

30-015-29609

COG OPERATING

Fren
Eddy County, NM
Willow State #6
VH - Job #32K0411353

RECEIVED

JUN 15 2011

NMOCD ARTESIA

Survey: Actual

SDI Standard Survey Report

13 May, 2011

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

[Signature]

Notarized this date 17th of May, 2011.

[Signature]

Notary Signature
County of Midland
State of Texas



Scientific Drilling
Directional Drilling Operations

Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Willow State #6
Project:	Fren	TVD Reference:	WELL @ 0.0usft (Original Well Elev)
Site:	Eddy County, NM	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Willow State #6	North Reference:	Grid
Wellbore:	VH - Job #32K0411353	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0411353	Database:	EDM-Regulatory

Project	Fren		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico Central 3002		

Site		Eddy County, NM			
Site Position:		Northing:	675,503.50 usft	Latitude:	32° 50' 2.400 N
From:	Lat/Long	Easting:	1,237,871.91 usft	Longitude:	103° 50' 52.800 W
Position Uncertainty:	0.0 usft	Slot Radius:	0"	Grid Convergence:	1.30 °

Well	Willow State #6, Vertical					
Well Position	+N/-S	0 0 usft	Northing:	673,915 51 usft	Latitude:	32° 49' 48 000 N
	+E/-W	0 0 usft	Easting:	1,232,066 73 usft	Longitude:	103° 52' 1 200 W
Position Uncertainty		0 0 usft	Wellhead Elevation:	usft	Ground Level:	0 0 usft

Wellbore	VH - Job #32K0411353				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	4/19/2011	7.79	60.70	48,991

Design		VH - Job #32K0411353		
Audit Notes:				
Version:	1 0	Phase:	ACTUAL	Tie On Depth:
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0 0	0 0	0 0	172 22

Survey Program		Date	5/13/2011		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	6,503.0	Actual (VH - Job #32K0411353)	Keeper	Keeper Gyro	

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.0
100.0	0.35	128.19	100.0	-0.2	0.2	128.19	0.3
200.0	0.36	146.92	200.0	-0.6	0.7	134.53	0.9
300.0	0.30	161.06	300.0	-1.2	0.9	141.75	1.5
400.0	0.19	138.36	400.0	-1.5	1.1	144.09	1.9
500.0	0.15	89.71	500.0	-1.6	1.3	140.77	2.1
600.0	0.23	51.94	600.0	-1.5	1.6	132.99	2.2
700.0	0.35	36.50	700.0	-1.2	2.0	120.30	2.3
800.0	0.42	50.75	800.0	-0.7	2.4	105.48	2.5
900.0	0.68	63.89	900.0	-0.2	3.3	93.21	3.3
1,000.0	0.72	76.19	1,000.0	0.2	4.4	87.02	4.4
1,100.0	1.14	70.88	1,100.0	0.7	5.9	83.25	6.0

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Wellbore:	VH - Job #32K0411353	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0411353	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	1 34	67 95	1,199 9	1 5	8 0	79 56	8 1
1,300 0	1 48	61 39	1,299 9	2 5	10 2	76 07	10 5
1,400 0	1 79	61 03	1,399 9	3 9	12 7	72 91	13 3
1,500 0	1 93	53 90	1,499 8	5 7	15 4	69 87	16 4
1,600 0	1 95	52 16	1,599 8	7 7	18 1	67 02	19 7
1,700 0	1 89	54 07	1,699 7	9 7	20 8	65 00	22 9
1,800 0	1 73	57 65	1,799 7	11 5	23 4	63 89	26 1
1,900 0	1 37	57 45	1,899 6	12 9	25 7	63 30	28 8
2,000 0	1 12	59 85	1,999 6	14 1	27 5	62 96	30 9
2,100 0	0 76	60 17	2,099 6	14 9	29 0	62 81	32 6
2,200 0	0 61	68 90	2,199 6	15 4	30 0	62 86	33 8
2,300 0	0 34	97 82	2,299 6	15 6	30 8	63 23	34 5
2,400 0	0 53	189 63	2,399 6	15 1	31 0	64 13	34 5
2,500 0	0 65	206 39	2,499 6	14 1	30 7	65 36	33 8
2,600 0	0 99	208 79	2,599 6	12 8	30 0	66 89	32 7
2,700 0	1 12	191 22	2,699 5	11 1	29 4	69 33	31 5
2,800 0	1 44	192 59	2,799 5	8 9	29 0	72 88	30 3
2,900 0	1 68	186 88	2,899 5	6 2	28 5	77 66	29 2
3,000 0	1 75	191 99	2,999 4	3 3	28 0	83 30	28 2
3,100 0	1 98	189 41	3,099 4	0 1	27 4	89 80	27 4
3,200 0	2 26	191 68	3,199 3	-3 5	26 8	97 53	27 0
3,300 0	2 36	189 02	3,299 2	-7 5	26 0	106 08	27 1
3,400 0	2 48	187 61	3,399 1	-11 7	25 4	114 68	28 0
3,500 0	2 82	187 98	3,499 0	-16 3	24 8	123 26	29 7
3,600 0	2 90	180 74	3,598 9	-21 2	24 4	131 00	32 4
3,700 0	2 84	181 41	3,698 8	-26 2	24 3	137 16	35 8
3,800 0	3 02	180 08	3,798 6	-31 3	24 3	142 26	39 6
3,900 0	3 12	184 91	3,898 5	-36 7	24 0	146 78	43 9
4,000 0	3 15	181 34	3,998 4	-42 1	23 7	150 62	48 4
4,100 0	3 20	181 14	4,098 2	-47 7	23 6	153 66	53 2
4,200 0	2 95	180 42	4,198 1	-53 0	23 5	156 08	58 0
4,300 0	2 92	182 76	4,297 9	-58 2	23 4	158 09	62 7
4,400 0	2 98	179 93	4,397 8	-63 3	23 3	159 82	67 5
4,500 0	2 98	178 69	4,497 7	-68 5	23 3	161 19	72 4
4,600 0	2 72	177 74	4,597 5	-73 5	23 5	162 27	77 1
4,700 0	2 89	176 95	4,697 4	-78 4	23 7	163 16	81 9
4,800 0	2 75	178 95	4,797 3	-83 3	23 9	163 99	86 6
4,900 0	2 85	179 48	4,897 2	-88 2	24 0	164 80	91 4
5,000 0	2 62	179 90	4,997 1	-92 9	24 0	165 53	96 0
5,100 0	2 73	183 94	5,097 0	-97 6	23 8	166 28	100 5
5,200 0	2 68	179 19	5,196 8	-102 3	23 7	166 96	105 0
5,300 0	2 81	177 13	5,296 7	-107 1	23 9	167 44	109 7
5,400 0	2 73	178 25	5,396 6	-111 9	24 0	167 87	114 5
5,500 0	2 13	182 80	5,496 5	-116 2	24 0	168 31	118 6

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Wellbore:	VH - Job #32K0411353	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0411353	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	2.27	188.21	5,596.4	-120.0	23.7	168.85	122.3	
5,700.0	1.92	188.21	5,696.4	-123.6	23.1	169.40	125.7	
5,800.0	2.05	187.04	5,796.3	-127.0	22.7	169.88	129.0	
5,900.0	2.01	182.86	5,896.3	-130.6	22.4	170.28	132.5	
6,000.0	2.12	181.54	5,996.2	-134.2	22.2	170.59	136.0	
6,100.0	2.20	184.86	6,096.1	-137.9	22.0	170.93	139.7	
6,200.0	2.07	188.00	6,196.1	-141.6	21.6	171.33	143.3	
6,300.0	1.70	185.85	6,296.0	-144.9	21.2	171.67	146.4	
6,400.0	1.39	190.20	6,396.0	-147.6	20.8	171.96	149.0	
6,500.0	1.32	186.47	6,495.9	-149.9	20.5	172.21	151.3	
6,503.0	1.31	185.50	6,498.9	-150.0	20.5	172.22	151.4	



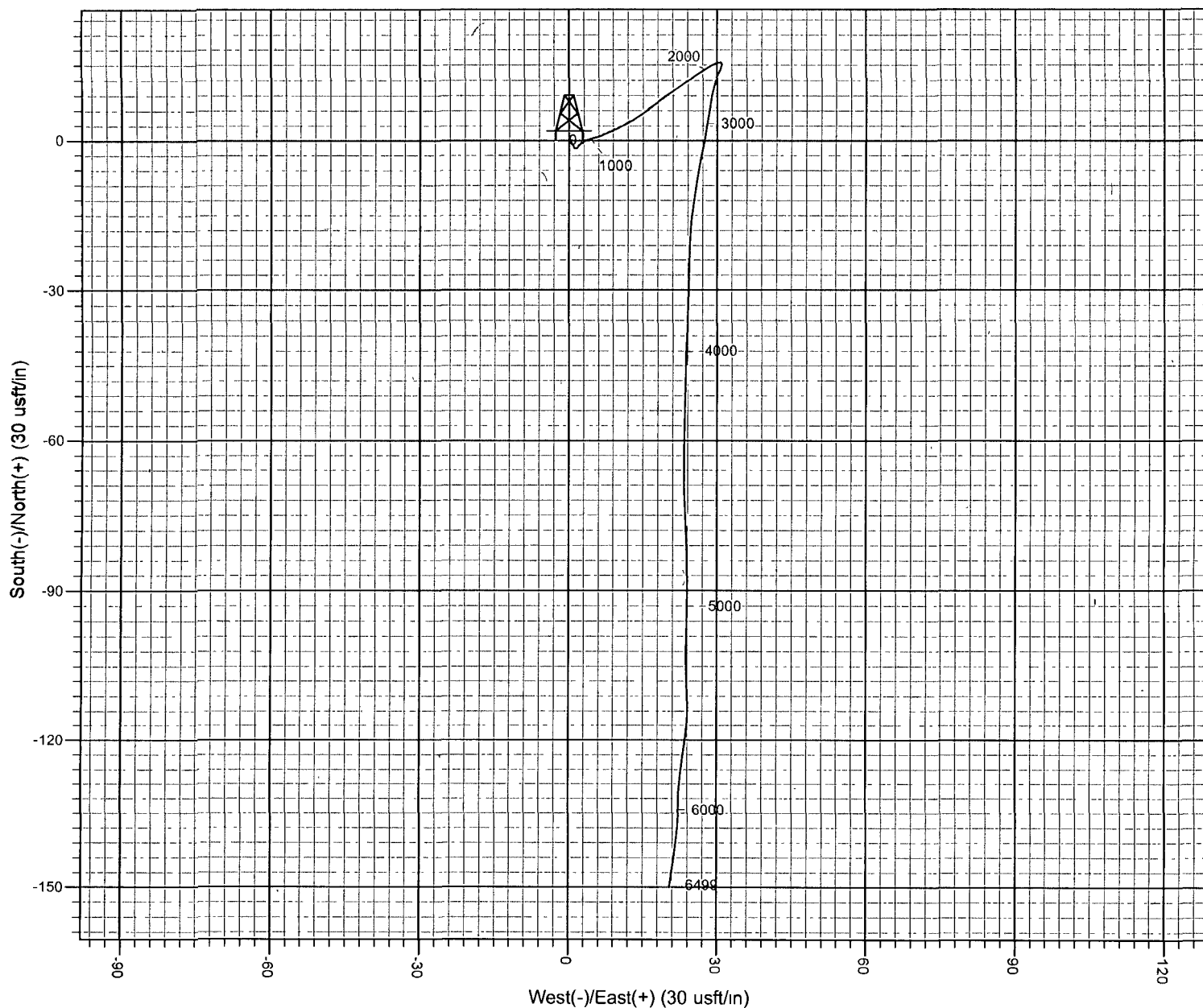
Project: Fren
 Eddy County, NM
 Well: Willow State #6
 Wellbore: VH - Job #32K0411353
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Azimuths to Grid North
 True North -1 29°
 Magnetic North 6 50°
 Magnetic Field
 Strength 48990 6snT
 Dip Angle 60 70°
 Date 4/19/2011
 Model IGRF2010

WELL DETAILS: Willow State #6
 WELL @ 0.0usft (Original Well Elev)
 Ground Level: 0.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	673915.51	1232066.73	32° 49' 48.000 N	103° 52' 1.200 W	



PROJECT DETAILS Fren
 Geodetic System: US State Plane 1927 (Exact solution)
 Datum: NAD 1927 (NADCON CONUS)
 Ellipsoid: Clarke 1866
 Zone: New Mexico Central 3002
 System Datum: Mean Sea Level

SITE DETAILS: Eddy County, NM
 Site Centre Latitude: 32° 50' 2.400 N
 Longitude: 103° 50' 52.800 W
 Positional Uncertainty: 0.0
 Convergence: 1.30
 Local North: Grid