

PETRO OPERATING COMPANY LLC

Well Name: **BEF West 16**

Surface Location: BEF 1S66W2 Pad Sec.2-T1S-R66W

North American Datum 1983 , US State Plane 1983, Colorado Northern Zone

Ground Elevation: 5049.0

+N/-S+E/-W Northing Easting Latitude Longitude Slot

0.0 0.0 1241830.493214415.64 39.994670 -104.734700

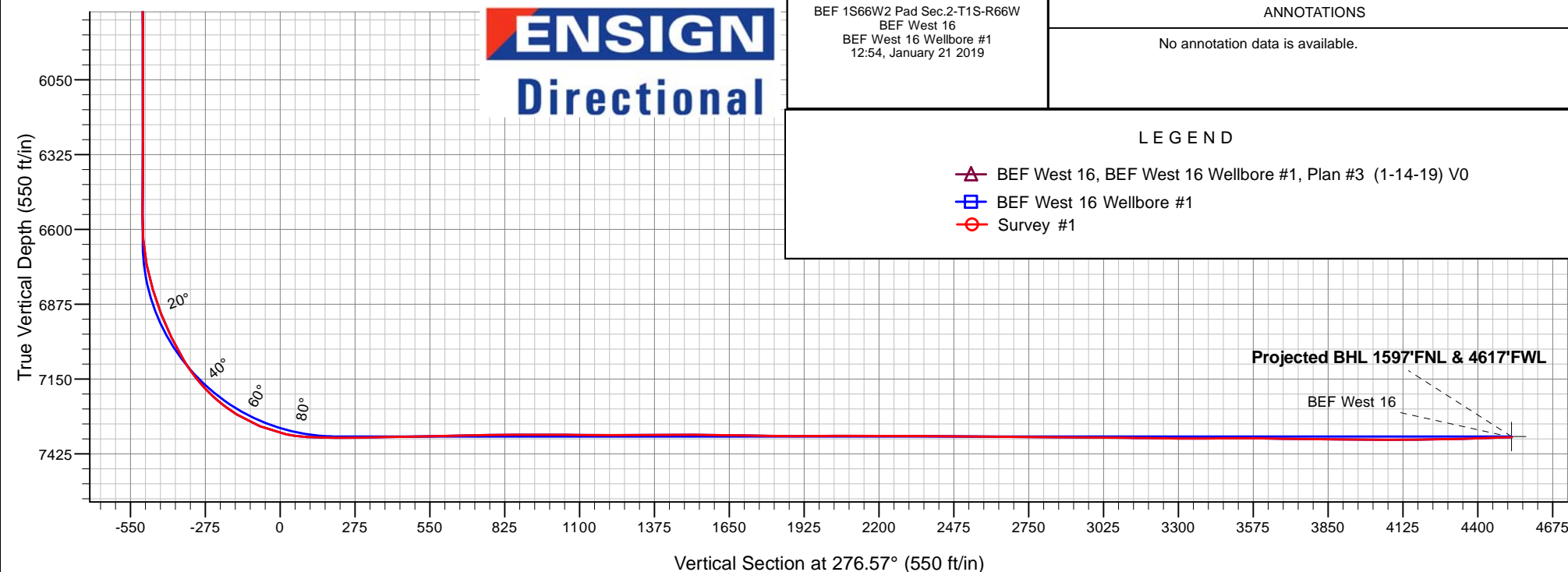
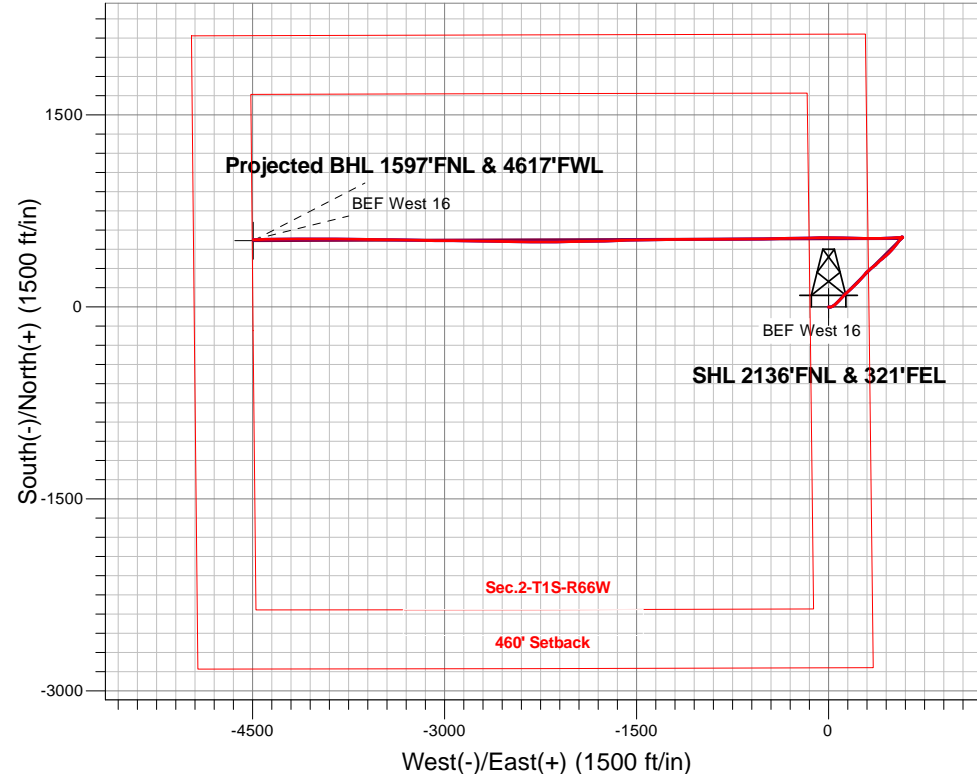
RKB - 27' WELL @ 5076.0ft (RKB - 27')

FINAL SURVEY

Projected Bottom Hole Location

12,197'MD 7364'TVD 526'N & 4494'W of SHL

91.8 degree Incl @ 268.8 degree AZM





PETRO OPERATING COMPANY LLC

SEC.2-T1S-R66W

BEF 1S66W2 Pad Sec.2-T1S-R66W

BEF West 16

BEF West 16 Wellbore #1

Survey: Survey #1

Standard Survey Report

21 January, 2019

Company:	PETRO OPERATING COMPANY LLC	Local Co-ordinate Reference:	Well BEF West 16
Project:	SEC.2-T1S-R66W	TVD Reference:	WELL @ 5076.0ft (RKB - 27')
Site:	BEF 1S66W2 Pad Sec.2-T1S-R66W	MD Reference:	WELL @ 5076.0ft (RKB - 27')
Well:	BEF West 16	North Reference:	True
Wellbore:	BEF West 16 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	BEF West 16 Wellbore #1	Database:	US_EDM

Project	SEC.2-T1S-R66W, Adams County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		Using Well Reference Point
Map Zone:	Colorado Northern Zone		Using geodetic scale factor

Site		BEF 1S66W2 Pad Sec.2-T1S-R66W			
Site Position:		Northing:	1,241,928.85 usft	Latitude:	39.994940
From:	Lat/Long	Easting:	3,214,414.79 usft	Longitude:	-104.734700
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.49 °

Well	BEF West 16					
Well Position	+N/-S	0.0 ft	Northing:	1,241,830.49 usft	Latitude:	39.994670
	+E/-W	0.0 ft	Easting:	3,214,415.64 usft	Longitude:	-104.734700
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	5,049.0 ft

Wellbore	BEF West 16 Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	1/14/2019	8.07	66.28	51,930

Design	BEF West 16 Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	276.57	

Survey Program	Date	1/21/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
215.0	12,197.0	Survey #1 (BEF West 16 Wellbore #1)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
1.0	0.00	130.20	1.0	0.0	0.0	0.0	0.19	0.19	0.00	
SHL 2136'FNL & 321'FEL										
215.0	0.40	130.20	215.0	-0.5	0.6	-0.6	0.19	0.19	0.00	
309.0	1.50	109.50	309.0	-1.1	2.0	-2.1	1.21	1.17	-22.02	
404.0	3.00	89.80	403.9	-1.5	5.6	-5.8	1.75	1.58	-20.74	
499.0	4.50	83.30	498.7	-1.1	11.8	-11.9	1.64	1.58	-6.84	
594.0	5.60	83.30	593.3	-0.1	20.1	-20.0	1.16	1.16	0.00	
689.0	6.20	61.20	687.8	2.9	29.2	-28.7	2.46	0.63	-23.26	
784.0	7.70	53.60	782.1	9.2	38.9	-37.5	1.85	1.58	-8.00	
879.0	8.30	50.30	876.2	17.3	49.3	-46.9	0.80	0.63	-3.47	

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Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
973.0	9.00	47.10	969.1	26.7	59.9	-56.4	0.90	0.74	-3.40
1,068.0	10.80	45.20	1,062.7	38.0	71.6	-66.8	1.93	1.89	-2.00
1,163.0	11.20	43.20	1,156.0	51.0	84.2	-77.9	0.58	0.42	-2.11
1,257.0	11.60	43.40	1,248.1	64.5	97.0	-89.0	0.43	0.43	0.21
1,351.0	10.60	41.70	1,340.4	77.8	109.2	-99.6	1.12	-1.06	-1.81
1,446.0	9.80	43.60	1,433.9	90.2	120.6	-109.5	0.91	-0.84	2.00
1,508.0	9.60	46.00	1,495.0	97.6	128.0	-116.0	0.73	-0.32	3.87
1,571.0	10.10	46.40	1,557.1	105.1	135.8	-122.8	0.80	0.79	0.63
1,665.0	11.70	48.90	1,649.4	117.0	148.9	-134.5	1.77	1.70	2.66
1,760.0	11.30	47.80	1,742.4	129.6	163.1	-147.2	0.48	-0.42	-1.16
1,855.0	10.90	47.40	1,835.7	142.0	176.6	-159.2	0.43	-0.42	-0.42
1,950.0	12.40	49.40	1,928.7	154.7	190.9	-172.0	1.63	1.58	2.11
2,045.0	12.00	48.50	2,021.6	167.9	206.1	-185.5	0.47	-0.42	-0.95
2,140.0	11.70	44.80	2,114.5	181.2	220.3	-198.1	0.86	-0.32	-3.89
2,234.0	12.10	41.80	2,206.5	195.3	233.5	-209.7	0.78	0.43	-3.19
2,329.0	11.40	39.50	2,299.5	210.0	246.1	-220.5	0.89	-0.74	-2.42
2,424.0	10.80	37.40	2,392.8	224.3	257.5	-230.2	0.76	-0.63	-2.21
2,519.0	11.30	43.20	2,486.0	238.2	269.3	-240.3	1.28	0.53	6.11
2,613.0	10.70	40.60	2,578.3	251.5	281.3	-250.7	0.83	-0.64	-2.77
2,708.0	9.80	38.00	2,671.8	264.6	292.0	-259.8	1.06	-0.95	-2.74
2,803.0	10.80	49.90	2,765.2	276.7	303.8	-270.1	2.47	1.05	12.53
2,898.0	9.30	48.30	2,858.8	287.5	316.3	-281.4	1.61	-1.58	-1.68
2,993.0	10.70	52.40	2,952.3	298.0	329.1	-292.8	1.65	1.47	4.32
3,088.0	9.80	52.20	3,045.8	308.4	342.4	-304.9	0.95	-0.95	-0.21
3,182.0	10.00	50.60	3,138.4	318.4	355.1	-316.3	0.36	0.21	-1.70
3,277.0	9.50	47.60	3,232.0	329.0	367.2	-327.2	0.75	-0.53	-3.16
3,372.0	11.60	48.00	3,325.4	340.6	380.1	-338.6	2.21	2.21	0.42
3,467.0	10.50	44.80	3,418.7	353.2	393.3	-350.3	1.33	-1.16	-3.37
3,562.0	12.10	50.80	3,511.8	365.6	407.1	-362.6	2.09	1.68	6.32
3,657.0	10.80	51.50	3,604.9	377.4	421.8	-375.8	1.38	-1.37	0.74
3,751.0	11.90	48.10	3,697.1	389.4	435.9	-388.5	1.37	1.17	-3.62
3,846.0	10.60	50.40	3,790.3	401.5	449.9	-401.0	1.45	-1.37	2.42
3,940.0	11.90	47.60	3,882.5	413.6	463.8	-413.4	1.50	1.38	-2.98
4,035.0	10.60	44.60	3,975.6	426.4	477.1	-425.2	1.50	-1.37	-3.16
4,130.0	11.50	41.50	4,068.9	439.7	489.5	-436.0	1.13	0.95	-3.26
4,225.0	9.90	41.10	4,162.2	452.9	501.2	-446.1	1.69	-1.68	-0.42
4,319.0	11.50	38.80	4,254.6	466.3	512.4	-455.6	1.76	1.70	-2.45
4,414.0	10.30	40.10	4,347.9	480.2	523.8	-465.4	1.29	-1.26	1.37
4,509.0	9.10	38.50	4,441.5	492.6	533.9	-474.0	1.29	-1.26	-1.68
4,604.0	8.80	36.50	4,535.3	504.3	542.9	-481.6	0.45	-0.32	-2.11
4,699.0	7.90	33.60	4,629.3	515.6	550.9	-488.2	1.05	-0.95	-3.05
4,794.0	6.60	49.70	4,723.6	524.6	558.6	-494.9	2.53	-1.37	16.95
4,888.0	6.70	47.40	4,817.0	531.8	566.8	-502.2	0.30	0.11	-2.45

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4,983.0	4.70	51.30	4,911.5	538.0	573.9	-508.6	2.14	-2.11	4.11
5,078.0	2.90	36.90	5,006.3	542.3	578.4	-512.5	2.13	-1.89	-15.16
5,173.0	0.50	26.20	5,101.2	544.6	580.0	-513.9	2.54	-2.53	-11.26
5,268.0	0.40	345.90	5,196.2	545.3	580.1	-513.9	0.34	-0.11	-42.42
5,363.0	0.80	297.40	5,291.2	545.9	579.4	-513.2	0.65	0.42	-51.05
5,457.0	1.10	275.60	5,385.2	546.3	578.0	-511.6	0.49	0.32	-23.19
5,551.0	1.20	306.40	5,479.2	547.0	576.3	-509.9	0.66	0.11	32.77
5,645.0	0.70	254.50	5,573.2	547.4	574.9	-508.5	1.01	-0.53	-55.21
5,740.0	0.80	261.50	5,668.2	547.2	573.7	-507.3	0.14	0.11	7.37
5,835.0	1.00	240.60	5,763.2	546.7	572.3	-506.0	0.40	0.21	-22.00
5,930.0	1.00	264.40	5,858.1	546.2	570.8	-504.5	0.43	0.00	25.05
6,024.0	0.70	150.60	5,952.1	545.6	570.3	-504.1	1.53	-0.32	-121.06
6,119.0	0.30	158.00	6,047.1	544.9	570.6	-504.5	0.43	-0.42	7.79
6,212.0	0.20	183.00	6,140.1	544.5	570.7	-504.7	0.16	-0.11	26.88
6,331.0	0.30	202.10	6,259.1	544.0	570.6	-504.6	0.11	0.08	16.05
6,426.0	0.50	165.20	6,354.1	543.3	570.6	-504.7	0.33	0.21	-38.84
6,520.0	0.80	140.40	6,448.1	542.4	571.1	-505.3	0.43	0.32	-26.38
6,614.0	0.50	159.20	6,542.1	541.5	571.7	-506.0	0.39	-0.32	20.00
6,708.0	3.70	267.50	6,636.0	541.0	568.8	-503.1	4.13	3.40	115.21
6,802.0	11.10	272.30	6,729.2	541.3	556.7	-491.1	7.89	7.87	5.11
6,897.0	16.90	267.50	6,821.3	541.0	533.8	-468.3	6.22	6.11	-5.05
6,991.0	21.50	265.90	6,910.1	539.2	502.9	-437.9	4.93	4.89	-1.70
7,086.0	26.00	268.80	6,997.0	537.5	464.7	-400.1	4.89	4.74	3.05
7,181.0	31.70	268.20	7,080.2	536.3	418.9	-354.8	6.01	6.00	-0.63
7,229.0	35.40	269.30	7,120.2	535.7	392.4	-328.5	7.81	7.71	2.29
7,276.0	39.90	270.00	7,157.4	535.6	363.7	-300.0	9.62	9.57	1.49
7,324.0	44.60	270.50	7,192.9	535.7	331.4	-267.9	9.82	9.79	1.04
7,370.0	48.60	270.00	7,224.5	535.9	298.0	-234.7	8.73	8.70	-1.09
7,418.0	53.60	270.20	7,254.7	535.9	260.7	-197.6	10.42	10.42	0.42
7,464.0	58.50	270.00	7,280.3	536.0	222.5	-159.7	10.66	10.65	-0.43
7,559.0	67.80	272.30	7,323.2	537.8	137.9	-75.4	10.02	9.79	2.42
7,654.0	77.50	271.70	7,351.5	540.9	47.4	14.9	10.23	10.21	-0.63
7,749.0	87.80	268.60	7,363.6	541.1	-46.7	108.3	11.31	10.84	-3.26
7,843.0	89.40	268.40	7,365.9	538.7	-140.7	201.4	1.72	1.70	-0.21
7,848.0	89.49	268.46	7,366.0	538.5	-145.7	206.3	2.16	1.80	1.20
7,848.2	89.49	268.46	7,366.0	538.5	-145.8	206.5	0.00	0.00	0.00
LPL 1605°FNL & 460°FEL									
7,938.0	91.10	269.60	7,365.5	537.0	-235.6	295.5	2.20	1.79	1.27
8,032.0	91.50	268.80	7,363.4	535.7	-329.6	388.7	0.95	0.43	-0.85
8,127.0	90.60	269.50	7,361.6	534.3	-424.6	482.9	1.20	-0.95	0.74
8,221.0	91.00	268.80	7,360.3	532.9	-518.6	576.1	0.86	0.43	-0.74
8,316.0	91.80	268.20	7,358.0	530.4	-613.5	670.2	1.05	0.84	-0.63
8,411.0	90.80	269.30	7,355.9	528.3	-708.4	764.2	1.56	-1.05	1.16

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8,506.0	89.90	270.20	7,355.3	527.9	-803.4	858.6	1.34	-0.95	0.95
8,601.0	90.50	269.50	7,354.9	527.7	-898.4	952.9	0.97	0.63	-0.74
8,695.0	89.40	270.70	7,355.0	527.8	-992.4	1,046.3	1.73	-1.17	1.28
8,789.0	89.50	269.80	7,355.9	528.2	-1,086.4	1,139.7	0.96	0.11	-0.96
8,884.0	90.00	270.00	7,356.3	528.1	-1,181.4	1,234.1	0.57	0.53	0.21
8,979.0	90.30	268.90	7,356.1	527.2	-1,276.4	1,328.4	1.20	0.32	-1.16
9,074.0	90.90	268.80	7,355.1	525.3	-1,371.4	1,422.5	0.64	0.63	-0.11
9,169.0	89.30	269.60	7,354.9	523.9	-1,466.4	1,516.7	1.88	-1.68	0.84
9,263.0	89.30	267.90	7,356.1	521.9	-1,560.3	1,609.8	1.81	0.00	-1.81
9,357.0	89.40	267.20	7,357.2	517.9	-1,654.3	1,702.6	0.75	0.11	-0.74
9,451.0	88.70	268.60	7,358.7	514.4	-1,748.2	1,795.6	1.66	-0.74	1.49
9,545.0	89.80	269.30	7,359.9	512.7	-1,842.1	1,888.7	1.39	1.17	0.74
9,640.0	90.20	269.10	7,359.9	511.4	-1,937.1	1,982.9	0.47	0.42	-0.21
9,735.0	90.70	268.60	7,359.2	509.5	-2,032.1	2,077.1	0.74	0.53	-0.53
9,829.0	89.70	269.60	7,358.9	508.0	-2,126.1	2,170.3	1.50	-1.06	1.06
9,924.0	90.20	269.50	7,358.9	507.2	-2,221.1	2,264.6	0.54	0.53	-0.11
10,019.0	89.30	271.40	7,359.4	508.0	-2,316.1	2,359.0	2.21	-0.95	2.00
10,113.0	89.40	271.20	7,360.4	510.1	-2,410.1	2,452.6	0.24	0.11	-0.21
10,208.0	89.60	271.40	7,361.3	512.3	-2,505.0	2,547.2	0.30	0.21	0.21
10,303.0	89.60	270.30	7,361.9	513.7	-2,600.0	2,641.7	1.16	0.00	-1.16
10,398.0	89.40	269.60	7,362.8	513.6	-2,695.0	2,736.1	0.77	-0.21	-0.74
10,492.0	89.30	271.70	7,363.8	514.7	-2,789.0	2,829.6	2.24	-0.11	2.23
10,587.0	89.60	271.20	7,364.7	517.1	-2,884.0	2,924.2	0.61	0.32	-0.53
10,682.0	89.20	269.60	7,365.7	517.7	-2,978.9	3,018.6	1.74	-0.42	-1.68
10,777.0	90.00	269.80	7,366.4	517.2	-3,073.9	3,112.9	0.87	0.84	0.21
10,871.0	88.80	271.70	7,367.4	518.5	-3,167.9	3,206.4	2.39	-1.28	2.02
10,966.0	89.30	271.20	7,368.9	520.9	-3,262.9	3,301.1	0.74	0.53	-0.53
11,061.0	90.60	271.70	7,369.0	523.3	-3,357.8	3,395.7	1.47	1.37	0.53
11,156.0	91.10	271.40	7,367.6	525.8	-3,452.8	3,490.3	0.61	0.53	-0.32
11,250.0	88.80	271.20	7,367.7	528.0	-3,546.8	3,583.9	2.46	-2.45	-0.21
11,345.0	89.10	270.50	7,369.4	529.4	-3,641.7	3,678.4	0.80	0.32	-0.74
11,440.0	89.30	270.20	7,370.8	530.0	-3,736.7	3,772.8	0.38	0.21	-0.32
11,535.0	89.50	270.20	7,371.8	530.3	-3,831.7	3,867.2	0.21	0.21	0.00
11,630.0	89.30	270.00	7,372.8	530.5	-3,926.7	3,961.6	0.30	-0.21	-0.21
11,724.0	90.10	270.30	7,373.3	530.7	-4,020.7	4,055.0	0.91	0.85	0.32
11,819.0	90.30	269.80	7,372.9	530.8	-4,115.7	4,149.4	0.57	0.21	-0.53
11,914.0	91.00	269.50	7,371.8	530.2	-4,210.7	4,243.7	0.80	0.74	-0.32
12,009.0	91.50	269.30	7,369.8	529.2	-4,305.7	4,338.0	0.57	0.53	-0.21
12,104.0	92.00	268.80	7,366.9	527.6	-4,400.6	4,432.1	0.74	0.53	-0.53
12,137.0	91.80	268.80	7,365.8	526.9	-4,433.6	4,464.8	0.61	-0.61	0.00
12,197.0	91.80	268.80	7,363.9	525.7	-4,493.6	4,524.2	0.00	0.00	0.00
Projected BHL 1597'FNL & 461'FWL									

Company:	PETRO OPERATING COMPANY LLC	Local Co-ordinate Reference:	Well BEF West 16
Project:	SEC.2-T1S-R66W	TVD Reference:	WELL @ 5076.0ft (RKB - 27')
Site:	BEF 1S66W2 Pad Sec.2-T1S-R66W	MD Reference:	WELL @ 5076.0ft (RKB - 27')
Well:	BEF West 16	North Reference:	True
Wellbore:	BEF West 16 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	BEF West 16 Wellbore #1	Database:	US_EDM

Design Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
SHL 2136'FNL & 321'FE - survey hits target center - Point	0.00	0.00	1.0	0.0	0.0	1,241,830.50	3,214,415.64	39.994670	-104.734700
Projected BHL 1597'FNL - survey misses target center by 8.5ft at 12197.0ft MD (7363.9 TVD, 525.7 N, -4493.6 E) - Point	0.00	0.00	7,361.0	517.7	-4,494.1	1,242,309.37	3,209,917.42	39.996090	-104.750740

Checked By: _____	Approved By: _____	Date: _____
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