

# **PDC ENERGY**

**WELD COUNTY, COLORADO**

**SE SE SEC. 18 T4N R67W 6th P.M.**

**RIEDER 18Y-241**

**JOB #2015-045-135**

**28 June, 2015**

**Survey: FINAL SURVEYS**





Project: WELD COUNTY, COLORADO  
Site: SE SE SEC. 18 T4N R67W 6th P.M.  
Well: RIEDER 18Y-241  
Wellbore: JOB #2015-045-135  
Design: FINAL SURVEYS

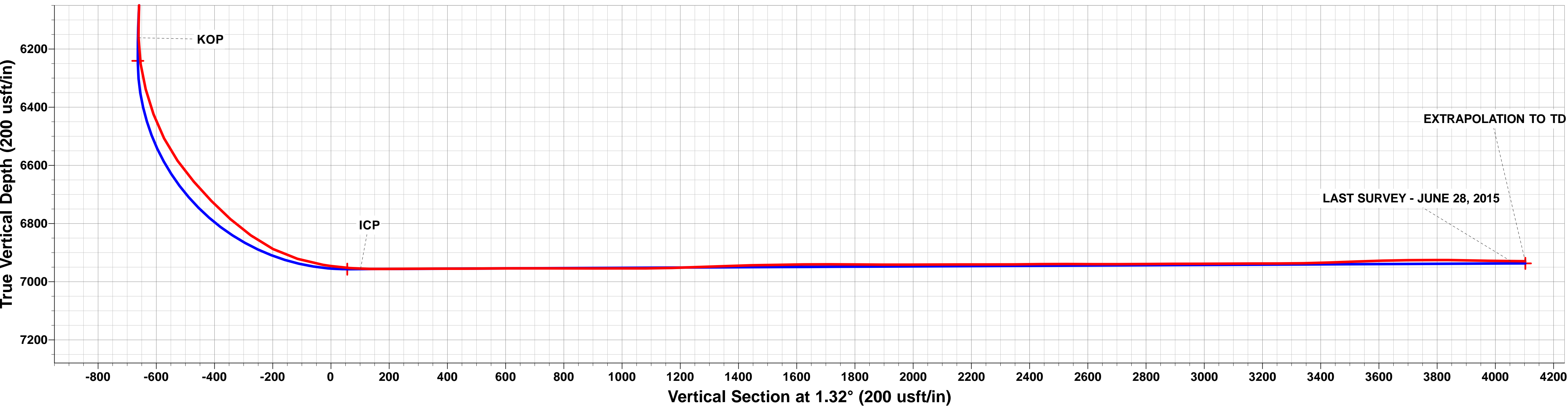
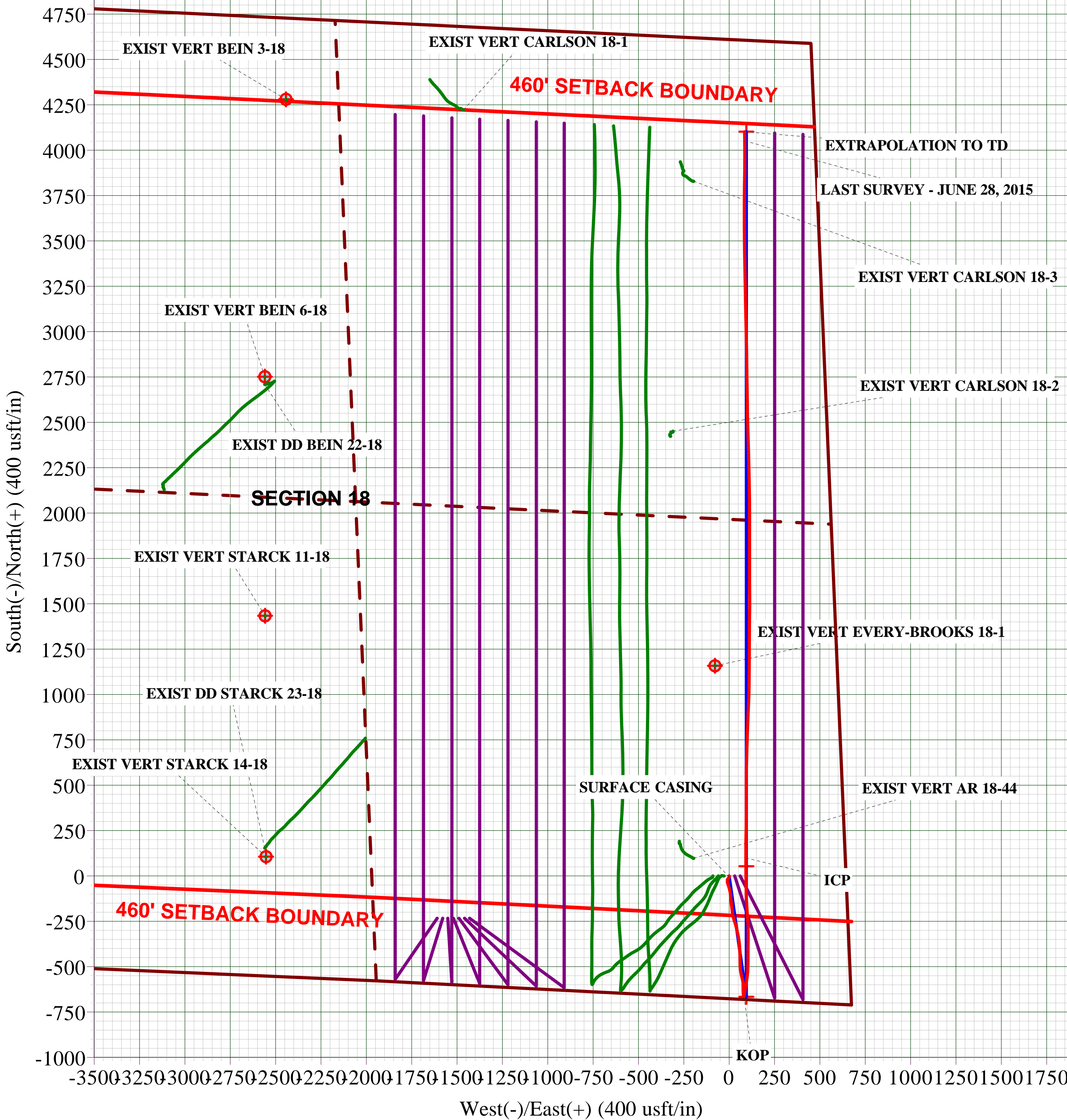
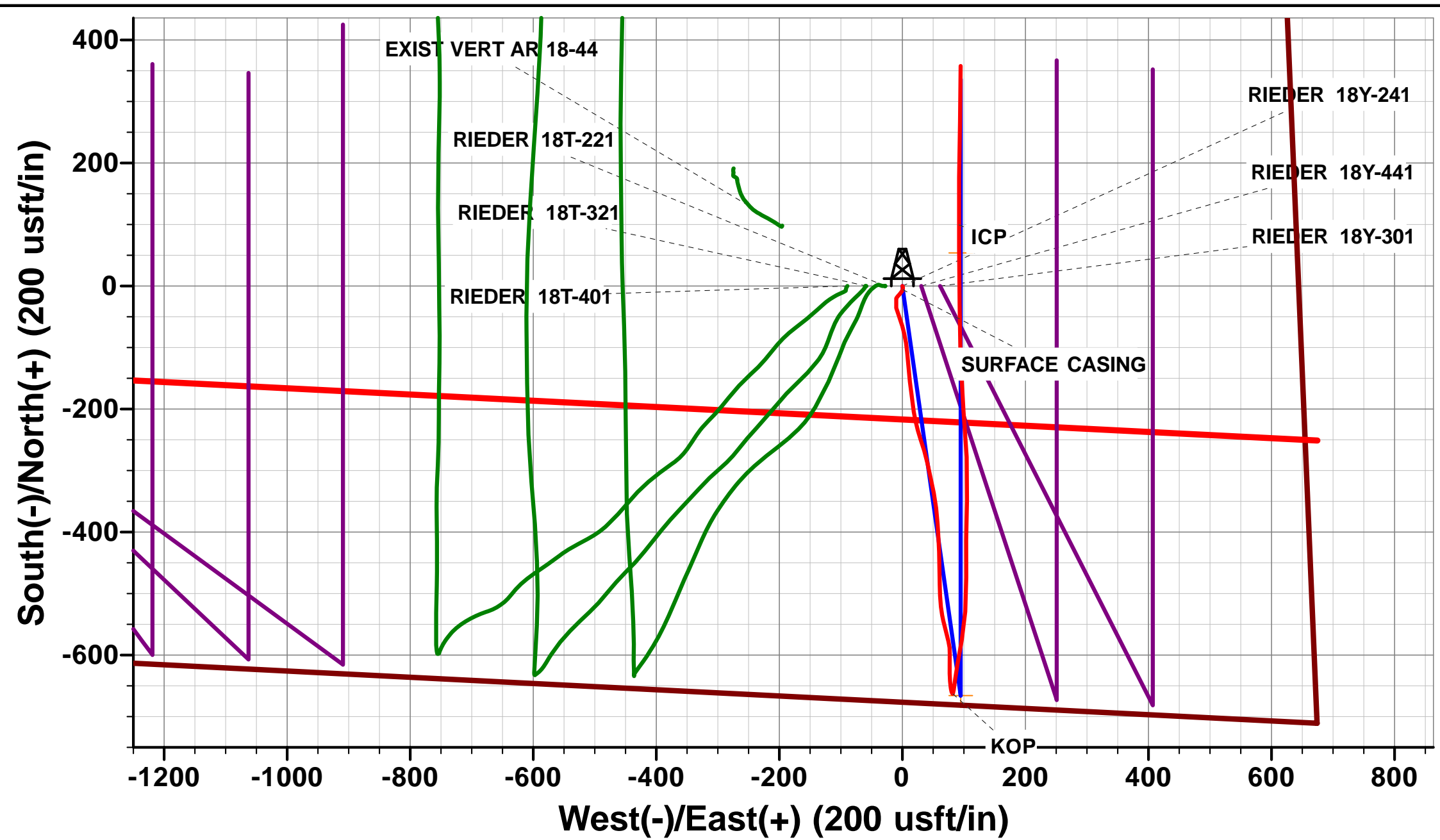
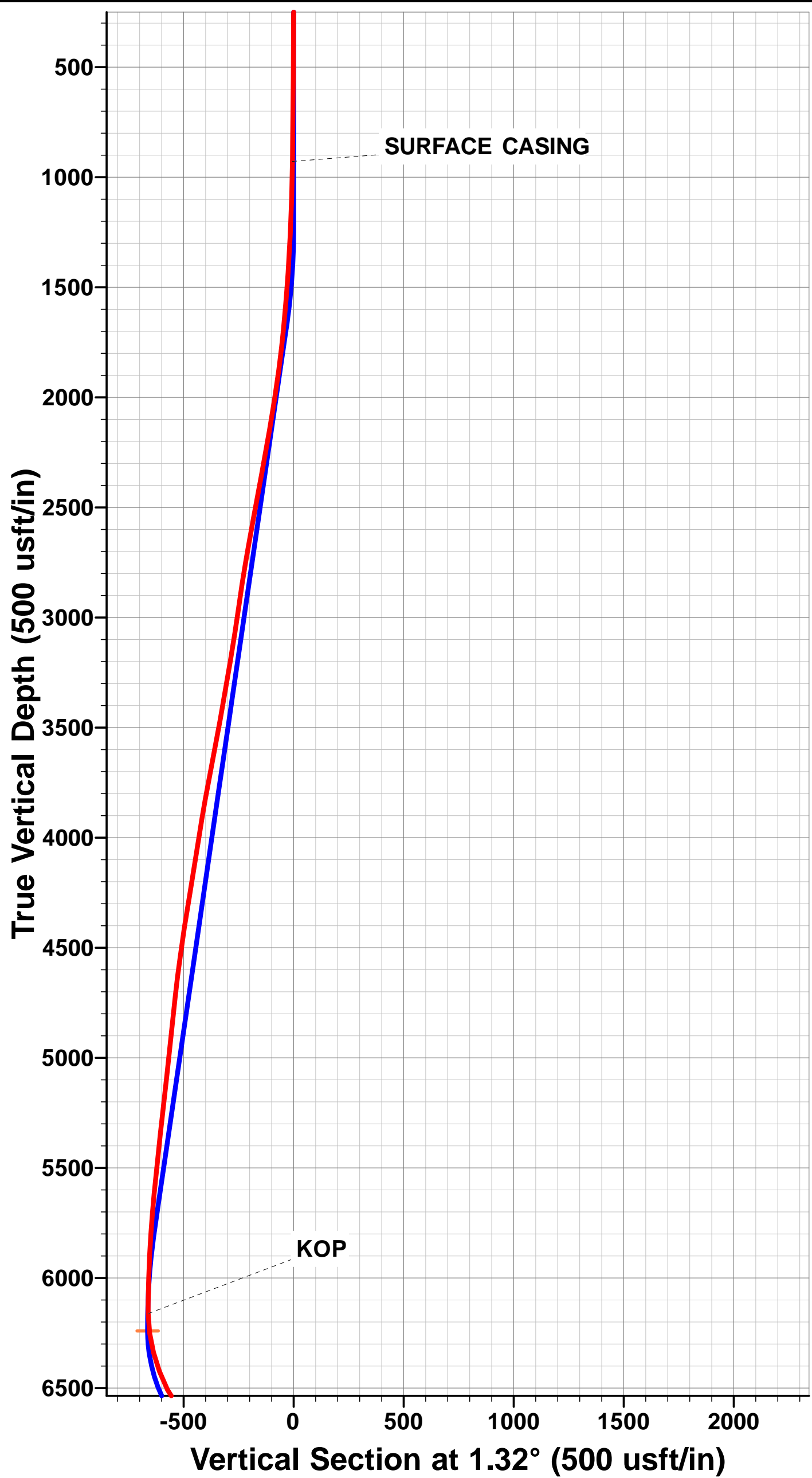
ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSec	Dep	Annotation
929.0	929.0	0.98	194.59	-5.6	0.5	-5.6	6.6	SURFACE CASING
6161.5	6211.0	1.09	55.24	-662.9	82.1	-660.9	681.5	KOP
6955.0	7423.0	87.60	359.72	99.7	91.9	101.8	1446.5	ICP
6929.1	11376.0	89.30	359.50	4051.7	85.8	4052.6	5399.0	LAST SURVEY - JUNE 28, 2015
6929.7	11426.0	89.30	359.50	4101.7	85.4	4102.5	5449.0	EXTRAPOLATION TO TD

AS DRILLED LOCAL COORDINATES:  
SHL: 678ft FSL & 652ft FEL Sec 18  
ICP: 578.3ft FSL & 560.1ft FEL Sec 18  
BHL: 500.4ft FNL & 394.4ft FEL Sec 18

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude	Shape
7' ICP *NEW* - RIEDER 18Y-241 (P2)	6957.0	53.9	94.8	40.307998	-104.925130	Point
BHL - RIEDER 18Y-241 (P2)	6937.0	4102.1	94.8	40.319110	-104.925130	Point
KOP - RIEDER 18Y-241 (P2)	6240.8	-665.8	94.8	40.306022	-104.925130	Point



## Survey Report



<b>Company:</b>	PDC ENERGY	<b>Local Co-ordinate Reference:</b>	Well RIEDER 18Y-241
<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB @ 4818.0usft (ENS 135)
<b>Site:</b>	SE SE SEC. 18 T4N R67W 6th P.M.	<b>MD Reference:</b>	KB @ 4818.0usft (ENS 135)
<b>Well:</b>	RIEDER 18Y-241	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB #2015-045-135	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL SURVEYS	<b>Database:</b>	EDM 5000.1 Single User Db

<b>Project</b>	WELD COUNTY, COLORADO		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Northern Zone		Using geodetic scale factor

Site	SE SE SEC. 18 T4N R67W 6th P.M.				
Site Position:		Northing:	1,355,509.25 usft	Latitude:	40.307850
From:	Lat/Long	Easting:	3,160,139.69 usft	Longitude:	-104.925790
Position Uncertainty:	0.0 usft	Slot Radius:	1.10000 ft	Grid Convergence:	0.37 °

Well	RIEDER 18Y-241					
Well Position	+N/-S	0.0 usft	Northing:	1,355,509.81 usft	Latitude:	40.307850
	+E/-W	0.0 usft	Easting:	3,160,228.93 usft	Longitude:	-104.925470
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,806.0 usft

<b>Wellbore</b>	JOB #2015-045-135				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	28/04/2015	8.51	66.81	52,571

Design	FINAL SURVEYS				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	1.32	

<b>Survey Program</b>	<b>Date</b>	28/06/2015			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
266.0	11,426.0	FINAL SURVEYS (JOB #2015-045-135)	MWD	MWD - Standard	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>Subsea Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>
0.0	0.00	0.00	0.0	-4,818.0	0.0	0.0	0.0	0.00	0.00	0.00
266.0	0.30	125.30	266.0	-4,552.0	-0.4	0.6	-0.4	0.11	0.11	0.00
547.0	0.30	208.40	547.0	-4,271.0	-1.5	0.8	-1.5	0.14	0.00	29.57
827.0	0.80	175.20	827.0	-3,991.0	-4.1	0.6	-4.1	0.20	0.18	-11.86
<b>SURFACE CASING</b>										
929.0	0.98	194.59	929.0	-3,889.0	-5.6	0.5	-5.6	0.34	0.18	19.01
1,017.0	1.20	205.60	1,017.0	-3,801.0	-7.2	-0.1	-7.2	0.34	0.25	12.51
1,297.0	3.90	221.80	1,296.7	-3,521.3	-16.9	-7.7	-17.1	0.99	0.96	5.79
1,578.0	5.00	160.00	1,576.9	-3,241.1	-35.6	-9.9	-35.8	1.66	0.39	-21.99
1,859.0	7.70	162.90	1,856.2	-2,961.8	-65.1	-0.2	-65.1	0.97	0.96	1.03
2,140.0	9.90	174.20	2,133.9	-2,684.1	-107.1	7.8	-106.9	0.99	0.78	4.02
2,412.0	10.70	175.10	2,401.5	-2,416.5	-155.5	12.3	-155.2	0.30	0.29	0.33
2,683.0	10.30	170.40	2,668.0	-2,150.0	-204.5	18.5	-204.0	0.35	-0.15	-1.73

# Survey Report



<b>Company:</b>	PDC ENERGY	<b>Local Co-ordinate Reference:</b>	Well RIEDER 18Y-241
<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB @ 4818.0usft (ENS 135)
<b>Site:</b>	SE SE SEC. 18 T4N R67W 6th P.M.	<b>MD Reference:</b>	KB @ 4818.0usft (ENS 135)
<b>Well:</b>	RIEDER 18Y-241	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB #2015-045-135	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL SURVEYS	<b>Database:</b>	EDM 5000.1 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
2,954.0	8.60	161.10	2,935.3	-1,882.7	-247.5	29.1	-246.8	0.84	-0.63	-3.43
3,226.0	9.80	166.40	3,203.8	-1,614.2	-289.3	41.1	-288.3	0.54	0.44	1.95
3,497.0	10.60	169.40	3,470.5	-1,347.5	-336.2	51.1	-334.9	0.35	0.30	1.11
3,768.0	10.90	176.40	3,736.8	-1,081.2	-386.3	57.3	-384.9	0.49	0.11	2.58
4,039.0	8.70	178.10	4,003.8	-814.2	-432.3	59.6	-430.9	0.82	-0.81	0.63
4,309.0	9.60	179.60	4,270.4	-547.6	-475.3	60.5	-473.7	0.34	0.33	0.56
4,582.0	8.00	174.90	4,540.2	-277.8	-517.0	62.3	-515.4	0.64	-0.59	-1.72
4,853.0	5.80	164.40	4,809.2	-8.8	-548.9	67.7	-547.2	0.93	-0.81	-3.87
5,125.0	6.70	166.90	5,079.6	261.6	-577.6	75.0	-575.7	0.35	0.33	0.92
5,396.0	6.20	185.50	5,348.9	530.9	-607.6	77.1	-605.6	0.79	-0.18	6.86
5,667.0	5.70	174.90	5,618.4	800.4	-635.6	76.9	-633.6	0.44	-0.18	-3.91
5,938.0	2.80	171.70	5,888.7	1,070.7	-655.5	79.1	-653.5	1.07	-1.07	-1.18
6,164.0	1.20	139.00	6,114.5	1,296.5	-662.8	81.4	-660.7	0.84	-0.71	-14.47
6,209.0	1.00	63.00	6,159.5	1,341.5	-663.0	82.1	-660.9	3.03	-0.44	-168.89
<b>KOP</b>										
6,211.0	1.09	55.24	6,161.5	1,343.5	-662.9	82.1	-660.9	8.24	4.26	-388.14
6,300.0	8.00	6.50	6,250.2	1,432.2	-656.3	83.5	-654.2	8.24	7.77	-54.76
6,390.0	14.80	7.90	6,338.4	1,520.4	-638.7	85.8	-636.5	7.56	7.56	1.56
6,480.0	20.10	10.20	6,424.2	1,606.2	-612.0	90.1	-609.8	5.94	5.89	2.56
6,571.0	27.90	9.60	6,507.3	1,689.3	-575.6	96.5	-573.2	8.58	8.57	-0.66
6,661.0	34.50	5.00	6,584.2	1,766.2	-529.4	102.2	-526.9	7.79	7.33	-5.11
6,752.0	41.10	359.10	6,656.1	1,838.1	-473.7	104.0	-471.2	8.26	7.25	-6.48
6,842.0	43.50	0.30	6,722.7	1,904.7	-413.2	103.7	-410.7	2.81	2.67	1.33
6,932.0	48.90	2.00	6,784.9	1,966.9	-348.2	105.0	-345.7	6.15	6.00	1.89
7,022.0	54.20	357.20	6,840.9	2,022.9	-277.8	104.4	-275.3	7.22	5.89	-5.33
7,112.0	62.90	355.10	6,887.8	2,069.8	-201.3	99.2	-199.0	9.87	9.67	-2.33
7,203.0	73.50	358.40	6,921.6	2,103.6	-117.1	94.5	-114.9	12.12	11.65	3.63
7,293.0	80.20	359.80	6,942.0	2,124.0	-29.5	93.2	-27.3	7.60	7.44	1.56
7,386.0	86.20	359.10	6,953.0	2,135.0	62.8	92.3	64.9	6.49	6.45	-0.75
<b>ICP</b>										
7,423.0	87.60	359.72	6,955.0	2,137.0	99.7	91.9	101.8	4.12	3.77	1.67
7,500.0	90.50	1.00	6,956.3	2,138.3	176.7	92.4	178.8	4.12	3.77	1.67
7,590.0	90.40	0.80	6,955.6	2,137.6	266.7	93.8	268.8	0.25	-0.11	-0.22
7,681.0	90.00	0.40	6,955.3	2,137.3	357.7	94.7	359.8	0.62	-0.44	-0.44
7,771.0	90.10	359.50	6,955.2	2,137.2	447.7	94.7	449.8	1.01	0.11	-1.00
7,861.0	90.50	0.20	6,954.7	2,136.7	537.7	94.4	539.7	0.90	0.44	0.78
7,951.0	90.20	1.60	6,954.2	2,136.2	627.7	95.8	629.7	1.59	-0.33	1.56
8,042.0	89.90	1.60	6,954.1	2,136.1	718.6	98.4	720.7	0.33	-0.33	0.00
8,132.0	89.80	2.00	6,954.4	2,136.4	808.6	101.2	810.7	0.46	-0.11	0.44
8,223.0	90.10	2.50	6,954.4	2,136.4	899.5	104.8	901.7	0.64	0.33	0.55
8,313.0	90.10	2.30	6,954.3	2,136.3	989.4	108.5	991.7	0.22	0.00	-0.22
8,403.0	89.80	359.70	6,954.4	2,136.4	1,079.4	110.1	1,081.7	2.91	-0.33	-2.89
8,493.0	92.10	0.70	6,952.9	2,134.9	1,169.4	110.4	1,171.6	2.79	2.56	1.11
8,583.0	91.90	0.50	6,949.7	2,131.7	1,259.3	111.4	1,261.6	0.31	-0.22	-0.22
8,674.0	92.00	0.10	6,946.6	2,128.6	1,350.3	111.9	1,352.5	0.45	0.11	-0.44
8,764.0	91.60	1.00	6,943.8	2,125.8	1,440.2	112.7	1,442.5	1.09	-0.44	1.00
8,855.0	90.60	359.80	6,942.0	2,124.0	1,531.2	113.3	1,533.4	1.72	-1.10	-1.32
8,945.0	91.00	359.50	6,940.8	2,122.8	1,621.2	112.8	1,623.4	0.56	0.44	-0.33
9,036.0	89.70	0.30	6,940.2	2,122.2	1,712.2	112.6	1,714.4	1.68	-1.43	0.88
9,126.0	89.40	359.70	6,940.9	2,122.9	1,802.2	112.6	1,804.3	0.75	-0.33	-0.67
9,217.0	89.90	0.00	6,941.5	2,123.5	1,893.2	112.4	1,895.3	0.64	0.55	0.33
9,307.0	90.20	0.10	6,941.4	2,123.4	1,983.2	112.5	1,985.3	0.35	0.33	0.11
9,398.0	90.20	359.40	6,941.1	2,123.1	2,074.2	112.1	2,076.2	0.77	0.00	-0.77

## Survey Report



<b>Company:</b>	PDC ENERGY	<b>Local Co-ordinate Reference:</b>	Well RIEDER 18Y-241
<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB @ 4818.0usft (ENS 135)
<b>Site:</b>	SE SE SEC. 18 T4N R67W 6th P.M.	<b>MD Reference:</b>	KB @ 4818.0usft (ENS 135)
<b>Well:</b>	RIEDER 18Y-241	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB #2015-045-135	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL SURVEYS	<b>Database:</b>	EDM 5000.1 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,488.0	90.00	358.80	6,940.9	2,122.9	2,164.2	110.7	2,166.2	0.70	-0.22	-0.67
9,579.0	90.00	358.70	6,940.9	2,122.9	2,255.2	108.7	2,257.1	0.11	0.00	-0.11
9,669.0	90.30	358.50	6,940.7	2,122.7	2,345.1	106.5	2,347.0	0.40	0.33	-0.22
9,759.0	90.90	358.10	6,939.8	2,121.8	2,435.1	103.8	2,436.8	0.80	0.67	-0.44
9,850.0	89.60	359.00	6,939.4	2,121.4	2,526.1	101.5	2,527.7	1.74	-1.43	0.99
9,941.0	89.70	359.10	6,939.9	2,121.9	2,617.0	100.0	2,618.7	0.16	0.11	0.11
10,031.0	90.40	359.20	6,939.8	2,121.8	2,707.0	98.7	2,708.6	0.79	0.78	0.11
10,121.0	90.40	359.40	6,939.2	2,121.2	2,797.0	97.6	2,798.5	0.22	0.00	0.22
10,212.0	90.20	359.00	6,938.7	2,120.7	2,888.0	96.3	2,889.5	0.49	-0.22	-0.44
10,302.0	90.20	359.00	6,938.4	2,120.4	2,978.0	94.7	2,979.4	0.00	0.00	0.00
10,393.0	90.30	358.80	6,938.0	2,120.0	3,069.0	93.0	3,070.3	0.25	0.11	-0.22
10,483.0	90.20	358.70	6,937.6	2,119.6	3,159.0	91.0	3,160.2	0.16	-0.11	-0.11
10,574.0	89.90	357.90	6,937.6	2,119.6	3,249.9	88.3	3,251.1	0.94	-0.33	-0.88
10,664.0	91.30	359.50	6,936.6	2,118.6	3,339.9	86.3	3,341.0	2.36	1.56	1.78
10,754.0	92.00	359.00	6,934.0	2,116.0	3,429.8	85.1	3,430.9	0.96	0.78	-0.56
10,844.0	91.90	0.00	6,931.0	2,113.0	3,519.8	84.3	3,520.8	1.12	-0.11	1.11
10,935.0	92.00	359.20	6,927.9	2,109.9	3,610.7	83.7	3,611.7	0.89	0.11	-0.88
11,025.0	90.20	1.00	6,926.1	2,108.1	3,700.7	83.8	3,701.7	2.83	-2.00	2.00
11,116.0	90.30	0.60	6,925.7	2,107.7	3,791.7	85.1	3,792.6	0.45	0.11	-0.44
11,206.0	88.80	0.30	6,926.4	2,108.4	3,881.7	85.8	3,882.6	1.70	-1.67	-0.33
11,296.0	89.20	0.10	6,928.0	2,110.0	3,971.7	86.1	3,972.6	0.50	0.44	-0.22
<b>LAST SURVEY - JUNE 28, 2015</b>										
<b>11,376.0</b>	<b>89.30</b>	<b>359.50</b>	<b>6,929.1</b>	<b>2,111.1</b>	<b>4,051.7</b>	<b>85.8</b>	<b>4,052.6</b>	<b>0.76</b>	<b>0.12</b>	<b>-0.75</b>
<b>EXTRAPOLATION TO TD</b>										
<b>11,426.0</b>	<b>89.30</b>	<b>359.50</b>	<b>6,929.7</b>	<b>2,111.7</b>	<b>4,101.7</b>	<b>85.4</b>	<b>4,102.5</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>



# Survey Report



<b>Company:</b>	PDC ENERGY	<b>Local Co-ordinate Reference:</b>	Well RIEDER 18Y-241
<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB @ 4818.0usft (ENS 135)
<b>Site:</b>	SE SE SEC. 18 T4N R67W 6th P.M.	<b>MD Reference:</b>	KB @ 4818.0usft (ENS 135)
<b>Well:</b>	RIEDER 18Y-241	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB #2015-045-135	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL SURVEYS	<b>Database:</b>	EDM 5000.1 Single User Db

Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
KOP - RIEDER 18Y-241 - survey misses target center by 14.1usft at 6290.1usft MD (6240.4 TVD, -657.6 N, 83.4 E) - Point	0.00	0.00	6,240.8	-665.8	94.8	1,354,844.67	3,160,328.04	40.306022	-104.925130
7" ICP *NEW* - RIEDER - survey misses target center by 23.4usft at 7188.7usft MD (6917.3 TVD, -130.8 N, 95.0 E) - Point	0.00	0.00	6,939.0	-139.5	94.8	1,355,370.94	3,160,324.63	40.307467	-104.925130
EXIST VERT EVERY-BF - survey misses target center by 303.3usft at 8477.5usft MD (6953.4 TVD, 1153.9 N, 110.3 E) - Circle (radius 30.0)	0.00	0.00	7,191.0	1,158.5	-78.1	1,356,667.73	3,160,143.35	40.311030	-104.925750
7" ICP *NEW* - RIEDER - survey misses target center by 5.2usft at 7377.6usft MD (6952.4 TVD, 54.4 N, 92.4 E) - Point	0.00	0.00	6,957.0	53.9	94.8	1,355,564.32	3,160,323.38	40.307998	-104.925130
BHL - RIEDER 18Y-241 - survey misses target center by 14.7usft at 11426.0usft MD (6929.7 TVD, 4101.7 N, 85.4 E) - Point	0.00	0.00	6,941.0	4,102.1	94.8	1,359,612.26	3,160,297.16	40.319110	-104.925130
KOP - RIEDER 18Y-241 - survey misses target center by 38.8usft at 6424.4usft MD (6371.5 TVD, -629.4 N, 87.2 E) - Point	0.00	0.00	6,382.4	-665.8	94.8	1,354,844.67	3,160,328.04	40.306022	-104.925130
EXIST VERT STARCK 1 - survey misses target center by 2800.8usft at 8705.6usft MD (6945.6 TVD, 1381.9 N, 112.0 E) - Circle (radius 30.0)	0.00	0.00	7,790.0	1,434.0	-2,557.9	1,356,927.19	3,157,661.88	40.311786	-104.934642
EXIST VERT BEIN 6-18 - survey misses target center by 2779.5usft at 10102.5usft MD (6939.3 TVD, 2778.5 N, 97.8 E) - Circle (radius 30.0)	0.00	0.00	7,755.0	2,751.7	-2,559.2	1,358,244.80	3,157,652.08	40.315403	-104.934647
BHL - RIEDER 18Y-241 - survey misses target center by 11.9usft at 11426.0usft MD (6929.7 TVD, 4101.7 N, 85.4 E) - Point	0.00	0.00	6,937.0	4,102.1	94.8	1,359,612.26	3,160,297.16	40.319110	-104.925130
EXIST VERT BEIN 3-18 - survey misses target center by 2556.3usft at 11426.0usft MD (6929.7 TVD, 4101.7 N, 85.4 E) - Circle (radius 30.0)	0.00	0.00	7,263.0	4,280.7	-2,442.7	1,359,774.44	3,157,758.61	40.319600	-104.934230
EXIST VERT STARCK 1 - survey misses target center by 2775.1usft at 7427.2usft MD (6955.2 TVD, 103.9 N, 91.9 E) - Circle (radius 30.0)	0.00	0.00	7,797.0	106.5	-2,552.5	1,355,599.78	3,157,675.92	40.308142	-104.934622

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
929.0	929.0	-5.6	0.5	SURFACE CASING
6,211.0	6,161.5	-662.9	82.1	KOP
7,423.0	6,955.0	99.7	91.9	ICP
11,376.0	6,929.1	4,051.7	85.8	LAST SURVEY - JUNE 28, 2015
11,426.0	6,929.7	4,101.7	85.4	EXTRAPOLATION TO TD

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