



Empirica

Scale: 5" / 100'
Measured Depth Log

Well Name Winder South 5_ST1

Location Sec. 9-T6N-R67W

State Colorado

Country USA

County Weld

Rig Number Patterson 346

API Number 05-123-43407-00

Field Wattenberg

Geographic Region DJ Basin

Drilling Completed 9/17/2016

Spud Date 9/15/2016

Surface Coordinates SHL: 2306'FNL, 448' FEL, Sec. 9 T6N R67W

Lat: 40.502674

Long: -104.890483

Bottom Hole Coordinates BHL: 1870'FFSLL, 460' FFWLL, Sec. 8 T6N R67W

Ground Elevation 4,855'

K.B. Elevation 4,879.5'

Logged Interval 11,023' To 15,760'

Total Depth 15,760'

Formation Codell

Type of Drilling Fluid Oil Based Mud

Operator

Company Extraction Oil & Gas

Address 1888 Sherman St., Suite 200
Denver, CO 80203

Geologist

Name Jared Rouse

Company Extraction Oil & Gas

Address 1888 Sherman St., Suite 200
Denver, CO 80203



Other

Equipment ML-589

Comments Start: 9-9-16
TD: 9-19-16

Services Provided 2-man Logging
On Site Geosteering

Logger Names Dominic Pitre/ Nicholas

Address ALS Empirica
6510 Guhn Road
Houston, Texas 77040

Zone Color Coding

Oil

Note

Error

Condensate

Core

Water

Gas

Pressure

Seal

Other Sy

ORGANIC

PINPOINT

GAS SHC

DEAD

VUGGY

EVEN

NORMAL

QUESTIONABLE

Engineering

OIL SHO

SPOTTED STAINING

BIT

OVERTUR

CASING

REVERSE

Porosity

CONNECTION (LEFT)

SIDEWAL

E EARTHY

CONNECTION (RIGHT)

SIDEWAL

FENESTRAL

CONNECTION GAS

SLIDE

F FRACTURE

CORE - LOST

SURVE

INTERCRYSTALLINE

CORE - RECOVERED

TRIP GA

INTEROOLITIC

DST INTERVAL

WIRELIN

MOLDIC

FAULT

WIRELIN

Oil Show

ORGANIC

PINPOINT

GAS SHC

DEAD

VUGGY

EVEN

NORMAL

QUESTIONABLE

Engineering

OIL SHO

SPOTTED STAINING

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CONNECTION (LEFT)

SIDEWAL

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CONNECTION (RIGHT)

SIDEWAL

FENESTRAL

CONNECTION GAS

SLIDE

F FRACTURE

CORE - LOST

SURVE

INTERCRYSTALLINE

CORE - RECOVERED

TRIP GA

INTEROOLITIC

DST INTERVAL

WIRELIN

MOLDIC

FAULT

WIRELIN

Rock Types

UNKNOWN

ANHYDRITE

GYPSUM

SALT

CHALK

LIMESTONE

DOLOMITE

CHERT

COAL

MARLSTONE

CLAYSTONE

SHALE

SHALE GRAY

SHALE COLORED

SILTSTONE

SANDSTONE

CONGLOMERATE

BRECCIA

TILL

BENTONITE

TUFF

IGNEOUS

METAMORPHIC

CEMENT

Accessories

F FOSSIL

GASTROPOD

OOLITE

OSTRACOD

PELECYPOD

PELLET

PISOLUTE

BRACHIOPOD

BRYOZOA

CEPHALOPOD

CORAL

CRINOID

ECHINOID

FISH

FORAMINIFERA

ARGILLACEOUS

ARGILLITE GRAIN

B BENTONITE

BITUMINOUS 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

ANHYDRITE STRINGER

BENTONITE STRINGER

COAL STRINGER

DOLOMITE STRINGER

GYPSUM STRINGER

LIMESTONE STRINGER

MARLSTONE (CALC) STRG

MARLSTONE (DOL) STRG

SANDSTONE STRINGER

SHALE STRINGER

SILTSTONE STRINGER

Watkins

mbols

RMATION TOP L LITHOGRAPHIC

Rounding

WV MX MICROXLN

MIN DEPTH A ANGULAR MS MUDSTONE

FAULT R ROUNDED PS PACKSTONE

W SUBANG WS WACKSTONE

NNED STRATA P SUBRND

Sorting

E FAULT

Textures

L CORE (LEFT) M MODERATE

L CORE (RIGHT) BS BOUNDSTONE P POOR

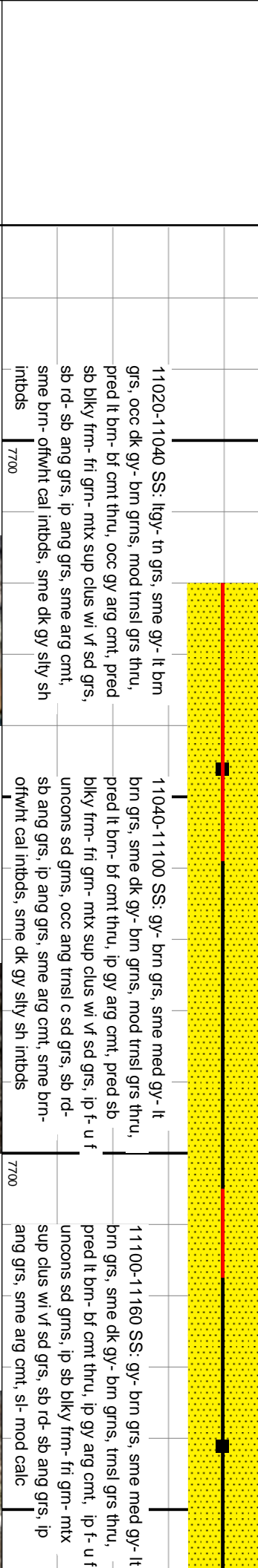
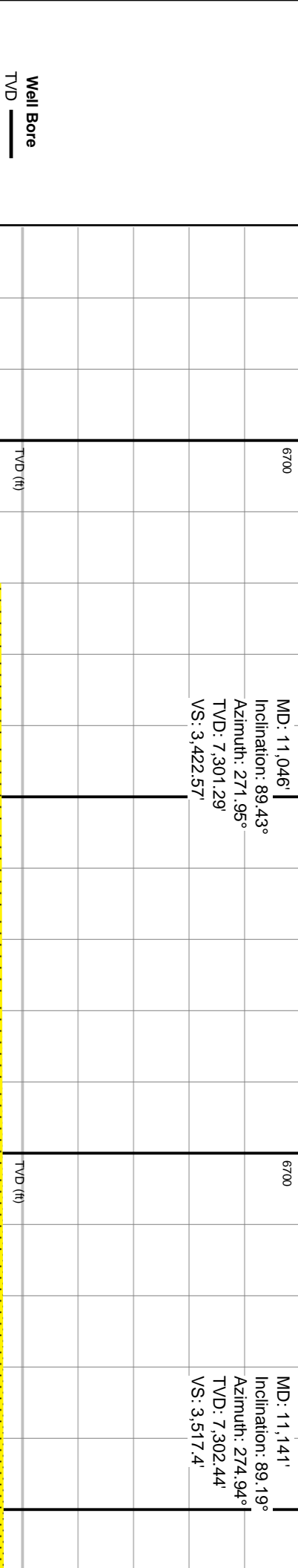
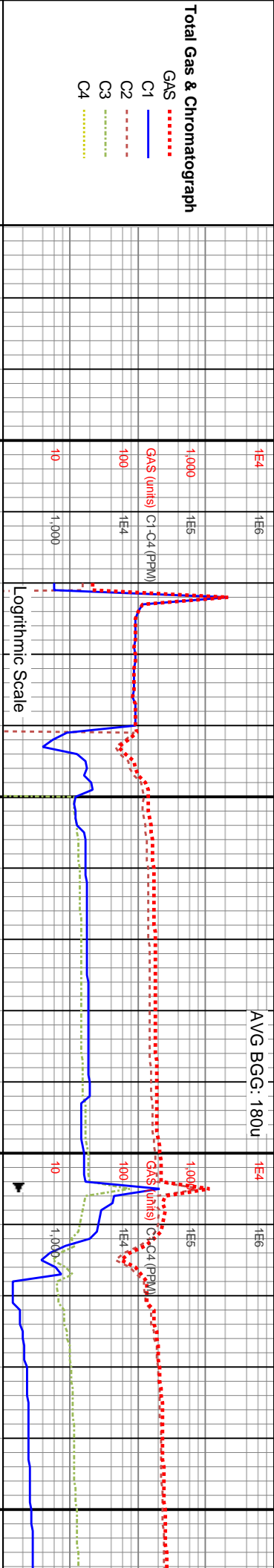
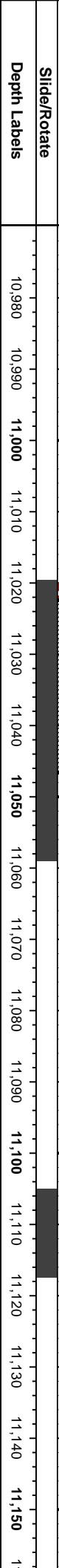
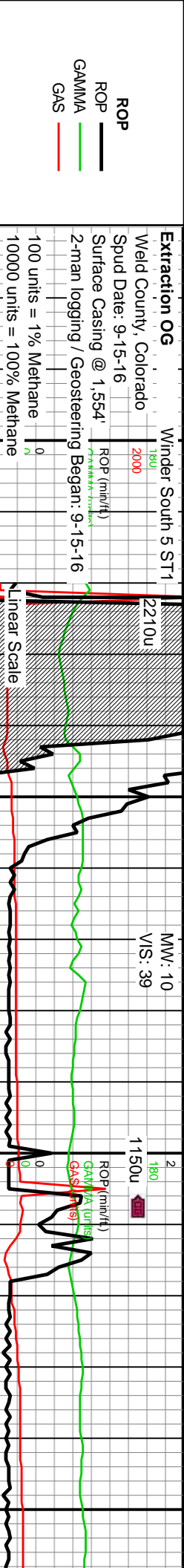
C CHALKY W WELL

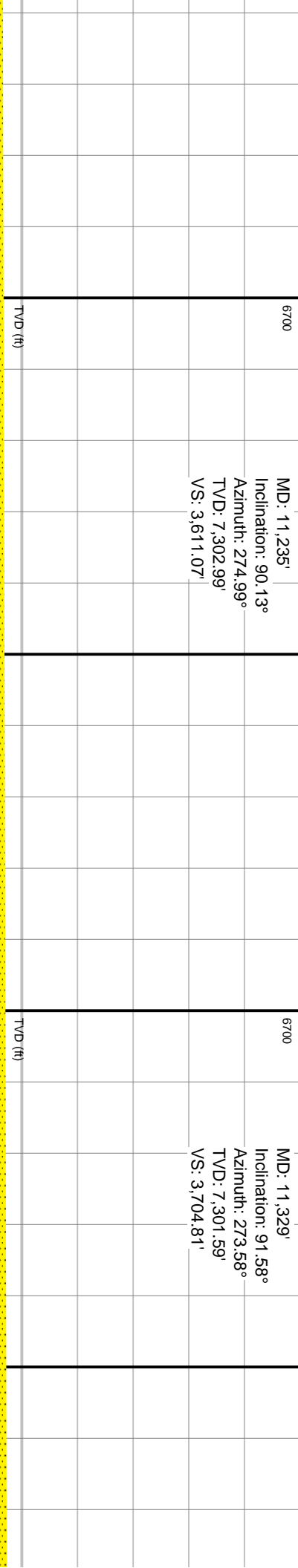
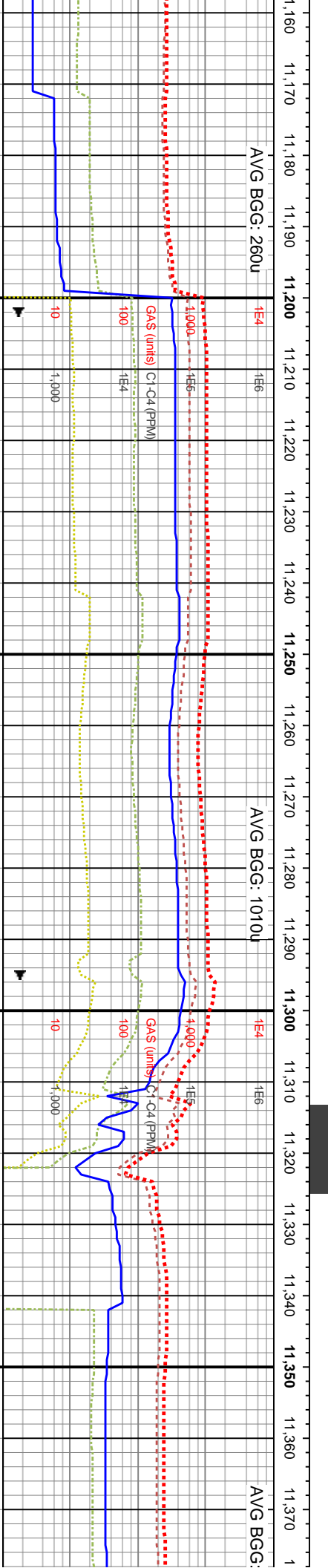
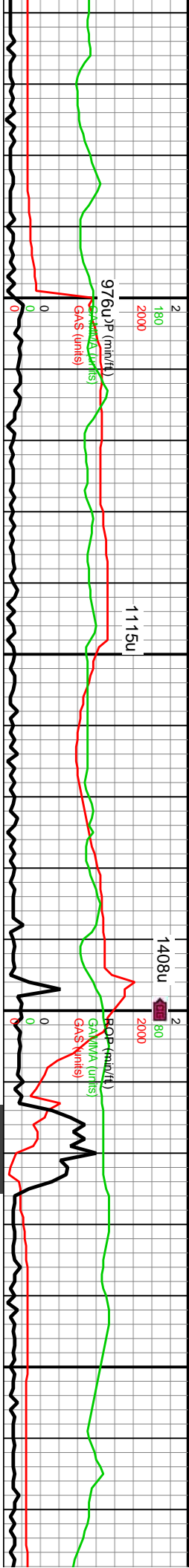
Y CX CRYPTOXLN

AS E EARTHY

E TESTED - LEFT FX FINELYXLN

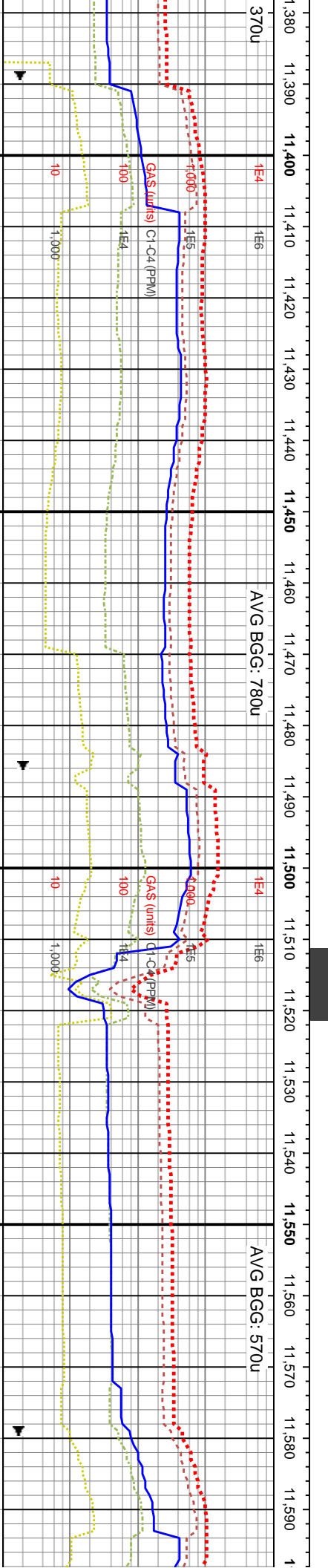
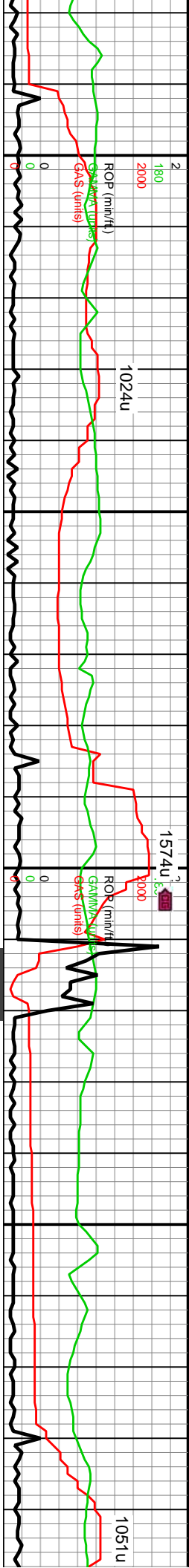
E TESTED - RT GS GRAINSTONE





11160-11220 SS: gy- lt brn grs, sme med gy- tn grs, tnsl grs thru, pred lt brn- bf cnt thru, ip gy arg cnt, pred sb blkly frm- fri grm- mtx sup clus wi vf sd grs, sme f- u f uncongs sd grns, sb rd- sb ang grs, ip ang grs, sme arg cnt, sl- mod calc	11220-11280 SS: gy- lt brn grs, sme med gy- tn grs, tnsl grs thru, pred lt brn- bf cnt thru, ip gy arg cnt, pred sb blkly frm- fri grm- mtx sup clus wi vf sd grs, abnt f- u f uncongs sd grns, sb rd- sb ang grs, ip ang grs, sme arg cnt, sl- mod calc	11280-11340 SS: gy- lt brn grs, sme med gy- tn grs, tnsl grs thru, pred lt brn- bf cnt thru, ip gy arg cnt, pred sb blkly frm- fri grm- mtx sup clus wi vf sd grs, abnt f- u f uncongs sd grns, sb rd- sb ang grs, ip ang grs, sme arg cnt, sl- mod calc	11340-11400 SS: pred lt brn grs, tnsl grs thru, pred lt brn- bf cnt thru, ip gy arg cnt, pred sb blkly frm- fri grm- mtx sup clus f- u f uncongs sd grns, occ u med grs, ip ang grs, sme arg cnt
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MD: 11,424'
Inclination: 91.18°
Azimuth: 272.86°
TVD: 7,299.3'
VS: 3,799.64'

WOB: 19Klbs
Rotary: 71RPM
Strokes: 220SPM
Pump Rate: 639GPM

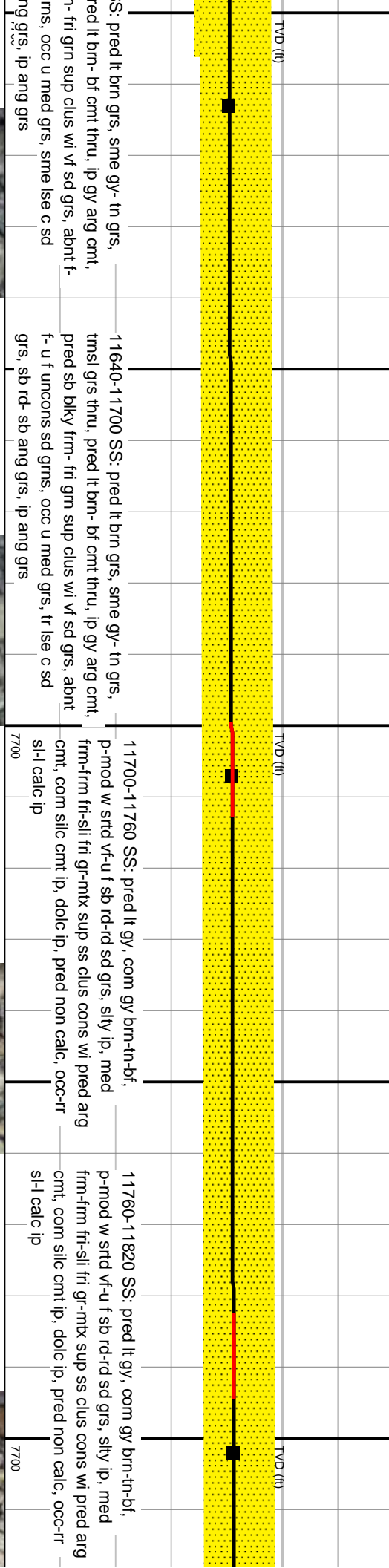
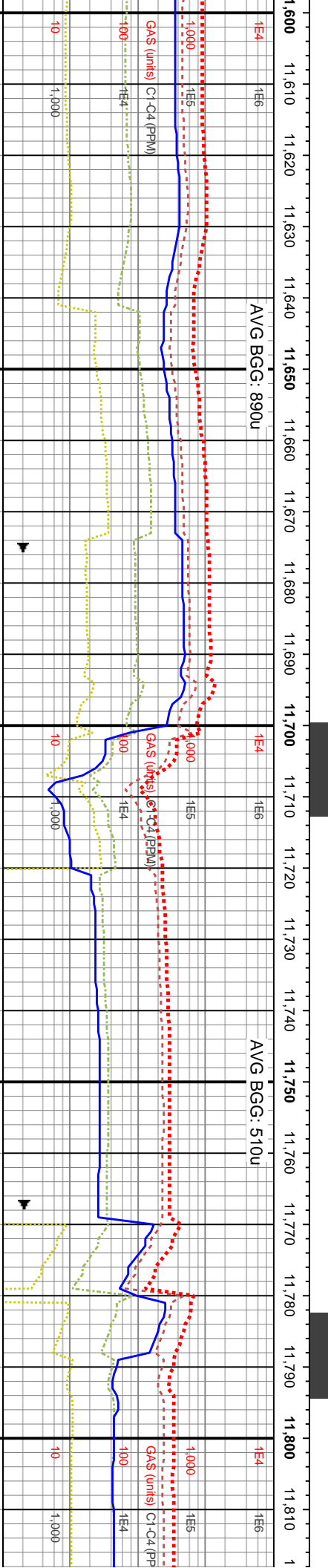
MD: 11,519'
Inclination: 91.14°
Azimuth: 271.39°
TVD: 7,297.38'
VS: 3,894.57'

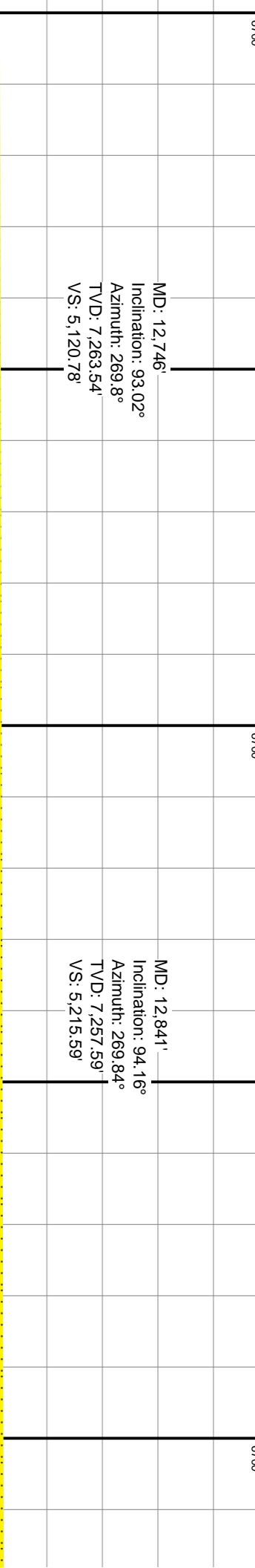
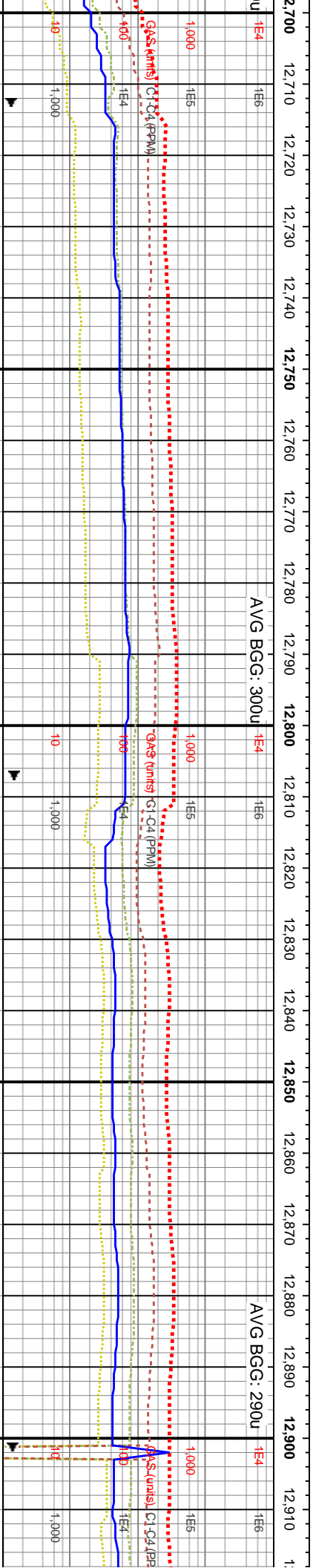
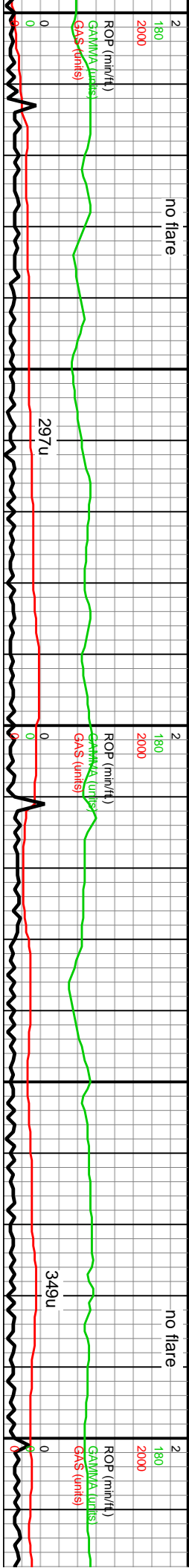
TVD (ft)

TVD (ft)

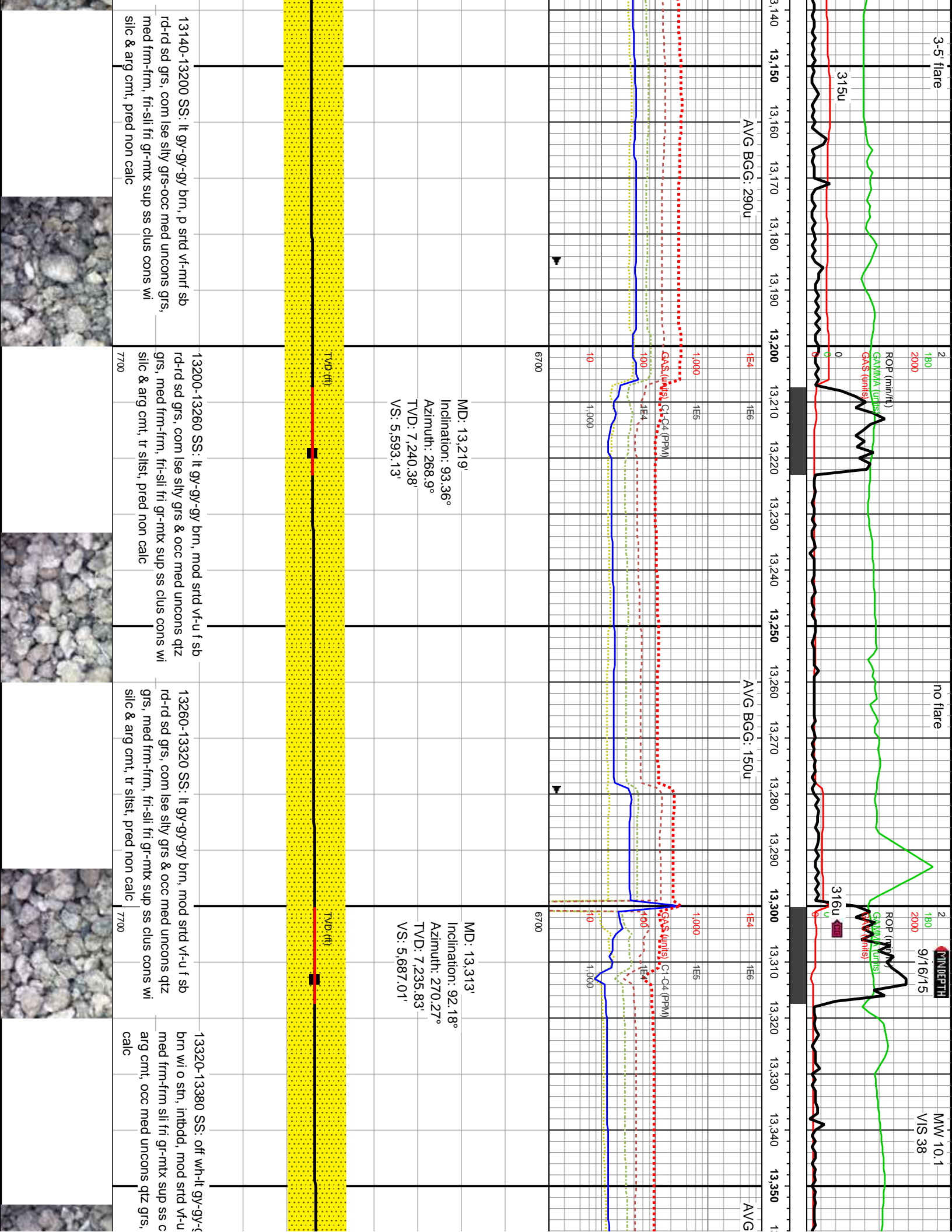
sme gy- tn grs, thru, ip gy arg cmt, wi vf sd grs, abnt grs, sb rd- sb ang	11400-11460 SS: pred lt brn grs, sme gy- tn grs, trnsl grs thru, pred lt brn- bf cmt thru, ip gy arg cmt, pred sb blkly frm- fri gm sup clus wi vf sd grs, abnt f- u f unconcs sd grns, occ u med grs, sb rd- sb ang grs, ip ang grs, sme arg cmt	11460-11520 SS: pred lt brn grs, sme gy- tn grs, trnsl grs thru, pred lt brn- bf cmt thru, ip gy arg cmt, pred sb blkly frm- fri gm sup clus wi vf sd grs, abnt f- u f unconcs sd grns, occ u med grs, sb rd- sb ang grs, ip ang grs, sme arg cmt	11520-11580 SS: pred lt brn grs, sme gy- tn grs, trnsl grs thru, pred lt brn- bf cmt thru, ip gy arg cmt, pred sb blkly frm- fri gm sup clus wi vf sd grs, abnt f- u f unconcs sd grns, sme lse c sd grs, sb rd- sb ang grs, ip ang grs	11580-11640 S: trnsl grs thru, p pred sb blkly frm u f unconcs sd g grs, sb rd- sb a
7700	7700	7700		

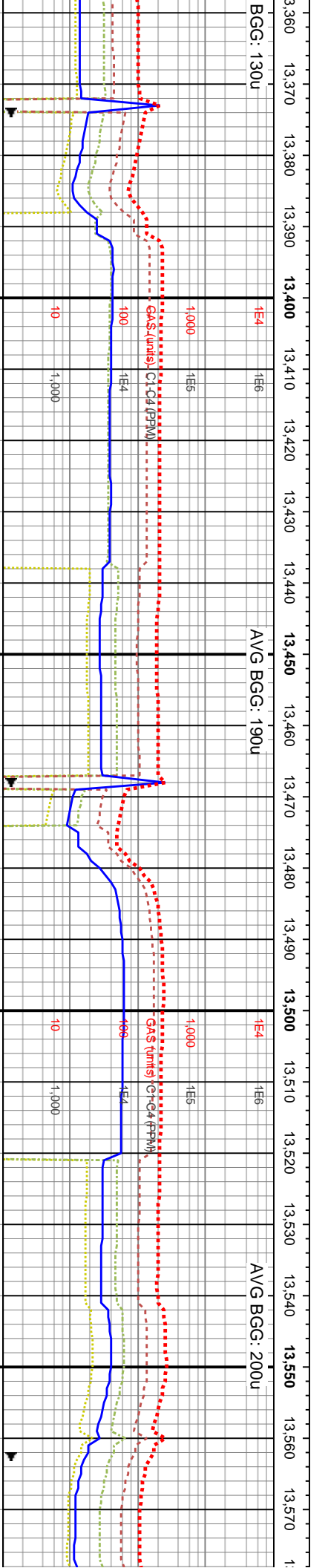
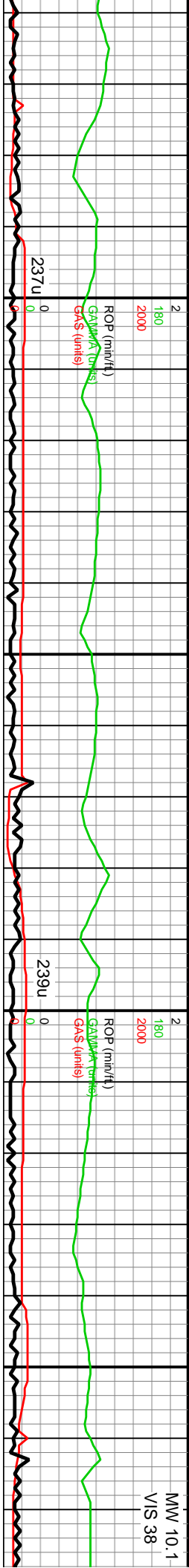






brn, mod-mod frm-frn fri-sli pred arg cnt,	12720-12780 SS: lt gy-gy-lt gy brn, p-mod w srted vf-u f sb rd-rd sd grs, com ise silty grs thru, med frm-frn fri-sli fri gr-mtx sup ss clus cons wi pred arg cnt, com silc cnt ip, pred non calc	12780-12840 SS: lt gy-gy-lt gy brn, mod-mod w srted vf-u f sb rd-rd sd grs, med frm-frn fri-sli fri gr-mtx sup ss clus cons wi pred arg cnt, com silc cnt ip, non calc	12840-12900 SS: lt gy-gy-lt gy brn, mod-mod w srted vf-u f sb rd-rd sd grs, med frm-frn fri-sli fri gr-mtx sup ss clus cons wi pred arg cnt, com silc cnt ip, non calc	12900-12960 SS: sb rd-rd sd grs, fri-sli fri gr-mtx s com silc cnt ip,
7700	7700	7700		7700

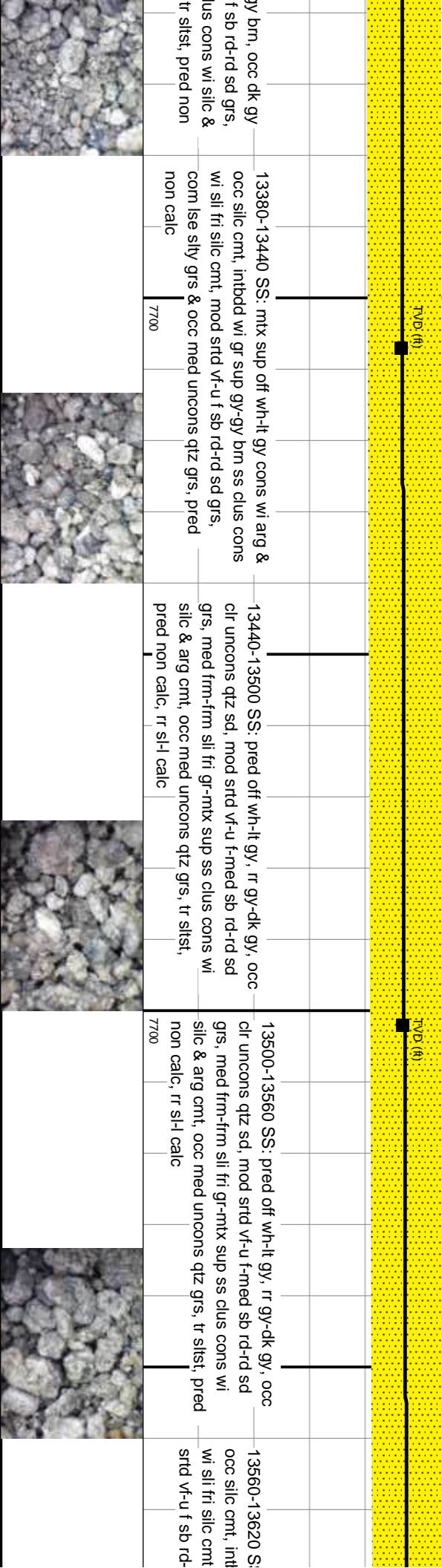


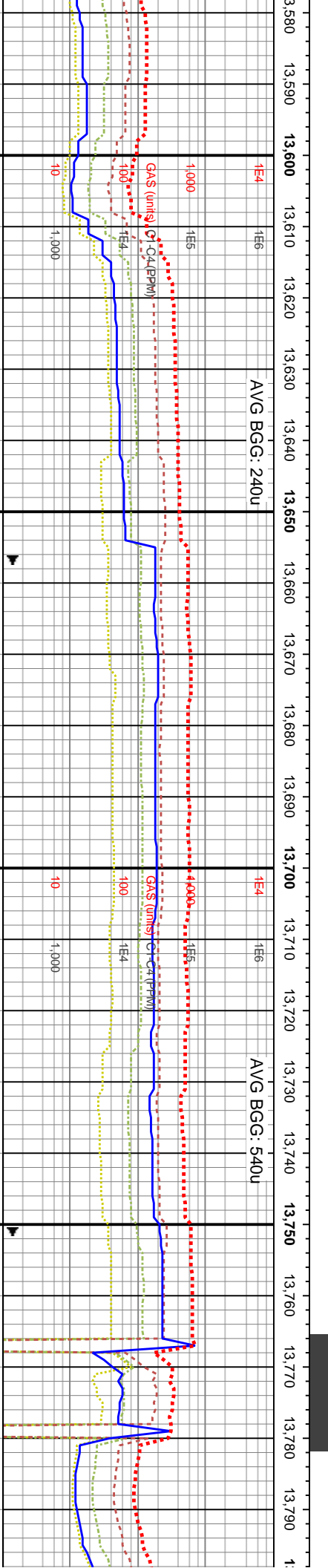
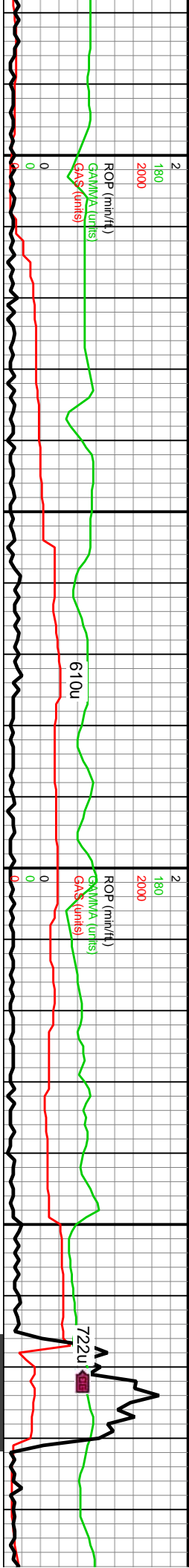


MD: 13,407'
Inclination: 91.61°
Azimuth: 269.87°
TVD: 7,232.72'
VS: 5,780.96'

WOB: 44Klbs
Rotary: 71RPM
Strokes: 210SPM
Pump Rate: 611GPM

MD: 13,502'
Inclination: 92.25°
Azimuth: 269.55°
TVD: 7,229.52'
VS: 5,875.9'





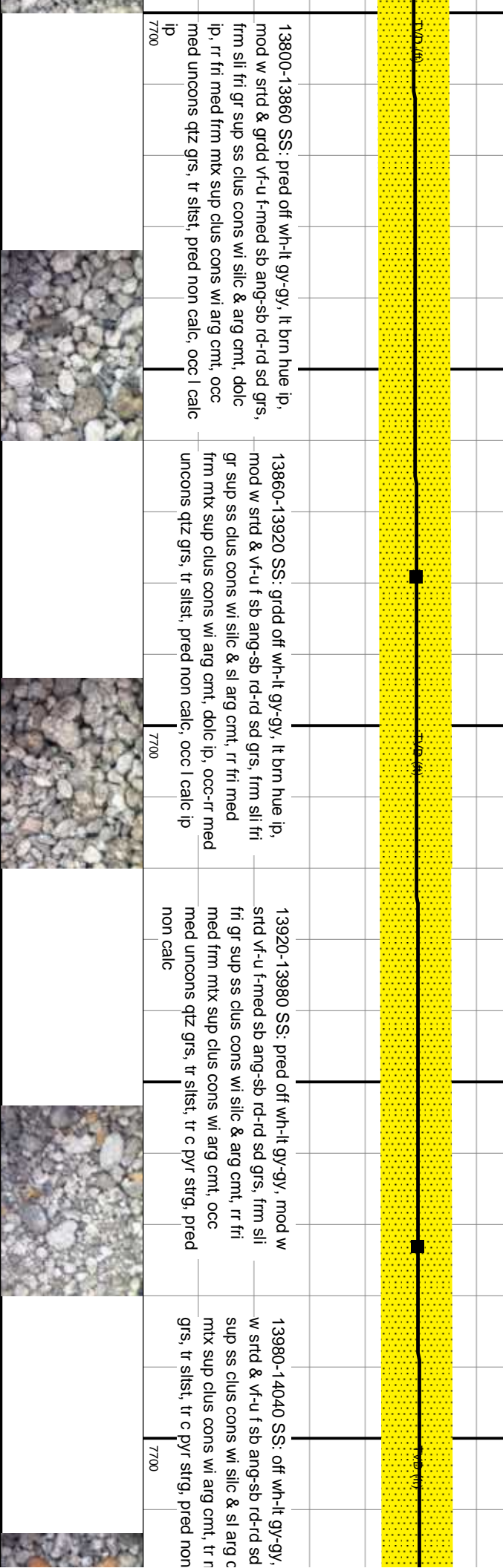
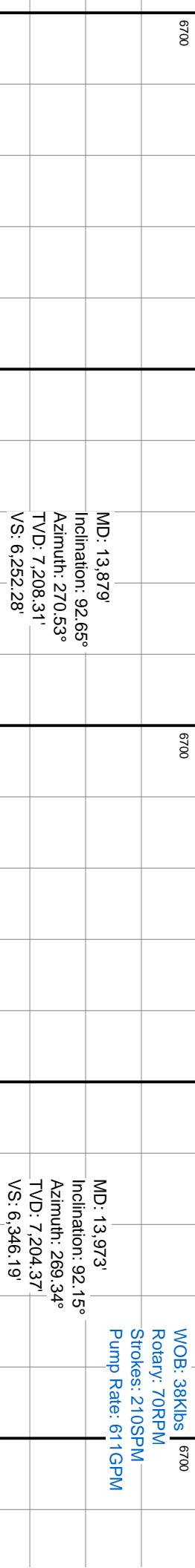
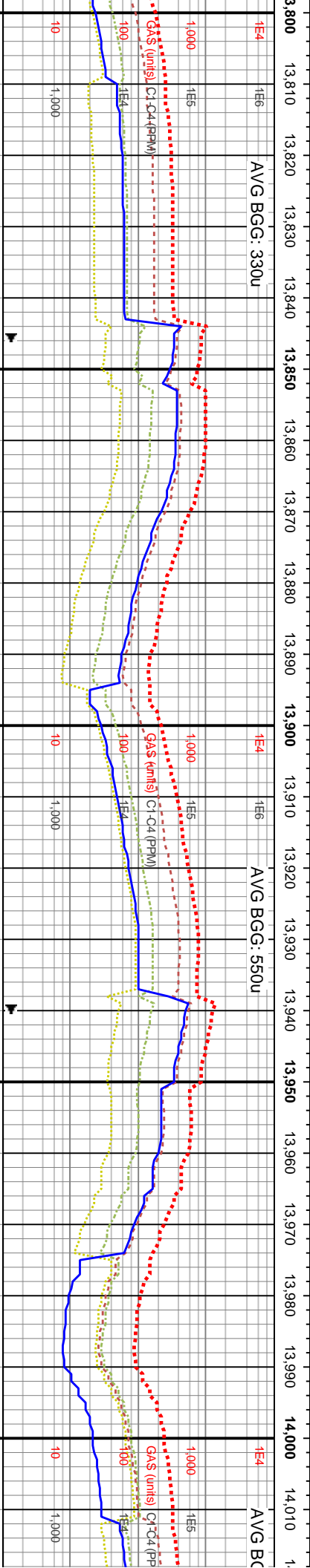
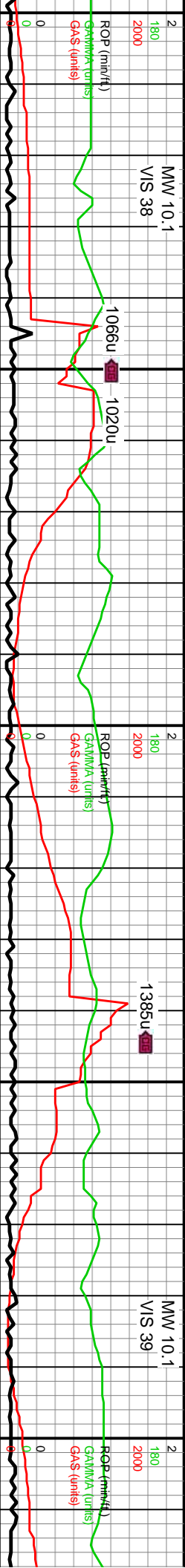
MD: 13,596'
Inclination: 93.43°
Azimuth: 269.82°
TVD: 7,224.86'
VS: 5,969.78'

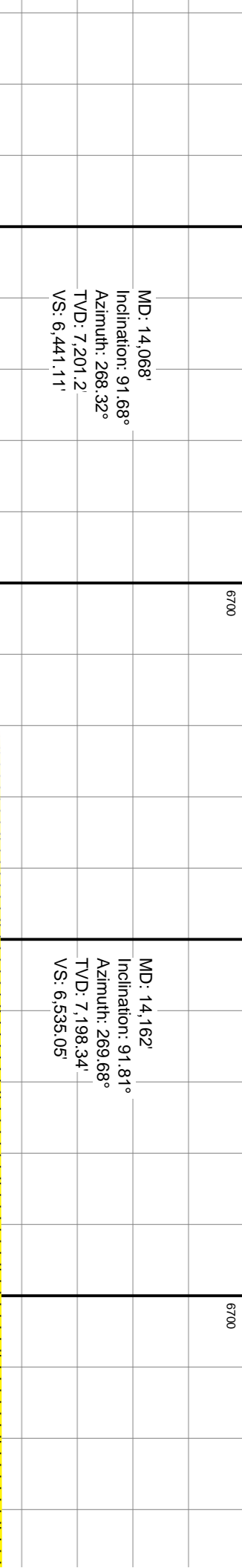
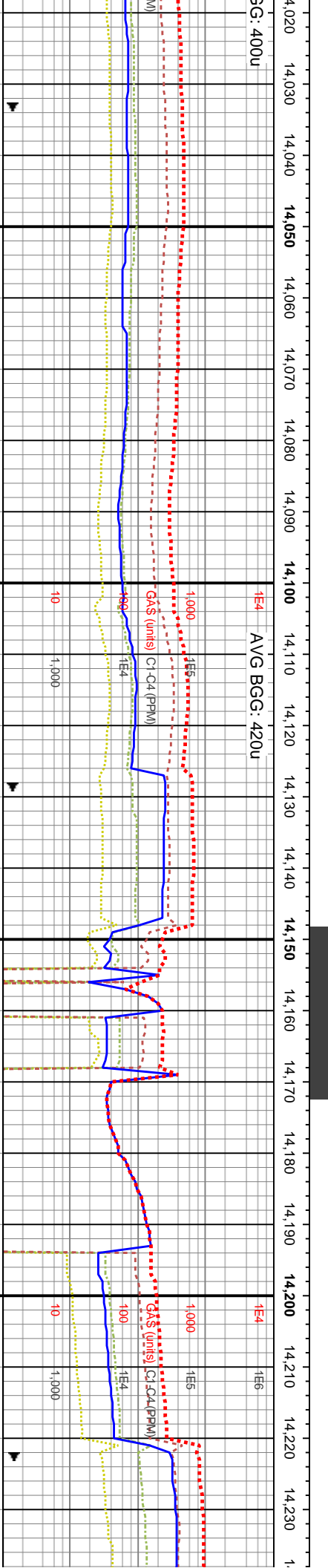
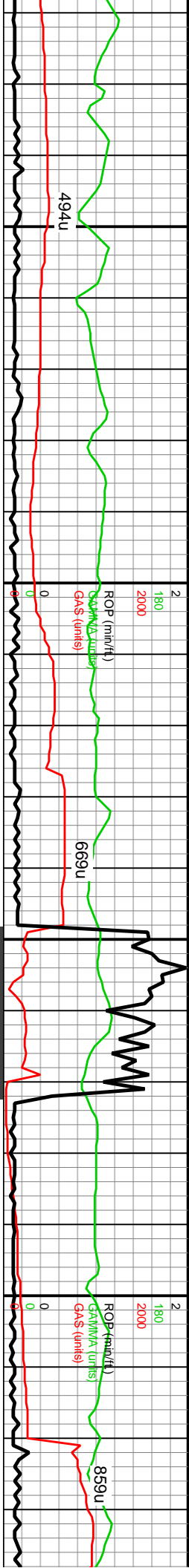
MD: 13,690'
Inclination: 94.17°
Azimuth: 269.52°
TVD: 7,218.63'
VS: 6,063.57'

MD: 13,784'
Inclination: 92.85°
Azimuth: 270.97°
TVD: 7,212.88'
VS: 6,157.39'

TVD (ft)	
7700	13620-13680 SS: pred off wh-it gy, rr gy-dk gy, occ clr unconcs qtz sd, mod srtf vf-u f-med sb rd-rd sd grs, med frm-frm sli fri gr-mtx sup ss clus cons wi silic & arg cmt, occ med unconcs qtz grs, tr slst, pred non calc, rr sl-l calc
7700	13680-13740 SS: pred off wh-it gy-gy, lt brn hue ip, mod w srtf & grdd vf-u f-med sb ang-sb rd-rd sd grs, frm sli fri gr sup ss clus cons wi silic & arg cmt, dolc ip, rr fri med frm mtx sup clus cons wi arg cmt, occ med unconcs qtz grs, tr slst, pred non calc, occ l calc
7700	13740-13800 SS: grdd off wh-it gy-gy, lt brn hue ip, mod w srtf & vf-u f sb ang-sb rd-rd sd grs, frm sli fri gr sup ss clus cons wi silic & sl arg cmt, rr fri med frm mtx sup clus cons wi arg cmt, dolc ip, occ-rr med unconcs qtz grs, tr slst, pred non calc, occ l calc ip

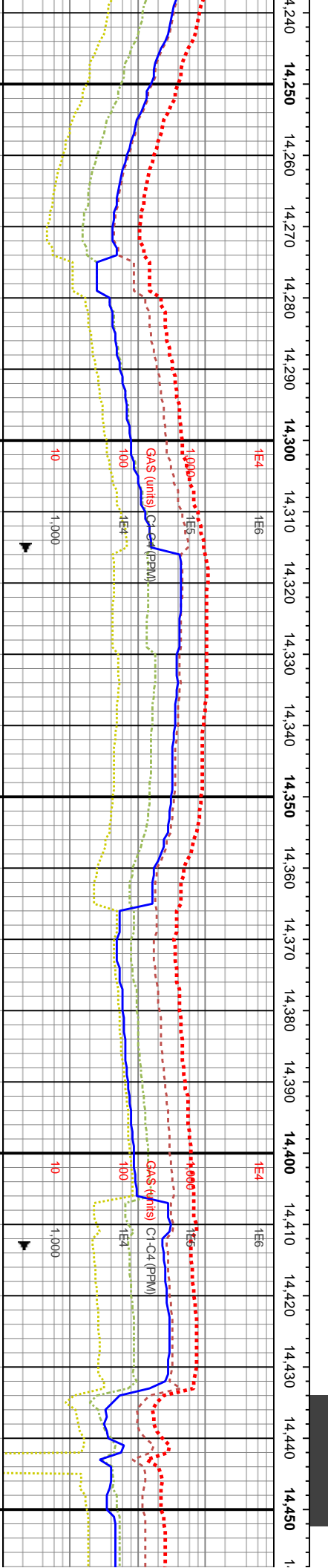
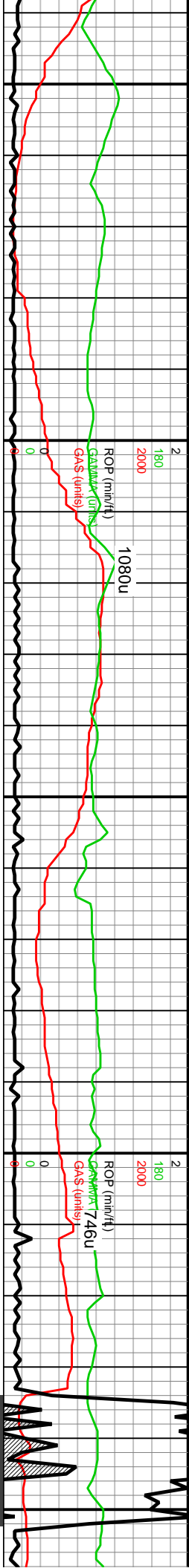






MD: 14,068' Inclination: 91.68° Azimuth: 268.32° TVD: 7,201.2' VS: 6,441.11'		14040-14100 SS: pred off wh-lt gy-gy, mod w srted v-f-u f-med sb ang-sb rd-rd sd grs, frm sli fri gr sup ss clus cons wi silic & arg cmnt, rr fri med frm mix sup clus cons wi arg cmnt, occ med unconcs qtz grs, tr silst, tr c pyr strg, pred non calc	14100-14160 SS: off wh-lt gy-gy, occ dk gy brn wi o stn, mod w srted v-f-u f-sb ang-sb rd-rd sd grs, rr l med unconcs qtz sd ip, frm sli fri pred gr sup ss clus cons wi silic & arg cmnt, rr med frm mix sup clus cons wi arg cmnt, tr silst, tr c pyr strg, pred non calc	14160-14220 SS: off wh-lt gy-gy, occ dk gy brn wi o stn, mod w srted v-f-u f-sb ang-sb rd-rd sd grs, rr l med unconcs qtz sd ip, frm sli fri pred gr sup ss clus cons wi silic & arg cmnt, rr med frm mix sup clus cons wi arg cmnt, tr silst, tr c pyr strg, pred non calc	14220-14230 SS: off wh-lt gy-gy, occ dk gy brn wi o stn, mod w srted v-f-u f-sb ang-sb rd-rd sd grs, rr l med unconcs qtz sd ip, frm sli fri pred gr sup ss clus cons wi silic & arg cmnt, rr med frm mix sup clus cons wi arg cmnt, tr silst, tr c pyr strg, pred non calc
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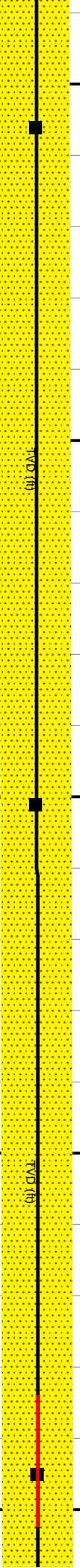




MD: 14,256'
Inclination: 91.78°
Azimuth: 270.45°
TVD: 7,195.39'
VS: 6.629'

MD: 14,351'
Inclination: 90.3°
Azimuth: 269.49°
TVD: 7,193.71'
VS: 6.723.98'

MD: 14,445'
Inclination: 91.21°
Azimuth: 270.43°
TVD: 7,192.47'
VS: 6.817.97'



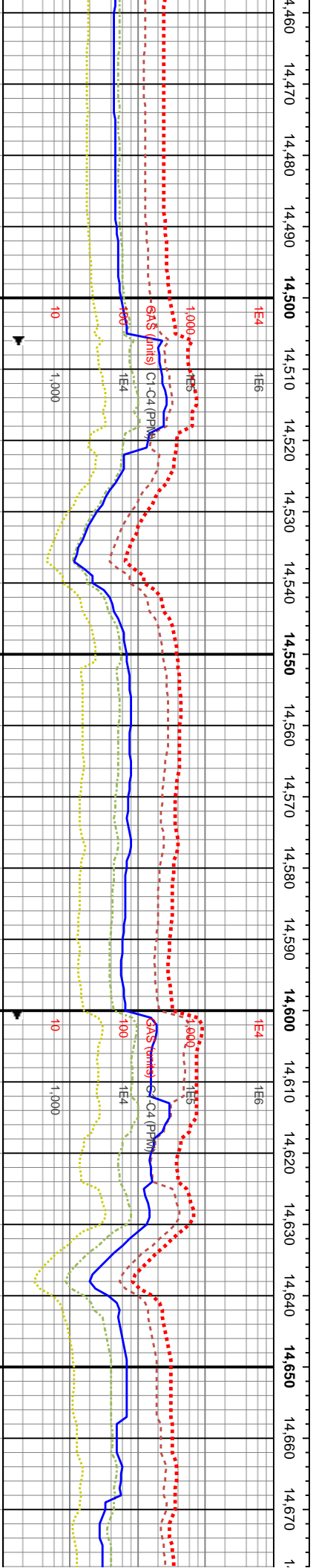
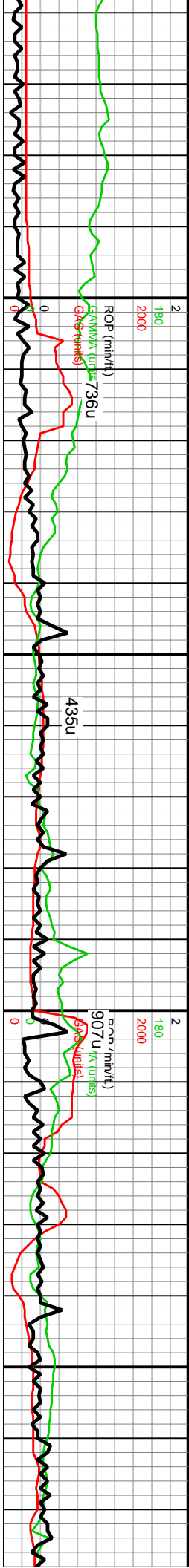
14280 SS: off wh-it-gy-gy, occ dk gy brn
mod w strd vf-u f-sb ang-sb rd-rd sd
med uncongs qtz sd ip, frm sil fri pred
clus cons wi silc & arg cnt, r med
sup clus cons wi arg cnt, tr silst, tr c
pred non calc

14280-14340 SS: pred lt brn grs, sme gy-tn
grs, trnsi grs thru, pred lt brn- bf cnt thru, occ
dk gy arg cnt, pred sb blk/frm- fri grn sup
clus wi vf sd grs, abnt f- u f uncongs sd grns,
occ u med lse sd grs, sb rd- sb ang grs, ip
ang grs, abnt calc cnt, ip lmy intbds

14340-14400 SS: pred lt brn grs, sme gy-tn
grs, trnsi grs thru, pred lt brn- bf cnt thru,
occ dk gy arg cnt, pred sb blk/frm- fri grn
sup clus wi vf sd grs, abnt f- u f uncongs sd
grns, occ u med- c lse sd grs, sb rd- sb
ang grs, ip ang grs, abnt calc cnt, ip lmy-
blk stly sh intbds

14400-14460 SS: pred lt brn grs, sme gy-tn grs,
trnsi grs thru, pred lt brn- bf cnt thru, occ dk gy
arg cnt, pred sb blk/frm- fri grn sup clus wi vf sd
grs, abnt f- u f uncongs sd grns, occ u med- c lse
sd grs, sb rd- sb ang grs, ip ang grs, abnt calc
cnt, ip lmy- blk stly sh intbds

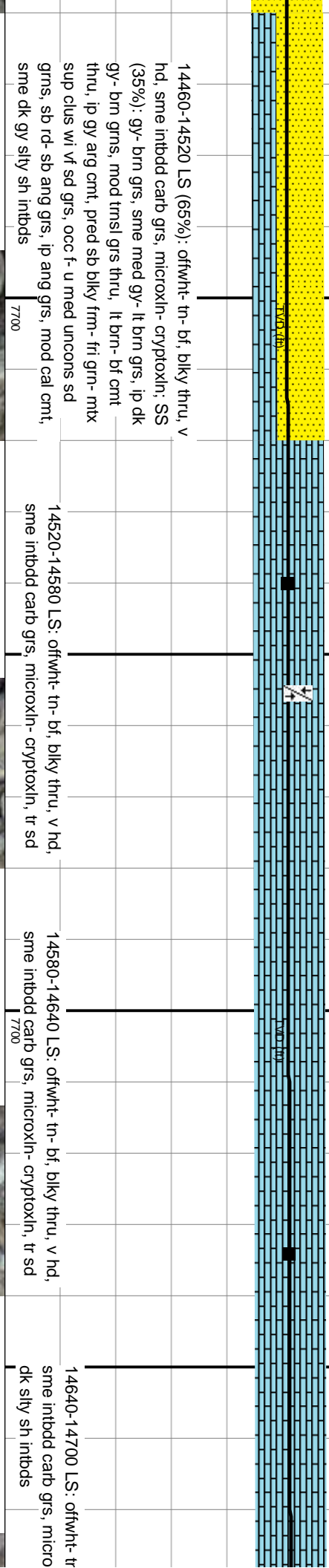


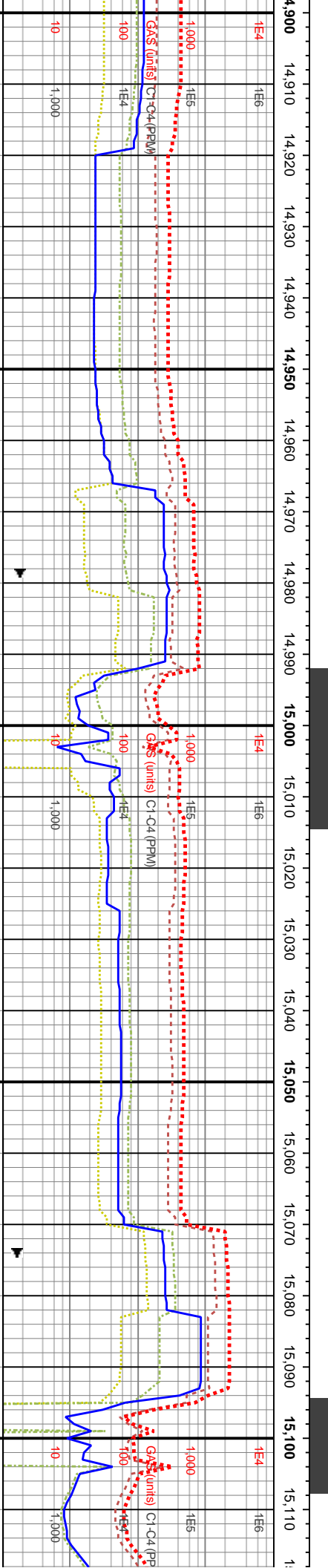
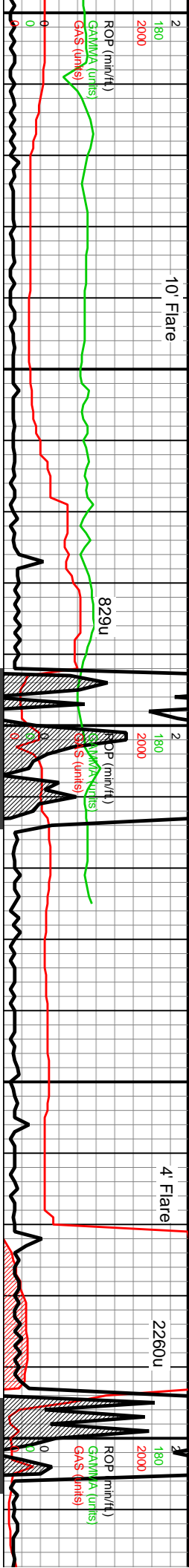


WOB: 38Klbs
Rotary: 71RPM
Strokes: 210SPM
Pump Rate: 611GPM

MD: 14,540'
Inclination: 91.18°
Azimuth: 269.73°
TVD: 7,190.49'
VS: 6.912.95'

MD: 14,634'
Inclination: 92.18°
Azimuth: 269.4°
TVD: 7,187.73'
VS: 7,006.9'





67MD: 14,913'
Inclination: 93.22°
Azimuth: 270.62°
TVD: 7,173.61'
VS: 7,285.52'

WOB: 70Klbs
Rotary: 30RPM
Strokes: 200SPM
Pump Rate: 581GPM

6MD: 15,012'
Inclination: 92.18°
Azimuth: 270.72°
TVD: 7,168.95'
VS: 7,384.4'

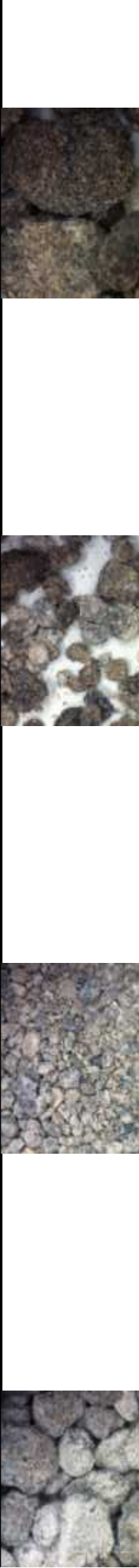
MD: 15,107'
Inclination: 92.08°
Azimuth: 270.91°
TVD: 7,165.42'
VS: 7,479.33'

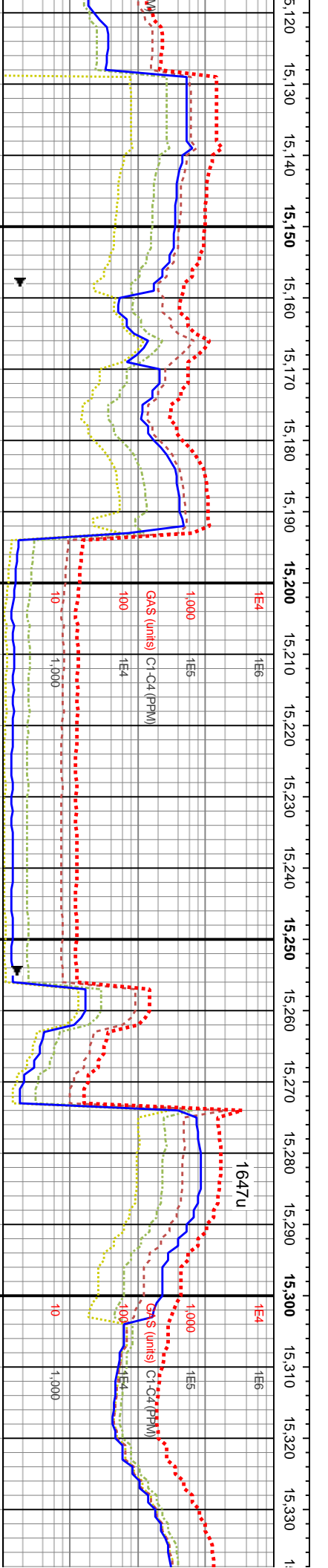
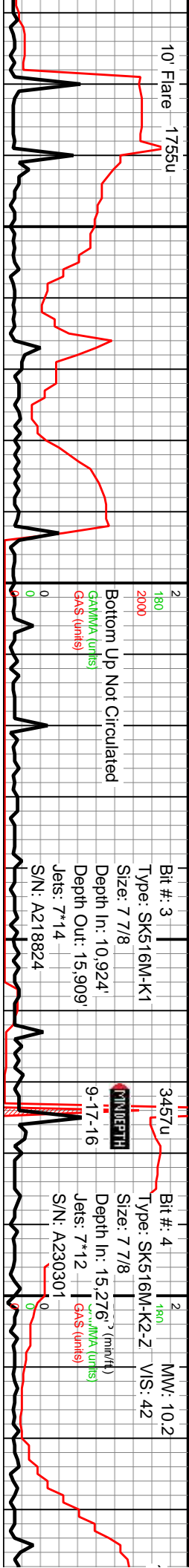
80-14940 SS: gy- brn grs, sme med
It brn grs, ip dk gy- brn grns, mod
sl grs thru, lt brn- bf cnt thru, ip gy arg
pred sb blkly frm- fri grn- mtix sup
s wi vf sd grs, occ med- c unconcs sd
sb rd- sb ang grs, sl cal

14940-15000 SS: lt gy- brn grs, sme med gy- lt
brn grs, ip dk gy- brn grns, mod trns grs thru, lt
brn- bf cnt thru, ip gy arg cnt, pred sb blkly frm- fri
grn- mtix sup clus wi vf sd grs, occ med- c unconcs
sd grs, sb rd- sb ang grs, sl cal

15000-15060 SS: lt gy- brn grs, sme
med gy- lt brn grs, ip dk gy- brn grns,
mod trns grs thru, lt brn- bf cnt thru, ip
gy arg cnt, pred sb blkly frm- fri grn- mtix
sup clus wi vf sd grs, occ med- c
unconcs sd grs, sb rd- sb ang grs, sl cal

15060-15120 SS: gy- brn grs, sme lt gy- lt brn
grs, ip dk gy- brn grns, mod trns grs thru, lt
brn- bf cnt thru, ip gy arg cnt, pred sb blkly
frm- fri grn- mtix sup clus wi vf sd grs, ip f- med
unconcs sd grs, sb rd- sb ang grs, sl cal





MD: 15,193'
Inclination: 91.48°
Azimuth: 270.29°
TVD: 7,162.69'

TVD (ft)

NW

MD: 15,287'
Inclination: 91.48°
Azimuth: 269.53°
TVD: 7,160.32'
VS: 7,659.25'

TVD (ft)

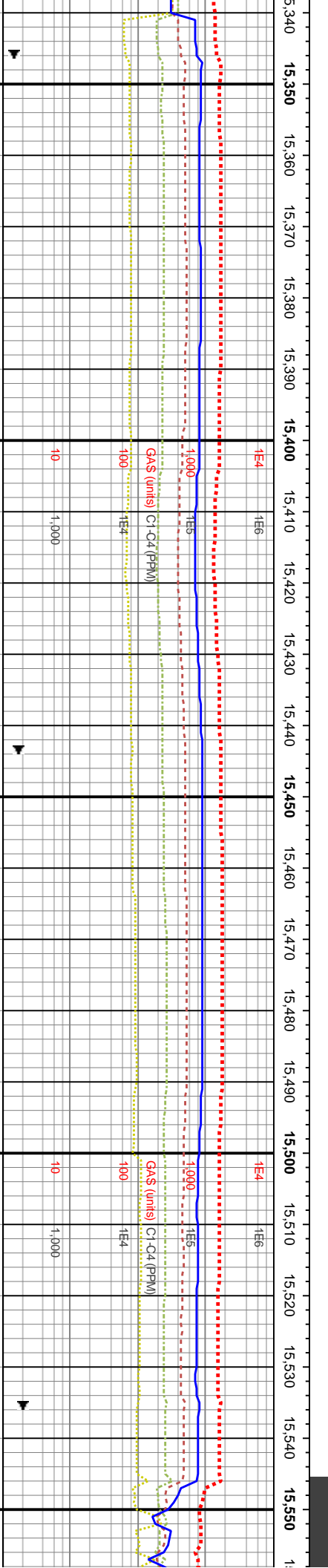
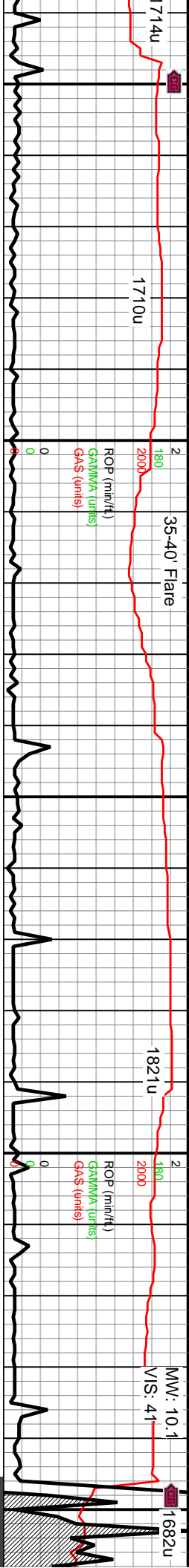
15120-15180 SS: gy- brn grs, sme lt gy- lt brn grs, ip dk gy- brn grms, mod trnsi grs thru, lt brn- bf cnt thru, ip gy arg cnt, pred sb blkly frm- fri grm- mtx sup clus wi vf sd grs, ip f- med unconcs sd grs, sb rd- sb ang grs, sl cal

5180-15240 SS: gy- brn grs, sme lt gy- lt brn grs, ip dk gy- brn grms, mod trnsi grs thru, lt brn- bf cnt thru, ip gy arg cnt, pred sb blkly frm- fri grm- mtx sup clus wi vf sd grs, ip f- med unconcs sd grs, sb rd- sb ang grs, sl cal

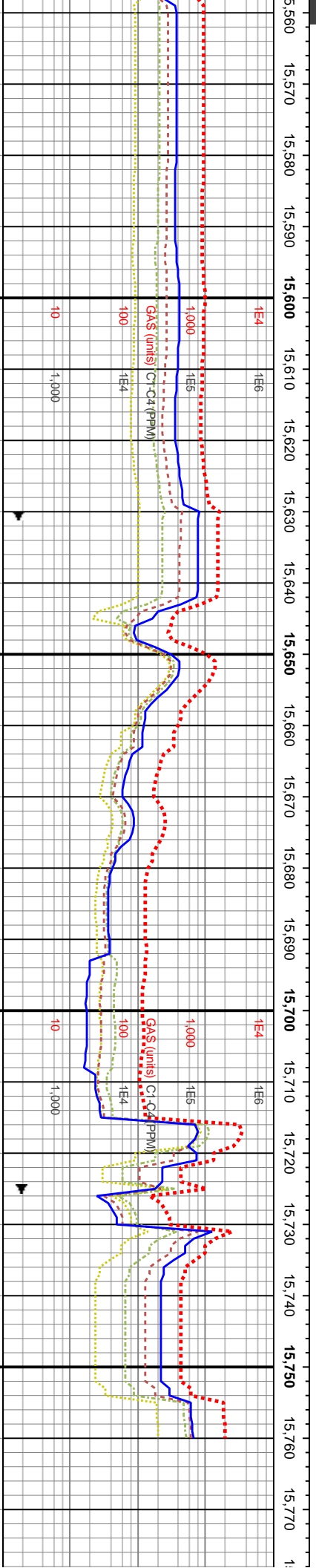
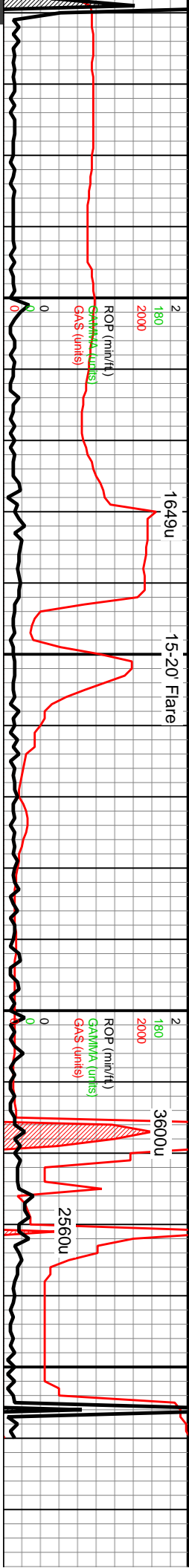
15240-15300 SS: gy- lt brn grs, sme lt gy- lt brn grs, ip dk gy- brn grms, mod trnsi grs thru, lt brn- bf cnt thru, ip gy arg cnt, pred sb blkly frm- fri grm- mtx sup clus wi vf sd grs, ip f- med unconcs sd grs, sb rd- sb ang grs, sme sl cal, rr pyr

15300-15360 SS: gy- lt brn grs, sme lt gy- lt brn grs, ip dk gy- brn grms, mod trnsi grs thru, bf cnt thru, ip gy arg cnt, pred sb blkly frm- fri grm- mtx sup clus wi vf sd grs, ip f- med unconcs sd grs, sb rd- sb ang grs, sme sl cal





MD: 15,382' Inclination: 90.7° Azimuth: 268.53° TVD: 7,158.51' VS: 7,754.21'	6700	15360-15420 SS: gy- lt brn grs, sme lt gy- lt brn grs, ip dk gy- brn grms, mod trnsi grs thru, lt brn- bf cnt thru, ip gy arg cnt, pred sb blkyl frm- fri grn- mtx sup clus wi vf sd grs, ip f- med uncons sd grs, occ c grs, sb rd- sb ang grs, sme sl cal, rr pyr	7700
MD: 15,476' Inclination: 90.7° Azimuth: 268.44° TVD: 7,157.36' VS: 7,848.17'	6700	15360-15420 SS: gy- lt brn grs, sme lt gy- lt brn grs, ip dk gy- brn grms, mod trnsi grs thru, lt brn- bf cnt thru, ip gy arg cnt, pred sb blkyl frm- fri grn- mtx sup clus wi vf sd grs, mod f- med uncons sd grs, occ med- c trnsi ang sd grs, sb rd- sb ang grs, sme sl cal, rr pyr	7700
		15480-15540 SS: gy- lt brn grs, sme lt gy- lt brn grs, ip dk gy- brn grms, mod trnsi grs thru, lt brn- bf cnt thru, abnt gy arg cnt, pred sb blkyl frm- fri grn- mtx sup clus wi vf sd grs, ip f- med uncons sd grs, occ c grs, sb rd- sb ang grs, sme sl cal, rr pyr	7700
		15540-15600 SS: gy- lt brn grs, sme lt gy- lt brn grs, ip dk gy- brn grms, mod trnsi grs thru, lt brn- bf cnt thru, abnt gy arg cnt, pred sb blkyl frm- fri grn- mtx sup clus wi vf sd grs, ip f- med uncons sd grs, occ c grs, sb rd- sb ang grs, sme sl cal, rr pyr	7700



MD: 15,571'	MD: 15,665'	MD: 15,760'
Inclination: 90.67°	Inclination: 90.3°	Inclination: 89.66°
Azimuth: 269.81°	Azimuth: 269.17°	Azimuth: 269.39°
TVD: 7,156.23'	TVD: 7,155.43'	TVD: 7,155.47'
VS: 7,943.14'	VS: 8,037.13'	VS: 8,132.12'

6700	6700	6700
15600-15660 SS: gy- lt brn grs, sme lt gy- brn grs, ip dk gy- brn grs, mod trnsl grs thru, lt brn- bf cnt thru, ooc gy arg cnt, pred sb blkly frm- fri grn sup clus wi vf- f sd grs, occ mtix sup clus, mod f- med unconcs sd grs, occ c grs, sb rd- sb ang grs, sme sl cal, rr pyr, tr blk slty sh	15660-15720 SS: gy- lt brn grs, sme lt gy- brn grs, ip dk gy- brn grs, mod trnsl grs thru, lt brn- bf cnt thru, abnt gy arg cnt, pred sb blkly frm- fri grn sup clus wi vf- f sd grs, occ mtix sup clus, mod f- med unconcs sd grs, occ c grs, sb rd- sb ang grs, sme sl cal, rr pyr, tr blk slty sh	15720-15780 SS: gy- lt brn grs, sme lt gy- brn grs, ip dk gy- brn grs, mod trnsl grs thru, lt brn- bf cnt thru, ooc gy arg cnt, pred sb blkly frm- fri grn sup clus wi vf- f sd grs, occ mtix sup clus, mod f- med unconcs sd grs, sme c grs, sb rd- sb ang grs, sme sl cal, tr blk slty sh



