

Noble Energy

CO, Weld County (NAD 83 NZ)
Sec 25 Twn 4 N Rng 65 W
Heartland C30-79-1HN Original Hole
05-123-39555
PD 828



A Schlumberger Company

Final Survey Report

17-Sep-2014

Well Coordinates:	NAD83 CO State Plane,N Zone,US Ft
	N 40° 16' 36.22800" W 104° 36' 13.14000"
	1344918.1 usFt 3250092.42 usFt
Ground Level:	4845.00 ft MSL
TVD Reference:	KB 16ft @ 4861.00 ft MSL
Local Coordinate Origin:	Heartland C30-79-1HN well head
Vertical Section Azimuth:	3.080 ° (Grid North)
North Reference:	Grid North

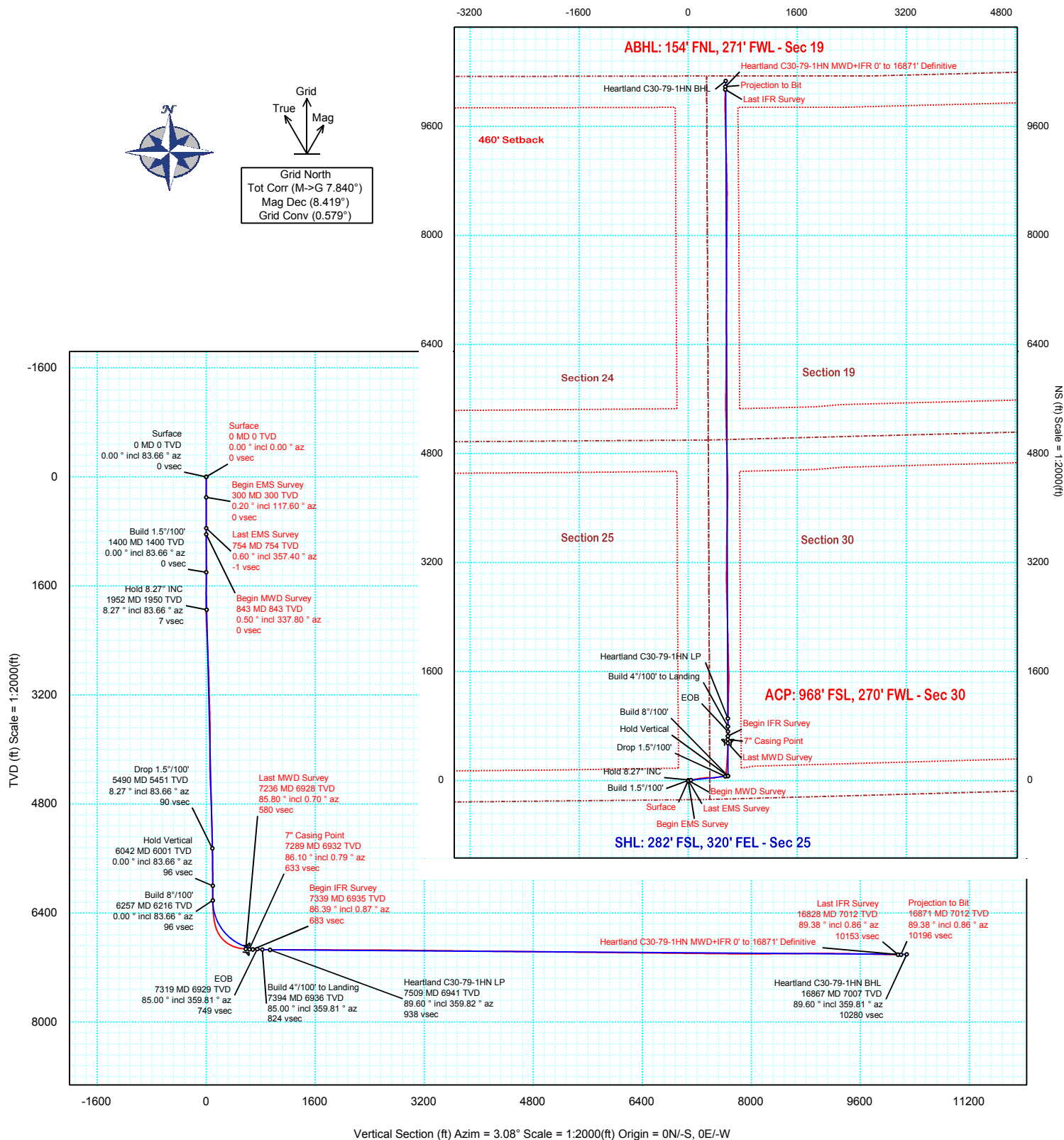
DOX Version: 2.8

Borehole: Original Hole	Well: Heartland C30-79-1HN	Field: CO, Weld County (NAD 83 NZ)	Structure: 25-04N-65W (Heartland C30-79-1HN Pad) - PD 828
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Gravity & Magnetic Parameters	Surface Location	NAD83 Colorado State Plane, Northern Zone, US Feet	Miscellaneous
Model: BGGM 2014 Dip: 66.858° Date: 15-Sep-2014	Lat: N 40 16 36.23 Northing: 1344918.58ftU Grid Conv: 0.5793°	Slot: Heartland C30-79-1HN TVD Ref: KB 16ft(4861ft above MSL)	Plan: Heartland C30-79-1HN MWD+IFR 0' to 16871' Definitive
MagDec: 8.419° FS: 52635.555mT Gravity FS: 999.018mgn (9.80665 Based)	Lon: W 104 36 12.53 Easting: S 3250139.85ftU Scale Fact: 0.99995695		

PvA

EW (ft) Scale = 1:2000(ft)





Heartland C30-79-1HN MWD+IFR 0' to 16871' Definitive Survey Geodetic Report (Def Survey)



Report Date: September 26, 2014 - 09:44 AM
Client: Noble Energy
Field: CO, Weld County (NAD 83 NZ)
Structure / Slot: Noble 25-04N-65W (Heartland C30-79-1HN Pad) - PD 828 / Heartland C30-79-1HN
Well: Heartland C30-79-1HN
Borehole: Original Hole
UWI / API#: Unknown / Unknown
Survey Name: Heartland C30-79-1HN MWD+IFR 0' to 16871' Definitive
Survey Date: September 15, 2014
Tort / AHD / DDI / ERD Ratio: 278.254 ° / 10729.842 ft / 6.856 / 1.530
Coordinate Reference System: NAD83 Colorado State Plane, Northern Zone, US Feet
Location Lat / Long: N 40° 16' 36.22800", W 104° 36' 12.52800"
Location Grid N/E Y/X: N 1344918.576 ftUS, E 3250139.854 ftUS
CRS Grid Convergence Angle: 0.5793 °
Grid Scale Factor: 0.99995695
Version / Patch: 2.8.551.0

Survey / DLS Computation: Minimum Curvature / Lubinski
Vertical Section Azimuth: 3.077 ° (Grid North)
Vertical Section Origin: 0.000 ft, 0.000 ft
TVD Reference Datum: KB 16ft
TVD Reference Elevation: 4861.000 ft above MSL
Seabed / Ground Elevation: 4845.000 ft above MSL
Magnetic Declination: 8.419 °
Total Gravity Field Strength: 999.0180mgn (9.80665 Based)
Gravity Model: GARM
Total Magnetic Field Strength: 52635.555 nT
Magnetic Dip Angle: 66.858 °
Declination Date: September 15, 2014
Magnetic Declination Model: BGGM 2014
North Reference: Grid North
Grid Convergence Used: 0.5793 °
Total Corr Mag North->Grid North: 7.8401 °
Local Coord Referenced To: Well Head

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
Surface	0.00	0.00	0.00	0.00	0.00	0.00	0.00	N/A	1344918.58	3250139.85	N 40 16 36.23	W 104 36 12.53
Begin EMS	300.00	0.20	117.60	300.00	-0.22	-0.24	0.46	0.07	1344918.33	3250140.32	N 40 16 36.23	W 104 36 12.52
Survey	699.00	0.20	126.60	699.00	-0.89	-0.98	1.64	0.01	1344917.60	3250141.49	N 40 16 36.22	W 104 36 12.51
Last EMS	754.00	0.60	357.40	754.00	-0.66	-0.75	1.70	1.35	1344917.83	3250141.56	N 40 16 36.22	W 104 36 12.51
Survey	843.00	0.50	337.80	842.99	0.16	0.08	1.54	0.24	1344918.65	3250141.39	N 40 16 36.23	W 104 36 12.51
	933.00	0.70	330.90	932.99	0.98	0.92	1.12	0.24	1344919.50	3250140.97	N 40 16 36.24	W 104 36 12.51
	1023.00	0.80	325.80	1022.98	1.94	1.92	0.50	0.13	1344920.50	3250140.35	N 40 16 36.25	W 104 36 12.52
	1131.00	0.90	320.60	1130.97	3.17	3.20	-0.46	0.12	1344921.77	3250139.39	N 40 16 36.26	W 104 36 12.53
	1225.00	1.10	316.40	1224.95	4.33	4.42	-1.55	0.23	1344923.00	3250138.30	N 40 16 36.27	W 104 36 12.55
	1319.00	1.00	307.70	1318.94	5.68	5.78	-1.76	1.35	1344924.36	3250138.10	N 40 16 36.29	W 104 36 12.55
	1413.00	0.80	138.60	1412.93	5.94	5.99	-0.90	1.55	1344924.57	3250138.95	N 40 16 36.29	W 104 36 12.54
	1508.00	2.20	127.90	1507.90	4.42	4.38	0.97	1.50	1344922.95	3250140.83	N 40 16 36.27	W 104 36 12.51
	1601.00	3.60	130.20	1600.78	1.64	1.39	4.61	1.51	1344919.97	3250144.47	N 40 16 36.24	W 104 36 12.47
	1696.00	4.20	114.20	1695.56	-1.41	-1.96	10.06	1.30	1344916.62	3250149.92	N 40 16 36.21	W 104 36 12.40
	1791.00	5.10	107.60	1790.25	-3.73	-4.66	17.26	1.10	1344913.92	3250157.12	N 40 16 36.18	W 104 36 12.31
	1886.00	4.60	82.20	1884.92	-4.07	-5.42	25.06	2.30	1344913.16	3250164.92	N 40 16 36.17	W 104 36 12.21
	1981.00	5.50	76.30	1979.55	-2.03	-3.82	33.26	1.09	1344914.75	3250173.11	N 40 16 36.19	W 104 36 12.10
	2060.00	6.70	80.80	2058.10	0.04	-2.19	41.49	1.63	1344916.39	3250181.34	N 40 16 36.20	W 104 36 11.99
	2150.00	6.50	69.80	2147.51	3.17	0.41	51.45	1.42	1344918.98	3250191.30	N 40 16 36.23	W 104 36 11.86
	2240.00	7.80	77.60	2236.81	6.81	3.48	62.20	1.80	1344922.06	3250202.05	N 40 16 36.26	W 104 36 11.73
	2329.00	8.30	68.70	2324.93	11.08	7.11	74.08	1.51	1344925.69	3250213.93	N 40 16 36.29	W 104 36 11.57
	2419.00	8.10	70.80	2414.01	16.16	11.55	86.12	0.40	1344930.13	3250225.97	N 40 16 36.33	W 104 36 11.42
	2509.00	7.70	71.60	2503.16	20.77	15.54	97.83	0.46	1344934.12	3250237.68	N 40 16 36.37	W 104 36 11.26
	2599.00	8.00	77.00	2592.32	24.71	18.85	109.65	0.88	1344937.43	3250249.50	N 40 16 36.40	W 104 36 11.11
	2689.00	9.20	78.20	2681.30	28.30	21.73	122.80	1.35	1344940.31	3250262.65	N 40 16 36.43	W 104 36 10.94
	2779.00	10.60	81.20	2769.96	31.85	24.47	138.02	1.66	1344943.05	3250277.87	N 40 16 36.46	W 104 36 10.74
	2868.00	10.50	77.90	2857.46	35.65	27.42	154.04	0.69	1344946.00	3250293.89	N 40 16 36.48	W 104 36 10.54
	2958.00	10.70	83.30	2945.93	39.22	30.12	170.36	1.13	1344948.69	3250301.21	N 40 16 36.51	W 104 36 10.33
	3048.00	10.30	87.50	3034.42	41.42	31.44	186.70	0.96	1344950.02	3250326.54	N 40 16 36.52	W 104 36 10.12
	3138.00	9.00	86.20	3123.14	43.05	32.26	201.76	1.46	1344950.84	3250341.60	N 40 16 36.53	W 104 36 9.92
	3228.00	8.50	79.80	3212.10	45.42	33.91	215.33	1.22	1344952.48	3250355.17	N 40 16 36.54	W 104 36 9.75
	3318.00	8.00	83.00	3301.17	48.04	35.85	228.09	0.75	1344954.42	3250367.94	N 40 16 36.56	W 104 36 9.58
	3407.00	8.50	81.10	3389.25	50.49	37.62	240.74	0.64	1344956.19	3250380.58	N 40 16 36.58	W 104 36 9.42
	3497.00	7.90	83.40	3478.33	52.91	39.36	253.45	0.76	1344957.93	3250393.30	N 40 16 36.59	W 104 36 9.25
	3587.00	6.70	82.40	3567.59	54.92	40.77	264.80	1.34	1344959.34	3250404.64	N 40 16 36.60	W 104 36 9.11
	3677.00	6.90	83.10	3656.96	56.83	42.11	275.37	0.24	1344960.68	3250415.22	N 40 16 36.62	W 104 36 8.97
	3767.00	7.00	93.00	3746.30	57.77	42.47	286.22	1.33	1344961.05	3250426.06	N 40 16 36.62	W 104 36 8.83
	3857.00	7.90	98.00	3835.54	57.25	41.32	297.82	1.23	1344959.90	3250437.66	N 40 16 36.61	W 104 36 8.68
	3946.00	9.70	98.40	3923.49	56.03	39.38	311.29	2.02	1344957.95	3250451.13	N 40 16 36.59	W 104 36 8.51
	4036.00	9.50	96.50	4012.23	54.88	37.43	326.17	0.42	1344956.00	3250466.01	N 40 16 36.57	W 104 36 8.32
	4126.00	8.40	94.30	4101.14	54.30	36.10	340.11	1.28	1344954.67	3250479.95	N 40 16 36.55	W 104 36 8.14
	4216.00	7.10	94.80	4190.31	53.99	35.14	352.21	1.45	1344953.71	3250492.05	N 40 16 36.54	W 104 36 7.98
	4306.00	8.00	86.80	4279.53	54.51	35.02	364.00	1.54	1344953.60	3250503.84	N 40 16 36.54	W 104 36 7.83
	4396.00	7.90	81.10	4368.67	56.48	36.33	376.37	0.88	1344954.90	3250516.21	N 40 16 36.55	W 104 36 7.67
	4486.00	8.90	78.60	4457.70	59.50	38.66	389.30	1.18	1344957.24	3250529.14	N 40 16 36.57	W 104 36 7.50
	4576.00	10.00	78.60	4546.48	63.20	41.58	403.79	1.22	1344960.16	3250543.62	N 40 16 36.60	W 104 36 7.31
	4666.00	9.40	76.10	4635.19	67.30	44.89	418.58	0.81	1344963.47	3250558.42	N 40 16 36.63	W 104 36 7.12
	4755.00	8.90	77.90	4723.06	71.22	48.08	432.37	0.65	1344966.65	3250572.20	N 40 16 36.66	W 104 36 6.94
	4845.00	9.00	79.70	4811.97	74.67	50.80	446.10	0.33	1344969.37	3250585.94	N 40 16 36.69	W 104 36 6.77
	4935.00	8.70	81.30	4900.89	77.69	53.09	459.76	0.43	1344971.66	3250599.59	N 40 16 36.71	W 104 36 6.59
	5025.00	7.90	76.00	4989.95	80.89	55.61	472.49	1.23	1344974.19	3250612.32	N 40 16 36.73	W 104 36 6.43
	5115.00	8.00	81.40	5079.09	83.98	58.05	484.68	0.84	1344976.62	3250624.51	N 40 16 36.75	W 104 36 6.27
	5205.00	9.10	86.80	5168.09	86.02	59.38	497.98	1.51	1344977.95	3250637.81	N 40 16 36.76	W 104 36 6.10
	5294.00	7.30	81.70	5256.18	87.91	60.59	510.60	2.18	1344979.16	3250650.44	N 40 16 36.78	W 104 36 5.93
	5384.00	8.00	84.10	5345.37	90.01	62.06	522.49	0.85	1344980.63	3250662.32	N 40 16 36.79	W 104 36 5.78
	5474.00	7.70	86.00	5434.53	91.73	63.12	534.74	0.44	1344981.70	3250674.57	N 40 16 36.80	W 104 36 5.62
	5564.00	5.40	84.00	5523.94	93.15	63.99	544.96	2.57	1344982.56	3250684.79	N 40 16 36.81	W 104 36 5.49
	5654.00	5.20	91.00	5613.55	93.96	64.36	553.25	0.75	1344982.93	3250693.08	N 40 16 36.81	W 104 36 5.38
	5744.00	4.30	91.40	5703.24	94.21	64.20	560.70	1.00	1344982.78	3250700.53	N 40 16 36.81	W 104 36 5.29
	5834.00	4.10	96.50	5793.00	94.12	63.76	567.27	0.47	1344982.33	3250707.10	N 40 16 36.80	W 104 36 5.20
	5923.00	2.80	92.30	5881.84	93.95	63.31	572.61	1.49	1344981.88	3250712.44	N 40 16 36.80	W 104 36 5.13
	6013.00	1.50	98.90	5971.77	93.86	63.04	575.97	1.47	1344981.61	3250715.80	N 40 16 36.79	W 104 36 5.09
	6103.00	0.50	192.30	6061.76	93.36	62.47	577.05	1.79	1344981.05	3250716.88	N 40 16 36.79	W 104 36 5.08
	6238.00	1.40	306.90	6196.75	93.69	62.89	575.60	1.24	1344981.46	3250715.43	N 40 16 36.79	W 104 36 5.09
	6283.00	3.40	322.90	6241.71	95.02	64.28	574.36	4.64	1344982.86	3250714.19	N 40 16 36.81	W 104 36 5.11
	6328.00	4.60	325.80	6286.60	97.48	66.84	572.54	2.70	1344985.41	3250712.37	N 40 16 36.83	W 104 36 5.13
	6373.00	4.50	313.50	6331.46	100.06	69.55	570.25	2.18	1344988.12	3250710.07	N 40 16 36.86	W 104 36 5.16
	6418.00	6.30	317.20	6376.26	102.92	72.57	567.29	4.07	1344991.15	3250707.12	N 40 16 36.89	W 104 36 5.20
	6463.00	6.80	323.40	6420.96	106.69	76.52	564.02	1.92	1344995.10	3250703.85	N 40 16 36.93	W 104 36 5.24
	6508.00	7.70	339.60	6465.61	111.51	81.49	561.38	4.94	1345000.06	3250701.21	N 40 16 36.98	W 104 36 5.27
	6553.00	10.50	345.40	6510.04	118.18	88.28	559.30	6.54	1345006.86	3250699.13	N 40 16 37.04	W 104 36 5.30
	6597.00	12.60	351.20	6553.15	126.70	96.91	557.55	5.45	1345015.48	3250697.38	N 40 16 37.13	W 104 36 5.32

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
	6777.00	32.20	6.80	6719.00	191.62	161.72	561.41	12.25	1345080.28	3250701.24	N 40 16 37.77 W 104 36 5.26	
	6822.00	38.20	5.90	6756.66	217.50	187.49	564.26	13.38	1345106.05	3250704.09	N 40 16 38.02 W 104 36 5.22	
	6867.00	44.40	4.40	6790.45	247.17	217.05	566.90	13.95	1345135.62	3250706.73	N 40 16 38.32 W 104 36 5.19	
	6912.00	50.40	3.10	6820.90	280.27	250.09	569.05	13.50	1345168.65	3250708.88	N 40 16 38.64 W 104 36 5.15	
	6957.00	56.50	2.30	6847.68	316.41	286.18	570.74	13.63	1345204.75	3250710.57	N 40 16 39.00 W 104 36 5.13	
	7001.00	62.50	4.10	6870.00	354.30	324.01	572.87	14.08	1345242.58	3250712.70	N 40 16 39.37 W 104 36 5.09	
	7046.00	67.40	3.60	6889.05	395.05	364.68	575.61	10.94	1345283.24	3250715.44	N 40 16 39.77 W 104 36 5.05	
	7091.00	73.00	2.90	6904.29	437.37	406.93	578.00	12.53	1345325.49	3250717.83	N 40 16 40.19 W 104 36 5.02	
	7136.00	78.20	1.50	6915.48	480.94	450.47	579.67	11.94	1345369.03	3250719.50	N 40 16 40.62 W 104 36 4.99	
	7181.00	83.20	0.70	6922.75	525.30	494.86	580.52	11.25	1345413.41	3250720.35	N 40 16 41.06 W 104 36 4.97	
Last MWD Survey	7236.00	85.80	0.70	6928.02	580.00	549.59	581.19	4.73	1345468.15	3250721.01	N 40 16 41.60 W 104 36 4.96	
7" Casing Point	7289.00	86.10	0.79	6931.76	632.82	602.46	581.87	0.60	1345521.01	3250721.70	N 40 16 42.12 W 104 36 4.94	
Begin IFR Survey	7339.00	86.39	0.87	6935.03	682.68	652.34	582.59	0.60	1345570.89	3250722.42	N 40 16 42.62 W 104 36 4.93	
	7381.00	86.87	0.33	6937.50	724.56	694.27	583.03	1.72	1345612.81	3250722.86	N 40 16 43.03 W 104 36 4.92	
	7430.00	88.66	0.20	6939.41	773.47	743.23	583.26	3.66	1345661.77	3250723.09	N 40 16 43.51 W 104 36 4.91	
	7475.00	90.62	0.34	6939.70	818.41	788.23	583.47	4.37	1345706.77	3250723.30	N 40 16 43.96 W 104 36 4.90	
	7520.00	90.17	1.24	6939.39	863.37	833.22	584.09	2.24	1345751.76	3250723.92	N 40 16 44.40 W 104 36 4.88	
	7565.00	89.86	0.85	6939.37	908.34	878.21	584.91	1.11	1345796.75	3250724.74	N 40 16 44.85 W 104 36 4.87	
	7610.00	89.97	0.49	6939.44	953.30	923.21	585.44	0.84	1345841.74	3250725.27	N 40 16 45.29 W 104 36 4.85	
	7654.00	89.72	0.87	6939.56	997.26	967.21	585.96	1.03	1345885.74	3250725.79	N 40 16 45.73 W 104 36 4.84	
	7699.00	89.83	0.80	6939.74	1042.23	1012.20	586.62	0.29	1345930.73	3250726.45	N 40 16 46.17 W 104 36 4.83	
	7744.00	89.76	0.43	6939.90	1087.19	1057.20	587.10	0.84	1345975.73	3250726.93	N 40 16 46.62 W 104 36 4.82	
	7789.00	89.69	0.78	6940.11	1132.15	1102.19	587.58	0.79	1346020.72	3250727.40	N 40 16 47.06 W 104 36 4.80	
	7834.00	89.90	2.53	6940.27	1177.13	1147.17	588.88	3.92	1346065.70	3250728.70	N 40 16 47.50 W 104 36 4.78	
	7879.00	90.07	1.79	6940.29	1222.12	1192.14	590.57	1.69	1346110.66	3250730.40	N 40 16 47.95 W 104 36 4.75	
	7924.00	90.10	0.97	6940.22	1267.10	1237.13	591.65	1.82	1346155.65	3250731.48	N 40 16 48.39 W 104 36 4.73	
	7969.00	89.79	0.59	6940.26	1312.07	1282.12	592.27	1.09	1346200.64	3250732.10	N 40 16 48.84 W 104 36 4.72	
	8014.00	89.73	1.15	6940.45	1357.03	1327.12	592.95	1.25	1346245.63	3250732.78	N 40 16 49.28 W 104 36 4.70	
	8059.00	90.21	2.48	6940.47	1402.02	1372.09	594.38	3.14	1346290.61	3250734.20	N 40 16 49.73 W 104 36 4.68	
	8104.00	89.73	2.24	6940.50	1447.02	1417.06	596.23	1.19	1346335.57	3250736.06	N 40 16 50.17 W 104 36 4.65	
	8149.00	89.76	0.13	6940.70	1491.99	1462.04	597.16	4.69	1346380.55	3250736.99	N 40 16 50.62 W 104 36 4.63	
	8193.00	89.73	359.05	6940.89	1535.91	1506.04	596.84	2.46	1346424.55	3250736.67	N 40 16 51.05 W 104 36 4.63	
	8238.00	89.93	359.18	6941.03	1580.80	1551.04	596.15	0.53	1346469.54	3250735.98	N 40 16 51.49 W 104 36 4.63	
	8283.00	90.00	358.54	6941.06	1625.68	1596.03	595.25	1.43	1346514.53	3250735.08	N 40 16 51.94 W 104 36 4.64	
	8328.00	90.03	358.10	6941.04	1670.52	1641.01	593.94	0.98	1346559.51	3250733.76	N 40 16 52.38 W 104 36 4.65	
	8373.00	89.66	357.70	6941.17	1715.34	1685.98	592.29	1.21	1346604.48	3250732.11	N 40 16 52.83 W 104 36 4.67	
	8418.00	89.90	359.26	6941.34	1760.19	1730.96	591.09	3.51	1346649.46	3250730.92	N 40 16 53.27 W 104 36 4.68	
	8463.00	89.86	359.21	6941.43	1805.09	1775.95	590.49	0.14	1346694.45	3250730.32	N 40 16 53.72 W 104 36 4.68	
	8508.00	89.83	358.74	6941.55	1849.98	1820.95	589.69	1.05	1346739.44	3250729.51	N 40 16 54.16 W 104 36 4.68	
	8553.00	89.86	359.11	6941.68	1894.86	1865.94	588.84	0.82	1346784.43	3250728.67	N 40 16 54.61 W 104 36 4.69	
	8597.00	89.90	358.62	6941.77	1938.74	1909.93	587.97	1.12	1346828.42	3250727.80	N 40 16 55.04 W 104 36 4.69	
	8642.00	89.86	359.39	6941.86	1983.62	1954.92	587.19	1.71	1346873.41	3250727.02	N 40 16 55.49 W 104 36 4.70	
	8687.00	89.90	358.44	6941.96	2028.50	1999.91	586.34	2.11	1346918.40	3250726.17	N 40 16 55.93 W 104 36 4.70	
	8732.00	89.93	358.35	6942.02	2073.35	2044.90	585.08	0.21	1346963.38	3250724.91	N 40 16 56.38 W 104 36 4.71	
	8777.00	89.79	358.80	6942.13	2118.21	2089.88	583.96	1.05	1347008.36	3250723.79	N 40 16 56.82 W 104 36 4.72	
	8822.00	89.90	358.44	6942.25	2163.08	2134.87	582.87	0.84	1347053.35	3250722.70	N 40 16 57.27 W 104 36 4.73	
	8867.00	89.90	357.61	6942.33	2207.90	2179.84	581.32	1.84	1347098.32	3250721.15	N 40 16 57.71 W 104 36 4.74	
	8912.00	89.79	357.76	6942.45	2252.70	2224.80	579.51	0.41	1347143.28	3250719.33	N 40 16 58.15 W 104 36 4.76	
	8957.00	89.97	359.11	6942.55	2297.56	2269.79	578.28	3.03	1347188.26	3250718.11	N 40 16 58.60 W 104 36 4.77	
	9002.00	89.77	358.70	6942.57	2342.44	2314.78	577.42	0.91	1347233.25	3250717.25	N 40 16 59.04 W 104 36 4.78	
	9047.00	89.83	358.66	6942.65	2387.30	2359.77	576.38	0.32	1347278.24	3250716.21	N 40 16 59.49 W 104 36 4.78	
	9092.00	89.97	357.65	6942.73	2432.14	2404.74	574.93	2.27	1347323.21	3250714.76	N 40 16 59.93 W 104 36 4.80	
	9137.00	89.76	358.67	6942.84	2476.97	2449.72	573.49	2.31	1347368.18	3250713.32	N 40 17 0.38 W 104 36 4.81	
	9182.00	89.97	358.67	6942.94	2521.84	2494.71	572.44	0.47	1347413.17	3250712.27	N 40 17 0.82 W 104 36 4.82	
	9226.00	89.38	359.25	6943.19	2565.72	2538.70	571.64	1.88	1347457.16	3250711.47	N 40 17 1.26 W 104 36 4.82	
	9271.00	89.45	358.38	6943.65	2610.60	2583.69	570.71	1.94	1347502.15	3250710.54	N 40 17 1.70 W 104 36 4.83	
	9316.00	89.31	358.18	6944.14	2655.44	2628.66	569.36	0.54	1347547.12	3250709.19	N 40 17 2.15 W 104 36 4.84	
	9361.00	89.45	358.66	6944.62	2700.28	2673.64	568.12	1.11	1347592.10	3250707.95	N 40 17 2.59 W 104 36 4.85	
	9406.00	89.45	358.29	6945.06	2745.14	2718.62	566.92	0.82	1347637.08	3250706.75	N 40 17 3.03 W 104 36 4.86	
	9451.00	89.31	358.20	6945.54	2789.97	2763.60	565.55	0.37	1347682.05	3250705.37	N 40 17 3.48 W 104 36 4.87	
	9496.00	89.45	358.79	6946.03	2834.83	2808.58	564.36	1.35	1347727.03	3250704.19	N 40 17 3.92 W 104 36 4.88	
	9541.00	89.42	358.47	6946.47	2879.69	2853.57	563.29	0.71	1347772.02	3250703.12	N 40 17 4.37 W 104 36 4.89	
	9586.00	89.38	358.71	6946.95	2924.55	2898.55	562.18	0.54	1347817.00	3250702.01	N 40 17 4.81 W 104 36 4.90	
	9631.00	89.45	358.74	6947.41	2969.42	2943.54	561.18	0.17	1347861.98	3250701.01	N 40 17 5.26 W 104 36 4.90	
	9676.00	89.21	0.93	6947.93	3014.34	2988.53	561.05	4.90	1347906.97	3250700.88	N 40 17 5.70 W 104 36 4.90	
	9720.00	89.31	1.01	6948.50	3058.31	3032.52	561.80	0.29	1347950.96	3250701.62	N 40 17 6.14 W 104 36 4.88	
	9765.00	89.42	0.65	6949.00	3103.27	3077.51	562.45	0.84	1347995.95	3250702.28	N 40 17 6.58 W 104 36 4.87	
	9810.00	89.42	0.23	6949.45	3148.22	3122.51	562.79	0.93	1348040.95	3250702.62	N 40 17 7.03 W 104 36 4.86	
	9855.00	89.55	0.23	6949.86	3193.16	3167.51	562.97	0.29	1348085.94	3250702.80	N 40 17 7.47 W 104 36 4.85	
	9900.00	89.35	0.66	6950.29	3238.11	3212.50	563.32	1.05	1348130.94	3250703.15	N 40 17 7.92 W 104 36 4.84	
	9945.00	89.38	0.60	6950.79	3283.07	3257.50	563.82	0.15	1348175.93	3250703.65	N 40 17 8.36 W 104 36 4.83	
	9990.00	89.31	0.39	6951.30	3328.02	3302.49	564.21	0.49	1348220.92	3250704.03	N 40 17 8.80 W 104 36 4.82	
	10035.00	89.28	0.86	6951.86	3372.97	3347.49	564.70	1.05	1348265.91	3250704.53	N 40 17 9.25 W 104 36 4.81	
	10080.00	89.28	0.55	6952.42	3417.93	3392.48	565.25	0.69	1348310.90	3250705.08	N 40 17 9.69 W 104 36 4.79	
	10125.00	89.31	0.41	6952.98	3462.88	3437.48	565.63	0.32	1348355.90	3250705.46	N 40 17 10.14 W 104 36 4.78	
	10169.00	89.31	0.83	6953.51	3506.84	3481.47	566.10	0.95	1348399.89	3250705.93	N 40 17 10.57 W 104 36 4.77	
	10214.											

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
	11330.00	89.42	358.24	6966.43	4666.25	4642.11	574.41	0.41	1349560.48	3250714.23	N 40 17 22.04 W	104 36 4.51
	11361.00	89.42	358.29	6966.74	4697.14	4673.09	573.47	0.16	1349591.46	3250713.30	N 40 17 22.35 W	104 36 4.52
	11392.00	89.35	358.02	6967.08	4728.02	4704.08	572.47	0.90	1349622.44	3250712.30	N 40 17 22.65 W	104 36 4.53
	11424.00	89.52	358.02	6967.39	4759.90	4736.06	571.36	0.53	1349654.42	3250711.19	N 40 17 22.97 W	104 36 4.54
	11455.00	89.24	357.93	6967.73	4790.77	4767.03	570.27	0.95	1349685.40	3250710.10	N 40 17 23.28 W	104 36 4.55
	11487.00	89.38	358.28	6968.11	4822.65	4799.01	569.21	1.18	1349717.37	3250709.04	N 40 17 23.59 W	104 36 4.56
	11518.00	89.31	358.91	6968.47	4853.55	4830.00	568.45	2.04	1349748.36	3250708.28	N 40 17 23.90 W	104 36 4.56
	11549.00	89.38	358.48	6968.82	4884.46	4860.99	567.74	1.41	1349779.35	3250707.57	N 40 17 24.20 W	104 36 4.57
	11580.00	89.42	358.20	6969.15	4915.35	4891.98	566.85	0.91	1349810.33	3250706.67	N 40 17 24.51 W	104 36 4.58
	11611.00	89.38	358.17	6969.47	4946.24	4922.96	565.86	0.16	1349841.32	3250705.69	N 40 17 24.82 W	104 36 4.58
	11642.00	89.31	357.63	6969.82	4977.11	4953.94	564.73	1.76	1349872.29	3250704.56	N 40 17 25.12 W	104 36 4.59
	11673.00	89.21	358.54	6970.22	5007.99	4984.92	563.69	2.95	1349903.27	3250703.52	N 40 17 25.43 W	104 36 4.60
	11705.00	89.42	358.50	6970.61	5039.89	5016.90	562.87	0.67	1349935.25	3250702.69	N 40 17 25.75 W	104 36 4.61
	11735.00	89.31	358.45	6970.94	5069.79	5046.89	562.07	0.40	1349965.24	3250701.90	N 40 17 26.04 W	104 36 4.62
	11767.00	89.35	358.46	6971.31	5101.68	5078.88	561.20	0.13	1349997.23	3250701.03	N 40 17 26.36 W	104 36 4.62
	11798.00	89.38	358.72	6971.66	5132.58	5109.87	560.44	0.84	1350028.21	3250700.27	N 40 17 26.66 W	104 36 4.63
	11829.00	89.38	358.79	6971.99	5163.49	5140.86	559.77	0.23	1350059.20	3250699.60	N 40 17 26.97 W	104 36 4.63
	11861.00	89.45	358.74	6972.32	5195.40	5172.85	559.08	0.27	1350091.19	3250698.91	N 40 17 27.29 W	104 36 4.64
	11892.00	89.38	358.58	6972.64	5226.31	5203.84	558.35	0.56	1350122.18	3250698.18	N 40 17 27.59 W	104 36 4.64
	11924.00	89.42	358.85	6972.97	5258.21	5235.83	557.64	0.85	1350154.17	3250697.47	N 40 17 27.91 W	104 36 4.65
	11954.00	89.38	359.03	6973.29	5288.13	5265.82	557.08	0.61	1350184.16	3250696.91	N 40 17 28.21 W	104 36 4.65
	11985.00	89.42	358.72	6973.61	5319.05	5296.81	556.47	1.01	1350215.15	3250696.30	N 40 17 28.51 W	104 36 4.66
	12016.00	89.28	358.01	6973.96	5349.94	5327.80	555.59	2.33	1350246.14	3250695.42	N 40 17 28.82 W	104 36 4.66
	12047.00	89.42	358.06	6974.31	5380.82	5358.78	554.53	0.48	1350277.11	3250694.35	N 40 17 29.12 W	104 36 4.67
	12078.00	89.31	357.96	6974.66	5411.70	5389.76	553.45	0.48	1350308.09	3250693.28	N 40 17 29.43 W	104 36 4.68
	12110.00	89.38	358.23	6975.02	5443.57	5421.74	552.39	0.87	1350340.07	3250692.21	N 40 17 29.75 W	104 36 4.69
	12141.00	89.28	358.94	6975.39	5474.48	5452.73	551.62	2.31	1350371.06	3250691.45	N 40 17 30.05 W	104 36 4.70
	12172.00	89.35	359.30	6975.76	5505.40	5483.72	551.14	1.18	1350402.05	3250690.97	N 40 17 30.36 W	104 36 4.70
	12203.00	89.38	359.86	6976.10	5536.34	5514.72	550.92	1.81	1350433.05	3250690.75	N 40 17 30.67 W	104 36 4.70
	12248.00	89.38	0.08	6976.59	5581.27	5559.72	550.89	0.49	1350478.04	3250690.72	N 40 17 31.11 W	104 36 4.69
	12293.00	89.38	0.95	6977.07	5626.22	5604.71	551.30	1.93	1350523.03	3250691.13	N 40 17 31.55 W	104 36 4.68
	12338.00	89.38	0.85	6977.56	5671.19	5649.70	552.00	0.22	1350568.02	3250691.83	N 40 17 32.00 W	104 36 4.67
	12383.00	89.31	0.68	6978.07	5716.15	5694.70	552.60	0.41	1350613.02	3250692.43	N 40 17 32.44 W	104 36 4.65
	12428.00	89.62	0.66	6978.49	5761.11	5739.69	553.13	0.69	1350658.01	3250692.96	N 40 17 32.89 W	104 36 4.64
	12473.00	89.52	1.59	6978.83	5806.08	5784.68	554.01	2.08	1350703.00	3250693.84	N 40 17 33.33 W	104 36 4.62
	12518.00	89.48	0.83	6979.23	5851.05	5829.67	554.96	1.69	1350747.98	3250694.79	N 40 17 33.78 W	104 36 4.61
	12562.00	89.28	1.13	6979.70	5895.02	5873.66	555.72	0.82	1350791.97	3250695.55	N 40 17 34.21 W	104 36 4.59
	12607.00	89.42	359.93	6980.21	5939.97	5918.65	556.13	2.68	1350836.96	3250695.96	N 40 17 34.66 W	104 36 4.58
	12652.00	89.31	359.99	6980.71	5984.90	5963.65	556.10	0.28	1350881.96	3250695.93	N 40 17 35.10 W	104 36 4.57
	12697.00	89.24	1.42	6981.28	6029.86	6008.64	556.66	3.18	1350926.95	3250696.48	N 40 17 35.55 W	104 36 4.56
	12742.00	89.38	0.22	6981.82	6074.82	6053.63	557.30	2.68	1350971.94	3250697.13	N 40 17 35.99 W	104 36 4.55
	12787.00	89.45	359.73	6982.28	6119.75	6098.63	557.28	1.10	1351016.93	3250697.11	N 40 17 36.43 W	104 36 4.54
	12832.00	89.31	0.74	6982.77	6164.69	6143.63	557.46	2.27	1351061.93	3250697.29	N 40 17 36.88 W	104 36 4.53
	12877.00	89.42	0.42	6983.27	6209.65	6188.62	557.92	0.75	1351106.92	3250697.75	N 40 17 37.32 W	104 36 4.52
	12922.00	89.35	0.52	6983.75	6254.60	6233.62	558.29	0.27	1351151.91	3250698.12	N 40 17 37.77 W	104 36 4.51
	12966.00	89.45	0.34	6984.21	6298.55	6277.61	558.62	0.47	1351195.91	3250698.45	N 40 17 38.20 W	104 36 4.50
	13011.00	89.45	0.06	6984.64	6343.49	6322.61	558.78	0.62	1351240.90	3250698.61	N 40 17 38.65 W	104 36 4.49
	13056.00	89.59	0.56	6985.02	6388.44	6367.61	559.02	1.15	1351285.90	3250698.85	N 40 17 39.09 W	104 36 4.48
	13101.00	89.24	0.12	6985.48	6433.38	6412.61	559.29	1.25	1351330.89	3250699.12	N 40 17 39.54 W	104 36 4.47
	13146.00	89.48	359.90	6985.98	6478.32	6457.60	559.29	0.72	1351375.89	3250699.12	N 40 17 39.98 W	104 36 4.47
	13191.00	89.59	0.47	6986.35	6523.26	6502.60	559.44	1.29	1351420.88	3250699.27	N 40 17 40.43 W	104 36 4.46
	13236.00	89.35	357.93	6986.76	6568.15	6545.87	558.81	5.67	1351465.87	3250698.64	N 40 17 40.87 W	104 36 4.46
	13281.00	89.35	0.21	6987.27	6613.03	6592.58	558.08	5.07	1351510.86	3250697.91	N 40 17 41.32 W	104 36 4.47
	13326.00	89.55	359.77	6987.71	6657.96	6637.55	558.07	1.07	1351555.85	3250697.90	N 40 17 41.76 W	104 36 4.46
	13371.00	89.31	0.15	6988.15	6702.90	6682.58	558.04	1.00	1351600.85	3250697.87	N 40 17 42.20 W	104 36 4.45
	13415.00	89.38	0.11	6988.66	6746.83	6726.57	558.14	0.18	1351644.85	3250697.97	N 40 17 42.64 W	104 36 4.45
	13460.00	89.42	359.80	6989.13	6791.77	6771.57	558.11	0.69	1351689.84	3250697.94	N 40 17 43.08 W	104 36 4.44
	13505.00	89.38	0.46	6989.60	6836.70	6816.57	558.21	1.47	1351734.84	3250698.04	N 40 17 43.53 W	104 36 4.44
	13550.00	89.35	0.93	6990.10	6881.66	6861.56	558.75	1.05	1351779.83	3250698.58	N 40 17 43.97 W	104 36 4.42
	13595.00	89.42	0.83	6990.58	6926.63	6906.55	559.45	0.27	1351824.82	3250699.27	N 40 17 44.42 W	104 36 4.41
	13640.00	89.35	0.73	6991.06	6971.59	6951.55	560.06	0.27	1351869.81	3250699.89	N 40 17 44.86 W	104 36 4.39
	13685.00	89.35	0.22	6991.57	7016.54	6996.54	560.43	1.13	1351914.80	3250700.26	N 40 17 45.31 W	104 36 4.38
	13730.00	89.38	1.02	6992.07	7061.49	7041.54	560.92	1.78	1351959.79	3250700.75	N 40 17 45.75 W	104 36 4.37
	13775.00	89.52	0.60	6992.51	7106.46	7086.53	561.55	0.98	1352004.79	3250701.38	N 40 17 46.20 W	104 36 4.36
	13819.00	89.28	0.97	6992.97	7150.42	7130.52	562.16	1.00	1352048.78	3250701.99	N 40 17 46.63 W	104 36 4.34
	13864.00	89.31	0.37	6993.52	7195.37	7175.52	562.68	1.33	1352093.77	3250702.51	N 40 17 47.08 W	104 36 4.33
	13909.00	89.45	0.19	6994.01	7240.32	7220.51	562.90	0.51	1352138.76	3250702.73	N 40 17 47.52 W	104 36 4.32
	13954.00	89.48	0.29	6994.43	7285.26	7265.51	563.09	0.23	1352183.76	3250702.92	N 40 17 47.96 W	104 36 4.31
	13999.00	89.35	0.59	6994.89	7330.21	7310.51	563.44	0.73	1352228.75	3250703.27	N 40 17 48.41 W	104 36 4.30
	14044.00	89.38	0.22	6995.38	7375.16	7355.50	563.76	0.82	1352273.75	3250703.58	N 40 17 48.85 W	104 36 4.29
	14089.00	89.52	0.35	6995.82	7420.10	7400.50	563.98	0.42	1352318.74	3250703.81	N 40 17 49.30 W	104 36 4.28
	14134.00	89.31	359.48	6996.28	7465.03	7445.50	563.91	1.99	1352363.74	3250703.74	N 40 17 49.74 W	104 36 4.28
	14179.00	89.38	359.30	6996.79	7509.94	7490.49	563.43	0.43	1352408.73	3250703.26	N 40 17 50.19 W	104 36 4.28
	14224.00	89.42	0.56	6997.26	7554.86	7535.49	563.38	2.80	1352453.72	3250703.21	N 40 17 50.63 W	104 36 4.27
	14268.00	89.45	0.31	6997.70	7598.82	7579.48	563.71	0.57	1352497.72	3250703.54	N 40 17 51.07 W	104 36 4.26
	14313.00	89.52	359.90	6998.10	76							

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
	15840.00	89.38	358.76	6994.15	9168.12	9151.22	560.55	1.51	1354069.39	3250700.38	N 40 18 6.60 W 104 36 4.10	
	15885.00	89.28	358.12	6994.67	9212.97	9196.20	559.33	1.44	1354114.36	3250699.16	N 40 18 7.04 W 104 36 4.11	
	15930.00	89.24	358.13	6995.25	9257.80	9241.17	557.86	0.09	1354159.33	3250697.69	N 40 18 7.49 W 104 36 4.12	
	15975.00	89.28	357.95	6995.83	9302.62	9286.14	556.32	0.41	1354204.30	3250696.15	N 40 18 7.93 W 104 36 4.14	
	16019.00	89.42	358.93	6996.33	9346.47	9330.13	555.12	2.25	1354248.28	3250694.95	N 40 18 8.37 W 104 36 4.15	
	16064.00	89.21	357.85	6996.87	9391.32	9375.10	553.86	2.44	1354293.26	3250693.68	N 40 18 8.81 W 104 36 4.16	
	16109.00	88.63	357.17	6997.72	9436.10	9420.05	551.90	1.99	1354338.20	3250691.73	N 40 18 9.26 W 104 36 4.18	
	16154.00	88.73	359.18	6998.76	9480.92	9465.02	550.47	4.47	1354383.17	3250690.30	N 40 18 9.70 W 104 36 4.19	
	16199.00	88.90	359.30	6999.69	9525.81	9510.00	549.87	0.46	1354428.15	3250689.70	N 40 18 10.14 W 104 36 4.19	
	16244.00	88.90	358.99	7000.55	9570.69	9554.99	549.20	0.69	1354473.13	3250689.03	N 40 18 10.59 W 104 36 4.19	
	16289.00	88.83	359.39	7001.44	9615.58	9599.98	548.56	0.90	1354518.12	3250688.39	N 40 18 11.03 W 104 36 4.20	
	16334.00	88.87	358.20	7002.35	9660.45	9644.96	547.62	2.65	1354563.10	3250687.45	N 40 18 11.48 W 104 36 4.20	
	16379.00	88.83	357.69	7003.25	9705.26	9689.92	546.00	1.14	1354608.06	3250685.83	N 40 18 11.92 W 104 36 4.22	
	16424.00	88.76	358.71	7004.20	9750.08	9734.88	544.59	2.27	1354653.02	3250684.42	N 40 18 12.37 W 104 36 4.23	
	16469.00	88.83	358.59	7005.14	9794.94	9779.86	543.53	0.31	1354698.00	3250683.36	N 40 18 12.81 W 104 36 4.24	
	16514.00	88.80	358.50	7006.07	9839.79	9824.84	542.39	0.21	1354742.97	3250682.22	N 40 18 13.26 W 104 36 4.25	
	16559.00	88.76	358.39	7007.03	9884.63	9869.81	541.17	0.26	1354787.94	3250681.00	N 40 18 13.70 W 104 36 4.26	
	16604.00	88.80	0.76	7007.99	9929.53	9914.80	540.83	5.27	1354832.93	3250680.66	N 40 18 14.15 W 104 36 4.25	
	16648.00	88.80	1.18	7008.91	9973.49	9958.78	541.58	0.95	1354876.91	3250681.41	N 40 18 14.58 W 104 36 4.24	
	16693.00	88.87	0.40	7009.82	10018.45	10003.77	542.20	1.74	1354921.89	3250682.03	N 40 18 15.02 W 104 36 4.22	
	16738.00	89.42	1.35	7010.50	10063.41	10048.76	542.89	2.44	1354966.88	3250682.72	N 40 18 15.47 W 104 36 4.21	
	16783.00	89.24	1.41	7011.02	10108.39	10093.74	543.97	0.42	1355011.86	3250683.80	N 40 18 15.91 W 104 36 4.19	
Last IFR Survey	16828.00	89.38	0.86	7011.56	10153.36	10138.73	544.86	1.26	1355056.85	3250684.69	N 40 18 16.36 W 104 36 4.17	
Projection to Bit	16871.00	89.38	0.86	7012.03	10196.32	10181.72	545.51	0.00	1355099.84	3250685.34	N 40 18 16.78 W 104 36 4.16	

Survey Type: 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	Casing Diameter (in)	Survey Tool Type	Borehole / Survey
Surface	1	0.000	16.000	Act Stns	13.750	9.625	SLB_EMS-STD-Depth Only	Original Hole / Heartland C30-79-1HN MWD+IFR 0' to 16871'
Surface	1	16.000	754.000	Act Stns	13.750	9.625	SLB_EMS-STD	Original Hole / Heartland C30-79-1HN MWD+IFR 0' to 16871'
Intermediate	1	754.000	7236.000	Act Stns	8.750	7.000	SLB_MWD-STD	Original Hole / Heartland C30-79-1HN MWD+IFR 0' to 16871'
* Lateral	1	7236.000	16828.000	Act Stns	6.125	4.500	SLB_MWD+IFR+DMAG	Original Hole / Heartland C30-79-1HN MWD+IFR 0' to 16871'
Bit Projection	1	16828.000	16871.000	Act Stns	6.125	4.500	SLB_BLIND+TREND	Original Hole / Heartland C30-79-1HN MWD+IFR 0' to 16871'

* SLB_MWD+IFR+DMAG =
MWD+IFR1+MS_WY