



Job Number: SVGJ-141358  
 Company: PDC  
 Lease/Well: National Hog Farm 17-12  
 Location: Weld County, CO  
 Rig Name: MS Energy Wireline  
 RKB: 0'  
 G.L. or M.S.L.: GL

State/Country: Colorado/USA  
 Declination: 8.23°  
 Grid: East To True North  
 File name: S:\2014SU~1\PDC\GJ\NATION~1\1712.SVY  
 Date/Time: 26-Nov-14 / 11:56  
 Curve Name: Surface - 6600' M.D. (Rate Gyro)

### MS SURVEY

#### WINSERVE SURVEY CALCULATIONS

*Minimum Curvature Method*

*Vertical Section Plane .00*

*Vertical Section Referenced to Wellhead*

*Rectangular Coordinates Referenced to Wellhead*

| Measured<br>Depth<br>FT | Incl<br>Angle<br>Deg | Drift<br>Direction<br>Deg | True<br>Vertical<br>Depth | N-S<br>FT | E-W<br>FT | Vertical<br>Section<br>FT | C L O S U R E  |                  | Dogleg<br>Severity<br>Deg/100 |
|-------------------------|----------------------|---------------------------|---------------------------|-----------|-----------|---------------------------|----------------|------------------|-------------------------------|
|                         |                      |                           |                           |           |           |                           | Distance<br>FT | Direction<br>Deg |                               |
| .00                     | .00                  | .00                       | .00                       | .00       | .00       | .00                       | .00            | .00              | .00                           |
| 100.00                  | .32                  | 161.99                    | 100.00                    | -.27      | .09       | -.27                      | .28            | 161.99           | .32                           |
| 200.00                  | .57                  | 170.96                    | 200.00                    | -1.02     | .25       | -1.02                     | 1.05           | 166.21           | .26                           |
| 300.00                  | .44                  | 173.81                    | 299.99                    | -1.90     | .37       | -1.90                     | 1.93           | 168.94           | .13                           |
| 400.00                  | .39                  | 177.87                    | 399.99                    | -2.62     | .42       | -2.62                     | 2.65           | 170.79           | .06                           |
| 500.00                  | .27                  | 192.20                    | 499.99                    | -3.19     | .39       | -3.19                     | 3.21           | 173.07           | .14                           |
| 600.00                  | .27                  | 148.64                    | 599.99                    | -3.62     | .46       | -3.62                     | 3.65           | 172.75           | .20                           |
| 700.00                  | .11                  | 106.39                    | 699.99                    | -3.85     | .67       | -3.85                     | 3.91           | 170.05           | .20                           |
| 800.00                  | .15                  | 123.67                    | 799.99                    | -3.95     | .88       | -3.95                     | 4.04           | 167.49           | .06                           |
| 900.00                  | .30                  | 94.15                     | 899.99                    | -4.04     | 1.25      | -4.04                     | 4.23           | 162.85           | .18                           |

| Measured<br>Depth<br>FT | Incl<br>Angle<br>Deg | Drift<br>Direction<br>Deg | True<br>Vertical<br>Depth | N-S<br>FT | E-W<br>FT | Vertical<br>Section<br>FT | C L O S U R E  |                  | Dogleg<br>Severity<br>Deg/100 |
|-------------------------|----------------------|---------------------------|---------------------------|-----------|-----------|---------------------------|----------------|------------------|-------------------------------|
|                         |                      |                           |                           |           |           |                           | Distance<br>FT | Direction<br>Deg |                               |
| 1000.00                 | .31                  | 79.59                     | 999.98                    | -4.01     | 1.77      | -4.01                     | 4.38           | 156.14           | .08                           |
| 1100.00                 | .16                  | 65.35                     | 1099.98                   | -3.90     | 2.17      | -3.90                     | 4.46           | 150.96           | .16                           |
| 1200.00                 | .21                  | 110.20                    | 1199.98                   | -3.91     | 2.46      | -3.91                     | 4.62           | 147.75           | .15                           |
| 1300.00                 | .32                  | 93.33                     | 1299.98                   | -3.99     | 2.92      | -3.99                     | 4.94           | 143.81           | .13                           |
| 1400.00                 | .32                  | 53.02                     | 1399.98                   | -3.83     | 3.42      | -3.83                     | 5.14           | 138.29           | .22                           |
| 1500.00                 | .20                  | 25.25                     | 1499.98                   | -3.51     | 3.72      | -3.51                     | 5.11           | 133.36           | .17                           |
| 1600.00                 | .33                  | 50.00                     | 1599.98                   | -3.17     | 4.01      | -3.17                     | 5.11           | 128.29           | .17                           |
| 1700.00                 | .42                  | 19.91                     | 1699.98                   | -2.64     | 4.36      | -2.64                     | 5.09           | 121.18           | .21                           |
| 1800.00                 | .43                  | 24.94                     | 1799.97                   | -1.95     | 4.64      | -1.95                     | 5.03           | 112.81           | .04                           |
| 1900.00                 | .31                  | 37.51                     | 1899.97                   | -1.40     | 4.96      | -1.40                     | 5.15           | 105.71           | .14                           |
| 2000.00                 | .51                  | 83.14                     | 1999.97                   | -1.13     | 5.57      | -1.13                     | 5.68           | 101.45           | .37                           |
| 2100.00                 | .87                  | 74.08                     | 2099.96                   | -.87      | 6.74      | -.87                      | 6.80           | 97.33            | .38                           |
| 2200.00                 | 1.37                 | 59.27                     | 2199.94                   | -.05      | 8.50      | -.05                      | 8.50           | 90.32            | .57                           |
| 2300.00                 | 1.24                 | 60.81                     | 2299.92                   | 1.09      | 10.47     | 1.09                      | 10.53          | 84.05            | .13                           |
| 2400.00                 | 1.39                 | 61.62                     | 2399.89                   | 2.20      | 12.48     | 2.20                      | 12.67          | 80.03            | .15                           |
| 2500.00                 | 1.34                 | 50.59                     | 2499.86                   | 3.51      | 14.45     | 3.51                      | 14.87          | 76.33            | .27                           |
| 2600.00                 | 1.08                 | 48.91                     | 2599.84                   | 4.88      | 16.07     | 4.88                      | 16.79          | 73.12            | .26                           |
| 2700.00                 | .86                  | 57.33                     | 2699.83                   | 5.90      | 17.41     | 5.90                      | 18.38          | 71.28            | .26                           |
| 2800.00                 | .98                  | 62.04                     | 2799.81                   | 6.71      | 18.80     | 6.71                      | 19.96          | 70.36            | .14                           |
| 2900.00                 | .79                  | 58.12                     | 2899.80                   | 7.47      | 20.14     | 7.47                      | 21.48          | 69.64            | .20                           |
| 3000.00                 | .73                  | 78.44                     | 2999.79                   | 7.96      | 21.35     | 7.96                      | 22.78          | 69.54            | .27                           |
| 3100.00                 | .67                  | 73.94                     | 3099.78                   | 8.25      | 22.53     | 8.25                      | 23.99          | 69.88            | .08                           |
| 3200.00                 | .22                  | 292.91                    | 3199.78                   | 8.49      | 22.92     | 8.49                      | 24.44          | 69.67            | .85                           |
| 3300.00                 | .65                  | 264.33                    | 3299.78                   | 8.51      | 22.17     | 8.51                      | 23.75          | 69.01            | .47                           |
| 3400.00                 | 1.00                 | 278.08                    | 3399.77                   | 8.57      | 20.75     | 8.57                      | 22.45          | 67.55            | .40                           |
| 3500.00                 | 1.18                 | 268.74                    | 3499.75                   | 8.67      | 18.85     | 8.67                      | 20.75          | 65.29            | .25                           |
| 3600.00                 | 1.02                 | 266.68                    | 3599.73                   | 8.60      | 16.94     | 8.60                      | 18.99          | 63.08            | .16                           |
| 3700.00                 | 1.13                 | 278.66                    | 3699.71                   | 8.70      | 15.07     | 8.70                      | 17.40          | 60.01            | .25                           |
| 3800.00                 | 1.29                 | 268.77                    | 3799.69                   | 8.82      | 12.97     | 8.82                      | 15.69          | 55.78            | .26                           |

| Measured<br>Depth<br>FT           | Incl<br>Angle<br>Deg | Drift<br>Direction<br>Deg | True<br>Vertical<br>Depth | N-S<br>FT | E-W<br>FT | Vertical<br>Section<br>FT | C L O S U R E  |                  | Dogleg<br>Severity<br>Deg/100 |
|-----------------------------------|----------------------|---------------------------|---------------------------|-----------|-----------|---------------------------|----------------|------------------|-------------------------------|
|                                   |                      |                           |                           |           |           |                           | Distance<br>FT | Direction<br>Deg |                               |
| 3900.00                           | 1.35                 | 278.35                    | 3899.67                   | 8.97      | 10.68     | 8.97                      | 13.95          | 49.98            | .23                           |
| 4000.00                           | 1.43                 | 271.99                    | 3999.64                   | 9.18      | 8.27      | 9.18                      | 12.36          | 42.00            | .17                           |
| 4100.00                           | 1.43                 | 292.06                    | 4099.61                   | 9.69      | 5.86      | 9.69                      | 11.33          | 31.17            | .50                           |
| 4200.00                           | 1.71                 | 295.03                    | 4199.57                   | 10.79     | 3.36      | 10.79                     | 11.30          | 17.27            | .29                           |
| 4300.00                           | 1.37                 | 305.00                    | 4299.53                   | 12.11     | 1.03      | 12.11                     | 12.15          | 4.84             | .43                           |
| 4400.00                           | .76                  | 317.27                    | 4399.51                   | 13.28     | -.40      | 13.28                     | 13.29          | 358.26           | .65                           |
| 4500.00                           | .66                  | 206.42                    | 4499.51                   | 13.26     | -1.11     | 13.26                     | 13.30          | 355.21           | 1.17                          |
| 4600.00                           | 1.20                 | 213.89                    | 4599.50                   | 11.87     | -1.95     | 11.87                     | 12.03          | 350.67           | .55                           |
| 4700.00                           | 1.69                 | 208.32                    | 4699.47                   | 9.70      | -3.23     | 9.70                      | 10.23          | 341.57           | .51                           |
| 4800.00                           | 1.73                 | 199.39                    | 4799.42                   | 6.98      | -4.43     | 6.98                      | 8.27           | 327.58           | .27                           |
| 4900.00                           | 1.81                 | 207.66                    | 4899.37                   | 4.16      | -5.67     | 4.16                      | 7.03           | 306.26           | .27                           |
| 5000.00                           | 1.46                 | 210.60                    | 4999.33                   | 1.66      | -7.05     | 1.66                      | 7.24           | 283.27           | .36                           |
| 5100.00                           | 1.72                 | 217.33                    | 5099.29                   | -.63      | -8.61     | -.63                      | 8.63           | 265.84           | .32                           |
| 5200.00                           | 1.39                 | 215.26                    | 5199.26                   | -2.81     | -10.22    | -2.81                     | 10.60          | 254.62           | .33                           |
| 5300.00                           | 1.46                 | 224.38                    | 5299.23                   | -4.71     | -11.81    | -4.71                     | 12.72          | 248.25           | .24                           |
| 5400.00                           | 1.28                 | 222.64                    | 5399.20                   | -6.44     | -13.46    | -6.44                     | 14.92          | 244.42           | .18                           |
| 5500.00                           | .96                  | 226.45                    | 5499.18                   | -7.84     | -14.82    | -7.84                     | 16.77          | 242.12           | .33                           |
| 5600.00                           | .98                  | 236.74                    | 5599.16                   | -8.89     | -16.14    | -8.89                     | 18.43          | 241.16           | .18                           |
| 5700.00                           | 1.15                 | 238.16                    | 5699.15                   | -9.89     | -17.71    | -9.89                     | 20.28          | 240.83           | .17                           |
| 5800.00                           | .95                  | 238.14                    | 5799.13                   | -10.85    | -19.27    | -10.85                    | 22.12          | 240.61           | .20                           |
| 5900.00                           | 1.36                 | 238.54                    | 5899.11                   | -11.91    | -20.98    | -11.91                    | 24.13          | 240.42           | .41                           |
| 6000.00                           | 1.79                 | 248.07                    | 5999.07                   | -13.11    | -23.45    | -13.11                    | 26.86          | 240.78           | .50                           |
| 6100.00                           | 2.03                 | 246.10                    | 6099.02                   | -14.41    | -26.51    | -14.41                    | 30.18          | 241.47           | .25                           |
| 6200.00                           | 2.82                 | 248.49                    | 6198.93                   | -16.03    | -30.42    | -16.03                    | 34.39          | 242.21           | .80                           |
| 6300.00                           | 2.63                 | 241.75                    | 6298.81                   | -18.02    | -34.73    | -18.02                    | 39.13          | 242.58           | .37                           |
| 6400.00                           | 2.99                 | 236.01                    | 6398.69                   | -20.57    | -38.91    | -20.57                    | 44.02          | 242.14           | .46                           |
| 6500.00                           | 3.24                 | 240.48                    | 6498.54                   | -23.42    | -43.54    | -23.42                    | 49.43          | 241.73           | .35                           |
| <b>Last Survey Depth Recorded</b> |                      |                           |                           |           |           |                           |                |                  |                               |
| 6600.00                           | 2.19                 | 244.80                    | 6598.43                   | -25.62    | -47.72    | -25.62                    | 54.17          | 241.77           | 1.07                          |