



Scientific
Drilling

Directional Survey Certification

7327 West Barton Road
Casper, WY 82604
(307)-472-6621 Fax (307) 472-5439

Operator	OXY USA RMAT
Well Name & No.	Cascade Creek 697-15-19B
County & State	Garfield County, CO
SDI Job No.	42DEF10121373
Rig	H&P 353

I, Rex Hall, having personal knowledge of all the facts, hereby
certify that the attached directional survey run from a measured depth of 0 feet to a
measured depth of 9335 feet is true and correct as determined from all available records.


Signature

24-Feb-11
Date

Rex Hall
Grand Junction Drilling Engineer
Scientific Drilling - Rocky Mountain District

OXY USA RMAT

**Garfield County, CO NAD27
Cascade Creek 697-15-01 Pad
CC 697-15-19B - Slot M**

OH

Design: OH

Standard Survey Report

24 February, 2011

Scientific Drilling International

Survey Report

Company:	OXY USA RMAT	Local Co-ordinate Reference:	Well CC 697-15-19B - Slot M
Project:	Garfield County, CO NAD27	TVD Reference:	GL 8348' & RKB 30' @ 8378.00ft
Site:	Cascade Creek 697-15-01 Pad	MD Reference:	GL 8348' & RKB 30' @ 8378.00ft
Well:	CC 697-15-19B	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Rockies-R5000.1

Project	Garfield County, CO NAD27		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	Colorado Central 502		

Site	Cascade Creek 697-15-01 Pad, Sec 15 T6S R97W		
Site Position:		Northing:	629,156.97 usft
From:	Map	Easting:	1,234,961.93 usft
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in
		Latitude:	39° 31' 46.180 N
		Longitude:	108° 12' 45.350 W
		Grid Convergence:	-1.71 °

Well	CC 697-15-19B - Slot M		
Well Position	+N/-S	0.00 ft	Northing:
	+E/-W	0.00 ft	Easting:
Position Uncertainty	0.00 ft		Wellhead Elevation:
			Latitude:
			Longitude:
			Ground Level:

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination
			Dip Angle
			Field Strength
	IGRF2010	2010/11/24	10.52
			65.74
			52,277

Design	OH		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(ft)	(ft)	(ft)
	0.00	0.00	0.00
			141.67

Survey Program	Date	2011/02/24		
From	To	Survey (Wellbore)	Tool Name	Description
(ft)	(ft)			
109.00	416.00	Survey #1 - Surface Gyro (OH)	Standard Keeper 103	Standard Wireline Keeper ver 1.0.3
433.00	2,671.00	Survey #2 - Surface MWD (OH)	MWD-SDI	MWD - Standard ISCWSA
2,789.00	9,335.00	Survey #3 - Production MWD (OH)	MWD-SDI	MWD - Standard ISCWSA

Survey									
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn
Depth	(°)	(°)	Depth	(ft)	(ft)	Section	Rate	Rate	Rate
(ft)			(ft)			(ft)	(°/100ft)	(°/100ft)	(°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
109.00	0.35	77.28	109.00	0.07	0.32	0.14	0.32	0.32	0.00
First SDI Gyro Survey									
170.00	0.74	106.38	170.00	0.00	0.88	0.55	0.76	0.64	47.70
201.00	1.13	128.44	200.99	-0.24	1.32	1.01	1.69	1.26	71.16
263.00	2.30	142.49	262.96	-1.61	2.55	2.85	1.99	1.89	22.66
293.00	2.84	153.25	292.93	-2.75	3.25	4.18	2.41	1.80	35.87
324.00	2.45	159.20	323.90	-4.06	3.83	5.56	1.54	-1.26	19.19
355.00	1.45	138.97	354.88	-4.97	4.33	6.58	3.87	-3.23	-65.26

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Site:	Cascade Creek 697-15-01 Pad	MD Reference:	GL 8348' & RKB 30' @ 8378.00ft
Well:	CC 697-15-19B	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Rockies-R5000.1

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
386.00	0.86	119.43	385.88	-5.38	4.79	7.19	2.26	-1.90	-63.03
416.00	0.77	94.52	415.87	-5.51	5.18	7.54	1.21	-0.30	-83.03
Last SDI Gyro Survey									
433.00	0.91	121.26	432.87	-5.59	5.41	7.74	2.42	0.82	157.29
First SDI MWD Survey									
525.00	2.37	142.95	524.83	-7.49	7.18	10.33	1.70	1.59	23.58
617.00	4.04	147.35	616.69	-11.73	10.08	15.45	1.83	1.82	4.78
711.00	5.63	144.10	710.35	-18.26	14.57	23.36	1.72	1.69	-3.46
803.00	7.39	141.81	801.75	-26.56	20.87	33.78	1.93	1.91	-2.49
897.00	7.65	137.06	894.94	-35.89	28.87	46.06	0.72	0.28	-5.05
992.00	8.09	132.58	989.05	-45.05	38.10	58.97	0.79	0.46	-4.72
1,086.00	8.88	136.36	1,082.02	-54.77	47.98	72.72	1.03	0.84	4.02
1,181.00	10.20	139.44	1,175.71	-66.47	58.51	88.43	1.49	1.39	3.24
1,275.00	10.73	140.23	1,268.14	-79.52	69.52	105.50	0.58	0.56	0.84
1,370.00	12.49	140.93	1,361.19	-94.29	81.65	124.61	1.86	1.85	0.74
1,464.00	14.77	142.60	1,452.54	-111.71	95.34	146.76	2.46	2.43	1.78
1,559.00	15.12	142.69	1,544.33	-131.18	110.21	171.25	0.37	0.37	0.09
1,654.00	16.36	142.07	1,635.76	-151.59	125.94	197.02	1.32	1.31	-0.65
1,748.00	16.27	141.11	1,725.98	-172.28	142.35	223.43	0.30	-0.10	-1.02
1,843.00	17.41	139.44	1,816.90	-193.44	159.94	250.94	1.30	1.20	-1.76
1,937.00	16.62	138.91	1,906.79	-214.25	177.92	278.42	0.86	-0.84	-0.56
2,032.00	17.50	139.53	1,997.61	-235.36	196.12	306.26	0.95	0.93	0.65
2,126.00	19.26	141.28	2,086.81	-258.21	215.00	335.89	1.96	1.87	1.86
2,221.00	20.40	140.67	2,176.17	-283.24	235.29	368.11	1.22	1.20	-0.64
2,315.00	21.90	144.54	2,263.84	-310.19	255.85	402.01	2.18	1.60	4.12
2,410.00	21.81	144.89	2,352.02	-339.06	276.27	437.32	0.17	-0.09	0.37
2,504.00	22.34	145.85	2,439.13	-368.13	296.35	472.57	0.68	0.56	1.02
2,599.00	22.07	145.24	2,527.08	-397.74	316.66	508.39	0.37	-0.28	-0.64
2,671.00	21.90	145.50	2,593.85	-419.91	331.97	535.29	0.27	-0.24	0.36
Last Survey in 14 3/4" Hole									
2,789.00	21.19	145.95	2,703.60	-455.72	356.38	578.51	0.62	-0.60	0.38
First SDI Production MWD Survey									
2,883.00	20.58	142.70	2,791.43	-482.94	375.90	611.98	1.39	-0.65	-3.46
2,978.00	21.46	141.73	2,880.10	-509.87	396.79	646.05	1.00	0.93	-1.02
3,072.00	22.77	141.56	2,967.19	-537.62	418.75	681.44	1.40	1.39	-0.18
3,167.00	23.30	143.84	3,054.61	-567.18	441.26	718.60	1.09	0.56	2.40
3,261.00	25.32	143.40	3,140.27	-598.33	464.22	757.27	2.16	2.15	-0.47
3,356.00	26.12	139.01	3,225.87	-630.43	490.05	798.47	2.17	0.84	-4.62
3,450.00	24.89	138.66	3,310.71	-660.90	516.69	838.89	1.32	-1.31	-0.37
3,544.00	24.97	137.95	3,395.95	-690.49	543.04	878.45	0.33	0.09	-0.76
3,639.00	23.21	138.13	3,482.67	-719.32	568.97	917.14	1.85	-1.85	0.19
3,733.00	24.01	138.57	3,568.80	-747.45	593.99	954.73	0.87	0.85	0.47
3,828.00	22.34	138.13	3,656.13	-775.39	618.83	992.05	1.77	-1.76	-0.46
3,922.00	22.86	139.36	3,742.92	-802.55	642.65	1,028.12	0.75	0.55	1.31

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Survey Report

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Project:	Garfield County, CO NAD27	TVD Reference:	GL 8348' & RKB 30' @ 8378.00ft
Site:	Cascade Creek 697-15-01 Pad	MD Reference:	GL 8348' & RKB 30' @ 8378.00ft
Well:	CC 697-15-19B	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Rockies-R5000.1

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
4,017.00	23.13	140.33	3,830.37	-830.91	666.58	1,065.22	0.49	0.28	1.02	
4,112.00	23.92	140.24	3,917.47	-860.08	690.81	1,103.12	0.83	0.83	-0.09	
4,206.00	24.53	142.00	4,003.19	-890.11	715.01	1,141.69	1.01	0.65	1.87	
4,301.00	23.74	141.73	4,089.89	-920.66	738.99	1,180.53	0.84	-0.83	-0.28	
4,395.00	23.21	141.38	4,176.11	-949.99	762.27	1,217.98	0.58	-0.56	-0.37	
4,490.00	21.98	141.64	4,263.81	-978.56	784.99	1,254.48	1.30	-1.29	0.27	
4,584.00	22.51	138.92	4,350.82	-1,005.92	807.73	1,290.04	1.23	0.56	-2.89	
4,679.00	23.48	138.57	4,438.27	-1,033.81	832.21	1,327.10	1.03	1.02	-0.37	
4,774.00	22.86	138.74	4,525.61	-1,061.88	856.90	1,364.43	0.66	-0.65	0.18	
4,868.00	22.95	140.24	4,612.20	-1,089.69	880.66	1,400.99	0.63	0.10	1.60	
4,962.00	23.04	138.83	4,698.73	-1,117.62	904.49	1,437.68	0.59	0.10	-1.50	
5,057.00	20.75	136.02	4,786.87	-1,143.73	928.42	1,473.00	2.65	-2.41	-2.96	
5,151.00	19.35	134.70	4,875.17	-1,166.67	951.05	1,505.03	1.57	-1.49	-1.40	
5,246.00	17.32	133.12	4,965.35	-1,187.41	972.57	1,534.64	2.20	-2.14	-1.66	
5,340.00	17.94	134.17	5,054.93	-1,207.06	993.16	1,562.83	0.74	0.66	1.12	
5,435.00	17.67	136.20	5,145.38	-1,227.66	1,013.64	1,591.69	0.71	-0.28	2.14	
5,530.00	17.41	137.16	5,235.97	-1,248.49	1,033.28	1,620.21	0.41	-0.27	1.01	
5,624.00	17.76	136.90	5,325.57	-1,269.27	1,052.64	1,648.51	0.38	0.37	-0.28	
5,718.00	16.71	139.62	5,415.35	-1,290.03	1,071.19	1,676.31	1.41	-1.12	2.89	
5,813.00	16.71	138.74	5,506.34	-1,310.70	1,089.04	1,703.60	0.27	0.00	-0.93	
5,907.00	14.95	141.12	5,596.77	-1,330.30	1,105.57	1,729.22	2.00	-1.87	2.53	
6,002.00	12.49	144.90	5,689.06	-1,348.25	1,119.17	1,751.73	2.75	-2.59	3.98	
6,097.00	11.17	144.37	5,782.04	-1,364.13	1,130.44	1,771.18	1.39	-1.39	-0.56	
6,191.00	10.29	146.74	5,874.39	-1,378.55	1,140.35	1,788.64	1.05	-0.94	2.52	
6,286.00	10.20	138.39	5,967.88	-1,391.94	1,150.59	1,805.49	1.56	-0.09	-8.79	
6,380.00	9.50	138.04	6,060.50	-1,403.93	1,161.30	1,821.54	0.75	-0.74	-0.37	
6,475.00	9.15	136.37	6,154.24	-1,415.23	1,171.75	1,836.89	0.47	-0.37	-1.76	
6,569.00	8.53	141.82	6,247.13	-1,426.12	1,181.22	1,851.30	1.11	-0.66	5.80	
6,664.00	8.09	141.56	6,341.13	-1,436.89	1,189.73	1,865.03	0.46	-0.46	-0.27	
6,758.00	8.09	143.31	6,434.19	-1,447.38	1,197.79	1,878.26	0.26	0.00	1.86	
6,853.00	8.00	145.78	6,528.26	-1,458.20	1,205.51	1,891.53	0.38	-0.09	2.60	
6,947.00	7.83	147.89	6,621.36	-1,469.03	1,212.59	1,904.42	0.36	-0.18	2.24	
7,042.00	7.74	149.64	6,715.49	-1,480.04	1,219.26	1,917.19	0.27	-0.09	1.84	
7,137.00	7.65	151.14	6,809.63	-1,491.09	1,225.55	1,929.76	0.23	-0.09	1.58	
7,231.00	7.21	156.23	6,902.84	-1,501.97	1,230.94	1,941.64	0.84	-0.47	5.41	
7,326.00	7.83	149.38	6,997.03	-1,513.00	1,236.64	1,953.83	1.15	0.65	-7.21	
7,420.00	8.35	141.64	7,090.10	-1,523.86	1,244.14	1,967.00	1.28	0.55	-8.23	
7,515.00	8.18	139.80	7,184.11	-1,534.43	1,252.78	1,980.65	0.33	-0.18	-1.94	
7,609.00	7.47	140.94	7,277.23	-1,544.28	1,260.95	1,993.44	0.77	-0.76	1.21	
7,704.00	6.77	140.41	7,371.50	-1,553.39	1,268.41	2,005.22	0.74	-0.74	-0.56	
7,799.00	7.12	139.45	7,465.80	-1,562.18	1,275.81	2,016.70	0.39	0.37	-1.01	
7,893.00	8.71	143.49	7,558.91	-1,572.33	1,283.83	2,029.63	1.79	1.69	4.30	
7,988.00	7.47	149.55	7,652.96	-1,583.44	1,291.24	2,042.94	1.58	-1.31	6.38	

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Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Rockies-R5000.1

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
8,082.00	6.07	153.60	7,746.30	-1,593.16	1,296.55	2,053.86	1.57	-1.49	4.31
8,177.00	5.28	164.14	7,840.84	-1,601.86	1,299.97	2,062.81	1.37	-0.83	11.09
8,271.00	5.63	175.75	7,934.42	-1,610.62	1,301.50	2,070.63	1.23	0.37	12.35
8,366.00	5.72	176.19	8,028.95	-1,619.99	1,302.16	2,078.39	0.11	0.09	0.46
8,468.00	5.45	180.93	8,130.47	-1,629.90	1,302.42	2,086.33	0.52	-0.26	4.65
8,555.00	4.40	189.11	8,217.14	-1,637.33	1,301.82	2,091.78	1.45	-1.21	9.40
8,649.00	4.22	175.39	8,310.88	-1,644.34	1,301.53	2,097.10	1.11	-0.19	-14.60
8,744.00	5.01	169.07	8,405.57	-1,651.90	1,302.60	2,103.69	0.99	0.83	-6.65
8,839.00	5.10	175.48	8,500.20	-1,660.18	1,303.71	2,110.88	0.60	0.09	6.75
8,933.00	4.22	177.33	8,593.89	-1,667.80	1,304.21	2,117.16	0.95	-0.94	1.97
9,028.00	4.04	178.38	8,688.65	-1,674.63	1,304.46	2,122.68	0.21	-0.19	1.11
9,122.00	4.22	179.79	8,782.40	-1,681.40	1,304.57	2,128.06	0.22	0.19	1.50
9,217.00	5.01	183.57	8,877.09	-1,689.04	1,304.32	2,133.90	0.89	0.83	3.98
9,282.00	4.84	192.01	8,941.85	-1,694.55	1,303.58	2,137.76	1.14	-0.26	12.98
Last SDI Production MWD Survey									
9,335.00	4.84	192.01	8,994.67	-1,698.93	1,302.65	2,140.61	0.00	0.00	0.00
Projection To TD - BHL = 627443.22, 1236261.60									

Design Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
109.00	109.00	0.07	0.32	First SDI Gyro Survey
416.00	415.87	-5.51	5.18	Last SDI Gyro Survey
433.00	432.87	-5.59	5.41	First SDI MWD Survey
2,671.00	2,593.85	-419.91	331.97	Last Survey in 14 3/4" Hole
2,789.00	2,703.60	-455.72	356.38	First SDI Production MWD Survey
9,282.00	8,941.85	-1,694.55	1,303.58	Last SDI Production MWD Survey
9,335.00	8,994.67	-1,698.93	1,302.65	Projection To TD
9,335.00	8,994.67	-1,698.93	1,302.65	BHL = 627443.22, 1236261.60

Checked By: _____ Approved By: _____ Date: _____