



Piceance Energy, LLC

Mesa County, CO

Piceance 28-10 Pad

Piceance Federal 28-21E

Slot A-11

Survey: Survey #1

Survey Report - Geographic

23 December, 2015



Project: Mesa County, CO
Site: Piceance 28-10 Pad
Well: Piceance Federal 28-21E
Wellbore: Slot A-11
Design: Design #2
Latitude: 39.246336
Longitude: -107.774994
Ground Level: 7679.00
Well @ 7701.00usft

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PROJECT DETAILS: Mesa County, CO

Geodetic System: US State Plane 1983
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone: Colorado Central Zone
System Datum: Mean Sea Level

REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well Piceance Federal 28-21E, True North
Vertical (TVD) Reference: Well @ 7701.00usft
Section (VS) Reference: Slot - (0.00N, 0.00E)
Measured Depth Reference: Well @ 7701.00usft
Calculation Method: Minimum Curvature

WELL DETAILS: Piceance Federal 28-21E

+N/-S	+E/-W	Northing	Ground Level: Easting	Latitude	Longitude	Slot
0.00	0.00	1522679.060	235785.630	39.246336	-107.774994	

WELLBORE TARGET DETAILS (MAP CO-ORDINATES AND LAT/LONG)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
Piceance 28-21E tgt	7921.00	-1877.64	1922.76	1520753.860	2357660.775	39.241181	-107.768206	Circle (Radius: 50.00)

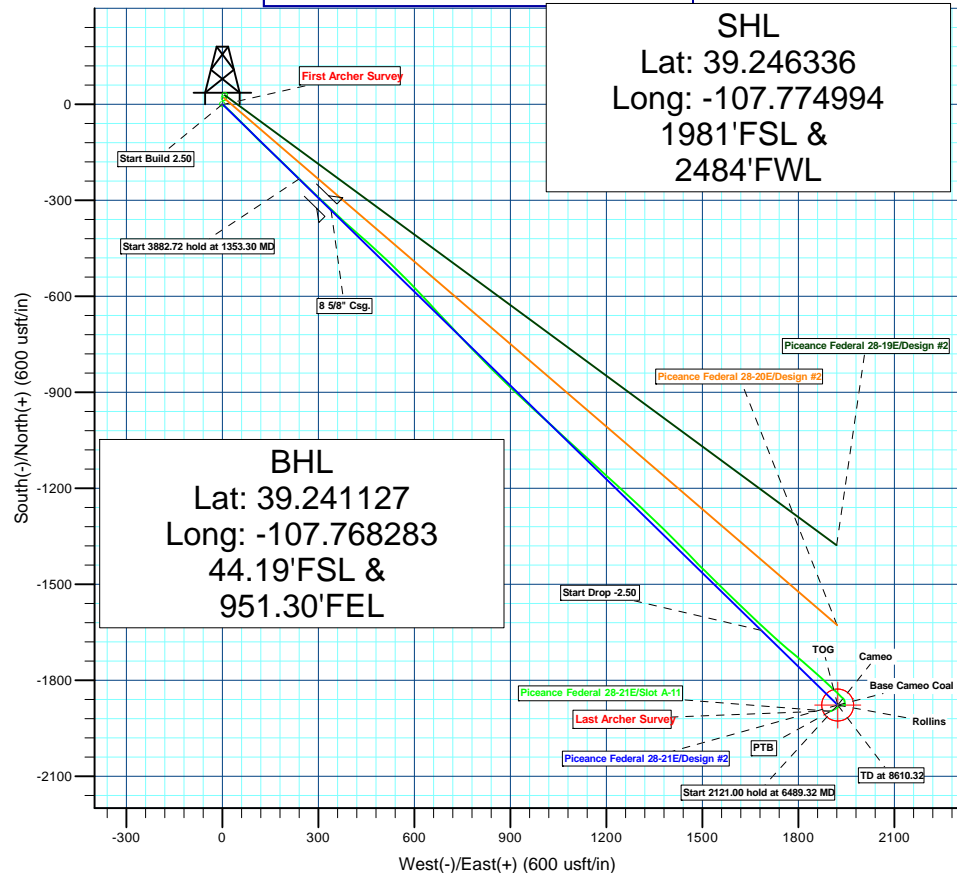
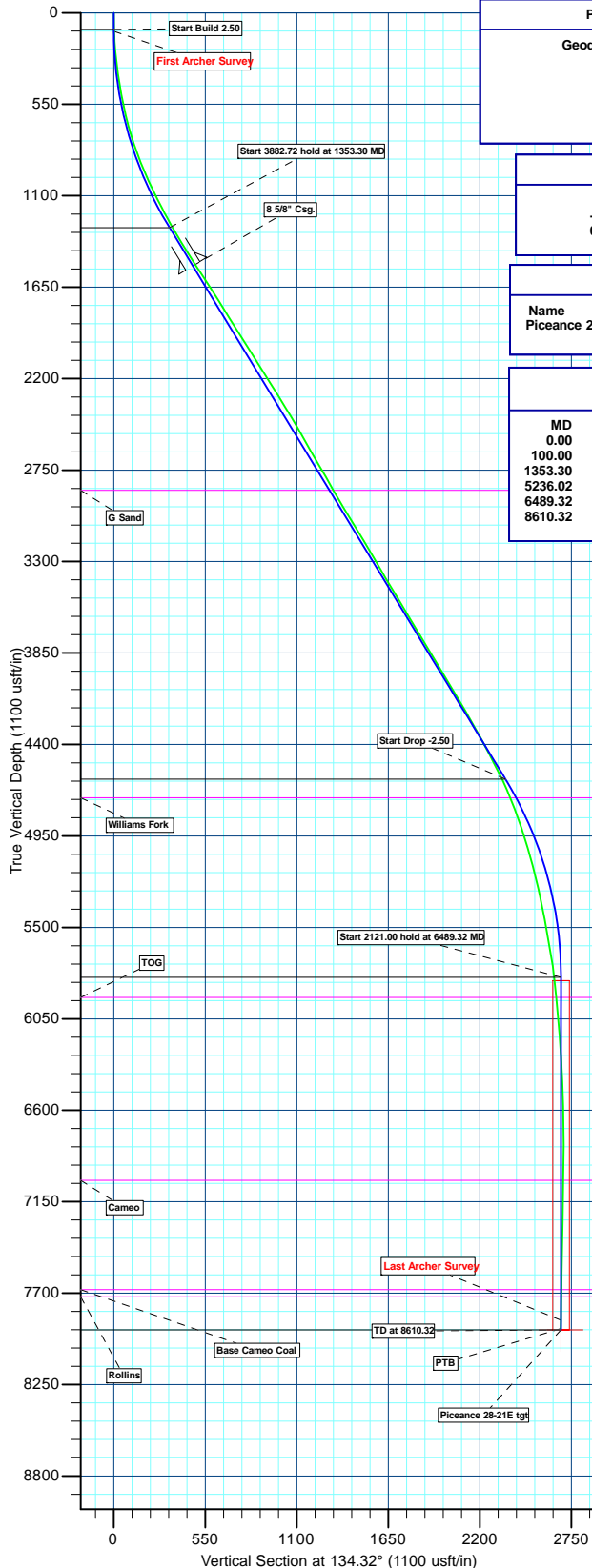
SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	Start Build 2.50
1353.30	31.33	134.32	1291.76	-233.52	239.13	2.50	134.32	334.23	Start 3882.72 hold at 1353.30 MD
5236.02	31.33	134.32	4608.24	-1644.14	1683.64	0.00	0.00	2353.26	Start Drop -2.50
6489.32	0.00	0.00	5800.00	-1877.66	1922.76	2.50	180.00	2687.49	Start 2121.00 hold at 6489.32 MD
8610.32	0.00	0.00	7921.00	-1877.66	1922.76	0.00	0.00	2687.49	TD at 8610.32

FORMATION TOP DETAILS

TVDPath	MDPath	Formation
2871.00	3202.17	G Sand
4721.00	5365.86	Williams Fork
5921.00	6610.32	TOG
7021.00	7710.32	Cameo
7679.00	8368.32	Base Cameo Coal
7721.00	8410.32	Rollins

Azimuths to True North
Magnetic North: 9.73°
Magnetic Field
Strength: 51746.4snT
Dip Angle: 65.47°
Date: 03/31/2015
Model: IGRF2010



Plan: Design #2 (Piceance Federal 28-21E/Slot A-11)

Created By: Ricky Osburn Date: 13:25, January 21 2016



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Survey Report - Geographic

Company:	Piceance Energy, LLC	Local Co-ordinate Reference:	Well Piceance Federal 28-21E
Project:	Mesa County, CO	TVD Reference:	Well @ 7701.00usft
Site:	Piceance 28-10 Pad	MD Reference:	Well @ 7701.00usft
Well:	Piceance Federal 28-21E	North Reference:	True
Wellbore:	Slot A-11	Survey Calculation Method:	Minimum Curvature
Design:	Slot A-11	Database:	EDMDBBW

Project	Mesa County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		

Site	Piceance 28-10 Pad				
Site Position:		Northing:	1,522,822.786 usft	Latitude:	39.246733
From:	Lat/Long	Easting:	2,355,826.215 usft	Longitude:	-107.774864
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16"	Grid Convergence:	-1.43 °

Well	Piceance Federal 28-21E					
Well Position	+N/-S	0.00 usft	Northing:	1,522,679.069 usft	Latitude:	39.246336
	+E/-W	0.00 usft	Easting:	2,355,785.630 usft	Longitude:	-107.774994
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	7,679.00 usft

Wellbore	Slot A-11				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	03/31/15	9.73	65.47	51,746

Design	Slot A-11				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)		+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00		0.00	0.00	134.01

Survey Program	Date	10/14/15			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
112.00	8,574.00	Survey #1 (Slot A-11)	MWD	MWD - Standard	



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Survey Report - Geographic

Company:	Piceance Energy, LLC	Local Co-ordinate Reference:	Well Piceance Federal 28-21E
Project:	Mesa County, CO	TVD Reference:	Well @ 7701.00usft
Site:	Piceance 28-10 Pad	MD Reference:	Well @ 7701.00usft
Well:	Piceance Federal 28-21E	North Reference:	True
Wellbore:	Slot A-11	Survey Calculation Method:	Minimum Curvature
Design:	Slot A-11	Database:	EDMDBBW

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.00	0.00	0.00	0.00	1,522,679.069	2,355,785.630	39.246336	-107.774994
First Archer Survey									
112.00	1.80	127.94	111.98	-1.08	1.39	1,522,677.953	2,355,786.990	39.246333	-107.774990
204.00	4.39	132.69	203.84	-4.36	5.12	1,522,674.584	2,355,790.635	39.246324	-107.774976
297.00	7.34	132.07	296.34	-10.75	12.14	1,522,668.015	2,355,797.500	39.246307	-107.774952
389.00	7.65	133.39	387.56	-18.90	20.96	1,522,659.653	2,355,806.106	39.246284	-107.774920
481.00	10.41	134.97	478.41	-28.98	31.29	1,522,649.314	2,355,816.183	39.246256	-107.774884
573.00	12.35	134.45	568.59	-41.75	44.19	1,522,636.230	2,355,828.764	39.246221	-107.774838
665.00	14.37	134.89	658.10	-56.69	59.31	1,522,620.907	2,355,843.498	39.246180	-107.774785
757.00	17.53	135.85	746.55	-74.70	77.05	1,522,602.466	2,355,860.785	39.246131	-107.774722
849.00	19.69	135.59	833.73	-95.71	97.55	1,522,580.943	2,355,880.752	39.246073	-107.774650
942.00	21.97	133.74	920.65	-118.94	121.08	1,522,557.138	2,355,903.699	39.246010	-107.774567
1,033.00	24.65	133.57	1,004.21	-143.79	147.14	1,522,531.640	2,355,929.121	39.245941	-107.774475
1,128.00	27.38	133.92	1,089.58	-172.60	177.23	1,522,502.083	2,355,958.485	39.245862	-107.774369
1,223.00	26.63	133.30	1,174.22	-202.36	208.46	1,522,471.556	2,355,988.960	39.245780	-107.774258
1,318.00	28.61	134.62	1,258.39	-232.94	240.15	1,522,440.191	2,356,019.872	39.245696	-107.774146
1,413.00	31.29	134.10	1,340.70	-266.09	274.06	1,522,406.201	2,356,052.944	39.245605	-107.774027
1,508.00	31.25	132.86	1,421.90	-300.02	309.84	1,522,371.386	2,356,087.862	39.245512	-107.773900
1,620.00	33.00	134.10	1,516.75	-341.01	353.04	1,522,329.327	2,356,130.024	39.245400	-107.773748
1,693.00	33.71	132.51	1,577.72	-368.53	382.25	1,522,301.081	2,356,158.535	39.245324	-107.773645
1,788.00	32.83	131.37	1,657.15	-403.37	421.01	1,522,265.287	2,356,196.411	39.245229	-107.773508
1,883.00	32.04	131.02	1,737.33	-436.93	459.35	1,522,230.778	2,356,233.897	39.245136	-107.773372
1,978.00	31.25	133.38	1,818.21	-470.39	496.28	1,522,196.399	2,356,269.972	39.245045	-107.773242
2,072.00	32.08	133.48	1,898.22	-504.31	532.11	1,522,161.589	2,356,304.946	39.244951	-107.773116
2,167.00	32.74	136.03	1,978.42	-540.16	568.25	1,522,124.845	2,356,340.180	39.244853	-107.772988
2,262.00	31.90	135.85	2,058.70	-576.66	603.57	1,522,087.472	2,356,374.575	39.244753	-107.772863
2,357.00	32.65	137.79	2,139.03	-613.66	638.28	1,522,049.622	2,356,408.340	39.244651	-107.772741
2,452.00	32.21	136.56	2,219.21	-651.02	672.90	1,522,011.401	2,356,442.021	39.244549	-107.772618
2,547.00	31.38	136.55	2,299.95	-687.36	707.32	1,521,974.210	2,356,475.519	39.244449	-107.772497
2,642.00	31.77	137.17	2,380.89	-723.66	741.33	1,521,937.072	2,356,508.612	39.244349	-107.772377
2,736.00	30.50	136.03	2,461.35	-758.98	774.72	1,521,900.930	2,356,541.103	39.244252	-107.772259
2,831.00	29.22	135.94	2,543.74	-792.99	807.58	1,521,866.102	2,356,573.106	39.244159	-107.772143
2,926.00	30.06	134.89	2,626.30	-826.45	840.57	1,521,831.831	2,356,605.240	39.244067	-107.772026
3,021.00	30.23	134.36	2,708.46	-859.96	874.52	1,521,797.479	2,356,638.345	39.243975	-107.771907
3,115.00	29.31	133.66	2,790.05	-892.39	908.09	1,521,764.219	2,356,671.087	39.243886	-107.771788
3,210.00	30.01	133.57	2,872.60	-924.82	942.12	1,521,730.949	2,356,704.300	39.243797	-107.771668
3,304.00	30.98	132.43	2,953.60	-957.35	977.01	1,521,697.560	2,356,738.364	39.243708	-107.771545
3,399.00	30.45	131.81	3,035.27	-989.89	1,013.00	1,521,664.124	2,356,773.527	39.243618	-107.771418
3,494.00	31.86	132.86	3,116.57	-1,022.99	1,049.32	1,521,630.120	2,356,809.010	39.243527	-107.771289
3,589.00	31.20	132.86	3,197.54	-1,056.79	1,085.74	1,521,595.427	2,356,844.569	39.243434	-107.771161
3,684.00	30.41	131.72	3,279.14	-1,089.53	1,121.72	1,521,561.797	2,356,879.722	39.243345	-107.771034
3,779.00	29.49	132.16	3,361.45	-1,121.22	1,157.00	1,521,529.227	2,356,914.197	39.243258	-107.770909
3,874.00	31.46	132.51	3,443.33	-1,153.67	1,192.62	1,521,495.896	2,356,948.985	39.243168	-107.770783
3,969.00	31.20	132.34	3,524.47	-1,187.00	1,229.08	1,521,461.669	2,356,984.601	39.243077	-107.770655
4,064.00	30.32	132.60	3,606.11	-1,219.80	1,264.92	1,521,427.977	2,357,019.609	39.242987	-107.770528
4,158.00	31.95	133.57	3,686.57	-1,253.01	1,300.41	1,521,393.894	2,357,054.254	39.242896	-107.770403
4,253.00	31.20	133.57	3,767.50	-1,287.29	1,336.45	1,521,358.718	2,357,089.425	39.242802	-107.770276
4,348.00	30.23	133.30	3,849.17	-1,320.65	1,371.68	1,521,324.484	2,357,123.812	39.242710	-107.770151
4,443.00	31.51	135.68	3,930.72	-1,354.82	1,406.43	1,521,289.459	2,357,157.698	39.242616	-107.770029
4,538.00	30.45	135.94	4,012.16	-1,389.88	1,440.52	1,521,253.555	2,357,190.895	39.242520	-107.769908
4,633.00	31.42	135.85	4,093.65	-1,424.95	1,474.51	1,521,217.648	2,357,223.995	39.242424	-107.769788
4,728.00	30.41	134.45	4,175.15	-1,459.55	1,508.92	1,521,182.191	2,357,257.531	39.242329	-107.769667
4,823.00	29.88	135.06	4,257.30	-1,493.14	1,542.80	1,521,147.765	2,357,290.559	39.242236	-107.769547
4,918.00	28.65	133.57	4,340.18	-1,525.59	1,576.02	1,521,114.495	2,357,322.954	39.242147	-107.769430
5,013.00	27.99	133.92	4,423.81	-1,556.75	1,608.58	1,521,082.529	2,357,354.722	39.242062	-107.769315



Archer

Survey Report - Geographic

Company:	Piceance Energy, LLC	Local Co-ordinate Reference:	Well Piceance Federal 28-21E
Project:	Mesa County, CO	TVD Reference:	Well @ 7701.00usft
Site:	Piceance 28-10 Pad	MD Reference:	Well @ 7701.00usft
Well:	Piceance Federal 28-21E	North Reference:	True
Wellbore:	Slot A-11	Survey Calculation Method:	Minimum Curvature
Design:	Slot A-11	Database:	EDMDBBW

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,108.00	27.20	132.95	4,508.00	-1,587.01	1,640.53	1,521,051.480	2,357,385.905	39.241979	-107.769202
5,203.00	26.28	133.48	4,592.84	-1,616.27	1,671.68	1,521,021.444	2,357,416.315	39.241898	-107.769092
5,298.00	23.16	133.57	4,679.12	-1,643.63	1,700.48	1,520,993.377	2,357,444.425	39.241823	-107.768990
5,393.00	20.96	131.46	4,767.16	-1,667.76	1,726.76	1,520,968.597	2,357,470.085	39.241757	-107.768898
5,488.00	19.64	131.28	4,856.26	-1,689.54	1,751.49	1,520,946.200	2,357,494.264	39.241697	-107.768810
5,583.00	17.45	129.00	4,946.32	-1,709.04	1,774.56	1,520,926.129	2,357,516.839	39.241644	-107.768729
5,678.00	16.26	130.67	5,037.24	-1,726.67	1,795.72	1,520,907.973	2,357,537.549	39.241595	-107.768654
5,772.00	14.59	131.11	5,127.85	-1,743.04	1,814.62	1,520,891.143	2,357,556.037	39.241550	-107.768587
5,867.00	13.75	131.02	5,219.96	-1,758.31	1,832.15	1,520,875.431	2,357,573.183	39.241508	-107.768525
5,961.00	12.39	129.52	5,311.53	-1,772.06	1,848.36	1,520,861.279	2,357,589.042	39.241470	-107.768468
6,056.00	11.16	133.22	5,404.53	-1,784.84	1,862.93	1,520,848.137	2,357,603.279	39.241435	-107.768417
6,151.00	10.68	133.66	5,497.81	-1,797.22	1,875.99	1,520,835.440	2,357,616.034	39.241401	-107.768371
6,246.00	9.75	133.22	5,591.30	-1,808.80	1,888.22	1,520,823.552	2,357,627.970	39.241370	-107.768327
6,341.00	8.83	133.30	5,685.05	-1,819.31	1,899.39	1,520,812.766	2,357,638.873	39.241341	-107.768288
6,436.00	7.16	129.52	5,779.13	-1,828.08	1,909.27	1,520,803.753	2,357,648.524	39.241317	-107.768253
6,531.00	5.63	134.97	5,873.53	-1,835.14	1,917.13	1,520,796.497	2,357,656.209	39.241297	-107.768225
6,626.00	5.36	134.97	5,968.10	-1,841.57	1,923.57	1,520,789.908	2,357,662.482	39.241280	-107.768203
6,720.00	4.75	136.91	6,061.73	-1,847.52	1,929.33	1,520,783.821	2,357,668.097	39.241263	-107.768182
6,815.00	4.57	131.28	6,156.42	-1,852.89	1,934.86	1,520,778.314	2,357,673.492	39.241249	-107.768163
6,910.00	4.31	134.10	6,251.13	-1,857.87	1,940.27	1,520,773.199	2,357,678.773	39.241235	-107.768144
7,005.00	2.55	161.25	6,345.96	-1,862.35	1,943.51	1,520,768.633	2,357,681.903	39.241223	-107.768132
7,100.00	2.59	171.71	6,440.87	-1,866.48	1,944.50	1,520,764.485	2,357,682.788	39.241211	-107.768129
7,195.00	2.55	183.67	6,535.77	-1,870.71	1,944.68	1,520,760.249	2,357,682.856	39.241200	-107.768128
7,290.00	2.33	152.82	6,630.69	-1,874.54	1,945.42	1,520,756.404	2,357,683.507	39.241189	-107.768126
7,385.00	0.75	210.82	6,725.66	-1,876.79	1,945.99	1,520,754.139	2,357,684.014	39.241183	-107.768124
7,480.00	1.01	14.48	6,820.65	-1,876.52	1,945.88	1,520,754.418	2,357,683.912	39.241184	-107.768124
7,574.00	0.97	283.60	6,914.64	-1,875.53	1,945.31	1,520,755.421	2,357,683.371	39.241186	-107.768126
7,669.00	1.14	248.09	7,009.63	-1,875.69	1,943.65	1,520,755.299	2,357,681.709	39.241186	-107.768132
7,764.00	1.98	238.51	7,104.59	-1,876.90	1,941.38	1,520,754.147	2,357,679.403	39.241183	-107.768140
7,859.00	2.20	261.27	7,199.53	-1,878.03	1,938.18	1,520,753.093	2,357,676.173	39.241179	-107.768151
7,953.00	2.86	250.81	7,293.44	-1,879.08	1,934.18	1,520,752.149	2,357,672.150	39.241177	-107.768165
8,048.00	3.65	245.19	7,388.29	-1,881.13	1,929.19	1,520,750.226	2,357,667.117	39.241171	-107.768183
8,143.00	3.74	235.78	7,483.09	-1,884.14	1,923.89	1,520,747.349	2,357,661.737	39.241163	-107.768202
8,238.00	3.03	235.61	7,577.92	-1,887.30	1,919.25	1,520,744.305	2,357,657.025	39.241154	-107.768218
8,333.00	3.34	245.54	7,672.78	-1,889.86	1,914.66	1,520,741.857	2,357,652.371	39.241147	-107.768234
8,428.00	3.91	242.29	7,767.59	-1,892.51	1,909.28	1,520,739.341	2,357,646.920	39.241140	-107.768253
Last Archer Survey									
8,523.00	3.69	239.74	7,862.38	-1,895.56	1,903.77	1,520,736.433	2,357,641.337	39.241131	-107.768273
PTB - Piceance 28-21E tgt									
8,574.00	3.69	239.74	7,913.27	-1,897.21	1,900.93	1,520,734.850	2,357,638.462	39.241127	-107.768283



Archer

Survey Report - Geographic

Company:	Piceance Energy, LLC	Local Co-ordinate Reference:	Well Piceance Federal 28-21E
Project:	Mesa County, CO	TVD Reference:	Well @ 7701.00usft
Site:	Piceance 28-10 Pad	MD Reference:	Well @ 7701.00usft
Well:	Piceance Federal 28-21E	North Reference:	True
Wellbore:	Slot A-11	Survey Calculation Method:	Minimum Curvature
Design:	Slot A-11	Database:	EDMDBBW

Survey Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
112.00	111.98	-1.08	1.39	First Archer Survey	
8,523.00	7,862.38	-1,895.56	1,903.77	Last Archer Survey	
8,574.00	7,913.27	-1,897.21	1,900.93	PTB	

Checked By:	_____	Approved By:	_____	Date:	_____
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