

Well Integrity Log Interpretation (MFC56)

Company: Mull Drilling Company ONC.
Well: NWAU #14
Field: Arapahoe
Country: USA
Run: 1
Logging Date: 09/25/2024
Analyst: William Redfield
Reviewer: -





Table of Contents

1.	Objective and Conclusions.....	3
1.1.	Introduction.....	3
1.2.	Objectives	3
1.3.	Conclusions.....	3
1.4.	Log Quality Control	4
1.5.	Log Interpretation.....	6
1.5.1.	Details	6
1.5.2.	MFC Charts.....	9
1.6.	Joint Table from MFC.....	13
2.	Appendix A: Well Diagram	17
3.	Appendix B: Tool Specification	18
3.1.	MFC Tool Specifications & Logging Modes.....	18
3.2.	Tool String Diagram	19
4.	Appendix C: Definition of Terms in Pipe Analysis Report	20
4.1.	Pipe Dimensions	20
4.2.	Maximum Penetration.....	21
4.3.	Wall Loss	22
5.	Appendix D: Data Processing/Data Display	25
5.1.	Data Processing	25
5.2.	Description of Post Processed Presentation	25
5.3.	Media & Listing of Files.....	25



MFC Log Interpretation

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1. Objective and Conclusions

1.1. Introduction

The 56 Arm Multi Finger Caliper (MFC56) tool was run on September 25, 2024, in well NWAU #14 from 5244.25 feet to surface.

1.2. Objectives

The objective of the survey was to identify and accurately quantify any wall loss or damage (such as cross-sectional distortion or buckling) within the 5-1/2" casing.

1.3. Conclusions

- There is some light to medium ovality from 4835 to 5050 feet. The ovality results in some slight false penetration. These areas should not be considered damage. (**Figure 1**)
- At some connections, particularly above 800 feet, there are collars that show slight deformations that are typically associated with over-torquing. These are not significant deformations. (**Figure 2**)
- Generally, the pipe appears in good condition. The arm values sit above 9.2% from nominal, but this is within API specifications and is fairly common in new casing. (**Figure 3**)



1.4. Log Quality Control

Table 1 – MFC Log Quality Control

LQC Area		Result
¹ Are all fingers in contact with inner pipe wall (raw data)?		Yes
² Before and after calibrations performed and within specification?		Yes
³ Excentralization correction applied?		Yes
⁴ Is tool centralization acceptable?		Yes
⁵ Does average radius approximate theoretical nominal radius (in good pipe)?		Yes
⁶ Are inner wall manufacturing patterns clearly visible (in good pipe)?		Yes
⁷ Any sticking/reconstructed fingers?		No
⁸ Connections/collars identifiable on all finger traces?		Yes
⁹ Is the level of tool rotation acceptable?		Yes
¹⁰ Has the correct master calibration (MTC) been applied?		Yes
¹¹ Does the repeat pass correlate with the main pass?		N/A
LQC Comments		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11	None provided	
Additional Comments		



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Supporting Well Information			
Required	Received?	Optional	Received?
LAS File	Yes	Well History	No
Field Print	Yes	Production History	No
Job Log	Yes	Well Status	No
Well Diagram	No	Open Hole GR Log	No
Completion Diagram	N/A	Cement Evaluation Log	No
Tool String Diagram	Yes	Borehole Fluid Type	No
Logging Program	N/A	Well Trajectory Survey	No
Job Objectives	Yes	DB File	Yes



1.5. Log Interpretation

1.5.1.Details

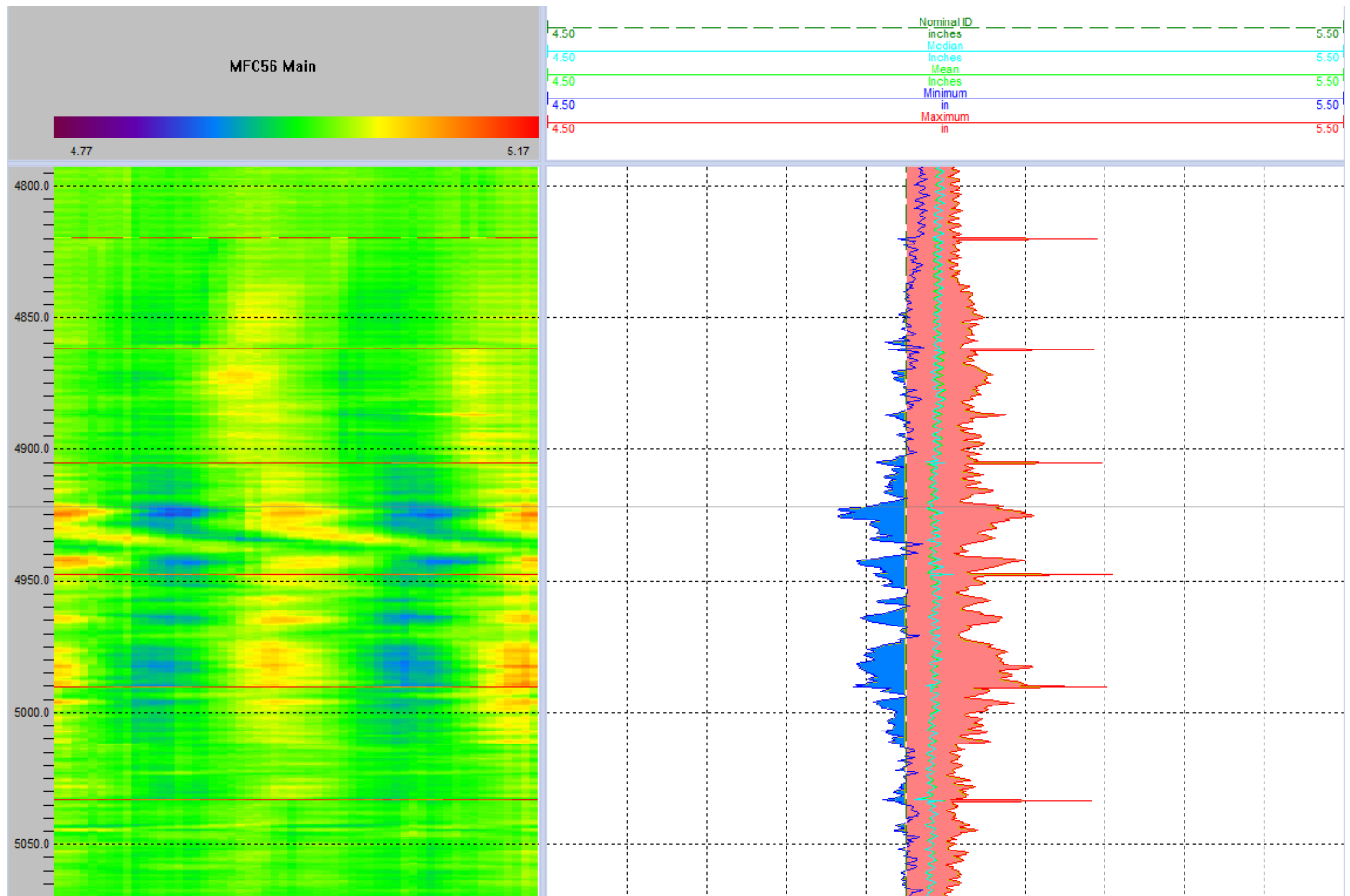


Figure 1, Ovality 4835 – 5050 feet

There is some light to medium ovality from 4835 to 5050 feet. The ovality results in some slight false penetration. These areas should not be considered damage.



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Company: Mull Drilling Company ONC.

Well: NWAU #14

Logging Date: 09/25/2024

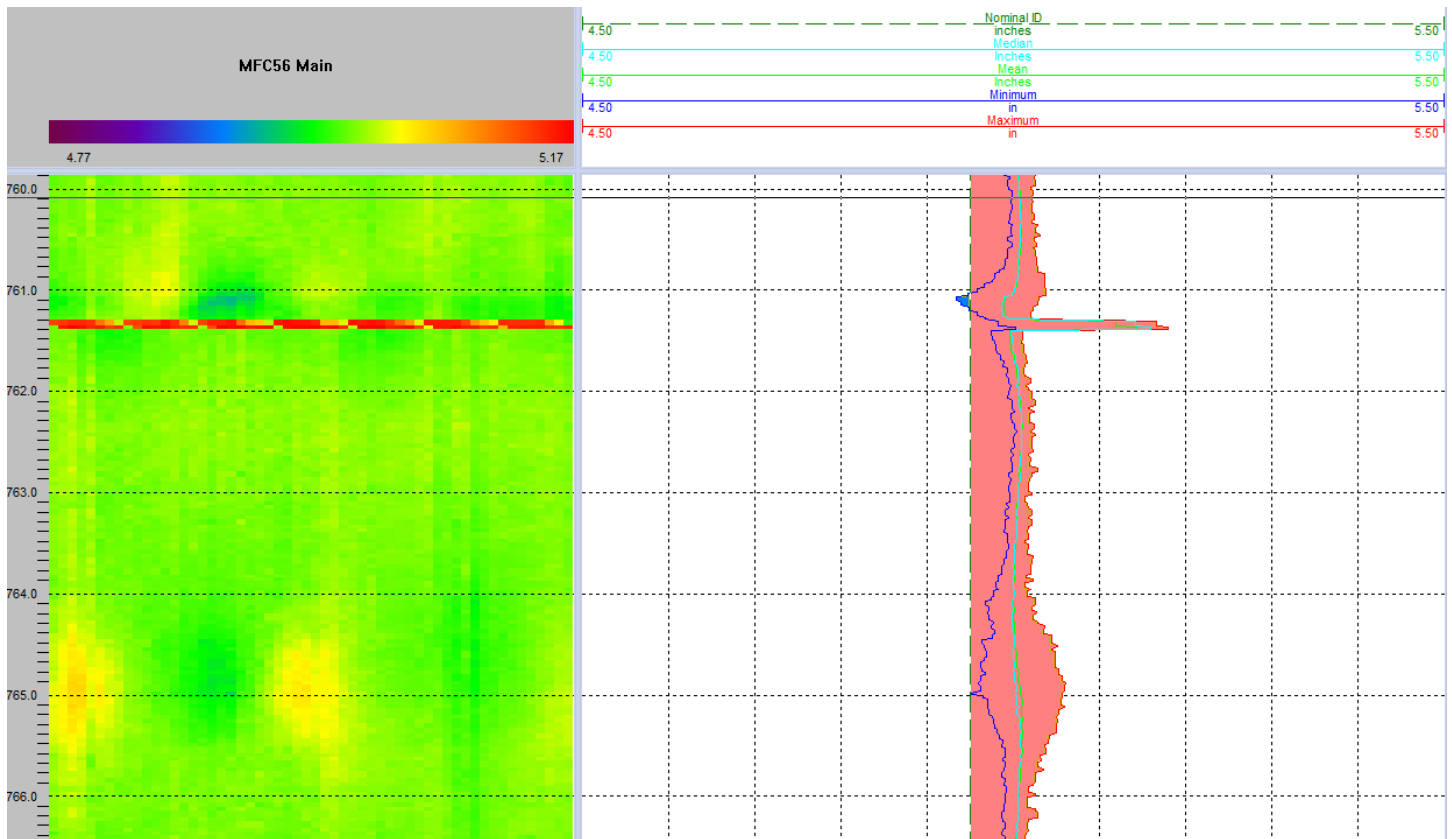


Figure 2, Light deformation near connections above 800 feet

At some connections, particularly above 800 feet, there are collars that show slight deformations that are typically associated with over-torquing. These are not significant deformations.

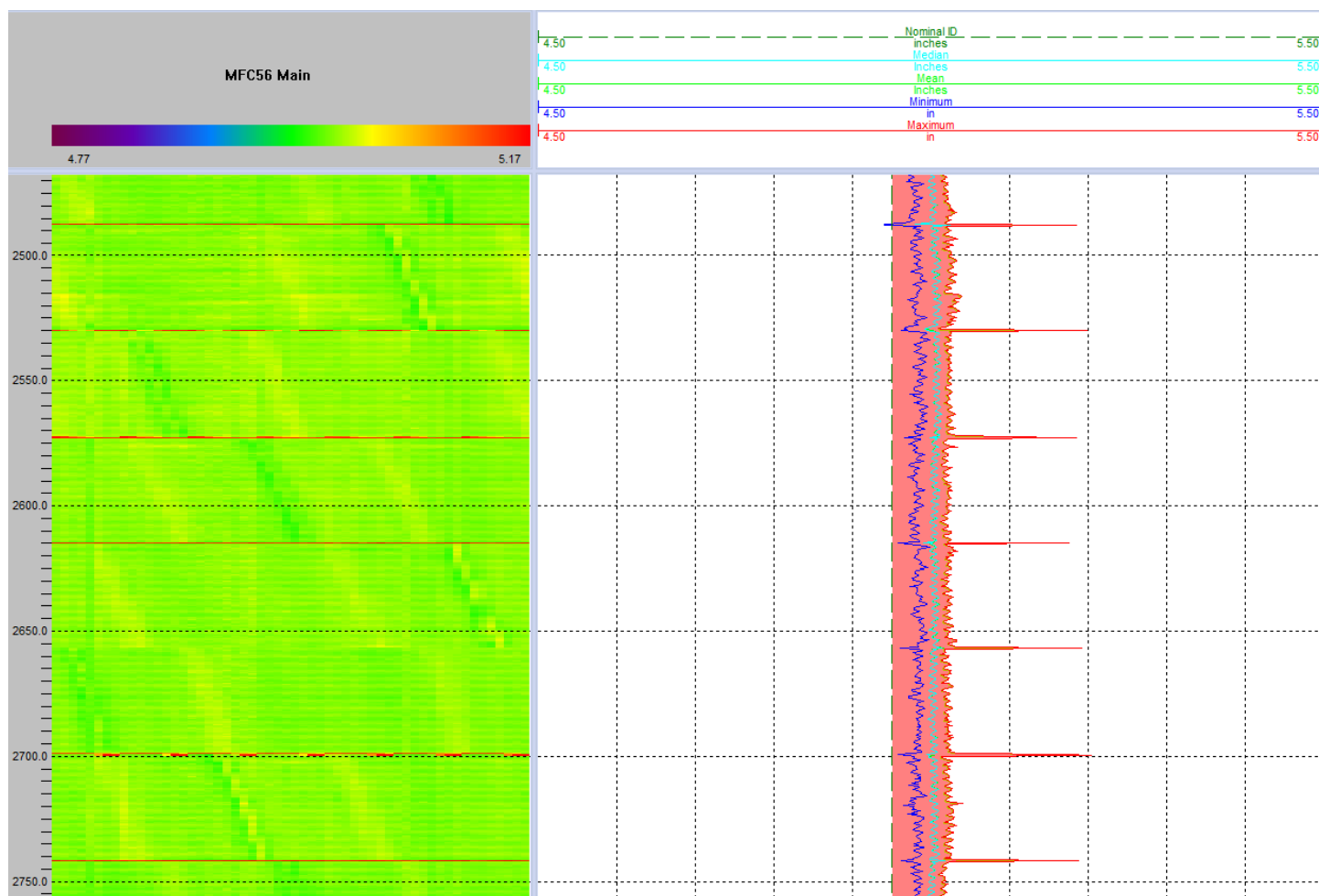


Figure 3, Sample of the pipe

Generally, the pipe appears in good condition. The arm values sit above 9.2% from nominal, but this is within API specifications and is fairly common in new casing.



1.5.2.MFC Charts

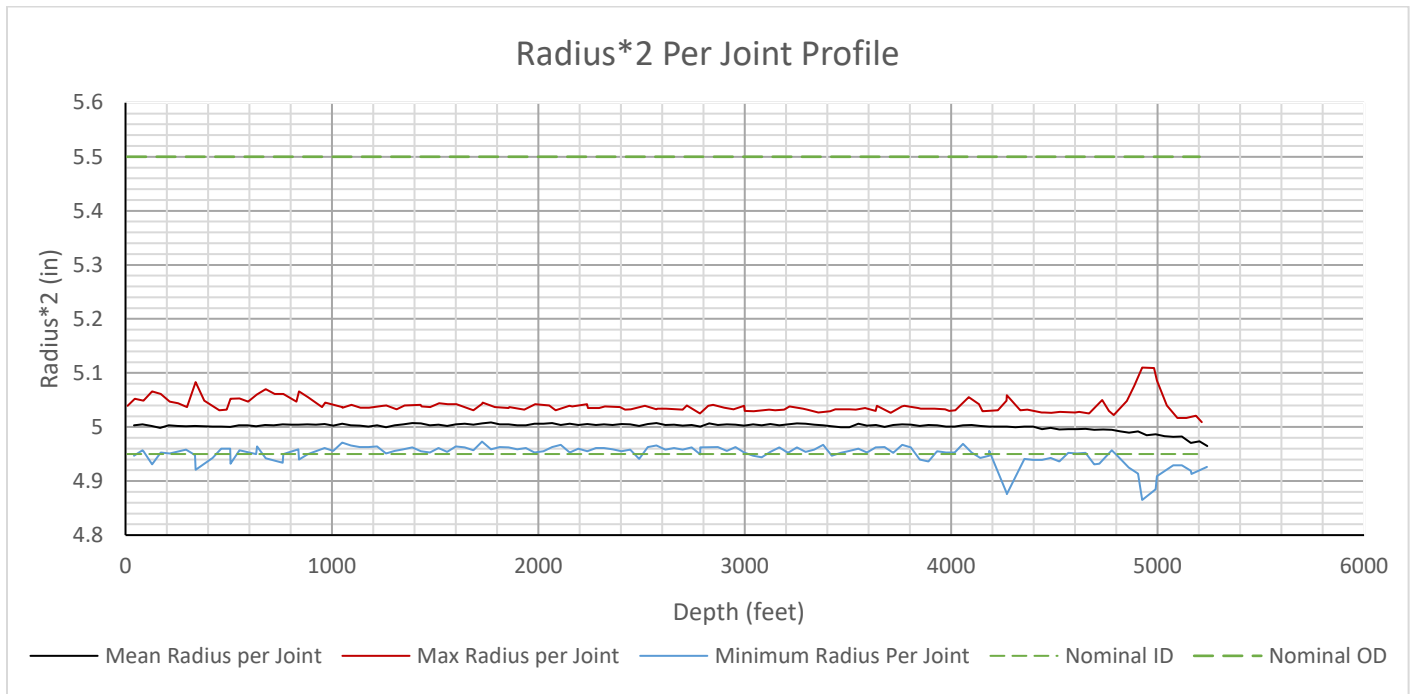


Figure 4, MFC Min/Max/Avg Radius*2 Per Joint

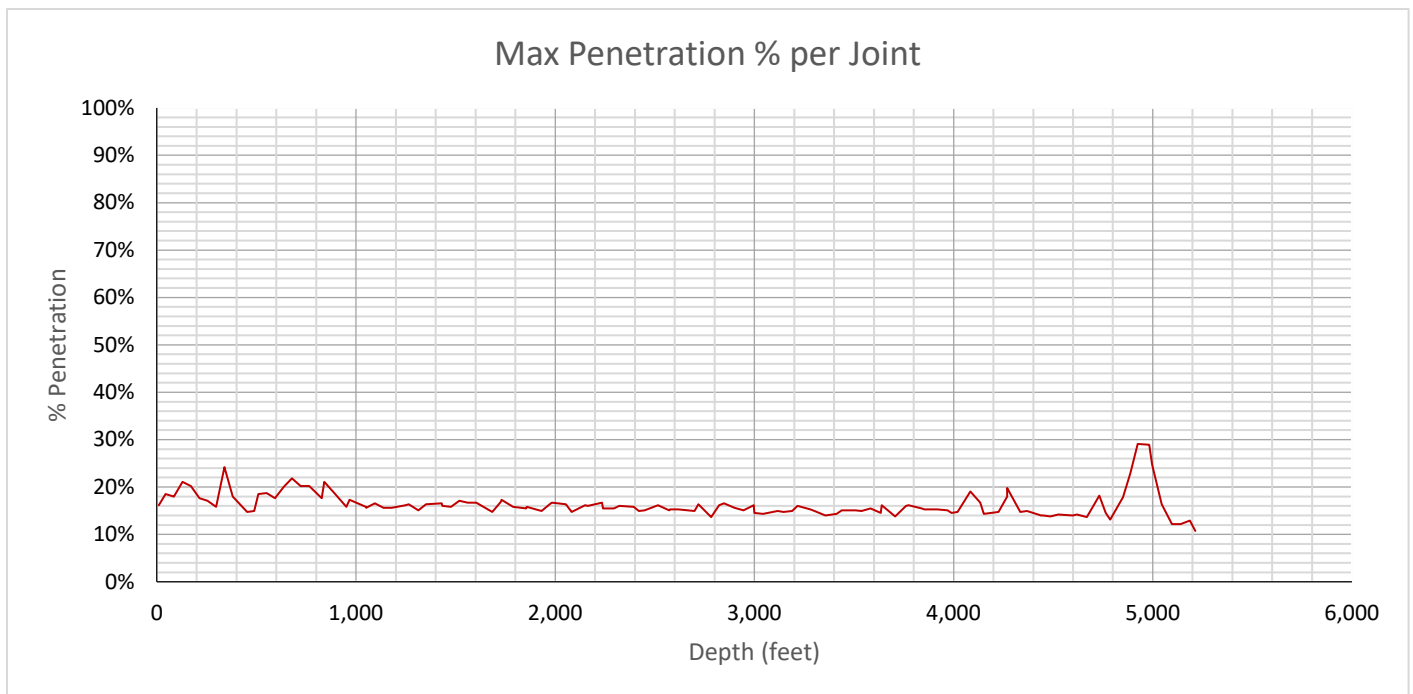


Figure 5, Max Penetration Percent Per Joint



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Logging Date: 09/25/2024

Max Penetration % Pie Graph

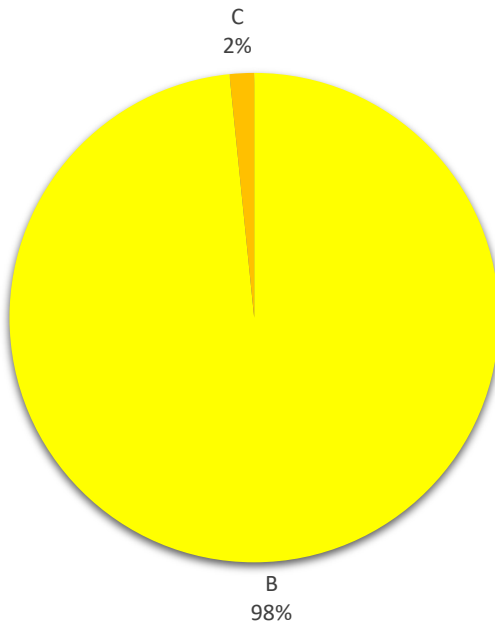


Figure 6

Grade Color	Penetration %	Comment
A	<10%	Very Light
B	10>-25%	Light
C	25>-50%	Moderate
D	50>-75%	Significant
E	>75%	Severe

Grade	Joints
A	0
B	122
C	2
D	0
E	0

Top Body(ft)	Bottom Body(ft)	Max Pen(%)	Grade	Max Pen Depth(ft)	Max Pen(in)	Comment
4905.26	4947.51	29.1	C	4925.11	5.110	Ovality
4947.84	4990.34	28.9	C	4982.79	5.109	Ovality



Max Metal Loss % Pie Graph

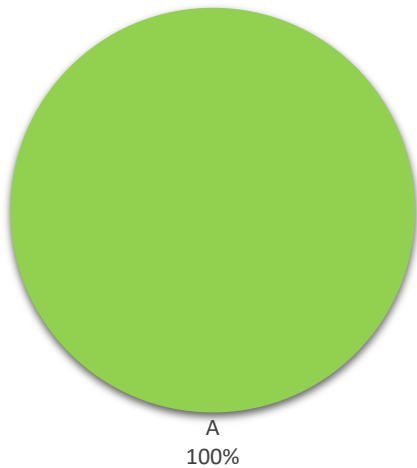


Figure 7

Grade Color	Wall Loss %	Comment
A	<12%	Very Light
B	12>-20%	Light
C	20>-30%	Moderate
D	30>-40%	Significant
E	>40%	Severe

Grade	Joints
A	124
B	0
C	0
D	0
E	0

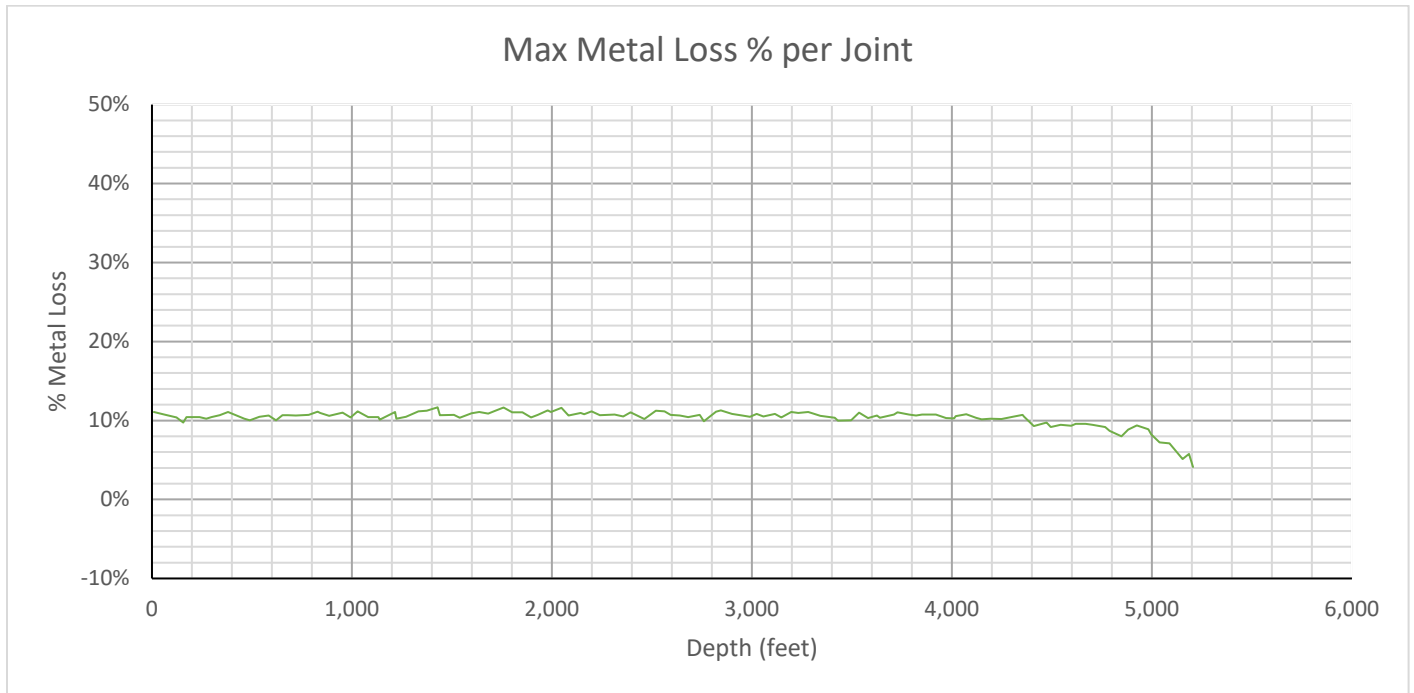


Figure 8, Max Wall Loss Per Joint (MFC)

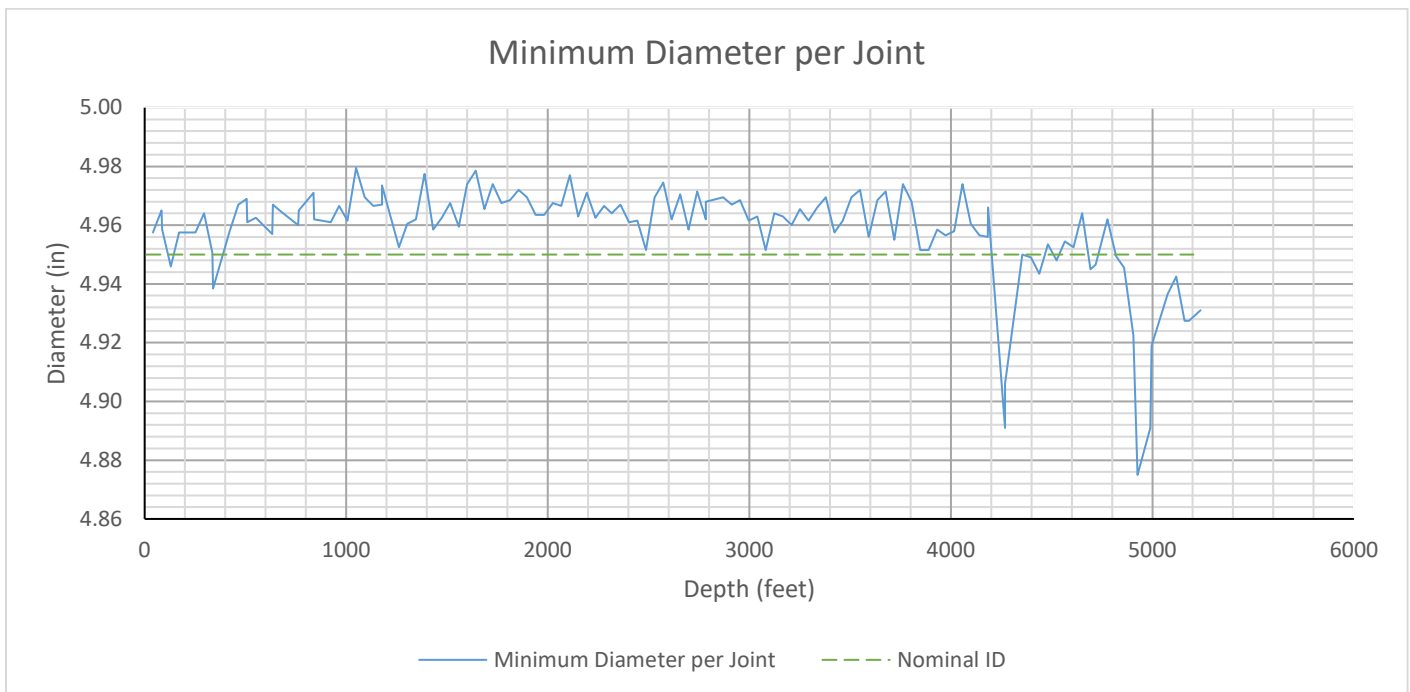


Figure 9, Minimum Diameter Per Joint



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1.6. Joint Table from MFC

#	Top Body(ft)	Bottom Body(ft)	Body Length(ft)	Max Pen(%)	Pen Grade	Max Pen Depth(ft)	Max Pen(in)	Max Loss (%)	ML Grade	Max Loss Depth(ft)	Min Diam(in)	Min Diam Depth(ft)
1	8.65	41.08	32.43	16.2	B	10.12	5.039	11.1	A	9.60	4.958	40.98
2	41.37	83.08	41.72	18.5	B	44.47	5.052	10.7	A	61.99	4.965	83.08
3	83.43	125.90	42.47	18.0	B	86.47	5.049	10.4	A	122.54	4.959	86.46
4	126.51	168.27	41.76	21.1	B	129.41	5.066	9.7	A	156.01	4.946	129.01
5	168.55	210.07	41.52	20.2	B	171.31	5.061	10.4	A	172.91	4.958	171.42
6	210.44	252.04	41.60	17.6	B	213.58	5.047	10.4	A	238.74	4.958	252.00
7	252.37	293.95	41.58	17.1	B	254.94	5.044	10.2	A	272.21	4.964	293.95
8	294.24	336.71	42.47	15.8	B	297.69	5.037	10.4	A	296.42	4.951	336.70
9	336.99	379.27	42.28	24.2	B	340.06	5.083	10.7	A	338.69	4.939	339.98
10	379.56	421.57	42.02	18.0	B	382.13	5.049	11.1	A	380.91	4.958	421.57
11	421.94	463.98	42.03	14.7	B	453.65	5.031	10.2	A	461.99	4.967	463.94
12	464.33	506.39	42.07	14.9	B	489.73	5.032	10.0	A	489.43	4.969	506.34
13	506.69	548.51	41.82	18.5	B	509.13	5.052	10.5	A	537.52	4.961	509.02
14	548.83	590.83	42.00	18.7	B	552.18	5.053	10.6	A	584.13	4.963	551.73
15	591.18	633.25	42.07	17.6	B	594.27	5.047	10.0	A	619.84	4.957	633.18
16	633.53	675.97	42.44	20.0	B	636.50	5.060	10.7	A	653.07	4.967	636.74
17	676.32	718.47	42.15	21.8	B	679.15	5.070	10.7	A	679.34	4.965	679.00
18	718.82	761.17	42.35	20.2	B	722.14	5.061	10.6	A	719.44	4.960	761.15
19	761.52	803.49	41.97	20.2	B	764.89	5.061	10.7	A	782.86	4.965	764.73
20	803.80	837.74	33.93	17.6	B	827.75	5.047	11.1	A	827.88	4.971	837.74
21	838.07	880.52	42.45	21.1	B	840.64	5.066	11.0	A	841.75	4.962	840.59
22	880.84	922.86	42.02	19.1	B	883.70	5.055	10.6	A	885.68	4.961	922.79
23	923.14	964.04	40.90	15.8	B	952.12	5.037	11.0	A	952.85	4.967	963.99
24	964.34	1006.58	42.23	17.3	B	967.56	5.045	10.4	A	992.88	4.962	1006.57
25	1006.89	1049.16	42.27	15.8	B	1048.94	5.037	11.1	A	1029.05	4.980	1049.06
26	1049.44	1091.68	42.23	15.6	B	1051.97	5.036	10.4	A	1080.64	4.970	1091.66
27	1092.00	1134.43	42.44	16.5	B	1095.27	5.041	10.4	A	1132.89	4.967	1134.40
28	1134.76	1176.98	42.22	15.6	B	1138.10	5.036	10.1	A	1138.44	4.967	1176.98
29	1177.33	1219.03	41.70	15.6	B	1179.69	5.036	11.1	A	1216.14	4.974	1177.33
30	1219.30	1261.48	42.18	16.2	B	1248.72	5.039	10.2	A	1222.57	4.953	1261.43
31	1261.80	1303.65	41.85	16.4	B	1264.37	5.040	10.5	A	1269.47	4.961	1303.60
32	1303.97	1346.07	42.10	15.1	B	1312.49	5.033	11.2	A	1332.93	4.962	1346.02
33	1346.37	1388.60	42.23	16.4	B	1352.05	5.040	11.2	A	1374.39	4.978	1388.52
34	1388.96	1430.97	42.02	16.5	B	1430.07	5.041	11.7	A	1428.87	4.959	1430.91



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35	1431.26	1473.71	42.45	16.0	B	1434.20	5.038	10.7	A	1440.34	4.963	1473.71
36	1474.03	1516.21	42.18	15.8	B	1476.55	5.037	10.7	A	1509.24	4.968	1516.21
37	1516.56	1557.99	41.43	17.1	B	1519.45	5.044	10.3	A	1539.25	4.960	1557.89
38	1558.31	1600.51	42.20	16.7	B	1560.78	5.042	10.9	A	1598.44	4.974	1600.48
39	1600.84	1642.95	42.10	16.7	B	1603.82	5.042	11.1	A	1636.43	4.979	1642.88
40	1643.23	1685.10	41.87	14.7	B	1684.95	5.031	10.9	A	1680.69	4.966	1685.10
41	1685.38	1727.65	42.27	16.9	B	1727.48	5.043	11.2	A	1713.05	4.974	1727.56
42	1728.05	1770.38	42.34	17.3	B	1730.97	5.045	11.7	A	1757.26	4.968	1770.35
43	1770.78	1812.65	41.87	15.8	B	1789.47	5.037	11.1	A	1801.36	4.969	1812.63
44	1813.00	1855.20	42.20	15.5	B	1855.09	5.035	11.0	A	1852.08	4.972	1855.20
45	1855.54	1897.60	42.07	15.8	B	1858.54	5.037	10.4	A	1895.03	4.970	1897.55
46	1897.94	1939.79	41.85	14.9	B	1932.17	5.032	10.7	A	1929.80	4.964	1939.74
47	1940.14	1981.96	41.82	16.5	B	1977.80	5.041	11.3	A	1978.08	4.964	1981.94
48	1982.24	2024.66	42.42	16.7	B	1984.74	5.042	11.1	A	1994.10	4.968	2024.64
49	2024.96	2066.54	41.58	16.4	B	2053.35	5.040	11.6	A	2047.39	4.967	2066.47
50	2066.88	2108.93	42.05	14.7	B	2082.97	5.031	10.6	A	2082.97	4.977	2108.89
51	2109.24	2151.38	42.13	16.2	B	2149.56	5.039	10.9	A	2144.01	4.963	2151.36
52	2151.68	2194.11	42.44	16.0	B	2164.02	5.038	10.8	A	2161.06	4.971	2194.11
53	2194.43	2236.50	42.07	16.7	B	2235.14	5.042	11.2	A	2197.69	4.963	2236.50
54	2236.81	2278.75	41.93	15.5	B	2239.67	5.035	10.7	A	2239.74	4.967	2278.65
55	2279.07	2317.64	38.58	15.5	B	2295.16	5.035	10.7	A	2313.05	4.964	2317.64
56	2317.96	2360.16	42.20	16.0	B	2321.78	5.038	10.5	A	2356.85	4.967	2360.14
57	2360.44	2402.61	42.17	15.8	B	2394.91	5.037	11.0	A	2392.44	4.961	2402.54
58	2402.93	2445.01	42.08	14.9	B	2419.53	5.032	10.9	A	2405.32	4.962	2444.96
59	2445.36	2487.53	42.17	15.1	B	2448.49	5.033	10.2	A	2462.61	4.952	2487.45
60	2487.85	2529.90	42.05	16.2	B	2516.66	5.039	11.2	A	2518.84	4.970	2529.90
61	2530.30	2572.57	42.27	15.1	B	2572.33	5.033	11.2	A	2563.17	4.975	2572.50
62	2572.85	2614.89	42.03	15.3	B	2576.32	5.034	10.7	A	2593.46	4.962	2614.80
63	2615.17	2656.72	41.55	15.3	B	2617.87	5.034	10.6	A	2639.23	4.971	2656.69
64	2657.02	2699.32	42.30	14.9	B	2699.05	5.032	10.4	A	2680.87	4.959	2699.27
65	2699.60	2741.76	42.15	16.4	B	2718.84	5.040	10.7	A	2739.18	4.972	2741.69
66	2742.07	2784.31	42.23	13.6	B	2783.17	5.025	9.9	A	2760.19	4.962	2784.29
67	2784.62	2827.13	42.50	16.2	B	2823.70	5.039	11.1	A	2820.65	4.968	2784.62
68	2827.43	2869.64	42.22	16.5	B	2846.78	5.041	11.3	A	2844.63	4.970	2869.64
69	2869.99	2912.35	42.35	15.6	B	2900.32	5.036	10.9	A	2900.41	4.967	2912.35
70	2912.63	2954.70	42.07	15.1	B	2945.83	5.033	10.6	A	2951.44	4.969	2954.70
71	2955.01	2996.71	41.70	16.2	B	2996.48	5.039	10.5	A	2989.78	4.962	2996.66



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72	2997.03	3039.52	42.49	14.5	B	2999.69	5.030	10.8	A	3022.97	4.963	3039.38
73	3039.80	3081.84	42.04	14.4	B	3043.14	5.029	10.5	A	3057.99	4.952	3081.83
74	3082.24	3124.20	41.96	14.9	B	3117.14	5.032	10.8	A	3114.33	4.964	3124.20
75	3124.49	3166.79	42.30	14.7	B	3146.41	5.031	10.4	A	3146.76	4.963	3166.77
76	3167.09	3209.39	42.30	14.9	B	3190.03	5.032	11.1	A	3196.08	4.960	3209.32
77	3209.67	3251.87	42.20	16.0	B	3216.50	5.038	10.9	A	3231.01	4.966	3251.82
78	3252.16	3294.29	42.13	15.3	B	3281.85	5.034	11.1	A	3281.20	4.962	3294.29
79	3294.63	3336.73	42.10	14.9	B	3302.02	5.032	10.9	A	3302.19	4.966	3336.68
80	3337.06	3379.36	42.30	14.0	B	3356.23	5.027	10.6	A	3341.59	4.970	3379.34
81	3379.66	3421.88	42.22	14.4	B	3413.16	5.029	10.4	A	3413.61	4.958	3421.85
82	3422.16	3464.62	42.45	15.1	B	3438.88	5.033	10.0	A	3430.01	4.962	3464.51
83	3464.93	3507.32	42.39	15.1	B	3507.22	5.033	10.0	A	3495.63	4.970	3507.32
84	3507.58	3550.22	42.64	14.9	B	3538.09	5.032	11.0	A	3535.49	4.972	3550.22
85	3550.54	3592.70	42.17	15.5	B	3582.50	5.035	10.3	A	3579.71	4.956	3592.69
86	3593.02	3634.64	41.62	14.5	B	3634.42	5.030	10.6	A	3624.85	4.969	3634.64
87	3634.92	3677.42	42.50	16.2	B	3639.41	5.039	10.3	A	3639.46	4.972	3677.32
88	3677.74	3719.81	42.07	13.8	B	3706.96	5.026	10.8	A	3709.82	4.955	3719.81
89	3720.16	3762.54	42.39	16.0	B	3761.56	5.038	11.0	A	3727.31	4.974	3762.49
90	3762.83	3805.14	42.32	16.2	B	3773.65	5.039	10.7	A	3784.74	4.968	3805.08
91	3805.46	3847.58	42.12	15.5	B	3840.48	5.035	10.6	A	3819.89	4.952	3847.50
92	3847.90	3889.73	41.83	15.3	B	3852.74	5.034	10.7	A	3850.10	4.952	3889.60
93	3890.05	3931.91	41.87	15.3	B	3918.70	5.034	10.7	A	3918.80	4.959	3931.86
94	3932.25	3974.30	42.06	15.1	B	3970.59	5.033	10.3	A	3970.37	4.957	3974.30
95	3974.70	4017.02	42.32	14.5	B	3989.61	5.030	10.3	A	4010.80	4.958	4017.02
96	4017.42	4057.16	39.74	14.7	B	4019.49	5.031	10.5	A	4019.49	4.974	4057.11
97	4057.47	4099.23	41.76	19.1	B	4084.99	5.055	10.8	A	4072.08	4.961	4099.23
98	4099.63	4141.37	41.74	16.7	B	4134.87	5.042	10.4	A	4120.12	4.957	4141.35
99	4141.67	4183.95	42.28	14.4	B	4151.72	5.029	10.2	A	4148.63	4.956	4183.88
100	4184.30	4226.57	42.27	14.7	B	4226.38	5.031	10.2	A	4191.35	4.966	4184.38
101	4226.87	4269.15	42.28	18.0	B	4268.50	5.049	10.2	A	4248.10	4.891	4269.14
102	4269.47	4311.97	42.50	19.8	B	4269.55	5.059	10.5	A	4303.15	4.906	4269.49
103	4312.26	4354.44	42.18	14.7	B	4334.80	5.031	10.7	A	4352.65	4.950	4354.41
104	4354.74	4396.84	42.10	14.9	B	4368.10	5.032	10.5	A	4359.22	4.949	4396.79
105	4397.11	4439.19	42.08	14.0	B	4438.98	5.027	9.3	A	4408.73	4.944	4439.19
106	4439.48	4481.68	42.20	14.0	B	4450.87	5.027	9.7	A	4473.48	4.954	4481.54
107	4481.96	4524.20	42.23	13.8	B	4485.33	5.026	9.2	A	4494.14	4.948	4524.18
108	4524.51	4566.38	41.87	14.2	B	4526.02	5.028	9.5	A	4543.42	4.955	4566.36



MFC Log Interpretation

Company: Mull Drilling Company ONC.

Well: NWAU #14

Logging Date: 09/25/2024

#	Top Body(ft)	Bottom Body(ft)	Body Length(ft)	Max Pen(%)	Pen Grade	Max Pen Depth(ft)	Max Pen(in)	Max Loss (%)	ML Grade	Max Loss Depth(ft)	Min Diam(in)	Min Diam Depth(ft)
109	4566.71	4608.60	41.88	14.0	B	4598.83	5.027	9.3	A	4595.94	4.953	4608.58
110	4608.93	4651.02	42.08	14.2	B	4619.25	5.028	9.6	A	4619.29	4.964	4651.02
111	4651.30	4693.33	42.03	13.6	B	4668.47	5.025	9.6	A	4668.20	4.945	4693.23
112	4693.65	4735.42	41.77	18.2	B	4731.58	5.050	9.4	A	4702.35	4.947	4718.02
113	4735.70	4777.64	41.93	14.5	B	4763.16	5.030	9.2	A	4765.71	4.962	4777.55
114	4777.95	4820.02	42.07	13.1	B	4786.64	5.022	8.7	A	4789.17	4.950	4820.02
115	4820.32	4862.10	41.78	17.8	B	4850.21	5.048	8.0	A	4847.16	4.946	4859.87
116	4862.44	4904.94	42.50	22.9	B	4886.95	5.076	8.8	A	4880.79	4.923	4904.94
117	4905.26	4947.51	42.25	29.1	C	4925.11	5.110	9.4	A	4924.73	4.875	4925.45
118	4947.84	4990.34	42.50	28.9	C	4982.79	5.109	8.9	A	4982.71	4.891	4990.26
119	4990.66	5033.05	42.39	24.7	B	4996.17	5.086	8.2	A	4996.17	4.919	4996.76
120	5033.35	5075.18	41.83	16.4	B	5044.80	5.040	7.2	A	5038.49	4.937	5075.18
121	5075.46	5117.60	42.13	12.2	B	5096.27	5.017	7.1	A	5087.27	4.943	5117.53
122	5117.93	5160.17	42.23	12.2	B	5139.26	5.017	5.1	A	5153.57	4.928	5160.07
123	5160.47	5202.89	42.42	12.9	B	5186.23	5.021	5.8	A	5185.72	4.928	5181.69
124	5203.29	5240.56	37.27	10.7	B	5213.82	5.009	4.1	A	5205.29	4.931	5238.84



2. Appendix A: Well Diagram

Not Provided

Figure 10, Well Diagram



3. Appendix B: Tool Specification

3.1. MFC Tool Specifications & Logging Modes

Type	MFC24C	MFC40C	MFC56C
O.D.	43 mm (1 11/16")	73mm (2 7/8")	90mm (3 1/2")
Working Temperature	-20- 175°C(-40-350°F)		
Working Pressure	≤100MPa (15,000 PSI)		
Working Voltage	90V±2		
Working Current	37mA±3		
Measurement Range	45-180mm (1 3/4"-7 1/12")	80-210mm (3 1/8"-8 1/4")	100-245mm (3 15/16"- 9 13/20") 100-350mm (3 15/16"-13 4/5" with extension fingers)
Measurement Accuracy	±0.5mm (±0.02")		
Resolution	0.1mm(0.004")		
Deviation Range	0-180°		
Deviation Accuracy	±5°		
Deviation Sensitivity	0.1°		
Relative Azimuth Range	0-360°		
Relative Azimuth Accuracy	±5°		
Relative Azimuth Sensitivity	0.1°		
Transmission Mode	Mono-conductor		
Speed	≤600 m/h (1968ft/h)		
	(Vertical Resolution =8mm or 5/16")		



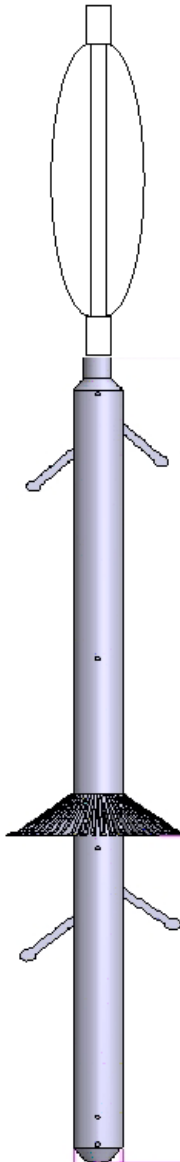
MFC Log Interpretation

Company: Mull Drilling Company ONC.

Well: NWAU #14

Logging Date: 09/25/2024

3.2. Tool String Diagram

Sensor	Offset (ft)	Schematic	Description	Length (ft)	O.D. (in)	Weight (lb)
			CENTRALIZER-Superior 1 11/16" Centralizer	2.88	0.00	8.00
			MFC-56C-B (20101) GOWell 56 Arms Caliper - Legacy	6.55	3.54	135.58
Meas	2.35					
Aux1	1.45					

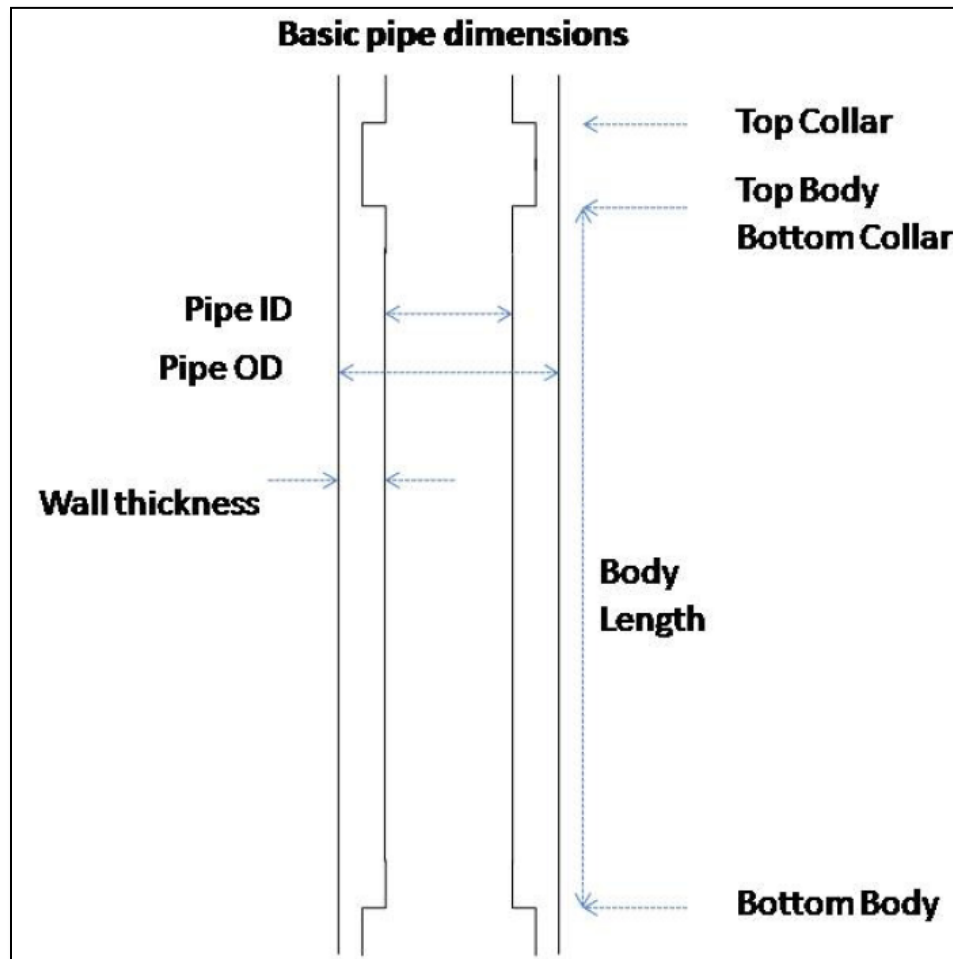
Dataset: mull nwau 14.db: field/well/run1/pass1
Total length: 9.43 ft
Total weight: 143.58 lb
O.D.: 3.54 in

Figure 11, Tool Diagram

4. Appendix C: Definition of Terms in Pipe Analysis Report

Listed here are definitions for the MFC report. Not all terms are used in the report, but are here for reference.

4.1. Pipe Dimensions



Top Body (ft/m)

Processed measured depth in m/ft of top of the pipe section.

Body Length (ft/m)

Length in m/ft of the pipe section.

Mean mean diameter [Mean Mean (ins/mm)]

The mean average value of the mean diameter in ins/mm over the pipe length.

Mean median diameter [Mean median (ins/mm)]

The mean average value of the median diameter in ins/mm over the pipe length.

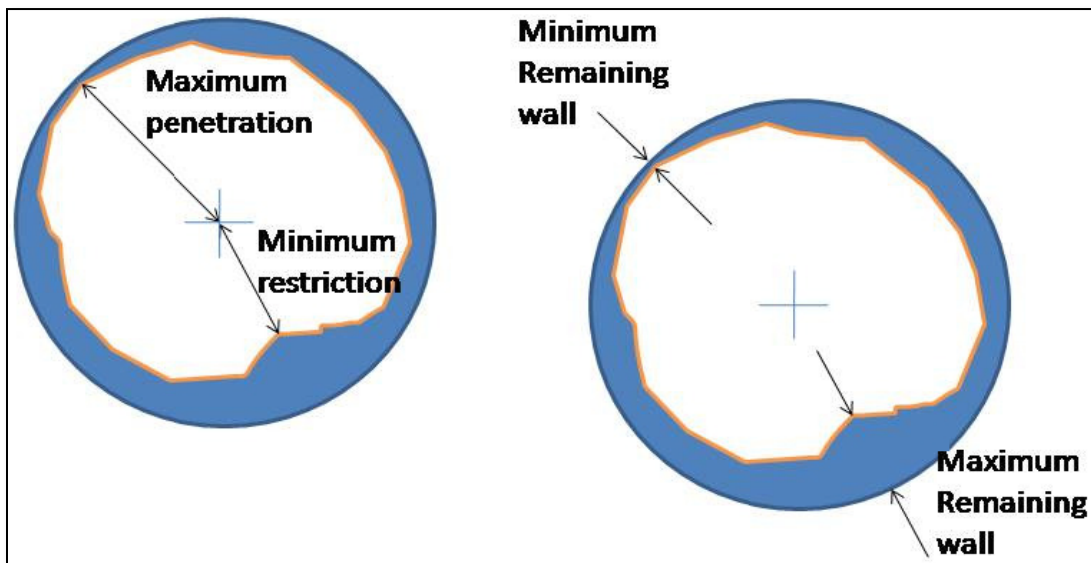
Mean remaining wall [Mean wall (ins/mm)]

The average remaining wall thickness in ins/mm of this pipe length.

Mean remaining wall [Mean wall (%)]

The average remaining wall thickness in % of nominal thickness of this pipe length.

4.2. Maximum Penetration



Maximum penetration [Max.Pen] (ins/mm)

Twice radius in inches or mm at maximum penetration of the pipe wall in the pipe section. (Expressed as a diameter - twice radius - for comparison with Nominal and Drift IDs).

Maximum penetration % [Max.Pen (%)]

Maximum penetration of the wall in the pipe section, expressed as a percentage relative to the difference between Nominal thickness at the maximum penetration point.

Maximum penetration depth [Max.Pen depth]

Depth in m/ft of the maximum wall penetration in the pipe section.

Maximum penetration arm [Max.Pen arm (no.)]

Arm number with maximum wall penetration in the pipe section.

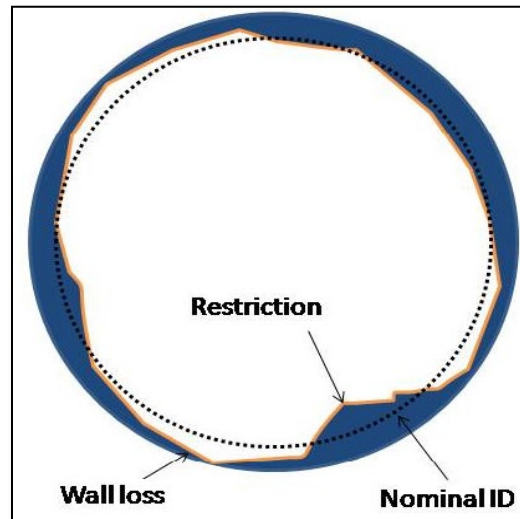
Minimum remaining wall [Min Wall (ins/mm)]

Minimum wall thickness in the pipe section in inches or mm. Negative value implies wall is fully penetrated.

Minimum remaining wall % [Min Wall (%)]

Minimum wall thickness in the pipe section as % of wall thickness at maximum penetration point. Negative value implies wall is fully penetrated.

4.3. Wall Loss



Maximum loss [Max.Loss (ins**2 or mm**2)]

The maximum value of metal loss in this pipe section, expressed as the areal loss of wall relative to the outer diameter and nominal diameters. For each sampled depth in the pipe the metal loss is calculated as:

Absolute wall loss = $(\pi/4n)\Sigma(S_i^2 - ID^2)$, where n is the number of caliper arms, S_i is twice the radius measured by caliper arm i , ID is the Nominal ID of the pipe.

The joint analysis module reports the maximum of the wall loss in the pipe section independent of the maximum penetration.

Maximum loss % [Max.Loss (%)]

The maximum value of metal loss in the pipe, expressed as the percentage areal loss of wall relative to the outer diameter and nominal diameters. For each sampled depth in the pipe the loss is calculated as:

Percentage wall loss = $(100/n) \Sigma(S_i^2 - ID^2) / (OD^2 - ID^2)$, where n is the number of caliper arms, S_i is twice the radius measured by caliper arm i , ID is the Nominal ID of the pipe.

Maximum Loss depth [Max.Loss Depth]

Depth in m/ft of maximum metal loss in the pipe.

Mean Wall Loss [Mean Loss (%)]



The mean average value of the areal wall loss wrt inner and outer nominal diameters over the pipe length (%).

Restriction volume (ins3 or m*3)**

The integrated restriction in cubic inches or mm or cubic metres of the borehole over this pipe length.

Restriction volume (%)

The integrated restriction of the borehole as a %age of the bore volume over this pipe length Restrictions.

Minimum radial restriction [Min Res (ins/mm)]

Smallest arm reading in inches or mm in the pipe section, (expressed as twice radius for comparison with Nominal and Drift IDs).

Minimum radial restriction % [Min Res (%)]

Smallest arm reading in the pipe section, expressed as a percentage relative to the Nominal ID and Outer diameters. If a negative percentage is reported, the minimum radius is smaller than the Nominal Inside Radius of the pipe.

Minimum radial restriction depth [Min Res. Depth]

Depth in m/ft of smallest arm reading in the pipe section.

Minimum radial restriction arm [Min. Res. arm]

Arm number showing minimum radial restriction in the pipe section.

Minimum radial restriction orientation [Min. Res. dirn]

Orientation in degrees of arm with minimum radial restriction in the pipe section. *Tool upside curve required in input .vw1 data file.

Maximum wall thickness [Max Wall (Ins/mm)]

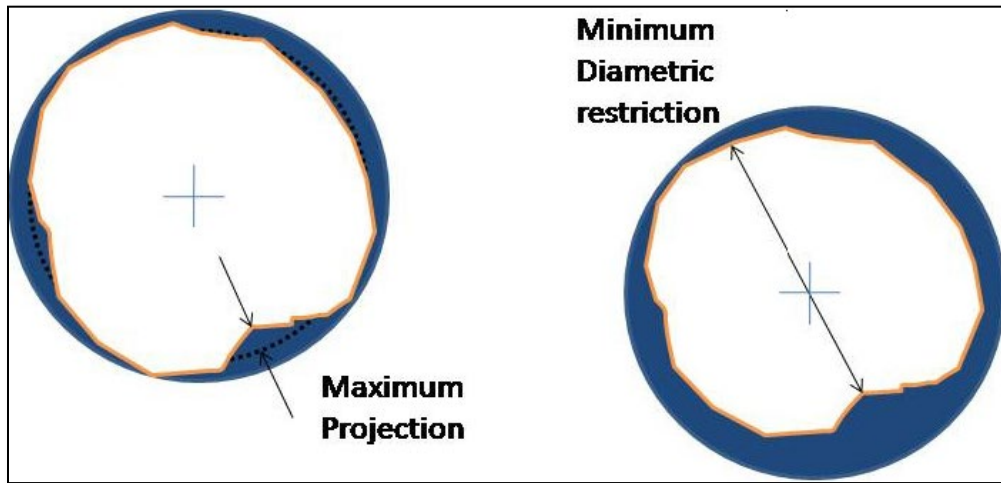
Maximum wall thickness in the pipe section in inches or mm.

Maximum remaining wall % [Max Wall (%)]

Maximum wall thickness in the pipe section as %age of wall thickness at minimum restriction point.

Maximum projection [Max Proj (ins/mm)].

Largest projection into the well bore from the pipe wall in ins/mm based on Nominal IR.



Maximum projection % [Max Proj (%)].

Largest projection into the well bore from the pipe wall as a %age of Nominal IR.

Minimum diametric restriction [Min Diam. (ins/mm)]

Smallest diameter in inches or mm of the pipe section measured on opposing arms.

Minimum diametric restriction % [Min Diam. (%)]

Smallest diameter in the pipe section measured on opposing arms as a %age of Nominal ID.

Minimum diametric restriction depth [Min Diam. Depth]

Depth of smallest diameter in the pipe section measured on opposing arms

Minimum diametric restriction arm [Min Diam. arm]

First arm with smallest diameter in the pipe section measured on opposing arms

Minimum diametric restriction orientation [Min Diam. dirn]

Orientation in degrees of first arm with smallest diameter in the pipe section measured on opposing arms. *Tool upside curve required in input .vw1 data file.

5. Appendix D: Data Processing/Data Display

5.1. Data Processing

1) MFC processing workflow

Once the data is loaded into the ViewWell software, the data is analyzed and compared with logs and schematics given by the clients. If there are any depth issues or abnormal data points, the data will be shifted or edited accordingly. Then collar detection is used to build tables of the location of each inner and outer joint. Then the thickness curves are created using the channel that most appropriately affects the thickness. From here, any anomalies are noted for the final report. Joint tables are then created for further analysis.

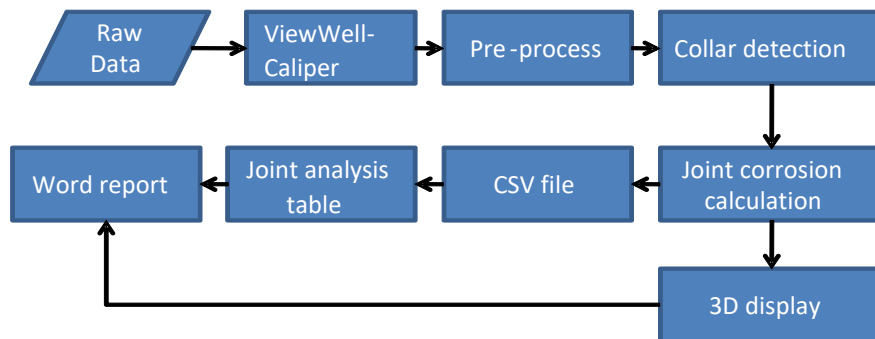


Figure 12 - MFC processing workflow

5.2. Description of Post Processed Presentation

Multi-arm track: Multi-finger curves and color VDL. Palette setting: Rainbow.

Panel 1: Maximum, red; Minimum, blue; Mean, light green; Median, aqua; Nominal ID and Nominal OD, black; shading between Maximum and Nominal ID, light orange; shading between Mean and Minimum, light blue; shading between Minimum and Nominal ID, white.

Panel 2: Temperature, brown; Eccentricity, black; Gamma Ray, green.

5.3. Media & Listing of Files

Files delivered by GOWell are:

1. Final word report;
2. Joint by joint summary table, which lists all the joints damage or corrosion condition;
3. Result Plots with scale of 1:200 & 1:1000 in tiff format;
4. ViewWell context files and ViewWell viewer