Appendix B – Shadow Flicker Assessment Results

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SHADOW FLICKER MODELING REPORT

Luverne Wind Energy Center Repower Project
Steele County, North Dakota

Prepared for:

Atwell, LLC
311 North Main
Ann Arbor, Michigan 48104

Prepared by:

Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

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1.0 EXECUTIVE SUMMARY

The Luverne Wind Energy Center Repowering Project (the Project) is an existing wind park in Steele County, North Dakota that is planned to be repowered by Otter Tail Power Company (Otter Tail). Atwell has retained Epsilon Associates, Inc. (Epsilon) to conduct a shadow flicker assessment for the proposed Project. This report presents results of the shadow flicker modeling from the proposed repower in Steele County.

Shadow flicker modeling was conducted for the 33 Otter Tail Luverne General Electric (GE) repowered wind turbines. 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 all Otter Tail Luverne Wind wind turbines is 22 hours, 1 minute per year. 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 Luverne Wind Energy Center Repower Project will consist of 33 repowered wind turbines. The proposed wind turbines are all GE 1.5 MW units with a rotor diameter of 97 meters and a hub height of 80 meters. Figure 2-1 shows the locations of the 33 wind turbines 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.

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 Atwell. 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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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

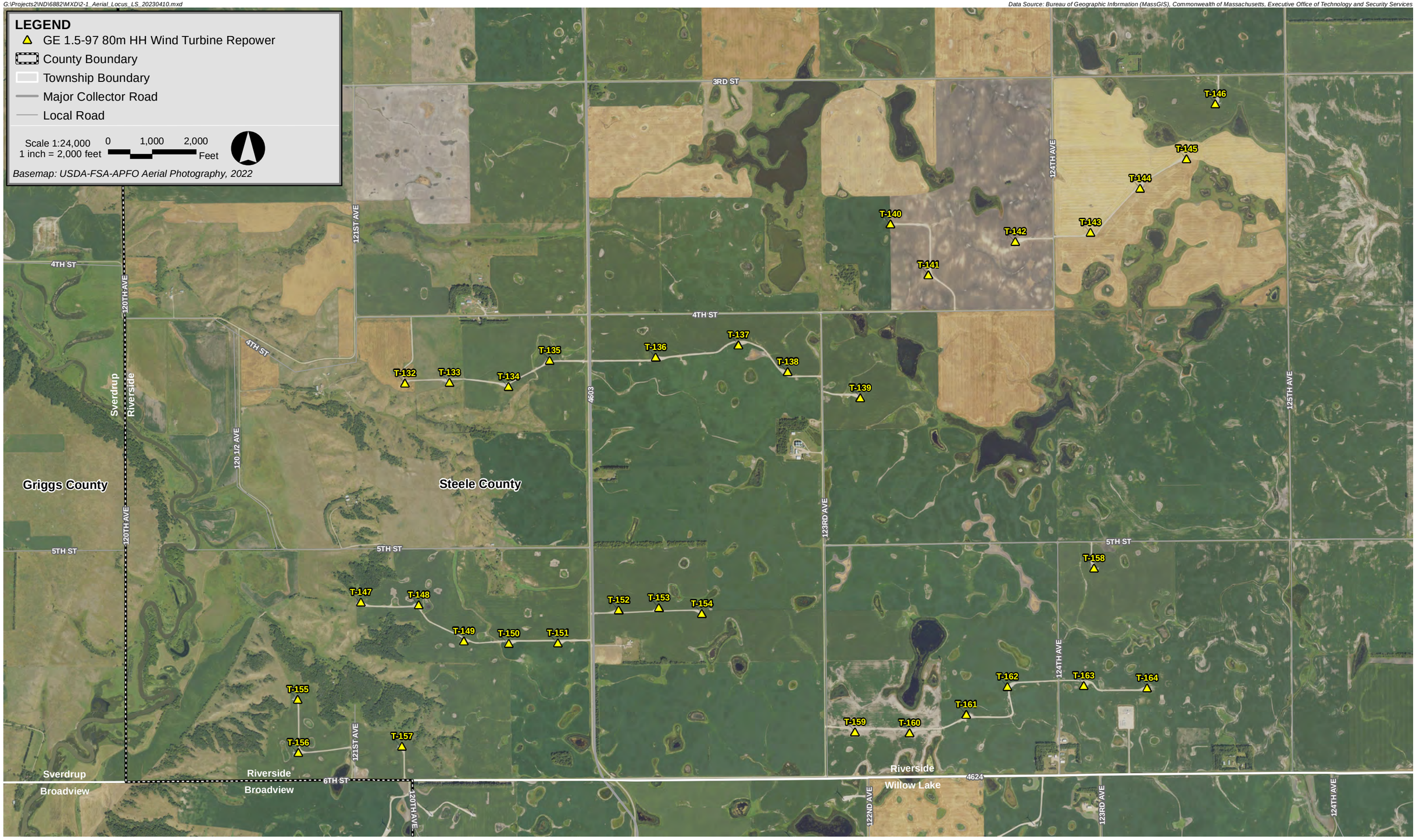
LEGEND

- GE 1.5-97 80m HH Wind Turbine Repower
- County Boundary
- Township Boundary
- Major Collector Road
- Local Road

Scale 1:24,000
1 inch = 2,000 feet

0 1,000 2,000 Feet

Basemap: USDA-FSA-APFO Aerial Photography, 2022



Luverne Wind Repower **Steele County, North Dakota**

Epsilon Associates Inc.

Figure 2-1
Aerial Locus

3.0 SHADOW FLICKER MODELING

3.1 Modeling Methodology

Shadow flicker was modeled using a software package, WindPRO version 3.6. 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 sent to Epsilon on December 20, 2022. Locations of the turbines are shown in Figure 3-1 and the coordinates are provided in Appendix A. All 33 wind turbines are GE 1.5-97 wind turbines with a 97-meter rotor diameter and a hub height of 80 meters. Each wind turbine has the following characteristics based on the technical data provided by Atwell:

		GE 1.5-97
♦ Rated Power	=	1,500 kW
♦ Hub Height	=	80 meters
♦ Rotor Diameter	=	97 meters
♦ Cut-in Wind Speed	=	3 m/s
♦ Cut-out Wind Speed	=	25 m/s
♦ Maximum RPM	=	16.2 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. For this Project, ten times the largest rotor diameter of the proposed wind turbines corresponds to a distance of 0.6 miles (970 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 and existing wind turbines.

A modeling receptor dataset was provided to Epsilon on January 26, 2023. The dataset included 40 receptors. Atwell provided additional information stating that receptor L37 was uninhabited; therefore, a total of 39 receptors were input to the model. Each modeling point was assumed to have a window facing all directions ("greenhouse" mode) which yields conservative results. All

modeling receptors are identified in Figure 3-1. 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 modeling receptors 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 Fargo, North Dakota from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI).[1] 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. A publicly available dataset[2] using measured data for a five-year period of hourly wind directions and wind speeds at 3 meters and 10 meters was obtained by Epsilon. Epsilon then scaled this dataset to 80 meters 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 85% of the year. Table 3-2 shows the distribution of operational hours for the 16 wind directions.

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[1] NCEI (formerly NCDC), https://www1.ncdc.noaa.gov/pub/data/ccd-data/pctpos20.dat. Accessed in March 2023.

[2] North Dakota Agricultural Weather Network (NDAWN), 2018-2022, Carrington, ND.

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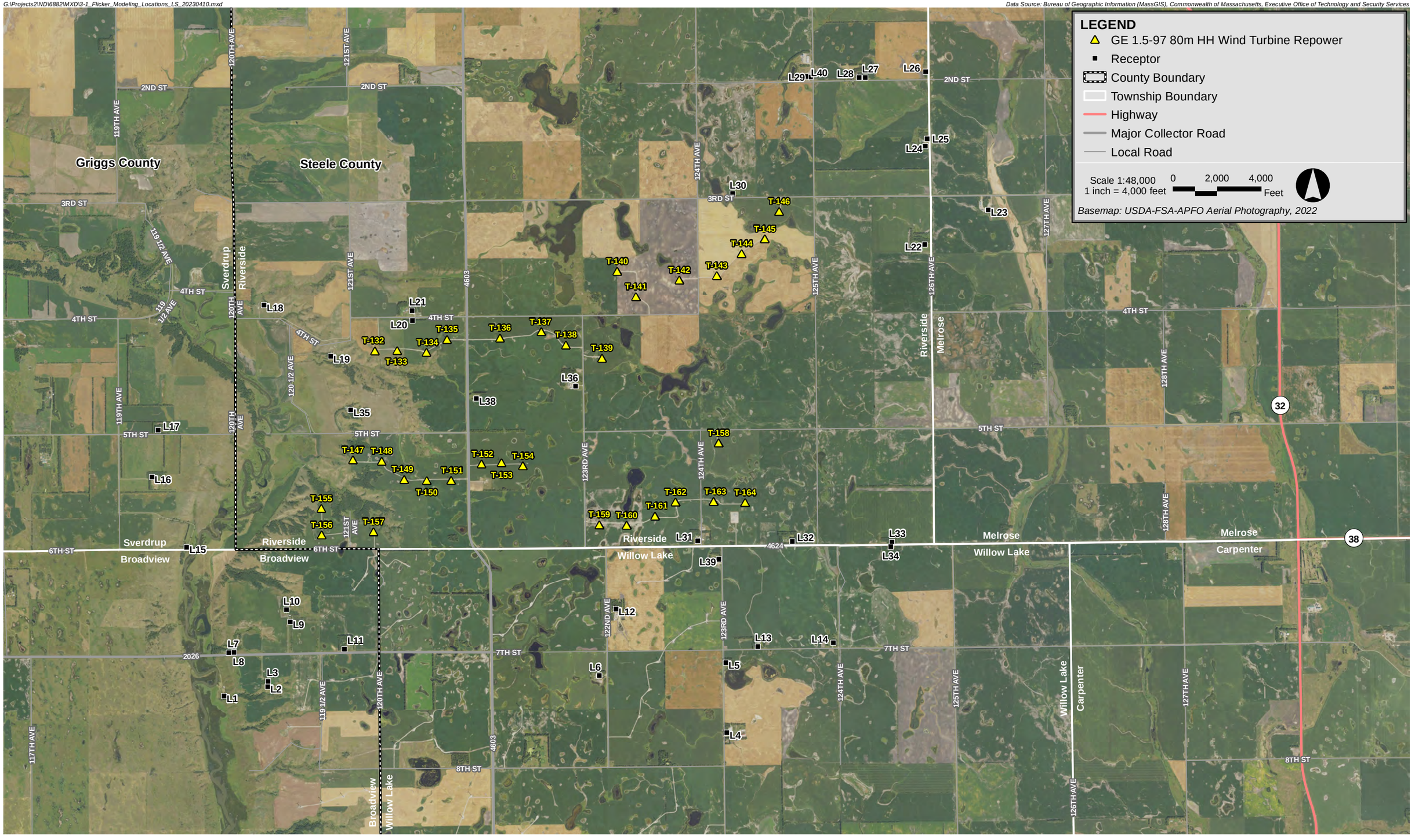
Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Luverne Wind Repower **Steele County, North Dakota**

Epsilon Associates Inc.

Figure 3-1

Shadow Flicker Modeling Locations

Table 3-1 Monthly Percent of Possible Sunshine

Month	Possible Sunshine
January	52%
February	54%
March	59%
April	57%
May	60%
June	64%
July	74%
August	71%
September	63%
October	51%
November	39%
December	39%

Table 3-2 Operational Hours per Wind Direction Sector

Wind Sector	Operational Hours
N	364
NNE	231
NE	235
ENE	234
E	299
ESE	398
SE	720
SSE	587
S	362
SSW	314
SW	482
WSW	477
W	675
WNW	931
NW	686
NNW	429
Annual	7424

3.2 Results

Following the modeling methodology outlined in Section 3.1, WindPRO was used to calculate shadow flicker at the 39 discrete modeling receptor points. In addition to the discrete modeling points, shadow flicker isolines were generated based on the grid calculations. Table B-1.1 in Appendix B presents the modeling results for the receptors sorted by ID. Table B-1.2 in Appendix B presents the modeling results for the receptors sorted by Expected Flicker. Both worst-case and expected values are presented.

The modeled worst-case annual shadow flicker duration for all 39 receptors ranged from 0 hours, 0 minutes per year to 85 hours, 12 minutes per year. The maximum flicker duration was at receptor L20.

The predicted expected annual shadow flicker duration ranged from 0 hours, 0 minutes per year to 22 hours, 1 minute per year. The maximum expected flicker duration calculated was at receptor L20. Twenty eight (28) of the receptors were predicted to experience no annual shadow flicker. Seven (7) of the receptors were predicted to experience some shadow flicker but less than 10 hours per year. The modeling results showed that four (4) of the receptors would be expected to have between 10 hours and 30 hours of shadow flicker per year. Zero (0) receptors are expected to have over 30 hours of flicker per year. Figure 3-2 displays the modeled flicker isolines (expected hrs/yr) over aerial imagery in relation to modeled wind turbines and modeling receptors.

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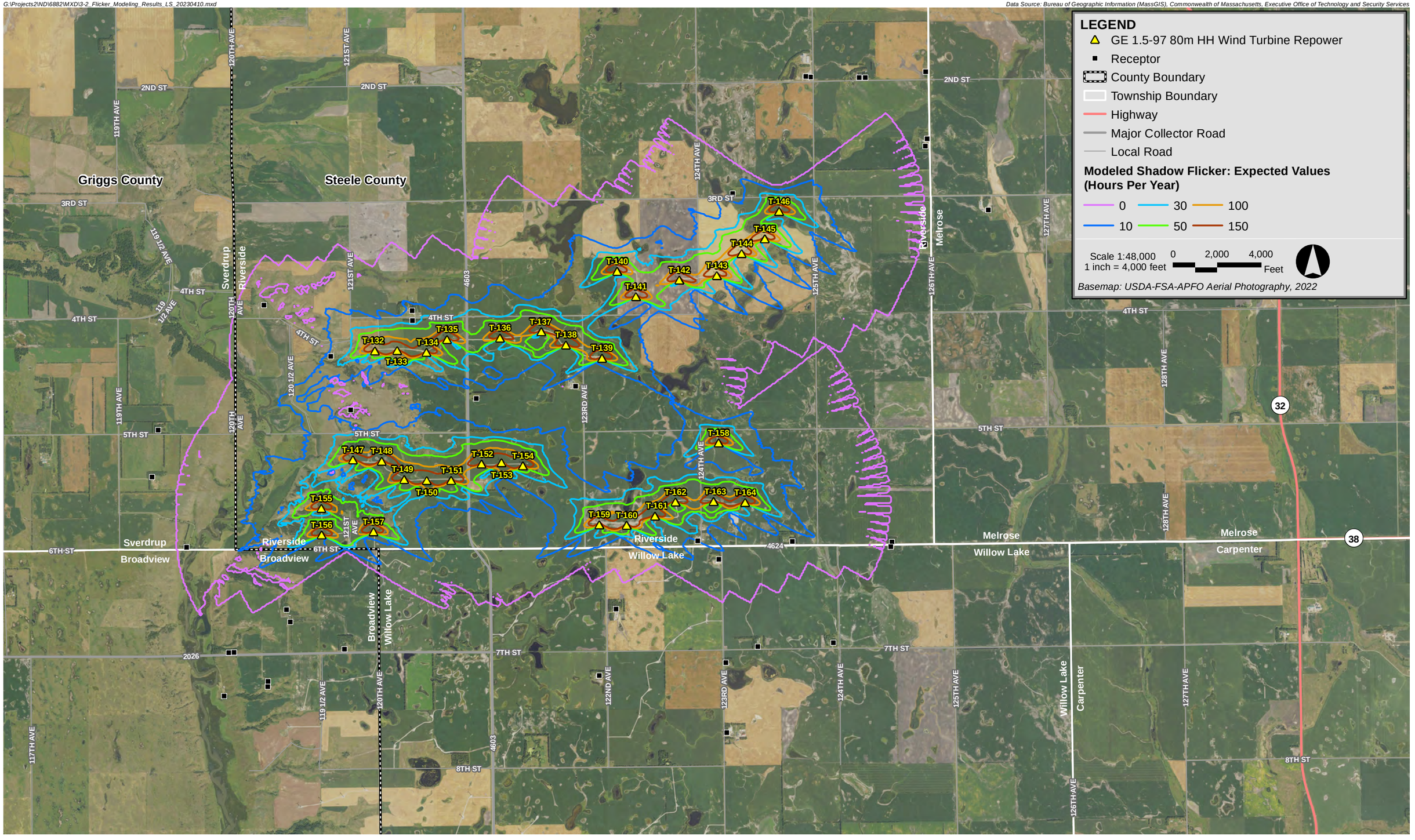
Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Luverne Wind Repower **Steele County, North Dakota**

Epsilon ASSOCIATES INC.

Figure 3-2

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 14N (meters)	
			X (Easting)	Y (Northing)
T-132	GE 1.5-97	80	578517.24	5244672.39
T-133	GE 1.5-97	80	578826.67	5244676.53
T-134	GE 1.5-97	80	579235.03	5244648.56
T-135	GE 1.5-97	80	579519.62	5244830.47
T-136	GE 1.5-97	80	580251.83	5244851.41
T-137	GE 1.5-97	80	580824.66	5244937.29
T-138	GE 1.5-97	80	581167.19	5244752.82
T-139	GE 1.5-97	80	581668.21	5244570.68
T-140	GE 1.5-97	80	581878.53	5245774.06
T-141	GE 1.5-97	80	582139.93	5245422.35
T-142	GE 1.5-97	80	582741.17	5245652.97
T-143	GE 1.5-97	80	583261.20	5245715.78
T-144	GE 1.5-97	80	583604.29	5246020.87
T-145	GE 1.5-97	80	583926.35	5246225.65
T-146	GE 1.5-97	80	584124.89	5246606.30
T-147	GE 1.5-97	80	578212.34	5243156.78
T-148	GE 1.5-97	80	578613.18	5243139.56
T-149	GE 1.5-97	80	578926.12	5242888.10
T-150	GE 1.5-97	80	579235.93	5242870.26
T-151	GE 1.5-97	80	579576.05	5242874.84
T-152	GE 1.5-97	80	579996.11	5243102.73
T-153	GE 1.5-97	80	580275.47	5243117.98
T-154	GE 1.5-97	80	580570.56	5243077.44
T-155	GE 1.5-97	80	577775.59	5242483.98
T-156	GE 1.5-97	80	577780.43	5242117.25
T-157	GE 1.5-97	80	578497.71	5242160.33
T-158	GE 1.5-97	80	583286.60	5243393.02
T-159	GE 1.5-97	80	581632.29	5242258.43
T-160	GE 1.5-97	80	582010.61	5242252.24
T-161	GE 1.5-97	80	582401.49	5242380.30
T-162	GE 1.5-97	80	582685.87	5242572.91
T-163	GE 1.5-97	80	583215.05	5242580.37
T-164	GE 1.5-97	80	583653.42	5242564.57

Appendix B

Shadow Flicker Modeling Results: Modeling Receptors

Table B-1.1: Shadow Flicker Modeling Results at Discrete Points - Sorted by Receptor ID

Receptor ID	Coordinates UTM NAD83 Zone 14N (meters)		Worst Case Shadow Flicker Hours per Year	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)	(HH:MM/year)	(HH:MM/year)
L1	576423.27	5239881.84	0:00	0:00
L2	577029.96	5240014.58	0:00	0:00
L3	577035.85	5240087.47	0:00	0:00
L4	583399.72	5239374.00	0:00	0:00
L5	583387.15	5240348.46	0:00	0:00
L6	581632.42	5240165.69	0:00	0:00
L7	576491.93	5240485.96	0:00	0:00
L8	576564.55	5240490.68	0:00	0:00
L9	577344.04	5240910.55	0:00	0:00
L10	577289.60	5241080.11	0:00	0:00
L11	578096.72	5240534.24	0:00	0:00
L12	581862.55	5241090.16	0:00	0:00
L13	583831.22	5240569.56	0:00	0:00
L14	584880.11	5240621.88	0:00	0:00
L15	575905.69	5241949.56	4:46	1:41
L16	575424.70	5242922.41	0:00	0:00
L17	575509.75	5243573.82	0:00	0:00
L18	576978.42	5245308.26	4:42	1:30
L19	577903.54	5244595.42	36:50	13:30
L20	579040.35	5245093.04	85:12	22:01
L21	579035.09	5245231.44	74:11	18:51
L22	586144.56	5246150.00	0:00	0:00
L23	587027.75	5246631.22	0:00	0:00
L24	586153.90	5247517.22	0:00	0:00
L25	586178.12	5247618.30	0:00	0:00
L26	586157.97	5248548.89	0:00	0:00
L27	585319.35	5248466.39	0:00	0:00
L28	585233.95	5248467.61	0:00	0:00
L29	584561.59	5248475.39	0:00	0:00
L30	583482.04	5246855.54	18:43	5:57
L31	582997.86	5242037.63	29:26	11:44
L32	584307.76	5242029.53	16:05	6:36
L33	585692.25	5242020.78	0:00	0:00
L34	585673.49	5241957.43	0:00	0:00
L35	578181.62	5243851.70	0:00	0:00
L36	581301.12	5244181.87	3:57	1:05
L38	579925.20	5244012.65	19:58	7:01
L39	583289.33	5241779.21	6:40	2:40
L40	584496.45	5248483.45	0:00	0:00

Table B-1.2: Shadow Flicker Modeling Results at Discrete Points - Sorted by Expected Flicker

Receptor ID	Coordinates UTM NAD83 Zone 14N (meters)		Worst Case Shadow Flicker Hours per Year	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)	(HH:MM/year)	(HH:MM/year)
L20	579040.35	5245093.04	85:12	22:01
L21	579035.09	5245231.44	74:11	18:51
L19	577903.54	5244595.42	36:50	13:30
L31	582997.86	5242037.63	29:26	11:44
L38	579925.20	5244012.65	19:58	7:01
L32	584307.76	5242029.53	16:05	6:36
L30	583482.04	5246855.54	18:43	5:57
L39	583289.33	5241779.21	6:40	2:40
L15	575905.69	5241949.56	4:46	1:41
L18	576978.42	5245308.26	4:42	1:30
L36	581301.12	5244181.87	3:57	1:05
L1	576423.27	5239881.84	0:00	0:00
L2	577029.96	5240014.58	0:00	0:00
L3	577035.85	5240087.47	0:00	0:00
L4	583399.72	5239374.00	0:00	0:00
L5	583387.15	5240348.46	0:00	0:00
L6	581632.42	5240165.69	0:00	0:00
L7	576491.93	5240485.96	0:00	0:00
L8	576564.55	5240490.68	0:00	0:00
L9	577344.04	5240910.55	0:00	0:00
L10	577289.60	5241080.11	0:00	0:00
L11	578096.72	5240534.24	0:00	0:00
L12	581862.55	5241090.16	0:00	0:00
L13	583831.22	5240569.56	0:00	0:00
L14	584880.11	5240621.88	0:00	0:00
L16	575424.70	5242922.41	0:00	0:00
L17	575509.75	5243573.82	0:00	0:00
L22	586144.56	5246150.00	0:00	0:00
L23	587027.75	5246631.22	0:00	0:00
L24	586153.90	5247517.22	0:00	0:00
L25	586178.12	5247618.30	0:00	0:00
L26	586157.97	5248548.89	0:00	0:00
L27	585319.35	5248466.39	0:00	0:00
L28	585233.95	5248467.61	0:00	0:00
L29	584561.59	5248475.39	0:00	0:00
L33	585692.25	5242020.78	0:00	0:00
L34	585673.49	5241957.43	0:00	0:00
L35	578181.62	5243851.70	0:00	0:00
L40	584496.45	5248483.45	0:00	0:00

Project:
6882 Otter Tail Luverne Wind

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L15 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4549)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:17	07:58	07:13	07:12	06:16	05:39	05:37	06:07	06:47	07:27	08:11	07:55
	16:49	17:30	18:12	19:56	20:38	21:17	21:31	21:07	20:15	19:15	18:16	16:43
2	08:17	07:57	07:11	07:10	07:33 (31)	06:15	05:38	05:37	06:08	06:48	07:28	08:13	07:56
	16:50	17:32	18:13	19:58	3 07:36 (31)	20:40	21:18	21:30	21:06	20:13	19:13	18:14	16:42
3	08:17	07:55	07:09	07:08	07:31 (31)	06:13	05:37	05:38	06:09	06:50	07:30	08:14	07:57
	16:51	17:33	18:15	19:59	7 07:38 (31)	20:41	21:18	21:30	21:04	20:11	19:11	18:12	16:42
4	08:17	07:54	07:07	07:06	07:29 (31)	06:11	05:37	05:39	06:10	06:51 07:29 (31)	07:31	08:16	07:58
	16:52	17:35	18:16	20:01	9 07:38 (31)	20:42	21:19	21:30	21:03	20:09 1 07:30 (31)	19:09	18:11	16:41
5	08:17	07:53	07:06	07:04	07:27 (31)	06:10	05:36	05:39	06:12	06:52 07:25 (31)	07:33	07:17	07:59
	16:53	17:36	18:18	20:02	12 07:39 (31)	20:44	21:20	21:30	21:01	20:07 7 07:32 (31)	19:07	17:09	16:41
6	08:17	07:51	07:04	07:02	07:26 (31)	06:08	05:36	05:40	06:13	06:54 07:24 (31)	07:34	07:19	08:01
	16:54	17:38	18:19	20:03	12 07:38 (31)	20:45	21:21	21:29	21:00	20:05 10 07:34 (31)	19:05	17:08	16:41
7	08:17	07:50	07:02	07:00	07:26 (31)	06:07	05:35	05:41	06:14	06:55 07:22 (31)	07:35	07:20	08:02
	16:55	17:39	18:21	20:05	12 07:38 (31)	20:46	21:22	21:29	20:59	20:03 12 07:34 (31)	19:03	17:07	16:40
8	08:17	07:48	07:00	06:58	07:27 (31)	06:05	05:35	05:42	06:16	06:56 07:22 (31)	07:37	07:22	08:03
	16:56	17:41	18:22	20:06	9 07:36 (31)	20:48	21:23	21:29	20:57	20:01 12 07:34 (31)	19:01	17:05	16:40
9	08:16	07:47	06:58	06:56	07:29 (31)	06:04	05:35	05:42	06:17	06:58 07:22 (31)	07:38	07:23	08:04
	16:58	17:42	18:24	20:08	6 07:35 (31)	20:49	21:23	21:28	20:56	19:59 11 07:33 (31)	18:57	17:04	16:40
10	08:16	07:45	06:56	06:54	06:02	05:34	05:43	06:18	06:59 07:24 (31)	07:39	07:25	08:05
	16:59	17:44	18:25	20:09	20:50	21:24	21:28	20:54	19:57 9 07:33 (31)	18:55	17:02	16:40
11	08:16	07:44	06:54	06:52	06:01	05:34	05:44	06:19	07:00 07:25 (31)	07:41	07:26	08:06
	17:00	17:46	18:26	20:10	20:52	21:25	21:27	20:52	19:55 6 07:31 (31)	18:53	17:01	16:40
12	08:15	07:42	07:52	06:50	06:00	05:34	05:45	06:21	07:02	07:42	07:28	08:07
	17:01	17:47	18:28	20:12	20:53	21:26	21:27	20:51	19:53	18:51	17:00	16:40
13	08:15	07:41	07:50	06:48	05:58	05:33	05:46	06:22	07:03	07:44	07:29	08:08
	17:02	17:49	19:29	20:13	20:54	21:26	21:26	20:49	19:51	18:49	16:59	16:40
14	08:14	07:39	07:48	06:47	05:57	05:33	05:47	06:23 07:01 (24)	07:04	07:45	07:31	08:09
	17:04	17:50	19:31	20:15	20:56	21:27	21:25	20:48 2 07:03 (24)	19:49	18:47	16:57	16:40
15	08:14	07:38	07:46	06:45	05:56	05:33	05:48	06:25 06:58 (24)	07:06	07:47	07:32	08:09
	17:05	17:52	19:32	20:16	20:57	21:27	21:25	20:46 8 07:06 (24)	19:47	18:45	16:56	16:40
16	08:13	07:36	07:44	06:43	05:54	05:33	05:49	06:26 06:57 (24)	07:07	07:48	07:34	08:10
	17:06	17:53	19:34	20:17	20:58	21:28	21:24	20:44 9 07:06 (24)	19:45	18:43	16:55	16:40
17	08:12	07:34	07:42	06:41	05:53	05:33	05:50	06:27 06:55 (24)	07:08	07:49	07:35	08:11
	17:08	17:55	19:35	20:19	21:00	21:28	21:23	20:43 12 07:07 (24)	19:43	18:41	16:54	16:40
18	08:12	07:33	07:40	06:39	05:52	05:33	05:51	06:29 06:56 (24)	07:10	07:51	07:37	08:12
	17:09	17:56	19:37	20:20	21:01	21:29	21:22	20:41 12 07:08 (24)	19:41	18:40	16:53	16:41
19	08:11	07:31	07:38	06:37	05:51	05:33	05:52	06:30 06:56 (24)	07:11	07:52	07:38	08:12
	17:11	17:58	19:38	20:22	21:02	21:29	21:21	20:39 11 07:07 (24)	19:39	18:38	16:52	16:41
20	08:10	07:29	07:36	06:35	05:50	05:33	05:53	06:31 06:57 (24)	07:12	07:54	07:40	08:13
	17:12	18:00	19:39	20:23	21:03	21:29	21:20	20:37 9 07:06 (24)	19:37	18:36	16:51	16:41
21	08:09	07:28	07:34	06:34	05:48	05:33	05:54	06:33 06:58 (24)	07:14	07:55	07:41	08:14
	17:13	18:00	19:41	20:24	21:04	21:30	21:20	20:36 7 07:05 (24)	19:35	18:34	16:50	16:42
22	08:08	07:26	07:32	06:32	06:56 (24)	05:47	05:34	05:55 06:34 07:00 (24)	07:15	07:57	07:43	08:14
	17:15	18:01	19:42	20:26	3 06:59 (24)	21:06	21:30	21:19 20:34 4 07:04 (24)	19:33	18:32	16:49	16:42
23	08:08	07:24	07:30	06:30	06:54 (24)	05:46	05:34	05:56 06:35	07:16	07:58	07:44	08:15
	17:16	18:03	19:44	20:27	6 07:00 (24)	21:07	21:30	21:18 20:32	19:31	18:31	16:48	16:43
24	08:07	07:22	07:28	06:28	06:52 (24)	05:45	05:34	05:57 06:37	07:18	08:00	07:45	08:15
	17:18	18:04	19:45	20:29	9 07:01 (24)	21:08	21:30	21:17 20:30	19:29	18:29	16:47	16:43
25	08:06	07:20	07:26	06:26	06:50 (24)	05:44	05:34	05:58 06:38	07:19	08:01	07:47	08:16
	17:19	18:06	19:47	20:30	10 07:00 (24)	21:09	21:31	21:15 20:28	19:27	18:27	16:46	16:44
26	08:05	07:19	07:24	06:25	06:49 (24)	05:43	05:35	05:59 06:39	07:20	08:03	07:48	08:16
	17:21	18:07	19:48	20:31	12 07:01 (24)	21:10	21:31	21:14 20:26	19:25	18:25	16:46	16:44
27	08:04	07:17	07:22	06:23	06:49 (24)	05:43	05:35	06:01 06:41	07:22	08:04	07:49	08:16
	17:22	18:09	19:49	20:33	11 07:00 (24)	21:11	21:31	21:13 20:25	19:23	18:24	16:45	16:45
28	08:02	07:15	07:20	06:21	06:49 (24)	05:42	05:35	06:02 06:42	07:23	08:05	07:51	08:17
	17:24	18:10	19:51	20:34	10 06:59 (24)	21:12	21:31	21:12 20:23	19:21	18:22	16:44	16:46
29	08:01		07:18	06:20	06:50 (24)	05:41	05:36	06:03 06:43	07:24	08:07	07:52	08:17
	17:25		19:52	20:35	9 06:59 (24)	21:14	21:31	21:11 20:21	19:19	18:20	16:44	16:46
30	08:00		07:16	06:18	06:52 (24)	05:40	05:36	06:04 06:45	07:26	08:08	07:53	08:17
	17:27		19:54	20:37	4 06:56 (24)	21:15	21:31	21:10 20:19	19:17	18:19	16:43	16:47
31	07:59		07:14		05:39		06:05	06:46		08:10		08:17
	17:28		19:55		21:16		21:08	20:17		18:17		16:48
Potential sun hours	277	286	367	406	466	476	482	443	380	339	282	265
Total, worst case				144				74	68			
Sun reduction				0.57				0.71	0.63			
Oper. time red.				0.85				0.85	0.85			
Wind dir. red.				0.68				0.66	0.69			
Total reduction				0.33				0.40	0.37			
Total, real				47				29	25			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L18 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4552)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January	February		March	April	May	June	July	August	September	October		November	December
1	08:17	07:58		07:13	07:12	06:16	05:38	05:37	06:07	06:47	07:27		08:11	07:55
	16:49	17:30		18:12	19:56	20:38	21:17	21:31	21:07	20:15	19:15		18:15	16:42
2	08:17	07:57		07:11	07:10	06:14	05:38	05:37	06:08	06:48	07:28		08:13	07:56
	16:50	17:31		18:13	19:58	20:40	21:18	21:31	21:06	20:13	19:13		18:14	16:42
3	08:17	07:55		07:09	07:08	06:13	05:37	05:38	06:09	06:50	07:30		08:14	07:57
	16:51	17:33		18:15	19:59	20:41	21:19	21:30	21:04	20:11	19:11		18:12	16:41
4	08:17	07:54		07:07	07:06	06:11	05:37	05:38	06:10	06:51	07:31		08:16	07:58
	16:52	17:34		18:16	20:01	20:42	21:19	21:30	21:03	20:09	19:09		18:11	16:41
5	08:17	07:53		07:06	07:04	06:10	05:36	05:39	06:12	06:52	07:32		07:17	07:59
	16:53	17:36		18:18	20:02	20:44	21:20	21:30	21:02	20:07	19:07		17:09	16:41
6	08:17	07:51		07:04	07:02	06:08	05:36	05:40	06:13	06:54	07:34		07:19	08:01
	16:54	17:38		18:19	20:03	20:45	21:21	21:29	21:00	20:05	19:05		17:08	16:40
7	08:17	07:50		07:02	07:00	06:07	05:35	05:41	06:14	06:55	07:35		07:20	08:02
	16:55	17:39		18:21	20:05	20:46	21:22	21:29	20:59	20:03	19:03		17:06	16:40
8	08:17	07:48		07:00	06:58	06:05	05:35	05:41	06:15	06:56	07:37		07:22	08:03
	16:56	17:41		18:22	20:06	20:48	21:23	21:29	20:57	20:01	19:01		17:05	16:40
9	08:16	07:47		06:58	06:56	06:04	05:34	05:42	06:17	06:58	07:38		07:23	08:04
	16:57	17:42		18:23	20:08	20:49	21:24	21:28	20:56	19:59	18:57		17:04	16:40
10	08:16	07:45		06:56	06:54	06:02	05:34	05:43	06:18	06:59	07:39		07:25	08:05
	16:59	17:44		18:25	20:09	20:50	21:24	21:28	20:54	19:57	18:55		17:02	16:40
11	08:16	07:44		06:54	06:52	06:01	05:34	05:44	06:19	07:00	07:41		07:26	08:06
	17:00	17:45		18:26	20:10	20:52	21:25	21:27	20:52	19:55	18:53		17:01	16:40
12	08:15	07:42	08:07 (9)	07:52	06:50	05:59	05:33	05:45	06:21	07:02	07:42		07:28	08:07
	17:01	17:47	1 08:08 (9)	18:28	20:12	20:53	21:26	21:27	20:51	19:53	18:51		17:00	16:39
13	08:15	07:41	08:06 (9)	07:50	06:48	05:58	05:33	05:46	06:22	07:03	07:44		07:29	08:08
	17:02	17:49	5 08:11 (9)	19:29	20:13	20:54	21:26	21:26	20:49	19:51	18:49		16:58	16:40
14	08:14	07:39	08:04 (9)	07:48	06:46	05:57	05:33	05:46	06:23	07:04	07:45		07:31	08:09
	17:04	17:50	8 08:12 (9)	19:31	20:15	20:56	21:27	21:25	20:48	19:49	18:47		16:57	16:40
15	08:14	07:38	08:03 (9)	07:46	06:45	05:55	05:33	05:47	06:25	07:06	07:47		07:32	08:09
	17:05	17:52	10 08:13 (9)	19:32	20:16	20:57	21:27	21:25	20:46	19:47	18:45		16:56	16:40
16	08:13	07:36	08:01 (9)	07:44	06:43	05:54	05:33	05:48	06:26	07:07	07:48		07:34	08:10
	17:06	17:53	12 08:13 (9)	19:34	20:17	20:58	21:28	21:24	20:44	19:45	18:43		16:55	16:40
17	08:12	07:34	07:59 (9)	07:42	06:41	05:53	05:33	05:49	06:27	07:08	07:49		07:35	08:11
	17:08	17:55	14 08:13 (9)	19:35	20:19	21:00	21:28	21:23	20:43	19:43	18:41		16:54	16:40
18	08:12	07:33	07:59 (9)	07:40	06:39	05:52	05:33	05:50	06:29	07:10	07:51	08:21 (28)	07:37	08:12
	17:09	17:56	13 08:12 (9)	19:37	20:20	21:01	21:29	21:22	20:41	19:41	18:40	7 08:28 (28)	16:53	16:40
19	08:11	07:31	07:56 (28)	07:38	06:37	05:51	05:33	05:51	06:30	07:11	07:52	08:19 (28)	07:38	08:12
	17:10	17:58	13 08:12 (9)	19:38	20:22	21:02	21:29	21:21	20:39	19:39	18:38	9 08:28 (28)	16:52	16:41
20	08:10	07:29	07:54 (28)	07:36	06:35	05:49	05:33	05:53	06:31	07:12	07:54	08:19 (28)	07:40	08:13
	17:12	17:59	15 08:11 (9)	19:39	20:23	21:03	21:30	21:21	20:37	19:37	18:36	11 08:30 (28)	16:51	16:41
21	08:09	07:28	07:52 (28)	07:34	06:33	05:48	05:33	05:54	06:32	07:14	07:55	08:20 (28)	07:41	08:14
	17:13	18:01	13 08:09 (9)	19:41	20:24	21:05	21:30	21:20	20:36	19:35	18:34	9 08:29 (28)	16:50	16:41
22	08:08	07:26	07:50 (28)	07:32	06:32	05:47	05:33	05:55	06:34	07:15	07:57	08:22 (28)	07:43	08:14
	17:15	18:01	9 07:59 (28)	19:42	20:26	21:06	21:30	21:19	20:34	19:33	18:32	10 08:38 (9)	16:49	16:42
23	08:08	07:24	07:48 (28)	07:30	06:30	05:46	05:34	05:56	06:35	07:16	07:58	08:24 (28)	07:44	08:15
	17:16	18:02	10 07:58 (28)	19:44	20:27	21:07	21:30	21:18	20:32	19:31	18:30	14 08:41 (9)	16:48	16:42
24	08:07	07:22	07:49 (28)	07:28	06:28	05:45	05:34	05:57	06:36	07:18	08:00	08:25 (28)	07:45	08:15
	17:18	18:04	9 07:58 (28)	19:45	20:29	21:08	21:31	21:17	20:30	19:29	18:29	15 08:42 (9)	16:47	16:43
25	08:06	07:20	07:50 (28)	07:26	06:26	05:44	05:34	05:58	06:38	07:19	08:01	08:30 (9)	07:47	08:16
	17:19	18:06	7 07:57 (28)	19:46	20:30	21:09	21:31	21:16	20:28	19:27	18:27	13 08:43 (9)	16:46	16:43
26	08:05	07:19		07:24	06:25	05:43	05:34	05:59	06:39	07:20	08:03	08:29 (9)	07:48	08:16
	17:21	18:07		19:48	20:31	21:10	21:31	21:14	20:26	19:25	18:25	13 08:42 (9)	16:46	16:44
27	08:04	07:17		07:22	06:23	05:42	05:35	06:00	06:40	07:22	08:04	08:30 (9)	07:49	08:16
	17:22	18:09		19:49	20:33	21:11	21:31	21:13	20:25	19:23	18:24	13 08:43 (9)	16:45	16:45
28	08:03	07:15		07:20	06:21	05:42	05:35	06:02	06:42	07:23	08:05	08:31 (9)	07:51	08:17
	17:24	18:10		19:51	20:34	21:13	21:31	21:12	20:23	19:21	18:22	11 08:42 (9)	16:44	16:46
29	08:01			07:18	06:19	05:41	05:36	06:03	06:43	07:24	08:07	08:33 (9)	07:52	08:17
	17:25			19:52	20:35	21:14	21:31	21:11	20:21	19:19	18:20	9 08:42 (9)	16:44	16:46
30	08:00			07:16	06:18	05:40	05:36	06:04	06:44	07:26	08:08	08:35 (9)	07:53	08:17
	17:27			19:54	20:37	21:15	21:31	21:10	20:19	19:17	18:19	6 08:41 (9)	16:43	16:47
31	07:59			07:14		05:39		06:05	06:46		08:10	08:36 (9)		08:17
	17:28			19:55		21:16		21:08	20:17		18:17	3 08:39 (9)		16:48
Potential sun hours	277	286		367	406	466	476	482	443	380	339		282	265
Total, worst case			139									143		
Sun reduction			0.54									0.51		
Oper. time red.			0.85									0.85		
Wind dir. red.			0.72									0.72		
Total reduction			0.33									0.31		
Total, real			46									45		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L19 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4553)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:17	07:58	07:13	07:12	07:37 (30)	06:16	07:24 (9)	05:38	05:37	06:07	06:47	07:14 (19)	07:27	08:11	07:55
	16:49	17:30	18:12	19:56	16 07:53 (30)	20:38	28 07:52 (9)	21:17	21:31	21:07	20:15	39 07:53 (9)	19:15	18:15	16:42
2	08:17	07:57	07:11	07:10	07:37 (30)	06:14	07:25 (9)	05:38	05:37	06:08	06:48	07:14 (19)	07:28	08:13	07:56
	16:50	17:31	18:13	19:58	16 07:53 (30)	20:40	27 07:52 (9)	21:18	21:30	21:06	20:13	36 07:50 (28)	19:12	18:14	16:42
3	08:17	07:55	07:09	07:08	07:36 (30)	06:13	07:26 (9)	05:37	05:38	06:09	06:50	07:15 (19)	07:30	08:14	07:57
	16:51	17:33	18:15	19:59	17 07:53 (30)	20:41	24 07:50 (9)	21:18	21:30	21:04	20:11	36 07:51 (28)	19:10	18:12	16:41
4	08:17	07:54	07:07	07:06	07:36 (30)	06:11	07:28 (9)	05:37	05:38	06:10	06:51	07:16 (19)	07:31	08:16	07:58
	16:52	17:34	18:16	20:01	17 07:53 (30)	20:42	21 07:49 (9)	21:19	21:30	21:03	20:09	34 07:50 (28)	19:08	18:11	16:41
5	08:17	07:53	07:06	07:04	07:34 (28)	06:10	07:29 (9)	05:36	05:39	06:12	06:52	07:17 (19)	07:32	08:17	07:59
	16:53	17:36	18:18	20:02	18 07:52 (30)	20:44	17 07:46 (9)	21:20	21:30	21:01	20:07	31 07:49 (28)	19:06	17:09	16:41
6	08:17	07:51	07:04	07:02	07:32 (28)	06:08	07:32 (9)	05:36	05:40	06:13	06:54	07:19 (19)	07:34	07:19	08:01
	16:54	17:38	18:19	20:03	18 07:50 (28)	20:45	12 07:44 (9)	21:21	21:29	21:00	20:05	25 07:48 (28)	19:04	17:08	16:40
7	08:17	07:50	07:02	07:00	07:31 (28)	06:07		05:35	05:41	06:14	06:55	07:28 (28)	07:35	07:20	08:02
	16:55	17:39	18:20	20:05	20 07:51 (28)	20:46		21:22	21:29	20:59	20:03	19 07:47 (28)	19:03	17:06	16:40
8	08:17	07:48	07:00	06:58	07:21 (19)	06:05		05:35	05:41	06:15	07:42 (9)	06:56	07:28 (28)	07:37	07:22	08:03
	16:56	17:41	18:22	20:06	28 07:51 (28)	20:48		21:23	21:29	20:57	11 07:53 (9)	20:01	18 07:46 (30)	19:01	17:05	16:40
9	08:16	07:47	06:58	06:56	07:19 (19)	06:04		05:34	05:42	06:17	07:39 (9)	06:58	07:30 (28)	07:38	07:23	08:04
	16:57	17:42	18:23	20:08	32 07:52 (28)	20:49		21:23	21:28	20:55	16 07:55 (9)	19:59	16 07:46 (30)	18:57	17:04	16:40
10	08:16	07:45	06:56	06:54	07:17 (19)	06:02		05:34	05:43	06:18	07:37 (9)	06:59	07:30 (30)	07:39	07:25	08:05
	16:59	17:44	18:25	20:09	35 07:52 (28)	20:50		21:24	21:28	20:54	21 07:58 (9)	19:57	17 07:47 (30)	18:55	17:02	16:40
11	08:16	07:44	06:54	06:52	07:16 (19)	06:01		05:34	05:44	06:19	07:35 (9)	07:00	07:30 (30)	07:41	07:26	08:06
	17:00	17:45	18:26	20:10	36 07:52 (28)	20:52		21:25	21:27	20:52	24 07:59 (9)	19:55	17 07:47 (30)	18:53	17:01	16:39
12	08:15	07:42	07:52	06:50	07:16 (19)	05:59		05:33	05:45	06:21	07:34 (9)	07:02	07:29 (30)	07:42	07:28	08:07
	17:01	17:47	18:28	20:12	37 07:53 (9)	20:53		21:26	21:27	20:51	26 08:00 (9)	19:53	17 07:46 (30)	18:51	17:00	16:39
13	08:15	07:41	07:50	06:48	07:15 (19)	05:58		05:33	05:46	06:22	07:32 (9)	07:03	07:29 (30)	07:44	07:29	08:08
	17:02	17:48	19:29	20:13	40 07:55 (9)	20:54		21:26	21:26	20:49	29 08:01 (9)	19:51	16 07:45 (30)	18:49	16:58	16:39
14	08:14	07:39	07:48	06:46	07:16 (19)	05:57		05:33	05:46	06:23	07:32 (9)	07:04	07:30 (30)	07:45	07:31	08:09
	17:04	17:50	19:31	20:14	40 07:56 (9)	20:56		21:27	21:25	20:48	30 08:02 (9)	19:49	14 07:44 (30)	18:47	16:57	16:40
15	08:14	07:38	07:46	06:44	07:16 (19)	05:55		05:33	05:47	06:25	07:31 (9)	07:06	07:31 (30)	07:46	07:32	08:09
	17:05	17:52	19:32	20:16	39 07:57 (9)	20:57		21:27	21:25	20:46	32 08:03 (9)	19:47	11 07:42 (30)	18:45	16:56	16:40
16	08:13	07:36	07:44	06:43	07:18 (19)	05:54		05:33	05:48	06:26	07:30 (9)	07:07	07:33 (30)	07:48	07:34	08:10
	17:06	17:53	19:34	20:17	37 07:57 (9)	20:58		21:28	21:24	20:44	33 08:03 (9)	19:45	6 07:39 (30)	18:43	16:55	16:40
17	08:12	07:34	07:42	06:41	07:25 (9)	05:53		05:33	05:49	06:27	07:29 (9)	07:08		07:49	07:35	08:11
	17:08	17:55	19:35	20:19	33 07:58 (9)	20:59		21:28	21:23	20:42	34 08:03 (9)	19:43		18:41	16:54	16:40
18	08:12	07:33	07:40	06:39	07:24 (9)	05:52		05:33	05:50	06:28	07:29 (9)	07:10		07:51	07:37	08:12
	17:09	17:56	19:36	20:20	34 07:58 (9)	21:01		21:29	21:22	20:41	35 08:04 (9)	19:41		18:39	16:53	16:40
19	08:11	07:31	07:38	06:37	07:24 (9)	05:51		05:33	05:51	06:30	07:28 (9)	07:11		07:52	07:38	08:12
	17:10	17:58	19:38	20:21	35 07:59 (9)	21:02		21:29	21:21	20:39	36 08:04 (9)	19:39		18:38	16:52	16:41
20	08:10	07:29	07:36	06:35	07:23 (9)	05:49		05:33	05:53	06:31	07:28 (9)	07:12		07:54	07:40	08:13
	17:12	17:59	19:39	20:23	36 07:59 (9)	21:03		21:29	21:20	20:37	36 08:04 (9)	19:37		18:36	16:51	16:41
21	08:09	07:27	07:34	06:33	07:23 (9)	05:48		05:33	05:54	06:32	07:27 (9)	07:14		07:55	07:41	08:14
	17:13	18:01	19:41	20:24	36 07:59 (9)	21:04		21:30	21:20	20:35	36 08:03 (9)	19:35		18:34	16:50	16:41
22	08:08	07:26	07:32	06:32	07:22 (9)	05:47		05:33	05:55	06:34	07:27 (9)	07:15		07:57	07:42	08:14
	17:15	18:01	19:42	20:26	36 07:58 (9)	21:06		21:30	21:19	20:34	37 08:04 (9)	19:33		18:32	16:49	16:42
23	08:08	07:24	07:30	06:30	07:22 (9)	05:46		05:34	05:56	06:35	07:27 (9)	07:16		07:58	07:44	08:15
	17:16	18:02	19:44	20:27	37 07:59 (9)	21:07		21:30	21:18	20:32	36 08:03 (9)	19:31		18:30	16:48	16:42
24	08:07	07:22	07:28	06:28	07:22 (9)	05:45		05:34	05:57	06:36	07:27 (9)	07:18		07:59	07:45	08:15
	17:18	18:04	19:45	20:28	36 07:58 (9)	21:08		21:30	21:17	20:30	36 08:03 (9)	19:29		18:29	16:47	16:43
25	08:06	07:20	07:26	06:26	07:22 (9)	05:44		05:34	05:58	06:38	07:27 (9)	07:19		08:01	07:47	08:16
	17:19	18:05	19:46	20:30	35 07:57 (9)	21:09		21:31	21:15	20:28	35 08:02 (9)	19:27		18:27	16:46	16:43
26	08:05	07:19	07:24	06:24	07:22 (9)	05:43		05:34	05:59	06:39	07:27 (9)	07:20		08:02	07:48	08:16
	17:21	18:07	19:48	20:31	36 07:58 (9)	21:10		21:31	21:14	20:26	35 08:02 (9)	19:25		18:25	16:46	16:44
27	08:04	07:17	07:22	06:23	07:22 (9)	05:42		05:35	06:00	06:40	07:28 (9)	07:22		08:04	07:49	08:16
	17:22	18:09	19:49	20:33	35 07:57 (9)	21:11		21:31	21:13	20:24	33 08:01 (9)	19:23		18:24	16:45	16:45
28	08:02	07:15	07:20	06:21	07:22 (9)	05:42		05:35	06:02	06:42	07:21 (19)	07:23		08:05	07:51	08:17
	17:24	18:10	19:51	20:34	34 07:56 (9)	21:12		21:31	21:12	20:23	34 07:59 (9)	19:21		18:22	16:44	16:45
29	08:01		07:18 07:42 (30)	06:19	07:23 (9)	05:41		05:36	06:03	06:43	07:18 (19)	07:24		08:07	07:52	08:17
	17:25		19:52 9 07:51 (30)	20:35	32 07:55 (9)	21:14		21:31	21:11	20:21	38 07:58 (9)	19:19		18:20	16:43	16:46
30	08:00		07:16 07:40 (30)	06:18	07:24 (9)	05:40		05:36	06:04	06:44	07:17 (19)	07:26		08:08	07:53	08:17
	17:27		19:53 12 07:52 (30)	20:37	30 07:54 (9)	21:15		21:31	21:10	20:19	39 07:57 (9)	19:17		18:19	16:43	16:47
31	07:59		07:14 07:38 (30)			05:39			06:05	06:46	07:15 (19)			08:10		08:17
	17:28		19:55 15 07:53 (30)			21:16			21:08	20:17	40 07:55 (9)			18:17		16:48
Potential sun hours	277	286	367	406		466		476	482	443		380		339	282	265
Total, worst case			36		931		129				762		352			
Sun reduction			0.59		0.57		0.60				0.71		0.63			
Oper. time red.			0.85		0.85		0.85				0.85		0.85			
Wind dir. red.			0.70		0.69		0.68				0.68		0.69			
Total reduction			0.35		0.33		0.35				0.41		0.37			
Total, real			13		309		45				314		130			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L20 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4554)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January			February			March			April		May	June
1	08:17		14:32 (28)	07:58		08:28 (19)	07:13		08:30 (19)	07:12		06:16	05:38
	16:49	32	16:22 (9)	17:30	47	16:44 (9)	18:11	11	08:41 (19)	19:56		20:38	21:17
2	08:17		14:34 (28)	07:56		08:25 (19)	07:11			07:10		06:14	05:38
	16:50	31	16:23 (9)	17:31	51	16:43 (9)	18:13			19:58		20:40	21:17
3	08:17		14:35 (28)	07:55		08:24 (19)	07:09			07:08		06:13	05:37
	16:51	29	16:23 (9)	17:33	52	16:43 (9)	18:14			19:59		20:41	21:18
4	08:17		14:37 (28)	07:54		08:23 (19)	07:07		07:31 (6)	07:06		06:11	05:37
	16:52	27	16:24 (9)	17:34	52	16:42 (9)	18:16	5	07:36 (6)	20:00		20:42	21:19
5	08:17		14:40 (28)	07:53		08:21 (19)	07:05		07:29 (6)	07:04		06:10	05:36
	16:53	24	16:25 (9)	17:36	52	16:40 (9)	18:17	8	07:37 (6)	20:02		20:44	21:20
6	08:17		16:09 (9)	07:51		08:21 (19)	07:04		07:27 (6)	07:02		06:08	05:35
	16:54	18	16:27 (9)	17:37	48	16:38 (9)	18:19	11	07:38 (6)	20:03		20:45	21:21
7	08:17		16:09 (9)	07:50		08:20 (19)	07:02		07:25 (6)	07:00		06:07	05:35
	16:55	19	16:28 (9)	17:39	43	16:34 (9)	18:20	14	07:39 (6)	20:05		20:46	21:22
8	08:17		16:09 (9)	07:48		08:20 (19)	07:00		07:23 (6)	06:58		06:05	05:35
	16:56	20	16:29 (9)	17:41	36	08:56 (19)	18:22	16	07:39 (6)	20:06		20:48	21:23
9	08:16		16:09 (9)	07:47		08:18 (19)	06:58		07:21 (6)	06:56		06:04	05:34
	16:57	21	16:30 (9)	17:42	38	08:56 (19)	18:23	17	07:38 (6)	20:07		20:49	21:23
10	08:16		16:08 (9)	07:45		08:19 (19)	06:56		07:20 (6)	06:54		06:02	05:34
	16:58	23	16:31 (9)	17:44	39	08:58 (19)	18:25	18	07:38 (6)	20:09		20:50	21:24
11	08:16		16:09 (9)	07:44		08:18 (19)	06:54		07:20 (6)	06:52		06:01	05:34
	17:00	24	16:33 (9)	17:45	40	08:58 (19)	18:26	17	07:37 (6)	20:10		20:52	21:25
12	08:15		16:08 (9)	07:42		08:17 (19)	07:52		08:21 (6)	06:50		05:59	05:33
	17:01	26	16:34 (9)	17:47	41	08:58 (19)	18:28	15	08:36 (6)	20:12		20:53	21:25
13	08:15		16:09 (9)	07:41		08:17 (19)	07:50		08:22 (6)	06:48		05:58	05:33
	17:02	27	16:36 (9)	17:48	42	08:59 (19)	19:29	12	08:34 (6)	20:13		20:54	21:26
14	08:14		16:08 (9)	07:39		08:17 (19)	07:48		08:24 (6)	06:46		05:57	05:33
	17:04	29	16:37 (9)	17:50	41	08:58 (19)	19:31	8	08:32 (6)	20:14		20:56	21:27
15	08:14		16:08 (9)	07:38		08:16 (19)	07:46		08:09 (17)	06:44		05:55	05:33
	17:05	30	16:38 (9)	17:52	42	08:58 (19)	19:32	2	08:11 (17)	20:16		20:57	21:27
16	08:13		16:09 (9)	07:36		08:17 (19)	07:44		08:07 (17)	06:43		05:54	05:33
	17:06	31	16:40 (9)	17:53	42	08:59 (19)	19:34	5	08:12 (17)	20:17		20:58	21:28
17	08:12		16:09 (9)	07:34		08:17 (19)	07:42		08:05 (17)	06:41		05:53	05:33
	17:08	32	16:41 (9)	17:55	41	08:58 (19)	19:35	7	08:12 (17)	20:19		20:59	21:28
18	08:12		16:09 (9)	07:33		08:17 (19)	07:40		08:03 (17)	06:39		05:52	05:33
	17:09	33	16:42 (9)	17:56	41	08:58 (19)	19:36	9	08:12 (17)	20:20		21:01	21:29
19	08:11		16:09 (9)	07:31		08:17 (19)	07:38		08:01 (17)	06:37		05:50	05:33
	17:10	34	16:43 (9)	17:58	40	08:57 (19)	19:38	10	08:11 (17)	20:21		21:02	21:29
20	08:10		16:09 (9)	07:29		08:18 (19)	07:36		08:00 (17)	06:35		05:49	05:33
	17:12	35	16:44 (9)	17:59	39	08:57 (19)	19:39	9	08:09 (17)	20:23		21:03	21:29
21	08:09		16:09 (9)	07:27		08:18 (19)	07:34		08:02 (17)	06:33		05:48	05:33
	17:13	35	16:44 (9)	18:01	38	08:56 (19)	19:41	5	08:07 (17)	20:24		21:04	21:30
22	08:08		16:09 (9)	07:26		08:19 (19)	07:32			06:31		05:47	05:33
	17:15	35	16:44 (9)	18:01	36	08:55 (19)	19:42			20:26		21:06	21:30
23	08:07		16:09 (9)	07:24		08:19 (19)	07:30			06:30		05:46	05:33
	17:16	36	16:45 (9)	18:02	35	08:54 (19)	19:44			20:27		21:07	21:30
24	08:07		16:10 (9)	07:22		08:20 (19)	07:28			06:28		05:45	05:34
	17:18	35	16:45 (9)	18:04	33	08:53 (19)	19:45			20:28		21:08	21:30
25	08:06		16:10 (9)	07:20		08:22 (19)	07:26			06:26		05:44	05:34
	17:19	35	16:45 (9)	18:05	30	08:52 (19)	19:46			20:30		21:09	21:31
26	08:05		16:10 (9)	07:19		08:23 (19)	07:24			06:24		05:43	05:34
	17:21	35	16:45 (9)	18:07	27	08:50 (19)	19:48			20:31		21:10	21:31
27	08:03		16:11 (9)	07:17		08:25 (19)	07:22			06:23		05:42	05:35
	17:22	34	16:45 (9)	18:08	23	08:48 (19)	19:49			20:33		21:11	21:31
28	08:02		16:12 (9)	07:15		08:27 (19)	07:20			06:21		05:41	05:35
	17:24	34	16:46 (9)	18:10	18	08:45 (19)	19:51			20:34		21:12	21:31
29	08:01		16:13 (9)				07:18			06:19		05:41	05:36
	17:25	33	16:46 (9)				19:52			20:35		21:13	21:31
30	08:00		16:13 (9)				07:16			06:18		05:40	05:36
	17:27	32	16:45 (9)				19:53			20:37		21:14	21:31
31	07:59		08:30 (19)				07:14					05:39	
	17:28	44	16:45 (9)				19:55					21:16	
Potential sun hours	277			286			367			406		466	476
Total, worst case		933			1107			199					
Sun reduction		0.52			0.54			0.59					
Oper. time red.		0.85			0.85			0.85					
Wind dir. red.		0.59			0.70			0.71					
Total reduction		0.26			0.32			0.35					
Total, real		240			352			70					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L20 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4554)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	July	August	September			October			November			December		
1	05:37	06:06	06:47			07:27		08:04 (6)	08:11		08:47 (19)	07:55		15:50 (9)
	21:31	21:07	20:15			19:14	8	08:12 (6)	18:15	40	09:27 (19)	16:42	26	16:16 (9)
2	05:37	06:08	06:48			07:28		08:02 (6)	08:13		08:47 (19)	07:56		15:51 (9)
	21:30	21:06	20:13			19:12	12	08:14 (6)	18:14	39	09:26 (19)	16:42	25	16:16 (9)
3	05:38	06:09	06:50			07:30		08:00 (6)	08:14		08:48 (19)	07:57		15:52 (9)
	21:30	21:04	20:11			19:10	15	08:15 (6)	18:12	38	09:26 (19)	16:41	23	16:15 (9)
4	05:38	06:10	06:51			07:31		07:58 (6)	08:16		08:49 (19)	07:58		15:52 (9)
	21:30	21:03	20:09			19:08	17	08:15 (6)	18:11	37	09:26 (19)	16:41	22	16:14 (9)
5	05:39	06:11	06:52			07:32		07:58 (6)	07:17		07:49 (19)	07:59		15:53 (9)
	21:30	21:01	20:07			19:06	18	08:16 (6)	17:09	38	16:01 (9)	16:41	21	16:14 (9)
6	05:40	06:13	06:54			07:34		07:58 (6)	07:19		07:50 (19)	08:00		15:54 (9)
	21:29	21:00	20:05			19:04	17	08:15 (6)	17:08	47	16:07 (9)	16:40	20	16:14 (9)
7	05:40	06:14	06:55			07:35		08:00 (6)	07:20		07:52 (19)	08:02		15:55 (9)
	21:29	20:58	20:03			19:02	16	08:16 (6)	17:06	50	16:10 (9)	16:40	19	16:14 (9)
8	05:41	06:15	06:56			07:37		08:01 (6)	07:22		07:52 (19)	08:03		15:56 (9)
	21:29	20:57	20:01			19:00	14	08:15 (6)	17:05	52	16:11 (9)	16:40	17	16:13 (9)
9	05:42	06:17	06:58			07:38		08:02 (6)	07:23		07:54 (19)	08:04		14:27 (28)
	21:28	20:55	19:59			18:57	11	08:13 (6)	17:04	52	16:13 (9)	16:40	25	16:13 (9)
10	05:43	06:18	06:59			07:39		08:04 (6)	07:25		07:55 (19)	08:05		14:25 (28)
	21:28	20:54	19:57			18:55	9	08:13 (6)	17:02	50	16:13 (9)	16:39	29	16:13 (9)
11	05:44	06:19	07:00			07:41		08:05 (6)	07:26		07:57 (19)	08:06		14:24 (28)
	21:27	20:52	19:55			18:53	5	08:10 (6)	17:01	50	16:15 (9)	16:39	30	16:12 (9)
12	05:45	06:21	07:01			07:42		08:07 (6)	07:28		08:00 (19)	08:07		14:23 (28)
	21:27	20:51	19:53			18:51	1	08:08 (6)	17:00	46	16:16 (9)	16:39	31	16:12 (9)
13	05:45	06:22	07:03			07:44			07:29		08:03 (19)	08:08		14:23 (28)
	21:26	20:49	19:51			18:49			16:58	40	16:16 (9)	16:39	31	16:12 (9)
14	05:46	06:23	07:04			07:45		09:04 (19)	07:31		15:45 (9)	08:08		14:23 (28)
	21:25	20:47	19:49			18:47	9	09:13 (19)	16:57	32	16:17 (9)	16:39	32	16:12 (9)
15	05:47	06:24	07:05			07:46		08:59 (19)	07:32		15:44 (9)	08:09		14:23 (28)
	21:25	20:46	19:47			18:45	18	09:17 (19)	16:56	33	16:17 (9)	16:40	33	16:13 (9)
16	05:48	06:26	07:07			07:48		08:57 (19)	07:34		15:44 (9)	08:10		14:22 (28)
	21:24	20:44	19:45			18:43	23	09:20 (19)	16:55	34	16:18 (9)	16:40	33	16:12 (9)
17	05:49	06:27	07:08			07:49		08:55 (19)	07:35		15:44 (9)	08:11		14:22 (28)
	21:23	20:42	19:43			18:41	26	09:21 (19)	16:54	35	16:19 (9)	16:40	33	16:12 (9)
18	05:50	06:28	07:09			07:51		08:53 (19)	07:37		15:44 (9)	08:12		14:22 (28)
	21:22	20:41	19:41			18:39	30	09:23 (19)	16:53	35	16:19 (9)	16:40	34	16:13 (9)
19	05:51	06:30	07:11			07:52		08:51 (19)	07:38		15:44 (9)	08:12		14:23 (28)
	21:21	20:39	19:39			18:38	33	09:24 (19)	16:52	36	16:20 (9)	16:41	33	16:13 (9)
20	05:52	06:31	07:12			07:54		08:51 (19)	07:40		15:44 (9)	08:13		14:23 (28)
	21:20	20:37	19:37			18:36	34	09:25 (19)	16:51	35	16:19 (9)	16:41	33	16:13 (9)
21	05:54	06:32	07:13			07:55		08:49 (19)	07:41		15:45 (9)	08:14		14:23 (28)
	21:20	20:35	19:35			18:34	37	09:26 (19)	16:50	35	16:20 (9)	16:41	34	16:14 (9)
22	05:55	06:34	07:15			07:57		08:49 (19)	07:42		15:44 (9)	08:14		14:23 (28)
	21:19	20:34	19:33			18:32	38	09:27 (19)	16:49	36	16:20 (9)	16:42	34	16:14 (9)
23	05:56	06:35	07:16			07:58		08:47 (19)	07:44		15:45 (9)	08:15		14:24 (28)
	21:18	20:32	19:31			18:30	40	09:27 (19)	16:48	35	16:20 (9)	16:42	34	16:15 (9)
24	05:57	06:36	07:17		07:46 (17)	07:59		08:47 (19)	07:45		15:45 (9)	08:15		14:24 (28)
	21:16	20:30	19:29	6	07:52 (17)	18:29	40	09:27 (19)	16:47	35	16:20 (9)	16:43	34	16:15 (9)
25	05:58	06:38	07:19		07:44 (17)	08:01		08:47 (19)	07:47		15:46 (9)	08:16		14:26 (28)
	21:15	20:28	19:27	9	07:53 (17)	18:27	41	09:28 (19)	16:46	35	16:21 (9)	16:43	33	16:16 (9)
26	05:59	06:39	07:20		07:44 (17)	08:02		08:46 (19)	07:48		15:46 (9)	08:16		14:26 (28)
	21:14	20:26	19:25	10	07:54 (17)	18:25	42	09:28 (19)	16:45	33	16:19 (9)	16:44	34	16:17 (9)
27	06:00	06:40	07:22		07:46 (17)	08:04		08:47 (19)	07:49		15:47 (9)	08:16		14:27 (28)
	21:13	20:24	19:23	8	07:54 (17)	18:23	41	09:28 (19)	16:45	32	16:19 (9)	16:45	33	16:17 (9)
28	06:02	06:42	07:23		07:47 (17)	08:05		08:46 (19)	07:51		15:48 (9)	08:17		14:27 (28)
	21:12	20:23	19:21	7	07:54 (17)	18:22	42	09:28 (19)	16:44	30	16:18 (9)	16:45	33	16:17 (9)
29	06:03	06:43	07:24		07:48 (17)	08:07		08:46 (19)	07:52		15:49 (9)	08:17		14:28 (28)
	21:11	20:21	19:18	5	07:53 (17)	18:20	42	09:28 (19)	16:43	29	16:18 (9)	16:46	33	16:18 (9)
30	06:04	06:44	07:26		07:50 (17)	08:08		08:47 (19)	07:53		15:49 (9)	08:17		14:30 (28)
	21:10	20:19	19:16	2	07:52 (17)	18:19	41	09:28 (19)	16:43	28	16:17 (9)	16:47	33	16:20 (9)
31	06:05	06:46				08:10		08:46 (19)				08:17		14:31 (28)
	21:08	20:17				18:17	41	09:27 (19)				16:48	33	16:21 (9)
Potential sun hours	482	443	380			339			282			265		
Total, worst case				47			761			1147			918	
Sun reduction				0.63			0.51			0.39			0.39	
Oper. time red.				0.85			0.85			0.85			0.85	
Wind dir. red.				0.71			0.72			0.63			0.56	
Total reduction				0.38			0.31			0.21			0.18	
Total, real				18			234			238			170	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L21 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4555)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January		February		March		April	May	June	July	August	September	October		November		December	
1	08:17		08:48 (19)	07:58		08:56 (19)	07:13		07:42 (6)	07:12	06:16	05:38	05:37	06:06	06:47	07:27		08:11		07:55		08:29 (19)
	16:49	55	16:05 (9)	17:30	30	09:26 (19)	18:11	15	07:57 (6)	19:56	20:38	21:17	21:31	21:07	20:15	19:14		18:15		16:42	53	15:45 (9)
2	08:17		08:48 (19)	07:56		08:56 (19)	07:11		07:43 (6)	07:10	06:14	05:38	05:37	06:08	06:48	07:28		08:13		07:56		08:30 (19)
	16:50	55	16:05 (9)	17:31	29	09:25 (19)	18:13	13	07:56 (6)	19:58	20:40	21:17	21:30	21:06	20:13	19:12	7	08:03 (17)	18:14	16:42	54	15:47 (9)
3	08:17		08:47 (19)	07:55		08:58 (19)	07:09		07:44 (6)	07:08	06:13	05:37	05:38	06:09	06:50	07:30		07:54 (17)	08:14	07:57		08:31 (19)
	16:51	56	16:05 (9)	17:33	26	09:24 (19)	18:14	9	07:53 (6)	19:59	20:41	21:18	21:30	21:04	20:11	19:10	10	08:04 (17)	18:12	16:41	54	15:48 (9)
4	08:17		08:47 (19)	07:54		09:00 (19)	07:07			07:06	06:11	05:37	05:38	06:10	06:51	07:31		07:55 (17)	08:16	07:58		08:31 (19)
	16:52	56	16:05 (9)	17:34	23	09:23 (19)	18:16			20:00	20:42	21:19	21:30	21:03	20:09	19:08	9	08:04 (17)	18:11	16:41	56	15:49 (9)
5	08:17		08:48 (19)	07:53		09:01 (19)	07:05			07:04	06:10	05:36	05:39	06:11	06:52	07:32		07:57 (17)	08:17	07:59		08:32 (19)
	16:53	55	16:05 (9)	17:36	20	09:21 (19)	18:17			20:02	20:44	21:20	21:30	21:01	20:07	19:06	7	08:04 (17)	17:09	16:41	56	15:50 (9)
6	08:17		08:48 (19)	07:51		09:04 (19)	07:04			07:02	06:08	05:35	05:40	06:13	06:54	07:34		07:58 (17)	07:19	08:35 (19)	08:00		08:33 (19)
	16:54	56	16:06 (9)	17:37	15	09:19 (19)	18:19			20:03	20:45	21:21	21:29	21:00	20:05	19:04	6	08:04 (17)	17:08	12 08:47 (19)	16:40	57	15:51 (9)
7	08:17		08:48 (19)	07:50		09:07 (19)	07:02			07:00	06:06	05:35	05:40	06:14	06:55	07:35		08:00 (17)	07:20	08:32 (19)	08:02		08:34 (19)
	16:55	56	16:06 (9)	17:39	8	09:15 (19)	18:20			20:05	20:46	21:22	21:29	20:58	20:03	19:02	3	08:03 (17)	17:06	19 08:51 (19)	16:40	57	15:52 (9)
8	08:17		08:48 (19)	07:48			07:00		07:23 (17)	06:58	06:05	05:35	05:41	06:15	06:56	07:37			07:22	08:30 (19)	08:03		08:35 (19)
	16:56	56	16:06 (9)	17:41			18:22	3	07:26 (17)	20:06	20:48	21:23	21:29	20:57	20:01	19:00			17:05	22 08:52 (19)	16:40	56	15:53 (9)
9	08:16		08:48 (19)	07:47			06:58		07:21 (17)	06:56	06:04	05:34	05:42	06:17	06:58	07:38			07:23	08:29 (19)	08:04		08:35 (19)
	16:57	56	16:06 (9)	17:42			18:23	6	07:27 (17)	20:07	20:49	21:23	21:28	20:55	19:59	18:57			17:04	25 08:54 (19)	16:40	56	15:53 (9)
10	08:16		08:48 (19)	07:45			06:56		07:19 (17)	06:54	06:02	05:34	05:43	06:18	06:59	07:39			07:25	08:27 (19)	08:05		08:36 (19)
	16:58	54	16:05 (9)	17:44			18:25	7	07:26 (17)	20:09	20:50	21:24	21:28	20:54	19:57	18:55			17:02	28 08:55 (19)	16:39	56	15:54 (9)
11	08:16		08:48 (19)	07:44			06:54		07:17 (17)	06:52	06:01	05:34	05:44	06:19	07:00	07:41			07:26	08:27 (19)	08:06		08:37 (19)
	17:00	55	16:05 (9)	17:45			18:26	9	07:26 (17)	20:10	20:52	21:25	21:27	20:52	19:55	18:53			17:01	29 08:56 (19)	16:39	56	15:55 (9)
12	08:15		08:48 (19)	07:42			07:52		08:15 (17)	06:50	05:59	05:33	05:45	06:21	07:01	07:42		08:19 (6)	07:28	08:27 (19)	08:07		08:38 (19)
	17:01	53	16:04 (9)	17:47			18:28	10	08:25 (17)	20:12	20:53	21:25	21:27	20:51	19:53	18:51	8	08:27 (6)	17:00	31 08:58 (19)	16:39	55	15:55 (9)
13	08:15		08:48 (19)	07:41			07:50		08:16 (17)	06:48	05:58	05:33	05:45	06:22	07:03	07:44		08:16 (6)	07:29	08:25 (19)	08:08		08:39 (19)
	17:02	52	16:04 (9)	17:48			19:29	7	08:23 (17)	20:13	20:54	21:26	21:26	20:49	19:51	18:49	13	08:29 (6)	16:58	33 08:58 (19)	16:39	55	15:56 (9)
14	08:14		08:48 (19)	07:39			07:48			06:46	05:57	05:33	05:46	06:23	07:04	07:45		08:15 (6)	07:31	08:25 (19)	08:08		08:40 (19)
	17:04	51	16:03 (9)	17:50			19:31			20:14	20:56	21:27	21:25	20:47	19:49	18:47	15	08:30 (6)	16:57	34 08:59 (19)	16:39	55	15:57 (9)
15	08:14		08:48 (19)	07:38			07:46			06:44	05:55	05:33	05:47	06:24	07:05	07:46		08:14 (6)	07:32	08:24 (19)	08:09		08:41 (19)
	17:05	48	16:02 (9)	17:52			19:32			20:16	20:57	21:27	21:25	20:46	19:47	18:45	16	08:30 (6)	16:56	35 08:59 (19)	16:40	53	15:57 (9)
16	08:13		08:49 (19)	07:36			07:44			06:43	05:54	05:33	05:48	06:26	07:07	07:48		08:13 (6)	07:34	08:25 (19)	08:10		08:40 (19)
	17:06	42	16:00 (9)	17:53			19:34			20:17	20:58	21:28	21:24	20:44	19:45	18:43	18	08:31 (6)	16:55	35 09:00 (19)	16:40	54	15:57 (9)
17	08:12		08:49 (19)	07:34			07:42			06:41	05:53	05:33	05:49	06:27	07:08	07:49		08:14 (6)	07:35	08:25 (19)	08:11		08:41 (19)
	17:08	36	09:25 (19)	17:55			19:35			20:19	20:59	21:28	21:23	20:42	19:43	18:41	16	08:30 (6)	16:54	36 09:01 (19)	16:40	54	15:58 (9)
18	08:12		08:49 (19)	07:33			07:40			06:39	05:52	05:33	05:50	06:28	07:09	07:51		08:16 (6)	07:37	08:24 (19)	08:12		08:42 (19)
	17:09	37	09:26 (19)	17:56			19:36			20:20	21:01	21:29	21:22	20:41	19:41	18:39	15	08:31 (6)	16:53	37 09:01 (19)	16:40	54	15:59 (9)
19	08:11		08:49 (19)	07:31			07:38			06:37	05:50	05:33	05:51	06:30	07:11	07:52		08:17 (6)	07:38	08:25 (19)	08:12		08:43 (19)
	17:10	37	09:26 (19)	17:58			19:38			20:21	21:02	21:29	21:21	20:39	19:39	18:38	13	08:30 (6)	16:52	37 09:02 (19)	16:41	53	16:00 (9)
20	08:10		08:49 (19)	07:29			07:36			06:35	05:49	05:33	05:52	06:31	07:12	07:54		08:19 (6)	07:40	08:24 (19)	08:13		08:43 (19)
	17:12	37	09:26 (19)	17:59			19:39			20:23	21:03	21:29	21:20	20:37	19:37	18:36	10	08:29 (6)	16:51	38 09:02 (19)	16:41	54	16:00 (9)
21	08:09		08:49 (19)	07:27		07:52 (6)	07:34			06:33	05:48	05:33	05:54	06:32	07:13	07:55		08:20 (6)	07:41	08:25 (19)	08:14		08:44 (19)
	17:13	38	09:27 (19)	18:01	3	07:55 (6)	19:41			20:24	21:04	21:30	21:20	20:35	19:35	18:34	8	08:28 (6)	16:50	38 09:03 (19)	16:41	53	16:00 (9)
22	08:08		08:49 (19)	07:26		07:50 (6)	07:32			06:31	05:47	05:33	05:55	06:34	07:15	07:57		08:22 (6)	07:42	08:25 (19)	08:14		08:44 (19)
	17:15	38	09:27 (19)	18:01	7	07:57 (6)	19:42			20:26	21:06	21:30	21:19	20:34	19:33	18:32	4	08:26 (6)	16:49	37 09:02 (19)	16:42	53	16:00 (9)
23	08:07		08:50 (19)	07:24		07:48 (6)	07:30			06:30	05:46	05:33	05:56	06:35	07:16	07:58			07:44	08:25 (19)	08:15		08:45 (19)
	17:16	37	09:27 (19)	18:02	10	07:58 (6)	19:44			20:27	21:07	21:30	21:18	20:32	19:31	18:30			16:48	38 09:03 (19)	16:42	53	16:01 (9)
24	08:07		08:50 (19)	07:22		07:46 (6)	07:28			06:28	05:45	05:34	05:57	06:36	07:17	07:59			07:45	08:25 (19)	08:15		08:45 (19)
	17:18	37	09:27 (19)	18:04	12	07:58 (6)	19:45			20:28	21:08	21:30	21:16	20:30	19:29	18:29			16:47	38 09:03 (19)	16:43	54	16:02 (9)
25	08:06		08:50 (19)	07:20		07:45 (6)	07:26			06:26	05:44	05:34	05:58	06:38	07:19	08:01			07:47	08:26 (19)	08:16		08:46 (19)
	17:19	38	09:28 (19)	18:05	14	07:59 (6)	19:46			20:30	21:09	21:31	21:15	20:28	19:27	18:27			16:46	38 09:04 (19)	16:43	54	16:03 (9)
26	08:05		08:51 (19)	07:19		07:43 (6)	07:24			06:24	05:43	05:34	05:59	06:39	07:20	08:02			07:48	08:26 (19)	08:16		08:46 (19)
	17:21	37	09:28 (19)	18:07	16	07:59 (6)	19:48			20:31	21:10	21:31	21:14	20:26	19:25	18:25			16:45	37 09:03 (19)	16:44	53	16:03 (9)
27	08:04		08:52 (19)	07:17		07:41 (6)	07:22			06:23	05:42	05:35	06:00	06:40	07:22	08:04			07:49	08:27 (19)	08:16		08:46 (19)
	17:22	36	09:28 (19)	18:08	18	07:59 (6)	19:49			20:33	21:11	21:31	21:13	20:24	19:23	18:23			16:45	37 09:04 (19)	16:45	54	16:03 (9)
28	08:02		08:52 (19)	07:15		07:41 (6)	07:20			06:21	05:41	05:35	06:02	06:42	07:23	08:05			07:51	08:27 (19)	08:17		08:46 (19)
	17:24	36	09:28 (19)	18:10	17	07:58 (6)	19:51			20:34	21:12	21:31	21:12	20:23	19:21	18:22			16:44	46 15:40 (9)	16:45	54	16:03 (9)
29	08:01		08:53 (19)				07:18			06:19	05:41	05:36	06:03	06:43	07:24	08:07			07:52	08:29 (19)	08:17		08:46 (19)
	17:25	35	09:28 (19)				19:52			20:35	21:13	21:31	21:11	20:21	19:18	18:20			16:43	48 15:43 (9)	16:46	54	16:03 (9)
30	08:00		08:53 (19)				07:16			06:18	05:40	05:36	06:04	06:44	07:26	08:08			07:53	08:29 (19)	08:17		08:48 (19)
	17:27	34	09:27 (19)				19:53			20:37	21:15	21:31	21:10	20:19	19:16	18:19			16:43	50 15:44 (9)	16:47	53	16:04 (9)
31	07:59		08:54 (19)				07:14				05:39		06:05	06:46		08:10					08:17		08:48 (19)
	17:28	32	09:26 (19)				19:55				21:16		21:08	20:17		18:17					16:48	54	16:05 (9)
Potential sun hours	277			286		367		406	466	476	482	443	380	339			282			265		
Total, worst case		1401			248		79									178		858			1687	
Sun reduction		0.52			0.54		0.59									0.51		0.39			0.39	
Oper. time red.		0.85			0.85		0.85									0.85		0.85			0.85	
Wind dir. red.		0.67			0.71		0.72									0.72		0.70			0.64	
Total reduction		0.30			0.33		0.36									0.31		0.23			0.21	
Total, real		415			81		28									55		198			354	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L30 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4564)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January		February		March		April	May	June	July	August	September	October		November		December
1	08:17		07:58		07:13	07:52 (27)	07:12	06:16	05:38	05:36	06:06	06:47	07:27		08:11	08:38 (27)	07:54
	16:49		17:29		18:11	27 08:19 (27)	19:56	20:38	21:16	21:30	21:07	20:15	19:14		18:15	3 08:41 (27)	16:42
2	08:17		07:56		07:11	07:53 (27)	07:10	06:14	05:37	05:37	06:07	06:48	07:28		08:13		07:56
	16:50		17:31		18:13	24 08:17 (27)	19:57	20:39	21:17	21:30	21:05	20:13	19:12		18:13		16:41
3	08:17		07:55		07:09	07:55 (27)	07:08	06:12	05:37	05:37	06:09	06:49	07:29		08:14		07:57
	16:51		17:33		18:14	20 08:15 (27)	19:59	20:41	21:18	21:30	21:04	20:11	19:10		18:12		16:41
4	08:17		07:54		07:07	07:57 (27)	07:06	06:11	05:36	05:38	06:10	06:51	07:31		08:16		07:58
	16:52		17:34		18:16	16 08:13 (27)	20:00	20:42	21:19	21:30	21:03	20:09	19:08		18:10		16:41
5	08:17		07:52		07:05	08:00 (27)	07:04	06:09	05:36	05:39	06:11	06:52	07:32		07:17		07:59
	16:53		17:36		18:17	9 08:09 (27)	20:02	20:43	21:20	21:30	21:01	20:07	19:06		17:09		16:40
6	08:17		07:51		07:03		07:02	06:08	05:35	05:39	06:12	06:53	07:34		07:19		08:00
	16:54		17:37		18:19		20:03	20:45	21:21	21:29	21:00	20:05	19:04		17:07		16:40
7	08:17		07:50		07:01		07:00	06:06	05:35	05:40	06:14	06:55	07:35		07:20		08:01
	16:55		17:39		18:20		20:04	20:46	21:22	21:29	20:58	20:03	19:02		17:06		16:40
8	08:16		07:48		06:59		06:58	06:05	05:34	05:41	06:15	06:56	07:36		07:22		08:02
	16:56		17:40		18:22		20:06	20:47	21:22	21:28	20:57	20:01	19:00		17:05		16:39
9	08:16		07:47		06:58		06:56	06:03	05:34	05:42	06:16	06:57	07:38		07:23		08:04
	16:57		17:42		18:23		20:07	20:49	21:23	21:28	20:55	19:59	18:56		17:03		16:39
10	08:16		07:45		06:56		06:54	06:02	05:34	05:43	06:18	06:59	07:39	08:35 (27)	07:25		08:05
	16:58		17:43		18:25		20:09	20:50	21:24	21:27	20:54	19:57	18:54	9 08:44 (27)	17:02		16:39
11	08:15		07:44		06:54		06:52	06:00	05:33	05:43	06:19	07:00	07:41	08:31 (27)	07:26		08:06
	16:59		17:45		18:26		20:10	20:51	21:25	21:27	20:52	19:55	18:52	16 08:47 (27)	17:01		16:39
12	08:15		07:42	08:07 (27)	07:52		06:50	05:59	05:33	05:44	06:20	07:01	07:42	08:29 (27)	07:28		08:07
	17:01		17:47	7 08:14 (27)	18:27		20:11	20:53	21:25	21:26	20:51	19:53	18:50	20 08:49 (27)	16:59		16:39
13	08:14		07:41	08:06 (27)	07:50		06:48	05:58	05:33	05:45	06:22	07:03	07:43	08:27 (27)	07:29		08:07
	17:02		17:48	11 08:17 (27)	19:29		20:13	20:54	21:26	21:26	20:49	19:51	18:49	23 08:50 (27)	16:58		16:39
14	08:14		07:39	08:04 (27)	07:48		06:46	05:56	05:33	05:46	06:23	07:04	07:45	08:26 (27)	07:31		08:08
	17:03		17:50	14 08:18 (27)	19:30		20:14	20:55	21:27	21:25	20:47	19:49	18:47	26 08:52 (27)	16:57		16:39
15	08:13		07:37	08:02 (27)	07:46		06:44	05:55	05:33	05:47	06:24	07:05	07:46	08:24 (27)	07:32	16:24 (3)	08:09
	17:05		17:51	17 08:19 (27)	19:32		20:16	20:57	21:27	21:24	20:46	19:47	18:45	28 08:52 (27)	16:56	4 16:28 (3)	16:39
16	08:13		07:36	08:00 (27)	07:44		06:42	05:54	05:32	05:48	06:25	07:07	07:48	08:23 (27)	07:34	16:22 (3)	08:10
	17:06		17:53	20 08:20 (27)	19:33		20:17	20:58	21:28	21:24	20:44	19:45	18:43	30 08:53 (27)	16:55	8 16:30 (3)	16:39
17	08:12		07:34	07:59 (27)	07:42		06:40	05:53	05:32	05:49	06:27	07:08	07:49	08:22 (27)	07:35	16:22 (3)	08:11
	17:07		17:54	22 08:21 (27)	19:35		20:18	20:59	21:28	21:23	20:42	19:43	18:41	31 08:53 (27)	16:53	7 16:29 (3)	16:40
18	08:11		07:32	07:57 (27)	07:40		06:39	05:51	05:32	05:50	06:28	07:09	07:50	08:22 (27)	07:37	16:21 (3)	08:11
	17:09		17:56	25 08:22 (27)	19:36		20:20	21:01	21:29	21:22	20:41	19:41	18:39	32 08:54 (27)	16:52	6 16:27 (3)	16:40
19	08:11		07:31	07:55 (27)	07:38		06:37	05:50	05:33	05:51	06:29	07:11	07:52	08:21 (27)	07:38	16:21 (3)	08:12
	17:10		17:57	27 08:22 (27)	19:38		20:21	21:02	21:29	21:21	20:39	19:39	18:37	33 08:54 (27)	16:51	6 16:27 (3)	16:40
20	08:10		07:29	07:54 (27)	07:36		06:35	05:49	05:33	05:52	06:31	07:12	07:53	08:21 (27)	07:39	16:21 (3)	08:13
	17:11		17:59	29 08:23 (27)	19:39		20:23	21:03	21:29	21:20	20:37	19:37	18:35	33 08:54 (27)	16:50	4 16:25 (3)	16:41
21	08:09		07:27	07:52 (27)	07:34		06:33	05:48	05:33	05:53	06:32	07:13	07:55	08:20 (27)	07:41	16:22 (3)	08:13
	17:13		18:01	31 08:23 (27)	19:40		20:24	21:04	21:30	21:19	20:35	19:35	18:34	33 08:53 (27)	16:49	2 16:24 (3)	16:41
22	08:08	16:46 (3)	07:25	07:50 (27)	07:32		06:31	05:47	05:33	05:54	06:33	07:15	07:56	08:22 (27)	07:42	16:21 (3)	08:14
	17:14	2 16:48 (3)	18:01	33 08:23 (27)	19:42		20:25	21:05	21:30	21:18	20:33	19:33	18:32	32 08:54 (27)	16:48	2 16:23 (3)	16:41
23	08:07	16:46 (3)	07:24	07:50 (27)	07:30		06:29	05:46	05:33	05:55	06:35	07:16	07:58	08:23 (27)	07:44		08:14
	17:16	4 16:50 (3)	18:02	33 08:23 (27)	19:43		20:27	21:07	21:30	21:17	20:32	19:30	18:30	30 08:53 (27)	16:48		16:42
24	08:06	16:47 (3)	07:22	07:50 (27)	07:28		06:28	05:45	05:33	05:57	06:36	07:17	07:59	08:25 (27)	07:45		08:15
	17:17	4 16:51 (3)	18:04	32 08:22 (27)	19:45		20:28	21:08	21:30	21:16	20:30	19:28	18:28	28 08:53 (27)	16:47		16:43
25	08:05	16:47 (3)	07:20	07:50 (27)	07:26		06:26	05:44	05:34	05:58	06:37	07:19	08:01	08:26 (27)	07:46		08:15
	17:19	6 16:53 (3)	18:05	32 08:22 (27)	19:46		20:30	21:09	21:30	21:15	20:28	19:26	18:27	26 08:52 (27)	16:46		16:43
26	08:04	16:48 (3)	07:18	07:51 (27)	07:24		06:24	05:43	05:34	05:59	06:39	07:20	08:02	08:28 (27)	07:48		08:16
	17:20	7 16:55 (3)	18:07	31 08:22 (27)	19:48		20:31	21:10	21:31	21:14	20:26	19:24	18:25	23 08:51 (27)	16:45		16:44
27	08:03	16:49 (3)	07:16	07:51 (27)	07:22		06:22	05:42	05:34	06:00	06:40	07:21	08:04	08:30 (27)	07:49		08:16
	17:22	7 16:56 (3)	18:08	30 08:21 (27)	19:49		20:32	21:11	21:31	21:13	20:24	19:22	18:23	21 08:51 (27)	16:44		16:44
28	08:02	16:51 (3)	07:15	07:52 (27)	07:20		06:21	05:41	05:35	06:01	06:41	07:23	08:05	08:31 (27)	07:50		08:16
	17:23	6 16:57 (3)	18:10	28 08:20 (27)	19:50		20:34	21:12	21:31	21:12	20:22	19:20	18:22	18 08:49 (27)	16:44		16:45
29	08:01				07:18		06:19	05:40	05:35	06:02	06:43	07:24	08:07	08:33 (27)	07:52		08:17
	17:25				19:52		20:35	21:13	21:31	21:11	20:20	19:18	18:20	15 08:48 (27)	16:43		16:46
30	08:00				07:16		06:17	05:40	05:36	06:04	06:44	07:25	08:08	08:34 (27)	07:53		08:17
	17:26				19:53		20:37	21:14	21:31	21:09	20:19	19:16	18:18	12 08:46 (27)	16:43		16:47
31	07:59				07:14			05:39		06:05	06:45		08:10	08:36 (27)			08:17
	17:28				19:55			21:15		21:08	20:17		18:17	8 08:44 (27)			08:17
Potential sun hours	277		286		367		406	466	476	482	443	380	339		282		265
Total, worst case		36		422		96								527		42	
Sun reduction		0.52		0.54		0.59								0.51		0.39	
Oper. time red.		0.85		0.85		0.85								0.85		0.85	
Wind dir. red.		0.59		0.73		0.73								0.73		0.60	
Total reduction		0.26		0.33		0.36								0.31		0.20	
Total, real		9		140		35								165		8	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L31 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4565)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:17	07:57	07:13	07:12	06:16	19:48 (1)	05:38	20:37 (18)	05:37	20:35 (18)	06:06	06:47	19:44 (13)	07:27	08:11	07:54
	16:49	17:30	18:11	19:56	20:38 11	19:59 (1)	21:16 14	20:51 (18)	21:30 28	21:03 (18)	21:07	20:15 7	19:51 (13)	19:14	18:15	16:42
2	08:17	07:56	07:11	07:10	06:14	19:52 (1)	05:38	20:35 (18)	05:37	20:36 (18)	06:08	06:48	19:44 (13)	07:28	08:13	07:55
	16:50	17:31	18:13	19:57	20:39 4	19:56 (1)	21:17 17	20:52 (18)	21:30 27	21:03 (18)	21:05	20:13 4	19:48 (13)	19:12	18:14	16:42
3	08:17	07:55	07:09	07:08	06:13		05:37	20:35 (18)	05:38	20:36 (18)	06:09	06:49	19:45 (13)	07:29	08:14	07:57
	16:51	17:33	18:14	19:59	20:41		21:18 18	20:53 (18)	21:30 27	21:03 (18)	21:04	20:11 1	19:46 (13)	19:10	18:12	16:41
4	08:17	07:54	07:07	07:06	06:11		05:36	20:34 (18)	05:38	20:37 (18)	06:10	06:51		07:31	08:16	07:58
	16:52	17:34	18:16	20:00	20:42		21:19 19	20:53 (18)	21:30 26	21:03 (18)	21:03	20:09		19:08	18:11	16:41
5	08:17	07:52	07:05	07:04	06:09		05:36	20:34 (18)	05:39	20:38 (18)	06:11	06:52		07:32	07:17	07:59
	16:53	17:36	18:17	20:02	20:43		21:20 21	20:55 (18)	21:29 25	21:03 (18)	21:01	20:07		19:06	17:09	16:40
6	08:17	07:51	07:03	07:02	06:08		05:35	20:33 (18)	05:40	20:38 (18)	06:13	06:53		07:34	07:19	08:00
	16:54	17:37	18:19	20:03	20:45		21:21 22	20:55 (18)	21:29 24	21:02 (18)	21:00	20:05		19:04	17:08	16:40
7	08:16	07:49	07:01	07:00	06:06		05:35	20:33 (18)	05:40	20:39 (18)	06:14	06:55		07:35	07:20	08:01
	16:55	17:39	18:20	20:04	20:46		21:22 23	20:56 (18)	21:29 23	21:02 (18)	20:58	20:03		19:02	17:06	16:40
8	08:16	07:48	06:59	06:58	06:05		05:35	20:32 (18)	05:41	20:40 (18)	06:15	06:56		07:36	07:22	08:02
	16:56	17:40	18:22	20:06	20:47		21:22 24	20:56 (18)	21:28 22	21:02 (18)	20:57	20:01		19:00	17:05	16:40
9	08:16	07:47	06:58	06:56	06:03		05:34	20:32 (18)	05:42	20:40 (18)	06:16	06:57		07:38	07:23	08:03
	16:57	17:42	18:23	20:07	20:49		21:23 25	20:57 (18)	21:28 21	21:01 (18)	20:55	19:59		18:56	17:03	16:39
10	08:16	07:45	06:56	06:54	06:02		05:34	20:32 (18)	05:43	20:41 (18)	06:18	06:59		07:39	07:25	08:04
	16:58	17:44	18:25	20:09	20:50		21:24 26	20:58 (18)	21:27 19	21:00 (18)	20:54	19:57		18:54	17:02	16:39
11	08:15	07:44	06:54	06:52 19:46 (13)	06:01		05:34	20:32 (18)	05:44	20:42 (18)	06:19	07:00		07:41	07:26	08:05
	17:00	17:45	18:26	20:10 3 19:49 (13)	20:51		21:24 27	20:59 (18)	21:27 18	21:00 (18)	20:52	19:55		18:52	17:01	16:39
12	08:15	07:42	07:52	06:50 19:44 (13)	05:59		05:33	20:31 (18)	05:44	20:43 (18)	06:20	07:01		07:42	07:28	08:06
	17:01	17:47	18:28	20:11 6 19:50 (13)	20:53		21:25 27	20:58 (18)	21:26 17	21:00 (18)	20:50	19:53		18:51	16:59	16:39
13	08:14	07:40	07:50	06:48 19:44 (13)	05:58		05:33	20:31 (18)	05:45	20:45 (18)	06:22 19:57 (1)	07:03		07:43	07:29	08:07
	17:02	17:48	19:29	20:13 8 19:52 (13)	20:54		21:26 28	20:59 (18)	21:26 14	20:59 (18)	20:49 10 20:07 (1)	19:51		18:49	16:58	16:39
14	08:14	07:39	07:48	06:46 19:44 (13)	05:57		05:33	20:31 (18)	05:46	20:46 (18)	06:23 19:55 (1)	07:04		07:45	07:31	08:08
	17:03	17:50	19:30	20:14 9 19:53 (13)	20:55		21:26 29	21:00 (18)	21:25 12	20:58 (18)	20:47 13 20:08 (1)	19:49		18:47	16:57	16:39
15	08:13	07:37	07:46	06:44 19:43 (13)	05:55		05:33	20:32 (18)	05:47	20:49 (18)	06:24 19:54 (1)	07:05		07:46	07:32	08:09
	17:05	17:51	19:32	20:16 12 19:55 (13)	20:57		21:27 28	21:00 (18)	21:24 7	20:56 (18)	20:46 16 20:10 (1)	19:47		18:45	16:56	16:39
16	08:13	07:36	07:44	06:42 19:43 (13)	05:54		05:33	20:32 (18)	05:48		06:26 19:52 (1)	07:07		07:48	07:33	08:10
	17:06	17:53	19:33	20:17 13 19:56 (1)	20:58		21:27 29	21:01 (18)	21:23		20:44 19 20:11 (1)	19:45		18:43	16:55	16:40
17	08:12	07:34	07:42	06:41 19:43 (13)	05:53		05:33	20:32 (18)	05:49		06:27 19:51 (1)	07:08		07:49	07:35	08:11
	17:07	17:54	19:35	20:18 14 19:57 (1)	20:59		21:28 29	21:01 (18)	21:23		20:42 20 20:11 (1)	19:43		18:41	16:54	16:40
18	08:11	07:32	07:40	06:39 19:43 (13)	05:52		05:33	20:32 (18)	05:50		06:28 19:50 (1)	07:09		07:50	07:36	08:11
	17:09	17:56	19:36	20:20 15 19:58 (1)	21:00		21:28 29	21:01 (18)	21:22		20:40 21 20:11 (1)	19:41		18:39	16:53	16:40
19	08:11	07:31	07:38	06:37 19:44 (13)	05:50		05:33	20:32 (18)	05:51		06:30 19:50 (1)	07:11		07:52	07:38	08:12
	17:10	17:58	19:38	20:21 15 19:59 (1)	21:02		21:29 30	21:02 (18)	21:21		20:39 22 20:12 (1)	19:39		18:37	16:51	16:40
20	08:10	07:29	07:36	06:35 19:46 (1)	05:49		05:33	20:32 (18)	05:52		06:31 19:49 (1)	07:12		07:53	07:39	08:13
	17:12	17:59	19:39	20:23 15 20:01 (1)	21:03		21:29 30	21:02 (18)	21:20		20:37 23 20:12 (1)	19:37		18:36	16:51	16:41
21	08:09	07:27	07:34	06:33 19:45 (1)	05:48		05:33	20:33 (18)	05:53		06:32 19:49 (1)	07:13		07:55	07:41	08:13
	17:13	18:01	19:40	20:24 18 20:03 (1)	21:04		21:29 30	21:03 (18)	21:19		20:35 22 20:11 (1)	19:35		18:34	16:50	16:41
22	08:08	07:25	07:32	06:31 19:44 (1)	05:47		05:33	20:33 (18)	05:55		06:34 19:48 (1)	07:15		07:56	07:42	08:14
	17:15	18:01	19:42	20:25 20 20:04 (1)	21:05		21:30 30	21:03 (18)	21:18		20:33 21 20:09 (1)	19:33		18:32	16:49	16:42
23	08:07	07:24	07:30	06:30 19:43 (1)	05:46		05:33	20:33 (18)	05:56		06:35 19:49 (1)	07:16		07:58	07:44	08:14
	17:16	18:02	19:43	20:27 22 20:05 (1)	21:06		21:30 30	21:03 (18)	21:17		20:32 19 20:08 (1)	19:30		18:30	16:48	16:42
24	08:06	07:22	07:28	06:28 19:44 (1)	05:45		05:34	20:33 (18)	05:57		06:36 19:49 (1)	07:17		07:59	07:45	08:15
	17:17	18:04	19:45	20:28 22 20:06 (1)	21:08		21:30 30	21:03 (18)	21:16		20:30 17 20:06 (1)	19:28		18:28	16:47	16:43
25	08:05	07:20	07:26	06:26 19:43 (1)	05:44		05:34	20:34 (18)	05:58		06:38 19:48 (13)	07:19		08:01	07:46	08:15
	17:19	18:05	19:46	20:30 23 20:06 (1)	21:09		21:30 30	21:04 (18)	21:15		20:28 16 20:04 (1)	19:26		18:27	16:46	16:43
26	08:04	07:18	07:24	06:24 19:43 (1)	05:43		05:34	20:34 (18)	05:59		06:39 19:46 (13)	07:20		08:02	07:48	08:16
	17:20	18:07	19:48	20:31 22 20:05 (1)	21:10		21:30 29	21:03 (18)	21:14		20:26 15 20:01 (1)	19:24		18:25	16:45	16:44
27	08:03	07:16	07:22	06:23 19:44 (1)	05:42		05:35	20:34 (18)	06:00		06:40 19:46 (13)	07:21		08:04	07:49	08:16
	17:22	18:08	19:49	20:32 21 20:05 (1)	21:11		21:30 29	21:03 (18)	21:13		20:24 14 20:00 (1)	19:22		18:23	16:45	16:45
28	08:02	07:15	07:20	06:21 19:45 (1)	05:41		05:35	20:35 (18)	06:01		06:41 19:45 (13)	07:23		08:05	07:50	08:16
	17:23	18:10	19:50	20:34 19 20:04 (1)	21:12		21:30 29	21:04 (18)	21:12		20:22 13 19:58 (1)	19:20		18:22	16:44	16:45
29	08:01		07:18	06:19 19:45 (1)	05:41		05:36	20:35 (18)	06:03		06:43 19:44 (13)	07:24		08:07	07:52	08:16
	17:25		19:52	20:35 17 20:02 (1)	21:13		21:30 28	21:03 (18)	21:10		20:20 12 19:56 (13)	19:18		18:20	16:43	16:46
30	08:00		07:16	06:17 19:47 (1)	05:40 20:40 (18)		05:36	20:35 (18)	06:04		06:44 19:43 (13)	07:25		08:08	07:53	08:17
	17:27		19:53	20:36 14 20:01 (1)	21:14 7 20:47 (18)		21:30 29	21:04 (18)	21:09		20:18 11 19:54 (13)	19:16		18:18	16:43	16:47
31	07:59		07:14		05:39 20:37 (18)				06:05		06:45 19:44 (13)			08:10		08:17
	17:28		19:55		21:15 12 20:49 (18)				21:08		20:17 9 19:53 (13)			18:17		16:48
Potential sun hours	277	286	367	406	466	476	482	443	380	339	282	265
Total, worst case				308	34	789	310	313	12			
Sun reduction				0.57	0.60	0.64	0.74	0.71	0.63			
Oper. time red.				0.85	0.85	0.85	0.85	0.85	0.85			
Wind dir. red.				0.72	0.72	0.72	0.72	0.72	0.71			
Total reduction				0.35	0.36	0.39	0.45	0.43	0.38			
Total, real				106	12	307	139	135	5			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L32 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4566)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:17	07:57	07:13	07:12	06:16	20:11 (11) 05:38	20:33 (20) 05:36	20:43 (20) 06:06	06:47	07:27	08:11	07:54
	16:49	17:30	18:11	19:56	20:38 4	20:15 (11) 21:16 18	20:51 (20) 21:30 10	20:53 (20) 21:07	20:15	19:14	18:15	16:42
2	08:17	07:56	07:11	07:10	06:14	20:11 (11) 05:38	20:33 (20) 05:37	20:43 (20) 06:07	06:48	07:28	08:12	07:55
	16:50	17:31	18:13	19:57	20:39 6	20:17 (11) 21:17 18	20:51 (20) 21:30 11	20:54 (20) 21:05	20:13	19:12	18:14	16:42
3	08:17	07:55	07:09	07:08	06:13	20:11 (11) 05:37	20:33 (20) 05:38	20:42 (20) 06:09	06:49	07:29	08:14	07:57
	16:51	17:33	18:14	19:59	20:41 7	20:18 (11) 21:18 18	20:51 (20) 21:30 12	20:54 (20) 21:04	20:11	19:10	18:12	16:41
4	08:17	07:54	07:07	07:06	06:11	20:11 (11) 05:36	20:34 (20) 05:38	20:42 (20) 06:10	06:51	07:31	08:15	07:58
	16:52	17:34	18:16	20:00	20:42 9	20:20 (11) 21:19 17	20:51 (20) 21:30 13	20:55 (20) 21:02	20:09	19:08	18:10	16:41
5	08:17	07:52	07:05	07:04	06:09	20:11 (11) 05:36	20:35 (20) 05:39	20:43 (20) 06:11	06:52	07:32	07:17	07:59
	16:53	17:36	18:17	20:02	20:43 9	20:20 (11) 21:20 17	20:52 (20) 21:29 13	20:56 (20) 21:01	20:07	19:06	17:09	16:40
6	08:17	07:51	07:03	07:02	06:08	20:13 (11) 05:35	20:35 (20) 05:40	20:42 (20) 06:13	06:53	07:33	07:18	08:00
	16:54	17:37	18:19	20:03	20:45 9	20:22 (11) 21:21 16	20:51 (20) 21:29 14	20:56 (20) 21:00	20:05	19:04	17:08	16:40
7	08:16	07:49	07:01	07:00	06:06	20:13 (11) 05:35	20:36 (20) 05:40	20:42 (20) 06:14 20:24 (11)	06:55	07:35	07:20	08:01
	16:55	17:39	18:20	20:04	20:46 8	20:21 (11) 21:21 15	20:51 (20) 21:29 15	20:57 (20) 20:58 6 20:30 (11)	20:03	19:02	17:06	16:40
8	08:16	07:48	06:59	06:58	06:05	05:34	20:36 (20) 05:41	20:42 (20) 06:15 20:22 (11)	06:56	07:36	07:21	08:02
	16:56	17:40	18:22	20:06	20:47	21:22 14	20:50 (20) 21:28 16	20:58 (20) 20:57 10 20:32 (11)	20:01	19:00	17:05	16:40
9	08:16	07:46	06:57	06:56	06:03	05:34	20:37 (20) 05:42	20:41 (20) 06:16 20:21 (11)	06:57	07:38	07:23	08:03
	16:57	17:42	18:23	20:07	20:49	21:23 13	20:50 (20) 21:28 17	20:58 (20) 20:55 9 20:30 (11)	19:59	18:56	17:03	16:39
10	08:16	07:45	06:55	06:54	06:02	05:34	20:37 (20) 05:43	20:41 (20) 06:18 20:20 (11)	06:59	07:39	07:24	08:04
	16:58	17:44	18:25	20:09	20:50	21:24 13	20:50 (20) 21:27 17	20:58 (20) 20:54 8 20:28 (11)	19:57	18:54	17:02	16:39
11	08:15	07:43	06:54	06:52	06:01	05:33	20:38 (20) 05:44	20:41 (20) 06:19 20:20 (11)	07:00	07:40	07:26	08:05
	17:00	17:45	18:26	20:10	20:51	21:24 12	20:50 (20) 21:27 18	20:59 (20) 20:52 8 20:28 (11)	19:55	18:52	17:01	16:39
12	08:15	07:42	07:52	06:50	05:59	05:33	20:38 (20) 05:44	20:41 (20) 06:20 20:20 (11)	07:01	07:42	07:27	08:06
	17:01	17:47	18:27	20:11	20:53	21:25 11	20:49 (20) 21:26 18	20:59 (20) 20:50 6 20:26 (11)	19:53	18:50	16:59	16:39
13	08:14	07:40	07:50	06:48	05:58	05:33	20:39 (20) 05:45	20:41 (20) 06:22 20:19 (11)	07:03	07:43	07:29	08:07
	17:02	17:48	19:29	20:13	20:54	21:26 10	20:49 (20) 21:26 18	20:59 (20) 20:49 5 20:24 (11)	19:51	18:49	16:58	16:39
14	08:14	07:39	07:48	06:46 19:52 (18)	05:56	05:33	20:40 (20) 05:46	20:41 (20) 06:23 20:19 (11)	07:04	07:45	07:30	08:08
	17:03	17:50	19:30	20:14 1 19:53 (18)	20:55	21:26 9	20:49 (20) 21:25 18	20:59 (20) 20:47 3 20:22 (11)	19:49	18:47	16:57	16:39
15	08:13	07:37	07:46	06:44 19:52 (18)	05:55	05:33	20:40 (20) 05:47	20:40 (20) 06:24	07:05	07:46	07:32	08:09
	17:05	17:51	19:32	20:16 3 19:55 (18)	20:57	21:27 9	20:49 (20) 21:24 17	20:57 (20) 20:45	19:47	18:45	16:56	16:39
16	08:13	07:36	07:44	06:42 19:51 (18)	05:54	05:33	20:41 (20) 05:48	20:40 (20) 06:26	07:07	07:48	07:33	08:10
	17:06	17:53	19:33	20:17 5 19:56 (18)	20:58	21:27 8	20:49 (20) 21:23 16	20:56 (20) 20:44	19:45	18:43	16:55	16:40
17	08:12	07:34	07:42	06:40 19:51 (18)	05:53	05:33	20:42 (20) 05:49	20:40 (20) 06:27	07:08	07:49	07:35	08:11
	17:07	17:54	19:35	20:18 6 19:57 (18)	20:59	21:28 7	20:49 (20) 21:23 16	20:56 (20) 20:42	19:43	18:41	16:54	16:40
18	08:11	07:32	07:40	06:39 19:52 (18)	05:51	20:35 (20) 05:33	20:42 (20) 05:50	20:41 (20) 06:28	07:09	07:50	07:36	08:11
	17:09	17:56	19:36	20:20 6 19:58 (18)	21:00 1	20:36 (20) 21:28 6	20:48 (20) 21:22 14	20:55 (20) 20:40	19:41	18:39	16:52	16:40
19	08:10	07:31	07:38	06:37 19:54 (18)	05:50	20:34 (20) 05:33	20:42 (20) 05:51	20:41 (20) 06:30	07:11	07:52	07:38	08:12
	17:10	17:58	19:38	20:21 4 19:58 (18)	21:02 3	20:37 (20) 21:29 6	20:48 (20) 21:21 13	20:54 (20) 20:39	19:39	18:37	16:51	16:40
20	08:10	07:29	07:36	06:35	05:49	20:33 (20) 05:33	20:43 (20) 05:52	20:41 (20) 06:31	07:12	07:53	07:39	08:13
	17:12	17:59	19:39	20:23	21:03 5	20:38 (20) 21:29 5	20:48 (20) 21:20 12	20:53 (20) 20:37	19:37	18:36	16:50	16:41
21	08:09	07:27	07:34	06:33	05:48	20:32 (20) 05:33	20:44 (20) 05:53	20:41 (20) 06:32	07:13	07:55	07:41	08:13
	17:13	18:01	19:40	20:24	21:04 7	20:39 (20) 21:29 5	20:49 (20) 21:19 12	20:53 (20) 20:35	19:35	18:34	16:49	16:41
22	08:08	07:25	07:32	06:31	05:47	20:32 (20) 05:33	20:44 (20) 05:54	20:41 (20) 06:33	07:15	07:56	07:42	08:14
	17:14	18:01	19:42	20:25	21:05 8	20:40 (20) 21:30 5	20:49 (20) 21:18 11	20:52 (20) 20:33	19:32	18:32	16:49	16:42
23	08:07	07:24	07:30	06:29	05:46	20:31 (20) 05:33	20:44 (20) 05:56	20:42 (20) 06:35	07:16	07:58	07:43	08:14
	17:16	18:02	19:43	20:27	21:06 11	20:42 (20) 21:30 5	20:49 (20) 21:17 9	20:51 (20) 20:31	19:30	18:30	16:48	16:42
24	08:06	07:22	07:28	06:28	05:45	20:32 (20) 05:34	20:44 (20) 05:57	20:43 (20) 06:36	07:17	07:59	07:45	08:15
	17:17	18:04	19:45	20:28	21:08 11	20:43 (20) 21:30 5	20:49 (20) 21:16 8	20:51 (20) 20:30	19:28	18:28	16:47	16:43
25	08:05	07:20	07:26	06:26	05:44	20:32 (20) 05:34	20:44 (20) 05:58	20:44 (20) 06:37	07:19	08:01	07:46	08:15
	17:19	18:05	19:46	20:29	21:09 12	20:44 (20) 21:30 6	20:50 (20) 21:15 5	20:49 (20) 20:28	19:26	18:27	16:46	16:43
26	08:04	07:18	07:24	06:24	05:43	20:32 (20) 05:34	20:44 (20) 05:59	20:45 (20) 06:39 19:55 (18)	07:20	08:02	07:48	08:16
	17:20	18:07	19:48	20:31	21:10 13	20:45 (20) 21:30 7	20:51 (20) 21:14 3	20:48 (20) 20:26 6 20:01 (18)	19:24	18:25	16:45	16:44
27	08:03	07:16	07:22	06:22	05:42	20:32 (20) 05:35	20:43 (20) 06:00	20:46 (20) 06:40 19:54 (18)	07:21	08:04	07:49	08:16
	17:22	18:08	19:49	20:32	21:11 14	20:46 (20) 21:30 8	20:51 (20) 21:13 1	20:47 (20) 20:24 6 20:00 (18)	19:22	18:23	16:45	16:45
28	08:02	07:15	07:20	06:21	05:41	20:31 (20) 05:35	20:44 (20) 06:01	06:41 19:53 (18)	07:23	08:05	07:50	08:16
	17:23	18:10	19:50	20:34	21:12 16	20:47 (20) 21:30 8	20:52 (20) 21:12	20:22 5 19:58 (18)	19:20	18:22	16:44	16:45
29	08:01		07:18	06:19	05:40	20:32 (20) 05:35	20:43 (20) 06:03	06:43 19:52 (18)	07:24	08:07	07:52	08:16
	17:25		19:52	20:35	21:13 16	20:48 (20) 21:30 9	20:52 (20) 21:10	20:20 4 19:56 (18)	19:18	18:20	16:43	16:46
30	08:00		07:16	06:17 20:12 (11)	05:40	20:32 (20) 05:36	20:44 (20) 06:04	06:44 19:52 (18)	07:25	08:08	07:53	08:17
	17:26		19:53	20:36 2 20:14 (11)	21:14 17	20:49 (20) 21:30 9	20:53 (20) 21:09	20:18 2 19:54 (18)	19:16	18:18	16:43	16:47
31	07:59		07:14		05:39	20:32 (20)	06:05	06:45		08:09		08:17
	17:28		19:55		21:15 18	20:50 (20)	21:08	20:17		18:17		16:48
Potential sun hours	277	286	367	406	466	476	482	443	380	339	282	265
Total, worst case				27	204	309	347	78				
Sun reduction				0.57	0.60	0.64	0.74	0.71				
Oper. time red.				0.85	0.85	0.85	0.85	0.85				
Wind dir. red.				0.72	0.72	0.72	0.72	0.72				
Total reduction				0.35	0.37	0.39	0.45	0.43				
Total, real				9	75	121	157	34				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com

Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L36 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4570)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January		February	March	April	May		June		July		August		September	October	November	December	
1	08:17	16:18 (21)	07:58	07:13	07:12	06:16		05:38		05:37	21:01 (6)	06:06		06:47	07:27	08:11	07:54	16:09 (21)
	16:49	3 16:21 (21)	17:30	18:11	19:56	20:38		21:16		21:30	2 21:03 (6)	21:07		20:15	19:14	18:15	16:42	6 16:15 (21)
2	08:17	16:19 (21)	07:56	07:11	07:10	06:14		05:38		05:37	21:02 (6)	06:08		06:48	07:28	08:13	07:56	16:09 (21)
	16:50	3 16:22 (21)	17:31	18:13	19:58	20:39		21:17		21:30	2 21:04 (6)	21:05		20:13	19:12	18:14	16:42	7 16:16 (21)
3	08:17	16:19 (21)	07:55	07:09	07:08	06:13		05:37		05:38	21:01 (6)	06:09		06:49	07:30	08:14	07:57	16:08 (21)
	16:51	4 16:23 (21)	17:33	18:14	19:59	20:41		21:18		21:30	2 21:03 (6)	21:04		20:11	19:10	18:12	16:41	7 16:15 (21)
4	08:17	16:20 (21)	07:54	07:07	07:06	06:11		05:36		05:38	21:02 (6)	06:10		06:51	07:31	08:16	07:58	16:08 (21)
	16:52	4 16:24 (21)	17:34	18:16	20:00	20:42		21:19		21:30	1 21:03 (6)	21:03		20:09	19:08	18:11	16:41	6 16:14 (21)
5	08:17	16:21 (21)	07:52	07:05	07:04	06:09		05:36		05:39		06:11		06:52	07:32	07:17	07:59	16:07 (21)
	16:53	4 16:25 (21)	17:36	18:17	20:02	20:43		21:20		21:30		21:01		20:07	19:06	17:09	16:40	7 16:14 (21)
6	08:17	16:21 (21)	07:51	07:03	07:02	06:08	20:21 (19)	05:35		05:40		06:13		06:53	07:34	07:19	08:00	16:07 (21)
	16:54	6 16:27 (21)	17:37	18:19	20:03	20:45	1 20:22 (19)	21:21		21:29		21:00		20:05	19:04	17:08	16:40	6 16:13 (21)
7	08:17	16:21 (21)	07:50	07:01	07:00	06:06	20:22 (19)	05:35		05:40		06:14		06:55	07:35	07:20	08:01	16:08 (21)
	16:55	6 16:27 (21)	17:39	18:20	20:05	20:46	1 20:23 (19)	21:22		21:29		20:58		20:03	19:02	17:06	16:40	6 16:14 (21)
8	08:16	16:22 (21)	07:48	07:00	06:58	06:05		05:35		05:41		06:15	20:31 (19)	06:56	07:36	07:22	08:03	16:08 (21)
	16:56	7 16:29 (21)	17:41	18:22	20:06	20:48		21:22		21:28		20:57	1 20:32 (19)	20:01	19:00	17:05	16:40	5 16:13 (21)
9	08:16	16:24 (21)	07:47	06:58	06:56	06:03		05:34		05:42		06:17	20:29 (19)	06:57	07:38	07:23	08:04	16:08 (21)
	16:57	6 16:30 (21)	17:42	18:23	20:07	20:49		21:23		21:28		20:55	1 20:30 (19)	19:59	18:56	17:03	16:40	5 16:13 (21)
10	08:16	16:24 (21)	07:45	06:56	06:54	06:02		05:34	20:57 (6)	05:43		06:18		06:59	07:39	07:25	08:05	16:09 (21)
	16:58	7 16:31 (21)	17:44	18:25	20:09	20:50		21:24	1 20:58 (6)	21:27		20:54		19:57	18:54	17:02	16:39	4 16:13 (21)
11	08:15	16:26 (21)	07:44	06:54	06:52	06:01		05:34	20:58 (6)	05:44		06:19		07:00	07:41	07:26	08:06	16:09 (21)
	17:00	7 16:33 (21)	17:45	18:26	20:10	20:52		21:25	1 20:59 (6)	21:27		20:52		19:55	18:53	17:01	16:39	3 16:12 (21)
12	08:15	16:26 (21)	07:42	07:52	06:50	05:59		05:33	20:58 (6)	05:44		06:20		07:01	07:42	07:28	08:07	16:09 (21)
	17:01	8 16:34 (21)	17:47	18:28	20:12	20:53		21:25	2 21:00 (6)	21:26		20:51		19:53	18:51	17:00	16:39	3 16:12 (21)
13	08:14	16:29 (21)	07:41	07:50	06:48	05:58		05:33	20:57 (6)	05:45		06:22		07:03	07:43	07:29	08:07	16:10 (21)
	17:02	4 16:33 (21)	17:48	19:29	20:13	20:54		21:26	2 20:59 (6)	21:26		20:49		19:51	18:49	16:58	16:39	2 16:12 (21)
14	08:14		07:39	07:48	06:46	05:57		05:33	20:57 (6)	05:46		06:23		07:04	07:45	07:31	08:08	16:10 (21)
	17:03		17:50	19:31	20:14	20:55		21:27	3 21:00 (6)	21:25		20:47		19:49	18:47	16:57	16:39	3 16:13 (21)
15	08:13		07:37	07:46	06:44	05:55		05:33	20:57 (6)	05:47		06:24		07:05	07:46	07:32	08:09	16:11 (21)
	17:05		17:51	19:32	20:16	20:57		21:27	4 21:01 (6)	21:24		20:46		19:47	18:45	16:56	16:40	2 16:13 (21)
16	08:13		07:36	07:44	06:42	05:54		05:33	20:57 (6)	05:48		06:26		07:07	07:48	07:34	08:10	16:11 (21)
	17:06		17:53	19:33	20:17	20:58		21:28	4 21:01 (6)	21:24		20:44		19:45	18:43	16:55	16:40	1 16:12 (21)
17	08:12		07:34	07:42	06:41	05:53		05:33	20:57 (6)	05:49		06:27		07:08	07:49	07:35	08:11	16:11 (21)
	17:07		17:55	19:35	20:19	20:59		21:28	4 21:01 (6)	21:23		20:42		19:43	18:41	16:54	16:40	1 16:12 (21)
18	08:11		07:32	07:40	06:39	05:52		05:33	20:58 (6)	05:50		06:28		07:09	07:51	07:37	08:11	16:12 (21)
	17:09		17:56	19:36	20:20	21:01		21:29	4 21:02 (6)	21:22		20:41		19:41	18:39	16:53	16:40	1 16:13 (21)
19	08:11		07:31	07:38	06:37	05:50		05:33	20:58 (6)	05:51		06:30		07:11	07:52	07:38	08:12	16:12 (21)
	17:10		17:58	19:38	20:21	21:02		21:29	4 21:02 (6)	21:21		20:39		19:39	18:37	16:52	16:40	1 16:13 (21)
20	08:10		07:29	07:36	06:35	05:49		05:33	20:58 (6)	05:52		06:31		07:12	07:53	07:39	08:13	
	17:12		17:59	19:39	20:23	21:03		21:29	4 21:02 (6)	21:20		20:37		19:37	18:36	16:51	16:41	
21	08:09		07:27	07:34	06:33	05:48		05:33	20:59 (6)	05:53		06:32		07:13	07:55	07:41	08:13	
	17:13		18:01	19:41	20:24	21:04		21:30	4 21:03 (6)	21:19		20:35		19:35	18:34	16:50	16:41	
22	08:08		07:26	07:32	06:31	05:47		05:33	20:59 (6)	05:55		06:34		07:15	07:56	07:42	08:14	
	17:15		18:01	19:42	20:25	21:05		21:30	4 21:03 (6)	21:18		20:33		19:33	18:32	16:49	16:42	
23	08:07		07:24	07:30	06:30	05:46		05:33	20:59 (6)	05:56		06:35		07:16	07:58	07:44	08:14	
	17:16		18:02	19:43	20:27	21:07		21:30	4 21:03 (6)	21:17		20:32		19:31	18:30	16:48	16:42	
24	08:06		07:22	07:28	06:28	05:45		05:34	20:59 (6)	05:57		06:36		07:17	07:59	07:45	08:15	
	17:17		18:04	19:45	20:28	21:08		21:30	4 21:03 (6)	21:16		20:30		19:29	18:29	16:47	16:43	
25	08:05		07:20	07:26	06:26	05:44		05:34	21:00 (6)	05:58		06:38		07:19	08:01	07:46	08:15	
	17:19		18:05	19:46	20:30	21:09		21:30	4 21:04 (6)	21:15		20:28		19:27	18:27	16:46	16:43	
26	08:04		07:18	07:24	06:24	05:43		05:34	21:00 (6)	05:59		06:39		07:20	08:02	07:48	08:16	16:16 (21)
	17:20		18:07	19:48	20:31	21:10		21:31	4 21:04 (6)	21:14		20:26		19:24	18:25	16:45	16:44	1 16:17 (21)
27	08:03		07:17	07:22	06:23	05:42		05:35	20:59 (6)	06:00		06:40		07:21	08:04	07:49	08:16	16:16 (21)
	17:22		18:08	19:49	20:32	21:11		21:31	4 21:03 (6)	21:13		20:24		19:22	18:23	16:45	16:45	1 16:17 (21)
28	08:02		07:15	07:20	06:21	05:41		05:35	21:00 (6)	06:01		06:42		07:23	08:05	07:50	08:16	16:16 (21)
	17:23		18:10	19:50	20:34	21:12		21:31	4 21:04 (6)	21:12		20:22		19:20	18:22	16:44	16:45	2 16:18 (21)
29	08:01			07:18	06:19	05:41		05:36	21:00 (6)	06:03		06:43		07:24	08:07	07:52	08:17	16:17 (21)
	17:25			19:52	20:35	21:13		21:31	3 21:03 (6)	21:11		20:21		19:18	18:20	16:43	16:46	1 16:18 (21)
30	08:00			07:16	06:18	05:40		05:36	21:01 (6)	06:04		06:44		07:25	08:08	07:53	08:17	16:17 (21)
	17:27			19:53	20:37	21:14		21:31	3 21:04 (6)	21:09		20:19		19:16	18:18	16:43	16:47	2 16:19 (21)
31	07:59			07:14		05:39				06:05		06:46			08:10		08:17	16:17 (21)
	17:28			19:55		21:15				21:08		20:17			18:17		16:48	3 16:20 (21)
Potential sun hours	277		286	367	406	466		476		482		443		380	339	282	265	
Total, worst case		69					2		71		7		2					86
Sun reduction		0.52					0.60		0.64		0.74		0.71					0.39
Oper. time red.		0.85					0.85		0.85		0.85		0.85					0.85
Wind dir. red.		0.59					0.72		0.71		0.71		0.72					0.59
Total reduction		0.25					0.36		0.38		0.44		0.43					0.19
Total, real		18					1		27		3		1					16

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L37 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4571)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January	February		March		April		May		June	
1	08:17	07:58		07:13		07:12		19:08 (15)	06:16	05:38	06:22 (8)
	16:49	17:30		18:11		19:56	28	19:36 (15)	20:38	21:16	42 07:04 (8)
2	08:17	07:56		07:11		07:10		19:06 (15)	06:14	05:38	06:22 (8)
	16:50	17:31		18:13		19:58	31	19:37 (15)	20:39	21:17	42 07:04 (8)
3	08:17	07:55		07:09		07:08		19:04 (15)	06:13	05:37	06:23 (8)
	16:51	17:33		18:14		19:59	34	19:38 (15)	20:41	21:18	41 07:04 (8)
4	08:17	07:54		07:07		07:06		19:02 (15)	06:11	05:37	06:23 (8)
	16:52	17:34		18:16		20:00	38	19:40 (15)	20:42	21:19	41 07:04 (8)
5	08:17	07:52		07:05		07:04		19:01 (15)	06:10	05:36	06:23 (8)
	16:53	17:36		18:17		20:02	40	19:41 (15)	20:44	21:20	41 07:04 (8)
6	08:17	07:51		07:03		07:02		19:00 (15)	06:08	05:36	06:23 (8)
	16:54	17:37		18:19		20:03	42	19:42 (15)	20:45	21:21	41 07:04 (8)
7	08:17	07:50		07:02		07:00		18:59 (15)	06:07	06:36 (8)	05:35 06:24 (8)
	16:55	17:39		18:20		20:05	43	19:42 (15)	20:46	11 06:47 (8)	21:22 40 07:04 (8)
8	08:16	07:48		07:00		06:58		18:58 (15)	06:05	06:33 (8)	05:35 06:24 (8)
	16:56	17:41		18:22		20:06	44	19:42 (15)	20:48	18 06:51 (8)	21:23 41 07:05 (8)
9	08:16	07:47		06:58		06:56		18:57 (15)	06:04	06:31 (8)	05:34 06:24 (8)
	16:57	17:42		18:23		20:07	46	19:43 (15)	20:49	22 06:53 (8)	21:23 40 07:04 (8)
10	08:16	07:45		06:56		06:54		18:56 (15)	06:02	06:29 (8)	05:34 06:24 (8)
	16:59	17:44		18:25		20:09	47	19:43 (15)	20:50	25 06:54 (8)	21:24 40 07:04 (8)
11	08:15	07:44		06:54		06:52		18:56 (15)	06:01	06:28 (8)	05:34 06:25 (8)
	17:00	17:45		18:26		20:10	46	19:42 (15)	20:52	28 06:56 (8)	21:25 40 07:05 (8)
12	08:15	07:42		07:52		06:50		18:56 (15)	05:59	06:27 (8)	05:33 06:25 (8)
	17:01	17:47		18:28		20:12	47	19:43 (15)	20:53	30 06:57 (8)	21:25 40 07:05 (8)
13	08:14	07:41	17:23 (12)	07:50		06:48		18:56 (15)	05:58	06:25 (8)	05:33 06:25 (8)
	17:02	17:48	2 17:25 (12)	19:29		20:13	47	19:43 (15)	20:54	32 06:57 (8)	21:26 39 07:04 (8)
14	08:14	07:39	17:23 (12)	07:48		06:46		18:55 (15)	05:57	06:25 (8)	05:33 06:25 (8)
	17:04	17:50	4 17:27 (12)	19:31		20:14	49	19:54 (14)	20:55	33 06:58 (8)	21:27 39 07:04 (8)
15	08:13	07:37	08:02 (13)	07:46		06:44		18:55 (15)	05:55	06:24 (8)	05:33 06:26 (8)
	17:05	17:52	5 17:28 (12)	19:32		20:16	49	19:55 (14)	20:57	35 06:59 (8)	21:27 38 07:04 (8)
16	08:13	07:36	08:01 (13)	07:44		06:43		18:55 (15)	05:54	06:24 (8)	05:33 06:26 (8)
	17:06	17:53	7 17:30 (12)	19:33		20:17	49	19:56 (23)	20:58	36 07:00 (8)	21:28 39 07:05 (8)
17	08:12	07:34	07:59 (13)	07:42		06:41		18:55 (15)	05:53	06:23 (8)	05:33 06:26 (8)
	17:08	17:55	8 17:32 (12)	19:35		20:19	51	19:57 (23)	20:59	38 07:01 (8)	21:28 39 07:05 (8)
18	08:11	07:32	07:57 (13)	07:40		06:39		18:55 (15)	05:52	06:23 (8)	05:33 06:27 (8)
	17:09	17:56	6 08:03 (13)	19:36		20:20	51	19:58 (23)	21:01	38 07:01 (8)	21:29 38 07:05 (8)
19	08:11	07:31	07:55 (13)	07:38		06:37		18:56 (15)	05:50	06:22 (8)	05:33 06:27 (8)
	17:10	17:58	7 08:02 (13)	19:38		20:21	50	20:00 (23)	21:02	40 07:02 (8)	21:29 38 07:05 (8)
20	08:10	07:29	07:54 (13)	07:36		06:35		18:56 (15)	05:49	06:22 (8)	05:33 06:28 (8)
	17:12	17:59	8 08:02 (13)	19:39		20:23	50	20:01 (23)	21:03	40 07:02 (8)	21:29 38 07:06 (8)
21	08:09	07:27	07:53 (13)	07:34		06:33		18:57 (15)	05:48	06:22 (8)	05:33 06:28 (8)
	17:13	18:01	6 07:59 (13)	19:41		20:24	48	20:03 (23)	21:04	41 07:03 (8)	21:30 38 07:06 (8)
22	08:08	07:26		07:32		06:31		18:57 (15)	05:47	06:22 (8)	05:33 06:28 (8)
	17:15	18:01		19:42		20:26	39	19:36 (15)	21:05	41 07:03 (8)	21:30 38 07:06 (8)
23	08:07	07:24		07:30		06:30		18:59 (15)	05:46	06:22 (8)	05:33 06:28 (8)
	17:16	18:02		19:43		20:27	37	19:36 (15)	21:07	41 07:03 (8)	21:30 38 07:06 (8)
24	08:06	07:22		07:28		06:28		18:59 (15)	05:45	06:21 (8)	05:34 06:28 (8)
	17:18	18:04		19:45		20:28	35	19:34 (15)	21:08	42 07:03 (8)	21:30 38 07:06 (8)
25	08:05	07:20		07:26		06:26		19:00 (15)	05:44	06:21 (8)	05:34 06:29 (8)
	17:19	18:05		19:46		20:30	33	19:33 (15)	21:09	42 07:03 (8)	21:30 38 07:07 (8)
26	08:04	07:18		07:24	19:24 (5)	06:24		19:01 (15)	05:43	06:21 (8)	05:34 06:29 (8)
	17:21	18:07		19:48	3 19:27 (5)	20:31	30	19:31 (15)	21:10	42 07:03 (8)	21:31 38 07:07 (8)
27	08:03	07:17		07:22	19:21 (5)	06:23		19:03 (15)	05:42	06:21 (8)	05:35 06:28 (8)
	17:22	18:08		19:49	8 19:29 (5)	20:33	27	19:30 (15)	21:11	42 07:03 (8)	21:31 39 07:07 (8)
28	08:02	07:15		07:20	19:20 (5)	06:21		19:05 (15)	05:41	06:21 (8)	05:35 06:29 (8)
	17:24	18:10		19:51	10 19:30 (5)	20:34	22	19:27 (15)	21:12	42 07:03 (8)	21:31 39 07:08 (8)
29	08:01			07:18	19:18 (15)	06:19		19:08 (15)	05:41	06:22 (8)	05:36 06:29 (8)
	17:25			19:52	14 19:32 (5)	20:35	17	19:25 (15)	21:13	42 07:04 (8)	21:31 38 07:07 (8)
30	08:00			07:16	19:13 (15)	06:18		19:13 (15)	05:40	06:22 (8)	05:36 06:29 (8)
	17:27			19:53	20 19:33 (15)	20:37	6	19:19 (15)	21:14	42 07:04 (8)	21:31 39 07:08 (8)
31	07:59			07:14	19:10 (15)				05:39	06:21 (8)	
	17:28			19:55	24 19:34 (15)				21:15	42 07:03 (8)	
Potential sun hours	277	286		367		406			466		476
Total, worst case			53		79		1176		885		1180
Sun reduction			0.54		0.59		0.57		0.60		0.64
Oper. time red.			0.85		0.85		0.85		0.85		0.85
Wind dir. red.			0.70		0.71		0.71		0.64		0.64
Total reduction			0.32		0.35		0.34		0.33		0.35
Total, real			17		28		404		289		411

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L37 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4571)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	July		August		September		October		November	December
1	05:37		06:06		06:47		07:27		08:11	07:54
	21:30	39	07:08 (8)	33	07:09 (8)	20:15 47	19:42 (15)	19:14	18:15	16:42
2	05:37		06:08		06:37 (8)	06:48	18:54 (15)	07:28	08:13	07:56
	21:30	40	07:09 (8)	30	07:07 (8)	20:13 47	19:41 (15)	19:12	18:14	16:42
3	05:38		06:09		06:38 (8)	06:50	18:55 (15)	07:30	08:14	07:57
	21:30	39	07:08 (8)	28	07:06 (8)	20:11 47	19:42 (15)	19:10	18:12	16:41
4	05:38		06:10		06:39 (8)	06:51	18:55 (15)	07:31	08:16	07:58
	21:30	40	07:09 (8)	25	07:04 (8)	20:09 46	19:41 (15)	19:08	18:11	16:41
5	05:39		06:11		06:41 (8)	06:52	18:54 (15)	07:32	07:17	07:59
	21:30	40	07:10 (8)	23	07:04 (8)	20:07 46	19:40 (15)	19:06	17:09	16:41
6	05:40		06:13		06:43 (8)	06:54	18:54 (15)	07:34	07:19	08:00
	21:29	41	07:10 (8)	18	07:01 (8)	20:05 45	19:39 (15)	19:04	17:08	16:40
7	05:41		06:14		06:45 (8)	06:55	18:55 (15)	07:35	07:20	08:01
	21:29	40	07:10 (8)	13	06:58 (8)	20:03 43	19:38 (15)	19:02	17:06	16:40
8	05:41		06:15		06:56		18:55 (15)	07:36	07:22	08:03
	21:28	41	07:11 (8)		20:01	42	19:37 (15)	19:00	17:05	16:40
9	05:42		06:17		06:57		18:56 (15)	07:38	07:23	08:04
	21:28	41	07:11 (8)		19:59	39	19:35 (15)	18:57	17:04	16:40
10	05:43		06:18		06:59		18:57 (15)	07:39	07:25	08:05
	21:27	42	07:11 (8)		19:57	37	19:34 (15)	18:55	17:02	16:40
11	05:44		06:19		07:00		18:58 (15)	07:41	07:26	08:06
	21:27	41	07:11 (8)		19:55	33	19:31 (15)	18:53	17:01	16:39
12	05:45		06:21		07:01		18:59 (15)	07:42	07:28	08:07
	21:26	42	07:12 (8)		19:53	30	19:29 (15)	18:51	17:00	16:39
13	05:45		06:22		07:03		19:00 (15)	07:43	07:29	08:07
	21:26	42	07:12 (8)		19:51	27	19:27 (15)	18:49	16:58	16:39
14	05:46		06:23		07:04		19:02 (15)	07:45	07:31	08:08
	21:25	42	07:12 (8)		19:49	23	19:25 (15)	18:47	16:57	16:40
15	05:47		06:24		19:17 (15)	07:05	19:05 (15)	07:46	07:32	08:09
	21:24	42	07:13 (8)	14	19:31 (15)	19:47 18	19:23 (5)	18:45	16:56	16:40
16	05:48		06:26		19:13 (15)	07:07	19:08 (5)	07:48	07:34	08:10
	21:24	42	07:13 (8)	21	19:34 (15)	19:45 13	19:21 (5)	18:43	16:55	16:40
17	05:49		06:27		19:11 (15)	07:08	19:10 (5)	07:49	07:35	08:11
	21:23	42	07:13 (8)	24	19:35 (15)	19:43 9	19:19 (5)	18:41	16:54	16:40
18	05:50		06:28		19:09 (15)	07:09	19:10 (5)	07:51	07:37	08:11
	21:22	42	07:13 (8)	29	19:38 (15)	19:41 7	19:17 (5)	18:39	16:53	16:40
19	05:51		06:30		19:07 (15)	07:11	19:12 (5)	07:52	07:38	08:12
	21:21	42	07:13 (8)	32	19:39 (15)	19:39 3	19:15 (5)	18:38	16:52	16:41
20	05:52		06:31		19:05 (15)	07:12		07:54	07:39	08:13
	21:20	42	07:13 (8)	35	19:40 (15)	19:37		18:36	16:51	16:41
21	05:54		06:32		19:04 (15)	07:13		07:55	07:41	08:13
	21:19	42	07:13 (8)	36	19:40 (15)	19:35		18:34	16:50	16:41
22	05:55		06:34		19:03 (15)	07:15		07:56	08:24 (13)	07:42 08:14
	21:18	41	07:13 (8)	39	19:42 (15)	19:33		18:32 5	08:29 (13)	16:49 16:42
23	05:56		06:35		19:02 (15)	07:16		07:58	08:23 (13)	07:44 08:14
	21:17	41	07:13 (8)	46	20:07 (23)	19:31		18:30 8	08:31 (13)	16:48 16:42
24	05:57		06:36		19:00 (15)	07:17		07:59	08:25 (13)	07:45 08:15
	21:16	41	07:13 (8)	50	20:06 (23)	19:29		18:29 7	08:32 (13)	16:47 16:43
25	05:58		06:38		18:59 (15)	07:19		08:01	08:27 (13)	07:46 08:15
	21:15	40	07:12 (8)	50	20:04 (23)	19:27		18:27 6	08:33 (13)	16:46 16:43
26	05:59		06:39		18:59 (15)	07:20		08:02	08:28 (13)	07:48 08:16
	21:14	39	07:12 (8)	50	20:02 (23)	19:25		18:25 5	08:33 (13)	16:45 16:44
27	06:00		06:40		18:58 (15)	07:21		08:04	08:30 (13)	07:49 08:16
	21:13	38	07:11 (8)	50	20:00 (23)	19:23		18:23 7	18:00 (12)	16:45 16:45
28	06:02		06:42		18:57 (15)	07:23		08:05	08:31 (13)	07:51 08:16
	21:12	38	07:11 (8)	49	19:58 (23)	19:20		18:22 5	17:58 (12)	16:44 16:45
29	06:03		06:43		18:56 (15)	07:24		08:07	17:53 (12)	07:52 08:17
	21:11	36	07:10 (8)	49	19:56 (14)	19:18		18:20 4	17:57 (12)	16:43 16:46
30	06:04		06:44		18:56 (15)	07:25		08:08	17:52 (12)	07:53 08:17
	21:09	35	07:09 (8)	49	19:55 (14)	19:16		18:19 2	17:54 (12)	16:43 16:47
31	06:05		06:46		18:56 (15)			08:10	17:52 (12)	08:17
	21:08	34	07:10 (8)	48	19:53 (14)			18:17 1	17:53 (12)	16:48
Potential sun hours	482		443		380		339		282	265
Total, worst case		1247		841		602		50		
Sun reduction		0.74		0.71		0.63		0.51		
Oper. time red.		0.85		0.85		0.85		0.85		
Wind dir. red.		0.64		0.70		0.71		0.70		
Total reduction		0.40		0.42		0.38		0.30		
Total, real		502		353		228		15		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L38 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4572)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January			February			March	April			May			June		
1	08:17			07:58			07:13	07:12			06:16		06:42 (22)	05:38		06:06 (16)
	16:49			17:30			18:11	19:56			20:38	6	06:48 (22)	21:16	8	06:14 (16)
2	08:17			07:56			07:11	07:10			06:14			05:38		06:05 (16)
	16:50			17:31			18:13	19:58			20:39			21:17	10	20:52 (28)
3	08:17			07:55			07:09	07:08			06:13			05:37		06:05 (16)
	16:51			17:33			18:14	19:59			20:41			21:18	11	20:53 (28)
4	08:17			07:54			07:07	07:06			06:11			05:37		06:04 (16)
	16:52			17:34			18:16	20:00			20:42			21:19	13	20:53 (28)
5	08:17			07:52			07:05	07:04			06:10			05:36		06:04 (16)
	16:53			17:36			18:17	20:02			20:44			21:20	15	20:55 (28)
6	08:17			07:51			07:03	07:02			06:08			05:35		06:03 (16)
	16:54			17:37			18:19	20:03			20:45			21:21	16	20:55 (28)
7	08:17			07:50			07:02	07:00			06:06			05:35		06:03 (16)
	16:55			17:39			18:20	20:05			20:46			21:22	18	20:56 (28)
8	08:16			07:48		17:16 (14)	07:00	06:58			06:05			05:35		06:03 (16)
	16:56			17:41	1	17:17 (14)	18:22	20:06			20:48			21:23	18	20:57 (28)
9	08:16			07:47		17:16 (14)	06:58	06:56			06:04			05:34		06:02 (16)
	16:57			17:42	2	17:18 (14)	18:23	20:07			20:49			21:23	20	20:57 (28)
10	08:16			07:45		17:17 (14)	06:56	06:54			06:02			05:34		06:02 (16)
	16:58			17:44	2	17:19 (14)	18:25	20:09			20:50			21:24	20	20:58 (28)
11	08:15			07:44		17:19 (14)	06:54	06:52			06:01			05:34		06:02 (16)
	17:00			17:45	3	17:22 (14)	18:26	20:10			20:52			21:25	22	20:59 (28)
12	08:15			07:42			07:52	06:50			05:59			05:33		06:02 (16)
	17:01			17:47			18:28	20:12			20:53			21:25	23	21:00 (28)
13	08:15			07:41			07:50	06:48			05:58			05:33		06:01 (16)
	17:02			17:48			19:29	20:13			20:54			21:26	22	20:59 (28)
14	08:14			07:39			07:48	06:46			05:57			05:33		06:01 (16)
	17:04			17:50			19:31	20:14			20:56			21:27	23	21:00 (28)
15	08:13			07:37			07:46	06:44			05:55		20:32 (9)	05:33		06:01 (16)
	17:05			17:52			19:32	20:16			20:57	1	20:33 (9)	21:27	24	21:00 (28)
16	08:13			07:36			07:44	06:43			05:54		20:32 (9)	05:33		06:01 (16)
	17:06			17:53			19:33	20:17			20:58	2	20:34 (9)	21:28	25	21:01 (28)
17	08:12			07:34			07:42	06:41			05:53		20:32 (9)	05:33		06:01 (16)
	17:08			17:55			19:35	20:19			20:59	4	20:36 (9)	21:28	24	21:01 (28)
18	08:11			07:33			07:40	06:39			05:52		20:32 (9)	05:33		06:02 (16)
	17:09			17:56			19:36	20:20			21:01	5	20:37 (9)	21:29	24	21:02 (28)
19	08:11			07:31			07:38	06:37			05:50		20:33 (9)	05:33		06:02 (16)
	17:10			17:58			19:38	20:21			21:02	5	20:38 (9)	21:29	24	21:02 (28)
20	08:10			07:29			07:36	06:35			05:49		20:33 (9)	05:33		06:03 (16)
	17:12			17:59			19:39	20:23			21:03	6	20:39 (9)	21:29	24	21:03 (28)
21	08:09		16:46 (23)	07:27			07:34	06:33			05:48		20:33 (9)	05:33		06:03 (16)
	17:13	1	16:47 (23)	18:01			19:41	20:24			21:04	7	20:40 (9)	21:30	24	21:03 (28)
22	08:08		16:46 (23)	07:26			07:32	06:31			05:47		20:35 (9)	05:33		06:03 (16)
	17:15	2	16:48 (23)	18:01			19:42	20:26			21:06	7	20:42 (9)	21:30	24	21:03 (28)
23	08:07		16:46 (23)	07:24			07:30	06:30			05:46		20:36 (9)	05:33		06:03 (16)
	17:16	4	16:50 (23)	18:02			19:43	20:27			21:07	7	20:43 (9)	21:30	24	21:03 (28)
24	08:06		16:47 (23)	07:22			07:28	06:28			05:45		20:37 (9)	05:34		06:03 (16)
	17:18	4	16:51 (23)	18:04			19:45	20:28			21:08	7	20:44 (9)	21:30	24	21:03 (28)
25	08:05		16:47 (23)	07:20			07:26	06:26		06:50 (22)	05:44		20:39 (9)	05:34		06:04 (16)
	17:19	6	16:53 (23)	18:05			19:46	20:30	2	06:52 (22)	21:09	2	20:41 (9)	21:30	24	21:04 (28)
26	08:04		16:48 (23)	07:18			07:24	06:24		06:48 (22)	05:43			05:34		06:03 (16)
	17:21	7	16:55 (23)	18:07			19:48	20:31	4	06:52 (22)	21:10			21:31	25	21:04 (28)
27	08:03		16:49 (23)	07:17			07:22	06:23		06:47 (22)	05:42		06:09 (16)	05:35		06:03 (16)
	17:22	8	16:57 (23)	18:08			19:49	20:33	5	06:52 (22)	21:11	2	06:11 (16)	21:31	24	21:03 (28)
28	08:02		16:50 (23)	07:15			07:20	06:21		06:45 (22)	05:41		06:08 (16)	05:35		06:04 (16)
	17:24	8	16:58 (23)	18:10			19:51	20:34	7	06:52 (22)	21:12	4	06:12 (16)	21:31	25	21:04 (28)
29	08:01		16:52 (23)				07:18	06:19		06:44 (22)	05:41		06:08 (16)	05:36		06:04 (16)
	17:25	8	17:00 (23)				19:52	20:35	8	06:52 (22)	21:13	5	06:13 (16)	21:31	24	21:03 (28)
30	08:00		16:53 (23)				07:16	06:18		06:42 (22)	05:40		06:07 (16)	05:36		06:05 (16)
	17:27	5	16:58 (23)				19:53	20:37	8	06:50 (22)	21:14	6	06:13 (16)	21:31	23	21:04 (28)
31	07:59						07:14				05:39		06:06 (16)			
	17:28						19:55				21:15	7	06:13 (16)			
Potential sun hours	277			286			367	406			466			476		
Total, worst case		53			8				34			83			625	
Sun reduction		0.52			0.54				0.57			0.60			0.64	
Oper. time red.		0.85			0.85				0.85			0.85			0.85	
Wind dir. red.		0.60			0.63				0.66			0.69			0.64	
Total reduction		0.26			0.29				0.32			0.35			0.35	
Total, real		14			2				11			29			218	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L38 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4572)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	July		August		September	October	November		December
1	05:37		06:05 (16)	06:06		06:47	07:27	08:11	17:49 (14)	07:54
	21:30	22	21:03 (28)	21:07		20:15	19:14	18:15	3	17:52 (14)	16:42
2	05:37		06:06 (16)	06:08		06:48	07:28	08:13		17:47 (14)	07:56
	21:30	23	21:04 (28)	21:06		20:13	19:12	18:14	3	17:50 (14)	16:42
3	05:38		06:06 (16)	06:09		06:50	07:30	08:14		17:46 (14)	07:57
	21:30	22	21:03 (28)	21:04		20:11	19:10	18:12	2	17:48 (14)	16:41
4	05:38		06:07 (16)	06:10		06:51	07:31	08:16		17:46 (14)	07:58
	21:30	20	21:03 (28)	21:03		20:09	19:08	18:11	1	17:47 (14)	16:41
5	05:39		06:08 (16)	06:11		06:52	07:32	07:17			07:59
	21:30	20	21:03 (28)	21:01		20:07	19:06	17:09			16:41
6	05:40		06:08 (16)	06:13		06:54	07:34	07:19			08:00
	21:29	18	21:02 (28)	21:00		20:05	19:04	17:08			16:40
7	05:40		06:09 (16)	06:14		06:55	07:35	07:20			08:01
	21:29	18	21:02 (28)	20:58		20:03	19:02	17:06			16:40
8	05:41		06:10 (16)	06:15		06:56	07:36	07:22			08:03
	21:29	16	21:02 (28)	20:57		20:01	19:00	17:05			16:40
9	05:42		06:11 (16)	06:17		06:57	07:38	07:23			08:04
	21:28	15	21:02 (28)	20:55		19:59	18:56	17:04			16:40
10	05:43		06:11 (16)	06:18		06:59	07:39	07:25			08:05
	21:28	13	21:00 (28)	20:54		19:57	18:55	17:02			16:39
11	05:44		06:12 (16)	06:19		07:00	07:41	07:26			08:06
	21:27	11	21:00 (28)	20:52		19:55	18:53	17:01			16:39
12	05:45		06:13 (16)	06:20		07:01	07:42	07:28			08:07
	21:26	10	21:00 (28)	20:51		19:53	18:51	17:00			16:39
13	05:45		06:14 (16)	06:22	06:51 (22)	07:03	07:44	07:29			08:08
	21:26	8	06:22 (16)	20:49	5 06:56 (22)	19:51	18:49	16:58			16:39
14	05:46		06:15 (16)	06:23	06:50 (22)	07:04	07:45	07:31		16:24 (23)	08:08
	21:25	7	06:22 (16)	20:47	8 06:58 (22)	19:49	18:47	16:57	7	16:31 (23)	16:39
15	05:47		06:16 (16)	06:24	06:51 (22)	07:05	07:46	07:32		16:22 (23)	08:09
	21:24	6	06:22 (16)	20:46	8 06:59 (22)	19:47	18:45	16:56	9	16:31 (23)	16:40
16	05:48		06:17 (16)	06:26	06:52 (22)	07:07	07:48	07:34		16:22 (23)	08:10
	21:24	5	06:22 (16)	20:44	7 06:59 (22)	19:45	18:43	16:55	8	16:30 (23)	16:40
17	05:49		06:18 (16)	06:27	06:53 (22)	07:08	07:49	07:35		16:22 (23)	08:11
	21:23	4	06:22 (16)	20:42	6 06:59 (22)	19:43	18:41	16:54	7	16:29 (23)	16:40
18	05:50		06:19 (16)	06:28	06:54 (22)	07:09	07:51	07:37		16:21 (23)	08:12
	21:22	2	06:21 (16)	20:41	4 06:58 (22)	19:41	18:39	16:53	6	16:27 (23)	16:40
19	05:51			06:30	06:56 (22)	07:11	07:52	07:38		16:21 (23)	08:12
	21:21			20:39	3 06:59 (22)	19:39	18:38	16:52	6	16:27 (23)	16:41
20	05:52		20:50 (9)	06:31	06:57 (22)	07:12	07:54	07:40		16:21 (23)	08:13
	21:20	1	20:51 (9)	20:37	1 06:58 (22)	19:37	18:36	16:51	4	16:25 (23)	16:41
21	05:54		20:47 (9)	06:32		07:13	07:55	07:41		16:22 (23)	08:13
	21:19	7	20:54 (9)	20:35		19:35	18:34	16:50	3	16:25 (23)	16:41
22	05:55		20:46 (9)	06:34		07:15	07:56	07:42		16:22 (23)	08:14
	21:18	7	20:53 (9)	20:34		19:33	18:32	16:49	1	16:23 (23)	16:42
23	05:56		20:45 (9)	06:35		07:16	07:58	07:44			08:15
	21:17	7	20:52 (9)	20:32		19:31	18:30	16:48			16:42
24	05:57		20:44 (9)	06:36		07:17	07:59	07:45			08:15
	21:16	7	20:51 (9)	20:30		19:29	18:29	16:47			16:43
25	05:58		20:43 (9)	06:38		07:19	08:01	07:47			08:15
	21:15	7	20:50 (9)	20:28		19:27	18:27	16:46			16:43
26	05:59		20:43 (9)	06:39		07:20	08:02	07:48			08:16
	21:14	5	20:48 (9)	20:26		19:25	18:25	16:45			16:44
27	06:00		20:43 (9)	06:40		07:21	08:04	07:49			08:16
	21:13	4	20:47 (9)	20:24		19:23	18:23	16:45			16:45
28	06:02		20:42 (9)	06:42		07:23	08:05	07:51			08:16
	21:12	4	20:46 (9)	20:22		19:20	18:22	16:44			16:45
29	06:03		20:42 (9)	06:43		07:24	08:07	07:52			08:17
	21:11	3	20:45 (9)	20:21		19:18	18:20	16:43			16:46
30	06:04		20:42 (9)	06:44		07:26	08:08	07:53			08:17
	21:09	1	20:43 (9)	20:19		19:16	18:18	16:43			16:47
31	06:05			06:46			08:10				08:17
	21:08			20:17			18:17				16:48
Potential sun hours	482			443		380	339	282			265
Total, worst case		293			42				60		
Sun reduction		0.74			0.71				0.39		
Oper. time red.		0.85			0.85				0.85		
Wind dir. red.		0.65			0.66				0.60		
Total reduction		0.41			0.39				0.20		
Total, real		119			17				12		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Epsilon Associates, Inc
3 Clock Tower Place, Suite 250
US-MAYNARD MA 01754
978 897 7100
Richard Lampeter / rlampeter@epsilonassociates.com
Calculated:
3/15/2023 9:45 PM/3.6.361

SHADOW - Calendar

Calculation: Points and Grid Shadow receptor: L39 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4573)

Assumptions for shadow calculations

Reference year for calendar 2023

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.52	0.54	0.59	0.57	0.60	0.64	0.74	0.71	0.63	0.51	0.39	0.39

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
364	231	235	234	299	398	720	587	362	314	482	477	675	931	686	429	7,424

	January	February	March	April		May		June	July		August		September	October	November	December
1	08:17	07:57	07:13	07:12		06:16		20:06 (13)	05:38	05:37		06:06		20:25 (1)	06:47	07:27	08:11	07:54
	16:49	17:30	18:11	19:56		20:38	9	20:15 (13)	21:16	21:30		21:07	13	20:38 (1)	20:15	19:14	18:15	16:42
2	08:17	07:56	07:11	07:10		06:14		20:08 (13)	05:38	05:37		06:08		20:24 (1)	06:48	07:28	08:13	07:55
	16:50	17:31	18:13	19:57		20:39	5	20:13 (13)	21:17	21:30		21:05	14	20:38 (1)	20:13	19:12	18:14	16:42
3	08:17	07:55	07:09	07:08		06:13		20:15 (1)	05:37	05:38		06:09		20:23 (1)	06:49	07:29	08:14	07:57
	16:51	17:33	18:14	19:59		20:41	3	20:18 (1)	21:18	21:30		21:04	16	20:39 (1)	20:11	19:10	18:12	16:41
4	08:17	07:54	07:07	07:06		06:11		20:14 (1)	05:36	05:38		06:10		20:22 (1)	06:51	07:31	08:16	07:58
	16:52	17:34	18:16	20:00		20:42	6	20:20 (1)	21:19	21:30		21:03	15	20:37 (1)	20:09	19:08	18:11	16:41
5	08:17	07:52	07:05	07:04		06:09		20:13 (1)	05:36	05:39		06:11		20:22 (1)	06:52	07:32	07:17	07:59
	16:53	17:36	18:17	20:02		20:43	7	20:20 (1)	21:20	21:29		21:01	13	20:35 (1)	20:07	19:06	17:09	16:40
6	08:17	07:51	07:03	07:02		06:08		20:13 (1)	05:35	05:40		06:13		20:22 (1)	06:53	07:34	07:19	08:00
	16:54	17:37	18:19	20:03		20:45	9	20:22 (1)	21:21	21:29		21:00	13	20:35 (1)	20:05	19:04	17:08	16:40
7	08:16	07:49	07:01	07:00		06:06		20:12 (1)	05:35	05:40		06:14		20:22 (1)	06:55	07:35	07:20	08:01
	16:55	17:39	18:20	20:04		20:46	11	20:23 (1)	21:22	21:29		20:58	11	20:33 (1)	20:03	19:02	17:06	16:40
8	08:16	07:48	06:59	06:58		06:05		20:12 (1)	05:35	05:41		06:15		20:22 (1)	06:56	07:36	07:22	08:02
	16:56	17:40	18:22	20:06		20:47	12	20:24 (1)	21:22	21:28		20:57	10	20:32 (1)	20:01	19:00	17:05	16:40
9	08:16	07:47	06:57	06:56		06:03		20:12 (1)	05:34	05:42		06:16		20:22 (1)	06:57	07:38	07:23	08:03
	16:57	17:42	18:23	20:07		20:49	14	20:26 (1)	21:23	21:28		20:55	8	20:30 (1)	19:59	18:56	17:03	16:39
10	08:16	07:45	06:56	06:54		06:02		20:12 (1)	05:34	05:43		06:18		20:22 (1)	06:59	07:39	07:25	08:04
	16:58	17:44	18:25	20:09		20:50	15	20:27 (1)	21:24	21:27		20:54	6	20:28 (1)	19:57	18:54	17:02	16:39
11	08:15	07:44	06:54	06:52		06:01		20:13 (1)	05:34	05:44		06:19		20:24 (1)	07:00	07:40	07:26	08:05
	17:00	17:45	18:26	20:10		20:51	15	20:28 (1)	21:24	21:27		20:52	4	20:28 (1)	19:55	18:52	17:01	16:39
12	08:15	07:42	07:52	06:50		05:59		20:13 (1)	05:33	05:44		06:20		20:17 (13)	07:01	07:42	07:28	08:06
	17:01	17:47	18:28	20:11		20:53	15	20:28 (1)	21:25	21:26		20:50	5	20:26 (1)	19:53	18:51	16:59	16:39
13	08:14	07:40	07:50	06:48		05:58		20:13 (1)	05:33	05:45		06:22		20:14 (13)	07:03	07:43	07:29	08:07
	17:02	17:48	19:29	20:13		20:54	14	20:27 (1)	21:26	21:26		20:49	9	20:23 (13)	19:51	18:49	16:58	16:39
14	08:14	07:39	07:48	06:46		05:56		20:14 (1)	05:33	05:46		06:23		20:13 (13)	07:04	07:45	07:30	08:08
	17:03	17:50	19:30	20:14		20:55	12	20:26 (1)	21:26	21:25		20:47	9	20:22 (13)	19:49	18:47	16:57	16:39
15	08:13	07:37	07:46	06:44		05:55		20:16 (1)	05:33	05:47		06:24		20:13 (13)	07:05	07:46	07:32	08:09
	17:05	17:51	19:32	20:16		20:57	9	20:25 (1)	21:27	21:24		20:46	8	20:21 (13)	19:47	18:45	16:56	16:39
16	08:13	07:36	07:44	06:42		05:54		20:18 (1)	05:33	05:48		06:26		20:12 (13)	07:07	07:48	07:33	08:10
	17:06	17:53	19:33	20:17		20:58	5	20:23 (1)	21:27	21:23		20:44	7	20:19 (13)	19:45	18:43	16:55	16:40
17	08:12	07:34	07:42	06:40		05:53			05:33	05:49		06:27		20:11 (13)	07:08	07:49	07:35	08:11
	17:07	17:54	19:35	20:18		20:59			21:28	21:23		20:42	6	20:17 (13)	19:43	18:41	16:54	16:40
18	08:11	07:32	07:40	06:39		05:51			05:33	05:50		06:28		20:11 (13)	07:09	07:50	07:36	08:11
	17:09	17:56	19:36	20:20		21:00			21:28	21:22		20:40	5	20:16 (13)	19:41	18:39	16:53	16:40
19	08:11	07:31	07:38	06:37		05:50			05:33	05:51		06:30		20:12 (13)	07:11	07:52	07:38	08:12
	17:10	17:58	19:38	20:21		21:02			21:29	21:21		20:39	3	20:15 (13)	19:39	18:37	16:51	16:40
20	08:10	07:29	07:36	06:35		05:49			05:33	05:52		06:31		20:12 (13)	07:12	07:53	07:39	08:13
	17:12	17:59	19:39	20:23		21:03			21:29	21:20		20:37	1	20:13 (13)	19:37	18:36	16:50	16:41
21	08:09	07:27	07:34	06:33		05:48			05:33	05:53		06:32			07:13	07:55	07:41	08:13
	17:13	18:01	19:40	20:24		21:04			21:29	21:19		20:35			19:35	18:34	16:50	16:41
22	08:08	07:25	07:32	06:31		05:47			05:33	05:55		06:34			07:15	07:56	07:42	08:14
	17:14	18:01	19:42	20:25		21:05			21:30	21:18		20:33			19:33	18:32	16:49	16:42
23	08:07	07:24	07:30	06:30		05:46			05:33	05:56		06:35			07:16	07:58	07:44	08:14
	17:16	18:02	19:43	20:27		21:06			21:30	21:17		20:32			19:30	18:30	16:48	16:42
24	08:06	07:22	07:28	06:28		05:45			05:34	05:57		06:36			07:17	07:59	07:45	08:15
	17:17	18:04	19:45	20:28		21:08			21:30	21:16		20:30			19:28	18:28	16:47	16:43
25	08:05	07:20	07:26	06:26	20:05 (13)	05:44			05:34	05:58		06:38			07:19	08:01	07:46	08:15
	17:19	18:05	19:46	20:30	3 20:08 (13)	21:09			21:30	21:15		20:28			19:26	18:27	16:46	16:43
26	08:04	07:18	07:24	06:24	20:04 (13)	05:43			05:34	05:59		06:39			07:20	08:02	07:48	08:16
	17:20	18:07	19:48	20:31	5 20:09 (13)	21:10			21:30	21:14		20:26			19:24	18:25	16:45	16:44
27	08:03	07:16	07:22	06:23	20:05 (13)	05:42			05:35	06:00		06:40			07:21	08:04	07:49	08:16
	17:22	18:08	19:49	20:32	6 20:11 (13)	21:11			21:30	21:13		20:24			19:22	18:23	16:45	16:45
28	08:02	07:15	07:20	06:21	20:04 (13)	05:41			05:35	06:01		06:41			07:23	08:05	07:50	08:16
	17:23	18:10	19:50	20:34	8 20:12 (13)	21:12			21:30	21:12		20:22			19:20	18:22	16:44	16:45
29	08:01		07:18	06:19	20:04 (13)	05:41			05:36	06:03	20:29 (1)	06:43			07:24	08:07	07:52	08:16
	17:25		19:52	20:35	8 20:12 (13)	21:13			21:30	21:10	4 20:33 (1)	20:20			19:18	18:20	16:43	16:46
30	08:00		07:16	06:17	20:05 (13)	05:40			05:36	06:04	20:26 (1)	06:44			07:25	08:08	07:53	08:17
	17:26		19:53	20:36	9 20:14 (13)	21:14			21:30	21:09	9 20:35 (1)	20:18			19:16	18:18	16:43	16:47
31	07:59		07:14			05:39				06:05	20:25 (1)	06:45				08:10		08:17
	17:28		19:55			21:15				21:08	11 20:36 (1)	20:17				18:17		16:48
Potential sun hours	277	286	367	406		466		476	482		443		380	339	282	265
Total, worst case					39		161			24			176					
Sun reduction					0.57		0.60			0.74			0.71					
Oper. time red.					0.85		0.85			0.85			0.85					
Wind dir. red.					0.72		0.72			0.72			0.72					
Total reduction					0.35		0.37			0.45			0.44					
Total, real					14		59			11			77					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)