CRAB RUN
SOLAR PROJECT

Exhibit G
Glare Analysis Study

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MEMO

TO	Crab Run Solar Project, LLC
FROM	Joshua Adams, Partner-In-Charge Ellen Mullins, Project Manager Ally Schuler, Consulting Associate Pearl Elliot, Consulting Associate Ben Sussman, Associate Technical Partner
DATE	8 December 2025
REFERENCE	Crab Run Glare Analysis Memo
SUBJECT	Crab Run Solar Project - Glare Analysis Memorandum

1. INTRODUCTION

Crab Run Solar Project, LLC (Crab Run), a subsidiary of Savion, LLC, proposes to construct and operate the Crab Run Solar Project (Project), a photovoltaic (PV) solar facility in Marion County, Kentucky (County). Crab Run has engaged Environmental Resources Management, Inc. (ERM) to conduct a glare analysis for the proposed Project, as part of its application to the Kentucky Public Service Commission (PSC). In support of the PSC process, ERM has prepared this memorandum summarizing the methodologies utilized and results of the glare analysis. Glare analysis documentation from the industry-standard ForgeSolar online glare analysis tool is provided in Appendix A.

2. PROJECT AND SITE DESCRIPTION

The proposed Project footprint is approximately 245 fenced acres containing 5 areas of PV arrays and other Project infrastructure (Site) with a generation capacity of up to 45 megawatts (MW). The Site is located in an unincorporated area of Marion County, Kentucky, approximately 1.8 miles southeast of Loretto, north of Arthur Mattingly Road and east of Frogtown Road.

The PV system will include single axis tracking modules with shade- and slope-aware backtracking capability, oriented south at a bearing of 180 degrees with a tilt angle of 60 degrees. The average height of the PV panels, measured from the ground to the PV panel centroid, will be approximately 6 feet. The ground coverage ratio (GCR) of the PV panels will be 0.417 (41.7 percent). The PV panels will contain smooth glass with an anti-reflective coating.

The Site is primarily active or recently cultivated agricultural land, including large, open fields, occasional fencerows and tree lines, and minimal built infrastructure. The surrounding area is characterized by low-density rural development (especially along Frogtown Road), scattered single-family residences, and farmland.

The Site is generally flat, with gentle elevation variation across the Project Area ranging from roughly 662 to 753 feet above mean sea level (AMSL), with an average elevation of 725 feet AMSL. The terrain is typical of agricultural fields in the region, which are characterized as predominantly cleared lands, graded for surface water runoff and bordered by natural vegetative buffers or roadside ditches.

3. VIEWPOINT SUMMARY AND DISCUSSION

ERM identified a representative sample of potential viewpoints within a one-mile radius of the Project. Viewpoints are locations from which the Project may be visible to human receptors, such as residents, motorists, pilots, recreationists, and tourists. Such viewers may be sensitive to potential glare caused by the PV panels. ERM identified these viewpoints, referred to as "receptors" in the glare analysis results (Appendix A), through review of aerial imagery, topographic maps, and other publicly available online mapping resources.

Based on review of the Federal Aviation Administration (FAA) database, aeronautical charts, aerial photos, and a Google search, ERM identified the Lebanon Springfield Airport-George Hoerter Field (Hoerter Field), a public-use airport located approximately 6 nautical miles east of the Site. ERM evaluated 2-mile-long flight paths (FP 1 and FP 2) (one for each direction of Runway 11/29) as part of the glare analysis (Figure 2). As reported by the FAA, the approach glide slope is 3.00 degrees for Runway 11 (FP 1) and 3.10 degrees at Runway 29 (FP 2). ERM assumed these glide slope values for each flight path, along with an assumed threshold crossing height of 50 feet (based on typical threshold crossing heights at comparable airfields) to define both flight paths. Hoerter Field does not have an air traffic control tower. No other public-use aircraft facilities were identified within ten nautical miles of the Site.

ERM identified nine stationary locations to serve as representative viewpoints for the glare analysis. These viewpoints are identified using the abbreviation "OP" ("observation point") and are numbered sequentially—OP 1 through 9 (Figure 1). Viewpoints OP 1 through 4 represent residences along Frogtown Road, west of the Project boundary. Because other residences along Frogtown Road have similar topographic and vegetation settings, similar views of PV arrays from residences not directly represented by these OPs are also likely in this area. Viewpoints 5 through 8 represent surrounding residences along Arthur Mattingly Road, south of the Project boundary. Viewpoint OP 9 represents a residence along North Loretto Road, approximately 0.4 mile north of the Project boundary. Locations with no views of the Project due to topography and/or extensive forest cover were excluded from the glare analysis. ERM also evaluated three road segments surrounding the Project boundary as route receptors to determine whether glare could potentially be observed by motorists traveling on each road. The driver eye-height for assessing glare impacts used was 6 feet, which accounts for the range of heights for both cars and high clearance trucks. Sections of Frogtown Road, North Loretto Road, and Arthur Mattingly Road were all evaluated due to their vicinity to the Project. Due to the minimal traffic volume on private driveways and farm lanes, these types of routes were not included in this study.

Due to the topographic setting, existing forest vegetation, and distances between these viewpoints and the proposed PV arrays, the Project will include vegetation screening to mitigate potential glare and visual impacts. To accurately reflect these mitigations, this study includes vegetation screening along the east and west boundaries of the Site, with screening vegetation heights capped at 25 feet.

4. GLARE ANALYSIS

This glare analysis is based on design parameters for a single-axis tracking system with shade- and slope-aware backtracking capability, as described in Section 2. It is important to note that glare would not occur in areas where line-of-sight views of solar panels are screened by topography, structures, or vegetation (including proposed screening vegetation). Therefore, locations where glare may occur are limited to areas with direct views of the proposed solar panels. Potential visibility could change over time due to seasonal variation in foliage (i.e., "leaf-off" conditions during the winter vs. "leaf-on" conditions in other seasons), planting or removal of vegetation or construction or removal of structures. The ForgeSolar tool does not, by default, consider the screening effects of vegetation, structures, or topographic features between a PV array and the identified viewpoints. As described in Section 2, the model includes two proposed vegetative screening lines that were manually added as visual obstructions in the glare analysis.

4.1 BACKGROUND

PV panels are designed to absorb rather than reflect sunlight to maximize energy capture. For this Project, Crab Run has selected PV panels that contain smooth glass with an anti-reflective coating. ERM included this parameter in the glare analysis.

PV solar projects do not typically cause harmful or nuisance levels of glare, defined as a continuous source of bright light that may be visible to nearby residents, motorists, or pilots. The absorbing, rather than reflecting, nature of PV technology, in conjunction with proper site planning and design, has allowed PV panels to be commonly and safely installed on airport properties nationwide.

The amount of light reflected from solar panels depends on several factors, including the amount of sunlight hitting the panel surface, the surface's reflectivity (based on variables such as the presence of textured glass and/or anti-reflective coatings), the geographic location, time of year, weather conditions, and solar panel orientation. These factors affect the angle of incidence of the sun relative to sensitive viewers, and the amount of glare experienced. With respect to glare, angle of incidence is the angle at which light deviates from perpendicular to a surface. The angle of incidence changes as the sun moves across the sky and is generally lowest at solar noon (when the sun is at its highest point above the horizon and light is reflected toward the sky) and highest at dawn and dusk (when the sun is low in the sky and light is reflected from a high angle of incidence in the opposite direction).

4.2 METHODOLOGY

ERM used the industry standard ForgeSolar GlareGauge tool to assess potential glare and ocular impact at nine viewpoints, along the three road segments, and at two flight paths as shown on Figures 1 and 2. The tool calculates ocular impact based on anticipated levels of retinal irradiance (amount of light received by the retina) and the subtended angle (size and distance) of the glare source. The ForgeSolar tool uses three categories to report potential ocular hazards ranging from retinal burns to temporary after-image (defined as a visual phenomenon in which glare persists in the viewer's vision, even after looking away from the source). These categories include:

- "Green" ratings indicate a low potential to cause after-image (flash blindness);
- "Yellow" ratings indicate the potential to cause temporary after-image; and
- "Red" ratings indicate potential to cause retinal burn and permanent eye damage.

When simulating glare, the ForgeSolar tool modifies the vertex elevations of a PV array footprint so that all points of the PV array reside on a single planar surface. The ForgeSolar tool also may convert PV array footprints with large concavities into a convex shape by filling in these concavities. Therefore, to enhance the accuracy of the glare analysis (by preventing the flattening of hills and reducing the presence of large concavities), ERM subdivided the proposed layout of PV arrays into seven smaller areas (labeled PV 01 through PV 07) as shown on Figure 1.

The ForgeSolar tool considers the orientation of PV panels, sun angles throughout the day, and the slope of the PV array, based on the underlying topography and height above ground of the PV panels. Analysis of potential glare observed from stationary viewpoints (OP 1 through 9) is based on a 360-degree field of view. By comparison, analysis of glare along the road segments are calculated using a 100-degree field of view (50 degrees to the left and right) centered on the direction of travel (in both directions) along the route. Glare assessment along the flight paths also use a 100-degree field of view with a maximum downward viewing angle of 30 degrees. This default value is based on FAA research, which determined that the impact of glare beyond a 100-degree field of view is mitigated.[1]

4.3 RESULTS

As documented in Appendix A, the glare analysis results predict the Project will generate no green, yellow, or red glare at any of the evaluated receptors at any time throughout the year.

While the Solar Glare Hazard Analysis Tool (SGHAT) technology used by ForgeSolar's GlareGauge analysis does not identify cause for the absence of glare, several factors likely contribute to this finding. These include design considerations like the location and orientation of the PV arrays, the selected panel model, and the incorporation of vegetation buffers.

Vegetation buffers along the east and west boundaries likely serve as effective visual screens for numerous OPs (and the residential areas that those OPs represent), as well as segments of

[1] Rogers, J. A., et al. (2015). "Evaluation of Glare as a Hazard for General Aviation Pilots on Final Approach", Federal Aviation Administration

Frogtown Road, North Loretto Road, and Arthur Mattingly Road. In addition, the single-axis tracking system reduces glare (by design) by minimizing the angle of incidence. When the angle of incidence angle is smaller, sunlight hits the panel more directly, causing reflected light to deflect upward at a steeper angle, rather than spreading out horizontally. The two flightpaths would not experience glare, likely due to distance and direction.

4.4 CONCLUSIONS

As currently designed, the proposed Project is predicted to generate no harmful glare at any of the evaluated receptors, including nine observation points, three route receptors, and two flight paths.

Given the absence of impact, it is unlikely that regulatory agencies should require additional mitigation efforts beyond the inclusion of the proposed vegetation screening.

APPENDIX A. FIGURES

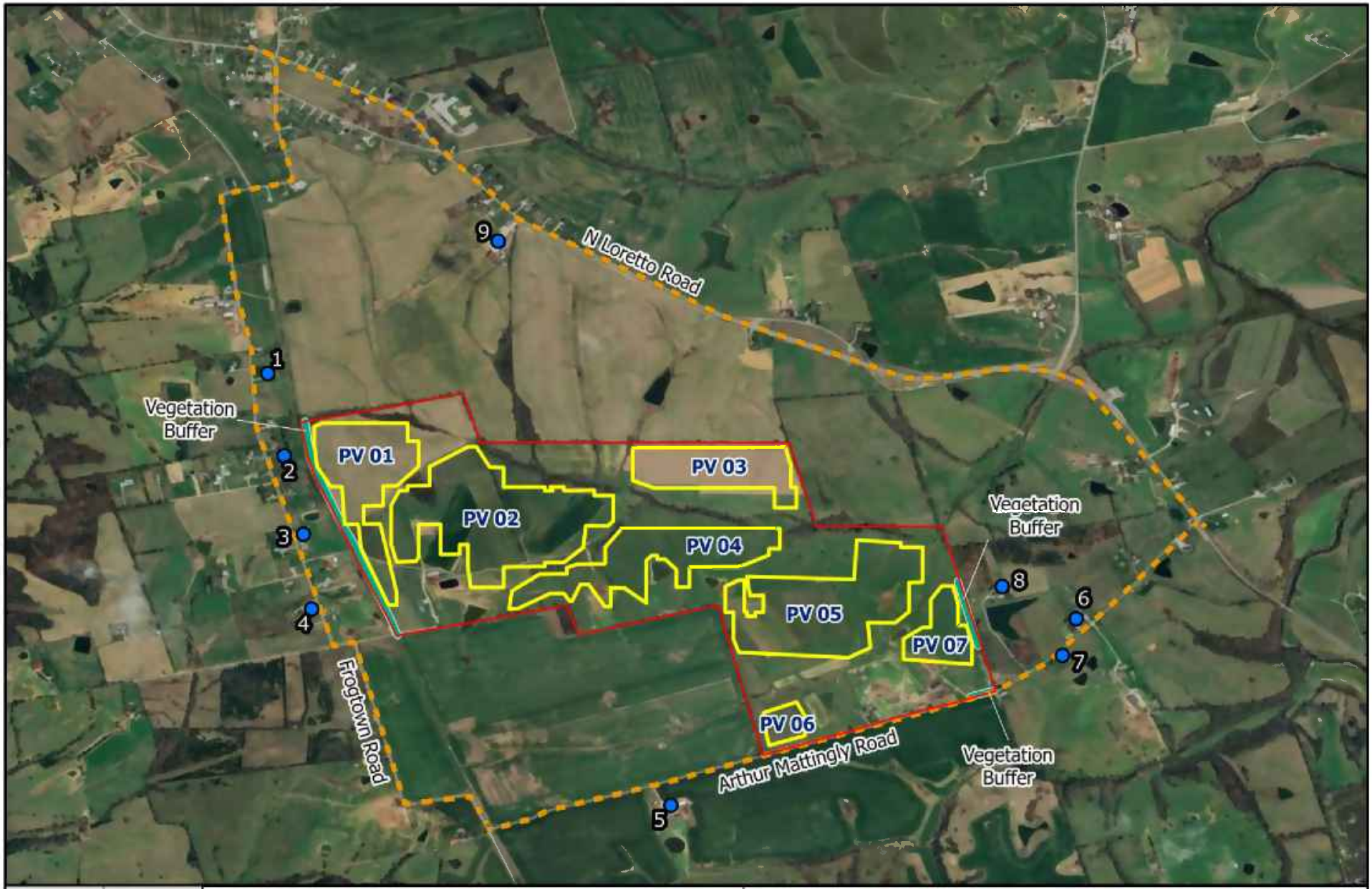

Figure 1
Site Layout Map
Crab Run Solar Project
Crab Run Solar Project, LLC
Lebanon, Kentucky

CRAB RUN SOLAR PROJECT

ERM

MPLS M:\US\Projects\A-C\Crab_Run_Solar\ArcGIS\Crab_Run_Project\Crab_Run_Solar_Project.aprx\Crab_Run_Site_Layout | REVISED: 12/02/2025 | SCALE: 1:22,000 DRAWN BY: MPLS GIS

Figure 2
Lebanon Springfield Airport
Crab Run Solar Project
Crab Run Solar Project, LLC
Lebanon, Kentucky

CRAB RUN SOLAR PROJECT

ERM

MPLS M:\US\Projects\A-C\Crab_Run_Solar\ArcGIS\Crab_Run_Project\Crab_Run_Solar_Project.aprx\Crab_Run_Flight_Path_Layout | REVISED: 11/12/2025 | SCALE: 1:90,000 DRAWN BY: MPLS GIS

APPENDIX B. FORGESOLAR GLARE ANALYSIS RESULTS

FORGESOLAR GLARE ANALYSIS

Project: **Crab Run Solar Project**
Site configuration: **Crab Run**

Created 21 Jul, 2025
Updated 01 Dec, 2025
Time-step 1 minute
Timezone offset UTC-5
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 10 MW to 100 MW
Site ID 155397.26006

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
PV analysis methodology V2

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV 01	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 02	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 03	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 04	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 05	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 06	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 07	SA tracking	SA tracking	0	0.0	0	0.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arthur Mattingly Road	0	0.0	0	0.0
Frogtown Road	0	0.0	0	0.0
N Loretto Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

Component Data

PV Arrays

Name: PV 01
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Ground Coverage Ratio: 0.417
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.613151	-85.378730	716.86	6.00	722.86
2	37.613146	-85.375640	716.26	6.00	722.26
3	37.612493	-85.375626	726.24	6.00	732.24
4	37.612491	-85.375236	721.26	6.00	727.26
5	37.611573	-85.375228	708.67	6.00	714.67
6	37.610858	-85.375987	715.40	6.00	721.40
7	37.610849	-85.376512	726.06	6.00	732.06
8	37.610146	-85.376509	717.37	6.00	723.37
9	37.610132	-85.377208	724.21	6.00	730.21
10	37.609474	-85.377212	724.70	6.00	730.70
11	37.609476	-85.376614	722.83	6.00	728.83
12	37.606980	-85.376006	737.33	6.00	743.33
13	37.606508	-85.375969	743.47	6.00	749.47
14	37.606516	-85.376303	746.21	6.00	752.21
15	37.608585	-85.377336	735.30	6.00	741.30
16	37.609464	-85.377353	723.77	6.00	729.77
17	37.609462	-85.377890	729.19	6.00	735.19
18	37.610840	-85.377957	735.71	6.00	741.71
19	37.610841	-85.378372	737.38	6.00	743.38
20	37.611558	-85.378883	731.47	6.00	737.47
21	37.612324	-85.378986	723.72	6.00	729.72
22	37.613033	-85.379006	717.79	6.00	723.79

Name: PV 02
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Ground Coverage Ratio: 0.417
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.612297	-85.373127	697.62	6.00	703.62
2	37.612293	-85.373417	700.06	6.00	706.06
3	37.611566	-85.374801	708.55	6.00	714.55
4	37.610878	-85.374806	729.88	6.00	735.88
5	37.610861	-85.375589	714.33	6.00	720.33
6	37.610699	-85.375592	713.69	6.00	719.69
7	37.610695	-85.375884	715.09	6.00	721.09
8	37.610172	-85.376158	717.96	6.00	723.96
9	37.608719	-85.376166	725.57	6.00	731.57
10	37.608092	-85.375986	728.31	6.00	734.31
11	37.608109	-85.375278	737.01	6.00	743.01
12	37.608253	-85.375203	737.95	6.00	743.95
13	37.609450	-85.375203	743.39	6.00	749.39
14	37.609458	-85.374412	750.51	6.00	756.51
15	37.608357	-85.374398	743.24	6.00	749.24
16	37.608368	-85.373749	743.61	6.00	749.61
17	37.608719	-85.373739	745.83	6.00	751.83
18	37.608721	-85.373427	747.24	6.00	753.24
19	37.607913	-85.373358	742.09	6.00	748.09
20	37.607911	-85.373401	742.51	6.00	748.51
21	37.607161	-85.373339	727.84	6.00	733.84
22	37.607161	-85.372057	713.31	6.00	719.31
23	37.607899	-85.372062	734.26	6.00	740.26
24	37.607916	-85.370606	707.02	6.00	713.02
25	37.608058	-85.370614	713.52	6.00	719.52
26	37.608071	-85.369855	700.85	6.00	706.85
27	37.608615	-85.369157	696.28	6.00	702.28
28	37.609411	-85.369149	719.74	6.00	725.74
29	37.609403	-85.368256	690.54	6.00	696.54
30	37.609592	-85.368087	690.08	6.00	696.08
31	37.610512	-85.368101	703.32	6.00	709.32
32	37.610514	-85.368784	713.97	6.00	719.97
33	37.610705	-85.368787	708.43	6.00	714.43
34	37.610691	-85.369938	716.73	6.00	722.73
35	37.610829	-85.369935	714.61	6.00	720.61
36	37.610829	-85.370351	706.48	6.00	712.48
37	37.610695	-85.370348	704.99	6.00	710.99
38	37.610691	-85.370576	705.16	6.00	711.16
39	37.610823	-85.370576	704.88	6.00	710.88
40	37.610818	-85.372148	726.39	6.00	732.39
41	37.611534	-85.372148	709.57	6.00	715.57
42	37.611538	-85.372625	716.56	6.00	722.56

Name: PV 03
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Ground Coverage Ratio: 0.417
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.612218	-85.367400	694.64	6.00	700.64
2	37.612252	-85.361842	713.42	6.00	719.42
3	37.611571	-85.361636	710.11	6.00	716.11
4	37.610813	-85.361626	694.41	6.00	700.41
5	37.610811	-85.361395	695.86	6.00	701.86
6	37.610058	-85.361400	678.74	6.00	684.74
7	37.610065	-85.362216	676.34	6.00	682.34
8	37.610794	-85.362213	691.11	6.00	697.11
9	37.610775	-85.366646	684.28	6.00	690.28
10	37.611064	-85.367410	685.94	6.00	691.94

Name: PV 04
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Ground Coverage Ratio: 0.417
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.606375	-85.371874	734.71	6.00	740.71
2	37.606376	-85.371581	738.14	6.00	744.14
3	37.606944	-85.370426	711.39	6.00	717.39
4	37.606943	-85.369906	722.30	6.00	728.30
5	37.606658	-85.369663	733.26	6.00	739.26
6	37.606658	-85.369561	736.35	6.00	742.35
7	37.607269	-85.369343	722.25	6.00	728.25
8	37.607265	-85.369041	720.15	6.00	726.15
9	37.606460	-85.368402	723.96	6.00	729.96
10	37.606462	-85.368174	720.10	6.00	726.10
11	37.607145	-85.368176	709.34	6.00	715.34
12	37.607145	-85.367710	711.09	6.00	717.09
13	37.606592	-85.366882	726.57	6.00	732.57
14	37.608137	-85.366882	719.97	6.00	725.97
15	37.608320	-85.366727	718.62	6.00	724.62
16	37.608318	-85.366471	710.92	6.00	716.92
17	37.608193	-85.366455	713.22	6.00	719.22
18	37.608183	-85.366172	708.49	6.00	714.49
19	37.607811	-85.365788	711.38	6.00	717.38
20	37.607173	-85.365789	718.68	6.00	724.68
21	37.607168	-85.365291	721.06	6.00	727.06
22	37.607884	-85.365294	712.02	6.00	718.02
23	37.607898	-85.363536	712.97	6.00	718.97
24	37.608342	-85.362416	699.92	6.00	705.92
25	37.608569	-85.362429	693.35	6.00	699.35
26	37.608567	-85.361970	692.15	6.00	698.15
27	37.609297	-85.361992	675.22	6.00	681.22
28	37.609297	-85.366306	692.51	6.00	698.51
29	37.609297	-85.367845	695.69	6.00	701.69
30	37.608610	-85.368360	703.83	6.00	709.83
31	37.608016	-85.368368	702.88	6.00	708.88
32	37.608006	-85.369393	706.22	6.00	712.22
33	37.607882	-85.369800	704.98	6.00	710.98
34	37.607652	-85.369803	713.61	6.00	719.61
35	37.607643	-85.370799	705.85	6.00	711.85
36	37.607030	-85.371844	714.59	6.00	720.59

Name: PV 05
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Ground Coverage Ratio: 0.417
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.607426	-85.363324	714.11	6.00	720.11
2	37.607428	-85.363493	718.28	6.00	724.28
3	37.607201	-85.363951	735.16	6.00	741.16
4	37.606251	-85.363954	736.04	6.00	742.04
5	37.606249	-85.363672	730.63	6.00	736.63
6	37.605281	-85.363672	717.65	6.00	723.65
7	37.604786	-85.363498	721.49	6.00	727.49
8	37.604601	-85.359507	687.80	6.00	693.80
9	37.604969	-85.358742	689.54	6.00	695.54
10	37.605880	-85.358758	697.54	6.00	703.54
11	37.605870	-85.357844	679.93	6.00	685.93
12	37.606267	-85.357267	676.14	6.00	682.14
13	37.607344	-85.357286	697.68	6.00	703.68
14	37.607356	-85.356822	676.73	6.00	682.73
15	37.608634	-85.356830	676.13	6.00	682.13
16	37.608626	-85.357592	677.25	6.00	683.25
17	37.608775	-85.357590	678.95	6.00	684.95
18	37.608891	-85.359210	721.38	6.00	727.38
19	37.607446	-85.359255	729.94	6.00	735.94
20	37.607555	-85.363154	708.70	6.00	714.70
21	37.606863	-85.363147	728.70	6.00	734.70
22	37.606863	-85.362596	734.13	6.00	740.13
23	37.606264	-85.362604	732.19	6.00	738.19
24	37.606254	-85.362851	732.25	6.00	738.25
25	37.606103	-85.362862	732.18	6.00	738.18
26	37.606095	-85.363195	730.34	6.00	736.34
27	37.606267	-85.363196	731.49	6.00	737.49
28	37.606277	-85.363339	730.88	6.00	736.88

Name: PV 06
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Ground Coverage Ratio: 0.417
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.602591	-85.362559	705.05	6.00	711.05
2	37.602979	-85.361354	714.74	6.00	720.74
3	37.602476	-85.361116	725.53	6.00	731.53
4	37.601746	-85.361125	737.41	6.00	743.41
5	37.601403	-85.362422	722.35	6.00	728.35
6	37.601819	-85.362545	714.67	6.00	720.67

Name: PV 07
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Ground Coverage Ratio: 0.417
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.605285	-85.357466	686.45	6.00	692.45
2	37.604539	-85.357506	692.26	6.00	698.26
3	37.604346	-85.355009	721.27	6.00	727.27
4	37.605126	-85.355007	724.34	6.00	730.34
5	37.605769	-85.355200	700.41	6.00	706.41
6	37.605769	-85.355468	700.95	6.00	706.95
7	37.606512	-85.355465	694.37	6.00	700.37
8	37.607222	-85.355684	689.90	6.00	695.90
9	37.607215	-85.356113	679.81	6.00	685.81
10	37.606721	-85.356487	676.33	6.00	682.33
11	37.605698	-85.356488	694.18	6.00	700.18
12	37.605698	-85.356802	689.54	6.00	695.54

Route Receptors

Name: Arthur Mattingly Road
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.598298	-85.372665	745.36	6.00	751.36
2	37.598719	-85.371077	753.22	6.00	759.22
3	37.599016	-85.370476	747.33	6.00	753.33
4	37.600036	-85.366249	742.70	6.00	748.70
5	37.601396	-85.361158	741.49	6.00	747.49
6	37.602650	-85.356641	729.41	6.00	735.41
7	37.603339	-85.354157	736.03	6.00	742.03
8	37.604388	-85.352339	739.73	6.00	745.73
9	37.606539	-85.349866	725.89	6.00	731.89
10	37.607784	-85.348616	730.24	6.00	736.24
11	37.609519	-85.346829	730.23	6.00	736.23

Name: Frogtown Road
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.626589	-85.380619	752.63	6.00	758.63
2	37.626249	-85.380404	749.54	6.00	755.54
3	37.624107	-85.380426	736.73	6.00	742.73
4	37.622196	-85.379782	740.42	6.00	746.42
5	37.622026	-85.379825	740.44	6.00	746.44
6	37.621924	-85.379986	742.62	6.00	748.62
7	37.621524	-85.382271	738.43	6.00	744.43
8	37.621405	-85.382357	736.99	6.00	742.99
9	37.618116	-85.381874	738.63	6.00	744.63
10	37.615907	-85.381306	738.18	6.00	744.18
11	37.612975	-85.381123	733.49	6.00	739.49
12	37.605019	-85.378323	740.55	6.00	746.55
13	37.605155	-85.377626	733.09	6.00	739.09
14	37.605070	-85.377508	733.61	6.00	739.61
15	37.604722	-85.377379	732.04	6.00	738.04
16	37.599272	-85.375673	748.27	6.00	754.27
17	37.599533	-85.373323	746.41	6.00	752.41
18	37.598526	-85.372658	745.55	6.00	751.55

Name: N Loretto Road
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	37.626867	-85.381386	754.72	6.00	760.72
2	37.626714	-85.380893	753.39	6.00	759.39
3	37.624403	-85.375528	754.06	6.00	760.06
4	37.623570	-85.374820	751.61	6.00	757.61
5	37.622584	-85.373833	756.01	6.00	762.01
6	37.621258	-85.372245	752.28	6.00	758.28
7	37.620613	-85.371559	755.86	6.00	761.86
8	37.617842	-85.365701	734.66	6.00	740.66
9	37.617026	-85.363963	741.86	6.00	747.86
10	37.614800	-85.357354	730.27	6.00	736.27
11	37.614783	-85.356581	716.73	6.00	722.73
12	37.614953	-85.355294	715.16	6.00	721.16
13	37.615191	-85.353169	687.22	6.00	693.22
14	37.615038	-85.352096	665.92	6.00	671.92
15	37.614613	-85.351002	669.09	6.00	675.09
16	37.609360	-85.346539	732.89	6.00	738.89

Flight Path Receptors

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 105.1°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	37.635132	-85.249445	823.06	50.00	873.06
Two-mile	37.642654	-85.284739	780.60	645.88	1426.49

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 286.1°
Glide slope: 3.1°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	37.631919	-85.234511	868.80	50.00	918.80
Two-mile	37.623901	-85.199394	909.24	581.47	1490.71

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	37.614959	-85.380665	734.19	8.00
OP 2	2	37.611961	-85.380093	721.79	8.00
OP 3	3	37.609098	-85.379380	742.72	8.00
OP 4	4	37.606367	-85.379107	740.18	8.00
OP 5	5	37.599213	-85.365956	749.27	8.00
OP 6	6	37.606019	-85.351215	743.01	8.00
OP 7	7	37.604675	-85.351653	746.72	8.00
OP 8	8	37.607191	-85.353865	730.12	8.00
OP 9	9	37.619787	-85.372321	760.40	8.00

Obstruction Components

Name: Vegetation Buffer 1
Top height: 25.0 ft

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	37.605411	-85.375968	743.79
2	37.605988	-85.376209	745.64
3	37.606778	-85.376611	745.15
4	37.608359	-85.377403	737.15
5	37.608764	-85.377561	732.22
6	37.609417	-85.377963	731.00
7	37.611381	-85.378924	729.52
8	37.612377	-85.379216	722.36
9	37.613210	-85.379334	719.73

Name: Vegetation Buffer 2
Top height: 25.0 ft

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	37.607373	-85.355518	689.28
2	37.605027	-85.354778	728.96

Name: Vegetation Buffer 3
Top height: 25.0 ft

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	37.603177	-85.355048	726.17
2	37.603398	-85.354232	735.75

Glare Analysis Results

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV 01	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 02	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 03	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 04	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 05	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 06	SA tracking	SA tracking	0	0.0	0	0.0	-
PV 07	SA tracking	SA tracking	0	0.0	0	0.0	-

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arthur Mattingly Road	0	0.0	0	0.0
Frogtown Road	0	0.0	0	0.0
N Loretto Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

PV: PV 01 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arthur Mattingly Road	0	0.0	0	0.0
Frogtown Road	0	0.0	0	0.0
N Loretto Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

PV 01 and Route: Arthur Mattingly Road

No glare found

PV 01 and Route: Frogtown Road

No glare found

PV 01 and Route: N Loretto Road

No glare found

PV 01 and FP: FP 1

No glare found

PV 01 and FP: FP 2

No glare found

PV 01 and OP 1

No glare found

PV 01 and OP 2

No glare found

PV 01 and OP 3

No glare found

PV 01 and OP 4

No glare found

PV 01 and OP 5

No glare found

PV 01 and OP 6

No glare found

PV 01 and OP 7

No glare found

PV 01 and OP 8

No glare found

PV 01 and OP 9

No glare found

PV: PV 02 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arthur Mattingly Road	0	0.0	0	0.0
Frogtown Road	0	0.0	0	0.0
N Loretto Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

PV 02 and Route: Arthur Mattingly Road

No glare found

PV 02 and Route: Frogtown Road

No glare found

PV 02 and Route: N Loretto Road

No glare found

PV 02 and FP: FP 1

No glare found

PV 02 and FP: FP 2

No glare found

PV 02 and OP 1

No glare found

PV 02 and OP 2

No glare found

PV 02 and OP 3

No glare found

PV 02 and OP 4

No glare found

PV 02 and OP 5

No glare found

PV 02 and OP 6

No glare found

PV 02 and OP 7

No glare found

PV 02 and OP 8

No glare found

PV 02 and OP 9

No glare found

PV: PV 03 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arthur Mattingly Road	0	0.0	0	0.0
Frogtown Road	0	0.0	0	0.0
N Loretto Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

PV 03 and Route: Arthur Mattingly Road

No glare found

PV 03 and Route: Frogtown Road

No glare found

PV 03 and Route: N Loretto Road

No glare found

PV 03 and FP: FP 1

No glare found

PV 03 and FP: FP 2

No glare found

PV 03 and OP 1

No glare found

PV 03 and OP 2

No glare found

PV 03 and OP 3

No glare found

PV 03 and OP 4

No glare found

PV 03 and OP 5

No glare found

PV 03 and OP 6

No glare found

PV 03 and OP 7

No glare found

PV 03 and OP 8

No glare found

PV 03 and OP 9

No glare found

PV: PV 04 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arthur Mattingly Road	0	0.0	0	0.0
Frogtown Road	0	0.0	0	0.0
N Loretto Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

PV 04 and Route: Arthur Mattingly Road

No glare found

PV 04 and Route: Frogtown Road

No glare found

PV 04 and Route: N Loretto Road

No glare found

PV 04 and FP: FP 1

No glare found

PV 04 and FP: FP 2

No glare found

PV 04 and OP 1

No glare found

PV 04 and OP 2

No glare found

PV 04 and OP 3

No glare found

PV 04 and OP 4

No glare found

PV 04 and OP 5

No glare found

PV 04 and OP 6

No glare found

PV 04 and OP 7

No glare found

PV 04 and OP 8

No glare found

PV 04 and OP 9

No glare found

PV: PV 05 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arthur Mattingly Road	0	0.0	0	0.0
Frogtown Road	0	0.0	0	0.0
N Loretto Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

PV 05 and Route: Arthur Mattingly Road

No glare found

PV 05 and Route: Frogtown Road

No glare found

PV 05 and Route: N Loretto Road

No glare found

PV 05 and FP: FP 1

No glare found

PV 05 and FP: FP 2

No glare found

PV 05 and OP 1

No glare found

PV 05 and OP 2

No glare found

PV 05 and OP 3

No glare found

PV 05 and OP 4

No glare found

PV 05 and OP 5

No glare found

PV 05 and OP 6

No glare found

PV 05 and OP 7

No glare found

PV 05 and OP 8

No glare found

PV 05 and OP 9

No glare found

PV: PV 06 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arthur Mattingly Road	0	0.0	0	0.0
Frogtown Road	0	0.0	0	0.0
N Loretto Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

PV 06 and Route: Arthur Mattingly Road

No glare found

PV 06 and Route: Frogtown Road

No glare found

PV 06 and Route: N Loretto Road

No glare found

PV 06 and FP: FP 1

No glare found

PV 06 and FP: FP 2

No glare found

PV 06 and OP 1

No glare found

PV 06 and OP 2

No glare found

PV 06 and OP 3

No glare found

PV 06 and OP 4

No glare found

PV 06 and OP 5

No glare found

PV 06 and OP 6

No glare found

PV 06 and OP 7

No glare found

PV 06 and OP 8

No glare found

PV 06 and OP 9

No glare found

PV: PV 07 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Arthur Mattingly Road	0	0.0	0	0.0
Frogtown Road	0	0.0	0	0.0
N Loretto Road	0	0.0	0	0.0
FP 1	0	0.0	0	0.0
FP 2	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0

PV 07 and Route: Arthur Mattingly Road

No glare found

PV 07 and Route: Frogtown Road

No glare found

PV 07 and Route: N Loretto Road

No glare found

PV 07 and FP: FP 1

No glare found

PV 07 and FP: FP 2

No glare found

PV 07 and OP 1

No glare found

PV 07 and OP 2

No glare found

PV 07 and OP 3

No glare found

PV 07 and OP 4

No glare found

PV 07 and OP 5

No glare found

PV 07 and OP 6

No glare found

PV 07 and OP 7

No glare found

PV 07 and OP 8

No glare found

PV 07 and OP 9

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians