APPENDIX H – Shadow Flicker Analysis

SHADOW FLICKER MODELING REPORT

Dodge County Wind Project
Dodge and Steele Counties, Minnesota

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1.0 EXECUTIVE SUMMARY

The Dodge County Wind Project (Project) is a proposed wind power generation facility proposed to consist of 79 wind turbines in Dodge and Steele Counties, Minnesota. The proposed Project is nameplate capacity is 258.92 megawatts (MW) and is being developed by Dodge County Wind, LLC (DCW) an indirect, wholly owned subsidiary of NextEra Energy Resources, LLC, (NEER). DCW has retained Epsilon Associates, Inc. (Epsilon) to conduct a shadow flicker assessment for the proposed wind turbines for this Project. This report presents results of the shadow flicker modeling analysis.

The purpose of this analysis is to predict the annual durations of wind turbine shadow flicker at nearby receptors.

The maximum expected annual duration of shadow flicker at a modeling receptor resulting from the operation of the 79 wind turbines is 59 hours, 42 minutes, which occurs at a participating receptor. The maximum expected duration of annual shadow flicker at a non-participating receptor is 40 hours, 30 minutes. The modeling results are conservative in that modeling receptors were treated as "greenhouses" (i.e. having windows on all sides) and the surrounding area was assumed to be without vegetation or structures ("bare earth").

2.0 INTRODUCTION

The Project will consist of 79 wind turbines using a combination of two potential General Electric (GE) models including the 2.52 MW, 90-meter hub height wind turbine; and the 3.40 MW wind turbine at either 81-meter or 98-meter hub height. Figure 2-1 shows the locations of the 79 wind turbines with the Project Boundary over aerial imagery.

Shadow flicker can be defined as an intermittent change in the intensity of light in a given area resulting from the operation of a wind turbine due to its interaction with the sun. An indoor observer experiences repeated changes in the brightness of the room as shadows cast from the wind turbine blades briefly pass by windows as the blades rotate. In order for this to occur, the wind turbine must be operating, the sun must be shining, and the window must be within the shadow region of the wind turbine, otherwise there is no shadow flicker. A stationary wind turbine only generates a stationary shadow similar to any other structure.

Based on the current design and operation of typical modern wind turbines, shadow flicker is not a cause of epileptic seizures. According to the Epilepsy Foundation, "Generally, flashing lights most likely to trigger seizures are between the frequency of 5 to 30 flashes per second (Hertz)."[1] Based on the data available for the actual or similar wind turbine models proposed for this Project, the maximum rotational speed of 15.7 rpm[2] corresponds to a shadow flicker frequency of 0.8 Hz. This frequency is well below the frequency identified by the Epilepsy Foundation; therefore, the triggering of epileptic seizures is not a concern with this Project.

This report presents the findings of a shadow flicker modeling study for the Project. The wind turbines were modeled with the WindPRO software package using information provided by DCW. The expected annual duration of shadow flicker was calculated at modeling receptors and shadow flicker isolines for the area surrounding the Project were generated. The results of the modeling are found within this report.

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[1] Epilepsy Foundation, http://www.epilepsy.com/learn/triggers-seizures/photosensitivity-and-seizures. Accessed in July 2021.

[2] The maximum rpm of the GE 3.40 wind turbine is not currently available from GE. The maximum rpm of the GE 3.4 wind turbine is expected to be equal to the maximum rotor speed of the GE 3.03-140 wind turbine which according to the Technical Documentation Wind Turbine Generator Systems Sierra Platform - 60 Hz is 12.6 rpm. The maximum rpm of the GE 2.52-116 wind turbine is 15.7 rpm.

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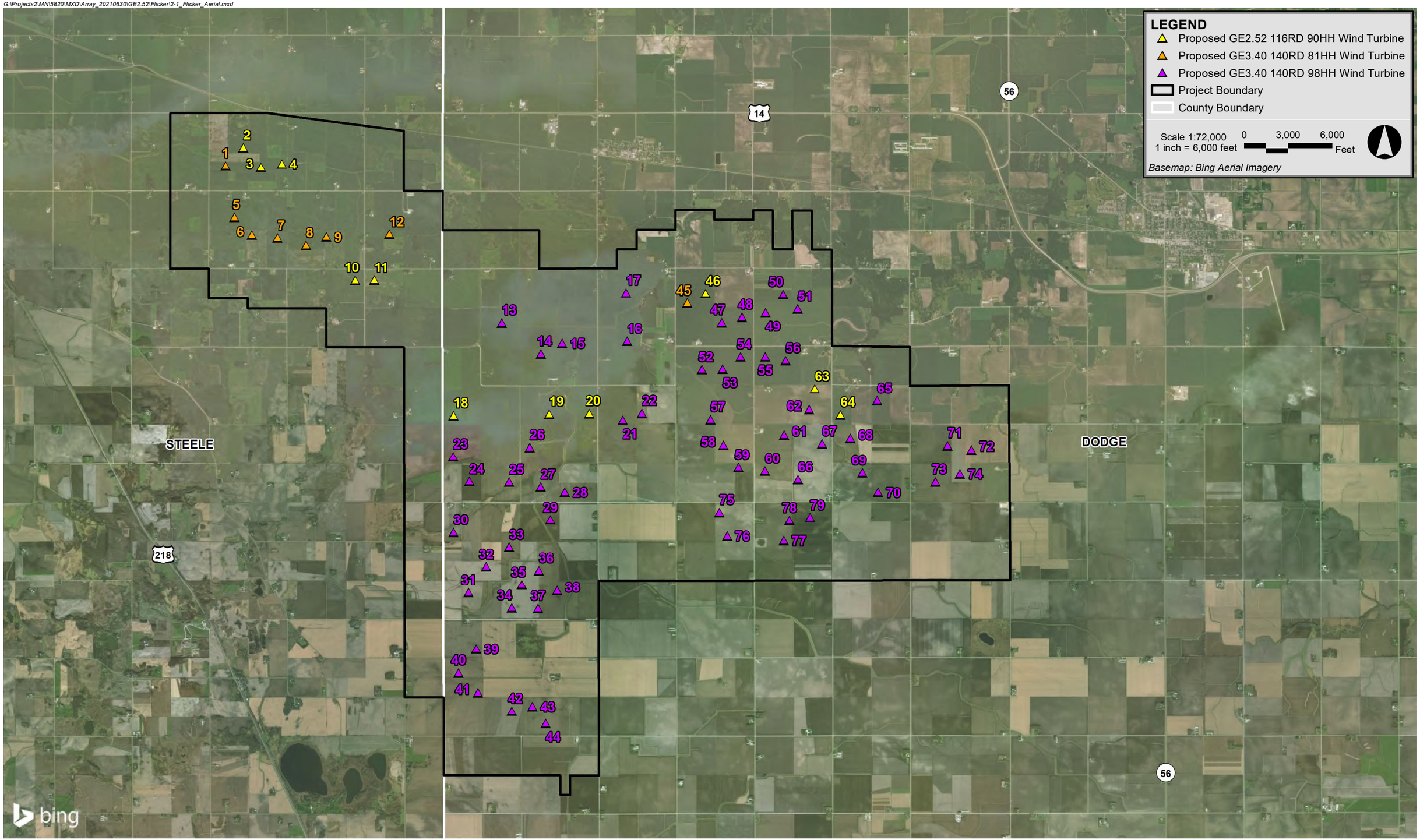

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Figure 2-1
Aerial Locus

3.0 SHADOW FLICKER MODELING

3.1 Modeling Methodology

Shadow flicker was modeled using a software package, WindPRO version 3.4. WindPRO is a software suite developed by EMD International A/S and is used for assessing potential environmental impacts from wind turbines. Using the Shadow module within WindPRO, worst-case shadow flicker in the area surrounding the wind turbines was calculated based on data inputs including: location of the wind turbines, location of discrete receptor points, wind turbine dimensions, flicker calculation limits, and terrain data. Based on these data, the model was able to incorporate the appropriate sun angle and maximum daily sunlight for this latitude into the calculations. The resulting worst-case calculations assume that the sun is always shining during daylight hours and that the wind turbine is always operating. The WindPRO Shadow module can be further refined by incorporating sunshine probabilities and wind turbine operational estimates by wind direction over the course of a year. The values produced by this further refinement are known as the "expected" shadow flicker. Both worst-case and expected annual shadow flicker durations are presented in this section.

This analysis is for the wind turbine array dated August 6, 2021. The analysis incorporates a Project boundary provided to Epsilon on June 10, 2021. Locations of the turbines are shown in Figure 3-1 and the coordinates are provided in Appendix A. Eleven (11) wind turbines are GE 2.52-116 wind turbines with a 116.5-meter rotor diameter and a hub height of 90 meters. Eight (8) wind turbines are GE 3.40-140 wind turbines with a 140-meter rotor diameter and a hub height of 81 meters. Sixty (60) wind turbines are GE 3.40-140 wind turbines with a 140-meter rotor diameter and a hub height of 98 meters. Each wind turbine has the following characteristics based on the technical data provided by DCW:

		GE 2.52-116	GE 3.40-140
♦ Rated Power	=	2,520 kW	3,400 kW
♦ Hub Height	=	90 meters	81/98 meters
♦ Rotor Diameter	=	116.5 meters	140 meters
♦ Cut-in Wind Speed	=	3 m/s	3 m/s[3]
♦ Cut-out Wind Speed	=	32 m/s	26 m/s[4]
♦ Maximum RPM	=	15.7 rpm	N/A rpm[5]

[3] Identified as "preliminary" by GE.

[4] Identified as "preliminary" by GE.

[5] The maximum rpm is not currently available from the manufacturer for this model. The maximum rpm of the GE 3.4 wind turbine is expected to be equal to the maximum rotor speed of the GE 3.03-140 wind turbine which according to the Technical Documentation Wind Turbine Generator Systems Sierra Platform - 60 Hz is 12.6 rpm.

To-date, there are no federal, state, or local regulations regarding the maximum radial distance from a wind turbine to which shadow flicker should be analyzed applicable to this Project. In the United States, shadow flicker is commonly evaluated out to a distance of ten times the rotor diameter. According to the Massachusetts Model Bylaw for wind energy facilities, shadow flicker impacts are minimal at and beyond a distance of ten rotor diameters.[6] Defining the shadow flicker calculation area has also been addressed in Europe where the ten times rotor diameter approach has been accepted in multiple European countries.[7] Some jurisdictions conservatively require a larger calculation area. The New Hampshire Site Evaluation Committee through rulemaking docket 2014-04 adopted rules on December 15, 2015 outlining application requirements and criteria for energy facilities, including wind energy facilities. As part of these revised regulations, Site 301.08(a)(2) requires an evaluation distance of at least 1 mile from a wind turbine.[8] Section 16-50j-94, part (g), of the Regulations of Connecticut State Agencies identifies the components required in a shadow flicker evaluation report which includes the calculation of shadow flicker from each proposed wind turbine to any off-site occupied structure within a 1.25 mile radius.[9] For this Project, ten times the largest rotor diameter of the proposed wind turbines corresponds to a distance of 0.87 miles (1,400 m). Conservatively, this analysis includes shadow flicker calculations out to 1.25 miles (2,012 m) from each wind turbine in the model for the proposed layout.

A dataset dated September 2, 2021 and containing participation status information for property parcels in the proximity of the Project was provided by DCW. This dataset was utilized to determine participation status for parcels in the vicinity of the Project as shown in Figure 3-1. Color coded shading indicates whether a parcel is participating or non-participating.

A modeling receptor shapefile dataset dated May 5, 2021, was provided by DCW. Epsilon created receptor points of these structures from the centroid of each of these polygons. The resulting 554 receptors were input into the WindPRO model. Each modeling point was assumed to have a window facing all directions ("greenhouse" mode) which yields conservative results. Participation status for each modeling receptor was assigned based on the data presented in Figure 3-1. All modeling receptors are identified in Figure 3-2 and are distinguished as either participating or non-participating. The model was set to limit calculations to 2,012 meters from a wind turbine, the equivalent of 1.25 miles. Consequently, shadow flicker at any of the 554 modeling receptors

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[6] Massachusetts Department of Energy Resources, "Model As-of-Right Zoning Ordinance or Bylaw: Allowing Use of Wind Energy Facilities" 2009.

[7] Parsons Brinckerhoff, "Update of UK Shadow Flicker Evidence Base" Prepared for Department of Energy and Climate Change, 2011.

[8] State of New Hampshire Site Evaluation Committee Site 300 Rules (2015), available at http://www.gencourt.state.nh.us/rules/state_agencies/site100-300.html Accessed in June 2020.

[9] State of Connecticut CSC Wind Regulations (2014), available at https://eregulations.ct.gov/eRegsPortal/Browse/RCSA?id=Title_16Subtitle_16-50jSection_16-50j-94&content=shadow%20flicker/ Accessed in June 2020.

greater than the corresponding limitation distance from a wind turbine was zero. In addition to modeling discrete points, shadow flicker was calculated at grid points in the area surrounding the modeled wind turbines to generate flicker isolines. A 20-meter spacing was used for this grid.

The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset (NED) developed by the U.S. Geological Survey. Conservatively, obstacles, i.e. buildings and vegetation, were excluded from the analysis. This is effectively a "bare earth" scenario which is conservative. When accounted for in the shadow flicker calculations, such obstacles may significantly mitigate or eliminate the flicker effect depending on their size, type, and location. In addition, shadow flicker durations were calculated only when the angle of the sun was at least 3° above the horizon.

Monthly sunshine probability values were input for each month from January to December. These numbers were obtained from a publicly available historical dataset for Minneapolis-St. Paul, Minnesota from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI).[10] Table 3-1 shows the percentage of sunshine hours by month used in the shadow flicker modeling. These values are the percentages that the sun is expected to be shining during daylight hours.

The number of hours the wind turbines are expected to operate for the 16 cardinal wind directions was input into the model. An hourly dataset for a two year period of wind directions and scaled wind speed was provided by DCW for a height of 98 meters. Epsilon used this data to calculate the typical annual number of operational hours per wind direction sector. These hours per wind direction sector are used by WindPRO to estimate the "wind direction" and "operation time" reduction factors. Based on this dataset, the wind turbines would operate 93% of the year. Table 3-2 shows the distribution of operational hours for the 16 wind directions.

[10] NCEI (formerly NCDC), http://www1.ncdc.noaa.gov/pub/data/ccd-data/pctpos15.dat. Accessed in January 2021.

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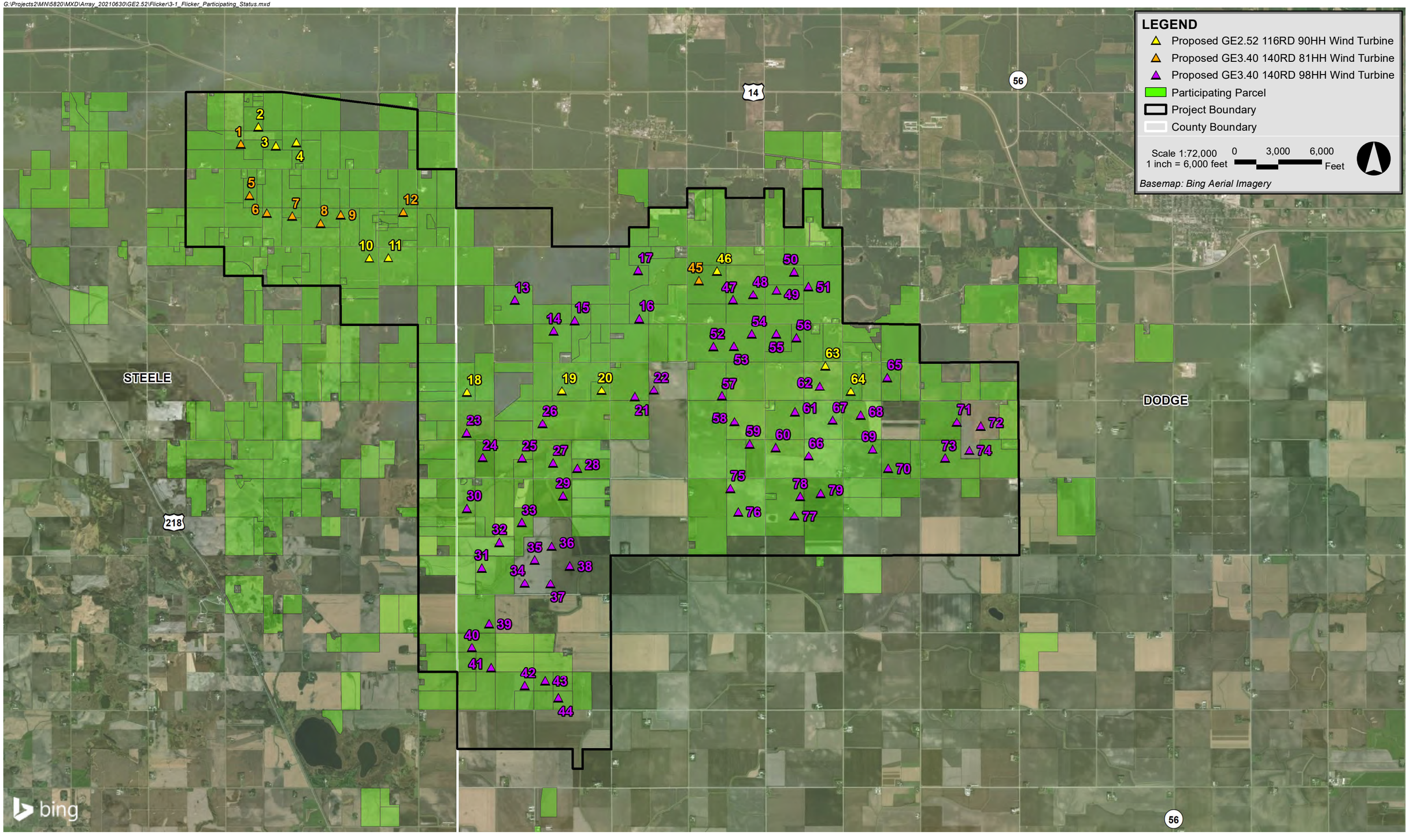

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Figure 3-1
Participation Status

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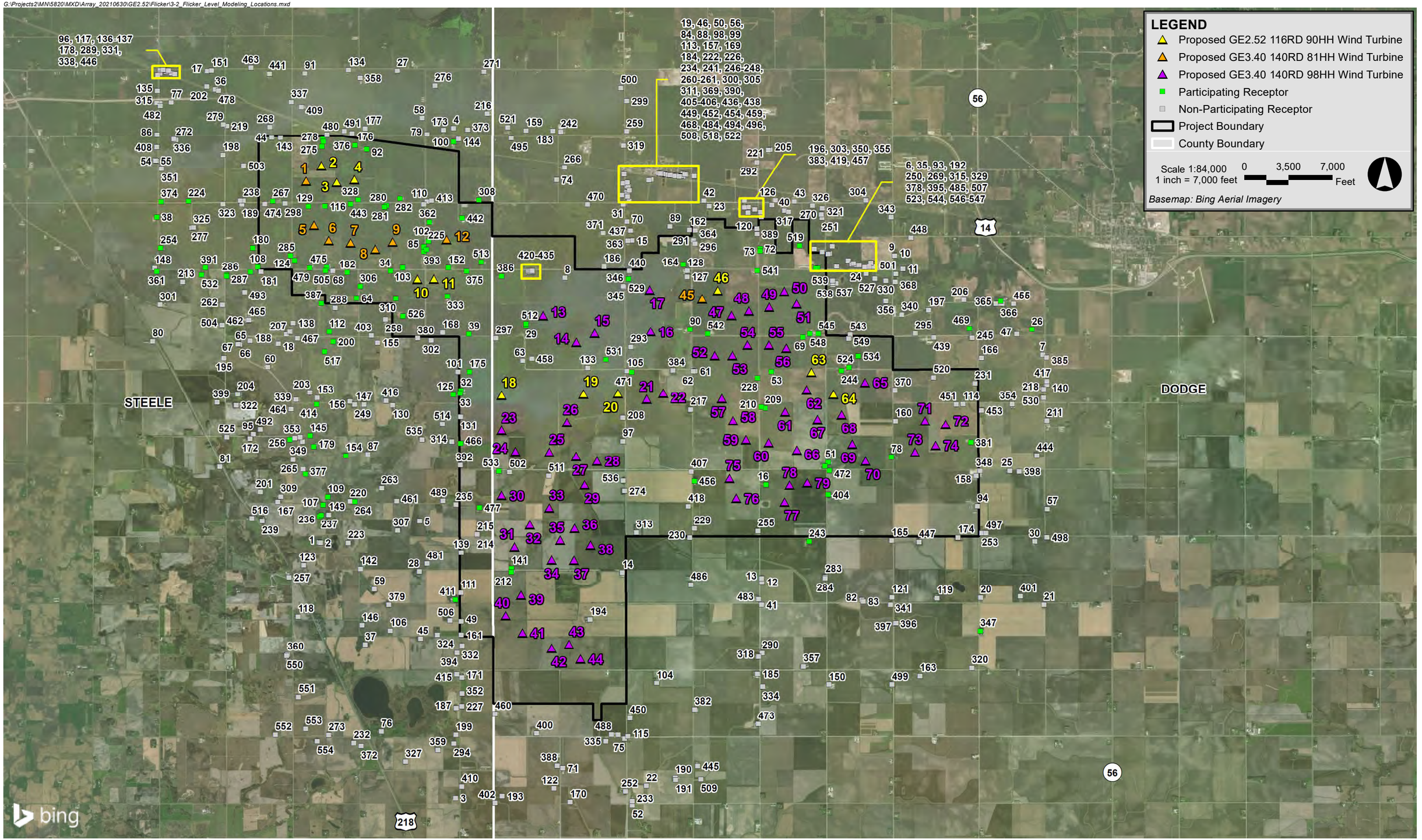

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Figure 3-2
Shadow Flicker Modeling Locations

Table 3-1 Monthly Percent of Possible Sunshine

Month	Possible Sunshine
January	53%
February	59%
March	57%
April	56%
May	62%
June	67%
July	74%
August	69%
September	62%
October	51%
November	37%
December	38%

Table 3-2 Operational Hours per Wind Direction Sector

Wind Sector	Operational Hours
N	193
NNE	369
NE	339
ENE	406
E	332
ESE	400
SE	458
SSE	563
S	973
SSW	662
SW	456
WSW	381
W	429
WNW	794
NW	869
NNW	510
Annual	8134

3.2 Results

Following the modeling methodology outlined in Section 3.1, WindPRO was used to calculate shadow flicker at the 554 discrete modeling receptor points and generate shadow flicker isolines based on the grid calculations. Table B-1 in Appendix B presents the modeling results. Both expected and worst-case values are presented.

The predicted expected annual shadow flicker duration ranged from 0 hours, 0 minutes per year to 59 hours, 42 minutes per year for all 554 receptors. The maximum modeled expected annual flicker was at a participating receptor (#16). The maximum modeled expected annual flicker at a non-participating receptor (#217) is 40 hours, 30 minutes. The majority of the receptors (387) were predicted to experience no annual shadow flicker. Ninety-three (93) receptors were predicted to experience some shadow flicker but less than 10 hours per year. The modeling results showed that 52 receptors would be expected to have between 10 hours and 30 hours of shadow flicker per year. Twenty-two (22) receptors are expected to have over 30 hours of flicker per year, three (3) of which are non-participating receptors. Figure 3-3 displays the modeled flicker isolines (expected hours per year) over aerial imagery in relation to modeled wind turbines and modeling receptors.

The modeled worst-case annual shadow flicker duration for all the 554 receptors ranged from 0 hours, 0 minutes per year to 187 hours, 38 minutes per year. The maximum flicker modeled occurs at a participating receptor (#16). The maximum predicted annual flicker at a non-participating receptor (#62) is 129 hours, 17 minutes.

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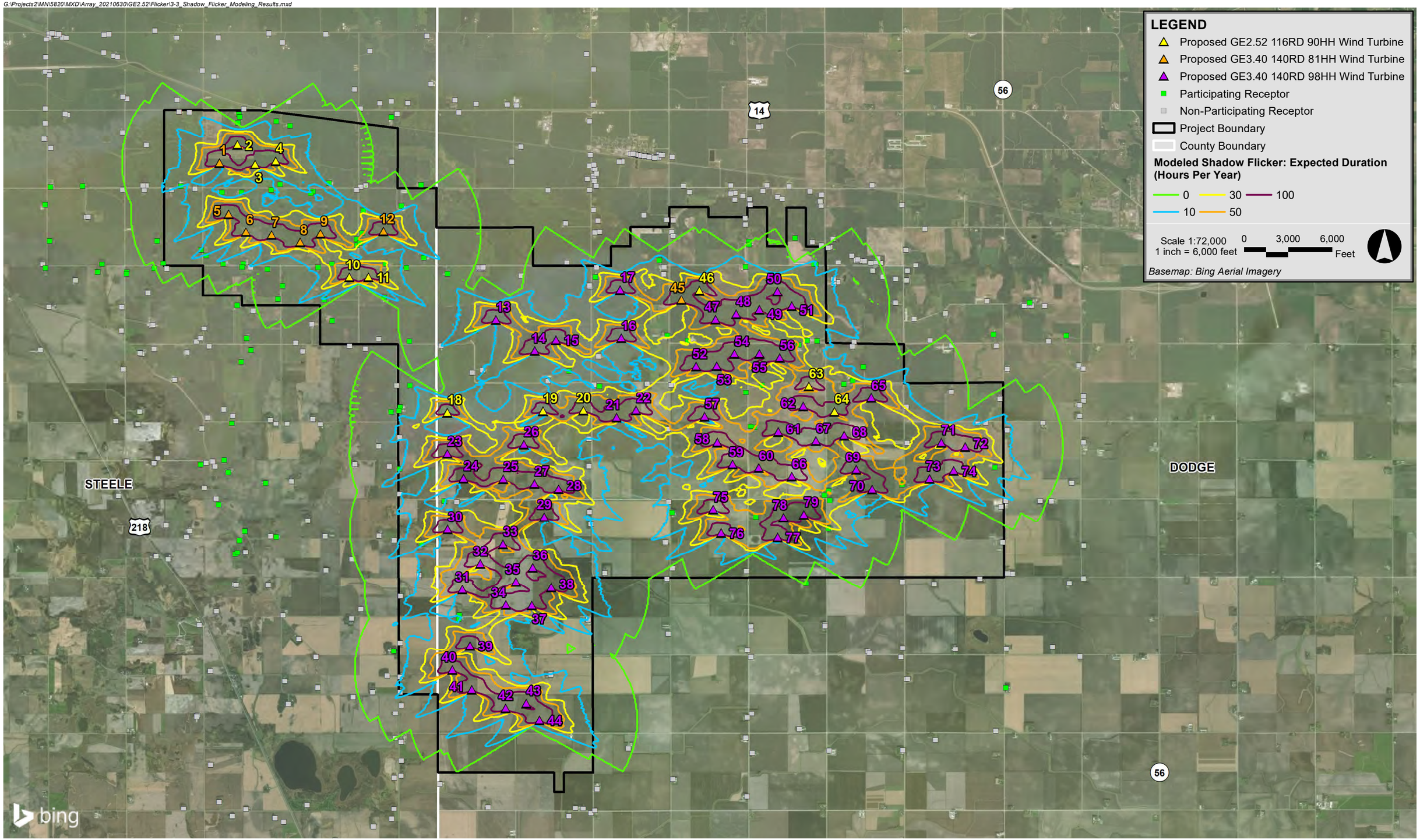

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Figure 3-3
Shadow Flicker Modeling Results

Appendix A
Wind Turbine Coordinates

Table A-1: Wind Turbine Coordinates

Wind Turbine ID	Wind Turbine Type	Hub Height (m)	Coordinates NAD83 UTM Zone 15N (meters)	
			X (Easting)	Y (Northing)
1	GE 3.40-140	81	491833.64	4876550.20
2	GE 2.52-116	90	492201.04	4876919.97
3	GE 2.52-116	90	492569.38	4876518.39
4	GE 2.52-116	90	492996.56	4876584.77
5	GE 3.40-140	81	492019.80	4875481.13
6	GE 3.40-140	81	492378.46	4875113.83
7	GE 3.40-140	81	492907.99	4875054.71
8	GE 3.40-140	81	493499.68	4874900.16
9	GE 3.40-140	81	493919.78	4875078.01
10	GE 2.52-116	90	494517.66	4874174.37
11	GE 2.52-116	90	494914.91	4874179.95
12	GE 3.40-140	81	495224.99	4875131.00
13	GE 3.40-140	98	497555.00	4873299.98
14	GE 3.40-140	98	498362.88	4872653.09
15	GE 3.40-140	98	498801.66	4872874.52
16	GE 3.40-140	98	500151.19	4872915.46
17	GE 3.40-140	98	500128.00	4873915.02
18	GE 2.52-116	90	496551.86	4871371.23
19	GE 2.52-116	90	498533.05	4871403.03
20	GE 2.52-116	90	499365.15	4871415.02
21	GE 3.40-140	98	500057.93	4871278.09
22	GE 3.40-140	98	500455.06	4871419.87
23	GE 3.40-140	98	496549.82	4870523.33
24	GE 3.40-140	98	496884.96	4870009.95
25	GE 3.40-140	98	497707.42	4869998.13
26	GE 3.40-140	98	498132.62	4870716.51
27	GE 3.40-140	98	498355.18	4869896.00
28	GE 3.40-140	98	498856.04	4869788.73
29	GE 3.40-140	98	498557.56	4869211.98
30	GE 3.40-140	98	496554.40	4868952.85
31	GE 3.40-140	98	496863.12	4867708.34
32	GE 3.40-140	98	497232.19	4868242.38
33	GE 3.40-140	98	497702.64	4868650.42
34	GE 3.40-140	98	497760.10	4867390.04
35	GE 3.40-140	98	497969.79	4867869.99
36	GE 3.40-140	98	498320.10	4868159.99
37	GE 3.40-140	98	498299.93	4867380.02
38	GE 3.40-140	98	498699.96	4867749.98
39	GE 3.40-140	98	497020.03	4866539.95
40	GE 3.40-140	98	496654.61	4866044.22
41	GE 3.40-140	98	497058.43	4865628.15
42	GE 3.40-140	98	497758.72	4865252.58
43	GE 3.40-140	98	498185.02	4865349.96

Table A-1: Wind Turbine Coordinates

Wind Turbine ID	Wind Turbine Type	Hub Height (m)	Coordinates NAD83 UTM Zone 15N (meters)	
			X (Easting)	Y (Northing)
44	GE 3.40-140	98	498460.38	4864997.78
45	GE 3.40-140	81	501394.99	4873705.00
46	GE 2.52-116	90	501769.66	4873902.40
47	GE 3.40-140	98	502105.17	4873305.04
48	GE 3.40-140	98	502527.18	4873413.71
49	GE 3.40-140	98	503014.54	4873505.98
50	GE 3.40-140	98	503383.44	4873883.37
51	GE 3.40-140	98	503679.97	4873582.99
52	GE 3.40-140	98	501700.04	4872330.14
53	GE 3.40-140	98	502126.00	4872334.64
54	GE 3.40-140	98	502494.94	4872589.99
55	GE 3.40-140	98	503009.99	4872589.99
56	GE 3.40-140	98	503430.06	4872510.03
57	GE 3.40-140	98	501875.01	4871294.85
58	GE 3.40-140	98	502140.74	4870760.46
59	GE 3.40-140	98	502455.04	4870299.87
60	GE 3.40-140	98	503000.05	4870224.87
61	GE 3.40-140	98	503399.99	4870970.10
62	GE 3.40-140	98	503919.96	4871500.10
63	GE 2.52-116	90	504034.89	4871924.89
64	GE 2.52-116	90	504566.05	4871390.30
65	GE 3.40-140	98	505326.98	4871679.98
66	GE 3.40-140	98	503683.30	4870048.74
67	GE 3.40-140	98	504184.96	4870789.95
68	GE 3.40-140	98	504769.97	4870899.97
69	GE 3.40-140	98	505020.03	4870190.00
70	GE 3.40-140	98	505344.97	4869785.03
71	GE 3.40-140	98	506779.98	4870749.95
72	GE 3.40-140	98	507275.54	4870666.61
73	GE 3.40-140	98	506535.07	4870000.09
74	GE 3.40-140	98	507036.52	4870165.95
75	GE 3.40-140	98	502055.00	4869364.97
76	GE 3.40-140	98	502219.93	4868879.99
77	GE 3.40-140	98	503390.01	4868790.00
78	GE 3.40-140	98	503509.98	4869199.95
79	GE 3.40-140	98	503935.02	4869259.99

Appendix B

Shadow Flicker Modeling Results: Modeling Receptors

Table B-1: Shadow Flicker Modeling Results

Receptor ID	Coordinates NAD83 UTM Zone 15N (meters)		Participation Status	Worst-Case Shadow Flicker - Annual	Worst-Case Shadow Flicker Days - Annual	Worst-Case Shadow Flicker Hours - Daily	Expected Shadow Flicker Hours - Annual
	X (Easting)	Y (Northing)		(HH:MM/year)	(Days/year)	(HH:MM/day)	(HH:MM/year)
1	492148.90	4867812.87	Non-Participating	0:00	0	0:00	0:00
2	492180.08	4867809.47	Non-Participating	0:00	0	0:00	0:00
3	495444.03	4861638.31	Non-Participating	0:00	0	0:00	0:00
4	495390.98	4877824.97	Non-Participating	0:00	0	0:00	0:00
5	494573.56	4868329.31	Non-Participating	0:00	0	0:00	0:00
6	504299.92	4874836.45	Non-Participating	0:00	0	0:00	0:00
7	509624.70	4872351.24	Non-Participating	0:00	0	0:00	0:00
8	498080.72	4874206.33	Non-Participating	0:00	0	0:00	0:00
9	506037.74	4874748.88	Non-Participating	0:00	0	0:00	0:00
10	506050.32	4874743.43	Non-Participating	0:00	0	0:00	0:00
11	506246.45	4874423.48	Non-Participating	0:00	0	0:00	0:00
12	502839.80	4866861.85	Non-Participating	0:00	0	0:00	0:00
13	502835.06	4866942.95	Non-Participating	0:00	0	0:00	0:00
14	499468.85	4867081.29	Non-Participating	26:50	117	0:26	10:49
15	499700.20	4875114.66	Non-Participating	0:00	0	0:00	0:00
16	502937.95	4869210.18	Participating	187:38	233	1:21	59:42
17	489444.63	4879205.60	Non-Participating	0:00	0	0:00	0:00
18	491159.74	4872616.50	Non-Participating	0:00	0	0:00	0:00
19	499576.26	4876273.51	Non-Participating	0:00	0	0:00	0:00
20	508124.36	4866478.11	Non-Participating	0:00	0	0:00	0:00
21	509652.52	4866311.23	Non-Participating	0:00	0	0:00	0:00
22	500054.15	4861931.65	Non-Participating	0:00	0	0:00	0:00
23	501566.55	4875940.76	Non-Participating	0:00	0	0:00	0:00
24	505360.45	4874306.38	Non-Participating	3:31	23	0:14	1:02
25	508830.24	4869546.99	Non-Participating	3:19	26	0:12	1:19
26	509364.26	4872963.09	Participating	0:00	0	0:00	0:00
27	494034.23	4879211.36	Non-Participating	0:00	0	0:00	0:00
28	494568.65	4867108.30	Non-Participating	0:00	0	0:00	0:00
29	497143.55	4873066.70	Participating	56:38	116	0:56	21:04
30	509431.80	4867835.01	Non-Participating	0:00	0	0:00	0:00
31	499492.96	4875983.78	Non-Participating	0:00	0	0:00	0:00
32	495572.93	4871481.19	Participating	10:27	34	0:26	3:38
33	495552.31	4871411.17	Participating	19:17	67	0:26	5:58
34	493871.98	4874370.65	Participating	48:05	128	0:52	16:59
35	504538.01	4874969.76	Non-Participating	0:00	0	0:00	0:00
36	489643.48	4878761.03	Non-Participating	0:00	0	0:00	0:00
37	493257.01	4865337.79	Non-Participating	0:00	0	0:00	0:00
38	488221.75	4875677.22	Participating	0:00	0	0:00	0:00
39	495765.52	4872848.11	Participating	2:38	21	0:11	0:55
40	503390.38	4875834.17	Non-Participating	0:00	0	0:00	0:00
41	502832.53	4866306.09	Non-Participating	0:00	0	0:00	0:00
42	501440.38	4876069.62	Non-Participating	0:00	0	0:00	0:00
43	503625.79	4876054.09	Non-Participating	0:00	0	0:00	0:00
44	490995.28	4877602.23	Non-Participating	8:58	63	0:18	2:35
45	494598.08	4865480.81	Non-Participating	0:00	0	0:00	0:00
46	500508.85	4876698.70	Non-Participating	0:00	0	0:00	0:00
47	508999.23	4872848.82	Non-Participating	0:00	0	0:00	0:00
48	491762.16	4869588.01	Non-Participating	0:00	0	0:00	0:00
49	495577.58	4865899.35	Non-Participating	26:15	109	0:29	9:19
50	499631.54	4876067.43	Non-Participating	0:00	0	0:00	0:00
51	504442.72	4869750.39	Participating	149:48	265	0:51	48:07
52	499711.80	4861462.44	Non-Participating	0:00	0	0:00	0:00
53	503069.05	4871941.72	Participating	89:53	236	0:54	32:35
54	488218.70	4877029.52	Non-Participating	0:00	0	0:00	0:00
55	488197.62	4877040.78	Non-Participating	0:00	0	0:00	0:00
56	500607.23	4876688.71	Non-Participating	0:00	0	0:00	0:00
57	509728.20	4868620.30	Non-Participating	0:00	0	0:00	0:00
58	494631.94	4878067.90	Non-Participating	0:00	0	0:00	0:00
59	493478.04	4866683.95	Non-Participating	0:00	0	0:00	0:00
60	490904.04	4872049.28	Non-Participating	0:00	0	0:00	0:00
61	501225.17	4871956.07	Non-Participating	116:37	216	0:46	36:42
62	501183.46	4871944.67	Non-Participating	129:17	217	0:57	39:38
63	497067.23	4872202.85	Non-Participating	14:08	65	0:23	5:01
64	493047.36	4873719.28	Participating	5:21	38	0:14	1:55
65	490198.35	4872610.03	Non-Participating	0:00	0	0:00	0:00
66	490231.07	4872594.88	Non-Participating	0:00	0	0:00	0:00
67	490185.97	4872604.25	Non-Participating	0:00	0	0:00	0:00
68	492480.63	4874371.00	Non-Participating	22:01	73	0:25	8:24
69	503825.75	4872775.72	Participating	162:46	279	1:09	48:10
70	499581.44	4875569.38	Non-Participating	0:00	0	0:00	0:00
71	498033.70	4862361.30	Non-Participating	0:00	0	0:00	0:00
72	502794.29	4874913.12	Participating	0:00	0	0:00	0:00
73	502796.00	4874854.78	Participating	3:15	21	0:12	0:40

Table B-1: Shadow Flicker Modeling Results

Receptor ID	Coordinates NAD83 UTM Zone 15N (meters)		Participation Status	Worst-Case Shadow Flicker - Annual	Worst-Case Shadow Flicker Days - Annual	Worst-Case Shadow Flicker Hours - Daily	Expected Shadow Flicker Hours - Annual
	X (Easting)	Y (Northing)		(HH:MM/year)	(Days/year)	(HH:MM/day)	(HH:MM/year)
74	497881.90	4876575.38	Non-Participating	0:00	0	0:00	0:00
75	499526.62	4863072.56	Non-Participating	0:00	0	0:00	0:00
76	493648.84	4863245.61	Non-Participating	0:00	0	0:00	0:00
77	488576.77	4878448.64	Non-Participating	0:00	0	0:00	0:00
78	505966.88	4869878.37	Participating	145:06	209	1:29	52:38
79	494750.75	4877672.55	Non-Participating	0:00	0	0:00	0:00
80	488124.42	4872673.44	Non-Participating	0:00	0	0:00	0:00
81	489743.70	4869646.39	Non-Participating	0:00	0	0:00	0:00
82	505258.78	4866422.16	Non-Participating	0:00	0	0:00	0:00
83	505289.10	4866389.62	Non-Participating	0:00	0	0:00	0:00
84	500430.38	4876723.10	Non-Participating	0:00	0	0:00	0:00
85	494674.40	4874964.71	Participating	127:15	199	1:09	47:29
86	488229.97	4877669.00	Non-Participating	0:00	0	0:00	0:00
87	493327.54	4869945.54	Non-Participating	0:00	0	0:00	0:00
88	500474.45	4876712.64	Non-Participating	0:00	0	0:00	0:00
89	500623.45	4875455.65	Non-Participating	0:00	0	0:00	0:00
90	501103.54	4872965.76	Participating	79:58	239	0:33	25:58
91	491805.15	4879143.63	Non-Participating	0:00	0	0:00	0:00
92	493295.90	4877317.09	Participating	10:42	58	0:21	3:08
93	505521.46	4874472.14	Non-Participating	0:00	0	0:00	0:00
94	508048.16	4868687.71	Non-Participating	0:00	0	0:00	0:00
95	490558.27	4870427.40	Non-Participating	0:00	0	0:00	0:00
96	488455.23	4879188.75	Non-Participating	0:00	0	0:00	0:00
97	499482.01	4870257.86	Non-Participating	78:17	190	0:44	21:09
98	499579.78	4876426.53	Non-Participating	0:00	0	0:00	0:00
99	500954.88	4876712.04	Non-Participating	0:00	0	0:00	0:00
100	495393.83	4877492.70	Participating	0:00	0	0:00	0:00
101	495503.67	4871935.80	Non-Participating	8:48	37	0:22	2:36
102	494809.73	4875554.74	Participating	82:42	129	0:59	22:51
103	494160.31	4874449.84	Participating	138:22	248	1:02	43:37
104	500298.35	4864413.90	Non-Participating	2:46	22	0:11	1:05
105	499582.97	4871955.15	Non-Participating	39:57	115	0:50	12:36
106	493864.69	4865674.98	Non-Participating	0:00	0	0:00	0:00
107	492244.31	4868718.62	Participating	0:00	0	0:00	0:00
108	490664.39	4874465.11	Participating	2:50	24	0:10	1:03
109	492356.73	4868911.94	Participating	0:00	0	0:00	0:00
110	494752.02	4876048.27	Non-Participating	1:38	18	0:08	0:38
111	495573.03	4866602.09	Non-Participating	22:21	105	0:26	6:57
112	492395.06	4872907.23	Participating	0:00	0	0:00	0:00
113	500368.53	4876730.47	Non-Participating	0:00	0	0:00	0:00
114	507701.03	4871155.54	Non-Participating	64:22	113	0:51	16:13
115	499602.96	4863130.00	Non-Participating	0:00	0	0:00	0:00
116	492288.94	4875934.54	Participating	7:01	44	0:21	1:49
117	488579.52	4879153.91	Non-Participating	0:00	0	0:00	0:00
118	491639.96	4866018.48	Non-Participating	0:00	0	0:00	0:00
119	507073.63	4866464.97	Non-Participating	0:00	0	0:00	0:00
120	502717.76	4875399.03	Non-Participating	0:00	0	0:00	0:00
121	505982.22	4866488.49	Non-Participating	0:00	0	0:00	0:00
122	497815.41	4861867.43	Non-Participating	0:00	0	0:00	0:00
123	491772.09	4867257.85	Non-Participating	0:00	0	0:00	0:00
124	491554.77	4874628.63	Participating	21:54	103	0:21	8:08
125	495388.32	4871382.70	Participating	22:54	92	0:22	6:50
126	503168.34	4876081.13	Non-Participating	0:00	0	0:00	0:00
127	501030.87	4874233.06	Non-Participating	52:56	122	0:58	16:17
128	501040.98	4874377.91	Non-Participating	42:55	90	0:49	12:13
129	491888.32	4875933.22	Participating	19:59	107	0:22	6:04
130	493922.16	4871131.52	Non-Participating	0:00	0	0:00	0:00
131	495560.88	4870852.56	Non-Participating	42:01	150	0:31	14:42
132	488299.76	4878423.35	Non-Participating	0:00	0	0:00	0:00
133	498636.66	4872028.29	Non-Participating	40:17	152	0:31	11:50
134	492857.85	4879228.58	Non-Participating	0:00	0	0:00	0:00
135	488237.17	4878728.89	Non-Participating	0:00	0	0:00	0:00
136	488407.42	4879222.82	Non-Participating	0:00	0	0:00	0:00
137	488660.48	4879131.37	Non-Participating	0:00	0	0:00	0:00
138	491517.60	4873118.79	Non-Participating	0:00	0	0:00	0:00
139	495581.70	4867569.37	Non-Participating	21:26	123	0:23	7:02
140	509724.36	4871619.32	Non-Participating	0:00	0	0:00	0:00
141	496797.40	4867179.31	Participating	31:16	110	0:37	11:13
142	493147.64	4867171.40	Non-Participating	0:00	0	0:00	0:00
143	491208.49	4877594.08	Non-Participating	18:38	78	0:23	5:07
144	495513.20	4877563.58	Non-Participating	0:00	0	0:00	0:00
145	491932.00	4870388.39	Participating	0:00	0	0:00	0:00
146	493183.89	4865808.35	Non-Participating	0:00	0	0:00	0:00

Table B-1: Shadow Flicker Modeling Results

Receptor ID	Coordinates NAD83 UTM Zone 15N (meters)		Participation Status	Worst-Case Shadow Flicker - Annual	Worst-Case Shadow Flicker Days - Annual	Worst-Case Shadow Flicker Hours - Daily	Expected Shadow Flicker Hours - Annual
	X (Easting)	Y (Northing)		(HH:MM/year)	(Days/year)	(HH:MM/day)	(HH:MM/year)
147	493234.84	4871143.88	Non-Participating	0:00	0	0:00	0:00
148	488176.82	4874444.29	Non-Participating	0:00	0	0:00	0:00
149	492375.72	4868476.15	Non-Participating	0:00	0	0:00	0:00
150	504458.08	4864371.22	Non-Participating	0:00	0	0:00	0:00
151	489544.91	4879213.73	Non-Participating	0:00	0	0:00	0:00
152	495267.53	4874447.81	Participating	134:13	217	1:08	36:42
153	492103.49	4871307.03	Non-Participating	0:00	0	0:00	0:00
154	492791.30	4869909.10	Participating	0:00	0	0:00	0:00
155	493559.19	4872640.63	Non-Participating	0:00	0	0:00	0:00
156	492888.38	4871222.75	Non-Participating	0:00	0	0:00	0:00
157	500491.51	4876706.12	Non-Participating	0:00	0	0:00	0:00
158	508018.56	4869420.73	Non-Participating	6:58	36	0:17	2:53
159	497144.63	4877768.68	Non-Participating	0:00	0	0:00	0:00
160	506068.93	4870747.29	Non-Participating	79:55	167	0:59	26:14
161	495577.32	4865576.05	Non-Participating	27:23	104	0:27	10:20
162	501089.42	4875368.23	Non-Participating	0:00	0	0:00	0:00
163	506656.97	4864586.31	Non-Participating	0:00	0	0:00	0:00
164	500941.84	4874531.82	Participating	60:30	79	1:05	15:31
165	505975.17	4867859.30	Non-Participating	0:00	0	0:00	0:00
166	508144.63	4872272.89	Non-Participating	0:00	0	0:00	0:00
167	491147.12	4868792.53	Non-Participating	0:00	0	0:00	0:00
168	495131.09	4872888.37	Non-Participating	0:00	0	0:00	0:00
169	500930.64	4876656.51	Non-Participating	0:00	0	0:00	0:00
170	498210.22	4861540.63	Non-Participating	0:00	0	0:00	0:00
171	495589.79	4864552.29	Non-Participating	0:00	0	0:00	0:00
172	490476.84	4870316.70	Non-Participating	0:00	0	0:00	0:00
173	495153.79	4877778.54	Non-Participating	0:00	0	0:00	0:00
174	507576.91	4867930.10	Non-Participating	0:00	0	0:00	0:00
175	495774.75	4871932.37	Participating	27:30	81	0:30	7:37
176	492942.35	4877694.92	Non-Participating	0:00	0	0:00	0:00
177	493256.63	4877818.13	Non-Participating	5:59	29	0:16	1:18
178	488305.00	4879226.91	Non-Participating	0:00	0	0:00	0:00
179	492013.05	4870129.41	Participating	0:00	0	0:00	0:00
180	490540.60	4874928.89	Participating	6:48	48	0:14	2:28
181	490740.99	4874350.24	Non-Participating	4:13	34	0:11	1:36
182	492825.92	4874335.43	Participating	1:54	17	0:10	0:40
183	497791.37	4877758.09	Non-Participating	0:00	0	0:00	0:00
184	499586.33	4876218.60	Non-Participating	0:00	0	0:00	0:00
185	502733.21	4864639.89	Non-Participating	0:00	0	0:00	0:00
186	499027.32	4874481.53	Non-Participating	17:55	75	0:26	4:56
187	495454.20	4863810.52	Non-Participating	0:00	0	0:00	0:00
188	490478.72	4872689.88	Non-Participating	0:00	0	0:00	0:00
189	490278.72	4875981.79	Non-Participating	6:43	49	0:14	2:25
190	500749.17	4862127.79	Non-Participating	0:00	0	0:00	0:00
191	500757.86	4862075.69	Non-Participating	0:00	0	0:00	0:00
192	504107.57	4874903.13	Non-Participating	0:00	0	0:00	0:00
193	496567.40	4861683.18	Non-Participating	0:00	0	0:00	0:00
194	498696.73	4865948.08	Non-Participating	47:11	124	0:44	11:54
195	489845.83	4872269.79	Non-Participating	0:00	0	0:00	0:00
196	502511.25	4875918.65	Non-Participating	0:00	0	0:00	0:00
197	506867.25	4873425.96	Non-Participating	0:00	0	0:00	0:00
198	489825.59	4877177.74	Non-Participating	0:00	0	0:00	0:00
199	495448.22	4863162.40	Non-Participating	0:00	0	0:00	0:00
200	492485.87	4872667.38	Participating	0:00	0	0:00	0:00
201	490726.89	4869031.52	Non-Participating	0:00	0	0:00	0:00
202	489435.33	4878830.81	Non-Participating	0:00	0	0:00	0:00
203	491925.48	4871433.16	Non-Participating	0:00	0	0:00	0:00
204	490181.91	4871393.10	Non-Participating	0:00	0	0:00	0:00
205	503040.46	4877305.74	Non-Participating	0:00	0	0:00	0:00
206	507720.87	4873679.54	Non-Participating	0:00	0	0:00	0:00
207	491353.72	4872843.53	Non-Participating	0:00	0	0:00	0:00
208	499483.98	4870832.33	Non-Participating	35:29	132	0:28	11:07
209	502915.25	4871061.73	Participating	148:02	263	1:15	51:49
210	502825.89	4871089.68	Participating	123:12	224	1:04	41:44
211	509723.09	4870758.45	Non-Participating	0:00	0	0:00	0:00
212	496786.19	4867096.04	Participating	25:26	77	0:32	9:15
213	488850.02	4874111.98	Non-Participating	0:00	0	0:00	0:00
214	495966.80	4867986.23	Non-Participating	32:37	124	0:34	11:13
215	495966.13	4868005.71	Non-Participating	32:14	122	0:34	11:07
216	496208.01	4878176.00	Non-Participating	0:00	0	0:00	0:00
217	501117.53	4871025.47	Non-Participating	107:36	210	0:48	40:30
218	509646.97	4871517.51	Non-Participating	0:00	0	0:00	0:00
219	489915.77	4877879.58	Non-Participating	0:00	0	0:00	0:00

Table B-1: Shadow Flicker Modeling Results

Receptor ID	Coordinates NAD83 UTM Zone 15N (meters)		Participation Status	Worst-Case Shadow Flicker - Annual	Worst-Case Shadow Flicker Days - Annual	Worst-Case Shadow Flicker Hours - Daily	Expected Shadow Flicker Hours - Annual
	X (Easting)	Y (Northing)		(HH:MM/year)	(Days/year)	(HH:MM/day)	(HH:MM/year)
220	492895.31	4868806.16	Non-Participating	0:00	0	0:00	0:00
221	502995.95	4877296.70	Non-Participating	0:00	0	0:00	0:00
222	501003.67	4876706.51	Non-Participating	0:00	0	0:00	0:00
223	492845.37	4867800.41	Non-Participating	0:00	0	0:00	0:00
224	488996.21	4876058.27	Participating	0:00	0	0:00	0:00
225	494785.68	4875094.79	Participating	122:49	151	1:23	43:49
226	500169.04	4876581.94	Non-Participating	0:00	0	0:00	0:00
227	495593.56	4863852.66	Non-Participating	0:00	0	0:00	0:00
228	502731.49	4871786.99	Participating	64:38	218	0:34	21:36
229	501213.17	4868148.37	Non-Participating	0:00	0	0:00	0:00
230	501099.20	4867929.07	Non-Participating	0:00	0	0:00	0:00
231	507989.46	4871655.59	Non-Participating	16:18	63	0:22	3:52
232	492984.78	4862963.95	Non-Participating	0:00	0	0:00	0:00
233	499708.68	4861562.23	Non-Participating	0:00	0	0:00	0:00
234	501207.50	4876670.87	Non-Participating	0:00	0	0:00	0:00
235	495449.98	4868723.71	Non-Participating	24:16	118	0:28	7:51
236	492158.99	4868443.65	Participating	0:00	0	0:00	0:00
237	492202.23	4868471.49	Participating	0:00	0	0:00	0:00
238	490317.49	4876072.38	Non-Participating	7:07	48	0:15	2:32
239	490772.87	4868330.67	Non-Participating	0:00	0	0:00	0:00
240	504474.32	4874800.84	Non-Participating	14:56	45	0:24	3:25
241	499451.86	4876209.11	Non-Participating	0:00	0	0:00	0:00
242	497981.30	4877738.38	Non-Participating	0:00	0	0:00	0:00
243	503983.64	4867834.43	Participating	0:00	0	0:00	0:00
244	504760.55	4871962.27	Participating	121:01	254	1:21	38:51
245	507916.22	4872759.08	Non-Participating	0:00	0	0:00	0:00
246	500109.86	4876571.91	Non-Participating	0:00	0	0:00	0:00
247	499493.32	4876494.63	Non-Participating	0:00	0	0:00	0:00
248	500792.52	4876671.42	Non-Participating	0:00	0	0:00	0:00
249	493001.46	4871141.57	Non-Participating	0:00	0	0:00	0:00
250	505468.21	4874567.16	Non-Participating	0:00	0	0:00	0:00
251	504293.80	4875657.39	Non-Participating	0:00	0	0:00	0:00
252	499548.84	4861796.60	Non-Participating	0:00	0	0:00	0:00
253	508150.60	4868038.13	Non-Participating	0:00	0	0:00	0:00
254	488314.12	4874924.71	Participating	0:00	0	0:00	0:00
255	502745.82	4868089.17	Non-Participating	0:00	0	0:00	0:00
256	491441.79	4870295.15	Participating	0:00	0	0:00	0:00
257	491419.59	4866969.08	Non-Participating	0:00	0	0:00	0:00
258	493748.19	4873206.06	Non-Participating	0:00	0	0:00	0:00
259	499574.91	4877748.37	Non-Participating	0:00	0	0:00	0:00
260	500570.48	4876697.94	Non-Participating	0:00	0	0:00	0:00
261	500682.67	4876686.29	Non-Participating	0:00	0	0:00	0:00
262	489807.34	4873556.75	Non-Participating	0:00	0	0:00	0:00
263	493660.68	4869127.12	Non-Participating	0:00	0	0:00	0:00
264	493008.97	4868796.76	Participating	0:00	0	0:00	0:00
265	491521.01	4869811.96	Non-Participating	0:00	0	0:00	0:00
266	498071.67	4876876.94	Non-Participating	0:00	0	0:00	0:00
267	491030.47	4876061.23	Participating	33:22	166	0:27	10:48
268	490953.76	4877850.89	Non-Participating	9:39	53	0:16	2:38
269	504925.86	4874621.85	Non-Participating	15:08	65	0:20	3:39
270	504273.69	4875741.16	Non-Participating	0:00	0	0:00	0:00
271	496127.52	4879185.09	Non-Participating	0:00	0	0:00	0:00
272	488684.76	4877538.01	Non-Participating	0:00	0	0:00	0:00
273	492380.19	4863158.39	Non-Participating	0:00	0	0:00	0:00
274	499523.83	4869059.24	Non-Participating	35:21	126	0:33	10:49
275	492212.61	4877378.62	Participating	0:00	0	0:00	0:00
276	494947.99	4878856.51	Non-Participating	0:00	0	0:00	0:00
277	489073.80	4875419.12	Non-Participating	0:00	0	0:00	0:00
278	492233.76	4877556.00	Participating	0:00	0	0:00	0:00
279	489833.11	4877912.50	Non-Participating	0:00	0	0:00	0:00
280	493769.89	4875949.78	Participating	21:53	123	0:26	7:42
281	493718.91	4875916.68	Participating	27:59	147	0:21	10:14
282	494098.64	4876122.28	Participating	18:37	107	0:21	6:58
283	504379.21	4866974.98	Non-Participating	0:00	0	0:00	0:00
284	504371.08	4866947.02	Non-Participating	0:00	0	0:00	0:00
285	491453.41	4874743.92	Participating	30:55	102	0:32	11:37
286	489909.66	4874272.91	Participating	0:00	0	0:00	0:00
287	489907.11	4874247.07	Participating	0:00	0	0:00	0:00
288	492532.30	4873484.11	Non-Participating	0:00	0	0:00	0:00
289	488299.49	4879147.02	Non-Participating	0:00	0	0:00	0:00
290	502850.33	4865135.09	Non-Participating	0:00	0	0:00	0:00
291	501192.38	4875114.79	Non-Participating	0:00	0	0:00	0:00
292	502719.54	4876996.39	Non-Participating	0:00	0	0:00	0:00

Table B-1: Shadow Flicker Modeling Results

Receptor ID	Coordinates NAD83 UTM Zone 15N (meters)		Participation Status	Worst-Case Shadow Flicker - Annual	Worst-Case Shadow Flicker Days - Annual	Worst-Case Shadow Flicker Hours - Daily	Expected Shadow Flicker Hours - Annual
	X (Easting)	Y (Northing)		(HH:MM/year)	(Days/year)	(HH:MM/day)	(HH:MM/year)
293	499678.09	4872538.62	Non-Participating	43:35	121	0:36	17:47
294	495398.34	4862952.06	Non-Participating	0:00	0	0:00	0:00
295	506546.78	4872867.33	Non-Participating	0:00	0	0:00	0:00
296	501224.93	4875033.82	Non-Participating	0:00	0	0:00	0:00
297	496419.85	4872754.66	Non-Participating	26:51	96	0:25	10:14
298	491327.24	4876003.33	Non-Participating	55:00	139	0:44	16:25
299	499578.51	4878480.97	Non-Participating	0:00	0	0:00	0:00
300	500931.24	4876716.77	Non-Participating	0:00	0	0:00	0:00
301	488302.80	4873560.59	Non-Participating	0:00	0	0:00	0:00
302	494852.79	4872697.89	Non-Participating	0:00	0	0:00	0:00
303	502421.45	4876071.99	Non-Participating	0:00	0	0:00	0:00
304	505348.39	4876079.30	Non-Participating	0:00	0	0:00	0:00
305	500868.27	4876669.90	Non-Participating	0:00	0	0:00	0:00
306	493138.15	4874000.89	Participating	4:34	28	0:16	1:34
307	494040.64	4868103.53	Non-Participating	0:00	0	0:00	0:00
308	496006.82	4876086.98	Participating	0:00	0	0:00	0:00
309	491215.79	4868919.33	Non-Participating	0:00	0	0:00	0:00
310	494001.93	4873709.24	Participating	24:02	68	0:28	9:10
311	499611.85	4876413.28	Non-Participating	0:00	0	0:00	0:00
312	504182.95	4874445.24	Participating	41:34	94	0:42	10:02
313	499811.09	4868052.86	Non-Participating	22:35	105	0:27	7:08
314	495349.04	4870249.03	Non-Participating	14:29	62	0:24	5:01
315	488228.07	4878434.32	Non-Participating	0:00	0	0:00	0:00
316	491442.10	4872910.02	Non-Participating	0:00	0	0:00	0:00
317	503487.85	4875801.04	Non-Participating	0:00	0	0:00	0:00
318	502760.12	4865050.38	Non-Participating	0:00	0	0:00	0:00
319	499494.76	4877405.80	Non-Participating	0:00	0	0:00	0:00
320	507907.62	4864779.23	Non-Participating	0:00	0	0:00	0:00
321	504300.61	4875884.53	Non-Participating	0:00	0	0:00	0:00
322	490143.16	4871129.16	Non-Participating	0:00	0	0:00	0:00
323	489826.64	4875986.81	Non-Participating	0:00	0	0:00	0:00
324	494999.19	4865577.98	Non-Participating	3:44	25	0:13	1:19
325	489115.47	4875427.87	Non-Participating	0:00	0	0:00	0:00
326	504059.72	4875949.28	Non-Participating	0:00	0	0:00	0:00
327	494233.58	4862515.25	Non-Participating	0:00	0	0:00	0:00
328	493087.73	4876095.24	Participating	18:29	83	0:23	5:55
329	505014.97	4874528.13	Non-Participating	15:41	91	0:19	4:04
330	505833.99	4874138.56	Non-Participating	0:00	0	0:00	0:00
331	488245.43	4879102.59	Non-Participating	0:00	0	0:00	0:00
332	495596.87	4865310.03	Non-Participating	5:26	29	0:17	1:54
333	495246.75	4873763.89	Participating	18:30	54	0:27	7:57
334	502864.73	4864320.41	Non-Participating	0:00	0	0:00	0:00
335	499067.20	4863010.71	Non-Participating	0:00	0	0:00	0:00
336	488635.60	4877560.13	Non-Participating	0:00	0	0:00	0:00
337	491477.34	4878458.84	Non-Participating	0:00	0	0:00	0:00
338	488370.70	4879229.42	Non-Participating	0:00	0	0:00	0:00
339	491586.16	4871267.36	Non-Participating	0:00	0	0:00	0:00
340	506219.35	4873319.67	Non-Participating	0:00	0	0:00	0:00
341	505944.93	4866305.68	Non-Participating	0:00	0	0:00	0:00
342	490485.73	4874353.08	Participating	0:00	0	0:00	0:00
343	505959.74	4875672.79	Non-Participating	0:00	0	0:00	0:00
344	503082.57	4875966.50	Non-Participating	0:00	0	0:00	0:00
345	499507.02	4873983.67	Non-Participating	43:10	68	0:51	15:03
346	499493.07	4874005.43	Non-Participating	40:28	64	0:50	14:01
347	508114.92	4865669.97	Participating	0:00	0	0:00	0:00
348	508112.13	4869543.81	Non-Participating	15:03	75	0:18	6:16
349	491741.81	4870251.28	Non-Participating	0:00	0	0:00	0:00
350	502824.36	4875679.02	Non-Participating	0:00	0	0:00	0:00
351	488336.85	4876851.24	Non-Participating	0:00	0	0:00	0:00
352	495596.99	4864158.82	Non-Participating	0:00	0	0:00	0:00
353	491690.59	4870352.19	Non-Participating	0:00	0	0:00	0:00
354	508881.77	4871158.61	Non-Participating	3:47	22	0:15	1:10
355	502671.38	4875862.64	Non-Participating	0:00	0	0:00	0:00
356	505835.12	4873648.89	Non-Participating	0:00	0	0:00	0:00
357	503841.78	4864815.50	Non-Participating	0:00	0	0:00	0:00
358	493137.26	4879037.00	Non-Participating	0:00	0	0:00	0:00
359	495018.61	4862796.39	Non-Participating	0:00	0	0:00	0:00
360	491382.19	4865101.53	Non-Participating	0:00	0	0:00	0:00
361	488227.26	4874360.15	Participating	0:00	0	0:00	0:00
362	494673.57	4875982.30	Non-Participating	3:45	40	0:09	1:15
363	499603.78	4875103.88	Non-Participating	0:00	0	0:00	0:00
364	501230.12	4875352.04	Non-Participating	0:00	0	0:00	0:00
365	508497.51	4873580.91	Non-Participating	0:00	0	0:00	0:00

Table B-1: Shadow Flicker Modeling Results

Receptor ID	Coordinates NAD83 UTM Zone 15N (meters)		Participation Status	Worst-Case Shadow Flicker - Annual	Worst-Case Shadow Flicker Days - Annual	Worst-Case Shadow Flicker Hours - Daily	Expected Shadow Flicker Hours - Annual
	X (Easting)	Y (Northing)		(HH:MM/year)	(Days/year)	(HH:MM/day)	(HH:MM/year)
366	508610.68	4873584.75	Non-Participating	0:00	0	0:00	0:00
367	508645.50	4873585.73	Non-Participating	0:00	0	0:00	0:00
368	506061.93	4874108.69	Non-Participating	0:00	0	0:00	0:00
369	500547.66	4876700.33	Non-Participating	0:00	0	0:00	0:00
370	506051.62	4871490.73	Non-Participating	72:54	213	0:45	25:17
371	499003.18	4875289.99	Non-Participating	0:00	0	0:00	0:00
372	493163.47	4862892.03	Non-Participating	0:00	0	0:00	0:00
373	495733.86	4877787.86	Non-Participating	0:00	0	0:00	0:00
374	488331.26	4876045.64	Participating	0:00	0	0:00	0:00
375	495703.45	4874365.14	Participating	23:45	66	0:42	7:39
376	493010.79	4877410.17	Participating	28:25	100	0:30	7:00
377	491814.47	4869464.04	Participating	0:00	0	0:00	0:00
378	505131.50	4874516.31	Non-Participating	10:13	61	0:18	2:42
379	493828.30	4866305.38	Non-Participating	0:00	0	0:00	0:00
380	494525.65	4872748.24	Non-Participating	0:00	0	0:00	0:00
381	507887.22	4870232.34	Participating	54:40	148	0:38	20:54
382	501220.91	4863779.36	Non-Participating	0:00	0	0:00	0:00
383	502811.08	4875791.86	Non-Participating	0:00	0	0:00	0:00
384	500691.52	4871972.10	Non-Participating	51:16	167	0:31	16:40
385	509717.05	4872284.24	Non-Participating	0:00	0	0:00	0:00
386	496555.95	4874246.61	Participating	2:28	18	0:12	0:51
387	492199.55	4873593.52	Participating	0:00	0	0:00	0:00
388	497898.95	4862420.50	Non-Participating	0:00	0	0:00	0:00
389	502722.77	4875265.62	Non-Participating	0:00	0	0:00	0:00
390	499511.63	4876710.19	Non-Participating	0:00	0	0:00	0:00
391	489397.15	4874448.48	Participating	0:00	0	0:00	0:00
392	495560.39	4869683.96	Non-Participating	30:55	106	0:27	9:14
393	494677.85	4874842.56	Participating	86:57	163	0:50	33:34
394	495476.72	4865142.67	Non-Participating	4:42	28	0:15	1:42
395	505419.99	4874473.85	Non-Participating	2:52	22	0:12	0:45
396	506061.42	4865852.28	Non-Participating	0:00	0	0:00	0:00
397	506082.39	4865857.89	Non-Participating	0:00	0	0:00	0:00
398	509057.18	4869533.17	Non-Participating	0:00	0	0:00	0:00
399	489683.66	4871204.50	Non-Participating	0:00	0	0:00	0:00
400	497395.94	4863196.86	Non-Participating	0:00	0	0:00	0:00
401	509081.25	4866514.23	Non-Participating	0:00	0	0:00	0:00
402	496393.62	4861524.14	Non-Participating	0:00	0	0:00	0:00
403	493409.85	4872818.20	Non-Participating	0:00	0	0:00	0:00
404	504438.28	4868964.58	Participating	61:06	141	0:40	23:51
405	500749.57	4876674.35	Non-Participating	0:00	0	0:00	0:00
406	499586.30	4876513.64	Non-Participating	0:00	0	0:00	0:00
407	501133.29	4869524.33	Non-Participating	40:32	158	0:35	13:30
408	488226.20	4877367.74	Non-Participating	0:00	0	0:00	0:00
409	491716.82	4878333.38	Non-Participating	0:00	0	0:00	0:00
410	495595.08	4861914.80	Non-Participating	0:00	0	0:00	0:00
411	495437.61	4866427.58	Participating	15:36	80	0:23	5:08
412	491558.71	4870331.03	Non-Participating	0:00	0	0:00	0:00
413	494862.10	4876074.35	Non-Participating	1:08	15	0:07	0:25
414	492089.64	4871150.41	Participating	0:00	0	0:00	0:00
415	495468.48	4864632.88	Non-Participating	0:10	10	0:01	0:03
416	493766.86	4871238.86	Non-Participating	0:00	0	0:00	0:00
417	509722.75	4871708.96	Non-Participating	0:00	0	0:00	0:00
418	501064.43	4868684.20	Non-Participating	11:30	39	0:27	4:01
419	502505.60	4875781.28	Non-Participating	0:00	0	0:00	0:00
420	497293.09	4874334.76	Non-Participating	0:00	0	0:00	0:00
421	497274.63	4874334.92	Non-Participating	0:00	0	0:00	0:00
422	497256.16	4874334.77	Non-Participating	0:00	0	0:00	0:00
423	497237.89	4874334.67	Non-Participating	0:00	0	0:00	0:00
424	497219.31	4874334.59	Non-Participating	0:00	0	0:00	0:00
425	497200.95	4874334.85	Non-Participating	0:00	0	0:00	0:00
426	497278.72	4874353.53	Non-Participating	0:00	0	0:00	0:00
427	497257.81	4874352.60	Non-Participating	0:00	0	0:00	0:00
428	497236.58	4874352.64	Non-Participating	0:00	0	0:00	0:00
429	497221.47	4874352.52	Non-Participating	0:00	0	0:00	0:00
430	497200.99	4874369.50	Non-Participating	0:00	0	0:00	0:00
431	497219.57	4874369.71	Non-Participating	0:00	0	0:00	0:00
432	497237.79	4874369.57	Non-Participating	0:00	0	0:00	0:00
433	497256.20	4874369.63	Non-Participating	0:00	0	0:00	0:00
434	497274.63	4874369.66	Non-Participating	0:00	0	0:00	0:00
435	497293.00	4874369.73	Non-Participating	0:00	0	0:00	0:00
436	500886.20	4876660.66	Non-Participating	0:00	0	0:00	0:00
437	499668.60	4875349.36	Non-Participating	0:00	0	0:00	0:00
438	500770.03	4876675.90	Non-Participating	0:00	0	0:00	0:00

Table B-1: Shadow Flicker Modeling Results

Receptor ID	Coordinates NAD83 UTM Zone 15N (meters)		Participation Status	Worst-Case Shadow Flicker - Annual	Worst-Case Shadow Flicker Days - Annual	Worst-Case Shadow Flicker Hours - Daily	Expected Shadow Flicker Hours - Annual
	X (Easting)	Y (Northing)		(HH:MM/year)	(Days/year)	(HH:MM/day)	(HH:MM/year)
439	506995.22	4872765.17	Non-Participating	3:27	30	0:11	0:50
440	499639.21	4874370.00	Non-Participating	66:36	103	0:52	18:37
441	490945.40	4879140.93	Non-Participating	0:00	0	0:00	0:00
442	495598.94	4875650.06	Participating	2:12	19	0:10	0:40
443	492906.37	4875984.85	Participating	40:30	147	0:30	13:32
444	509479.19	4869914.41	Non-Participating	0:00	0	0:00	0:00
445	501290.11	4862407.81	Non-Participating	0:00	0	0:00	0:00
446	488509.35	4879213.50	Non-Participating	0:00	0	0:00	0:00
447	506635.17	4867819.96	Non-Participating	0:00	0	0:00	0:00
448	506437.32	4875179.84	Non-Participating	0:00	0	0:00	0:00
449	500652.58	4876684.25	Non-Participating	0:00	0	0:00	0:00
450	499654.24	4863571.20	Non-Participating	0:00	0	0:00	0:00
451	507535.22	4871149.63	Non-Participating	34:16	81	0:39	9:09
452	500451.92	4876714.42	Non-Participating	0:00	0	0:00	0:00
453	508143.08	4871003.16	Non-Participating	51:41	149	0:36	14:13
454	500843.70	4876652.47	Non-Participating	0:00	0	0:00	0:00
455	508917.86	4873581.47	Non-Participating	0:00	0	0:00	0:00
456	501209.40	4869298.05	Participating	37:43	95	0:39	13:02
457	502417.67	4875910.23	Non-Participating	0:00	0	0:00	0:00
458	497283.92	4872250.10	Non-Participating	26:05	103	0:30	9:14
459	500981.00	4876708.76	Non-Participating	0:00	0	0:00	0:00
460	496395.27	4863671.46	Non-Participating	0:00	0	0:00	0:00
461	494020.79	4868808.31	Non-Participating	0:00	0	0:00	0:00
462	490427.86	4873183.64	Non-Participating	0:00	0	0:00	0:00
463	490497.29	4879284.50	Non-Participating	0:00	0	0:00	0:00
464	491468.31	4871037.31	Non-Participating	0:00	0	0:00	0:00
465	490452.59	4873194.31	Non-Participating	0:00	0	0:00	0:00
466	495562.49	4870203.57	Participating	26:32	86	0:31	9:38
467	491620.99	4872745.10	Non-Participating	0:00	0	0:00	0:00
468	500723.37	4876670.77	Non-Participating	0:00	0	0:00	0:00
469	507857.09	4872987.73	Participating	0:00	0	0:00	0:00
470	498631.77	4875978.22	Non-Participating	0:00	0	0:00	0:00
471	499698.91	4871923.64	Participating	57:58	176	0:38	17:54
472	504468.79	4869548.16	Participating	124:07	268	1:14	38:39
473	502756.22	4863425.02	Non-Participating	0:00	0	0:00	0:00
474	490837.88	4875989.18	Non-Participating	27:24	137	0:22	9:45
475	492326.49	4874457.09	Participating	10:55	45	0:22	4:06
476	490247.04	4876072.83	Non-Participating	5:52	44	0:13	2:04
477	496021.63	4868651.59	Participating	45:24	114	0:43	16:49
478	489719.66	4878734.68	Non-Participating	0:00	0	0:00	0:00
479	491912.40	4874442.94	Participating	9:08	64	0:13	3:21
480	492335.56	4877666.68	Non-Participating	0:00	0	0:00	0:00
481	494755.62	4867301.87	Non-Participating	0:00	0	0:00	0:00
482	488311.29	4878360.36	Non-Participating	0:00	0	0:00	0:00
483	502759.90	4866445.66	Non-Participating	0:00	0	0:00	0:00
484	500348.72	4876733.11	Non-Participating	0:00	0	0:00	0:00
485	505318.66	4874468.86	Non-Participating	3:34	26	0:13	0:55
486	501125.52	4866792.07	Non-Participating	0:00	0	0:00	0:00
487	508605.03	4873649.14	Participating	0:00	0	0:00	0:00
488	499202.59	4863171.88	Non-Participating	0:00	0	0:00	0:00
489	495135.78	4868817.65	Non-Participating	5:37	27	0:18	1:55
490	494741.77	4874889.79	Participating	94:27	180	0:58	35:48
491	492757.62	4877748.96	Non-Participating	0:00	0	0:00	0:00
492	490731.38	4870543.18	Non-Participating	0:00	0	0:00	0:00
493	490349.33	4873858.84	Non-Participating	0:00	0	0:00	0:00
494	499637.54	4876318.99	Non-Participating	0:00	0	0:00	0:00
495	496785.28	4877588.42	Non-Participating	0:00	0	0:00	0:00
496	500627.99	4876689.66	Non-Participating	0:00	0	0:00	0:00
497	508252.48	4868033.65	Non-Participating	0:00	0	0:00	0:00
498	509725.01	4867937.72	Non-Participating	0:00	0	0:00	0:00
499	505981.82	4864375.37	Non-Participating	0:00	0	0:00	0:00
500	499436.27	4878799.75	Non-Participating	0:00	0	0:00	0:00
501	506077.00	4874303.87	Non-Participating	0:00	0	0:00	0:00
502	496744.15	4869518.04	Non-Participating	47:01	155	0:32	16:42
503	490319.60	4876916.87	Non-Participating	5:27	38	0:15	1:48
504	489803.92	4873069.39	Non-Participating	0:00	0	0:00	0:00
505	492302.79	4874377.83	Participating	12:29	54	0:21	4:45
506	495306.29	4865922.44	Non-Participating	12:45	76	0:20	4:24
507	505185.78	4874513.54	Non-Participating	8:27	54	0:16	2:15
508	499597.88	4876172.38	Non-Participating	0:00	0	0:00	0:00
509	501365.76	4862090.52	Non-Participating	0:00	0	0:00	0:00
510	504360.97	4869658.55	Participating	155:07	271	1:08	45:35
511	497691.90	4869423.21	Non-Participating	43:21	127	0:36	14:32

Table B-1: Shadow Flicker Modeling Results

Receptor ID	Coordinates NAD83 UTM Zone 15N (meters)		Participation Status	Worst-Case Shadow Flicker - Annual	Worst-Case Shadow Flicker Days - Annual	Worst-Case Shadow Flicker Hours - Daily	Expected Shadow Flicker Hours - Annual
	X (Easting)	Y (Northing)		(HH:MM/year)	(Days/year)	(HH:MM/day)	(HH:MM/year)
512	497142.14	4873103.16	Participating	96:05	141	1:13	36:19
513	496060.29	4874587.30	Participating	11:54	63	0:24	3:51
514	495126.58	4870677.51	Non-Participating	14:13	89	0:19	5:10
515	492250.67	4877501.38	Participating	0:00	0	0:00	0:00
516	490521.74	4868389.31	Non-Participating	0:00	0	0:00	0:00
517	492281.45	4872422.94	Participating	0:00	0	0:00	0:00
518	500409.09	4876727.57	Non-Participating	0:00	0	0:00	0:00
519	503747.13	4874987.28	Participating	0:00	0	0:00	0:00
520	506985.27	4871798.35	Non-Participating	3:24	22	0:14	1:10
521	496705.42	4877845.55	Non-Participating	0:00	0	0:00	0:00
522	500389.56	4876729.01	Non-Participating	0:00	0	0:00	0:00
523	505048.39	4874549.97	Non-Participating	14:17	89	0:18	3:42
524	504946.69	4872040.72	Participating	139:23	181	1:18	40:32
525	489918.96	4870356.26	Non-Participating	0:00	0	0:00	0:00
526	494169.21	4873281.87	Participating	0:00	0	0:00	0:00
527	505573.00	4874186.08	Non-Participating	2:04	18	0:11	0:38
528	499366.96	4863166.72	Non-Participating	0:00	0	0:00	0:00
529	499616.32	4874178.09	Participating	62:07	84	0:57	20:15
530	509643.87	4871308.65	Non-Participating	0:00	0	0:00	0:00
531	499067.37	4872230.94	Participating	22:58	81	0:31	8:48
532	489306.45	4874282.73	Participating	0:00	0	0:00	0:00
533	496489.80	4869537.38	Participating	30:00	132	0:24	9:51
534	505164.50	4872318.94	Participating	20:02	99	0:21	5:40
535	494634.19	4870301.00	Non-Participating	2:03	18	0:10	0:41
536	499492.38	4869310.44	Non-Participating	44:13	158	0:34	17:02
537	504630.53	4874072.92	Non-Participating	28:57	95	0:31	8:33
538	504552.69	4874040.29	Non-Participating	35:00	101	0:34	10:23
539	504556.13	4874084.02	Non-Participating	34:44	108	0:33	9:52
540	504547.30	4874140.68	Non-Participating	37:27	126	0:33	10:06
541	502725.31	4874382.87	Participating	61:32	113	0:42	17:09
542	501527.90	4872857.67	Participating	101:24	243	0:44	32:23
543	504972.65	4872837.46	Non-Participating	15:09	83	0:18	5:37
544	504438.06	4874785.50	Non-Participating	14:27	44	0:24	3:18
545	504203.57	4872854.80	Participating	57:35	169	0:39	19:37
546	504139.68	4874436.98	Participating	44:41	91	0:45	10:47
547	504646.40	4874483.32	Non-Participating	20:56	92	0:23	5:18
548	503999.63	4872857.70	Participating	79:40	181	0:50	23:10
549	504935.78	4872740.79	Non-Participating	14:35	67	0:19	3:57
550	491361.28	4865072.21	Non-Participating	0:00	0	0:00	0:00
551	491649.13	4864075.81	Non-Participating	0:00	0	0:00	0:00
552	491087.39	4863167.93	Non-Participating	0:00	0	0:00	0:00
553	491823.21	4863310.08	Non-Participating	0:00	0	0:00	0:00
554	492097.62	4863009.42	Non-Participating	0:00	0	0:00	0:00

APPENDIX I – Telecommunications Study/Electromagnetic Interference Analysis

Dodge County Wind, MN
Electromagnetic Interference Analysis

Dodge County Wind LLC

The following document was prepared by NextEra Analytics, an indirect wholly-owned subsidiary of NextEra Energy Resources, LLC (NEER) for the use of Dodge County Wind, LLC, as an indirect wholly-owned subsidiary of NEER. NextEra Analytics has prepared this report based on available government information by the Federal Communications Commission (FCC) and internal analysis methods. We cannot guarantee the accuracy of the data collected by the FCC. Microwave tower and link information may be inaccurate or incomplete due to FCC applicant error.

Executive Summary

NextEra Analytics, an affiliate of Dodge County Wind LLC (Dodge County) assessed the potential for interference of licensed communication links in close proximity to the proposed Dodge County Wind Project area for the purposes of determining exclusion zones to aid the design of a proposed wind energy generation project. This report summarizes the microwave links and towers along with local cellular towers, media towers (AM and FM), television, and aviation towers, identified within and near the assessment area.

A review of the Federal Communications Commission (FCC) national database and the Universal Licensing System was conducted to identify these possible constraints. Wind turbine offset distances were taken in consideration for the design of the wind turbine array.

Electromagnetic analysis results show that interference is not expected to impact nearby microwave, AM, FM, cellular, TV, and aviation towers based on the array design.

The analysis is current as of July 21, 2021. NextEra Analytics recommends a refresh of this analysis if the proposed wind energy generation project has not been constructed after two years.

This report only provides analysis for licensed radio towers and links found within the FCC database. Many local municipalities (police, fire, etc.) do not license microwave links, NextEra Analytics recommends that Dodge County LLC coordinate with the appropriate local municipality officials. Also not included within the database are microwave towers and links utilized by the Federal government (Dept. of Defense, Dept. of Commerce, etc.), again for public safety concerns. A letter stating “No Harmful Interference Anticipated (NHIA)” has been received from the National Telecommunications and Information Agency (NTIA).

Dodge County Wind, MN – Electromagnetic Interference

NextEra Analytics, an affiliate of Dodge County Wind LLC (Dodge County) assessed the potential for interference of licensed communication links in close proximity to the proposed Dodge County Wind Project area for the purposes of determining exclusion zones to aid the design of a proposed wind energy generation project. This report summarizes the microwave links and towers along with local cellular towers, media towers (AM and FM), television, and aviation towers, identified within and near the assessment area.

A review of the FCC national database and the Universal Licensing System was conducted to identify these possible constraints. Wind turbine offset distances were taken into consideration for the design of the wind turbine array.

The site is located in Dodge and Steele County, Minnesota, roughly 28 kilometers west of the city of Rochester, Minnesota. Figure 1 below, depicts the project location of Dodge County Wind.

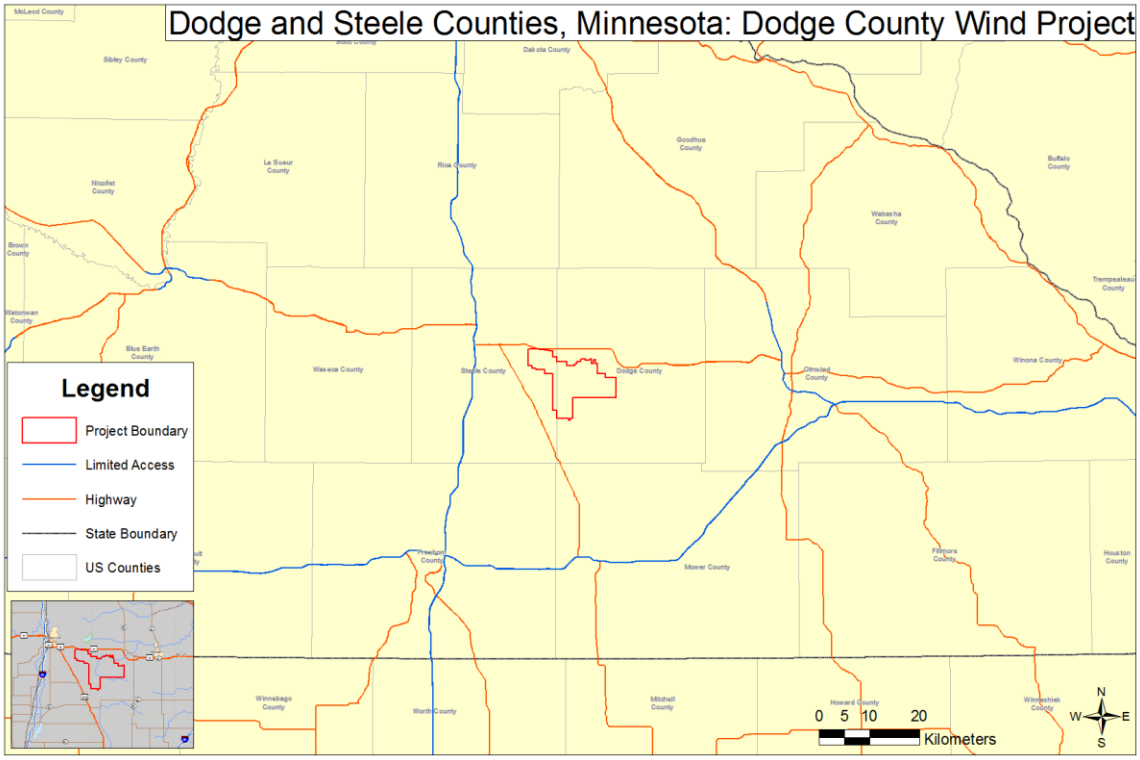

Figure 1: Dodge County Wind Project Location

Turbine Technology

Dodge County Wind is a proposed wind energy generation site that consists of 79 turbine locations. The layout is composed of 60 GE3.40-140-98 turbines (3.40MW rated capacity; 140m rotor diameter, or RD; 98m hub height, or HH), 8 GE3.40-140-81 turbines (3.40MW rated capacity; 140m RD; 81m HH), and 11 GE2.52-116-90 turbines (2.52MW rated capacity; 116.5m RD; 90m HH) for a total capacity of 258.92MW. Turbine layout details are included in Table 1 and Figure 2.

Turbine Technology	GE3.40-140-98 / GE3.40-140-81 / GE2.52-116-90
Turbine Count	60 / 8 / 11
Hub Height (m)	98 / 81 / 90
Rotor Diameter (m)	140 / 140 / 116.5
Turbine Rated Power (MW)	3.40 / 3.40 / 2.52
Total Capacity (MW)	258.92

Table 1: Dodge County Layout Summary

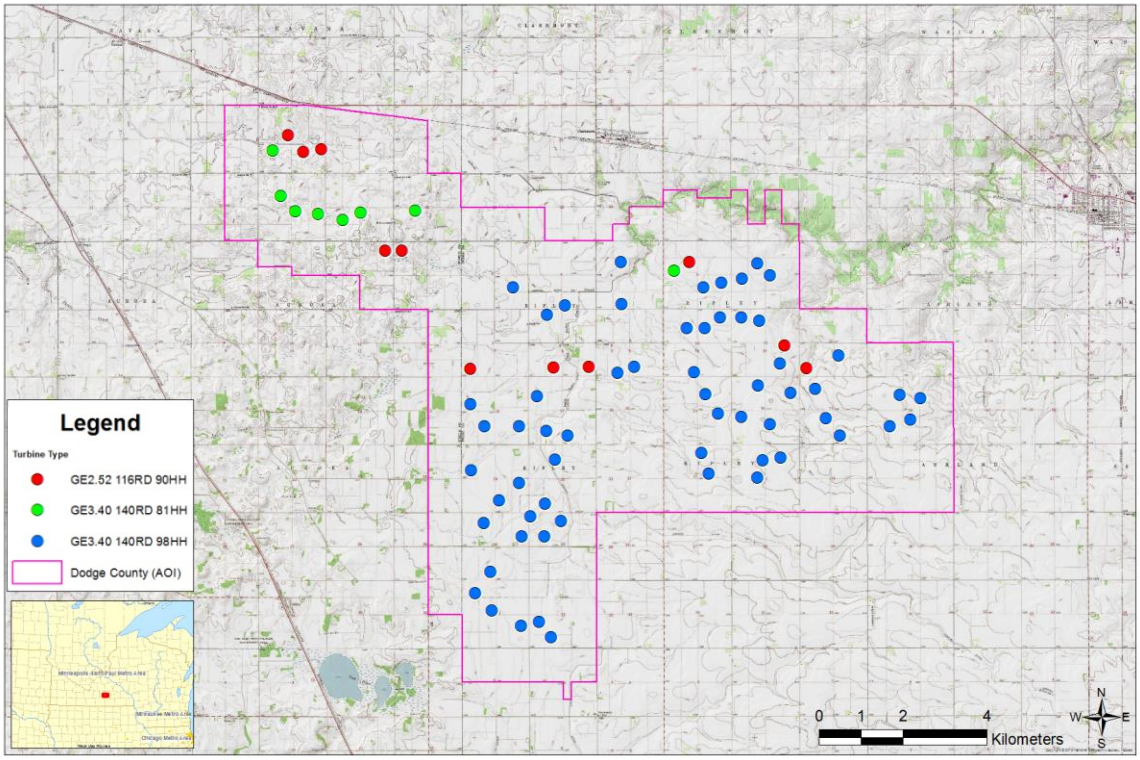

Figure 2: Dodge County Wind Turbine Technology Allocation

It should be noted that the technology of some of the turbines in this layout may be changed prior to construction. In that event, provided that the rotor diameter of the turbine in question does not increase and the location of the turbine is not

shifted, the conclusions outlined in this report regarding the telecommunications impact from Dodge County will not materially change. Any modifications to turbine capacity and hub height will also not change the telecommunications impact of the wind farm.

Data Sources

Within the United States, the location of industrial and commercial telecommunication systems, including microwave links, are collected and maintained by the Wireless Telecommunications Bureau (WTB), a division of the FCC. This data is made publicly available through the ULS database, which contains licensing information on both current and permit pending facilities for microwave, cellular, media, and several radio services utilized by private industry (non-Federal telecommunication systems). License information supplied within the ULS database is updated daily, and is dependent upon information provided by each individual applicant.

NextEra Analytics used several data sources (ESRI satellite imagery, Google Earth, etc.) of high resolution imagery to aid in assessing the accuracy of the geographic locations of each microwave tower with links intersecting the project boundary or area of interest (AOI).

Methodology

The ULS database, described earlier, was used to identify the microwave towers, microwave links, cellular, AM, FM, and aviation towers within a 25-kilometer radius that may impact the Dodge County Wind Farm. Television towers were identified within a 100-kilometer radius. The database provides detailed information for each radio tower and link, which was used to calculate turbine exclusion zones to ensure interference compliance.

Exclusion zones for wind turbines near microwave links are calculated using a theory proposed by Bacon (2002), which identifies the radius of the 2nd Fresnel zone, a theoretical sphere representative of a propagating radio wave, as an appropriate offset distance. Calculations of the 2nd Fresnel zone can be determined by:

$$2nd\ Fresnel\ zone\ Radius = \sqrt{\frac{2\lambda d_1 d_2}{d_1 + d_2}} \qquad (1)$$

Where:
d_1, d_2 = distances from each end of the radio path.
λ = wavelength of the corresponding radio frequency.

To account for precision errors within the ULS database, and to further reduce the potential for interference from a wind turbine, a Worst Case Fresnel Zone (WCFZ) was calculated for each microwave link. The WCFZ provides the maximum offset distance required, and is determined by the 2nd Fresnel zone radius obtained at the midpoint of the link, where $d_1 = d_2$. Adjusting Eq. 1 to calculate the WCFZ in meters yields the following:

$$WCFZ = 17.32\sqrt{\frac{nD}{4(F)}} \quad (2)$$

Where:
D = distance between the transmitter and receiver towers.
F = frequency in GHz.
n = Fresnel zone, which for the 2nd Fresnel Zone n = 2.

The calculated radius distance from Eq. 2 provides a three-dimensional turbine exclusion zone around each microwave link that can be used to guide wind turbine array design.

In addition to the WCFZ calculated for each microwave link, NextEra Analytics applies an offset of one-half RD plus 10 meter to account for turbine blade overhang. A turbine overhang offset using a 140 m turbine technology is included within this analysis to represent the GE3.40-140 wind turbine generator, which is the generator with the largest rotor diameter at the site, and is thus the turbine technology that would potentially cause the greatest interference.

The WTB cannot provide quality assurance for every license within the ULS database, so accuracy of the data relies on applicant certifications, and, in extreme cases, license audits. It has been NextEra Analytics' experience that most inaccuracies occur with regard to the location of the radio towers, where approximation or lack of precision of the geographic coordinates can result in a difference in the position of the tower by as much as 500 meters.

To fully account for these location errors, NextEra Analytics recommends on-site verification to identify the exact location of the transmitter and receiver towers. However, for this analysis, NextEra Analytics used high-resolution satellite imagery to identify possible tower location errors. Most microwave, media, and cellular towers extend well over 80m above ground level, and can be clearly viewed within high resolution satellite imagery. Each tower that may impact the project boundary was investigated for potential location error. Adjustments to the location of the microwave, media, and cellular towers are only made if clear evidence from the satellite imagery shows an inaccuracy.

Microwave Links and Microwave Towers

No microwave towers were identified within the Project area. However, fourteen microwave links have been identified near the project area and seven have been found to intersect the AOI. The WCFZ for all of these links has been calculated, and the appropriate turbine offset has been used to minimize any harmful impact from the proposed turbine layout.

Figure 3 below illustrates the position of each microwave link with respect to the project boundary and turbine locations.

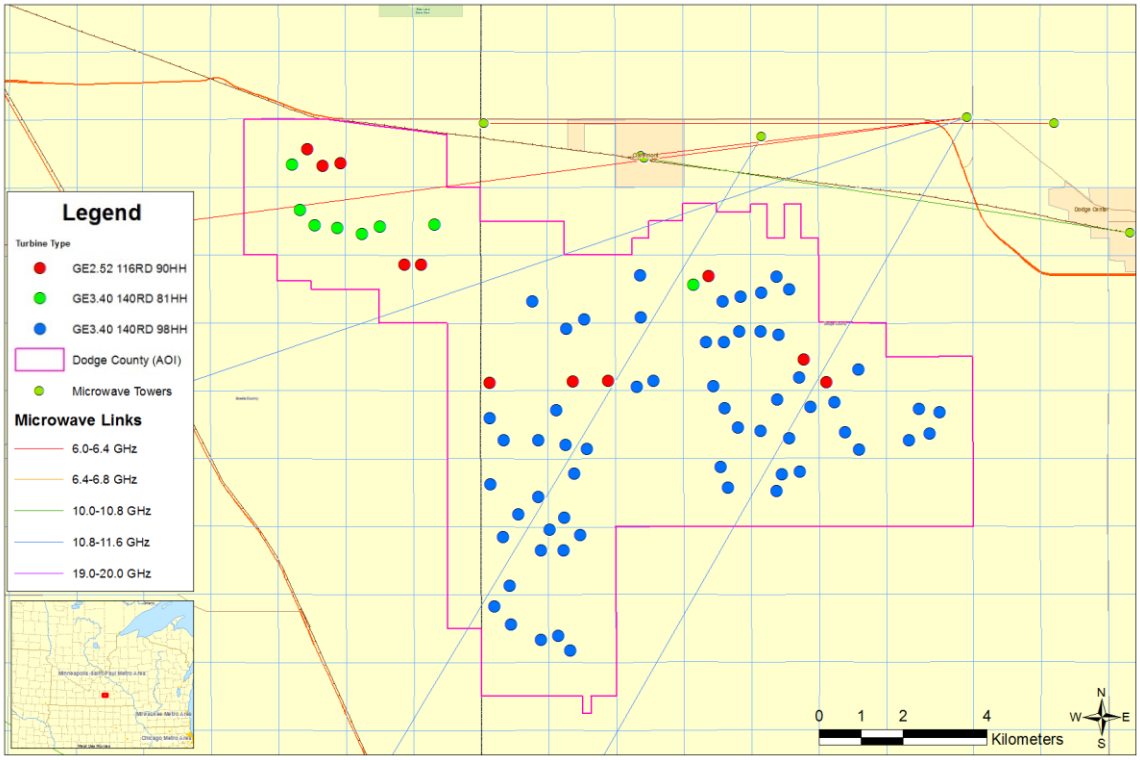

Figure 3: Dodge County Wind with Microwave Links

Table 2 provides more detailed information on each microwave link in proximity to the area with the calculated WCFZ.

ID	STATUS	TRANSMITTER CALLSIGN	MICROWAVE NAME	BAND FREQ (GHz)	WCFZ (m)	BEAM LENGTH (km)
1	Active	WQJE209	Minnesota, State of	6.6	27.20	32.74
2	Active	WQJY578	Minnesota, State of	6.3	27.82	32.74
3	Active	WQPN825	Cellco Partnership	6	18.40	13.59
4	Active	WQPN827	Cellco Partnership	6.3	18.03	13.59
5	Active	WQQD451	Radio Link Internet	10.8	17.18	21.16
6	Active	WQQD451	Radio Link Internet	10.8	18.14	23.77
7	Active	WQQD513	Radio Link Internet	11.2	20.63	31.92
8	Active	WQQD513	Radio Link Internet	11.3	17.74	23.77
9	Active	WQQD513	Radio Link Internet	19.6	7.74	7.84
10	Active	WQWJ905	T-MOBILE LICENSE LLC	11	15.44	17.50
11	Active	WQWJ906	T-MOBILE LICENSE LLC	11.5	15.11	17.50
12	Active	WQZP635	Radio Link Internet	6	13.99	7.84
13	Pending	WRAU529	Minnesota WiFi	11.6	12.33	11.72
14	Active	WRFS598	Minnesota Wifi	10.8	12.78	11.72

Table 2: Detailed Information on Microwave Links in Proximity with the Project Boundary

There are a number of links that are within relatively close proximity to turbines. The Worst Case Fresnel Zone was calculated for each microwave link and a conservative offset of 80 meters was used to reduce the probability of harmful interference. Figures 4-7 provide aerial imagery of the turbine layout relative to the Fresnel zones and their offsets that intersect the project boundary.

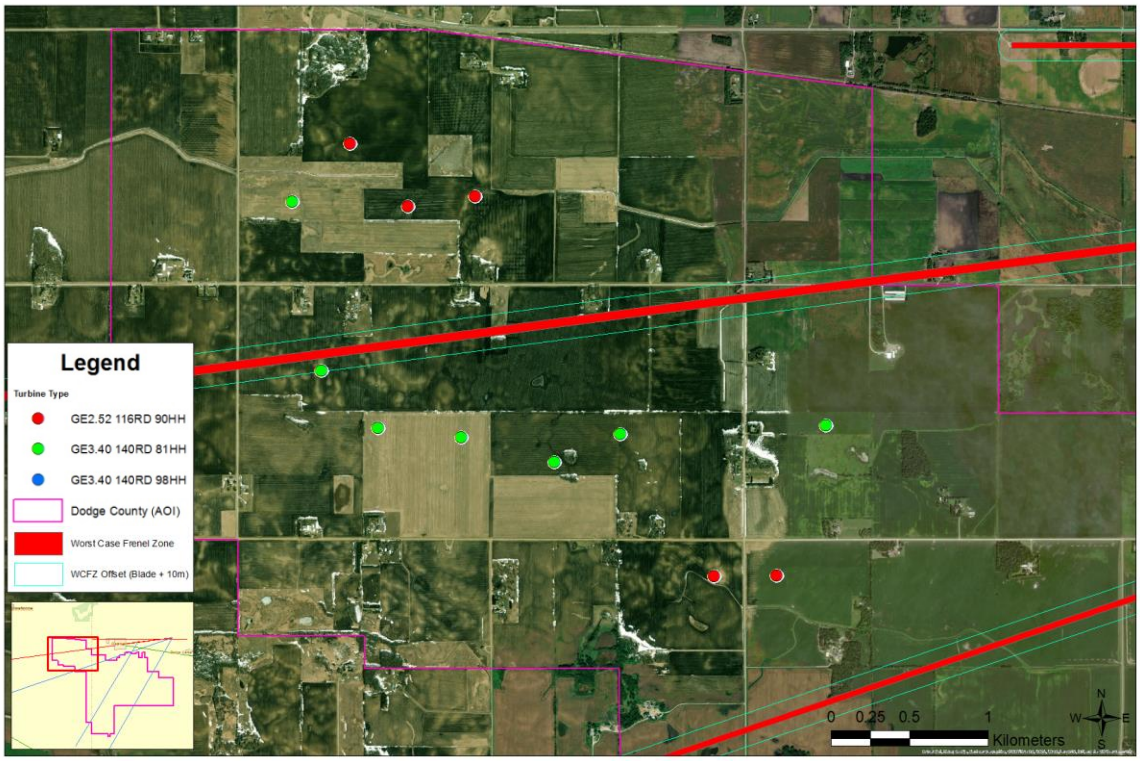

Figure 4: Dodge County Wind Fresnel Zone Northwest

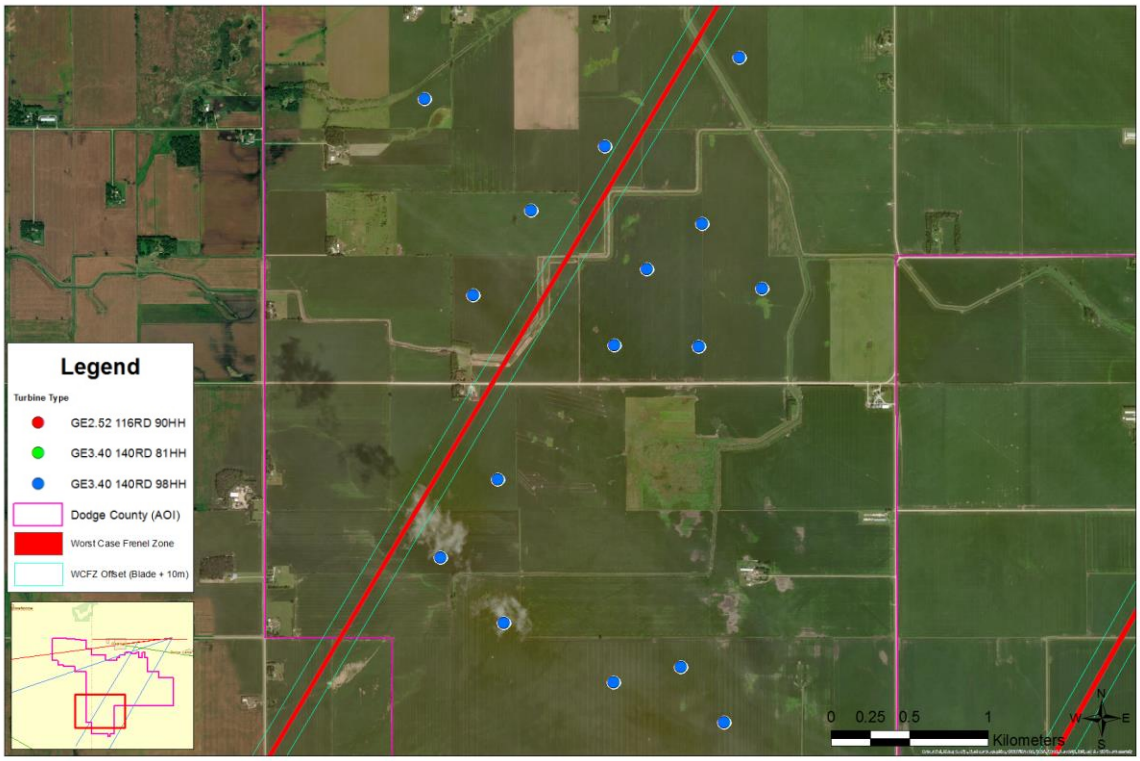

Figure 5: Dodge County Wind Fresnel Zone South

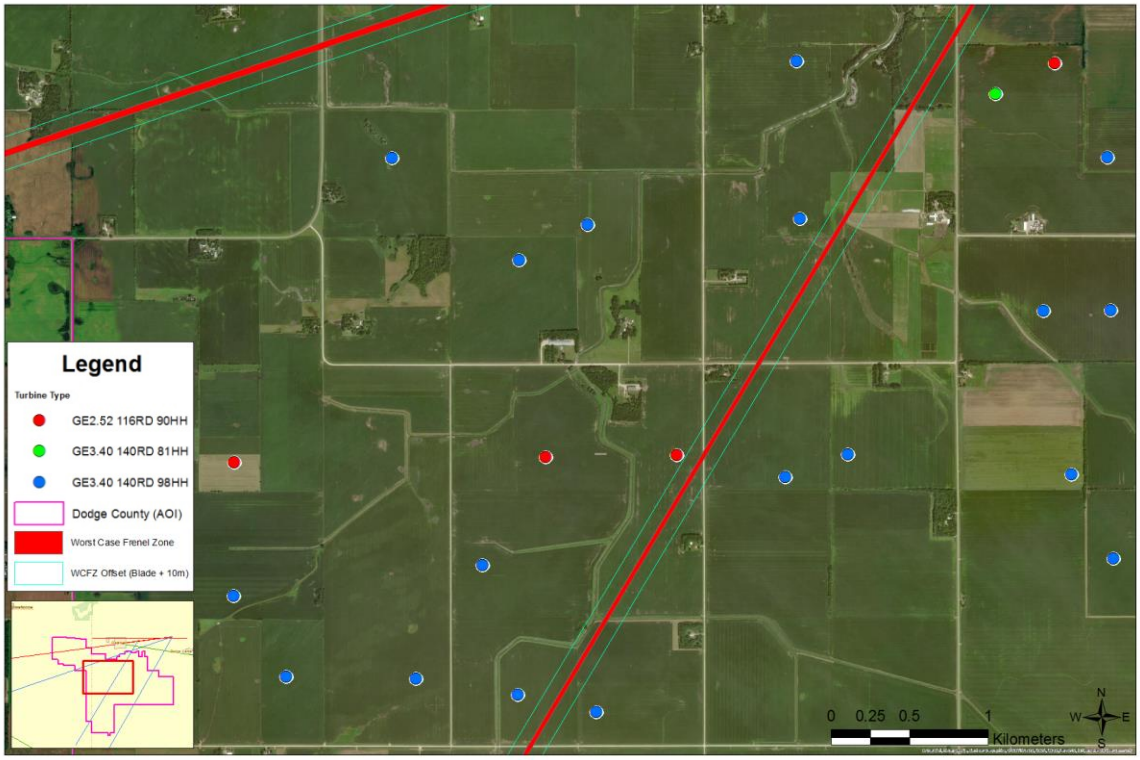

Figure 6: Dodge County Wind Fresnel Zone North

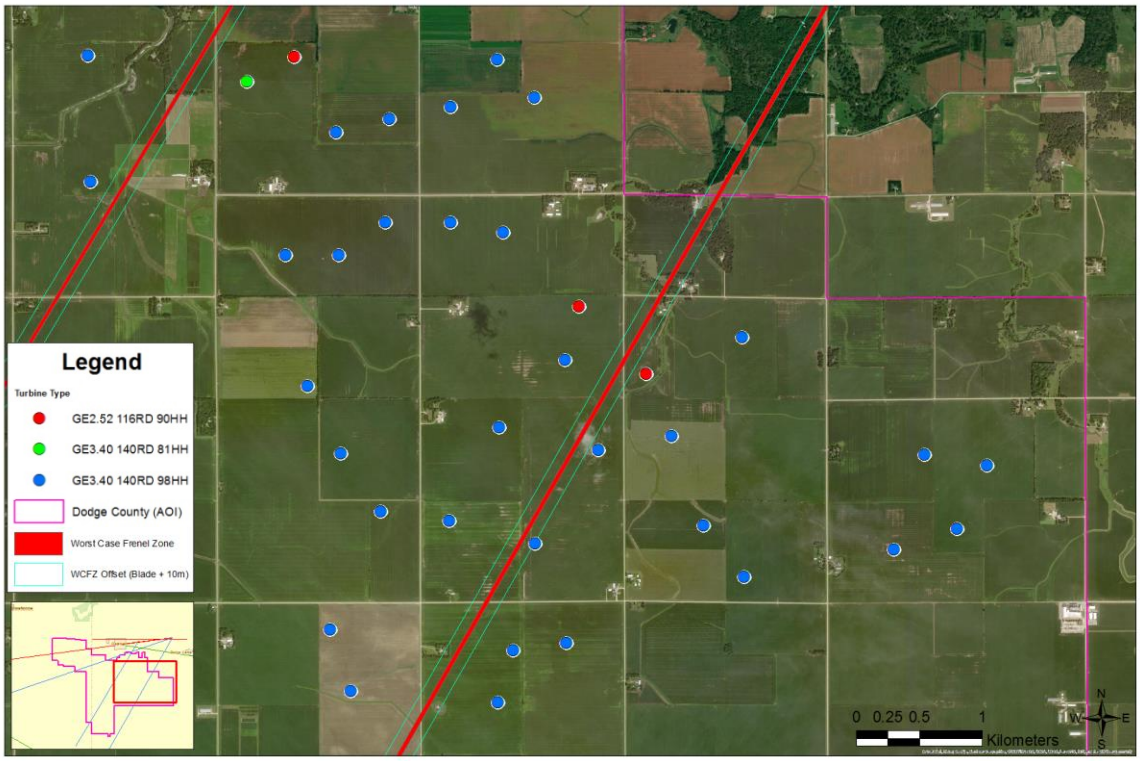

Figure 7: Dodge County Wind Fresnel Zone East

Cellular Towers

No cellular towers were identified within the project boundary. Thirteen cellular towers were discovered within 25 km of the project boundary and are identified in Table 3 and figure 8.

Harmful interference associated with cellular towers is not likely as cellular transitions or packet switching occurs when a cellular link becomes unavailable.

ID	CALLSIGN	LICENSEE	STATUS	LATITUDE	LONGITUDE	DISTANCE TO AOI (km)
1	KNKA667	AT&T Mobility Spectrum LLC	Active	44.02406	-92.59833	24.28
2	KNKA667	AT&T Mobility Spectrum LLC	Active	44.00672	-92.71861	14.52
3	KNKN403	ALLTEL Corporation	Active	43.87508	-93.04958	5.94
4	KNKN403	ALLTEL Corporation	Active	44.09361	-93.25389	11.96
5	KNKN403	ALLTEL Corporation	Active	44.11167	-93.18278	8.51
6	KNKN416	ALLTEL Corporation	Active	44.09556	-92.79833	13.26
7	KNKN416	ALLTEL Corporation	Active	44.25556	-92.98167	23.74
8	KNKN416	ALLTEL Corporation	Active	43.88539	-92.81933	10.91
9	KNKN572	AT&T Mobility Spectrum LLC	Active	43.91286	-93.07444	2.90
10	KNKN572	AT&T Mobility Spectrum LLC	Active	44.06072	-93.16472	4.00
11	KNLH690	Cellco Partnership	Active	44.08283	-93.22025	9.01
12	WPSJ612	ALLTEL Corporation	Active	44.00694	-92.71942	14.46
13	WPSJ612	ALLTEL Corporation	Active	44.05111	-92.87639	5.85

Table 3: Cellular Towers within 25 km of the Project Boundary

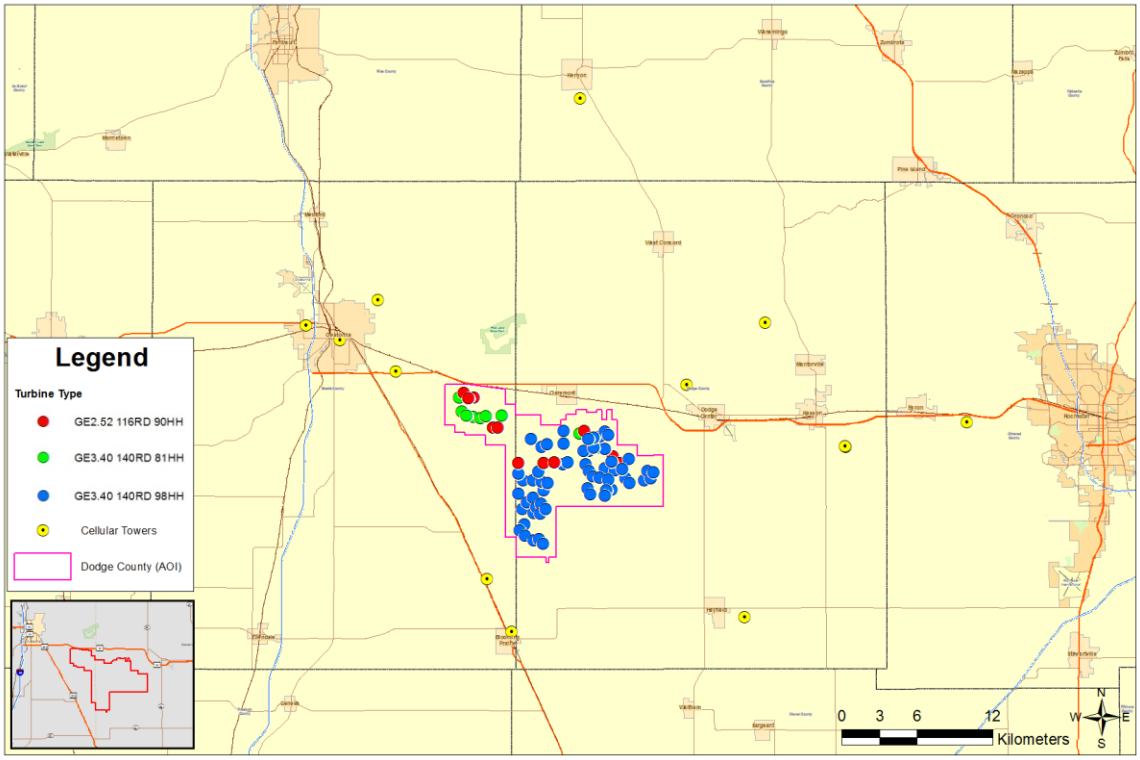

Figure 8: Cellular Towers within 25 km of the Project Boundary

Media Towers

No active AM radio towers were identified within the project boundary. Three AM towers were discovered within 25 km of the project boundary and are included in Table 4 and figure 9.

While no harmful interference to the AM towers is expected, reception of AM radio stations near each individual turbine may be impacted, especially for areas on the edge of AM radio coverage. The exclusion distance from AM towers is 1 wavelength from non-directional antennas and 10 wavelengths or 3 kilometers from directional antennas (Marlowe, 2015). Given most AM radio receptors will be nearby dwellings, which should have a sufficient offset from each turbine, any interruption to reception from the installation of wind turbines is expected to be minimal. The closest AM tower, KRFO, is located 5.7 km from the project boundary, and has a broadcasting frequency of 1390 kHz, which corresponds to a wavelength of 216 m. Thus, the proposed layout is greater than 10 wavelengths away from the closest station.

ID	CALLSIGN	LICENSEE	FREQUENCY (kHz)	LATITUDE	LONGITUDE	DISTANCE TO AOI (km)
1	KFOW	MAIN STREET BROADCASTING, INC.	1170	44.04472	-93.38556	21.57
2	KQAQ	REAL PRESENCE RADIO	970	43.70750	-92.94583	24.73
3	KRFO	TOWNSQUARE MEDIA FARIBAULT LICENSE, LLC	1390	44.07389	-93.18000	5.66

Table 4: AM Transmitter Towers within 25 km of the Project Boundary

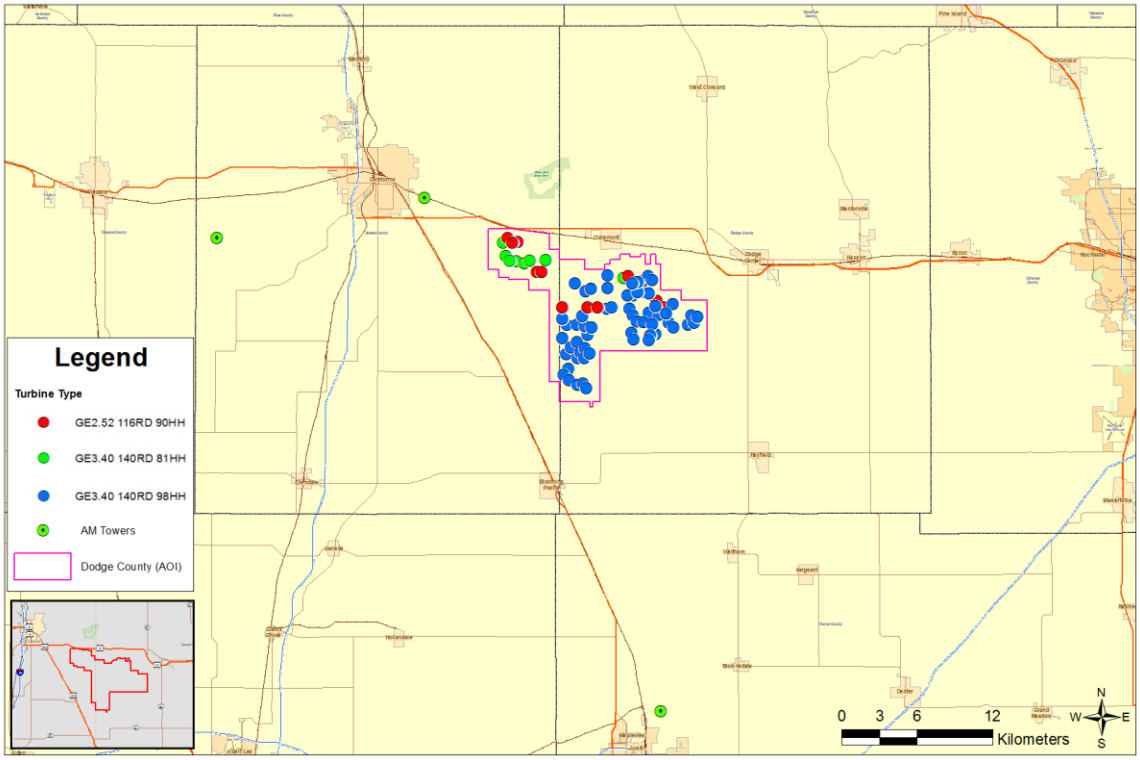

Figure 9: AM Transmitter Towers within 25 km of the Project Boundary

No active FM radio towers were identified within the project boundary. Thirteen FM towers were discovered within 25 km of the project boundary and are included in Table 5 and figure 10.

While no harmful interference to the FM towers is expected, reception of FM radio stations near each individual turbine may be impacted, especially for areas

on the edge of FM radio coverage. The recommended exclusion distance for FM towers is approximately 4 kilometers. FM stations that are closer than 4 kilometers to wind turbines have the potential to experience interference (Marlowe, 2015). Given most FM radio receptors will be nearby dwellings, which should have a sufficient offset from each turbine, any interruption to reception from the installation of wind turbines is expected to be minimal. One FM tower is located less than 4 km from the AOI, KCJL-LP, which is the most vulnerable tower to experience interference. The nearest wind turbine is located 3.97 km away from this tower.

ID	CALLSIGN	LICENSEE	FREQUENCY (MHz)	LATITUDE	LONGITUDE	DISTANCE TO AOI (km)
1	KRUE	MAIN STREET BROADCASTING, INC.	92.1	44.04556	-93.38389	21.44
2	K228DR	OWATONNA AREA CHRISTIAN RADIO, INC.	93.5	44.08983	-93.22464	9.65
3	K232FY	REAL PRESENCE RADIO	94.3	43.78806	-92.90806	17.36
4	K234DB	TOWNSQUARE MEDIA FARIBAULT LICENSE, LLC	94.7	44.07389	-93.18000	5.66
5	KCJL-LP	ONE DAY CHURCH PROJECT, INC.	95.1	43.99250	-92.86000	3.17
6	KWWK	TOWNSQUARE MEDIA ROCHESTER LICENSE, LLC	96.5	44.03306	-92.60278	24.05
7	K255AN	MINN-IOWA CHRISTIAN BROADCASTING, INC.	98.9	43.88708	-92.84894	9.53
8	KOWZ	BLOOMING PRAIRIE FARM RADIO INC.	100.9	44.04556	-93.38389	21.44
9	KRCH	IHM LICENSES, LLC	101.7	44.11639	-92.68944	21.14
10	K280EC	MINNESOTA PUBLIC RADIO	103.9	44.08861	-93.14028	4.51
11	KRFO-FM	TOWNSQUARE MEDIA FARIBAULT LICENSE, LLC	104.9	44.07389	-93.18000	5.66
12	K289AE	MINNESOTA PUBLIC RADIO	105.7	44.08861	-93.14028	4.51
13	K292GU	MAIN STREET BROADCASTING, INC.	106.3	44.04556	-93.38389	21.44

Table 5: FM Transmitter Towers within 25 km of the Project Boundary

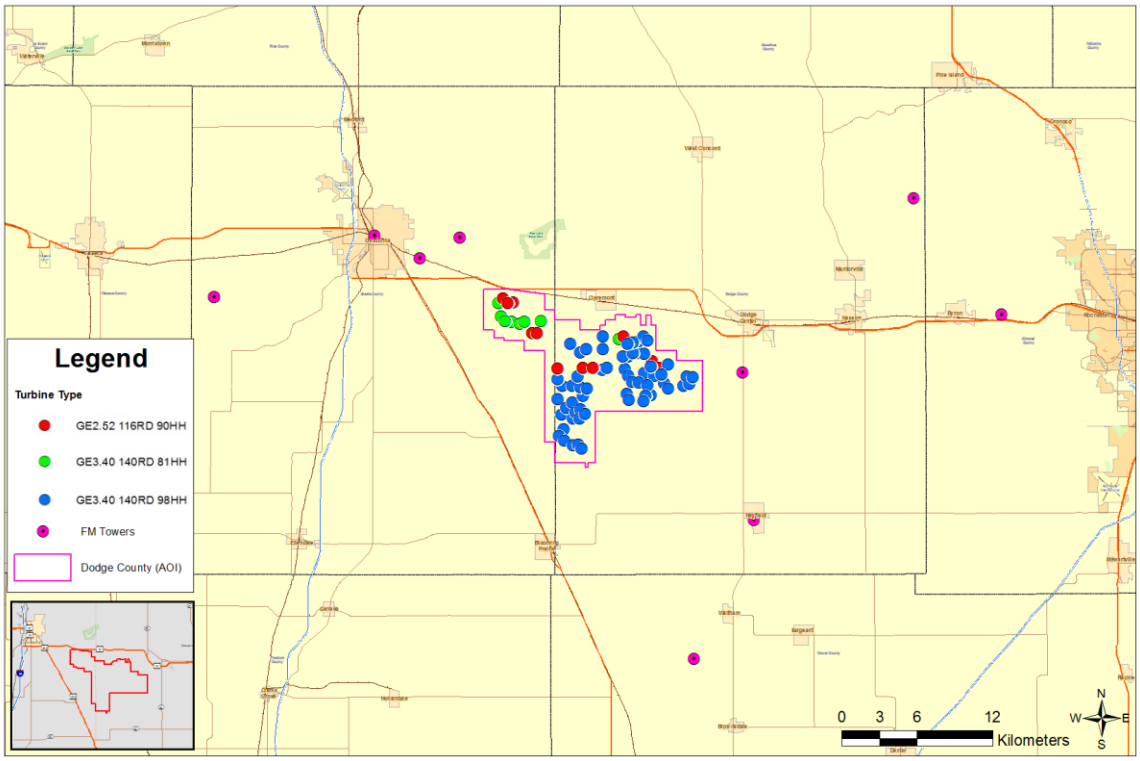

Figure 10: FM Transmitter Towers within 25 km of the Project Boundary

Television Stations

No digital or analog television stations were identified within the project boundary. Table 6 and figure 11 identifies television stations with approved or pending licenses within 100 km of the project boundary as determined by the FCC. There are 31 stations less than 50 km from the project boundary which are likely to be broadcasting to the region.

ID	CALLSIGN	LICENSEE	SERVICE	CHANNEL	ERP (kW)	LATITUDE	LONGITUDE	DISTANCE TO AOI (km)
1	W22FD-D	EDGE SPECTRUM, INC.	LPD	22	15	43.88806	-92.85783	9.15
2	K21NU-D	EDGE SPECTRUM, INC.	LPD	21	5	44.04553	-93.38408	21.46
3	K48KJ-D	EDGE SPECTRUM, INC.	LPD	48	4.92	44.04553	-93.38408	21.46
4	K14PU-D	LANDOVER 2 LLC	LPD	14	1	43.65964	-93.08675	30
5	K19KB-D	LANDOVER 2 LLC	LPD	19	1	43.65964	-93.08675	30
6	K34MP-D	LANDOVER 2 LLC	LPD	34	1	43.65964	-93.08675	30
7	K47OF-D	LANDOVER 2 LLC	LPD	47	1	43.65964	-93.08675	30
8	K43OH-D	LANDOVER 2 LLC	LPD	43	1	43.80403	-92.58022	31.24
9	K45MO-D	LANDOVER 2 LLC	LPD	45	1	43.80403	-92.58022	31.24
10	K27OW-D	DIGITAL NETWORKS-MIDWEST, LLC	LPT	27	5.62	43.67256	-92.83031	31.63
11	K48KJ-D	THREE ANGELS BROADCASTING NETWORK, INC.	LD	48	1.5	43.82532	-93.43253	32.98
12	DK43DH	TELEVIEW SYSTEMS OF MINNESOTA	TX	43	1.47	43.63832	-93.14712	33.24
13	DK53DI	TELEVIEW SYSTEMS OF MINNESOTA	TX	53	1.47	43.63832	-93.14712	33.24
14	DK55FJ	TELEVIEW SYSTEMS OF MINNESOTA	TX	55	1.47	43.63832	-93.14712	33.24
15	DK57EU	TELEVIEW SYSTEMS OF MINNESOTA	TX	57	1.47	43.63832	-93.14712	33.24
16	DK61EU	TELEVIEW SYSTEMS OF MINNESOTA	TX	61	1.47	43.63832	-93.14712	33.24
17	K35PC-D	HC2 STATION GROUP, INC.	LPD	35	15	43.97028	-92.41833	38.58
18	K31LN-D	EDGE SPECTRUM, INC.	LPD	31	4	43.98614	-92.41767	38.64
19	K52HH	MS COMMUNICATIONS, LLC	TX	52	0.004	43.97112	-92.41520	38.84
20	K30NI-D	LANDOVER 2 LLC	LPD	30	1	43.69033	-93.41778	39.95
21	K32LB-D	LANDOVER 2 LLC	LPD	32	1	43.69033	-93.41778	39.95
22	K38OU-D	LANDOVER 2 LLC	LPD	38	1	43.69033	-93.41778	39.95
23	K44LT-D	LANDOVER 2 LLC	LPD	44	1	43.69033	-93.41778	39.95
24	K41MP-D	SPECTRUM EVOLUTION, INC.	LPD	41	1	43.91744	-92.40433	40.07
25	K40JT	DIGITAL NETWORKS-MIDWEST, LLC	LPX	40	10.7	43.62778	-93.36389	42.09
26	K25NK-D	THREE ANGELS BROADCASTING NETWORK, INC.	LPD	25	15	44.04111	-92.34056	45.02
27	K56HW	TRINITY BROADCASTING NETWORK	TX	56	75	44.04222	-92.34080	45.02
28	K58GC	THREE ANGELS BROADCASTING NETWORK, INC.	TX	58	29	44.04222	-92.34079	45.02
29	KAAL	KAAL-TV, LLC	DTV	36	620	43.64278	-92.52667	46.67
30	KSMQ-TV	KSMQ PUBLIC SERVICE MEDIA, INC.	DTV	20	319.2	43.64278	-92.52667	46.67
31	KXLT-TV	SAGAMOREHILL OF MINNESOTA LICENSES, LLC	DTV	26	108	43.64278	-92.52667	46.67
32	KIMT	ROCHESTER TV LICENSE COMPANY, LLC	DTV	24	472	43.47556	-92.70833	55.6
33	KYIN	IOWA PUBLIC BROADCASTING BOARD	DTV	18	533	43.47556	-92.70833	55.6
34	KTTC	KTTC LICENSE, LLC	DTV	10	43.1	43.57083	-92.42722	57.95
35	K22LG-D	LANDOVER 2 LLC	LPD	22	1	43.65253	-93.74222	63.89
36	K26MG-D	LANDOVER 2 LLC	LPD	26	1	43.65253	-93.74222	63.89
37	K28MU-D	LANDOVER 2 LLC	LPD	28	1	43.65253	-93.74222	63.89
38	K50NB-D	LANDOVER 2 LLC	LPD	50	1	43.65253	-93.74222	63.89
39	KILW-LD	DTV AMERICA CORPORATION	LD	28	6	44.69528	-93.01830	71.7
40	KMQV-LD	DTV AMERICA CORPORATION	LD	49	6	44.69528	-93.01810	71.7
41	KWJM-LD	DTV AMERICA CORPORATION	LD	15	6	44.69528	-93.01830	71.7
42	K19IT-D	SPECTRUM EVOLUTION, INC.	LPD	19	1	43.93217	-91.96233	75.27
43	K27KL-D	SPECTRUM EVOLUTION, INC.	LPD	27	1	43.93217	-91.96233	75.27
44	K29JH-D	SPECTRUM EVOLUTION, INC.	LPD	29	1	43.93217	-91.96233	75.27
45	K31KX-D	SPECTRUM EVOLUTION, INC.	LPD	31	1	43.93217	-91.96233	75.27
46	K40NI-D	LANDOVER 2 LLC	LPD	40	1	43.93217	-91.96233	75.27
47	K40JS-D	BLUE EARTH-NICOLLET FARIBAULT COOPERATIVE ELECTRIC ASSOCIATION	LD	40	3	43.58582	-93.92960	80.71
48	K49JG-D	BLUE EARTH-NICOLLET FARIBAULT COOPERATIVE ELECTRIC ASSOCIATION	LD	49	3	43.58582	-93.92960	80.71
49	K51KB-D	SOUTH CENTRAL ELECTRIC ASSOCIATION	LD	51	3	43.58582	-93.92965	80.71
50	K14KD-D	SOUTH CENTRAL ELECTRIC ASSOCIATION	LPD	14	3	43.58583	-93.92972	80.72
51	K16MA-D	BLUE EARTH-NICOLLET FARIBAULT COOPERATIVE ELECTRIC ASSOCIATION	LPT	16	3	43.58583	-93.92972	80.72
52	K17MX-D	COOPERATIVE TELEVISION ASSOCIATION OF SOUTHERN MINNESOTA	LPD	17	3	43.58583	-93.92972	80.72
53	K19LJ-D	BLUE EARTH-NICOLLET FARIBAULT COOPERATIVE ELECTRIC ASSOCIATION	LPT	19	3	43.58583	-93.92972	80.72
54	K21KF-D	COOPERATIVE TELEVISION ASSOCIATION OF SOUTHERN MINNESOTA	LPD	21	3	43.58583	-93.92972	80.72
55	K23FY-D	COOPERATIVE TELEVISION ASSOCIATION OF SOUTHERN MINNESOTA	LPT	23	3	43.58583	-93.92972	80.72
56	K27FI-D	SOUTH CENTRAL ELECTRIC ASSOCIATION	LPT	27	3	43.58583	-93.92972	80.72
57	K29IF-D	BLUE EARTH-NICOLLET FARIBAULT COOPERATIVE ELECTRIC ASSOCIATION	LPD	29	3.1	43.58583	-93.92972	80.72
58	K31EF-D	SOUTH CENTRAL ELECTRIC ASSOCIATION	LPT	31	3	43.58583	-93.92972	80.72
59	K34NV-D	SOUTH CENTRAL ELECTRIC ASSOCIATION	LPT	34	3	43.58583	-93.92972	80.72
60	K35IU-D	SOUTH CENTRAL ELECTRIC ASSOCIATION	LPT	35	3	43.58583	-93.92972	80.72
61	K47MI-D	COOPERATIVE TELEVISION ASSOCIATION OF SOUTHERN MINNESOTA	LD	47	3	43.58583	-93.92970	80.72
62	K45MN-D	LANDOVER 2 LLC	LPD	45	1	43.65856	-94.17675	94.36
63	K25QC-D	EDGE SPECTRUM, INC.	LPD	25	7.5	44.05150	-94.29997	94.82
64	K43JE-D	EDGE SPECTRUM, INC.	LPD	43	10.82	44.05150	-94.29997	94.82
65	W19EN-D	STATE OF WISCONSIN - EDUCATIONAL COMMUNICATIONS BOARD	LPT	19	6	44.90278	-92.69111	98.72
66	W47CO-D	STATE OF WISCONSIN - EDUCATIONAL COMMUNICATIONS BOARD	LD	47	1.6	44.90282	-92.69131	98.72
67	K22LJ-D	EDGE SPECTRUM, INC.	LPD	22	5	43.06664	-93.36525	99.14
68	K27MI-D	EDGE SPECTRUM, INC.	LPD	27	3	43.06664	-93.36525	99.14
69	K35PA-D	EDGE SPECTRUM, INC.	LPD	35	15	43.06664	-93.36525	99.14

Table 6: Television Stations within 100 km of the Project Boundary

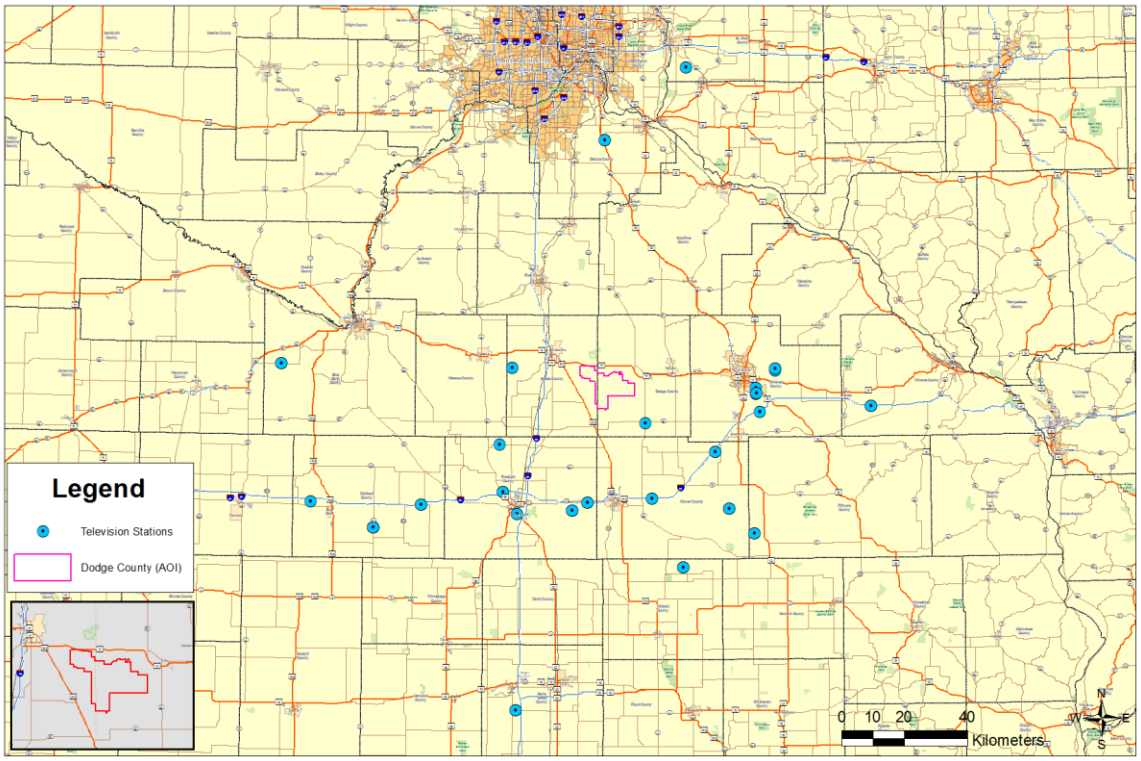

Figure 11: Television Stations within 100 km of the Project Boundary

While the impact of wind turbines on digital television reception is not well known due to limited cases and testing, any interference is expected to be limited to areas near the edge of station reception, areas near a turbine that is within the line-of-sight between the transmit tower and receptor, and areas of complex topography (OfCom, 2009). Most of the stations within 100km are low power stations or translator stations and have limited range and are not anticipated to experience reception degradation. There are six full power stations, KXLT-TV, KSMQ-TV, KAAL, KIMT, KYIN, and KTTC, which have a possibility of experiencing reception degradation if the proposed wind farm is located in the line-of-sight.

It is important to note that this assessment is based on broad assumptions, as it is difficult to accurately pinpoint the impact a large wind farm may have on each individual household due to a large number of external variables (topography, weather, antennae, etc.) which affect the propagation of the television radio signal.

Aviation Towers

No active Aviation towers were identified within the project boundary. Seven aviation towers were discovered within 25 km of the project boundary and are included in Table 7 and figure 12.

While no harmful interference is expected for the aviation towers; Dodge County Wind is subject to a Federal Aviation Agency (FAA) to determine any exclusion zones. Proposed turbine locations will maintain the standard appropriate offset distances in addition to any setbacks set by the agency to minimize harmful impact.

ID	STATUS	CALLSIGN	LICENSEE	SERVICE	LATITUDE	LONGITUDE	DISTANCE TO AOI (km)
1	Active	WGE2	MINNESOTA, STATE OF	AF Aeronautical and Fixed	44.02025	-92.82964	5.99
2	Active	WJZ8	MINNESOTA, STATE OF	AF Aeronautical and Fixed	44.12139	-93.25028	13.22
3	Active	WQSR490	Minnesota, State of MNDOT Aeronautics	AR Aviation Radionavigation	44.12975	-93.27192	15.17
4	Active	WRLA2017	MINNESOTA, STATE OF	AR Aviation Radionavigation	44.07389	-93.12194	2.49
5	Active	WRLB2051	MINNESOTA, STATE OF	AR Aviation Radionavigation	44.07389	-93.15556	3.99
6	Active	WRLG2026	MINNESOTA, STATE OF	AR Aviation Radionavigation	44.11969	-93.25578	13.47
7	Active	WRLL2041	MINNESOTA, STATE OF	AR Aviation Radionavigation	44.12914	-93.27272	15.18

Table 7: Aviation Towers within 25 km of the Project Boundary

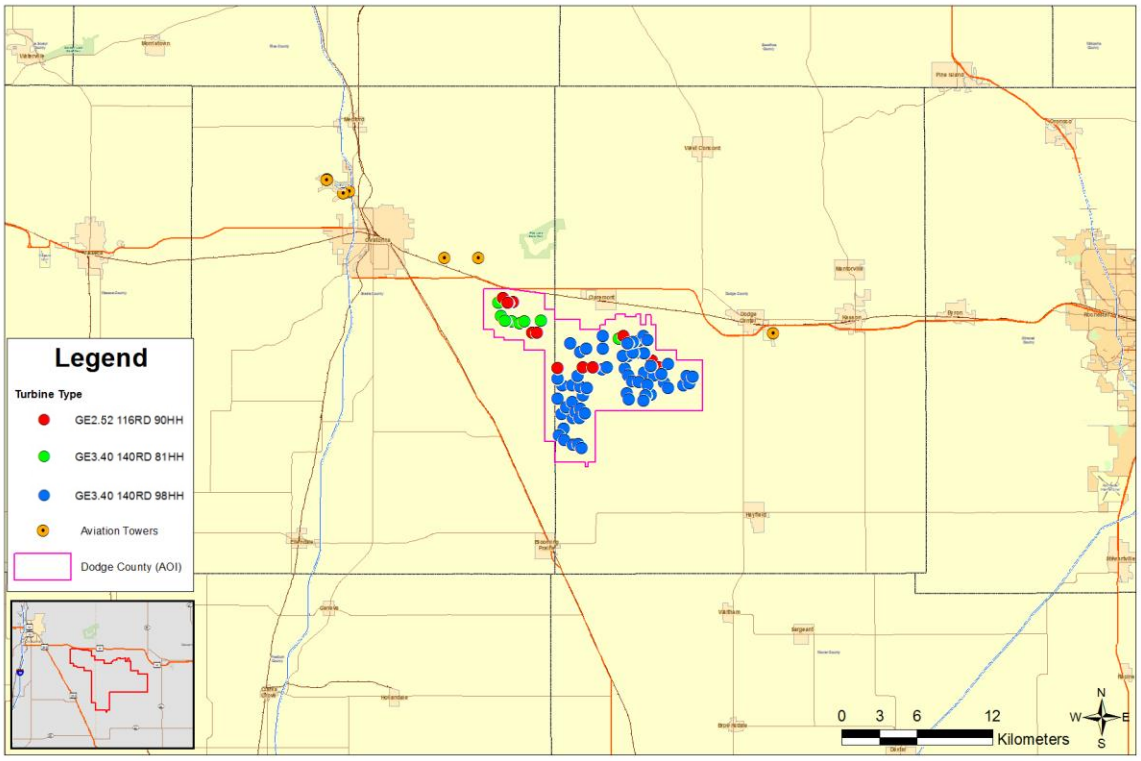

Figure 12: Aviation Towers within 25 km of the Project Boundary

Conclusion and Recommendations

NextEra Analytics analyzed the potential for wind turbine interference on licensed microwave links located within the proposed Dodge County Wind Project energy generation site. This report summarizes the microwave towers, microwave links, cellular towers, media towers, television towers, and aviation towers within and near the project boundary.

Seven microwave links were found to intersect the project boundary, and an appropriate offset to the WCFZ has been utilized to mitigate harmful interference from the proposed turbine layout. No interference from the proposed turbine layout is expected near microwave, AM, FM, cellular, aviation, and TV towers. This analysis is current as of July 21, 2021. NextEra Analytics recommends a refresh of this analysis if the proposed wind energy generation project has not been constructed after two years.

It is important to note that this report only provides analysis for licensed radio towers and links found within the FCC-ULS database. Many local municipalities (police, fire, etc.) do not license microwave links, NextEra Analytics recommends Dodge County Wind LLC coordinate with the appropriate local municipality officials. Also not included within the database are microwave towers and links utilized by the Federal government (Dept. of Defense, Dept. of Commerce, etc.), again for public safety concerns. A Federal communications study by the National Telecommunications and Information Agency (NTIA) has been conducted stating no harmful interference is expected in the project area.

References

Bacon, David F.,"A proposed method for establishing an exclusion zone around a terrestrial fixed radio link outside of which a wind turbine will cause negligible degradation of the radio link performance." http://www.ofcom.org.uk/radiocomms/ifi/licensing/classes/fixed/Windfarms/windfarmdavidbacon.pdf,Version 1.1,Oct 2002.

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Marlowe, Frank. "The Importance of Electromagnetic-impact Analyses for Wind Permitting." *Windpower Engineering & Development*. Broadcast Wind, 2015. Web. 19 July 2017.

APPENDIX J – Phase I Cultural Literature Review

CULTURAL RESOURCES LITERATURE SEARCH

DODGE WIND ENERGY CENTER
DODGE AND STEELE COUNTIES MINNESOTA

Prepared for

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Submitted by Atwell, LLC

Atwell Project No. 16002517

July 28, 2021

EXECUTIVE SUMMARY

Dodge County Wind, LLC, a wholly owned subsidiary of NextEra Energy Resources, LLC, is proposing the construction of the Dodge County Wind Energy Facility (Project), a large wind energy conversion system (LWECS) with a capacity of 258.92 megawatts. The Project would be constructed within an approximately 28,348-acre area (Project Area) in Dodge and Steele Counties, Minnesota (Southeast Riverine West [3w] and Prairie Lake East [2e] archaeological regions). The Project has applied for a Public Utility Commission permit (PUC Docket No. WS-20-866 for an LWECS). This Project does not involve federal funding or permitting and is not subject to federal historic preservation regulations.

Atwell, LLC (Atwell) was contracted to conduct an updated cultural resources literature search of the proposed Project Area to update cultural resources investigations originally conducted for the Project in 2018 and to identify any cultural resources that may have been recorded since that time. This report also incorporates minor changes to the Project Area boundary that have occurred since 2018. The cultural resources literature search is designed to accomplish the following: (1) to aid Dodge County Wind, LLC in complying with the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act, (2) to identify currently known cultural resources and ascertain their recorded potential eligibility for listing in the National Register of Historic Places (NRHP), (3) to aid in project planning and avoid tribal and cultural sensitive areas, and (4) to produce a report documenting the results of the literature search.

Atwell conducted the cultural resources literature search by examining electronic records held by the Minnesota State Historic Preservation Office (MnSHPO) and the Office of the State Archaeologist in May 2020 to identify cultural resource records within the Project Area and a 1-mile buffer of the Project Area. County and township histories, historic maps, county atlases, the Andreas Atlas, county soil surveys, and current and historic aerial photographs were also examined. In total, 78 documented architectural resources were identified in MnSHPO records within the Project Area and 1-mile buffer. The Project has voluntarily avoided direct impacts to all recorded architectural resources within the Project Area and 1-mile buffer. Therefore, no additional architectural investigation is recommended.

In total, 8 archaeological sites have been recorded within the Project Area. Six of these archaeological sites have been determined Not Eligible or recommended as Not Eligible for the NRHP, and two have not yet been evaluated for listing in the NRHP. The Project has voluntarily committed to avoiding direct impacts to all of these archaeological sites.

Three cemeteries were identified within the Project Area. As currently proposed, the Project has implemented a 100-foot avoidance buffer around these cemeteries to avoid direct impacts and

avoid potential violations of Minnesota Statute 307.08, which protects private cemeteries and burial grounds.

While the majority of proposed infrastructure locations have been previously subjected to archaeological survey in 2018, the remainder will be surveyed in 2021. In compliance with the Public Utilities Commission LWECS site permit review requirements, Atwell recommends that currently proposed infrastructure locations that have not been surveyed should be examined by a qualified archaeologist to identify any unrecorded archaeological sites that could possibly be present in these locations.

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1 INTRODUCTION

Dodge County Wind, LLC (DCW), a wholly owned subsidiary of NextEra Energy Resources, LLC, is proposing the construction of the Dodge County Wind Energy Facility (Project), a large wind energy conversion system (LWECS) with a capacity of 258.92 megawatts (MW). The Project would be constructed within an approximately 28,348-acre area (Project Area) in Dodge and Steele Counties, Minnesota (Figure 1). The Project has applied for a Public Utility Commission (PUC) permit (PUC Docket No. WS-20-866 for an LWECS). This Project does not involve federal funding or permitting and is not subject to federal historic preservation regulations.

Atwell, LLC (Atwell) was contracted to conduct an updated cultural resources literature search of the proposed Project Area including all proposed wind turbine locations, access roads, crane walking paths, collector substation, operations and maintenance facility, laydown yard, and an underground electric collection system. This report updates the cultural resources literature search that was originally conducted for the Project in 2018 (Pfennig and Kotwasinski 2018) to identify any cultural resources that may have been recorded since that time. This report also incorporates minor changes to the Project Area boundary that have occurred since the 2018 cultural literature search.

1.1 PROJECT DESCRIPTION AND LOCATION

The Project proposes the construction of 68 General Electric (GE) 3.4 MW wind turbines and 11 GE 2.52 MW wind turbines. A maximum of 79 turbines are proposed for construction. Energy from the turbines will be routed through underground electrical collection systems that will deliver power to the Project collector substation. This power will be stepped up at the Project's collector substation from the collection line to the transmission line. The entire collection system will be buried underground.

The Project Area is located in western Dodge County and eastern Steele County in southeastern Minnesota, immediately southwest of Dodge Center and north of Blooming Prairie, Minnesota. Table 1.1 lists the townships, ranges, and sections in which the Project Area is located.

Table 1.1. Project Area Location

County Name	Township Name	Township	Range	Sections
Steele	Aurora	106N	19W	1–4, 11–13, 24, 25, 36
Steele	Havana	107N	19W	25–28, 33–36
Dodge	Claremont	107N	18W	31–35
Dodge	Ashland	106N	17W	7, 18, 19
Dodge	Ripley	106N	18W	2–24, 29–32
Dodge	Westfield	105N	18W	5, 8

1.2 ENVIRONMENTAL SETTING AND HISTORY

The Project Area is located in portions of the Southeast Riverine West (3w) and Prairie Lake East (2e) archaeological regions. The Southeast Riverine West archaeological region covers most of southeastern Minnesota, including all of Dodge and Olmsted Counties. The Prairie Lake East archaeological region covers most of southwestern and south-central Minnesota and includes portions of Steele County (Hudak et al. 2002). The majority of the Project Area is located in the Southeast Riverine West archaeological region. Archaeological resources are predominantly concentrated along the Mississippi River and its tributaries in this area and expected resource locations would be near water sources on bluff tops and terraces. The landscape is characterized by stream-dissected terrain. No natural lakes are in the region; however, three major river systems extend westward from the Mississippi into the region's interior: the Cannon, the Zumbro, and the Root. The climate is known to be the mildest in the state with a growing season of at least 160 days per year and consistent average rainfall.

1.2.1 Regional Setting

The Environmental Protection Agency (EPA) Ecoregion mapping data (EPA 2015) indicates that the Project Area is located within the Eastern Iowa and Minnesota Drift Plains (EIMDP) Level IV ecoregion of the Western Corn Belt Plains ecoregion Level III (EPA 2015). The EIMDP ecoregion receives approximately 24 to 36 inches of precipitation per year and is characterized by fertile undulating plains with scattered stream systems covered by glacial tills dominated by row crops and some pasture (EPA 2015). The Minnesota Department of Natural Resources (MNDNR) Ecological Classification System further defines the Project Area as the Eastern Broadleaf Forest Province (EBFP), a transition zone between the western prairies and eastern mixed conifer/deciduous forests (MNDNR 2017). The EBFP includes the Minnesota and Northeast Iowa Morainal subsection (222M), characterized by deciduous forest, woodland, and prairie in a hummocky morainal landscape, and the Oak Savanna subsection (222Me) historically covered by bur oak savanna, patches of tallgrass prairie, and maple-basswood forest on gently rolling hills (MNDNR 2017).

The Project Area is situated near the small communities of Dodge Center (approximately 3.5 miles northeast), Claremont (approximately 0.8 miles north), and Blooming Prairie (approximately 4.8 miles south). Small farmsteads are scattered throughout the Project Area, and public roads are generally situated in a grid-like arrangement. Overall, the Project Area is dominated by agricultural cropland and a moderately extensive network of agricultural ditches with intermittent and ephemeral streams, many of which support herbaceous riparian buffers. The general topography of the Project Area has an undulating, rolling relief with elevations between 1,190 and 1,350 feet above mean sea level. The Project Area generally slopes to the east and is

predominantly composed of silty loam soils that were formed in glacial till and eolian deposits (NRCS 2020).

1.2.2 Environmental History

During the Pleistocene Ice Age (60,000 B.P to 17,000 B.P.), southeastern Minnesota was lightly glaciated and had a stream-dissected terrain. From 17,000 B.P. to 15,500 B.P., Dodge County was largely free of ice, but remained unattractive for human habitation largely due to sparse vegetation that allowed few animals to inhabit the region (Hudak et al. 2002). This climate kept human utilization of the region to a minimum. By approximately 14,000 B.P., glaciers had completely melted and left Dodge County generally covered by an open boreal coniferous forest dominated by grasses and scattered conifer trees. As glaciers receded, the ecology of the region became more diversified (Gibbon 2012).

From 8000 B.P. to 3000 B.P. the Project Area primarily consisted of prairie vegetation and animal associations. Typical mammals included buffalo, elk, skunk, badger, jackrabbit, ground squirrel, gopher, and coyote. Scattered forests of oak and hickory were present along stream valleys, around lakes, and on some plateaus and low hills. The most common tree species were oak, sycamore, cottonwood, elm, hackberry, maple, basswood, and beech. Hunter-gatherers entered prairies seasonally to hunt buffalo. Likewise, small groups lived year-round on the prairies (Gibbon 2012).

From 3,000 B.P. to present, deciduous forest encompassed much of the Project Area. Deciduous forest was characterized by broadleaf deciduous trees with a wide variety of animals present. Although white-tailed deer were the primary game animal, bison and badgers inhabited areas of open grassland. The climate of the province was still more moderate, with shorter winters, less snowfall, and longer, hotter summers. Soils were deeper and richer, and drainage systems much more mature than in northern Minnesota (Gibbon 2012).

Numerous small streams and seasonal washes were scattered throughout Dodge County with few lakes dotting the region. When Euro-Americans began to settle the region, a vast majority of the landscape was composed of tall grass prairie with oak and hickory forests along stream valleys. Climate in the Project Area region is among the mildest in the state with an annual precipitation range between 28 and 30 inches (Hudak et al. 2002).

2 RESEARCH DESIGN

2.1 OBJECTIVES

The objectives of the cultural resources literature search are as follows: (1) to aid DCW in complying with the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act, (2) to identify currently known cultural resources and ascertain their recorded potential eligibility for listing in the National Register of Historic Places (NRHP), (3) to aid in project planning and avoid tribal and cultural sensitive areas, and (4) to produce a report documenting the results of the literature search.

2.2 RESEARCH METHODS

The literature search consists of an examination of files from the Minnesota State Historic Preservation Office (MnSHPO) and the Office of the State Archaeologist (OSA). Electronic records were requested from the MnSHPO by Benjamin Banks on May 22, 2020, and were received on May 27, 2020. The OSA records were reviewed electronically utilizing the OSA Portal online mapping database between May 22 and May 28, 2020. The literature search assists in identifying previous cultural resource investigations, previously recorded archaeological sites, the potential for sites within the Project Area, and previously recorded architectural resources.

The recorded NRHP eligibility of resources identified by the literature search are based on the National Register Criteria in 36 CFR Part 60.1, guidelines established by the National Park Service, and historic contexts developed by the MnSHPO. In order to be eligible for NRHP listing, a cultural resource must retain integrity and meet one or more of the following criteria:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of persons significant in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded, or may be likely to yield, information important in prehistory or history.

A cultural resource must possess several characteristics in order to retain sufficient integrity for listing in the NRHP. There are seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. The three aspects of integrity that are specifically relevant to archaeological sites are typically location, materials, and association.

3 LITERATURE SEARCH RESULTS

The literature search included review of records within the Project Area and within a 1-mile buffer surrounding the Project Area. Records reviewed included state archaeological and historic site files available from the OSA and MnSHPO, NRHP data available from the National Park Service, and state historic architecture inventory data available from the MnSHPO. Additionally, county and township histories and historic maps including Bureau of Land Management (BLM) General Land Office (GLO) plat maps (BLM 2020), county atlases (*The Farmer Magazine* 1914a; *The Farmer Magazine* 1914b), the Andreas Atlas (Andreas 1874), county soil surveys, and current and historic aerial photographs were examined. Recorded architectural resources, archaeological sites, and previously conducted cultural resources investigations located within the Project Area and 1-mile buffer are illustrated in Figure 2.

3.1 HISTORICAL ATLAS AND MAP REVIEW

Review of GLO Record Original Survey Maps ranging in dates from 1854 to 1856 (BLM 2020) do not depict potential cultural resources within the Project Area. The *Illustrated Historical Atlas of Minnesota* (Andreas 1874) documents 13 property owners within the Project Area: KG. Ayer, W. Blowers, JK. Bucklin, LT. Dagget and Son, P. Engelking, DG. Fuller, John Ingalls, HC. Syke, D. King, CH. Manchester, P. McCrady, F. Meyers, and Jesse Nunn. The Andreas Atlas depicts residential structures associated with each of the 13 landowners and two schools scattered throughout the Project Area.

Atwell reviewed the 1914 historic atlas for Dodge County (*The Farmer Magazine* 1914a) and Steele County (*The Farmer Magazine* 1914b) and determined that the Project Area was sparsely populated with many residential buildings at that time. Churches and schools were scattered throughout the Project Area. Villages appeared in multiple townships but were small in size, typically less than 80 acres. School district boundaries were outlined in most townships in unsystematic order, as well as defined Rural Free Delivery System routes, which were common for the time. The Chicago and Northwestern Railroad traversed Havana and Claremont Townships from southeast to northwest.

In Claremont Township, the City of Claremont is platted in the center of Section 28 along the Chicago and Northwestern Railroad. In Ripley Township, the Village of Venture appears in the upper northwest corner of Section 35 at the intersection of present-day 140th Avenue and 690th Street. A school (southeast corner of intersection) and a church (northeast corner of intersection) were also depicted at the location of Venture Village. Review of current aerial imagery shows that this area is currently agricultural fields, and structures related to Venture Village do not appear to be extant.

U.S. Geological Survey (USGS) topographic maps ranging in date from 1954 to 1958 (ESRI 2020) indicate the Project Area was sparsely populated with a generally well-established section-line county road network. Residential construction was largely located within 250 feet of roads. Schools and churches were interspersed periodically throughout the Project Area. The Aurora Lutheran Cemetery, Saint John's Lutheran Cemetery, and the Thompson Cemetery are depicted on USGS topographic maps within the Project Area.

3.2 PREVIOUS CULTURAL RESOURCES SURVEYS

Previous cultural resources survey records are available for the Project Area and include nine investigations that have been completed within the Project Area and 1-mile buffer. Previous cultural resources investigations included six reports related to improvements on Trunk Highway (TH) 14, a railroad improvement Project, and a multiple resource area nomination for historic resources of Dodge County. Additionally, Atwell previously conducted a Phase I archaeological survey for the proposed Project in 2018. A report of this investigation (Pfennig and Kotwasinski 2018) documented three newly recorded archaeological sites (21DO0017, 21DO0018, and 21DO0019), which were recommended Not Eligible for listing in the NRHP. The report was provided to the MnSHPO for review and comment on August 8, 2018, and concurrence on the findings was received from MnSHPO on September 12, 2018. Table 3.1 provides more specific information related to the previous surveys conducted within the Project Area and 1-mile buffer.

3.3 ARCHITECTURAL RESOURCES

The OSA records identified 12 architectural resources within the Project Area and an additional 66 architectural resources within the 1-mile buffer, for a total of 78 documented resources (Table 3.2). Within the Project Area, the Pichner Farmstead (ST-HAV-034), the Dunker Farmstead (ST-HAV-035), and the Thompson/Ripka Farmstead (ST-HAV-038) have been officially determined Eligible for listing in the NRHP under Criterion C by the MnSHPO. Bridge 20501 (DO-CLT-053), the Aurora Lutheran Church (ST-HAV-006), a farmstead (ST-HAV-023), the Thompson Cemetery (ST-HAV-036), and the Thompson Farmstead (ST-HAV-037) are also located in the Project Area and have been recommended Not Eligible for listing in the NRHP. Ripley Town Hall (DO-RIP-001) is also located within the Project Area and remains unevaluated for NRHP eligibility. The remaining three resources (ST-HAV-001, ST-HAV-004, and ST-HAV-008) within the Project Area remain unevaluated for NRHP eligibility and do not appear on current aerial imagery, which suggests that they may have been demolished.

Table 3.1. Cultural Resource Surveys Conducted Within the Project Area and 1-Mile Buffer

Report Number	Author	Title	Report Date
DO-81-1H	Frame, Robert M. III	Historic Resources of Dodge County, Multiple Resource Area Nomination	1981
mult-91-10	Harrison, C.	Report on Preliminary Cultural Resource Reconnaissance Survey Along Corridor Proposed for Reconstruction of TH 14, Kasson to TH 218, Owatonna, Dodge and Steele Counties, Minnesota	1991
mult-92-04	Harrison, C.	Report on Cultural Resource Investigations along Corridors Proposed for the Reconstruction of TH 14 between Kasson and TH 218 at Owatonna, Dodge and Steele Counties, Minnesota (Parts 1 & 2)	1992
DO-91-01	Ketz, A.	Phase II Archaeological Testing for the TH 14 Realignment, Dodge Center Creek East Site, Dodge County, Minnesota	1994
DO-08-x1	Florin, F., et.al.	Phase I Archaeological Survey and Phase II Evaluation of Site 21ST19 and 21ST21 for the TH 14 Improvement Project, Owatonna to Dodge Center in Steele and Dodge Counties, Minnesota. Report of Investigation #85	2008
ST-08-x1	Florin, F., and J. Lindbeck	Phase I Archaeological Survey for the TH 14 Improvement Project, Owatonna to Dodge Center in Steele and Dodge Counties, Minnesota. Report of Investigation #81	2008
DO-09-x1	Terrell, Michelle, and Andrea Vermeer	Phase I and II Archaeological Investigations of the Minnesota Rehabilitation Segment	2009
DO-09-x2	Florin, Frank	Phase II Testing at Site 21DO14 for the Bypass Alignment Alternative 3—Claremont Option 4, TH14 Improvement Project, Owatonna to Dodge Center in Steele and Dodge Counties, Minnesota. Report of Investigation #86	2009
	Pfennig, K., and J. Kotwasinski	Phase I Archaeological Survey for the Dodge Wind Energy Center and Transmission Line Dodge, Steele, and Olmstead Counties, Minnesota	2018

Table 3.2. Architectural Resource Records Within the Project Area and 1-Mile Buffer

Architectural Inventory Number	Property Name	County	Project Area	NRHP Eligibility
DO-CLC-002	Church	Dodge	In 1-Mile Buffer	Unevaluated
DO-CLC-003	Claremont School	Dodge	In 1-Mile Buffer	Unevaluated
DO-CLC-004	Commercial Complex	Dodge	In 1-Mile Buffer	Unevaluated
DO-CLC-008	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-009	Rand's Arabians	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-010	Greenway Cooperative Service	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-011	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible

Architectural Inventory Number	Property Name	County	Project Area	NRHP Eligibility
DO-CLC-012	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-013	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-014	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-015	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-016	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-017	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-018	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-019	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-020	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-021	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-022	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-023	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-024	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-025	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-026	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-027	Claremont Water Plant	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-028	Greenway Cooperative Service	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-030	Winona & St. Peter Railroad Claremont Segment	Dodge	In 1-Mile Buffer	Officially Eligible—Criteria A and C
DO-CLC-031	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-032	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-034	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-035	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-036	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-037	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible

Architectural Inventory Number	Property Name	County	Project Area	NRHP Eligibility
DO-CLC-038	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-039	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-040	House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-041	Commercial Building	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLC-042	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-002	Farmstead	Dodge	In 1-Mile Buffer	Unevaluated
DO-CLT-007	Kubat Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-009	Winona & St. Peter Railroad Claremont Segment	Dodge	In 1-Mile Buffer	Officially Eligible—Criteria A and C
DO-CLT-010	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-014	Arendts Farmstead	Dodge	In 1-Mile Buffer	Officially Eligible—Criterion C
DO-CLT-018	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-019	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-022	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-023	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-024	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-031	Lehmann Farmstead	Dodge	In 1-Mile Buffer	Officially Eligible—Criterion C, May have been demolished
DO-CLT-034	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-046	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-048	Claremont Hillside Cemetery	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-049	St. Francis de Sales Cemetery	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-050	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-051	Farmstead	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-052	McMartin House	Dodge	In 1-Mile Buffer	Recommended Not Eligible
DO-CLT-053	Bridge 20501	Dodge	In Project Area	Recommended Not Eligible

Architectural Inventory Number	Property Name	County	Project Area	NRHP Eligibility
DO-RIP-001	Ripley Town Hall	Dodge	In Project Area	Unevaluated
DO-WSF-001	Church	Dodge	In 1-Mile Buffer	Unevaluated
ST-AUR-006	School	Steele	In 1-Mile Buffer	Unevaluated
ST-HAV-001	Stark's Creamery	Steele	In Project Area	Unevaluated, Possibly Demolished
ST-HAV-004	District School No. 68	Steele	In Project Area	Unevaluated, Possibly Demolished
ST-HAV-005	District School No. 26	Steele	In 1-Mile Buffer	Recommended Not Eligible
ST-HAV-006	Aurora Lutheran Church	Steele	In Project Area	Recommended Not Eligible
ST-HAV-008	St. John's Evangelical Lutheran Church	Steele	In Project Area	Unevaluated, Possibly Demolished
ST-HAV-020	Farmstead	Steele	In 1-Mile Buffer	Recommended Not Eligible
ST-HAV-021	Farmstead	Steele	In 1-Mile Buffer	Recommended Not Eligible
ST-HAV-023	Farmstead	Steele	In Project Area	Recommended Not Eligible
ST-HAV-024	Nelson Farmstead	Steele	In 1-Mile Buffer	Officially Eligible—Criterion C
ST-HAV-025	Tollefson Farmstead	Steele	In 1-Mile Buffer	Recommended Not Eligible
ST-HAV-026	Farmstead	Steele	In 1-Mile Buffer	Recommended Not Eligible
ST-HAV-027	Farmstead	Steele	In 1-Mile Buffer	Recommended Not Eligible
ST-HAV-029	Natzel Farmstead	Steele	In 1-Mile Buffer	Recommended Not Eligible
ST-HAV-030	Farmstead	Steele	In 1-Mile Buffer	Recommended Not Eligible
ST-HAV-034	Pichner Farmstead	Steele	In Project Area	Officially Eligible—Criterion C
ST-HAV-035	Dunker Farmstead	Steele	In Project Area	Officially Eligible—Criterion C
ST-HAV-036	Thompson Cemetery	Steele	In Project Area	Recommended Not Eligible
ST-HAV-037	Thompson Farmstead	Steele	In Project Area	Recommended Not Eligible
ST-HAV-038	Thompson/Ripka Farmstead	Steele	In Project Area	Officially Eligible—Criterion C
ST-HAV-050	Farmstead	Steele	In 1-Mile Buffer	Recommended Not Eligible

Approximately half of the 66 architectural resources located within the 1-mile buffer (N=35) are associated with the City of Claremont. Within the 1-mile buffer, the Winona and St. Peter Railroad Claremont Segment (DO-CLC-030 and DO-CLT-009), the Arents Farmstead (DO-CLT-014), the Lehmann Farmstead (DO-CLT-031), and the Nelson Farmstead (ST-HAV_024) have been determined Eligible for listing in the NRHP by the MnSHPO. An additional 25 houses, 22 farmsteads, 4 commercial properties, 2 cemeteries, a water plant, and a school have been recommended Not Eligible for listing in the NRHP at the time of their recording. The remaining 6 resources are unevaluated for NRHP eligibility.

Review of architectural resources under the Minnesota Historic Sites Act would typically only include NRHP, Minnesota State Historic Sites Network (MSHSN), or Minnesota State Register of Historic Places (MSRHP) designated or listed resources. Architectural resources listed on the NRHP, MSHSN, or MSRHP are not present within the Project Area or 1-mile buffer. Architectural resources that have not been designated or listed on the NRHP, MSHSN, or MSRHP (resources that are unevaluated or not eligible) would not require additional architectural evaluation or avoidance by the Project. The closest NRHP, MSHSN, and/or MSRHP listed property is the Blooming Prairie Commercial Historic District (NRHP Reference Number 94000832) in Blooming Prairie, Steele County, which is just over 4.8 miles southeast of the Project Area.

3.4 ARCHAEOLOGICAL RESOURCES

The literature search identified 8 archaeological site records within the Project Area and an additional 11 archaeological sites records within the 1-mile buffer (Table 3.3). Of the 8 sites within the Project Area, 3 have been determined Not Eligible for listing on the NRHP, 3 have been recommended Not Eligible, and 2 are unevaluated. Of the 11 sites within the 1-mile buffer, 1 site (12-DO-0012) has been determined Eligible for the NRHP and 8 are unevaluated. One site has been partially evaluated as Not Eligible while another is unevaluated but likely not eligible.

Table 3.3. Archaeological Sites and Leads Within the Project Area and 1-Mile Buffer

Site Number, Name	County, Township	Site Type, Function	Cultural Affiliation	NRHP Eligibility	Location Relative to Project Area
21DO0012, Claremont Station	Dodge, Claremont Twp.	Transportation Related Ruin	Post-Contact, Historic Euro-American	**Eligible**	In 1-Mile Buffer
21DO0013, (no name)	Dodge, Claremont Twp.	Single Artifact Find Spot	Pre-Contact	Unevaluated (Likely Not Eligible)	In 1-Mile Buffer
21DO0014, (no name)	Dodge, Claremont Twp.	Lithic Scatter, Habitation	Pre-Contact: Paleoindian, Archaic, and Initial Woodland Traditions	Portion Not Eligible, Remainder Unevaluated	In 1-Mile Buffer

Site Number, Name	County, Township	Site Type, Function	Cultural Affiliation	NRHP Eligibility	Location Relative to Project Area
21DO0015, (no name)	Dodge, Claremont Twp.	Lithic Scatter	Pre-Contact	Unevaluated	In 1-Mile Buffer
21DO0017, (no name)	Dodge, Ripley Twp.	Artifact Scatter, Farmstead	Post-Contact, Historic Euro-American	Not Eligible	In Project Area
21DO0018, (no name)	Dodge, Ripley Twp.	Artifact Scatter, Farmstead	Post-Contact, Historic Euro-American	Not Eligible	In Project Area
21DO0019, (no name)	Dodge, Ripley Twp.	Artifact Scatter, Historic Dump	Post-Contact, Historic Euro-American	Not Eligible	In Project Area
21ST0019, (no name)	Steele, Havana Twp.	Lithic Scatter, Workshop	Pre-Contact	Unevaluated	In 1-Mile Buffer
21ST0020, (no name)	Steele, Havana Twp.	Lithic Scatter, Workshop	Pre-Contact	Unevaluated	In 1-Mile Buffer
21ST0021, (no name)	Steele, Havana Twp.	Lithic Scatter, Workshop	Pre-Contact: Paleoindian, Late Woodland	Unevaluated	In 1-Mile Buffer
21ST0022, (no name)	Steele, Havana Twp.	Lithic Scatter, Workshop	Pre-Contact	Unevaluated	In 1-Mile Buffer
21ST0024, (no name)	Steele, Havanna Twp.	Lithic Scatter, Habitation	Pre-Contact: Late Woodland	Unevaluated	In Project Area
21ST0025, (no name)	Steele, Havanna Twp.	Lithic Scatter, Habitation	Pre-Contact: Paleoindian, Late Woodland	Unevaluated	In Project Area
21ST0026, (no name)	Steele, Havanna Twp.	Lithic Scatter, Habitation	Pre-Contact	Recommended Not Eligible	In Project Area
21ST0027, (no name)	Steele, Havanna Twp.	Single Artifact Find Spot	Pre-Contact	Recommended Not Eligible	In Project Area
21ST0028, (no name)	Steele, Havanna Twp.	Single Artifact Find Spot	Pre-Contact	Recommended Not Eligible	In Project Area
21ST0034, Eaker 1	Steele, Blooming Prairie Twp.	Lithic Scatter	Pre-Contact	Unevaluated	In 1-Mile Buffer
21ST0035, Eaker 2	Steele, Blooming Prairie Twp.	Lithic Scatter	Pre-Contact	Unevaluated	In 1-Mile Buffer
21ST0036, Eaker 3	Steele, Blooming Prairie Twp.	Lithic Scatter	Pre-Contact	Unevaluated	In 1-Mile Buffer

4 CULTURE HISTORY

The following prehistoric and historic contexts were generated from previously prepared syntheses for the State of Minnesota and the Upper Midwest (Dobbs 1990a, 1990b; MnSHPO 1993; Hudak et al. 2002; Gibbon 2012). The Pre-Contact period is divided into four traditions: Paleoindian, Archaic, Woodland, and Plains Village and Mississippian/Oneota. These traditions are further defined by significant changes in how Native American communities exploited technology and food sources.

4.1 PALEOINDIAN TRADITION (12,000 TO 8000 B.P)

This period is marked by the retreat of glacial ice and the draining of several lakes, including Lake Agassiz and Lake Superior. The Paleoindian occupations in Minnesota were characterized by low population density, and sites were often short-term, specialized activity areas that resulted in a sparse archaeological signature. Paleoindians had a nomadic lifestyle and lived near game animals, sources of wood, chert, large streams, and other major water sources. Paleoindians based their movements on the seasons, the availability of plants, and the migratory patterns of game animals.

Paleoindian Tradition archaeological sites are often identified by isolated projectile points and scatters of a few lithic artifacts on the ground surface. Justice (1987) divides these projectile points into Early Paleoindian—Fluted Point Pattern (Clovis, Gainey, and Folsom points) and Late Paleoindian—non-fluted Lanceolate Point Pattern (Plano and Cody Complex points). Other lithic tool types associated with the patterns of the Paleoindian Tradition in Minnesota include bifacially flaked knives, simple choppers, adzes, and large scrapers (Dobbs 1990a).

4.2 ARCHAIC TRADITION (8000 TO 2800 B.P.)

The end of the Pleistocene marked the end of the last Ice Age and the beginning of the Archaic period. The retreating glaciers exposed new land surfaces unlike any in present-day Minnesota. Expanses of prairie began to displace the forests, expansive lakes, and large, swift rivers fed by glacial runoff. Dietary and settlement patterns shifted as people adapted to environmental changes. More diverse plant and animal resources were utilized during the Archaic period, and the toolkit diversified to include ground and pecked stone tools, copper tools, and a wider variety of projectile point types. Archaic Tradition technology is characterized by a change in projectile point manufacture, shifting from lanceolate to notched and stemmed points.

During the Archaic period, regional differences in material culture began to develop. The four distinct Archaic Tradition contexts identified in Minnesota include the Shield Archaic, Lake-Forest Archaic, Prairie Archaic, and Eastern Archaic (Dobbs 1990a). Research suggests that community size increased from previous Paleoindian populations, yet remained small with day-to-day

activities taking place at a series of small seasonal camps (Anfinson 1987). As with known Paleoindian sites, Archaic sites are relatively small and sparse.

4.3 WOODLAND TRADITION (2800 B.P. TO EUROPEAN CONTACT)

Throughout the Midwestern United States, the Woodland Tradition is generally divided into three periods: Early, Middle, and Late; however Anfinson (1987) has suggested that a division into Initial and Terminal periods may be more appropriate in Minnesota. The climate during this period shifted from dry and warm to moist and cool and began to stabilize to resemble the climate that exists in the state today (Anfinson 1990).

Woodland Tradition cultures exhibit evidence of an increasingly sedentary lifestyle. This is evident in the manufacture of ceramic vessels, construction of burial mounds, and cultivation of specific plant species (Dobbs 1990a). The original divisions of Early, Middle, and Late Woodland were differentiated by their changes in technology. Ceramics during the Early Woodland period are normally thick and crude with cord-marked decoration on the exterior. During the Middle Woodland there is early evidence of earthen burial mounds. The Late Woodland period continues the tradition of ceramics and burial mounds, but ceramic decorations and styles become more regionalized (Anfinson 1990). Despite significant changes in many aspects of the Woodland culture, archaeological research indicates that life during the Woodland Tradition remained similar to that of the Archaic period, with a dependence upon a diverse, seasonal resource base of plants and animals (Anfinson 1987:222). Site types assigned to the Woodland Tradition throughout the region range from small, limited-use sites to large village and habitation sites.

4.4 PLAINS VILLAGE AND MISSISSIPPIAN/ONEOTA TRADITIONS (1100 B.P. TO EUROPEAN CONTACT)

During the Plains Village and Mississippian/Oneota Traditions, archaeological sites in Minnesota exhibit significant changes in subsistence and settlement patterns. Populations became larger and even more regionalized than was typical during previous periods. In addition, ceramic vessels were manufactured using different forms and decoration, agriculture intensified, and settlement patterns shifted to larger and more permanent villages (usually near river settings). Archaeologists attribute sites that exhibit these cultural changes to two major traditions: Plains Village and Mississippian/Oneota. These traditions are split further based on region: the Plains Village Tradition is typical in the western part of the state, and the Mississippian Tradition is typical in the eastern part of the state (Anfinson 1987). These traditions last from the end of the Terminal Woodland Tradition to first contact with European explorers (Anfinson 1987).

Anfinson (1987) has suggested the Plains Village Tradition and the Mississippian/Oneota Traditions developed due to regionalization of groups that allowed the creation of distinctive ideas and life-ways. Archaeological evidence suggests the Plains Village complexes developed out

of an indigenous Late Woodland base; however, archaeologists are unsure how the Oneota complexes developed (Dobbs 1990a). Plains Village and Oneota site types are similar to those associated with the Woodland Tradition. The archaeological remains of these complexes range from burial mounds to small, limited-use sites and extensive habitation sites. Site location patterns remain consistent with the Woodland Period.

4.5 CONTACT/POST-CONTACT PERIOD (1639 TO PRESENT)

The Contact period generally refers to the span of time extending from the first European explorations until intensive Euro-American settlement of the region. Minnesota's historical period began in 1673 when French explorers Jacques Marquette and Louis Joliet encountered the upper portion of the Mississippi River. During the time of initial contact, the Ioway, Santee Dakota, and possibly the Oto occupied the southeastern portion of Minnesota (Dobbs 1990b). The territory containing modern-day Minnesota was claimed during this period by Spain, France, Great Britain, and the United States.

Settlement and exploration in Minnesota were driven by the establishment, operation, and adaptation of fur trading and exchanging goods. The presence of French and British explorers caused changes to the Native American populations. Native American populations migrated from the east, and certain areas of Minnesota saw a depopulation of native peoples because of introduced diseases and warfare (Dobbs 1990b). A large-scale evacuation of Native Americans in Minnesota, after growing tensions, allowed for further settlement of the area by Europeans.

The large-scale evacuation of Native Americans was a result of an armed conflicted between the United States and the Dakota Sioux Indians. Throughout the late 1850s, treaty violations by the United States and unfair annuity payments by U.S. agents caused increasing tension among the Dakota Indians (Ginkel et al. 2016). Over the duration of several months, battles between the Dakota and the settlers, and later the United States Army, took place throughout the Minnesota River valley. The war ended on December 26, 1862, when 38 Dakota Indians were hanged in Mankato in the largest mass execution in U.S. history (Ginkel et al. 2016). Afterward, the government forced most of the remaining Dakota to leave Minnesota.

Minnesota became a territory in 1849 and achieved statehood on May 11, 1858 (Dodge County Historical Society 2017). The first European settlers arrived by steamboats via major rivers and tributaries. Many towns developed into agricultural processing and distribution centers. Industries such as milling and brewing became widespread throughout Minnesota (Hill 1884). In addition to milling, Minnesota was a leader in lumbering and iron mining (Hill 1884).

The rivers, alongside which many towns were established, acted as a major source of transportation and power for these industries. The establishment of railroads in Minnesota in the late nineteenth century spurred rapid growth in the agriculture industry and became a major source of transportation for Minnesota's leading industries (Hill 1884).

Dodge County was historically inhabited by the Mdewakanton Sioux, the Sauk, and the Fox Indians (Dodge County Historical Society 2017). The region of Dodge County was common hunting and combat ground for Native Americans. Native Americans resided in Dodge County as late as 1856–1857; eventually, population declined due to smallpox and loss of land.

The early European settlers of Dodge County were predominantly of New England birth (Dodge County Historical Society 2017). By 1855, settlement had progressed rapidly in Dodge County with the establishment of farms, roads, a hotel, and a tavern. The county was established under the Minnesota territorial government in 1855, with Mantorville as the County Seat (Dodge County Historical Society 2017). The county is named for Henry Dodge, a two-time governor of Wisconsin.

In the early history of Dodge County, agriculture was a leading industry producing wheat, corn, oats, barley, and potatoes in commercial quantities (Dodge County Historical Society 2017). After a decline in wheat production, dairying and diversified farming increased rapidly. The Dodge County Agricultural Society was established in 1857 (Hill 1884). In that same year, the Dodge County Agricultural Society held the first county fair, which was also the first county fair in the Minnesota Territory (Hill 1884).

5 CONCLUSIONS AND RECOMMENDATIONS

Atwell conducted a literature search of the Project Area and 1-mile buffer. Based on the results of this review, very few cultural resources are known to be present within the Project Area. Atwell recommends the following:

- For architectural resources, Minnesota Historical Society (MnHS) review under the Minnesota Historic Sites Act in conjunction with the PUC LWECS Site Permit review suggests that only architectural resources designated or listed on the NRHP, MSHSN, and MSRHP would require avoidance by the Project. Cultural resources designated or listed on the NRHP, MSHSN, and MSRHP are not located within the Project Area or 1-mile buffer. Architectural resources within the Project Area or 1-mile buffer that are unevaluated or eligible for listing on the NRHP but are not currently designated or listed on the NRHP, MSHSN, or MSRHP would not require avoidance or further evaluation for MnHS review under the Minnesota Historic Sites Act. Nevertheless, the Project has voluntarily avoided direct impacts to all recorded architectural resources within the Project Area and 1-mile buffer. Therefore, no additional architectural investigation is recommended.
- In total, eight archaeological sites have been recorded within the Project Area. Of these archaeological sites, six have been evaluated as either not eligible or recommended not eligible and two are unevaluated for listing in the NRHP. DCW has voluntarily committed to avoiding direct impacts to all of these archaeological sites.
- In total, 11 archaeological sites have been recorded within the 1-mile buffer, of which only 1 site has been determined Eligible for listing in the NRHP. Archaeological sites within the 1-mile buffer would not be impacted by the Project.
- The Aurora Lutheran Cemetery, Saint John's Lutheran Cemetery, and the Thompson Cemetery are depicted on USGS topographic maps within the Project Area. The Thompson Cemetery was also identified in MnSHPO records. As currently proposed, the Project has implemented a 100-foot avoidance buffer around these cemeteries to avoid direct impacts and avoid potential violations of Minnesota Statute 307.08, which protects private cemeteries and burial grounds.
- The majority of proposed infrastructure locations have been previously subjected to archaeological survey in 2018 (Pfennig and Kotwasinski 2018). In compliance with the PUC LWECS Site Permit review requirements, Atwell recommends that currently proposed infrastructure locations that have not been surveyed should be examined by a qualified archaeologist to identify any unrecorded archaeological sites that could possibly be present in these locations.

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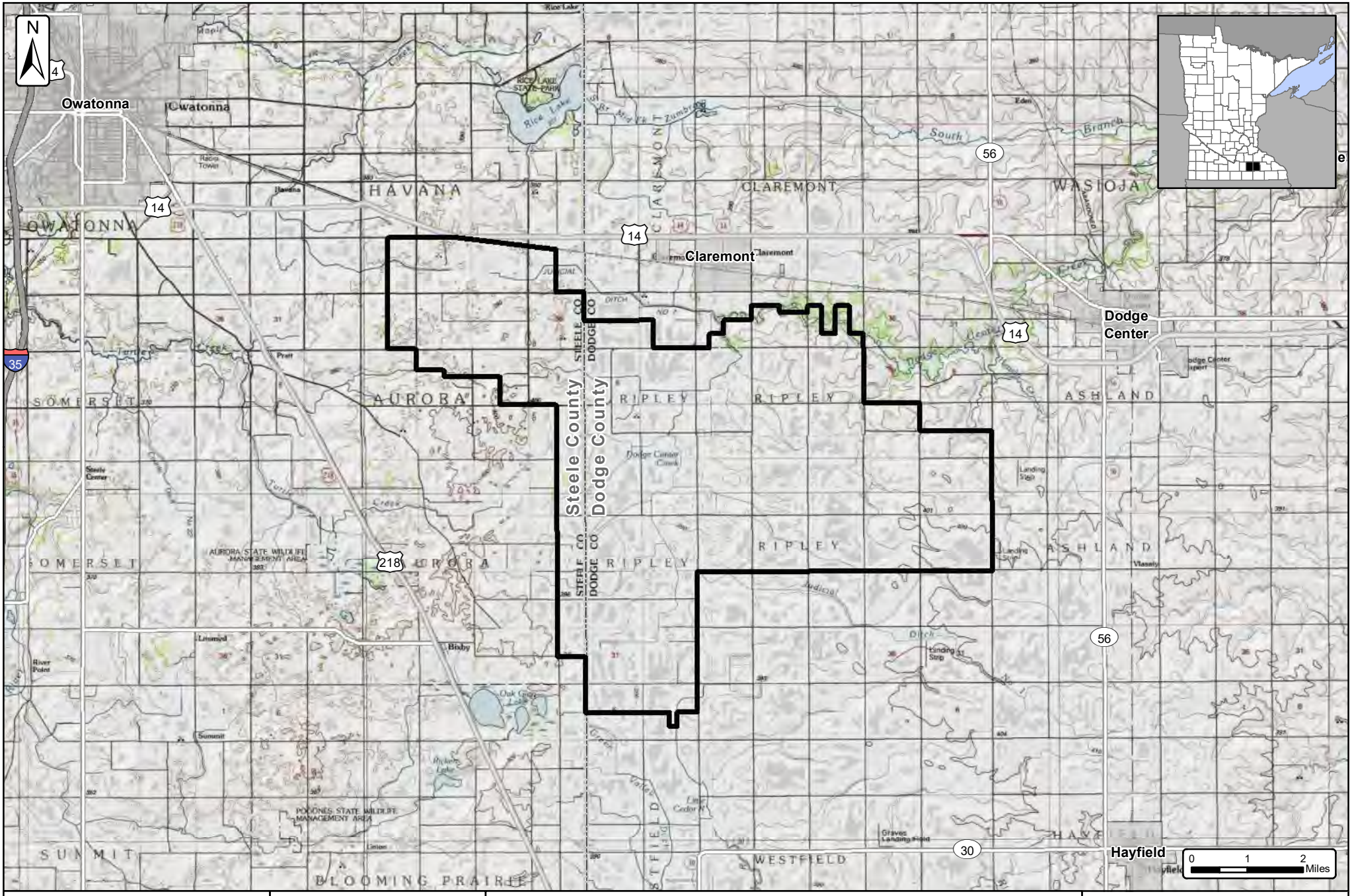
FIGURES

CONFIDENTIAL MAP: DO NOT DISTRIBUTE



Dodge County Wind, LLC

Figure 1. Site Location Map

Steele County and Dodge County, Minnesota

Date: 7/7/2021

Client:

Dodge County Wind, LLC

Atwell, LLC Project:16002517

Wind Resource Area (5/10/2021) (±28,348 Ac.)

City/Village

Counties

BUSINESS CONFIDENTIAL NOT FOR DISTRIBUTION

SOURCE: USGS TOPOGRAPHIC QUADS

ATWELL

APPENDIX K – Decommissioning Plan

DECOMMISSIONING PLAN

Dodge County Wind Energy Facility

Docket No. IP-6981/WS-20-866

Dodge County Wind, LLC

July 27, 2021

Decommissioning Plan: Dodge County Wind Energy Facility

1.0 INTRODUCTION

1.1 Background

Dodge County Wind, LLC (DCW) is filing a Site Permit application with the Minnesota Public Utilities Commission (Commission) to construct and operate a 258.92-megawatt (MW) wind energy facility. The Dodge County Wind Energy Facility (Project) will comprise of 60 GE 3.4 MW (HH = 98m) turbines, 8 GE 3.4 MW (HH = 81m) turbines, and 11 GE 2.52 MW (HH = 90m) turbines; 26 miles of access roads; 72 miles of underground electrical collection; and associated facilities. The Project is located in Dodge and Steele Counties, Minnesota, and includes approximately 19,802 acres of mostly farmland. A power purchase agreement has been signed with Great River Energy for a duration of 30 years. The anticipated commercial operation date for the Project is end of 2023.

1.2 Decommissioning Plan Objective

DCW anticipates that a condition of the Site Permit will be submission of a Decommissioning Plan prior to construction of the facility, with updates to the Plan every five years thereafter. The Plan will provide information identifying all surety and financial securities established for decommissioning and site restoration of the Project in accordance with the requirements of Minnesota Administrative Rules 7854.0500, subpart 13.

At the end of the project's useful life, DCW plans to decommission the facility. The purpose of this Decommissioning Plan is to establish the protocols for disassembly of the Project and to financially guarantee funding of the decommissioning process for assurance the site can be restored to a condition as close to its preconstruction state as feasible.

As part of this Decommissioning Plan, DCW is providing a third-party detailed estimated cost schedule prepared by Atwell, LLC, for project decommissioning activities (see Attachment A). Estimated costs of decommissioning have increased since DCW last filed its Decommissioning Plan in March 2019. This is largely attributable to increases in the estimated cost of concrete foundation demolition and disposal, which are decommissioning undertakings associated with both wind turbine and substation equipment.

DCW will furnish a financial surety, bond, or other form of surety equal to the total estimated cost to Dodge and Steele Counties. The financial surety will ensure adequate financing for the decommissioning process, available to Dodge and Steele Counties, for administering the decommissioning and restoration process.

This Decommissioning Plan has been created to establish the approach for the following decommissioning activities:

- Site preparation and acquisition of necessary permits required for the structural

dismantling activities (crane pads, crane paths, etc.)
- Installation of soil erosion and sedimentation control best management practices (BMPs)
- Disassembly and removal of existing turbines
- Abandonment or removal of existing infrastructure associated with the turbines
- Scarification and reseeding of disturbed areas, where applicable
- Establishment of vegetation on disturbed soils
- Mitigation for potential impacts on sensitive environmental features including agricultural soils
- Mitigation for potential impacts to agricultural facilities, agricultural drainage tiles, and public drainage ditches, if affected

The Decommissioning Plan has been developed per the following guidelines:

- Conformance with Minnesota Administrative Rules 7854.0500, subp.13
- Energy Environmental Review and Analysis (EERA) Large Wind Energy Conversion System (LWECS) Application Guidance
- EERA Recommendations on Review of Solar and Wind Decommissioning Plans (Commission Docket Number E999/M-17-123)

1.3 Anticipated Life of the Project

DCW estimates that the Project will have a useful life of at least 30 years. Once the Project has reached its useful life, implementation of the steps described in this Decommissioning Plan can be completed to restore the land to the condition it was in prior to operation of the Project. This Decommissioning Plan also provides a guarantee that DCW has a surety, bond, or other form of financial surety in place that will cover the cost of that decommissioning effort.

2.0 DECOMMISSIONING PROCESS PROTOCOL

2.1 Decommissioning Notification

Once DCW has determined that the Project has reached the end of its useful life and is ready to be decommissioned, DCW will first notify participating landowners, local governments, and the Commission of initiation and commencement of planned decommissioning activities via a mailed letter 10 days prior to inception of those planned activities. This letter will also provide the name and contact information of an individual designated by DCW to manage landowner inquiries. Once decommissioning restoration is completed, DCW will notify all participating landowners, local government, and the Commission of decommissioning completion via a mailed letter within 30 days of completion.

2.2 Decommissioning Preparation Activities

The first step in the Decommissioning Plan will be for DCW to contact all participating landowners to determine their preference on removal or abandonment of project infrastructure. For example,

some landowners may prefer to leave access roads in place because often the access roads benefit their farming activities. Electrical collection lines may also be left in place at the landowner's request to reduce disruption of their fields.

DCW has a contractual obligation with landowners for restoration of properties back to a condition comparable to that of the property prior to the installation of the Project. Per section 11.4 of the LWECS Application Guidance, DCW is providing example decommissioning, abandonment, and removal condition language for reference from the landowner lease agreements below:

> *Removal of Improvements. (a) Within eighteen (18) months after termination or expiration of the Easement Term, Operator shall, unless otherwise agreed by Owner, remove all of the Improvements on the Owner's Property and restore the Owner's Property to its approximate original condition that existed before Operator constructed its Improvements all at Operator's sole cost and expense. At termination or expiration of the Easement Term, Operator shall be required to remove facilities down to a level of forty-eight (48) inches below grade and return the grade to a condition comparable to conditions prior to Operator's installation of Improvements on the Owner's Property. If Operator fails to remove any portion of the Improvements or restore the Owner Property as required within the required time period, that portion of the Improvements shall be considered abandoned by Operator and Owner may remove that portion of the Improvements from the Owner's Property and dispose of it in its sole discretion without notice or liability to Operator. In the event Operator fails to remove any of the Improvements or restore the Owner's Property as required, and Owner removes any portion of the Improvements or restores the Owner's Property at Owner's expense, Operator shall reimburse Owner for all reasonable costs of removing that portion of the Improvements or restoration of the Owner's Property as required by the Site Permit and/or this Agreement, less any salvage or resale value received by Owner, within thirty (30) days after receipt of an invoice from Owner. If Operator fails to pay or reimburse Owner for any decommissioning, removal or restoration costs, Owner may withdraw such funds from the Decommissioning Security or pursue any other lawful remedy or recourse.*

Once the landowner coordination has occurred and the extent of disturbance areas are understood, DCW will develop a Storm Water Pollution Prevention Plan (SWPPP) and submit for a National Pollutant Discharge Elimination System permit based on the anticipated disturbances for both demolition and new temporary construction required for project component removal. Crane pads and potential crane walks will be installed to support the turbine removal process after soil erosion BMPs are in place. Other permits (such as those that may be needed for impacts to wetlands or other sensitive environmental features) will also be obtained, as applicable.

2.2.1 Erosion and Sedimentation Control Measures

General erosion and sedimentation control measures will be integrated, as appropriate, in the SWPPP. Example measures include, but are not limited to, the following BMPs:

- Silt fence or straw wattle installation on the downslope and adjacent to sensitive water features
- Slopes greater than four to one should be protected with erosion control blankets or mulch blankets
- Stabilization of disturbed soils with seed application
- Stripped topsoil shall be placed in soil stockpiles and placed in a manner to not interfere with natural drainage to waterways, which could promote soil erosion. Topsoil stockpiles should be surrounded by either silt fence or straw wattles. If the stockpile is to remain for an extended period of time, it should be temporarily seeded.
- Temporary construction entrances should be established consisting of 1-inch x 3-inch aggregate to reduce erosion onto roadways.
- Dust control measures
- Use of filtration bags for dewatering activities

2.2.2 Project Disconnection Measures

Before any demolition begins, the Project will first be disconnected from the electrical grid by following all energy industry safety standards and best practices to allow for the safe dismantling of the project components including turbines, electrical collection lines, and substation components. The general process for disconnecting the Project from the grid is as follows:

- Power down and lock all turbines to prevent the flow of electricity from the Project to the substation
- Place generator step-up transformer (GSU) breaker in open position (if this is an option on GSU)
- Place the GSU disconnect switch in the open position to electrically disconnect/isolate the Project from the gen-tie
- Place collection feeder breakers in open position
- Place the collection feeder disconnect switches in the open position
- In coordination with the Transmission Operator, de-energize the gen-tie line between the DCW plant/substation and the Point of Interconnection (POI) substation, which will effectively de-energize the main step-up transformer (GSU)
- Remove the POI connection wires from the substation and gen-tie line, disconnecting the project substation from the grid
- Safely begin the dismantling of substation, turbines, ADLS radar sites, operations and maintenance (O&M) building, and electrical components of the Project

2.3 Removal of Facilities

Decommissioning will include the dismantling and removal of the wind towers, wind turbine generators, foundations, meteorological (MET) towers, access roads, underground collection lines, pad-mounted transformers, collection substation, and the O&M facility to a depth of 4 feet, unless requested by the landowner or other entity. Turbine tower sections will be dismantled utilizing cranes. A single large crane is typically used to disassemble the turbines, and smaller cranes would lift the parts onto trucks to be hauled away. MET towers will also be similarly removed.

After dismantling and excavating the facility, high-value components will be removed for scrap value. The remaining materials will be left on the landowner property where expressly requested by the landowner or will be reduced to transportable size and removed from the site for disposal. Unsalvageable materials will be disposed of at authorized sites in accordance with applicable regulations.

Following the dismantling and removal of project infrastructure, DCW will return the Project Area to a condition that is as close to preconstruction conditions as feasible in accordance with the lease agreement between the landowners and DCW.

2.3.1 Turbines and Meteorological Tower

The disassembly and removal of this equipment will essentially be the same as its installation, but in reverse order. For turbines, the rotor (hub and blades) are removed from the nacelle and, with the help of a smaller crane, turned horizontally and set on the ground. Next, the nacelle will be removed from the top of the tower, followed by each portion of the tower. Once the turbine rotor has been removed, a crew and small crane will disassemble it into the hub and three loose turbine blades. When the rotor is disassembled, the blades will be placed into a carrying frame, which can then be loaded onto a truck for removal from the site. The hub can also be removed once it is disassembled from the blades. Turbine foundations will be removed to a depth of 4 feet. DCW will work with landowners regarding whether the landowner prefers to keep extracted concrete on their property. If landowners prefer to keep extracted concrete, the concrete will be crushed and provided to the landowner.

The project MET tower will be removed in a similar fashion to the turbines. A small crane will be used to dismantle the structure from the top down, and the pieces of the structure will be loaded onto trucks to be removed from the site.

2.3.2 Access Roads

DCW will work with landowners regarding whether the landowner prefers to keep the access roads in place. In the event landowners do not want to keep the access roads, or portions thereof, the access roads will be removed, and the land will be restored. Any geotextile fabric that is encountered during demolition will be removed and taken to an approved landfill.

2.3.3 Underground Collection and Pad-Mounted Transformers

Where feasible, all underground collection lines buried less than 4 feet below the surface will be removed unless requested by the landowner, or other entity, to remain in place. DCW will work with landowners or applicable entities to determine whether underground collection lines may be left in place when located less than 4 feet below the surface to minimize impacts to agricultural activities and the environment. If the underground collection lines are to be removed, a trench will be opened, and the cables will be pulled out. Cables will be cut into manageable sections and removed from the site.

Once the electrical system has been shut off, pad-mounted transformers will be disconnected from the collection system and wind turbine generators and hauled offsite. The concrete pads will be crushed and either hauled offsite or provided to the landowner, if requested.

2.3.4 Collection Substation and O&M

All aboveground structures at the collection substation including the conductors, switches, transformers, fencing, and other components will be dismantled and removed from the site. Additionally, the structures at the project O&M facility will be removed. All concrete foundations will be crushed and either hauled offsite or provided to the landowner, if requested. Where feasible, all underground infrastructure associated with the substation and O&M facility, including underground conduits and grounding wires, will also be removed to a depth of 4 feet, unless it has been negotiated with the landowner that this infrastructure may be abandoned in place.

2.4 Salvage and Disposal

After dismantling the Project, high value components will be removed for scrap value. The remaining materials will be left on the landowner property where expressly requested by the landowner or will be reduced to transportable size and removed from the site for disposal. Materials will be disposed of where disposal is permitted and where there is capacity for the disposal. Generally, turbines, turbine blades, transformers, electrical components, and towers are refurbished and resold or are recycled for scrap. Unsalvageable materials will be disposed of at authorized sites in accordance with applicable regulations. Decommissioning of the turbines will include removal and transport of generators and towers offsite to disposal facilities and/or sale of towers and generators.

2.5 Hazardous Materials

During decommissioning, required hazardous materials will be temporarily stored and utilized. These hazardous materials may consist of fuel, lubricating oil, hydraulic oil, propylene glycol, and other materials required for the decommissioning. Decommissioning will require the removal of pad-mounted and grounding transformers that contain large quantities of cooling fluids, likely consisting of mineral oil.

Due to the presence of hazardous materials during decommissioning, there is the potential for spills and/or leaks. The primary concerns associated with these spills and/or leaks are potential impacts to surface water and groundwater resources and/or soil contamination. A Spill Prevention, Control, and Countermeasure Plan (SPCC) will be created for decommissioning. The SPCC Plan will detail the appropriate storage, cleanup, and disposal of hazardous wastes to ensure potential impacts are avoided.

Any hazardous material wastes generated will be handled and disposed of in accordance with Minnesota Rule Chapter 7045, local rules and regulations, and the site-specific SPCC. Any monitoring, transportation, or handling of materials will be conducted by trained and qualified personnel utilizing established procedures and proper equipment.

2.6 Restoration

Following the dismantling and removal of project infrastructure, DCW will return the Project Area to a condition that is as close to preconstruction conditions as feasible. DCW will implement the following:

- All areas where infrastructure has been removed will be graded and reseeded, as appropriate, in coordination with landowners or other entities.
    - After removal of all foundation materials, the areas will be filled with clean, compatible subgrade material compacted to a density similar to the surrounding subgrade material.
    - DCW will coordinate with local Natural Resources Conservation Service staff to revegetate non-cropland and pasture areas disturbed during decommissioning with native seed mixes appropriate to the region. Reseeding with native seed mixtures will be used on restoration areas except in cropland areas and in areas where landowners indicate preference for other seeding plans. Reseeding of cropland areas will be conducted in coordination with the landowner.

Topsoil will be removed prior to removal of structures from all work areas and stockpiled and separated from other excavated material. The topsoil will be replaced to original depth, and original surface contours will be reestablished where feasible. Any topsoil deficiency and trench settling shall be mitigated with imported topsoil consistent with the quality of the affected site.

Areas compacted by equipment used in the decommissioning may be tilled in a manner adequate to restore the topsoil and subgrade material to a density consistent with the surrounding areas and then will be reseeded. The depth of compaction relief will depend on site-specific conditions.

3.0 DECOMMISSIONING SECURITY

DCW will furnish a financial surety, bond, or other form of surety equal to the total estimated cost to Dodge and Steele Counties. An agreement describing the amount of the assurance, a timeline for funding of the assurance, a description of how the amount of security available will be

reconciled with the changing cost estimates, and the proposed beneficiary of the security will be finalized with Dodge and Steele Counties prior to project operation.

Attachment A

Dodge County Wind Project Cost Estimate

DODGE COUNTY WIND PROJECT — THIRD-PARTY DECOMMISSIONING COST ESTIMATE

To: Mark Lennox, Dodge County Wind, LLC

From: Timothy Jones, Civil Engineer, Atwell, LLC

Date: July 27, 2021

RE: DODGE COUNTY WIND PROJECT – THIRD-PARTY DECOMMISSIONING COST ESTIMATE

Cost Estimate

Estimated Cost of Decommissioning

Dodge County Wind, LLC (DCW) retained Atwell, LLC (Atwell) to develop an independent, third-party cost estimate for the decommissioning of the Dodge County Wind Project (Project). The decommissioning cost estimate provided herein includes an estimate of the cost to return the site to a condition compatible with the surrounding land and similar to the conditions that existed before development of the Project. This estimate is based upon the described Project and decommissioning methods summarized in the "Decommissioning Plan: Dodge County Wind Energy Facility" dated July 27, 2021 and associated with Minnesota Public Utility Commission Docket Number IP-6981/WS-20-866.

Included in the estimate are the costs to decommission the power generating equipment associated with the Project, as well as the costs to retire the project facilities, with all turbine foundations removed to a depth of 4 feet below grade. These costs are offset by the estimated revenue that will be received for scrap value of steel, aluminum, and copper equipment. No resale of the project facilities for reuse is considered and thus, accordingly, the cost estimate provided herein is a "no resale" estimate.

At the time of decommissioning, the above-grade steel structures and turbine nacelles are assumed to have significant scrap value that will offset a portion of the cost to remove these items. However, the Project will also incur costs for removal and disposal of the wind turbine generator blades, foundations, and other project facilities, along with the costs for the restoration of the site following the removal of salvageable equipment and disposal of other items.

Table 1. Decommissioning Cost (In Current U.S. Dollars)

Item		Quantity	Unit	Unit Price	Cost Estimate
1.0 Field Activities					
	1.1 Field Equipment, facilities & personnel	1	LS	$900,000	$900,000
	1.2 Site Facilities - Rental	1	LS	$10,000	$10,000
	1.3 Field Management	20	Weeks	$18,500	$370,000
2.0 Substation					
	2.1 Substation & Switchyard Removal	1	LS	$500,000	$500,000
3.0 Tower and Nacelle Units					
	3.1 Construct/remove temporary crane pads	79	EA	$9,000	$711,000
	3.2 Turbine Removal	79	EA	$35,000	$2,765,000
	3.3 Turbine Foundation Removal	79	EA	$20,000	$1,580,000
	3.4 Turbine Sizing & Loadout (Salvage Value)	79	EA	($22,000)	($1,738,000)
4.0 Pad Mounted Transformer & Collection Line Removal					
	4.1 Pad Mount Transformers	79	EA	$1,700	$134,300
	4.2 Underground collection line	72	Miles	$12,000	$864,000
5.0 Tower Access and Site Roads					
	5.1 Restoration of Gravel Road	81,351	CY	$13	$1,057,564
	5.2 Culvert Removals	27	EA	$1,000	$27,000
6.0 Site Restoration					
	6.1 Site Restoration, Seeding, and Revegetation	1	LS	$800,000	$800,000
7.0 Site Restoration					
	7.1 Meteorological Tower Removal	1	EA	$2,000	$2,000
	7.2 ADLS Radar Removal	2	EA	$2,000	$4,000
8.0 Administrative & Project Management					
	8.1 Office, Project Management	5	Percent	$399,300	$399,300
	8.2 Contrator OH & Fee (13%)	13	Percent	$1,038,300	$1,038,300
	TOTAL:				**$9,424,500**

Cost Assumptions

This estimate is based upon the described Project and decommissioning methods summarized in the "Decommissioning Plan: Dodge County Wind Energy Facility" dated July 27, 2021. The tasks associated with decommissioning were each estimated separately to include labor requirements, equipment needs, and duration. Production rates were established in accordance with similar decommissioning plans. Labor rates prevalent to the geographic area of the Project were obtained by referencing U.S. Department of Labor wage determinations. Typical average markups that are industry standard were applied for contingency, overhead, and fee. Atwell used the following estimating methods and assumptions as follows:

- Labor costs were developed by reviewing U.S. Department of Labor wage determinations and rates published by RS Means. An average rate was developed that includes base wage, fringe, and payroll tax liability. The final rate used in the estimate is an average of 40 hours standard (ST), and 10 hours overtime (OT) per week, assuming a 50-hour work week during decommissioning activities.
- Equipment rates (commonly referred to as yellow iron rates) used in the estimate are developed based on historical vendor quotes derived from RS Means. Rates include fuel, maintenance, and wear and tear of ground-engaging components. Rates utilized assume the use of rental equipment, not owned.
- Mobilization and demobilization costs reflect the actual cost to mobilize equipment, facilities, and crew to the project site. A substantial portion of this cost is for the crane and crew required for turbine removal. This amount does not include the front loading of costs from other tasks.
- Work was estimated on a unit cost basis, priced by task that follows the progression of work from start to finish. Unit costs are developed by including the labor, equipment, and production rate required for each individual task. Historical vendor quotes and estimator's experience are utilized to establish the crew, equipment, and production for each individual task.
- Turbine removal will require the construction and subsequent removal of temporary crane pads. The estimated cost of crane pads is based on an engineered design from a similar project.
- All concrete foundations will be removed to a depth of 4 feet below grade. Gravel from road removal will be utilized to backfill to within 6 inches of final grade, and then an additional 6 inches of topsoil will be applied. Concrete foundation removal

will be accomplished with the use of excavators with concrete breakers. Processed concrete will be transported offsite under the same assumptions as road gravel.

- Culverts required are estimated at a rate of 1/3 of total turbines.
- The costs for temporary facilities have been included in the restoration cost. These include one office trailer, two storage units, portable toilets, first aid supplies, and utilities.
- Field management during construction activities is included in the estimate. These costs include one superintendent, one health and safety representative, and two field engineers. These positions are critical to the safe and successful execution of work.
- Contractor Home Office, Project Management, Overhead, and Fee can vary widely. As such, averages were developed for the estimate and added as a percentage of total cost. These include 5 percent for Home Office and Project Management, and 13 percent for Overhead and Fee. Note that Contractor contingency costs are not included. Several other miscellaneous costs have been approximated, including permits, engineering, signage, fencing, traffic control, utility disconnects, etc. In the context of the overall estimate, these are incidental costs that are covered in the estimate markups.

APPENDIX L – FEMA Floodplain Panels

Steele County

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base Map information shown on this FIRM was provided for the cities of Owatonna, Medford, Blooming Prairie, and Ellendale by Aero-Metric, Inc., dated 2007 and captured at a resolution of six inches. For all other areas of Steele County the imagery used is from the Farm Services Administration (FSA) dated 2003-2004 at a resolution of half a meter.

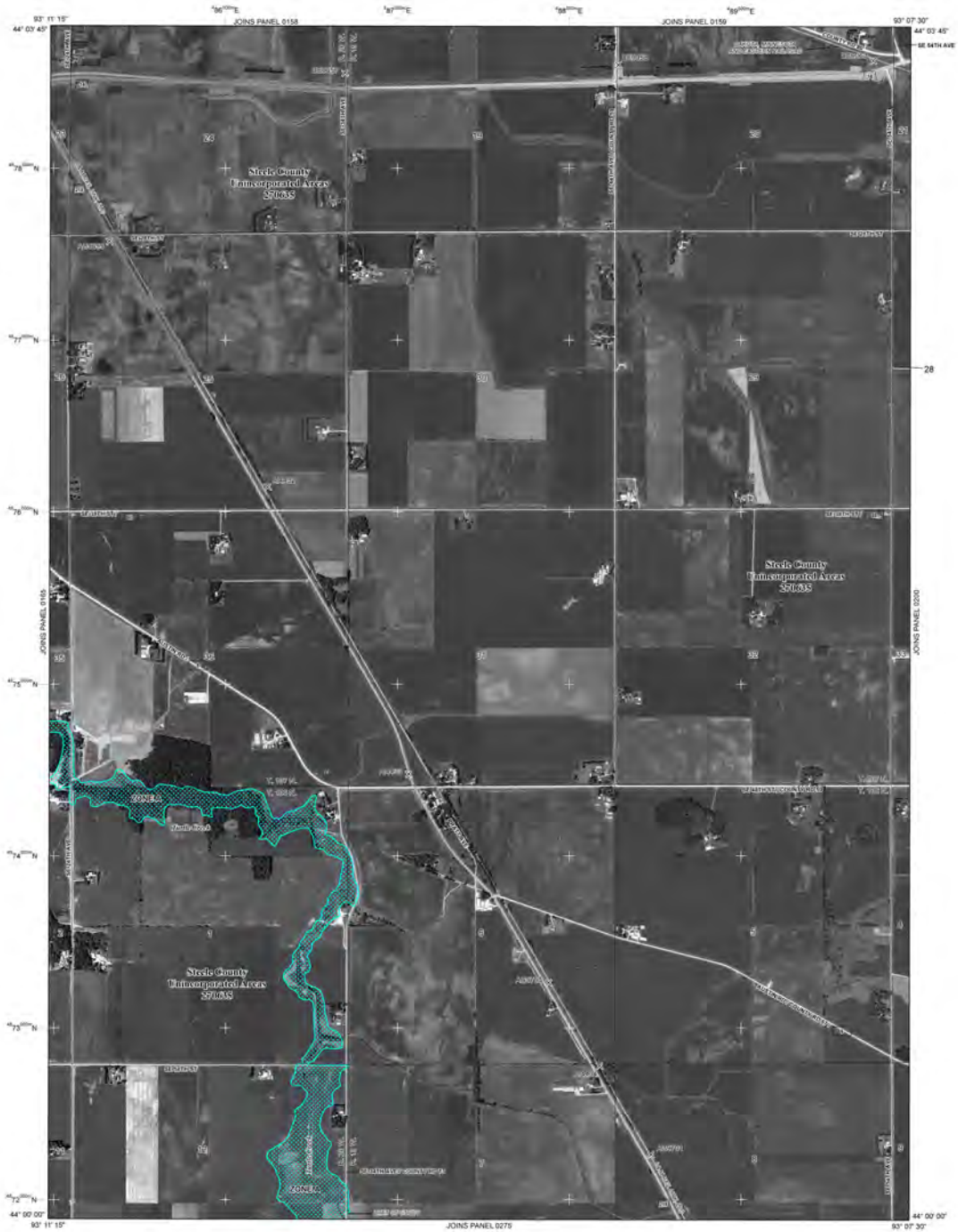
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 5000 m N — 1000-meter Universal Transverse Mercator grid values, zone 15
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
December 2, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0170C

FIRM

FLOOD INSURANCE RATE MAP

STEELE COUNTY, MINNESOTA AND INCORPORATED AREAS

PANEL 170 OF 400
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

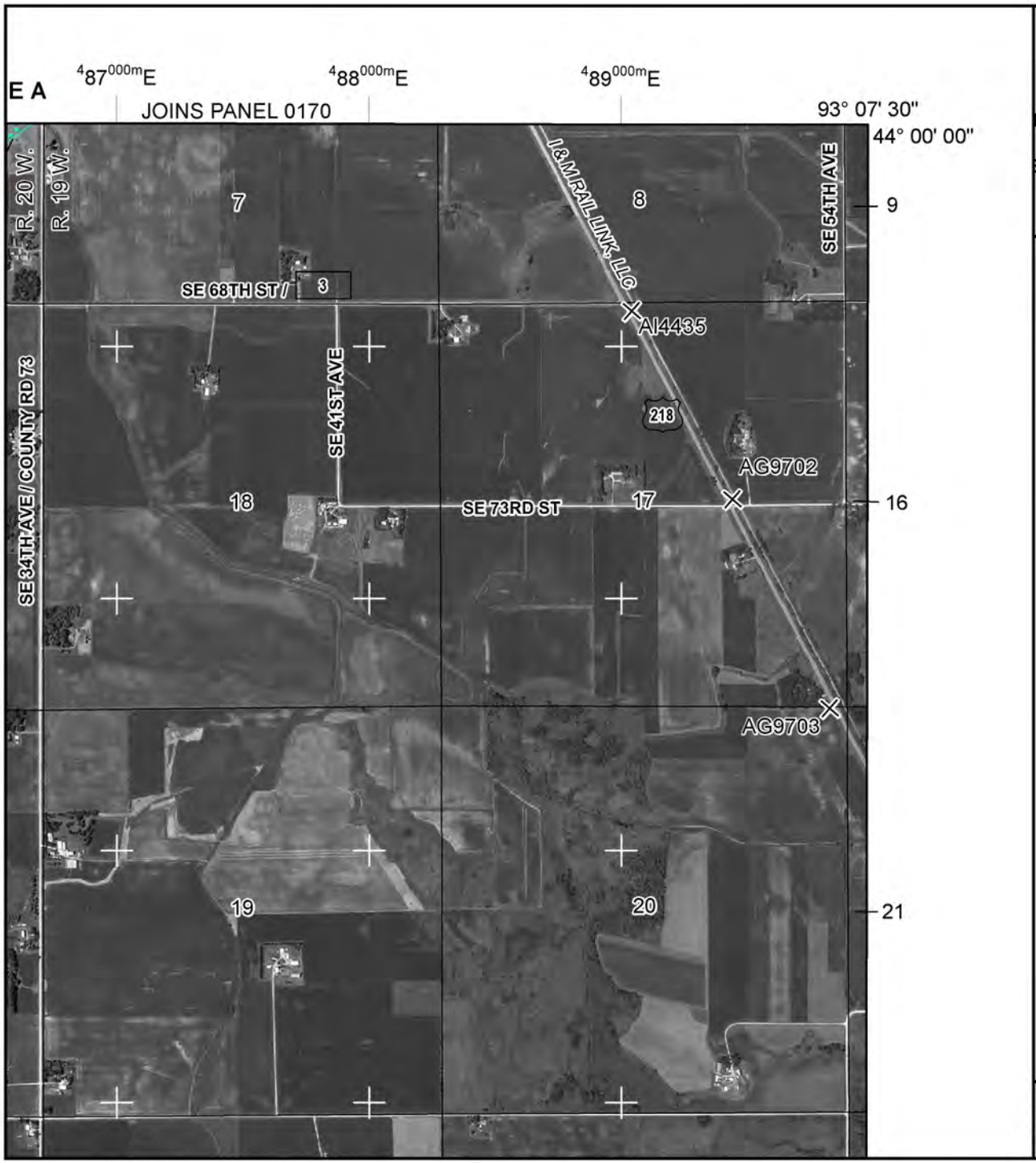
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
STEELE COUNTY	270035	0170	C

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
27147C0170C
EFFECTIVE DATE
DECEMBER 2, 2011

Federal Emergency Management Agency



MAP SCALE 1" = 2000'

1000 0 2000 4000

FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0275C

FIRM

FLOOD INSURANCE RATE MAP

STEELE COUNTY, MINNESOTA AND INCORPORATED AREAS

PANEL 275 OF 400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
STEELE COUNTY	270635	0275	C

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
27147C0275C

EFFECTIVE DATE
DECEMBER 2, 2011

Federal Emergency Management Agency

NOTES TO USERS

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To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base Map information shown on this FIRM was provided for the cities of Owatonna, Medford, Blooming Prairie, and Ellendale by Aero-Metric, Inc., dated 2007 and captured at a resolution of six inches. For all other areas of Steele County the imagery used is from the Farm Services Administration (FSA) dated 2003-2004 at a resolution of half a meter.

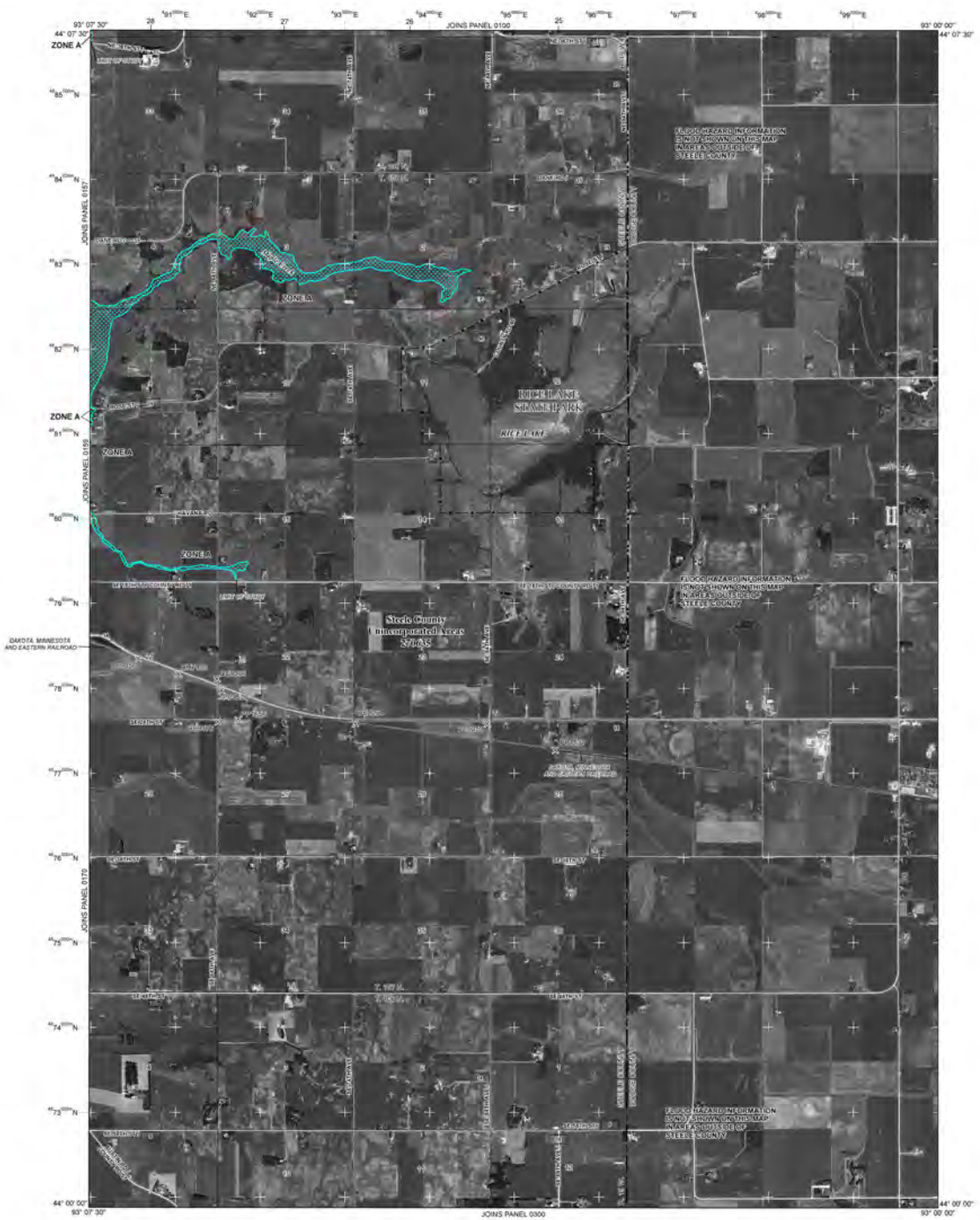
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- **ZONE A** — No Base Flood Elevations determined.
- **ZONE AE** — Base Flood Elevations determined.
- **ZONE AH** — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- **ZONE AO** — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE AR** — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- **ZONE A99** — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- **ZONE V** — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- **ZONE VE** — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- **ZONE X** — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- **ZONE X** — Areas determined to be outside the 0.2% annual chance floodplain.
- **ZONE D** — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- (A) — (A) — Cross section line
- (23) — (23) — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 5000 m N — 1000-meter Universal Transverse Mercator grid values, zone 15
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
December 2, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0200C

FIRM

FLOOD INSURANCE RATE MAP

STEELE COUNTY, MINNESOTA AND INCORPORATED AREAS

PANEL 200 OF 400
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
STEELE COUNTY	270035	0200	C

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MAP NUMBER
27147C0200C
EFFECTIVE DATE
DECEMBER 2, 2011

Federal Emergency Management Agency

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LEGEND

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- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 5000 m N — 1000-meter Universal Transverse Mercator grid values, zone 15
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
December 2, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0300C

FIRM

FLOOD INSURANCE RATE MAP

STEELE COUNTY, MINNESOTA AND INCORPORATED AREAS

PANEL 300 OF 400
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BLOOMING PRAIRIE, CITY OF	270353	0300	C
STEELE COUNTY	270035	0300	C

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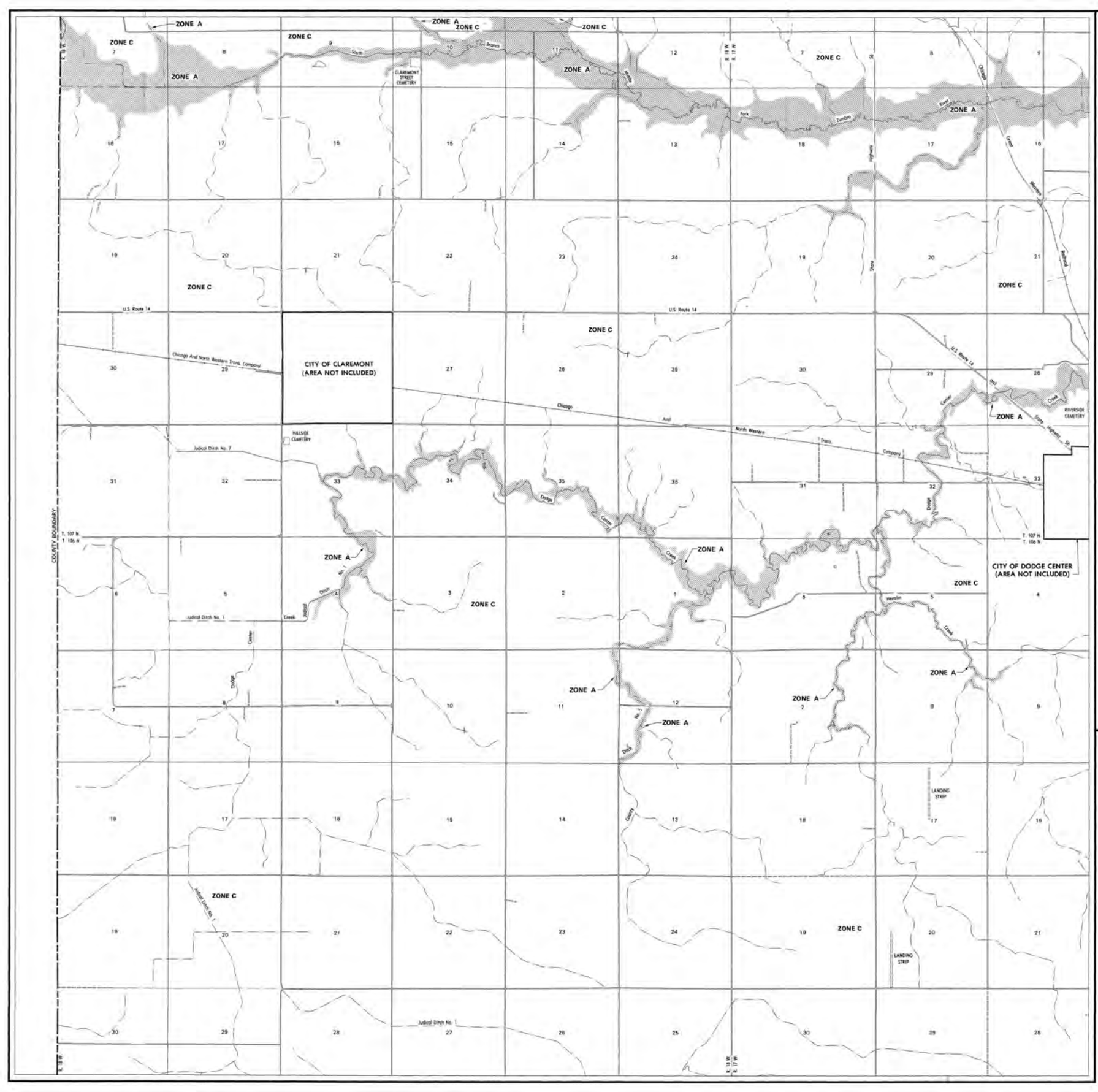
MAP NUMBER
27147C0300C
EFFECTIVE DATE
DECEMBER 2, 2011

Federal Emergency Management Agency

Dodge County



KEY TO SYMBOLS

ZONE C
ZONE A
ZONE C

Base Flood Elevation Line — 513

Base Flood Elevation — (513' MSL)

Elevation Reference Mark — RM2 ×

River Mile — • M1.5

***EXPLANATION OF ZONE DESIGNATIONS**

A flood insurance map displays the zone designations for a community according to areas of designated flood hazards. The zone designations used by FIA are:

Zone Symbol	Category
A	Areas of special flood hazards (SFHA) and without base flood elevations determined.
A1 through A30	Areas of special flood hazards (SFHA) with base flood elevations. Zones are assigned according to flood hazard factors, and dates of SFHA identification.
AO	Areas of special flood hazards that have shallow flood depths (less than two feet) and/or unpredictable flow paths. Base flood elevations are not determined.
V	Areas of special flood hazards, with velocity, that are inundated by tidal floods. Zones are assigned according to flood hazard factors and dates of SFH identification.
B	Area of moderate flood hazards.
C	Area of minimal flood hazards.
D	Area of undetermined, but possible, flood hazards.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

INITIAL IDENTIFICATION
MARCH 11, 1977

CONVERSION TO REGULAR PROGRAM
APRIL 15, 1979 (WITHOUT A MAP)

FLOOD INSURANCE RATE MAP EFFECTIVE:
SEPTEMBER 24, 1982

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

APPROXIMATE SCALE
2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

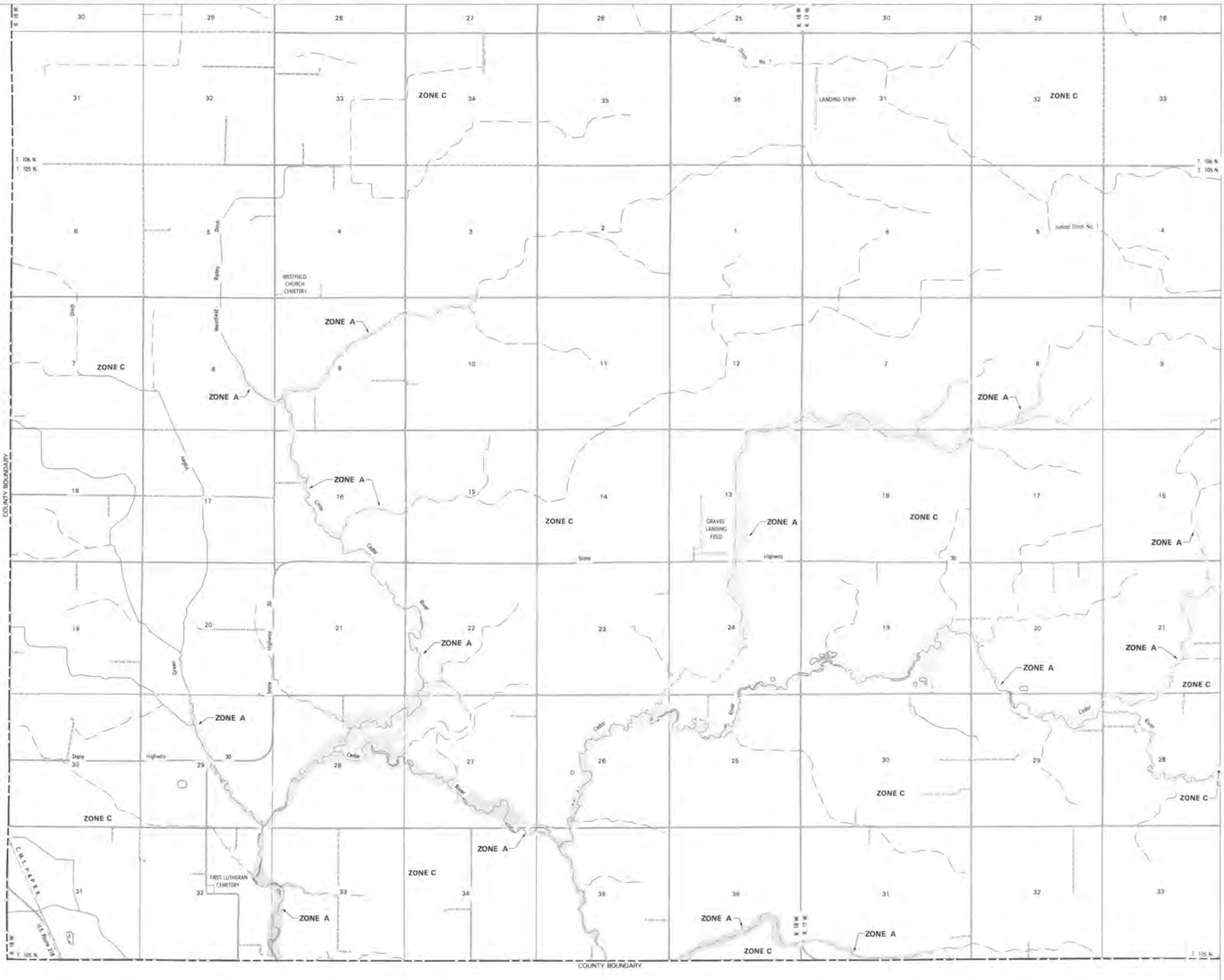
DODGE COUNTY, MINNESOTA
UNINCORPORATED AREA

PANEL 75 OF 150
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
270548 0075 B

EFFECTIVE DATE:
SEPTEMBER 24, 1982

Federal Emergency Management Agency



KEY TO SYMBOLS

ZONE C
ZONE A
ZONE C

Base Flood Elevation Line	513
Base Flood Elevation	(513' MSL)
Elevation Reference Mark	RM1 ×
River Mile	• M1.5

***EXPLANATION OF ZONE DESIGNATIONS**

A flood insurance map displays the zone designations for a community according to areas of designated flood hazards. The zone designations used by FIA are:

Zone Symbol	Category
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INITIAL IDENTIFICATION
MARCH 11, 1977

CONVERSION TO REGULAR PROGRAM
APRIL 15, 1979 (WITHOUT A MAP)

FLOOD INSURANCE RATE MAP EFFECTIVE:
SEPTEMBER 24, 1982

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

APPROXIMATE SCALE
2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

DODGE COUNTY, MINNESOTA
UNINCORPORATED AREA

PANEL 125 OF 150
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
270548 0125 B

EFFECTIVE DATE:
SEPTEMBER 24, 1982

Federal Emergency Management Agency