



# Shell

Reno County, Kansas (NAD27)

Reffner 2308

4-2HS

Wellbore #1

Survey: MS MWD

## Standard Survey Report

15 April, 2013



<b>Company:</b>	Shell	<b>Local Co-ordinate Reference:</b>	Well 4-2HS
<b>Project:</b>	Reno County, Kansas (NAD27)	<b>TVD Reference:</b>	WELL @ 1681.90usft (Patterson 264)
<b>Site:</b>	Reffner 2308	<b>MD Reference:</b>	WELL @ 1681.90usft (Patterson 264)
<b>Well:</b>	4-2HS	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Survey	<b>Database:</b>	Well Planning Conroe

<b>Project</b>	Reno County, Kansas (NAD27)		
<b>Map System:</b>	US State Plane 1927 (Exact solution)	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	NAD 1927 (NADCON CONUS)		
<b>Map Zone:</b>	Kansas South 1502		

<b>Well</b>	4-2HS				
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	516,682.68 usft	<b>Latitude:</b> 38° 5' 7.1299 N
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	2,083,651.86 usft	<b>Longitude:</b> 98° 12' 33.694 W
<b>Position Uncertainty</b>		0.00 usft	<b>Wellhead Elevation:</b>	usft	<b>Ground Level:</b> 1,659.00 usft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	WMM_2010	03/10/13	4.62	66.01	52,296

<b>Design</b>	Survey				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	174.10	

<b>Survey Program</b>	<b>Date</b>	04/15/13			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
146.00	8,071.00	MS MWD (Wellbore #1)	MWD	MWD - Standard	

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)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
146.00	0.60	48.20	146.00	0.51	0.57	-0.45	0.41	0.41	0.00
236.00	1.60	59.10	235.98	1.47	2.00	-1.26	1.13	1.11	12.11
297.00	2.30	70.90	296.94	2.31	3.89	-1.90	1.32	1.15	19.34
419.00	2.60	74.10	418.83	3.87	8.86	-2.93	0.27	0.25	2.62
511.00	3.80	98.80	510.69	3.97	13.88	-2.52	1.96	1.30	26.85
603.00	4.20	100.90	602.47	2.87	20.20	-0.78	0.46	0.43	2.28
696.00	2.80	66.10	695.30	3.14	25.62	-0.49	2.67	-1.51	-37.42
788.00	1.60	351.30	787.25	5.32	27.48	-2.47	3.08	-1.30	-81.30
880.00	0.30	225.50	879.24	6.43	27.12	-3.60	1.95	-1.41	-136.74
970.00	1.70	285.20	969.22	6.61	25.66	-3.94	1.74	1.56	66.33
1,064.00	1.90	230.70	1,063.18	5.99	23.11	-3.58	1.76	0.21	-57.98
1,155.00	2.20	227.00	1,154.12	3.84	20.67	-1.70	0.36	0.33	-4.07
1,245.00	1.00	209.20	1,244.09	1.98	19.02	-0.01	1.43	-1.33	-19.78
1,335.00	1.00	191.20	1,334.07	0.52	18.48	1.38	0.35	0.00	-20.00



<b>Company:</b>	Shell	<b>Local Co-ordinate Reference:</b>	Well 4-2HS
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<b>Site:</b>	Reffner 2308	<b>MD Reference:</b>	WELL @ 1681.90usft (Patterson 264)
<b>Well:</b>	4-2HS	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Survey	<b>Database:</b>	Well Planning Conroe

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)
1,426.00	0.80	185.10	1,425.06	-0.89	18.27	2.76	0.24	-0.22	-6.70
1,518.00	0.90	182.80	1,517.05	-2.25	18.18	4.11	0.11	0.11	-2.50
1,610.00	1.20	191.90	1,609.04	-3.92	17.95	5.74	0.37	0.33	9.89
1,702.00	0.70	188.80	1,701.02	-5.41	17.66	7.20	0.55	-0.54	-3.37
1,793.00	1.20	176.60	1,792.01	-6.91	17.63	8.69	0.59	0.55	-13.41
1,883.00	1.20	188.30	1,881.99	-8.79	17.55	10.54	0.27	0.00	13.00
1,976.00	1.30	178.80	1,974.97	-10.81	17.43	12.54	0.25	0.11	-10.22
2,070.00	1.50	182.70	2,068.94	-13.10	17.40	14.82	0.24	0.21	4.15
2,164.00	0.40	180.70	2,162.93	-14.66	17.34	16.36	1.17	-1.17	-2.13
2,257.00	0.30	175.40	2,255.93	-15.22	17.35	16.93	0.11	-0.11	-5.70
2,351.00	0.30	184.10	2,349.92	-15.72	17.35	17.42	0.05	0.00	9.26
2,445.00	0.30	189.10	2,443.92	-16.20	17.30	17.90	0.03	0.00	5.32
2,538.00	0.30	205.90	2,536.92	-16.66	17.15	18.34	0.09	0.00	18.06
2,632.00	0.30	180.70	2,630.92	-17.13	17.04	18.79	0.14	0.00	-26.81
2,726.00	0.30	152.70	2,724.92	-17.60	17.15	19.27	0.15	0.00	-29.79
2,820.00	0.70	2.00	2,818.92	-17.24	17.29	18.93	1.03	0.43	-160.32
2,913.00	1.00	22.00	2,911.91	-15.92	17.61	17.65	0.45	0.32	21.51
3,007.00	1.00	10.00	3,005.89	-14.35	18.06	16.13	0.22	0.00	-12.77
3,101.00	0.70	34.00	3,099.88	-13.07	18.52	14.90	0.49	-0.32	25.53
3,133.00	1.10	116.20	3,131.88	-13.04	18.91	14.92	3.82	1.25	256.88
3,164.00	2.90	142.20	3,162.86	-13.79	19.66	15.74	6.36	5.81	83.87
3,195.00	5.20	133.30	3,193.78	-15.38	21.16	17.47	7.67	7.42	-28.71
3,227.00	7.80	165.80	3,225.58	-18.48	22.75	20.72	13.77	8.13	101.56
3,258.00	10.50	169.90	3,256.19	-23.30	23.76	25.62	8.95	8.71	13.23
3,288.00	13.60	168.80	3,285.52	-29.45	24.92	31.86	10.36	10.33	-3.67
3,319.00	17.30	167.20	3,315.40	-37.52	26.65	40.06	12.01	11.94	-5.16
3,351.00	21.10	169.40	3,345.61	-47.83	28.77	50.53	12.09	11.88	6.88
3,382.00	24.00	171.20	3,374.24	-59.55	30.76	62.39	9.62	9.35	5.81
3,413.00	28.00	173.50	3,402.10	-73.01	32.55	75.97	13.30	12.90	7.42
3,444.00	31.80	174.80	3,428.96	-88.38	34.11	91.42	12.43	12.26	4.19
3,475.00	35.60	174.70	3,454.75	-105.51	35.69	108.62	12.26	12.26	-0.32
3,507.00	39.80	174.50	3,480.06	-124.98	37.53	128.18	13.13	13.13	-0.63
3,538.00	43.80	173.60	3,503.17	-145.53	39.68	148.84	13.05	12.90	-2.90
3,569.00	46.90	173.90	3,524.95	-167.45	42.08	170.89	10.02	10.00	0.97
3,600.00	48.90	174.50	3,545.74	-190.33	44.40	193.89	6.61	6.45	1.94
3,632.00	51.30	175.70	3,566.26	-214.79	46.49	218.43	8.03	7.50	3.75
3,663.00	53.90	177.00	3,585.09	-239.36	48.05	243.04	9.02	8.39	4.19
3,694.00	57.70	178.10	3,602.51	-264.98	49.14	268.62	12.60	12.26	3.55
3,725.00	62.00	177.40	3,618.08	-291.75	50.20	295.37	14.01	13.87	-2.26
3,757.00	63.30	177.60	3,632.78	-320.15	51.44	323.74	4.10	4.06	0.63
3,788.00	65.80	177.60	3,646.10	-348.11	52.61	351.68	8.06	8.06	0.00
3,819.00	68.40	177.10	3,658.16	-376.64	53.93	380.19	8.52	8.39	-1.61
3,850.00	72.10	175.70	3,668.63	-405.75	55.77	409.33	12.67	11.94	-4.52
3,883.00	76.00	174.80	3,677.70	-437.37	58.40	441.05	12.11	11.82	-2.73



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<b>Site:</b>	Reffner 2308	<b>MD Reference:</b>	WELL @ 1681.90usft (Patterson 264)
<b>Well:</b>	4-2HS	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Survey	<b>Database:</b>	Well Planning Conroe

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)	
3,913.00	79.70	174.20	3,684.01	-466.55	61.21	470.37	12.49	12.33	-2.00	
3,944.00	82.80	172.70	3,688.73	-496.99	64.71	501.01	11.08	10.00	-4.84	
3,975.00	85.50	170.90	3,691.89	-527.51	69.10	531.82	10.45	8.71	-5.81	
4,006.00	87.50	171.00	3,693.78	-558.06	73.97	562.71	6.46	6.45	0.32	
4,037.00	90.20	171.40	3,694.40	-588.69	78.71	593.66	8.80	8.71	1.29	
4,172.00	91.40	170.40	3,692.52	-721.97	100.06	728.43	1.16	0.89	-0.74	
4,266.00	89.80	170.70	3,691.53	-814.69	115.49	822.24	1.73	-1.70	0.32	
4,359.00	89.90	171.50	3,691.78	-906.57	129.88	915.12	0.87	0.11	0.86	
4,453.00	90.00	172.50	3,691.86	-999.65	142.96	1,009.05	1.07	0.11	1.06	
4,546.00	89.80	173.30	3,692.02	-1,091.94	154.46	1,102.03	0.89	-0.22	0.86	
4,640.00	89.40	174.70	3,692.68	-1,185.42	164.28	1,196.02	1.55	-0.43	1.49	
4,734.00	89.70	173.90	3,693.42	-1,278.95	173.62	1,290.02	0.91	0.32	-0.85	
4,824.00	90.20	175.00	3,693.50	-1,368.52	182.32	1,380.02	1.34	0.56	1.22	
4,915.00	91.20	174.40	3,692.38	-1,459.13	190.73	1,471.00	1.28	1.10	-0.66	
5,007.00	89.80	174.70	3,691.58	-1,550.71	199.47	1,562.99	1.56	-1.52	0.33	
5,099.00	89.60	175.20	3,692.06	-1,642.35	207.56	1,654.98	0.59	-0.22	0.54	
5,191.00	90.20	175.50	3,692.22	-1,734.04	215.02	1,746.96	0.73	0.65	0.33	
5,284.00	90.40	176.10	3,691.74	-1,826.79	221.83	1,839.92	0.68	0.22	0.65	
5,376.00	90.60	175.50	3,690.93	-1,918.54	228.57	1,931.87	0.69	0.22	-0.65	
5,468.00	88.90	175.30	3,691.33	-2,010.24	235.95	2,023.85	1.86	-1.85	-0.22	
5,560.00	88.70	175.20	3,693.26	-2,101.90	243.56	2,115.81	0.24	-0.22	-0.11	
5,651.00	89.50	174.80	3,694.69	-2,192.55	251.50	2,206.78	0.98	0.88	-0.44	
5,742.00	89.60	174.60	3,695.41	-2,283.15	259.90	2,297.78	0.25	0.11	-0.22	
5,833.00	89.60	174.10	3,696.04	-2,373.71	268.86	2,388.77	0.55	0.00	-0.55	
5,923.00	90.50	173.90	3,695.96	-2,463.22	278.27	2,478.77	1.02	1.00	-0.22	
6,013.00	90.30	174.40	3,695.33	-2,552.74	287.44	2,568.77	0.60	-0.22	0.56	
6,104.00	91.40	174.00	3,693.98	-2,643.27	296.63	2,659.76	1.29	1.21	-0.44	
6,196.00	89.50	175.00	3,693.26	-2,734.83	305.45	2,751.75	2.33	-2.07	1.09	
6,288.00	89.80	174.90	3,693.82	-2,826.48	313.55	2,843.73	0.34	0.33	-0.11	
6,380.00	90.10	174.70	3,693.90	-2,918.10	321.89	2,935.73	0.39	0.33	-0.22	
6,471.00	91.10	174.90	3,692.95	-3,008.72	330.13	3,026.71	1.12	1.10	0.22	
6,561.00	89.60	174.40	3,692.40	-3,098.32	338.53	3,116.71	1.76	-1.67	-0.56	
6,654.00	89.30	173.10	3,693.29	-3,190.76	348.65	3,209.70	1.43	-0.32	-1.40	
6,747.00	89.30	172.80	3,694.43	-3,283.05	360.06	3,302.67	0.32	0.00	-0.32	
6,841.00	90.80	172.90	3,694.35	-3,376.32	371.76	3,396.65	1.60	1.60	0.11	
6,935.00	92.30	173.30	3,691.81	-3,469.60	383.05	3,490.59	1.65	1.60	0.43	
7,029.00	92.80	173.10	3,687.62	-3,562.85	394.17	3,584.49	0.57	0.53	-0.21	
7,122.00	92.80	172.40	3,683.08	-3,654.99	405.89	3,677.35	0.75	0.00	-0.75	
7,216.00	92.90	173.00	3,678.41	-3,748.11	417.82	3,771.21	0.65	0.11	0.64	
7,310.00	91.20	173.20	3,675.04	-3,841.37	429.11	3,865.13	1.82	-1.81	0.21	
7,404.00	90.50	174.50	3,673.65	-3,934.82	439.18	3,959.12	1.57	-0.74	1.38	
7,497.00	88.40	174.60	3,674.54	-4,027.39	448.01	4,052.10	2.26	-2.26	0.11	
7,591.00	85.00	174.90	3,679.95	-4,120.82	456.59	4,145.93	3.63	-3.62	0.32	



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<b>Site:</b>	Reffner 2308	<b>MD Reference:</b>	WELL @ 1681.90usft (Patterson 264)
<b>Well:</b>	4-2HS	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Survey	<b>Database:</b>	Well Planning Conroe

Survey										
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7,685.00	85.80	175.00	3,687.49	-4,214.15	464.84	4,239.61	0.86	0.85	0.11	
7,778.00	86.60	173.90	3,693.65	-4,306.51	473.82	4,332.41	1.46	0.86	-1.18	
7,872.00	88.40	174.20	3,697.75	-4,399.91	483.55	4,426.31	1.94	1.91	0.32	
7,966.00	89.80	174.80	3,699.23	-4,493.47	492.56	4,520.30	1.62	1.49	0.64	
8,010.00	90.50	174.50	3,699.12	-4,537.27	496.66	4,564.29	1.73	1.59	-0.68	
8,071.00	90.50	174.50	3,698.58	-4,597.99	502.51	4,625.29	0.00	0.00	0.00	
<b>Projection to TD-8071.00' MD</b>										

Survey Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
8,071.00	3,698.58	-4,597.99	502.51	Projection to TD-8071.00' MD	