

FREE STATE SOLAR PROJECT, LLC

SOLAR GLARE STUDY

KANSAS SKY ENERGY CENTER

PROJECT NO. 147658

REVISION 2

AUGUST 16, 2023

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List of Abbreviations

Abbreviation	Term/Phrase/Name
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
FAA	Federal Aviation Administration
Free State	Free State Solar Project, LLC
LOS	Line-of-sight
LWC	Lawrence Regional Airport
OP	Observation Point
Project	Kansas Sky Energy Center
PV	Photovoltaic
Route	Path Receptor Route
SGHAT	Solar Glare Hazard Analysis Tool
SGOHP	Solar Glare Ocular Hazard Plot

1.0 Executive Summary

Burns & McDonnell Engineering Company, Inc. (“Burns & McDonnell”) was retained by Free State Solar Project, LLC (“Free State”) to conduct a glare study for the proposed Kansas Sky Energy Center (the “Project”), which is located in Douglas County, Kansas. The purpose of the study was to identify the potential for glare directed onto nearby properties or roadways from the proposed Project in Douglas County.

Fifty (50) observation points (“OPs”) representing stationary observers at nearby residences, nine (9) path receptor routes (“Routes”) representing eight (8) nearby roadway observers and one (1) nearby railway observer, and four (4) airport runway landing approach paths were reviewed and studied for the potential for glare from the Project in Douglas County.

The first part of the study consisted of evaluating each observer for the potential for glare from the Project utilizing the Solar Glare Hazard Analysis Tool (“SGHAT”), which was developed by Sandia National Laboratory in conjunction with the Federal Aviation Administration (“FAA”) and licensed for commercial use to ForgeSolar. The analysis in ForgeSolar assumed no visual obstructions between the glare and an observer.

The second step of the study, if glare was identified at an observer from ForgeSolar, further evaluated the line of sight (“LOS”) for that instance to determine the observers that have an unobstructed, partially obstructed, or completely obstructed LOS using the latest available satellite imagery and considering existing visual obstructions. These results were then reviewed with the Solar Glare Hazard Analysis Tool output to determine if glare would be directed onto nearby observers from the Project.

From the study, it was determined that there were three (3) instances of “yellow” glare reported by ForgeSolar in the first step before evaluating LOS for each instance in the second step of the study. After evaluating the LOS from the latest available satellite imagery and for the location of the sun from the perspective of the observer during instances of glare, the following conclusions were noted:

1. For the fifty (50) observation points assessed representing nearby residences, one (1) instance of “yellow” glare were noted:
 - a. One (1) instance was determined to have minimal or no existing visual obstructions to reduce or mitigate the glare. However, this instance is considered not consequential due to it being at the same time and from a similar direction as the sun for the observer.
2. For the nine (9) path receptor routes assessed representing eight (8) nearby roadways and one (1) nearby railway, two (2) instances of “yellow” glare were noted:
 - a. One (1) instance of glare occurring for westbound vehicular traffic near the intersection of North 1900 Road and East 1400 Road was determined to have minimal or no existing visual obstructions that may reduce or mitigate the glare. However, the glare for the instance is considered not consequential due to it being at the same time and from a similar direction as the sun for the observer.

- b. One (1) instance of glare occurring for westbound railway traffic was determined to have some existing visual obstructions that may reduce or mitigate the glare. However, the glare for the instance is considered not consequential due to it being at the same time and from a similar direction as the sun for the observer.
3. For the four (4) runway landing approach paths assessed representing the Lawrence Regional Airport (“LWC”), no instances of “yellow” glare were noted.

The study contained several assumptions to address uncertainties in the information provided and the modeling tools that likely overestimate the instances of glare reported and resulted in more conservative mitigation recommendations. Beyond existing visual obstructions, the planned visual screening added as part of the Project development may further reduce or eliminate the glare identified by acting as a visual obstruction supplementing the existing visual obstructions.

1.1 Background

The solar glare study analyzing the potential for glare from the Project was performed to comply with the Douglas County Zoning Regulations. Sandia National Laboratories developed the Solar Glare Hazard Analysis Tool, which determines the risk of glare potential from solar energy systems (Sandia National Laboratories, 2019) and is available for commercial use from ForgeSolar. The Solar Glare Hazard Analysis Tool determines if there is a potential for glare by performing a geometric analysis that considers the position of the sun, specified observers and routes, and specifications for the PV array, including the maximum tracking angle if the array uses single-axis tracking. These parameters were used to evaluate if glare could be directed onto nearby properties and roadways for the Project.

The Solar Glare Hazard Analysis Tool does not account for changes in topography, vegetation, or structures that would partially or completely obstruct the view and reduce or mitigate the impact of the glare on an observer, unless that object is specifically modeled as an obstruction component in ForgeSolar. Accordingly, a second LOS analysis is performed following the glare analysis for ground-level observers that were noted to have the potential to experience glare in areas where there may only be partial visual obstructions existing.

1.2 Site Overview

The Kansas Sky Energy Center is located in Douglas County. While equipment selections and ratings during preliminary Project development are subject to change, the site was modeled with parameters specific to the currently proposed equipment of the utility-scale photovoltaic system utilizing a single-axis tracking racking solution which is expected for the Project. Details of the anticipated placement of trackers on the Project site can be found in the site layout included in Appendix A.

1.3 Glare Analysis

To perform the glare analysis, the Solar Glare Hazard Analysis Tool licensed for commercial use to ForgeSolar was utilized (Sandia National Laboratories, 2019). The Solar Glare Hazard Analysis Tool allows the user to specify a site location, draw an outline of the proposed photovoltaic array, and specify observer locations. Once these parameters are given, the properties of the arrays such as the tracking type, tilt, module surface type, and orientation

can be specified for each array. Latitude, longitude, and elevation for each receptor and array vertex are tracked and used for sun position and vector calculations to determine glare for the observation points for every minute in a calendar year (ForgeSolar, 2019).

The Solar output indicates if there is potential for glare at the identified receptors. If glare exists, the Solar Glare Hazard Analysis Tool creates the Solar Glare Ocular Hazard Plot (“SGOHP”), which identifies the degree of the hazard, the location on the array it is from, and the time it occurs. The Solar Glare Hazard Analysis Tool evaluated the potential glare at the receptors for every minute in a full calendar year, considers the sun’s path through the sky throughout a calendar year, and conservatively considers clear and sunny conditions for every day in a calendar year.

The glare determined by the Solar Glare Hazard Analysis Tool is assigned a color value of “green”, “yellow”, or “red” based on the intensity of the light that reaches an observer’s retina and the size of the glare in the observer’s field of view in increasing severity. “Green” glare is glare that is bright and large enough to affect some observers in ideal conditions, “yellow” glare is glare bright and large enough to affect most observers when occurring, and “red” glare is bright and large enough to cause retinal burn in most observers. It should be noted that no receptors in this study were given a determination of “red” glare by the Solar Glare Hazard Analysis Tool, i.e., the glare did not have the potential to cause retinal burn, and “red” glare is typically only possible for concentrated solar-thermal projects.

1.4 Line-of-sight (“LOS”) Analysis

The instances of glare identified by ForgeSolar were further reviewed for potential visual obstructions. The line of sight from the observers to the arrays were categorized as “Visible”, “Marginally Visible”, or “Not Visible” due to geography, vegetation, structures, or other existing objects. These results were then combined with the Solar Glare Hazard Analysis Tool output to determine if glare could affect an observer with an unobstructed line of sight (“LOS”). If no potential for glare was noted from the Solar Glare Hazard Analysis Tool, then the LOS was not evaluated as there was no potential for glare noted that may need further mitigation with visual obstructions to the LOS.

Any visual obstructions between the source of glare and the observer such as geography, vegetation, or structures will serve to reduce the intensity of the light that reaches an observer’s retina and the size of the glare in the observer’s field of view by blocking the light. Accordingly, the instances of glare identified in this study may over-represent actual glare experienced by an observer when the Project is operating. Any added visual screening such as fencing, vegetation buffers, or berms required to meet other permitting requirements should reduce or eliminate the potential for an observer to experience glare when the screening is acting as a visual obstruction to the line of sight.

Determinations of “Marginal” and “Not Visible” line of sight when glare instances were identified were required to have multiple visual obstructions to address the uncertainty of individual visual obstructions being removed. Accordingly, the results of the LOS analysis may under-report the existing visual screening to address uncertainties in the long-term placement and provide more conservative mitigation recommendations.

2.0 Background

2.1 Douglas County Zoning Regulations

The Douglas County Zoning Regulations provides the following:

Section 12-306-49.05.F: *Glare: All solar panels must be constructed to minimize glare or reflection onto adjacent properties and roadways and must not interfere with traffic, including air traffic, or create a safety hazard as per any Local, State, and Federal laws and regulations. Examples of measures that can be utilized to limit glare include, but are not limited to:*

- 1) *Textured glass;*
- 2) *Anti-reflective coatings;*
- 3) *Screening;*
- 4) *Distance; or*
- 5) *Positioning units in a manner that reduces glare.*

Section 12-306-49.06.D.16: Solar Glare Hazard Analysis

The applicant shall provide a Solar Glare Hazard Analysis utilizing the latest version of the Solar Glare Hazard Analysis Tool (SGHAT), or its equivalent, to evaluate the solar glare aviation hazard and potential impact on neighbors.

2.2 Definition of Glare

Glare is defined as a continuous source of bright light reflecting or refracting off a surface. Glare is generally associated with stationary objects, which, due to the slow relative movement of the sun, reflect sunlight for a longer duration. Industry-standard glare analysis tools evaluate the occurrence of glare on a minute-by-minute basis; accordingly, they generally refer to reflected and refracted solar light as 'glare' (ForgeSolar, 2019).

3.0 Methodology

3.1 Study Purpose

The purpose of this study was to identify any glare created by the Kansas Sky Energy Center and directed onto nearby properties or roadways. This was achieved by modeling the site in ForgeSolar, reviewing instances of glare that were identified to determine if there was an unobstructed line of sight, and determining if the glare was originating from a direction different than the sun in an observer's field of view.

From Burns & McDonnell's experience on similar large solar energy systems, an appropriate threshold for glare received for nearby properties, evaluated as "OPs", that are not operating a motor vehicle must meet three criteria:

- There is a potential for glare ("yellow" glare) from the Project to be reflected/refracted to the observer.
- There exist no visual obstructions between the source of glare and the observer of glare that would otherwise mitigate the ocular impact.
- The glare received by the observer is not from the same direction as the sun in the hour immediately following sunrise or the hour immediately preceding sunset.

From Burns & McDonnell's experience on similar large solar energy systems, an appropriate threshold for glare received for nearby vehicle operators traveling on the roadways or railways must meet four criteria:

- There is a potential for glare ("yellow" glare) from the Project to be reflected/refracted to the vehicle operator on the adjacent roadways or railways.
- There exist no visual obstructions between the source of glare and the vehicle operator that would otherwise mitigate the ocular impact.
- The glare received by a vehicle operator is within a 25-degree horizontal view angle in the normal direction of travel. (Note: this is based on the FAA study where it was determined "...that any sources of glare at an airport may be potentially mitigated if the angle of the glare is greater than 25 degrees from the direction that the pilot is looking in") (Rogers, et al., 2015).
- The glare received by the vehicle operator is not from the same direction as the sun in the hour immediately following sunrise or the hour immediately preceding sunset.

From Burns & McDonnell's experience on similar large solar energy systems an appropriate threshold for glare, on nearby airports without an airport traffic control tower and subject to the FAA 2021 policy regarding glare, must meet four criteria:

- There is a potential for glare ("yellow" glare) from the Project to be reflected/refracted to the pilots on the runway landing approach for each runway.
- There exist no visual obstructions between the source of glare and the pilots that would otherwise mitigate the ocular impact.

- The glare received by a pilot is within a 25-degree horizontal and 30-degree downward view angle in the normal direction of travel. (Note: this is based on the FAA study where it was determined “...that any sources of glare at an airport may be potentially mitigated if the angle of the glare is greater than 25 degrees from the direction that the pilot is looking in” and the 2013 FAA policy) (Rogers, et al., 2015)(FAA,2013).

From Burns & McDonnell’s experience on similar large solar energy systems, an appropriate threshold for glare to be consequential determined by ForgeSolar is “yellow” glare and not “green” glare due to the overall conservative nature of the ForgeSolar modeling assumptions, the low potential for afterimage in a typical observer described by “green” glare in ideal conditions in the original studies performed by Ho, C.K., and the allowable thresholds used by the Federal Aviation Administration in previous and current policies.

The overall conservative nature of the ForgeSolar modeling assumptions include but are not limited to sunny conditions year-round, a completely free horizon that does not affect localized sunset and sunrise times, and complete coverage of modules in the modeled regions with no full or partial visual obstructions from the site equipment itself for ideal conditions to generate glare. Furthermore, a result of “green” glare is described as a “low potential to cause afterimage” as in it does not cause afterimage in all observers and assumes ideal conditions for it to occur when reported (Ho, 2011). Lastly, the FAA in the interim and more conservative policy regarding glint and glare that was in effect from October 23rd, 2013 to May 11th, 2021 allowed for pilots to experience “green” glare during the two-mile landing approach and considered “yellow” glare to be the sufficient threshold to be consequential (FAA, 2013). On May 11th, 2021 following eight years of feedback the FAA also modified these requirements and now allows for “green” as well as “yellow” glare for landing approaches at federally-obligated airports (FAA, 2021).

Accordingly, all nearby properties, roads, and airports were identified with “yellow” glare were reported in Section 4.0. The “yellow” glare is considered consequential if (1) the source of the glare has no visual obstructions between the source of the glare and the observer, (2) the glare is not from the same direction as the sun during either sunset or sunrise, and (3) the glare is greater than 25 degrees from the direction that the driver or pilot is looking. It should be noted the ForgeSolar analysis output included as Appendix C to Appendix F reports on all instances of “green” and “yellow” glare and instances of glare discussed in this report discuss “yellow” glare instances.

3.2 Observation Point, Array Outline, and Obstruction Component Generation

The fifty (50) observation points (“OPs”), nine (9) path receptors routes (“Routes”), and four (4) flight paths to be assessed were identified by Free State and confirmed Burns & McDonnell. The analysis features consisted of residences represented as OP 1 to OP 50; roadways represented as Route 1 to Route 8; a single railway represented as OP 9; and the Lawrence Regional runway landing approaches represented as FP 1, FP 15, FP 19, and FP 33 for each respective runway. The locations of the OPs, Routes, and flight paths as well as the numbering is included for reference in Appendix B.

Each OP, Route, and Flight Path considers the ground elevation at the respective location in the geometric calculations with an additional height above the ground height for the observer type. The stationary observer height was modeled to be six (6) feet above the ground height for a typical standing observer for OPs, four (4) feet above ground height for an observer sitting in a vehicle for Routes, and fourteen (14) feet above ground height for an observer operating a train on the railway represented by Route 7. The observer height for the landing paths were modeled as the threshold crossing height for each runway, as recorded by the FAA, and extended out two miles at the runway landing glide slope in accordance with the interim and more conservative FAA policy from 2013.

The site consists of several non-contiguous arrays, which were modeled as twelve (12) separate polygons named PV01 to PV12. The Solar Glare Hazard Analysis Tool assesses glare for the entire area encompassed by the polygon indicated as being an array. Therefore, all areas that were indicated to be covered by modules within the bounds of the array vertices, as well as the gaps between rows and areas representing access roads, were included in the geometric analysis.

For the ForgeSolar analysis, no obstruction components were utilized and the LOS was reviewed in the second step of the study.

3.3 Solar Glare Hazard Analysis Tool Analysis

Once the observers were defined, the array location and parameters were loaded into ForgeSolar, and the geometric analysis was performed. A summary of the parameters of the PV array and modules as input are shown in Table 3-1, and the locations and numberings of the arrays are included for reference in Appendix B.

Table 3-1: Parameters Used for PV Arrays and Modules

Array Type	Max Tracking Angle (degrees)	Resting Angle (degrees)	Array Azimuth (degrees)	Module Surface Material	Average Height Above Ground (ft)	Ground Coverage Ratio (%)
Single-axis tracking	+/- 60	5	180	Smooth glass with anti-reflective coating	5	30.47

The “resting angle” in the ForgeSolar parameters refers to the maximum angle the trackers will rotate backward to during periods of back-tracking, and not the nighttime tracker stow angle. For the analysis, the resting angle was set to five (5) degrees as the trackers do not typically reach table or stow position (a zero-degree angle) until the sun is on or below the horizon when in back-tracking operation. Burns & McDonnell’s experience with similar projects has shown it would generate erroneous results if the resting angle in ForgeSolar were set to zero degrees.

The results of the Solar Glare Hazard Analysis Tool analysis were put into a summary table identifying the observers that had the potential for glare from the Project array that would be causing the glare. The commercially available implementation of the Solar Glare Hazard Analysis Tool, ForgeSolar, is limited to performing a glare analysis on twenty (20)

photovoltaic arrays and forty (40) observation points for each geometric analysis. Accordingly, for twelve (12) arrays, fifty (50) observation points, nine (9) path receptors, and four (4) flight paths assessed for this study, four (4) separate geometric analysis calculations in ForgeSolar were performed to address this limitation. The complete results of the analysis performed in ForgeSolar are provided in Appendix C to Appendix F.

3.4 Line-of-Sight (“LOS”) Analysis

The instances of glare identified by ForgeSolar were further reviewed for potential visual obstructions. The Project site was screened with a desktop analysis utilizing the latest publicly available satellite imagery to determine LOS for any instances of glare identified in the results of the ForgeSolar analysis. Each receptor was put into one of three categories:

- Visible, i.e., an observer would have a mostly unobstructed view of the arrays;
- Not Visible, i.e., an observer would not see the arrays due to existing obstructions; and
- Marginally Visible, i.e., an observer could see some of the arrays, but the view would be partially obstructed by existing obstructions.

The results of the LOS analysis were then combined with the Solar Glare Hazard Analysis Tool results to identify which observers could experience glare that was visible and/or marginally visible from the observer’s perspective. Those observers that Solar Glare Hazard Analysis Tool indicated could potentially receive glare but were categorized as “Not Visible” are deemed as not consequential. Those observers that could potentially receive glare and had visible or marginally visible lines of sight to the source of glare were investigated further.

4.0 Results

4.1 ForgeSolar Analysis Results

A summary of results of the Solar Glare Hazard Analysis Tool analysis performed in ForgeSolar can be seen in Table 4-1. Full details of the glare analysis can be found in the ForgeSolar results included as Appendix C to Appendix F.

Table 4-1: ForgeSolar Results Summary

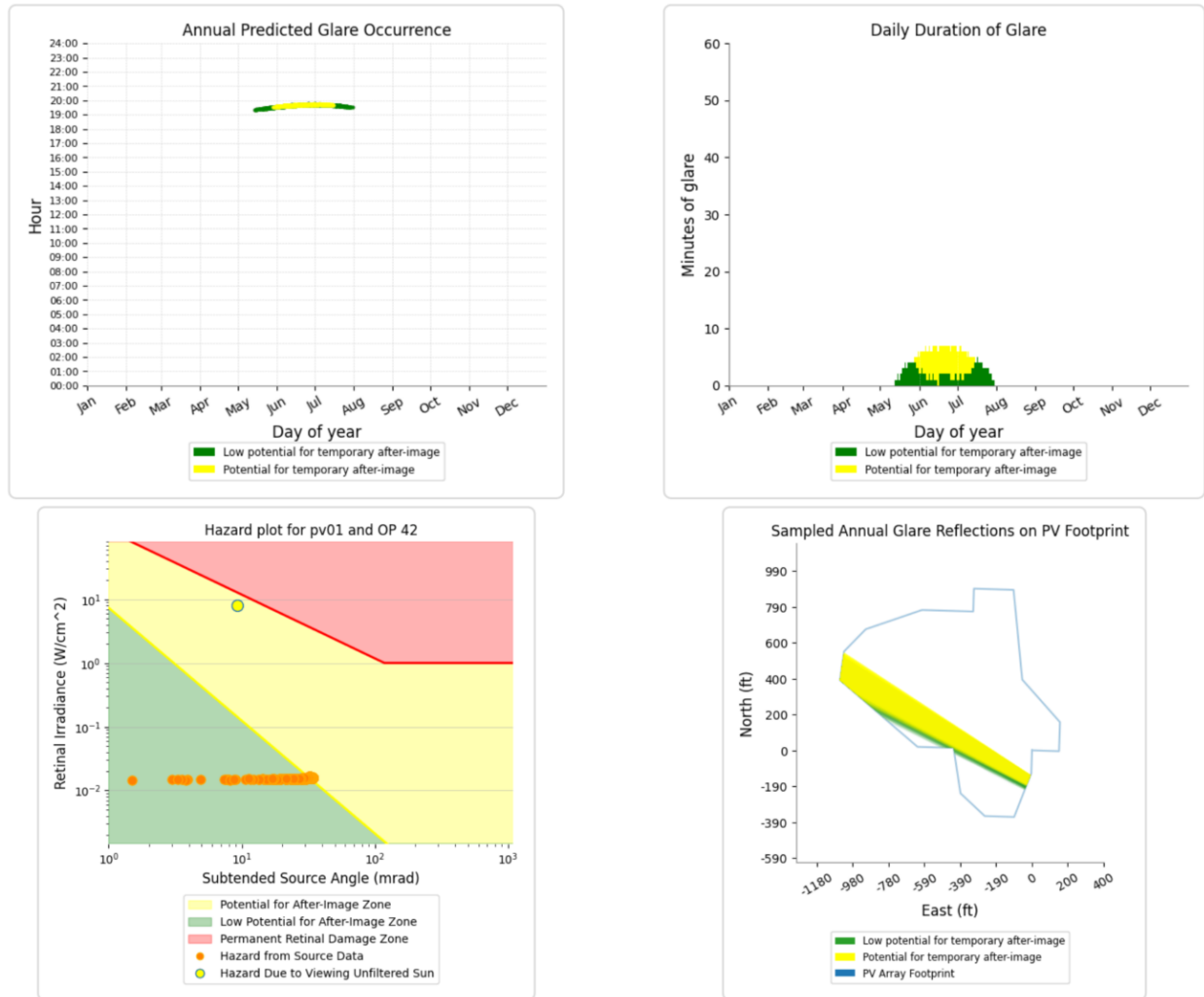
Receptor	Result	Instance
OP 1	No potential for “yellow” or “red” glare noted	
OP 2	No potential for “yellow” or “red” glare noted	
OP 3	No potential for “yellow” or “red” glare noted	
OP 4	No potential for “yellow” or “red” glare noted	
OP 5	No potential for “yellow” or “red” glare noted	
OP 6	No potential for “yellow” or “red” glare noted	
OP 7	No potential for “yellow” or “red” glare noted	
OP 8	No potential for “yellow” or “red” glare noted	
OP 9	No potential for “yellow” or “red” glare noted	
OP 10	No potential for “yellow” or “red” glare noted	
OP 11	No potential for “yellow” or “red” glare noted	
OP 12	No potential for “yellow” or “red” glare noted	
OP 13	No potential for “yellow” or “red” glare noted	
OP 14	No potential for “yellow” or “red” glare noted	
OP 15	No potential for “yellow” or “red” glare noted	
OP 16	No potential for “yellow” or “red” glare noted	
OP 17	No potential for “yellow” or “red” glare noted	
OP 18	No potential for “yellow” or “red” glare noted	
OP 19	No potential for “yellow” or “red” glare noted	
OP 20	No potential for “yellow” or “red” glare noted	
OP 21	No potential for “yellow” or “red” glare noted	
OP 22	No potential for “yellow” or “red” glare noted	
OP 23	No potential for “yellow” or “red” glare noted	
OP 24	No potential for “yellow” or “red” glare noted	
OP 25	No potential for “yellow” or “red” glare noted	
OP 26	No potential for “yellow” or “red” glare noted	
OP 27	No potential for “yellow” or “red” glare noted	
OP 28	No potential for “yellow” or “red” glare noted	
OP 29	No potential for “yellow” or “red” glare noted	
OP 30	No potential for “yellow” or “red” glare noted	

OP 31	No potential for “yellow” or “red” glare noted	
OP 32	No potential for “yellow” or “red” glare noted	
OP 33	No potential for “yellow” or “red” glare noted	
OP 34	No potential for “yellow” or “red” glare noted	
OP 35	No potential for “yellow” or “red” glare noted	
OP 36	No potential for “yellow” or “red” glare noted	
OP 37	No potential for “yellow” or “red” glare noted	
OP 38	No potential for “yellow” or “red” glare noted	
OP 39	No potential for “yellow” or “red” glare noted	
OP 40	No potential for “yellow” or “red” glare noted	
OP 41	No potential for “yellow” or “red” glare noted	
OP 42	213 mins of “yellow” glare in calendar year from Block 1	1
OP 43	No potential for “yellow” or “red” glare noted	
OP 44	No potential for “yellow” or “red” glare noted	
OP 45	No potential for “yellow” or “red” glare noted	
OP 46	No potential for “yellow” or “red” glare noted	
OP 47	No potential for “yellow” or “red” glare noted	
OP 48	No potential for “yellow” or “red” glare noted	
OP 49	No potential for “yellow” or “red” glare noted	
OP 50	No potential for “yellow” or “red” glare noted	
Route 1	No potential for “yellow” or “red” glare noted	
Route 2	No potential for “yellow” or “red” glare noted	
Route 3	42 mins of “yellow” glare in calendar year from Block 1	2
Route 4	No potential for “yellow” or “red” glare noted	
Route 5	No potential for “yellow” or “red” glare noted	
Route 6	No potential for “yellow” or “red” glare noted	
Route 7	No potential for “yellow” or “red” glare noted	
Route 8 (Railroad)	60 mins of “yellow” glare in calendar year from Block 2	3
FP 1	No potential for “yellow” or “red” glare noted	
FP 15	No potential for “yellow” or “red” glare noted	
FP 19	No potential for “yellow” or “red” glare noted	
FP 33	No potential for “yellow” or “red” glare noted	

4.1.1 Instance 1, Block 1 and OP 42

Details of the Solar Glare Hazard Analysis Tool results can be seen below in the generated Solar Glare Ocular Hazard Plots (“SGOHP”). The glare occurs between approximately 8:30 PM to 9:00 PM Central Standard Time in Late May through mid-July, occurs for approximately eight (8) minutes at its longest occurrence, originates from a southwest region of Block 1, and the observer would see the glare coming from a similar direction as directly viewing the sun for summer sunset hours. From Burns & McDonnell’s experience on similar large solar energy systems, this instance of glare is not consequential due to it being at a similar time and direction as the sun for the observer.

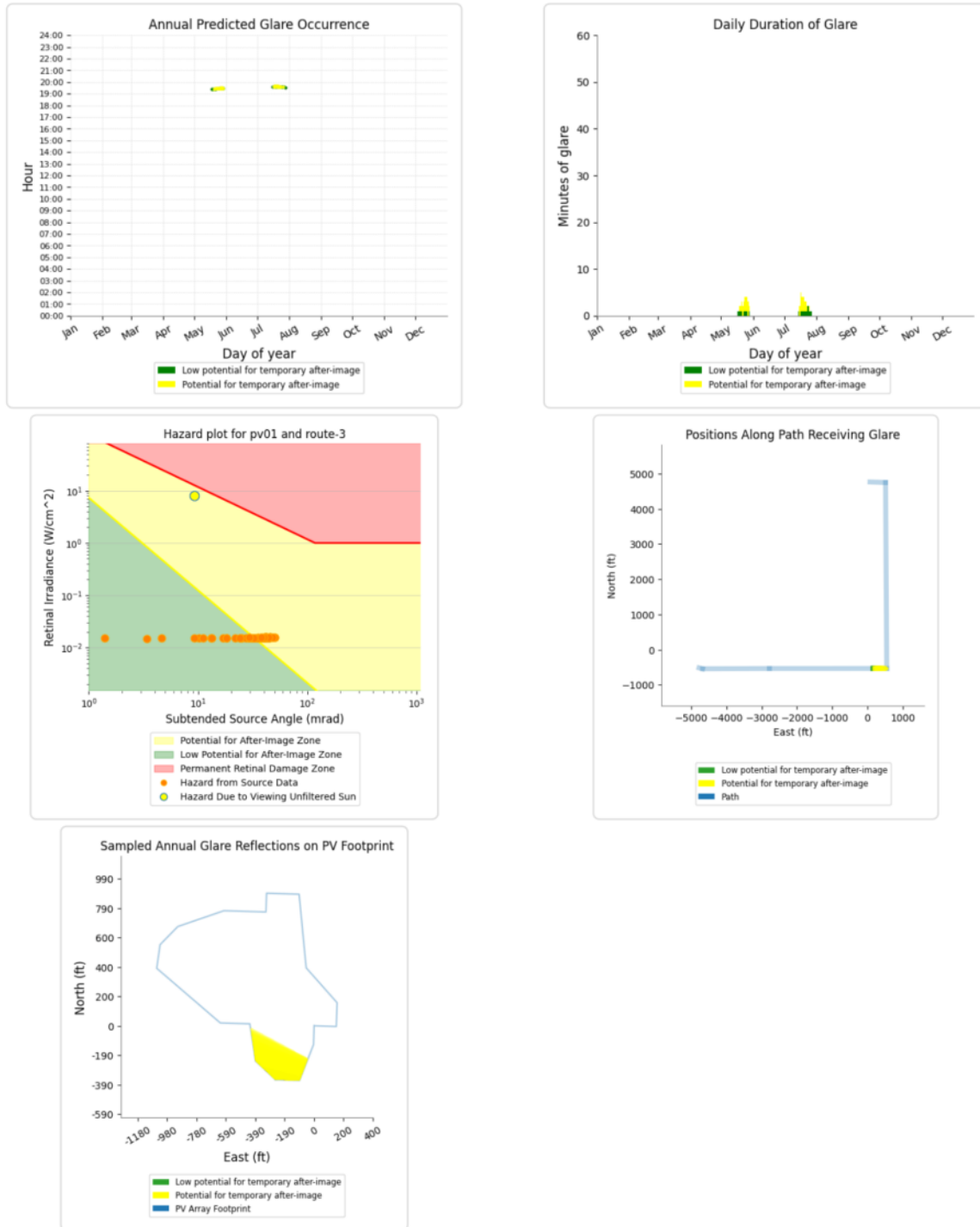
Figure 1: Instance 1, Block 1 and OP 42, Solar Glare Hazard Analysis Tool Results



4.1.2 Instance 2, Block 1 and Route 3

Details of the Solar Glare Hazard Analysis Tool results can be seen below in the generated Solar Glare Ocular Hazard Plots (“SGOHP”). The glare occurs between approximately 8:15 PM to 8:45 PM Eastern Standard Time mid-May and mid-July, occurs for approximately five (5) minutes at its longest occurrence, and originates from a southern portion of Block 1. The observer would see the glare coming from a similar direction as directly viewing the sun for summer sunset hours. From Burns & McDonnell’s experience on similar large solar energy systems, this instance of glare is not consequential due to it being at a similar time and direction as the sun for the observer.

Figure 2: Instance 2, Block 1 and Route 3, Solar Glare Hazard Analysis Tool Results

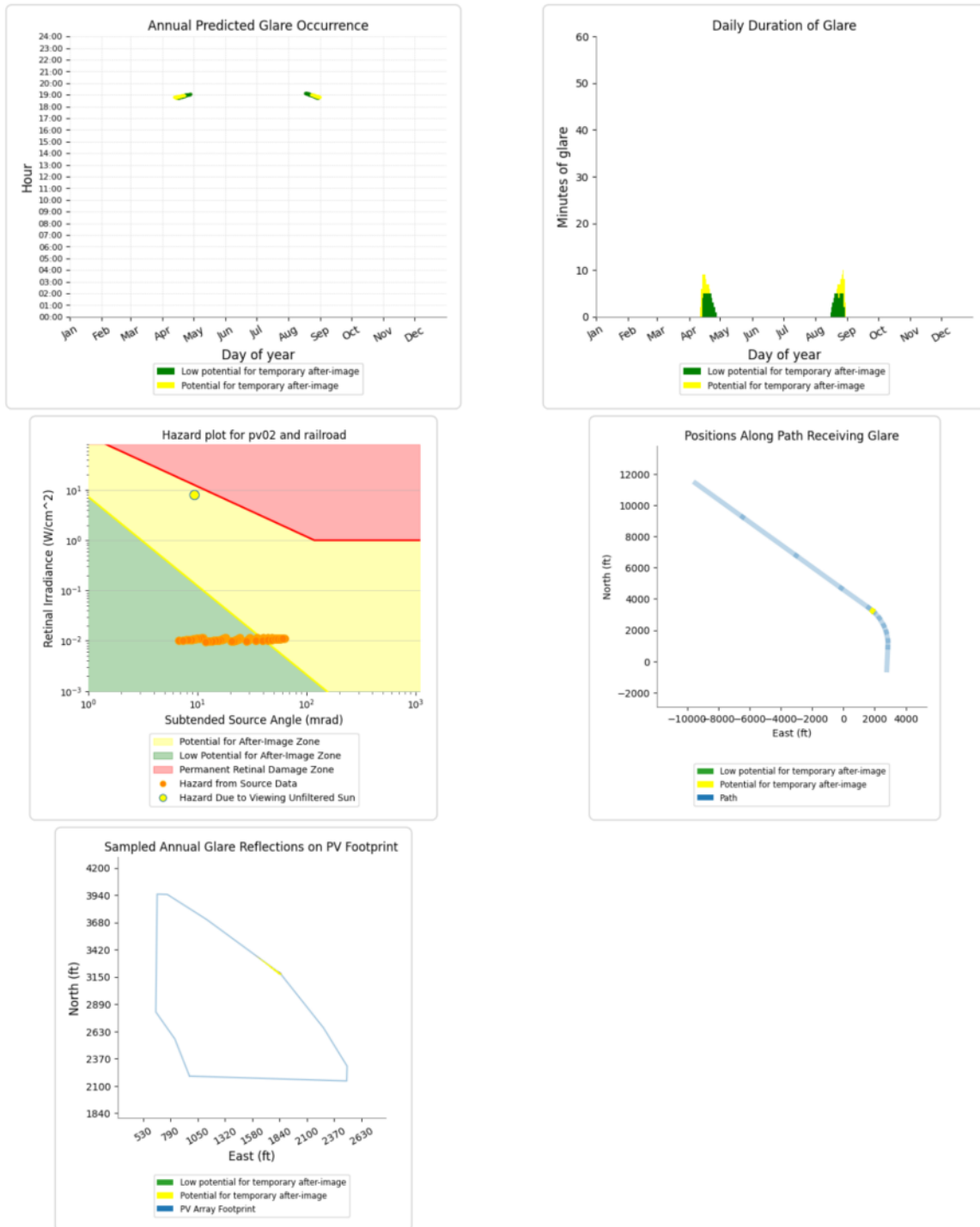


4.1.3 Instance 3, Block 2 and Route 9 (Railroad)

Details of the Solar Glare Hazard Analysis Tool results can be seen below in the generated Solar Glare Ocular Hazard Plots (“SGOHP”). The glare occurs between approximately 7:45 PM to 8:00 PM Eastern Standard Time mid-April and late-August, occurs for approximately ten

(10) minutes at its longest occurrence, and originates from an eastern portion of Block 2. The observer would see the glare coming from a similar direction as directly viewing the sun for summer sunset hours. From Burns & McDonnell's experience on similar large solar energy systems, this instance of glare is not consequential due to it being at a similar time and direction as the sun for the observer.

Figure 3: Instance 3, Block 2 and Route 9 (Railroad), Solar Glare Hazard Analysis Tool Results



4.2 Line-of-Sight Analysis Results

The Project site was then screened with a desktop analysis utilizing the latest publicly available satellite imagery to determine LOS for the observation points that showed the potential to receive glare from the Project arrays. Each observer was put into one of three categories:

- Visible, i.e., an observer would have a mostly unobstructed view of the arrays;
- Not Visible, i.e., an observer would not see the arrays due to existing obstructions; and
- Marginally Visible, i.e., an observer could see some of the arrays, but the view would be partially obstructed.

The results of the analysis can be seen below in Table 4-2.

Table 4-2: Line-of-Sight Analysis Results

Instance	Result
1	Visible
2	Marginally Visible
3	Marginally Visible

4.2.1 Instance 1, Block 1 and OP 42, Line-of-Sight Analysis Results

OP 42 is a residence located approximately 500 feet southeast of Block 1. There exist some structures, vegetation, geography, and project arrays between the OP and the source of glare.

From Burns & McDonnell's experience on similar large solar energy systems, this instance of glare evaluated for the line of sight is considered "visible" due to the distance between the source of glare and receptor and minimal visual obstructions in the path between them. However, it should be noted that any additional visual screening, including the planned visual screening that is part of the Project development, may serve to reduce or mitigate the glare experienced at the receptor.

4.2.2 Instance 2, Block 1 and Route 3, Line-of-Sight Analysis Results

Route 3 is a path receptor representing North 1900 Road and East 1400 Road where the two roads intersect and the roads between the intersections. The glare identified is experienced by westbound traffic for an approximately 500-foot stretch of North 1900 Road, near the intersection of North 1900 Road and East 1400 Road. Between this stretch of North 1900 Road and Block 1, there is minimal or no existing vegetation on the north side of North 1900 Road.

From Burns & McDonnell's experience on similar large solar energy systems, this instance of glare evaluated for the line of sight is considered "marginally visible" as the path between the source of glare and the receptor may not be completely visually obstructed by existing obstructions. However, some existing visual obstructions do exist that may reduce or mitigate

the impact of glare on the receptor. It should be noted that any additional visual screening, including the planned visual screening that is part of the Project development, may serve to reduce or mitigate the glare experienced at the receptor.

4.2.3 Instance 3, Block 2 and Route 9 (Railroad), Line-of-Sight Analysis Results

Route 9 is a path receptor representing the Union Pacific Railroad that runs parallel to Highway 24. The glare identified is experienced by northwest bound traffic for an approximately 300-foot stretch of the railroad. Between this stretch of the railroad and Block 2 there exists a region of existing vegetation on the west side of railroad.

From Burns & McDonnell's experience on similar large solar energy systems, this instance of glare evaluated for the line of sight is considered "marginally visible" as the path between the source of glare and the receptor may not be completely visually obstructed by existing obstructions. However, some existing visual obstructions do exist that may reduce or mitigate the impact of glare on the receptor. It should be noted that any additional visual screening, including the planned visual screening that is part of the Project development, may serve to reduce or mitigate the glare experienced at the receptor.

5.0 Conclusion

Burns & McDonnell used the Solar Glare Hazard Analysis Tool licensed to ForgeSolar and the latest available satellite imagery in a desktop analysis to evaluate the potential for glare directed to properties and roadways in the area adjacent to the Kansas Sky Energy Center. The following conclusions from that analysis are noted:

1. The observation points that were identified by Burns & McDonnell and assessed represent residences as observers that are nearby to the Project site based on Burns & McDonnell's experience with similar projects. For the fifty (50) observation points assessed representing nearby residences, one (1) instance of "yellow" glare was noted:
 - a. One (1) instance was determined to have minimal or no existing visual obstructions to reduce or mitigate the glare. However, this instance is considered not consequential due to it being at the same time and from a similar direction as the sun for the observer.
2. The path receptor routes that were identified by Burns & McDonnell and assessed represent nearby roadways and one railway as observers that are adjacent to the Project site based on Burns & McDonnell's experience with similar projects. For the nine (9) path receptor routes assessed representing eight (8) nearby roadways and one (1) nearby railway, two (2) instances of "yellow" glare were noted:
 - a. One (1) instance of glare occurring for westbound traffic on North 1900 Road near the intersection of North 1900 Road and East 1400 Road. North 1900 Road was determined to have minimal or no existing visual obstructions on the north side of the road that may reduce or mitigate the glare. However, the glare for one/both instances considered not consequential due to the glare being at the same time and from a similar direction as the sun for the observer.
 - b. One (1) instance of glare occurring for westbound railway traffic was determined to have some existing visual obstructions that may reduce or mitigate the glare. However, the glare for the instance is considered not consequential due to it being at the same time and from a similar direction as the sun for the observer.
3. For the four (4) landing flight path assessed representing the Lawrence Regional Airport ("LWC"), no instances of "yellow" glare were noted.

Since all the areas with potential glare were noted as inconsequential due to glare occurring at the same time and from a similar direction as the sun for the observer, no additional modifications to the Project design or additional mitigation are necessary.

6.0 References

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APPENDIX A - KANSAS SKY ENERGY CENTER SITE PLAN

PREPARED FOR:

FREE STATE SOLAR PROJECT, LLC.

422 Admiral Blvd,
Kansas City, MO 64106

REVISIONS:

#	DATE	COMMENT	BY	CHK	APR
A	08/14/23	Permitting Site Plans	SJM	EFE	RJC

LEGEND:

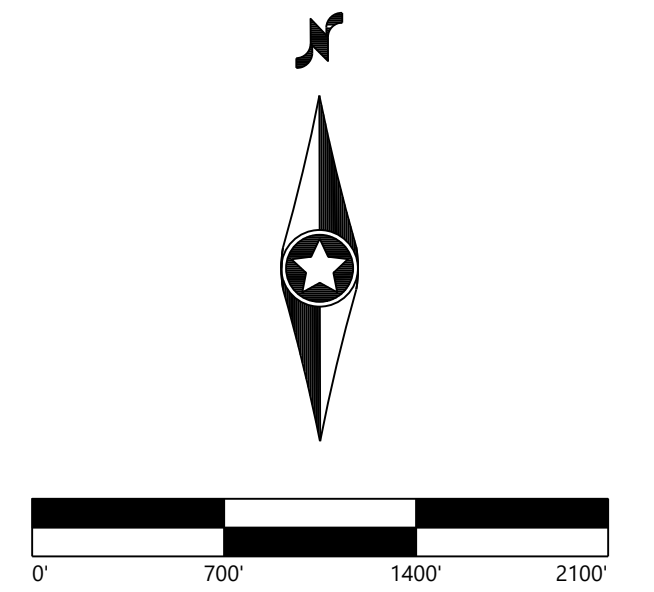
- PROJECT AREA BOUNDARY
- RIGHT-OF-WAY LINES
- EASEMENT LINES
- EX. 5' INDEX CONTOUR
- EX. 1' INTERVAL CONTOUR
- EX. TREELINE
- EX. PAVED ROAD
- EX. GRAVEL ROAD
- EX. RAIL LINE
- EX. FENCE
- EX. OVERHEAD POWER
- EX. FIBER OPTIC LINE
- EX. GAS PIPELINE
- EX. TELEPHONE LINE
- EX. WATER LINE
- EX. WETLAND
- LEVEE CRITICAL ZONE
- FEMA FLOOD ZONE A
- PROPOSED SECURITY FENCE
- PROPOSED SUBSTATION SECURITY FENCE
- PROPOSED UNDERGROUND COLLECTION
- PROPOSED MODULE AREA BOUNDARIES
- PROPOSED ACCESS ROAD
- PROPOSED INVERTER SKID
- PROPOSED BASIN LOCATION
- PROPOSED PROJECT FACILITIES
- PROPOSED TEMPORARY LAYDOWN YARD
- PROPOSED WILDLIFE CORRIDOR
- PROPOSED TRACKING SOLAR ARRAY
- FLOOD DEPTH: 1-2'
- FLOOD DEPTH: 2-3'
- FLOOD DEPTH: 3+'

NOTES:

1. FLOOD MODELING OF EXISTING 100 YR. 24-HR STORM PROVIDED BY WESTWOOD.
2. TOTAL SITE AREA: 631 ACRES
3. MV ROUTING SHOWN FOR REFERENCE ONLY

PRELIMINARY ELECTRICAL DATA

MODULES PER STRING	29
NUMBER OF STRINGS	10,068
NUMBER OF MODULES	291,972
MODULE TYPE	CANADIAN SOLAR CS7N-670TB-AG MODULE
MODULE SIZE	670 W
RACKING TYPE	NEXTRACKER



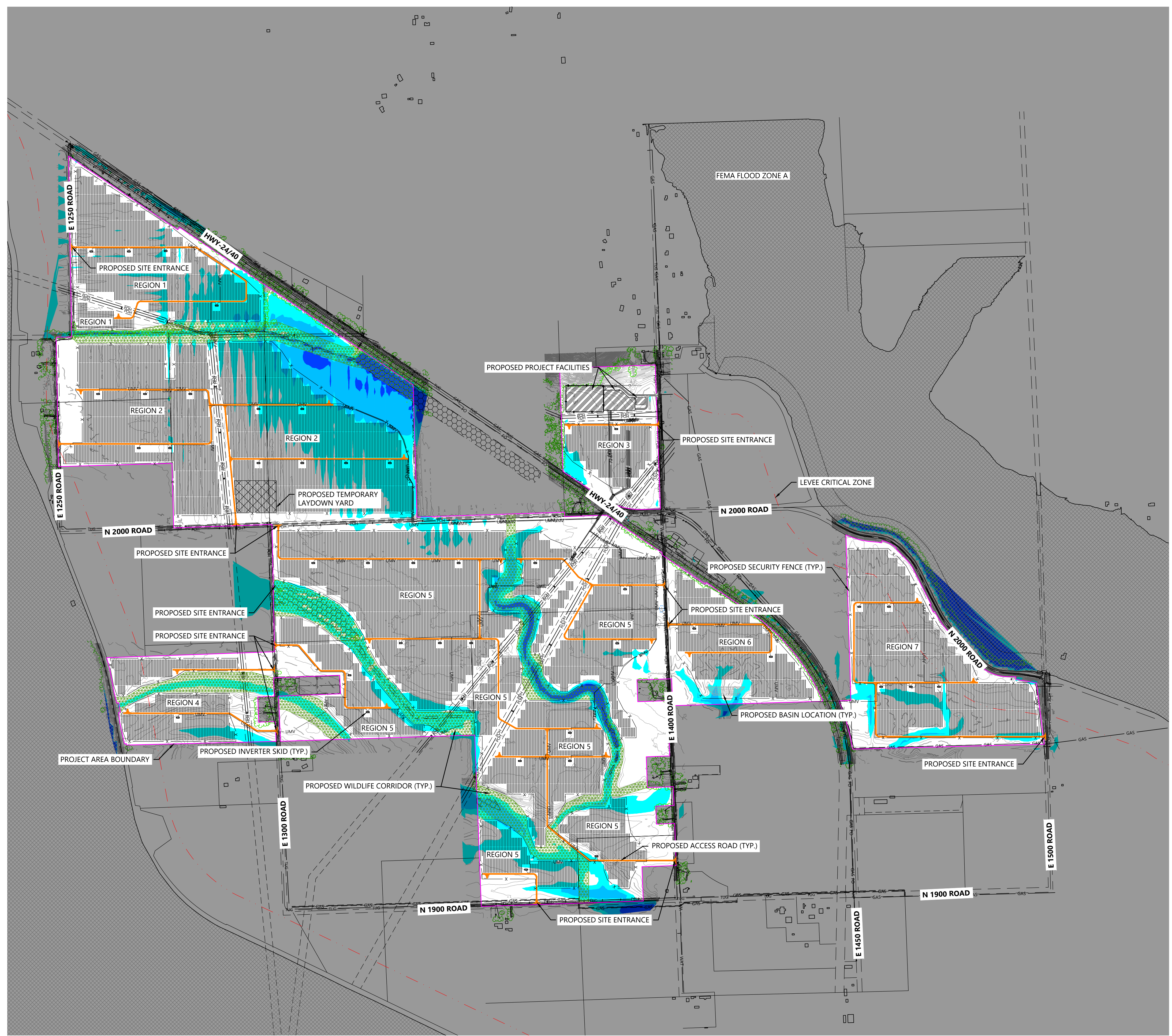
Kansas Sky Energy Center

Douglas County, Kansas

Overall Site Plan of Proposed Conditions

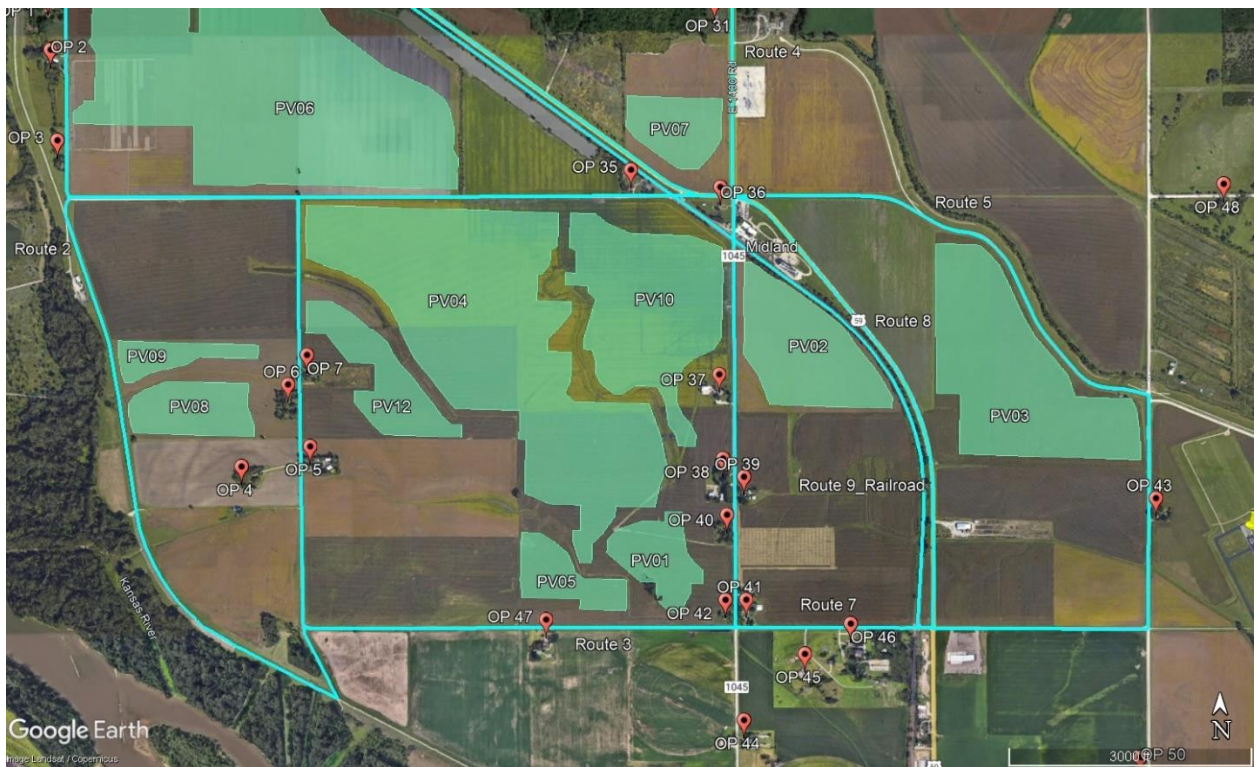
FOR CONDITIONAL USE PERMIT

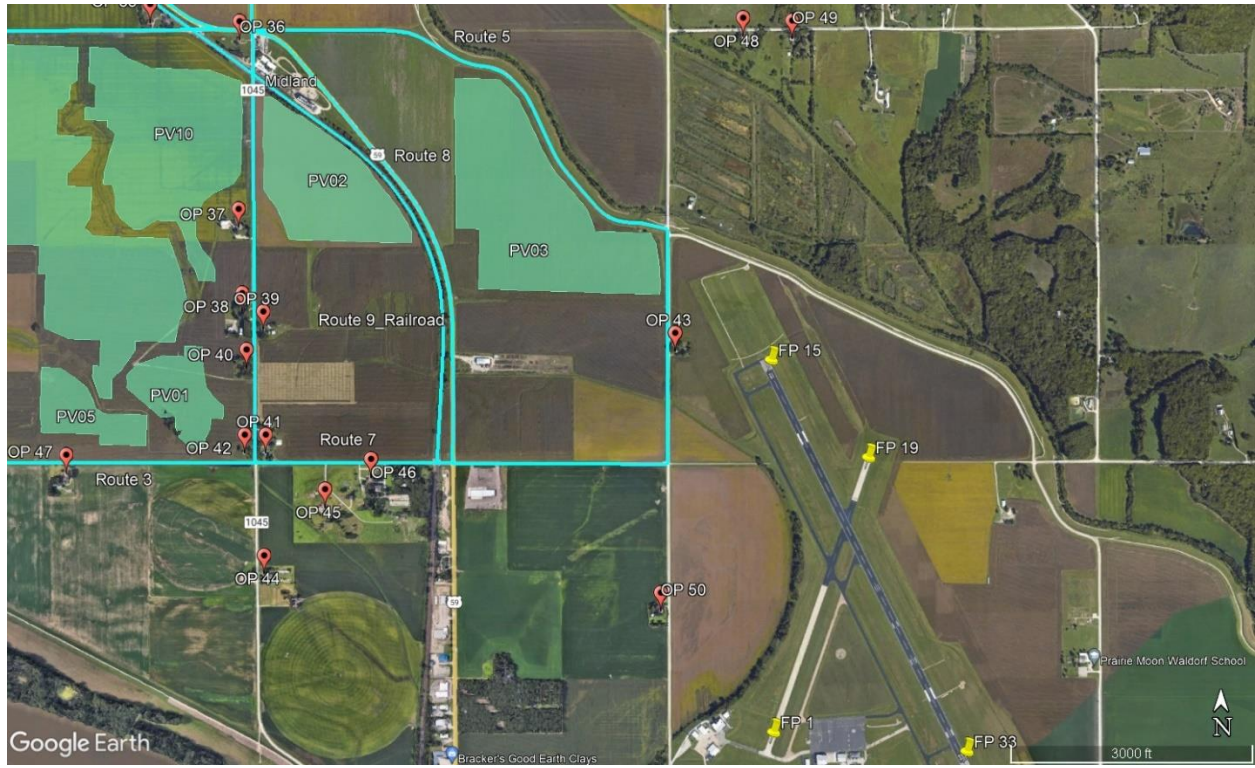
DATE: 08/14/2023 REV:
SHEET: C201 A



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APPENDIX B - ARRAY AND RECEPTOR LOCATIONS





Route Receptors

Name: Railroad
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.015123	-95.234241	828.22	14.00	842.22
2	39.019116	-95.234005	826.50	14.00	840.50
3	39.020250	-95.233983	831.60	14.00	845.60
4	39.021767	-95.234348	833.81	14.00	847.81
5	39.022900	-95.234917	835.69	14.00	849.69
6	39.024217	-95.235915	837.85	14.00	851.85
7	39.025268	-95.237084	838.67	14.00	852.67
8	39.026034	-95.238307	839.07	14.00	853.07
9	39.029493	-95.244508	840.19	14.00	854.19
10	39.035202	-95.254647	838.37	14.00	852.37
11	39.041985	-95.266717	840.81	14.00	854.81
12	39.047968	-95.277349	845.62	14.00	859.62

Name: Route 1
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.044180	-95.270074	837.47	4.00	841.47
2	39.043870	-95.270149	841.72	4.00	845.72
3	39.041497	-95.270193	833.99	4.00	837.99
4	39.037189	-95.270242	833.41	4.00	837.41
5	39.036926	-95.270298	832.01	4.00	836.01
6	39.036812	-95.270418	834.96	4.00	838.96
7	39.036792	-95.271014	836.02	4.00	840.02
8	39.036703	-95.271144	835.20	4.00	839.20
9	39.033007	-95.271095	836.05	4.00	840.05
10	39.029834	-95.271075	835.46	4.00	839.46
11	39.029620	-95.270981	836.37	4.00	840.37
12	39.029630	-95.257350	832.71	4.00	836.71
13	39.029698	-95.243761	838.86	4.00	842.86
14	39.030091	-95.244942	836.18	4.00	840.18
15	39.036852	-95.257067	835.75	4.00	839.75
16	39.044180	-95.270074	837.47	4.00	841.47

Name: Route 2
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.029622	-95.270982	836.37	4.00	840.37
2	39.029372	-95.271153	838.45	4.00	842.45
3	39.029022	-95.271132	844.70	4.00	848.70
4	39.024698	-95.269222	844.06	4.00	848.06
5	39.020991	-95.268449	842.02	4.00	846.02
6	39.019085	-95.268074	843.60	4.00	847.60
7	39.017631	-95.267531	842.70	4.00	846.70
8	39.016311	-95.266515	843.25	4.00	847.25
9	39.015216	-95.265232	841.51	4.00	845.51
10	39.014522	-95.263755	841.84	4.00	845.84
11	39.012743	-95.259373	842.06	4.00	846.06
12	39.013259	-95.259677	831.44	4.00	835.44
13	39.014592	-95.260582	829.94	4.00	833.94
14	39.014871	-95.260771	830.94	4.00	834.94
15	39.015244	-95.260890	830.96	4.00	834.96
16	39.029659	-95.261078	833.58	4.00	837.58

Name: Route 3
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.015198	-95.260849	831.22	4.00	835.22
2	39.015125	-95.260500	829.63	4.00	833.63
3	39.015144	-95.253821	829.32	4.00	833.32
4	39.015148	-95.242083	826.00	4.00	830.00
5	39.029660	-95.242199	840.48	4.00	844.48
6	39.029702	-95.243755	838.86	4.00	842.86

Name: Route 4
Path type: Two-way
Observer view angle: 25.0°



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.029707	-95.242237	840.37	4.00	844.37
2	39.038915	-95.242274	890.21	4.00	894.21

Name: Route 5
Path type: Two-way
Observer view angle: 25.0°



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.029702	-95.242156	841.00	4.00	845.00
2	39.029669	-95.236051	837.40	4.00	841.40
3	39.029544	-95.235241	840.47	4.00	844.47
4	39.028677	-95.233240	846.41	4.00	850.41
5	39.028452	-95.232092	846.24	4.00	850.24
6	39.028335	-95.231502	846.27	4.00	850.27
7	39.028102	-95.231052	845.91	4.00	849.91
8	39.027564	-95.230413	845.76	4.00	849.76
9	39.027085	-95.230064	845.20	4.00	849.20
10	39.025585	-95.229190	844.51	4.00	848.51
11	39.024939	-95.228654	844.48	4.00	848.48
12	39.023610	-95.227162	844.05	4.00	848.05
13	39.023376	-95.226717	844.09	4.00	848.09
14	39.023218	-95.226073	843.85	4.00	847.85
15	39.023176	-95.225296	843.80	4.00	847.80
16	39.023009	-95.224228	845.57	4.00	849.57
17	39.015124	-95.224212	819.75	4.00	823.75
18	39.015124	-95.233535	821.83	4.00	825.83

Name: Route 6
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.042564	-95.267200	841.36	4.00	845.36
2	39.043522	-95.266264	851.42	4.00	855.42
3	39.044397	-95.265205	870.75	4.00	874.75
4	39.045775	-95.263389	931.48	4.00	935.48

Name: Route 7
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.015155	-95.242087	825.94	4.00	829.94
2	39.015117	-95.233553	821.75	4.00	825.75

Name: Route 8
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.029668	-95.242208	840.64	4.00	844.64
2	39.029518	-95.241500	839.79	4.00	843.79
3	39.029181	-95.240792	838.02	4.00	842.02
4	39.028622	-95.240132	836.42	4.00	840.42
5	39.023988	-95.235261	833.43	4.00	837.43
6	39.022730	-95.234339	833.05	4.00	837.05
7	39.021454	-95.233845	829.94	4.00	833.94
8	39.020797	-95.233697	824.69	4.00	828.69
9	39.020101	-95.233574	824.86	4.00	828.86
10	39.015118	-95.233543	821.83	4.00	825.83

**APPENDIX C - FORGESOLAR ANALYSIS RESULTS, BLOCK
1 TO 12 AND OP1 TO OP40**

FORGESOLAR GLARE ANALYSIS

Project: **147658 - Kansas Sky Energy Center Solar Project**

Site configuration: **OP1 through OP40**

Client: Savion, LLC

Created 05 Jun, 2023

Updated 07 Jun, 2023

Time-step 1 minute

Timezone offset UTC-6

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m²

Category 500 kW to 1 MW

Site ID 92160.15781

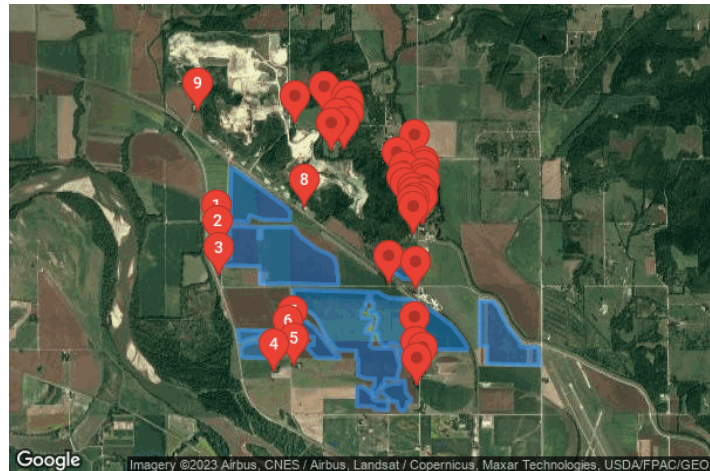
Ocular transmission coefficient 0.5

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 kWh
			min	hr	min	hr	
PV01	SA tracking	SA tracking	0	0.0	0	0.0	-
PV02	SA tracking	SA tracking	0	0.0	0	0.0	-
PV03	SA tracking	SA tracking	0	0.0	0	0.0	-
PV04	SA tracking	SA tracking	0	0.0	0	0.0	-
PV05	SA tracking	SA tracking	0	0.0	0	0.0	-
PV06	SA tracking	SA tracking	0	0.0	0	0.0	-
PV07	SA tracking	SA tracking	0	0.0	0	0.0	-
PV08	SA tracking	SA tracking	0	0.0	0	0.0	-
PV09	SA tracking	SA tracking	0	0.0	0	0.0	-
PV10	SA tracking	SA tracking	0	0.0	0	0.0	-
PV11	SA tracking	SA tracking	0	0.0	0	0.0	-
PV12	SA tracking	SA tracking	0	0.0	0	0.0	-

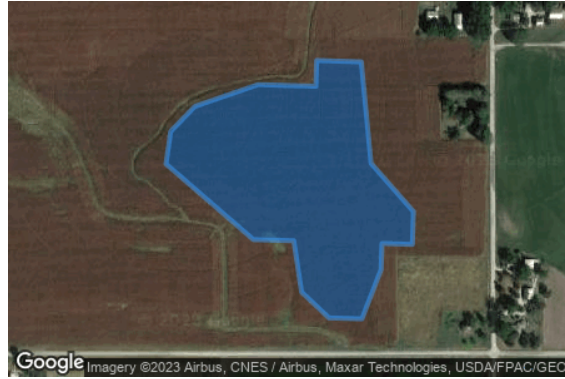
Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0
OP 40	0	0.0	0	0.0

Component Data

PV Arrays

Name: PV01
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 5.0°
Ground Coverage Ratio: 0.3047
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	39.016617	-95.244020	827.27	5.00	832.27
2	39.016272	-95.244034	827.34	5.00	832.34
3	39.015614	-95.244364	823.51	5.00	828.51
4	39.015627	-95.244932	821.48	5.00	826.48
5	39.015970	-95.245402	822.33	5.00	827.33
6	39.016653	-95.245535	823.91	5.00	828.91
7	39.016669	-95.246231	822.15	5.00	827.15
8	39.017674	-95.247731	823.75	5.00	828.75
9	39.018107	-95.247651	824.54	5.00	829.54
10	39.018440	-95.247233	824.88	5.00	829.88
11	39.018730	-95.246146	825.28	5.00	830.28
12	39.018707	-95.245156	826.92	5.00	831.92
13	39.019051	-95.245142	827.25	5.00	832.25
14	39.019033	-95.244375	826.88	5.00	831.88
15	39.017682	-95.244208	828.31	5.00	833.31
16	39.017041	-95.243479	826.85	5.00	831.85
17	39.016604	-95.243497	826.90	5.00	831.90
18	39.016617	-95.244020	827.27	5.00	832.27

Name: PV02

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.022637	-95.240606	827.24	5.00	832.24
2	39.023619	-95.241102	831.26	5.00	836.26
3	39.024337	-95.241748	831.73	5.00	836.73
4	39.027451	-95.241702	833.52	5.00	838.52
5	39.027443	-95.241358	833.25	5.00	838.25
6	39.026778	-95.240021	833.21	5.00	838.21
7	39.025349	-95.237528	832.74	5.00	837.74
8	39.023915	-95.236070	831.64	5.00	836.64
9	39.022901	-95.235270	830.97	5.00	835.97
10	39.022511	-95.235285	830.67	5.00	835.67
11	39.022637	-95.240606	827.24	5.00	832.24

Name: PV03

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.020970	-95.232399	828.58	5.00	833.58
2	39.022939	-95.232321	829.91	5.00	834.91
3	39.023016	-95.233376	830.40	5.00	835.40
4	39.028071	-95.233398	837.06	5.00	842.06
5	39.028025	-95.231478	836.11	5.00	841.11
6	39.027690	-95.231019	835.92	5.00	840.92
7	39.027356	-95.230648	835.63	5.00	840.63
8	39.024956	-95.229098	832.51	5.00	837.51
9	39.023647	-95.227655	832.91	5.00	837.91
10	39.022912	-95.227325	832.64	5.00	837.64
11	39.022855	-95.224925	832.72	5.00	837.72
12	39.022505	-95.224688	832.49	5.00	837.49
13	39.021198	-95.224511	829.69	5.00	834.69
14	39.020782	-95.224527	828.97	5.00	833.97
15	39.020970	-95.232399	828.58	5.00	833.58

Name: PV04

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

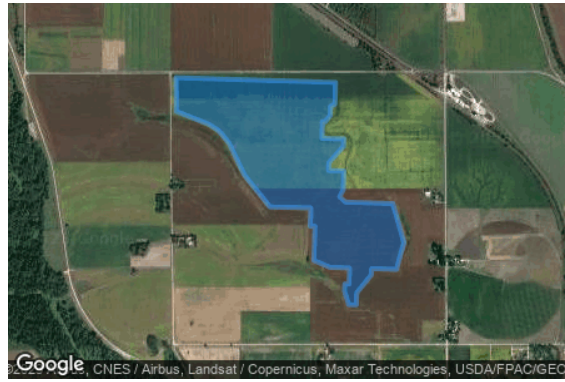
Ground Coverage Ratio: 0.3047

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	39.024855	-95.250222	833.09	5.00	838.09
2	39.024444	-95.250239	833.23	5.00	838.23
3	39.024419	-95.249197	830.59	5.00	835.59
4	39.023410	-95.249236	832.59	5.00	837.59
5	39.023046	-95.249492	832.82	5.00	837.82
6	39.022762	-95.249088	832.86	5.00	837.86
7	39.022684	-95.245828	829.47	5.00	834.47
8	39.020609	-95.245063	831.10	5.00	836.10
9	39.019178	-95.245580	829.11	5.00	834.11
10	39.019218	-95.247289	835.18	5.00	840.18
11	39.018901	-95.247302	832.95	5.00	837.95
12	39.017938	-95.248313	823.82	5.00	828.82
13	39.017295	-95.248338	823.93	5.00	828.93
14	39.017307	-95.248859	823.22	5.00	828.22
15	39.018021	-95.249152	822.86	5.00	827.86
16	39.018402	-95.249137	822.90	5.00	827.90
17	39.018395	-95.248838	823.69	5.00	828.69
18	39.019254	-95.248804	830.79	5.00	835.79
19	39.019286	-95.250151	830.44	5.00	835.44
20	39.019657	-95.251254	829.37	5.00	834.37
21	39.021475	-95.251183	832.52	5.00	837.52
22	39.021482	-95.251502	831.41	5.00	836.41
23	39.022451	-95.251464	832.19	5.00	837.19
24	39.022504	-95.254269	831.83	5.00	836.83
25	39.024200	-95.256028	832.20	5.00	837.20
26	39.025903	-95.257086	832.68	5.00	837.68
27	39.026560	-95.257795	832.52	5.00	837.52
28	39.026906	-95.258482	832.98	5.00	837.98
29	39.027587	-95.260703	832.93	5.00	837.93
30	39.029383	-95.260719	833.48	5.00	838.48
31	39.029124	-95.249763	832.71	5.00	837.71
32	39.027984	-95.249807	831.00	5.00	836.00
33	39.027832	-95.250113	832.78	5.00	837.78
34	39.027373	-95.250130	830.55	5.00	835.55
35	39.027037	-95.250479	831.52	5.00	836.52
36	39.027041	-95.250668	832.31	5.00	837.31
37	39.026155	-95.250702	832.59	5.00	837.59
38	39.026119	-95.249205	831.46	5.00	836.46
39	39.025730	-95.249220	832.28	5.00	837.28
40	39.024855	-95.250222	833.09	5.00	838.09

Name: PV05

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.016786	-95.248659	822.87	5.00	827.87
2	39.016741	-95.246787	821.98	5.00	826.98
3	39.015690	-95.246828	821.44	5.00	826.44
4	39.015738	-95.248858	822.17	5.00	827.17
5	39.016081	-95.248845	824.00	5.00	829.00
6	39.016142	-95.251397	825.17	5.00	830.17
7	39.018354	-95.251386	823.89	5.00	828.89
8	39.018335	-95.250582	821.97	5.00	826.97
9	39.018014	-95.249934	822.04	5.00	827.04
10	39.017662	-95.249387	822.27	5.00	827.27
11	39.016992	-95.249036	822.70	5.00	827.70
12	39.016786	-95.248659	822.87	5.00	827.87

Name: PV06

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.030007	-95.263334	834.21	5.00	839.21
2	39.030060	-95.265595	834.70	5.00	839.70
3	39.032039	-95.265596	833.71	5.00	838.71
4	39.032123	-95.270837	837.01	5.00	842.01
5	39.032549	-95.270820	836.46	5.00	841.46
6	39.032897	-95.270357	836.00	5.00	841.00
7	39.032886	-95.269908	835.65	5.00	840.65
8	39.034499	-95.269846	834.99	5.00	839.99
9	39.034866	-95.270170	835.08	5.00	840.08
10	39.035024	-95.270050	834.75	5.00	839.75
11	39.036582	-95.269990	834.91	5.00	839.91
12	39.036483	-95.265780	833.44	5.00	838.44
13	39.035198	-95.265830	833.71	5.00	838.71
14	39.035188	-95.265399	834.10	5.00	839.10
15	39.036473	-95.265349	833.60	5.00	838.60
16	39.036455	-95.260683	831.17	5.00	836.17
17	39.035445	-95.259724	831.18	5.00	836.18
18	39.033998	-95.257245	831.41	5.00	836.41
19	39.033333	-95.255333	831.35	5.00	836.35
20	39.032961	-95.254726	831.41	5.00	836.41
21	39.031988	-95.254297	831.99	5.00	836.99
22	39.031248	-95.254326	832.17	5.00	837.17
23	39.030942	-95.254113	832.04	5.00	837.04
24	39.029891	-95.254154	832.16	5.00	837.16
25	39.030096	-95.262848	833.81	5.00	838.81
26	39.030007	-95.263334	834.21	5.00	839.21

Name: PV07

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.031558	-95.242714	838.81	5.00	843.81
2	39.030571	-95.243689	837.96	5.00	842.96
3	39.030592	-95.244594	836.50	5.00	841.50
4	39.031620	-95.246453	834.57	5.00	839.57
5	39.031995	-95.246836	834.59	5.00	839.59
6	39.033052	-95.246795	834.88	5.00	839.88
7	39.032954	-95.242660	838.57	5.00	843.57
8	39.031558	-95.242714	838.81	5.00	843.81

Name: PV08

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.021557	-95.262988	831.45	5.00	836.45
2	39.021680	-95.268223	834.25	5.00	839.25
3	39.022699	-95.268430	833.95	5.00	838.95
4	39.023143	-95.267776	831.75	5.00	836.75
5	39.023442	-95.266772	830.87	5.00	835.87
6	39.023359	-95.263218	833.83	5.00	838.83
7	39.022565	-95.263249	831.12	5.00	836.12
8	39.021943	-95.262973	829.67	5.00	834.67
9	39.021557	-95.262988	831.45	5.00	836.45

Name: PV09

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

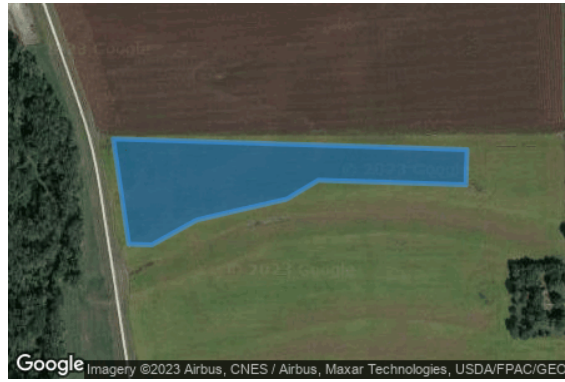
Ground Coverage Ratio: 0.3047

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	39.024804	-95.268873	836.60	5.00	841.60
2	39.024661	-95.262793	835.34	5.00	840.34
3	39.024193	-95.262811	835.96	5.00	840.96
4	39.024253	-95.265346	836.03	5.00	841.03
5	39.024002	-95.265887	833.82	5.00	838.82
6	39.023722	-95.267439	834.10	5.00	839.10
7	39.023392	-95.268209	834.13	5.00	839.13
8	39.023401	-95.268605	835.31	5.00	840.31
9	39.024804	-95.268873	836.60	5.00	841.60

Name: PV10

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.028369	-95.244729	833.73	5.00	838.73
2	39.028353	-95.244049	834.04	5.00	839.04
3	39.027960	-95.242656	834.19	5.00	839.19
4	39.024891	-95.242701	832.14	5.00	837.14
5	39.024497	-95.243036	831.65	5.00	836.65
6	39.023912	-95.244323	831.76	5.00	836.76
7	39.023478	-95.244629	832.44	5.00	837.44
8	39.022767	-95.244657	832.62	5.00	837.62
9	39.021624	-95.243803	833.83	5.00	838.83
10	39.021239	-95.243818	833.96	5.00	838.96
11	39.021257	-95.244565	831.96	5.00	836.96
12	39.021965	-95.245003	829.69	5.00	834.69
13	39.022934	-95.245261	830.93	5.00	835.93
14	39.023255	-95.245522	830.47	5.00	835.47
15	39.023277	-95.246409	830.32	5.00	835.32
16	39.022983	-95.247020	830.37	5.00	835.37
17	39.022992	-95.247391	831.50	5.00	836.50
18	39.023331	-95.247933	830.58	5.00	835.58
19	39.023676	-95.248160	831.46	5.00	836.46
20	39.024496	-95.248322	832.77	5.00	837.77
21	39.024505	-95.248687	832.44	5.00	837.44
22	39.024885	-95.248673	831.91	5.00	836.91
23	39.026203	-95.248167	831.91	5.00	836.91
24	39.026434	-95.248501	831.85	5.00	836.85
25	39.026645	-95.248493	832.12	5.00	837.12
26	39.026669	-95.249502	832.38	5.00	837.38
27	39.027096	-95.249486	830.87	5.00	835.87
28	39.027085	-95.249037	832.39	5.00	837.39
29	39.027817	-95.249008	831.62	5.00	836.62
30	39.027948	-95.249303	831.09	5.00	836.09
31	39.029112	-95.249257	832.39	5.00	837.39
32	39.029086	-95.248163	831.98	5.00	836.98
33	39.028759	-95.247640	832.82	5.00	837.82
34	39.028413	-95.246591	833.21	5.00	838.21
35	39.028369	-95.244729	833.73	5.00	838.73

Name: PV11

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.038168	-95.269953	833.40	5.00	838.40
2	39.043184	-95.269833	835.86	5.00	840.86
3	39.043177	-95.269564	835.34	5.00	840.34
4	39.038793	-95.261850	832.00	5.00	837.00
5	39.038247	-95.261165	832.03	5.00	837.03
6	39.037223	-95.261205	831.48	5.00	836.48
7	39.037319	-95.265281	832.42	5.00	837.42
8	39.037825	-95.267098	833.55	5.00	838.55
9	39.037053	-95.267281	835.22	5.00	840.22
10	39.037117	-95.269994	835.34	5.00	840.34
11	39.038168	-95.269953	833.40	5.00	838.40

Name: PV12

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.024057	-95.258868	834.03	5.00	839.03
2	39.025007	-95.259839	833.58	5.00	838.58
3	39.025060	-95.260735	833.68	5.00	838.68
4	39.026153	-95.260692	833.28	5.00	838.28
5	39.026127	-95.259604	832.51	5.00	837.51
6	39.025111	-95.257671	832.32	5.00	837.32
7	39.022302	-95.254856	831.73	5.00	836.73
8	39.021986	-95.254428	831.49	5.00	836.49
9	39.021974	-95.253945	831.42	5.00	836.42
10	39.021548	-95.253961	832.34	5.00	837.34
11	39.021629	-95.257378	831.18	5.00	836.18
12	39.022740	-95.258652	832.09	5.00	837.09
13	39.023122	-95.258638	835.83	5.00	840.83
14	39.023101	-95.257756	835.08	5.00	840.08
15	39.023978	-95.257722	833.04	5.00	838.04
16	39.024057	-95.258868	834.03	5.00	839.03

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	39.035754	-95.271896	837.43	6.00
OP 2	2	39.033976	-95.271785	829.87	6.00
OP 3	3	39.030923	-95.271478	834.70	6.00
OP 4	4	39.019953	-95.263503	833.48	6.00
OP 5	5	39.020629	-95.260532	831.21	6.00
OP 6	6	39.022712	-95.261480	838.41	6.00
OP 7	7	39.023706	-95.260671	836.96	6.00
OP 8	8	39.038639	-95.259013	837.99	6.00
OP 9	9	39.049645	-95.274699	858.62	6.00
OP 10	10	39.048059	-95.260416	1002.94	6.00
OP 11	11	39.049235	-95.256037	1006.04	6.00
OP 12	12	39.048128	-95.252812	1011.81	6.00
OP 13	13	39.047401	-95.252546	1000.39	6.00
OP 14	14	39.046223	-95.252552	1004.82	6.00
OP 15	15	39.046134	-95.254161	1017.39	6.00
OP 16	16	39.045001	-95.255084	1022.62	6.00
OP 17	17	39.045237	-95.253228	994.95	6.00
OP 18	18	39.043738	-95.242849	861.01	6.00
OP 19	19	39.041750	-95.245468	937.59	6.00
OP 20	20	39.040636	-95.241548	860.27	6.00
OP 21	21	39.040196	-95.241510	869.25	6.00
OP 22	22	39.040145	-95.244423	901.64	6.00
OP 23	23	39.038945	-95.244807	918.97	6.00
OP 24	24	39.038807	-95.241641	884.53	6.00
OP 25	25	39.038472	-95.241324	877.38	6.00
OP 26	26	39.038195	-95.244227	925.84	6.00
OP 27	27	39.037696	-95.243304	907.52	6.00
OP 28	28	39.037126	-95.243065	901.12	6.00
OP 29	29	39.036558	-95.242933	897.11	6.00
OP 30	30	39.036259	-95.243248	877.68	6.00
OP 31	31	39.035538	-95.243022	869.59	6.00
OP 32	32	39.036686	-95.241622	878.46	6.00
OP 33	33	39.037128	-95.241686	879.65	6.00
OP 34	34	39.039285	-95.241648	883.04	6.00
OP 35	35	39.029935	-95.246635	835.78	6.00
OP 36	36	39.029354	-95.242763	839.17	6.00
OP 37	37	39.023052	-95.242809	832.81	6.00
OP 38	38	39.020222	-95.242652	835.80	6.00
OP 39	39	39.019606	-95.241740	832.42	6.00
OP 40	40	39.018329	-95.242474	828.30	6.00

Glare Analysis Results

Summary of Results No glare predicted

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
PV01	SA tracking	SA tracking	0	0.0	0	0.0	-
PV02	SA tracking	SA tracking	0	0.0	0	0.0	-
PV03	SA tracking	SA tracking	0	0.0	0	0.0	-
PV04	SA tracking	SA tracking	0	0.0	0	0.0	-
PV05	SA tracking	SA tracking	0	0.0	0	0.0	-
PV06	SA tracking	SA tracking	0	0.0	0	0.0	-
PV07	SA tracking	SA tracking	0	0.0	0	0.0	-
PV08	SA tracking	SA tracking	0	0.0	0	0.0	-
PV09	SA tracking	SA tracking	0	0.0	0	0.0	-
PV10	SA tracking	SA tracking	0	0.0	0	0.0	-
PV11	SA tracking	SA tracking	0	0.0	0	0.0	-
PV12	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
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0
OP 40	0	0.0	0	0.0

PV: PV01 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0
OP 40	0	0.0	0	0.0

PV01 and OP 1

No glare found

PV01 and OP 2

No glare found

PV01 and OP 3

No glare found

PV01 and OP 4

No glare found

PV01 and OP 5

No glare found

PV01 and OP 6

No glare found

PV01 and OP 7

No glare found

PV01 and OP 8

No glare found

PV01 and OP 9

No glare found

PV01 and OP 10

No glare found

PV01 and OP 11

No glare found

PV01 and OP 12

No glare found

PV01 and OP 13

No glare found

PV01 and OP 14

No glare found

PV01 and OP 15

No glare found

PV01 and OP 16

No glare found

PV01 and OP 17

No glare found

PV01 and OP 18

No glare found

PV01 and OP 19

No glare found

PV01 and OP 20

No glare found

PV01 and OP 21

No glare found

PV01 and OP 22

No glare found

PV01 and OP 23

No glare found

PV01 and OP 24

No glare found

PV01 and OP 25

No glare found

PV01 and OP 26

No glare found

PV01 and OP 27

No glare found

PV01 and OP 28

No glare found

PV01 and OP 29

No glare found

PV01 and OP 30

No glare found

PV01 and OP 31

No glare found

PV01 and OP 32

No glare found

PV01 and OP 33

No glare found

PV01 and OP 34

No glare found

PV01 and OP 35

No glare found

PV01 and OP 36

No glare found

PV01 and OP 37

No glare found

PV01 and OP 38

No glare found

PV01 and OP 39

No glare found

PV01 and OP 40

No glare found

PV: PV02 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV02 and OP 1

No glare found

PV02 and OP 2

No glare found

PV02 and OP 3

No glare found

PV02 and OP 4

No glare found

PV02 and OP 5

No glare found

PV02 and OP 6

No glare found

PV02 and OP 7

No glare found

PV02 and OP 8

No glare found

PV02 and OP 9

No glare found

PV02 and OP 10

No glare found

PV02 and OP 11

No glare found

PV02 and OP 12

No glare found

PV02 and OP 13

No glare found

PV02 and OP 14

No glare found

PV02 and OP 15

No glare found

PV02 and OP 16

No glare found

PV02 and OP 17

No glare found

PV02 and OP 18

No glare found

PV02 and OP 19

No glare found

PV02 and OP 20

No glare found

PV02 and OP 21

No glare found

PV02 and OP 22

No glare found

PV02 and OP 23

No glare found

PV02 and OP 24

No glare found

PV02 and OP 25

No glare found

PV02 and OP 26

No glare found

PV02 and OP 27

No glare found

PV02 and OP 28

No glare found

PV02 and OP 29

No glare found

PV02 and OP 30

No glare found

PV02 and OP 31

No glare found

PV02 and OP 32

No glare found

PV02 and OP 33

No glare found

PV02 and OP 34

No glare found

PV02 and OP 35

No glare found

PV02 and OP 36

No glare found

PV02 and OP 37

No glare found

PV02 and OP 38

No glare found

PV02 and OP 39

No glare found

PV02 and OP 40

No glare found

PV: PV03 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV03 and OP 1

No glare found

PV03 and OP 2

No glare found

PV03 and OP 3

No glare found

PV03 and OP 4

No glare found

PV03 and OP 5

No glare found

PV03 and OP 6

No glare found

PV03 and OP 7

No glare found

PV03 and OP 8

No glare found

PV03 and OP 9

No glare found

PV03 and OP 10

No glare found

PV03 and OP 11

No glare found

PV03 and OP 12

No glare found

PV03 and OP 13

No glare found

PV03 and OP 14

No glare found

PV03 and OP 15

No glare found

PV03 and OP 16

No glare found

PV03 and OP 17

No glare found

PV03 and OP 18

No glare found

PV03 and OP 19

No glare found

PV03 and OP 20

No glare found

PV03 and OP 21

No glare found

PV03 and OP 22

No glare found

PV03 and OP 23

No glare found

PV03 and OP 24

No glare found

PV03 and OP 25

No glare found

PV03 and OP 26

No glare found

PV03 and OP 27

No glare found

PV03 and OP 28

No glare found

PV03 and OP 29

No glare found

PV03 and OP 30

No glare found

PV03 and OP 31

No glare found

PV03 and OP 32

No glare found

PV03 and OP 33

No glare found

PV03 and OP 34

No glare found

PV03 and OP 35

No glare found

PV03 and OP 36

No glare found

PV03 and OP 37

No glare found

PV03 and OP 38

No glare found

PV03 and OP 39

No glare found

PV03 and OP 40

No glare found

PV: PV04 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV04 and OP 1

No glare found

PV04 and OP 2

No glare found

PV04 and OP 3

No glare found

PV04 and OP 4

No glare found

PV04 and OP 5

No glare found

PV04 and OP 6

No glare found

PV04 and OP 7

No glare found

PV04 and OP 8

No glare found

PV04 and OP 9

No glare found

PV04 and OP 10

No glare found

PV04 and OP 11

No glare found

PV04 and OP 12

No glare found

PV04 and OP 13

No glare found

PV04 and OP 14

No glare found

PV04 and OP 15

No glare found

PV04 and OP 16

No glare found

PV04 and OP 17

No glare found

PV04 and OP 18

No glare found

PV04 and OP 19

No glare found

PV04 and OP 20

No glare found

PV04 and OP 21

No glare found

PV04 and OP 22

No glare found

PV04 and OP 23

No glare found

PV04 and OP 24

No glare found

PV04 and OP 25

No glare found

PV04 and OP 26

No glare found

PV04 and OP 27

No glare found

PV04 and OP 28

No glare found

PV04 and OP 29

No glare found

PV04 and OP 30

No glare found

PV04 and OP 31

No glare found

PV04 and OP 32

No glare found

PV04 and OP 33

No glare found

PV04 and OP 34

No glare found

PV04 and OP 35

No glare found

PV04 and OP 36

No glare found

PV04 and OP 37

No glare found

PV04 and OP 38

No glare found

PV04 and OP 39

No glare found

PV04 and OP 40

No glare found

PV: PV05 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV05 and OP 1

No glare found

PV05 and OP 2

No glare found

PV05 and OP 3

No glare found

PV05 and OP 4

No glare found

PV05 and OP 5

No glare found

PV05 and OP 6

No glare found

PV05 and OP 7

No glare found

PV05 and OP 8

No glare found

PV05 and OP 9

No glare found

PV05 and OP 10

No glare found

PV05 and OP 11

No glare found

PV05 and OP 12

No glare found

PV05 and OP 13

No glare found

PV05 and OP 14

No glare found

PV05 and OP 15

No glare found

PV05 and OP 16

No glare found

PV05 and OP 17

No glare found

PV05 and OP 18

No glare found

PV05 and OP 19

No glare found

PV05 and OP 20

No glare found

PV05 and OP 21

No glare found

PV05 and OP 22

No glare found

PV05 and OP 23

No glare found

PV05 and OP 24

No glare found

PV05 and OP 25

No glare found

PV05 and OP 26

No glare found

PV05 and OP 27

No glare found

PV05 and OP 28

No glare found

PV05 and OP 29

No glare found

PV05 and OP 30

No glare found

PV05 and OP 31

No glare found

PV05 and OP 32

No glare found

PV05 and OP 33

No glare found

PV05 and OP 34

No glare found

PV05 and OP 35

No glare found

PV05 and OP 36

No glare found

PV05 and OP 37

No glare found

PV05 and OP 38

No glare found

PV05 and OP 39

No glare found

PV05 and OP 40

No glare found

PV: PV06 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV06 and OP 1

No glare found

PV06 and OP 2

No glare found

PV06 and OP 3

No glare found

PV06 and OP 4

No glare found

PV06 and OP 5

No glare found

PV06 and OP 6

No glare found

PV06 and OP 7

No glare found

PV06 and OP 8

No glare found

PV06 and OP 9

No glare found

PV06 and OP 10

No glare found

PV06 and OP 11

No glare found

PV06 and OP 12

No glare found

PV06 and OP 13

No glare found

PV06 and OP 14

No glare found

PV06 and OP 15

No glare found

PV06 and OP 16

No glare found

PV06 and OP 17

No glare found

PV06 and OP 18

No glare found

PV06 and OP 19

No glare found

PV06 and OP 20

No glare found

PV06 and OP 21

No glare found

PV06 and OP 22

No glare found

PV06 and OP 23

No glare found

PV06 and OP 24

No glare found

PV06 and OP 25

No glare found

PV06 and OP 26

No glare found

PV06 and OP 27

No glare found

PV06 and OP 28

No glare found

PV06 and OP 29

No glare found

PV06 and OP 30

No glare found

PV06 and OP 31

No glare found

PV06 and OP 32

No glare found

PV06 and OP 33

No glare found

PV06 and OP 34

No glare found

PV06 and OP 35

No glare found

PV06 and OP 36

No glare found

PV06 and OP 37

No glare found

PV06 and OP 38

No glare found

PV06 and OP 39

No glare found

PV06 and OP 40

No glare found

PV: PV07 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV07 and OP 1

No glare found

PV07 and OP 2

No glare found

PV07 and OP 3

No glare found

PV07 and OP 4

No glare found

PV07 and OP 5

No glare found

PV07 and OP 6

No glare found

PV07 and OP 7

No glare found

PV07 and OP 8

No glare found

PV07 and OP 9

No glare found

PV07 and OP 10

No glare found

PV07 and OP 11

No glare found

PV07 and OP 12

No glare found

PV07 and OP 13

No glare found

PV07 and OP 14

No glare found

PV07 and OP 15

No glare found

PV07 and OP 16

No glare found

PV07 and OP 17

No glare found

PV07 and OP 18

No glare found

PV07 and OP 19

No glare found

PV07 and OP 20

No glare found

PV07 and OP 21

No glare found

PV07 and OP 22

No glare found

PV07 and OP 23

No glare found

PV07 and OP 24

No glare found

PV07 and OP 25

No glare found

PV07 and OP 26

No glare found

PV07 and OP 27

No glare found

PV07 and OP 28

No glare found

PV07 and OP 29

No glare found

PV07 and OP 30

No glare found

PV07 and OP 31

No glare found

PV07 and OP 32

No glare found

PV07 and OP 33

No glare found

PV07 and OP 34

No glare found

PV07 and OP 35

No glare found

PV07 and OP 36

No glare found

PV07 and OP 37

No glare found

PV07 and OP 38

No glare found

PV07 and OP 39

No glare found

PV07 and OP 40

No glare found

PV: PV08 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV08 and OP 1

No glare found

PV08 and OP 2

No glare found

PV08 and OP 3

No glare found

PV08 and OP 4

No glare found

PV08 and OP 5

No glare found

PV08 and OP 6

No glare found

PV08 and OP 7

No glare found

PV08 and OP 8

No glare found

PV08 and OP 9

No glare found

PV08 and OP 10

No glare found

PV08 and OP 11

No glare found

PV08 and OP 12

No glare found

PV08 and OP 13

No glare found

PV08 and OP 14

No glare found

PV08 and OP 15

No glare found

PV08 and OP 16

No glare found

PV08 and OP 17

No glare found

PV08 and OP 18

No glare found

PV08 and OP 19

No glare found

PV08 and OP 20

No glare found

PV08 and OP 21

No glare found

PV08 and OP 22

No glare found

PV08 and OP 23

No glare found

PV08 and OP 24

No glare found

PV08 and OP 25

No glare found

PV08 and OP 26

No glare found

PV08 and OP 27

No glare found

PV08 and OP 28

No glare found

PV08 and OP 29

No glare found

PV08 and OP 30

No glare found

PV08 and OP 31

No glare found

PV08 and OP 32

No glare found

PV08 and OP 33

No glare found

PV08 and OP 34

No glare found

PV08 and OP 35

No glare found

PV08 and OP 36

No glare found

PV08 and OP 37

No glare found

PV08 and OP 38

No glare found

PV08 and OP 39

No glare found

PV08 and OP 40

No glare found

PV: PV09 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV09 and OP 1

No glare found

PV09 and OP 2

No glare found

PV09 and OP 3

No glare found

PV09 and OP 4

No glare found

PV09 and OP 5

No glare found

PV09 and OP 6

No glare found

PV09 and OP 7

No glare found

PV09 and OP 8

No glare found

PV09 and OP 9

No glare found

PV09 and OP 10

No glare found

PV09 and OP 11

No glare found

PV09 and OP 12

No glare found

PV09 and OP 13

No glare found

PV09 and OP 14

No glare found

PV09 and OP 15

No glare found

PV09 and OP 16

No glare found

PV09 and OP 17

No glare found

PV09 and OP 18

No glare found

PV09 and OP 19

No glare found

PV09 and OP 20

No glare found

PV09 and OP 21

No glare found

PV09 and OP 22

No glare found

PV09 and OP 23

No glare found

PV09 and OP 24

No glare found

PV09 and OP 25

No glare found

PV09 and OP 26

No glare found

PV09 and OP 27

No glare found

PV09 and OP 28

No glare found

PV09 and OP 29

No glare found

PV09 and OP 30

No glare found

PV09 and OP 31

No glare found

PV09 and OP 32

No glare found

PV09 and OP 33

No glare found

PV09 and OP 34

No glare found

PV09 and OP 35

No glare found

PV09 and OP 36

No glare found

PV09 and OP 37

No glare found

PV09 and OP 38

No glare found

PV09 and OP 39

No glare found

PV09 and OP 40

No glare found

PV: PV10 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV10 and OP 1

No glare found

PV10 and OP 2

No glare found

PV10 and OP 3

No glare found

PV10 and OP 4

No glare found

PV10 and OP 5

No glare found

PV10 and OP 6

No glare found

PV10 and OP 7

No glare found

PV10 and OP 8

No glare found

PV10 and OP 9

No glare found

PV10 and OP 10

No glare found

PV10 and OP 11

No glare found

PV10 and OP 12

No glare found

PV10 and OP 13

No glare found

PV10 and OP 14

No glare found

PV10 and OP 15

No glare found

PV10 and OP 16

No glare found

PV10 and OP 17

No glare found

PV10 and OP 18

No glare found

PV10 and OP 19

No glare found

PV10 and OP 20

No glare found

PV10 and OP 21

No glare found

PV10 and OP 22

No glare found

PV10 and OP 23

No glare found

PV10 and OP 24

No glare found

PV10 and OP 25

No glare found

PV10 and OP 26

No glare found

PV10 and OP 27

No glare found

PV10 and OP 28

No glare found

PV10 and OP 29

No glare found

PV10 and OP 30

No glare found

PV10 and OP 31

No glare found

PV10 and OP 32

No glare found

PV10 and OP 33

No glare found

PV10 and OP 34

No glare found

PV10 and OP 35

No glare found

PV10 and OP 36

No glare found

PV10 and OP 37

No glare found

PV10 and OP 38

No glare found

PV10 and OP 39

No glare found

PV10 and OP 40

No glare found

PV: PV11 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV11 and OP 1

No glare found

PV11 and OP 2

No glare found

PV11 and OP 3

No glare found

PV11 and OP 4

No glare found

PV11 and OP 5

No glare found

PV11 and OP 6

No glare found

PV11 and OP 7

No glare found

PV11 and OP 8

No glare found

PV11 and OP 9

No glare found

PV11 and OP 10

No glare found

PV11 and OP 11

No glare found

PV11 and OP 12

No glare found

PV11 and OP 13

No glare found

PV11 and OP 14

No glare found

PV11 and OP 15

No glare found

PV11 and OP 16

No glare found

PV11 and OP 17

No glare found

PV11 and OP 18

No glare found

PV11 and OP 19

No glare found

PV11 and OP 20

No glare found

PV11 and OP 21

No glare found

PV11 and OP 22

No glare found

PV11 and OP 23

No glare found

PV11 and OP 24

No glare found

PV11 and OP 25

No glare found

PV11 and OP 26

No glare found

PV11 and OP 27

No glare found

PV11 and OP 28

No glare found

PV11 and OP 29

No glare found

PV11 and OP 30

No glare found

PV11 and OP 31

No glare found

PV11 and OP 32

No glare found

PV11 and OP 33

No glare found

PV11 and OP 34

No glare found

PV11 and OP 35

No glare found

PV11 and OP 36

No glare found

PV11 and OP 37

No glare found

PV11 and OP 38

No glare found

PV11 and OP 39

No glare found

PV11 and OP 40

No glare found

PV: PV12 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
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
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	0	0.0	0	0.0
OP 22	0	0.0	0	0.0
OP 23	0	0.0	0	0.0
OP 24	0	0.0	0	0.0
OP 25	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 40	0	0.0	0	0.0

PV12 and OP 1

No glare found

PV12 and OP 2

No glare found

PV12 and OP 3

No glare found

PV12 and OP 4

No glare found

PV12 and OP 5

No glare found

PV12 and OP 6

No glare found

PV12 and OP 7

No glare found

PV12 and OP 8

No glare found

PV12 and OP 9

No glare found

PV12 and OP 10

No glare found

PV12 and OP 11

No glare found

PV12 and OP 12

No glare found

PV12 and OP 13

No glare found

PV12 and OP 14

No glare found

PV12 and OP 15

No glare found

PV12 and OP 16

No glare found

PV12 and OP 17

No glare found

PV12 and OP 18

No glare found

PV12 and OP 19

No glare found

PV12 and OP 20

No glare found

PV12 and OP 21

No glare found

PV12 and OP 22

No glare found

PV12 and OP 23

No glare found

PV12 and OP 24

No glare found

PV12 and OP 25

No glare found

PV12 and OP 26

No glare found

PV12 and OP 27

No glare found

PV12 and OP 28

No glare found

PV12 and OP 29

No glare found

PV12 and OP 30

No glare found

PV12 and OP 31

No glare found

PV12 and OP 32

No glare found

PV12 and OP 33

No glare found

PV12 and OP 34

No glare found

PV12 and OP 35

No glare found

PV12 and OP 36

No glare found

PV12 and OP 37

No glare found

PV12 and OP 38

No glare found

PV12 and OP 39

No glare found

PV12 and OP 40

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

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**APPENDIX D - FORGESOLAR ANALYSIS RESULTS, BLOCK 1
TO 12 AND OP41 TO OP50**

FORGESOLAR GLARE ANALYSIS

Project: **147658 - Kansas Sky Energy Center Solar Project**

Site configuration: **OP41 through OP49**

Client: Savion, LLC

Created 05 Jun, 2023

Updated 07 Jun, 2023

Time-step 1 minute

Timezone offset UTC-6

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m²

Category 500 kW to 1 MW

Site ID 92161.15781

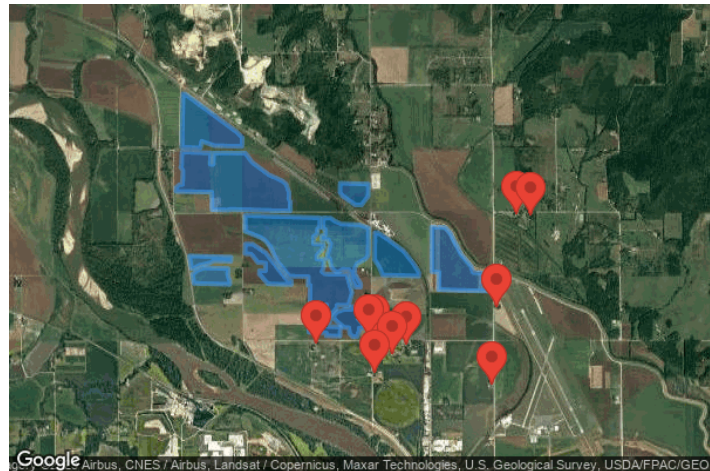
Ocular transmission coefficient 0.5

Pupil diameter 0.002 m

Eye focal length 0.017 m

Sun subtended angle 9.3 mrad

PV analysis methodology V2



Summary of Results Glare with potential for temporary after-image predicted

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
PV01	SA tracking	SA tracking	818	13.6	213	3.5	-
PV02	SA tracking	SA tracking	0	0.0	0	0.0	-
PV03	SA tracking	SA tracking	0	0.0	0	0.0	-
PV04	SA tracking	SA tracking	0	0.0	0	0.0	-
PV05	SA tracking	SA tracking	0	0.0	0	0.0	-
PV06	SA tracking	SA tracking	0	0.0	0	0.0	-
PV07	SA tracking	SA tracking	0	0.0	0	0.0	-
PV08	SA tracking	SA tracking	0	0.0	0	0.0	-
PV09	SA tracking	SA tracking	0	0.0	0	0.0	-
PV10	SA tracking	SA tracking	0	0.0	0	0.0	-
PV11	SA tracking	SA tracking	0	0.0	0	0.0	-
PV12	SA tracking	SA tracking	0	0.0	0	0.0	-

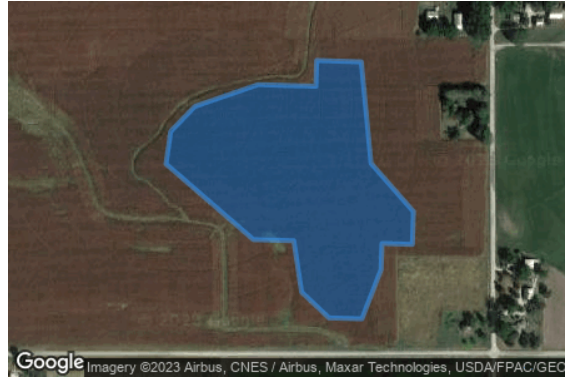
Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	334	5.6	0	0.0
OP 42	180	3.0	213	3.5
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	304	5.1	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

Component Data

PV Arrays

Name: PV01
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 5.0°
Ground Coverage Ratio: 0.3047
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	39.016617	-95.244020	827.27	5.00	832.27
2	39.016272	-95.244034	827.34	5.00	832.34
3	39.015614	-95.244364	823.51	5.00	828.51
4	39.015627	-95.244932	821.48	5.00	826.48
5	39.015970	-95.245402	822.33	5.00	827.33
6	39.016653	-95.245535	823.91	5.00	828.91
7	39.016669	-95.246231	822.15	5.00	827.15
8	39.017674	-95.247731	823.75	5.00	828.75
9	39.018107	-95.247651	824.54	5.00	829.54
10	39.018440	-95.247233	824.88	5.00	829.88
11	39.018730	-95.246146	825.28	5.00	830.28
12	39.018707	-95.245156	826.92	5.00	831.92
13	39.019051	-95.245142	827.25	5.00	832.25
14	39.019033	-95.244375	826.88	5.00	831.88
15	39.017682	-95.244208	828.31	5.00	833.31
16	39.017041	-95.243479	826.85	5.00	831.85
17	39.016604	-95.243497	826.90	5.00	831.90
18	39.016617	-95.244020	827.27	5.00	832.27

Name: PV02

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.022637	-95.240606	827.24	5.00	832.24
2	39.023619	-95.241102	831.26	5.00	836.26
3	39.024337	-95.241748	831.73	5.00	836.73
4	39.027451	-95.241702	833.52	5.00	838.52
5	39.027443	-95.241358	833.25	5.00	838.25
6	39.026778	-95.240021	833.21	5.00	838.21
7	39.025349	-95.237528	832.74	5.00	837.74
8	39.023915	-95.236070	831.64	5.00	836.64
9	39.022901	-95.235270	830.97	5.00	835.97
10	39.022511	-95.235285	830.67	5.00	835.67
11	39.022637	-95.240606	827.24	5.00	832.24

Name: PV03

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.020970	-95.232399	828.58	5.00	833.58
2	39.022939	-95.232321	829.91	5.00	834.91
3	39.023016	-95.233376	830.40	5.00	835.40
4	39.028071	-95.233398	837.06	5.00	842.06
5	39.028025	-95.231478	836.11	5.00	841.11
6	39.027690	-95.231019	835.92	5.00	840.92
7	39.027356	-95.230648	835.63	5.00	840.63
8	39.024956	-95.229098	832.51	5.00	837.51
9	39.023647	-95.227655	832.91	5.00	837.91
10	39.022912	-95.227325	832.64	5.00	837.64
11	39.022855	-95.224925	832.72	5.00	837.72
12	39.022505	-95.224688	832.49	5.00	837.49
13	39.021198	-95.224511	829.69	5.00	834.69
14	39.020782	-95.224527	828.97	5.00	833.97
15	39.020970	-95.232399	828.58	5.00	833.58

Name: PV04

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

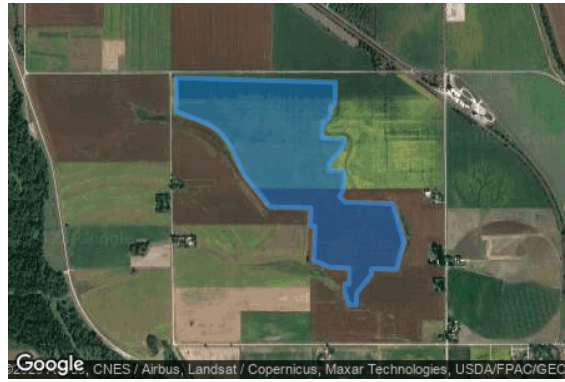
Ground Coverage Ratio: 0.3047

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	39.024855	-95.250222	833.09	5.00	838.09
2	39.024444	-95.250239	833.23	5.00	838.23
3	39.024419	-95.249197	830.59	5.00	835.59
4	39.023410	-95.249236	832.59	5.00	837.59
5	39.023046	-95.249492	832.82	5.00	837.82
6	39.022762	-95.249088	832.86	5.00	837.86
7	39.022684	-95.245828	829.47	5.00	834.47
8	39.020609	-95.245063	831.10	5.00	836.10
9	39.019178	-95.245580	829.11	5.00	834.11
10	39.019218	-95.247289	835.18	5.00	840.18
11	39.018901	-95.247302	832.95	5.00	837.95
12	39.017938	-95.248313	823.82	5.00	828.82
13	39.017295	-95.248338	823.93	5.00	828.93
14	39.017307	-95.248859	823.22	5.00	828.22
15	39.018021	-95.249152	822.86	5.00	827.86
16	39.018402	-95.249137	822.90	5.00	827.90
17	39.018395	-95.248838	823.69	5.00	828.69
18	39.019254	-95.248804	830.79	5.00	835.79
19	39.019286	-95.250151	830.44	5.00	835.44
20	39.019657	-95.251254	829.37	5.00	834.37
21	39.021475	-95.251183	832.52	5.00	837.52
22	39.021482	-95.251502	831.41	5.00	836.41
23	39.022451	-95.251464	832.19	5.00	837.19
24	39.022504	-95.254269	831.83	5.00	836.83
25	39.024200	-95.256028	832.20	5.00	837.20
26	39.025903	-95.257086	832.68	5.00	837.68
27	39.026560	-95.257795	832.52	5.00	837.52
28	39.026906	-95.258482	832.98	5.00	837.98
29	39.027587	-95.260703	832.93	5.00	837.93
30	39.029383	-95.260719	833.48	5.00	838.48
31	39.029124	-95.249763	832.71	5.00	837.71
32	39.027984	-95.249807	831.00	5.00	836.00
33	39.027832	-95.250113	832.78	5.00	837.78
34	39.027373	-95.250130	830.55	5.00	835.55
35	39.027037	-95.250479	831.52	5.00	836.52
36	39.027041	-95.250668	832.31	5.00	837.31
37	39.026155	-95.250702	832.59	5.00	837.59
38	39.026119	-95.249205	831.46	5.00	836.46
39	39.025730	-95.249220	832.28	5.00	837.28
40	39.024855	-95.250222	833.09	5.00	838.09

Name: PV05

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.016786	-95.248659	822.87	5.00	827.87
2	39.016741	-95.246787	821.98	5.00	826.98
3	39.015690	-95.246828	821.44	5.00	826.44
4	39.015738	-95.248858	822.17	5.00	827.17
5	39.016081	-95.248845	824.00	5.00	829.00
6	39.016142	-95.251397	825.17	5.00	830.17
7	39.018354	-95.251386	823.89	5.00	828.89
8	39.018335	-95.250582	821.97	5.00	826.97
9	39.018014	-95.249934	822.04	5.00	827.04
10	39.017662	-95.249387	822.27	5.00	827.27
11	39.016992	-95.249036	822.70	5.00	827.70
12	39.016786	-95.248659	822.87	5.00	827.87

Name: PV06

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.030007	-95.263334	834.21	5.00	839.21
2	39.030060	-95.265595	834.70	5.00	839.70
3	39.032039	-95.265596	833.71	5.00	838.71
4	39.032123	-95.270837	837.01	5.00	842.01
5	39.032549	-95.270820	836.46	5.00	841.46
6	39.032897	-95.270357	836.00	5.00	841.00
7	39.032886	-95.269908	835.65	5.00	840.65
8	39.034499	-95.269846	834.99	5.00	839.99
9	39.034866	-95.270170	835.08	5.00	840.08
10	39.035024	-95.270050	834.75	5.00	839.75
11	39.036582	-95.269990	834.91	5.00	839.91
12	39.036483	-95.265780	833.44	5.00	838.44
13	39.035198	-95.265830	833.71	5.00	838.71
14	39.035188	-95.265399	834.10	5.00	839.10
15	39.036473	-95.265349	833.60	5.00	838.60
16	39.036455	-95.260683	831.17	5.00	836.17
17	39.035445	-95.259724	831.18	5.00	836.18
18	39.033998	-95.257245	831.41	5.00	836.41
19	39.033333	-95.255333	831.35	5.00	836.35
20	39.032961	-95.254726	831.41	5.00	836.41
21	39.031988	-95.254297	831.99	5.00	836.99
22	39.031248	-95.254326	832.17	5.00	837.17
23	39.030942	-95.254113	832.04	5.00	837.04
24	39.029891	-95.254154	832.16	5.00	837.16
25	39.030096	-95.262848	833.81	5.00	838.81
26	39.030007	-95.263334	834.21	5.00	839.21

Name: PV07

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.031558	-95.242714	838.81	5.00	843.81
2	39.030571	-95.243689	837.96	5.00	842.96
3	39.030592	-95.244594	836.50	5.00	841.50
4	39.031620	-95.246453	834.57	5.00	839.57
5	39.031995	-95.246836	834.59	5.00	839.59
6	39.033052	-95.246795	834.88	5.00	839.88
7	39.032954	-95.242660	838.57	5.00	843.57
8	39.031558	-95.242714	838.81	5.00	843.81

Name: PV08

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.021557	-95.262988	831.45	5.00	836.45
2	39.021680	-95.268223	834.25	5.00	839.25
3	39.022699	-95.268430	833.95	5.00	838.95
4	39.023143	-95.267776	831.75	5.00	836.75
5	39.023442	-95.266772	830.87	5.00	835.87
6	39.023359	-95.263218	833.83	5.00	838.83
7	39.022565	-95.263249	831.12	5.00	836.12
8	39.021943	-95.262973	829.67	5.00	834.67
9	39.021557	-95.262988	831.45	5.00	836.45

Name: PV09

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.024804	-95.268873	836.60	5.00	841.60
2	39.024661	-95.262793	835.34	5.00	840.34
3	39.024193	-95.262811	835.96	5.00	840.96
4	39.024253	-95.265346	836.03	5.00	841.03
5	39.024002	-95.265887	833.82	5.00	838.82
6	39.023722	-95.267439	834.10	5.00	839.10
7	39.023392	-95.268209	834.13	5.00	839.13
8	39.023401	-95.268605	835.31	5.00	840.31
9	39.024804	-95.268873	836.60	5.00	841.60

Name: PV10

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.028369	-95.244729	833.73	5.00	838.73
2	39.028353	-95.244049	834.04	5.00	839.04
3	39.027960	-95.242656	834.19	5.00	839.19
4	39.024891	-95.242701	832.14	5.00	837.14
5	39.024497	-95.243036	831.65	5.00	836.65
6	39.023912	-95.244323	831.76	5.00	836.76
7	39.023478	-95.244629	832.44	5.00	837.44
8	39.022767	-95.244657	832.62	5.00	837.62
9	39.021624	-95.243803	833.83	5.00	838.83
10	39.021239	-95.243818	833.96	5.00	838.96
11	39.021257	-95.244565	831.96	5.00	836.96
12	39.021965	-95.245003	829.69	5.00	834.69
13	39.022934	-95.245261	830.93	5.00	835.93
14	39.023255	-95.245522	830.47	5.00	835.47
15	39.023277	-95.246409	830.32	5.00	835.32
16	39.022983	-95.247020	830.37	5.00	835.37
17	39.022992	-95.247391	831.50	5.00	836.50
18	39.023331	-95.247933	830.58	5.00	835.58
19	39.023676	-95.248160	831.46	5.00	836.46
20	39.024496	-95.248322	832.77	5.00	837.77
21	39.024505	-95.248687	832.44	5.00	837.44
22	39.024885	-95.248673	831.91	5.00	836.91
23	39.026203	-95.248167	831.91	5.00	836.91
24	39.026434	-95.248501	831.85	5.00	836.85
25	39.026645	-95.248493	832.12	5.00	837.12
26	39.026669	-95.249502	832.38	5.00	837.38
27	39.027096	-95.249486	830.87	5.00	835.87
28	39.027085	-95.249037	832.39	5.00	837.39
29	39.027817	-95.249008	831.62	5.00	836.62
30	39.027948	-95.249303	831.09	5.00	836.09
31	39.029112	-95.249257	832.39	5.00	837.39
32	39.029086	-95.248163	831.98	5.00	836.98
33	39.028759	-95.247640	832.82	5.00	837.82
34	39.028413	-95.246591	833.21	5.00	838.21
35	39.028369	-95.244729	833.73	5.00	838.73

Name: PV11

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.038168	-95.269953	833.40	5.00	838.40
2	39.043184	-95.269833	835.86	5.00	840.86
3	39.043177	-95.269564	835.34	5.00	840.34
4	39.038793	-95.261850	832.00	5.00	837.00
5	39.038247	-95.261165	832.03	5.00	837.03
6	39.037223	-95.261205	831.48	5.00	836.48
7	39.037319	-95.265281	832.42	5.00	837.42
8	39.037825	-95.267098	833.55	5.00	838.55
9	39.037053	-95.267281	835.22	5.00	840.22
10	39.037117	-95.269994	835.34	5.00	840.34
11	39.038168	-95.269953	833.40	5.00	838.40

Name: PV12

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.024057	-95.258868	834.03	5.00	839.03
2	39.025007	-95.259839	833.58	5.00	838.58
3	39.025060	-95.260735	833.68	5.00	838.68
4	39.026153	-95.260692	833.28	5.00	838.28
5	39.026127	-95.259604	832.51	5.00	837.51
6	39.025111	-95.257671	832.32	5.00	837.32
7	39.022302	-95.254856	831.73	5.00	836.73
8	39.021986	-95.254428	831.49	5.00	836.49
9	39.021974	-95.253945	831.42	5.00	836.42
10	39.021548	-95.253961	832.34	5.00	837.34
11	39.021629	-95.257378	831.18	5.00	836.18
12	39.022740	-95.258652	832.09	5.00	837.09
13	39.023122	-95.258638	835.83	5.00	840.83
14	39.023101	-95.257756	835.08	5.00	840.08
15	39.023978	-95.257722	833.04	5.00	838.04
16	39.024057	-95.258868	834.03	5.00	839.03

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 41	41	39.015470	-95.241640	830.27	6.00
OP 42	42	39.015467	-95.242543	830.78	6.00
OP 43	43	39.018884	-95.223898	832.56	6.00
OP 44	44	39.011404	-95.241732	827.66	6.00
OP 45	45	39.013632	-95.239090	828.38	6.00
OP 46	46	39.014648	-95.237097	828.68	6.00
OP 47	47	39.014790	-95.250317	827.03	6.00
OP 48	48	39.029457	-95.220956	849.74	6.00
OP 49	49	39.029352	-95.218838	863.94	6.00
OP 50	50	39.010140	-95.224523	823.84	6.00

Glare Analysis Results

Summary of Results Glare with potential for temporary after-image predicted

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
PV01	SA tracking	SA tracking	818	13.6	213	3.5	-
PV02	SA tracking	SA tracking	0	0.0	0	0.0	-
PV03	SA tracking	SA tracking	0	0.0	0	0.0	-
PV04	SA tracking	SA tracking	0	0.0	0	0.0	-
PV05	SA tracking	SA tracking	0	0.0	0	0.0	-
PV06	SA tracking	SA tracking	0	0.0	0	0.0	-
PV07	SA tracking	SA tracking	0	0.0	0	0.0	-
PV08	SA tracking	SA tracking	0	0.0	0	0.0	-
PV09	SA tracking	SA tracking	0	0.0	0	0.0	-
PV10	SA tracking	SA tracking	0	0.0	0	0.0	-
PV11	SA tracking	SA tracking	0	0.0	0	0.0	-
PV12	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
OP 41	334	5.6	0	0.0
OP 42	180	3.0	213	3.5
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	304	5.1	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV: PV01 potential temporary after-image

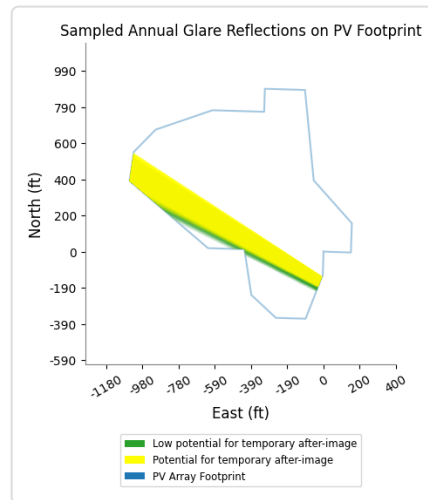
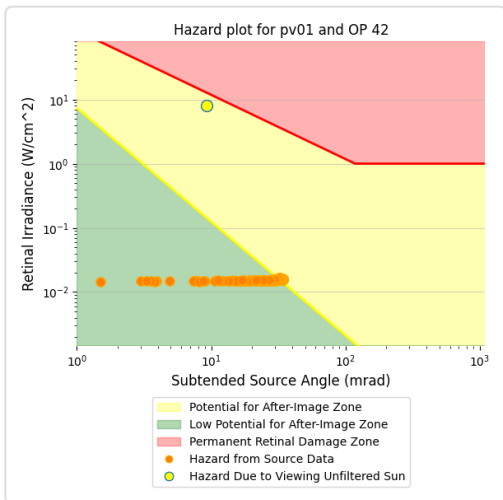
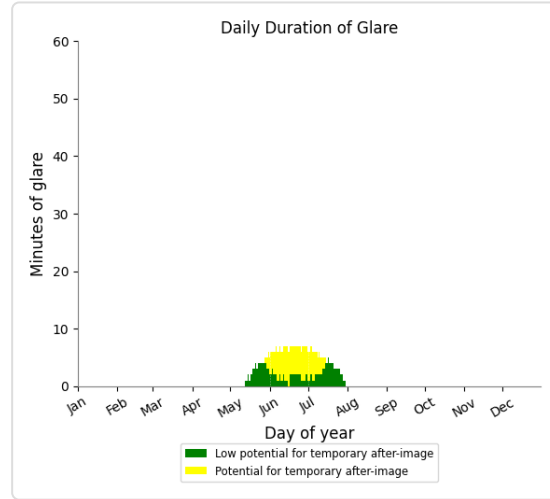
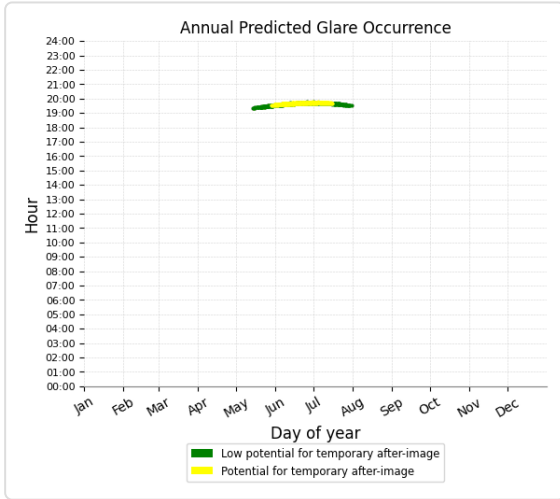
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 42	180	3.0	213	3.5
OP 41	334	5.6	0	0.0
OP 45	304	5.1	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV01 and OP 42

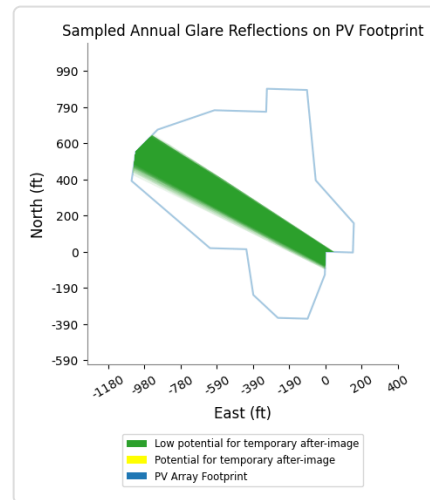
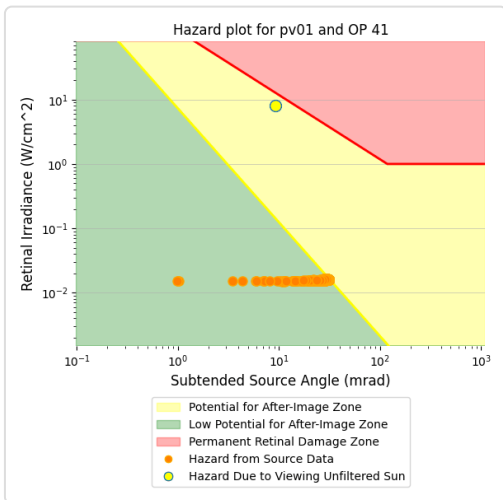
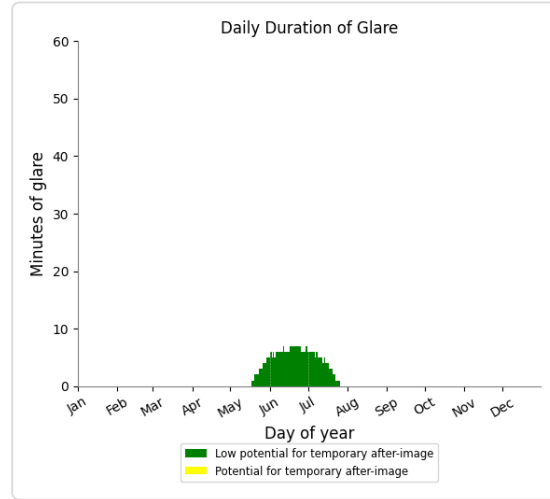
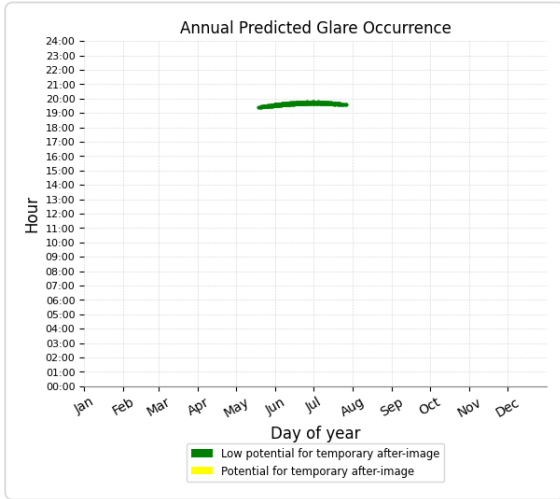
Yellow glare: 213 min.

Green glare: 180 min.



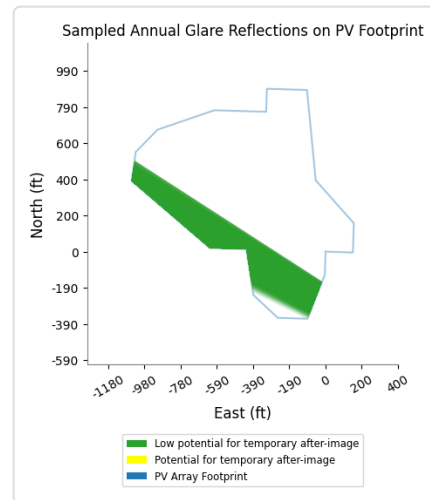
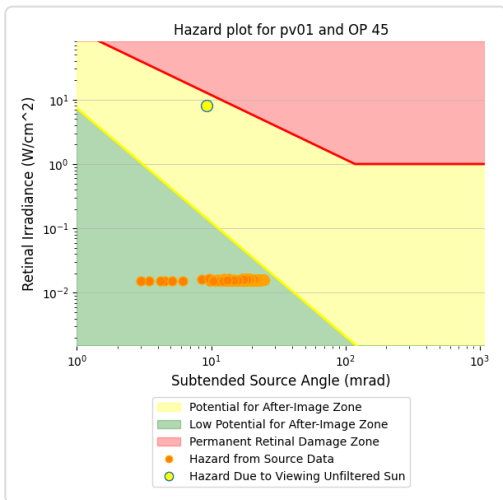
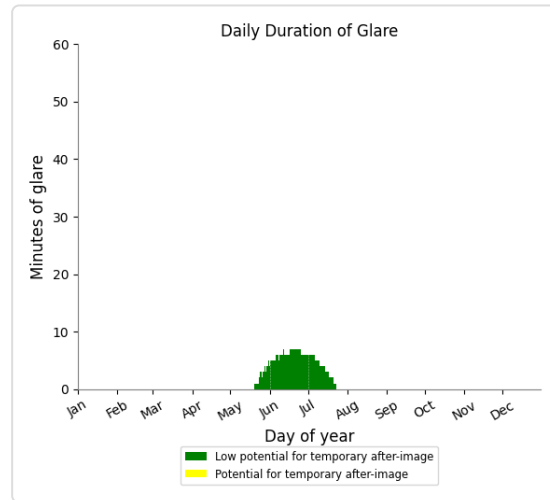
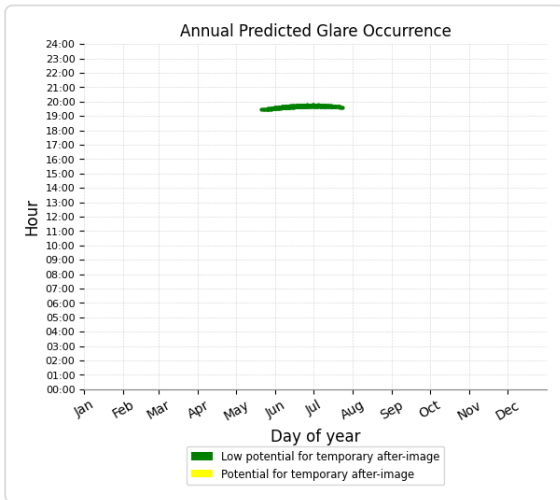
PV01 and OP 41

Yellow glare: none
 Green glare: 334 min.



PV01 and OP 45

Yellow glare: none
Green glare: 304 min.



PV01 and OP 43

No glare found

PV01 and OP 44

No glare found

PV01 and OP 46

No glare found

PV01 and OP 47

No glare found

PV01 and OP 48

No glare found

PV01 and OP 49

No glare found

PV01 and OP 50

No glare found

PV: PV02 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV02 and OP 41

No glare found

PV02 and OP 42

No glare found

PV02 and OP 43

No glare found

PV02 and OP 44

No glare found

PV02 and OP 45

No glare found

PV02 and OP 46

No glare found

PV02 and OP 47

No glare found

PV02 and OP 48

No glare found

PV02 and OP 49

No glare found

PV02 and OP 50

No glare found

PV: PV03 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV03 and OP 41

No glare found

PV03 and OP 42

No glare found

PV03 and OP 43

No glare found

PV03 and OP 44

No glare found

PV03 and OP 45

No glare found

PV03 and OP 46

No glare found

PV03 and OP 47

No glare found

PV03 and OP 48

No glare found

PV03 and OP 49

No glare found

PV03 and OP 50

No glare found

PV: PV04 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV04 and OP 41

No glare found

PV04 and OP 42

No glare found

PV04 and OP 43

No glare found

PV04 and OP 44

No glare found

PV04 and OP 45

No glare found

PV04 and OP 46

No glare found

PV04 and OP 47

No glare found

PV04 and OP 48

No glare found

PV04 and OP 49

No glare found

PV04 and OP 50

No glare found

PV: PV05 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV05 and OP 41

No glare found

PV05 and OP 42

No glare found

PV05 and OP 43

No glare found

PV05 and OP 44

No glare found

PV05 and OP 45

No glare found

PV05 and OP 46

No glare found

PV05 and OP 47

No glare found

PV05 and OP 48

No glare found

PV05 and OP 49

No glare found

PV05 and OP 50

No glare found

PV: PV06 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV06 and OP 41

No glare found

PV06 and OP 42

No glare found

PV06 and OP 43

No glare found

PV06 and OP 44

No glare found

PV06 and OP 45

No glare found

PV06 and OP 46

No glare found

PV06 and OP 47

No glare found

PV06 and OP 48

No glare found

PV06 and OP 49

No glare found

PV06 and OP 50

No glare found

PV: PV07 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV07 and OP 41

No glare found

PV07 and OP 42

No glare found

PV07 and OP 43

No glare found

PV07 and OP 44

No glare found

PV07 and OP 45

No glare found

PV07 and OP 46

No glare found

PV07 and OP 47

No glare found

PV07 and OP 48

No glare found

PV07 and OP 49

No glare found

PV07 and OP 50

No glare found

PV: PV08 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV08 and OP 41

No glare found

PV08 and OP 42

No glare found

PV08 and OP 43

No glare found

PV08 and OP 44

No glare found

PV08 and OP 45

No glare found

PV08 and OP 46

No glare found

PV08 and OP 47

No glare found

PV08 and OP 48

No glare found

PV08 and OP 49

No glare found

PV08 and OP 50

No glare found

PV: PV09 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV09 and OP 41

No glare found

PV09 and OP 42

No glare found

PV09 and OP 43

No glare found

PV09 and OP 44

No glare found

PV09 and OP 45

No glare found

PV09 and OP 46

No glare found

PV09 and OP 47

No glare found

PV09 and OP 48

No glare found

PV09 and OP 49

No glare found

PV09 and OP 50

No glare found

PV: PV10 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV10 and OP 41

No glare found

PV10 and OP 42

No glare found

PV10 and OP 43

No glare found

PV10 and OP 44

No glare found

PV10 and OP 45

No glare found

PV10 and OP 46

No glare found

PV10 and OP 47

No glare found

PV10 and OP 48

No glare found

PV10 and OP 49

No glare found

PV10 and OP 50

No glare found

PV: PV11 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV11 and OP 41

No glare found

PV11 and OP 42

No glare found

PV11 and OP 43

No glare found

PV11 and OP 44

No glare found

PV11 and OP 45

No glare found

PV11 and OP 46

No glare found

PV11 and OP 47

No glare found

PV11 and OP 48

No glare found

PV11 and OP 49

No glare found

PV11 and OP 50

No glare found

PV: PV12 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 41	0	0.0	0	0.0
OP 42	0	0.0	0	0.0
OP 43	0	0.0	0	0.0
OP 44	0	0.0	0	0.0
OP 45	0	0.0	0	0.0
OP 46	0	0.0	0	0.0
OP 47	0	0.0	0	0.0
OP 48	0	0.0	0	0.0
OP 49	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

PV12 and OP 41

No glare found

PV12 and OP 42

No glare found

PV12 and OP 43

No glare found

PV12 and OP 44

No glare found

PV12 and OP 45

No glare found

PV12 and OP 46

No glare found

PV12 and OP 47

No glare found

PV12 and OP 48

No glare found

PV12 and OP 49

No glare found

PV12 and OP 50

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

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**APPENDIX E - FORGESOLAR ANALYSIS RESULTS, BLOCK 1
TO 12 AND ROADS**

FORGESOLAR GLARE ANALYSIS

Project: **147658 - Kansas Sky Energy Center Solar Project**

Site configuration: **Array with Roads**

Client: Savion, LLC

Created 05 Jun, 2023

Updated 07 Jun, 2023

Time-step 1 minute

Timezone offset UTC-6

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m²

Category 500 kW to 1 MW

Site ID 92164.15781

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 Glare with potential for temporary after-image predicted

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
PV01	SA tracking	SA tracking	23	0.4	42	0.7	-
PV02	SA tracking	SA tracking	112	1.9	60	1.0	-
PV03	SA tracking	SA tracking	0	0.0	0	0.0	-
PV04	SA tracking	SA tracking	0	0.0	0	0.0	-
PV05	SA tracking	SA tracking	0	0.0	0	0.0	-
PV06	SA tracking	SA tracking	0	0.0	0	0.0	-
PV07	SA tracking	SA tracking	0	0.0	0	0.0	-
PV08	SA tracking	SA tracking	0	0.0	0	0.0	-
PV09	SA tracking	SA tracking	0	0.0	0	0.0	-
PV10	SA tracking	SA tracking	0	0.0	0	0.0	-
PV11	SA tracking	SA tracking	0	0.0	0	0.0	-
PV12	SA tracking	SA tracking	0	0.0	0	0.0	-

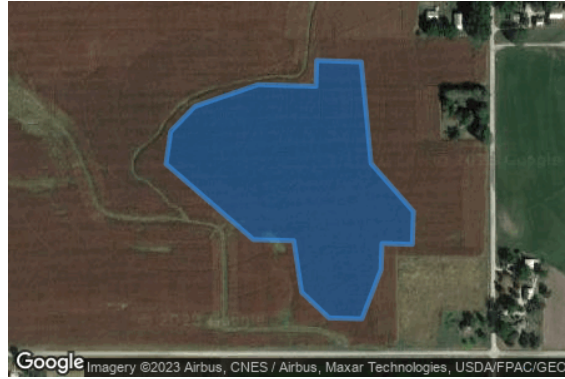
Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	112	1.9	60	1.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	23	0.4	42	0.7
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

Component Data

PV Arrays

Name: PV01
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 5.0°
Ground Coverage Ratio: 0.3047
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	39.016617	-95.244020	827.27	5.00	832.27
2	39.016272	-95.244034	827.34	5.00	832.34
3	39.015614	-95.244364	823.51	5.00	828.51
4	39.015627	-95.244932	821.48	5.00	826.48
5	39.015970	-95.245402	822.33	5.00	827.33
6	39.016653	-95.245535	823.91	5.00	828.91
7	39.016669	-95.246231	822.15	5.00	827.15
8	39.017674	-95.247731	823.75	5.00	828.75
9	39.018107	-95.247651	824.54	5.00	829.54
10	39.018440	-95.247233	824.88	5.00	829.88
11	39.018730	-95.246146	825.28	5.00	830.28
12	39.018707	-95.245156	826.92	5.00	831.92
13	39.019051	-95.245142	827.25	5.00	832.25
14	39.019033	-95.244375	826.88	5.00	831.88
15	39.017682	-95.244208	828.31	5.00	833.31
16	39.017041	-95.243479	826.85	5.00	831.85
17	39.016604	-95.243497	826.90	5.00	831.90
18	39.016617	-95.244020	827.27	5.00	832.27

Name: PV02

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.022637	-95.240606	827.24	5.00	832.24
2	39.023619	-95.241102	831.26	5.00	836.26
3	39.024337	-95.241748	831.73	5.00	836.73
4	39.027451	-95.241702	833.52	5.00	838.52
5	39.027443	-95.241358	833.25	5.00	838.25
6	39.026778	-95.240021	833.21	5.00	838.21
7	39.025349	-95.237528	832.74	5.00	837.74
8	39.023915	-95.236070	831.64	5.00	836.64
9	39.022901	-95.235270	830.97	5.00	835.97
10	39.022511	-95.235285	830.67	5.00	835.67
11	39.022637	-95.240606	827.24	5.00	832.24

Name: PV03

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.020970	-95.232399	828.58	5.00	833.58
2	39.022939	-95.232321	829.91	5.00	834.91
3	39.023016	-95.233376	830.40	5.00	835.40
4	39.028071	-95.233398	837.06	5.00	842.06
5	39.028025	-95.231478	836.11	5.00	841.11
6	39.027690	-95.231019	835.92	5.00	840.92
7	39.027356	-95.230648	835.63	5.00	840.63
8	39.024956	-95.229098	832.51	5.00	837.51
9	39.023647	-95.227655	832.91	5.00	837.91
10	39.022912	-95.227325	832.64	5.00	837.64
11	39.022855	-95.224925	832.72	5.00	837.72
12	39.022505	-95.224688	832.49	5.00	837.49
13	39.021198	-95.224511	829.69	5.00	834.69
14	39.020782	-95.224527	828.97	5.00	833.97
15	39.020970	-95.232399	828.58	5.00	833.58

Name: PV04

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

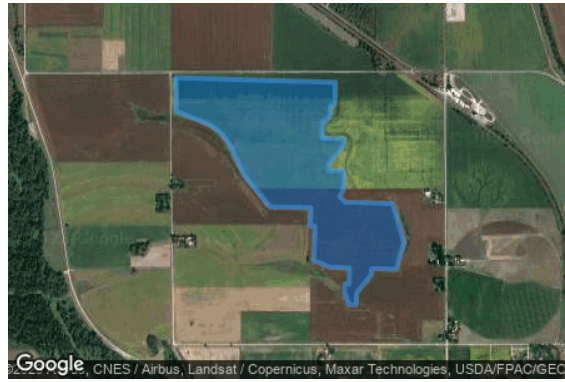
Ground Coverage Ratio: 0.3047

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	39.024855	-95.250222	833.11	5.00	838.11
2	39.024444	-95.250239	833.16	5.00	838.16
3	39.024419	-95.249197	830.59	5.00	835.59
4	39.023410	-95.249236	832.37	5.00	837.37
5	39.023046	-95.249492	832.64	5.00	837.64
6	39.022762	-95.249088	832.65	5.00	837.65
7	39.022684	-95.245828	830.15	5.00	835.15
8	39.020609	-95.245063	830.91	5.00	835.91
9	39.019178	-95.245580	829.07	5.00	834.07
10	39.019218	-95.247289	834.96	5.00	839.96
11	39.018901	-95.247302	833.18	5.00	838.18
12	39.017938	-95.248313	823.47	5.00	828.47
13	39.017295	-95.248338	822.99	5.00	827.99
14	39.017307	-95.248859	822.55	5.00	827.55
15	39.018021	-95.249152	822.12	5.00	827.12
16	39.018402	-95.249137	822.53	5.00	827.53
17	39.018395	-95.248838	823.75	5.00	828.75
18	39.019254	-95.248804	831.36	5.00	836.36
19	39.019286	-95.250151	829.95	5.00	834.95
20	39.019657	-95.251254	829.05	5.00	834.05
21	39.021475	-95.251183	832.00	5.00	837.00
22	39.021482	-95.251502	832.19	5.00	837.19
23	39.022451	-95.251464	831.98	5.00	836.98
24	39.022504	-95.254269	831.77	5.00	836.77
25	39.024200	-95.256028	832.19	5.00	837.19
26	39.025903	-95.257086	832.48	5.00	837.48
27	39.026560	-95.257795	832.62	5.00	837.62
28	39.026906	-95.258482	832.87	5.00	837.87
29	39.027590	-95.260700	832.93	5.00	837.93
30	39.029383	-95.260719	833.48	5.00	838.48
31	39.029124	-95.249763	832.64	5.00	837.64
32	39.027984	-95.249807	831.24	5.00	836.24
33	39.027832	-95.250113	832.70	5.00	837.70
34	39.027373	-95.250130	830.59	5.00	835.59
35	39.027037	-95.250479	831.47	5.00	836.47
36	39.027041	-95.250668	832.38	5.00	837.38
37	39.026155	-95.250702	832.49	5.00	837.49
38	39.026119	-95.249205	831.52	5.00	836.52
39	39.025730	-95.249220	832.12	5.00	837.12
40	39.024855	-95.250222	833.11	5.00	838.11

Name: PV05

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.016786	-95.248659	822.87	5.00	827.87
2	39.016741	-95.246787	821.98	5.00	826.98
3	39.015690	-95.246828	821.44	5.00	826.44
4	39.015738	-95.248858	822.17	5.00	827.17
5	39.016081	-95.248845	824.00	5.00	829.00
6	39.016142	-95.251397	825.17	5.00	830.17
7	39.018354	-95.251386	823.89	5.00	828.89
8	39.018335	-95.250582	821.97	5.00	826.97
9	39.018014	-95.249934	822.04	5.00	827.04
10	39.017662	-95.249387	822.27	5.00	827.27
11	39.016992	-95.249036	822.70	5.00	827.70
12	39.016786	-95.248659	822.87	5.00	827.87

Name: PV06

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.030007	-95.263334	834.21	5.00	839.21
2	39.030060	-95.265595	834.70	5.00	839.70
3	39.032039	-95.265596	833.71	5.00	838.71
4	39.032123	-95.270837	837.01	5.00	842.01
5	39.032549	-95.270820	836.46	5.00	841.46
6	39.032897	-95.270357	836.00	5.00	841.00
7	39.032886	-95.269908	835.65	5.00	840.65
8	39.034499	-95.269846	834.99	5.00	839.99
9	39.034866	-95.270170	835.08	5.00	840.08
10	39.035024	-95.270050	834.75	5.00	839.75
11	39.036582	-95.269990	834.91	5.00	839.91
12	39.036483	-95.265780	833.44	5.00	838.44
13	39.035198	-95.265830	833.71	5.00	838.71
14	39.035188	-95.265399	834.10	5.00	839.10
15	39.036473	-95.265349	833.60	5.00	838.60
16	39.036455	-95.260683	831.17	5.00	836.17
17	39.035445	-95.259724	831.18	5.00	836.18
18	39.033998	-95.257245	831.41	5.00	836.41
19	39.033333	-95.255333	831.35	5.00	836.35
20	39.032961	-95.254726	831.41	5.00	836.41
21	39.031988	-95.254297	831.99	5.00	836.99
22	39.031248	-95.254326	832.17	5.00	837.17
23	39.030942	-95.254113	832.04	5.00	837.04
24	39.029891	-95.254154	832.16	5.00	837.16
25	39.030096	-95.262848	833.81	5.00	838.81
26	39.030007	-95.263334	834.21	5.00	839.21

Name: PV07

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.031558	-95.242714	838.81	5.00	843.81
2	39.030571	-95.243689	837.96	5.00	842.96
3	39.030592	-95.244594	836.50	5.00	841.50
4	39.031620	-95.246453	834.57	5.00	839.57
5	39.031995	-95.246836	834.59	5.00	839.59
6	39.033052	-95.246795	834.88	5.00	839.88
7	39.032954	-95.242660	838.57	5.00	843.57
8	39.031558	-95.242714	838.81	5.00	843.81

Name: PV08

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.021557	-95.262988	831.45	5.00	836.45
2	39.021680	-95.268223	834.25	5.00	839.25
3	39.022699	-95.268430	833.95	5.00	838.95
4	39.023143	-95.267776	831.75	5.00	836.75
5	39.023442	-95.266772	830.87	5.00	835.87
6	39.023359	-95.263218	833.83	5.00	838.83
7	39.022565	-95.263249	831.12	5.00	836.12
8	39.021943	-95.262973	829.67	5.00	834.67
9	39.021557	-95.262988	831.45	5.00	836.45

Name: PV09

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

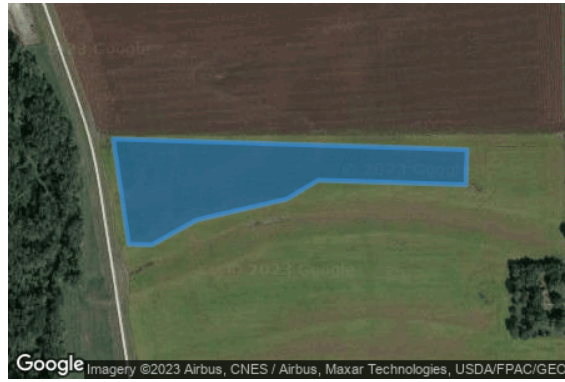
Ground Coverage Ratio: 0.3047

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	39.024804	-95.268873	836.60	5.00	841.60
2	39.024661	-95.262793	835.34	5.00	840.34
3	39.024193	-95.262811	835.96	5.00	840.96
4	39.024253	-95.265346	836.03	5.00	841.03
5	39.024002	-95.265887	833.82	5.00	838.82
6	39.023722	-95.267439	834.10	5.00	839.10
7	39.023392	-95.268209	834.13	5.00	839.13
8	39.023401	-95.268605	835.31	5.00	840.31
9	39.024804	-95.268873	836.60	5.00	841.60

Name: PV10

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.028369	-95.244729	833.73	5.00	838.73
2	39.028353	-95.244049	834.04	5.00	839.04
3	39.027960	-95.242656	834.19	5.00	839.19
4	39.024891	-95.242701	832.14	5.00	837.14
5	39.024497	-95.243036	831.65	5.00	836.65
6	39.023912	-95.244323	831.76	5.00	836.76
7	39.023478	-95.244629	832.44	5.00	837.44
8	39.022767	-95.244657	832.62	5.00	837.62
9	39.021624	-95.243803	833.83	5.00	838.83
10	39.021239	-95.243818	833.96	5.00	838.96
11	39.021257	-95.244565	831.96	5.00	836.96
12	39.021965	-95.245003	829.69	5.00	834.69
13	39.022934	-95.245261	830.93	5.00	835.93
14	39.023255	-95.245522	830.47	5.00	835.47
15	39.023277	-95.246409	830.32	5.00	835.32
16	39.022983	-95.247020	830.37	5.00	835.37
17	39.022992	-95.247391	831.50	5.00	836.50
18	39.023331	-95.247933	830.58	5.00	835.58
19	39.023676	-95.248160	831.46	5.00	836.46
20	39.024496	-95.248322	832.77	5.00	837.77
21	39.024505	-95.248687	832.44	5.00	837.44
22	39.024885	-95.248673	831.91	5.00	836.91
23	39.026203	-95.248167	831.91	5.00	836.91
24	39.026434	-95.248501	831.85	5.00	836.85
25	39.026645	-95.248493	832.12	5.00	837.12
26	39.026669	-95.249502	832.38	5.00	837.38
27	39.027096	-95.249486	830.87	5.00	835.87
28	39.027085	-95.249037	832.39	5.00	837.39
29	39.027817	-95.249008	831.62	5.00	836.62
30	39.027948	-95.249303	831.09	5.00	836.09
31	39.029112	-95.249257	832.39	5.00	837.39
32	39.029086	-95.248163	831.98	5.00	836.98
33	39.028759	-95.247640	832.82	5.00	837.82
34	39.028413	-95.246591	833.21	5.00	838.21
35	39.028369	-95.244729	833.73	5.00	838.73

Name: PV11

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.038168	-95.269953	833.40	5.00	838.40
2	39.043184	-95.269833	835.86	5.00	840.86
3	39.043177	-95.269564	835.34	5.00	840.34
4	39.038793	-95.261850	832.00	5.00	837.00
5	39.038247	-95.261165	832.03	5.00	837.03
6	39.037223	-95.261205	831.48	5.00	836.48
7	39.037319	-95.265281	832.42	5.00	837.42
8	39.037825	-95.267098	833.55	5.00	838.55
9	39.037053	-95.267281	835.22	5.00	840.22
10	39.037117	-95.269994	835.34	5.00	840.34
11	39.038168	-95.269953	833.40	5.00	838.40

Name: PV12

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.024057	-95.258868	834.03	5.00	839.03
2	39.025007	-95.259839	833.58	5.00	838.58
3	39.025060	-95.260735	833.68	5.00	838.68
4	39.026153	-95.260692	833.28	5.00	838.28
5	39.026127	-95.259604	832.51	5.00	837.51
6	39.025111	-95.257671	832.32	5.00	837.32
7	39.022302	-95.254856	831.73	5.00	836.73
8	39.021986	-95.254428	831.49	5.00	836.49
9	39.021974	-95.253945	831.42	5.00	836.42
10	39.021548	-95.253961	832.34	5.00	837.34
11	39.021629	-95.257378	831.18	5.00	836.18
12	39.022740	-95.258652	832.09	5.00	837.09
13	39.023122	-95.258638	835.83	5.00	840.83
14	39.023101	-95.257756	835.08	5.00	840.08
15	39.023978	-95.257722	833.04	5.00	838.04
16	39.024057	-95.258868	834.03	5.00	839.03

Route Receptors

Name: Railroad
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.015123	-95.234241	828.22	14.00	842.22
2	39.019116	-95.234005	826.50	14.00	840.50
3	39.020250	-95.233983	831.60	14.00	845.60
4	39.021767	-95.234348	833.81	14.00	847.81
5	39.022900	-95.234917	835.69	14.00	849.69
6	39.024217	-95.235915	837.85	14.00	851.85
7	39.025268	-95.237084	838.67	14.00	852.67
8	39.026034	-95.238307	839.07	14.00	853.07
9	39.029493	-95.244508	840.19	14.00	854.19
10	39.035202	-95.254647	838.37	14.00	852.37
11	39.041985	-95.266717	840.81	14.00	854.81
12	39.047968	-95.277349	845.62	14.00	859.62

Name: Route 1
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.044180	-95.270074	837.47	4.00	841.47
2	39.043870	-95.270149	841.72	4.00	845.72
3	39.041497	-95.270193	833.99	4.00	837.99
4	39.037189	-95.270242	833.41	4.00	837.41
5	39.036926	-95.270298	832.01	4.00	836.01
6	39.036812	-95.270418	834.96	4.00	838.96
7	39.036792	-95.271014	836.02	4.00	840.02
8	39.036703	-95.271144	835.20	4.00	839.20
9	39.033007	-95.271095	836.05	4.00	840.05
10	39.029834	-95.271075	835.46	4.00	839.46
11	39.029620	-95.270981	836.37	4.00	840.37
12	39.029630	-95.257350	832.71	4.00	836.71
13	39.029698	-95.243761	838.86	4.00	842.86
14	39.030091	-95.244942	836.18	4.00	840.18
15	39.036852	-95.257067	835.75	4.00	839.75
16	39.044180	-95.270074	837.47	4.00	841.47

Name: Route 2
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.029622	-95.270982	836.37	4.00	840.37
2	39.029372	-95.271153	838.45	4.00	842.45
3	39.029022	-95.271132	844.70	4.00	848.70
4	39.024698	-95.269222	844.06	4.00	848.06
5	39.020991	-95.268449	842.02	4.00	846.02
6	39.019085	-95.268074	843.60	4.00	847.60
7	39.017631	-95.267531	842.70	4.00	846.70
8	39.016311	-95.266515	843.25	4.00	847.25
9	39.015216	-95.265232	841.51	4.00	845.51
10	39.014522	-95.263755	841.84	4.00	845.84
11	39.012743	-95.259373	842.06	4.00	846.06
12	39.013259	-95.259677	831.44	4.00	835.44
13	39.014592	-95.260582	829.94	4.00	833.94
14	39.014871	-95.260771	830.94	4.00	834.94
15	39.015244	-95.260890	830.96	4.00	834.96
16	39.029659	-95.261078	833.58	4.00	837.58

Name: Route 3
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.015198	-95.260849	831.22	4.00	835.22
2	39.015125	-95.260500	829.63	4.00	833.63
3	39.015144	-95.253821	829.32	4.00	833.32
4	39.015148	-95.242083	826.00	4.00	830.00
5	39.029660	-95.242199	840.48	4.00	844.48
6	39.029702	-95.243755	838.86	4.00	842.86

Name: Route 4
Path type: Two-way
Observer view angle: 25.0°



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.029707	-95.242237	840.37	4.00	844.37
2	39.038915	-95.242274	890.21	4.00	894.21

Name: Route 5
Path type: Two-way
Observer view angle: 25.0°



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Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.029702	-95.242156	841.00	4.00	845.00
2	39.029669	-95.236051	837.40	4.00	841.40
3	39.029544	-95.235241	840.47	4.00	844.47
4	39.028677	-95.233240	846.41	4.00	850.41
5	39.028452	-95.232092	846.24	4.00	850.24
6	39.028335	-95.231502	846.27	4.00	850.27
7	39.028102	-95.231052	845.91	4.00	849.91
8	39.027564	-95.230413	845.76	4.00	849.76
9	39.027085	-95.230064	845.20	4.00	849.20
10	39.025585	-95.229190	844.51	4.00	848.51
11	39.024939	-95.228654	844.48	4.00	848.48
12	39.023610	-95.227162	844.05	4.00	848.05
13	39.023376	-95.226717	844.09	4.00	848.09
14	39.023218	-95.226073	843.85	4.00	847.85
15	39.023176	-95.225296	843.80	4.00	847.80
16	39.023009	-95.224228	845.57	4.00	849.57
17	39.015124	-95.224212	819.75	4.00	823.75
18	39.015124	-95.233535	821.83	4.00	825.83

Name: Route 6
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.042564	-95.267200	841.36	4.00	845.36
2	39.043522	-95.266264	851.42	4.00	855.42
3	39.044397	-95.265205	870.75	4.00	874.75
4	39.045775	-95.263389	931.48	4.00	935.48

Name: Route 7
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.015155	-95.242087	825.94	4.00	829.94
2	39.015117	-95.233553	821.75	4.00	825.75

Name: Route 8
Path type: Two-way
Observer view angle: 25.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	39.029668	-95.242208	840.64	4.00	844.64
2	39.029518	-95.241500	839.79	4.00	843.79
3	39.029181	-95.240792	838.02	4.00	842.02
4	39.028622	-95.240132	836.42	4.00	840.42
5	39.023988	-95.235261	833.43	4.00	837.43
6	39.022730	-95.234339	833.05	4.00	837.05
7	39.021454	-95.233845	829.94	4.00	833.94
8	39.020797	-95.233697	824.69	4.00	828.69
9	39.020101	-95.233574	824.86	4.00	828.86
10	39.015118	-95.233543	821.83	4.00	825.83

Glare Analysis Results

Summary of Results Glare with potential for temporary after-image predicted

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
PV01	SA tracking	SA tracking	23	0.4	42	0.7	-
PV02	SA tracking	SA tracking	112	1.9	60	1.0	-
PV03	SA tracking	SA tracking	0	0.0	0	0.0	-
PV04	SA tracking	SA tracking	0	0.0	0	0.0	-
PV05	SA tracking	SA tracking	0	0.0	0	0.0	-
PV06	SA tracking	SA tracking	0	0.0	0	0.0	-
PV07	SA tracking	SA tracking	0	0.0	0	0.0	-
PV08	SA tracking	SA tracking	0	0.0	0	0.0	-
PV09	SA tracking	SA tracking	0	0.0	0	0.0	-
PV10	SA tracking	SA tracking	0	0.0	0	0.0	-
PV11	SA tracking	SA tracking	0	0.0	0	0.0	-
PV12	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
Railroad	112	1.9	60	1.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	23	0.4	42	0.7
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV: PV01 potential temporary after-image

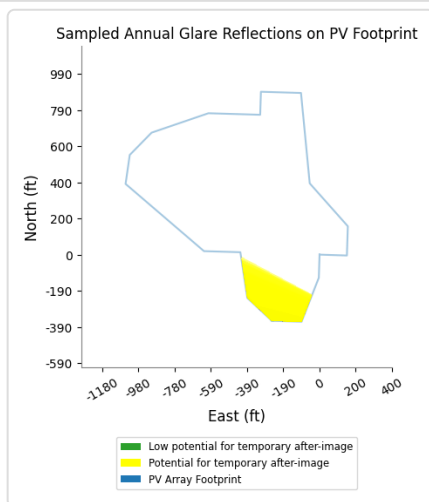
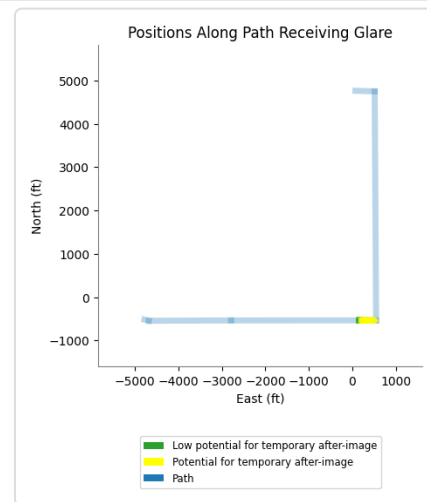
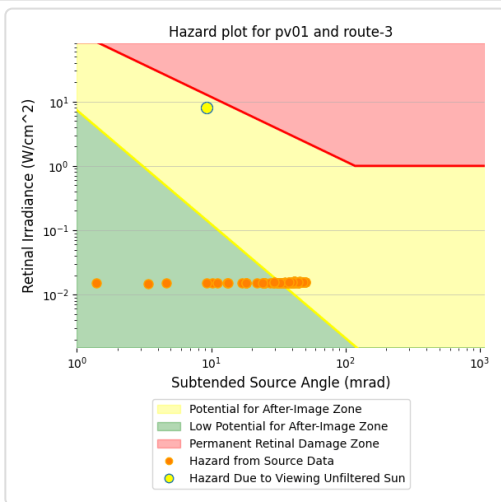
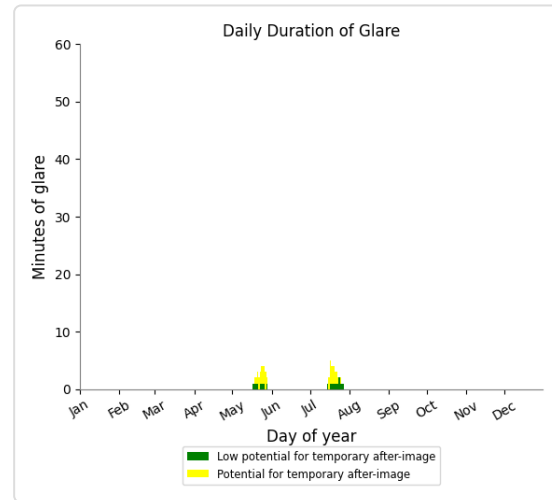
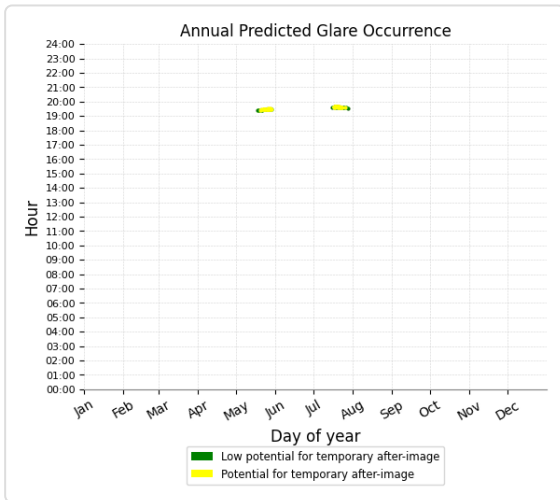
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 3	23	0.4	42	0.7
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV01 and Route: Route 3

Yellow glare: 42 min.

Green glare: 23 min.



PV01 and Route: Railroad

No glare found

PV01 and Route: Route 1

No glare found

PV01 and Route: Route 2

No glare found

PV01 and Route: Route 4

No glare found

PV01 and Route: Route 5

No glare found

PV01 and Route: Route 6

No glare found

PV01 and Route: Route 7

No glare found

PV01 and Route: Route 8

No glare found

PV: PV02 potential temporary after-image

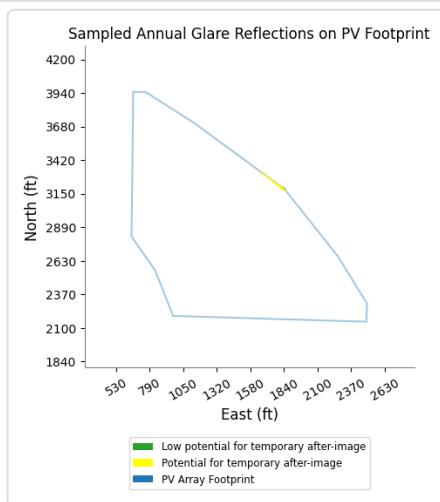
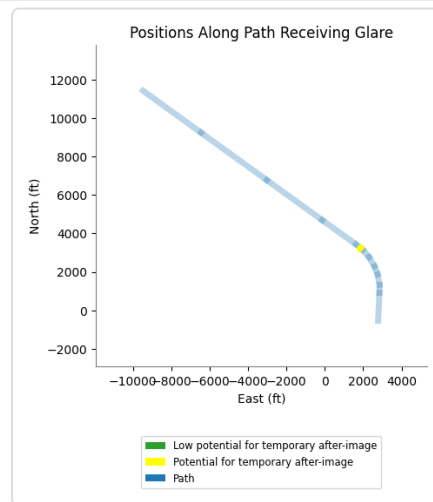
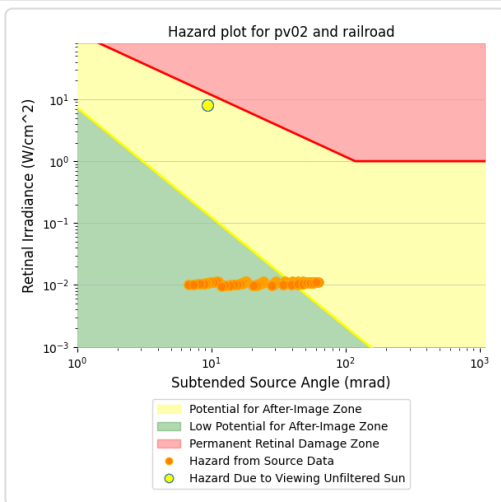
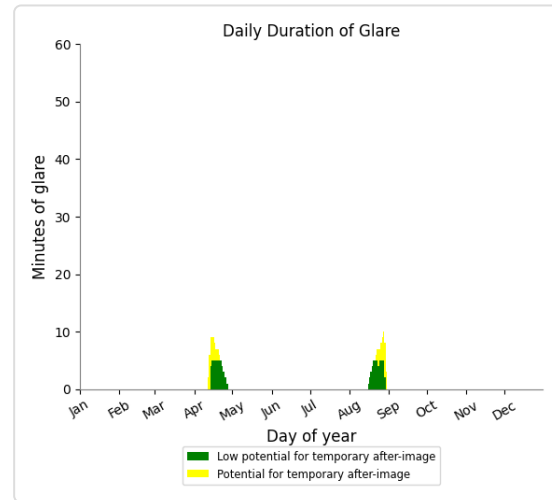
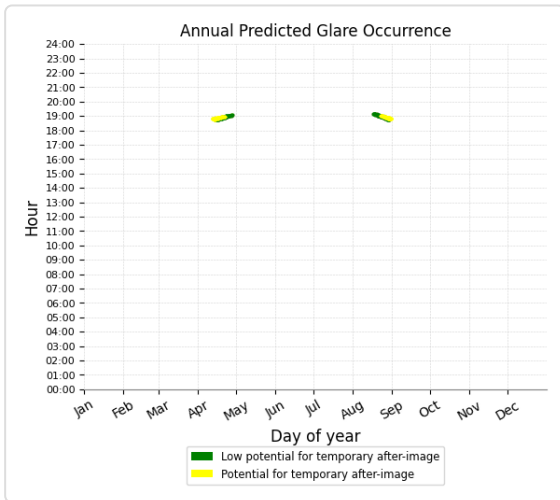
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	112	1.9	60	1.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV02 and Route: Railroad

Yellow glare: 60 min.

Green glare: 112 min.



PV02 and Route: Route 1

No glare found

PV02 and Route: Route 2

No glare found

PV02 and Route: Route 3

No glare found

PV02 and Route: Route 4

No glare found

PV02 and Route: Route 5

No glare found

PV02 and Route: Route 6

No glare found

PV02 and Route: Route 7

No glare found

PV02 and Route: Route 8

No glare found

PV: PV03 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV03 and Route: Railroad

No glare found

PV03 and Route: Route 1

No glare found

PV03 and Route: Route 2

No glare found

PV03 and Route: Route 3

No glare found

PV03 and Route: Route 4

No glare found

PV03 and Route: Route 5

No glare found

PV03 and Route: Route 6

No glare found

PV03 and Route: Route 7

No glare found

PV03 and Route: Route 8

No glare found

PV: PV04 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV04 and Route: Railroad

No glare found

PV04 and Route: Route 1

No glare found

PV04 and Route: Route 2

No glare found

PV04 and Route: Route 3

No glare found

PV04 and Route: Route 4

No glare found

PV04 and Route: Route 5

No glare found

PV04 and Route: Route 6

No glare found

PV04 and Route: Route 7

No glare found

PV04 and Route: Route 8

No glare found

PV: PV05 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV05 and Route: Railroad

No glare found

PV05 and Route: Route 1

No glare found

PV05 and Route: Route 2

No glare found

PV05 and Route: Route 3

No glare found

PV05 and Route: Route 4

No glare found

PV05 and Route: Route 5

No glare found

PV05 and Route: Route 6

No glare found

PV05 and Route: Route 7

No glare found

PV05 and Route: Route 8

No glare found

PV: PV06 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV06 and Route: Railroad

No glare found

PV06 and Route: Route 1

No glare found

PV06 and Route: Route 2

No glare found

PV06 and Route: Route 3

No glare found

PV06 and Route: Route 4

No glare found

PV06 and Route: Route 5

No glare found

PV06 and Route: Route 6

No glare found

PV06 and Route: Route 7

No glare found

PV06 and Route: Route 8

No glare found

PV: PV07 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV07 and Route: Railroad

No glare found

PV07 and Route: Route 1

No glare found

PV07 and Route: Route 2

No glare found

PV07 and Route: Route 3

No glare found

PV07 and Route: Route 4

No glare found

PV07 and Route: Route 5

No glare found

PV07 and Route: Route 6

No glare found

PV07 and Route: Route 7

No glare found

PV07 and Route: Route 8

No glare found

PV: PV08 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV08 and Route: Railroad

No glare found

PV08 and Route: Route 1

No glare found

PV08 and Route: Route 2

No glare found

PV08 and Route: Route 3

No glare found

PV08 and Route: Route 4

No glare found

PV08 and Route: Route 5

No glare found

PV08 and Route: Route 6

No glare found

PV08 and Route: Route 7

No glare found

PV08 and Route: Route 8

No glare found

PV: PV09 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV09 and Route: Railroad

No glare found

PV09 and Route: Route 1

No glare found

PV09 and Route: Route 2

No glare found

PV09 and Route: Route 3

No glare found

PV09 and Route: Route 4

No glare found

PV09 and Route: Route 5

No glare found

PV09 and Route: Route 6

No glare found

PV09 and Route: Route 7

No glare found

PV09 and Route: Route 8

No glare found

PV: PV10 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV10 and Route: Railroad

No glare found

PV10 and Route: Route 1

No glare found

PV10 and Route: Route 2

No glare found

PV10 and Route: Route 3

No glare found

PV10 and Route: Route 4

No glare found

PV10 and Route: Route 5

No glare found

PV10 and Route: Route 6

No glare found

PV10 and Route: Route 7

No glare found

PV10 and Route: Route 8

No glare found

PV: PV11 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV11 and Route: Railroad

No glare found

PV11 and Route: Route 1

No glare found

PV11 and Route: Route 2

No glare found

PV11 and Route: Route 3

No glare found

PV11 and Route: Route 4

No glare found

PV11 and Route: Route 5

No glare found

PV11 and Route: Route 6

No glare found

PV11 and Route: Route 7

No glare found

PV11 and Route: Route 8

No glare found

PV: PV12 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Railroad	0	0.0	0	0.0
Route 1	0	0.0	0	0.0
Route 2	0	0.0	0	0.0
Route 3	0	0.0	0	0.0
Route 4	0	0.0	0	0.0
Route 5	0	0.0	0	0.0
Route 6	0	0.0	0	0.0
Route 7	0	0.0	0	0.0
Route 8	0	0.0	0	0.0

PV12 and Route: Railroad

No glare found

PV12 and Route: Route 1

No glare found

PV12 and Route: Route 2

No glare found

PV12 and Route: Route 3

No glare found

PV12 and Route: Route 4

No glare found

PV12 and Route: Route 5

No glare found

PV12 and Route: Route 6

No glare found

PV12 and Route: Route 7

No glare found

PV12 and Route: Route 8

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

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**APPENDIX F - FORGESOLAR ANALYSIS RESULTS, BLOCK 1
TO 12 AND AIRPORT**

FORGESOLAR GLARE ANALYSIS

Project: **147658 - Kansas Sky Energy Center Solar Project**

Site configuration: **Array with Airport**

Client: Savion, LLC

Created 05 Jun, 2023

Updated 07 Jun, 2023

Time-step 1 minute

Timezone offset UTC-6

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m²

Category 500 kW to 1 MW

Site ID 92162.15781

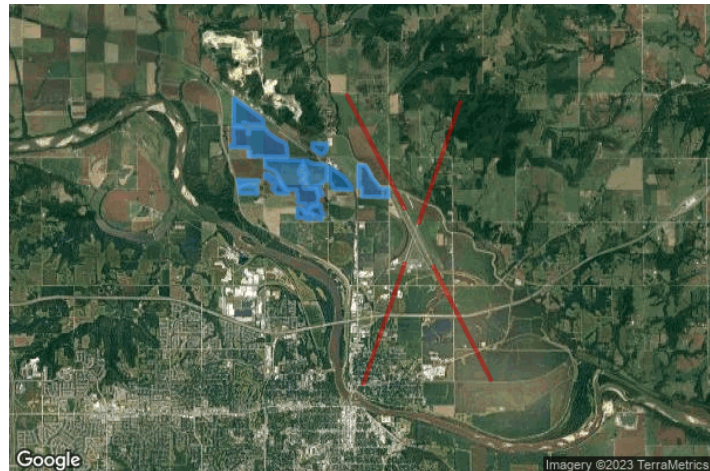
Ocular transmission coefficient 0.5

Pupil diameter 0.002 m

Eye focal length 0.017 m

Sun subtended angle 9.3 mrad

PV analysis methodology V2



Summary of Results Glare with low potential for temporary after-image predicted

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
PV01	SA tracking	SA tracking	386	6.4	0	0.0	-
PV02	SA tracking	SA tracking	0	0.0	0	0.0	-
PV03	SA tracking	SA tracking	0	0.0	0	0.0	-
PV04	SA tracking	SA tracking	0	0.0	0	0.0	-
PV05	SA tracking	SA tracking	0	0.0	0	0.0	-
PV06	SA tracking	SA tracking	0	0.0	0	0.0	-
PV07	SA tracking	SA tracking	0	0.0	0	0.0	-
PV08	SA tracking	SA tracking	0	0.0	0	0.0	-
PV09	SA tracking	SA tracking	0	0.0	0	0.0	-
PV10	SA tracking	SA tracking	0	0.0	0	0.0	-
PV11	SA tracking	SA tracking	0	0.0	0	0.0	-
PV12	SA tracking	SA tracking	0	0.0	0	0.0	-

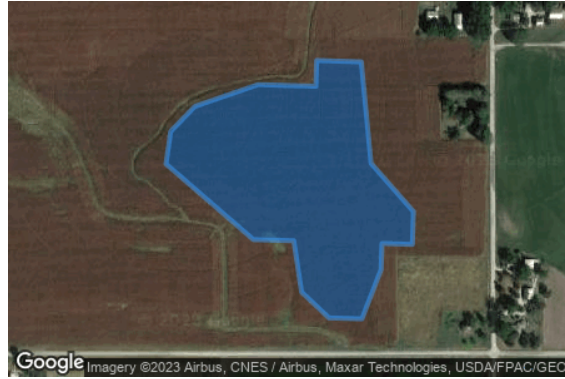
Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	386	6.4	0	0.0

Component Data

PV Arrays

Name: PV01
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 5.0°
Ground Coverage Ratio: 0.3047
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	39.016617	-95.244020	827.27	5.00	832.27
2	39.016272	-95.244034	827.34	5.00	832.34
3	39.015614	-95.244364	823.51	5.00	828.51
4	39.015627	-95.244932	821.48	5.00	826.48
5	39.015970	-95.245402	822.33	5.00	827.33
6	39.016653	-95.245535	823.91	5.00	828.91
7	39.016669	-95.246231	822.15	5.00	827.15
8	39.017674	-95.247731	823.75	5.00	828.75
9	39.018107	-95.247651	824.54	5.00	829.54
10	39.018440	-95.247233	824.88	5.00	829.88
11	39.018730	-95.246146	825.28	5.00	830.28
12	39.018707	-95.245156	826.92	5.00	831.92
13	39.019051	-95.245142	827.25	5.00	832.25
14	39.019033	-95.244375	826.88	5.00	831.88
15	39.017682	-95.244208	828.31	5.00	833.31
16	39.017041	-95.243479	826.85	5.00	831.85
17	39.016604	-95.243497	826.90	5.00	831.90
18	39.016617	-95.244020	827.27	5.00	832.27

Name: PV02

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.022637	-95.240606	827.24	5.00	832.24
2	39.023619	-95.241102	831.26	5.00	836.26
3	39.024337	-95.241748	831.73	5.00	836.73
4	39.027451	-95.241702	833.52	5.00	838.52
5	39.027443	-95.241358	833.25	5.00	838.25
6	39.026778	-95.240021	833.21	5.00	838.21
7	39.025349	-95.237528	832.74	5.00	837.74
8	39.023915	-95.236070	831.64	5.00	836.64
9	39.022901	-95.235270	830.97	5.00	835.97
10	39.022511	-95.235285	830.67	5.00	835.67
11	39.022637	-95.240606	827.24	5.00	832.24

Name: PV03

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.020970	-95.232399	828.58	5.00	833.58
2	39.022939	-95.232321	829.91	5.00	834.91
3	39.023016	-95.233376	830.40	5.00	835.40
4	39.028071	-95.233398	837.06	5.00	842.06
5	39.028025	-95.231478	836.11	5.00	841.11
6	39.027690	-95.231019	835.92	5.00	840.92
7	39.027356	-95.230648	835.63	5.00	840.63
8	39.024956	-95.229098	832.51	5.00	837.51
9	39.023647	-95.227655	832.91	5.00	837.91
10	39.022912	-95.227325	832.64	5.00	837.64
11	39.022855	-95.224925	832.72	5.00	837.72
12	39.022505	-95.224688	832.49	5.00	837.49
13	39.021198	-95.224511	829.69	5.00	834.69
14	39.020782	-95.224527	828.97	5.00	833.97
15	39.020970	-95.232399	828.58	5.00	833.58

Name: PV04

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

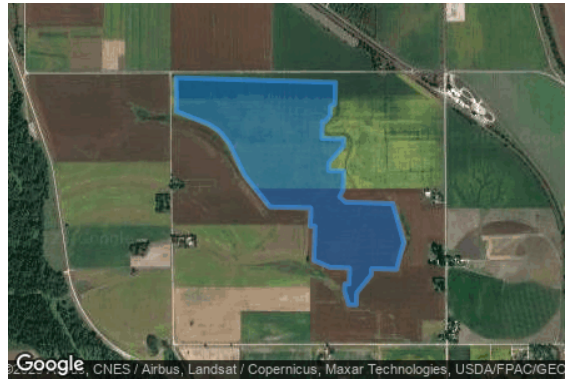
Ground Coverage Ratio: 0.3047

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	39.024855	-95.250222	833.09	5.00	838.09
2	39.024444	-95.250239	833.23	5.00	838.23
3	39.024419	-95.249197	830.59	5.00	835.59
4	39.023410	-95.249236	832.59	5.00	837.59
5	39.023046	-95.249492	832.82	5.00	837.82
6	39.022762	-95.249088	832.86	5.00	837.86
7	39.022684	-95.245828	829.47	5.00	834.47
8	39.020609	-95.245063	831.10	5.00	836.10
9	39.019178	-95.245580	829.11	5.00	834.11
10	39.019218	-95.247289	835.18	5.00	840.18
11	39.018901	-95.247302	832.95	5.00	837.95
12	39.017938	-95.248313	823.82	5.00	828.82
13	39.017295	-95.248338	823.93	5.00	828.93
14	39.017307	-95.248859	823.22	5.00	828.22
15	39.018021	-95.249152	822.86	5.00	827.86
16	39.018402	-95.249137	822.90	5.00	827.90
17	39.018395	-95.248838	823.69	5.00	828.69
18	39.019254	-95.248804	830.79	5.00	835.79
19	39.019286	-95.250151	830.44	5.00	835.44
20	39.019657	-95.251254	829.37	5.00	834.37
21	39.021475	-95.251183	832.52	5.00	837.52
22	39.021482	-95.251502	831.41	5.00	836.41
23	39.022451	-95.251464	832.19	5.00	837.19
24	39.022504	-95.254269	831.83	5.00	836.83
25	39.024200	-95.256028	832.20	5.00	837.20
26	39.025903	-95.257086	832.68	5.00	837.68
27	39.026560	-95.257795	832.52	5.00	837.52
28	39.026906	-95.258482	832.98	5.00	837.98
29	39.027587	-95.260703	832.93	5.00	837.93
30	39.029383	-95.260719	833.48	5.00	838.48
31	39.029124	-95.249763	832.71	5.00	837.71
32	39.027984	-95.249807	831.00	5.00	836.00
33	39.027832	-95.250113	832.78	5.00	837.78
34	39.027373	-95.250130	830.55	5.00	835.55
35	39.027037	-95.250479	831.52	5.00	836.52
36	39.027041	-95.250668	832.31	5.00	837.31
37	39.026155	-95.250702	832.59	5.00	837.59
38	39.026119	-95.249205	831.46	5.00	836.46
39	39.025730	-95.249220	832.28	5.00	837.28
40	39.024855	-95.250222	833.09	5.00	838.09

Name: PV05

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.016786	-95.248659	822.87	5.00	827.87
2	39.016741	-95.246787	821.98	5.00	826.98
3	39.015690	-95.246828	821.44	5.00	826.44
4	39.015738	-95.248858	822.17	5.00	827.17
5	39.016081	-95.248845	824.00	5.00	829.00
6	39.016142	-95.251397	825.17	5.00	830.17
7	39.018354	-95.251386	823.89	5.00	828.89
8	39.018335	-95.250582	821.97	5.00	826.97
9	39.018014	-95.249934	822.04	5.00	827.04
10	39.017662	-95.249387	822.27	5.00	827.27
11	39.016992	-95.249036	822.70	5.00	827.70
12	39.016786	-95.248659	822.87	5.00	827.87

Name: PV06

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.030007	-95.263334	834.21	5.00	839.21
2	39.030060	-95.265595	834.70	5.00	839.70
3	39.032039	-95.265596	833.71	5.00	838.71
4	39.032123	-95.270837	837.01	5.00	842.01
5	39.032549	-95.270820	836.46	5.00	841.46
6	39.032897	-95.270357	836.00	5.00	841.00
7	39.032886	-95.269908	835.65	5.00	840.65
8	39.034499	-95.269846	834.99	5.00	839.99
9	39.034866	-95.270170	835.08	5.00	840.08
10	39.035024	-95.270050	834.75	5.00	839.75
11	39.036582	-95.269990	834.91	5.00	839.91
12	39.036483	-95.265780	833.44	5.00	838.44
13	39.035198	-95.265830	833.71	5.00	838.71
14	39.035188	-95.265399	834.10	5.00	839.10
15	39.036473	-95.265349	833.60	5.00	838.60
16	39.036455	-95.260683	831.17	5.00	836.17
17	39.035445	-95.259724	831.18	5.00	836.18
18	39.033998	-95.257245	831.41	5.00	836.41
19	39.033333	-95.255333	831.35	5.00	836.35
20	39.032961	-95.254726	831.41	5.00	836.41
21	39.031988	-95.254297	831.99	5.00	836.99
22	39.031248	-95.254326	832.17	5.00	837.17
23	39.030942	-95.254113	832.04	5.00	837.04
24	39.029891	-95.254154	832.16	5.00	837.16
25	39.030096	-95.262848	833.81	5.00	838.81
26	39.030007	-95.263334	834.21	5.00	839.21

Name: PV07

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.031558	-95.242714	838.81	5.00	843.81
2	39.030571	-95.243689	837.96	5.00	842.96
3	39.030592	-95.244594	836.50	5.00	841.50
4	39.031620	-95.246453	834.57	5.00	839.57
5	39.031995	-95.246836	834.59	5.00	839.59
6	39.033052	-95.246795	834.88	5.00	839.88
7	39.032954	-95.242660	838.57	5.00	843.57
8	39.031558	-95.242714	838.81	5.00	843.81

Name: PV08

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.021557	-95.262988	831.45	5.00	836.45
2	39.021680	-95.268223	834.25	5.00	839.25
3	39.022699	-95.268430	833.95	5.00	838.95
4	39.023143	-95.267776	831.75	5.00	836.75
5	39.023442	-95.266772	830.87	5.00	835.87
6	39.023359	-95.263218	833.83	5.00	838.83
7	39.022565	-95.263249	831.12	5.00	836.12
8	39.021943	-95.262973	829.67	5.00	834.67
9	39.021557	-95.262988	831.45	5.00	836.45

Name: PV09

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.024804	-95.268873	836.60	5.00	841.60
2	39.024661	-95.262793	835.34	5.00	840.34
3	39.024193	-95.262811	835.96	5.00	840.96
4	39.024253	-95.265346	836.03	5.00	841.03
5	39.024002	-95.265887	833.82	5.00	838.82
6	39.023722	-95.267439	834.10	5.00	839.10
7	39.023392	-95.268209	834.13	5.00	839.13
8	39.023401	-95.268605	835.31	5.00	840.31
9	39.024804	-95.268873	836.60	5.00	841.60

Name: PV10

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.028369	-95.244729	833.73	5.00	838.73
2	39.028353	-95.244049	834.04	5.00	839.04
3	39.027960	-95.242656	834.19	5.00	839.19
4	39.024891	-95.242701	832.14	5.00	837.14
5	39.024497	-95.243036	831.65	5.00	836.65
6	39.023912	-95.244323	831.76	5.00	836.76
7	39.023478	-95.244629	832.44	5.00	837.44
8	39.022767	-95.244657	832.62	5.00	837.62
9	39.021624	-95.243803	833.83	5.00	838.83
10	39.021239	-95.243818	833.96	5.00	838.96
11	39.021257	-95.244565	831.96	5.00	836.96
12	39.021965	-95.245003	829.69	5.00	834.69
13	39.022934	-95.245261	830.93	5.00	835.93
14	39.023255	-95.245522	830.47	5.00	835.47
15	39.023277	-95.246409	830.32	5.00	835.32
16	39.022983	-95.247020	830.37	5.00	835.37
17	39.022992	-95.247391	831.50	5.00	836.50
18	39.023331	-95.247933	830.58	5.00	835.58
19	39.023676	-95.248160	831.46	5.00	836.46
20	39.024496	-95.248322	832.77	5.00	837.77
21	39.024505	-95.248687	832.44	5.00	837.44
22	39.024885	-95.248673	831.91	5.00	836.91
23	39.026203	-95.248167	831.91	5.00	836.91
24	39.026434	-95.248501	831.85	5.00	836.85
25	39.026645	-95.248493	832.12	5.00	837.12
26	39.026669	-95.249502	832.38	5.00	837.38
27	39.027096	-95.249486	830.87	5.00	835.87
28	39.027085	-95.249037	832.39	5.00	837.39
29	39.027817	-95.249008	831.62	5.00	836.62
30	39.027948	-95.249303	831.09	5.00	836.09
31	39.029112	-95.249257	832.39	5.00	837.39
32	39.029086	-95.248163	831.98	5.00	836.98
33	39.028759	-95.247640	832.82	5.00	837.82
34	39.028413	-95.246591	833.21	5.00	838.21
35	39.028369	-95.244729	833.73	5.00	838.73

Name: PV11

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.038168	-95.269953	833.40	5.00	838.40
2	39.043184	-95.269833	835.86	5.00	840.86
3	39.043177	-95.269564	835.34	5.00	840.34
4	39.038793	-95.261850	832.00	5.00	837.00
5	39.038247	-95.261165	832.03	5.00	837.03
6	39.037223	-95.261205	831.48	5.00	836.48
7	39.037319	-95.265281	832.42	5.00	837.42
8	39.037825	-95.267098	833.55	5.00	838.55
9	39.037053	-95.267281	835.22	5.00	840.22
10	39.037117	-95.269994	835.34	5.00	840.34
11	39.038168	-95.269953	833.40	5.00	838.40

Name: PV12

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 5.0°

Ground Coverage Ratio: 0.3047

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	39.024057	-95.258868	834.03	5.00	839.03
2	39.025007	-95.259839	833.58	5.00	838.58
3	39.025060	-95.260735	833.68	5.00	838.68
4	39.026153	-95.260692	833.28	5.00	838.28
5	39.026127	-95.259604	832.51	5.00	837.51
6	39.025111	-95.257671	832.32	5.00	837.32
7	39.022302	-95.254856	831.73	5.00	836.73
8	39.021986	-95.254428	831.49	5.00	836.49
9	39.021974	-95.253945	831.42	5.00	836.42
10	39.021548	-95.253961	832.34	5.00	837.34
11	39.021629	-95.257378	831.18	5.00	836.18
12	39.022740	-95.258652	832.09	5.00	837.09
13	39.023122	-95.258638	835.83	5.00	840.83
14	39.023101	-95.257756	835.08	5.00	840.08
15	39.023978	-95.257722	833.04	5.00	838.04
16	39.024057	-95.258868	834.03	5.00	839.03

Flight Path Receptors

Name: FP 1

Description:

Threshold height: 40 ft

Direction: 19.0°

Glide slope: 3.5°

Pilot view restricted? Yes

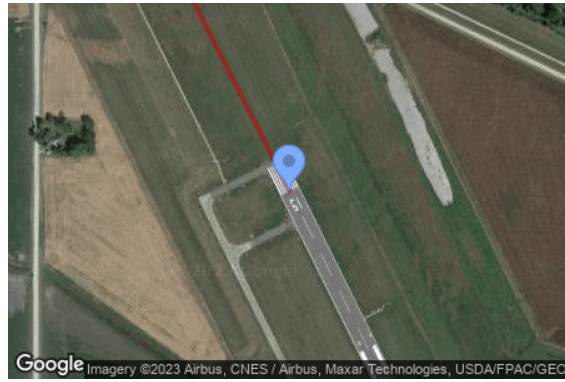
Vertical view: 30.0°

Azimuthal view: 50.0°



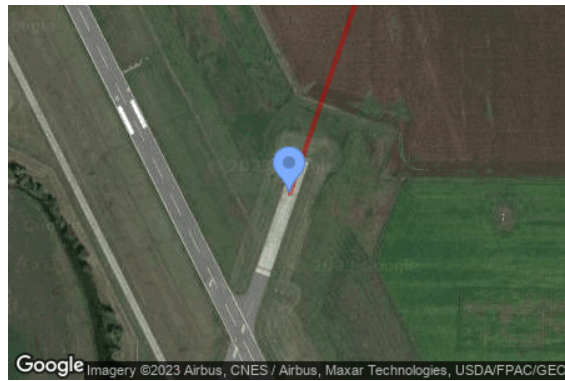
Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	39.005729	-95.219805	832.60	40.00	872.60
Two-mile	38.978391	-95.231932	823.80	694.69	1518.48

Name: FP 15
Description:
Threshold height: 45 ft
Direction: 153.0°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



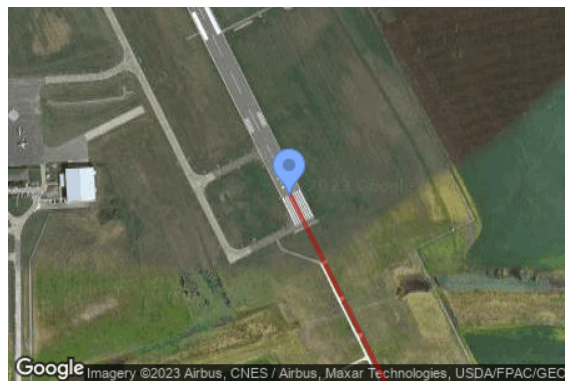
Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	39.018247	-95.219847	830.81	45.00	875.81
Two-mile	39.044008	-95.236762	845.93	583.30	1429.24

Name: FP 19
Description:
Threshold height: 40 ft
Direction: 199.0°
Glide slope: 3.5°
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	39.014962	-95.215689	830.96	40.00	870.96
Two-mile	39.042300	-95.203560	1031.51	485.33	1516.84

Name: FP 33
Description:
Threshold height: 52 ft
Direction: 333.0°
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	39.005068	-95.211436	827.97	52.00	879.97
Two-mile	38.979307	-95.194525	814.27	619.13	1433.39

Glare Analysis Results

Summary of Results Glare with low potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV01	SA tracking	SA tracking	386	6.4	0	0.0	-
PV02	SA tracking	SA tracking	0	0.0	0	0.0	-
PV03	SA tracking	SA tracking	0	0.0	0	0.0	-
PV04	SA tracking	SA tracking	0	0.0	0	0.0	-
PV05	SA tracking	SA tracking	0	0.0	0	0.0	-
PV06	SA tracking	SA tracking	0	0.0	0	0.0	-
PV07	SA tracking	SA tracking	0	0.0	0	0.0	-
PV08	SA tracking	SA tracking	0	0.0	0	0.0	-
PV09	SA tracking	SA tracking	0	0.0	0	0.0	-
PV10	SA tracking	SA tracking	0	0.0	0	0.0	-
PV11	SA tracking	SA tracking	0	0.0	0	0.0	-
PV12	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
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	386	6.4	0	0.0

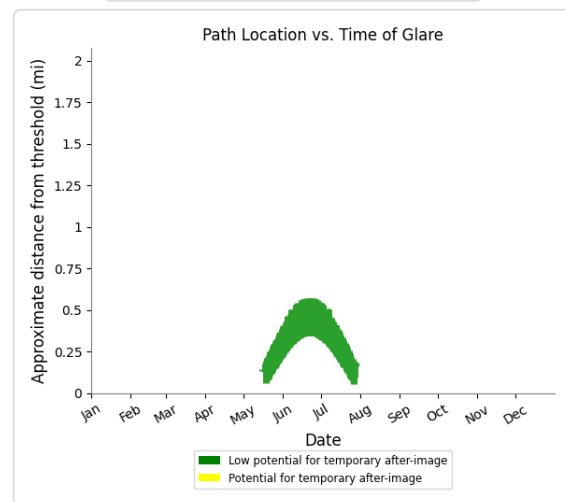
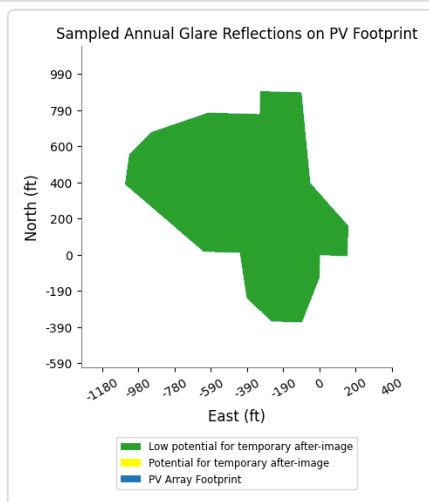
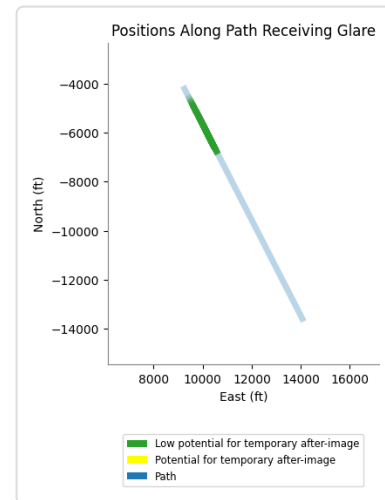
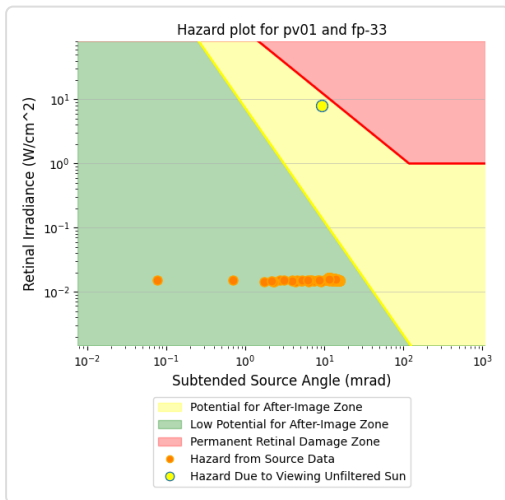
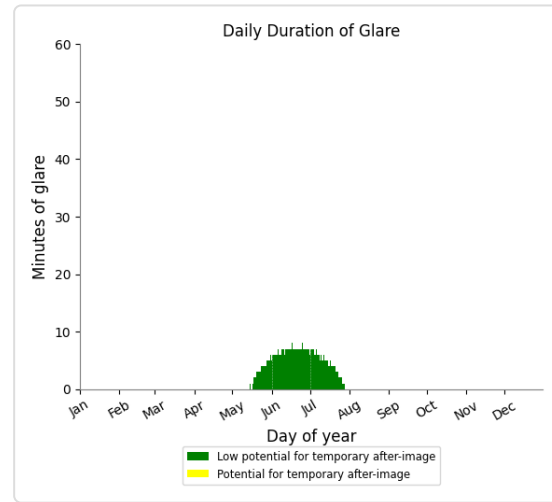
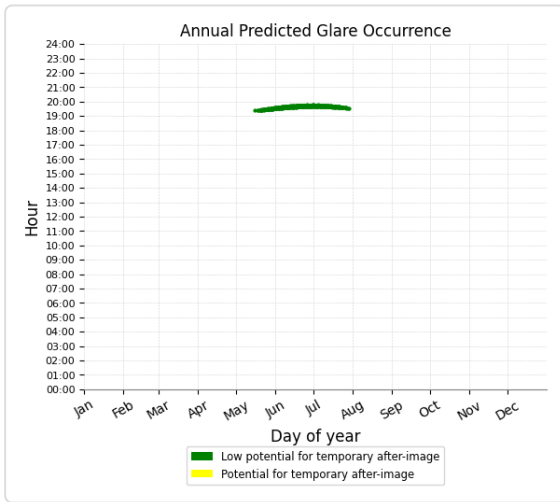
PV: PV01 low potential for temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 33	386	6.4	0	0.0
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0

PV01 and FP: FP 33

Yellow glare: none
Green glare: 386 min.



PV01 and FP: FP 1

No glare found

PV01 and FP: FP 15

No glare found

PV01 and FP: FP 19

No glare found

PV: PV02 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV02 and FP: FP 1

No glare found

PV02 and FP: FP 15

No glare found

PV02 and FP: FP 19

No glare found

PV02 and FP: FP 33

No glare found

PV: PV03 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV03 and FP: FP 1

No glare found

PV03 and FP: FP 15

No glare found

PV03 and FP: FP 19

No glare found

PV03 and FP: FP 33

No glare found

PV: PV04 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV04 and FP: FP 1

No glare found

PV04 and FP: FP 15

No glare found

PV04 and FP: FP 19

No glare found

PV04 and FP: FP 33

No glare found

PV: PV05 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV05 and FP: FP 1

No glare found

PV05 and FP: FP 15

No glare found

PV05 and FP: FP 19

No glare found

PV05 and FP: FP 33

No glare found

PV: PV06 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV06 and FP: FP 1

No glare found

PV06 and FP: FP 15

No glare found

PV06 and FP: FP 19

No glare found

PV06 and FP: FP 33

No glare found

PV: PV07 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV07 and FP: FP 1

No glare found

PV07 and FP: FP 15

No glare found

PV07 and FP: FP 19

No glare found

PV07 and FP: FP 33

No glare found

PV: PV08 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV08 and FP: FP 1

No glare found

PV08 and FP: FP 15

No glare found

PV08 and FP: FP 19

No glare found

PV08 and FP: FP 33

No glare found

PV: PV09 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV09 and FP: FP 1

No glare found

PV09 and FP: FP 15

No glare found

PV09 and FP: FP 19

No glare found

PV09 and FP: FP 33

No glare found

PV: PV10 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV10 and FP: FP 1

No glare found

PV10 and FP: FP 15

No glare found

PV10 and FP: FP 19

No glare found

PV10 and FP: FP 33

No glare found

PV: PV11 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV11 and FP: FP 1

No glare found

PV11 and FP: FP 15

No glare found

PV11 and FP: FP 19

No glare found

PV11 and FP: FP 33

No glare found

PV: PV12 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 1	0	0.0	0	0.0
FP 15	0	0.0	0	0.0
FP 19	0	0.0	0	0.0
FP 33	0	0.0	0	0.0

PV12 and FP: FP 1

No glare found

PV12 and FP: FP 15

No glare found

PV12 and FP: FP 19

No glare found

PV12 and FP: FP 33

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

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