

# **PDC ENERGY**

**WELD COUNTY, COLORADO**

**SE SE SEC. 18 T4N R64W 6th P.M.**

**COLLINS 18Q-301**

**JOB #2015-116-123**

**03 October, 2015**

**Survey: FINAL SURVEYS**





Project: WELD COUNTY, COLORADO  
Site: SE SE SEC. 18 T4N R64W 6th P.M.  
Well: COLLINS 18Q-301  
Wellbore: JOB #2015-116-123  
Design: FINAL SURVEYS

#### ANNOTATIONS

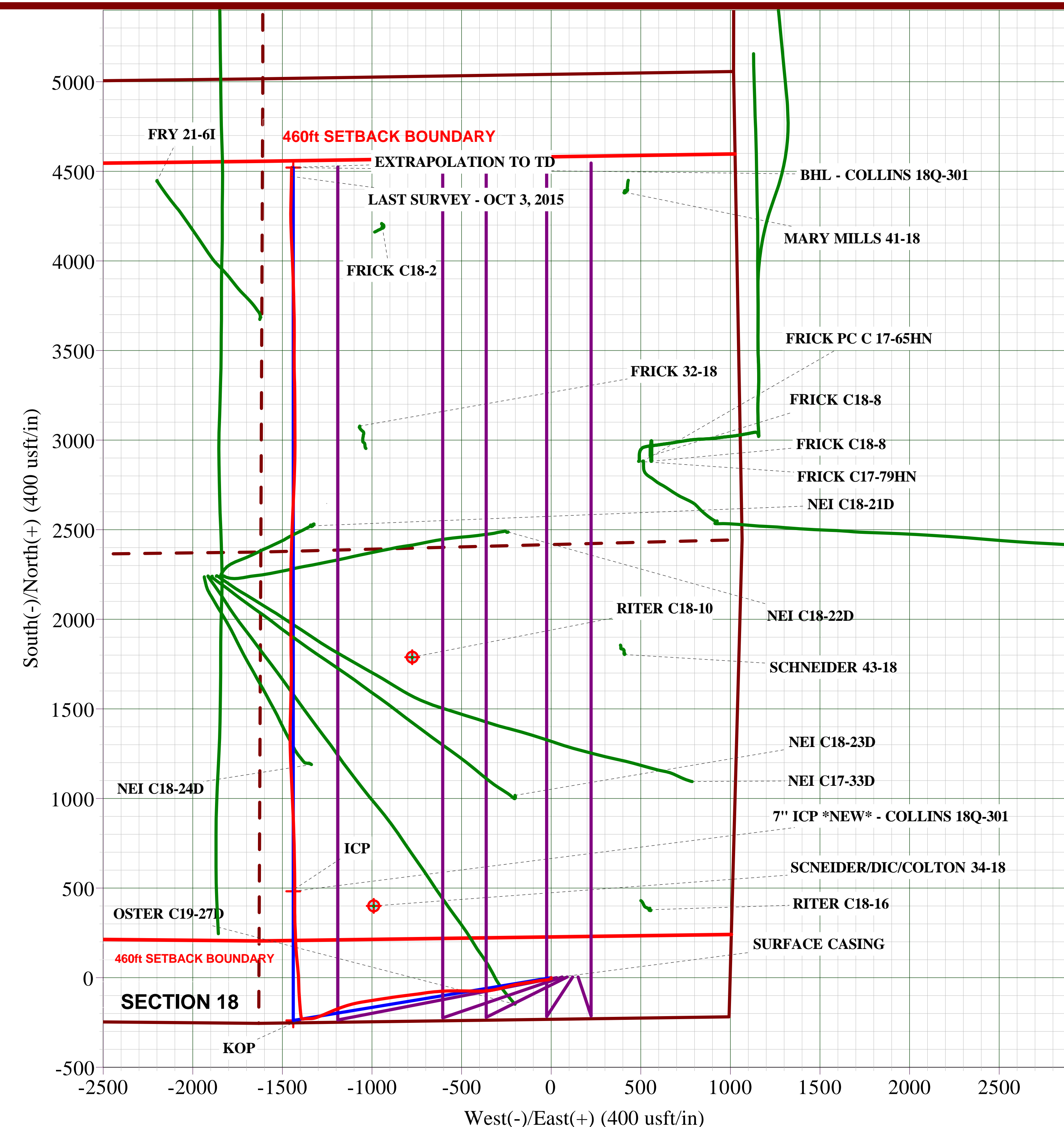
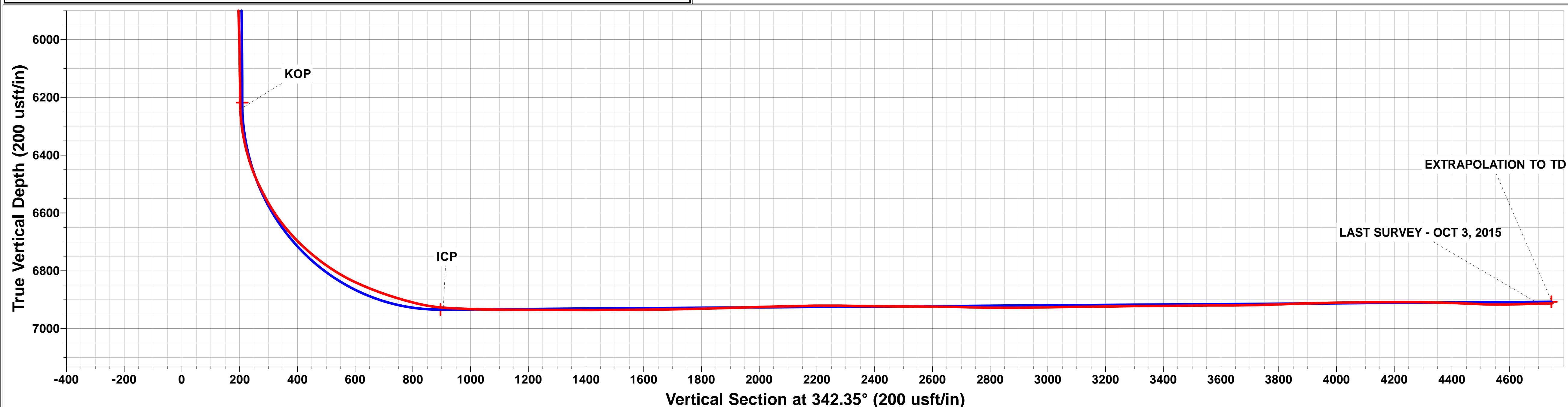
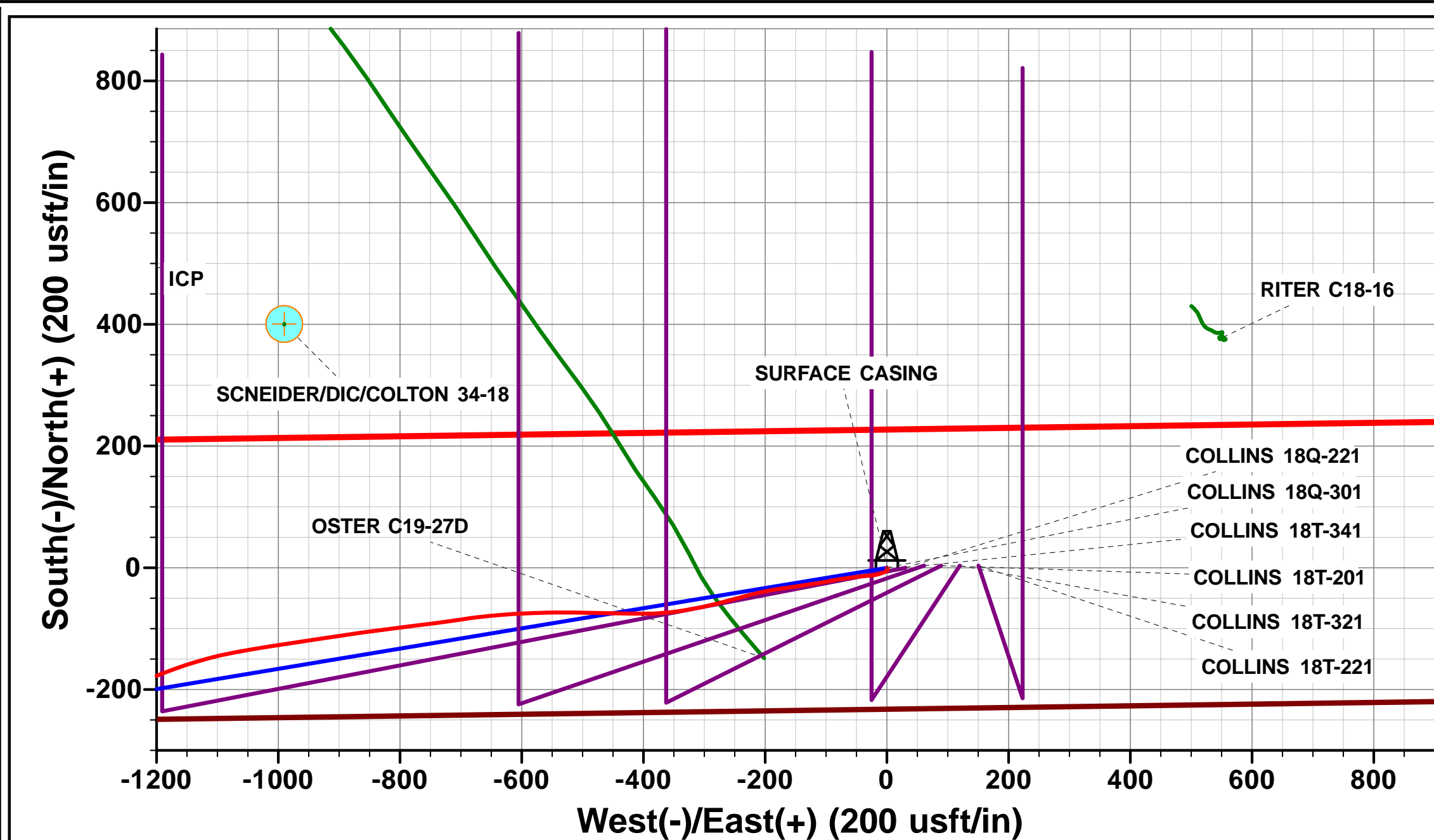
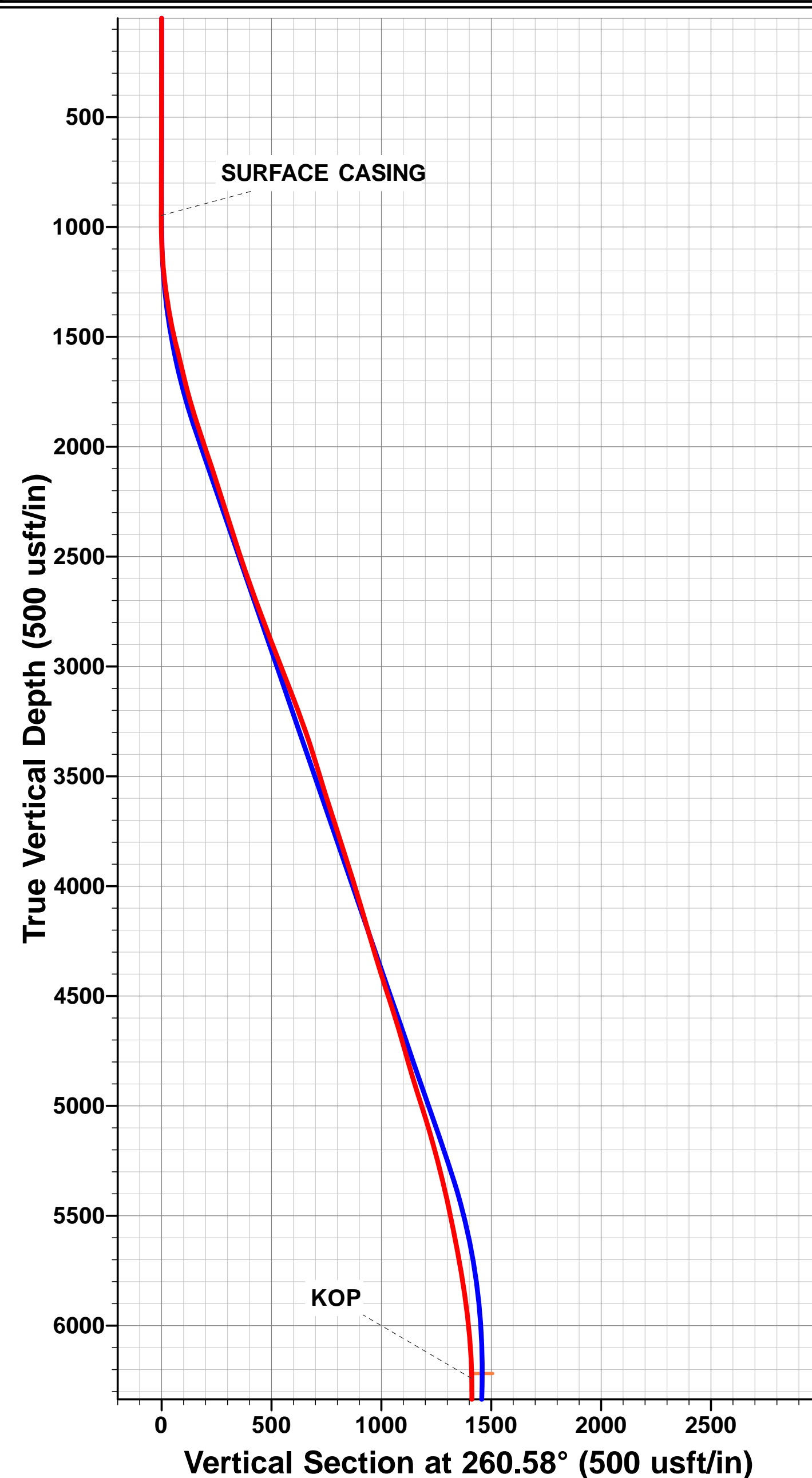
TVD	MD	Inc	Azi	+N/-S	+E/-W	VSec	Dep	Annotation
948.0	948.0	0.49	178.99	-2.9	1.7	-3.3	3.6	SURFACE CASING
6240.7	6451.0	2.30	312.14	-230.5	-1391.9	202.5	1428.5	KOP
6927.8	7546.0	85.60	0.02	495.2	-1430.8	905.8	2155.9	ICP
6913.9	11525.0	91.40	0.90	4471.9	-1449.0	4700.8	6134.1	LAST SURVEY - OCT 3, 2015
6912.7	11575.0	91.40	0.90	4521.9	-1448.2	4748.1	6184.1	EXTRAPOLATION TO TD

#### AS DRILLED LOCAL COORDINATES:

SHL: 234ft FSL & 1000ft FEL Sec 18  
7" ICP: 729.3ft FSL & 2430ft FEL Sec 18  
BHL: 499.2ft FNL & 2476.3ft FEL Sec 18

#### WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude	Shape
7" ICP *NEW* - COLLINS 18Q-301	6934.4	482.2	-1438.9	40.307063	-104.592819	Point
BHL - COLLINS 18Q-301	6907.5	4521.1	-1438.9	40.318150	-104.592820	Point
KOP - COLLINS 18Q-301	6218.2	-238.7	-1438.9	40.305085	-104.592819	Point



## Survey Report



<b>Company:</b>	PDC ENERGY	<b>Local Co-ordinate Reference:</b>	Well COLLINS 18Q-301
<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB @ 4797.5usft (ENS 123)
<b>Site:</b>	SE SE SEC. 18 T4N R64W 6th P.M.	<b>MD Reference:</b>	KB @ 4797.5usft (ENS 123)
<b>Well:</b>	COLLINS 18Q-301	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB #2015-116-123	<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 R64W 6th P.M.				
Site Position:		Northing:	1,355,536.25 usft	Latitude:	40.305750
From:	Lat/Long	Easting:	3,254,595.50 usft	Longitude:	-104.587120
Position Uncertainty:	0.0 usft	Slot Radius:	1.10000 ft	Grid Convergence:	0.59 °

Well	COLLINS 18Q-301					
Well Position	+N/-S	0.0 usft	Northing:	1,355,531.05 usft	Latitude:	40.305740
	+E/-W	0.0 usft	Easting:	3,254,444.94 usft	Longitude:	-104.587660
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,784.0 usft

<b>Wellbore</b>	JOB #2015-116-123				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	02/07/2015	8.32	66.86	52,586

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	342.35

<b>Survey Program</b>	<b>Date</b>	03/10/2015			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
237.0	11,575.0	FINAL SURVEYS (JOB #2015-116-123)	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	-4,797.5	0.0	0.0	0.0	0.00	0.00	0.00
237.0	0.00	152.60	237.0	-4,560.5	0.0	0.0	0.0	0.00	0.00	0.00
516.0	0.20	116.00	516.0	-4,281.5	-0.2	0.4	-0.3	0.07	0.07	0.00
796.0	0.60	157.30	796.0	-4,001.5	-1.8	1.4	-2.1	0.17	0.14	14.75
905.0	0.30	171.30	905.0	-3,892.5	-2.6	1.7	-3.0	0.29	-0.28	12.84
<b>SURFACE CASING</b>										
948.0	0.49	178.99	948.0	-3,849.5	-2.9	1.7	-3.3	0.46	0.44	17.88
1,014.0	0.80	183.40	1,014.0	-3,783.5	-3.6	1.7	-4.0	0.48	0.47	6.68
1,107.0	3.50	247.80	1,106.9	-3,690.6	-5.3	-1.0	-4.8	3.48	2.90	69.25
1,200.0	5.50	245.20	1,199.6	-3,597.9	-8.3	-7.6	-5.6	2.16	2.15	-2.80
1,294.0	8.40	258.40	1,292.9	-3,504.6	-11.6	-18.5	-5.4	3.50	3.09	14.04
1,387.0	9.10	268.30	1,384.9	-3,412.6	-13.1	-32.5	-2.7	1.78	0.75	10.65
1,479.0	12.40	261.80	1,475.2	-3,322.3	-14.8	-49.5	0.9	3.82	3.59	-7.07

# Survey Report



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<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB @ 4797.5usft (ENS 123)
<b>Site:</b>	SE SE SEC. 18 T4N R64W 6th P.M.	<b>MD Reference:</b>	KB @ 4797.5usft (ENS 123)
<b>Well:</b>	COLLINS 18Q-301	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB #2015-116-123	<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)
1,573.0	14.40	263.00	1,566.7	-3,230.8	-17.6	-71.1	4.8	2.15	2.13	1.28
1,666.0	13.10	257.40	1,657.0	-3,140.5	-21.3	-92.9	7.8	2.00	-1.40	-6.02
1,759.0	14.90	262.20	1,747.2	-3,050.3	-25.3	-115.0	10.8	2.30	1.94	5.16
1,853.0	16.60	260.60	1,837.7	-2,959.8	-29.1	-140.2	14.8	1.87	1.81	-1.70
1,946.0	18.80	262.50	1,926.3	-2,871.2	-33.2	-168.2	19.4	2.45	2.37	2.04
2,036.0	18.60	258.70	2,011.6	-2,785.9	-37.9	-196.7	23.5	1.37	-0.22	-4.22
2,126.0	18.30	256.20	2,096.9	-2,700.6	-44.1	-224.4	26.0	0.94	-0.33	-2.78
2,216.0	17.80	253.70	2,182.5	-2,615.0	-51.3	-251.4	27.3	1.02	-0.56	-2.78
2,486.0	17.90	260.50	2,439.5	-2,358.0	-69.8	-331.9	34.2	0.77	0.04	2.52
2,756.0	20.30	271.80	2,694.7	-2,102.8	-75.2	-419.7	55.7	1.63	0.89	4.19
3,025.0	22.00	270.50	2,945.6	-1,851.9	-73.3	-516.7	86.9	0.66	0.63	-0.48
3,295.0	20.70	266.20	3,197.1	-1,600.4	-76.0	-614.9	114.1	0.75	-0.48	-1.59
3,565.0	16.80	261.30	3,452.7	-1,344.8	-85.0	-701.1	131.6	1.56	-1.44	-1.81
3,834.0	18.10	263.50	3,709.3	-1,088.2	-95.7	-781.1	145.7	0.54	0.48	0.82
4,103.0	17.40	261.60	3,965.5	-832.0	-106.3	-862.4	160.3	0.34	-0.26	-0.71
4,373.0	16.00	261.40	4,224.1	-573.4	-117.7	-939.1	172.6	0.52	-0.52	-0.07
4,642.0	18.40	261.40	4,481.1	-316.4	-129.6	-1,017.8	185.2	0.89	0.89	0.00
4,911.0	15.70	257.30	4,738.3	-59.2	-144.0	-1,095.3	195.0	1.10	-1.00	-1.52
5,182.0	18.20	250.20	4,997.5	200.0	-166.4	-1,170.9	196.6	1.20	0.92	-2.62
5,451.0	14.90	245.90	5,255.3	457.8	-194.7	-1,242.0	191.1	1.31	-1.23	-1.60
5,720.0	12.00	248.70	5,516.9	719.4	-219.0	-1,299.6	185.4	1.10	-1.08	1.04
5,990.0	9.40	271.10	5,782.3	984.8	-228.8	-1,347.9	190.8	1.80	-0.96	8.30
6,260.0	5.40	261.40	6,050.0	1,252.5	-230.3	-1,382.5	199.8	1.55	-1.48	-3.59
6,350.0	2.30	268.20	6,139.8	1,342.3	-231.0	-1,388.5	201.0	3.48	-3.44	7.56
6,439.0	1.70	283.20	6,228.8	1,431.3	-230.7	-1,391.6	202.2	0.89	-0.67	16.85
<b>KOP</b>										
6,451.0	2.30	312.14	6,240.7	1,443.2	-230.5	-1,391.9	202.5	9.66	5.03	241.19
6,529.0	9.30	347.30	6,318.3	1,520.8	-223.3	-1,394.5	210.1	9.66	8.97	45.07
6,619.0	16.40	354.10	6,406.0	1,608.5	-203.5	-1,397.4	229.8	8.05	7.89	7.56
6,708.0	24.90	354.10	6,489.2	1,691.7	-172.4	-1,400.6	260.5	9.55	9.55	0.00
6,798.0	31.00	356.50	6,568.7	1,771.2	-130.3	-1,404.0	301.6	6.89	6.78	2.67
6,888.0	39.10	356.70	6,642.3	1,844.8	-78.8	-1,407.0	351.6	9.00	9.00	0.22
6,978.0	47.60	358.50	6,707.7	1,910.2	-17.1	-1,409.5	411.2	9.54	9.44	2.00
7,067.0	52.90	354.40	6,764.6	1,967.1	51.1	-1,413.8	477.5	6.93	5.96	-4.61
7,157.0	60.70	354.70	6,813.8	2,016.3	126.0	-1,421.0	551.1	8.67	8.67	0.33
7,247.0	68.10	357.70	6,852.7	2,055.2	207.0	-1,426.3	629.8	8.75	8.22	3.33
7,337.0	72.00	358.00	6,883.4	2,085.9	291.5	-1,429.5	711.3	4.34	4.33	0.33
7,427.0	75.80	0.00	6,908.4	2,110.9	377.9	-1,431.0	794.1	4.73	4.22	2.22
7,517.0	82.80	0.10	6,925.1	2,127.6	466.3	-1,430.9	878.3	7.78	7.78	0.11
7,528.0	84.70	0.20	6,926.3	2,128.8	477.2	-1,430.9	888.7	17.30	17.27	0.91
<b>ICP</b>										
7,546.0	85.60	0.02	6,927.8	2,130.3	495.2	-1,430.8	905.8	5.10	5.00	-1.00
7,588.0	87.70	359.60	6,930.2	2,132.7	537.1	-1,431.0	945.8	5.10	5.00	-1.00
7,633.0	87.70	359.00	6,932.0	2,134.5	582.1	-1,431.5	988.8	1.33	0.00	-1.33
7,723.0	89.30	359.10	6,934.4	2,136.9	672.0	-1,433.0	1,075.0	1.78	1.78	0.11
7,813.0	89.70	358.60	6,935.2	2,137.7	762.0	-1,434.8	1,161.2	0.71	0.44	-0.56
7,903.0	89.70	358.00	6,935.7	2,138.2	851.9	-1,437.5	1,247.8	0.67	0.00	-0.67
7,992.0	89.90	357.50	6,936.0	2,138.5	940.9	-1,441.0	1,333.6	0.61	0.22	-0.56
8,082.0	90.00	357.20	6,936.0	2,138.5	1,030.8	-1,445.1	1,420.5	0.35	0.11	-0.33
8,172.0	90.60	356.90	6,935.6	2,138.1	1,120.7	-1,449.8	1,507.6	0.75	0.67	-0.33
8,262.0	90.60	358.20	6,934.6	2,137.1	1,210.6	-1,453.6	1,594.4	1.44	0.00	1.44
8,352.0	90.70	358.20	6,933.6	2,136.1	1,300.5	-1,456.4	1,681.0	0.11	0.11	0.00
8,442.0	91.20	1.70	6,932.1	2,134.6	1,390.5	-1,456.5	1,766.7	3.93	0.56	3.89

## Survey Report



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<b>Site:</b>	SE SE SEC. 18 T4N R64W 6th P.M.	<b>MD Reference:</b>	KB @ 4797.5usft (ENS 123)
<b>Well:</b>	COLLINS 18Q-301	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB #2015-116-123	<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)
8,532.0	91.50	1.40	6,930.0	2,132.5	1,480.4	-1,454.1	1,851.7	0.47	0.33	-0.33
8,621.0	91.70	1.10	6,927.5	2,130.0	1,569.4	-1,452.1	1,935.9	0.41	0.22	-0.34
8,711.0	91.60	0.90	6,924.9	2,127.4	1,659.3	-1,450.6	2,021.1	0.25	-0.11	-0.22
8,801.0	91.10	359.40	6,922.8	2,125.3	1,749.3	-1,450.3	2,106.8	1.76	-0.56	-1.67
8,891.0	91.30	359.00	6,920.9	2,123.4	1,839.3	-1,451.6	2,192.9	0.50	0.22	-0.44
8,981.0	88.80	0.20	6,920.8	2,123.3	1,929.3	-1,452.2	2,278.8	3.08	-2.78	1.33
9,070.0	89.20	0.20	6,922.4	2,124.9	2,018.2	-1,451.9	2,363.5	0.45	0.45	0.00
9,160.0	89.80	359.50	6,923.2	2,125.7	2,108.2	-1,452.1	2,449.3	1.02	0.67	-0.78
9,250.0	89.80	359.40	6,923.5	2,126.0	2,198.2	-1,453.0	2,535.4	0.11	0.00	-0.11
9,390.0	88.80	2.20	6,925.2	2,127.7	2,338.2	-1,451.1	2,668.1	2.12	-0.71	2.00
9,430.0	88.80	2.10	6,926.0	2,128.5	2,378.2	-1,449.6	2,705.8	0.25	0.00	-0.25
9,519.0	88.70	1.90	6,928.0	2,130.5	2,467.1	-1,446.4	2,789.6	0.25	-0.11	-0.22
9,609.0	90.80	2.50	6,928.4	2,130.9	2,557.0	-1,443.0	2,874.2	2.43	2.33	0.67
9,699.0	90.90	2.30	6,927.0	2,129.5	2,646.9	-1,439.2	2,958.7	0.25	0.11	-0.22
9,789.0	90.70	2.30	6,925.8	2,128.3	2,736.8	-1,435.6	3,043.3	0.22	-0.22	0.00
9,879.0	90.50	2.40	6,924.8	2,127.3	2,826.8	-1,431.9	3,127.9	0.25	-0.22	0.11
9,969.0	91.10	0.30	6,923.6	2,126.1	2,916.7	-1,429.8	3,213.0	2.43	0.67	-2.33
10,059.0	90.60	359.70	6,922.2	2,124.7	3,006.7	-1,429.8	3,298.7	0.87	-0.56	-0.67
10,149.0	90.10	359.60	6,921.7	2,124.2	3,096.7	-1,430.4	3,384.7	0.57	-0.56	-0.11
10,238.0	90.80	0.20	6,921.0	2,123.5	3,185.7	-1,430.5	3,469.5	1.04	0.79	0.67
10,328.0	90.50	359.30	6,920.0	2,122.5	3,275.7	-1,430.9	3,555.4	1.05	-0.33	-1.00
10,418.0	89.50	358.00	6,920.0	2,122.5	3,365.7	-1,433.0	3,641.8	1.82	-1.11	-1.44
10,508.0	92.00	0.60	6,918.8	2,121.3	3,455.6	-1,434.1	3,727.8	4.01	2.78	2.89
10,597.0	91.70	0.20	6,915.9	2,118.4	3,544.6	-1,433.5	3,812.4	0.56	-0.34	-0.45
10,687.0	91.60	359.50	6,913.3	2,115.8	3,634.5	-1,433.7	3,898.2	0.79	-0.11	-0.78
10,777.0	91.80	358.90	6,910.7	2,113.2	3,724.5	-1,435.0	3,984.3	0.70	0.22	-0.67
10,867.0	90.00	358.40	6,909.2	2,111.7	3,814.5	-1,437.1	4,070.7	2.08	-2.00	-0.56
10,957.0	90.20	358.00	6,909.1	2,111.6	3,904.4	-1,439.9	4,157.2	0.50	0.22	-0.44
11,046.0	90.40	357.30	6,908.6	2,111.1	3,993.3	-1,443.6	4,243.1	0.82	0.22	-0.79
11,136.0	88.60	358.00	6,909.4	2,111.9	4,083.3	-1,447.3	4,329.9	2.15	-2.00	0.78
11,226.0	88.00	357.20	6,912.1	2,114.6	4,173.1	-1,451.0	4,416.7	1.11	-0.67	-0.89
11,316.0	87.30	0.20	6,915.8	2,118.3	4,263.0	-1,453.1	4,502.9	3.42	-0.78	3.33
11,406.0	91.30	1.70	6,916.9	2,119.4	4,353.0	-1,451.6	4,588.2	4.75	4.44	1.67
11,496.0	91.50	1.00	6,914.7	2,117.2	4,442.9	-1,449.5	4,673.3	0.81	0.22	-0.78
LAST SURVEY - OCT 3, 2015										
11,525.0	91.40	0.90	6,913.9	2,116.4	4,471.9	-1,449.0	4,700.8	0.49	-0.34	-0.34
EXTRAPOLATION TO TD										
11,575.0	91.40	0.90	6,912.7	2,115.2	4,521.9	-1,448.2	4,748.1	0.00	0.00	0.00

## Survey Report



<b>Company:</b>	PDC ENERGY	<b>Local Co-ordinate Reference:</b>	Well COLLINS 18Q-301
<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB @ 4797.5usft (ENS 123)
<b>Site:</b>	SE SE SEC. 18 T4N R64W 6th P.M.	<b>MD Reference:</b>	KB @ 4797.5usft (ENS 123)
<b>Well:</b>	COLLINS 18Q-301	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB #2015-116-123	<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
7" ICP *NEW* - COLLIN - survey misses target center by 11.1usft at 7533.6usft MD (6926.8 TVD, 482.8 N, -1430.8 E) - Point	0.00	0.00	6,934.4	482.2	-1,438.9	1,355,998.40	3,253,001.22	40.307063	-104.592819
RITER C18-10 - survey misses target center by 724.9usft at 8825.5usft MD (6922.3 TVD, 1773.8 N, -1450.6 E) - Circle (radius 30.0)	0.00	0.00	7,185.5	1,788.8	-775.3	1,357,311.66	3,253,651.30	40.310650	-104.590440
KOP - COLLINS 18Q-30 - survey misses target center by 48.3usft at 6430.1usft MD (6219.8 TVD, -230.8 N, -1391.3 E) - Point	0.00	0.00	6,218.2	-238.7	-1,438.9	1,355,277.57	3,253,008.64	40.305085	-104.592819
BHL - COLLINS 18Q-30 - survey misses target center by 10.7usft at 11574.5usft MD (6912.7 TVD, 4521.4 N, -1448.2 E) - Point	0.00	0.00	6,907.5	4,521.1	-1,438.9	1,360,036.90	3,252,959.66	40.318150	-104.592820
SCHNEIDER/DIC/COLT - survey misses target center by 827.6usft at 7528.0usft MD (6926.3 TVD, 477.2 N, -1430.9 E) - Circle (radius 30.0)	0.00	0.00	7,622.5	400.8	-990.1	1,355,921.58	3,253,450.80	40.306840	-104.591210

Survey Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
948.0	948.0	-2.9	1.7	SURFACE CASING	
6,451.0	6,240.7	-230.5	-1,391.9	KOP	
7,546.0	6,927.8	495.2	-1,430.8	ICP	
11,525.0	6,913.9	4,471.9	-1,449.0	LAST SURVEY - OCT 3, 2015	
11,575.0	6,912.7	4,521.9	-1,448.2	EXTRAPOLATION TO TD	

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