HALLIBURTON

iCem® Service

PDC ENERGY - EBUS

United States of America, COLORADO

For: PDC Energy

J Clark 14N Foam Production

Job Date: Saturday, June 30, 2018

Sincerely,

Ryan Keeran

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 **J Clark 14N** cement foam production 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.

17bbls of Mudflush III was circulated 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 #:** 3870581	**Quote #:** 0022460901	**Sales Order #:** 0904956949
Customer: PDC ENERGY-EBUS		**Customer Rep:** Vaughn staples/Tony B.	
Well Name: J CLARK	**Well #:** 14N		**API/UWI #:** 05-123-46693-00
Field: WATTENBERG	**City (SAP):** GREELEY	**County/Parish:** WELD	**State:** COLORADO
Legal Description: NW NE-14-5N-65W-550FNL-1979FEL			
Contractor: ENSIGN DRLG	**Rig/Platform Name/Num:** ENSIGN 152		
Job BOM: 14143 14143			
Well Type: HORIZONTAL OIL			
Sales Person: HALAMERICA\HX38199	**Srvc Supervisor:** Kamereon White		

Job

Formation Name				
Formation Depth (MD)	**Top**		**Bottom**	
Form Type			**BHST**	
Job depth MD	12095 ft		**Job Depth TVD**	6762
Water Depth			**Wk Ht Above Floor**	7'
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	LTC	J-55	0	1677		1677
Casing		5.5	4.778	20		P-110	0	12094		6762
Open Hole Section			8.5				1677	6762	1677	6762
Open Hole Section			8.5				6762	120095	6762	6762

Tools and Accessories

Type	Size in	Qty	Make	Depth ft		Type	Size in	Qty	Make
Guide Shoe	5.5					**Top Plug**	5.5	1	WTHR
Float Shoe	5.5	1		12094		**Bottom Plug**	5.5	1	WTHR
Float Collar	5.5	2		12059.12		**SSR plug set**	5.5		HES
Insert Float	5.5					**Plug Container**	5.5	1	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	Mud Flush III (Powder)	Mud Flush III	50	bbl	8.4				
42 gal/bbl		**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
2	12.5 lb/gal Tuned Spacer III	Tuned Spacer III	100	bbl	12.5	2.74	16.9	5	
203.65 lbm/bbl		**BARITE, BULK (100003681)**							
34.60 gal/bbl		**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
3	HalSeal	HALSEAL (TM) SYSTEM	620	sack	15.6	1.18		5	5.18
1.50 %		**FOAMER 1026, TOTE (102166506)**							
0.40 %		**HALAD-766, 55 LB SACK (101477695)**							
5.19 Gal		**FRESH WATER**							
0.35 %		**HR-601, 50 LB BAG (101328348)**							

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	14.4# ElastiCem	ELASTICEM (TM) SYSTEM	755	sack	14.4	1.7		5	7.3
7.30 Gal		**FRESH WATER**							
0.20 %		**HALAD(R)-344, 50 LB (100003670)**							
0.3750 %		**HR-5, 50 LB SK (100005050)**							

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	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
6	Water	Water	246	bbl	8.33				

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
7	Contingency Cap	HALCEM (TM) SYSTEM	100	sack	15.8	1.17		2	5.16
5.16 Gal		**FRESH WATER**							

Cement Left In Pipe	**Amount**	42 ft	Reason	**Shoe Joint**	
Mix Water:	7 PH	**Mix Water Chloride:**	< 200 PPM	Mix Water Temperature:	**76°F**
Cement Temperature:		**Plug Displaced by:**	8.33	Disp. Temperature:	
Plug Bumped?	Yes	**Bump Pressure:**	2300	Floats Held?	**Yes**
Cement Returns:	17bbls Mud Flush	**Returns Density:**	8.4 ppg	Returns Temperature:	

Comment

2.0 Real-Time Job Summary

2.1 Job Event Log

Type	Seq. No.	Activity	Graph Label	Date	Time	Source	Line Pressure (psi)	DH Density (ppg)	Comb Pump Rate (bbl/min)	Pump Stg Tot (bbl)	N2 Pump Std Rt (scfm)	Comments
Event	1	Call Out	Call Out	6/29/2018	16:00:00	USER						Crew called out for O/L at 2200. Crew picked up cement, chemicals, and plug container at the yard.
Event	2	Pre-Convoy Safety Meeting	Pre-Convoy Safety Meeting	6/29/2018	19:00:00	USER						Discussed hazards of traveling to location and proper routes.
Event	3	Arrive At Loc	Arrive At Loc	6/29/2018	20:30:00	USER						Crew arrived on location approx. 20:00. Spoke with company man and confirmed volumes. TD 12095' TP 12094' 5.5" casing 20#. 8.5# hole. MW at 10.6#. Rig performed 3 bottoms up.
Event	4	Pre-Job Safety Meeting	Pre-Job Safety Meeting	6/30/2018	00:45:00	USER	-1.00	8.34	0.00	0.00	0	Held pre job safety meeting with the Halliburton, PDC, Ensign, and WFT crews. Discussed hazards of performing cement job and job details.
Event	5	Start Job	Start Job	6/30/2018	02:18:52	COM6	0.00	8.41	0.00	0.00	0	
Event	6	Test Lines	Test Lines	6/30/2018	02:21:44	COM6	150.00	8.35	0.00	5.10	83	Pressure test cement lines to 7000psi. Pressure fell off 2psi/second. Bled off to tighten up lines.
Event	7	Test Lines	Test Lines	6/30/2018	02:33:35	COM6	-3.00	8.34	0.00	5.10	0	Pressure test cement lines to 7000 psi. Pressure held well. Pressure tested

												nitrogen lines to 9000psi. After holding pressure on cement lines for 5 min, bled back all pressure to the truck. Bled back nitrogen lines to 2000 psi.
Event	8	Drop Bottom Plug	Drop Bottom Plug	6/30/2018	02:46:17	COM6	5.00	8.34	0.00	5.40	0	Dropped bottom plug. Verified by company rep.
Event	9	Pump Spacer 1	Pump Spacer 1	6/30/2018	02:47:50	COM6	3.00	8.34	0.00	0.00	0	Pump 50 bbls MudFlush. 8.34ppg. Started at 2bpm and brought rate up to 5bpm.
Event	10	Pump Spacer 2	Pump Spacer 2	6/30/2018	03:02:24	COM6	711.00	8.36	4.90	50.20	0	Pump 100 bbls TSIII at 12.5ppg. Pumped at 5bpm. Also had some issues with some lo torc valves leaking, but we maintained pumping the TSIII and pumped the calculated volume and then we shutdown to swap out the lo-torc vales, fixed and continued the job.
Event	11	Shutdown	Shutdown	6/30/2018	03:27:19	COM6	125.00	12.13	0.00	100.10	0	Shut down to mix up cap cement and close lo torq valve on foam injection manifold
Event	12	Pump Cap Cement	Pump Cap Cement	6/30/2018	03:35:41	COM6	16.00	11.72	0.00	0.00	0	Pump 21 bbls (100 sks) of 15.6ppg cap HalCem. Yield: 1.18 ft3/sk. Water Requirement: 16.91 gal/sk. Pumped at 5 bpm and brought on foamer approximately 5 bbls in for a foam concentration of 0.368 gal/bbl.
Event	13	Pump Foam Cement	Pump Foam Cement	6/30/2018	03:40:48	COM6	319.00	15.58	5.00	0.00	0	Pump 130.5 bbls (620 sks) of foamed HalCem. Cement foamed from 15.6ppg mix

												density to 13.7ppg final density. Mix yield at 1.18 gal/sk and mix water requirement at 5.18 gal/sk. Foamer concentration at 0.368 gal/bbl. Approximately 22,000 scf N2 used for cement and another 50,000 scf N2 used for cool down. Pumped at 5bpm.
Event	14	Pump Tail Cement	Pump Tail Cement	6/30/2018	04:08:14	COM6	1034.00	15.21	5.00	0.00	1049	Pump 229 bbls (755 sks) of 14.4 tail ElastiCem. Yield: 1.70 ft3/sk. Water Requirement: 7.30 gal/sk. Pumped at 5 bpm. No foamer or N2. Pumped at 5bpm.
Event	15	Check Weight	Check Weight	6/30/2018	04:09:12	COM6	738.00	14.62	5.00	4.90	0	Pressurized mud scales confirmed 14.4ppg
Event	16	Check Weight	Check Weight	6/30/2018	04:32:31	COM6	282.00	14.45	5.00	121.70	0	Pressurized mud scales confirmed 14.4ppg
Event	17	Shutdown	Shutdown	6/30/2018	05:00:49	COM6	118.00	14.40	2.80	257.60	0	Shut down to blow back lines and drop top plug. Rig closed chokes.
Event	18	Drop Top Plug	Drop Top Plug	6/30/2018	05:11:52	COM6	1.00	8.00	0.00	275.50	0	Dropped top plug. Company rep witnessed.
Event	19	Pump Displacement	Pump Displacement	6/30/2018	05:11:56	COM6	1.00	8.00	0.00	275.50	0	Pump 266 bbls displacement. Some issues maintaining higher pump rates due to water delivery.15gal MMCR in first 20 bbls. Biocide and StaClear throughout the first 226.
Event	20	Displ Reached Cement	Displ Reached Cement	6/30/2018	05:22:52	COM6	95.00	8.32	4.90	46.70		

Event	21	Bump Plug	Bump Plug	6/30/2018	06:06:36	COM6	2796.00	8.40	0.00	279.90	Pumped calculated displacement and bumped at 2300 psi. Brought up to 2800 psi. Approximately 17 bbls MudFlush returned to surface.
Event	22	Other	Other	6/30/2018	06:06:40	COM6	2798.00	8.40	0.00	279.90	Opened wet shoe sub at 3300 psi and pumped 5 bbl wet shoe.
Event	23	Shutdown	Shutdown	6/30/2018	06:08:39	COM6	2306.00	8.40	0.00	286.20	Shutdown after we opened the wet shoe sub.
Event	24	Other	Other	6/30/2018	06:09:17	COM6	1921.00	8.37	0.00	286.20	Checked floats - floats held and 2 bbls returned to pump
Event	25	End Job	End Job	6/30/2018	06:10:39	COM6					Cement job complete
Event	26	Pre-Rig Down Safety Meeting	Pre-Rig Down Safety Meeting	6/30/2018	06:20:00	USER	-3843.00	0.38	0.00	286.20	Discussed proper communication and chain of operation in order to rig down safely.
Event	27	Rig-Down Completed	Rig-Down Completed	6/30/2018	07:00:00	USER					Rig down completed safely and without spills.
Event	28	Safety Meeting	Safety Meeting	6/30/2018	07:15:00	USER					Pre Convoy safety meeting to return to yard.
Event	29	Crew Leave Location	Crew Leave Location	6/30/2018	07:30:00	USER					Kamereon White and crew would like to thank you for your business and choosing Halliburton cement, please give us a call if you have any questions.