

PDC ENERGY

WELD COUNTY, COLORADO

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

RIEDER 18Y-441

JOB #2015-046-135

07 July, 2015

Survey: FINAL SURVEYS





Project: WELD COUNTY, COLORADO
Site: SE SE SEC. 18 T4N R67W 6th P.M.
Well: RIEDER 18Y-441
Wellbore: JOB #2015-046-135
Design: FINAL SURVEYS

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSect	Dep	Annotation
875.0	875.0	0.79	292.55	0.7	-4.6	0.4	5.9	SURFACE CASING
6381.7	6436.0	5.16	24.51	-669.5	220.9	-656.7	736.0	KOP
7137.3	7591.0	87.75	359.30	67.3	224.4	79.2	1473.0	ICP
7160.5	11570.0	91.10	0.30	4044.3	227.3	4050.7	5451.2	LAST SURVEY - JULY 7, 2015
7160.1	11620.0	90.00	0.30	4094.3	227.6	4100.6	5501.2	EXRAPOLATION TO TD

AS DRILLED LOCAL COORDINATES:

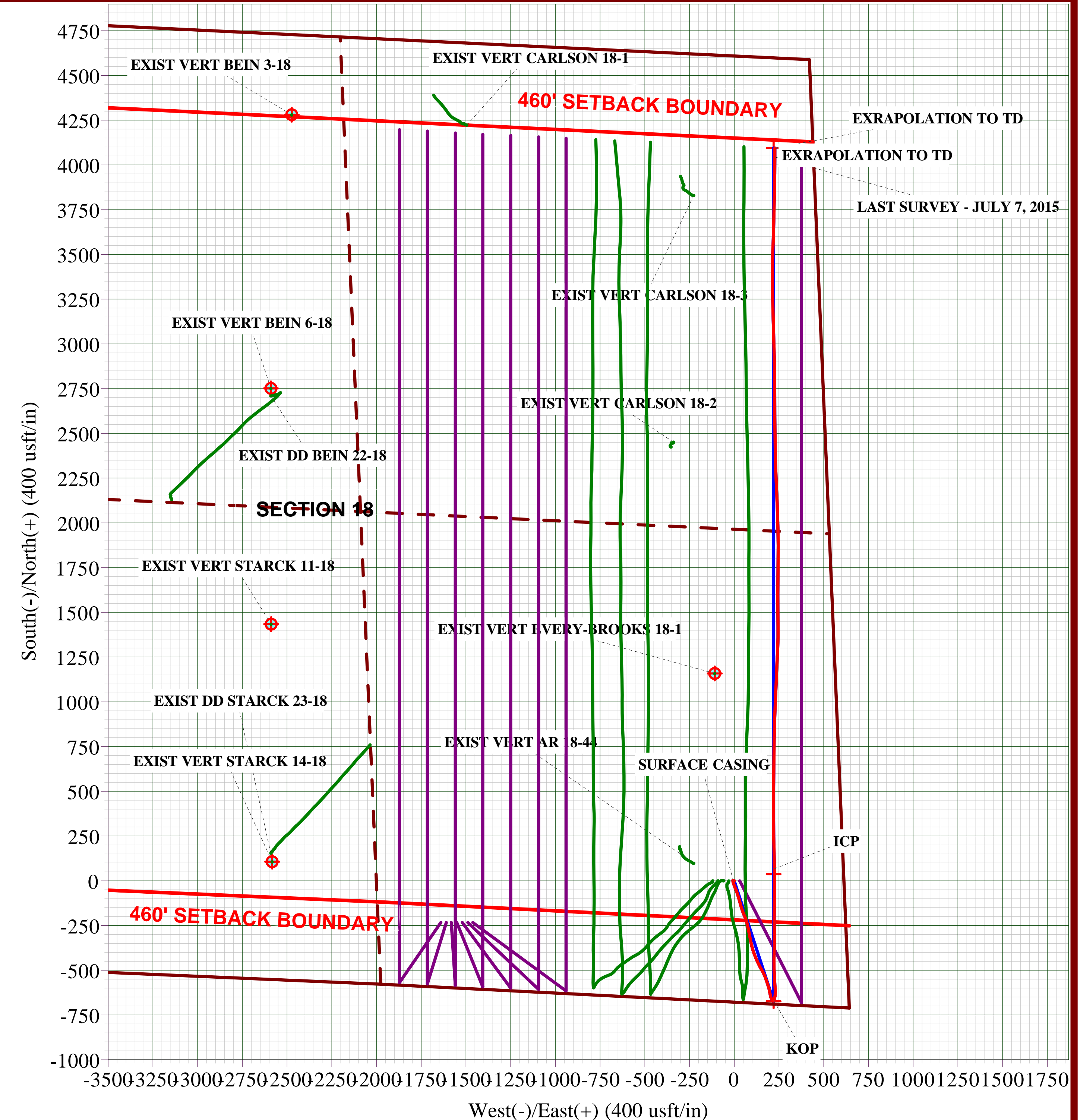
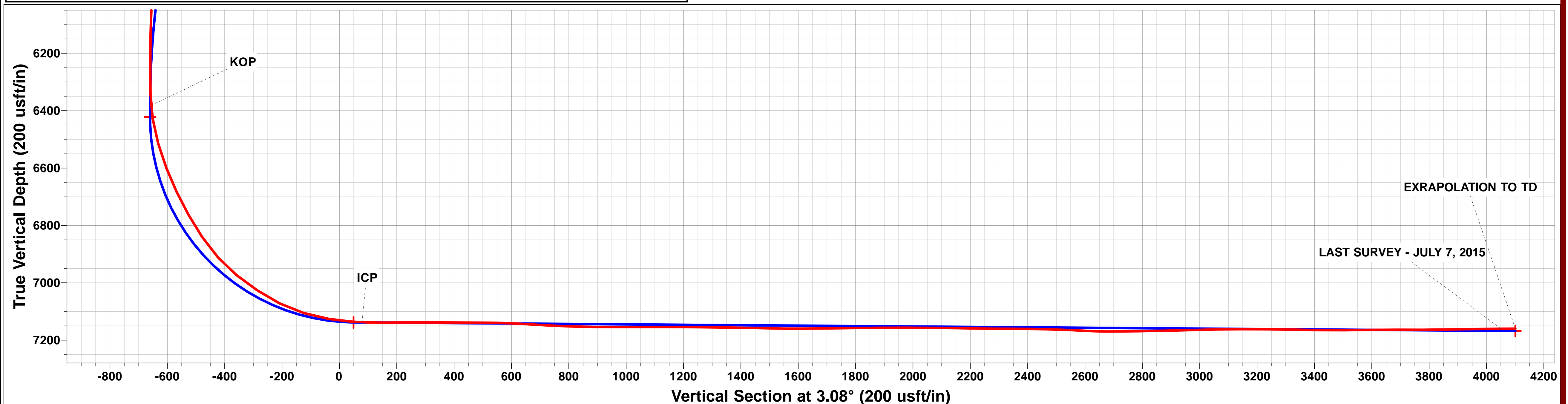
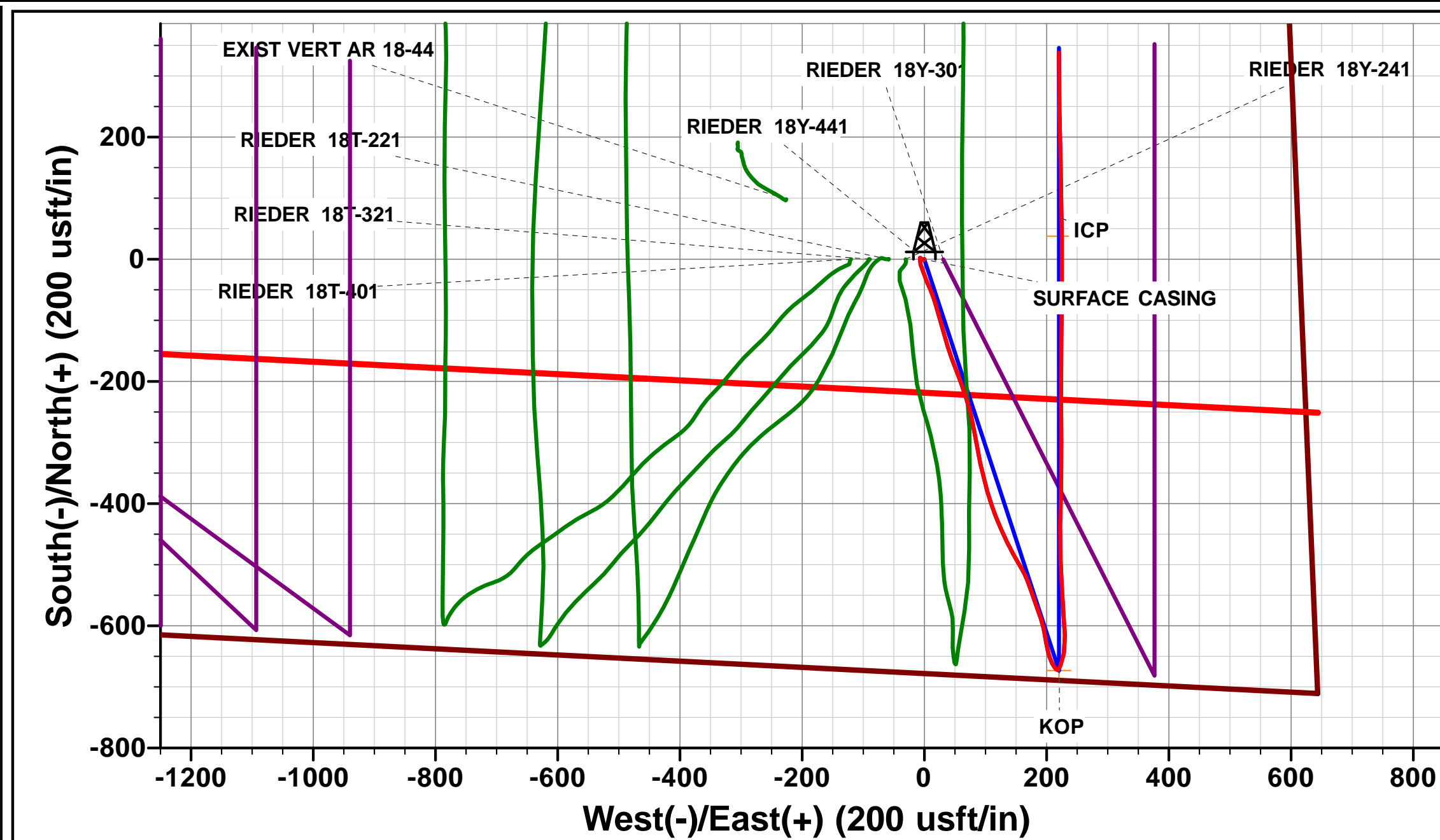
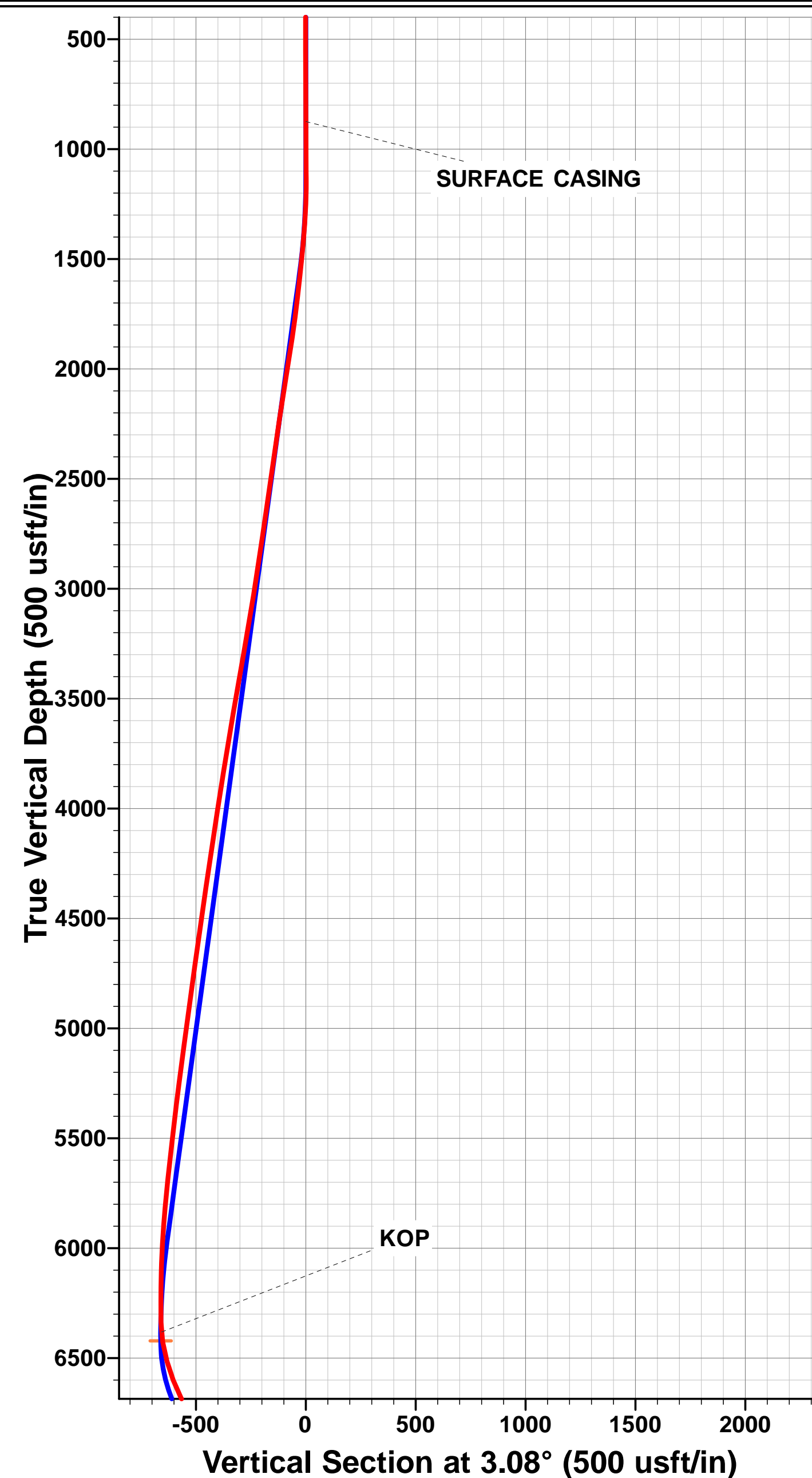
SHL: 679ft FSL & 622ft FEL Sec 18

ICP: 746.3ft FSL & 397.6ft FEL Sec 18

BHL: 500.5ft FNL & 222.7ft FEL Sec 18

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude	Shape
7" ICP *NEW* - RIEDER 18Y-441 (P2)	7138.0	37.7	220.3	40.307953	-104.924570	Point
BHL - RIEDER 18Y-441 (P2)	7168.0	4094.8	220.3	40.319090	-104.924570	Point
KOP - RIEDER 18Y-441 (P2)	6421.8	-673.1	220.3	40.306002	-104.924570	Point



Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well RIEDER 18Y-441
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4819.0usft (ENS 135)
Site:	SE SE SEC. 18 T4N R67W 6th P.M.	MD Reference:	KB @ 4819.0usft (ENS 135)
Well:	RIEDER 18Y-441	North Reference:	True
Wellbore:	JOB #2015-046-135	Survey Calculation Method:	Minimum Curvature
Design:	FINAL SURVEYS	Database:	EDM 5000.1 Single User Db

Project	WELD COUNTY, COLORADO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	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-441					
Well Position	+N/-S	0.0 usft	Northing:	1,355,510.01 usft	Latitude:	40.307850
	+E/-W	0.0 usft	Easting:	3,160,259.61 usft	Longitude:	-104.925360
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,806.0 usft

Wellbore	JOB #2015-046-135				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	28/06/2015	8.50	66.80	52,552

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	3.08	

Survey Program	Date	07/07/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
270.0	11,620.0	FINAL SURVEYS (JOB #2015-046-135)	MWD	MWD - Standard	

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)
0.0	0.00	0.00	0.0	-4,819.0	0.0	0.0	0.0	0.00	0.00	0.00
270.0	0.40	223.60	270.0	-4,549.0	-0.7	-0.6	-0.7	0.15	0.15	0.00
552.0	0.30	324.60	552.0	-4,267.0	-0.8	-1.8	-0.9	0.19	-0.04	35.82
833.0	0.80	289.10	833.0	-3,986.0	0.4	-4.0	0.2	0.21	0.18	-12.63
SURFACE CASING										
875.0	0.79	292.55	875.0	-3,944.0	0.7	-4.6	0.4	0.12	-0.02	8.21
1,111.0	0.80	312.30	1,111.0	-3,708.0	2.4	-7.3	2.0	0.12	0.00	8.37
1,392.0	5.10	168.30	1,391.6	-3,427.4	-8.5	-6.2	-8.9	2.05	1.53	-51.25
1,673.0	7.50	154.40	1,670.9	-3,148.1	-37.3	4.2	-37.0	1.01	0.85	-4.95
1,954.0	9.80	162.70	1,948.7	-2,870.3	-76.7	19.3	-75.5	0.93	0.82	2.95
2,232.0	9.10	165.80	2,222.9	-2,596.1	-120.6	31.7	-118.7	0.31	-0.25	1.12
2,503.0	8.70	159.60	2,490.7	-2,328.3	-160.6	44.1	-158.0	0.38	-0.15	-2.29
2,774.0	9.00	159.10	2,758.5	-2,060.5	-199.6	58.8	-196.1	0.11	0.11	-0.18

Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well RIEDER 18Y-441
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4819.0usft (ENS 135)
Site:	SE SE SEC. 18 T4N R67W 6th P.M.	MD Reference:	KB @ 4819.0usft (ENS 135)
Well:	RIEDER 18Y-441	North Reference:	True
Wellbore:	JOB #2015-046-135	Survey Calculation Method:	Minimum Curvature
Design:	FINAL SURVEYS	Database:	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)
3,046.0	9.60	164.30	3,026.9	-1,792.1	-241.3	72.5	-237.0	0.38	0.22	1.91
3,318.0	10.50	170.70	3,294.7	-1,524.3	-287.6	82.7	-282.7	0.53	0.33	2.35
3,589.0	9.80	167.80	3,561.5	-1,257.5	-334.5	91.5	-329.1	0.32	-0.26	-1.07
3,859.0	9.90	164.00	3,827.5	-991.5	-379.3	102.8	-373.2	0.24	0.04	-1.41
4,130.0	9.10	158.50	4,094.8	-724.2	-421.6	117.1	-414.7	0.45	-0.30	-2.03
4,401.0	9.90	154.10	4,362.1	-456.9	-462.5	135.1	-454.6	0.40	0.30	-1.62
4,673.0	9.20	148.80	4,630.3	-188.7	-502.1	156.6	-493.0	0.41	-0.26	-1.95
4,944.0	8.40	163.00	4,898.1	79.1	-539.6	173.6	-529.5	0.85	-0.30	5.24
5,216.0	8.30	158.90	5,167.3	348.3	-576.9	186.5	-566.1	0.22	-0.04	-1.51
5,487.0	6.60	170.10	5,436.0	617.0	-610.5	196.2	-599.1	0.82	-0.63	4.13
5,758.0	6.60	167.30	5,705.2	886.2	-641.0	202.3	-629.3	0.12	0.00	-1.03
6,029.0	3.90	149.10	5,975.0	1,156.0	-664.2	210.5	-651.9	1.16	-1.00	-6.72
6,300.0	1.10	87.90	6,245.8	1,426.8	-672.0	217.8	-659.3	1.29	-1.03	-22.58
6,391.0	1.30	67.30	6,336.8	1,517.8	-671.5	219.6	-658.8	0.52	0.22	-22.64
KOP										
6,436.0	5.16	24.51	6,381.7	1,562.7	-669.5	220.9	-656.7	9.54	8.57	-95.08
6,481.0	9.40	19.10	6,426.3	1,607.3	-664.2	223.0	-651.3	9.54	9.43	-12.03
6,571.0	16.00	13.40	6,514.1	1,695.1	-645.2	228.3	-632.0	7.46	7.33	-6.33
6,662.0	21.40	355.30	6,600.3	1,781.3	-616.4	229.8	-603.1	8.65	5.93	-19.89
6,752.0	25.60	357.40	6,682.8	1,863.8	-580.6	227.6	-567.5	4.76	4.67	2.33
6,842.0	29.40	356.00	6,762.6	1,943.6	-539.1	225.1	-526.2	4.28	4.22	-1.56
6,932.0	33.80	357.90	6,839.3	2,020.3	-492.0	222.7	-479.3	5.01	4.89	2.11
7,023.0	42.00	0.60	6,911.0	2,092.0	-436.2	222.1	-423.6	9.19	9.01	2.97
7,113.0	50.50	2.10	6,973.2	2,154.2	-371.2	223.7	-358.7	9.52	9.44	1.67
7,203.0	57.00	358.80	7,026.4	2,207.4	-298.7	224.2	-286.2	7.80	7.22	-3.67
7,293.0	62.60	0.10	7,071.7	2,252.7	-221.0	223.4	-208.6	6.35	6.22	1.44
7,384.0	73.70	0.80	7,105.5	2,286.5	-136.6	224.1	-124.4	12.22	12.20	0.77
7,474.0	79.80	0.30	7,126.1	2,307.1	-49.1	224.9	-36.9	6.80	6.78	-0.56
7,556.0	86.80	359.50	7,135.7	2,316.7	32.3	224.8	44.3	8.59	8.54	-0.98
ICP										
7,591.0	87.75	359.30	7,137.3	2,318.3	67.3	224.4	79.2	2.78	2.72	-0.56
7,681.0	90.20	358.80	7,138.9	2,319.9	157.2	222.9	169.0	2.78	2.72	-0.56
7,772.0	90.50	358.60	7,138.4	2,319.4	248.2	220.9	259.7	0.40	0.33	-0.22
7,862.0	89.40	0.30	7,138.5	2,319.5	338.2	220.0	349.5	2.25	-1.22	1.89
7,952.0	90.00	359.70	7,138.9	2,319.9	428.2	220.0	439.4	0.94	0.67	-0.67
8,042.0	89.20	0.40	7,139.6	2,320.6	518.2	220.1	529.3	1.18	-0.89	0.78
8,133.0	87.00	1.00	7,142.6	2,323.6	609.1	221.2	620.1	2.51	-2.42	0.66
8,223.0	86.50	0.30	7,147.7	2,328.7	699.0	222.2	709.9	0.95	-0.56	-0.78
8,313.0	88.00	1.00	7,152.0	2,333.0	788.9	223.2	799.7	1.84	1.67	0.78
8,403.0	89.40	1.60	7,154.0	2,335.0	878.8	225.3	889.6	1.69	1.56	0.67
8,493.0	89.90	2.50	7,154.6	2,335.6	968.8	228.5	979.6	1.14	0.56	1.00
8,584.0	90.30	2.70	7,154.4	2,335.4	1,059.7	232.6	1,070.6	0.49	0.44	0.22
8,674.0	89.60	1.90	7,154.5	2,335.5	1,149.6	236.2	1,160.6	1.18	-0.78	-0.89
8,765.0	89.80	3.20	7,155.0	2,336.0	1,240.5	240.3	1,251.6	1.45	0.22	1.43
8,855.0	89.10	1.70	7,155.8	2,336.8	1,330.4	244.1	1,341.6	1.84	-0.78	-1.67
8,946.0	88.90	359.50	7,157.4	2,338.4	1,421.4	245.1	1,432.5	2.43	-0.22	-2.42
9,036.0	88.70	359.30	7,159.3	2,340.3	1,511.4	244.2	1,522.3	0.31	-0.22	-0.22
9,127.0	90.50	0.40	7,160.0	2,341.0	1,602.3	243.9	1,613.1	2.32	1.98	1.21
9,217.0	90.70	0.60	7,159.0	2,340.0	1,692.3	244.7	1,703.0	0.31	0.22	0.22
9,308.0	90.80	0.30	7,157.8	2,338.8	1,783.3	245.4	1,793.9	0.35	0.11	-0.33
9,398.0	90.40	0.10	7,156.9	2,337.9	1,873.3	245.7	1,883.8	0.50	-0.44	-0.22
9,489.0	89.80	358.40	7,156.7	2,337.7	1,964.3	244.5	1,974.6	1.98	-0.66	-1.87
9,579.0	89.50	358.10	7,157.3	2,338.3	2,054.3	241.8	2,064.3	0.47	-0.33	-0.33

Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well RIEDER 18Y-441
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4819.0usft (ENS 135)
Site:	SE SE SEC. 18 T4N R67W 6th P.M.	MD Reference:	KB @ 4819.0usft (ENS 135)
Well:	RIEDER 18Y-441	North Reference:	True
Wellbore:	JOB #2015-046-135	Survey Calculation Method:	Minimum Curvature
Design:	FINAL SURVEYS	Database:	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)
9,670.0	89.30	357.80	7,158.2	2,339.2	2,145.2	238.5	2,154.9	0.40	-0.22	-0.33
9,760.0	88.90	357.20	7,159.6	2,340.6	2,235.1	234.6	2,244.5	0.80	-0.44	-0.67
9,850.0	89.90	358.50	7,160.6	2,341.6	2,325.0	231.2	2,334.1	1.82	1.11	1.44
9,941.0	89.10	359.00	7,161.4	2,342.4	2,416.0	229.3	2,424.8	1.04	-0.88	0.55
10,031.0	88.00	359.30	7,163.7	2,344.7	2,506.0	227.9	2,514.6	1.27	-1.22	0.33
10,121.0	86.90	359.50	7,167.7	2,348.7	2,595.9	227.0	2,604.3	1.24	-1.22	0.22
10,212.0	90.20	0.10	7,170.0	2,351.0	2,686.8	226.7	2,695.1	3.69	3.63	0.66
10,303.0	91.10	359.50	7,168.9	2,349.9	2,777.8	226.3	2,786.0	1.19	0.99	-0.66
10,393.0	91.00	358.80	7,167.3	2,348.3	2,867.8	225.0	2,875.7	0.79	-0.11	-0.78
10,484.0	91.80	358.80	7,165.1	2,346.1	2,958.7	223.1	2,966.5	0.88	0.88	0.00
10,574.0	91.30	357.90	7,162.6	2,343.6	3,048.7	220.5	3,056.1	1.14	-0.56	-1.00
10,664.0	89.70	358.70	7,161.8	2,342.8	3,138.6	217.8	3,145.8	1.99	-1.78	0.89
10,755.0	89.70	358.80	7,162.3	2,343.3	3,229.6	215.9	3,236.5	0.11	0.00	0.11
10,845.0	88.90	358.30	7,163.4	2,344.4	3,319.6	213.6	3,326.3	1.05	-0.89	-0.56
10,935.0	88.80	0.80	7,165.2	2,346.2	3,409.5	212.9	3,416.1	2.78	-0.11	2.78
11,026.0	90.90	2.20	7,165.5	2,346.5	3,500.5	215.3	3,507.0	2.77	2.31	1.54
11,116.0	90.60	2.00	7,164.3	2,345.3	3,590.4	218.6	3,597.0	0.40	-0.33	-0.22
11,207.0	90.00	1.40	7,163.8	2,344.8	3,681.4	221.2	3,688.0	0.93	-0.66	-0.66
11,297.0	89.90	1.00	7,163.9	2,344.9	3,771.4	223.1	3,777.9	0.46	-0.11	-0.44
11,387.0	91.40	1.20	7,162.9	2,343.9	3,861.3	224.9	3,867.9	1.68	1.67	0.22
11,478.0	90.20	0.80	7,161.6	2,342.6	3,952.3	226.4	3,958.8	1.39	-1.32	-0.44
LAST SURVEY - JULY 7, 2015										
11,570.0	91.10	0.30	7,160.5	2,341.5	4,044.3	227.3	4,050.7	1.12	0.98	-0.54
EXTRAPOLATION TO TD										
11,620.0	90.00	0.30	7,160.1	2,341.1	4,094.3	227.6	4,100.6	2.20	-2.20	0.00

Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well RIEDER 18Y-441
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4819.0usft (ENS 135)
Site:	SE SE SEC. 18 T4N R67W 6th P.M.	MD Reference:	KB @ 4819.0usft (ENS 135)
Well:	RIEDER 18Y-441	North Reference:	True
Wellbore:	JOB #2015-046-135	Survey Calculation Method:	Minimum Curvature
Design:	FINAL SURVEYS	Database:	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-441 - survey misses target center by 47.8usft at 6625.9usft MD (6566.4 TVD, -628.8 N, 230.2 E) - Point	0.00	0.00	6,581.4	-673.1	220.3	1,354,838.39	3,160,484.26	40.306002	-104.924570
EXIST VERT EVERY-BF - survey misses target center by 347.2usft at 8669.1usft MD (7154.5 TVD, 1144.7 N, 236.1 E) - Circle (radius 30.0)	0.00	0.00	7,192.0	1,158.5	-108.8	1,356,667.73	3,160,143.35	40.311030	-104.925750
KOP - RIEDER 18Y-441 - survey misses target center by 8.5usft at 6475.3usft MD (6420.7 TVD, -665.0 N, 222.7 E) - Point	0.00	0.00	6,421.8	-673.1	220.3	1,354,838.39	3,160,484.26	40.306002	-104.924570
EXIST VERT STARCK 1 - survey misses target center by 2903.2usft at 9001.6usft MD (7158.6 TVD, 1477.0 N, 244.6 E) - Circle (radius 30.0)	0.00	0.00	7,791.0	1,434.0	-2,588.6	1,356,927.19	3,157,661.88	40.311786	-104.934642
EXIST VERT BEIN 6-18 - survey misses target center by 2876.8usft at 10280.1usft MD (7169.3 TVD, 2754.9 N, 226.5 E) - Circle (radius 30.0)	0.00	0.00	7,756.0	2,751.7	-2,589.9	1,358,244.80	3,157,652.08	40.315403	-104.934647
BHL - RIEDER 18Y-441 - survey misses target center by 10.8usft at 11620.0usft MD (7160.1 TVD, 4094.3 N, 227.6 E) - Point	0.00	0.00	7,168.0	4,094.8	220.3	1,359,605.99	3,160,453.36	40.319090	-104.924570
7" ICP *NEW* - RIEDER - survey misses target center by 35.4usft at 7383.5usft MD (7105.3 TVD, -137.1 N, 224.1 E) - Point	0.00	0.00	7,138.0	-150.2	220.3	1,355,361.25	3,160,480.87	40.307438	-104.924570
7" ICP *NEW* - RIEDER - survey misses target center by 4.9usft at 7561.5usft MD (7136.0 TVD, 37.8 N, 224.8 E) - Point	0.00	0.00	7,138.0	37.7	220.3	1,355,549.14	3,160,479.65	40.307953	-104.924570
BHL - RIEDER 18Y-441 - survey misses target center by 10.8usft at 11620.0usft MD (7160.1 TVD, 4094.3 N, 227.6 E) - Point	0.00	0.00	7,168.0	4,094.8	220.3	1,359,605.99	3,160,453.36	40.319090	-104.924570
EXIST VERT BEIN 3-18 - survey misses target center by 2709.4usft at 11620.0usft MD (7160.1 TVD, 4094.3 N, 227.6 E) - Circle (radius 30.0)	0.00	0.00	7,264.0	4,280.7	-2,473.4	1,359,774.44	3,157,758.61	40.319600	-104.934230
EXIST VERT STARCK 1 - survey misses target center by 2882.9usft at 7689.9usft MD (7138.9 TVD, 166.2 N, 222.8 E) - Circle (radius 30.0)	0.00	0.00	7,798.0	106.5	-2,583.2	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)	
875.0	875.0	0.7	-4.6	SURFACE CASING
6,436.0	6,381.7	-669.5	220.9	KOP
7,591.0	7,137.3	67.3	224.4	ICP
11,570.0	7,160.5	4,044.3	227.3	LAST SURVEY - JULY 7, 2015
11,620.0	7,160.1	4,094.3	227.6	EXTRAPOLATION TO TD

Checked By: _____ Approved By: _____ Date: _____