



RESERVOIR GROUP

Scale: 5" / 100'

Measured Depth Log

Well Name BEF West 15

Location Section 2, Township 1S, Range 66W

State Colorado

County Adams

Country USA

Rig Number True 33

API Number 05-001-10219

AFE # 10219

Geographic Region Rockies

Field Wattenberg

Spud Date 12/26/2018

Drilling Completed 1/12/2019

Surface Coordinates 2152' FNL & 322' FEL, Sec. 2, T1S, R66W

Latitude: 39.99463, Longitude: -104.7347

Bottom Hole Coordinates 1632' FNL & 460' FWL, Sec. 2, T1S, R66W

Ground Elevation 5,049'

K.B. Elevation 5,076'

Logged Interval 7,550' To 15,525'

Total Depth 15,525'

Formation Codell

Type of Drilling Fluid Water Based Mud

Operator

Company Petro Operating Company, LLC

Address 9033 East Easter Place, Suite 112
Centennial, CO 80112-2105

Petro  **operatin**
Company, LLC

Geologist

Name Michael Domenick

Company Petro Operating Company, LLC

Address 9033 East Easter Place, Suite 112
Centennial, CO 80112-2105

Petro  **operatin**
Company, LLC

Other

Loggers: Byron Pitulski/Greg Diefenbach
Services Provided: 2 Man Logging, Geosteering
Equipment: ML-531 & ML-585
Start Date 01/10/2018
Release Date: 01/13/2019
Job #: 1853RK1812

Zone Color Coding

Oil

Note

Error

Condensate

Core

Water

Gas

Pressure

Seal

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

Acc

F FOSSIL

GASTROPOD

ARGILLITE GRAY

B BENTONITE

BITUMENOUS

BRECCIA FRAC

CALCAREOUS

CARBONACEO

CHTDK

CHTLT

COAL - THIN BR

DOLOMITIC

FELDSPAR

FERRUGINOUS

FERRUGINOUS

GASTROPOD

OOULTE

OSTRACOD

PELECYPOD

PELLET

PISOLITE

PLANT REMAINS

PLANT SPORES

SCAPHOPOD

STROMATOPOROID

ANHYDRITIC

Other

OIL SHOW

ORGANIC

P PINPOINT

V VUGGY

EVEN

QUESTIONABLE

SPOTTED STAINING

Engineering

CASING

CONNECTION (LEFT)

CONNECTION (RIGHT)

CONNECTION GAS

CORE - LOST

CORE - RECOVERED

DST INTERVAL

FAULT

Porosity

E EARTHY

F FENESTRAL

F FRACTURE

INTERCRYSTALLINE

INTEROOLITIC

MOLDIC

Accessories

S	GLAUCONITE	
AIN	GYPSIFEROUS	
	HEAVY MINERAL	ANHYDRITE STRINGER
	SUBSTANCE	BENTONITE STRINGER
	KAOLIN	COAL STRINGER
	MARLSTONE	DOLomite STRINGER
	MINERAL CRYSTALS	GYPSUM STRINGER
	NODULES	LIMESTONE STRINGER
	PHOSPHATE PELLETS	MARLSTONE (CALC) STRG
	PYRITE	MARLSTONE (DOL) STRG
	SALT CAST	SANDSTONE STRINGER
	SANDY	SHALE STRINGER
	SILICEOUS	SILTSTONE STRINGER
	SLITY	
	TUFFACEOUS	

Stringer

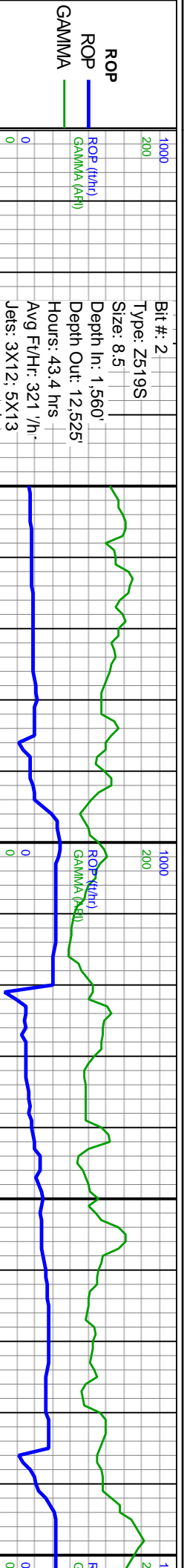
Symbols

FORMATION TOP		L LITHOGRAPHIC
AS SHOW		MX MICROXLN
DEPTH	ANGULAR	MS MUDSTONE
MIN DEPTH		
ORMAL FAULT	R ROUNDED	PS PACKSTONE
L SHOW	S SUBANG	WS WACKESTONE
VERTURNED STRATA	SUBRND	
VERSE FAULT		
DE WALL CORE (LEFT)		M MODERATE
DE WALL CORE (RIGHT)	B BOUNDSTONE	P POOR
DE	C CHALKY	W WELL
SURVEY	CX CRYPTOXLN	
RIP GAS	E EARTHY	
RELINE TESTED - LEFT	FX FINELYYXLN	
RELINE TESTED - RT	GS GRAINSTONE	

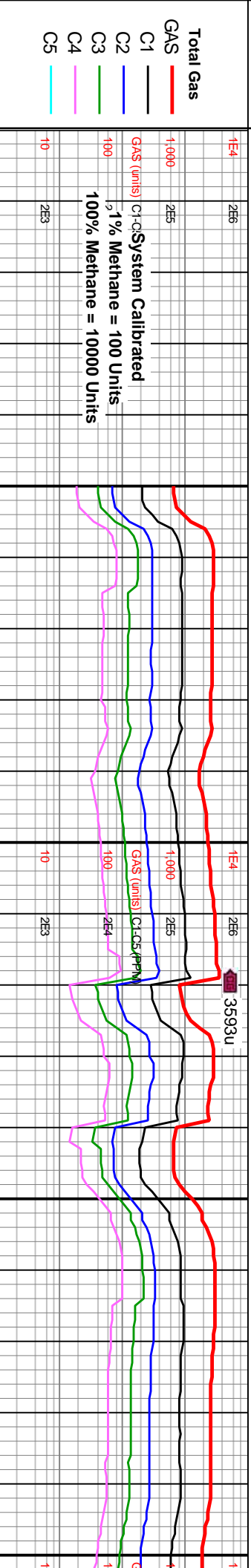
Rounding

Sorting

Textures



Slide/Rotate	Depth Labels	Notes
	7,510 7,520 7,530 7,540 7,550 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	<div><div>MD: 7,559' INC: 45.6° AZM: 271.6° TVD: 7,403.97' VS: -361.26'</div><div>Niobrara C 7594MD/7427TVD</div><div>WOB: 32klbs RPM: 30 SPM: 170 SPP: 3,429psi</div><div>MW IN: 9.9+ VIS IN: 45 MW OUT: 10.1 VIS OUT: 44</div><div>MD: 7,654' INC: 52.1° AZM: 274.6° TVD: 7,466.46' VS: -289.89'</div></div>

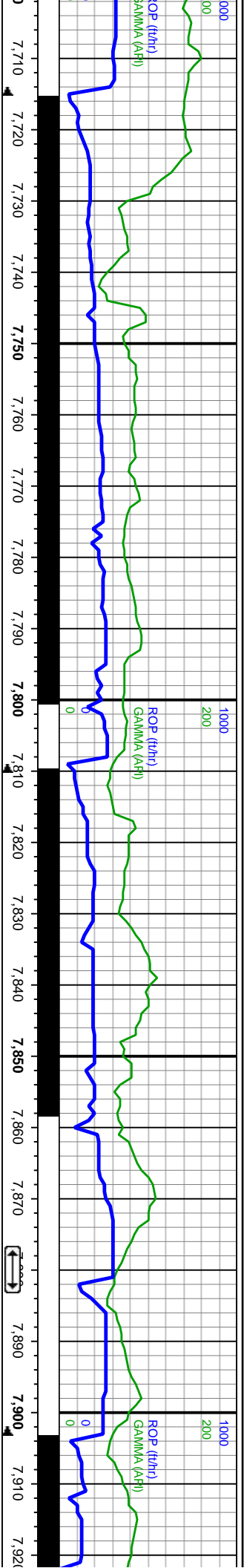


Well Bore	TV	TV	TV
Petro Operating Co. BEF West 15	7200	7200	7
9 5/8" Surface Casing @ 1,535'			
Spud Date: 12/26/2018			
2 Man Logging Began 01/10/2019	TVD (ft)	TVD (ft)	T
All Depths Correspond to Driller's Pipe Tally			
Continued from Vertical Log	8200	8200	8

60% CHK: offwht, amor, sft-med frm, vf-f;
40% MRLST: gry-dk gry, silty, amor, f-med,
mnr pyr, abnt free chk

55% MRLST: gry-dk gry, amor, fy lam chk,
dissm sil, mnr pyr; 45% CHK: offwht to lt
brn, amor, sft-med frm, vugy, occ free chk





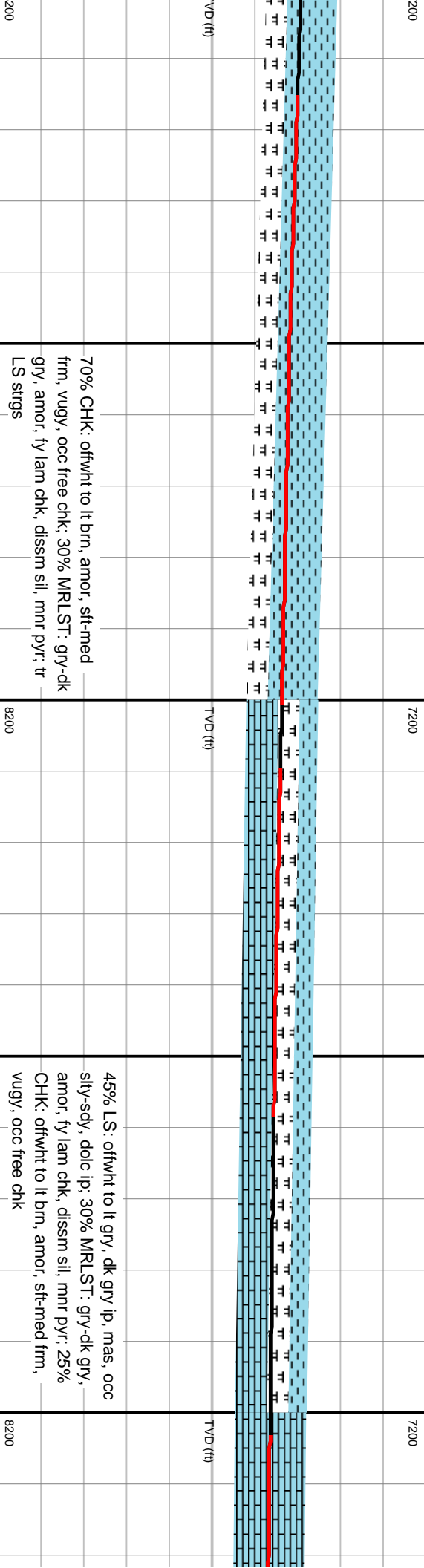
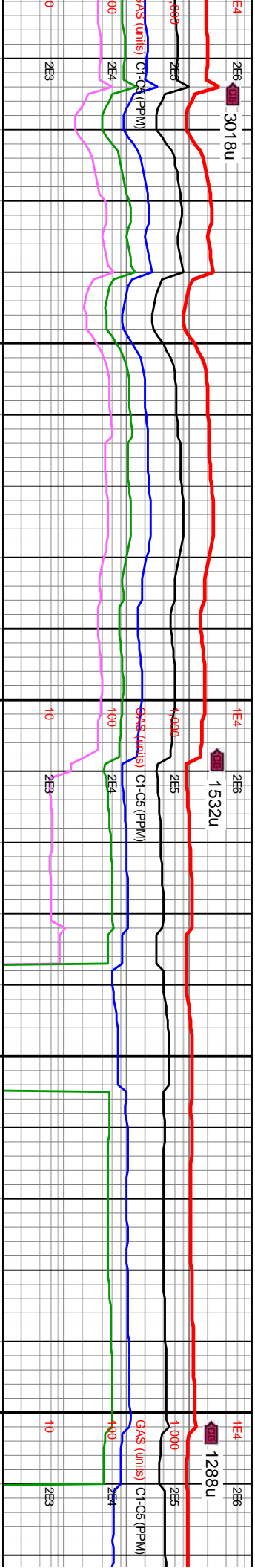
MMW IN: 9.9
VIS IN: 43
MMW OUT: 10
VIS OUT: 43

MD: 7,749'
INC: 61.6°
AZM: 274.9°
TVD: 7,518.35'
VS: -210.48'

WOB: 0kbs
RPM: 0
SPM: 170
SPP: 3.213psi

MD: 7,843'
INC: 76.2°
AZM: 275.3°
TVD: 7,552.1'
VS: -123.04'

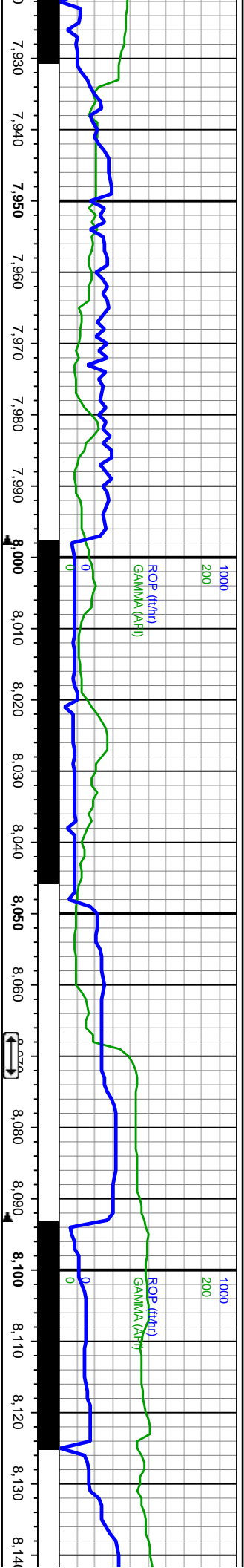
Ft. Hayes
7879MD/7560TVD



70% CHK: offwht to lt brn, amor, sft-med
frm, vugy, occ free chk; 30% MRLST: gry-dk
gry, amor, fy lam chk, dissil, mn pyr; tr
LS strgs

45% LS: offwht to lt gry, dk gry ip, mas, occ
sily-sdy, dolc ip; 30% MRLST: gry-dk gry,
amor, fy lam chk, dissil, mn pyr; 25%
CHK: offwht to lt brn, amor, sft-med frm,
vugy, occ free chk





MD: 7,938'
INC: 79.7°
AZM: 274°
TVD: 7,571.93'
VS: -30.2'

MW IN: 9.8+
VIS IN: 43
MW OUT: 9.9+
VIS OUT: 43

WOB: 34klbs
RPM: 9
SPM: 169
SPP: 2.695psi

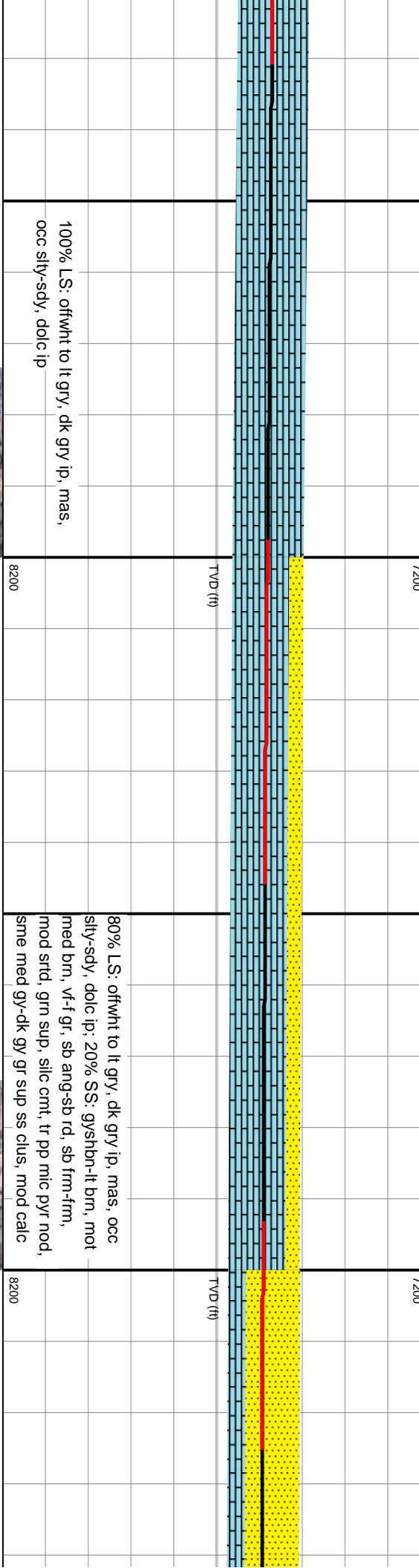
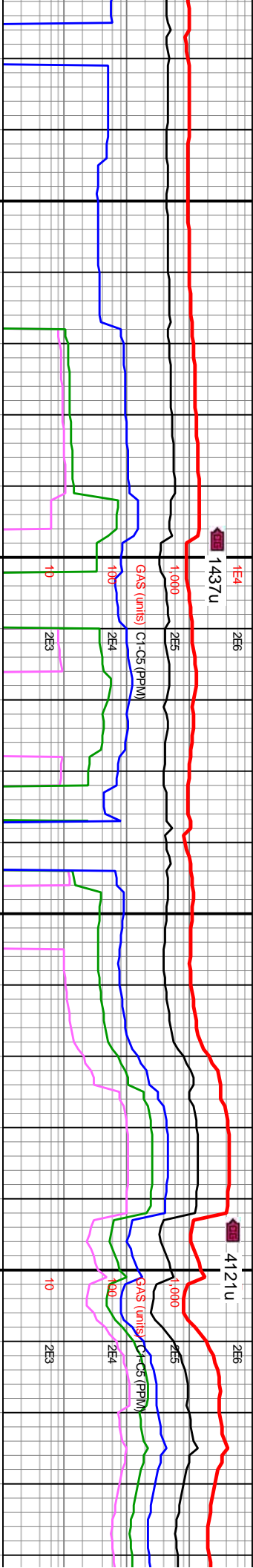
MD: 8,033'
INC: 83.3°
AZM: 271°
TVD: 7,585.97'
VS: 63.51'

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

8069MD/7589TVD

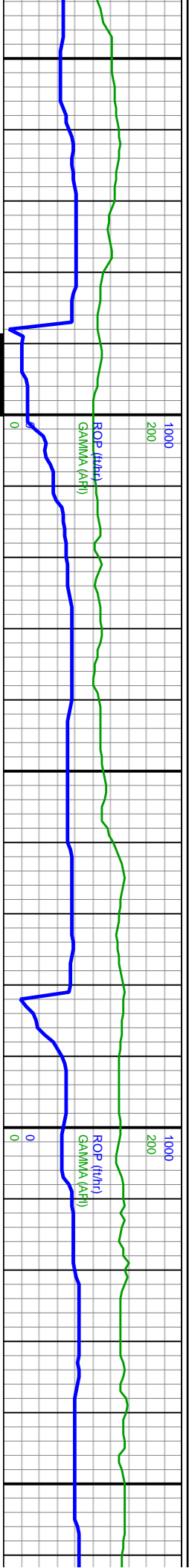
Land Curve
8,125' MD

MD: 8,127'
INC: 87.4°
AZM: 269.5°
TVD: 7,593.59'
VS: 156.63'



100% LS: offwht to lt gry, dk gry ip, mas,
occ silty-sdy, dolc ip

80% LS: offwht to lt gry, dk gry ip, mas, occ
silty-sdy, dolc ip; 20% SS: gyshtn-lt brn, mot
med brn, vf-f gr, sb ang-sb rd, sb frm-frm,
mod strd, grn sup, silc cnt, tr pp mltc pyr nod,
sme med gy-dk gy gr sup ss clus, mod calc

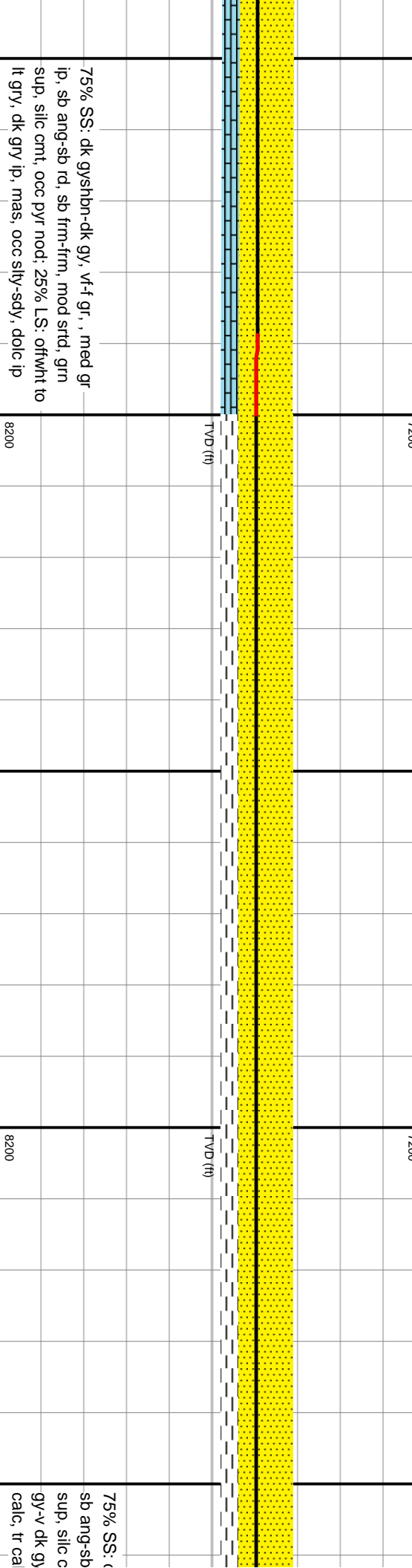
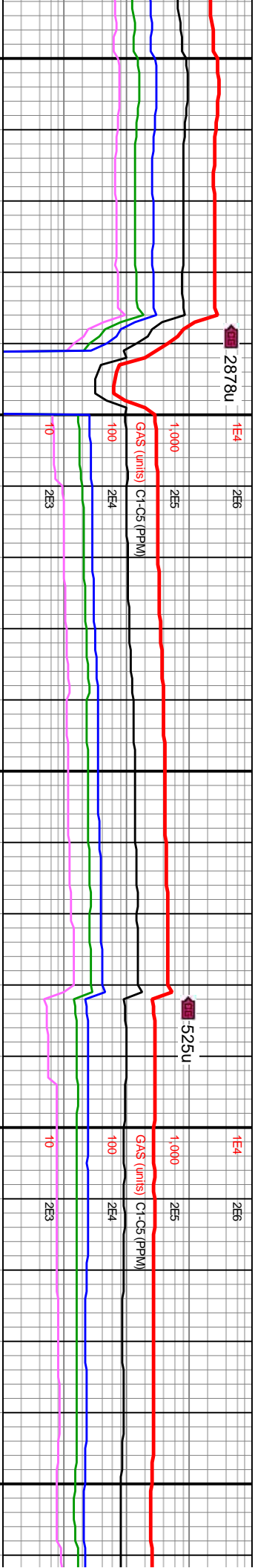


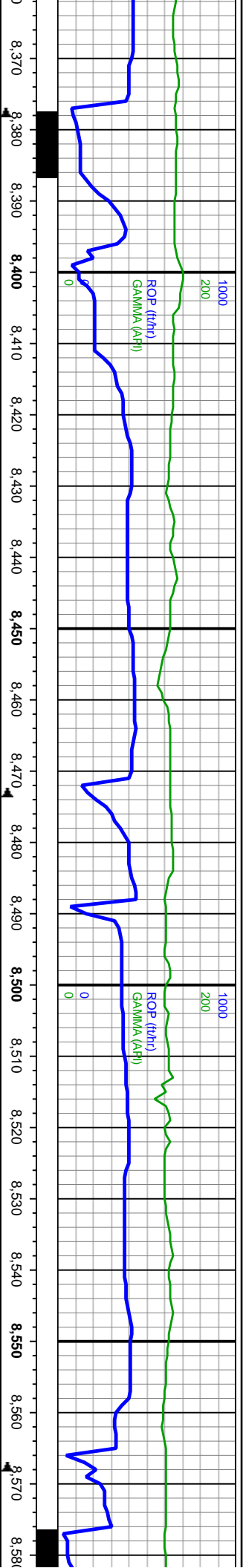
WOB: 24.6klbs
RPM: 10
SPM: 170
SPP: 2,662psi

MD: 8,222'
INC: 90.1°
AZM: 269.5°
TVD: 7,595.66'
VS: 250.91'

MD: 8,316'
INC: 90.4°
AZM: 269.3°
TVD: 7,595.25'
VS: 344.2'

MW IN: 9.8
VIS IN: 42
MW OUT: 9.8
VIS OUT: 41





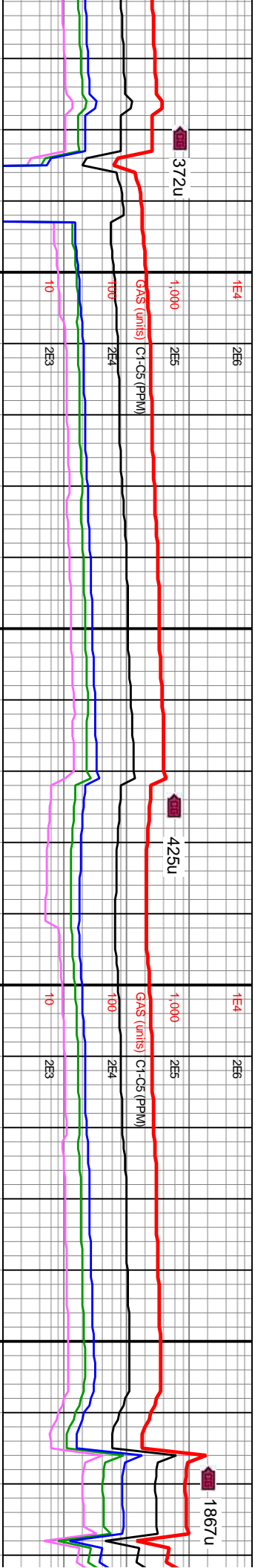
WOB: 32klbs
RPM: 60
SPM: 170
SPP: 3.518psi

MD: 8.411'
INC: 89.8°
AZM: 268.6°
TVD: 7.595.09'
VS: 438.39'

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

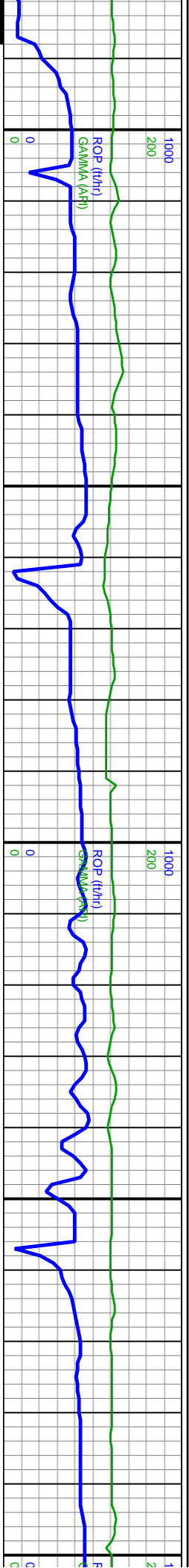
MD: 8.506'
INC: 90°
AZM: 267.5°
TVD: 7.595.25'
VS: 532.37'

MD: 8.506'
INC: 90°
AZM: 267.5°
TVD: 7.595.25'
VS: 532.37'



TVD (ft)		TVD (ft)		TVD (ft)	
8200		8200		8200	
dk gysbhn-dk gy, vf-f gr, med gr ip, rd, sb frm-frm, mod strt, grn mt, occ pyr nod; 25% Mrlly SH: dk ; mot, suc, frm-hd, ply fis, brit, mod frac fl		80% SS: dk gysbhn-dk gy, vf sb ang-sb rd, sb frm-frm, mo sup, silic cmt, occ pyr nod; 20 gy-v dk gy, mot, suc, frm-hd, calc, tr cal frac fl			





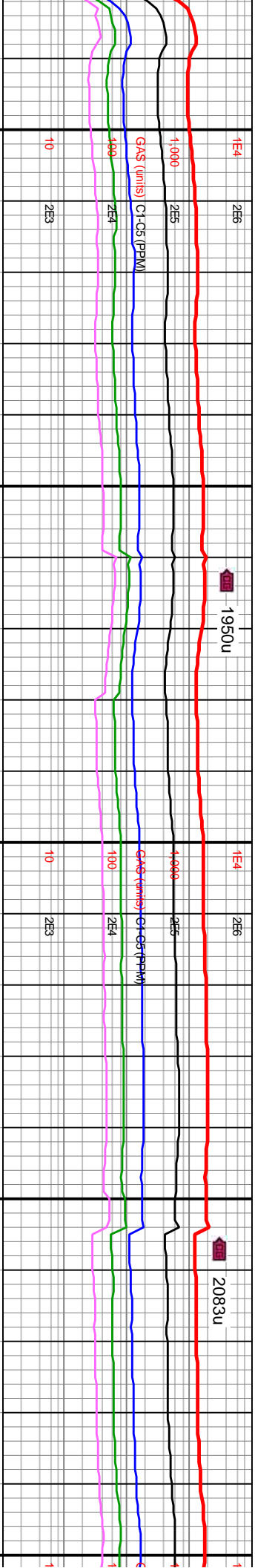
8,590 8,600 8,610 8,620 8,630 8,640 8,650 8,660 8,670 8,680 8,690 8,700 8,710 8,720 8,730 8,740 8,750 8,760 8,770 8,780 8,790 8,800

WOB: 22.6klbs
90°
RPM: 61
268.8°
SPM: 170
7.595.25'
SPP: 3.222psi
26.38'

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

MD: 8.695'
INC: 90°
AZM: 268.1°
TVD: 7.595.25'
VS: 719.47'

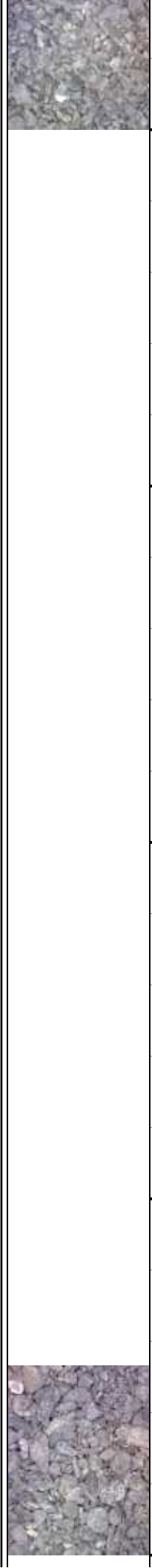
WOB: 26.6klbs
90°
RPM: 60
268.8°
SPM: 170
7.595.25'
SPP: 3.44psi

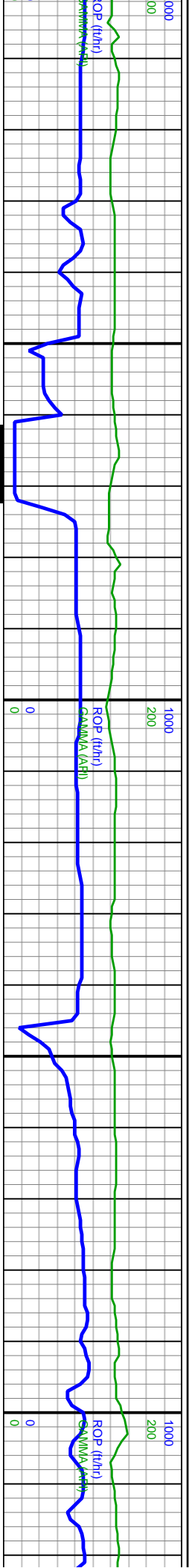


7,200 8,200

TVD (ft)

100% SS: dk gysbhn-med gy, vt-f gr, v dk gr ip, sb ang-sb rd, pily-lam, frm-hd, w srrd, grm sup, calc cmt, silic ip, occ CHK, occ MRLST

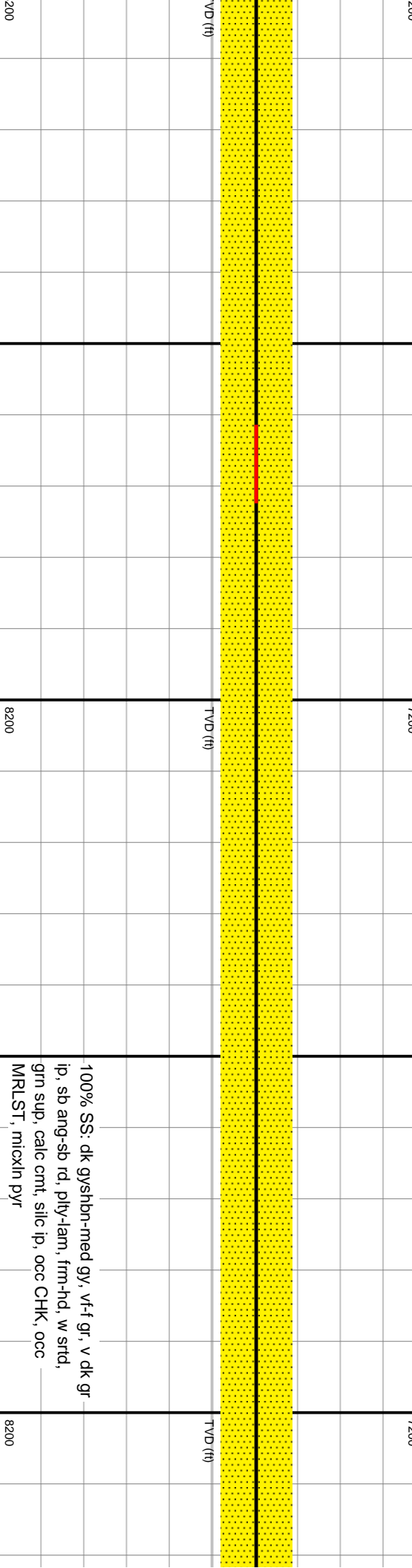
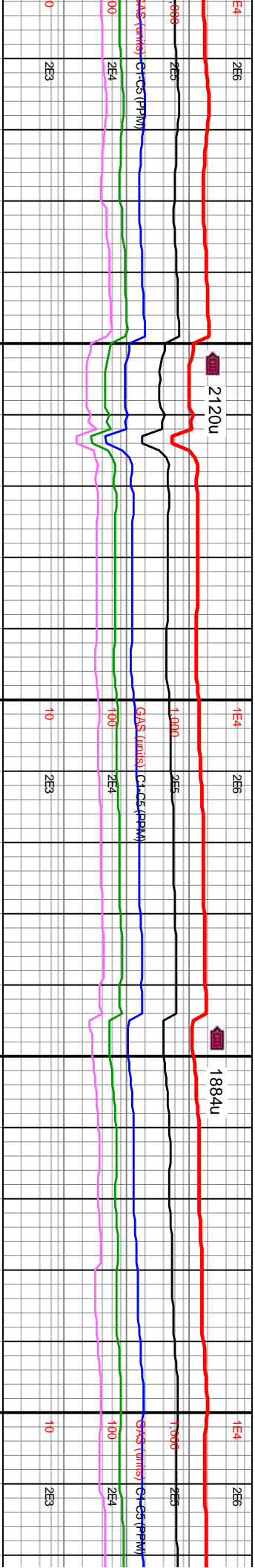




8kbls MW IN: 9.8
VIS IN: 44
MW OUT: 9.9
VIS OUT: 43

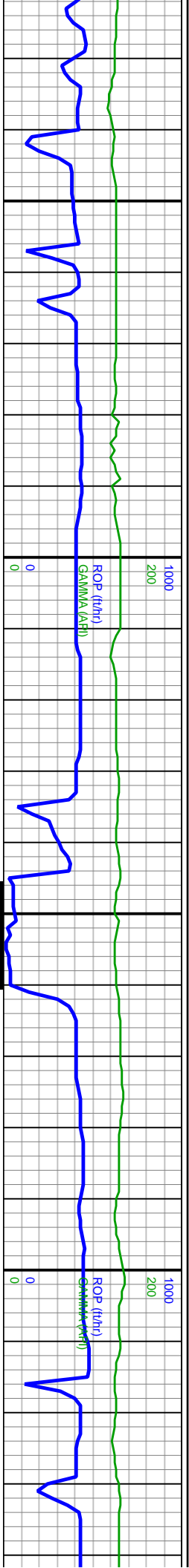
MD: 8,884'
INC: 89.5°
AZM: 268.9°
TVD: 7,596.66'
VS: 906.57'

WOB: 29.8kbls
RPM: 60
SPM: 170
SPP: 3,563psi



100% SS: dk gyshtn-med gy, vf-f gr, v dk gr
ip, sb ang-sb rd, pty-lam, frm-hd, w strd,
grn sup, calc cnt, silc ip, occ CHK, occ
MRLST, micxln pyr

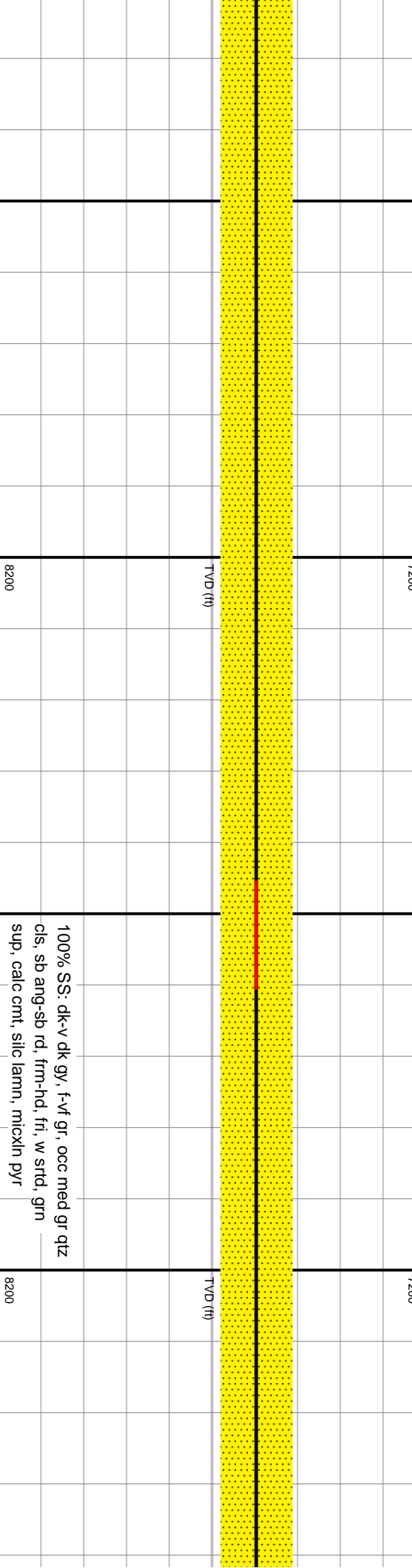
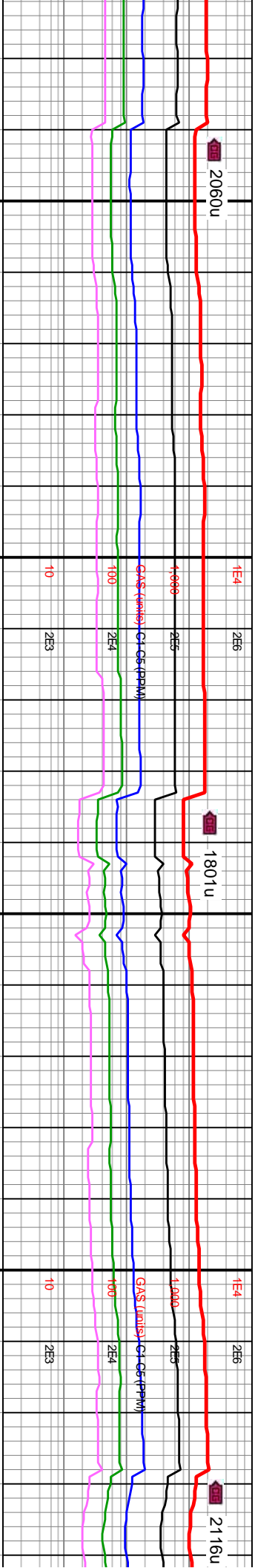




MD: 9,074' MW IN: 10
INC: 89.9° VIS IN: 43
AZM: 267.9° MW OUT: 10.1
TVD: 7,596.33' VIS OUT: 43
VS: 1,094.75'

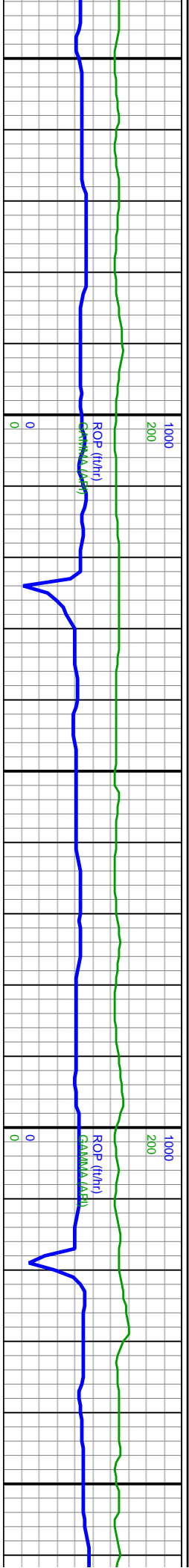
MD: 9,169' INC: 89.7°
AZM: 269.3°
TVD: 7,596.66'
VS: 1,188.86'

WOB: 20.8kbs RPM: 60
SPM: 169 VIS IN: 41
SPP: 3,198psi MW OUT: 9.9
VIS OUT: 42



100% SS: dk-v dk gy, f-vf gr, occ med gr qtz
cls, sb ang-sb rd, frm-hd, fri, w srd, grn
sup, calc cmt, silic lamn, micxn pyr





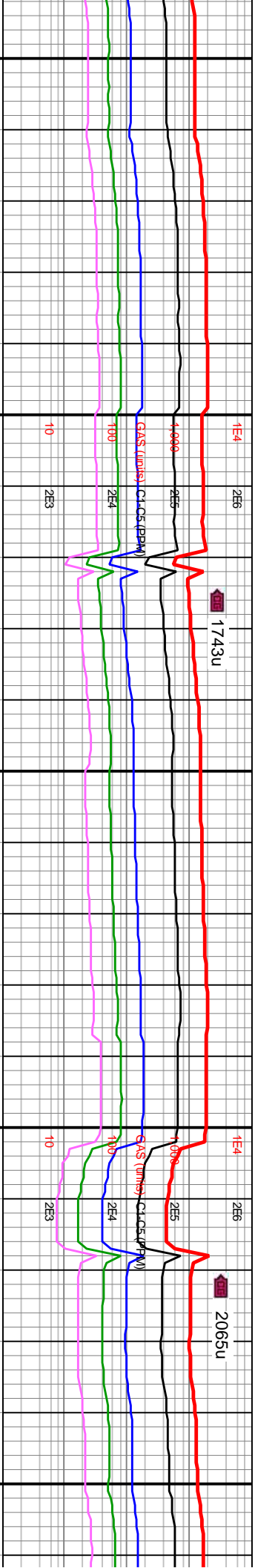
9,250 9,260 9,270 9,280 9,290 9,300 9,310 9,320 9,330 9,340 9,350 9,360 9,370 9,380 9,390 9,400 9,410 9,420 9,430 9,440 9,450 9,460

MD: 9,263'
INC: 89.5°
AZM: 268.9°
TVD: 7,597.31'
VS: 1,282.09'

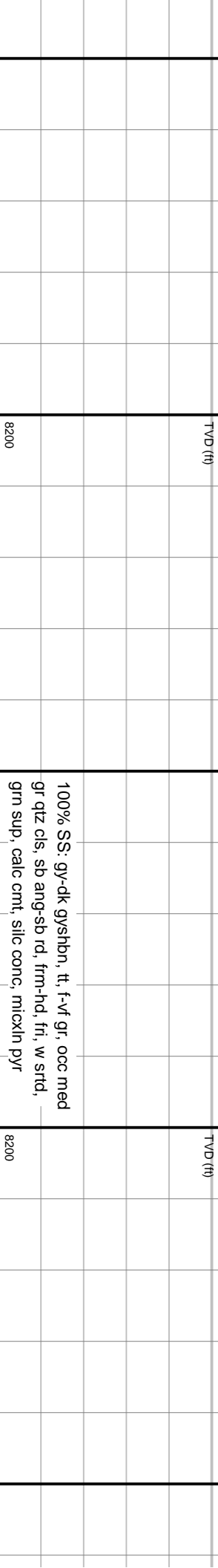
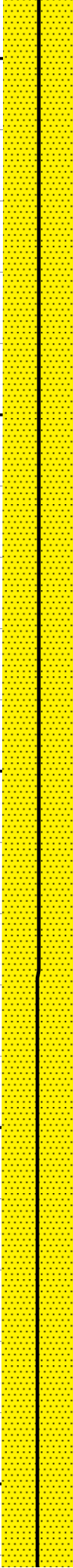
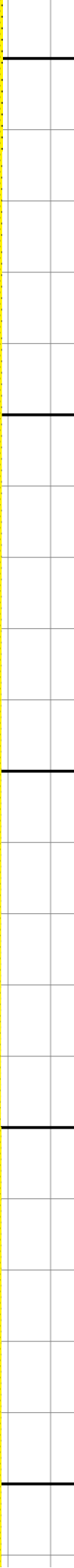
MD: 9,357'
INC: 89.5°
AZM: 269.1°
TVD: 7,598.13'
VS: 1,375.29'

WOB: 27.9kbs
RPM: 60
SPM: 169
SPP: 3,532psi

MD: 9,451'
INC: 89.4°
AZM: 268.6°
TVD: 7,599.04'
VS: 1,468.47'

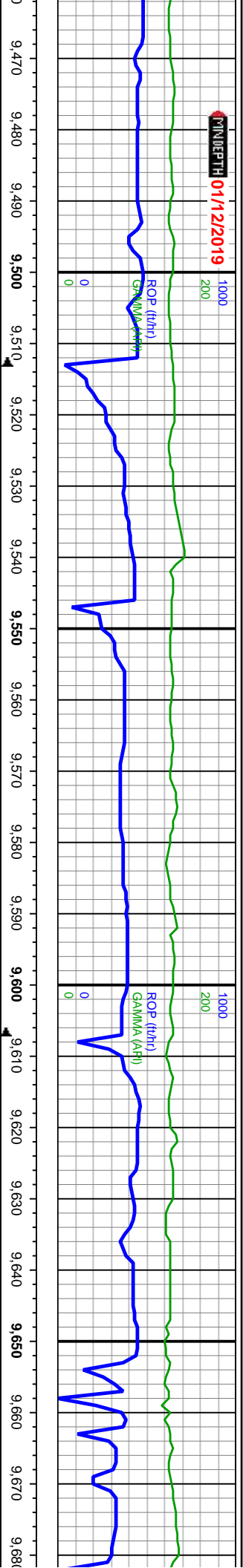


7200



100% SS: gy-dk gysbhn, tt, f-vf gr, occ med
gr qtz cls, sb ang-sb rd, frm-hd, fri, w strd,
grn sup, calc cnt, silic conc, mixln pyr

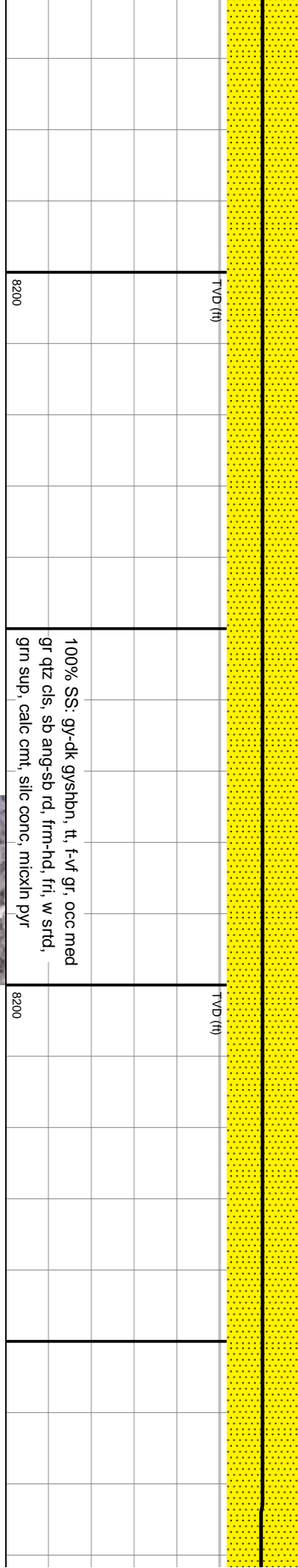


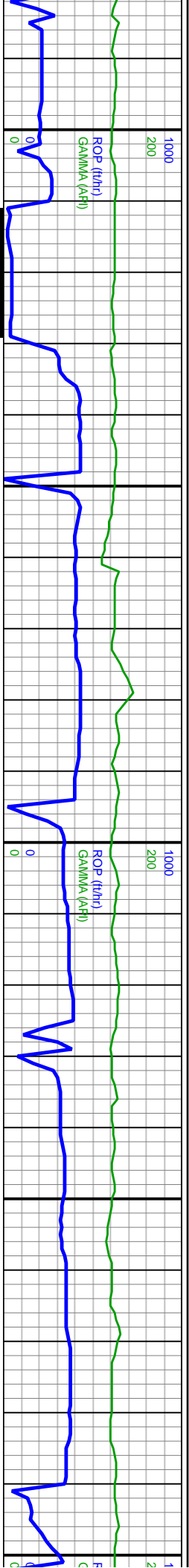


MD: 9,545'
INC: 89.3°
AZM: 268.6°
TVD: 7,600.1'
VS: 1,561.59'

WOB: 27.3kibs
RPM: 60
SPM: 169
SPP: 3,522psi

MD: 9,640'
INC: 89.3°
AZM: 267.7°
TVD: 7,601.26'
VS: 1,655.59'



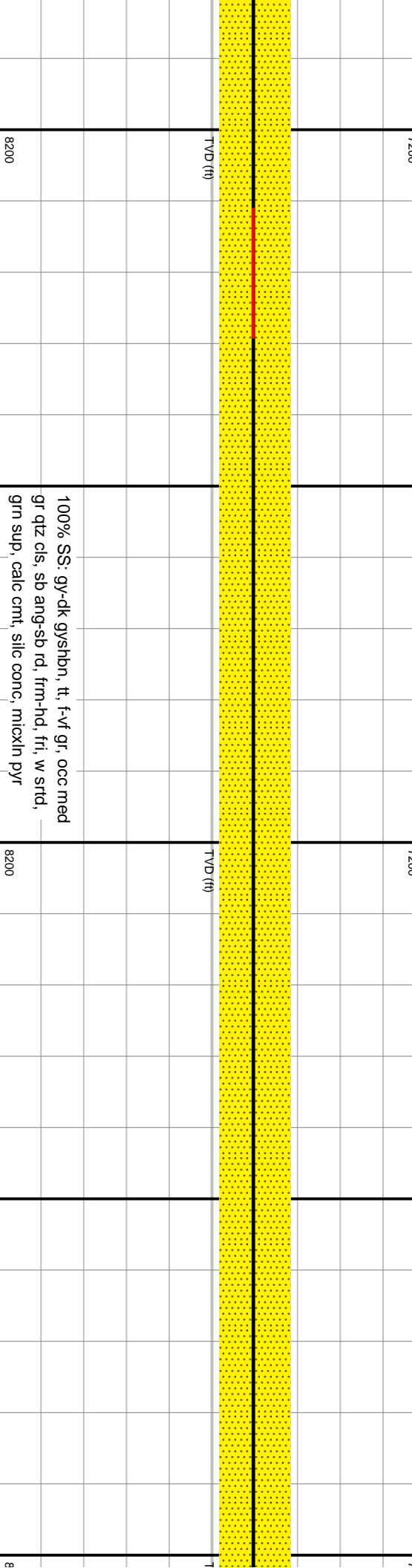
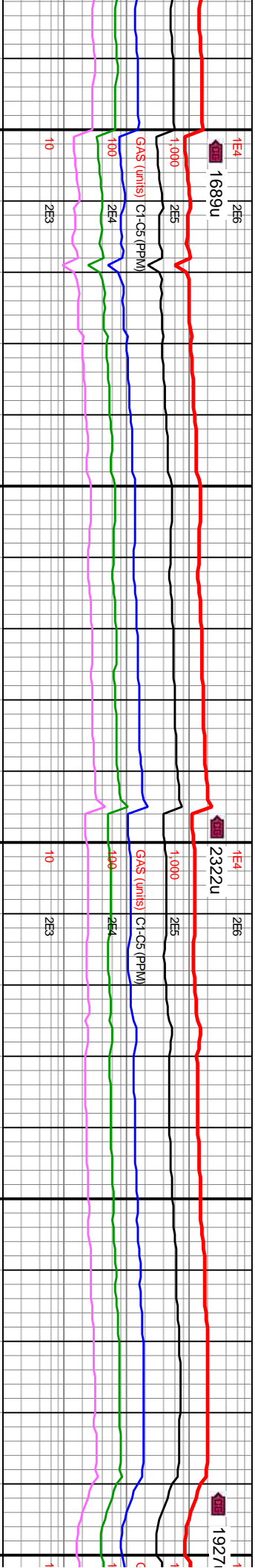


MD: 9,735'
INC: 89.3°
AZM: 269.3°
TVD: 7,602.42'
VS: 1,749.67'

WOB: 23.1klbs
RPM: 59
SPM: 169
SPP: 3,399psi

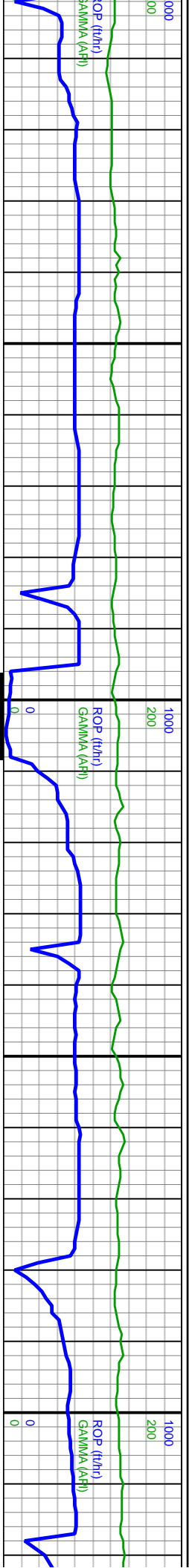
MD: 9,830'
INC: 89.4°
AZM: 269.1°
TVD: 7,603.5'
VS: 1,843.91'

MMW IN: 9.8
VIS IN: 40
MMW OUT: 9.9
VIS OUT: 40



100% SS: gy-dk gysbhn, tt, f-vf gr, occ med
gr qtz cls, sb ang-sb rd, frm-hd, fri, w std,
grn sup, calc cmt, silc conc, micxln pyr



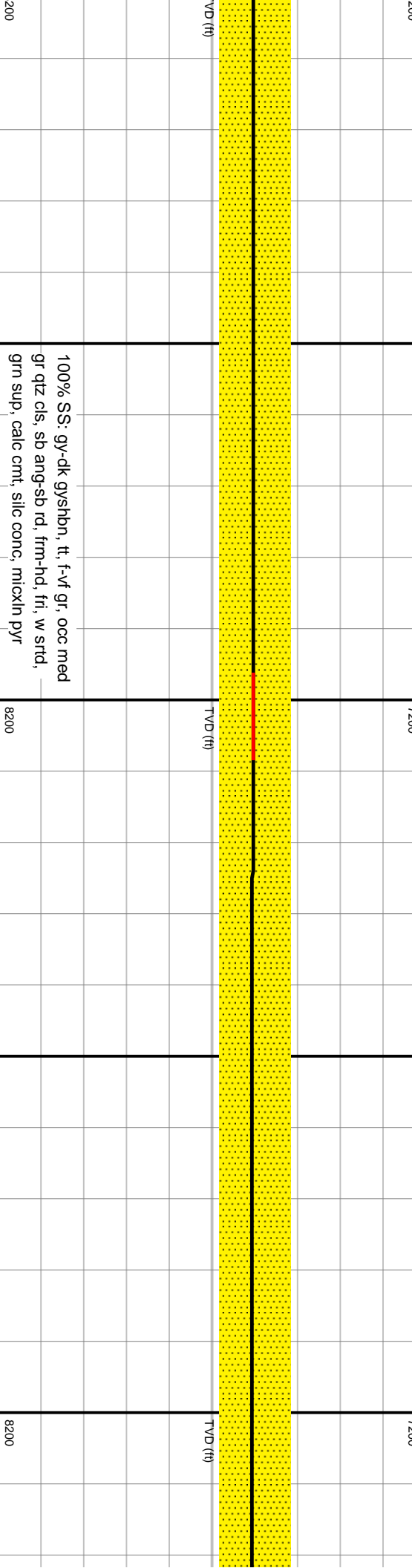
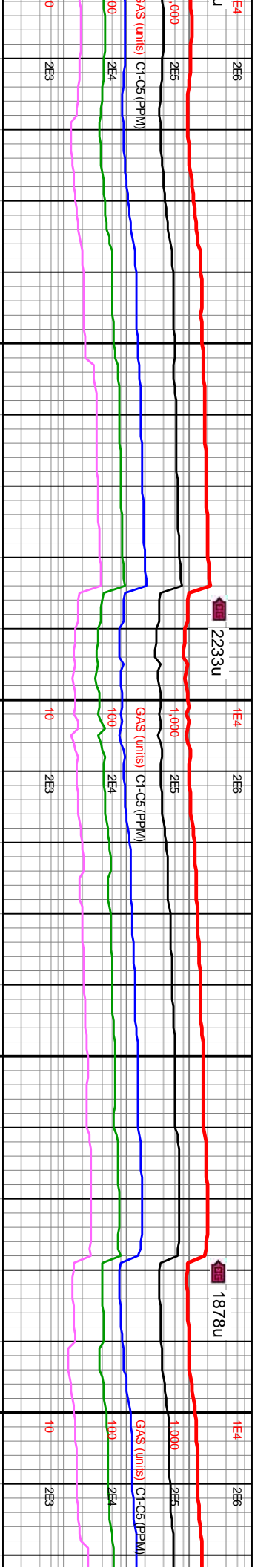


MD: 9,924'
INC: 89.5°
T: 9.9
AZM: 269.3°
TVD: 7,604.4'
VS: 1,937.16'

WOB: 22.3klbs
RPM: 61
SPM: 169
SPP: 3,526psi

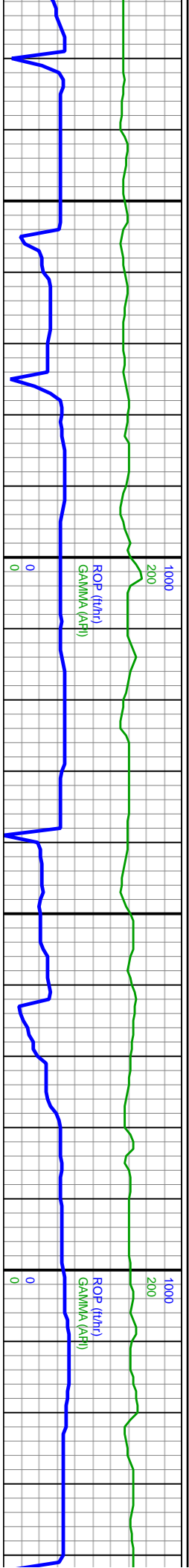
MD: 10,019'
INC: 89.8°
AZM: 271.4°
TVD: 7,604.98'
VS: 2,031.61'

MD: 10,113'
INC: 89.8°
AZM: 271.2°
TVD: 7,605.31'
VS: 2,125.24'



100% SS: gy-dk gysbhn, tt, f-vf gr, occ med
gr qtz cls, sb ang-sb rd, frm-hd, fri, w strd,
grn sup, calc cnt, silc conc, mixcln pyr



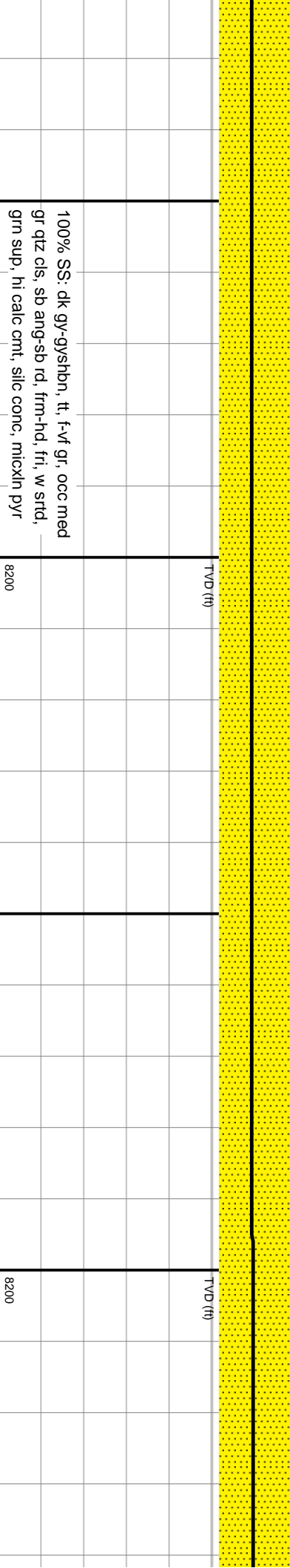
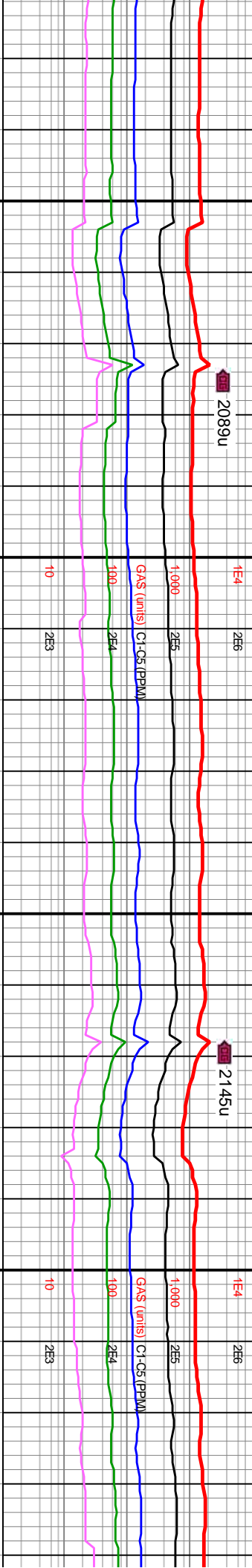


MW IN: 9.8
VIS IN: 40
MW OUT: 10
VIS OUT: 41

WOB: 25klbs
RPM: 60
SPM: 171
SPP: 3.681psi
MD: 10.208'
INC: 90.3°
AZM: 271°
TVD: 7.605.23
VS: 2.219.83'

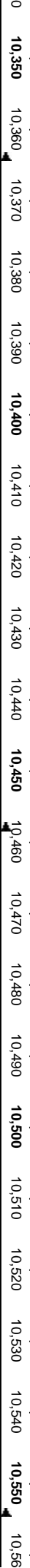
MD: 10.303'
INC: 90°
AZM: 270.3°
TVD: 7.604.98'
VS: 2.314.34'

MW IN: 9.9
VIS IN: 40
MW OUT: 10+
VIS OUT: 40



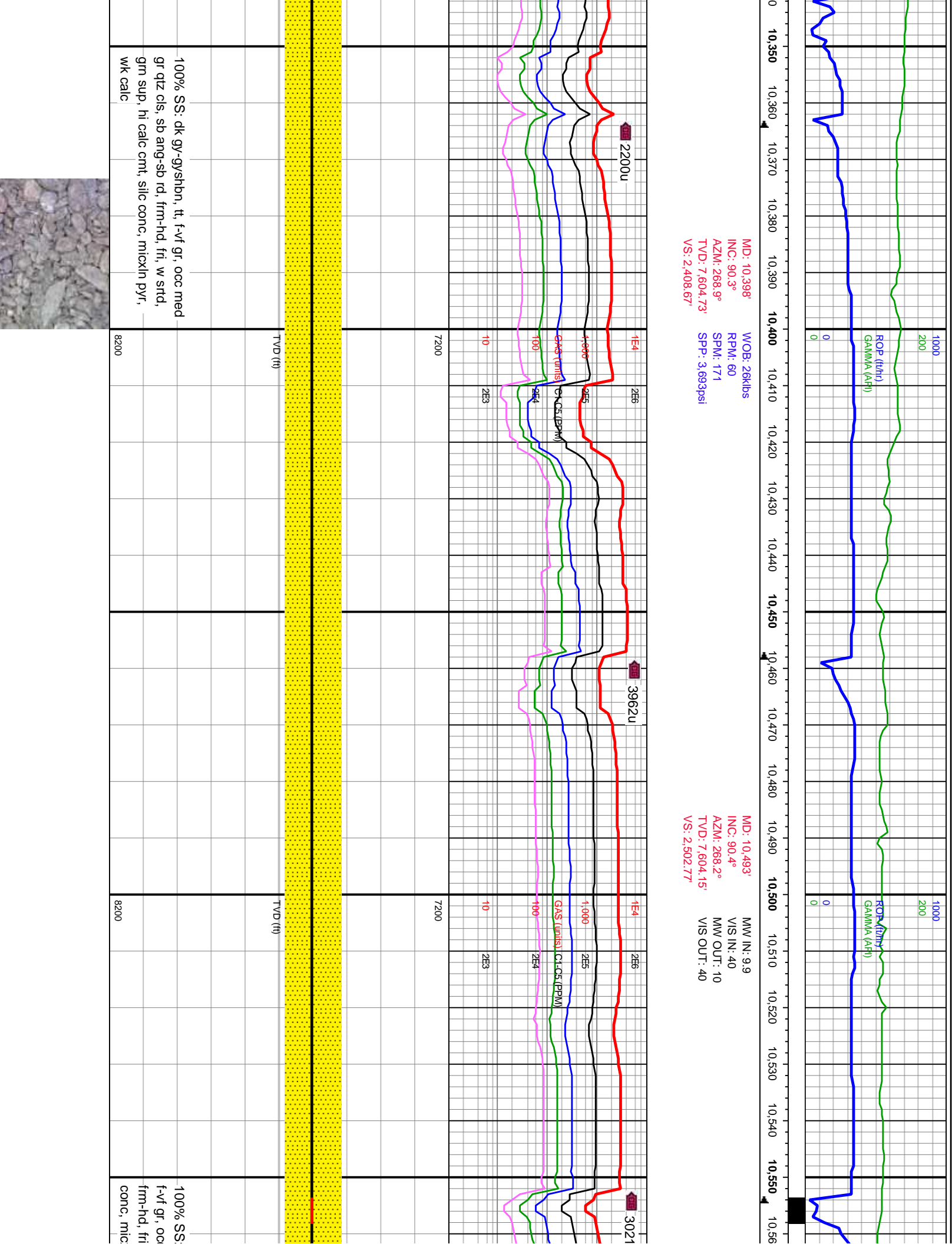
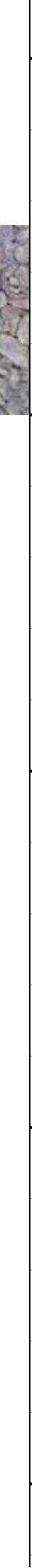
100% SS: dk gy-gyshbn, tt, f-vf gr, occ med
gr qtz cls, sb ang-sb rd, frm-hd, fri, w std,
grn sup, hi calc cnt, silic conc, micxn pyr

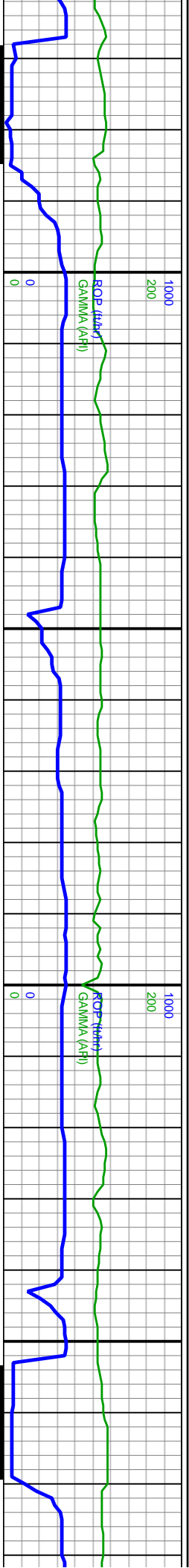




MD: 10.493'
INC: 90.4°
AZM: 268.2°
TVD: 7,604.15'
VS: 2,502.77'

MW IN: 9.9
VIS IN: 40
MW OUT: 10
VIS OUT: 40





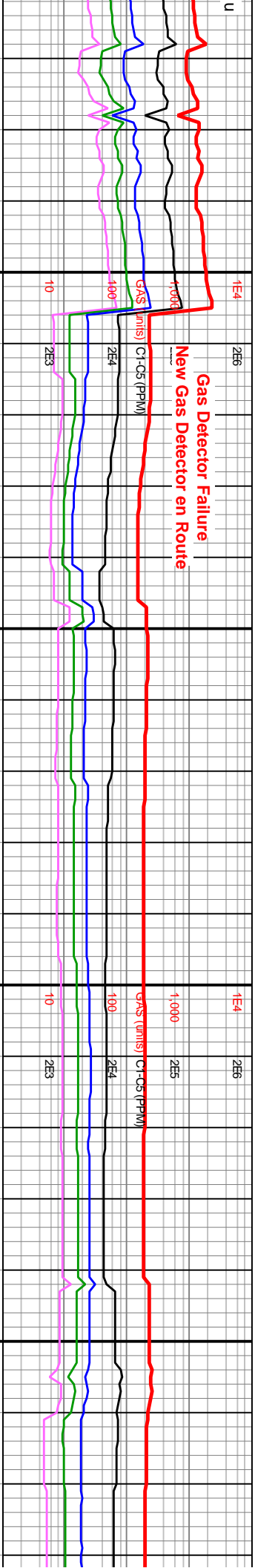
MD: 10,587'
INC: 89.9°
AZM: 269.1°
TVD: 7,603.91'
VS: 2,595.9'

WOB: 22kibs
RPM: 60
SPM: 170
SPP: 3,400psi

MW IN: 9.9+
VIS IN: 40
MW OUT: 10+
VIS OUT: 40

MD: 10,682'
INC: 90.4°
AZM: 269.3°
TVD: 7,603.66'
VS: 2,690.14'

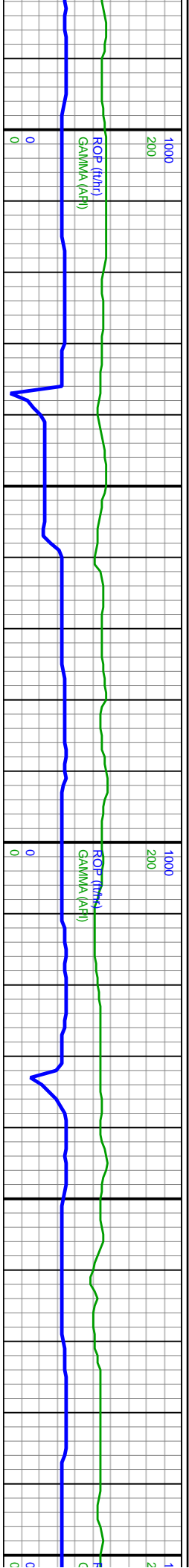
MD: 10,777'
INC: 89.7°
AZM: 271.4°
TVD: 7,603.5'
VS: 2,784.6'



dk gy-gyshbn, incrg lt gy-crm, tt,
c med gr qtz cls, sb ang-sb rd,
, w strd, gm sup, hi calc cnt, silc
ckn pyr, wk calc

100% SS: predy dk gy-gysht
gy-crm, tt, f-vf gr, occ med gr
ang-sb rd, frm-hd, fri, w strd,
calc cnt, silc conc, wk calc



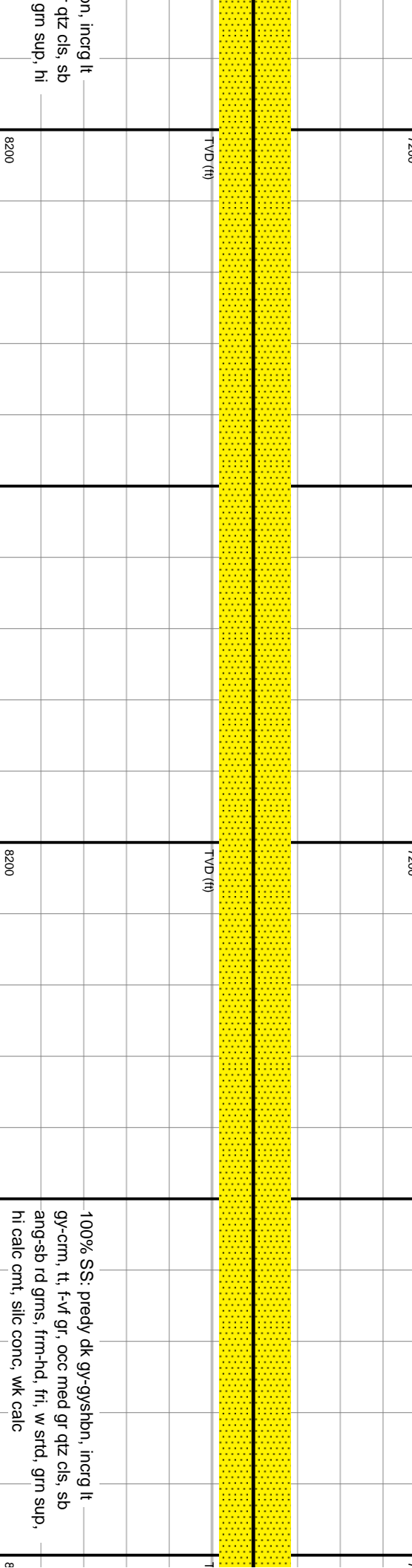
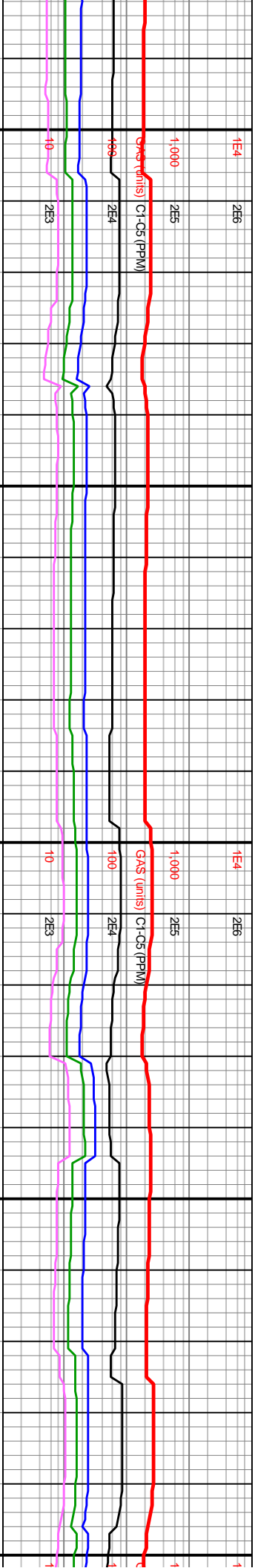


WOB: 22klbs
RPM: 60
SPM: 169
SPP: 3.389psi

MD: 10,872'
INC: 89.9°
AZM: 270.9°
TVD: 7,603.91'
VS: 2,879.2'

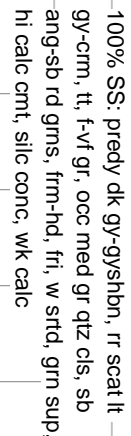
WOB: 27klbs
RPM: 60
SPM: 16
SPP: 3.4

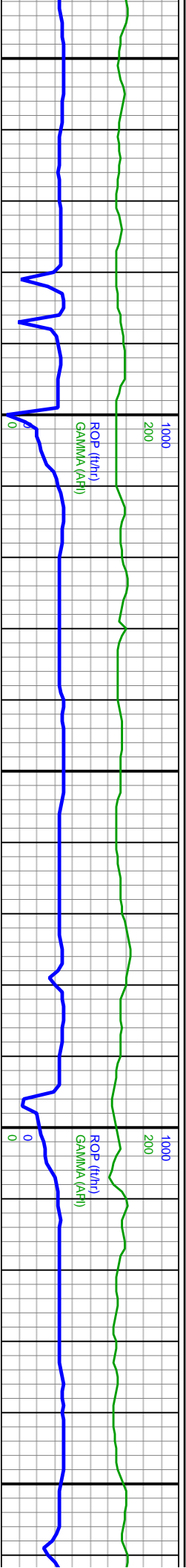
MD: 10,966'
INC: 89.6°
AZM: 270.7°
TVD: 7,604.32'
VS: 2,972.74'





MD: 11,444
INC: 89.91
AZM: 270
TVD: 7,600
VS: 3,444





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 11,66

MD: 11,535'
INC: 90°
AZM: 270.3°
TVD: 7,607.63'
VS: 3,539.17'

MD: 11,630'
INC: 90.2°
AZM: 270°
TVD: 7,607.47'
VS: 3,633.6'

MW IN: 10
VIS IN: 40
MW OUT: 10.1+
VIS OUT: 40

WOB: 16kbs
RPM: 60
SPM: 170
SPP: 3,497psi

1E4	2E6	1E4	2E6	1E4	2E6
1,000	2E5	1,000	2E5	1,000	2E5
GAS (units)	C1-C5 (PPM)	GAS (units)	C1-C5 (PPM)	GAS (units)	C1-C5 (PPM)
100	2E4	100	2E4	100	2E4
10	2E3	10	2E3	10	2E3

Gas Detector Off Line

Gas Detector Off Line

Gas Detector Off Line

8200	8200	8200
TVD (ft)	TVD (ft)	TVD (ft)

100% SS: predy dk gy-gyshbn, rr scat lt
gy-crm, tt, f-vf gr, occ med gr qtz cls, frm-hd,
fri, sb ang-sb rd grms, w srted, grm sup, hi
calc cnt, silic conc, v wk calc



