

30.015.39051

CIMAREX ENERGY

Empire

Eddy County, NM

Pere Marquette 18 Federal #5H

VH - Job #32K0911841

Survey: Actual

SDI Standard Survey Report

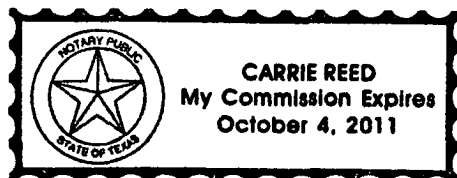
This survey is correct to the best of my knowledge and is supported by actual field data.

K. W. Hanton

Notarized this date 4th of October, 2011.

Carrie Reed

Notary Signature
County of Midland
State of Texas



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	CIMAREX ENERGY	Local Co-ordinate Reference:	Well Pere Marquette 18 Federal #5H
Project:	Empire	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Eddy County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Pere Marquette 18 Federal #5H	North Reference:	Grid
Wellbore:	VH - Job #32K0911841	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0911841	Database:	EDM-Regulatory

Project		Empire	
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Eddy County, NM				
Site Position:		Northing:	673,477 15 usft	Latitude:	32° 51' 4 550 N
From:	Lat/Long	Easting:	570,262 08 usft	Longitude:	104° 6' 16 340 W
Position Uncertainty:	0 0 usft	Slot Radius:	0"	Grid Convergence:	0 12 °

Well	Pere Marquette 18 Federal #5H, Directional (Great White)					
Well Position	+N/-S	0 0 usft	Northing:	669,053 37 usft	Latitude:	32° 50' 20 797 N
	+E/-W	0 0 usft	Easting:	569,245 21 usft	Longitude:	104° 6' 28 371 W
Position Uncertainty		0 0 usft	Wellhead Elevation:	usft	Ground Level:	0 0 usft

Wellbore	VH - Job #32K0911841				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	9/3/2011	7 86	60 66	48,931

Design	VH - Job #32K0911841			
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	89 86

Survey Program		Date	10/23/2011		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100 0	1,015 0	Actual (VH - Job #32K0911841)	Keeper	Keeper Gyro	

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
0 0	0 00	0 00	0 0	0 0	0 0	0 00	0 0
100 0	0 41	254 57	100 0	-0 1	-0 3	254 57	0 4
200 0	0 34	317 20	200 0	0 0	-0 9	271 76	0 9
300 0	0 40	70 73	300 0	0 4	-0 8	295 26	0 8
400 0	0 42	105 06	400 0	0 4	-0 1	348 11	0 4
500 0	1 06	75 65	500 0	0 5	1 2	66 28	1 3
600 0	1 28	76 90	600 0	1 0	3 2	72 46	3 3
700 0	1 51	81 39	699 9	1 4	5 5	75 37	5 7
800 0	1 94	82 02	799 9	1 9	8 5	77 57	8 7
900 0	1 99	74 42	899 8	2 6	11 9	77 74	12 1
1,000 0	1 77	80 36	999 8	3 3	15 1	77 63	15 4
1,015 0	1 43	84 38	1,014 8	3 4	15 5	77 75	15 8



Scientific Drilling
Directional Drilling Operations

Project: Empire
Eddy County, NM
Well: Pere Marquette 18 Federal #5H
Wellbore: VH - Job #32K0911841
Design: VH - Job #32K0911841

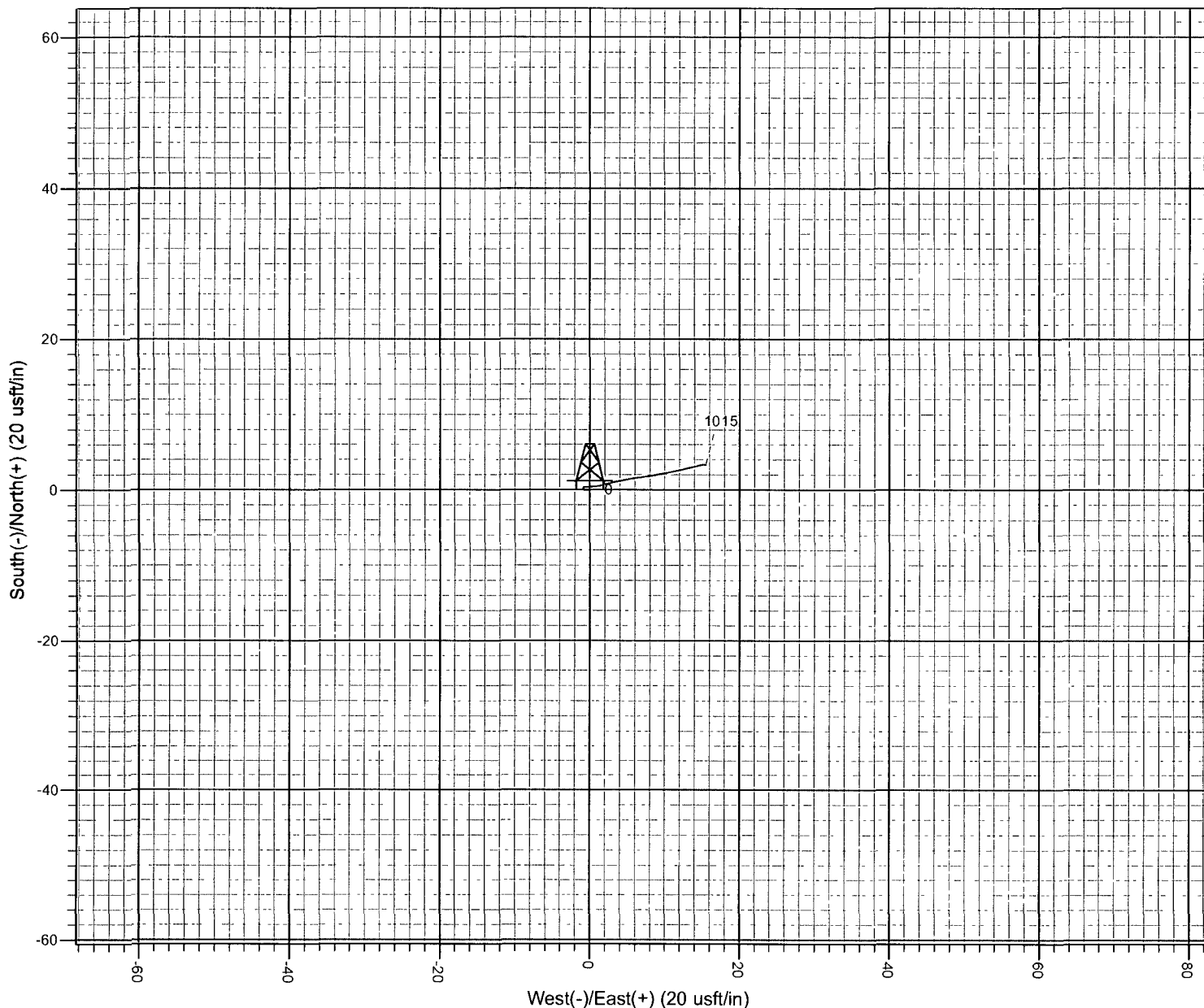


Azimuths to Grid North
True North -0 12°
Magnetic North 7 73°

Magnetic Field
Strength 48930 8snT
Dip Angle 60 66°
Date 9/3/2011
Model IGRF2010

WELL DETAILS: Pere Marquette 18 Federal #5H
WELL @ 0.0usft (Original Well Elev)
Ground Level: 0.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0 0	669053.37	569245.21	32° 50' 20.797 N	104° 6' 28.371 W	



PROJECT DETAILS: Empire
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level

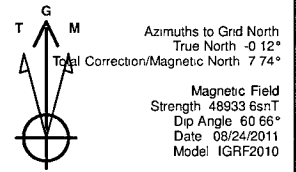
SITE DETAILS: Eddy County, NM
Site Centre Latitude: 32° 51' 4.550 N
Longitude: 104° 6' 16 340 W
Positional Uncertainty: 0 0
Convergence: 0.12
Local North: Grid



WELL DETAILS Pere Marquette 18 Fed #5							
+N/-S	+E/-W	Northing	Ground Level	0 0	Latitude	Longitude	Slot
0 0	0 0	669075 30	Easting	610581.20	32° 50' 20 799 N	104° 6' 28 371 W	



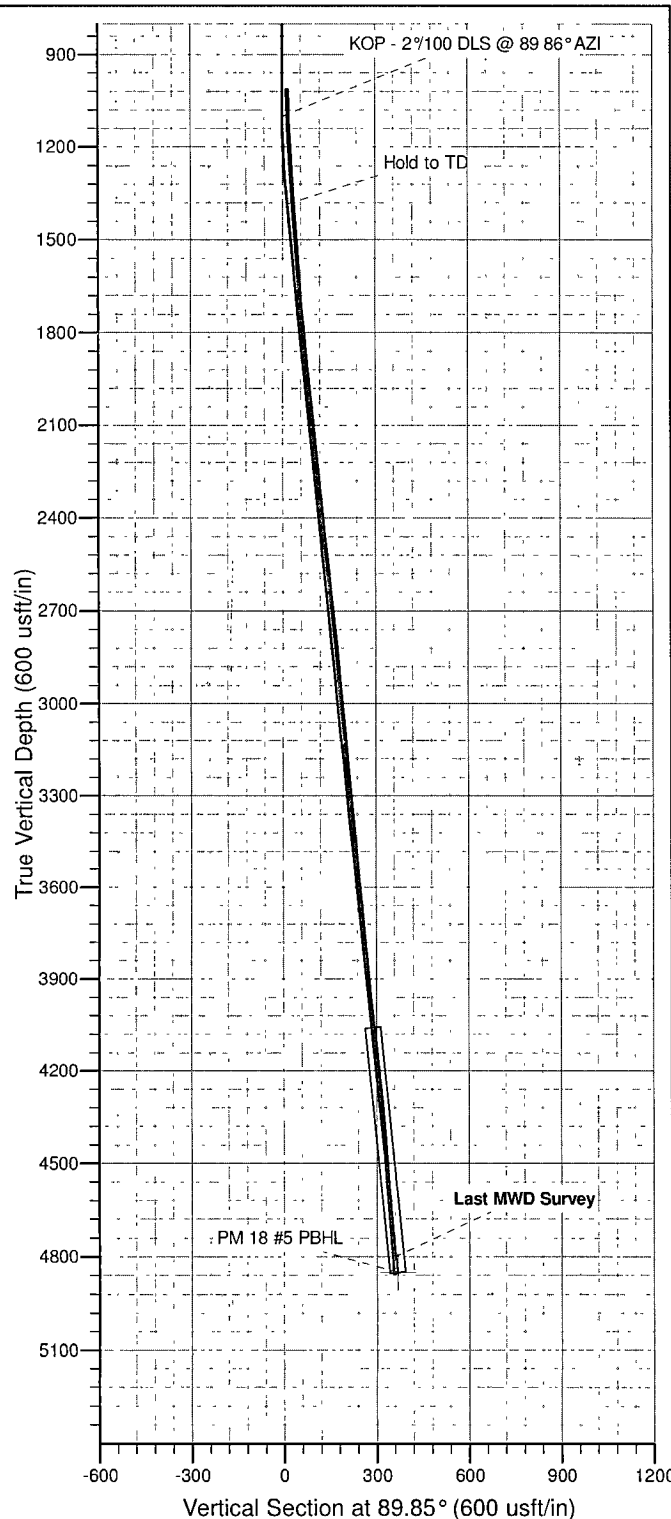
Project Eddy County (NM83E)
Site Sec 18-T17S-R29E
Well: Pere Marquette 18 Fed #5
Wellbore Wellbore #1
Design Design #2



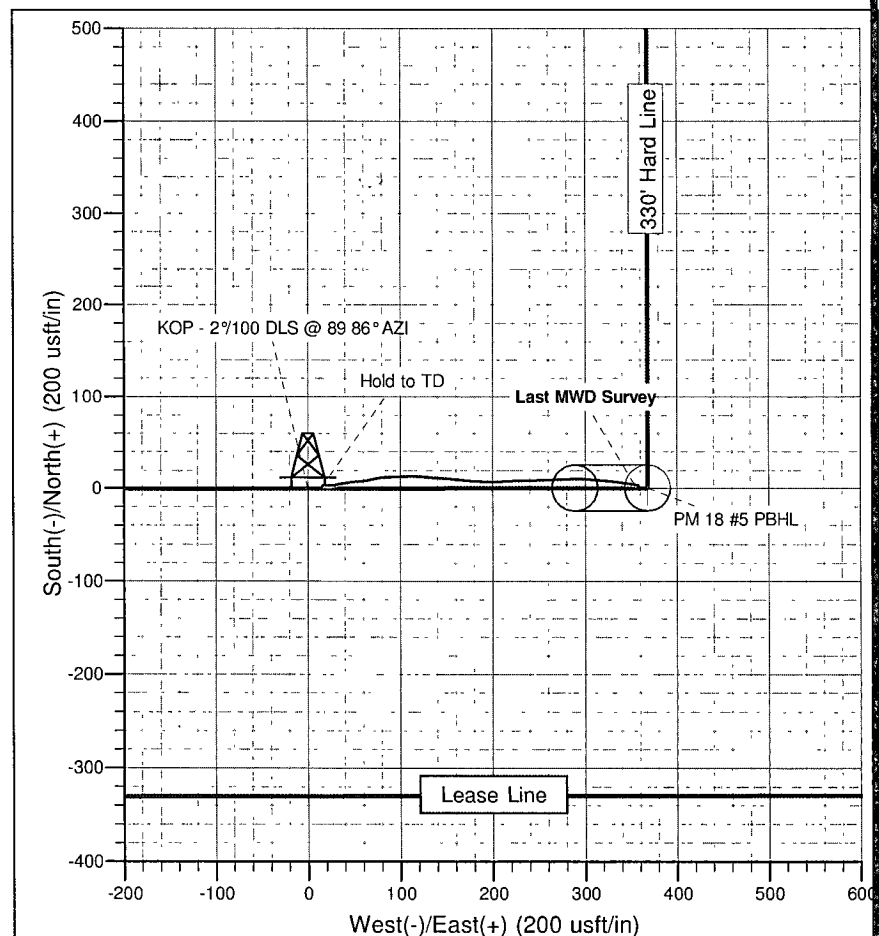
DESIGN TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PM 18 #5 PBHL	4850 0	1 0	368 0	669076 28	610949 20	32° 50' 20 799 N	104° 6' 24 058 W
- plan misses target center by 4 0usft at 4868 1usft MD (4850 0 TVD, 1.0 N, 364 0 E)							
Shape							Circle (Radius 25 0)

SECTION DETAILS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Target
0 0	0 00	0 00	0 0	0 0	0 0	0 00	0 00	0 0	
1100 0	0 00	0 00	1100 0	0 0	0 0	0 00	0 00	0 0	
1388 2	5 76	89 85	1387.7	0 0	14 5	2 00	89 85	14 5	
4868 1	5 76	89 85	4850 0	1 0	364.0	0 00	0 00	364.0	

ANNOTATIONS									
TVD	MD	Inc	Azi	+N/-S	+E/-W	Vsect	Departure	Annotation	
1100.0	1100.0	0.00	0.00	0 0	0 0	0.0	0.0	KOP - 2°100 DLS @ 89 86° AZI	
1384.5	1385.0	5.70	89.85	0 0	14.2	14.2	14.2	Hold to TD	
	5269.7							TD at 5269.7	



25' Target Radius



Cimarex Energy Co. (Midland)

Eddy County (NM83E)

Sec 18-T17S-R29E

Pere Marquette 18 Fed #5

Wellbore #1

Survey: Survey #1

Standard Survey Report

12 September, 2011

Great White Directional Services

Survey Report

Company:	Cimarex Energy Co. (Midland)	Local Co-ordinate Reference:	Well Pere Marquette 18 Fed #5
Project:	Eddy County (NM83E)	TVD Reference:	WELL @ 0.0usft (Original Well Elev)
Site:	Sec 18-T17S-R29E	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Pere Marquette 18 Fed #5	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM-5000 1 Single User Db

Project: Eddy County (NM83E)			
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site: Sec 18-T17S-R29E					
Site Position:		Northing:	669,464.80 usft	Latitude:	32° 50' 24.712 N
From:	Map	Easting:	607,648.10 usft	Longitude:	104° 7' 2.741 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.12 °

Well	Pere Marquette 18 Fed #5					
Well Position	+N/-S	0.0 usft	Northing:	669,075.30 usft	Latitude:	32° 50' 20.798 N
	+E/-W	0.0 usft	Easting:	610,581.20 usft	Longitude:	104° 6' 28.371 W
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft	Ground Level:	0.0 usft	

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	08/24/11	7.86	60.66	48,934

Design		Wellbore #1						
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		89.85

Survey Program		Date	09/12/11		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
1,015.0	4,870.0	Survey #1 (Wellbore #1)	MWD	MWD - Standard	

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,015.0	1.43	84.38	1,014.8	3.4	15.5	15.5	0.00	0.00	0.00
1,064.0	1.30	68.70	1,063.8	3.6	16.6	16.6	0.80	-0.27	-32.00
1,127.0	1.70	102.20	1,126.7	3.7	18.2	18.2	1.50	0.63	53.17
1,221.0	3.40	89.20	1,220.6	3.4	22.3	22.3	1.90	1.81	-13.83
1,315.0	3.80	81.70	1,314.5	3.9	28.2	28.2	0.66	0.43	-7.98
1,410.0	3.90	75.80	1,409.2	5.2	34.5	34.5	0.43	0.11	-6.21
1,505.0	4.70	83.80	1,504.0	6.4	41.5	41.5	1.05	0.84	8.42
1,599.0	4.30	84.90	1,597.7	7.1	48.8	48.8	0.44	-0.43	1.17
1,694.0	5.00	84.30	1,692.4	7.8	56.5	56.5	0.74	0.74	-0.63
1,789.0	6.20	80.00	1,786.9	9.1	65.6	65.7	1.34	1.26	-4.53

Great White Directional Services

Survey Report

Company:	Cimarex Energy Co. (Midland)	Local Co-ordinate Reference:	Well Pere Marquette-18 Fed #5
Project:	Eddy County (NM83E)	TVD Reference:	WELL @ 0.0usft (Original Well Elev)
Site:	Sec 18-T17S-R29E	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Pere Marquette 18 Fed #5	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000-1 Single User Db

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,884.0	5.60	76.40	1,881.4	11.1	75.2	75.2	0.74	-0.63	-3.79
1,978.0	6.00	85.60	1,974.9	12.6	84.5	84.6	1.08	0.43	9.79
2,072.0	5.70	89.90	2,068.4	13.0	94.1	94.1	0.56	-0.32	4.57
2,168.0	5.50	87.70	2,164.0	13.2	103.5	103.5	0.31	-0.21	-2.29
2,263.0	5.20	87.70	2,258.6	13.5	112.3	112.4	0.32	-0.32	0.00
2,358.0	6.20	95.40	2,353.1	13.2	121.7	121.8	1.32	1.05	8.11
2,453.0	6.30	94.60	2,447.5	12.3	132.0	132.1	0.14	0.11	-0.84
2,547.0	6.20	95.00	2,541.0	11.4	142.2	142.3	0.12	-0.11	0.43
2,643.0	6.20	94.80	2,636.4	10.6	152.6	152.6	0.02	0.00	-0.21
2,737.0	6.10	95.90	2,729.9	9.6	162.6	162.6	0.16	-0.11	1.17
2,831.0	5.80	94.30	2,823.4	8.8	172.3	172.3	0.36	-0.32	-1.70
2,926.0	5.40	95.30	2,917.9	8.0	181.5	181.6	0.43	-0.42	1.05
3,021.0	5.40	90.60	3,012.5	7.5	190.5	190.5	0.47	0.00	-4.95
3,115.0	5.30	92.30	3,106.1	7.3	199.2	199.2	0.20	-0.11	1.81
3,210.0	5.30	86.10	3,200.7	7.4	208.0	208.0	0.60	0.00	-6.53
3,306.0	5.50	86.10	3,296.3	8.0	217.0	217.0	0.21	0.21	0.00
3,401.0	5.40	87.80	3,390.8	8.5	226.0	226.0	0.20	-0.11	1.79
3,496.0	5.20	89.20	3,485.4	8.8	234.8	234.8	0.25	-0.21	1.47
3,591.0	5.10	88.60	3,580.0	8.9	243.3	243.3	0.12	-0.11	-0.63
3,685.0	5.10	90.20	3,673.7	9.0	251.7	251.7	0.15	0.00	1.70
3,780.0	5.60	86.70	3,768.2	9.3	260.5	260.5	0.63	0.53	-3.68
3,875.0	5.20	86.10	3,862.8	9.8	269.4	269.4	0.43	-0.42	-0.63
3,969.0	5.90	87.50	3,956.4	10.3	278.5	278.5	0.76	0.74	1.49
4,063.0	6.50	87.90	4,049.8	10.7	288.6	288.7	0.64	0.64	0.43
4,157.0	6.00	95.00	4,143.3	10.5	298.9	298.9	0.98	-0.53	7.55
4,252.0	6.20	95.10	4,237.7	9.6	308.9	308.9	0.21	0.21	0.11
4,347.0	4.70	94.30	4,332.3	8.9	317.9	317.9	1.58	-1.58	-0.84
4,442.0	4.70	96.10	4,427.0	8.1	325.7	325.7	0.16	0.00	1.89
4,537.0	4.20	94.40	4,521.7	7.5	333.0	333.0	0.54	-0.53	-1.79
4,632.0	4.30	96.50	4,616.4	6.8	340.0	340.0	0.19	0.11	2.21
4,726.0	4.50	100.30	4,710.2	5.7	347.1	347.1	0.38	0.21	4.04
4,819.0	4.10	99.90	4,802.9	4.5	354.0	354.0	0.43	-0.43	-0.43
Last MWD Survey									
4,867.0	4.10	99.90	4,850.8	3.9	357.4	357.4	0.00	0.00	0.00
PM 18 #5 PBHL									
4,870.0	4.10	99.90	4,853.8	3.9	357.6	357.6	0.00	0.00	0.00
Projection to Bit									

Great White Directional Services
Survey Report

Company:	Cimarex Energy Co. (Midland)	Local Co-ordinate Reference:	Well Pere Marquette 18 Fed #5
Project:	Eddy County (NM83E)	TVD Reference:	WELL @ 0.0usft (Original Well Elev)
Site:	Sec 18-T17S-R29E	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Pere Marquette 18 Fed #5	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
4,819.0	4,802.9	4.5	354.0	Last MWD Survey
4,870.0	4,853.8	3.9	357.6	Projection to Bit

Checked By: _____	Approved By: _____	Date: _____
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