

# Noble Energy

Garfield County, CO (NAD 83)  
Sec. 8-T8S-R95W (SGV 8D PAD)  
SGV Federal 7-41A - A 4

Plan #2

Design: Vaughn Gyro and Sperry MWD Survey

## Sperry Drilling Services

### Final Survey Report

04 March, 2011

Well Coordinates: 1,573,839.81 N, 2,286,011.11 E (39° 22' 54.09" N, 108° 01' 34.68" W)  
Ground Level: 6,341.70 ft

Local Coordinate Origin:	Centered on Well SGV Federal 7-41A - Slot A 4
Viewing Datum:	RKB 24' @ 6365.70ft (H&P 322)
TVDs to System:	N
North Reference:	Grid
Unit System:	API - US Survey Feet - Custom

Geodetic Scale Factor Applied  
Version: 2003.16 Build: 43I

**HALLIBURTON**

## Design Report for SGV Federal 7-41A - Vaughn Gyro and Sperry MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120.00	1.21	260.30	119.99	-0.21	-1.25	0.67	1.01
<b>Surveys from 120.00ft to 550.00ft are Vaughn Gyro Surveys</b>							
182.00	2.73	292.28	181.95	0.24	-3.26	2.34	2.94
275.00	2.82	323.56	274.85	2.92	-6.67	6.60	1.61
367.00	2.84	321.16	366.74	6.51	-9.44	11.14	0.13
458.00	4.00	331.45	457.58	11.06	-12.37	16.48	1.44
550.00	5.05	314.20	549.29	16.70	-16.81	23.65	1.86
<b>Tie-On to Vaughn Gyro Survey</b>							
616.00	6.80	323.96	614.94	21.88	-21.19	30.43	3.05
<b>First Sperry MWD Survey</b>							
707.00	8.88	324.55	705.08	31.96	-28.44	42.78	2.29
799.00	11.56	323.04	795.61	45.12	-38.10	59.03	2.93
893.00	13.72	322.83	887.33	61.53	-50.50	79.54	2.30
988.00	15.91	321.33	979.17	80.67	-65.44	103.78	2.34
1,082.00	17.80	321.02	1,069.13	101.90	-82.53	131.00	2.01
1,177.00	19.52	319.38	1,159.13	125.24	-102.00	161.38	1.89
1,271.00	21.08	319.44	1,247.29	150.00	-123.22	193.99	1.66
1,365.00	22.29	320.10	1,334.63	176.52	-145.65	228.71	1.31
1,460.00	23.88	320.98	1,422.02	205.29	-169.31	265.93	1.71
1,650.00	23.13	319.31	1,596.26	263.46	-217.86	341.67	0.53
1,744.00	22.27	320.41	1,682.98	291.19	-241.24	377.93	1.02
1,839.00	21.17	320.72	1,771.23	318.34	-263.58	413.07	1.16
1,933.00	21.91	320.51	1,858.67	345.01	-285.48	447.55	0.79
2,028.00	20.50	320.74	1,947.23	371.57	-307.28	481.89	1.49
2,122.00	21.94	321.01	2,034.86	397.97	-328.74	515.88	1.54
2,216.00	21.58	319.44	2,122.16	424.75	-351.03	550.71	0.73
2,311.00	21.66	317.77	2,210.48	451.01	-374.18	585.71	0.65
2,405.00	21.33	317.63	2,297.94	476.48	-397.36	620.15	0.36
2,499.00	20.50	320.42	2,385.75	501.80	-419.37	653.70	1.38
2,594.00	20.56	322.29	2,474.71	527.82	-440.17	686.97	0.69
2,688.00	18.23	320.10	2,563.37	552.16	-459.70	718.14	2.60
2,782.00	18.54	322.44	2,652.58	575.29	-478.24	747.74	0.85
2,877.00	19.12	319.75	2,742.49	599.13	-497.50	778.37	1.10
2,971.00	20.35	320.82	2,830.97	623.55	-517.78	810.09	1.36
3,065.00	21.35	320.88	2,918.82	649.50	-538.90	843.52	1.06
3,160.00	21.53	320.00	3,007.24	676.27	-561.01	878.22	0.39
3,254.00	21.90	321.26	3,094.57	703.16	-583.07	912.97	0.63
3,348.00	21.31	320.71	3,181.97	730.05	-604.86	947.55	0.66
3,443.00	21.69	322.82	3,270.36	757.40	-626.40	982.30	0.91
3,537.00	21.83	321.83	3,357.66	784.98	-647.70	1,017.07	0.42
3,631.00	20.45	321.21	3,445.33	811.52	-668.79	1,050.92	1.49
3,725.00	20.89	321.49	3,533.28	837.43	-689.51	1,084.06	0.48
3,820.00	21.20	321.77	3,621.94	864.18	-710.68	1,118.12	0.34
3,914.00	19.36	321.07	3,710.11	889.65	-730.99	1,150.66	1.97
4,008.00	20.17	320.50	3,798.58	914.28	-751.09	1,182.42	0.89
4,102.00	20.99	318.60	3,886.58	939.41	-772.54	1,215.45	1.12
4,197.00	19.19	317.41	3,975.79	963.67	-794.36	1,248.08	1.94
4,291.00	18.28	317.86	4,064.81	985.98	-814.70	1,278.27	0.98
4,385.00	16.62	319.61	4,154.48	1,007.15	-833.31	1,306.45	1.85

## Design Report for SGV Federal 7-41A - Vaughn Gyro and Sperry MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
4,480.00	14.96	317.89	4,245.90	1,026.60	-850.33	1,332.30	1.82
4,574.00	13.82	315.13	4,336.95	1,043.55	-866.39	1,355.64	1.42
4,668.00	12.47	319.25	4,428.48	1,059.20	-880.94	1,377.00	1.75
4,762.00	10.90	323.21	4,520.53	1,074.01	-892.89	1,396.00	1.87
4,856.00	8.76	321.96	4,613.15	1,086.76	-902.62	1,412.01	2.29
4,951.00	7.71	325.69	4,707.17	1,097.73	-910.67	1,425.55	1.24
5,045.00	7.42	329.27	4,800.35	1,108.15	-917.33	1,437.77	0.59
5,139.00	5.43	325.40	4,893.76	1,117.03	-922.95	1,448.15	2.17
5,234.00	4.95	321.64	4,988.37	1,123.94	-928.05	1,456.70	0.62
5,328.00	3.88	314.36	5,082.09	1,129.35	-932.84	1,463.92	1.28
5,422.00	3.42	320.53	5,175.90	1,133.74	-936.90	1,469.90	0.64
5,517.00	2.61	312.70	5,270.76	1,137.39	-940.29	1,474.88	0.95
5,611.00	2.24	293.46	5,364.68	1,139.57	-943.55	1,478.68	0.95
5,705.00	2.39	289.31	5,458.60	1,140.95	-947.08	1,482.05	0.24
5,800.00	2.21	279.71	5,553.53	1,141.92	-950.75	1,485.21	0.45
5,894.00	1.27	253.44	5,647.49	1,141.93	-953.54	1,487.06	1.29
5,988.00	2.08	230.23	5,741.45	1,140.54	-955.85	1,487.56	1.11
6,083.00	2.42	219.49	5,836.37	1,137.89	-958.45	1,487.30	0.57
6,177.00	2.64	219.30	5,930.28	1,134.68	-961.08	1,486.64	0.23
6,271.00	2.66	232.03	6,024.18	1,131.66	-964.17	1,486.43	0.63
6,365.00	2.77	235.26	6,118.08	1,129.03	-967.76	1,486.84	0.20
6,459.00	2.72	246.49	6,211.97	1,126.84	-971.67	1,487.79	0.57
6,554.00	2.83	250.70	6,306.86	1,125.17	-975.95	1,489.38	0.24
6,648.00	3.47	242.54	6,400.72	1,123.09	-980.67	1,490.95	0.83
6,742.00	3.75	238.00	6,494.53	1,120.15	-985.80	1,492.15	0.43
6,836.00	4.12	245.45	6,588.31	1,117.12	-991.48	1,493.64	0.67
6,915.00	3.58	246.69	6,667.13	1,114.96	-996.32	1,495.24	0.69
<b>Final Sperry MWD Survey</b>							
6,975.00	3.58	246.69	6,727.01	1,113.48	-999.76	1,496.42	0.00
<b>Survey Projection to TD - Estimated BHL: 142' FNL, 723' FEL</b>							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N-S (ft)	+E-W (ft)	
120.00	119.99	-0.21	-1.25	Surveys from 120.00ft to 550.00ft are Vaughn Gyro Surveys
550.00	549.29	16.70	-16.81	Tie-On to Vaughn Gyro Survey
616.00	614.94	21.88	-21.19	First Sperry MWD Survey
6,915.00	6,667.13	1,114.96	-996.32	Final Sperry MWD Survey
6,975.00	6,727.01	1,113.48	-999.76	Survey Projection to TD
6,975.00	6,727.01	1,113.48	-999.76	Estimated BHL: 142' FNL, 723' FEL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N_S (ft)	+E-W (ft)	
Target	SGV Federal 7-41A Plan #2 BH Tgt	318.47	Slot	0.00	0.00	0.00

## Design Report for SGV Federal 7-41A - Vaughn Gyro and Sperry MWD Survey

### Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
120.00	550.00	Vaughn Gyro Surveys	NS-GYRO-MS
616.00	6,975.00	Sperry MWD Surveys	MWD

### Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
SGV Federal 7-41A - actual wellpath misses target center by 1060.04ft at 6975.00ft MD (6727.01 TVD, 1113.48 N, -999.76 E) - Point	0.00	0.00	7,787.00	1,117.38	-989.66	1,574,957.14	2,285,021.50	39° 23' 4.855 N	108° 1' 47.676 W
SGV Federal 7-41A - actual wellpath misses target center by 8.46ft at 5433.52ft MD (5187.40 TVD, 1134.26 N, -937.33 E) - Rectangle (sides W25.00 H25.00 D0.00)	0.00	0.00	5,187.00	1,142.38	-939.66	1,574,982.13	2,285,071.50	39° 23' 5.116 N	108° 1' 47.048 W
SGV Federal 7-41A - actual wellpath hits target center - Polygon Point 1 Point 2	0.00	360.00	0.00	0.00	0.00	1,573,839.81	2,286,011.11	39° 22' 54.088 N	108° 1' 34.681 W
				-1,200.00	1,155.38	1,574,995.13	2,284,811.17		
				-800.00	1,155.38	1,574,995.13	2,285,211.15		
SGV Federal 7-41A - actual wellpath misses target center by 54.98ft at 5434.34ft MD (5188.22 TVD, 1134.29 N, -937.36 E) - Rectangle (sides W88.00 H200.00 D2,600.00)	0.00	0.00	5,187.00	1,117.38	-989.66	1,574,957.14	2,285,021.50	39° 23' 4.855 N	108° 1' 47.676 W

## North Reference Sheet for Sec. 8-T8S-R95W (SGV 8D PAD) - SGV Federal 7-41A - Plan #2

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to RKB 24' @ 6365.70ft (H&P 322). Northing and Easting are relative to SGV Federal 7-41A - Slot A 4

Coordinate System is US State Plane 1983, Colorado Central Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is 105° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:39° 45' 0.000 N°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99994788

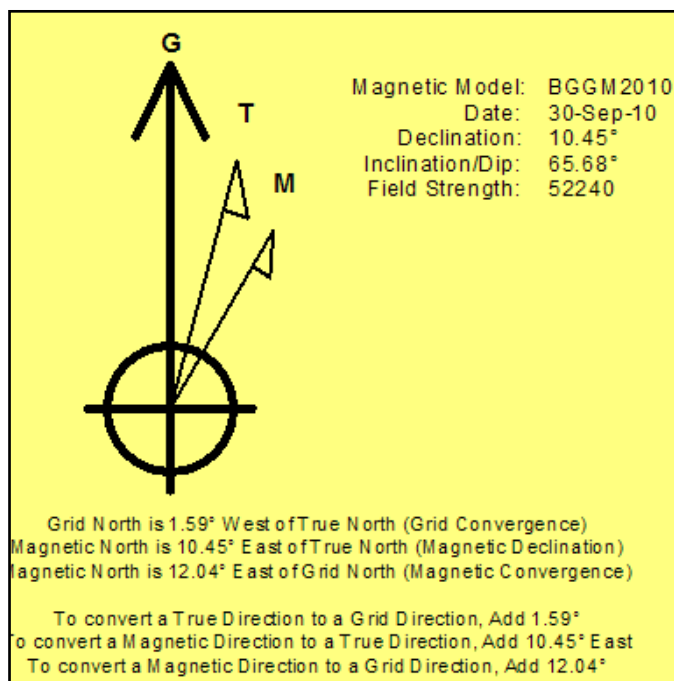
Grid Coordinates of Well: 1,573,839.81 ft N, 2,286,011.11 ft E

Geographical Coordinates of Well: 39° 22' 54.09" N, 108° 01' 34.68" W

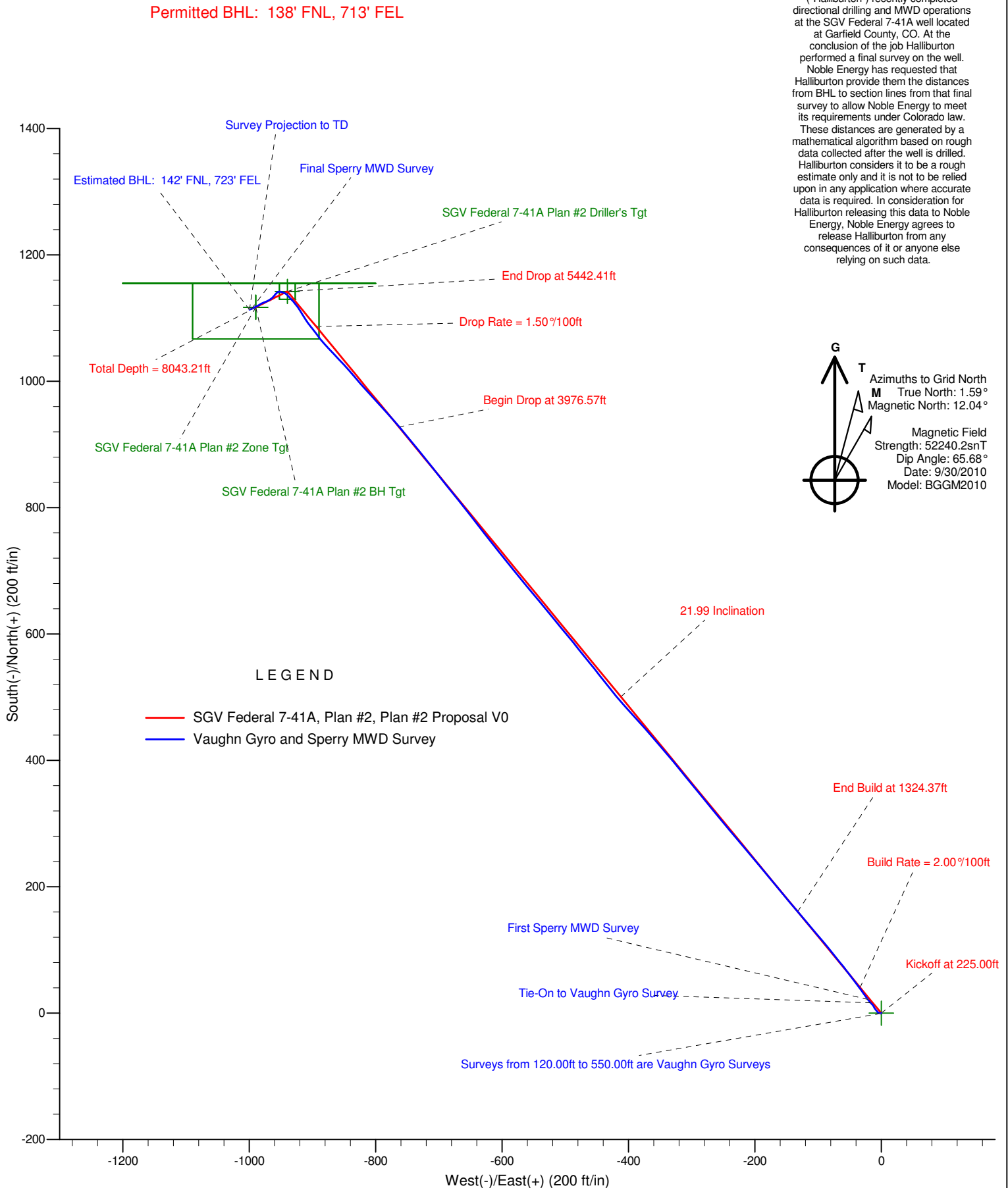
Grid Convergence at Surface is: -1.59°

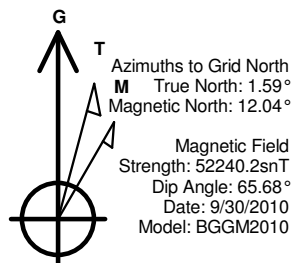
Based upon Minimum Curvature type calculations, at a Measured Depth of 6,975.00ft  
the Bottom Hole Displacement is 1,496.45ft in the Direction of 318.08° (Grid).

Magnetic Convergence at surface is: -12.04° (30 September 2010, , BGGM2010)



Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the SGV Federal 7-41A well located at Garfield County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.





### LEGEND

- SGV Federal 7-41A, Plan #2, Plan #2 Proposal V0
- Vaughn Gyro and Sperry MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the SGV Federal 7-41A well located at Garfield County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.

