



Glare Hazard Analysis

PCR Lone Tree

Johnson County, Iowa

August 2, 2022

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PCR LONE TREE SOLAR PROJECT GLARE HAZARD ANALYSIS

Executive Summary

Stantec Consulting Services, Inc. (Stantec) utilized the web-based ForgeSolar glare hazard analysis program to analyze the potential for glare from the proposed PCR Lone Tree solar project (Project), a 9.9-megawatt (MW), utility-scale, solar-powered electric generating facility located in Johnson County, Iowa (**Figure 1**). The Project will include photovoltaic (PV) solar panels mounted on a racking system to maximize solar energy capture and electric generation of the array. The Project area will encompass approximately 50 acres in an agricultural area located approximately 2.5 miles northwest of the community of Lone Tree in central Iowa. The ForgeSolar program identifies the three following types of glare (no color indicates no glare predicted):

- GREEN - Low potential for temporary after-image.
- YELLOW - Potential for temporary after-image.
- RED - Potential for permanent eye damage.

Based on the solar array parameters provided and the current site design, glare from the Project is not predicted to impact pilots landing at two airports located within a 10-mile radius of the Project, including the Iowa City VORTAC Airport and the Iowa City Municipal Airport. The results of the ForgeSolar analysis determined that glare from the Project is not predicted to occur for drivers of vehicles on two road segments adjacent to the Project, including Sioux Avenue Southeast and Route 22.

The analysis was completed at two viewing heights for roadways: five feet for cars and small trucks and nine feet for semi-trucks. Glare is not predicted for 6 structures, primarily residences, that were analyzed within proximity to the Project area. All routes and structures were analyzed using 4.5-foot and 9-foot panel heights. The analysis was conducted using the 'shade-slope' methodology, which simulates backtracking of panels at night to return panels to the resting positions, and during the daytime to account for operational measures used to avoid shading effects, as well as tilt caused by the topography of the land.

*****It should be noted that a 'resting angle' of 60 degrees was used for the panels in the analysis. If panels are rotated back to a 0-degree position once they reach their maximum rotation, but before sunset, they will be facing up at sunrise and sunset, which results in a high likelihood of glare (see Figure 2 below). Panels should therefore not be returned to a 0-degree position prior to sunset and should be in place at 60 degrees to the east prior to sunrise.***

**PCR LONE TREE SOLAR PROJECT
GLARE HAZARD ANALYSIS**

Abbreviations

| | |
|------------------|--|
| AGL | above ground level |
| deg | degrees (0 is due north, 180 is due south) |
| DNI | direct normal irradiance |
| FAA | Federal Aviation Administration |
| FP | flight path (landing path from threshold to two miles out) |
| ft | Foot |
| kW | Kilowatt |
| kWh | kilowatt hour |
| m | Meters |
| mi | Mile |
| min | Minutes |
| mrad | Milliradian |
| MW | Megawatt |
| MSL | mean sea level |
| OP | observation point (e.g., control tower, vehicle location) |
| PV | Photovoltaic |
| W/m ² | Watts per square meter |

**PCR LONE TREE SOLAR PROJECT
GLARE HAZARD ANALYSIS**

Glossary

| | |
|------------------------------------|--|
| Eye Focal Length [meter (m)] | Typical distance between the cornea and the retina of the human eye, default is 0.017, though some sources indicate that the typical length is 0.022. |
| Glide Slope [degrees (deg)] | Angle at which the plane approaches the runway during landing (default is 3 deg from horizontal). |
| Maximum Tracking Angle (deg) | Rotation limit of panels in either direction. Full rotation is 2×maximum tracking angle. E.g., maximum tracking angle of 60 deg indicates full panel rotation range of 120 deg. |
| Resting Angle (deg) | Angle modules return to after maximum angle is reached. |
| Observation Point | A specific location, such as a control tower or vehicle, from which an observer might experience glare. |
| Ocular Transmission Coefficient | Related to the ability of the eye to transmit light, set by at 0.5 by ForgeSolar. |
| Offset angle of module (deg) | Additional tilt/elevation angle between the tracking axis and the panel. |
| Orientation of Tracking Axis (deg) | Azimuthal position of tracking axis measured clockwise from true north. Tracking systems in the northern hemisphere are typically oriented near 180 deg. Tracking systems in the southern hemisphere are typically oriented near 0 deg. |
| Peak DNI (W/m ²)** | This value is set at 1,000 by ForgeSolar and is the amount of solar radiation per unit surface area by a surface perpendicular to the sun's rays in a straight line from the direction of the sun at its current position in the sky. |
| Pupil Diameter (m) | Typical pupil diameter for observer, default is 0.002 m. |
| PV Array Axis Tracking | Panel tracking mode, if any. Panel can be set to track along one (single) or two (dual) axis tracking. This parameter affects the positioning of the panels at every time step when the sun is up. |
| PV Array Panel Material | Surface material of panels, including use of anti-reflective coating (ARC). Options include smooth glass without ARC, smooth glass with ARC, light-textured glass without ARC, light-textured glass with ARC, and deeply textured glass. |
| Rated Power (kilowatts) | Power rating of the solar array - used to estimate the energy output per year of the array (optional). |
| Slope Error (mrad) | Accounts for beam scatter of sunlight on the array. Default is 8.43 mrad for smooth glass with anti-reflective coating, but the value may be adjusted based on the panel material type. |
| Subtended Angle of Sun (mrad) | The angle above horizontal at which the viewer observes the sun, default value is 9.3 mrad. |
| Threshold | The physical beginning of the runway. Aircraft are typically expected to be 50 feet above ground at this point. |

**PCR LONE TREE SOLAR PROJECT
GLARE HAZARD ANALYSIS**

| | |
|--------------------------------------|---|
| Time Interval (minutes) | Time step intervals used by the program for analyses. Default is set to analyze for glare at every one-minute interval throughout the year. |
| Time zone | Time zone difference from Greenwich Mean Time at the location of the analysis. |
| Tilt of Tracking Axis (deg) | The elevation angle of the tracking axis upon which panels rotate (e.g., torque tube), measured from flat ground. 0 deg implies the axis is on level, flat ground. Values between 0 and 30 deg are typical. |
| Vary Reflectivity | Varies panel reflectivity with sun position at each time step. |
| Maximum Downward Viewing Angle (deg) | The angle extending downward from the horizon indicating the maximum downward viewing angle from the cockpit. Used to determine whether glare is visible by the pilot along the flight path. Default is 30 degrees. |

Sources:

Ho, Clifford, K., Cianan A. Sims, Julius E. Yellowhair. 2015. Solar Glare Hazard Analysis Tool (SGHAT) User's Manual v. 2H. Sandia National Laboratories.

ForgeSolar – PV Planning & Glare Analysis. <https://www.forgesolar.com/>

** <http://www.3tier.com/en/support/solar-prospecting-tools/what-direct-normal-irradiance-solar-prospecting/>

1.0 INTRODUCTION

On behalf of PCR Lone Tree solar project, Stantec Consulting Services Inc. utilized the web-based ForgeSolar glare hazard analysis program to complete a glare analysis for the Project to determine the potential effect of glint and/or glare (glare) from the photovoltaic (PV) solar panels on pilots and airport operations, residents in the area, and drivers in the vicinity of the Project Area. The Project is approximately 2.5 miles northwest of the community of Lone Tree in Johnson County, central Iowa (**Figure 1**).

ForgeSolar is an interactive tool that provides a quantified assessment of (1) when and where glare will occur throughout the year for a prescribed solar project and (2) potential effects on the human eye at locations where glare occurs. Glare can occur from the reflection of sunlight on the PV solar panels of utility-scale solar-powered electric generating facilities. While PV solar panels absorb direct sunlight, some reflection can occur when the panels are directed close to horizontal, which mainly occurs during sunset and sunrise when the incidence angle of the panels is highest, as depicted in **Figure 2** below.

ForgeSolar uses an interactive Google map for site location, mapping the proposed PV array(s) and specifying observer locations, vehicular travel routes, and flight paths. Latitude, longitude, and elevation are automatically recorded through the Google interface, providing necessary information for sun position and vector calculations. Additional information regarding the orientation and tilt of the PV solar panels, reflectance, environment, and ocular factors are entered by the user.

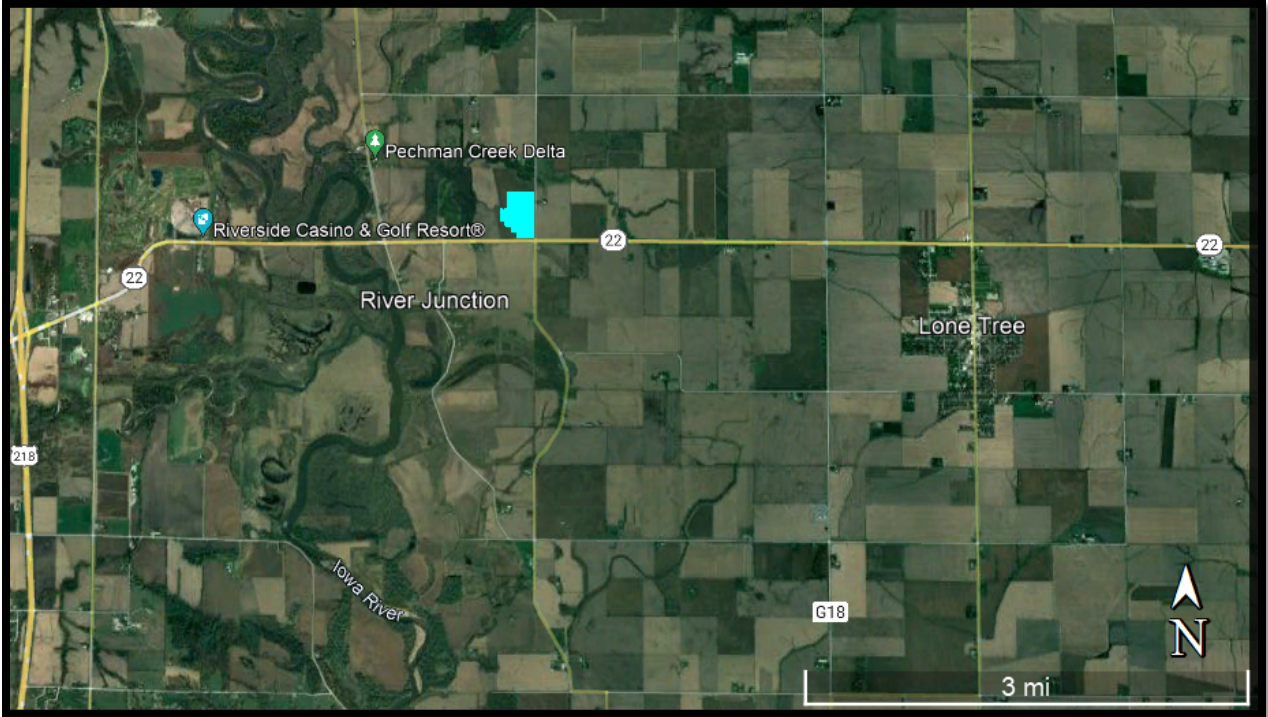
If glare is found, ForgeSolar calculates the retinal irradiance and subtended angle (size/distance) of the glare source to predict potential ocular hazards ranging from temporary after-image to retinal burn. The results are presented in a plot that specifies when glare will occur throughout the year, with color codes indicating the potential ocular hazard.

This study analyzes potential glare for pilots landing on all available approach paths at two airports located within 10 miles of the Project area (**Figure 3**). Glare analyses were also conducted for drivers of vehicles at five feet (ft) above ground level (AGL) for cars and small trucks and nine feet AGL for semi-truck viewing heights on two road segments adjacent to the PV panels (**Figure 4**).

The analysis also included potential glare to viewers at 6 unique structures, primarily residences, in the vicinity of the Project using a 16-ft AGL viewing height which is a conservative viewing height for one- and two-story structures (**Figure 4**). The airports, roadways, and structures were analyzed using 4.5-ft and 9-ft AGL panel heights. The arrays used in the analysis program were drawn to be conservative in the glare analysis by analyzing slightly more area than the panels will occupy.

**PCR LONE TREE SOLAR PROJECT
GLARE HAZARD ANALYSIS**

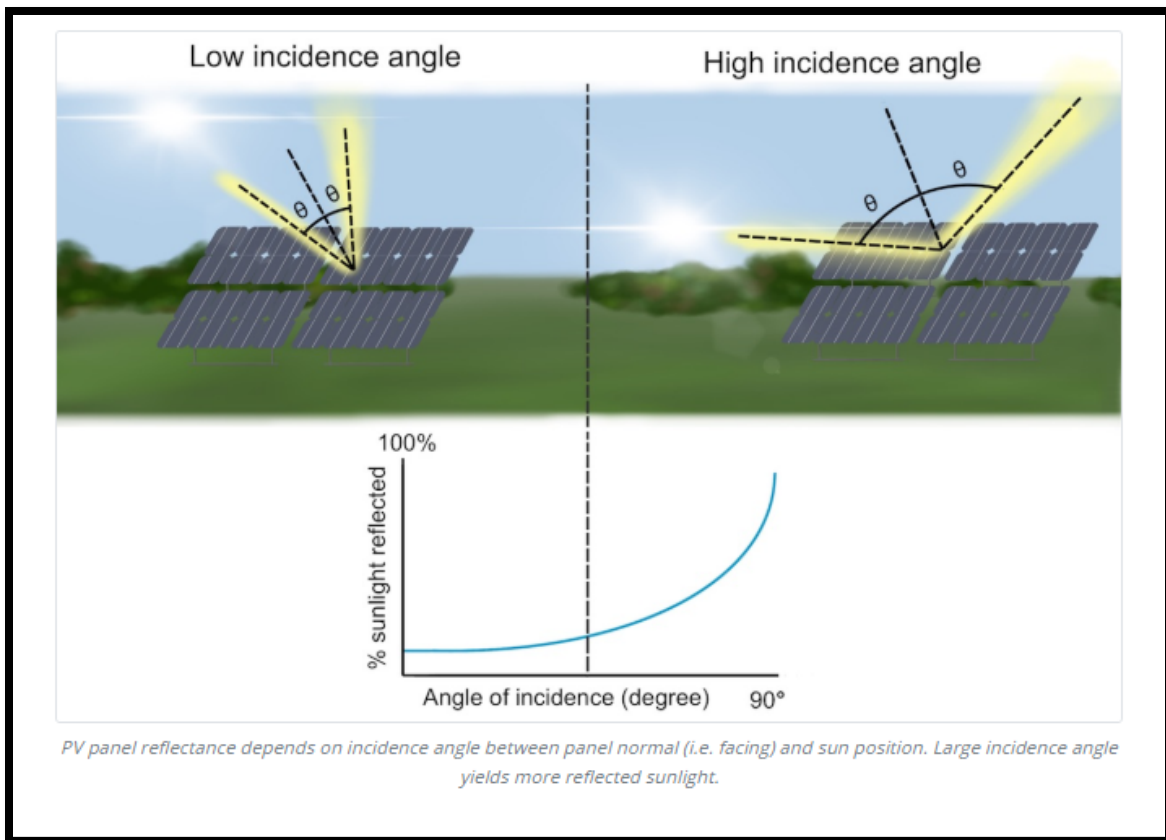
Figure 1. PCR Lone Tree Solar Project Location Map*



*Project location is shown in blue. Source: Google Earth Imagery

PCR LONE TREE SOLAR PROJECT
GLARE HAZARD ANALYSIS

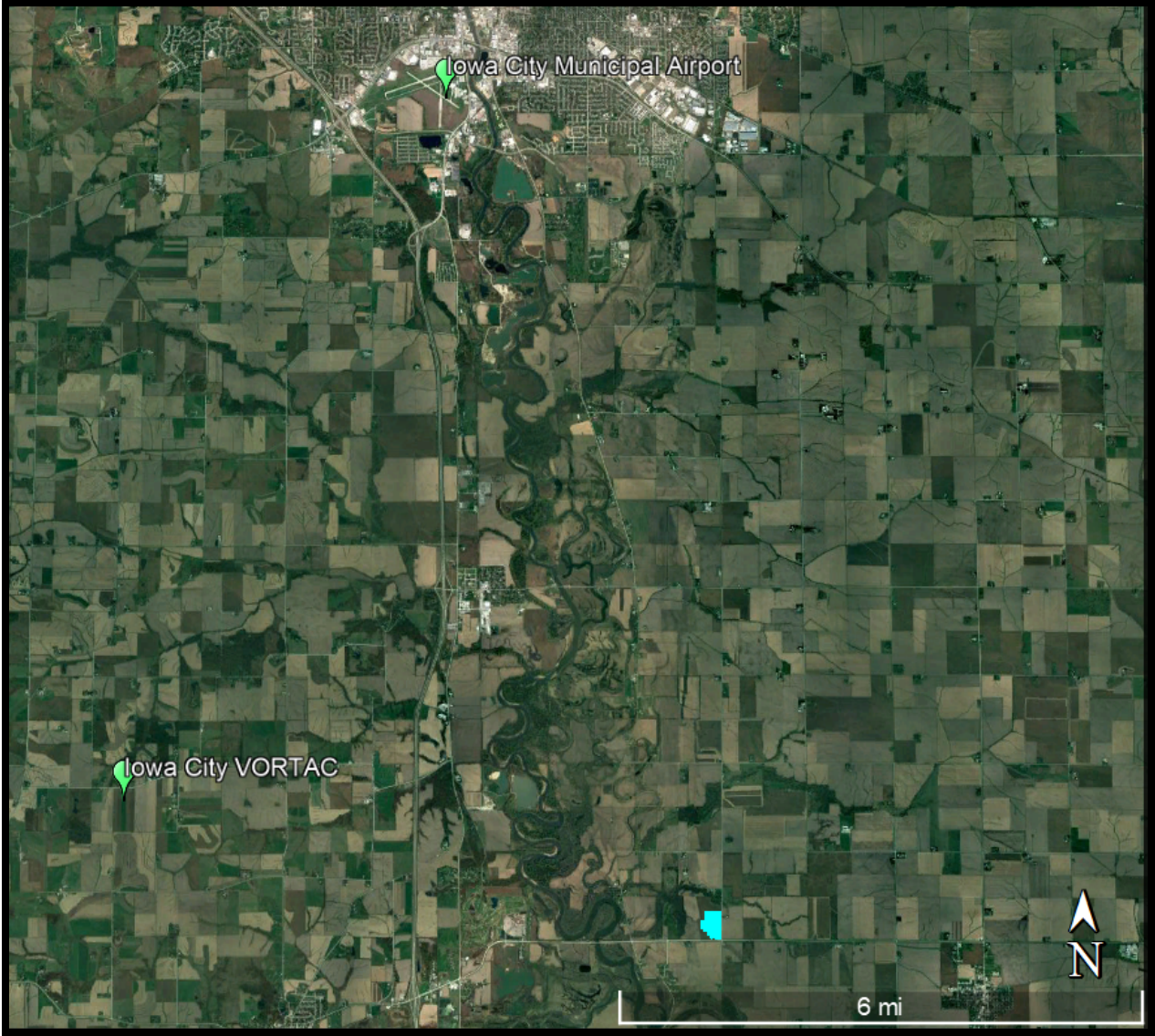
Figure 2. Reflectivity Differences Between Low and High Incidence Angles



Source: ForgeSolar 2022

**PCR LONE TREE SOLAR PROJECT
GLARE HAZARD ANALYSIS**

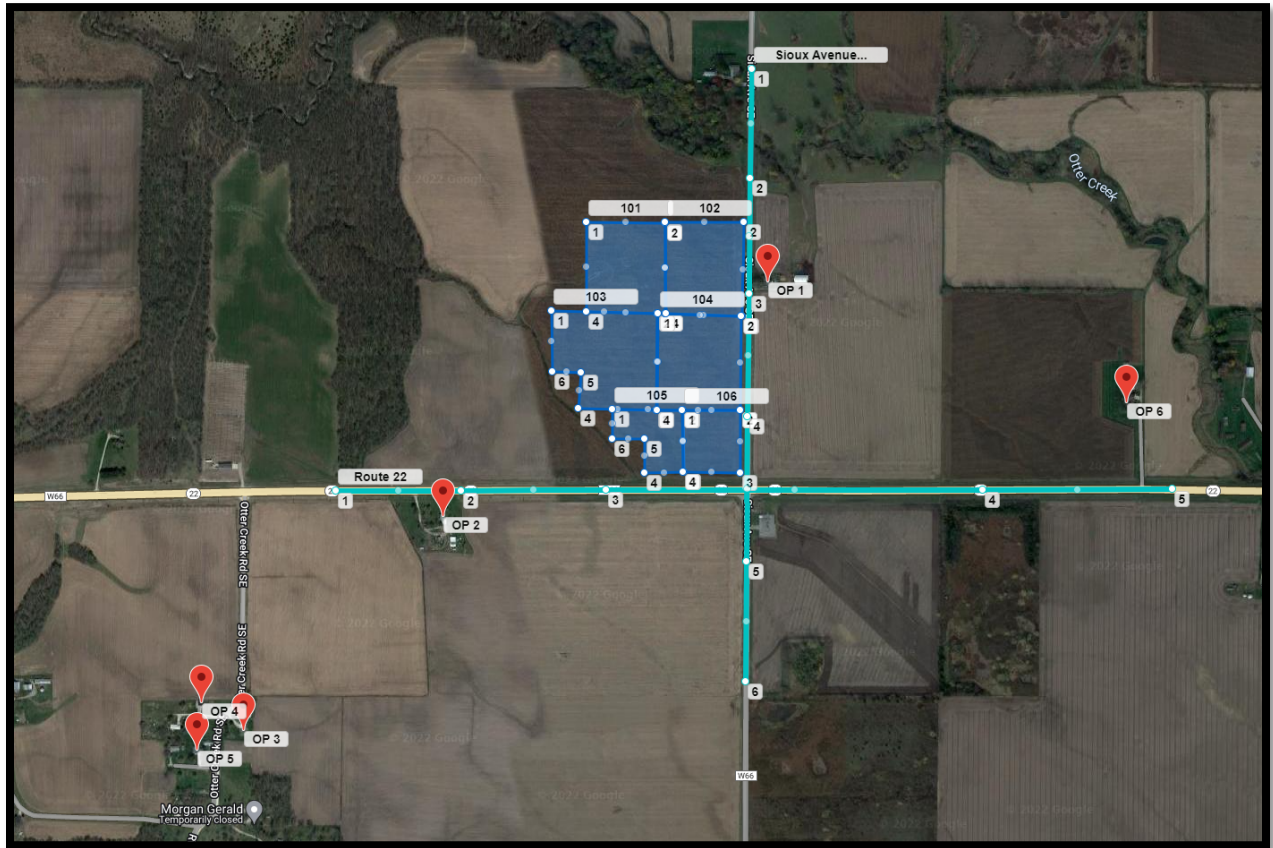
Figure 3. Airports Within Vicinity of the PCR Lone Tree Solar Project*



*Project location is shown in blue. Source: Google Earth Imagery

**PCR LONE TREE SOLAR PROJECT
GLARE HAZARD ANALYSIS**

Figure 4: Analysis Area, Structures, and Roadways*



*Red markers indicate structures, turquoise lines indicate roads, and blue polygons indicate PV arrays. Source: ForgeSolar, Google Earth Imagery

2.0 DATA INPUT SUMMARY

The parameters used for the analyses is listed in **Table 1** below. “Default” indicates the default parameter value set by ForgeSolar and is considered the most conservative value for the parameter. “Chosen” parameters were selected to perform the most conservative analysis concerning glare potential. “Provided” parameters are Project specific information provided by the client.

2.1 SOLAR ARRAY

The location of the solar array and array parameters used for the analyses is based on information provided by PCR Investments SP 2 LLC (**Table 1**). The analyses described below were conducted using 4.5-ft and 9-ft panel heights AGL. A detailed description of each parameter is provided in the Glossary.

Table 1: Solar Panel Parameters Used for Glare Analysis

| Parameter | Value Used | Default, Chosen or Provided? |
|--|---|----------------------------------|
| Axis tracking | Single | Provided |
| Tracking Axis Tilt (deg) | Varies – determined by ForgeSolar | Shade-Slope Analysis Method Used |
| Tracking Axis Orientation (deg) | 180.0 | Provided |
| Tracking Axis Panel Offset (deg) | 0.0 | Default |
| Maximum Tracking Angle (deg) | 60.0 | Provided |
| Resting Angle (deg) | 60.0 | Provided |
| Rated Power (kW) | Not Used | NA |
| Vary reflectivity? | Yes | Default |
| Panel material | Smooth glass with Anti-Reflective Coating | Provided |
| Time zone offset | -6 | Based on site location |
| Subtended angle of sun (mrad) | 9.3 | Default |
| Peak DNI (W/m ²) | 1,000 | Default |
| Ocular transmission coefficient | 0.5 | Default |
| Pupil diameter (m) | 0.002 | Default |
| Eye focal length (m) | 0.017 | Default |
| Time interval (min) | 1 | Default |
| Correlate slope error with surface type? | Yes | Default |
| Slope error (mrad) | 8.43 | Default |

2.2 AIRPORT APPROACH PATHS AND AIR TRAFFIC CONTROL TOWER

Two airports were found to be located within 10 miles of this project, including the Iowa City Municipal Airport and the Iowa City VORTAC Airport. There are no Air Traffic Control Towers (ATCTs) associated with either airport.

2.3 ROADWAYS AND PROPERTIES LOCATED ADJACENT TO THE SOLAR ARRAYS

This analysis included potential glare to vehicles traveling on two road segments in the vicinity of the Project Area. The ForgeSolar program sets the default viewing angle of the array at 50 degrees from the driver's direct line of sight when looking forward. The Federal Aviation Administration (FAA) has determined that glare beyond 50 degrees from the line of sight will not impact the viewer¹.

Potential glare to drivers was evaluated for both passenger vehicles and semi-trucks, where the passenger vehicles were assumed to have a maximum viewing height of five feet AGL, while the viewing height for drivers of semi-trucks was assumed to be a maximum of nine feet AGL. The location of the roadway routes analyzed is shown as blue-green route lines in **Figure 4**.

Analyses for each array block was run twice, once for 5-ft car heights and once for 9-ft truck heights, and once again for each of the two-panel heights (4.5-ft and 9-ft AGL).

Potential glare to viewers from 6 unique structures in the vicinity of the Project was also analyzed at 16-ft AGL viewing heights.

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

3.0 GLARE ANALYSES RESULTS

The web-based ForgeSolar program was used to analyze glare potential in one-minute increments throughout the year. The program identifies the three following types of glare (no color indicates no glare predicted):

- GREEN** - Low potential for temporary after-image.
- YELLOW** - Potential for temporary after-image.
- RED** - Potential for permanent eye damage.

3.1 AIRPORT APPROACH PATHS

Glare is not predicted for pilots approaching any of the airport runways at the airports depicted in **Figure 3**, at any time of the day, any time throughout the year based on the input parameters described above.

3.2 AIR TRAFFIC CONTROL TOWERS

There are no ATCTs associated with either airport included in this analysis and therefore no impacts are predicted to ATCT staff as a result of this Project.

3.3 ROADWAYS AND PROPERTIES LOCATED ADJACENT TO THE SOLAR ARRAYS

Glare is not predicted for drivers along any of the two road segments analyzed that are adjacent to the Project area. The potential for glare for a range of driver conditions was evaluated for viewing heights of five feet for cars and small trucks and nine feet for semi-trucks. Glare is also not predicted for 6 unique structures analyzed at 16-ft viewing heights, as shown in **Figure 4**.

4.0 CONCLUSIONS

Based on the solar array parameters provided, glare is not predicted for planes approaching the Iowa City Municipal Airport or the Iowa City VORTAC Airport (**Figure 3**). Glare is not predicted for drivers of vehicles on either of the roadways adjacent to the Project area, including Sioux Avenue Southeast and Route 22, at viewing heights of five feet for cars and small trucks and nine feet for semi-trucks. Glare is also not predicted for 6 unique structures with 16-ft viewing heights (**Figure 4**). All receptors were analyzed using 4.5-ft and 9-ft AGL panel heights.

APPENDIX A

ForgeSolar Reports

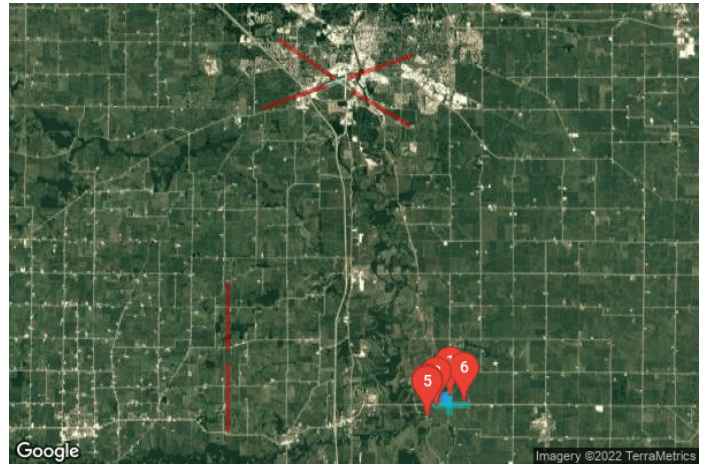


Lone Tree

5ft vehicles 4_5ft panels

Created July 19, 2022
 Updated July 19, 2022
 Time-step 1 minute
 Timezone offset UTC-6
 Site ID 72737.12762

Project type Advanced
 Project status: active
 Category 5 MW to 10 MW



Misc. Analysis Settings

DNI: varies (1,000.0 W/m² peak)
 Ocular transmission coefficient: 0.5
 Pupil diameter: 0.002 m
 Eye focal length: 0.017 m
 Sun subtended angle: 9.3 mrad

Analysis Methodologies:

- Observation point: **Version 2**
- 2-Mile Flight Path: **Version 2**
- Route: **Version 2**

Summary of Results No glare predicted!

| PV Name | Tilt | Orientation | "Green" Glare | "Yellow" Glare | Energy Produced |
|---------|-------------|-------------|---------------|----------------|-----------------|
| | deg | deg | min | min | kWh |
| 101 | SA tracking | SA tracking | 0 | 0 | - |
| 102 | SA tracking | SA tracking | 0 | 0 | - |
| 103 | SA tracking | SA tracking | 0 | 0 | - |
| 104 | SA tracking | SA tracking | 0 | 0 | - |
| 105 | SA tracking | SA tracking | 0 | 0 | - |
| 106 | SA tracking | SA tracking | 0 | 0 | - |

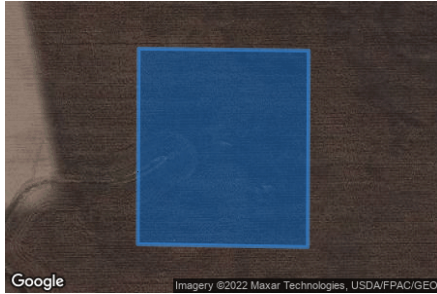
Component Data

PV Array(s)

Total PV footprint area: 37.8 acres

Name: 101
Footprint area: 7.0 acres
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0 deg
Maximum tracking angle: 60.0 deg
Resting angle: 60.0 deg
Ground Coverage Ratio: 0.5
Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.501270 | -91.487308 | 645.40 | 4.50 | 649.90 |
| 2 | 41.501254 | -91.485420 | 649.57 | 4.50 | 654.07 |
| 3 | 41.499631 | -91.485431 | 644.12 | 4.50 | 648.62 |
| 4 | 41.499655 | -91.487319 | 642.11 | 4.50 | 646.61 |



Name: 102
Footprint area: 7.1 acres
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0 deg
Maximum tracking angle: 60.0 deg
Resting angle: 60.0 deg
Ground Coverage Ratio: 0.5
Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.501270 | -91.485431 | 649.53 | 4.50 | 654.03 |
| 2 | 41.501262 | -91.483543 | 651.08 | 4.50 | 655.58 |
| 3 | 41.499575 | -91.483586 | 650.83 | 4.50 | 655.33 |
| 4 | 41.499623 | -91.485409 | 644.12 | 4.50 | 648.62 |



Name: 103

Footprint area: 9.1 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

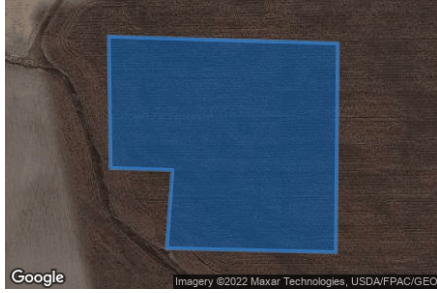
Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.499679 | -91.488156 | 640.90 | 4.50 | 645.40 |
| 2 | 41.499623 | -91.485613 | 643.79 | 4.50 | 648.29 |
| 3 | 41.497887 | -91.485635 | 643.87 | 4.50 | 648.37 |
| 4 | 41.497919 | -91.487512 | 638.25 | 4.50 | 642.75 |
| 5 | 41.498570 | -91.487448 | 643.68 | 4.50 | 648.18 |
| 6 | 41.498586 | -91.488135 | 637.90 | 4.50 | 642.40 |



Name: 104

Footprint area: 7.8 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

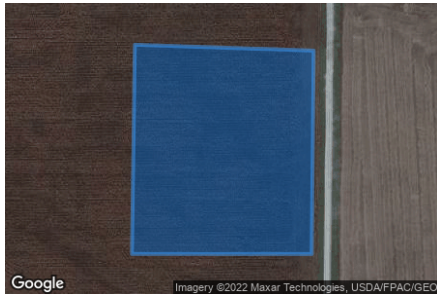
Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.499623 | -91.485592 | 643.80 | 4.50 | 648.30 |
| 2 | 41.499575 | -91.483607 | 650.81 | 4.50 | 655.31 |
| 3 | 41.497895 | -91.483628 | 644.57 | 4.50 | 649.07 |
| 4 | 41.497895 | -91.485624 | 643.83 | 4.50 | 648.33 |



Name: 105

Footprint area: 3.4 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.497911 | -91.486686 | 641.09 | 4.50 | 645.59 |
| 2 | 41.497895 | -91.485002 | 644.80 | 4.50 | 649.30 |
| 3 | 41.496778 | -91.484980 | 648.00 | 4.50 | 652.50 |
| 4 | 41.496762 | -91.485924 | 641.17 | 4.50 | 645.67 |
| 5 | 41.497373 | -91.485924 | 644.88 | 4.50 | 649.38 |
| 6 | 41.497373 | -91.486697 | 639.95 | 4.50 | 644.45 |



Name: 106

Footprint area: 3.5 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.497887 | -91.485012 | 644.75 | 4.50 | 649.25 |
| 2 | 41.497895 | -91.483618 | 644.61 | 4.50 | 649.11 |
| 3 | 41.496770 | -91.483628 | 644.83 | 4.50 | 649.33 |
| 4 | 41.496778 | -91.484991 | 648.08 | 4.50 | 652.58 |



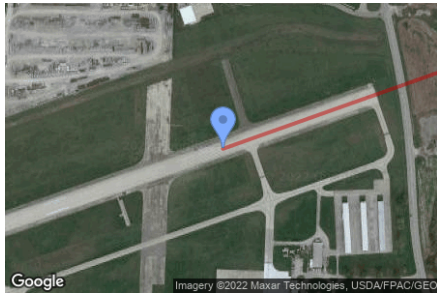
2-Mile Flight Path Receptor(s)

Name: Iowa City Municipal Airport Runway 12
Description:
Threshold height : 50 ft
Direction: 124.9 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg



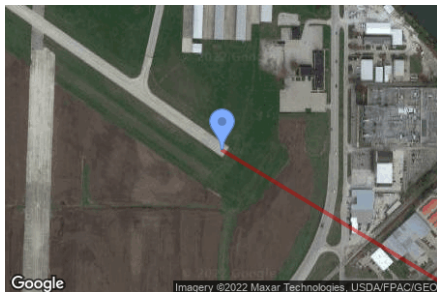
| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.641881 | -91.552672 | 658.27 | 50.00 | 708.27 |
| 2-mile point | 41.658402 | -91.584459 | 734.65 | 527.08 | 1261.73 |

Name: Iowa City Municipal Airport Runway 25
Description:
Threshold height : 50 ft
Direction: 250.5 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg



| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.641981 | -91.543386 | 651.95 | 50.00 | 701.95 |
| 2-mile point | 41.651642 | -91.506878 | 688.37 | 567.03 | 1255.41 |

Name: Iowa City Municipal Airport Runway 30
Description:
Threshold height : 50 ft
Direction: 301.1 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg



| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.635859 | -91.541074 | 645.76 | 50.00 | 695.76 |
| 2-mile point | 41.620912 | -91.507921 | 654.79 | 594.42 | 1249.22 |

Name: Iowa City Municipal Airport Runway 7

Description:

Threshold height : 50 ft

Direction: 70.7 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.638252 | -91.557687 | 679.31 | 50.00 | 729.31 |
| 2-mile point | 41.628682 | -91.594236 | 777.41 | 505.36 | 1282.76 |

Name: Iowa City VORTAC Northbound

Description:

Threshold height : 50 ft

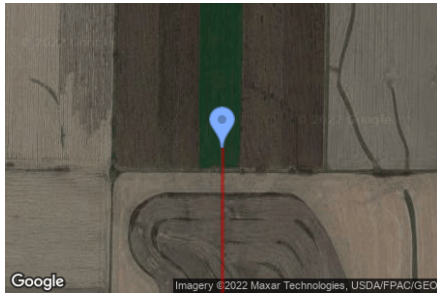
Direction: 0.0 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.514682 | -91.615792 | 755.02 | 50.00 | 805.02 |
| 2-mile point | 41.485769 | -91.615792 | 689.57 | 668.91 | 1358.48 |

Name: Iowa City VORTAC Southbound

Description:

Threshold height : 50 ft

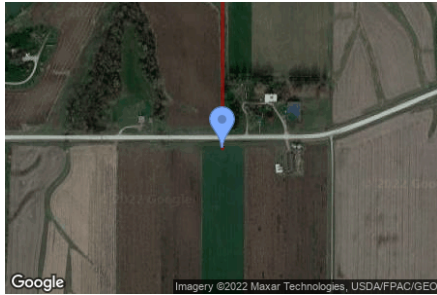
Direction: 180.0 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.521398 | -91.615792 | 759.29 | 50.00 | 809.29 |
| 2-mile point | 41.550310 | -91.615792 | 746.13 | 616.62 | 1362.75 |

Route Receptor(s)

Name: Route 22
Route type: Two-way
View angle: 50.0 deg



| Vertex | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| 1 | 41.496439 | -91.493315 | 645.65 | 5.00 | 650.65 |
| 2 | 41.496447 | -91.490311 | 645.49 | 5.00 | 650.49 |
| 3 | 41.496463 | -91.486846 | 645.02 | 5.00 | 650.02 |
| 4 | 41.496459 | -91.477801 | 652.83 | 5.00 | 657.83 |
| 5 | 41.496471 | -91.473263 | 650.93 | 5.00 | 655.93 |

Name: Sioux Avenue Southeast
Route type: Two-way
View angle: 50.0 deg



| Vertex | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| 1 | 41.504006 | -91.483348 | 653.02 | 5.00 | 658.02 |
| 2 | 41.502052 | -91.483383 | 638.86 | 5.00 | 643.86 |
| 3 | 41.499975 | -91.483420 | 653.91 | 5.00 | 658.91 |
| 4 | 41.497781 | -91.483445 | 645.65 | 5.00 | 650.65 |
| 5 | 41.495169 | -91.483477 | 646.31 | 5.00 | 651.31 |
| 6 | 41.493024 | -91.483488 | 649.06 | 5.00 | 654.06 |

Discrete Observation Receptors

| Number | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total Elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| OP 1 | 41.500190 | -91.482968 | 659.51 | 16.00 | 675.51 |
| OP 2 | 41.495973 | -91.490753 | 649.49 | 16.00 | 665.49 |
| OP 3 | 41.492142 | -91.495540 | 651.72 | 16.00 | 667.72 |
| OP 4 | 41.492636 | -91.496554 | 647.79 | 16.00 | 663.79 |
| OP 5 | 41.491784 | -91.496656 | 660.04 | 16.00 | 676.04 |
| OP 6 | 41.498026 | -91.474356 | 657.90 | 16.00 | 673.90 |

Summary of PV Glare Analysis

PV configuration and total predicted glare

| PV Name | Tilt | Orientation | "Green" Glare | "Yellow" Glare | Energy Produced | Data File |
|---------|-------------|-------------|---------------|----------------|-----------------|-----------|
| | deg | deg | min | min | kWh | |
| 101 | SA tracking | SA tracking | 0 | 0 | - | |
| 102 | SA tracking | SA tracking | 0 | 0 | - | |
| 103 | SA tracking | SA tracking | 0 | 0 | - | |
| 104 | SA tracking | SA tracking | 0 | 0 | - | |
| 105 | SA tracking | SA tracking | 0 | 0 | - | |
| 106 | SA tracking | SA tracking | 0 | 0 | - | |

PV & Receptor Analysis Results

Results for each PV array and receptor

101 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|-------------------|--------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

102 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

103 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

104 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

105 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

106 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|-------------------|--------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

Assumptions

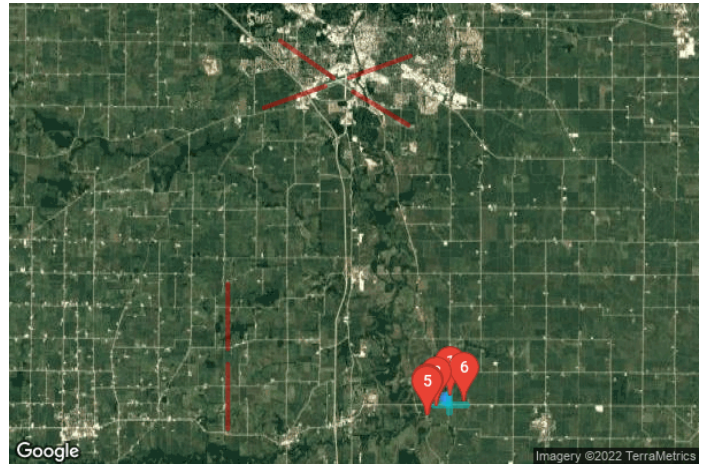
- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.
- 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.
- 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.
- 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.)
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
- Refer to the **Help page** for detailed assumptions and limitations not listed here.

Lone Tree

5ft vehicles 9ft panels 60 rest

Created July 19, 2022
 Updated July 19, 2022
 Time-step 1 minute
 Timezone offset UTC-6
 Site ID 72738.12762

Project type Advanced
 Project status: active
 Category 5 MW to 10 MW



Misc. Analysis Settings

DNI: varies (1,000.0 W/m² peak)
 Ocular transmission coefficient: 0.5
 Pupil diameter: 0.002 m
 Eye focal length: 0.017 m
 Sun subtended angle: 9.3 mrad

Analysis Methodologies:

- Observation point: **Version 2**
- 2-Mile Flight Path: **Version 2**
- Route: **Version 2**

Summary of Results No glare predicted!

| PV Name | Tilt | Orientation | "Green" Glare | "Yellow" Glare | Energy Produced |
|---------|-------------|-------------|---------------|----------------|-----------------|
| | deg | deg | min | min | kWh |
| 101 | SA tracking | SA tracking | 0 | 0 | - |
| 102 | SA tracking | SA tracking | 0 | 0 | - |
| 103 | SA tracking | SA tracking | 0 | 0 | - |
| 104 | SA tracking | SA tracking | 0 | 0 | - |
| 105 | SA tracking | SA tracking | 0 | 0 | - |
| 106 | SA tracking | SA tracking | 0 | 0 | - |

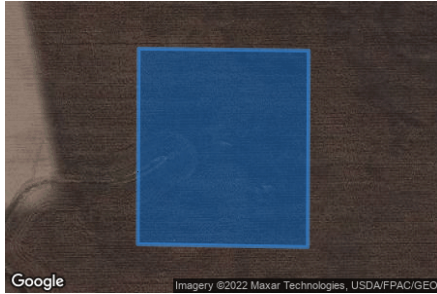
Component Data

PV Array(s)

Total PV footprint area: 37.8 acres

Name: 101
Footprint area: 7.0 acres
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0 deg
Maximum tracking angle: 60.0 deg
Resting angle: 60.0 deg
Ground Coverage Ratio: 0.5
Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.501270 | -91.487308 | 645.40 | 9.00 | 654.40 |
| 2 | 41.501254 | -91.485420 | 649.57 | 9.00 | 658.57 |
| 3 | 41.499631 | -91.485431 | 644.12 | 9.00 | 653.12 |
| 4 | 41.499655 | -91.487319 | 642.11 | 9.00 | 651.11 |



Name: 102
Footprint area: 7.1 acres
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0 deg
Maximum tracking angle: 60.0 deg
Resting angle: 60.0 deg
Ground Coverage Ratio: 0.5
Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.501270 | -91.485431 | 649.53 | 9.00 | 658.53 |
| 2 | 41.501262 | -91.483543 | 651.08 | 9.00 | 660.08 |
| 3 | 41.499575 | -91.483586 | 650.83 | 9.00 | 659.83 |
| 4 | 41.499623 | -91.485409 | 644.12 | 9.00 | 653.12 |



Name: 103

Footprint area: 9.1 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

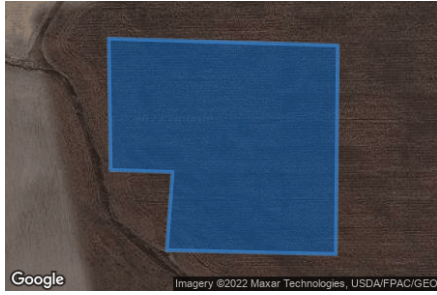
Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.499679 | -91.488156 | 640.90 | 9.00 | 649.90 |
| 2 | 41.499623 | -91.485613 | 643.79 | 9.00 | 652.79 |
| 3 | 41.497887 | -91.485635 | 643.87 | 9.00 | 652.87 |
| 4 | 41.497919 | -91.487512 | 638.25 | 9.00 | 647.25 |
| 5 | 41.498570 | -91.487448 | 643.68 | 9.00 | 652.68 |
| 6 | 41.498586 | -91.488135 | 637.90 | 9.00 | 646.90 |



Name: 104

Footprint area: 7.8 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

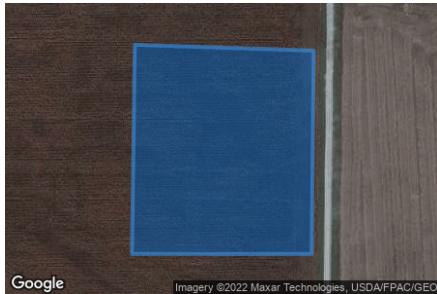
Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.499623 | -91.485592 | 643.80 | 9.00 | 652.80 |
| 2 | 41.499575 | -91.483607 | 650.81 | 9.00 | 659.81 |
| 3 | 41.497895 | -91.483628 | 644.57 | 9.00 | 653.57 |
| 4 | 41.497895 | -91.485624 | 643.83 | 9.00 | 652.83 |



Name: 105

Footprint area: 3.4 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.497911 | -91.486686 | 641.09 | 9.00 | 650.09 |
| 2 | 41.497895 | -91.485002 | 644.80 | 9.00 | 653.80 |
| 3 | 41.496778 | -91.484980 | 648.00 | 9.00 | 657.00 |
| 4 | 41.496762 | -91.485924 | 641.17 | 9.00 | 650.17 |
| 5 | 41.497373 | -91.485924 | 644.88 | 9.00 | 653.88 |
| 6 | 41.497373 | -91.486697 | 639.95 | 9.00 | 648.95 |



Name: 106

Footprint area: 3.5 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.497887 | -91.485012 | 644.75 | 9.00 | 653.76 |
| 2 | 41.497895 | -91.483618 | 644.61 | 9.00 | 653.61 |
| 3 | 41.496770 | -91.483628 | 644.83 | 9.00 | 653.83 |
| 4 | 41.496778 | -91.484991 | 648.08 | 9.00 | 657.08 |



2-Mile Flight Path Receptor(s)

Name: Iowa City Municipal Airport Runway 12

Description:

Threshold height : 50 ft

Direction: 124.9 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.641881 | -91.552672 | 658.27 | 50.00 | 708.27 |
| 2-mile point | 41.658402 | -91.584459 | 734.65 | 527.08 | 1261.73 |

Name: Iowa City Municipal Airport Runway 25

Description:

Threshold height : 50 ft

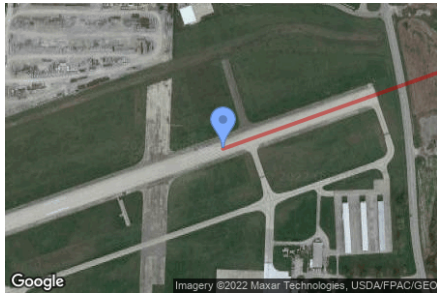
Direction: 250.5 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.641981 | -91.543386 | 651.95 | 50.00 | 701.95 |
| 2-mile point | 41.651642 | -91.506878 | 688.37 | 567.03 | 1255.41 |

Name: Iowa City Municipal Airport Runway 30

Description:

Threshold height : 50 ft

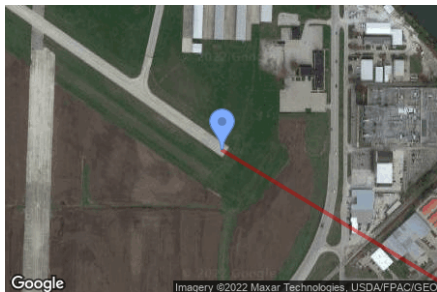
Direction: 301.1 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.635859 | -91.541074 | 645.76 | 50.00 | 695.76 |
| 2-mile point | 41.620912 | -91.507921 | 654.79 | 594.42 | 1249.22 |

Name: Iowa City Municipal Airport Runway 7

Description:

Threshold height : 50 ft

Direction: 70.7 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.638252 | -91.557687 | 679.31 | 50.00 | 729.31 |
| 2-mile point | 41.628682 | -91.594236 | 777.41 | 505.36 | 1282.76 |

Name: Iowa City VORTAC Northbound

Description:

Threshold height : 50 ft

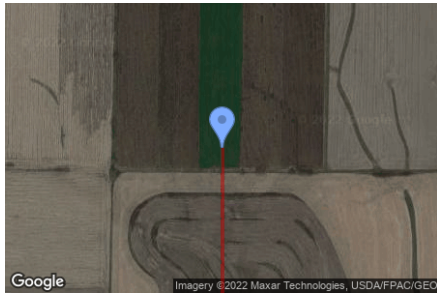
Direction: 0.0 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.514682 | -91.615792 | 755.02 | 50.00 | 805.02 |
| 2-mile point | 41.485769 | -91.615792 | 689.57 | 668.91 | 1358.48 |

Name: Iowa City VORTAC Southbound

Description:

Threshold height : 50 ft

Direction: 180.0 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.521398 | -91.615792 | 759.29 | 50.00 | 809.29 |
| 2-mile point | 41.550310 | -91.615792 | 746.13 | 616.62 | 1362.75 |

Route Receptor(s)

Name: Route 22
Route type: Two-way
View angle: 50.0 deg



| Vertex | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| 1 | 41.496439 | -91.493315 | 645.65 | 5.00 | 650.65 |
| 2 | 41.496447 | -91.490311 | 645.49 | 5.00 | 650.49 |
| 3 | 41.496463 | -91.486846 | 645.02 | 5.00 | 650.02 |
| 4 | 41.496459 | -91.477801 | 652.83 | 5.00 | 657.83 |
| 5 | 41.496471 | -91.473263 | 650.93 | 5.00 | 655.93 |

Name: Sioux Avenue Southeast
Route type: Two-way
View angle: 50.0 deg



| Vertex | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| 1 | 41.504006 | -91.483348 | 653.02 | 5.00 | 658.02 |
| 2 | 41.502052 | -91.483383 | 638.86 | 5.00 | 643.86 |
| 3 | 41.499975 | -91.483420 | 653.91 | 5.00 | 658.91 |
| 4 | 41.497781 | -91.483445 | 645.65 | 5.00 | 650.65 |
| 5 | 41.495169 | -91.483477 | 646.31 | 5.00 | 651.31 |
| 6 | 41.493024 | -91.483488 | 649.06 | 5.00 | 654.06 |

Discrete Observation Receptors

| Number | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total Elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| OP 1 | 41.500190 | -91.482968 | 659.51 | 16.00 | 675.51 |
| OP 2 | 41.495973 | -91.490753 | 649.49 | 16.00 | 665.49 |
| OP 3 | 41.492142 | -91.495540 | 651.72 | 16.00 | 667.72 |
| OP 4 | 41.492636 | -91.496554 | 647.79 | 16.00 | 663.79 |
| OP 5 | 41.491784 | -91.496656 | 660.04 | 16.00 | 676.04 |
| OP 6 | 41.498026 | -91.474356 | 657.90 | 16.00 | 673.90 |

Summary of PV Glare Analysis

PV configuration and total predicted glare

| PV Name | Tilt | Orientation | "Green" Glare | "Yellow" Glare | Energy Produced | Data File |
|---------|-------------|-------------|---------------|----------------|-----------------|-----------|
| | deg | deg | min | min | kWh | |
| 101 | SA tracking | SA tracking | 0 | 0 | - | |
| 102 | SA tracking | SA tracking | 0 | 0 | - | |
| 103 | SA tracking | SA tracking | 0 | 0 | - | |
| 104 | SA tracking | SA tracking | 0 | 0 | - | |
| 105 | SA tracking | SA tracking | 0 | 0 | - | |
| 106 | SA tracking | SA tracking | 0 | 0 | - | |

PV & Receptor Analysis Results

Results for each PV array and receptor

101 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|-------------------|--------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

102 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

103 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

104 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

105 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

106 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|-------------------|--------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.
- 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.
- 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.
- 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.)
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
- Refer to the **Help page** for detailed assumptions and limitations not listed here.

Lone Tree

9ft vehicles 4_5ft panels

Created July 18, 2022
 Updated July 19, 2022
 Time-step 1 minute
 Timezone offset UTC-6
 Site ID 72597.12762

Project type Advanced
 Project status: active
 Category 5 MW to 10 MW



Misc. Analysis Settings

DNI: varies (1,000.0 W/m² peak)
 Ocular transmission coefficient: 0.5
 Pupil diameter: 0.002 m
 Eye focal length: 0.017 m
 Sun subtended angle: 9.3 mrad

Analysis Methodologies:

- Observation point: **Version 2**
- 2-Mile Flight Path: **Version 2**
- Route: **Version 2**

Summary of Results No glare predicted!

| PV Name | Tilt | Orientation | "Green" Glare | "Yellow" Glare | Energy Produced |
|---------|-------------|-------------|---------------|----------------|-----------------|
| | deg | deg | min | min | kWh |
| 101 | SA tracking | SA tracking | 0 | 0 | - |
| 102 | SA tracking | SA tracking | 0 | 0 | - |
| 103 | SA tracking | SA tracking | 0 | 0 | - |
| 104 | SA tracking | SA tracking | 0 | 0 | - |
| 105 | SA tracking | SA tracking | 0 | 0 | - |
| 106 | SA tracking | SA tracking | 0 | 0 | - |

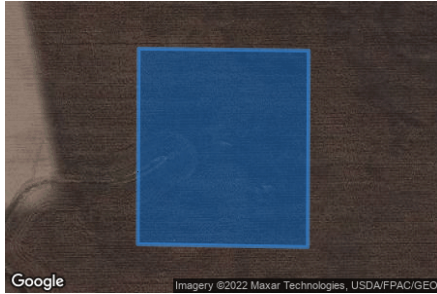
Component Data

PV Array(s)

Total PV footprint area: 37.8 acres

Name: 101
Footprint area: 7.0 acres
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0 deg
Maximum tracking angle: 60.0 deg
Resting angle: 60.0 deg
Ground Coverage Ratio: 0.5
Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.501270 | -91.487308 | 645.40 | 4.50 | 649.90 |
| 2 | 41.501254 | -91.485420 | 649.57 | 4.50 | 654.07 |
| 3 | 41.499631 | -91.485431 | 644.12 | 4.50 | 648.62 |
| 4 | 41.499655 | -91.487319 | 642.11 | 4.50 | 646.61 |



Name: 102
Footprint area: 7.1 acres
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0 deg
Maximum tracking angle: 60.0 deg
Resting angle: 60.0 deg
Ground Coverage Ratio: 0.5
Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.501270 | -91.485431 | 649.53 | 4.50 | 654.03 |
| 2 | 41.501262 | -91.483543 | 651.08 | 4.50 | 655.58 |
| 3 | 41.499575 | -91.483586 | 650.83 | 4.50 | 655.33 |
| 4 | 41.499623 | -91.485409 | 644.12 | 4.50 | 648.62 |



Name: 103

Footprint area: 9.1 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

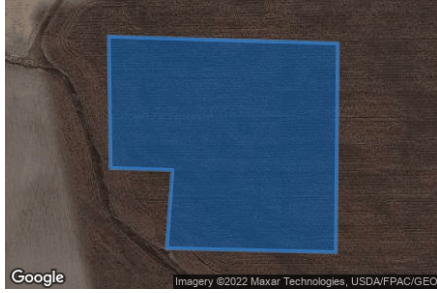
Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.499679 | -91.488156 | 640.90 | 4.50 | 645.40 |
| 2 | 41.499623 | -91.485613 | 643.79 | 4.50 | 648.29 |
| 3 | 41.497887 | -91.485635 | 643.87 | 4.50 | 648.37 |
| 4 | 41.497919 | -91.487512 | 638.25 | 4.50 | 642.75 |
| 5 | 41.498570 | -91.487448 | 643.68 | 4.50 | 648.18 |
| 6 | 41.498586 | -91.488135 | 637.90 | 4.50 | 642.40 |



Name: 104

Footprint area: 7.8 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

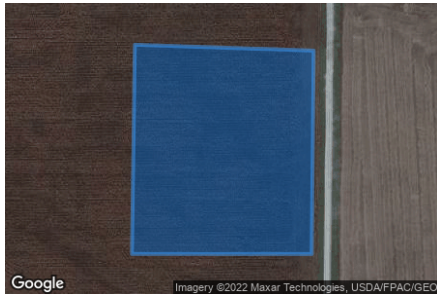
Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.499623 | -91.485592 | 643.80 | 4.50 | 648.30 |
| 2 | 41.499575 | -91.483607 | 650.81 | 4.50 | 655.31 |
| 3 | 41.497895 | -91.483628 | 644.57 | 4.50 | 649.07 |
| 4 | 41.497895 | -91.485624 | 643.83 | 4.50 | 648.33 |



Name: 105

Footprint area: 3.4 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.497911 | -91.486686 | 641.09 | 4.50 | 645.59 |
| 2 | 41.497895 | -91.485002 | 644.80 | 4.50 | 649.30 |
| 3 | 41.496778 | -91.484980 | 648.00 | 4.50 | 652.50 |
| 4 | 41.496762 | -91.485924 | 641.17 | 4.50 | 645.67 |
| 5 | 41.497373 | -91.485924 | 644.88 | 4.50 | 649.38 |
| 6 | 41.497373 | -91.486697 | 639.95 | 4.50 | 644.45 |



Name: 106

Footprint area: 3.5 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.497887 | -91.485012 | 644.75 | 4.50 | 649.25 |
| 2 | 41.497895 | -91.483618 | 644.61 | 4.50 | 649.11 |
| 3 | 41.496770 | -91.483628 | 644.83 | 4.50 | 649.33 |
| 4 | 41.496778 | -91.484991 | 648.08 | 4.50 | 652.58 |



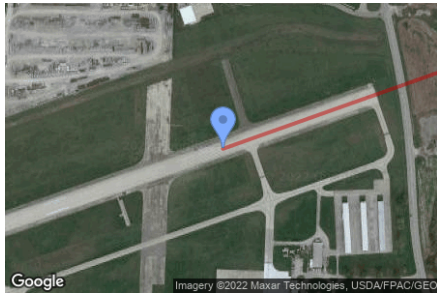
2-Mile Flight Path Receptor(s)

Name: Iowa City Municipal Airport Runway 12
Description:
Threshold height : 50 ft
Direction: 124.9 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg



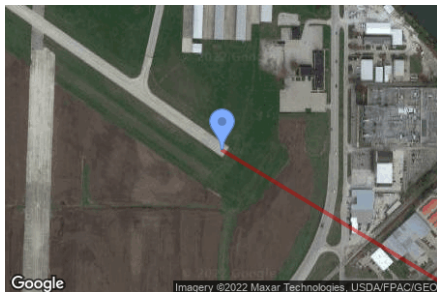
| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.641881 | -91.552672 | 658.27 | 50.00 | 708.27 |
| 2-mile point | 41.658402 | -91.584459 | 734.65 | 527.08 | 1261.73 |

Name: Iowa City Municipal Airport Runway 25
Description:
Threshold height : 50 ft
Direction: 250.5 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg



| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.641981 | -91.543386 | 651.95 | 50.00 | 701.95 |
| 2-mile point | 41.651642 | -91.506878 | 688.37 | 567.03 | 1255.41 |

Name: Iowa City Municipal Airport Runway 30
Description:
Threshold height : 50 ft
Direction: 301.1 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg



| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.635859 | -91.541074 | 645.76 | 50.00 | 695.76 |
| 2-mile point | 41.620912 | -91.507921 | 654.79 | 594.42 | 1249.22 |

Name: Iowa City Municipal Airport Runway 7

Description:

Threshold height : 50 ft

Direction: 70.7 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.638252 | -91.557687 | 679.31 | 50.00 | 729.31 |
| 2-mile point | 41.628682 | -91.594236 | 777.41 | 505.36 | 1282.76 |

Name: Iowa City VORTAC Northbound

Description:

Threshold height : 50 ft

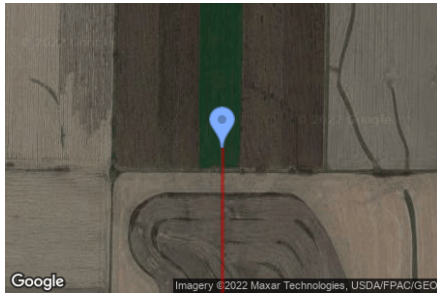
Direction: 0.0 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.514682 | -91.615792 | 755.02 | 50.00 | 805.02 |
| 2-mile point | 41.485769 | -91.615792 | 689.57 | 668.91 | 1358.48 |

Name: Iowa City VORTAC Southbound

Description:

Threshold height : 50 ft

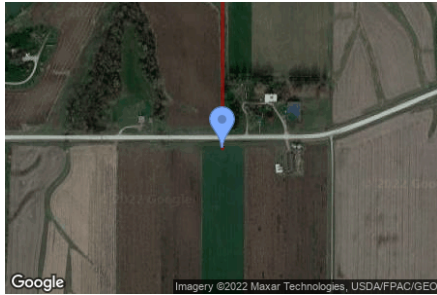
Direction: 180.0 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.521398 | -91.615792 | 759.29 | 50.00 | 809.29 |
| 2-mile point | 41.550310 | -91.615792 | 746.13 | 616.62 | 1362.75 |

Route Receptor(s)

Name: Route 22
Route type: Two-way
View angle: 50.0 deg



| Vertex | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| 1 | 41.496439 | -91.493315 | 645.65 | 9.00 | 654.65 |
| 2 | 41.496447 | -91.490311 | 645.49 | 9.00 | 654.49 |
| 3 | 41.496463 | -91.486846 | 645.02 | 9.00 | 654.02 |
| 4 | 41.496459 | -91.477801 | 652.83 | 9.00 | 661.83 |
| 5 | 41.496471 | -91.473263 | 650.93 | 9.00 | 659.93 |

Name: Sioux Avenue Southeast
Route type: Two-way
View angle: 50.0 deg



| Vertex | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| 1 | 41.504006 | -91.483348 | 653.02 | 9.00 | 662.02 |
| 2 | 41.502052 | -91.483383 | 638.86 | 9.00 | 647.86 |
| 3 | 41.499975 | -91.483420 | 653.91 | 9.00 | 662.91 |
| 4 | 41.497781 | -91.483445 | 645.65 | 9.00 | 654.65 |
| 5 | 41.495169 | -91.483477 | 646.31 | 9.00 | 655.31 |
| 6 | 41.493024 | -91.483488 | 649.06 | 9.00 | 658.06 |

Discrete Observation Receptors

| Number | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total Elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| OP 1 | 41.500190 | -91.482968 | 659.51 | 16.00 | 675.51 |
| OP 2 | 41.495973 | -91.490753 | 649.49 | 16.00 | 665.49 |
| OP 3 | 41.492142 | -91.495540 | 651.72 | 16.00 | 667.72 |
| OP 4 | 41.492636 | -91.496554 | 647.79 | 16.00 | 663.79 |
| OP 5 | 41.491784 | -91.496656 | 660.04 | 16.00 | 676.04 |
| OP 6 | 41.498026 | -91.474356 | 657.90 | 16.00 | 673.90 |

Summary of PV Glare Analysis

PV configuration and total predicted glare

| PV Name | Tilt | Orientation | "Green" Glare | "Yellow" Glare | Energy Produced | Data File |
|---------|-------------|-------------|---------------|----------------|-----------------|-----------|
| | deg | deg | min | min | kWh | |
| 101 | SA tracking | SA tracking | 0 | 0 | - | |
| 102 | SA tracking | SA tracking | 0 | 0 | - | |
| 103 | SA tracking | SA tracking | 0 | 0 | - | |
| 104 | SA tracking | SA tracking | 0 | 0 | - | |
| 105 | SA tracking | SA tracking | 0 | 0 | - | |
| 106 | SA tracking | SA tracking | 0 | 0 | - | |

PV & Receptor Analysis Results

Results for each PV array and receptor

101 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|-------------------|--------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

102 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

103 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

104 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

105 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

106 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|-------------------|--------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

Assumptions

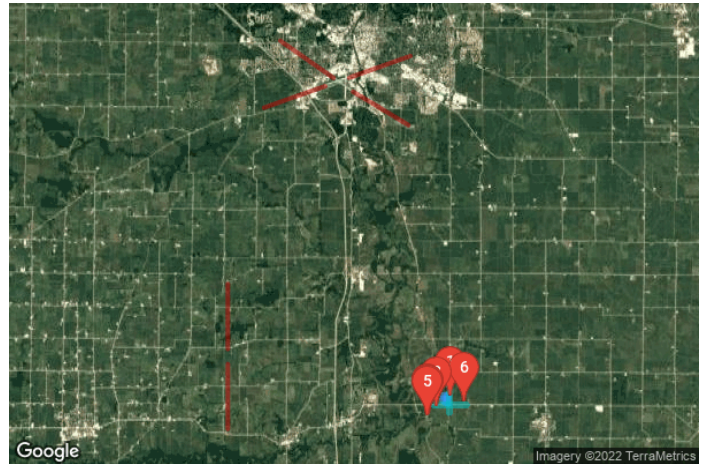
- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.
- 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.
- 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.
- 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.)
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
- Refer to the **Help page** for detailed assumptions and limitations not listed here.

Lone Tree

9ft vehicles 9ft panels 60 rest

Created July 19, 2022
 Updated July 19, 2022
 Time-step 1 minute
 Timezone offset UTC-6
 Site ID 72739.12762

Project type Advanced
 Project status: active
 Category 5 MW to 10 MW



Misc. Analysis Settings

DNI: **varies (1,000.0 W/m² peak)**
 Ocular transmission coefficient: **0.5**
 Pupil diameter: **0.002 m**
 Eye focal length: **0.017 m**
 Sun subtended angle: **9.3 mrad**

Analysis Methodologies:

- Observation point: **Version 2**
- 2-Mile Flight Path: **Version 2**
- Route: **Version 2**

Summary of Results No glare predicted!

| PV Name | Tilt | Orientation | "Green" Glare | "Yellow" Glare | Energy Produced |
|---------|-------------|-------------|---------------|----------------|-----------------|
| | deg | deg | min | min | kWh |
| 101 | SA tracking | SA tracking | 0 | 0 | - |
| 102 | SA tracking | SA tracking | 0 | 0 | - |
| 103 | SA tracking | SA tracking | 0 | 0 | - |
| 104 | SA tracking | SA tracking | 0 | 0 | - |
| 105 | SA tracking | SA tracking | 0 | 0 | - |
| 106 | SA tracking | SA tracking | 0 | 0 | - |

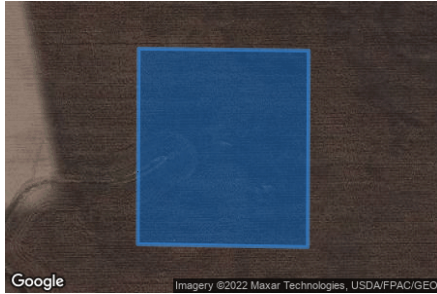
Component Data

PV Array(s)

Total PV footprint area: 37.8 acres

Name: 101
Footprint area: 7.0 acres
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0 deg
Maximum tracking angle: 60.0 deg
Resting angle: 60.0 deg
Ground Coverage Ratio: 0.5
Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.501270 | -91.487308 | 645.40 | 9.00 | 654.40 |
| 2 | 41.501254 | -91.485420 | 649.57 | 9.00 | 658.57 |
| 3 | 41.499631 | -91.485431 | 644.12 | 9.00 | 653.12 |
| 4 | 41.499655 | -91.487319 | 642.11 | 9.00 | 651.11 |



Name: 102
Footprint area: 7.1 acres
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0 deg
Maximum tracking angle: 60.0 deg
Resting angle: 60.0 deg
Ground Coverage Ratio: 0.5
Rated power: -
Panel material: Smooth glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.501270 | -91.485431 | 649.53 | 9.00 | 658.53 |
| 2 | 41.501262 | -91.483543 | 651.08 | 9.00 | 660.08 |
| 3 | 41.499575 | -91.483586 | 650.83 | 9.00 | 659.83 |
| 4 | 41.499623 | -91.485409 | 644.12 | 9.00 | 653.12 |



Name: 103

Footprint area: 9.1 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

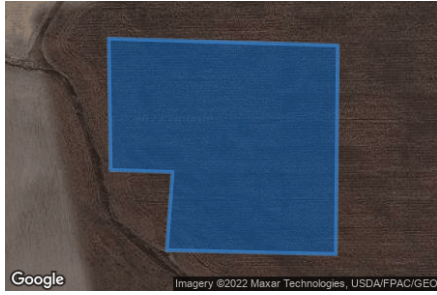
Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.499679 | -91.488156 | 640.90 | 9.00 | 649.90 |
| 2 | 41.499623 | -91.485613 | 643.79 | 9.00 | 652.79 |
| 3 | 41.497887 | -91.485635 | 643.87 | 9.00 | 652.87 |
| 4 | 41.497919 | -91.487512 | 638.25 | 9.00 | 647.25 |
| 5 | 41.498570 | -91.487448 | 643.68 | 9.00 | 652.68 |
| 6 | 41.498586 | -91.488135 | 637.90 | 9.00 | 646.90 |



Name: 104

Footprint area: 7.8 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

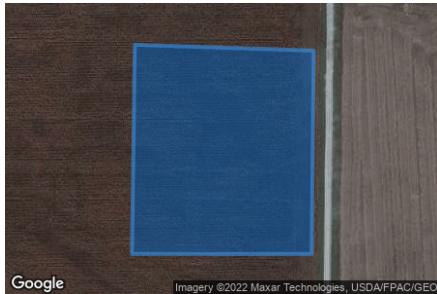
Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.499623 | -91.485592 | 643.80 | 9.00 | 652.80 |
| 2 | 41.499575 | -91.483607 | 650.81 | 9.00 | 659.81 |
| 3 | 41.497895 | -91.483628 | 644.57 | 9.00 | 653.57 |
| 4 | 41.497895 | -91.485624 | 643.83 | 9.00 | 652.83 |



Name: 105

Footprint area: 3.4 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.497911 | -91.486686 | 641.09 | 9.00 | 650.09 |
| 2 | 41.497895 | -91.485002 | 644.80 | 9.00 | 653.80 |
| 3 | 41.496778 | -91.484980 | 648.00 | 9.00 | 657.00 |
| 4 | 41.496762 | -91.485924 | 641.17 | 9.00 | 650.17 |
| 5 | 41.497373 | -91.485924 | 644.88 | 9.00 | 653.88 |
| 6 | 41.497373 | -91.486697 | 639.95 | 9.00 | 648.95 |



Name: 106

Footprint area: 3.5 acres

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0 deg

Maximum tracking angle: 60.0 deg

Resting angle: 60.0 deg

Ground Coverage Ratio: 0.5

Rated power: -

Panel material: Smooth glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 8.43 mrad

| Vertex | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| 1 | 41.497887 | -91.485012 | 644.75 | 9.00 | 653.76 |
| 2 | 41.497895 | -91.483618 | 644.61 | 9.00 | 653.61 |
| 3 | 41.496770 | -91.483628 | 644.83 | 9.00 | 653.83 |
| 4 | 41.496778 | -91.484991 | 648.08 | 9.00 | 657.08 |



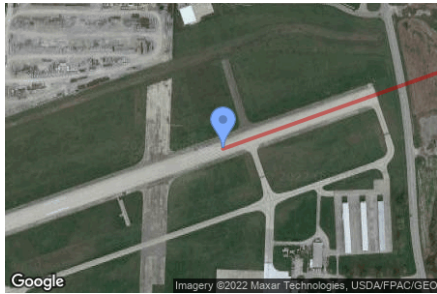
2-Mile Flight Path Receptor(s)

Name: Iowa City Municipal Airport Runway 12
Description:
Threshold height : 50 ft
Direction: 124.9 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg



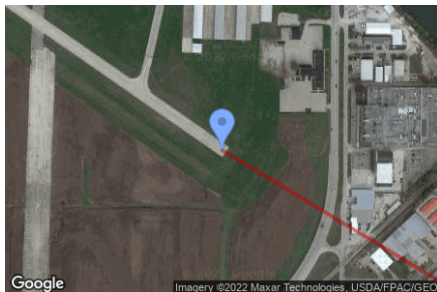
| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.641881 | -91.552672 | 658.27 | 50.00 | 708.27 |
| 2-mile point | 41.658402 | -91.584459 | 734.65 | 527.08 | 1261.73 |

Name: Iowa City Municipal Airport Runway 25
Description:
Threshold height : 50 ft
Direction: 250.5 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg



| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.641981 | -91.543386 | 651.95 | 50.00 | 701.95 |
| 2-mile point | 41.651642 | -91.506878 | 688.37 | 567.03 | 1255.41 |

Name: Iowa City Municipal Airport Runway 30
Description:
Threshold height : 50 ft
Direction: 301.1 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 50.0 deg



| Point | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| Threshold | 41.635859 | -91.541074 | 645.76 | 50.00 | 695.76 |
| 2-mile point | 41.620912 | -91.507921 | 654.79 | 594.42 | 1249.22 |

Name: Iowa City Municipal Airport Runway 7

Description:

Threshold height : 50 ft

Direction: 70.7 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.638252 | -91.557687 | 679.31 | 50.00 | 729.31 |
| 2-mile point | 41.628682 | -91.594236 | 777.41 | 505.36 | 1282.76 |

Name: Iowa City VORTAC Northbound

Description:

Threshold height : 50 ft

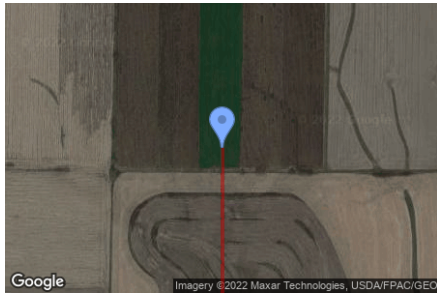
Direction: 0.0 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.514682 | -91.615792 | 755.02 | 50.00 | 805.02 |
| 2-mile point | 41.485769 | -91.615792 | 689.57 | 668.91 | 1358.48 |

Name: Iowa City VORTAC Southbound

Description:

Threshold height : 50 ft

Direction: 180.0 deg

Glide slope: 3.0 deg

Pilot view restricted? Yes

Vertical view restriction: 30.0 deg

Azimuthal view restriction: 50.0 deg



| Point | Latitude | Longitude | Ground elevation | Height above ground | Total elevation |
|--------------|-----------|------------|------------------|---------------------|-----------------|
| | deg | deg | ft | ft | ft |
| Threshold | 41.521398 | -91.615792 | 759.29 | 50.00 | 809.29 |
| 2-mile point | 41.550310 | -91.615792 | 746.13 | 616.62 | 1362.75 |

Route Receptor(s)

Name: Route 22
Route type: Two-way
View angle: 50.0 deg



| Vertex | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| 1 | 41.496439 | -91.493315 | 645.65 | 9.00 | 654.65 |
| 2 | 41.496447 | -91.490311 | 645.49 | 9.00 | 654.49 |
| 3 | 41.496463 | -91.486846 | 645.02 | 9.00 | 654.02 |
| 4 | 41.496459 | -91.477801 | 652.83 | 9.00 | 661.83 |
| 5 | 41.496471 | -91.473263 | 650.93 | 9.00 | 659.93 |

Name: Sioux Avenue Southeast
Route type: Two-way
View angle: 50.0 deg



| Vertex | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| 1 | 41.504006 | -91.483348 | 653.02 | 9.00 | 662.02 |
| 2 | 41.502052 | -91.483383 | 638.86 | 9.00 | 647.86 |
| 3 | 41.499975 | -91.483420 | 653.91 | 9.00 | 662.91 |
| 4 | 41.497781 | -91.483445 | 645.65 | 9.00 | 654.65 |
| 5 | 41.495169 | -91.483477 | 646.31 | 9.00 | 655.31 |
| 6 | 41.493024 | -91.483488 | 649.06 | 9.00 | 658.06 |

Discrete Observation Receptors

| Number | Latitude deg | Longitude deg | Ground elevation ft | Height above ground ft | Total Elevation ft |
|--------|-----------------|------------------|------------------------|---------------------------|-----------------------|
| OP 1 | 41.500190 | -91.482968 | 659.51 | 16.00 | 675.51 |
| OP 2 | 41.495973 | -91.490753 | 649.49 | 16.00 | 665.49 |
| OP 3 | 41.492142 | -91.495540 | 651.72 | 16.00 | 667.72 |
| OP 4 | 41.492636 | -91.496554 | 647.79 | 16.00 | 663.79 |
| OP 5 | 41.491784 | -91.496656 | 660.04 | 16.00 | 676.04 |
| OP 6 | 41.498026 | -91.474356 | 657.90 | 16.00 | 673.90 |

Summary of PV Glare Analysis

PV configuration and total predicted glare

| PV Name | Tilt | Orientation | "Green" Glare | "Yellow" Glare | Energy Produced | Data File |
|---------|-------------|-------------|---------------|----------------|-----------------|-----------|
| | deg | deg | min | min | kWh | |
| 101 | SA tracking | SA tracking | 0 | 0 | - | |
| 102 | SA tracking | SA tracking | 0 | 0 | - | |
| 103 | SA tracking | SA tracking | 0 | 0 | - | |
| 104 | SA tracking | SA tracking | 0 | 0 | - | |
| 105 | SA tracking | SA tracking | 0 | 0 | - | |
| 106 | SA tracking | SA tracking | 0 | 0 | - | |

PV & Receptor Analysis Results

Results for each PV array and receptor

101 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|-------------------|--------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

102 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

103 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

104 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

105 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|--------------------------|---------------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

106 no glare found

| Component | Green glare (min) | Yellow glare (min) |
|---|-------------------|--------------------|
| FP: Iowa City Municipal Airport Runway 12 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 25 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 30 | 0 | 0 |
| FP: Iowa City Municipal Airport Runway 7 | 0 | 0 |
| FP: Iowa City VORTAC Northbound | 0 | 0 |
| FP: Iowa City VORTAC Southbound | 0 | 0 |
| OP: OP 1 | 0 | 0 |
| OP: OP 2 | 0 | 0 |
| OP: OP 3 | 0 | 0 |
| OP: OP 4 | 0 | 0 |
| OP: OP 5 | 0 | 0 |
| OP: OP 6 | 0 | 0 |
| Route: Route 22 | 0 | 0 |
| Route: Sioux Avenue Southeast | 0 | 0 |

No glare found

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.
- 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.
- 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.
- 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.)
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
- Refer to the **Help page** for detailed assumptions and limitations not listed here.