



Weatherford

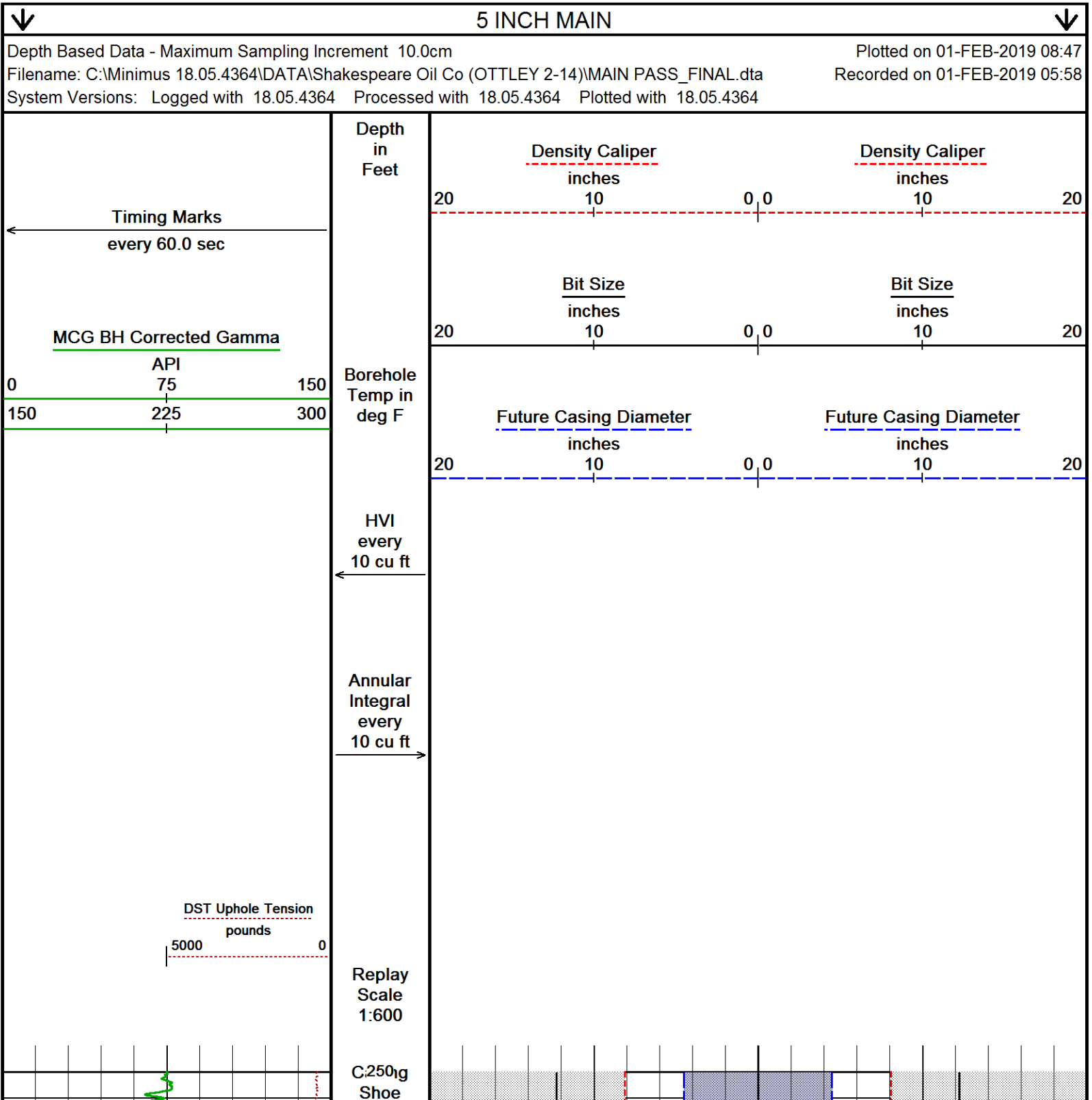
CALIPER LOG

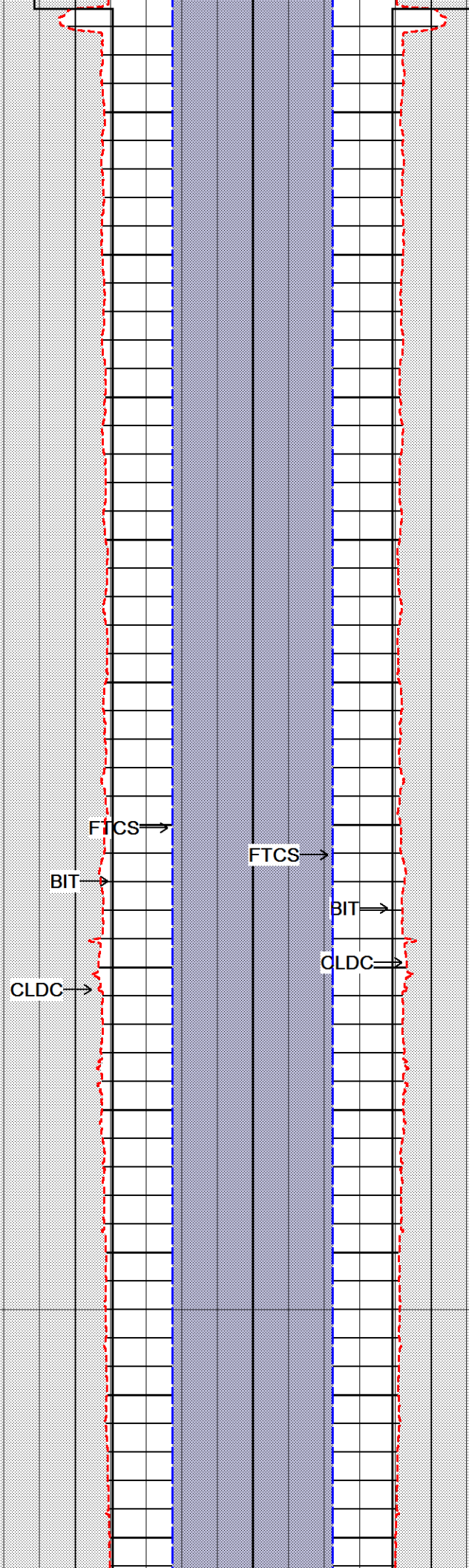
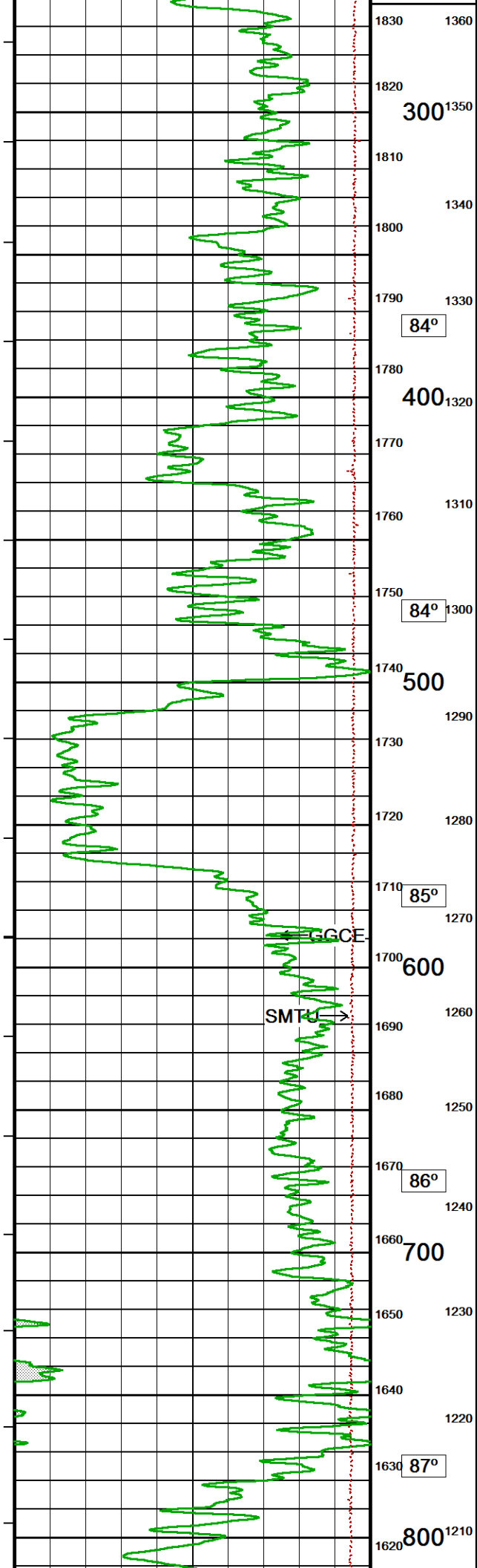
COMPANY										SHAKESPEARE OIL CO., INC.									
WELL										K OTTLEY 2-14									
FIELD										WILDCAT									
PROVINCE/COUNTY										LOGAN									
COUNTRY/STATE										USA / KANSAS									
LOCATION										NW-SW-SE-SE 500' FSL & 1150' FEL									
SEC 14		TWP 14S		RGE 32W		Other Services				PHOTO DENSITY									
Latitude		38.831151				ARRAY INDUCTION				MICRO RESISTIVITY									
Longitude		-100.8393015				DUAL SPACED NEUTRON													
API Number		15-109-21579																	
Permanent Datum Ground Level, Elevation 2791 feet										Elevations: feet									
Log Measured From KB, 9.00 feet above Permanent Datum										KB 2800.00									
Drilling Measured From KB										DF 2791.00									
Date		01-FEB-2019																	
Run Number		ONE																	
Service Order		18148-236170428																	
Depth Driller		4550.00								feet									
Depth Logger		4548.00								feet									
First Reading		4532.80								feet									
Last Reading		262.00								feet									
Casing Driller		264.00								feet									
Casing Logger		262.00								feet									
Bit Size		7.875								inches									
Hole Fluid Type		WATER BASED																	
Density / Viscosity		9.40		lb/USg		57.00		sec/qt											
PH / Fluid Loss		10.00				9.60		ml/30Min											
Sample Source		FLOW LINE																	
Rm @ Measured Temp		0.45 @ 83.0								ohm-m									
Rmf @ Measured Temp		0.40 @ 83.0								ohm-m									
Rmc @ Measured Temp		0.54 @ 83.0								ohm-m									
Source Rmf / Rmc		CALC				CALC													
Rm @ BHT		0.34 @ 111.0								ohm-m									
Time Since Circulation		3.0 HOURS																	
Max Recorded Temp		111.00								deg F									
Equipment / Base		13244				LIB													
Recorded By		S. WIGHT																	
Witnessed By		TIM LAUER																	

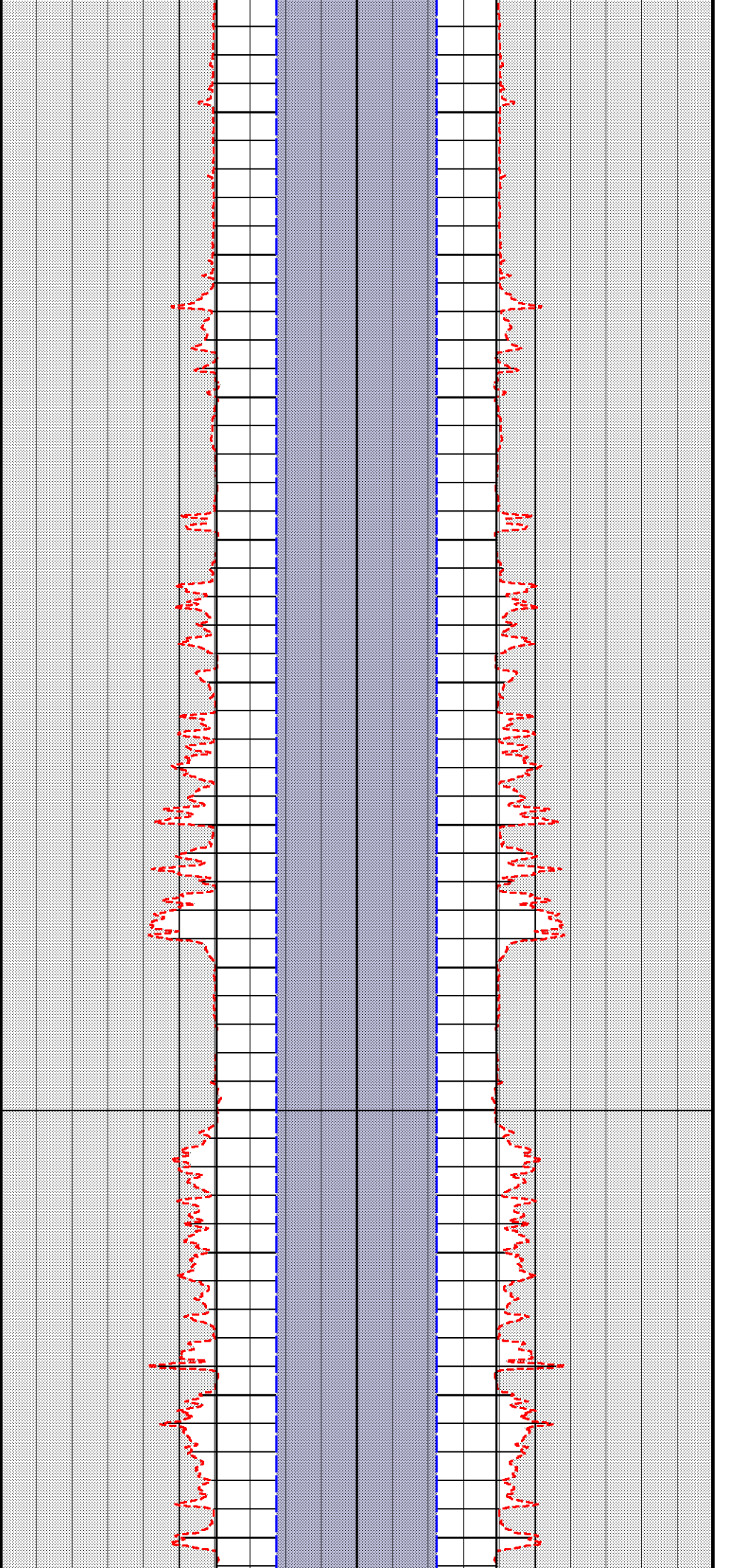
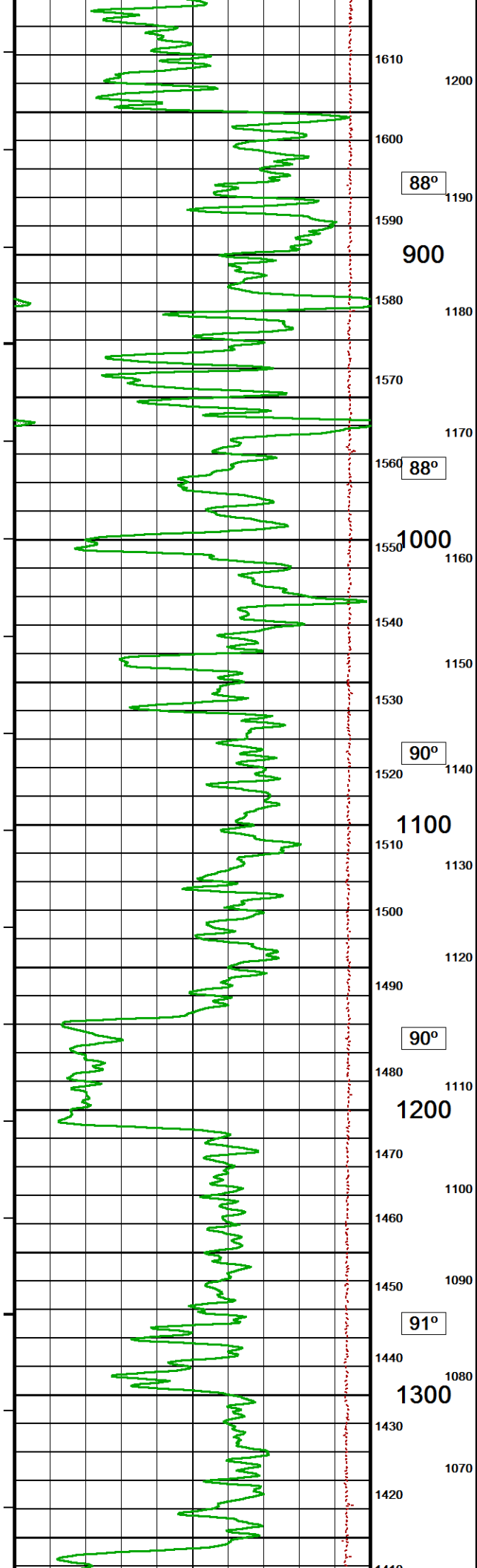
BOREHOLE RECORD					Last Edited: 01-FEB-2019 07:24
Bit Size inches		Depth From feet		Depth To feet	
12.250		0.00		264.00	
7.875		264.00		4550.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	8.625	0.00	264.00	24.00	

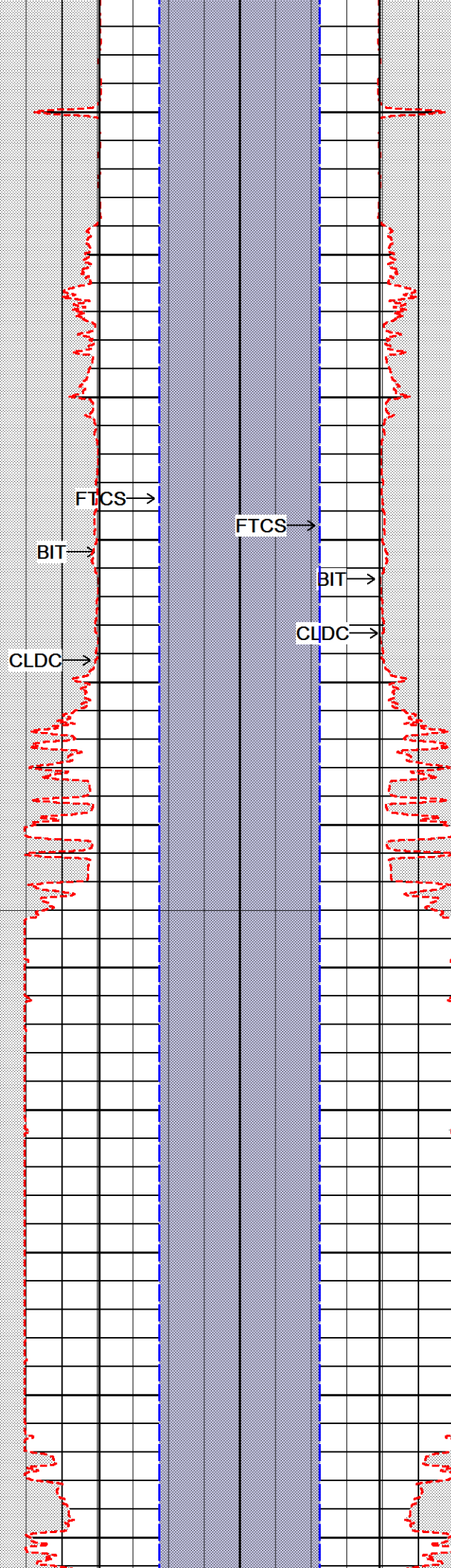
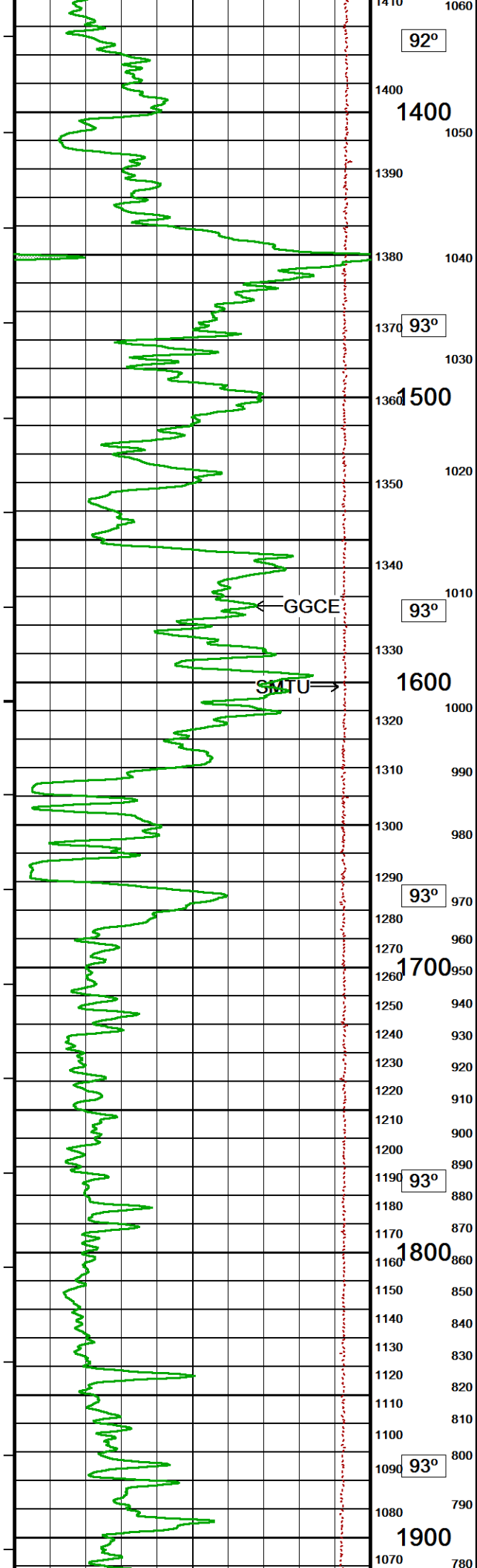
REMARKS
- RUN ONE: MCG, MML, MDN, MPD, MAI RUN IN COMBINATION. - HARDWARE: DUAL BOWSPRING USED ON MDN. 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 1835 CU.FT.
- ANNULAR HOLE VOLUME WITH 4.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING: 1360 CU.FT.
- RIG: DUKE #4.
- OPERATOR: B TOVAR, B COPELAND, D STEELE

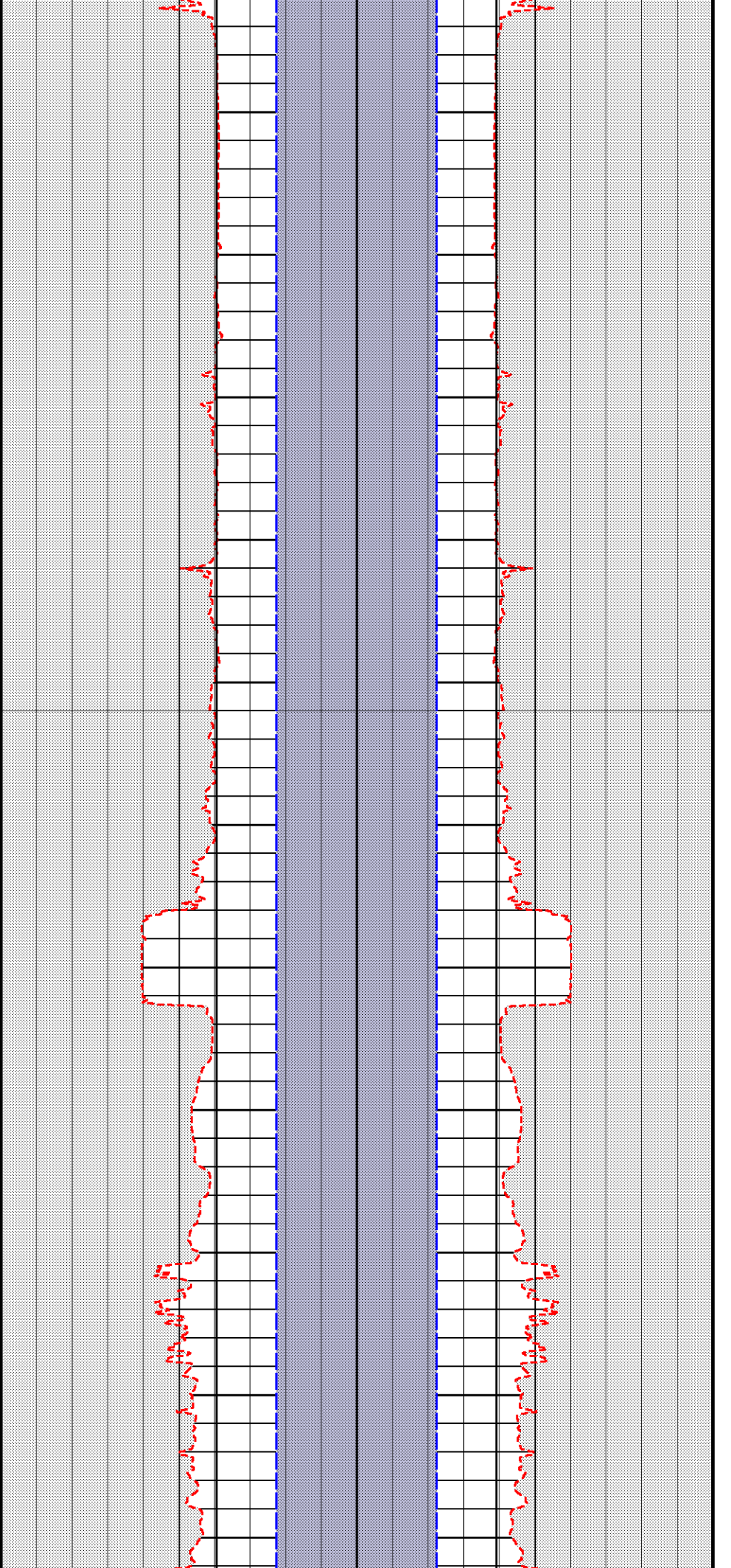
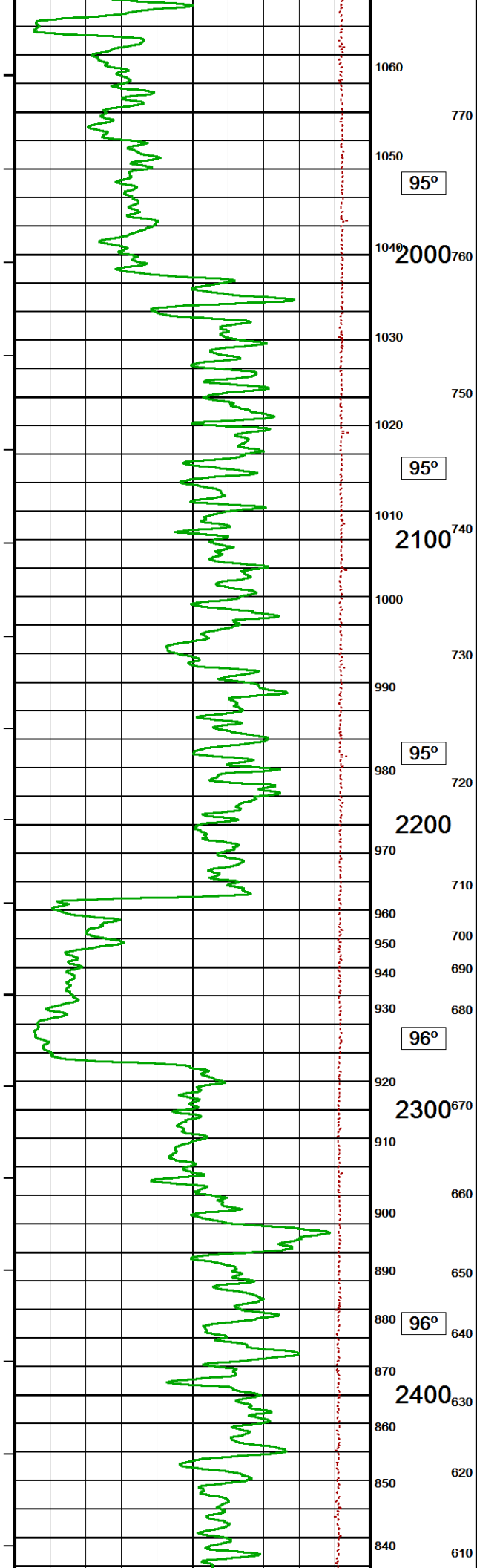
In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.

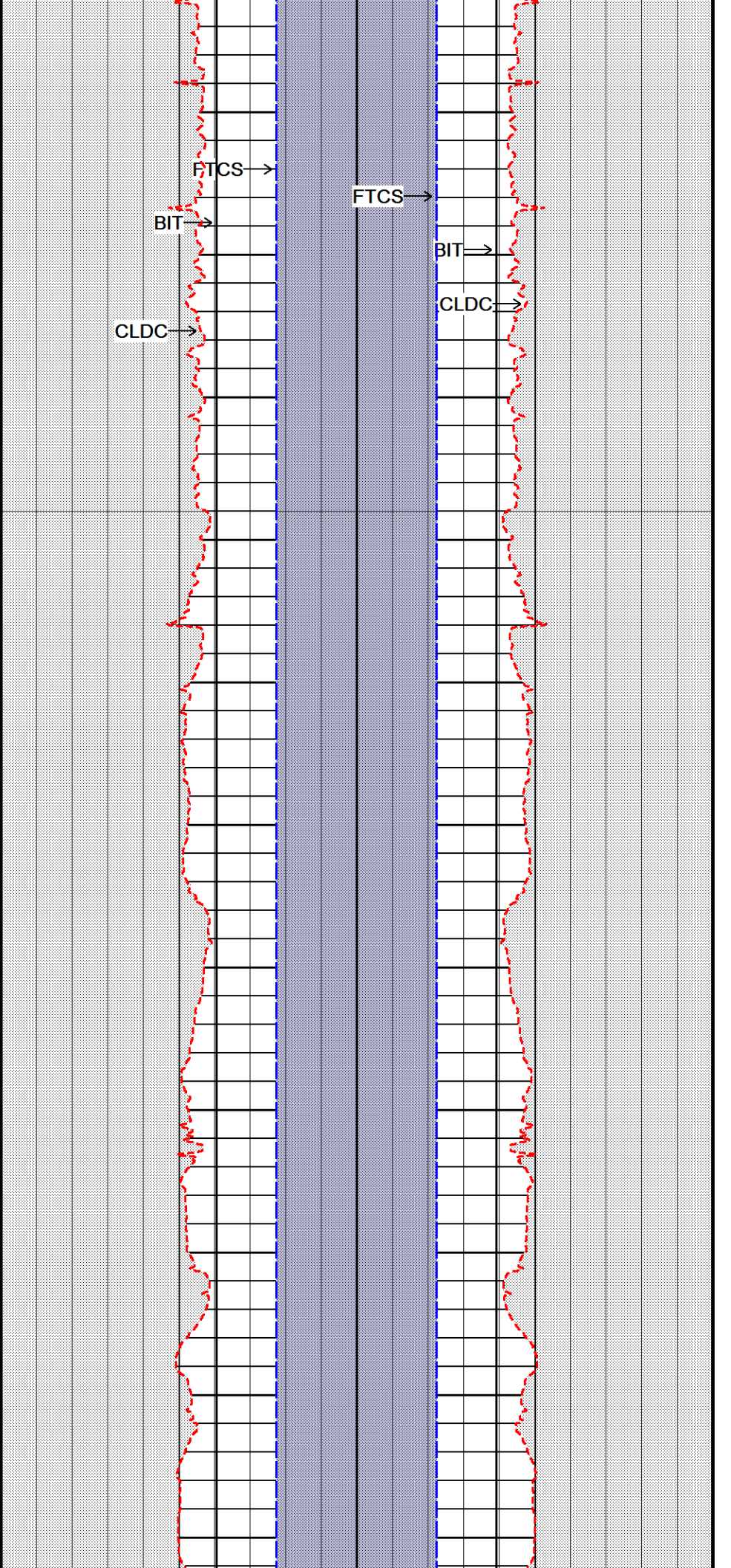
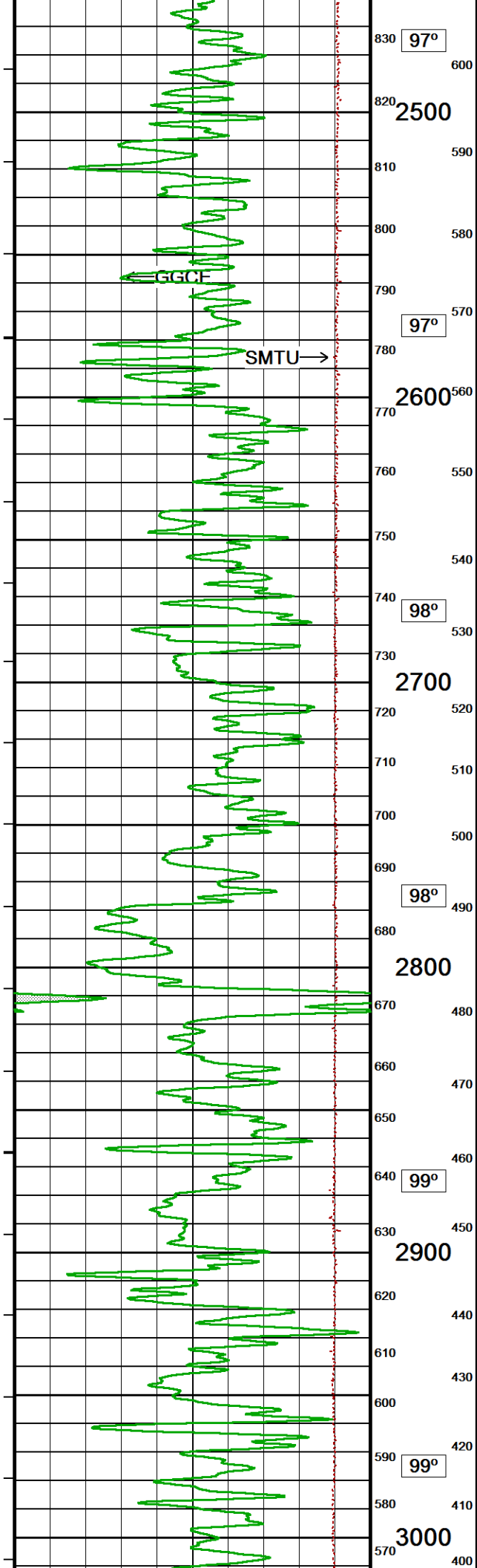


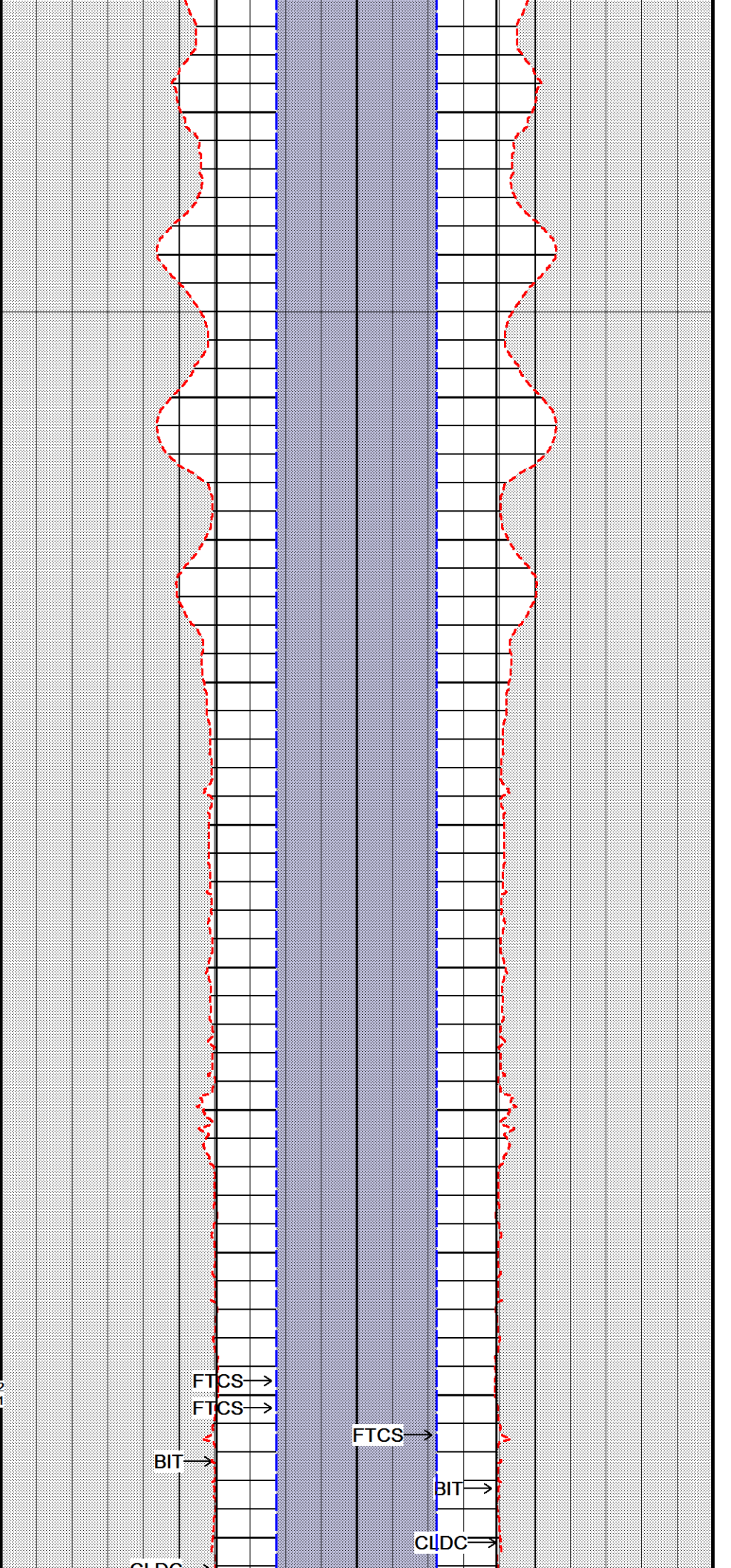
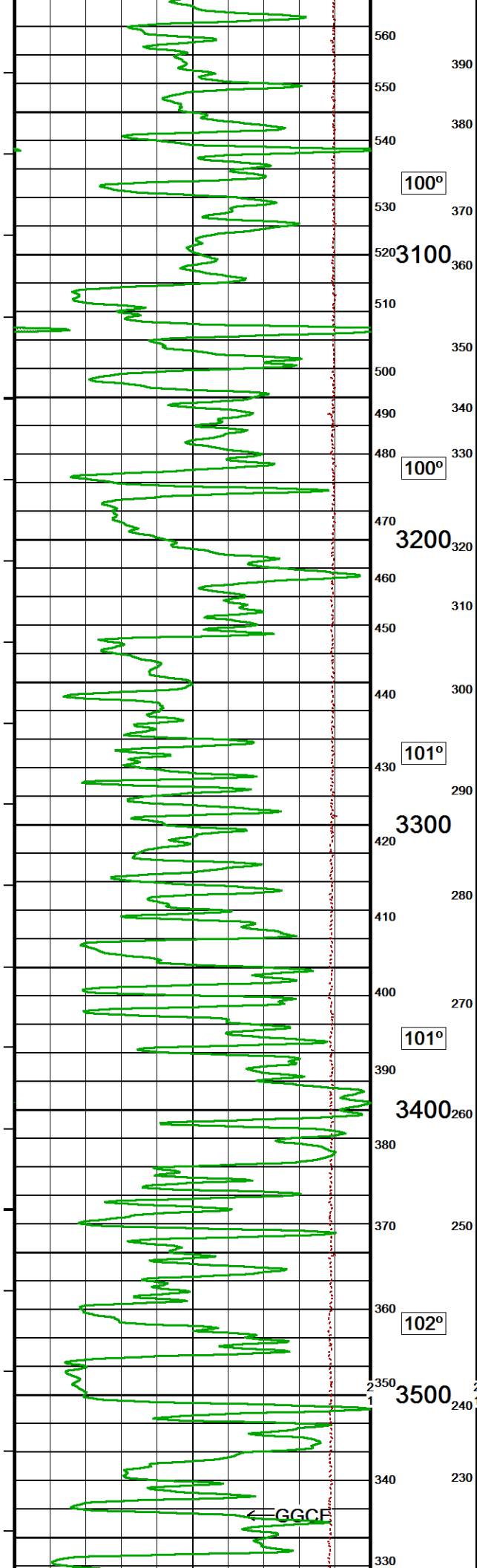


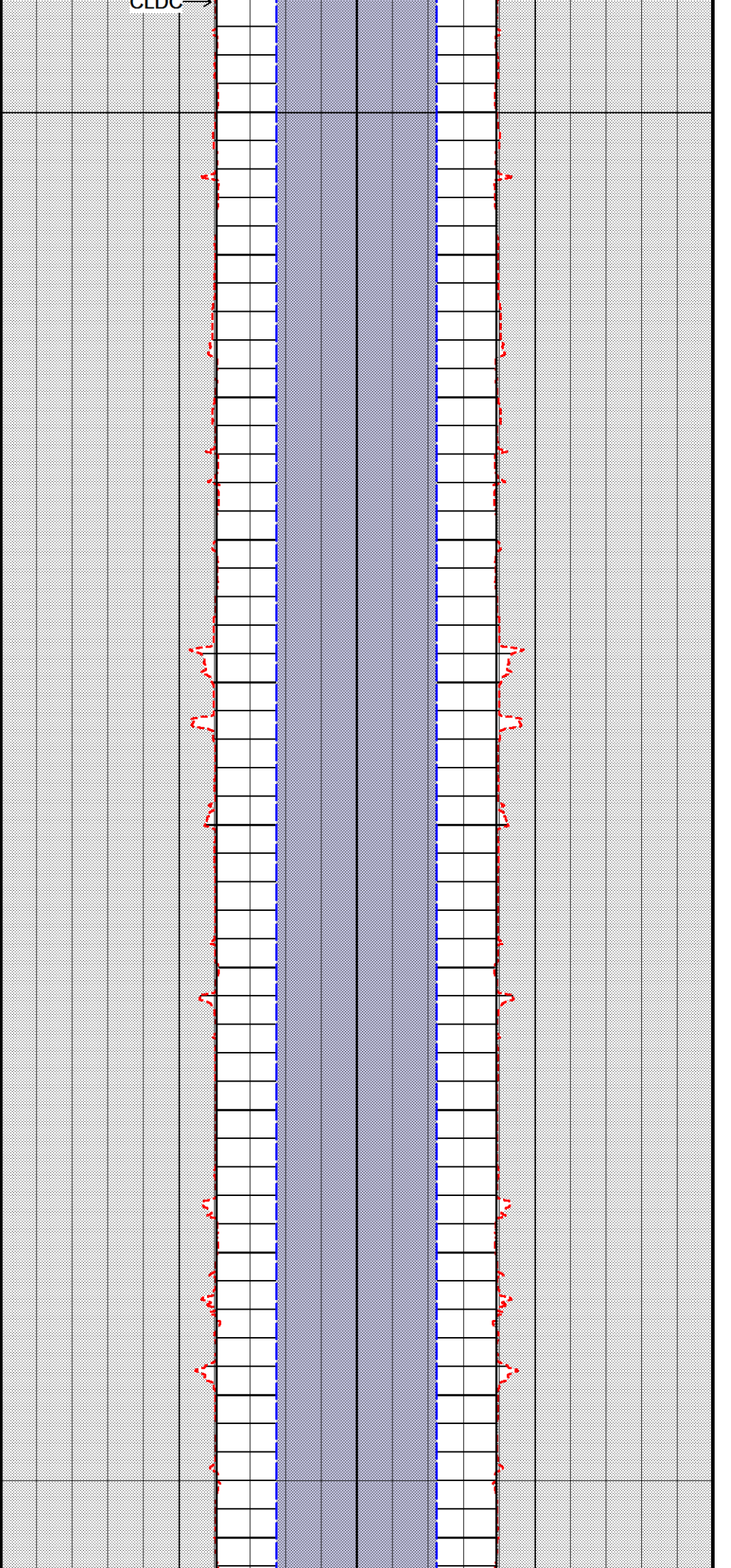
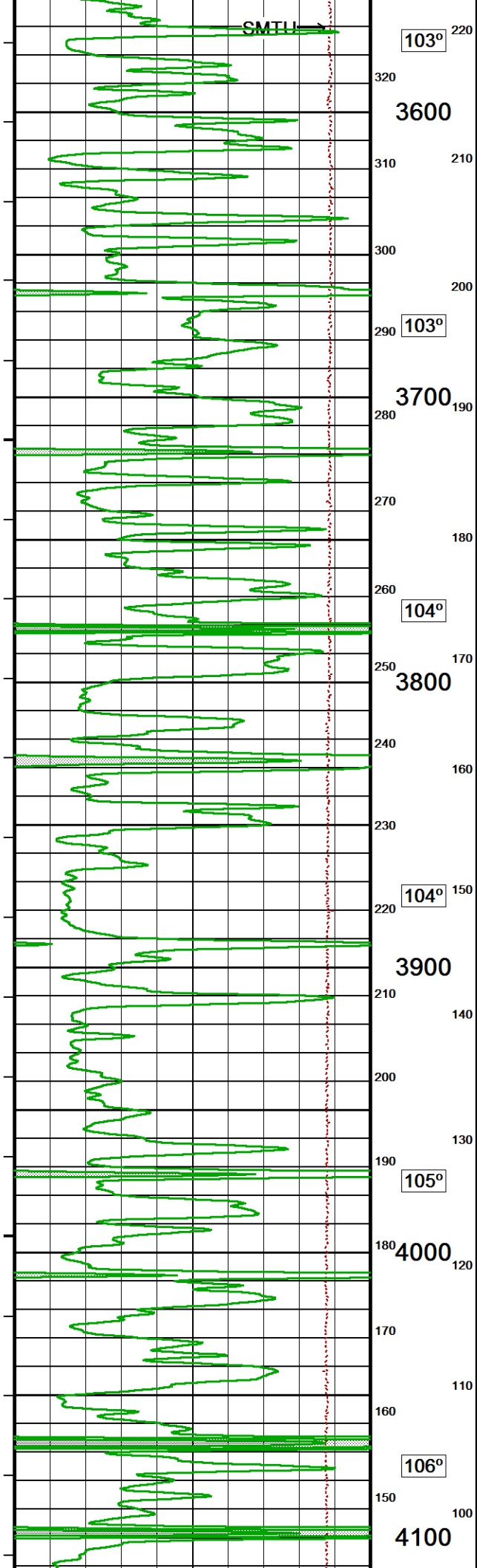


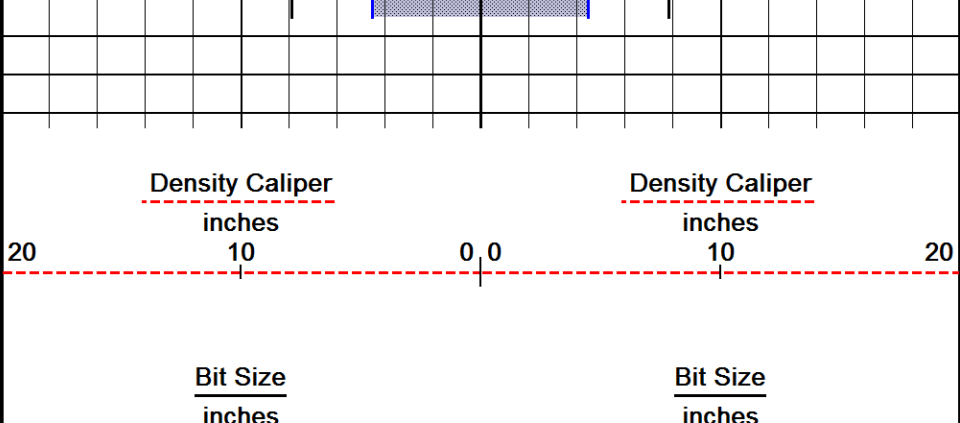
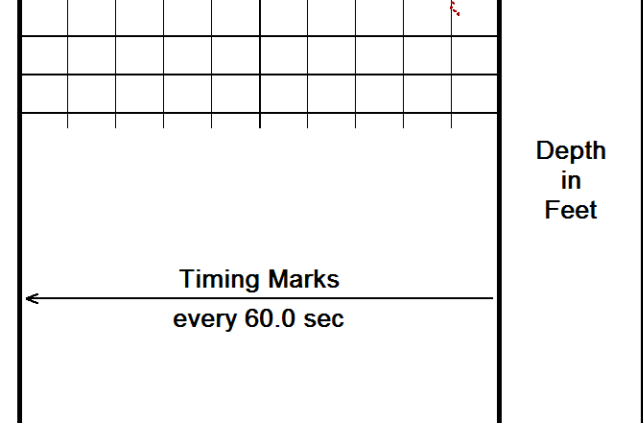
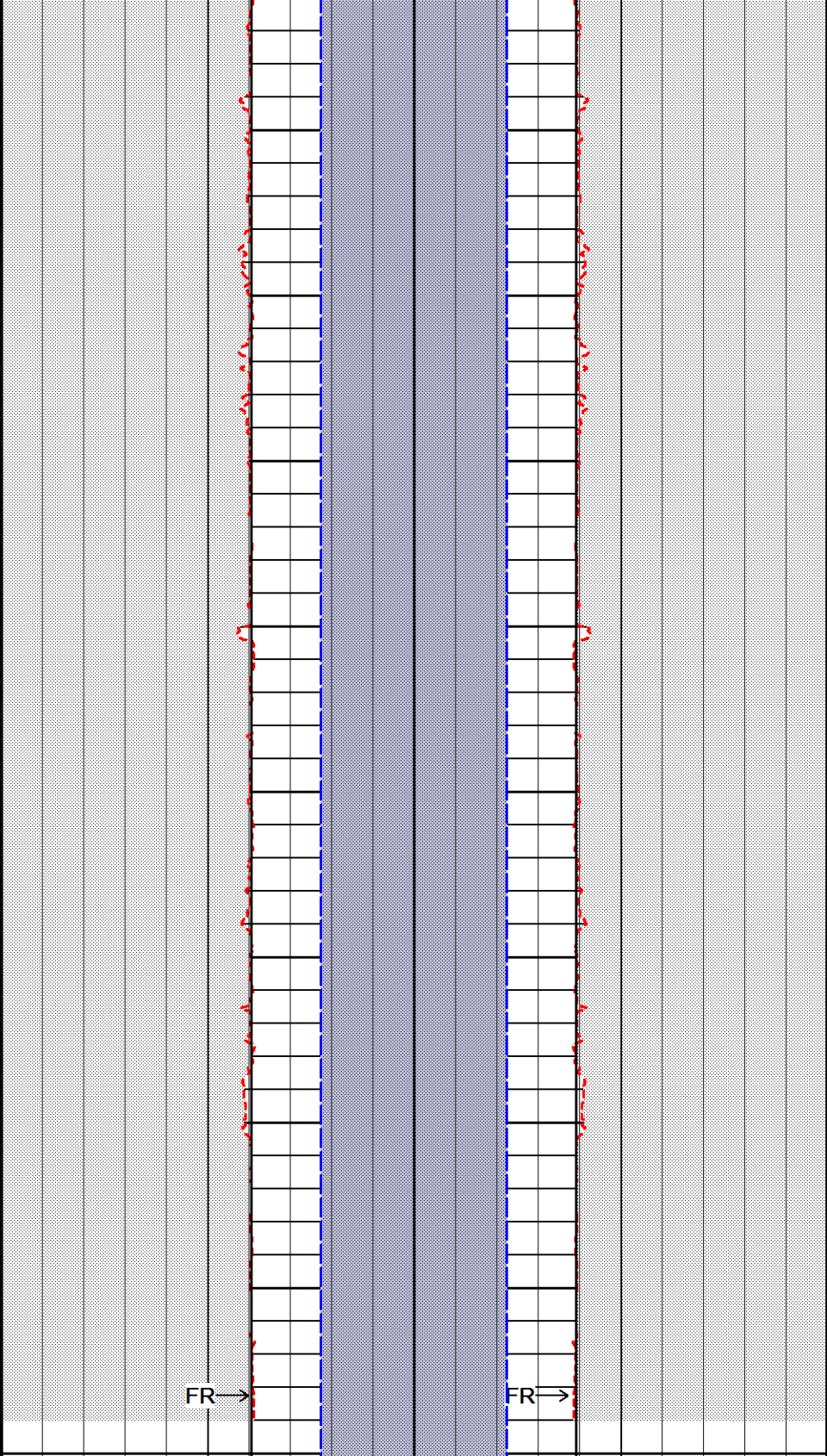
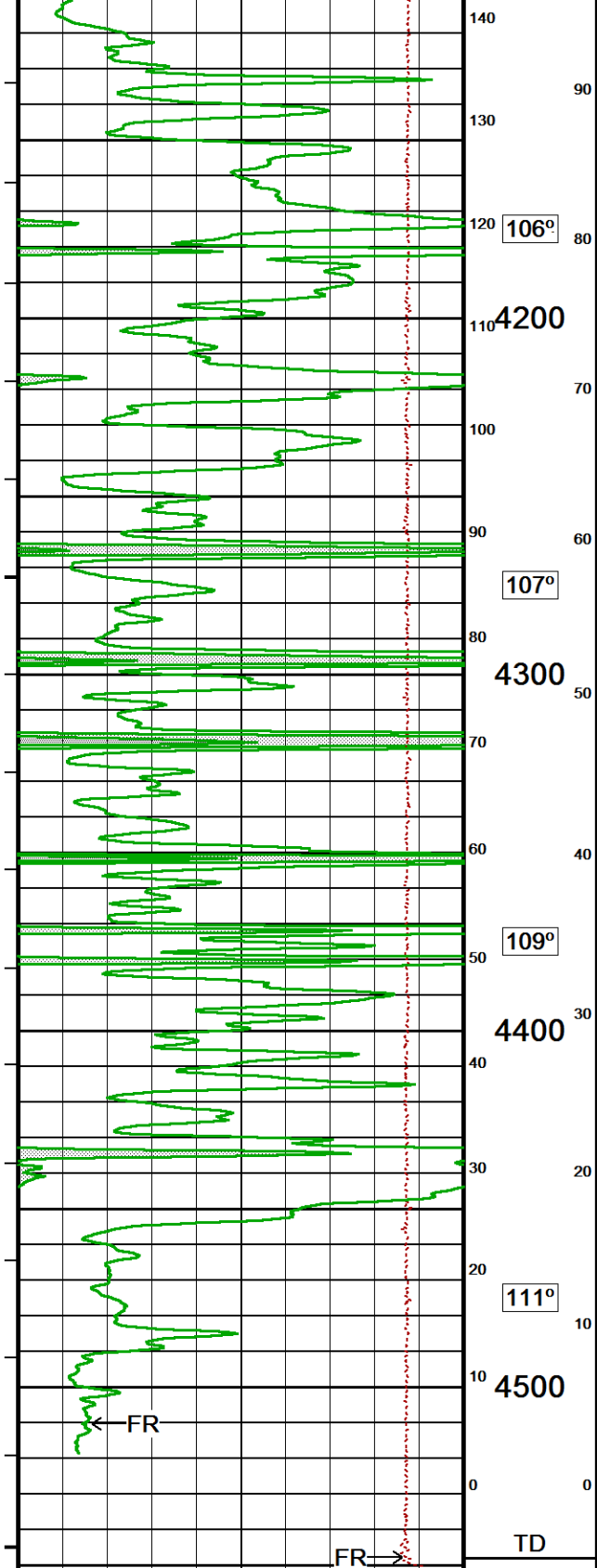


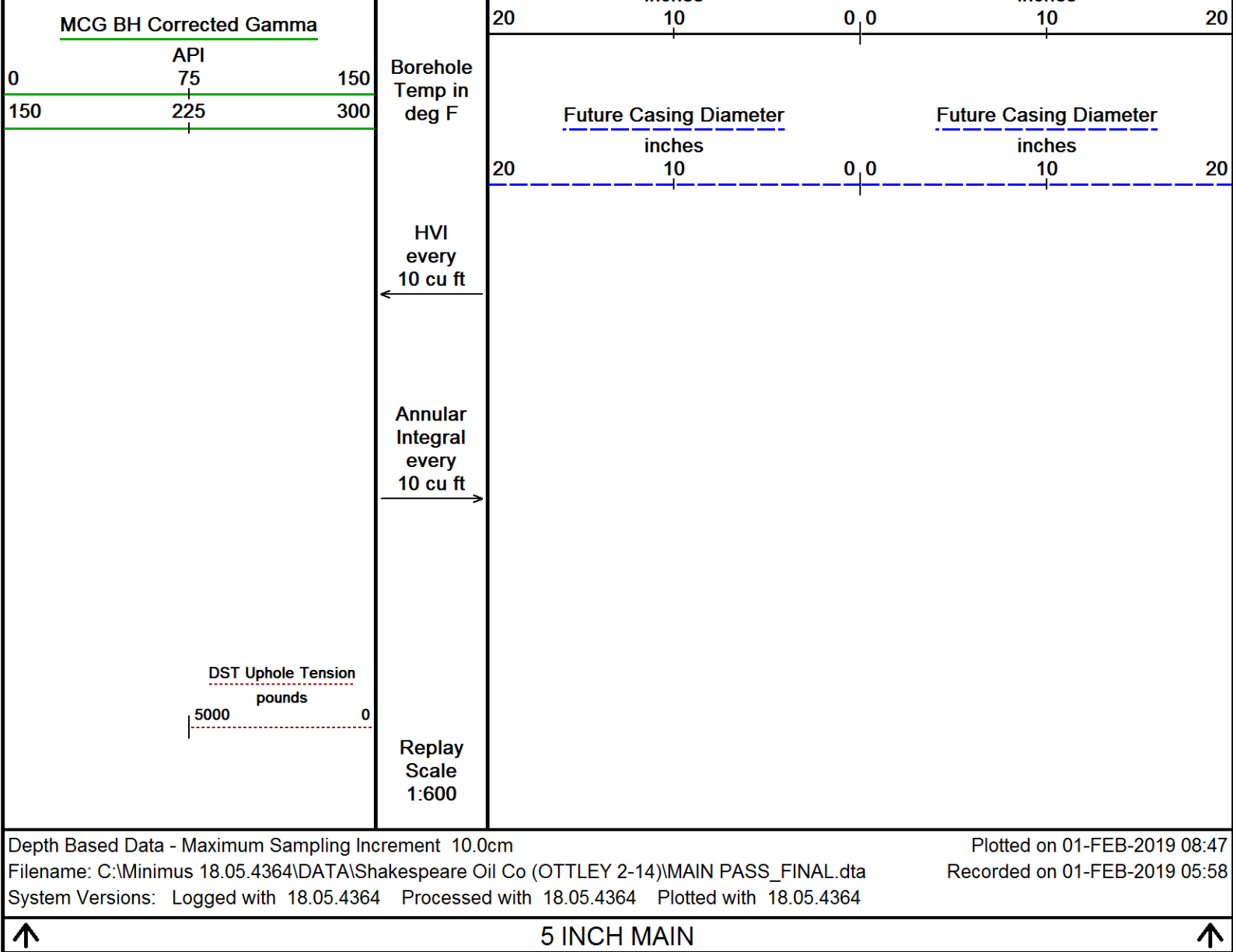












BEFORE SURVEY CALIBRATION		
C:\Minimus 18.05.4364\DATA\Shakespeare Oil Co (OTTLEY 2-14)\MAIN PASS_FINAL.dta		
General Constants All 000		Last Edited on 01-FEB-2019,08:32
General Parameters		
Mud Resistivity	0.450	ohm-metres
Mud Resistivity Temperature	83.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	
Hole/Annular Volume and Differential Caliper Parameters		
HVOL Method	Single Caliper	
HVOL Caliper 1	MMR Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	4.500	inches
Caliper for Differential Caliper	MMR Caliper	
Rwa Parameters		
Porosity used	Crossplot Porosity	
Resistivity used	Array Ind. Four Res Rt	
RWA Constant A	0.620	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

Down-hole Tension Calibration SMS 0		Field Calibration on 01-FEB-2019 04:18
Reading No	Measured	Calibrated (lbs)

1	14340.40	0.00
2	14867.91	377.00
SP Calibration MCG-D.K 443		
	Measured	Calibrated (mV)
Reference 1	100.8	99.9
Reference 2	-98.4	-99.9
Field Calibration on 10-DEC-2018 15:37		
High Resolution Temperature Calibration MCG-D.K 443		
	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	212.00	212.00
Field Calibration on 12-OCT-2018,05:20		
High Resolution Temperature Constants MCG-D.K 443		
Last Edited on 12-OCT-2018,05:20		
Pre-filter Length	11	
Gamma Calibration MCG-D.K 443		
	Measured	Calibrated (API)
Background	79	54
Calibrator (Gross)	744	510
Calibrator (Net)	665	456
Field Calibration on 31-JAN-2019 17:18		
Gamma Calibration Tolerances MCG-D.K 443		
Ratio	1.458	1.40 1.475 1.55 Counts/API
Gamma Constants MCG-D.K 443		
Last Edited on 01-FEB-2019,04:57		
Gamma Calibrator Number	MCGGRCC141	
GRC-M Calibrator Jig in Use?	NO	
Inactive Background Jig in Use?	NO	
Mud Density	1.13	gm/cc
Caliper Source for Processing	MMR Caliper	
Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%
Micro Normal and Micro Inverse Calibration MMR-B.A 91		
Base Calibration on 18-JAN-2019 12:24		
Field Check on 31-JAN-2019 16:51		
	Resistor 1 (ohm)	Resistor 2 (ohm)
	10.0	50.0
Base Calibration		
	Measured	Calibrated (ohm-m)
Micro Normal	10.2 49.8	5.1 25.6
Micro Inverse	9.9 49.4	3.4 16.9
Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	93.8	93.8
Micro Inverse	62.3	62.3
Micro Normal & Micro Inverse Calibration Tolerance MMR-B.A 91		
Micro Normal Res. 1	10.2	-5% 10.0 +5% ohm
Micro Inverse Res. 1	9.9	-5% 10.0 +5% ohm
Micro Normal Res. 2	49.8	-5% 50.0 +5% ohm
Micro Inverse Res. 2	49.4	-5% 50.0 +5% ohm
Micro Normal Base Check	93.8	-2% 93.40 +2% ohm-m
Micro Inverse Base Check	62.3	-2% 62.27 +2% ohm-m
Micro Normal Field Check	93.8	-2% 93.8 +2% ohm-m
Micro Inverse Field Check	62.3	-2% 62.3 +2% ohm-m
Micro Normal and Micro Inverse Constants MMR-B.A 91		
Last Edited on 13-APR-2018,05:04		
Pad Type	8-12 in Soft Rubber Inflatable 006-9011-159	
Micro Normal K Factor	0.5110	
Micro Inverse K Factor	0.3380	
Standoff Offset	0.0000	inches

Caliper Calibration MMR-B.A 91

Base Calibration on 18-JAN-2019 14:14

Field Calibration on 31-JAN-2019 16:54

Base Calibration

Reading No

Measured

Calibrator Size (in)

1

14078

5.98

2

17477

7.97

3

20615

9.86

4

24868

11.92

5

0

0.00

6

N/A

N/A

Field Calibration

Measured Caliper (in)

Actual Caliper (in)

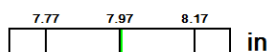
7.97

7.97

Caliper Calibration Tolerances MMR-B.A 91

Short Arm Field Cal.

7.97



in

Micro-Resistivity Caliper Constants MMR-B.A 91

Sonde Configuration

Resistivity Mode

Micro Laterolog Calibration MMR-B.A 91

Base Calibration on 31-DEC-1999 00:00

Field Check on 31-DEC-1999 00:00

Base Calibration

Resistor 1 (ohm)

Resistor 2 (ohm)

0.0

0.0

Measured

Calibrated (ohm-m)

Ref 1

Ref 2

Ref 1

Ref 2

0.0

0.0

0.0

0.0

Base Check (ohm-m)

Field Check (ohm-m)

0.0

0.0

Micro Laterolog Constants MMR-B.A 91

Pad Type

6 in Solid Nylon B23059

Standoff Offset

0.0000

inches

Micro Laterolog K Factor

0.0128

Micro Laterolog Rm K Factor

N/A

Mudcake Thickness Correction Constants

Mud Cake Source

Constant Value

Mud Cake Thickness

0.4000

inches

Mud Cake Thickness Caliper

Mud Cake Resistivity

0.1500

ohm-m

Mud Cake Resistivity Temp.

20.00

Degrees C

Mud Cake Resistivity Source

Constant Value

Temp. for Rmc Corr.

MCG External Temperature

Neutron Calibration MDN-B.A 292

Base Calibration on 07-JAN-2019,13:23

Field Check on 31-JAN-2019 17:01

Base Calibration

Measured

Calibrated (cps)

Near

Far

Near

Far

2910

91

3714

110

Ratio

31.871

33.764

Field Calibrator at Base

Calibrated (cps)

2207

3209

Ratio

0.688

Field Check

Calibrated (cps)

2227

3174

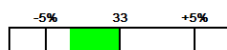
Ratio

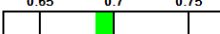
0.702

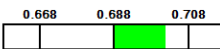
Neutron Calibration Tolerances MDN-B.A 292

Ratio

31.871



Base Check 0.688 

Field Check 0.702 

Neutron Constants MDN-B.A 292

Last Edited on 31-JAN-2019,16:57

Neutron Source Id P0204NN
 Neutron Jig Number NJ5736
 Air Hole Processing Legacy
 Caliper Source for Processing Density Caliper
 Stand-off 0.00 inches
 Mud Density 1.00 gm/cc
 Limestone Sigma 7.10 cu
 Sandstone Sigma 4.26 cu
 Dolomite Sigma 4.70 cu
 Formation Pressure Source None
 Formation Pressure N/A kpsi
 Temperature Source Constant Value
 Temperature 68.00 degrees F
 Mud Salinity 0.00 kppm
 Salinity Correction Not Applied
 Formation Fluid Salinity Source None
 Formation Fluid Salinity N/A kppm
 Barite Mud Correction Not Applied

Induction Calibration MAI-B.J 390

Factory Loop Calibration 07-JAN-2019 10:28

Field Check on 31-JAN-2019 16:41

Factory Loop Calibration

High Conductivity Reference Resistor 3.3 ohm
 Low Conductivity Reference Resistor 333.3 ohm

Array	Measured Signal (unitless)		Reference Conductivity (mmho/m)		Calibration	
	Low	High	Low	High	Gain	Offset
1 (near)	16.8	458.6	9.3	966.2	2.166	-27.2
2	6.3	377.7	7.6	821.4	2.191	-6.2
3	3.8	258.6	5.2	566.0	2.200	-3.0
4 (far)	1.9	132.3	2.6	279.2	2.121	-1.4

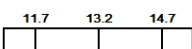
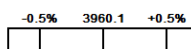
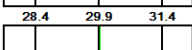
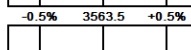
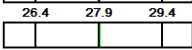
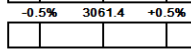
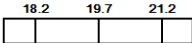
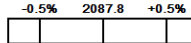
Array Temperature 77.9 Deg F

Tool Checks

Array	Factory Reference (mmho/m)		Before Survey (mmho/m)		Deg F
	Low	High	Low	High	
1 (near)	13.2	3960.1	13.2	3959.7	65.0
2	29.9	3563.5	30.0	3563.4	
3	27.9	3061.4	28.0	3061.6	
4 (far)	19.7	2087.8	19.7	2087.8	

Array Temperature 64.9

Induction Check Tolerances MAI-B.J 390

Low Array	Value	Bar Chart	Unit	High Array	Value	Bar Chart	Unit
Low Array 1	13.2		mmho/m	High Array 1	3959.7		mmho/m
Low Array 2	30.0		mmho/m	High Array 2	3563.4		mmho/m
Low Array 3	28.0		mmho/m	High Array 3	3061.6		mmho/m
Low Array 4	19.7		mmho/m	High Array 4	2087.8		mmho/m

Induction Constants MAI-B.J 390

Last Edited on 01-FEB-2019,04:51

Induction Model RtAP-NC

Borehole Correction Constants

Tool Centred No

Hole Size Source Density Caliper

Hole Size Constant Value N/A inches

Stand-off Type Fins

Stand-off 0.50 inches

Number of Fins on Stand-off 8.0000

Stand-off Fin Angle 45.00 degrees

Stand-off Fin Width 0.5000 inches

Stand Off Film Width	0.0000	inches
Rm Source	Global Value: Temperature Corrected	
Temp. for Rm Corr.	MCG External Temperature	
Borehole Correction Method	Default	
Squasher Start	0.0020	mhos/metre
Squasher Offset	N/A	mhos/metre
Borehole Normalisation		
DRM1	0.0000	DRC1 0.0000
DRM2	0.0000	DRC2 0.0000
MRM1	0.0000	MRC1 0.0000
MRM2	0.0000	MRC2 0.0000
SRM1	0.0000	SRC1 0.0000
SRM2	0.0000	SRC2 0.0000
Calibration Site Corrections		
Channel 1	0.00	mmhos/metre
Channel 2	0.00	mmhos/metre
Channel 3	0.00	mmhos/metre
Channel 4	0.00	mmhos/metre
Symmetrised Receiver Gains		
Receiver 1	1.00	
Receiver 2	1.00	
Receiver 3	1.00	
Receiver 4	1.00	
Apparent Porosity and Water Saturation Constants		
Archie Constant (A)	1.00	
Cementation Exponent (M)	2.00	
Saturation Exponent (N)	2.00	
Saturation of Water for Apor	100.00	percent
Resistivity of Water for Apor and Sw	0.05	ohm-m
Resistivity of Mud Filtrate for Sw	0.00	ohm-m
Source for Rt	0.00	
Source for Rxo	0.00	

High Resolution Temperature Calibration MAI-B.J 390			Field Calibration on 15-MAY-2018,12:48
	Measured	Calibrated(Deg F)	
Lower	10.00	10.00	
Upper	100.00	100.00	

High Resolution Temperature Constants MAI-B.J 390		Last Edited on 06-MAR-2018,13:01
Pre-filter Length	11	

Caliper Calibration MPD-C.A 216			Base Calibration on 18-JAN-2019 17:06
Field Calibration on 31-JAN-2019,17:29			
Base Calibration			
Reading No	Measured	Calibrator Size (in)	
1	16199	3.99	
2	24624	5.98	
3	33344	7.97	
4	41632	9.86	
5	50912	11.92	
6	N/A	N/A	
Field Calibration			
	Measured Caliper (in)	Actual Caliper (in)	
	7.93	7.97	

Caliper Calibration Tolerances MPD-C.A 216		
Long Arm Field Cal.	7.93	7.57 7.97 8.37 in

Photo Density Calibration MPD-C.A 216			Base Calibration on 18-JAN-2019 16:36
Field Check on 31-JAN-2019 16:50			
Density Calibration			
Base Calibration	Measured	Calibrated (sdu)	
	Near	Far	Near
Background	003	1180	

Background	993	1180		
Reference 1	46604	22300	59556	30836
Reference 2	18380	2158	24941	2541

Field Check at Base

993.3 1179.8

Field Check

994.6 1180.0

PE Calibration

Base Calibration

Measured

Calibrated

	WS	WH	Ratio
Background	179	890	
Reference 1	19088	46448	0.415
Reference 2	5249	18271	0.292

Ratio

0.371

0.272

Field Check at Base

179.3 890.5

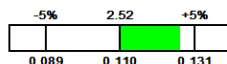
Field Check

183.0 894.1

Photo Density Calibration Tolerances MPD-C.A 216

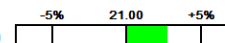
Near Density Ratio

2.62



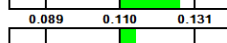
Far Density Ratio

21.59



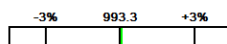
PE Calibration

0.115



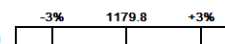
Near Den. Field Check

994.6



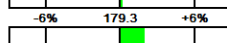
Far Den. Field Check

1180.0



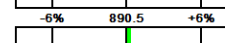
PE WS Field Check

183.0



PE WH Field Check

894.1



Density Constants MPD-C.A 216

Last Edited on 01-FEB-2019,05:51

Density Source Id	P50557B
Nylon Calibrator Number	DNCE695
Aluminium Calibrator Number	DACD698
Density Shoe Profile	8 inch
Caliper Source for Processing	MMR Caliper
PE Correction to Density	Not Applied
Mud Density	1.13 gm/cc
Mud Density Type	
Mud Filtrate Density	1.00 gm/cc
Dry Hole Mud Filtrate Density	1.00 gm/cc
DNCT	0.00 gm/cc
CRCT	0.00 gm/cc
Density Z/A Correction	Hybrid
Precision Enhanced Density Processing	Applied
Matrix Density (gm/cc)	Depth (ft)
2.71	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00

DOWNHOLE EQUIPMENT

C:\Minimus 18.05.4364\DATA\Shakespeare Oil Co (OTTLEY 2-14)\MAIN PASS_FINAL.dta

11B Tension Cablehead

MCB-A 1 LG: 2.18 ft WT: 19.8 lb OD: 2.244 in

Compact Swivel Head Adaptor

SHA-J.B 717 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in



37.44 ft GRGC - MCG Gamma Ray

Compact Comms Gamma
MCG-D.K 443 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

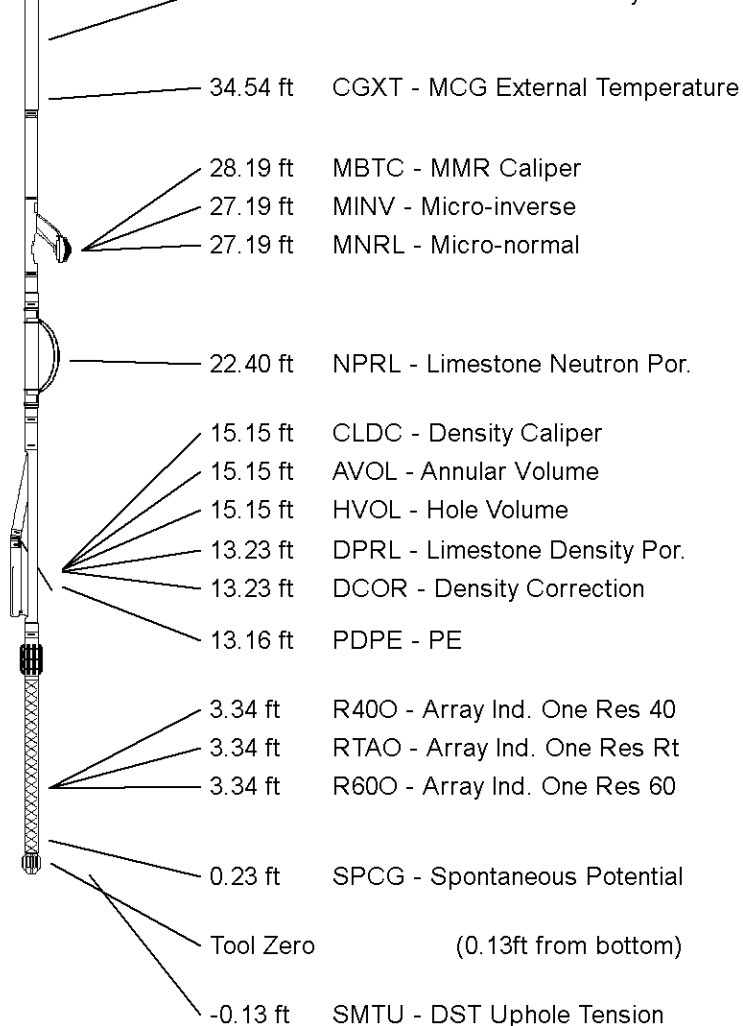
Compact Micro-Resistivity
MMR-B.A 91 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron
MDN-B.A 292 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-C.A 216 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Induction
MAI-B.J 390 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 47.21 ft Weight: 377.0 lb



All measurements relative to tool zero.

COMPANY	SHAKESPEARE OIL CO., INC.
WELL	K OTTLEY 2-14
FIELD	WILDCAT
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA / KANSAS

Elevation Kelly Bushing	2800	feet	First Reading	4532.80	feet
Elevation Drill Floor		feet	Depth Driller	4550.00	feet
Elevation Ground Level	2791	feet	Depth Logger	4548.00	feet



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CALIPER LOG