



Weatherford

MICRORESISTIVITY LOG

COMPANY			SHAKESPEARE OIL CO., INC.		
WELL			ANDERSON #1-33		
FIELD			WILDCAT		
PROVINCE/COUNTY			DECATUR		
COUNTRY/STATE			U.S.A. / KANSAS		
LOCATION			1090' FSL & 1135' FWL		
SEC 33	TWP 4S	RGE 29W	Other Services		MAI/MFE
Latitude		MDN/MPD			
Longitude		MSS			
API Number		15-039-21233			
Permanent Datum GL, Elevation 2776 feet					
Log Measured From KB					
Drilling Measured From KB @ 8 FEET					
Date	16-SEP-2016		Elevations:		
Run Number	ONE		KB	2784.00	
Service Order	4558-161170171		DF	2782.00	
Depth Driller	4500.00		feet	2776.00	
Depth Logger	4504.00		feet		
First Reading	4458.00		feet		
Last Reading	3600.00		feet		
Casing Driller	264.00		feet		
Casing Logger	264.00		feet		
Bit Size	7.875		inches		
Hole Fluid Type	CHEMICAL				
Density / Viscosity	9.30 lb/USg		60.00 CP		
PH / Fluid Loss	10.00		6.80 ml/30Min		
Sample Source	FLOWLINE				
Rm @ Measured Temp	1.45 @ 75.0		ohm-m		
Rmf @ Measured Temp	1.16 @ 75.0		ohm-m		
Rmc @ Measured Temp	1.74 @ 75.0		ohm-m		
Source Rmf / Rmc	CALC		CALC		
Rm @ BHT	0.95 @115.0		ohm-m		
Time Since Circulation	5 HOURS				
Max Recorded Temp	115.00		deg F		
Equipment / Base	13096		OKC		
Recorded By	ADAM SILL				
Witnessed By	TIM PRIEST				

BOREHOLE RECORD					Last Edited: 16-SEP-2016 09:36
Bit Size inches		Depth From feet		Depth To feet	
7.875		264.00		4500.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	8.625	0.00	264.00	24.00	

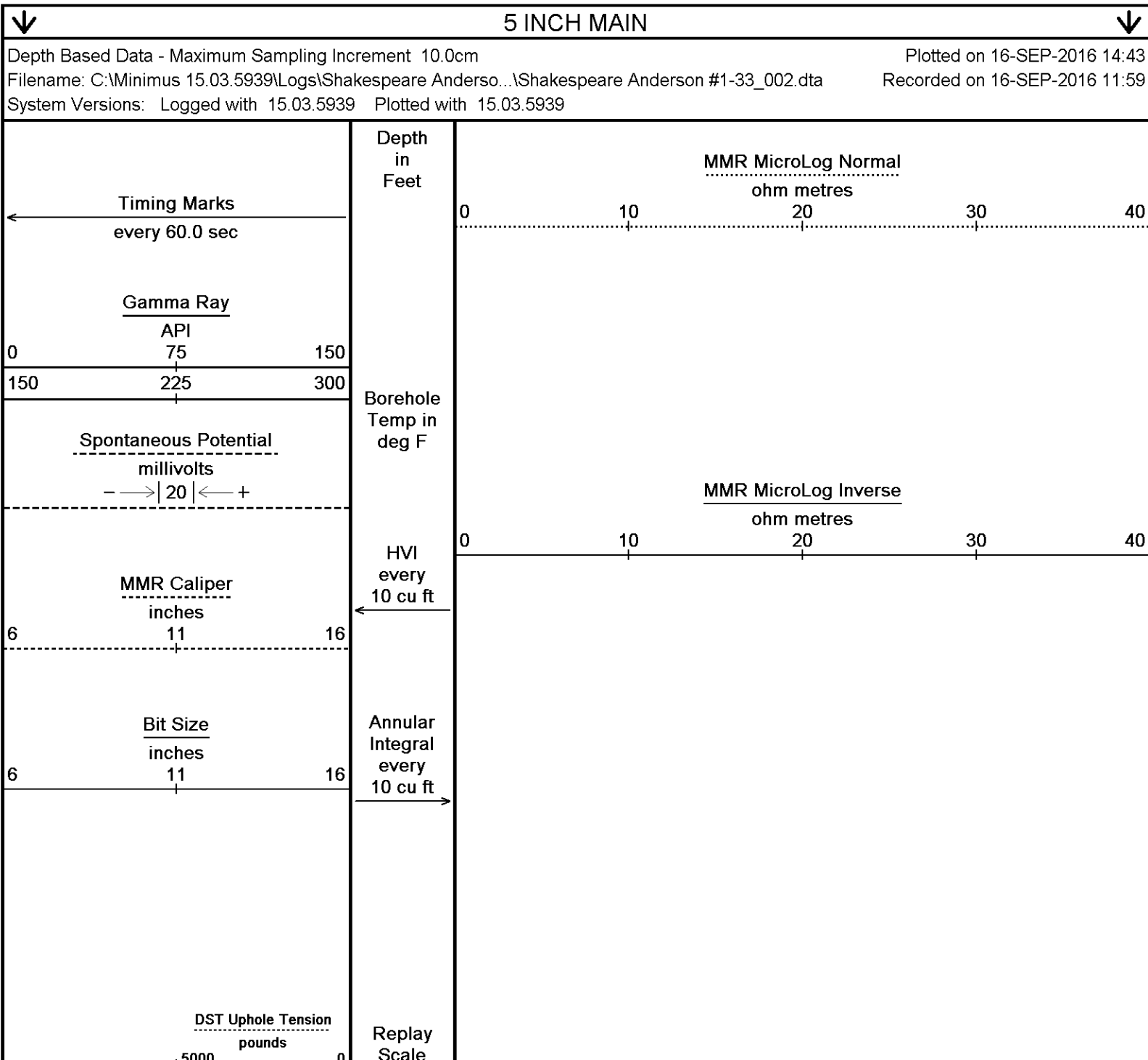
REMARKS
- SOFTWARE ISSUE: WLS 15.03.5939.
- RUN ONE: MCG, MML, MDN, MPD, MFE, MSS, MAI RUN IN COMBINATION. - HARDWARE: DUAL BOWSPRING USED ON MDN. 0.5 INCH STANDOFF USED ON MFE. TWO 0.5 INCH STANDOFFS USED ON MSS. 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- 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: 1672 CU.FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO 3600 FEET: 168 CU.FT.

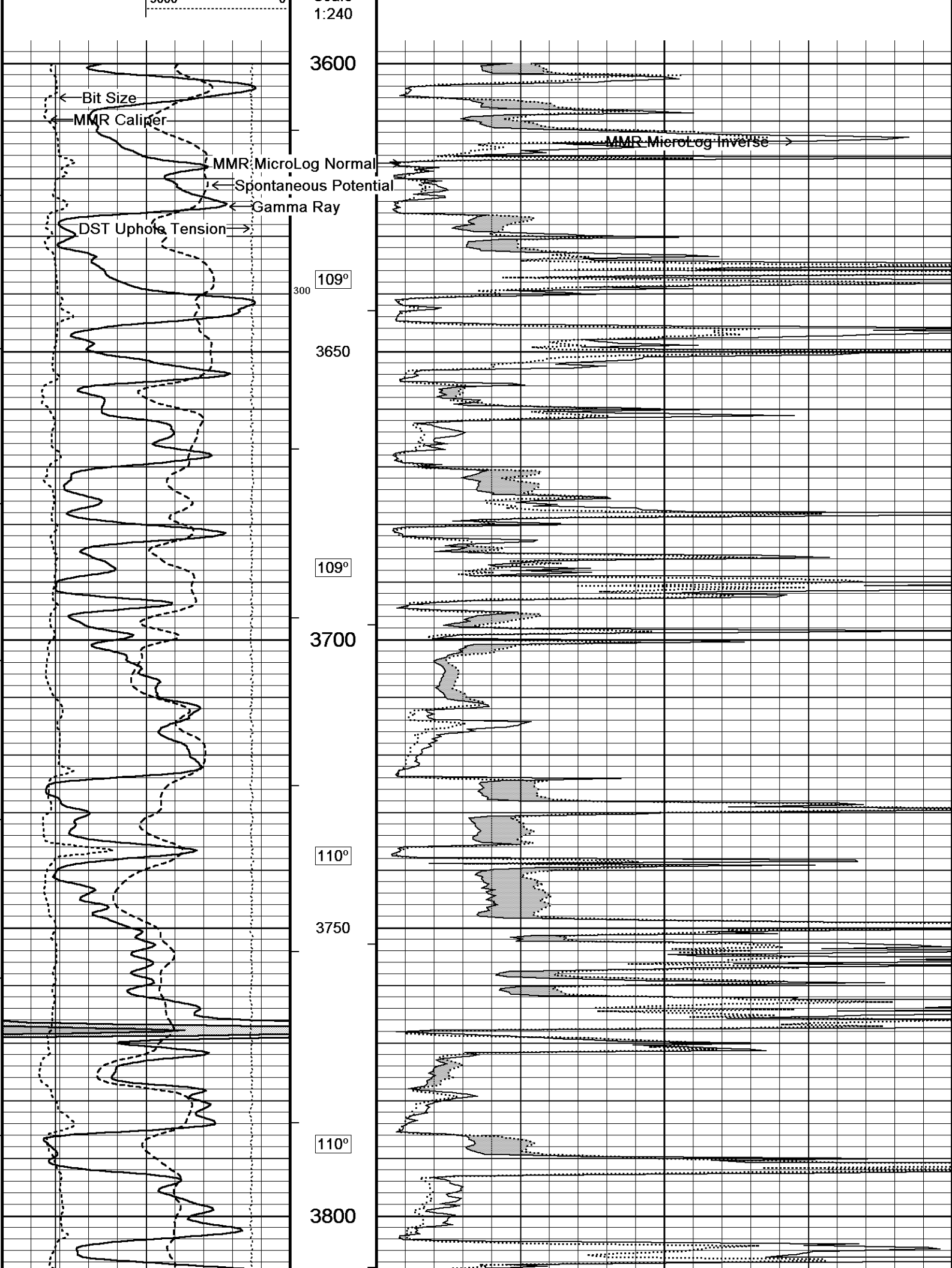
- RIG: DUKE #4.

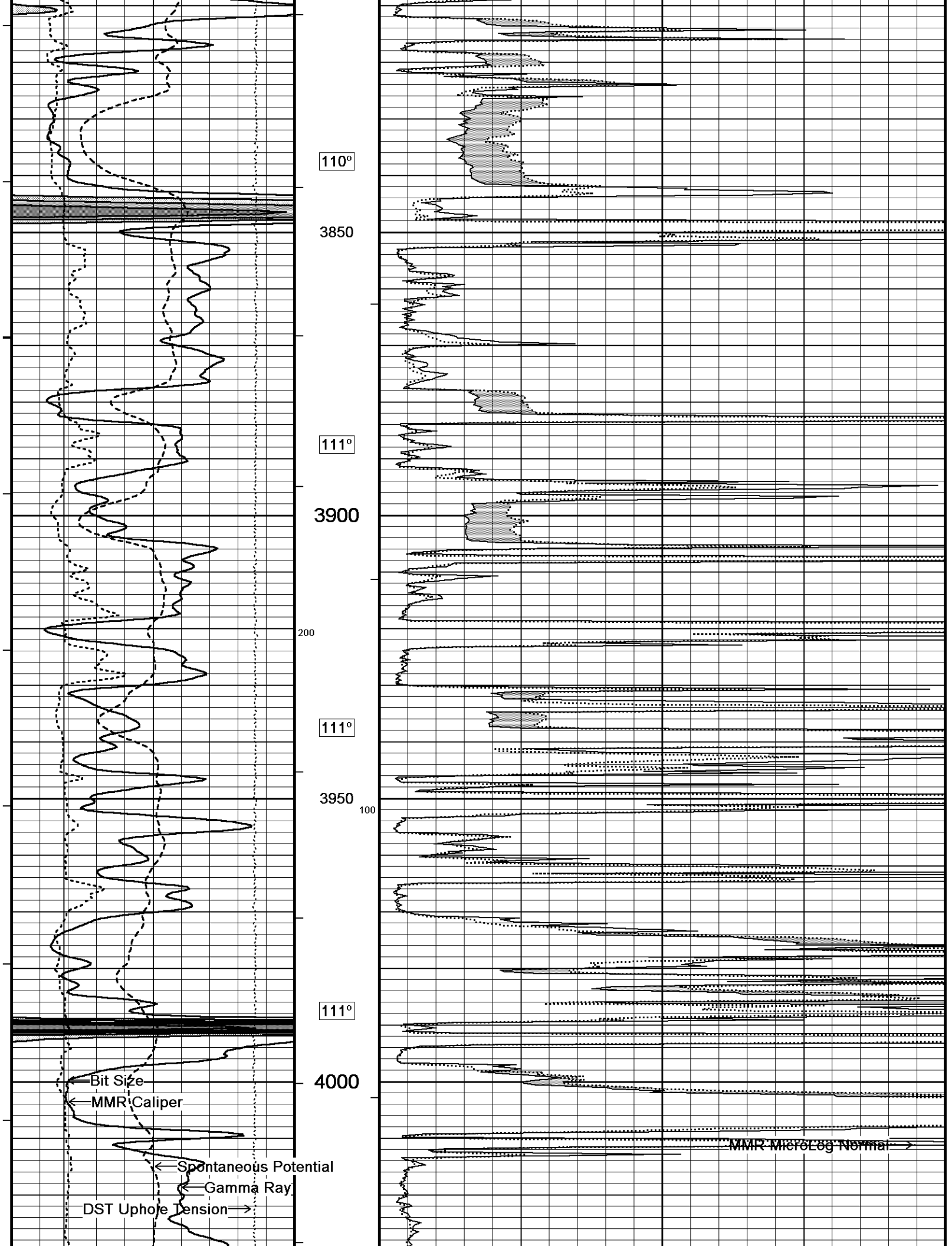
- ENGINEER: A. SILL.

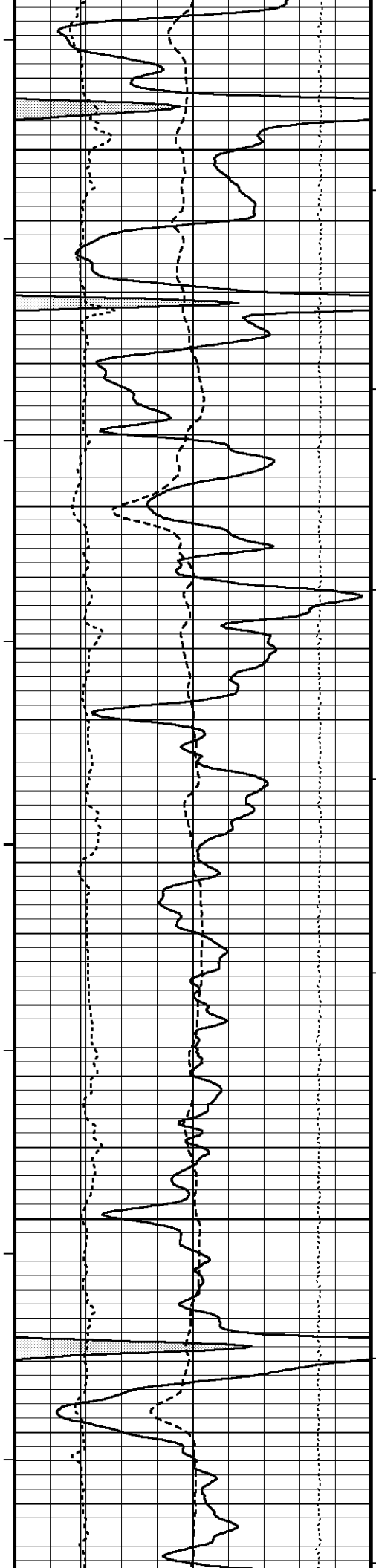
- OPERATOR: J. JONES.

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.









112°

4050

112°

4100

113°

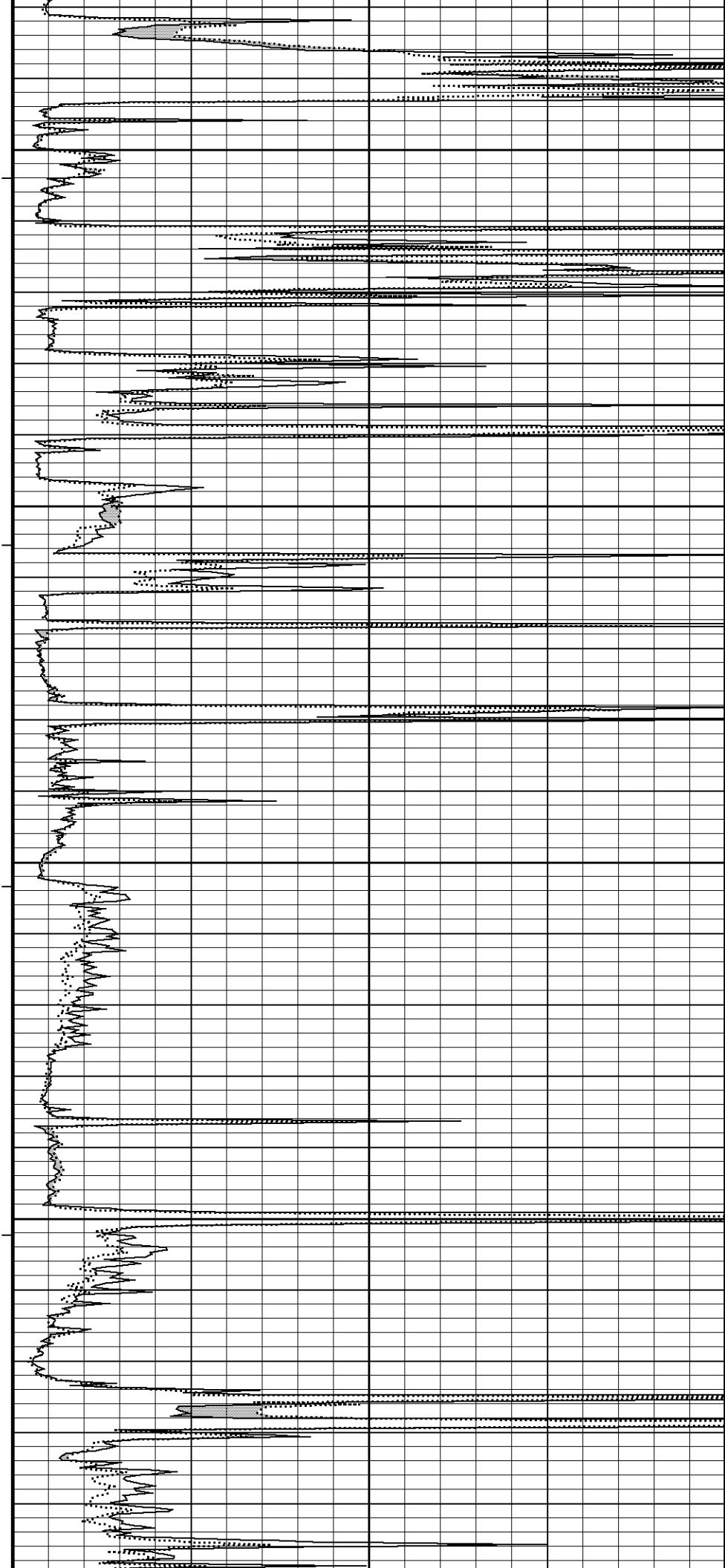
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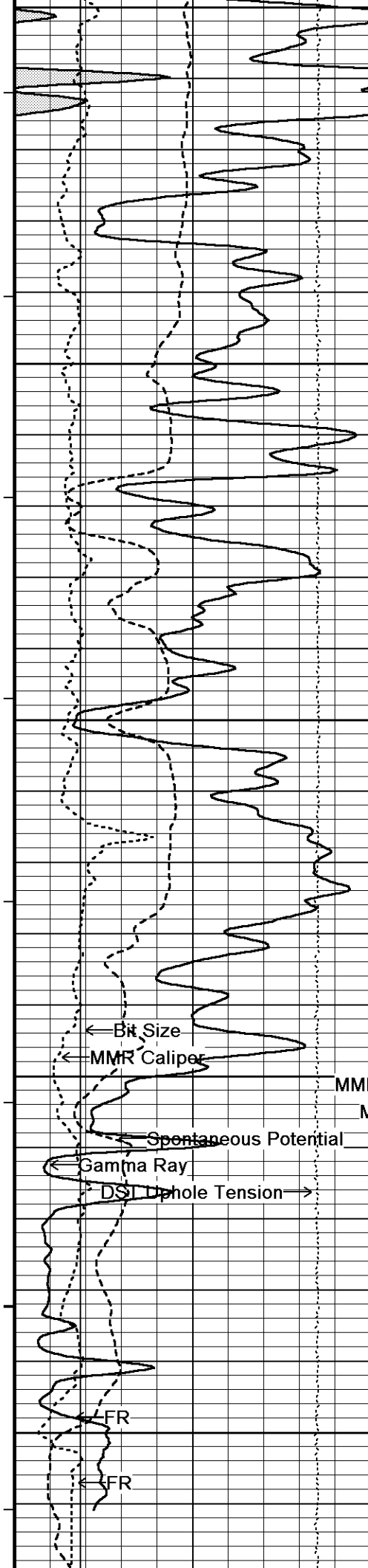
113°

100

4200

114°





4250

115°

4300

115°

4350

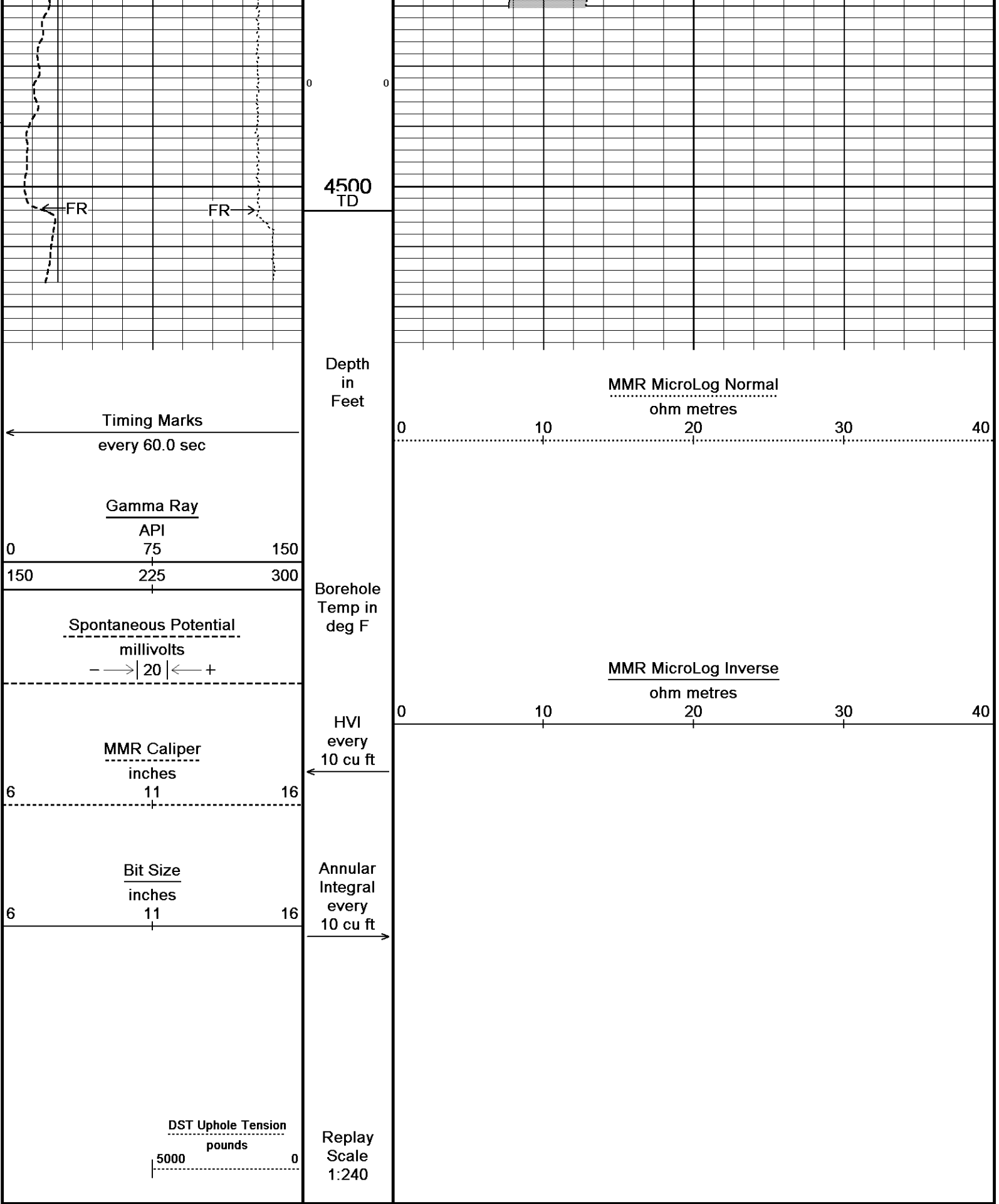
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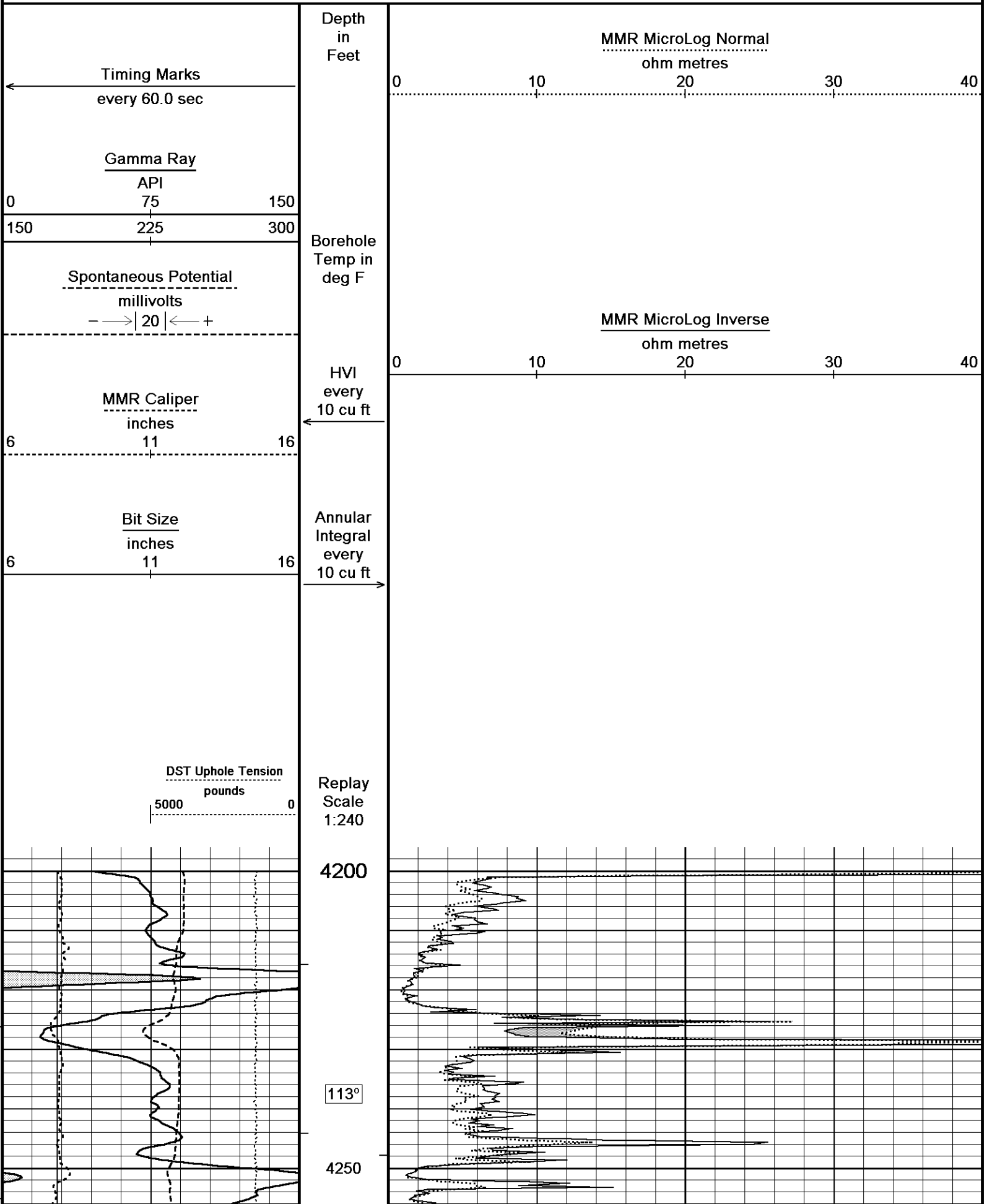
MMR MicroLog Inverse
MMR MicroLog Normal

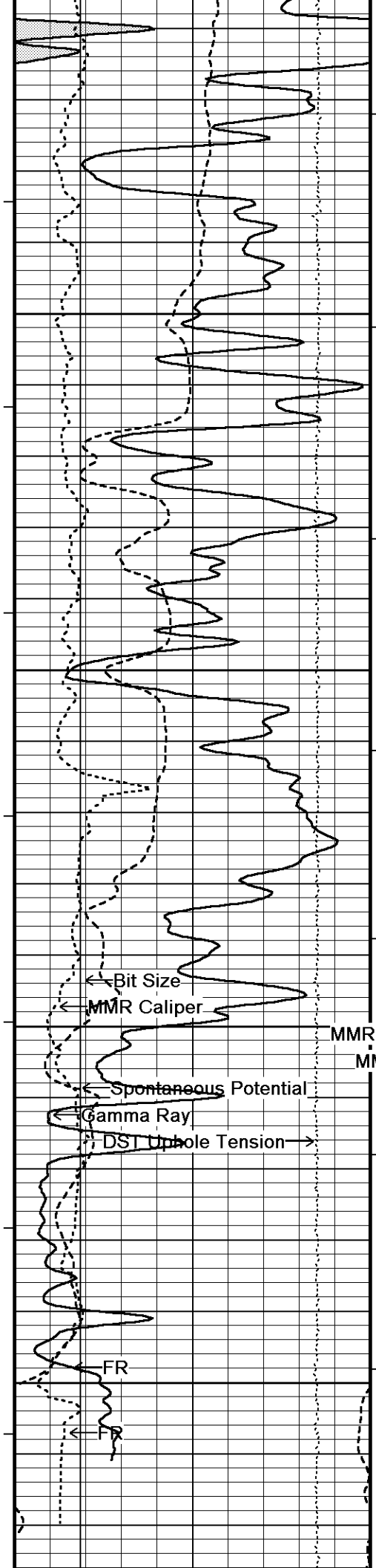
115°

4450

FR







114°

4300

114°

4350

114°

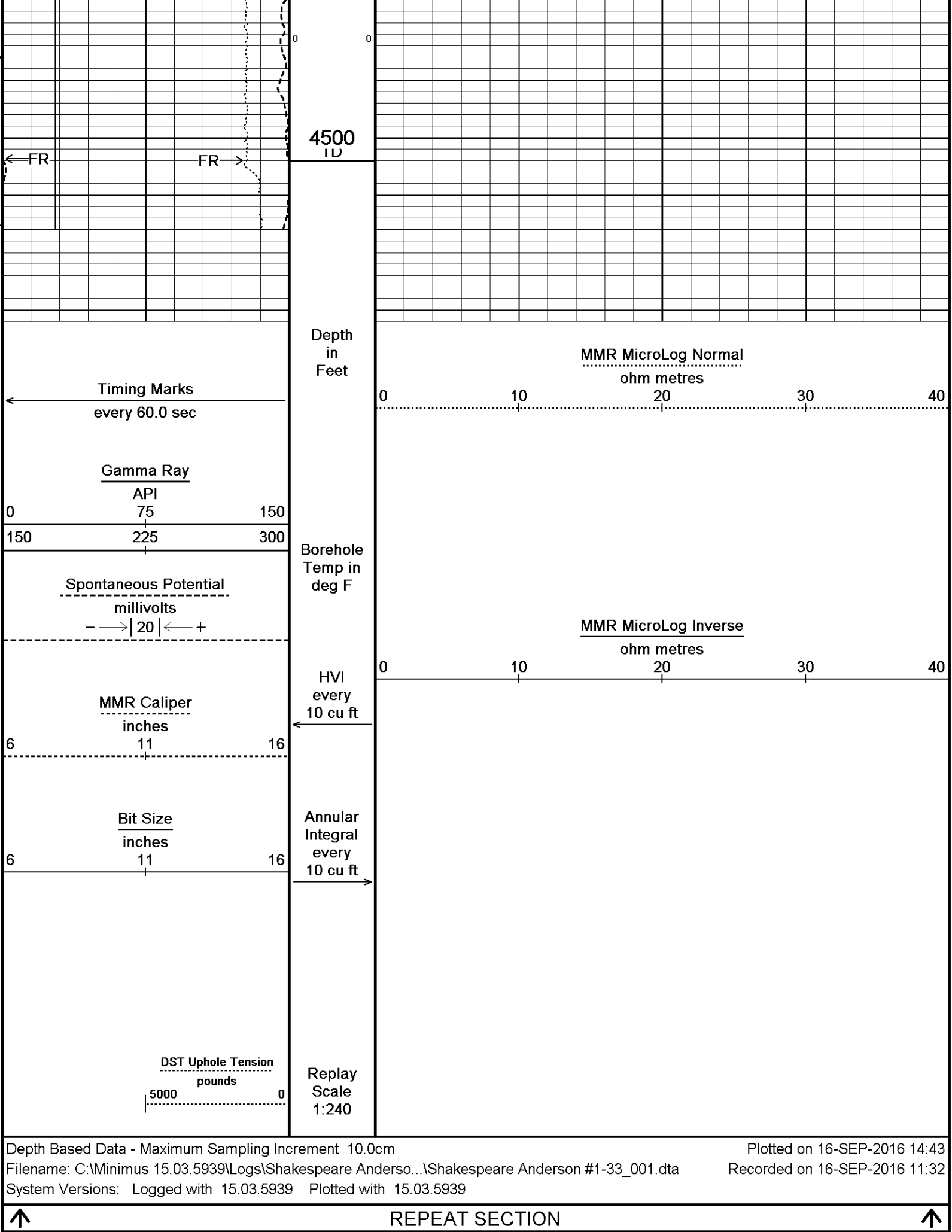
MMR MicroLog Inverse

MMR MicroLog Normal

114°

4450

FR → FR →



BEFORE SURVEY CALIBRATION

C:\Minimus 15.03.5939\Logs\Shakespeare Anderson #1-33\Shakespeare Anderson #1-33_001.dta

General Constants All 000

Last Edited on 16-SEP-2016,11:13

General Parameters

Mud Resistivity	1.450	ohm-metres
Mud Resistivity Temperature	75.000	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	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	None	

Rwa Parameters

Porosity used	Limestone Density Por.	
Resistivity used	Array Ind. One Res Rt	
RWA Constant A	0.610	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

Down-hole Tension Calibration SMS 0

Field Calibration on 24-JUL-2016 15:20

Reading No	Measured	Calibrated (lbs)
1	15235.81	0.00
2	16026.61	481.00

Gamma Calibration MCG-C 123

Field Calibration on 15-SEP-2016 17:04

	Measured	Calibrated (API)
Background	70	48
Calibrator (Gross)	734	504
Calibrator (Net)	664	456

Gamma Calibration Tolerances MCG-C 123

Ratio	1.457		Counts/API
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Gamma Constants MCG-C 123

Last Edited on 16-SEP-2016,09:38

Gamma Calibrator Number	MCGGRCC141	
GRC-M Calibrator Jig in Use?	NO	
Inactive Background Jig in Use?	NO	
Mud Density	1.12	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

High Resolution Temperature Calibration MCG-C 123

Field Calibration on 31-OCT-2015,17:05

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	100.00	100.00

High Resolution Temperature Constants MCG-C 123

Last Edited on 22-SEP-2015,11:43

Pre-filter Length	11
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SP Calibration MCG-C 123

Field Calibration on 14-JUL-2016 12:06

	Measured	Calibrated (mV)
Reference 1	101.2	100.6
Reference 2	-99.1	-99.9

Micro Normal and Micro Inverse Calibration MMR-C.A 247

Base Calibration on 28-AUG-2016 19:13

Field Check on 15-SEP-2016 16:48

Base Calibration		
	Measured	Calibrated (ohm-m)

Channel	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	10.2	49.9	5.1	25.6
Micro Inverse	10.0	49.5	3.4	16.9

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	93.6	93.6
Micro Inverse	62.2	62.2

Micro Normal & Micro Inverse Calibration Tolerance MMR-C.A 247

Micro Normal Res. 1	10.2		ohm	Micro Normal Res. 2	49.9		ohm
Micro Inverse Res. 1	10.0		ohm	Micro Inverse Res. 2	49.5		ohm
Micro Normal Base Check	93.6		ohm-m				
Micro Inverse Base Check	62.2		ohm-m				
Micro Normal Field Check	93.6		ohm-m				
Micro Inverse Field Check	62.2		ohm-m				

Micro Normal and Micro Inverse Constants MMR-C.A 247

Last Edited on 26-JUN-2016,15:44

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-C.A 247

Base Calibration on 28-AUG-2016 19:08
Field Calibration on 15-SEP-2016 16:45

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	14869	5.98
2	18207	7.97
3	21411	9.86
4	25389	11.92
5	0	0.00
6	N/A	N/A
Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	7.95	7.97

Caliper Calibration Tolerances MMR-C.A 247

Short Arm Field Cal.	7.95		in
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Micro-Resistivity Caliper Constants MMR-C.A 247

Last Edited on

Sonde Configuration	Resistivity Mode
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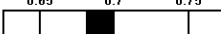
Neutron Calibration MDN-A.B 66

Base Calibration on 22-MAY-2016,18:15
Field Check on 15-SEP-2016 17:26

Base Calibration				
	Measured	Calibrated (cps)		
	Near Far	Near Far		
Ratio	3116 97	3714 110		
	32.277	33.764		
Field Calibrator at Base		Calibrated (cps)		
Ratio		2061 3028		
		0.681		
Field Check		Calibrated (cps)		
Ratio		2173 3105		
		0.700		

Neutron Calibration Tolerances MDN-A.B 66

Ratio	32.277	
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Base Check 0.681 

Field Check 0.700 

Neutron Constants MDN-A.B 66

Last Edited on 16-SEP-2016,09:38

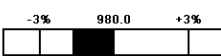
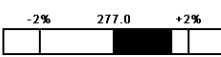
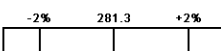
Neutron Source Id	P0204NN	
Neutron Jig Number	NJ5736	
Air Hole Processing	Legacy	
Caliper Source for Processing	Density Caliper	
Stand-off	0.00	inches
Mud Density	1.00	gm/cc
Limestone Sigma	7.10	cu
Sandstone Sigma	4.26	cu
Dolomite Sigma	4.70	cu
Formation Pressure Source	None	
Formation Pressure	N/A	kpsi
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	

FE Calibration MFE-B.J 352

Base Calibration on 28-AUG-2016 18:58
Field Check on 15-SEP-2016 16:35

Base Calibration	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	963.3	126.8
Base Check		281.3
Field Check		281.4

FE Calibration Tolerances MFE-B.J 352

Reference 2	963.3		ohm
Base Check	281.3		ohm-m
Field Check	281.4		ohm-m

FE Constants MFE-B.J 352

Last Edited on 16-SEP-2016,09:37

Running Mode	No Sleeve	
MFE K Factor	0.1268	
Borehole Correction Constants		
Sonde Position	0.5	inches
Hole Size Source	Density Caliper	
Hole Size Constant Value	N/A	inches
Rm Source	Global Value: Temperature Corrected	
Temp. for Rm Corr.	MCG External Temperature	

Sonic Constants MSS-A.A 55

Last Edited on 16-SEP-2016,09:37

Maximum Boundary Contrast	100.00	micro-sec/ft
Fluid Transit Time	189.00	micro-sec/ft
Limestone Transit Time	47.50	micro-sec/ft
Sandstone Transit Time	55.50	micro-sec/ft
Dolomite Transit Time	43.50	micro-sec/ft
Sonic used for Porosities	3-5' Compensated Sonic	
Correction for Sonde Skew	Applied	
Cycle Stretch Algorithm	Applied	
MN3FT	N/A	micro-sec
MX3FT	N/A	micro-sec
Hunt-Raymer Constant	83.13	micro-sec/ft

Sonde Mode
Hole Type

Compensated
Open Hole

Sonde Parameters

	Measured	Calibrated			
Offset	N/A	0.0000			
Free Pipe	N/A	N/A			
Peak Amplitude Source		N/A			
Waveform	Start Time (micro-sec)	Width (micro-sec)	Pre Gain	Start Gain	Discriminator (mV)
3'	N/A	N/A	N/A	N/A	N/A
4'	N/A	N/A	N/A	N/A	N/A
5'	N/A	N/A	N/A	N/A	N/A
6'	N/A	N/A	N/A	N/A	N/A

Processed Fixed Gate Parameters

Waveform Used For Processing	N/A			
Start Time (micro-sec)	End Time (micro-sec)	Discriminator (mV)	N/A	
N/A	N/A	N/A		
N/A	N/A	N/A	N/A	
N/A	N/A	N/A	N/A	
N/A	N/A	N/A	N/A	
N/A	N/A	N/A	N/A	

Full Waveform Parameters

Use 3' Waveform to derive TR	N/A	
Use 4' Waveform to derive TR	N/A	
Use 5' Waveform to derive TR	N/A	
Use 6' Waveform to derive TR	N/A	
3' Waveform Discriminator Level	N/A	mV
4' Waveform Discriminator Level	N/A	mV
5' Waveform Discriminator Level	N/A	mV
6' Waveform Discriminator Level	N/A	mV
3' Waveform Filter	N/A	
4' Waveform Filter	N/A	
5' Waveform Filter	N/A	
6' Waveform Filter	N/A	
Semblance Level	N/A	
Semblance Window Width	N/A	micro-sec
Sonic 1 Despiker	N/A	N/A
Sonic 2 Despiker	N/A	N/A

Induction Calibration MAI-A.A 111

Base Calibration on 05-AUG-2014,09:34
Field Check on 15-SEP-2016 16:34

Base Calibration

Test Loop Calibration	Measured	Calibrated (mmho/m)
Channel	Low High	Low High
1	17.6 473.6	9.3 966.2
2	6.4 385.9	7.6 821.4
3	3.2 264.0	5.2 566.0
4	2.1 135.5	2.6 279.2

Array Temperature 23.0 Deg F

Test Loop Calibration Verified 22-MAY-2016,17:59

Channel	Base Check (mmho/m)	Field Check (mmho/m)	
	Low High	Low High	
1	12.1 3873.0	10.9 3868.8	
2	29.8 3528.1	28.0 3523.2	
3	29.1 3021.3	27.5 3016.8	
4	19.1 2058.5	18.0 2055.1	
Deep	17.7 1962.1	16.7 1958.8	
Medium	43.1 3976.4	40.9 3970.7	
Shallow	44.4 5232.7	41.8 5226.0	
Array Temperature	65.8	82.2	Deg F

Induction Calibration Tolerances MAI-A A 111

Induction Calibration Tolerances MAI-A.A 111

Low Conductivity 1	17.6		mmho/m	High Conductivity 1	473.6		mmho/m
Low Conductivity 2	6.4		mmho/m	High Conductivity 2	385.9		mmho/m
Low Conductivity 3	3.2		mmho/m	High Conductivity 3	264.0		mmho/m
Low Conductivity 4	2.1		mmho/m	High Conductivity 4	135.5		mmho/m
Background Vx 1	0.0		mmho/m	Phase Check Loop 1	0.0		%
Background Vx 2	0.0		mmho/m	Phase Check Loop 2	0.0		%
Background Vx 3	0.0		mmho/m	Phase Check Loop 3	0.0		%
Background Vx 4	0.0		mmho/m	Phase Check Loop 4	0.0		%

Induction Constants MAI-A.A 111

Last Edited on 16-SEP-2016,09:37

Induction Model		RtAP-WBM	
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
Rm Source	Global Value: Temperature Corrected		
Temp. for Rm Corr.	MCG External Temperature		
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-A.A 111

Field Calibration on 24-NOV-2014,10:23

	Measured	Calibrated(Deg F)
Lower	10.00	10.00
Upper	100.00	100.00

High Resolution Temperature Constants MAI-A.A 111

Last Edited on 26-JUN-2014,15:06

Photo Density Calibration MPD-B 104

Base Calibration on 28-AUG-2016 20:24

Field Check on 15-SEP-2016 16:42

Density Calibration

Base Calibration

	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Background	1145	1339		
Reference 1	49665	24007	59556	30836
Reference 2	20032	2442	24941	2541

Field Check at Base

1144.9 1338.6

Field Check

1140.3 1322.0

PE Calibration

Base Calibration

	Measured		Calibrated Ratio
	WS	WH	
Background	211	1021	
Reference 1	20773	49486	0.424
Reference 2	5807	19899	0.296

Field Check at Base

211.3 1021.2

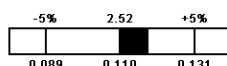
Field Check

208.3 1017.9

Photo Density Calibration Tolerances MPD-B 104

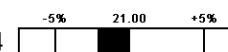
Near Density Ratio

2.57



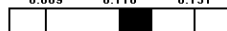
Far Density Ratio

20.54



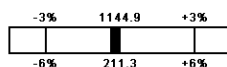
PE Calibration

0.119



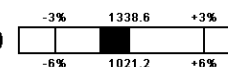
Near Den. Field Check

1140.3



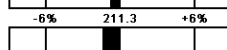
Far Den. Field Check

1322.0



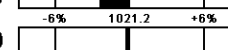
PE WS Field Check

208.3



PE WH Field Check

1017.9



Density Constants MPD-B 104

Last Edited on 16-SEP-2016,09:37

Density Source Id	P50557B	
Nylon Calibrator Number	DNCE695	
Aluminium Calibrator Number	DACD698	
Density Shoe Profile	8 inch	
Caliper Source for Processing	Density Caliper	
PE Correction to Density	Not Applied	
Mud Density	1.12	gm/cc
Mud Density Z/A Multiplier	1.11	
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	
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	

Caliper Calibration MPD-B 104

Base Calibration on 28-AUG-2016 19:51

Field Calibration on 15-SEP-2016 16:36

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	13646	3.99
2	22688	5.98
3	24207	7.07

3	31297	7.97
4	39521	9.86
5	48608	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.90	7.97

Caliper Calibration Tolerances MPD-B 104

Short Arm Field Cal.	7.90	7.77 7.97 8.17	in
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DOWNHOLE EQUIPMENT

C:\Minimus 15.03.5939\Logs\Shakespeare Anderson #1-33\Shakespeare Anderson #1-33_001.dta

Cablehead, 11 pin
CBH-CA 176 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Comms Gamma
MCG-C 123 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity
MMR-C.A 247 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

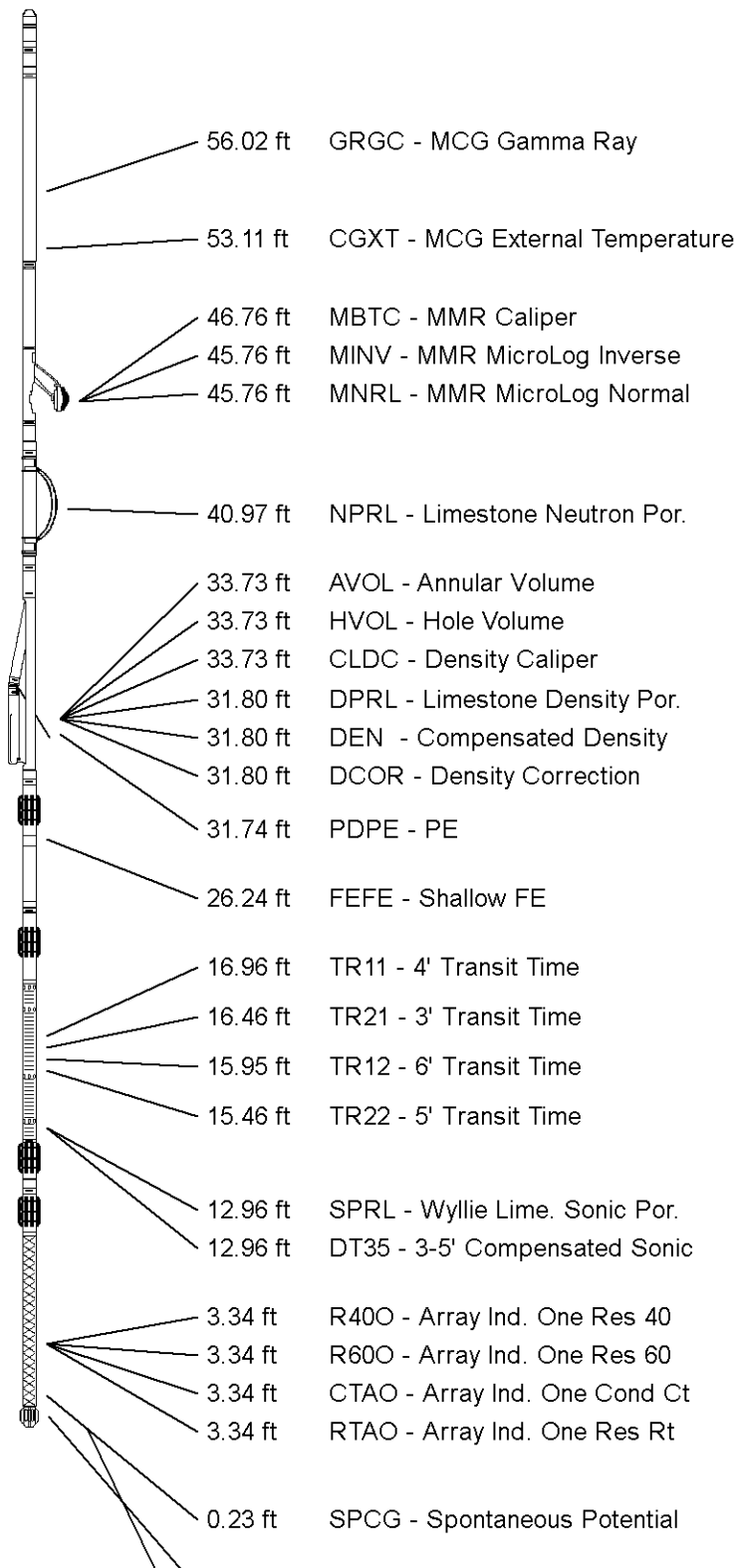
Compact Density/Caliper
MPD-B 104 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Focussed Electric
MFE-B.J 352 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Sonic
MSS-A.A 55 LG: 12.52 ft WT: 72.8 lb OD: 2.244 in

Compact Induction
MAI-A.A 111 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 63.70 ft Weight: 480.6 lb



Tool Zero (0.13ft from bottom)

-0.13 ft SMTU - DST Uphole Tension

All measurements relative to tool zero.

COMPANY	SHAKESPEARE OIL CO., INC.
WELL	ANDERSON #1-33
FIELD	WILDCAT
PROVINCE/COUNTY	DECATUR
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	2784.00	feet	First Reading	4458.00	feet
Elevation Drill Floor	2782.00	feet	Depth Driller	4500.00	feet
Elevation Ground Level	2776.00	feet	Depth Logger	4504.00	feet



MICRORESISTIVITY LOG

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