



Noble Energy PEN2CHS Gyro+MWD 0ft to 16485ft MD Survey Report

(Def Survey)

Report Date: June 13, 2014 - 08:20 AM
Client: Noble Energy
Field: WV Ritchie County (NAD27)
Structure / Slot: Noble Energy PEN2 Pad / PEN2CHS
Well: PEN2CHS
Borehole: Original Borehole
UWI / API#: Unknown / Unknown
Survey Name: Noble Energy PEN2CHS Gyro+MWD 0ft to 16485ft MD
Survey Date: May 23, 2014
Tort / AHD / DDI / ERD Ratio: 263.748 * 11041.344 ft / 8.881 / 1.750
Coordinate Reference System: NAD27 West Virginia State Plane, Northern Zone, US Feet
Location Lat / Long: N 39° 20' 11.48000", W 81° 0' 45.76000"
Location Grid N/E Y/X: N 308280 481 1RUS, E 1572150 255 1RUS
CRS Grid Convergence Angle: -0.9648 *
Grid Scale Factor: 0.99995343
Version / Patch: 2.7.1043.0

Survey / DLS Computation: Minimum Curvature / Lubinski
Vertical Section Azimuth: 143.249 * (Grid North)
Vertical Section Origin: 0.000 ft, 0.000 ft
TVI Reference Datum: KB
TVI Reference Elevation: 1101.190 ft above MSL
Seabed / Ground Elevation: 1075.190 ft above MSL
Magnetic Declination: -7.864 *
Total Gravity Field Strength: 999.30610mg (9.80665 Based)
Gravity Model: GARIM
Total Magnetic Field Strength: 52221.845 nT
Magnetic Dip Angle: 66.832 *
Declination Date: May 23, 2014
Magnetic Declination Model: HDGM 2013
North Reference: Grid North
Grid Convergence Used: -0.9648 *
Total Corr Mag North->Grid North: -6.8993 *
Local Coord Referenced To: Well Head

Table with columns: Comments, MD (ft), Incl (°), Azim Grid (°), TVD (ft), TVDSS (ft), VSEC (ft), NS (ft), EW (ft), DLS (ft/100ft), BR (ft/100ft), TR (ft/100ft), Northing (ftUS), Easting (ftUS), Latitude (N/S * °), Longitude (E/W * °), Directional Difficulty Index. The table contains multiple rows of survey data points.

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Table with columns: Comments, MD (ft), Incl (°), Azim Grid (°), TVD (ft), TVDSS (ft), VSEC (ft), NS (ft), EW (ft), DL8 (°N000), BR (°N000), TR (°N000), Northing (ft), Easting (ft), Latitude (N/S - ° - ' - ")

Survey Type: Def Survey

Survey Error Model: ISCSWA Rev 0 - 3-D 95 000% Confidence 2.7955 sigma

Survey Program:

Table with columns: Description, Part, MD From (ft), MD To (ft), EOU Freq (ft), Hole Size (in), Casing Diameter (in), Survey Tool Type, Borehole / Survey

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Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVDSS (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLB (*100ft)	GR (*100ft)	TR (*100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S + ° ' ")	Longitude (E/W + ° ' ")	Directional Difficulty Index	
		1	0.000	26.000	Act Strs	30.000	30.000	SLB_NSQ+MSHOT-Depth Only									
		1	26.000	952.000	Act Strs	30.000	30.000	SLB_NSQ+MSHOT									
		1	952.000	1097.000	Act Strs	30.000	30.000	SLB_MWD-STD									
		1	1097.000	1193.000	Act Strs	30.000	30.000	SLB_INC_ONLY<10									
		1	1193.000	5475.000	Act Strs	30.000	30.000	SLB_MWD-STD									
		1	5475.000	6863.000	Act Strs	30.000	30.000	SLB_MWD-INC_ONLY>10									
		1	6863.000	6959.000	Act Strs	30.000	30.000	SLB_MWD-STD									
		1	6959.000	7054.000	Act Strs	30.000	30.000	SLB_MWD-INC_ONLY>10									
		1	7054.000	8009.000	Act Strs	30.000	30.000	SLB_MWD-STD									
		1	8009.000	8105.000	Act Strs	30.000	30.000	SLB_MWD-INC_ONLY>10									
		1	8105.000	8870.000	Act Strs	30.000	30.000	SLB_MWD-STD									
		1	8870.000	9061.000	Act Strs	30.000	30.000	SLB_MWD-INC_ONLY>10									
		1	9061.000	9157.000	Act Strs	30.000	30.000	SLB_MWD-STD									
		1	9157.000	9253.000	Act Strs	30.000	30.000	SLB_MWD-INC_ONLY>10									
		1	9253.000	9539.000	Act Strs	30.000	30.000	SLB_MWD-STD									
		1	9539.000	9633.000	Act Strs	30.000	30.000	SLB_MWD-INC_ONLY>10									
		1	9633.000	10490.000	Act Strs	30.000	30.000	SLB_MWD-STD									
		1	10490.000	11029.000	Act Strs	30.000	30.000	SLB_MWD-INC_ONLY>10									
		1	11029.000	16456.000	Act Strs	30.000	30.000	SLB_MWD-STD									
		1	16456.000	16485.000	Act Strs	30.000	30.000	SLB_DLIND+TREND									

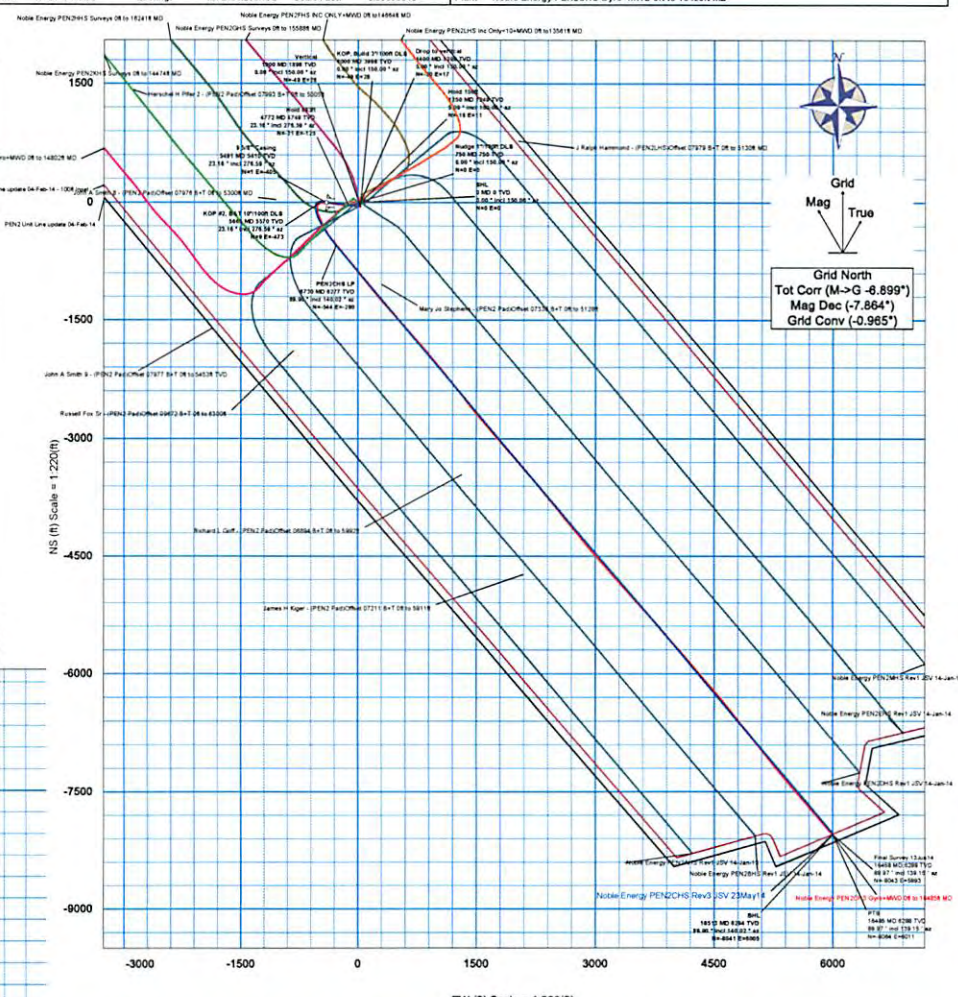
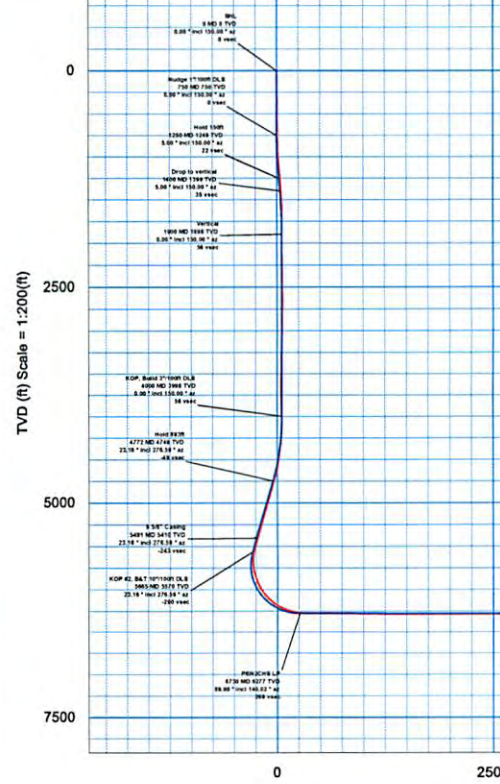
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Borehole:	Original Borehole	Well:	PEN2CHS	Field:	WV Ritchie County (NAD27)	Structure:	Nomac 78
Gravity & Magnetic Parameters		Surface Location			Miscellaneous		
Model:	HGM 2013	Dip:	66.832°	Date:	23-May-2014	Lat:	N 39 20 11.48
MagDec:	-7.864°	FS:	52221.845T	Gravity FS:	999.309mm (9.80665 Based)	Lon:	W 81 0 45.76
		NAD27 West Virginia State Plane, Northern Zone, US Feet			Slot: PEN2CHS TVD Ref: KB(1101.19ft above MSL)		
		Easting: 1572150.255RU			Scale Fact: 0.99995343		
		Plan: Noble Energy PEN2CHS Gyro+MWD Dr to 14658R MD					

Grid Coordinates		Surface Location		Grid Count	
Northing	Easting	Latitude	Longitude	W 81 0 45.76	V 81 0 45.76
143.24	143.24				
Target Name	Shape	Dimension	Latitude	Longitude	Northing
Well	Point	N/A	39 20 11.48	81 0 45.76	1101.19
PEN2 Line Line Control Pt	Point	N/A	39 20 11.48	81 0 45.76	1101.19
PEN2 Line Line Control Pt	Point	N/A	39 20 11.48	81 0 45.76	1101.19
PEN2CHS LP	Point	N/A	39 20 11.48	81 0 45.76	1101.19

FA#T	Seq	Survey Tool	Vendor/Tool	Tool Size	Depth	MD From	MD To	Survey	EQZ Bias	EQZ Size	Comment
Penetration (Feet)											
1	1	SLB_NSGM-DHOT-Down Only		30	30	0	28	Aut Strk	1.20	1.20	
1	2	SLB_NSGM-DHOT-Down Only		30	30	28	952	Aut Strk	3.53	2.75	
1	3	SLB_MWD-STD		30	30	952	1087	Aut Strk	3.87	2.8	
1	4	SLB_MC_ONLY-10		30	30	1087	1193	Aut Strk	10.43	10.19	
1	5	SLB_MWD-STD		30	30	1193	5475	Aut Strk	22.43	19.47	
1	6	SLB_MWD-STD		30	30	5475	6893	Aut Strk	322.28	26.31	
1	7	SLB_MWD-STD		30	30	6893	8069	Aut Strk	348.26	28.49	
1	8	SLB_MWD-STD		30	30	8069	7054	Aut Strk	348.31	27.69	
1	9	SLB_MWD-STD		30	30	7054	8009	Aut Strk	347.79	31.94	
1	10	SLB_MWD-STD		30	30	8009	8105	Aut Strk	348.19	32.88	
1	11	SLB_MWD-STD		30	30	8105	8870	Aut Strk	350.14	37.74	
1	12	SLB_MWD-STD		30	30	8870	9061	Aut Strk	352.74	44.83	
1	13	SLB_MWD-STD		30	30	9061	8157	Aut Strk	354.77	49.53	
1	14	SLB_MWD-STD		30	30	8157	8253	Aut Strk	355.21	49.98	
1	15	SLB_MWD-STD		30	30	8253	9539	Aut Strk	356.43	52.91	
1	16	SLB_MWD-STD		30	30	9539	9633	Aut Strk	356.83	53.24	
1	17	SLB_MWD-STD		30	30	9633	10460	Aut Strk	359.83	58.31	
1	18	SLB_MWD-STD		30	30	10460	11428	Aut Strk	406.5	106.5	
1	19	SLB_MWD-STD		30	30	11428	14648	Aut Strk	528.79	145.58	
1	20	SLB_MWD-STD		30	30	14648	14658	Aut Strk	538.69	143.76	

Critical Point	MD	INCL	AZIM	TVD	VSEC	N(+S)	E(+W)	DLB
DL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Survey 13Jun14	14648.00	88.87	138.15	8287.84	10030.57	-8043.09	5993.42	0.13
PTB	14648.00	88.87	138.15	8287.84	10057.50	-8053.52	6011.08	0.00



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Noble Energy PEN2CHS Rev5 JSV 23May14

Final Survey 13Jun14
MD: 14648.00 TVD: 8287.84
INCL: 88.87° AZIM: 138.15°
DLB: 0.13

PTB
MD: 14648.00 TVD: 10057.50
INCL: 88.87° AZIM: 138.15°
DLB: 0.00

Plan ref: Noble Energy PEN2CHS Gyro+MWD Dr to 14658R MD
Drawing ref: [blank]
Copy number: 4 of 5
Date: 13-Jun-2014
Drawn by: [blank]
Checked by: [blank]
Copy number: [blank]

Vertical Section (ft) Azim = 143.249° Scale = 1:2000(ft) Origin = 0N/-S, 0E/-W