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Mack Energy

Chaves County

Sec 27-T15S-R29E

Grand Forks Federal Com #2H

Lateral

Survey: Survey #2

Standard Survey Report

13 March, 2019

Survey Report

Company:	Mack Energy	Local Co-ordinate Reference:	Well Grand Forks Federal Com #2H
Project:	Chaves County	TVD Reference:	KB=17.50 @ 3897.90usft
Site:	Sec 27-T15S-R29E	MD Reference:	KB=17.50 @ 3897.90usft
Well:	Grand Forks Federal Com #2H	North Reference:	Grid
Wellbore:	Lateral	Survey Calculation Method:	Minimum Curvature
Design:	Lateral	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 27-T15S-R29E			
Site Position:		Northing:	724,986.76 usft	Latitude:	32.99258
From:	Lat/Long	Easting:	640,272.84 usft	Longitude:	-104.01065
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.18 °

Well	Grand Forks Federal Com #2H					
Well Position	+N/-S	0.00 usft	Northing:	724,986.76 usft	Latitude:	32.99258
	+E/-W	0.00 usft	Easting:	640,272.84 usft	Longitude:	-104.01065
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	3,880.40 usft

Wellbore		Lateral			
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	12/31/2018	7.33	60.70	48,201

Design					Lateral						
Audit Notes:											
Version:		1.0		Phase:		ACTUAL		Tie On Depth:		2,538.00	
Vertical Section:		Depth From (TVD)			+N/-S		+E/-W		Direction		
		(usft)			(usft)		(usft)		(°)		
		0.00			0.00		0.00		37.06		

Survey Program		Date	3/13/2019		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
372.00	2,538.00	Survey #1 (Pilot)	MWD	MWD - Standard	
2,725.00	2,925.00	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)
2,538.00	0.26	333.19	2,537.08	-1.45	3.12	0.72	0.00	0.00	0.00
2,721.00	2.15	17.27	2,720.03	2.20	3.95	4.13	1.08	1.03	24.09
1st MWD Survey									
2,816.00	9.45	358.99	2,814.49	11.71	4.34	11.96	7.83	7.68	-19.24
2,911.00	17.14	356.09	2,906.87	33.51	3.25	28.70	8.12	8.09	-3.05
3,005.00	23.78	354.50	2,994.90	66.23	0.48	53.14	7.09	7.06	-1.69
3,100.00	30.46	354.33	3,079.40	109.30	-3.74	84.98	7.03	7.03	-0.18
3,194.00	37.93	353.71	3,157.10	161.80	-9.26	123.55	7.96	7.95	-0.66
3,289.00	44.88	353.10	3,228.31	224.18	-16.50	168.96	7.33	7.32	-0.64
3,384.00	52.09	351.87	3,291.24	294.65	-25.84	219.57	7.65	7.59	-1.29

Survey Report

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Well:	Grand Forks Federal Com #2H	North Reference:	Grid
Wellbore:	Lateral	Survey Calculation Method:	Minimum Curvature
Design:	Lateral	Database:	EDM 5000.1

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)	
3,400.00	53.45	351.87	3,300.92	307.26	-27.64	228.55	8.50	8.50	0.00	
3,415.00	54.02	351.95	3,309.79	319.23	-29.34	237.08	3.82	3.80	0.53	
3,433.00	54.77	351.95	3,320.27	333.72	-31.39	247.41	4.17	4.17	0.00	
3,447.00	55.08	351.95	3,328.31	345.07	-32.99	255.50	2.21	2.21	0.00	
3,465.00	55.65	352.04	3,338.54	359.73	-35.06	265.96	3.19	3.17	0.50	
3,478.00	55.91	351.95	3,345.86	370.38	-36.55	273.55	2.08	2.00	-0.69	
3,496.00	56.35	351.95	3,355.89	385.18	-38.65	284.10	2.44	2.44	0.00	
3,509.00	56.75	351.95	3,363.05	395.92	-40.16	291.76	3.08	3.08	0.00	
3,526.00	58.15	352.66	3,372.20	410.12	-42.08	301.93	8.96	8.24	4.18	
3,541.00	59.52	353.19	3,379.96	422.85	-43.66	311.15	9.62	9.13	3.53	
3,635.00	67.96	359.51	3,421.55	506.86	-48.85	375.06	10.81	8.98	6.72	
3,728.00	76.79	359.34	3,449.68	595.40	-49.74	445.18	9.50	9.49	-0.18	
3,796.73	84.93	0.17	3,460.59	663.20	-50.03	499.12	11.90	11.84	1.21	
FTP Grand Forks Fed Com #2H										
3,797.00	84.96	0.17	3,460.61	663.47	-50.03	499.33	11.90	11.84	1.18	
Cross 100' FSL 3797 MD/3460.61 TVD 663.47 N -50.03 W N: 725650.2 E: 640222.8										
3,823.00	88.04	0.48	3,462.20	689.41	-49.88	520.13	11.90	11.84	1.18	
3,855.00	89.23	0.48	3,462.96	721.40	-49.61	545.82	3.72	3.72	0.00	
3,951.00	92.35	358.11	3,461.64	817.37	-50.79	621.69	4.08	3.25	-2.47	
4,046.00	89.85	356.88	3,459.81	912.25	-54.94	694.91	2.93	-2.63	-1.29	
4,167.00	89.05	358.46	3,460.98	1,033.14	-59.86	788.42	1.46	-0.66	1.31	
4,262.00	90.07	358.99	3,461.70	1,128.11	-61.98	862.94	1.21	1.07	0.56	
4,356.00	91.16	359.34	3,460.70	1,222.09	-63.35	937.12	1.22	1.16	0.37	
4,451.00	92.18	359.25	3,457.93	1,317.05	-64.51	1,012.19	1.08	1.07	-0.09	
4,546.00	90.90	359.34	3,455.37	1,412.00	-65.68	1,087.27	1.35	-1.35	0.09	
4,641.00	92.09	359.34	3,452.90	1,506.96	-66.78	1,162.39	1.25	1.25	0.00	
4,736.00	90.59	0.48	3,450.67	1,601.93	-66.93	1,238.09	1.98	-1.58	1.20	
4,831.00	91.43	0.92	3,449.00	1,696.91	-65.76	1,314.59	1.00	0.88	0.46	
4,926.00	90.37	0.48	3,447.51	1,791.89	-64.60	1,391.08	1.21	-1.12	-0.46	
5,022.00	89.85	359.43	3,447.32	1,887.89	-64.68	1,467.65	1.22	-0.54	-1.09	
5,117.00	90.64	0.39	3,446.92	1,982.88	-64.83	1,543.37	1.31	0.83	1.01	
5,211.00	90.20	358.81	3,446.23	2,076.88	-65.49	1,617.99	1.74	-0.47	-1.68	
5,304.00	91.03	358.46	3,445.23	2,169.84	-67.70	1,690.84	0.97	0.89	-0.38	
5,399.00	89.58	358.11	3,444.72	2,264.80	-70.54	1,764.91	1.57	-1.53	-0.37	
5,494.00	90.33	358.63	3,444.80	2,359.76	-73.25	1,839.06	0.96	0.79	0.55	
5,589.00	91.16	358.55	3,443.56	2,454.72	-75.58	1,913.44	0.88	0.87	-0.08	
5,684.00	89.89	359.34	3,442.69	2,549.70	-77.33	1,988.18	1.57	-1.34	0.83	
5,779.00	90.55	359.69	3,442.33	2,644.69	-78.14	2,063.51	0.79	0.69	0.37	
5,846.00	91.78	359.78	3,440.97	2,711.68	-78.45	2,116.78	1.84	1.84	0.13	
5,941.00	90.37	358.99	3,439.18	2,806.65	-79.47	2,191.96	1.70	-1.48	-0.83	
6,035.00	90.77	358.46	3,438.25	2,900.62	-81.56	2,265.69	0.71	0.43	-0.56	
6,129.00	92.88	359.87	3,435.26	2,994.56	-82.93	2,339.83	2.70	2.24	1.50	
6,187.00	91.60	359.69	3,432.99	3,052.51	-83.15	2,385.95	2.23	-2.21	-0.31	

Survey Report

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Well:	Grand Forks Federal Com #2H	North Reference:	Grid
Wellbore:	Lateral	Survey Calculation Method:	Minimum Curvature
Design:	Lateral	Database:	EDM 5000.1

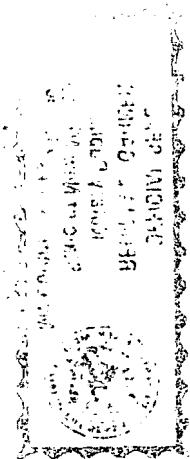
Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
6,251.00	91.38	359.60	3,431.32	3,116.49	-83.55	2,436.76	0.37	-0.34	-0.14	
6,346.00	91.03	358.99	3,429.33	3,211.46	-84.71	2,511.85	0.74	-0.37	-0.64	
6,440.00	92.48	358.72	3,426.45	3,305.39	-86.59	2,585.69	1.57	1.54	-0.29	
6,536.00	92.35	358.63	3,422.40	3,401.28	-88.81	2,660.87	0.16	-0.14	-0.09	
6,631.00	88.97	359.07	3,421.31	3,496.24	-90.72	2,735.51	3.59	-3.56	0.46	
6,726.00	89.14	358.63	3,422.87	3,591.21	-92.62	2,810.15	0.50	0.18	-0.46	
6,826.00	89.36	358.20	3,424.18	3,691.16	-95.39	2,888.25	0.48	0.22	-0.43	
6,924.00	89.98	357.67	3,424.75	3,789.10	-98.92	2,964.28	0.83	0.63	-0.54	
7,018.00	88.26	357.32	3,426.19	3,882.99	-103.03	3,036.73	1.87	-1.83	-0.37	
7,113.00	86.37	359.78	3,430.64	3,977.85	-105.43	3,110.98	3.26	-1.99	2.59	
7,207.00	88.31	1.01	3,435.01	4,071.74	-104.78	3,186.30	2.44	2.06	1.31	
7,302.00	89.27	0.92	3,437.01	4,166.70	-103.18	3,263.05	1.01	1.01	-0.09	
7,396.00	89.80	0.83	3,437.77	4,260.69	-101.75	3,338.92	0.57	0.56	-0.10	
7,491.00	90.99	0.13	3,437.12	4,355.68	-100.95	3,415.21	1.45	1.25	-0.74	
7,586.00	91.96	0.57	3,434.67	4,450.64	-100.37	3,491.35	1.12	1.02	0.46	
7,680.00	91.87	359.34	3,431.53	4,544.59	-100.44	3,566.28	1.31	-0.10	-1.31	
7,774.00	90.86	359.43	3,429.29	4,638.56	-101.45	3,640.66	1.08	-1.07	0.10	
7,869.00	89.93	359.25	3,428.64	4,733.55	-102.55	3,715.81	1.00	-0.98	-0.19	
7,963.00	90.46	359.25	3,428.32	4,827.54	-103.78	3,790.07	0.56	0.56	0.00	
8,058.00	91.12	359.78	3,427.01	4,922.52	-104.58	3,865.39	0.89	0.69	0.56	
8,154.00	90.46	358.63	3,425.68	5,018.50	-105.91	3,941.19	1.38	-0.69	-1.20	
8,249.00	89.45	358.99	3,425.76	5,113.48	-107.89	4,015.80	1.13	-1.06	0.38	
8,344.00	89.10	359.78	3,426.96	5,208.47	-108.91	4,090.99	0.91	-0.37	0.83	
8,438.00	90.46	359.60	3,427.32	5,302.46	-109.42	4,165.69	1.46	1.45	-0.19	
8,533.00	91.43	358.81	3,425.76	5,397.44	-110.73	4,240.69	1.32	1.02	-0.83	
8,628.00	91.96	358.72	3,422.95	5,492.38	-112.78	4,315.22	0.57	0.56	-0.09	
8,721.00	90.64	359.25	3,420.84	5,585.34	-114.43	4,388.42	1.53	-1.42	0.57	
8,800.00	89.19	359.25	3,420.95	5,664.33	-115.46	4,450.83	1.84	-1.84	0.00	
8,852.00	89.45	359.43	3,421.57	5,716.32	-116.06	4,491.96	0.61	0.50	0.35	
8,922.46	89.85	359.76	3,422.00	5,786.78	-116.56	4,547.89	0.73	0.56	0.47	
LTP Grand Forks Fed Com #2H										
8,922.50	89.85	359.76	3,422.00	5,786.82	-116.56	4,547.92	0.73	0.56	0.47	
Gross 100' FNL 8922.50 MD/3422.0 TVD 5786.82 N -116.56 W N: 730773.5 E: 640156.2										
8,946.00	89.98	359.87	3,422.04	5,810.32	-116.63	4,566.63	0.73	0.56	0.47	
Last MWD Survey 8946 MD/3422.04 TVD 5810.32 N -116.63 W N: 730797.0 E: 640156.2										
8,968.00	89.93	359.95	3,422.06	5,832.32	-116.67	4,584.17	0.43	-0.23	0.36	
PTB 8968 MD/3422.05 TVD 5832.32 N -116.67 W N: 730819.0 E: 640156.1 - BHL Grand Forks Fed Com #2H										

Survey Report

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Project:	Chaves County	TVD Reference:	KB=17.50 @ 3897.90usft
Site:	Sec 27-T15S-R29E	MD Reference:	KB=17.50 @ 3897.90usft
Well:	Grand Forks Federal Com #2H	North Reference:	Grid
Wellbore:	Lateral	Survey Calculation Method:	Minimum Curvature
Design:	Lateral	Database:	EDM 5000.1

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,721.00	2,720.03	2.20	3.95	1st MWD Survey
3,797.00	3,460.61	663.47	-50.03	Cross 100' FSL 3797 MD/3460.61 TVD 663.47 N -50.03 W N: 725650.2 E: 640156.1
8,922.50	3,422.00	5,786.82	-116.56	Cross 100' FNL 8922.50 MD/3422.0 TVD 5786.82 N -116.56 W N: 730773.5 E: 640156.1
8,946.00	3,422.04	5,810.32	-116.63	Last MWD Survey 8946 MD/3422.04 TVD 5810.32 N -116.63 W N: 730797.0 E: 640156.1
8,968.00	3,422.06	5,832.32	-116.67	PTB 8968 MD/3422.05 TVD 5832.32 N -116.67 W N: 730819.0 E: 640156.1

Checked By: _____	Approved By: _____	Date: _____
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Grand Forks Fed Com 2-H

MD(ftKB) Incl(deg) Azm(deg) TVD(ftKB)

101	0.50		
258	1.00		
372	2.10	97.60	371.92
434	2.20	93.20	433.87
526	1.60	87.00	525.82
713	1.50	39.90	712.76
903	2.20	6.90	902.67
1092	0.24	319.30	1091.62
1136	2.50	313.70	1135.60
1247	2.11	317.28	1246.51
1309	2.07	317.72	1308.47
1404	0.57	266.21	1403.44
1594	1.41	199.95	1593.42
1783	1.41	198.19	1782.36
1971	1.41	190.01	1970.30
2160	1.41	185.71	2159.25
2350	1.23	182.37	2349.20
2538	0.26	333.19	2537.18
2725	0.62	350.20	2724.18
2726	0.53	345.32	2725.18
2780	0.62	348.26	2779.18
2816	9.45	358.99	2815.00
2875	0.62	357.05	2873.72
2911	17.14	356.09	2909.16
2915	0.62	355.16	2913.10
3005	23.78	354.50	3000.47
3100	30.46	354.33	3084.98
3104	0.79	350.94	3088.79
3194	37.93	353.71	3172.22
3289	44.88	353.10	3243.43
3293	0.70	341.01	3247.03
3384	52.09	351.87	3325.84
3400	53.45	351.87	3335.52
3415	54.02	351.95	3344.39
3447	55.08	351.95	3362.95
3465	55.65	352.04	3373.18
3478	55.91	351.95	3380.49
3481	0.92	334.15	3383.03
3496	56.35	351.95	3395.69
3509	56.75	351.95	3402.86
3526	58.15	352.66	3412.00
3541	59.52	353.19	3419.76

MD(ftKB)	Incl(deg)	Azm(deg)	TVD(ftKB)
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3635	67.96	359.51	3461.35
3652	0.92	335.82	3474.59
3728	76.79	359.34	3529.56
3823	88.04	0.48	3542.08
3855	89.23	0.48	3542.84
3951	92.35	358.11	3541.52
4046	89.85	356.88	3539.70
4167	89.05	358.46	3540.86
4356	91.16	359.34	3540.51
4451	92.18	359.25	3537.74
4546	90.90	359.34	3535.19
4641	92.09	359.34	3532.71
4736	90.59	0.48	3530.49
4831	90.86	0.92	3529.29
4928	90.37	0.48	3528.25
5022	89.85	359.43	3528.07
5117	90.64	0.39	3527.66
5211	90.20	358.81	3526.97
5304	91.03	358.46	3525.97
5399	89.58	358.11	3525.47
5494	90.33	358.63	3525.54
5589	91.16	358.55	3524.31
5684	89.89	359.34	3523.44
5779	90.55	359.69	3523.07
5846	91.78	359.78	3521.71
5941	90.37	358.99	3519.93
6035	90.77	358.46	3518.99
6129	92.88	359.87	3516.00
6187	91.60	359.69	3513.73
6251	91.38	359.60	3512.07
6346	91.03	358.99	3510.07
6440	92.48	358.72	3507.19
6534	92.35	358.63	3503.23
6631	88.97	359.07	3502.11
6726	89.14	358.63	3503.68
6924	89.98	357.67	3505.20
7018	88.26	357.32	3506.64
7113	86.37	359.78	3511.09
7207	88.31	1.01	3515.46
7302	89.27	0.92	3517.46
7396	89.80	0.83	3518.23
7491	90.99	0.13	3517.57
7586	91.96	0.57	3515.13
7680	91.87	359.34	3511.98
7774	90.86	359.43	3509.75

MD(ftKB)	Incl(deg)	Azm(deg)	TVD(ftKB)
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7869	89.93	359.25	3509.09
7963	90.46	359.25	3508.77
8058	91.12	359.78	3507.46
8154	90.46	358.63	3506.14
8249	88.57	358.55	3506.94
8249	89.45	358.99	3506.94
8438	90.46	359.60	3507.09
8533	91.43	358.81	3505.52
8628	91.96	358.72	3502.71
8721	90.64	359.25	3500.60
8800	89.19	359.25	3500.72
8852	89.45	359.43	3501.34
8866	89.98	359.87	3501.41
8968	89.93	359.95	3501.49

EOF