RESERVOIR GROUP

Scale: 5" / 100'
Measured Depth Log

Well Name	Sam 3M-25H-M166_Mudlog_COGCC		
Location	Sec. 25 T1N R66W		
State	Colorado	**County**	Weld
Country	USA	**Rig Number**	Ensign 140
API Number	05123461300000	**AFE #**	16190877
Geographic Region	Rockies	**Field**	Wattenberg
Spud Date	9/13/2018	**Drilling Completed**	9/16/2018
Surface Coordinates	Lat/Long: 40.018565/-104.733856 SHL: Sec: 25 Twp: 1N 66W Footage: 1293 FSL 310 FWL		
Bottom Hole Coordinates	Proposed BHL: Sec: 25 Twp: 1N 66W Footages: 225 FFSLL 460 FFELL		
Ground Elevation	5,080'	**K.B. Elevation**	5,109'
Logged Interval	6,750' **To** 11,925'	**Total Depth**	11,925'
Formation	C Chalk		
Type of Drilling Fluid	Synthetic Oil Based Mud		

Operator

Company Crestone Peak Resources

Address 1801 California Street, Suite 2500
Denver, CO 80202

CRESTONE PEAK

CRESTONE PEAK
RESOURCES

Geologist

Name John Ready

Company Crestone Peak Resources

Address 1801 California Street, Suite 2500
Denver, CO 80202

Zone Color Coding

Oil	Condensate	Gas
Note	Core	Pressure
Error	Water	Seal

Other

Loggers: Nicholas Watkins / Thomas Yull

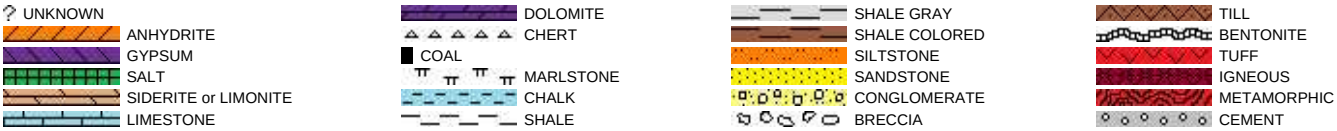
Services Provided: 2-Man Mudlogging / Geosteering

Equipment: ML-533

Contractor: Empirica, Reservoir Group
6360 West Sam Houston Pkwy N
Houston, TX 77041

Service Start Date: 9/13/2018

Rock Types



Accessories

Fossils

ALGAE
AMPHIPORA
BELEMNITE
BIOCLASTIC
BRACHOIPOD
BRYOZOA
CEPHALOPOD
CORAL
CRINOID
ECHINOID
FISH
FORAMINIFERA
FOSSIL
GASTROPOD
OOLITE
OSTRACOD
PELECYPOD
PELLET
PISOLITE
PLANT REMAINS
PLANT SPORES
SCAPHOPOD
STROMATOPOROID

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
MINERAL CRYSTALS
NODULES
PHOSPHATE PELLETS
PYRITE
SALT CAST
SANDY
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

Other Symbols

Oil Show

- D DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

Porosity

- E EARTHY
- FENESTRAL
- F FRACTURE
- INTERCRYSTALLINE
- INTEROOLITIC
- MOLDIC
- O ORGANIC
- P PINPOINT
- VUGGY

Engineering

- BIT
- CASING
- CONNECTION (LEFT)
- CONNECTION (RIGHT)
- CONNECTION GAS
- CORE - LOST
- CORE - RECOVERED
- DST INTERVAL
- FAULT

Other Symbols

- FORMATION TOP
- GAS SHOW
- MN DEPTH
- NORMAL FAULT
- OIL SHOW
- OVERTURNED STRATA
- REVERSE FAULT
- SIDEWALL CORE (LEFT)
- SIDEWALL CORE (RIGHT)
- SLIDE
- SURVEY
- TRIP GAS
- WIRELINE TESTED - LEFT
- WIRELINE TESTED - RT

Rounding

- A ANGULAR
- R ROUNDED
- SUBANG
- SUBRND

Textures

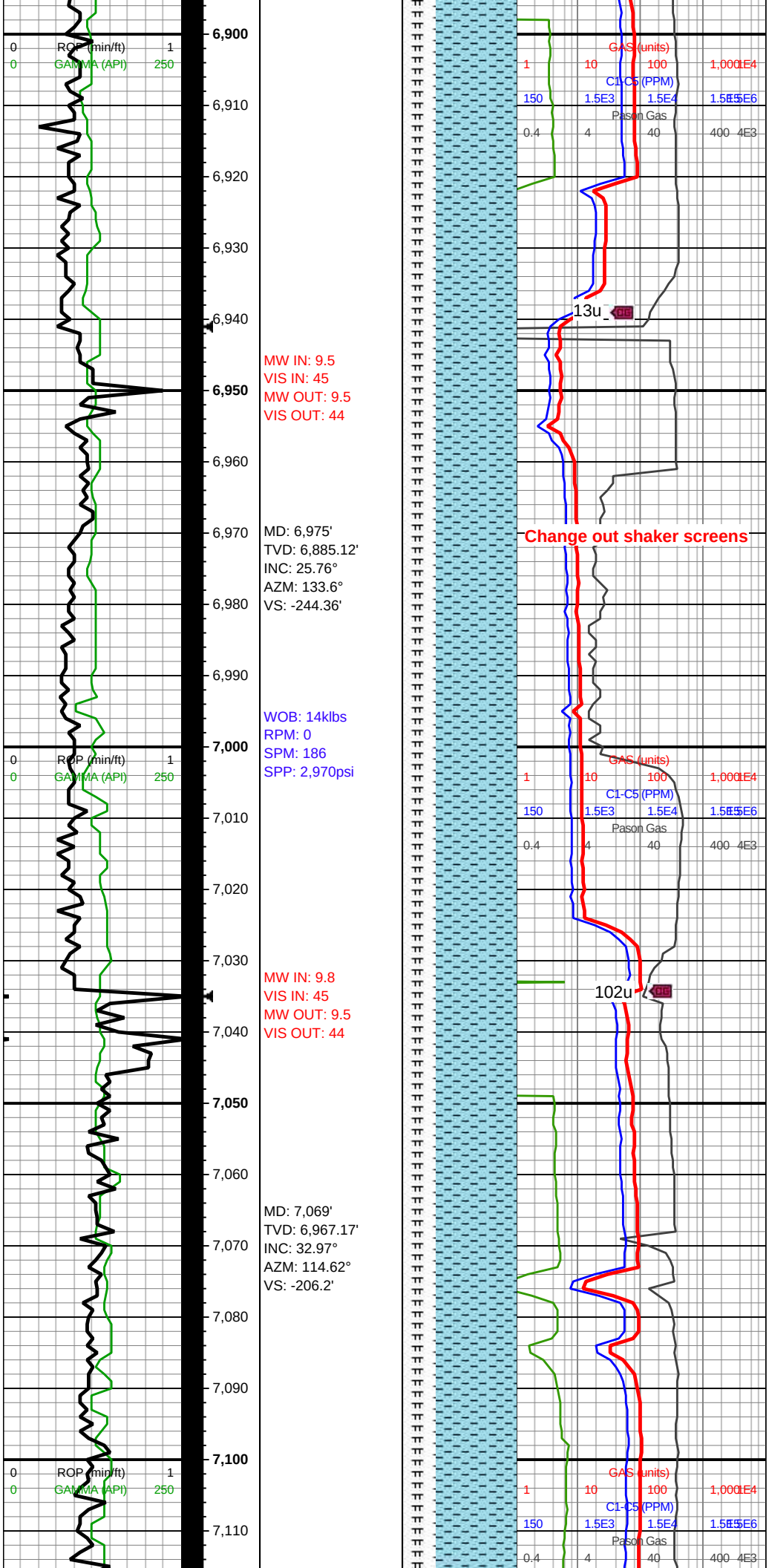
- BS BOUNDSTONE
- C CHALKY
- CX CRYPTOXLN
- E EARTHY
- FX FINELYXLN
- GS GRAINSTONE
- L LITHOGRAPHIC
- MX MICROXLN
- MS MUDSTONE
- PS PACKSTONE
- WS WACKESTONE

Sorting

- M MODERATE
- P POOR
- W WELL

ROP / GAMMA	Slide/Rotate	Depth Labels	Notes	% Lith	Total Gas (GAS, C1, C2, C3, C4, C5, Pason Gas)	Lithology Descriptions	Images
Crestone Peak Resources **Sam 3M-25H-M166** **9 5/8" Surface Casing @ 2,424'** **Spud Date: 9/13/18** **2 man Logging Began: 9/14/2018 @ 6,750'** **All Depths Correspond to Driller's Pipe Tally**		6,710 6,720 6,730 6,740 **6,750** 6,760 6,770 6,780 6,790 **6,800** 6,810 6,820 6,830 6,840 **6,850** 6,860 6,870 6,880 6,890	**KOP @ 6,752'** MW IN: 9.55 VIS IN: 47 MW OUT: 9.5 VIS OUT: 46 MD: 6,786' TVD: 6,706.33' INC: 9.27° AZM: 168.58° VS: -280.7' WOB: 17klbs RPM: 0 SPM: 183 SPP: 2,980psi MW IN: 9.5 VIS IN: 45 MW OUT: 9.5 VIS OUT: 44 MD: 6,880' TVD: 6,797.4' INC: 19.3° AZM: 140.46° VS: -269.29'		GAS (units) 1 10 100 1,000 1E4 C1-C5 (PPM) 150 1.5E3 1.5E4 1.5E5 1.5E6 Pason Gas 0.4 4 40 400 4E3 **SYSTEM CALIBRATED** **1% Methane = 100 Units** **100% Methane = 10000 Units** **Logarithmic Scale** 277u 89u	6750-6800 SLTY SH (70%): mod dk gy-v dk gy, tr gyshbn-lt gy, v rr blk, frm-v frm, sb plty, v f slty tex; SLTST (30%): gy-dk gy, frm-sl hrd, blky, non calc, rgh tex, tr pyr 6800-6850 SLTY SH (60%): lt gy, occ lt gyshbn-med gy ip, sft-sb frm w hydrated ctngs, occ frm mod fis sb blky-blky slty sh, slty thru, occ sdy, vf lam, non calc; SLTST (40%): gy-dk gy, frm-brit, blky-plty, slty tex, non calc 6850-6900 SLTY SH (55%): off wh-lt gy sft-sb frm w hydrated water solu ctngs intbdd wi frm mod fis sb blky-blky med gy slty sh, non calc; SLTST (40%): gy-dk gy, frm-brit, blky-plty, slty tex, non calc; SST (5%): offwht-lt gy, frm, blky, w cons gr sup cls cons wi arg-silc cmt, v f grnd grdg to slt	  

ROP (min/ft) 0 1
GAMMA (API) 0 250



MW IN: 9.5
VIS IN: 45
MW OUT: 9.5
VIS OUT: 44

MD: 6,975'
TVD: 6,885.12'
INC: 25.76°
AZM: 133.6°
VS: -244.36'

WOB: 14klbs
RPM: 0
SPM: 186
SPP: 2,970psi

MW IN: 9.8
VIS IN: 45
MW OUT: 9.5
VIS OUT: 44

MD: 7,069'
TVD: 6,967.17'
INC: 32.97°
AZM: 114.62°
VS: -206.2'

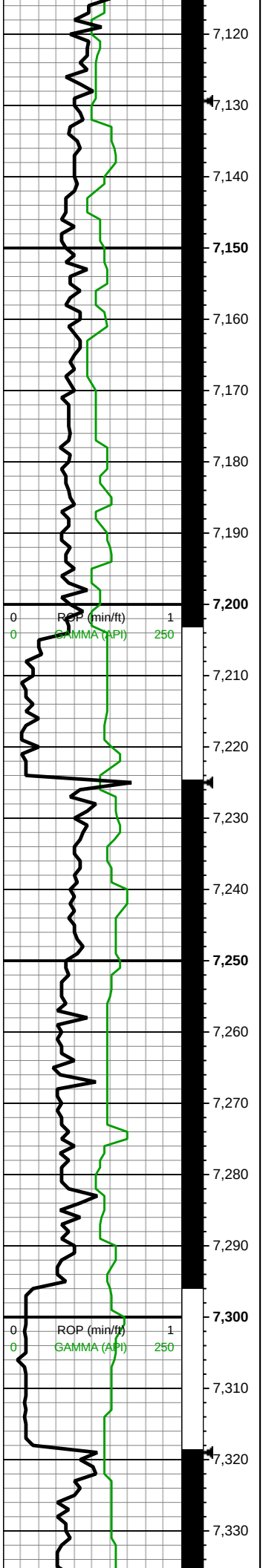
6900-6950 SLTY SH (70%): v lt gy-lt gy, predy v sft w hydrated, sme sb frm, mod fis sb blky ctngs wi f lamn, sm arg-sl slty tex, non calc; SLTST (30%): gy-dk gy, occ v dk gy-blk, frm, brit, non calc, sl calc ip

6950-7000 SLTY SH (75%): v lt gy-lt gy, predy v sft w hydrated, sme sb frm, mod fis sb blky ctngs wi f lamn, sm arg-sl slty tex, non calc; SLTST (25%): gy-dk gy, occ v dk gy-blk, frm, brit, non calc, sl calc ip

7000-7050 SLTY SH (90%): med gy-med gyshbn-dk gy, sft-sb frm-frm-brit, mod fis sb blky-blky ctngs, sl slty tex, rr vf-c sp pyr strg, non calc; SLTST (10%): lt gy-dk gy, frm-v frm-brit silc sltst, non calc

7050-7100 SLTY SH (70%): predy gy-gyshbn sb frm-frm mod fis sb blky-sb plty ctngs, occ off wh-v lt gy sft w hydrated gumbo slty sh, thn lamn, slty arg tex, non calc; SLTST (30%): gy-dk gy, frm-brit, sb plty-plty, brit, occ v dk gy wi vugy silc vn, tr vf pyr, non calc

7100-7150 SLTY SH (70%): predy gy-gyshbn

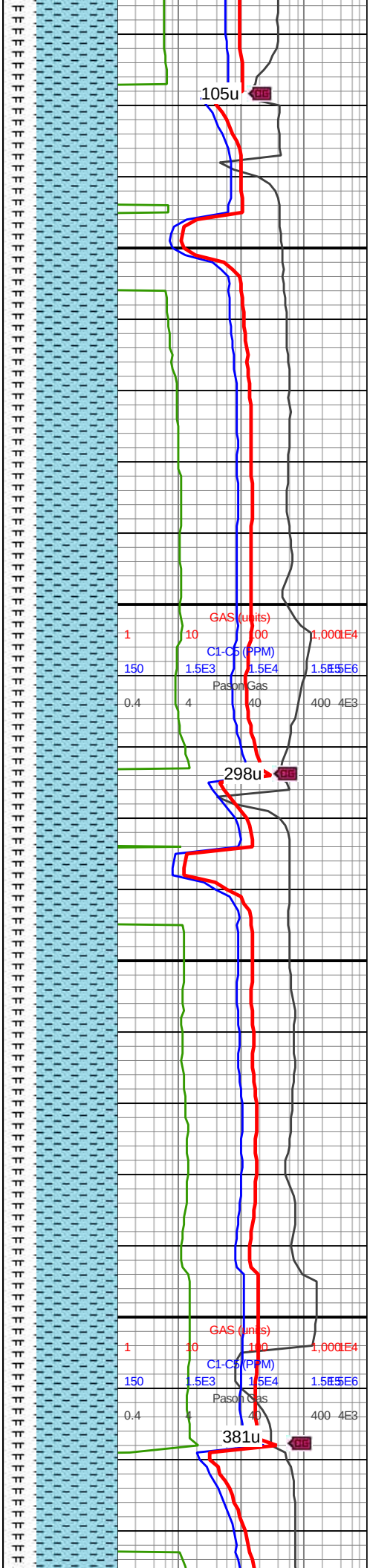


MD: 7,164'
TVD: 7,042.55'
INC: 42.2°
AZM: 98.88°
VS: -150.95'

WOB: 17klbs
RPM: 0
SPM: 186
SPP: 3,170psi

MD: 7,259'
TVD: 7,108.68'
INC: 49.54°
AZM: 92.82°
VS: -83.21'

MW IN: 9.7
VIS IN: 44
MW OUT: 9.7
VIS OUT: 44



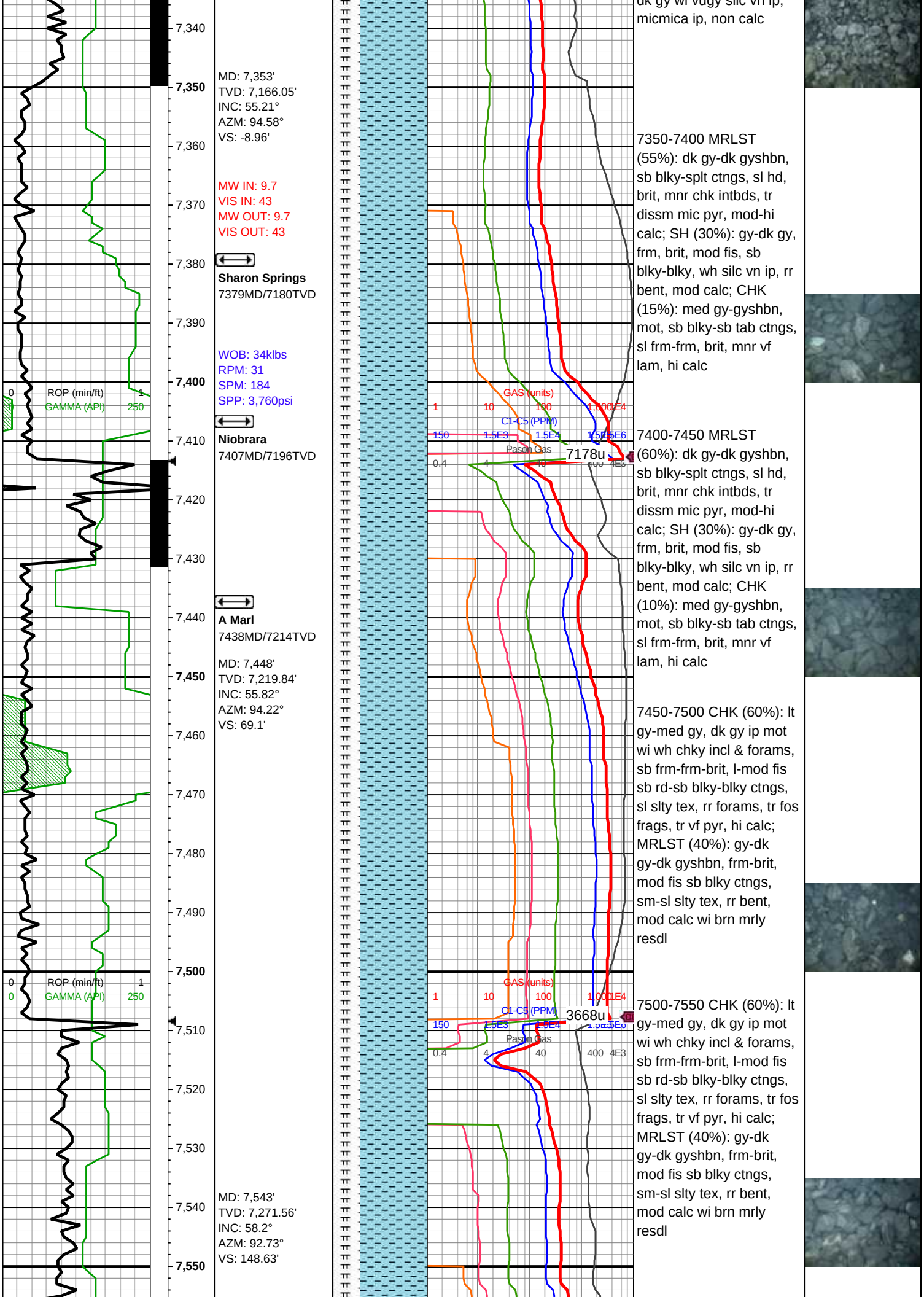
sb frm-frm mod fis sb blky-sb plty ctngs, occ off wh-v lt gy sft w hydrated gumbo slty sh, thn lamn, slty arg tex, non calc; SLTST (30%): gy-dk gy, frm-brit, sb plty-plty, brit, occ v dk gy wi vugy silc vn, tr vf pyr, non calc

7150-7200 SLTY SH (70%): predy gy-gyshbn sb frm-frm mod fis sb blky-sb plty ctngs, occ off wh-v lt gy sft w hydrated gumbo slty sh, thn lamn, slty arg tex, non calc; SLTST (30%): gy-dk gy, frm-brit, sb plty-plty, brit, occ v dk gy wi vugy silc vn, tr vf pyr, non calc

7200-7250 SLTY SH (70%): predy gy-gyshbn sb frm-frm mod fis sb blky-sb plty ctngs, occ off wh-v lt gy sft w hydrated gumbo slty sh, thn lamn, slty arg tex, non calc; SLTST (30%): gy-dk gy, frm-brit, sb plty-plty, brit, occ v dk gy wi vugy silc vn, tr vf pyr, non calc

7250-7300 SLTY SH (80%): predy gy-gyshbn sb frm-frm mod fis sb blky-sb plty ctngs, occ off wh-v lt gy sft w hydrated gumbo slty sh, thn lamn, slty arg tex, non calc; SLTST (20%): gy-dk gy, frm-brit, sb plty-plty, brit, occ v dk gy wi vugy silc vn, tr vf pyr, non calc

7300-7350 SLTY SH (75%): lt gy-lt gyshbn sft-sb frm v w hydrated water solu ctngs, thn lamn, sm arg tex wi slt thru, non calc-sl calc; SLTST (25%): gy-dk gy, frm-brit, sb plty-plty, occ v



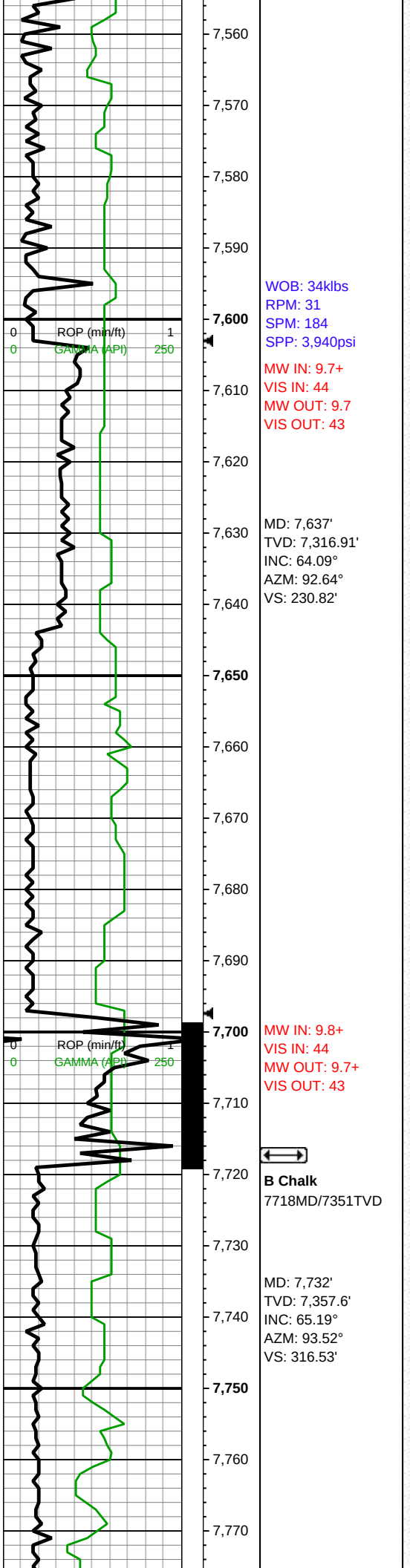
dk gy wi vugy silc vn ip, micmica ip, non calc

7350-7400 MRLST (55%): dk gy-dk gyshbn, sb blky-splt ctngs, sl hd, brit, mnr chk intbds, tr dissm mic pyr, mod-hi calc; SH (30%): gy-dk gy, frm, brit, mod fis, sb blky-blky, wh silc vn ip, rr bent, mod calc; CHK (15%): med gy-gyshbn, mot, sb blky-sb tab ctngs, sl frm-frm, brit, mnr vf lam, hi calc

7400-7450 MRLST (60%): dk gy-dk gyshbn, sb blky-splt ctngs, sl hd, brit, mnr chk intbds, tr dissm mic pyr, mod-hi calc; SH (30%): gy-dk gy, frm, brit, mod fis, sb blky-blky, wh silc vn ip, rr bent, mod calc; CHK (10%): med gy-gyshbn, mot, sb blky-sb tab ctngs, sl frm-frm, brit, mnr vf lam, hi calc

7450-7500 CHK (60%): lt gy-med gy, dk gy ip mot wi wh chky incl & forams, sb frm-frm-brit, l-mod fis sb rd-sb blky-blky ctngs, sl slty tex, rr forams, tr fos frags, tr vf pyr, hi calc; MRLST (40%): gy-dk gy-dk gyshbn, frm-brit, mod fis sb blky ctngs, sm-sl slty tex, rr bent, mod calc wi brn mrly resdl

7500-7550 CHK (60%): lt gy-med gy, dk gy ip mot wi wh chky incl & forams, sb frm-frm-brit, l-mod fis sb rd-sb blky-blky ctngs, sl slty tex, rr forams, tr fos frags, tr vf pyr, hi calc; MRLST (40%): gy-dk gy-dk gyshbn, frm-brit, mod fis sb blky ctngs, sm-sl slty tex, rr bent, mod calc wi brn mrly resdl



7,560
7,570
7,580
7,590
7,600
7,610
7,620
7,630
7,640
7,650
7,660
7,670
7,680
7,690
7,700
7,710
7,720
7,730
7,740
7,750
7,760
7,770

WOB: 34klbs
RPM: 31
SPM: 184
SPP: 3,940psi

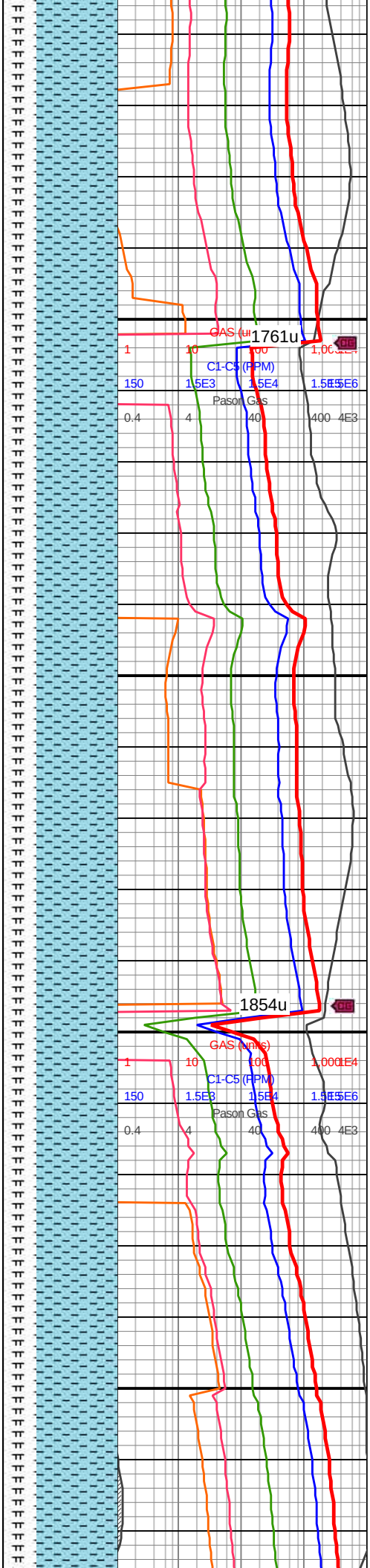
MW IN: 9.7+
VIS IN: 44
MW OUT: 9.7
VIS OUT: 43

MD: 7,637'
TVD: 7,316.91'
INC: 64.09°
AZM: 92.64°
VS: 230.82'

MW IN: 9.8+
VIS IN: 44
MW OUT: 9.7+
VIS OUT: 43

B Chalk
7718MD/7351TVD

MD: 7,732'
TVD: 7,357.6'
INC: 65.19°
AZM: 93.52°
VS: 316.53'



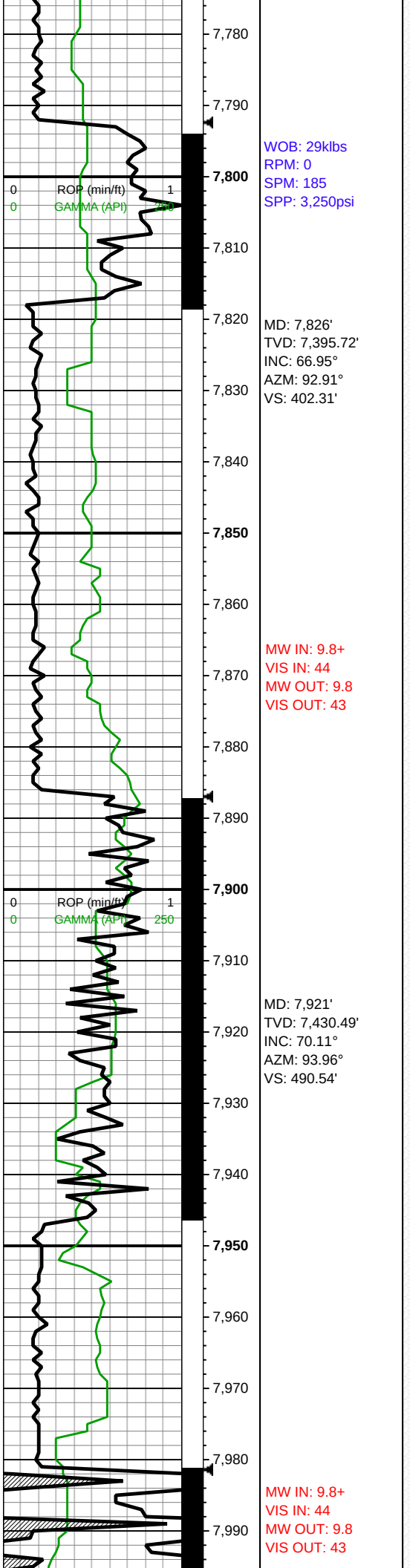
7550-7600 MRLST (60%): gy-dk gy-dk gyshbn, frm-brit, mod fis sb blky ctngs, sm-sl slty tex, mod calc wi brn mrly resdl; CHK (40%): lt gy-med gy, dk gy ip mot wi wh chky incl & forams, sb frm-frm-brit, l-mod fis sb rd-sb blky-blky ctngs, sl slty tex, rr forams, tr fos frags, tr vf pyr, hi calc

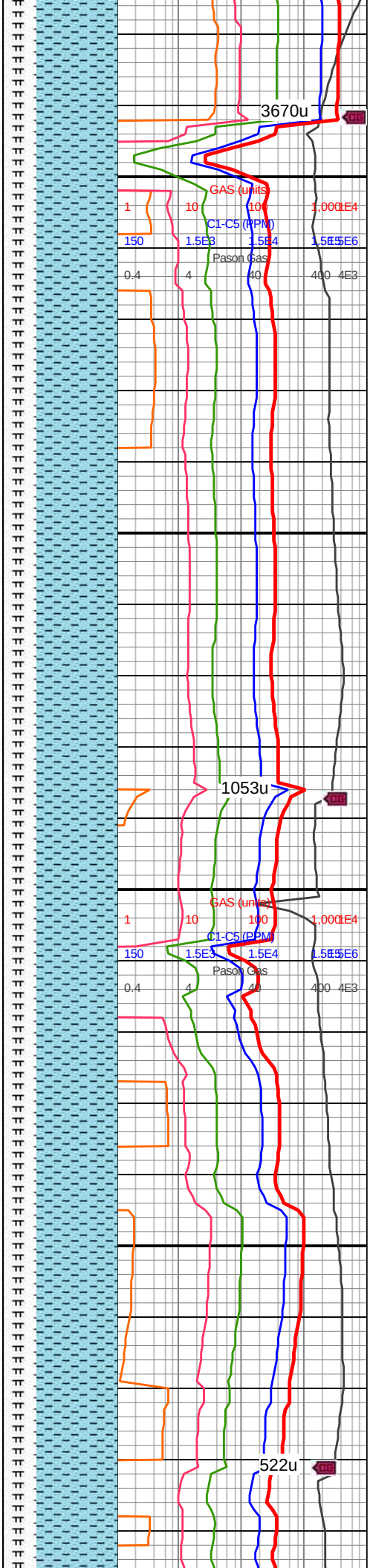
7600-7650 MRLST (70%): gy-dk gy-dk gyshbn, frm-brit, mod fis sb blky ctngs, sm-sl slty tex, mod calc wi brn mrly resdl; CHK (30%): lt gy-med gy, dk gy ip mot wi wh chky incl & forams, sb frm-frm-brit, l-mod fis sb rd-sb blky-blky ctngs, sl slty tex, rr forams, tr fos frags, tr vf pyr, hi calc

7650-7700 MRLST (90%): gy-dk gy-v dk gy, com gyshbn, frm-brit mod fis sb blky-blky ctngs, sm arg-sl slty tex, occ brn marl incl & rr o stn, tr vf pyr, mod calc wi brn mrly resdl; CHK (10%): predy med gy, lt gy ip, frm-brit, mod fis, slty arg tex, sb blky-blky, hi calc

7700-7750 MRLST (80%): gy-gyshbn-dk gy, mot wi brn marl incl, frm-brit sb rd-sb blky-blky l-mod fis ctngs, sm arg-sl slty tex, tr vf pyr, mod calc wi brn mrly resdl; CHK (20%): predy med gy, lt gy ip, frm-brit, mod fis, slty arg tex, sb blky-blky, hi calc

7750-7800 CHK (65%): gy-dk gy wi f wh chky incl & vf chky lamn, frm-brit, mod fis sb blky-hi fis blky ctngs, sm sl slty tex, tr forams, tr lt gy-tn bent, tr





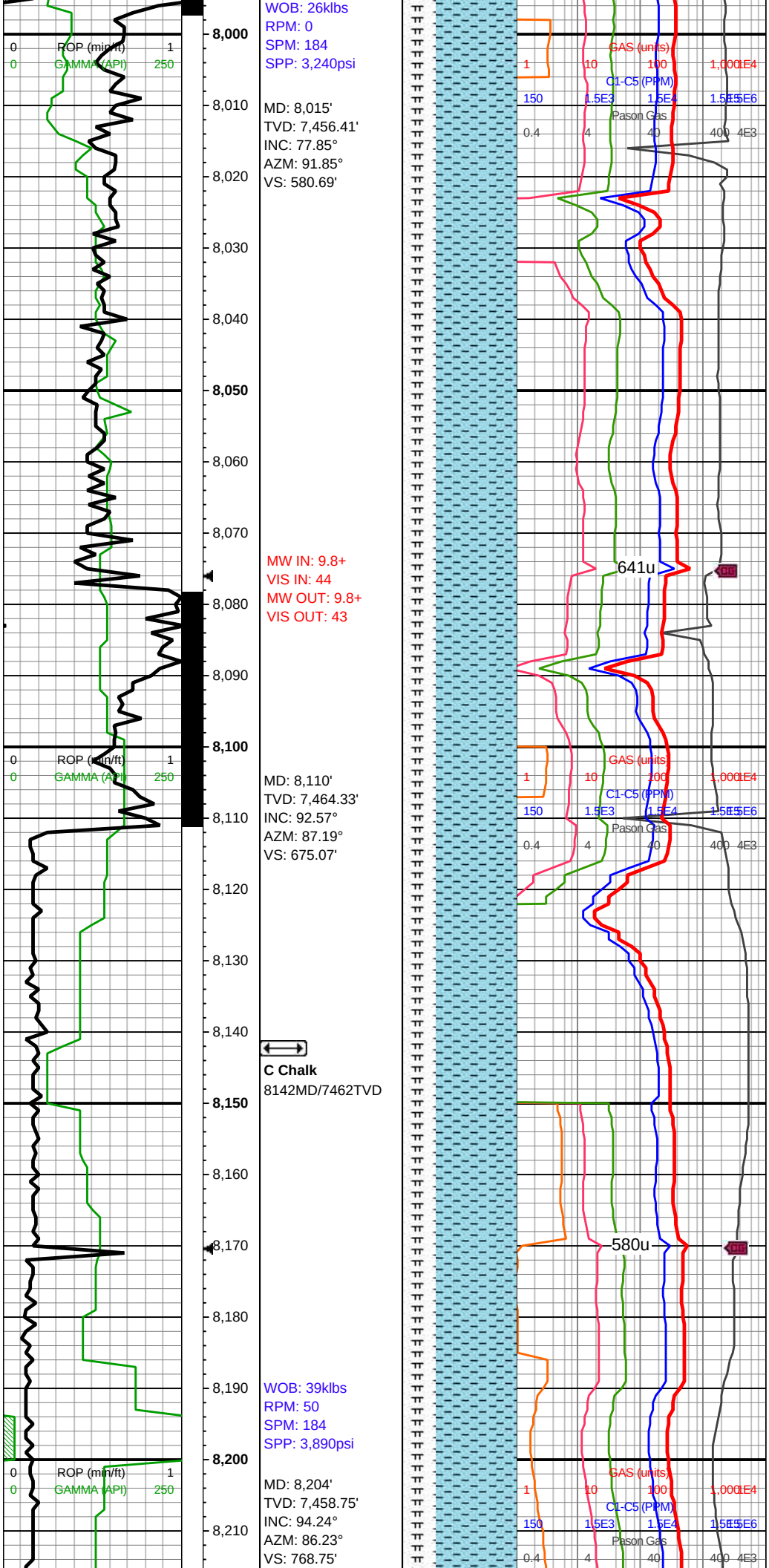
vf pyr, hi calc; MRLST (35%): dk gy-dk gyshbn, frm-brit, mod fis sb blky-blky ctngs, mot wi brn marl incl, tr vf pyr, tr tn bent, mod calc wi brn mrly resdl

7800-7850 CHK (80%): gy-dk gy wi f wh chky incl & lamn, frm-brit, mod fis sb blky-hi fis blky ctngs, sm sl slty tex, tr vf pyr, hi calc; MRLST (20%): dk gy-dk gyshbn, frm-brit, mod fis sb blky-blky ctngs, mot wi brn marl incl, tr vf pyr, tr tn bent, mod calc wi brn mrly resdl

7850-7900 CHK (70%): gy-dk gy wi f wh chky incl & lamn, frm-brit, mod fis sb blky-hi fis blky ctngs, sm sl slty tex, tr vf pyr, hi calc; MRLST (30%): dk gy-dk gyshbn, frm-brit, mod fis sb blky-blky ctngs, mot wi brn marl incl, tr vf pyr, tr tn bent, mod calc wi brn mrly resdl

7900-7950 CHK (75%): gy-dk gy wi f wh chky incl & lamn, frm-brit, mod fis sb blky-hi fis blky ctngs, sm sl slty tex, tr vf pyr, hi calc; MRLST (25%): dk gy-dk gyshbn, frm-brit, mod fis sb blky-blky ctngs, mot wi brn marl incl, tr vf pyr, tr tn bent, mod calc wi brn mrly resdl

7950-8000 CHK (70%): lt gy-lt gyshbn wi yel brn o stn, sb frm-frm, brit ip, l-mod fis sb rd-sb blky ctngs, sl slty tex, thn chky lamn, tr vf pyr, hi calc; MRLST (30%): dk gy, frm-brit mod fis sb blky-blky ctngs, sl slty tex, tr vf pyr, mod calc wi brn



WOB: 26klbs
RPM: 0
SPM: 184
SPP: 3,240psi

MD: 8,015'
TVD: 7,456.41'
INC: 77.85°
AZM: 91.85°
VS: 580.69'

MW IN: 9.8+
VIS IN: 44
MW OUT: 9.8+
VIS OUT: 43

MD: 8,110'
TVD: 7,464.33'
INC: 92.57°
AZM: 87.19°
VS: 675.07'

C Chalk
8142MD/7462TVD

WOB: 39klbs
RPM: 50
SPM: 184
SPP: 3,890psi

MD: 8,204'
TVD: 7,458.75'
INC: 94.24°
AZM: 86.23°
VS: 768.75'

resdl

8000-8050 CHK (85%): lt gy-lt gyshbn wi yel brn o stn, sb frm-frm, brit ip, l-mod fis sb rd-sb blky ctngs, sl slty tex, thn chky lamn, tr vf pyr, hi calc; MRLST (15%): dk gy, frm-brit mod fis sb blky-blky ctngs, sl slty tex, tr vf pyr, mod calc wi brn resdl

8050-8100 CHK (75%): lt gy-lt gyshbn wi yel brn o stn, sb frm-frm, brit ip, l-mod fis sb rd-sb blky ctngs, sl slty tex, thn chky lamn, tr vf pyr, hi calc; MRLST (25%): dk gy, frm-brit mod fis sb blky-blky ctngs, sl slty tex, tr vf pyr, mod calc wi brn resdl

8100-8150 CHK (60%): lt-med gy wi occ f wh chky incl, frm-brit, sb blky-blky ctngs, tr foram, v tr fos frag, tr vf pyr, hi calc; MRLST (40%): dk gy, rr blk, frm-brit, blky-sb blky ctngs, predy sm arg tex, sl slty ip, tr vf pyr, mod calc

8150-8200 CHK (70%): lt-med gy wi occ f wh chky incl, frm-brit, sb blky-blky ctngs, tr foram, v tr fos frag, tr vf pyr, hi calc; MRLST (30%): dk gy, rr blk, frm-brit, blky-sb blky ctngs, predy sm arg tex, sl slty ip, tr vf pyr, mod calc

8,220
8,230
8,240
8,250
8,260
8,270
8,280
8,290
8,300
8,310
8,320
8,330
8,340
8,350
8,360
8,370
8,380
8,390
8,400
8,410
8,420
8,430

MNDEPT 9/15/2018

MW IN: 9.8
VIS IN: 44
MW OUT: 9.8+
VIS OUT: 43

MD: 8,299'
TVD: 7,453.18'
INC: 92.48°
AZM: 89.22°
VS: 863.51'

C Chalk 8338MD, 7452TVD

MD: 8,393'
TVD: 7,449.43'
INC: 92.09°
AZM: 91.76°
VS: 957.42'

WOB: 36klbs
RPM: 66
SPM: 184
SPP: 3,910psi

0 ROP (min/ft) 1
0 GAMMA (API) 250

854u

662u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

8200-8300 CHK (60%): lt-med gy wi occ f wh chky incl, frm-brit, sb blky-blky ctngs, tr foram, v tr fos frag, tr vf pyr, hi calc; MRLST (40%): dk gy, rr blk, frm-brit, blky-sb blky ctngs, predy sm arg tex, sl slty ip, tr vf pyr, mod calc

8300-8400 CHK (80%): lt-med gy wi occ f wh chky incl, frm-brit, sb blky-blky ctngs, tr foram, v tr fos frag, tr vf pyr, hi calc; MRLST (20%): dk gy, rr blk, frm-brit, blky-sb blky ctngs, predy sm arg tex, sl slty ip, tr vf pyr, mod calc

8,440
8,450
8,460
8,470
8,480
8,490
8,500
8,510
8,520
8,530
8,540
8,550
8,560
8,570
8,580
8,590
8,600
8,610
8,620
8,630
8,640
8,650

0 ROP (min/ft) 1
0 GAMMA (API) 250

MW IN: 9.8
VIS IN: 43
MW OUT: 9.8
VIS OUT: 42

MD: 8,488'
TVD: 7,447.32'
INC: 90.46°
AZM: 92.38°
VS: 1,052.32'

0 ROP (min/ft) 1
0 GAMMA (API) 250

MD: 8,582'
TVD: 7,446.13'
INC: 90.99°
AZM: 92.82°
VS: 1,146.21'

WOB: 36klbs
RPM: 66
SPM: 184
SPP: 3,885psi

MW IN: 9.8
VIS IN: 43

1105u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

944u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

1209u

8400-8500 CHK (75%): lt-med gy wi occ f wh chky incl, frm-brit, sb blky-blky ctngs, tr foram, v tr fos frag, tr vf pyr, hi calc; MRLST (25%): dk gy, rr blk, frm-brit, blky-sb blky ctngs, predy sm arg tex, sl slty ip, tr vf pyr, mod calc

8500-8600 CHK (80%): lt-med gy wi occ f wh chky incl, frm-brit, sb blky-blky ctngs, tr foram, v tr fos frag, tr vf pyr, hi calc; MRLST (20%): dk gy, rr blk, frm-brit, blky-sb blky ctngs, predy sm arg tex, sl slty ip, tr vf pyr, mod calc

MW OUT: 9.8
VIS OUT: 42

MD: 8,676'
TVD: 7,445.19'
INC: 90.15°
AZM: 89.65°
VS: 1,240.17'

WOB: 39klbs
RPM: 66
SPM: 184
SPP: 3,986psi

MD: 8,771'
TVD: 7,444.5'
INC: 90.68°
AZM: 87.98°
VS: 1,335.15'

MD: 8,866'
TVD: 7,442.8'
INC: 91.38°
AZM: 87.02°
VS: 1,430.05'

8,660
8,670
8,680
8,690
8,700
8,710
8,720
8,730
8,740
8,750
8,760
8,770
8,780
8,790
8,800
8,810
8,820
8,830
8,840
8,850
8,860
8,870

0 ROP (min/ft) 1
0 GAMMA (API) 250

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

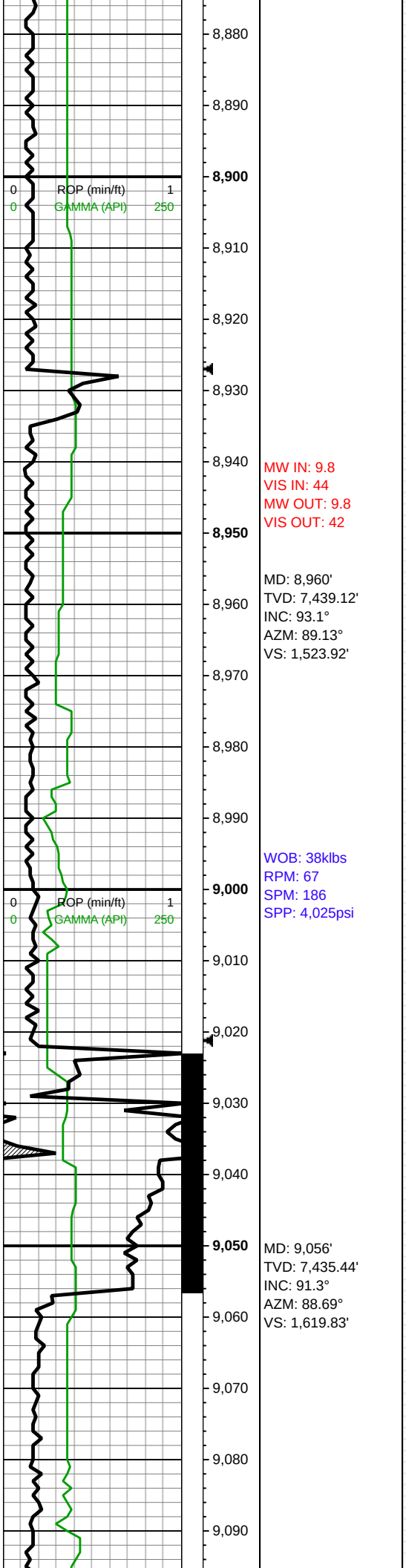
1001u

1346u

8600-8700 CHK (80%): pred lt gry wi lt brn, sme sl med gy-brn,occ f wh chky incl,frm-sl brit, sb blky-sl plty, sl sft ip, v calc, tr pyr, scat lse cal; MRLST (20%): v dk gy-blk, occ gyshbn, frm-v frm, blky, calc, sl rgh tex wi com micmica

8700-8800 CHK (85%): pred lt gry wi lt brn, sme sl med gy-brn,occ f wh chky incl,frm-sl brit, sb blky-sl plty, sl sft ip, v calc, tr pyr, scat lse cal; MRLST (15%): v dk gy-blk, occ gyshbn, frm-v frm, blky, calc, sl rgh tex wi com micmica

8800-8900 CHK (80%): pred lt gry wi lt brn, sme

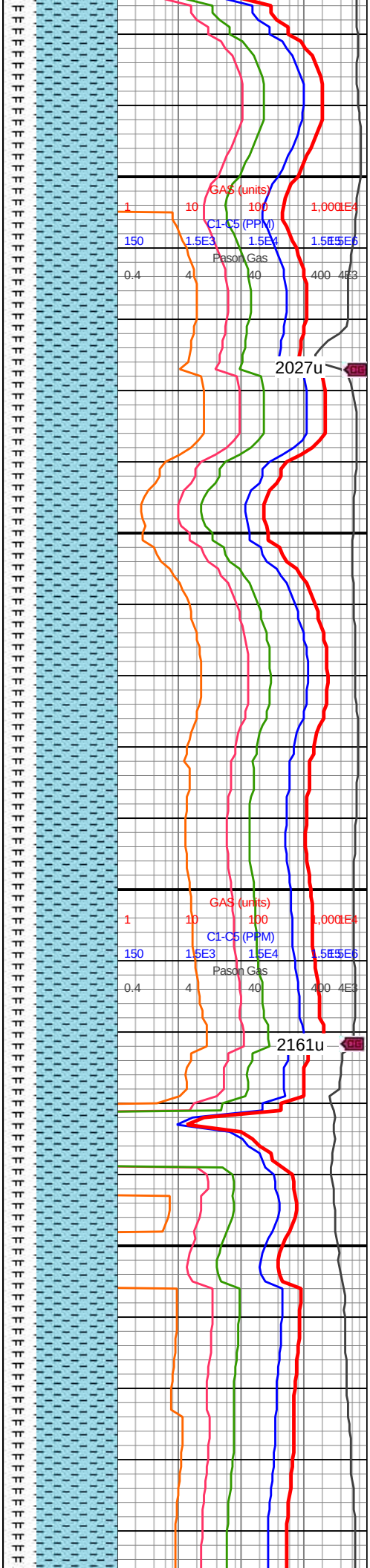


MW IN: 9.8
VIS IN: 44
MW OUT: 9.8
VIS OUT: 42

MD: 8,960'
TVD: 7,439.12'
INC: 93.1°
AZM: 89.13°
VS: 1,523.92'

WOB: 38klbs
RPM: 67
SPM: 186
SPP: 4,025psi

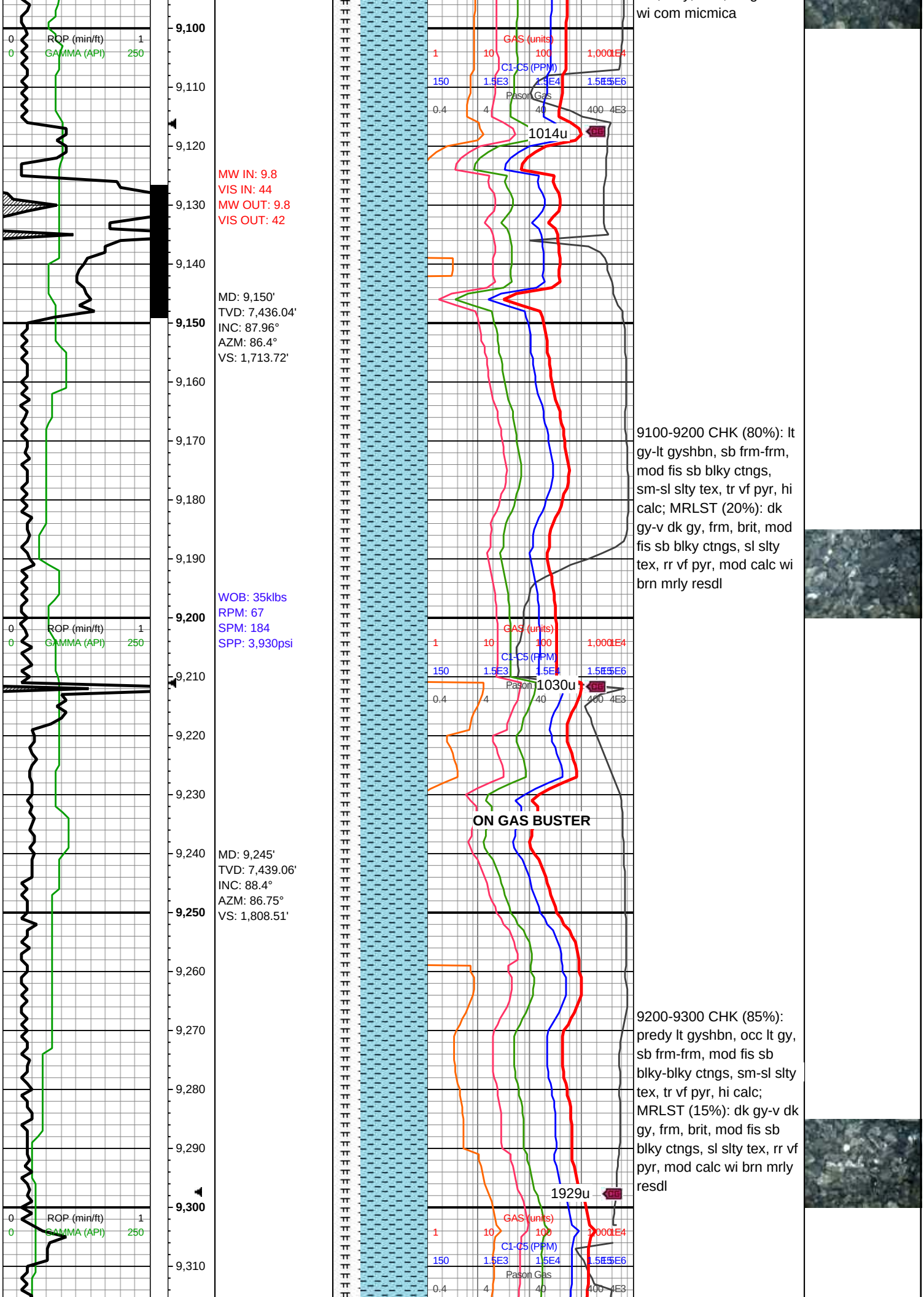
MD: 9,056'
TVD: 7,435.44'
INC: 91.3°
AZM: 88.69°
VS: 1,619.83'



chky incl,frm-sl brit, sb blky-sl plty, sl sft ip, v calc, tr pyr, scat lse cal; MRLST (20%): v dk gy-blk, occ gyshbn, frm-v frm, blky, calc, sl rgh tex wi com micmica

8900-9000 CHK (80%): pred lt gry wi lt brn, sme sl med gy-brn,occ f wh chky incl,frm-sl brit, sb blky-sl plty, sl sft ip, v calc, tr pyr, scat lse cal; MRLST (20%): v dk gy-blk, occ gyshbn, frm-v frm, blky, calc, sl rgh tex wi com micmica

9000-9100 CHK (90%): pred lt gry wi lt brn, sme sl med gy-brn,occ f wh chky incl,frm-sl brit, sb blky-sl plty, sl sft ip, v calc, tr pyr, scat lse cal; MRLST (10%): v dk gy-blk, occ gyshbn, frm-v frm, blky, calc, sl rgh tex



MW IN: 9.8
VIS IN: 44
MW OUT: 9.8
VIS OUT: 42

MD: 9,150'
TVD: 7,436.04'
INC: 87.96°
AZM: 86.4°
VS: 1,713.72'

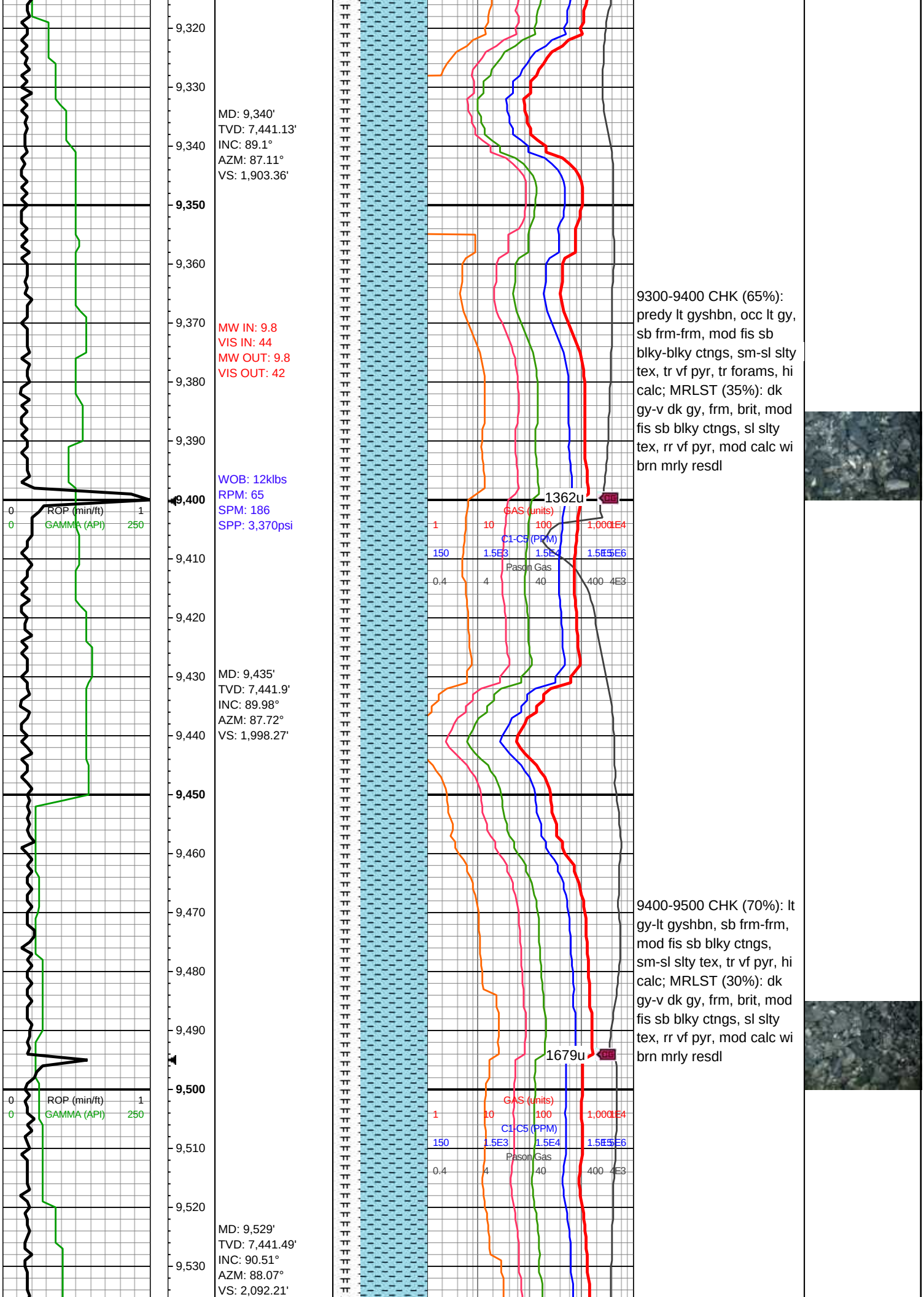
WOB: 35klbs
RPM: 67
SPM: 184
SPP: 3,930psi

MD: 9,245'
TVD: 7,439.06'
INC: 88.4°
AZM: 86.75°
VS: 1,808.51'

wi com micmica

9100-9200 CHK (80%): lt gy-lt gyshbn, sb frm-frm, mod fis sb blky ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (20%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

9200-9300 CHK (85%): predy lt gyshbn, occ lt gy, sb frm-frm, mod fis sb blky-blky ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (15%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl



9300-9400 CHK (65%): predy lt gyshbn, occ lt gy, sb frm-frm, mod fis sb blky-blky ctngs, sm-sl slty tex, tr vf pyr, tr forams, hi calc; MRLST (35%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

9400-9500 CHK (70%): lt gy-lt gyshbn, sb frm-frm, mod fis sb blky ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (30%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

9,540
9,550
9,560
9,570
9,580
9,590
9,600
9,610
9,620
9,630
9,640
9,650
9,660
9,670
9,680
9,690
9,700
9,710
9,720
9,730
9,740
9,750

0 ROP (min/ft) 1
0 GAMMA (API) 250

WOB: 35klbs
RPM: 65
SPM: 184
SPP: 3,890psi

MW IN: 9.8
VIS IN: 44
MW OUT: 9.8
VIS OUT: 42

MD: 9,623'
TVD: 7,441.2'
INC: 89.85°
AZM: 90.53°
VS: 2,186.19'

MD: 9,717'
TVD: 7,440.9'
INC: 90.51°
AZM: 91.41°
VS: 2,280.17'

MW IN: 9.7
VIS IN: 44
MW OUT: 9.7
VIS OUT: 42

1368u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

9500-9600 CHK (60%): lt gy-med gy-gyshbn, sb frm-frm, brit ip, l-mod fis sb rd-sb blky-blky ctngs, sm-sl slty tex, tr forams, hi calc; MRLST (40%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, tr vf pyr, mod calc wi brn mrly resdl

829u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

9600-9700 CHK (55%): lt gy-med gy-gyshbn, sb frm-frm, brit ip, l-mod fis sb rd-sb blky-blky ctngs, sm-sl slty tex, tr forams, hi calc; MRLST (45%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, tr vf pyr, mod calc wi brn mrly resdl

9,760
9,770
9,780
9,790
9,800
9,810
9,820
9,830
9,840
9,850
9,860
9,870
9,880
9,890
9,900
9,910
9,920
9,930
9,940
9,950
9,960
9,970

ROP (min/ft)
GAMMA (API)
0
250
1

WOB: 53klbs
RPM: 0
SPM: 184
SPP: 3,370psi

MD: 9,812'
TVD: 7,441.81'
INC: 88.4°
AZM: 90.53°
VS: 2,375.15'

MD: 9,906'
TVD: 7,444.91'
INC: 87.82°
AZM: 90.27°
VS: 2,469.09'

MW IN: 9.8
VIS IN: 44
MW OUT: 9.85
VIS OUT: 44

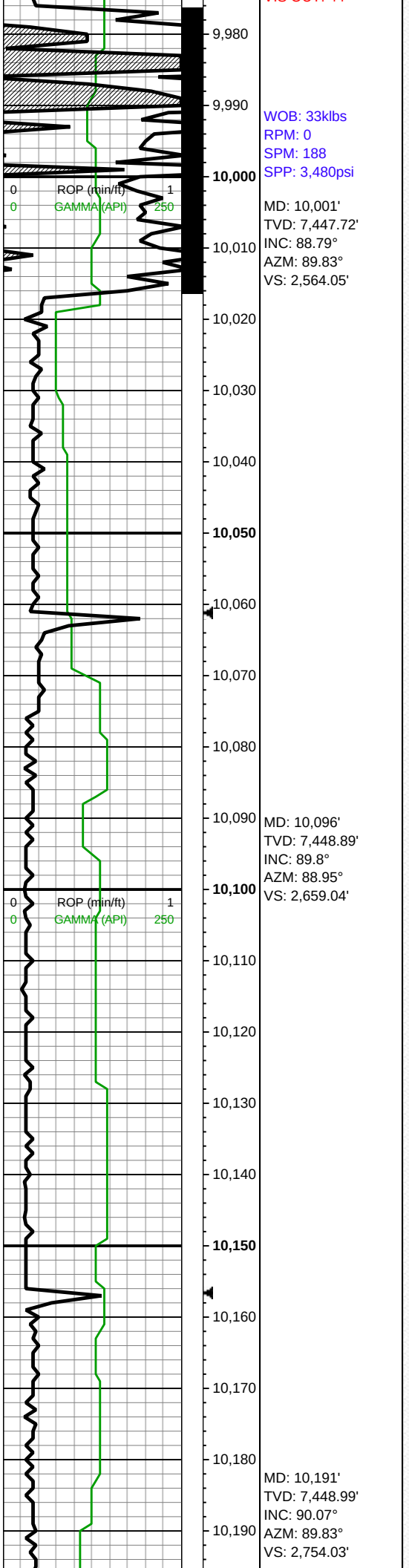
GAS (units)
1
10
100
1,000
1E4
C1-C5 (PPM)
150
1.5E3
1.5E4
1.5E5
1.5E6
Pason Gas
0.4
4
40
400
4E3

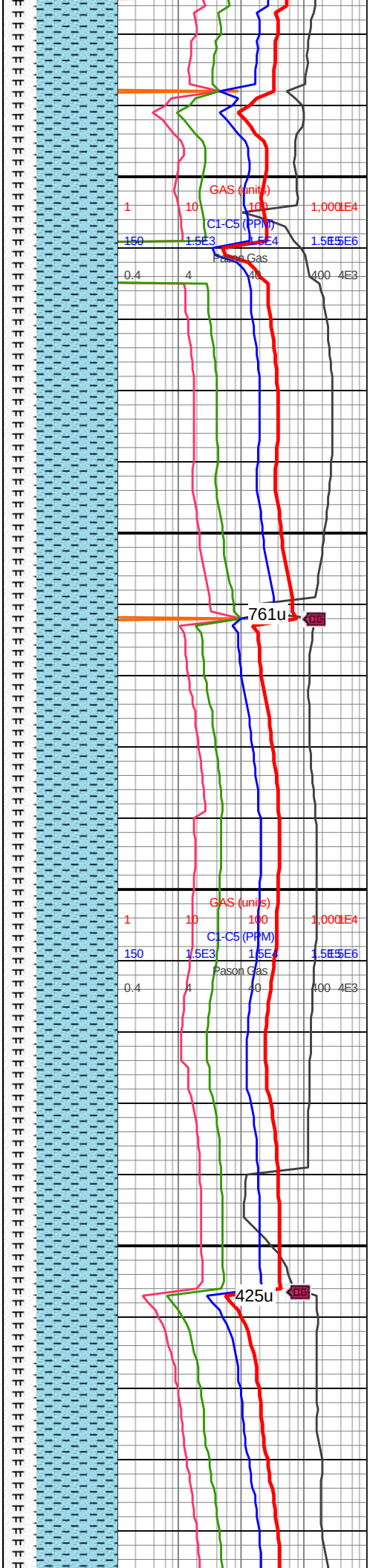
771u
1008u
1010u

9700-9800 CHK (75%): lt gy-med gy wi f sp chky incl, sb frm-frm, brit ip, l-mod fis sb rd-sb blky-blky ctngs, sm-sl slty tex, tr forams, hi calc; MRLST (25%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, tr vf pyr, mod calc wi brn mrly resdl

9800-9900 MRLST (55%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, tr vf pyr, mod calc wi brn mrly resdl; CHK (45%): lt gy-med gy wi f sp chky incl, sb frm-frm, brit ip, l-mod fis sb rd-sb blky-blky ctngs, sm-sl slty tex, tr forams, hi calc

9900-10000 CHK (80%): lt gy-lt gyshbn, sb

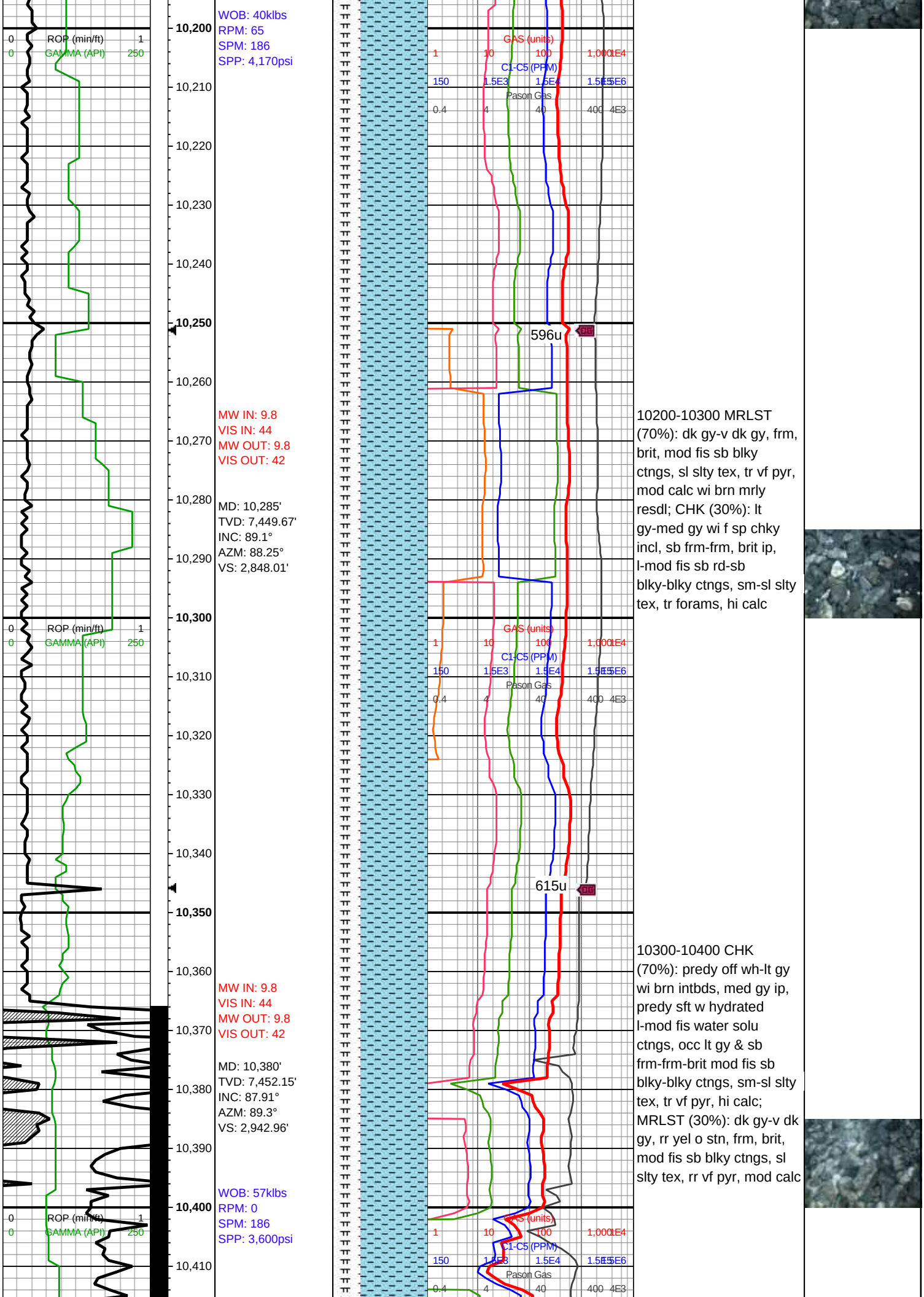




frm-frm, mod fis sb blky ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (20%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

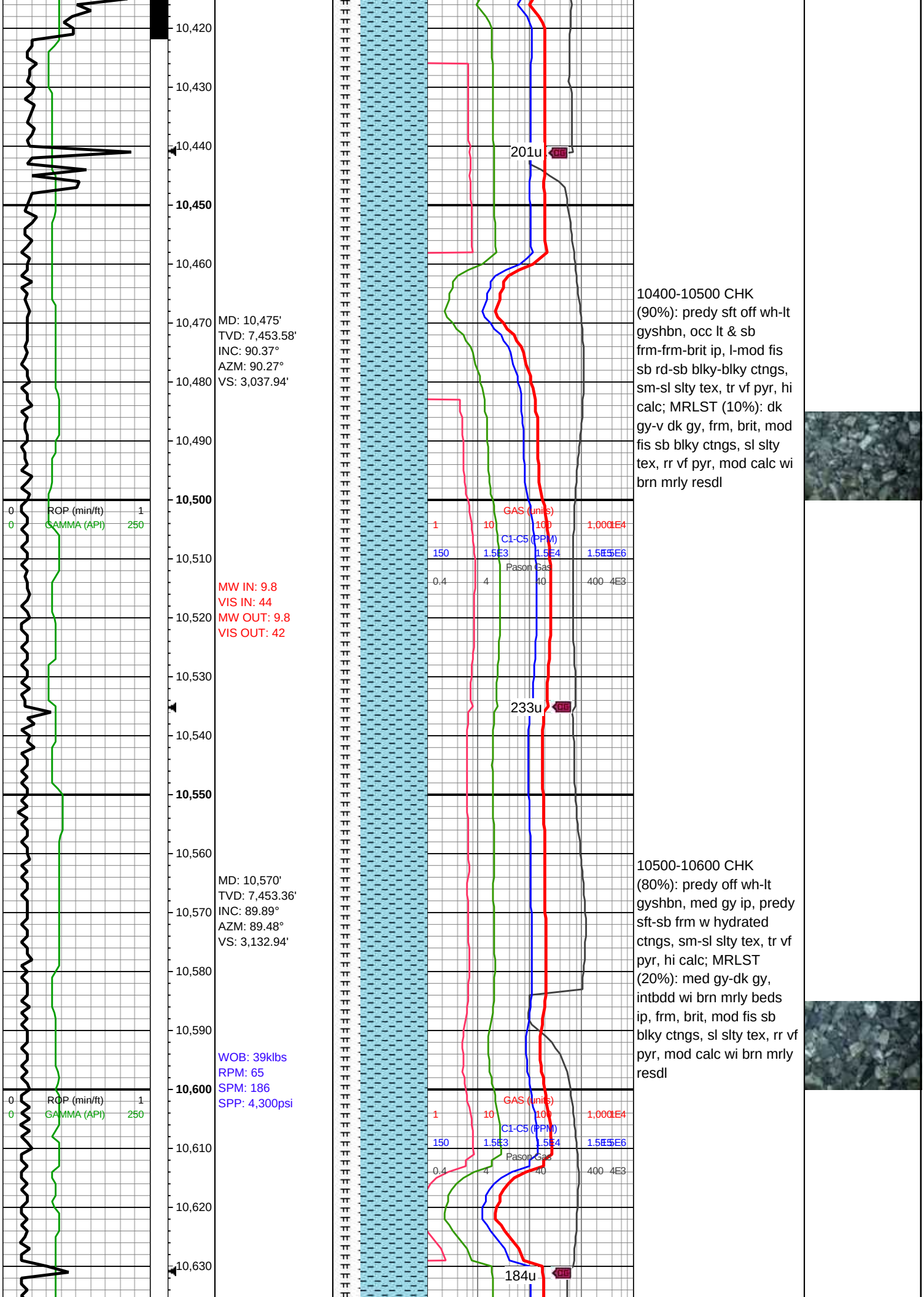
10000-10100 CHK (60%): predy lt gyshbn, occ lt gy-med-dk gy wi f-u f wh chky & foram incl, sb frm-frm, brit, mod fis sb blky-blky ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (40%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

10100-10200 MRLST (50%): dk gy-v dk gy, occ sp brn marl incl frm, brit, mod fis sb blky-sb plty ctngs, sl slty tex, mod calc; CHK (50%): lt gy-med gy wi f sp chky incl, sft-sb frm lt gy intbds-frm med gy brit intbds, l-mod fis sb rd-sb blky-blky ctngs, sm-sl slty tex, tr forams, hi calc



10200-10300 MRLST (70%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, tr vf pyr, mod calc wi brn mrly resdl; CHK (30%): lt gy-med gy wi f sp chky incl, sb frm-frm, brit ip, l-mod fis sb rd-sb blky-blky ctngs, sm-sl slty tex, tr forams, hi calc

10300-10400 CHK (70%): predy off wh-lt gy wi brn intbds, med gy ip, predy sft w hydrated l-mod fis water solu ctngs, occ lt gy & sb frm-frm-brit mod fis sb blky-blky ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (30%): dk gy-v dk gy, rr yel o stn, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc



10400-10500 CHK (90%): predy sft off wh-lt gyshbn, occ lt & sb frm-frm-brit ip, l-mod fis sb rd-sb blky-blky ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (10%): dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

10500-10600 CHK (80%): predy off wh-lt gyshbn, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (20%): med gy-dk gy, intbdd wi brn mrly beds ip, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

10,640
10,650
10,660
10,670
10,680
10,690
10,700
10,710
10,720
10,730
10,740
10,750
10,760
10,770
10,780
10,790
10,800
10,810
10,820
10,830
10,840
10,850

0 ROP (min/ft) 1
0 GAMMA (API) 250

MD: 10,665'
TVD: 7,451.32'
INC: 92.57°
AZM: 91.5°
VS: 3,227.9'

MW IN: 9.8
VIS IN: 45
MW OUT: 9.75
VIS OUT: 43

MD: 10,759'
TVD: 7,446.46'
INC: 93.36°
AZM: 91.59°
VS: 3,321.73'

WOB: 39klbs
RPM: 65
SPM: 184
SPP: 4,190psi

MW IN: 9.8
VIS IN: 44
MW OUT: 9.7+
VIS OUT: 43

MD: 10,854'
TVD: 7,443.11'
INC: 90.68°

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

216u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

302u

10600-10700 CHK (75%): predy sft off wh-lt gy w hydrated ctngs, med gy sb frm-frm ctngs, rr dk gy wi f wh chky incl, sm-sl slty tex, hi calc; MRLST (25%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

10700-10800 CHK (75%): predy off wh-lt gy, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (25%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

AZM: 91.5°
VS: 3,416.63'

10,860
10,870
10,880
10,890
10,900
10,910
10,920
10,930
10,940
10,950
10,960
10,970
10,980
10,990
11,000
11,010
11,020
11,030
11,040
11,050
11,060
11,070

MW IN: 9.75
VIS IN: 44
MW OUT: 9.75
VIS OUT: 42

0 ROP (min/ft) 1
0 GAMMA (API) 250

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3
256u

10800-10900 CHK (80%): predy off wh-lt gy, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (20%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

MD: 10,948'
TVD: 7,441.71'
INC: 91.03°
AZM: 90.53°
VS: 3,510.6'

WOB: 37klbs
RPM: 65
SPM: 184
SPP: 4,170psi

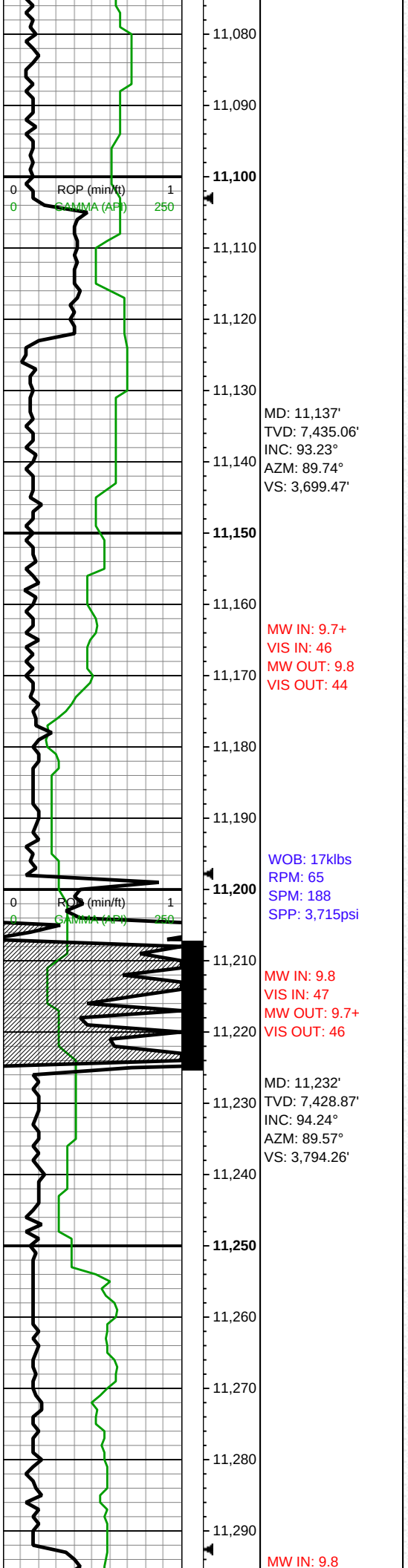
0 ROP (min/ft) 1
0 GAMMA (API) 250

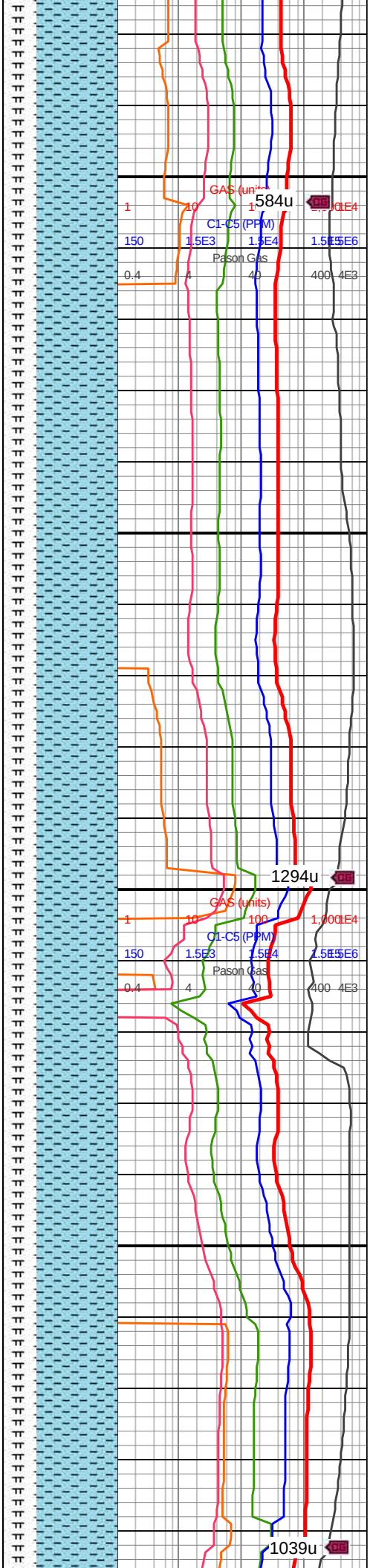
GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3
320u

10900-11000 CHK (75%): predy off wh-lt gy, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (25%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

MD: 11,043'
TVD: 7,439.27'
INC: 91.91°
AZM: 90.27°
VS: 3,605.56'

11000-11100 MRLST (70%): dk gy-v dk gy, occ sp brn marl incl frm, brit, mod fis sb blky-sb plty ctngs, sl slty tex, mod





calc, CHK (30%): lt gy-med gy wi f sp chky incl, sft-sb frm lt gy intbds-frm med gy brit intbds, l-mod fis sb rd-sb blky-blky ctngs, sm-sl slty tex, tr forams, hi calc

11100-11200 MRLST (50%): dk gy-v dk gy, occ sp brn marl incl frm, brit, mod fis sb blky-sb plty ctngs, sl slty tex, mod calc; CHK (50%): lt gy-med gy wi f sp chky incl, sft-sb frm lt gy intbds-frm med gy brit intbds, l-mod fis sb rd-sb blky-blky ctngs, sm-sl slty tex, tr forams, hi calc

11200-11300 CHK (75%): predy off wh-lt gy, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (25%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc

VIS IN: 47
MW OUT: 9.8
VIS OUT: 46

MD: 11,327'
TVD: 7,423.23'
INC: 92.57°
AZM: 90.18°
VS: 3,889.09'

MW IN: 9.7+
VIS IN: 46
MW OUT: 9.7+
VIS OUT: 45

WOB: 24klbs
RPM: 0
SPM: 187
SPP: 3,492psi

MD: 11,421'
TVD: 7,421.06'
INC: 90.07°
AZM: 91.68°
VS: 3,983.04'

MW IN: 9.7+
VIS IN: 47
MW OUT: 9.7+
VIS OUT: 45

9/16/2018

MD

MD: 11,516'
TVD: 7,423.28'

wi brn mrly resdl

11300-11400 CHK (70%): predy off wh-lt gy, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (30%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

11400-11500 CHK (50%): predy off wh-lt gy, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (50%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

INC: 87.25°
AZM: 93.43°
VS: 4,077.9'

11,520
11,530
11,540
11,550
11,560
11,570
11,580
11,590
11,600
11,610
11,620
11,630
11,640
11,650
11,660
11,670
11,680
11,690
11,700
11,710
11,720
11,730

0 ROP (min/ft) 1
0 GAMMA (API) 250

WOB: 39klbs
RPM: 65
SPM: 186
SPP: 4,260psi

MD: 11,611'
TVD: 7,427.37'
INC: 87.82°
AZM: 93.61°
VS: 4,172.63'

MD: 11,705'
TVD: 7,430'
INC: 88.97°
AZM: 93.61°
VS: 4,266.39'

1190u

27u

GAS (units)
1 10 100 1,000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

11500-11600 MRLST (60%): dk gy-v dk gy, occ sp brn marl incl frm, brit, mod fis sb blky-sb plty ctngs, sl slty tex, mod calc; CHK (40%): lt gy-med gy wi f sp chky incl, sft-sb frm lt gy intbds-frm med gy brit intbds, l-mod fis sb rd-sb blky-blky ctngs, sm-sl slty tex, tr forams, hi calc

11600-11700 CHK (60%): predy off wh-lt gy, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (40%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

0 ROP (min/ft) 1
0 GAMMA (API) 250

11,740
11,750
11,760
11,770
11,780
11,790
11,800
11,810
11,820
11,830
11,840
11,850
11,860
11,870
11,880
11,890
11,900
11,910
11,920
11,930
11,940
11,950

MW IN: 9.7
VIS IN: 45
MW OUT: 9.7
VIS OUT: 45

WOB: 36klbs
RPM: 65
SPM: 186
SPP: 4,315psi

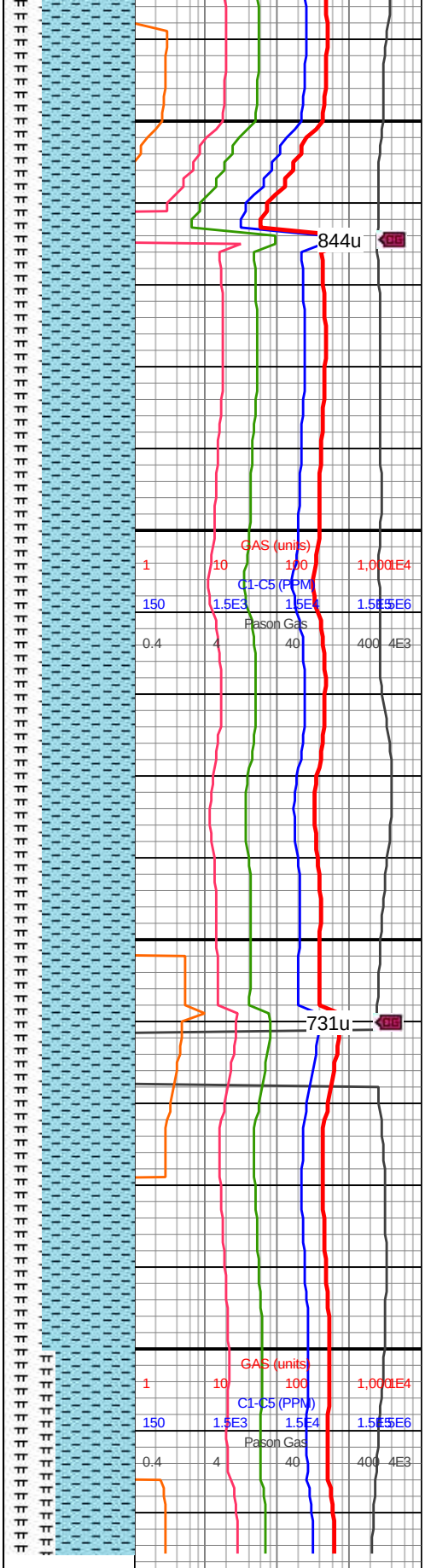
MD: 11,800'
TVD: 7,431.68'
INC: 89.01°
AZM: 92.12°
VS: 4,361.25'

MD: 11,865'
TVD: 7,432.53'
INC: 89.49°
AZM: 92.2°
VS: 4,426.19'

Projection to bit

MD: 11,925'
TVD: 7,433.06'
INC: 89.49°
AZM: 92.2°
VS: 4,486.14'

TD Well @ 01:49hrs 9/16/18



11700-11800 CHK (60%): predy off wh-lt gy, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (40%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

11800-11900 CHK (70%): predy off wh-lt gy, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (30%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl

11900-11925 CHK (60%): predy off wh-lt gy, med gy ip, predy sft-sb frm w hydrated ctngs, sm-sl slty tex, tr vf pyr, hi calc; MRLST (40%): med gy-dk gy-v dk gy, frm, brit, mod fis sb blky ctngs, sl slty tex, rr vf pyr, mod calc wi brn mrly resdl