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## Customer Information

Operator: Noble Energy Inc  
1625 Broadway  
Suite 2200  
Denver, Colorado 80202

Geologist: Renee Clackler  
Noble Energy Inc.

## Mud Logging Details

Logger: Tom Denney &  
Jeremy Needham

Log Interval: 2500' MD to 6750' MD

Start Date: January 14, 2014

Release Date: January 21, 2014

## Well Information

Well Name: Wells Ranch  
AA21-67-1HN

Location: 21-T6N-63W  
1637' FNL, 421' FEL

County: Weld  
State: Colorado

Drilling Rig: H&P 277

Total Depth: 10675' MD

TD Date: January 21, 2014

Formation: Niobrara B Chalk

KB Elevation: 4751'

GR Elevation: 4727'

API Number: 05-123-37724-0000

## ROCK TYPES

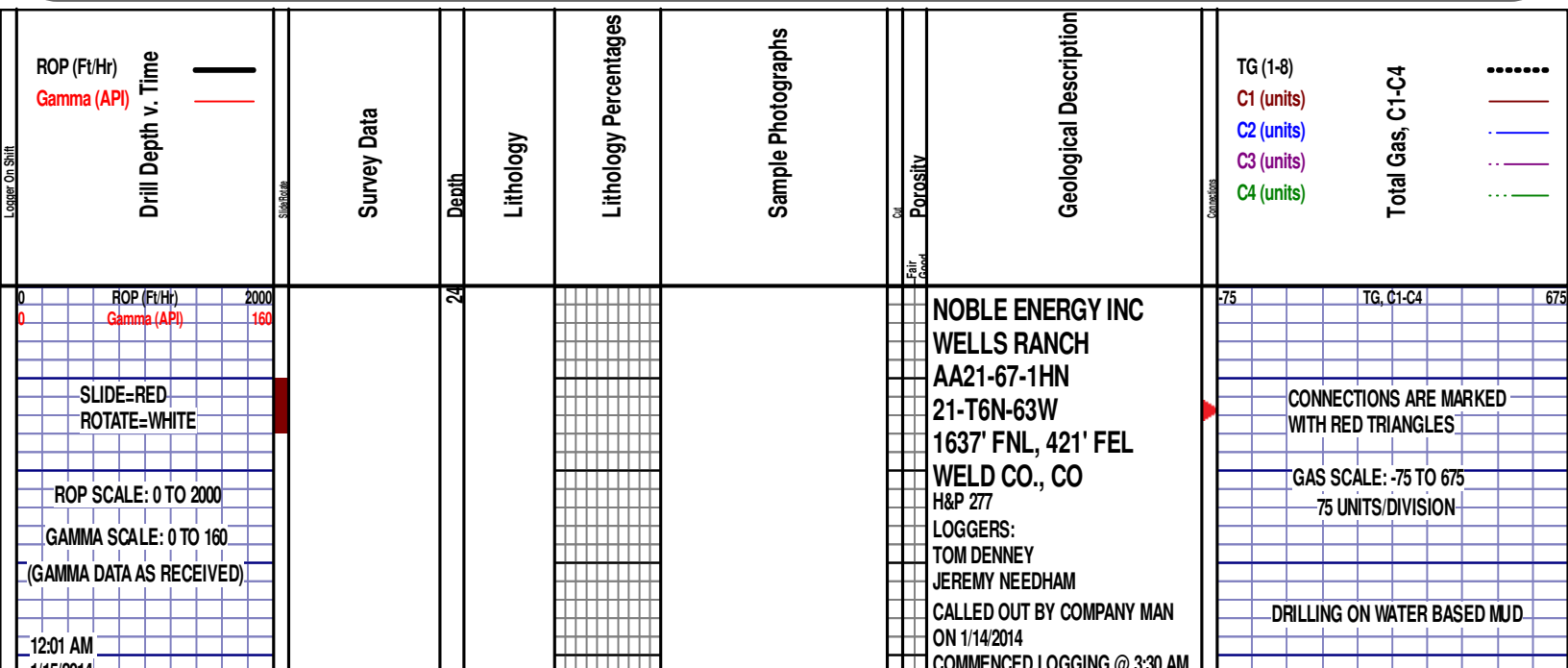
Anhy  
Bent  
Cht  
Clyst  
Coal  
Congl  
Dol

Gyp  
Igne  
Lmst  
Meta  
Mrlst  
Salt  
Shale

Shcol  
Chalk  
Slst  
Ss  
Till  
gw  
Imywash

ogw  
olmywash  
oshly gw  
shly gw  
sdygw  
hvyrcbsh  
nosmpl

Lsdetrit  
sltst  
sdy sh



1/15/2014  
FT/24 HRS 0  
DAY 02

WOB 13.4K  
PP 2340  
RPM 101  
SPM 67/66

MD 2536 TVD 2535.89  
INC 0.8 AZ 129.5  
VS 12.48

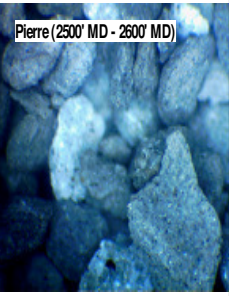
MD 2631 TVD 2630.88  
INC 0.6 AZ 124.4  
VS 11.56

ROP (Ft/Hr) 2000  
Gamma (API) 160

COMMENCED LOGGING @ 08:00 AM  
ON 1/15/2014 @ 2500' MD W/BIT #2,  
8.75", ULTERRA/U519M, (S/N) 20509  
IN @ 970' MD

**PIERRE**  
1026' MD 1026' TVD  
(BEFORE LOGGING DEPTH)

DEPTH 2203'  
WT 8.70  
VIS 30  
PH 10.2  
FIL 27.9  
CL 1400  
CAL 60  
H2O 97.9  
OIL 0.0  
LGS 10.05  
GELS 0/0/0  
PV 1  
YP 4  
CK 1/0  
SOL 1.9



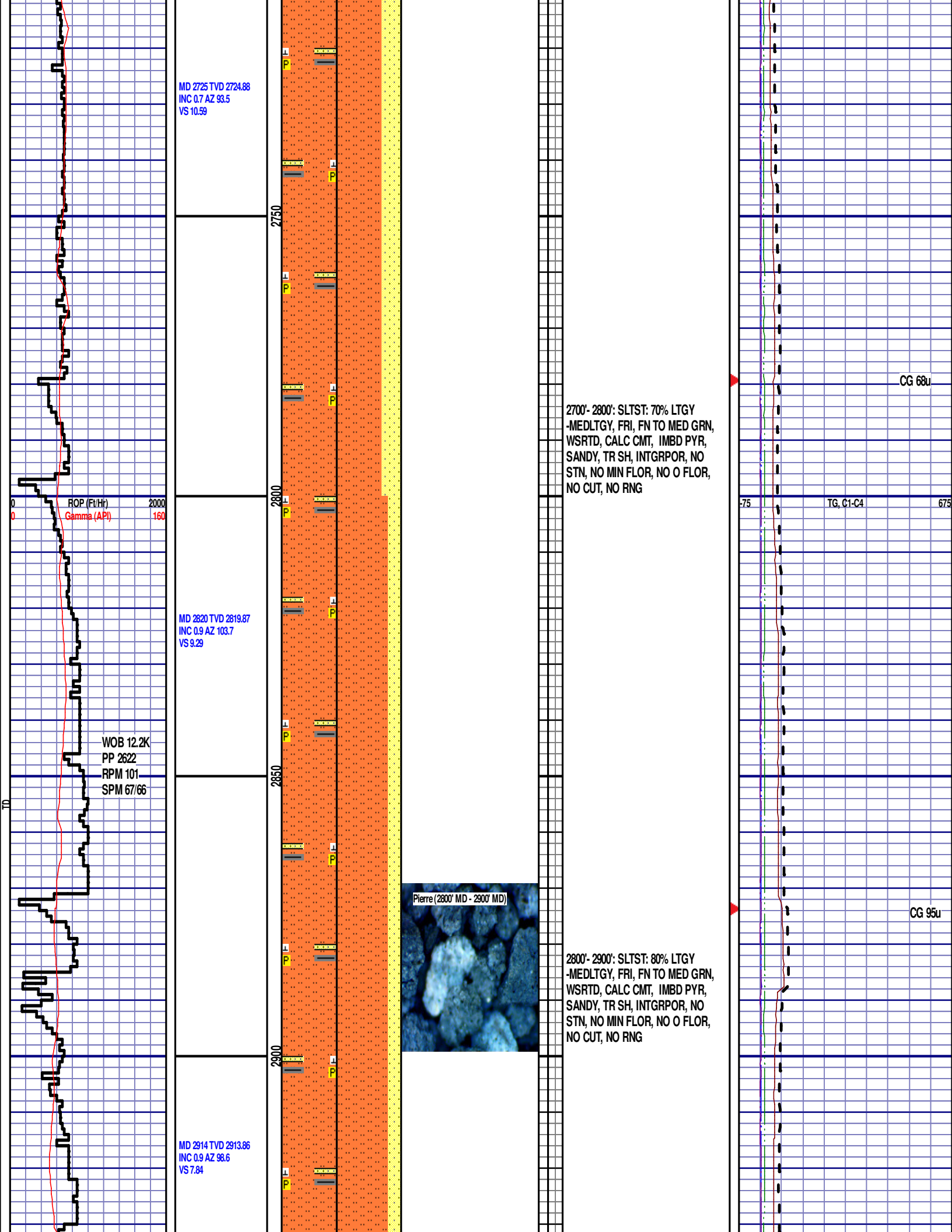
2500'- 2600': SLTST: 75% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
SANDY, TR SH, INTGRPOR, NO  
STN, NO MIN FLOR, NO O FLOR,  
NO CUT, NO RNG

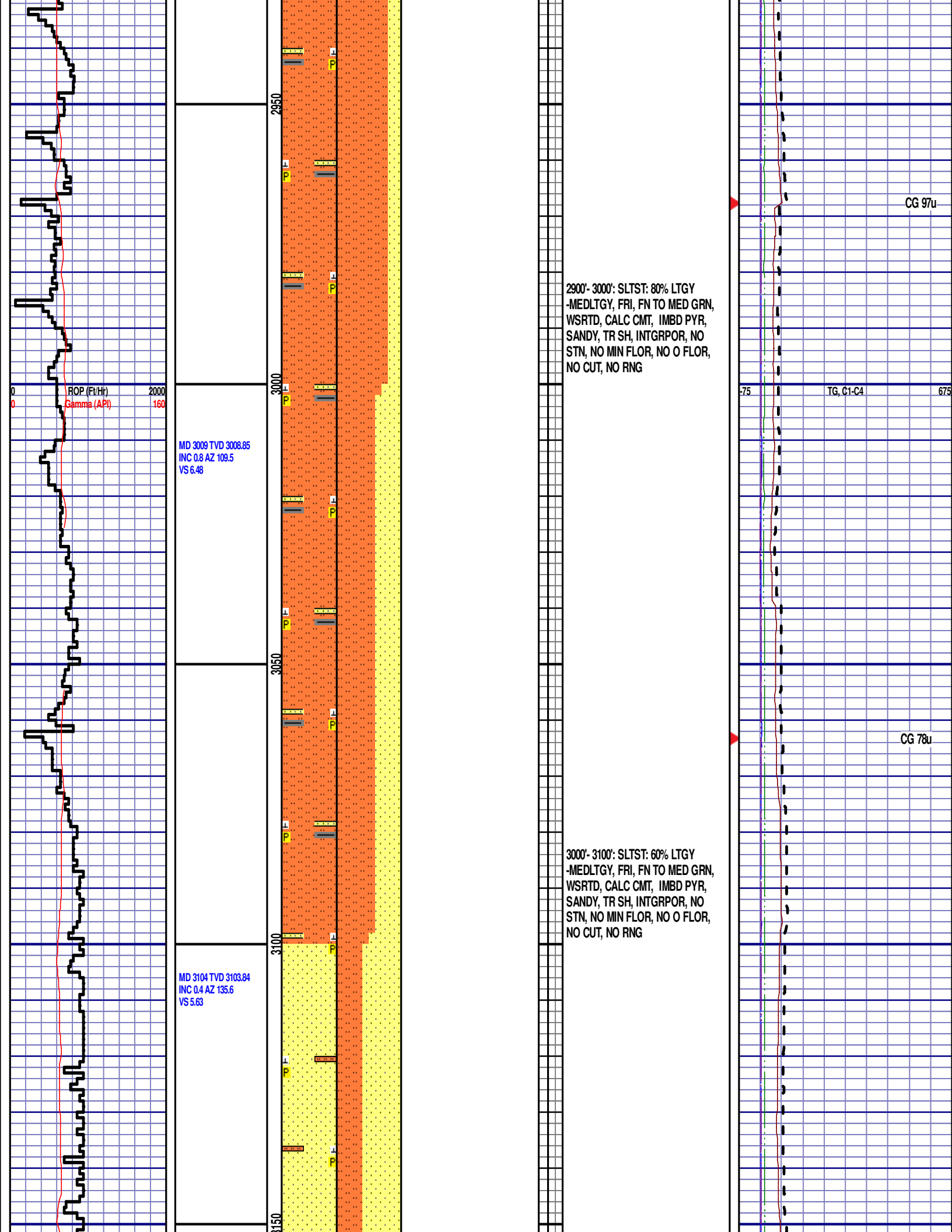
CG 103u

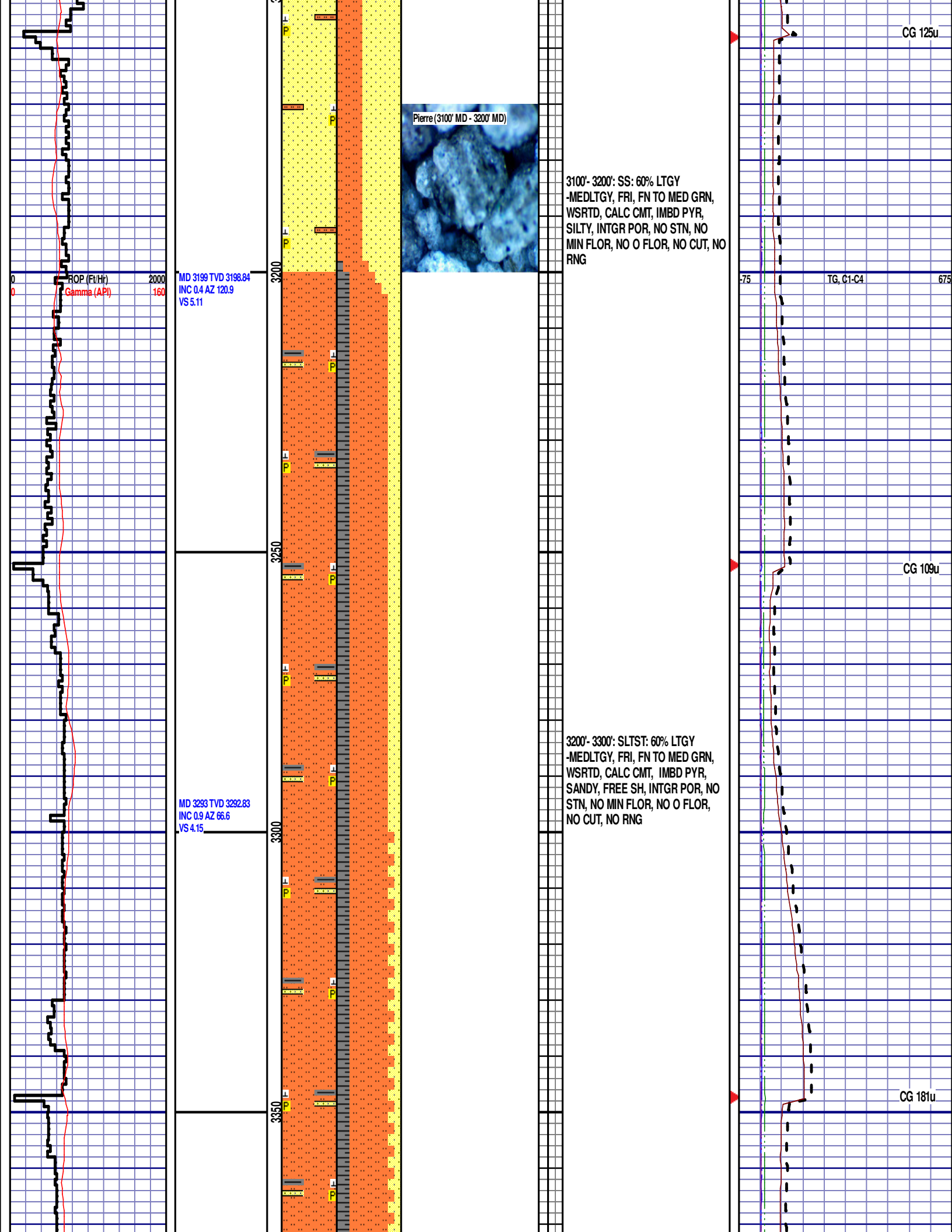
75 TG, C1-C4 675

2600'- 2700': SLTST: 65% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
SANDY, TR SH, INTGRPOR, NO  
STN, NO MIN FLOR, NO O FLOR,  
NO CUT, NO RNG

CG 77u







MD 3388 TVD 3387.81  
INC 1.5 AZ 73.2  
VS 2.27

ROP (Ft/Hr) 2000  
Gamma (API) 160

3400

3450

3500

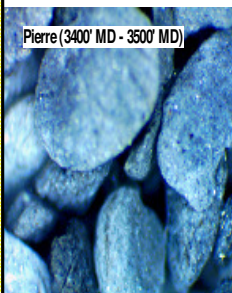
3550

MD 3483 TVD 3482.79  
INC 1 AZ 64.4  
VS 0.33

MD 3578 TVD 3577.77  
INC 1.1 AZ 36.9  
VS -0.97

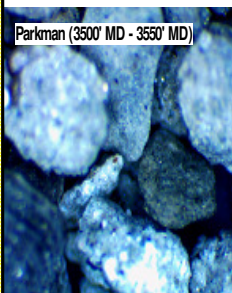
3300'- 3400': SLTST: 65% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
SANDY, FREE SH, INTGR POR, NO  
STN, NO MIN FLOR, NO O FLOR,  
NO CUT, NO RNG

Pierre (3400' MD - 3500' MD)



3400'- 3500': SLTST: 60% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
SANDY, FREE SH, INTGR POR, NO  
STN, NO MIN FLOR, NO O FLOR,  
NO CUT, NO RNG

Parkman (3500' MD - 3550' MD)



## PARKMAN

3535' MD 3535' TVD

3500'- 3550': SS: 70% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
IMBD GLAUC, SILTY, INTGR POR,  
NO STN, NO MIN FLOR, NO O  
FLOR, NO CUT, NO RNG

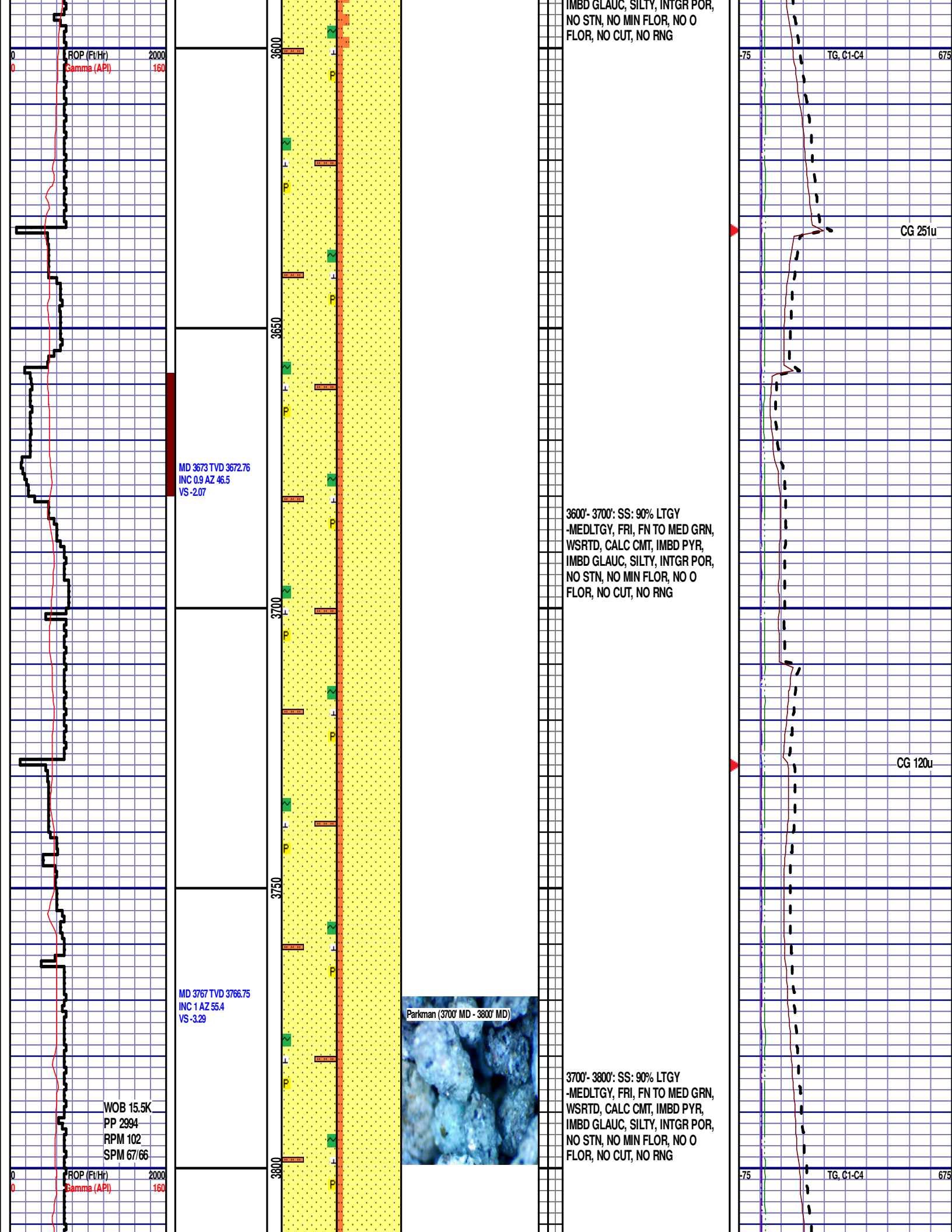
3550'- 3600': SS: 85% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,

TG, C1-C4

CG 173u

CG 106u





IMBD GLAUC, SILTY, INTGR POR,  
NO STN, NO MIN FLOR, NO O  
FLOR, NO CUT, NO RNG

75 TG, C1-C4 675

CG 251u

3600'- 3700': SS: 90% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
IMBD GLAUC, SILTY, INTGR POR,  
NO STN, NO MIN FLOR, NO O  
FLOR, NO CUT, NO RNG

CG 120u

MD 3673 TVD 3672.76  
INC 0.9 AZ 46.5  
VS -2.07

MD 3767 TVD 3766.75  
INC 1 AZ 55.4  
VS -3.29

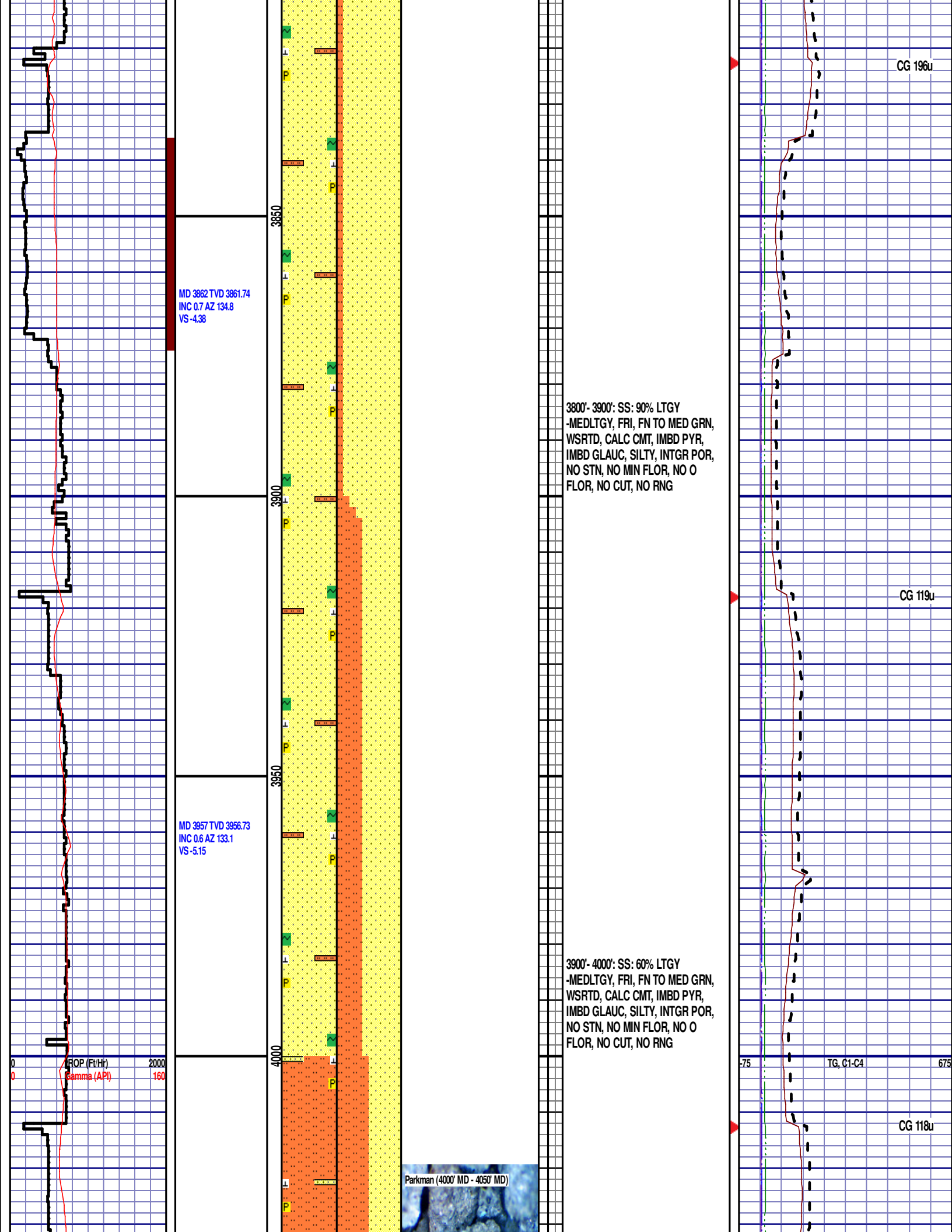
WOB 15.5K  
PP 2994  
RPM 102  
SPM 67/66

Parkman (3700' MD - 3800' MD)

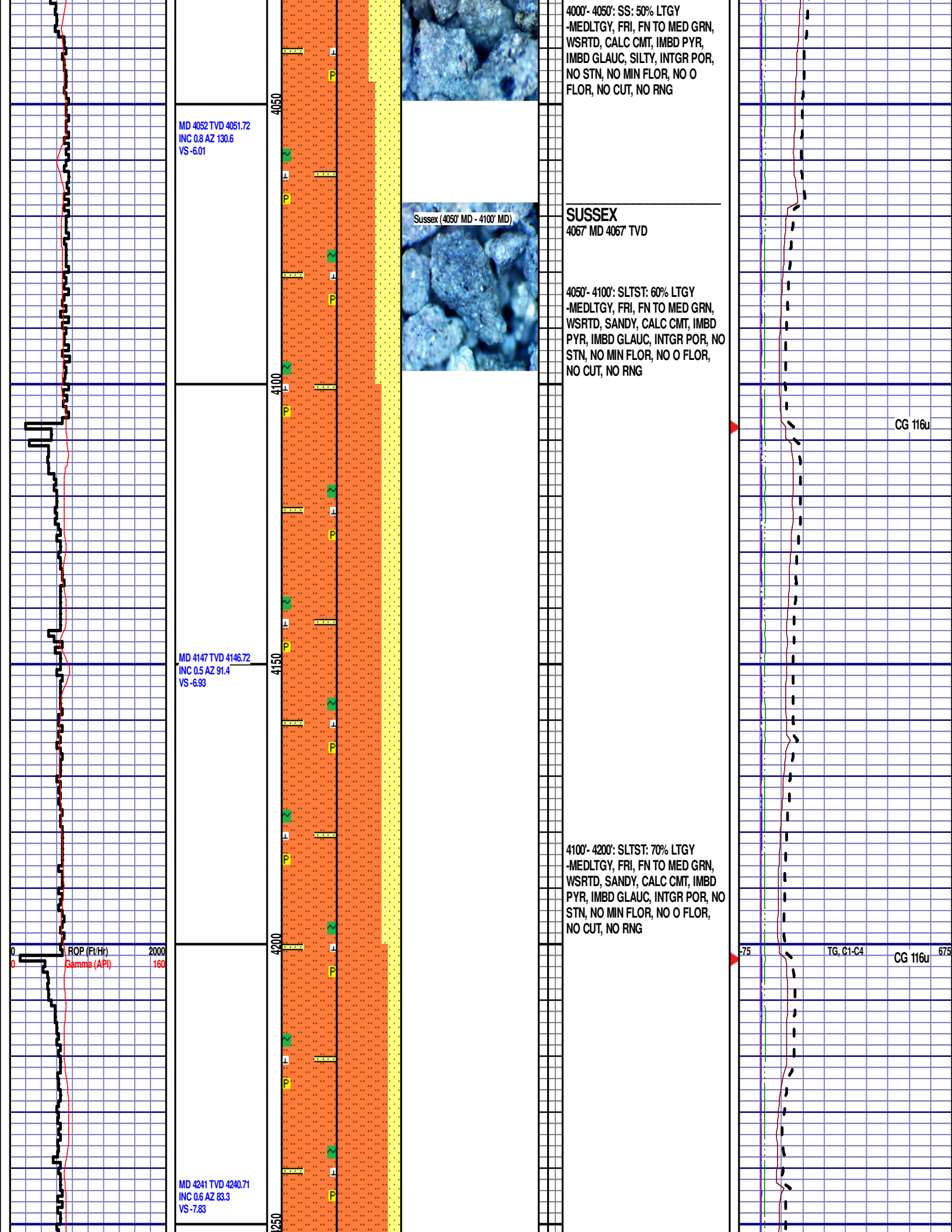


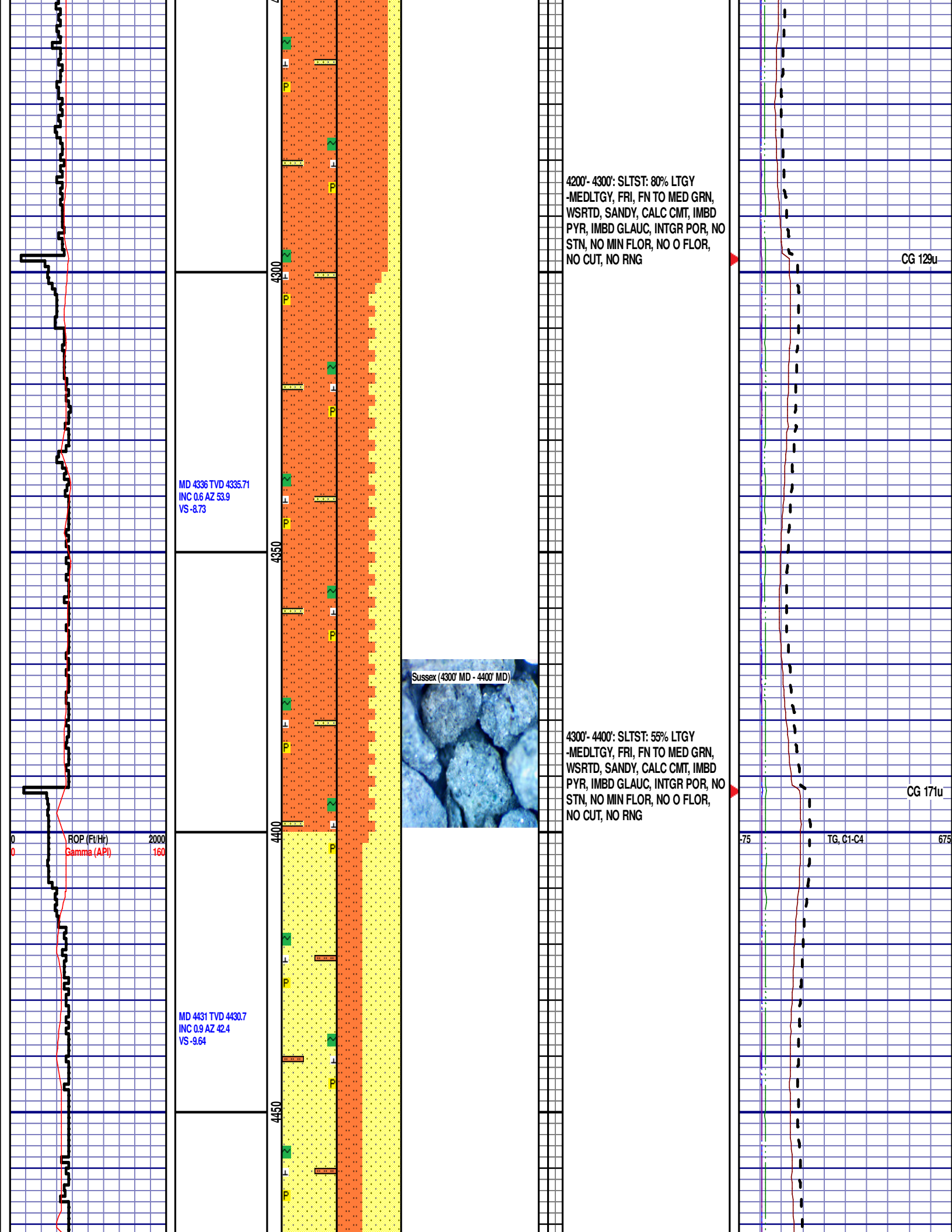
3700'- 3800': SS: 90% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
IMBD GLAUC, SILTY, INTGR POR,  
NO STN, NO MIN FLOR, NO O  
FLOR, NO CUT, NO RNG

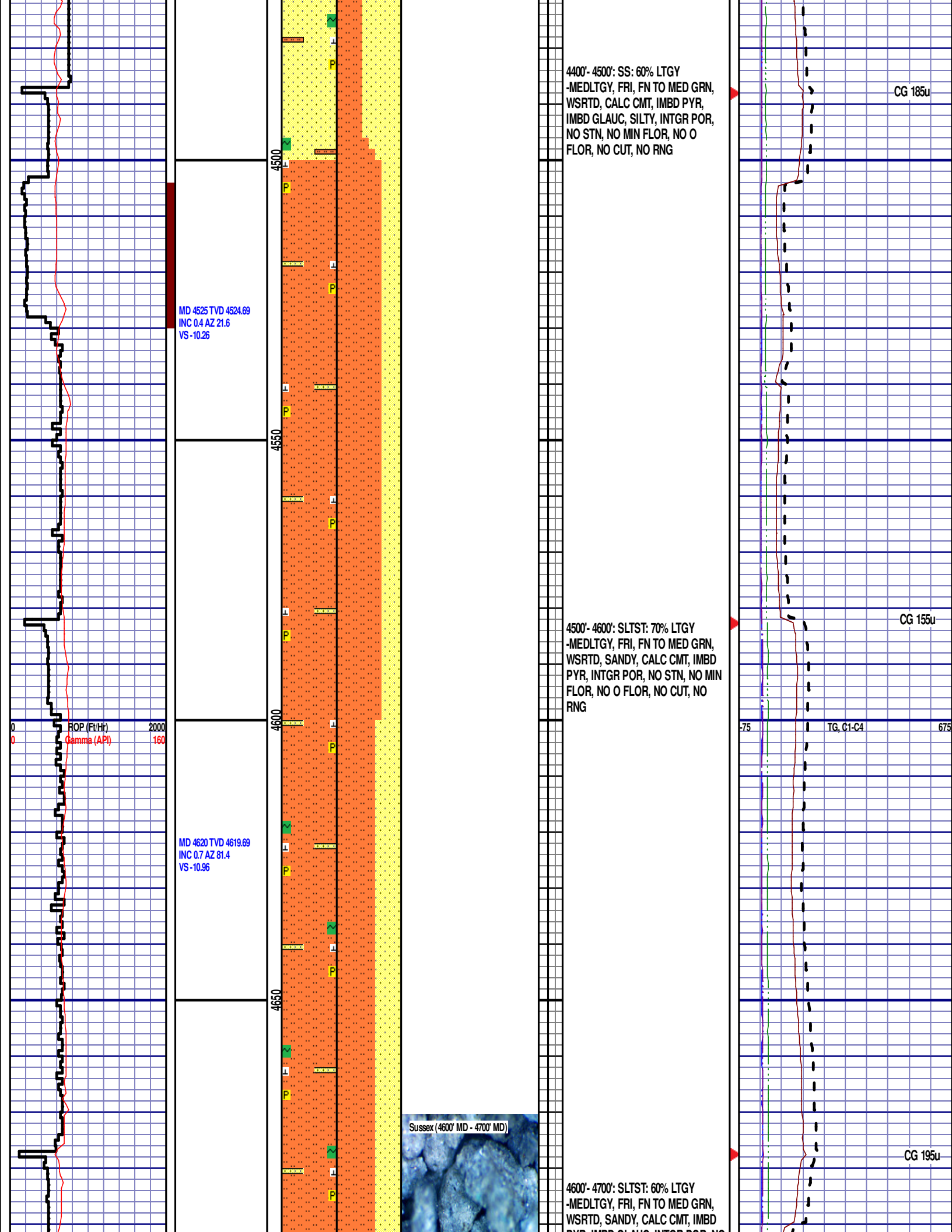
75 TG, C1-C4 675

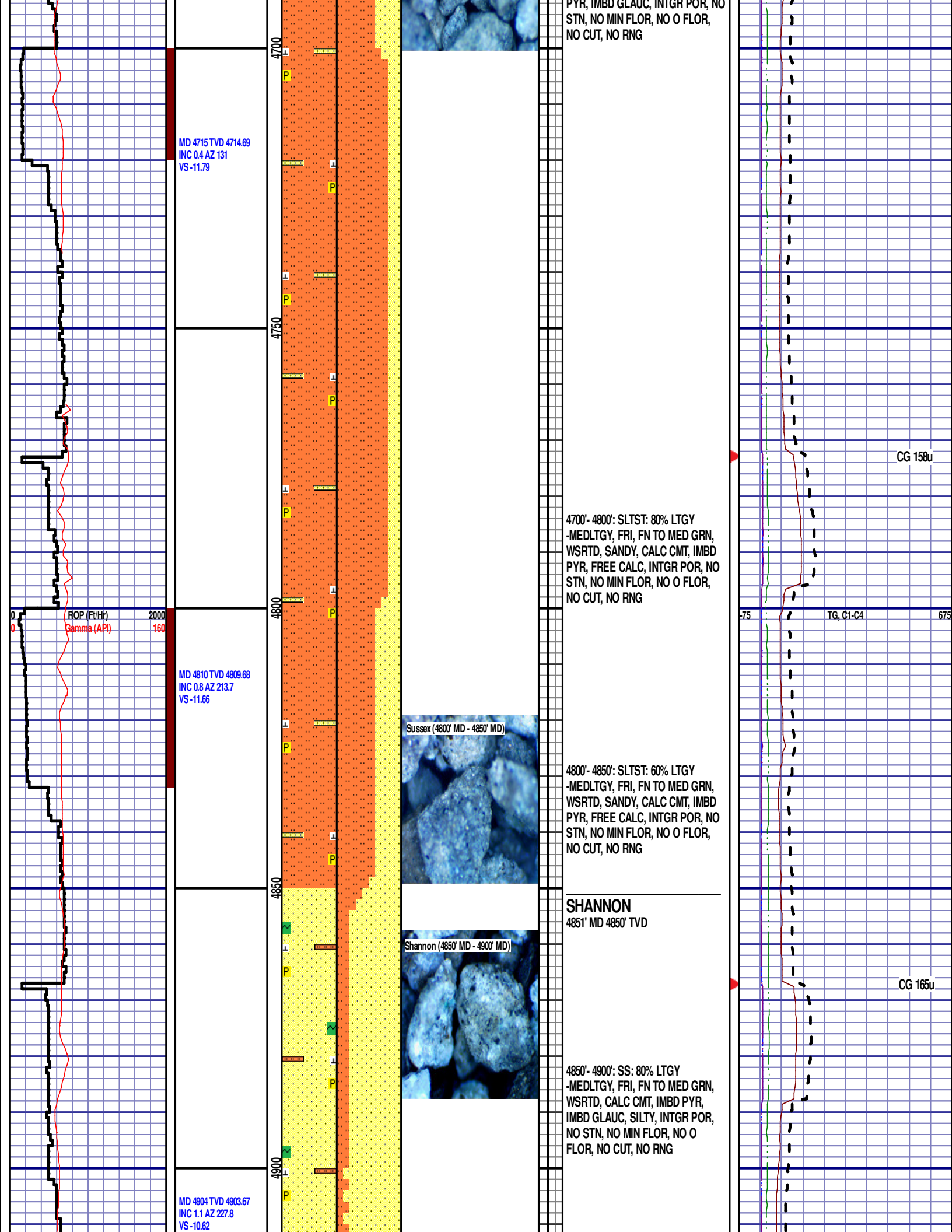


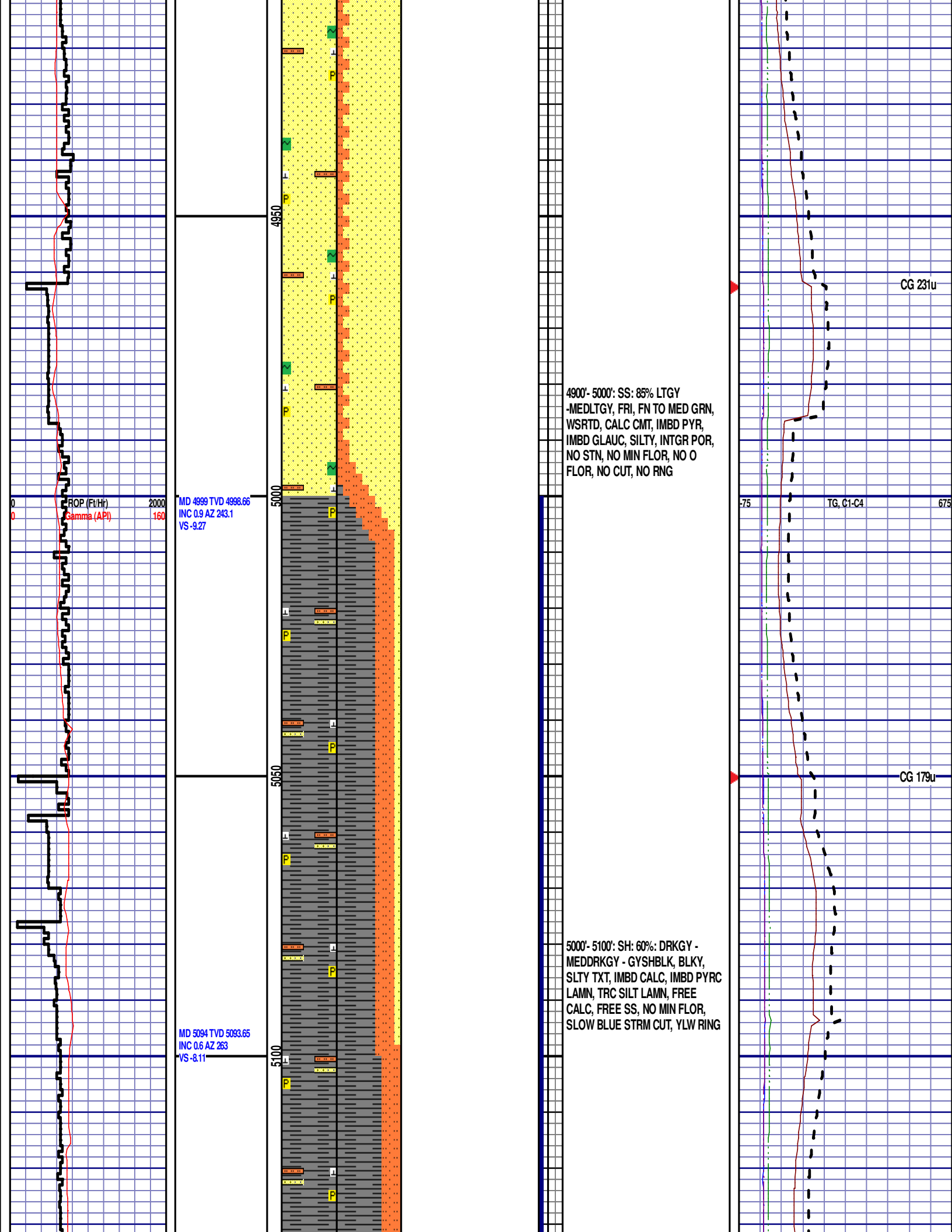


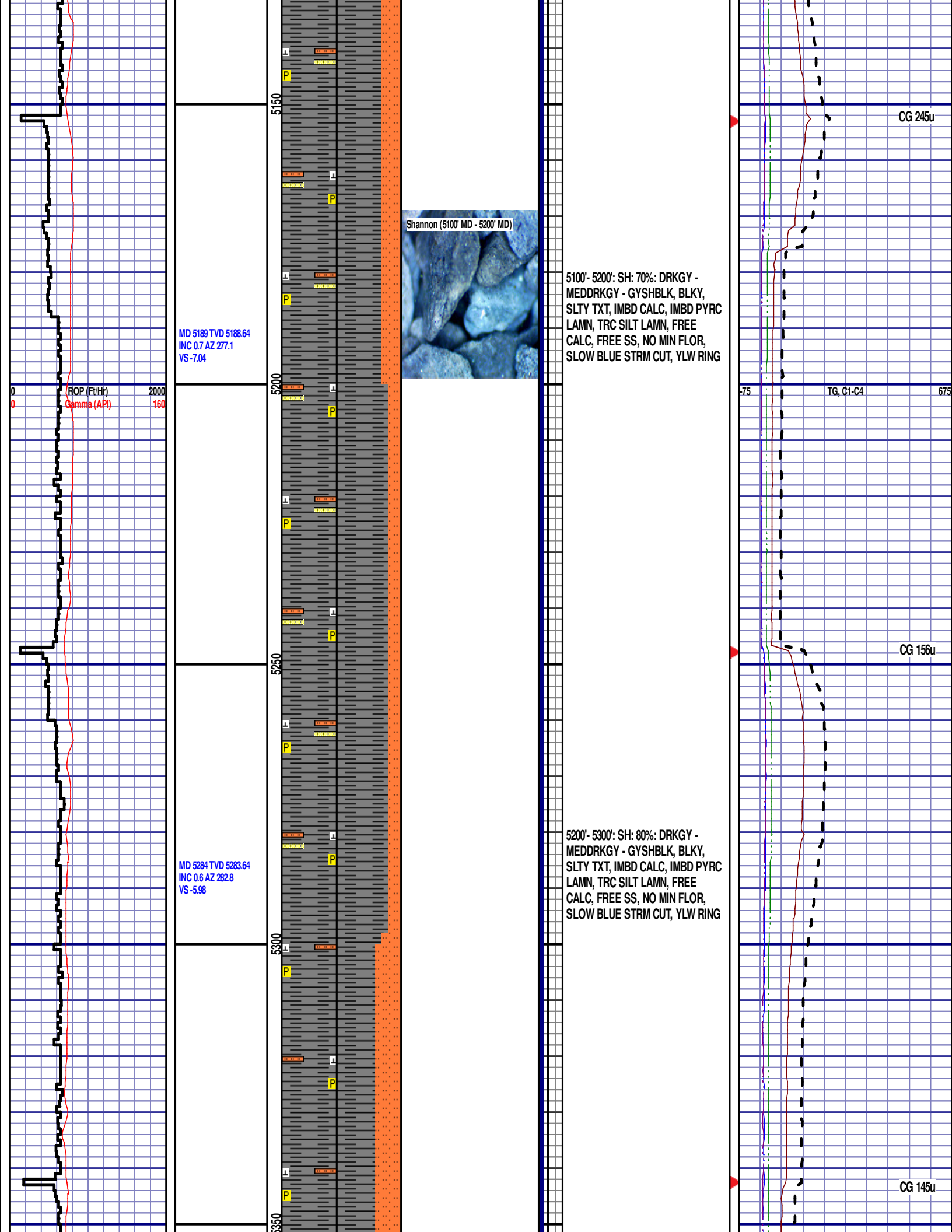














MD 5378 TVD 5377.63  
INC 1.1 AZ 325.8  
VS-5

ROP (Ft/Hr) 2000  
Gamma (API) 160

5300'- 5400': SH: 60%: DRKGY -  
MEDDRKGY - GYSHBLK, BLKY,  
SLTY TXT, IMBD CALC, IMBD PYRC  
LAMN, TRC SILT LAMN, FREE  
CALC, NO MIN FLOR, SLOW BLUE  
STRM CUT, YLW RING

(SHAKER #1 TURNED OFF TO  
CHANGE OUT SCREENS)

CG 80u

DEPTH 5438'  
WT 8.90  
VIS 28  
PH 8.9  
FIL 32.2  
CL 1600  
CAL 80  
H2O 96.8  
OIL 0.0  
LGS 14.69  
GELS 0/0/0  
PV 1  
YP 4  
CK 20  
SOL 2.9

(CLEANED OUT  
POSSUM BELLY)

CG 294u

MD 5473 TVD 5472.61  
INC 1.1 AZ 313.4  
VS-3.84

Shannon (5400' MD - 5500' MD)



5400'- 5500': SH: 60%: DRKGY -  
MEDDRKGY - GYSHBLK, BLKY,  
SLTY TXT, IMBD CALC, IMBD PYRC  
LAMN, TRC SILT LAMN, FREE  
CALC, FREE SS, NO MIN FLOR,  
SLOW BLUE STRM CUT, YLW RING

MD 5568 TVD 5567.59

INC 1.1 AZ 322.8  
VS -2.63

ROP (Ft/Hr)  
Gamma (API)

MD 5663 TVD 5662.57  
INC 1.2 AZ 334.5  
VS -1.67

MD 5757 TVD 5756.54  
INC 1.8 AZ 347.4  
VS -0.94

5600

5650

5700

5750

Shannon (5700' MD - 5800' MD)

5500'- 5600': SH: 80%: DRKGY -  
MEDDRKGY - GYSHBLK, BLKY,  
SLTY TXT, IMBD CALC, IMBD PYRC  
LAMN, TRC SILT LAMN, FREE  
CALC, NO MIN FLOR, SLOW BLUE  
STRM CUT, YLW RING

5600'- 5700': SH: 70%: DRKGY -  
MEDDRKGY - GYSHBLK, BLKY,  
SLTY TXT, IMBD CALC, IMBD PYRC  
LAMN, TRC SILT LAMN, FREE  
CALC, NO MIN FLOR, SLOW BLUE  
STRM CUT, YLW RING

5700'- 5800': SLTST: 70% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
WTO 200' NO STRM CUT, YLW RING

75

TG, C1-C4

675

CG 145u

(CLEANED OUT  
POSSUM BELLY)

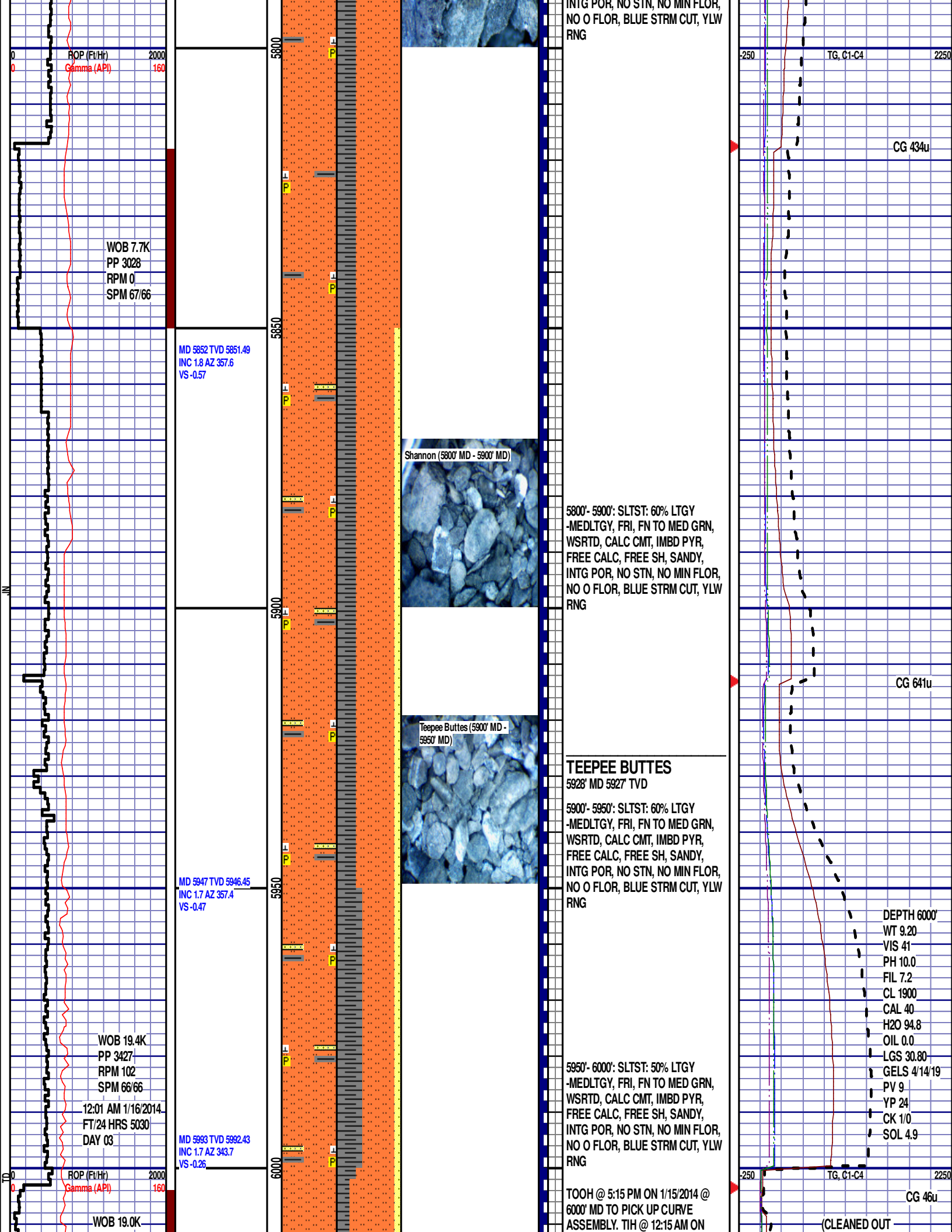
CG 197u

Scale Change  
TG, C1-C4

GAS SCALE: - 250 TO 2250  
(250 UNITS/DIVISION)

250

2250



PP 2087  
RPM 0  
SPM 51/50

MD 6040 TVD 6039.37  
INC 4.2 AZ 292.6  
VS 1.52

MD 6087 TVD 6086.09  
INC 8.2 AZ 281.5  
VS 6.38

MD 6135 TVD 6133.37  
INC 11.5 AZ 281.6  
VS 14.41

ROP (Ft/Hr) 2000  
Gamma (API) 160

MD 6229 TVD 6224.45

6050

6100

6150

6200

Teepee Buttes (6180' MD - 6210' MD)



1/16/2014. RESUMED DRILLING @  
8:02 AM ON 1/16/2014 W/ BIT #3,  
8.75", SMITH/SDI513, (S/N) JH7451 IN  
@ 6000' MD.

SWITCHING TO 30' SAMPLE  
INTERVAL

6000'- 6060': SLTST: 70% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, BLUE STRM CUT, YLW  
RNG

6060'- 6090': SLTST: 80% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, BLUE STRM CUT, YLW  
RNG

6090'- 6120': SLTST: 60% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, IMMED BLUE STRM  
CUT, YLW RNG

6120'- 6150': SLTST: 60% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, IMMED BLUE STRM  
CUT, YLW RNG

6150'- 6180': SLTST: 70% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, IMMED BLUE STRM  
CUT, YLW RNG

6180'- 6210': SLTST: 80% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, IMMED BLUE STRM  
CUT, YLW RNG

6210'- 6240': SLTST: 70% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, IMMED BLUE STRM  
CUT, YLW RNG

POSSUM BELLY)

CG 263u

CG 240u

TG, C1-C4

INC 17 AZ 275  
VS 37.28

MD 6324 TVD 6313.81  
INC 22.6 AZ 268.3  
VS 69.38

ROP (Ft/Hr)  
Gamma (API)

2000  
160

MD 6419 TVD 6398.88  
INC 30.1 AZ 268.3  
VS 111.51

6250

6300

6350

6400

6450

INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, IMMED BLUE STRM  
CUT, YLW RNG

6240'- 6270': SLTST: 70% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, IMMED BLUE STRM  
CUT, YLW RNG

6270'- 6300': SLTST: 60% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, IMMED BLUE STRM  
CUT, YLW RNG

6300'- 6330': SLTST: 55% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, SANDY,  
INTG POR, NO STN, NO MIN FLOR,  
NO O FLOR, IMMED BLUE STRM  
CUT, YLW RNG

6330'- 6360': SLTST: 55% LTGY  
-MEDLTGY, FRI, FN TO MED GRN,  
WSRTD, CALC CMT, IMBD PYR,  
FREE CALC, FREE SH, INTG POR,  
NO STN, NO MIN FLOR, NO O  
FLOR, IMMED BLUE STRM CUT,  
YLW RNG

6360'- 6390': SH: 60%: DRKGY -  
MEDDRKGY - GYSHBLK, BLKY,  
SLTY TXT, IMBD CALC, IMBD PYRC  
LAMN, SILTY, NO MIN FLOR, IMMED  
BLUE STRM CUT, YLW RNG

6390'- 6420': SH: 70%: DRKGY -  
MEDDRKGY - GYSHBLK, BLKY,  
SLTY TXT, IMBD CALC, IMBD PYRC  
LAMN, SILTY, NO MIN FLOR, IMMED  
BLUE STRM CUT, YLW RNG

6420'- 6450': SH: 60%: DRKGY -  
MEDDRKGY - GYSHBLK, BLKY,  
SLTY TXT, IMBD CALC, IMBD PYRC  
LAMN, SILTY, NO MIN FLOR, IMMED  
BLUE STRM CUT, YLW RING

CG 442u

CG 630u

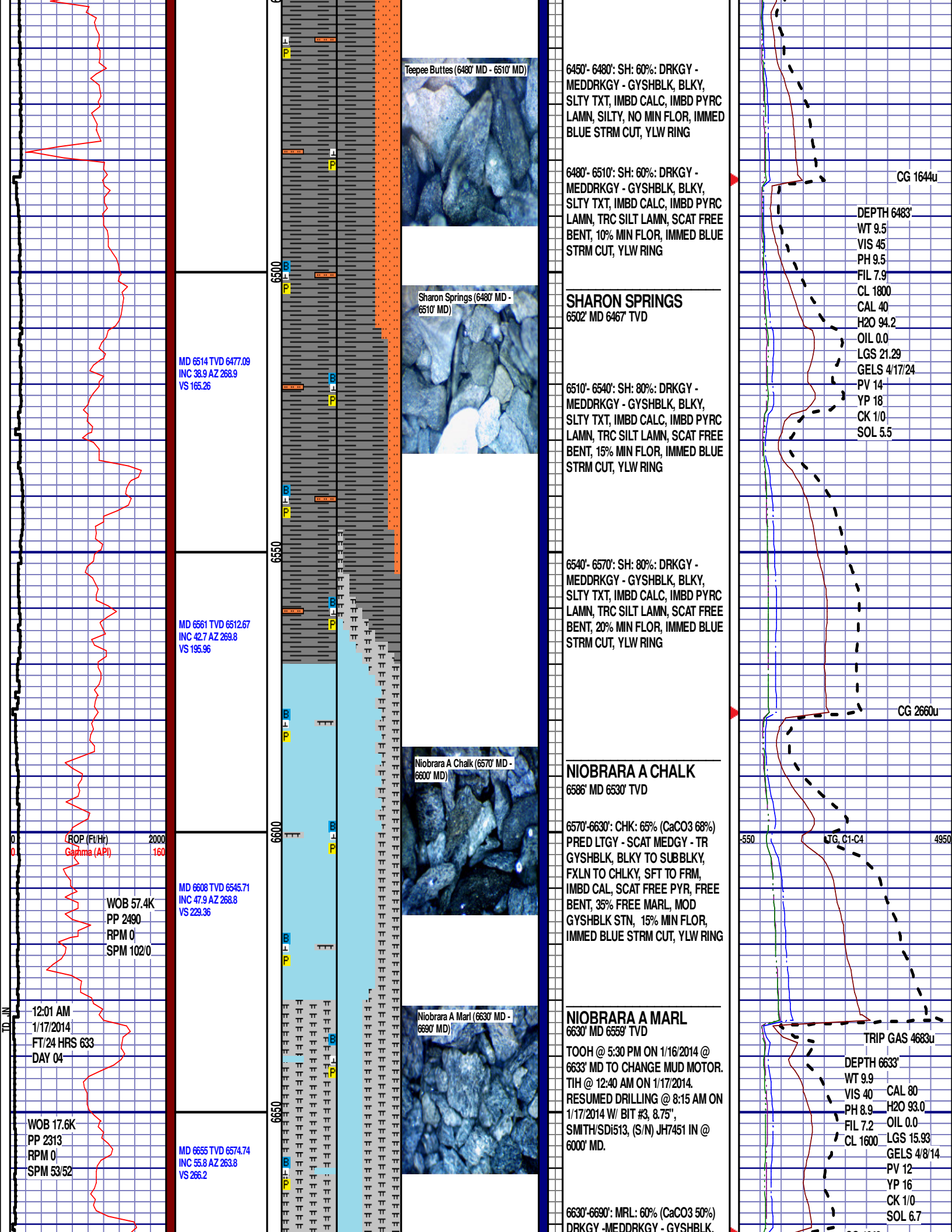
Scale Change  
TG, C1-C4

GAS SCALE: -550 TO 4950  
(550 UNITS/DIVISION)

-550

4950

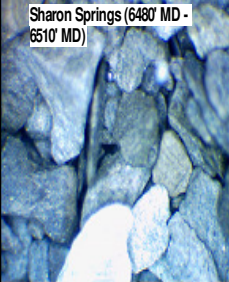




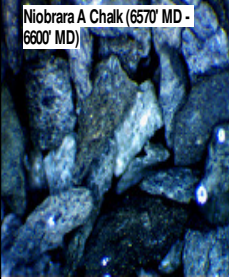
Teepee Buttes (6480' MD - 6510' MD)



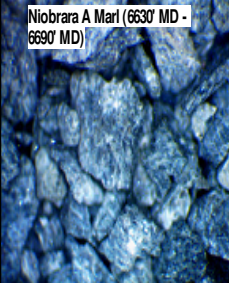
Sharon Springs (6480' MD - 6510' MD)



Niobrara A Chalk (6570' MD - 6600' MD)



Niobrara A Marl (6630' MD - 6690' MD)



6450'- 6480': SH: 60%: DRKGY - MEDDRKGY - GYSHBLK, BLKY, SLTY TXT, IMBD CALC, IMBD PYRC LAMN, SILTY, NO MIN FLOR, IMMED BLUE STRM CUT, YLW RING

6480'- 6510': SH: 60%: DRKGY - MEDDRKGY - GYSHBLK, BLKY, SLTY TXT, IMBD CALC, IMBD PYRC LAMN, TRC SILT LAMN, SCAT FREE BENT, 10% MIN FLOR, IMMED BLUE STRM CUT, YLW RING

### SHARON SPRINGS

6502' MD 6467' TVD

6510'- 6540': SH: 80%: DRKGY - MEDDRKGY - GYSHBLK, BLKY, SLTY TXT, IMBD CALC, IMBD PYRC LAMN, TRC SILT LAMN, SCAT FREE BENT, 15% MIN FLOR, IMMED BLUE STRM CUT, YLW RING

6540'- 6570': SH: 80%: DRKGY - MEDDRKGY - GYSHBLK, BLKY, SLTY TXT, IMBD CALC, IMBD PYRC LAMN, TRC SILT LAMN, SCAT FREE BENT, 20% MIN FLOR, IMMED BLUE STRM CUT, YLW RING

### NIOBRARA A CHALK

6586' MD 6530' TVD

6570'-6630': CHK: 65% (CaCO3 68%)  
PRED LTGY - SCAT MEDGY - TR GYSHBLK, BLKY TO SUBBLKY, FXLN TO CHLKY, SFT TO FRM, IMBD CAL, SCAT FREE PYR, FREE BENT, 35% FREE MARL, MOD GYSHBLK STN, 15% MIN FLOR, IMMED BLUE STRM CUT, YLW RING

### NIOBRARA A MARL

6630' MD 6559' TVD

TOOH @ 5:30 PM ON 1/16/2014 @ 6633' MD TO CHANGE MUD MOTOR. TIH @ 12:40 AM ON 1/17/2014. RESUMED DRILLING @ 8:15 AM ON 1/17/2014 W/ BIT #3, 8.75", SMITH/SDI513, (S/N) JH7451 IN @ 6000' MD.

6630'-6690': MRL: 60% (CaCO3 50%)  
DRKGY -MEDDRKGY - GYSHBLK

CG 1644u

DEPTH 6483'

WT 9.5  
VIS 45  
PH 9.5  
FIL 7.9  
CL 1800  
CAL 40  
H2O 94.2  
OIL 0.0  
LGS 21.29  
GELS 4/17/24  
PV 14  
YP 18  
CK 1/0  
SOL 5.5

CG 2660u

TG, C1-C4

TRIP GAS 4683u

DEPTH 6633'

WT 9.9  
VIS 40  
PH 8.9  
FIL 7.2  
CL 1600  
CAL 80  
H2O 93.0  
OIL 0.0  
LGS 15.93  
GELS 4/8/14  
PV 12  
YP 16  
CK 1/0  
SOL 6.7



MD 6703 TVD 6598.65  
INC 64.4 AZ 260.1  
VS 307.39

WOB 25.2K  
PP 2479  
RPM 0  
SPM 53/53

6700

6750

00

B  
P

P

SOFT TO BRITTLE, FREE CALC,  
SCAT PYRC LAMN, IMBD CALC,  
FREE BENT, 40% FREE CHK, PRED  
LTGY - SCAT MEDGY, 10% MIN  
FLOR, IMMED BLUE STRM CUT,  
YLW RING

6690'-6720': MRL: 70% (CaCO3 52%)  
DRKGY -MEDDRKGY - GYSHBLK,  
SOFT TO BRITTLE, FREE CALC,  
SCAT PYRC LAMN, IMBD CALC, 30%  
FREE CHK, PRED LTGY - SCAT  
MEDGY, 5% MIN FLOR, IMMED  
BLUE STRM CUT, YLW RING

6720'-6750': MRL: 80% (CaCO3 50%)  
DRKGY -MEDDRKGY - GYSHBLK,  
SOFT TO BRITTLE, FREE CALC,  
SCAT PYRC LAMN, IMBD CALC, 20%  
FREE CHK, PRED LTGY - SCAT  
MEDGY, 5% MIN FLOR, IMMED  
BLUE STRM CUT, YLW RING

END OF VERTICAL LOG @ 6750' MD  
ON 1/17/2014, CONTINUED ON  
HORIZONTAL LOG.

CG 1942u