



MWD SURVEY REPORT

MWD Services, LLC

MEASUREMENT WHILE DRILLING SERVICES

Report Date : March 31, 2014
 Job Number : 14037
 Operator : Unit Petroleum
 Lease / Well : Haw Ranch 29 #2H
 Location : Reno County, KS
 Field : Haw Ranch
 Contractor / Rig : Unit Drilling #331
 Directional Company : InWell
 MWD Field Rep. : John A. Huval/ Steve McCall
 Tie In Survey Reference : Assume Veritcal
 Calculation Method : MINIMUM CURVATURE

Target +N / -S = 4785.3'
 Target +E / -W = 100.0'
 Target TVD = 3970.0'
 Magnetic Declination +E / -W = 4.65°
 Grid Convergence +E / -W = 0.04°
 Total Correction +E / -W = 4.61°
 North Reference = Grid
 RKB Height = 14.00'
 Ground Level Elevation = 1766'
 Vertical Section Azimuth = 0.00°

Comments :
 SURVEY #0 = Assume Vertical
 SURVEY # 132 = STRAIGHT LINE PROJECTED SURVEY TO BIT DEPTH

Srv. No.	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (deg/100')
							+N / -S (ft)	+E / -W (ft)	Distance (ft)	Azimuth (deg)	
0	0.00'	0.00°	0.00°		0.00'	0.00'	0.00'	0.00'			
1	218.00'	1.30°	143.10°	218'	217.98'	-1.98'	-1.98'	1.48'	2.47'	143.10°	0.60°
2	310.00'	1.20°	142.70°	92'	309.96'	-3.58'	-3.58'	2.70'	4.48'	143.01°	0.11°
3	403.00'	1.00°	140.10°	93'	402.94'	-4.98'	-4.98'	3.81'	6.26'	142.59°	0.22°
4	496.00'	0.80°	126.40°	93'	495.93'	-5.98'	-5.98'	4.85'	7.70'	140.98°	0.31°
5	588.00'	0.70°	153.70°	92'	587.92'	-6.87'	-6.87'	5.62'	8.87'	140.73°	0.40°
6	681.00'	0.70°	161.00°	93'	680.92'	-7.91'	-7.91'	6.05'	9.96'	142.60°	0.10°
7	774.00'	0.50°	153.20°	93'	773.91'	-8.81'	-8.81'	6.42'	10.90'	143.93°	0.23°
8	868.00'	0.40°	133.70°	94'	867.91'	-9.41'	-9.41'	6.84'	11.63'	143.97°	0.19°
9	961.00'	0.40°	130.90°	93'	960.91'	-9.84'	-9.84'	7.32'	12.27'	143.36°	0.02°
10	1053.00'	0.40°	138.20°	92'	1052.90'	-10.29'	-10.29'	7.78'	12.90'	142.92°	0.06°
11	1146.00'	0.40°	153.10°	93'	1145.90'	-10.83'	-10.83'	8.14'	13.55'	143.05°	0.11°
12	1238.00'	0.50°	158.50°	92'	1237.90'	-11.48'	-11.48'	8.43'	14.25'	143.71°	0.12°
13	1331.00'	0.80°	157.60°	93'	1330.89'	-12.46'	-12.46'	8.83'	15.27'	144.68°	0.32°
14	1423.00'	0.80°	142.10°	92'	1422.88'	-13.56'	-13.56'	9.47'	16.54'	145.08°	0.23°
15	1552.00'	0.50°	84.20°	129'	1551.88'	-14.22'	-14.22'	10.58'	17.72'	143.34°	0.53°
16	1646.00'	0.60°	79.10°	94'	1645.87'	-14.08'	-14.08'	11.47'	18.17'	140.83°	0.12°
17	1740.00'	0.60°	94.40°	94'	1739.87'	-14.03'	-14.03'	12.45'	18.75'	138.41°	0.17°
18	1836.00'	1.10°	117.30°	96'	1835.86'	-14.49'	-14.49'	13.77'	19.99'	136.46°	0.62°
19	1931.00'	2.30°	120.70°	95'	1930.81'	-15.88'	-15.88'	16.22'	22.70'	134.40°	1.27°
20	2026.00'	3.40°	126.40°	95'	2025.69'	-18.53'	-18.53'	20.12'	27.35'	132.63°	1.19°
21	2122.00'	4.40°	129.70°	96'	2121.47'	-22.57'	-22.57'	25.25'	33.86'	131.79°	1.07°
22	2216.00'	5.50°	126.90°	94'	2215.12'	-27.57'	-27.57'	31.63'	41.96'	131.09°	1.20°
23	2312.00'	5.20°	127.90°	96'	2310.70'	-33.01'	-33.01'	38.74'	50.89'	130.44°	0.33°
24	2406.00'	5.70°	125.10°	94'	2404.28'	-38.31'	-38.31'	45.92'	59.80'	129.84°	0.60°
25	2502.00'	6.50°	125.10°	96'	2499.73'	-44.18'	-44.18'	54.26'	69.97'	129.15°	0.83°
26	2597.00'	6.00°	124.80°	95'	2594.17'	-50.10'	-50.10'	62.74'	80.29'	128.61°	0.53°
27	2690.00'	5.70°	126.00°	93'	2686.68'	-55.59'	-55.59'	70.47'	89.76'	128.27°	0.35°
28	2785.00'	5.40°	125.00°	95'	2781.24'	-60.93'	-60.93'	77.95'	98.93'	128.01°	0.33°
29	2881.00'	5.10°	126.50°	96'	2876.83'	-66.06'	-66.06'	85.08'	107.71'	127.83°	0.34°
30	2976.00'	5.00°	125.10°	95'	2971.46'	-70.95'	-70.95'	91.86'	116.07'	127.68°	0.17°
31	3070.00'	5.10°	125.70°	94'	3065.10'	-75.74'	-75.74'	98.60'	124.34'	127.53°	0.12°
32	3165.00'	4.00°	123.60°	95'	3159.80'	-80.04'	-80.04'	104.79'	131.86'	127.37°	1.17°
33	3256.00'	3.00°	125.20°	91'	3250.63'	-83.17'	-83.17'	109.38'	137.41'	127.25°	1.10°
34	3290.00'	3.00°	116.10°	34'	3284.58'	-84.07'	-84.07'	110.91'	139.17'	127.16°	1.40°
35	3322.00'	3.00°	80.00°	32'	3316.54'	-84.30'	-84.30'	112.48'	140.57'	126.85°	5.81°

Srv. No.	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (deg/100')
							+N / -S (ft)	+E / -W (ft)	Distance (ft)	Azimuth (deg)	
36	3354.00'	4.00°	48.30°	32'	3348.48'	-83.41'	-83.41'	114.14'	141.37'	126.16°	6.69°
37	3385.00'	6.10°	42.00°	31'	3379.36'	-81.46'	-81.46'	116.05'	141.79'	125.07°	7.00°
38	3417.00'	8.10°	30.60°	32'	3411.12'	-78.26'	-78.26'	118.34'	141.87'	123.48°	7.62°
39	3449.00'	9.80°	18.90°	32'	3442.73'	-73.74'	-73.74'	120.37'	141.16'	121.49°	7.76°
40	3480.00'	11.60°	9.70°	31'	3473.19'	-68.17'	-68.17'	121.75'	139.54'	119.25°	7.99°
41	3512.00'	14.20°	5.80°	32'	3504.38'	-61.10'	-61.10'	122.69'	137.06'	116.47°	8.56°
42	3544.00'	17.20°	3.50°	32'	3535.18'	-52.47'	-52.47'	123.37'	134.07'	113.04°	9.57°
43	3575.00'	20.00°	0.90°	31'	3564.56'	-42.59'	-42.59'	123.74'	130.86'	108.99°	9.42°
44	3607.00'	23.30°	359.00°	32'	3594.30'	-30.79'	-30.79'	123.71'	127.48'	103.97°	10.54°
45	3638.00'	26.90°	358.60°	31'	3622.37'	-17.64'	-17.64'	123.43'	124.69'	98.13°	11.63°
46	3670.00'	30.70°	358.50°	32'	3650.41'	-2.23'	-2.23'	123.04'	123.06'	91.04°	11.88°
47	3702.00'	34.10°	358.50°	32'	3677.42'	14.91'	14.91'	122.59'	123.50'	83.07°	10.63°
48	3732.00'	37.50°	358.60°	30'	3701.75'	32.45'	32.45'	122.15'	126.39'	75.12°	11.34°
49	3764.00'	41.50°	358.50°	32'	3726.44'	52.79'	52.79'	121.63'	132.60'	66.54°	12.50°
50	3795.00'	45.80°	358.60°	31'	3748.86'	74.18'	74.18'	121.09'	142.01'	58.51°	13.87°
51	3827.00'	49.60°	359.10°	32'	3770.39'	97.83'	97.83'	120.62'	155.31'	50.95°	11.93°
52	3859.00'	53.90°	359.00°	32'	3790.20'	122.96'	122.96'	120.20'	171.95'	44.35°	13.44°
53	3891.00'	55.70°	359.30°	32'	3808.64'	149.10'	149.10'	119.82'	191.28'	38.79°	5.68°
54	3922.00'	55.90°	359.30°	31'	3826.07'	174.74'	174.74'	119.50'	211.69'	34.37°	0.65°
55	3954.00'	56.20°	359.10°	32'	3843.94'	201.28'	201.28'	119.13'	233.89'	30.62°	1.07°
56	3986.00'	56.40°	358.90°	32'	3861.70'	227.90'	227.90'	118.67'	256.94'	27.51°	0.81°
57	4017.00'	57.10°	358.70°	31'	3878.69'	253.82'	253.82'	118.13'	279.96'	24.96°	2.32°
58	4049.00'	60.30°	358.80°	32'	3895.31'	281.15'	281.15'	117.53'	304.73'	22.69°	10.00°
59	4081.00'	64.30°	359.10°	32'	3910.19'	309.47'	309.47'	117.01'	330.85'	20.71°	12.53°
60	4113.00'	68.30°	359.50°	32'	3923.05'	338.76'	338.76'	116.66'	358.29'	19.00°	12.55°
61	4144.00'	72.40°	359.80°	31'	3933.47'	367.95'	367.95'	116.48'	385.95'	17.57°	13.26°
62	4176.00'	76.40°	0.20°	32'	3942.07'	398.77'	398.77'	116.48'	415.43'	16.28°	12.56°
63	4207.00'	79.90°	0.90°	31'	3948.44'	429.10'	429.10'	116.77'	444.71'	15.22°	11.50°
64	4238.00'	83.80°	1.20°	31'	3952.83'	459.78'	459.78'	117.33'	474.51'	14.32°	12.62°
65	4269.00'	85.10°	1.30°	31'	3955.83'	490.62'	490.62'	118.01'	504.62'	13.52°	4.21°
66	4349.00'	88.40°	0.90°	80'	3960.36'	570.47'	570.47'	119.54'	582.86'	11.83°	4.16°
67	4412.00'	89.40°	0.80°	63'	3961.57'	633.45'	633.45'	120.47'	644.80'	10.77°	1.60°
68	4473.00'	90.20°	0.60°	61'	3961.79'	694.44'	694.44'	121.22'	704.94'	9.90°	1.35°
69	4535.00'	90.60°	0.00°	62'	3961.35'	756.44'	756.44'	121.54'	766.14'	9.13°	1.16°
70	4598.00'	91.20°	359.60°	63'	3960.36'	819.43'	819.43'	121.32'	828.37'	8.42°	1.14°
71	4660.00'	90.00°	359.90°	62'	3959.71'	881.43'	881.43'	121.05'	889.70'	7.82°	2.00°
72	4722.00'	90.00°	0.40°	62'	3959.71'	943.43'	943.43'	121.22'	951.18'	7.32°	0.81°
73	4783.00'	90.40°	0.60°	61'	3959.50'	1004.42'	1004.42'	121.75'	1011.78'	6.91°	0.73°
74	4845.00'	90.40°	1.00°	62'	3959.07'	1066.42'	1066.42'	122.61'	1073.44'	6.56°	0.65°
75	4907.00'	90.00°	0.90°	62'	3958.85'	1128.41'	1128.41'	123.64'	1135.16'	6.25°	0.67°
76	4968.00'	88.00°	0.80°	61'	3959.92'	1189.39'	1189.39'	124.55'	1195.89'	5.98°	3.28°
77	5030.00'	88.50°	0.90°	62'	3961.81'	1251.35'	1251.35'	125.47'	1257.63'	5.73°	0.82°
78	5091.00'	89.10°	0.20°	61'	3963.09'	1312.34'	1312.34'	126.05'	1318.38'	5.49°	1.51°
79	5153.00'	89.00°	359.70°	62'	3964.12'	1374.33'	1374.33'	126.00'	1380.09'	5.24°	0.82°

Srv. No.	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (deg/100')
							+N / -S (ft)	+E / -W (ft)	Distance (ft)	Azimuth (deg)	
80	5214.00'	89.10°	359.00°	61'	3965.13'	1435.31'	1435.31'	125.31'	1440.77'	4.99°	1.16°
81	5276.00'	89.40°	358.50°	62'	3965.94'	1497.29'	1497.29'	123.95'	1502.42'	4.73°	0.94°
82	5337.00'	89.40°	357.80°	61'	3966.58'	1558.26'	1558.26'	121.98'	1563.03'	4.48°	1.15°
83	5399.00'	89.70°	357.20°	62'	3967.06'	1620.20'	1620.20'	119.28'	1624.58'	4.21°	1.08°
84	5460.00'	89.50°	356.50°	61'	3967.49'	1681.10'	1681.10'	115.93'	1685.10'	3.94°	1.19°
85	5521.00'	89.10°	356.30°	61'	3968.24'	1741.98'	1741.98'	112.10'	1745.58'	3.68°	0.73°
86	5583.00'	88.50°	355.90°	62'	3969.53'	1803.82'	1803.82'	107.88'	1807.04'	3.42°	1.16°
87	5644.00'	88.80°	356.50°	61'	3970.97'	1864.67'	1864.67'	103.84'	1867.56'	3.19°	1.10°
88	5706.00'	90.10°	356.40°	62'	3971.57'	1926.55'	1926.55'	100.00'	1929.14'	2.97°	2.10°
89	5767.00'	90.60°	355.90°	61'	3971.19'	1987.41'	1987.41'	95.91'	1989.72'	2.76°	1.16°
90	5829.00'	90.70°	355.40°	62'	3970.49'	2049.22'	2049.22'	91.20'	2051.25'	2.55°	0.82°
91	5891.00'	90.50°	354.90°	62'	3969.84'	2111.00'	2111.00'	85.96'	2112.75'	2.33°	0.87°
92	5952.00'	90.20°	354.60°	61'	3969.47'	2171.74'	2171.74'	80.38'	2173.23'	2.12°	0.70°
93	6014.00'	90.90°	354.90°	62'	3968.87'	2233.48'	2233.48'	74.71'	2234.73'	1.92°	1.23°
94	6075.00'	91.10°	354.50°	61'	3967.81'	2294.21'	2294.21'	69.07'	2295.25'	1.72°	0.73°
95	6136.00'	90.10°	354.20°	61'	3967.17'	2354.91'	2354.91'	63.07'	2355.75'	1.53°	1.71°
96	6198.00'	90.10°	354.40°	62'	3967.06'	2416.60'	2416.60'	56.91'	2417.27'	1.35°	0.32°
97	6260.00'	89.90°	354.10°	62'	3967.06'	2478.29'	2478.29'	50.70'	2478.81'	1.17°	0.58°
98	6322.00'	89.50°	353.60°	62'	3967.39'	2539.93'	2539.93'	44.06'	2540.31'	0.99°	1.03°
99	6384.00'	89.40°	353.30°	62'	3967.98'	2601.52'	2601.52'	36.99'	2601.79'	0.81°	0.51°
100	6445.00'	89.70°	353.20°	61'	3968.46'	2662.10'	2662.10'	29.82'	2662.26'	0.64°	0.52°
101	6507.00'	89.80°	353.40°	62'	3968.73'	2723.67'	2723.67'	22.58'	2723.77'	0.48°	0.36°
102	6569.00'	89.50°	353.50°	62'	3969.11'	2785.27'	2785.27'	15.51'	2785.31'	0.32°	0.51°
103	6630.00'	89.80°	353.10°	61'	3969.48'	2845.85'	2845.85'	8.39'	2845.86'	0.17°	0.82°
104	6692.00'	89.10°	354.10°	62'	3970.08'	2907.46'	2907.46'	1.48'	2907.46'	0.03°	1.97°
105	6754.00'	88.70°	353.80°	62'	3971.27'	2969.10'	2969.10'	-5.05'	2969.11'	359.90°	0.81°
106	6816.00'	88.10°	354.10°	62'	3973.00'	3030.73'	3030.73'	-11.58'	3030.75'	359.78°	1.08°
107	6878.00'	87.90°	353.70°	62'	3975.16'	3092.34'	3092.34'	-18.17'	3092.40'	359.66°	0.72°
108	6940.00'	88.90°	356.40°	62'	3976.89'	3154.08'	3154.08'	-23.51'	3154.17'	359.57°	4.64°
109	7001.00'	89.80°	358.40°	61'	3977.59'	3215.01'	3215.01'	-26.28'	3215.12'	359.53°	3.60°
110	7063.00'	89.30°	1.70°	62'	3978.07'	3277.00'	3277.00'	-26.23'	3277.11'	359.54°	5.38°
111	7125.00'	89.00°	2.20°	62'	3978.99'	3338.96'	3338.96'	-24.12'	3339.05'	359.59°	0.94°
112	7186.00'	89.50°	2.10°	61'	3979.79'	3399.91'	3399.91'	-21.83'	3399.98'	359.63°	0.84°
113	7247.00'	89.50°	2.30°	61'	3980.32'	3460.86'	3460.86'	-19.49'	3460.92'	359.68°	0.33°
114	7308.00'	91.00°	3.20°	61'	3980.06'	3521.79'	3521.79'	-16.56'	3521.83'	359.73°	2.87°
115	7370.00'	91.70°	3.00°	62'	3978.60'	3583.68'	3583.68'	-13.21'	3583.71'	359.79°	1.17°
116	7432.00'	92.30°	2.60°	62'	3976.43'	3645.57'	3645.57'	-10.18'	3645.58'	359.84°	1.16°
117	7493.00'	92.80°	2.30°	61'	3973.72'	3706.45'	3706.45'	-7.58'	3706.46'	359.88°	0.96°
118	7555.00'	93.00°	2.00°	62'	3970.58'	3768.33'	3768.33'	-5.25'	3768.33'	359.92°	0.58°
119	7617.00'	91.70°	1.70°	62'	3968.04'	3830.24'	3830.24'	-3.25'	3830.24'	359.95°	2.15°
120	7678.00'	91.70°	1.50°	61'	3966.23'	3891.19'	3891.19'	-1.55'	3891.19'	359.98°	0.33°
121	7740.00'	91.70°	3.00°	62'	3964.39'	3953.12'	3953.12'	0.88'	3953.12'	0.01°	2.42°
122	7802.00'	90.50°	3.50°	62'	3963.20'	4015.00'	4015.00'	4.40'	4015.01'	0.06°	2.10°
123	7863.00'	90.80°	3.30°	61'	3962.51'	4075.89'	4075.89'	8.01'	4075.90'	0.11°	0.59°
124	7925.00'	91.40°	3.40°	62'	3961.32'	4137.77'	4137.77'	11.64'	4137.79'	0.16°	0.98°
125	7987.00'	90.00°	4.70°	62'	3960.56'	4199.61'	4199.61'	16.01'	4199.64'	0.22°	3.08°
126	8049.00'	91.30°	4.90°	62'	3959.86'	4261.39'	4261.39'	21.20'	4261.44'	0.29°	2.12°
127	8111.00'	92.10°	4.60°	62'	3958.02'	4323.15'	4323.15'	26.33'	4323.23'	0.35°	1.38°
128	8172.00'	92.80°	3.90°	61'	3955.41'	4383.92'	4383.92'	30.85'	4384.03'	0.40°	1.62°
129	8234.00'	93.00°	4.30°	62'	3952.27'	4445.69'	4445.69'	35.28'	4445.83'	0.45°	0.72°

Srv. No.	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (deg/100 ')
							+N / -S (ft)	+E / -W (ft)	Distance (ft)	Azimuth (deg)	
130	8296.00'	93.60°	3.90°	62'	3948.71'	4507.42'	4507.42'	39.70'	4507.60'	0.50°	1.16°
131	8327.00'	93.10°	3.80°	31'	3946.89'	4538.30'	4538.30'	41.78'	4538.49'	0.53°	1.64°
132	8370.00'	93.10°	3.80°	43'	3944.57'	4581.14'	4581.14'	44.63'	4581.36'	0.56°	0.00°