RESERVOIR GROUP

Scale: 5" / 100'
Measured Depth Log

Well Name	Sam 3B-25H-M166		
Location	Sec. 25 T1N R66W		
State	Colorado	**County**	Weld
Country	USA	**Rig Number**	Ensign 140
API Number	05123461280000	**AFE #**	16190870
Geographic Region	Rockies	**Field**	Wattenberg
Spud Date	8/13/2018	**Drilling Completed**	8/15/2018
Surface Coordinates	Lat/Long: 40.018867/-104.733853 SHL: Sec: 25 Twp: 1N 66W Footage: 1403 FSL 311 FWL		
Bottom Hole Coordinates	Proposed BHL: Sec: 25 Twp: 1N 66W Footages: 2425 FFSLL 460 FFELL		
Ground Elevation	5,085'	**K.B. Elevation**	5,109'
Logged Interval	6,900' **To** 12,115'	**Total Depth**	12,115'
Formation	Codell		
Type of Drilling Fluid	Synthetic Oil Based Mud		

Operator

Company Crestone Peak Resources

Address 1801 California Street, Suite 2500
Denver, CO 80202

Geologist

Name John Ready

Company Crestone Peak Resources

Address 1801 California Street, Suite 2500

Zone Color Coding

Oil	Condensate	Gas
Note	Core	Pressure
Error	Water	Seal

Denver, CO 80202

Other

Loggers: Brian Ferwerda / Nicholas Watkins

Services Provided: 2-Man Mudlogging / Geosteering

Equipment: ML-522

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

Service Start Date: 8/14/2018

Rock Types

- UNKNOWN
- ANHYDRITE
- GYPSUM
- SALT
- SIDERITE or LIMONITE
- LIMESTONE
- DOLOMITE
- CHERT
- COAL
- MARLSTONE
- CHALK
- SHALE
- SHALE GRAY
- SHALE COLORED
- SILTSTONE
- SANDSTONE
- CONGLOMERATE
- BRECCIA
- TILL
- BENTONITE
- TUFF
- IGNEOUS
- METAMORPHIC
- CEMENT

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

- DEAD
- EVEN
- QUESTIONABLE
- SPOTTED STAINING

Porosity

- EARTHY
- FENESTRAL
- FRACTURE
- INTERCRYSTALLINE
- INTEROOLITIC
- MOLDIC
- ORGANIC
- PINPOINT
- VUGGY

Engineering

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

- ANGULAR
- ROUNDED
- SUBANG
- SUBRND

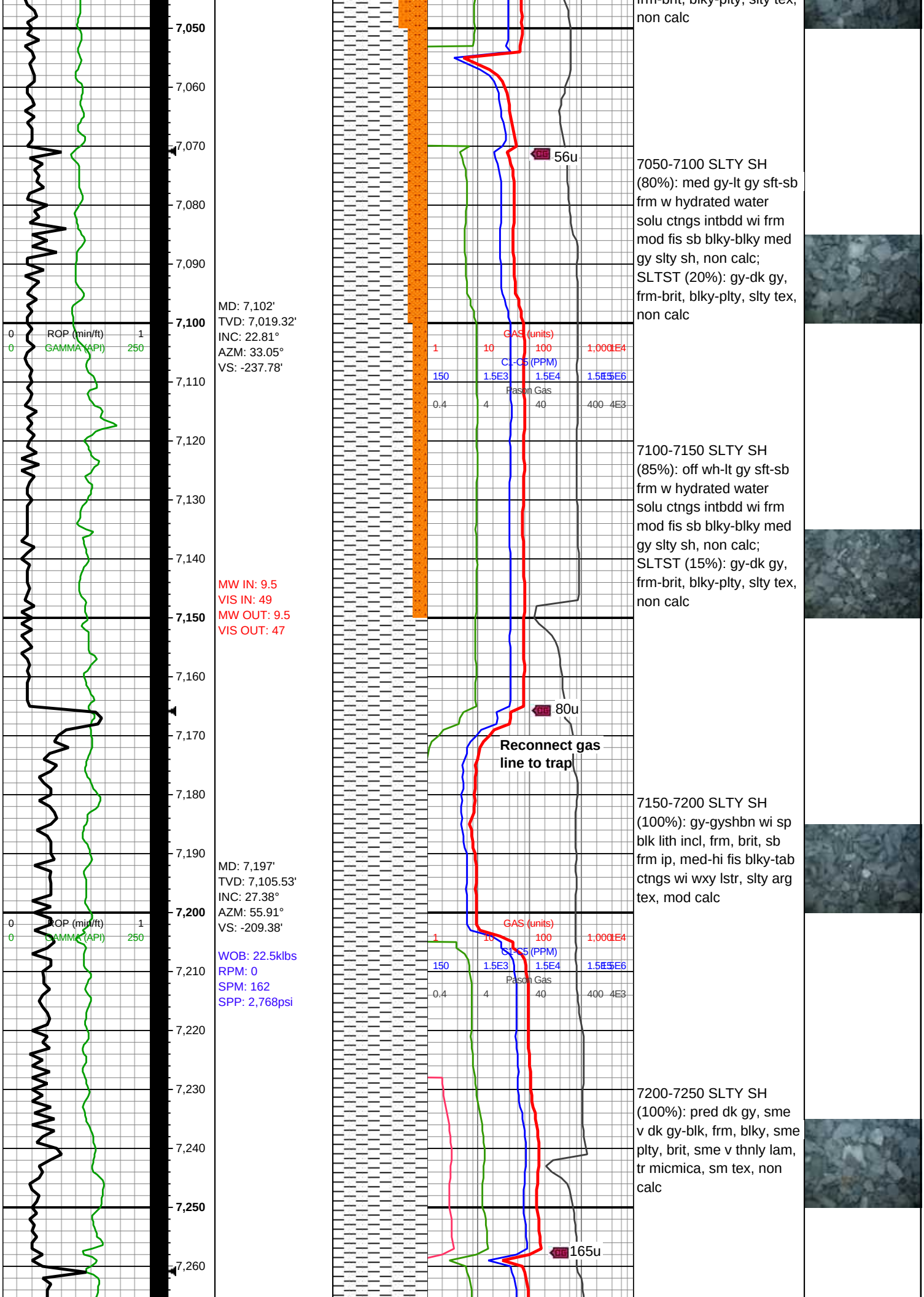
Textures

- BOUNDSTONE
- CHALKY
- CRYPTOXLN
- EARTHY
- FINELYXLN
- GRAINSTONE
- LITHOGRAPHIC
- MICROXLN
- MUDSTONE
- PACKSTONE
- WACKESTONE

Sorting

- MODERATE
- POOR
- 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 3B-25H-M166** **9 5/8" Surface Casing @ 2,428'** **Spud Date: 8/13/18** **2 man Logging Began: 8/14/18 @ 6,900'** **All Depths Correspond to Driller's Pipe Tally**		6,860 6,870 6,880 6,890 **6,900** 6,910 6,920 6,930 6,940 **6,950** 6,960 6,970 6,980 6,990 **7,000** 7,010 7,020 7,030 7,040	Bit #: 1 Type: U516M Size: 8 1/2 Depth In: 2,428' Depth Out: 12,115' Hours: 27.4 hrs Avg Ft/Hr: 354 '/hr Jets: 6x13 S/N: 41638 MD: 6,913' TVD: 6,841.47' INC: 12.7° AZM: 23.03° VS: -266.88' MW IN: 9.4+ VIS IN: 49 MW OUT: 9.5 VIS OUT: 48 WOB: 25.3klbs RPM: 0 SPM: 198 SPP: 3,582psi MD: 7,007' TVD: 6,931.27' INC: 21.36° AZM: 25.14° VS: -255.38'		**SYSTEM CALIBRATED** **1% Methane = 100 Units** **100% Methane = 10000 Units** 59u	6900-6950 SLTY SH (60%): off wh-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 6950-7000 SLTY SH (75%): predy gy-gyshbn sb frm-frm mod fis sb blky-sb plty, abnt hydrated gumbo slty sh, thn lamn, slty arg tex, non calc; SLTST (25%): gy-dk gy, frm-brit, sb plty-plty, brit, occ v dk gy wi vugy silc vn, tr vf pyr, non calc 7000-7050 SLTY SH (70%): predy 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 (30%): gy-dk gy,	  



frm-brit, blky-plty, slty tex, non calc

7050-7100 SLTY SH (80%): med gy-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 (20%): gy-dk gy, frm-brit, blky-plty, slty tex, non calc

7100-7150 SLTY SH (85%): 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 (15%): gy-dk gy, frm-brit, blky-plty, slty tex, non calc

7150-7200 SLTY SH (100%): gy-gyshbn wi sp blk lith incl, frm, brit, sb frm ip, med-hi fis blky-tab ctngs wi wxy lstr, slty arg tex, mod calc

7200-7250 SLTY SH (100%): pred dk gy, sme v dk gy-blk, frm, blky, sme plty, brit, sme v thnly lam, tr micmica, sm tex, non calc

7,270
7,280
7,290
7,300
7,310
7,320
7,330
7,340
7,350
7,360
7,370
7,380
7,390
7,400
7,410
7,420
7,430
7,440
7,450
7,460
7,470
7,480

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

MD: 7,291'
TVD: 7,187.19'
INC: 32.08°
AZM: 66.89°
VS: -168.32'

Sharon Springs
7300 MD/7195 TVD

Niobrara
7315 MD/7207 TVD

7250-7300 SLTY SH (100%): gyshbn-med gy, mot lt gy, lam dk brn, blky-sb tab ctngs, sl frm-frm, stri, vf lam, sl slty tex, sl micmica, non-sl calc, mnr imbd/dissm mic pyr

7300-7350 MRLST (80%): dk gy-v dk gy, frm-brit, med-hi fis blky ctngs, rr vf pyr; CHK (20%): lt gy-gy, sb frm-frm, rd-sb rd-sb blky l-mod fis ctngs, f wh chky incl, rr vf pyr, hi calc

395u

MD: 7,385'
TVD: 7,263.03'
INC: 40.25°
AZM: 71.55°
VS: -116.33'

WOB: 31.2klbs
RPM: 0
SPM: 198
SPP: 3,775psi

7350-7400 MRLST (75%): dk gy-dk gyshbn, sl hd-v frm, mod fis, sb blky-tab ctngs, sm arg tex, mod calc, tr pp mic pyr; CHK (25%): med brn-gyshbn, frm-sft, mod fis, tab-sb blky, tr free CHK, v calc

7400-7450 MRLST (85%): pred med-sme dk gry, blky-sb blky, brit-sl hrd, hi calc, chky lam wi sme chky tex; CHK (15%): pred lt med gy-sme occ lt brn, sl sft-frm, blky, v-hi calc, v rr-occ pyrc nod wi sme tr pyr

288u

MW IN: 9.5
VIS IN: 48
MW OUT: 9.5
VIS OUT: 46

MD: 7,480'
TVD: 7,331.36'
INC: 47.77°
AZM: 79.64°

7450-7500 MRLST (75%): med gy-dk gy-occ blk, frm-hd-brit, med fis sb blky-blky, sm-sl slty

VS: -52.37'

7,490

7,500

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

7,510

7,520

7,530

7,540

B Chalk
7549 MD/7376 TVD

7,550

7,560

7,570

MD: 7,575'
TVD: 7,392.65'
INC: 52.03°
AZM: 90.45°
VS: 19.87'

7,580

7,590

WOB: 37.2klbs
RPM: 0
SPM: 202
SPP: 4,092psi

7,600

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

7,610

7,620

7,630

MW IN: 9.5
VIS IN: 45
MW OUT: 9.5+
VIS OUT: 42

7,640

7,650

C Chalk
7658 MD/7442 TVD

7,660

MD: 7,670'
TVD: 7,448.44'
INC: 56.03°
AZM: 93.35°
VS: 96.66'

7,670

7,680

7,690

7,700

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

415u

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

542u

GAS (units)
1 10 100 1,000 1E4

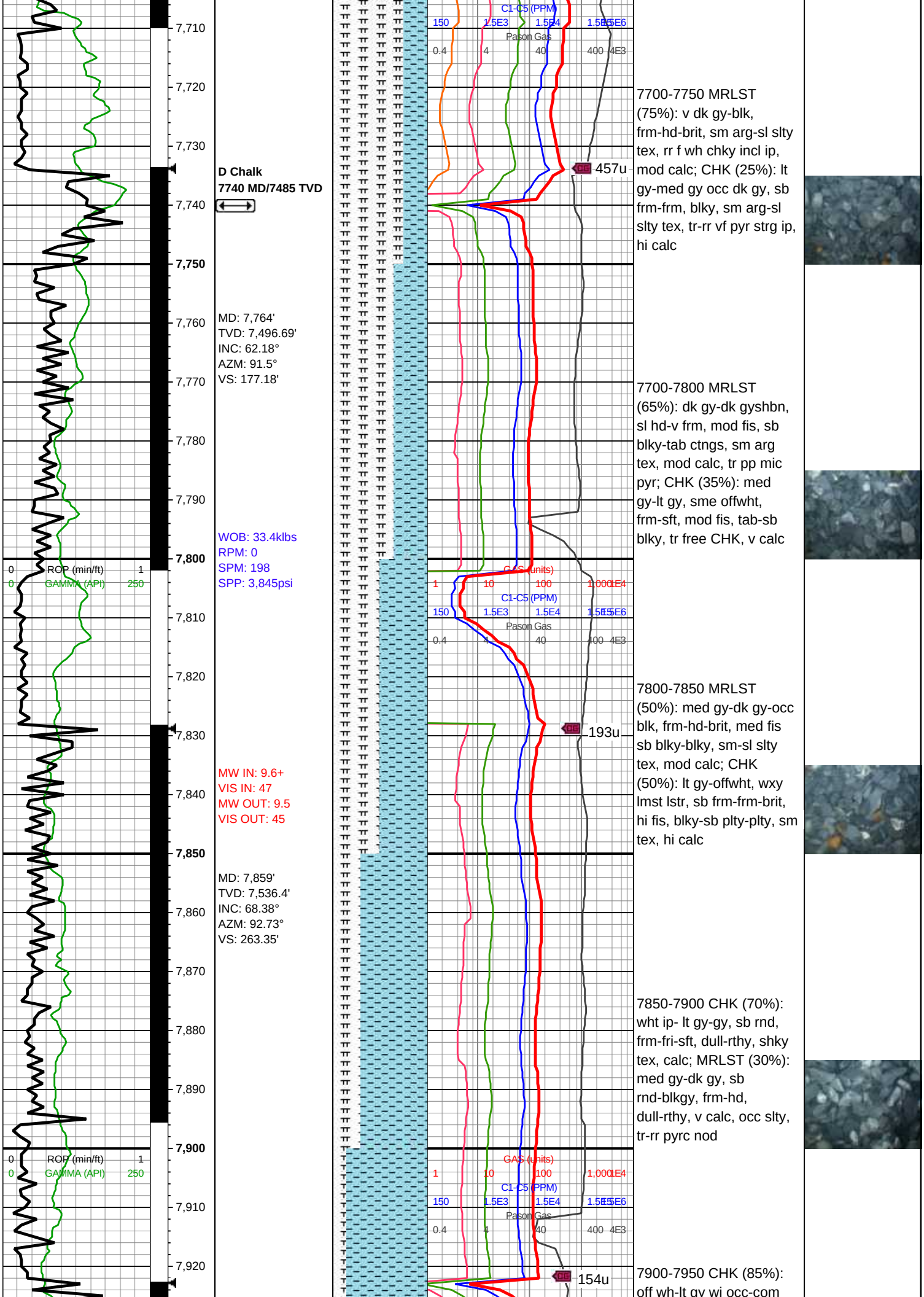
tex, mod calc, CHK (25%): lt gy-dk gy, tn hue thru, wxy lmst lstr, sb frm-frm-brit, hi fis, blky-sb plty-plty, chky tex, hi calc

7500-7550 MRLST (60%): dk gy-gyshbn ip, sb frm-frm, brit ip, blky, sm-sl slty arg tex, occ mot brn mrly incl ip, occ calc frac fill; CHK (40%): med gy, dk gy ip, tr lt gy, frm-brit, sb blky-blky ctngs, chky tex, occ foram, tr vf pyr, hi calc

7550-7600 CHK (65%): v lt gy-lt gy, med gy ip, sft-sb frm-frm mod fis sb blky-blky ctngs, sm chky-sl slty arg tex, hi calc; MRLST (35%): dk gy-blk wi occ brn marl incl, frm, brit, mod fis sb blky-blky ctngs, sm sl slty tex, mod calc

7600-7650 MRLST (70%): med gy-dk gy-occ blk, frm-hd-brit, med fis sb blky-blky, sm-sl slty tex, mod calc; CHK (30%): lt gy-dk gy, tn hue thru, wxy lmst lstr, sb frm-frm-brit, hi fis, blky-sb plty-plty, sm tex, hi calc

7650-7700 CHK (70%): lt gy-gyshbn-med gy wi occ f wh chky incl thru, frm, sb blky-blky ctngs, chky tex, rr-tr foram, tr fos frags, v calc; MRLST (30%): med gyshbn-dk gy, frm-brit, blky-sb blky, sm arg-sl slty tex, mod calc



D Chalk
7740 MD/7485 TVD

MD: 7,764'
TVD: 7,496.69'
INC: 62.18°
AZM: 91.5°
VS: 177.18'

WOB: 33.4klbs
RPM: 0
SPM: 198
SPP: 3,845psi

MW IN: 9.6+
VIS IN: 47
MW OUT: 9.5
VIS OUT: 45

MD: 7,859'
TVD: 7,536.4'
INC: 68.38°
AZM: 92.73°
VS: 263.35'

7700-7750 MRLST (75%): v dk gy-blk, frm-hd-brit, sm arg-sl slty tex, rr f wh chky incl ip, mod calc; CHK (25%): lt gy-med gy occ dk gy, sb frm-frm, blky, sm arg-sl slty tex, tr-rr vf pyr strg ip, hi calc

7700-7800 MRLST (65%): dk gy-dk gyshbn, sl hd-v frm, mod fis, sb blky-tab ctngs, sm arg tex, mod calc, tr pp mic pyr; CHK (35%): med gy-lt gy, sme offwht, frm-sft, mod fis, tab-sb blky, tr free CHK, v calc

7800-7850 MRLST (50%): med gy-dk gy-occ blk, frm-hd-brit, med fis sb blky-blky, sm-sl slty tex, mod calc; CHK (50%): lt gy-offwht, wxy lmst lstr, sb frm-frm-brit, hi fis, blky-sb plty-plty, sm tex, hi calc

7850-7900 CHK (70%): wht ip- lt gy-gy, sb rnd, frm-fri-sft, dull-rthy, shky tex, calc; MRLST (30%): med gy-dk gy, sb rnd-blkgy, frm-hd, dull-rthy, v calc, occ slty, tr-rr pyrc nod

7900-7950 CHK (85%): off wh-lt gy wi occ-com

7,930
7,940
7,950
7,960
7,970
7,980
7,990
8,000
8,010
8,020
8,030
8,040
8,050
8,060
8,070
8,080
8,090
8,100
8,110
8,120
8,130
8,140

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

MD: 7,954'
TVD: 7,564.68'
INC: 76.95°
AZM: 95.28°
VS: 353.67'

WOB: 41.3klbs
RPM: 30
SPM: 202
SPP: 4,538psi

MD: 8,048'
TVD: 7,583.79'
INC: 79.59°
AZM: 95.72°
VS: 445.22'

MW IN: 9.7
VIS IN: 46
MW OUT: 9.6+
VIS OUT: 45

Fort Hayes
8080 MD/7589 TVD

MD: 8,143'
TVD: 7,598.59'
INC: 82.49°

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

153u

576u

wh chky incl, sft-sb frm, sb blky-blky, sm chk, tr vf pyr, hi calc; MRLST (15%): dk gy, frm, brit, sb blky, sl slty tex, occ brn marly incl, rr vf pyr, mod calc

7950-8000 CHK (75%): v lt gy-lt gy, lt gyshbn-med gy ip, sft-sb frm-frm, sb blky-blky, tr c pyr strg, hi calc; MRLST (25%): dk gy-blk wi occ brn marl incl, frm, brit, mod fis sb blky-blky ctngs, sm sl slty tex, mod calc

8000-8050 LS (70%): tn-lt brn, frm, brit, ang ctngs, crpxln mudst, occ wkst, tr vf pyr, hi calc; CHK (30%): off wh-lt gy, sft-sb frm-frm-brit mod fis sb blky-blky ctngs, occ-com wh chky incl, sm chky-sl slty-sl gt tex, tr vf pyr, hi calc

8050-8100 LMST (100%): lt gy-tn-lt gyshbn, rr dk gy lmst, crpxln mudst, occ wkst, tr vf pyr, hi calc

AZM: 92.56°
VS: 538.75'

8,150
8,160
8,170
8,180
8,190
8,200
8,210
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

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

WOB: 40.5klbs
RPM: 31
SPM: 201
SPP: 4,577psi

GAS (units)
1 10 100 1000 1E4
C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

450u

8100-8200LS (100%): lt gy-tn-lt brn, frm, brit, sb blky-blky, sme plty, crpxln mudst-mict, occ wkst, tr vf pyr, hi calc

MD: 8,237'
TVD: 7,608.45'
INC: 85.47°
AZM: 90.27°
VS: 632.17'

MW IN: 9.8
VIS IN: 45
MW OUT: 9.7
VIS OUT: 43

Codell
8279 MD/7612 TVD

8200-8300 LS (90%) med gry-tn wht ip, hd-brit, v ang-blky, cryptoxln tex, hi calc; SST (10%): pred med gy-dk gy brn, fri-sli fri gr sup clus cons wi arg & silc cmt, occ lt gy-gy mtx sup ss cons wi arg cmt, ply srtd vf-f sd grs, calc

303u

MD: 8,331'
TVD: 7,614.61'
INC: 87.01°
AZM: 87.99°
VS: 725.95'

MW IN: 9.8+
VIS IN: 46
MW OUT: 9.8
VIS OUT: 45

WOB: 36.1klbs
RPM: 0
SPM: 200
SPP: 3,777psi

MD: 8,426'
TVD: 7,620.62'
INC: 85.74°
AZM: 87.72°
VS: 815.39'

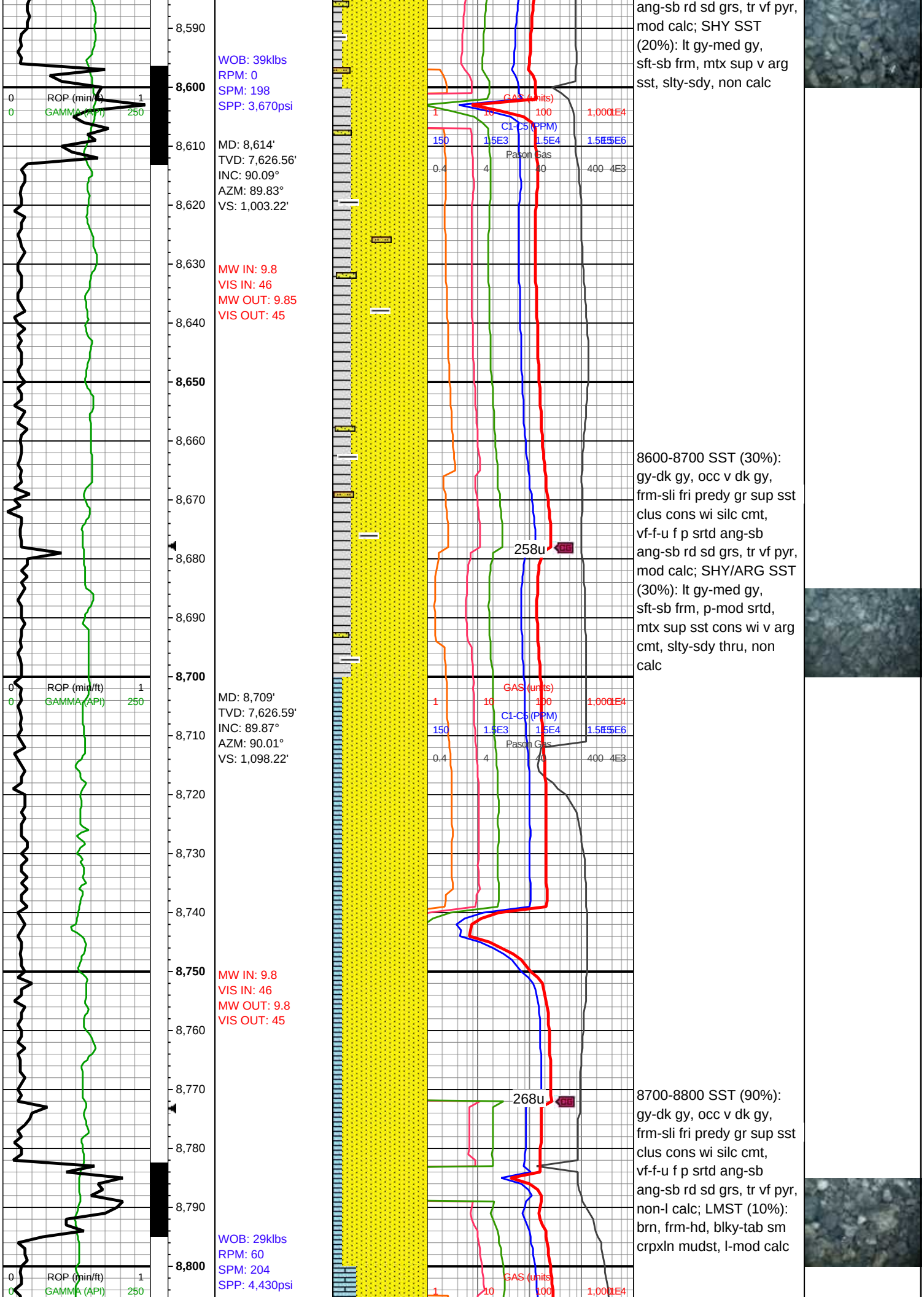
MW IN: 9.8
VIS IN: 46
MW OUT: 9.8
VIS OUT: 45

MD: 8,520'
TVD: 7,625.37'
INC: 88.46°
AZM: 90.01°
VS: 909.23'

8300-8400 SST (100%): lt gy-gy-gy-gyshbn-dk gy, p-mod srtd vf-f sd grs, predy frm-hd sli fri gr sup sst clus cons wi silc cmt wi com wh sd grs, com off wh-lt gy-gy sft-sb frm v arg sst, predy non calc, sl calc ip

8400-8500 SST (100%): dk gy-dk gy brn gr-mtx sup clus, occ lt gy-gy mtx sup sst, pred dk gy wi f sb rd qtz sd gr incl, p srtd vf-f sd grs, pred sb rd-rd sli fri gr sup ss clus cons wi silc & arg cmt, uncons ip, non calc

8500-8600 SST (80%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb



ang-sb rd sd grs, tr vf pyr, mod calc; SHY SST (20%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

8600-8700 SST (30%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY/ARG SST (30%): lt gy-med gy, sft-sb frm, p-mod srtd, mtx sup sst cons wi v arg cmt, slty-sdy thru, non calc

8700-8800 SST (90%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, non-l calc; LMST (10%): brn, frm-hd, blky-tab sm crpxln mudst, l-mod calc

MD: 8,803'
TVD: 7,625.3'
INC: 91.71°
AZM: 89.92°
VS: 1,192.21'

MD: 8,899'
TVD: 7,622.28'
INC: 91.89°
AZM: 90.09°
VS: 1,288.16'

15' DTW

MD: 8,993'
TVD: 7,619.72'
INC: 91.23°
AZM: 89.92°
VS: 1,382.13'

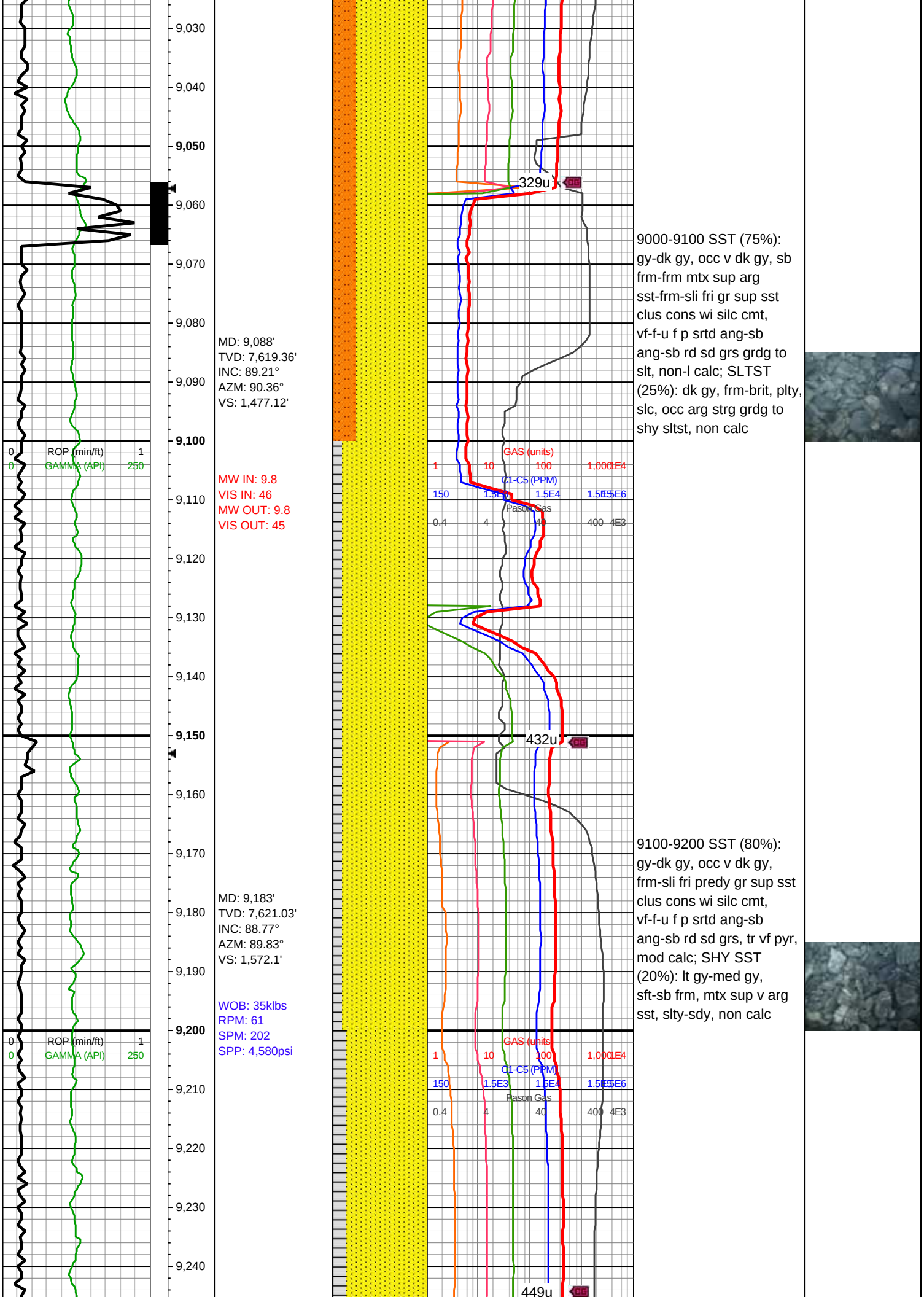
WOB: 37klbs
RPM: 60
SPM: 201
SPP: 4,600psi

538u

1651u

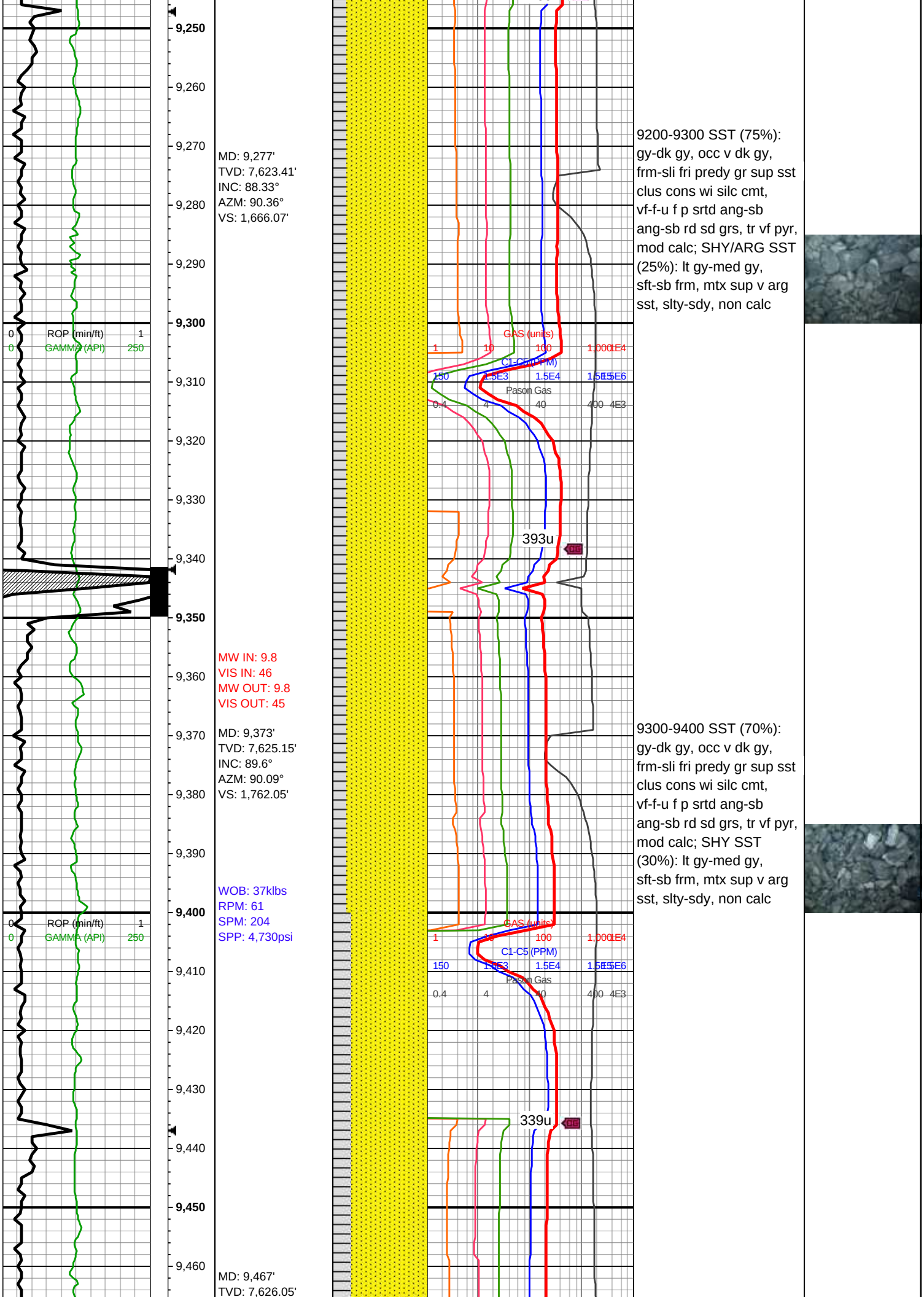
8800-8900 SST (75%): gy-dk gy-occ v dk gy, frm-hd, mod srtd f-u f ang-sb ang-sb rd sd grs, sli fri gr sup sst clus cons wi silc cmt, non-l calc; LMST (25%): brn, frm-hd, blky-tab sm crpxln mudst, l-mod calc

8900-9000 SST (90%): gy-dk gy, occ v dk gy, sb frm-frm mtx sup arg sst-frm-sli fri gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs grdg to slt, non-l calc; SLTST (10%): dk gy, frm-brit, plty, slc, occ arg strg grdg to shy sltst, non calc



9000-9100 SST (75%): gy-dk gy, occ v dk gy, sb frm-frm mtx sup arg sst-frm-sli fri gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs grdg to slt, non-l calc; SLTST (25%): dk gy, frm-brit, plty, slc, occ arg strg grdg to shy sltst, non calc

9100-9200 SST (80%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY SST (20%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc



9200-9300 SST (75%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY/ARG SST (25%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

9300-9400 SST (70%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY SST (30%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

INC: 89.3°
AZM: 90.45°
VS: 1,856.05'

9,470
9,480
9,490
9,500
9,510
9,520
9,530
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

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

338u

9400-9500 SST (65%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY/ARG SST (35%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

MD: 9,562'
TVD: 7,627.76'
INC: 88.64°
AZM: 90.53°
VS: 1,951.03'

WOB: 37klbs
RPM: 61
SPM: 200
SPP: 4,700psi

312u

9500-9600 SST (50%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt grdg down to sltst, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY SST (35%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc; SLST (15%): gy-dk gy, frm, brit, silc-occ sl arg, non calc

MW IN: 9.8
VIS IN: 46
MW OUT: 9.8
VIS OUT: 45

MD: 9,656'
TVD: 7,628.84'
INC: 90.04°
AZM: 89.66°
VS: 2,045.02'

9600-9700 SST (50%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt grdg down to sltst, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY SST (35%): lt

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

9,690
9,700
9,710
9,720
9,730
9,740
9,750
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

281u

gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc; SLST (15%): gy-dk gy, frm, brit, silc-occ sl arg, non calc

MD: 9,750'
TVD: 7,629.35'
INC: 89.34°
AZM: 90.71°
VS: 2,139.01'

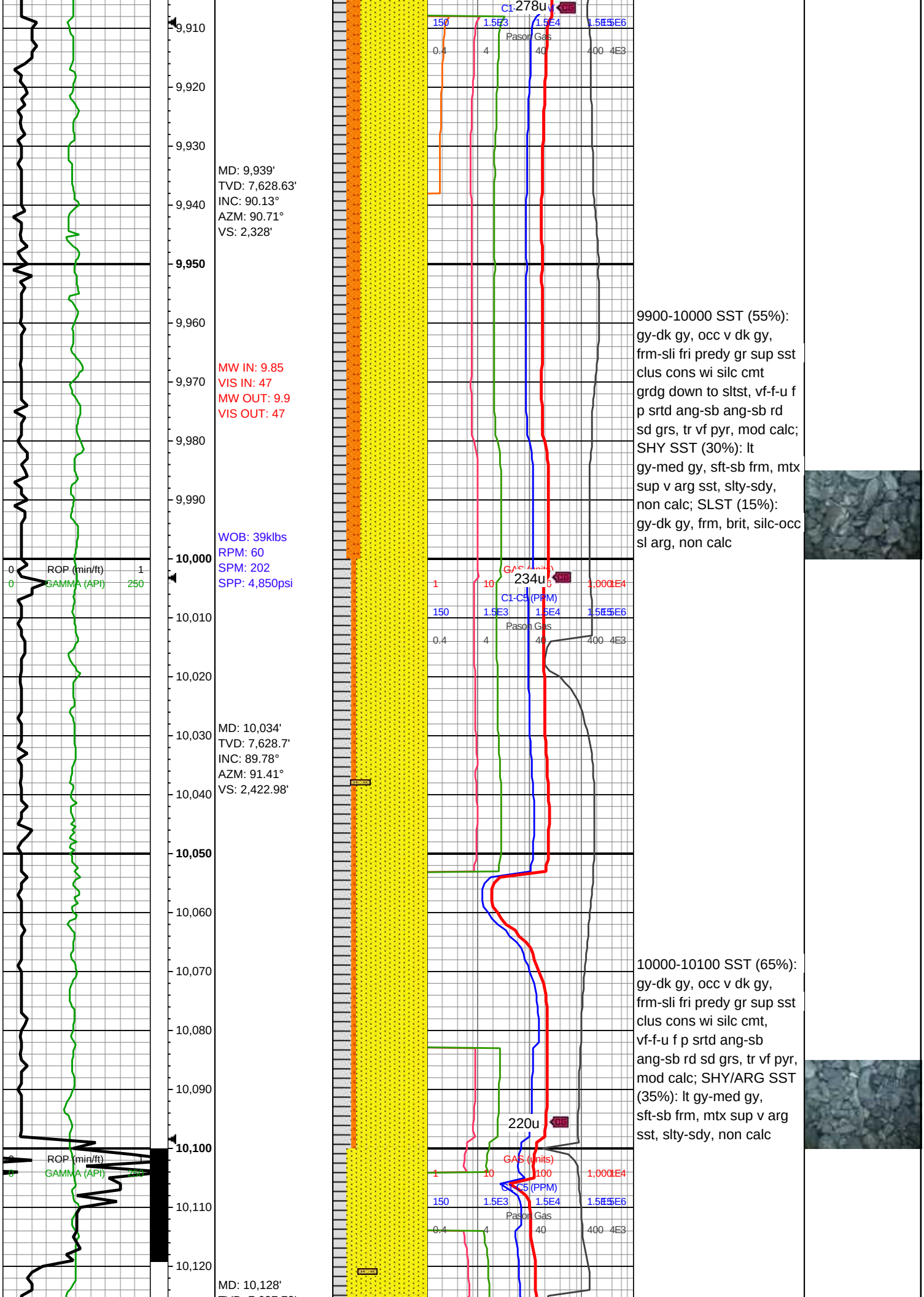
9700-9800 SST (60%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt grdg down to sltst, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY SST (30%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc; SLST (10%): gy-dk gy, frm, brit, silc-occ sl arg, non calc

WOB: 39klbs
RPM: 60
SPM: 202
SPP: 4,780psi

210u

MD: 9,844'
TVD: 7,629.32'
INC: 90.7°
AZM: 89.39°
VS: 2,233.01'

9800-9900 SST (45%): dk gy-v dk gy, mod srtd slty-vf sd grs grdg to sltst-arg sltst, f sd grs ip, sb frm-frm mtx sup arg sst, l-mod calc wi incr arg cmt grdg to shy sst; SHY SST (40%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc; SLST (15%): gy-dk gy, frm, brit, silc-occ sl arg, non calc



9900-10000 SST (55%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt grdg down to sltst, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY SST (30%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc; SLST (15%): gy-dk gy, frm, brit, silc-occ sl arg, non calc

10000-10100 SST (65%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY/ARG SST (35%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

TVD: 7,627.73'
INC: 91.41°
AZM: 89.3°
VS: 2,516.97'

MW IN: 9.85
VIS IN: 47
MW OUT: 9.9
VIS OUT: 47

WOB: 31klbs
RPM: 60
SPM: 200
SPP: 4,470psi

MD: 10,223'
TVD: 7,625.57'
INC: 91.19°
AZM: 89.83°
VS: 2,611.94'

MD: 10,318'
TVD: 7,623.71'
INC: 91.06°
AZM: 90.53°
VS: 2,706.92'

10,130
10,140
10,150
10,160
10,170
10,180
10,190
10,200
10,210
10,220
10,230
10,240
10,250
10,260
10,270
10,280
10,290
10,300
10,310
10,320
10,330
10,340

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

236u

200u

10100-10200 SST (70%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY SST (30%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

10200-10300 SST (80%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-p-mod srtd ang-sb ang-sb rd sd grs, tr vf pyr-pyr intbdd strg, l-mod calc; SHY SST (20%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

MNDEPTH 8/15/18

10,350
10,360
10,370
10,380
10,390
10,400
10,410
10,420
10,430
10,440
10,450
10,460
10,470
10,480
10,490
10,500
10,510
10,520
10,530
10,540
10,550
10,560

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

227u

MD: 10,413'
TVD: 7,622.28'
INC: 90.66°
AZM: 92.29°
VS: 2,801.87'

10300-10400 SST (80%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-p-mod srtd ang-sb ang-sb rd sd grs, tr vf pyr-pyr intbdd strg, l-mod calc; SHY SST (20%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

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

174u

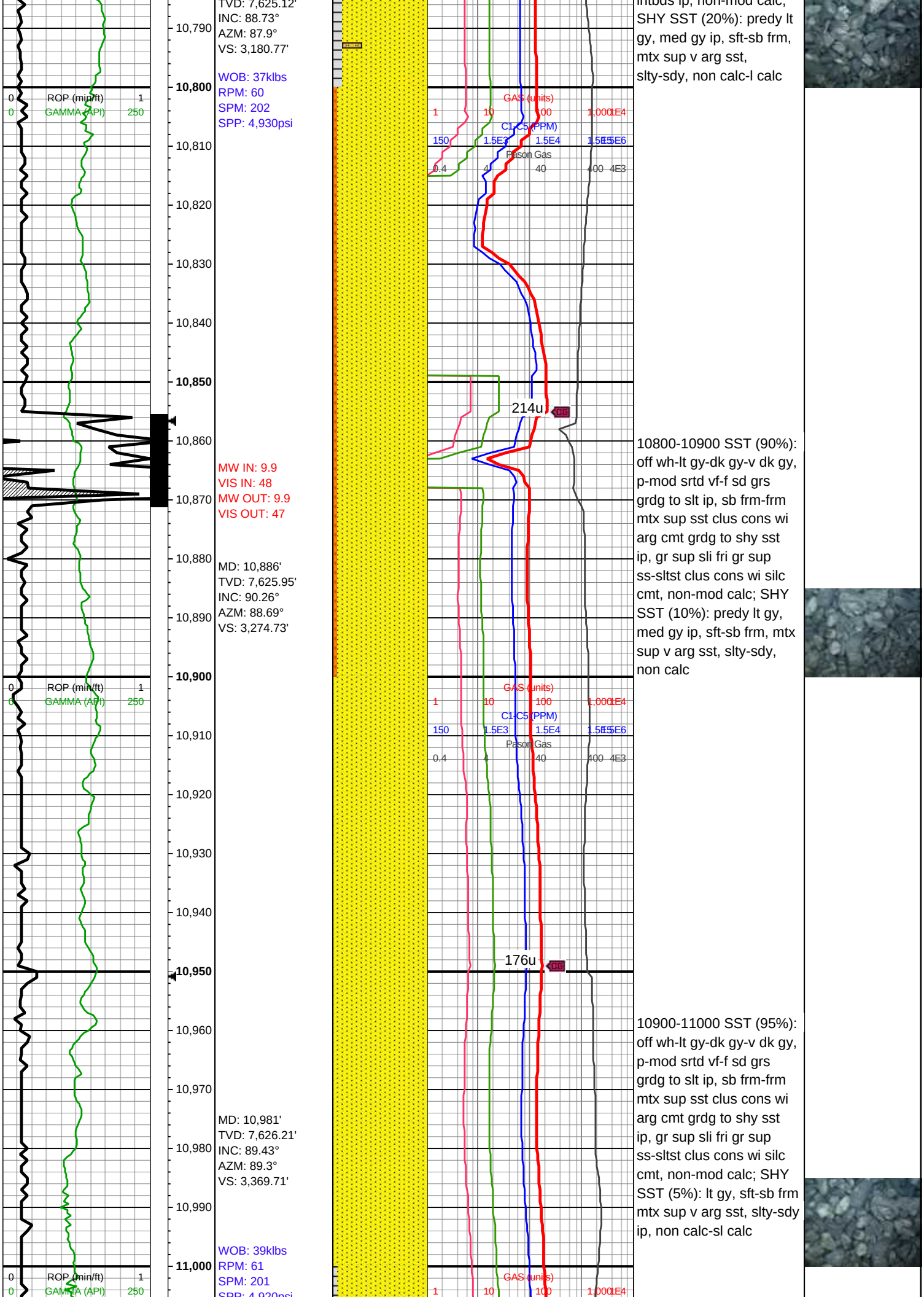
10400-10500 SST (70%): gy-dk gy-v dk gy, p-mod srtd vf sd grs grdg to slt, frm-sli fri gr-mtx sup sst clus cons wi silc cmt-arg mtx sup cmt ip, non-mod calc; SHY SST (30%): predy lt gy, med gy ip, wh lamn ip, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

MD: 10,507'
TVD: 7,622.17'
INC: 89.47°
AZM: 89.39°
VS: 2,895.85'

10500-10600 SST (70%): gy-dk gy-v dk gy, p-mod srtd vf sd grs grdg to slt, frm-sli fri gr-mtx sup sst clus cons wi silc cmt-arg mtx sup cmt ip, non-mod calc; SHY SST (30%): predy lt gy, med gy ip, wh lamn ip, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

10600-10700 SST (75%): gy-dk gy-v dk gy, occ lt gy arg sst grdg to shy sst, p-mod srtd vf-f sd grs grdg to slt, sb frm-frm-sli fri gr-mtx sup sst clus cons wi silc cmt-arg mtx sup cmt ip, non-mod calc; SHY SST (25%): predy lt gy, med gy ip, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

10700-10800 SST (80%): gy-dk gy, p-mod srtd vf-f sd grs grdg to slt ip, pred gr-mtx sup sst clus cons wi silc-arg cmt, slty



intbds lp, non-mod calc, SHY SST (20%): predy lt gy, med gy ip, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc-l calc

10800-10900 SST (90%): off wh-lt gy-dk gy-v dk gy, p-mod srtd vf-f sd grs grdg to slt ip, sb frm-frm mtx sup sst clus cons wi arg cmt grdg to shy sst ip, gr sup sli fri gr sup ss-sltst clus cons wi silc cmt, non-mod calc; SHY SST (10%): predy lt gy, med gy ip, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

10900-11000 SST (95%): off wh-lt gy-dk gy-v dk gy, p-mod srtd vf-f sd grs grdg to slt ip, sb frm-frm mtx sup sst clus cons wi arg cmt grdg to shy sst ip, gr sup sli fri gr sup ss-sltst clus cons wi silc cmt, non-mod calc; SHY SST (5%): lt gy, sft-sb frm mtx sup v arg sst, slty-sdy ip, non calc-sl calc

SPP: 4,920psi

MW IN: 9.9
VIS IN: 48
MW OUT: 9.9
VIS OUT: 47

MD: 11,075'
TVD: 7,626.42'
INC: 90.31°
AZM: 88.6°
VS: 3,469'

MD: 11,170'
TVD: 7,626.13'
INC: 90.04°
AZM: 88.69°
VS: 3,563.99'

WOB: 37klbs
RPM: 61
SPM: 204
SPP: 5,040psi

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

C1-C5 (PPM)
150 1.5E3 1.5E4 1.5E5 1.5E6
Pason Gas
0.4 4 40 400 4E3

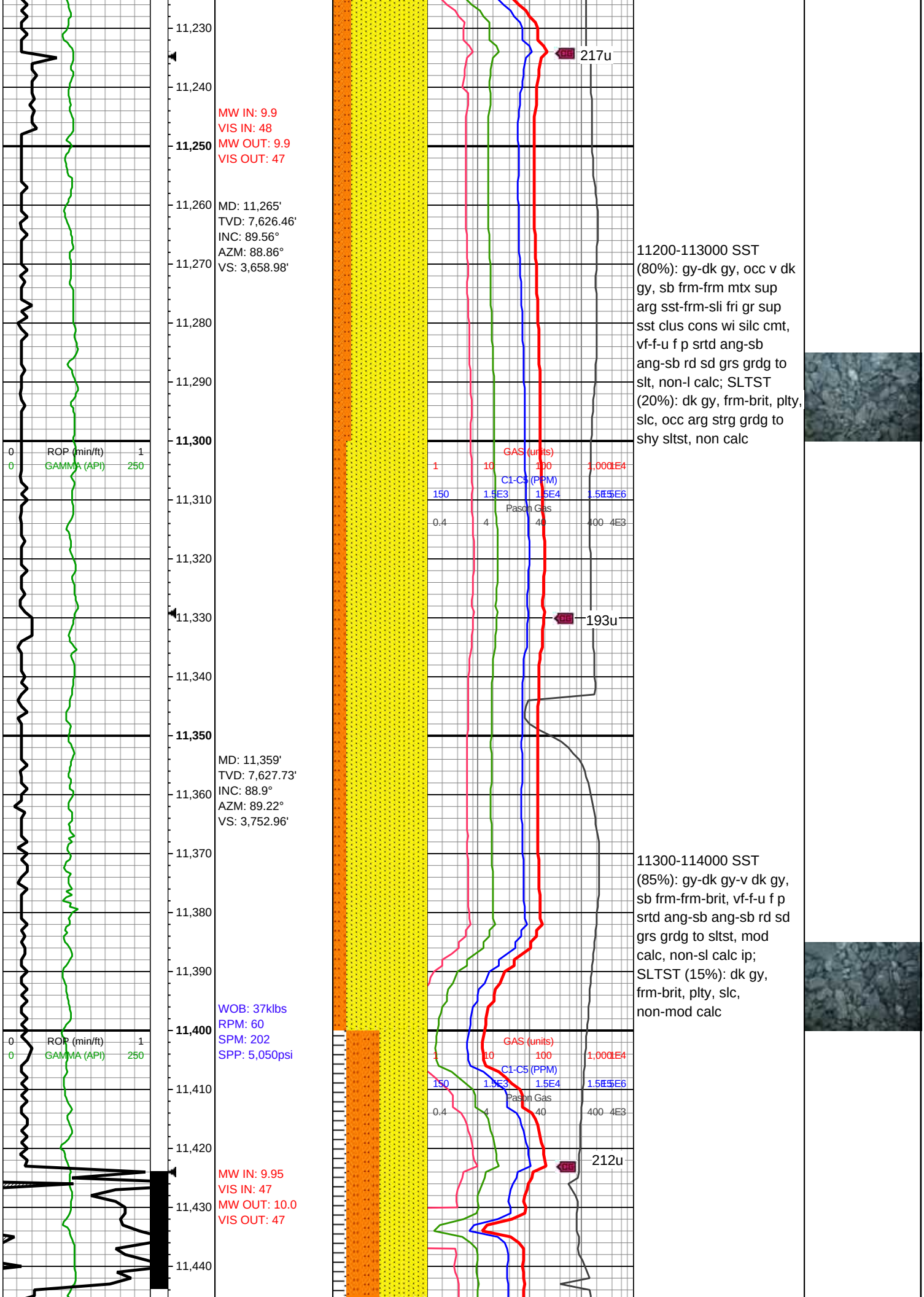
GAS (units)
1 10 100 1,000 1E4

263u

223u

11000-11100 SST (90%): gy-dk gy, p-mod srtd vf-f sd grs grdg to slt ip, pred gr-mtx sup sst clus cons wi silc-arg cmt, slty intbds ip, mod calc; SHY SST (10%): predy lt gy, med gy ip, sft-sb frm, mtx sup v arg sst, slty-sdy, l calc

11100-11200 SST (80%): gy-dk gy, p-mod srtd vf-f sd grs grdg to slt ip, pred gr-mtx sup sst clus cons wi silc-arg cmt, slty intbds ip, mod calc; SHY SST (20%): predy lt gy, med gy ip, sft-sb frm, mtx sup v arg sst, slty-sdy, l calc



11200-113000 SST (80%): gy-dk gy, occ v dk gy, sb frm-frm mtx sup arg sst-frm-sli fri gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs grdg to slt, non-l calc; SLTST (20%): dk gy, frm-brit, plty, slc, occ arg strg grdg to shy sltst, non calc

11300-114000 SST (85%): gy-dk gy-v dk gy, sb frm-frm-brit, vf-f-u f p srtd ang-sb ang-sb rd sd grs grdg to sltst, mod calc, non-sl calc ip; SLTST (15%): dk gy, frm-brit, plty, slc, non-mod calc

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

11,450
11,460
11,470
11,480
11,490
11,500
11,510
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

MD: 11,454'
TVD: 7,628.67'
INC: 89.96°
AZM: 88.07°
VS: 3,847.94'

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

181u

11400-11500 SST (50%): gy-dk gy-v dk gy, p-mod srtd vf sd grs grdg to slt, frm-sli fri gr-mtx sup sst clus cons wi silc cmt-arg mtx sup cmt ip, non-mod calc; SLTST (35%): dk gy, frm-brit, plty, slc, non-mod calc; SHY SST (15%): predy lt gy, med gy ip, wh lamn ip, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

MD: 11,549'
TVD: 7,629.29'
INC: 89.3°
AZM: 87.99°
VS: 3,942.9'

11500-11600 SLST (55%): gy-dk gy, frm, brit, silc-occ sl arg, non calc; SST (30%): dk gy-v dk gy, mod srtd slty-vf sd grs grdg to sltst-arg sltst, f sd grs ip, sb frm-frm mtx sup arg sst, l-mod calc wi incr arg cmt grdg to shy sst; SHY SST (15%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

WOB: 40klbs
RPM: 60
SPM: 200
SPP: 5,016psi

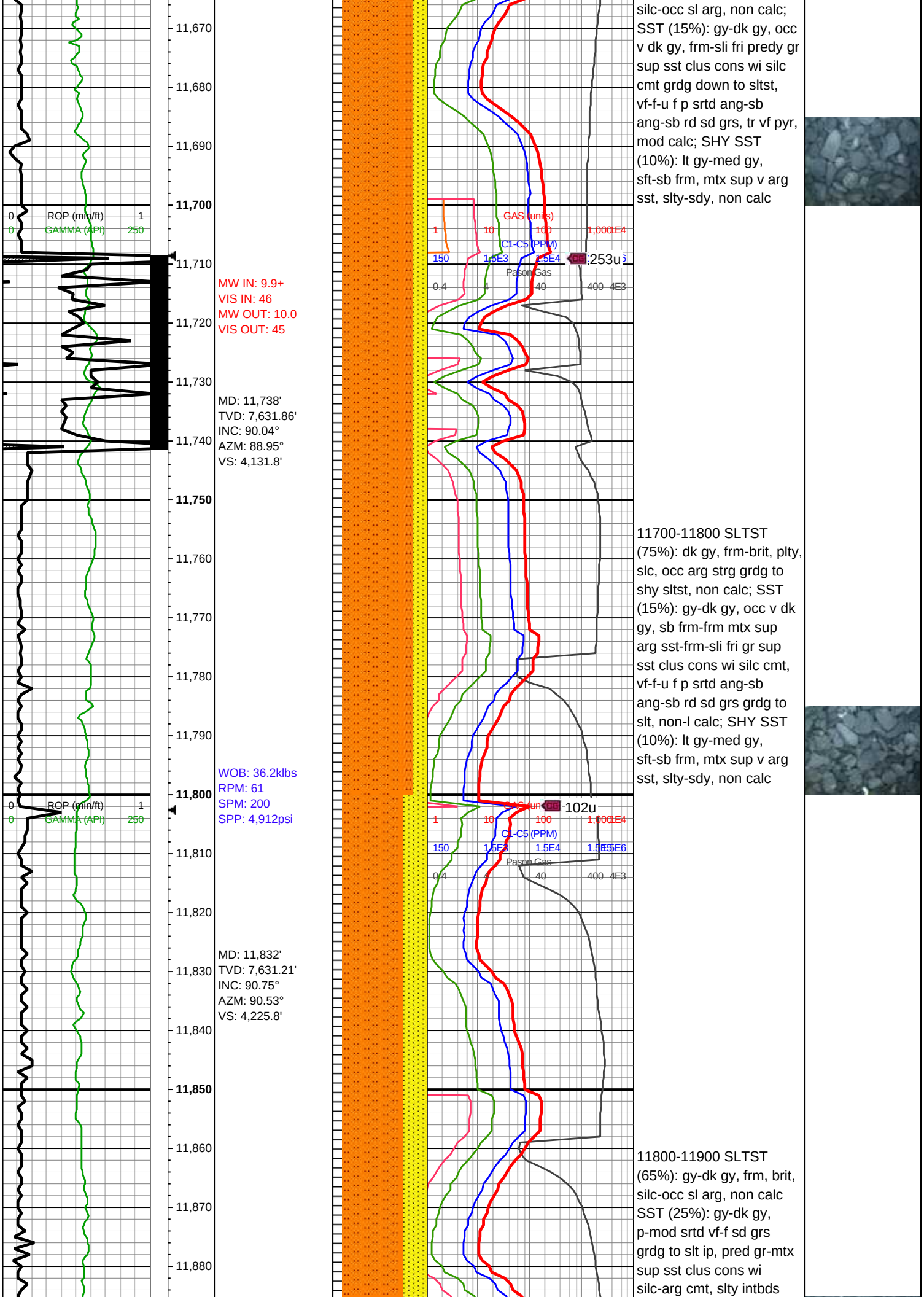
0 ROP (min/ft) 1
0 GAMMA (API) 250

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

299u

MD: 11,644'
TVD: 7,630.89'
INC: 88.77°
AZM: 87.55°
VS: 4,037.84'

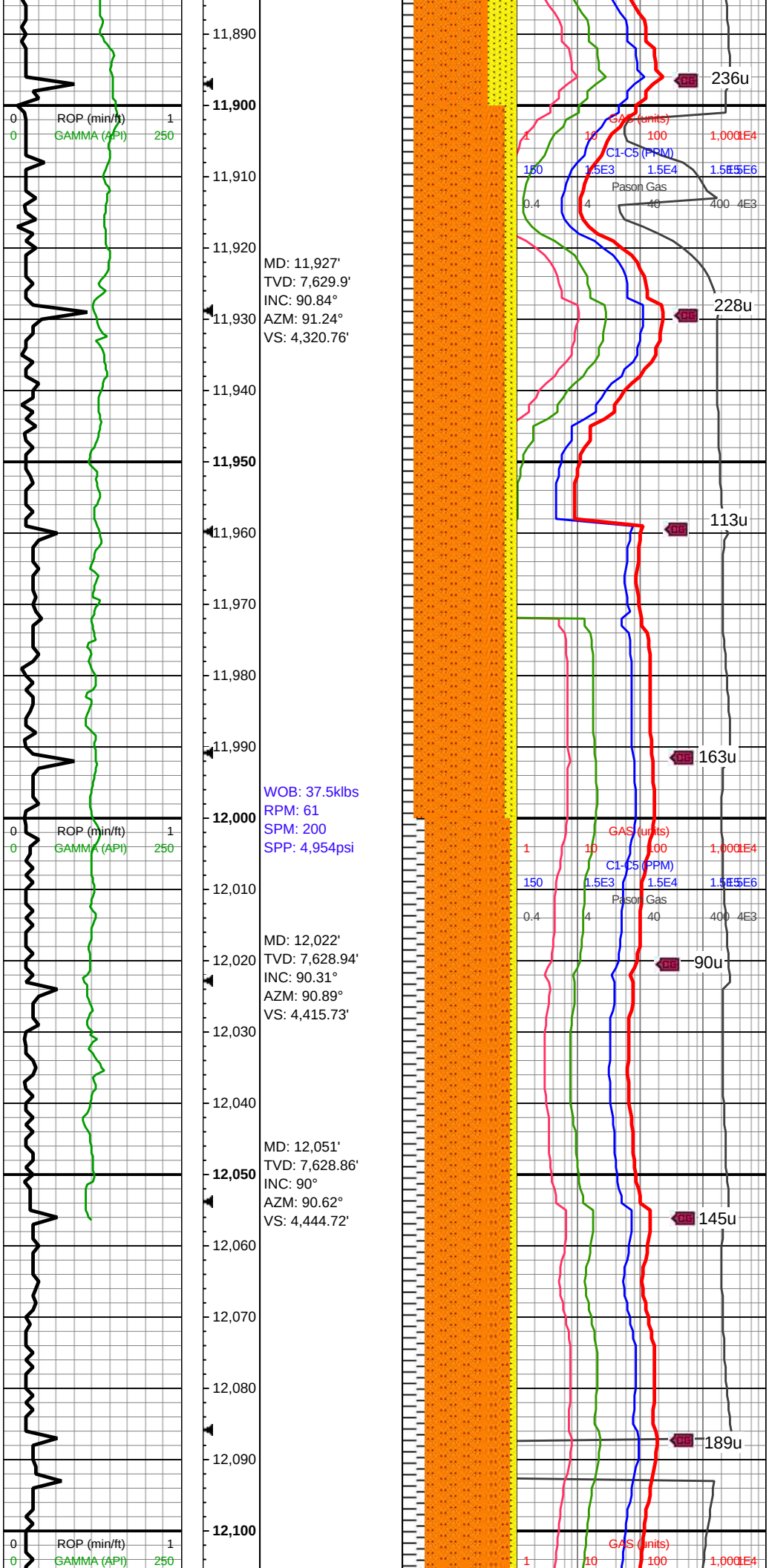
11600-11700 SLTST (75%): gy-dk gy, frm, brit,



silc-occ sl arg, non calc; SST (15%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt grdg down to sltst, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SHY SST (10%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

11700-11800 SLTST (75%): dk gy, frm-brit, plty, slc, occ arg strg grdg to shy sltst, non calc; SST (15%): gy-dk gy, occ v dk gy, sb frm-frm mtx sup arg sst-frm-sli fri gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs grdg to slt, non-l calc; SHY SST (10%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

11800-11900 SLTST (65%): gy-dk gy, frm, brit, silc-occ sl arg, non calc SST (25%): gy-dk gy, p-mod srtd vf-f sd grs grdg to slt ip, pred gr-mtx sup sst clus cons wi silc-arg cmt, slty intbds



MD: 11,927'
TVD: 7,629.9'
INC: 90.84°
AZM: 91.24°
VS: 4,320.76'

WOB: 37.5klbs
RPM: 61
SPM: 200
SPP: 4,954psi

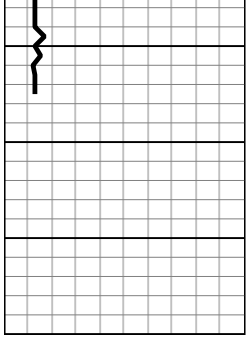
MD: 12,022'
TVD: 7,628.94'
INC: 90.31°
AZM: 90.89°
VS: 4,415.73'

MD: 12,051'
TVD: 7,628.86'
INC: 90°
AZM: 90.62°
VS: 4,444.72'

ip, mod calc; SHY SST (10%): predy lt gy, med gy ip, sft-sb frm, mtx sup v arg sst, slty-sdy, l calc

11900-12000 SLTST (75%): gy-dk gy, frm, brit, silc-occ sl arg, non calc; SST (10%): gy-dk gy, occ v dk gy, frm-sli fri predy gr sup sst clus cons wi silc cmt, vf-f-u f p srtd ang-sb ang-sb rd sd grs, tr vf pyr, mod calc; SH (10%): lt gy-med gy, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc

12000-12115 SLTST (75%): gy-dk gy, frm, brit, silc-occ sl arg, non calc; SH (20%): predy lt gy, med gy ip, sft-sb frm, mtx sup v arg sst, slty-sdy, non calc; SST (5%): gy-dk gy-v dk gy arg sst grdg to shy sst, p-mod srtd vf-f sd grs grdg to slt, sb frm-frm-sli fri gr-mtx sup sst clus cons wi silc



12,110

12,120

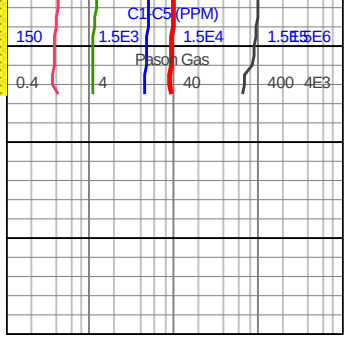
12,130

12,140

Bit Projection

MD: 12,115'
TVD: 7,628.86'
INC: 90°
AZM: 90.62°
VS: 4,503.36'

TD Well @ 08:15hrs 8/15/2018



cmt-arg mtx sup cmt lp, non-mod calc, scat tn BENT