

<b>Borehole:</b> <b>Original Borehole</b>	<b>Well:</b> <b>SHR-38E-HSM</b>	<b>Field:</b> <b>WV Tyler County (NAD 27)</b>	<b>Structure:</b> <b>Patterson 801</b>
<b>Gravity &amp; Magnetic Parameters</b>		<b>Surface Location</b>	
Model: <b>HGDM 2019</b>	Dip: <b>66.45°</b>	Date: <b>25-Jun-2019</b>	Surface Location: <b>NAD27 West Virginia State Plane, Northern Zone, US Feet</b>
MagDec: <b>-7.70F°</b>	FS: <b>61623.77InT</b>	Gravity FS: <b>999.321mgal (8.0666 Based)</b>	Lat: <b>N 39 22 16.74</b>
			Northing: <b>320156.889US</b>
			Grid Conv: <b>-0.8517'</b>
			Eastng: <b>16224720US</b>
			Scale Fact: <b>0.99996067</b>
			Miscellaneous: <b>Slot: SHR-38E-HSM TVD Ref: KB(1040.66R above MSL)</b>
			Plan: <b>CNX SHR-38E-HSM Surveys Off to 20160R MD</b>

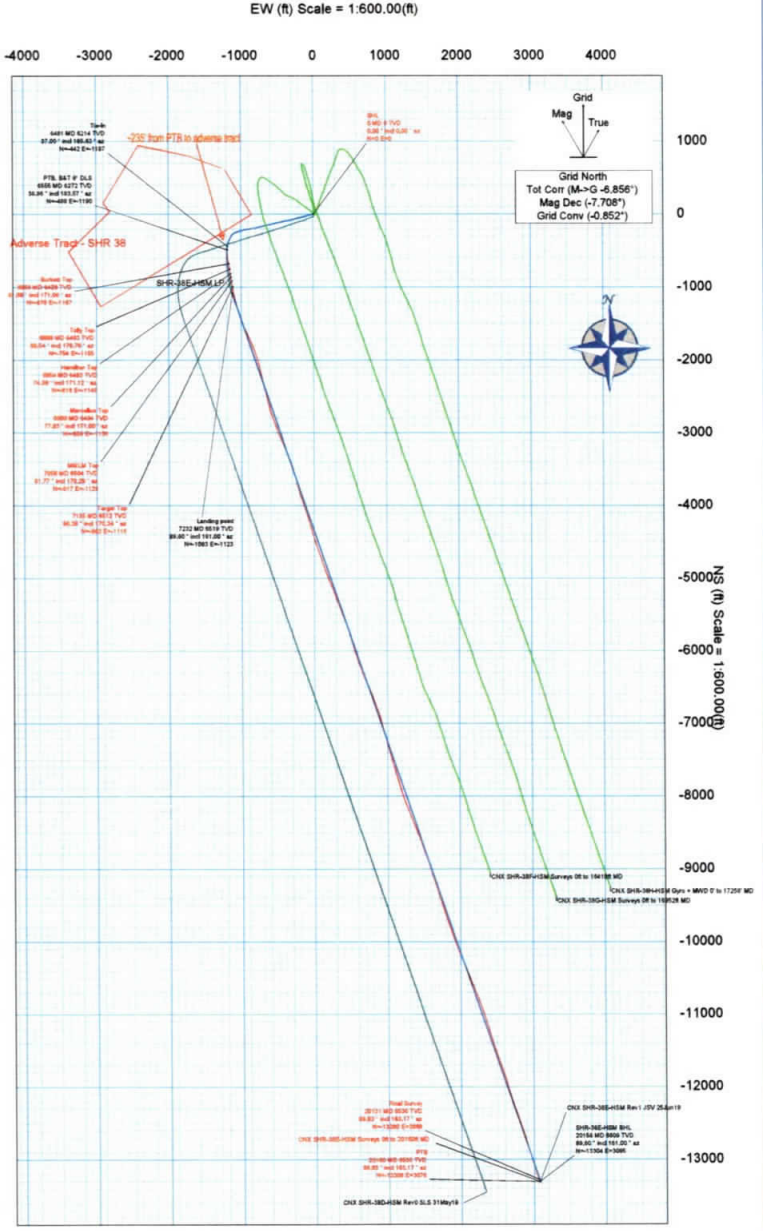
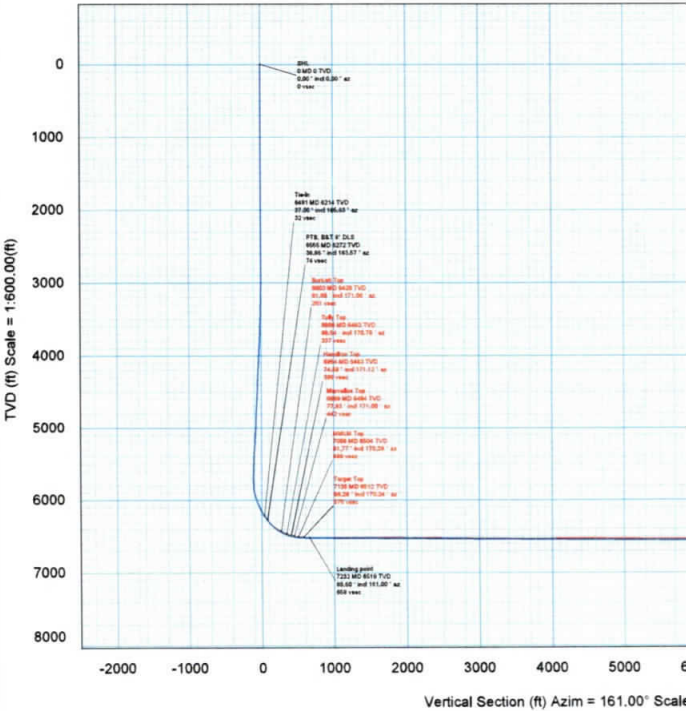
Critical Points							
Point	MD	BHCL	AZM	TVD	VSEC	NEVSec	EV(99%)
SHL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Surfset Top	9903.00	91.60	171.06	6427.87	295.94	-477.82	-1147.29
Tubg Top	9885.00	86.54	170.74	6442.96	337.18	-754.32	-1150.02
Tubhse Top	8954.00	74.58	171.12	6483.00	388.82	-416.31	-1145.14
Manhole Top	8999.00	77.83	171.00	6493.86	442.04	-458.50	-1136.42
MMLN Top	7058.00	81.77	176.29	6504.13	499.27	-416.78	-1126.89
Target Top	7136.00	86.29	175.34	6512.07	574.88	-480.23	-1119.84
Final Survey	20131.00	88.83	163.17	8530.27	13899.23	-13276.87	3967.78
PTB	20165.00	88.81	163.17	8536.36	13904.21	-13287.71	3976.16

PART	Seq	Survey Tool	Survey Tool Code	Velocity/Freq	Mag. Bias	Coiling Rate	Apparent Mag. Ind. P1	MD From (ft)	MD To (ft)	Survey Frequency (Hz)	AVG (ft)	AVG (ft)	Comments/Contingency
1	1	NAL_NGSH-HOT-COIL	001	30	30	0	0	28	198.425	1.261	1.25		
1	2	NAL_NGSH-HOT-COIL	001	30	30	0	0	28	198.425	1.261	1.25		
1	3	NAL_NGSH-HOT-COIL	001	30	30	0	0	28	198.425	1.261	1.25		
1	4	NAL_NGSH-HOT-COIL	001	30	30	0	0	28	198.425	1.261	1.25		
1	5	NAL_NGSH-HOT-COIL	001	30	30	0	0	28	198.425	1.261	1.25		

Borehole Location										
Northing	Eastng									
320156.879	162247.488									
Grid Coord										
Latitude	Longitude									
N 39 22 16.74	W 80 50 7.60									
Local Coord										
Target Name	Shape	Dimension	Latitude	Longitude	Northing	Eastng	TVD	VSec	NEV(99%)	EV(99%)
Adverse Tract - SHR 38	Public	N/A	N 38 24 52.89	W 80 50 45.70	32000.78	161903.13	1045.85	-1581.83	11962.80	-2633.02
SHR-38E-HSM BHL	Part	N/A	N 38 25 5.76	W 80 48 25.83	30862.81	162554.86	851.00	13584.03	-13304.45	3085.15
SHR-38E-HSM LP	Part	N/A	N 38 22 6.94	W 80 50 22.22	31943.85	162138.80	851.00	842.17	-473.88	-1162.48

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Office of Oil and Gas  
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Environmental Protection

- CNX SHR-38E-HSM Surveys Off to 20160R MD
- CNX SHR-38E-HSM Rev 1 25Jun19
- CNX SHR-38E-HSM Rev 2 25Jun19
- CNX SHR-38E-HSM Rev 3 31May19
- CNX SHR-38E-HSM Rev 4 31May19
- Adverse Tract - SHR 38
- SHR-38E-HSM BHL
- SHR-38E-HSM LP



**CONTROLLED**

Plan ref: CNX 2019-06-25-19-001-001  
Drawing ref: 2019-06-25-19-001-001  
Copy number: 01  
Date: 19-06-2019  
Drawn By: J. Stamen  
Copy number: 19

CNX SHR-38E-HSM Surveys Off to 20160ft MD Survey Geodetic Report

(Def Survey)

Report Date: July 18, 2019 - 04:11 PM
Client: CNX Gas
Field: WV Tyler Field (NAD 27)
Structure / Slot: CNX SHR-38 Pad / SHR-38E-HSM
Well: SHR-38E-HSM
Borehole: Original Borehole
UWI / API#: Unknown / Unknown
Survey Name: CNX SHR-38E-HSM Surveys Off to 20160ft MD
Survey Date: June 25, 2019
Tori AHD / DDI / ERD Ratio: 319.186 / 1.14234.178 / 7 / 167 / 12.281
Coordinates Reference System: NAD27 West Virginia State Plane, Northern Zone, US Feet
Location Lat / Long: N 30° 22' 16.73502", W 80° 50' 7.80192"
Location Grid NE Y/X: N 320156.670 RUS, E 1022471.980 RUS
CRS Grid Convergence Angle: -0.8517"
Grid Scale Factor: 0.999995067
Version / Patch: 2.10.753.0

Survey / DLS Computation: Minimum Curvature / Lubinski
Vertical Section Azimuth: 161.000 (Grid North)
Vertical Section Origin: 0.000 R, 0.000 R
TVD Reference Datum: KB
TVD Reference Elevation: 1040.650 R above MSL
Seabed / Ground Elevation: 1011.650 R above MSL
Magnetic Declination: -7.708"
Total Gravity Field Strength: 969.3213mg (9.80665 Baud)
Gravity Model: GARM
North Reference: 18223.771 nT
Magnetic Dip Angle: 66.450"
Declination Date: June 25, 2019
Magnetic Declination Model: HDGM 2019
North Reference: Grid North
Grid Convergence Used: -0.8517"
Total Corr Mag North-Grid North: -0.8563"
Local Coord Referenced To: Wall Head

Table with columns: Comments, MD, Incl, Azim Grid, TVD, TVDSS, VSEC, NS, EW, DLS, TF, BR, TR, Northing, Easting, Latitude, Longitude, Directional. Contains multiple rows of survey data points.

Comments	MD (ft)	Incl (°)	Asm Grid (°)	TVD (ft)	TVD88 (ft)	VREG (ft)	NS (ft)	EW (ft)	DLB (ft)	TF (ft)	SR (ft)	TR (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude	Directional	Difficulty Index
	7022.00	00.87	156.83	8514.25	5473.80	1358.45	-1728.23	-860.01	1.85	116.70R	0.18	1.84	318420.54	1621602.23	-80.2651367	-80.8342890	5.73	
	8117.00	00.08	156.04	8513.65	5473.00	1453.27	-1823.39	-833.43	1.33	60R	-0.04	1.17	318332.70	1621636.61	-80.2652748	-80.8342942	5.77	
	8006.00	00.06	156.08	8513.55	5472.00	1647.20	-1811.95	-790.53	1.74	84.48R	0.00	1.04	318245.12	1621672.51	-80.2653488	-80.8341702	5.76	
	8206.00	00.78	163.27	8513.88	5473.03	1841.18	-2000.77	-799.67	3.63	93.72R	-0.30	3.62	318156.01	1621702.37	-80.2654945	-80.8340183	5.80	
	8300.00	00.50	167.50	8514.28	5473.03	1735.87	-2092.86	-745.78	3.89	94.44L	-0.20	3.85	318064.10	1621729.29	-80.2656401	-80.8337920	5.83	
	8304.00	00.72	187.13	8514.02	5474.27	1829.20	-2184.41	-725.21	0.54	127.12L	0.23	-0.40	317972.36	1621746.83	-80.2657810	-80.8336473	5.85	
	8400.00	00.44	166.76	8516.61	5474.96	1923.78	-2278.95	-703.75	0.49	111.13L	-0.29	-0.30	317878.85	1621768.28	-80.2659200	-80.8335027	5.87	
	8503.00	00.27	165.32	8516.97	5475.02	2017.23	-2368.30	-681.87	0.60	97.45L	-0.18	0.61	317786.84	1621790.19	-80.2660590	-80.8333581	5.86	
	8678.00	00.61	166.05	8517.00	5476.95	2111.94	-2460.61	-659.19	0.46	70.84L	0.30	-0.28	317695.20	1621812.84	-80.2661980	-80.8332134	5.91	
	8772.00	00.00	164.94	8517.92	5477.27	2206.65	-2561.81	-635.85	1.25	123.33R	0.41	-1.18	317605.20	1621835.38	-80.2663370	-80.8330686	5.92	
	8890.00	00.27	166.06	8518.52	5477.87	2290.30	-2642.61	-612.10	1.41	88.81L	-0.78	1.18	317514.20	1621858.03	-80.2664760	-80.8329239	5.94	
	8901.00	00.36	160.87	8519.64	5478.90	2384.23	-2723.64	-585.07	5.45	72.13L	0.12	-4.45	317423.18	1621880.90	-80.2666150	-80.8327792	5.97	
	9098.00	00.76	159.03	8520.33	5479.88	2480.22	-2803.05	-552.07	1.37	153.78R	0.42	-1.31	317332.77	1621903.90	-80.2667540	-80.8326344	6.00	
	9102.00	00.55	160.87	8520.88	5480.23	2583.10	-2881.24	-520.44	2.36	98.58L	-0.24	0.28	317241.56	1621926.87	-80.2668930	-80.8324897	6.03	
	9244.00	00.38	168.13	8521.78	5481.11	2677.13	-2966.80	-486.75	1.90	62.39L	-0.18	-1.85	317151.85	1621949.27	-80.2670320	-80.8323450	6.03	
	9336.00	00.27	165.48	8522.88	5482.23	2771.95	-3048.29	-448.34	0.74	70.12R	-0.12	-7.79	317061.54	1622022.68	-80.2671710	-80.8321903	6.05	
	9433.00	00.18	165.08	8524.17	5483.92	2885.45	-3131.08	-410.71	2.70	80.19R	-0.12	0.53	316970.88	1622095.31	-80.2673100	-80.8320456	6.08	
	9528.00	00.55	166.06	8525.24	5484.50	2990.13	-3258.97	-372.55	0.83	93.75R	0.41	0.71	316880.87	1622068.40	-80.2674490	-80.8318909	6.08	
	9622.00	00.38	169.30	8526.12	5485.47	3053.98	-3346.10	-334.02	2.81	86.86R	-0.18	2.81	316791.76	1622141.70	-80.2675880	-80.8317462	6.10	
	9717.00	00.50	161.37	8527.04	5486.39	3148.97	-3433.55	-305.35	2.18	98.09R	0.13	2.18	316701.30	1622215.00	-80.2677270	-80.8315915	6.11	
	9811.00	00.65	164.44	8527.82	5487.17	3242.90	-3523.20	-277.72	3.27	81.45R	0.05	3.27	316610.47	1622288.30	-80.2678660	-80.8314467	6.13	
	9906.00	00.72	185.57	8528.42	5487.77	3336.87	-3616.18	-253.40	1.22	108.03L	0.18	1.20	316519.66	1622361.60	-80.2680050	-80.8313020	6.15	
	10004.00	00.36	183.50	8529.40	5488.65	3430.84	-3709.16	-229.14	0.30	121.75R	0.27	0.68	316428.85	1622434.90	-80.2681440	-80.8311573	6.18	
	10100.00	00.83	190.70	8531.30	5490.85	3620.35	-3888.25	-172.18	3.08	21.45L	0.47	-0.04	316288.63	1622508.20	-80.2682830	-80.8310126	6.20	
	10283.00	00.20	180.48	8531.12	5490.47	3714.35	-3978.00	-140.04	0.64	161.79R	0.00	-0.23	316197.96	1622581.50	-80.2684220	-80.8308679	6.21	
	10378.00	00.17	180.83	8530.98	5490.01	3808.33	-4067.52	-108.55	0.53	81.78R	-0.23	0.47	316107.20	1622654.80	-80.2685610	-80.8307232	6.24	
	10472.00	00.45	182.87	8530.15	5489.50	3902.33	-4156.91	-80.36	2.90	91.22R	0.30	2.90	316016.44	1622728.10	-80.2687000	-80.8305785	6.23	
	10567.00	00.28	185.28	8530.45	5489.23	4000.15	-4246.39	-58.62	2.36	98.58L	-0.24	0.28	315925.68	1622801.40	-80.2688390	-80.8304338	6.24	
	10661.00	00.00	183.23	8529.13	5488.48	4098.19	-4337.90	-29.45	2.90	78.09L	-0.41	-2.63	315835.00	1622874.70	-80.2689780	-80.8302891	6.28	
	10766.00	00.11	182.71	8529.04	5488.30	4186.82	-4428.74	-1.83	0.56	38.79L	0.12	-0.55	315744.24	1622948.00	-80.2691170	-80.8301444	6.28	
	10861.00	00.28	182.63	8528.94	5488.13	4284.87	-4519.58	1.03	105.81R	0.14	0.54	315653.48	1623021.30	-80.2692560	-80.8300000	6.30		
	10945.00	00.84	186.90	8527.98	5487.53	4375.88	-4608.28	57.40	4.20	51.34L	-0.72	-2.53	315562.72	1623094.60	-80.2693950	-80.8298553	6.32	
	11030.00	00.22	185.55	8527.85	5487.20	4466.80	-4696.43	89.97	0.88	110.62R	0.30	-0.37	315471.96	1623167.90	-80.2695340	-80.8297106	6.33	
	11134.00	00.65	181.34	8528.04	5487.39	4564.85	-4785.95	121.77	2.01	30.29L	-0.71	1.58	315381.20	1623241.20	-80.2696730	-80.8295659	6.34	
	11228.00	00.05	181.26	8528.90	5488.04	4658.84	-4874.08	151.91	0.15	80L	0.12	-0.10	315290.44	1623314.50	-80.2698120	-80.8294212	6.35	
	11322.00	00.86	188.81	8529.25	5488.80	4752.82	-4964.20	184.51	2.78	80R	0.00	-0.78	315200.73	1623387.80	-80.2699510	-80.8292765	6.37	
	11417.00	00.10	182.81	8529.81	5489.18	4846.81	-5054.32	118.78	0.66	120.56L	0.10	-0.21	315110.97	1623461.10	-80.2700900	-80.8291318	6.38	
	11511.00	00.27	188.01	8530.00	5489.04	4941.63	-5146.10	253.44	0.82	74.09R	-0.41	-0.70	315021.26	1623534.40	-80.2702290	-80.8289871	6.36	
	11606.00	00.85	185.00	8531.05	5491.01	5036.53	-5237.40	288.20	1.07	19.44R	0.20	1.03	314931.50	1623607.70	-80.2703680	-80.8288424	6.40	
	11700.00	00.72	186.06	8532.26	5491.81	5130.48	-5331.25	321.91	1.10	110.74R	0.18	0.06	314841.70	1623681.00	-80.2705070	-80.8286977	6.41	
	11794.00	00.33	186.08	8533.04	5492.30	5224.44	-5430.33	354.73	1.17	83.10L	-0.41	1.10	314751.92	1623754.30	-80.2706460	-80.8285530	6.43	
	11888.00	00.61	187.75	8533.92	5493.27	5318.37	-5531.95	388.90	2.47	72.81R	0.29	0.24	314662.16	1623827.60	-80.2707850	-80.8284083	6.44	
	11982.00	00.10	185.88	8534.10	5493.46	5412.33	-5634.56	423.48	0.60	87.35R	0.16	0.42	314572.40	1623900.90	-80.2709240	-80.8282636	6.45	
	12078.00	00.08	186.30	8533.91	5493.28	5506.75	-5688.75	458.90	2.80	83.89R	-0.12	2.85	314482.22	1623974.20	-80.2710630	-80.8281189	6.46	
	12173.00	00.34	185.90	8533.58	5492.83	5603.25	-5756.90	493.84	2.86	35R	0.20	2.86	314392.46	1624047.50	-80.2712020	-80.8279742	6.48	
	12267.00	00.10	183.27	8533.25	5492.47	5699.75	-5825.15	528.78	0.42	116.82R	-0.10	0.30	314302.70	1624120.80	-80.2713410	-80.8278295	6.46	
	12362.00	00.83	183.67	8533.35	5492.70	5792.11	-5900.83	564.26	0.40	80L	-0.24	0.42	314212.95	1624194.10	-80.2714800	-80.8276848	6.50	
	12456.00	00.83	181.41	8533.02	5492.87	5886.07	-6002.47	608.54	2.30	68.1L	0.00	-0.30	314123.20	1624267.40	-80.2716190	-80.8275401	6.51	
	12551.00	00.60	181.33	8533.35	5492.70	5981.07	-6110.40	658.80	0.71	147.53L	0.71	-0.08	314033.44	1624340.70	-80.2717580	-80.8273954	6.52	
	12645.00	00.17	181.12	8532.80	5492.15	6075.07	-6208.40	692.14	0.42	105.74L	-0.36	-0.22	313943.68	1624414.00	-80.2718970	-80.8272507	6.54	
	12740.00	00.55	186.92	8533.03	5492.38	6170.05	-6297.78	735.10	1.41	84.87L	-0.66	-2.32	313853.92	1624487.30	-80.2720360	-80.8271060	6.57	
	12834.00	00.78	186.40	8533.06	5492.40	6264.85	-6386.82	778.02	1.72	81.94L	-0.48	-0.61	313764.16	1624560.60	-80.2721750	-80.8269613	6.54	
	12929.00	00.88	186.40	8533.06	5492.40	6359.68	-6471.89	820.94	2.01	101.66R	0.05	-1.72	313674.40	1624633.90	-80.2723140	-80.8268166	6.57	
	13023.00	00.38	187.30	8534.74	5494.00	6452.10	-6557.92	772.87	2.03	74.11R	-0.43	2.02	313584.64	1624707.20	-80.2724530	-80.8266719	6.58	
	13118.00	00.83	186.88	8535.30	5494.74	6546.13	-6648.00	808.31	1.73	90R	0.47	1.86	313494.88	1624780.50	-80.2725920	-80.8265272	6.56	
	13212.00	00.83	186.03	8535.87	5495.02	6640.07	-6733.79	842.07	1.10	107.61R	0.00	1.16	313405.12	1624853.80	-80.2727310	-80.8263825	6.41	
	13307.00	00.60	186.07	8536.23	5495.86	6736.04	-6822.80	876.26	1.15	81.73R	-0.35	1.00	313315.36	1624927.10	-80.2728700	-80.8262378	6.41	
	13401.00	00.10	186.03	8536.56	5496.70	6830.01	-6912.81	910.45	0.60	134.58L	-0.46	0.60	313225.60	1625000.40	-80.2730090	-80.8260931	6.38	

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVDSS (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLB (°/100ft)	TF (ft)	BR (°/100ft)	TR (°/100ft)	Northing (ft)	Easting (ft)	Latitude (°)	Longitude (°)	Directional
	10605.00	90.73	163.05	6532.90	5492.25	13069.45	-12806.61	2910.70	1.03	160.25L	0.00	-1.00	307350.73	1625301.55	36.33627768	-80.82445125	7.13
	10730.00	90.34	162.91	6532.02	5491.37	13154.39	-12807.44	2947.51	0.44	74.48L	-0.41	-0.15	307259.90	1625410.35	36.33602975	-80.82434623	7.14
	10824.00	90.39	162.73	6531.42	5490.77	13246.34	-12987.25	2975.27	0.20	29.2L	0.05	-0.19	307170.10	1625447.12	36.33578434	-80.82424540	7.15
	10918.00	90.73	162.54	6530.50	5489.85	13342.29	-13076.96	3003.33	0.41	174.92L	0.30	-0.20	307080.39	1625475.17	36.33553021	-80.82414150	7.15
	20013.00	89.83	162.49	6530.04	5489.39	13437.28	-13187.58	3031.89	0.95	78.55L	-0.05	-0.08	306999.80	1625503.73	36.33529165	-80.82403587	7.16
	20107.00	89.94	162.00	6530.22	5489.57	13531.24	-13257.07	3090.58	0.50	95.37R	0.12	-0.49	306900.29	1625532.42	36.33504708	-80.82392979	7.16
Final Survey	20131.00	89.83	163.17	6530.27	5489.62	13565.23	-13279.97	3067.76	4.90	HS	-0.46	4.88	306877.39	1625539.80	36.33498451	-80.82390321	7.17
PTB	20180.00	89.83	163.17	6530.36	5489.71	13564.21	-13307.73	3079.16	0.00		0.00	0.00	306849.83	1625548.00	36.33490855	-80.82387209	7.17

Survey Type: Def Survey

Survey Error Model: ISOWSA Rev 0 \*\*\* 3-D 65 000% 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	29.000	1/88 425	30.000	30.000	NAL_NSG+MSHOT-Depth Only	Original Borehole / CNX SHR-38E-HSM Surveys 0ft to 20160ft MD
	1	29.000	29.000	Act Str	30.000	30.000	NAL_NSG+MSHOT-Depth Only	Original Borehole / CNX SHR-38E-HSM Surveys 0ft to 20160ft MD
	1	29.000	2558.000	Act Str	30.000	30.000	NAL_NSG+MSHOT	Original Borehole / CNX SHR-38E-HSM Surveys 0ft to 20160ft MD
	1	2558.000	6481.000	Act Str	30.000	30.000	NAL_MWD-NCH_SLB	Original Borehole / CNX SHR-38E-HSM Surveys 0ft to 20160ft MD
	1	6481.000	20180.000	Act Str	30.000	30.000	NAL_MWD_1.0_DEG	Original Borehole / CNX SHR-38E-HSM Surveys 0ft to 20160ft MD

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