



Directional Survey

DELAWARE BASIN UNRESTRICTED

Well Name: THISTLE UNIT 117H

30-025-43548

Sub-Division DELAWARE BASIN	Region LEA COUNTY CORE	Field Name JOHNSON RANCH	County LEA	State/Province NM						
Surface Legal Location 34-23S-33E	API/UMI 3002543548	Latitude (°) 32° 15' 15.804" N	Longitude (°) 103° 33' 11.351" W	Orig KB Elevation (ft) 3,658.80	Ground Elev MSL (ft) 3,637.80	KB - GL (ft) 21.00				
Wellbores										
Wellbore Name OH	Parent Wellbore	SAP Well ID 40811	Vertical Section Direction (°)							
Kick Offs & Key Depths										
Date 2/28/2017	Type CURVE	Top Depth (ftKB) 9,166.0								
Date 3/13/2017	Type CURVE	Top Depth (ftKB) 9,105.0								
Date 3/16/2017	Type LATERAL	Top Depth (ftKB) 9,998.0								
Actual Deviation Survey COMPOSITE OH, Proposed? No										
Definitive? No Proposed? No Proposed Deviation Survey										
Deviation Survey										
Date 3/6/2017	Description COMPOSITE OH									
MD Tie In (ftKB) 0.00	TVD Tie In (ftKB) 0.00	Inclination Tie In (°) 0.00	Azimuth Tie In (°) 0.00	NS Tie In (ft) 0.00	EW Tie In (ft) 0.00					
Survey Data										
Date	MD (ftKB)	Incl (°)	Azm (°)	TVD (ftKB)	VS (ft)	N/S (ft)	E/W (ft)	DLS (°/100ft)	Survey Tool	Survey Company
3/6/2017	139.00	0.00	180.10	139.00	0.00	0.00	0.00	0.00	MWD	LEAM DRILLING SYSTEMS
3/6/2017	208.00	0.40	212.70	208.00	-0.19	-0.20	-0.13	0.58	MWD	LEAM DRILLING SYSTEMS
3/6/2017	268.00	0.10	104.90	268.00	-0.37	-0.39	-0.19	0.73	MWD	LEAM DRILLING SYSTEMS
3/6/2017	361.00	0.20	127.40	361.00	-0.51	-0.51	0.01	0.12	MWD	LEAM DRILLING SYSTEMS
3/6/2017	452.00	0.20	145.70	452.00	-0.76	-0.74	0.23	0.07	MWD	LEAM DRILLING SYSTEMS
3/6/2017	545.00	0.10	358.70	545.00	-0.82	-0.79	0.32	0.31	MWD	LEAM DRILLING SYSTEMS
3/6/2017	638.00	0.50	7.30	638.00	-0.34	-0.31	0.37	0.43	MWD	LEAM DRILLING SYSTEMS
3/6/2017	733.00	0.60	348.40	732.99	0.55	0.59	0.32	0.22	MWD	LEAM DRILLING SYSTEMS
3/6/2017	828.00	0.80	282.80	827.99	1.26	1.22	-0.42	0.82	MWD	LEAM DRILLING SYSTEMS
3/6/2017	923.00	0.60	358.00	922.98	1.97	1.87	-1.09	0.91	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,016.00	0.70	243.10	1,015.98	2.25	2.10	-1.61	1.18	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,113.00	0.30	205.70	1,112.97	1.82	1.60	-2.25	0.51	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,206.00	1.00	302.10	1,205.97	2.11	1.81	-3.04	1.16	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,277.00	0.40	250.10	1,276.96	2.43	2.06	-3.80	1.15	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,320.00	0.60	313.90	1,319.96	2.56	2.16	-4.10	1.29	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,415.00	0.60	326.50	1,414.96	3.38	2.92	-4.74	0.14	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,510.00	0.80	0.20	1,509.95	4.48	4.00	-5.01	0.47	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,605.00	0.80	353.90	1,604.94	5.80	5.32	-5.08	0.09	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,700.00	0.30	343.50	1,699.94	6.71	6.22	-5.22	0.53	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,795.00	0.50	326.20	1,794.93	7.32	6.80	-5.52	0.24	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,890.00	0.20	327.60	1,889.93	7.83	7.29	-5.84	0.32	MWD	LEAM DRILLING SYSTEMS
3/6/2017	1,985.00	0.20	33.00	1,984.93	8.11	7.57	-5.84	0.23	MWD	LEAM DRILLING SYSTEMS
3/6/2017	2,080.00	0.20	311.40	2,079.93	8.36	7.62	-5.87	0.28	MWD	LEAM DRILLING SYSTEMS
3/6/2017	2,175.00	0.10	266.40	2,174.93	8.49	7.92	-6.08	0.16	MWD	LEAM DRILLING SYSTEMS
3/6/2017	2,270.00	0.50	318.30	2,269.93	8.82	8.22	-6.44	0.47	MWD	LEAM DRILLING SYSTEMS
3/6/2017	2,365.00	1.50	265.50	2,364.92	9.19	8.44	-7.95	1.33	MWD	LEAM DRILLING SYSTEMS
3/6/2017	2,460.00	3.00	261.30	2,459.84	9.08	7.96	-11.65	1.59	MWD	LEAM DRILLING SYSTEMS
3/6/2017	2,555.00	4.00	260.70	2,554.66	8.75	7.05	-17.38	1.05	MWD	LEAM DRILLING SYSTEMS
3/7/2017	2,651.00	5.00	263.00	2,650.36	8.44	6.00	-24.83	1.06	MWD	LEAM DRILLING SYSTEMS
3/7/2017	2,746.00	5.90	265.80	2,744.93	8.48	5.14	-33.81	0.99	MWD	LEAM DRILLING SYSTEMS
3/7/2017	2,841.00	6.80	262.50	2,839.35	8.43	4.05	-44.26	1.02	MWD	LEAM DRILLING SYSTEMS
3/7/2017	2,936.00	6.90	261.70	2,933.67	8.00	2.49	-55.48	0.15	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,031.00	6.70	263.30	3,028.00	7.65	1.02	-66.63	0.29	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,126.00	6.30	266.60	3,122.39	7.76	0.06	-77.34	0.58	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,222.00	6.10	266.50	3,217.83	8.17	-0.56	-87.69	0.21	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,317.00	6.10	263.00	3,312.29	8.25	-1.48	-97.74	0.39	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,412.00	5.80	261.50	3,406.78	7.91	-2.81	-107.50	0.36	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,507.00	6.20	256.50	3,501.26	6.98	-4.72	-117.23	0.69	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,602.00	5.90	256.90	3,595.73	5.66	-7.02	-126.97	0.32	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,697.00	5.90	254.50	3,690.23	4.20	-9.43	-136.44	0.26	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,792.00	5.40	252.70	3,784.77	2.47	-12.07	-145.41	0.56	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,888.00	5.60	254.90	3,880.33	0.80	-14.63	-154.24	0.30	MWD	LEAM DRILLING SYSTEMS
3/7/2017	3,983.00	5.30	258.50	3,974.90	-0.40	-16.71	-163.02	0.48	MWD	LEAM DRILLING SYSTEMS
3/7/2017	4,078.00	5.90	252.10	4,069.44	-1.87	-19.09	-171.96	0.91	MWD	LEAM DRILLING SYSTEMS
3/7/2017	4,173.00	5.60	252.70	4,163.97	-3.83	-21.97	-181.04	0.32	MWD	LEAM DRILLING SYSTEMS
3/7/2017	4,268.00	5.90	249.50	4,258.49	-6.01	-25.05	-190.04	0.46	MWD	LEAM DRILLING SYSTEMS
3/7/2017	4,362.00	5.90	246.60	4,351.99	-8.71	-28.67	-198.99	0.32	MWD	LEAM DRILLING SYSTEMS
3/7/2017	4,457.00	5.80	245.10	4,446.50	-11.77	-32.63	-207.83	0.19	MWD	LEAM DRILLING SYSTEMS
3/7/2017	4,551.00	6.20	246.20	4,539.98	-14.91	-36.67	-216.78	0.44	MWD	LEAM DRILLING SYSTEMS
3/7/2017	4,646.00	6.90	244.60	4,634.36	-18.42	-41.19	-226.63	0.76	MWD	LEAM DRILLING SYSTEMS
3/7/2017	4,740.00	6.20	240.30	4,727.75	-22.39	-46.13	-236.14	0.91	MWD	LEAM DRILLING SYSTEMS
3/7/2017	4,835.00	6.10	239.40	4,822.20	-26.60	-51.24	-244.94	0.15	MWD	LEAM DRILLING SYSTEMS
3/8/2017	4,930.00	6.90	241.00	4,916.59	-30.98	-56.58	-254.28	0.86	MWD	LEAM DRILLING SYSTEMS
3/8/2017	5,025.00	7.10	245.40	5,010.88	-35.14	-61.79	-264.61	0.60	MWD	LEAM DRILLING SYSTEMS
3/8/2017	5,120.00	6.90	249.60	5,105.17	-38.48	-66.22	-275.29	0.58	MWD	LEAM DRILLING SYSTEMS
3/8/2017	5,149.00	6.80	251.90	5,133.97	-39.29	-67.36	-278.56	1.01	MWD	LEAM DRILLING SYSTEMS
3/9/2017	5,248.00	6.40	242.00	5,232.31	-42.64	-71.77	-289.00	1.22	MWD	LEAM DRILLING SYSTEMS
3/9/2017	5,343.00	7.60	255.70	5,326.61	-45.59	-75.81	-299.76	2.16	MWD	LEAM DRILLING SYSTEMS
3/9/2017	5,438.00	7.10	250.30	5,420.83	-47.95	-79.34	-311.38	0.90	MWD	LEAM DRILLING SYSTEMS
3/9/2017	5,533.00	7.10	267.90	5,515.11	-48.99	-81.54	-322.78	2.28	MWD	LEAM DRILLING SYSTEMS
3/10/2017	5,628.00	7.30	265.20	5,609.36	-48.53	-82.26	-334.66	0.41	MWD	LEAM DRILLING SYSTEMS
3/10/2017	5,723.00	7.70	270.50	5,703.65	-47.74	-82.70	-347.04	0.84	MWD	LEAM DRILLING SYSTEMS
3/10/2017	5,818.00	7.90	266.80	5,797.67	-46.77	-83.01	-359.92	0.57	MWD	LEAM DRILLING SYSTEMS

HOBBS OGD

JAN 25 2018

RECEIVED

Provide signature page for
directional survey



Directional Survey

DELAWARE BASIN UNRESTRICTED

Well Name: THISTLE UNIT 117H

Sub-Division DELAWARE BASIN	Region LEA COUNTY CORE	Field Name JOHNSON RANCH	County LEA	State/Province NM
Surface Legal Location 34-23S-33E	API/UVI 3002543548	Latitude (°) 32° 15' 15.804" N	Longitude (°) 103° 33' 11.351" W	Orig KB Elevation (ft) 3,658.80
				Ground Elev MSL (ft) 3,637.80
				KB - GL (ft) 21.00

Survey Data										
Date	MD (RKB)	incl (°)	Azm (°)	TVD (RKB)	VS (ft)	NIS (ft)	E/W (ft)	DLS (°/100ft)	Survey Tool	Survey Company
3/10/2017	5,914.00	6.90	263.80	5,892.87	-46.53	-84.00	-372.24	1.12	MWD	LEAM DRILLING SYSTEMS
3/10/2017	6,009.00	6.70	258.60	5,987.21	-47.12	-85.72	-383.34	0.68	MWD	LEAM DRILLING SYSTEMS
3/10/2017	6,104.00	6.40	252.90	6,081.59	-48.72	-88.37	-393.84	0.75	MWD	LEAM DRILLING SYSTEMS
3/10/2017	6,199.00	6.80	253.80	6,175.96	-50.79	-91.49	-404.30	0.43	MWD	LEAM DRILLING SYSTEMS
3/10/2017	6,294.00	5.50	250.50	6,270.41	-52.90	-94.58	-413.99	1.42	MWD	LEAM DRILLING SYSTEMS
3/10/2017	6,389.00	7.60	256.10	6,364.79	-54.88	-97.61	-424.38	2.31	MWD	LEAM DRILLING SYSTEMS
3/10/2017	6,484.00	7.40	256.60	6,458.97	-56.59	-100.54	-436.43	0.22	MWD	LEAM DRILLING SYSTEMS
3/10/2017	6,579.00	7.30	261.50	6,553.19	-57.70	-102.85	-448.35	0.67	MWD	LEAM DRILLING SYSTEMS
3/10/2017	6,675.00	7.40	254.00	6,648.41	-59.10	-105.46	-460.33	1.00	MWD	LEAM DRILLING SYSTEMS
3/10/2017	6,770.00	8.20	253.50	6,742.53	-61.46	-109.07	-472.71	0.85	MWD	LEAM DRILLING SYSTEMS
3/11/2017	6,865.00	7.00	264.70	6,836.70	-62.69	-111.53	-484.97	2.00	MWD	LEAM DRILLING SYSTEMS
3/11/2017	6,960.00	7.60	272.40	6,930.93	-61.76	-111.80	-497.01	1.21	MWD	LEAM DRILLING SYSTEMS
3/11/2017	7,055.00	6.10	247.70	7,025.27	-62.31	-113.45	-507.96	3.44	MWD	LEAM DRILLING SYSTEMS
3/11/2017	7,150.00	7.20	267.20	7,119.64	-63.45	-115.66	-518.58	2.63	MWD	LEAM DRILLING SYSTEMS
3/11/2017	7,245.00	8.00	266.10	7,213.80	-62.94	-116.40	-531.12	0.86	MWD	LEAM DRILLING SYSTEMS
3/11/2017	7,340.00	6.50	254.90	7,308.05	-63.61	-118.25	-542.91	2.16	MWD	LEAM DRILLING SYSTEMS
3/11/2017	7,435.00	6.10	252.60	7,402.47	-65.51	-121.16	-552.91	0.50	MWD	LEAM DRILLING SYSTEMS
3/11/2017	7,530.00	5.40	247.80	7,496.99	-67.80	-124.36	-561.87	0.89	MWD	LEAM DRILLING SYSTEMS
3/11/2017	7,625.00	5.50	245.90	7,591.56	-70.50	-127.90	-570.16	0.22	MWD	LEAM DRILLING SYSTEMS
3/11/2017	7,720.00	4.70	252.00	7,686.19	-72.77	-130.97	-578.02	1.02	MWD	LEAM DRILLING SYSTEMS
3/11/2017	7,815.00	4.50	281.90	7,780.90	-72.47	-131.40	-585.37	2.50	MWD	LEAM DRILLING SYSTEMS
3/11/2017	7,911.00	4.25	283.00	7,876.62	-70.19	-129.82	-592.52	0.27	MWD	LEAM DRILLING SYSTEMS
3/11/2017	8,006.00	5.90	273.30	7,971.24	-68.29	-128.75	-600.83	1.95	MWD	LEAM DRILLING SYSTEMS
3/11/2017	8,101.00	7.50	264.00	8,065.59	-67.56	-129.12	-611.87	2.03	MWD	LEAM DRILLING SYSTEMS
3/11/2017	8,196.00	7.40	262.90	8,159.79	-67.74	-130.52	-624.11	0.18	MWD	LEAM DRILLING SYSTEMS
3/11/2017	8,291.00	6.50	265.60	8,254.09	-67.76	-131.69	-635.54	1.01	MWD	LEAM DRILLING SYSTEMS
3/12/2017	8,386.00	4.70	239.60	8,348.65	-69.26	-134.07	-644.26	3.23	MWD	LEAM DRILLING SYSTEMS
3/12/2017	8,481.00	5.50	258.40	8,443.28	-71.36	-136.96	-652.08	1.94	MWD	LEAM DRILLING SYSTEMS
3/12/2017	8,576.00	4.10	271.40	8,537.95	-71.40	-137.79	-659.93	1.86	MWD	LEAM DRILLING SYSTEMS
3/12/2017	8,671.00	2.80	263.60	8,632.77	-71.01	-137.97	-665.63	1.45	MWD	LEAM DRILLING SYSTEMS
3/12/2017	8,766.00	1.80	249.90	8,727.70	-71.41	-138.74	-669.34	1.19	MWD	LEAM DRILLING SYSTEMS
3/12/2017	8,861.00	0.90	225.20	8,822.67	-72.25	-139.78	-671.27	1.11	MWD	LEAM DRILLING SYSTEMS
3/12/2017	8,956.00	1.60	261.20	8,917.65	-72.79	-140.50	-673.11	1.07	MWD	LEAM DRILLING SYSTEMS
3/12/2017	9,046.00	2.30	270.30	9,007.59	-72.67	-140.69	-676.16	0.85	MWD	LEAM DRILLING SYSTEMS
3/13/2017	9,148.00	4.90	358.60	9,109.44	-68.11	-136.32	-678.31	5.24	MWD	LEAM DRILLING SYSTEMS
3/13/2017	9,195.00	11.10	3.30	9,155.96	-61.63	-129.79	-678.10	13.25	MWD	LEAM DRILLING SYSTEMS
3/13/2017	9,242.00	15.40	4.20	9,201.70	-51.01	-119.04	-677.38	9.16	MWD	LEAM DRILLING SYSTEMS
3/13/2017	9,289.00	19.30	1.90	9,246.55	-37.16	-105.05	-676.67	8.42	MWD	LEAM DRILLING SYSTEMS
3/14/2017	9,338.00	23.00	358.90	9,292.25	-19.58	-87.38	-676.58	7.87	MWD	LEAM DRILLING SYSTEMS
3/14/2017	9,385.00	26.90	357.00	9,334.85	0.20	-67.57	-677.32	8.47	MWD	LEAM DRILLING SYSTEMS
3/14/2017	9,432.00	29.60	353.30	9,376.25	22.43	-45.42	-679.23	6.84	MWD	LEAM DRILLING SYSTEMS
3/14/2017	9,479.00	33.80	351.90	9,416.23	47.11	-20.94	-682.43	9.07	MWD	LEAM DRILLING SYSTEMS
3/14/2017	9,527.00	37.80	351.20	9,455.16	75.15	6.83	-686.56	8.38	MWD	LEAM DRILLING SYSTEMS
3/15/2017	9,576.00	41.60	349.80	9,492.85	106.37	37.69	-691.74	7.97	MWD	LEAM DRILLING SYSTEMS
3/15/2017	9,624.00	45.80	353.60	9,527.55	139.48	70.49	-696.48	10.32	MWD	LEAM DRILLING SYSTEMS
3/15/2017	9,672.00	51.60	357.50	9,559.22	175.50	106.42	-699.22	13.53	MWD	LEAM DRILLING SYSTEMS
3/15/2017	9,719.00	58.00	359.40	9,586.30	213.78	144.79	-700.24	14.01	MWD	LEAM DRILLING SYSTEMS
3/15/2017	9,767.00	65.80	359.60	9,608.90	255.92	187.09	-700.60	16.25	MWD	LEAM DRILLING SYSTEMS
3/15/2017	9,814.00	72.30	359.10	9,625.69	299.61	230.96	-701.10	13.87	MWD	LEAM DRILLING SYSTEMS
3/15/2017	9,861.00	80.50	358.70	9,636.73	345.11	276.59	-701.98	17.47	MWD	LEAM DRILLING SYSTEMS
3/15/2017	9,909.00	85.80	358.90	9,642.46	392.60	324.22	-702.98	11.05	MWD	LEAM DRILLING SYSTEMS
3/16/2017	9,951.00	87.40	358.90	9,644.95	434.39	366.14	-703.79	3.81	MWD	LEAM DRILLING SYSTEMS
3/16/2017	10,013.00	91.10	359.10	9,645.76	496.17	428.12	-704.87	5.98	MWD	LEAM DRILLING SYSTEMS
3/16/2017	10,108.00	89.90	359.10	9,644.93	590.82	523.10	-706.36	1.26	MWD	LEAM DRILLING SYSTEMS
3/16/2017	10,203.00	89.70	358.20	9,645.26	685.55	618.07	-708.60	0.97	MWD	LEAM DRILLING SYSTEMS
3/16/2017	10,298.00	89.90	358.20	9,645.59	780.33	713.02	-711.58	0.21	MWD	LEAM DRILLING SYSTEMS
3/16/2017	10,393.00	90.10	358.00	9,645.59	875.12	807.97	-714.73	0.30	MWD	LEAM DRILLING SYSTEMS
3/16/2017	10,487.00	90.20	359.40	9,645.35	968.83	901.94	-716.86	1.49	MWD	LEAM DRILLING SYSTEMS
3/16/2017	10,582.00	89.80	359.80	9,645.35	1,063.43	996.94	-717.53	0.60	MWD	LEAM DRILLING SYSTEMS
3/16/2017	10,677.00	89.70	358.60	9,645.76	1,158.07	1,091.93	-718.85	1.27	MWD	LEAM DRILLING SYSTEMS
3/17/2017	10,771.00	90.10	358.60	9,645.93	1,251.81	1,185.90	-721.15	0.43	MWD	LEAM DRILLING SYSTEMS
3/17/2017	10,866.00	90.10	358.00	9,645.76	1,346.57	1,280.86	-723.97	0.63	MWD	LEAM DRILLING SYSTEMS
3/17/2017	10,960.00	90.00	358.40	9,645.68	1,440.35	1,374.81	-726.92	0.44	MWD	LEAM DRILLING SYSTEMS
3/17/2017	11,055.00	90.00	357.90	9,645.68	1,535.14	1,469.76	-729.99	0.53	MWD	LEAM DRILLING SYSTEMS
3/17/2017	11,149.00	90.20	358.40	9,645.51	1,628.92	1,563.71	-733.02	0.57	MWD	LEAM DRILLING SYSTEMS
3/17/2017	11,244.00	90.10	358.70	9,645.27	1,723.66	1,658.68	-735.43	0.33	MWD	LEAM DRILLING SYSTEMS
3/17/2017	11,339.00	90.10	359.60	9,645.10	1,818.32	1,753.67	-736.84	0.95	MWD	LEAM DRILLING SYSTEMS
3/17/2017	11,435.00	89.00	359.30	9,645.85	1,913.92	1,849.66	-737.76	1.19	MWD	LEAM DRILLING SYSTEMS
3/17/2017	11,530.00	89.20	359.10	9,647.35	2,008.56	1,944.64	-739.08	0.30	MWD	LEAM DRILLING SYSTEMS
3/17/2017	11,625.00	89.00	359.60	9,648.84	2,103.18	2,039.62	-740.16	0.57	MWD	LEAM DRILLING SYSTEMS
3/17/2017	11,720.00	89.20	0.70	9,650.33	2,197.67	2,134.61	-739.91	1.18	MWD	LEAM DRILLING SYSTEMS
3/17/2017	11,815.00	89.20	2.30	9,651.66	2,291.90	2,229.56	-737.43	1.68	MWD	LEAM DRILLING SYSTEMS
3/17/2017	11,910.00	89.20	4.40	9,652.98	2,385.70	2,324.39	-731.87	2.21	MWD	LEAM DRILLING SYSTEMS
3/17/2017	12,005.00	89.20	4.90	9,654.31	2,479.14	2,419.06	-724.17	0.53	MWD	LEAM DRILLING SYSTEMS
3/17/2017	12,100.00	89.10	3.50	9,655.72	2,572.71	2,513.80	-717.22	1.48	MWD	LEAM DRILLING SYSTEMS
3/17/2017	12,195.00	89.10	2.30	9,657.21	2,666.63	2,608.66	-712.41	1.26	MWD	LEAM DRILLING SYSTEMS
3/17/2017	12,290.00	89.20	2.30	9,658.62	2,760.69	2,703.57	-708.60	0.11	MWD	LEAM DRILLING SYSTEMS



Well Name: THISTLE UNIT 117H

Sub-Division DELAWARE BASIN	Region LEA COUNTY CORE	Field Name JOHNSON RANCH	County LEA	State/Province NM
Surface Legal Location 34-23S-33E	API/UWI 3002543548	Latitude (°) 32° 15' 15.804" N	Longitude (°) 103° 33' 11.351" W	Orig KB Elevation (ft) 3,658.80
				Ground Elev MSL (ft) 3,637.80
				KB - GL (ft) 21.00

Survey Data

Date	MD (ft/KB)	Incl (°)	Azm (°)	TVD (ft/KB)	VS (ft)	N/S (ft)	E/W (ft)	DLS (°/100ft)	Survey Tool	Survey Company
3/17/2017	12,385.00	89.00	0.90	9,660.11	2,854.90	2,798.52	-705.95	1.49	MWD	LEAM DRILLING SYSTEMS
3/17/2017	12,480.00	88.80	359.60	9,661.94	2,949.37	2,893.50	-705.53	1.38	MWD	LEAM DRILLING SYSTEMS
3/17/2017	12,575.00	89.20	359.60	9,663.59	3,043.95	2,988.49	-706.20	0.42	MWD	LEAM DRILLING SYSTEMS
3/17/2017	12,670.00	89.10	359.40	9,665.00	3,138.54	3,083.47	-707.02	0.24	MWD	LEAM DRILLING SYSTEMS
3/17/2017	12,765.00	89.20	359.30	9,666.41	3,233.16	3,178.45	-708.10	0.15	MWD	LEAM DRILLING SYSTEMS
3/17/2017	12,860.00	89.20	359.40	9,667.74	3,327.78	3,273.44	-709.18	0.11	MWD	LEAM DRILLING SYSTEMS
3/17/2017	12,955.00	89.20	359.40	9,669.07	3,422.39	3,368.43	-710.17	0.00	MWD	LEAM DRILLING SYSTEMS
3/17/2017	13,050.00	89.20	359.10	9,670.39	3,517.03	3,463.41	-711.42	0.32	MWD	LEAM DRILLING SYSTEMS
3/17/2017	13,145.00	89.00	359.10	9,671.88	3,611.68	3,558.38	-712.91	0.21	MWD	LEAM DRILLING SYSTEMS
3/18/2017	13,240.00	89.30	359.10	9,673.29	3,706.34	3,653.36	-714.40	0.32	MWD	LEAM DRILLING SYSTEMS
3/18/2017	13,336.00	89.20	358.90	9,674.55	3,802.00	3,749.34	-716.08	0.23	MWD	LEAM DRILLING SYSTEMS
3/18/2017	13,431.00	89.20	359.10	9,675.88	3,896.67	3,844.32	-717.74	0.21	MWD	LEAM DRILLING SYSTEMS
3/18/2017	13,526.00	89.30	359.40	9,677.12	3,991.31	3,939.30	-718.98	0.33	MWD	LEAM DRILLING SYSTEMS
3/18/2017	13,526.00	89.30	359.40	9,677.12	3,991.31	3,939.30	-718.98	0.33	MWD	LEAM DRILLING SYSTEMS
3/18/2017	13,526.00	89.30	359.40	9,677.12	3,991.31	3,939.30	-718.98	0.33	MWD	LEAM DRILLING SYSTEMS
3/18/2017	13,621.00	89.10	358.90	9,678.45	4,085.96	4,034.28	-720.39	0.57	MWD	LEAM DRILLING SYSTEMS
3/18/2017	13,716.00	89.30	358.70	9,679.77	4,180.65	4,129.25	-722.38	0.30	MWD	LEAM DRILLING SYSTEMS
3/18/2017	13,811.00	89.20	358.70	9,681.02	4,275.36	4,224.22	-724.53	0.11	MWD	LEAM DRILLING SYSTEMS
3/18/2017	13,906.00	89.20	359.40	9,682.34	4,370.02	4,319.19	-726.11	0.74	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,001.00	89.20	358.70	9,683.67	4,464.69	4,414.17	-727.68	0.74	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,096.00	88.70	358.20	9,685.41	4,559.42	4,509.12	-730.25	0.74	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,190.00	89.30	358.90	9,687.05	4,653.14	4,603.07	-732.63	0.98	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,285.00	89.10	358.60	9,688.38	4,747.85	4,698.04	-734.70	0.38	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,380.00	89.20	359.10	9,689.79	4,842.53	4,793.01	-736.61	0.54	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,475.00	89.50	359.10	9,690.86	4,937.19	4,887.99	-738.10	0.32	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,570.00	89.20	358.90	9,691.94	5,031.87	4,982.97	-739.76	0.38	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,665.00	89.10	359.40	9,693.35	5,126.51	5,077.95	-741.17	0.54	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,760.00	89.20	359.40	9,694.76	5,221.12	5,172.94	-742.16	0.11	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,855.00	88.90	358.60	9,696.34	5,315.79	5,267.91	-743.82	0.90	MWD	LEAM DRILLING SYSTEMS
3/18/2017	14,950.00	89.10	359.10	9,697.99	5,410.47	5,362.87	-745.73	0.57	MWD	LEAM DRILLING SYSTEMS
3/18/2017	15,045.00	89.20	0.30	9,699.40	5,505.04	5,457.86	-746.22	1.27	MWD	LEAM DRILLING SYSTEMS
3/18/2017	15,140.00	88.20	358.70	9,701.56	5,599.62	5,552.83	-747.05	1.99	MWD	LEAM DRILLING SYSTEMS
3/18/2017	15,235.00	87.90	357.20	9,704.79	5,694.36	5,647.71	-750.45	1.61	MWD	LEAM DRILLING SYSTEMS
3/18/2017	15,330.00	90.70	358.40	9,705.95	5,789.17	5,742.62	-754.09	3.21	MWD	LEAM DRILLING SYSTEMS
3/19/2017	15,425.00	92.00	2.10	9,703.71	5,883.61	5,837.57	-753.68	4.13	MWD	LEAM DRILLING SYSTEMS
3/19/2017	15,520.00	88.50	2.60	9,703.30	5,977.65	5,932.48	-749.79	3.72	MWD	LEAM DRILLING SYSTEMS
3/19/2017	15,615.00	89.10	1.70	9,705.29	6,071.74	6,027.39	-746.22	1.14	MWD	LEAM DRILLING SYSTEMS
3/19/2017	15,711.00	88.80	2.10	9,707.05	6,166.87	6,123.32	-743.04	0.52	MWD	LEAM DRILLING SYSTEMS
3/19/2017	15,806.00	89.10	1.70	9,708.79	6,261.02	6,218.25	-739.89	0.53	MWD	LEAM DRILLING SYSTEMS
3/21/2017	15,906.00	89.60	1.70	9,709.92	6,360.18	6,318.20	-736.92	0.50	MWD	LEAM DRILLING SYSTEMS
3/21/2017	16,001.00	89.60	1.90	9,710.59	6,454.36	6,413.15	-733.94	0.21	MWD	LEAM DRILLING SYSTEMS
3/21/2017	16,096.00	88.80	1.70	9,711.91	6,548.53	6,508.10	-730.96	0.87	MWD	LEAM DRILLING SYSTEMS
3/21/2017	16,191.00	86.60	1.00	9,715.72	6,642.73	6,602.99	-728.72	2.43	MWD	LEAM DRILLING SYSTEMS
3/21/2017	16,286.00	85.00	357.50	9,722.68	6,737.10	6,697.70	-729.96	4.04	MWD	LEAM DRILLING SYSTEMS
3/21/2017	16,381.00	87.40	355.80	9,728.98	6,831.80	6,792.32	-735.50	3.09	MWD	LEAM DRILLING SYSTEMS
3/21/2017	16,476.00	90.60	356.10	9,730.64	6,926.74	6,887.06	-742.21	3.38	MWD	LEAM DRILLING SYSTEMS
3/21/2017	16,571.00	90.00	357.00	9,730.14	7,021.68	6,981.88	-747.92	1.14	MWD	LEAM DRILLING SYSTEMS
3/21/2017	16,666.00	90.00	357.20	9,730.14	7,116.54	7,076.76	-752.73	0.21	MWD	LEAM DRILLING SYSTEMS
3/22/2017	16,761.00	90.00	358.40	9,730.14	7,211.36	7,171.69	-756.38	1.26	MWD	LEAM DRILLING SYSTEMS
3/22/2017	16,856.00	90.20	358.00	9,729.97	7,306.14	7,266.64	-759.36	0.47	MWD	LEAM DRILLING SYSTEMS
3/22/2017	16,951.00	90.10	358.40	9,729.73	7,400.92	7,361.60	-762.34	0.43	MWD	LEAM DRILLING SYSTEMS
3/22/2017	17,046.00	90.00	358.00	9,729.64	7,495.70	7,456.55	-765.33	0.43	MWD	LEAM DRILLING SYSTEMS
3/22/2017	17,142.00	89.90	358.20	9,729.73	7,591.49	7,552.50	-768.51	0.23	MWD	LEAM DRILLING SYSTEMS
3/22/2017	17,237.00	90.00	358.20	9,729.81	7,686.26	7,647.45	-771.49	0.11	MWD	LEAM DRILLING SYSTEMS
3/22/2017	17,297.00	90.70	358.20	9,729.44	7,746.12	7,707.42	-773.38	1.17	MWD	LEAM DRILLING SYSTEMS
3/22/2017	17,329.00	90.70	358.20	9,729.05	7,778.05	7,739.40	-774.38	0.00	BIT	