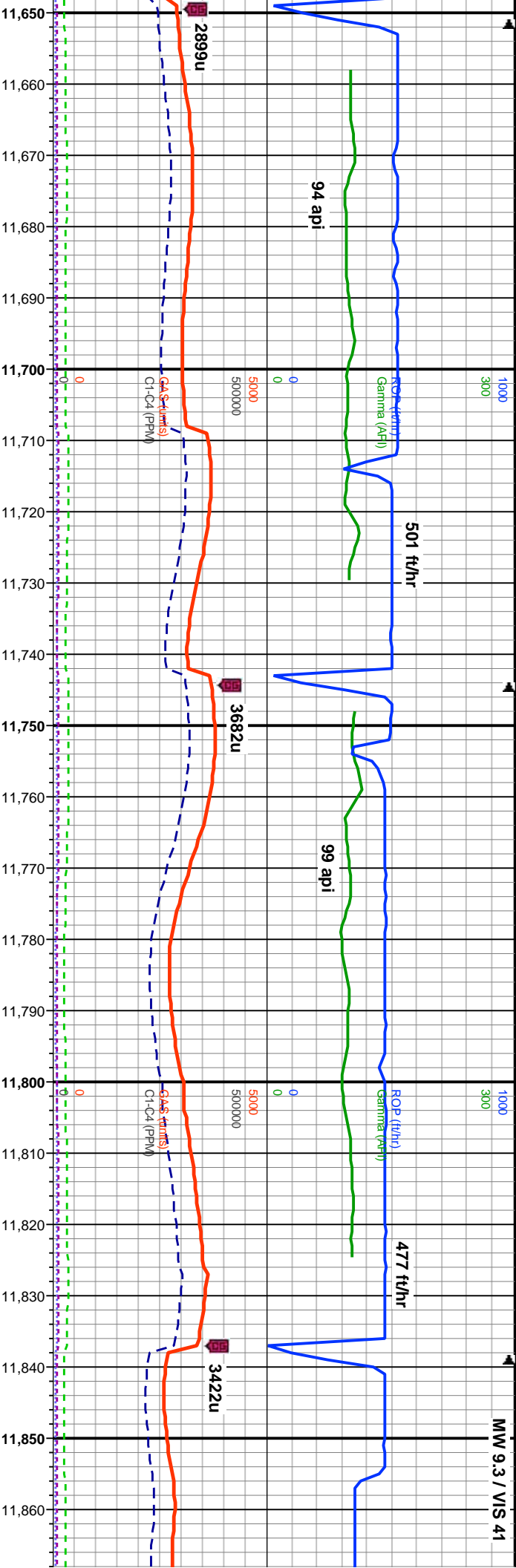


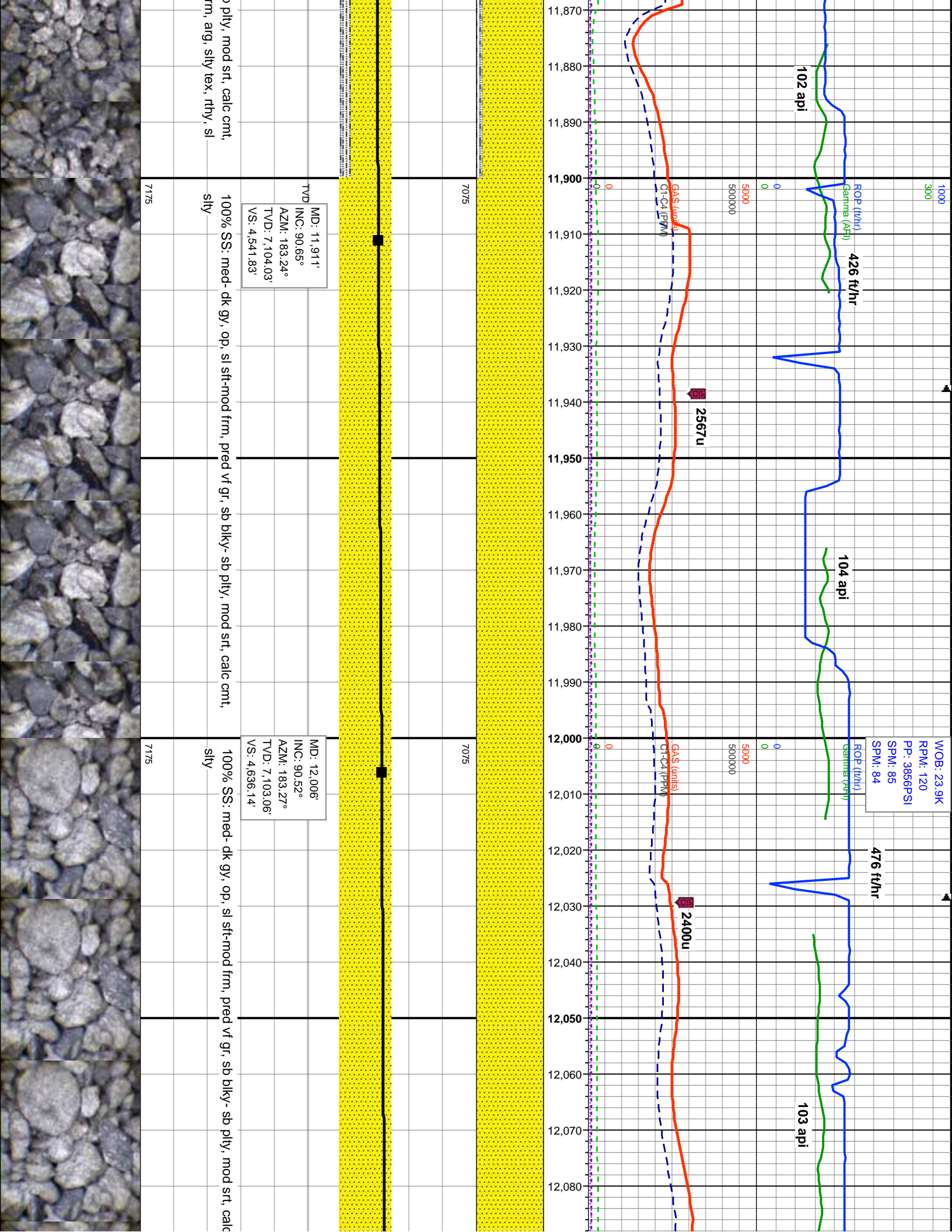
MD: 11,249'
INC: 89.72°
AZM: 178.07°
TVD: 7,106.56'
VS: 3,881.82'

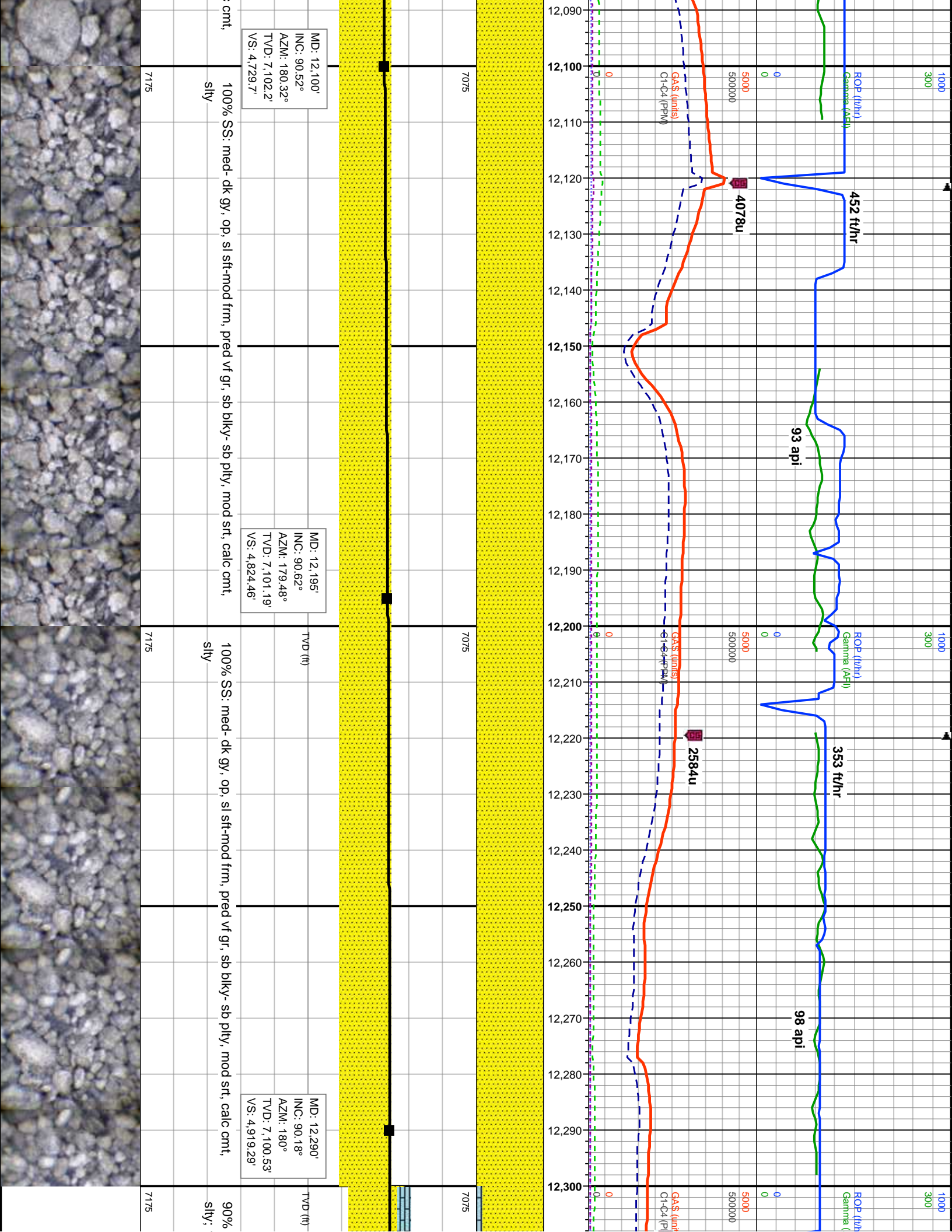
MD: 11,344'
INC: 89.69°
AZM: 179.94°
TVD: 7,107.05'
VS: 3,976.72'

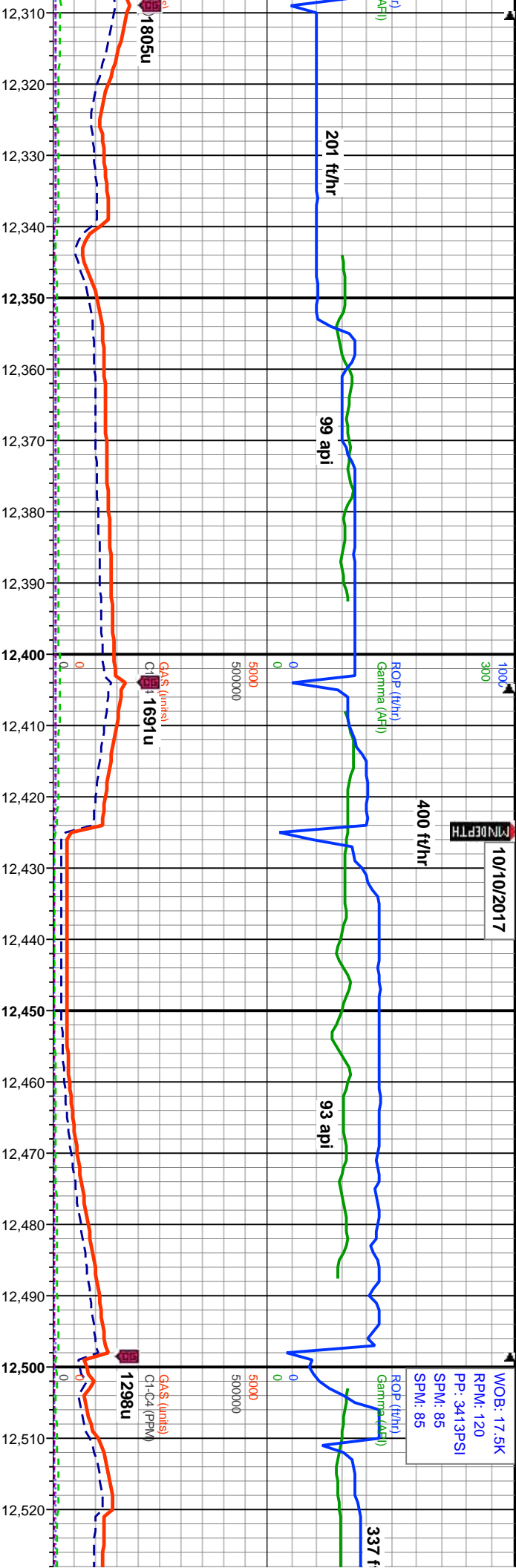












MD: 12,384'
INC: 89.75°
AZM: 179.52°
TVD: 7,100.59'
VS: 5,013.12'

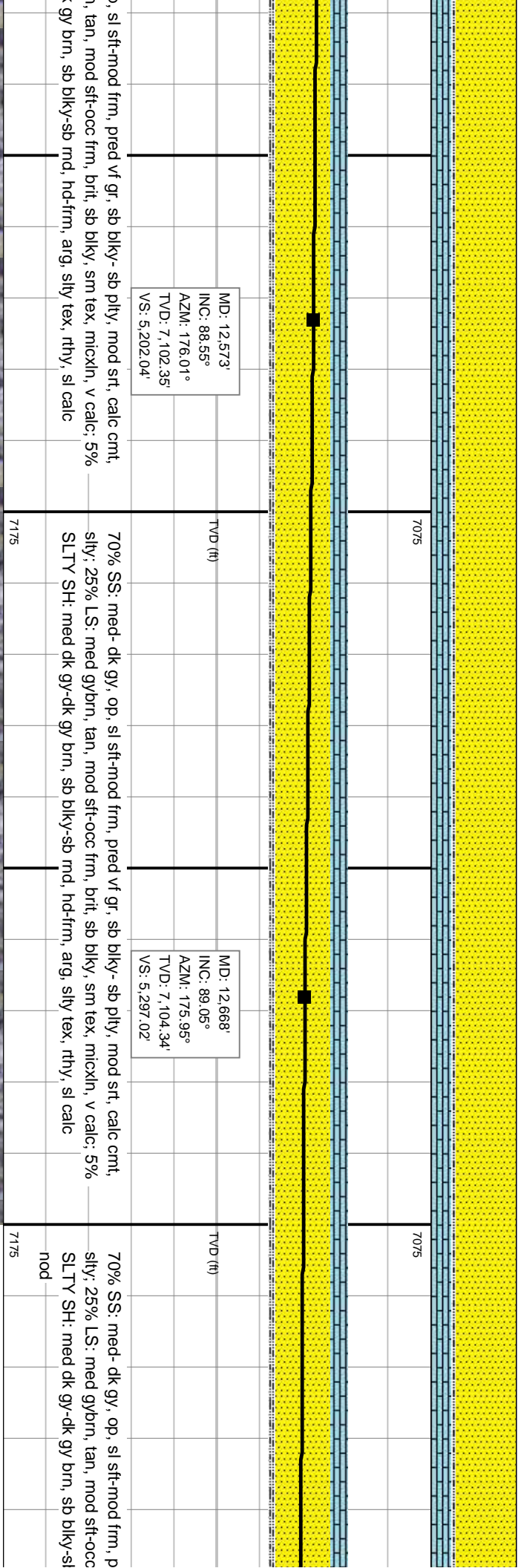
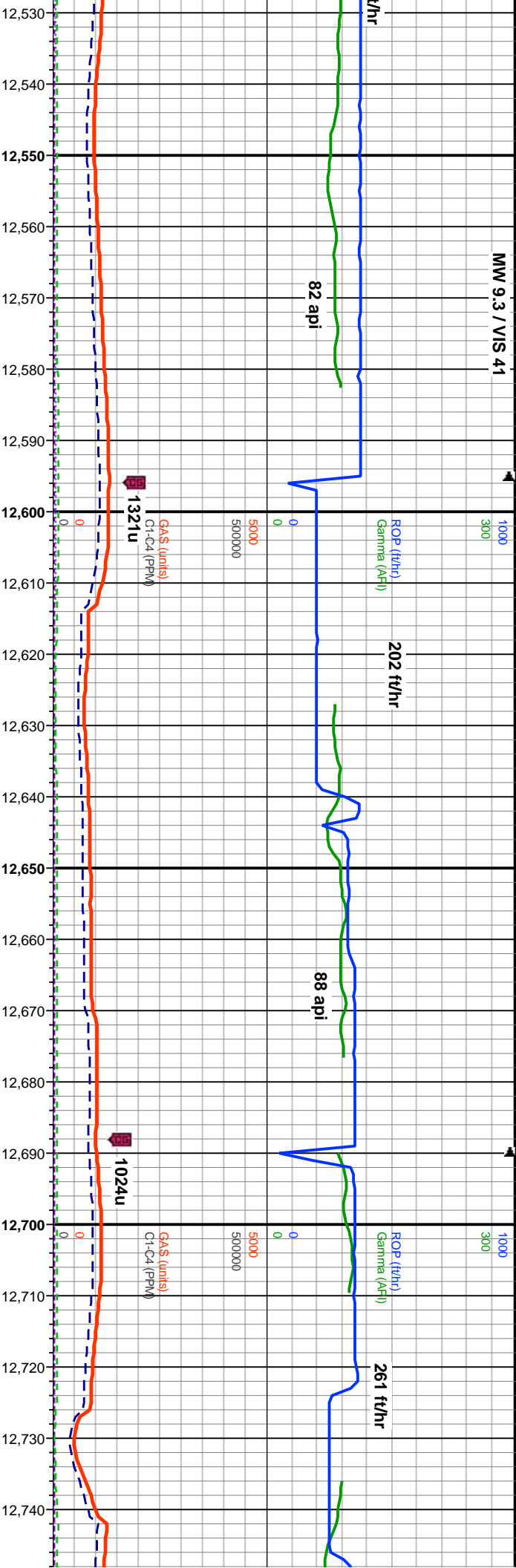
MD: 12,479'
INC: 89.78°
AZM: 177.16°
TVD: 7,100.98'
VS: 5,108.06'

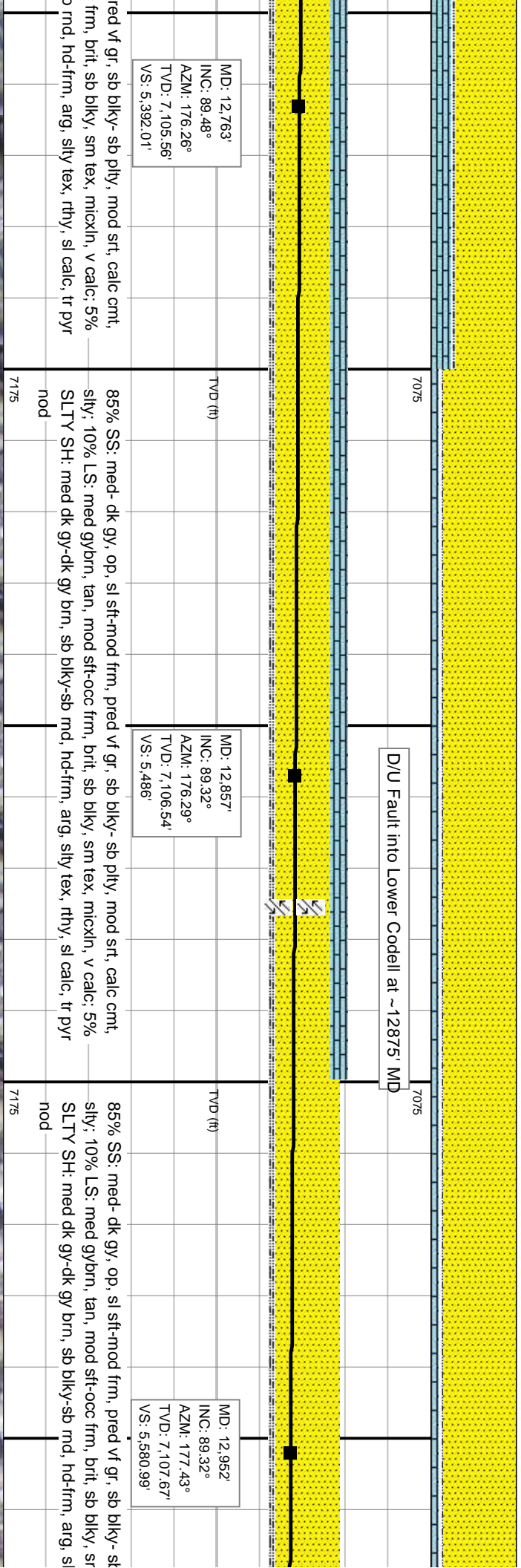
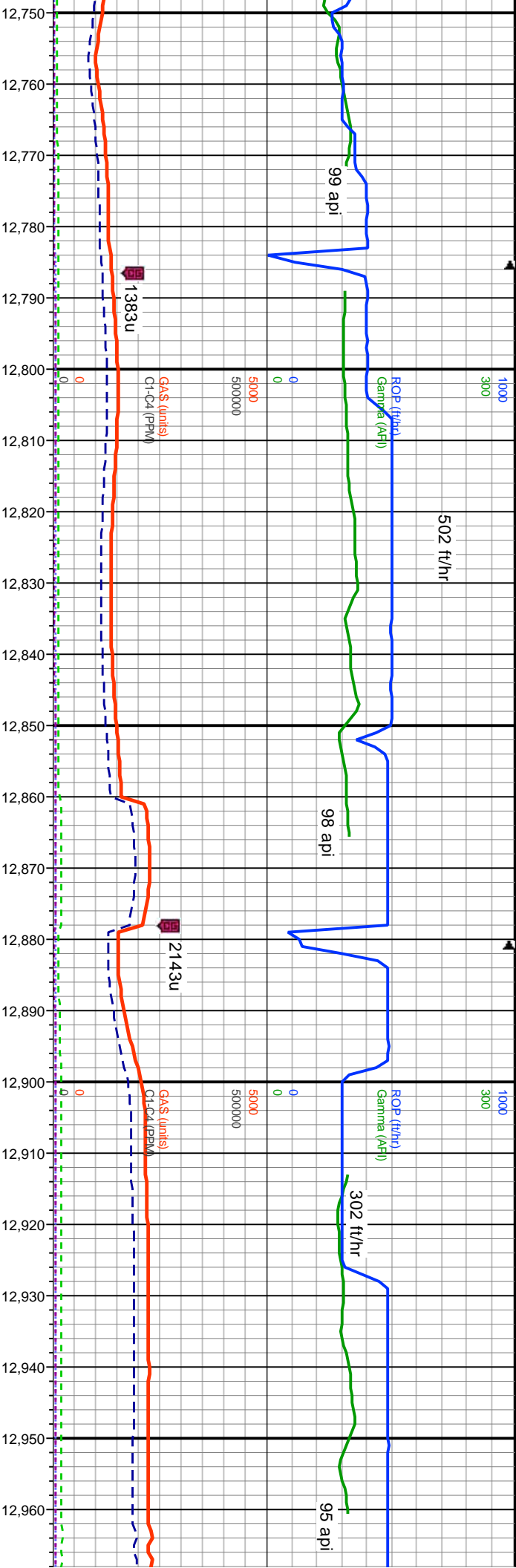
SS: med- dk gy, op, si sft-mod frm, pred vt gr, sb blk- sb ply, mod srt, calc cnt,
10% LS: med gybrn, tan, mod sft-occ frm, brt, sb blk, sm tex, micxn, v calc.

90% SS: med- dk gy, op, si sft-mod frm, pred vt gr, sb blk- sb ply, mod srt, calc cnt,
sily, 10% LS: med gybrn, tan, mod sft-occ frm, brt, sb blk, sm tex, micxn, v calc

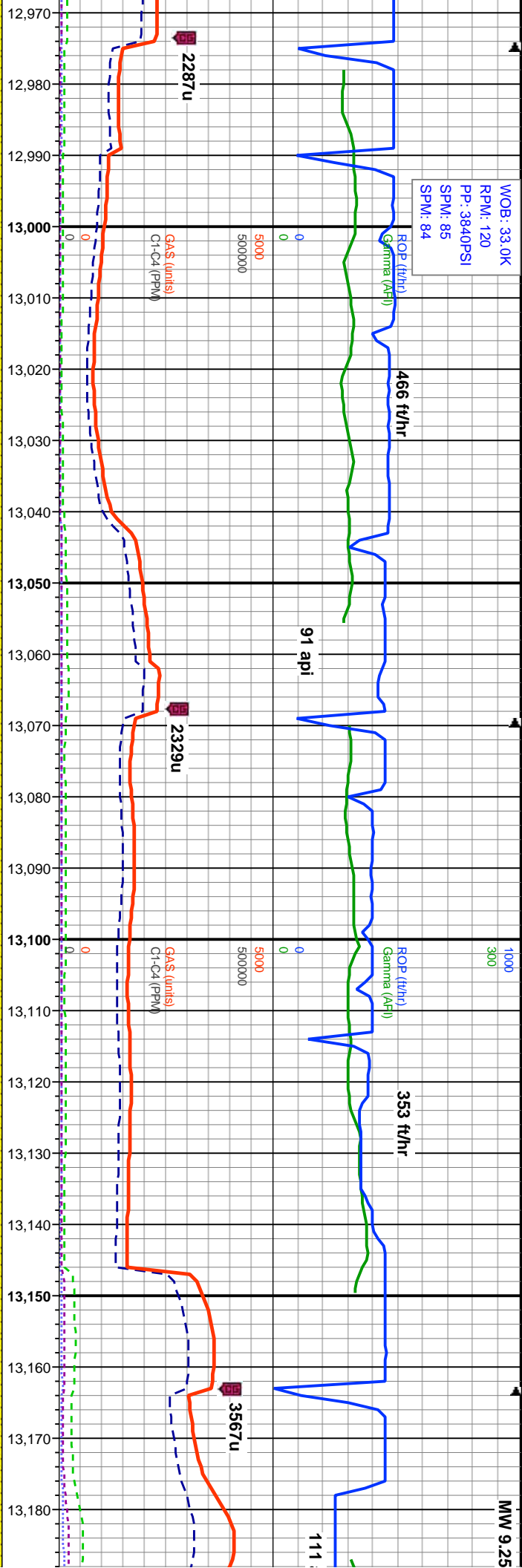
70% SS: med- dk gy, op
sily, 25% LS: med gybrn
SLTY SH: med dk gy-dl







WOB: 33.0K
RPM: 120
PP: 3840PSI
SPM: 85
SPM: 84



7075

7075

TVD (ft)

TVD (ft)

MD: 13,046'
INC: 89.48°
AZM: 179.35°
TVD: 7,108.65'
VS: 5.674.92'

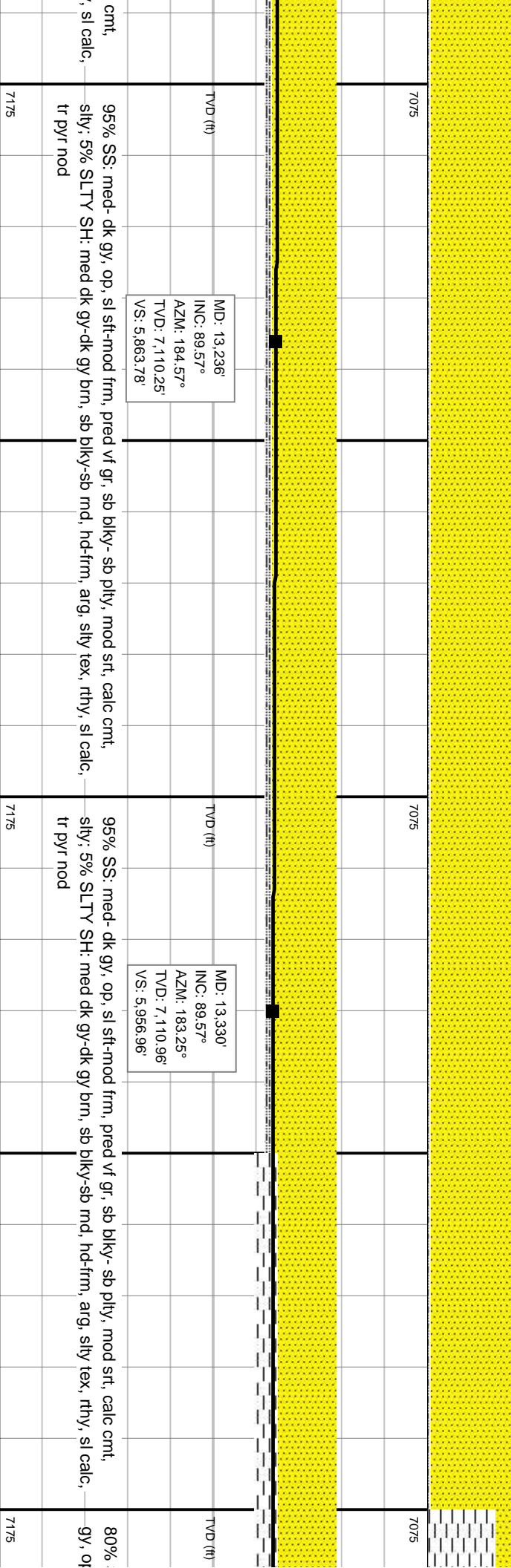
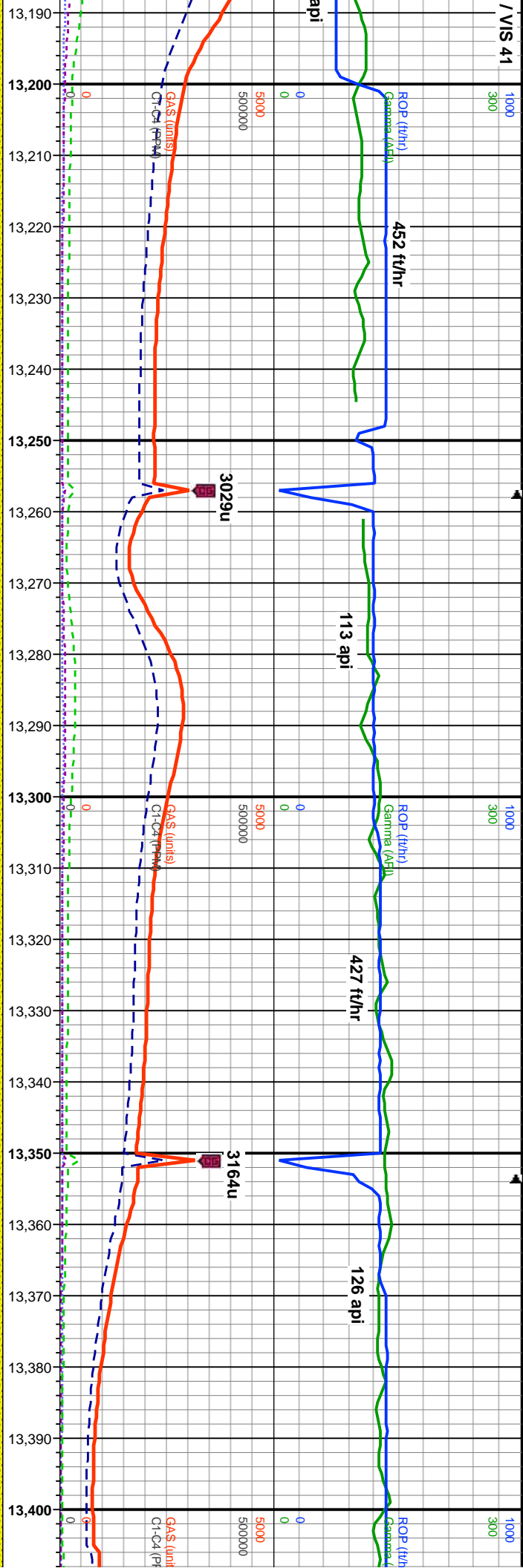
MD: 13,141'
INC: 89.51°
AZM: 182.92°
TVD: 7,109.49'
VS: 5.769.57'

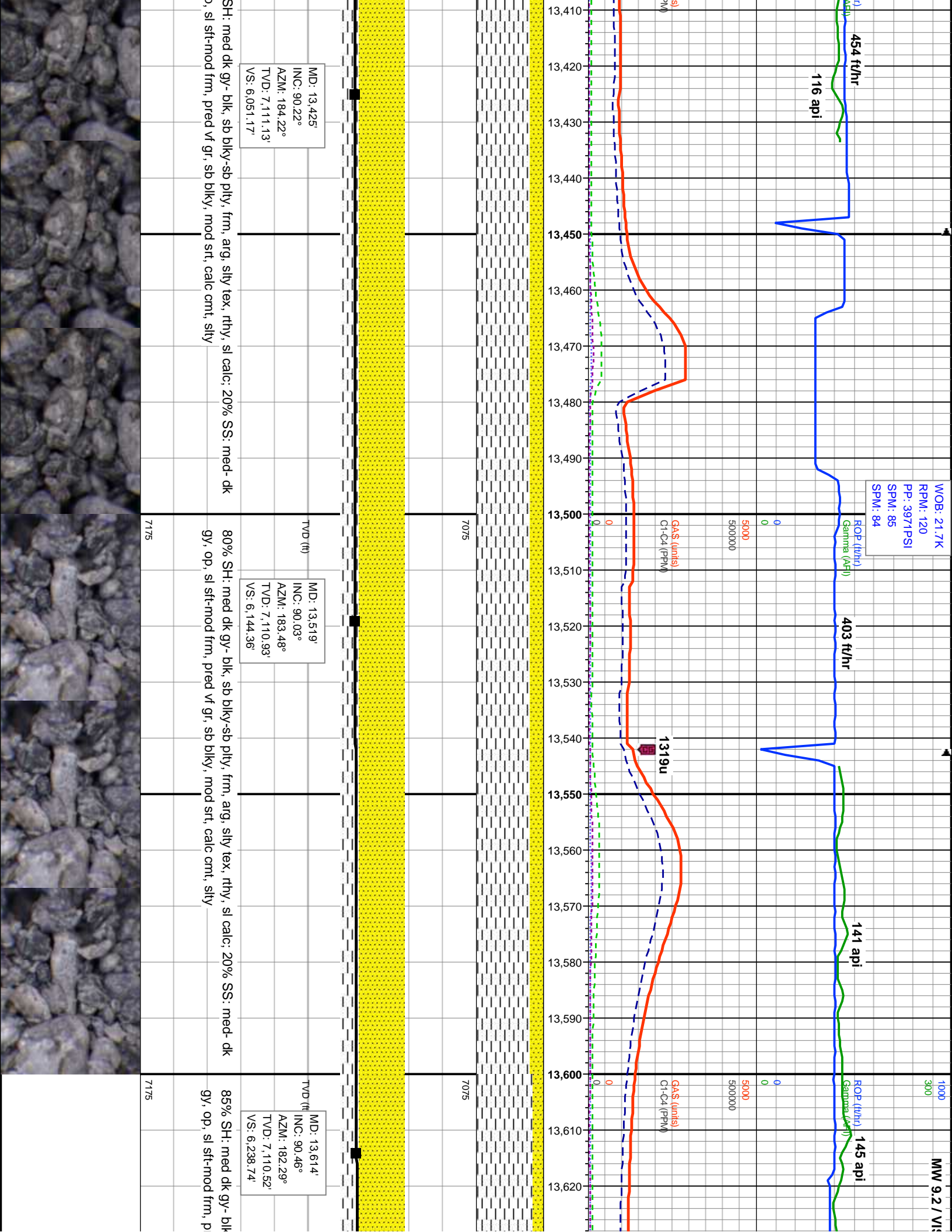
90% SS: med- dk gy, op, si sft-mod frm, pred vt gr, sb blk- sb ply, mod srt, calc cmt, n tex, micxn, v calc: 5%
95% SS: med- dk gy, op, si sft-mod frm, pred vt gr, sb blk- sb ply, mod srt, calc cmt, n tex, micxn, v calc: 5%
SLTY SH: med dk gy-dk gy brn, sb blk- sb md, hd-frm, arg, silty tex, rthy, sl calc, tr pyr nod

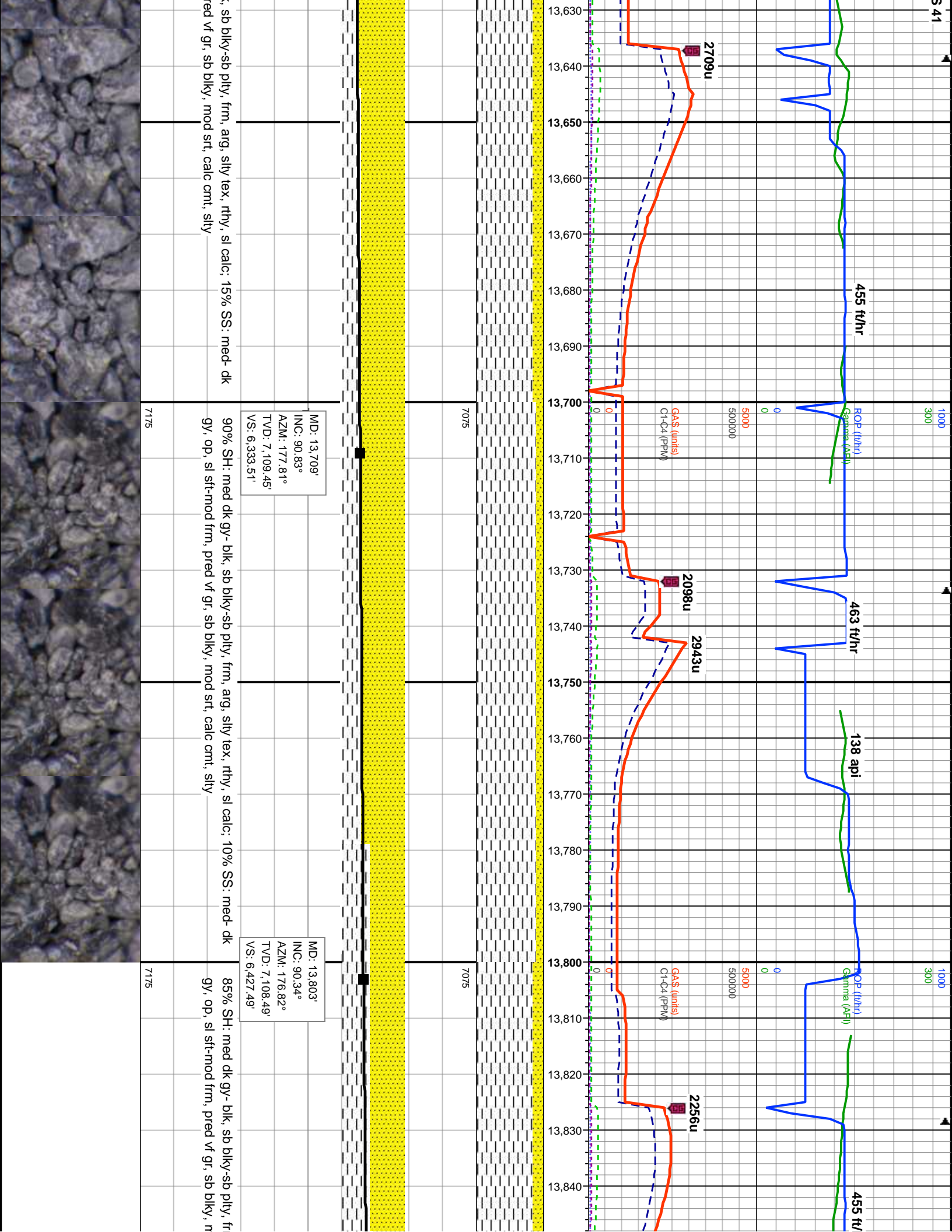
7175

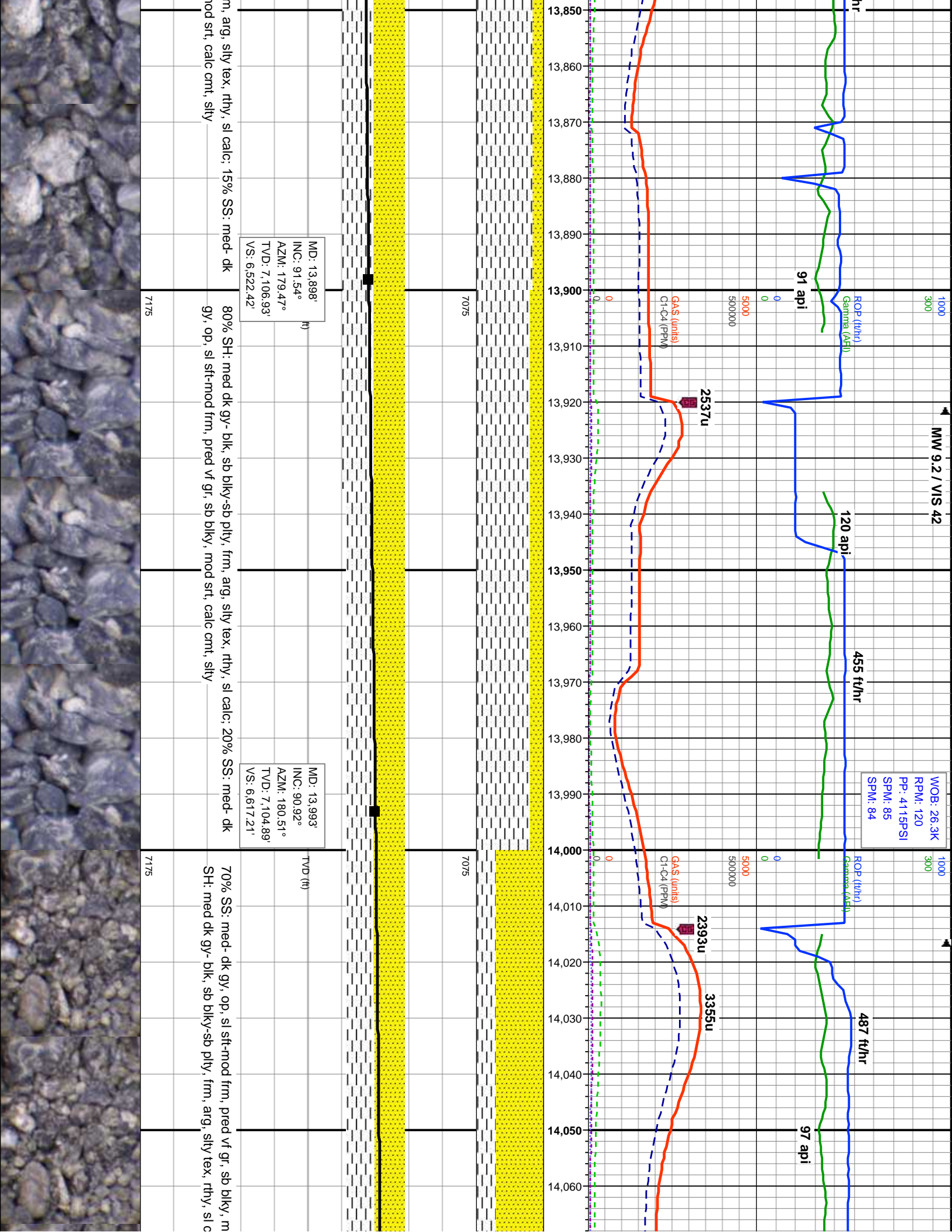
7175

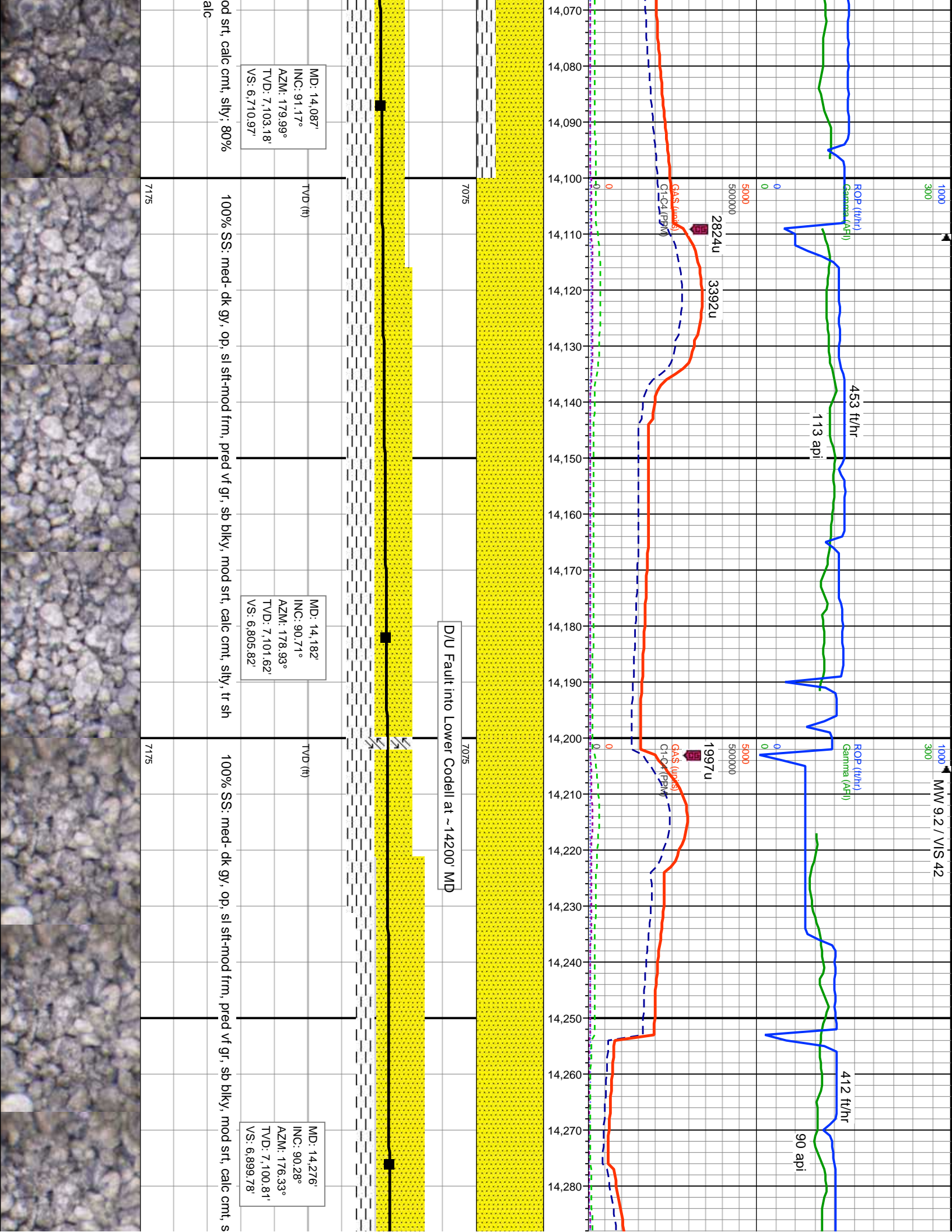




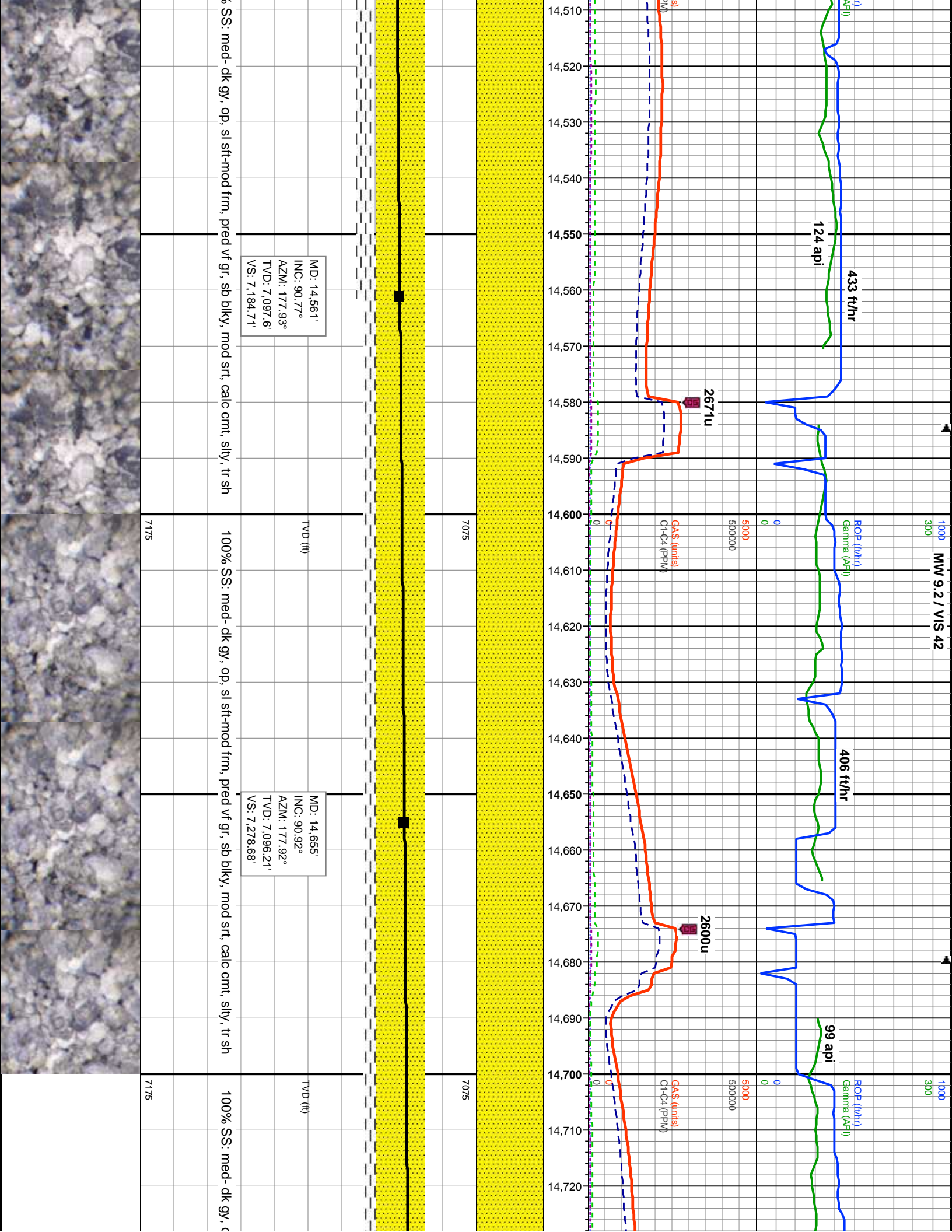


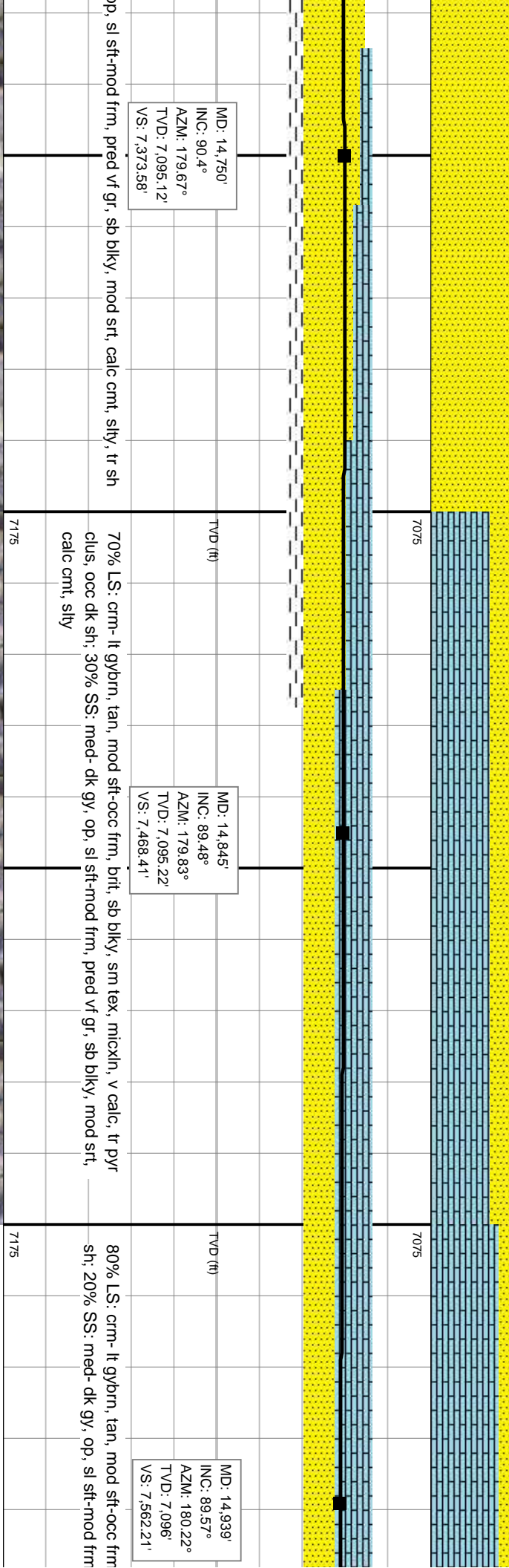
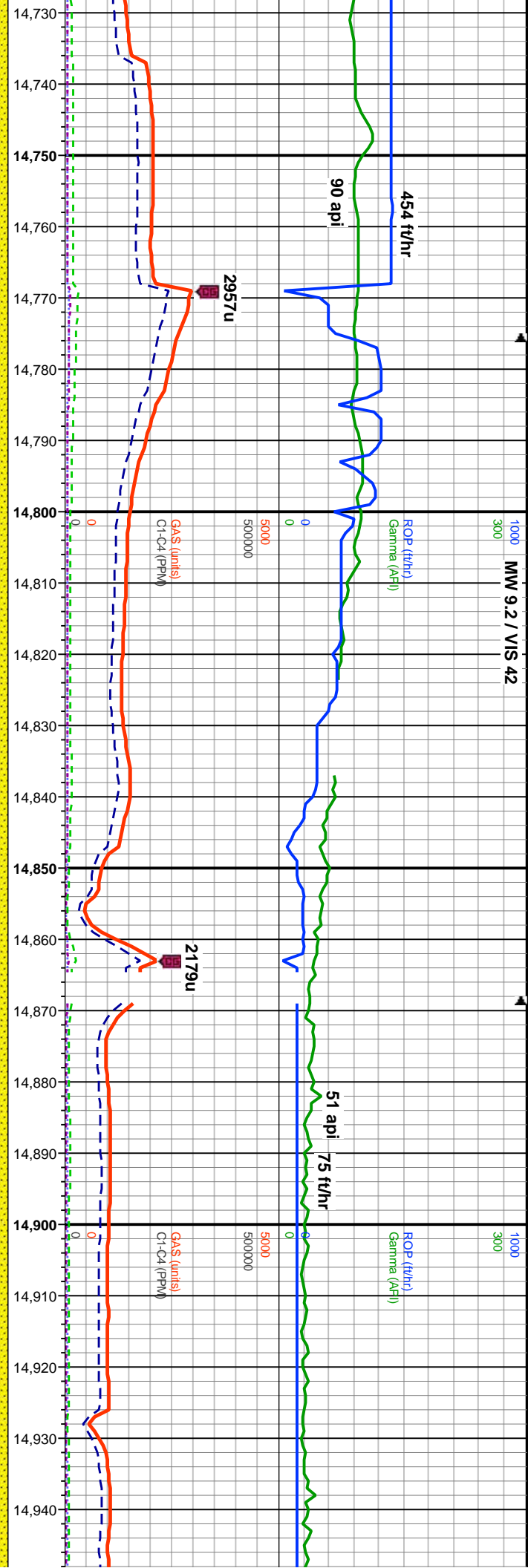






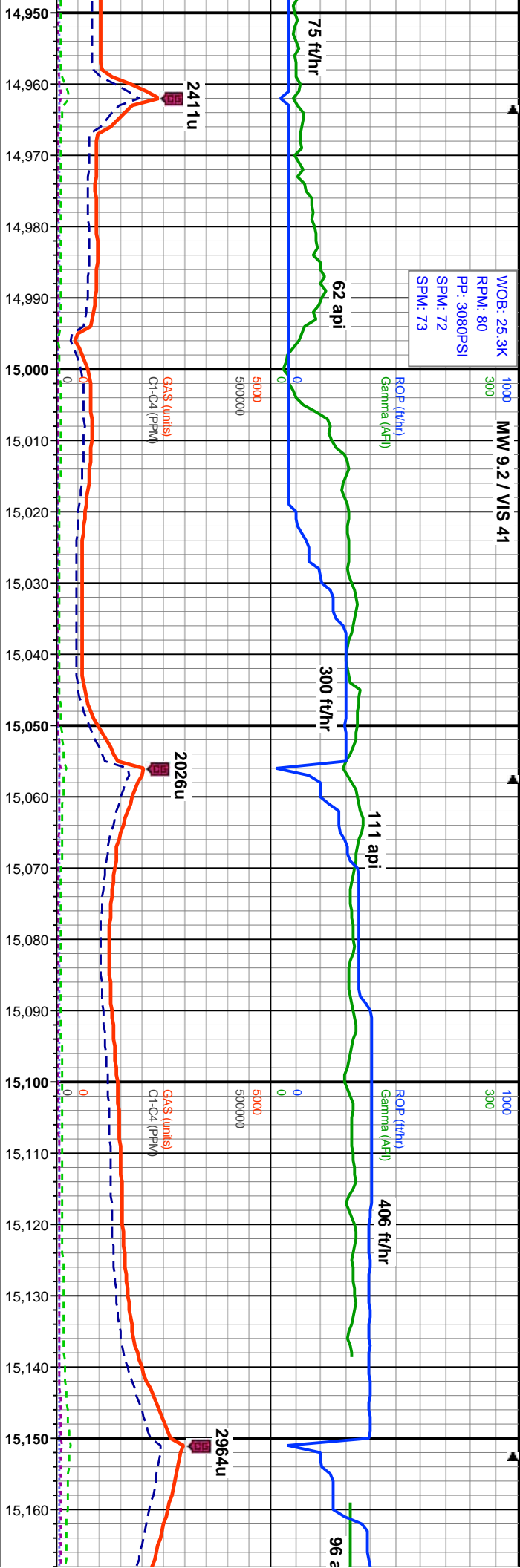






WOB: 25.3K
RPM: 80
PP: 3080PSI
SPM: 72
SPM: 73

MW 9.2 / VIS 41



MD: 15.034'
INC: 89.26°
AZM: 179.88°
TVD: 7.096.97'
VS: 7.657.01'

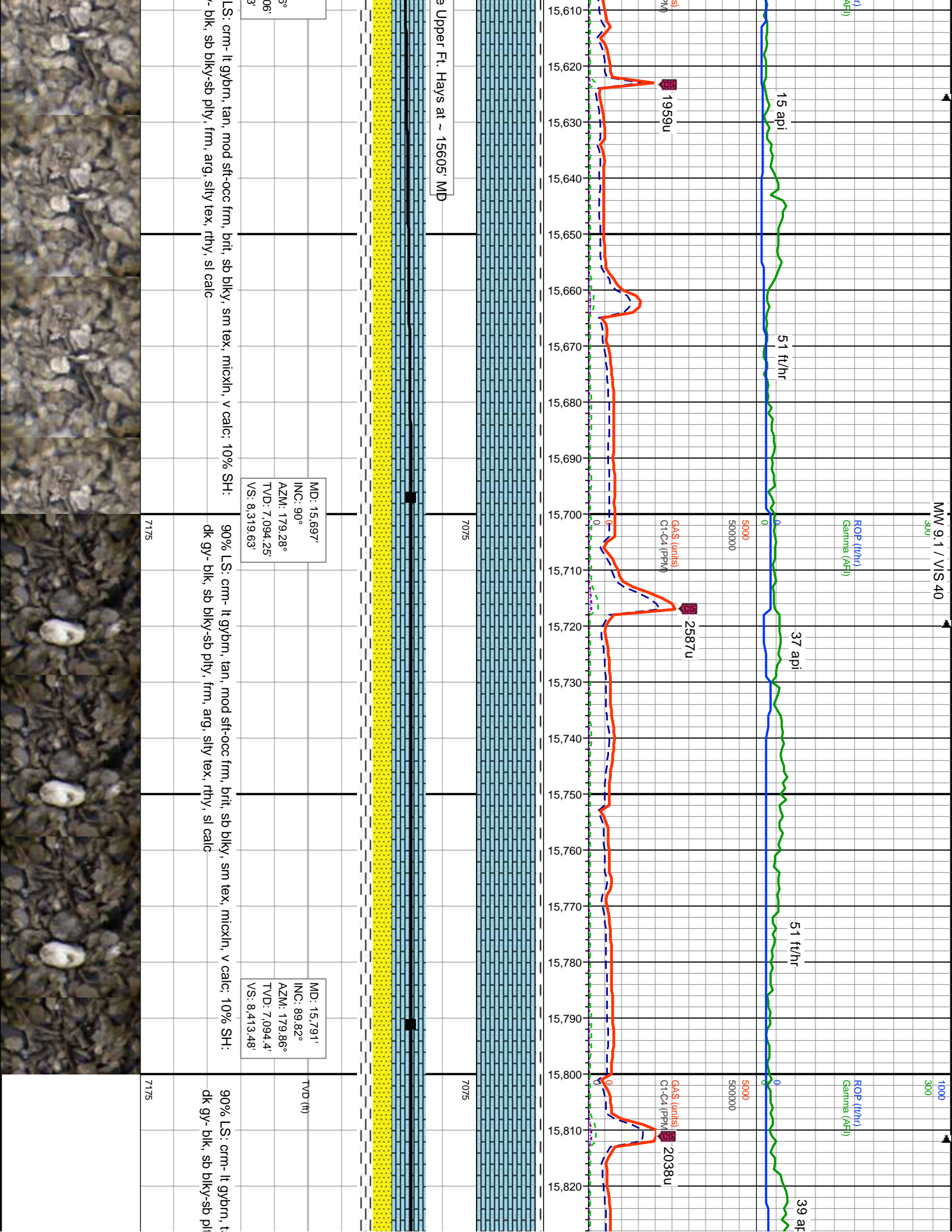
MD: 15.128'
INC: 89.35°
AZM: 178.52°
TVD: 7.098.11'
VS: 7.750.88'

, brit, sb blkly, sm tex, micxln, v calc, occ dk
, pred vf gr, sb blkly, mod srt, calc cnt, silty

80% SS: med- dk gy, op, sl sft-mod frm, pred vf gr, sb blkly, mod srt, calc cnt, silty; 20%
LS: crm- lt gybm, tan, mod sft-occ frm, brit, sb blkly, sm tex, micxln, v calc

90% SS: med- dk gy, op, sl sft-mod frm, pred vf gr, sb blkly, m
LS: crm- lt gybm, tan, mod sft-occ frm, brit, sb blkly, sm tex, m





MW 9.1+ / VIS 40

10/11/2017

DEPTH

1000

300

ROP (ft/hr)
Gamma (API)

59 ft/hr

18 api

51 ft/hr

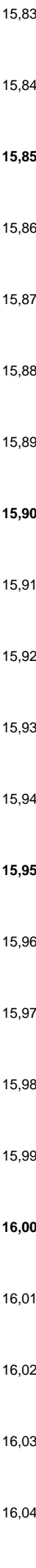
93 api

WOB: 25.8K
RPM: 50
PP: 3304PSI
SPM: 72
SPM: 72

ROP (ft/hr)
Gamma (API)

GAS (inches)
C1-C2 1892u

GAS (inches)
C1-C2 1645u



7075

7075

MD: 15,886'
INC: 90.09°
AZM: 180.57°
TVD: 7,094.47'
VS: 8,508.27'

MD: 15,980'
INC: 89.82°
AZM: 180.73°
TVD: 7,094.54'
VS: 8,602'

TVD (ft)

TVD (ft)

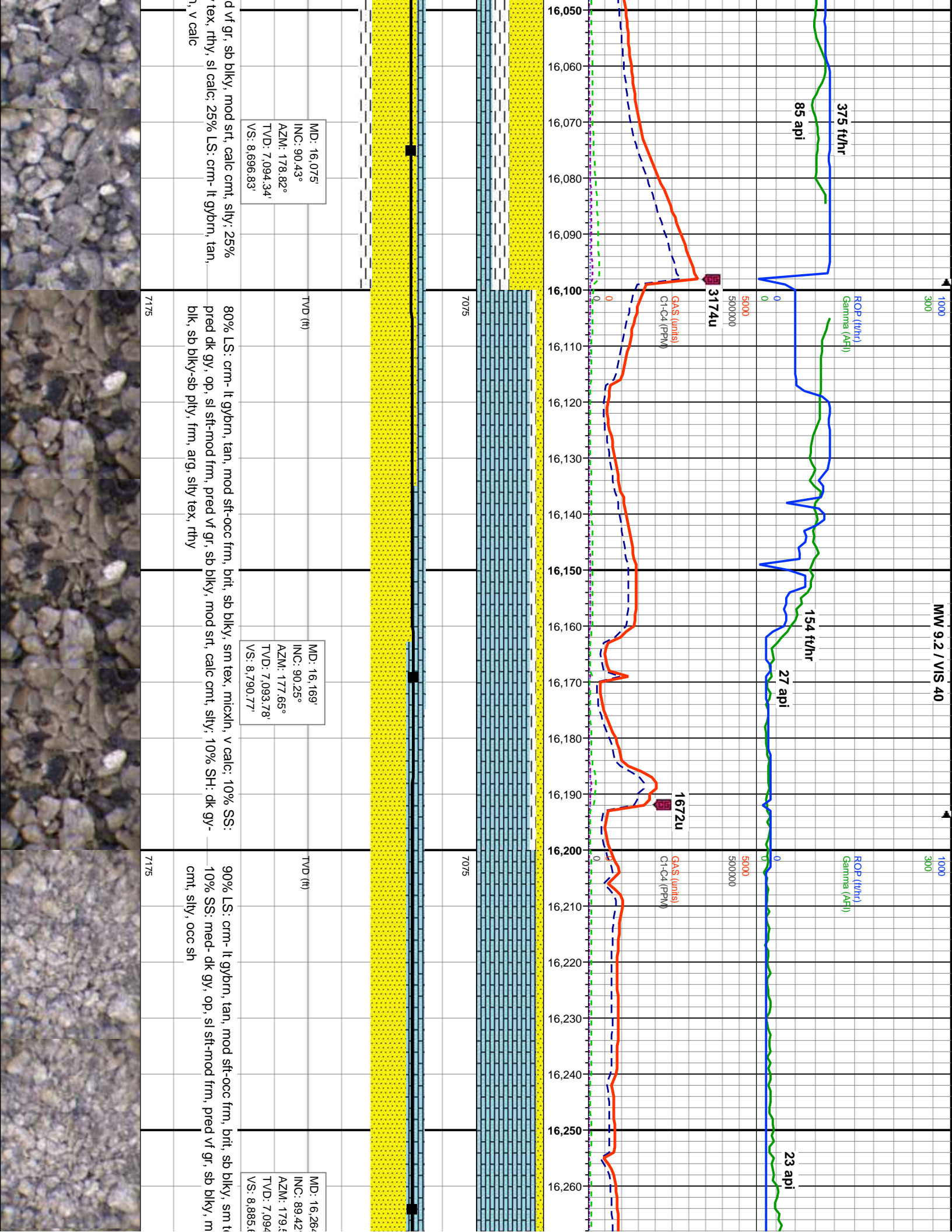
60% LS: crm- lt gybrn, tan, mod sft-occ frm, brit, sb blk, sm tex, micxln, v calc; 30% SS: pred dk gy, op, sl sft-mod frm, pred vf gr, sb blk, mod srt, calc cnt, slty; 10% SH: dk gy-blk, sb blk-sb plty, frm, arg, slty tex, rthy, sl calc

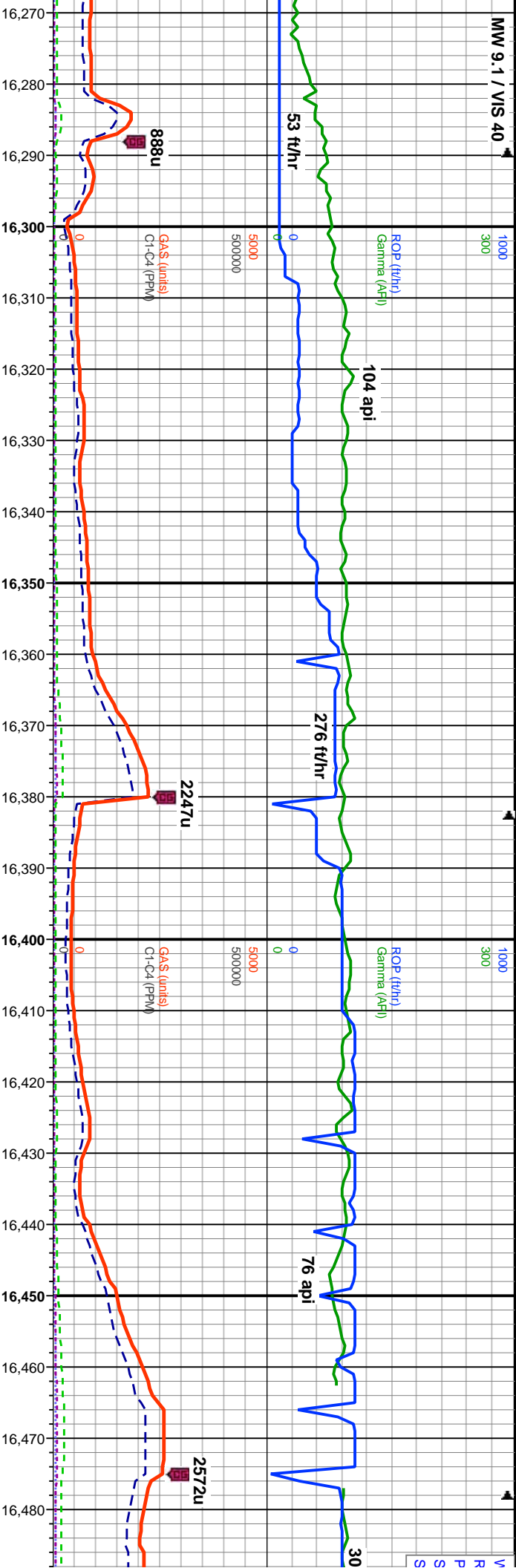
50% SS: pred dk gy, op, sl sft-mod frm, pre SH: dk gy-blk, sb blk-sb plty, frm, arg, slty mod sft-occ frm, brit, sb blk, sm tex, micxln

7175

7175







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