



**EMPIRICA**  
*The Surface Logging Company*

Scale: 5" / 100'  
Measured Depth Log

**Well Name** Pavistma SW #1

**Location** 1665' FSL, 200' FWL NWSW 32-6N-67W

**State** Colorado

**Country** USA

**API Number** 05-123-37703-00

**Region** DJ Basin

**Spud Date** 9-12-13

**Surface Coordinates** Lat: 44.440534

Long: -104.924793

**Bottom Hole Coordinates** Lat: 40.4411895

Long: -104.9080935

**Ground Elevation** 4,954'

**Logged Interval** 5,000'

**Formation** Niobrara

**Type of Drilling Fluid** Fresh Water

**To** 11,775'

**K.B. Elevation** 4,976.5'

**Total Depth** 11,775'

**County** Weld

**Rig Number** Frontier #10

**Field** Wattenburg

**Drilling Completed** 9-19-2013

**Company** Tektok Windsor

**Address** 640 Plaza Drive  
Highlands Ranch

**Name** Dominic Pitre / D

**Company** Empirica

**Address** 6741 Satsuma D  
Houston, TX 770  
(713)-466-7400

**Equipment**

**Comments**

ML-

2 M

Stal

Rela

Operator

LLC

#290

), CO 80129

Geologist

an Scott

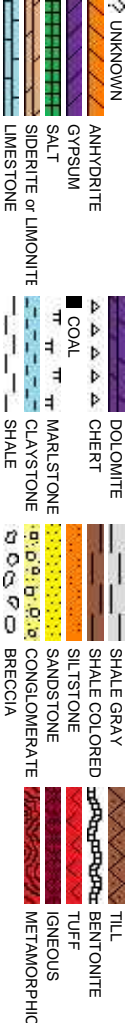
11/1/2013

Other

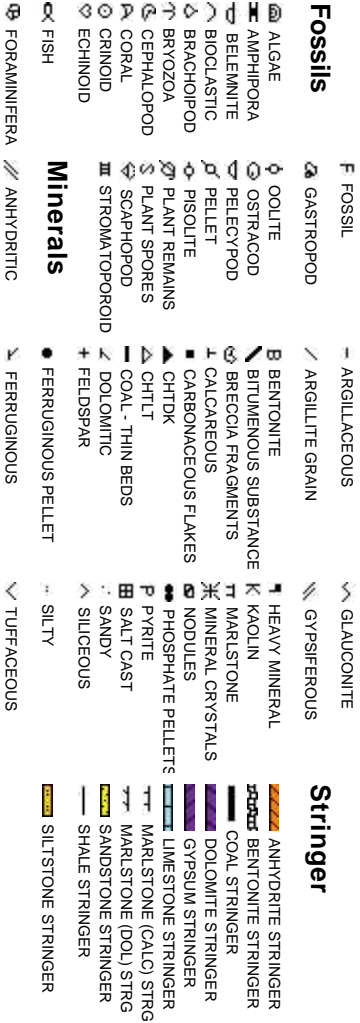
056

an Logging Service  
t Date: 8-26-2013  
ase Date: 9-22-2013

Rock Types



Accessories



Oil

DE  
EV  
OL  
ST  
FE  
FR  
IN  
IN

Other Symbols

Show

- MOLDIC
- ORGANIC
- PINPOINT
- VUGGY

QUESTIONABLE  
DOTTED STAINING

osity

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

Engineering

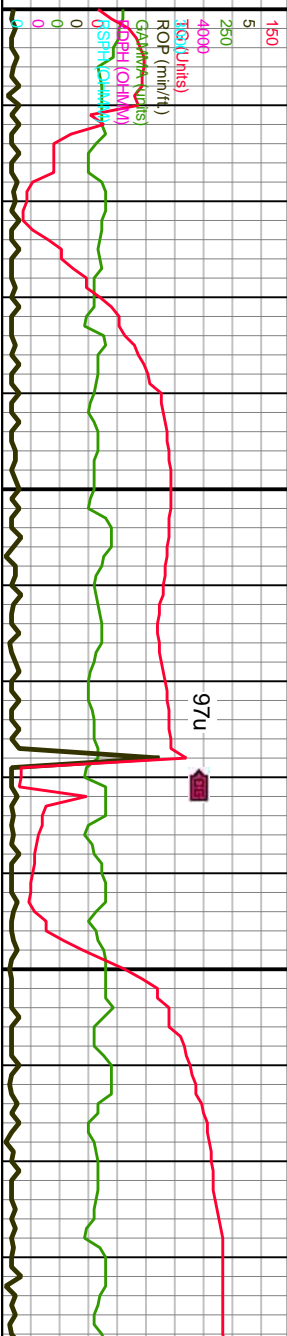
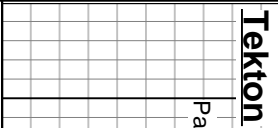
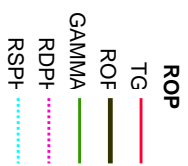
- FAULT
- FORMATION TOP
- GAS SHOW
- MINDEPTH MN DEPTH
- NORMAL FAULT
- OIL SHOW
- OVERTURNED STRATA
- REVERSE FAULT
- SIDEWALL CORE (LEFT)
- SIDEWALL CORE (RIGHT)
- SIDEWALL CORE (RIGHT)
- SLIDE
- SURVEY
- TRIP GAS

Rounding

- WIRELINE TESTED - LEFT
- WIRELINE TESTED - RT
- ANGULAR
- ROUNDED
- SUBANG
- SUBRND
- FINELYXLN
- GRAINSTONE
- LITHOGRAPHIC
- MICROXLN
- MUDSTONE
- PACKSTONE
- WACKESTONE
- BOUNDSTONE
- CHALKY
- CRYPTOXLN
- MODERATE
- POOR
- WELL

Textures

Sorting



### Slide/Rotate

## Depth Labels

5,000

**5,050**

**5,100**

### Total Gas & Chromatograph

GAS

C1

C2 .....

3

28

BCG:

SD1611MPX

Gas (units)

C1 (PPM) C2 (PPM) C3 (PPM) C4 (PPM)

P

5000

5000-5060 SS: pred gy, lt gy, mod frm to mod hd, blkly, v f gr, slty-arg, p srt, w cmttd, dl calc, sl pp por

5060-5120 SS: pred gy, lt gy, mod frm to mod hd, blkly, v f gr, slty-arg, p srt, w cmtd, dl calc, sl pp por

5120-5180 SS: pred gy, lt gy, mod frm to mo  
v f gr, silty-arg, p srt, w cmt'd, dl calc, sl pp po

**Well Bore**  
**TVD —**

TVD (ft)

WOB: 24 K  
ROT: 36  
STKS: 118 SPM  
Pump Rate: 550 GPM

DP @ 5,000'

MD: 5,024  
TVD: 4,983.98  
Inclination: 1.2 °  
Azimuth: 284.1 °  
VS: -470.06 '

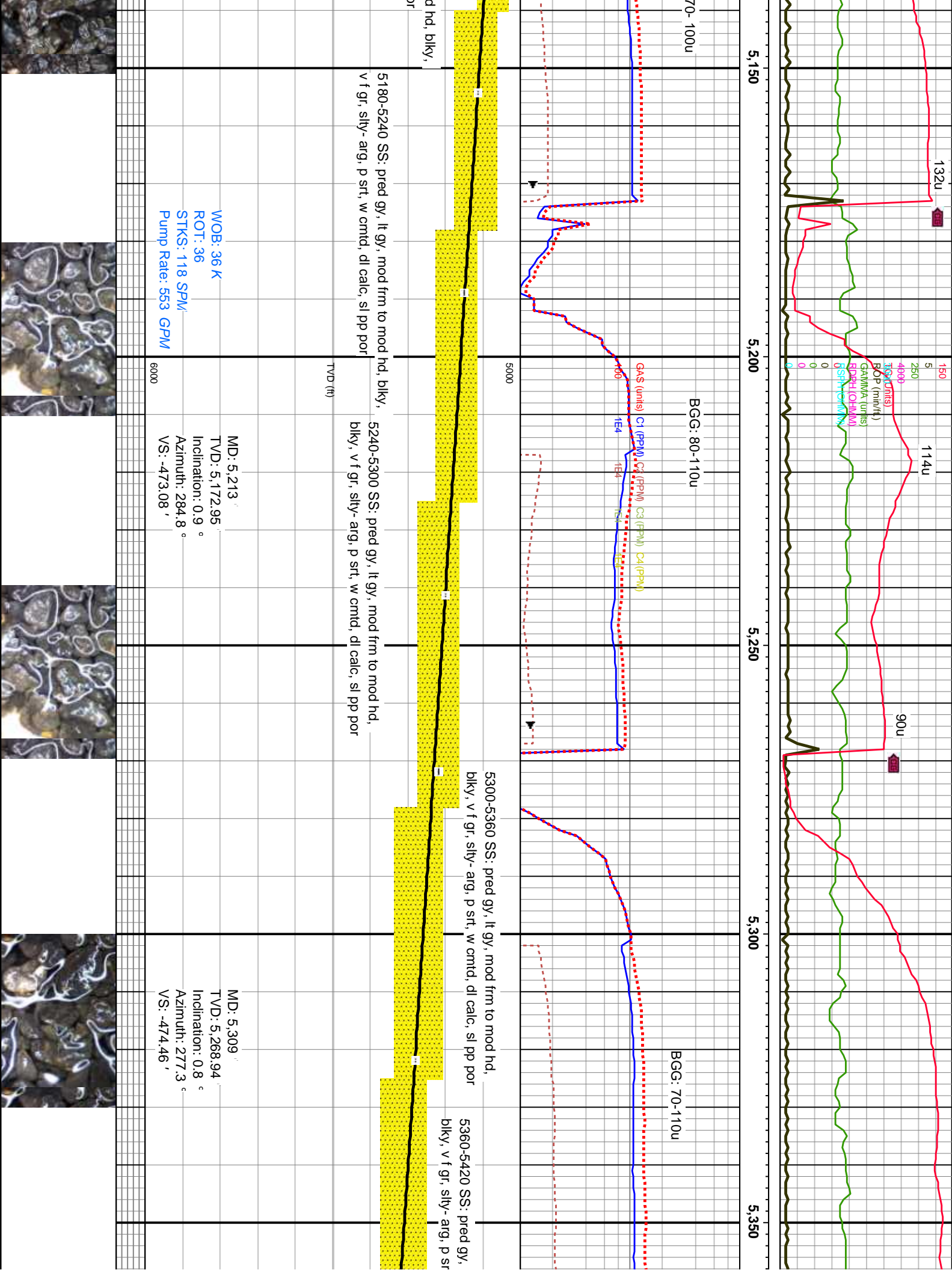
DS @ 5,120'

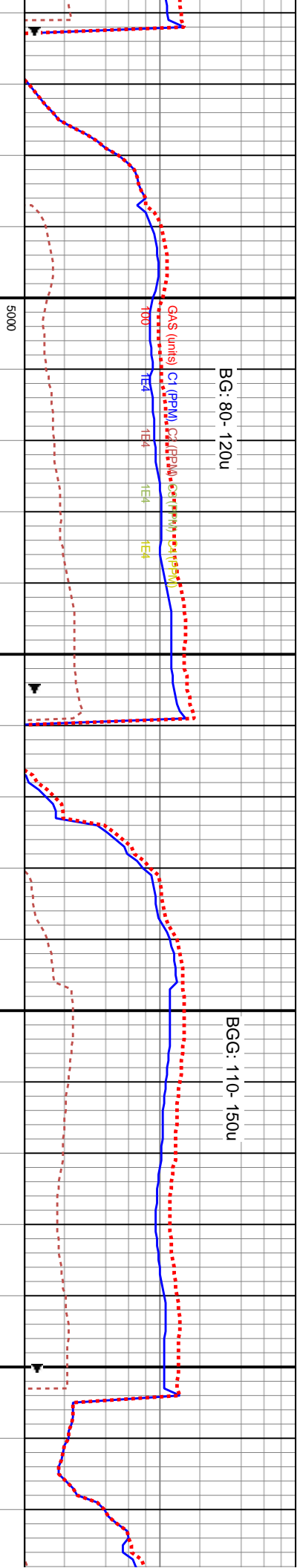
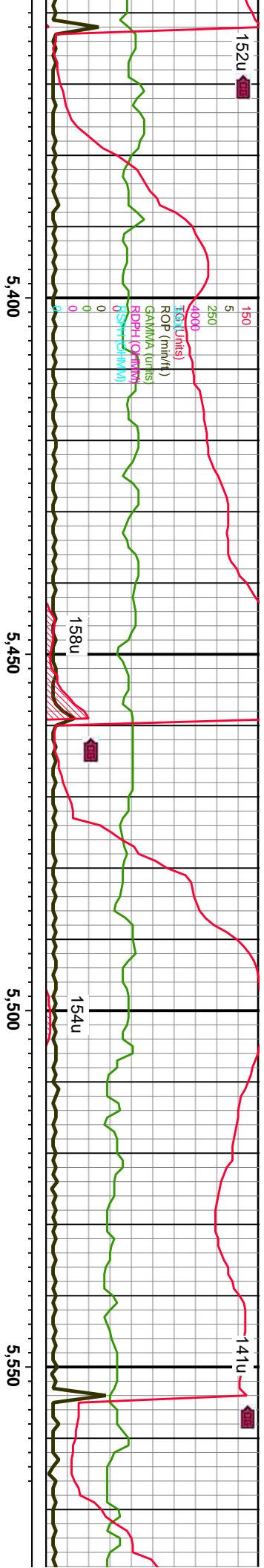
MD: 5,118  
TVD: 5,077.96  
Inclination: 0.9 °  
Azimuth: 290.1 °  
VS: -471.68 '

## Oil Show

॥

## Images

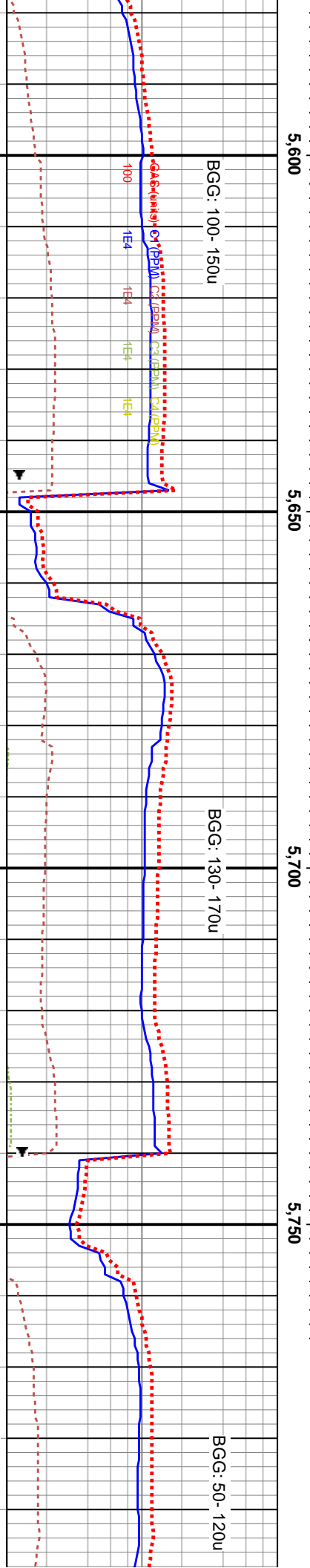
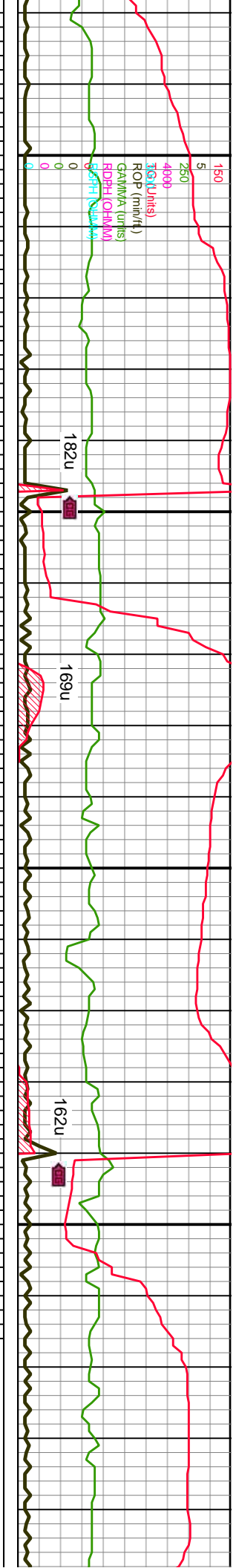




Interval	Formation	Log Type	MD (ft)	TVD (ft)	Inclination (°)	Azimuth (°)	VS (ft)
5420-5480	SS: pred gy, lt gy, mod frm to mod hd, blkly, v f gr, slty- arg, p srt, w cntd, dl calc, sl pp por		5,403	5,362.93	1.2	251.1	-476.05
5480-5540	SS: pred gy, lt gy, mod frm to mod hd, blkly, v f gr, slty- arg, p srt, w cntd, dl calc, sl pp por		5,497	5,456.91	1.1	257.4	-477.89
5540-5600	SS: pred gy, lt gy, mod frm to mod hd, blkly, v f gr, slty- arg, p srt, w cntd, no vis por						
5600-							

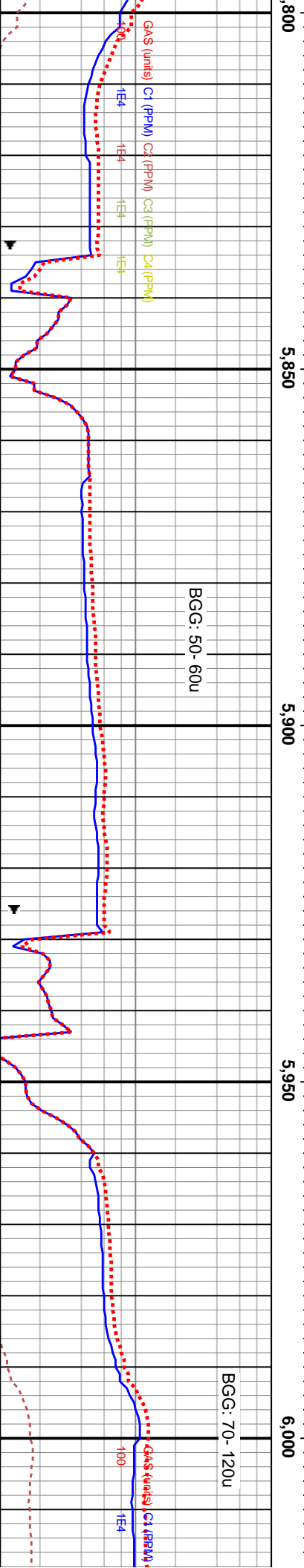
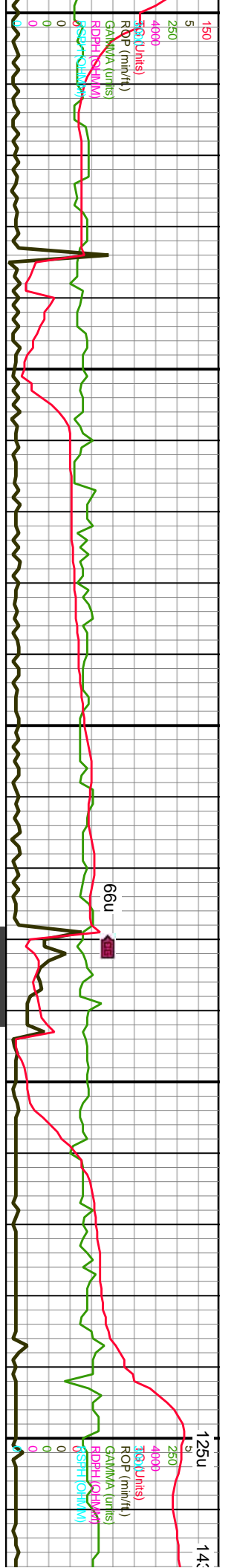






BGG: 100- 150u		BGG: 130- 170u		BGG: 50- 120u	
6660 SS: pred gy, lt gy, mod frm to mod hd, f gr, silty- arg, p srt, w cntd, no visible por		5720-5780 SS: pred gy, lt gy, mod frm to mod hd, blkly, v f gr, silty- arg, p srt, w cntd, no visible por		5780-5840 SS: pred gy, lt gy, mod frm to m blkly, v f gr, silty- arg, p srt, w cntd, no visible	
MD: 5,591' TVD: 5,550.89' Inclination: 1.2° Azimuth: 227.9° Pump Rate: 551 GPM VS: -479.53'		MD: 5,686' TVD: 5,645.87' Inclination: 1.1° Azimuth: 234.4° VS: -481.06'		MD: 5,779' TVD: 5,738.85' Inclination: 1.1° Azimuth: 209.4° VS: -482.28'	





5840-5900 SS: pred gy, lt gy, mod frm to mod hd,  
blky, v f gr, silty- arg, p srt, w cntd, no visible por

5900-5960 SS: pred gy, lt gy, mod frm to mod hd,  
blky, v f gr, silty- arg, p srt, w cntd, no visible por

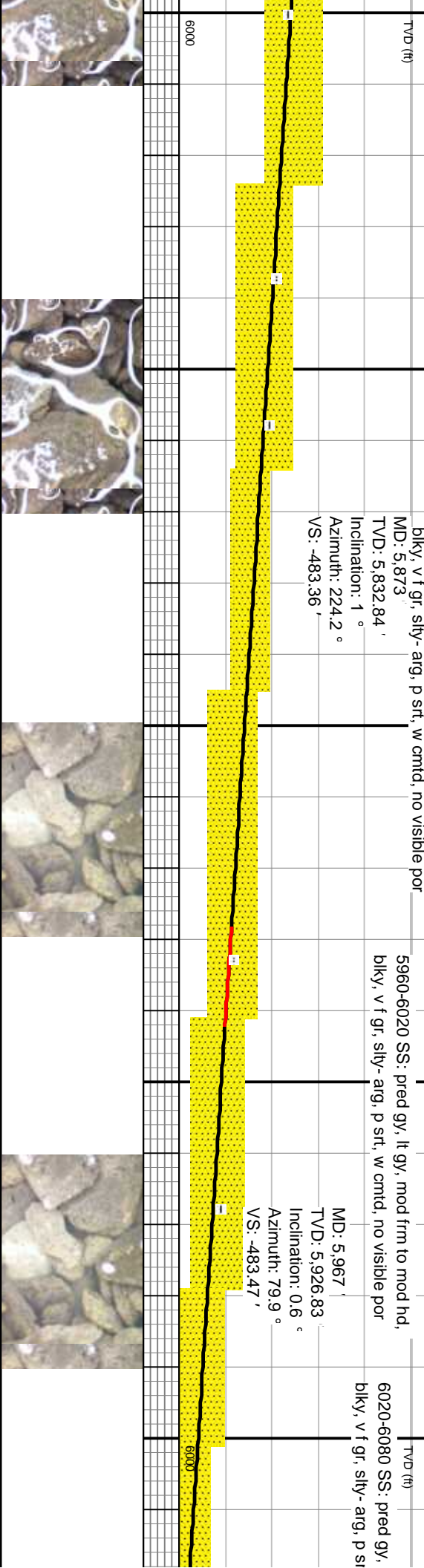
5960-6020 SS: pred gy, lt gy, mod frm to mod hd,  
blky, v f gr, silty- arg, p srt, w cntd, no visible por

6020-6080 SS: pred gy,  
blky, v f gr, silty- arg, p srt

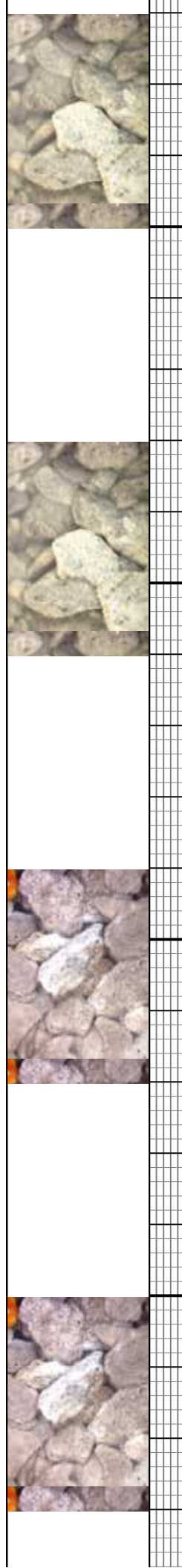
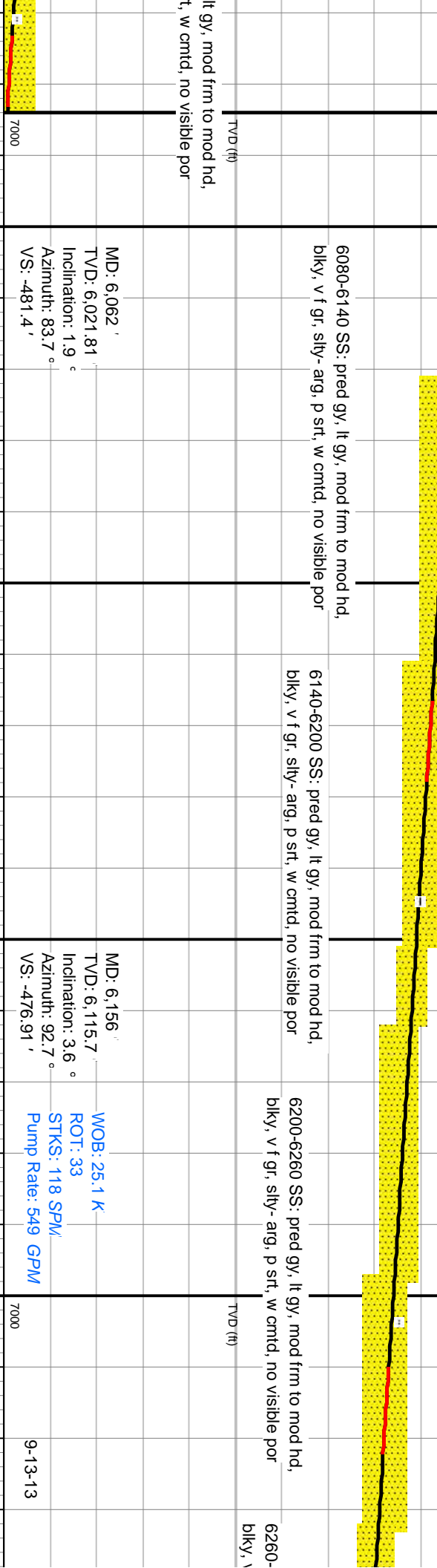
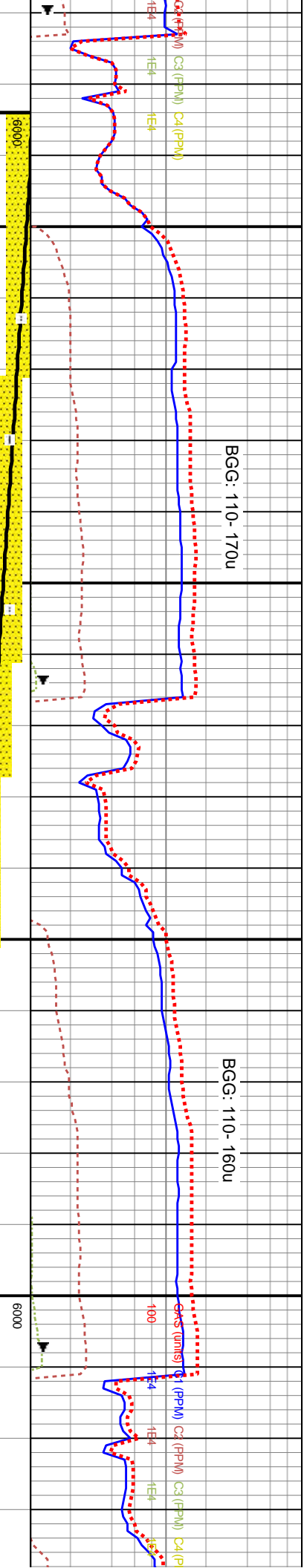
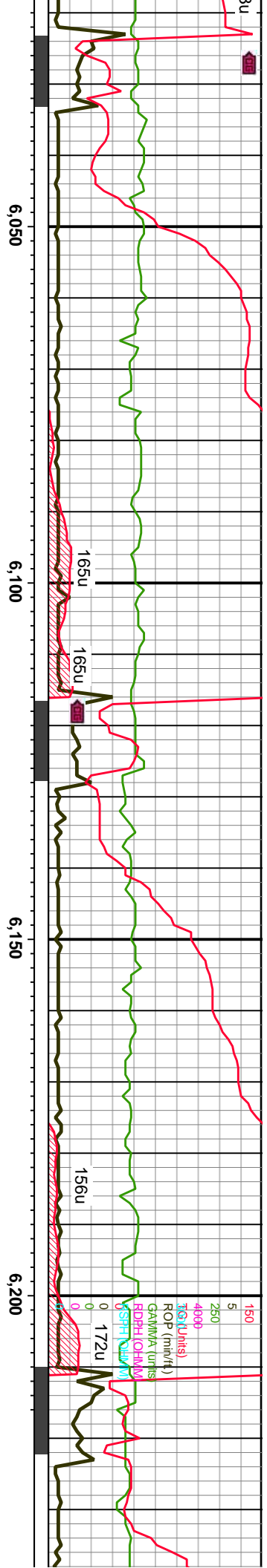
MD: 5,873 '  
TVD: 5,832.84 '  
Inclination: 1 °  
Azimuth: 224.2 °  
VS: -483.36 '

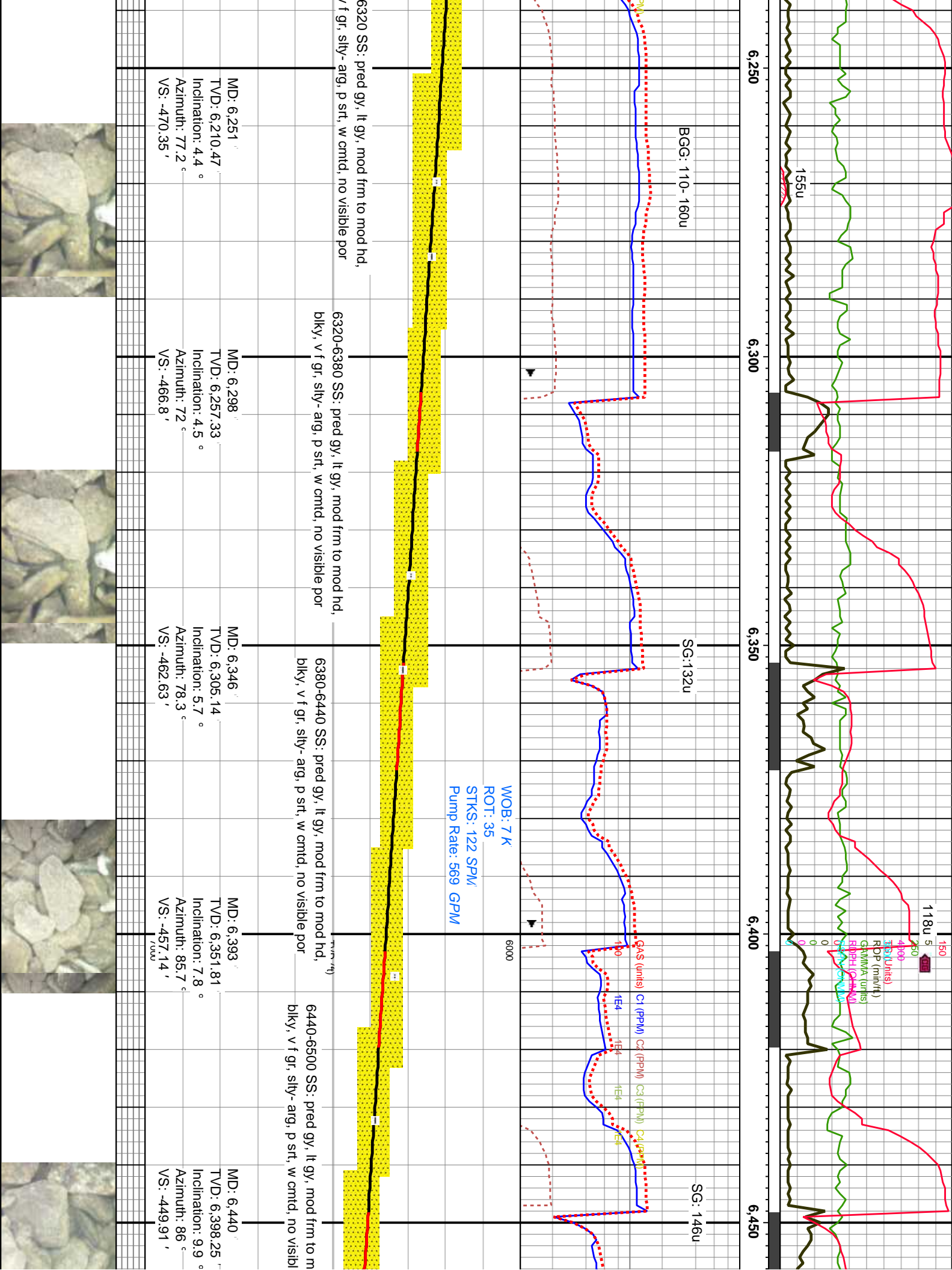
MD: 5,967 '  
TVD: 5,926.83 '  
Inclination: 0.6 °  
Azimuth: 79.9 °  
VS: -483.47 '

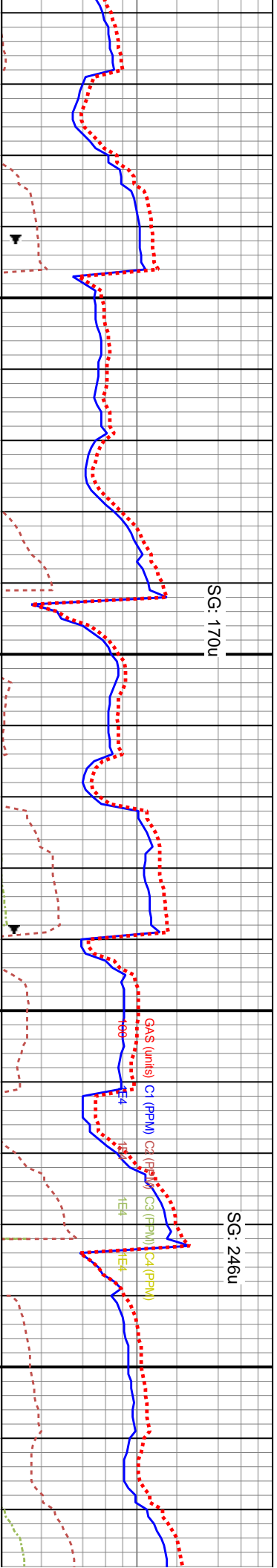
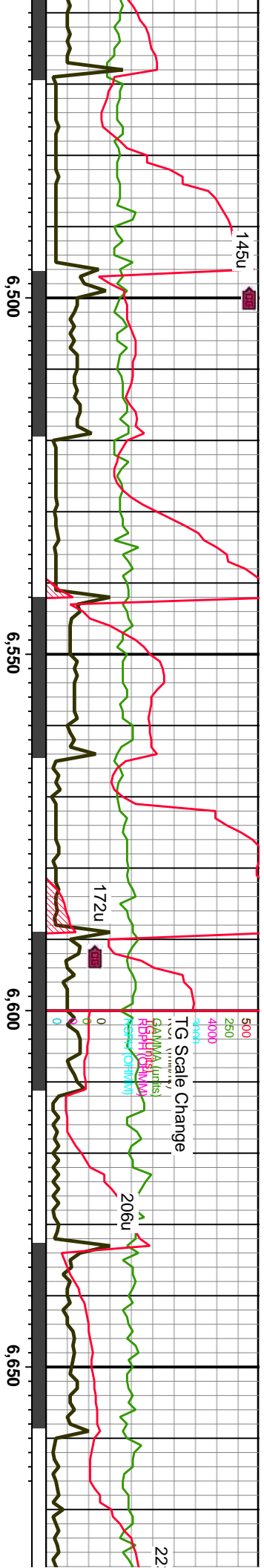
WOB: 24.6 K  
ROT: 35  
STKS: 118 SPM  
Pump Rate: 549 GPM



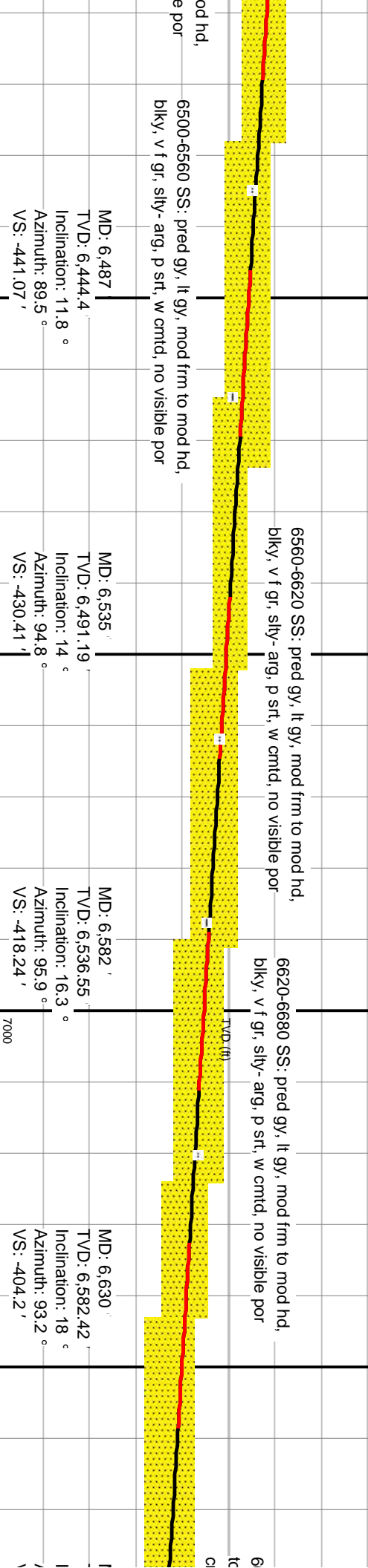




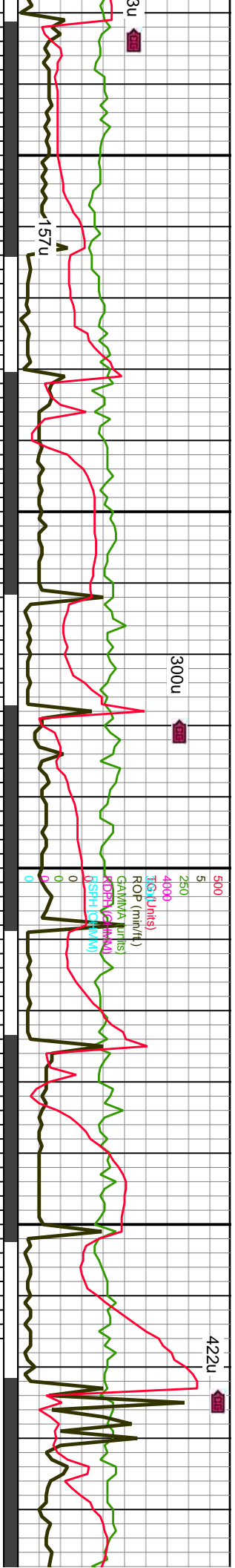




WOB: 28.4 K	
ROT: 0	
STKS: 120 SPM	
Pump Rate: 560 GPM	







6,700

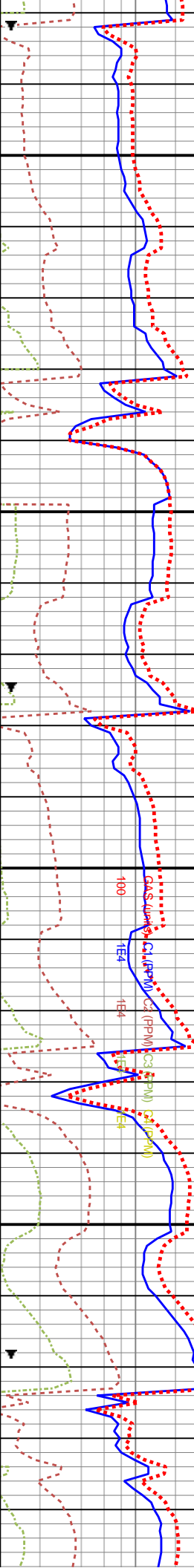
6,750

6,800

6,850

SG: 226u

SG: 305u



MD: 6,769'  
TVD: 6,710.57'  
Inclination: 28.1°  
Azimuth: 88.1°  
VS: -350.91'

MD: 6,816'  
TVD: 6,751.41'  
Inclination: 31.2°  
Azimuth: 90.6°  
VS: -327.68'

MD: 6,863'  
TVD: 6,791.05'  
Inclination: 33.8°  
Azimuth: 94.5°  
VS: -302.54'

6880-6740 SS: pred gy, lt gy, mod frm  
mod hd, blkly, v f gr, stly- arg, p srt, w  
mid, no visible por

6740-6800 SS: pred gy- lt gy, occ  
off wh, mod frm to mod hd, blkly, v f  
gr, v stly- arg, p srt, w cntd, v sl  
calc, sl carb, ip f lam, no visible por

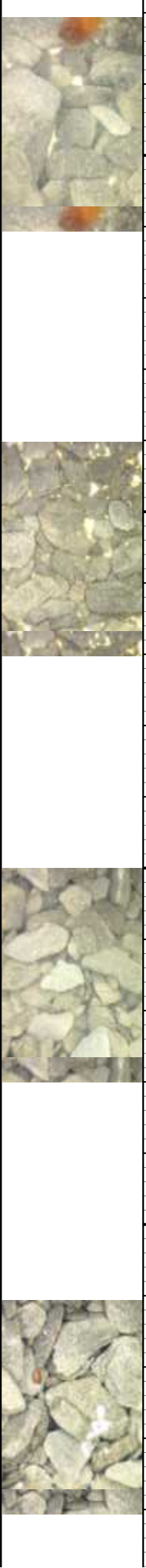
6800-6860 SS: pred gy- lt gy, occ off wh, mod  
frm to mod hd, blkly, v f gr, v stly- arg, p srt, v  
sl- sl calc, sl carb, ip f lam, tr cal, no visible  
por, sme stly sh, tr lt gn cut

6860-6920 SS: pred gy- lt gy, occ off wh,  
mod frm to mod hd, blkly, v f gr, v stly- arg,  
p srt, v sl- sl calc, sl carb, ip f lam, tr cal,  
no visible por, sme stly sh, tr lt gn cut

MD: 6,677'  
TVD: 6,626.8'  
Inclination: 20.4°  
Azimuth: 92°  
VS: -388.81'

MD: 6,722'  
TVD: 6,668.4'  
Inclination: 24.3°  
Azimuth: 89.2°  
VS: -371.65' DP @ 6,740'

WOB: 11.5 K  
ROT: 32  
STKS: 118 SPM/  
Pump Rate: 555 GPM

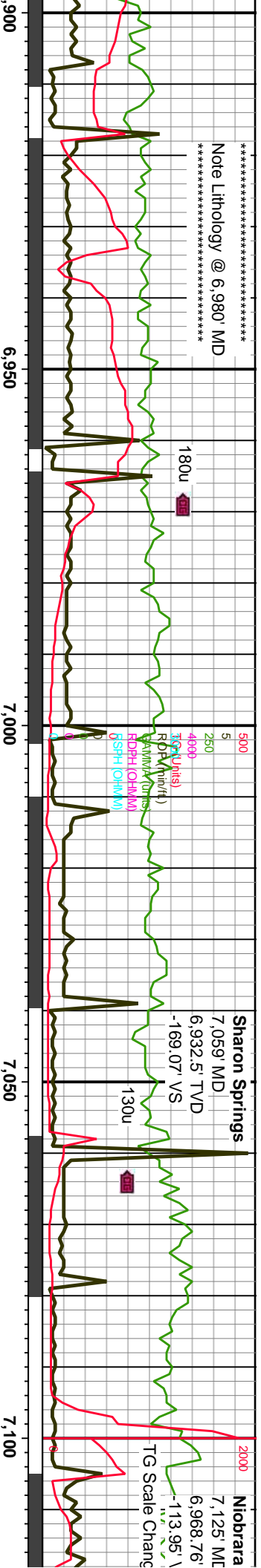


\*\*\*\*\*  
Note Lithology @ 6,980' MD  
\*\*\*\*\*

Sharon Springs  
7,059' MD  
6,932.5' TVD  
-169.07' VS

Niobrara  
7,125' MD  
6,968.76' VS

TG Scale Change



SG: 193

Gas (units) C1 (PPM) C2 (PPM) C3 (PPM) C4 (PPM)  
100 1E4 1E4 1E4  
SG: 35u

SG: 702u

MD: 6,910' TVD: 6,829.43' Inclination: 36.7 ° Azimuth: 94.8 ° VS: -275.63'	MD: 6,957' TVD: 6,865.61' Inclination: 42.6 ° Azimuth: 90.1 ° VS: -245.78'	MD: 7,003' TVD: 6,897.72' Inclination: 48.8 ° Azimuth: 89.7 ° VS: -212.9'	MD: 7,050' TVD: 6,927.19' Inclination: 53.5 ° Azimuth: 89 ° VS: -176.33'	MD: 7,097' TVD: 6,953.91' Inclination: 57.2 ° Azimuth: 88.8 ° VS: -137.69'
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6920-6980 SS: pred gy- lt gy, occ off wh, mod frm to mod hd, blk- pty, v f gr, v silty- arg, p srt, v sl- sl calc, sl- mod carb, mod f lam, tr cal, no visible por, sme silty sh, rr unconstrns trns med qtz grs, rr ly dissim pyr, pos fe sin, tr lt gn crush cut

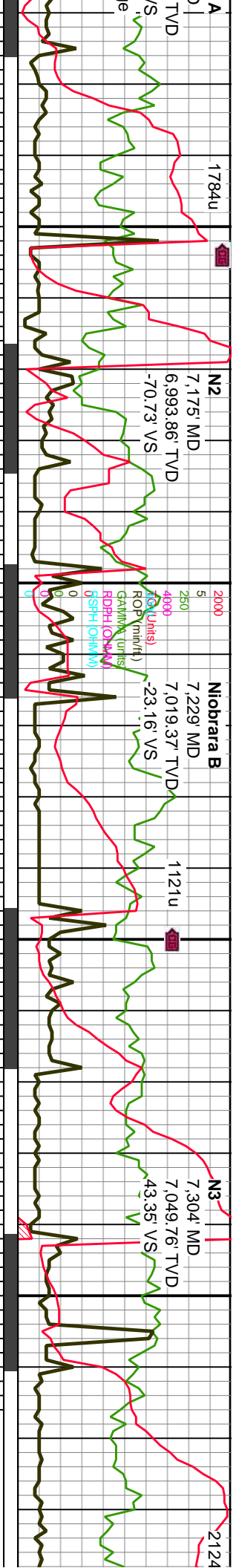
6980-7040 SS: pred gy- lt gy, occ off wh, mod frm to mod hd, blk- pty, v f gr, v silty- arg, p srt, v sl- sl calc, sl- mod carb, mod f lam, sme cal, no visible por, rr ly dissim py, tr lt gn crush cut; SLTY SH: pred gy- md gy, frm, ip sl frm- hd, blk- pty, sm tex, pred mot w chk incl, v sil- sl calc, carb

7040-7100 SLTY SH: pred gy- md gy, frm, ip sl frm- hd, blk- pty, mltst, sm tex, pred mot w chk incl, v sil- sl calc, carb; SS: pred gy- lt gy, occ off wh, mod frm to mod hd, blk- pty, v f gr, v silty- arg, p srt, v sl- sl calc, sl- mod carb, mod f lam, sme cal, no visible por, rr ly dissim pyr, ip silty sh, sme br gn flor, tr lt gn crush cut

7100-7160 SLTY SH: pred gy- md gy, frm, ip sl frm- hd, blk- pty, mltst, sm tex, pred mot w pos fos shells, calc, carb, tr- p lt gn crush cut







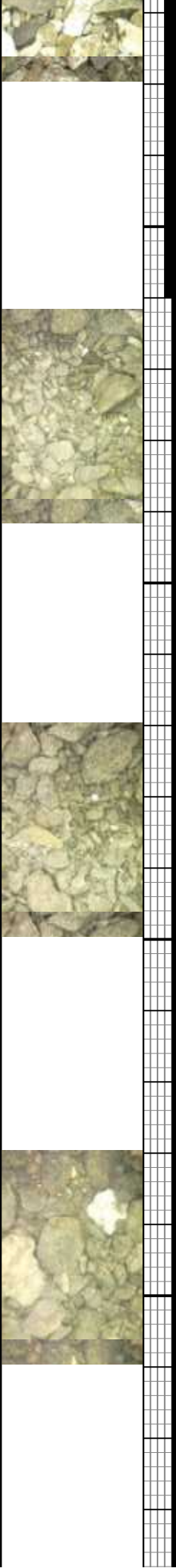
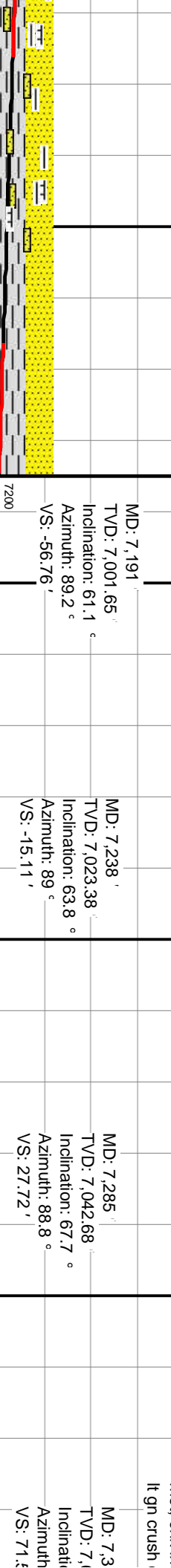
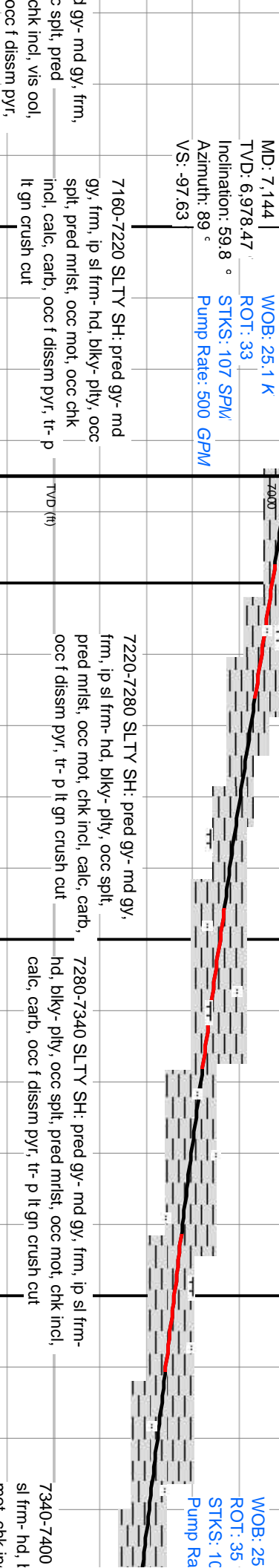
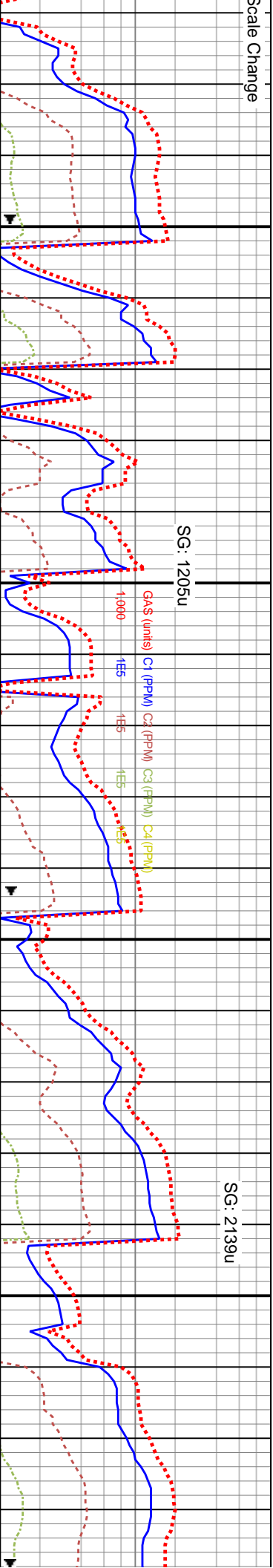
7,150

7,200

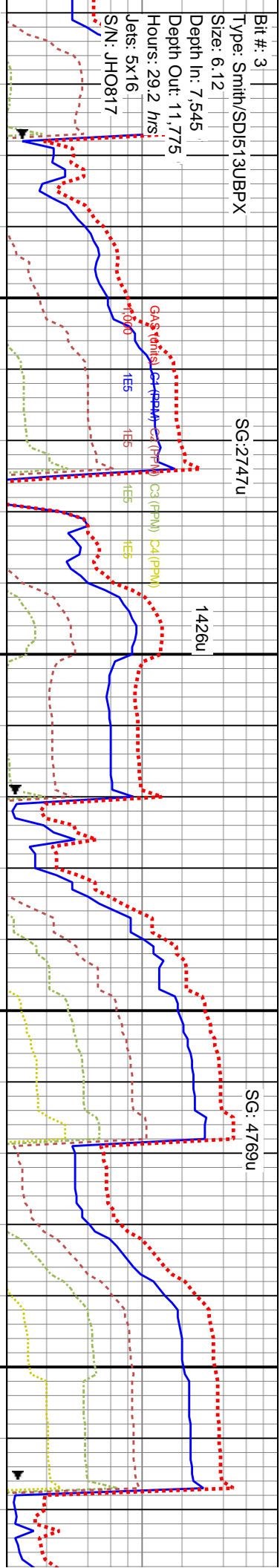
7,250

7,300

Scale Change



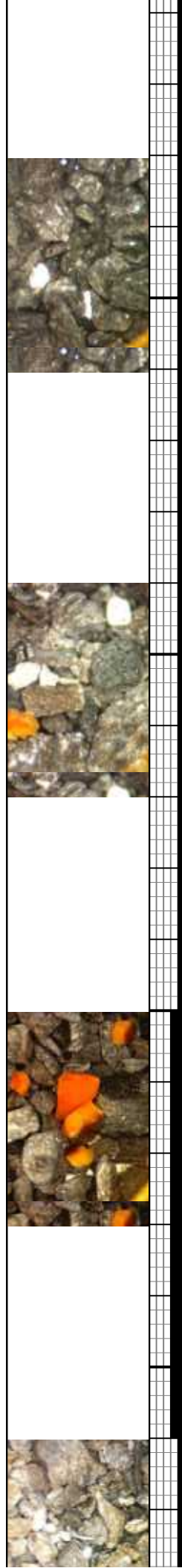
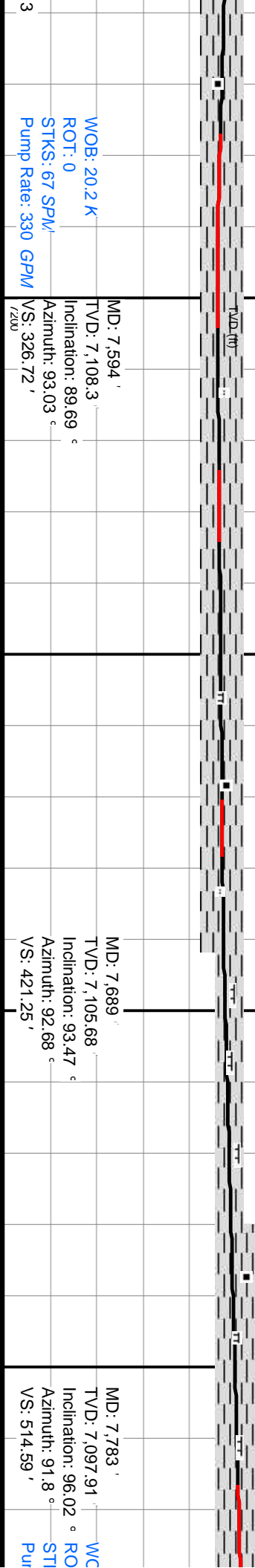




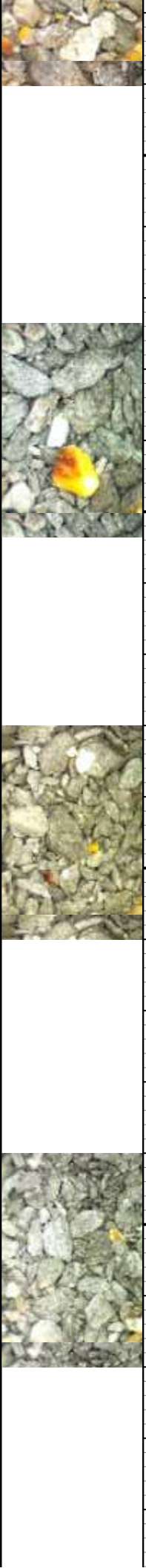
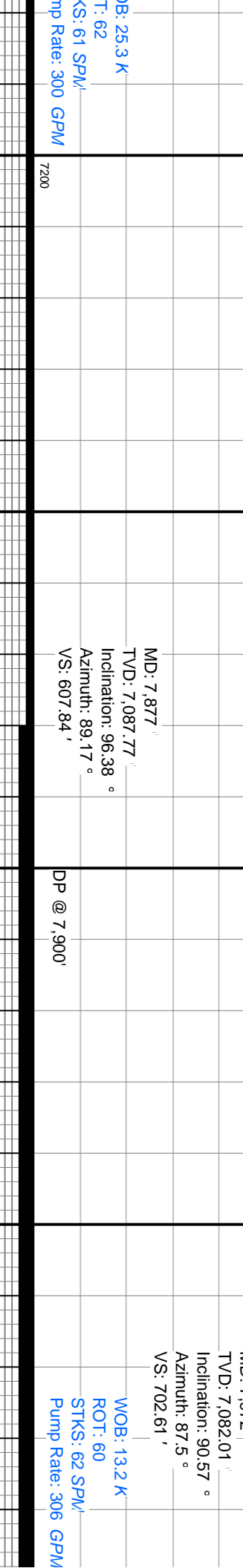
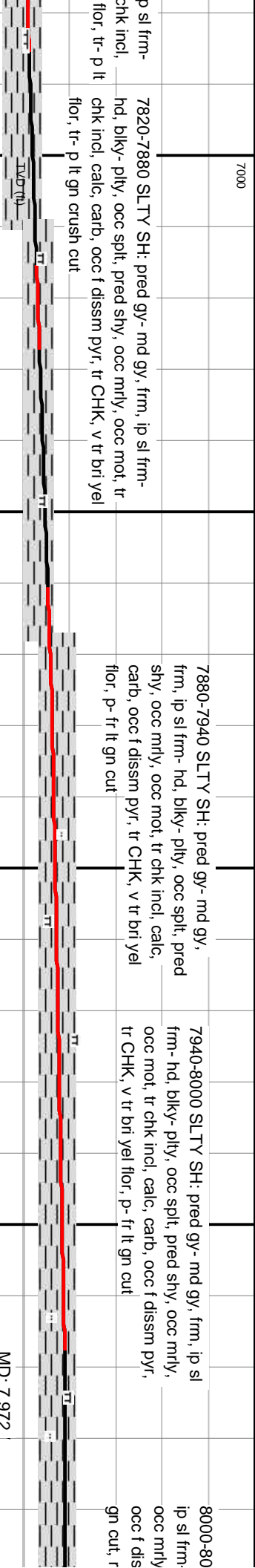
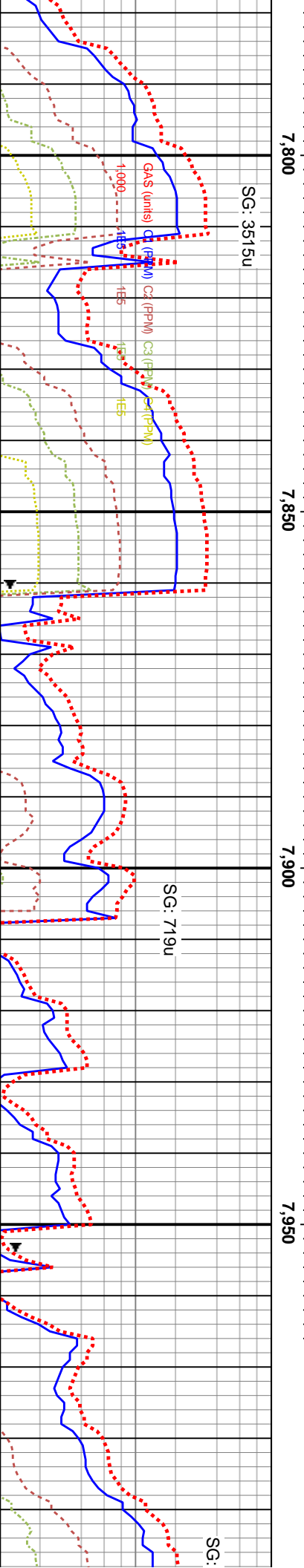
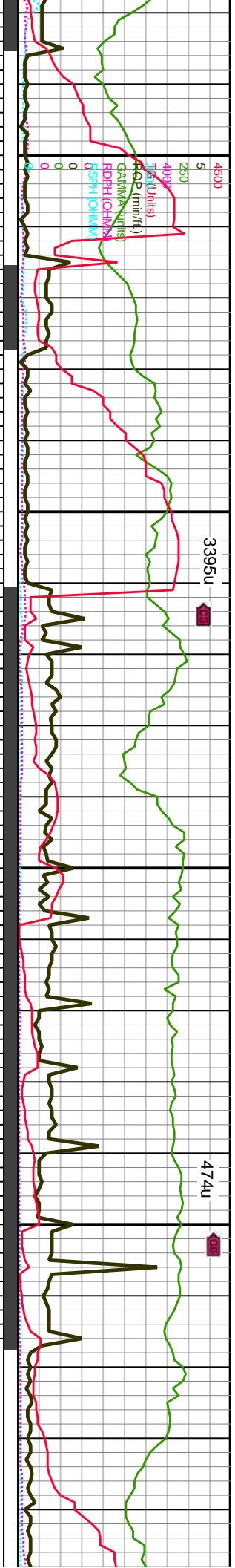
7640-7700 SLTY SH: pred gy- md gy, frm, ip sl frm-  
hd, blk- pily, occ spl, pred mrlst, occ mot, chk incl,  
carb, carb, occ f dissim pyr, rr CHK, tr bri yel flr, tr- p lt  
gn crush cut

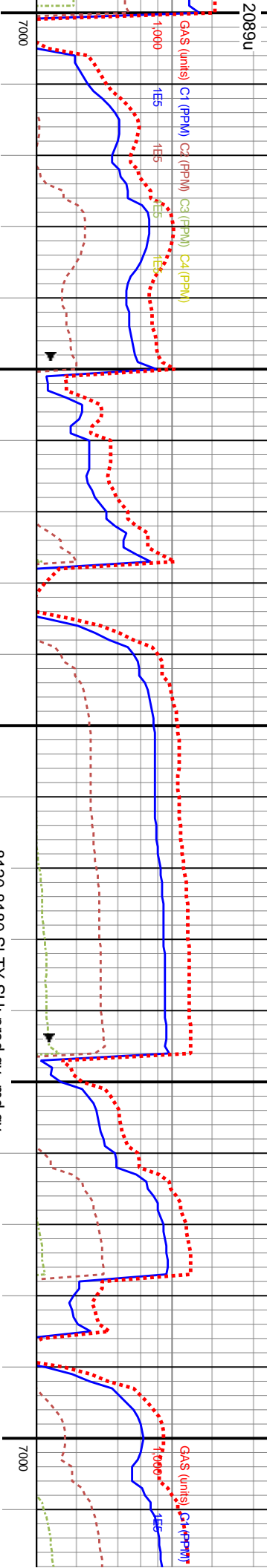
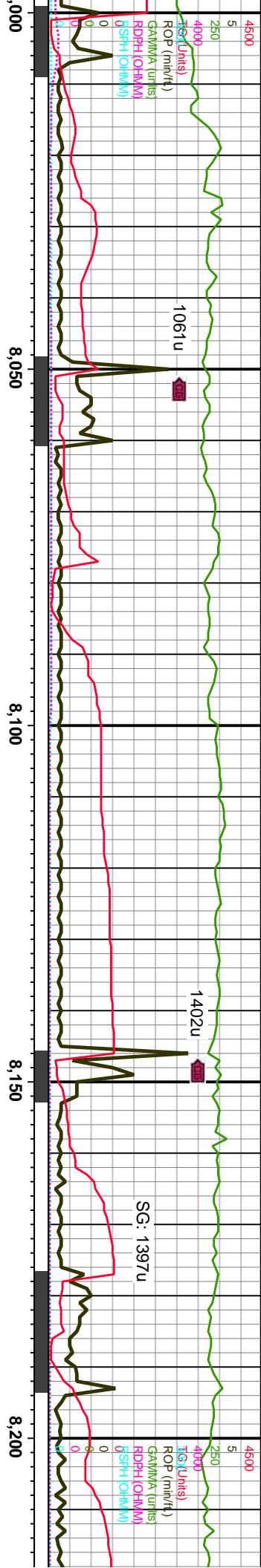
7700-7760 SLTY SH: pred gy- md gy, frm, ip sl frm-  
hd, blk- pily, occ spl, pred mrlst, occ mot, chk incl,  
carb, carb, occ f dissim pyr, rr CHK, tr bri yel flr, tr- p lt  
gn crush cut

7760-7820 SLTY SH: pred gy- md gy, frm, ip sl frm-  
hd, blk- pily, occ spl, pred mrlst, occ mot, chk incl,  
carb, carb, occ f dissim pyr, rr CHK, tr bri yel flr, tr- p lt  
gn crush cut







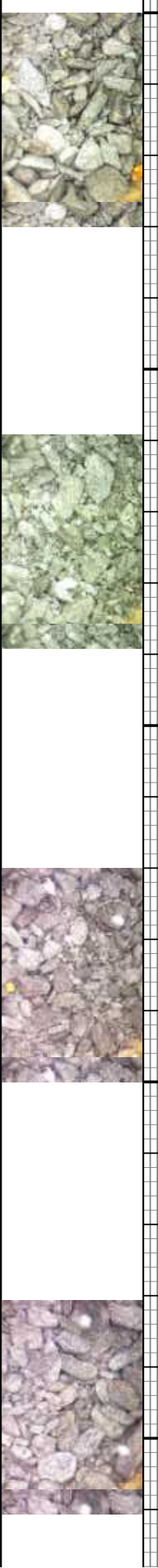


60 SLTY SH: pred gy- md gy, frm, blk, frm, ip sl  
8060-8120 SLTY SH: pred gy- md gy, frm, ip sl  
8120-8180 SLTY SH: pred gy- md gy, blk, frm, ip sl  
8180-8240 SLTY SH: pred gy- md gy, blk, frm, ip sl  
8240-8300 SLTY SH: pred gy- md gy, blk, frm, ip sl

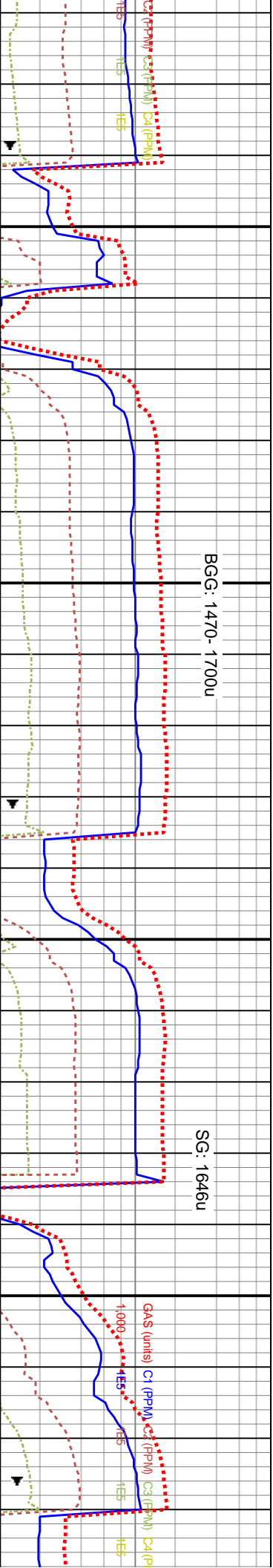
MD: 8,066'  
TVD: 7,082.01'  
Inclination: 89.43°  
Azimuth: 87.23°  
VS: 796.61'

MD: 8,161'  
TVD: 7,082.51'  
Inclination: 89.96°  
Azimuth: 86.79°  
VS: 891.61'

WOB: 13.2 K  
ROT: 60  
STKS: 62 SPM  
Pump Rate: 303 GPM

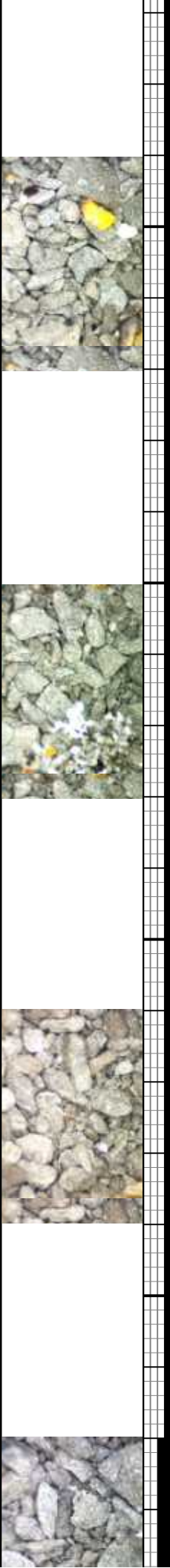


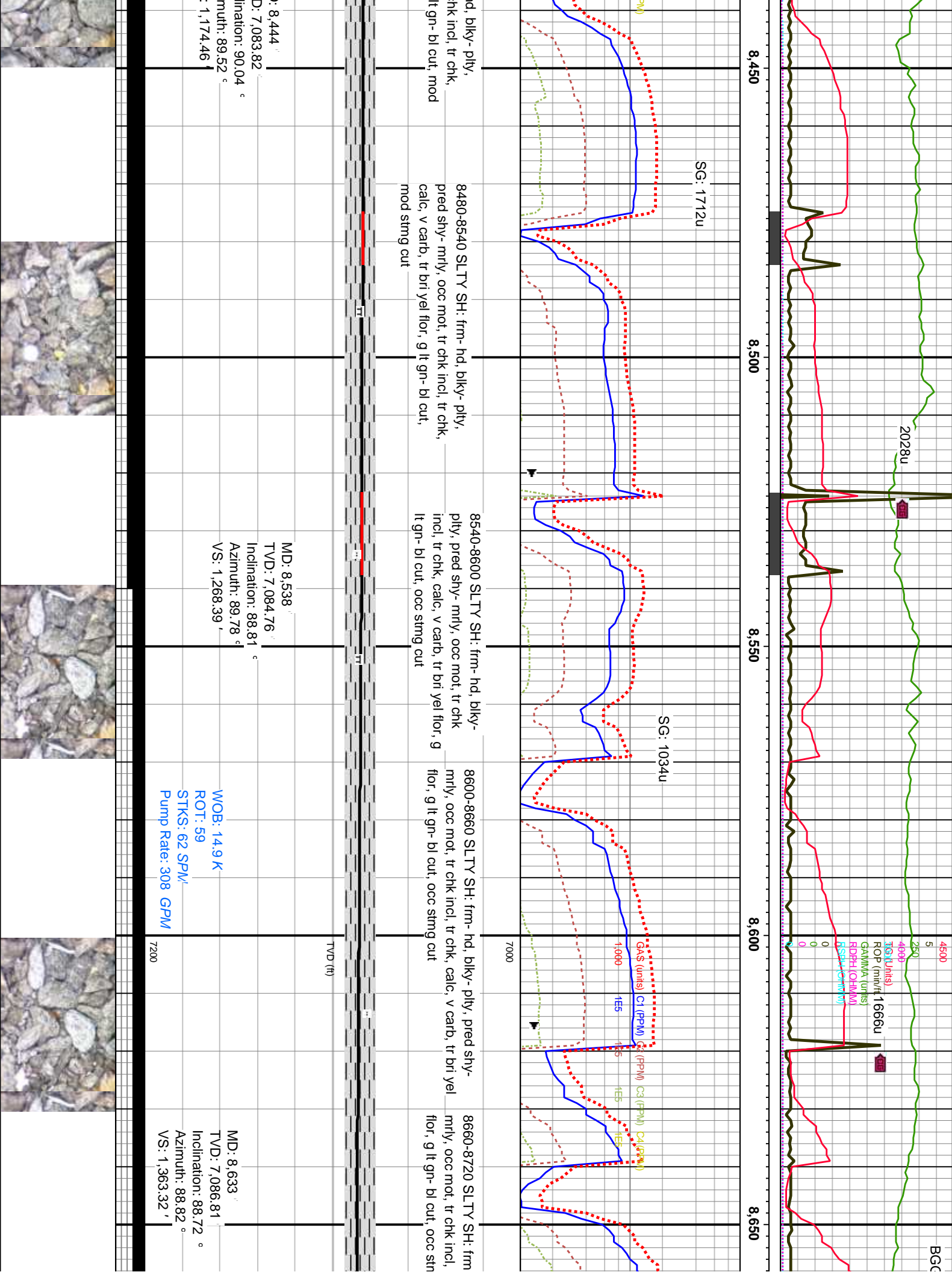




8240-8300 SLTY SH: pred gy- md gy, occ blk, frm, ip sl frm- hd, blkv- pty, pred shy- mrlly, occ mot, tr chk incl, tr chk, calc, v carb, tr bri yel flor, g lt gn cut	8300-8360 SLTY SH: pred gy- md gy, occ blk, frm, ip sl frm- hd, blkv- pty, pred shy- mrlly, occ mot, tr chk incl, tr chk, calc, v carb, tr bri yel flor, g lt gn cut, sme sting cut	8360-8420 SLTY SH: pred gy- md gy, occ blk, frm, ip sl frm- hd, blkv- pty, pred shy- mrlly, occ mot, tr chk incl, tr chk, calc, v carb, tr bri yel flor, g lt gn cut, sme sting cut	8420-8480 SLTY SH: frm- t pred shy- mrlly, occ mot, tr c calc, v carb, tr bri yel flor, g sting cut
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MD: 8,255 TVD: 7,083.09 Inclination: 89.34 ° Azimuth: 89.52 ° VS: 985.59 '	MD: 8,350 TVD: 7,083.74 Inclination: 89.87 ° Azimuth: 89.52 ° VS: 1,080.53 '	WOB: 15.8 K ROT: 60 STKS: 61 SPM Pump Rate: 304 GPM	TVD (ft)
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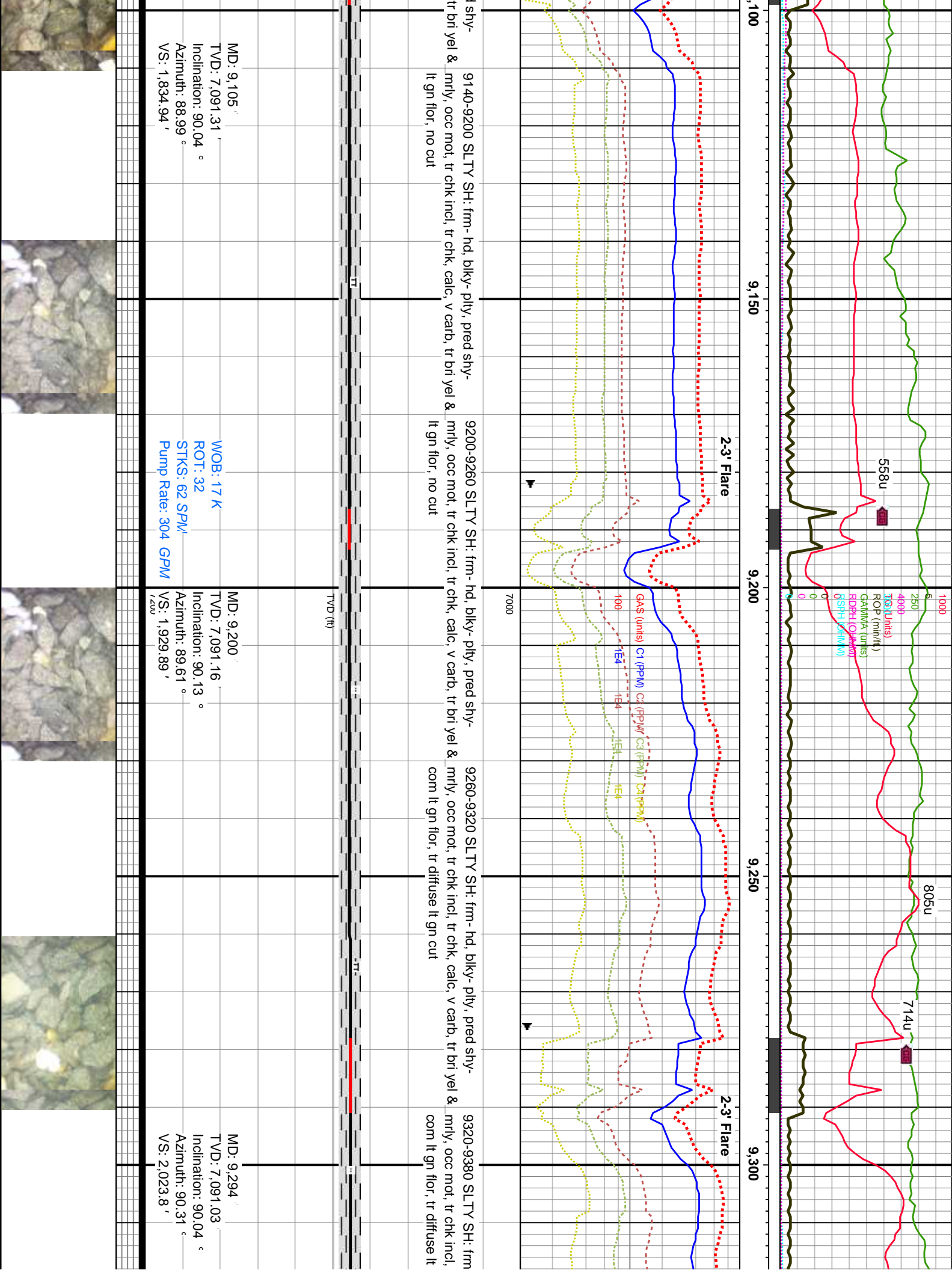




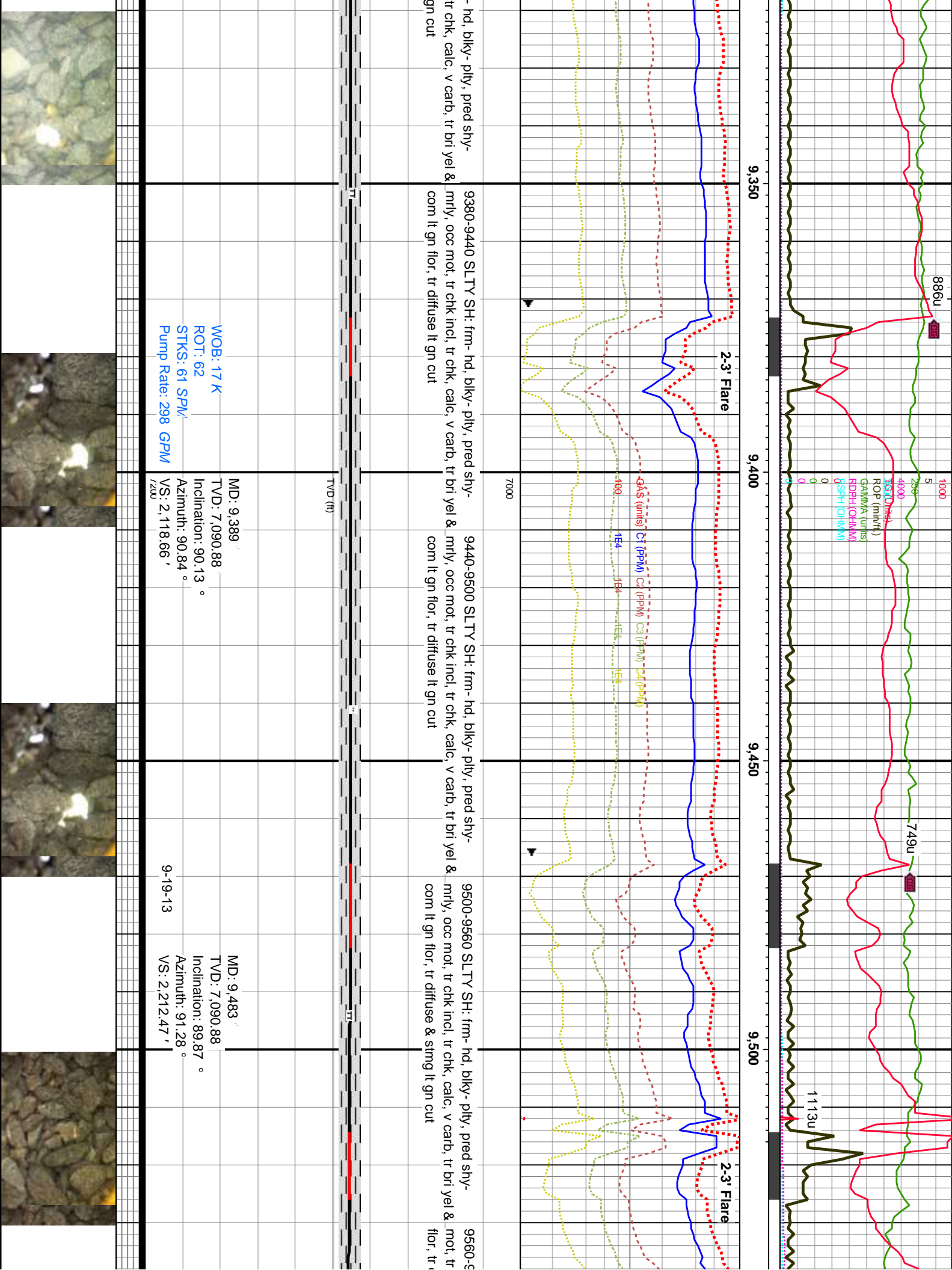


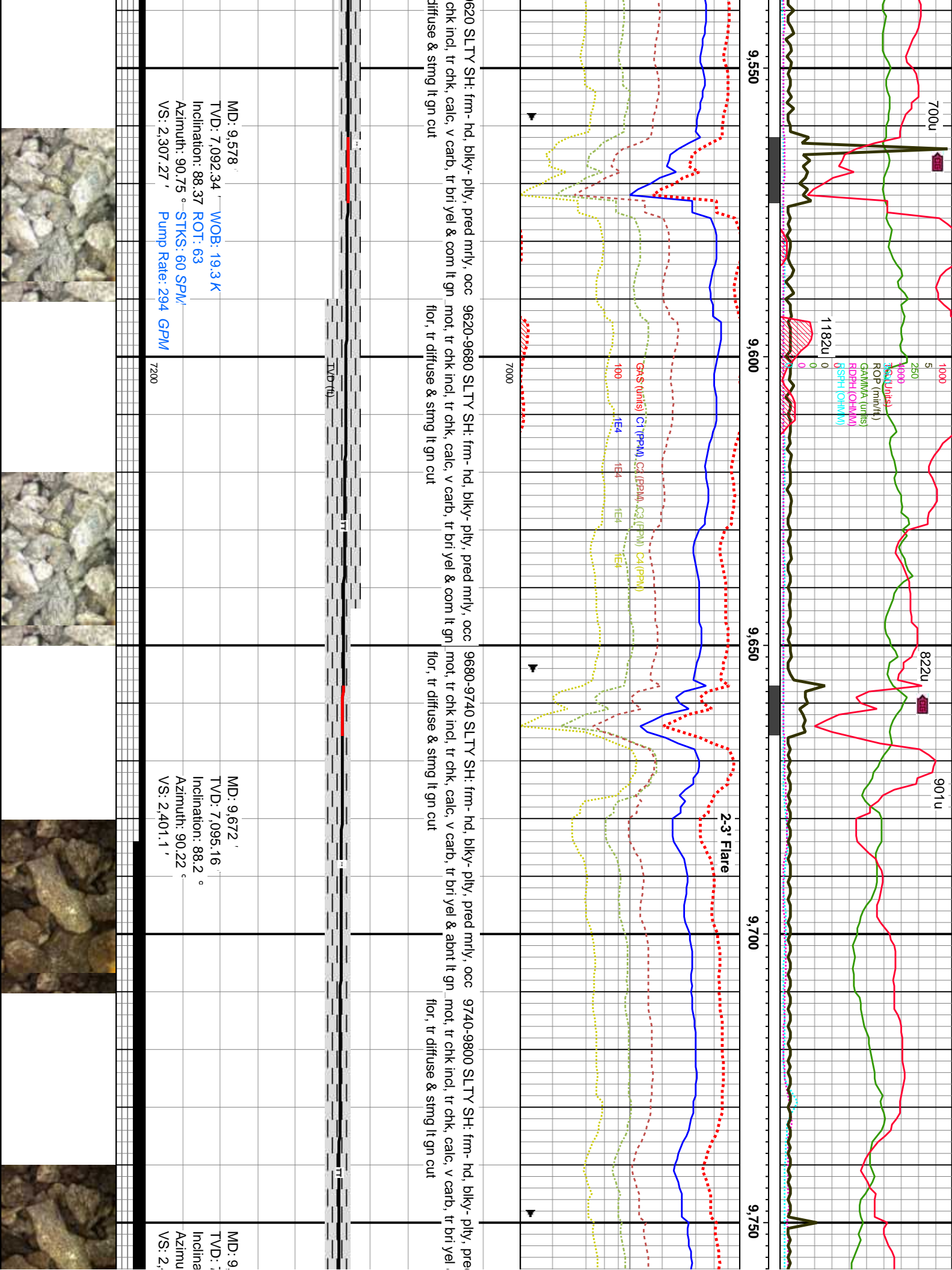


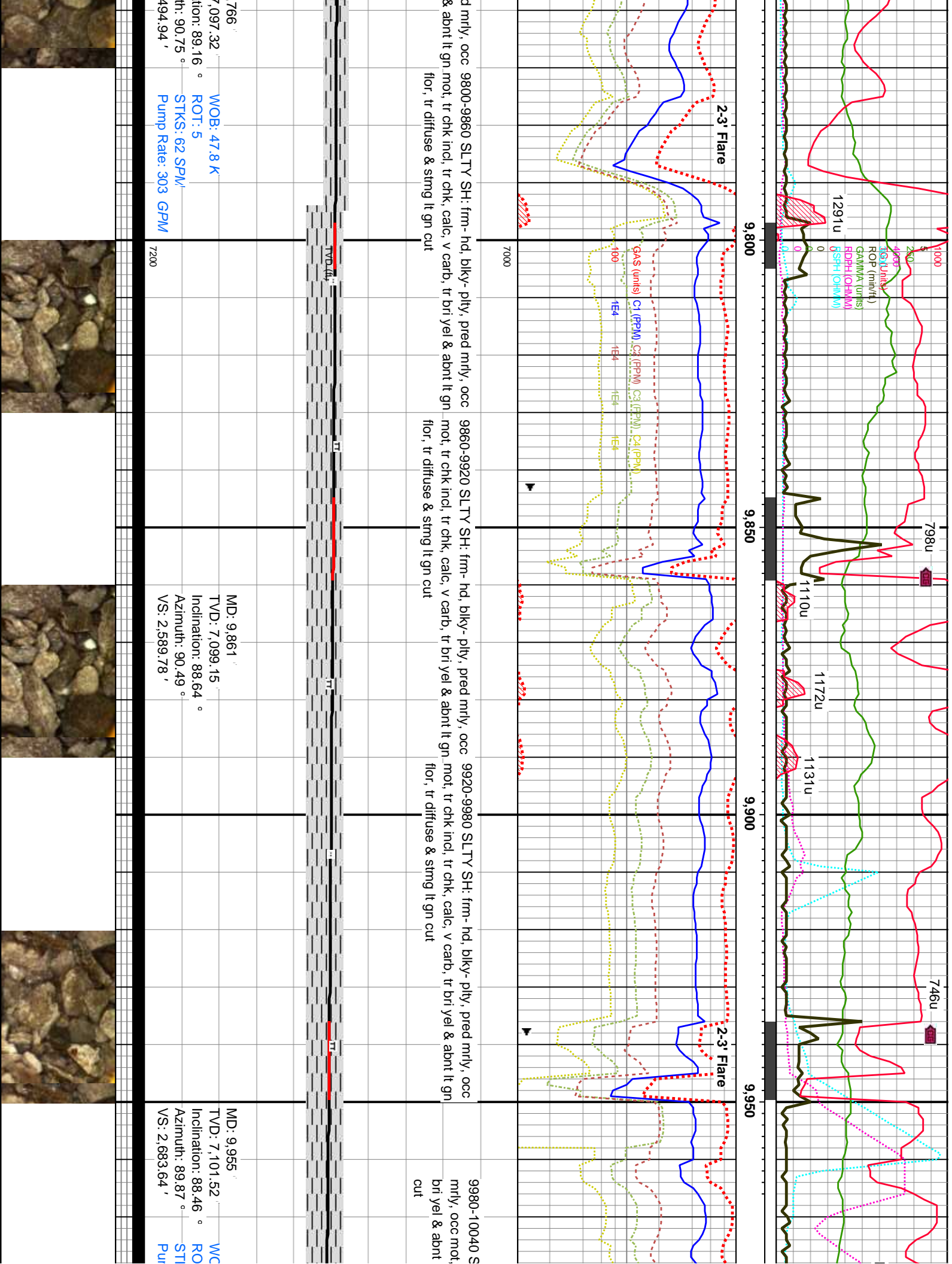


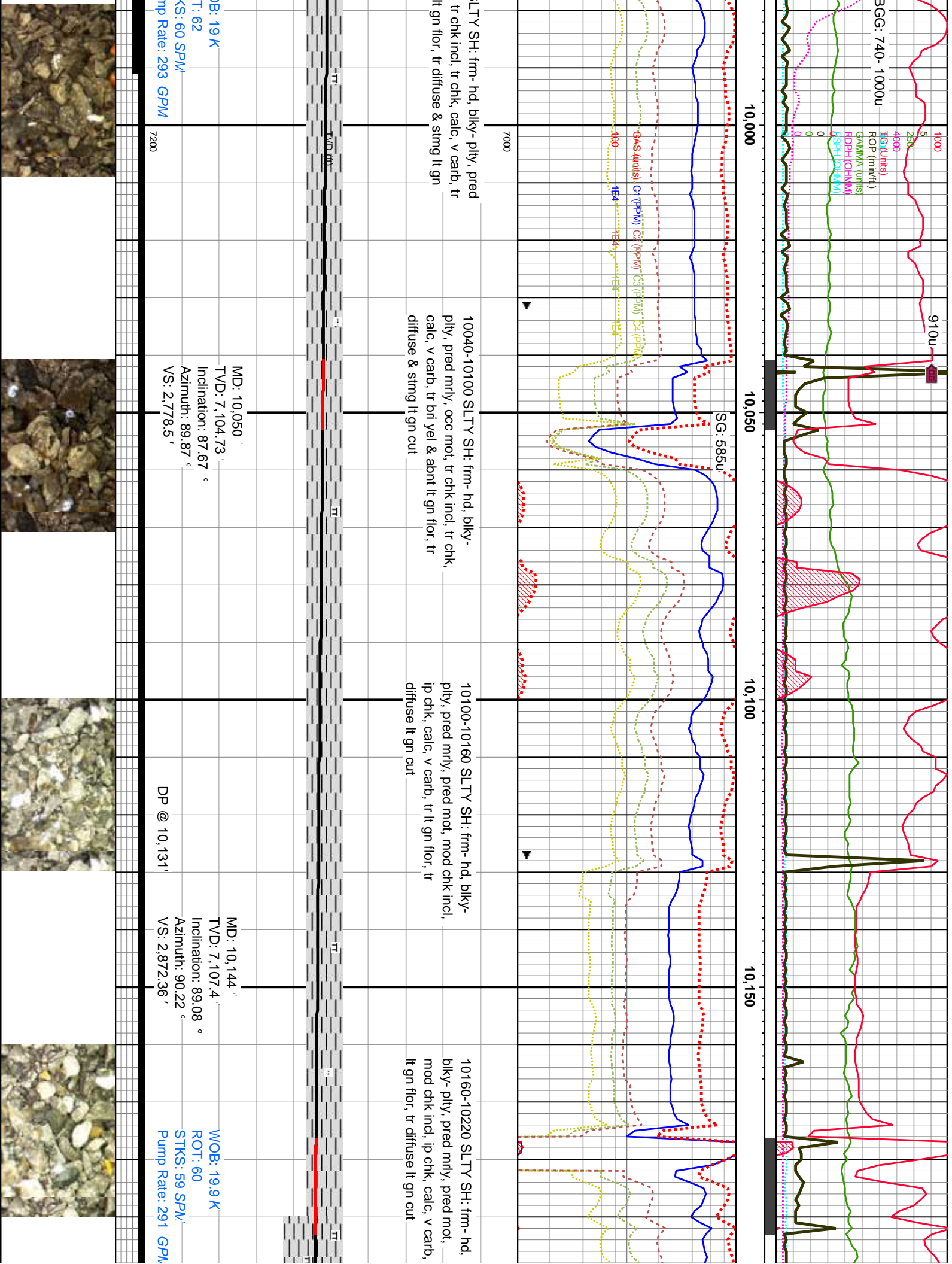




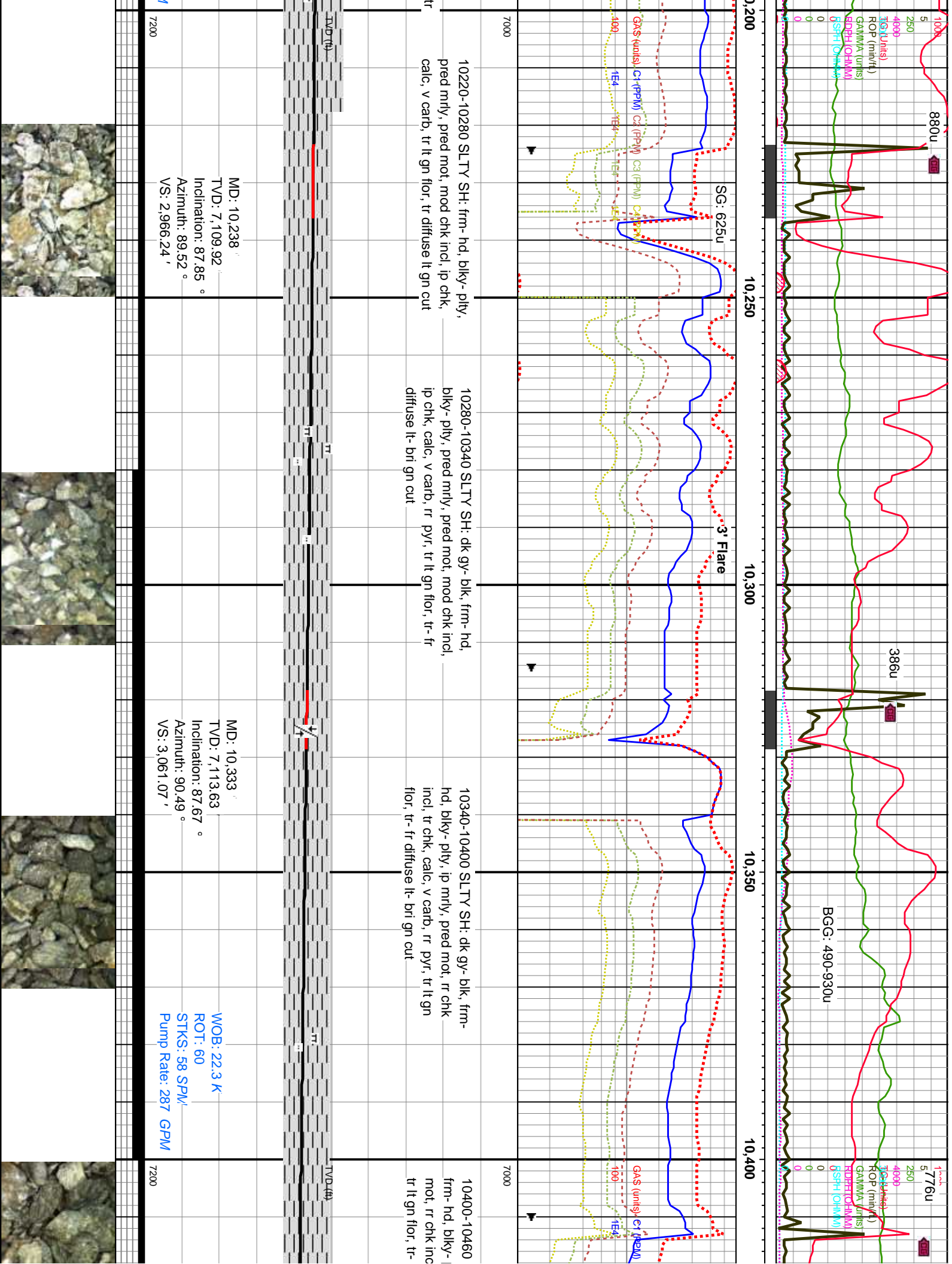












MD: 10,238'  
TVD: 7,109.92'  
Inclination: 87.85°  
Azimuth: 89.52°  
VS: 2,966.24'

MD: 10,333'  
TVD: 7,113.63'  
Inclination: 87.67°  
Azimuth: 90.49°  
VS: 3,061.07'

WOB: 22.3 K  
ROT: 60  
STKS: 58 SPM  
Pump Rate: 287 GPM

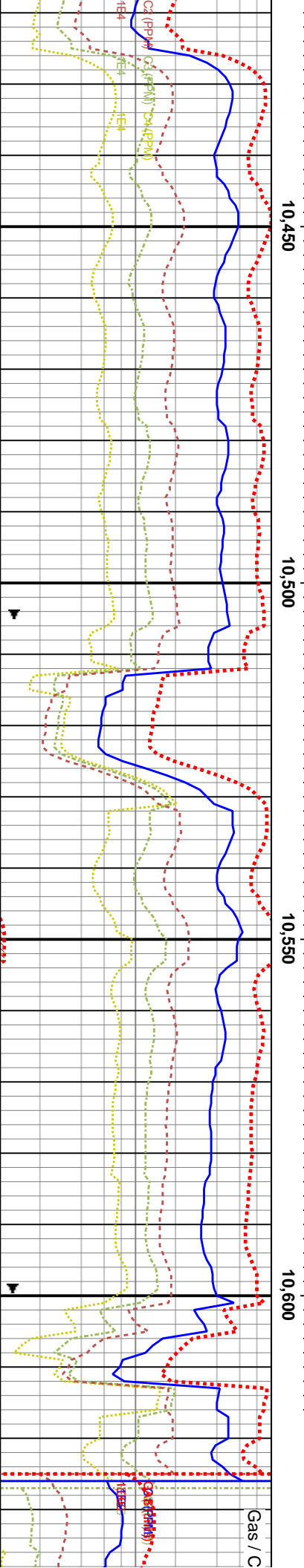
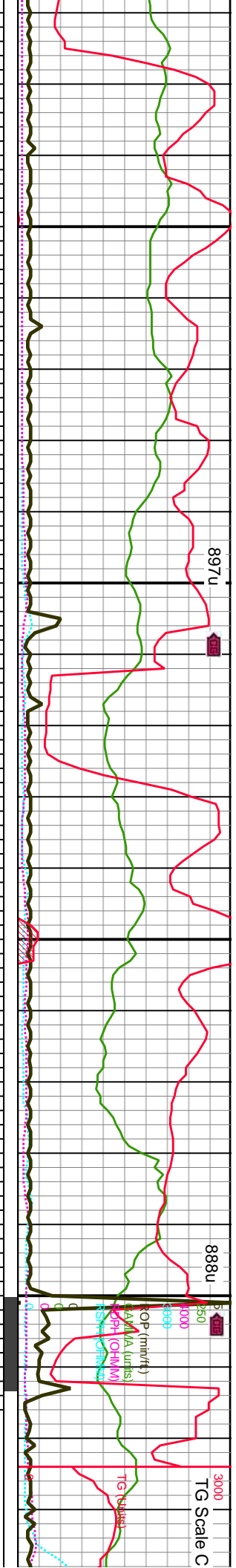
10220-10280 SLTY SH: frm- hd, blk- ply,  
pred mrl, pred mot, mod chk incl, ip chk,  
calc, v carb, tr lt gn flor, tr diffuse lt gn cut

10280-10340 SLTY SH: dk gy- blk, frm- hd,  
blk- ply, pred mrl, pred mot, mod chk incl,  
ip chk, calc, v carb, rr pyr, tr lt gn flor, tr- fr  
diffuse lt- brn gn cut

10340-10400 SLTY SH: dk gy- blk, frm-  
hd, blk- ply, ip mrl, pred mot, rr chk  
incl, tr chk, calc, v carb, rr pyr, tr lt gn  
flor, tr- fr diffuse lt- brn gn cut

10400-10460  
frm- hd, blk-  
mot, rr chk inc  
tr lt gn flor, tr-





SLTY SH: dk gy- blk, bily, ip mrlly, pred l, tr chk, calc, v carb, tr diffuse lt- bri gn cut

10460-10520 SLTY SH: dk gy- blk, frm- hd, blkly- ply, ip mrlly, pred mot, rr chk incl, tr chk, calc, v carb, rr pyr, tr lt gn flor, tr- tr diffuse lt- bri gn cut

10520-10580 SLTY SH: dk gy- blk, frm- hd, blkly- ply, ip mrlly, pred mot, rr chk incl, tr chk, calc, v carb, tr lt gn flor, tr- tr diffuse lt- bri gn cut

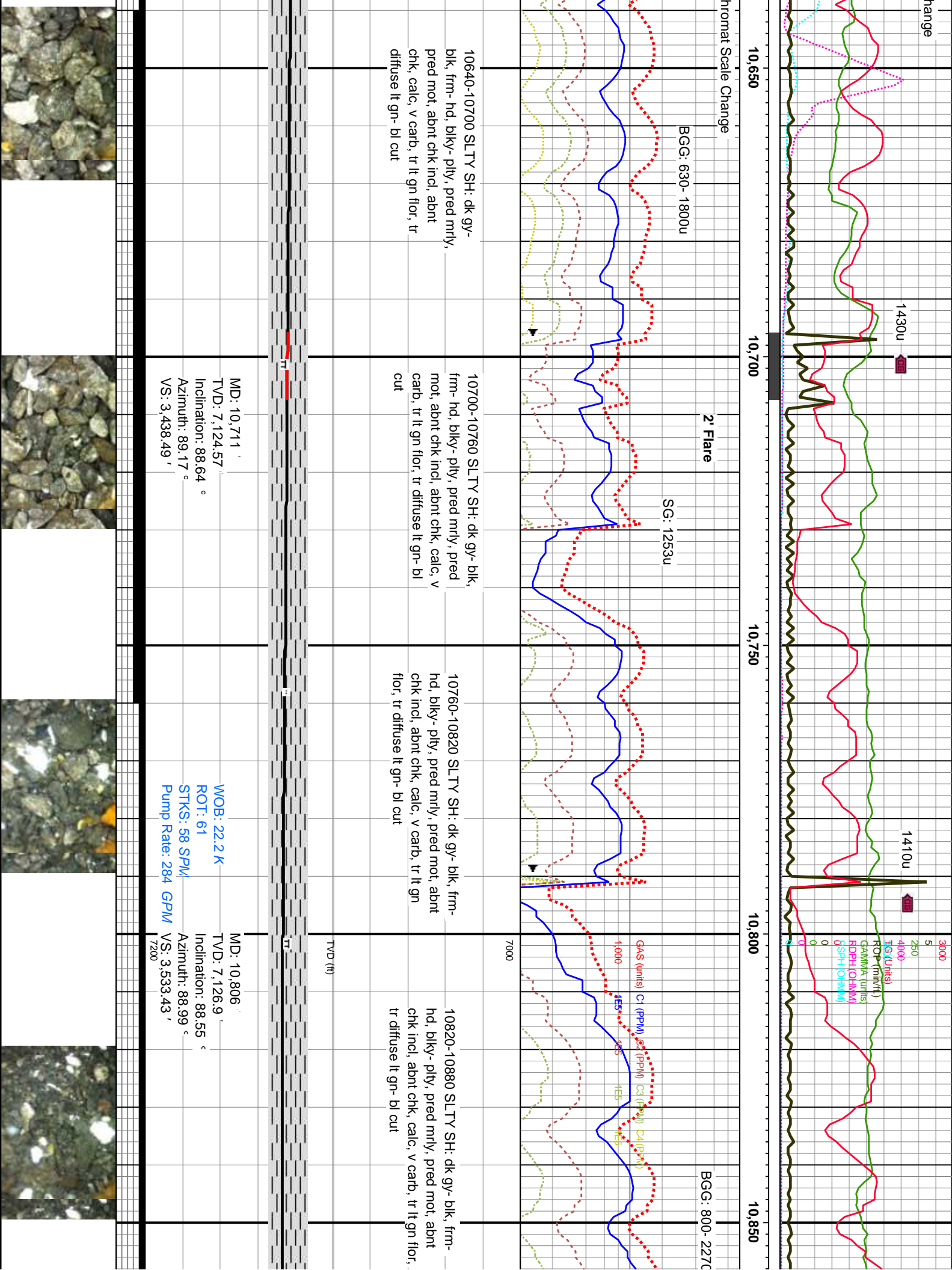
10580-10640 SLTY SH: dk gy- blk, frm- hd, blkly- ply, ip bf, ip mrlly, pred mot, rr chk incl, tr chk, calc, v carb, lt gn flor, tr diffuse lt gn cut

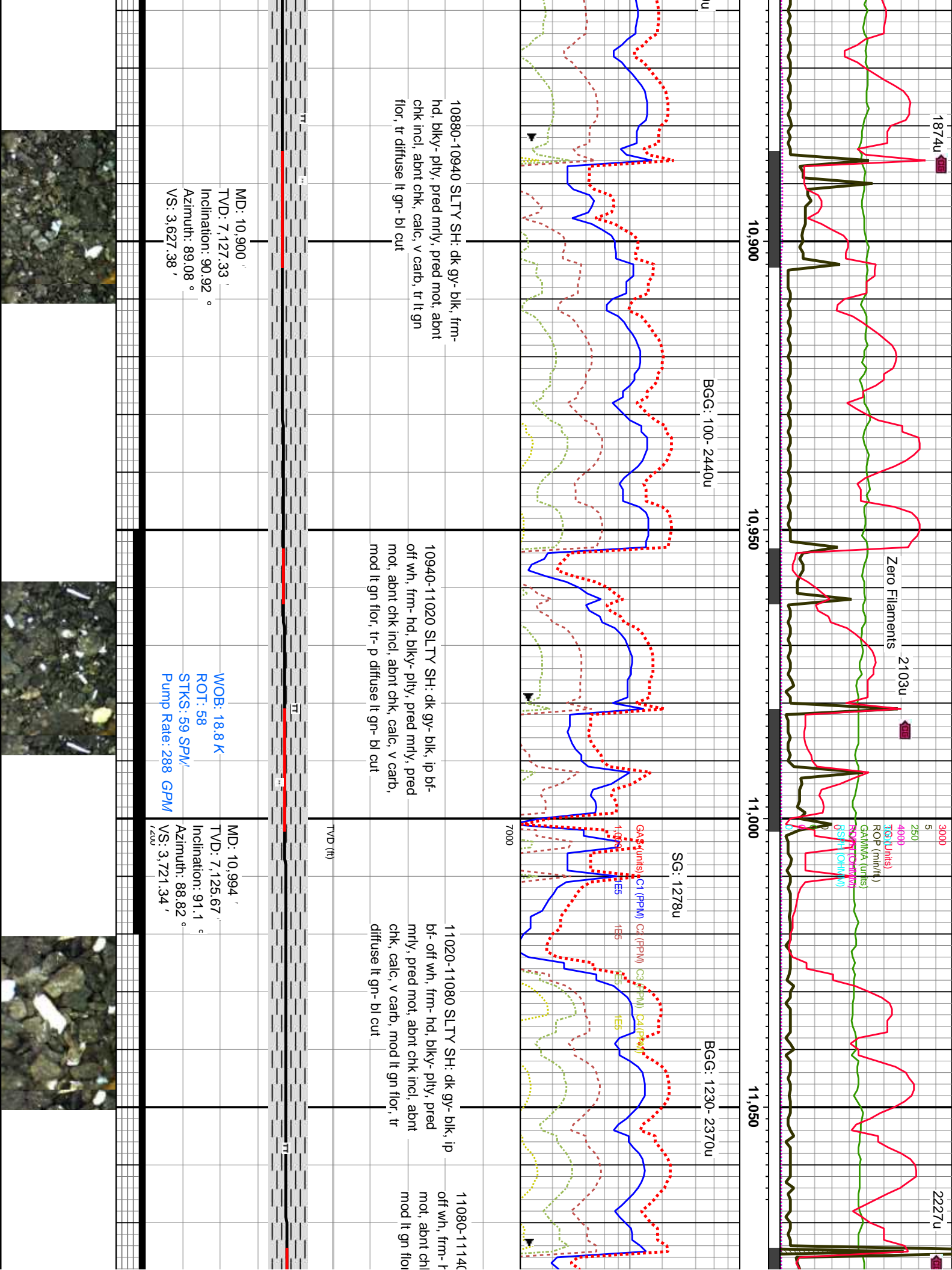
MD: 10,427 ' TVD: 7,117.24 ' Inclination: 87.93 ° Azimuth: 90.31 ° VS: 3,154.88 '

MD: 10,522 ' TVD: 7,120.08 ' Inclination: 88.64 ° Azimuth: 90.57 ° VS: 3,249.71 '

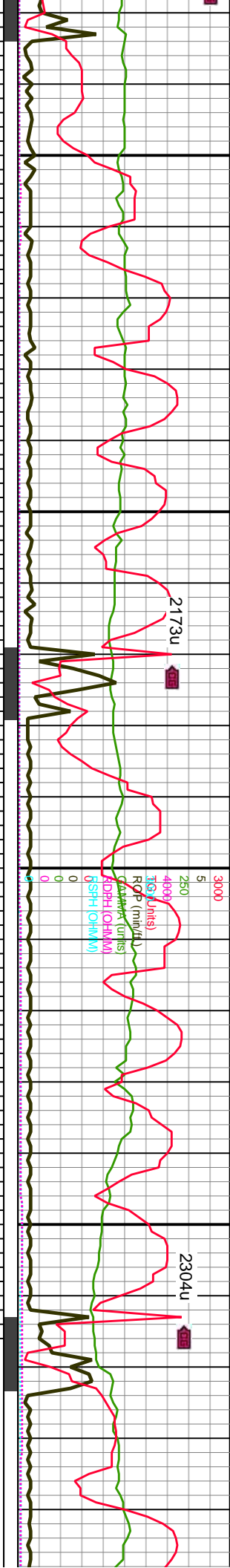
MD: 10,617 ' TVD: 7,122.34 ' Inclination: 88.64 ° Azimuth: 89.7 ° VS: 3,344.58 '











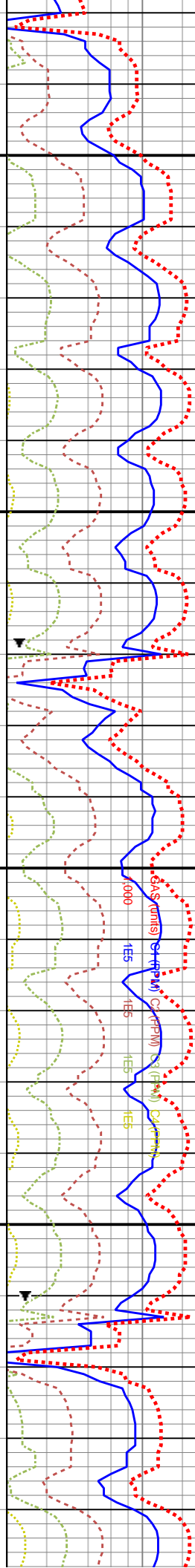
11,100

11,150

11,200

11,250

BGG-890-2250u



7000

SLTY SH: dk gy-blk, ip bf-

hd, blk- ply, pred mly, pred k incl, abnt chk, calc, v carb, tr diffuse lt gn- bl cut

11140-11200 SLTY SH: dk gy-blk, ip bf- off wh, frm-hd, blk- ply, pred mly, pred mot, abnt chk incl, abnt chk, calc, v carb, mod lt gn flr, tr diffuse lt gn- bl cut

11200-11260 SLTY SH: dk gy-blk, ip bf- off wh, frm-hd, blk- ply, pred mly, pred mot, abnt chk incl, abnt chk, calc, v carb, mod lt gn flr, tr diffuse lt gn- bl cut

11260-11320 SLTY SH: dk gy-blk, ip bf- off wh, frm-hd, blk- ply, pred mly, pred mot, abnt chk incl, abnt chk, calc, v carb, mod lt gn flr, tr diffuse lt gn- bl cut

11320 ply, p v carb

TVD (ft)

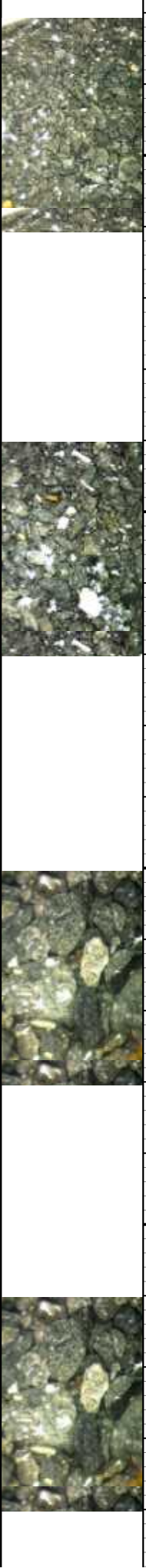
11

MD: 11,089'  
TVD: 7,124.73'  
Inclination: 90.04°  
Azimuth: 88.03°  
VS: 3,816.32'

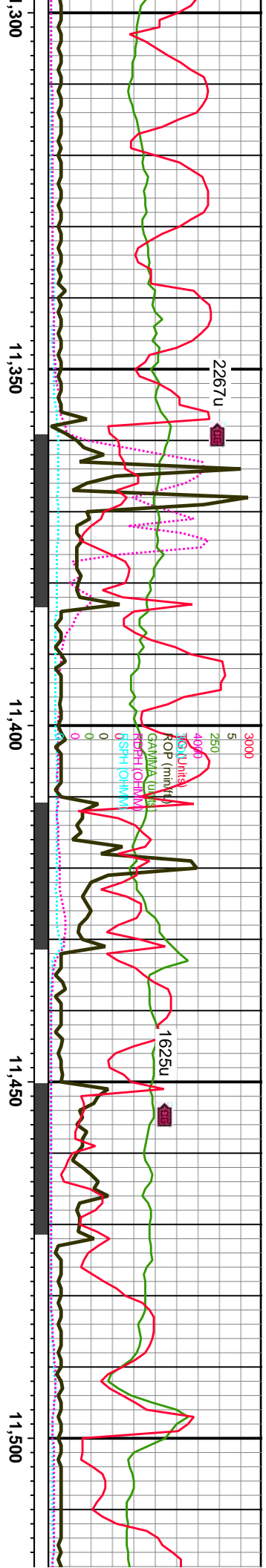
WOB: 19.3 K  
ROT: 60  
STKS: 57 SPM/  
Pump Rate: 279 GPM

MD: 11,183'  
TVD: 7,124.15'  
Inclination: 90.66°  
Azimuth: 89.34°  
VS: 3,910.29'

MD: 11,278'  
TVD: 7,122.84'  
Inclination: 90.92°  
Azimuth: 88.46°  
VS: 4,005.25'







BGG: 1300-2350u

BGG: 1000-2400u

med gy, lt gy, frm-hd, blyk-  
-11380 SLTY SH: med gy, lt gy, frm-hd, blyk-  
med mrv, pred mot, com chk incl, com chk, calc,  
mod lt gn flr, tr diffuse lt gn-bl cut

11380-11440 SLTY SH: med gy, lt gy, frm-hd, bllk-  
ply, pred mrlly, pred mot, com chk incl, com chk, calc,  
v carb, mod lt gn flor, tr diffuse lt gn-bl cut

11440-11500 SLTY SH: med gy, lt gy, frm- hd, blyk-  
pity, pred mrlly, pred mot, abnt chk incl, abnt chk, calc  
v carb, mod lt gn flor, tr diffuse lt gn- bl cut

11500-11560 SLTY SH: med gy, lt gy, frm-r  
ply, pred mrlly, pred mot, abnt chk incl, abnt  
v carb, mod lt gn flor, tr diffuse lt gn-bl cut

DS @ 11,300'

MD: 11,372	WOB: 21.2 K
TVD: 7,120.54	ROT: 60
Inclination: 91.89	STKS: 58 SPM
Azimuth: 88.46	Pump Rate: 283 GPM
VS: 4,099.2'	

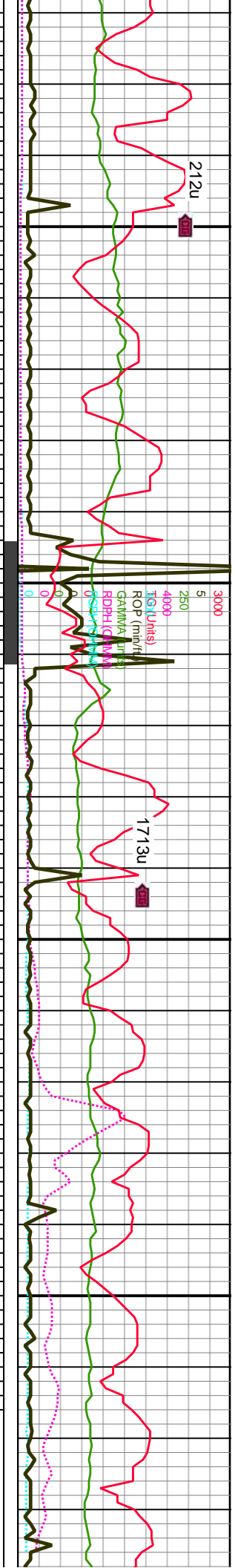
7200

MD: 11,467  
TVD: 7,119.45  
Inclination: 89.43 °  
Azimuth: 88.2 °  
VS: 4,194.18'

TV/D (ft)

7000





11,550

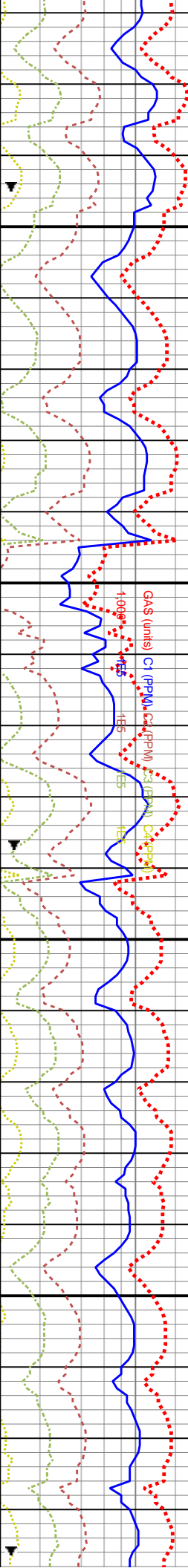
11,600

11,650

11,700

BGG: 500- 2200u

BGG: 1000- 1800u



7000

11560-11620 SL.TY SH: med gy, lt gy, frm- hd, blk- ply, pred mrlly, pred mot, abnt chk incl, abnt chk, calc, v carb, abnt bri yel & mod lt gn flor, tr diffuse lt gn- bl cut

11620-11680 SL.TY SH: med gy, lt gy, frm- hd, blk- ply, pred mrlly, pred mot, abnt chk incl, abnt chk, calc, v carb, abnt bri yel & mod lt gn flor, tr diffuse lt gn- bl cut

11680-11740 SL.TY SH: med gy, lt gy, frm- hd, blk- ply, pred mrlly, pred mot, abnt chk incl, abnt chk, calc, v carb, abnt bri yel & mod lt gn flor, tr diffuse lt gn- bl cut

TVD (ft)

MD: 11,561'  
TVD: 7,120.17'  
Inclination: 89.69 °  
Azimuth: 87.15 °  
VS: 4,288.17'

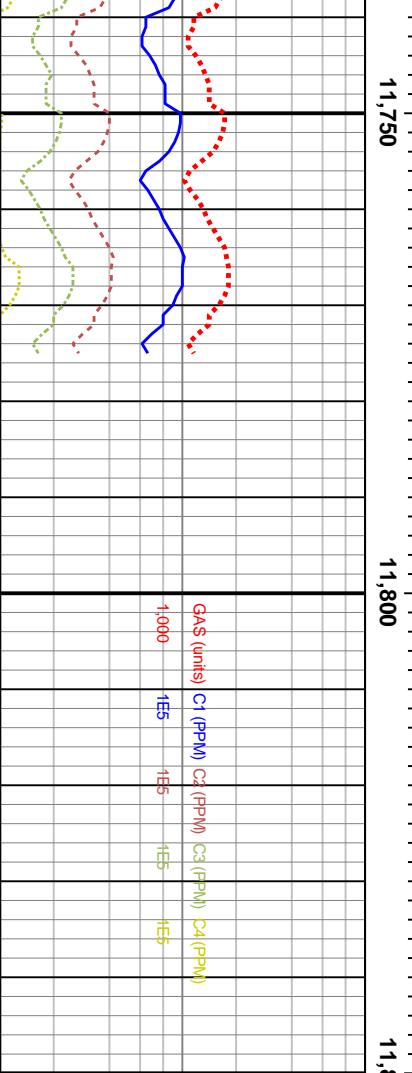
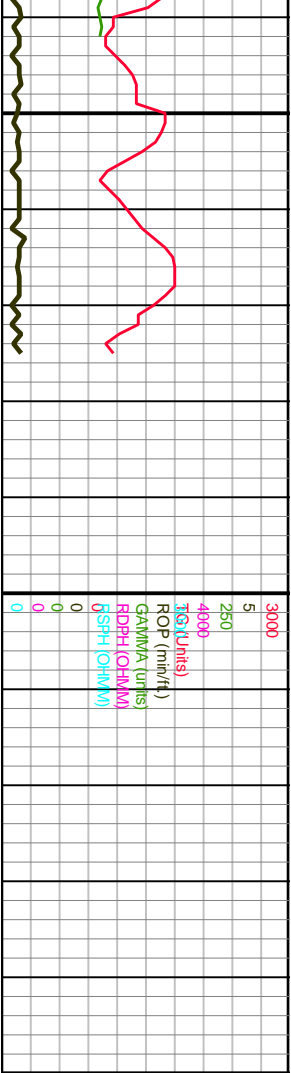
WOB: 76 K  
ROT: 10  
STKS: 60 SPM/  
Pump Rate: 293 GPM

MD: 11,656'  
TVD: 7,119.66'  
Inclination: 90.92 °  
Azimuth: 88.29 °  
VS: 4,383.17'

MD: 11,697'  
TVD: 7,118.69'  
Inclination: 91.8 °  
Azimuth: 88.11 °  
VS: 4,424.15'



11740-11775  
gy, lt gy, frm- l mrlly, pred mo abnt chk, calc yel & mod lt gn- bl cut



SLTY SH: med  
nd, biky- pty, pred  
t, abnt chk incl,  
v carb, abnt bri  
n floor, tr diffuse lt

TVD (ft)

7000

**TD Reached @ 11,775'**  
**on 9/19/13 @ 23:15hrs**



MD: 11,775 '  
TVD: 7,116.24 '  
Inclination: 91.8 °  
Azimuth: 88.11 °  
VS: 4,502.11 '

7200