



Schlumberger

Southwestern Energy Franz Thoman OHI 3H Surveys Off to 23194ft MD
Survey Geodetic Report
(Def Survey)

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Office of Oil and Gas
JAN 29 2021

WV Department of
Environmental Protection

Report Date: January 27, 2020 - 04:44 PM
Client: Southwestern Energy
Field: WV Ohio County (NAD 83 UTM 17N)
Structure / Slot: Southwestern Energy Franz Thoman OHI Pad / Franz Thoman OHI 3H
Well: Franz Thoman OHI 3H
Borehole: Original Borehole
UMI / APN: Unknown / Unknown
Survey Name: Southwestern Energy Franz Thoman OHI 3H Surveys Off to 23194ft MD
Survey Date: January 17, 2020
Tort / AHD / DDI / ERD Ratio: 270.161 ' / 18093.391 ft / 7.285 / 3.078
Coordinate Reference System: NAD83 UTM Zone 17N, US Feet
Location Lat / Long: N 40° 11' 12.19920", W 80° 39' 35.52120"
Location Grid M/E W/E: N 14576701.963 RUS, E 1735481.062 RUS
CRS Grid Convergence Angle: 0.2193 °
Grid Scale Factor: 0.99961034
Version / Patch: 2.10.794.0
Survey / DLS Computation: Minimum Curvature / Lubinski
Vertical Section Azimuth: 343.500 ° (Grid North)
Vertical Section Origin: 0.000 ft, 0.000 ft
TVD Reference Datum: KS
TVD Reference Elevation: 1163.300 ft above MSL
Seabed / Ground Elevation: 1137.200 ft above MSL
Magnetic Declination: -8.047 °
Total Gravity Field Strength: 999.3702mgm (3.80868 Base)
Gravity Model: GARM
Total Magnetic Field Strength: 52370.590 nT
Magnetic Dip Angle: 67.303 °
Declination Date: January 17, 2020
Magnetic Declination Model: HDGM 2019
North Reference: Grid North
Grid Convergence Used: 0.2193 °
Total Corr Mag North-Grid: -8.2661 °
Local Coord Referenced To: Well Head

Table with columns: Comments, MD (ft), Incd (ft), Azim (Grid) (°), TVD (ft), TVDSS (ft), VSEC (ft), NS (ft), EW (ft), DLS (ft), TF (ft), BR (ft), TR (ft), Northing (RUS), Easting (RUS), Latitude (°), Longitude (°), Directional (°), Directional Index. The table contains a large grid of numerical data points for each depth interval.

09/10/2021

JAN 29 2021

WV Department of Environmental Protection

Comments	MD (ft)	Incl (ft)	Acim Grid (ft)	TVD (ft)	TVDSS (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (ft)	TF (ft)	BR (ft)	TR (ft)	Northing (ft)	Longitude (ft)	Directional Drift (ft)	
	8690.00	90.22	344.11	5661.36	4696.06	3032.65	2853.74	-1047.79	1.45	130.17	-0.17	-1.45	14578924.58	80144800.41	-80.66396364	5.98
	9161.00	90.06	343.92	5661.14	4697.84	3125.65	2842.15	-1072.70	0.27	23.29	-0.20	-1.45	14578942.98	80144800.41	-80.66396364	5.98
	9153.00	90.34	344.04	5660.81	4687.51	3217.65	3030.57	-1068.00	0.33	LS	0.30	0.13	14579731.35	80145055.40	-80.66373526	5.99
	9246.00	88.89	344.04	5660.63	4697.33	3319.64	3119.99	-1123.66	0.48	86.57L	-0.48	0.00	14579800.73	80145055.40	-80.66373526	6.01
	9338.00	90.06	343.64	5660.67	4697.33	3402.64	3209.35	-1149.27	0.47	82.98L	0.18	0.40	14579938.17	80145055.40	-80.66373526	6.02
	9431.00	90.34	343.27	5660.34	4697.04	3488.64	3297.50	-1175.75	0.50	79.26R	0.30	0.00	14579980.73	80145055.40	-80.66402714	6.04
	9524.00	90.45	343.85	5659.70	4686.40	3588.64	3386.70	-1202.07	0.63	90R	0.12	0.82	14580067.33	80145055.40	-80.66412037	6.05
	9618.00	90.45	344.33	5658.58	4695.68	3680.63	3475.17	-1227.29	0.52	109.54R	0.00	0.52	14580175.77	80145274.28	-80.66429336	6.07
	9709.00	90.34	344.64	5658.34	4695.44	3773.61	3564.78	-1252.18	0.35	36.03L	-0.12	0.33	14580265.34	80145274.28	-80.66429336	6.08
	9802.00	90.56	344.48	5657.61	4694.31	3866.59	3654.42	-1276.92	0.29	7.03R	0.24	-0.17	14580344.85	80145274.28	-80.66429336	6.11
	9895.00	91.29	344.57	5656.11	4692.81	3958.57	3744.03	-1301.73	0.79	122.79R	0.78	0.10	14580444.53	80145274.28	-80.66429336	6.16
	9987.00	90.84	345.27	5654.40	4691.10	4051.52	3833.65	-1325.66	0.90	90L	-0.49	0.78	14580533.31	80145274.28	-80.66455644	6.12
	10080.00	90.84	343.94	5653.00	4689.73	4144.49	3922.50	-1350.35	1.43	36.25R	0.00	-0.43	14580622.83	80145311.35	-80.66464353	6.14
	10173.00	91.29	344.27	5651.30	4688.00	4237.47	4011.55	-1375.75	0.60	129.44L	-0.48	0.35	14580712.32	80145311.35	-80.66473412	6.15
	10266.00	90.78	343.65	5649.54	4686.34	4329.45	4100.23	-1401.23	0.87	90L	-0.55	0.40	14580800.89	80145311.35	-80.66482314	6.17
	10358.00	90.78	343.01	5648.38	4685.08	4422.44	4189.42	-1427.91	0.89	128.16R	0.00	-0.69	14580898.74	80145311.35	-80.66491736	6.18
	10451.00	90.67	343.15	5647.20	4683.90	4515.43	4278.35	-1454.97	1.19	59.9L	-0.12	0.15	14580987.67	80145311.35	-80.66501287	6.19
	10543.00	91.18	342.27	5645.71	4682.41	4607.41	4366.21	-1482.31	1.11	163.61R	0.55	-0.96	14581066.47	80145311.35	-80.66510858	6.20
	10636.00	91.29	342.42	5644.21	4680.91	4703.38	4454.82	-1510.51	0.57	46.69R	-0.35	0.36	14581155.04	80145311.35	-80.66520426	6.23
	10729.00	91.01	342.78	5642.75	4679.35	4799.35	4543.56	-1538.32	0.51	101.51L	0.18	0.53	14581243.74	80145311.35	-80.66530000	6.24
	10821.00	90.84	342.24	5641.32	4678.02	4895.33	4631.29	-1566.96	0.60	92.18L	-0.12	-0.59	14581331.47	80145311.35	-80.66540525	6.25
	10914.00	91.00	340.68	5639.50	4676.60	4987.26	4719.45	-1595.55	1.70	95.57R	-0.06	-1.70	14581419.56	80145311.35	-80.66550988	6.24
	11007.00	90.67	342.40	5638.68	4675.38	5071.19	4807.64	-1625.01	1.88	10.3R	-0.18	1.87	14581507.72	80145311.35	-80.66561407	6.27
	11100.00	90.78	342.42	5637.50	4674.20	5164.17	4896.29	-1653.11	1.02	152.4L	0.12	0.02	14581596.33	80145311.35	-80.66571841	6.28
	11192.00	90.34	342.19	5636.60	4673.30	5256.14	4983.93	-1681.07	0.54	71.91R	-0.48	-0.25	14581683.94	80145311.35	-80.66582269	6.29
	11284.00	90.50	342.48	5635.53	4672.63	5348.12	5071.62	-1708.63	0.56	90.56	0.56	0.56	14581771.62	80145311.35	-80.66592700	6.31
	11376.00	90.50	342.44	5634.33	4671.83	5439.11	5158.45	-1736.11	0.26	96.27R	0.00	-0.26	14581859.33	80145311.35	-80.66603139	6.32
	11468.00	90.34	343.42	5633.45	4671.15	5532.10	5247.35	-1763.40	1.07	88.53L	-0.17	1.05	14581947.26	80145311.35	-80.66613573	6.34
	11561.00	90.29	343.02	5632.66	4670.36	5625.16	5335.22	-1790.25	0.43	69.01L	-0.06	-0.43	14582035.26	80145311.35	-80.66624006	6.33
	11653.00	90.56	342.29	5631.26	4669.98	5717.08	5424.20	-1817.68	0.85	97.67R	0.30	-0.79	14582124.04	80145311.35	-80.66634439	6.35
	11745.00	90.39	343.53	5630.51	4669.21	5809.07	5512.14	-1844.71	1.36	126.87R	0.18	1.35	14582211.94	80145311.35	-80.66644872	6.37
	11837.00	90.00	344.05	5629.20	4668.90	5902.07	5601.44	-1872.68	0.70	31.39L	-0.42	-0.56	14582300.21	80145311.35	-80.66655305	6.32
	11931.00	90.56	343.71	5628.14	4668.44	5995.07	5690.78	-1900.50	0.70	85.74R	0.80	-0.37	14582388.51	80145311.35	-80.66665739	6.39
	12023.00	90.67	343.49	5627.15	4667.45	6087.95	5779.41	-1928.18	0.81	80.73L	0.12	1.81	14582476.10	80145311.35	-80.66676172	6.40
	12115.00	90.90	342.85	5626.19	4666.78	6179.32	5867.56	-1955.78	0.50	127.58L	-0.53	1.53	14582564.71	80145311.35	-80.66686605	6.41
	12207.00	90.45	343.20	5625.41	4666.11	6271.01	5956.24	-1983.91	0.80	115.14R	-0.48	-0.80	14582652.57	80145311.35	-80.66697038	6.42
	12298.00	90.34	343.50	5624.78	4665.48	6362.01	6043.43	-2012.96	0.35	61.78L	0.12	0.33	14582743.02	80145311.35	-80.66707469	6.44
	12389.00	90.56	343.08	5623.07	4663.77	6453.01	6130.58	-2042.14	0.51	94.83R	-0.24	-0.43	14582830.14	80145311.35	-80.66717900	6.43
	12482.00	90.50	343.80	5622.21	4662.91	6546.00	6219.72	-2070.63	0.77	19.44L	-0.06	0.76	14582919.25	80145311.35	-80.66728331	6.45
	12575.00	90.84	343.68	5621.32	4662.04	6639.00	6308.00	-2100.87	0.39	120.97L	0.00	-0.13	14583008.67	80145311.35	-80.66738762	6.47
	12667.00	90.78	343.78	5620.52	4661.22	6732.00	6396.00	-2131.82	0.17	47.29L	-0.37	0.13	14583098.06	80145311.35	-80.66749193	6.45
	12760.00	90.84	343.71	5620.46	4660.46	6825.98	6485.48	-2162.78	0.19	102.14L	0.13	0.14	14583185.91	80145311.35	-80.66759589	6.48
	12851.00	90.67	343.55	5621.21	4660.91	6914.96	6573.56	-2193.19	0.85	92.64R	-0.25	-1.27	14583273.95	80145311.35	-80.66769984	6.49
	12942.00	90.45	343.62	5620.18	4660.68	7004.96	6662.06	-2223.66	1.19	131.82R	-0.05	1.19	14583362.97	80145311.35	-80.66780379	6.45
	13034.00	90.45	343.82	5619.33	4660.33	7097.95	6749.53	-2254.44	0.81	58.29R	0.18	0.21	14583451.25	80145311.35	-80.66790775	6.50
	13126.00	91.29	345.18	5617.83	4659.83	7189.52	6837.57	-2285.02	1.74	119.4L	0.91	-1.48	14583539.89	80145311.35	-80.66801171	6.51
	13218.00	90.67	344.06	5616.38	4659.05	7281.89	6926.26	-2315.64	1.37	90L	-0.87	-1.20	14583628.51	80145311.35	-80.66811566	6.53
	13308.00	90.67	343.31	5615.29	4658.99	7372.88	7013.80	-2281.95	0.85	90L	0.00	-0.85	14583712.81	80145311.35	-80.66821957	6.54
	13405.00	90.67	343.70	5614.17	4658.67	7468.87	7105.40	-2310.00	0.64	90R	0.00	-0.64	14583801.54	80145311.35	-80.66832346	6.56
	13500.00	90.78	343.23	5613.06	4658.16	7560.86	7197.55	-2338.75	0.46	105.11L	0.00	-0.46	14583890.58	80145311.35	-80.66842731	6.55
	13595.00	90.73	343.32	5611.90	4658.00	7658.85	7287.24	-2365.01	0.66	98.39L	0.06	-0.01	14583980.35	80145311.35	-80.66853120	6.57
	13689.00	90.67	343.72	5610.75	4657.45	7752.85	7377.38	-2391.68	0.43	5.19L	-0.06	0.43	14584070.45	80145311.35	-80.66863509	6.57
	13784.00	90.78	343.71	5609.55	4656.25	7847.84	7468.56	-2418.31	0.12	90R	0.12	-0.01	14584167.60	80145311.35	-80.66873898	6.58
	13879.00	90.78	344.22	5608.25	4654.95	7942.83	7559.85	-2444.55	0.54	74.05R	0.00	0.54	14584258.85	80145311.35	-80.66884287	6.59
	13974.00	90.84	344.43	5606.91	4653.61	8037.81	7651.31	-2470.22	0.23	58.69R	0.06	0.22	14584350.28	80145311.35	-80.66894676	6.58
	14068.00	91.12	344.89	5605.80	4652.30	8131.77	7744.56	-2498.08	0.67	103.44R	0.57	0.67	14584440.48	80145311.35	-80.66905065	6.61
	14163.00	90.73	344.53	5604.73	4651.03	8226.74	7833.57	-2526.13	0.56	90L	-0.41	-0.38	14584532.47	80145311.35	-80.66915454	6.62
	14257.00	90.73	344.12	5602.57	4649.27	8320.72	7924.07	-2555.52	0.44	90R	0.00	-0.44	14584622.93	80145311.35	-80.66925843	6.63
	14352.00	90.73	344.13	5601.36	4648.06	8415.71	8015.44	-2585.49	0.03	133.36R	0.00	-0.03	14584714.27	80145311.35	-80.66936232	6.63
	14447.00	90.56	344.33	5600.29	4646.99	8510.69	8106.87	-2615.29	0.28	46.27L	-0.18	0.19	14584805.65	80145311.35	-80.66946621	6.64
	14542.00	90.78	344.10	5600.18	4645.88	8605.68	8198.28	-2645.13	0.34	90R	0.23	-0.24	14584897.03	80145311.35	-80.66957010	



Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	TVDSS (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (ft/100ft)	TF (ft)	BR (ft/100ft)	TR (ft/100ft)	Northing (ft/US)	Easting (ft/US)	Latitude (°)	Longitude (°)	Directional Drift/Deviation Index
20893.00	90.90	343.78	5725.58	4562.28	14892.82	14003.31	-4345.45	1.24	85.89R	0.06	-1.24	1450089.79	1731137.34	40.17520683	-80.67522556		7.11
20963.00	90.78	344.35	5724.20	4560.90	14754.81	14093.55	-4371.72	1.25	145.49L	-0.13	1.24	14500789.89	1731111.07	40.17545366	-80.67531811		7.12
20788.00	90.62	344.24	5723.04	4559.74	14849.80	14185.00	-4397.44	0.20	68.89R	-0.17	-0.12	14500881.41	1731085.37	40.17570494	-80.67540993		7.13
20883.00	91.06	345.38	5731.64	4558.34	14944.78	14278.67	-4422.32	1.29	136.79L	0.46	1.20	14500673.04	1731050.49	40.17595682	-80.67549679		7.13
20977.00	90.73	345.07	5720.18	4556.88	15038.70	14367.55	-4446.29	0.48	27.47R	-0.35	-0.33	14501063.88	1731036.53	40.17620653	-80.67558138		7.14
21072.00	91.23	345.33	5718.55	4555.25	15133.65	14459.38	-4470.56	0.59	74.62L	0.53	0.27	14501153.68	1731012.28	40.17645885	-80.67566701		7.14
21167.00	91.34	344.89	5716.42	4553.12	15228.58	14551.19	-4494.93	0.44	124.51R	0.12	-0.42	14501247.44	1730987.91	40.17671108	-80.67575333		7.15
21261.00	91.12	345.25	5714.40	4551.10	15322.53	14641.99	-4515.11	0.41	90L	-0.23	0.34	14501338.22	1730963.74	40.17696600	-80.67583936		7.15
21356.00	91.12	343.12	5712.55	4549.25	15417.50	14735.37	-4540.00	2.24	90L	0.00	-2.24	14501429.57	1730937.87	40.17721170	-80.67592981		7.16
21450.00	91.12	342.93	5710.71	4547.41	15511.48	14823.26	-4572.43	0.20	94.97L	0.00	-0.20	14501519.42	1730910.44	40.17745872	-80.67602683		7.17
21545.00	90.90	340.41	5709.03	4545.73	15605.41	14913.42	-4602.90	2.86	86.85L	-0.23	-2.65	14501609.54	1730880.58	40.17770580	-80.67612354		7.18
21640.00	90.85	339.50	5707.50	4544.20	15701.21	15002.65	-4634.96	0.96	84.55L	0.05	-0.36	14501698.74	1730848.04	40.17795177	-80.67624789		7.18
21734.00	91.01	338.87	5705.89	4542.59	15794.93	15090.50	-4668.26	0.87	88.62R	0.06	-0.87	14501788.56	1730814.65	40.17819325	-80.67636629		7.19
21829.00	91.06	340.98	5704.18	4540.88	15889.72	15179.71	-4700.86	2.22	96.11R	0.05	2.22	14501875.73	1730782.06	40.17843846	-80.67648177		7.20
21924.00	90.73	344.05	5702.69	4539.39	15984.69	15270.30	-4729.40	3.25	70.46R	-0.35	3.23	14501968.28	1730753.54	40.17868741	-80.67658741		7.21
22018.00	91.23	345.46	5701.07	4537.77	16079.65	15361.94	-4754.37	1.57	39.49R	0.53	1.46	14502057.89	1730728.57	40.17893821	-80.67669390		7.21
22113.00	91.40	345.90	5699.91	4535.61	16173.56	15452.94	-4777.85	0.23	61.63R	0.18	0.15	14502148.85	1730700.10	40.17918622	-80.67679375		7.22
22208.00	91.74	346.23	5698.31	4533.01	16268.44	15545.04	-4800.96	0.75	37.72R	0.36	0.66	14502240.92	1730662.00	40.17944229	-80.67689325		7.22
22303.00	92.36	346.71	5692.91	4529.61	16363.25	15637.35	-4823.18	0.83	99.85L	0.65	0.51	14502333.19	1730635.80	40.17969598	-80.67699154		7.23
22398.00	91.79	343.46	5689.47	4526.17	16458.14	15729.07	-4847.81	3.47	156.69R	-0.60	-3.42	14502424.88	1730605.37	40.17994932	-80.67699678		7.24
22493.00	90.84	343.87	5687.31	4524.01	16552.12	15819.25	-4874.04	1.10	144.59R	-1.01	0.44	14502515.02	1730576.95	40.18019673	-80.67709320		7.24
22587.00	90.39	344.19	5686.29	4522.98	16647.19	15910.58	-4900.16	0.58	85.69L	-0.47	0.34	14502606.31	1730552.83	40.18044888	-80.67718554		7.25
22682.00	90.56	341.93	5685.50	4522.20	16742.09	16001.45	-4927.65	2.39	33.29R	0.16	-2.38	14502697.15	1730525.16	40.18069639	-80.67728341		7.26
22776.00	91.23	342.37	5684.04	4520.74	16836.06	16090.92	-4956.66	0.85	121.43L	0.71	0.47	14502786.58	1730502.36	40.18094225	-80.67738535		7.26
22871.00	91.12	342.19	5682.09	4518.79	16931.01	16181.39	-4985.57	0.22	90L	-0.12	-0.19	14502877.01	1730487.46	40.18119369	-80.67748763		7.27
22966.00	91.12	341.20	5680.23	4516.93	17025.95	16271.56	-5015.40	1.04	87.44L	0.00	-1.04	14502967.15	1730467.64	40.18143872	-80.67759232		7.27
23060.00	90.95	339.90	5678.53	4515.23	17119.81	16360.18	-5046.70	1.39	62.58L	-0.18	-1.38	14503055.74	1730436.36	40.18168229	-80.67770407		7.28
23155.00	91.23	339.36	5676.73	4513.43	17214.57	16448.23	-5079.76	0.64	HS	0.29	-0.57	14503144.75	1730403.31	40.18192704	-80.67782123		7.28
Projection to TD	23194.00	91.23	339.36	5675.88	4512.58	17253.46	16485.71	-5093.50	0.00	0.00	0.00	14503181.22	1730389.57	40.18202733	-80.67788985		7.29

Survey Type: Def Survey

Survey Error Model: ISOWSA 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	26.000	1.98/425	30.000	30.000	NAL_NSG+MSHOT-Depth Only	Original Borehole / Southwestern Energy Franz Thoman OHI 3H Surveys Off to 23194ft MD
	1	26.000	26.000	Act Sins	30.000	30.000	NAL_NSG+MSHOT-Depth Only	Original Borehole / Southwestern Energy Franz Thoman OHI 3H Surveys Off to 23194ft MD
	1	26.000	491.000	Act Sins	30.000	30.000	NAL_NSG+MSHOT	Original Borehole / Southwestern Energy Franz Thoman OHI 3H
	1	491.000	4961.000	Act Sins	30.000	30.000	NAL_MWD-NON_SLB	Original Borehole / Southwestern Energy Franz Thoman OHI 3H
	1	4961.000	23194.000	Act Sins	30.000	30.000	NAL_MWD_1.0_DEG	Original Borehole / Southwestern Energy Franz Thoman OHI 3H

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