



Caza Operating, LLC

Lea County, NM (NAD 27 NME)

Igloo 19 State

#1H

OH

Design: OH

Standard Survey Report

17 January, 2017

HOBBS OCD

SEP 20 2017

RECEIVED



www.scientificdrilling.com

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well #1H
Project:	Lea County, NM (NAD 27 NME)	TVD Reference:	KB= 27' @ 3725.00usft (Nabors 893)
Site:	Igloo 19 State	MD Reference:	KB= 27' @ 3725.00usft (Nabors 893)
Well:	#1H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Midland District

Project	Lea County, NM (NAD 27 NME)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Igloo 19 State		
Site Position:		Northing:	565,491.30 usft
From:	Map	Easting:	759,949.60 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 33' 6.525 N
		Longitude:	103° 29' 22.896 W
		Grid Convergence:	0.45 °

Well	#1H		
Well Position	+N/-S	0.00 usft	Northing: 565,491.30 usft
	+E/-W	0.00 usft	Easting: 759,949.60 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	32° 33' 6.525 N
		Longitude:	103° 29' 22.896 W
		Ground Level:	3,698.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	12/14/2016	6.78	60.55	48,347

Design	OH				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (bearing)	
	0.00	0.00	0.00	356.09	

Survey Program	Date	1/17/2017			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
186.00	15,380.00	SDI MWD #1 (OH)	MWD+HDGM	OWSG MWD + HDGM	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (bearing)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
186.00	0.38	307.87	186.00	0.38	-0.49	0.41	0.20	0.20	0.00	
368.00	0.17	295.36	368.00	0.86	-1.21	0.95	0.12	-0.12	-6.87	
556.00	0.36	275.99	555.99	1.05	-2.05	1.18	0.11	0.10	-10.30	
772.00	0.62	279.06	771.99	1.30	-3.88	1.56	0.12	0.12	1.42	
955.00	0.64	316.79	954.98	2.20	-5.55	2.58	0.22	0.01	20.62	
1,139.00	0.59	355.29	1,138.97	3.89	-6.33	4.32	0.22	-0.03	20.92	
1,327.00	0.52	350.96	1,326.96	5.70	-6.55	6.14	0.04	-0.04	-2.30	
1,517.00	0.57	334.04	1,516.95	7.40	-7.10	7.87	0.09	0.03	-8.91	
1,707.00	1.04	314.36	1,706.93	9.46	-8.74	10.03	0.28	0.25	-10.36	

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well #1H
Project:	Lea County, NM (NAD 27 NME)	TVD Reference:	KB= 27' @ 3725.00usft (Nabors 893)
Site:	Igloo 19 State	MD Reference:	KB= 27' @ 3725.00usft (Nabors 893)
Well:	#1H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Midland District

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (bearing)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
1,868.00	1.08	311.68	1,867.90	11.49	-10.92	12.21	0.04	0.02	-1.66	
1,981.00	1.18	318.31	1,980.88	13.07	-12.49	13.89	0.15	0.09	5.87	
2,172.00	0.86	342.85	2,171.85	15.90	-14.22	16.84	0.28	-0.17	12.85	
2,362.00	0.98	344.88	2,361.83	18.84	-15.07	19.82	0.07	0.06	1.07	
2,552.00	1.00	342.76	2,551.80	21.99	-15.98	23.03	0.02	0.01	-1.12	
2,742.00	0.83	342.79	2,741.77	24.89	-16.88	25.98	0.09	-0.09	0.02	
2,933.00	0.82	356.85	2,932.75	27.57	-17.36	28.69	0.11	-0.01	7.36	
3,123.00	1.46	44.18	3,122.72	30.66	-15.75	31.67	0.57	0.34	24.91	
3,312.00	1.90	47.82	3,311.64	34.50	-11.75	35.22	0.24	0.23	1.93	
3,502.00	2.34	46.58	3,501.51	39.28	-6.60	39.64	0.23	0.23	-0.65	
3,691.00	0.31	345.45	3,690.45	42.42	-3.93	42.59	1.17	-1.07	-32.34	
3,880.00	0.54	340.75	3,879.44	43.76	-4.35	43.95	0.12	0.12	-2.49	
4,069.00	0.74	291.74	4,068.43	45.05	-5.78	45.34	0.30	0.11	-25.93	
4,259.00	0.96	308.22	4,258.41	46.49	-8.17	46.94	0.17	0.12	8.67	
4,449.00	1.02	286.18	4,448.39	47.95	-11.04	48.59	0.20	0.03	-11.60	
4,639.00	0.99	249.94	4,638.36	47.86	-14.21	48.71	0.33	-0.02	-19.07	
4,829.00	1.56	248.90	4,828.31	46.36	-18.16	47.49	0.30	0.30	-0.55	
5,019.00	1.74	258.53	5,018.23	44.86	-23.40	46.35	0.17	0.09	5.07	
5,210.00	2.27	251.90	5,209.11	43.11	-29.84	45.04	0.30	0.28	-3.47	
5,399.00	1.81	228.84	5,398.00	39.98	-35.64	42.32	0.49	-0.24	-12.20	
5,589.00	1.69	229.76	5,587.91	36.19	-40.04	38.84	0.06	-0.06	0.48	
5,714.00	1.78	228.48	5,712.85	33.72	-42.90	36.56	0.08	0.07	-1.02	
5,904.00	2.11	174.61	5,902.76	28.28	-44.78	31.27	0.94	0.17	-28.35	
6,094.00	2.09	172.35	6,092.63	21.36	-43.99	24.31	0.04	-0.01	-1.19	
6,283.00	2.43	174.94	6,281.48	13.95	-43.18	16.87	0.19	0.18	1.37	
6,472.00	2.13	167.53	6,470.33	6.53	-42.07	9.39	0.22	-0.16	-3.92	
6,662.00	2.25	162.54	6,660.19	-0.47	-40.19	2.27	0.12	0.06	-2.63	
6,851.00	1.81	161.42	6,849.08	-6.84	-38.12	-4.22	0.23	-0.23	-0.59	
7,041.00	1.91	160.39	7,038.97	-12.67	-36.10	-10.17	0.06	0.05	-0.54	
7,231.00	1.68	166.43	7,228.88	-18.36	-34.39	-15.97	0.16	-0.12	3.18	
7,422.00	2.19	173.68	7,419.77	-24.71	-33.33	-22.37	0.30	0.27	3.80	
7,612.00	2.04	167.97	7,609.64	-31.62	-32.23	-29.35	0.14	-0.08	-3.01	
7,802.00	2.01	182.73	7,799.53	-38.26	-31.68	-36.01	0.27	-0.02	7.77	
7,992.00	2.00	187.26	7,989.41	-44.87	-32.26	-42.57	0.08	-0.01	2.38	
8,183.00	1.79	186.81	8,180.31	-51.14	-33.03	-48.77	0.11	-0.11	-0.24	
8,373.00	1.67	201.84	8,370.22	-56.66	-34.41	-54.18	0.25	-0.06	7.91	
8,563.00	1.61	193.78	8,560.14	-61.82	-36.08	-59.22	0.13	-0.03	-4.24	
8,753.00	1.62	204.24	8,750.07	-66.86	-37.82	-64.13	0.16	0.01	5.51	
8,943.00	1.01	221.30	8,940.02	-70.57	-40.03	-67.67	0.38	-0.32	8.98	
9,133.00	1.08	200.67	9,129.99	-73.50	-41.76	-70.48	0.20	0.04	-10.86	
9,322.00	1.47	204.92	9,318.94	-77.37	-43.41	-74.23	0.21	0.21	2.25	
9,512.00	1.68	202.27	9,508.87	-82.16	-45.50	-78.86	0.12	0.11	-1.39	
9,702.00	1.69	232.71	9,698.79	-86.43	-48.78	-82.90	0.47	0.01	16.02	
9,893.00	1.82	252.47	9,889.70	-89.05	-53.91	-85.16	0.32	0.07	10.35	

Company: Caza Operating, LLC
Project: Lea County, NM (NAD 27 NME)
Site: Igloo 19 State
Well: #1H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #1H
TVD Reference: KB= 27' @ 3725.00usft (Nabors 893)
MD Reference: KB= 27' @ 3725.00usft (Nabors 893)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Midland District

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (bearing)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
10,093.00	1.87	247.30	10,089.60	-91.27	-59.95	-86.96	0.09	0.03	-2.59	
10,188.00	1.85	254.59	10,184.55	-92.27	-62.86	-87.77	0.25	-0.02	7.67	
10,235.00	2.03	308.43	10,231.52	-91.96	-64.24	-87.36	3.75	0.38	114.55	
10,283.00	7.13	353.12	10,279.36	-88.47	-65.27	-83.81	12.21	10.63	93.10	
10,330.00	14.30	359.17	10,325.52	-79.76	-65.70	-75.09	15.42	15.26	12.87	
10,378.00	21.07	0.55	10,371.22	-65.18	-65.70	-60.55	14.13	14.10	2.88	
10,426.00	26.05	359.55	10,415.21	-46.00	-65.70	-41.41	10.41	10.38	-2.08	
10,473.00	29.51	357.24	10,456.78	-24.12	-66.34	-19.53	7.71	7.36	-4.91	
10,520.00	33.50	356.39	10,496.85	0.40	-67.72	5.02	8.54	8.49	-1.81	
10,568.00	38.16	356.00	10,535.75	28.43	-69.59	33.11	9.72	9.71	-0.81	
10,615.00	41.03	356.08	10,571.97	58.31	-71.66	63.06	6.11	6.11	0.17	
10,663.00	44.00	356.95	10,607.34	90.68	-73.62	95.50	6.31	6.19	1.81	
10,710.00	47.82	357.55	10,640.04	124.40	-75.23	129.24	8.18	8.13	1.28	
10,718.07	48.64	357.51	10,645.42	130.41	-75.49	135.26	10.15	10.15	-0.44	
Production Entrance (10718' MD)										
10,758.00	52.69	357.35	10,670.72	161.26	-76.88	166.13	10.15	10.15	-0.41	
10,805.00	56.58	356.08	10,697.92	199.51	-79.08	204.44	8.56	8.28	-2.70	
10,853.00	60.42	355.65	10,722.99	240.32	-82.04	245.36	8.04	8.00	-0.90	
10,900.00	64.61	355.90	10,744.68	281.90	-85.11	287.05	8.93	8.91	0.53	
10,947.00	68.42	356.92	10,763.41	324.91	-87.80	330.14	8.35	8.11	2.17	
10,994.00	71.21	358.00	10,779.62	368.98	-89.75	374.24	6.32	5.94	2.30	
11,042.00	74.10	358.49	10,793.93	414.77	-91.15	420.02	6.10	6.02	1.02	
11,089.00	77.92	358.53	10,805.29	460.35	-92.34	465.58	8.13	8.13	0.09	
11,137.00	81.38	357.77	10,813.92	507.54	-93.86	512.76	7.37	7.21	-1.58	
11,184.00	84.22	357.36	10,819.81	554.12	-95.84	559.37	6.10	6.04	-0.87	
11,232.00	88.32	357.24	10,822.93	601.95	-98.10	607.24	8.55	8.54	-0.25	
11,327.00	89.26	355.87	10,824.93	696.76	-103.81	702.22	1.75	0.99	-1.44	
11,421.00	90.74	355.32	10,824.93	790.48	-111.03	796.21	1.68	1.57	-0.59	
11,516.00	90.87	354.45	10,823.60	885.09	-119.50	891.18	0.93	0.14	-0.92	
11,611.00	92.79	355.02	10,820.57	979.63	-128.21	986.10	2.11	2.02	0.60	
11,706.00	93.63	355.17	10,815.25	1,074.14	-136.32	1,080.93	0.90	0.88	0.16	
11,801.00	93.76	356.87	10,809.12	1,168.71	-142.90	1,175.73	1.79	0.14	1.79	
11,896.00	93.29	357.75	10,803.28	1,263.42	-147.35	1,270.53	1.05	-0.49	0.93	
11,991.00	92.21	356.94	10,798.72	1,358.21	-151.74	1,365.40	1.42	-1.14	-0.85	
12,086.00	90.84	356.64	10,796.20	1,453.02	-157.06	1,460.35	1.48	-1.44	-0.32	
12,181.00	91.91	356.49	10,793.92	1,547.82	-162.75	1,555.32	1.14	1.13	-0.16	
12,276.00	91.04	356.37	10,791.47	1,642.61	-168.67	1,650.29	0.92	-0.92	-0.13	
12,372.00	91.78	355.53	10,789.11	1,738.34	-175.44	1,746.26	1.17	0.77	-0.88	
12,467.00	91.61	355.22	10,786.30	1,832.99	-183.10	1,841.21	0.37	-0.18	-0.33	
12,562.00	90.34	356.25	10,784.68	1,927.71	-190.16	1,936.19	1.72	-1.34	1.08	
12,657.00	92.45	355.50	10,782.37	2,022.43	-197.00	2,031.15	2.36	2.22	-0.79	
12,752.00	92.69	356.24	10,778.11	2,117.08	-203.83	2,126.06	0.82	0.25	0.78	
12,846.00	91.11	357.34	10,774.99	2,210.88	-209.09	2,219.99	2.05	-1.68	1.17	

Company: Caza Operating, LLC
Project: Lea County, NM (NAD 27 NME)
Site: Igloo 19 State
Well: #1H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #1H
TVD Reference: KB= 27' @ 3725.00usft (Nabors 893)
MD Reference: KB= 27' @ 3725.00usft (Nabors 893)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Midland District

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (bearing)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
12,941.00	91.07	355.57	10,773.19	2,305.68	-214.96	2,314.97	1.86	-0.04	-1.86	
13,036.00	91.88	355.58	10,770.74	2,400.36	-222.29	2,409.93	0.85	0.85	0.01	
13,131.00	90.24	355.88	10,768.98	2,495.08	-229.36	2,504.91	1.75	-1.73	0.32	
13,225.00	90.70	357.87	10,768.21	2,588.93	-234.49	2,598.90	2.17	0.49	2.12	
13,320.00	91.58	357.85	10,766.32	2,683.84	-238.03	2,693.83	0.93	0.93	-0.02	
13,415.00	90.67	358.60	10,764.46	2,778.78	-240.97	2,788.74	1.24	-0.96	0.79	
13,510.00	89.53	358.80	10,764.29	2,873.75	-243.13	2,883.64	1.22	-1.20	0.21	
13,605.00	90.47	357.05	10,764.29	2,968.68	-246.57	2,978.59	2.09	0.99	-1.84	
13,700.00	89.76	358.04	10,764.10	3,063.60	-250.64	3,073.56	1.28	-0.75	1.04	
13,795.00	90.91	358.34	10,763.55	3,158.54	-253.64	3,168.49	1.25	1.21	0.32	
13,890.00	91.14	359.37	10,761.85	3,253.51	-255.54	3,263.36	1.11	0.24	1.08	
13,984.00	90.24	359.35	10,760.71	3,347.50	-256.59	3,357.20	0.96	-0.96	-0.02	
14,080.00	89.19	0.14	10,761.19	3,443.49	-257.01	3,453.00	1.37	-1.09	0.82	
14,174.00	91.34	358.74	10,760.76	3,537.48	-257.93	3,546.83	2.73	2.29	-1.49	
14,269.00	90.13	358.13	10,759.54	3,632.43	-260.53	3,641.74	1.43	-1.27	-0.64	
14,364.00	89.23	358.07	10,760.07	3,727.38	-263.68	3,736.68	0.95	-0.95	-0.06	
14,459.00	87.75	357.09	10,762.57	3,822.26	-267.69	3,831.61	1.87	-1.56	-1.03	
14,553.00	89.20	356.81	10,765.07	3,916.09	-272.69	3,925.57	1.57	1.54	-0.30	
14,647.00	88.92	356.56	10,766.62	4,009.92	-278.12	4,019.55	0.40	-0.30	-0.27	
14,741.00	89.87	357.70	10,767.61	4,103.79	-282.83	4,113.53	1.58	1.01	1.21	
14,836.00	88.86	357.65	10,768.66	4,198.71	-286.68	4,208.48	1.06	-1.06	-0.05	
14,930.00	90.67	356.72	10,769.05	4,292.59	-291.30	4,302.46	2.16	1.93	-0.99	
15,024.00	89.63	356.59	10,768.80	4,386.43	-296.78	4,396.45	1.11	-1.11	-0.14	
15,118.00	91.31	355.78	10,768.03	4,480.21	-303.04	4,490.45	1.98	1.79	-0.86	
15,212.00	89.30	356.34	10,767.53	4,573.98	-309.49	4,584.44	2.22	-2.14	0.60	
15,307.00	88.42	356.57	10,769.42	4,668.78	-315.37	4,679.42	0.96	-0.93	0.24	
Final MWD Survey (15307.00' MD)										
15,380.00	88.42	356.57	10,771.43	4,741.62	-319.73	4,752.39	0.00	0.00	0.00	
Final Projection to Bit (15380.00' MD)										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
10,718.07	10,645.42	130.41	-75.49	Production Entrance (10718' MD)	
15,307.00	10,769.42	4,668.78	-315.37	Final MWD Survey (15307.00' MD)	
15,380.00	10,771.43	4,741.62	-319.73	Final Projection to Bit (15380.00' MD)	

Checked By: _____ Approved By: _____ Date: _____

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