

Figure 5
KOP Location POP102 Existing
Bear Valley Solar Energy Project
San Bernardino County, CA



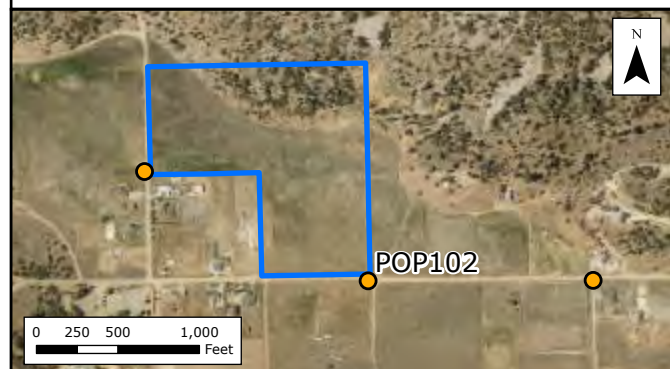


Figure 6
KOP Location POP102 with Rendered Image
Bear Valley Solar Energy Project
San Bernardino County, CA





Figure 7
KOP Location POP106 Existing
Bear Valley Solar Energy Project
San Bernardino County, CA





Figure 8
KOP Location POP106 with Rendered Image
Bear Valley Solar Energy Project
San Bernardino County, CA





W 230° 240° 250° 260° 270° 280° 290° 300° 310° NW 320° 330° 340°



Figure 9
KOP Location POP107 Existing
Bear Valley Solar Energy Project
San Bernardino County, CA





W 230° 240° 250° 260° 270° 280° 290° 300° 310° NW 320° 330° 340°



Figure 10
KOP Location POP107 with Rendered Image
Bear Valley Solar Energy Project
San Bernardino County, CA





APPENDIX B

GLARE ASSESSMENT



MEMO

TO	Yannick Tamm, Senior Manager, Project Development EDF Renewables Distribution-Scale Power
FROM	Mat Carson, Project Manager Duncan Quinn, Senior Consultant Ian Todd, Partner-in-Charge Ben Sussman, Technical Consulting Director
DATE	16 December 2024
REFERENCE	0739207
SUBJECT	Bear Valley Solar Energy Project - Glare Analysis Memorandum

1. INTRODUCTION

Bear Valley Electric Service, Inc. (BVES), proposes to construct the Bear Valley Solar Energy Project (Project), a photovoltaic (PV) solar facility in unincorporated San Bernardino County, California. The Project is being designed, permitted, and developed by EDF Renewables Distribution-Scale Power (EDFR-DSP). EDFR-DSP has engaged Environmental Resources Management, Inc. (ERM) to conduct a glare analysis for the proposed Project in response to the County’s request for additional technical studies to inform the Conditional Use Permit (CUP) application and the California Environmental Quality Act (CEQA) review.

In support of this process, ERM has prepared this memorandum summarizing the methodologies utilized and results of the glare analysis. Glare analysis documentation from the industry-standard ForgeSolar online glare analysis tool is provided in Appendix A.

2. PROJECT AND SITE DESCRIPTION

The proposed Project is located on a 30-acre parcel with a fenced area of 18.9 acres containing PV arrays and other Project infrastructure (Site). The Site is located at 2151 Erwin Ranch Road (north side of road), approximately 0.4 mile east of the Lakewood Drive intersection in the unincorporated community of Big Bear, California (Figures 1, 2, and 3). The Project will have a generation capacity of 5.7 megawatts (MW). The Project will eventually be owned and operated by BVES.

The Project’s PV panels will be mounted on single-axis trackers oriented south at 180 degrees with a tracking angle range of motion of +/-60 degrees. The average height of center of the PV panels above ground will be approximately 5 feet. The ground

coverage ratio (GCR) of the PV panels will be 0.40 (40 percent), and the PV panels will contain smooth glass with an anti-reflective coating. The PV panel tracking modules will implement a shade- and slope-aware backtracking strategy with the shallowest possible angle of east/west rotation during backtracking of 0 degrees.

The fenced area of the Site to be developed is open, flat land covered with low shrubs. Elevation of the fenced area ranges from approximately 6,770 to 6,790 feet above mean sea level. A forested hillside immediately north of the fenced area rises approximately 500 feet above the Site. The Project vicinity features flat, open shrubland with scattered homes and ranches to the west, south, and east. The Site is bordered to the west by Lakewood Drive and to the south by Erwin Ranch Road.

3. VIEWPOINT SUMMARY AND DISCUSSION

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

Based on ERM’s review of the Federal Aviation Administration (FAA) database,¹ aerial photos, and a Google search, the nearest aircraft facility is Big Bear Airport (L35), located 2.6 miles west-northwest of the Project. ERM evaluated a total of three 2-mile-long flight paths (FP 1, FP 2, and FP 3) to Runway 08/26 at this airport as part of the glare analysis (Figure 3). As documented by the FAA and Big Bear Airport,² Runway 08 approach (FP 1) has a bearing of 74 degrees and threshold crossing height of 29 feet. Runway 26 has two approaches, bearing 270 degrees (FP 2) and bearing 256 degrees (FP 3), both with a threshold crossing height of 46 feet. All three flight paths have a glide slope of 4.3 degrees. Big Bear Airport does not have an air traffic control tower (ATCT). ERM identified no other airports within 10 miles of the Site.

ERM identified 16 stationary locations to serve as representative viewpoints for the glare analysis. These viewpoints are identified using the abbreviation “OP” and are numbered sequentially—OP 1 through OP 16 (Figures 1 and 2). OP 1 is located on a pickleball court at Big Bear Ranch Park, a San Bernadino County Parks and Recreation facility at 2080 Erwin Ranch Road. OP 7 is on the grounds of the Big Bear Equestrian Center & Bear Valley Farms at 1601 East Big Bear Boulevard. The remaining 14 viewpoints represent individual residences in the vicinity of the Project. ERM also

¹ Federal Aviation Administration. Circle Search for Airports. Available online <https://oeaaa.faa.gov/oeaaa/external/searchAction.jsp?action=showCircleSearchAirportsForm>. Accessed 5 November 2024.

² Big Bear Airport. Approach and Departure Procedures. Available online <https://www.bigbearcityairport.com/pilots/>. Accessed 5 November 2024.

identified six road segments including Erwin Ranch Road, Lakewood Drive, Central Lane, Willow Lane, Cypress Lane, and Jensen Drive – Ringwood Trail to evaluate whether glare could potentially be observed by motorists traveling these roads.

To mitigate potential visual impacts (including glare) observed from these viewpoints, the Project design includes a visual screen consisting of a vegetative buffer along the southern and western boundaries of the Site (Figures 1 and 2). A fixed-knot agricultural-style fence is also proposed along the southwestern side of the Site where it abuts residential properties; however, this type of fence would not provide significant visual screening.

At full growth, the vegetative buffer along the frontages of Erwin Ranch Road and Lakewood Drive is conservatively expected to provide a fully opaque screen up to a minimum estimated height of 8 feet. At full growth, the vegetative buffer between the Site and residential properties is conservatively expected to provide a fully opaque screen up to a minimum estimated height of 6 feet. Because the ForgeSolar tool assumes that visual obstructions provide complete screening, these conservative height estimates were used in this analysis. At full growth, however, the vegetative buffers may provide at least partial screening up to an estimated height of 12 feet. For comparison, the glare analysis results without the visual buffers are provided in Appendix B.

4. GLARE ANALYSIS

This glare analysis is based on design parameters provided by EDFR-DSP for single-axis trackers as described above in Section 2. It is important to note that glare would not be experienced if the solar panels are screened by topography, structures, or vegetation. Therefore, locations where glare may occur would be limited to areas with direct views of the proposed solar panels. Potential visibility could change over time due to planting or removal of vegetation or construction or removal of structures. The ForgeSolar tool does not, by default, consider the screening effects of vegetation, structures, or topographic features between a PV array and the identified viewpoints. However, the proposed visual buffers described in Section 3 above were incorporated into this glare analysis.

4.1 BACKGROUND

PV panels are designed to absorb rather than reflect sunlight to maximize energy capture. Many PV panels utilize textured glass and/or have anti-reflective coatings to further minimize reflectivity. Based on information provided by EDFR-DSP, the Project's PV panels will contain smooth glass with an anti-reflective coating. ERM included this parameter in the glare analysis.

PV solar projects do not typically cause harmful or nuisance levels of glare, defined as a continuous source of bright light that may be visible to nearby residents, motorists,

or pilots. The absorbing, rather than reflecting, nature of PV technology, in conjunction with proper site planning and design, has allowed PV panels to be commonly and safely installed on airport properties nationwide.³ Additionally, PV panels have a lower index of refraction/reflectivity than common sources of glare in residential environments. The glare and reflectance levels from a given PV system are lower than those of steel, snow, standard glass, plexiglass, and smooth water. The glare and reflectance levels of modules are further reduced with the application of anti-reflective coatings. PV suppliers typically use stippled glass for panels as the "texturing" of the glass allows more light energy to be channeled/transmitted through the glass while weakening the reflected light. With the application of anti-reflective coatings and the use of modern glass technology, Project PV panels would display overall low reflectivity. In addition, because tracker systems follow the sun, the underside of the PV panels and most of the structure supporting them are shadowed throughout the day.

Light reflected from the PV panels would travel above the line of sight of most, if not all, viewers. PV tracking systems position the array so that the sun's rays are always perpendicular to the face of the panel. Reflected light is directed back toward the sun. During midday conditions, when the sun is high in the sky, the rays of the sun are reflected directly upwards. When the sun is low on the horizon (near dawn or dusk), the sun's angle in the sky is low; however, reflected rays would still be directed away from ground-level receptors because the maximum downward angle of the arrays would not be below 30 degrees. Due to their low reflectivity, the panels are not expected to cause visual impairment for motorists on local roadways near the Project site.

The amount of light reflected from solar panels depends on several factors, including the amount of sunlight hitting the panel surface, the surface's reflectivity (based on variables such as the presence of textured glass and/or anti-reflective coatings), the geographic location, time of year, weather conditions, and solar panel orientation. These factors affect the angle of incidence of the sun relative to sensitive viewers, and the amount of glare experienced.³ With respect to glare, angle of incidence is the angle at which light deviates from perpendicular to a surface. The angle of incidence changes as the sun moves across the sky and is generally lowest at solar noon (when the sun is at its highest point above the horizon and light is reflected toward the sky) and highest at dawn and dusk (when the sun is low in the sky and light is reflected from a high angle of incidence in the opposite direction).

³ Federal Aviation Administration. 2018. *Technical Guidance for Evaluating Selected Solar Technologies on Airports*. Version 1.1, April 2018. Available online <https://www.faa.gov/sites/faa.gov/files/airports/environmental/FAA-Airport-Solar-Guide-2018.pdf>.

4.2 METHODOLOGY

ERM used the industry standard ForgeSolar GlareGauge⁴ tool to assess potential glare and ocular impact at the 16 viewpoints and along the 6 road segments as shown on Figures 1 and 2. Glare was also assessed along flight approach paths FP 1, FP 2, and FP 3 at Big Bear Airport located 2.6 miles west-northwest of the Site (Figure 3). The tool calculates ocular impact from anticipated levels of retinal irradiance (amount of light received by the retina) and the subtended angle (size and distance) of the glare source. The ForgeSolar tool uses three categories to report potential ocular hazards ranging from retinal burns to temporary after-image, defined as a visual phenomenon in which glare persists in the viewer's vision, even after looking away from the source. These categories include:

- "Green" ratings indicate a low potential to cause after-image (flash blindness);
- "Yellow" ratings indicate the potential to cause temporary after-image; and
- "Red" ratings indicate potential to cause retinal burn and permanent eye damage.⁵

When simulating glare, the ForgeSolar tool modifies the vertex elevations of a PV array footprint so that all points of the PV array reside on a single planar surface. The ForgeSolar tool also may convert PV array footprints with large concavities into a convex shape by filling in these concavities. Therefore, to enhance the accuracy of the glare analysis (by preventing the flattening of hills and reducing the presence of large concavities), ERM divided the PV array area into three smaller sections (labeled PV 01 through PV 03) as shown on Figures 1 and 2.

The ForgeSolar tool considers the direction the PV panels face throughout the day and the slope of the PV array, based on the underlying topography, elevation, and height above ground of the PV panels. Analysis of potential glare observed from stationary viewpoints (OP 1 through OP 16) is based on a 360-degree field of view. By comparison, analysis of glare along the six road segments is calculated using a 100-degree field of view (50 degrees to the left and right) centered on the direction of travel (in both directions) along the routes. Glare assessment along the flight paths also use a 100-degree field of view with a maximum downward viewing angle of 30 degrees. This default value is based on FAA research, which determined that the impact of glare beyond a 100-degree field of view is mitigated.⁶

⁴ ForgeSolar Glare Analysis tool. Available online <https://www.forgesolar.com/>. Accessed 5 November 2024.

⁵ ForgeSolar. Fundamentals: About Glint and Glare. Available online <https://www.forgesolar.com/help/#glare>. Accessed 5 November 2024.

⁶ Rogers, J. A., et al. 2015. "Evaluation of Glare as a Hazard for General Aviation Pilots on Final Approach." Federal Aviation Administration, Office of Aerospace Medicine. Report No. DOT/FAA/AM-15/12. Available online https://www.faa.gov/sites/faa.gov/files/data_research/research/med_humanfacs/oamtechreports/201512.pdf.

4.3 RESULTS

As summarized in Table 1 and documented in Appendix A, the glare analysis results predict the Project will generate green and yellow glare along Jensen Drive – Ringwood Trail from a point southwest of OP 6 to the intersection with Lakewood Drive near the northwest corner of the Site. Along Erwin Ranch Road, green glare is predicted west of the intersection with Lakewood Drive. A negligible amount of yellow glare (1 minute per year) is predicted on Erwin Ranch Road. The analysis predicts green glare at the northern end of Lakewood Drive near Jensen Drive. No yellow glare is predicted on Lakewood Drive, and no glare of any type is predicted along Central Lane, Cypress Lane, or Willow Lane.

The analysis predicts green glare along flight path FP 1, the approach to Runway 08 at Big Bear Airport. No yellow glare is predicted along FP 1, and no glare of any type is predicted along FP 2 or FP 3, the two approaches to Runway 26.

No yellow glare is predicted at any of the viewpoints OP 1 through OP 16. Green glare is predicted at viewpoints OP 3 through OP 7. No glare of any type is predicted at viewpoints OP 1, OP 2, and OP 8 through OP 16.

Table 1: Bear Valley Solar Energy Project – Summary of Predicted Glare (with visual buffers)

Viewpoint Location	Annual Green Glare (minutes/year)	Annual Yellow Glare (minutes/year)	Glare Source	Distance and Direction to Source	Approximate Time of Year and Day	Maximum Daily Duration (Green and Yellow combined) (minutes/day)	Comments
Erwin Ranch Road	68	none	PV 01	0.3 mi NE	Jun to Jul - morning	3	Glare predicted along western segment of road, northwest of Big Bear Ranch Park
	518	1	PV 02	0.2 mi NE	May to Aug - morning	7	Glare predicted along segment of road west of Lakewood Drive
Jensen Drive – Ringwood Trail	1,956	137	PV 01	630 ft SE	Nov to Jan - morning	31	
	1,269	none	PV 02	0.2 mi SE	Nov to Jan - morning	19	
Lakewood Drive	413	none	PV 02	0.2 mi SE	Dec to Jan - morning	11	Glare predicted at northern end of road near Jensen Drive
FP 1	459	none	PV 01	3.5 mi E	Feb to Mar and Sep to Oct - morning	12	
	146	none	PV 02	3.6 mi E	Feb to Mar and Sep to Oct - morning	5	
OP 3	101	none	PV 02	450 ft ENE	Apr to Sep - morning	2	

Table 1: Bear Valley Solar Energy Project – Summary of Predicted Glare (with visual buffers)

Viewpoint Location	Annual Green Glare (minutes/year)	Annual Yellow Glare (minutes/year)	Glare Source	Distance and Direction to Source	Approximate Time of Year and Day	Maximum Daily Duration (Green and Yellow combined) (minutes/day)	Comments
OP 4	73	none	PV 01	570 ft NE	May to Jul - morning	4	
	429	none	PV 02	640 ft ENE	Feb to May and Jul to Sep - morning	8	
OP 5	341	none	PV 01	350 ft NE	Apr to Aug - morning	8	
	304	none	PV 02	870 ft E	Mar, May, and Aug - morning	10	
OP 6	86	none	PV 02	0.3 mi SE	Dec - morning	6	
OP 7	73	none	PV 01	0.4 mi ESE	Feb to Mar and Oct - morning	8	

All viewpoints where glare is predicted in Table 1 are located on the western side of the PV array(s) generating the glare. Consequently, predicted glare would occur in the morning at these locations when the sun is low in the eastern sky and a person may observe glare when looking eastward toward the PV array. Graphs in Appendix A provide additional detail showing both the hour of day and daily duration of predicted glare each day throughout the year for every PV array and viewpoint combination.

It should be noted that glare observed at a viewpoint from multiple PV arrays may partially occur at the same time, particularly when glare is reflected from PV arrays that appear closely aligned relative to the observer. As a result, the total annual duration of glare predicted for each viewpoint in the Appendix A Summary of Results Table may include overlapping periods of glare for viewpoints that receive glare from more than one PV array.

In addition, the glare analysis does not consider potential cloud cover. The amounts of glare predicted in Table 1 and Appendix A represent total potential amounts of glare assuming clear, sunny skies every day throughout the year.

4.4 CONCLUSIONS

As currently designed, the Project would potentially reflect glare onto segments of Erwin Ranch Road, Jensen Drive – Ringwood Trail, and Lakewood Drive, as well as other viewpoints identified in Table 1 during certain periods of the year. However, the proposed visual buffers significantly reduced predicted glare along Erwin Ranch Road, Lakewood Drive, and at OP 3, OP 4, OP 5, and OP 7. The visual buffers eliminated

predicted glare at OP 1, OP 2, OP 8, and OP 15. (The glare analysis results without the visual buffers are provided in Appendix B for reference.)

Because viewpoints OP 6 and Jensen Drive – Ringwood Trail are located up to 110 feet above and northwest of the Site, the lines of sight from these viewpoints would not be affected by the proposed buffers. Consequently, predicted glare at these locations remained nearly unchanged. At OP 6, however, only 86 minutes of annual green glare (a maximum of 6 minutes per day) is predicted.

In 2021, the FAA issued an updated policy regarding reviews of solar projects on federally obligated airport property in which the FAA concluded that in most cases “glare from solar energy systems to pilots on final approach is similar to glint and glare pilots routinely experience from water bodies, glass facade buildings, parking lots, and similar features.”⁷ FAA policy focuses on potential impacts on crews in ATCTs, which would not apply to airports without ATCTs such as Big Bear Airport.

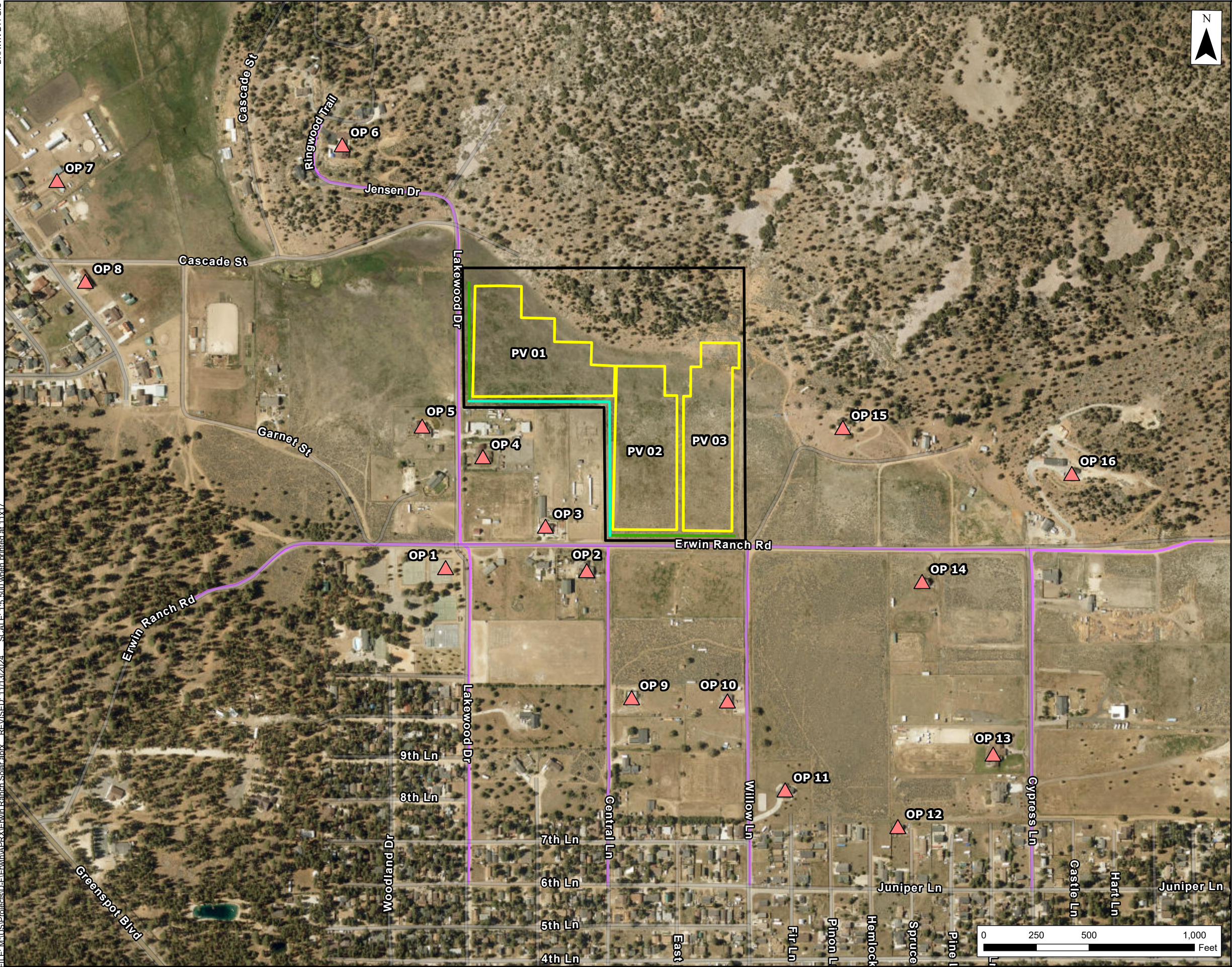
Along flight path FP 1, located 3.5 miles west of the Site, the results predict a maximum of around 12 minutes of green glare in the morning per day for about one month in the spring and fall. These levels and duration of glare from the Project potentially observed by pilots would likely be similar to or less than levels occasionally reflected from the much larger Big Bear Lake located directly under FP 1. In addition, Baldwin Lake, located 2.1 miles east-northeast and roughly in line with FP 1, could also be a potential source of glare for pilots at certain times. Based on these factors, glare impacts on pilots caused by the Project are expected to be minimal.

⁷ FAA. 2021. Federal Aviation Administration Policy: Review of Solar Energy System Projects on Federally-Obligated Airports. 86 FR 25801.

FIGURES

DRAWN BY: GIS

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- Legend**
- Observation Point
 - Route Receptor
 - Vegetative Buffer 8 feet
 - Vegetative Buffer 6 feet
 - PV Array
 - Site Boundary

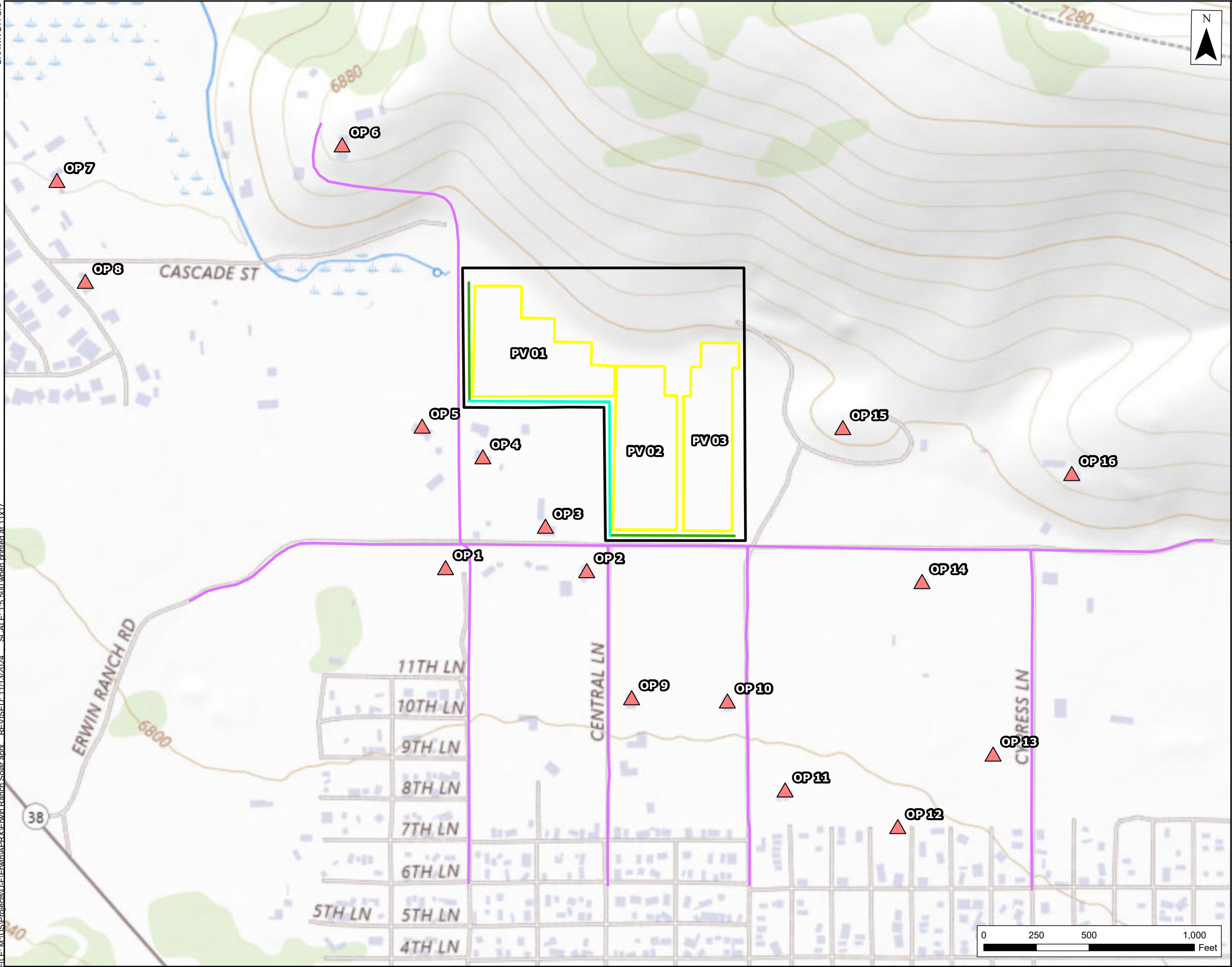
**Figure 1
Glare Analysis
Aerial Map**
Bear Valley Solar Energy Project
San Bernardino County, CA



Source: Esri - World Aerial Map; NAD 1983 2011 StatePlane California V FIPS 0405 Ft US

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Legend

- Observation Point
- Route Receptor
- Vegetative Buffer 8 feet
- Vegetative Buffer 6 feet
- PV Array
- Site Boundary

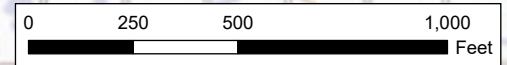


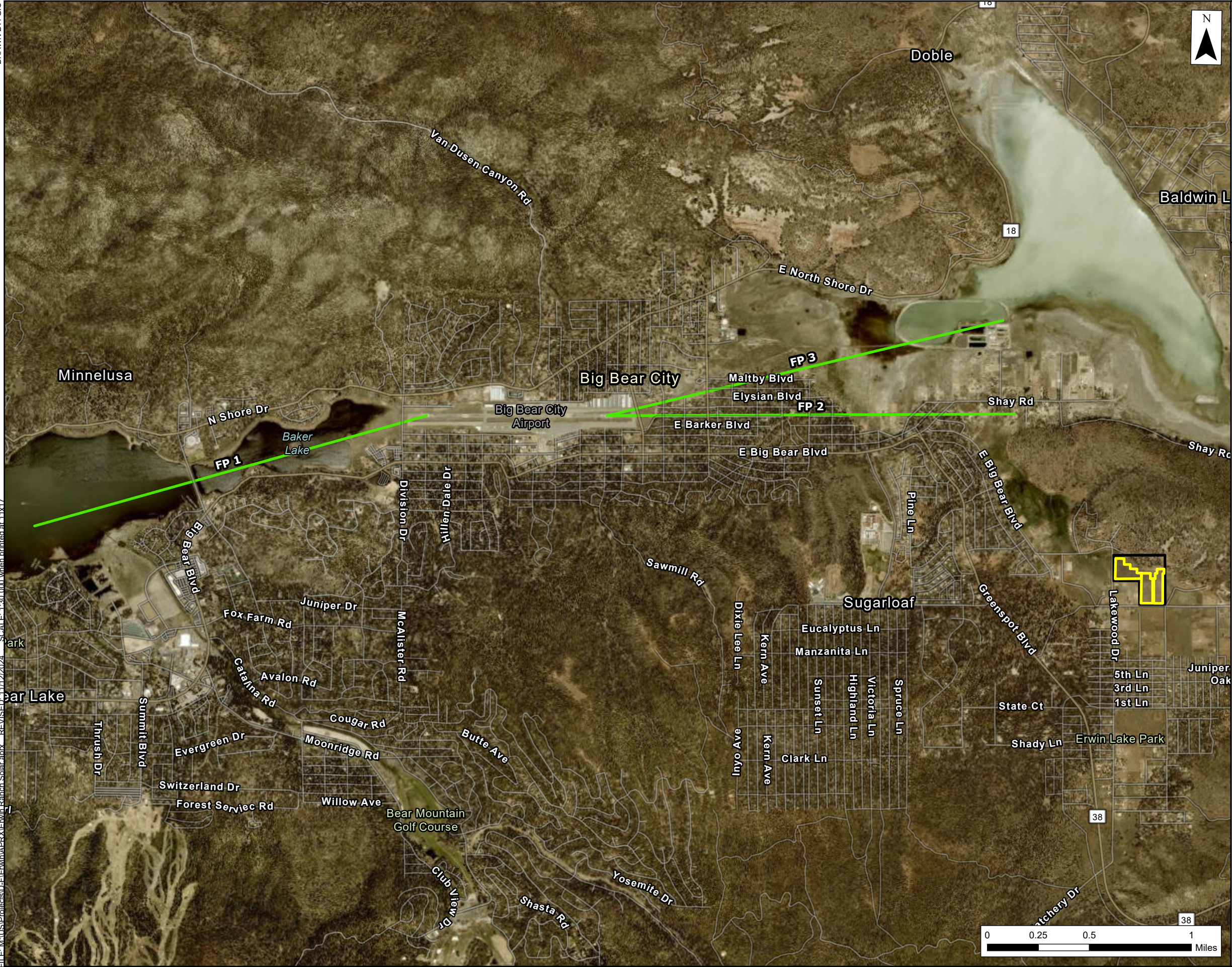
Figure 2
Glare Analysis
Topographic Map
 Bear Valley Solar Energy Project
 San Bernardino County, CA



Source: USGS - World Topographic Map; NAD 1983 2011 StatePlane California V FIPS 0405 Ft US

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Legend

- Flight Path
- PV Array
- Site Boundary

Figure 3
Glare Analysis
Flight Path Map
 Bear Valley Solar Energy Project
 San Bernardino County, CA



Source: Esri - World Aerial Map; NAD 1983 2011 StatePlane California V FIPS 0405 Ft US

APPENDIX A - FORGESOLAR GLARE ANALYSIS RESULTS (WITH VISUAL BUFFERS)

FORGESOLAR GLARE ANALYSIS

Project: **Bear Valley Solar Energy Project**

Proposed 5.7-megawatt (MW) solar photovoltaic (PV) project located on approximately 30 acres on Erwin Ranch Road in unincorporated San Bernardino County, California

Site configuration: **BV2-Buffer-BT-0-deg**

Client: EDF Renewables Distributed Solutions

Created 20 Nov, 2024

Updated 21 Nov, 2024

Time-step 1 minute

Timezone offset UTC-8

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m²

Category 5 MW to 10 MW

Site ID 134663.22713

Ocular transmission coefficient 0.5

Pupil diameter 0.002 m

Eye focal length 0.017 m

Sun subtended angle 9.3 mrad

PV analysis methodology V2



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

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
PV 01	SA tracking	SA tracking	2,970	49.5	137	2.3	-
PV 02	SA tracking	SA tracking	3,266	54.4	1	0.0	-
PV 03	SA tracking	SA tracking	0	0.0	0	0.0	-

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

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Central Ln	0	0.0	0	0.0
Cypress Ln	0	0.0	0	0.0
Erwin Ranch Rd	586	9.8	1	0.0
Jensen Dr - Ringwood Trl	3,225	53.8	137	2.3
Lakewood Dr	413	6.9	0	0.0
Willow Ln	0	0.0	0	0.0
FP 1	605	10.1	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
FP 2	0	0.0	0	0.0
FP 3	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	101	1.7	0	0.0
OP 4	502	8.4	0	0.0
OP 5	645	10.8	0	0.0
OP 6	86	1.4	0	0.0
OP 7	73	1.2	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

Component Data

PV Arrays

Name: PV 01
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.4
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.253853	-116.805054	6771.20	5.00	6776.20
2	34.252416	-116.805086	6775.06	5.00	6780.06
3	34.252416	-116.802892	6776.59	5.00	6781.59
4	34.252846	-116.802881	6775.61	5.00	6780.61
5	34.252855	-116.803235	6775.53	5.00	6780.53
6	34.253130	-116.803235	6775.72	5.00	6780.72
7	34.253134	-116.803809	6775.33	5.00	6780.33
8	34.253440	-116.803809	6775.38	5.00	6780.38
9	34.253449	-116.804335	6771.80	5.00	6776.80
10	34.253853	-116.804340	6771.96	5.00	6776.96

Name: PV 02
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.4
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.252851	-116.802849	6775.62	5.00	6780.62
2	34.250696	-116.802871	6787.99	5.00	6792.99
3	34.250691	-116.801884	6789.00	5.00	6794.00
4	34.252434	-116.801889	6779.00	5.00	6784.00
5	34.252434	-116.802087	6778.96	5.00	6783.96
6	34.252846	-116.802082	6779.03	5.00	6784.03

Name: PV 03

Axis tracking: Single-axis rotation

Backtracking: Shade-slope

Tracking axis orientation: 180.0°

Max tracking angle: 60.0°

Resting angle: 0.0°

Ground Coverage Ratio: 0.4

Rated power: -

Panel material: Smooth glass with AR coating

Reflectivity: Vary with sun

Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.252842	-116.801664	6779.38	5.00	6784.38
2	34.252429	-116.801658	6779.03	5.00	6784.03
3	34.252429	-116.801766	6779.01	5.00	6784.01
4	34.250691	-116.801760	6788.78	5.00	6793.78
5	34.250691	-116.801015	6790.45	5.00	6795.45
6	34.252837	-116.801009	6783.78	5.00	6788.78
7	34.252846	-116.800923	6783.67	5.00	6788.67
8	34.253148	-116.800923	6788.55	5.00	6793.55
9	34.253148	-116.801508	6785.10	5.00	6790.10
10	34.252842	-116.801508	6780.63	5.00	6785.63

Route Receptors

Name: Central Ln

Path type: Two-way

Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.250483	-116.802954	6790.01	6.00	6796.01
2	34.250096	-116.802964	6791.93	6.00	6797.93
3	34.248468	-116.802939	6802.29	6.00	6808.29
4	34.247755	-116.802940	6807.07	6.00	6813.07
5	34.247484	-116.802905	6811.78	6.00	6817.78
6	34.247213	-116.802937	6813.37	6.00	6819.37
7	34.246607	-116.802937	6815.85	6.00	6821.85
8	34.246044	-116.802929	6820.51	6.00	6826.51

Name: Cypress Ln
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.250452	-116.796329	6785.05	6.00	6791.05
2	34.250324	-116.796310	6785.09	6.00	6791.09
3	34.250054	-116.796284	6786.42	6.00	6792.42
4	34.249657	-116.796278	6787.18	6.00	6793.18
5	34.249205	-116.796295	6788.78	6.00	6794.78
6	34.248635	-116.796284	6790.82	6.00	6796.82
7	34.247979	-116.796291	6795.51	6.00	6801.51
8	34.246908	-116.796287	6800.76	6.00	6806.76
9	34.246012	-116.796269	6806.49	6.00	6812.49

Name: Erwin Ranch Rd
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.249734	-116.809496	6792.06	6.00	6798.06
2	34.249871	-116.809195	6790.28	6.00	6796.28
3	34.249938	-116.808806	6790.59	6.00	6796.59
4	34.250011	-116.808589	6791.37	6.00	6797.37
5	34.250381	-116.808066	6789.30	6.00	6795.30
6	34.250459	-116.807875	6786.66	6.00	6792.66
7	34.250494	-116.807639	6787.38	6.00	6793.38
8	34.250461	-116.805797	6787.21	6.00	6793.21
9	34.250475	-116.805231	6787.96	6.00	6793.96
10	34.250486	-116.802771	6789.27	6.00	6795.27
11	34.250486	-116.800950	6790.17	6.00	6796.17
12	34.250446	-116.799719	6789.39	6.00	6795.39
13	34.250445	-116.798042	6785.76	6.00	6791.76
14	34.250453	-116.795711	6784.23	6.00	6790.23
15	34.250422	-116.794424	6782.28	6.00	6788.28
16	34.250453	-116.794212	6781.85	6.00	6787.85
17	34.250581	-116.793743	6780.66	6.00	6786.66
18	34.250579	-116.793461	6780.12	6.00	6786.12

Name: Jensen Dr - Ringwood Trl

Path type: Two-way

Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.255954	-116.807491	6886.54	6.00	6892.54
2	34.255753	-116.807575	6879.13	6.00	6885.13
3	34.255549	-116.807623	6870.92	6.00	6876.92
4	34.255393	-116.807599	6864.32	6.00	6870.32
5	34.255287	-116.807521	6860.81	6.00	6866.81
6	34.255209	-116.807368	6860.05	6.00	6866.05
7	34.255154	-116.807025	6853.49	6.00	6859.49
8	34.255087	-116.806322	6828.14	6.00	6834.14
9	34.255054	-116.805780	6801.69	6.00	6807.69
10	34.255010	-116.805571	6793.31	6.00	6799.31
11	34.254937	-116.805466	6786.99	6.00	6792.99
12	34.254798	-116.805393	6779.93	6.00	6785.93
13	34.254640	-116.805352	6773.79	6.00	6779.79

Name: Lakewood Dr

Path type: Two-way

Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.254638	-116.805351	6773.79	6.00	6779.79
2	34.254467	-116.805323	6770.65	6.00	6776.65
3	34.253181	-116.805316	6771.85	6.00	6777.85
4	34.251804	-116.805305	6781.38	6.00	6787.38
5	34.250521	-116.805290	6787.95	6.00	6793.95
6	34.250477	-116.805234	6787.87	6.00	6793.87
7	34.250441	-116.805157	6788.76	6.00	6794.76
8	34.250277	-116.805129	6791.08	6.00	6797.08
9	34.248736	-116.805133	6800.24	6.00	6806.24
10	34.246602	-116.805109	6817.69	6.00	6823.69
11	34.246063	-116.805117	6821.27	6.00	6827.27

Name: Willow Ln
Path type: Two-way
Observer view angle: 50.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.250480	-116.800751	6789.82	6.00	6795.82
2	34.250180	-116.800764	6791.62	6.00	6797.62
3	34.249547	-116.800757	6794.12	6.00	6800.12
4	34.249281	-116.800783	6795.52	6.00	6801.52
5	34.249089	-116.800761	6797.77	6.00	6803.77
6	34.248947	-116.800753	6798.84	6.00	6804.84
7	34.248821	-116.800764	6799.14	6.00	6805.14
8	34.248335	-116.800759	6802.48	6.00	6808.48
9	34.247605	-116.800731	6808.51	6.00	6814.51
10	34.246942	-116.800731	6813.29	6.00	6819.29
11	34.246783	-116.800711	6815.89	6.00	6821.89
12	34.246054	-116.800711	6817.99	6.00	6823.99

Flight Path Receptors

Name: FP 1
Description:
Threshold height: 29 ft
Direction: 74.0°
Glide slope: 4.3°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	34.263779	-116.864144	6753.64	29.00	6782.64
Two-mile	34.255809	-116.897812	6745.41	831.24	7576.65

Name: FP 2
Description:
Threshold height: 46 ft
Direction: 270.0°
Glide slope: 4.3°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	34.263835	-116.848690	6756.32	46.00	6802.32
Two-mile	34.263835	-116.813665	6743.08	853.25	7596.33

Name: FP 3
Description:
Threshold height: 46 ft
Direction: 256.0°
Glide slope: 4.3°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



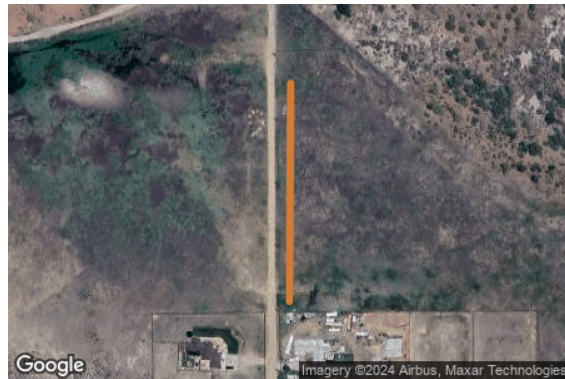
Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	34.263835	-116.848689	6756.32	46.00	6802.32
Two-mile	34.270829	-116.814705	6711.30	885.04	7596.33

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	34.250192	-116.805503	6792.88	6.00
OP 2	2	34.250160	-116.803294	6795.48	8.00
OP 3	3	34.250738	-116.803942	6791.36	8.00
OP 4	4	34.251642	-116.804936	6784.71	8.00
OP 5	5	34.252013	-116.805874	6778.97	8.00
OP 6	6	34.255694	-116.807161	6896.13	8.00
OP 7	7	34.255223	-116.811646	6764.44	6.00
OP 8	8	34.253904	-116.811181	6772.14	8.00
OP 9	9	34.248501	-116.802576	6803.42	8.00
OP 10	10	34.248474	-116.801074	6804.24	8.00
OP 11	11	34.247310	-116.800162	6812.56	8.00
OP 12	12	34.246845	-116.798387	6809.84	8.00
OP 13	13	34.247796	-116.796905	6796.92	8.00
OP 14	14	34.250039	-116.798024	6790.95	8.00
OP 15	15	34.252042	-116.799274	6819.42	8.00
OP 16	16	34.251464	-116.795675	6862.01	8.00

Obstruction Components

Name: Vegetative Buffer 1
Top height: 8.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	34.253910	-116.805161	6770.27
2	34.252367	-116.805172	6775.08

Name: Vegetative Buffer 2

Top height: 8.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	34.250638	-116.802924	6788.60
2	34.250634	-116.800966	6790.49

Name: Vegetative Buffer-Solid Wall 3

Top height: 6.0 ft



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)
1	34.252367	-116.805177	6775.08
2	34.252358	-116.802924	6776.98
3	34.250634	-116.802924	6788.68

Glare Analysis Results

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

PV Array	Tilt °	Orient °	Annual Green Glare		Annual Yellow Glare		Energy kWh
			min	hr	min	hr	
PV 01	SA tracking	SA tracking	2,970	49.5	137	2.3	-
PV 02	SA tracking	SA tracking	3,266	54.4	1	0.0	-
PV 03	SA tracking	SA tracking	0	0.0	0	0.0	-

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

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Central Ln	0	0.0	0	0.0
Cypress Ln	0	0.0	0	0.0
Erwin Ranch Rd	586	9.8	1	0.0
Jensen Dr - Ringwood Trl	3,225	53.8	137	2.3
Lakewood Dr	413	6.9	0	0.0
Willow Ln	0	0.0	0	0.0
FP 1	605	10.1	0	0.0
FP 2	0	0.0	0	0.0
FP 3	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	101	1.7	0	0.0
OP 4	502	8.4	0	0.0
OP 5	645	10.8	0	0.0
OP 6	86	1.4	0	0.0
OP 7	73	1.2	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

PV: PV 01 potential temporary after-image

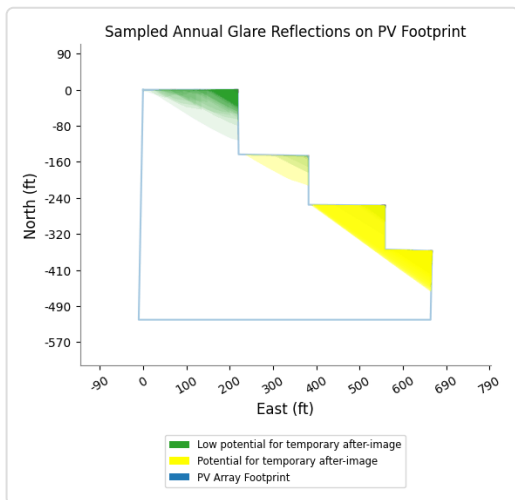
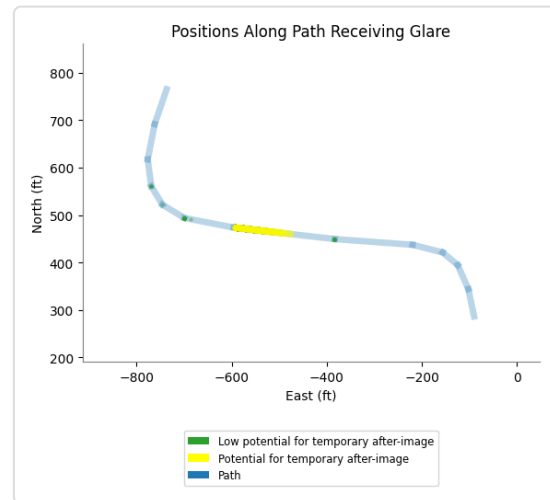
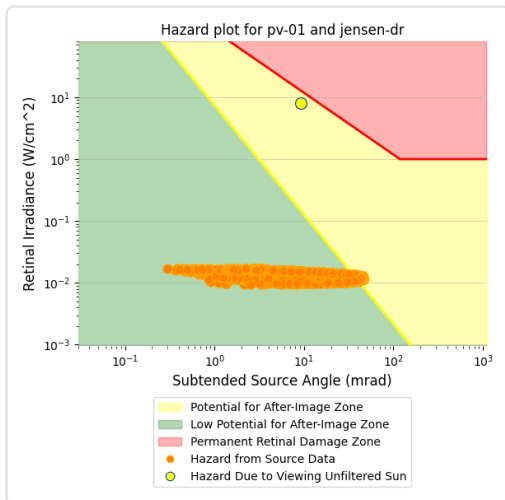
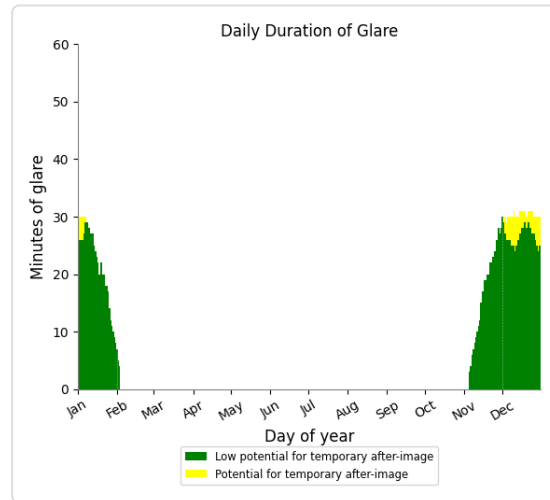
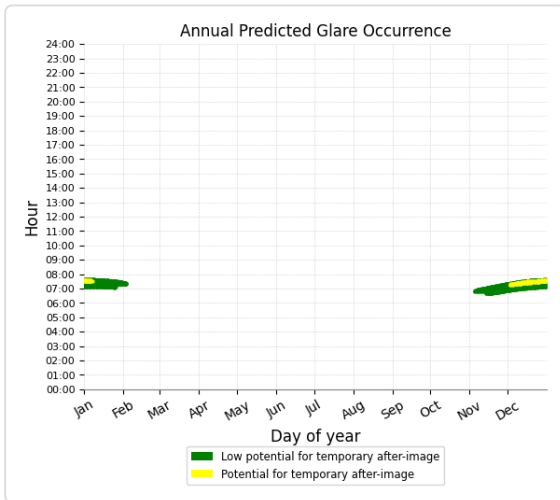
Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Jensen Dr - Ringwood Trl	1,956	32.6	137	2.3
Erwin Ranch Rd	68	1.1	0	0.0
Central Ln	0	0.0	0	0.0
Cypress Ln	0	0.0	0	0.0
Lakewood Dr	0	0.0	0	0.0
Willow Ln	0	0.0	0	0.0
FP 1	459	7.7	0	0.0
FP 2	0	0.0	0	0.0
FP 3	0	0.0	0	0.0
OP 4	73	1.2	0	0.0
OP 5	341	5.7	0	0.0
OP 7	73	1.2	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 6	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

PV 01 and Route: Jensen Dr - Ringwood Trl

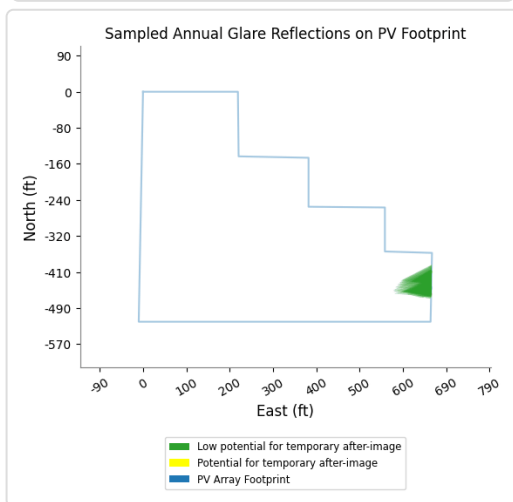
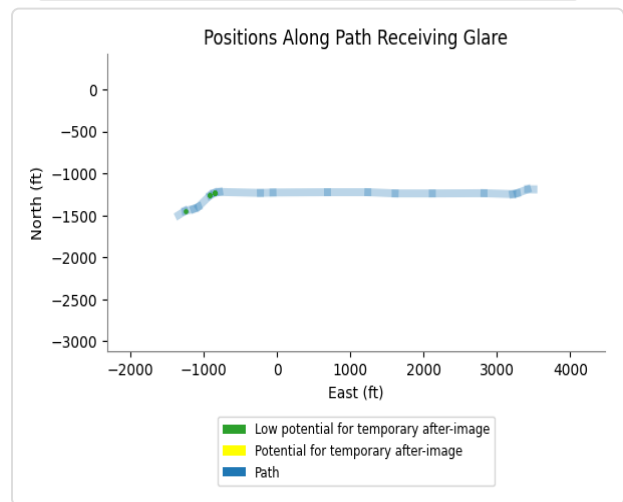
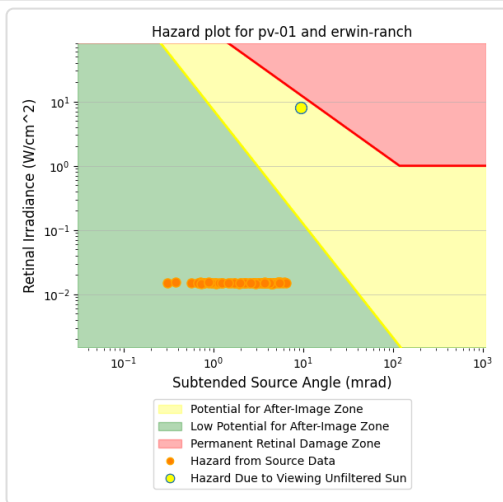
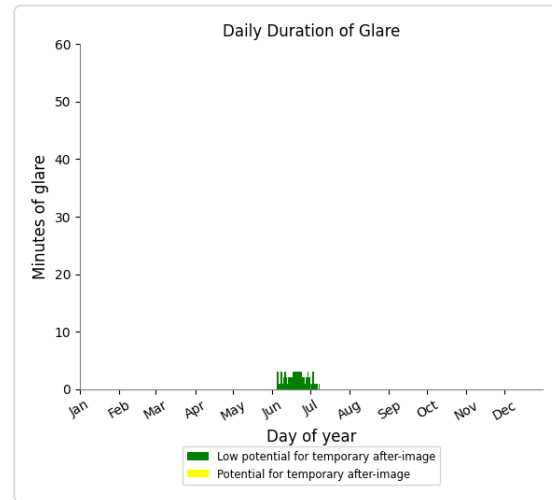
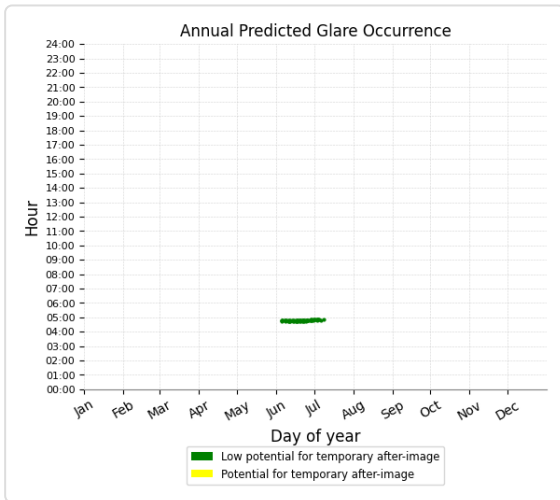
Yellow glare: 137 min.

Green glare: 1,956 min.



PV 01 and Route: Erwin Ranch Rd

Yellow glare: none
Green glare: 68 min.



PV 01 and Route: Central Ln

No glare found

PV 01 and Route: Cypress Ln

No glare found

PV 01 and Route: Lakewood Dr

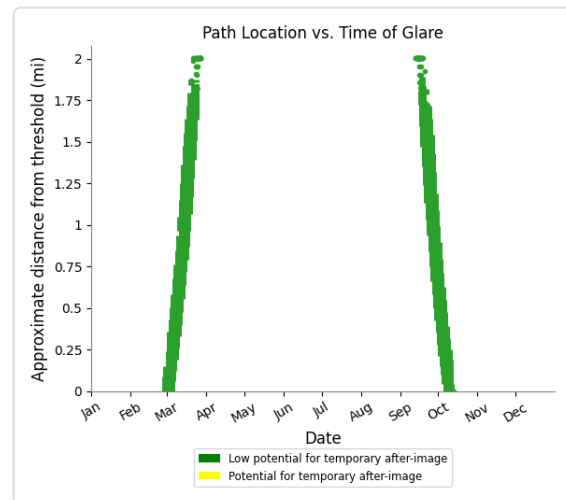
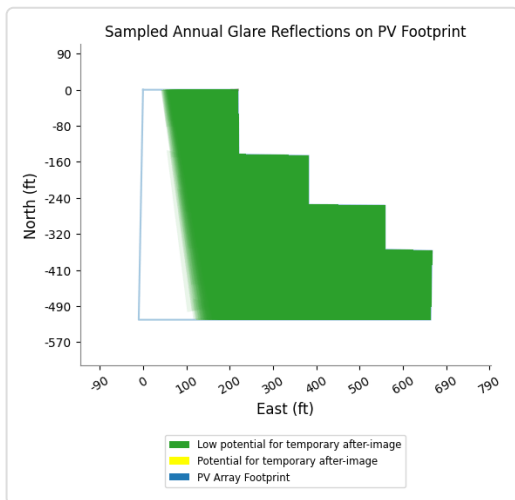
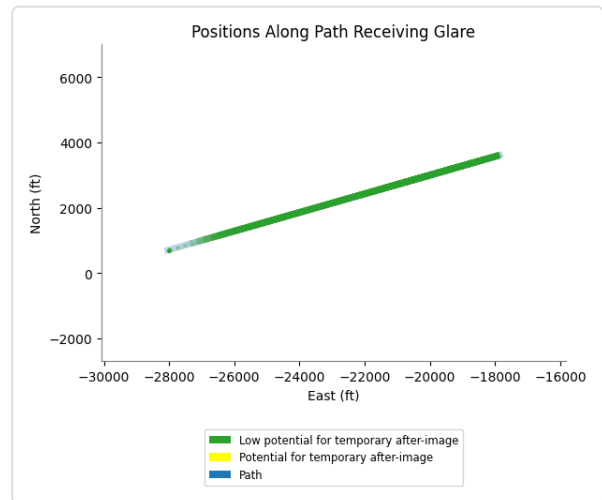
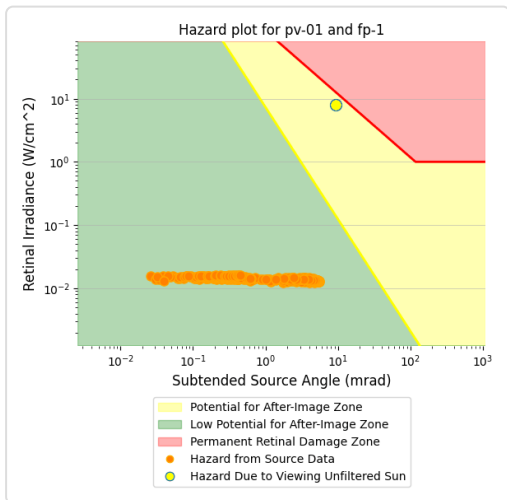
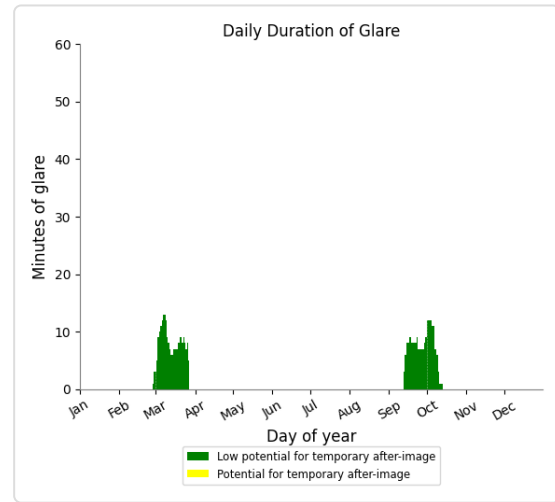
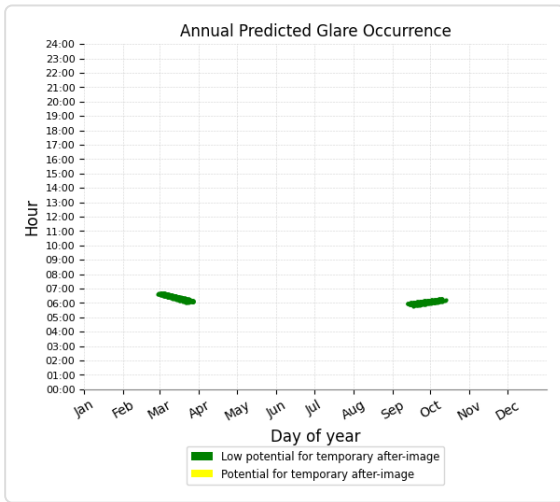
No glare found

PV 01 and Route: Willow Ln

No glare found

PV 01 and FP: FP 1

Yellow glare: none
 Green glare: 459 min.



PV 01 and FP: FP 2

No glare found

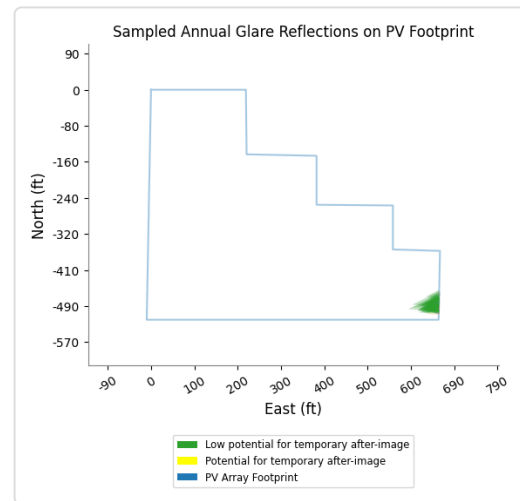
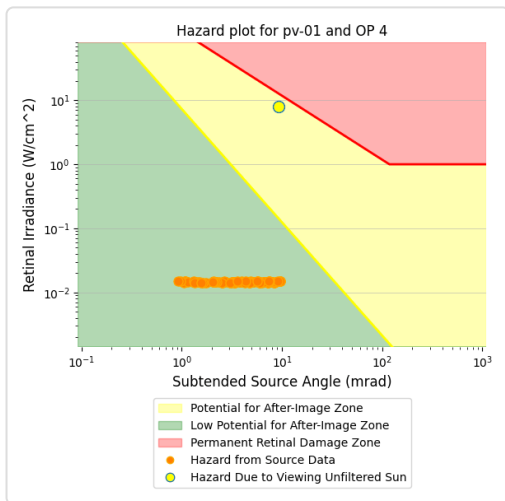
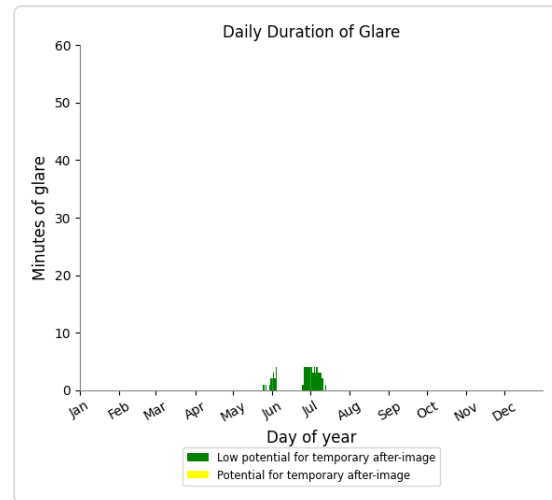
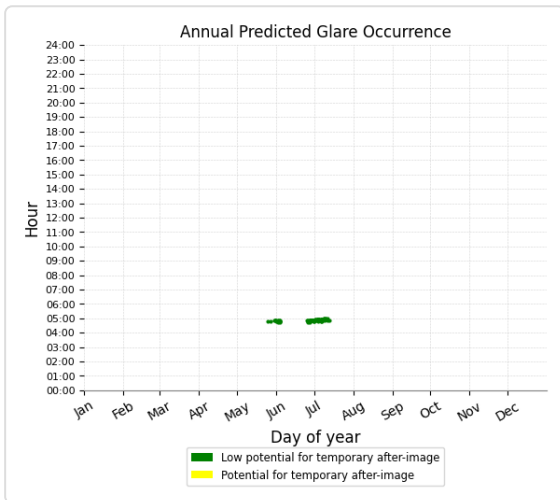
PV 01 and FP: FP 3

No glare found

PV 01 and OP 4

Yellow glare: none

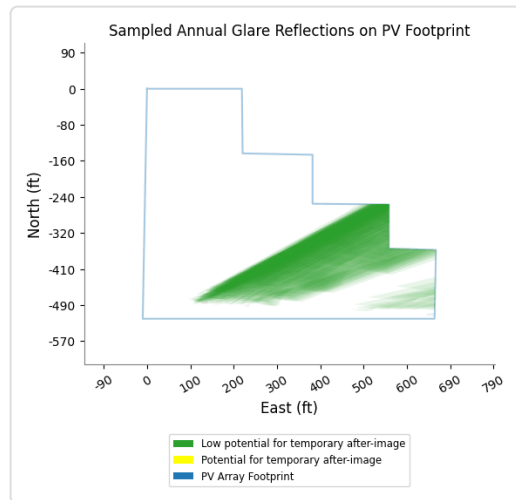
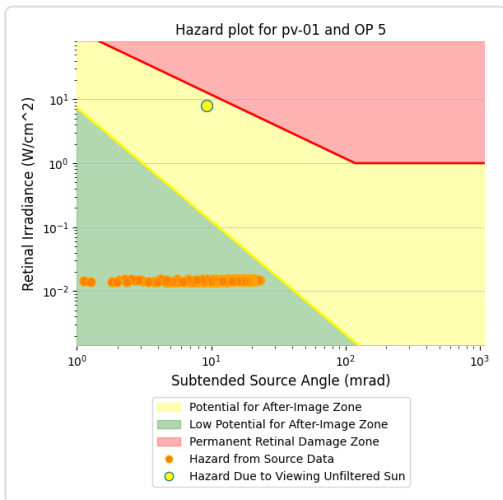
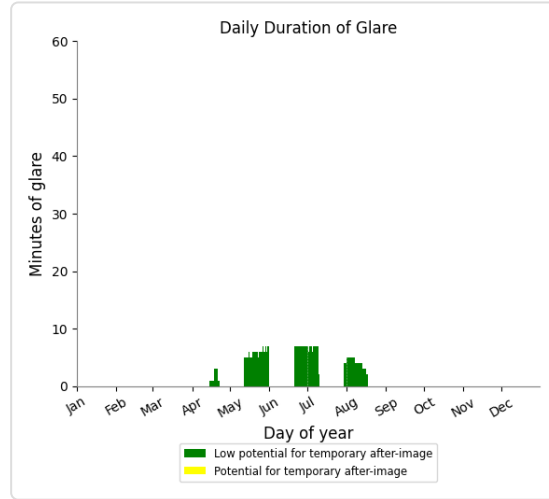
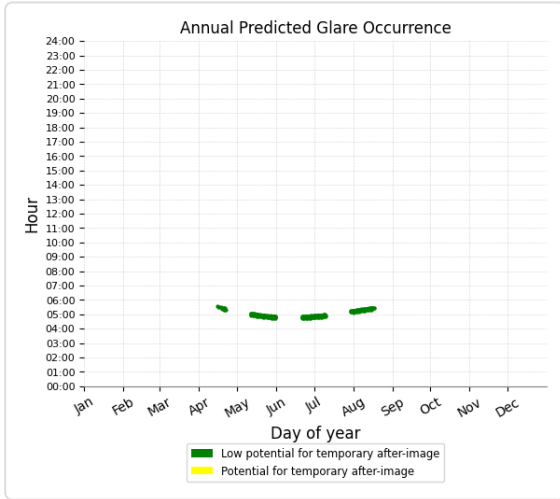
Green glare: 73 min.



PV 01 and OP 5

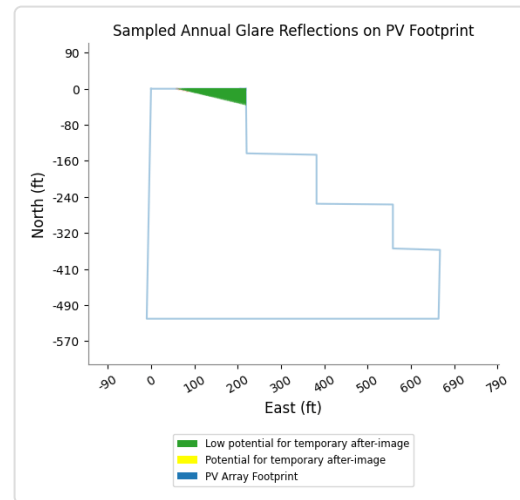
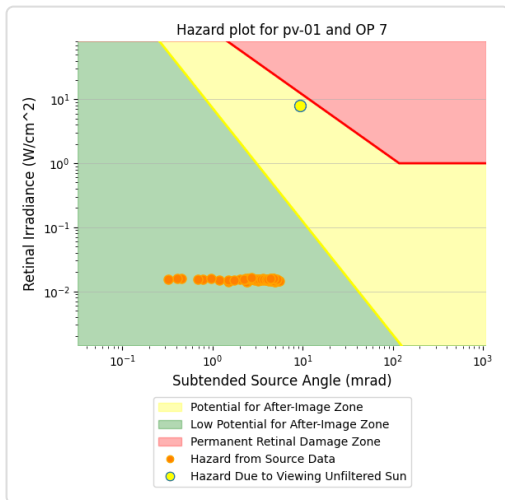
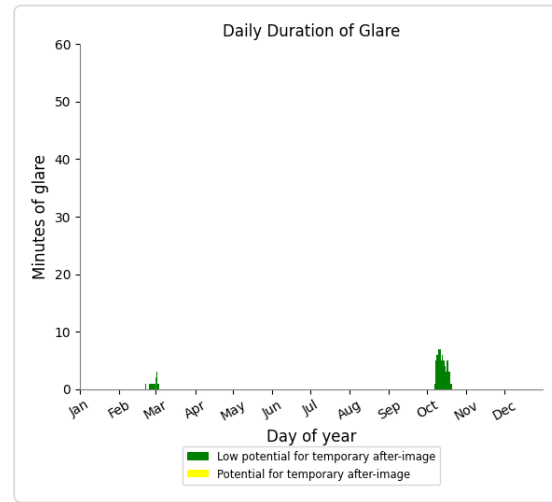
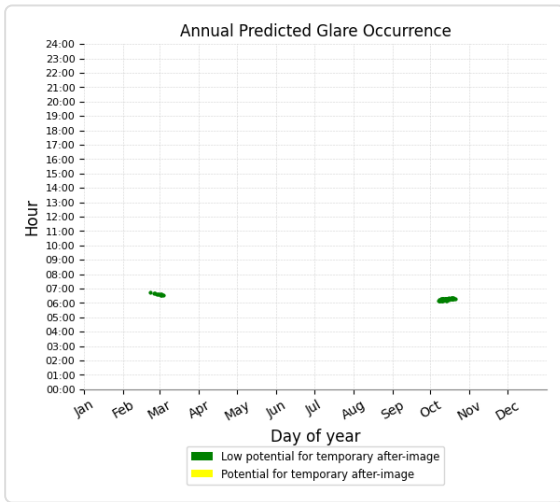
Yellow glare: none

Green glare: 341 min.



PV 01 and OP 7

Yellow glare: none
Green glare: 73 min.



PV 01 and OP 1

No glare found

PV 01 and OP 2

No glare found

PV 01 and OP 3

No glare found

PV 01 and OP 6

No glare found

PV 01 and OP 8

No glare found

PV 01 and OP 9

No glare found

PV 01 and OP 10

No glare found

PV 01 and OP 11

No glare found

PV 01 and OP 12

No glare found

PV 01 and OP 13

No glare found

PV 01 and OP 14

No glare found

PV 01 and OP 15

No glare found

PV 01 and OP 16

No glare found

PV: PV 02 potential temporary after-image

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Erwin Ranch Rd	518	8.6	1	0.0
Jensen Dr - Ringwood Trl	1,269	21.1	0	0.0
Lakewood Dr	413	6.9	0	0.0
Central Ln	0	0.0	0	0.0
Cypress Ln	0	0.0	0	0.0
Willow Ln	0	0.0	0	0.0
FP 1	146	2.4	0	0.0
FP 2	0	0.0	0	0.0
FP 3	0	0.0	0	0.0
OP 3	101	1.7	0	0.0
OP 4	429	7.2	0	0.0
OP 5	304	5.1	0	0.0
OP 6	86	1.4	0	0.0
OP 1	0	0.0	0	0.0
OP 2	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