

JUL 15 2015

WV GEOLOGICAL SURVEY  
MORGANTOWN, WV



Antero Resources  
Twyford Unit 1H  
Doddridge County WV  
Northing: 14272641.39  
Easting: 1690517.20  
As Drilled

**WELL DETAILS:** Twyford Unit 1H

|      |      |             |  |      |
|------|------|-------------|--|------|
| AN/S | +E/W | Northing    | Longitude                                | Slot |
| 0.0  | 0.0  | 14272641.39 | 1690517.2039° 18' 14.101180" 49 22.411 W |      |

Ground Level: 824.0

Latitude: 38° 52' 24.11" N

Longitude: 80° 49' 22.411" W

---

**PROJECT DETAILS:** Doddridge County WV

Geodetic System: Universal Transverse Mercator (US Survey Feet)

Datum: NAD 1983 (NADCON CONUS)

Ellipsoid: Clarke 1866

Zone: Zone 17N (84 W to 78 W)

System Datum: Mean Sea Level

---

**REFERENCE INFORMATION**

Coordinate (NET) Reference: West Twyford Unit 1H, Old North

Vertical (VD) Reference: E3 Twyford 1H (E24.G), 23 KPI @ 847' Out

Measured Depth Reference: E3 Twyford 1H (E24.G), 23 KPI @ 847' Out

Calculation Method: Minimum Curvature

---

**DESIGN TARGET DETAILS**

| Name                 | TD     | +N/S    | +E/W   | Northing    | Easting                                  | Latitude | Longitude | Shape |
|----------------------|--------|---------|--------|-------------|--|----------|-----------|-------|
| SH Twyford 1H        | 6499.9 | -8157.3 | 0.0    | 14272641.39 | 1690517.2039° 18' 14.101180" 49 22.411 W | Point    |           |       |
| Actual BH Twyford 1H |        |         | 452.19 | 14262464.07 | 1695039.1139° 18' 53.333160" 49 25.068 W | Point    |           |       |

---

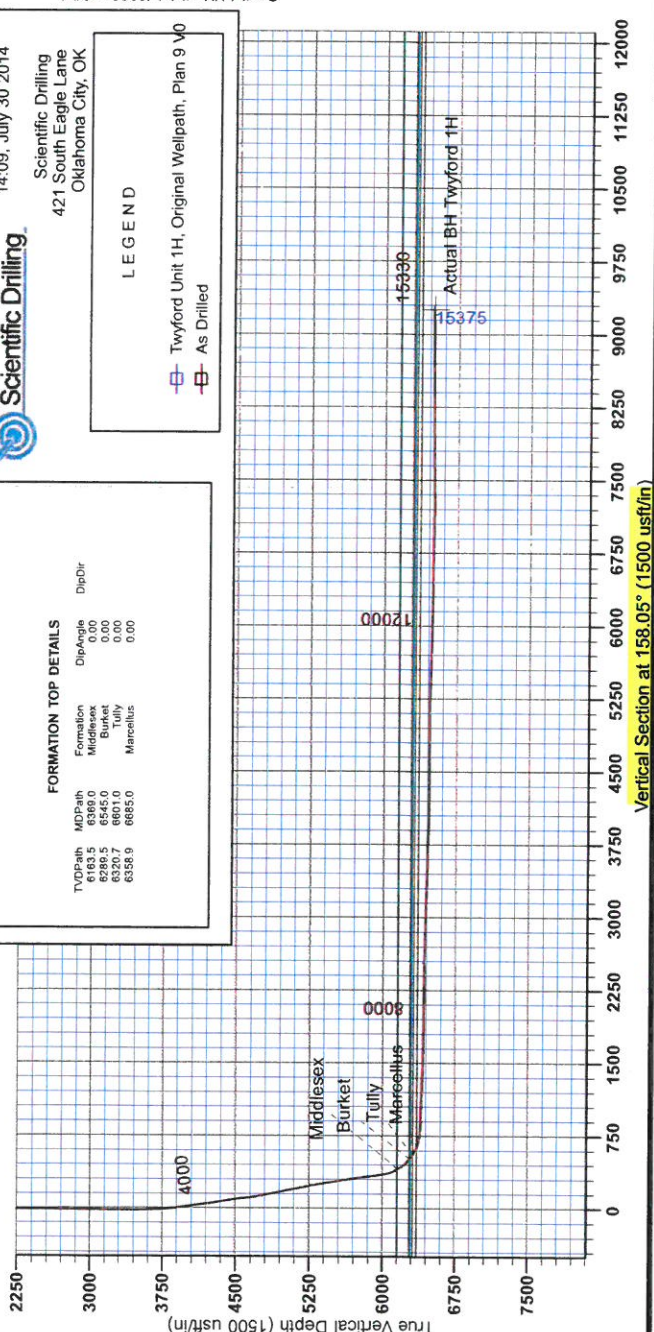
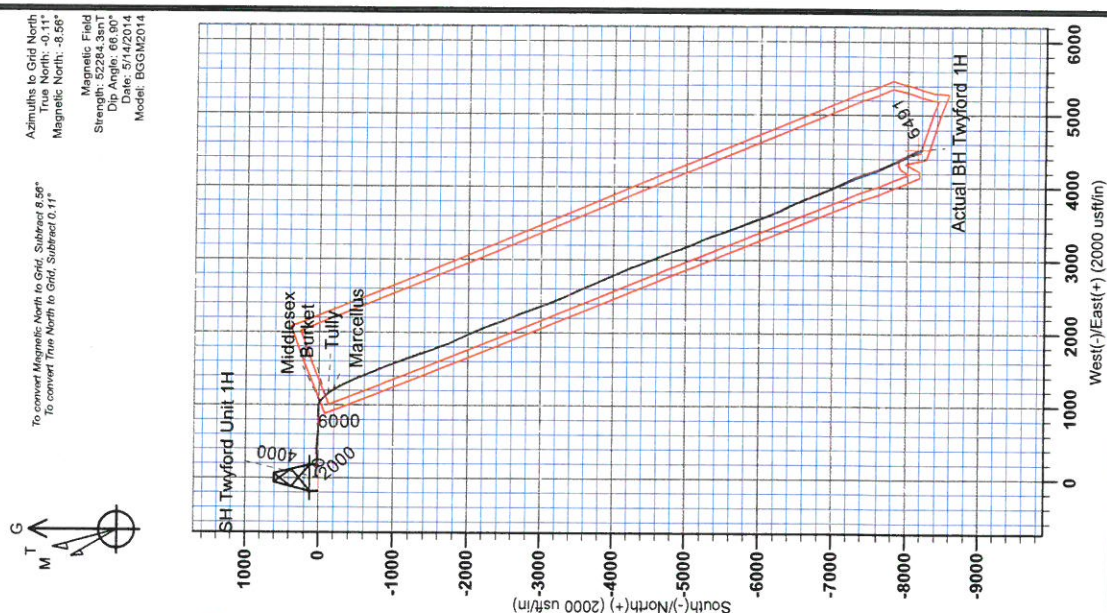
**FORMATION TOP DETAILS**

| MDPath | MD     | DipAngle | DipDir |
|--------|--------|----------|--------|
| 6183.5 | 6369.0 | 0.00     |        |
| 6286.5 | 6545.0 | 0.00     |        |
| 6389.5 | 6721.0 | 0.00     |        |
| 6588.9 | 6885.0 | 0.00     |        |

---

**LEGEND**

- Twyford Unit 1H, Original Wellpath, Plan 9 V0
- As Drilled





RECEIVED

JUN 15 2015

WV GEOLOGICAL SURVEY  
MORGANTOWN, WV

## **Antero Resources**

**Doddridge County WV  
Shearer/Hiley/McPherson/Twyford Pad  
Twyford Unit 1H**

**Original Wellpath**

**Design: As Drilled**

## **Standard Survey Report**

**30 July, 2014**





JUN 15 2015



Scientific Drilling International  
Survey Report



|                  |                                     |                                     |  |
|------------------|-------------------------------------|-------------------------------------|--|
| <b>Company:</b>  | Antero Resources                    | <b>Local Co-ordinate Reference:</b> | Well Twyford Unit 1H                     |
| <b>Project:</b>  | Doddridge County WV                 | <b>TVD Reference:</b>               | F3 Twyford 1H 824 GL + 23 KB @ 847.0usft |
| <b>Site:</b>     | Shearer/Hiley/McPherson/Twyford Pad | <b>MD Reference:</b>                | F3 Twyford 1H 824 GL + 23 KB @ 847.0usft |
| <b>Well:</b>     | Twyford Unit 1H                     | <b>North Reference:</b>             | Grid                                     |
| <b>Wellbore:</b> | Original Wellpath                   | <b>Survey Calculation Method:</b>   | Minimum Curvature                        |
| <b>Design:</b>   | As Drilled                          | <b>Database:</b>                    | Oklahoma District                        |

|                    |  |                      |                |
|--------------------|--|----------------------|----------------|
| <b>Project</b>     | Doddridge County WV, McClellan District        |                      |                |
| <b>Map System:</b> | Universal Transverse Mercator (US Survey Feet) | <b>System Datum:</b> | Mean Sea Level |
| <b>Geo Datum:</b>  | NAD 1927 (NADCON CONUS)                        |                      |                |
| <b>Map Zone:</b>   | Zone 17N (84 W to 78 W)                        |                      |                |

|                              |                                     |                     |                    |                          |                  |
|------------------------------|-------------------------------------|---------------------|--------------------|--------------------------|------------------|
| <b>Site</b>                  | Shearer/Hiley/McPherson/Twyford Pad |                     |                    |                          |                  |
| <b>Site Position:</b>        |                                     | <b>Northing:</b>    | 14,272,631.37 usft | <b>Latitude:</b>         | 39° 18' 14.002 N |
| <b>From:</b>                 | Map                                 | <b>Easting:</b>     | 1,690,515.37 usft  | <b>Longitude:</b>        | 80° 49' 22.435 W |
| <b>Position Uncertainty:</b> | 2.0 usft                            | <b>Slot Radius:</b> | 13-3/16 "          | <b>Grid Convergence:</b> | 0.11 °           |

|                             |                 |          |                            |                    |                      |                  |
|-----------------------------|-----------------|----------|----------------------------|--------------------|----------------------|------------------|
| <b>Well</b>                 | Twyford Unit 1H |          |                            |                    |                      |                  |
| <b>Well Position</b>        | <b>+N/-S</b>    | 0.0 usft | <b>Northing:</b>           | 14,272,641.39 usft | <b>Latitude:</b>     | 39° 18' 14.101 N |
|                             | <b>+E/-W</b>    | 0.0 usft | <b>Easting:</b>            | 1,690,517.20 usft  | <b>Longitude:</b>    | 80° 49' 22.411 W |
| <b>Position Uncertainty</b> | 2.0 usft        |          | <b>Wellhead Elevation:</b> | 847.0 usft         | <b>Ground Level:</b> | 824.0 usft       |

|                 |                   |  |  |  |  |
|-----------------|-------------------|--|--|--|--|
| <b>Wellbore</b> | Original Wellpath |  |  |  |  |
|-----------------|-------------------|--|--|--|--|

| Magnetics | Model Name | Sample Date | Declination (°) | Dip Angle (°) | Field Strength (nT) |
|-----------|------------|-------------|-----------------|---------------|---------------------|
|           | BGGM2014   | 5/14/2014   | -8.45           | 66.90         | 52,284              |

|               |            |  |  |  |  |
|---------------|------------|--|--|--|--|
| <b>Design</b> | As Drilled |  |  |  |  |
|---------------|------------|--|--|--|--|

|                     |     |               |        |                      |     |
|---------------------|-----|---------------|--------|----------------------|-----|
| <b>Audit Notes:</b> |     |               |        |                      |     |
| <b>Version:</b>     | 1.0 | <b>Phase:</b> | ACTUAL | <b>Tie On Depth:</b> | 0.0 |

|                          |                                |                     |                     |                      |
|--------------------------|--------------------------------|---------------------|---------------------|----------------------|
| <b>Vertical Section:</b> | <b>Depth From (TVD) (usft)</b> | <b>+N/-S (usft)</b> | <b>+E/-W (usft)</b> | <b>Direction (°)</b> |
|                          | 0.0                            | 0.0                 | 0.0                 | 158.05               |

| Survey Program |           | Date                                     |                     |  |  |
|----------------|-----------|--|---------------------|--|--|
| From (usft)    | To (usft) | Survey (Wellbore)                        | Tool Name           | Description  |  |
| 110.0          | 3,468.0   | Survey #4 Final Gyro (Original Wellpath) | SDI Standard Keeper | Scientific Drilling Intl. Standard Wireline Keeper |  |
| 3,510.0        | 15,330.0  | Survey #3 MWD (Original Wellpath)        | MWD SDI             | MWD - Standard ver 1.0.1                           |  |

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|-----------------------|-----------------|-------------|-----------------------|--------------|--------------|-------------------------|-------------------------|------------------------|-----------------------|
| 0.0                   | 0.00            | 0.00        | 0.0                   | 0.0          | 0.0          | 0.0                     | 0.00                    | 0.00                   | 0.00                  |
| 110.0                 | 0.76            | 240.62      | 110.0                 | -0.4         | -0.6         | 0.1                     | 0.69                    | 0.69                   | 0.00                  |
| 210.0                 | 0.66            | 254.90      | 210.0                 | -0.8         | -1.8         | 0.1                     | 0.20                    | -0.10                  | 14.28                 |
| 310.0                 | 0.49            | 253.42      | 310.0                 | -1.1         | -2.7         | 0.0                     | 0.17                    | -0.17                  | -1.48                 |
| 410.0                 | 0.29            | 252.80      | 410.0                 | -1.3         | -3.4         | -0.1                    | 0.20                    | -0.20                  | -0.62                 |
| 510.0                 | 0.19            | 229.97      | 510.0                 | -1.5         | -3.8         | 0.0                     | 0.14                    | -0.10                  | -22.83                |
| 610.0                 | 0.11            | 246.81      | 610.0                 | -1.6         | -4.0         | 0.0                     | 0.09                    | -0.08                  | 16.84                 |
| 710.0                 | 0.13            | 244.72      | 710.0                 | -1.7         | -4.2         | 0.0                     | 0.02                    | 0.02                   | -2.09                 |
| 810.0                 | 0.15            | 1.31        | 810.0                 | -1.6         | -4.3         | -0.1                    | 0.24                    | 0.02                   | 116.59                |
| 910.0                 | 2.69            | 35.01       | 909.9                 | 0.4          | -2.9         | -1.5                    | 2.57                    | 2.54                   | 33.70                 |

JUN 15 2015



Scientific Drilling International

Survey Report



|                  |                                     |                                     |  |
|------------------|-------------------------------------|-------------------------------------|--|
| <b>Company:</b>  | Antero Resources                    | <b>Local Co-ordinate Reference:</b> | Well Twyford Unit 1H                     |
| <b>Project:</b>  | Doddridge County WV                 | <b>TVD Reference:</b>               | F3 Twyford 1H 824 GL + 23 KB @ 847.0usft |
| <b>Site:</b>     | Shearer/Hiley/McPherson/Twyford Pad | <b>MD Reference:</b>                | F3 Twyford 1H 824 GL + 23 KB @ 847.0usft |
| <b>Well:</b>     | Twyford Unit 1H                     | <b>North Reference:</b>             | Grid                                     |
| <b>Wellbore:</b> | Original Wellpath                   | <b>Survey Calculation Method:</b>   | Minimum Curvature                        |
| <b>Design:</b>   | As Drilled                          | <b>Database:</b>                    | Oklahoma District                        |

Survey

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N-S (usft) | +E-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|-----------------------|-----------------|-------------|-----------------------|-------------|-------------|-------------------------|-------------------------|------------------------|-----------------------|
| 1,010.0               | 3.97            | 49.21       | 1,009.8               | 4.6         | 1.1         | -3.9                    | 1.51                    | 1.28                   | 14.20                 |
| 1,110.0               | 4.32            | 53.22       | 1,109.5               | 9.1         | 6.7         | -6.0                    | 0.45                    | 0.35                   | 4.01                  |
| 1,210.0               | 4.06            | 54.58       | 1,209.2               | 13.4        | 12.6        | -7.7                    | 0.28                    | -0.26                  | 1.36                  |
| 1,310.0               | 3.26            | 56.26       | 1,309.0               | 17.1        | 17.8        | -9.2                    | 0.81                    | -0.80                  | 1.68                  |
| 1,410.0               | 2.71            | 57.16       | 1,408.9               | 19.9        | 22.2        | -10.2                   | 0.55                    | -0.55                  | 0.90                  |
| 1,510.0               | 2.07            | 61.31       | 1,508.8               | 22.1        | 25.8        | -10.8                   | 0.66                    | -0.64                  | 4.15                  |
| 1,610.0               | 1.82            | 60.82       | 1,608.8               | 23.7        | 28.7        | -11.3                   | 0.25                    | -0.25                  | -0.49                 |
| 1,710.0               | 1.35            | 57.25       | 1,708.7               | 25.1        | 31.1        | -11.7                   | 0.48                    | -0.47                  | -3.57                 |
| 1,810.0               | 1.21            | 55.73       | 1,808.7               | 26.4        | 33.0        | -12.1                   | 0.14                    | -0.14                  | -1.52                 |
| 1,910.0               | 0.97            | 52.55       | 1,908.7               | 27.5        | 34.5        | -12.6                   | 0.25                    | -0.24                  | -3.18                 |
| 2,010.0               | 0.81            | 49.05       | 2,008.7               | 28.4        | 35.7        | -13.0                   | 0.17                    | -0.16                  | -3.50                 |
| 2,110.0               | 0.74            | 45.57       | 2,108.7               | 29.4        | 36.7        | -13.5                   | 0.08                    | -0.07                  | -3.48                 |
| 2,210.0               | 0.58            | 27.33       | 2,208.6               | 30.3        | 37.4        | -14.1                   | 0.26                    | -0.16                  | -18.24                |
| 2,310.0               | 0.44            | 32.39       | 2,308.6               | 31.0        | 37.9        | -14.6                   | 0.15                    | -0.14                  | 5.06                  |
| 2,410.0               | 0.52            | 14.65       | 2,408.6               | 31.8        | 38.2        | -15.2                   | 0.17                    | 0.08                   | -17.74                |
| 2,510.0               | 0.50            | 18.55       | 2,508.6               | 32.6        | 38.4        | -15.9                   | 0.04                    | -0.02                  | 3.90                  |
| 2,610.0               | 0.48            | 6.89        | 2,608.6               | 33.5        | 38.6        | -16.6                   | 0.10                    | -0.02                  | -11.66                |
| 2,710.0               | 0.28            | 332.64      | 2,708.6               | 34.1        | 38.6        | -17.2                   | 0.29                    | -0.20                  | -34.25                |
| 2,810.0               | 0.31            | 307.84      | 2,808.6               | 34.5        | 38.2        | -17.7                   | 0.13                    | 0.03                   | -24.80                |
| 2,910.0               | 0.35            | 321.04      | 2,908.6               | 34.9        | 37.8        | -18.2                   | 0.09                    | 0.04                   | 13.20                 |
| 3,010.0               | 0.43            | 291.24      | 3,008.6               | 35.3        | 37.3        | -18.8                   | 0.21                    | 0.08                   | -29.80                |
| 3,110.0               | 0.39            | 297.32      | 3,108.6               | 35.6        | 36.6        | -19.3                   | 0.06                    | -0.04                  | 6.08                  |
| 3,210.0               | 0.61            | 316.19      | 3,208.6               | 36.1        | 36.0        | -20.0                   | 0.27                    | 0.22                   | 18.87                 |
| 3,310.0               | 0.43            | 307.05      | 3,308.6               | 36.7        | 35.3        | -20.9                   | 0.20                    | -0.18                  | -9.14                 |
| 3,410.0               | 0.46            | 326.11      | 3,408.6               | 37.3        | 34.8        | -21.6                   | 0.15                    | 0.03                   | 19.06                 |
| 3,510.0               | 0.40            | 328.19      | 3,508.6               | 37.9        | 34.4        | -22.3                   | 0.06                    | -0.06                  | 2.08                  |
| 3,578.2               | 2.04            | 95.79       | 3,576.8               | 38.0        | 35.4        | -22.0                   | 3.38                    | 2.40                   | 187.07                |
| 3,610.0               | 3.11            | 98.51       | 3,608.6               | 37.8        | 36.9        | -21.3                   | 3.39                    | 3.37                   | 8.56                  |
| 3,710.0               | 7.32            | 93.03       | 3,708.1               | 37.1        | 45.9        | -17.2                   | 4.23                    | 4.21                   | -5.48                 |
| 3,810.0               | 10.48           | 96.21       | 3,806.9               | 35.7        | 61.3        | -10.2                   | 3.20                    | 3.16                   | 3.18                  |
| 3,845.7               | 11.62           | 97.56       | 3,841.9               | 34.9        | 68.1        | -6.9                    | 3.28                    | 3.19                   | 3.78                  |
| 3,910.0               | 13.68           | 99.43       | 3,904.7               | 32.8        | 82.0        | 0.2                     | 3.27                    | 3.20                   | 2.91                  |
| 4,010.0               | 16.32           | 97.10       | 4,001.3               | 29.1        | 107.6       | 13.2                    | 2.71                    | 2.64                   | -2.33                 |
| 4,110.0               | 18.49           | 95.44       | 4,096.7               | 25.9        | 137.4       | 27.3                    | 2.23                    | 2.17                   | -1.66                 |
| 4,210.0               | 19.38           | 92.02       | 4,191.3               | 23.8        | 169.7       | 41.4                    | 1.42                    | 0.89                   | -3.42                 |
| 4,310.0               | 22.35           | 90.89       | 4,284.7               | 22.9        | 205.3       | 55.5                    | 3.00                    | 2.97                   | -1.13                 |
| 4,324.9               | 22.60           | 91.13       | 4,298.5               | 22.8        | 211.0       | 57.7                    | 1.78                    | 1.67                   | 1.61                  |
| 4,410.0               | 24.02           | 92.41       | 4,376.6               | 21.8        | 244.7       | 71.3                    | 1.77                    | 1.67                   | 1.50                  |
| 4,510.0               | 23.16           | 88.82       | 4,468.3               | 21.3        | 284.7       | 86.6                    | 1.67                    | -0.86                  | -3.59                 |
| 4,610.0               | 22.04           | 84.95       | 4,560.6               | 23.4        | 323.0       | 99.1                    | 1.86                    | -1.12                  | -3.87                 |
| 4,710.0               | 21.79           | 87.58       | 4,653.4               | 25.8        | 360.3       | 110.7                   | 1.01                    | -0.25                  | 2.63                  |
| 4,792.8               | 22.56           | 90.58       | 4,730.1               | 26.3        | 391.5       | 121.9                   | 1.65                    | 0.93                   | 3.62                  |
| 4,810.0               | 22.73           | 91.18       | 4,745.9               | 26.2        | 398.1       | 124.5                   | 1.67                    | 0.99                   | 3.49                  |



JUN 15 2015



## Scientific Drilling International

Survey Report



**Company:** Antero Resources  
**Project:** Doddridge County WV  
**Site:** Shearer/Hiley/McPherson/Twyford Pad  
**Well:** Twyford Unit 1H  
**Wellbore:** Original Wellpath  
**Design:** As Drilled

**Local Co-ordinate Reference:** Well Twyford Unit 1H  
**TVD Reference:** F3 Twyford 1H 824 GL + 23 KB @ 847.0usft  
**MD Reference:** F3 Twyford 1H 824 GL + 23 KB @ 847.0usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** Oklahoma District

**Survey**

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|-----------------------|-----------------|-------------|-----------------------|--------------|--------------|-------------------------|-------------------------|------------------------|-----------------------|
| 4,910.0               | 25.43           | 93.95       | 4,837.2               | 24.3         | 438.9        | 141.5                   | 2.93                    | 2.70                   | 2.77                  |
| 5,010.0               | 26.11           | 94.70       | 4,927.3               | 21.0         | 482.2        | 160.7                   | 0.75                    | 0.68                   | 0.75                  |
| 5,081.4               | 25.76           | 94.69       | 4,991.5               | 18.5         | 513.4        | 174.7                   | 0.49                    | -0.49                  | -0.01                 |
| 5,110.0               | 25.62           | 94.68       | 5,017.3               | 17.5         | 525.7        | 180.3                   | 0.49                    | -0.49                  | -0.04                 |
| 5,210.0               | 25.26           | 93.55       | 5,107.6               | 14.4         | 568.6        | 199.2                   | 0.60                    | -0.36                  | -1.13                 |
| 5,310.0               | 25.15           | 93.86       | 5,198.1               | 11.6         | 611.0        | 217.6                   | 0.17                    | -0.11                  | 0.31                  |
| 5,410.0               | 24.05           | 93.62       | 5,289.0               | 8.9          | 652.6        | 235.7                   | 1.10                    | -1.10                  | -0.24                 |
| 5,510.0               | 23.86           | 91.71       | 5,380.4               | 7.0          | 693.1        | 252.6                   | 0.80                    | -0.19                  | -1.91                 |
| 5,610.0               | 23.30           | 91.87       | 5,472.0               | 5.8          | 733.1        | 268.7                   | 0.56                    | -0.56                  | 0.16                  |
| 5,710.0               | 22.12           | 92.25       | 5,564.3               | 4.4          | 771.7        | 284.4                   | 1.19                    | -1.18                  | 0.38                  |
| 5,810.0               | 22.13           | 91.06       | 5,656.9               | 3.3          | 809.4        | 299.5                   | 0.45                    | 0.01                   | -1.19                 |
| 5,910.0               | 22.50           | 89.46       | 5,749.4               | 3.1          | 847.3        | 313.8                   | 0.71                    | 0.37                   | -1.60                 |
| 5,944.0               | 22.04           | 89.33       | 5,780.9               | 3.3          | 860.2        | 318.5                   | 1.36                    | -1.35                  | -0.38                 |
| 6,026.0               | 21.62           | 86.67       | 5,857.0               | 4.3          | 890.7        | 328.9                   | 1.31                    | -0.51                  | -3.24                 |
| 6,046.0               | 21.54           | 87.11       | 5,875.6               | 4.7          | 898.0        | 331.3                   | 0.90                    | -0.40                  | 2.20                  |
| 6,078.0               | 21.15           | 85.43       | 5,905.4               | 5.5          | 909.6        | 334.9                   | 2.27                    | -1.22                  | -5.25                 |
| 6,141.0               | 21.05           | 85.01       | 5,964.2               | 7.4          | 932.2        | 341.6                   | 0.29                    | -0.16                  | -0.67                 |
| 6,173.0               | 24.72           | 88.86       | 5,993.6               | 8.0          | 944.7        | 345.7                   | 12.38                   | 11.47                  | 12.03                 |
| 6,204.0               | 26.98           | 90.67       | 6,021.5               | 8.1          | 958.2        | 350.7                   | 7.72                    | 7.29                   | 5.84                  |
| 6,236.0               | 27.35           | 92.46       | 6,050.0               | 7.7          | 972.8        | 356.5                   | 2.80                    | 1.16                   | 5.59                  |
| 6,268.0               | 28.62           | 100.99      | 6,078.3               | 5.9          | 987.6        | 363.7                   | 13.11                   | 3.97                   | 26.66                 |
| 6,299.0               | 30.99           | 107.66      | 6,105.2               | 2.0          | 1,002.5      | 372.8                   | 13.14                   | 7.65                   | 21.52                 |
| 6,331.0               | 33.37           | 113.50      | 6,132.3               | -4.0         | 1,018.5      | 384.4                   | 12.23                   | 7.44                   | 18.25                 |
| 6,362.0               | 35.57           | 119.22      | 6,157.8               | -11.8        | 1,034.2      | 397.5                   | 12.62                   | 7.10                   | 18.45                 |
| 6,369.0               | 36.14           | 120.30      | 6,163.5               | -13.8        | 1,037.7      | 400.7                   | 12.17                   | 8.14                   | 15.45                 |
| <b>Middlesex</b>      |                 |             |                       |              |              |                         |                         |                        |                       |
| 6,394.0               | 38.25           | 123.93      | 6,183.4               | -21.8        | 1,050.5      | 412.9                   | 12.17                   | 8.44                   | 14.52                 |
| 6,426.0               | 41.24           | 127.55      | 6,208.0               | -33.8        | 1,067.1      | 430.2                   | 11.81                   | 9.34                   | 11.31                 |
| 6,458.0               | 44.21           | 131.20      | 6,231.5               | -47.6        | 1,083.9      | 449.3                   | 12.08                   | 9.28                   | 11.41                 |
| 6,489.0               | 46.92           | 133.72      | 6,253.2               | -62.5        | 1,100.2      | 469.2                   | 10.49                   | 8.74                   | 8.13                  |
| 6,521.0               | 49.85           | 135.40      | 6,274.5               | -79.3        | 1,117.2      | 491.2                   | 9.96                    | 9.16                   | 5.25                  |
| 6,545.0               | 52.90           | 137.22      | 6,289.5               | -92.9        | 1,130.2      | 508.6                   | 14.02                   | 12.70                  | 7.60                  |
| <b>Burket</b>         |                 |             |                       |              |              |                         |                         |                        |                       |
| 6,553.0               | 53.92           | 137.80      | 6,294.2               | -97.6        | 1,134.5      | 514.6                   | 14.02                   | 12.77                  | 7.19                  |
| 6,584.0               | 57.40           | 141.21      | 6,311.7               | -117.1       | 1,151.1      | 538.9                   | 14.44                   | 11.23                  | 11.00                 |
| 6,601.0               | 58.88           | 142.28      | 6,320.7               | -128.4       | 1,160.0      | 552.7                   | 10.23                   | 8.73                   | 6.27                  |
| <b>Tully</b>          |                 |             |                       |              |              |                         |                         |                        |                       |
| 6,616.0               | 60.20           | 143.19      | 6,328.3               | -138.7       | 1,167.9      | 565.2                   | 10.23                   | 8.78                   | 6.09                  |
| 6,647.0               | 63.19           | 144.80      | 6,343.0               | -160.8       | 1,183.9      | 591.7                   | 10.67                   | 9.65                   | 5.19                  |
| 6,679.0               | 66.79           | 145.75      | 6,356.5               | -184.6       | 1,200.4      | 620.0                   | 11.57                   | 11.25                  | 2.97                  |
| 6,685.0               | 67.51           | 146.03      | 6,358.9               | -189.2       | 1,203.5      | 625.4                   | 12.72                   | 11.95                  | 4.71                  |
| <b>Marcellus</b>      |                 |             |                       |              |              |                         |                         |                        |                       |
| 6,710.0               | 70.50           | 147.18      | 6,367.8               | -208.7       | 1,216.4      | 648.2                   | 12.72                   | 11.97                  | 4.59                  |
| 6,741.0               | 74.65           | 148.66      | 6,377.1               | -233.7       | 1,232.1      | 677.3                   | 14.14                   | 13.39                  | 4.77                  |



**Company:** Antero Resources  
**Project:** Doddridge County WV  
**Site:** Shearer/Hiley/McPherson/Twyford Pad  
**Well:** Twyford Unit 1H  
**Wellbore:** Original Wellpath  
**Design:** As Drilled

**Local Co-ordinate Reference:** Well Twyford Unit 1H  
**TVD Reference:** F3 Twyford 1H 824 GL + 23 KB @ 847.0usft  
**MD Reference:** F3 Twyford 1H 824 GL + 23 KB @ 847.0usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** Oklahoma District

**Survey**

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|-----------------------|-----------------|-------------|-----------------------|--------------|--------------|-------------------------|-------------------------|------------------------|-----------------------|
| 6,772.0               | 78.88           | 150.24      | 6,384.2               | -259.7       | 1,247.4      | 707.2                   | 14.52                   | 13.65                  | 5.10                  |
| 6,803.0               | 82.20           | 150.96      | 6,389.3               | -286.4       | 1,262.4      | 737.5                   | 10.95                   | 10.71                  | 2.32                  |
| 6,881.0               | 88.86           | 156.09      | 6,395.4               | -355.9       | 1,297.0      | 814.9                   | 10.76                   | 8.54                   | 6.58                  |
| 6,976.0               | 87.78           | 155.76      | 6,398.2               | -442.6       | 1,335.8      | 909.8                   | 1.19                    | -1.14                  | -0.35                 |
| 7,070.0               | 88.26           | 153.52      | 6,401.4               | -527.5       | 1,376.0      | 1,003.6                 | 2.44                    | 0.51                   | -2.38                 |
| 7,165.0               | 87.99           | 156.91      | 6,404.5               | -613.7       | 1,415.8      | 1,098.4                 | 3.58                    | -0.28                  | 3.57                  |
| 7,260.0               | 88.22           | 156.94      | 6,407.7               | -701.0       | 1,453.0      | 1,193.4                 | 0.24                    | 0.24                   | 0.03                  |
| 7,354.0               | 87.95           | 158.87      | 6,410.8               | -788.1       | 1,488.3      | 1,287.3                 | 2.07                    | -0.29                  | 2.05                  |
| 7,449.0               | 87.95           | 157.61      | 6,414.2               | -876.3       | 1,523.5      | 1,382.2                 | 1.33                    | 0.00                   | -1.33                 |
| 7,543.0               | 87.78           | 160.51      | 6,417.7               | -964.0       | 1,557.1      | 1,476.1                 | 3.09                    | -0.18                  | 3.09                  |
| 7,639.0               | 89.40           | 157.42      | 6,420.1               | -1,053.5     | 1,591.5      | 1,572.1                 | 3.63                    | 1.69                   | -3.22                 |
| 7,734.0               | 88.93           | 159.26      | 6,421.4               | -1,141.8     | 1,626.6      | 1,667.1                 | 2.00                    | -0.49                  | 1.94                  |
| 7,829.0               | 89.06           | 159.46      | 6,423.1               | -1,230.7     | 1,660.1      | 1,762.0                 | 0.25                    | 0.14                   | 0.21                  |
| 7,923.0               | 88.99           | 160.88      | 6,424.7               | -1,319.1     | 1,692.0      | 1,856.0                 | 1.51                    | -0.07                  | 1.51                  |
| 8,016.0               | 89.63           | 161.91      | 6,425.8               | -1,407.3     | 1,721.6      | 1,948.8                 | 1.30                    | 0.69                   | 1.11                  |
| 8,112.0               | 90.27           | 159.11      | 6,425.9               | -1,497.7     | 1,753.7      | 2,044.7                 | 2.99                    | 0.67                   | -2.92                 |
| 8,208.0               | 89.26           | 159.44      | 6,426.3               | -1,587.5     | 1,787.6      | 2,140.7                 | 1.11                    | -1.05                  | 0.34                  |
| 8,302.0               | 89.50           | 159.82      | 6,427.3               | -1,675.6     | 1,820.4      | 2,234.6                 | 0.48                    | 0.26                   | 0.40                  |
| 8,397.0               | 88.69           | 156.48      | 6,428.8               | -1,763.8     | 1,855.7      | 2,329.6                 | 3.62                    | -0.85                  | -3.52                 |
| 8,492.0               | 89.46           | 155.09      | 6,430.4               | -1,850.4     | 1,894.7      | 2,424.5                 | 1.67                    | 0.81                   | -1.46                 |
| 8,587.0               | 88.46           | 154.91      | 6,432.1               | -1,936.5     | 1,934.8      | 2,519.4                 | 1.07                    | -1.05                  | -0.19                 |
| 8,681.0               | 88.99           | 154.64      | 6,434.2               | -2,021.5     | 1,974.9      | 2,613.2                 | 0.63                    | 0.56                   | -0.29                 |
| 8,776.0               | 88.82           | 157.20      | 6,436.0               | -2,108.2     | 2,013.6      | 2,708.1                 | 2.70                    | -0.18                  | 2.69                  |
| 8,871.0               | 89.23           | 157.07      | 6,437.6               | -2,195.8     | 2,050.5      | 2,803.1                 | 0.45                    | 0.43                   | -0.14                 |
| 8,966.0               | 88.66           | 159.88      | 6,439.4               | -2,284.1     | 2,085.4      | 2,898.0                 | 3.02                    | -0.60                  | 2.96                  |
| 9,056.0               | 88.35           | 160.00      | 6,441.7               | -2,368.6     | 2,116.2      | 2,988.0                 | 0.37                    | -0.34                  | 0.13                  |
| 9,145.0               | 89.03           | 159.78      | 6,443.7               | -2,452.2     | 2,146.8      | 3,076.9                 | 0.80                    | 0.76                   | -0.25                 |
| 9,235.0               | 88.22           | 157.01      | 6,445.9               | -2,535.8     | 2,179.9      | 3,166.8                 | 3.21                    | -0.90                  | -3.08                 |
| 9,325.0               | 88.39           | 157.20      | 6,448.6               | -2,618.7     | 2,214.9      | 3,256.8                 | 0.28                    | 0.19                   | 0.21                  |
| 9,415.0               | 89.43           | 158.27      | 6,450.3               | -2,702.0     | 2,249.0      | 3,346.8                 | 1.66                    | 1.16                   | 1.19                  |
| 9,506.0               | 88.76           | 160.27      | 6,451.7               | -2,787.0     | 2,281.2      | 3,437.7                 | 2.32                    | -0.74                  | 2.20                  |
| 9,596.0               | 89.43           | 160.43      | 6,453.1               | -2,871.8     | 2,311.5      | 3,527.7                 | 0.77                    | 0.74                   | 0.18                  |
| 9,687.0               | 87.79           | 159.80      | 6,455.3               | -2,957.3     | 2,342.4      | 3,618.6                 | 1.93                    | -1.80                  | -0.69                 |
| 9,777.0               | 88.08           | 160.59      | 6,458.6               | -3,042.0     | 2,372.9      | 3,708.4                 | 0.93                    | 0.32                   | 0.88                  |
| 9,868.0               | 87.92           | 157.82      | 6,461.8               | -3,127.0     | 2,405.2      | 3,799.4                 | 3.05                    | -0.18                  | -3.04                 |
| 9,958.0               | 87.54           | 157.80      | 6,465.3               | -3,210.2     | 2,439.2      | 3,889.3                 | 0.42                    | -0.42                  | -0.02                 |
| 10,049.0              | 89.43           | 157.23      | 6,467.7               | -3,294.3     | 2,473.9      | 3,980.2                 | 2.17                    | 2.08                   | -0.63                 |
| 10,144.0              | 90.03           | 155.78      | 6,468.2               | -3,381.4     | 2,511.8      | 4,075.2                 | 1.65                    | 0.63                   | -1.53                 |
| 10,239.0              | 90.34           | 154.54      | 6,467.9               | -3,467.6     | 2,551.7      | 4,170.1                 | 1.35                    | 0.33                   | -1.31                 |
| 10,333.0              | 89.36           | 156.31      | 6,468.1               | -3,553.1     | 2,590.8      | 4,264.0                 | 2.15                    | -1.04                  | 1.88                  |
| 10,429.0              | 89.87           | 157.11      | 6,468.8               | -3,641.3     | 2,628.8      | 4,360.0                 | 0.99                    | 0.53                   | 0.83                  |
| 10,523.0              | 90.74           | 157.32      | 6,468.3               | -3,727.9     | 2,665.2      | 4,453.9                 | 0.95                    | 0.93                   | 0.22                  |
| 10,617.0              | 88.99           | 157.65      | 6,468.5               | -3,814.8     | 2,701.2      | 4,547.9                 | 1.89                    | -1.86                  | 0.35                  |



JUN 15 2015



Scientific Drilling International  
Survey Report



**Company:** Antero Resources  
**Project:** Doddridge County WV  
**Site:** Shearer/Hiley/McPherson/Twyford Pad  
**Well:** Twyford Unit 1H  
**Wellbore:** Original Wellpath  
**Design:** As Drilled

**Local Co-ordinate Reference:** Well Twyford Unit 1H  
**TVD Reference:** F3 Twyford 1H 824 GL + 23 KB @ 847.0usft  
**MD Reference:** F3 Twyford 1H 824 GL + 23 KB @ 847.0usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** Oklahoma District

Survey

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|-----------------------|-----------------|-------------|-----------------------|--------------|--------------|-------------------------|-------------------------|------------------------|-----------------------|
| 10,712.0              | 89.40           | 156.36      | 6,469.8               | -3,902.2     | 2,738.3      | 4,642.9                 | 1.42                    | 0.43                   | -1.36                 |
| 10,807.0              | 88.99           | 155.40      | 6,471.1               | -3,988.9     | 2,777.1      | 4,737.8                 | 1.10                    | -0.43                  | -1.01                 |
| 10,901.0              | 89.43           | 156.01      | 6,472.4               | -4,074.6     | 2,815.8      | 4,831.7                 | 0.80                    | 0.47                   | 0.65                  |
| 10,996.0              | 89.83           | 157.08      | 6,473.1               | -4,161.7     | 2,853.6      | 4,926.7                 | 1.20                    | 0.42                   | 1.13                  |
| 11,091.0              | 90.17           | 159.73      | 6,473.1               | -4,250.0     | 2,888.5      | 5,021.7                 | 2.81                    | 0.36                   | 2.79                  |
| 11,186.0              | 90.50           | 159.50      | 6,472.5               | -4,339.1     | 2,921.6      | 5,116.7                 | 0.42                    | 0.35                   | -0.24                 |
| 11,281.0              | 89.23           | 158.25      | 6,472.7               | -4,427.7     | 2,955.9      | 5,211.6                 | 1.88                    | -1.34                  | -1.32                 |
| 11,375.0              | 88.02           | 159.44      | 6,475.0               | -4,515.3     | 2,989.8      | 5,305.6                 | 1.81                    | -1.29                  | 1.27                  |
| 11,471.0              | 87.88           | 159.02      | 6,478.4               | -4,605.0     | 3,023.8      | 5,401.5                 | 0.46                    | -0.15                  | -0.44                 |
| 11,565.0              | 88.49           | 157.28      | 6,481.4               | -4,692.2     | 3,058.8      | 5,495.5                 | 1.96                    | 0.65                   | -1.85                 |
| 11,660.0              | 88.75           | 160.11      | 6,483.7               | -4,780.7     | 3,093.3      | 5,590.4                 | 2.99                    | 0.27                   | 2.98                  |
| 11,754.0              | 88.79           | 161.99      | 6,485.7               | -4,869.6     | 3,123.8      | 5,684.3                 | 2.00                    | 0.04                   | 2.00                  |
| 11,848.0              | 88.56           | 157.14      | 6,487.9               | -4,957.6     | 3,156.6      | 5,778.2                 | 5.16                    | -0.24                  | -5.16                 |
| 11,942.0              | 88.79           | 158.36      | 6,490.0               | -5,044.6     | 3,192.2      | 5,872.2                 | 1.32                    | 0.24                   | 1.30                  |
| 12,037.0              | 89.09           | 155.17      | 6,491.8               | -5,131.9     | 3,229.6      | 5,967.1                 | 3.37                    | 0.32                   | -3.36                 |
| 12,133.0              | 89.56           | 154.56      | 6,492.9               | -5,218.8     | 3,270.4      | 6,062.9                 | 0.80                    | 0.49                   | -0.64                 |
| 12,227.0              | 89.09           | 160.33      | 6,494.0               | -5,305.5     | 3,306.4      | 6,156.9                 | 6.16                    | -0.50                  | 6.14                  |
| 12,323.0              | 88.96           | 162.53      | 6,495.7               | -5,396.5     | 3,337.0      | 6,252.7                 | 2.30                    | -0.14                  | 2.29                  |
| 12,417.0              | 88.96           | 160.00      | 6,497.4               | -5,485.5     | 3,367.2      | 6,346.5                 | 2.69                    | 0.00                   | -2.69                 |
| 12,511.0              | 89.60           | 159.59      | 6,498.6               | -5,573.7     | 3,399.7      | 6,440.5                 | 0.81                    | 0.68                   | -0.44                 |
| 12,607.0              | 90.03           | 159.73      | 6,498.9               | -5,663.7     | 3,433.0      | 6,536.4                 | 0.47                    | 0.45                   | 0.15                  |
| 12,701.0              | 88.66           | 158.14      | 6,500.0               | -5,751.5     | 3,466.8      | 6,630.4                 | 2.23                    | -1.46                  | -1.69                 |
| 12,796.0              | 88.76           | 159.16      | 6,502.1               | -5,839.9     | 3,501.4      | 6,725.4                 | 1.08                    | 0.11                   | 1.07                  |
| 12,891.0              | 89.46           | 159.53      | 6,503.6               | -5,928.8     | 3,534.9      | 6,820.4                 | 0.83                    | 0.74                   | 0.39                  |
| 12,985.0              | 90.13           | 160.39      | 6,503.9               | -6,017.1     | 3,567.1      | 6,914.3                 | 1.16                    | 0.71                   | 0.91                  |
| 13,080.0              | 89.16           | 157.59      | 6,504.5               | -6,105.8     | 3,601.2      | 7,009.3                 | 3.12                    | -1.02                  | -2.95                 |
| 13,175.0              | 89.77           | 155.40      | 6,505.4               | -6,192.9     | 3,639.0      | 7,104.2                 | 2.39                    | 0.64                   | -2.31                 |
| 13,270.0              | 89.93           | 155.52      | 6,505.6               | -6,279.3     | 3,678.5      | 7,199.1                 | 0.21                    | 0.17                   | 0.13                  |
| 13,365.0              | 89.83           | 153.42      | 6,505.8               | -6,365.0     | 3,719.4      | 7,293.9                 | 2.21                    | -0.11                  | -2.21                 |
| 13,460.0              | 90.03           | 154.76      | 6,505.9               | -6,450.5     | 3,761.0      | 7,388.7                 | 1.43                    | 0.21                   | 1.41                  |
| 13,555.0              | 91.01           | 156.49      | 6,505.1               | -6,537.0     | 3,800.2      | 7,483.6                 | 2.09                    | 1.03                   | 1.82                  |
| 13,650.0              | 89.90           | 158.16      | 6,504.3               | -6,624.6     | 3,836.8      | 7,578.6                 | 2.11                    | -1.17                  | 1.76                  |
| 13,745.0              | 90.64           | 158.79      | 6,503.9               | -6,713.0     | 3,871.6      | 7,673.6                 | 1.02                    | 0.78                   | 0.66                  |
| 13,840.0              | 91.37           | 156.75      | 6,502.2               | -6,800.9     | 3,907.6      | 7,768.6                 | 2.28                    | 0.77                   | -2.15                 |
| 13,935.0              | 89.80           | 155.98      | 6,501.2               | -6,888.0     | 3,945.6      | 7,863.5                 | 1.84                    | -1.65                  | -0.81                 |
| 14,029.0              | 89.90           | 156.33      | 6,501.5               | -6,973.9     | 3,983.6      | 7,957.5                 | 0.39                    | 0.11                   | 0.37                  |
| 14,124.0              | 90.57           | 155.53      | 6,501.1               | -7,060.7     | 4,022.4      | 8,052.4                 | 1.10                    | 0.71                   | -0.84                 |
| 14,219.0              | 90.57           | 155.32      | 6,500.2               | -7,147.1     | 4,061.9      | 8,147.3                 | 0.22                    | 0.00                   | -0.22                 |
| 14,313.0              | 90.40           | 156.33      | 6,499.4               | -7,232.8     | 4,100.4      | 8,241.2                 | 1.09                    | -0.18                  | 1.07                  |
| 14,409.0              | 90.27           | 156.57      | 6,498.8               | -7,320.8     | 4,138.7      | 8,337.2                 | 0.28                    | -0.14                  | 0.25                  |
| 14,503.0              | 90.50           | 158.24      | 6,498.2               | -7,407.6     | 4,174.9      | 8,431.2                 | 1.79                    | 0.24                   | 1.78                  |
| 14,598.0              | 91.01           | 159.69      | 6,496.9               | -7,496.3     | 4,209.0      | 8,526.2                 | 1.62                    | 0.54                   | 1.53                  |
| 14,694.0              | 91.04           | 158.07      | 6,495.2               | -7,585.8     | 4,243.5      | 8,622.1                 | 1.69                    | 0.03                   | -1.69                 |
| 14,788.0              | 89.33           | 154.85      | 6,494.9               | -7,672.0     | 4,281.1      | 8,716.1                 | 3.88                    | -1.82                  | -3.43                 |



**Company:** Antero Resources  
**Project:** Doddridge County WV  
**Site:** Shearer/Hiley/McPherson/Twyford Pad  
**Well:** Twyford Unit 1H  
**Wellbore:** Original Wellpath  
**Design:** As Drilled

**Local Co-ordinate Reference:** Well Twyford Unit 1H  
**TVD Reference:** F3 Twyford 1H 824 GL + 23 KB @ 847.0usft  
**MD Reference:** F3 Twyford 1H 824 GL + 23 KB @ 847.0usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** Oklahoma District

**Survey**

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) |
|-----------------------|-----------------|-------------|-----------------------|--------------|--------------|-------------------------|-------------------------|------------------------|-----------------------|
| 14,883.0              | 89.36           | 155.20      | 6,496.0               | -7,758.1     | 4,321.2      | 8,810.9                 | 0.37                    | 0.03                   | 0.37                  |
| 14,978.0              | 90.03           | 153.75      | 6,496.5               | -7,843.8     | 4,362.1      | 8,905.7                 | 1.68                    | 0.71                   | -1.53                 |
| 15,073.0              | 90.17           | 154.01      | 6,496.3               | -7,929.1     | 4,403.9      | 9,000.5                 | 0.31                    | 0.15                   | 0.27                  |
| 15,167.0              | 90.94           | 152.70      | 6,495.4               | -8,013.1     | 4,446.1      | 9,094.2                 | 1.62                    | 0.82                   | -1.39                 |
| 15,262.0              | 91.84           | 152.17      | 6,493.1               | -8,097.3     | 4,490.0      | 9,188.7                 | 1.10                    | 0.95                   | -0.56                 |
| 15,271.0              | 91.84           | 152.03      | 6,492.8               | -8,105.2     | 4,494.3      | 9,197.6                 | 1.55                    | 0.00                   | -1.56                 |
| 15,330.0              | 91.84           | 152.03      | 6,490.9               | -8,157.3     | 4,521.9      | 9,256.3                 | 0.00                    | 0.00                   | 0.00                  |

**Formations**

| Measured Depth (usft) | Vertical Depth (usft) | Name      | Lithology | Dip (°) | Dip Direction (°) |
|-----------------------|-----------------------|-----------|-----------|---------|-------------------|
| 6,369.0               | 6,163.5               | Middlesex |           | 0.00    |                   |
| 6,545.0               | 6,289.5               | Burket    |           | 0.00    |                   |
| 6,601.0               | 6,320.7               | Tully     |           | 0.00    |                   |
| 6,685.0               | 6,358.9               | Marcellus |           | 0.00    |                   |

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_

RECEIVED  
 JUN 15 2015  
 WV GEOLOGICAL SURVEY  
 MORGANTOWN, WV