Attachment H. Glint and Glare Analysis Solar Glare Report

February 25, 2022

High Top Solar, LLC Project

Prepared for:

Cypress Creek Renewables, LLC
3402 Pico Blvd.
Santa Monica, CA 90405

Prepared by:

TRC
Fort Collins, CO

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Acronyms and Abbreviations

Notation	Definition
°	Degrees
AC	Alternating Current
AGL	Above ground level
ASC	Application for Site Certification
ATCT	Air Traffic Control Tower
BESS	Battery energy storage system
CCR	Cypress Creek Renewables, LLC
DC	Direct Current
DoD	U.S. Department of Defense
EFSEC	State of Washington Energy Facility Site Evaluation Council
FAA	Federal Aviation Administration
FR	Federal Register
kV	Kilovolt
MPE	Maximum Project Extent is defined as the area that contains the Project Footprint and additional construction areas. The larger extent of the MPE will allow for the shifting of project components, known as micro-siting, based on a final approved project design.
M94	Desert Aire Regional Airport
min/yr	Minutes per year
MW	megawatts
OP	Observation Point
Project	High Top Solar, LLC Project
Project Site Control Boundary	Total of the leased areas and easements for the Project
PV	photovoltaic
SGHAT	Solar Glare Hazard Analysis Tool
SR	State Route
Study Area	Survey Area for glint and glare analysis
TCH	threshold-crossing height
TRC	TRC Environmental Corporation
VR	Visual Route
WSDOT	Washington State Department of Transportation

1.0 Introduction

Cypress Creek Renewables, LLC (CCR) proposes to construct and operate the High Top Solar, LLC Project (Project). A solar glare analysis is required to be documented as part of the Application for Site Certification (ASC) to the Washington Energy Facility Site Evaluation Council (EFSEC). Under certain conditions, solar photovoltaic (PV) arrays can reflect sunlight and produce glint, a momentary flash of bright light, or glare, a continuous source of bright light. TRC Environmental Corporation (TRC) was contracted by the Project to complete the solar glare analysis.

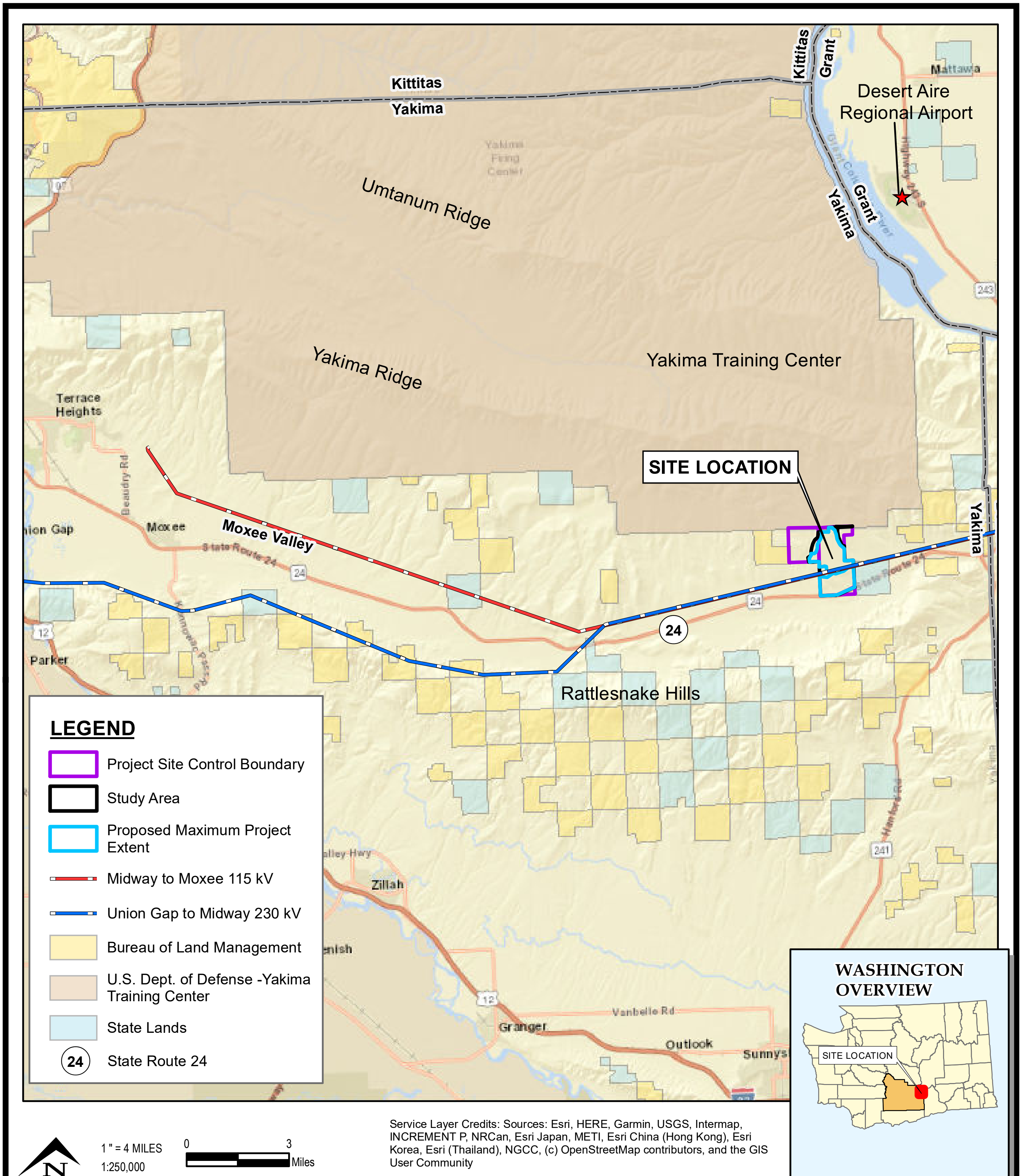
1.1 Background

The Project is situated north of Washington State Route (SR) 24, south of the Yakima Training Center, and approximately 20 miles east of the town of Moxee, in Yakima County, Washington (Figure 1-1). The Project Site Control Boundary (~1,564 acres) is defined as the total of the leased areas and easements for the Project (Figure 1-1). Within the Project Site Control Boundary, a smaller Study Area (1,114 acres) was defined for glint and glare analysis (Figure 1-1). The Maximum Project Extent (MPE) is defined as the area that contains the Project Footprint and additional construction areas. The larger extent of the MPE will allow for the shifting of project components, known as micro-siting, based on a final approved project design (926.6 acres).

The Project will use solar photovoltaic (PV) panels organized in arrays and aggregated to an injection capacity limited to 80 megawatts (MW) of alternating current (AC) solar capacity at the point of interconnection to the electric power grid. The Project will interconnect through a dedicated switchyard located on the Project adjacent to PacifiCorp's Union Gap-Midway 230 kV (kilovolt) transmission line that runs through the southern part of the Project. PacifiCorp's Union Gap-Midway 230 kV transmission line connects to PacifiCorp's shared Midway substation, which is approximately nine miles east and north of the Project and to PacifiCorp's Union Gap substation, which is approximately 25 miles west of the Project. A security fence will be installed within 20 feet of the final approved locations of the panel arrays. The exact fence line located will be micro-sited based on the final approved design for the Project.

A Battery Energy Storage System (BESS) may be required for the Project. The BESS system will store energy from the Project or grid, which will be supplied to the electrical grid when needed. If required, the BESS will be located next to the Project substation (for AC coupled) or as smaller battery cabinets collocated throughout the MPE at the inverter pad locations (for Direct Current [DC] coupled).

An Operations and Maintenance trailer, and employee parking will be located just west of the Project substation. The trailer will be permanently located during the life of the Project and will include a bathroom. During construction, the employee parking area and the Operation and Maintenance trailer footprint will be used as a construction laydown yard. Access to the Project will be from SR-24 on the east side of the MPE.



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TRC

11180 NW Maple St. Suite 310
Issaquah, WA 98027
425-395-0010
www.trccompanies.com

TRC - GIS

PROJECT:

CYPRESS CREEK RENEWABLES, LLC
HIGH TOP SOLAR, LLC
YAKIMA COUNTY, WASHINGTON

TITLE:

HIGH TOP PROJECT OVERVIEW MAP

DRAWN BY:	R. BLAKE
CHECKED BY:	P. LORENZ
APPROVED BY:	E. BERGQUIST
DATE:	MARCH 2022
PROJ. NO.:	422984
FILE: Fig 1-1_High Top_Overview Map Glint and Glare.mxd	

FIGURE1-1

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2.0 Permitting and Regulatory Requirements

2.1.1 Federal Aviation Administration Interim Policy

The 2013 Federal Aviation Administration (FAA) Interim Policy 78 Federal Register (FR) 63276 was originally developed for solar projects located on airport property. Use of the Solar Glare Hazard Analysis Tool (SGHAT) is recommended and approved by the FAA for on-airport solar projects (FAA 2013). However, the Interim Policy and SGHAT have been adopted by the industry for solar projects located on off-airport property. The FAA requires that on-airport solar projects meet the following standards:

1. The study is conducted with the SGHAT's default (or stricter) analysis and observer parameters (details included in Appendix A).
1. No potential for yellow glare or glare with potential for after-image for any flight path from the runway threshold extending out two miles.
2. No potential for glint or glare in the existing or planned Air Traffic Control Tower (ATCT) cab.

2.2 Summary of Consultation

Prior to conducting this study, TRC consulted with the Washington State Department of Transportation (WSDOT) and the Department of Defense (DoD) to determine if a glare study would be required to document a lack of potential glare impacts to vehicle traffic on SR 24 and military flightpaths, respectively.

TRC provided the Project footprint to Kimberly Peacher, Community Planning and Liaison Officer for the Northwest Training Range Complex (Yakima Training Center, DoD), on February 19, 2021. On February 22, 2021, Kimberly Peacher confirmed, via email correspondence and a follow-up phone call, that the military training flightpath, Visual Route (VR) 1350, passes in close proximity to the Study Area. The DoD requested that a glare study be conducted to confirm no glare impacts to air traffic traveling along this route and parameters were confirmed via email. On February 18, 2021, TRC contacted Jacob Prilucik, Transportation Engineer for the WSDOT South Central Region, to discuss study parameters and specific concerns for WSDOT. TRC submitted the Project footprint to Mr. Prilucik on March 15, 2021. Mr. Prilucik requested screening measures as necessary to mitigate the impacts from glare.

TRC also used the FAA Notice Criteria Tool to determine the location of the nearest FAA-obligated airports and to determine if notification to the FAA would be required for new construction within the Study Area. According to the FAA Tool, Notice is not expected to be required for the construction of the Project (FAA 2021a).

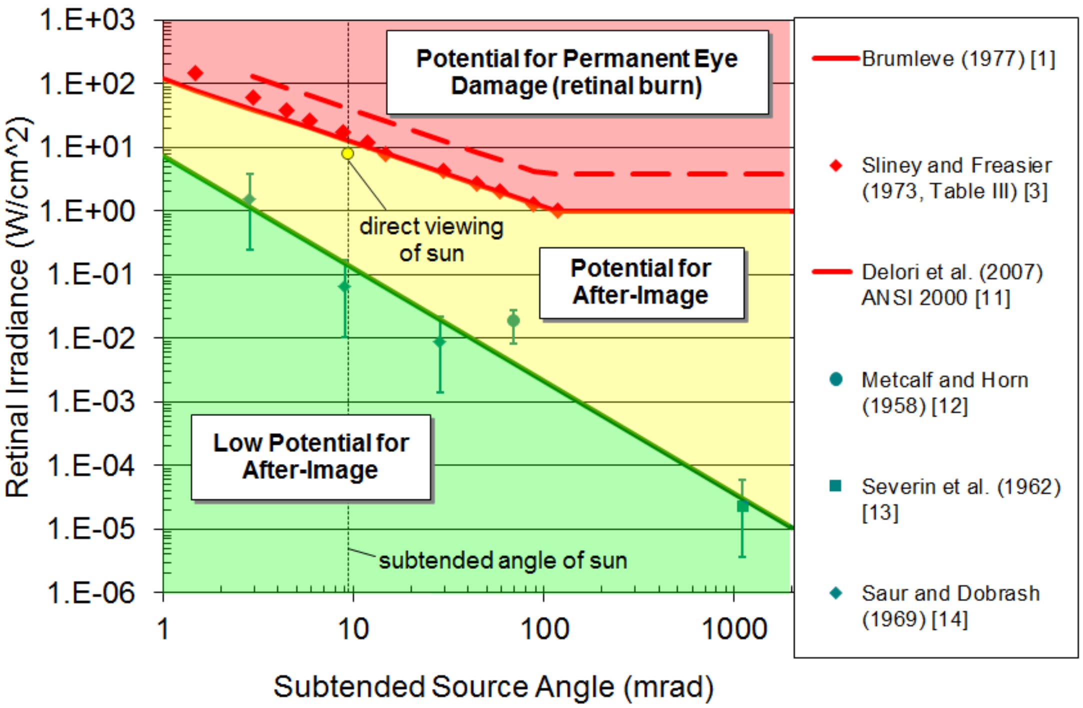
2.3 Approach/Methods

2.3.1 Glare Hazard Analysis Tool

To conduct the glint and glare analysis, TRC used methods developed by Sandia National Laboratories and described in the SGHAT User's Manual (Ho and Sims 2013). The SGHAT-compliant software used in this analysis is under license to TRC by ForgeSolar.

The magnitude of glint and glare depends on several factors such as the sun's position, the location of the observer, and characteristics of the solar PV array including location, orientation, tilt, and optical properties of the modules used. Glare visibility from an observer's location was analyzed once glare characteristics were determined. Ocular hazard potential was estimated based on the retinal irradiance and subtended angle (size/distance) of the predicted glare (Ho 2011). Potential ocular hazards range from temporary after-image to retinal burn depending on the retinal irradiance and subtended angle, as shown in Figure 2-1. The SGHAT classifies solar glare into three categories, denoted as "green," "yellow," or "red" glare.

- Green glare is the mildest of the classifications and has low potential to cause after-image and no potential to cause retinal burn.
- Yellow glare is a moderate level of glare and has some potential for temporary after-image and no potential to cause retinal burn.
- Red glare is a serious and significant form of glare with potential to cause retinal burn and/or permanent eye damage.



Source Ho 2011

Figure 2-1. Potential Glare Impacts

Limitations of the SGHAT applicable to this Project are as follows:

- The SGHAT does not rigorously represent the detailed geometry of a solar panel array; detailed features such as gaps between modules, variable heights of the PV array, and support structures may impact actual glare results. However, the accuracy of the current approach has been validated by a number of test cases.

- The model does not consider obstacles (either natural or artificial, existing or proposed) and mitigation measures between the observation points and prescribed solar installation that may obstruct the predicted glare.
- The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain.

In general, default values given by the SGHAT in this analysis reflect the worst-case scenario. As such, the actual glare created by the Project is likely to be less than that predicted by the model.

The following additional assumptions have been used for the analysis:

- Time zone for the Project was set at UTC-8 (Pacific Standard Time).
- Subtended angle of the sun of 9.8 milliradian is assumed, as recommended by the SGHAT. This is the average angle of the sun as viewed from earth as it moves throughout the course of the day.
- The time interval for the analysis was set to run at 1-minute increments.

A more detailed explanation of assumptions is included in Appendix A.

2.3.2 Project Specifications

The Project is proposed to be mounted on a single-axis tracking system with axes that are oriented to the south (180°), and an east-west tilt angle ranging from 60° to -60°. A resting angle (also called stow angle) of 60° is proposed, with panels mounted to the tracking system at a height of 7.99 feet. The glare analysis was conducted using tracking axis tilt angles of 0° and 10° to account for variations in slope within Study Area. Panels are proposed to have a smooth-textured surface. The coating on the panels is unknown at this time. To be conservative, the glare analysis was conducted, assuming no anti-reflective coating would be used.

2.3.3 Observer Parameters

The analysis was conducted for nearby occupied residences identified via aerial imagery and Google “Street View” photos (Google Earth Pro 2021). Three residences were identified in the area surrounding the Study Area. Locations and number of stories were confirmed during site visits conducted in April 2021. All residences modeled are one-story homes. The analysis was conducted using ForgeSolar’s Observation Point (OP) tool to model glare visible from single locations. A height of six feet was used to represent an observer in the window of a single-story home.

For traffic traveling on SR 24, ForgeSolar’s Route Receptor tool was used. The tool uses a multi-line representation that can simulate observers traveling along continuous paths such as roadways. Vehicles were modeled traveling in either direction along SR 24, and a height of five feet was used to represent the average height of an observer seated in a vehicle. The Route Receptor tool was also used to simulate a military aircraft traveling along VR 1350. A floor altitude of 200 feet above ground level (AGL) was used with flights traveling south-southwest. Additional detail about the receptor parameters used is included in Appendix A.

2.3.4 Desert Aire Regional Airport

Desert Aire Regional Airport (M94) is the nearest FAA-obligated airport. Although it is not located in close proximity to the Study Area, TRC also performed the glare analysis to ensure no impacts are predicted for flights landing at M94. TRC used ForgeSolar's Two-mile Flightpath tool to estimate glare predicted to be visible from flights descending to land at M94's runway. The Flightpath tool simulates aircraft following a straight-line approach toward a runway, including a restricted field-of-view to filter unrealistic glare.

M94 is located approximately nine miles north-northeast of the Study Area. According to the FAA, M94 uses one asphalt runway, Runway 10/28, which has a northwest-southeast alignment. No ATCTs are identified by the FAA at this airport. For Runway 10, specific values for glide slope and threshold-crossing height (TCH) are not provided by the FAA. Thus, default values were used for aircraft landing at this runway (FAA 2021b).

Runway parameters used in this analysis are as follows:

Runway 10

- Glide slope (Visual Glide Path): 3°
- TCH: 50 feet AGL
- Runway heading (Azimuth): 115°

Runway 28

- Glide slope (Visual Glide Path): 4°
- TCH: 45 feet AGL
- Runway heading (Azimuth): 295°

Default values for the modeled pilot's viewshed were used in the Flightpath analysis. A maximum vertical field of view from the pilot of 30° and an azimuthal (horizontal) viewing angle ranging from 50° to -50°.

2.4 Results

Using the parameters specified above, no glare is modeled to be visible at the selected observation points, traffic traveling either direction on SR 24, military training flights on VR 1350, or by flights approaching either runway at M94 (Table 2-1). Detailed results are included in Appendix A.

Table 2-1. Project Glare Study Results[a]

Receptor	Green Glare (min/yr)	Yellow Glare (min/yr)	Red Glare (min/yr)
OP1	0	0	0
OP2	0	0	0
OP3	0	0	0
SR 24	0	0	0
VR 1350	0	0	0
M94 Runway 10	0	0	0

Receptor	Green Glare (min/yr)	Yellow Glare (min/yr)	Red Glare (min/yr)
M94 Runway 28	0	0	0

[a] minutes/year = min/yr, observation point = OP

Table 2-2 below demonstrates that the parameters used in this study and lack of glare received by flights landing at M94 comply with the guidelines set forth by the FAA 2013 Interim Policy (FAA 2013). Additional detail regarding these parameters is included in Appendix A.

Table 2-2. FAA 2013 Policy Adherence.

Component	Status	Description
Analysis Parameters	PASS	Analysis time interval and eye characteristics used are acceptable.
2-mile Flight Path(s)	PASS	Flight path receptor(s) do not receive yellow glare.
ATCT(s)	N/A	No ATCT receptors designated.

In order to further ensure that no glare impacts would be expected to occur from the Project, TRC also assessed glare impacts using an additional offset angle of 10° to account for modules situated on slopes. No glare was predicted at any of the selected receptors using the additional offset angle. Results of this supplemental analysis were provided to CCR separately.

2.5 Characterization of Affected Environment

Much of the area surrounding the Study Area is currently undeveloped or used for agricultural activities, with several farm outbuildings located adjacent, and a small number of rural residences located east of the Study Area along SR 24. SR 24 runs east-west along the southern Study Area boundary and transects the southeastern corner of the Study Area. The FAA identifies one public-use airport, M94, located approximately nine miles north-northeast of the Study Area. No other public-use airports are located within 10 miles of the Study Area (FAA 2021c). In addition, the Study Area is situated just south of the Yakima Training Center, a large open-land area used for various military training exercises, including military training flights.

No existing sources of glare occur on or near the Study Area. The location of sensitive receptors, including airports, air flight routes, highways, and residences are described above.

2.6 Potential Project Impacts

Based on the results of these analyses, the Project, as currently designed is not predicted to create any potentially significant glare impacts to residences, roadways, or air traffic. This study was conducted using an intentionally conservative approach to represent the “worst-case scenario” for glare predicted. In most cases, glare predicted by this model will likely be an over-estimate of the actual glare visible by observers. However, if the Project design will change significantly, TRC recommends conducting this analysis using the revised design specifications to ensure no changes to expected impacts.

2.7 Mitigation Measures

No mitigation measures are proposed, as no glare is predicted to be visible at any of the representative receptors.

2.8 Summary of Effects and Significant Unavoidable Impacts After Mitigation

No significant unavoidable impacts from glare are expected.

2.9 References

Federal Aviation Administration (FAA). 2013 *Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports.* 78 FR 63276. Retrieved April 2021 from: https://www.federalregister.gov/documents/2013/10/23/2013-24729/interim-policy-faa-review-of-solar-energy-system-projects-on-federally-obligated-airports

FAA. 2021a. *Notice Criteria Tool.* Retrieved February 2021 from: https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp?action=showNoNoticeRequiredToolForm

FAA. 2021b. *Aeronautical Information Services – Desert Aire Rgnl, Mattawa, WA, United States.* Retrieved April 2021 from: https://nfdc.faa.gov/nfdcApps/services/ajv5/airportDisplay.jsp?airportId=M94

FAA. 2021c. *Circle Search for Airports.* Retrieved February 2021 from https://oeaaa.faa.gov/oeaaa/external/searchAction.jsp?action=showCircleSearchAirportsForm

Google Earth Pro. 2021. Aerial imagery of 46°31'55.32"N, 119°58' 19.84"W Accessed May 2021.

Ho, C.K. 2011. *Summary of Impact Analyses of Renewable Energy Technologies on Aviation and Airports, Presentation to Federal Aviation Administration, Feb.* 16. Retrieved February 2021 from: https://share-ng.sandia.gov/glare-tools/references/Overview_energy_impact_analyses_glare_thermal.pdf

Ho, C.K., and C.A. Sims. 2013. *Solar Glare Hazard Analysis Tool (SGHAT) User's Manual c 3.0.* Retrieved February 2021 from: https://www.forgesolar.com/static/docs/SGHAT3-GlareGauge_user_manual_v1.pdf

Appendix A. High Top Solar, LLC Project Solar Glare Hazard Analysis Report

FORGESOLAR GLARE ANALYSIS

Project: **High Top Solar**
Proposed utility-scale solar

Site configuration: **High Top_Config 3_10 deg**
Analysis conducted by Alan Plumeau (aplumeau@trccompanies.com) at 22:35 on 22 Jul, 2021.

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)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	N/A	No ATCT receptors designated

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

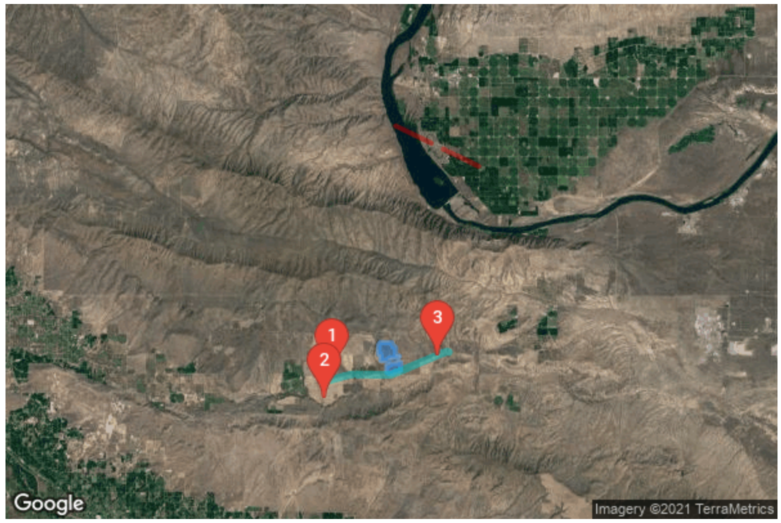
- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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

SITE CONFIGURATION

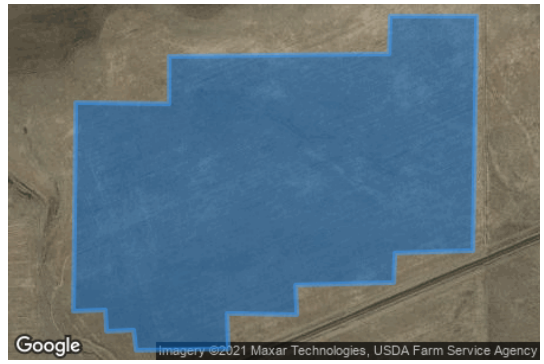
Analysis Parameters

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: 56565.9519



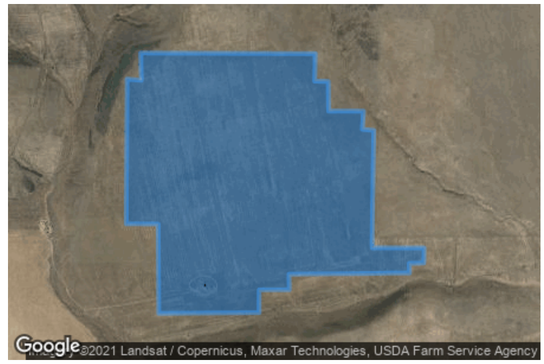
PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 10.0°
Tracking axis panel offset: 0.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Rated power: -
Panel material: Smooth glass without 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	46.520413	-119.971234	1560.69	7.99	1568.68
2	46.520442	-119.967886	1541.80	7.99	1549.79
3	46.521328	-119.967929	1557.53	7.99	1565.52
4	46.521299	-119.965397	1542.32	7.99	1550.31
5	46.522037	-119.965440	1556.99	7.99	1564.98
6	46.522096	-119.961878	1519.69	7.99	1527.68
7	46.522834	-119.961835	1525.53	7.99	1533.52
8	46.522893	-119.959003	1487.62	7.99	1495.61
9	46.528740	-119.958874	1556.60	7.99	1564.59
10	46.528740	-119.962007	1620.66	7.99	1628.65
11	46.527795	-119.962050	1597.84	7.99	1605.83
12	46.527736	-119.970032	1697.20	7.99	1705.20
13	46.526555	-119.970032	1690.65	7.99	1698.65
14	46.526584	-119.973422	1762.47	7.99	1770.47
15	46.521387	-119.973508	1580.70	7.99	1588.69
16	46.521417	-119.972350	1579.54	7.99	1587.53
17	46.520885	-119.972307	1572.04	7.99	1580.03
18	46.520915	-119.971320	1566.57	7.99	1574.56

Name: PV array 2
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 10.0°
Tracking axis panel offset: 0.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Rated power: -
Panel material: Smooth glass without 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	46.538906	-119.964225	1760.79	7.99	1768.78
2	46.534005	-119.964332	1677.06	7.99	1685.05
3	46.533479	-119.964332	1664.33	7.99	1672.32
4	46.533471	-119.960566	1623.58	7.99	1631.57
5	46.532721	-119.960582	1611.54	7.99	1619.53
6	46.532704	-119.961647	1626.05	7.99	1634.04
7	46.532224	-119.961621	1617.72	7.99	1625.71
8	46.532223	-119.963100	1631.46	7.99	1639.45
9	46.532200	-119.964525	1632.88	7.99	1640.87
10	46.532171	-119.970361	1684.65	7.99	1692.64
11	46.531389	-119.970340	1669.74	7.99	1677.73
12	46.531389	-119.972529	1686.29	7.99	1694.28
13	46.530252	-119.972529	1663.93	7.99	1671.92
14	46.530218	-119.979809	1709.05	7.99	1717.04
15	46.534661	-119.979852	1793.99	7.99	1801.98
16	46.534669	-119.982168	1810.90	7.99	1818.89
17	46.541872	-119.982104	1961.64	7.99	1969.63
18	46.541813	-119.981074	1957.28	7.99	1965.27
19	46.543171	-119.981117	1984.35	7.99	1992.34
20	46.543141	-119.968457	1883.56	7.99	1891.55
21	46.541769	-119.968500	1871.17	7.99	1879.16
22	46.541754	-119.967513	1854.68	7.99	1862.67
23	46.540278	-119.967491	1828.76	7.99	1836.75
24	46.540278	-119.964959	1772.73	7.99	1780.72
25	46.539378	-119.965045	1780.89	7.99	1788.88
26	46.539319	-119.964208	1759.83	7.99	1767.82

Flight Path Receptor(s)

Name: Runway 10
Description:
Threshold height: 50 ft
Direction: 116.0°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	46.689373	-119.926220	543.64	50.00	593.64
Two-mile	46.702047	-119.964148	488.58	658.52	1147.10

Name: Runway 28
Description:
Threshold height: 45 ft
Direction: 296.0°
Glide slope: 4.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	46.685093	-119.913404	581.05	45.00	626.05
Two-mile	46.672419	-119.875479	676.97	687.54	1364.51

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	46.520110	-120.031782	1795.07	6.00
OP 2	2	46.502617	-120.040677	1790.47	6.00
OP 3	3	46.532991	-119.919288	1380.19	6.00

Route Receptor(s)

Name: Highway 24
Path type: Two-way
Observer view angle: 50.0°

Note: Route receptors are excluded from this FAA policy review. Use the 2-mile flight path receptor to simulate flight paths according to FAA guidelines.

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	46.514562	-120.040831	1747.27	5.00	1752.27
2	46.515994	-120.032870	1748.66	5.00	1753.66
3	46.517818	-120.022935	1723.57	5.00	1728.57
4	46.519590	-120.013183	1696.37	5.00	1701.37
5	46.519782	-120.011884	1693.63	5.00	1698.63
6	46.519796	-120.011037	1691.40	5.00	1696.40
7	46.519863	-119.997840	1634.43	5.00	1639.43
8	46.519553	-119.981457	1573.24	5.00	1578.24
9	46.519582	-119.970181	1550.37	5.00	1555.37
10	46.519649	-119.969087	1544.81	5.00	1549.81
11	46.523517	-119.955494	1460.64	5.00	1465.64
12	46.526640	-119.944840	1432.26	5.00	1437.26
13	46.529430	-119.935152	1412.09	5.00	1417.09
14	46.536191	-119.911817	1354.53	5.00	1359.53
15	46.536427	-119.910658	1354.42	5.00	1359.42
16	46.536478	-119.909392	1352.50	5.00	1357.50
17	46.536323	-119.907418	1351.05	5.00	1356.05

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1	SA tracking	SA tracking	0	0	-
PV array 2	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
Runway 10	0	0
Runway 28	0	0
OP 1	0	0
OP 2	0	0
OP 3	0	0
Highway 24	0	0

Results for: PV array 1

Receptor	Green Glare (min)	Yellow Glare (min)
Runway 10	0	0
Runway 28	0	0
OP 1	0	0
OP 2	0	0
OP 3	0	0
Highway 24	0	0

Flight Path: Runway 10

0 minutes of yellow glare
0 minutes of green glare

Flight Path: Runway 28

0 minutes of yellow glare
0 minutes of green glare

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

Route: Highway 24

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2

Receptor	Green Glare (min)	Yellow Glare (min)
Runway 10	0	0
Runway 28	0	0
OP 1	0	0
OP 2	0	0
OP 3	0	0
Highway 24	0	0

Flight Path: Runway 10

0 minutes of yellow glare
0 minutes of green glare

Flight Path: Runway 28

0 minutes of yellow glare
0 minutes of green glare

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

Route: Highway 24

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.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
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.