

51-01627



Noble Energy MND9CHS Gyro+MWD 0ft to 15820ft MD Survey Report

(Def Survey)

Report Date: November 22, 2013 - 10:55 AM
Client: Noble Energy
Field: WV Marshall County (NAD 27)
Structure / Slot: Noble Energy MND9 Pad / MND9CHS
Well: MND9CHS
Borehole: Original Borehole
UWI / AP# : Unknown / Unknown
Survey Name: Noble Energy MND9CHS Gyro+MWD 0ft to 15820ft MD
Survey Date: November 11, 2013
Tort / AHD / ODI / ERD Ratio: 257.428 * 19938.089 ft / 6.803 * 1.561
Coordinate Reference System: NAD27 West Virginia State Plane, Northern Zone, US Feet
Location Lat / Long: N 39° 49' 53.11700", W 80° 47' 14.23800"
Location Grid NE YD: N 487526 998 ftUS, E 163486 130 ftUS
CRS Grid Convergence Angle: -0.8210 *
Grid Scale Factor: 0.99994715
Version / Patch: 2.7.998.0

Survey / DLS Computation: Minimum Curvature / Lubinski
Vertical Section Azimuth: 322.393 * (Grid North)
Vertical Section Origin: 0.000 ft, 0.000 ft
TVD Reference Datum: KB
TVD Reference Elevation: 1245.600 ft above MSL
Seabed / Ground Elevation: 1219.620 ft above MSL
Magnetic Declination: -7.592 *
Total Gravity Field Strength: 999.3452mgm (9.80665 Based)
Gravity Model: GARIM
Total Magnetic Field Strength: 52843.703 nT
Magnetic Dip Angle: 67.350 *
Declination Date: November 11, 2013
Magnetic Declination Model: HDGM 2013
Grid North: 0.8210 *
Grid Convergence Used: -0.8210 *
Total Corr Mag North-Grid North: -6.7705 *
Local Coord Referenced To: Well Head

Table with columns: Comments, MD (ft), Incl (°), Azim Grid (°), TVD (ft), TVDSS (ft), VSEC (ft), NS (ft), EW (ft), DLS (ft/100ft), BR (ft/100ft), TR (ft/100ft), Northing (ftUS), Easting (ftUS), Latitude (N/S * °), Longitude (E/W * °), Directional Difficulty Index

12/12/2014

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Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVD88 (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (ft/100ft)	BR (ft/100ft)	TR (ft/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (WGS 84)	Longitude (WGS 84)	Directional Difficulty Index
	6097.00	32.28	257.46	5635.61	4680.01	-36.26	-142.00	-121.76	9.94	0.64	18.86	487384.82	1638364.82	N 39 49 51.70 W	80 47 15.77	4.32
	6035.00	33.52	266.30	5675.94	4730.34	-25.43	-145.73	-147.52	10.32	2.58	18.42	487391.19	1638368.82	N 39 49 51.70 W	80 47 16.10	4.39
	6062.00	35.87	273.93	6014.00	4769.00	-9.05	-148.92	-174.22	10.50	5.00	16.23	487391.29	1638311.92	N 39 49 51.65 W	80 47 16.44	4.45
	6129.00	38.39	277.31	6052.07	4806.47	10.39	-142.82	-202.44	6.90	5.36	7.19	487384.00	1638283.70	N 39 49 51.68 W	80 47 16.81	4.51
	6176.00	41.80	280.36	6088.02	4842.42	32.34	-136.15	-232.34	6.37	7.26	6.49	487388.77	1638253.80	N 39 49 51.72 W	80 47 17.19	4.56
	6224.00	45.50	284.56	6122.78	4877.16	57.78	-130.95	-264.66	6.82	7.71	6.61	487393.96	1638223.90	N 39 49 51.76 W	80 47 17.61	4.62
	6272.00	49.29	288.77	6155.25	4909.65	86.45	-126.75	-294.47	7.17	7.90	6.71	487408.13	1638193.89	N 39 49 51.68 W	80 47 18.04	4.68
	6319.00	52.15	6185.01	6241.00	4952.41	117.34	-126.03	-324.53	6.31	6.09	7.32	487418.68	1638153.62	N 39 49 52.00 W	80 47 18.48	4.73
	6366.00	55.80	298.17	6212.65	4987.05	150.83	-92.44	-387.17	10.33	7.77	6.43	487434.47	1638118.96	N 39 49 52.15 W	80 47 18.93	4.78
	6413.00	58.21	300.45	6238.25	4992.85	186.82	-73.73	-401.85	9.20	5.13	9.11	487453.18	1638084.20	N 39 49 52.30 W	80 47 19.37	4.83
	6457.20	59.83	306.17	6261.00	5015.40	222.65	-52.90	-436.18	11.75	3.69	12.93	487474.01	1638050.83	N 39 49 52.53 W	80 47 19.78	4.88
	6490.00	60.05	308.52	6282.39	5018.79	224.06	-51.47	-435.46	11.77	4.83	12.64	487475.43	1638050.83	N 39 49 52.55 W	80 47 19.81	4.88
	6508.00	63.84	310.63	6284.97	5030.37	268.00	-25.00	-485.50	11.18	7.90	6.08	487501.91	1638011.51	N 39 49 52.80 W	80 47 20.24	4.93
	6512.64	64.19	311.13	6287.00	5041.40	270.18	-22.26	-471.64	9.52	7.54	6.47	487504.65	1638014.65	N 39 49 52.83 W	80 47 20.28	4.94
	6555.00	67.43	313.83	6304.36	5058.76	308.24	3.84	-500.13	9.91	7.65	6.37	487500.74	1637998.03	N 39 49 53.08 W	80 47 20.65	4.98
	6603.00	70.92	315.85	6321.42	5075.82	352.70	35.47	-531.93	8.27	7.27	4.21	487562.37	1637954.23	N 39 49 53.30 W	80 47 21.00	5.02
	6604.78	71.00	315.95	6322.00	5076.40	354.38	36.66	-533.10	9.49	8.67	5.82	487563.58	1637953.00	N 39 49 53.40 W	80 47 21.08	5.02
	6650.00	74.73	318.45	6335.30	5069.70	397.41	86.39	-562.45	9.88	8.12	5.53	487595.29	1637923.71	N 39 49 53.71 W	80 47 21.46	5.08
	6697.00	77.53	319.96	6346.57	5100.97	442.96	102.93	-592.25	6.72	5.96	3.21	487620.83	1637893.91	N 39 49 54.05 W	80 47 21.85	5.10
	6744.00	80.80	321.78	6355.33	5109.73	489.11	138.74	-621.39	8.27	7.36	3.63	487655.64	1637864.77	N 39 49 54.40 W	80 47 22.25	5.14
	6792.00	83.66	323.82	6361.74	5116.14	536.67	176.62	-650.15	7.00	5.56	4.29	487703.52	1637836.01	N 39 49 54.77 W	80 47 22.60	5.17
	6830.00	87.28	325.49	6365.45	5119.85	583.48	214.83	-677.25	8.48	7.70	3.56	487741.73	1637808.92	N 39 49 55.14 W	80 47 22.96	5.21
	6886.00	91.37	326.61	6368.00	5120.40	630.40	254.56	-703.83	6.71	8.70	0.26	487780.47	1637782.34	N 39 49 55.52 W	80 47 23.31	5.24
	6954.00	89.66	328.08	6365.38	5119.78	690.27	310.87	-742.57	2.57	-2.48	0.68	487837.56	1637743.60	N 39 49 56.06 W	80 47 23.81	5.28
	7061.00	89.38	324.50	6366.44	5120.84	825.10	414.25	-814.31	1.27	-0.22	-1.25	487941.13	1637671.87	N 39 49 57.10 W	80 47 24.75	5.34
	7175.00	91.44	325.21	6365.78	5120.18	919.00	491.10	-868.42	2.32	2.19	0.78	488017.06	1637617.96	N 39 49 57.65 W	80 47 25.46	5.39
	7270.00	90.72	323.83	6363.97	5118.37	1013.92	568.35	-920.68	1.83	-0.68	-1.66	488093.22	1637562.50	N 39 49 58.30 W	80 47 26.16	5.43
	7365.00	91.36	323.67	6362.23	5116.83	1108.68	644.85	-979.98	1.70	0.69	0.04	488171.72	1637506.21	N 39 49 58.35 W	80 47 26.92	5.46
	7460.00	91.55	323.57	6359.80	5114.20	1203.63	721.31	-1036.31	0.21	0.18	-0.11	488246.18	1637449.88	N 39 50 0.10 W	80 47 27.65	5.50
	7555.00	91.65	323.98	6357.15	5111.55	1298.77	797.91	-1092.44	0.42	0.11	0.41	488324.77	1637393.75	N 39 50 0.85 W	80 47 28.39	5.53
	7650.00	90.45	322.34	6355.41	5109.81	1393.74	879.31	-1148.40	2.12	-1.28	-1.71	488400.77	1637336.79	N 39 50 1.56 W	80 47 29.13	5.56
	7744.00	89.07	322.85	6353.56	5108.56	1487.72	960.67	-1205.47	1.74	0.66	1.61	488478.92	1637280.59	N 39 50 1.32 W	80 47 29.87	5.59
	7839.00	90.42	324.12	6352.78	5107.18	1587.07	1025.00	-1261.10	0.56	-0.48	0.29	488554.94	1637225.02	N 39 50 3.07 W	80 47 30.59	5.62
	7933.00	90.86	326.04	6351.55	5105.95	1678.55	1102.98	-1315.48	2.04	0.25	2.02	488629.82	1637170.72	N 39 50 3.63 W	80 47 31.30	5.65
	8029.00	90.69	325.59	6350.26	5104.66	1771.32	1182.02	-1368.16	0.81	-0.18	0.56	488708.86	1637116.04	N 39 50 4.60 W	80 47 31.99	5.68
	8124.00	90.62	326.78	6349.15	5103.56	1865.11	1266.11	-1426.47	0.86	-0.07	0.86	488786.95	1637063.17	N 39 50 5.37 W	80 47 32.68	5.70
	8217.00	90.72	326.80	6348.08	5102.48	1959.88	1330.17	-1473.13	1.17	0.11	1.17	488866.00	1637013.08	N 39 50 6.14 W	80 47 33.37	5.73
	8311.00	90.82	326.80	6346.82	5101.22	2053.58	1417.86	-1524.53	0.14	0.11	-0.10	488944.69	1636961.66	N 39 50 6.91 W	80 47 34.04	5.75
	8408.00	91.13	326.07	6345.20	5099.60	2149.48	1497.48	-1576.36	0.43	0.33	0.28	489029.86	1636909.86	N 39 50 7.69 W	80 47 34.72	5.78
	8501.00	90.98	325.77	6343.47	5097.87	2242.06	1583.23	-1629.24	0.08	-0.18	-0.63	489103.74	1636855.14	N 39 50 8.51 W	80 47 35.40	5.81
	8595.00	91.00	325.88	6341.64	5096.24	2337.65	1659.64	-1680.04	1.27	0.04	1.27	489183.48	1636800.10	N 39 50 9.25 W	80 47 36.08	5.82
	8690.00	91.00	325.32	6340.20	5094.60	2431.38	1735.01	-1731.91	2.51	0.00	-2.51	489261.82	1636754.32	N 39 50 10.02 W	80 47 36.76	5.85
	8785.00	90.82	324.63	6338.66	5093.26	2526.27	1812.89	-1786.29	0.65	-0.40	-0.52	489330.70	1636709.94	N 39 50 10.78 W	80 47 37.47	5.87
	8879.00	91.27	325.83	6337.01	5091.71	2620.13	1890.24	-1839.89	1.36	0.69	1.17	489417.04	1636664.55	N 39 50 11.53 W	80 47 38.17	5.89
	8974.00	91.72	326.51	6335.68	5090.08	2714.95	1968.72	-1893.18	0.73	-0.58	-0.44	489495.52	1636620.05	N 39 50 12.20 W	80 47 38.87	5.91
	9069.00	91.20	326.01	6334.07	5088.47	2809.78	2047.25	-1946.63	0.73	0.51	0.53	489574.04	1636576.01	N 39 50 13.07 W	80 47 39.57	5.93
	9164.00	91.07	325.25	6332.18	5086.56	2904.00	2125.65	-2000.25	0.81	-0.14	-0.80	489652.44	1636531.97	N 39 50 13.84 W	80 47 40.27	5.95
	9258.00	91.31	323.90	6330.23	5084.63	2998.51	2202.27	-2054.66	1.36	0.26	-1.34	489729.05	1636487.58	N 39 50 14.59 W	80 47 40.98	5.97
	9353.00	90.78	324.16	6328.52	5082.92	3093.45	2279.19	-2110.39	0.61	-0.58	0.16	489805.97	1636443.75	N 39 50 15.34 W	80 47 41.71	5.98
	9447.00	90.96	324.32	6327.11	5081.51	3187.29	2355.46	-2165.32	0.27	0.21	0.17	489882.23	1636399.30	N 39 50 16.09 W	80 47 42.43	6.00
	9542.00	91.00	324.36	6325.48	5079.88	3282.33	2432.63	-2220.89	0.08	0.04	0.04	489959.40	1636355.56	N 39 50 16.84 W	80 47 43.15	6.02
	9637.00	90.82	324.08	6323.97	5078.37	3377.27	2509.69	-2276.29	0.35	-0.19	-0.29	490036.48	1636311.03	N 39 50 17.59 W	80 47 43.88	6.03
	9732.00	90.86	324.34	6322.58	5076.98	3472.21	2596.74	-2331.78	0.28	0.04	0.27	490113.51	1636267.48	N 39 50 18.35 W	80 47 44.60	6.05
	9826.00	90.45	322.89	6321.50	5075.90	3566.18	2682.41	-2387.54	1.00	-0.44	-1.54	490189.17	1636223.87	N 39 50 19.09 W	80 47 45.33	6.07
	9921.00	90.79	324.34	6320.48	5074.68	3651.15	2738.88	-2443.80	1.57	0.36	1.53	490265.64	1636180.38	N 39 50 19.83 W	80 47 46.07	6.08
	10015.00	90.55	326.11	6319.38	5073.78	3755.02	2816.00	-2497.40	1.00	-0.26	1.68	490344.84	1636136.77	N 39 50 20.59 W	80 47 46.77	6.10
	10110.00	90.55	324.19	6318.47	5072.87	3849.90	2894.04	-2551.77	2.02	0.00	-2.02	490420.79	1636094.49	N 39 50 21.35 W	80 47 47.48	6.12
	10208.00	90.79	326.98	6317.35	5071.75	3944.74	2972.39	-2605.47	2.93	0.25	2.92	490499.13	1636050.80	N 39 50 22.12 W	80 47 48.18	6.14
	10300.00	91.03	326.61	6315.85	5070.25	4039.51	3051.40	-2658.20	1.44	0.35	-1.42	490578.14	1636008.08	N 39 50 22.89 W	80 47 48.87	6.16
	10394.00	90.72	325.63	6314.41	5068.81	4133.27	3129.87	-2711.27	0.33	-0.33	0.02	490655.71	1635965.01	N 39 50 23.65 W	80 47 49.57	6.17
	10488.00	91.41	324.54	6313.47	5067.87	4228.24	3208.81	-2765.64	1.19	-0.30						

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Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVDS9 (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (*/100ft)	DR (*/100ft)	TR (*/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")	Directional Difficulty Index
Final Survey 22- Nov-13	15777.00	90.78	324.05	6238.77	4993.17	9505.89	7528.19	-5808.40	0.42	0.05	0.41	495052.68	1832678.05	N 39 51 6.86 W	80 48 30.09	6.80
PTS	15820.00	90.78	324.05	6238.20	4992.60	9549.86	7560.09	-5833.64	0.00	0.00	0.00	495087.48	1832652.81	N 39 51 7.00 W	80 48 30.42	6.80

Survey Type: Def Survey

Survey Error Model: ISCWBA Rev 0 *** 3-D 95.000% Confidence 2.7055 sigma
 Survey Program:

Description	Part	MD From (ft)	MD To (ft)	EOU Freq (ft)	Hole Size (in)	Casing Diameter (in)	Survey Tool Type	Borehole / Survey
	1	0.000	25.980	Act Sns	30.000	30.000	SLB_NSG+MSHOT-Depth Only	Original Borehole / Noble Energy MND9CHS Gyro+MWD 0ft to 15820ft MD
	1	25.980	2411.000	Act Sns	30.000	30.000	SLB_NSG+MSHOT	Original Borehole / Noble Energy MND9CHS Gyro+MWD 0ft to
	1	2411.000	15777.000	Act Sns	30.000	30.000	SLB_MWD-STD	Original Borehole / Noble Energy MND9CHS Gyro+MWD 0ft to
	1	15777.000	15820.000	Act Sns	30.000	30.000	SLB_BLDND+TREND	Original Borehole / Noble Energy MND9CHS Gyro+MWD 0ft to

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