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AVIATION GLINT AND GLARE ASSESSMENT

Proposed Roof Mounted Solar PV

Tallaght, Co. Dublin

Prepared by Macro Works Ltd

May 2026

LVIA I TVIA I Landscape Design I Visibility Analysis I Glint and Glare I Verified Photomontages I CGI I Shadow Flicker Analysis

Registered Landscape Architect

1. AVIATION GLINT AND GLARE ASSESSMENT

1.1 INTRODUCTION

This Glint and Glare Assessment was carried out by Macro Works Ltd to determine the potential for solar reflectance effects upon aviation receptors in respect of proposed roof-mounted solar PV installations on the roof the existing County Hall and Library in Tallaght in County Dublin. The proposed panels will remain in a fixed position throughout the day and year (i.e. they will not rotate to track the movement of the sun). The proposed panels will be fixed at varies angles with some facing south, east and west. Figure 1.1 and Figure 1.2 refer.

Figure 1.1 Aerial view indicating the location of the proposed PV panels

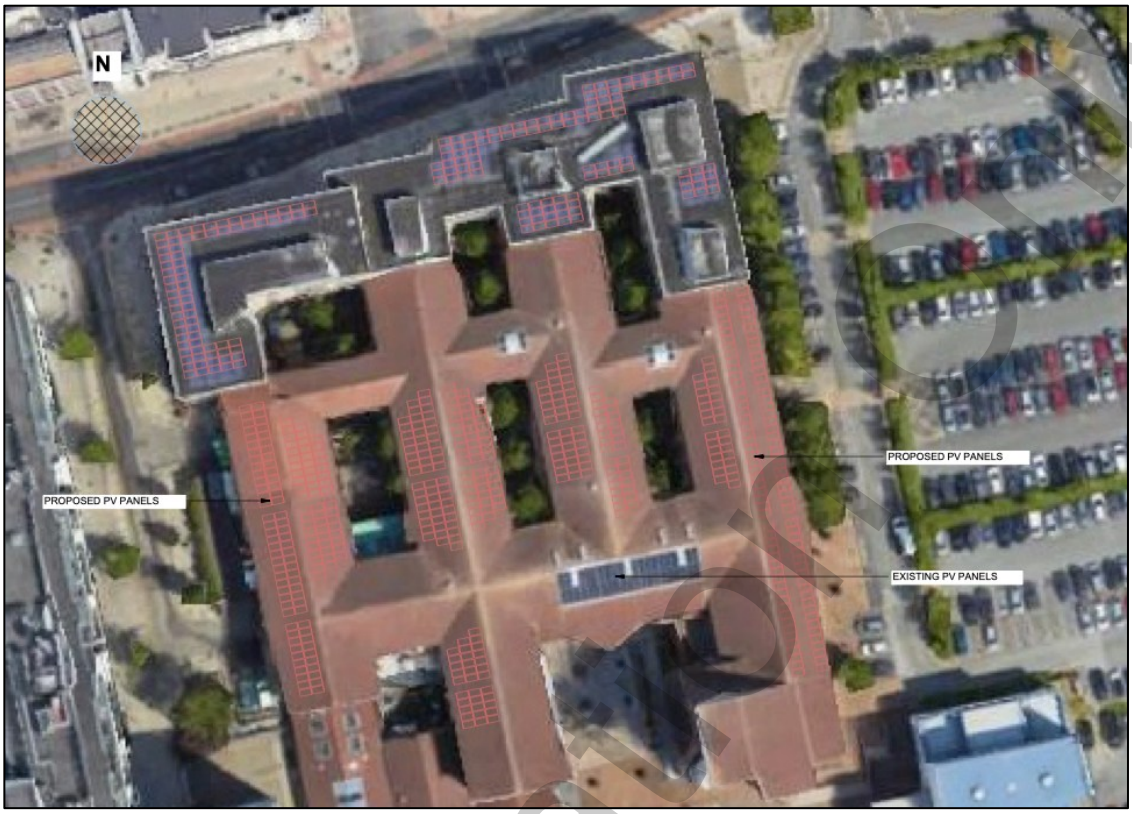


Figure 1.2 Extract from drawing "SDC2401-ALT-CHL-XX-DR-E-63000 - County Hall & Tallaght Library - Solar PV Layout-Layout1" showing the roof layout with the proposed PV panels.

1.1.1 Statement of Authority

Macro Works' relevant experience includes twenty years of analysing the visual effects of a wide range of infrastructural and commercial development types. This experience includes numerous domestic and international wind and solar energy developments.

1.1.2 Guidance and Best Practice

The Irish Aviation Authority (IAA) has not published any specific guidance on solar PV developments. The IAA identifies the need to ensure safety in relation to potential reflectance effects emitting from solar developments and highlights the potential for an ocular assessment to be requested.[1] The European Union Aviation Safety Authority (EASA) requires an assessment of the luminance of proposed PV panels, rather than by ocular irradiance, so as not to dazzle air traffic controllers to the extent of a reduction in visual perception of airport operations.[2] EASA found that 20,000 cd/m2 was the maximum acceptable luminance value for solar PV arrays in the vicinity of an aviation receptor. As the IAA refer to the need for an ocular assessment, this analysis will focus on potential ocular effects.

[1] Irish Aviation Authority. (2025). IAA - National Aviation Safeguarding Framework, Consultation Document, p. 30.

2 European Union Aviation Safety Agency. (2025). Certification Specifications and Guidance Material for Aerodrome Design (CS-ADR-DSN). Issue 7. Page 161. https://www.easa.europa.eu/en/document-library/certification-specifications/group/cs-adr-dsn-aerodromes-design?utm_source=chatgpt.com#cs-adr-dsn-aerodromes-design.

The sequence of guidance developed by the United States Federal Aviation Administration (FAA) to address the potential hazards that solar developments may pose to aviation activities, is considered the most comprehensive for the purposes of assessment of solar developments near aerodromes. The initial guidance was prepared in 2010 (entitled 'Technical Guidance for Evaluating Selected Solar Technologies on Airports' (archived)), was subsequently updated in 2013[3] (entitled 'Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports'). The most current version of the guidance (Version 1.1) 'Technical Guidance for Evaluating Selected Solar Technologies on Airports' was released in 2018.[4]

The SGHAT was developed in conjunction with the FAA in harmony with this guidance and is adopted as the standard for measuring the ocular impact of solar developments. Furthermore, it is commonly regarded as the accepted industry standard by aviation authorities internationally when considering the glint and glare effects upon aviation-related receptors.

There is currently no aviation-authority guidance from either the IAA, FAA or EASA that specifically addresses glint and glare impacts from solar installations in relation to helipads or heliports. Existing guidance and policy documents are primarily framed around fixed-wing aircraft operations at aerodromes, with a focus on potential ocular impacts to pilots and air traffic controllers during critical phases of flight. In the absence of helipad-specific criteria, it is best practice to apply the same underlying aviation safety principles to helicopter operations, namely that reflections from solar panels should not result in distracting or hazardous glare that could impair pilot vision during approach, landing, take-off or departure.

By virtue of their efficiency, the intensity of reflected light from modern PV solar panels is deliberately low and currently equates with that of the reflection from still water. Recent studies generally agree, however, that there still exists the potential for hazard or nuisance upon surrounding receptors. Macro Works' glint and glare analysis methods and determination of effects are based on a combination of available studies and established best practice. This methodology has been successfully implemented on numerous previous solar farm projects that met with the approval of various Planning Authorities

Federal Aviation Authority

Within the FAA's interim policy, a 'Review of Solar Energy System Projects on Federally Obligated Airports'[5] it states:

> *"To obtain FAA approval to revise an airport layout plan to depict a solar installation and/or a ''no objection'' to a Notice of Proposed Construction Form 7460–1, the airport sponsor will be required to demonstrate that the proposed solar energy system meets the following standards:*
>
> *No potential for glint or glare in the existing or planned Airport Traffic Control Tower (ATCT) cab, and*

3 Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports, Department of Transportation, Federal Aviation Administration, date: 10/2013

4 Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018

5 Federal Aviation Administration (FAA). (2013). Department of Transportation - Federal Aviation Administration. Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports. Vol 78 (No 205), 63276-63279. Available at: https://www.federalregister.gov/documents/2013/10/23/2013-24729/interim-policy-faa-review-of-solar-energy-system-projects-on-federally-obligated-airports

No potential for glare or "low potential for after-image" (shown in green in Figure 1[Figure 1.3 refers]) along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing thresholds) as shown on the current FAA-approved Airport Layout Plan (ALP). The final approach path is defined as two (2) miles from fifty (50) feet above the landing threshold using a standard three (3) degree glidepath."

An update of the policy in 2021[6] replaced this interim policy, with the key amendment of deprioritising runway approaches as critical aviation receptors, citing the following;

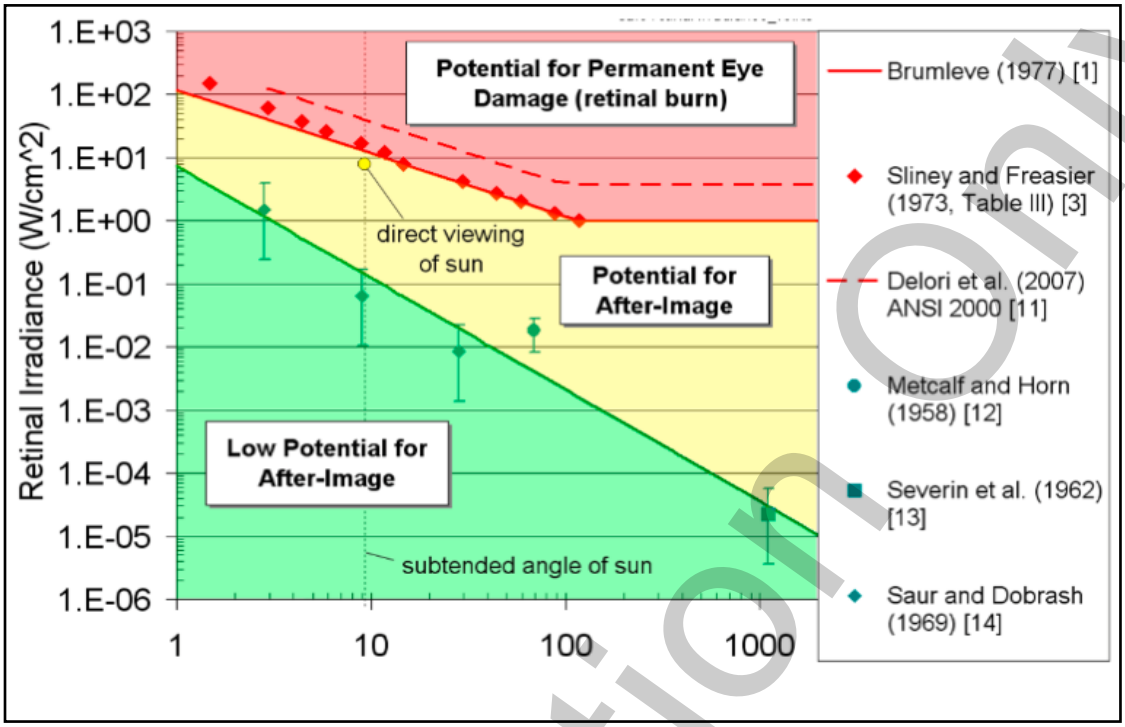
"Initially, FAA believed that solar energy systems could introduce a novel glint and glare effect to pilots on final approach. FAA has subsequently concluded that in most cases, the glint and glare from solar energy systems to pilots on final approach is similar to glint and glare pilots routinely experience from water bodies, glass-façade buildings, parking lots, and similar features. However, FAA has continued to receive reports of potential glint and glare from on-airport solar energy systems on personnel working in ATCT cabs. Therefore, FAA has determined the scope of agency policy should be focused on the impact of on-airport solar energy systems to federally-obligated towered airports, specifically the airport's ATCT" (Federal Aviation Administration 05/11/2021).

In summary, glare at an ATCT is not acceptable and while still relevant glare with a ''low potential for after-image'' is generally acceptable along final approach paths to runways in most instances.

Solar Glare Hazard Analysis Tool

The SGHAT was designed to determine whether a proposed solar energy project would result in the potential for ocular impact as depicted on the Solar Glare Hazard Analysis Plot (Figure 1.3 refers). SGHAT analyses ocular impact over the entire calendar year in one minute intervals from when the sun rises above the horizon until the sun sets below the horizon. One of the principal outputs from the SGHAT report is a glare plot per receptor that indicates the time of day and days per year that glare has the potential to occur. SGHAT plot classifies the intensity of ocular impact as either Green Glare, Yellow Glare or Red Glare. These colour classifications are equivalent to the FAA's definitions regarding the level of ocular impact e.g. 'Green Glare' in the SGHAT is synonymous to the FAA's ''low potential for after-image',' and so forth. The various correlations are illustrated on the Solar Glare Hazard Analysis Plot.

6 Federal Aviation Administration Policy: Review of Solar Energy System Projects on Federally-Obligated Airports; date: 11/2021



Solar Glare Ocular Hazard Plot: The potential ocular hazard from solar glare is a function of retinal irradiance and the subtended angle (size/distance) of the glare source. It should be noted that the ratio of spectrally weighted solar illuminance to solar irradiance at the earth's surface yields a conversion factor of ~100 lumens/W. Plot adapted from Ho et al., 2011.

Chart References: Ho, C.K., C.M. Ghanbari, and R.B. Diver, 2011, Methodology to Assess Potential Glint and Glare Hazards from Concentrating Solar Power Plants: Analytical Models and Experimental Validation, J. Solar Energy Engineering, August 2011, Vol. 133, 031021-1 – 031021-9.

Figure 1.3 - Figure 1 from the FAA Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports

1.2 METHODOLOGY

The process for dealing with aviation receptors is as follows:

1. The Federal Aviation Administration (FAA) approved Solar Glare Hazard Analysis Tool (SGHAT) is used to determine if any of these aviation receptors has the potential to theoretically experience glint or glare. This tool also calculates the intensity of such reflectance and whether it is acceptable by FAA standards.

2. SGHAT does not account for terrain screening or screening provided by surface elements such as existing vegetation or buildings, therefore the results of the SGHAT may need to be considered, in conjunction with an assessment of existing intervening screening that may be present, to establish if reflectance can actually be experienced at the receptors.

3. Finally, if necessary, additional assessment is undertaken using Macro Works' bespoke model which would into account any screening provided by any proposed mitigation measures.

1.2.1 Identification of Relevant Receptors

The Planning and Development (Solar Safeguarding Zone) Regulations 2022 set out 43 Solar Safeguarding Zones (SSZs). A SSZ is an area around an airport, aerodrome or helipad in which there is a potential for glint or glare from solar panels to impact aviation safety.

Observation Points

Tallaght Hospital helipad is situated approximately 170m northwest of the proposed development. Thirteen Observation Points (OP), with heights ranging from 1.7m to 300m, were assessed for potential reflectance.

Figure 1.4 Map showing the location of the proposed development relative to the identified aviation receptor.

1.3 RESULTS

1.3.1 Observation Points (OP 1 - 13)

The SGHAT results are contained in Appendix A and show that none of the 13 OPs analysed had potential for Green or Yellow Glare to occur.

All 13 OPs analysed showed potential for Green Glare although none of the OP's showed potential for Yellow Glare. OP8 has the highest periods of potential reflectance (Green Glare) with some 14209 mins of glare per annum. The absence of Yellow Glare is regarded as a 'Pass' in this assessment as there would only be low potential for after-image

1.4 OVERALL CONCLUSION

From the analysis and discussions contained herein, it is considered that the proposed PV arrays at the existing County Hall and Library Building in Tallaght results in a 'Pass' at the Tallaght Hospital Helipad receptor.

APPENDIX A: SGHAT RESULTS

FORGESOLAR GLARE ANALYSIS

Project: **Tallaght Hospital Helipad**
Site configuration: **County_Hall_and_Library_Tallaght**
Analysis conducted by Luis Dominguez (luis@macroworks.ie) at 14:27 on 22 May, 2026.
Calculated via ForgeSolar Radiometric Physics Engine v3.1.3

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

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

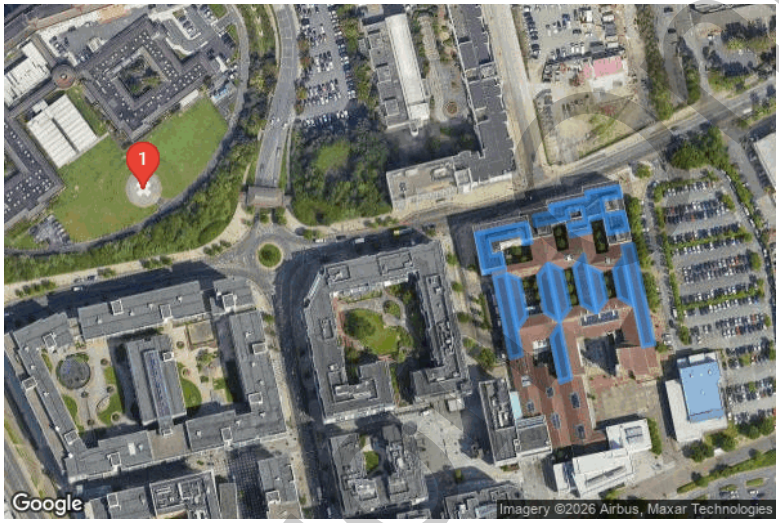
- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 178927.29579

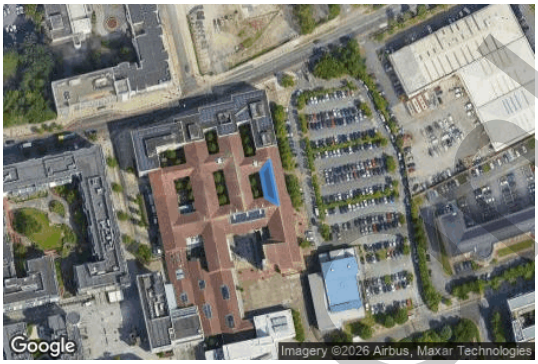


PV Array(s)

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 5.0°
Orientation: 168.0°
Rated power: -
Panel material: Smooth glass without AR coating

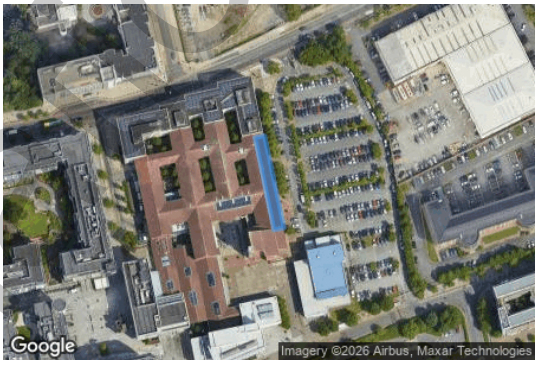
Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.289282	-6.374008	98.00	18.20	116.20
2	53.289086	-6.373941	98.00	18.20	116.20
3	53.289108	-6.373768	98.00	18.20	116.20
4	53.289183	-6.373798	98.00	18.20	116.20
5	53.289174	-6.373879	98.00	18.20	116.20
6	53.289250	-6.373906	98.00	18.20	116.20
7	53.289284	-6.373625	98.00	18.20	116.20
8	53.289233	-6.373611	98.00	18.20	116.20
9	53.289240	-6.373548	98.00	18.20	116.20
10	53.289337	-6.373584	98.00	18.20	116.20

Name: PV array 10
Axis tracking: Fixed (no rotation)
Tilt: 5.0°
Orientation: 258.0°
Rated power: -
Panel material: Smooth glass without AR coating



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.289104	-6.372858	98.00	14.80	112.80
2	53.288966	-6.372813	98.00	14.80	112.80
3	53.288929	-6.372705	98.00	9.00	107.00
4	53.289162	-6.372783	98.00	9.00	107.00

Name: PV array 11
Axis tracking: Fixed (no rotation)
Tilt: 35.0°
Orientation: 78.0°
Rated power: -
Panel material: Smooth glass without AR coating



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.289221	-6.372788	98.00	14.80	112.80
2	53.288723	-6.372615	98.00	14.80	112.80
3	53.288734	-6.372524	98.00	9.00	107.00
4	53.289231	-6.372699	98.00	9.00	107.00

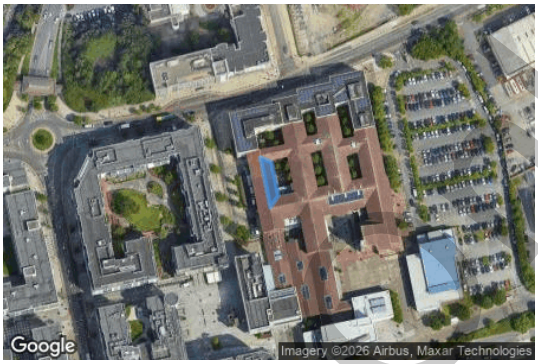
Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 5.0°
Orientation: 168.0°
Rated power: -
Panel material: Smooth glass without AR coating

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.289372	-6.373522	98.00	15.20	113.20
2	53.289324	-6.373511	98.00	15.20	113.20
3	53.289359	-6.373238	98.00	15.20	113.20
4	53.289395	-6.373250	98.00	15.20	113.20
5	53.289411	-6.373120	98.00	15.20	113.20
6	53.289343	-6.373098	98.00	15.20	113.20
7	53.289328	-6.373236	98.00	15.20	113.20
8	53.289272	-6.373216	98.00	15.20	113.20
9	53.289293	-6.373054	98.00	15.20	113.20
10	53.289351	-6.373076	98.00	15.20	113.20
11	53.289371	-6.372932	98.00	15.20	113.20
12	53.289284	-6.372903	98.00	15.20	113.20
13	53.289304	-6.372740	98.00	15.20	113.20
14	53.289390	-6.372781	98.00	15.20	113.20
15	53.289377	-6.372936	98.00	15.20	113.20
16	53.289452	-6.372962	98.00	15.20	113.20
17	53.289470	-6.372799	98.00	15.20	113.20
18	53.289518	-6.372819	98.00	15.20	113.20
19	53.289488	-6.373088	98.00	15.20	113.20
20	53.289461	-6.373077	98.00	15.20	113.20
21	53.289421	-6.373389	98.00	15.20	113.20
22	53.289389	-6.373379	98.00	15.20	113.20

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 35.0°
Orientation: 258.0°
Rated power: -
Panel material: Smooth glass without AR coating

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.289083	-6.373764	98.00	14.80	112.80
2	53.288678	-6.373627	98.00	14.80	112.80
3	53.288665	-6.373718	98.00	9.00	107.00
4	53.289069	-6.373857	98.00	9.00	107.00

Name: PV array 4
Axis tracking: Fixed (no rotation)
Tilt: 35.0°
Orientation: 78.0°
Rated power: -
Panel material: Smooth glass without AR coating



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.289081	-6.373749	98.00	14.80	112.80
2	53.288813	-6.373660	98.00	14.80	112.80
3	53.288874	-6.373586	98.00	9.00	107.00
4	53.289056	-6.373648	98.00	9.00	107.00

Name: PV array 5
Axis tracking: Fixed (no rotation)
Tilt: 35.0°
Orientation: 258.0°
Rated power: -
Panel material: Smooth glass without AR coating

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.289072	-6.373490	98.00	9.00	107.00
2	53.289129	-6.373418	98.00	14.80	112.80
3	53.288850	-6.373316	98.00	14.80	112.80
4	53.288892	-6.373432	98.00	9.00	107.00

Name: PV array 6
Axis tracking: Fixed (no rotation)
Tilt: 35.0°
Orientation: 258.0°
Rated power: -
Panel material: Smooth glass without AR coating

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.288834	-6.373310	98.00	14.80	112.80
2	53.288563	-6.373216	98.00	14.80	112.80
3	53.288544	-6.373302	98.00	9.00	107.00
4	53.288766	-6.373379	98.00	9.00	107.00

Name: PV array 7
Axis tracking: Fixed (no rotation)
Tilt: 35.0°
Orientation: 78.0°
Rated power: -
Panel material: Smooth glass without AR coating

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.289133	-6.373401	98.00	14.80	112.80
2	53.288851	-6.373304	98.00	14.80	112.80
3	53.288916	-6.373226	98.00	9.00	107.00
4	53.289103	-6.373296	98.00	9.00	107.00

Name: PV array 8
Axis tracking: Fixed (no rotation)
Tilt: 35.0°
Orientation: 258.0°
Rated power: -
Panel material: Smooth glass without AR coating

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.289178	-6.373110	98.00	14.80	112.80
2	53.288894	-6.373009	98.00	14.80	112.80
3	53.288933	-6.373126	98.00	9.00	107.00
4	53.289116	-6.373189	98.00	9.00	107.00

Name: PV array 9
Axis tracking: Fixed (no rotation)
Tilt: 35.0°
Orientation: 78.0°
Rated power: -
Panel material: Smooth glass without AR coating

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.289120	-6.373072	98.00	14.80	112.80
2	53.288894	-6.372998	98.00	14.80	112.80
3	53.288956	-6.372922	98.00	9.00	107.00
4	53.289089	-6.372969	98.00	9.00	107.00

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	53.289501	-6.376776	104.60	1.70
OP 2	2	53.289501	-6.376776	104.60	25.00
OP 3	3	53.289501	-6.376776	104.60	50.00
OP 4	4	53.289501	-6.376776	104.60	75.00
OP 5	5	53.289501	-6.376776	104.60	100.00
OP 6	6	53.289501	-6.376776	104.60	125.00
OP 7	7	53.289501	-6.376776	104.60	150.00
OP 8	8	53.289501	-6.376776	104.60	175.00
OP 9	9	53.289501	-6.376776	104.60	200.00
OP 10	10	53.289501	-6.376776	104.60	225.00
OP 11	11	53.289501	-6.376776	104.60	250.00
OP 12	12	53.289501	-6.376776	104.60	275.00
OP 13	13	53.289501	-6.376776	104.60	300.00

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1	5.0	168.0	20,674	0	-
PV array 10	5.0	258.0	10,750	0	-
PV array 11	35.0	78.0	0	0	-
PV array 2	5.0	168.0	22,279	0	-
PV array 3	35.0	258.0	35,553	0	-
PV array 4	35.0	78.0	0	0	-
PV array 5	35.0	258.0	10,252	0	-
PV array 6	35.0	258.0	32,384	0	-
PV array 7	35.0	78.0	0	0	-
PV array 8	35.0	258.0	2,013	0	-
PV array 9	35.0	78.0	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	7597	0
OP 2	8529	0
OP 3	9115	0
OP 4	9193	0
OP 5	9651	0
OP 6	10767	0
OP 7	12144	0
OP 8	14209	0
OP 9	13543	0
OP 10	11919	0
OP 11	10322	0
OP 12	8622	0
OP 13	8294	0

Results for: PV array 1

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	700	0
OP 3	1395	0
OP 4	1504	0
OP 5	1668	0
OP 6	1899	0
OP 7	2289	0
OP 8	3369	0
OP 9	3482	0
OP 10	2640	0
OP 11	1488	0
OP 12	240	0
OP 13	0	0

Point Receptor: OP 1

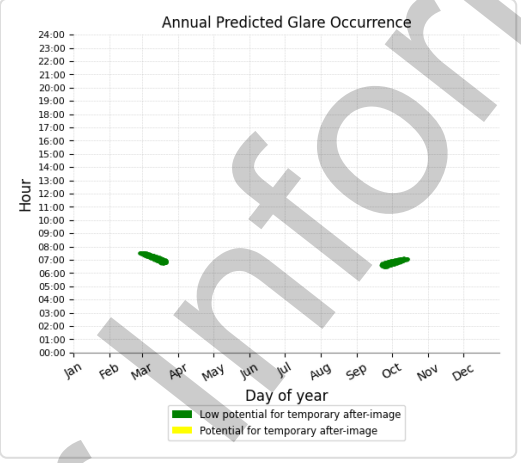
0 minutes of yellow glare

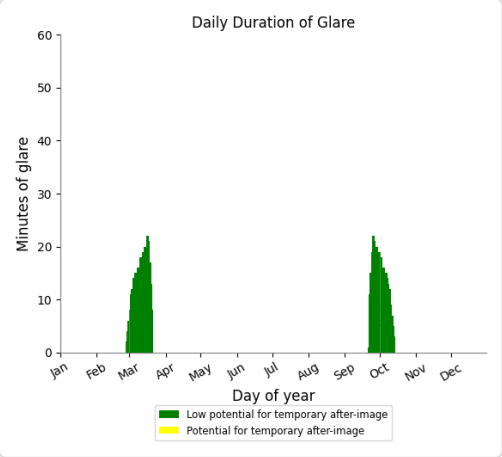
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare

700 minutes of green glare

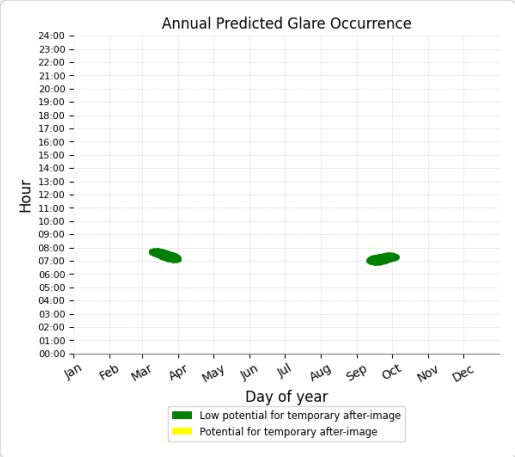


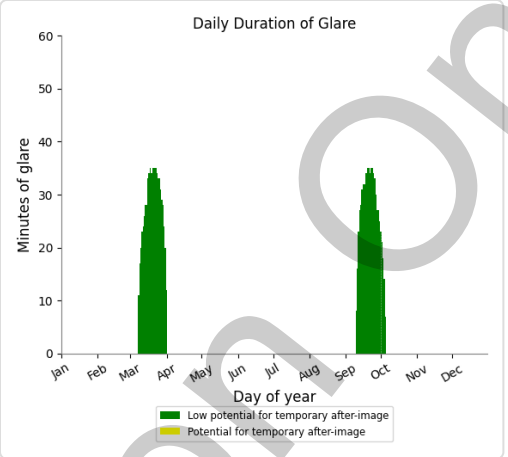


Point Receptor: OP 3

0 minutes of yellow glare

1395 minutes of green glare

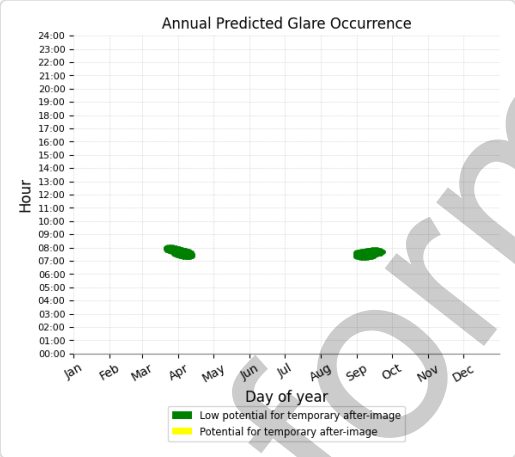


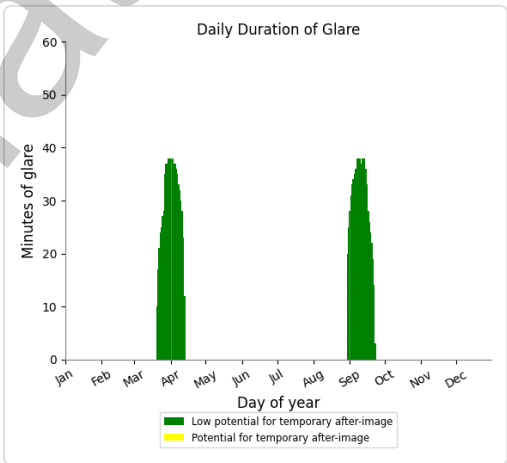


Point Receptor: OP 4

0 minutes of yellow glare

1504 minutes of green glare

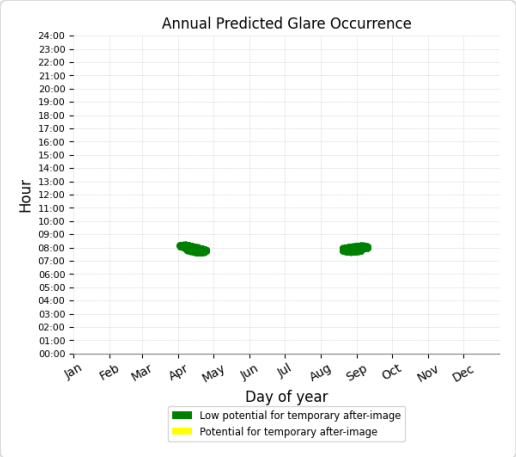


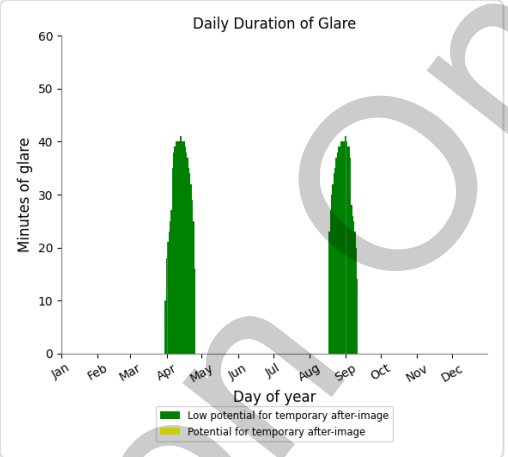


Point Receptor: OP 5

0 minutes of yellow glare

1668 minutes of green glare

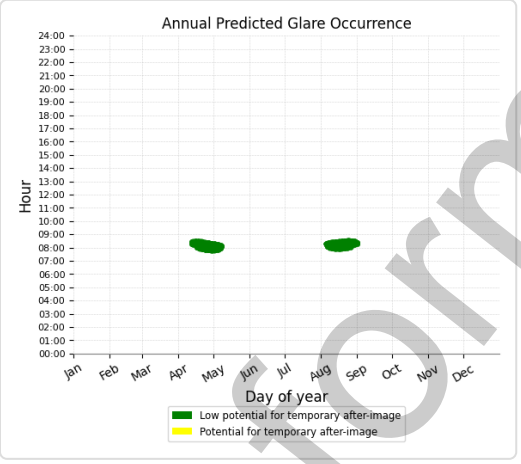


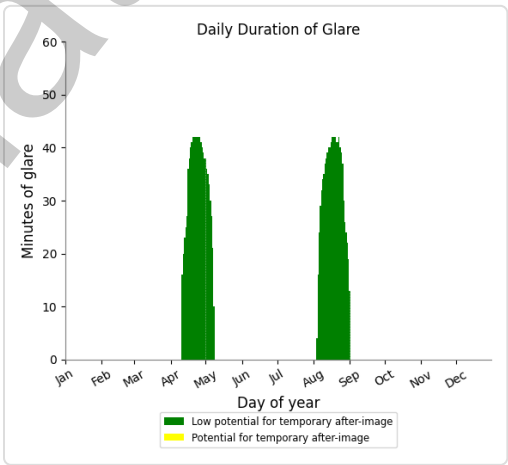


Point Receptor: OP 6

0 minutes of yellow glare

1899 minutes of green glare

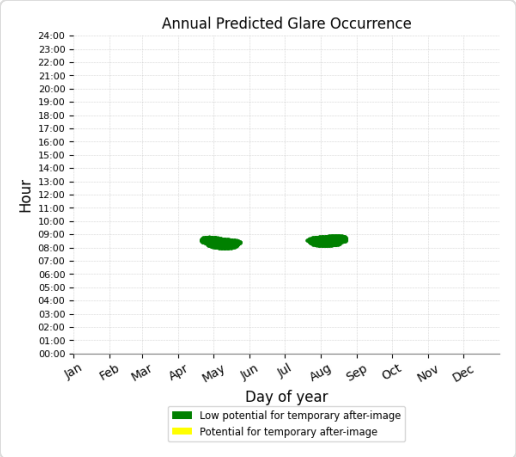


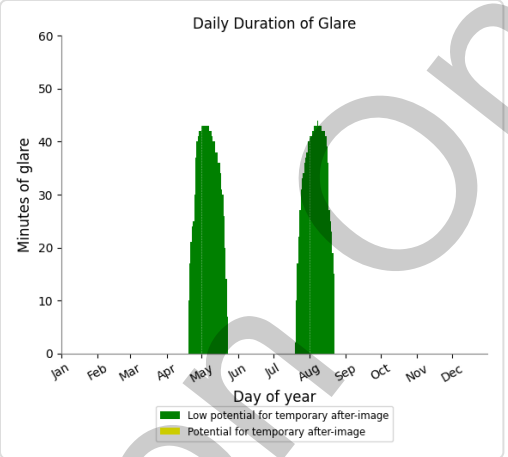


Point Receptor: OP 7

0 minutes of yellow glare

2289 minutes of green glare

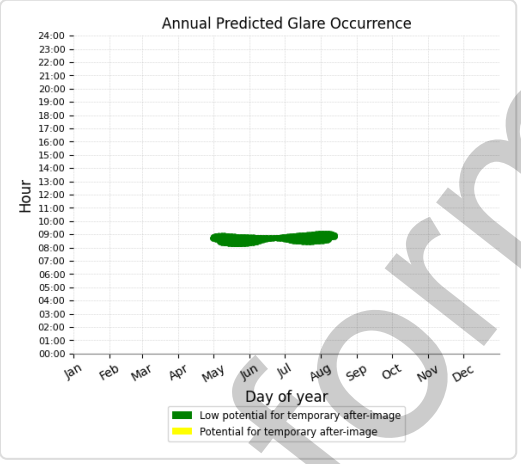


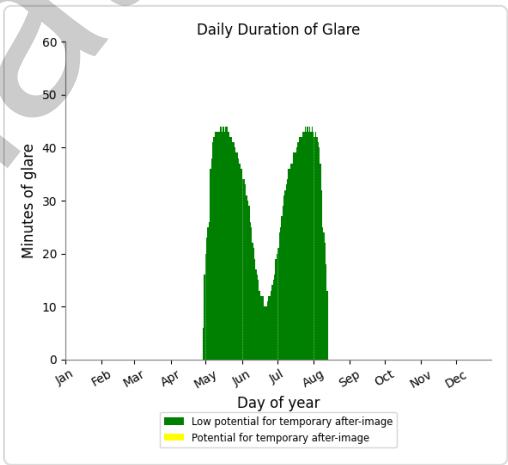


Point Receptor: OP 8

0 minutes of yellow glare

3369 minutes of green glare

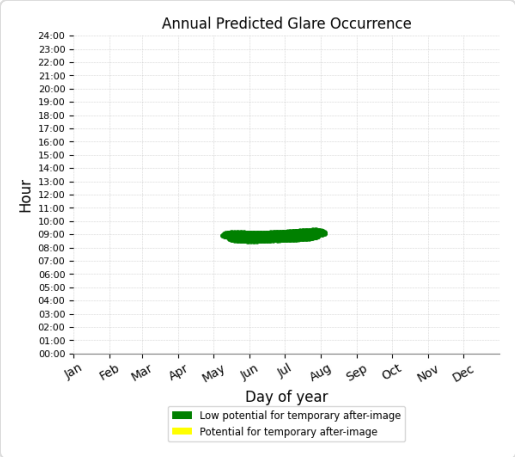


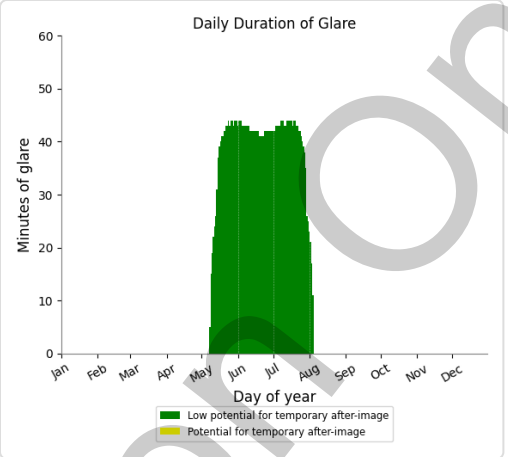


Point Receptor: OP 9

0 minutes of yellow glare

3482 minutes of green glare

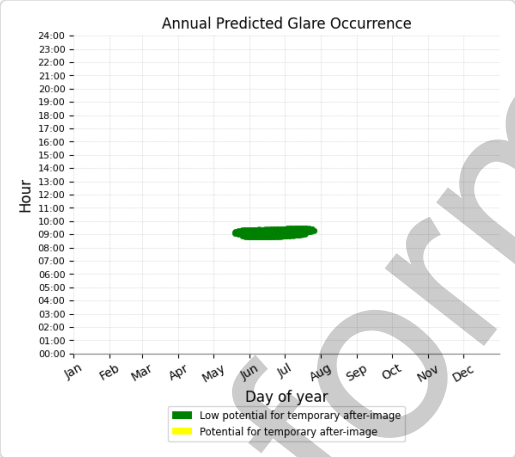


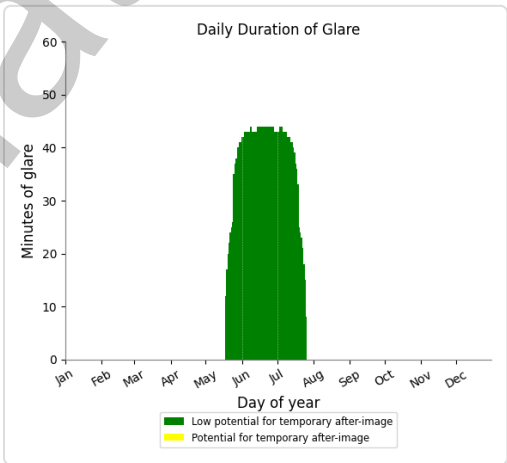


Point Receptor: OP 10

0 minutes of yellow glare

2640 minutes of green glare

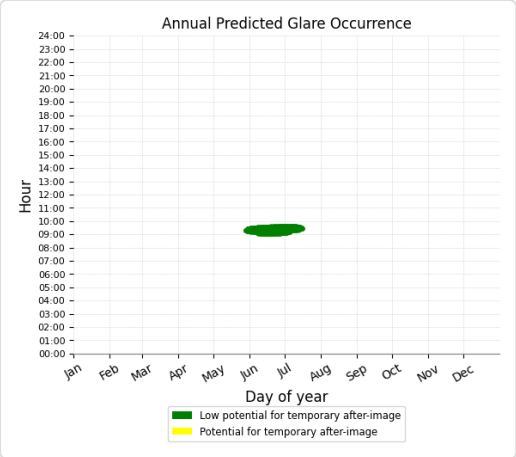


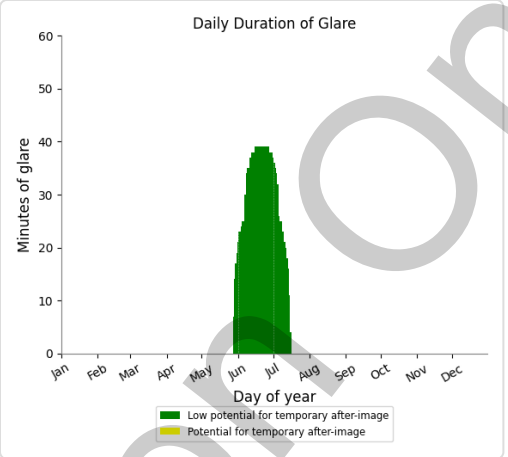


Point Receptor: OP 11

0 minutes of yellow glare

1488 minutes of green glare

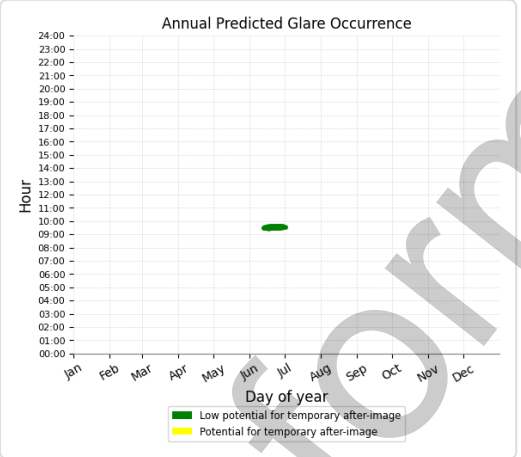


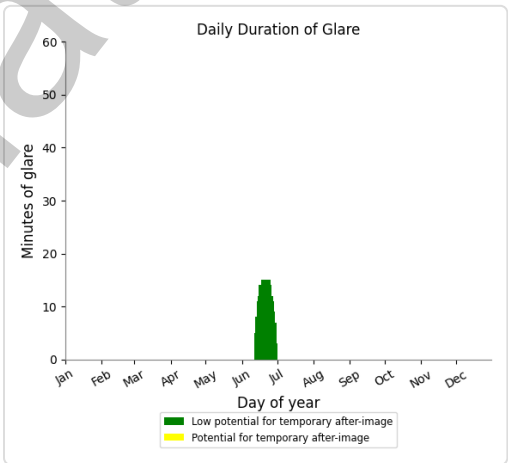


Point Receptor: OP 12

0 minutes of yellow glare

240 minutes of green glare





Point Receptor: OP 13

0 minutes of yellow glare

0 minutes of green glare

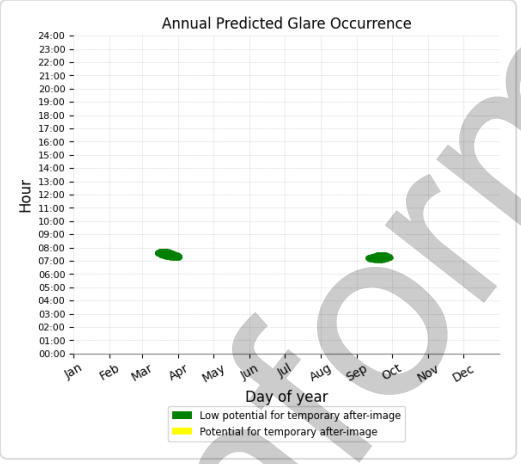
Results for: PV array 10

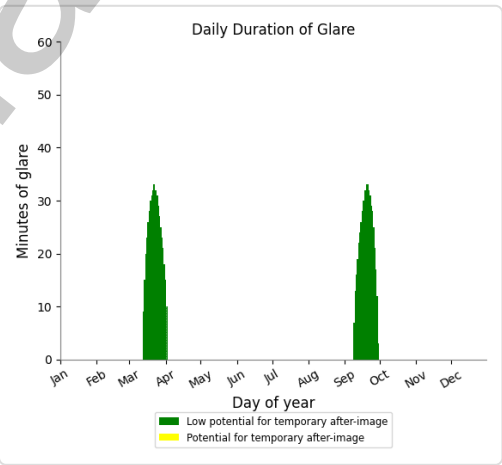
Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	1023	0
OP 2	1027	0
OP 3	1062	0
OP 4	1142	0
OP 5	1311	0
OP 6	1879	0
OP 7	2013	0
OP 8	1203	0
OP 9	90	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0

Point Receptor: OP 1

0 minutes of yellow glare

1023 minutes of green glare

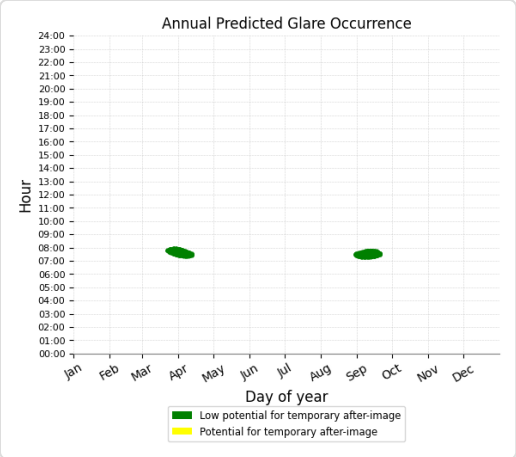


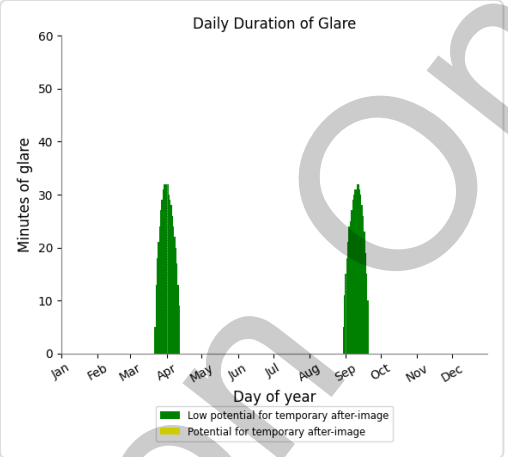


Point Receptor: OP 2

0 minutes of yellow glare

1027 minutes of green glare

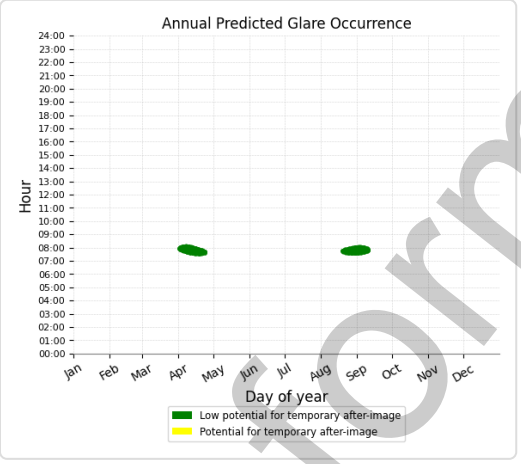


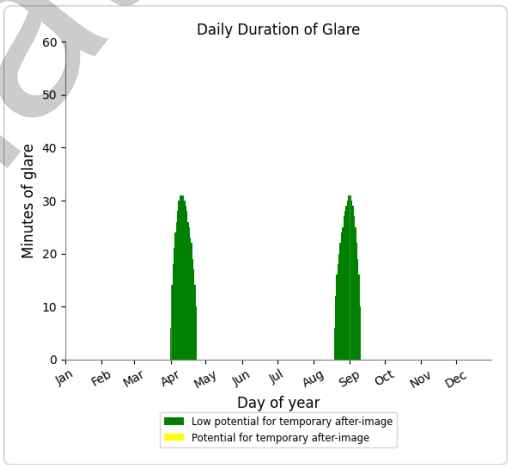


Point Receptor: OP 3

0 minutes of yellow glare

1062 minutes of green glare

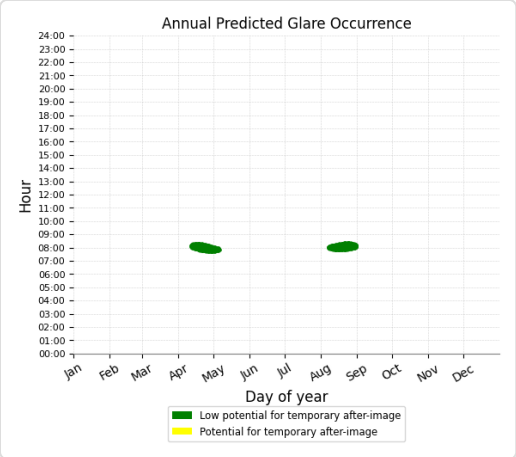


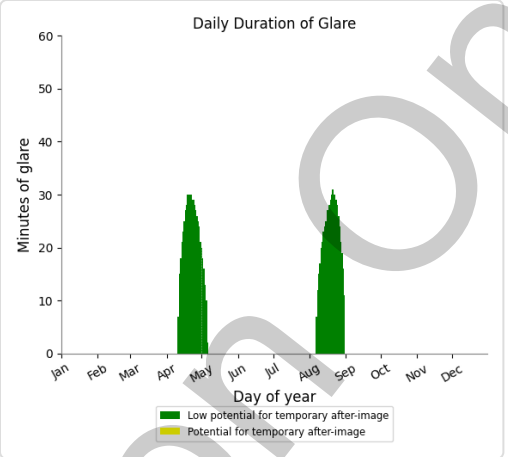


Point Receptor: OP 4

0 minutes of yellow glare

1142 minutes of green glare

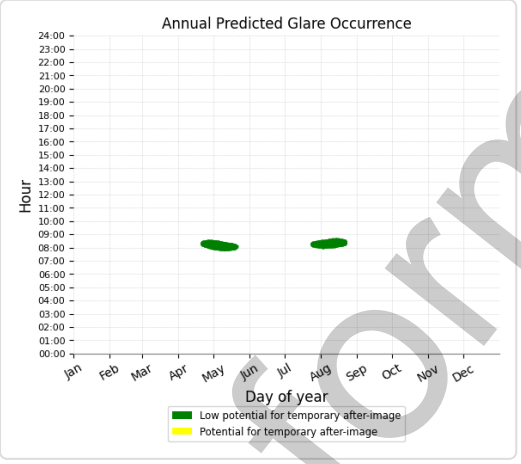


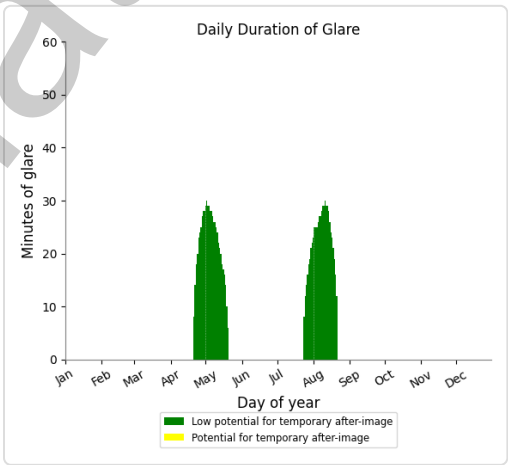


Point Receptor: OP 5

0 minutes of yellow glare

1311 minutes of green glare

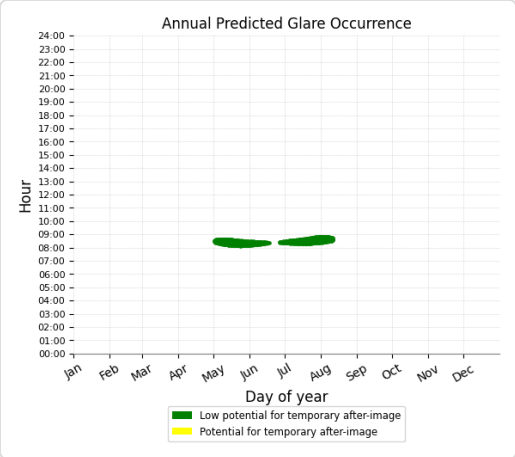


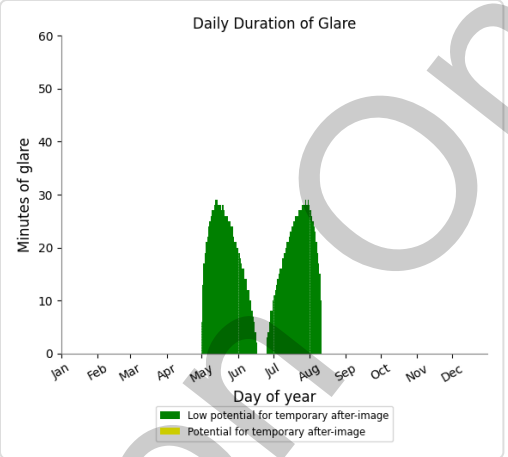


Point Receptor: OP 6

0 minutes of yellow glare

1879 minutes of green glare

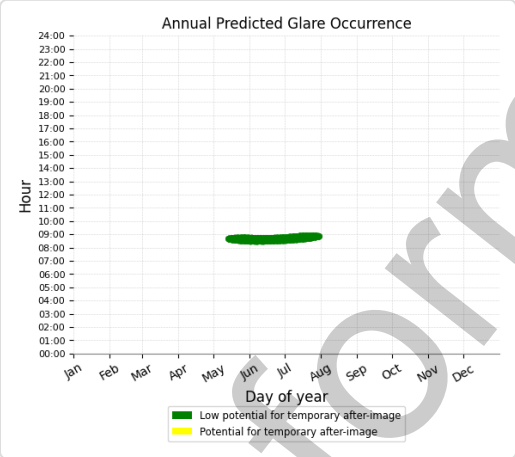


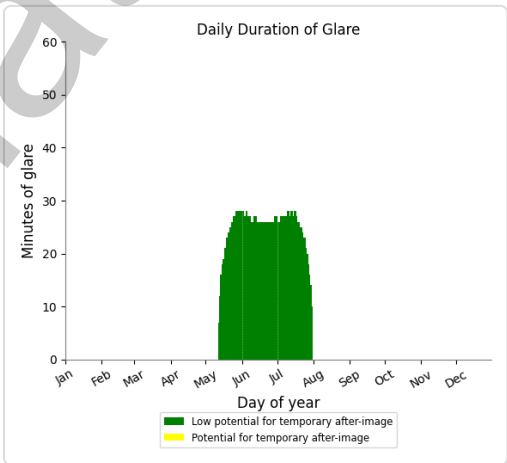


Point Receptor: OP 7

0 minutes of yellow glare

2013 minutes of green glare

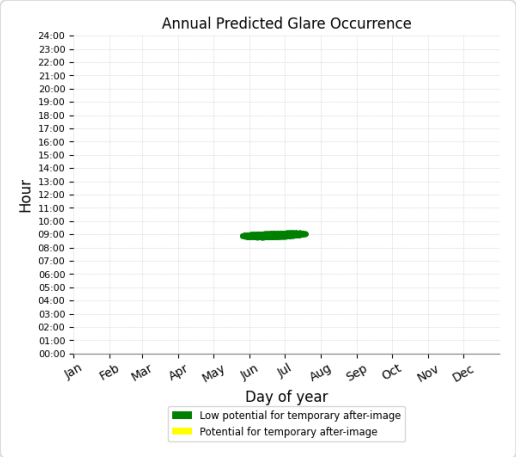


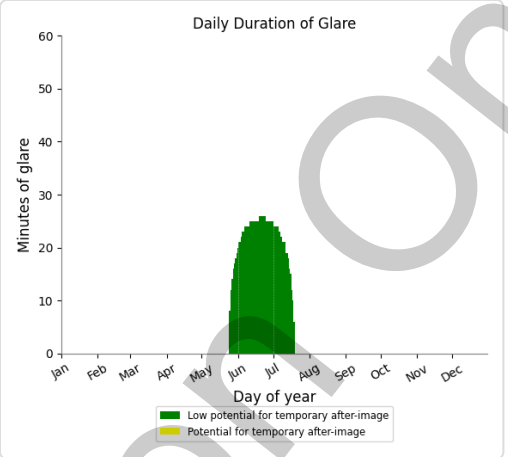


Point Receptor: OP 8

0 minutes of yellow glare

1203 minutes of green glare

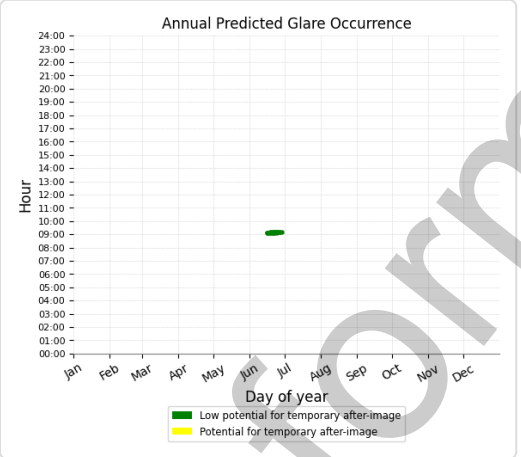


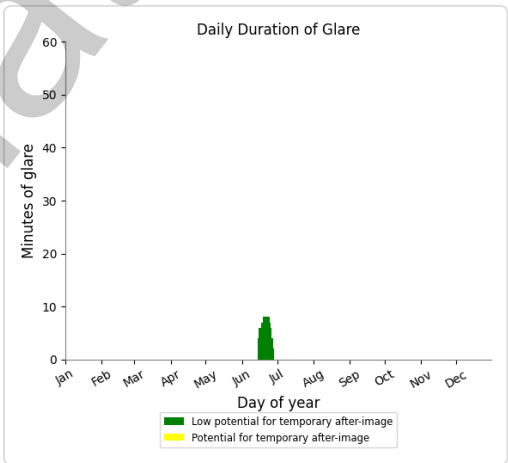


Point Receptor: OP 9

0 minutes of yellow glare

90 minutes of green glare





Point Receptor: OP 10

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 11

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 12

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 13

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 11

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0
OP 9	0	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 7

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 8

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 9

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 10

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 11

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 12

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 13

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	815	0
OP 3	1247	0
OP 4	1435	0
OP 5	1686	0
OP 6	1997	0
OP 7	2477	0
OP 8	3879	0
OP 9	3816	0
OP 10	2745	0
OP 11	1637	0
OP 12	545	0
OP 13	0	0

Point Receptor: OP 1

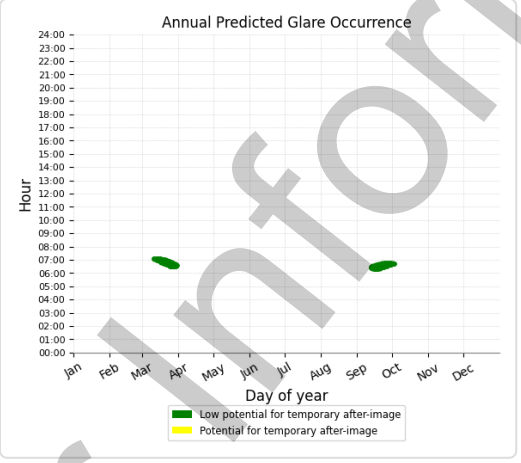
0 minutes of yellow glare

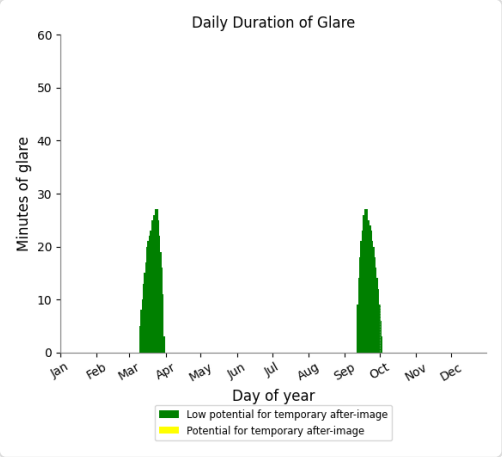
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare

815 minutes of green glare

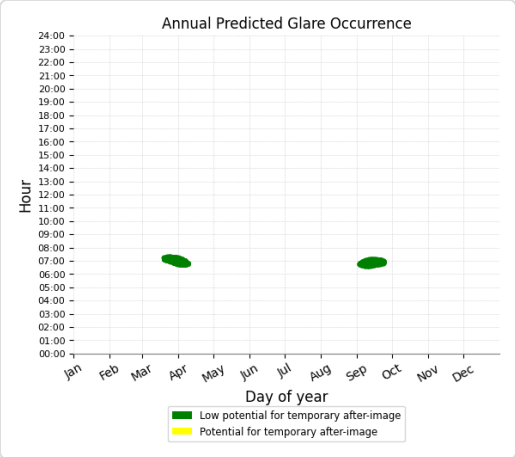


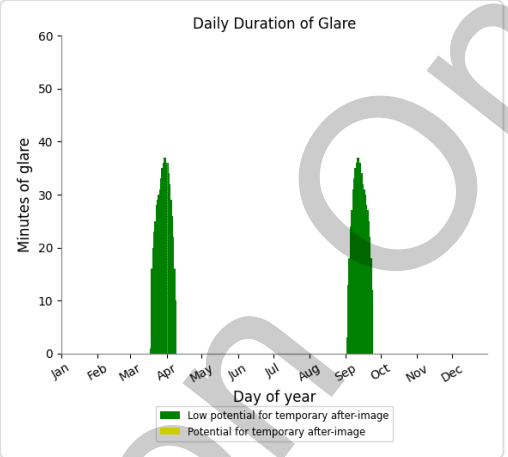


Point Receptor: OP 3

0 minutes of yellow glare

1247 minutes of green glare

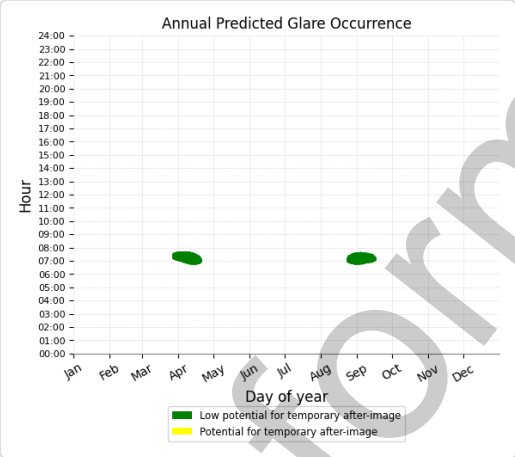


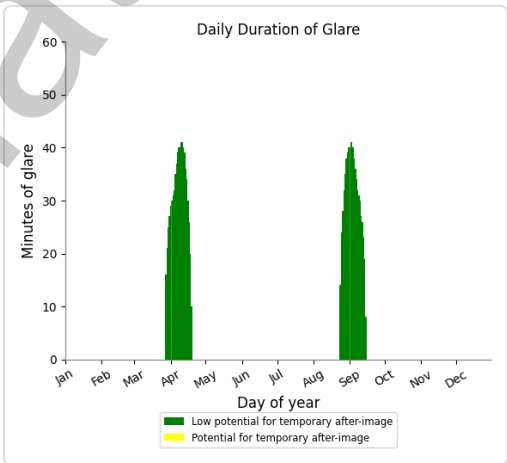


Point Receptor: OP 4

0 minutes of yellow glare

1435 minutes of green glare

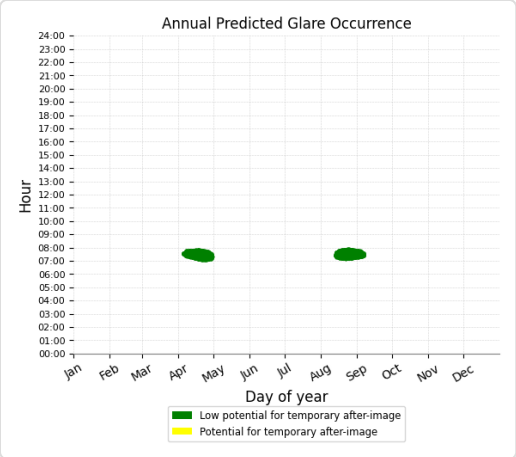


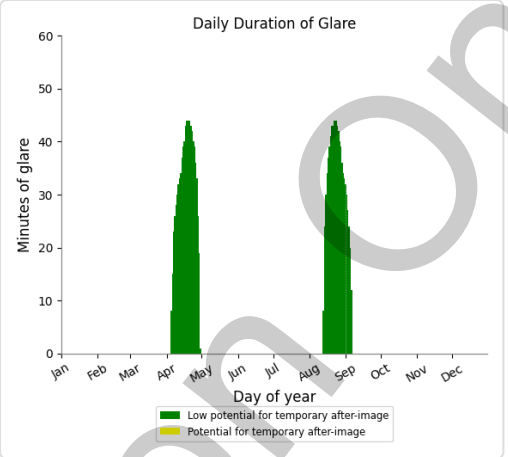


Point Receptor: OP 5

0 minutes of yellow glare

1686 minutes of green glare

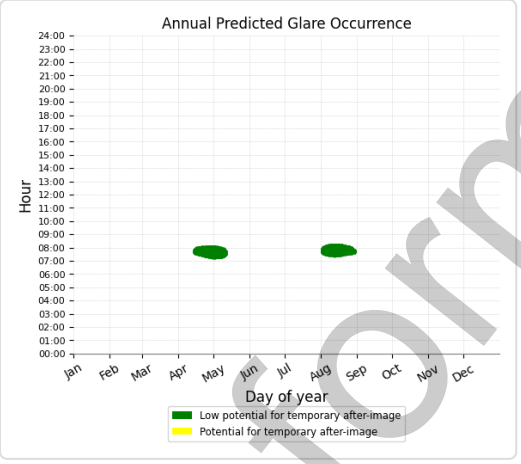


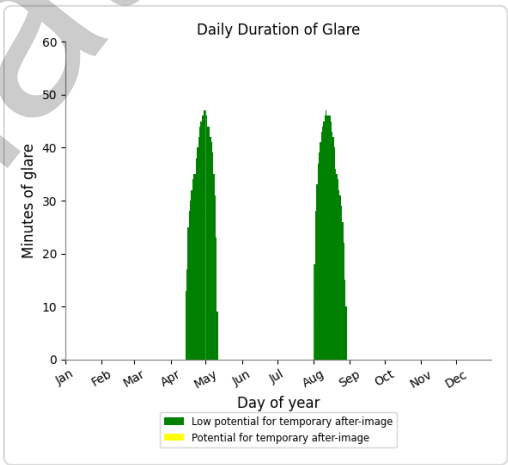


Point Receptor: OP 6

0 minutes of yellow glare

1997 minutes of green glare

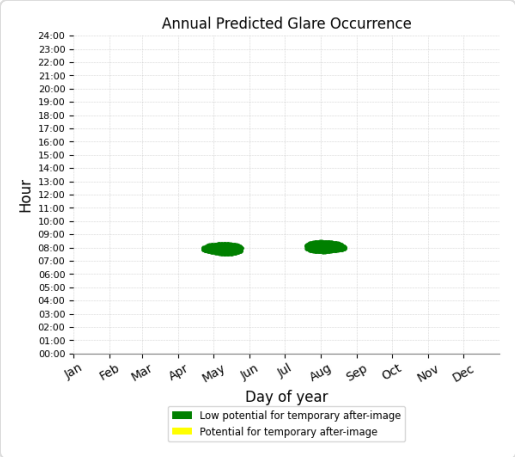


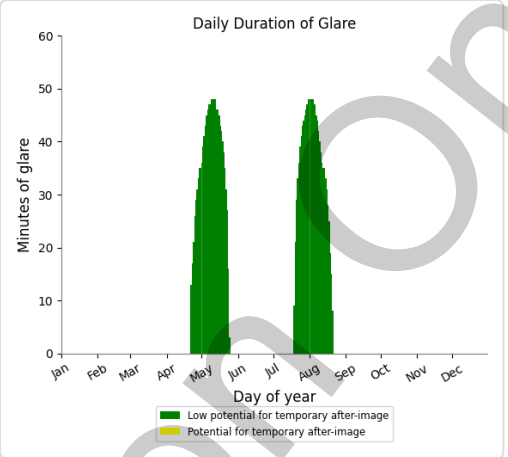


Point Receptor: OP 7

0 minutes of yellow glare

2477 minutes of green glare

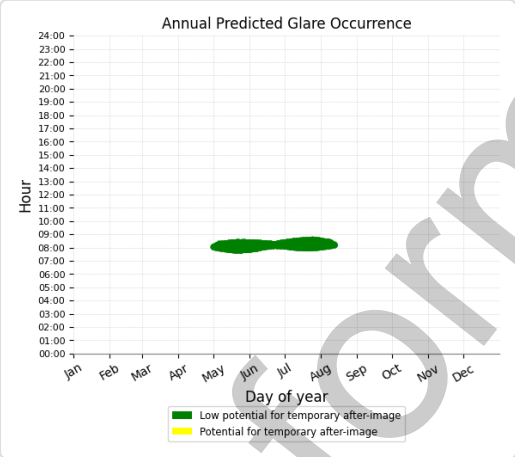


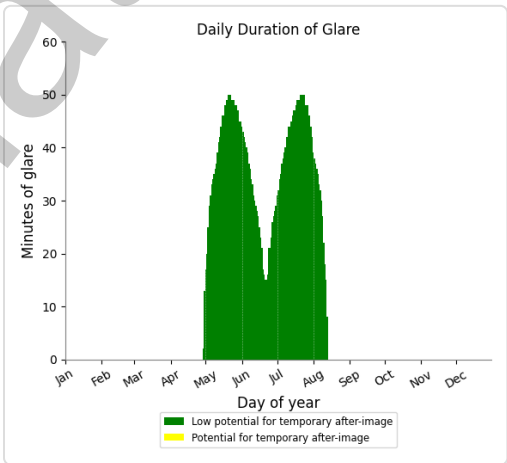


Point Receptor: OP 8

0 minutes of yellow glare

3879 minutes of green glare

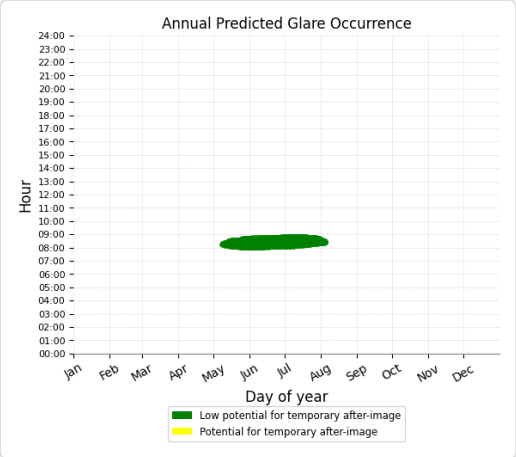


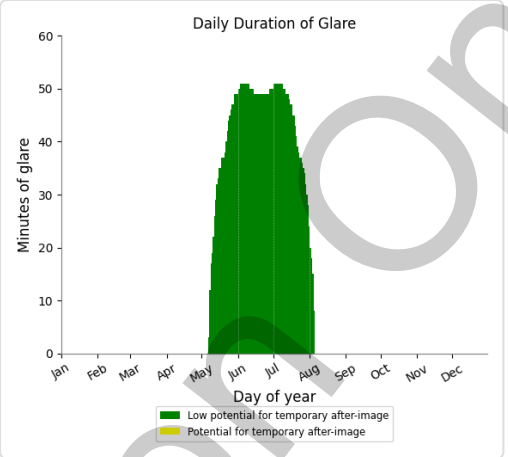


Point Receptor: OP 9

0 minutes of yellow glare

3816 minutes of green glare

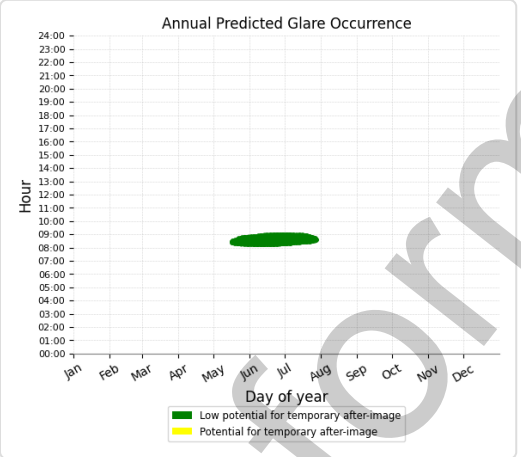


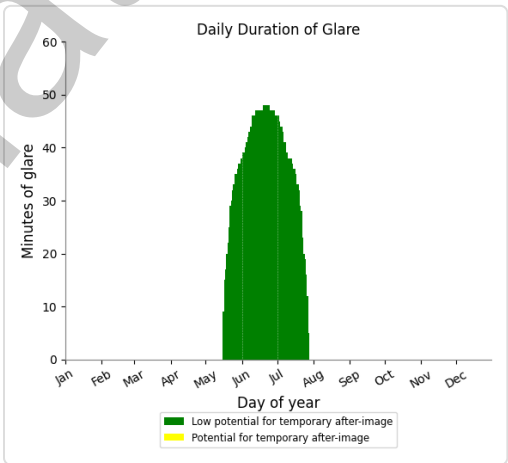


Point Receptor: OP 10

0 minutes of yellow glare

2745 minutes of green glare

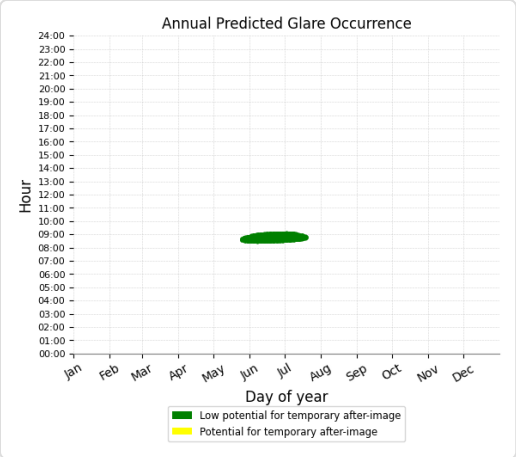


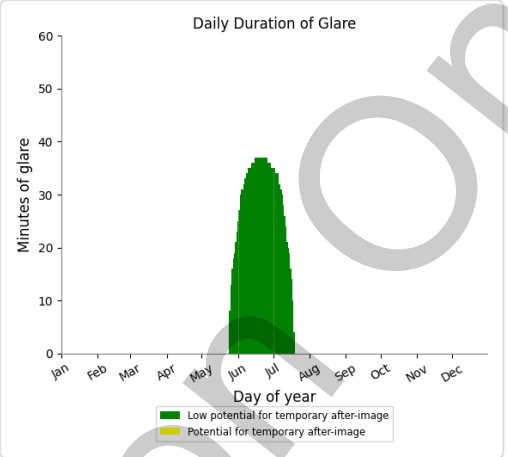


Point Receptor: OP 11

0 minutes of yellow glare

1637 minutes of green glare

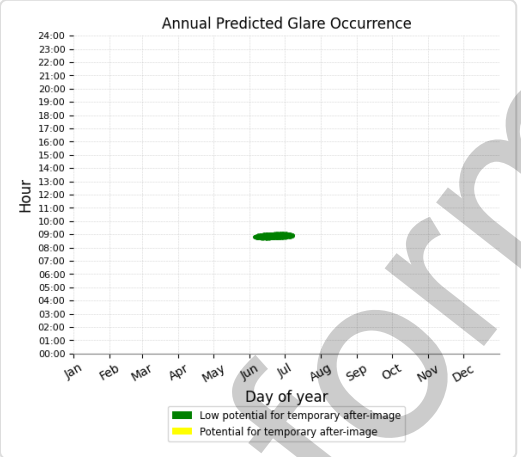


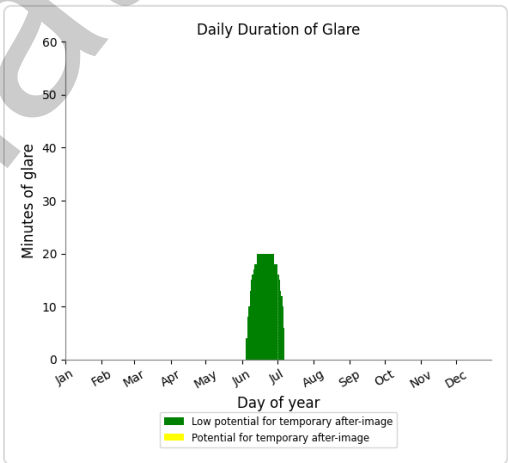


Point Receptor: OP 12

0 minutes of yellow glare

545 minutes of green glare





Point Receptor: OP 13

0 minutes of yellow glare

0 minutes of green glare

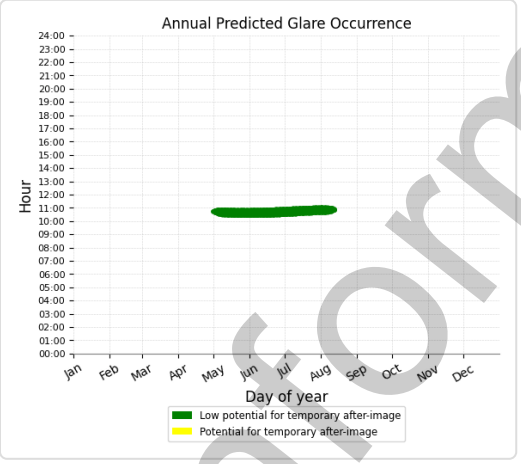
Results for: PV array 3

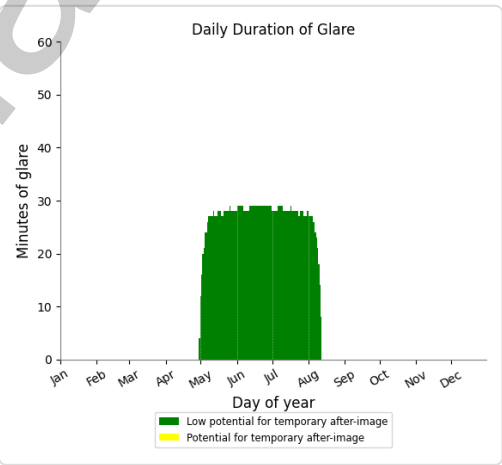
Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	2814	0
OP 2	2677	0
OP 3	2551	0
OP 4	2527	0
OP 5	2486	0
OP 6	2533	0
OP 7	2593	0
OP 8	2672	0
OP 9	2766	0
OP 10	2878	0
OP 11	2986	0
OP 12	3044	0
OP 13	3026	0

Point Receptor: OP 1

0 minutes of yellow glare

2814 minutes of green glare

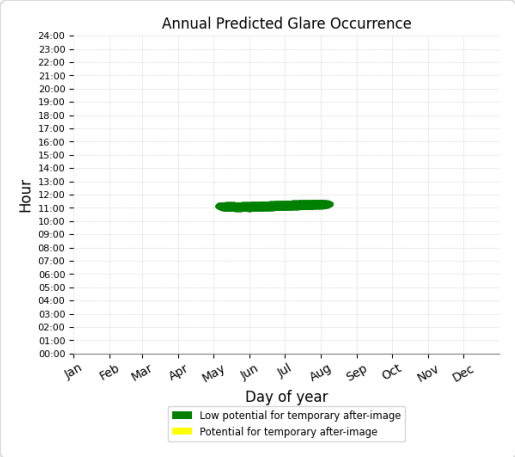


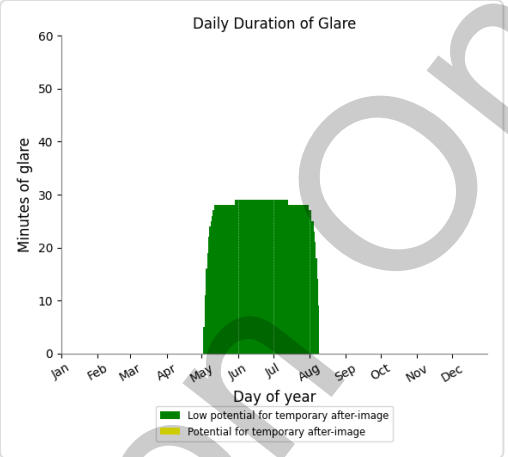


Point Receptor: OP 2

0 minutes of yellow glare

2677 minutes of green glare

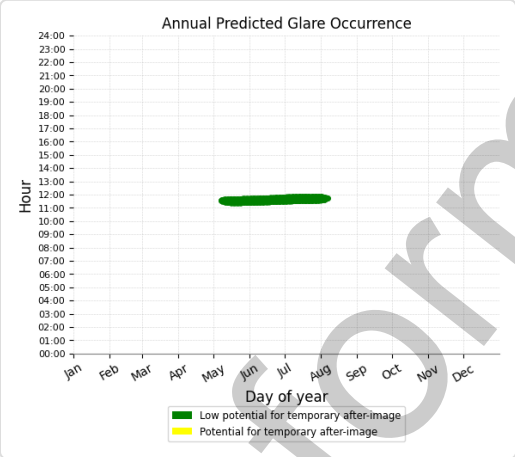


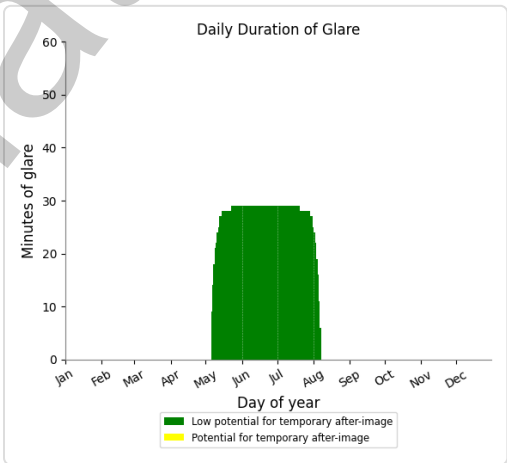


Point Receptor: OP 3

0 minutes of yellow glare

2551 minutes of green glare

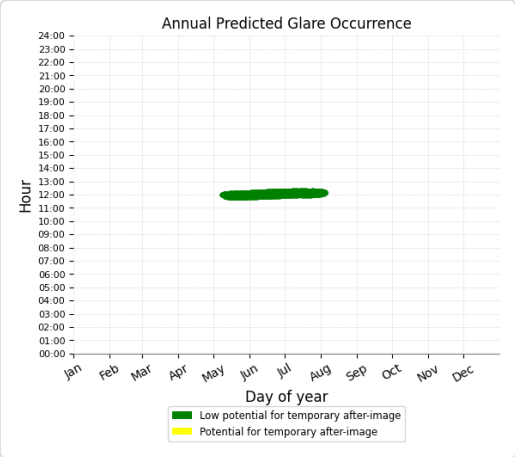


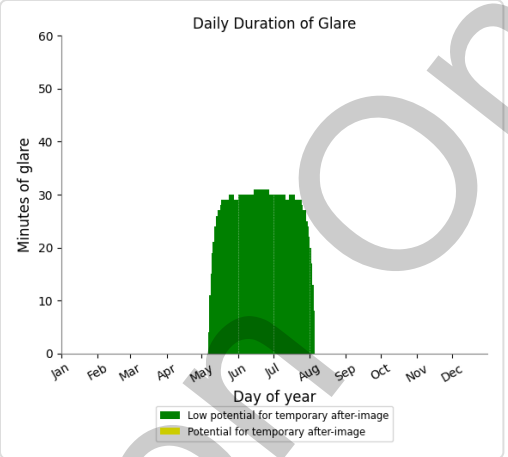


Point Receptor: OP 4

0 minutes of yellow glare

2527 minutes of green glare

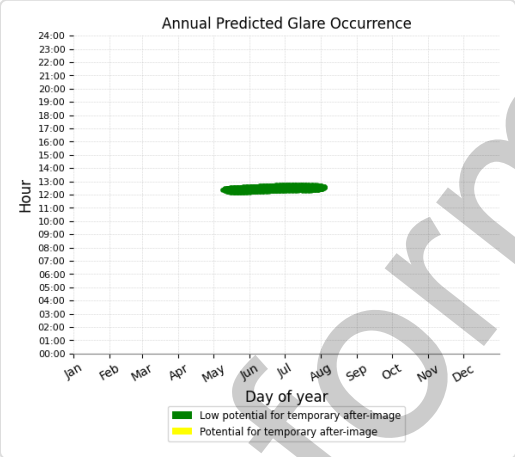


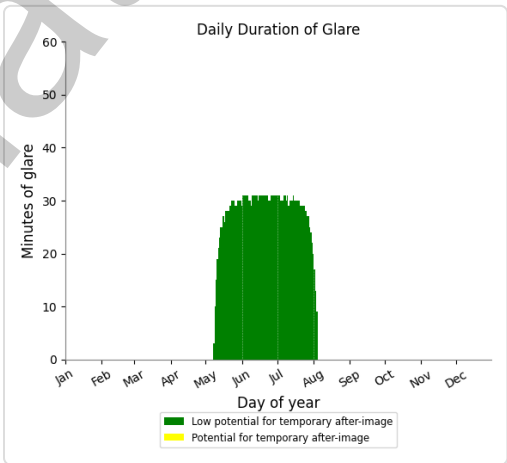


Point Receptor: OP 5

0 minutes of yellow glare

2486 minutes of green glare

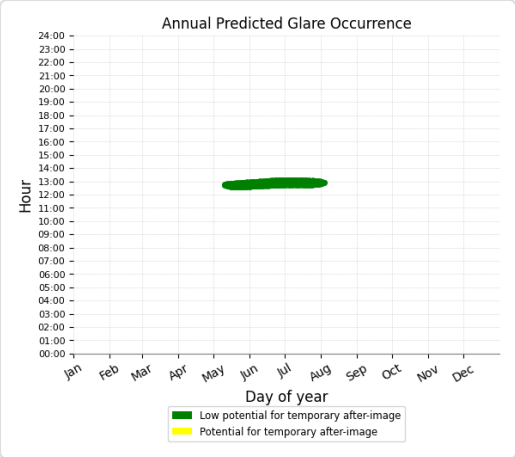


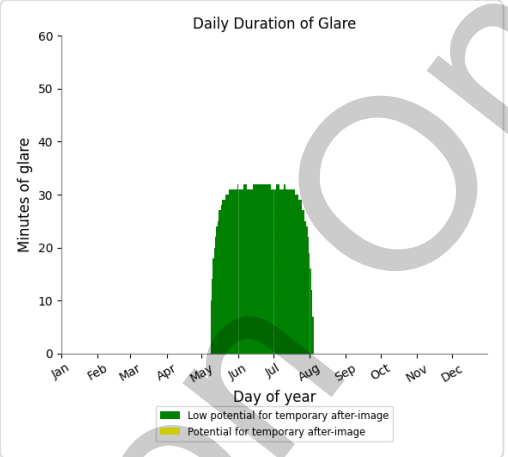


Point Receptor: OP 6

0 minutes of yellow glare

2533 minutes of green glare

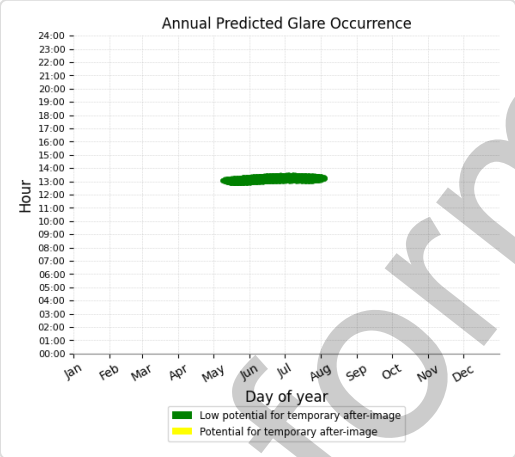


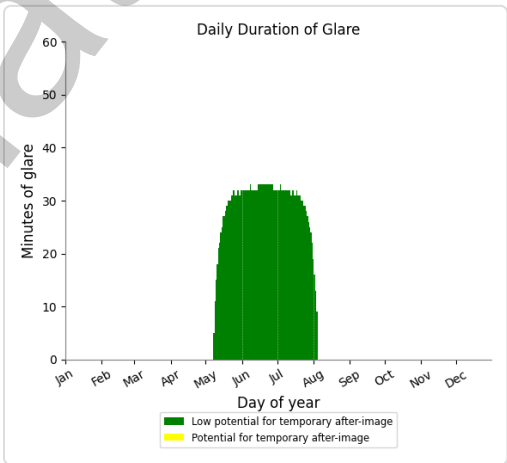


Point Receptor: OP 7

0 minutes of yellow glare

2593 minutes of green glare

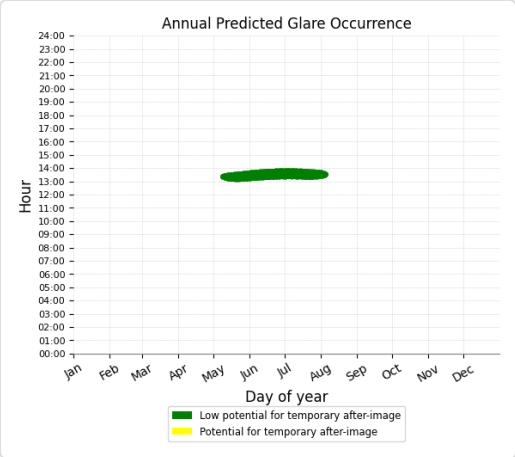


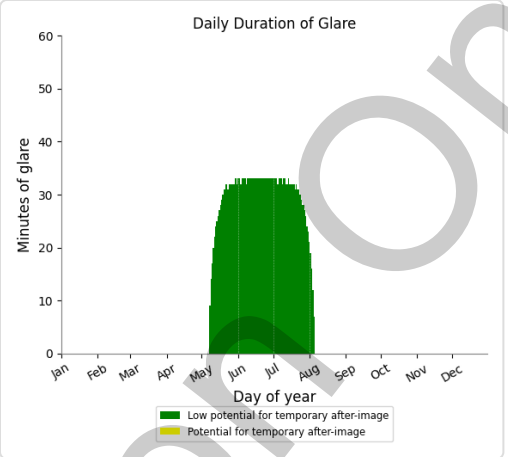


Point Receptor: OP 8

0 minutes of yellow glare

2672 minutes of green glare

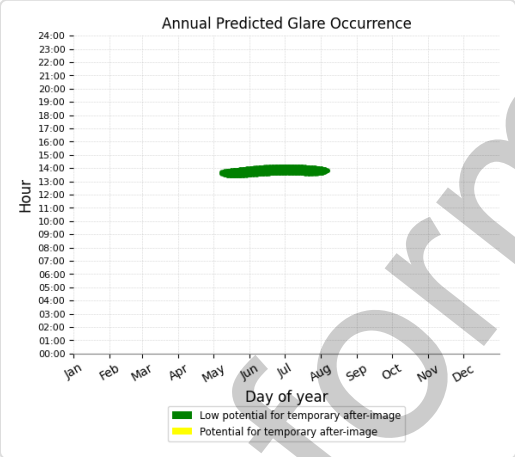


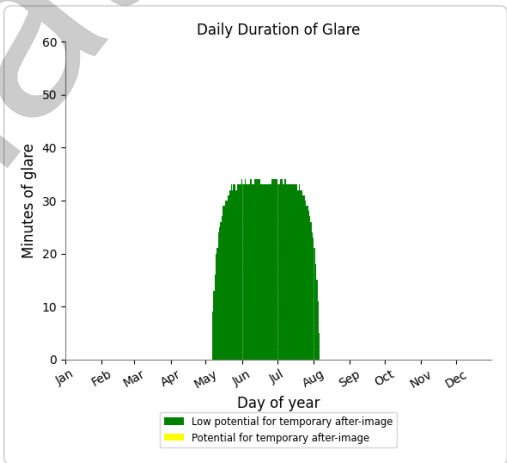


Point Receptor: OP 9

0 minutes of yellow glare

2766 minutes of green glare

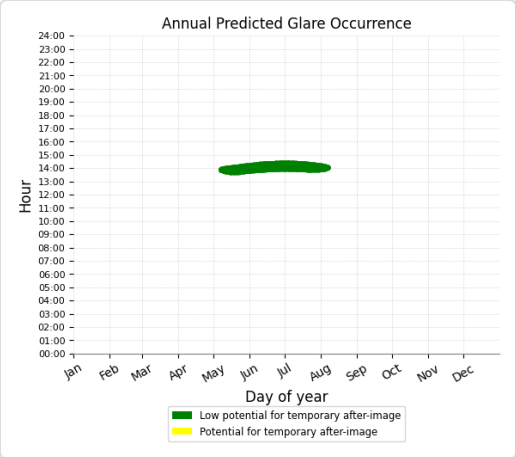


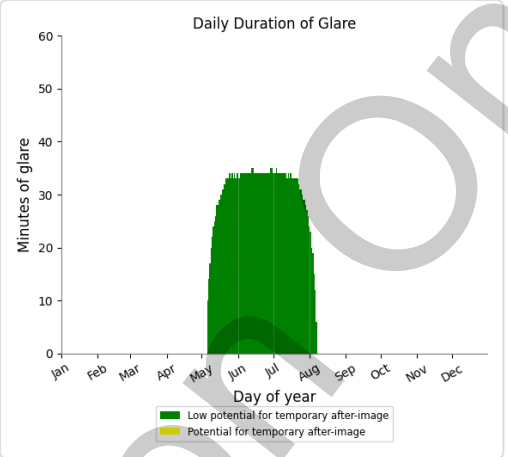


Point Receptor: OP 10

0 minutes of yellow glare

2878 minutes of green glare

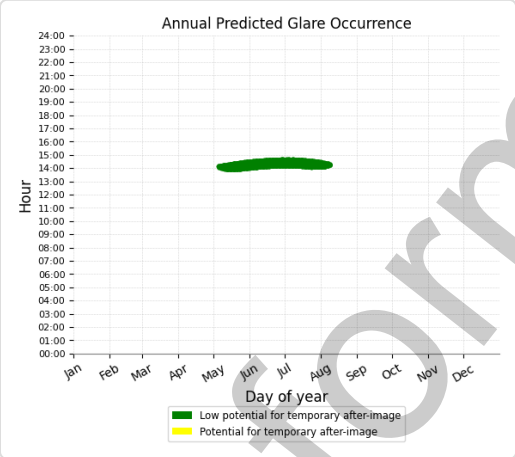


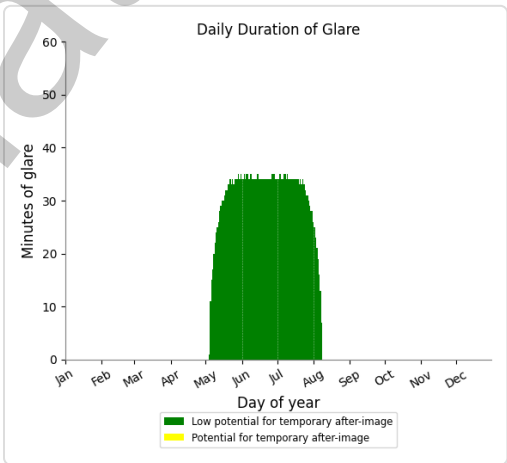


Point Receptor: OP 11

0 minutes of yellow glare

2986 minutes of green glare

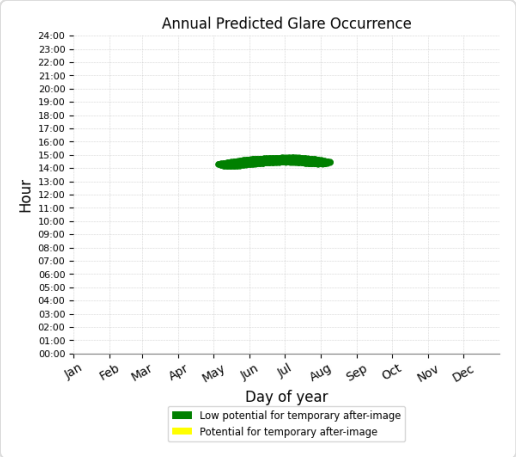


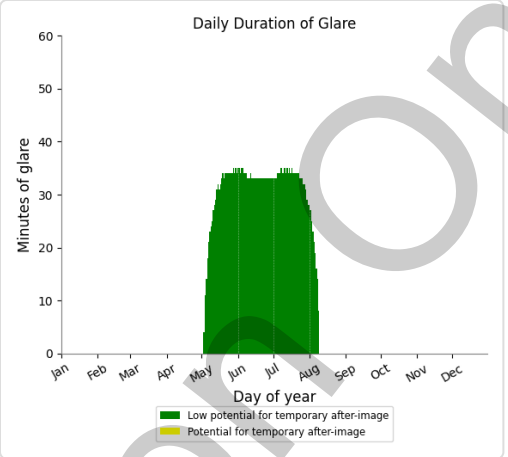


Point Receptor: OP 12

0 minutes of yellow glare

3044 minutes of green glare

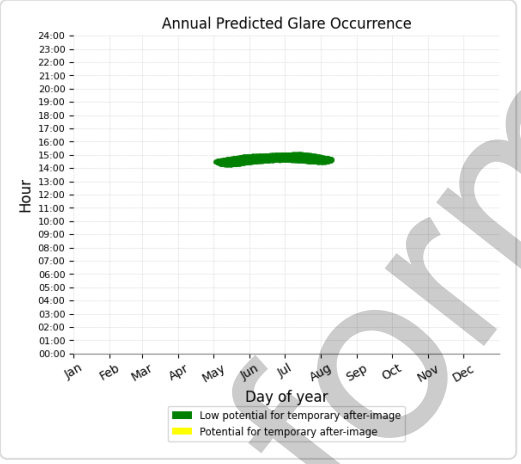


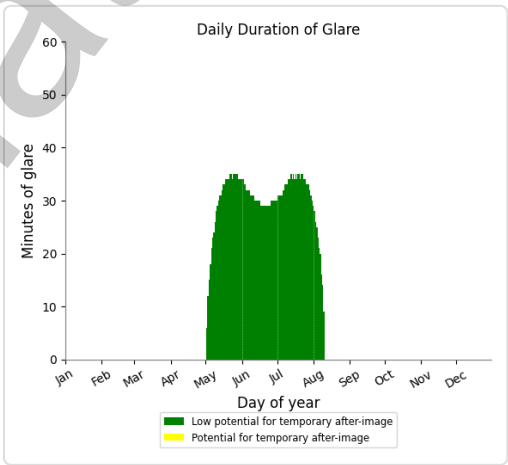


Point Receptor: OP 13

0 minutes of yellow glare

3026 minutes of green glare





Results for: PV array 4

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0
OP 9	0	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 7

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 8

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 9

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 10

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 11

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 12

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 13

0 minutes of yellow glare
0 minutes of green glare

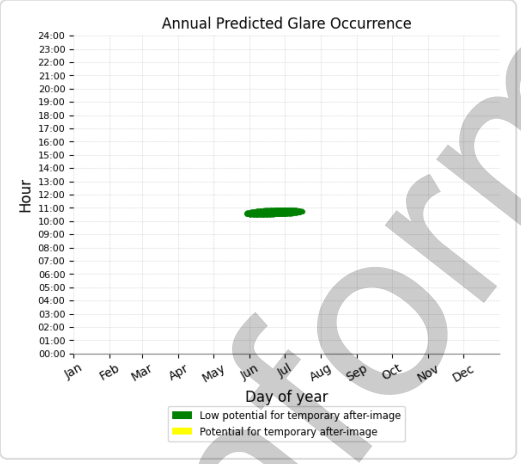
Results for: PV array 5

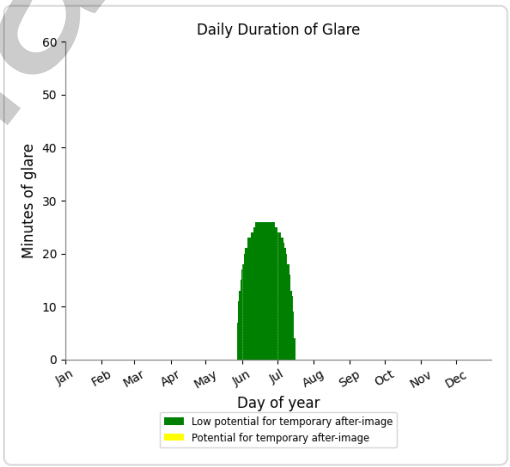
Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	1073	0
OP 2	677	0
OP 3	314	0
OP 4	91	0
OP 5	22	0
OP 6	86	0
OP 7	310	0
OP 8	597	0
OP 9	886	0
OP 10	1171	0
OP 11	1435	0
OP 12	1681	0
OP 13	1909	0

Point Receptor: OP 1

0 minutes of yellow glare

1073 minutes of green glare

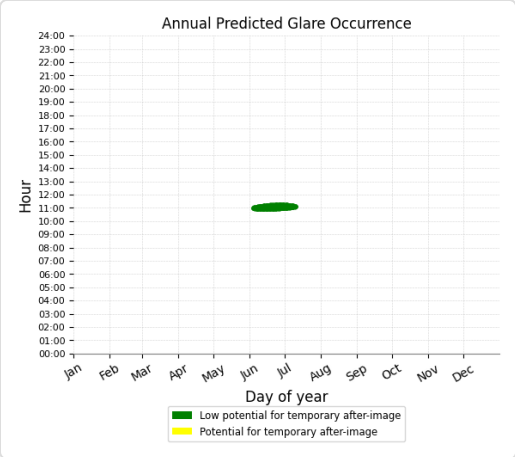


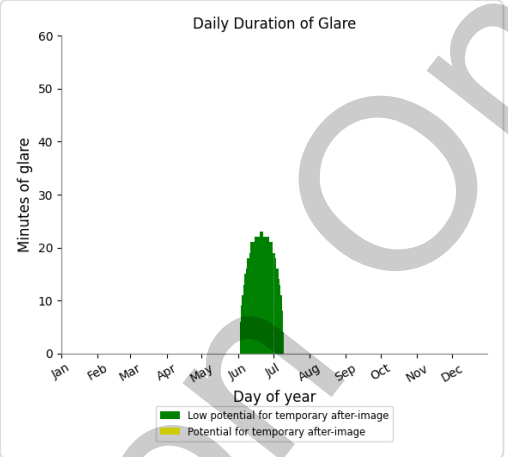


Point Receptor: OP 2

0 minutes of yellow glare

677 minutes of green glare

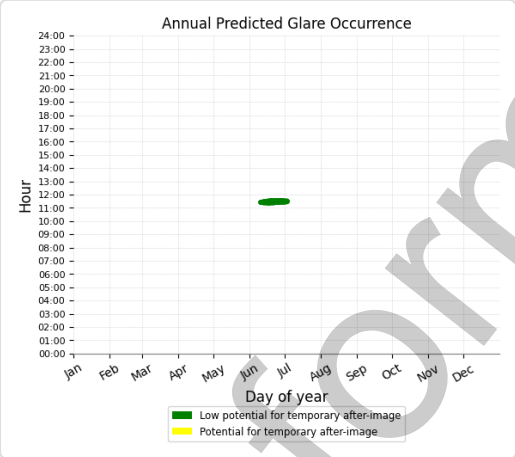


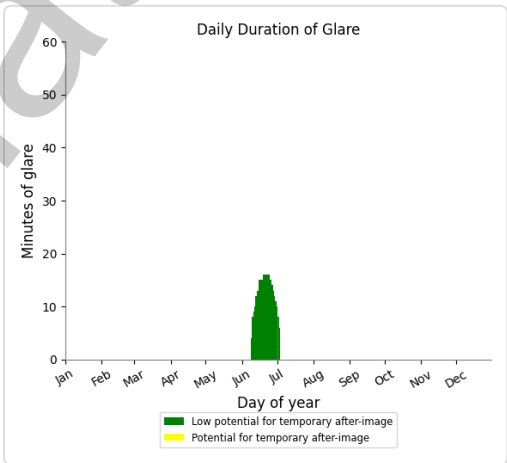


Point Receptor: OP 3

0 minutes of yellow glare

314 minutes of green glare

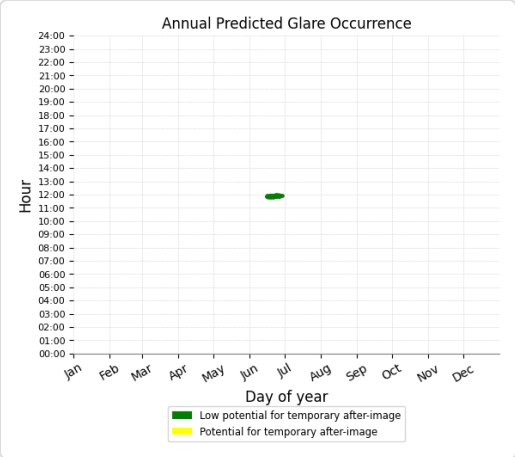


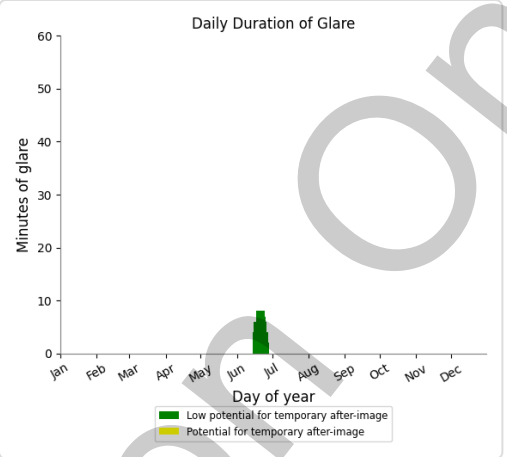


Point Receptor: OP 4

0 minutes of yellow glare

91 minutes of green glare

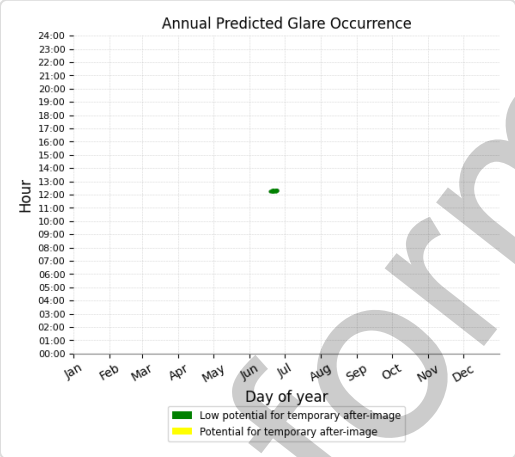


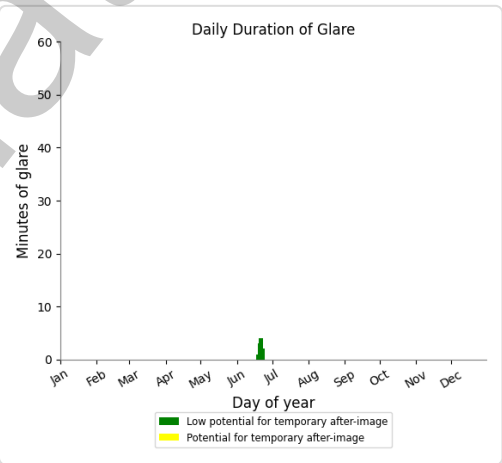


Point Receptor: OP 5

0 minutes of yellow glare

22 minutes of green glare

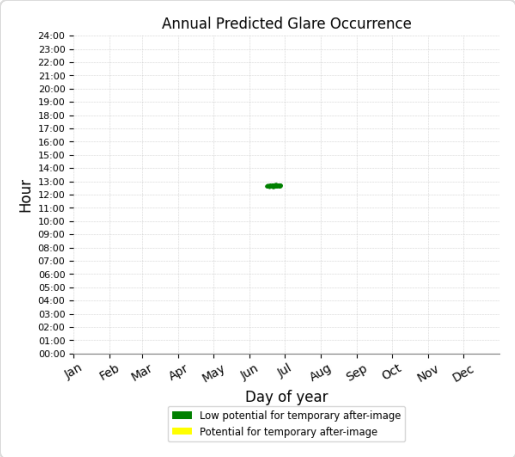


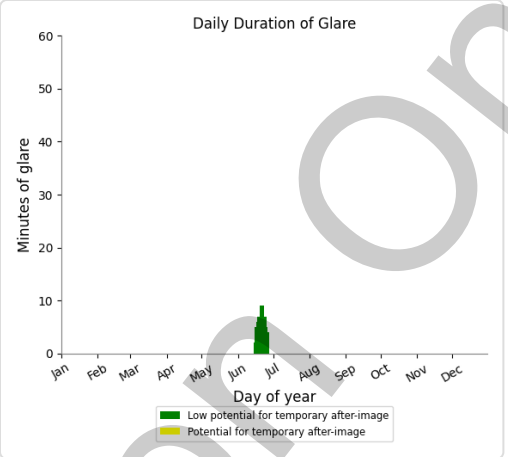


Point Receptor: OP 6

0 minutes of yellow glare

86 minutes of green glare

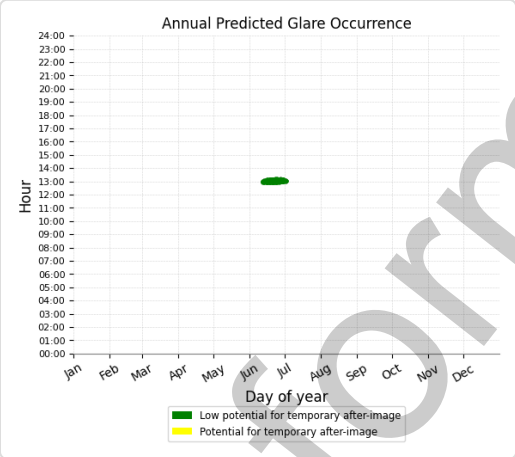


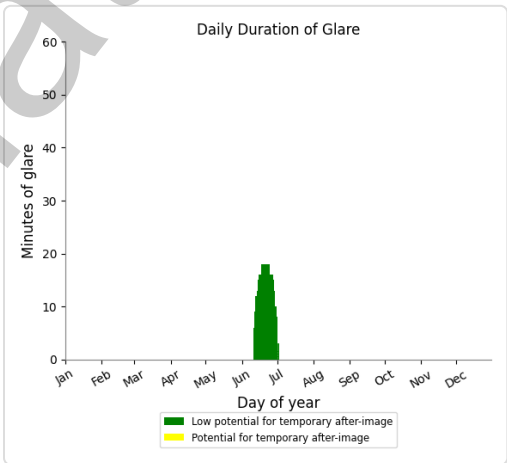


Point Receptor: OP 7

0 minutes of yellow glare

310 minutes of green glare

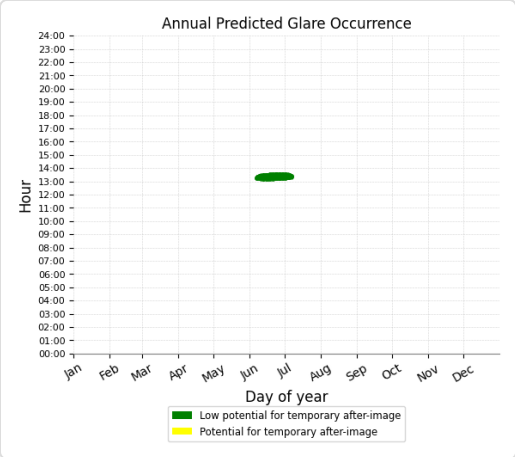


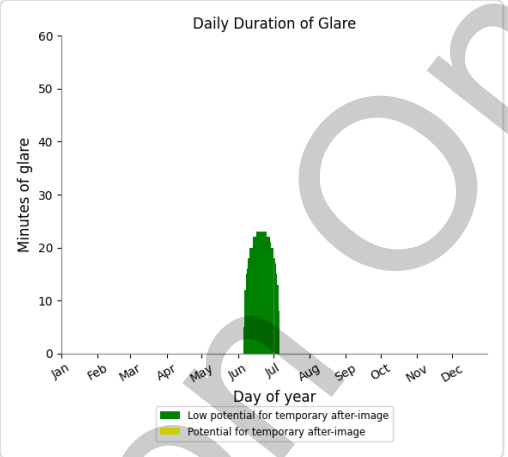


Point Receptor: OP 8

0 minutes of yellow glare

597 minutes of green glare

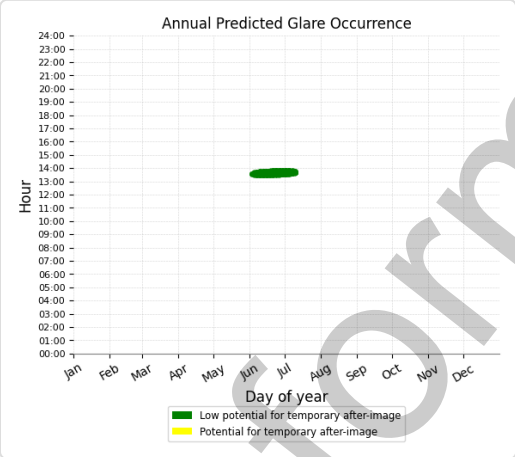


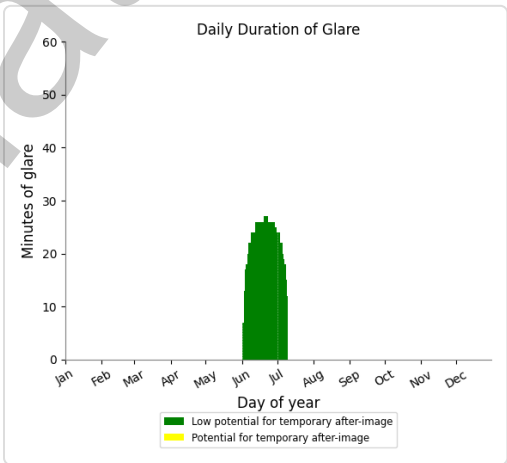


Point Receptor: OP 9

0 minutes of yellow glare

886 minutes of green glare

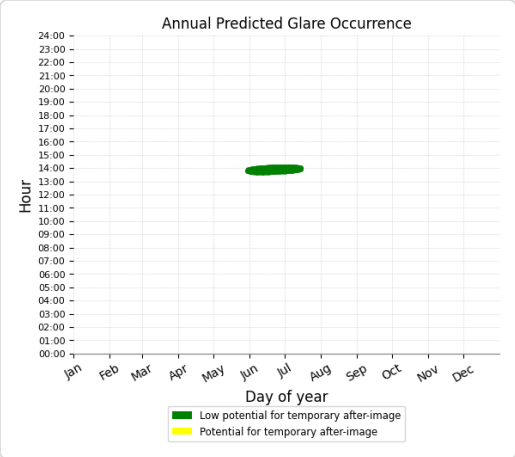


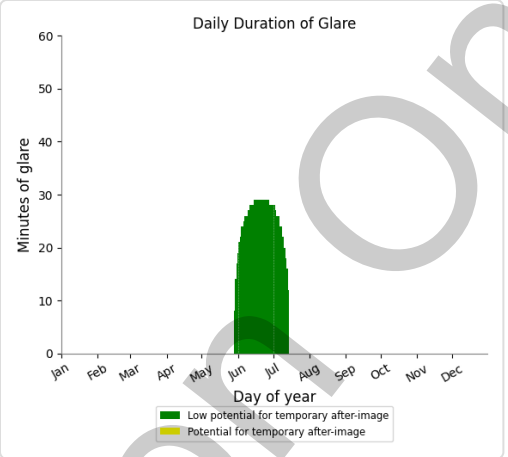


Point Receptor: OP 10

0 minutes of yellow glare

1171 minutes of green glare

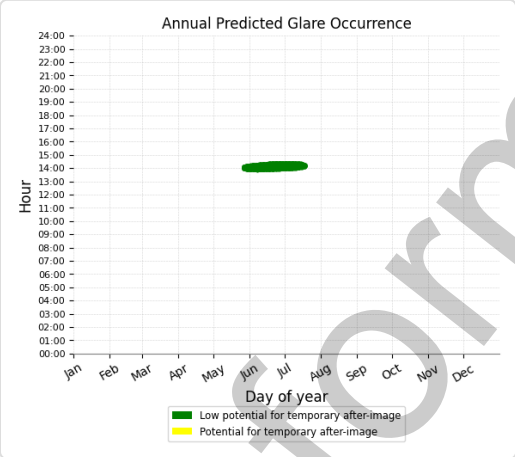


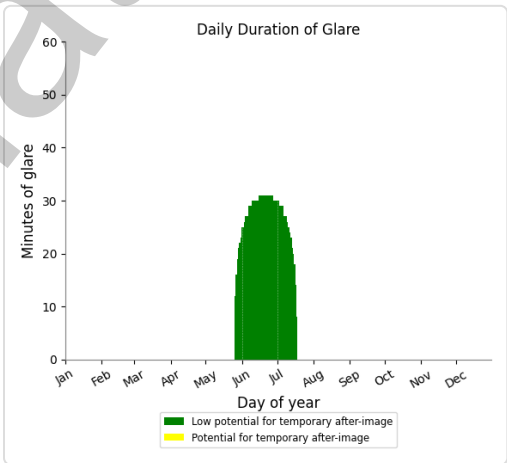


Point Receptor: OP 11

0 minutes of yellow glare

1435 minutes of green glare

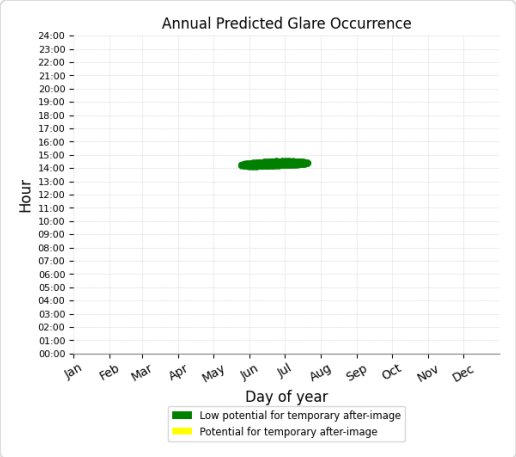


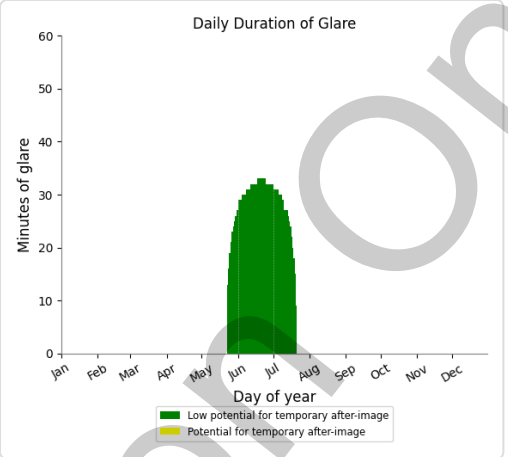


Point Receptor: OP 12

0 minutes of yellow glare

1681 minutes of green glare

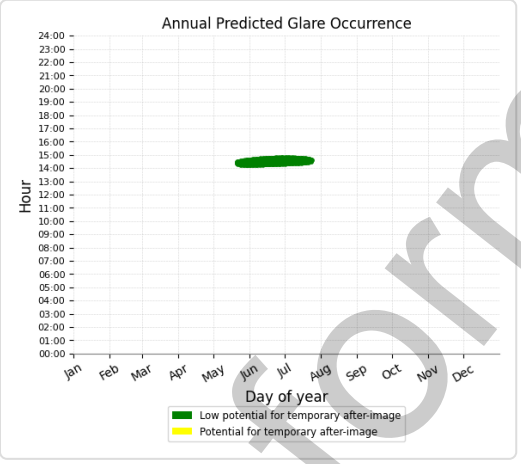


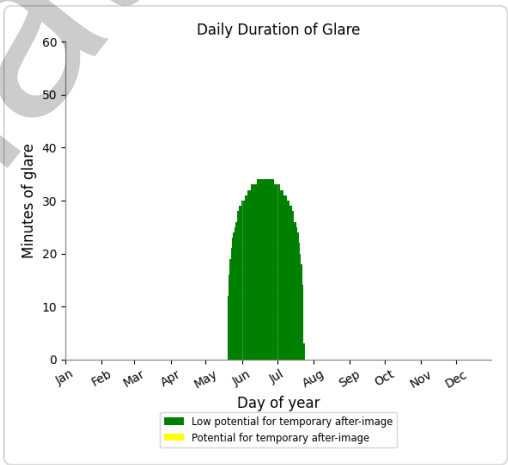


Point Receptor: OP 13

0 minutes of yellow glare

1909 minutes of green glare





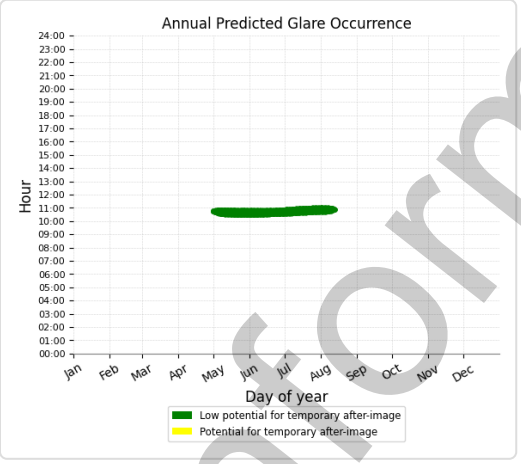
Results for: PV array 6

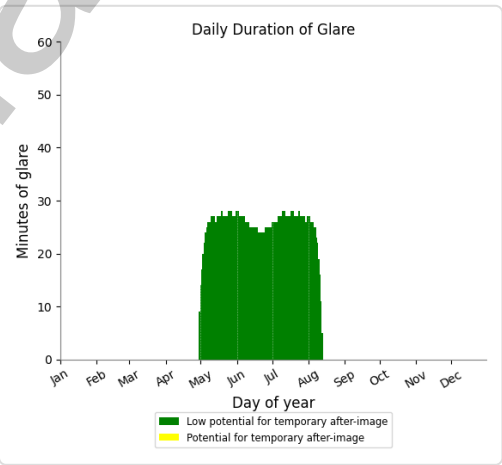
Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	2687	0
OP 2	2633	0
OP 3	2546	0
OP 4	2494	0
OP 5	2478	0
OP 6	2373	0
OP 7	2462	0
OP 8	2489	0
OP 9	2503	0
OP 10	2485	0
OP 11	2465	0
OP 12	2423	0
OP 13	2346	0

Point Receptor: OP 1

0 minutes of yellow glare

2687 minutes of green glare

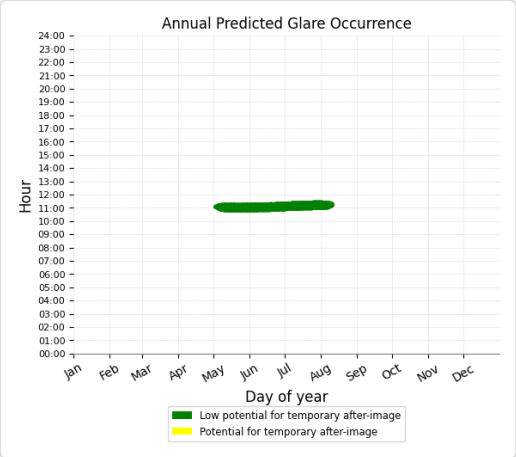


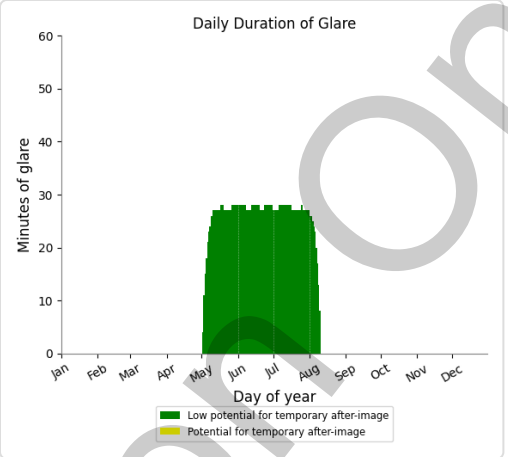


Point Receptor: OP 2

0 minutes of yellow glare

2633 minutes of green glare

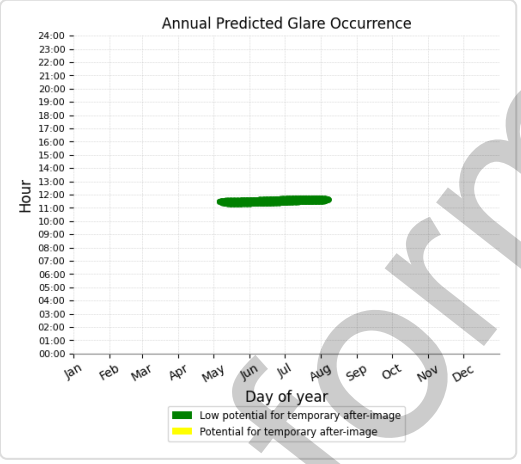


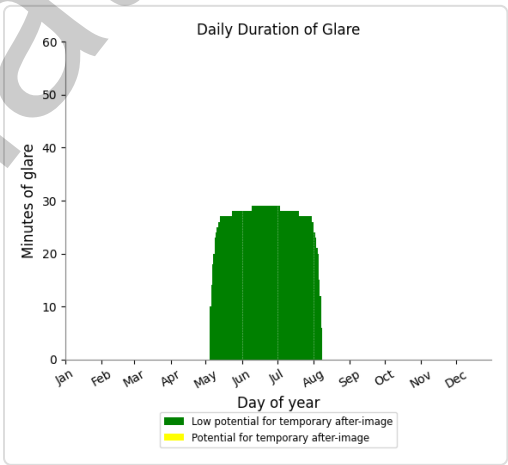


Point Receptor: OP 3

0 minutes of yellow glare

2546 minutes of green glare

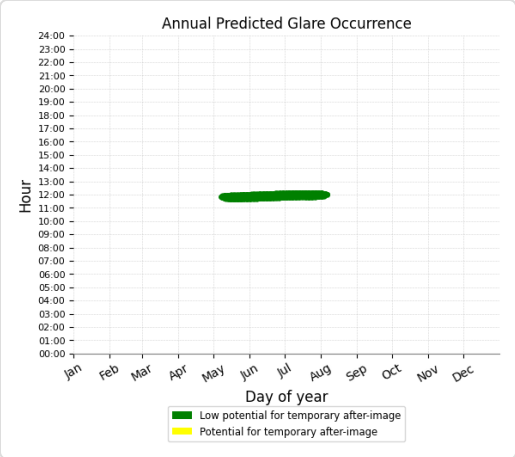


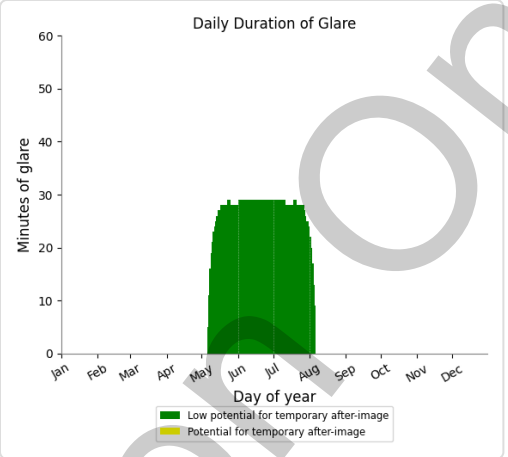


Point Receptor: OP 4

0 minutes of yellow glare

2494 minutes of green glare

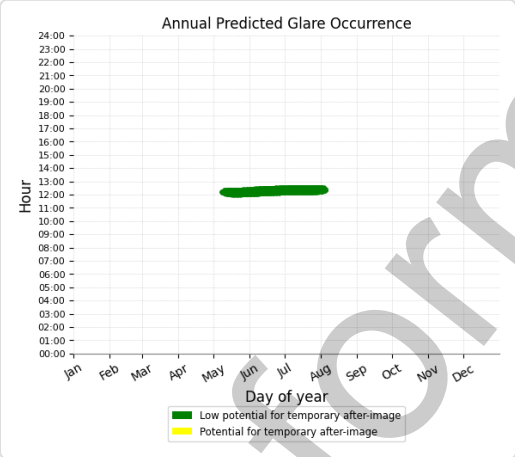


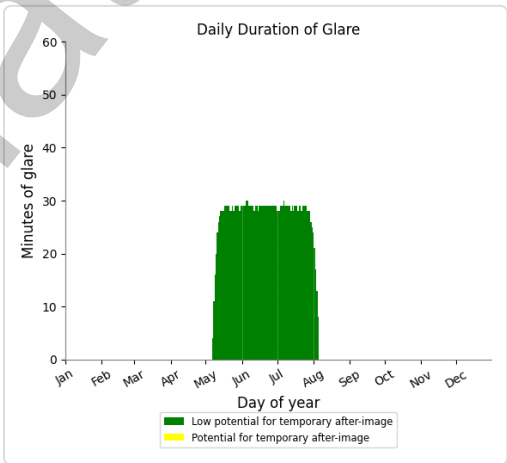


Point Receptor: OP 5

0 minutes of yellow glare

2478 minutes of green glare

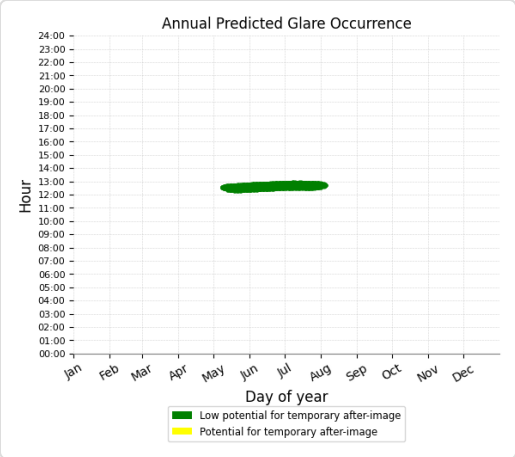


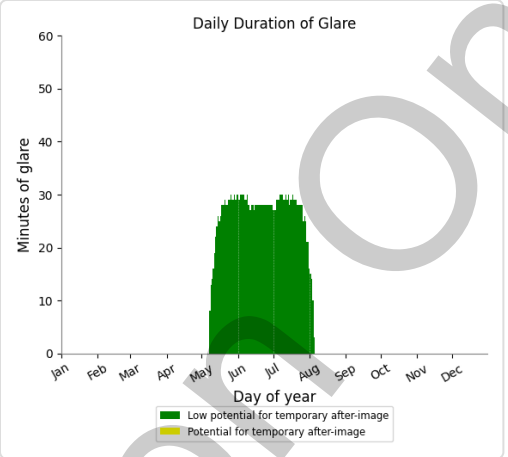


Point Receptor: OP 6

0 minutes of yellow glare

2373 minutes of green glare

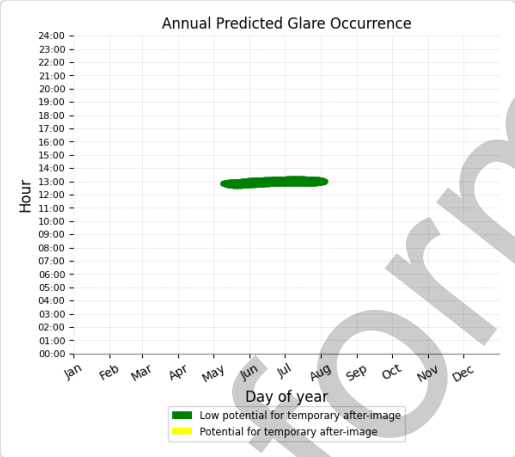


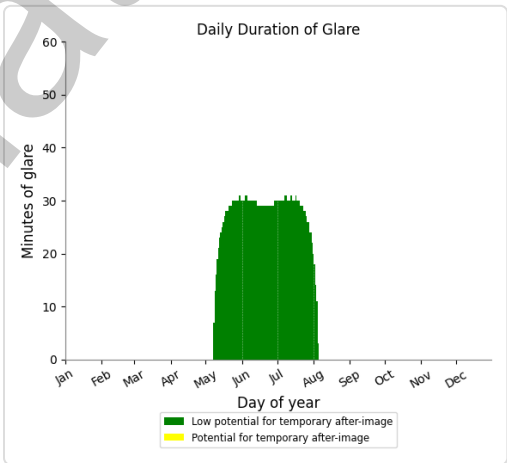


Point Receptor: OP 7

0 minutes of yellow glare

2462 minutes of green glare

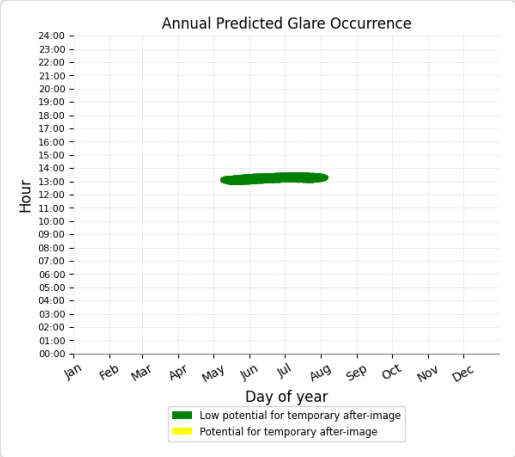


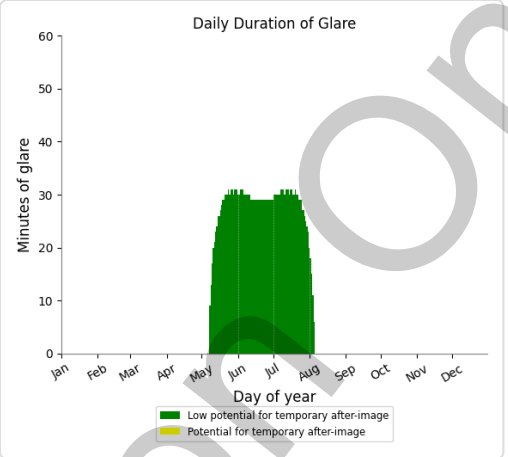


Point Receptor: OP 8

0 minutes of yellow glare

2489 minutes of green glare

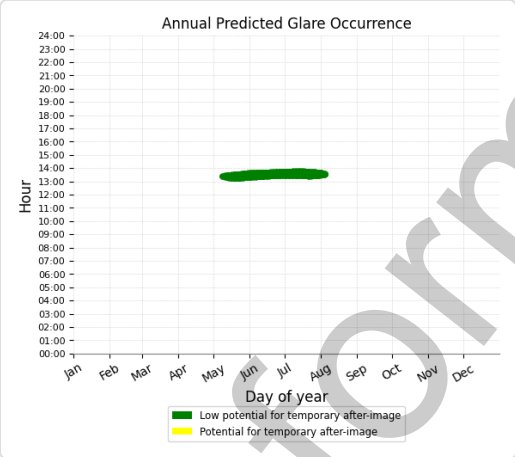


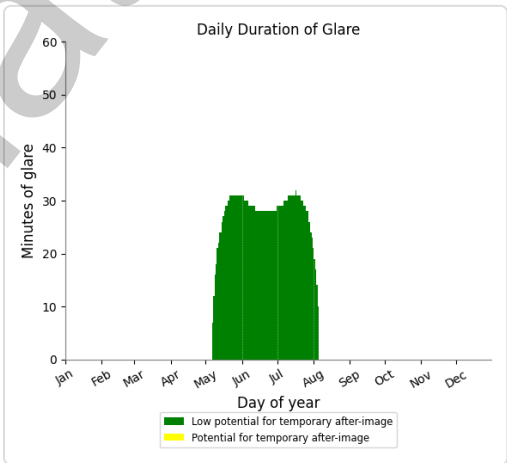


Point Receptor: OP 9

0 minutes of yellow glare

2503 minutes of green glare

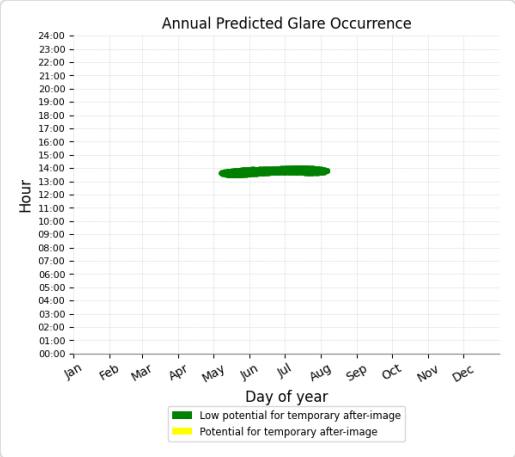


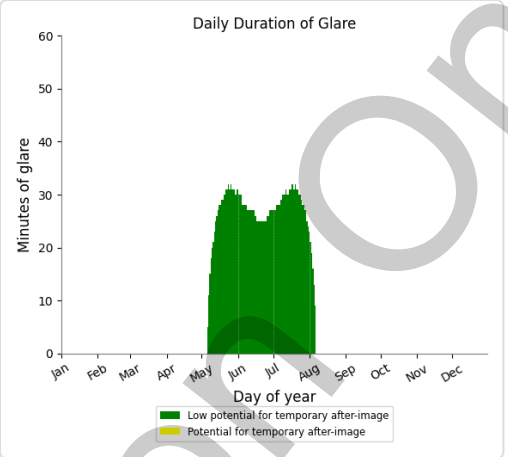


Point Receptor: OP 10

0 minutes of yellow glare

2485 minutes of green glare

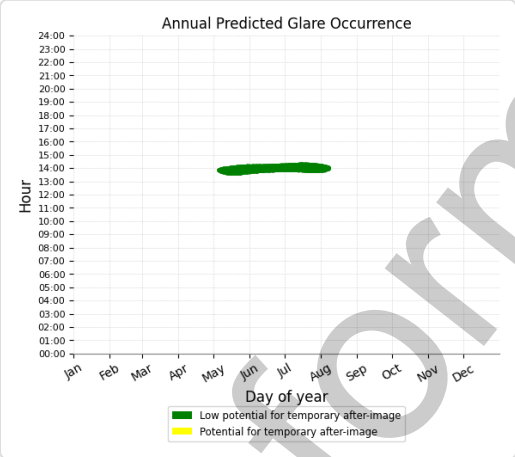


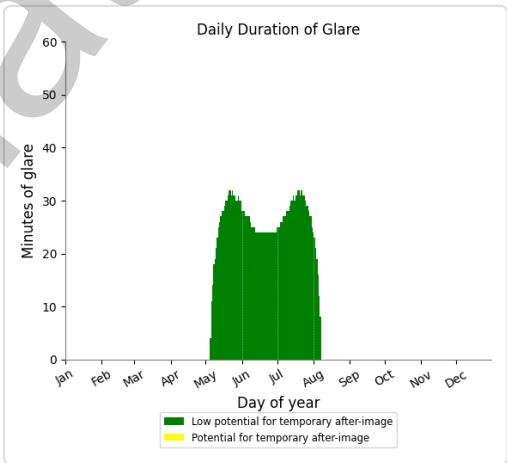


Point Receptor: OP 11

0 minutes of yellow glare

2465 minutes of green glare

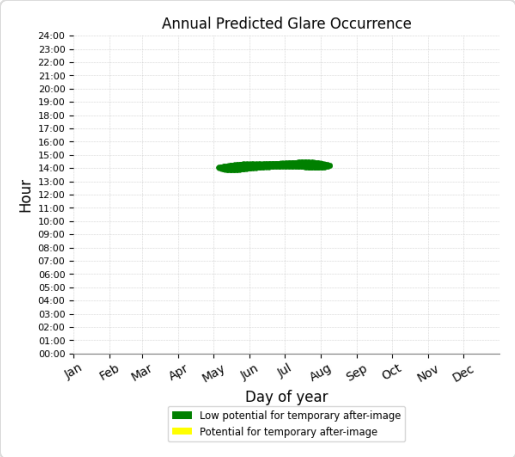


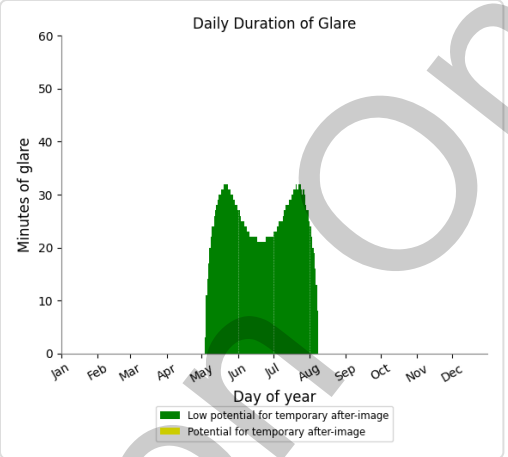


Point Receptor: OP 12

0 minutes of yellow glare

2423 minutes of green glare

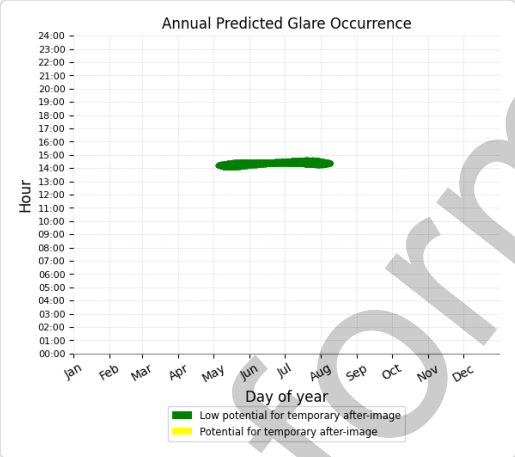


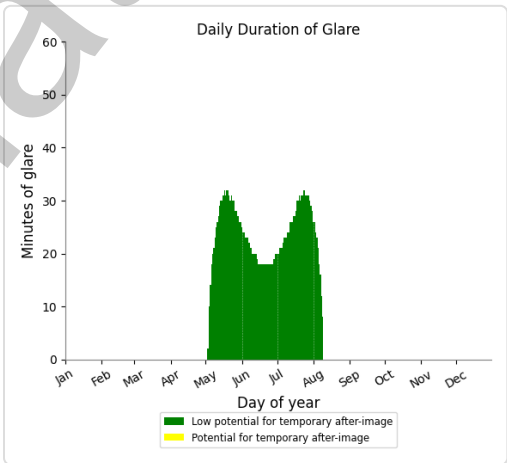


Point Receptor: OP 13

0 minutes of yellow glare

2346 minutes of green glare





Results for: PV array 7

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0
OP 9	0	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 7

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 8

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 9

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 10

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 11

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 12

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 13

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 8

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0
OP 9	0	0
OP 10	0	0
OP 11	311	0
OP 12	689	0
OP 13	1013	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 7

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 8

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 9

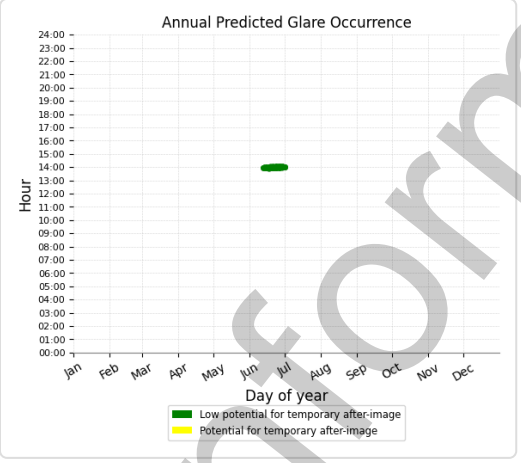
0 minutes of yellow glare
0 minutes of green glare

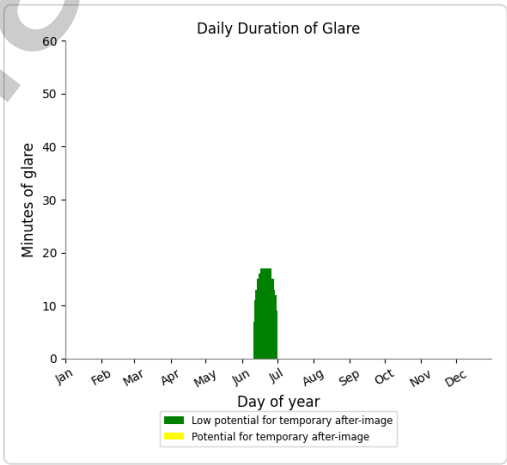
Point Receptor: OP 10

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 11

0 minutes of yellow glare
311 minutes of green glare

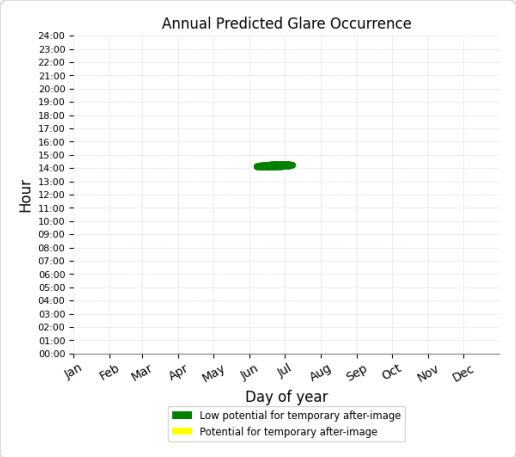


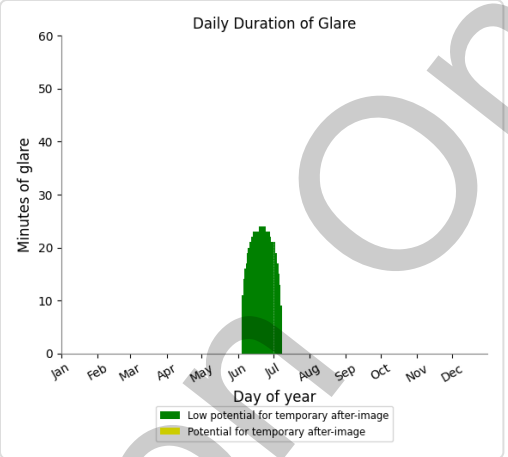


Point Receptor: OP 12

0 minutes of yellow glare

689 minutes of green glare

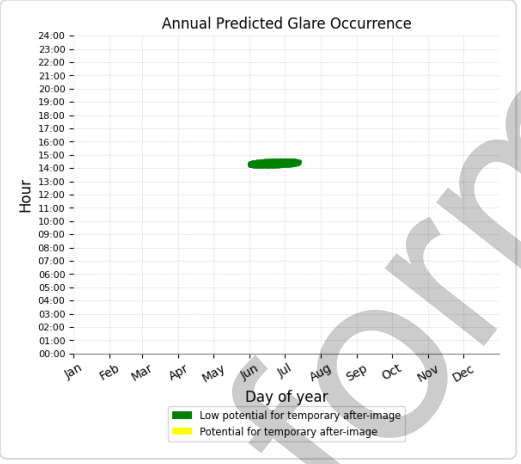


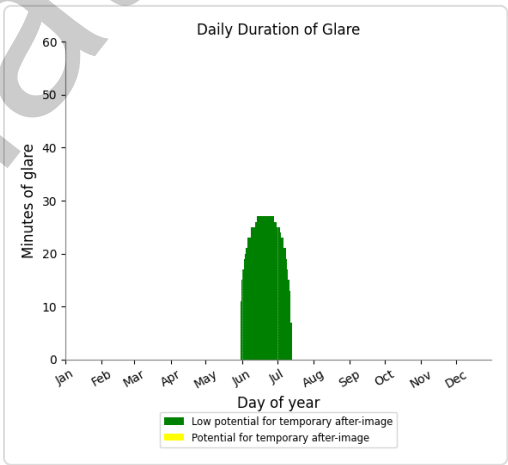


Point Receptor: OP 13

0 minutes of yellow glare

1013 minutes of green glare





Results for: PV array 9

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0
OP 9	0	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 7

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 8

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 9

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 10

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 11

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 12

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 13

0 minutes of yellow glare
0 minutes of green glare

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.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
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.)
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.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
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.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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.