

DEC 21 2015

Cathedral Energy Services

Survey Report

Company:	OXY USA PERMIAN EOR	Local Co-ordinate Reference:	Well SHU (G/SA) 257
Project:	HOBBS, SOUTH	TVD Reference:	Original KB @ 3627.3usft (H&P 340 - KB - 16.5)
Site:	SOUTH HOBBS GRAYBURG-SA UNIT	MD Reference:	Original KB @ 3627.3usft (H&P 340 - KB - 16.5)
Well:	SHU (G/SA) 257	North Reference:	Grid
Wellbore:	ST00	Survey Calculation Method:	Minimum Curvature
Design:	Final	Database:	USA EDM 5000 Multi Users DB

Project	HOBBS, SOUTH, North America, HOBBS, SOUTH - ALTURA HOBBS-OP		
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		Using geodetic scale factor

Site	SOUTH HOBBS GRAYBURG-SA UNIT				
Site Position:		Northing:	617,518.60 usft	Latitude:	32.692216
From:	Map	Easting:	859,408.09 usft	Longitude:	-103.165105
Position Uncertainty:	1.0 usft	Slot Radius:	600"	Grid Convergence:	0.63 °

Well	SHU (G/SA) 257					
Well Position	+N/-S	0.0 usft	Northing:	616,052.68 usft	Latitude:	32.688011
	+E/-W	0.0 usft	Easting:	865,214.97 usft	Longitude:	-103.146287
Position Uncertainty	1.0 usft		Wellhead Elevation:	3,610.8 usft	Ground Level:	3,610.8 usft

Wellbore	ST00				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	3/26/2015	6.95	60.59	48,559

Design	Final				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	324.66	

Survey Program	Date	9/13/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
140.0	5,016.0	Survey #1 (ST00)	MWD+HDGM+AX+SAG_B0(	OWSG MWD + HDGM + Axial Corr + Sag Correction	

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100us)	Formations / Comments
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
140.0	0.70	182.00	140.0	-0.9	0.0	-0.7	0.50	0.50	
291.0	0.80	187.40	291.0	-2.8	-0.2	-2.2	0.08	0.07	
443.0	0.70	195.60	443.0	-4.8	-0.6	-3.6	0.10	-0.07	
623.0	0.80	197.60	623.0	-7.0	-1.3	-5.0	0.06	0.06	
803.0	2.00	293.60	802.9	-7.0	-4.5	-3.1	1.24	0.67	
982.0	5.80	317.80	981.5	1.0	-13.5	8.6	2.27	2.12	
1,162.0	9.00	320.20	1,160.0	18.5	-28.6	31.7	1.79	1.78	
1,342.0	10.90	326.50	1,337.2	43.6	-47.0	62.7	1.22	1.06	
1,530.0	12.50	323.20	1,521.3	74.7	-69.0	100.8	0.92	0.85	
1,610.0	11.80	322.40	1,599.5	88.1	-79.2	117.7	0.90	-0.87	
1,790.0	17.30	327.10	1,773.7	125.2	-105.0	162.8	3.12	3.06	
1,969.0	23.00	325.60	1,941.7	176.4	-139.2	224.4	3.20	3.18	

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Site: SOUTH HOBBS GRAYBURG-SA UNIT
Well: SHU (G/SA) 257
Wellbore: ST00
Design: Final

Local Co-ordinate Reference: Well SHU (G/SA) 257
TVD Reference: Original KB @ 3627.3usft (H&P 340 - KB - 16.5)
MD Reference: Original KB @ 3627.3usft (H&P 340 - KB - 16.5)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: USA EDM 5000 Multi Users DB

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100us)	Formations / Comments
2,149.0	26.40	325.20	2,105.2	238.3	-181.9	299.6	1.89	1.89	
2,329.0	29.70	325.80	2,264.0	308.1	-229.8	384.2	1.84	1.83	
2,509.0	30.70	327.30	2,419.6	383.6	-279.7	474.7	0.70	0.56	
2,689.0	31.20	328.20	2,574.0	461.9	-329.1	567.2	0.38	0.28	
2,868.0	36.00	325.50	2,723.0	544.7	-383.4	666.1	2.81	2.68	
3,048.0	40.00	324.80	2,864.8	635.6	-446.7	776.9	2.24	2.22	
3,228.0	39.20	323.80	3,003.5	728.8	-513.7	891.6	0.57	-0.44	
3,408.0	37.00	323.80	3,145.2	818.4	-579.3	1,002.7	1.22	-1.22	
3,588.0	38.80	322.80	3,287.2	907.1	-645.3	1,113.2	1.06	1.00	
3,768.0	37.90	325.10	3,428.4	997.3	-711.1	1,224.9	0.94	-0.50	
3,948.0	41.00	327.10	3,567.4	1,092.3	-774.8	1,339.2	1.86	1.72	
4,128.0	41.20	326.70	3,703.0	1,191.4	-839.4	1,457.4	0.18	0.11	
4,308.0	39.70	325.80	3,840.0	1,288.5	-904.3	1,574.1	0.89	-0.83	
4,488.0	32.80	326.10	3,985.0	1,376.6	-963.9	1,680.5	3.83	-3.83	
4,667.0	33.80	326.40	4,134.6	1,458.3	-1,018.5	1,778.7	0.57	0.56	
4,847.0	35.80	327.50	4,282.4	1,544.5	-1,074.5	1,881.4	1.16	1.11	
4,947.0	37.10	327.60	4,362.9	1,594.6	-1,106.3	1,940.7	1.30	1.30	Last CES Survey @ 4947' MD
5,016.0	37.10	327.60	4,417.9	1,629.7	-1,128.6	1,982.3	0.00	0.00	PTB @ 5016' MD

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Targets									
Target Name	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)		
- Shape									
SHU (G/SA) 257 BHL T	0.00	0.00	4,007.0	1,473.2	-1,044.7	617,525.97	864,170.19	32.692092	-103.149628
- survey misses target center by 94.0usft at 4575.1usft MD (4058.1 TVD, 1416.1 N, -990.3 E)									
- Circle (radius 100.0)									

Formations						
Measured Depth	Vertical Depth	Name	Lithology	Dip	Dip Direction	
(usft)	(usft)			(°)	(°)	
197.3	197.3	Red Beds				
1,561.7	1,552.3	RustleR				
1,664.1	1,652.3	Top Salt				
2,842.5	2,702.3	Base Salt				
3,766.6	3,427.3	Queen				
4,160.2	3,727.3	Grayburg				
4,405.9	3,917.3	Basal Grayburg				
4,514.5	4,007.3	San Andres				

Survey Annotations				
Measured Depth	Vertical Depth	Local Coordinates		Comment
(usft)	(usft)	+N/-S (usft)	+E/-W (usft)	
4,947.0	4,362.9	1,594.6	-1,106.3	Last CES Survey @ 4947' MD
5,016.0	4,417.9	1,629.7	-1,128.6	PTB @ 5016' MD

Checked By: _____	Approved By: _____	Date: _____
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