

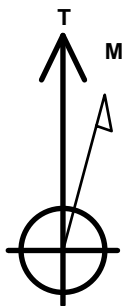
PETROLEUM DEVELOPMENT CORP DJ Basin

Well Name: **Hop 18E-232**

Surface Location: Hop 5N64W18A Pad Sec.18-T5N-R64W
 North American Datum 1983 , US State Plane 1983 Colorado Northern Zone
 Ground Elevation: 4628.0
 +N/-S +E/-W Northing Easting Latitude Longitude Slot
 0.0 0.0 1391153.82 3250983.06 40.403618 -104.598774
 Original Well Elev WELL @ 4641.0ft (Original Well Elev)

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Shape
SHL 1000'FNL, 848'FWL, SEC.18	1.0	0.0	0.0	Point
BHL 375'FNL, 500'FEL, SEC.17	6662.0	692.0	9052.1	Point



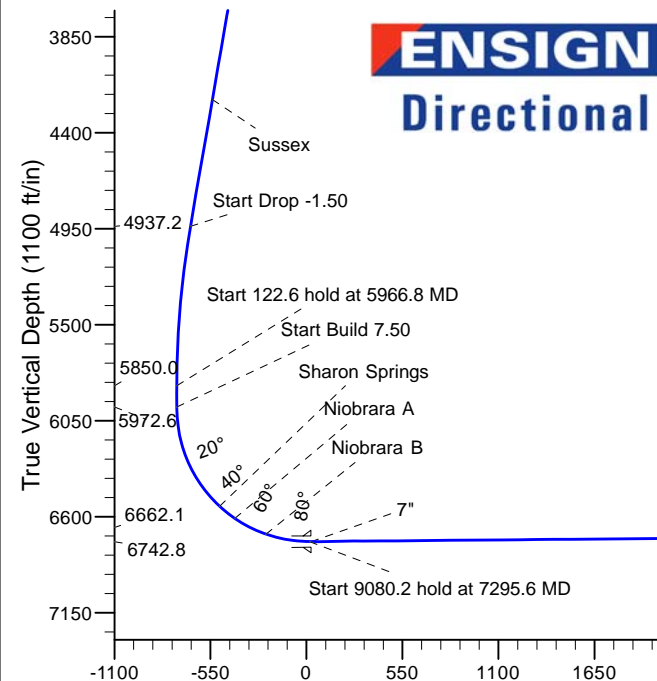
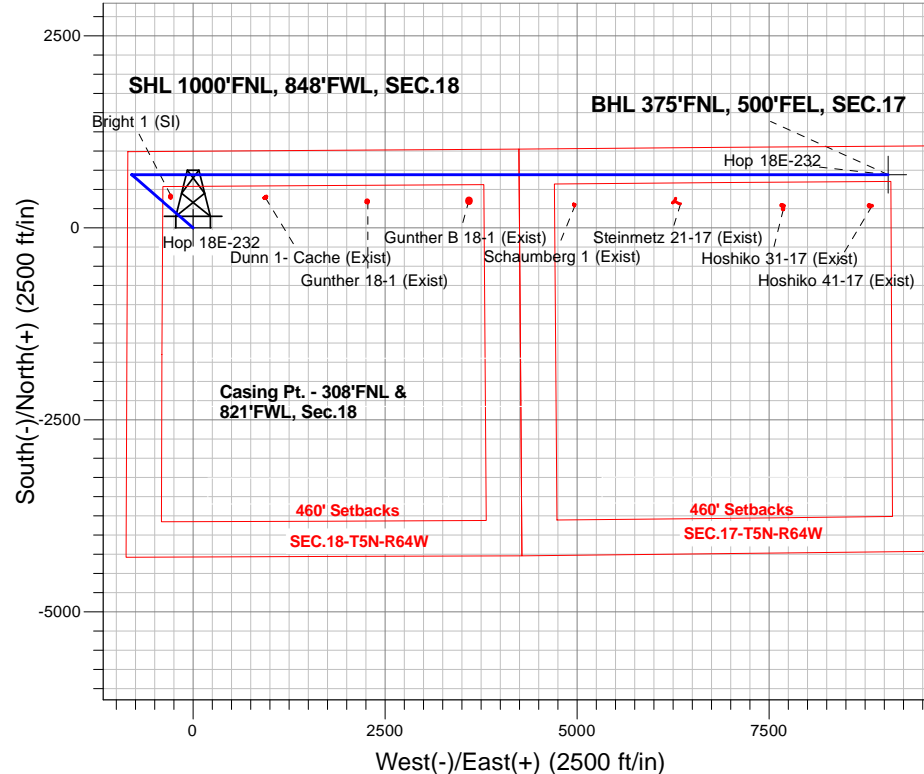
Azimuths to True North
 Magnetic North: 8.16°

Magnetic Field
 Strength: 52675.9snT
 Dip Angle: 66.92°
 Date: 12/21/2015
 Model: IGRF2010

Hop 5N64W18A Pad Sec.18-T5N-R64W
 Hop 18E-232
 Plan #1 (12-16-15)
 10:52, December 21 2015

ANNOTATIONS

TVD	MD	Annotation
400.0	400.0	KOP - Start Build 1.00
4937.2	5045.1	Start Drop -1.50
5850.0	5966.8	Start 122.6 hold at 5966.8 MD
5972.6	6089.4	Start Build 7.50
6736.5	7295.6	Start 9080.2 hold at 7295.6 MD
6662.0	16375.8	TD at 16375.8



SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Target
1	0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
2	400.0	0.00	0.00	400.0	0.0	0.0	0.00	0.00	0.0	
3	1782.5	13.83	310.93	1769.1	108.8	-125.4	1.00	310.93	-116.7	
4	5045.1	13.83	310.93	4937.2	619.5	-714.4	0.00	0.00	-665.1	
5	5966.8	0.00	0.00	5850.0	692.0	-798.0	1.50	180.00	-742.9	
6	6095.7	0.00	0.00	5978.9	692.0	-798.0	0.00	0.00	-742.9	
7	7302.5	90.51	90.00	6742.8	692.0	-27.3	7.50	90.00	25.6	
8	16382.2	90.51	90.00	6662.0	692.0	9052.1	0.00	0.00	9078.5	BHL 375'FNL, 500'FEL, SEC.17

BHL 375'FNL, 500'FEL, SEC.17

TD at 16375.8

Vertical Section at 85.63° (1100 ft/in)



PETROLEUM DEVELOPMENT CORP DJ Basin

SEC.18-T5N-R64W

Hop 5N64W18A Pad Sec.18-T5N-R64W

Hop 18E-232

Wellbore #1

Plan: Plan #1 (12-16-15)

Standard Planning Report

21 December, 2015

Database:	US_EDM	Local Co-ordinate Reference:	Well Hop 18E-232
Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Project	SEC.18-T5N-R64W, Weld County, Colorado		
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		Hop 5N64W18A Pad Sec.18-T5N-R64W			
Site Position:		Northing:	1,391,153.68 usft	Latitude:	40.403618
From:	Lat/Long	Easting:	3,250,968.30 usft	Longitude:	-104.598827
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.58

Well	Hop 18E-232					
Well Position	+N/-S	0.0 ft	Northing:	1,391,153.82 usft	Latitude:	40.403618
	+E/-W	14.8 ft	Easting:	3,250,983.06 usft	Longitude:	-104.598774
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	4,628.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	12/21/2015	8.17	66.92	52,676

Design	Plan #1 (12-16-15)			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.0	0.0	0.0	85.63

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
400.0	0.00	0.00	400.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,782.5	13.83	310.93	1,769.1	108.8	-125.4	1.00	1.00	0.00	310.93	
5,045.1	13.83	310.93	4,937.2	619.5	-714.4	0.00	0.00	0.00	0.00	
5,966.8	0.00	0.00	5,850.0	692.0	-798.0	1.50	-1.50	0.00	180.00	
6,095.7	0.00	0.00	5,978.9	692.0	-798.0	0.00	0.00	0.00	0.00	
7,302.5	90.51	90.00	6,742.8	692.0	-27.3	7.50	7.50	0.00	90.00	
16,382.2	90.51	90.00	6,662.0	692.0	9,052.1	0.00	0.00	0.00	0.00	BHL 375°FNL, 500°F E

Database:	US_EDM	Local Co-ordinate Reference:	Well Hop 18E-232
Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Planned 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	0.00	1.0	0.0	0.0	0.0	0.00	0.00	0.00
SHL 1000'FNL, 848'FWL, SEC.18									
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00
KOP - Start Build 1.00									
500.0	1.00	310.93	500.0	0.6	-0.7	-0.6	1.00	1.00	0.00
600.0	2.00	310.93	600.0	2.3	-2.6	-2.5	1.00	1.00	0.00
700.0	3.00	310.93	699.9	5.1	-5.9	-5.5	1.00	1.00	0.00
800.0	4.00	310.93	799.7	9.1	-10.5	-9.8	1.00	1.00	0.00
900.0	5.00	310.93	899.4	14.3	-16.5	-15.3	1.00	1.00	0.00
1,000.0	6.00	310.93	998.9	20.6	-23.7	-22.1	1.00	1.00	0.00
1,100.0	7.00	310.93	1,098.3	28.0	-32.3	-30.0	1.00	1.00	0.00
1,200.0	8.00	310.93	1,197.4	36.5	-42.1	-39.2	1.00	1.00	0.00
1,300.0	9.00	310.93	1,296.3	46.2	-53.3	-49.6	1.00	1.00	0.00
1,400.0	10.00	310.93	1,394.9	57.0	-65.8	-61.2	1.00	1.00	0.00
1,500.0	11.00	310.93	1,493.3	69.0	-79.5	-74.0	1.00	1.00	0.00
1,600.0	12.00	310.93	1,591.2	82.0	-94.6	-88.1	1.00	1.00	0.00
1,700.0	13.00	310.93	1,688.9	96.2	-110.9	-103.3	1.00	1.00	0.00
1,782.5	13.83	310.93	1,769.1	108.8	-125.4	-116.7	1.00	1.00	0.00
1,800.0	13.83	310.93	1,786.1	111.5	-128.6	-119.7	0.00	0.00	0.00
1,900.0	13.83	310.93	1,883.2	127.1	-146.6	-136.5	0.00	0.00	0.00
2,000.0	13.83	310.93	1,980.3	142.8	-164.7	-153.3	0.00	0.00	0.00
2,100.0	13.83	310.93	2,077.4	158.5	-182.7	-170.1	0.00	0.00	0.00
2,200.0	13.83	310.93	2,174.5	174.1	-200.8	-186.9	0.00	0.00	0.00
2,300.0	13.83	310.93	2,271.6	189.8	-218.8	-203.7	0.00	0.00	0.00
2,400.0	13.83	310.93	2,368.7	205.4	-236.9	-220.5	0.00	0.00	0.00
2,500.0	13.83	310.93	2,465.8	221.1	-254.9	-237.3	0.00	0.00	0.00
2,600.0	13.83	310.93	2,562.9	236.7	-273.0	-254.1	0.00	0.00	0.00
2,700.0	13.83	310.93	2,660.0	252.4	-291.0	-270.9	0.00	0.00	0.00
2,800.0	13.83	310.93	2,757.1	268.0	-309.1	-287.8	0.00	0.00	0.00
2,900.0	13.83	310.93	2,854.2	283.7	-327.1	-304.6	0.00	0.00	0.00
3,000.0	13.83	310.93	2,951.4	299.4	-345.2	-321.4	0.00	0.00	0.00
3,100.0	13.83	310.93	3,048.5	315.0	-363.2	-338.2	0.00	0.00	0.00
3,200.0	13.83	310.93	3,145.6	330.7	-381.3	-355.0	0.00	0.00	0.00
3,300.0	13.83	310.93	3,242.7	346.3	-399.4	-371.8	0.00	0.00	0.00
3,400.0	13.83	310.93	3,339.8	362.0	-417.4	-388.6	0.00	0.00	0.00
3,500.0	13.83	310.93	3,436.9	377.6	-435.5	-405.4	0.00	0.00	0.00
3,554.7	13.83	310.93	3,490.0	386.2	-445.3	-414.6	0.00	0.00	0.00
Parkman									
3,600.0	13.83	310.93	3,534.0	393.3	-453.5	-422.2	0.00	0.00	0.00
3,700.0	13.83	310.93	3,631.1	408.9	-471.6	-439.0	0.00	0.00	0.00
3,800.0	13.83	310.93	3,728.2	424.6	-489.6	-455.8	0.00	0.00	0.00
3,900.0	13.83	310.93	3,825.3	440.3	-507.7	-472.6	0.00	0.00	0.00
4,000.0	13.83	310.93	3,922.4	455.9	-525.7	-489.4	0.00	0.00	0.00
4,100.0	13.83	310.93	4,019.5	471.6	-543.8	-506.2	0.00	0.00	0.00
4,200.0	13.83	310.93	4,116.6	487.2	-561.8	-523.1	0.00	0.00	0.00
4,296.2	13.83	310.93	4,210.0	502.3	-579.2	-539.2	0.00	0.00	0.00
Sussex									
4,300.0	13.83	310.93	4,213.7	502.9	-579.9	-539.9	0.00	0.00	0.00
4,400.0	13.83	310.93	4,310.8	518.5	-597.9	-556.7	0.00	0.00	0.00

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Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Planned 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)
4,500.0	13.83	310.93	4,407.9	534.2	-616.0	-573.5	0.00	0.00	0.00
4,600.0	13.83	310.93	4,505.0	549.9	-634.0	-590.3	0.00	0.00	0.00
4,700.0	13.83	310.93	4,602.1	565.5	-652.1	-607.1	0.00	0.00	0.00
4,800.0	13.83	310.93	4,699.2	581.2	-670.1	-623.9	0.00	0.00	0.00
4,900.0	13.83	310.93	4,796.3	596.8	-688.2	-640.7	0.00	0.00	0.00
5,000.0	13.83	310.93	4,893.4	612.5	-706.3	-657.5	0.00	0.00	0.00
5,045.1	13.83	310.93	4,937.2	619.5	-714.4	-665.1	0.00	0.00	0.00
Start Drop -1.50									
5,100.0	13.00	310.93	4,990.6	627.9	-724.0	-674.0	1.50	-1.50	0.00
5,200.0	11.50	310.93	5,088.3	641.8	-740.0	-689.0	1.50	-1.50	0.00
5,300.0	10.00	310.93	5,186.6	654.0	-754.1	-702.1	1.50	-1.50	0.00
5,400.0	8.50	310.93	5,285.3	664.5	-766.3	-713.4	1.50	-1.50	0.00
5,500.0	7.00	310.93	5,384.3	673.4	-776.5	-722.9	1.50	-1.50	0.00
5,600.0	5.50	310.93	5,483.7	680.5	-784.7	-730.5	1.50	-1.50	0.00
5,700.0	4.00	310.93	5,583.4	685.9	-791.0	-736.4	1.50	-1.50	0.00
5,800.0	2.50	310.93	5,683.2	689.7	-795.2	-740.4	1.50	-1.50	0.00
5,900.0	1.00	310.93	5,783.2	691.7	-797.6	-742.5	1.50	-1.50	0.00
5,966.8	0.00	310.93	5,850.0	692.0	-798.0	-742.9	1.50	-1.50	0.00
Start 122.6 hold at 5966.8 MD									
6,000.0	0.00	0.00	5,883.2	692.0	-798.0	-742.9	0.00	0.00	0.00
6,089.4	0.00	0.00	5,972.6	692.0	-798.0	-742.9	0.00	0.00	0.00
Start Build 7.50									
6,095.7	0.00	0.00	5,978.9	692.0	-798.0	-742.9	0.00	0.00	0.00
6,100.0	0.32	90.00	5,983.2	692.0	-798.0	-742.9	7.50	7.50	0.00
6,200.0	7.82	90.00	6,082.9	692.0	-790.9	-735.8	7.50	7.50	0.00
6,300.0	15.32	90.00	6,180.8	692.0	-770.8	-715.9	7.50	7.50	0.00
6,400.0	22.82	90.00	6,275.2	692.0	-738.2	-683.3	7.50	7.50	0.00
6,500.0	30.32	90.00	6,364.6	692.0	-693.5	-638.7	7.50	7.50	0.00
6,600.0	37.82	90.00	6,447.4	692.0	-637.5	-582.9	7.50	7.50	0.00
6,700.0	45.32	90.00	6,522.1	692.0	-571.2	-516.8	7.50	7.50	0.00
6,725.9	47.26	90.00	6,540.0	692.0	-552.5	-498.1	7.50	7.50	0.00
Sharon Springs									
6,800.0	52.82	90.00	6,587.6	692.0	-495.7	-441.5	7.50	7.50	0.00
6,838.4	55.70	90.00	6,610.0	692.0	-464.6	-410.4	7.50	7.50	0.00
Niobrara A									
6,900.0	60.32	90.00	6,642.6	692.0	-412.3	-358.4	7.50	7.50	0.00
7,000.0	67.82	90.00	6,686.3	692.0	-322.4	-268.8	7.50	7.50	0.00
7,038.6	70.72	90.00	6,700.0	692.0	-286.3	-232.7	7.50	7.50	0.00
Niobrara B									
7,100.0	75.32	90.00	6,717.9	692.0	-227.6	-174.2	7.50	7.50	0.00
7,200.0	82.82	90.00	6,736.9	692.0	-129.5	-76.4	7.50	7.50	0.00
7,295.6	89.99	90.00	6,742.8	692.0	-34.2	18.7	7.50	7.50	0.00
Start 9080.2 hold at 7295.6 MD									
7,300.0	90.32	90.00	6,742.8	692.0	-29.8	23.1	7.50	7.50	0.00
7,302.5	90.51	90.00	6,742.8	692.0	-27.3	25.6	7.50	7.50	0.00
7"									
7,400.0	90.51	90.00	6,742.0	692.0	70.2	122.8	0.00	0.00	0.00
7,500.0	90.51	90.00	6,741.1	692.0	170.2	222.5	0.00	0.00	0.00
7,600.0	90.51	90.00	6,740.2	692.0	270.2	322.2	0.00	0.00	0.00
7,700.0	90.51	90.00	6,739.3	692.0	370.2	421.9	0.00	0.00	0.00
7,800.0	90.51	90.00	6,738.4	692.0	470.2	521.6	0.00	0.00	0.00
7,900.0	90.51	90.00	6,737.5	692.0	570.2	621.3	0.00	0.00	0.00

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Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Planned 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)
8,000.0	90.51	90.00	6,736.6	692.0	670.2	721.0	0.00	0.00	0.00
8,100.0	90.51	90.00	6,735.7	692.0	770.2	820.7	0.00	0.00	0.00
8,200.0	90.51	90.00	6,734.8	692.0	870.2	920.4	0.00	0.00	0.00
8,300.0	90.51	90.00	6,733.9	692.0	970.2	1,020.1	0.00	0.00	0.00
8,400.0	90.51	90.00	6,733.0	692.0	1,070.2	1,119.8	0.00	0.00	0.00
8,500.0	90.51	90.00	6,732.2	692.0	1,170.2	1,219.5	0.00	0.00	0.00
8,600.0	90.51	90.00	6,731.3	692.0	1,270.2	1,319.2	0.00	0.00	0.00
8,700.0	90.51	90.00	6,730.4	692.0	1,370.2	1,418.9	0.00	0.00	0.00
8,800.0	90.51	90.00	6,729.5	692.0	1,470.2	1,518.6	0.00	0.00	0.00
8,900.0	90.51	90.00	6,728.6	692.0	1,570.2	1,618.3	0.00	0.00	0.00
9,000.0	90.51	90.00	6,727.7	692.0	1,670.2	1,718.1	0.00	0.00	0.00
9,100.0	90.51	90.00	6,726.8	692.0	1,770.2	1,817.8	0.00	0.00	0.00
9,200.0	90.51	90.00	6,725.9	692.0	1,870.2	1,917.5	0.00	0.00	0.00
9,300.0	90.51	90.00	6,725.0	692.0	1,970.1	2,017.2	0.00	0.00	0.00
9,400.0	90.51	90.00	6,724.1	692.0	2,070.1	2,116.9	0.00	0.00	0.00
9,500.0	90.51	90.00	6,723.3	692.0	2,170.1	2,216.6	0.00	0.00	0.00
9,600.0	90.51	90.00	6,722.4	692.0	2,270.1	2,316.3	0.00	0.00	0.00
9,700.0	90.51	90.00	6,721.5	692.0	2,370.1	2,416.0	0.00	0.00	0.00
9,800.0	90.51	90.00	6,720.6	692.0	2,470.1	2,515.7	0.00	0.00	0.00
9,900.0	90.51	90.00	6,719.7	692.0	2,570.1	2,615.4	0.00	0.00	0.00
10,000.0	90.51	90.00	6,718.8	692.0	2,670.1	2,715.1	0.00	0.00	0.00
10,100.0	90.51	90.00	6,717.9	692.0	2,770.1	2,814.8	0.00	0.00	0.00
10,200.0	90.51	90.00	6,717.0	692.0	2,870.1	2,914.5	0.00	0.00	0.00
10,300.0	90.51	90.00	6,716.1	692.0	2,970.1	3,014.2	0.00	0.00	0.00
10,400.0	90.51	90.00	6,715.2	692.0	3,070.1	3,113.9	0.00	0.00	0.00
10,500.0	90.51	90.00	6,714.4	692.0	3,170.1	3,213.6	0.00	0.00	0.00
10,600.0	90.51	90.00	6,713.5	692.0	3,270.1	3,313.3	0.00	0.00	0.00
10,700.0	90.51	90.00	6,712.6	692.0	3,370.1	3,413.0	0.00	0.00	0.00
10,800.0	90.51	90.00	6,711.7	692.0	3,470.1	3,512.7	0.00	0.00	0.00
10,900.0	90.51	90.00	6,710.8	692.0	3,570.1	3,612.4	0.00	0.00	0.00
11,000.0	90.51	90.00	6,709.9	692.0	3,670.1	3,712.2	0.00	0.00	0.00
11,100.0	90.51	90.00	6,709.0	692.0	3,770.1	3,811.9	0.00	0.00	0.00
11,200.0	90.51	90.00	6,708.1	692.0	3,870.1	3,911.6	0.00	0.00	0.00
11,300.0	90.51	90.00	6,707.2	692.0	3,970.1	4,011.3	0.00	0.00	0.00
11,400.0	90.51	90.00	6,706.3	692.0	4,070.1	4,111.0	0.00	0.00	0.00
11,500.0	90.51	90.00	6,705.5	692.0	4,170.1	4,210.7	0.00	0.00	0.00
11,600.0	90.51	90.00	6,704.6	692.0	4,270.1	4,310.4	0.00	0.00	0.00
11,700.0	90.51	90.00	6,703.7	692.0	4,370.1	4,410.1	0.00	0.00	0.00
11,800.0	90.51	90.00	6,702.8	692.0	4,470.0	4,509.8	0.00	0.00	0.00
11,900.0	90.51	90.00	6,701.9	692.0	4,570.0	4,609.5	0.00	0.00	0.00
12,000.0	90.51	90.00	6,701.0	692.0	4,670.0	4,709.2	0.00	0.00	0.00
12,100.0	90.51	90.00	6,700.1	692.0	4,770.0	4,808.9	0.00	0.00	0.00
12,200.0	90.51	90.00	6,699.2	692.0	4,870.0	4,908.6	0.00	0.00	0.00
12,300.0	90.51	90.00	6,698.3	692.0	4,970.0	5,008.3	0.00	0.00	0.00
12,400.0	90.51	90.00	6,697.4	692.0	5,070.0	5,108.0	0.00	0.00	0.00
12,500.0	90.51	90.00	6,696.6	692.0	5,170.0	5,207.7	0.00	0.00	0.00
12,600.0	90.51	90.00	6,695.7	692.0	5,270.0	5,307.4	0.00	0.00	0.00
12,700.0	90.51	90.00	6,694.8	692.0	5,370.0	5,407.1	0.00	0.00	0.00
12,800.0	90.51	90.00	6,693.9	692.0	5,470.0	5,506.8	0.00	0.00	0.00
12,900.0	90.51	90.00	6,693.0	692.0	5,570.0	5,606.6	0.00	0.00	0.00
13,000.0	90.51	90.00	6,692.1	692.0	5,670.0	5,706.3	0.00	0.00	0.00
13,100.0	90.51	90.00	6,691.2	692.0	5,770.0	5,806.0	0.00	0.00	0.00
13,200.0	90.51	90.00	6,690.3	692.0	5,870.0	5,905.7	0.00	0.00	0.00

Database:	US_EDM	Local Co-ordinate Reference:	Well Hop 18E-232
Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Planned 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)	
13,300.0	90.51	90.00	6,689.4	692.0	5,970.0	6,005.4	0.00	0.00	0.00	
13,400.0	90.51	90.00	6,688.5	692.0	6,070.0	6,105.1	0.00	0.00	0.00	
13,500.0	90.51	90.00	6,687.7	692.0	6,170.0	6,204.8	0.00	0.00	0.00	
13,600.0	90.51	90.00	6,686.8	692.0	6,270.0	6,304.5	0.00	0.00	0.00	
13,700.0	90.51	90.00	6,685.9	692.0	6,370.0	6,404.2	0.00	0.00	0.00	
13,800.0	90.51	90.00	6,685.0	692.0	6,470.0	6,503.9	0.00	0.00	0.00	
13,900.0	90.51	90.00	6,684.1	692.0	6,570.0	6,603.6	0.00	0.00	0.00	
14,000.0	90.51	90.00	6,683.2	692.0	6,670.0	6,703.3	0.00	0.00	0.00	
14,100.0	90.51	90.00	6,682.3	692.0	6,770.0	6,803.0	0.00	0.00	0.00	
14,200.0	90.51	90.00	6,681.4	692.0	6,870.0	6,902.7	0.00	0.00	0.00	
14,300.0	90.51	90.00	6,680.5	692.0	6,969.9	7,002.4	0.00	0.00	0.00	
14,400.0	90.51	90.00	6,679.6	692.0	7,069.9	7,102.1	0.00	0.00	0.00	
14,500.0	90.51	90.00	6,678.8	692.0	7,169.9	7,201.8	0.00	0.00	0.00	
14,600.0	90.51	90.00	6,677.9	692.0	7,269.9	7,301.5	0.00	0.00	0.00	
14,700.0	90.51	90.00	6,677.0	692.0	7,369.9	7,401.2	0.00	0.00	0.00	
14,800.0	90.51	90.00	6,676.1	692.0	7,469.9	7,500.9	0.00	0.00	0.00	
14,900.0	90.51	90.00	6,675.2	692.0	7,569.9	7,600.7	0.00	0.00	0.00	
15,000.0	90.51	90.00	6,674.3	692.0	7,669.9	7,700.4	0.00	0.00	0.00	
15,100.0	90.51	90.00	6,673.4	692.0	7,769.9	7,800.1	0.00	0.00	0.00	
15,200.0	90.51	90.00	6,672.5	692.0	7,869.9	7,899.8	0.00	0.00	0.00	
15,300.0	90.51	90.00	6,671.6	692.0	7,969.9	7,999.5	0.00	0.00	0.00	
15,400.0	90.51	90.00	6,670.7	692.0	8,069.9	8,099.2	0.00	0.00	0.00	
15,500.0	90.51	90.00	6,669.9	692.0	8,169.9	8,198.9	0.00	0.00	0.00	
15,600.0	90.51	90.00	6,669.0	692.0	8,269.9	8,298.6	0.00	0.00	0.00	
15,700.0	90.51	90.00	6,668.1	692.0	8,369.9	8,398.3	0.00	0.00	0.00	
15,800.0	90.51	90.00	6,667.2	692.0	8,469.9	8,498.0	0.00	0.00	0.00	
15,900.0	90.51	90.00	6,666.3	692.0	8,569.9	8,597.7	0.00	0.00	0.00	
16,000.0	90.51	90.00	6,665.4	692.0	8,669.9	8,697.4	0.00	0.00	0.00	
16,100.0	90.51	90.00	6,664.5	692.0	8,769.9	8,797.1	0.00	0.00	0.00	
16,200.0	90.51	90.00	6,663.6	692.0	8,869.9	8,896.8	0.00	0.00	0.00	
16,300.0	90.51	90.00	6,662.7	692.0	8,969.9	8,996.5	0.00	0.00	0.00	
16,375.8	90.51	90.00	6,662.1	692.0	9,045.7	9,072.1	0.00	0.00	0.00	
TD at 16375.8										
16,382.2	90.51	90.00	6,662.0	692.0	9,052.1	9,078.5	0.00	0.00	0.00	
BHL 375'FNL, 500'FEL, SEC.17										

Design Targets										
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude	
- hit/miss target										
- Shape										
SHL 1000'FNL, 848'FWL	0.00	0.00	1.0	0.0	0.0	1,391,153.83	3,250,983.06	40.403618	-104.598774	
- plan hits target center										
- Point										
BHL 375'FNL, 500'FEL,	0.00	0.00	6,662.0	692.0	9,052.1	1,391,937.79	3,260,027.25	40.405513	-104.566271	
- plan hits target center										
- Point										

Database:	US_EDM	Local Co-ordinate Reference:	Well Hop 18E-232
Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Casing Points				
Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,302.5	6,742.8	7"	7	8-3/4

Formations				
Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)
3,554.7	3,490.0	Parkman		0.00
4,296.2	4,210.0	Sussex		0.00
6,725.9	6,540.0	Sharon Springs		0.00
6,838.4	6,610.0	Niobrara A		0.00
7,038.6	6,700.0	Niobrara B		0.00

Plan Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
400.0	400.0	0.0	0.0	KOP - Start Build 1.00
5,045.1	4,937.2	108.8	-125.4	Start Drop -1.50
5,966.8	5,850.0	619.5	-714.4	Start 122.6 hold at 5966.8 MD
6,089.4	5,972.6	692.0	-798.0	Start Build 7.50
7,295.6	6,736.5	692.0	-798.0	Start 9080.2 hold at 7295.6 MD
16,375.8	6,662.0	692.0	-27.8	TD at 16375.8



PETROLEUM DEVELOPMENT CORP DJ Basin

SEC.18-T5N-R64W

Hop 5N64W18A Pad Sec.18-T5N-R64W

Hop 18E-232

Wellbore #1

Plan #1 (12-16-15)

Anticollision Report

21 December, 2015



Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Reference	Plan #1 (12-16-15)		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 500.0 ft	Error Surface:	Elliptical Conic
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program	Date	12/21/2015		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
0.0	16,382.2	Plan #1 (12-16-15) (Wellbore #1)	MWD	MWD - Standard

Summary						
Site Name	Reference Measured Depth (ft)	Offset Measured Depth (ft)	Distance Between Centres (ft)	Distance Between Ellipses (ft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Existing Wells - Sec.17 & 18-T5N-R64W						
Bright 1 (SI) - Wellbore #1 - Wellbore #1	3,136.0	3,068.6	105.8	88.7	6.175	CC, ES
Bright 1 (SI) - Wellbore #1 - Wellbore #1	3,200.0	3,130.4	107.1	89.6	6.140	SF
Conquest-Holton 1-13 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Dunn 1- Cache (Exist) - Wellbore #1 - Wellbore #1	8,273.8	6,720.9	299.0	242.0	5.239	CC, ES
Dunn 1- Cache (Exist) - Wellbore #1 - Wellbore #1	8,300.0	6,720.5	300.2	242.4	5.200	SF
Gunther 18-1 (Exist) - Wellbore #1 - Wellbore #1	9,604.9	6,706.4	347.6	255.7	3.781	CC, ES, SF
Gunther B 18-1 (Exist) - Wellbore #1 - Wellbore #1	10,923.7	6,691.6	334.8	84.8	1.339	Level 3, CC, ES, SF
Hoshiko 31-17 (Exist) - Wellbore #1 - Wellbore #1	15,011.7	6,660.3	448.2	206.3	1.853	CC, ES, SF
Hoshiko 41-17 (Exist) - Wellbore #1 - Wellbore #1	16,154.2	6,637.0	405.4	131.5	1.480	Level 3, CC, ES, SF
Schaumburg 1 (Exist) - Wellbore #1 - Wellbore #1	12,304.6	6,677.1	389.0	222.8	2.341	CC, ES, SF
Steinmetz 21-17 (Exist) - Wellbore #1 - Wellbore #1	13,672.0	6,667.3	378.8	173.2	1.843	CC, ES
Steinmetz 21-17 (Exist) - Wellbore #1 - Wellbore #1	13,700.0	6,667.6	379.8	173.5	1.841	SF
Hop 5N64W18A Pad Sec.18-T5N-R64W						
Hop 18E-332 - Wellbore #1 - Plan #1 (12-16-15)	400.0	400.0	15.0	13.5	9.561	CC
Hop 18E-332 - Wellbore #1 - Plan #1 (12-16-15)	16,382.2	16,427.0	246.9	-270.6	0.477	Level 1, ES, SF
Hop 18E-402 - Wellbore #1 - Plan #1 (12-16-15)	200.0	200.0	14.8	14.1	21.891	CC
Hop 18E-402 - Wellbore #1 - Plan #1 (12-16-15)	16,382.2	16,556.8	272.5	-131.1	0.675	Level 1, ES, SF
Hop 18F-102 - Wellbore #1 - Plan #1 (12-16-15)	400.0	400.0	45.1	43.5	28.677	CC, ES
Hop 18F-102 - Wellbore #1 - Plan #1 (12-16-15)	900.0	899.4	63.3	59.5	16.585	SF
Hop 18F-212 - Wellbore #1 - Plan #1 (12-16-15)	400.0	400.0	30.1	28.5	19.119	CC, ES
Hop 18F-212 - Wellbore #1 - Plan #1 (12-16-15)	800.0	799.7	41.7	38.4	12.400	SF

Offset Design	Existing Wells - Sec.17 & 18-T5N-R64W - Bright 1 (SI) - Wellbore #1 - Wellbore #1										Offset Site Error:	0.0 ft
Survey Program:	100-NS-GYRO-MS										Offset Well Error:	0.0 ft
Reference	Offset	Semi Major Axis		Distance		Minimum Separation		Warning				
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor
0.0	0.0	0.0	0.0	0.0	0.0	-36.46	390.5	-288.5	485.8			
100.0	100.0	80.2	80.2	0.1	0.1	-36.45	390.8	-288.7	485.9	485.7	0.22	2,218.599
200.0	200.0	177.0	177.0	0.3	0.3	-36.43	391.8	-289.2	487.0	486.4	0.67	722.079
300.0	300.0	273.8	273.7	0.6	0.6	-36.38	393.4	-289.8	488.8	487.6	1.16	423.104
400.0	400.0	372.9	372.9	0.8	0.9	-36.28	395.8	-290.5	491.0	489.4	1.64	299.124
500.0	500.0	473.6	473.5	1.0	1.1	12.93	398.2	-291.0	492.4	490.3	2.13	231.482

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Sec.17 & 18-T5N-R64W - Bright 1 (SI) - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 ft
Survey Program: 100-NS-GYRO-MS												Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	
600.0	600.0	574.9	574.8	1.2	1.4	13.13	400.5	-291.3	491.9	489.3	2.61	188.136	
700.0	699.9	675.9	675.7	1.5	1.7	13.36	402.4	-291.6	489.4	486.3	3.10	157.665	
800.0	799.7	776.2	776.0	1.7	1.9	13.62	404.2	-291.9	485.0	481.4	3.59	134.938	
900.0	899.4	876.2	876.0	1.9	2.2	13.93	405.8	-292.3	479.0	474.9	4.09	117.210	
1,000.0	998.9	976.1	976.0	2.2	2.5	14.30	407.3	-292.7	471.2	466.6	4.58	102.875	
1,100.0	1,098.3	1,076.5	1,076.3	2.5	2.7	14.73	408.7	-293.2	461.6	456.5	5.08	90.928	
1,200.0	1,197.4	1,176.5	1,176.3	2.8	3.0	15.21	409.8	-293.6	450.2	444.6	5.57	80.765	
1,300.0	1,296.3	1,275.5	1,275.3	3.1	3.2	15.79	410.9	-294.1	437.0	431.0	6.07	71.970	
1,400.0	1,394.9	1,374.8	1,374.6	3.4	3.5	16.48	412.0	-294.4	422.3	415.7	6.58	64.200	
1,500.0	1,493.3	1,474.5	1,474.3	3.8	3.8	17.32	412.9	-294.7	405.7	398.6	7.09	57.225	
1,600.0	1,591.2	1,574.0	1,573.8	4.2	4.0	18.30	413.5	-294.8	387.2	379.6	7.61	50.900	
1,700.0	1,688.9	1,671.9	1,671.7	4.6	4.3	19.44	413.8	-294.8	367.0	358.9	8.13	45.165	
1,782.5	1,769.1	1,752.7	1,752.5	5.0	4.4	20.53	413.9	-295.1	349.2	340.7	8.52	40.968	
1,800.0	1,786.1	1,769.8	1,769.6	5.0	4.5	20.77	413.9	-295.1	345.3	336.7	8.61	40.113	
1,900.0	1,883.2	1,868.6	1,868.3	5.5	4.6	22.20	413.6	-295.6	322.9	313.9	9.03	35.755	
2,000.0	1,980.3	1,966.8	1,966.6	6.0	4.6	23.78	412.8	-296.0	300.2	290.8	9.41	31.890	
2,100.0	2,077.4	2,064.2	2,064.0	6.5	4.7	25.58	411.6	-296.5	277.6	267.8	9.81	28.294	
2,200.0	2,174.5	2,161.4	2,161.2	6.9	4.7	27.72	410.5	-296.8	255.1	244.9	10.23	24.932	
2,300.0	2,271.6	2,258.5	2,258.3	7.4	4.7	30.35	409.4	-296.7	233.0	222.3	10.69	21.795	
2,400.0	2,368.7	2,355.5	2,355.3	7.9	4.8	33.55	408.2	-296.5	211.4	200.2	11.20	18.871	
2,500.0	2,465.8	2,452.5	2,452.3	8.4	4.8	37.44	407.0	-296.3	190.5	178.7	11.79	16.160	
2,600.0	2,562.9	2,549.6	2,549.4	8.9	4.9	42.17	405.7	-296.3	170.6	158.1	12.47	13.682	
2,700.0	2,660.0	2,646.7	2,646.5	9.4	5.0	48.04	404.2	-296.4	151.9	138.7	13.25	11.463	
2,800.0	2,757.1	2,743.6	2,743.3	9.9	5.1	55.35	402.6	-296.6	135.2	121.0	14.15	9.556	
2,900.0	2,854.2	2,840.4	2,840.1	10.4	5.2	64.45	401.1	-296.7	121.3	106.2	15.12	8.020	
3,000.0	2,951.4	2,937.2	2,936.9	10.9	5.3	75.32	399.7	-297.0	111.3	95.2	16.09	6.915	
3,100.0	3,048.5	3,033.9	3,033.6	11.4	5.5	87.42	398.6	-297.7	106.2	89.3	16.91	6.282	
3,136.0	3,083.4	3,068.6	3,068.3	11.6	5.6	91.92	398.3	-297.8	105.8	88.7	17.14	6.175 CC, ES	
3,200.0	3,145.6	3,130.4	3,130.0	11.9	5.7	99.89	398.0	-298.0	107.1	89.6	17.44	6.140 SF	
3,300.0	3,242.7	3,227.1	3,226.8	12.4	5.8	111.62	397.6	-298.2	113.5	95.8	17.64	6.430	
3,400.0	3,339.8	3,323.9	3,323.5	12.9	5.9	121.75	397.4	-298.0	124.6	106.9	17.64	7.062	
3,500.0	3,436.9	3,420.8	3,420.5	13.4	6.1	130.09	397.3	-297.8	139.1	121.5	17.56	7.921	
3,600.0	3,534.0	3,517.9	3,517.6	13.9	6.2	136.82	397.1	-297.5	156.1	138.6	17.52	8.909	
3,700.0	3,631.1	3,615.1	3,614.8	14.4	6.3	142.25	396.7	-297.3	174.7	157.1	17.55	9.956	
3,800.0	3,728.2	3,712.1	3,711.8	15.0	6.5	146.64	396.3	-297.1	194.5	176.9	17.65	11.021	
3,900.0	3,825.3	3,809.4	3,809.0	15.5	6.7	150.23	395.9	-297.1	215.2	197.4	17.82	12.074	
4,000.0	3,922.4	3,906.9	3,906.6	16.0	6.8	153.19	395.6	-297.1	236.4	218.4	18.06	13.087	
4,100.0	4,019.5	4,003.5	4,003.2	16.5	7.0	155.61	395.3	-297.2	258.1	239.8	18.35	14.069	
4,200.0	4,116.6	4,100.2	4,099.8	17.0	7.2	157.64	395.2	-297.0	280.3	261.7	18.64	15.038	
4,300.0	4,213.7	4,197.1	4,196.7	17.5	7.4	159.37	395.0	-296.8	303.0	284.0	18.96	15.977	
4,400.0	4,310.8	4,294.1	4,293.8	18.0	7.5	160.87	394.7	-296.6	325.8	306.5	19.31	16.874	
4,500.0	4,407.9	4,391.5	4,391.1	18.5	7.7	162.20	394.4	-296.4	348.8	329.1	19.68	17.721	
4,600.0	4,505.0	4,489.3	4,489.0	19.0	7.9	163.38	394.1	-296.4	371.8	351.7	20.08	18.513	
4,700.0	4,602.1	4,586.8	4,586.5	19.5	8.1	164.39	394.0	-296.5	394.8	374.3	20.47	19.284	
4,800.0	4,699.2	4,683.8	4,683.5	20.0	8.3	165.26	394.1	-296.6	417.8	396.9	20.86	20.025	
4,900.0	4,796.3	4,782.0	4,781.6	20.5	8.4	166.05	394.2	-296.7	440.8	419.5	21.27	20.729	
5,000.0	4,893.4	4,877.8	4,877.5	21.0	8.6	166.73	394.5	-296.8	463.9	442.2	21.65	21.428	
5,045.1	4,937.2	4,921.5	4,921.1	21.3	8.6	167.02	394.5	-296.8	474.4	452.6	21.82	21.737	
5,100.0	4,990.6	4,975.5	4,975.2	21.5	8.7	167.40	394.5	-296.8	486.8	464.7	22.06	22.064	
6,500.0	6,364.6	6,355.5	6,354.8	23.4	11.1	38.34	421.1	-293.0	483.5	460.5	23.07	20.964	
6,550.0	6,406.9	6,398.2	6,397.4	23.2	11.2	41.50	421.6	-293.4	461.1	438.2	22.90	20.135	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Sec.17 & 18-T5N-R64W - Bright 1 (SI) - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 100-NS-GYRO-MS													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis			Distance						Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
6,600.0	6,447.4	6,437.8	6,437.0	23.1	11.2	45.20	422.1	-293.7	437.2	414.1	23.02	18.990		
6,650.0	6,485.8	6,475.4	6,474.7	23.0	11.3	49.54	422.5	-294.0	412.0	388.5	23.51	17.524		
6,700.0	6,522.1	6,510.9	6,510.2	22.9	11.4	54.51	422.9	-294.2	386.3	361.9	24.41	15.822		
6,750.0	6,556.1	6,544.1	6,543.4	22.8	11.5	60.05	423.2	-294.3	360.6	334.9	25.68	14.042		
6,800.0	6,587.6	6,575.0	6,574.3	22.7	11.5	66.00	423.5	-294.3	335.7	308.5	27.17	12.355		
6,850.0	6,616.5	6,603.4	6,602.6	22.6	11.6	72.09	423.8	-294.3	312.7	284.0	28.69	10.897		
6,900.0	6,642.6	6,628.5	6,627.8	22.5	11.6	77.90	423.9	-294.3	292.9	262.9	30.05	9.747		
6,950.0	6,665.9	6,651.1	6,650.3	22.5	11.7	83.20	424.0	-294.2	278.0	246.8	31.17	8.919		
7,000.0	6,686.3	6,670.9	6,670.2	22.5	11.7	87.69	424.1	-294.1	269.5	237.4	32.03	8.414		
7,030.3	6,697.2	6,681.6	6,680.8	22.6	11.7	89.92	424.1	-294.1	268.0	235.5	32.45	8.257		
7,050.0	6,703.7	6,688.0	6,687.2	22.6	11.7	91.16	424.0	-294.0	268.6	236.0	32.69	8.218		
7,100.0	6,717.9	6,702.2	6,701.4	22.8	11.7	93.48	424.0	-294.0	276.1	242.9	33.25	8.305		
7,150.0	6,729.0	6,713.5	6,712.8	23.0	11.8	94.60	424.0	-293.9	291.7	257.9	33.79	8.633		
7,200.0	6,736.9	6,721.8	6,721.0	23.3	11.8	94.41	423.9	-293.8	314.4	280.1	34.38	9.147		
7,250.0	6,741.5	6,726.8	6,726.1	23.7	11.8	92.86	423.9	-293.8	343.1	308.1	35.01	9.798		
7,302.5	6,742.8	6,728.7	6,727.9	24.3	11.8	89.73	423.9	-293.7	378.0	342.4	35.67	10.599		
7,400.0	6,742.0	6,728.7	6,727.9	25.6	11.8	89.73	423.9	-293.7	452.1	414.9	37.22	12.146		

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Sec.17 & 18-T5N-R64W - Dunn 1- Cache (Exist) - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 100-NS-GYRO-MS													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis			Distance							
Measured Depth	Vertical Depth	Measured Depth	Vertical Depth	Reference	Offset	Highside Toolface	Offset Wellbore Centre		Between Centres	Between Ellipses	Minimum Separation	Separation Factor	Warning	
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	+N/-S (ft)	+E/-W (ft)	(ft)	(ft)	(ft)			
7,900.0	6,737.5	6,727.0	6,726.5	35.7	12.3	91.21	393.0	943.9	478.6	430.5	48.08	9.955		
8,000.0	6,736.6	6,725.4	6,724.9	38.1	12.3	90.90	393.0	943.9	405.4	355.0	50.41	8.042		
8,100.0	6,735.7	6,723.8	6,723.3	40.5	12.3	90.59	393.0	943.9	345.8	293.0	52.80	6.549		
8,200.0	6,734.8	6,722.2	6,721.6	43.0	12.3	90.28	393.0	943.9	308.0	252.7	55.24	5.575		
8,273.8	6,734.2	6,720.9	6,720.4	44.8	12.3	90.05	393.0	943.9	299.0	242.0	57.07	5.239 CC, ES		
8,300.0	6,733.9	6,720.5	6,720.0	45.5	12.3	89.97	393.0	943.9	300.2	242.4	57.73	5.200 SF		
8,400.0	6,733.0	6,718.8	6,718.3	48.0	12.3	89.64	393.0	944.0	324.6	264.3	60.24	5.388		
8,500.0	6,732.2	6,717.1	6,716.6	50.6	12.3	89.32	393.0	944.0	375.0	312.2	62.78	5.972		
8,600.0	6,731.3	6,715.4	6,714.9	53.2	12.3	88.99	393.0	944.0	442.5	377.2	65.35	6.772		

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Sec.17 & 18-T5N-R64W - Gunther 18-1 (Exist) - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 100-NS-GYRO-MS													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis		Distance							Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
9,300.0	6,725.0	6,708.2	6,707.6	71.7	12.0	90.37	344.4	2,275.0	462.4	378.7	83.69	5.525		
9,400.0	6,724.1	6,707.6	6,707.0	74.4	12.0	90.27	344.4	2,275.0	403.5	317.1	86.39	4.671		
9,500.0	6,723.3	6,707.0	6,706.4	77.2	12.0	90.17	344.4	2,275.0	363.1	274.0	89.09	4.076		
9,600.0	6,722.4	6,706.4	6,705.8	79.9	12.0	90.08	344.4	2,275.0	347.7	255.9	91.80	3.787		
9,604.9	6,722.3	6,706.4	6,705.8	80.0	12.0	90.07	344.4	2,275.0	347.6	255.7	91.94	3.781 CC, ES, SF		
9,700.0	6,721.5	6,705.8	6,705.2	82.6	12.0	89.98	344.4	2,275.0	360.4	265.9	94.52	3.813		
9,800.0	6,720.6	6,705.2	6,704.6	85.3	12.0	89.88	344.4	2,275.0	398.6	301.4	97.24	4.099		
9,900.0	6,719.7	6,704.6	6,704.0	88.0	12.0	89.78	344.4	2,275.0	456.0	356.0	99.97	4.561		

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design		Existing Wells - Sec.17 & 18-T5N-R64W - Gunther B 18-1 (Exist) - Wellbore #1 - Wellbore #1										Offset Site Error:		0.0 ft	
Survey Program:		7035-UNKNOWN										Offset Well Error:		0.0 ft	
Reference		Offset		Semi Major Axis			Distance							Warning	
Measured Depth Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor			
10,600.0	6,713.5	6,694.5	6,694.5	107.3	133.9	90.49	357.3	3,593.8	465.7	224.6	241.09	1.931			
10,700.0	6,712.6	6,693.6	6,693.6	110.0	133.9	90.34	357.3	3,593.8	402.6	158.8	243.84	1.651			
10,800.0	6,711.7	6,692.7	6,692.7	112.8	133.9	90.19	357.3	3,593.8	356.9	110.3	246.58	1.447	Level 3		
10,900.0	6,710.8	6,691.8	6,691.8	115.6	133.8	90.04	357.3	3,593.8	335.6	86.3	249.32	1.346	Level 3		
10,923.7	6,710.6	6,691.6	6,691.6	116.2	133.8	90.00	357.3	3,593.8	334.8	84.8	249.97	1.339	Level 3, CC, ES, SF		
11,000.0	6,709.9	6,690.9	6,690.9	118.3	133.8	89.88	357.3	3,593.8	343.3	91.3	252.07	1.362	Level 3		
11,100.0	6,709.0	6,690.0	6,690.0	121.1	133.8	89.73	357.3	3,593.8	378.3	123.5	254.81	1.485	Level 3		
11,200.0	6,708.1	6,689.1	6,689.1	123.9	133.8	89.58	357.3	3,593.8	434.0	176.5	257.55	1.685			

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Sec.17 & 18-T5N-R64W - Hoshiko 31-17 (Exist) - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 100-NS-GYRO-MS													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis		Distance							Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
14,800.0	6,676.1	6,659.9	6,658.4	224.3	11.8	89.90	243.8	7,681.6	495.7	259.7	235.95	2.101		
14,900.0	6,675.2	6,660.1	6,658.6	227.0	11.8	89.92	243.8	7,681.6	461.9	223.2	238.75	1.935		
15,000.0	6,674.3	6,660.2	6,658.7	229.8	11.8	89.94	243.8	7,681.6	448.4	206.8	241.55	1.856		
15,011.7	6,674.2	6,660.3	6,658.7	230.2	11.8	89.94	243.8	7,681.6	448.2	206.3	241.87	1.853	CC, ES, SF	
15,100.0	6,673.4	6,660.4	6,658.9	232.6	11.8	89.96	243.8	7,681.6	456.8	212.5	244.35	1.870		
15,200.0	6,672.5	6,660.6	6,659.1	235.4	11.8	89.98	243.8	7,681.6	486.1	239.0	247.15	1.967		

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Sec.17 & 18-T5N-R64W - Hoshiko 41-17 (Exist) - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 100-NS-GYRO-MS													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
15,900.0	6,666.3	6,630.2	6,629.3	255.0	11.7	89.05	286.7	8,823.8	478.4	211.7	266.66	1.794		
16,000.0	6,665.4	6,632.8	6,632.0	257.8	11.7	89.43	286.7	8,823.9	433.7	164.2	269.50	1.609		
16,100.0	6,664.5	6,635.5	6,634.7	260.6	11.7	89.81	286.7	8,824.0	409.0	136.6	272.33	1.502		
16,154.2	6,664.0	6,637.0	6,636.2	262.2	11.7	90.02	286.7	8,824.1	405.4	131.5	273.86	1.480	Level 3, CC, ES, SF	
16,200.0	6,663.6	6,638.3	6,637.4	263.4	11.7	90.20	286.7	8,824.1	407.9	132.8	275.15	1.483	Level 3	
16,300.0	6,662.7	6,641.1	6,640.2	266.2	11.8	90.59	286.7	8,824.2	430.8	152.8	277.96	1.550		
16,382.2	6,662.0	6,643.4	6,642.6	268.6	11.8	90.92	286.7	8,824.3	465.0	184.8	280.26	1.659		

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Sec.17 & 18-T5N-R64W - Schaumberg 1 (Exist) - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 100-NS-GYRO-MS													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis			Distance							
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
12,000.0	6,701.0	6,677.1	6,676.7	146.1	11.7	89.91	303.0	4,974.6	494.1	336.4	157.74	3.132		
12,100.0	6,700.1	6,677.1	6,676.7	148.9	11.7	89.91	303.0	4,974.6	439.6	279.0	160.52	2.738		
12,200.0	6,699.2	6,677.1	6,676.7	151.7	11.7	89.91	303.0	4,974.6	402.9	239.6	163.31	2.467		
12,300.0	6,698.3	6,677.1	6,676.7	154.4	11.7	89.92	303.0	4,974.6	389.1	223.0	166.09	2.343		
12,304.6	6,698.3	6,677.1	6,676.7	154.6	11.7	89.92	303.0	4,974.6	389.0	222.8	166.22	2.341	CC, ES, SF	
12,400.0	6,697.4	6,677.2	6,676.7	157.2	11.7	89.92	303.0	4,974.6	400.6	231.7	168.88	2.372		
12,500.0	6,696.6	6,677.2	6,676.7	160.0	11.7	89.92	303.0	4,974.6	435.4	263.7	171.66	2.536		
12,600.0	6,695.7	6,677.2	6,676.8	162.8	11.7	89.92	303.0	4,974.6	488.5	314.0	174.45	2.800		

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Sec.17 & 18-T5N-R64W - Steinmetz 21-17 (Exist) - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 ft
Survey Program: 100-NS-GYRO-MS												Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Minimum Separation (ft)	Separation Factor	Warning		
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)		Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)					
13,400.0	6,688.5	6,664.2	6,660.9	185.1	12.9	89.66	313.2	6,341.9	466.3	268.4	197.96	2.356	
13,500.0	6,687.7	6,665.4	6,662.0	187.9	12.9	89.83	313.2	6,341.9	416.0	215.3	200.76	2.072	
13,600.0	6,686.8	6,666.5	6,663.1	190.7	12.9	90.00	313.2	6,341.9	385.6	182.0	203.56	1.894	
13,672.0	6,686.1	6,667.3	6,663.9	192.7	12.9	90.12	313.2	6,342.0	378.8	173.2	205.58	1.843 CC, ES	
13,700.0	6,685.9	6,667.6	6,664.3	193.5	12.9	90.17	313.2	6,342.0	379.8	173.5	206.36	1.841 SF	
13,800.0	6,685.0	6,668.7	6,665.4	196.3	12.9	90.34	313.2	6,342.0	399.8	190.7	209.16	1.912	
13,900.0	6,684.1	6,669.8	6,666.5	199.1	12.9	90.51	313.2	6,342.0	442.1	230.2	211.96	2.086	

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-332 - Wellbore #1 - Plan #1 (12-16-15)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
0.0	0.0	0.0	0.0	0.0	0.0	91.37	-0.4	15.0	15.0	15.0	0.00	N/A		
100.0	100.0	100.0	100.0	0.1	0.1	91.37	-0.4	15.0	15.0	14.8	0.22	66.930		
200.0	200.0	200.0	200.0	0.3	0.3	91.37	-0.4	15.0	15.0	14.4	0.67	22.310		
300.0	300.0	300.0	300.0	0.6	0.6	91.37	-0.4	15.0	15.0	13.9	1.12	13.386		
400.0	400.0	400.0	400.0	0.8	0.8	91.37	-0.4	15.0	15.0	13.5	1.57	9.561 CC		
500.0	500.0	500.0	500.0	1.0	1.0	142.46	-0.4	15.0	15.7	13.7	2.02	7.787		
600.0	600.0	600.0	600.0	1.2	1.2	147.57	-0.4	15.0	17.9	15.4	2.47	7.250		
700.0	699.9	700.2	700.2	1.5	1.5	153.16	0.1	14.3	20.8	17.9	2.91	7.169		
800.0	799.7	800.5	800.5	1.7	1.7	158.15	1.4	12.0	23.8	20.5	3.35	7.128		
900.0	899.4	900.9	900.8	1.9	1.9	162.74	3.5	8.1	26.9	23.1	3.79	7.104		
1,000.0	998.9	1,001.3	1,001.0	2.2	2.1	167.04	6.5	2.8	30.1	25.8	4.24	7.099		
1,100.0	1,098.3	1,101.8	1,101.2	2.5	2.4	171.12	10.4	-4.1	33.3	28.6	4.69	7.111		
1,200.0	1,197.4	1,202.3	1,201.2	2.8	2.6	175.02	15.1	-12.6	36.7	31.6	5.14	7.139		
1,300.0	1,296.3	1,302.9	1,301.2	3.1	2.9	178.76	20.7	-22.5	40.3	34.7	5.61	7.180		
1,400.0	1,394.9	1,403.5	1,400.9	3.4	3.2	-177.66	27.1	-34.0	44.0	37.9	6.09	7.230		
1,500.0	1,493.3	1,504.2	1,500.4	3.8	3.5	-174.23	34.4	-47.1	47.9	41.3	6.58	7.283		
1,600.0	1,591.2	1,604.9	1,599.8	4.2	3.8	-170.94	42.6	-61.6	52.1	45.0	7.10	7.334		
1,700.0	1,688.9	1,705.6	1,698.8	4.6	4.2	-167.80	51.6	-77.7	56.5	48.8	7.65	7.379		
1,782.5	1,769.1	1,788.8	1,780.3	5.0	4.5	-165.31	59.7	-92.2	60.3	52.1	8.14	7.408		
1,800.0	1,786.1	1,806.4	1,797.5	5.0	4.6	-164.79	61.5	-95.4	61.1	52.8	8.25	7.407		
1,900.0	1,883.2	1,906.5	1,895.3	5.5	5.0	-161.86	71.9	-113.9	65.3	56.4	8.90	7.341		
2,000.0	1,980.3	2,006.4	1,992.9	6.0	5.4	-159.28	82.3	-132.5	69.6	60.1	9.58	7.269		
2,100.0	2,077.4	2,106.2	2,090.5	6.5	5.8	-157.00	92.7	-151.1	74.1	63.8	10.29	7.199		
2,200.0	2,174.5	2,206.1	2,188.0	6.9	6.3	-154.98	103.1	-169.7	78.7	67.6	11.03	7.131		
2,300.0	2,271.6	2,306.0	2,285.6	7.4	6.7	-153.19	113.5	-188.2	83.3	71.5	11.79	7.067		
2,400.0	2,368.7	2,405.8	2,383.2	7.9	7.1	-151.58	124.0	-206.8	88.0	75.5	12.57	7.005		
2,500.0	2,465.8	2,505.7	2,480.7	8.4	7.6	-150.14	134.4	-225.4	92.8	79.4	13.36	6.948		
2,600.0	2,562.9	2,605.5	2,578.3	8.9	8.0	-148.84	144.8	-244.0	97.6	83.5	14.16	6.894		
2,700.0	2,660.0	2,705.4	2,675.8	9.4	8.5	-147.67	155.2	-262.5	102.5	87.5	14.98	6.845		
2,800.0	2,757.1	2,805.3	2,773.4	9.9	8.9	-146.60	165.6	-281.1	107.4	91.6	15.80	6.799		
2,900.0	2,854.2	2,905.1	2,871.0	10.4	9.4	-145.63	176.0	-299.7	112.4	95.8	16.64	6.756		
3,000.0	2,951.4	3,005.0	2,968.5	10.9	9.8	-144.74	186.4	-318.3	117.4	99.9	17.48	6.716		
3,100.0	3,048.5	3,104.8	3,066.1	11.4	10.3	-143.92	196.8	-336.8	122.4	104.1	18.32	6.680		
3,200.0	3,145.6	3,204.7	3,163.7	11.9	10.7	-143.16	207.2	-355.4	127.4	108.2	19.17	6.646		
3,300.0	3,242.7	3,304.6	3,261.2	12.4	11.2	-142.47	217.6	-374.0	132.5	112.4	20.03	6.614		
3,400.0	3,339.8	3,404.4	3,358.8	12.9	11.7	-141.82	228.1	-392.6	137.5	116.6	20.89	6.585		
3,500.0	3,436.9	3,504.3	3,456.3	13.4	12.1	-141.22	238.5	-411.1	142.6	120.9	21.75	6.558		
3,600.0	3,534.0	3,604.1	3,553.9	13.9	12.6	-140.66	248.9	-429.7	147.7	125.1	22.61	6.533		
3,700.0	3,631.1	3,704.0	3,651.5	14.4	13.0	-140.14	259.3	-448.3	152.8	129.4	23.48	6.509		
3,800.0	3,728.2	3,803.9	3,749.0	15.0	13.5	-139.65	269.7	-466.9	158.0	133.6	24.35	6.487		
3,900.0	3,825.3	3,903.7	3,846.6	15.5	13.9	-139.20	280.1	-485.4	163.1	137.9	25.22	6.466		
4,000.0	3,922.4	4,003.6	3,944.2	16.0	14.4	-138.77	290.5	-504.0	168.2	142.1	26.10	6.447		
4,100.0	4,019.5	4,103.4	4,041.7	16.5	14.9	-138.37	300.9	-522.6	173.4	146.4	26.97	6.429		
4,200.0	4,116.6	4,203.3	4,139.3	17.0	15.3	-137.99	311.3	-541.2	178.6	150.7	27.85	6.412		
4,300.0	4,213.7	4,303.2	4,236.9	17.5	15.8	-137.63	321.7	-559.7	183.7	155.0	28.73	6.396		
4,400.0	4,310.8	4,403.0	4,334.4	18.0	16.3	-137.29	332.2	-578.3	188.9	159.3	29.60	6.381		
4,500.0	4,407.9	4,502.9	4,432.0	18.5	16.7	-136.97	342.6	-596.9	194.1	163.6	30.48	6.367		
4,600.0	4,505.0	4,602.7	4,529.5	19.0	17.2	-136.66	353.0	-615.5	199.3	167.9	31.37	6.353		
4,700.0	4,602.1	4,702.6	4,627.1	19.5	17.6	-136.37	363.4	-634.0	204.5	172.2	32.25	6.340		
4,800.0	4,699.2	4,802.5	4,724.7	20.0	18.1	-136.10	373.8	-652.6	209.7	176.5	33.13	6.328		
4,900.0	4,796.3	4,902.3	4,822.2	20.5	18.6	-135.84	384.2	-671.2	214.9	180.9	34.01	6.317		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis			Distance						Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
5,000.0	4,893.4	5,002.2	4,919.8	21.0	19.0	-135.59	394.6	-689.8	220.1	185.2	34.90	6.306		
5,045.1	4,937.2	5,047.3	4,963.8	21.3	19.2	-135.48	399.3	-698.2	222.4	187.1	35.30	6.301		
5,100.0	4,990.6	5,102.0	5,017.4	21.5	19.5	-135.31	405.0	-708.4	225.0	189.2	35.78	6.289		
5,200.0	5,088.3	5,200.0	5,113.1	21.9	19.9	-134.67	415.2	-726.5	228.4	191.7	36.63	6.233		
5,300.0	5,186.6	5,297.8	5,209.0	22.2	20.3	-133.98	424.4	-743.0	230.9	193.6	37.37	6.179		
5,400.0	5,285.3	5,394.6	5,304.4	22.5	20.6	-133.37	432.4	-757.2	233.1	195.1	38.04	6.128		
5,500.0	5,384.3	5,491.4	5,400.3	22.8	20.8	-132.82	439.2	-769.3	234.8	196.2	38.64	6.077		
5,600.0	5,483.7	5,588.3	5,496.5	23.0	21.1	-132.33	444.8	-779.3	236.1	197.0	39.18	6.027		
5,700.0	5,583.4	5,685.3	5,593.0	23.2	21.3	-131.90	449.2	-787.2	237.0	197.3	39.65	5.977		
5,800.0	5,683.2	5,782.2	5,689.7	23.4	21.4	-131.52	452.4	-792.9	237.4	197.3	40.05	5.927		
5,900.0	5,783.2	5,879.2	5,786.7	23.5	21.6	-131.20	454.4	-796.5	237.3	196.9	40.38	5.876		
5,966.8	5,850.0	5,944.1	5,851.5	23.6	21.7	179.93	455.1	-797.7	237.0	202.0	34.95	6.779		
6,000.0	5,883.2	5,976.3	5,883.7	23.6	21.7	179.98	455.2	-797.9	236.8	201.8	35.03	6.760		
6,038.7	5,921.9	6,014.5	5,921.9	23.7	21.8	179.99	455.2	-798.0	236.8	201.7	35.14	6.738		
6,095.7	5,978.9	6,071.5	5,978.9	23.7	21.8	179.99	455.2	-798.0	236.8	201.5	35.32	6.705		
6,100.0	5,983.2	6,075.8	5,983.2	23.7	21.8	89.99	455.2	-798.0	236.8	195.9	40.94	5.785		
6,108.9	5,992.0	6,084.6	5,992.0	23.7	21.9	90.02	455.2	-798.0	236.8	195.8	40.96	5.781		
6,150.0	6,033.1	6,125.7	6,033.1	23.8	21.9	90.46	455.2	-798.0	236.8	195.7	41.16	5.754		
6,200.0	6,082.9	6,175.8	6,083.2	23.8	22.0	91.50	455.2	-797.1	236.9	195.4	41.47	5.713		
6,250.0	6,132.1	6,226.1	6,133.3	23.8	22.0	92.58	455.2	-793.1	237.1	195.3	41.71	5.683		
6,300.0	6,180.8	6,276.8	6,183.5	23.7	22.0	93.64	455.2	-785.7	237.3	195.4	41.88	5.666		
6,350.0	6,228.5	6,327.7	6,233.3	23.7	21.9	94.69	455.2	-775.0	237.6	195.6	41.97	5.661		
6,400.0	6,275.2	6,379.0	6,282.5	23.6	21.9	95.72	455.2	-760.9	238.0	196.0	41.99	5.668		
6,450.0	6,320.6	6,430.6	6,331.0	23.5	21.8	96.73	455.2	-743.3	238.5	196.5	41.95	5.685		
6,500.0	6,364.6	6,482.5	6,378.5	23.4	21.7	97.70	455.2	-722.4	239.0	197.1	41.84	5.712		
6,550.0	6,406.9	6,534.6	6,424.7	23.2	21.6	98.64	455.2	-698.2	239.5	197.9	41.68	5.747		
6,600.0	6,447.4	6,587.1	6,469.4	23.1	21.4	99.54	455.2	-670.8	240.1	198.7	41.49	5.788		
6,650.0	6,485.8	6,639.8	6,512.3	23.0	21.3	100.40	455.2	-640.1	240.8	199.5	41.28	5.832		
6,700.0	6,522.1	6,692.9	6,553.2	22.9	21.2	101.20	455.2	-606.4	241.4	200.4	41.08	5.878		
6,750.0	6,556.1	6,746.2	6,591.9	22.8	21.1	101.96	455.2	-569.8	242.1	201.2	40.90	5.919		
6,800.0	6,587.6	6,799.7	6,628.1	22.7	21.0	102.66	455.2	-530.3	242.7	202.0	40.77	5.954		
6,850.0	6,616.5	6,853.5	6,661.6	22.6	21.0	103.30	455.2	-488.3	243.4	202.6	40.72	5.976		
6,900.0	6,642.6	6,907.5	6,692.1	22.5	21.0	103.89	455.2	-443.8	244.0	203.2	40.79	5.981		
6,950.0	6,665.9	6,961.6	6,719.5	22.5	21.0	104.41	455.2	-397.0	244.5	203.5	40.98	5.966		
7,000.0	6,686.3	7,016.0	6,743.6	22.5	21.2	104.86	455.2	-348.3	245.0	203.7	41.33	5.929		
7,050.0	6,703.7	7,070.5	6,764.3	22.6	21.4	105.24	455.2	-297.9	245.5	203.6	41.84	5.866		
7,100.0	6,717.9	7,125.2	6,781.3	22.8	21.7	105.56	455.2	-245.9	245.8	203.3	42.54	5.779		
7,150.0	6,729.0	7,179.9	6,794.6	23.0	22.1	105.81	455.2	-192.8	246.1	202.7	43.41	5.670		
7,200.0	6,736.9	7,234.8	6,804.0	23.3	22.7	105.98	455.2	-138.8	246.3	201.9	44.46	5.541		
7,250.0	6,741.5	7,289.7	6,809.6	23.7	23.3	106.09	455.2	-84.2	246.5	200.8	45.67	5.397		
7,302.5	6,742.8	7,347.3	6,811.2	24.3	24.0	106.12	455.2	-26.7	246.5	199.4	47.10	5.233		
7,400.0	6,742.0	7,444.8	6,810.4	25.6	25.5	106.12	455.2	70.8	246.5	196.4	50.12	4.918		
7,500.0	6,741.1	7,544.8	6,809.5	27.3	27.2	106.12	455.2	170.8	246.5	192.9	53.56	4.603		
7,600.0	6,740.2	7,644.8	6,808.6	29.2	29.2	106.13	455.2	270.8	246.5	189.2	57.30	4.302		
7,700.0	6,739.3	7,744.8	6,807.8	31.3	31.2	106.13	455.2	370.8	246.5	185.2	61.30	4.021		
7,800.0	6,738.4	7,844.8	6,806.9	33.4	33.4	106.14	455.2	470.8	246.5	181.0	65.50	3.764		
7,900.0	6,737.5	7,944.8	6,806.0	35.7	35.7	106.14	455.2	570.8	246.5	176.7	69.87	3.528		
8,000.0	6,736.6	8,044.8	6,805.2	38.1	38.0	106.14	455.2	670.8	246.5	172.2	74.37	3.315		
8,100.0	6,735.7	8,144.8	6,804.3	40.5	40.4	106.15	455.2	770.8	246.5	167.5	78.99	3.121		
8,200.0	6,734.8	8,244.8	6,803.4	43.0	42.9	106.15	455.2	870.8	246.5	162.8	83.71	2.945		
8,300.0	6,733.9	8,344.8	6,802.5	45.5	45.4	106.15	455.2	970.8	246.5	158.0	88.51	2.786		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-332 - Wellbore #1 - Plan #1 (12-16-15)												Offset Site Error:	0.0 ft
Survey Program: 0-MWD												Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis		Distance							
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
8,400.0	6,733.0	8,444.8	6,801.7	48.0	47.9	106.16	455.2	1,070.8	246.5	153.2	93.37	2.641	
8,500.0	6,732.2	8,544.8	6,800.8	50.6	50.5	106.16	455.2	1,170.8	246.6	148.3	98.29	2.508	
8,600.0	6,731.3	8,644.8	6,799.9	53.2	53.1	106.17	455.2	1,270.8	246.6	143.3	103.26	2.388	
8,700.0	6,730.4	8,744.8	6,799.0	55.8	55.7	106.17	455.2	1,370.8	246.6	138.3	108.27	2.277	
8,800.0	6,729.5	8,844.8	6,798.2	58.4	58.3	106.17	455.2	1,470.8	246.6	133.2	113.32	2.176	
8,900.0	6,728.6	8,944.8	6,797.3	61.0	60.9	106.18	455.2	1,570.8	246.6	128.2	118.40	2.082	
9,000.0	6,727.7	9,044.8	6,796.4	63.7	63.6	106.18	455.2	1,670.8	246.6	123.1	123.51	1.996	
9,100.0	6,726.8	9,144.8	6,795.6	66.4	66.3	106.19	455.2	1,770.8	246.6	117.9	128.65	1.917	
9,200.0	6,725.9	9,244.8	6,794.7	69.1	68.9	106.19	455.2	1,870.8	246.6	112.8	133.80	1.843	
9,300.0	6,725.0	9,344.8	6,793.8	71.7	71.6	106.19	455.2	1,970.7	246.6	107.6	138.98	1.774	
9,400.0	6,724.1	9,444.8	6,792.9	74.4	74.3	106.20	455.2	2,070.7	246.6	102.4	144.17	1.710	
9,500.0	6,723.3	9,544.8	6,792.1	77.2	77.0	106.20	455.2	2,170.7	246.6	97.2	149.38	1.651	
9,600.0	6,722.4	9,644.8	6,791.2	79.9	79.7	106.21	455.2	2,270.7	246.6	92.0	154.60	1.595	
9,700.0	6,721.5	9,744.8	6,790.3	82.6	82.5	106.21	455.2	2,370.7	246.6	86.8	159.84	1.543	
9,800.0	6,720.6	9,844.8	6,789.4	85.3	85.2	106.21	455.2	2,470.7	246.6	81.5	165.09	1.494	Level 3
9,900.0	6,719.7	9,944.8	6,788.6	88.0	87.9	106.22	455.2	2,570.7	246.6	76.3	170.34	1.448	Level 3
10,000.0	6,718.8	10,044.8	6,787.7	90.8	90.7	106.22	455.2	2,670.7	246.6	71.0	175.61	1.404	Level 3
10,100.0	6,717.9	10,144.8	6,786.8	93.5	93.4	106.23	455.2	2,770.7	246.6	65.7	180.88	1.363	Level 3
10,200.0	6,717.0	10,244.8	6,786.0	96.3	96.1	106.23	455.2	2,870.7	246.6	60.5	186.16	1.325	Level 3
10,300.0	6,716.1	10,344.8	6,785.1	99.0	98.9	106.23	455.2	2,970.7	246.6	55.2	191.45	1.288	Level 3
10,400.0	6,715.2	10,444.8	6,784.2	101.8	101.6	106.24	455.2	3,070.7	246.6	49.9	196.75	1.254	Level 3
10,500.0	6,714.4	10,544.8	6,783.3	104.5	104.4	106.24	455.2	3,170.7	246.6	44.6	202.05	1.221	Level 2
10,600.0	6,713.5	10,644.8	6,782.5	107.3	107.1	106.24	455.2	3,270.7	246.7	39.3	207.36	1.190	Level 2
10,700.0	6,712.6	10,744.8	6,781.6	110.0	109.9	106.25	455.2	3,370.7	246.7	34.0	212.67	1.160	Level 2
10,800.0	6,711.7	10,844.8	6,780.7	112.8	112.7	106.25	455.2	3,470.7	246.7	28.7	217.98	1.132	Level 2
10,900.0	6,710.8	10,944.8	6,779.8	115.6	115.4	106.26	455.2	3,570.7	246.7	23.4	223.30	1.105	Level 2
11,000.0	6,709.9	11,044.8	6,779.0	118.3	118.2	106.26	455.2	3,670.7	246.7	18.0	228.63	1.079	Level 2
11,100.0	6,709.0	11,144.8	6,778.1	121.1	121.0	106.26	455.2	3,770.7	246.7	12.7	233.96	1.054	Level 2
11,200.0	6,708.1	11,244.8	6,777.2	123.9	123.7	106.27	455.2	3,870.7	246.7	7.4	239.29	1.031	Level 2
11,300.0	6,707.2	11,344.8	6,776.4	126.6	126.5	106.27	455.2	3,970.7	246.7	2.1	244.62	1.008	Level 2
11,400.0	6,706.3	11,444.8	6,775.5	129.4	129.3	106.28	455.2	4,070.7	246.7	-3.3	249.96	0.987	Level 1
11,500.0	6,705.5	11,544.8	6,774.6	132.2	132.1	106.28	455.2	4,170.7	246.7	-8.6	255.30	0.966	Level 1
11,600.0	6,704.6	11,644.8	6,773.7	135.0	134.8	106.28	455.2	4,270.7	246.7	-13.9	260.65	0.946	Level 1
11,700.0	6,703.7	11,744.8	6,772.9	137.7	137.6	106.29	455.2	4,370.7	246.7	-19.3	265.99	0.927	Level 1
11,800.0	6,702.8	11,844.8	6,772.0	140.5	140.4	106.29	455.2	4,470.7	246.7	-24.6	271.34	0.909	Level 1
11,900.0	6,701.9	11,944.8	6,771.1	143.3	143.2	106.30	455.2	4,570.6	246.7	-30.0	276.69	0.892	Level 1
12,000.0	6,701.0	12,044.8	6,770.2	146.1	146.0	106.30	455.2	4,670.6	246.7	-35.3	282.05	0.875	Level 1
12,100.0	6,700.1	12,144.8	6,769.4	148.9	148.7	106.30	455.2	4,770.6	246.7	-40.7	287.40	0.858	Level 1
12,200.0	6,699.2	12,244.8	6,768.5	151.7	151.5	106.31	455.2	4,870.6	246.7	-46.0	292.76	0.843	Level 1
12,300.0	6,698.3	12,344.8	6,767.6	154.4	154.3	106.31	455.2	4,970.6	246.7	-51.4	298.11	0.828	Level 1
12,400.0	6,697.4	12,444.8	6,766.8	157.2	157.1	106.31	455.2	5,070.6	246.7	-56.7	303.47	0.813	Level 1
12,500.0	6,696.6	12,544.8	6,765.9	160.0	159.9	106.32	455.2	5,170.6	246.7	-62.1	308.83	0.799	Level 1
12,600.0	6,695.7	12,644.8	6,765.0	162.8	162.7	106.32	455.2	5,270.6	246.8	-67.4	314.20	0.785	Level 1
12,700.0	6,694.8	12,744.8	6,764.1	165.6	165.5	106.33	455.2	5,370.6	246.8	-72.8	319.56	0.772	Level 1
12,800.0	6,693.9	12,844.8	6,763.3	168.4	168.2	106.33	455.2	5,470.6	246.8	-78.2	324.92	0.759	Level 1
12,900.0	6,693.0	12,944.8	6,762.4	171.2	171.0	106.33	455.2	5,570.6	246.8	-83.5	330.29	0.747	Level 1
13,000.0	6,692.1	13,044.8	6,761.5	173.9	173.8	106.34	455.2	5,670.6	246.8	-88.9	335.66	0.735	Level 1
13,100.0	6,691.2	13,144.8	6,760.6	176.7	176.6	106.34	455.2	5,770.6	246.8	-94.3	341.03	0.724	Level 1
13,200.0	6,690.3	13,244.8	6,759.8	179.5	179.4	106.35	455.2	5,870.6	246.8	-99.6	346.39	0.712	Level 1
13,300.0	6,689.4	13,344.8	6,758.9	182.3	182.2	106.35	455.2	5,970.6	246.8	-105.0	351.76	0.702	Level 1
13,400.0	6,688.5	13,444.8	6,758.0	185.1	185.0	106.35	455.2	6,070.6	246.8	-110.3	357.14	0.691	Level 1

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis		Distance								Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	Offset Wellbore Centre +E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
13,500.0	6,687.7	13,544.8	6,757.2	187.9	187.8	106.36	455.2	6,170.6	246.8	-115.7	362.51	0.681	Level 1	
13,600.0	6,686.8	13,644.8	6,756.3	190.7	190.6	106.36	455.2	6,270.6	246.8	-121.1	367.88	0.671	Level 1	
13,700.0	6,685.9	13,744.8	6,755.4	193.5	193.4	106.37	455.2	6,370.6	246.8	-126.4	373.25	0.661	Level 1	
13,800.0	6,685.0	13,844.8	6,754.5	196.3	196.2	106.37	455.2	6,470.6	246.8	-131.8	378.63	0.652	Level 1	
13,900.0	6,684.1	13,944.8	6,753.7	199.1	199.0	106.37	455.2	6,570.6	246.8	-137.2	384.00	0.643	Level 1	
14,000.0	6,683.2	14,044.8	6,752.8	201.9	201.8	106.38	455.2	6,670.6	246.8	-142.6	389.38	0.634	Level 1	
14,100.0	6,682.3	14,144.8	6,751.9	204.7	204.6	106.38	455.2	6,770.6	246.8	-147.9	394.75	0.625	Level 1	
14,200.0	6,681.4	14,244.8	6,751.0	207.5	207.3	106.38	455.2	6,870.6	246.8	-153.3	400.13	0.617	Level 1	
14,300.0	6,680.5	14,344.8	6,750.2	210.3	210.1	106.39	455.2	6,970.6	246.8	-158.7	405.51	0.609	Level 1	
14,400.0	6,679.6	14,444.8	6,749.3	213.1	212.9	106.39	455.2	7,070.6	246.8	-164.0	410.88	0.601	Level 1	
14,500.0	6,678.8	14,544.8	6,748.4	215.9	215.7	106.40	455.2	7,170.5	246.8	-169.4	416.26	0.593	Level 1	
14,600.0	6,677.9	14,644.8	6,747.6	218.7	218.5	106.40	455.2	7,270.5	246.8	-174.8	421.64	0.585	Level 1	
14,700.0	6,677.0	14,744.8	6,746.7	221.5	221.3	106.40	455.2	7,370.5	246.9	-180.2	427.02	0.578	Level 1	
14,800.0	6,676.1	14,844.8	6,745.8	224.3	224.1	106.41	455.2	7,470.5	246.9	-185.5	432.40	0.571	Level 1	
14,900.0	6,675.2	14,944.8	6,744.9	227.0	226.9	106.41	455.2	7,570.5	246.9	-190.9	437.78	0.564	Level 1	
15,000.0	6,674.3	15,044.8	6,744.1	229.8	229.7	106.42	455.2	7,670.5	246.9	-196.3	443.16	0.557	Level 1	
15,100.0	6,673.4	15,144.8	6,743.2	232.6	232.5	106.42	455.2	7,770.5	246.9	-201.7	448.54	0.550	Level 1	
15,200.0	6,672.5	15,244.8	6,742.3	235.4	235.3	106.42	455.2	7,870.5	246.9	-207.0	453.92	0.544	Level 1	
15,300.0	6,671.6	15,344.8	6,741.4	238.2	238.1	106.43	455.2	7,970.5	246.9	-212.4	459.30	0.538	Level 1	
15,400.0	6,670.7	15,444.8	6,740.6	241.0	240.9	106.43	455.2	8,070.5	246.9	-217.8	464.68	0.531	Level 1	
15,500.0	6,669.9	15,544.8	6,739.7	243.8	243.7	106.44	455.2	8,170.5	246.9	-223.2	470.06	0.525	Level 1	
15,600.0	6,669.0	15,644.8	6,738.8	246.6	246.5	106.44	455.2	8,270.5	246.9	-228.5	475.44	0.519	Level 1	
15,700.0	6,668.1	15,744.8	6,738.0	249.4	249.3	106.44	455.2	8,370.5	246.9	-233.9	480.82	0.513	Level 1	
15,800.0	6,667.2	15,844.8	6,737.1	252.2	252.1	106.45	455.2	8,470.5	246.9	-239.3	486.21	0.508	Level 1	
15,900.0	6,666.3	15,944.8	6,736.2	255.0	254.9	106.45	455.2	8,570.5	246.9	-244.7	491.59	0.502	Level 1	
16,000.0	6,665.4	16,044.8	6,735.3	257.8	257.7	106.45	455.2	8,670.5	246.9	-250.1	496.97	0.497	Level 1	
16,100.0	6,664.5	16,144.8	6,734.5	260.6	260.5	106.46	455.2	8,770.5	246.9	-255.4	502.35	0.492	Level 1	
16,200.0	6,663.6	16,244.8	6,733.6	263.4	263.3	106.46	455.2	8,870.5	246.9	-260.8	507.74	0.486	Level 1	
16,300.0	6,662.7	16,344.8	6,732.7	266.2	266.1	106.47	455.2	8,970.5	246.9	-266.2	513.12	0.481	Level 1	
16,382.2	6,662.0	16,427.0	6,732.0	268.6	268.4	106.47	455.2	9,052.7	246.9	-270.6	517.54	0.477	Level 1, ES, SF	

Company:	PETROLEUM DEVELOPMENT CORP DJ	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Reference														
Offset				Semi Major Axis			Distance							Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
0.0	0.0	0.0	0.0	0.0	0.0	-89.97	0.0	-14.8	14.8	14.8	0.00	N/A		
100.0	100.0	100.0	100.0	0.1	0.1	-89.97	0.0	-14.8	14.8	14.5	0.22	65.672		
200.0	200.0	200.0	200.0	0.3	0.3	-89.97	0.0	-14.8	14.8	14.1	0.67	21.891 CC		
300.0	300.0	299.8	299.8	0.6	0.6	-87.53	0.7	-15.3	15.3	14.2	1.12	13.690		
400.0	400.0	399.6	399.5	0.8	0.8	-81.26	2.6	-17.1	17.3	15.7	1.57	10.992		
500.0	500.0	499.3	499.1	1.0	1.0	-25.50	5.9	-19.9	20.0	18.0	2.01	9.930		
600.0	600.0	598.9	598.6	1.2	1.2	-19.94	10.4	-23.9	22.8	20.4	2.46	9.281		
700.0	699.9	698.4	697.8	1.5	1.5	-15.15	16.3	-29.1	25.8	22.8	2.91	8.845		
800.0	799.7	797.9	796.8	1.7	1.8	-10.91	23.4	-35.3	28.7	25.4	3.37	8.538		
900.0	899.4	897.4	895.6	1.9	2.0	-7.08	31.9	-42.7	31.8	28.0	3.83	8.317		
1,000.0	998.9	996.7	994.2	2.2	2.3	-3.56	41.6	-51.2	35.0	30.7	4.29	8.153		
1,100.0	1,098.3	1,096.0	1,092.4	2.5	2.7	-0.28	52.6	-60.9	38.2	33.4	4.75	8.030		
1,200.0	1,197.4	1,195.3	1,190.3	2.8	3.0	2.80	64.8	-71.6	41.5	36.3	5.23	7.935		
1,300.0	1,296.3	1,294.4	1,287.8	3.1	3.4	5.71	78.3	-83.5	44.9	39.2	5.71	7.860		
1,400.0	1,394.9	1,393.5	1,384.9	3.4	3.8	8.47	93.1	-96.5	48.4	42.2	6.21	7.796		
1,500.0	1,493.3	1,492.6	1,481.6	3.8	4.2	11.11	109.1	-110.5	52.0	45.3	6.73	7.738		
1,600.0	1,591.2	1,591.5	1,577.9	4.2	4.7	13.63	126.4	-125.7	55.8	48.5	7.27	7.678		
1,700.0	1,688.9	1,690.8	1,674.1	4.6	5.1	16.07	144.9	-141.9	59.5	51.7	7.84	7.596		
1,782.5	1,769.1	1,773.3	1,753.9	5.0	5.6	18.20	160.4	-155.5	61.7	53.4	8.34	7.400		
1,800.0	1,786.1	1,790.8	1,770.9	5.0	5.6	18.67	163.7	-158.4	62.1	53.6	8.45	7.344		
1,900.0	1,883.2	1,890.7	1,867.6	5.5	6.1	21.27	182.5	-175.0	64.1	55.0	9.11	7.039		
2,000.0	1,980.3	1,990.7	1,964.3	6.0	6.7	23.70	201.3	-191.5	66.3	56.5	9.81	6.764		
2,100.0	2,077.4	2,090.6	2,061.1	6.5	7.2	25.96	220.2	-208.0	68.7	58.1	10.54	6.515		
2,200.0	2,174.5	2,190.5	2,157.8	6.9	7.7	28.08	239.0	-224.5	71.1	59.8	11.31	6.289		
2,300.0	2,271.6	2,290.5	2,254.6	7.4	8.2	30.05	257.8	-241.1	73.6	61.5	12.10	6.084		
2,400.0	2,368.7	2,390.4	2,351.3	7.9	8.7	31.89	276.7	-257.6	76.2	63.3	12.92	5.899		
2,500.0	2,465.8	2,490.3	2,448.1	8.4	9.2	33.61	295.5	-274.1	78.9	65.1	13.76	5.731		
2,600.0	2,562.9	2,590.3	2,544.8	8.9	9.8	35.21	314.3	-290.6	81.6	67.0	14.63	5.580		
2,700.0	2,660.0	2,690.2	2,641.6	9.4	10.3	36.71	333.1	-307.2	84.4	68.9	15.51	5.442		
2,800.0	2,757.1	2,790.2	2,738.3	9.9	10.8	38.12	352.0	-323.7	87.2	70.8	16.41	5.318		
2,900.0	2,854.2	2,890.1	2,835.1	10.4	11.3	39.43	370.8	-340.2	90.1	72.8	17.32	5.205		
3,000.0	2,951.4	2,990.0	2,931.8	10.9	11.8	40.66	389.6	-356.8	93.1	74.8	18.24	5.103		
3,100.0	3,048.5	3,090.0	3,028.6	11.4	12.4	41.82	408.5	-373.3	96.1	76.9	19.18	5.010		
3,200.0	3,145.6	3,189.9	3,125.3	11.9	12.9	42.90	427.3	-389.8	99.1	79.0	20.12	4.925		
3,300.0	3,242.7	3,289.8	3,222.0	12.4	13.4	43.92	446.1	-406.3	102.1	81.1	21.07	4.847		
3,400.0	3,339.8	3,389.8	3,318.8	12.9	13.9	44.88	464.9	-422.9	105.2	83.2	22.03	4.776		
3,500.0	3,436.9	3,489.7	3,415.5	13.4	14.5	45.79	483.8	-439.4	108.3	85.3	22.99	4.711		
3,600.0	3,534.0	3,589.7	3,512.3	13.9	15.0	46.65	502.6	-455.9	111.5	87.5	23.96	4.652		
3,700.0	3,631.1	3,689.6	3,609.0	14.4	15.5	47.45	521.4	-472.4	114.6	89.7	24.94	4.597		
3,800.0	3,728.2	3,789.5	3,705.8	15.0	16.0	48.22	540.3	-489.0	117.8	91.9	25.91	4.546		
3,900.0	3,825.3	3,889.5	3,802.5	15.5	16.6	48.94	559.1	-505.5	121.0	94.1	26.89	4.499		
4,000.0	3,922.4	3,989.4	3,899.3	16.0	17.1	49.63	577.9	-522.0	124.2	96.3	27.88	4.456		
4,100.0	4,019.5	4,089.3	3,996.0	16.5	17.6	50.28	596.7	-538.5	127.5	98.6	28.86	4.416		
4,200.0	4,116.6	4,189.3	4,092.8	17.0	18.2	50.90	615.6	-555.1	130.7	100.9	29.85	4.378		
4,300.0	4,213.7	4,289.2	4,189.5	17.5	18.7	51.49	634.4	-571.6	134.0	103.1	30.84	4.343		
4,400.0	4,310.8	4,389.1	4,286.3	18.0	19.2	52.05	653.2	-588.1	137.3	105.4	31.84	4.311		
4,500.0	4,407.9	4,489.1	4,383.0	18.5	19.7	52.59	672.1	-604.7	140.5	107.7	32.83	4.281		
4,600.0	4,505.0	4,589.0	4,479.8	19.0	20.3	53.10	690.9	-621.2	143.8	110.0	33.83	4.252		
4,700.0	4,602.1	4,689.0	4,576.5	19.5	20.8	53.59	709.7	-637.7	147.2	112.3	34.82	4.226		
4,800.0	4,699.2	4,788.9	4,673.2	20.0	21.3	54.06	728.5	-654.2	150.5	114.7	35.82	4.201		
4,900.0	4,796.3	4,888.8	4,770.0	20.5	21.8	54.50	747.4	-670.8	153.8	117.0	36.82	4.178		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-402 - Wellbore #1 - Plan #1 (12-16-15)													Offset Site Error: 0.0 ft	
Survey Program: 0-MWD													Offset Well Error: 0.0 ft	
Reference		Offset		Semi Major Axis			Distance						Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
5,000.0	4,893.4	4,988.8	4,866.7	21.0	22.4	54.93	766.2	-687.3	157.2	119.3	37.82	4.156		
5,045.1	4,937.2	5,033.9	4,910.4	21.3	22.6	55.12	774.7	-694.7	158.7	120.4	38.27	4.146		
5,100.0	4,990.6	5,088.7	4,963.5	21.5	22.9	55.25	785.0	-703.8	160.7	122.0	38.76	4.147		
5,200.0	5,088.3	5,189.1	5,060.7	21.9	23.4	54.93	803.9	-720.4	165.6	126.2	39.40	4.203		
5,300.0	5,186.6	5,292.1	5,160.8	22.2	23.8	54.34	821.9	-736.2	170.8	131.0	39.85	4.287		
5,400.0	5,285.3	5,395.2	5,261.7	22.5	24.2	53.73	837.9	-750.2	175.7	135.5	40.22	4.369		
5,500.0	5,384.3	5,498.4	5,363.2	22.8	24.5	53.09	851.9	-762.5	180.3	139.8	40.52	4.450		
5,600.0	5,483.7	5,601.8	5,465.4	23.0	24.8	52.43	863.8	-773.0	184.6	143.8	40.75	4.529		
5,700.0	5,583.4	5,705.3	5,568.1	23.2	25.1	51.74	873.6	-781.6	188.6	147.6	40.92	4.608		
5,800.0	5,683.2	5,808.9	5,671.2	23.4	25.3	51.02	881.4	-788.4	192.2	151.2	41.01	4.687		
5,900.0	5,783.2	5,912.7	5,774.7	23.5	25.5	50.27	887.1	-793.4	195.6	154.6	41.04	4.766		
5,966.8	5,850.0	5,982.1	5,844.0	23.6	25.6	0.68	889.7	-795.7	197.7	157.6	40.10	4.931		
6,000.0	5,883.2	6,016.6	5,878.5	23.6	25.7	0.44	890.6	-796.5	198.6	158.3	40.27	4.932		
6,095.7	5,978.9	6,116.2	5,978.0	23.7	25.8	0.08	892.0	-797.7	200.0	159.3	40.66	4.918		
6,100.0	5,983.2	6,120.7	5,982.5	23.7	25.8	-89.93	892.0	-797.7	200.0	158.8	41.19	4.856		
6,150.0	6,033.1	6,171.3	6,033.1	23.8	25.8	-90.48	892.1	-797.8	200.0	158.9	41.10	4.866		
6,200.0	6,082.9	6,221.0	6,082.9	23.8	25.9	-91.95	892.1	-797.8	200.1	159.4	40.69	4.919		
6,250.0	6,132.1	6,270.3	6,132.1	23.8	25.9	-94.28	892.1	-797.8	200.6	160.6	39.95	5.021		
6,300.0	6,180.8	6,320.6	6,182.4	23.7	26.0	-97.09	892.1	-796.2	201.6	162.6	38.99	5.171		
6,350.0	6,228.5	6,371.6	6,233.1	23.7	26.0	-99.86	892.1	-791.3	203.1	165.1	38.00	5.346		
6,400.0	6,275.2	6,423.3	6,284.2	23.6	26.0	-102.57	892.1	-782.8	205.1	168.1	36.98	5.547		
6,450.0	6,320.6	6,475.8	6,335.2	23.5	25.9	-105.19	892.1	-770.7	207.5	171.6	35.97	5.770		
6,500.0	6,364.6	6,529.0	6,386.1	23.4	25.9	-107.70	892.1	-754.9	210.3	175.4	34.96	6.016		
6,550.0	6,406.9	6,583.1	6,436.4	23.2	25.8	-110.10	892.1	-735.3	213.4	179.5	33.99	6.280		
6,600.0	6,447.4	6,637.9	6,485.9	23.1	25.7	-112.36	892.1	-711.8	216.8	183.8	33.05	6.561		
6,650.0	6,485.8	6,693.5	6,534.3	23.0	25.6	-114.49	892.1	-684.3	220.4	188.2	32.16	6.852		
6,700.0	6,522.1	6,750.0	6,581.2	22.9	25.4	-116.46	892.1	-653.0	224.0	192.7	31.34	7.148		
6,750.0	6,556.1	6,807.2	6,626.3	22.8	25.3	-118.28	892.1	-617.8	227.7	197.1	30.62	7.437		
6,800.0	6,587.6	6,865.2	6,669.2	22.7	25.2	-119.94	892.1	-578.8	231.4	201.4	30.02	7.710		
6,850.0	6,616.5	6,923.9	6,709.4	22.6	25.0	-121.44	892.1	-536.0	235.0	205.5	29.56	7.951		
6,900.0	6,642.6	6,983.4	6,746.7	22.5	24.9	-122.78	892.1	-489.8	238.4	209.1	29.27	8.145		
6,950.0	6,665.9	7,043.5	6,780.7	22.5	24.7	-123.96	892.1	-440.2	241.6	212.4	29.19	8.275		
7,000.0	6,686.3	7,104.2	6,810.9	22.5	24.6	-124.98	892.1	-387.5	244.5	215.1	29.35	8.328		
7,050.0	6,703.7	7,165.5	6,837.1	22.6	24.5	-125.84	892.1	-332.1	247.0	217.2	29.77	8.295		
7,100.0	6,717.9	7,227.2	6,858.9	22.8	24.5	-126.53	892.1	-274.4	249.1	218.7	30.46	8.180		
7,150.0	6,729.0	7,289.3	6,876.0	23.0	24.5	-127.08	892.1	-214.7	250.8	219.4	31.40	7.988		
7,200.0	6,736.9	7,351.7	6,888.3	23.3	24.5	-127.46	892.1	-153.6	252.0	219.4	32.58	7.734		
7,250.0	6,741.5	7,414.3	6,895.6	23.7	24.7	-127.68	892.1	-91.4	252.7	218.7	34.01	7.431		
7,302.5	6,742.8	7,479.4	6,897.7	24.3	25.1	-127.75	892.1	-26.4	253.0	217.3	35.71	7.084		
7,400.0	6,742.0	7,576.8	6,897.2	25.6	26.1	-127.81	892.1	71.1	253.2	214.9	38.24	6.621		
7,500.0	6,741.1	7,676.8	6,896.6	27.3	27.6	-127.87	892.1	171.1	253.4	212.2	41.14	6.158		
7,600.0	6,740.2	7,776.8	6,896.0	29.2	29.5	-127.93	892.1	271.1	253.6	209.3	44.31	5.723		
7,700.0	6,739.3	7,876.8	6,895.5	31.3	31.5	-127.99	892.1	371.1	253.8	206.1	47.69	5.322		
7,800.0	6,738.4	7,976.8	6,894.9	33.4	33.7	-128.05	892.1	471.1	254.0	202.8	51.23	4.958		
7,900.0	6,737.5	8,076.8	6,894.4	35.7	36.0	-128.11	892.1	571.1	254.2	199.3	54.90	4.630		
8,000.0	6,736.6	8,176.8	6,893.8	38.1	38.3	-128.16	892.1	671.1	254.4	195.7	58.68	4.335		
8,100.0	6,735.7	8,276.8	6,893.2	40.5	40.7	-128.22	892.1	771.1	254.6	192.0	62.55	4.070		
8,200.0	6,734.8	8,376.8	6,892.7	43.0	43.2	-128.28	892.1	871.1	254.8	188.3	66.49	3.832		
8,300.0	6,733.9	8,476.8	6,892.1	45.5	45.7	-128.34	892.1	971.1	255.0	184.5	70.48	3.618		
8,400.0	6,733.0	8,576.8	6,891.6	48.0	48.2	-128.40	892.1	1,071.1	255.2	180.7	74.52	3.425		
8,500.0	6,732.2	8,676.8	6,891.0	50.6	50.8	-128.46	892.1	1,171.1	255.4	176.8	78.59	3.250		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-402 - Wellbore #1 - Plan #1 (12-16-15)												Offset Site Error:	0.0 ft
Survey Program: 0-MWD												Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	
8,600.0	6,731.3	8,776.8	6,890.5	53.2	53.4	-128.52	892.1	1,271.1	255.6	172.9	82.70	3.091	
8,700.0	6,730.4	8,876.8	6,889.9	55.8	56.0	-128.57	892.1	1,371.1	255.8	169.0	86.83	2.946	
8,800.0	6,729.5	8,976.8	6,889.3	58.4	58.6	-128.63	892.1	1,471.1	256.0	165.1	90.99	2.814	
8,900.0	6,728.6	9,076.8	6,888.8	61.0	61.3	-128.69	892.1	1,571.1	256.2	161.1	95.16	2.693	
9,000.0	6,727.7	9,176.8	6,888.2	63.7	63.9	-128.75	892.1	1,671.1	256.5	157.1	99.34	2.581	
9,100.0	6,726.8	9,276.8	6,887.7	66.4	66.6	-128.80	892.1	1,771.1	256.7	153.1	103.54	2.479	
9,200.0	6,725.9	9,376.8	6,887.1	69.1	69.3	-128.86	892.1	1,871.1	256.9	149.1	107.75	2.384	
9,300.0	6,725.0	9,476.8	6,886.5	71.7	71.9	-128.92	892.1	1,971.0	257.1	145.1	111.97	2.296	
9,400.0	6,724.1	9,576.8	6,886.0	74.4	74.6	-128.98	892.1	2,071.0	257.3	141.1	116.19	2.214	
9,500.0	6,723.3	9,676.8	6,885.4	77.2	77.3	-129.03	892.1	2,171.0	257.5	137.1	120.42	2.138	
9,600.0	6,722.4	9,776.8	6,884.9	79.9	80.0	-129.09	892.1	2,271.0	257.7	133.1	124.65	2.067	
9,700.0	6,721.5	9,876.8	6,884.3	82.6	82.8	-129.15	892.1	2,371.0	257.9	129.0	128.88	2.001	
9,800.0	6,720.6	9,976.8	6,883.7	85.3	85.5	-129.21	892.1	2,471.0	258.1	125.0	133.12	1.939	
9,900.0	6,719.7	10,076.8	6,883.2	88.0	88.2	-129.26	892.1	2,571.0	258.3	121.0	137.36	1.881	
10,000.0	6,718.8	10,176.8	6,882.6	90.8	90.9	-129.32	892.1	2,671.0	258.5	116.9	141.60	1.826	
10,100.0	6,717.9	10,276.8	6,882.1	93.5	93.7	-129.38	892.1	2,771.0	258.8	112.9	145.83	1.774	
10,200.0	6,717.0	10,376.8	6,881.5	96.3	96.4	-129.43	892.1	2,871.0	259.0	108.9	150.07	1.726	
10,300.0	6,716.1	10,476.8	6,881.0	99.0	99.2	-129.49	892.1	2,971.0	259.2	104.9	154.31	1.680	
10,400.0	6,715.2	10,576.8	6,880.4	101.8	101.9	-129.55	892.1	3,071.0	259.4	100.8	158.54	1.636	
10,500.0	6,714.4	10,676.8	6,879.8	104.5	104.7	-129.60	892.1	3,171.0	259.6	96.8	162.77	1.595	
10,600.0	6,713.5	10,776.8	6,879.3	107.3	107.4	-129.66	892.1	3,271.0	259.8	92.8	167.00	1.556	
10,700.0	6,712.6	10,876.8	6,878.7	110.0	110.2	-129.72	892.1	3,371.0	260.0	88.8	171.23	1.519	
10,800.0	6,711.7	10,976.8	6,878.2	112.8	112.9	-129.77	892.1	3,471.0	260.2	84.8	175.45	1.483	Level 3
10,900.0	6,710.8	11,076.8	6,877.6	115.6	115.7	-129.83	892.1	3,571.0	260.4	80.8	179.67	1.450	Level 3
11,000.0	6,709.9	11,176.8	6,877.0	118.3	118.5	-129.88	892.1	3,671.0	260.7	76.8	183.89	1.417	Level 3
11,100.0	6,709.0	11,276.8	6,876.5	121.1	121.2	-129.94	892.1	3,771.0	260.9	72.8	188.11	1.387	Level 3
11,200.0	6,708.1	11,376.8	6,875.9	123.9	124.0	-130.00	892.1	3,871.0	261.1	68.8	192.32	1.358	Level 3
11,300.0	6,707.2	11,476.8	6,875.4	126.6	126.8	-130.05	892.1	3,971.0	261.3	64.8	196.52	1.330	Level 3
11,400.0	6,706.3	11,576.8	6,874.8	129.4	129.5	-130.11	892.1	4,071.0	261.5	60.8	200.73	1.303	Level 3
11,500.0	6,705.5	11,676.8	6,874.3	132.2	132.3	-130.16	892.1	4,171.0	261.7	56.8	204.92	1.277	Level 3
11,600.0	6,704.6	11,776.8	6,873.7	135.0	135.1	-130.22	892.1	4,271.0	261.9	52.8	209.12	1.253	Level 3
11,700.0	6,703.7	11,876.8	6,873.1	137.7	137.9	-130.27	892.1	4,371.0	262.1	48.8	213.31	1.229	Level 2
11,800.0	6,702.8	11,976.8	6,872.6	140.5	140.6	-130.33	892.1	4,471.0	262.4	44.9	217.49	1.206	Level 2
11,900.0	6,701.9	12,076.8	6,872.0	143.3	143.4	-130.38	892.1	4,571.0	262.6	40.9	221.67	1.185	Level 2
12,000.0	6,701.0	12,176.8	6,871.5	146.1	146.2	-130.44	892.1	4,671.0	262.8	36.9	225.85	1.164	Level 2
12,100.0	6,700.1	12,276.8	6,870.9	148.9	149.0	-130.49	892.1	4,771.0	263.0	33.0	230.02	1.143	Level 2
12,200.0	6,699.2	12,376.8	6,870.3	151.7	151.8	-130.55	892.1	4,871.0	263.2	29.0	234.19	1.124	Level 2
12,300.0	6,698.3	12,476.8	6,869.8	154.4	154.6	-130.60	892.1	4,971.0	263.4	25.1	238.35	1.105	Level 2
12,400.0	6,697.4	12,576.8	6,869.2	157.2	157.3	-130.66	892.1	5,071.0	263.7	21.2	242.50	1.087	Level 2
12,500.0	6,696.6	12,676.8	6,868.7	160.0	160.1	-130.71	892.1	5,171.0	263.9	17.2	246.65	1.070	Level 2
12,600.0	6,695.7	12,776.8	6,868.1	162.8	162.9	-130.77	892.1	5,271.0	264.1	13.3	250.80	1.053	Level 2
12,700.0	6,694.8	12,876.8	6,867.6	165.6	165.7	-130.82	892.1	5,371.0	264.3	9.4	254.94	1.037	Level 2
12,800.0	6,693.9	12,976.8	6,867.0	168.4	168.5	-130.88	892.1	5,471.0	264.5	5.4	259.08	1.021	Level 2
12,900.0	6,693.0	13,076.8	6,866.4	171.2	171.3	-130.93	892.1	5,571.0	264.7	1.5	263.21	1.006	Level 2
13,000.0	6,692.1	13,176.8	6,865.9	173.9	174.1	-130.99	892.1	5,671.0	265.0	-2.4	267.33	0.991	Level 1
13,100.0	6,691.2	13,276.8	6,865.3	176.7	176.8	-131.04	892.1	5,771.0	265.2	-6.3	271.45	0.977	Level 1
13,200.0	6,690.3	13,376.8	6,864.8	179.5	179.6	-131.09	892.1	5,871.0	265.4	-10.2	275.56	0.963	Level 1
13,300.0	6,689.4	13,476.8	6,864.2	182.3	182.4	-131.15	892.1	5,971.0	265.6	-14.1	279.67	0.950	Level 1
13,400.0	6,688.5	13,576.8	6,863.6	185.1	185.2	-131.20	892.1	6,071.0	265.8	-17.9	283.78	0.937	Level 1
13,500.0	6,687.7	13,676.8	6,863.1	187.9	188.0	-131.25	892.1	6,171.0	266.0	-21.8	287.87	0.924	Level 1
13,600.0	6,686.8	13,776.8	6,862.5	190.7	190.8	-131.31	892.1	6,271.0	266.3	-25.7	291.97	0.912	Level 1

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-402 - Wellbore #1 - Plan #1 (12-16-15)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	Offset Wellbore Centre +E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
13,700.0	6,685.9	13,876.8	6,862.0	193.5	193.6	-131.36	892.1	6,371.0	266.5	-29.6	296.05	0.900	Level 1	
13,800.0	6,685.0	13,976.8	6,861.4	196.3	196.4	-131.42	892.1	6,471.0	266.7	-33.4	300.13	0.889	Level 1	
13,900.0	6,684.1	14,076.8	6,860.9	199.1	199.2	-131.47	892.1	6,571.0	266.9	-37.3	304.21	0.877	Level 1	
14,000.0	6,683.2	14,176.8	6,860.3	201.9	202.0	-131.52	892.1	6,670.9	267.1	-41.1	308.28	0.867	Level 1	
14,100.0	6,682.3	14,276.8	6,859.7	204.7	204.8	-131.58	892.1	6,770.9	267.4	-45.0	312.34	0.856	Level 1	
14,200.0	6,681.4	14,376.8	6,859.2	207.5	207.6	-131.63	892.1	6,870.9	267.6	-48.8	316.40	0.846	Level 1	
14,300.0	6,680.5	14,476.8	6,858.6	210.3	210.4	-131.68	892.1	6,970.9	267.8	-52.7	320.46	0.836	Level 1	
14,400.0	6,679.6	14,576.8	6,858.1	213.1	213.2	-131.73	892.1	7,070.9	268.0	-56.5	324.50	0.826	Level 1	
14,500.0	6,678.8	14,676.8	6,857.5	215.9	216.0	-131.79	892.1	7,170.9	268.2	-60.3	328.55	0.816	Level 1	
14,600.0	6,677.9	14,776.8	6,856.9	218.7	218.8	-131.84	892.1	7,270.9	268.5	-64.1	332.58	0.807	Level 1	
14,700.0	6,677.0	14,876.8	6,856.4	221.5	221.5	-131.89	892.1	7,370.9	268.7	-67.9	336.61	0.798	Level 1	
14,800.0	6,676.1	14,976.8	6,855.8	224.3	224.3	-131.95	892.1	7,470.9	268.9	-71.7	340.64	0.789	Level 1	
14,900.0	6,675.2	15,076.8	6,855.3	227.0	227.1	-132.00	892.1	7,570.9	269.1	-75.5	344.66	0.781	Level 1	
15,000.0	6,674.3	15,176.8	6,854.7	229.8	229.9	-132.05	892.1	7,670.9	269.4	-79.3	348.67	0.773	Level 1	
15,100.0	6,673.4	15,276.8	6,854.1	232.6	232.7	-132.10	892.1	7,770.9	269.6	-83.1	352.68	0.764	Level 1	
15,200.0	6,672.5	15,376.8	6,853.6	235.4	235.5	-132.15	892.1	7,870.9	269.8	-86.9	356.68	0.756	Level 1	
15,300.0	6,671.6	15,476.8	6,853.0	238.2	238.3	-132.21	892.1	7,970.9	270.0	-90.7	360.68	0.749	Level 1	
15,400.0	6,670.7	15,576.8	6,852.5	241.0	241.1	-132.26	892.1	8,070.9	270.2	-94.4	364.67	0.741	Level 1	
15,500.0	6,669.9	15,676.8	6,851.9	243.8	243.9	-132.31	892.1	8,170.9	270.5	-98.2	368.65	0.734	Level 1	
15,600.0	6,669.0	15,776.8	6,851.4	246.6	246.7	-132.36	892.1	8,270.9	270.7	-101.9	372.63	0.726	Level 1	
15,700.0	6,668.1	15,876.8	6,850.8	249.4	249.5	-132.41	892.1	8,370.9	270.9	-105.7	376.61	0.719	Level 1	
15,800.0	6,667.2	15,976.8	6,850.2	252.2	252.3	-132.47	892.1	8,470.9	271.1	-109.4	380.57	0.712	Level 1	
15,900.0	6,666.3	16,076.8	6,849.7	255.0	255.1	-132.52	892.1	8,570.9	271.4	-113.2	384.54	0.706	Level 1	
16,000.0	6,665.4	16,176.8	6,849.1	257.8	257.9	-132.57	892.1	8,670.9	271.6	-116.9	388.49	0.699	Level 1	
16,100.0	6,664.5	16,276.8	6,848.6	260.6	260.7	-132.62	892.1	8,770.9	271.8	-120.6	392.44	0.693	Level 1	
16,200.0	6,663.6	16,376.8	6,848.0	263.4	263.5	-132.67	892.1	8,870.9	272.0	-124.4	396.39	0.686	Level 1	
16,300.0	6,662.7	16,476.8	6,847.4	266.2	266.3	-132.72	892.1	8,970.9	272.3	-128.1	400.33	0.680	Level 1	
16,382.2	6,662.0	16,556.8	6,847.0	268.6	268.6	-132.77	892.1	9,050.9	272.5	-131.1	403.52	0.675	Level 1, ES, SF	

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18F-102 - Wellbore #1 - Plan #1 (12-16-15)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
0.0	0.0	0.0	0.0	0.0	0.0	90.48	-0.4	45.1	45.1					
100.0	100.0	100.0	100.0	0.1	0.1	90.48	-0.4	45.1	45.1	44.9	0.22	200.741		
200.0	200.0	200.0	200.0	0.3	0.3	90.48	-0.4	45.1	45.1	44.4	0.67	66.914		
300.0	300.0	300.0	300.0	0.6	0.6	90.48	-0.4	45.1	45.1	44.0	1.12	40.148		
400.0	400.0	400.0	400.0	0.8	0.8	90.48	-0.4	45.1	45.1	43.5	1.57	28.677 CC, ES		
500.0	500.0	500.0	500.0	1.0	1.0	140.25	-0.4	45.1	45.8	43.8	2.02	22.674		
600.0	600.0	600.0	600.0	1.2	1.2	142.24	-0.4	45.1	47.8	45.4	2.46	19.406		
700.0	699.9	699.9	699.9	1.5	1.5	145.20	-0.4	45.1	51.3	48.4	2.91	17.626		
800.0	799.7	799.7	799.7	1.7	1.7	148.71	-0.4	45.1	56.5	53.1	3.36	16.785		
900.0	899.4	899.4	899.4	1.9	1.9	152.37	-0.4	45.1	63.3	59.5	3.82	16.585 SF		
1,000.0	998.9	998.9	998.9	2.2	2.1	155.87	-0.4	45.1	71.9	67.7	4.27	16.844		
1,100.0	1,098.3	1,099.4	1,099.4	2.5	2.3	159.42	-0.6	44.3	81.7	77.0	4.71	17.349		
1,200.0	1,197.4	1,200.0	1,200.0	2.8	2.5	163.19	-1.2	41.7	92.0	86.8	5.13	17.917		
1,300.0	1,296.3	1,300.5	1,300.4	3.1	2.7	167.06	-2.2	37.4	102.9	97.4	5.56	18.501		
1,400.0	1,394.9	1,400.9	1,400.6	3.4	3.0	170.95	-3.6	31.5	114.7	108.7	6.00	19.118		
1,500.0	1,493.3	1,501.2	1,500.6	3.8	3.2	174.77	-5.4	23.8	127.5	121.0	6.45	19.772		
1,600.0	1,591.2	1,601.4	1,600.3	4.2	3.4	178.47	-7.6	14.4	141.4	134.5	6.91	20.456		
1,700.0	1,688.9	1,701.3	1,699.6	4.6	3.7	-177.97	-10.2	3.4	156.5	149.1	7.40	21.156		
1,782.5	1,769.1	1,783.6	1,781.2	5.0	3.9	-175.18	-12.6	-7.0	170.0	162.2	7.82	21.730		
1,800.0	1,786.1	1,801.1	1,798.5	5.0	3.9	-174.61	-13.1	-9.3	172.9	165.0	7.92	21.844		
1,900.0	1,883.2	1,900.7	1,897.0	5.5	4.2	-171.40	-16.5	-23.7	189.6	181.1	8.48	22.345		
2,000.0	1,980.3	2,000.3	1,995.2	6.0	4.5	-168.27	-20.3	-39.7	206.0	196.9	9.10	22.647		
2,100.0	2,077.4	2,099.8	2,093.0	6.5	4.9	-165.21	-24.4	-57.3	222.3	212.5	9.76	22.780		
2,200.0	2,174.5	2,199.1	2,190.4	6.9	5.3	-162.18	-28.9	-76.6	238.5	228.0	10.47	22.774		
2,300.0	2,271.6	2,298.2	2,287.1	7.4	5.6	-159.17	-33.8	-97.5	254.9	243.6	11.25	22.661		
2,400.0	2,368.7	2,396.2	2,382.5	7.9	6.1	-156.32	-38.9	-119.2	271.5	259.5	12.06	22.506		
2,500.0	2,465.8	2,493.9	2,477.7	8.4	6.5	-153.80	-44.0	-140.9	288.8	275.9	12.91	22.372		
2,600.0	2,562.9	2,591.6	2,572.8	8.9	6.9	-151.57	-49.1	-162.6	306.5	292.8	13.77	22.259		
2,700.0	2,660.0	2,689.4	2,668.0	9.4	7.4	-149.57	-54.2	-184.3	324.7	310.0	14.65	22.166		
2,800.0	2,757.1	2,787.1	2,763.2	9.9	7.8	-147.79	-59.2	-206.0	343.2	327.7	15.54	22.089		
2,900.0	2,854.2	2,884.9	2,858.3	10.4	8.3	-146.19	-64.3	-227.7	362.0	345.5	16.43	22.027		
3,000.0	2,951.4	2,982.6	2,953.5	10.9	8.7	-144.75	-69.4	-249.4	381.0	363.7	17.34	21.977		
3,100.0	3,048.5	3,080.3	3,048.6	11.4	9.2	-143.44	-74.5	-271.1	400.3	382.0	18.24	21.939		
3,200.0	3,145.6	3,178.1	3,143.8	11.9	9.6	-142.26	-79.6	-292.8	419.7	400.5	19.16	21.909		
3,300.0	3,242.7	3,275.8	3,239.0	12.4	10.1	-141.18	-84.7	-314.5	439.3	419.2	20.07	21.886		
3,400.0	3,339.8	3,373.5	3,334.1	12.9	10.6	-140.19	-89.8	-336.2	459.0	438.0	20.99	21.870		
3,500.0	3,436.9	3,471.3	3,429.3	13.4	11.0	-139.28	-94.8	-357.9	478.9	457.0	21.91	21.859		
3,600.0	3,534.0	3,569.0	3,524.5	13.9	11.5	-138.44	-99.9	-379.6	498.8	476.0	22.83	21.853		

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design												Offset Site Error:	0.0 ft
Survey Program: 0-MWD												Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis		Distance							
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	90.70	-0.4	30.1	30.1				
100.0	100.0	100.0	100.0	0.1	0.1	90.70	-0.4	30.1	30.1	29.9	0.22	133.833	
200.0	200.0	200.0	200.0	0.3	0.3	90.70	-0.4	30.1	30.1	29.4	0.67	44.611	
300.0	300.0	300.0	300.0	0.6	0.6	90.70	-0.4	30.1	30.1	29.0	1.12	26.767	
400.0	400.0	400.0	400.0	0.8	0.8	90.70	-0.4	30.1	30.1	28.5	1.57	19.119 CC, ES	
500.0	500.0	500.0	500.0	1.0	1.0	140.81	-0.4	30.1	30.8	28.7	2.02	15.228	
600.0	600.0	600.0	600.0	1.2	1.2	143.69	-0.4	30.1	32.8	30.4	2.46	13.317	
700.0	699.9	699.9	699.9	1.5	1.5	147.74	-0.4	30.1	36.4	33.5	2.91	12.504	
800.0	799.7	799.7	799.7	1.7	1.7	152.19	-0.4	30.1	41.7	38.4	3.36	12.400 SF	
900.0	899.4	900.2	900.2	1.9	1.9	156.76	-0.3	29.2	48.0	44.2	3.80	12.609	
1,000.0	998.9	1,000.7	1,000.7	2.2	2.1	161.48	-0.2	26.6	54.4	50.2	4.23	12.856	
1,100.0	1,098.3	1,101.3	1,101.2	2.5	2.3	166.26	0.0	22.2	61.3	56.6	4.67	13.121	
1,200.0	1,197.4	1,201.9	1,201.6	2.8	2.5	171.02	0.3	16.0	68.6	63.5	5.11	13.425	
1,300.0	1,296.3	1,302.5	1,301.9	3.1	2.8	175.67	0.6	8.1	76.7	71.1	5.57	13.774	
1,400.0	1,394.9	1,403.1	1,402.0	3.4	3.0	-179.83	1.1	-1.6	85.4	79.4	6.03	14.162	
1,500.0	1,493.3	1,503.6	1,501.8	3.8	3.3	-175.55	1.6	-13.0	95.1	88.5	6.52	14.578	
1,600.0	1,591.2	1,604.0	1,601.4	4.2	3.6	-171.50	2.2	-26.2	105.6	98.6	7.04	15.007	
1,700.0	1,688.9	1,704.4	1,700.7	4.6	3.9	-167.71	2.8	-41.1	117.2	109.6	7.60	15.431	
1,782.5	1,769.1	1,787.1	1,782.3	5.0	4.1	-164.78	3.5	-54.7	127.5	119.4	8.09	15.766	
1,800.0	1,786.1	1,804.7	1,799.5	5.0	4.2	-164.18	3.6	-57.7	129.8	121.6	8.20	15.828	
1,900.0	1,883.2	1,904.9	1,898.1	5.5	4.5	-160.80	4.4	-76.0	142.4	133.5	8.87	16.051	
2,000.0	1,980.3	2,004.6	1,995.8	6.0	4.9	-157.48	5.3	-95.8	154.5	144.9	9.59	16.107	
2,100.0	2,077.4	2,103.5	2,092.6	6.5	5.3	-154.58	6.2	-115.7	167.0	156.7	10.36	16.128	
2,200.0	2,174.5	2,202.4	2,189.5	6.9	5.7	-152.09	7.1	-135.6	179.9	168.7	11.14	16.142	
2,300.0	2,271.6	2,301.2	2,286.3	7.4	6.1	-149.93	8.0	-155.5	193.0	181.1	11.95	16.150	
2,400.0	2,368.7	2,400.1	2,383.2	7.9	6.5	-148.05	8.9	-175.5	206.4	193.6	12.78	16.155	
2,500.0	2,465.8	2,499.0	2,480.0	8.4	6.9	-146.40	9.8	-195.4	220.0	206.4	13.61	16.159	
2,600.0	2,562.9	2,597.9	2,576.9	8.9	7.3	-144.94	10.7	-215.3	233.7	219.2	14.46	16.162	
2,700.0	2,660.0	2,696.8	2,673.8	9.4	7.8	-143.64	11.6	-235.2	247.6	232.2	15.32	16.164	
2,800.0	2,757.1	2,795.7	2,770.6	9.9	8.2	-142.49	12.5	-255.1	261.5	245.4	16.18	16.167	
2,900.0	2,854.2	2,894.6	2,867.5	10.4	8.6	-141.44	13.4	-275.0	275.6	258.6	17.04	16.170	
3,000.0	2,951.4	2,993.5	2,964.3	10.9	9.0	-140.50	14.3	-294.9	289.7	271.8	17.92	16.173	
3,100.0	3,048.5	3,092.3	3,061.2	11.4	9.5	-139.65	15.2	-314.8	304.0	285.2	18.79	16.176	
3,200.0	3,145.6	3,191.2	3,158.0	11.9	9.9	-138.88	16.1	-334.7	318.2	298.6	19.67	16.180	
3,300.0	3,242.7	3,290.1	3,254.9	12.4	10.3	-138.17	17.0	-354.7	332.6	312.0	20.55	16.184	
3,400.0	3,339.8	3,389.0	3,351.8	12.9	10.8	-137.51	17.9	-374.6	347.0	325.5	21.43	16.188	
3,500.0	3,436.9	3,487.9	3,448.6	13.4	11.2	-136.92	18.8	-394.5	361.4	339.1	22.32	16.192	
3,600.0	3,534.0	3,586.8	3,545.5	13.9	11.6	-136.36	19.7	-414.4	375.8	352.6	23.20	16.196	
3,700.0	3,631.1	3,685.7	3,642.3	14.4	12.1	-135.85	20.6	-434.3	390.3	366.2	24.09	16.200	
3,800.0	3,728.2	3,784.6	3,739.2	15.0	12.5	-135.37	21.5	-454.2	404.8	379.8	24.98	16.204	
3,900.0	3,825.3	3,883.4	3,836.1	15.5	13.0	-134.93	22.4	-474.1	419.4	393.5	25.87	16.209	
4,000.0	3,922.4	3,982.3	3,932.9	16.0	13.4	-134.52	23.3	-494.0	433.9	407.2	26.76	16.213	
4,100.0	4,019.5	4,081.2	4,029.8	16.5	13.8	-134.13	24.2	-514.0	448.5	420.8	27.66	16.218	
4,200.0	4,116.6	4,180.1	4,126.6	17.0	14.3	-133.77	25.1	-533.9	463.1	434.6	28.55	16.222	
4,300.0	4,213.7	4,279.0	4,223.5	17.5	14.7	-133.43	26.0	-553.8	477.7	448.3	29.44	16.226	
4,400.0	4,310.8	4,377.9	4,320.3	18.0	15.2	-133.11	26.9	-573.7	492.4	462.0	30.34	16.230	

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-232
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Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-232	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Reference Depths are relative to WELL @ 4641.0ft (Original Well Elev)

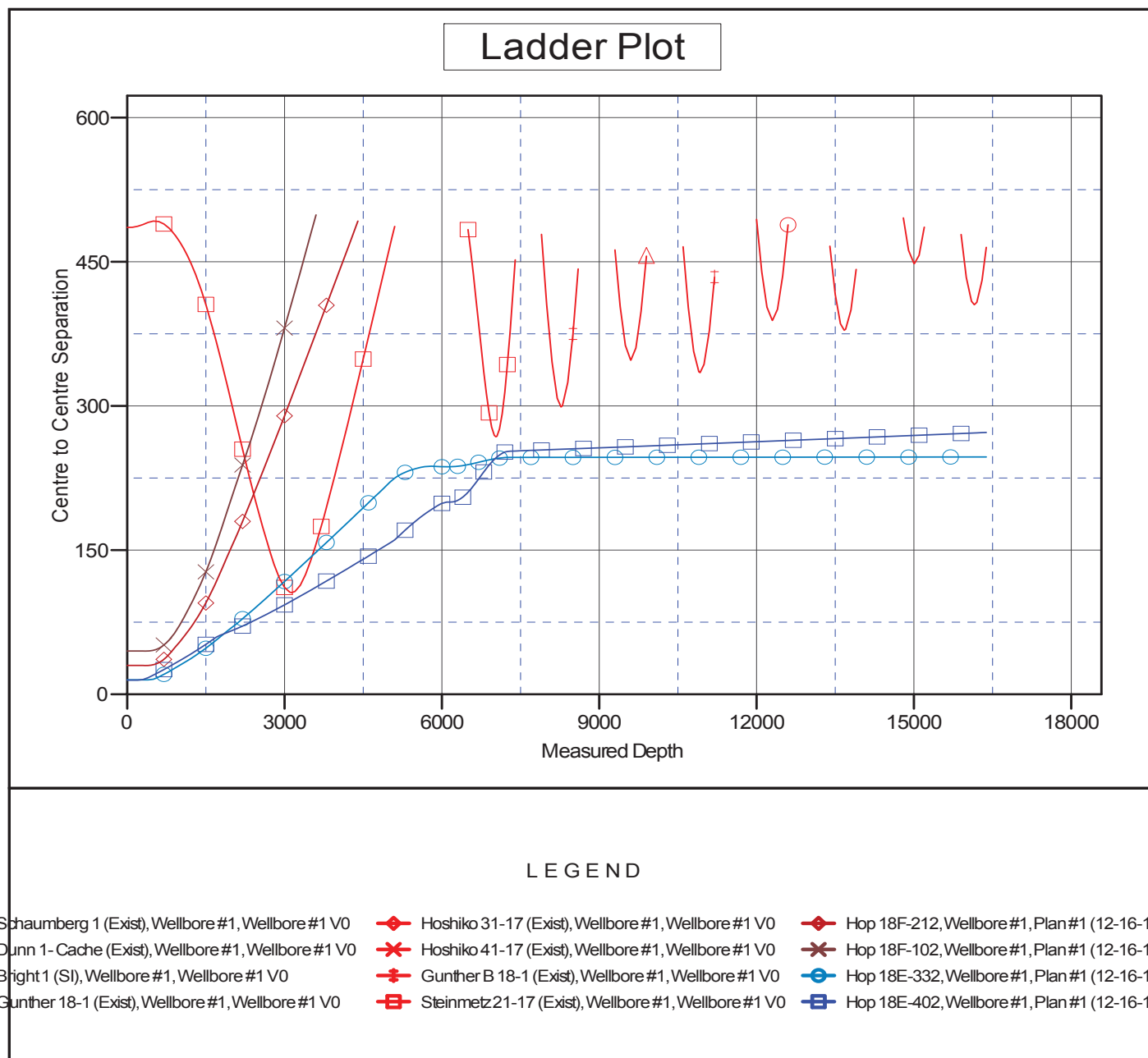
Offset Depths are relative to Offset Datum

Central Meridian is -105.500000

Coordinates are relative to: Hop 18E-232

Coordinate System is US State Plane 1983, Colorado Northern Zone

Grid Convergence at Surface is: 0.58°



Reference Depths are relative to WELL @ 4641.0ft (Original Well Elev)	Coordinates are relative to: Hop 18E-232
Offset Depths are relative to Offset Datum	Coordinate System is US State Plane 1983, Colorado Northern Zone
Central Meridian is -105.500000	Grid Convergence at Surface is: 0.58°

