

# **PDC ENERGY**

**WELD COUNTY, COLORADO**

**SE SW SEC. 29 T5N R63W 6th P.M.**

**R&R FARMS 29L-321**

**JOB # 2015-092-135**

**11 September, 2015**

**Survey: FINAL SURVEYS**





Project: WELD COUNTY, COLORADO  
Site: SE SW SEC. 29 T5N R63W 6th P.M.  
Well: R&R FARMS 29L-321  
Wellbore: JOB # 2015-092-135  
Design: FINAL SURVEYS

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSec	Dep	Annotation
923.0	923.0	0.20	288.13	-3.4	-3.6	-3.3	6.3	SURFACE CASING
5492.1	5519.0	1.98	22.23	-266.8	-132.2	-263.0	361.6	KOP
6459.1	6845.0	81.32	359.04	489.2	-122.7	492.4	1118.7	ICP
6438.5	10704.0	91.10	359.70	4346.7	-109.6	4348.1	4976.7	LAST SURVEY - SEPT 10, 2015
6437.6	10754.0	91.10	359.70	4396.7	-109.9	4398.1	5026.7	EXTRAPOLATION TO TD

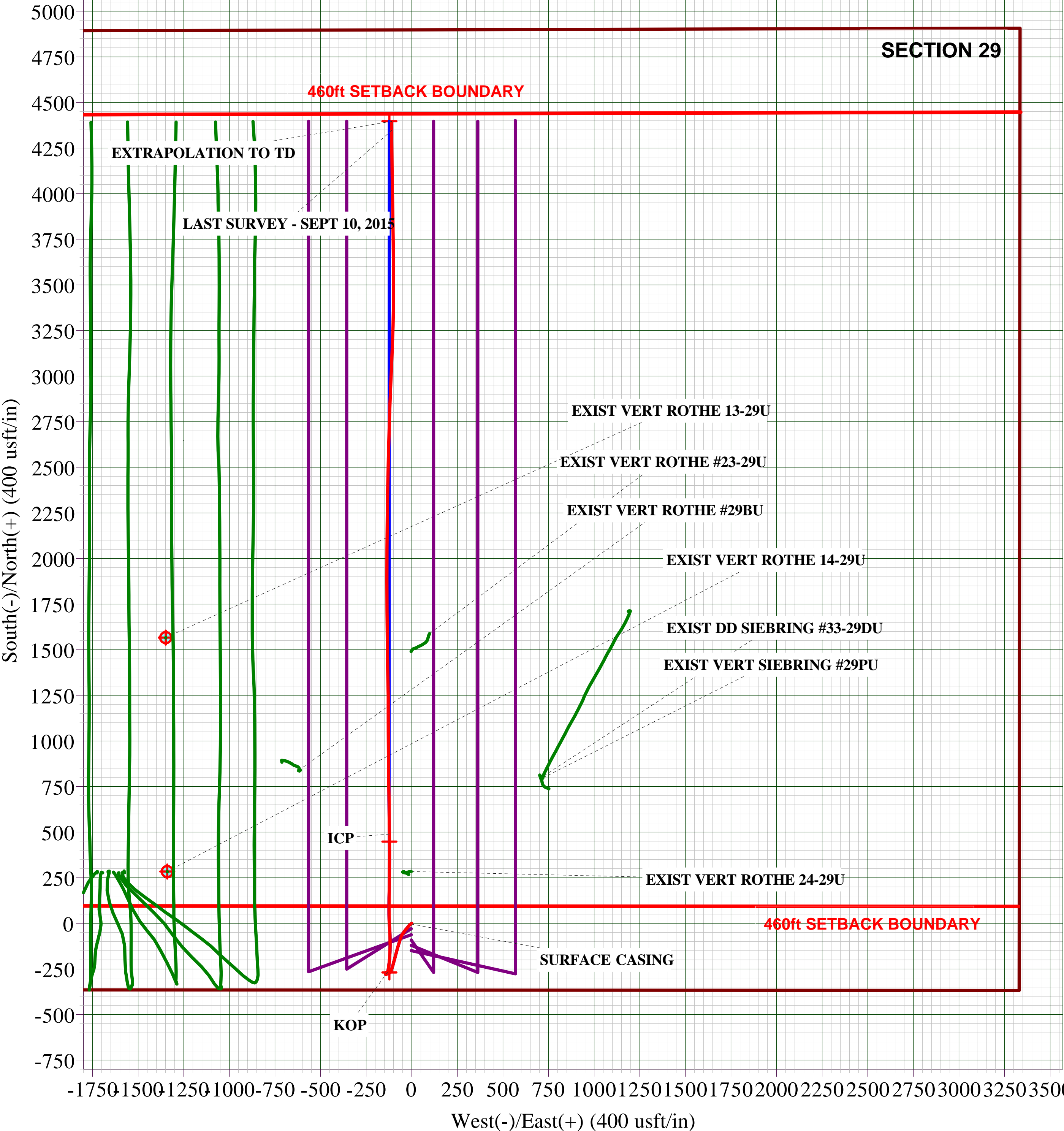
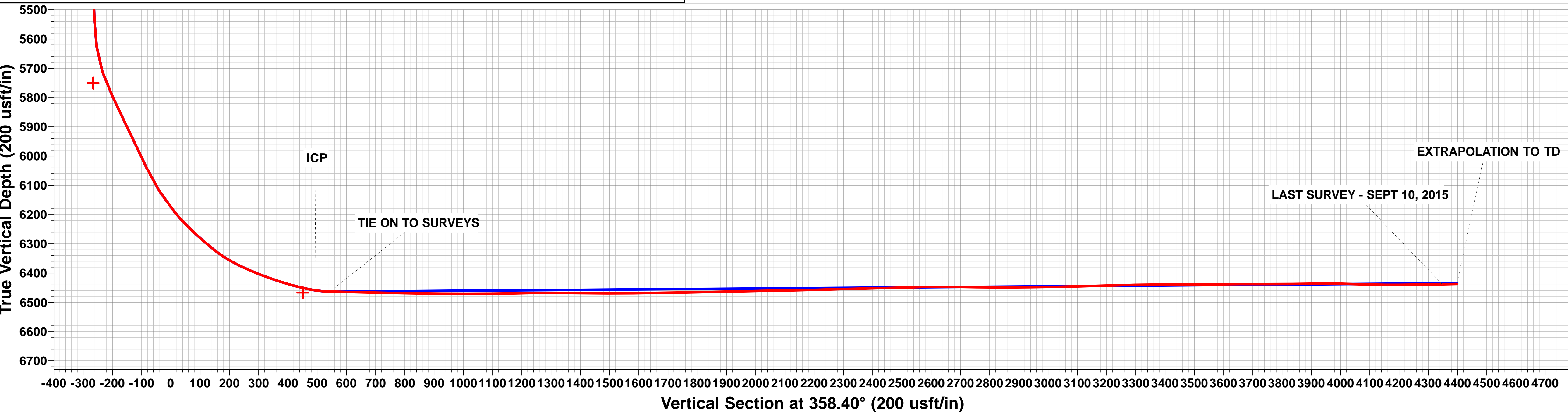
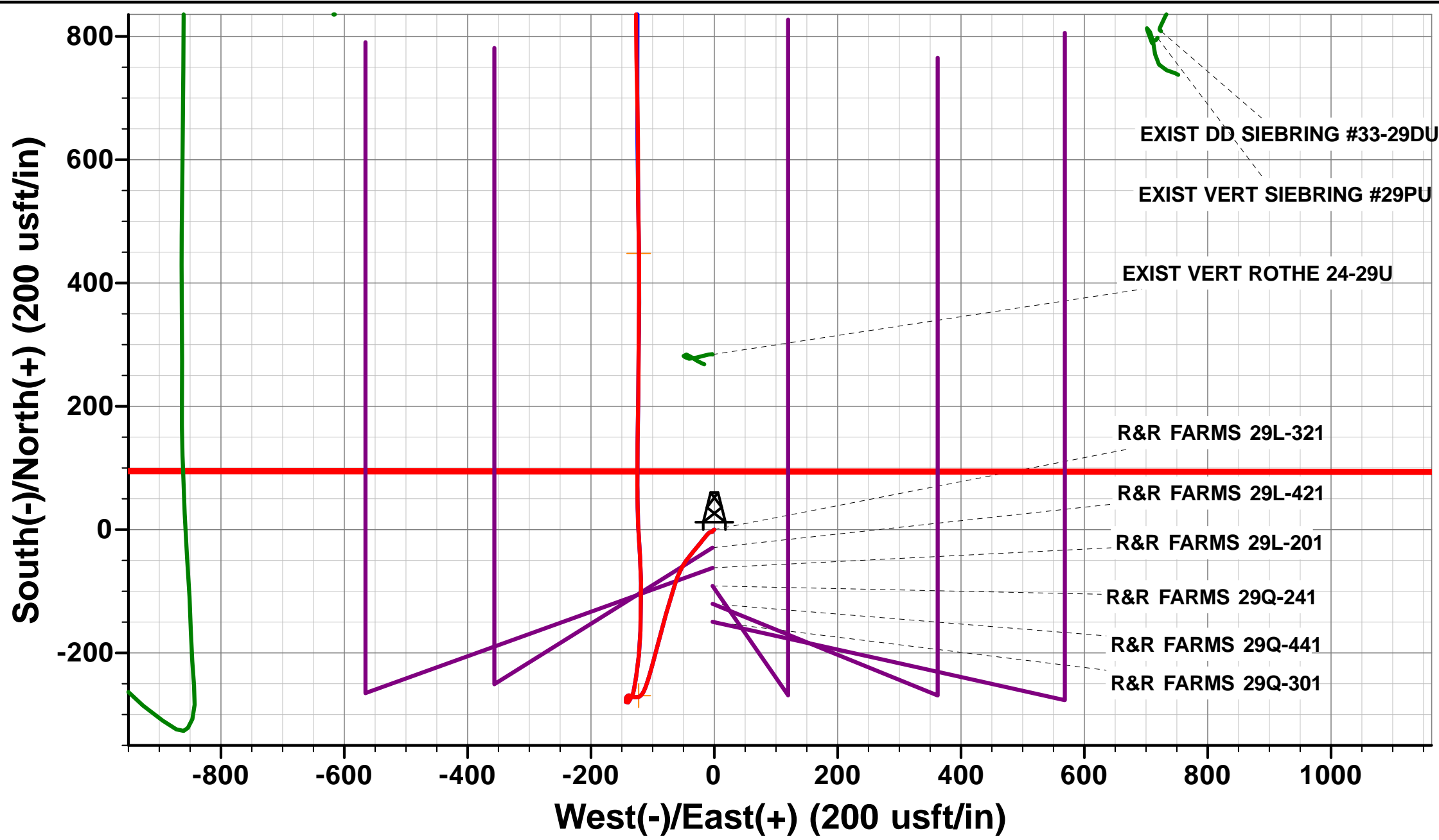
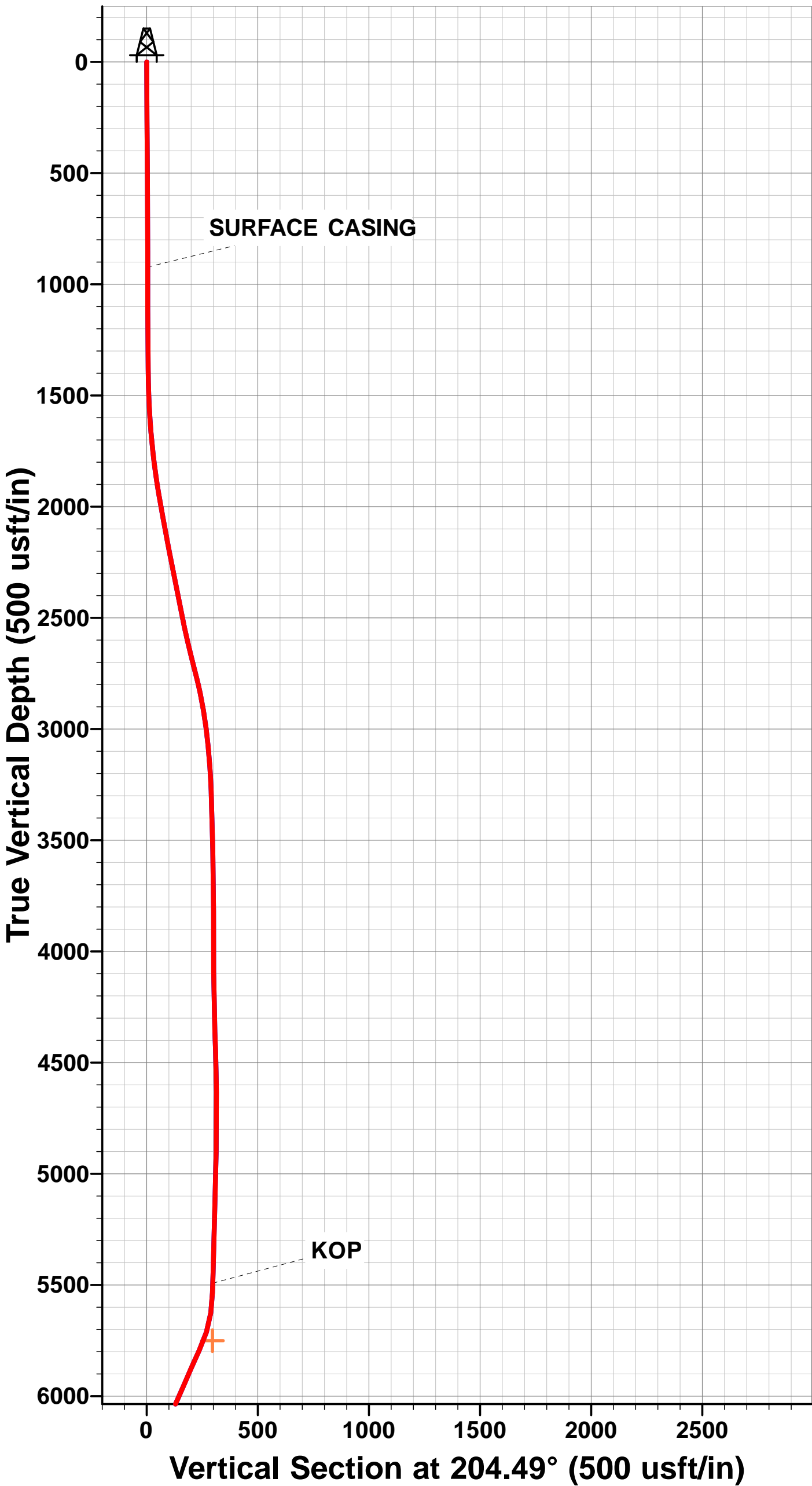
AS DRILLED LOCAL COORDINATES:

SHL: 365ft FSL & 2004t FWL Sec 29  
7" ICP: 854.2ft FSL & 1881.3ft FWL Sec 29  
BHL: 500.5ft FNL & 1931.7ft FWL Sec 29

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
7" ICP *NEW* - R&R FARMS 29L-321	6467.0	448.1	-122.6	40.365510	-104.462850
KOP - R&R FARMS 29L-321	5750.8	-269.2	-122.6	40.363541	-104.462850

Point



## Survey Report



<b>Company:</b>	PDC ENERGY	<b>Local Co-ordinate Reference:</b>	Well R&R FARMS 29L-321
<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB-EST @ 4586.0usft (Original Well Elev)
<b>Site:</b>	SE SW SEC. 29 T5N R63W 6th P.M.	<b>MD Reference:</b>	KB-EST @ 4586.0usft (Original Well Elev)
<b>Well:</b>	R&R FARMS 29L-321	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB # 2015-092-135	<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 SW SEC. 29 T5N R63W 6th P.M.				
Site Position:		Northing:	1,377,177.35 usft	Latitude:	40.364110
From:	Lat/Long	Easting:	3,289,123.16 usft	Longitude:	-104.462420
Position Uncertainty:	0.0 usft	Slot Radius:	1.10000 ft	Grid Convergence:	0.67 °

Well	R&R FARMS 29L-321					
Well Position	+N/-S	0.0 usft	Northing:	1,377,239.30 usft	Latitude:	40.364280
	+E/-W	0.0 usft	Easting:	3,289,125.22 usft	Longitude:	-104.462410
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,573.0 usft

<b>Wellbore</b>	JOB # 2015-092-135				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	06/08/2015	8.24	66.92	52,620

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	358.40

<b>Survey Program</b>	<b>Date</b>	11/09/2015			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
263.0	8,839.0	FINAL SURVEYS (JOB # 2015-092-135)	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	-4,586.0	0.0	0.0	0.0	0.00	0.00	0.00
263.0	0.60	242.30	263.0	-4,323.0	-0.6	-1.2	-0.6	0.23	0.23	0.00
543.0	0.50	189.60	543.0	-4,043.0	-2.5	-2.7	-2.4	0.18	-0.04	-18.82
856.0	0.20	307.50	856.0	-3,730.0	-3.5	-3.4	-3.4	0.20	-0.10	37.67
<b>SURFACE CASING</b>										
923.0	0.20	288.13	923.0	-3,663.0	-3.4	-3.6	-3.3	0.10	0.00	-28.92
1,105.0	0.30	251.20	1,105.0	-3,481.0	-3.5	-4.3	-3.4	0.10	0.05	-20.29
1,385.0	0.80	258.10	1,385.0	-3,201.0	-4.1	-7.0	-3.9	0.18	0.18	2.46
1,666.0	4.90	218.40	1,665.6	-2,920.4	-13.9	-16.3	-13.5	1.54	1.46	-14.13
1,946.0	9.90	219.80	1,943.1	-2,642.9	-41.8	-39.2	-40.7	1.79	1.79	0.50
2,220.0	11.40	198.40	2,212.5	-2,373.5	-85.6	-62.8	-83.8	1.53	0.55	-7.81
2,491.0	11.30	195.10	2,478.2	-2,107.8	-136.7	-78.2	-134.4	0.24	-0.04	-1.22
2,762.0	15.00	194.80	2,742.1	-1,843.9	-196.2	-94.1	-193.5	1.37	1.37	-0.11

# Survey Report



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<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB-EST @ 4586.0usft (Original Well Elev)
<b>Site:</b>	SE SW SEC. 29 T5N R63W 6th P.M.	<b>MD Reference:</b>	KB-EST @ 4586.0usft (Original Well Elev)
<b>Well:</b>	R&R FARMS 29L-321	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB # 2015-092-135	<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)
3,033.0	7.00	198.10	3,007.9	-1,578.1	-245.9	-108.2	-242.8	2.96	-2.95	1.22
3,304.0	2.20	216.00	3,277.9	-1,308.1	-265.8	-116.4	-262.5	1.83	-1.77	6.61
3,575.0	1.40	247.50	3,548.8	-1,037.2	-271.3	-122.5	-267.8	0.46	-0.30	11.62
3,846.0	1.50	281.80	3,819.7	-766.3	-271.9	-129.0	-268.2	0.32	0.04	12.66
4,117.0	1.80	297.10	4,090.6	-495.4	-269.2	-136.3	-265.3	0.20	0.11	5.65
4,388.0	2.40	209.40	4,361.5	-224.5	-272.2	-142.9	-268.1	1.09	0.22	-32.36
4,659.0	1.30	132.90	4,632.4	46.4	-279.2	-143.4	-275.1	0.90	-0.41	-28.23
4,930.0	0.90	52.50	4,903.3	317.3	-280.0	-139.4	-276.0	0.54	-0.15	-29.67
5,201.0	2.10	22.30	5,174.3	588.3	-274.1	-135.9	-270.3	0.52	0.44	-11.14
5,472.0	0.90	36.30	5,445.2	859.2	-267.8	-132.7	-264.0	0.46	-0.44	5.17
KOP										
5,519.0	1.98	22.23	5,492.1	906.1	-266.8	-132.2	-263.0	2.40	2.30	-29.94
5,562.0	3.00	18.40	5,535.1	949.1	-265.0	-131.6	-261.3	2.40	2.37	-8.90
5,653.0	6.50	11.20	5,625.8	1,039.8	-257.7	-129.8	-254.0	3.89	3.85	-7.91
5,742.0	20.00	9.10	5,712.2	1,126.2	-237.7	-126.4	-234.0	15.18	15.17	-2.36
5,832.0	25.10	5.60	5,795.3	1,209.3	-203.4	-122.1	-200.0	5.86	5.67	-3.89
5,922.0	26.00	1.80	5,876.5	1,290.5	-164.7	-119.6	-161.3	2.08	1.00	-4.22
6,013.0	25.20	359.50	5,958.6	1,372.6	-125.4	-119.2	-122.0	1.40	-0.88	-2.53
6,103.0	25.80	2.10	6,039.8	1,453.8	-86.7	-118.6	-83.3	1.41	0.67	2.89
6,193.0	31.80	354.30	6,118.7	1,532.7	-43.4	-120.3	-40.1	7.85	6.67	-8.67
6,283.0	40.10	358.20	6,191.5	1,605.5	9.2	-123.5	12.7	9.56	9.22	4.33
6,374.0	46.70	359.70	6,257.6	1,671.6	71.7	-124.6	75.1	7.34	7.25	1.65
6,464.0	51.00	0.90	6,316.8	1,730.8	139.4	-124.3	142.9	4.88	4.78	1.33
6,555.0	62.70	0.80	6,366.4	1,780.4	215.5	-123.1	218.8	12.86	12.86	-0.11
6,645.0	68.60	0.10	6,403.5	1,817.5	297.4	-122.5	300.7	6.59	6.56	-0.78
6,735.0	72.90	0.60	6,433.2	1,847.2	382.4	-122.0	385.6	4.81	4.78	0.56
6,826.0	78.40	358.90	6,455.7	1,869.7	470.5	-122.4	473.7	6.31	6.04	-1.87
ICP										
6,845.0	81.32	359.04	6,459.1	1,873.1	489.2	-122.7	492.4	15.37	15.35	0.72
6,897.0	89.30	359.40	6,463.3	1,877.3	541.0	-123.4	544.2	15.37	15.35	0.70
6,942.0	88.00	0.20	6,464.4	1,878.4	586.0	-123.6	589.2	3.39	-2.89	1.78
7,033.0	88.80	358.80	6,466.9	1,880.9	676.9	-124.4	680.1	1.77	0.88	-1.54
7,123.0	89.00	359.10	6,468.7	1,882.7	766.9	-126.0	770.1	0.40	0.22	0.33
7,213.0	89.30	359.50	6,470.0	1,884.0	856.9	-127.1	860.1	0.56	0.33	0.44
7,304.0	89.70	359.50	6,470.8	1,884.8	947.9	-127.9	951.1	0.44	0.44	0.00
7,394.0	90.20	359.70	6,470.9	1,884.9	1,037.9	-128.5	1,041.1	0.60	0.56	0.22
7,484.0	90.60	359.90	6,470.2	1,884.2	1,127.9	-128.9	1,131.0	0.50	0.44	0.22
7,575.0	91.30	359.90	6,468.7	1,882.7	1,218.9	-129.0	1,222.0	0.77	0.77	0.00
7,665.0	89.60	358.80	6,468.0	1,882.0	1,308.8	-130.0	1,312.0	2.25	-1.89	-1.22
7,755.0	89.20	358.60	6,469.0	1,883.0	1,398.8	-132.1	1,402.0	0.50	-0.44	-0.22
7,846.0	90.10	359.50	6,469.5	1,883.5	1,489.8	-133.6	1,492.9	1.40	0.99	0.99
7,936.0	90.50	359.60	6,469.1	1,883.1	1,579.8	-134.3	1,582.9	0.46	0.44	0.11
8,026.0	90.90	359.70	6,468.0	1,882.0	1,669.8	-134.8	1,672.9	0.46	0.44	0.11
8,117.0	90.90	359.80	6,466.5	1,880.5	1,760.8	-135.2	1,763.9	0.11	0.00	0.11
8,207.0	91.20	359.70	6,464.9	1,878.9	1,850.8	-135.6	1,853.8	0.35	0.33	-0.11
8,297.0	91.60	359.90	6,462.7	1,876.7	1,940.7	-135.9	1,943.8	0.50	0.44	0.22
8,388.0	90.70	0.50	6,460.9	1,874.9	2,031.7	-135.6	2,034.7	1.19	-0.99	0.66
8,478.0	91.20	0.50	6,459.4	1,873.4	2,121.7	-134.8	2,124.6	0.56	0.56	0.00
8,568.0	91.50	0.60	6,457.2	1,871.2	2,211.7	-134.0	2,214.5	0.35	0.33	0.11
8,658.0	91.70	0.60	6,454.7	1,868.7	2,301.6	-133.0	2,304.4	0.22	0.22	0.00
8,749.0	91.20	1.10	6,452.4	1,866.4	2,392.6	-131.7	2,395.3	0.78	-0.55	0.55
8,839.0	91.50	1.20	6,450.3	1,864.3	2,482.5	-129.9	2,485.2	0.35	0.33	0.11
8,929.0	91.80	1.60	6,447.7	1,861.7	2,572.5	-127.7	2,575.0	0.56	0.33	0.44

## Survey Report



<b>Company:</b>	PDC ENERGY	<b>Local Co-ordinate Reference:</b>	Well R&R FARMS 29L-321
<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB-EST @ 4586.0usft (Original Well Elev)
<b>Site:</b>	SE SW SEC. 29 T5N R63W 6th P.M.	<b>MD Reference:</b>	KB-EST @ 4586.0usft (Original Well Elev)
<b>Well:</b>	R&R FARMS 29L-321	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB # 2015-092-135	<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)
9,019.0	88.90	1.60	6,447.2	1,861.2	2,662.4	-125.2	2,664.9	3.22	-3.22	0.00
9,110.0	89.40	1.70	6,448.5	1,862.5	2,753.4	-122.5	2,755.7	0.56	0.55	0.11
9,200.0	89.90	2.20	6,449.1	1,863.1	2,843.3	-119.5	2,845.6	0.79	0.56	0.56
9,291.0	90.70	2.40	6,448.6	1,862.6	2,934.3	-115.8	2,936.3	0.91	0.88	0.22
9,381.0	91.00	2.40	6,447.3	1,861.3	3,024.2	-112.1	3,026.1	0.33	0.33	0.00
9,471.0	91.60	2.50	6,445.2	1,859.2	3,114.1	-108.2	3,115.9	0.68	0.67	0.11
9,562.0	91.30	2.30	6,442.9	1,856.9	3,205.0	-104.4	3,206.6	0.40	-0.33	-0.22
9,652.0	91.70	1.20	6,440.5	1,854.5	3,294.9	-101.7	3,296.4	1.30	0.44	-1.22
9,742.0	89.70	0.40	6,439.5	1,853.5	3,384.9	-100.4	3,386.3	2.39	-2.22	-0.89
9,833.0	90.20	359.90	6,439.5	1,853.5	3,475.9	-100.2	3,477.3	0.78	0.55	-0.55
9,923.0	90.90	0.00	6,438.7	1,852.7	3,565.9	-100.2	3,567.3	0.79	0.78	0.11
10,013.0	90.00	359.30	6,438.0	1,852.0	3,655.8	-100.8	3,657.2	1.27	-1.00	-0.78
10,103.0	90.00	359.30	6,438.0	1,852.0	3,745.8	-101.9	3,747.2	0.00	0.00	0.00
10,193.0	90.50	359.50	6,437.6	1,851.6	3,835.8	-102.8	3,837.2	0.60	0.56	0.22
10,284.0	91.00	359.00	6,436.4	1,850.4	3,926.8	-104.0	3,928.2	0.78	0.55	-0.55
10,375.0	88.10	358.90	6,437.1	1,851.1	4,017.8	-105.7	4,019.2	3.19	-3.19	-0.11
10,465.0	88.70	359.00	6,439.6	1,853.6	4,107.7	-107.3	4,109.1	0.68	0.67	0.11
10,555.0	90.30	359.50	6,440.4	1,854.4	4,197.7	-108.5	4,199.1	1.86	1.78	0.56
10,645.0	90.80	359.60	6,439.5	1,853.5	4,287.7	-109.2	4,289.1	0.57	0.56	0.11
LAST SURVEY - SEPT 10, 2015										
10,704.0	91.10	359.70	6,438.5	1,852.5	4,346.7	-109.6	4,348.1	0.54	0.51	0.17
EXTRAPOLATION TO TD										
10,754.0	91.10	359.70	6,437.6	1,851.6	4,396.7	-109.9	4,398.1	0.00	0.00	0.00

# Survey Report



<b>Company:</b>	PDC ENERGY	<b>Local Co-ordinate Reference:</b>	Well R&R FARMS 29L-321
<b>Project:</b>	WELD COUNTY, COLORADO	<b>TVD Reference:</b>	KB-EST @ 4586.0usft (Original Well Elev)
<b>Site:</b>	SE SW SEC. 29 T5N R63W 6th P.M.	<b>MD Reference:</b>	KB-EST @ 4586.0usft (Original Well Elev)
<b>Well:</b>	R&R FARMS 29L-321	<b>North Reference:</b>	True
<b>Wellbore:</b>	JOB # 2015-092-135	<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
7" ICP *NEW* - R&R FA - survey misses target center by 15.8usft at 6807.1usft MD (6451.8 TVD, 452.0 N, -122.1 E) - Point	0.00	0.00	6,467.0	448.1	-122.6	1,377,685.93	3,288,997.40	40.365510	-104.462850
EXIST VERT ROTHE #1 - survey misses target center by 1242.6usft at 7930.9usft MD (6469.1 TVD, 1574.7 N, -134.3 E) - Circle (radius 30.0)	0.00	0.00	6,732.0	1,566.6	-1,348.7	1,378,789.92	3,287,758.37	40.368580	-104.467250
BHL - R&R FARMS 29L- - survey misses target center by 26.7usft at 10754.0usft MD (6437.6 TVD, 4396.7 N, -109.9 E) - Point	0.00	0.00	6,461.0	4,397.2	-122.6	1,381,634.61	3,288,951.20	40.376350	-104.462850
BHL - R&R FARMS 29L- - survey misses target center by 13.0usft at 10754.0usft MD (6437.6 TVD, 4396.7 N, -109.9 E) - Point	0.00	0.00	6,435.0	4,397.2	-122.6	1,381,634.61	3,288,951.20	40.376350	-104.462850
KOP - R&R FARMS 29L - survey misses target center by 43.1usft at 5765.8usft MD (5734.5 TVD, -229.3 N, -125.2 E) - Point	0.00	0.00	5,750.8	-269.2	-122.6	1,376,968.70	3,289,005.79	40.363541	-104.462850
EXIST VERT ROTHE #1 - survey misses target center by 1255.5usft at 6729.8usft MD (6431.6 TVD, 377.4 N, -122.0 E) - Circle (radius 30.0)	0.00	0.00	6,720.0	284.2	-1,340.4	1,377,507.79	3,287,781.67	40.365060	-104.467220

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
923.0	923.0	-3.4	-3.6	SURFACE CASING
5,519.0	5,492.1	-266.8	-132.2	KOP
6,845.0	6,459.1	489.2	-122.7	ICP
10,704.0	6,438.5	4,346.7	-109.6	LAST SURVEY - SEPT 10, 2015
10,754.0	6,437.6	4,396.7	-109.9	EXTRAPOLATION TO TD

Checked By: _____	Approved By: _____	Date: _____
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