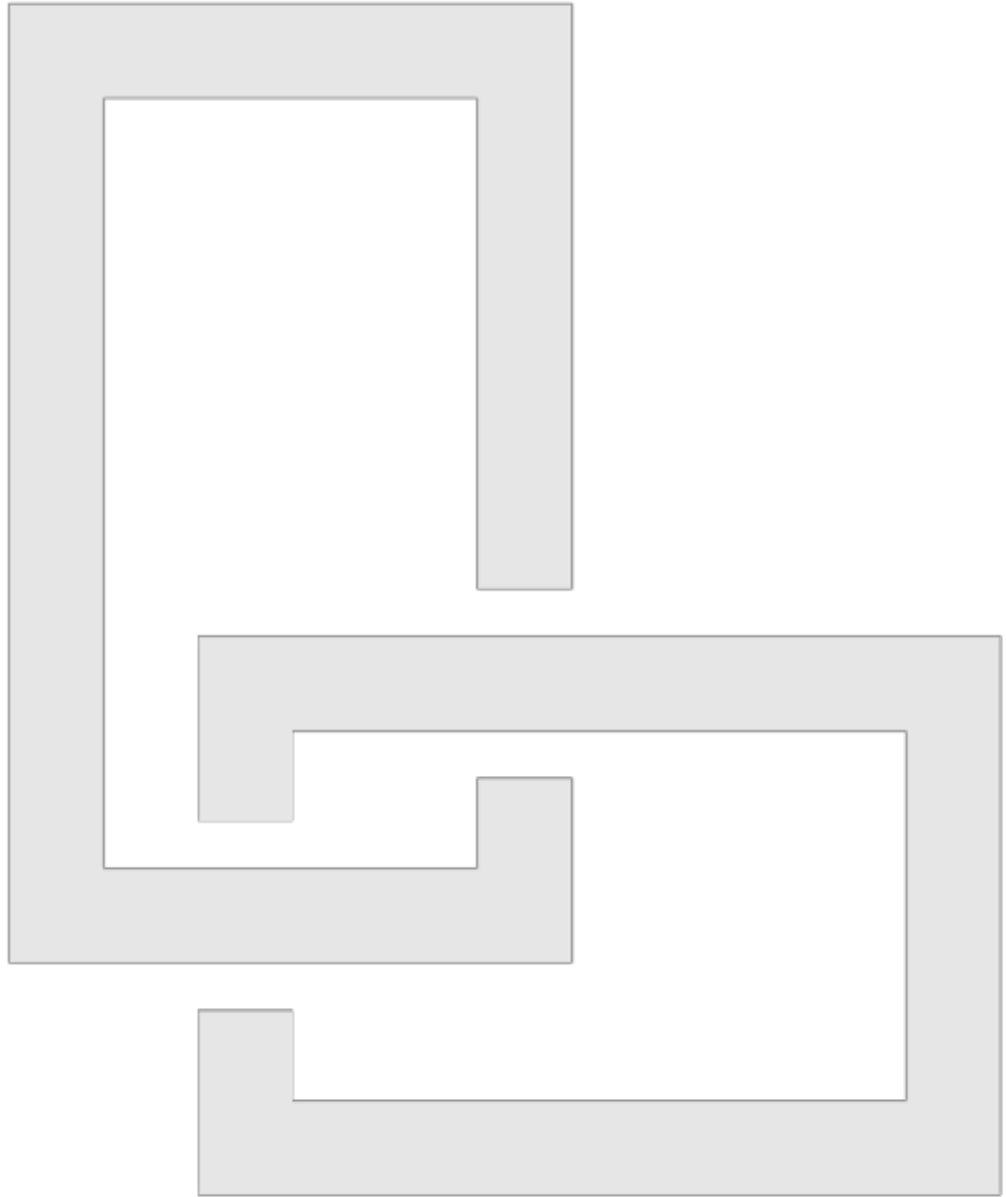


Prepared For:

Abundant Solar Power, Inc.
700 West Metro Park
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Submitted by:

LaBella Associates
1000 Dunham Drive
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Dunmore, PA 18515



Grandview Solar Project
Glint-Glare Analysis Report
September 2026
Project No. 2263503

SECTION 1: GENERAL CONSIDERATIONS CONCERNING GLARE FROM SOLAR PV FACILITIES

Technically, glare is the reflection of diffuse light sources like the sky, while glint is the reflection of directed light sources like the sun. Glint is far more intense than glare, and often what is referred to in the context of solar PV assessments. Despite these formal definitions, we will refer to the reflection of sunlight from the surface of solar panels as glare given its common usage.

When light reflects from the surface of an object, the angle of incidence is always equal to the angle of reflection, as shown in the image to the right. In addition, as the angle of incidence increases so does the amount of light reflected. For solar panels, less than 5% of light from the sun reflects at angles common throughout the heart of the day, while between 15 and 40% of sun light reflects during the early morning and late afternoon hours due to the steeper sun angles.

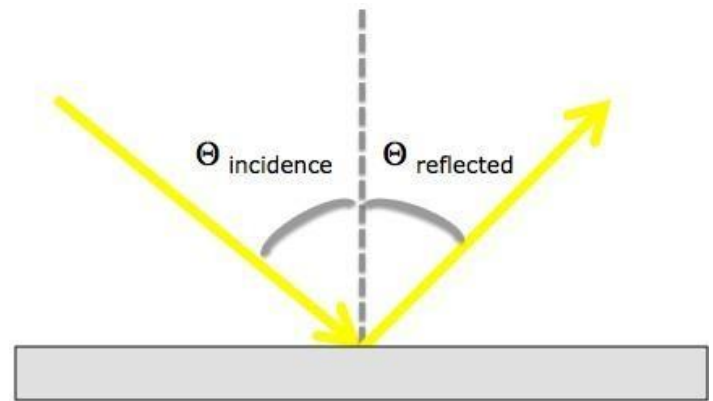


Figure 1 – Reflection Path

The tilt of the solar panels above the horizontal, their elevation above the ground, and the higher reflectivity of the panels at steeper solar angles mean that the only times glare from these facilities could potentially impact observers close to the ground, like those in cars or in homes, would be when the sun is quite low in the eastern or western sky during dawn or dusk. Additionally, since the panels are oriented to the south, no locations to the north of the array could ever receive glare from the panels, regardless of the time of year.

While solar panels will reflect some light as described above, solar glass is designed to capture as much sunlight as possible and thus will generally have similar or less reflectivity than other materials. For example, the smooth surface of a pond will reflect roughly the same amount of sunlight as a solar panel at the angles of interest here, while a freshly covered field of snow will reflect more than twice as much light on average and a steel surface would reflect more than four times as much light over these same angles. Thus, glare from solar facilities is not generally found to be a concern when compared to other materials common in the natural and built environments. This can be seen, for example, in the fact that several solar facilities have been built near airports with findings from the Federal Aviation Administration (FAA) that glare from them poses no hazard to air navigation.

SECTION 2: GLARE EVALUATION APPROACH

To ensure there is no glare set by the solar array the FAA developed *Technical Guidance for Evaluating Selected Solar Technologies on Airports* in 2010 (FAA Guidance). The FAA Guidance recommends use of the Solar Glare Hazard Analysis Tool (SGHAT) by Sandia National Laboratory to determine any potential glare impacts a result of the construction of a solar array. Given this, LaBella assessed the site based on the topography of the area and the natural and proposed vegetative screening around the Project site using the tool outlined above. The solar panel surfaces are modeled to an average of 8.5 feet above the natural ground on the project site. The project is located at 1127 Grandview Rd, Mount Joy, PA 17552.

The SGHAT that was used in this assessment was adopted by the FAA in October 2013 for use in assessing solar systems located on or near airports and can predict both the size and intensity of glare for every minute of every day of the year. Of particular importance when using these projections is to note that the Sandia tool is designed to be conservative with three assumptions acting to substantively overestimate the potential for near surface glare. First, the tool models the solar facility as large unbroken sheets of glass despite the fact that roughly 40 to 50% of the facility's area is undisturbed ground between the rows of panels. Second, the tool takes no credit for any obstructions or vegetative screens. And third, it makes no detailed accounting of cloud cover which could hide the sun and prevent direct solar reflections entirely on some days.

The details of this analysis for the present system are included below.

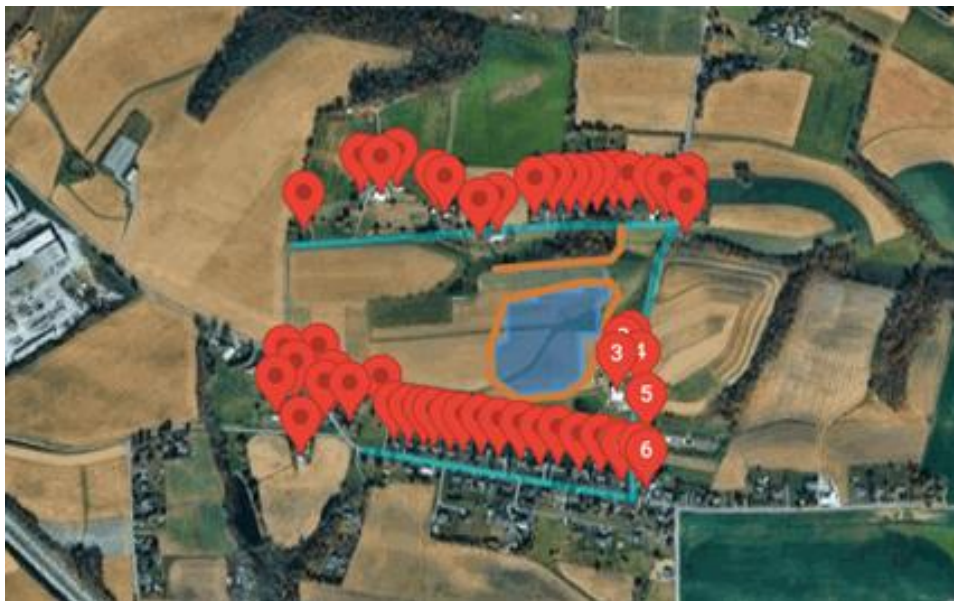


Figure 2 – Site Configuration with Receptor Locations

The SGHAT analysis was performed for the observation points at some of the residences adjacent to the site and included a route analysis for the roads on the north, south, and east sides of the site.

The following table summarizes the potential annual minutes of glare at each of the observation points shown on the map above. For the purposes of this report Green Glare is defined as glare with a low potential to cause flash blindness. Yellow Glare is defined as glare with the potential to cause temporary flash blindness. Red Glare is defined as glare with potential to cause permanent retinal damage.

The SGHAT analysis as performed including the proposed screening trees to the east of the system. Observation Point heights for this analysis were measured at seven (7) feet to represent observation from the first-floor of a residence/building, and fifteen (15) feet to represent observation from the second-floor level.

The results shown below are from the performed analysis, the 6-foot height of proposed screening trees was chosen in order to be more conservative when modeling the system, and to generate potential impacts that will occur at the time of tree-planting.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min.	hr.	min.	hr.
Grandview Rd- Car Height	0	0	0	0
Mt. Pleasant Rd- Car Height	1,986	33.1	2	0
Stauffer Rd- Car Height	0	0	0	0
OP1	835	13.9	3079	51.3
OP2	991	16.5	3063	51.0
OP3	936	15.6	2305	38.4
OP4	962	16.0	2949	49.1
OP5	936	15.6	948	15.8
OP6	0	0	0	0
OP7	0	0	0	0
OP8	0	0	0	0
OP9	0	0	0	0
OP10	0	0	0	0
OP11	0	0	0	0
OP12	0	0	0	0
OP13	0	0	0	0
OP14	0	0	0	0
OP15	0	0	0	0
OP16	0	0	0	0
OP17	0	0	0	0
OP18	0	0	0	0
OP19	0	0	0	0
OP20	0	0	0	0
OP21	187	3.1	0	0

OP22	1,287	21.4	0	0
OP23	1,539	25.6	0	0
OP24	1,344	22.4	303	5.0
OP25	1,431	23.9	92	1.5
OP26	0	0	0	0
OP27	0	0	0	0
OP28	0	0	0	0
OP29	0	0	0	0
OP30	0	0	0	0
OP31	0	0	0	0
OP32	0	0	0	0
OP33	0	0	0	0
OP34	0	0	0	0
OP35	0	0	0	0
OP36	0	0	0	0
OP37	0	0	0	0
OP38	0	0	0	0
OP39	0	0	0	0
OP40	0	0	0	0
OP41	0	0	0	0
OP42	640	10.7	0	0
OP43	1,411	23.5	0	0
OP44	1,882	31.4	278	4.6
OP45	1,213	20.2	0	0
OP46	1,819	30.3	0	0
OP47	898	15.0	0	0
OP48	2,029	33.8	0	0
OP49	1,739	29.0	0	0
OP50	0	0	0	0

Figure 3 – Proposed Glare Summary Table

Fifty (50) observation points were reviewed during the analysis. Each observation point was modeled at either seven (7) feet (or fifteen (15) feet , depending on if the structure(s) have multiple stories. Eighteen (18) object point locations, have the potential for green and yellow glare based on the SGHAT analysis. No areas analyzed have the potential for red glare.

Observation points 1 through 5, represent both one-story and two-story residential buildings along Grandview Road, located to the east of the site. Observation points 21 through 25 and 42 through 49 represent both one-story and two-story residential buildings along Mt. Pleasant Road located to the south-west area of the site. There is a potential for a combined 401 hours of green glare per year, and 216.7 hours of yellow glare per year at this location, however there is proposed vegetation that hides the array from the observation points, thus potentially minimizing the glare.

Observation points 6 through 19, 26 through 41, and 50 represent the additional nearby residential and agricultural structures in the area that mostly consist of two-story homes (modeled at 15 feet) and do not have the potential for any green or yellow glare.

Of the nearby routes that were analyzed, one of the three routes (Mt. Pleasant Rd) has potential for green and yellow glare from the project system. There is potential of 33.1 hrs of annual green glare while the other two nearby routes (Stauffer Rd & Grandview Rd) do not demonstrate any potential of experiencing green or yellow glare from the project system. All cars on each of the roads were modeled at a four and a half (4.5) feet height.

As noted above, the SGHAT does not fully consider existing vegetation between the observation points and the array. The impact of the potential glare is not known fully at this time, further investigation would be required in order to conclude if the green glare and yellow glare impacts can be reduced even further or eliminated entirely,

The full SGHAT Glare Analysis Report can be found in Appendix A.

SECTION 3: MITIGATION REDUCING THE POTENTIAL FOR GLARE FROM PROPOSED SOLAR PV FACILITY

Given the conservative nature of the above analysis, there are several features that will act to further minimize any potential impacts from glare at this site. First, the panels to be used at this site are manufactured with specialized glass and covered with anti-reflection coatings that substantively reduces their potential to create glare. Second, these panels are mounted on tracking systems. These tracking systems are utilized to optimize the amount of sunlight that the panels receive throughout the day. The trackers adjust the angle and orientation of the panels to ensure they are always facing the sun. By following the sun, the panels will spend less time in a position that may cause potential glare effects, shortening the duration of the glare. Third, the project site is proposed to include trees for screening, which will be implemented during and/or after construction. Exact heights of vegetation are unknown but can be investigated further.

SECTION 4: CONCLUSION

Given the above analysis, Eighteen (18) of the selected observation points may see some green and/or yellow glare from this proposed solar facility at certain times of the year. However, there is no potential impact for red glare. Green glare and yellow glare pose little to no human harm, unlike red glare. When the anti-reflection design elements of the solar panels to be used at this facility and the mitigating features of the site itself are considered, it can be concluded that glare may be minimized or eliminated, however impacts would need further investigation to determine this. Existing vegetation may also minimize some of the glare, however that would also require further investigation.

SECTION 5: REFERENCES

2018, *Technical Guidance for Evaluating Selected Solar Technologies on Airports*,
www.faa.gov/airports/environmental/policy_guidance/media/FAA-Airport-Solar-Guide-2018.pdf

ForgeSolar, 2016, www.forgesolar.com

APPENDIX A.

SGHAT Glare Analysis

FORGESOLAR GLARE ANALYSIS

Project: **Grandview Rd**

Proposed solar panel farm to be located in 1125 Grandview Rd, Mount Joy, PA.

Site configuration: **Grandview Rd-Abundant Solar**

Calculated via ForgeSolar Radiometric Physics Engine v3.2.1

Client: Abundant Solar

Created 14 Sep, 2026

Updated 22 Sep, 2026

Time-step 1 minute

Timezone offset UTC-5

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m²

Category 1 MW to 5 MW

Site ID 187771.30897

Ocular transmission coefficient 0.5

Pupil diameter 0.002 m

Eye focal length 0.017 m

Sun subtended angle 9.3 mrad

Min luminance threshold 5,000 cd/m²



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

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
Proposed Solar Arrays	30.0	180.0	24,065	401.1	13,019	217.0	-

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

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Grandview Rd- Car Height	0	0.0	0	0.0
Mt Pleasant Rd-Car Height	1,986	33.1	2	0.0
Stauffer Rd-Car Height	0	0.0	0	0.0
OP 1	835	13.9	3,079	51.3
OP 2	991	16.5	3,063	51.0
OP 3	936	15.6	2,305	38.4
OP 4	962	16.0	2,949	49.1
OP 5	936	15.6	948	15.8
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	187	3.1	0	0.0
OP 22	1,287	21.4	0	0.0
OP 23	1,539	25.6	0	0.0
OP 24	1,344	22.4	303	5.0
OP 25	1,431	23.9	92	1.5
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0
OP 40	0	0.0	0	0.0
OP 41	0	0.0	0	0.0
OP 42	640	10.7	0	0.0
OP 43	1,411	23.5	0	0.0
OP 44	1,882	31.4	278	4.6
OP 45	1,213	20.2	0	0.0
OP 46	1,819	30.3	0	0.0
OP 47	898	15.0	0	0.0
OP 48	2,029	33.8	0	0.0
OP 49	1,739	29.0	0	0.0
OP 50	0	0.0	0	0.0

Component Data

PV Arrays

Name: Proposed Solar Arrays
Axis tracking: Fixed (no rotation)
Tilt: 30.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass with AR coating



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.140807	-76.533878	458.66	8.50	467.16
2	40.140725	-76.535091	466.75	8.50	475.25
3	40.141074	-76.535686	481.64	8.50	490.14
4	40.141693	-76.535697	484.76	8.50	493.26
5	40.141816	-76.535332	483.00	8.50	491.50
6	40.142587	-76.535370	478.07	8.50	486.57
7	40.142612	-76.534570	479.59	8.50	488.09
8	40.142776	-76.534570	480.41	8.50	488.91
9	40.142792	-76.533358	474.68	8.50	483.18
10	40.142907	-76.533374	477.12	8.50	485.62
11	40.142907	-76.532671	470.51	8.50	479.01
12	40.142706	-76.532688	464.21	8.50	472.71
13	40.142595	-76.532961	464.83	8.50	473.33
14	40.141935	-76.532924	460.17	8.50	468.67
15	40.141923	-76.533428	464.63	8.50	473.13
16	40.141041	-76.533374	464.68	8.50	473.18

Route Receptors

Name: Grandview Rd- Car Height

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.144037	-76.530965	432.66	4.50	437.16
2	40.143484	-76.531357	420.51	4.50	425.01
3	40.141255	-76.531962	459.93	4.50	464.43
4	40.138671	-76.532031	470.49	4.50	474.99

Name: Mt Pleasant Rd-Car Height

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.138640	-76.532036	470.91	4.50	475.41
2	40.139612	-76.539072	476.23	4.50	480.73

Name: Stauffer Rd-Car Height

Path type: Two-way

Azimuthal view angle: 50.0°

Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	40.144099	-76.530948	435.69	4.50	440.19
2	40.144104	-76.532291	453.45	4.50	457.95
3	40.144111	-76.533604	456.86	4.50	461.36
4	40.144009	-76.535769	467.12	4.50	471.62
5	40.143890	-76.537443	458.19	4.50	462.69
6	40.143705	-76.540929	487.68	4.50	492.18

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	40.141185	-76.532101	463.35	7.00
OP 2	2	40.141095	-76.532278	462.70	7.00
OP 3	3	40.140751	-76.532433	453.72	10.50
OP 4	4	40.140789	-76.531817	452.92	15.00
OP 5	5	40.139929	-76.531648	441.60	7.00
OP 6	6	40.138824	-76.531668	469.63	15.00
OP 7	7	40.138949	-76.531864	467.36	7.00
OP 8	8	40.138965	-76.532301	470.08	15.00
OP 9	9	40.139034	-76.532385	474.63	7.00
OP 10	10	40.143946	-76.535569	466.19	7.00
OP 11	11	40.143846	-76.536030	462.67	15.00
OP 12	12	40.143914	-76.530649	426.62	15.00
OP 13	13	40.139115	-76.532859	473.75	15.00
OP 14	14	40.139161	-76.533428	480.61	15.00
OP 15	15	40.139275	-76.533970	481.97	15.00
OP 16	16	40.139284	-76.534469	482.07	15.00
OP 17	17	40.139370	-76.534962	481.43	15.00
OP 18	18	40.139444	-76.535526	482.57	15.00
OP 19	19	40.139509	-76.535987	485.95	15.00
OP 20	20	40.139537	-76.536458	487.43	15.00
OP 21	21	40.139565	-76.536804	487.05	15.00
OP 22	22	40.139637	-76.537231	487.32	15.00
OP 23	23	40.139674	-76.537515	487.63	15.00
OP 24	24	40.139709	-76.537867	485.53	15.00
OP 25	25	40.139766	-76.538253	484.35	15.00
OP 26	26	40.144267	-76.534576	463.74	15.00
OP 27	27	40.144339	-76.534120	460.63	15.00
OP 28	28	40.144339	-76.533690	460.91	15.00
OP 29	29	40.144353	-76.533307	462.31	15.00
OP 30	30	40.144388	-76.532532	461.94	15.00
OP 31	31	40.144361	-76.532156	455.56	15.00
OP 32	32	40.144355	-76.532937	462.12	15.00
OP 33	33	40.144293	-76.531511	450.71	7.00
OP 34	34	40.144252	-76.531142	444.62	15.00
OP 35	35	40.144353	-76.530590	435.58	15.00
OP 36	36	40.144724	-76.539143	490.97	15.00
OP 37	37	40.144685	-76.538598	492.94	7.00
OP 38	38	40.144314	-76.536950	477.26	15.00
OP 39	39	40.144388	-76.537216	479.75	15.00
OP 40	40	40.143984	-76.540652	482.58	15.00
OP 41	41	40.140301	-76.538594	489.63	15.00
OP 42	42	40.140158	-76.539447	484.32	15.00
OP 43	43	40.140388	-76.539839	482.73	15.00
OP 44	44	40.140933	-76.540246	485.19	15.00
OP 45	45	40.140215	-76.540094	481.83	15.00
OP 46	46	40.140888	-76.541129	479.93	15.00
OP 47	47	40.139481	-76.540722	475.76	15.00
OP 48	48	40.140601	-76.540856	476.23	7.00
OP 49	49	40.140292	-76.541345	469.21	7.00
OP 50	50	40.144830	-76.538185	497.81	7.00

Obstruction Components

Name: Existing Treeline

Top height: 32.81 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.143235	-76.535620	459.51
2	40.143424	-76.532600	446.87
3	40.143670	-76.532342	421.24
4	40.144059	-76.532348	453.15

Name: Proposed Treeline 1

Top height: 6.00 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.142624	-76.535380	477.94
2	40.142973	-76.533428	476.57
3	40.142965	-76.532634	469.76
4	40.142690	-76.532414	459.91
5	40.142276	-76.532736	454.64

Name: Proposed Treeline 2

Top height: 6.00 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	40.142116	-76.532768	454.55
2	40.141931	-76.532779	460.16
3	40.141058	-76.533229	464.42
4	40.140715	-76.533795	456.74
5	40.140623	-76.535026	463.75
6	40.141033	-76.535754	481.59
7	40.141697	-76.535773	484.94
8	40.142627	-76.535382	477.93

Glare Analysis Results

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

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
Proposed Solar Arrays	30.0	180.0	24,065	401.1	13,019	217.0	-

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

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Grandview Rd- Car Height	0	0.0	0	0.0
Mt Pleasant Rd-Car Height	1,986	33.1	2	0.0
Stauffer Rd-Car Height	0	0.0	0	0.0
OP 1	835	13.9	3,079	51.3
OP 2	991	16.5	3,063	51.0
OP 3	936	15.6	2,305	38.4
OP 4	962	16.0	2,949	49.1
OP 5	936	15.6	948	15.8
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 21	187	3.1	0	0.0
OP 22	1,287	21.4	0	0.0
OP 23	1,539	25.6	0	0.0
OP 24	1,344	22.4	303	5.0
OP 25	1,431	23.9	92	1.5
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0
OP 29	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0
OP 40	0	0.0	0	0.0
OP 41	0	0.0	0	0.0
OP 42	640	10.7	0	0.0
OP 43	1,411	23.5	0	0.0
OP 44	1,882	31.4	278	4.6
OP 45	1,213	20.2	0	0.0
OP 46	1,819	30.3	0	0.0
OP 47	898	15.0	0	0.0
OP 48	2,029	33.8	0	0.0
OP 49	1,739	29.0	0	0.0
OP 50	0	0.0	0	0.0

PV: Proposed Solar Arrays potential temporary after-image

Receptor results ordered by category of glare

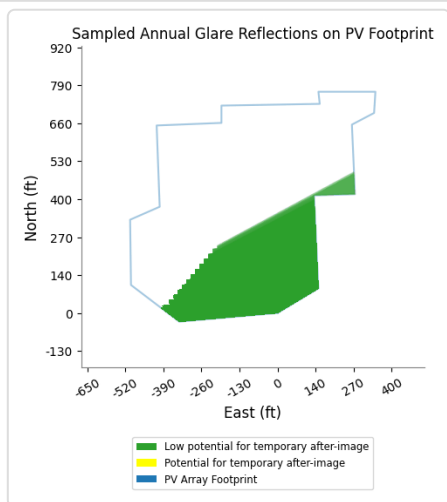
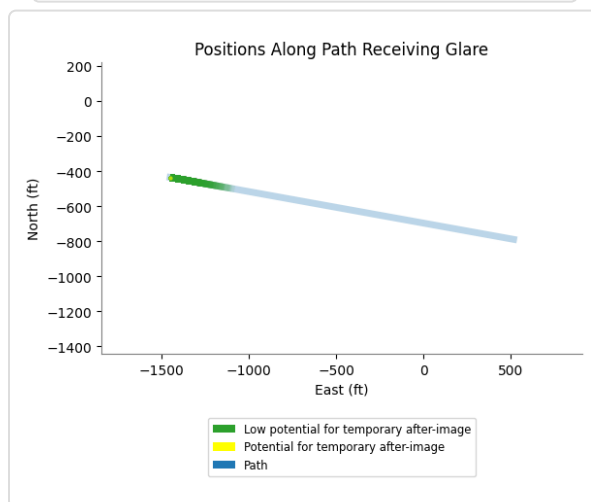
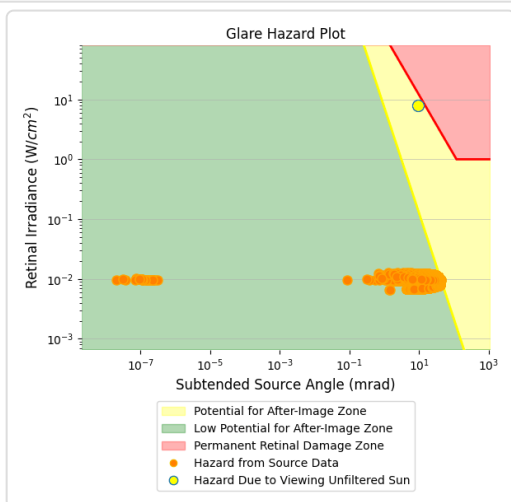
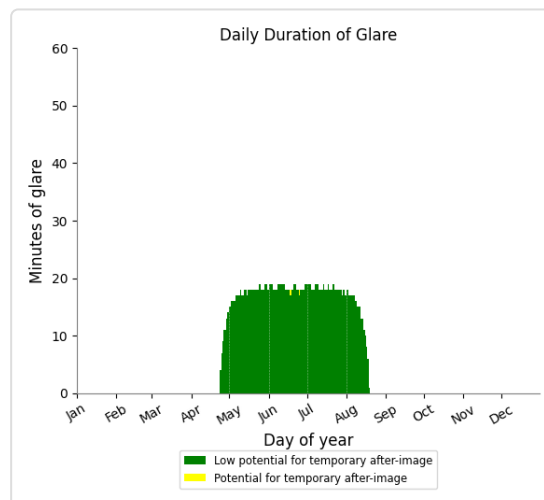
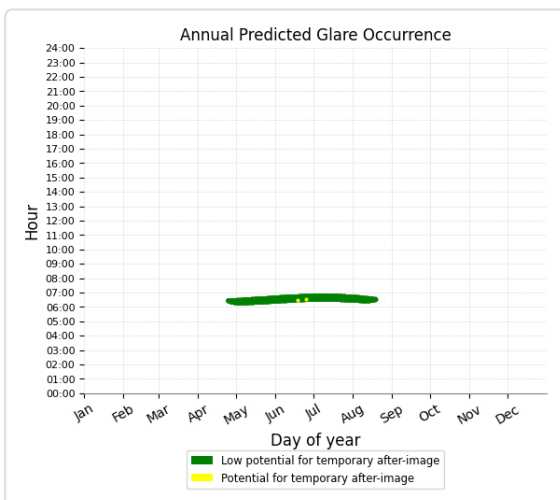
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Mt Pleasant Rd-Car Height	1,986	33.1	2	0.0
Grandview Rd- Car Height	0	0.0	0	0.0
Stauffer Rd-Car Height	0	0.0	0	0.0
OP 1	835	13.9	3,079	51.3
OP 2	991	16.5	3,063	51.0
OP 3	936	15.6	2,305	38.4
OP 4	962	16.0	2,949	49.1
OP 5	936	15.6	948	15.8
OP 24	1,344	22.4	303	5.0
OP 25	1,431	23.9	92	1.5
OP 44	1,882	31.4	278	4.6
OP 21	187	3.1	0	0.0
OP 22	1,287	21.4	0	0.0
OP 23	1,539	25.6	0	0.0
OP 42	640	10.7	0	0.0
OP 43	1,411	23.5	0	0.0
OP 45	1,213	20.2	0	0.0
OP 46	1,819	30.3	0	0.0
OP 47	898	15.0	0	0.0
OP 48	2,029	33.8	0	0.0
OP 49	1,739	29.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0
OP 15	0	0.0	0	0.0
OP 16	0	0.0	0	0.0
OP 17	0	0.0	0	0.0
OP 18	0	0.0	0	0.0
OP 19	0	0.0	0	0.0
OP 20	0	0.0	0	0.0
OP 26	0	0.0	0	0.0
OP 27	0	0.0	0	0.0
OP 28	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 29	0	0.0	0	0.0
OP 30	0	0.0	0	0.0
OP 31	0	0.0	0	0.0
OP 32	0	0.0	0	0.0
OP 33	0	0.0	0	0.0
OP 34	0	0.0	0	0.0
OP 35	0	0.0	0	0.0
OP 36	0	0.0	0	0.0
OP 37	0	0.0	0	0.0
OP 38	0	0.0	0	0.0
OP 39	0	0.0	0	0.0
OP 40	0	0.0	0	0.0
OP 41	0	0.0	0	0.0
OP 50	0	0.0	0	0.0

Proposed Solar Arrays and Route: Mt Pleasant Rd-Car Height

Yellow glare: 2 min.

Green glare: 1,986 min.



Proposed Solar Arrays and Route: Grandview Rd- Car Height

No glare found

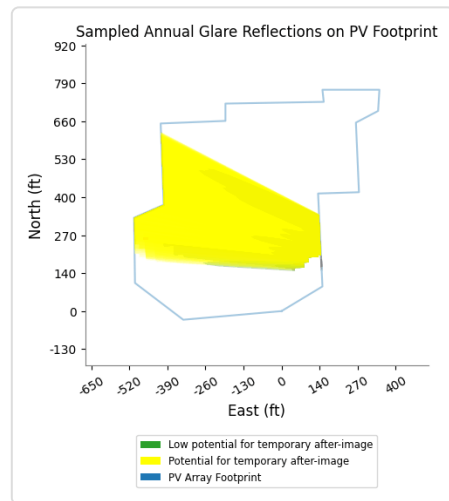
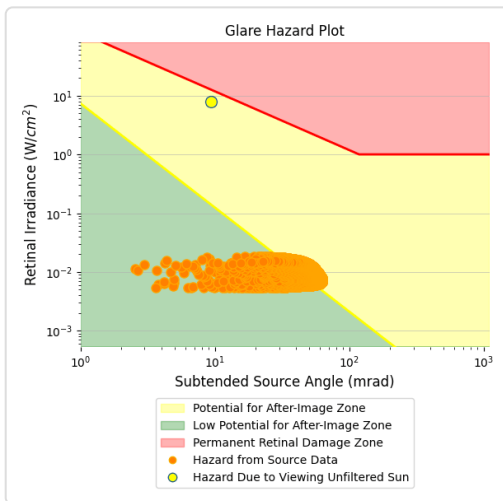
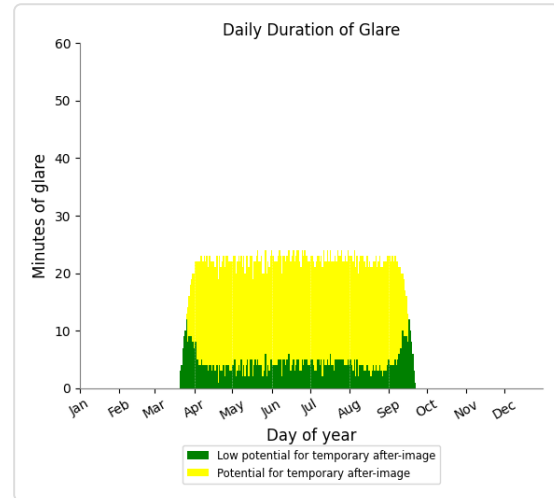
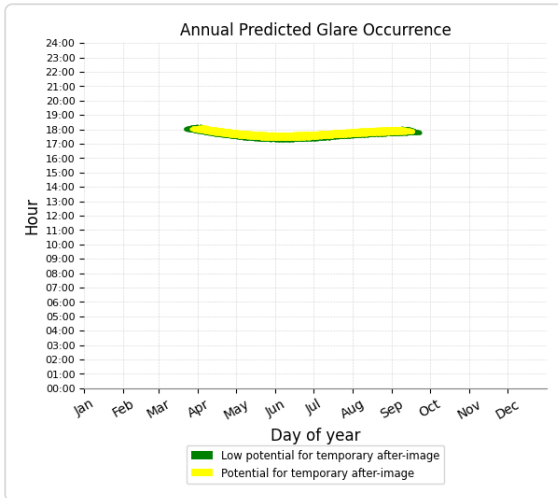
Proposed Solar Arrays and Route: Stauffer Rd-Car Height

No glare found

Proposed Solar Arrays and OP 1

Yellow glare: 3,079 min.

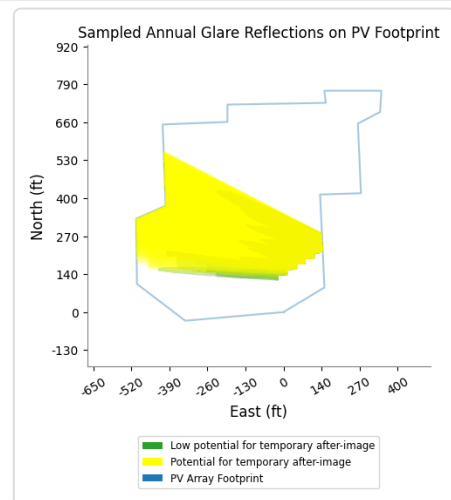
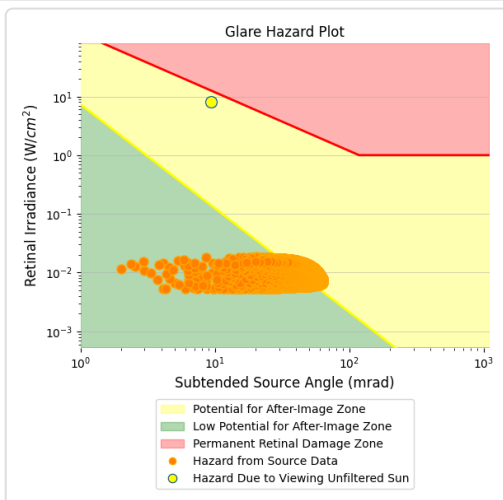
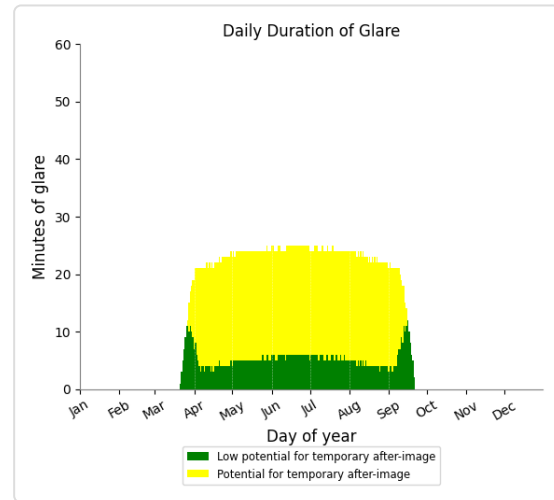
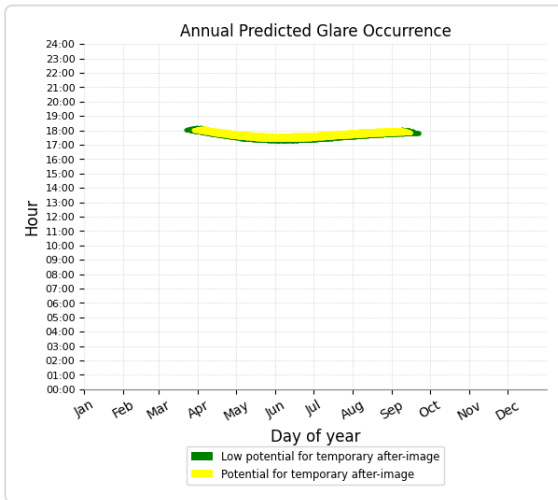
Green glare: 835 min.



Proposed Solar Arrays and OP 2

Yellow glare: 3,063 min.

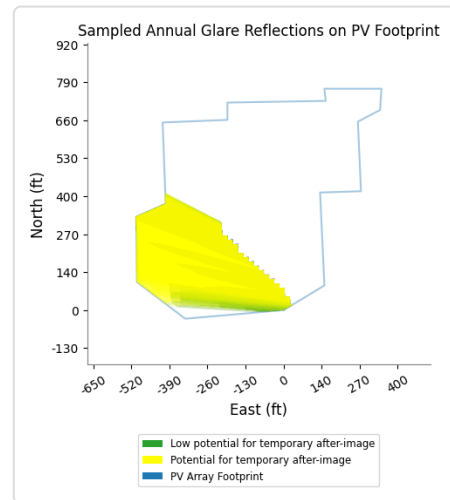
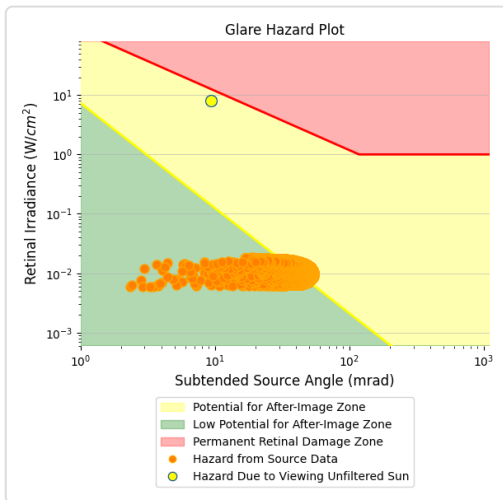
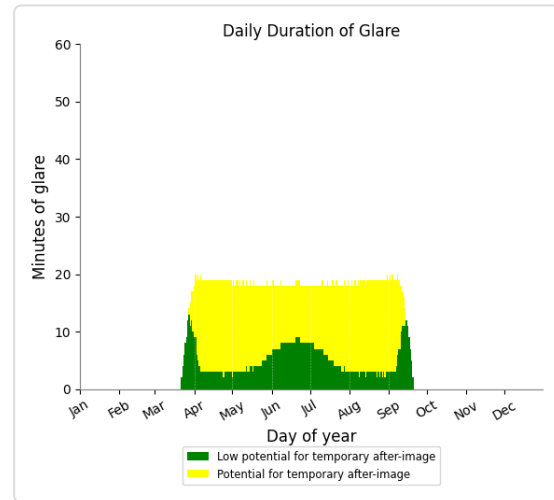
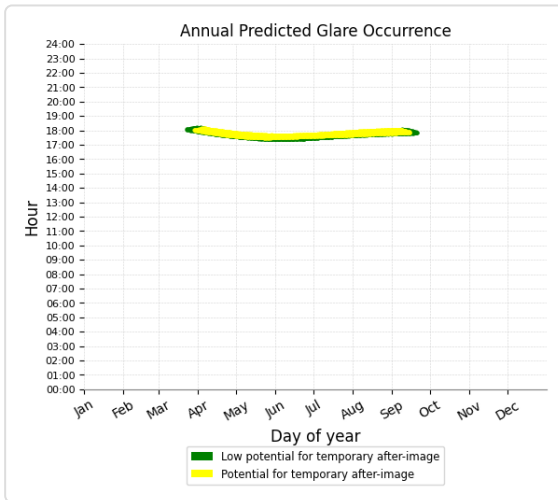
Green glare: 991 min.



Proposed Solar Arrays and OP 3

Yellow glare: 2,305 min.

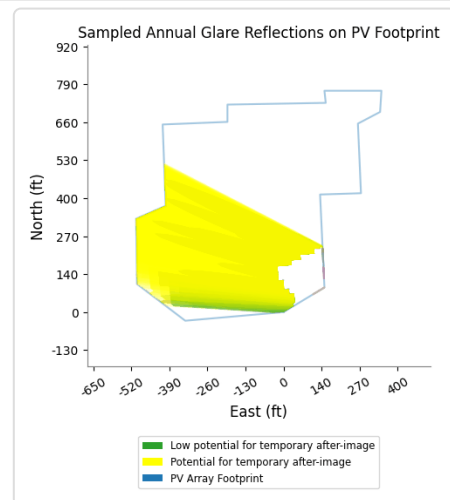
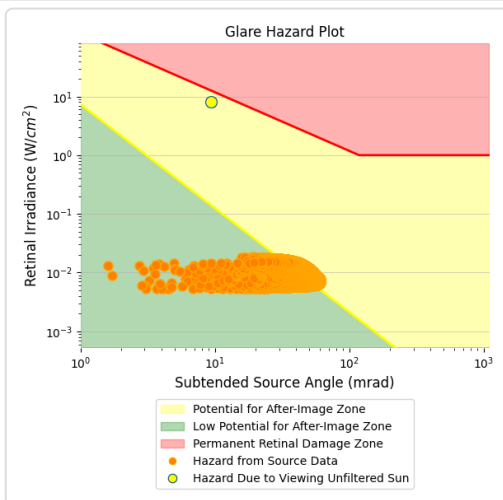
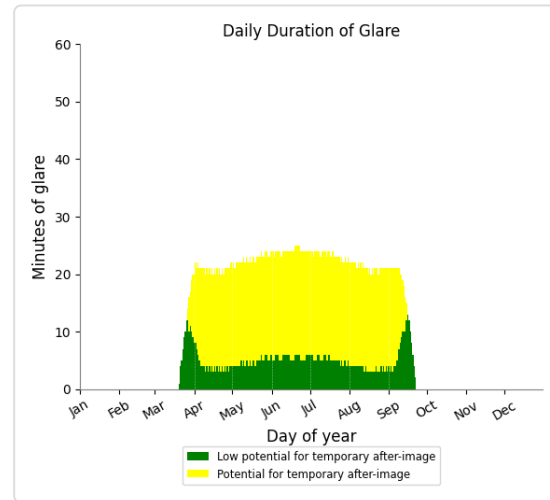
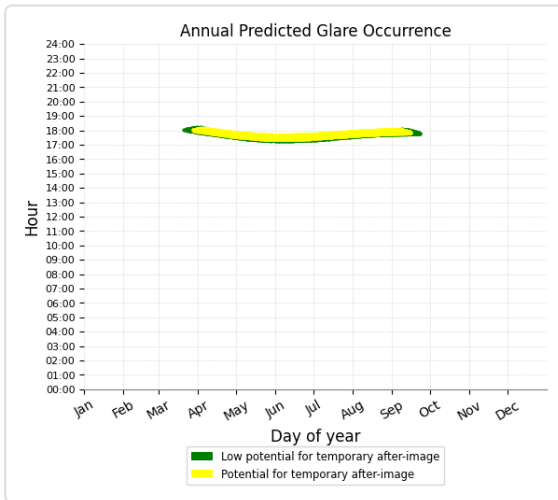
Green glare: 936 min.



Proposed Solar Arrays and OP 4

Yellow glare: 2,949 min.

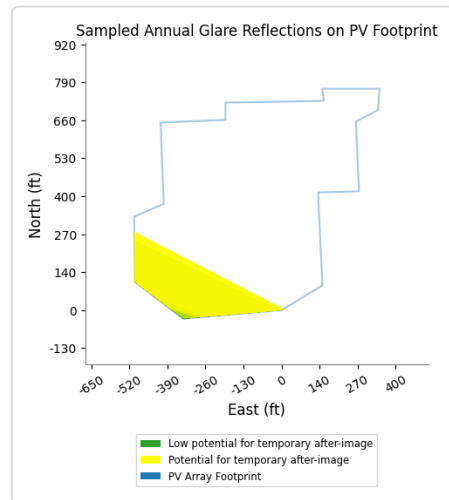
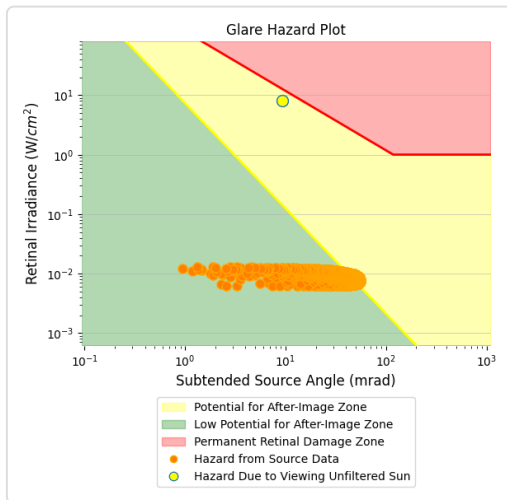
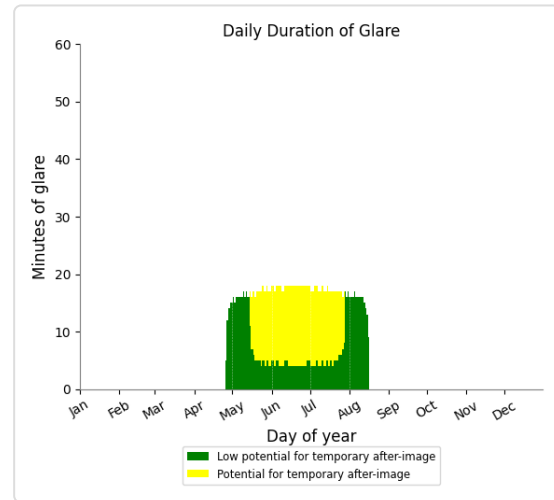
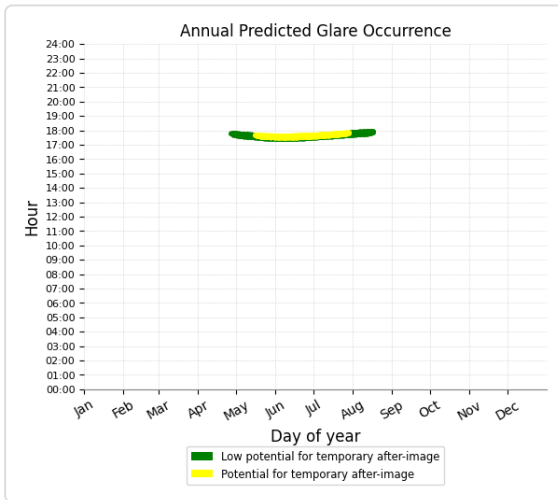
Green glare: 962 min.



Proposed Solar Arrays and OP 5

Yellow glare: 948 min.

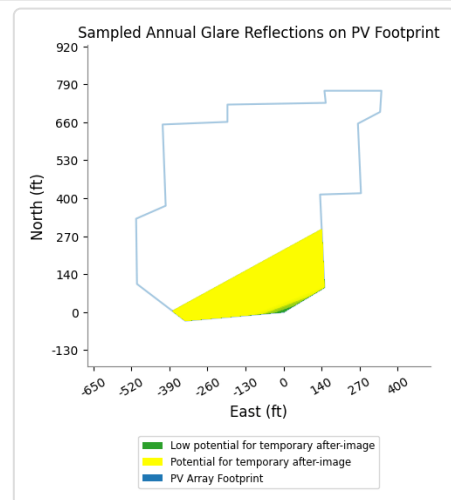
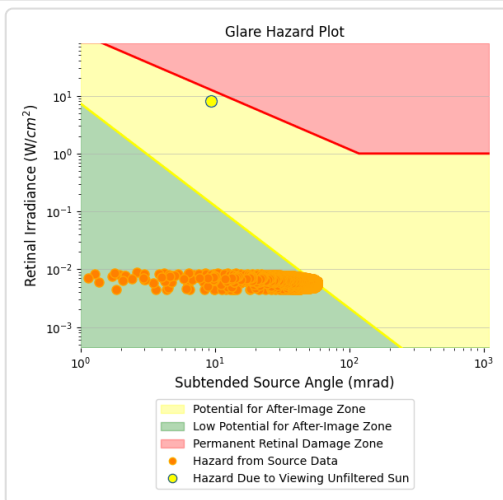
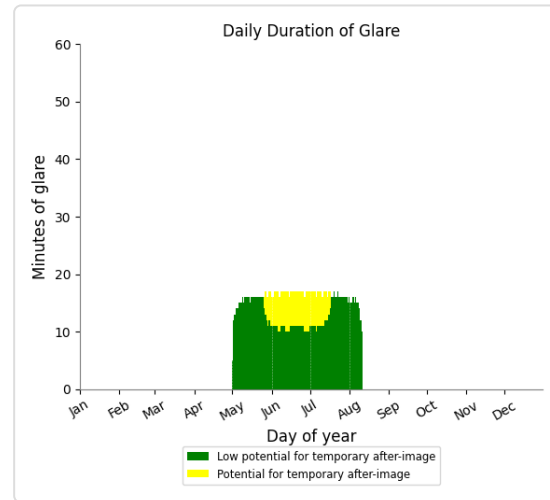
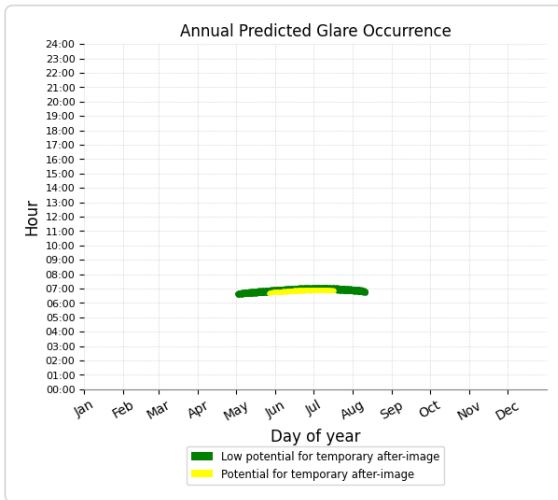
Green glare: 936 min.



Proposed Solar Arrays and OP 24

Yellow glare: 303 min.

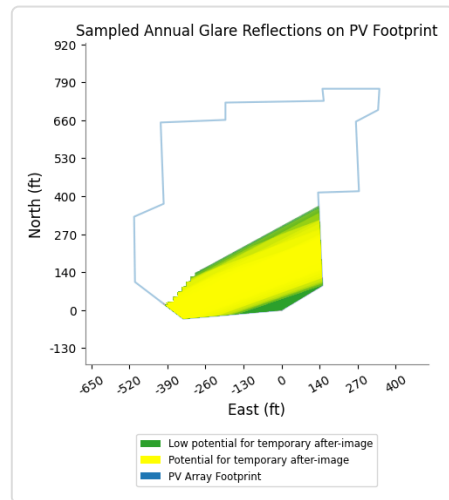
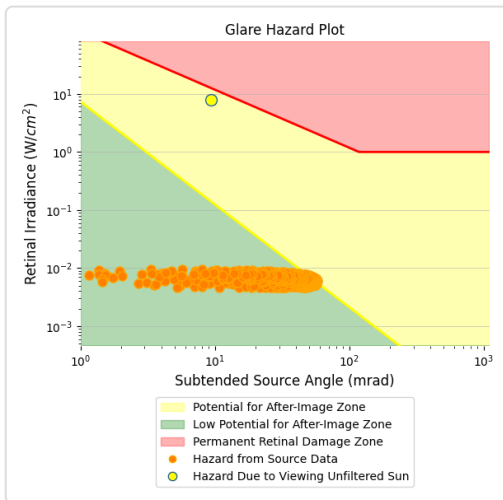
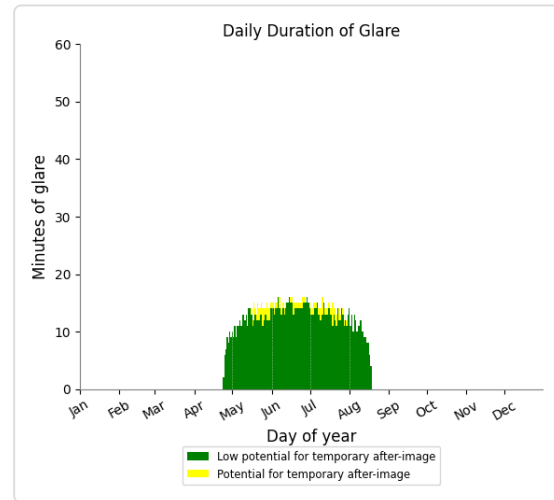
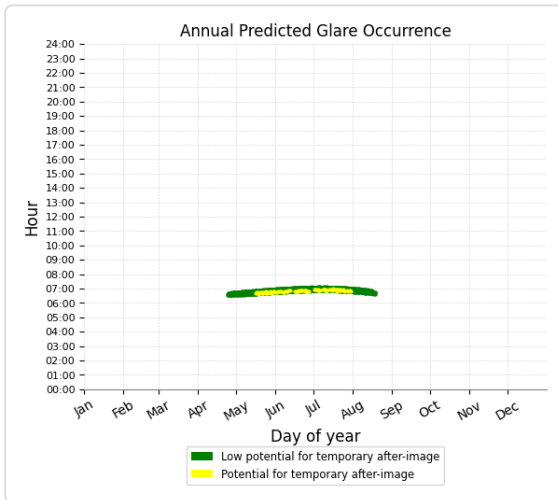
Green glare: 1,344 min.



Proposed Solar Arrays and OP 25

Yellow glare: 92 min.

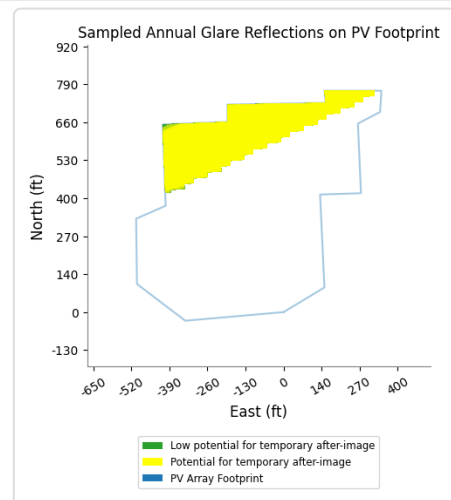
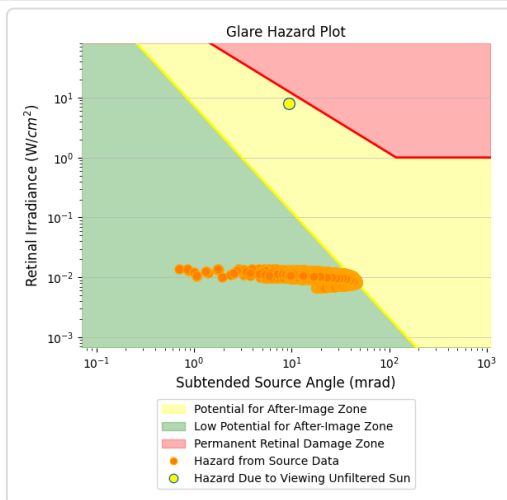
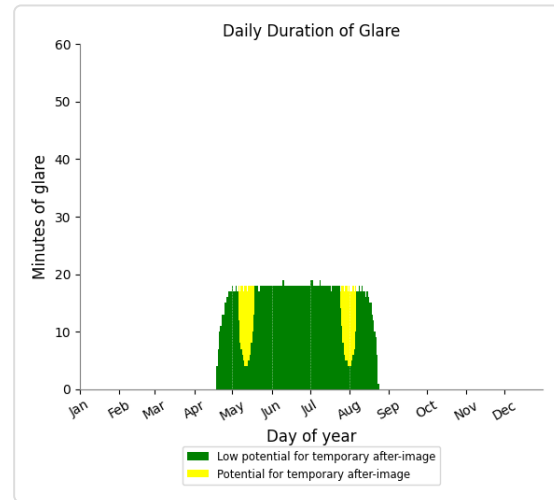
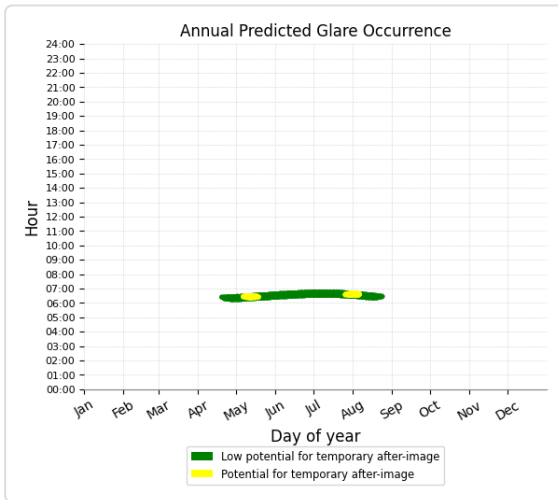
Green glare: 1,431 min.



Proposed Solar Arrays and OP 44

Yellow glare: 278 min.

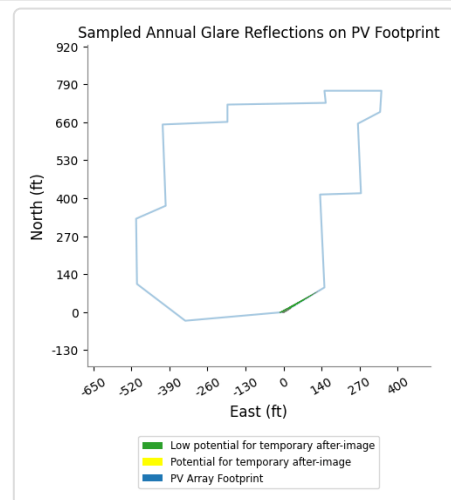
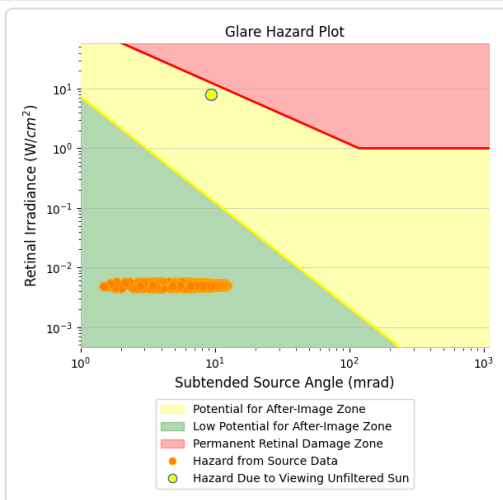
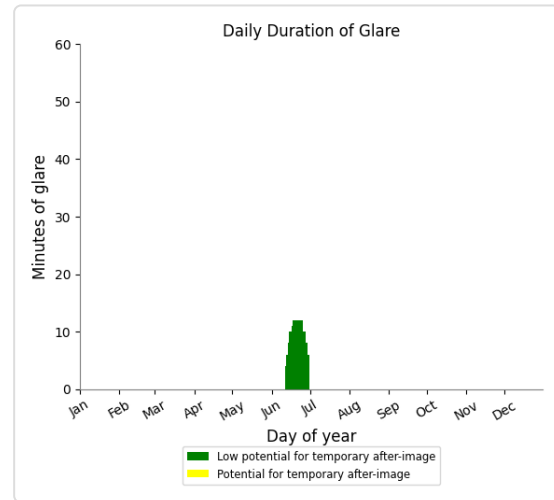
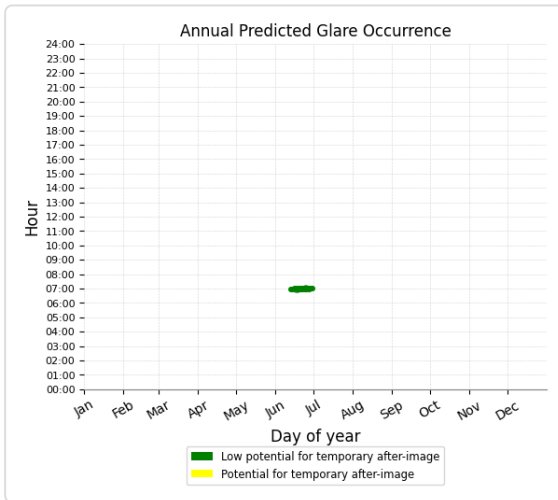
Green glare: 1,882 min.



Proposed Solar Arrays and OP 21

Yellow glare: none

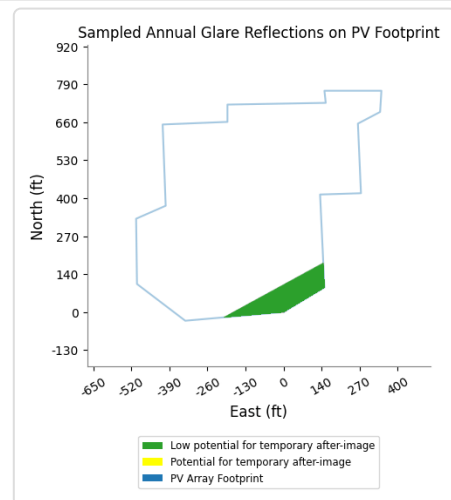
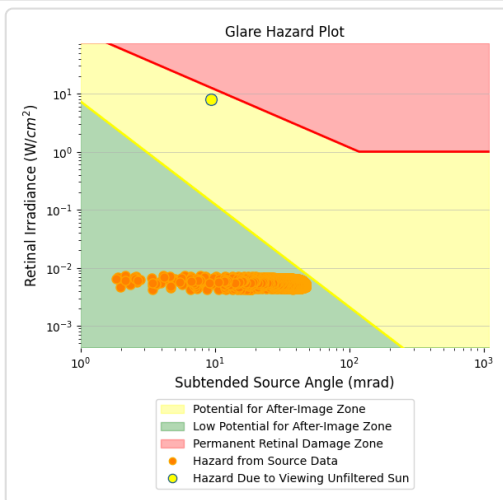
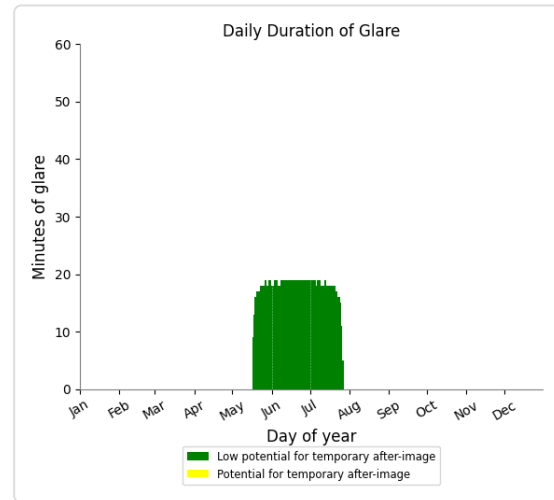
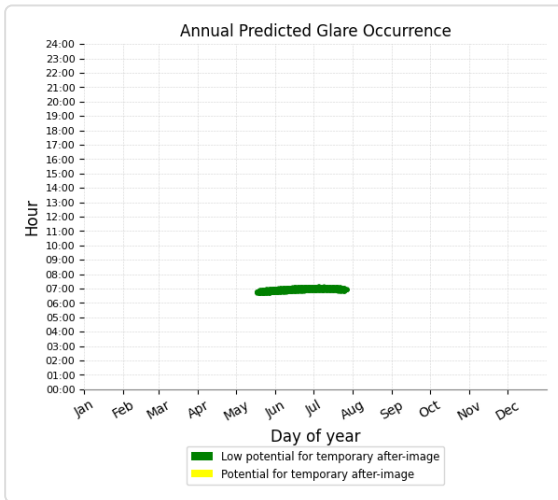
Green glare: 187 min.



Proposed Solar Arrays and OP 22

Yellow glare: none

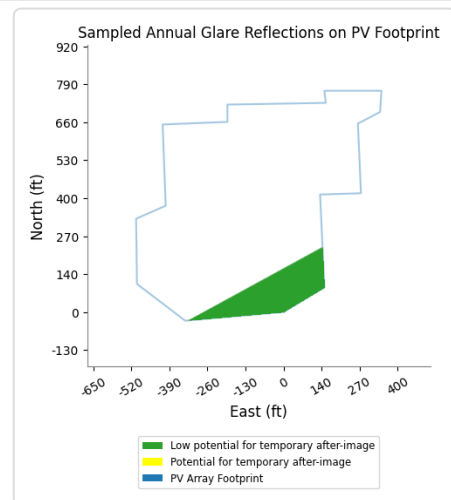
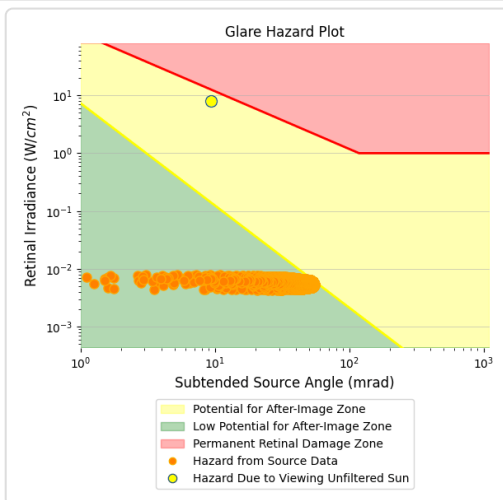
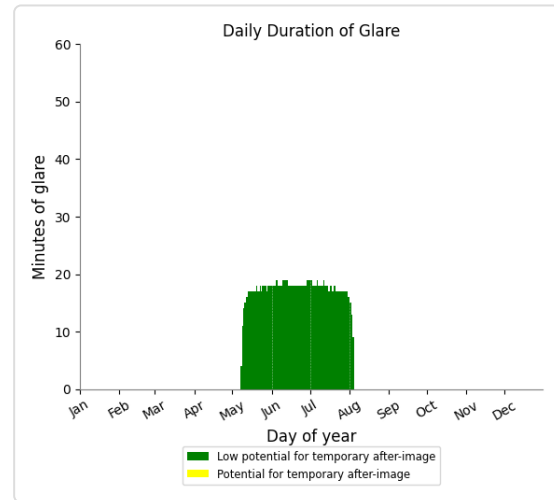
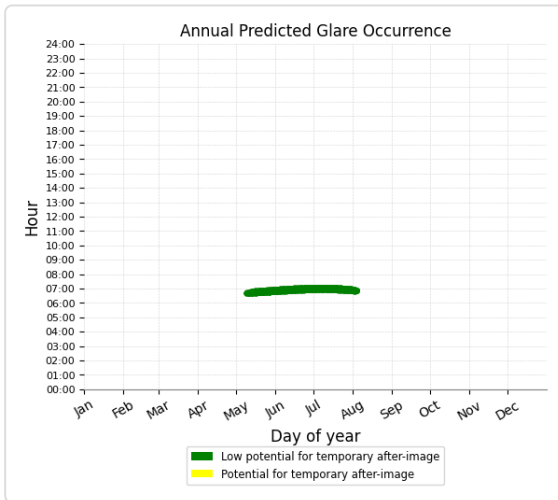
Green glare: 1,287 min.



Proposed Solar Arrays and OP 23

Yellow glare: none

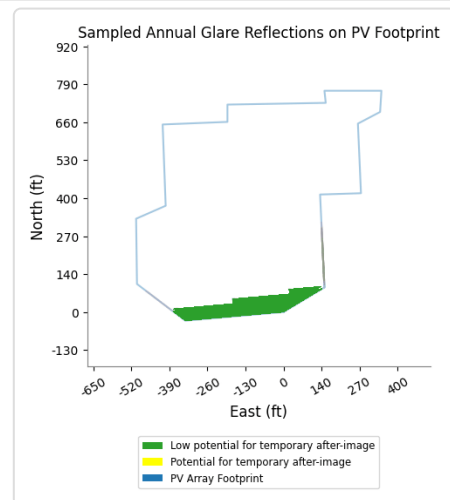
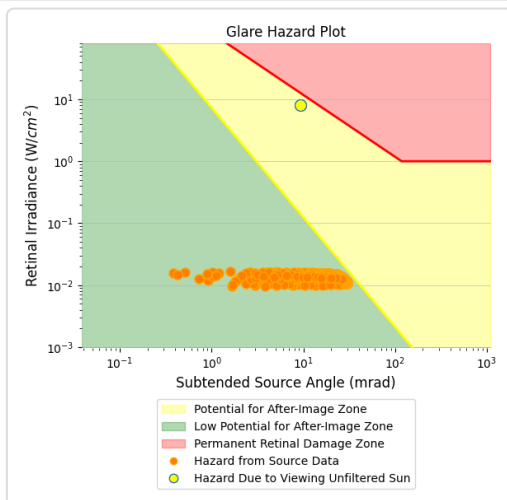
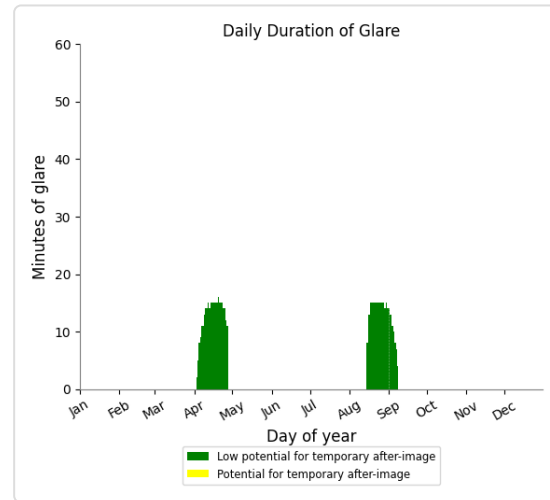
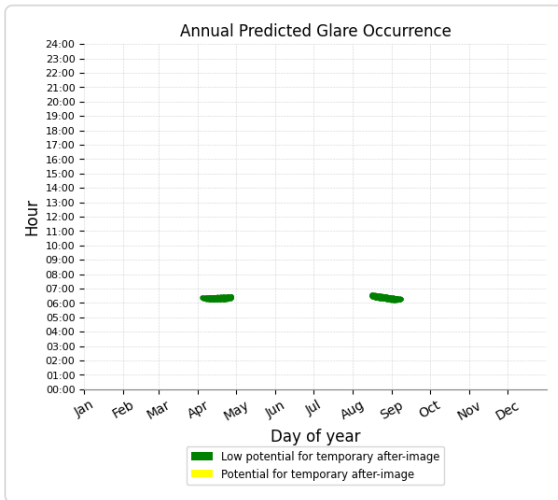
Green glare: 1,539 min.



Proposed Solar Arrays and OP 42

Yellow glare: none

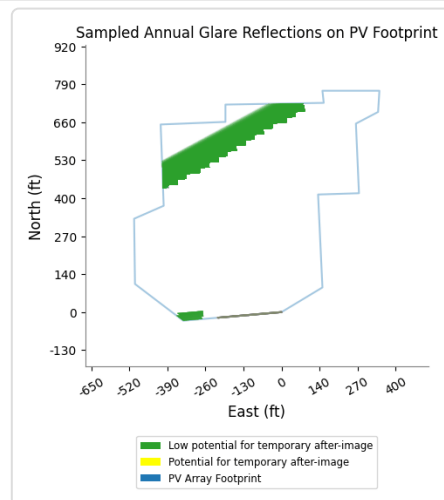
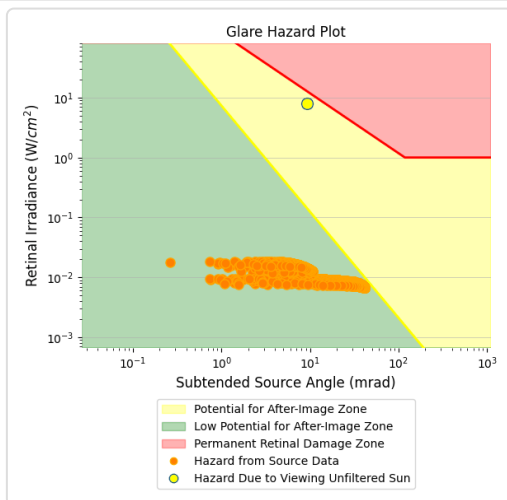
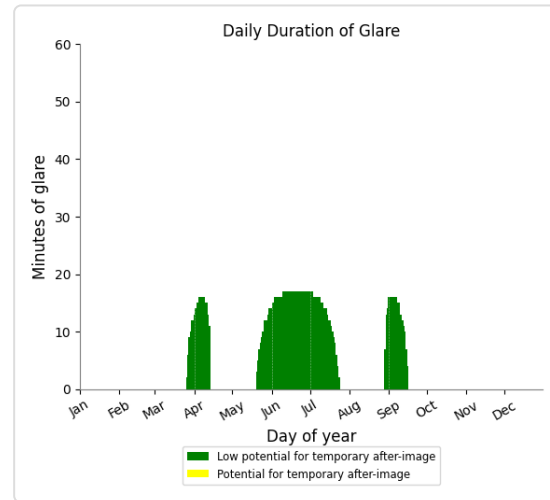
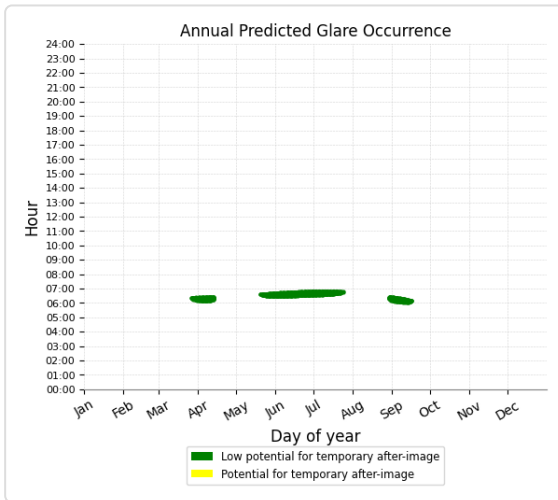
Green glare: 640 min.



Proposed Solar Arrays and OP 43

Yellow glare: none

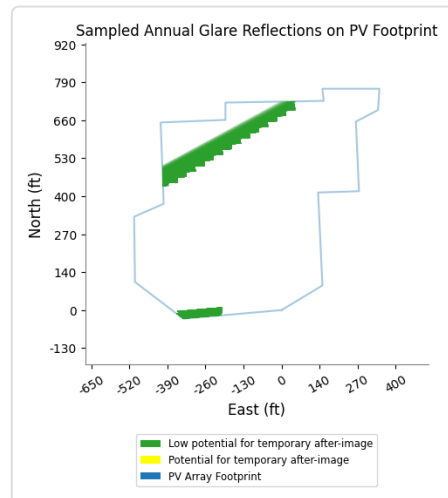
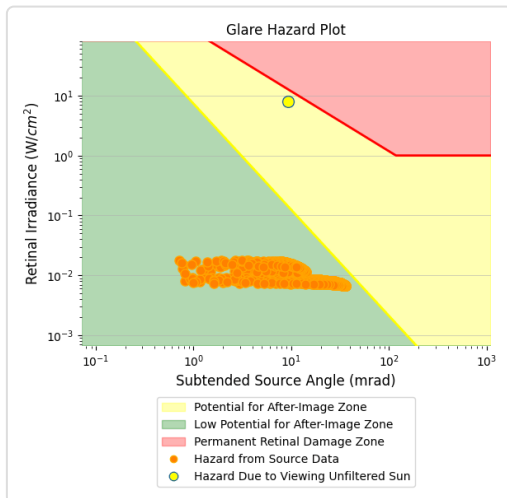
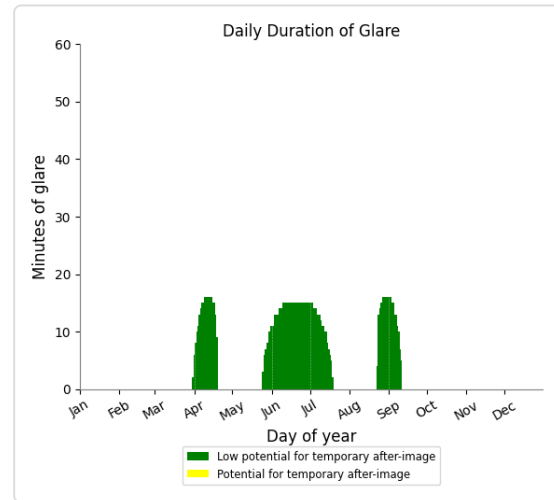
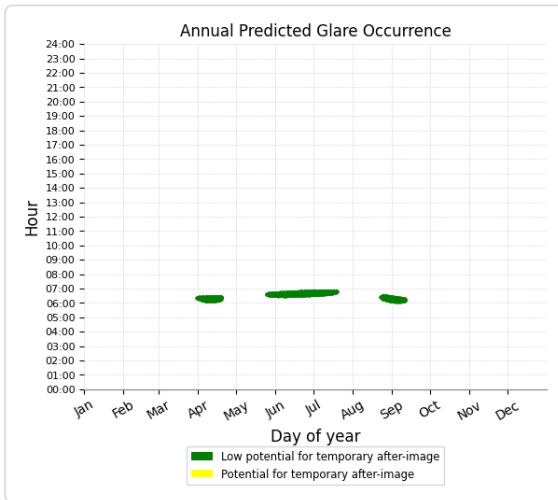
Green glare: 1,411 min.



Proposed Solar Arrays and OP 45

Yellow glare: none

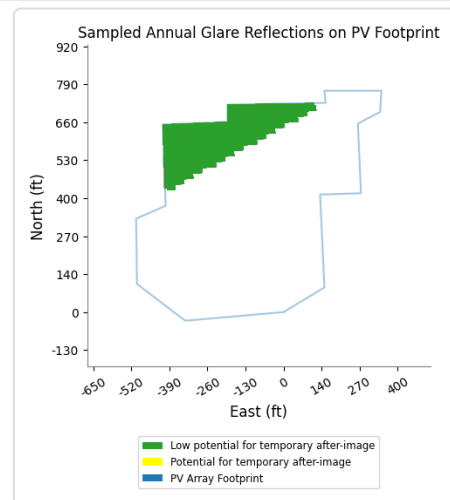
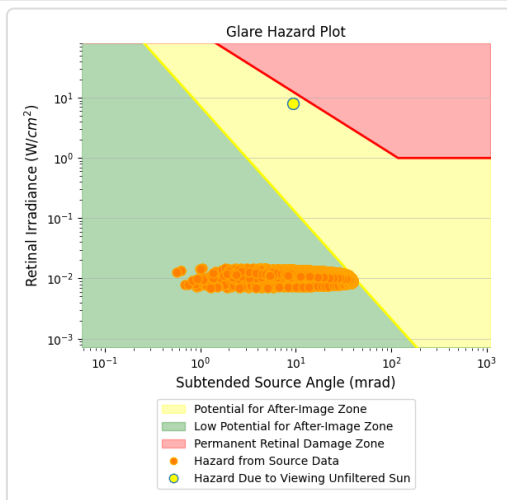
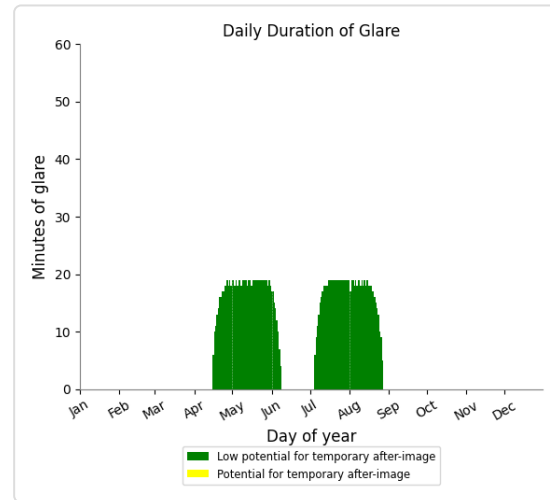
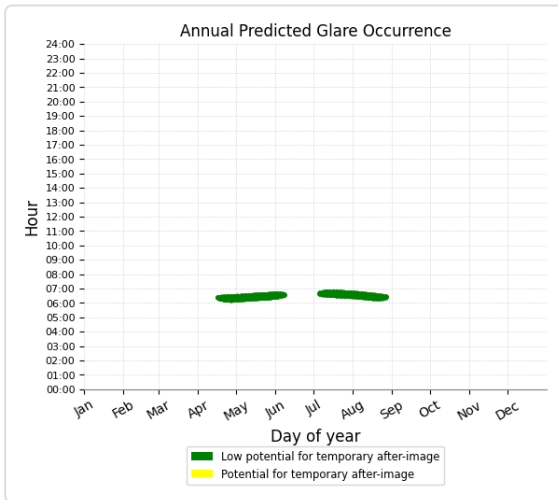
Green glare: 1,213 min.



Proposed Solar Arrays and OP 46

Yellow glare: none

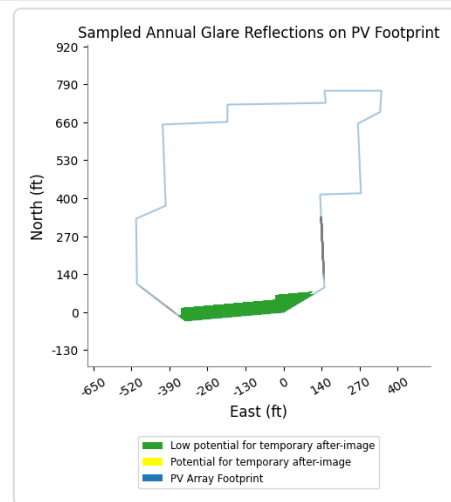
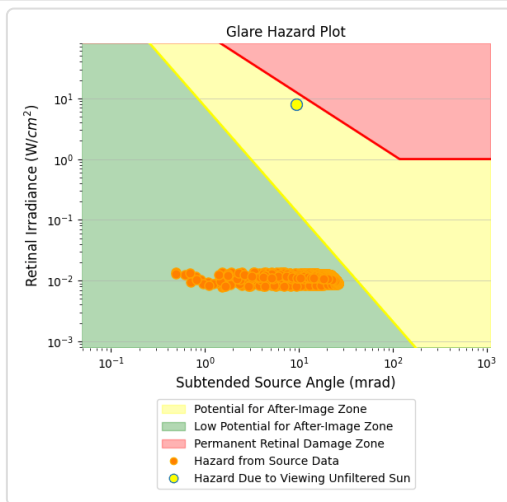
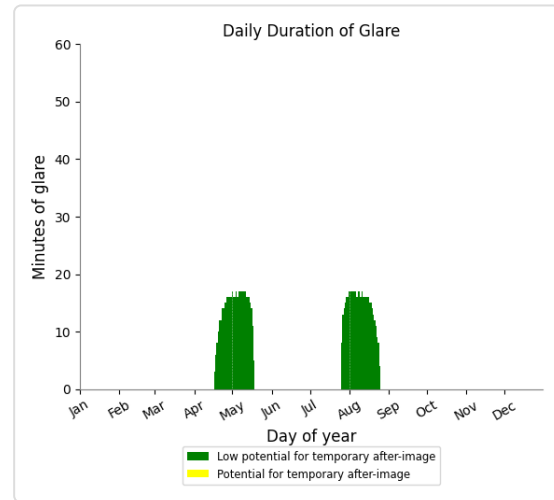
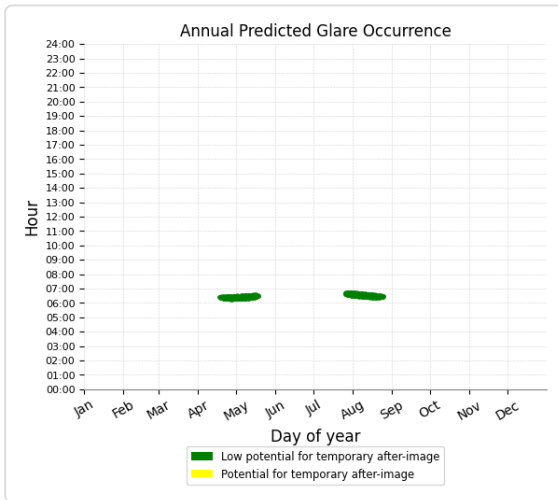
Green glare: 1,819 min.



Proposed Solar Arrays and OP 47

Yellow glare: none

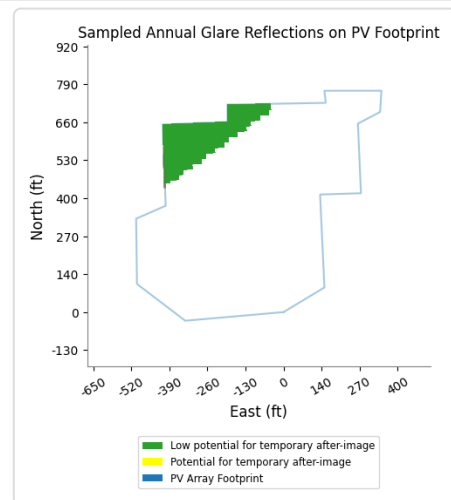
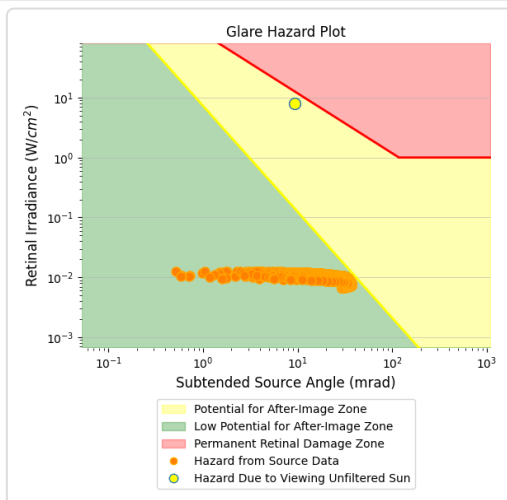
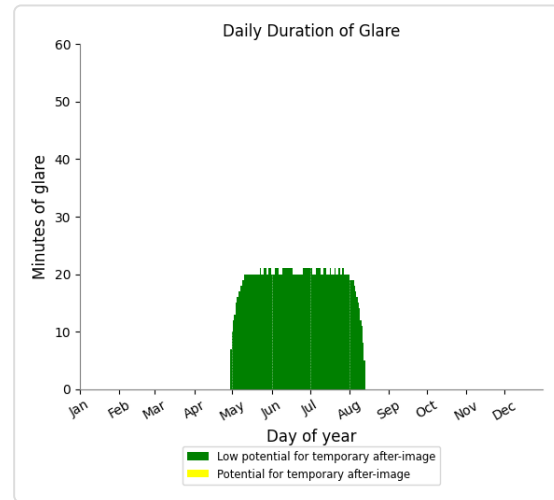
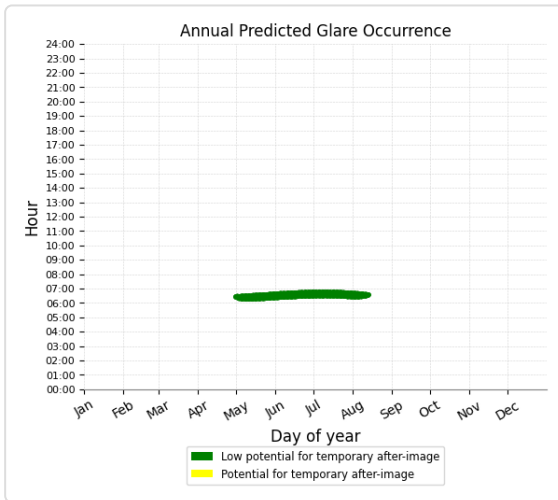
Green glare: 898 min.



Proposed Solar Arrays and OP 48

Yellow glare: none

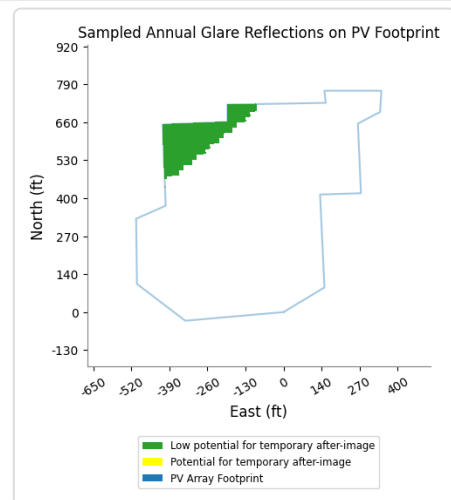
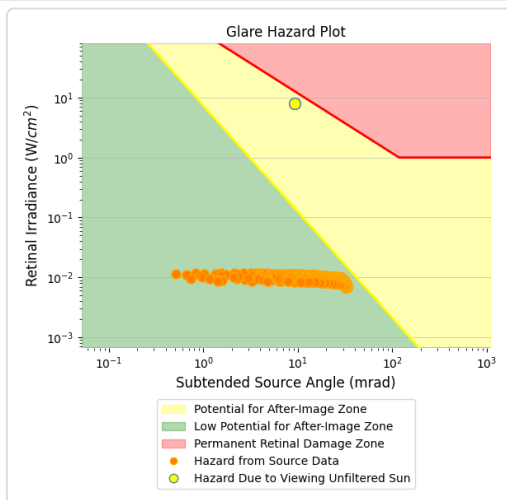
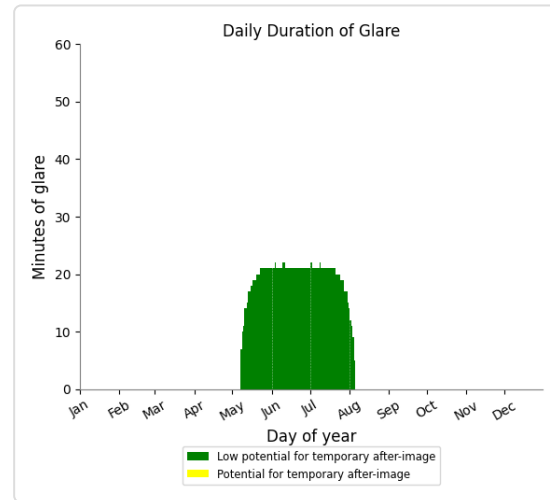
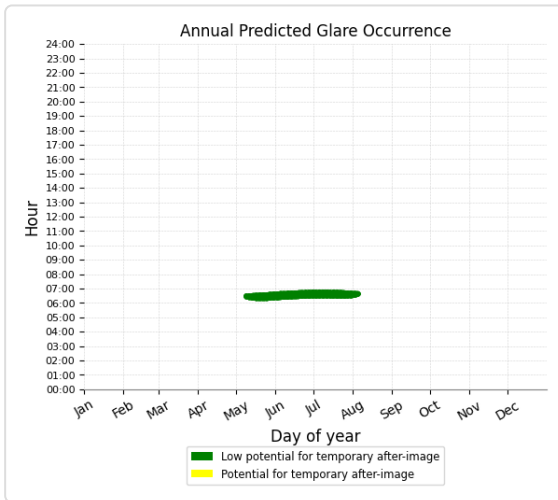
Green glare: 2,029 min.



Proposed Solar Arrays and OP 49

Yellow glare: none

Green glare: 1,739 min.



Proposed Solar Arrays and OP 6

No glare found

Proposed Solar Arrays and OP 7

No glare found

Proposed Solar Arrays and OP 8

No glare found

Proposed Solar Arrays and OP 9

No glare found

Proposed Solar Arrays and OP 10

No glare found

Proposed Solar Arrays and OP 11

No glare found

Proposed Solar Arrays and OP 12

No glare found

Proposed Solar Arrays and OP 13

No glare found

Proposed Solar Arrays and OP 14

No glare found

Proposed Solar Arrays and OP 15

No glare found

Proposed Solar Arrays and OP 16

No glare found

Proposed Solar Arrays and OP 17

No glare found

Proposed Solar Arrays and OP 18

No glare found

Proposed Solar Arrays and OP 19

No glare found

Proposed Solar Arrays and OP 20

No glare found

Proposed Solar Arrays and OP 26

No glare found

Proposed Solar Arrays and OP 27

No glare found

Proposed Solar Arrays and OP 28

No glare found

Proposed Solar Arrays and OP 29

No glare found

Proposed Solar Arrays and OP 30

No glare found

Proposed Solar Arrays and OP 31

No glare found

Proposed Solar Arrays and OP 32

No glare found

Proposed Solar Arrays and OP 33

No glare found

Proposed Solar Arrays and OP 34

No glare found

Proposed Solar Arrays and OP 35

No glare found

Proposed Solar Arrays and OP 36

No glare found

Proposed Solar Arrays and OP 37

No glare found

Proposed Solar Arrays and OP 38

No glare found

Proposed Solar Arrays and OP 39

No glare found

Proposed Solar Arrays and OP 40

No glare found

Proposed Solar Arrays and OP 41

No glare found

Proposed Solar Arrays and OP 50

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.

The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.

Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.

The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.

The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)

The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.

The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.

The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.

Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.

Refer to the Help page at www.forgesolar.com/help/ for assumptions and limitations not listed here.

ForgeSolar default analysis parameters and observer eye characteristics, listed for reference only. The values used for this analysis are given in the site summary above.

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

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This analysis was conducted using the best available radiometric modeling at the time of generation. Future updates to the modeling methodology may yield different results.

APPENDIX B.

Analysis Points and Route Receptors

