



Scale: 5" / 100'
Measured Depth Log

Well Name HOWARD 29N-21HZ

Location SESW SEC: 21 T: 1N 67W R: 6 PM

State COLORADO

Country U.S.A.

API Number 05-123-36792-0000

Region DJ BASIN

Spud Date 6/12/2013

Surface Coordinates 431 FSL, 1522 FWL

Bottom Hole Coordinates 460 FNL, 970 FWL

County WELD

Rig Number XTREME 6

AFE # 2077319.DRL

Field WATTENBERG

Drilling Completed 9/7/2013

Ground Elevation 5025

K.B. Elevation 5041

Logged Interval 7000 To 12009

Total Depth 12009

Formation NIOBRARA

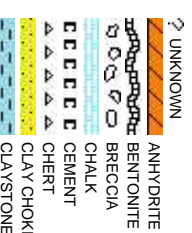
Type of Drilling Fluid LSND

Company Anadarko

Address 1099 18th St #1
Denver, CO 80202

Name ISAAC SMITH & ASSOCIATES

Company COLUMBINE LOGGING
Address 2385 S. LIPAN
DENVER, CO
80203



Operator

800
202

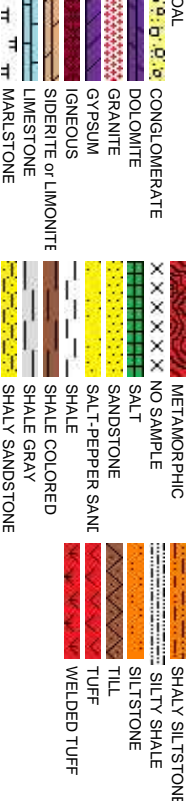
Geologist

& JASON BEACH

LOGGING

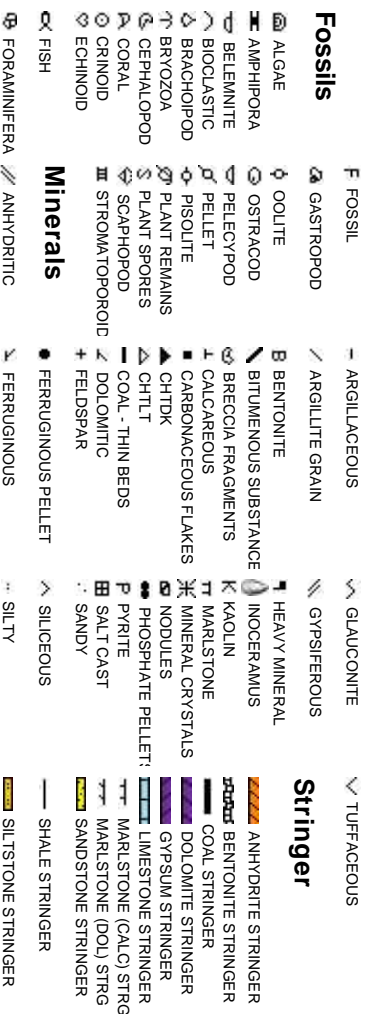
STREET

Rock Types



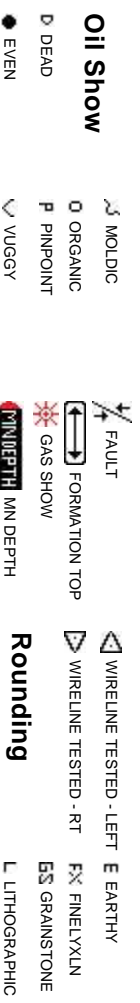
Accessories

Fossils

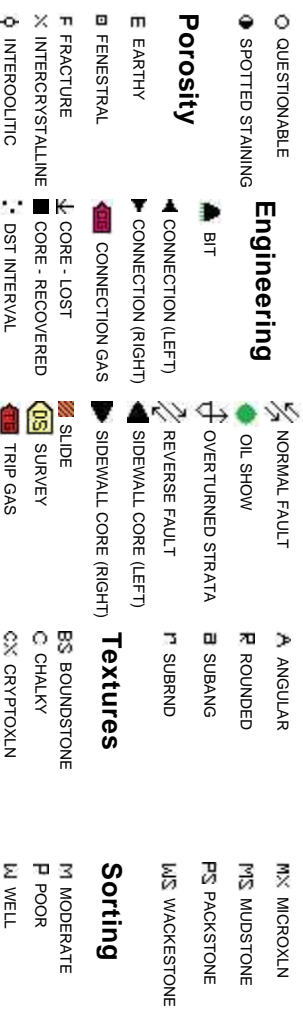


Other Symbols

Oil Show



Porosity



Textures

Sorting

Stringer

Slide/Rotate

ROP
ROF
GAMMA

ROP (min/h)
GAMMA (units)

BEGIN HOWARD 29N-21HZ @ 700
MD. DRILLING 8.75" HOLE W/ #1,
SMITH SD611, JH3413. DEPTH IN
941, DEPTH OUT 8003.

Total Gas & Chromatograph

GAS
C1
C2
C3
C4

GAS (units)
C1-C4 (PPM)

COLUMBINE LOGGING
2-MAN LOGGING CREW
9/02/2013

DRILLING UNDERBALANCE

Depth Labels

6,760 6,770 6,780 6,790 6,800 6,810 6,820 6,830 6,840 6,850 6,860 6,870 6,880 6,890 6,900 6,910 6,920 6,930 6,940

% Lith

6000

MD: 6.937
TVD: 6.877
Inclination:
Azimuth: 3
VS: -373.38

Well Bore
TVD

TVD (ft)

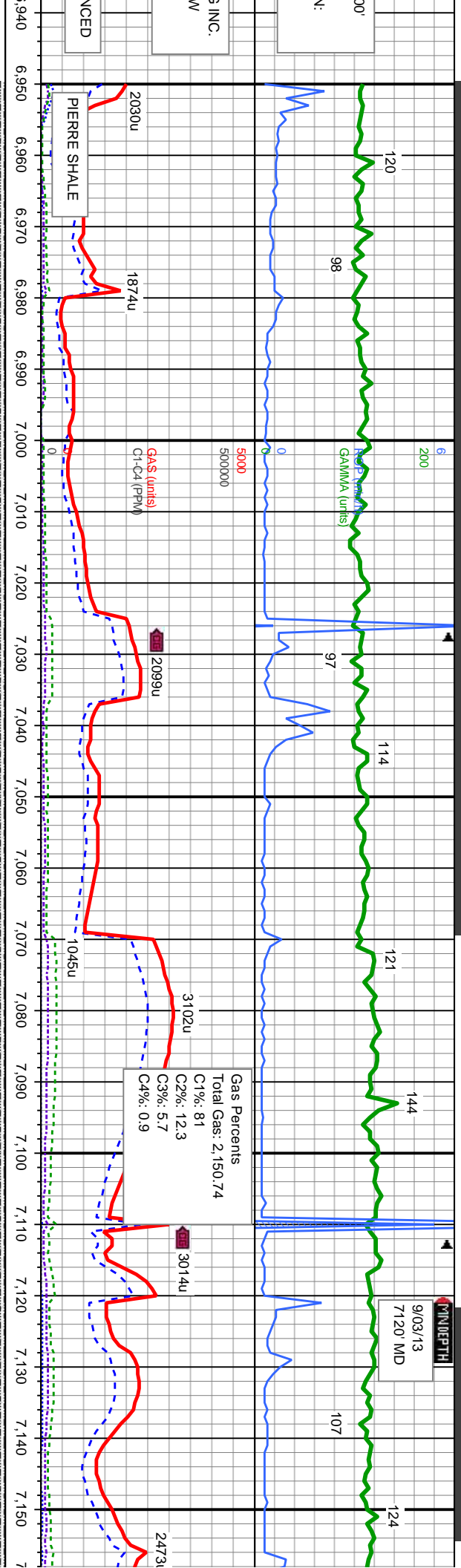
8000

Oil Show

TR
P
FR
G
E

Images

9/03/13
7120' MD



MD: 6.979
TVD: 6.919.72
Inclination: 5.08
Azimuth: 352.29
VS: -371.11

MD: 7.022
TVD: 6.962.28
Inclination: 10.93
Azimuth: 359.63
VS: -365.14

MD: 7.064
TVD: 7.003.09
Inclination: 16.22
Azimuth: 1.36
VS: -355.29

MD: 7.107
TVD: 7.044.28
Inclination: 17.15
Azimuth: 2.6
VS: -342.95

MD: 7.150
TVD: 7.085.07
Inclination: 1
Azimuth: 359
VS: -329.37

SLTY SH: med gy-dk gy, pily-sb blk, frm-sft, sb rnd-sb ang, mod fri, sl calc, no o

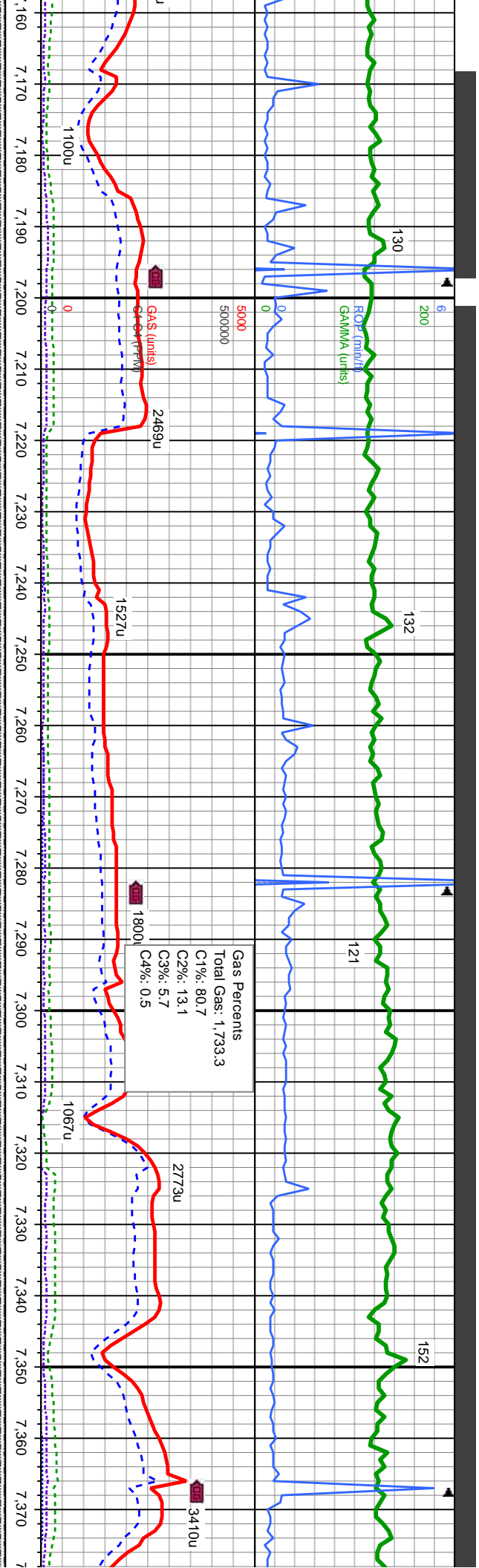
SLTY SH: med gy-dk gy, pily-sb blk, frm-sft, sb rnd-sb ang, mod fri, sl calc, no o

SLTY SH: med gy-dk gy, pily-sb blk, frm-sft, sb rnd-sb ang, mod fri, sl calc, n o

SLTY SH: med gy-dk gy, pily-sb blk, frm-sft, sb rnd-sb ang, mod fri, sl calc, no o

SLTY S





WT IN 9.8 OUT 9.8
VIS IN 40 OUT 40

WT IN 9.8 OUT 9.8
VIS IN 40 OUT 40

MD: 7.192
TVD: 7.124.41
Inclination: 21.35
Azimuth: 2.82
VS: -314.65

MD: 7.235
TVD: 7.164.1
Inclination: 23.88
Azimuth: 4.85
VS: -298.16

MD: 7.277
TVD: 7.201.66
Inclination: 29.18
Azimuth: 6.28
VS: -279.51

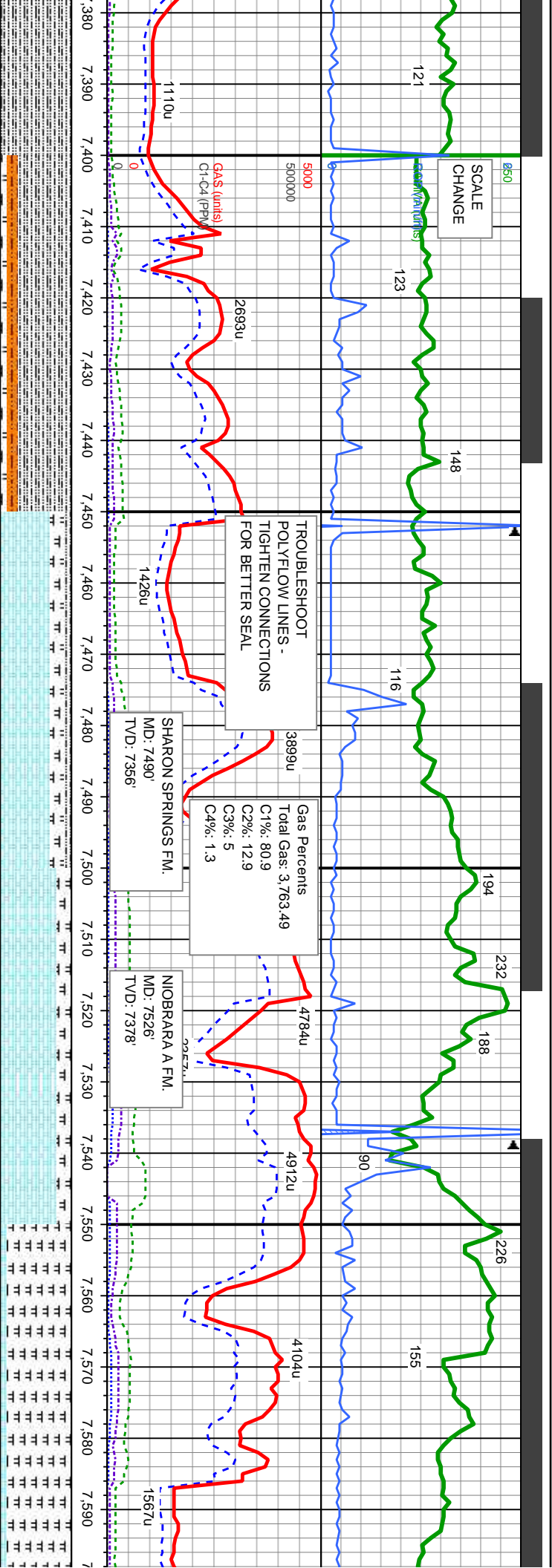
MD: 7.320
TVD: 7.237.97
Inclination: 35.52
Azimuth: 6.09
VS: -256.66

MD: 7.362
TVD: 7.270.73
Inclination: 41.91
Azimuth: 3.91
VS: -230.51

TVD: 0

H, med gy-dk gy, pily-sb blky, sb rnd-sb ang, mod fri, sl calc, no o	SLTY SH: med gy-dk gy, pily-sb blky, frm-sft, sb rnd-sb ang, mod fri, sl calc, tr it bl flr w/ frt yel cut	SLTY SH: med gy-dk gy, pily-sb blky, frm-sft, sb rnd-sb ang, mod fri, sl calc, tr it bl flr w/ frt yel cut	SLTY SH: med gy-dk gy, pily-sb blky, frm-sft, sb rnd-sb ang, mod fri, sl calc, tr it bl flr w/ frt yel cut
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TROUBLESHOOT
POLYFLOW LINES -
TIGHTEN CONNECTIONS
FOR BETTER SEAL

Gas Percents
Total Gas: 3,763.49
C1%: 80.9
C2%: 12.9
C3%: 5
C4%: 1.3

SHARON SPRINGS FM.
MD: 7490'
TVD: 7356'

NOBRARA A FM.
MD: 7526'
TVD: 7378'

WT IN 9.8 OUT 9.7
VIS IN 40 OUT 40

MD: 7,405
TVD: 7,301.3
Inclination: 47.43
Azimuth: 1.35
VS: -200.33

MD: 7,448
TVD: 7,329.64
Inclination: 50.11
Azimuth: 0.45
VS: -168.01

MD: 7,490
TVD: 7,356.19
Inclination: 51.45
Azimuth: 359.7
VS: -136.47

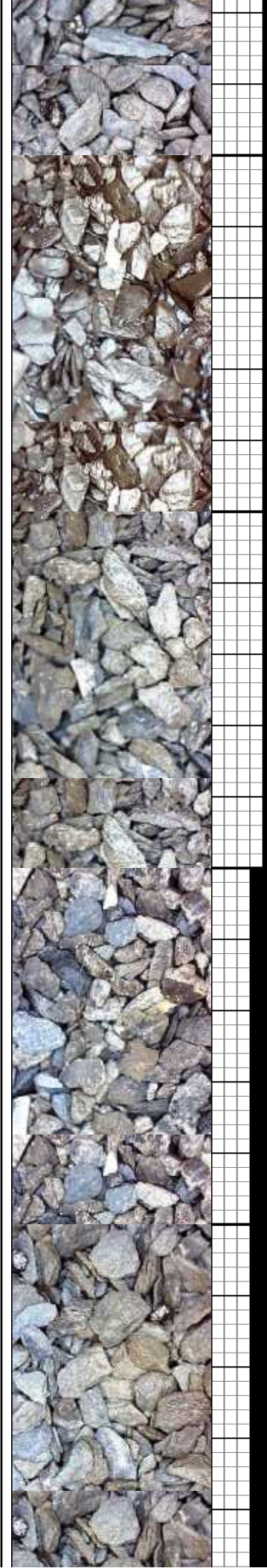
MD: 7,533
TVD: 7,382.15
Inclination: 54.27
Azimuth: 358.31
VS: -101.2

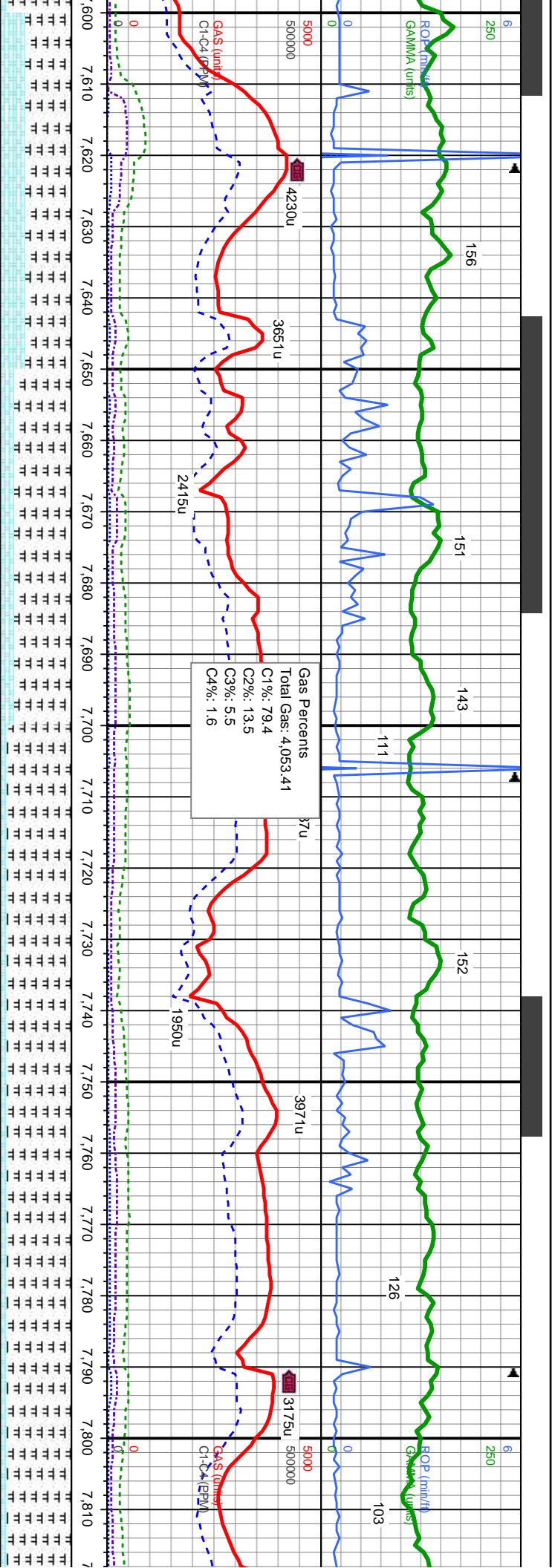
MD: 7,574
TVD: 7,404.43
Inclination: 59.89
Azimuth: 358.01
VS: -66.81

SH SLTST: lt gy-ft gy-brn, sb-bkly-sb-ply, med-v
frm, v sl calc, SLTY SH: med gy-dk gy, ply-sb
biky, frm-sft, sb rnd-sb ang, mod fr, sl
calc, MRLST: med-dk gy-gy brn, sb ply-biky,
mod sft-frm, sb arg-sily, calc, frt tr lt bl flr, sl str
8000

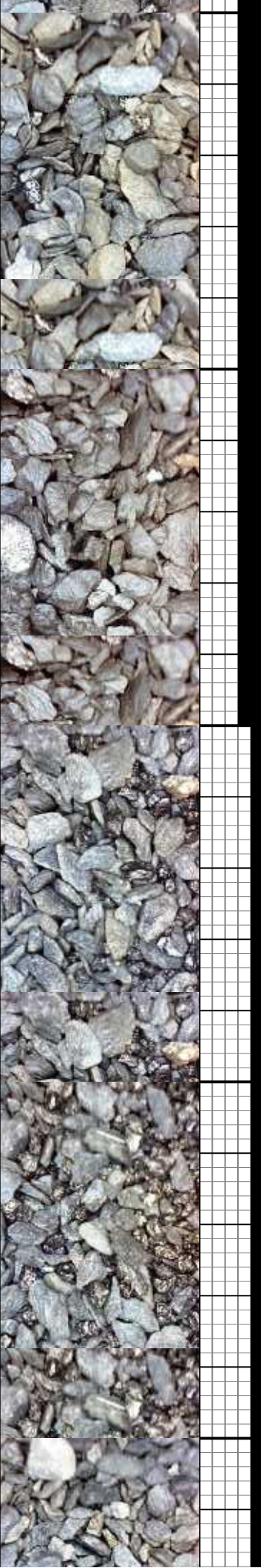
MRLST: med-dk gy-gy brn, sb ply-biky, mod
sft-frm, sb arg-sily, calc, CHK: lt-med gy, mod,
sb bkly-sb ply, sft-sl frm, fr, chky-sb wxy, v
calc, tr bent, tr lt bl flr, mod string

MRLST: med-dk gy-gy brn, sb ply-biky, mod
sft-frm, sb arg-sily, calc, CHK: lt-med
gy, mod, sb bkly-sb ply, sft-sl frm, fr, chky-sb
wxy, v calc, tr bent, tr lt bl flr, mod string





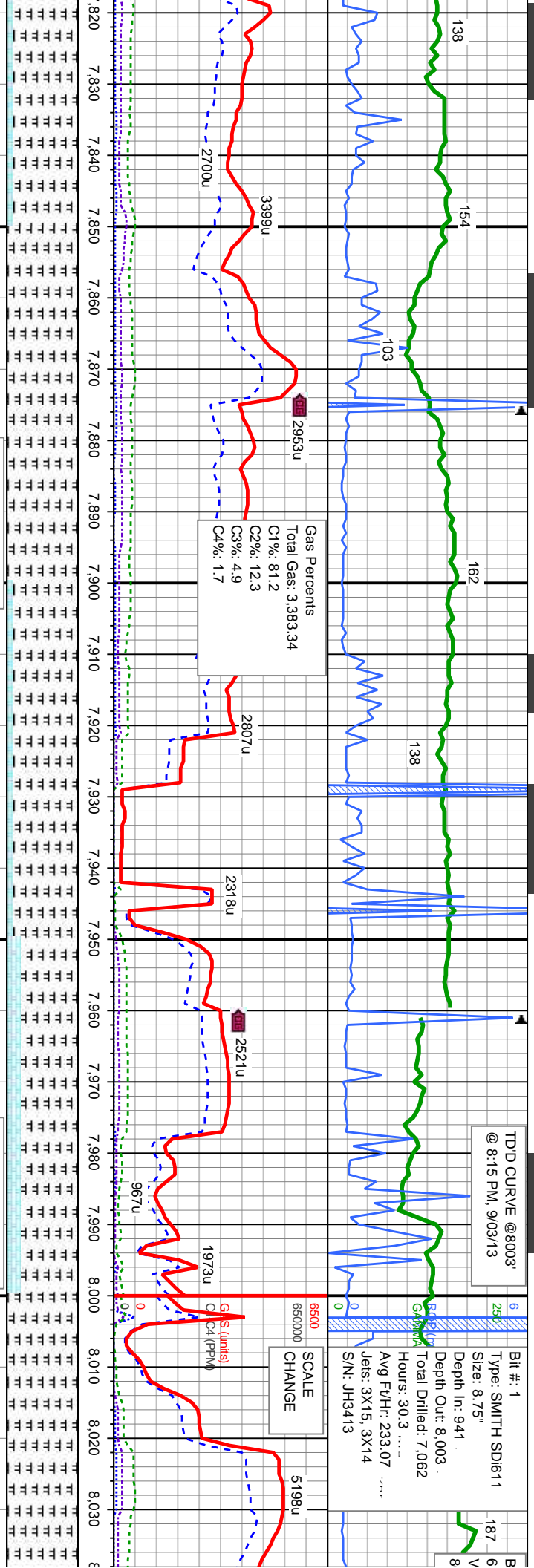
MRSLST: med-dk gy-gy brn, sb ply-biky, mod sft-frm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb biky-sb ply, sft-sl frm, fri, chky-sb wxy, v calc, tr bent, tr lt bl flr, mod string	MRSLST: med-dk gy-gy brn, sb ply-biky, mod sft-frm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb biky-sb ply, sft-sl frm, fri, chky-sb wxy, v calc, com bent, tr lt bl flr, mod string	MRSLST: med-dk gy-gy brn, sb ply-biky, mod sft-frm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb biky-sb ply, sft-sl frm, fri, chky-sb wxy, v calc, com bent, tr lt bl flr	MRSLST: med-dk gy-gy brn, sb ply-biky, mod sft-frm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb biky-sb ply, sft-sl frm, fri, chky-sb wxy, v calc, tr bent, tr lt bl flr, string	MRSLST: med-dk gy-gy brn, sb ply-biky, mod sft-frm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb biky-sb ply, sft-sl frm, fri, chky-sb wxy, v calc, tr bent, tr lt bl flr, string
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TD'D CURVE @8003'
@ 8:15 PM, 9/03/13

Bit #: 1
Type: SMITH SD611
Size: 8.75"
Depth In: 941
Depth Out: 8,003
Total Drilled: 7,062
Hours: 30.3
Avg Ft/Hr: 233.07
Jets: 3X15, 3X14
S/N: JH3413

SCALE
CHANGE

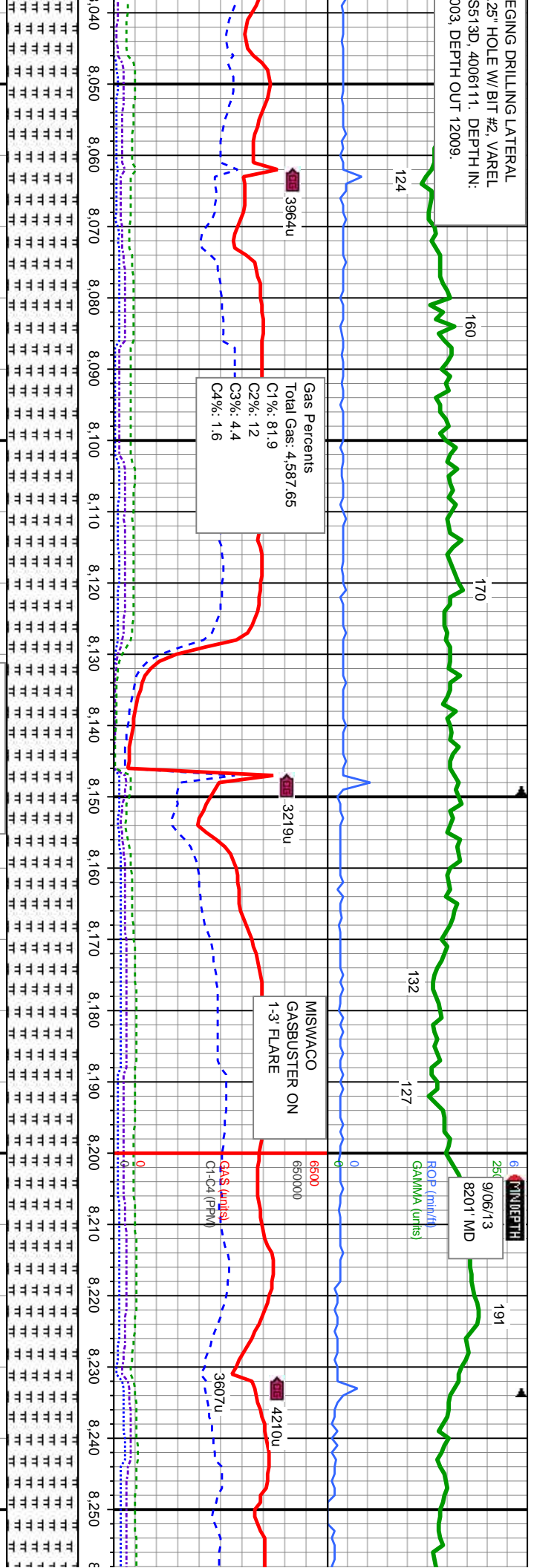


MD: 7.827 TVD: 7,481.62 Inclination: 80.16 Azimuth: 359.72 VS: 172.72	MD: 7.870 TVD: 7,487.84 Inclination: 83.21 Azimuth: 0.71 VS: 215.26	MD: 7.913 TVD: 7,492.2 Inclination: 85.16 Azimuth: 0.95 VS: 258.03	MD: 7.955 TVD: 7,494.77 Inclination: 87.81 Azimuth: 0.78 VS: 299.94	MD: 8.006 TVD: 7,495.89 Inclination: 89.69 Azimuth: 1.01 VS: 350.92
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-gy brn, sb ply-blky, mod calc, tr bent, CHK: lt-med ply, sft-sl frm, fri, chky-sb tr lt bl flr, strg	MR LST: med-dk gy-gy brn, sb ply-blky, mod sft-frm, sb arg-sily, calc, tr bent, v calc, tr lt bl flr, mod str	MR LST: med-dk gy-gy brn, sb ply-blky, mod sft-frm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mod, sb blky-sb ply, sft-sl frm, fri, chky-sb wxy, v calc, tr lt bl flr	MR LST: med-dk gy-gy brn, sb ply-blky, mod sft-frm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mod, sb blky-sb ply, sft-sl frm, fri, chky-sb wxy, v calc, tr lt bl flr	MR LST: med-dk gy-gy brn, sb lt bl flr w/ mod bl-wh cut
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ENGINEERING DRILLING LATERAL
25" HOLE W/ BIT #2, VAREL
SS5130, 4006111. DEPTH IN:
12003, DEPTH OUT 12009.



Gas Percents
Total Gas: 4.587.65
C1%: 81.9
C2%: 12
C3%: 4.4
C4%: 1.6

MISWACO
GASBUSTER ON
1-3' FLARE

6' MIN DEPTH
25"
9/06/13
8201' MD

MD: 8.091
TVD: 7.495.32
Inclination: 91.07
Azimuth: 0.93
VS: 435.89

WT IN 9.2 OUT 9.2
VIS IN 38 OUT 38

MD: 8.177
TVD: 7.493.06
Inclination: 91.94
Azimuth: 1.09
VS: 521.84

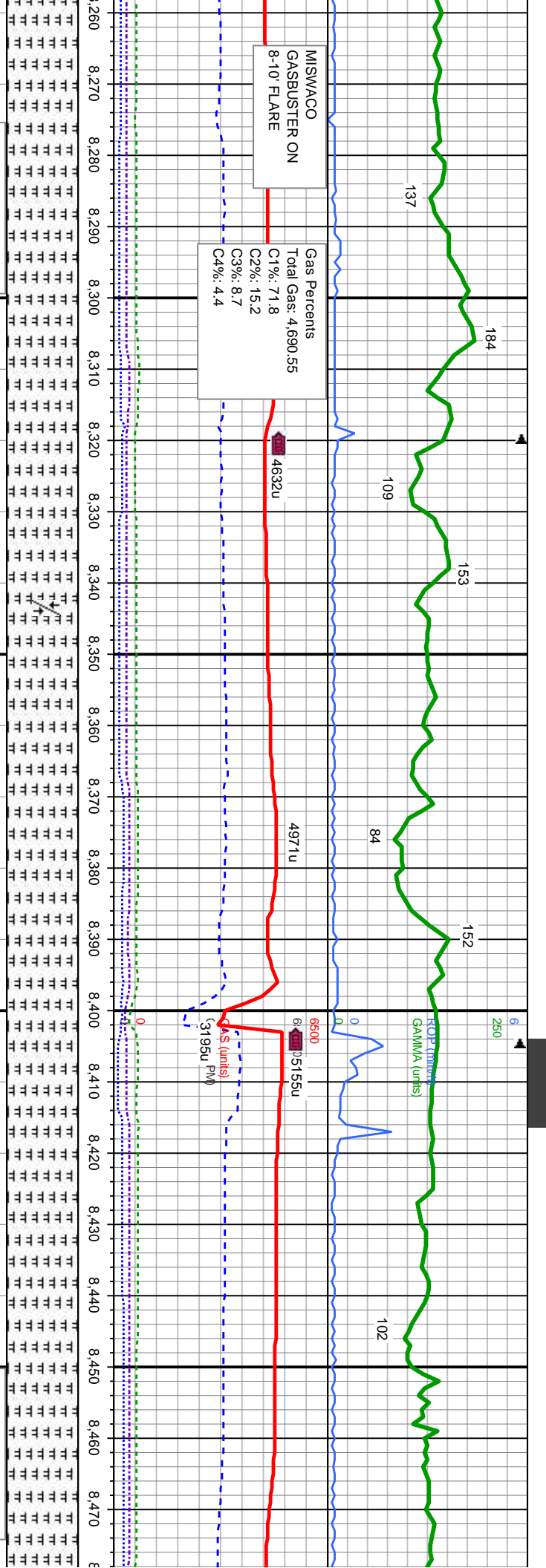
MD: 8.
TVD: 7
Inclina
Azimu
VS: 60

ply-blky, mod sft-fm, sb arg-sily, calc,

MRLST: med-dk gy-gy brn, sb ply-blky, mod sft-fm, sb arg-sily, calc,
tr lt bl flr, lt bl flr w/ mod bl-wh cut

MRLST: med-dk gy-gy brn, sb ply-blky, mod sft-fm, s
tr lt bl flr, lt bl flr w/ mod bl-wh cut





62.489.84
tion: 92.41
h: 1.42
6.75

WT IN 9.0 OUT 9.0
VIS IN 39 OUT 39

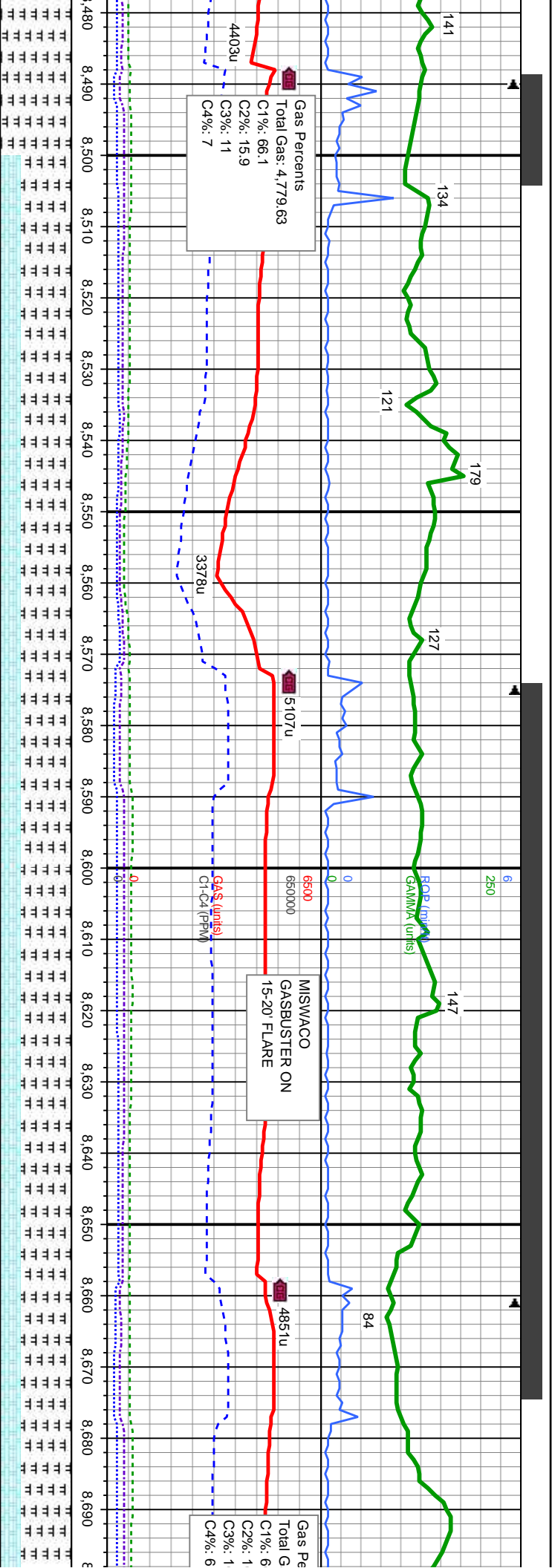
FAULT 1 OF 3 @8343' MD, 7486' TVD
86' UPWARD THROW

MD: 8.432
TVD: 7482.16
Inclination: 92.77
Azimuth: 1.01
VS: 776.53

MR LST: med-dk gy-gy brn, sb ply-blky, mod sft-fm, sb arg-sily, calc,
lt bl flr w/ mod bl-wh cut

MR LST: med-dk gy-gy brn, sb ply-blky, mod sft-fm, sb arg-sily, calc,
tr lt bl flr w/ v sl string halo cut



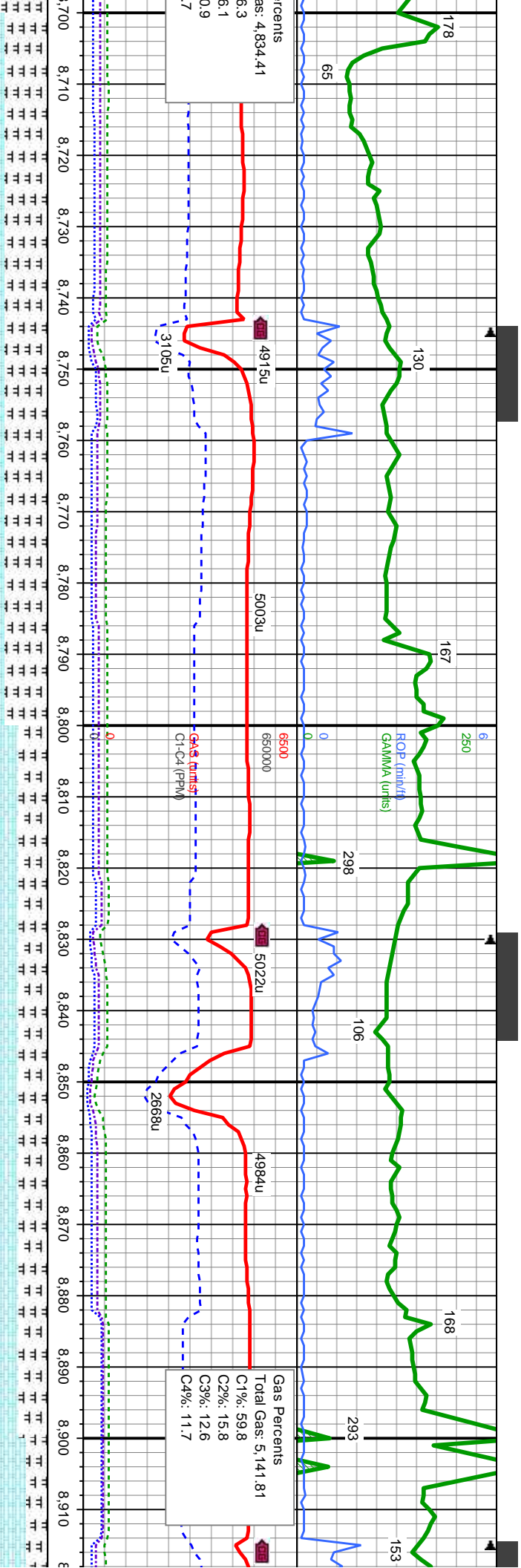


MD: 8,603
TVD: 7,475.74
Inclination: 91.53
Azimuth: 0.04
VS: 947.38

MR LST: med-dk gy-gy brn, sb pily-biky, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb biky-sb pily, sft-sl frm, fri, chky-sb wxy, v calc, tr bent, tr lt bl flr w v sl smg halo cut

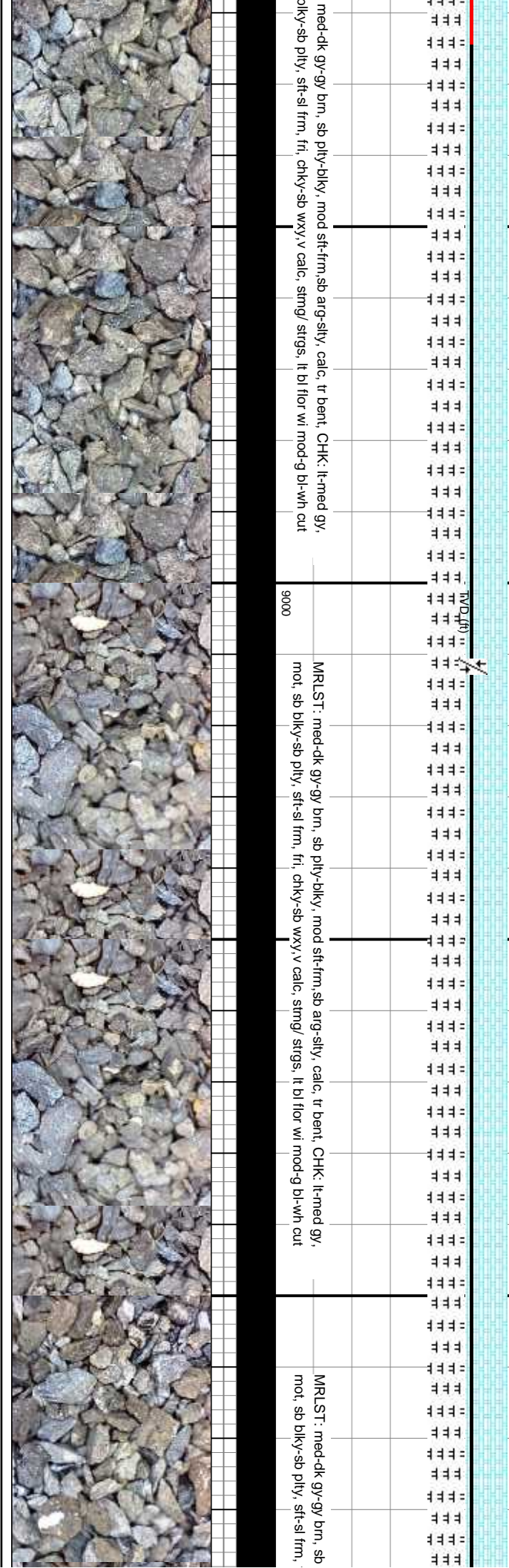
MR LST: med-dk gy-gy brn, sb pily-biky, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb biky-sb pily, sft-sl frm, fri, chky-sb wxy, v calc, tr bent, tr lt bl flr w v sl smg halo cut

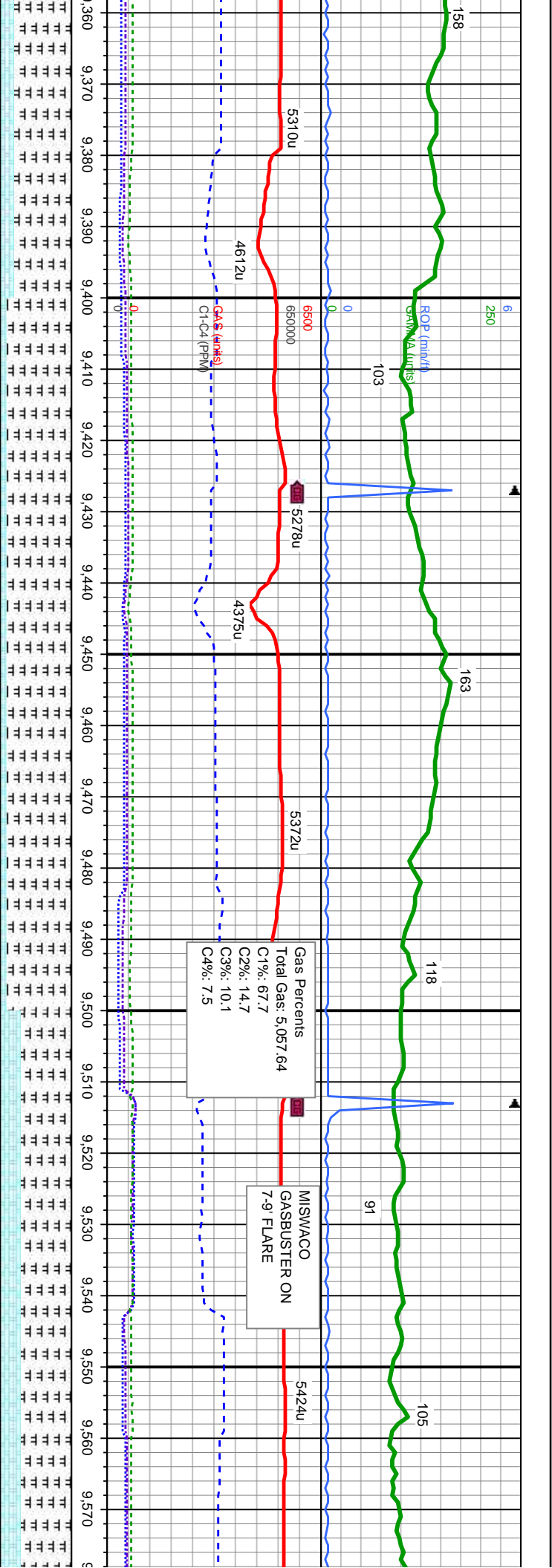




WT IN 9.0 OUT 9.0	WT IN 9.0 OUT 9.0
VIS IN 42 OUT 42	VIS IN 41 OUT 41
MD: 8.773	MD: 8.773
TVD: 7,471.84	TVD: 7,471.84
Inclination: 91.1	Inclination: 91.1
Azimuth: 359.38	Azimuth: 359.38
VS: 1,117.34	VS: 1,117.34
ROP (ft)	ROP (ft)
GAMMA (units)	GAMMA (units)
Gas (ppm)	Gas (ppm)
C1-C4 (ppm)	C1-C4 (ppm)
WT IN 9.0 OUT 9.0	WT IN 9.0 OUT 9.0
VIS IN 42 OUT 42	VIS IN 41 OUT 41
MD: 8.773	MD: 8.773
TVD: 7,471.84	TVD: 7,471.84
Inclination: 91.1	Inclination: 91.1
Azimuth: 359.38	Azimuth: 359.38
VS: 1,117.34	VS: 1,117.34
ROP (ft)	ROP (ft)
GAMMA (units)	GAMMA (units)
Gas (ppm)	Gas (ppm)
C1-C4 (ppm)	C1-C4 (ppm)
WT IN 9.0 OUT 9.0	WT IN 9.0 OUT 9.0
VIS IN 42 OUT 42	VIS IN 41 OUT 41
MD: 8.773	MD: 8.773
TVD: 7,471.84	TVD: 7,471.84
Inclination: 91.1	Inclination: 91.1
Azimuth: 359.38	Azimuth: 359.38
VS: 1,117.34	VS: 1,117.34
ROP (ft)	ROP (ft)
GAMMA (units)	GAMMA (units)
Gas (ppm)	Gas (ppm)
C1-C4 (ppm)	C1-C4 (ppm)







MD: 9.455
TVD: 7,468.52
Inclination: 89.32
Azimuth: 0.04
VS: 1,799.26

WT IN 9.0 OUT 9.0
VIS IN 41 OUT 39

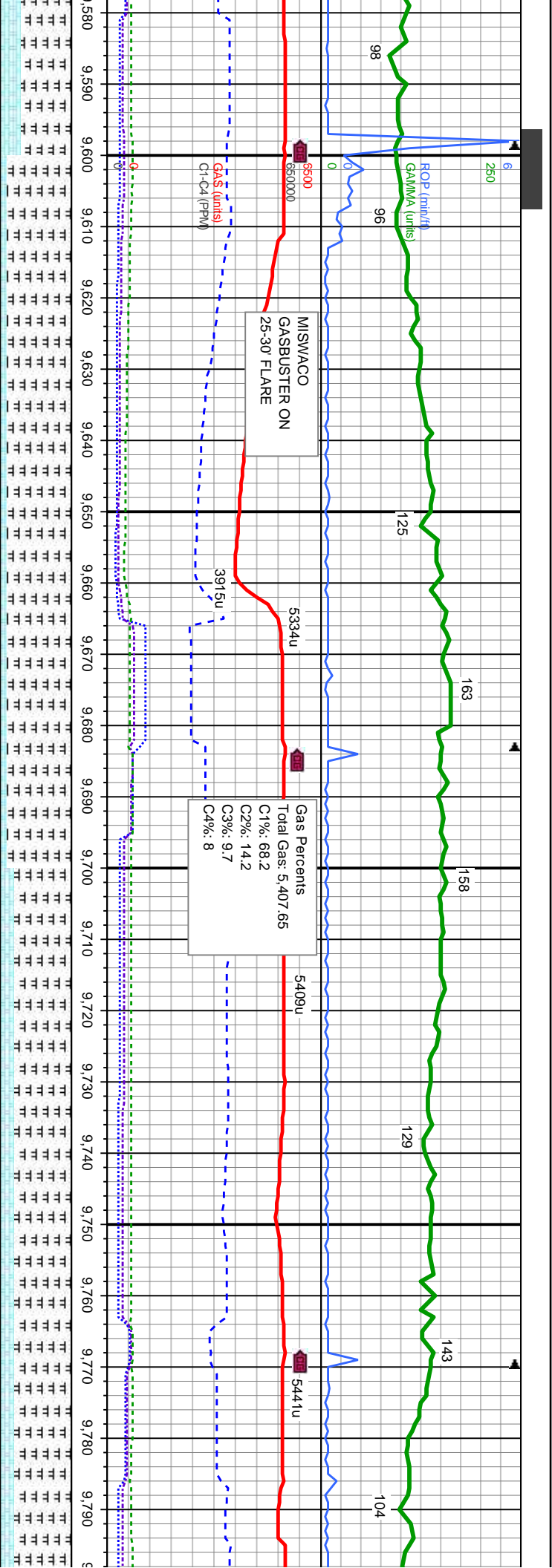
b arg-sily, calc, tr bent, CHK: lt-med gy, smng/ strgs, lt bl flr wi mod-g bl-wh cut

MRSLT: med-dk gy-gy brn, sb pily-biky, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb biky-sb pily, sft-sl frm, fti, chky-sb wxy, v calc, smng/ strgs, lt bl flr wi mod-g bl-wh cut

9000

MRSLT: med-dk gy-gy brn, sb pily-biky, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb biky-sb pily, sft-sl frm, fti, chky-sb wxy, v calc, smng/ strgs, lt bl flr wi



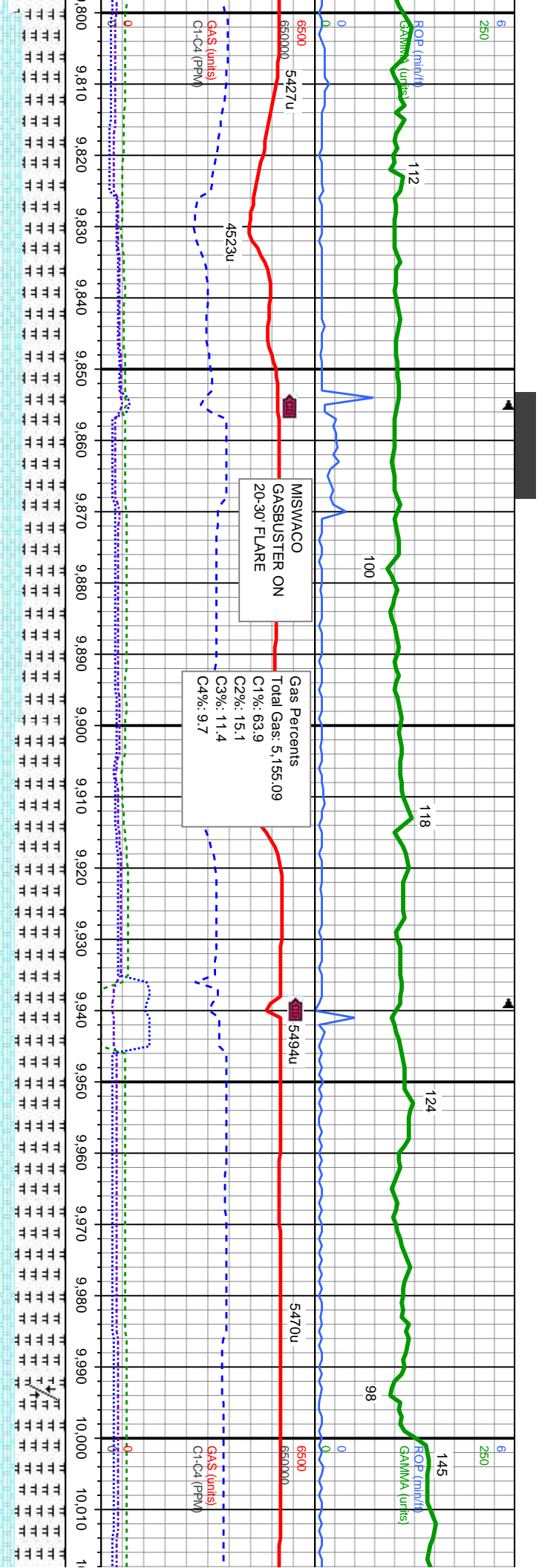


MISWACO
GASBUSTER ON
25-30' FLARE

Gas Percent
Total Gas: 5,407.65
C1%: 68.2
C2%: 14.2
C3%: 9.7
C4%: 8

CHK: lt-med gy, mod-g bl-wh cut	9000	MR.LST: med-dk gy-gy brn, sb pily-bkly, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mod, sb bkly-sb pily, sft-sl frm, fri, chky-sb wxy,v calc, string/ strgs, lt bl flr wi mod-g bl-wh cut	MR.LST: med-dk gy-gy brn, sb pily-bkly, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mod, sb bkly-sb pily, sft-sl frm, fri, chky-sb wxy,v calc, string/ strgs, lt bl flr wi mod-g bl-wh cut
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423. 91.72 1.1 17

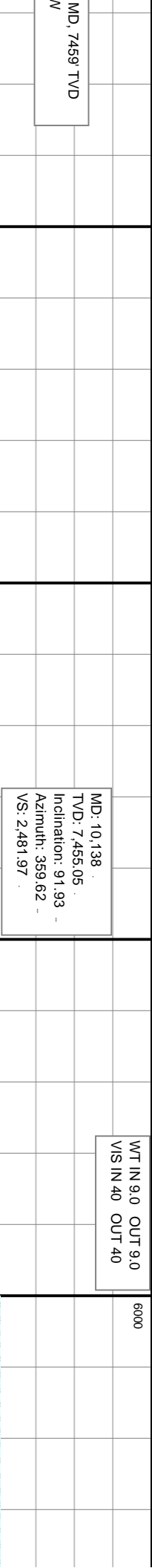
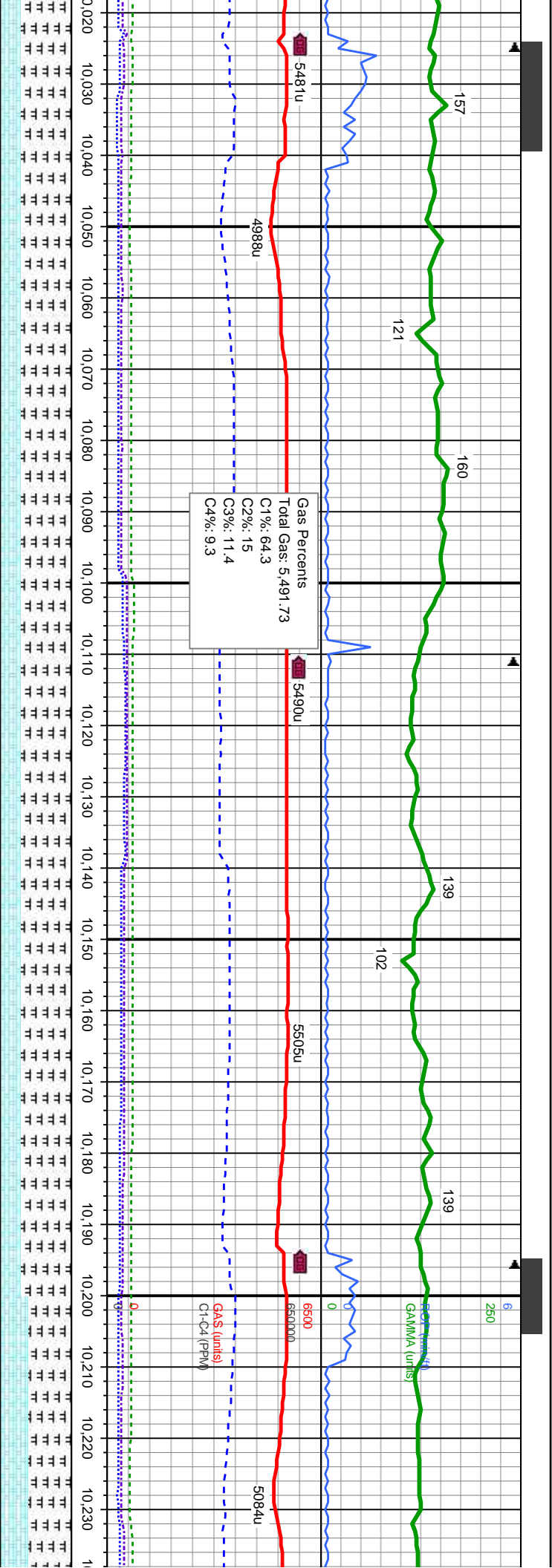
MD: 9.968
TVD: 7459.78
Inclination: 91.26
Azimuth: 1.27
VS: 2.312.06

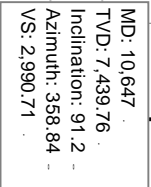
FAULT 3 OF 3 @ 9992
5 DOWNWARD THRO

MR.LST: med-dk gy-gy brn, sb pily-blky, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med
gy, mot, sb blky-sb pily, sft-sl frm, fri, chky-sb wxy, v calc, lt bl flr w/ mod bl-wh cut

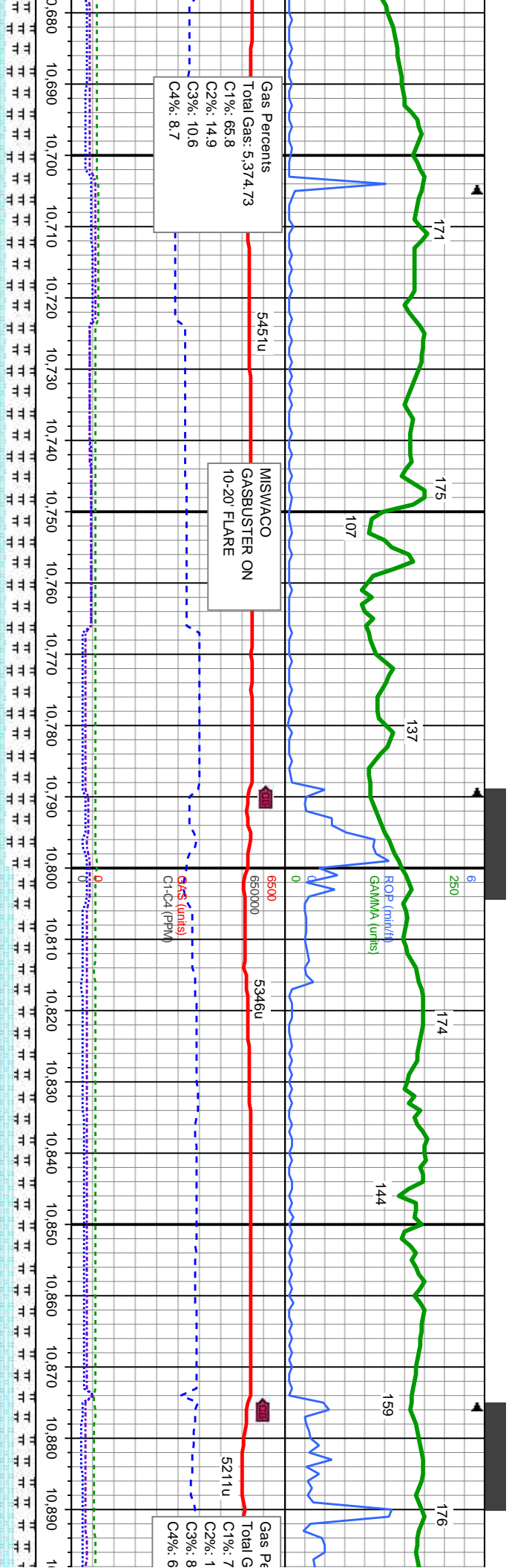
MR.LST: med-dk gy-gy brn, sb pily-blky, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med
gy, mot, sb blky-sb pily, sft-sl frm, fri, chky-sb wxy, v calc, lt bl flr w/ mod bl-wh cut







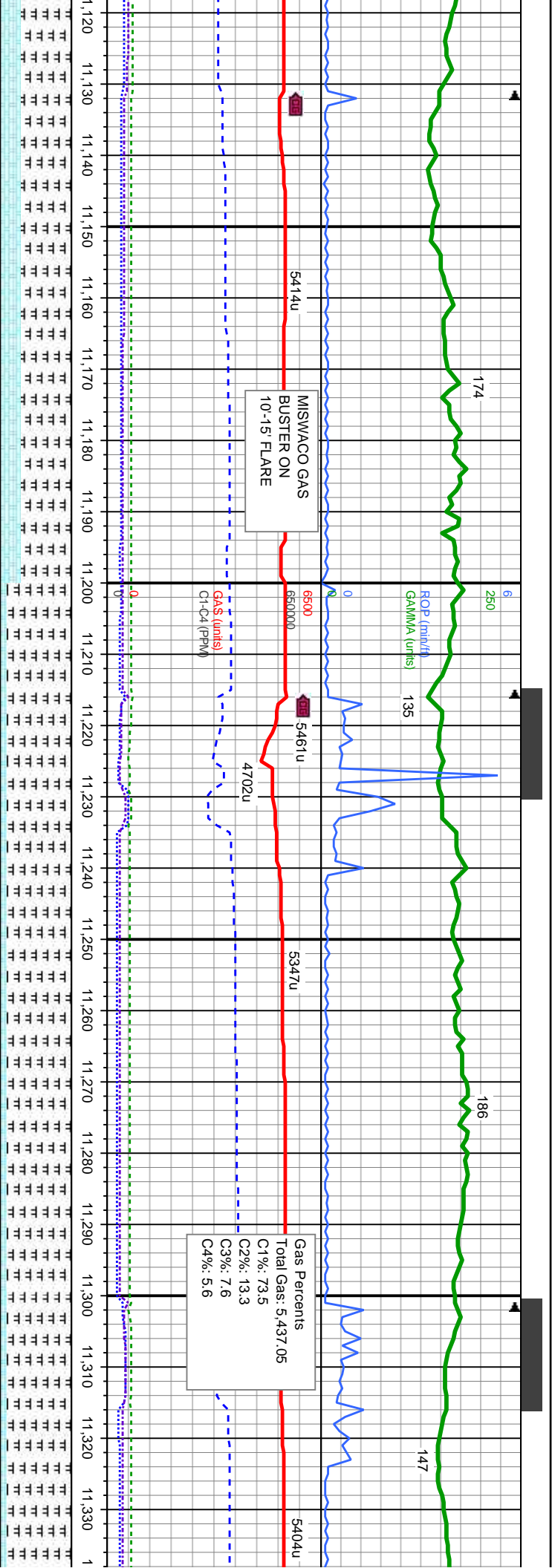
MR₁ST: med-dk gy-gy brn, sb pily-blky, mod sft-fm, sb arg-sily, calc, tr bentygy, mot, sb bkly-sb pily, sft-sl fm, fri, chky-sb wxy, v calc, lt bl flwr w/ mod bl-



MD: 10,818
TVD: 7,435.94
Inclination: 91.36
Azimuth: 359.63
VS: 3,161.66

CHK: lt-med	MR.LST: med-dk gy-gy brn, sb pily-bkly, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med	MR.LST: med-dk gy-gy brn, sb pily-bkly, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med
with cut	gy, mot, sb bkly-sb pily, sft-sl frm, fri, chky-sb wxy, v calc, lt bl flr w/ mod bl-wh cut	gy, mot, sb bkly-sb pily, sft-sl frm, fri, chky-sb wxy, v calc, lt bl flr w/ mod bl-wh cut

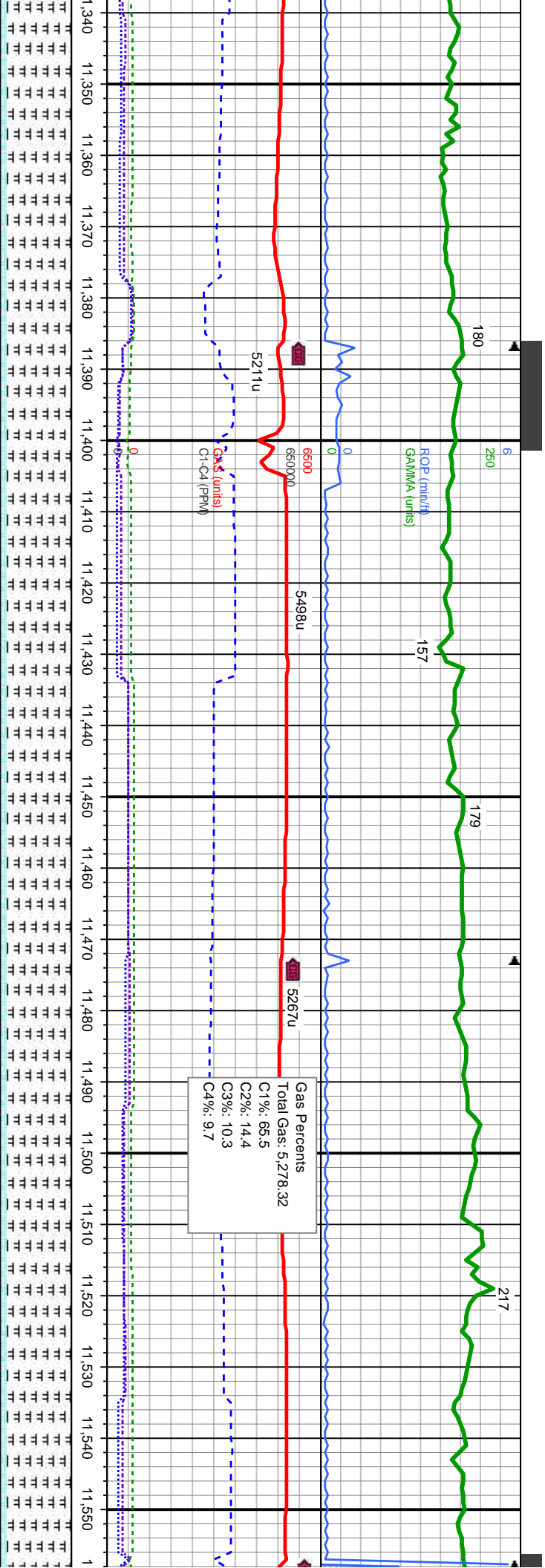




MD: 11,159
TVD: 7,427.48
Inclination: 91.93
Azimuth: 358.55
VS: 3,502.54

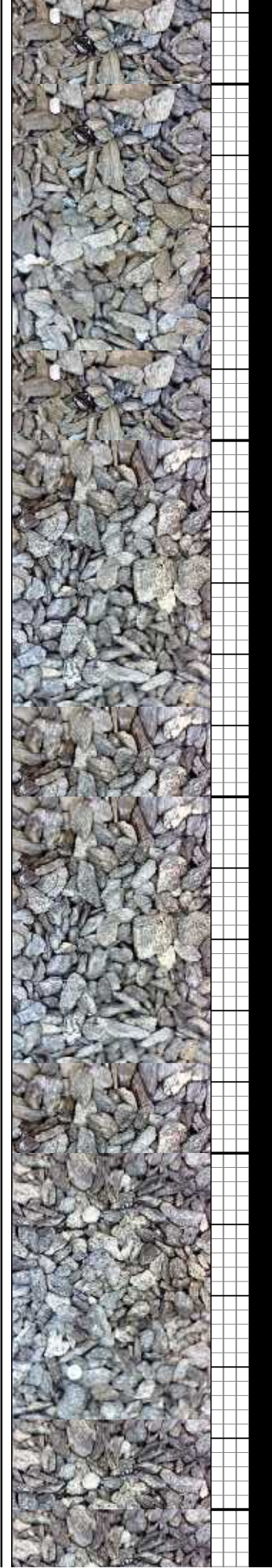
med-dk gy-gy brn, sb pily-blky, mod sft-fm, sb arg-sily, calc, tr bent, med gy, mot, sb blk-y-sb pily, sft-sl frm, fri, chky-sb wxy v calc, tr lt bl sl string halo cut	med-dk gy-gy brn, sb pily-blky, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb blk-y-sb pily, sft-sl frm, fri, chky-sb wxy v calc, tr lt bl flor wi v sl string halo cut	med-dk gy-gy brn, sb pily-blky, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb blk-y-sb pily, sft-sl frm, fri, chky-sb wxy v calc, tr lt bl flor wi v sl string halo cut	med-dk gy-gy brn, sb pily-blky, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb blk-y-sb pily, sft-sl frm, fri, chky-sb wxy v calc, tr lt bl flor wi v sl string halo cut
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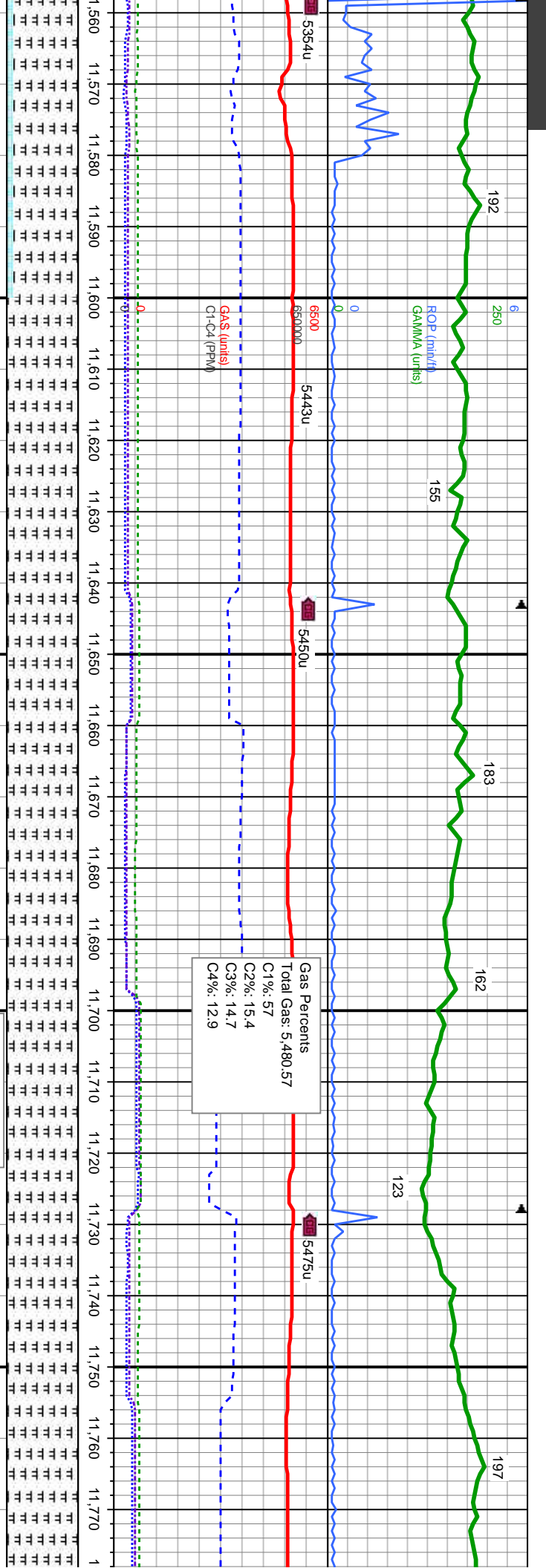
MD: 11,329
TVD: 7,423.02
Inclination: 91.07
Azimuth: 359.27
VS: 3,672.46



WT IN 8.9 OUT 8.9	6000	MD: 11,500 TVD: 7,419.55 Inclination: 91.26 Azimuth: 358.98 VS: 3.843.42
VIS IN 42 OUT 42	9000	

ply-bkly, mod sft-fm, sb arg-sily, calc, tr bent, b ply, sft-sl frm, fri, chky-sb wxy, v calc, tr lt bl	9000	MRSLT: med-dk gy-gy brn, sb ply-bkly, mod sft-fm, sb arg-sily, calc, tr bent, CHK: lt-med gy, mot, sb bkly-sb ply, sft-sl frm, fri, chky-sb wxy, v calc, tr lt bl flr wi v sl smng halo cut
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b arg-sily, calc, tr bent, y-y-sb wxy, v calc, tr lt bl		6000	MD (ft)	6000	WT IN 8.9 OUT 8.9 V/S IN 40 OUT 40
MRSLT: med-dk gy-gy brn, sb pily-blky, mod sft-fm, sb arg-sily, calc, tr bent, tr lt bl floor wi v sl string halo cut		9000	MD (ft)	9000	MRSLT: med-dk gy-gy brn, sb pily-blky, mod sft-fm, sb arg-sily, calc, tr bent, floor wi v sl string halo cut

