

# HALLIBURTON

iCem<sup>®</sup> Service

## **TERRA ENERGY PARTNERS**

Rock Springs District, Colorado

**For: Darrell Leatherman**

Date: Monday, March 02, 2020

## **Federal RWF 431-12**

4 ½" Production Casing

Post Job Report

Job Date: Monday, March 02, 2020

Sincerely,

**Benjamin Fuchs**

## Legal Notice

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### Disclaimer:

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## 1.0 Cementing Job Summary

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### 1.1 Executive Summary

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Halliburton appreciates the opportunity to perform the cementing services for this cementing services 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.

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, Rock Springs

**Job Times**

	Date	Time	Time Zone
<b>Called Out</b>	3/2/20	0400	MST
<b>On Location</b>	3/2/20	1400	MST
<b>Job Started</b>	3/2/20	2140	MST
<b>Job Completed</b>	3/2/20	2330	MST
<b>Departed Location</b>	3/3/20	0100	MST

## 1.2 Job Overview

		Units	Description
1	Surface temperature at time of job	°F	38
2	Mud type (OBM, WBM, SBM, Water, Brine)	lb/gal	wbm
3	Actual mud density	lb/gal	13.4
4	Time circulated before job	HH:MM	1.5
5	Mud volume circulated	Bbls	900
6	Rate at which well was circulated	Bpm	10
7	Pipe movement during hole circulation	Y/N	y
8	Rig pressure while circulating	Psi	1130
9	Time from end mud circulation to start of job	HH:MM	30
10	Pipe movement during cementing	Y/N	y
11	Calculated displacement	Bbls	142
12	Job displaced by	Rig/HES	hes
13	Annular flow before job	Y/N	n
14	Annular flow after job	Y/N	n
15	Length of rat hole	Ft	7
16	Units of gas detected while circulating	Units	0
17	Was lost circulation experienced at any time ?	Y/N	n

## 1.3 Planned Pump Schedule

Description	Stage No.	Density (ppg)	Rate (bbl/min)	Yield (ft <sup>3</sup> /sack)	Water Req. (gal/sack)	Volume (bbl)	Bulk Cement (sacks)	Duration (min)
10 lb/gal Base Production Mud	1	10.00	8.00			0.00		0.00
Water	2	8.33	6.00			10.00		1.67
Mud Flush	3	8.40	6.00			20.00		3.33
ThermaCem TEP Deep Tail @ 13.8 ppg	4	13.80	8.00	1.6300	7.271	361.44	1245.00	45.18
Top Plug/Start Displacement								
Water	5-1	8.33	10.00			103.63		10.36
Water	5-2	8.33	4.00			40.00		10.00
Total:						535.07		70.54

\*Pump schedule may include additional rows for displacement if "Automatic Rate Adjustment" was enabled and ECDs approached the fracture gradient.

## 1.4 Water Analysis Report

## CEMENT MIX WATER REQUIREMENTS

Item	Recorded Test Value	Units	Max. Acceptable Limit	Potential Problems in Exceeding Limit
pH	6.9	----	6.0 - 8.0	Chemicals in the water can cause severe retardation
Chlorides	<200	ppm	3000 ppm	Can shorten thickening time of cement
Sulfates		ppm	1500 ppm	Will greatly decrease the strength of cement
Total Hardness		ppm	500 mg/L	High concentrations will accelerate the set of the cement
Calcium		ppm	500 ppm	High concentrations will accelerate the set of the cement
Total Alkalinity		ppm	1000 ppm	Cement is greatly retarded to the point where it may not set up at all (typically occurs @ pH ≥ 8.3).
Potassium		ppm	5000 ppm	High concentrations will shorten the pump time of cement (indicates the presence of chlorides, therefore if Potassium levels are measured as high, so should the chlorides)
Iron		ppm	300 ppm	High concentrations will accelerate the set of the cement
Temperature	62	°F	50-80 °F	High temps will accelerate; Low temps may risk freezing in cold weather
Magnesium		ppm	300 ppm	High concentrations will accelerate the set of the cement <b>Calculation Method: Subtract tested "Calcium" value from "Total Hardness" value.</b>

## 2.0 Real-Time Job Summary

## 2.1 Job Event Log

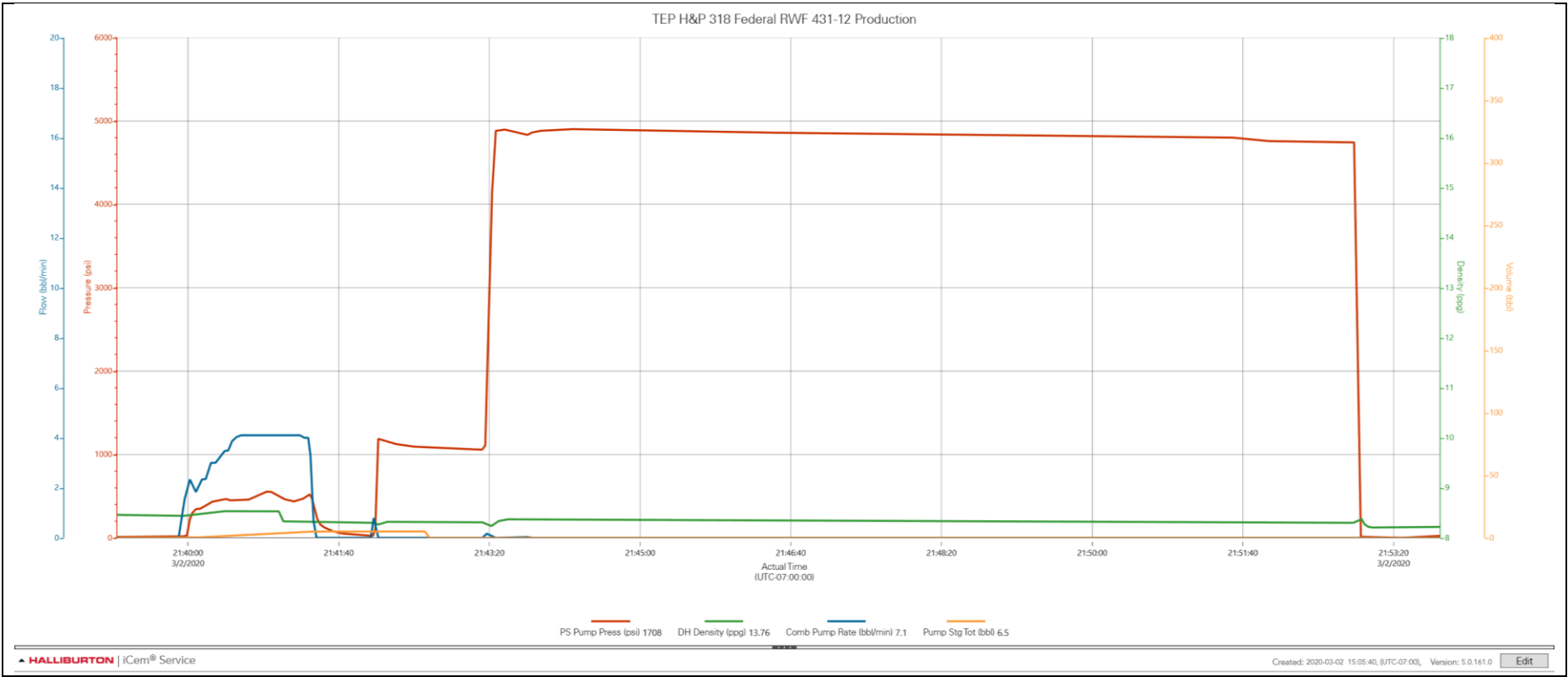
Type	Seq. No.	Graph Label	Date	Time	Source	PS Pump Press (psi)	DH Density (ppg)	Comb Pump Rate (bbl/min)	Pump Stg Tot (bbl)	Comments
Event	1	Call Out	3/2/2020	04:00:00	USER					
Event	2	Pre Journey	3/2/2020	08:15:00	USER					Discuss all travel related safety issues with crew
Event	3	Leave Yard	3/2/2020	08:30:00	USER					Stage in Parachute until 5:30. Small location.
Event	4	Arrive at Job	3/2/2020	14:00:00	USER					Meet with customer Darrell Leatherman and get numbers. 4.5" 11.5 lb casing set at 9165', 8.75" hole at 9172', 13.5 ppg WBM in the hole, 9.625" 36 lb Surface set at 1042', 30' Shoe Joint. Rig circulated @10 bbl/min with 930 psi for ~1.5 hrs. Mud properties: PV 17@120, YP 14, Gels 6/14/41. Water Test: pH 6.9, Temp 62, CI <200. Rig was running casing when we arrived on location.
Event	5	Site Assement	3/2/2020	14:05:00	USER					Identify and discuss all hazards with the crew
Event	6	Spot Equipment	3/2/2020	14:10:00	USER					Use spotters and radios.
Event	7	Pre Rig Up	3/2/2020	14:15:00	USER					Discuss all rig up related safety issues with crew
Event	8	Rig Up	3/2/2020	14:30:00	USER					
Event	9	Pre Job	3/2/2020	20:00:00	USER	0.00	0.01	0.10	1.20	Discuss all job related safety issues and pump schedule with customer, crew, and rig crew.
Event	10	Start Job	3/2/2020	21:39:00	USER	8.00	8.48	0.00	0.00	
Event	11	Fill Lines	3/2/2020	21:40:00	USER	127.00	8.44	2.30	0.10	5 bbls water
Event	12	Pressure Test	3/2/2020	21:43:00	USER	1066.00	8.31	0.00	0.00	Low and high pressure tests
Event	13	Pump Spacer 1	3/2/2020	21:53:00	USER	11.00	8.29	0.00	0.00	10 bbls water
Event	14	Pump Mud Flush	3/2/2020	21:56:00	USER	1087.00	8.35	7.10	0.40	20 bbls Mud Flush 8.4 ppg
Event	15	Pump Cement	3/2/2020	21:59:00	USER	1085.00	10.30	7.10	21.80	362 bbls cement 13.8 ppg, 1.63 cuft/sk, 7.27 gal/sk 1245 sks. 216 bbls water needed.

Event	16	Shutdown	3/2/2020	22:55:00	USER	473.00	13.69	2.40	403.40	Shutdown to drop plug
Event	17	Clean Lines	3/2/2020	22:56:00	USER	49.00	11.33	0.00	405.10	Wash lines to the pit.
Event	18	Drop Plug	3/2/2020	23:02:30	USER	-1.00	4.98	0.00	0.00	Customer to witness and verify.
Event	19	Pump Displacement	3/2/2020	23:03:00	USER	-1.00	8.14	0.00	0.00	142 bbls total. 10 bbls MMCR water, 30 bbls BE-6 water. KCl sacks throughout.
Event	20	Slow Rate	3/2/2020	23:17:00	USER	3070.00	8.35	9.00	127.40	Last 10 bbls
Event	21	Bump Plug	3/2/2020	23:20:00	USER	2867.00	8.33	4.00	143.10	FCP 2800 psi. Go 500 psi over final circulating psi. No cement to surface.
Event	22	Check Floats	3/2/2020	23:21:00	USER	3605.00	8.33	0.00	143.40	Floats held. 2 bbls back
Event	23	End Job	3/2/2020	23:21:30	USER	2999.00	8.33	0.00	143.40	
Event	24	Total Fluid Volumes	3/2/2020	23:22:00	USER	42.00	8.32	0.00	143.40	Spacer: 30 Lead: 362 Displacement: 142.
Event	25	Items to return	3/2/2020	23:23:00	USER	47.00	0.23	0.00	143.40	Sugar 100 lbs
Event	26	End Job	3/2/2020	23:25:00	USER	-1.00	-0.08	0.00	143.40	
Event	27	Pre Rig Down	3/2/2020	23:30:00	USER	-1.00	7.53	0.00	143.40	Discuss all rig down related safety issues with crew
Event	28	Rig Down	3/2/2020	23:45:00	USER	0.00	8.22	0.00	143.40	
Event	29	Pre Journey	3/3/2020	00:45:00	USER					Discuss all travel related safety issues with crew
Event	30	Leave Job	3/3/2020	01:00:00	USER					Thank you for your business! Benjamin Fuchs and crew.

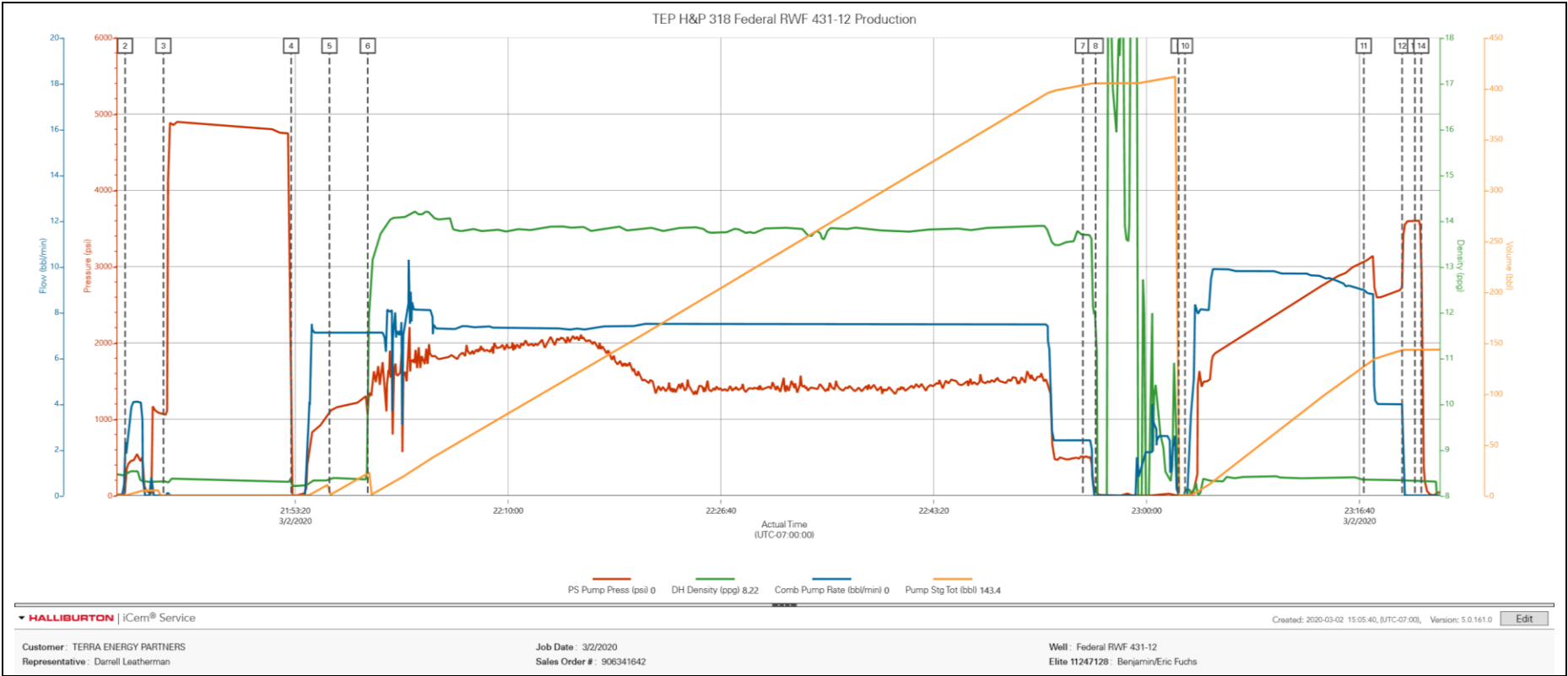


3.0 Attachments

3.1 Pressure Test.png



3.2 Job Chart.png



## 3.3 Job Chart No Events.png

