85-10031

PATHFINDER
A Schlumberger Company

Noble Energy PENS1FHS Gyro+MWD 0' MD to 15860' MD Final Survey Report

(Non-Def Survey)

noble energy

Received
Office of Oil & Gas
NOV 21 2014

Report Date:	December 19, 2013 - 10:30 AM
Client:	Noble Energy
Field:	WV Ritchie County (NAD27)
Structure / Slot:	Noble Energy PENS1 Pad / PENS1FHS
Well:	PENS1FHS
Borehole:	Original Borehole
UWI / API#:	Unknown / Unknown
Survey Name:	Noble Energy PENS1FHS Gyro+MWD 0' MD to update
Survey Date:	December 09, 2013
Tort / AHD / DDI / ERD Ratio:	239.915 ° / 10546.453 ft / 6.800 / 1.657
Coordinate Reference System:	NAD27 West Virginia State Plane, Northern Zone, US Feet
Location Lat / Long:	N 39° 20' 5.59707", W 80° 59' 35.00617"
Location Grid N/E Y/X:	N 307592.380 ftUS, E 1577698.670 ftUS
CRS Grid Convergence Angle:	-0.9522 °
Grid Scale Factor:	0.99995358
Version / Patch:	2.7.998.0

Survey / DLS Computation:	Minimum Curvature / Lubinski
Vertical Section Azimuth:	311.788 ° (Grid North)
Vertical Section Origin:	0.000 ft, 0.000 ft
TVD Reference Datum:	KB
TVD Reference Elevation:	1137.620 ft above MSL
Seabed / Ground Elevation:	1112.050 ft above MSL
Magnetic Declination:	-7.803 °
Total Gravity Field Strength:	999.3062mgn (9.80665 Based)
Gravity Model:	GARM
Total Magnetic Field Strength:	52291.181 nT
Magnetic Dip Angle:	66.875 °
Declination Date:	December 09, 2013
Magnetic Declination Model:	HDGM 2013
North Reference:	Grid North
Total Corr Mag North->Grid North:	-0.9522 °
Total Corr Mag ->Grid North:	-6.8508 °
Local Coord Referenced To:	Well Head

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVDSS (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	BR (°/100ft)	TR (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")	Directional Difficulty Index
SHL	0.00	0.00	0.00	0.00	-1137.62	0.00	0.00	0.00	N/A	N/A	N/A	307592.38	1577698.67	N 39 20 5.60	W 80 59 35.01	0.00
	126.00	0.67	120.09	126.00	-1011.62	-0.72	-0.37	0.64	0.53	0.53	0.00	307592.01	1577699.31	N 39 20 5.59	W 80 59 35.00	0.00
	226.00	0.16	215.72	225.99	-911.63	-1.31	-0.78	1.06	0.70	-0.51	95.63	307591.60	1577699.73	N 39 20 5.59	W 80 59 34.99	0.27
	326.00	0.20	222.20	325.99	-811.63	-1.32	-1.02	0.86	0.04	0.04	6.48	307591.36	1577699.53	N 39 20 5.59	W 80 59 34.99	0.38
	426.00	0.17	235.08	425.99	-711.63	-1.29	-1.23	0.62	0.05	-0.03	12.88	307591.15	1577699.29	N 39 20 5.58	W 80 59 35.00	0.47
	526.00	0.27	207.35	525.99	-611.63	-1.31	-1.53	0.39	0.14	0.10	-27.73	307590.85	1577699.06	N 39 20 5.58	W 80 59 35.00	0.58
	591.00	0.19	174.88	590.99	-546.63	-1.43	-1.77	0.33	0.23	-0.12	-49.95	307590.61	1577699.00	N 39 20 5.58	W 80 59 35.00	0.67
	791.00	0.45	288.55	790.99	-346.63	-0.95	-1.85	-0.38	0.28	0.13	56.84	307590.53	1577698.29	N 39 20 5.58	W 80 59 35.01	0.91
	885.00	0.45	281.30	884.99	-252.63	-0.29	-1.66	-1.09	0.06	0.00	-7.71	307590.72	1577697.58	N 39 20 5.58	W 80 59 35.02	1.00
	980.00	0.40	331.87	979.99	-157.63	0.34	-1.30	-1.62	0.39	-0.05	53.23	307591.08	1577697.05	N 39 20 5.58	W 80 59 35.03	1.13
	1076.00	0.35	20.95	1075.98	-61.64	0.76	-0.73	-1.67	0.33	-0.05	51.13	307591.65	1577697.00	N 39 20 5.59	W 80 59 35.03	1.22
	1172.00	1.04	353.17	1171.98	34.36	1.52	0.41	-1.67	0.78	0.72	-28.94	307592.79	1577697.00	N 39 20 5.60	W 80 59 35.03	1.40
	1266.00	2.34	320.68	1265.93	128.31	4.05	2.74	-2.99	1.67	1.38	-34.56	307595.12	1577695.69	N 39 20 5.62	W 80 59 35.04	1.70
	1360.00	3.48	297.73	1359.82	222.20	8.72	5.56	-6.73	1.71	1.21	-24.41	307597.94	1577691.94	N 39 20 5.65	W 80 59 35.09	1.99
	1454.00	4.10	280.36	1453.61	315.99	14.35	7.49	-12.56	1.38	0.66	-18.48	307599.87	1577686.11	N 39 20 5.67	W 80 59 35.17	2.22
	1550.00	3.86	269.63	1549.38	411.76	19.68	8.08	-19.16	0.81	-0.25	-11.18	307600.46	1577679.51	N 39 20 5.67	W 80 59 35.25	2.39
	1645.00	3.15	274.63	1644.20	506.58	24.13	8.27	-24.96	0.81	-0.75	5.26	307600.65	1577673.71	N 39 20 5.67	W 80 59 35.33	2.51
	1741.00	2.66	301.05	1740.08	602.46	28.42	9.64	-29.50	1.47	-0.51	27.52	307602.02	1577669.17	N 39 20 5.69	W 80 59 35.38	2.62
	1835.00	2.77	313.71	1833.98	696.36	32.83	12.33	-33.01	0.65	0.12	13.47	307604.71	1577665.66	N 39 20 5.71	W 80 59 35.43	2.70
	1929.00	2.41	315.08	1927.88	790.26	37.08	15.30	-36.05	0.39	-0.38	1.46	307607.68	1577662.62	N 39 20 5.74	W 80 59 35.47	2.75
	2024.00	1.79	279.85	2022.82	885.20	40.33	16.97	-38.92	1.48	-0.65	-37.08	307609.35	1577659.75	N 39 20 5.76	W 80 59 35.51	2.83
	2119.00	1.22	223.12	2117.79	980.17	41.61	16.48	-41.08	1.60	-0.60	-59.72	307608.86	1577657.60	N 39 20 5.75	W 80 59 35.53	2.89
	2215.00	1.10	142.85	2213.78	1076.16	40.73	15.00	-41.22	1.56	-0.13	-83.61	307607.38	1577657.45	N 39 20 5.74	W 80 59 35.53	2.95
	2310.00	0.87	98.76	2308.77	1171.15	39.23	14.17	-39.95	0.81	-0.24	-46.41	307606.55	1577658.72	N 39 20 5.73	W 80 59 35.52	2.98
	2404.00	0.33	349.90	2402.76	1265.14	38.85	14.32	-39.30	1.09	-0.57	-115.81	307606.70	1577659.38	N 39 20 5.73	W 80 59 35.51	3.01
	2500.00	0.76	314.57	2498.76	1361.14	39.70	15.04	-39.80	0.55	0.45	-36.80	307607.42	1577658.87	N 39 20 5.74	W 80 59 35.52	3.03
	2594.00	0.66	298.34	2592.75	1455.13	40.85	15.74	-40.72	0.24	-0.11	-17.27	307608.12	1577657.95	N 39 20 5.75	W 80 59 35.53	3.04
	2689.00	0.39	288.49	2687.75	1550.13	41.68	16.10	-41.51	0.30	-0.28	-10.37	307608.48	1577657.17	N 39 20 5.75	W 80 59 35.54	3.06
	2783.00	0.30	301.44	2781.75	1644.13	42.21	16.33	-42.02	0.13	-0.10	13.78	307608.71	1577656.65	N 39 20 5.75	W 80 59 35.54	3.06
	2878.00	0.44	93.55	2876.75	1739.13	42.17	16.44	-41.87	0.76	0.15	160.12	307608.82	1577656.80	N 39 20 5.75	W 80 59 35.54	3.08
	2974.00	0.49	126.88	2972.74	1835.12	41.47	16.17	-41.17	0.28	0.05	34.72	307608.55	1577657.50	N 39 20 5.75	W 80 59 35.53	3.09
	3070.00	0.45	133.84	3068.74	1931.12	40.69	15.66	-40.57	0.07	-0.04	7.25	307608.04	1577658.10	N 39 20 5.75	W 80 59 35.53	3.10
	3165.00	0.16	113.40	3163.74	2026.12	40.19	15.35	-40.18	0.32	-0.31	-21.52	307607.73	1577658.49	N 39 20 5.74	W 80 59 35.52	3.11
	3261.00	0.03	197.40	3259.74	2122.12	40.05	15.27	-40.07	0.17	-0.14	87.50	307607.65	1577658.61	N 39 20 5.74	W 80 59 35.52	3.12
	3356.00	0.14	228.20	3354.74	2217.12	40.05	15.17	-40.16	0.12	0.12	32.42	307607.55	1577658.51	N 39 20 5.74	W 80 59 35.52	3.12
	3452.00	0.11	69.99	3450.74	2313.12	40.02	15.12	-40.16	0.26	-0.03	-164.80	307607.50	1577658.51	N 39 20 5.74	W 80 59 35.52	3.12
	3548.00	0.20	128.67	3546.74	2409.12	39.81	15.05	-39.94	0.18	0.09	61.13	307607.43	1577658.73	N 39 20 5.74	W 80 59 35.52	3.13
	3643.00	0.51	180.95	3641.74	2504.12	39.37	14.53	-39.82	0.44	0.33	55.03	307606.91	1577658.85	N 39 20 5.73	W 80 59 35.52	3.14
	3737.00	1.08	235.37	3735.73	2598.11	39.30	13.60	-40.56	0.94	0.61	57.89	307605.98	1577658.12	N 39 20 5.72	W 80 59 35.53	3.17
	3833.00	3.34	215.97	3831.65	2694.03	39.23	10.83	-42.94	2.45	2.35	-20.21	307603.21	1577655.73	N 39 20 5.70	W 80 59 35.55	3.23
	3928.00	4.28	216.31	3926.44	2788.82	38.61	5.73	-46.67	0.99	0.99	0.36	307598.11	1577652.00	N 39 20 5.65	W 80 59 35.60	3.29
	4023.00	4.93	213.41	4021.13	2883.51	37.68	-0.53	-51.02	0.73	0.68	-3.05	307591.85	1577647.66	N 39 20 5.58	W 80 59 35.66	3.34
	4118.00	6.98	216.45	4115.62	2978.00	36.55	-8.59	-56.69	2.18	2.16	3.20	307583.79	1577641.98	N 39 20 5.50	W 80 59 35.73	3.42
	4213.00	9.11	219.30	4209.68	3072.06	35.69	-19.05	-64.89	2.28	2.24	3.00	307573.33	1577633.79	N 39 20 5.40	W 80 59 35.83	3.51
	4308.00	10.66	222.00	4303.26	3165.64	35.39	-31.40	-75.53	1.70	1.63	2.84	307560.98	1577623.14	N 39 20 5.27	W 80 59 35.96	3.60
	4403.00	12.18	222.75	4396.38	3258.76	35.59	-45.29	-88.21	1.61	1.60	0.79	307547.09	1577610.46	N 39 20 5.14	W 80 59 36.12	3.68
	4497.00	14.28	221.37	4487.88	3350.26	35.67	-61.27	-102.61	2.26	2.23	-1.47	307531.11	1577596.07	N 39 20 4.97	W 80 59 36.30	3.77
	4592.00	16.80	223.20	4579.40	3441.78	35.93	-80.08	-119.75	2.70	2.65	1.93	307512.31	1577578.92	N 39 20 4.79	W 80 59 36.51	3.86
	4687.00	18.73	225.01	4669.87	3532.25	37.12	-100.87	-139.94	2.11	2.03	1.91	307491.51	1577558.74	N 39 20 4.58	W 80 59 36.77	3.95
	4782.00	20.76	221.83	4759.28	3621.66	37.99	-124.20	-161.96	2.42	2.14	-3.35	307468.18	1577536.72	N 39 20 4.34	W 80 59 37.04	4.03
	4876.00	23.56	221.19	4846.33	3708.71	37.81	-150.76	-185.45	2.99	2.98	-0.68	307441.63	1577513.23	N 39 20 4.08	W 80 59 37.33	4.12
	4970.00	25.75	221.13	4931.75	3794.13	37.38	-180.28	-211.25	2.33	2.33	-0.06	307412.11	1577487.43	N 39 20 3.78	W 80 59 37.66	4.20
	5064.00	27.82	222.35	5015.66	3878.04	37.36	-211.87	-239.46	2.28	2.20	1.30	307380.52	1577459.22	N 39 20 3.46	W 80 59 38.01	4.27
	5158.00	29.56	220.68	5098.12	3960.50	37.13	-245.67	-269.36	2.04	1.85	-1.78	307346.72	1577429.33	N 39 20 3.13	W 80 59 38.38	4.34
	5251.00	31.78	219.98	5178.11	4040.49	35.91	-281.84	-300.05	2.42	2.39	-0.75	307310.55	1577398.64	N 39 20 2.76	W 80 59 38.76	4.40
	5346.00	33.23	221.02	5258.22	4120.60	34.77	-320.65	-333.21	1.64	1.53	1.09	307271.75	1577365.48	N 39 20 2.37	W 80 59 39.18	4.46
	5414.00	33.43	219.72	5315.04	4177.42	33.85	-349.12	-357.41	1.09	0.29	-1.91	307243.28	1577341.28	N 39 20 2.09	W 80 59 39.48	4.50
	5508.00	30.36	219.16	5394.84	4257.22	31.82	-387.46	-388.96	3.28	-3.27	-0.60	307204.94	1577309.73	N 39 20 1.70	W 80 59 39.87	4.56
	5603.00	37.13	222.50	5473.79	4336.17	31.08	-427.27	-423.54	7.39	7.13	3.52	307165.14	1577275.15	N 39 20 1.31	W 80 59 40.31	4.65
	5699.00	40.26	223.28	5548.71	4411.09	32.24	-471.22	-464.39	3.30	3.26	0.81	307121.18	1577234.30	N 39 20 0.86	W 80 59 40.82	4.71
	5795.00	39.50	221.95	5622.38	4484.76	33.14	-516.51	-506.07	1.19	-0.79	-1.39	307075.89	1577192.63	N 39 20 0.41	W 80 59 41.34	4.75
	5891.00	39.93	220.26	5696.23	4558.61	32.40	-562.73	-546.39	1.21	0.45	-1.76	307029.67	1577152.31	N 39 19 59.95	W 80 59 41.84	4.79
	5987.00	40.84	219.45	5769.35	4631.73	30.30	-610.48	-586.24	1.09	0.95	-0.84	306981.93	1577112.45	N 39 19 59.47	W 80 59 42.34	4.83
	6082.00	39.61	219.11	5841.88	4704.26	27.62	-657.97	-625.09	1.32	-1.29	-0.36	306934.44	1577073.61	N 39 19 58.99	W 80 59 42.82	4.87
	6129.00	40.38	224.96	5877.90	4740.28	27.76	-680.38	-645.30	8.16	1.64	12.45	306912.04	1577053.40	N 39 19 58.77	W 80 59 43.07	4.91
	6177.00	40.62	233.39	5914.43	4776.81	31.77	-700.71	-668.85	11.41	0.50	17.56	306891.70	1577029.85	N 39 19 58.56	W 80 59 43.37	4.95
	6224.00	41.26	240.99	5949.96	4812.34	39.95	-717.36	-694.70	10.68	1.36	16.17	306875.05	1577004.00	N 39 19 58.39	W 80 59 43.69	4.99
	6273.00	41.15	247.91	5986.84	4849.22	52.37	-731.27	-723.79	9.30	-0.22	14.12	306861.15	1576974.92	N 39 19 58.25	W 80 59 44.06	5.02
	6320.00	42.02	254.03	6022.01	4884.39	67.57	-741.42	-753.25	8.84	1.85	13.02	306851.00	1576945.46	N 39 19 58.15	W 80 59 44.43	5.06
	6369.00	43.59	260.50	6057.98	4920.36	86.90	-748.72	-785.70	9.52	3.20	13.20	306843.70	1576913.01	N 39 19 58.07	W 80 59 44.85	5.09
	6416.00	45.77	265.41	6091.40	4953.78	108.66	-752.74	-818.48	8.68	4.64	10.45	306839.67	1576880.23	N 39 19 58.02	W 80 59 45.26	5.12
	6463.00	47.29	270.83	6123.75	4986.13	133.33	-753.84	-852.54	8.97	3.23	11.53	306838.57	1576846.17	N 39 19 58.01	W 80 59 45.69	5.15
	6510.00	49.40	275.12	6155.00	5017.38	160.69	-752.00	-887.59	8.16	4.49	9.13	306840.42	1576811.12	N 39 19 58.02	W 80 59 46.14	5.18
	6559.00	52.64	278.92	6185.82	5048.20	191.98	-747.32	-925.38	8.95	6.61	7.76	306845.10	1576773.34	N 39 19 58.06	W 80 59 46.62	5.21
	6607.00	56.36	283.15	6213.70	5076.08	225.56	-739.81	-963.70	10.56	7.75	8.81	306852.61	1576735.01	N 39 19 58.13	W 80 59 47.11	5.24
	6654.00	59.84	287.32	6238.54	5100.92	261.25	-729.30	-1002.18	10.56	7.40	8.87	306863.11	1576696.54	N 39 19 58.23	W 80 59 47.60	5.27
	6702.00	63.61	290.83	6261.28	5123.66	300.24	-715.47	-1042.11	10.16	7.85	7.31	306876.94	1576656.62	N 39 19 58.36	W 80 59 48.12	5.30
	6749.00	67.10	294.90	6280.88	5143.26	340.64	-698.86	-1081.44	10.82	7.43	8.66	306893.55	1576617.28	N 39 19 58.51	W 80 59 48.62	5.33
	6800.00	70.06	299.30	6299.51	5161.89	386.55	-677.23	-1123.68	9.91	5.80	8.63	306915.19	1576575.04	N 39 19 58.72	W 80 59 49.16	5.37
	6844.00	70.67	302.96	6314.30	5176.68	427.27	-655.80	-1159.15	7.96	1.39	8.32	306936.61	1576539.58	N 39 19 58.93	W 80 59 49.62	5.39
	6891.00	71.98	306.77	6329.36	5191.74	471.46	-630.35	-1195.67	8.17	2.79	8.11	306962.06	1576503.06	N 39 19 59.17	W 80 59 50.09	5.42
	6939.00	75.94	310.34	6342.62	5205.00	517.50	-601.60	-1231.72	10.91	8.25	7.44	306990.81	1576467.01	N 39 19 59.45	W 80 59 50.55	5.45
	6986.00	80.85	314.05	6352.08	5214.46	563.51	-570.68	-1265.80	13.00	10.45	7.89	307021.73	1576432.93	N 39 19 59.75	W 80 59 50.99	5.48
	7034.00	84.01	317.05	6358.40	5220.78	610.98	-536.72	-1299.11	9.04	6.58	6.25	307055.69	1576399.62	N 39 20 0.08	W 80 59 51.42	5.50
	7081.00	89.07	321.56	6361.24	5223.62	657.46	-501.17	-1329.68	14.41	10.77	9.60	307091.24	1576369.06	N 39 20 0.43	W 80 59 51.82	5.53
	7130.00	91.24	324.14	6361.10	5223.48	705.54	-462.12	-1359.27	6.88	4.43	5.27	307130.28	1576339.47	N 39 20 0.81	W 80 59 52.20	5.56
	7231.00	90.48	321.68	6359.59	5221.97	804.63	-381.57	-1420.16	2.55	-0.75	-2.44	307210.83	1576278.57	N 39 20 1.59	W 80 59 53.00	5.59
	7326.00	88.66	320.66	6360.30	5222.68	898.35	-307.57	-1479.73	2.20	-1.92	-1.07	307284.83	1576219.02	N 39 20 2.31	W 80 59 53.77	5.62
	7421.00	88.45	321.56	6362.70	5225.08	992.06	-233.65	-1539.35	0.97	-0.22	0.95	307358.74	1576159.40	N 39 20 3.03	W 80 59 54.54	5.65
	7517.00	89.24	321.20	6364.63	5227.01	1086.70	-158.66	-1599.26	0.90	0.82	-0.38	307433.73	1576099.49	N 39 20 3.77	W 80 59 55.32	5.68
	7613.00	89.79	321.25	6365.44	5227.82	1181.40	-83.82	-1659.37	0.58	0.57	0.05	307508.56	1576039.38	N 39 20 4.50	W 80 59 56.10	5.70
	7708.00	90.14	319.76	6365.50	5227.88	1275.30	-10.51	-1719.79	1.61	0.37	-1.57	307581.87	1575978.96	N 39 20 5.21	W 80 59 56.89	5.73

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10031
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Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVDSS (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	BR (°/100ft)	TR (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")	Directional Difficulty Index
	7804.00	90.14	319.32	6365.27	5227.65	1370.42	62.53	-1782.09	0.46	0.00	-0.46	307654.91	1575916.67	N 39 20 5.52	W 80 59 57.70	5.75
	7899.00	90.21	319.53	6364.98	5227.36	1464.58	134.69	-1843.88	0.23	0.07	0.22	307727.06	1575854.88	N 39 20 6.62	W 80 59 58.50	5.78
	7995.00	90.17	320.17	6364.66	5227.04	1559.63	208.06	-1905.78	0.67	-0.04	0.67	307800.43	1575792.98	N 39 20 7.34	W 80 60 50.30	5.80
	8091.00	90.03	320.33	6364.49	5226.87	1654.58	281.87	-1967.17	0.22	-0.15	0.17	307874.24	1575731.60	N 39 20 8.08	W 81 0 0.10	5.82
	8186.00	90.10	320.15	6364.38	5226.76	1748.55	354.90	-2027.93	0.20	0.07	-0.19	307947.27	1575670.84	N 39 20 8.77	W 81 0 0.89	5.84
	8282.00	90.72	319.96	6363.70	5226.08	1843.55	428.50	-2089.56	0.68	0.65	-0.20	308020.86	1575609.21	N 39 20 9.49	W 81 0 1.89	5.86
	8377.00	90.38	319.60	6362.79	5225.17	1937.62	501.04	-2150.90	0.52	-0.36	-0.38	308093.39	1575547.87	N 39 20 10.19	W 81 0 2.48	5.88
	8472.00	90.14	319.43	6362.35	5224.73	2031.76	573.29	-2212.58	0.31	-0.25	-0.18	308165.64	1575486.20	N 39 20 10.90	W 81 0 3.28	5.90
	8568.00	89.68	318.45	6362.52	5224.90	2127.01	645.67	-2275.64	1.14	-0.50	-1.02	308238.02	1575423.14	N 39 20 11.60	W 81 0 4.10	5.92
	8664.00	90.28	318.78	6362.57	5224.95	2222.33	717.70	-2339.10	0.73	0.65	0.34	308310.05	1575350.68	N 39 20 12.30	W 81 0 4.92	5.94
	8759.00	90.34	319.07	6362.06	5224.44	2316.59	789.32	-2401.52	0.31	0.06	0.31	308381.66	1575297.27	N 39 20 13.00	W 81 0 5.73	5.96
	8855.00	90.21	319.75	6361.60	5223.98	2411.74	862.22	-2463.98	0.72	-0.14	0.71	308454.55	1575234.81	N 39 20 13.71	W 81 0 6.54	5.98
	8950.00	90.38	319.14	6361.11	5223.49	2505.89	934.39	-2525.75	0.67	0.18	-0.64	308526.73	1575173.05	N 39 20 14.41	W 81 0 7.34	5.99
	9046.00	89.93	318.44	6360.85	5223.23	2601.18	1006.61	-2588.90	0.87	-0.47	-0.73	308598.94	1575109.80	N 39 20 15.12	W 81 0 8.17	6.01
	9142.00	90.29	320.17	6360.67	5223.05	2696.35	1079.40	-2651.59	1.84	0.36	1.80	308671.72	1575047.21	N 39 20 15.83	W 81 0 8.98	6.03
	9237.00	90.38	319.41	6360.13	5222.51	2790.42	1151.94	-2712.92	0.81	0.11	-0.80	308744.27	1574985.89	N 39 20 16.53	W 81 0 9.77	6.05
	9333.00	90.38	319.39	6359.49	5221.87	2885.57	1224.83	-2775.39	0.02	0.00	-0.02	308817.15	1574923.42	N 39 20 17.24	W 81 0 10.58	6.06
	9429.00	90.34	319.82	6358.89	5221.27	2980.68	1297.94	-2837.60	0.45	-0.04	0.45	308890.26	1574861.21	N 39 20 17.96	W 81 0 11.39	6.08
	9525.00	90.21	319.69	6358.42	5220.80	3075.75	1371.22	-2899.62	0.19	-0.14	-0.14	308963.53	1574799.19	N 39 20 18.67	W 81 0 12.20	6.09
	9620.00	90.10	319.26	6358.17	5220.55	3169.90	1443.43	-2961.35	0.47	-0.12	-0.45	309035.74	1574737.46	N 39 20 19.37	W 81 0 13.00	6.11
	9715.00	90.45	318.99	6357.71	5220.09	3264.12	1515.26	-3023.52	0.47	0.37	-0.28	309107.57	1574675.30	N 39 20 20.07	W 81 0 13.80	6.12
	9811.00	90.55	319.24	6356.87	5219.25	3359.33	1587.84	-3086.35	0.28	0.10	0.26	309180.14	1574612.47	N 39 20 20.78	W 81 0 14.62	6.14
	9906.00	90.58	319.39	6355.94	5218.32	3453.51	1659.87	-3148.28	0.16	0.03	0.16	309252.17	1574550.54	N 39 20 21.48	W 81 0 15.42	6.15
	10001.00	90.55	318.92	6355.00	5217.38	3547.72	1731.74	-3210.41	0.50	-0.03	-0.49	309324.03	1574488.42	N 39 20 22.18	W 81 0 16.23	6.16
	10096.00	90.17	319.41	6354.40	5216.78	3641.93	1803.61	-3272.52	0.65	-0.40	0.52	309395.90	1574426.30	N 39 20 22.88	W 81 0 17.03	6.18
	10192.00	90.14	321.31	6354.14	5216.52	3736.85	1877.53	-3333.77	1.98	-0.03	1.98	309469.82	1574365.07	N 39 20 23.60	W 81 0 17.83	6.20
	10288.00	90.69	321.65	6353.45	5215.83	3831.48	1952.64	-3393.55	0.67	0.57	0.35	309544.93	1574305.28	N 39 20 24.33	W 81 0 18.61	6.21
	10383.00	90.41	319.57	6352.54	5214.92	3925.34	2026.05	-3453.83	2.21	-0.29	-2.19	309618.34	1574245.01	N 39 20 25.05	W 81 0 19.39	6.23
	10479.00	91.75	321.19	6350.73	5213.11	4020.25	2099.08	-3515.04	2.19	1.40	1.69	309692.26	1574183.80	N 39 20 25.77	W 81 0 20.18	6.24
	10574.00	90.96	321.87	6348.48	5210.86	4113.85	2174.34	-3574.12	1.10	-0.83	0.72	309766.62	1574124.72	N 39 20 26.49	W 81 0 20.95	6.26
	10670.00	90.38	321.18	6347.36	5209.74	4208.46	2249.49	-3633.84	0.94	-0.60	-0.72	309841.76	1574065.00	N 39 20 27.23	W 81 0 21.73	6.27
	10765.00	90.34	321.15	6346.76	5209.14	4302.19	2323.49	-3693.41	0.05	-0.04	-0.03	309915.76	1574005.43	N 39 20 27.95	W 81 0 22.50	6.28
	10861.00	89.97	321.60	6346.50	5208.88	4396.84	2398.49	-3753.34	0.61	-0.39	0.47	309990.75	1573945.51	N 39 20 28.68	W 81 0 23.28	6.29
	10956.00	90.07	321.80	6346.47	5208.85	4490.43	2473.04	-3812.22	0.24	0.11	0.21	310065.30	1573886.64	N 39 20 29.41	W 81 0 24.04	6.31
	11052.00	90.24	321.55	6346.21	5208.59	4585.00	2548.36	-3871.75	0.31	0.18	-0.26	310140.61	1573827.11	N 39 20 30.14	W 81 0 24.82	6.32
	11148.00	90.14	321.67	6345.89	5208.27	4679.58	2623.60	-3931.37	0.16	-0.10	0.13	310215.85	1573767.49	N 39 20 30.88	W 81 0 25.59	6.33
	11244.00	90.17	322.18	6345.63	5208.01	4774.00	2699.17	-3990.57	0.53	0.03	0.53	310291.42	1573708.30	N 39 20 31.61	W 81 0 26.36	6.34
	11340.00	90.17	320.39	6345.35	5207.73	4868.77	2774.07	-4050.61	1.86	0.00	-1.86	310366.32	1573648.26	N 39 20 32.34	W 81 0 27.14	6.36
	11435.00	90.14	320.05	6345.09	5207.47	4962.75	2847.06	-4111.39	0.36	-0.03	-0.36	310439.32	1573587.48	N 39 20 33.05	W 81 0 27.93	6.37
	11531.00	90.17	320.42	6344.83	5207.21	5057.70	2920.87	-4172.80	0.39	0.03	0.39	310513.11	1573526.07	N 39 20 33.77	W 81 0 28.73	6.38
	11627.00	90.21	319.83	6344.51	5206.89	5152.69	2994.55	-4234.34	0.62	0.04	-0.61	310586.78	1573464.53	N 39 20 34.49	W 81 0 29.53	6.39
	11722.00	90.17	319.48	6344.20	5206.58	5246.79	3066.95	-4295.85	0.37	-0.04	-0.37	310659.18	1573403.03	N 39 20 35.20	W 81 0 30.33	6.40
	11817.00	90.00	319.44	6344.05	5206.43	5340.94	3139.15	-4357.50	0.18	-0.18	-0.04	310731.38	1573341.29	N 39 20 35.90	W 81 0 31.13	6.41
	11913.00	89.90	319.15	6344.14	5206.52	5436.12	3211.92	-4420.20	0.32	-0.10	-0.30	310804.15	1573278.68	N 39 20 36.61	W 81 0 31.94	6.42
	12009.00	89.90	319.32	6344.31	5206.69	5531.41	3284.08	-4483.52	0.86	0.00	-0.86	310876.30	1573215.37	N 39 20 37.31	W 81 0 32.78	6.43
	12104.00	90.24	317.33	6344.19	5206.57	5625.89	3354.49	-4547.30	1.10	0.36	-1.04	310946.70	1573151.59	N 39 20 38.00	W 81 0 33.50	6.44
	12200.00	89.93	318.81	6344.05	5206.43	5721.31	3425.90	-4611.45	1.58	-0.32	1.54	311018.12	1573087.45	N 39 20 38.69	W 81 0 34.42	6.46
	12295.00	90.14	319.83	6343.99	5206.37	5815.49	3497.95	-4673.37	1.10	0.22	1.07	311090.16	1573025.53	N 39 20 39.39	W 81 0 35.22	6.47
	12391.00	89.97	319.59	6343.90	5206.28	5910.57	3571.17	-4735.45	0.31	-0.18	-0.25	311163.38	1572963.45	N 39 20 40.11	W 81 0 36.03	6.48
	12486.00	90.03	320.29	6343.90	5206.28	6004.61	3643.88	-4796.59	0.74	0.06	0.74	311236.09	1572902.31	N 39 20 40.81	W 81 0 36.82	6.49
	12582.00	90.10	319.96	6343.79	5206.17	6099.59	3717.56	-4858.14	0.35	0.07	-0.34	311309.76	1572840.77	N 39 20 41.53	W 81 0 37.62	6.50
	12677.00	90.00	319.89	6343.71	5206.09	6193.66	3790.15	-4919.42	0.30	-0.11	-0.28	311382.34	1572779.49	N 39 20 42.24	W 81 0 38.42	6.51
	12772.00	90.79	319.99	6343.05	5205.43	6287.72	3862.75	-4980.69	0.89	0.83	0.32	311454.94	1572718.22	N 39 20 42.95	W 81 0 39.21	6.52
	12868.00	90.69	320.11	6341.81	5204.19	6382.72	3936.33	-5042.33	0.16	-0.10	0.13	311528.52	1572656.59	N 39 20 43.68	W 81 0 40.01	6.53
	12962.00	91.24	320.43	6340.23	5202.61	6475.68	4008.62	-5102.40	0.68	0.59	0.34	311600.80	1572596.52	N 39 20 44.37	W 81 0 40.79	6.54
	13058.00	90.62	320.52	6338.67	5201.05	6570.56	4082.66	-5163.49	0.65	-0.65	0.09	311674.84	1572535.43	N 39 20 45.09	W 81 0 41.59	6.55
	13154.00	90.17	320.25	6338.01	5200.39	6665.48	4156.61	-5224.70	0.55	-0.47	-0.28	311748.79	1572474.23	N 39 20 45.81	W 81 0 42.38	6.56
	13249.00	89.42	320.10	6338.35	5200.73	6759.46	4229.57	-5285.54	0.81	-0.79	-0.16	311821.74	1572413.39	N 39 20 46.52	W 81 0 43.17	6.57
	13345.00	89.24	319.91	6339.47	5201.85	6854.47	4303.11	-5347.24	0.27	-0.19	-0.20	311895.28	1572351.69	N 39 20 47.24	W 81 0 43.97	6.57
	13440.00	89.21	320.09	6340.75	5203.13	6948.49	4375.87	-5408.30	0.19	-0.03	0.19	311968.04	1572290.64	N 39 20 47.95	W 81 0 44.76	6.58
	13536.00	89.24	319.53	6342.05	5204.43	7043.54	4449.20	-5470.24	0.58	0.03	-0.58	312041.37	1572228.69	N 39 20 48.66	W 81 0 45.57	6.59
	13631.00	89.11	320.24	6343.42	5205.80	7137.58	4521.85	-5531.44	0.76	-0.14	0.75	312114.01	1572167.49	N 39 20 49.37	W 81 0 46.36	6.60
	13727.00	89.11	319.51	6344.91	5207.29	7232.62	4595.24	-5593.30	0.76	0.00	-0.76	312187.40	1572105.64	N 39 20 50.08	W 81 0 47.17	6.61
	13823.00	89.11	319.25	6346.40	5208.78	7327.78	4668.10	-5655.80	0.27	0.00	-0.27	312260.26	1572043.15	N 39 20 50.79	W 81 0 47.98	6.62
	13918.00	89.14	319.52	6347.85	5210.23	7421.92	4740.21	-5717.63	0.29	0.03	0.28	312332.36	1571981.32	N 39 20 51.50	W 81 0 48.78	6.63
	14014.00	89.21	319.58	6349.24	5211.62	7517.03	4813.25	-5779.91	0.10	0.07	0.06	312405.40	1571919.04	N 39 20 52.21	W 81 0 49.59	6.64
	14110.00	88.87	319.77	6350.84	5213.22	7612.11	4886.43	-5842.02	0.41	-0.35	0.20	312478.58	1571856.93	N 39 20 52.92	W 81 0 50.39	6.64
	14204.00	88.38	318.87	6353.10	5215.48	7705.27	4957.70	-5903.28	1.00	-0.52	-0.96	312549.84	1571795.68	N 39 20 53.61	W 81 0 51.19	6.65
	14298.00	89.52	319.74	6354.82	5217.20	7798.44	5028.95	-5964.56	1.53	1.21	0.93	312621.09	1571734.40	N 39 20 54.31	W 81 0 51.98	6.66
	14393.00	89.55	319.96	6355.59	5217.97	7892.50	5101.56	-6025.81	0.23	0.03	0.23	312693.70	1571673.15	N 39 20 55.02	W 81 0 52.78	6.67
	14487.00	90.28	320.85	6355.73	5218.11	7985.44	5174.00	-6085.72	1.22	0.78	0.95	312766.13	1571613.24	N 39 20 55.72	W 81 0 53.56	6.68
	14582.00	90.65	320.71	6354.96	5217.34	8079.27	5247.59	-6145.79	0.42	0.39	-0.15	312839.72	1571553.18	N 39 20 56.44	W 81 0 54.34	6.69
	14677.00	90.72	320.08	6353.83	5216.21	8173.19	5320.78	-6206.34	0.67	0.07	-0.66	312912.90	1571492.63	N 39 20 57.15	W 81 0 55.12	6.70
	14772.00	90.27	318.81	6353.01	5215.39	8267.34	5392.96	-6268.11	1.42	-0.47	-1.34	312985.07	1571430.87	N 39 20 57.85	W 81 0 55.92	6.71
	14867.00	90.62	319.35	6352.27	5214.65	8361.56	5464.74	-6330.33	0.68	0.37	0.57	313056.85	1571368.65	N 39 20 58.55	W 81 0 56.73	6.72
	14963.00	90.38	318.93	6351.43	5213.81	8456.77	5537.34	-6393.13	0.50	-0.25	-0.44	313129.45	1571305.85	N 39 20 59.26	W 81 0 57.55	6.72
	15058.00	90.38	319.43	6350.80	5213.18	8550.98	5609.23	-6455.23	0.53	0.00	0.53	313201.34	1571243.75	N 39 20 59.96	W 81 0 58.35	6.73
	15152.00	90.41	320.01	6350.15	5212.53	8644.08	5680.94	-6516.00	0.62	0.03	0.62	313273.05	1571182.98	N 39 21 0.66	W 81 0 59.14	6.74
	15248.00	90.76	320.83	6349.17	5211.55	8738.98	5754.93	-6577.16	0.93	0.36	0.85	313347.03	1571121.82	N 39 21 1.38	W 81 0 59.94	6.75
	15342.00	90.14	320.29	6348.43	5210.81	8831.88	5827.52	-6636.88	0.87	-0.66	-0.57	313419.62	1571062.11	N 39 21 2.09	W 81 1 0.71	6.76
	15437.00	89.86	319.87	6348.43	5210.81	8925.89	5900.38	-6697.84	0.53	-0.29	-0.44	313492.47	1571001.15	N 39 21 2.80	W 81 1 1.50	6.76
	15532.00	90.28	320.33	6348.32	5210.70	9019.89	5973.26	-6758.78	0.66	0.44	0.48	313565.35	1570940.22	N 39 21 3.51	W 81 1 2.29	6.77
	15626.00	90.93	321.74	6347.33	5209.71	9112.66	6046.34	-6817.88	1.65	0.69	1.50	313638.43	1570881.12	N 39 21 4.22	W 81 1 3.06	6.78
	15721.00	90.69	321.54	6345.98	5208.36	9206.25	6120.82	-6876.84	0.33	-0.25	-0.21	313712.91	1570822.17	N 39 21 4.95	W 81 1 3.83	6.79
Last MWD Survey	15820.00	90.86	321.00	6344.64	5207.02	9303.89	6198.05	-6938.77	0.57	0.17	-0.55	313790.13	1570760.24	N 39 21 5.70	W 81 1 4.63	6.80
Proj to TD	15860.00	90.86	321.00	6344.04	5206.42	9343.37	6229.13	-6963.94	0.00	0.00	0.00	313821.21	1570735.07	N 39 21 6.00	W 81 1 4.96	6.80

Survey Type: Non-Def Survey

Survey Error Model: ISCWSA Rev 0 *** 3-D 95.000% Confidence 2.7955 sigma
Survey Program:

Description	Part	MD From (ft)	MD To (ft)	EOU Freq (ft)	Hole Size (in)	Casing Diameter (in)	Survey Tool Type	Borehole / Survey
	1	0.000	25.570	Act Stns	30.000	30.000	SLB_NSG+MSHOT-Depth Only	Original Borehole / Noble Energy PENS1FHS Gyro+MWD 0' MD to update
	1	25.570	591.000	Act Stns	30.000	30.000	SLB_NSG+MSHOT	Original Borehole / Noble Energy PENS1FHS Gyro+MWD 0' MD to
	1	591.000	5346.000	Act Stns	30.000	30.000	SLB_MWD-STD	Original Borehole / Noble Energy PENS1FHS Gyro+MWD 0' MD to
	1	5346.000	5508.000	Act Stns	30.000	30.000	SLB_MWD-INC_ONLY>10	Original Borehole / Noble Energy PENS1FHS Gyro+MWD 0' MD to
	1	5508.000	15820.000	Act Stns	30.000	30.000	SLB_MWD-STD	Original Borehole / Noble Energy PENS1FHS Gyro+MWD 0' MD to
	1	15820.000	15860.000	Act Stns	30.000	30.000	SLB_BLIND+TREND	Original Borehole / Noble Energy PENS1FHS Gyro+MWD 0' MD to

Receive
Office of Oi
NOV 21 20

12/05/2014

Received
Office of Oil & Gas
NOV 21 2014

85-10031

PATHFINDER
A Schlumberger Company

Noble Energy

noble energy

Borehole:	Well:	Field:	Structure:
Original Borehole	PENS1FHS	WV Ritchie County (NAD27)	Nomac 78

Gravity & Magnetic Parameters

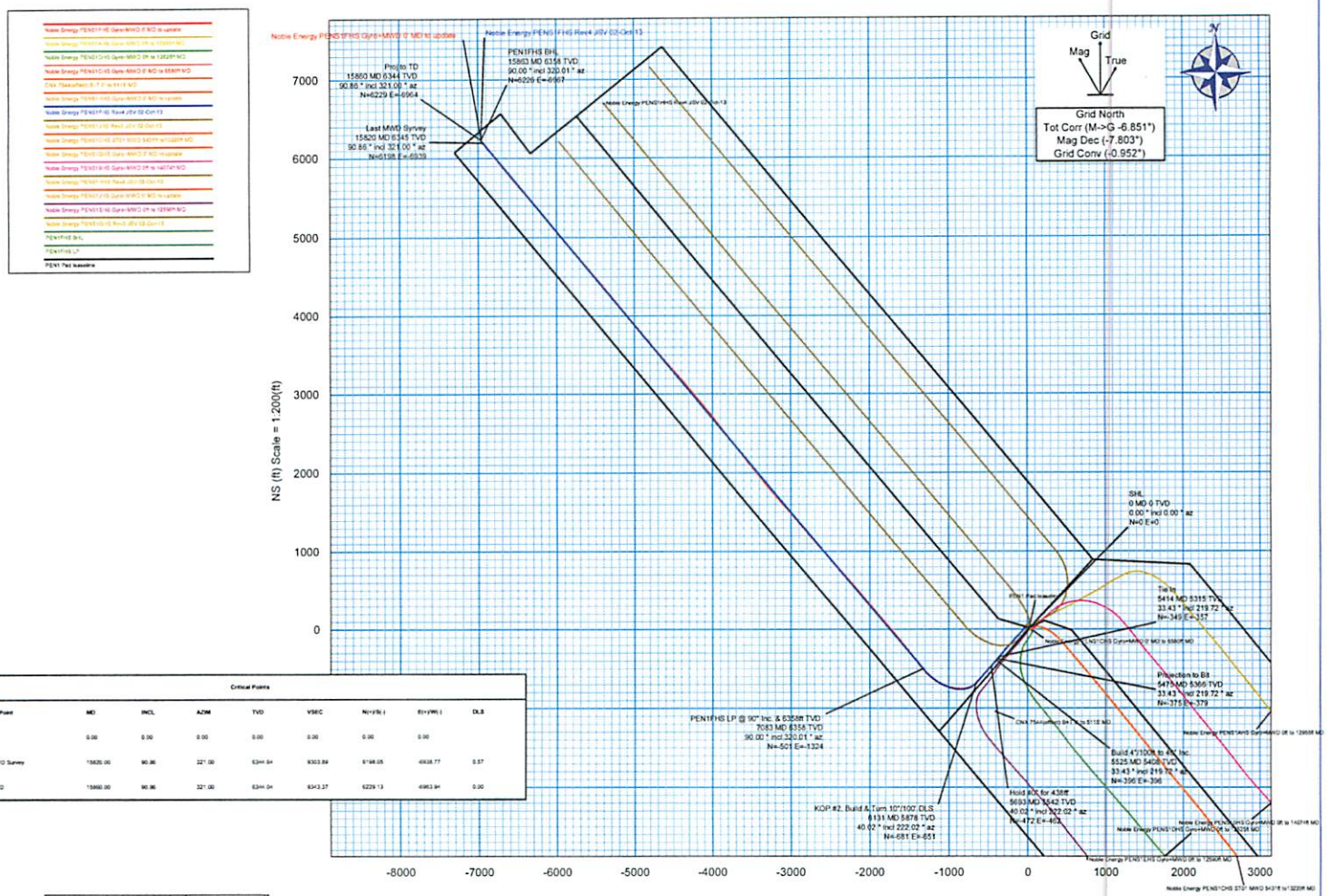
Model:	HDGM 2013	Dip:	66.875°	Date:	12/9/2013
MagDec:	-7.803°	FS:	52291.181nT	Gravity FS:	999.306mgn (9.80665 [illegible])

Surface Location NAD27 West Virginia State Plane, Northern Zone, US Feet

Lat:	N 39 20 5.60	Northing:	307592.38ftUS	Grid Conv:	-0.952°
Lon:	W 80 59 35.01	Easting:	1577698.67ftUS	Scale Fact:	1

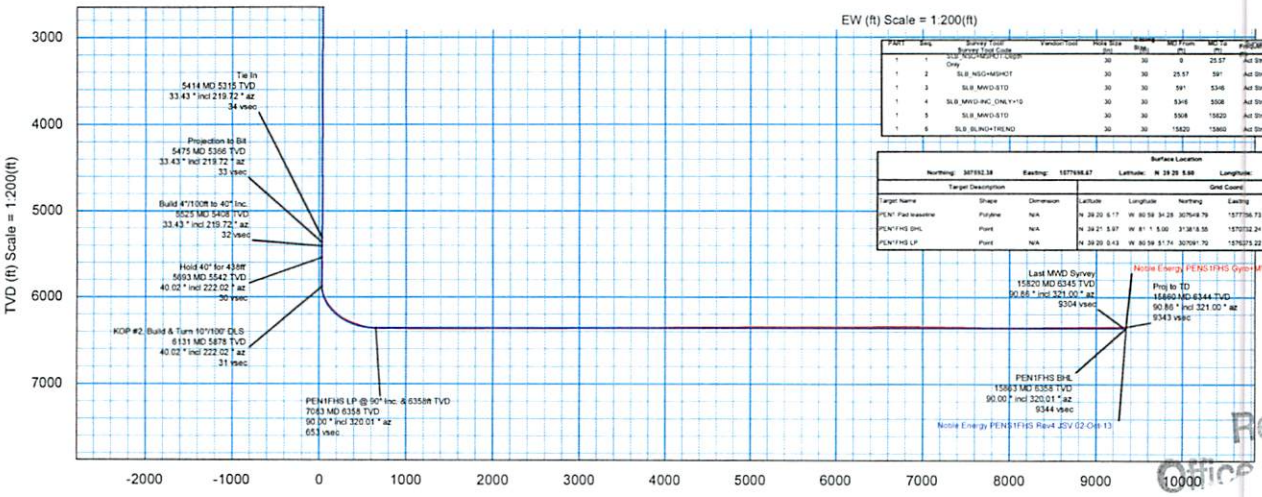
Miscellaneous

Slot:	PENS1FHS	TVD Ref:	KB(1137.62ft above MSL)
Plan:	Noble Energy PENS1FHS Gyro+MWD 0' MD to update		



Critical Points

Critical Point	MD	INCL	AZIM	TVD	VSEC	N+/-S(-)	E+/-W(-)	DLS
SHL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Last MWD Survey	15820.00	90.86	321.00	6344.84	9303.89	6198.05	-6938.77	0.37
Proj to TD	15860.00	90.86	321.00	6344.04	9343.37	6229.13	-6963.94	0.00



PART	Seq.	Survey Tool Survey Tool Code	Vendor Tool	Hole Size (in)	Casing Size	MD From (ft)	MD To (ft)	Start Date	End Date	Comments/ Comments
1	1	SLB_NSG+MSHOT-Depth Only		30	30	0	25.57	Act Strs	* 1.25	1.25
1	2	SLB_NSG+MSHOT		30	30	25.57	591	Act Strs	2.29	1.79
1	3	SLB_MWD-STD		30	30	591	5316	Act Strs	15.09	7.92
1	4	SLB_MWD-INC_ONLY+10		30	30	5316	5508	Act Strs	46.59	8.63
1	5	SLB_MWD-STD		30	30	5508	15820	Act Strs	267.84	60.8
1	6	SLB_BLIND+TREND		30	30	15820	15860	Act Strs	272.02	61.61

Surface Location

Northing: 307592.38 Easting: 1577698.67 Latitude: N 39 20 5.60 Longitude: W 80 59 35.01 VSec Azimuth: 311.788

Target Description			Grid Coord					Local Coord	
Target Name	Shape	Dimension	Latitude	Longitude	Northing	Easting	TVD	VSec	N+/-S(-)	E+/-W(-)
PEN1 Pad baseline	Polyline	N/A	N 39 20 6.17	W 80 59 34.28	307549.79	1577756.73	1137.62	-5.04	57.47	58.07
PEN1FHS BHL	Point	N/A	N 39 21 5.97	W 81 1 5.00	313818.55	1570732.24	6359.00	9343.70	6225.47	-6966.77
PEN1FHS LP	Point	N/A	N 39 20 0.43	W 80 59 51.74	307091.70	1576875.22	6359.00	653.17	-500.71	-1323.51

Office

12/05/2014