Technical Memorandum

To: Jon Yolles, Covus Development
From: Nick Johnson, Johnson Aviation, Inc.
Date: September 6, 2022

Subject: Ramona Gateway Project - Airport Land Use Compatibility

A. Introduction and Finding

The Ramona Gateway Project (Project) is a proposed mixed-use retail and industrial development located in the City of Perris, California (City) and within the Airport Influence Area (AIA) of the March Air Reserve Base/Inland Port Airport (MARB/IPA or Airport). The Airport Land Use Compatibility Plan[1] (ALUCP) for MARB/IPA was adopted by the Riverside County Airport Land Use Commission (ALUC) in 2014. The March ALUCP provides specific airport land use guidance in addition to the ALUC's Countywide Policies[2] adopted in the 2004. The City adopted its General Plan Land Use Element in 2005 and amended it in 2016[3] to incorporate the 2014 MARB/IPA ALUCP. The City adopted the Perris Valley Commerce Center Specific Plan[4] (PVCCSP) in 2012, with the latest amendment occurring in 2022. In 2018 the March Air Reserve Base (March ARB) Air Installations Compatible Use Zones (2018 AICUZ) Study[5] was updated from the original 2005 AICUZ. The 2018 AICUZ study provides the latest aircraft noise impact information associated with aircraft operations at the Base. The City adopted Chapter 19.51, March ARB/IP Airport Overlay Zone (MAOZ)[6] within the City's Zoning Code. The MAOZ ensures that the policies in the MARB/IPA ALUCP are adhered to when new development projects are proposed, and incompatible land uses are prevented. The Federal Aviation Administration (FAA) is required under 14 Code of Federal Regulations (CFR) Part 77[7] to protect navigable airspace by studying proposed developments and issuing determinations that a project would not be a hazard to air navigation.

The Project site is within the boundaries of the PVCCSP. The existing General Plan land use designation and zoning for the Project site is Specific Plan (i.e., the PVCCSP). The Project site has a PVCCSP land use designation of Commercial (northern portion of the Project site) and Business Professional Office (BPO) (southern portion of the Project). A Specific Plan Amendment is required for the proposed industrial use portion of the Project (to change the PVCCSP land use designation from Commercial and BPO to Light Industrial). Countywide ALUC Policies, Section 1.5.1(a) and State Law require an ALUC determination of consistency with the ALUCP prior to the approval by the City.

The intended use of the Project site is compatible within the AIA, and the ALUCP Zone C1. The occupancy analysis using the ALUCP guidance indicates that the total site intensity (people per acre) is less than the allowable parameters and both average and single-acre intensity are consistent with the ALUCP Zone C1 limits. ***Therefore, the proposed Project is found to be compatible with the parameters of the General Plan, the PVCCSP, the 2014 MARB/IPA ALUCP, MOAZ and the 2018 AICUZ study.***

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[1] https://www.rcaluc.org/Portals/13/17%20-%20Vol.%201%20March%20Air%20Reserve%20Base%20Final.pdf?ver=2016-08-15-145812-700
[2] https://www.rcaluc.org/Portals/13/PDFGeneral/plan/newplan/04-%20Vol.%201%20County%20wide%20Policies.pdf
[3] https://www.cityofperris.org/home/showpublisheddocument/457/637203139714030000
[4] https://www.cityofperris.org/home/showpublisheddocument/2647/637799977032200000
[5] https://www.marchjpa.com/documents/docs_forms/AICUZ_2018.pdf
[6] https://www.cityofperris.org/Home/ShowDocument?id=1835
[7] 14 CFR Part 77 – *Safe, Efficient Use, and Preservation of the Navigable Airspace*, https://www.ecfr.gov/current/title-14/chapter-I/subchapter-E/part-77

B. Purpose and Project Description

The purpose of this Technical Memorandum is to complete an airport land use compatibility assessment for the Project that addresses aviation safety, aircraft noise impacts, aircraft overflight, and airspace protection that addresses the operational risk to people and property within the Project site. This assessment is based on a review of relevant documents, local knowledge, and publicly available information.

The Project site is approximately 50-gross-acres (49.17-net-acre) located in the western portion of the PVCCSP planning area, in the City of Perris, in Riverside County. The Project site consists of five Assessor Parcel Numbers (APNs), which includes 317-120-021; 317-130-048, -025, -021, and -017. The Project site is located south of Ramona Expressway; west of Webster Avenue; east of Nevada Avenue; and north of Val Verde Academy, Val Verde High School, and the Val Verde Regional Learning Center. The Project also includes off-site improvements along the site-adjacent roadways; the off-site improvement area encompasses approximately 11 acres. A natural gas line would also be extended off-site along Ramona Expressway between Webster Avenue and Brennan Avenue. The Project site is located approximately 600 feet east of Interstate (I)-215 and approximately 6.7 miles south of State Route (SR)-60.

The Project site is also located approximately 1.2 miles south of the MARB/IPA, is within the AIA, and is within the City's AOZ. MARB/IPA consists of two runways. The primary runway (Runway 14-32) is 13,300 feet in length and is jointly use for both military and civilian use. The second smaller runway, Runway 12-30, is just over 3,000 feet in length and its use is restricted to military-related light aircraft. Figure 1 shows the Property (outlined in red) in relation to the Airport.

Figure 1 - Project Site Relative to MARB/IPA

The Ramona Gateway Project proposes a mixed-use retail and industrial development in the western portion of the City of Perris, near existing transportation facilities and truck routes.

The Project site is proposed to have eight retail buildings (totaling 37,215 square feet [sf]) on 6.95 net acres within the northern portion of the Project site, and a 950,224-sf industrial warehouse building on

42.22 net acres within the southern portion of the Project site. Retail and industrial space details are shown in Tables 1 and 2.

The conceptual site plan (Figure 2) includes 37,215 sf of retail space consisting of three drive-thru restaurant buildings; two multi-tenant buildings, one of which would include a drive-thru; one coffee shop with drive-thru; one convenience store with a gas station; and one drive-thru express carwash facility (Table 1).

Table 1 – Project Retail Space Detail

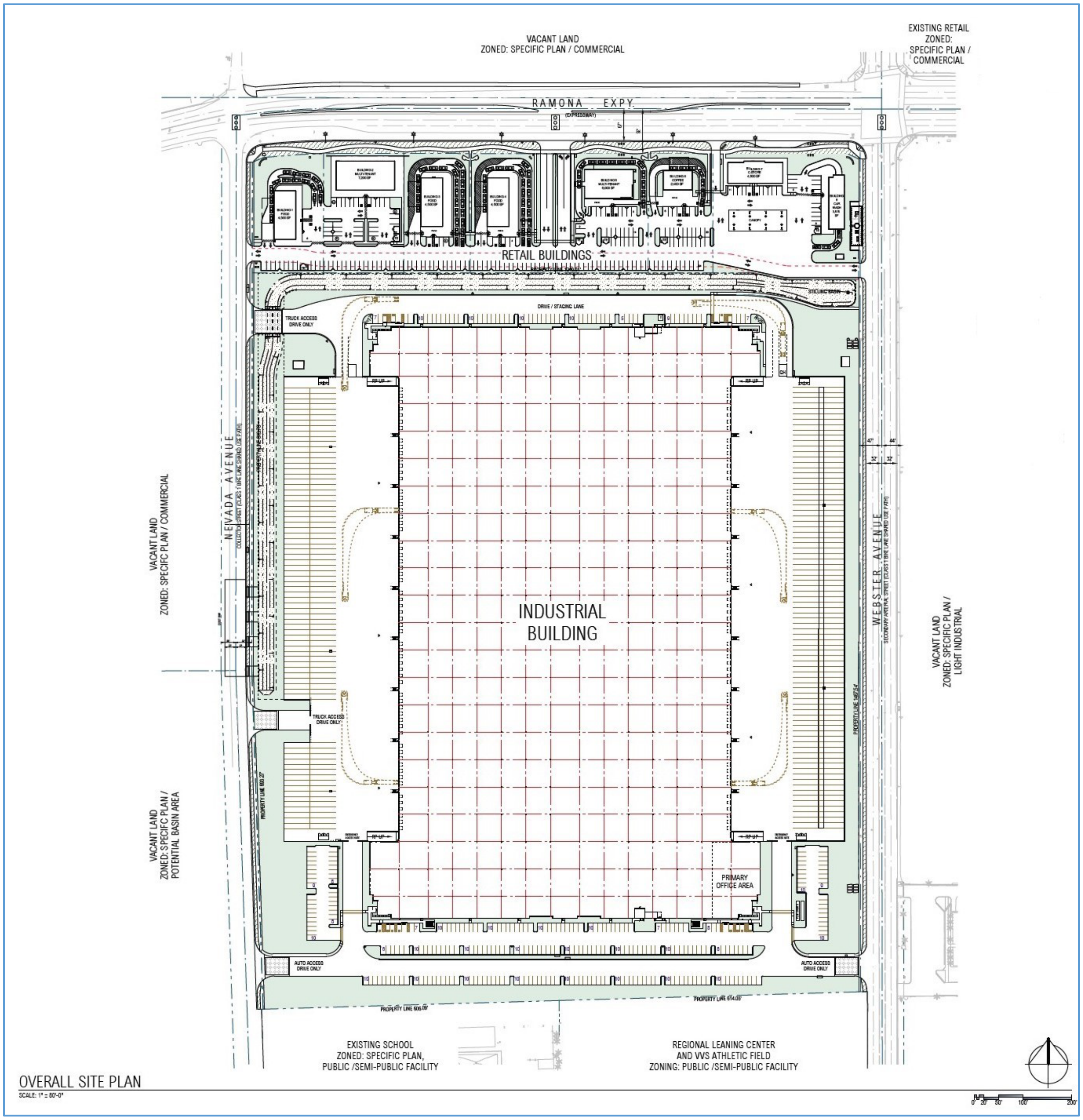
Building No.	Proposed Use	Area (sf)	Floor Area Ratio (FAR)	Lot Coverage (%)
Building 1	Drive-thru Restaurant	4,500	0.11	11.28
Building 2	Multi-Tenant	7,200		
Building 3	Drive-thru Restaurant	4,500		
Building 4	Drive-thru Restaurant	4,500		
Building 5	Multi-Tenant with drive-thru	6,000		
Building 6	Drive-thru Coffee	2,400		
Building 7	Convenience Store and Gas Station	4,600		
Building 8	Car Wash	3,515		
	Total Building Area	***37,215***		

The industrial component of the Project involves the construction and operation of a Class A high-cube warehouse building on approximately 42.2 net acres in the southern portion of the Project site. It is assumed that 95% of the building square footage would be operated as a high-cube non-sort fulfillment center warehouse and the remaining 5% would be operated as a high-cube cold storage warehouse. This industrial component may include up to 20,000 sf of ancillary office space.

Table 2 – Project Industrial Space Detail

Space Type	Area (sf)	FAR	Lot Coverage (%)
Building Footprint (ground level)	850,224	0.52	46.5
Mezzanine	100,000		
Total Building Area	***950,224***		

Figure 2 – Site Plan

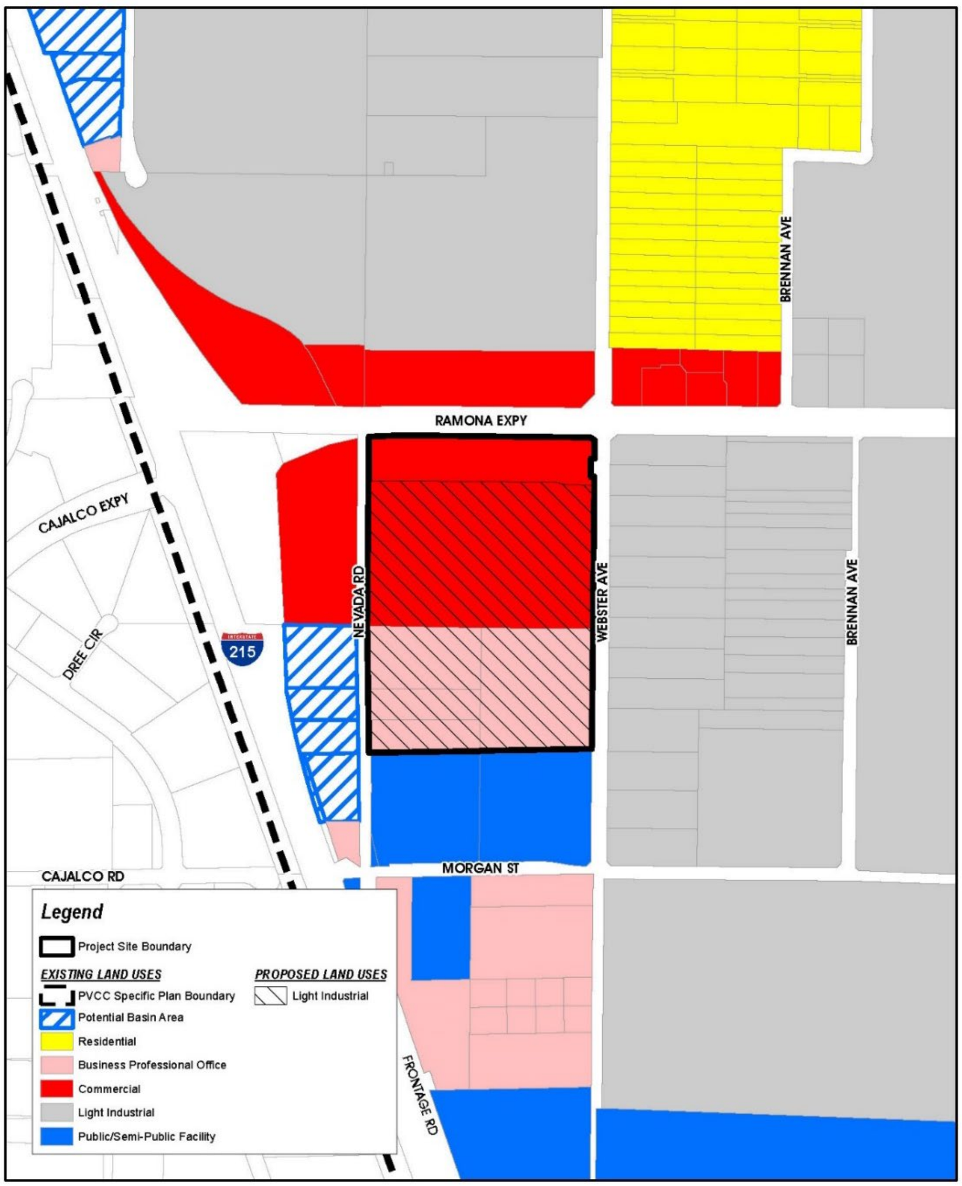


C. Land Use Jurisdiction and Compatibility

On January 10, 2012, the City of Perris City Council adopted the PVCCSP. The PVCCSP land uses allow for the development of approximately 3,500 acres which consist of industrial, commercial, and office uses, as well as public facilities.

The Project site is within the boundaries of the PVCCSP. The existing General Plan land use designation and zoning for the Project site is Specific Plan (i.e., the PVCCSP). The Project site has a PVCCSP land use designation of Commercial (northern portion of the Project site) and Business Professional Office (BPO) (southern portion of the Project). A Specific Plan Amendment is required for the proposed industrial use as shown in Figure 3.

Figure 3 – PVCCSP Existing and Proposed Land Use Designations



The PVCCSP and the Project site are within the City's AOZ, as shown on Figure 4. The City's General Plan Land Use Element and subsequently the PVCCSP incorporate the AOZ to ensure that the policies in the MARB/IPA ALUCP are adhered to when new development projects are proposed, and incompatible land uses are prevented. The MARB/IPA ALUCP was adopted in 2014 and is based on the U.S. Air Force's Air Installation Compatibility Use Zones Study for March Air Reserve Base (AICUZ) dated August 2005. The AICUZ was updated in 2018 because of the introduction of new aircraft, operational changes, and new flight tracks. This update provides new noise contours and information on accident potential. It does not change the dimensions of the clear zones or accident potential zones that are the basis for the ALUCP's compatibility zones used to evaluate land use compatibility.

The ALUCP is used to evaluate land use compatibility and development proposals in the vicinity of the Airport. The primary compatibility concerns are aircraft noise, the safety of people and property on the ground and in aircraft, the protection of airspace, and concerns related to overflights. The development restrictions associated with each zone consider the compatibility concerns of noise, safety, overflight, and airspace protection.

Specifically, the Project site is within Compatibility Zone C1. Zone C1 is the Primary Approach/ Departure Zone. Zone C1 is within or near the 60-CNEL contour. Accident potential risks are moderate in that aircraft fly at low altitudes over or near the zone. Single-event noise levels are potentially disruptive in this zone. Table 3 and 4 summarize the noise, safety, and land use compatibility criteria in the ALUCP for Zone C1.

Figure 4 – PVCCSP Boundary, Project Site, and MARB/IP Safety Zones

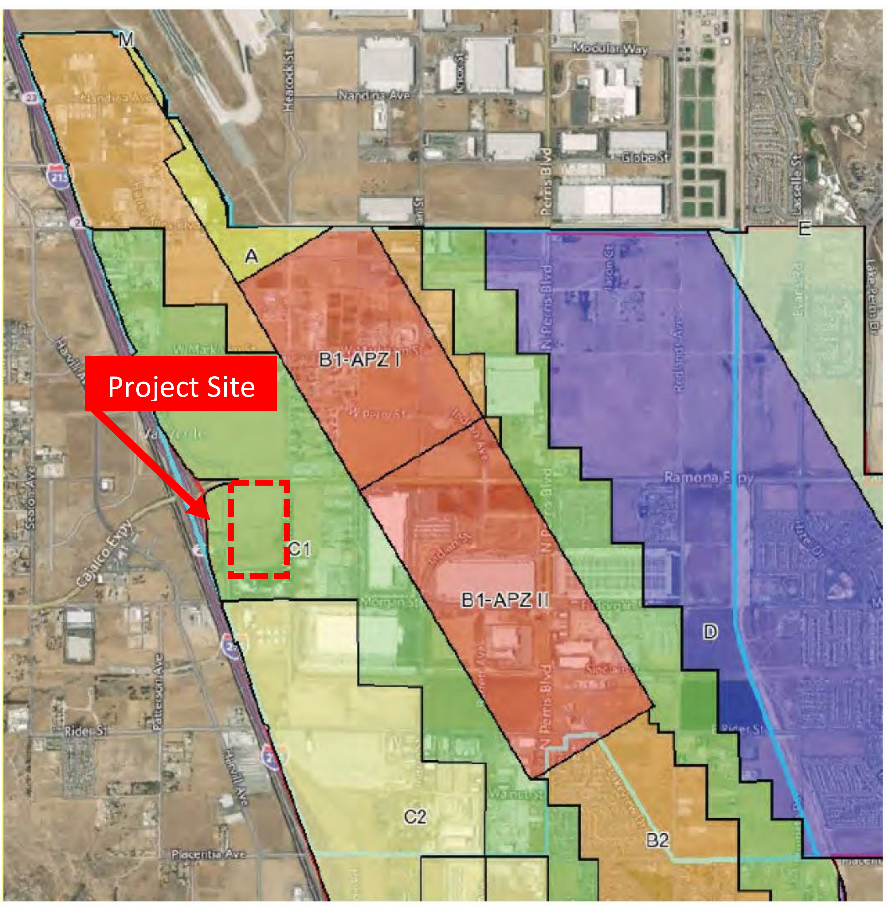


Table 3 – ALUCP Noise and Safety in C1

Zone	Noise and Overflight Factors	Safety and Airspace Protection Factors
C1 *Primary Approach/ Departure Zone*	*Noise Impact: Moderate to High* ▸ Within or near 60-CNEL contour ▸ Single-event noise may be disruptive to noise-sensitive land use activities; aircraft <2,000 feet above runway elevation on arrival and generally <3,000 feet above runway elevation on departure	*Risk Level: Moderate* ▸ Beneath or adjacent to low altitude overflight corridors

Table 4 – ALUCP Land Use Compatibility Zone C1

Zone	Locations	Density / Intensity Standards				Additional Criteria	
		Residential (d.u./ac) [1]	Other Uses (people/ac) [2]		Req'd Open Land	Prohibited Uses [3]	Other Development Conditions [4]
			Average [5]	Single Acre [6]			
C1	Primary Approach/ Departure Zone	≤3.0	100	250	No Req't	▸ Children's schools, day care centers, libraries ▸ Hospitals, congregate care facilities, places of assembly ▸ Noise-sensitive outdoor nonresidential uses [15] ▸ Hazards to flight [8]	▸ Critical community infrastructure facilities discouraged [16, 20] ▸ Aboveground bulk storage of hazardous materials discouraged [14, 20] ▸ Sound attenuation as necessary to meet interior noise level criteria [18] ▸ Airspace review req'd for objects >70 ft. tall [19] ▸ Electromagnetic radiation notification [9] ▸ Deed notice and disclosure [4]

With regards to the maximum density for "other uses" in Zone C1, the ALUCP allows an average intensity (people per acre) of 100. This means the total number of people permitted on a project site at any time, except rare special events, must not exceed the indicated usage intensity times the gross acreage of the site. The ALUCP allows a single acre intensity of 250. Clustering of nonresidential development is permitted; however no single acre of a project site shall exceed the indicated number of people per acre. Special risk-reduction building design measures are not applicable to MARB/IPA.

Prohibited noise-sensitive outdoor nonresidential uses in Zone C1 include major spectator-oriented sports stadiums, amphitheaters, concert halls and drive-in theaters. Prohibited hazards to flight in Zone C1 include physical, visual, and electronic forms of interference to aircraft operations, land uses that attract birds, and certain farming activities. In Zone C1, aboveground storage of more than 6,000 gallons of hazardous or flammable materials per tank is discouraged. Office space must have sound attenuation features sufficient to reduce the exterior aviation-related noise level to no more than CNEL 45 dB.

The Ramona Gateway Project proposes a mixed-use retail and industrial development in the western portion of the City of Perris, near existing transportation facilities and truck routes. The Project site is proposed to have eight retail buildings on 7.55 gross acres within the northern portion of the Project site, and a high-cube warehouse building on 42.42 gross acres within the southern portion of the Project site. A mixed-use retail and industrial development is considered compatible within Zone C1.

D. Maximum Occupancy

The intended use of the Property is a mix of retail and industrial. The Project site is proposed to have eight retail buildings (totaling 37,215 square feet [sf]) on 6.95 net acres (7.55 gross acres) within the northern portion of the Project site, and a 950,224-sf industrial warehouse building on 42.22 net acres (42.42 gross acres) within the southern portion of the Project site.

The retail space consists of three drive-thru restaurant buildings; two multi-tenant buildings, one of which would include a drive-thru; one coffee shop with drive-thru; one convenience store with a gas station; and one drive-thru express carwash facility.

The industrial component of the Project involves the construction and operation of a Class A high-cube warehouse building. It is assumed that 95% of the building square footage would be operated as a high-cube non-sort fulfillment center warehouse and the remaining 5% would be operated as a high-cube cold storage warehouse. The Project proposes including 20,000 sf of ancillary office space.

The MARB/IPA ALUCP provides methods for determining concentrations of people using either the number of parking spaces provided or the California Building Code. The following tables provide the occupancy levels for this Project.

Table 5 – Industrial Project Occupancy

Industrial Building Occupancy

Industrial Building (Zone C1)	Land Use	Building Size (sqft)	Site Area (gross acreage)	Occupancy Rate (sqft/occupant)	Maximum on Site Permitted (people)	Maximum on Site (people) with High-Cube Adjustment	ALUCP Average Intensity (people/acre)	Occupancy (average people/acre)
1	High-Cube Warehouse Ground Level	840,224		500		588		**13.87**
	High-Cube Warehouse Ground Floor - Office	10,000		100		50		**1.18**
1	High-Cube Warehouse Mezzanine	90,000		500		63		**1.49**
1	High-Cube Warehouse Mezzanine - Office	10,000		100		50		**1.18**
	Industrial TOTAL	***950,224***	***42.42***		***4,242***	***751***	***100***	**17.71**

1 - Occupancy rates, adjustments, and intensity standards as per the MARB/IPA ALUCP and County of Riverside ALUC. High-cube warehouses and distribution centers greater than 200,000 square feet shall be evaluated on the basis of 35% of the usage intensity. Office space in these industrial buildings shall be evaluated on the basis of 50% of the usage intensity from the CBC.

Table 6 – Retail Building Detail Occupancy

Retail Building Detail Occupancy				
Retail Buildings (Zone C1)	Land Use	Building Size (sqft) or Spaces	Occupancy Rate (sqft/occupant or space per occupant)	Maximum on Site (people)
1	Drive-thru Restaurant (dine-in area)	2,250	60	38
	Kitchen Area	2,250	200	11
	Stacking Spaces	16	1.5	24
	Seats for Outdoor Dining	40	1	40
				113
2	Multi-Tenant	7,200	115	**63**
3	Drive-thru Restaurant (dine-in area)	2,250	60	38
	Kitchen Area	2,250	200	11
	Stacking Spaces	24	1.5	36
	Seats for Outdoor Dining	40	1	40
				125
4	Drive-thru Restaurant (dine-in area)	2,250	60	38
	Kitchen Area	2,250	200	11
	Stacking Spaces	24	1.5	36
	Seats for Outdoor Dining	40	1	40
				125
5	Multi-Tenant	3,000	115	26
	Drive-thru Restaurant (dine-in area)	1,500	60	25
	Kitchen Area	1,500	200	8
	Stacking Spaces	13	1.5	20
	Seats for Outdoor Dining	20	1	20
				98
6	Drive-thru Coffee (dine-in)	1,200	60	20
	Kitchen Area	1,200	200	6
	Stacking Spaces	7	1.5	11
	Seats for Outdoor Dining	20	1	20
				57
7	Convenience Store	4,600	115	40
	Gas station pumps	8	1.5	12
				52
8	Car Wash	3,515	115	31

1 - Occupancy rates, adjustments, and intensity standards as per the MARB/IPA ALUCP and County of Riverside ALUC

Table 7 – Retail Building Total Occupancy

	Building Size (sqft)	Site Area (gross acreage)	ALUCP Single Acre Intensity (people/acre)	Maximum Single Acre Intensity (people/acre)	Maximum on Site Permitted (people)	Maximum on Site (people)	ALUCP Average Intensity (people/acre)	Occupancy (average people/acre)
RETAIL TOTAL	***37,215***	***7.55***	***250***	***250***	***755***	***662***	***100***	**87.68**

1 - Occupancy rates, adjustments, and intensity standards as per the MARB/IPA ALUCP and County of Riverside ALUC

For both the industrial portion of the Project and retail portion of the Project, the total site intensity falls within the allowable parameters.

As shown in Table 6, Buildings #3 and #4 each have the most people on site (125) and the area of these two buildings is approximately one acre. This means that this is the most intense acre and has 250 people maximum on site. The maximum single-acre intensity and average people per acre are also within the allowable parameters of the ALUCP.

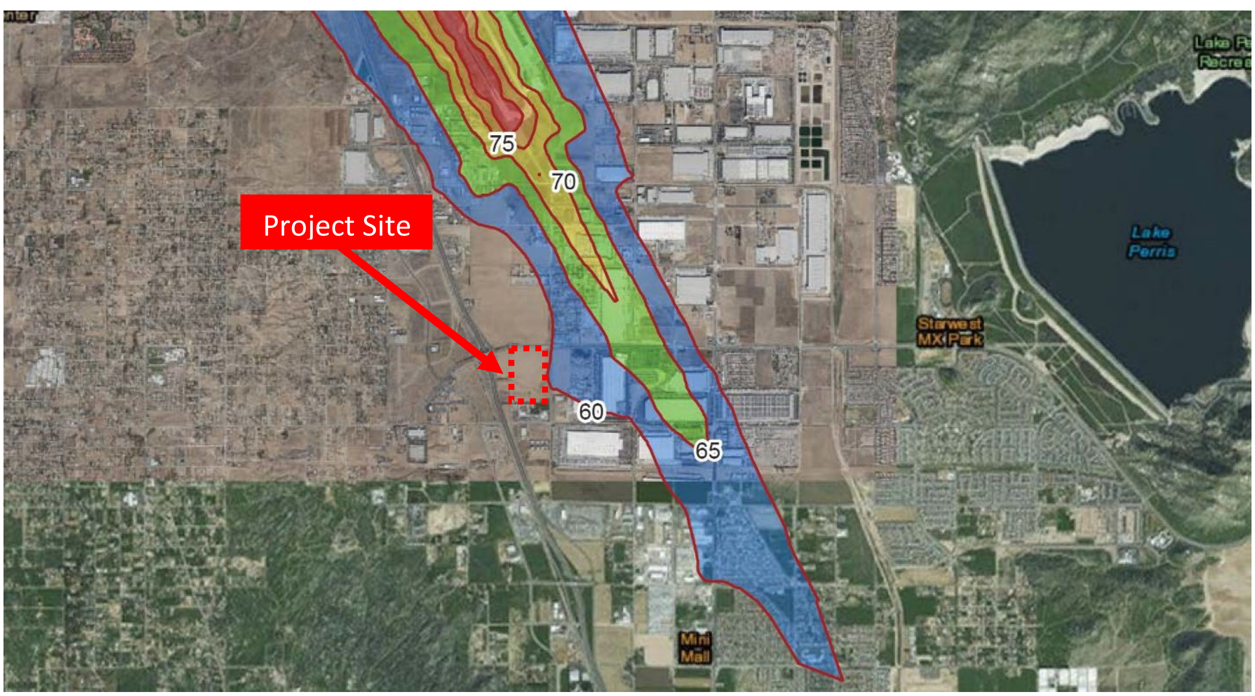
E. Aircraft Noise Impacts

Federal and state regulations set 65 decibels (dB) as the normally acceptable limit for aircraft noise, especially in urban areas. The AICUZ updated in 2018 provides the most recent noise contours for MARP/IPA. As shown in Figure 5, the Property is outside the 60 dB community noise equivalent level (CNEL) contour. This indicates that there are no anticipated significant noise impacts to the Property, especially since the Property will be used for retail and industrial purposes.

Current and projected nighttime activity by large aircraft at MARB/IPA may warrant consideration for a greater degree of sound attenuation for the interiors of buildings because single-event noise levels from aircraft operations can be particularly intrusive at night. The maximum aircraft-related, interior noise level considered acceptable for office uses is CNEL 45 dB. An acoustical study is required for any development proposed to be situated where the aviation-related noise exposure is more than 20 dB above the interior standard. This Project does not require an acoustical study.

The noise contours presented in the updated 2018 AICUZ (Figure 5) are based on total annual aircraft operations of 21,000 as noted in the noise contour assumptions of the 2018 AICUZ.

Figure 5 – 2018 MARB/IP AICUZ Noise Contours

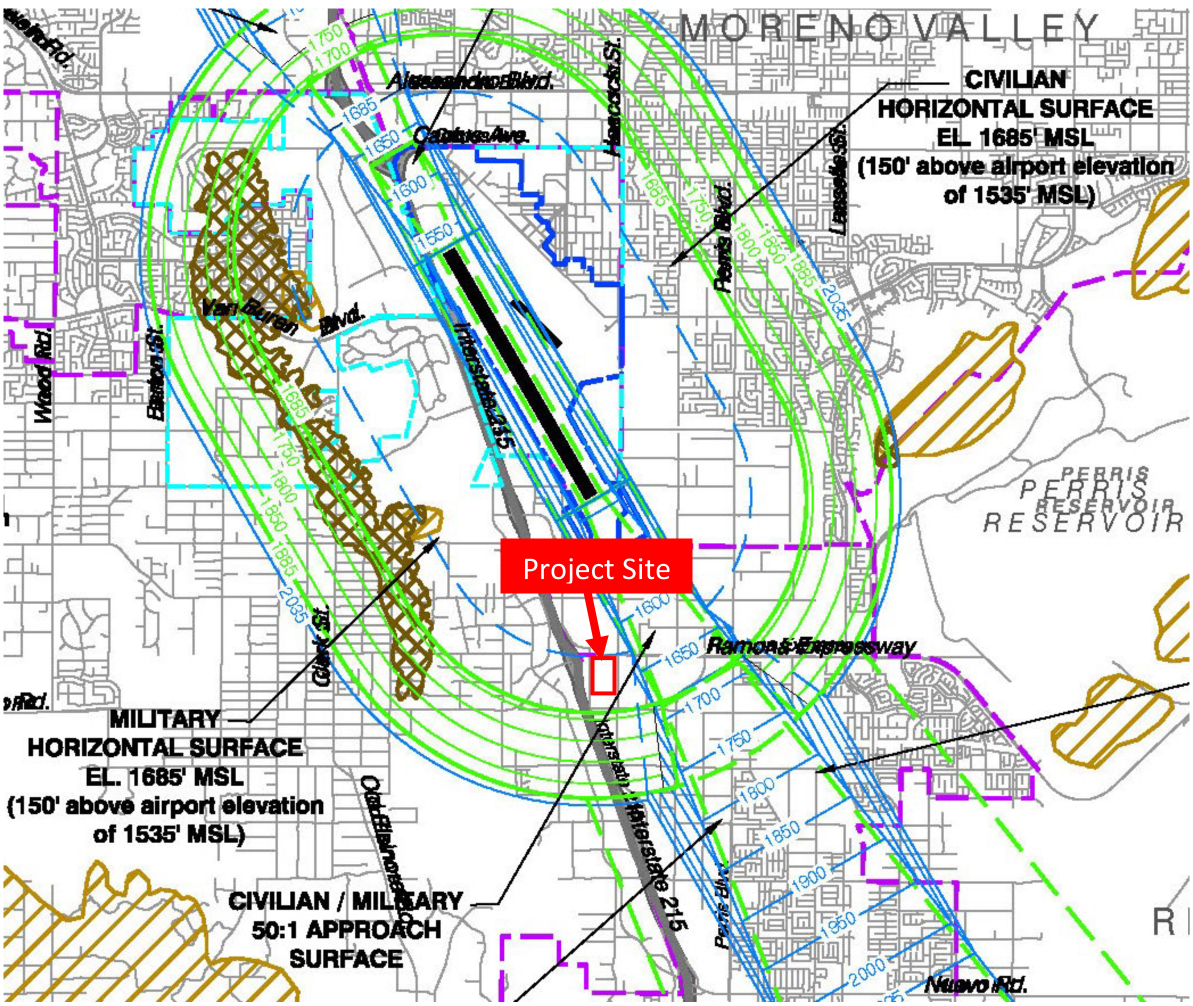


F. Airspace Protection/Height Zoning/Hazards to Air Navigation

The FAA is responsible for protecting and preserving airspace from hazards to air navigation. Title 14 of the United States Code of Federal Regulations Part 77 defines the regulations and process for providing these protections. 14 CFR § 77.19 establishes civil airport imaginary surfaces around each runway to ensure that proposed temporary and permanent structures and activities near airports will be studied by the FAA for their effects on the safe and efficient use of navigable airspace. Specifically, the Project site is below the Horizontal Surface, as shown in Figure 6.

The building height above finish floor elevation for the industrial warehouse is 48 feet; for the retail buildings it is a maximum of 26 feet. The ALUCP states that Airspace review is required for objects greater than 70 feet tall, however, that is considered general guidance. An Aeronautical Study by the FAA was initiated for the buildings associated with the Property. The study assessed the building locations, planned heights and whether there is a need for any associated lighting or markings to ensure that the buildings are conspicuous at night and during low visibility weather conditions. The FAA's Aeronautical Study made a "Determination of No Hazard to Air Navigation" for the proposed buildings on the Property (Appendix A).

Figure 6 – ALUCP Part 77 Surfaces



The Project proposes a potential solar PV installation on a portion of the roof of the industrial building. The potential solar PV installation would be located on the southerly portion of the industrial building roof in a total site area on the roof of the building of approximately 550,000 square feet. A Solar Glare Analysis was performed for the Project (Appendix B). The findings of the Solar Glare Analysis are that the Project **PASSES** the FAA's recommended solar glare tests and **PASSES** these same tests for four critical flight paths required by the March Air Reserve Base.

A deed notice and disclosure are required within Zone C1 as a condition of residential development, which does not apply to this Project. Hazards to flight are prohibited in Zone C1; this includes physical, visual, and electronic forms of interference to aircraft operations, land uses that attract birds, and certain farming activities. In Zone C1, aboveground storage of more than 6,000 gallons of hazardous or flammable materials per tank is discouraged.

G. Aircraft Overflight

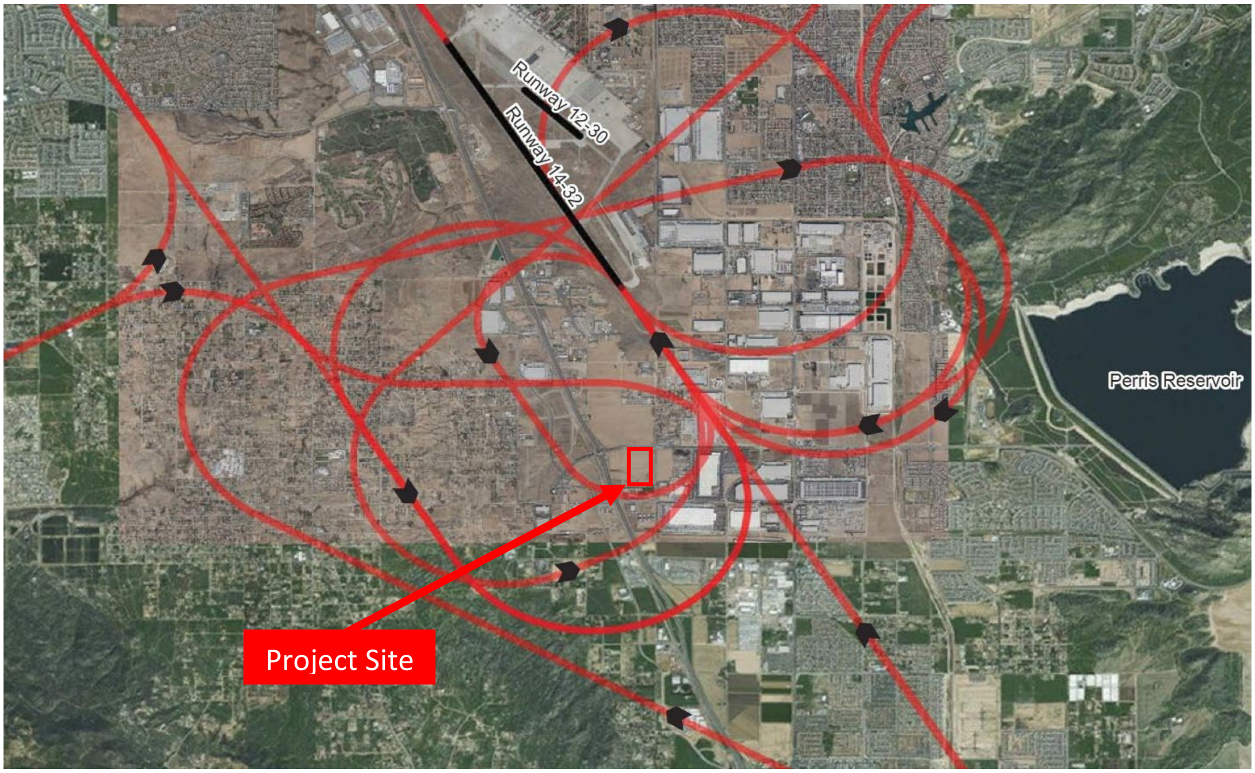
March Air Reserve Base supports both military and civilian aircraft operations. Through the Base Realignment and Closure Commission (BRAC) the Airport's role evolved from supporting various war efforts to supporting joint use military missions along with air cargo and general aviation.

The Airport's primary runway (Runway 14-32), which is oriented north-northwest/south-southeast, is 13,300 feet in length, making it one of the longest in the state of California. The length, width, and pavement strength of Runway 14-32 enables the accommodation of nearly any type of military or civilian aircraft. The length of Runway 12-30 (the secondary runway) was reduced to just over 3,000 feet and its use is restricted to light military aircraft (helicopters and Aero Club airplanes). Civilian use of Runway 12-30 is not permitted.

MARB/IPA is bordered by the City of Riverside to the northwest, the City of Moreno Valley to the northeast, the City of Perris to the south, and the County of Riverside to the west. The land uses in the vicinity of March ARB/IPA are generally compatible with base operations.

Compared to the years when March operated as an Air Force Base, aircraft activity levels are substantially lower, however, all property within the airport influence area (AIA) is subject to routine aircraft overflight. As shown in Figure 7, the Project site is located within the closed-circuit traffic pattern envelope, which means large aircraft overflights can be expected. Significant noise issues to the Property are not expected as per the noise contours presented in Figure 5 and based on the use of the Property for retail and industrial purposes.

Figure 7 – MARB/IPA 2018 AICUZ Overflight



H. Findings

The following airport land use compatibility findings for the Project are provided for consideration during the environmental review and discretionary permitting processes.

Findings of Fact

- The Ramona Gateway Project proposes the development of a mixed-use retail and industrial development.
- The Project site is within the boundaries of the PVCCSP.
- The Project site has a PVCCSP land use designation of Commercial and Business Professional Office. A Specific Plan Amendment is required for the proposed industrial use.
- The PVCCSP and the Project site are within the City's AOZ. The AOZ ensures that the policies in the MARB/IPA ALUCP are adhered to when new development projects are proposed, and incompatible land uses are prevented.
- The Project site is within ALUCP Compatibility Zone C1. Zone C1 is the Primary Approach/Departure Zone. Accident potential risks are moderate in Zone C1 in that aircraft fly at low altitudes over or near the zone. A mixed-use retail and industrial development is generally compatible with the allowable uses in Zone C1.
- The total site intensity falls within the allowable parameters of the ALUCP; the maximum single-acre intensity and average people per acre are also within the allowable parameters of the ALUCP.

- The Project is outside of the 2018 AICUZ 60 dB CNEL noise contour. This indicates that there are no anticipated significant aircraft noise impacts to the Property, especially since the Property will be used for retail and industrial purposes.
- The proposed buildings are less than 70 feet in height and outside of the 14 CFR Part 77 surface areas for March ARB. The FAA's Aeronautical Study made a "Determination of No Hazard to Air Navigation" for the proposed buildings on the Property (Appendix A).
- The Project proposes a potential solar PV installation on a portion of the roof of the industrial building. A Solar Glare Analysis was performed for the Project (Appendix B). The findings of the Solar Glare Analysis are that the Project **PASSES** the FAA's recommended solar glare tests and **PASSES** these same tests for four critical flight paths required by the March Air Reserve Base.
- The Project site is located under the traffic pattern area for March ARB and would therefore experience regular overflight by large aircraft at low altitudes maneuvering for landing and turning after takeoff.
- A deed notice and disclosure is not required for the proposed commercial and industrial land uses of the Project within ALUCP Zone C1.

Appendix A – FAA Determinations of No Hazard

Client PERRIS LANDCO LLC
Project Address Ramona Ave/Webster, Perris, CA
Airport Influence Area March Air Reserve Base
Distance From Runway 7,550

Structure Data for FAA Form 7460-1

Structure Name	(a) Finish Floor Elevation (AMSL)	(b) Building Height above Finish Floor Elevation (Feet)	(c) Top of Building Elevation (AMSL) (a + b = c)	**(d) Existing Site Elevation (AMSL) (Survey)**	**(e) Structure Height (Feet) (c - d = e) (rounded up)**	FAA Case Number
RGCC I-1	1489.10	48	1,537.10	**1491**	**47.00**	**2022-AWP-12523-OE**
RGCC I-2	1489.10	48	1,537.10	**1483**	**55.00**	**2022-AWP-12524-OE**
RGCC I-3	1489.10	48	1,537.10	**1486**	**52.00**	**2022-AWP-12525-OE**
RGCC I-4	1489.10	48	1,537.10	**1491**	**47.00**	**2022-AWP-12526-OE**

Notes:

(AMSL)	Above mean sea level
Structure Name	Added for FAA 7460-1 Case Identification
(a) Finish Floor Elevation (AMSL)	From building floor plan
(b) Building Height above Finish Floor Elevation (Feet)	From building floor plan
(c) Top of Building Elevation (AMSL)	From building elevations
(d) Existing Site Elevation (AMSL)	**For FAA 7460-1 Application - From grading plan**
(e) Structure Height (Feet)	**For FAA 7460-1 Application - calculated**

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2022-AWP-12523-OE

Issued Date: 08/03/2022

Jon Yolles
PERRIS LANDCO LLC
201 Spear Street
#1100
San Francisco, CA 94105

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Building RGCC I-1
Location:	Perris, CA
Latitude:	33-50-35.96N NAD 83
Longitude:	117-14-50.27W
Heights:	1491 feet site elevation (SE) 47 feet above ground level (AGL) 1538 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

The structure considered under this study lies in proximity to an airport and occupants may be subjected to noise from aircraft operating to and from the airport.

This determination expires on 02/03/2024 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

(c) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

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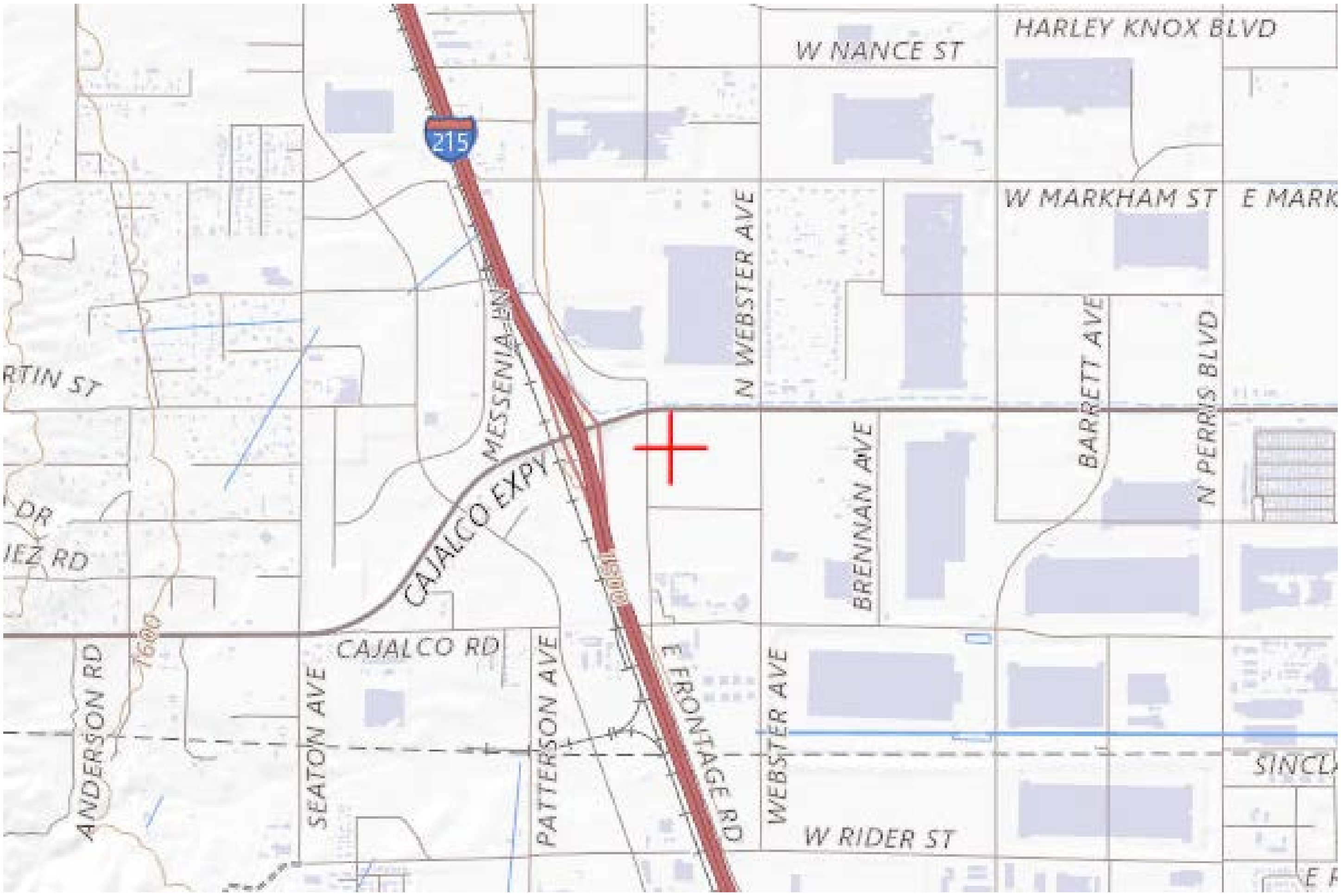
If we can be of further assistance, please contact our office at (847) 294-7575, or vivian.vilaro@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2022-AWP-12523-OE.

Signature Control No: 537974892-546524521 (DNE)
Vivian Vilaro
Specialist

Attachment(s)
Map(s)

TOPO Map for ASN 2022-AWP-12523-OE



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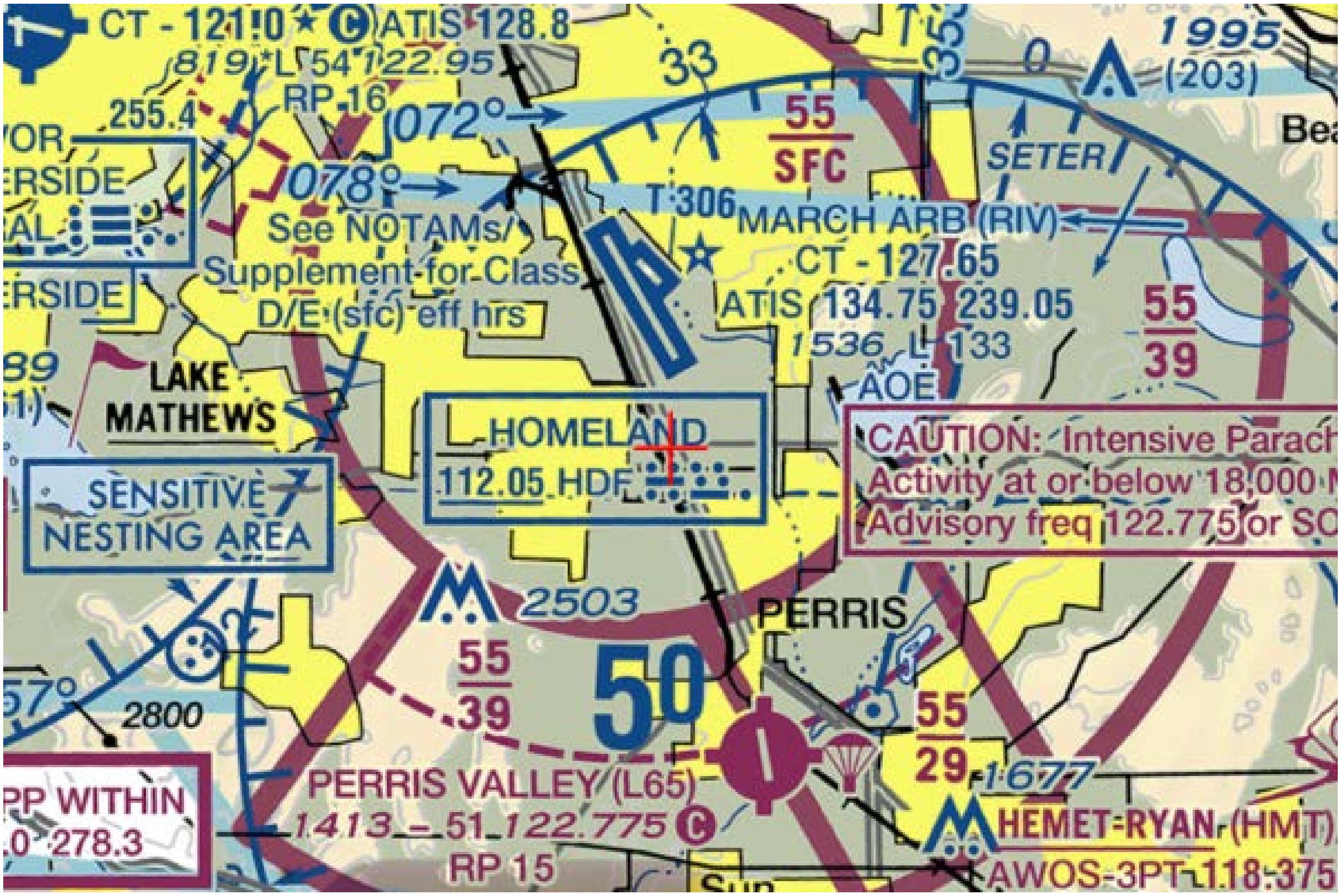

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10101 Hillwood Parkway
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Aeronautical Study No.
2022-AWP-12524-OE

Issued Date: 08/03/2022

Jon Yolles
PERRIS LANDCO LLC
201 Spear Street
#1100
San Francisco, CA 94105

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Building RGCC I-2
Location:	Perris, CA
Latitude:	33-50-35.96N NAD 83
Longitude:	117-14-40.93W
Heights:	1483 feet site elevation (SE)
	55 feet above ground level (AGL)
	1538 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

The structure considered under this study lies in proximity to an airport and occupants may be subjected to noise from aircraft operating to and from the airport.

This determination expires on 02/03/2024 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
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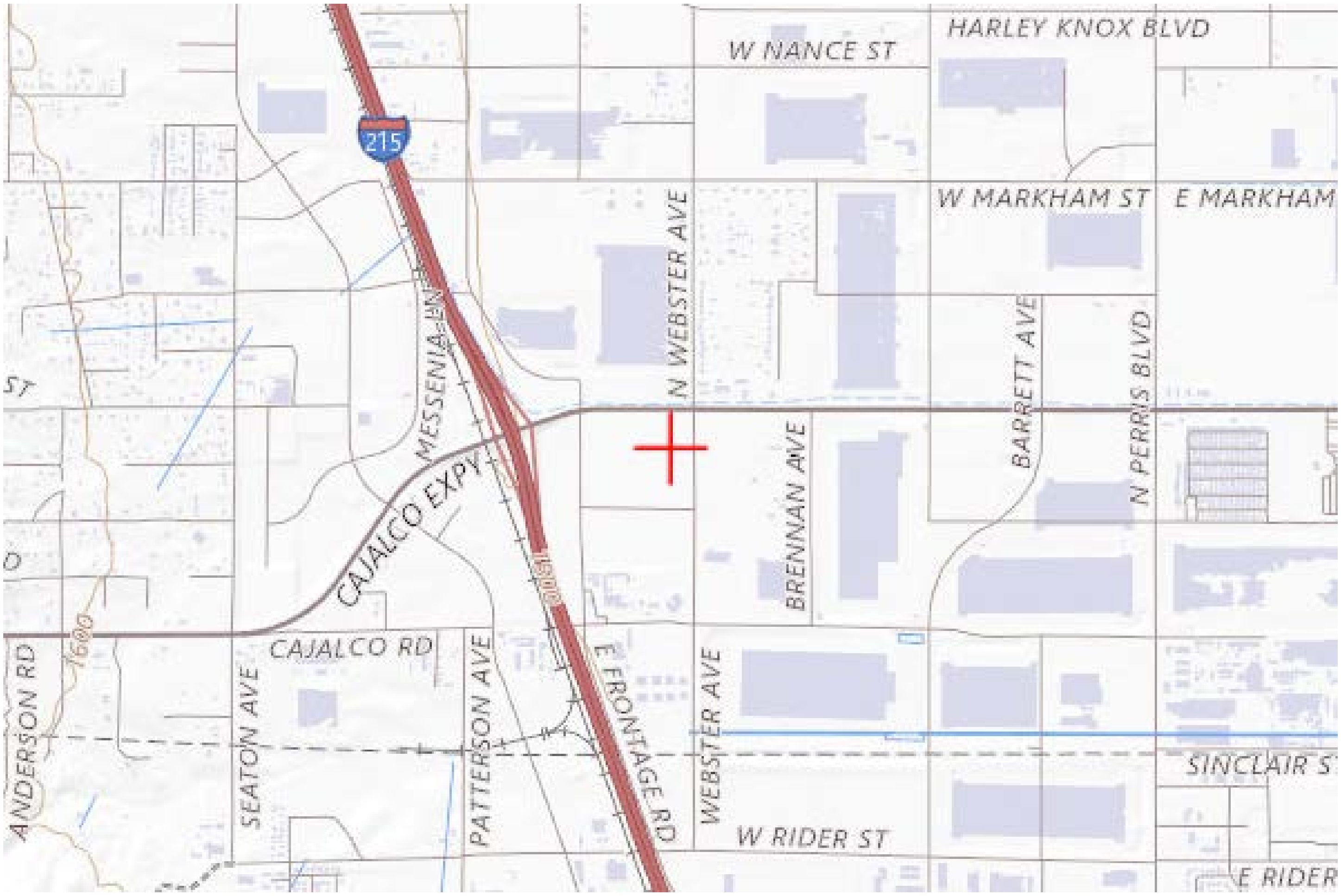
If we can be of further assistance, please contact our office at (847) 294-7575, or vivian.vilaro@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2022-AWP-12524-OE.

Signature Control No: 537974893-546524523 (DNE)

Vivian Vilaro
Specialist

Attachment(s)
Map(s)

TOPO Map for ASN 2022-AWP-12524-OE



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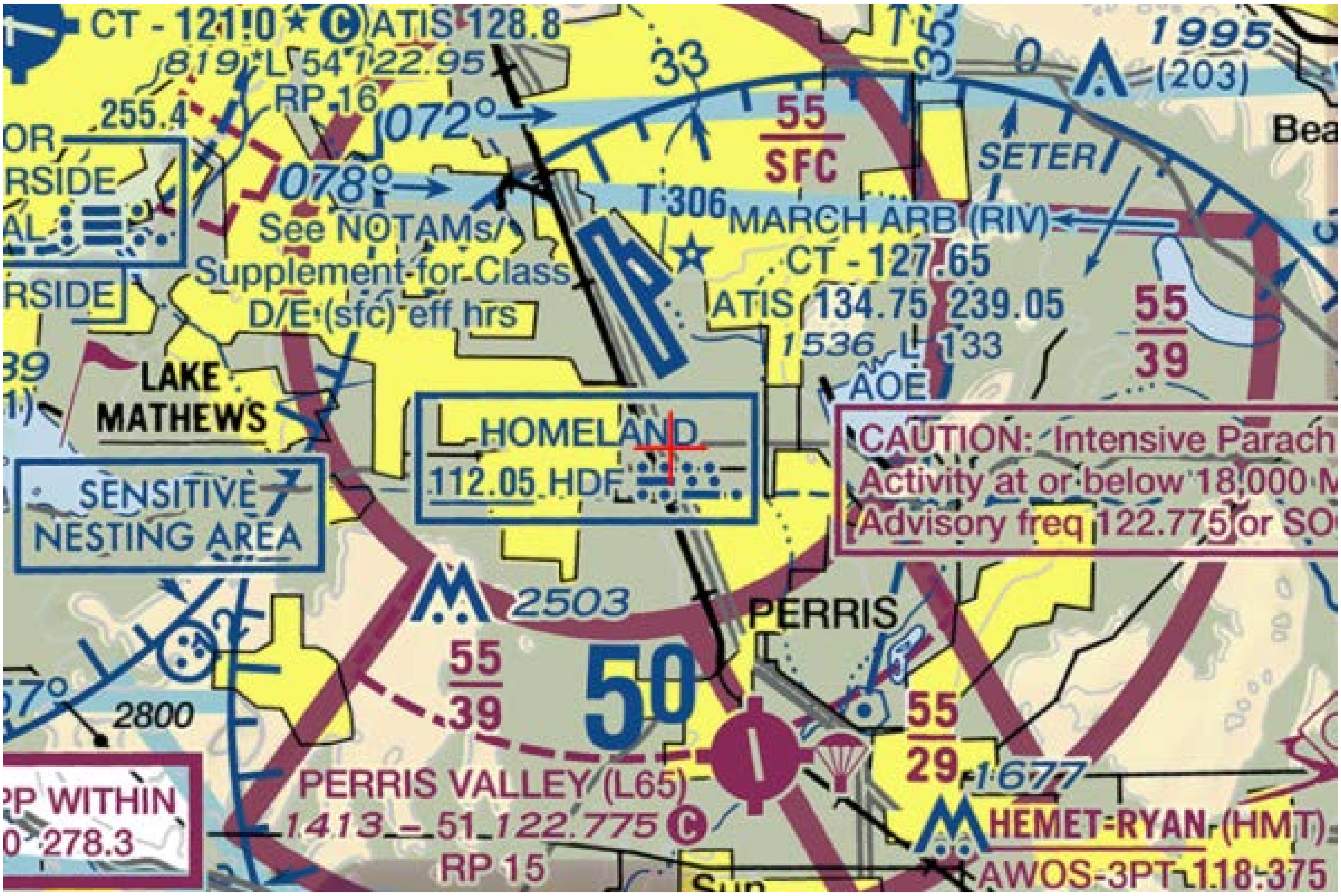

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Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2022-AWP-12525-OE

Issued Date: 08/03/2022

Jon Yolles
PERRIS LANDCO LLC
201 Spear Street
#1100
San Francisco, CA 94105

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Building RGCC I-3
Location:	Perris, CA
Latitude:	33-50-24.07N NAD 83
Longitude:	117-14-40.93W
Heights:	1486 feet site elevation (SE)
	52 feet above ground level (AGL)
	1538 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

The structure considered under this study lies in proximity to an airport and occupants may be subjected to noise from aircraft operating to and from the airport.

This determination expires on 02/03/2024 unless:

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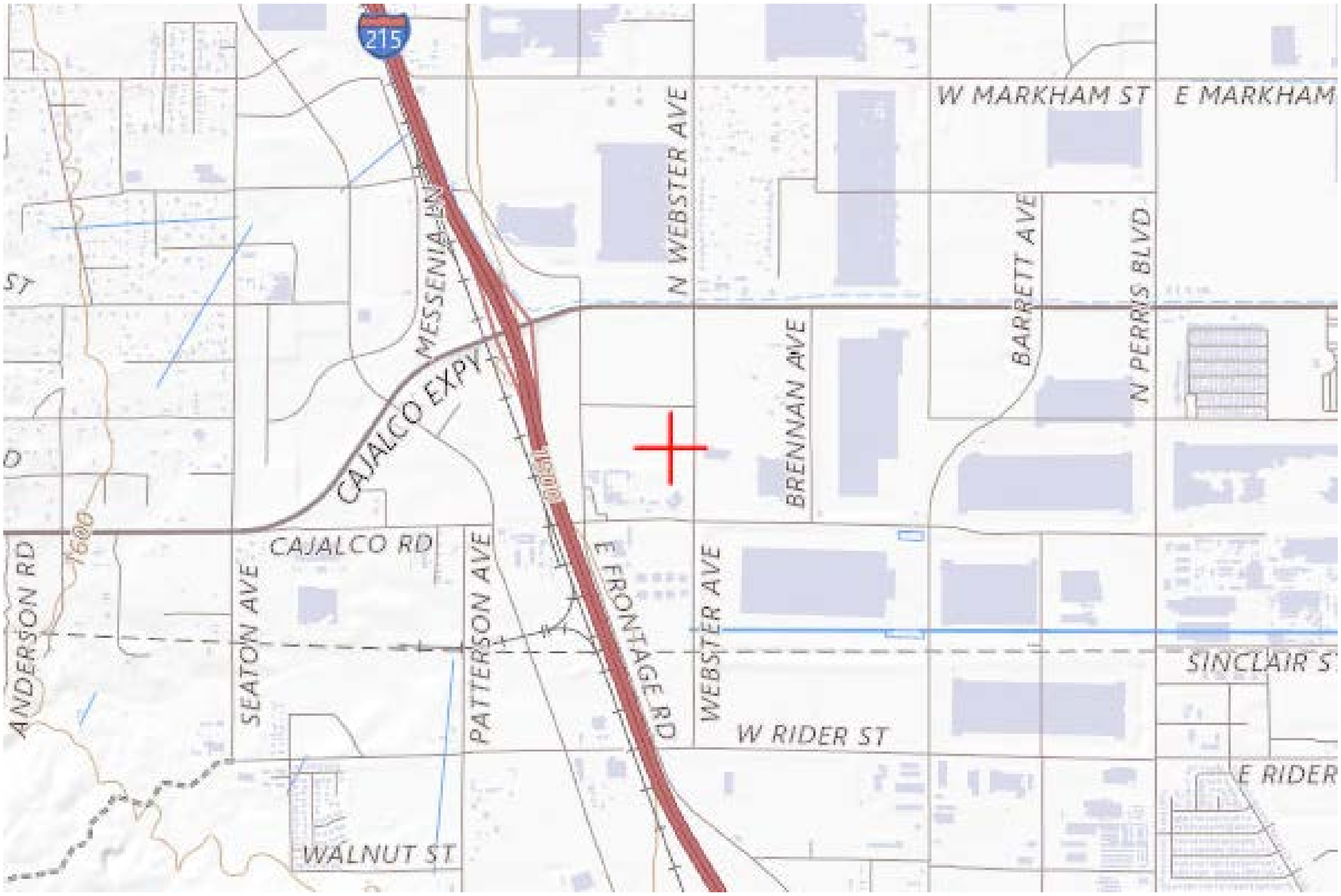
Signature Control No: 537974894-546524522 (DNE)

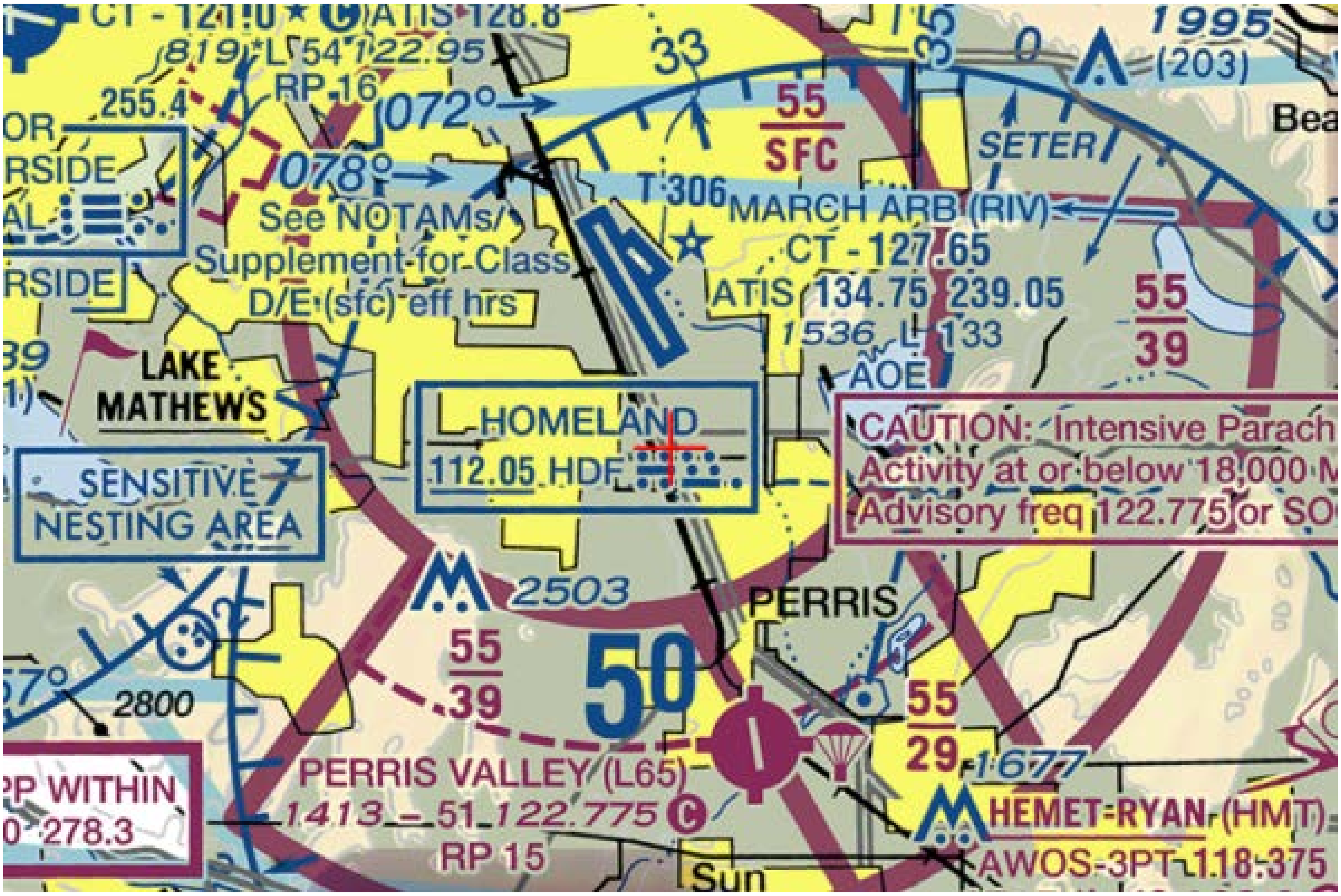
Vivian Vilaro
Specialist

Attachment(s)
Map(s)

TOPO Map for ASN 2022-AWP-12525-OE



Sectional Map for ASN 2022-AWP-12525-OE



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10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2022-AWP-12526-OE

Issued Date: 08/03/2022

Jon Yolles
PERRIS LANDCO LLC
201 Spear Street
#1100
San Francisco, CA 94105

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Building RGCC I-4
Location:	Perris, CA
Latitude:	33-50-24.07N NAD 83
Longitude:	117-14-50.27W
Heights:	1491 feet site elevation (SE)
	47 feet above ground level (AGL)
	1538 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

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Vivian Vilaro
Specialist

Attachment(s)
Map(s)

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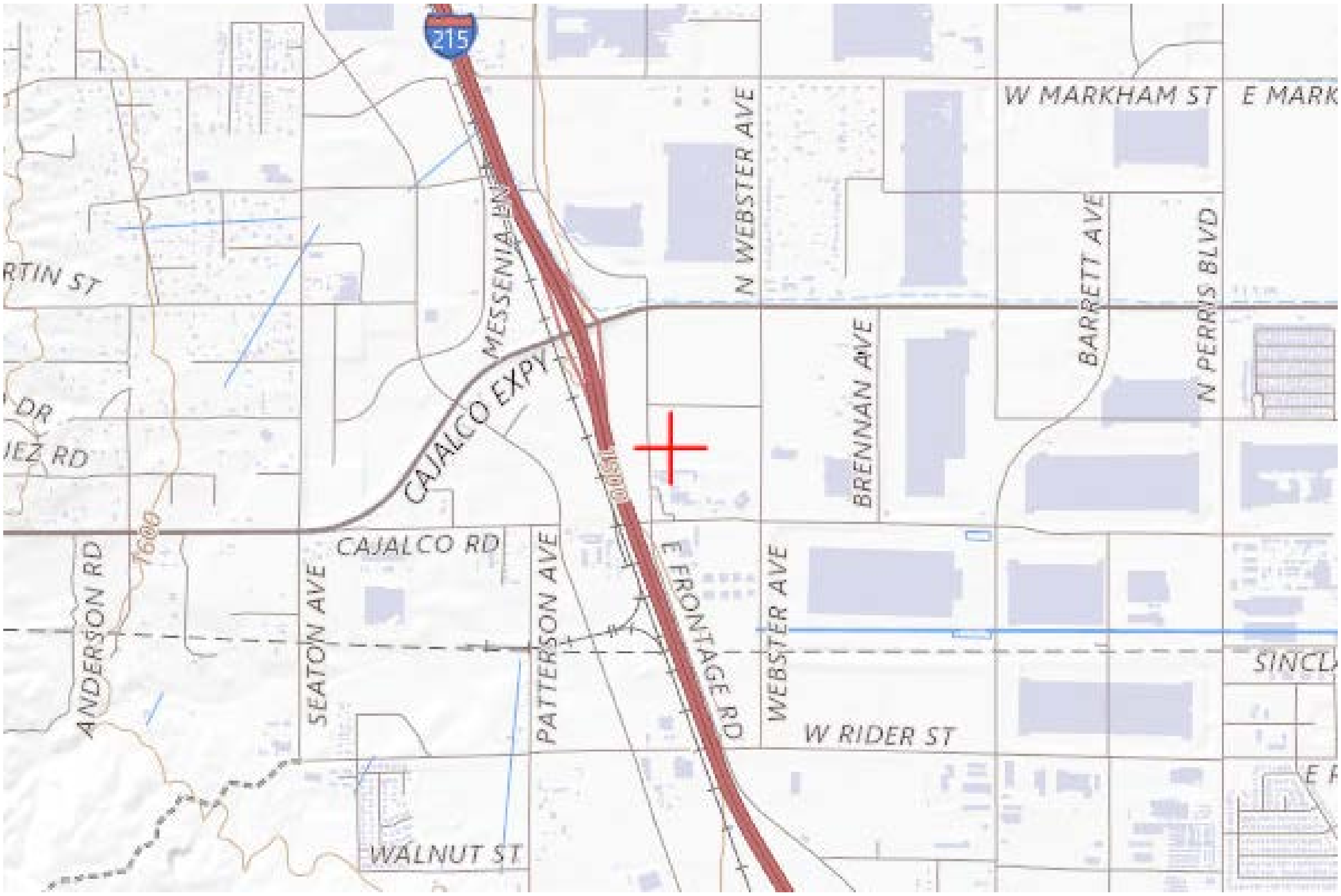
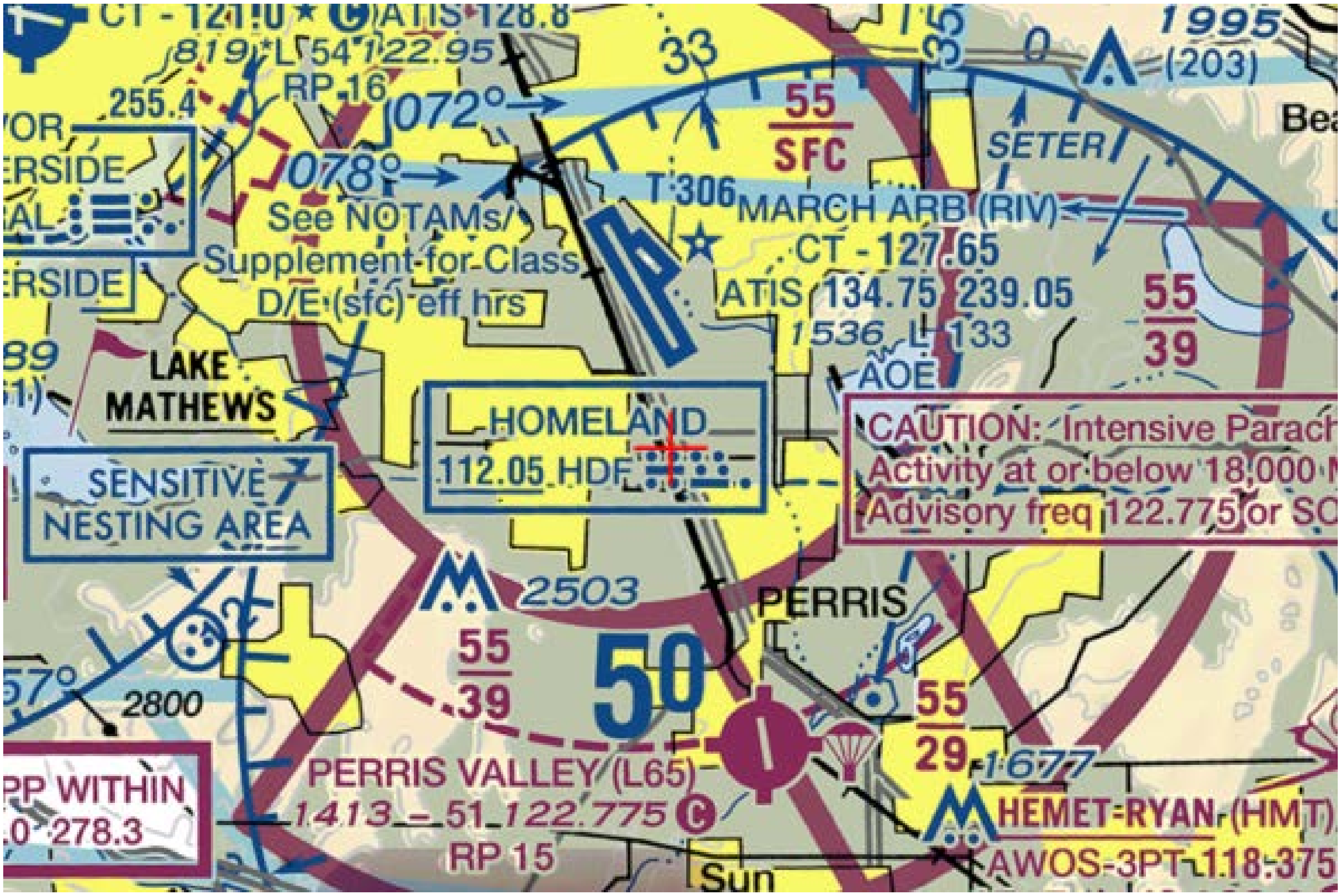


Sectional Map for ASN 2022-AWP-12526-OE



Appendix B – Solar Glare Analysis

Technical Memorandum

To: Jon Yolles, Covus Development
From: Nick Johnson, Johnson Aviation, Inc.
Date: July 26, 2022

Subject: Solar Glare Analysis – Solar Photovoltaic (PV) Installation, Ramona Gateway Commerce Center

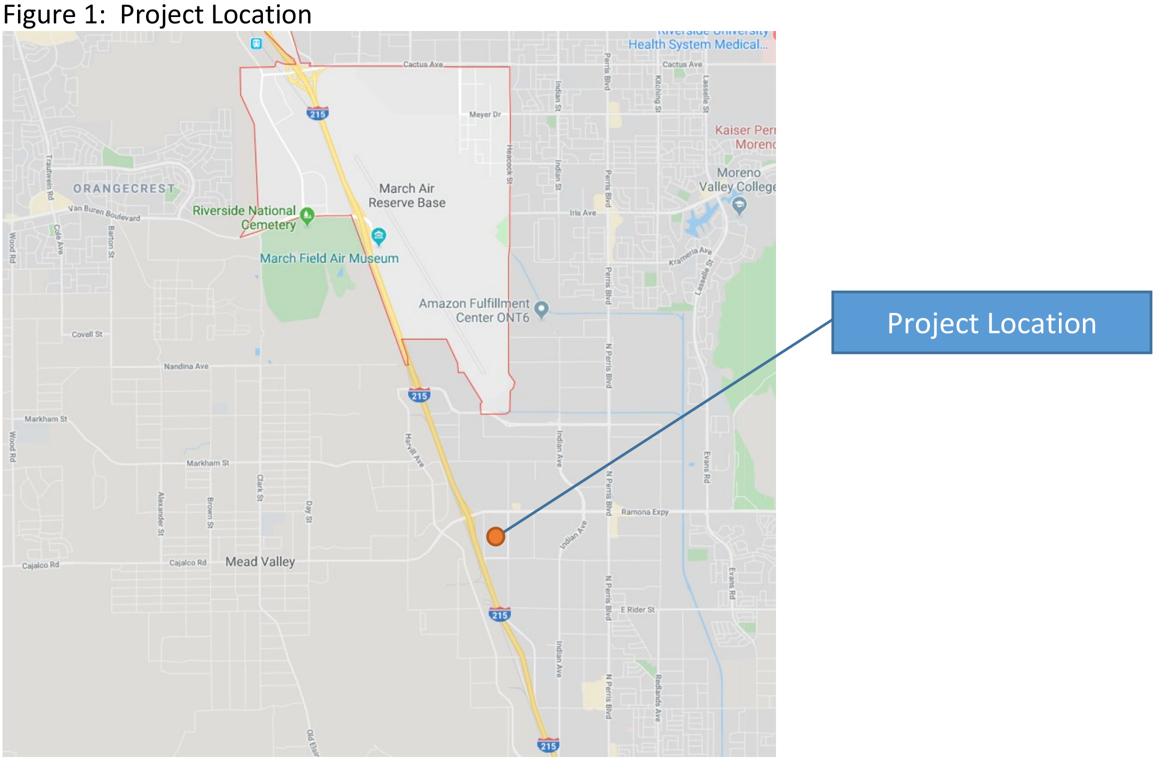
A. Findings

The findings of this Solar Glare Analysis are that the Proposed Project **PASSES** the FAA's recommended solar glare tests and **PASSES** these same tests for four critical flight paths required by the March Air Reserve Base. This Technical Memorandum outlines the study of the potential solar PV Project and substantiates these findings.

B. Introduction

The purpose of this technical memorandum is to assess the airport compatibility of a potential solar PV installation on a portion of the roof of the Industrial Building portion of the Ramona Gateway Commerce Center Project (Project). The Project site is located south of Ramona Expressway, west of Webster Avenue, north of Val Verde High School, and east of Nevada Road in the City of Perris (City) and within the March Air Reserve Base (March ARB) airport influence area (AIA) (See Figure 1). The analysis and findings of this memo are intended for review and acceptance by the City, Riverside County Airport Land Use Commission (ALUC) and the March ARB staff.

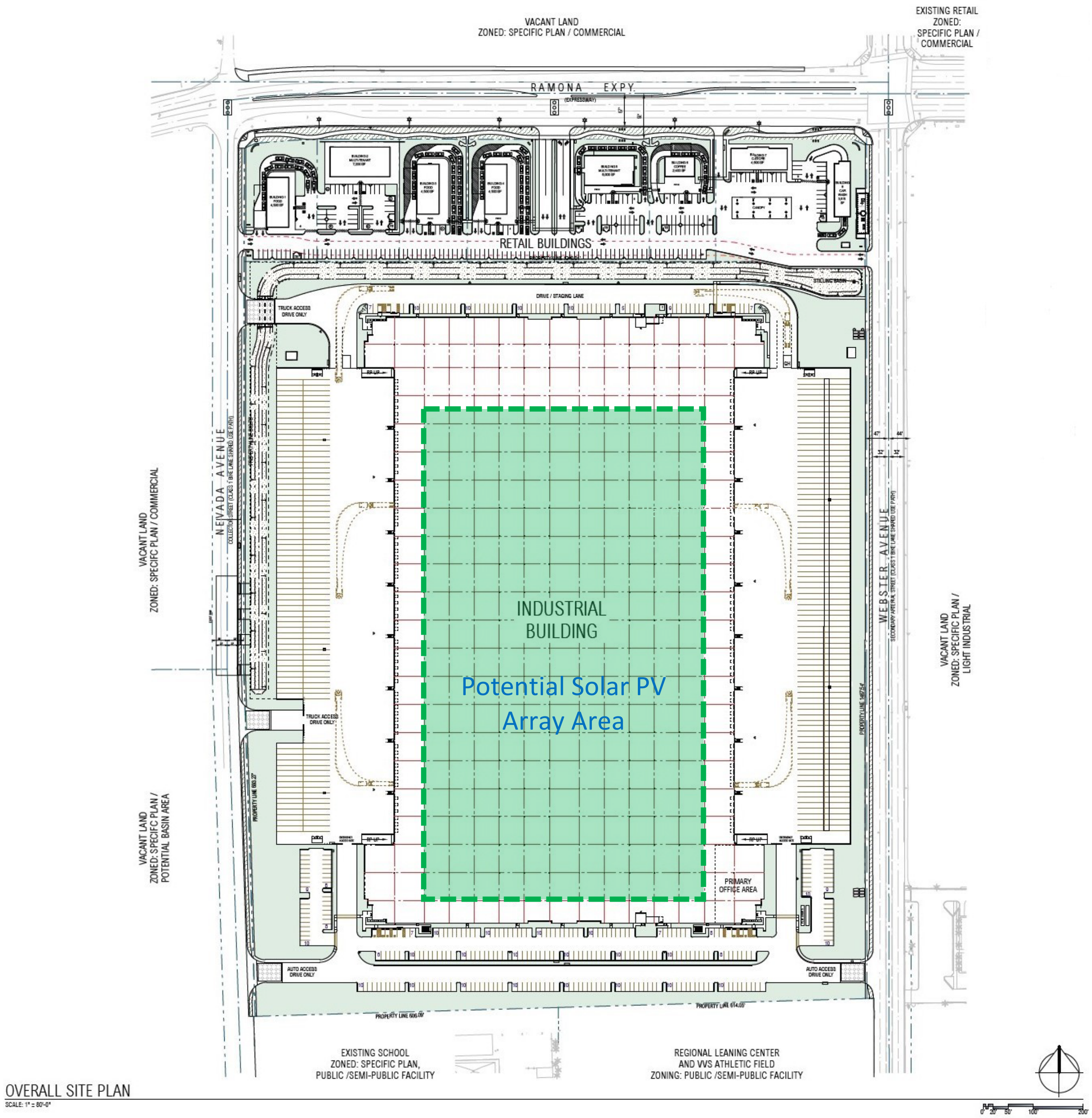
Figure 1: Project Location



C. Project Description

Perris Landco, LLC, the Project Owner, may decide to develop a roof-top solar PV installation on the Ramona Gateway Project. The site is comprised of commercial properties on the northern portion of the property along Ramona Expressway and a single industrial building totaling 950,224 square feet in southern portion of the property (approximately 850,224 square feet of footprint area and 100,000 square feet at the mezzanine level). The potential solar PV installation would be located on the southerly portion of the building roof (See Figure 2) in a total site area on the roof of the building of approximately 550,000 square feet.

Figure 2: Ramona Gateway Commerce Center Project – Potential Solar PV Installation



D. Standard of Review

This study and its findings have been prepared consistent with the Federal Aviation Administration's (FAA) policy to eliminate hazards to air navigation that may arise as the result of implementing solar energy facilities on and near airports. The FAA adopted an Interim Policy[1] for Solar PV project review in 2013 and completed a final solar glare policy in 2021[2]. In both the 2013 Interim Policy and the 2021 Final Policy, off-airport solar arrays are not required to meet the FAA's policies, but they are strongly encouraged to consider the requirements of this policy guidance when siting systems. Neither the FAA nor the US Department of Defense (DOD) control land use off of airport or base property. Both entities encourage collaboration with local land use jurisdictions like the ALUC and the City.

As solar PV was being implemented on and near airports in recent years, the FAA was finding that solar PV reflections of sunlight glint and glare were affecting pilots' vision, particularly on final approach to runways, and was also impacting some air traffic controllers' vision when controlling aircraft near airports. In conjunction with Sandia National Laboratories, the FAA developed a computer analysis tool to measure the potential impact of reflected glint and glare from Solar PV installations. The analysis of this impact is achieved through use of the Solar Glare Hazard Assessment Tool (SGHAT). At the time of the Interim Policy, Sandia Labs produced the tool to meet the analysis requirement. Since then, Sandia Labs has licensed the tool to other providers to sell commercially for solar glare analysis. ForgeSolar licensed the SGHAT tool and incorporated its software into their Glare Analysis tool. Johnson Aviation, Inc. uses the ForgeSolar Glare Analysis tool under subscription license from Sims Industries d/b/a ForgeSolar.

The following is the Standard for Measuring Ocular Impact from the FAA's 2013 Interim Policy:

> Standard for Measuring Ocular Impact
> FAA adopts the Solar Glare Hazard Analysis Plot as the standard for measuring the ocular impact of any proposed solar energy system on a federally obligated airport. 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:
>
> 1. No potential for glint or glare in the existing or planned Airport Traffic Control Tower (ATCT) cab; and
> 2. No potential for glare or "low potential for after-image" 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.
> 3. Ocular impact must be analyzed over the entire calendar year in one (1) minute intervals from when the sun rises above the horizon until the sun sets below the horizon.

---

[1] Background on the Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports, Federal Register, October 23, 2013.
[2] Federal Aviation Administration Policy: Review of Solar Energy System Projects on Federally-Obligated Airports, 86 Fed. Reg. 25801 (May 11, 2021), https://www.federalregister.gov/documents/2021/05/11/2021-09862/federal-aviation-administration-policy-review-of-solar-energy-system-projects-on-federally-obligated

After significant additional study of the issue, the FAA concluded in its final 2021 Policy that less restrictive analysis can achieve the same goals for limiting solar PV glare. The following are the revised FAA 2021 Policy limitations:

> This policy does not apply to:
>
> 1. Solar energy systems on airports that do not have an ATCT,
>
> 2. Airports that are not federally-obligated, or
>
> 3. Solar energy systems not located on airport property.
>
> Though this policy does not apply to proponents of solar energy systems located off airport property, they are encouraged to consider ocular impact for proposed systems in proximity to airports with ATCTs. In these cases, solar energy system proponents should coordinate with the local airport sponsor.

In addition to the FAA's standards for runway final approach paths and air traffic control tower visibility, the March ARB staff in conjunction with the Riverside County ALUC staff have established a series of air traffic patterns for the two runways located at the Base. Their concern is to ensure that land uses around the base are compatible with its air operations and that solar PV installations will not create a hazard to air navigation as a result of reflected sunlight and the associated potential glare. March ARB staff have provided four sets of geographic coordinates to define the standard traffic patterns listed below:

- FAA 2013 Policy Review (See Attachment A-1)
- FAA 2021 Policy Review (See Attachment A-2)
- Runway 12/30 General Aviation Traffic Pattern (See Attachment B)
- Runway 14/32 General Aviation Traffic Pattern (See Attachment C)
- Runway 14/32 C-17/KC-135 Traffic Pattern (See Attachment D)
- Runway 14/32 Overhead Traffic Pattern (See Attachment E)

E. Solar Glare Analysis Reports

The following pages of this Technical Memorandum provide the solar glare analysis reports for each of the suggested and required studies. The FAA standard study of the final approach paths to the runway ends and the Air Traffic Control Tower analysis is included in each individual report. The six reports are grouped by the flight path studies required by the March ARB and ALUC staff using the SGHAT program.

Attachment A-1
2013 FAA Policy Review

FORGESOLAR GLARE ANALYSIS

Project: **Ramona Gateway Commerce Center**

Solar glare analysis of approximately 250,000 s.f. solar PV array on rooftop of proposed RGCC industrial building.

Site configuration: **RGCC2-All Final Approaches**

Analysis conducted by Nick Johnson (nick.johnson@johnson-aviation.com) at 13:57 on 13 Jul, 2022.

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)	PASS	Receptor(s) marked as ATCT do not receive glare

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: 72250.12670
Methodology: V2

PV Array(s)

Name: RGCC Industrial Full Roof
Axis tracking: Fixed (no rotation)
Tilt: 10.0°
Orientation: 180.0°
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	33.843184	-117.246923	1490.07	53.00	1543.08
2	33.843184	-117.245079	1490.07	53.00	1543.08
3	33.840133	-117.245079	1490.07	53.00	1543.08
4	33.840133	-117.246923	1490.07	53.00	1543.08

Flight Path Receptor(s)

Name: RWY 12 Final
Description: None
Threshold height: 50 ft
Direction: 135.0°
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	33.890258	-117.260681	1500.07	50.00	1550.08
Two-mile	33.898508	-117.270608	1500.07	1300.06	2800.14

Name: RWY 14 Final
Description: None
Threshold height: 50 ft
Direction: 149.5°
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	33.896431	-117.270636	1500.07	50.00	1550.08
Two-mile	33.906486	-117.277783	1500.07	1500.07	3000.15

Name: RWY 30 Final
Description: None
Threshold height: 50 ft
Direction: 315.0°
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	33.884319	-117.253536	1500.07	50.00	1550.08
Two-mile	33.876069	-117.243611	1500.07	1300.06	2800.14

Name: RWY 32 Final
Description: None
Threshold height: 50 ft
Direction: 329.5°
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	33.864994	-117.248281	1500.07	50.00	1550.08
Two-mile	33.854942	-117.241136	1500.07	1500.07	3000.15

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
1-ATCT	1	33.891572	-117.251203	1511.07	118.01

Map image of 1-ATCT

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
RGCC Industrial Full Roof	10.0	180.0	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
RWY 12 Final	0	0
RWY 14 Final	0	0
RWY 30 Final	0	0
RWY 32 Final	0	0
1-ATCT	0	0

Results for: RGCC Industrial Full Roof

Receptor	Green Glare (min)	Yellow Glare (min)
RWY 12 Final	0	0
RWY 14 Final	0	0
RWY 30 Final	0	0
RWY 32 Final	0	0
1-ATCT	0	0

Flight Path: RWY 12 Final

0 minutes of yellow glare
0 minutes of green glare

Flight Path: RWY 14 Final

0 minutes of yellow glare
0 minutes of green glare

Flight Path: RWY 30 Final

0 minutes of yellow glare
0 minutes of green glare

Flight Path: RWY 32 Final

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 1-ATCT

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 V1 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.

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Attachment A-2
2021 FAA Policy Review

FORGESOLAR GLARE ANALYSIS

Project: **Ramona Gateway Commerce Center**

Solar glare analysis of approximately 250,000 s.f. solar PV array on rooftop of proposed RGCC industrial building.

Site configuration: **RGCC2-All Final Approaches**

Client: PERRIS LANDCO LLC

Created 13 Jul, 2022
Updated 13 Jul, 2022
Time-step 1 minute
Timezone offset UTC-8
Site ID 72250.12670
DNI peaks at 1,000.0 W/m^2
Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
Methodology V2

Glare Policy Adherence

The following table estimates the policy adherence of this glare analysis according to the **2021** U.S. Federal Aviation Administration Policy:

Review of Solar Energy System Projects on Federally-Obligated Airports

This policy may require the following criteria be met for solar energy systems on airport property:

- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics, including 1-minute time step.

ForgeSolar is not affiliated with the U.S. FAA and does not represent or speak officially for the U.S. FAA. ForgeSolar cannot approve or deny projects - results are informational only. Contact the relevant airport and FAA district office for information on policy and requirements.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
ATCT(s)	PASS	Receptor(s) marked as ATCT do not receive glare

The referenced policy can be read at https://www.federalregister.gov/d/2021-09862

Component Data

This report includes results for PV arrays and Observation Point ("OP") receptors marked as ATCTs. Components that are not pertinent to the policy, such as routes, flight paths, and vertical surfaces, are excluded.

PV Arrays

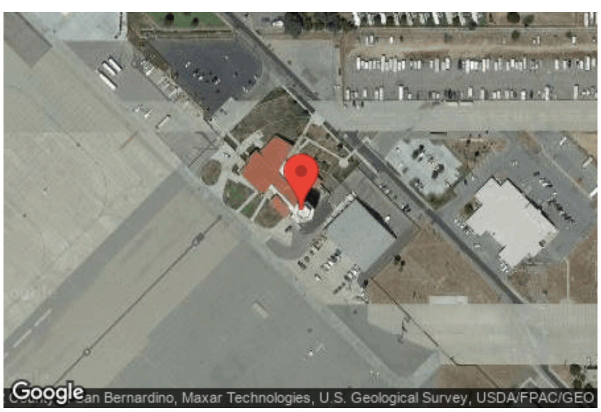
Name: RGCC Industrial Full Roof
Axis tracking: Fixed (no rotation)
Tilt: 10.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	33.843184	-117.246923	1490.07	53.00	1543.08
2	33.843184	-117.245079	1490.07	53.00	1543.08
3	33.840133	-117.245079	1490.07	53.00	1543.08
4	33.840133	-117.246923	1490.07	53.00	1543.08

Observation Point ATCT Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
1-ATCT	1	33.891572	-117.251203	1511.07	118.01

Map image of 1-ATCT



Glare Analysis Results

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
RGCC Industrial Full Roof	10.0	180.0	0	0.0	0	0.0	-

Total annual 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
1-ATCT	0	0.0	0	0.0

PV: RGCC Industrial Full Roof

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
1-ATCT	0	0.0	0	0.0

RGCC Industrial Full Roof and

1-ATCT

Receptor type: ATCT Observation Point

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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

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Attachment B
March ARB Runway 12/30 General Aviation Traffic Pattern Analysis

FORGESOLAR GLARE ANALYSIS

Project: **Ramona Gateway Commerce Center**
Solar glare analysis of approximately 250,000 s.f. solar PV array on rooftop of proposed RGCC industrial building.

Site configuration: **RGCC2-MARB Runway 12-30 GA Analysis**

Client: PERRIS LANDCO LLC

Created 13 Jul, 2022
Updated 13 Jul, 2022
Time-step 1 minute
Timezone offset UTC-8
Site ID 72251.12670
Category 500 kW to 1 MW
DNI peaks at 1,000.0 W/m^2
Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
Methodology V2

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
RGCC Industrial Full Roof	10.0	180.0	0	0.0	0	0.0	-

Total annual 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
RWY 12 GA Pattern Route	0	0.0	0	0.0
RWY 30 GA Pattern Route	0	0.0	0	0.0
RWY 12 Final	0	0.0	0	0.0
RWY 30 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

Component Data

PV Arrays

Name: RGCC Industrial Full Roof
Axis tracking: Fixed (no rotation)
Tilt: 10.0°
Orientation: 180.0°
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	33.843184	-117.246923	1490.07	53.00	1543.08
2	33.843184	-117.245079	1490.07	53.00	1543.08
3	33.840133	-117.245079	1490.07	53.00	1543.08
4	33.840133	-117.246923	1490.07	53.00	1543.08

Route Receptors

Name: RWY 12 GA Pattern Route
Path type: One-way (toward increasing index)
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	33.884319	-117.253536	1500.07	50.00	1550.08
2	33.876069	-117.243611	1500.07	1300.06	2800.14
3	33.876081	-117.235119	1500.07	1300.06	2800.14
4	33.880814	-117.229467	1500.07	1300.06	2800.14
5	33.887897	-117.229483	1500.07	1300.06	2800.14
6	33.910333	-117.256469	1500.07	1300.06	2800.14
7	33.910322	-117.264967	1500.07	1300.06	2800.14
8	33.905592	-117.270622	1500.07	1300.06	2800.14
9	33.898508	-117.270608	1500.07	1300.06	2800.14
10	33.890258	-117.260681	1500.07	50.00	1550.08

Name: RWY 30 GA Pattern Route
Path type: One-way (toward increasing index)
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	33.890258	-117.260681	1500.07	50.00	1550.08
2	33.898508	-117.270608	1500.07	1300.06	2800.14
3	33.905592	-117.270622	1500.07	1300.06	2800.14
4	33.910322	-117.264967	1500.07	1300.06	2800.14
5	33.910333	-117.256469	1500.07	1300.06	2800.14
6	33.887897	-117.229483	1500.07	1300.06	2800.14
7	33.880814	-117.229467	1500.07	1300.06	2800.14
8	33.876081	-117.235119	1500.07	1300.06	2800.14
9	33.876069	-117.243611	1500.07	1300.06	2800.14
10	33.884319	-117.253536	1500.07	50.00	1550.08

Flight Path Receptors

Name: RWY 12 Final
Description: None
Threshold height: 50 ft
Direction: 135.0°
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	33.890258	-117.260681	1500.07	50.00	1550.08
Two-mile	33.898508	-117.270608	1500.07	1300.06	2800.14

Name: RWY 30 Final
Description: None
Threshold height: 50 ft
Direction: 315.0°
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	33.884319	-117.253536	1500.07	50.00	1550.08
Two-mile	33.876069	-117.243611	1500.07	1300.06	2800.14

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
1-ATCT	1	33.891572	-117.251203	1511.07	118.01

Map image of 1-ATCT

Glare Analysis Results

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
RGCC Industrial Full Roof	10.0	180.0	0	0.0	0	0.0	-

Total annual 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
RWY 12 GA Pattern Route	0	0.0	0	0.0
RWY 30 GA Pattern Route	0	0.0	0	0.0
RWY 12 Final	0	0.0	0	0.0
RWY 30 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

PV: RGCC Industrial Full Roof no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
RWY 12 GA Pattern Route	0	0.0	0	0.0
RWY 30 GA Pattern Route	0	0.0	0	0.0
RWY 12 Final	0	0.0	0	0.0
RWY 30 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

RGCC Industrial Full Roof and RWY 12 GA Pattern Route

Receptor type: Route

No glare found

RGCC Industrial Full Roof and RWY 30 GA Pattern Route

Receptor type: Route

No glare found

RGCC Industrial Full Roof and RWY 12 Final

Receptor type: 2-mile Flight Path
No glare found

RGCC Industrial Full Roof and RWY 30 Final

Receptor type: 2-mile Flight Path
No glare found

RGCC Industrial Full Roof and 1-ATCT

Receptor type: Observation Point
No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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

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Attachment C
March ARB Runway 14/32 General Aviation Traffic Pattern Analysis

FORGESOLAR GLARE ANALYSIS

Project: **Ramona Gateway Commerce Center**

Solar glare analysis of approximately 250,000 s.f. solar PV array on rooftop of proposed RGCC industrial building.

Site configuration: **RGCC3-MARB Runway 14-32 GA Analysis**

Client: PERRIS LANDCO LLC

Created 13 Jul, 2022
Updated 13 Jul, 2022
Time-step 1 minute
Timezone offset UTC-8
Site ID 72271.12670
Category 500 kW to 1 MW
DNI peaks at 1,000.0 W/m^2
Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
Methodology V2

Summary of Results

Glare with low potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
RGCC Industrial Midpoint Roof	10.0	180.0	25,249	420.8	0	0.0	-

Total annual 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
RWY 14 GA Pattern Route	0	0.0	0	0.0
RWY 32 GA Pattern Route	25,249	420.8	0	0.0
RWY 14 Final	0	0.0	0	0.0
RWY 32 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

Component Data

PV Arrays

Name: RGCC Industrial Midpoint Roof
Axis tracking: Fixed (no rotation)
Tilt: 10.0°
Orientation: 180.0°
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	33.842756	-117.246934	1485.93	53.00	1538.93
2	33.842765	-117.245133	1482.32	53.00	1535.32
3	33.840025	-117.245079	1483.84	53.00	1536.84
4	33.839994	-117.246891	1489.02	53.00	1542.02

Route Receptors

Name: RWY 14 GA Pattern Route
Path type: One-way (toward increasing index)
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	33.864994	-117.248281	1500.07	50.00	1550.08
2	33.854942	-117.241136	1500.07	1500.07	3000.15
3	33.848078	-117.243236	1500.07	1500.07	3000.15
4	33.844669	-117.250119	1500.07	1500.07	3000.15
5	33.846422	-117.258344	1500.07	1500.07	3000.15
6	33.897972	-117.295011	1500.07	1500.07	3000.15
7	33.904833	-117.292903	1500.07	1500.07	3000.15
8	33.908242	-117.286017	1500.07	1500.07	3000.15
9	33.906486	-117.277783	1500.07	1500.07	3000.15
10	33.896431	-117.270636	1500.07	50.00	1550.08

Name: RWY 32 GA Pattern Route
Path type: One-way (toward increasing index)
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	33.896431	-117.270636	1500.07	50.00	1550.08
2	33.906486	-117.277783	1500.07	1500.07	3000.15
3	33.908242	-117.286017	1500.07	1500.07	3000.15
4	33.904833	-117.292903	1500.07	1500.07	3000.15
5	33.897972	-117.295011	1500.07	1500.07	3000.15
6	33.846422	-117.258344	1500.07	1500.07	3000.15
7	33.844669	-117.250119	1500.07	1500.07	3000.15
8	33.848078	-117.243236	1500.07	1500.07	3000.15
9	33.854942	-117.241136	1500.07	1500.07	3000.15
10	33.864994	-117.248281	1500.07	50.00	1550.08

Flight Path Receptors

Name: RWY 14 Final
Description: None
Threshold height: 50 ft
Direction: 149.5°
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	33.896431	-117.270636	1500.07	50.00	1550.08
Two-mile	33.906486	-117.277783	1500.07	1500.07	3000.15

Name: RWY 32 Final
Description: None
Threshold height: 50 ft
Direction: 329.5°
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	33.864994	-117.248281	1500.07	50.00	1550.08
Two-mile	33.854942	-117.241136	1500.07	1500.07	3000.15

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
1-ATCT	1	33.891572	-117.251203	1511.07	118.01

Map image of 1-ATCT

Glare Analysis Results

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

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
RGCC Industrial Midpoint Roof	10.0	180.0	25,249	420.8	0	0.0	-

Total annual 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
RWY 14 GA Pattern Route	0	0.0	0	0.0
RWY 32 GA Pattern Route	25,249	420.8	0	0.0
RWY 14 Final	0	0.0	0	0.0
RWY 32 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

PV: RGCC Industrial Midpoint Roof low potential for temporary after-image

Receptor results ordered by category of glare

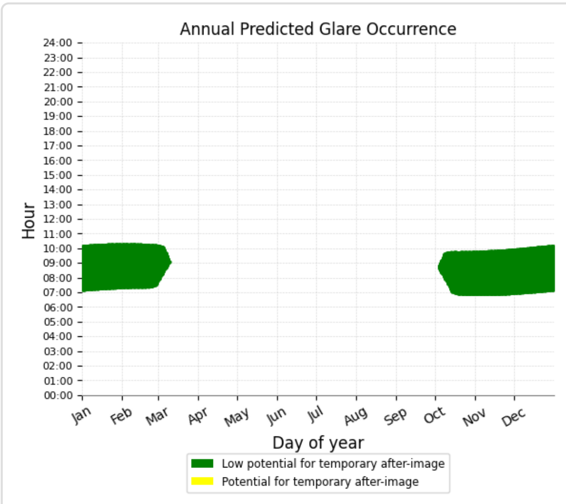
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
RWY 32 GA Pattern Route	25,249	420.8	0	0.0
RWY 14 GA Pattern Route	0	0.0	0	0.0
RWY 14 Final	0	0.0	0	0.0
RWY 32 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

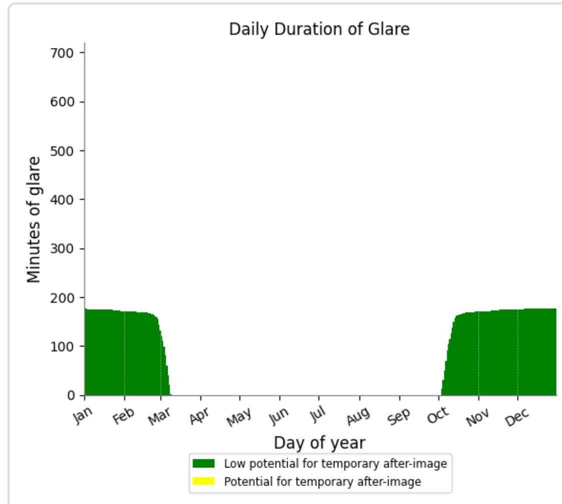
RGCC Industrial Midpoint Roof and RWY 32 GA Pattern Route

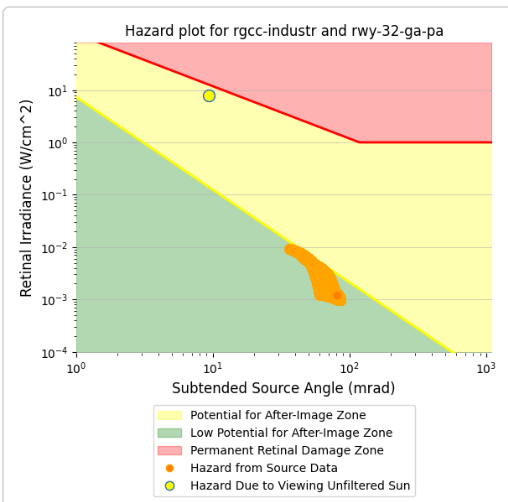
Receptor type: Route

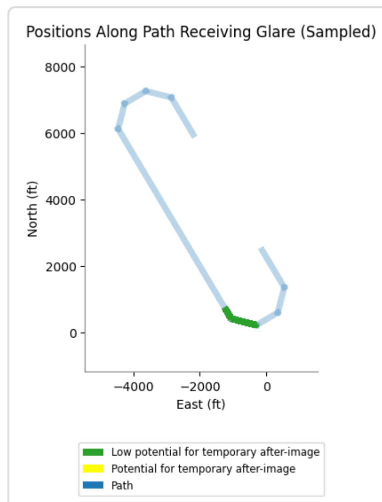
0 minutes of yellow glare

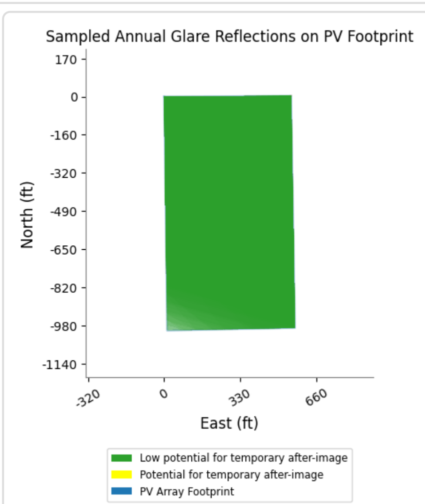
25,249 minutes of green glare











RGCC Industrial Midpoint Roof and RWY 14 GA Pattern Route

Receptor type: Route

No glare found

RGCC Industrial Midpoint Roof and RWY 14 Final

Receptor type: 2-mile Flight Path

No glare found

RGCC Industrial Midpoint Roof and RWY 32 Final

Receptor type: 2-mile Flight Path

No glare found

RGCC Industrial Midpoint Roof and 1-ATCT

Receptor type: Observation Point

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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

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Attachment D
March ARB Runway 14/32 C-17/KC-135 Traffic Pattern Analysis

FORGESOLAR GLARE ANALYSIS

Project: **Ramona Gateway Commerce Center**

Solar glare analysis of approximately 250,000 s.f. solar PV array on rooftop of proposed RGCC industrial building.

Site configuration: **RGCC2-MARB RWY 14-32 C-17 Analysis**

Client: PERRIS LANDCO LLC

Created 13 Jul, 2022
Updated 13 Jul, 2022
Time-step 1 minute
Timezone offset UTC-8
Site ID 72254.12670
Category 500 kW to 1 MW
DNI peaks at 1,000.0 W/m^2
Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
Methodology V2

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

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
RGCC Industrial Full Roof	10.0	180.0	6,861	114.3	0	0.0	-

Total annual 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
RWY 14 C-17 - KC-135 Pattern Route	0	0.0	0	0.0
RWY 32 C-17 - KC-135 Pattern Route	6,861	114.3	0	0.0
RWY 14 Final	0	0.0	0	0.0
RWY 32 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

Component Data

PV Arrays

Name: RGCC Industrial Full Roof
Axis tracking: Fixed (no rotation)
Tilt: 10.0°
Orientation: 180.0°
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	33.843184	-117.246923	1490.07	53.00	1543.08
2	33.843184	-117.245079	1490.07	53.00	1543.08
3	33.840133	-117.245079	1490.07	53.00	1543.08
4	33.840133	-117.246923	1490.07	53.00	1543.08

Route Receptors

Name: RWY 14 C-17 - KC-135 Pattern Route
Path type: One-way (toward increasing index)
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	33.864994	-117.248281	1500.07	50.00	1550.08
2	33.836269	-117.227869	1500.07	1500.07	3000.15
3	33.821961	-117.228367	1500.07	1500.07	3000.15
4	33.813147	-117.244350	1500.07	1500.07	3000.15
5	33.819225	-117.262269	1500.07	1500.07	3000.15
6	33.908131	-117.325528	1500.07	1500.07	3000.15
7	33.922394	-117.325047	1500.07	1500.07	3000.15
8	33.931244	-117.309014	1500.07	1500.07	3000.15
9	33.925156	-117.291061	1500.07	1500.07	3000.15
10	33.896431	-117.270636	1500.07	50.00	1550.08

Name: RWY 32 C-17 - KC-135 Pattern Route
Path type: One-way (toward increasing index)
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	33.896431	-117.270636	1500.07	50.00	1550.08
2	33.925156	-117.291061	1500.07	1500.07	3000.15
3	33.931244	-117.309014	1500.07	1500.07	3000.15
4	33.922394	-117.325047	1500.07	1500.07	3000.15
5	33.908131	-117.325528	1500.07	1500.07	3000.15
6	33.819225	-117.262269	1500.07	1500.07	3000.15
7	33.813147	-117.244350	1500.07	1500.07	3000.15
8	33.821961	-117.228367	1500.07	1500.07	3000.15
9	33.836269	-117.227869	1500.07	1500.07	3000.15
10	33.864994	-117.248281	1500.07	50.00	1550.08

Flight Path Receptors

Name: RWY 14 Final
Description: None
Threshold height: 50 ft
Direction: 149.5°
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	33.896431	-117.270636	1500.07	50.00	1550.08
Two-mile	33.906486	-117.277783	1500.07	1500.07	3000.15

Name: RWY 32 Final
Description: None
Threshold height: 50 ft
Direction: 329.5°
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	33.864994	-117.248281	1500.07	50.00	1550.08
Two-mile	33.854942	-117.241136	1500.07	1500.07	3000.15

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
1-ATCT	1	33.891572	-117.251203	1511.07	118.01

Map image of 1-ATCT

Glare Analysis Results

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

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
RGCC Industrial Full Roof	10.0	180.0	6,861	114.3	0	0.0	-

Total annual 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
RWY 14 C-17 - KC-135 Pattern Route	0	0.0	0	0.0
RWY 32 C-17 - KC-135 Pattern Route	6,861	114.3	0	0.0
RWY 14 Final	0	0.0	0	0.0
RWY 32 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

PV: RGCC Industrial Full Roof low potential for temporary after-image

Receptor results ordered by category of glare

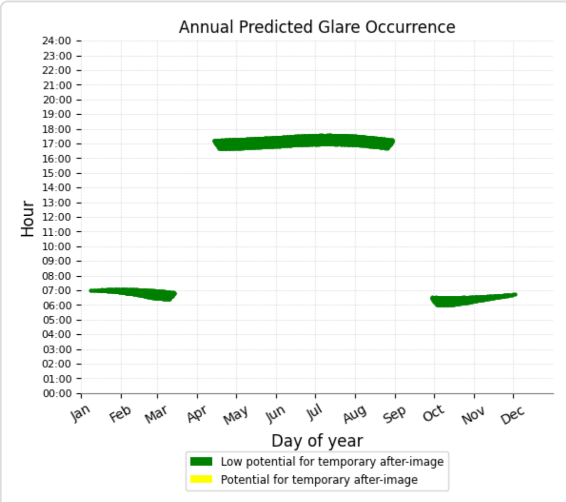
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
RWY 32 C-17 - KC-135 Pattern Route	6,861	114.3	0	0.0
RWY 14 C-17 - KC-135 Pattern Route	0	0.0	0	0.0
RWY 14 Final	0	0.0	0	0.0
RWY 32 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

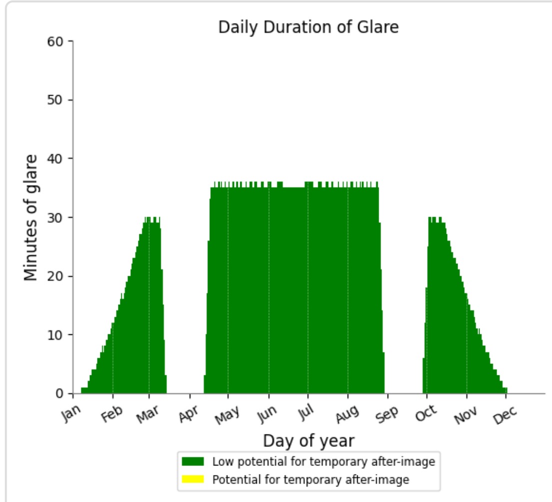
RGCC Industrial Full Roof and RWY 32 C-17 - KC-135 Pattern Route

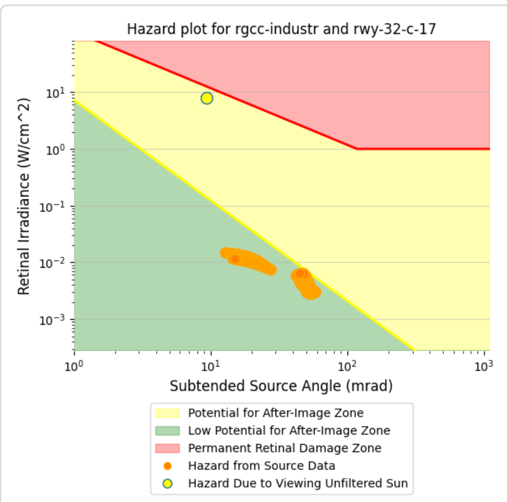
Receptor type: Route

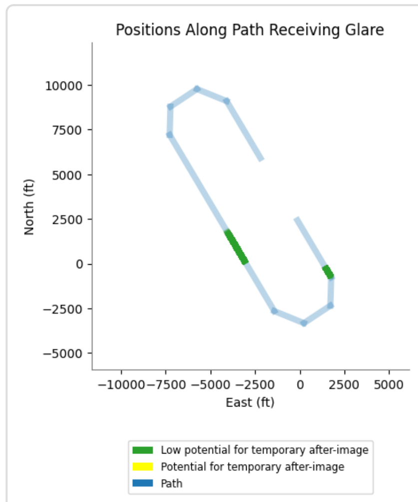
0 minutes of yellow glare

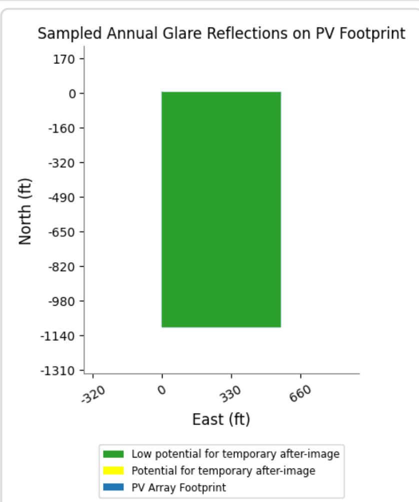
6,861 minutes of green glare











RGCC Industrial Full Roof and RWY 14 C-17 - KC-135 Pattern Route

Receptor type: Route

No glare found

RGCC Industrial Full Roof and RWY 14 Final

Receptor type: 2-mile Flight Path

No glare found

RGCC Industrial Full Roof and RWY 32 Final

Receptor type: 2-mile Flight Path

No glare found

RGCC Industrial Full Roof and 1-ATCT

Receptor type: Observation Point

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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

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Attachment E
March ARB Runway 14/32 Overhead Traffic Pattern Analysis

FORGESOLAR GLARE ANALYSIS

Project: **Ramona Gateway Commerce Center**

Solar glare analysis of approximately 250,000 s.f. solar PV array on rooftop of proposed RGCC industrial building.

Site configuration: **RGCC2-MARB RWY 14-32 Overhead Analysis**

Client: PERRIS LANDCO LLC

Created 13 Jul, 2022
Updated 13 Jul, 2022
Time-step 1 minute
Timezone offset UTC-8
Site ID 72256.12670
Category 500 kW to 1 MW
DNI peaks at 1,000.0 W/m^2
Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
Methodology V2

Summary of Results

Glare with low potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
RGCC Industrial Full Roof	10.0	180.0	10,174	169.6	0	0.0	-

Total annual 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
RWY 14 Overhead Route	0	0.0	0	0.0
RWY 32 Overhead Route	10,174	169.6	0	0.0
RWY 14 Final	0	0.0	0	0.0
RWY 32 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

Component Data

PV Arrays

Name: RGCC Industrial Full Roof
Axis tracking: Fixed (no rotation)
Tilt: 10.0°
Orientation: 180.0°
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	33.843184	-117.246923	1490.07	53.00	1543.08
2	33.843184	-117.245079	1490.07	53.00	1543.08
3	33.840133	-117.245079	1490.07	53.00	1543.08
4	33.840133	-117.246923	1490.07	53.00	1543.08

Route Receptors

Name: RWY 14 Overhead Route
Path type: One-way (toward increasing index)
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	33.968036	-117.322128	1500.07	2000.10	3500.17
2	33.880706	-117.259453	1500.07	2000.10	3500.17
3	33.863564	-117.293808	1500.07	2000.10	3500.17
4	33.908131	-117.325528	1500.07	2000.10	3500.17
5	33.925156	-117.291061	1500.07	2000.10	3500.17
6	33.896431	-117.270636	1500.07	50.00	1550.08

Name: RWY 32 Overhead Route
Path type: One-way (toward increasing index)
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	33.793375	-117.196878	1500.07	2000.10	3500.17
2	33.880706	-117.259453	1500.07	2000.10	3500.17
3	33.863564	-117.293808	1500.07	2000.10	3500.17
4	33.819225	-117.262269	1500.07	2000.10	3500.17
5	33.836269	-117.227869	1500.07	2000.10	3500.17
6	33.864994	-117.248281	1500.07	50.00	1550.08

Flight Path Receptors

Name: RWY 14 Final
Description: None
Threshold height: 50 ft
Direction: 149.5°
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	33.896431	-117.270636	1500.07	50.00	1550.08
Two-mile	33.906486	-117.277783	1500.07	2000.10	3500.17

Name: RWY 32 Final
Description: None
Threshold height: 50 ft
Direction: 329.5°
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	33.864994	-117.248281	1500.07	50.00	1550.08
Two-mile	33.854942	-117.241136	1500.07	2000.10	3500.17

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
1-ATCT	1	33.891572	-117.251203	1511.07	118.01

Map image of 1-ATCT

Glare Analysis Results

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

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
RGCC Industrial Full Roof	10.0	180.0	10,174	169.6	0	0.0	-

Total annual 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
RWY 14 Overhead Route	0	0.0	0	0.0
RWY 32 Overhead Route	10,174	169.6	0	0.0
RWY 14 Final	0	0.0	0	0.0
RWY 32 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

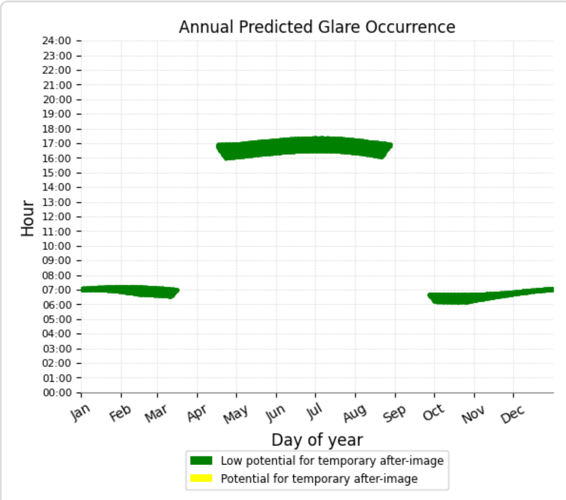
PV: RGCC Industrial Full Roof low potential for temporary after-image

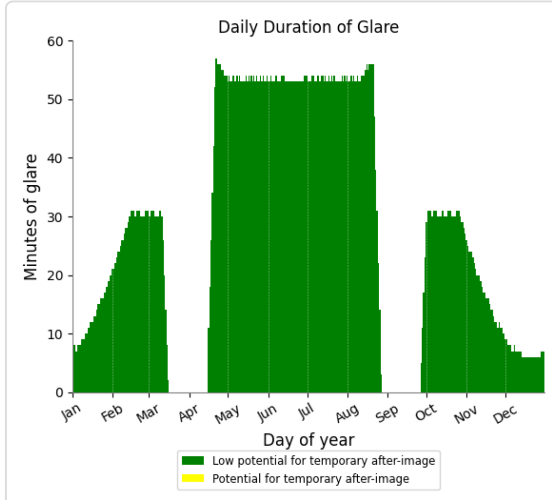
Receptor results ordered by category of glare

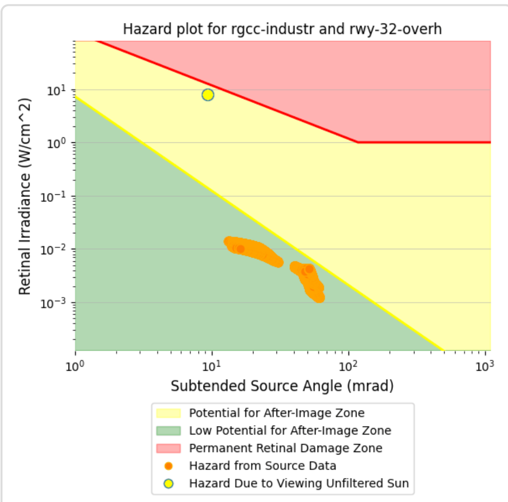
Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
RWY 32 Overhead Route	10,174	169.6	0	0.0
RWY 14 Overhead Route	0	0.0	0	0.0
RWY 14 Final	0	0.0	0	0.0
RWY 32 Final	0	0.0	0	0.0
1-ATCT	0	0.0	0	0.0

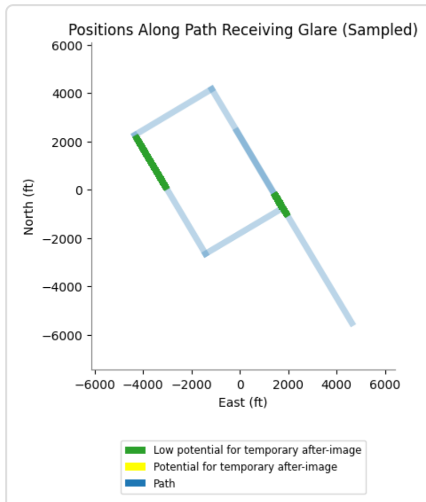
RGCC Industrial Full Roof and RWY 32 Overhead Route

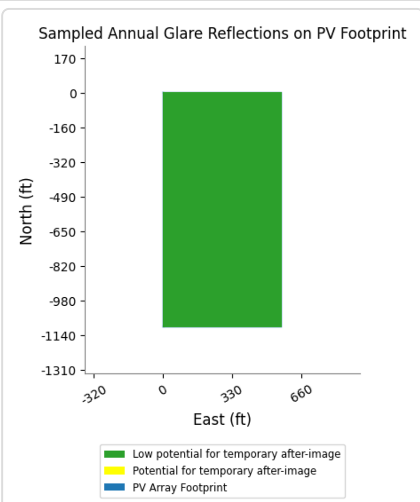
Receptor type: Route
0 minutes of yellow glare
10,174 minutes of green glare











RGCC Industrial Full Roof and RWY 14 Overhead Route

Receptor type: Route

No glare found

RGCC Industrial Full Roof and RWY 14 Final

Receptor type: 2-mile Flight Path

No glare found

RGCC Industrial Full Roof and RWY 32 Final

Receptor type: 2-mile Flight Path

No glare found

RGCC Industrial Full Roof and 1-ATCT

Receptor type: Observation Point

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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

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