

EAST COAST DIRECTIONAL DRILLING SPECIALIST
SURVEY CALCULATION REPORT

Minimum Curvature Method



Operator: **Tug Hill**
 Lease Name: **Kiowa County, KS**
 Job Number: **1085**
 Comments: **Kiowa County, KS**
 Survey Company: **East Coast DDS**

Target KBTVD: **4,829 Feet**
 Target Angle: **91.00 Degrees**
 Section Plane: **0.04 Degrees**
 Total Declination Correction: **6.18 Degrees**
 Bit to Survey Offset: **49 Feet**

Survey Number	Measured Depth-ft	Drift (Deg.)	Azimuth (Deg.)	Course Length	TVD (Ft.)	Vertical Section	+N/-S (Ft.)	+E/-W (Ft.)	BUR	DLS	KBTVD	+Above -Below Target	+ Right - Left Line
Gyro	50	0.30	123.32	50	50.0	-0.1	-0.1	0.1	0.6	0.6	50.0	4779.0	0.1
2	100	0.26	153.16	50	100.0	-0.2	-0.2	0.3	-0.1	0.3	100.0	4729.0	0.3
3	150	0.45	129.15	50	150.0	-0.5	-0.5	0.5	0.4	0.5	150.0	4679.0	0.5
4	200	0.32	117.50	50	200.0	-0.7	-0.7	0.7	-0.3	0.3	200.0	4629.0	0.8
5	250	0.32	109.03	50	250.0	-0.8	-0.8	1.0	0.0	0.1	250.0	4579.0	1.0
6	300	0.26	91.41	50	300.0	-0.8	-0.8	1.3	-0.1	0.2	300.0	4529.0	1.3
7	350	0.27	79.04	50	350.0	-0.8	-0.8	1.5	0.0	0.1	350.0	4479.0	1.5
8	400	0.47	70.44	50	400.0	-0.7	-0.7	1.8	0.4	0.4	400.0	4429.0	1.8
9	450	0.75	62.55	50	450.0	-0.5	-0.5	2.3	0.6	0.6	450.0	4379.0	2.3
10	500	1.14	60.40	50	500.0	-0.1	-0.1	3.0	0.8	0.8	500.0	4329.0	3.0
11	550	1.50	58.45	50	550.0	0.5	0.5	4.0	0.7	0.7	550.0	4279.0	4.0
12	600	1.84	60.15	50	599.9	1.2	1.2	5.2	0.7	0.7	600.0	4229.0	5.2
13	650	1.78	62.08	50	649.9	2.0	2.0	6.6	-0.1	0.2	650.0	4179.0	6.6
14	700	1.48	61.80	50	699.9	2.7	2.7	7.9	-0.6	0.6	700.0	4129.0	7.9
15	750	1.33	59.76	50	749.9	3.3	3.3	8.9	-0.3	0.3	749.9	4079.1	8.9
16	800	1.41	57.04	50	799.9	3.9	3.9	10.0	0.2	0.2	799.9	4029.1	10.0
17	848	1.74	56.97	48	847.9	4.6	4.6	11.1	0.7	0.7	847.9	3981.1	11.1
MWD	970	1.90	65.60	122	969.8	6.5	6.5	14.5	0.1	0.3	969.9	3859.1	14.5
19	1058	1.20	111.50	88	1057.8	6.7	6.7	16.7	-0.8	1.6	1057.9	3771.1	16.6
20	1089	2.50	120.70	31	1088.7	6.3	6.3	17.5	4.2	4.3	1088.9	3740.1	17.5
21	1119	3.30	102.60	30	1118.7	5.8	5.7	18.9	2.7	4.0	1118.8	3710.2	18.9
22	1151	3.70	102.00	32	1150.6	5.3	5.3	20.8	1.3	1.3	1150.7	3678.3	20.8
23	1243	5.60	91.30	92	1242.3	4.6	4.6	28.2	2.1	2.3	1242.4	3586.6	28.2
24	1335	5.80	90.90	92	1333.9	4.5	4.4	37.4	0.2	0.2	1334.0	3495.0	37.4
25	1427	4.60	84.50	92	1425.5	4.7	4.7	45.7	-1.3	1.4	1425.6	3403.4	45.7
26	1519	2.90	81.00	92	1517.3	5.5	5.4	51.7	-1.8	1.9	1517.4	3311.6	51.7
27	1611	1.50	82.60	92	1609.2	6.0	5.9	55.2	-1.5	1.5	1609.3	3219.7	55.2
28	1703	1.10	141.60	92	1701.2	5.4	5.4	56.9	-0.4	1.4	1701.3	3127.7	56.9
29	1795	0.80	148.10	92	1793.2	4.2	4.2	57.8	-0.3	0.3	1793.3	3035.7	57.8
30	1887	0.50	129.80	92	1885.2	3.4	3.4	58.4	-0.3	0.4	1885.2	2943.8	58.4
31	1982	0.30	99.70	95	1980.2	3.1	3.1	59.0	-0.2	0.3	1980.2	2848.8	59.0
32	2076	0.30	112.40	94	2074.2	3.0	2.9	59.5	0.0	0.1	2074.2	2754.8	59.5
33	2171	0.20	139.80	95	2169.2	2.7	2.7	59.8	-0.1	0.2	2169.2	2659.8	59.8
34	2266	0.30	151.70	95	2264.2	2.4	2.4	60.0	0.1	0.1	2264.2	2564.8	60.0
35	2361	0.60	226.30	95	2359.2	1.8	1.8	59.8	0.3	0.6	2359.2	2469.8	59.8
36	2455	0.80	245.70	94	2453.2	1.2	1.2	58.8	0.2	0.3	2453.2	2375.8	58.8
37	2550	0.90	254.20	95	2548.2	0.8	0.7	57.5	0.1	0.2	2548.2	2280.8	57.5
38	2645	1.10	249.30	95	2643.1	0.2	0.2	55.9	0.2	0.2	2643.1	2185.9	55.9
39	2740	0.30	242.80	95	2738.1	-0.2	-0.3	54.9	-0.8	0.8	2738.1	2090.9	54.9
40	2833	0.20	243.00	93	2831.1	-0.4	-0.4	54.5	-0.1	0.1	2831.1	1997.9	54.5
41	2928	0.30	305.80	95	2926.1	-0.3	-0.4	54.2	0.1	0.3	2926.1	1902.9	54.2
42	3023	0.40	280.80	95	3021.1	-0.12	-0.2	53.6	0.1	0.2	3021.1	1807.9	53.6
43	3118	0.30	254.00	95	3116.1	-0.1	-0.2	53.1	-0.1	0.2	3116.1	1712.9	53.1
44	3212	0.30	319.70	94	3210.1	0.0	0.0	52.7	0.0	0.3	3210.1	1618.9	52.7
45	3307	0.30	294.80	95	3305.1	0.3	0.2	52.3	0.0	0.1	3305.1	1523.9	52.3
46	3402	0.30	11.20	95	3400.1	0.6	0.6	52.1	0.0	0.4	3400.1	1428.9	52.1

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47	3496	0.40	26.80	94	3494.1	1.2	1.1	52.3	0.1	0.1	3494.1	1334.9	52.3
48	3591	0.60	2.60	95	3589.1	2.0	1.9	52.5	0.2	0.3	3589.1	1239.9	52.5
49	3686	0.50	9.30	95	3684.1	2.9	2.8	52.6	-0.1	0.1	3684.2	1144.8	52.6
50	3780	0.70	21.10	94	3778.1	3.8	3.8	52.8	0.2	0.2	3778.2	1050.8	52.8
51	3875	0.70	24.40	95	3873.1	4.9	4.8	53.3	0.0	0.0	3873.2	955.8	53.3
52	3970	0.50	18.20	95	3968.1	5.8	5.8	53.7	-0.2	0.2	3968.2	860.8	53.7
53	4064	0.60	17.90	94	4062.1	6.7	6.6	53.9	0.1	0.1	4062.2	766.8	53.9
54	4159	0.40	32.40	95	4157.1	7.4	7.4	54.3	-0.2	0.2	4157.2	671.8	54.3
55	4254	0.50	39.20	95	4252.1	8.0	8.0	54.7	0.1	0.1	4252.2	576.8	54.7
56	4348	0.80	46.80	94	4346.1	8.8	8.7	55.4	0.3	0.3	4346.2	482.8	55.4
57	4379	3.30	21.30	31	4377.1	9.8	9.7	55.9	8.1	8.4	4377.2	451.8	55.9
58	4411	7.10	16.60	32	4408.9	12.5	12.5	56.8	11.9	11.9	4409.1	419.9	56.8
59	4442	10.40	16.20	31	4439.6	17.0	17.0	58.2	10.6	10.6	4439.8	389.2	58.1
60	4474	14.30	15.90	32	4470.8	23.6	23.6	60.0	12.2	12.2	4471.2	357.8	60.0
61	4505	17.90	14.60	31	4500.6	31.9	31.9	62.3	11.6	11.7	4501.1	327.9	62.3
62	4537	21.70	12.90	32	4530.7	42.4	42.4	64.9	11.9	12.0	4531.4	297.6	64.8
63	4568	25.60	12.00	31	4559.1	54.6	54.5	67.5	12.6	12.6	4560.0	269.0	67.5
64	4600	29.30	11.50	32	4587.5	69.0	69.0	70.5	11.6	11.6	4588.7	240.3	70.5
65	4631	33.10	10.50	31	4614.0	84.8	84.7	73.6	12.3	12.4	4615.5	213.5	73.5
66	4663	36.80	9.00	32	4640.2	102.9	102.8	76.7	11.6	11.9	4642.0	187.0	76.6
67	4694	40.50	7.80	31	4664.4	122.0	122.0	79.5	11.9	12.2	4666.5	162.5	79.4
68	4726	44.40	7.00	32	4688.0	143.4	143.4	82.3	12.2	12.3	4690.5	138.5	82.2
69	4757	48.20	6.10	31	4709.4	165.7	165.6	84.8	12.3	12.4	4712.3	116.7	84.7
70	4789	52.00	4.90	32	4730.0	190.1	190.1	87.2	11.9	12.2	4733.3	95.7	87.0
71	4820	55.50	3.20	31	4748.3	215.1	215.0	88.9	11.3	12.1	4752.0	77.0	88.8
72	4852	59.90	1.60	32	4765.4	242.1	242.0	90.0	13.8	14.4	4769.6	59.4	89.9
73	4883	61.50	0.70	31	4780.6	269.1	269.0	90.6	5.2	5.7	4785.2	43.8	90.4
74	4915	61.30	0.60	32	4795.9	297.2	297.1	90.9	-0.6	0.7	4801.1	27.9	90.7
75	4946	61.10	0.60	31	4810.8	324.4	324.3	91.2	-0.6	0.6	4816.5	12.5	91.0
76	4978	60.90	1.20	32	4826.3	352.4	352.3	91.6	-0.6	1.8	4832.5	-3.5	91.4
77	5009	61.60	1.10	31	4841.2	379.5	379.5	92.2	2.3	2.3	4847.9	-18.9	91.9
78	5041	65.40	0.30	32	4855.5	408.2	408.1	92.5	11.9	12.1	4862.6	-33.6	92.2
79	5072	69.20	359.20	31	4867.5	436.7	436.7	92.4	12.3	12.7	4875.1	-46.1	92.1
80	5104	73.10	358.70	32	4877.8	467.0	467.0	91.8	12.2	12.3	4886.0	-57.0	91.5
81	5135	77.20	358.50	31	4885.7	497.0	496.9	91.1	13.2	13.2	4894.4	-65.4	90.8
82	5167	79.20	358.10	32	4892.3	528.3	528.2	90.2	6.3	6.4	4901.5	-72.5	89.8
83	5198	81.10	357.00	31	4897.6	558.8	558.7	88.9	6.1	7.1	4907.3	-78.3	88.5
84	5230	83.30	355.90	32	4901.9	590.4	590.4	86.9	6.9	7.7	4912.2	-83.2	86.5
85	5262	85.30	355.00	32	4905.1	622.2	622.1	84.4	6.3	6.8	4916.0	-87.0	83.9
86	5293	87.30	354.40	31	4907.1	653.0	652.9	81.5	6.5	6.7	4918.5	-89.5	81.1
87	5325	89.00	354.20	32	4908.1	684.8	684.7	78.3	5.3	5.3	4920.1	-91.1	77.9
88	5356	89.40	354.40	31	4908.6	715.6	715.6	75.3	1.3	1.4	4921.1	-92.1	74.8
89	5388	89.50	354.20	32	4908.9	747.5	747.4	72.1	0.3	0.7	4921.9	-92.9	71.6
90	5420	89.50	354.00	32	4909.2	779.3	779.2	68.8	0.0	0.6	4922.8	-93.8	68.3
91	5545	90.90	353.60	125	4908.7	903.5	903.5	55.3	1.1	1.2	4924.5	-95.5	54.7
92	5637	92.10	356.90	92	4906.3	995.2	995.1	47.7	1.3	3.8	4923.7	-94.7	47.0

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93	5729	90.70	359.10	92	4904.1	1087.1	1087.0	44.5	-1.5	2.8	4923.0	-94.0	43.7
94	5822	90.40	358.50	93	4903.2	1180.0	1180.0	42.5	-0.3	0.7	4923.8	-94.8	41.7
95	5914	91.30	358.90	92	4901.8	1272.0	1272.0	40.4	1.0	1.1	4924.0	-95.0	39.6
96	6006	89.30	0.50	92	4901.3	1364.0	1364.0	40.0	-2.2	2.8	4925.1	-96.1	39.0
97	6098	89.30	359.50	92	4902.5	1456.0	1455.9	40.0	0.0	1.1	4927.9	-98.9	38.9
98	6191	89.20	358.60	93	4903.7	1548.9	1548.9	38.4	-0.1	1.0	4930.7	-101.7	37.3
99	6283	93.30	0.60	92	4901.7	1640.9	1640.9	37.8	4.5	5.0	4930.3	-101.3	36.6
100	6377	92.10	359.70	94	4897.2	1734.8	1734.8	38.0	-1.3	1.6	4927.5	-98.5	36.8
101	6469	91.70	359.70	92	4894.2	1826.7	1826.7	37.5	-0.4	0.4	4926.1	-97.1	36.3
102	6561	92.30	359.70	92	4891.0	1918.7	1918.7	37.1	0.7	0.7	4924.5	-95.5	35.7
103	6653	92.80	359.90	92	4886.9	2010.6	2010.6	36.7	0.5	0.6	4922.0	-93.0	35.3
104	6745	91.80	359.80	92	4883.2	2102.5	2102.5	36.5	-1.1	1.1	4919.9	-90.9	35.0
105	6837	92.80	359.30	92	4879.5	2194.4	2194.4	35.8	1.1	1.2	4917.8	-88.8	34.2
106	6929	91.60	0.40	92	4876.0	2286.3	2286.3	35.5	-1.3	1.8	4915.9	-86.9	33.9
107	7021	92.50	0.60	92	4872.7	2378.3	2378.3	36.3	1.0	1.0	4914.2	-85.2	34.7
108	7113	91.80	1.20	92	4869.2	2470.2	2470.2	37.8	-0.8	1.0	4912.3	-83.3	36.1
109	7207	90.50	0.70	94	4867.3	2564.2	2564.1	39.3	-1.4	1.5	4912.1	-83.1	37.5
110	7302	89.00	0.20	95	4867.8	2659.2	2659.1	40.1	-1.6	1.7	4914.2	-85.2	38.2
111	7396	89.10	359.10	94	4869.3	2753.1	2753.1	39.5	0.1	1.2	4917.4	-88.4	37.6
112	7491	90.70	358.80	95	4869.5	2848.1	2848.1	37.8	1.7	1.7	4919.2	-90.2	35.8
113	7585	91.30	359.10	94	4867.8	2942.1	2942.1	36.0	0.6	0.7	4919.2	-90.2	34.0
114	7679	90.50	358.80	94	4866.4	3036.1	3036.0	34.3	-0.9	0.9	4919.4	-90.4	32.2
115	7774	90.00	358.10	95	4865.9	3131.0	3131.0	31.8	-0.5	0.9	4920.6	-91.6	29.6
116	7868	91.80	358.60	94	4864.5	3225.0	3224.9	29.0	1.9	2.0	4920.8	-91.8	26.8
117	7963	91.40	358.90	95	4861.8	3319.9	3319.9	27.0	-0.4	0.5	4919.8	-90.8	24.7
118	8057	90.20	357.90	94	4860.5	3413.8	3413.8	24.4	-1.3	1.7	4920.1	-91.1	22.0
119	8152	88.60	357.10	95	4861.5	3508.7	3508.7	20.2	-1.7	1.9	4922.7	-93.7	17.8
120	8246	88.40	358.00	94	4864.0	3602.6	3602.6	16.2	-0.2	1.0	4926.8	-97.8	13.7
121	8341	88.00	357.00	95	4866.9	3697.5	3697.5	12.1	-0.4	1.1	4931.5	-102.5	9.5
122	8434	87.30	357.80	93	4870.8	3790.3	3790.3	7.8	-0.8	1.1	4936.9	-107.9	5.2
123	8530	87.60	357.60	96	4875.0	3886.1	3886.1	4.0	0.3	0.4	4942.9	-113.9	1.3
124	8624	88.70	358.10	94	4878.1	3980.0	3980.0	0.5	1.2	1.3	4947.5	-118.5	-2.3
125	8719	89.00	359.10	95	4880.0	4074.9	4074.9	-1.9	0.3	1.1	4951.1	-122.1	-4.7
126	8813	90.70	359.10	94	4880.2	4168.9	4168.9	-3.3	1.8	1.8	4953.0	-124.0	-6.2
127	8908	91.00	359.20	95	4878.8	4263.9	4263.9	-4.7	0.3	0.3	4953.2	-124.2	-7.7
128	9002	90.10	0.30	94	4877.9	4357.9	4357.9	-5.2	-1.0	1.5	4954.0	-125.0	-8.2
129	9097	89.80	0.60	95	4878.0	4452.9	4452.9	-4.4	-0.3	0.4	4955.7	-126.7	-7.5
130	9191	89.50	0.80	94	4878.6	4546.9	4546.9	-3.3	-0.3	0.4	4957.9	-128.9	-6.4
131	9286	91.00	0.60	95	4878.2	4641.9	4641.9	-2.1	1.6	1.6	4959.2	-130.2	-5.3
132	9381	90.20	0.80	95	4877.2	4736.9	4736.9	-0.9	-0.8	0.9	4959.8	-130.8	-4.2
133	9475	90.60	0.50	94	4876.5	4830.8	4830.8	0.1	0.4	0.5	4960.8	-131.8	-3.2
134	9529	91.50	0.40	54	4875.5	4884.8	4884.8	0.6	1.7	1.7	4960.8	-131.8	-2.9
PTB	9578	92.00	0.40	49	4874.0	4933.8	4933.8	0.9	1.0	1.0	4960.1	-131.1	-2.5