

30-015-38246

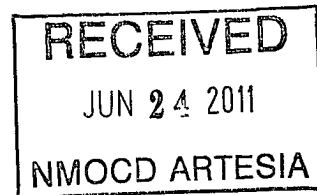
COG OPERATING

Willow Lake
Eddy County, NM
Boyles 24 #1H
VH - Job #32K1210958

Survey: Actual

SDI Standard Survey Report

08 December, 2010



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

Richardson

Notorized this date 29th of December, 2010.

Carrie Reed

Notary Signature
County of Midland
State of Texas



Scientific Drilling International, Inc.
SDI Standard Survey Report

Company:	COG OPERATING	Local Co-ordinate Reference:	Well Boyles 24 #1H
Project:	Willow Lake	TVD Reference:	WELL @ 0.0usft (Original Well Elev)
Site:	Eddy County, NM	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Boyles 24 #1H	North Reference:	Grid
Wellbore:	VH - Job #32K1210958	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K1210958	Database:	EDM-Regulatory

Project	Willow Lake		
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	Eddy County, NM		
Site Position:		Northing:	403,498.21 usft
From:	Lat/Long	Easting:	589,895.33 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"
		Latitude:	32° 6' 32.400 N
		Longitude:	104° 2' 34.800 W
		Grid Convergence:	0.15 °

Well	Boyles 24 #1H, Directional (DDC)		
Well Position	+N/-S	0.0 usft	Northing: 403,498.21 usft
	+E/-W	0.0 usft	Easting: 589,895.33 usft
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32° 6' 32.400 N
		Longitude:	104° 2' 34.800 W
		Ground Level:	0.0 usft

Wellbore	VH - Job #32K1210958				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
			(°)	(°)	(nT)
	BGGM2010	12/7/2010	7.91	60.01	48,602

Design	VH - Job #32K1210958			
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction
	(usft)	(usft)	(usft)	(°)
	0.0	0.0	0.0	359.50

Survey Program	Date	12/8/2010		
From	To	Survey (Wellbore)	Tool Name	Description
(usft)	(usft)			
100.0	6,500.0	Actual (VH - Job #32K1210958)	Keeper	Keeper Gyro

Survey								
Measured Depth	Inclination	Azimuth	True Vertical	North/South	East/West	Closure Azimuth	Closure Distance	
(usft)	(°)	(°)	Depth	(usft)	(usft)	(°)	(usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.0	
100.0	0.46	218.63	100.0	-0.3	-0.3	218.63	0.4	
200.0	0.32	200.55	200.0	-0.9	-0.6	213.99	1.1	
300.0	0.48	210.83	300.0	-1.5	-0.9	211.13	1.8	
400.0	0.36	204.19	400.0	-2.2	-1.3	210.21	2.5	
500.0	0.28	194.40	500.0	-2.7	-1.4	208.34	3.0	
600.0	0.31	214.60	600.0	-3.1	-1.7	207.86	3.6	
700.0	0.88	219.45	700.0	-4.0	-2.3	210.19	4.6	
800.0	0.83	220.66	800.0	-5.1	-3.3	212.61	6.1	
900.0	0.88	225.06	900.0	-6.2	-4.3	214.64	7.5	
1,000.0	1.00	218.91	999.9	-7.4	-5.4	215.92	9.1	
1,100.0	0.73	210.92	1,099.9	-8.6	-6.2	215.87	10.7	

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Wellbore:	VH - Job #32K1210958	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K1210958	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
1,200.0	0.71	214.69	1,199.9	-9.7	-6.9	215.54	11.9
1,300.0	0.44	200.33	1,299.9	-10.6	-7.4	215.05	12.9
1,400.0	0.37	236.65	1,399.9	-11.1	-7.8	215.14	13.6
1,500.0	0.48	247.91	1,499.9	-11.4	-8.5	216.53	14.2
1,600.0	0.45	247.26	1,599.9	-11.7	-9.2	218.14	14.9
1,700.0	0.30	248.25	1,699.9	-12.0	-9.8	219.33	15.5
1,800.0	0.26	232.46	1,799.9	-12.2	-10.2	219.97	16.0
1,900.0	0.94	91.69	1,899.9	-12.4	-9.6	217.80	15.7
2,000.0	2.28	100.49	1,999.9	-12.8	-6.8	208.14	14.5
2,100.0	2.43	110.39	2,099.8	-13.9	-2.9	191.76	14.2
2,200.0	3.31	109.05	2,199.7	-15.6	1.8	173.31	15.7
2,300.0	3.38	108.26	2,299.5	-17.4	7.4	157.12	18.9
2,400.0	3.41	108.05	2,399.3	-19.3	13.0	146.03	23.2
2,500.0	2.24	122.42	2,499.2	-21.2	17.5	140.58	27.5
2,600.0	1.39	134.87	2,599.1	-23.1	20.0	139.21	30.6
2,700.0	1.26	127.08	2,699.1	-24.7	21.7	138.65	32.9
2,800.0	1.16	129.35	2,799.1	-26.0	23.4	138.02	34.9
2,900.0	1.12	134.99	2,899.1	-27.3	24.8	137.70	36.9
3,000.0	1.11	133.42	2,999.0	-28.7	26.2	137.52	38.8
3,100.0	0.92	138.22	3,099.0	-29.9	27.5	137.44	40.6
3,200.0	0.68	135.98	3,199.0	-30.9	28.4	137.44	42.0
3,300.0	0.67	135.79	3,299.0	-31.8	29.2	137.39	43.2
3,400.0	0.68	136.61	3,399.0	-32.6	30.1	137.36	44.4
3,500.0	0.54	145.44	3,499.0	-33.5	30.7	137.43	45.4
3,600.0	0.53	151.21	3,599.0	-34.3	31.2	137.65	46.3
3,700.0	0.30	161.08	3,699.0	-34.9	31.5	137.91	47.0
3,800.0	0.31	204.67	3,799.0	-35.4	31.5	138.34	47.4
3,900.0	0.41	188.43	3,899.0	-36.0	31.3	138.96	47.7
4,000.0	0.33	146.77	3,999.0	-36.6	31.4	139.33	48.2
4,100.0	0.12	185.91	4,099.0	-36.9	31.6	139.47	48.6
4,200.0	0.29	195.40	4,199.0	-37.3	31.5	139.80	48.8
4,300.0	0.42	195.23	4,299.0	-37.9	31.3	140.40	49.2
4,400.0	0.55	180.35	4,399.0	-38.7	31.2	141.10	49.8
4,500.0	0.33	188.00	4,499.0	-39.5	31.2	141.68	50.3
4,600.0	0.42	211.43	4,599.0	-40.1	31.0	142.31	50.7
4,700.0	0.66	231.31	4,699.0	-40.8	30.3	143.34	50.8
4,800.0	0.73	214.71	4,799.0	-41.6	29.5	144.67	51.0
4,900.0	0.84	229.60	4,899.0	-42.6	28.6	146.15	51.3
5,000.0	1.07	222.23	4,998.9	-43.8	27.4	147.96	51.7
5,100.0	0.94	210.95	5,098.9	-45.2	26.4	149.75	52.3
5,200.0	1.00	214.31	5,198.9	-46.6	25.4	151.37	53.1
5,300.0	1.21	207.16	5,298.9	-48.3	24.5	153.12	54.1
5,400.0	1.23	201.80	5,398.9	-50.2	23.6	154.83	55.5
5,500.0	1.26	183.56	5,498.9	-52.3	23.1	156.15	57.2

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Site:	Eddy County, NM	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Boyles 24 #1H	North Reference:	Grid
Wellbore:	VH - Job #32K1210958	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K1210958	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
5,600.0	1.02	197.76	5,598.8	-54.3	22.8	157.22	58.8
5,700.0	0.98	197.59	5,698.8	-55.9	22.3	158.30	60.2
5,800.0	1.05	192.76	5,798.8	-57.6	21.8	159.28	61.6
5,900.0	1.17	176.01	5,898.8	-59.5	21.7	160.00	63.4
6,000.0	1.02	177.97	5,998.8	-61.4	21.8	160.49	65.2
6,100.0	1.14	173.08	6,098.7	-63.3	21.9	160.91	67.0
6,200.0	1.38	182.84	6,198.7	-65.5	22.0	161.45	69.1
6,300.0	1.65	174.06	6,298.7	-68.2	22.1	162.06	71.6
6,400.0	1.83	150.74	6,398.6	-71.0	23.0	162.05	74.6
6,500.0	1.91	136.58	6,498.6	-73.6	24.9	161.29	77.7



Project: Willow Lake
Eddy County, NM
Well: Boyles 24 #1H
Wellbore: VH - Job #32K1210958
Design: VH - Job #32K1210958

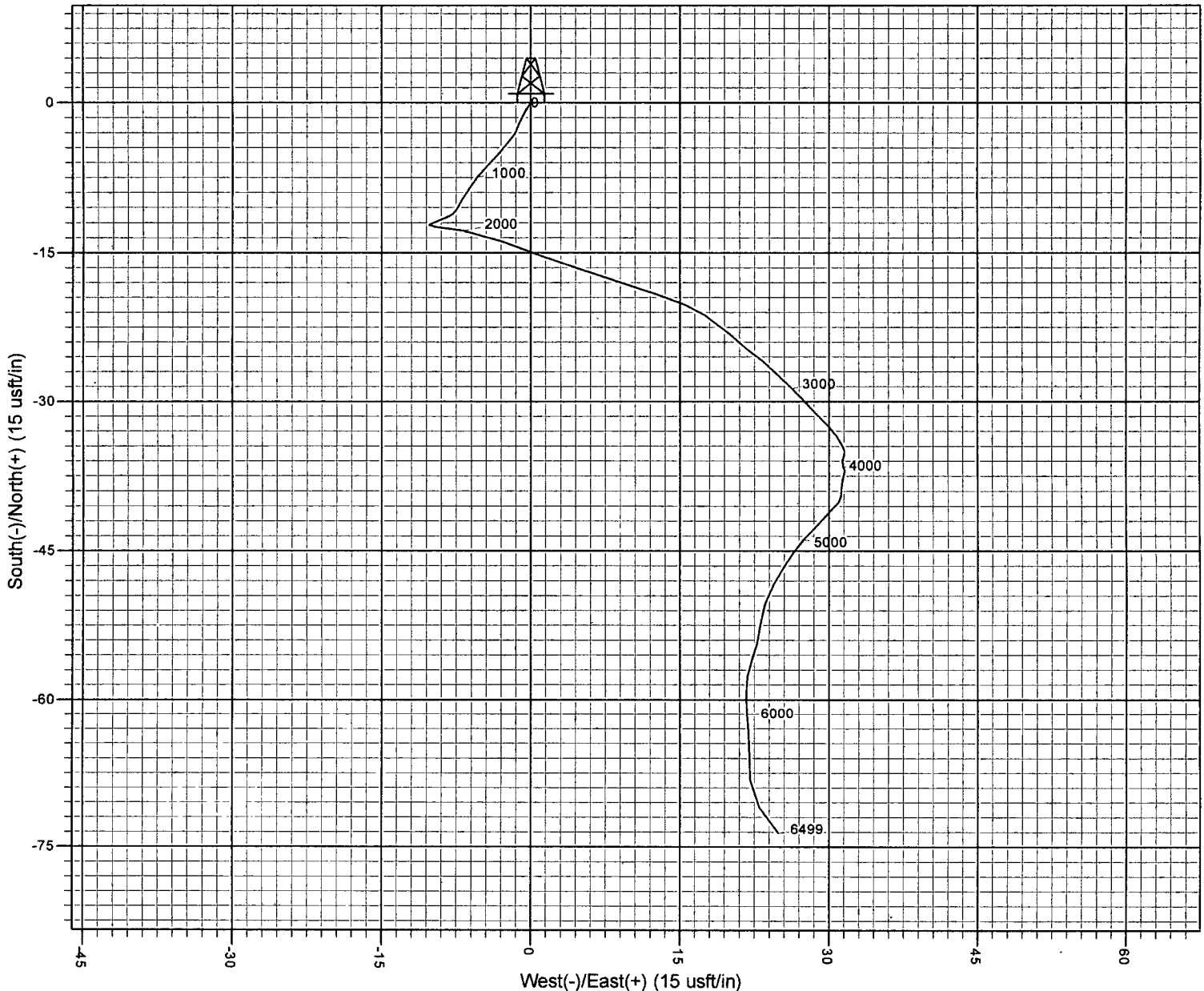


Azimuths to Grid North
True North: -0.15°
Magnetic North: 7.76°

Magnetic Field
Strength: 48602.2 nT
Dip Angle: 60.01°
Date: 12/7/2010
Model: BGGM2010

WELL DETAILS: Boyles 24 #1H
WELL @ 0.0usft (Original Well Elev)
Ground Level: 0.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	403498.21	589895.33	$32^\circ 6' 32.400\text{ N}$	$104^\circ 2' 34.800\text{ W}$	



PROJECT DETAILS: Willow Lake
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level

SITE DETAILS: Eddy County, NM
Site Centre Latitude: $32^\circ 6' 32.400\text{ N}$
Longitude: $104^\circ 2' 34.800\text{ W}$
Positional Uncertainty: 0.0
Convergence: 0.15
Local North: Grid