



Company: Noble Energy
Well: Steve J18-16
API #: 05-123-23639
Rig Name: Production/Lightning
State/County: Colorado/Weld
Latitude: 40.393, Longitude: -104.822
GRID North is 0.440 Degrees East of True North
VS-Azi: 0.000 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : Ground Level

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro_run01-01_ed.ut

Minimum Curvature Method

Report Date/Time: 8/17/2012 / 14:34

Vaughn Energy Services

Henderson, Colorado

866-835-8333

Randy Holcomb

RKB=Ground Level

| Measured Depth FT | Incl Angle Deg | Drift Direction Deg | TVD FT | +N/-S FT | +E/-W FT | Vertical Section FT | Closure Distance FT | Closure Direction Deg | Dogleg Severity Deg/100 |
|-------------------------|----------------------|---------------------------|-----------|-------------|-------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | **** |
| 100.000 | 0.257 | 317.284 | 100.000 | 0.165 | -0.152 | 0.165 | 0.225 | 317.284 | 0.257 |
| 200.000 | 0.551 | 352.425 | 199.997 | 0.807 | -0.368 | 0.807 | 0.887 | 335.479 | 0.372 |
| 300.000 | 0.710 | 354.280 | 299.991 | 1.900 | -0.493 | 1.900 | 1.963 | 345.447 | 0.159 |
| 400.000 | 1.262 | 354.183 | 399.976 | 3.612 | -0.667 | 3.612 | 3.673 | 349.543 | 0.552 |
| 500.000 | 1.721 | 4.790 | 499.942 | 6.204 | -0.653 | 6.204 | 6.238 | 353.993 | 0.534 |
| 600.000 | 1.978 | 13.686 | 599.890 | 9.377 | -0.119 | 9.377 | 9.378 | 359.272 | 0.385 |
| 700.000 | 2.135 | 15.618 | 699.826 | 12.848 | 0.791 | 12.848 | 12.872 | 3.521 | 0.171 |
| 800.000 | 2.163 | 18.400 | 799.755 | 16.432 | 1.888 | 16.432 | 16.540 | 6.553 | 0.108 |
| 900.000 | 2.502 | 30.264 | 899.673 | 20.108 | 3.584 | 20.108 | 20.425 | 10.105 | 0.588 |
| 1000.000 | 3.972 | 53.491 | 999.515 | 24.054 | 7.468 | 24.054 | 25.187 | 17.247 | 1.942 |
| 1100.000 | 5.861 | 62.311 | 1099.144 | 28.488 | 14.773 | 28.488 | 32.091 | 27.411 | 2.030 |
| 1200.000 | 7.147 | 72.491 | 1198.501 | 32.733 | 25.229 | 32.733 | 41.327 | 37.623 | 1.723 |
| 1300.000 | 9.159 | 75.656 | 1297.486 | 36.577 | 38.874 | 36.577 | 53.376 | 46.744 | 2.060 |
| 1400.000 | 10.945 | 78.798 | 1395.947 | 40.393 | 55.898 | 40.393 | 68.965 | 54.148 | 1.868 |
| 1500.000 | 12.810 | 81.163 | 1493.803 | 43.941 | 76.167 | 43.941 | 87.933 | 60.019 | 1.927 |
| 1600.000 | 13.772 | 78.258 | 1591.124 | 48.066 | 98.776 | 48.066 | 109.850 | 64.052 | 1.171 |
| 1700.000 | 14.062 | 79.652 | 1688.189 | 52.671 | 122.381 | 52.671 | 133.234 | 66.714 | 0.443 |
| 1800.000 | 17.877 | 78.481 | 1784.312 | 57.920 | 149.382 | 57.920 | 160.217 | 68.807 | 3.828 |
| 1900.000 | 18.959 | 78.710 | 1879.189 | 64.166 | 180.352 | 64.166 | 191.426 | 70.415 | 1.085 |
| 2000.000 | 20.520 | 81.386 | 1973.311 | 69.972 | 213.614 | 69.972 | 224.782 | 71.863 | 1.803 |
| 2100.000 | 21.692 | 80.284 | 2066.602 | 75.716 | 249.160 | 75.716 | 260.410 | 73.097 | 1.237 |
| 2200.000 | 22.403 | 80.072 | 2159.289 | 82.121 | 286.146 | 82.121 | 297.697 | 73.987 | 0.716 |
| 2300.000 | 23.644 | 79.183 | 2251.321 | 89.170 | 324.616 | 89.170 | 336.640 | 74.640 | 1.289 |
| 2400.000 | 23.983 | 77.757 | 2342.808 | 97.243 | 364.174 | 97.243 | 376.933 | 75.049 | 0.668 |
| 2500.000 | 22.464 | 75.966 | 2434.704 | 106.186 | 402.573 | 106.186 | 416.341 | 75.224 | 1.675 |
| 2600.000 | 22.620 | 76.360 | 2527.064 | 115.354 | 439.796 | 115.354 | 454.672 | 75.303 | 0.217 |
| 2700.000 | 23.518 | 76.037 | 2619.066 | 124.704 | 477.847 | 124.704 | 493.851 | 75.374 | 0.908 |
| 2800.000 | 23.623 | 75.975 | 2710.723 | 134.374 | 516.649 | 134.374 | 533.838 | 75.421 | 0.108 |
| 2900.000 | 25.184 | 76.696 | 2801.786 | 144.126 | 556.796 | 144.126 | 575.147 | 75.488 | 1.588 |
| 3000.000 | 25.613 | 76.249 | 2892.121 | 154.160 | 598.496 | 154.160 | 618.031 | 75.556 | 0.470 |
| 3100.000 | 24.540 | 76.828 | 2982.694 | 164.031 | 639.711 | 164.031 | 660.406 | 75.618 | 1.101 |
| 3200.000 | 23.899 | 77.727 | 3073.892 | 173.069 | 679.725 | 173.069 | 701.412 | 75.715 | 0.739 |
| 3300.000 | 24.660 | 77.311 | 3165.047 | 181.957 | 719.871 | 181.957 | 742.511 | 75.815 | 0.780 |
| 3400.000 | 24.114 | 76.186 | 3256.125 | 191.417 | 760.060 | 191.417 | 783.793 | 75.864 | 0.717 |

| Measured Depth FT | Incl Angle Deg | Drift Direction Deg | TVD FT | +N-S FT | +E-W FT | Vertical Section FT | Closure Distance FT | Closure Direction Deg | Dogleg Severity Deg/100 |
|-------------------------|----------------------|---------------------------|-----------|------------|------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 3500.000 | 23.926 | 75.239 | 3347.466 | 201.461 | 799.505 | 201.461 | 824.497 | 75.857 | 0.429 |
| 3600.000 | 24.431 | 74.639 | 3438.693 | 212.105 | 839.055 | 212.105 | 865.449 | 75.813 | 0.561 |
| 3700.000 | 24.539 | 74.586 | 3529.700 | 223.103 | 879.015 | 223.103 | 906.886 | 75.758 | 0.111 |
| 3800.000 | 23.960 | 73.472 | 3620.877 | 234.399 | 918.500 | 234.399 | 947.937 | 75.684 | 0.738 |
| 3900.000 | 23.938 | 73.422 | 3712.267 | 245.964 | 957.410 | 245.964 | 988.500 | 75.592 | 0.030 |
| 4000.000 | 24.854 | 74.255 | 3803.338 | 257.455 | 997.082 | 257.455 | 1029.784 | 75.522 | 0.978 |
| 4100.000 | 25.582 | 74.231 | 3893.807 | 269.025 | 1038.086 | 269.025 | 1072.379 | 75.471 | 0.728 |
| 4200.000 | 26.708 | 73.422 | 3983.574 | 281.305 | 1080.403 | 281.305 | 1116.425 | 75.406 | 1.182 |
| 4300.000 | 27.596 | 72.456 | 4072.553 | 294.699 | 1124.027 | 294.699 | 1162.018 | 75.309 | 0.991 |
| 4400.000 | 27.324 | 71.478 | 4161.287 | 308.972 | 1167.875 | 308.972 | 1208.054 | 75.181 | 0.526 |
| 4500.000 | 26.645 | 71.929 | 4250.399 | 323.218 | 1210.955 | 323.218 | 1253.348 | 75.055 | 0.709 |
| 4600.000 | 25.133 | 74.824 | 4340.364 | 335.734 | 1252.772 | 335.734 | 1296.979 | 74.998 | 1.970 |
| 4700.000 | 25.188 | 76.794 | 4430.878 | 346.155 | 1293.985 | 346.155 | 1339.485 | 75.023 | 0.840 |
| 4800.000 | 24.941 | 80.324 | 4521.466 | 354.560 | 1335.489 | 354.560 | 1381.754 | 75.131 | 1.515 |
| 4900.000 | 25.277 | 81.263 | 4612.016 | 361.347 | 1377.376 | 361.347 | 1423.986 | 75.300 | 0.521 |
| 5000.000 | 24.940 | 80.708 | 4702.566 | 367.995 | 1419.285 | 367.995 | 1466.216 | 75.464 | 0.411 |
| 5100.000 | 24.412 | 79.737 | 4793.435 | 375.081 | 1460.427 | 375.081 | 1507.824 | 75.596 | 0.666 |
| 5200.000 | 23.889 | 78.100 | 4884.683 | 382.938 | 1500.575 | 382.938 | 1548.667 | 75.684 | 0.850 |
| 5300.000 | 23.289 | 76.065 | 4976.328 | 391.875 | 1539.576 | 391.875 | 1588.666 | 75.720 | 1.011 |
| 5400.000 | 22.881 | 75.665 | 5068.320 | 401.449 | 1577.598 | 401.449 | 1627.875 | 75.723 | 0.437 |
| 5500.000 | 21.687 | 74.675 | 5160.850 | 411.146 | 1614.255 | 411.146 | 1665.791 | 75.711 | 1.251 |
| 5600.000 | 18.698 | 74.746 | 5254.693 | 420.249 | 1647.547 | 420.249 | 1700.300 | 75.690 | 2.989 |
| 5700.000 | 17.622 | 76.410 | 5349.711 | 428.023 | 1677.726 | 428.023 | 1731.464 | 75.688 | 1.194 |
| 5800.000 | 16.208 | 74.578 | 5445.383 | 435.292 | 1705.894 | 435.292 | 1760.555 | 75.685 | 1.512 |
| 5900.000 | 15.004 | 74.594 | 5541.695 | 442.442 | 1731.828 | 442.442 | 1787.452 | 75.669 | 1.203 |
| 6000.000 | 12.485 | 73.194 | 5638.824 | 449.007 | 1754.660 | 449.007 | 1811.198 | 75.646 | 2.541 |
| 6100.000 | 10.350 | 70.977 | 5736.840 | 455.061 | 1773.502 | 455.061 | 1830.953 | 75.609 | 2.180 |
| 6200.000 | 9.002 | 74.867 | 5835.416 | 460.032 | 1789.547 | 460.032 | 1847.731 | 75.583 | 1.497 |
| 6300.000 | 7.869 | 82.623 | 5934.336 | 462.954 | 1803.889 | 462.954 | 1862.349 | 75.606 | 1.604 |
| 6400.000 | 6.720 | 82.821 | 6033.525 | 464.564 | 1816.483 | 464.564 | 1874.948 | 75.654 | 1.149 |
| 6500.000 | 4.921 | 80.819 | 6133.005 | 465.979 | 1826.523 | 465.979 | 1885.026 | 75.688 | 1.810 |
| 6600.000 | 3.574 | 78.063 | 6232.728 | 467.308 | 1833.806 | 467.308 | 1892.412 | 75.704 | 1.362 |
| 6700.000 | 2.126 | 75.958 | 6332.602 | 468.403 | 1838.655 | 468.403 | 1897.381 | 75.708 | 1.452 |
| 6800.000 | 1.246 | 58.883 | 6432.558 | 469.415 | 1841.385 | 469.415 | 1900.276 | 75.698 | 1.004 |
| 6900.000 | 1.180 | 23.183 | 6532.537 | 470.923 | 1842.721 | 470.923 | 1901.943 | 75.664 | 0.746 |
| 7000.000 | 1.807 | 10.082 | 6632.503 | 473.422 | 1843.402 | 473.422 | 1903.223 | 75.597 | 0.710 |
| 7100.000 | 1.874 | 20.990 | 6732.452 | 476.500 | 1844.264 | 476.500 | 1904.826 | 75.513 | 0.356 |
| 7200.000 | 1.971 | 37.053 | 6832.396 | 479.399 | 1845.885 | 479.399 | 1907.122 | 75.441 | 0.546 |
| 7300.000 | 1.639 | 39.793 | 6932.347 | 481.870 | 1847.837 | 481.870 | 1909.633 | 75.384 | 0.342 |
| 7400.000 | 1.498 | 48.843 | 7032.309 | 483.829 | 1849.736 | 483.829 | 1911.966 | 75.342 | 0.285 |
| 7500.000 | 1.510 | 54.536 | 7132.275 | 485.454 | 1851.793 | 485.454 | 1914.368 | 75.310 | 0.150 |
| 7600.000 | 1.374 | 58.668 | 7232.243 | 486.842 | 1853.891 | 486.842 | 1916.749 | 75.286 | 0.171 |
| 7700.000 | 1.323 | 66.659 | 7332.216 | 487.923 | 1855.975 | 487.923 | 1919.039 | 75.271 | 0.195 |

HORIZONTAL DISPLACEMENT IS
1919.039 FEET AT 75.271 DEGREES