

PDC ENERGY

**WELD COUNTY, COLORADO
NW NW SEC. 19 T4N R63W 6th P.M.
SATER 19E-323
JOB #2016-004-135**

03 February, 2016

Survey: FINAL SURVEYS





Project: WELD COUNTY, COLORADO
Site: NW NW SEC. 19 T4N R63W 6th P.M.
Well: SATER 19E-323
Wellbore: JOB #2016-004-135
Design: FINAL SURVEYS

ANNOTATIONS								
TVD	MD	Inc	Azi	+N/-S	+E/-W	VSect	Dep	Annotation
1637.7	1642.0	9.42	305.29	51.8	-45.7	-49.8	89.0	9 5/8" SURFACE CASING
5819.2	5837.0	1.86	186.13	120.6	-189.3	-112.4	313.0	KOP
6487.3	6664.2	60.11	180.48	-304.0	-204.7	312.4	737.6	460ft SETBACK X-OVER PNT
6622.9	7183.0	88.75	179.93	-796.5	-197.9	804.2	1230.1	HZ LANDING PNT
6587.6	10894.0	90.40	175.90	-4505.2	-187.6	4509.1	4940.6	LAST SURVEY - FEB 3, 2016
6587.1	10978.0	90.40	175.90	-4589.0	-181.6	4592.6	5024.6	EXTRAPOLATION TO TD

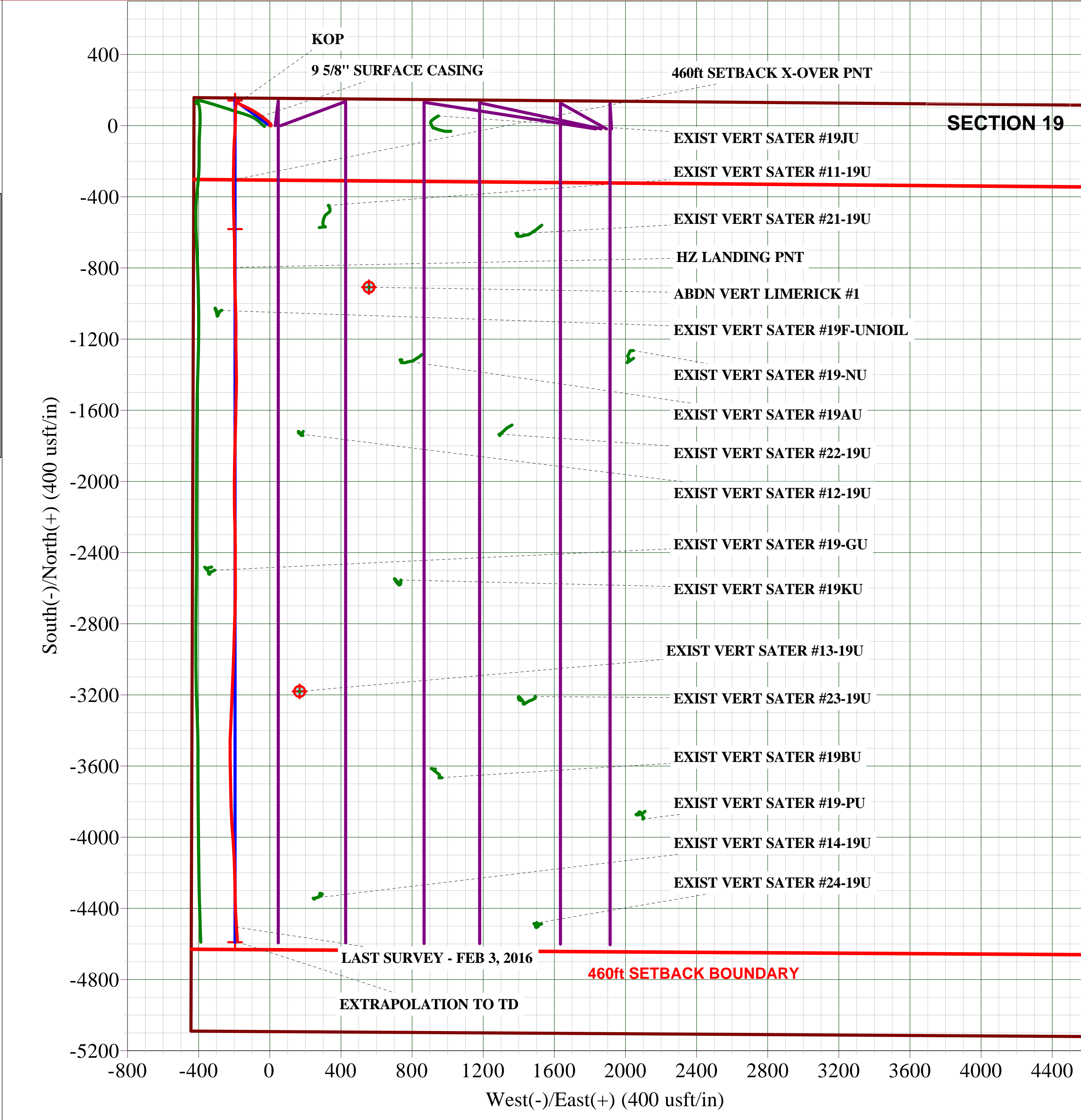
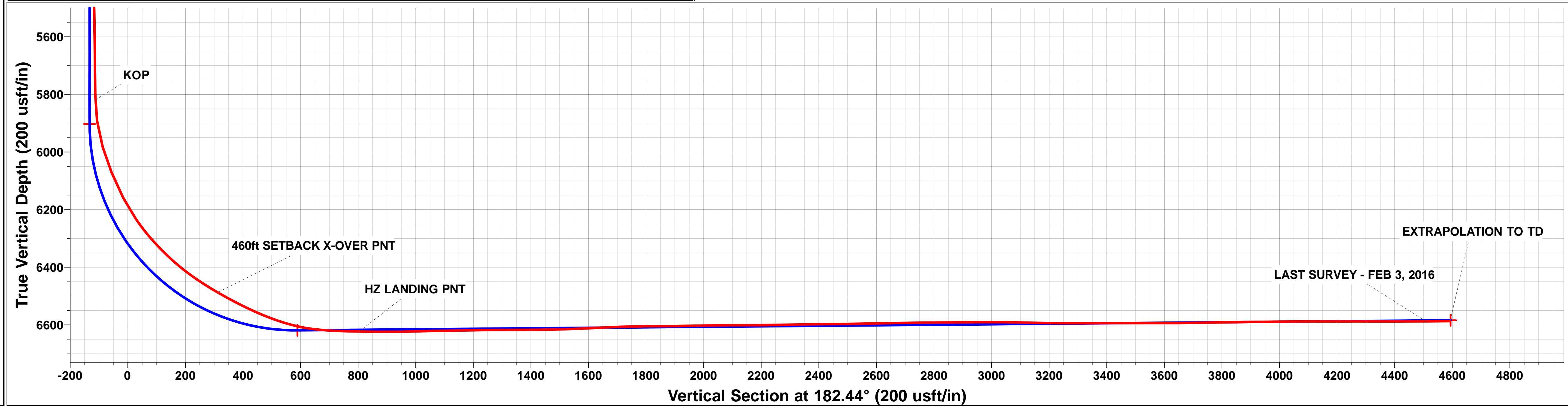
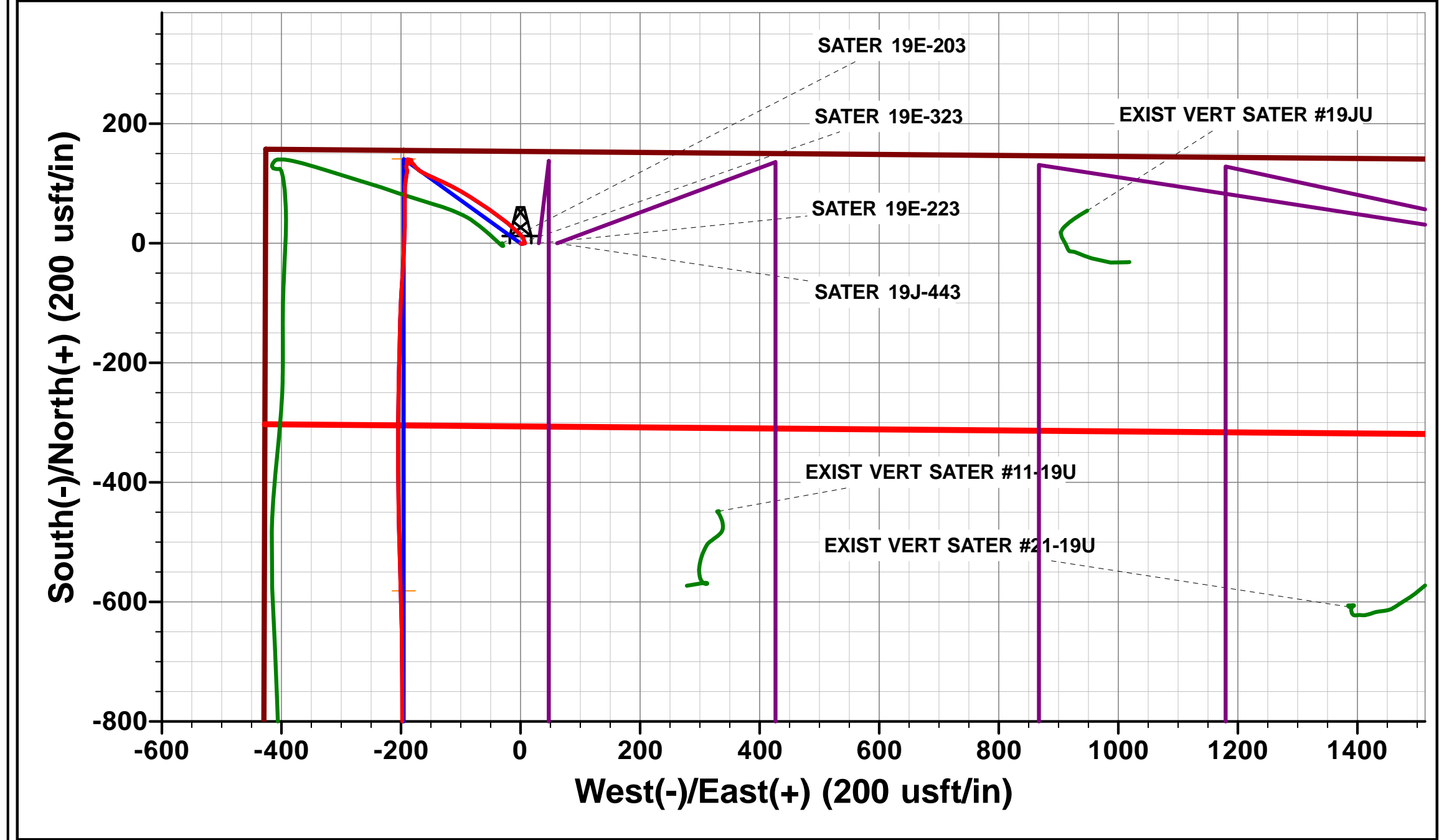
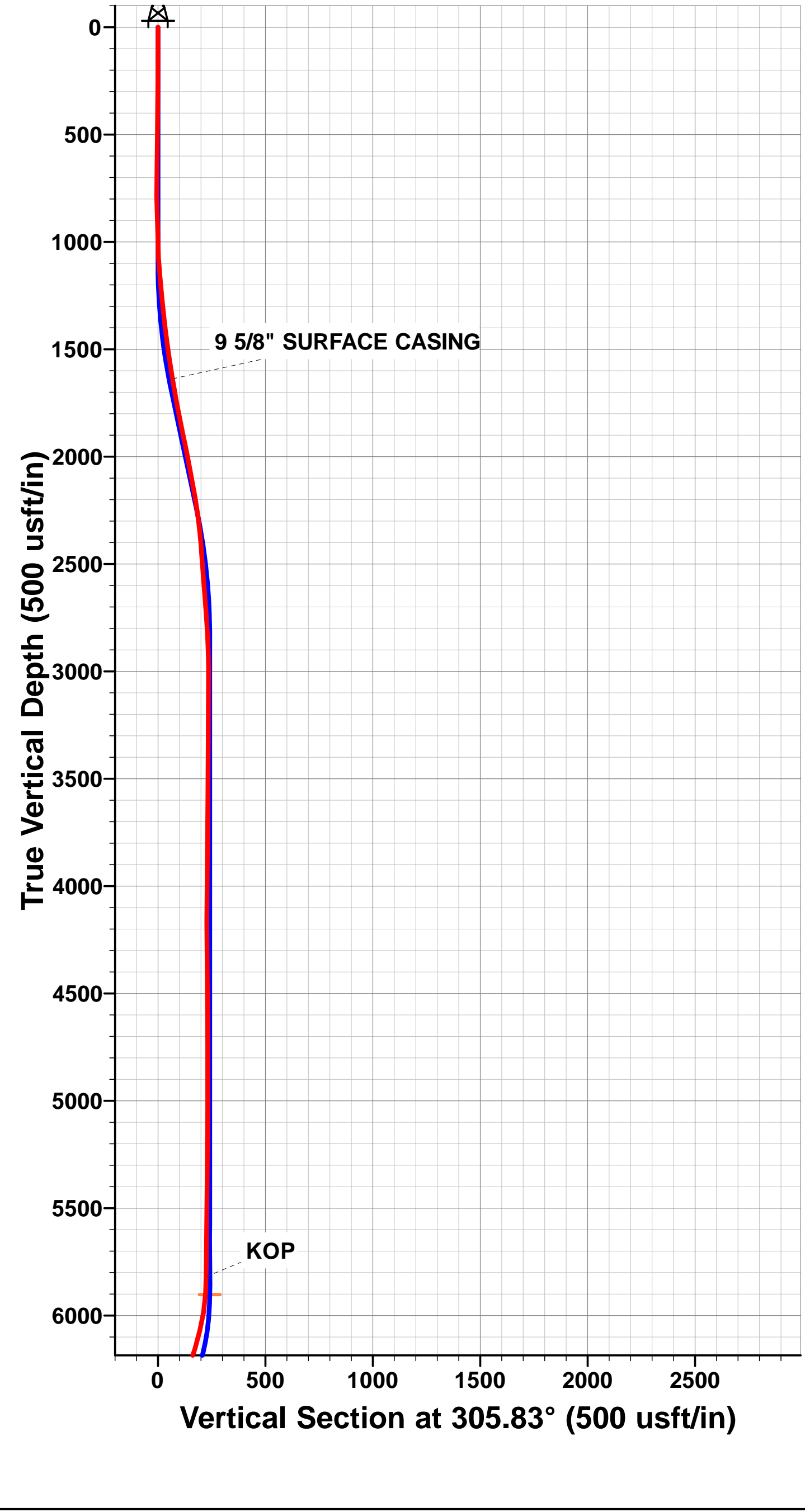
AS DRILLED LOCAL COORDINATES:

SHL: 154ft FNL & 426t FWL Sec 19

LANDING PNT: 952.5ft FNL & 236.3ft FWL Sec 19

BHL: 501.2ft FSL & 236.3ft FWL Sec 19

WELLBORE TARGET DETAILS (LAT/LONG)					
Name	TVD	+N/-S	+E/-W	Latitude	Longitude
BHL - SATER 19E-323	6584.0	-4590.2	-195.3	40.291880	-104.488860
KOP - SATER 19E-323	5902.8	141.0	-195.3	40.304867	-104.488860
LANDING PNT *NEW* - SATER 19E-323	6619.0	-581.4	-195.3	40.302884	-104.488860



Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well SATER 19E-323
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4674.0usft (Original Well Elev)
Site:	NW NW SEC. 19 T4N R63W 6th P.M.	MD Reference:	KB @ 4674.0usft (Original Well Elev)
Well:	SATER 19E-323	North Reference:	True
Wellbore:	JOB #2016-004-135	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	NW NW SEC. 19 T4N R63W 6th P.M.				
Site Position:		Northing:	1,355,372.81 usft	Latitude:	40.304480
From:	Lat/Long	Easting:	3,282,168.18 usft	Longitude:	-104.488270
Position Uncertainty:	0.0 usft	Slot Radius:	1.10000ft	Grid Convergence:	0.65 °

Well	SATER 19E-323					
Well Position	+N-S	0.0 usft	Northing:	1,355,373.15 usft	Latitude:	40.304480
	+E-W	0.0 usft	Easting:	3,282,198.86 usft	Longitude:	-104.488160
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,661.0 usft

Wellbore	JOB #2016-004-135				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	29/12/2015	8.21	66.86	52,540

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	182.44	

Survey Program	Date	03/02/2016			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
230.0	10,978.0	FINAL SURVEYS (JOB #2016-004-135)	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	4,674.0	0.0	0.0	0.0	0.00	0.00	0.00
230.0	0.20	132.20	230.0	4,444.0	-0.3	0.3	0.3	0.09	0.09	0.00
506.0	0.80	105.60	506.0	4,168.0	-1.1	2.5	1.0	0.23	0.22	-9.64
786.0	1.50	63.10	785.9	3,888.1	0.0	7.7	-0.3	0.38	0.25	-15.18
1,073.0	4.20	318.70	1,072.7	3,601.3	9.6	4.1	-9.8	1.67	0.94	-36.38
1,359.0	6.40	311.20	1,357.4	3,316.6	28.0	-14.8	-27.3	0.80	0.77	-2.62
1,600.0	9.00	305.90	1,596.2	3,077.8	47.9	-40.2	-46.1	1.12	1.08	-2.20
9 5/8" SURFACE CASING										
1,642.0	9.42	305.29	1,637.7	3,036.3	51.8	-45.7	-49.8	1.03	1.00	-1.44
1,888.0	11.90	302.60	1,879.4	2,794.6	77.1	-83.5	-73.5	1.03	1.01	-1.10
2,176.0	10.30	293.90	2,162.1	2,511.9	103.5	-132.1	-97.8	0.80	-0.56	-3.02
2,463.0	4.00	298.20	2,446.7	2,227.3	118.7	-164.4	-111.6	2.20	-2.20	1.50
2,750.0	4.80	324.50	2,732.9	1,941.1	133.2	-180.2	-125.4	0.75	0.28	9.16

Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well SATER 19E-323
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4674.0usft (Original Well Elev)
Site:	NW NW SEC. 19 T4N R63W 6th P.M.	MD Reference:	KB @ 4674.0usft (Original Well Elev)
Well:	SATER 19E-323	North Reference:	True
Wellbore:	JOB #2016-004-135	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)
3,038.0	1.20	215.90	3,020.5	1,653.5	140.6	-188.9	-132.4	1.84	-1.25	-37.71
3,326.0	1.00	171.40	3,308.5	1,365.5	135.6	-190.3	-127.4	0.30	-0.07	-15.45
3,614.0	1.60	28.50	3,596.5	1,077.5	136.7	-188.0	-128.6	0.86	0.21	-49.62
3,902.0	1.30	103.20	3,884.4	789.6	139.5	-182.9	-131.6	0.62	-0.10	25.94
4,189.0	1.70	220.90	4,171.3	502.7	135.5	-182.5	-127.6	0.90	0.14	41.01
4,477.0	0.80	299.00	4,459.3	214.7	133.3	-187.1	-125.2	0.60	-0.31	27.12
4,765.0	0.40	195.30	4,747.3	-73.3	133.3	-189.1	-125.1	0.34	-0.14	-36.01
5,052.0	0.80	217.20	5,034.2	-360.2	130.7	-190.6	-122.5	0.16	0.14	7.63
5,340.0	0.80	160.40	5,322.2	-648.2	127.2	-191.1	-119.0	0.26	0.00	-19.72
5,627.0	0.90	169.80	5,609.2	-935.2	123.1	-190.1	-114.9	0.06	0.03	3.28
5,818.0	0.50	142.80	5,800.2	-1,126.2	121.0	-189.3	-112.8	0.27	-0.21	-14.14
KOP										
5,837.0	1.86	186.13	5,819.2	-1,145.2	120.6	-189.3	-112.4	8.06	7.13	228.05
5,910.0	7.70	196.00	5,891.9	-1,217.9	114.7	-190.8	-106.5	8.06	8.01	13.52
6,003.0	16.60	183.80	5,982.7	-1,308.7	95.4	-193.4	-87.1	9.91	9.57	-13.12
6,095.0	22.10	177.40	6,069.5	-1,395.5	65.0	-193.5	-56.7	6.40	5.98	-6.96
6,187.0	27.00	182.30	6,153.2	-1,479.2	26.8	-193.5	-18.6	5.76	5.33	5.33
6,279.0	34.20	182.70	6,232.3	-1,558.3	-19.9	-195.6	28.2	7.83	7.83	0.43
6,371.0	41.70	183.80	6,304.8	-1,630.8	-76.4	-198.8	84.8	8.18	8.15	1.20
6,463.0	47.30	181.20	6,370.4	-1,696.4	-140.8	-201.6	149.2	6.40	6.09	-2.83
6,559.0	54.70	181.40	6,430.8	-1,756.8	-215.3	-203.2	223.8	7.71	7.71	0.21
6,655.0	59.80	180.60	6,482.7	-1,808.7	-296.0	-204.6	304.4	5.36	5.31	-0.83
460ft SETBACK X-OVER PNT										
6,664.2	60.11	180.48	6,487.3	-1,813.3	-304.0	-204.7	312.4	3.55	3.36	-1.30
6,750.0	63.00	179.40	6,528.2	-1,854.2	-379.4	-204.6	387.8	3.55	3.37	-1.26
6,846.0	67.80	179.10	6,568.1	-1,894.1	-466.7	-203.5	474.9	5.01	5.00	-0.31
6,941.0	74.60	177.80	6,598.7	-1,924.7	-556.5	-201.0	564.5	7.27	7.16	-1.37
7,037.0	84.40	179.00	6,616.2	-1,942.2	-650.7	-198.4	658.6	10.28	10.21	1.25
7,132.0	88.80	180.30	6,621.8	-1,947.8	-745.6	-197.8	753.3	4.83	4.63	1.37
HZ LANDING PNT										
7,183.0	88.75	179.93	6,622.9	-1,948.9	-796.5	-197.9	804.2	0.74	-0.10	-0.73
7,228.0	88.70	179.60	6,623.9	-1,949.9	-841.5	-197.8	849.2	0.74	-0.10	-0.73
7,324.0	91.40	178.00	6,623.8	-1,949.8	-937.5	-195.7	945.0	3.27	2.81	-1.67
7,420.0	91.30	177.60	6,621.6	-1,947.6	-1,033.4	-192.1	1,040.6	0.43	-0.10	-0.42
7,515.0	91.00	180.80	6,619.7	-1,945.7	-1,128.4	-190.7	1,135.4	3.38	-0.32	3.37
7,611.0	90.60	179.80	6,618.3	-1,944.3	-1,224.3	-191.2	1,231.4	1.12	-0.42	-1.04
7,707.0	90.20	178.00	6,617.7	-1,943.7	-1,320.3	-189.4	1,327.2	1.92	-0.42	-1.87
7,803.0	90.40	179.90	6,617.2	-1,943.2	-1,416.3	-187.6	1,423.0	1.99	0.21	1.98
7,898.0	91.80	181.90	6,615.3	-1,941.3	-1,511.3	-189.1	1,517.9	2.57	1.47	2.11
7,994.0	93.10	180.80	6,611.2	-1,937.2	-1,607.1	-191.4	1,613.8	1.77	1.35	-1.15
8,090.0	92.30	181.10	6,606.7	-1,932.7	-1,703.0	-193.0	1,709.7	0.89	-0.83	0.31
8,184.0	90.20	182.00	6,604.7	-1,930.7	-1,797.0	-195.5	1,803.6	2.43	-2.23	0.96
8,280.0	90.50	181.10	6,604.1	-1,930.1	-1,892.9	-198.1	1,899.6	0.99	0.31	-0.94
8,375.0	91.40	179.80	6,602.5	-1,928.5	-1,987.9	-198.9	1,994.6	1.66	0.95	-1.37
8,472.0	89.90	180.40	6,601.4	-1,927.4	-2,084.9	-199.0	2,091.5	1.67	-1.55	0.62
8,568.0	90.50	178.80	6,601.1	-1,927.1	-2,180.9	-198.4	2,187.3	1.78	0.62	-1.67
8,664.0	91.40	177.80	6,599.5	-1,925.5	-2,276.8	-195.5	2,283.1	1.40	0.94	-1.04
8,759.0	90.20	180.60	6,598.1	-1,924.1	-2,371.8	-194.2	2,377.9	3.21	-1.26	2.95
8,855.0	90.80	179.90	6,597.3	-1,923.3	-2,467.8	-194.6	2,473.8	0.96	0.62	-0.73
8,950.0	91.40	179.30	6,595.5	-1,921.5	-2,562.8	-193.9	2,568.7	0.89	0.63	-0.63
9,046.0	90.70	181.00	6,593.7	-1,919.7	-2,658.8	-194.2	2,664.6	1.91	-0.73	1.77
9,142.0	90.90	181.90	6,592.4	-1,918.4	-2,754.7	-196.6	2,760.6	0.96	0.21	0.94
9,238.0	90.00	181.40	6,591.6	-1,917.6	-2,850.7	-199.4	2,856.6	1.07	-0.94	-0.52

Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well SATER 19E-323
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4674.0usft (Original Well Elev)
Site:	NW NW SEC. 19 T4N R63W 6th P.M.	MD Reference:	KB @ 4674.0usft (Original Well Elev)
Well:	SATER 19E-323	North Reference:	True
Wellbore:	JOB #2016-004-135	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)
9,333.0	91.20	182.10	6,590.6	-1,916.6	-2,945.6	-202.3	2,951.6	1.46	1.26	0.74
9,428.0	88.80	182.30	6,590.6	-1,916.6	-3,040.5	-205.9	3,046.5	2.54	-2.53	0.21
9,524.0	88.70	182.00	6,592.7	-1,918.7	-3,136.4	-209.5	3,142.5	0.33	-0.10	-0.31
9,620.0	89.80	182.50	6,594.0	-1,920.0	-3,232.4	-213.3	3,238.5	1.26	1.15	0.52
9,716.0	90.00	182.70	6,594.1	-1,920.1	-3,328.3	-217.7	3,334.5	0.29	0.21	0.21
9,812.0	90.60	182.30	6,593.6	-1,919.6	-3,424.2	-221.8	3,430.5	0.75	0.62	-0.42
9,937.0	89.30	178.90	6,593.7	-1,919.7	-3,549.1	-223.2	3,555.4	2.91	-1.04	-2.72
10,032.0	90.80	179.10	6,593.7	-1,919.7	-3,644.1	-221.5	3,650.2	1.59	1.58	0.21
10,128.0	90.80	178.70	6,592.3	-1,918.3	-3,740.1	-219.7	3,746.1	0.42	0.00	-0.42
10,223.0	91.20	178.50	6,590.7	-1,916.7	-3,835.1	-217.3	3,840.8	0.47	0.42	-0.21
10,319.0	90.30	176.10	6,589.4	-1,915.4	-3,930.9	-212.8	3,936.4	2.67	-0.94	-2.50
10,415.0	90.90	175.60	6,588.4	-1,914.4	-4,026.7	-205.9	4,031.8	0.81	0.62	-0.52
10,511.0	89.80	177.40	6,587.8	-1,913.8	-4,122.5	-200.0	4,127.3	2.20	-1.15	1.87
10,606.0	89.90	179.00	6,588.1	-1,914.1	-4,217.4	-197.0	4,222.0	1.69	0.11	1.68
10,702.0	90.20	179.10	6,588.0	-1,914.0	-4,313.4	-195.4	4,317.8	0.33	0.31	0.10
10,798.0	89.90	177.80	6,587.9	-1,913.9	-4,409.4	-192.8	4,413.6	1.39	-0.31	-1.35
LAST SURVEY - FEB 3, 2016										
10,894.0	90.40	175.90	6,587.6	-1,913.6	-4,505.2	-187.6	4,509.1	2.05	0.52	-1.98
EXTRAPOLATION TO TD										
10,978.0	90.40	175.90	6,587.1	-1,913.1	-4,589.0	-181.6	4,592.6	0.00	0.00	0.00

Survey Report



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Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4674.0usft (Original Well Elev)
Site:	NW NW SEC. 19 T4N R63W 6th P.M.	MD Reference:	KB @ 4674.0usft (Original Well Elev)
Well:	SATER 19E-323	North Reference:	True
Wellbore:	JOB #2016-004-135	Survey Calculation Method:	Minimum Curvature
Design:	FINAL SURVEYS	Database:	EDM 5000.1 Single User Db

Targets									
Target Name	- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	
- Shape		(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)	
EXIST VERT SATER		0.00	0.00	7,318.0	-3,180.4	167.4	1,352,195.02	3,282,402.50	
- survey misses target center by 817.4usft at 9562.6usft MD (6593.4 TVD, -3175.0 N, -210.9 E)									
- Circle (radius 30.0)									
7" ICP *NEW* - SATE		0.00	0.00	6,619.0	-581.4	-195.3	1,354,789.58	3,282,010.21	
- survey misses target center by 14.5usft at 6969.4usft MD (6605.6 TVD, -584.0 N, -200.1 E)									
- Point									
BHL - SATER 19E-32		0.00	0.00	6,584.0	-4,590.2	-195.3	1,350,781.18	3,282,055.97	
- survey misses target center by 14.1usft at 10978.0usft MD (6587.1 TVD, -4589.0 N, -181.6 E)									
- Point									
KOP - SATER 19E-32		0.00	0.00	5,902.8	141.0	-195.3	1,355,511.91	3,282,001.97	
- survey misses target center by 27.9usft at 5915.3usft MD (5897.2 TVD, 114.0 N, -191.0 E)									
- Point									
ABDN VERT LIMERIC		0.00	0.00	7,208.0	-908.2	557.3	1,354,471.40	3,282,766.45	
- survey misses target center by 953.4usft at 7310.0usft MD (6624.1 TVD, -923.5 N, -196.2 E)									
- Circle (radius 30.0)									

Survey Annotations				
Measured Depth	Vertical Depth	Local Coordinates		Comment
(usft)	(usft)	+N/-S (usft)	+E/-W (usft)	
1,642.0	1,637.7	51.8	-45.7	9 5/8" SURFACE CASING
5,837.0	5,819.2	120.6	-189.3	KOP
6,664.2	6,487.3	-304.0	-204.7	460ft SETBACK X-OVER PNT
7,183.0	6,622.9	-796.5	-197.9	HZ LANDING PNT
10,894.0	6,587.6	-4,505.2	-187.6	LAST SURVEY - FEB 3, 2016
10,978.0	6,587.1	-4,589.0	-181.6	EXTRAPOLATION TO TD

Checked By: _____ Approved By: _____ Date: _____