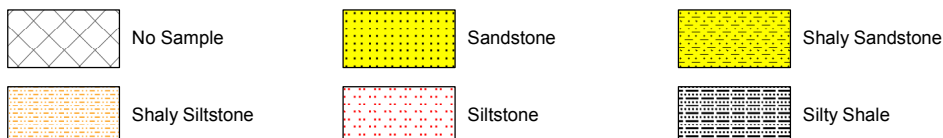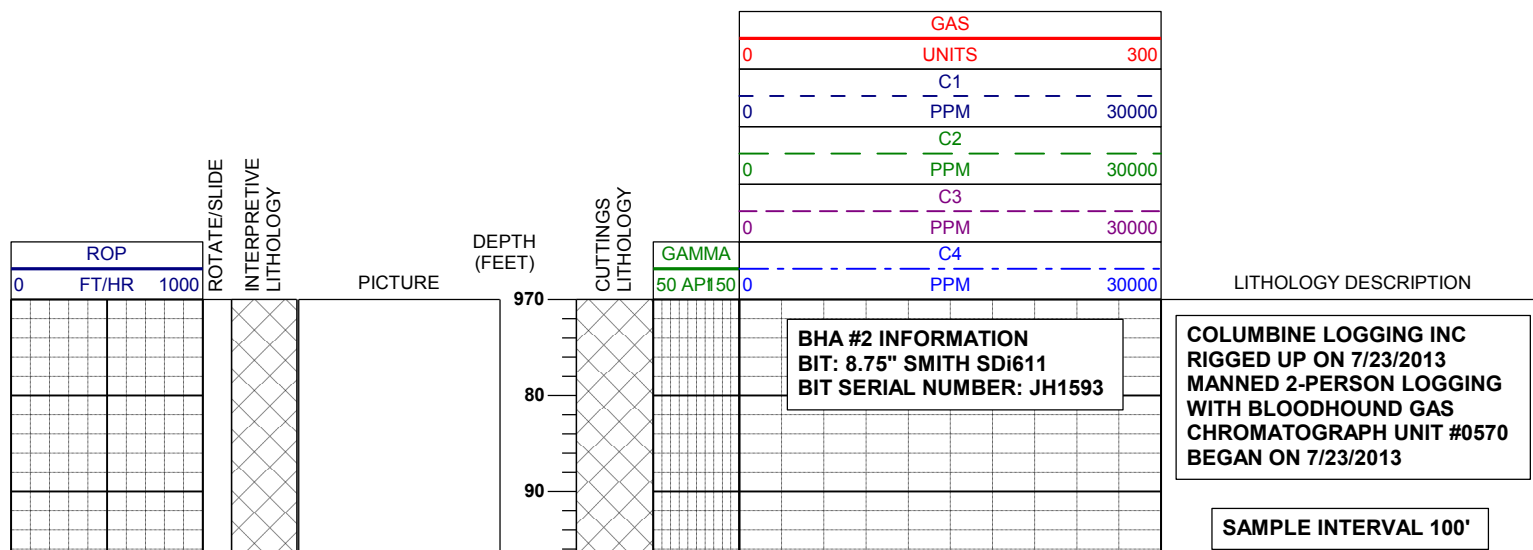LOG created using LPLOT VH Version 3.0, July 30, 2013, Copyright (C) 1999-2009 Pason Systems Corp.
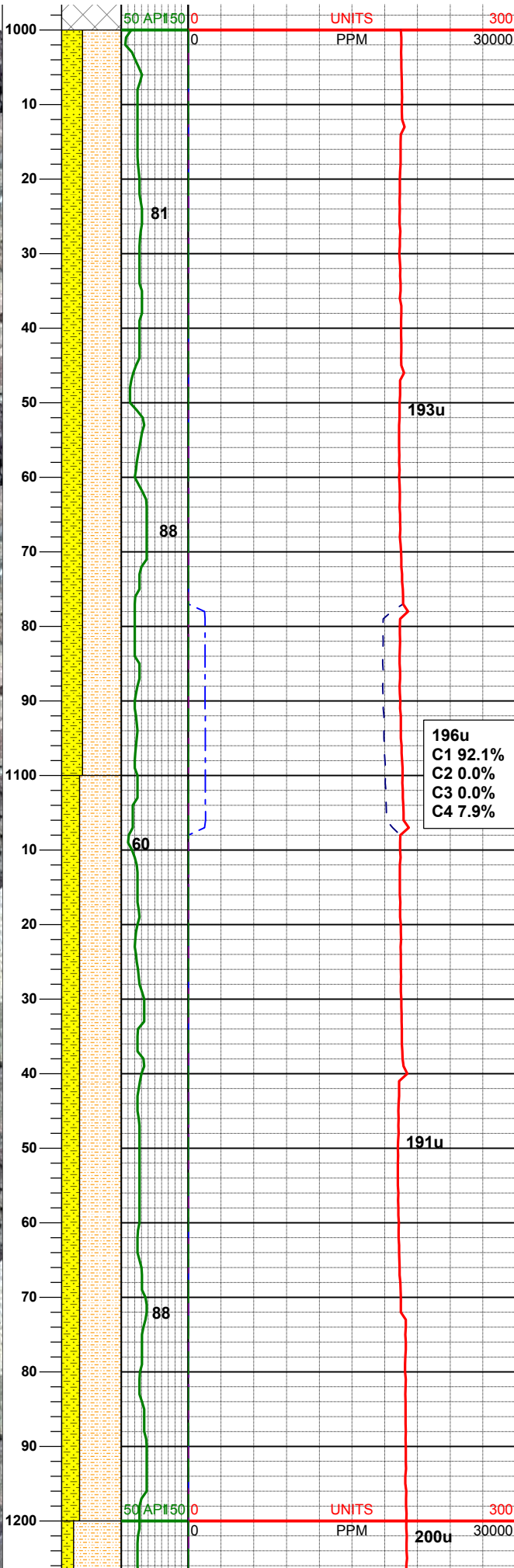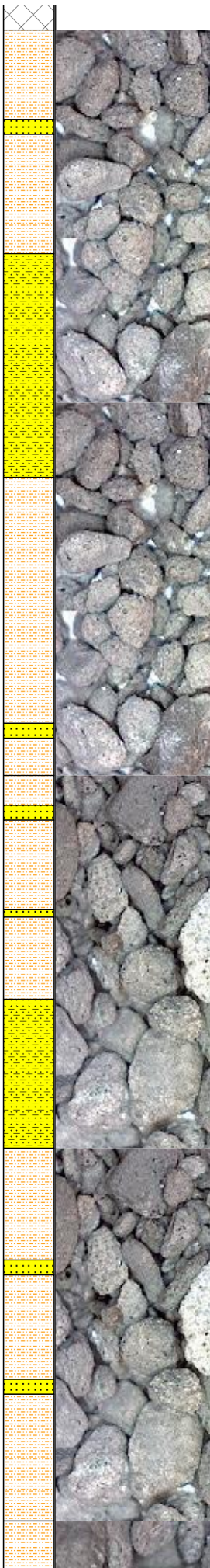
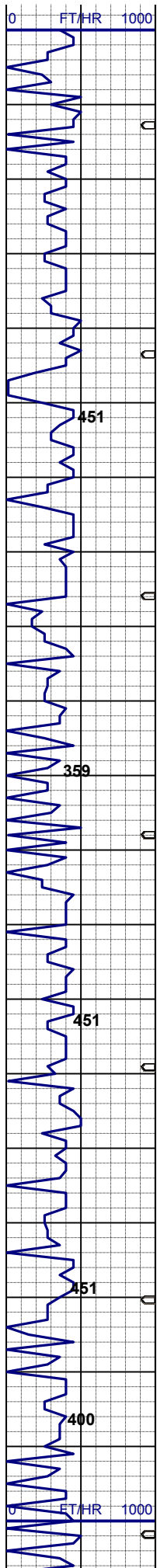|	
OPERATOR:	**NOBLE ENERGY**
WELL:	**MOSER H27-79HN**
LOCATION:	**SWSW SEC 22 T3N R65W**
COUNTY:	**WELD**
STATE:	**COLORADO**
SPOT:	**461' FSL, 291' FWL**
ELEVATION:	**4,813' GL, 4,826' KB**
FIELD:	**WATTENBERG**
SPUD DATE:	**7/22/13**
TD DATE:	**7/30/13**
DATES LOGGED:	**7/23/13 - 7/30/13**
DEPTHS LOGGED:	**1,000' - 11568'**
LOGGERS:	**RYAN SULLIVAN, MOHAMMED ALMUBARAK**
DRILLING FLUID:	**H20, LSND MUD**
DRILLING RIG:	**ENSIGN # 121**
API:	**05-123-34757-00**
LOG TYPE:	**Vertical**
SCALE:	**1:240 (5 inches per 100 feet)**
REMARKS:	**Wellsite Geological Services Provided By Columbine Logging Inc.**
	Latitude: N40.204950, Longitude: W-104.658240

LITHOLOGIES

No Sample	Sandstone	Shaly Sandstone
Shaly Siltstone	Siltstone	Silty Shale

ENGINEERING SYMBOLS

Connection	Connection Gas	Midnight Depth

GAS		
0	UNITS	300
C1		
0	PPM	30000
C2		
0	PPM	30000
C3		
0	PPM	30000
C4		
0	PPM	30000

ROP		ROTATE/SLIDE	INTERPRETIVE LITHOLOGY	PICTURE	DEPTH (FEET)	CUTTINGS LITHOLOGY	GAMMA		LITHOLOGY DESCRIPTION
0	FT/HR 1000						50 API 50		

Depth markers: 970, 80, 90

**BHA #2 INFORMATION
BIT: 8.75" SMITH SDi611
BIT SERIAL NUMBER: JH1593**

**COLUMBINE LOGGING INC
RIGGED UP ON 7/23/2013
MANNED 2-PERSON LOGGING
WITH BLOODHOUND GAS
CHROMATOGRAPH UNIT #0570
BEGAN ON 7/23/2013**

SAMPLE INTERVAL 100'

Track headers (top):
- 0 FT/HR 1000
- 50 API 50
- 0 UNITS 300
- 0 PPM 30000

Depth values shown: 1000, 10, 20, 30, 40, 50, 60, 70, 80, 90, 1100, 10, 20, 30, 40, 50, 60, 70, 80, 90, 1200

ROP values: 451, 359, 451, 451, 400

Gamma values: 81, 88, 60, 88
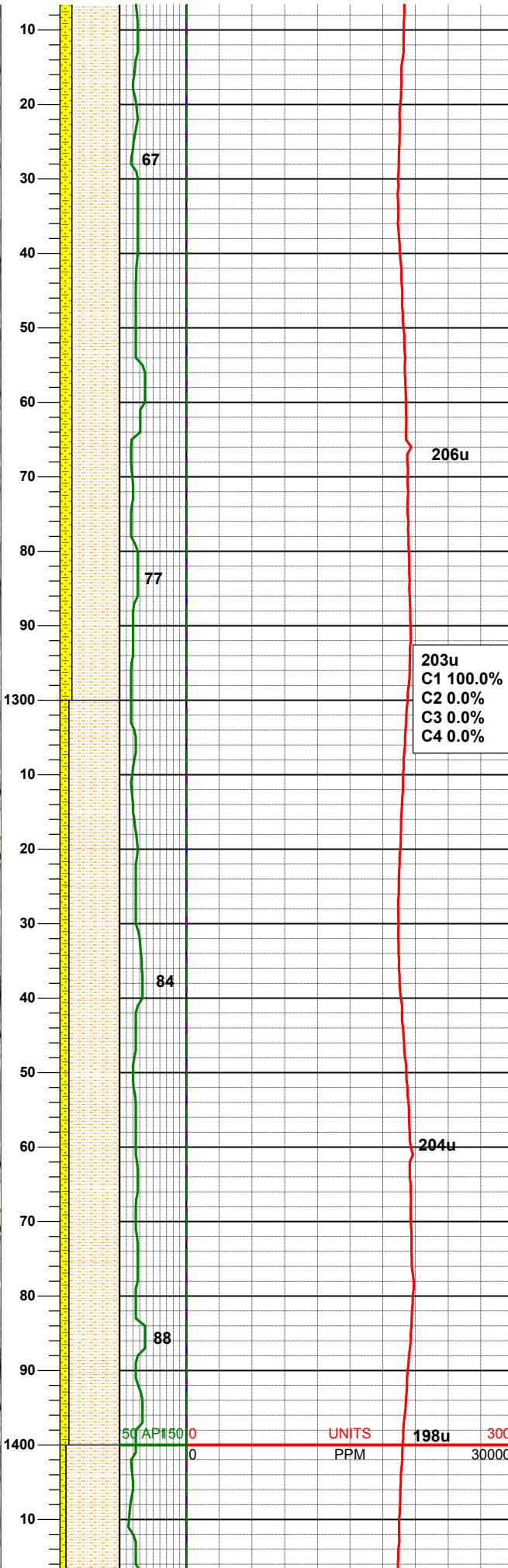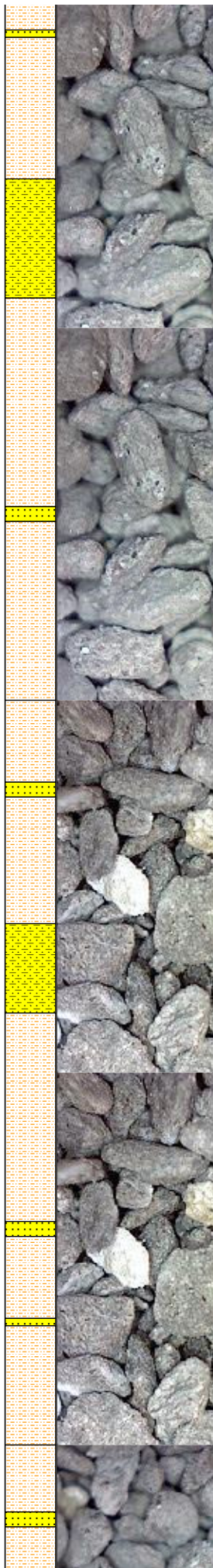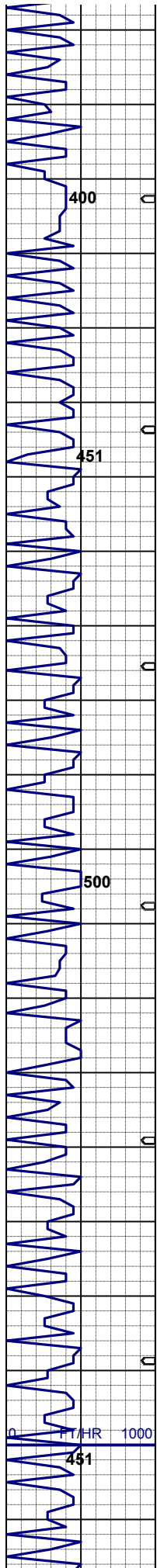
Gas show annotations: 193u, 196u, 191u, 200u

SURVEY @
MD 1025'
INC 0.3°
AZI 241.2°
TVD 1024.95'

SHYSS: lt-mgy, f-mfgr, sbrd-sbang, mod-psrt, sft, ppor, argcmt, slcalc, phlog, grd to
SHYSLTST: lt-mgy, occ dk gy, f-vfgr, sbrd-sbang, mod srt, arg mtx, sme ss, slow. diffuse v sl stmg dull bl mky cut, n flor stn or od

196u
C1 92.1%
C2 0.0%
C3 0.0%
C4 7.9%

SURVEY @
MD 1119'
INC 0.1°
AZI 65.6°
TVD 1118.95'

SHYSS: lt-mgy, f-mfgr, sbrd-sbang, mod-psrt, sft, ppor, argcmt, slcalc, phlog, grd to
SHYSLTST: lt-mgy, occ dk gy, f-vfgr, sbrd-sbang, mod srt, arg mtx, sme ss, slow. diffuse v sl stmg dull bl mky cut, n flor stn or od
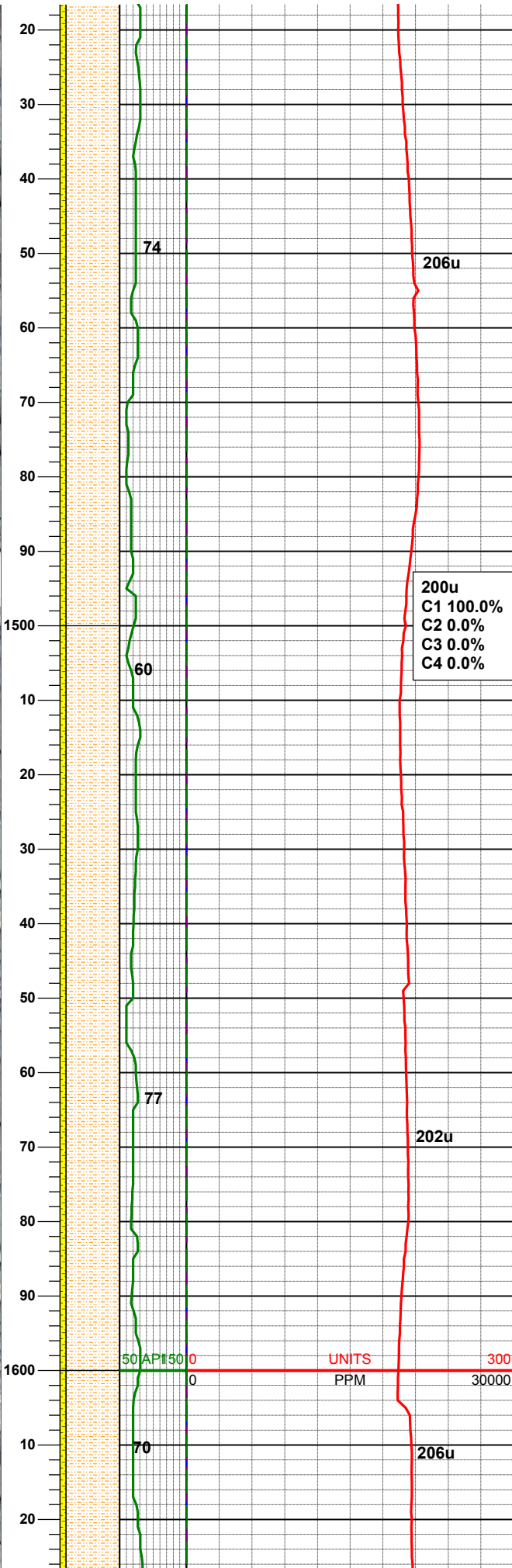
SURVEY @
MD 1214'
INC 0.4°
AZI 183.9°
TVD 1213.95'

SHYSS: lt-mgy, f-mfgr, sbrd-sbang, mod-psrt, sft, ppor, argcmt, slcalc, phlog, grd to
SHYSLTST: lt-mgy, occ dk gy, f-vfgr, sbrd-sbang, mod srt, arg mtx, sme ss, slow. diffuse v sl stmg dull bl mky cut, n flor stn or od
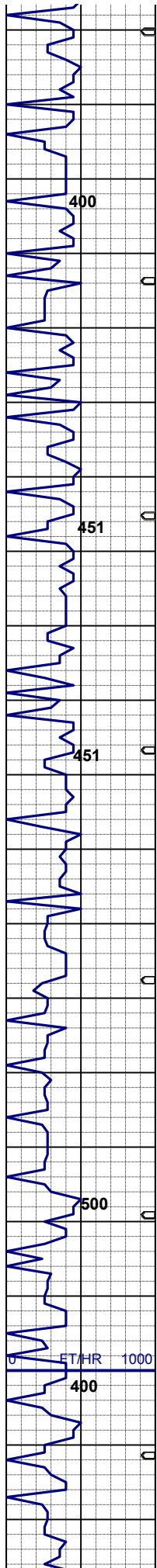
203u
C1 100.0%
C2 0.0%
C3 0.0%
C4 0.0%

SURVEY @
MD 1308'
INC 0.4°
AZI 204.8°
TVD 1307.94'

SHYSS: lt-mgy, f-mfgr, sbrd-sbang, mod-psrt, sft, ppor, argcmt, slcalc, phlog, grd to SHYSLTST: lt-mgy, occ dk gy, f-vfgr, sbrd-sbang, mod srt, arg mtx, sme ss, slow. diffuse v sl stmg dull bl mky cut, n flor stn or od

SURVEY @
MD 1403'
INC 0.3°
AZI 276.0°
TVD 1402.94'

400
451
500
451

FT/HR 1000

67
206u
77
84
204u
88
198u
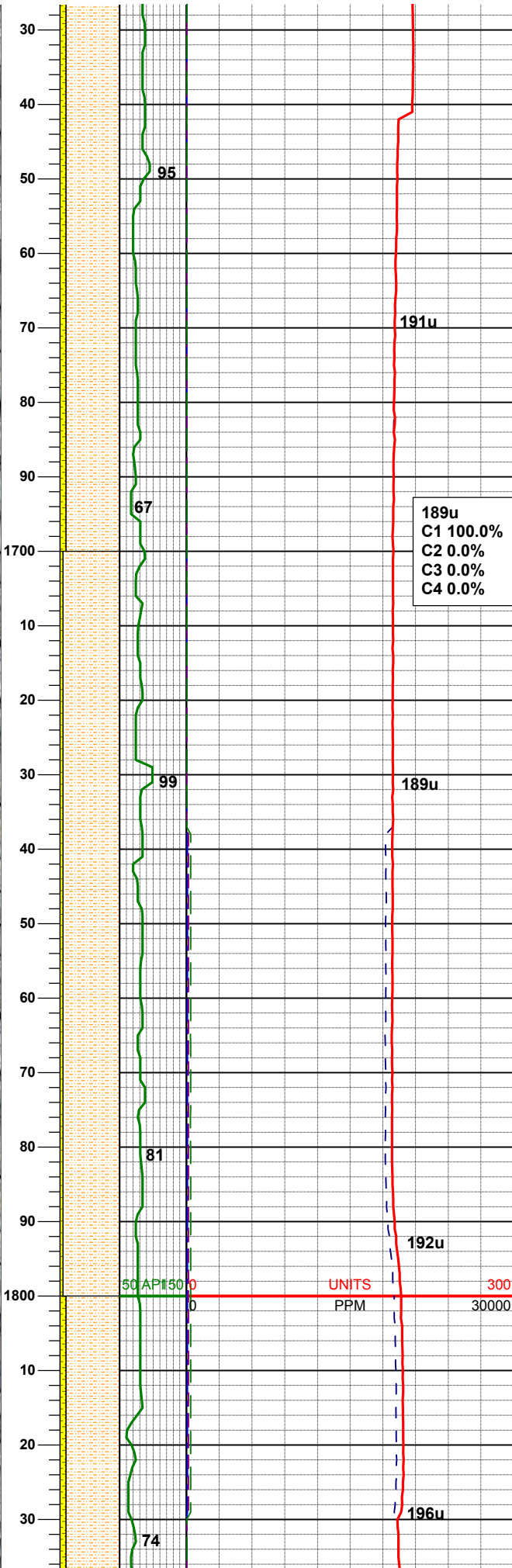
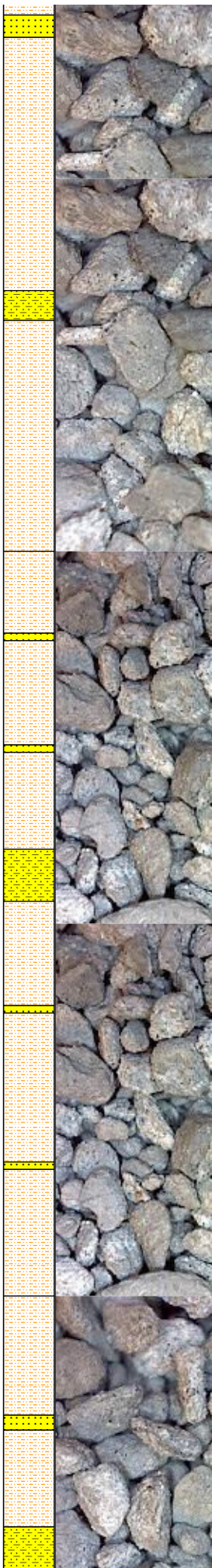50 API 50   0   UNITS   300
0   PPM   30000

SHYSS: lt-mgy, f-mfgr, sbrd-sbang, mod-psrt, sft, ppor, argcmt, slcalc, phlog, grd to
SHYSLTST: lt-mgy, occ dk gy, f-vfgr, sbrd-sbang, mod srt, arg mtx, sme ss, slow. diffuse v sl stmg dull bl mky cut, n flor stn or od

SURVEY @
MD 1496'
INC 0.2°
AZI 286.1°
TVD 1495.94'

200u
C1 100.0%
C2 0.0%
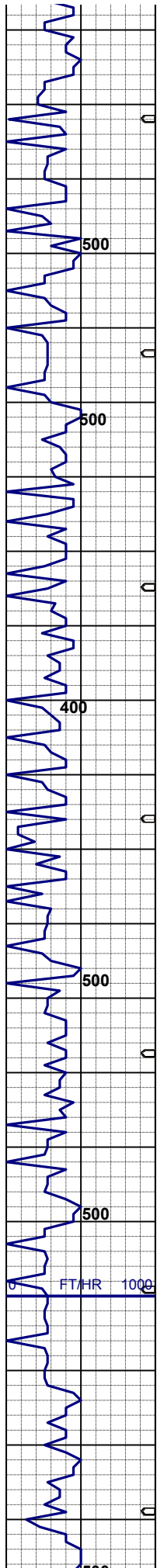**C3 0.0%**
C4 0.0%

SHYSS: lt-mgy, f-mfgr, sbrd-sbang, mod-psrt, sft, ppor, argcmt, slcalc, phlog, grd to
SHYSLTST: lt-mgy, occ dk gy, f-vfgr, sbrd-sbang, mod srt, arg mtx, sme ss, slow. diffuse v sl stmg dull bl mky cut, n flor stn or od

SURVEY @
MD 1591'
INC 0.4°
AZI 284.1°
TVD 1590.94'

Depth track: 20, 30, 40, 50, 60, 70, 80, 90, 1500, 10, 20, 30, 40, 50, 60, 70, 80, 90, 1600, 10, 20

ROP track: 400, 451, 451, 500, 400

Gamma values: 74, 60, 77, 70

Gas: 206u, 206u, 202u, 206u

Scale bars:
0 FT/HR 1000
50 API 50 | 0 UNITS 300
0 PPM 30000

SHYSS: lt-mgy, f-mfgr, sbrd-sbang, mod-psrt, sft, ppor, argcmt, slcalc, phlog, grd to
SHYSLTST: lt-mgy, occ dk gy, f-vfgr, sbrd-sbang, mod srt, arg mtx, sme ss, slow. diffuse v sl stmg dull bl mky cut, n flor stn or od

SURVEY @
MD 1685'
INC 0.8°
AZI 307.3°
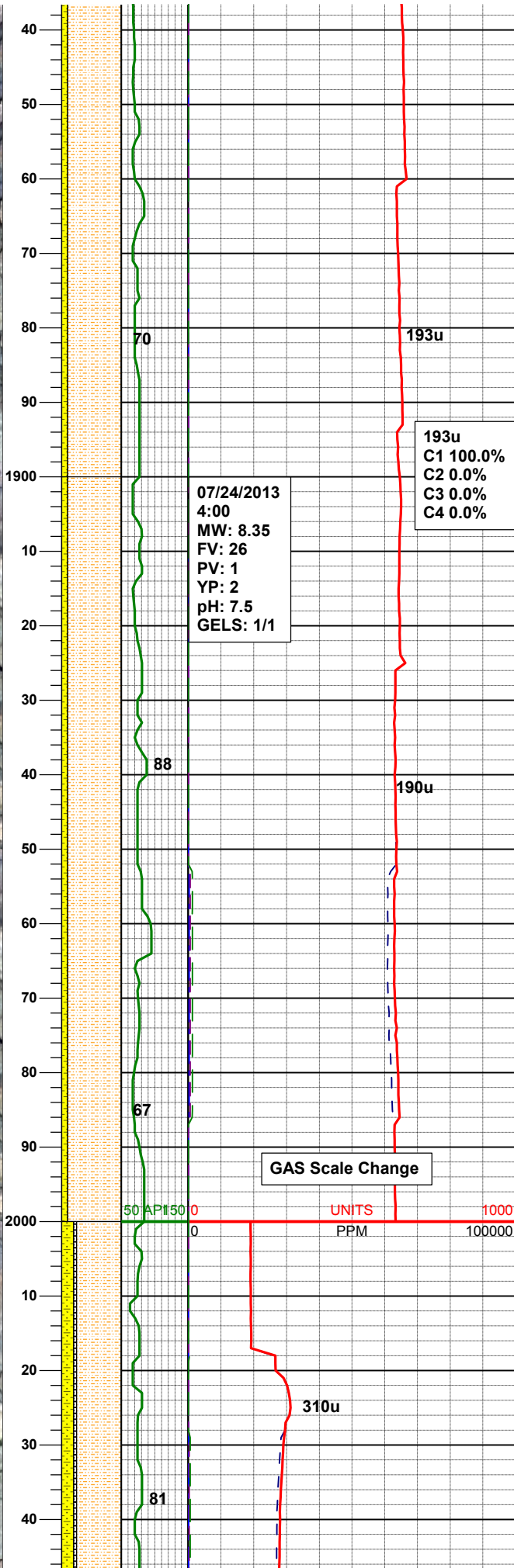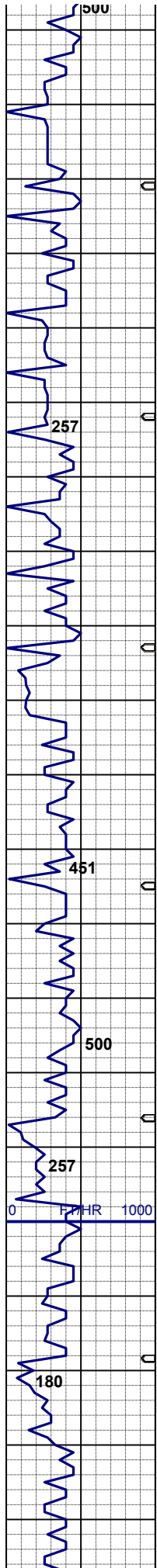TVD 1684.94'

189u
C1 100.0%
C2 0.0%
C3 0.0%
C4 0.0%

SHYSS: lt-mgy, f-mfgr, sbrd-sbang, mod-psrt, sft, ppor, argcmt, slcalc, phlog, grd to
SHYSLTST: lt-mgy, occ dk gy, f-vfgr, sbrd-sbang, mod srt, arg mtx, sme ss, slow. diffuse v sl stmg dull bl mky cut, n flor stn or od

SURVEY @
MD 1778'
INC 0.7°
AZI 334.6°
TVD 1777.93

30
40
50
60
70
80
90
1700
10
20
30
40
50
60
70
80
90
1800
10
20
30

95
67
99
81
74

191u
189u
192u
196u

0   FT/HR   1000

50 API 50   0   UNITS   300
0   PPM   30000

500

257

451

500

257

180

0   FT/HR   1000

40
50
60
70
80
90
1900
10
20
30
40
50
60
70
80
90
2000
10
20
30
40

70

88

67

81

50 API 50

07/24/2013
4:00
MW: 8.35
FV: 26
PV: 1
YP: 2
pH: 7.5
GELS: 1/1

193u

190u

GAS Scale Change

310u

0   UNITS   1000
0   PPM   100000

193u

193u
C1 100.0%
C2 0.0%
C3 0.0%
C4 0.0%

SHYSS: lt-mgy, f-mfgr, sbrd-sbang,
mod-psrt, sft, ppor, argcmt, slcalc,
phlog, grd to
SHYSLTST: lt-mgy, occ dk gy, f-vfgr,
sbrd-sbang, mod srt, arg mtx, sme ss,
slow. diffuse v sl stmg dull bl mky cut,
n flor stn or od

    MUD WT: 8.4+   VIS: 28 IN
    MUD WT: 8.4+   VIS: 28 OUT

SURVEY @
MD 1872'
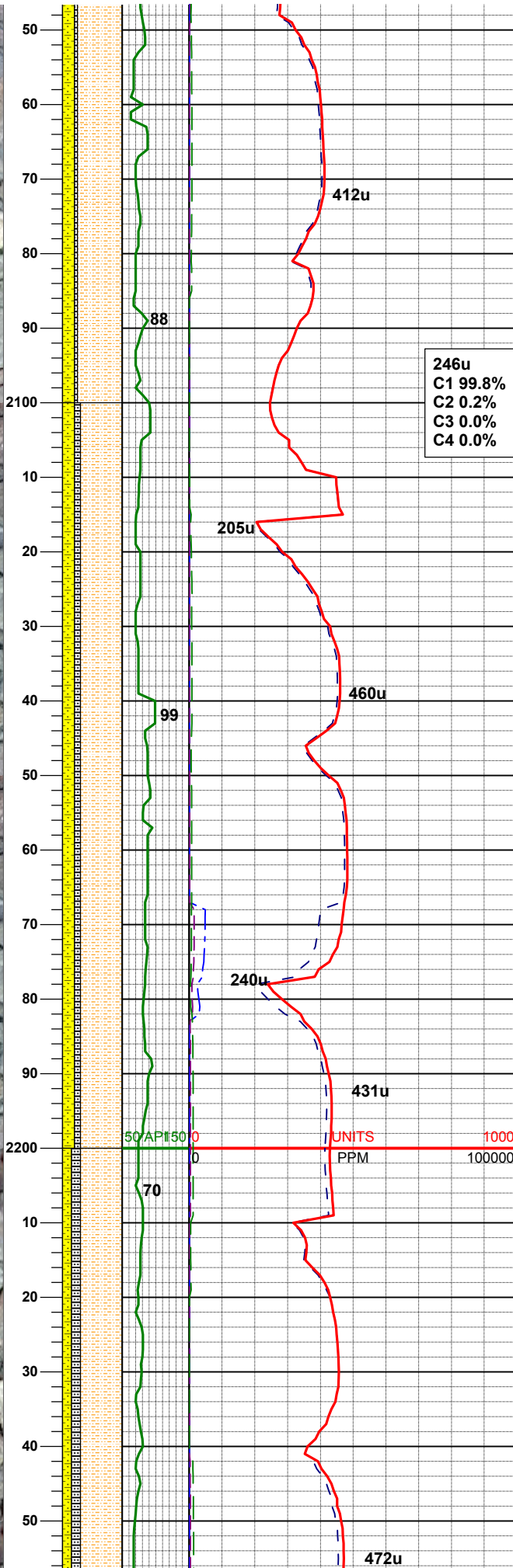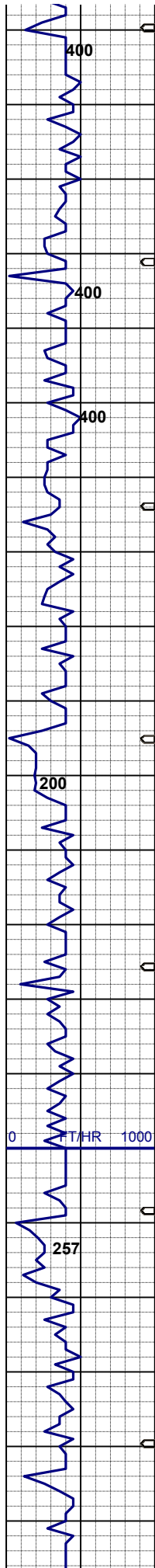**INC 0.9°**
AZI 306.3°
TVD 1871.92'

SHYSS: lt-mgy, f-mfgr, sbrd-sbang,
mod-psrt, sft, ppor, argcmt, slcalc,
phlog, grd to
SHYSLTST: lt-mgy, occ dk gy, f-vfgr,
sbrd-sbang, mod srt, arg mtx, sme ss,
slow. diffuse v sl stmg dull bl mky cut,
n flor stn or od

SURVEY @
MD 1967'
INC 1.1°
AZI 117.1°
TVD 1966.91'

SHYSLTST: lt gy, vf-f gr, sbang-sbrd,
mod srt, gt tex, arg-slty mtx, m sft, brit
-fri, vsl calc, spec w/ mica frag thru:

-rn, vsl calc, spec w/ mica frag thru;
SHYSS: lt gy, clr-trnsl gr, vf-f gr,
sbang-sbrd, mod srt, mod cmt, mod
hd, fri ip, tt clus, v sl calc; tr sltysh,
slow. diffuse sl stmg dull bl mky cut, n
flor stn or od

SURVEY @
MD 2062'
INC 3.0°
AZI 224°
TVD 2061.90'

MUD WT: 8.4   VIS: 27 IN
**MUD WT: 8.4+   VIS: 28 OUT**

412u

88

246u
C1 99.8%
C2 0.2%
C3 0.0%
C4 0.0%

205u

460u

99

SHYSLTST: lt gy, vf-f gr, sbang-sbrd,
mod srt, gt tex, arg-slty mtx, m sft, brit
-fri, vsl calc, spec w/ mica frag thru;
SHYSS: lt gy, clr-trnsl gr, vf-f gr,
sbang-sbrd, mod srt, mod cmt, mod
hd, fri ip, tt clus, v sl calc; tr sltysh,
slow. diffuse sl stmg dull bl mky cut, n
flor stn or od

SURVEY @
MD 2157'
INC 3.3°
AZI 207.3°
TVD 2156.73'

240u

431u

200

50 API 50 | 0   UNITS   1000
         0   PPM   100000

0   FT/HR   1000

70

257

MUD WT: 8.4   VIS: 27 IN
MUD WT: 8.4+   VIS: 28 OUT

SHYSLTST: lt gy, vf-f gr, sbang-sbrd,
mod srt, gt tex, arg-slty mtx, m sft, brit
-fri, vsl calc, spec w/ mica frag thru;
SHYSS: lt gy, clr-trnsl gr, vf-f gr,
sbang-sbrd, mod srt, mod cmt, mod
hd, fri ip, tt clus, v sl calc; tr sltysh,
slow. diffuse sl stmg dull bl mky cut, n

472u

400

400

400
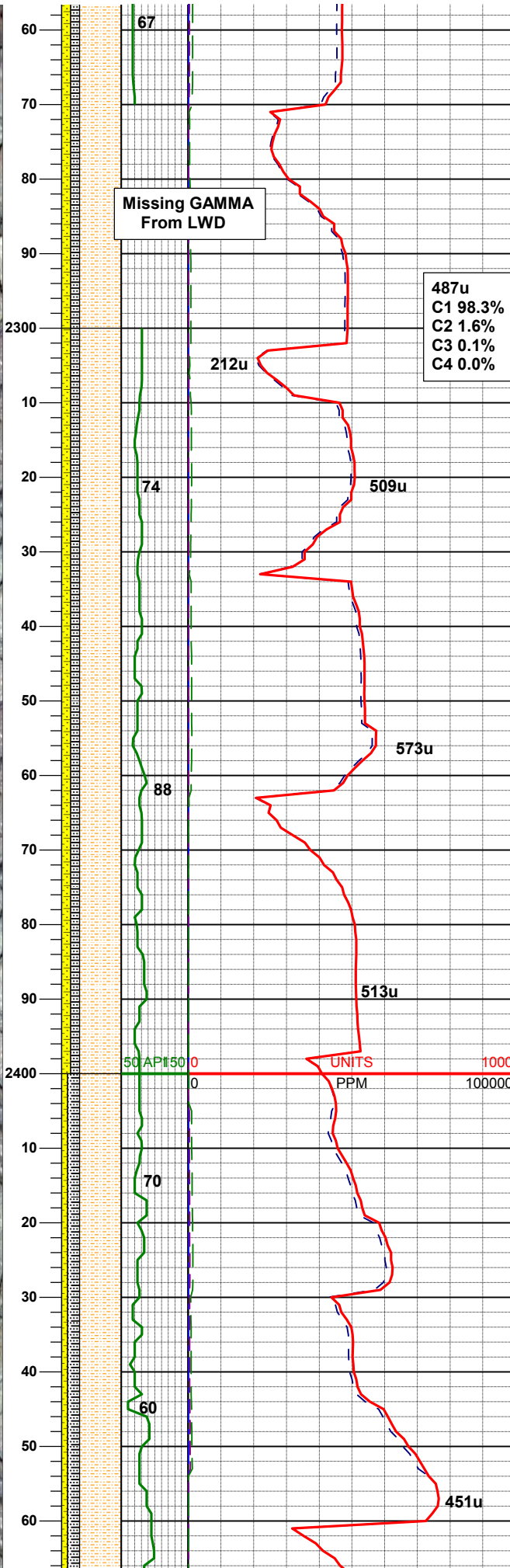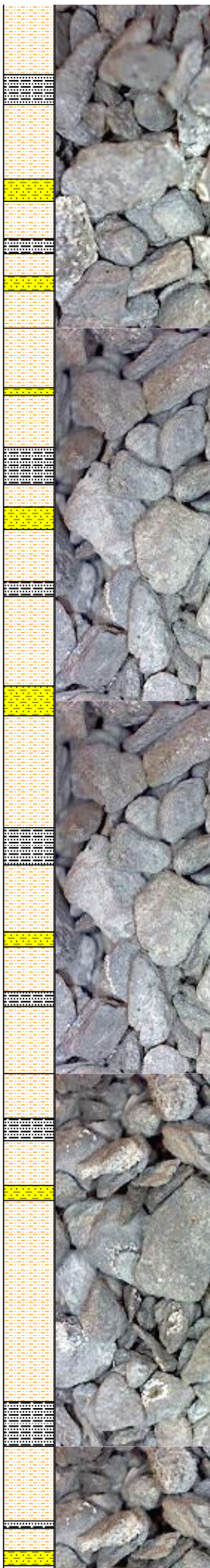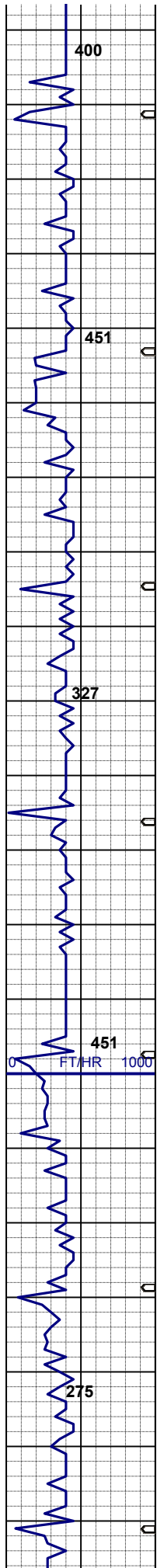
slow diffuse sl stmg dull bl mky cut, n flor stn or od

SURVEY @
MD 2252'
INC 3.8°
AZI 212.8°
TVD 2251.55'

400

451

327

451

275

0 FT/HR 1000

67

Missing GAMMA From LWD

2300

10

20

30

40

50

60

70

80

90

2400

10

20

30

40

50

60

74

88

70

60

50 API 50

0 UNITS 1000
0 PPM 100000

487u
C1 98.3%
C2 1.6%
C3 0.1%
C4 0.0%

212u

509u

573u

513u

451u

SURVEY @
MD 2346'
INC 4.1°
AZI 221.9°
TVD 2345.32'

SHYSLTST: lt gy, vf-f gr, sbang-sbrd, mod srt, gt tex, arg-slty mtx, m sft - firm, brit-fri, vsl calc, spec w/ mica frag thru; SHYSS: lt gy, clr-trnsl gr, vf-f gr, sbang-sbrd, mod srt, mod cmt, mod hd, fri ip, tt clus, v sl calc; tr sltysh, slow. diffuse sl stmg dull bl mky cut, n flor stn or od
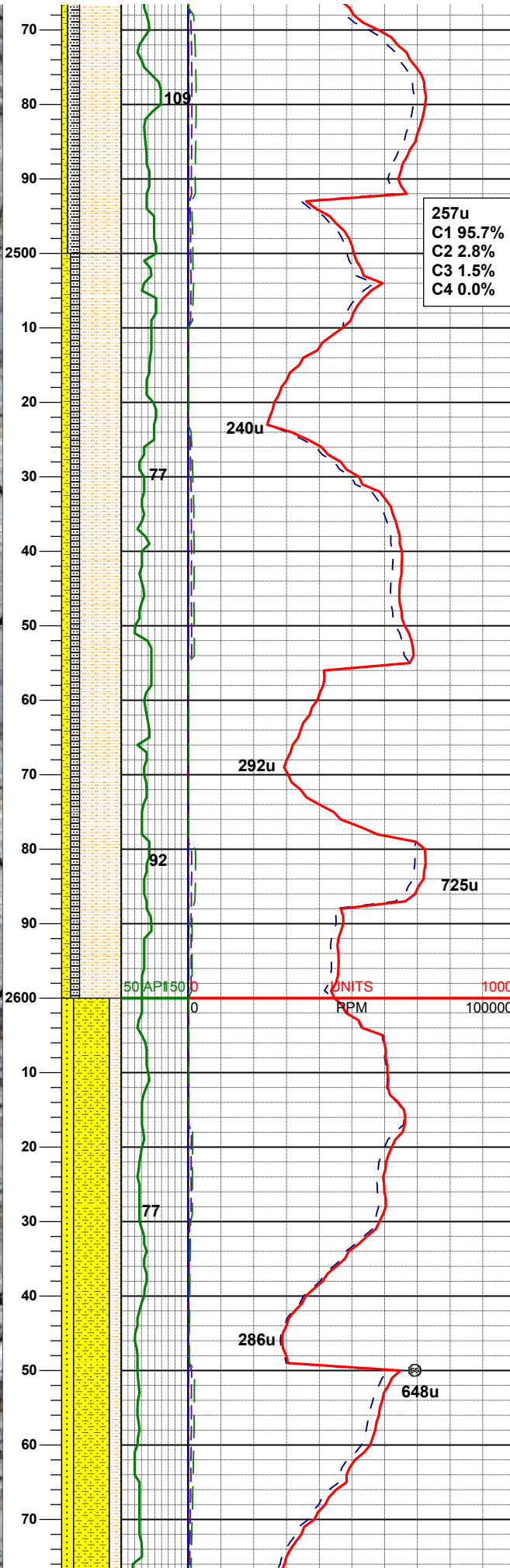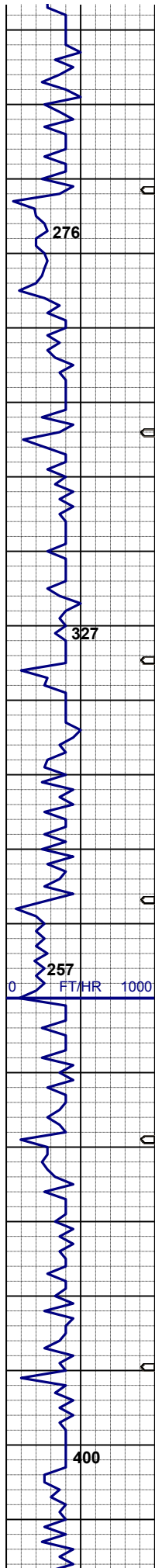
SURVEY @
MD 2441'
INC 4.5°
AZI 213.1°
TVD 2440.06'

SHYSLTST: lt gy, vf-f gr, sbang-sbrd, mod srt, gt tex, arg-slty mtx, m sft - firm, brit-fri, vsl calc, spec w/ mica frag thru; SLTYSH: lt gy - m gy, sme dk gy - gybrn, sft - mod firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg -slty mtx, sl calc; SHYSS: lt gy, clr-trnsl gr, vf-f gr, sbang-sbrd, mod srt, mod cmt, mod hd, fri ip, tt clus, v sl calc; slow. diffuse sl stmg dull bl mky cut, n flor stn or od

Depth track values (left curve, ROP FT/HR):
276
327
257
400

Scale: 0 FT/HR 1000

Depth markers (center): 70, 80, 90, 2500, 10, 20, 30, 40, 50, 60, 70, 80, 90, 2600, 10, 20, 30, 40, 50, 60, 70

Gas/chromatograph annotations:

257u
C1 95.7%
C2 2.8%
C3 1.5%
C4 0.0%

240u

292u

725u

286u

648u

Gamma ray values (green): 109, 77, 92, 77

Scale: 50 API 50 | 0 UNITS 1000 | 0 RPM 100000

SURVEY @
MD 2536'
INC 5.5°
AZI 224.2°
TVD 2534.7'

SHYSLTST: lt gy, vf-f gr, sbang-sbrd, mod srt, gt tex, arg-slty mtx, m sft - firm, brit-fri, vsl calc, spec w/ mica frag thru; SLTYSH: lt gy - m gy, sme dk gy - gybrn, sft - mod firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg -slty mtx, w/ sme dism pyr, sl calc; SHYSS: lt gy - wh ip, clr-trnsl gr, vf-f gr, sbang-sbrd, mod srt, mod cmt, mod hd, fri ip, tt clus, v sl calc; slow. diffuse sl stmg dull bl mky cut, n flor stn or od
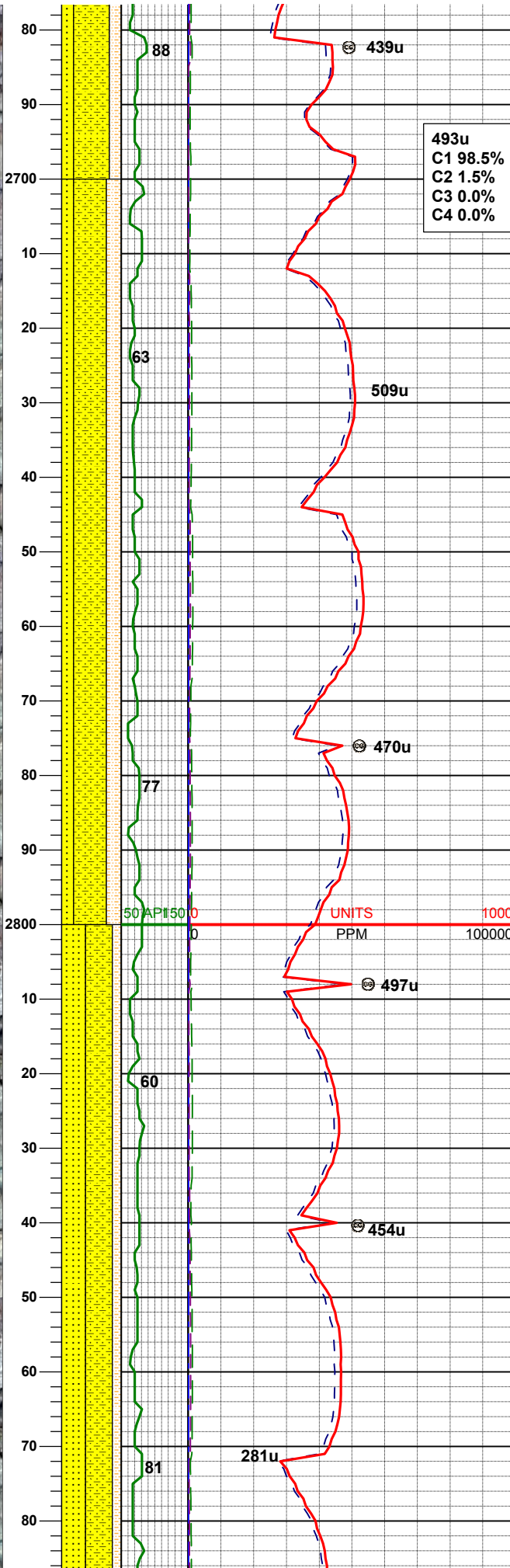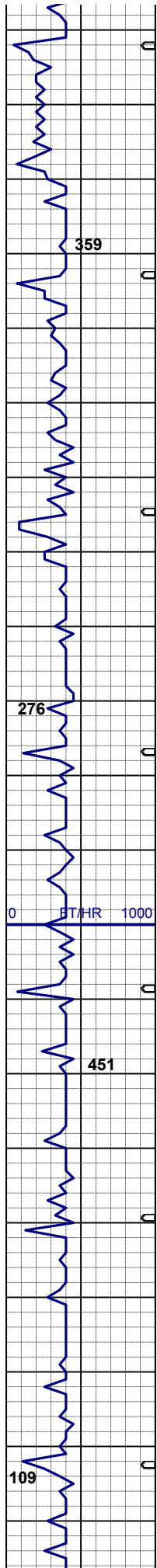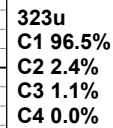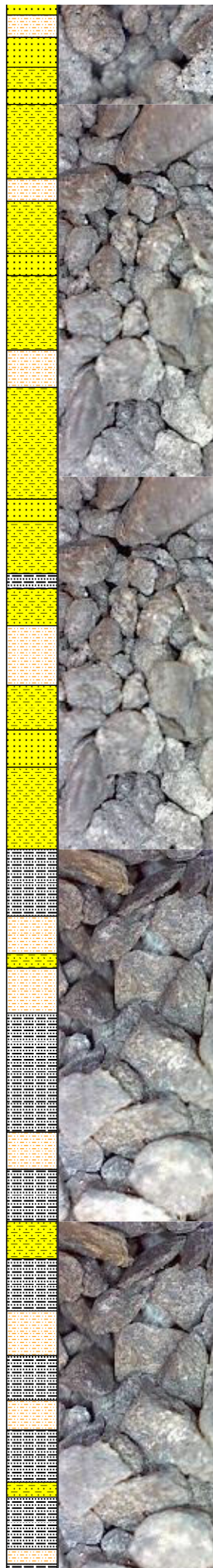
SURVEY @
MD 2631'
INC 5.9°
AZI 211.0°
TVD 2629.23'

SHYSS: lt gy - wh ip, clr-trnsl gr, vf-f gr, sbang-sbrd, mod srt, mod cmt, mod hd, fri ip, tt clus, v sl calc; SS: wh -ltgy, s&p, clr - trnsl gr, f - m gr, sbblky - sb ang, p - mod srt, argcmt, m sft - hd, pred brit, sl calc, tr glau; SHYSLTST: lt gy, vf-f gr, sbang-sbrd, mod srt, gt tex, arg-slty mtx, m sft - firm, brit-fri, sl calc, spec w/ mica frag thru; tr sltysh, slow. diffuse sl stmg dull bl mky cut, n flor stn or od

Depth track (center): 80, 90, 2700, 10, 20, 30, 40, 50, 60, 70, 80, 90, 2800, 10, 20, 30, 40, 50, 60, 70, 80

Track 1 (ROP, BT/HR 0 – 1000): 359, 276, 451, 109

Gamma Ray track (green, 50 API 50): 88, 63, 77, 60, 81

Gas track (red, UNITS 0 – 1000 / PPM 0 – 100000): 439u, 509u, 470u, 497u, 454u, 281u

493u
C1 98.5%
C2 1.5%
C3 0.0%
C4 0.0%

SURVEY @
MD 2726'
INC 7.7°
AZI 215.0°
TVD 2723.56'

SHYSS: lt gy - wh ip, clr-trnsl gr, vf-f gr, sbang-sbrd, mod srt, mod cmt, mod hd, brit - fri ip, tt clus, v sl calc; SS: wh-ltgy, s&p, clr - trnsl gr, f - m gr, sbblky - sb ang, p - mod srt, argcmt, m sft - hd, pred brit, sl calc, tr glau; SHYSLTST: lt gy - gy brn, vf-f gr, sbang-sbrd, mod srt, gt tex, arg-slty mtx, m sft - firm, brit-fri, sl calc, spec w/ mica frag thru; tr sltysh, slow. diffuse sl stmg dull bl mky cut, n flor stn or od

SURVEY @
MD 2820'
INC 7.6°
AZI 212.4°
TVD 2816.72'

SHYSS: lt gy - wh ip, clr-trnsl gr, vf-f gr, sbang-sbrd, mod srt, mod cmt, mod sft - hd, brit - fri ip, tt clus, v sl calc; SS: ltgy, s&p, clr - trnsl gr, f - m gr, sbblky - sb ang, p - mod srt, argcmt, mod hd, pred brit, sl calc, tr glau; SHYSLTST: lt gy - gy brn, vf-f gr, sbang-sbrd, mod srt, gt tex, arg-slty mtx, m sft - firm, brit-fri, sl calc, spec w/ mica frag thru; tr sltysh, slow. diffuse sl stmg dull bl mky cut, n flor stn or od

SURVEY @
MD 2915'
INC 7.1°
AZI 208.4°
TVD 2910.94'

```
323u
C1 96.5%
C2 2.4%
C3 1.1%
C4 0.0%
```

432u

477u

278u

SHYSS: lt gy - wh ip, clr-trnsl gr, vf-f gr, sbang-sbrd, mod srt, mod cmt, mod sft - hd, brit - fri ip, tt clus, v sl calc; SS: ltgy, s&p, clr - trnsl gr, f - m gr, sbblky - sb ang, p - mod srt, argcmt, mod hd, pred brit, sl calc, tr glau; SHYSLTST: lt gy - gy brn, vf-f gr, sbang-sbrd, mod srt, gt tex, arg-slty mtx, m sft - firm, brit-fri, sl calc, spec w/ mica frag thru; tr sltysh, slow. diffuse sl stmg dull bl mky cut, n flor stn or od

Logger's Top Pierre
@ 3000' MD

SURVEY @
MD 3010'
INC 7.1°
AZI 206.3°
TVD 3005.21'

273u

749u

235u

SLTYSH: lt gy - m gy, sme dk gy, v sft - mod firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, v sl calc, SHYSLTST: lt gy - gy brn, sdy ip, vf-f gr, sbang-sbrd, gt tex, arg-slty mtx, mod srt, m sft - firm, brit-fri, sl calc, spec w/ mica frag thru; occ shy ss, slow. diffuse sl stmg dull bl mky cut, tr dul yelgn & orng mnrl flor, n stn or od

771u

944u

C1 100.0%
C2 0.0%
C3 0.0%
C4 0.0%
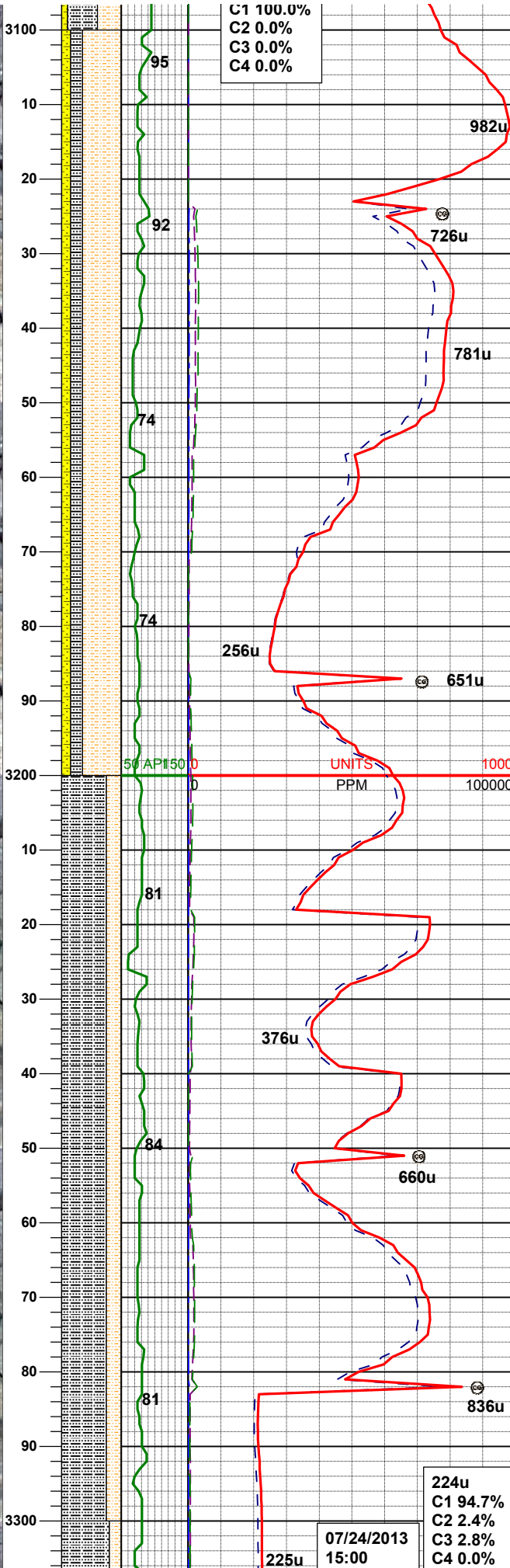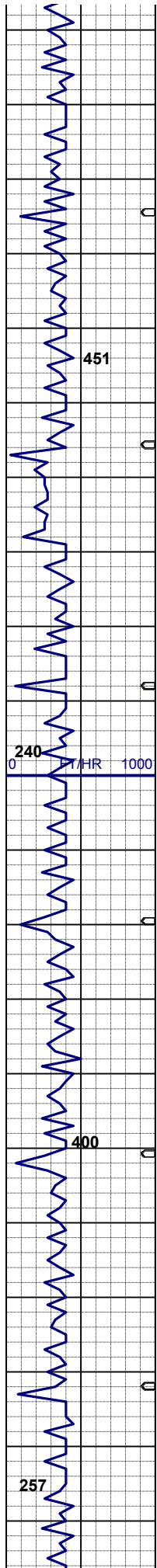
SURVEY @
MD 3105'
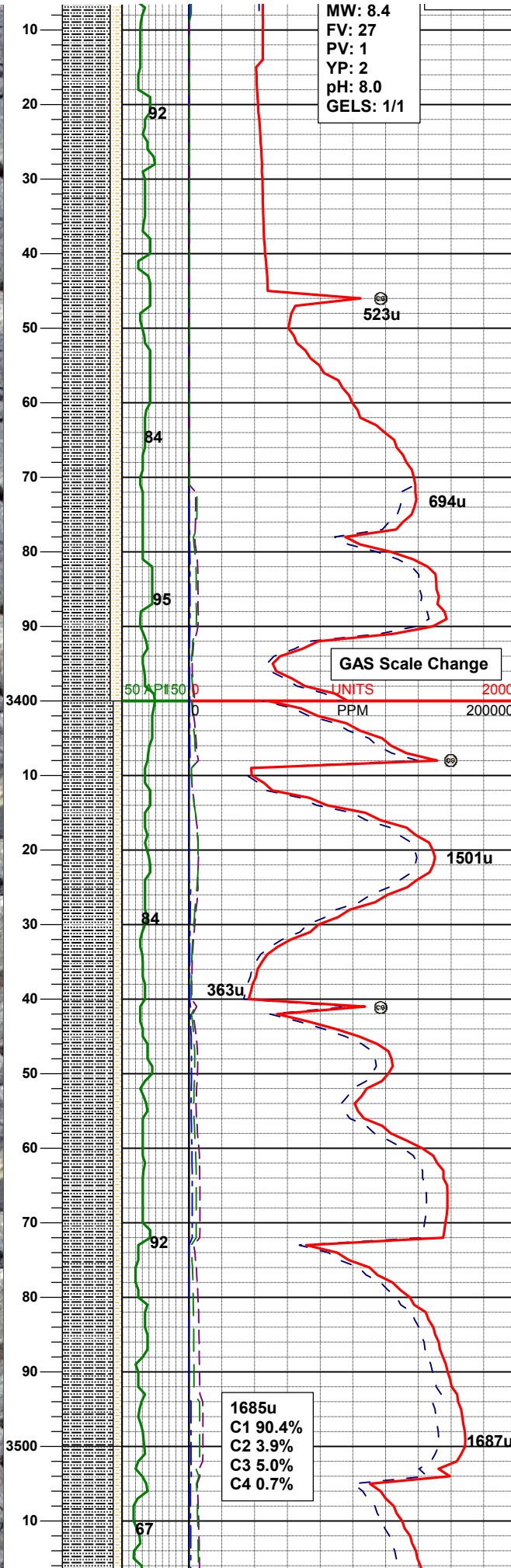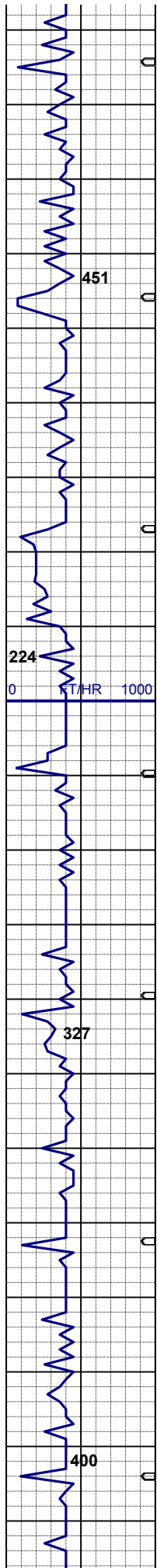INC 6.3°
AZI 201.2°
TVD 3099.56'

SHYSLTST: lt gy - gy brn, sdy ip, vf-f gr, sbang-sbrd, gt tex, arg-slty mtx, mod srt, m sft - firm, brit-fri, sl calc, spec w/ mica frag thru; SLTYSH: lt gy - m gy, sme dk gy, v sft - mod firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, v sl calc, occ shy ss, slow. diffuse sl stmg dull bl mky cut, tr dul yelgn & orng mnrl flor, n stn or od

SURVEY @
MD 3200'
INC 7.9°
AZI 206.8°
TVD 3193.83'

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc; SHYSLTST: lt gy - gy brn, sdy ip, vf-f gr, sbang-sbrd, gt tex, arg-slty mtx, mod srt, m sft - firm, brit-fri, sl calc, v slow. diffuse sl stmg dull bl mky cut, tr dul yelgn mnrl flor, n stn or od

SURVEY @
MD 3295'
INC 7.4°
AZI 202.7°
TVD 3287.99'

224u
C1 94.7%
C2 2.4%
C3 2.8%
C4 0.0%

07/24/2013
15:00

225u

Track values (FT/HR): 0 ... 1000, 451, 240, 400, 257

Gamma (API): 50 ... 50, 95, 92, 74, 74, 81, 84, 81

Gas (PPM): 0 ... 100000, UNITS, 982u, 726u, 781u, 256u, 651u, 376u, 660u, 836u

Depth: 3100, 10, 20, 30, 40, 50, 60, 70, 80, 90, 3200, 10, 20, 30, 40, 50, 60, 70, 80, 90, 3300

MW: 8.4
FV: 27
PV: 1
YP: 2
pH: 8.0
GELS: 1/1

92

84

95

GAS Scale Change

50 API 150

UNITS 2000

PPM

0 200000

451

224

0 KT/HR 1000

327

400

523u

694u

1501u

363u

1685u
C1 90.4%
C2 3.9%
C3 5.0%
C4 0.7%

1687u

84

92

67

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm - firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc; SHYSLTST: lt gy - gy brn, sdy ip, vf-f gr, sbang-sbrd, gt tex, arg-slty mtx, mod srt, m sft - firm, brit-fri, sl calc, n flor cut stn or od

SURVEY @
MD 3389'
INC 7.7°
AZI 205.2°
TVD 3381.17'

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm - firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc; SHYSLTST: lt gy - gy brn, sdy ip, vf-f gr, sbang-sbrd, gt tex, arg-slty mtx, mod srt, m sft - firm, brit-fri, sl calc, n flor cut stn or od

SURVEY @
MD 3484'
INC 7.1°
AZI 199.8°
TVD 3475.38'
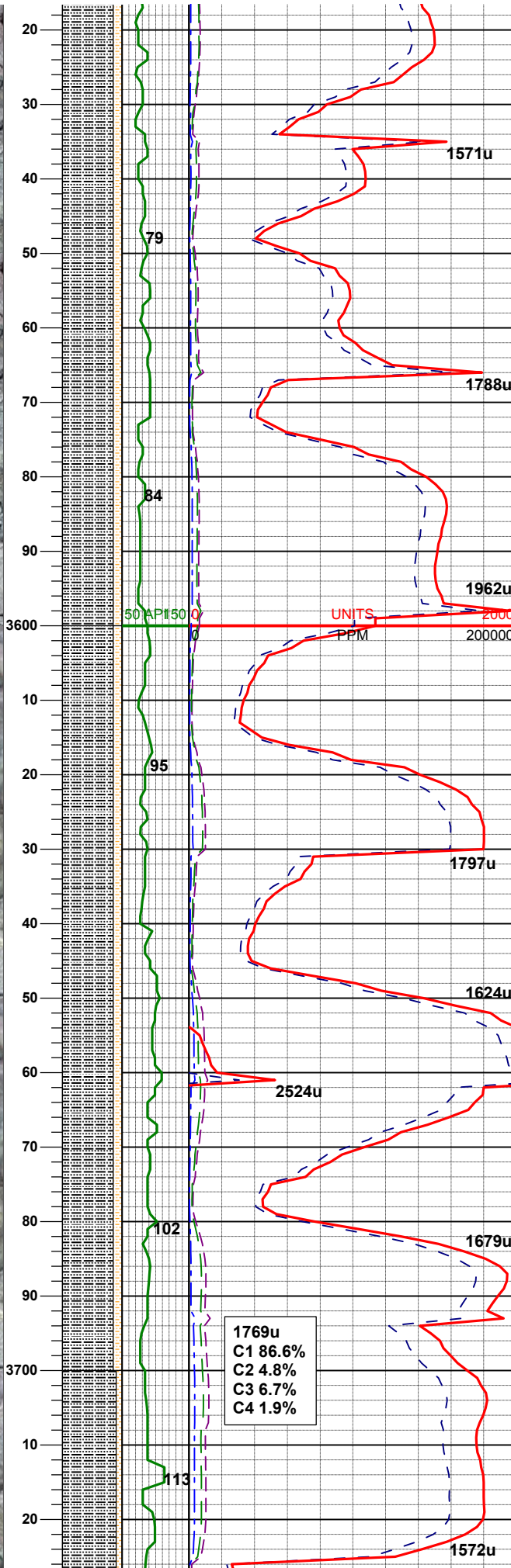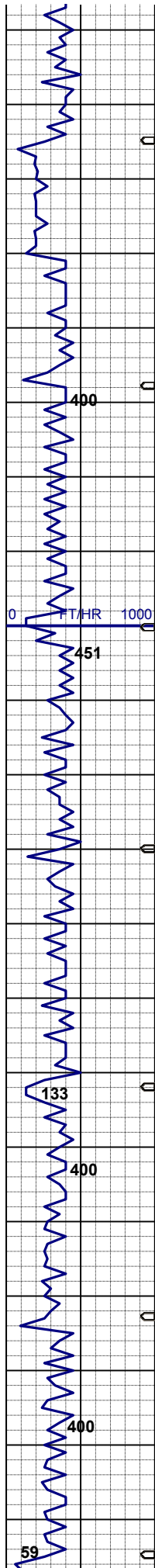
SLTYSH: lt gy - m gybrn, sme dk gy, mod firm - firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc; SHYSLTST: lt gy - gy brn, sdy ip, vf-f gr, sbang-sbrd, gt tex, arg-slty mtx, mod srt, m sft - firm, brit-fri, sl calc, n flor cut stn or od

MUD WT: 8.4   VIS: 28 IN
MUD WT: 8.4+   VIS: 27 OUT

SURVEY @
MD 3579'
INC 7.6°
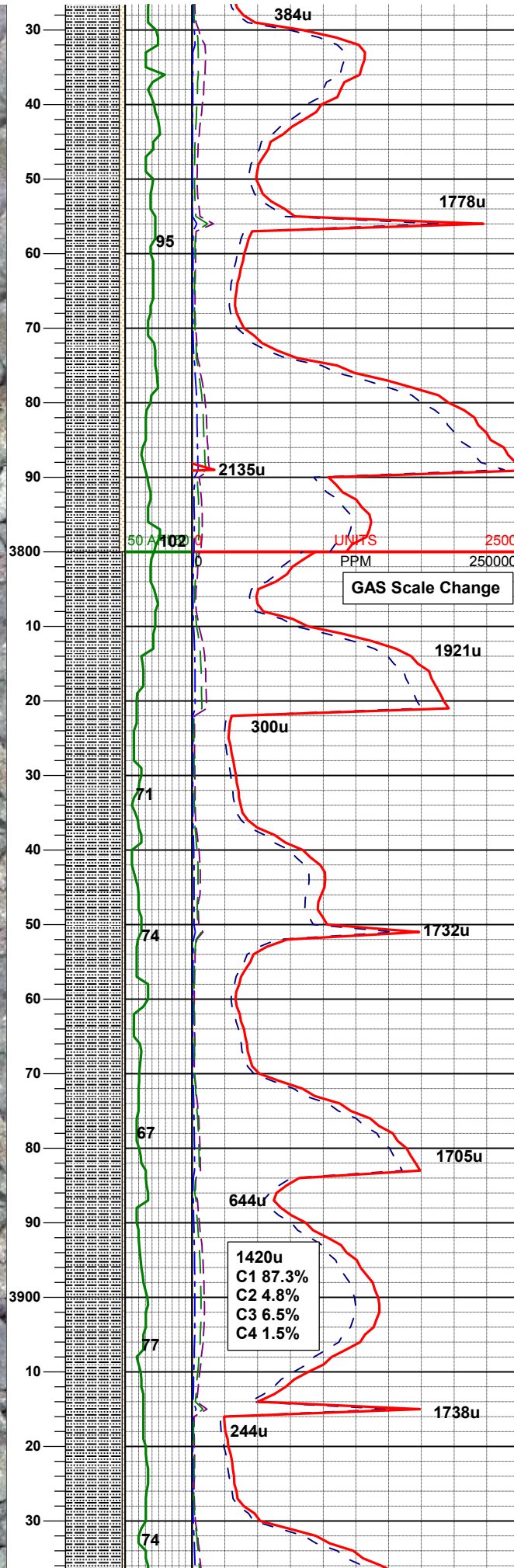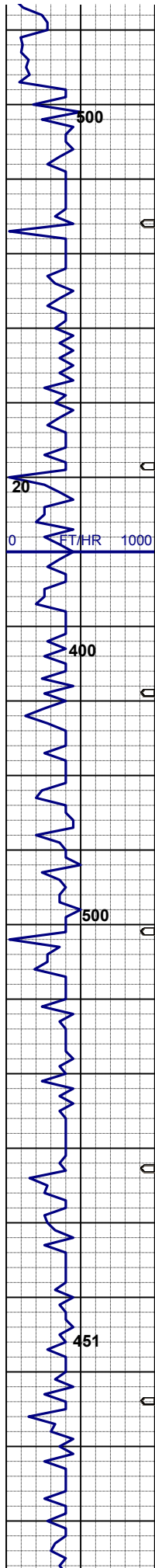**AZI 211.2°**
TVD 3569.61'

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm - firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc; SHYSLTST: lt gy - gy brn, sdy ip, vf-f gr, sbang-sbrd, gt tex, arg-slty mtx, mod srt, m sft - firm, brit-fri, sl calc, n flor cut stn or od

SURVEY @
MD 3674'
INC 7.0°
AZI 209.1°
TVD 3663.84'

1571u
1788u
1962u
1797u
1624u
2524u
1679u

1769u
C1 86.6%
C2 4.8%
C3 6.7%
C4 1.9%

1572u

0   FT/HR   1000
50 API 50   0   UNITS   2000
0   PPM   200000

400
451
133
400
400
59

79
84
95
102
113

Depth scale (center track): 30, 40, 50, 60, 70, 80, 90, 3800, 10, 20, 30, 40, 50, 60, 70, 80, 90, 3900, 10, 20, 30

ROP track (left): 500, 20, 0 FT/HR 1000, 400, 500, 451

Gas / chromatograph track values:
- 384u
- 1778u
- 95
- 2135u
- 50 A 102 0 · UNITS · 2500
- PPM · 250000
- GAS Scale Change
- 1921u
- 300u
- 71
- 74
- 1732u
- 67
- 1705u
- 644u
- 1420u
  C1 87.3%
  C2 4.8%
  C3 6.5%
  C4 1.5%
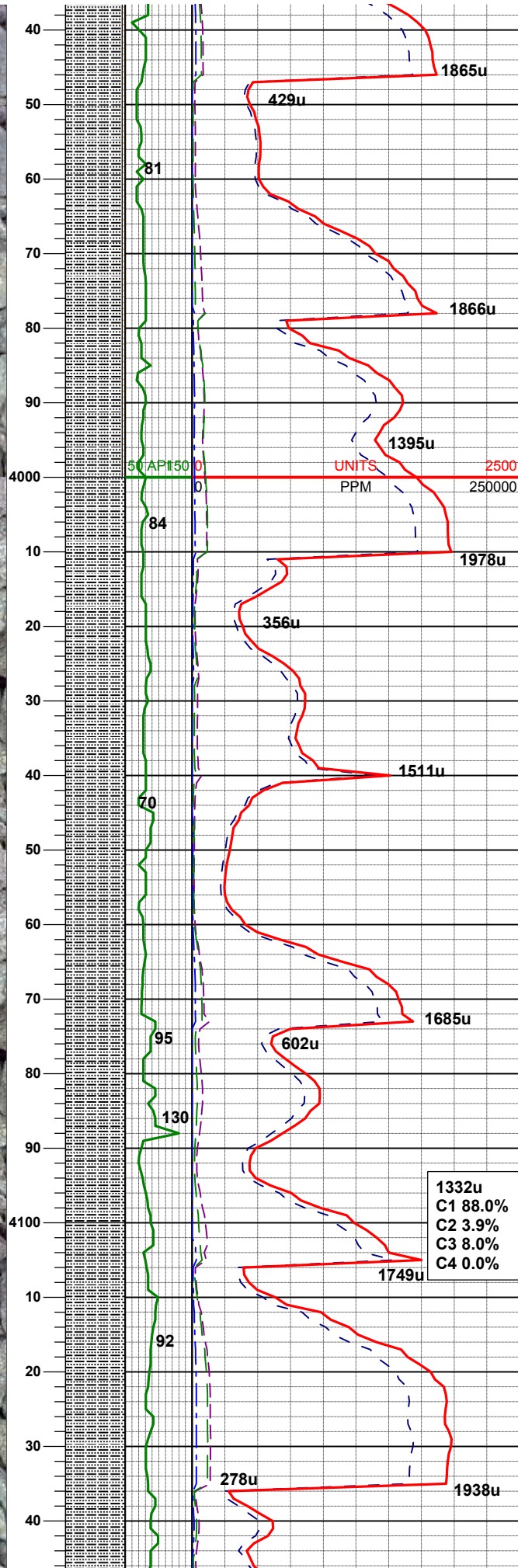- 77
- 1738u
- 244u
- 74

Right column notes:

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm - firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc; SHYSLTST: lt gy - gy brn, sdy ip, vf-f gr, sbang-sbrd, gt tex, arg-slty mtx, mod srt, m sft - firm, brit-fri, sl calc, n flor cut stn or od

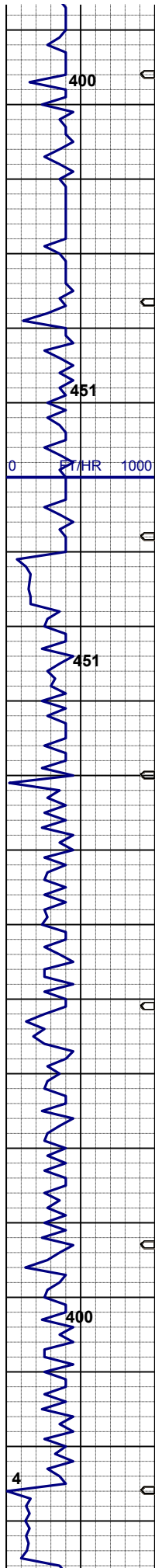**Logger's Top Parkman**
@ 3815' MD / 3804' TVD

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm - firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc; SHYSLTST: lt gy - gy brn, sdy ip, vf-f gr, sbang-sbrd, gt tex, arg-slty mtx, mod srt, m sft - firm, brit-fri, sl calc, n flor cut stn or od

SURVEY @
MD 3863'
INC 6.0°
AZI 210.1°
TVD 3851.66'

MUD WT: 8.4   VIS: 28 IN
MUD WT: 8.4   VIS: 28 OUT

Left Track (ROP)

400

451

451

400

4

0   FT/HR   1000

Gas / Chromatography Track

50 API 50   0   UNITS   2500

0   PPM   250000

1865u

429u

81

1866u

1395u

84

1978u

356u

1511u

70

1685u

602u

95

130

1332u
C1 88.0%
C2 3.9%
C3 8.0%
C4 0.0%

1749u

92

278u

1938u

Depth Track

40, 50, 60, 70, 80, 90, 4000, 10, 20, 30, 40, 50, 60, 70, 80, 90, 4100, 10, 20, 30, 40

Lithology Descriptions

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm - firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc; SHYSLTST: lt gy - gy brn, sdy ip, vf-f gr, sbang-sbrd, gt tex, arg-slty mtx, mod srt, m sft - firm, brit-fri, sl calc, n flor cut stn or od

SURVEY @
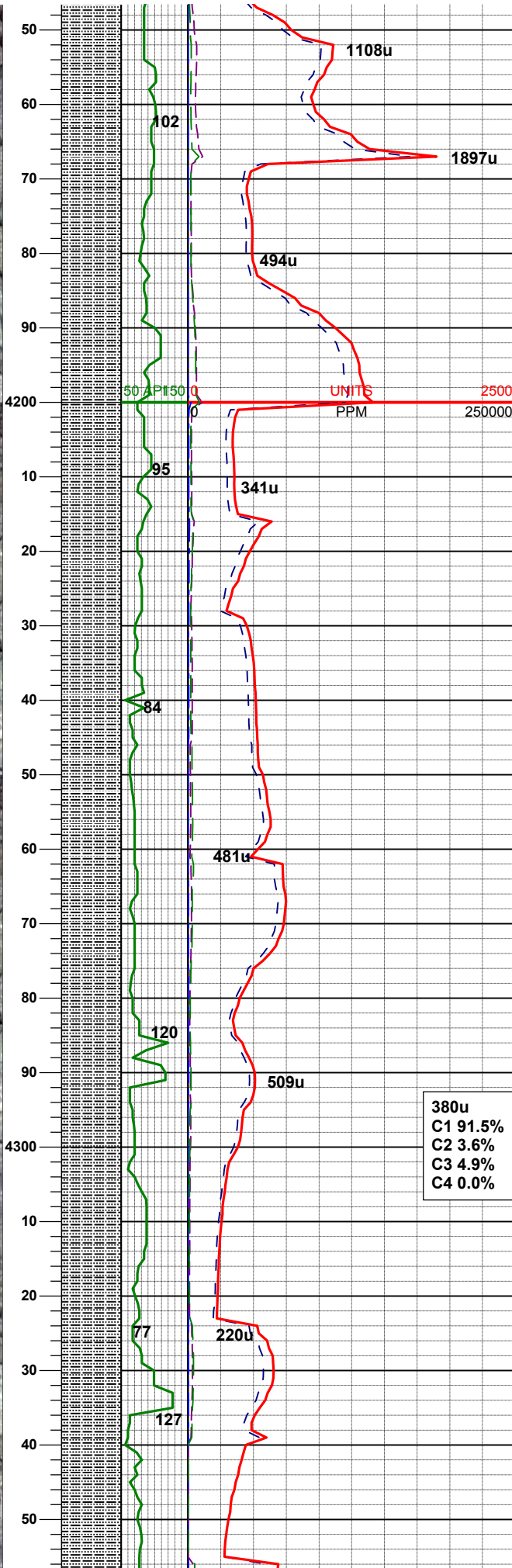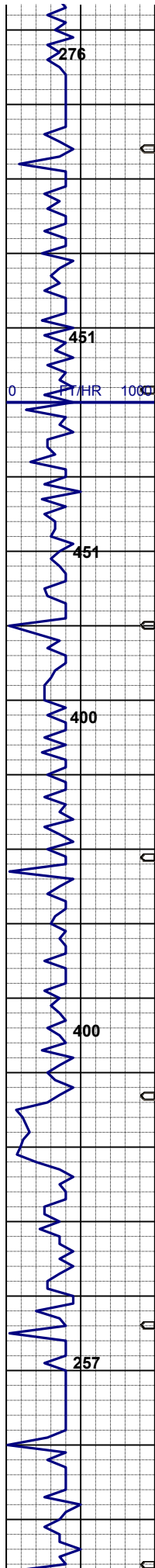**MD 3957'**
INC 6.0°
AZI 211.0°
TVD 3945.14'

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm - firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc

SURVEY @
MD 4052'
INC 6.9°
AZI 221.0°
TVD 4039.54'

SURVEY @
MD 4147'
INC 7.7°
AZI 218.7°
TVD 4133.77'

SLTYSH: lt gy - m gybrn, sme dk gy

SLTYSH: lt gy - m gybrn, sme dk gy,
mod firm - firm, brit ip, sbplty - sbblky,
sme plty, sl gt tex, arg-slty mtx, w/
dism pyr, v sl calc

1108u

102

1897u

494u

276

451

50 API 50   0   UNITS   2500
0   PPM   250000

0   FT/HR   1000

95

341u

451

SURVEY @
MD 4242'
INC 7.5°
AZI 217.3°
TVD 4227.94'

84

400

SLTYSH: lt gy - m gybrn, sme dk gy,
mod firm - firm, brit ip, sbplty - sbblky,
sme plty, sl gt tex, arg-slty mtx, w/
dism pyr, v sl calc

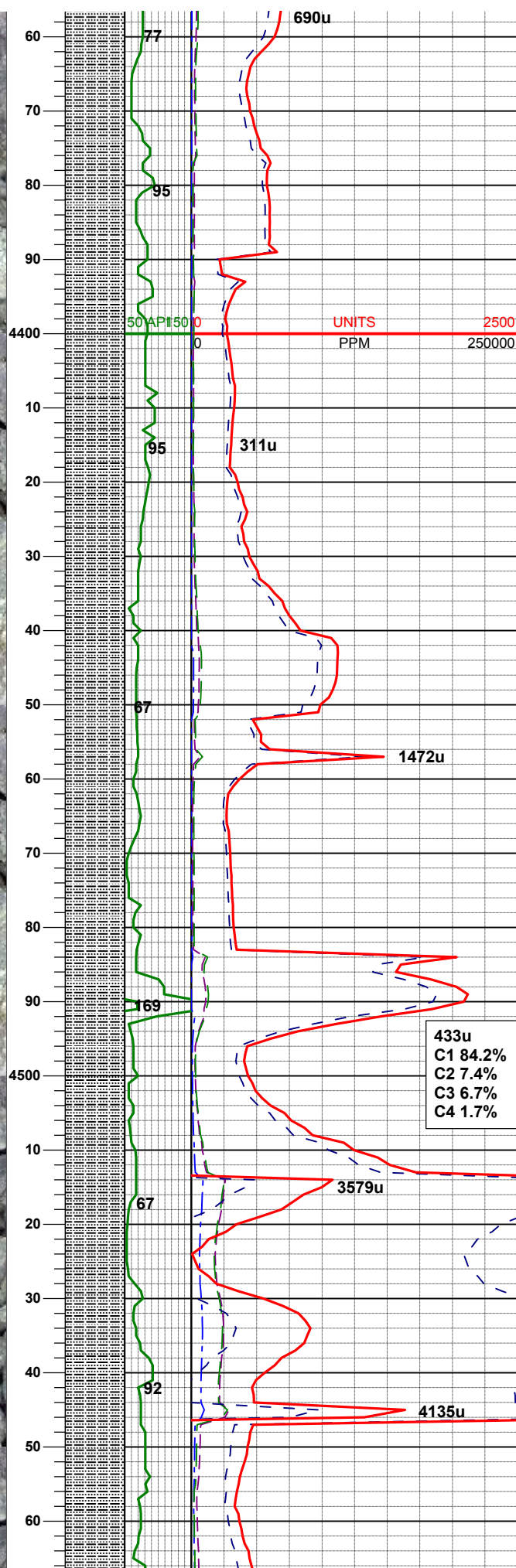481u

120

509u

400

380u
C1 91.5%
C2 3.6%
C3 4.9%
C4 0.0%

77   220u

257

127

SURVEY @
MD 4336'
INC 8.3°
AZI 223.3°
TVD 4321.05'

SLTYSH: lt gy - m gybrn, sme dk gy,
mod firm - firm, brit ip, sbplty - sbblky,
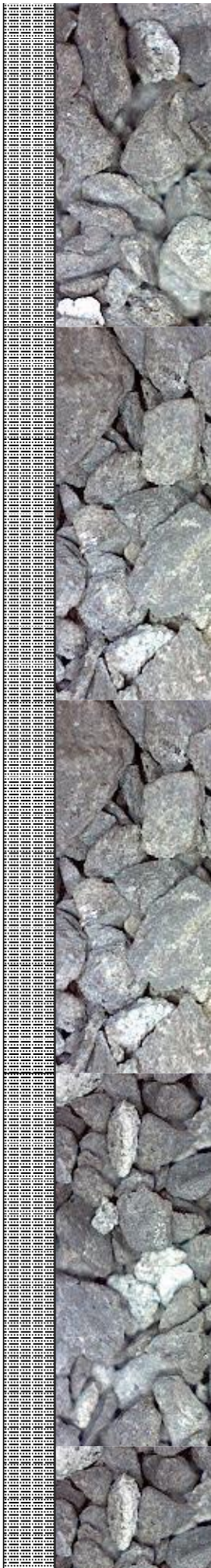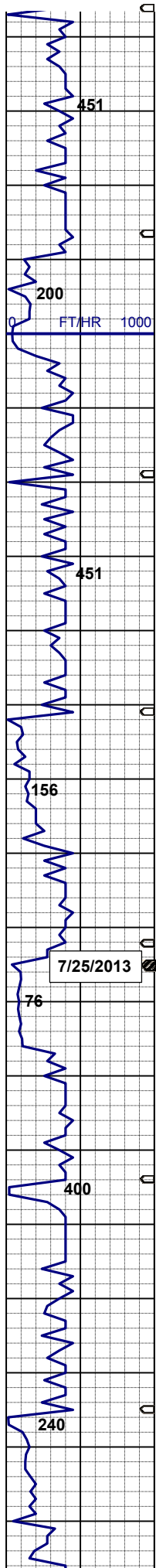sme plty, sl gt tex, arg-slty mtx, w/
dism pyr, v sl calc

Depth track (center):
60, 70, 80, 90, 4400, 10, 20, 30, 40, 50, 60, 70, 80, 90, 4500, 10, 20, 30, 40, 50, 60

Rate of penetration track (left):
451, 200, 0 FT/HR 1000, 451, 156, 7/25/2013, 76, 400, 240

Gas / curve track annotations:
690u, 77, 95, 95, 311u, 67, 1472u, 169, 433u
C1 84.2%
C2 7.4%
C3 6.7%
C4 1.7%
3579u, 67, 92, 4135u

50 API 50 0
UNITS 2500
0 PPM 250000

Right column annotations:

Logger's Top Sussex
@ 4418' MD / 4403' TVD

SURVEY @
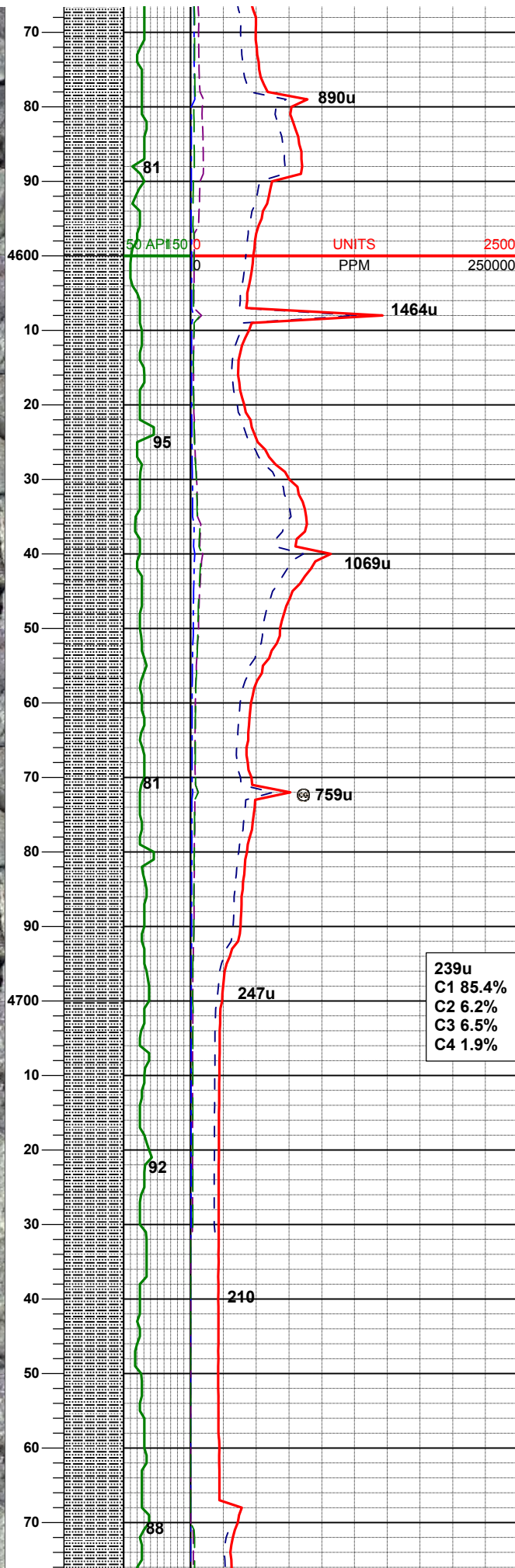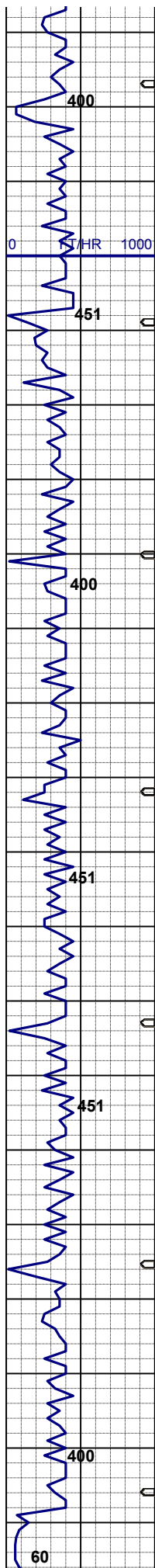MD 4431'
INC 6.2°
AZI 214.0°
TVD 4415.29'

SLTYSH: lt gy - m gybrn, sme dk gy,
mod firm - firm, brit ip, sbplty - sbblky,
sme plty, sl gt tex, arg-slty mtx, w/
dism pyr, v sl calc

MUD WT: 8.4   VIS: 28 IN
MUD WT: 8.4   VIS: 28 OUT

SURVEY @
MD 4526'
INC 7.7°
AZI 230.3°
TVD 4509.60'

SLTYSH: lt gy - m gybrn, sme dk gy,
mod firm - firm, brit ip, sbplty - sbblky,
sme plty, sl gt tex, arg-slty mtx, w/
dism pyr, v sl calc

400

0   FT/HR   1000

451

400

451

451

400

60

70

80

90

4600

10

20

30

40

50

60

70

80

90

4700

10

20

30

40

50

60

70

81

95

81

92

88

50 API 50

UNITS   2500

PPM   250000

0

890u

1464u

1069u

@ 759u

247u   239u
C1 85.4%
C2 6.2%
C3 6.5%
C4 1.9%

210

SURVEY @
MD 4621'
INC 8.9°
AZI 216.4°
TVD 4603'

SLTYSH: lt gy - m gybrn, sme dk gy,
mod firm - firm, brit ip, sbplty - sbblky,
sme plty, sl gt tex, arg-slty mtx, w/
dism pyr, v sl calc

SURVEY @
MD 4715'
INC 7.5°
AZI 218.4°
TVD 4696.64'

SLTYSH: lt gy - m gybrn, sme dk gy,
mod firm - firm, brit ip, sbplty - sbblky,
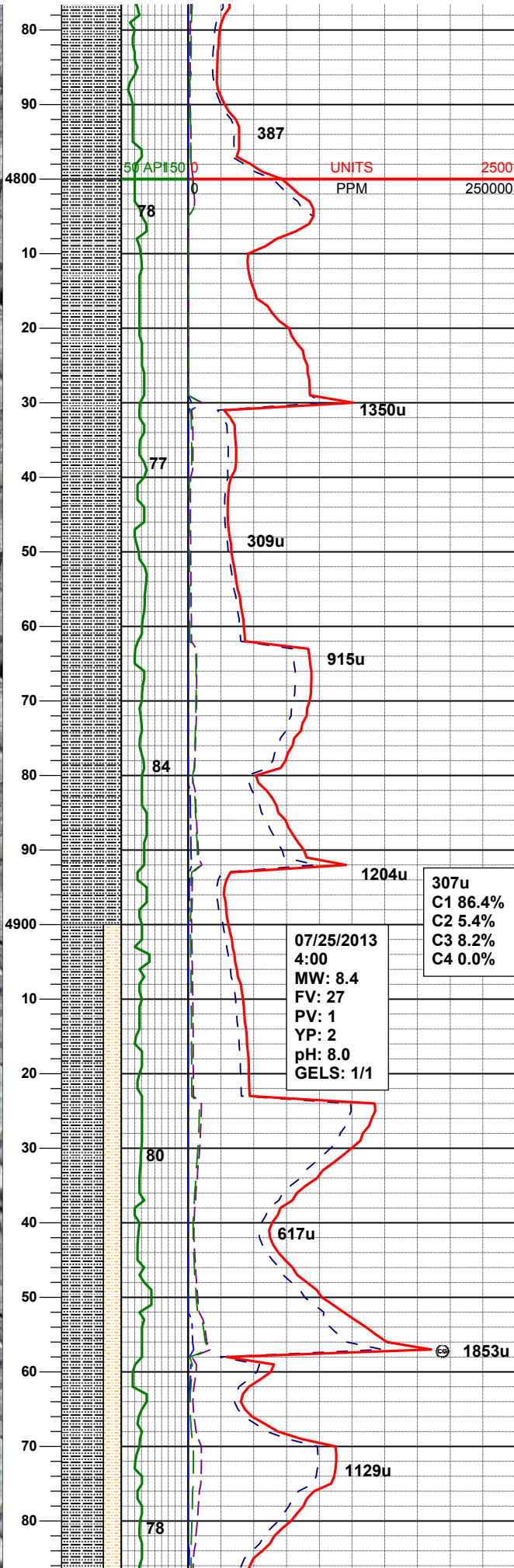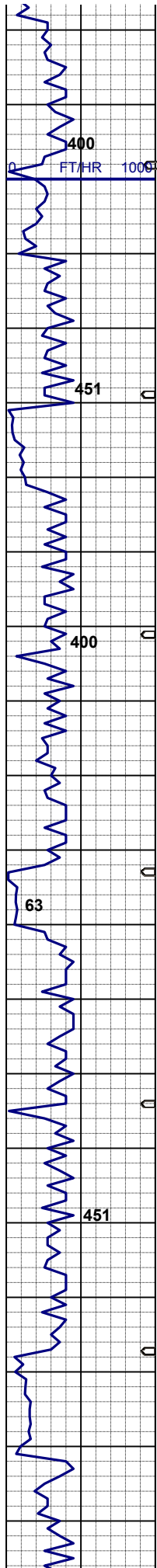sme plty, sl gt tex, arg-slty mtx, w/
dism pyr, v sl calc

Depth markers (center track): 80, 90, 4800, 10, 20, 30, 40, 50, 60, 70, 80, 90, 4900, 10, 20, 30, 40, 50, 60, 70, 80

ROP track (FT/HR): 0 FT/HR 1000
- 400
- 451
- 400
- 63
- 451

Gas / API track:
- 50 API 150
- UNITS 2500
- PPM 250000
- 0
- 387
- 78
- 1350u
- 77
- 309u
- 915u
- 84
- 1204u
- 80
- 617u
- 1853u
- 1129u
- 78

307u
C1 86.4%
C2 5.4%
C3 8.2%
C4 0.0%

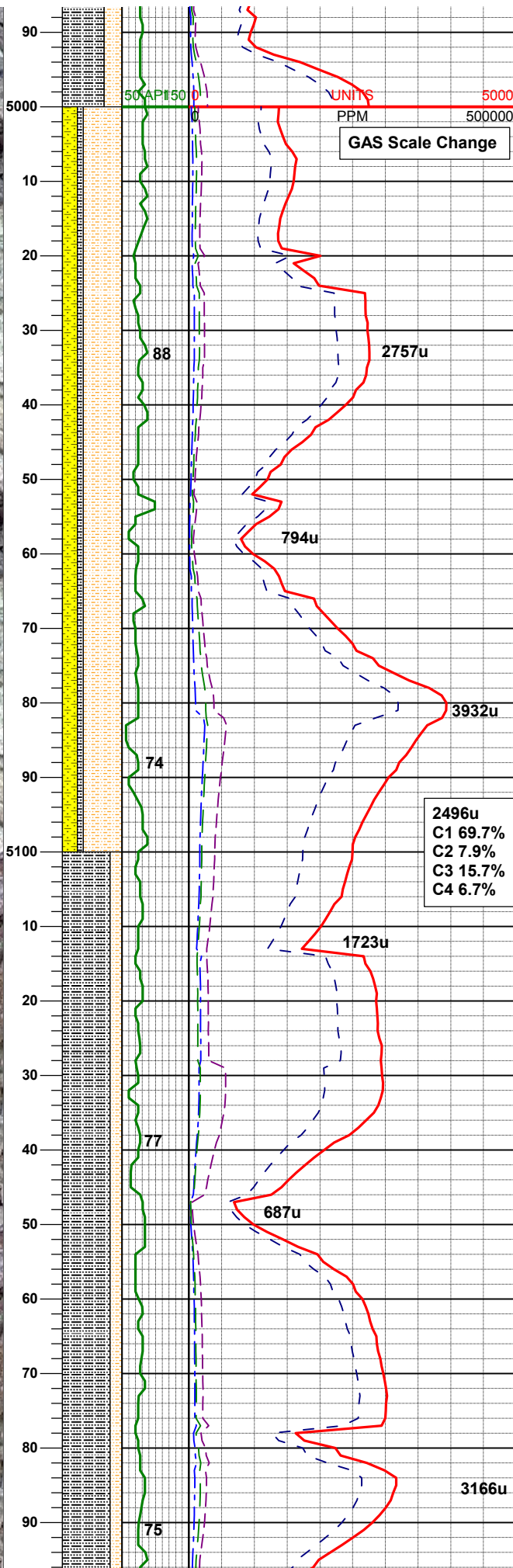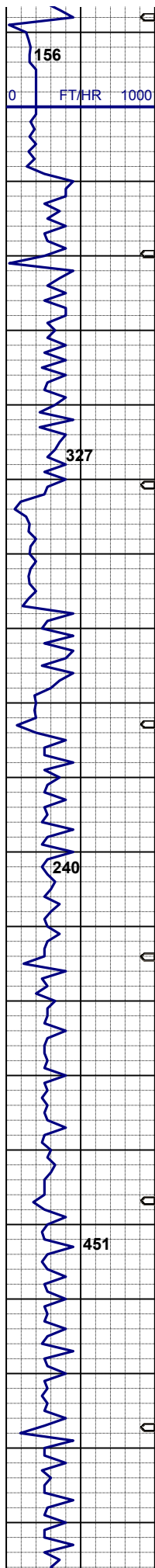07/25/2013
4:00
MW: 8.4
FV: 27
PV: 1
YP: 2
pH: 8.0
GELS: 1/1

SURVEY @
MD 4810'
INC 5.5°
AZI 210.6°
TVD 4791.03'

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm - firm, brit ip, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc

SURVEY @
MD 4905'
INC 5.4°
AZI 200.8°
TVD 4885.60'

SLTYSH: lt gy - m gybrn, mod firm - firm, brit ip, sbplty - sbblky, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc; SHYSLTST: lt gy - m gy brn, sdy ip, vf-f gr, sbang - sbrd - sbplty, gt tex, arg-slty mtx, w srt, m sft - firm, fri - brit, sl calc, tr dul yelgn mnrl flor, slow. diffuse dul bl wh cut, n stn or od

MUD WT: 8.4   VIS: 28 IN
MUD WT: 8.4   VIS: 28 OUT

Depth track (center): 90, 5000, 10, 20, 30, 40, 50, 60, 70, 80, 90, 5100, 10, 20, 30, 40, 50, 60, 70, 80, 90

ROP track (left):
156
327
240
451
0 FT/HR 1000

Gas track:
50 API 150
0 UNITS 5000
PPM 500000
0

GAS Scale Change

2757u
794u
3932u
2496u
C1 69.7%
C2 7.9%
C3 15.7%
C4 6.7%
1723u
687u
3166u

88
74
77
75

SURVEY @
MD 5000'
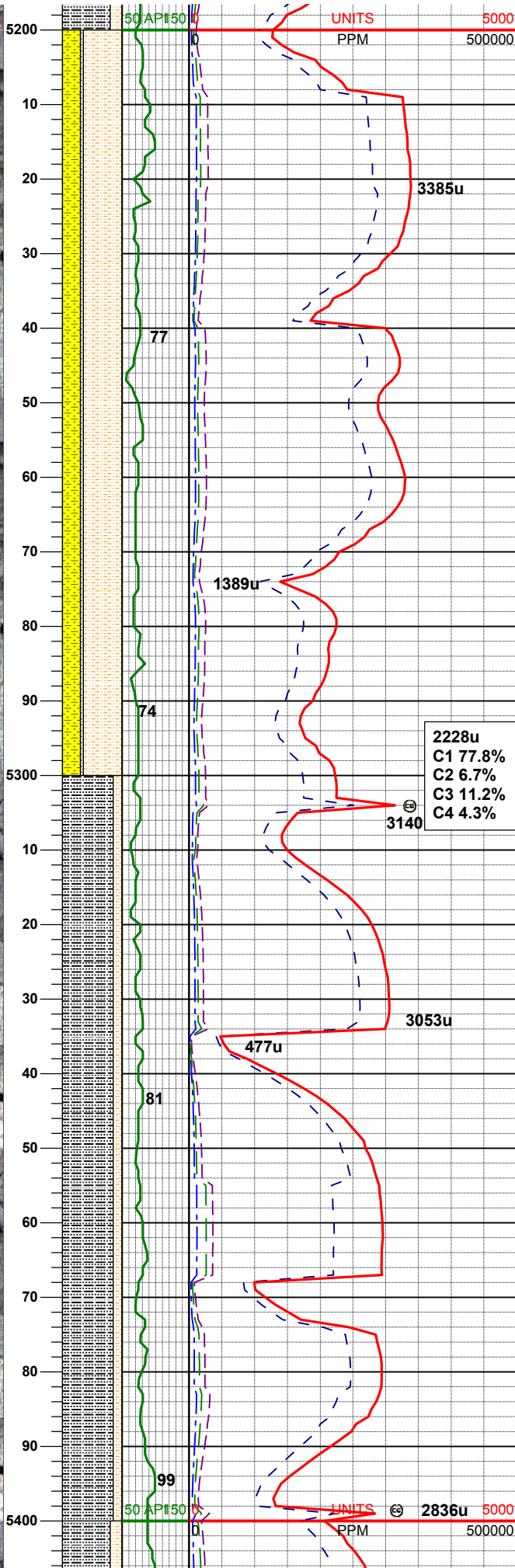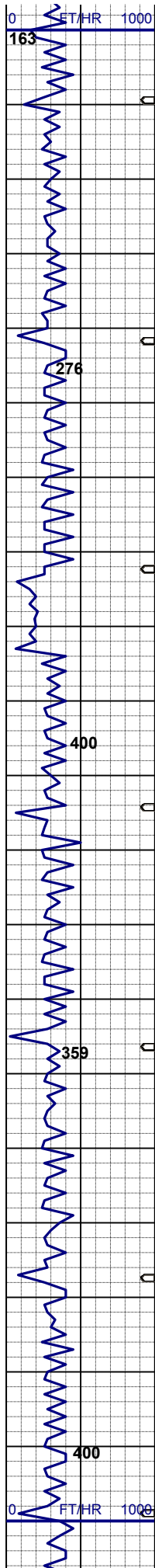INC 5.3°
AZI 221.2°
TVD 4980.20'

SHYSLTST: lt gy - m gy brn, sdy ip, vf
-f gr, sbang - sbrd - sbplty, sdy ip, gt
tex, arg-slty mtx, w srt, mod - firm,
brit, sl calc, SHYSS: lt gy - lt gybrn,
wh, clr - trnsl gr, sl s&p ip, pred mod
firm - occ sft, brit, vf - f gr, sbrd -
sbang, mod srt, sbblky - blky, occ slty
sh, tr dul blgn mnrl flor, slow. diffuse
dull bl wh cut, cut stn or od

SURVEY @
MD 5095'
INC 6.5°
AZI 225.1°
TVD 5074.69'

MUD WT: 8.4   VIS: 27 IN
MUD WT: 8.4   VIS: 28 OUT

SLTYSH: lt gy - m gybrn, sme dk gy,
firm, brit, sbplty - sbblky, sl gt tex, arg-
slty mtx, w/ dism pyr, v sl calc;
SHYSLTST: lt gy - m gy brn, sdy ip, vf
-f gr, sbang - sbrd - sbplty, gt tex, arg-
slty mtx, w srt, m sft - firm, fri - brit, sl
calc, tr dul yel orng mnrl flor, slow.
diffuse dull bl wh cut, n stn or od

SURVEY @
MD 5190'
INC 5.5°
AZI 219.6°
TVD 5169.17'

Logger's Top Shannon
@ 5206' MD / 5185' TVD

3385u

77

SHYSLTST: lt gy - m gy brn, sdy ip, vf
-f gr, sbang - sbrd - sbplty, sdy ip, gt
tex, arg-slty mtx, w srt, mod - firm,
brit, sl calc, spec w/ mica frag,
SHYSS: lt gy - lt gybrn, wh, clr - trnsl
gr, sl s&p ip, pred mod firm - occ sft,
brit, vf - f gr, sbrd - sbang, mod srt,
sbblky - blky, occ slty sh, mod fast
diffuse mod bl wh cut, n flor stn or od

1389u

74

SURVEY @
MD 5285'
INC 5.9°
AZI 219.4°
TVD 5263.7'

2228u
C1 77.8%
C2 6.7%
C3 11.2%
C4 4.3%
3140

3053u

MUD WT: 8.4+   VIS: 29 IN
MUD WT: 8.4+   VIS: 28 OUT

477u

81

SLTYSH: lt gy - m gybrn, sme dk gy,
firm, brit, sbplty - sbblky, sl gt tex, arg-
slty mtx, w/ dism pyr, v sl calc;
SHYSLTST: lt gy - m gy brn, sdy ip, vf
-f gr, sbang - sbrd - sbplty, gt tex, arg-
slty mtx, w srt, m sft - firm, fri - brit, sl
calc, mod fast diffuse mod bl wh cut,
n flor stn or od

SURVEY @
MD 5379'
INC 5.5°
AZI 217.5°
TVD 5357.24'
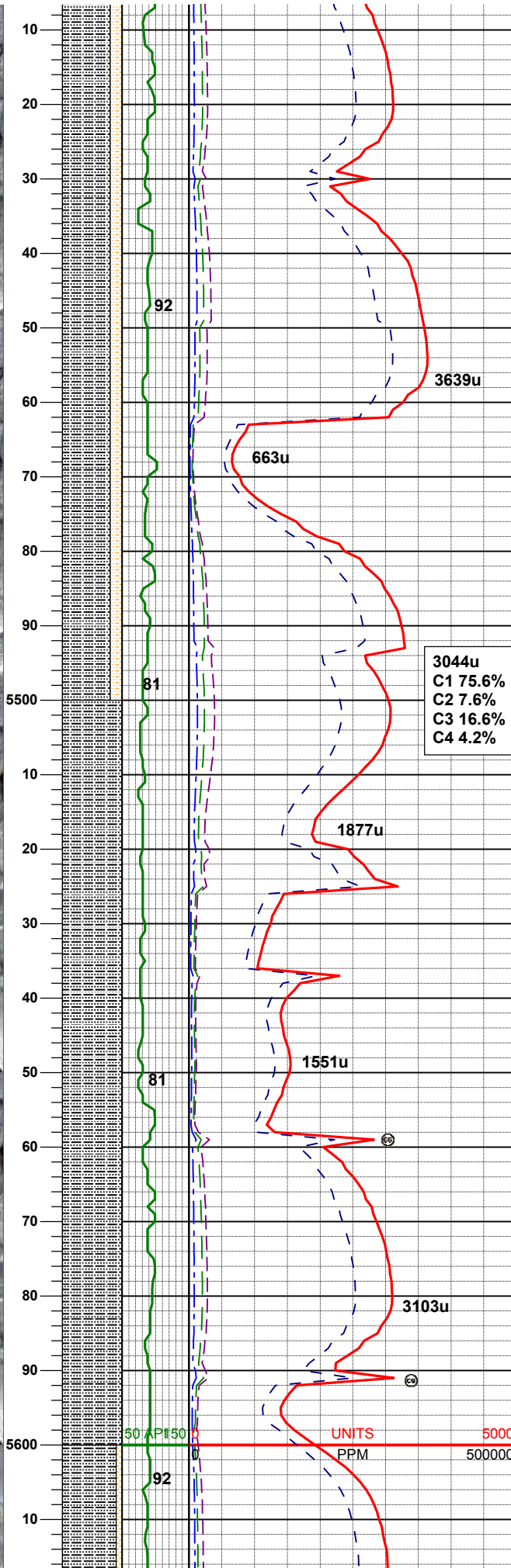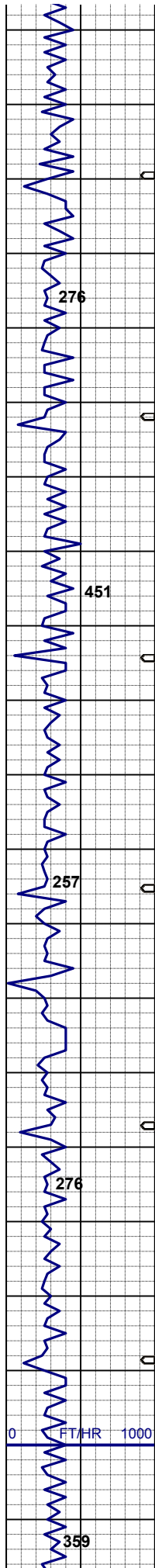
99

2836u

SLTYSH: lt gy - m gybrn, sme dk gy, firm, brit, sbplty - sbblky, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc; SHYSLTST: lt gy - m gy brn, sdy ip, vf -f gr, sbang - sbrd - sbplty, gt tex, arg-slty mtx, w srt, m sft - firm, fri - brit, sl calc, sl tr fos frag, mod fast diffuse dull bl wh cut, n flor stn or od
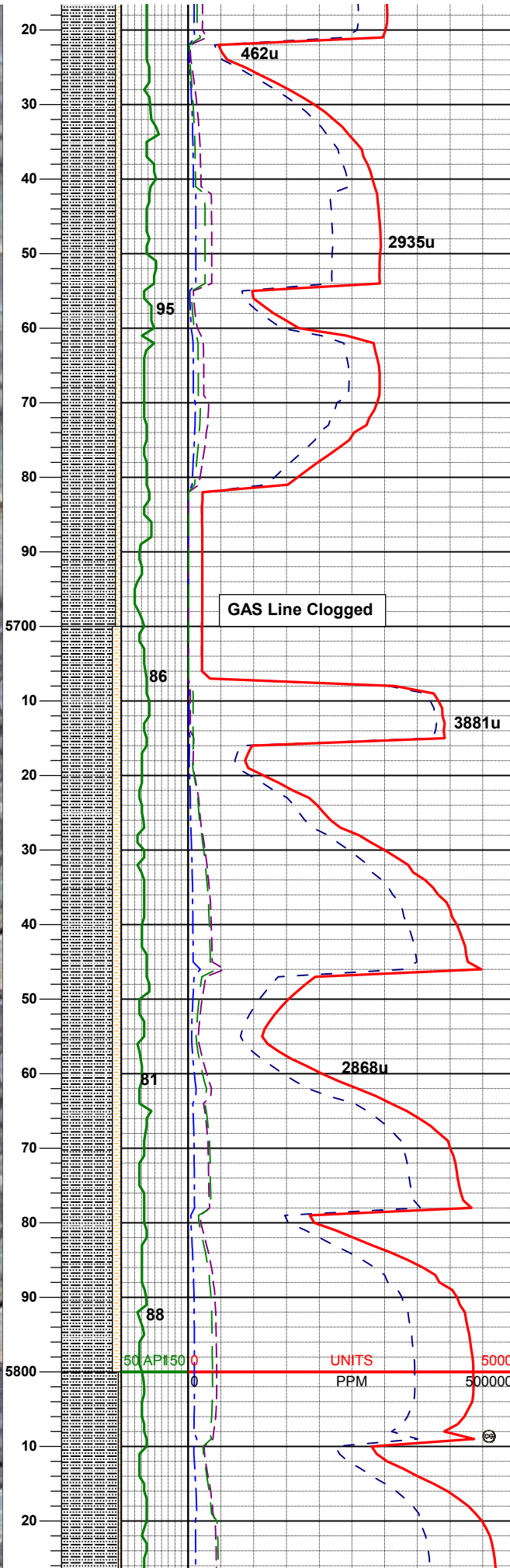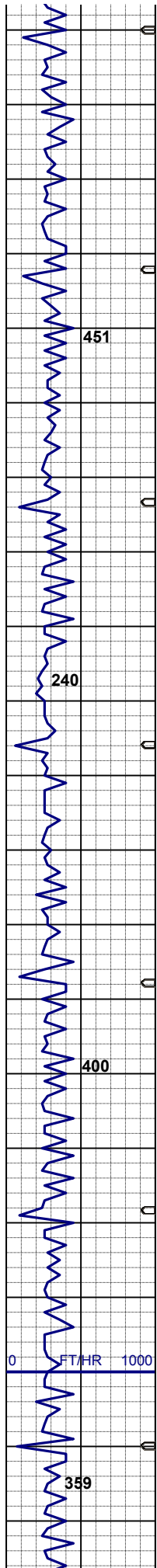
SURVEY @
MD 5474'
INC 4.6°
AZI 210.8°
TVD 5451.87'

3044u
C1 75.6%
C2 7.6%
C3 16.6%
C4 4.2%

MUD WT: 8.5+   VIS: 30 IN
MUD WT: 8.6   VIS: 29 OUT

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm, brit, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, mod fast diffuse, sl stmg, mod bri bl wh cut, n flor stn or od

SURVEY @
MD 5569'
INC 3.7°
AZI 209.8°
TVD 5546.66'

MUD WT: 8.5+   VIS: 30 IN
MUD WT: 8.6   VIS: 29 OUT

Curve values (left track): 276, 451, 257, 276, 359

Gas/API values: 92, 81, 81, 92

Gas readings: 3639u, 663u, 1877u, 1551u, 3103u

Depth markers: 10, 20, 30, 40, 50, 60, 70, 80, 90, 5500, 10, 20, 30, 40, 50, 60, 70, 80, 90, 5600, 10

Scales:
0 FT/HR 1000
50 API 50
UNITS 5000
PPM 500000

SLTYSH: lt gy - m gybrn, sme dk gy, mod firm - firm, brit, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, occ shysltst, slow. diffuse, dull bl cut, n flor stn or od

SURVEY @
MD 5664'
INC 3.1°
AZI 208.7°
TVD 5641.49'

MUD WT: 8.6   VIS: 30 IN
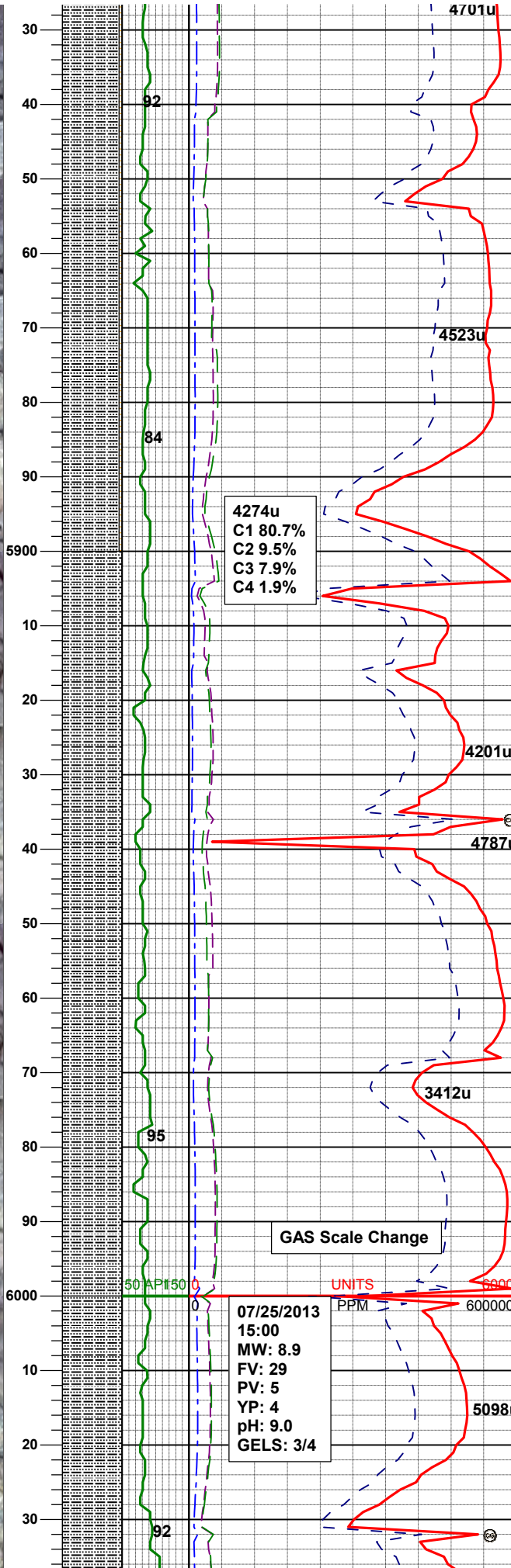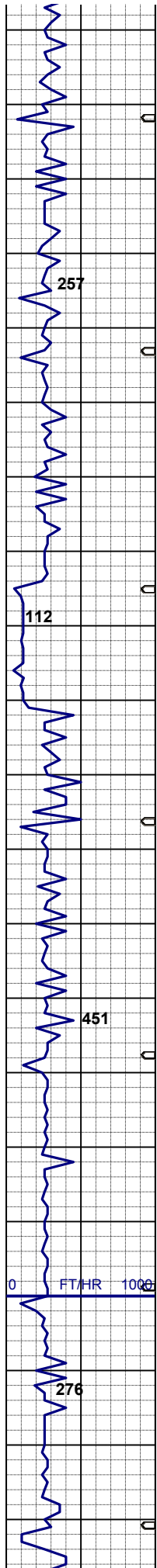**MUD WT: 8.6   VIS: 29 OUT**

SLTYSH: lt gy - m gybrn, sme dk gy, sft - mod firm, brit, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, occ shysltst, slow. diffuse, dull bl cut, n flor stn or od

SURVEY @
MD 5759'
INC 2.4°
AZI 203.7°
TVD 5736.38'

GAS Line Clogged

462u
2935u
95
86
3881u
81
2868u
88
451
240
400
359
0   FT/HR   1000
50 API 50   0   UNITS   5000
0   PPM   500000

Track 1 (ROP FT/HR): 257, 112, 451, 276
0 FT/HR 1000

Gas log labels: 4701u, 4523u

4274u
C1 80.7%
C2 9.5%
C3 7.9%
C4 1.9%

92, 84, 95, 92

4201u
4787u
3412u

GAS Scale Change

50 API 50   0   UNITS   6000
0   PPM   600000

07/25/2013
15:00
MW: 8.9
FV: 29
PV: 5
YP: 4
pH: 9.0
GELS: 3/4

5098u

SLTYSH: lt gy - m gybrn, sme dk gy, sft - mod firm, brit, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, occ shysltst, mod fast diffuse, sl stmg mod bri bl cut, n flor stn or od

SURVEY @
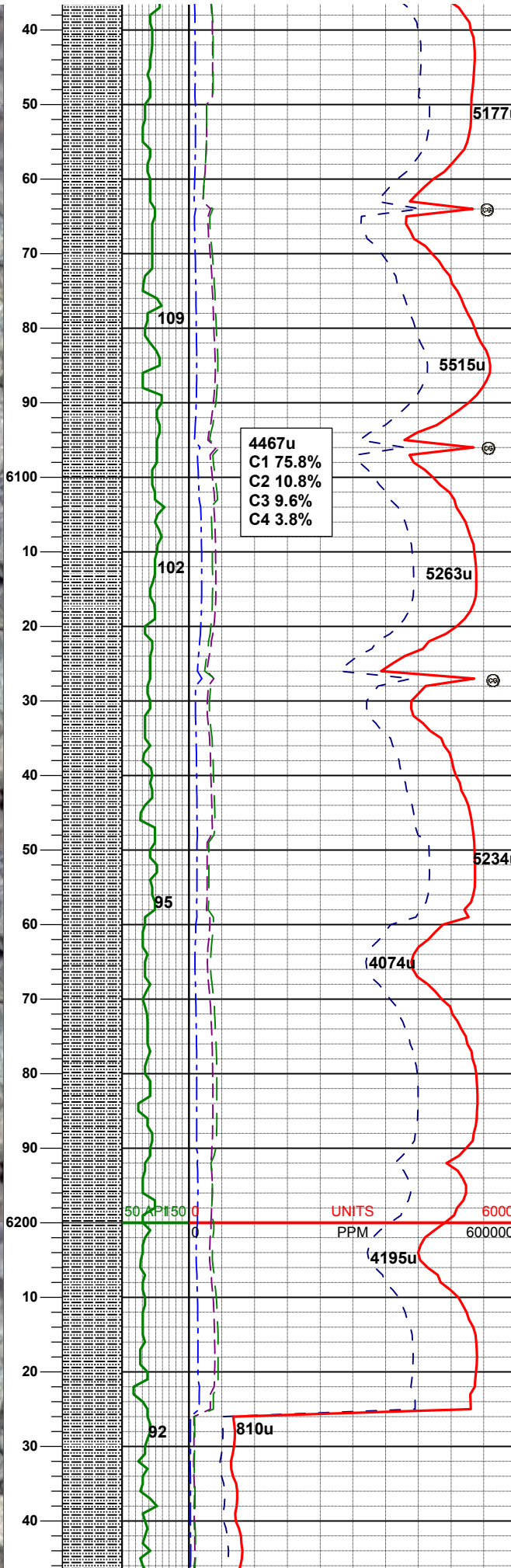**MD 5854'**
INC 2.3°
AZI 199.4°
TVD 5831.3'

MUD WT: 8.6   VIS: 30 IN
MUD WT: 8.6   VIS: 29 OUT

SURVEY @
MD 5948'
INC 2.9°
AZI 263.6°
TVD 5925.27'

SLTYSH: lt gy - m gybrn, sme dk gy, sft - mod firm, brit, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, tr shysltst, mod fast diffuse, sl stmg mod bri bl cut, n flor stn or od

MUD WT: 8.9   VIS: 30 IN
MUD WT: 8.9   VIS: 30 OUT

SURVEY @
MD 6043'
INC 0.5°

Depth column (center): 40, 50, 60, 70, 80, 90, 6100, 10, 20, 30, 40, 50, 60, 70, 80, 90, 6200, 10, 20, 30, 40

Left track (rate of penetration, FT/HR 0–1000):
327u
200
257
84
0 FT/HR 1000
327

Gas / total gas track (green API, red UNITS):
109
4467u
C1 75.8%
C2 10.8%
C3 9.6%
C4 3.8%
102
95
50 API 50   0
UNITS   6000
0
PPM   600000
92

Red curve (total gas, UNITS) labels:
5177u
5515u
5263u
5234u
4074u
4195u
810u

Right margin annotations:
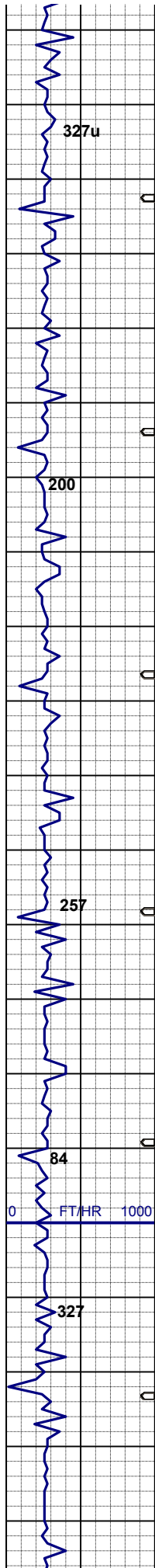
AZI 244.9°
TVD 6020.26'

SLTYSH: lt gy - m gybrn, sme dk gy, firm, brit, sbplty - sbblky, sme plty, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, sl tr shysltst, mod fast diffuse, stmg semi bri blwh mky cut, n flor stn or od

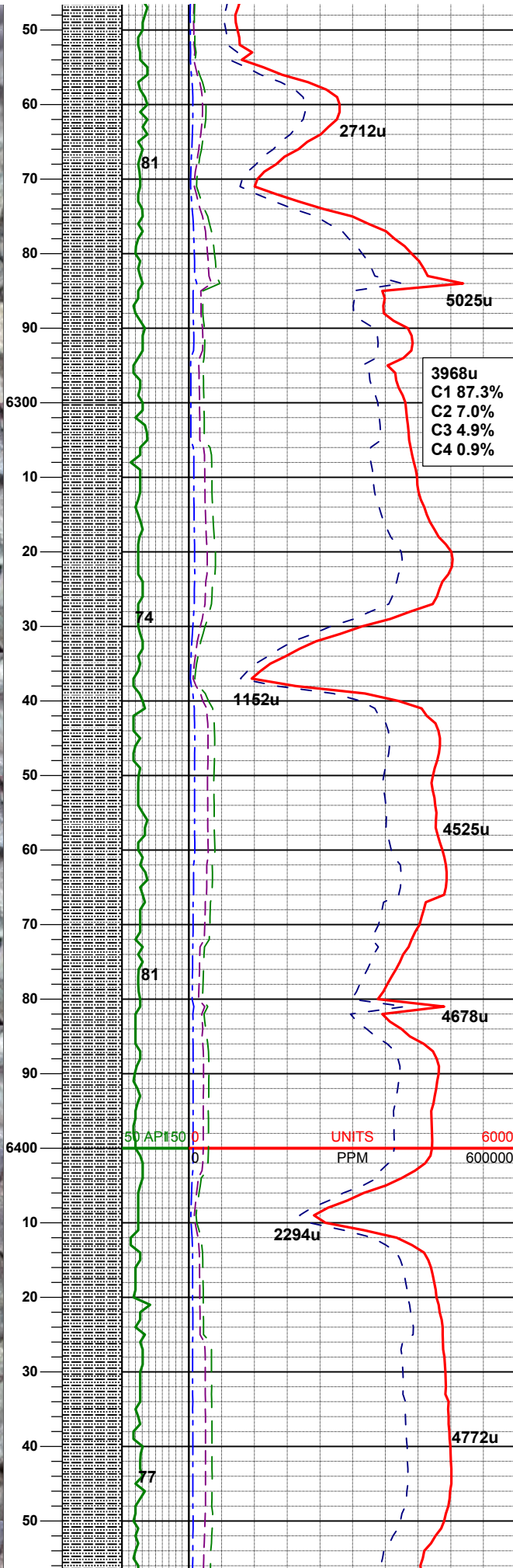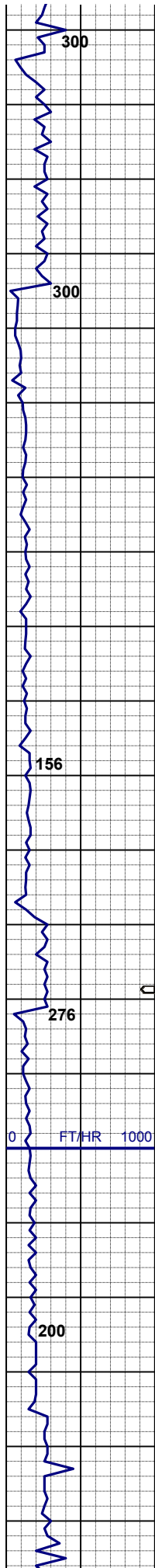**Logger's Top Teepee Buttes @ 6114' MD / 6091' TVD**

SURVEY @
MD 6138'
INC 0.4°
AZI 282.2°
TVD 6115.26'

SLTYSH: lt gy - m gybrn, sme dk gy, sft - pred firm, brit, sbplty - sbblky, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, sl tr shysltst, mod fast diffuse, mod bri bl cut, n flor stn or od

SURVEY @
MD 6233'
INC 0.4°
AZI 339.8°
TVD 348.51'

MUD WT: 9.5   VIS: 31 IN
MUD WT: 9.5   VIS: 30 OUT

SLTYSH: lt gy - m gybrn, sme dk gy,

Depth track (left):
300
300
156
276
0   FT/HR   1000
200

Gamma ray / units track:
81
74
81
81
50 API 50 0
6400
0
77

Gas curve annotations:
2712u
5025u

3968u
C1 87.3%
C2 7.0%
C3 4.9%
C4 0.9%

1152u
4525u
4678u

UNITS   6000
PPM   600000

2294u
4772u

Right column annotations:

sft - pred firm, brit, sbplty - sbblky, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, sl tr shysltst, mod fast diffuse, mod bri bl cut, n flor stn or od

Begin Building Curve
@ 6312' MD

SURVEY @
MD 6328'
INC 5.5°
AZI 181.3°
TVD 6305.12'

MUD WT: 9.4   VIS: 29 IN
MUD WT: 9.3+   VIS: 29 OUT

SLTYSH: lt gy - m gybrn, sme dk gy, sft - pred firm, brit, sbplty - sbblky, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, sl tr shysltst, mod fast diffuse, mod bri bl cut, n flor stn or od

SURVEY @
MD 6423'
INC 13.9°
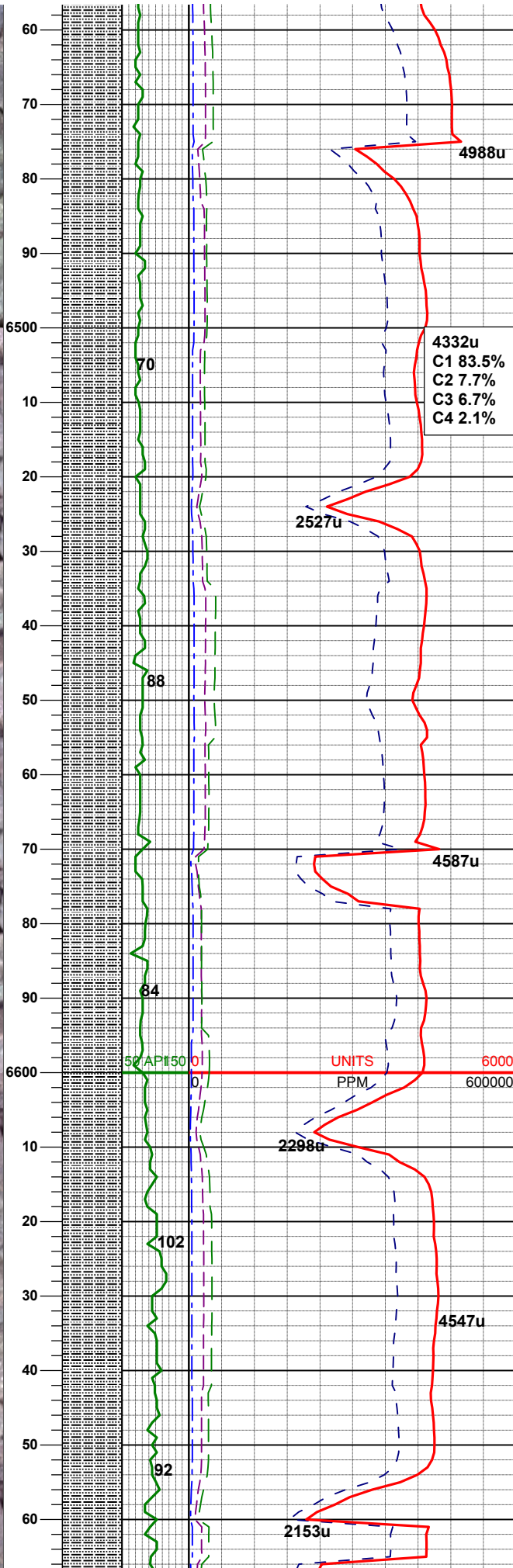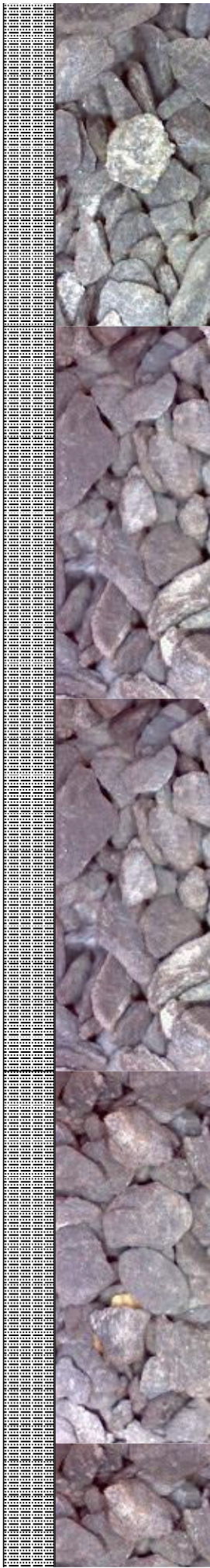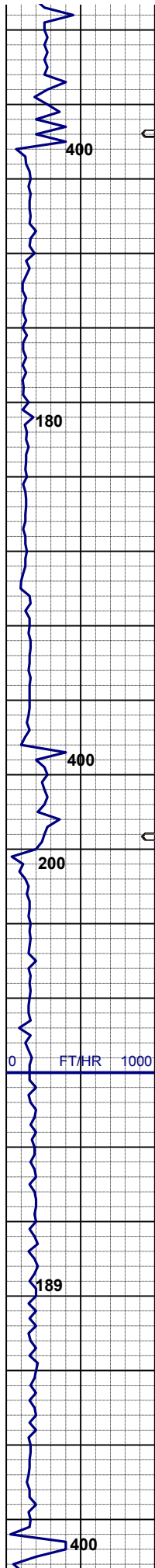**AZI 185.2°**
TVD 6398.68'

MUD WT: 9.7   VIS: 32 IN
MUD WT: 9.6   VIS: 31 OUT

SLTYSH: lt gy - m gybrn, sme dk gy, sft - pred firm, brit, sbplty - sbblky, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, sl tr shysltst, mod fast diffuse, mod bri bl cut, n flor stn or od

400

180

400

200

189

400

0   FT/HR   1000

70

88

84

102

92

50 API 50 0

0

4988u

4332u
C1 83.5%
C2 7.7%
C3 6.7%
C4 2.1%

2527u

4587u

UNITS   6000

PPM   600000

2298u

4547u

2153u

60 70 80 90 6500 10 20 30 40 50 60 70 80 90 6600 10 20 30 40 50 60

SURVEY @
MD 6517'
INC 16.1°
AZI 182.2°
TVD 6489.47'

MUD WT: 10   VIS: 32 IN
MUD WT: 9.9   VIS: 30 OUT

SLTYSH: lt gy - m gybrn, sme dk gy, sft - pred firm, brit, sbplty - sbblky, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, sl tr shysltst, mod fast diffuse, mod bri bl cut, n flor stn or od

SURVEY @
MD 6612'
INC 23.4°
AZI 183.4°
TVD 6578.82'

SLTYSH: lt gy - m gybrn, sme dk gy, sft - pred firm, brit, sbplty - sbblky, sl gt tex, arg-slty mtx, w/ dism pyr, v sl calc, sl tr shysltst, mod fast diffuse, mod bri bl cut, n flor stn or od

70

80

4041u

120

90

4091u
C1 86.5%
C2 6.6%
C3 5.6%
C4 1.4%

100

6700

**Thank You for Using
Columbine Logging, Inc.**

10

**LOG CONTINUES ON HORIZONTAL
MOSER H27-79HN**

20

30

40