

HALLIBURTON

iCem[®] Service

PDC ENERGY-EBUS

United States of America, COLORADO

For: Chris McMullen

Date: Saturday, December 15, 2018

WELD

PDC Thistle Down 31H-232 Production

Job Date: Saturday, December 15, 2018

Sincerely,

Steve Markovich

Legal Notice

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1.0 Cementing Job Summary

1.1 Executive Summary

Halliburton appreciates the opportunity to perform the cementing services on the cement casing job. A pre-job safety meeting was held before the job where details of the job were discussed, potential safety hazards were reviewed, and environmental compliance procedures were outlined.

Approximately 43 bbls of spacer were returned to surface.

Halliburton maintains a continuous quality improvement process and appreciates any comments or suggestions that you may have. Halliburton again thanks you for the opportunity to perform service work on this well. We hope to be your solutions provider for future projects.

Respectfully,

Halliburton Fort Lupton

The Road to Excellence Starts with Safety

Sold To #: 304535	Ship To #: 3819622	Quote #: 0022519912	Sales Order #: 0905346314
Customer: PDC ENERGY-EBUS		Customer Rep: Chris McMullen	
Well Name: THISTLE DOWN		Well #: 31H-232	API/UWI #: 05-123-45255-00
Field: WATTENBERG	City (SAP): KERSEY	County/Parish: WELD	State: COLORADO
Legal Description: NE SW-31-5N-64W-1429FSL-1357FWL			
Contractor: ENSIGN DRLG		Rig/Platform Name/Num: ENSIGN 152	
Job BOM: 7523 7523			
Well Type: HORIZONTAL OIL			
Sales Person: HALAMERICA/HX38199		Srvc Supervisor: Steven Markovich	

Job

Formation Name	
Formation Depth (MD)	Top Bottom
Form Type	BHST
Job depth MD	12870ft Job Depth TVD
Water Depth	Wk Ht Above Floor
Perforation Depth (MD)	From To

Well Data

Description	New / Used	Size in	ID in	Weight lbm/ft	Thread	Grade	Top MD ft	Bottom MD ft	Top TVD ft	Bottom TVD ft
Casing		9.625	8.921	36			0	1678		0
Casing		5.5	4.778	20			0	12870		0
Open Hole Section			8.5				1676	6876		0
Open Hole Section			8.5				6700	12874		0

Tools and Accessories

Type	Size in	Qty	Make	Depth ft	Type	Size in	Qty	Make
Guide Shoe	5.5			12870	Top Plug	5.5		HES
Float Shoe	5.5				Bottom Plug	5.5		HES
Float Collar	5.5				SSR plug set	5.5		HES
Insert Float	5.5				Plug Container	5.5		HES
Stage Tool	5.5				Centralizers	5.5		HES

Fluid Data

Stage/Plug #: 1										
Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft3/sack	Mix Fluid Gal	Rate bbl/min	Total Mix Fluid Gal	
1	12.5 lb/gal Tuned Spacer III	Tuned Spacer III	150	bbl	12.5	2.74				
34.60 gal/bbl		FRESH WATER								

203.65 lbm/bbl		BARITE, BULK (100003681)								
Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft3/sack	Mix Fluid Gal	Rate bbl/min	Total Mix Fluid Gal	
2	Gasstop B1	GASSTOP (TM) SYSTEM	615	sack	13.2	1.55		6	7.61	
5.01 Gal		FRESH WATER								
0.10 Gal		D-AIR 3000L, TOTETANK (101396181)								
Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft3/sack	Mix Fluid Gal	Rate bbl/min	Total Mix Fluid Gal	
3	ElastiCem	ELASTICEM (TM) SYSTEM	880	sack	14.4	1.7		8	7.3	
0.45 %		HR-5, 50 LB SK (100005050)								
7.32 Gal		FRESH WATER								
Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft3/sack	Mix Fluid Gal	Rate bbl/min	Total Mix Fluid Gal	
4	MMCR Displacement	MMCR Displacement	20	bbl	8.34					
0.50 gal/bbl		MICRO MATRIX CEMENT RETARDER, 5 GAL PAIL (100003781)								
Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft3/sack	Mix Fluid Gal	Rate bbl/min	Total Mix Fluid Gal	
5	Displacement fluid		263	bbl	8.34					
Cement Left In Pipe		Amount	0 ft			Reason			Wet Shoe	
Mix Water:		pH 7	Mix Water Chloride: 00 ppm			Mix Water Temperature:			70 °F °C	
Comment Spacer to surface at 240bbls away bringing 43bbls of spacer to surface. Bumped plug at 283bbls away, final lift pressure was 2367psi. WSS burst at 3802psi then pumped a 5bbl wet shoe. Estimated Top of Tail Cement 6352' Estimated Top of Lead Cement 2191'.										

2.0 Real-Time Job Summary

2.1 Job Event Log

Type	Seq. No.	Activity	Graph Label	Date	Time	Source	DH Density <i>(ppg)</i>	DS Pump Press <i>(psi)</i>	Comb Pump Rate <i>(bbl/min)</i>	Pump Stg Tot <i>(bbl)</i>	Comments
Event	1	Call Out	Call Out	12/15/2018	06:00:00	USER					Job called out with an on location time of 1200
Event	2	Crew Leave Yard	Crew Leave Yard	12/15/2018	09:20:00	USER					JSA with HES crew on directions and road hazards on the way to location
Event	3	Arrive At Loc	Arrive At Loc	12/15/2018	10:15:00	USER					Arrived on location, rig was still running casing. 4000' to run.
Event	4	Assessment Of Location Safety Meeting	Assessment Of Location Safety Meeting	12/15/2018	10:30:00	USER					JSA and hazard hunt with HES crew
Event	5	Start Job	Start Job	12/15/2018	16:11:50	COM4	8.33	125.00	6.10	14.50	Prime up pump and mix up latex.
Event	6	Circulate Well	Circulate Well	12/15/2018	17:02:07	COM4	8.42	-1.00	0.00	0.00	Circulate latex.
Event	7	Safety Meeting	Safety Meeting	12/15/2018	17:50:18	USER	8.35	-1.00	0.00	0.00	JSA with HES and Rig crew on job safety and procedure.
Event	8	Start Job	Start Job	12/15/2018	17:55:34	COM4	8.34	-1.00	0.00	0.00	TD 12874' TP 12870' FC 12855' WSS 12846' 5 1/2" 20# Production Casing, 8 1/2" Open Hole, 9 5/8" 36# Surface Casing at 1678' TVD 6876'
Event	9	Other	Other	12/15/2018	17:56:33	COM4	8.46	-6.00	0.00	0.00	Fill lines, 2bbl/min 280psi.
Event	10	Test Lines	Test Lines	12/15/2018	17:59:25	COM4	8.40	103.00	0.00	3.80	Set kick outs to 500psi and check low pressure kick outs, then bring pressure up

											to 5000psi and hold.
Event	11	Check Weight	Check Weight	12/15/2018	18:13:33	COM4	8.29	3.00	0.00	3.80	Weight verified by pressurized scales.
Event	12	Drop Bottom Plug	Drop Bottom Plug	12/15/2018	18:14:11	COM4	8.29	3.00	0.00	3.80	Plug pre loaded into HES head. Plugs loaded and dropped in front of Company rep.
Event	13	Pump Spacer 1	Pump Spacer 1	12/15/2018	18:14:25	COM4	8.29	4.00	0.00	0.00	Pump 150bbbls of 12.5ppg 2.74yield Tuned Spacer. Pumped at 5bbl/min 398psi.
Event	14	Check Weight	Check Weight	12/15/2018	18:15:13	COM4	12.48	360.00	2.90	1.50	Weight verified by pressurized scales.
Event	15	Pump Lead Cement	Pump Lead Cement	12/15/2018	18:43:41	COM4	12.79	215.00	5.10	0.00	Pump 169bbbls (615sks) of 13.2ppg 1.55yield Lead Cement with latex. Pumped at 8bbl/min 596psi.
Event	16	Check Weight	Check Weight	12/15/2018	18:44:13	COM4	13.03	245.00	5.10	2.70	Weight verified by pressurized scales.
Event	17	Check Weight	Check Weight	12/15/2018	18:46:38	COM4	13.24	430.00	7.10	14.50	Weight verified by pressurized scales.
Event	18	Check Weight	Check Weight	12/15/2018	18:55:47	COM4	13.27	624.00	8.00	86.00	Weight verified by pressurized scales.
Event	19	Pump Tail Cement	Pump Tail Cement	12/15/2018	19:08:51	COM4	14.02	606.00	6.70	0.10	Pump 266bbbls (880sks) of 14.4ppg 1.7yield Tail Cement. Pumped at 8bbl/min 840psi.
Event	20	Check Weight	Check Weight	12/15/2018	19:09:35	COM4	14.40	563.00	6.70	5.00	Weight verified by pressurized scales.
Event	21	Check Weight	Check Weight	12/15/2018	19:15:53	COM4	14.40	726.00	8.00	51.90	Weight verified by pressurized scales.
Event	22	Shutdown	Shutdown	12/15/2018	19:48:20	COM4	14.91	39.00	0.00	288.40	Shutdown and clean pumps and lines.
Event	23	Drop Top Plug	Drop Top Plug	12/15/2018	20:04:13	COM4	8.13	5.00	0.00	305.80	Plug pre loaded into HES

				8							head. Plugs dropped and loaded in front of Company rep.
Event	24	Pump Displacement	Pump Displacement	12/15/2018	20:04:18	COM4	8.13	4.00	0.00	305.80	Pump 284bbbls of H2O. First 20bbbls with MMCR. Then 264 with biocide and stayclear. Pumped at 8bbbls min and slowed rate with pressure increase. Spacer to surface at 240bbbls away, bringing 43bbbls to surface.
Event	25	Bump Plug	Bump Plug	12/15/2018	20:43:21	COM4	8.32	2367.00	3.90	291.30	Bumped plug at 283bbbls away, final lift pressure was 2367psi. Brought pressure 500psi over and held.
Event	26	Other	Other	12/15/2018	20:46:54	COM4	8.32	2867.00	0.30	0.00	Kicked in pumps at 2bbl/min to burst WSS.
Event	27	Other	Other	12/15/2018	20:47:25	COM4	8.35	3806.00	1.90	0.90	WSS burst at 3802psi. Increased rate to 5bbl/min and pumped a 5bbl wet shoe.
Event	28	End Job	End Job	12/15/2018	20:50:00	COM4	8.23	12.00	0.00	6.40	Thank you Steve Markovich and crew.