



Company: NOBLE ENERGY
 Well: PATRIOT B16-10
 Location: NENW SEC. 16-T5N-R64W
 Rig Name: LIGHTNING WIRE
 State/County: COLORADO/WELD
 Latitude: 40.40
 GRID North is 0.61 Degrees East of True North
 VS-Azi: 0.00 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Service Company : VAUGHN ENERGY SERVICES

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: patriotb16-10-01.ut
 Minimum Curvature Method
 Report Date/Time: 2/25/2011 / 06:42

VAUGHN ENERGY SERVICES
 CORPUS CHRISTI, TX
 800-606-4976
 SURVEYOR: CORY ALBERT

| 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 |
|-------------------------|----------------------|---------------------------|-----------|------------|------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | **** |
| 100.00 | 0.21 | 157.85 | 100.00 | -0.17 | 0.07 | -0.17 | 0.19 | 157.85 | 0.21 |
| 200.00 | 0.25 | 151.80 | 200.00 | -0.53 | 0.24 | -0.53 | 0.58 | 155.64 | 0.04 |
| 300.00 | 0.20 | 158.34 | 300.00 | -0.88 | 0.41 | -0.88 | 0.97 | 155.29 | 0.05 |
| 400.00 | 0.08 | 153.80 | 400.00 | -1.11 | 0.50 | -1.11 | 1.22 | 155.64 | 0.12 |
| 500.00 | 0.16 | 174.26 | 500.00 | -1.32 | 0.55 | -1.32 | 1.43 | 157.29 | 0.08 |
| 600.00 | 0.15 | 184.20 | 600.00 | -1.58 | 0.56 | -1.58 | 1.67 | 160.62 | 0.03 |
| 700.00 | 0.11 | 194.32 | 700.00 | -1.80 | 0.52 | -1.80 | 1.87 | 163.87 | 0.04 |
| 800.00 | 0.06 | 214.80 | 800.00 | -1.94 | 0.47 | -1.94 | 2.00 | 166.48 | 0.06 |
| 900.00 | 0.09 | 266.05 | 900.00 | -1.99 | 0.36 | -1.99 | 2.02 | 169.77 | 0.07 |
| 1000.00 | 0.08 | 284.10 | 1000.00 | -1.98 | 0.21 | -1.98 | 1.99 | 173.90 | 0.03 |
| 1100.00 | 0.04 | 284.47 | 1100.00 | -1.95 | 0.11 | -1.95 | 1.95 | 176.84 | 0.04 |
| 1200.00 | 0.16 | 297.92 | 1200.00 | -1.88 | -0.05 | -1.88 | 1.88 | 181.47 | 0.12 |
| 1300.00 | 0.11 | 282.46 | 1300.00 | -1.79 | -0.26 | -1.79 | 1.81 | 188.30 | 0.06 |
| 1400.00 | 0.07 | 279.55 | 1400.00 | -1.76 | -0.41 | -1.76 | 1.81 | 193.14 | 0.04 |
| 1500.00 | 0.14 | 232.74 | 1500.00 | -1.82 | -0.56 | -1.82 | 1.91 | 197.19 | 0.10 |
| 1600.00 | 0.05 | 199.58 | 1600.00 | -1.94 | -0.67 | -1.94 | 2.05 | 199.18 | 0.10 |
| 1700.00 | 0.20 | 184.33 | 1700.00 | -2.16 | -0.70 | -2.16 | 2.27 | 198.06 | 0.15 |
| 1800.00 | 0.14 | 203.21 | 1800.00 | -2.44 | -0.76 | -2.44 | 2.56 | 197.37 | 0.08 |
| 1900.00 | 0.29 | 187.41 | 1899.99 | -2.81 | -0.84 | -2.81 | 2.93 | 196.75 | 0.16 |
| 2000.00 | 0.29 | 176.22 | 1999.99 | -3.31 | -0.86 | -3.31 | 3.42 | 194.59 | 0.06 |
| 2100.00 | 0.45 | 155.04 | 2099.99 | -3.91 | -0.68 | -3.91 | 3.97 | 189.83 | 0.21 |
| 2200.00 | 0.55 | 162.33 | 2199.99 | -4.73 | -0.37 | -4.73 | 4.74 | 184.43 | 0.12 |
| 2300.00 | 0.61 | 168.74 | 2299.98 | -5.71 | -0.12 | -5.71 | 5.71 | 181.17 | 0.09 |
| 2400.00 | 0.71 | 181.66 | 2399.98 | -6.85 | -0.03 | -6.85 | 6.85 | 180.25 | 0.18 |
| 2500.00 | 0.68 | 180.70 | 2499.97 | -8.07 | -0.06 | -8.07 | 8.07 | 180.39 | 0.03 |
| 2600.00 | 0.74 | 188.35 | 2599.96 | -9.30 | -0.16 | -9.30 | 9.30 | 180.96 | 0.11 |
| 2700.00 | 0.76 | 196.46 | 2699.95 | -10.57 | -0.44 | -10.57 | 10.58 | 182.37 | 0.11 |
| 2800.00 | 0.61 | 196.64 | 2799.94 | -11.71 | -0.78 | -11.71 | 11.74 | 183.79 | 0.15 |
| 2900.00 | 0.47 | 199.14 | 2899.94 | -12.60 | -1.06 | -12.60 | 12.65 | 184.81 | 0.14 |
| 3000.00 | 0.47 | 195.58 | 2999.94 | -13.38 | -1.30 | -13.38 | 13.44 | 185.57 | 0.03 |
| 3100.00 | 0.76 | 188.94 | 3099.93 | -14.43 | -1.52 | -14.43 | 14.51 | 186.00 | 0.30 |
| 3200.00 | 1.03 | 170.93 | 3199.92 | -15.96 | -1.48 | -15.96 | 16.03 | 185.29 | 0.39 |
| 3300.00 | 1.42 | 186.99 | 3299.90 | -18.08 | -1.49 | -18.08 | 18.14 | 184.70 | 0.51 |
| 3400.00 | 1.85 | 205.93 | 3399.86 | -20.75 | -2.34 | -20.75 | 20.88 | 186.44 | 0.68 |
| 3500.00 | 2.05 | 210.80 | 3499.80 | -23.74 | -3.96 | -23.74 | 24.06 | 189.48 | 0.26 |
| 3600.00 | 1.99 | 214.45 | 3599.74 | -26.70 | -5.86 | -26.70 | 27.34 | 192.37 | 0.14 |

| 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 |
|--|----------------------|---------------------------|-----------|-------------|-------------|---------------------------|---------------------------|-----------------------------|-------------------------------|
| 3700.00 | 1.96 | 214.62 | 3699.68 | -29.54 | -7.81 | -29.54 | 30.55 | 194.81 | 0.03 |
| 3800.00 | 2.00 | 212.22 | 3799.62 | -32.42 | -9.71 | -32.42 | 33.84 | 196.68 | 0.09 |
| 3900.00 | 1.83 | 212.91 | 3899.56 | -35.24 | -11.51 | -35.24 | 37.07 | 198.09 | 0.18 |
| 4000.00 | 1.58 | 198.15 | 3999.52 | -37.89 | -12.81 | -37.89 | 39.99 | 198.68 | 0.50 |
| 4100.00 | 1.65 | 182.54 | 4099.48 | -40.63 | -13.30 | -40.63 | 42.75 | 198.13 | 0.44 |
| 4200.00 | 1.67 | 164.09 | 4199.44 | -43.47 | -12.96 | -43.47 | 45.36 | 196.61 | 0.53 |
| 4300.00 | 1.73 | 161.37 | 4299.39 | -46.30 | -12.08 | -46.30 | 47.85 | 194.62 | 0.10 |
| 4400.00 | 1.78 | 148.92 | 4399.35 | -49.06 | -10.80 | -49.06 | 50.23 | 192.42 | 0.38 |
| 4500.00 | 1.70 | 146.17 | 4499.30 | -51.62 | -9.17 | -51.62 | 52.43 | 190.08 | 0.11 |
| 4600.00 | 1.78 | 135.89 | 4599.26 | -53.97 | -7.26 | -53.97 | 54.46 | 187.66 | 0.32 |
| 4700.00 | 1.18 | 116.68 | 4699.22 | -55.55 | -5.26 | -55.55 | 55.80 | 185.41 | 0.77 |
| 4800.00 | 0.96 | 115.82 | 4799.20 | -56.38 | -3.59 | -56.38 | 56.49 | 183.65 | 0.22 |
| 4900.00 | 1.07 | 115.86 | 4899.19 | -57.15 | -2.00 | -57.15 | 57.18 | 182.00 | 0.11 |
| 5000.00 | 1.39 | 128.11 | 4999.17 | -58.30 | -0.20 | -58.30 | 58.30 | 180.20 | 0.41 |
| 5100.00 | 1.82 | 142.27 | 5099.13 | -60.31 | 1.72 | -60.31 | 60.33 | 178.37 | 0.58 |
| 5200.00 | 1.64 | 143.65 | 5199.08 | -62.71 | 3.54 | -62.71 | 62.81 | 176.77 | 0.18 |
| 5300.00 | 1.37 | 138.05 | 5299.05 | -64.75 | 5.19 | -64.75 | 64.96 | 175.42 | 0.31 |
| 5400.00 | 1.18 | 143.06 | 5399.02 | -66.46 | 6.60 | -66.46 | 66.79 | 174.33 | 0.22 |
| 5500.00 | 0.71 | 147.88 | 5499.01 | -67.81 | 7.55 | -67.81 | 68.23 | 173.65 | 0.48 |
| 5600.00 | 0.86 | 149.90 | 5599.00 | -68.99 | 8.26 | -68.99 | 69.48 | 173.18 | 0.16 |
| 5700.00 | 0.27 | 187.08 | 5698.99 | -69.87 | 8.60 | -69.87 | 70.40 | 172.98 | 0.67 |
| 5800.00 | 0.33 | 203.08 | 5798.99 | -70.36 | 8.46 | -70.36 | 70.87 | 173.14 | 0.10 |
| 5900.00 | 0.34 | 199.39 | 5898.99 | -70.90 | 8.25 | -70.90 | 71.38 | 173.36 | 0.02 |
| 6000.00 | 0.14 | 228.13 | 5998.99 | -71.26 | 8.06 | -71.26 | 71.72 | 173.54 | 0.22 |
| 6100.00 | 0.09 | 301.35 | 6098.99 | -71.31 | 7.90 | -71.31 | 71.74 | 173.67 | 0.15 |
| 6200.00 | 0.09 | 308.10 | 6198.99 | -71.22 | 7.78 | -71.22 | 71.64 | 173.77 | 0.01 |
| 6300.00 | 0.10 | 60.03 | 6298.99 | -71.13 | 7.80 | -71.13 | 71.55 | 173.74 | 0.16 |
| 6400.00 | 0.57 | 128.75 | 6398.99 | -71.40 | 8.27 | -71.40 | 71.87 | 173.40 | 0.55 |
| 6500.00 | 0.59 | 159.11 | 6498.98 | -72.19 | 8.84 | -72.19 | 72.73 | 173.02 | 0.30 |
| 6600.00 | 0.20 | 152.91 | 6598.98 | -72.83 | 9.10 | -72.83 | 73.39 | 172.87 | 0.39 |
| 6700.00 | 0.20 | 141.39 | 6698.98 | -73.12 | 9.29 | -73.12 | 73.71 | 172.76 | 0.04 |
| 6800.00 | 0.17 | 146.46 | 6798.98 | -73.38 | 9.49 | -73.38 | 74.00 | 172.63 | 0.03 |
| HORIZONTAL DISPLACEMENT IS 74.00 FEET AT 172.63 DEGREES | | | | | | | | | |