



Job Number: SVGJ-110913

Company: Petroleum Development Corporation

Lease/Well: Rotharmel 11-32

Location: Weld County, CO

Rig Name: MS Wireline

RKB: 0'

G.L. or M.S.L.: GL

State/Country: Colorado/USA

Declination: 8.90°

Grid: East To True

File name: F:\SURVEY\2011SU~1\PDC\ROTH1132.SVY

Date/Time: 04-Oct-11 / 14:25

Curve Name: Surface - 7300' M.D. (Rate Gyro)

WINSERVE SURVEY CALCULATIONS
 Minimum Curvature Method
 Vertical Section Plane .00
 Vertical Section Referenced to Wellhead
 Rectangular Coordinates Referenced to Wellhead

| Measured Depth FT | Incl Angle Deg | Drift Direction Deg | True Vertical Depth | N-S FT | E-W FT | Vertical Section FT | C L O S U R E | | Dogleg Severity Deg/100 |
|-------------------------|----------------------|---------------------------|---------------------------|-----------|-----------|---------------------------|----------------|------------------|-------------------------------|
| | | | | | | | Distance FT | Direction Deg | |
| .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 100.00 | .52 | 112.45 | 100.00 | -.17 | .42 | -.17 | .45 | 112.45 | .52 |
| 200.00 | .49 | 68.70 | 200.00 | -.19 | 1.24 | -.19 | 1.25 | 98.79 | .38 |
| 300.00 | .21 | 192.18 | 299.99 | -.22 | 1.60 | -.22 | 1.61 | 97.67 | .63 |
| 400.00 | .38 | 223.52 | 399.99 | -.63 | 1.33 | -.63 | 1.47 | 115.51 | .23 |
| 500.00 | .82 | 191.38 | 499.99 | -1.58 | .96 | -1.58 | 1.85 | 148.65 | .54 |
| 600.00 | .67 | 226.37 | 599.98 | -2.68 | .40 | -2.68 | 2.71 | 171.60 | .47 |
| 700.00 | .59 | 235.94 | 699.97 | -3.37 | -.45 | -3.37 | 3.40 | 187.66 | .13 |
| 800.00 | .72 | 214.58 | 799.97 | -4.18 | -1.24 | -4.18 | 4.36 | 196.49 | .27 |
| 900.00 | .15 | 273.95 | 899.96 | -4.69 | -1.72 | -4.69 | 4.99 | 200.19 | .66 |

| Measured Depth FT | Incl Angle Deg | Drift Direction Deg | True Vertical Depth | N-S FT | E-W FT | Vertical Section FT | C L O S U R E | | Dogleg Severity Deg/100 |
|-------------------------|----------------------|---------------------------|---------------------------|-----------|-----------|---------------------------|----------------|------------------|-------------------------------|
| | | | | | | | Distance FT | Direction Deg | |
| 1000.00 | .40 | 9.26 | 999.96 | -4.33 | -1.80 | -4.33 | 4.69 | 202.54 | .44 |
| 1100.00 | .43 | 36.80 | 1099.96 | -3.69 | -1.52 | -3.69 | 3.99 | 202.36 | .20 |
| 1200.00 | .45 | 357.49 | 1199.96 | -3.00 | -1.31 | -3.00 | 3.27 | 203.62 | .30 |
| 1300.00 | .24 | 245.33 | 1299.96 | -2.69 | -1.52 | -2.69 | 3.09 | 209.42 | .58 |
| 1400.00 | .16 | 80.54 | 1399.96 | -2.76 | -1.57 | -2.76 | 3.17 | 209.67 | .40 |
| 1500.00 | .46 | 282.84 | 1499.96 | -2.64 | -1.82 | -2.64 | 3.21 | 214.60 | .61 |
| 1600.00 | .56 | 253.84 | 1599.95 | -2.69 | -2.68 | -2.69 | 3.80 | 224.94 | .27 |
| 1700.00 | .37 | 309.19 | 1699.95 | -2.62 | -3.40 | -2.62 | 4.30 | 232.39 | .46 |
| 1800.00 | .70 | 252.88 | 1799.94 | -2.60 | -4.24 | -2.60 | 4.97 | 238.49 | .58 |
| 1900.00 | .72 | 249.37 | 1899.94 | -3.00 | -5.41 | -3.00 | 6.19 | 241.00 | .05 |
| 2000.00 | .75 | 262.70 | 1999.93 | -3.30 | -6.65 | -3.30 | 7.42 | 243.57 | .17 |
| 2100.00 | .83 | 251.17 | 2099.92 | -3.62 | -7.98 | -3.62 | 8.76 | 245.60 | .18 |
| 2200.00 | .66 | 253.10 | 2199.91 | -4.02 | -9.22 | -4.02 | 10.06 | 246.43 | .17 |
| 2300.00 | .86 | 214.32 | 2299.90 | -4.81 | -10.19 | -4.81 | 11.27 | 244.74 | .54 |
| 2400.00 | .59 | 257.31 | 2399.90 | -5.54 | -11.12 | -5.54 | 12.42 | 243.51 | .59 |
| 2500.00 | .85 | 213.57 | 2499.89 | -6.27 | -12.03 | -6.27 | 13.57 | 242.46 | .59 |
| 2600.00 | .87 | 211.67 | 2599.88 | -7.54 | -12.84 | -7.54 | 14.89 | 239.59 | .03 |
| 2700.00 | .81 | 238.20 | 2699.87 | -8.56 | -13.84 | -8.56 | 16.27 | 238.27 | .39 |
| 2800.00 | .72 | 248.17 | 2799.86 | -9.16 | -15.02 | -9.16 | 17.60 | 238.62 | .16 |
| 2900.00 | .79 | 246.12 | 2899.85 | -9.67 | -16.24 | -9.67 | 18.90 | 239.21 | .08 |
| 3000.00 | .97 | 217.77 | 2999.84 | -10.62 | -17.39 | -10.62 | 20.37 | 238.57 | .46 |
| 3100.00 | .67 | 231.76 | 3099.83 | -11.65 | -18.36 | -11.65 | 21.75 | 237.60 | .36 |
| 3200.00 | .54 | 252.29 | 3199.82 | -12.16 | -19.27 | -12.16 | 22.79 | 237.75 | .25 |
| 3300.00 | .49 | 199.20 | 3299.82 | -12.71 | -19.86 | -12.71 | 23.58 | 237.39 | .46 |
| 3400.00 | .21 | 66.32 | 3399.82 | -13.04 | -19.83 | -13.04 | 23.73 | 236.68 | .65 |
| 3500.00 | .27 | 197.06 | 3499.82 | -13.19 | -19.73 | -13.19 | 23.74 | 236.25 | .44 |
| 3600.00 | .39 | 304.38 | 3599.82 | -13.22 | -20.08 | -13.22 | 24.05 | 236.64 | .54 |
| 3700.00 | .33 | 269.82 | 3699.81 | -13.03 | -20.65 | -13.03 | 24.42 | 237.75 | .22 |
| 3800.00 | .56 | 302.28 | 3799.81 | -12.77 | -21.35 | -12.77 | 24.88 | 239.12 | .33 |

| Measured Depth FT | Incl Angle Deg | Drift Direction Deg | True Vertical Depth | N-S FT | E-W FT | Vertical Section FT | C L O S U R E | | Dogleg Severity Deg/100 |
|-------------------------|----------------------|---------------------------|---------------------------|-----------|-----------|---------------------------|----------------|------------------|-------------------------------|
| | | | | | | | Distance FT | Direction Deg | |
| 3900.00 | .18 | 17.09 | 3899.81 | -12.36 | -21.72 | -12.36 | 24.99 | 240.36 | .54 |
| 4000.00 | .27 | 19.56 | 3999.81 | -11.99 | -21.60 | -11.99 | 24.70 | 240.97 | .09 |
| 4100.00 | .34 | 285.47 | 4099.81 | -11.69 | -21.80 | -11.69 | 24.74 | 241.81 | .45 |
| 4200.00 | .04 | 321.60 | 4199.81 | -11.58 | -22.11 | -11.58 | 24.96 | 242.36 | .31 |
| 4300.00 | .69 | 232.30 | 4299.80 | -11.92 | -22.61 | -11.92 | 25.56 | 242.20 | .69 |
| 4400.00 | .44 | 275.69 | 4399.80 | -12.25 | -23.47 | -12.25 | 26.47 | 242.44 | .48 |
| 4500.00 | .16 | 5.59 | 4499.80 | -12.07 | -23.84 | -12.07 | 26.72 | 243.14 | .47 |
| 4600.00 | .48 | 248.29 | 4599.80 | -12.09 | -24.21 | -12.09 | 27.06 | 243.47 | .57 |
| 4700.00 | .46 | 249.47 | 4699.79 | -12.38 | -24.98 | -12.38 | 27.88 | 243.63 | .02 |
| 4800.00 | .36 | 197.02 | 4799.79 | -12.83 | -25.44 | -12.83 | 28.49 | 243.25 | .37 |
| 4900.00 | .23 | 287.32 | 4899.79 | -13.07 | -25.73 | -13.07 | 28.86 | 243.08 | .43 |
| 5000.00 | .43 | 226.14 | 4999.79 | -13.27 | -26.19 | -13.27 | 29.36 | 243.14 | .38 |
| 5100.00 | .19 | 351.00 | 5099.79 | -13.36 | -26.49 | -13.36 | 29.67 | 243.23 | .56 |
| 5200.00 | .40 | 305.07 | 5199.79 | -13.00 | -26.80 | -13.00 | 29.78 | 244.12 | .30 |
| 5300.00 | .45 | 275.14 | 5299.78 | -12.76 | -27.48 | -12.76 | 30.29 | 245.08 | .22 |
| 5400.00 | .53 | 281.94 | 5399.78 | -12.63 | -28.32 | -12.63 | 31.01 | 245.96 | .10 |
| 5500.00 | .38 | 332.96 | 5499.78 | -12.24 | -28.92 | -12.24 | 31.41 | 247.06 | .41 |
| 5600.00 | .29 | 343.74 | 5599.78 | -11.70 | -29.14 | -11.70 | 31.41 | 248.12 | .11 |
| 5700.00 | .45 | 213.97 | 5699.78 | -11.79 | -29.43 | -11.79 | 31.71 | 248.18 | .67 |
| 5800.00 | .25 | 209.71 | 5799.77 | -12.30 | -29.76 | -12.30 | 32.20 | 247.54 | .20 |
| 5900.00 | .13 | 220.56 | 5899.77 | -12.58 | -29.94 | -12.58 | 32.48 | 247.22 | .12 |
| 6000.00 | .25 | 239.96 | 5999.77 | -12.77 | -30.21 | -12.77 | 32.80 | 247.08 | .13 |
| 6100.00 | .51 | 91.45 | 6099.77 | -12.89 | -29.95 | -12.89 | 32.61 | 246.71 | .73 |
| 6200.00 | .39 | 132.08 | 6199.77 | -13.13 | -29.25 | -13.13 | 32.06 | 245.82 | .33 |
| 6300.00 | .17 | 156.91 | 6299.77 | -13.50 | -28.94 | -13.50 | 31.93 | 245.00 | .25 |
| 6400.00 | .24 | 147.81 | 6399.77 | -13.81 | -28.77 | -13.81 | 31.91 | 244.36 | .08 |
| 6500.00 | .42 | 86.07 | 6499.77 | -13.96 | -28.29 | -13.96 | 31.55 | 243.74 | .37 |
| 6600.00 | .60 | 78.08 | 6599.76 | -13.83 | -27.42 | -13.83 | 30.71 | 243.23 | .19 |
| 6700.00 | .61 | 80.49 | 6699.76 | -13.63 | -26.38 | -13.63 | 29.69 | 242.67 | .03 |

| Measured Depth FT | Incl Angle Deg | Drift Direction Deg | True Vertical Depth | N-S FT | E-W FT | Vertical Section FT | C L O S U R E | | Dogleg Severity Deg/100 |
|-------------------------|----------------------|---------------------------|---------------------------|-----------|-----------|---------------------------|----------------|------------------|-------------------------------|
| | | | | | | | Distance FT | Direction Deg | |
| 6800.00 | .62 | 115.27 | 6799.75 | -13.78 | -25.37 | -13.78 | 28.86 | 241.49 | .37 |
| 6900.00 | .57 | 114.84 | 6899.74 | -14.22 | -24.42 | -14.22 | 28.26 | 239.80 | .05 |
| 7000.00 | .47 | 124.72 | 6999.74 | -14.66 | -23.64 | -14.66 | 27.81 | 238.20 | .13 |
| 7100.00 | .09 | 173.89 | 7099.74 | -14.97 | -23.29 | -14.97 | 27.69 | 237.27 | .42 |
| 7200.00 | .70 | 76.17 | 7199.74 | -14.90 | -22.69 | -14.90 | 27.15 | 236.70 | .72 |

| | | | | | | | | | |
|-----------------------------------|-----|--------|---------|--------|--------|--------|-------|--------|-----|
| Last Survey Depth Recorded | | | | | | | | | |
| 7300.00 | .43 | 127.92 | 7299.73 | -14.99 | -21.80 | -14.99 | 26.45 | 235.49 | .55 |