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Directional Survey**

NM OIL CONSERVATION
ARTESIA DISTRICT

JAN 28 2019

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Mack Energy

Chaves County

Sec 18-T15S-R29E

Saskatoon Federal Com #1H

Lateral

30.005-64313

Survey: Survey #1

Standard Survey Report

24 September, 2018

Survey Report

Company: Mack Energy
Project: Chaves County
Site: Sec 18-T15S-R29E
Well: Saskatoon Federal Com #1H
Wellbore: Lateral
Design: Lateral

Local Co-ordinate Reference: Well Saskatoon Federal Com #1H
TVD Reference: KB=17.5 @ 3764.60usft
MD Reference: KB=17.5 @ 3764.60usft
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Project	Chaves County		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site		Sec 18-T15S-R29E			
Site Position:		Northing:	731,744.54 usft	Latitude:	33.01128
From:	Map	Easting:	623,696.04 usft	Longitude:	-104.06466
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.15 °

Well	Saskatoon Federal Com #1H					
Well Position	+N/-S	0.00 usft	Northing:	731,744.54 usft	Latitude:	33.01128
	+E/-W	0.00 usft	Easting:	623,696.04 usft	Longitude:	-104.06466
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	3,747.10 usft

Wellbore	Lateral				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	9/5/2018	7.35	60.70	48,232

Design	Lateral				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	2,239.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	179.92	

Survey Program		Date	9/24/2018	
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
243.00	2,239.00	Survey #1 (Pilot)	MWD	MWD - Standard
2,386.00	9,084.00	Survey #1 (Lateral)	MWD	MWD - Standard

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
2,239.00	0.79	269.88	2,238.86	2.46	-0.63	-2.46	0.00	0.00	0.00
2,386.00	0.18	122.25	2,385.86	2.33	-1.45	-2.33	0.64	-0.41	-100.43
1st Lateral MWD Survey									
2,399.00	0.09	190.01	2,398.86	2.31	-1.44	-2.31	1.29	-0.69	521.23
2,430.00	0.22	171.47	2,429.86	2.23	-1.43	-2.23	0.44	0.42	-59.81
2,462.00	0.79	156.79	2,461.86	1.97	-1.33	-1.97	1.81	1.78	-45.88
2,525.00	3.78	192.74	2,524.80	-0.46	-1.62	0.46	5.04	4.75	57.06
2,620.00	12.62	188.34	2,618.74	-13.81	-3.82	13.80	9.32	9.31	-4.63
2,715.00	23.52	184.56	2,708.92	-43.06	-6.84	43.05	11.53	11.47	-3.98
2,810.00	31.12	183.86	2,793.26	-86.52	-10.01	86.50	8.01	8.00	-0.74

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
2,905.00	38.55	181.40	2,871.19	-140.68	-12.39	140.66	7.96	7.82	-2.59
2,999.00	45.89	178.50	2,940.76	-203.79	-12.22	203.77	8.08	7.81	-3.09
3,093.00	52.26	179.03	3,002.30	-274.76	-10.70	274.74	6.79	6.78	0.56
3,107.00	53.01	179.38	3,010.80	-285.89	-10.55	285.87	5.71	5.36	2.50
3,125.00	53.49	179.47	3,021.57	-300.31	-10.41	300.29	2.70	2.67	0.50
3,140.00	53.89	179.55	3,030.45	-312.39	-10.30	312.38	2.70	2.67	0.53
3,156.00	54.15	179.47	3,039.85	-325.34	-10.19	325.33	1.67	1.63	-0.50
3,171.00	54.33	179.29	3,048.62	-337.51	-10.06	337.50	1.55	1.20	-1.20
3,187.00	54.64	179.55	3,057.91	-350.54	-9.93	350.52	2.35	1.94	1.63
3,202.00	55.16	179.29	3,066.54	-362.81	-9.80	362.79	3.75	3.47	-1.73
3,213.00	55.82	179.29	3,072.77	-371.87	-9.69	371.86	6.00	6.00	0.00
3,282.00	63.65	179.82	3,107.52	-431.42	-9.24	431.40	11.37	11.35	0.77
3,376.00	72.22	180.26	3,142.80	-518.45	-9.31	518.44	9.13	9.12	0.47
3,470.00	80.18	179.55	3,165.20	-609.66	-9.15	609.65	8.50	8.47	-0.76
3,533.00	88.09	179.82	3,171.64	-672.28	-8.81	672.27	12.56	12.56	0.43
3,565.00	89.89	180.26	3,172.20	-704.28	-8.83	704.26	5.79	5.63	1.38
3,684.00	92.18	180.08	3,170.05	-823.25	-9.18	823.24	1.93	1.92	-0.15
3,779.00	92.53	178.85	3,166.15	-918.16	-8.30	918.15	1.35	0.37	-1.29
3,821.00	91.96	178.15	3,164.50	-960.12	-7.20	960.10	2.14	-1.35	-1.66
Cross Section Line 3821 MD/384.5 TVD -960.21 S -7.2 W N: 730784.4 E: 623688.8									
3,874.00	91.25	177.27	3,163.01	-1,013.05	-5.08	1,013.04	2.14	-1.35	-1.66
3,969.00	89.80	177.80	3,162.14	-1,107.96	-1.00	1,107.95	1.63	-1.53	0.56
4,064.00	89.36	179.73	3,162.84	-1,202.93	1.05	1,202.93	2.08	-0.46	2.03
4,156.00	89.63	181.40	3,163.65	-1,294.92	0.14	1,294.92	1.84	0.29	1.82
4,250.00	90.46	181.40	3,163.58	-1,388.89	-2.15	1,388.88	0.88	0.88	0.00
4,344.00	89.63	180.87	3,163.50	-1,482.87	-4.01	1,482.86	1.05	-0.88	-0.56
4,439.00	90.46	180.61	3,163.43	-1,577.86	-5.24	1,577.85	0.92	0.87	-0.27
4,533.00	90.42	179.20	3,162.71	-1,671.85	-5.09	1,671.84	1.50	-0.04	-1.50
4,627.00	91.47	179.29	3,161.16	-1,765.83	-3.85	1,765.82	1.12	1.12	0.10
4,722.00	90.33	179.03	3,159.66	-1,860.81	-2.45	1,860.80	1.23	-1.20	-0.27
4,816.00	88.79	179.91	3,160.39	-1,954.80	-1.58	1,954.79	1.89	-1.64	0.94
4,910.00	89.63	180.17	3,161.68	-2,048.79	-1.65	2,048.78	0.94	0.89	0.28
5,005.00	90.59	180.26	3,161.50	-2,143.79	-2.01	2,143.78	1.01	1.01	0.09
5,100.00	89.80	179.91	3,161.18	-2,238.78	-2.15	2,238.78	0.91	-0.83	-0.37
5,194.00	90.51	180.43	3,160.92	-2,332.78	-2.43	2,332.78	0.94	0.76	0.55
5,289.00	90.81	179.47	3,159.83	-2,427.77	-2.34	2,427.77	1.06	0.32	-1.01
5,384.00	91.56	179.73	3,157.86	-2,522.75	-1.68	2,522.75	0.84	0.79	0.27
5,479.00	90.33	179.38	3,156.30	-2,617.73	-0.94	2,617.73	1.35	-1.29	-0.37
5,574.00	91.25	179.73	3,154.99	-2,712.72	-0.21	2,712.72	1.04	0.97	0.37
5,668.00	89.71	179.64	3,154.20	-2,806.71	0.31	2,806.71	1.64	-1.64	-0.10
5,762.00	90.73	179.99	3,153.84	-2,900.71	0.62	2,900.71	1.15	1.09	0.37
5,857.00	90.33	179.99	3,152.96	-2,995.71	0.63	2,995.70	0.42	-0.42	0.00
5,952.00	91.21	179.11	3,151.68	-3,090.69	1.38	3,090.69	1.31	0.93	-0.93

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,046.00	90.55	179.20	3,150.24	-3,184.67	2.76	3,184.67	0.71	-0.70	0.10
6,141.00	89.36	180.08	3,150.31	-3,279.67	3.36	3,279.67	1.56	-1.25	0.93
6,235.00	90.20	179.91	3,150.67	-3,373.66	3.37	3,373.67	0.91	0.89	-0.18
6,330.00	89.10	179.03	3,151.25	-3,468.66	4.25	3,468.66	1.48	-1.16	-0.93
6,425.00	89.93	178.85	3,152.06	-3,563.64	6.00	3,563.64	0.89	0.87	-0.19
6,520.00	90.51	178.76	3,151.69	-3,658.61	7.99	3,658.62	0.62	0.61	-0.09
6,614.00	91.08	178.41	3,150.39	-3,752.58	10.31	3,752.59	0.71	0.61	-0.37
6,709.00	90.86	179.82	3,148.78	-3,847.55	11.77	3,847.56	1.50	-0.23	1.48
6,803.00	91.34	179.47	3,146.98	-3,941.53	12.36	3,941.54	0.63	0.51	-0.37
6,897.00	90.64	180.52	3,145.35	-4,035.51	12.36	4,035.53	1.34	-0.74	1.12
6,993.00	89.36	181.22	3,145.35	-4,131.50	10.91	4,131.51	1.52	-1.33	0.73
7,087.00	89.85	180.87	3,146.00	-4,225.48	9.19	4,225.49	0.64	0.52	-0.37
7,181.00	90.33	181.22	3,145.85	-4,319.47	7.48	4,319.47	0.63	0.51	0.37
7,275.00	91.12	180.87	3,144.66	-4,413.44	5.76	4,413.44	0.92	0.84	-0.37
7,369.00	89.49	180.43	3,144.16	-4,507.43	4.70	4,507.43	1.80	-1.73	-0.47
7,463.00	90.29	180.26	3,144.34	-4,601.43	4.13	4,601.43	0.87	0.85	-0.18
7,557.00	90.81	180.61	3,143.44	-4,695.42	3.42	4,695.42	0.67	0.55	0.37
7,654.00	91.43	180.52	3,141.55	-4,792.40	2.46	4,792.39	0.65	0.64	-0.09
7,749.00	90.24	179.55	3,140.16	-4,887.38	2.40	4,887.38	1.62	-1.25	-1.02
7,843.00	90.42	179.47	3,139.62	-4,981.38	3.21	4,981.38	0.21	0.19	-0.09
7,938.00	91.21	179.55	3,138.27	-5,076.36	4.02	5,076.37	0.84	0.83	0.08
8,031.00	89.93	178.94	3,137.34	-5,169.35	5.25	5,169.35	1.52	-1.38	-0.66
8,126.00	90.15	178.85	3,137.28	-5,264.33	7.08	5,264.34	0.25	0.23	-0.09
8,221.00	89.01	179.03	3,137.97	-5,359.31	8.83	5,359.32	1.21	-1.20	0.19
8,315.00	89.80	179.03	3,138.95	-5,453.29	10.43	5,453.30	0.84	0.84	0.00
8,409.00	90.81	178.94	3,138.45	-5,547.27	12.09	5,547.29	1.08	1.07	-0.10
8,503.00	91.47	178.85	3,136.58	-5,641.24	13.90	5,641.25	0.71	0.70	-0.10
8,598.00	90.64	179.99	3,134.83	-5,736.21	14.86	5,736.23	1.48	-0.87	1.20
8,693.00	89.63	181.22	3,134.61	-5,831.21	13.86	5,831.22	1.68	-1.06	1.29
8,787.00	90.11	181.31	3,134.82	-5,925.18	11.79	5,925.19	0.52	0.51	0.10
8,882.00	90.77	181.31	3,134.09	-6,020.15	9.61	6,020.16	0.69	0.69	0.00
8,975.00	91.69	181.57	3,132.09	-6,113.10	7.28	6,113.11	1.03	0.99	0.28
9,038.00	92.70	181.40	3,129.68	-6,176.03	5.65	6,176.04	1.63	1.60	-0.27
Last Lateral MWD Survey 9038 MD/3129.68 TVD -6176.03 S 5.65 E N: 725568.5 E: 623701.6									
9,055.50	92.70	181.40	3,128.86	-6,193.51	5.22	6,193.51	0.00	0.00	0.00
Cross 35' FSL 9055.5 MD/3128.86 TVD -6193.51 S 5.22 E N: 725551.0 E: 623701.2									
9,084.00	92.70	181.40	3,127.51	-6,221.97	4.52	6,221.97	0.00	0.00	0.00
PTB 9084 MD/3127.51 TVD -6221.97 S 4.52 E N: 725522.5 E: 623700.15									

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Survey Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,386.00	2,385.86	2.33	-1.45	1st Lateral MWD Survey
3,821.00	3,164.50	-960.12	-7.20	Cross Section Line 3821 MD/364.5 TVD -960.21 S -7.2 W N: 730784.4 E: 6236
9,038.00	3,129.68	-6,176.03	5.65	Last Lateral MWD Survey 9038 MD/3129.68 TVD -6176.03 S 5.65 E N: 725568
9,055.50	3,128.86	-6,193.51	5.22	Cross 35' FSL 9055.5 MD/3128.86 TVD -6193.51 S 5.22 E N: 725551.0 E: 6237
9,084.00	3,127.51	-6,221.97	4.52	PTB 9084 MD/3127.51 TVD -6221.97 S 4.52 E N: 725522.5 E: 623700.15

Checked By: _____ Approved By: _____ Date: _____