



Directional Survey

DELAWARE BASIN EAST UNRESTRICTED

Well Name: NORTH THISTLE 2 STATE 1H

Sub-Division DELAWARE BASIN EAST	Region BASIN EAST	Field Name JOHNSON RANCH	County LEA	State/Province NM
Surface Legal Location SEC 2-23S-33E	API/Well 3002542533	Latitude (°) 32° 20' 22.42" N	Longitude (°) 103° 32' 28.239" W	Orig KB Elevation (ft) 3,537.50
				Ground Elev MSL (ft) 3,514.00
				KB - GL (ft) 23.50

Wellbores

Wellbore Name OH	Parent Wellbore	SAP Well ID 39161	Vertical Section Direction (°) 183.00
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Kick Offs & Key Depths

Date 11/23/2015	Type CURVE	Top Depth (ftKB) 9,049.0
Actual Deviation Survey EXTREME, Proposed? No	Definitive? No	Proposed? No
Proposed Deviation Survey		

Deviation Survey

Date 11/15/2015		Description EXTREME			
MD Tie In (ftKB)	TVD Tie In (ftKB)	Inclination Tie In (°)	Azimuth Tie In (°)	NS Tie In (ft)	EW Tie In (ft)

Survey Data

Date	MD (ftKB)	Incl (°)	Azm (°)	TVD (ftKB)	VS (ft)	N/S (ft)	E/W (ft)	DLS (°/100ft)	Survey Tool	Survey Company
11/15/2...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MWD	EXTREME
11/15/2...	139.00	0.40	299.38	139.00	-0.22	0.24	-0.42	0.29	MWD	EXTREME
11/15/2...	370.00	0.62	295.60	369.99	-1.05	1.17	-2.25	0.10	MWD	EXTREME
11/15/2...	514.00	1.01	313.40	513.97	-2.18	2.38	-3.88	0.32	MWD	EXTREME
11/15/2...	698.00	1.19	313.31	697.94	-4.46	4.81	-6.45	0.10	MWD	EXTREME
11/15/2...	883.00	1.49	313.31	882.89	-7.26	7.77	-9.59	0.16	MWD	EXTREME
11/15/2...	1,013.00	1.49	329.29	1,012.85	-9.76	10.39	-11.69	0.32	MWD	EXTREME
11/15/2...	1,152.00	1.20	334.23	1,151.81	-12.54	13.25	-13.24	0.22	MWD	WEATHERFORD
11/15/2...	1,340.00	0.95	327.18	1,339.78	-15.53	16.33	-14.94	0.15	MWD	WEATHERFORD
11/15/2...	1,531.00	0.45	330.62	1,530.76	-17.45	18.32	-16.17	0.26	MWD	WEATHERFORD
11/15/2...	1,722.00	0.29	350.83	1,721.76	-18.55	19.45	-16.61	0.11	MWD	WEATHERFORD
11/15/2...	1,913.00	0.25	351.56	1,912.75	-19.43	20.34	-16.75	0.02	MWD	WEATHERFORD
11/15/2...	2,104.00	0.16	5.10	2,103.75	-20.11	21.02	-16.79	0.05	MWD	WEATHERFORD
11/15/2...	2,295.00	0.56	46.28	2,294.75	-21.05	21.93	-16.09	0.24	MWD	WEATHERFORD
11/15/2...	2,486.00	0.71	44.66	2,485.74	-22.62	23.41	-14.59	0.08	MWD	WEATHERFORD
11/15/2...	2,677.00	0.91	57.36	2,676.72	-24.39	25.07	-12.48	0.14	MWD	WEATHERFORD
11/15/2...	2,868.00	1.07	55.13	2,867.69	-26.37	26.91	-9.74	0.09	MWD	WEATHERFORD
11/15/2...	3,059.00	1.43	57.77	3,058.64	-28.83	29.20	-6.26	0.19	MWD	WEATHERFORD
11/15/2...	3,250.00	0.70	56.18	3,249.61	-30.91	31.12	-3.27	0.38	MWD	WEATHERFORD
11/15/2...	3,442.00	0.82	59.81	3,441.59	-32.36	32.47	-1.11	0.07	MWD	WEATHERFORD
11/15/2...	3,633.00	1.24	62.47	3,632.56	-34.16	34.11	1.90	0.22	MWD	WEATHERFORD
11/15/2...	3,824.00	1.73	75.98	3,823.50	-36.06	35.76	6.53	0.31	MWD	WEATHERFORD
11/15/2...	4,015.00	1.86	91.45	4,014.40	-36.98	36.38	12.43	0.26	MWD	WEATHERFORD
11/15/2...	4,207.00	1.75	83.56	4,206.31	-37.55	36.63	18.46	0.14	MWD	WEATHERFORD
11/15/2...	4,398.00	1.07	68.86	4,397.25	-38.78	37.60	23.02	0.40	MWD	WEATHERFORD
11/15/2...	4,589.00	2.62	64.02	4,588.15	-41.60	40.16	28.61	0.81	MWD	WEATHERFORD
11/15/2...	4,685.00	1.82	56.81	4,684.07	-43.56	41.95	31.86	0.88	MWD	WEATHERFORD
11/15/2...	4,780.00	0.80	38.85	4,779.05	-44.99	43.30	33.53	1.14	MWD	WEATHERFORD
11/15/2...	4,876.00	0.90	44.03	4,875.04	-46.10	44.36	34.48	0.13	MWD	WEATHERFORD
11/15/2...	4,994.00	0.85	34.10	4,993.02	-47.55	45.75	35.61	0.14	MWD	WEATHERFORD
11/15/2...	5,168.00	0.76	19.47	5,167.01	-49.76	47.91	36.72	0.13	MWD	WEATHERFORD
11/15/2...	5,359.00	0.97	40.41	5,357.99	-52.26	50.33	38.19	0.20	MWD	WEATHERFORD
11/15/2...	5,550.00	1.26	17.73	5,548.95	-55.58	53.56	39.88	0.27	MWD	WEATHERFORD
11/15/2...	5,741.00	1.46	22.98	5,739.90	-59.90	57.81	41.47	0.12	MWD	WEATHERFORD
11/15/2...	5,932.00	1.40	5.93	5,930.84	-64.51	62.37	42.66	0.22	MWD	WEATHERFORD
11/15/2...	6,123.00	1.21	9.31	6,121.79	-68.85	66.68	43.23	0.11	MWD	WEATHERFORD
11/15/2...	6,313.00	1.41	4.59	6,311.74	-73.18	70.99	43.74	0.12	MWD	WEATHERFORD
11/15/2...	6,505.00	1.83	349.87	6,503.66	-78.53	76.36	43.39	0.31	MWD	WEATHERFORD
11/15/2...	6,696.00	1.94	353.51	6,694.56	-84.68	82.57	42.49	0.09	MWD	WEATHERFORD
11/15/2...	6,887.00	1.89	351.19	6,885.45	-90.96	88.90	41.64	0.05	MWD	WEATHERFORD
11/15/2...	7,078.00	1.55	351.14	7,076.37	-96.57	94.56	40.76	0.18	MWD	WEATHERFORD
11/15/2...	7,269.00	1.35	346.73	7,267.30	-101.25	99.31	39.85	0.12	MWD	WEATHERFORD
11/15/2...	7,459.00	1.02	353.25	7,457.26	-105.07	103.16	39.13	0.19	MWD	WEATHERFORD
11/15/2...	7,651.00	1.02	326.08	7,649.23	-108.12	106.28	37.98	0.25	MWD	WEATHERFORD
11/15/2...	7,842.00	0.85	326.33	7,840.21	-110.62	108.87	36.24	0.09	MWD	WEATHERFORD
11/15/2...	8,033.00	0.77	307.13	8,031.19	-112.47	110.82	34.44	0.15	MWD	WEATHERFORD
11/15/2...	8,223.00	0.66	282.08	8,221.18	-113.36	111.82	32.35	0.17	MWD	WEATHERFORD
11/15/2...	8,415.00	0.56	288.17	8,413.16	-113.78	112.35	30.37	0.06	MWD	WEATHERFORD
11/15/2...	8,606.00	0.78	275.77	8,604.15	-114.09	112.77	28.19	0.14	MWD	WEATHERFORD
11/15/2...	8,797.00	0.90	289.86	8,795.13	-114.59	113.41	25.49	0.12	MWD	WEATHERFORD
11/15/2...	8,983.00	0.51	276.91	8,981.12	-115.07	114.00	23.29	0.23	MWD	WEATHERFORD
11/15/2...	9,054.00	2.13	215.58	9,052.10	-113.98	112.97	22.21	2.73	MWD	WEATHERFORD
11/15/2...	9,086.00	6.16	193.48	9,084.01	-111.79	110.81	21.47	13.32	MWD	WEATHERFORD
11/15/2...	9,118.00	10.48	185.10	9,115.67	-107.19	106.24	20.81	13.99	MWD	WEATHERFORD
11/15/2...	9,149.00	14.75	182.94	9,145.91	-100.42	99.49	20.35	13.86	MWD	WEATHERFORD
11/15/2...	9,181.00	18.78	182.57	9,176.54	-91.19	90.27	19.91	12.60	MWD	WEATHERFORD
11/15/2...	9,213.00	22.55	182.65	9,206.48	-79.90	78.99	19.40	11.78	MWD	WEATHERFORD
11/15/2...	9,245.00	26.13	183.17	9,235.63	-66.71	65.83	18.73	11.21	MWD	WEATHERFORD
11/15/2...	9,293.00	31.61	183.68	9,277.65	-43.55	42.70	17.33	11.43	MWD	WEATHERFORD
11/15/2...	9,341.00	37.61	182.59	9,317.14	-16.30	15.49	15.86	12.57	MWD	WEATHERFORD
11/15/2...	9,389.00	41.79	183.13	9,354.06	14.35	-15.13	14.33	8.74	MWD	WEATHERFORD
11/15/2...	9,436.00	45.79	182.80	9,387.98	46.87	-47.60	12.65	8.52	MWD	WEATHERFORD

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11/15/2...	9,484.00	51.24	181.67	9,419.77	82.81	-83.52	11.26	11.49	MWD	WEATHERFORD
11/15/2...	9,532.00	57.41	182.39	9,447.75	121.78	-122.46	9.87	12.91	MWD	WEATHERFORD
11/15/2...	9,580.00	63.29	183.81	9,471.48	163.48	-164.10	7.60	12.52	MWD	WEATHERFORD
11/15/2...	9,627.00	66.75	184.65	9,491.33	206.06	-206.58	4.45	7.54	MWD	WEATHERFORD
11/15/2...	9,675.00	70.14	185.57	9,508.96	250.67	-251.04	0.47	7.28	MWD	WEATHERFORD
11/15/2...	9,723.00	73.38	185.73	9,523.98	296.20	-296.40	-4.01	6.76	MWD	WEATHERFORD
11/15/2...	9,771.00	75.87	185.72	9,536.71	342.43	-342.44	-8.63	5.19	MWD	WEATHERFORD
11/15/2...	9,819.00	78.37	183.67	9,547.41	389.19	-389.07	-12.46	6.67	MWD	WEATHERFORD
11/15/2...	9,851.00	81.15	182.55	9,553.10	420.68	-420.51	-14.16	9.35	MWD	WEATHERFORD
11/15/2...	9,895.00	85.44	182.43	9,558.23	464.37	-464.16	-16.06	9.75	MWD	WEATHERFORD
11/15/2...	9,927.00	87.06	181.45	9,560.33	496.29	-496.07	-17.14	5.91	MWD	WEATHERFORD
11/15/2...	9,990.00	90.56	182.10	9,561.63	559.25	-559.02	-19.09	5.65	MWD	WEATHERFORD
11/15/2...	10,086.00	90.84	182.25	9,560.46	655.24	-654.94	-22.74	0.33	MWD	WEATHERFORD
11/15/2...	10,182.00	90.84	182.30	9,559.05	751.22	-750.86	-26.55	0.05	MWD	WEATHERFORD
11/15/2...	10,278.00	91.26	181.70	9,557.29	847.19	-846.78	-29.90	0.76	MWD	WEATHERFORD
11/15/2...	10,373.00	89.72	182.33	9,556.48	942.17	-941.72	-33.24	1.75	MWD	WEATHERFORD
11/15/2...	10,469.00	88.81	182.01	9,557.71	1,038.15	-1,037.64	-36.87	1.00	MWD	WEATHERFORD
11/15/2...	10,565.00	87.48	181.50	9,560.82	1,134.07	-1,133.54	-39.81	1.48	MWD	WEATHERFORD
11/15/2...	10,660.00	87.48	181.96	9,565.00	1,228.96	-1,228.41	-42.67	0.48	MWD	WEATHERFORD
11/15/2...	10,755.00	86.57	181.87	9,569.93	1,323.81	-1,323.22	-45.84	0.96	MWD	WEATHERFORD
11/15/2...	10,851.00	87.55	182.95	9,574.85	1,419.68	-1,419.01	-49.88	1.52	MWD	WEATHERFORD
11/15/2...	10,947.00	88.53	183.13	9,578.14	1,515.62	-1,514.82	-54.96	1.04	MWD	WEATHERFORD
11/15/2...	11,042.00	90.56	184.19	9,578.89	1,610.60	-1,609.61	-61.03	2.41	MWD	WEATHERFORD
11/15/2...	11,137.00	91.19	184.83	9,577.44	1,705.56	-1,704.31	-68.50	0.95	MWD	WEATHERFORD
11/15/2...	11,233.00	91.82	185.72	9,574.92	1,801.45	-1,799.87	-77.32	1.14	MWD	WEATHERFORD
11/15/2...	11,328.00	90.98	185.35	9,572.60	1,896.32	-1,894.39	-86.48	0.97	MWD	WEATHERFORD
11/15/2...	11,424.00	93.08	186.28	9,569.20	1,992.14	-1,989.83	-96.20	2.39	MWD	WEATHERFORD
11/15/2...	11,519.00	92.10	185.31	9,564.90	2,086.93	-2,084.25	-105.78	1.45	MWD	WEATHERFORD
11/15/2...	11,614.00	92.45	185.70	9,561.13	2,181.76	-2,178.74	-114.89	0.55	MWD	WEATHERFORD
11/15/2...	11,710.00	90.14	184.93	9,558.96	2,277.65	-2,274.29	-123.78	2.54	MWD	WEATHERFORD
11/15/2...	11,806.00	88.95	184.51	9,559.73	2,373.61	-2,369.96	-131.68	1.31	MWD	WEATHERFORD
11/15/2...	11,901.00	89.02	184.62	9,561.41	2,468.56	-2,464.65	-139.24	0.14	MWD	WEATHERFORD
11/15/2...	11,997.00	89.79	183.98	9,562.41	2,564.52	-2,560.37	-146.43	1.04	MWD	WEATHERFORD
11/15/2...	12,092.00	89.44	183.97	9,563.04	2,659.51	-2,655.14	-153.02	0.37	MWD	WEATHERFORD
11/15/2...	12,188.00	88.67	184.30	9,564.63	2,755.48	-2,750.87	-159.94	0.87	MWD	WEATHERFORD
11/15/2...	12,283.00	88.95	182.85	9,566.60	2,850.45	-2,845.67	-165.86	1.55	MWD	WEATHERFORD
11/15/2...	12,378.00	90.42	182.81	9,567.12	2,945.44	-2,940.55	-170.55	1.55	MWD	WEATHERFORD
11/15/2...	12,474.00	90.77	182.55	9,566.13	3,041.44	-3,036.44	-175.04	0.45	MWD	WEATHERFORD
11/15/2...	12,569.00	89.44	182.32	9,565.95	3,136.43	-3,131.35	-179.08	1.42	MWD	WEATHERFORD
11/15/2...	12,665.00	89.51	183.61	9,566.83	3,232.42	-3,227.21	-184.04	1.35	MWD	WEATHERFORD
11/15/2...	12,760.00	90.07	183.36	9,567.18	3,327.42	-3,322.04	-189.82	0.65	MWD	WEATHERFORD
11/15/2...	12,856.00	90.49	183.45	9,566.71	3,423.41	-3,417.87	-195.52	0.45	MWD	WEATHERFORD
11/15/2...	12,951.00	90.70	183.70	9,565.72	3,518.40	-3,512.68	-201.44	0.34	MWD	WEATHERFORD
11/15/2...	13,047.00	90.42	182.80	9,564.79	3,614.40	-3,608.52	-206.88	0.98	MWD	WEATHERFORD
11/15/2...	13,143.00	89.16	181.98	9,565.14	3,710.39	-3,704.43	-210.89	1.57	MWD	WEATHERFORD
11/15/2...	13,238.00	91.19	182.75	9,564.85	3,805.38	-3,799.34	-214.81	2.29	MWD	WEATHERFORD
11/15/2...	13,334.00	90.07	182.92	9,563.79	3,901.37	-3,895.22	-219.56	1.18	MWD	WEATHERFORD
11/15/2...	13,429.00	89.37	182.36	9,564.26	3,996.37	-3,990.11	-223.93	0.94	MWD	WEATHERFORD
11/15/2...	13,524.00	87.90	181.94	9,566.52	4,091.33	-4,085.02	-227.49	1.61	MWD	WEATHERFORD
11/15/2...	13,620.00	88.67	182.44	9,569.39	4,187.27	-4,180.90	-231.16	0.96	MWD	WEATHERFORD
11/15/2...	13,716.00	88.39	182.46	9,571.85	4,283.24	-4,276.78	-235.26	0.29	MWD	WEATHERFORD
11/15/2...	13,804.00	88.60	182.59	9,574.17	4,371.20	-4,364.67	-239.14	0.28	MWD	WEATHERFORD
11/15/2...	13,879.00	88.60	182.59	9,576.00	4,446.18	-4,439.57	-242.53	0.00	BIT	WEATHERFORD