DOCKETED	
Docket Number:	23-OPT-01
Project Title:	Fountain Wind Project
TN #:	248330-2
Document Title:	Project Refinement Memo September 2021
Description:	N/A
Filer:	Caitlin Barns
Organization:	Stantec Consulting Services, Inc.
Submitter Role:	Applicant Consultant
Submission Date:	1/5/2023 10:09:40 AM
Docketed Date:	1/5/2023

Stantec

Memo

To:	Shasta County Planning Department and Board of Supervisors	From:	Stantec Environmental Services
File:	Fountain Wind Project	Date:	September 24, 2021

Reference: Analyses of Refinements to the Proposed Project Design Since Circulation of the Final Environmental Impact Report

1.1 REFINEMENTS TO THE PROPOSED PROJECT DESIGN

On behalf of the Fountain Wind Project, we are pleased to present a description and analyses of refinements to the project's design. These refinements address comments received from the public and respond to concerns raised by the Planning Commission at its June 22, 2021 hearing. These refinements represent a reduced version of the Project and combine elements from both Alternative 1 (South of SR 299 Alternative) and Alternative 2 (Increased Setbacks Alternative) as described in the Draft Environmental Impact Report (EIR).

All of the refinements are reductions in project size and scope in comparison to the original proposal. No new project components are being proposed. Locations of turbines, collector lines, substation and switching station, and access roads have not changed, although some are proposed to be eliminated. (See Figure 1 in Appendix A). For the reasons explained further below, these refinements to the project description do not require the County to recirculate the Draft EIR because none of the circumstances present in CEQA Guidelines section 15188.5 are present.

The refinements include the following:

- **Use of fewer, shorter turbines.** The original project proposed up to 72 turbines with a maximum turbine height of 679 feet. The refined project design would construct up to 48 turbines with a maximum turbine height of 610 feet, a 33% reduction in number of turbines and 10% reduction in turbine height. The turbines eliminated are on the periphery of the project, consolidating the project footprint and eliminating the access roads and collector lines to the northern, southern, and northwestern portions of the original Project Site. Together, these changes reduce impacts on aesthetics, noise, shadow flicker, wildfire, and biological resources.
- **Incorporation of Alternative 1 from Draft EIR (South of SR 299) / Elimination of A-string Turbines.** Alternative 1 from the Draft EIR contemplated elimination of the A-string turbines, the seven turbines proposed to the north of SR 299 (turbine numbers A01 through A07) and related infrastructure, including the associated aboveground collector line. The approximately 378-acre area located north of SR 299 would continue to be managed for timber production without any further project-related activities. The refined project adopts these features of Alternative 1 as part of the proposed project design. Incorporation of this element of Alternative 1 as part of the preferred project will reduce visual impacts, eliminate impacts to Richardson and Little Hatchet Creeks, and reduce overall ground disturbance.
- **Incorporation of Increased Property Line Setbacks described in Alternative 2 from Draft EIR**. Alternative 2 from the Draft EIR contemplated the removal of four turbines (M03, D05, B01 and K02)

to increase setback distances from residential properties and public roadways. Alternative 2 contemplated a setback from publicly maintained roads of 1.5 times the turbine height (i.e., 1,018.5 feet) and a setback from residential parcels of three times turbine height (i.e., within 2,037 feet). The refined project partially implements Alternative 2 by proposing removal of turbines M03, D05, and B01 in adopting more restrictive property line setbacks. The Alternative 2 road setbacks would not apply to turbine K02 because the turbine is not within 1,018.5 feet of a publicly maintained road. Therefore, turbine K02 was retained.

- **Elimination of D-string Turbines.** In addition to adoption of project reduction measures identified in the Alternatives in the Draft EIR, the applicant is proposing additional reductions, including the elimination of the D-string turbines. ConnectGen removed all five D-string turbines (turbine numbers D01 through D05) in the northwestern portion of the project directly adjacent to Moose Camp. The elimination of the D-string turbines accomplishes the following purposes:
    - Eliminates turbine construction noise and potential shadow flicker for non-participant residences, including receptors within Moose Camp.
    - Reduces Project visibility from Moose Camp.
    - Eliminates or reduces construction noise, shadow flicker, and views of turbines from the Lammers Trust property.
    - Implements MM 3.2-1, which requires the applicant to reduce visibility of turbines from the Fountain Fire Overlook. Rather than micro-siting turbines to reduce visibility, the turbines have been removed.
    - Removes turbines nearest to Moose Camp private-use helipad.
- **Elimination of Turbine B01.** Turbine B01 is proposed to be eliminated to increase setback from residences. Maintaining Turbine B01 in the proposal would still comply with Mitigation Measure (MM) 3.11-3, and County Condition of Approval (COA) 16, but is nonetheless proposed to be eliminated to reduce potential for shadow flicker and noise, and to decrease proposed infrastructure near SR 299. This turbine was also selected for removal to eliminate impacts on the sole, 5.5-acre occurrence within the Project Site of California Black Oak Woodland, a Sensitive Natural Community.
- **Elimination of N-string and Select M-string Turbines.** The applicant further proposes the elimination of the seven N-string turbines (turbine numbers N01, N01A, N02A, N02, N03, N04, N05) and four of the eight M-string turbines (turbine numbers M03, M04, M05, and M08A) to consolidate the project footprint and eliminate disturbance from access roads, collector lines, and turbine pads in the southern portion of the Project Site. The removal of turbines M03, M04, and M05 reduces turbine visibility from Round Mountain. The elimination of M03 and M04, located on a ridge, is in response to a suggestion from California Department of Fish and Wildlife to avoid siting turbines on ridges where they could impact migrating raptors. Turbine M08A was also selected for removal in order to eliminate impacts to an area of Rocky Mountain Maple Scrub, a Sensitive Natural Community.

Overall, these refinements reduce permanent ground disturbance by 33% and temporary ground disturbance by 35%. The refined project design reduces the length of the underground collector system by 31%, overhead electrical collector system by 58%, and access roads by 21% (Table 1). With these refinements to the project design, ConnectGen has also reduced the Project Area (leasehold area to accommodate the development) by 50%.

Table 1. Comparison of FEIR Project Description and Refined Project Layout

Project Detail	Described in FEIR	Refined Layout	Percent Reduction
Nameplate generating capacity	216 MW	216 MW	No change
Generating capacity per turbine	Up to 6.2	Up to 6.2[2]	No change
Number of Towers[1]	Up to 72	Up to 48	33%
Hub height	Up to 410 ft	328 ft	20%
Rotor diameter	Up to 558 ft	558 ft	No change
Blade tip height (max turbine height)	679 ft	610 ft	10%
Rotor-swept area per turbine	Up to 244,545 sq ft	Up to 244,545 sq ft	No change
Permanent disturbance area for tower pad (2.5 acres per pad)	180 acres	120 acres	33%
Underground electrical collector system	Up to 51 miles	Up to 35 miles	31%
Overhead electrical collector system	Up to 12 miles	Up to 5 miles	58%
Onsite collector substation	1 (5 acres permanent)	1 (5 acres permanent)	No change
Onsite switching station	1 (8 acres permanent)	1 (8 acres permanent)	No change
Access Roads	Up to 24 miles of new roads	Up to 19 miles of new roads	21%
Widen existing 16-foot-wide access roads	Up to 33 miles of existing roads may be widened	Up to 19 miles of existing roads may be widened	42%
Temporary Laydown Areas	14 (28 acres total)	9 (18 acres total)	36%
O&M facility	1 (5 acres permanent)	1 (5 acres permanent)	No change
Temporary concrete batch plant, if necessary	3 (up to 15 acres temporary)	3 (up to 15 acres temporary)	No change
MET towers	4 (2 acres total permanent)	3 (1.5 acres total permanent)	25%
Construction period	18-24 months	18-24 months	No change
Anticipated Total Temporary Construction Disturbance	1,384 acres	868 acres	35%
Anticipated Total Permanent Disturbance	713 acres	475 acres	33%

Source: Shasta County Planning 2021 Table 2-1; ConnectGen 2021

[1] The EIR assumes the Project could include up to 72 turbines. The total number of wind turbines would depend on the turbine model selected and final design. Calculations are estimations based on the maximum number of turbines.
2 The visual simulations included in the DEIR/FEIR and in Figure 6 depict turbines with a 5.7 MW capacity. The FEIR explains that use of turbines with a capacity "up to 6.2 MW" would not result in any new significant impacts.

1.2 PROJECT PERMITTING UPDATES

Since publication of the Final EIR, the Project has continued coordination with state and federal agencies regarding additional permits and approvals identified in Table 2-8 of the EIR. The following permitting update is provided to update the Planning Department and to provide further support for conclusions reached in the EIR.

Federal Aviation Administration No Hazard Determination

On July 1, 2021, The Federal Aviation Administration issued Determinations of No Hazard to Air Navigation for the Fountain Wind Project turbines. The determinations were based on results of an aeronautical study of 72 turbines each with a maximum height of 679 feet above ground level. The study confirmed that the structures would have no substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on the operation of air navigation facilities. This conclusion would not change with the reduction in the project's scope and size as now proposed.

1.3 CEQA ADEQUACY REVIEW

The project refinements outlined in this memorandum are not considered significant new information requiring recirculation of the EIR under section 15088.5 of the CEQA Guidelines. The project description included in the Draft and Final EIR included an analysis of the full 72 turbine layout and disclosed the impacts of the original project. Because the refined 48 turbine layout is a subset of the project analyzed in the Draft and Final EIR, the impacts are anticipated to be consistent with, or less than, the impact conclusions described in those documents. As explained in more detail below, no new significant environmental impacts would result, no identified impact would be made substantially more severe, no new feasible mitigation measures or alternatives have been identified that the project sponsor has declined to adopt. Finally the draft EIR remains adequate and the conclusions therein supported by substantial evidence.

1.4 ANALYSIS OF REFINEMENTS TO THE PROJECT DESCRIPTION

The following section analyzes the refinements in the proposed project since the publication of the Final EIR and contains information to support the conclusion that the project refinements would result in fewer and less severe environmental impacts than those disclosed in the Draft and Final EIR. The proposed project refinements would have no impact on the following topics analyzed in the Draft and Final EIR, and therefore these topics are omitted from this project change memorandum.

- Agriculture and Forestry Resources
- Air Quality and Greenhouse Gas Emissions
- Communications
- Energy
- Geology and Soils, or Paleontological or Mineral Resources
- Land Use and Planning
- Population and Housing
- Public Services
- Recreation
- Transportation
- Utilities and Service Systems

Stantec has conducted additional analyses to confirm that impacts concerning biological resources, cultural resources, visual resources, noise, hazards and hazardous materials, and hydrology and water quality as presented in the Draft and Final EIR would be reduced with the proposed refinements and would not constitute “significant new information”. The results of these analyses are presented in the following sections. Supplemental analyses also include an updated shadow flicker report (Appendix A) and updated visual simulations and viewshed analysis (Figure Series 5 and 6).

2.0 RESULTS OF ENVIRONMENTAL ANALYSIS OF PROJECT REFINEMENTS

The proposed refinements to the Project layout result in either no new impacts or a reduction in potential impacts to sensitive resources. Analyses supporting this conclusion are presented in the following sections and in the attached appendices. Recirculation of the Draft EIR is not required.

2.1 BIOLOGICAL RESOURCES

Sensitive Natural Communities and Special Status Plants

The refined project footprint falls entirely within the Biological Resources Survey Area analyzed in the Draft and Final EIR. Impacts resulting from construction of the refined project layout would be less than what is analyzed in the Draft and Final EIR. No additional numbers or types of special status plants or Sensitive Natural Communities would be impacted by construction of the refined project. Total permanent impacts to locations hosting Sensitive Natural Communities and/or special status plants would be reduced by 35%, and total temporary impacts would be reduced by 33%. The removal of turbine B01 would eliminate impacts on the sole, 5.5-acre occurrence of California Black Oak Woodland, a Sensitive Natural Community, within the Project Site. The removal of turbine M08A would also eliminate impacts to an area of Rocky Mountain Maple Scrub, a Sensitive Natural Community.

Hydrology and Water Quality and Wetlands and Aquatic Features

No additional acreage or different wetland or aquatic features would be impacted by construction of the refined project. Total permanent impacts to wetlands and other waters would be reduced by 53%. Total temporary impacts to wetlands and other waters would be reduced by 49%. (Table 2). With implementation of Alternative 1, the elimination of turbines north of SR 299, direct and indirect impacts to Richardson Creek and Little Hatchet Creek would be eliminated.

With the elimination of 516 acres of temporary construction disturbance, potential impacts to hydrology and water quality would be reduced to less than what is described in the Draft and Final EIR. With reduced ground disturbance, potential water quality impacts resulting from sedimentation, runoff, erosion, and spills would be eliminated in the areas that would no longer be subject to construction. Potential hydrology impacts resulting from changes to topography, introduction of impervious surfaces, soil compaction, and new or modifications to existing bridges or culverts would also be eliminated.

Special Status Wildlife

The refined project footprint falls entirely within the Biological Resources Survey Area analyzed in the DEIR and FEIR. Impacts resulting from construction of the refined project layout would be less than what is analyzed in the Draft and Final EIR. No additional habitat acreage or different types of special status species would be impacted by construction of the refined project. Total permanent impacts to special status species habitat would be reduced by 35%, and total temporary impacts would be reduced by 33%.

Table 2. Comparison of Permanent and Temporary Impacts to Aquatic Features between FEIR Project Description and Refined Project Layout

	Permanent Impacts				Temporary Impacts			
Feature Type	Permanent Impact Acreage Described in FEIR	Permanent Impact Acreage for Refined Layout	Reduction in Permanent Impact Acreage	Percent Reduction in Permanent Impact Acreage	Temporary Impact Acreage Described in FEIR	Temporary Impact Acreage for Refined Layout	Reduction in Temporary Impact Acreage	Percent Reduction in Temporary Impact Acreage
Other Waters								
Perennial stream	1.247	0.347	0.9	72%	0.471	0.159	0.312	66%
Intermittent stream	0.199	0.052	0.147	74%	0.075	0.038	0.037	49%
Ephemeral stream	0.044	0.03	0.014	32%	0.077	0.04	0.037	48%
Non-vegetated ditch	0.095	0.017	0.078	82%	0.034	0.016	0.018	53%
Culvert	0.011	0	0.011	100%	0	0	0	0%
Other Waters Subtotal	1.596	0.446	1.15	72%	0.657	0.253	0.404	61%
Wetlands								
Fresh emergent wetland	0.037	0.007	0.03	81%	0.01	0	0.01	100%
Riparian wetland	1.289	0.794	0.495	38%	1.219	0.818	0.401	33%
Wetland seep/spring	0.085	0.026	0.059	69%	0.171	0.007	0.164	96%
Wet meadow	0.386	0.354	0.032	8%	0.184	0.169	0.015	8%
Wetland Subtotal	1.797	1.181	0.616	34%	1.584	0.994	0.59	37%
Grand Total	1.8	1.181	1.766	53%	1.593	0.994	0.994	49%

Source: Stantec 2019a, ConnectGen 2021

Birds and Bats

Reduction in Construction Footprint. Impacts to birds and bats resulting from construction of the refined project layout would be less than what is analyzed in the Draft and Final EIR. No additional habitat acreage or different types of bird or bat species would be impacted by construction of the refined project. Total permanent impacts to bird and bat habitat, including riparian habitat that may support yellow warbler, would be reduced by 35%, and total temporary impacts would be reduced by 33%.

Fewer, Shorter Turbines. The Draft EIR concludes that construction of the original project design would result in significant and unavoidable impacts to eagles, migratory raptors such as Northern goshawk, and bats. The Draft EIR states that, compared to Hatchet Ridge (total blade tip height of 420 ft), the proposed project's considerably taller turbines (total blade tip height of 679 ft) could contribute to relatively greater impacts on bald or golden eagles, migratory raptors including goshawks, and bats (Shasta County Planning 2020). The refined project design uses shorter turbines (total blade tip height of 610 ft) and up to 24 fewer turbines than the ranges analyzed in the Draft and Final EIR, suggesting that potential operational impacts to avian species and bats are incrementally less than what was analyzed in the Draft and Final EIR. In addition, the elimination of turbines M03 and M04, located on a ridge, is in response to a suggestion from California Department of Fish and Wildlife to avoid siting turbines on ridges where they could impact migrating raptors.

Implementation of Voluntary Protection Measures and County-Mandated Conditions of Approval. The applicant has and continues to develop, construct, and operate the project in consideration of the U.S. Fish and Wildlife Service's Wind Energy Guidelines to reduce potential interaction with biological resources (MM 3.4-3a, COA 52). In compliance with COAs 53 and 54, the applicant will prepare a Bird and Bat Conservation Strategy and Nesting Bird Management Plan, which will include commitments to perform post-construction mortality monitoring, prey reduction measures, adaptive management strategies, and nest avoidance strategies, that, when implemented, would avoid or reduce potential impacts to avian and bat species. Furthermore, the applicant has committed to continued coordination with resource management agencies to discuss unforeseen operational impacts and adaptive management practices, as applicable.

Impacts to birds, particularly raptors, resulting from project operation will be further reduced through the implementation of several additional applicant commitments, including application of the Avian Power Line Interaction Committee's (APLIC) guidelines to reduce collisions (APLIC 2012) and electrocution (APLIC 2006) (COA 55). Seven miles of overhead collector lines are proposed to be removed from the design. For all remaining overhead collector lines, the applicant will reduce potential bird collisions by employing line marking devices as described in the guidance and required by COA 34 and following the guidance to reduce potential bird electrocutions by separating grounded and energized portions of aboveground collector lines.

2.2 CULTURAL RESOURCES

With implementation of the refined project footprint, there would be fewer potential direct and indirect impacts to cultural resources than disclosed in the Draft and Final EIR. With fewer turbines, impacts to scenic tribal cultural resources identified in the Draft EIR would be reduced. In addition, the potential for construction to encounter undiscovered cultural or tribal resources is reduced due to the elimination of turbines and their associated construction areas, and the reduction in the construction of new and widening of existing roads. Given that the refined project footprint falls entirely within the cultural resources survey area, no additional or different types of cultural resources are anticipated to be impacted by construction of the refined project.

2.3 NOISE

The Draft EIR found that the project construction and operation noise is within the thresholds identified in the Shasta County General Plan and other comparative regulations and guidelines. However, with implementation of the reduced project footprint, there would be even fewer potential impacts to sensitive noise receptors than what is analyzed in the Draft and Final EIR. The refined project footprint reduces construction areas by 33%, eliminating construction-related noise impacts from those construction areas no longer included in the project footprint.

The refined project footprint includes fewer wind turbines than those analyzed in the original noise technical report appended to the Draft EIR. Specifically, the refined project footprint removes Turbines A01 through A07, B01, D01 through D05, M03 through M05, M08A, and N01 through N05. Many of the turbines removed were those located nearest to noise-sensitive receptors in the project vicinity, specifically Turbines D01-D05. Table 3 shows the increase in distance between receptors analyzed in the Draft EIR and refined turbine locations. For each of the four receptors the distance to the nearest turbine has increased between approximately 2,500 and 5,200 feet. As noted in the Draft EIR, noise attenuation generally occurs as distance from the noise source increases, with typical attenuation of 6dB for each doubling of distance. As a result of the increased distance between turbine and receptor, construction and operation of turbines included in the refined project footprint would result in lower overall noise levels than those identified in the original project footprint analyzed in the Draft and Final EIR.

Table 3. Comparison of Distance between Receptor Locations and Nearest Turbine between FEIR Project Description and Refined Project Layout

Receptor	Approximate Distance from Receptor to Closest Turbine (feet) (Described in EIR)	Approximate Distance from Receptor to Closest Turbine (feet) (Refined Layout)	Percent Distance Increased to Receptor
LT-1	2,700 feet	7,900	192%
LT-2	3,200	7,400	131%
LT-3	4,300	8,100	88%
R-4	2,200	4,700	113%

2.4 SHADOW FLICKER

A shadow flicker study was performed on the refined project footprint (Appendix B). Results of modeling indicated that the refined project would significantly reduce shadow flicker at nearby receptors. The shadow flicker analysis presented in the Draft and Final EIR concluded that 40 receptors would receive between 0 and 30 hours of shadow flicker per year, and 18 receptors would receive more than 30 hours of shadow flicker per year (EDR 2020) (Table 4, Figure 3). With the refined project, only one receptor would receive more than 30 hours of shadow flicker per year. This one receptor is a project participant, i.e., a resident who will benefit economically from the project. A common finding is that annoyance from shadow flicker is lower among residents who benefit economically from wind turbines (EDR 2021).

Table 4. Comparison of Shadow Flicker Impacts between FEIR Project Description and Refined Project Layout

Hours of Shadow Flicker/Year	Described in FEIR	Refined Layout	Percent Reduction
0-1 hr/yr	1 receptor	1 receptor	No change
1-10 hr/yr	10 receptors	3 receptors	70%
10-20 hr/yr	14 receptors	0 receptors	100%
20-30 hr/yr	15 receptors	0 receptors	100%
>30 hr/yr	18 receptors	1 receptor[1]	94%
Total	58 receptors	5 receptors	91%

Source: EDR 2020, EDR 2021

Notes: 1 – this receptor is a project participant

2.5 WILDFIRE

The Draft EIR concluded that the project as originally designed would not result in increased wildfire risk because it would increase ground-based access to firefighters and facilitate their ability to suppress wildfires. A technical memorandum submitted to the Planning Commission (Quigley and Zerr 2021) further verified these conclusions and outlined the fire mitigation strategies proposed by the applicant. The following strategies, in combination with the refined project footprint, reduce risk of wildfire and provide effective means to combat wildfire:

- **Project infrastructure and roads serve as active fuel breaks**. The project, with its associated infrastructure including roadways, turbine pads, and other related infrastructure that will be nearly devoid of woody vegetation, will serve to break up the continuity of the existing dense vegetation. Breaking up this homogenous pine plantations can reduce the severity of wildfires and improve the survivability of the existing young pines. These access roads and turbine pads also effectively create numerous, permanent fuelbreaks that will provide for increased opportunities to slow and contain the spread of wildfires. Some of these access roads will be located along ridgelines where fire suppression can be highly effective (Figure 4a). The infrastructure, along with adjacent shaded fuel breaks, help reduce the risk of wildfire to the landowner's existing timber stands, adjacent timber owner's properties, and neighboring inholding properties.

- **Project roadways will decrease fire response time across the area, facilitating increased capacity and safe access for firefighters**. The associated roadways and travel corridors that will provide access to the turbines and related infrastructure will also serve to greatly increase access throughout the project area for wildfire suppression purposes, therefore decreasing response times for suppressing and containing wildfires. In addition, existing logging roads will be improved and bridges will be reinforced and widened to support the heavier equipment typically used in wildfire suppression (e.g., fire engines, dozer transports/lowboy trailers, water tenders).

- **Project roadways can serve as anchor points in combatting wildfire.** The cleared footprint of Project roads along with the adjacent shaded fuel breaks provide an opportunity for firefighters to use these linear fire spread barriers as anchor points and containment lines for suppressing wildfires.

- **Project roadways will provide emergency access routes for residents**. Those same roadways and travel corridors will also provide for improved egress routes for occupied inholdings within and adjacent to the Project Area, which may be used for wildfire evacuation or other emergencies.

- **Water sources installed as part of the project will facilitate fire suppression.** In combination with new or improved access roads, new, permanent water tanks distributed throughout the project (COA 103) (Figure 4a) will increase both the amount and the accessibility of water within the project footprint for fire suppression.

- **Increased monitoring will facilitate the rapid detection of wildfire.** During construction and operations, the increase in authorized human presence in the project area (e.g., construction workers and fire patrols during construction, and remote monitoring and maintenance workers during operations) will allow for more rapid detection of wildfires in an area that was previously unmonitored for much of the year. In addition, because the project's electrical infrastructure will be connected to PG&E's regional transmission network, including PG&E's high-voltage lines and associated rights-of-way that bisect the Project Site, the project's full-time remote monitoring program would alert personnel to incidents or hazardous conditions throughout PG&E's regional transmission network,

even beyond project boundaries. If an incident is identified, project operations personnel would be trained and staged to respond in addition to PG&E's operations personnel, effectively doubling the team responsible with detecting and responding to wildfires in the project area.

- **The project applicant will provide fire response training.** During construction, the project will maintain a fire coordinator (MM 3.16-2a, COA 107) who will be responsible for training all construction personnel on fire prevention, identification, reporting, and response (MM 3.16-3), and who will have a direct line of communication to appropriate authorities pursuant to the project's Fire Prevention Plan (MM 3.16-3) and Emergency Response Plan (MM 3.16-2c, COA 45). The applicant will also be responsible for training and providing necessary equipment to CAL FIRE and Shasta County Fire Department for the suppression of project-specific fires (COA 98).
- **Potential obstacles to aerial firefighting reduced.** The elimination of 24 turbines decreases the number of potential obstacles to combat wildland fires from the air. Aerial firefighting, particularly the use of helicopters, will still be possible throughout the project area, and the full suite of aerial firefighting assets, including air tankers and helicopters, can be effectively used along and within the perimeters of the project area. Turbines are spaced approximately half-mile apart, and turbine strings are generally spaced approximately one mile apart (Figure 4b), leaving more than adequate clearance for maneuverable aircraft such as helicopters.

As stated in the Draft and Final EIR, the risk of project infrastructure igniting a wildfire is low. Even at projects utilizing older turbine technology, turbine fires are rare and are quickly contained. For example, no fires have ever been reported at the adjacent Hatchet Ridge Wind Farm. The state-of-the-art turbines proposed for installation on this project will include fire detection and suppression systems (MM 3.16-2b, COA 101) within the turbine nacelle to detect and suppress interior fires. Turbines will be fully grounded, and include current-limiting switchgear installed at the base of the tower. If smoke triggers any alarm within a turbine, the turbine will automatically shut down. Alarms will trigger a gas-based suppression response within the electrical cabinet and switchgear to instantaneously extinguish the fire. The remote operations center will receive a notification of turbine shutdown and a response team would be immediately deployed.

Although Fountain Wind has reduced the number of turbines and infrastructure, the refined project continues to provide the extensive fire mitigation benefits of the original design.

2.6 VISUAL RESOURCES

The refined project design would reduce the project's impacts on public viewsheds and eliminate or reduce visibility of turbines in all views assessed in the Draft and Final EIR. While potential impacts to scenic vistas and views from publicly accessible vantage points would remain significant and unavoidable, some effects to aesthetics would be reduced or eliminated, as described below. The 48-turbine layout is shown in Appendix A overview maps alongside visual resources and Key Observation Points (KOPs) within a 30-mile radius (Figure 5a) and a 10-mile radius (Figure 5b).

The reduction in number of turbines from 72 to 48, and the associated smaller project footprint, would reduce the total area within which the project would be potentially visible as summarized in Table 5 and shown in the refined viewshed documents (Figures 5c through 5g). Figure 5c shows a simple comparison between the two project layouts, indicating the areas that were identified as having visibility of the project as proposed but where there would not be visibility of the project as refined.

Table 5. Comparison of Layout Viewsheds

Viewshed	Viewshed Study Area (Square Miles)		Area with Visibility (Square Miles)		Percentage of Viewshed Study Area with Visibility	
	72 Turbines; 679 ft height	48 Turbines; 610 ft height	72 Turbines; 679 ft height	48 Turbines; 610 ft height	72 Turbines; 679 ft height	48 Turbines; 610 ft height
30-mile radius – blade tip	3,513	3,324	975	801	27.8%	24.1%
30-mile radius – hub height	3,513	3,324	837	673	23.8%	20.2%
10-mile radius – blade tip	562	491	252	203	44.8%	41.3%
10-mile radius – hub height	562	491	225	179	40.0%	36.5%

Views from KOPs evaluated in the Draft and Final EIR would reflect the following changes under the refined design, as shown in Figures 6-1 through 6-7:

- **KOP 1: Fountain Fire Overlook** – With the refined design, turbines originally proposed to be located west of the Fountain Fire Overlook and near the Moose Camp residential area would not be installed. Therefore, these turbines would no longer be visible from KOP 1 (Figure 6-1).
- **KOP 2: Montgomery Creek** – One turbine, along the left edge of the view, would be removed with the refined design. The other nine turbines would remain visible but lower in profile along the ridgeline in the center of the view (Figure 6-2).
- **KOP 3: Round Mountain** – The three nearest visible turbines in the view evaluated in the Draft and Final EIR (in the right of the view, visible from between 3 and 3.6 miles away) would be removed under the refined design and another would drop below the ridgeline. The nine turbines remaining visible would appear from this distance as lower in profile along ridgelines due to shorter overall heights, though the larger rotor diameters portrayed in the simulations would make them slightly more prominent (Figure 6-3).
- **KOP 4: SR 299 at Tamarack Road** – Of the two project turbines visible from this location under the 72-turbine layout, one would be removed and the other would appear slightly lower in profile (Figure 6-4).
- **KOP 5: Burney** – Seven turbines visible along the ridgeline between 7 and 10 miles away (compared with eight visible with the 72-turbine layout) would appear slightly lower in profile (Figure 6-5).
- **KOP 6: SR 299 Pit River Overlook** – Twenty-three turbines would be visible in this broad view from 19 miles away (compared with 36 under the 72-turbine layout), appearing below, along, and beyond the same ridgeline along which Hatchet Ridge turbines currently appear (Figure 6-6).
- **KOP 7: Redding** – From just under 28 miles away, project turbines under the 48-turbine layout would appear in the same general portion of this view, though at a lower density than with the 72-turbine layout (Figure 6-7).

3.0 CONCLUSION

The proposed refinements to the project description adopt key elements of the Alternatives evaluated in the Draft EIR and propose even further reductions. The refined design would not result in any new or substantially more significant environmental impacts beyond those already disclosed in the Draft and Final EIR, as

summarized below in Table 6. Overall, the refinements would reduce potential environmental impacts resulting from project construction and operation. The refined design is not considered significant new information requiring recirculation under section 15088.5 of the CEQA Guidelines and would require any changes in the conclusions regarding environmental impacts in the Final EIR.

Table 6. Comparison of Turbine Layouts by CEQA Topic

CEQA Topic	CEQA Impact Conclusions Resulting from Layout Proposed in FEIR	Potential Impacts Resulting from Refined Layout
Aesthetics	Significant and Unavoidable Impacts to scenic vistas and views from publicly accessible vantage points; Less-than-Significant for all other criteria	Impacts reduced.
Agriculture	N/A[1]	N/A
Air Quality	Significant and Unavoidable Impacts resulting from PM_{10} emissions; Less-than-Significant with Mitigation for all other criteria	Impacts reduced.
Biological Resources	Significant and Unavoidable impacts to eagles, migratory raptors, and bats; Less-than-Significant with Mitigation or Less-than-Significant for all other criteria.	Impacts reduced.
Communications	Less-than-Significant with Mitigation or Less-than-Significant for all criteria.	No change.
Cultural & Tribal Resources	Significant and Unavoidable Impacts to tribal cultural resources; Less-than-Significant or Less-than-Significant with Mitigation for all other criteria.	Impacts reduced.
Energy	Less-than-Significant for all criteria.	No change.
Forestry	Less-than-signficant	Impacts further reduced.
Geology & Soils	Less-than-Significant for all criteria.	Impacts further reduced.
Greenhouse Gases	Less-than-Significant for all criteria.	Impacts further reduced.
Hazardous Materials (Shadow Flicker)	Less-than-Significant with Mitigation or Less-than-Significant for all criteria.	Impacts further reduced.
Hydrology & Water Quality	Less-than-Significant with Mitigation for all criteria.	Impacts further reduced.
Land Use	N/A	N/A
Mineral Resources	N/A	N/A

CEQA Topic	CEQA Impact Conclusions Resulting from Layout Proposed in FEIR	Potential Impacts Resulting from Refined Layout
Noise	Less-than-Significant with Mitigation or Less-than-Significant for all criteria.	Impacts further reduced.
Population & Housing	N/A	N/A
Public Services	N/A	N/A
Recreation	N/A	N/A
Transportation	Less-than-Significant with Mitigation or Less-than-Significant for all criteria.	Impacts further reduced.
Utilities & Service Systems	Less-than-Significant for all criteria.	Impacts further reduced.
Wildfire	Less-than-Significant with Mitigation or Less-than-Significant for all criteria.	Impacts further reduced.

Notes:

1 – (N/A) = topic was not analyzed in detail in DEIR or FEIR because the resource is not present within the project area or would not be affected by project construction (see DEIR Section 3.1.4).

4.0 REFERENCES

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_____. 2012. *Reducing Avian Collisions with Power Lines: The State of the Art in 2012.* Edison Electric Institute, APLIC, and the California Energy Commission. Washington, DC, and Sacramento, CA.

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_____. 2021. Fountain Wind Farm Updated Shadow Flicker Analysis. September 7, 2021. 23 pp.

Stantec Consulting Services, Inc. (Stantec). 2019a. Fountain Wind Energy Project. Aquatic Resources Survey Report.

_____. 2019b. Fountain Wind Energy Project Cultural Resources Phase I Inventory of 4,463 Acres, Shasta County, California.

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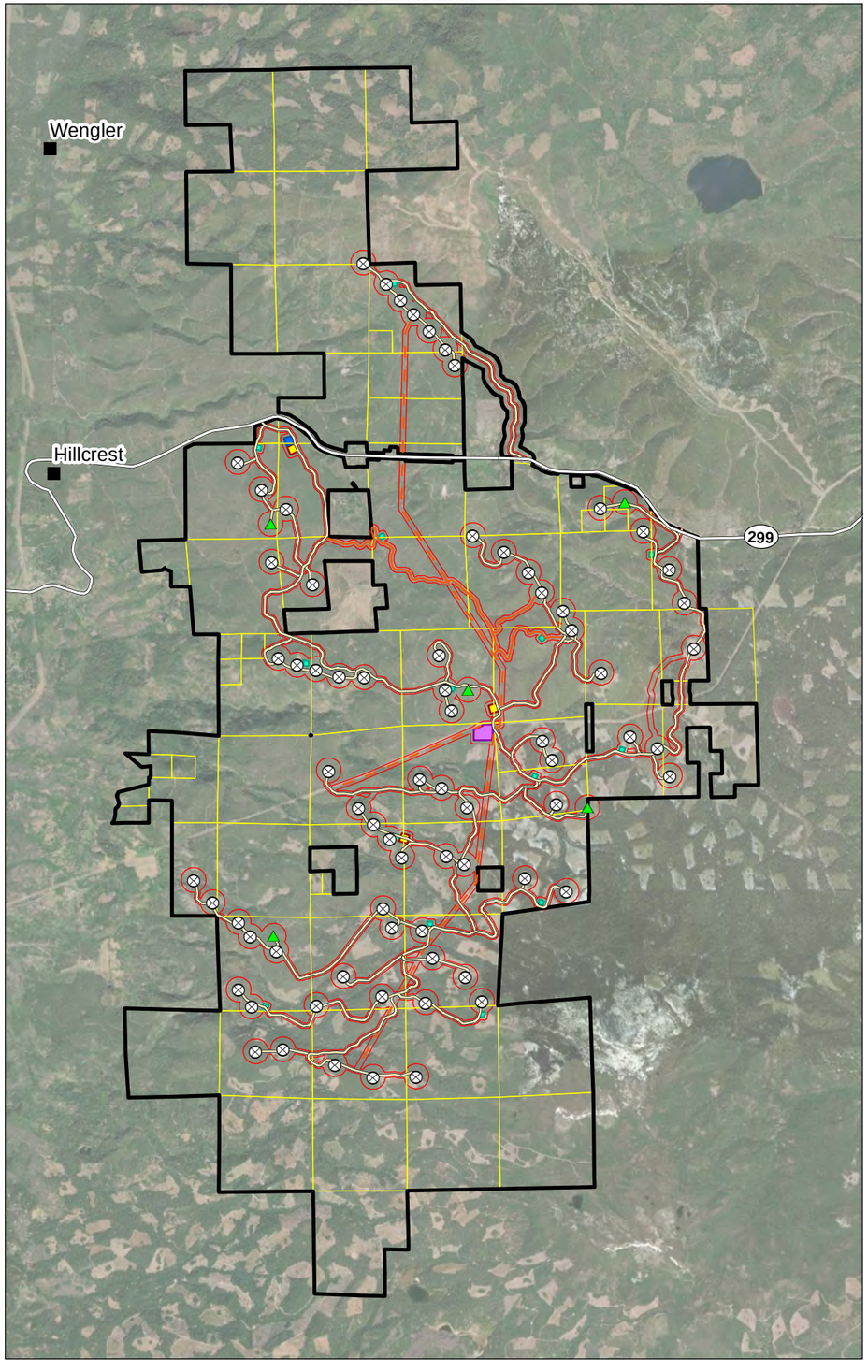
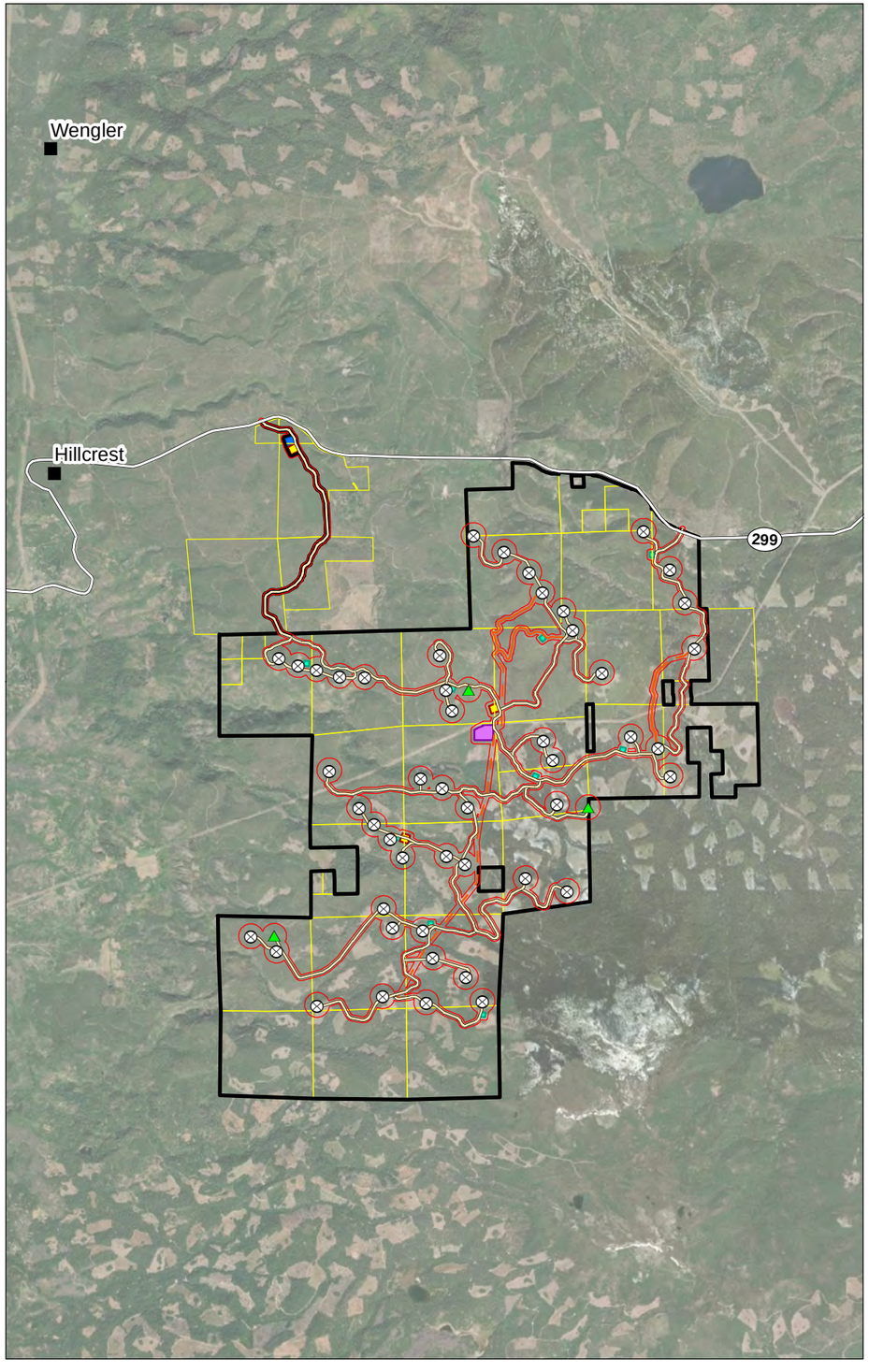
APPENDIX A – Figures

Original Project Layout



Refined Project Layout



Stantec

Legend

- Potential Turbine Location
- Project Site
- Leasehold Area
- MET Tower
- Access Roads
- Overhead Collection
- Underground Collection
- O&M Facility
- Batch Plant
- Staging Area
- Substation
- Parcel Boundary

N

0 1.5 3 Miles

(At original document size of 11x17)
1:96,000

<ita><bol><und>Notes</und></bol></ita>
<bol>1. </bol>Coordinate System: NAD 1983 UTM Zone 10N
<bol>2. Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Project Location
Shasta County
California

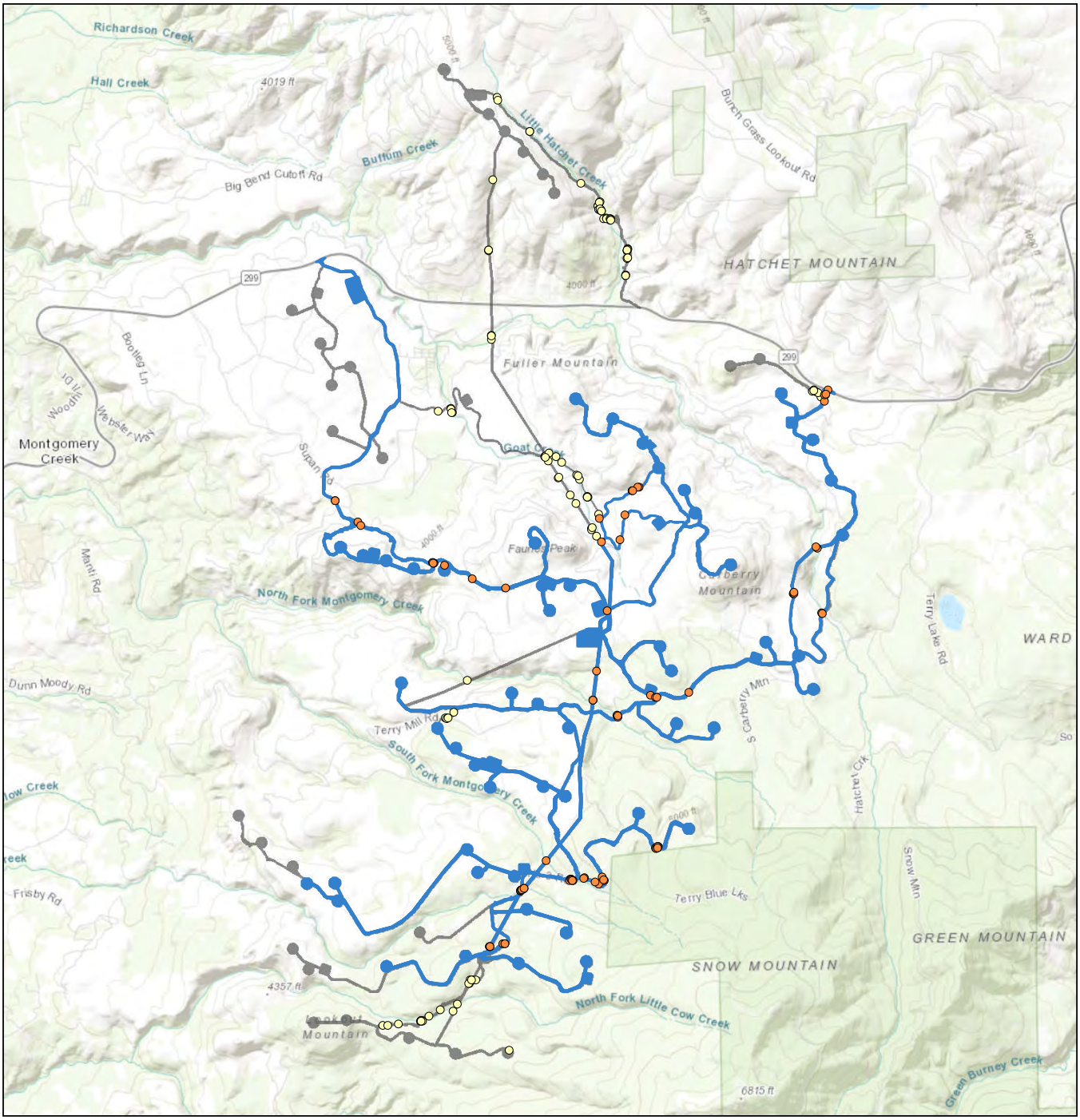
Prepared by LS on 2021-09-09
Reviewed by CB on 2021-09-09
Independent Review by JC 2021-09-09

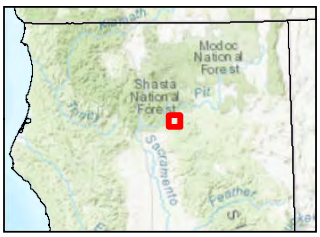
Client/Project 185804576
Fountain Wind Project
ConnectGen Operating LLC

Figure No.
1

Title
Project Location

V:\185\Active\185703743_FountainWind\03_data\gis_cad\gis\mxd\2021\project_layout_compare.mxd Revised: 2021-09-10 By: lansmith





Legend

Aquatic Resources Impact Locations

- Aquatic Resources Impacted by Original and Refined Layout
- Aquatic Resources Avoided by Refined Layout
- Refined Project Layout
- Original Project Layout

0 7,000 Feet

(At original document size of 8.5x11)
1:86,000

N

Stantec

Project Location
Shasta County
California

Prepared by GC on 2021-09-10
TR Review by SC on 2021-09-10

Client/Project
ConnectGen
Fountain Wind Energy

185704576

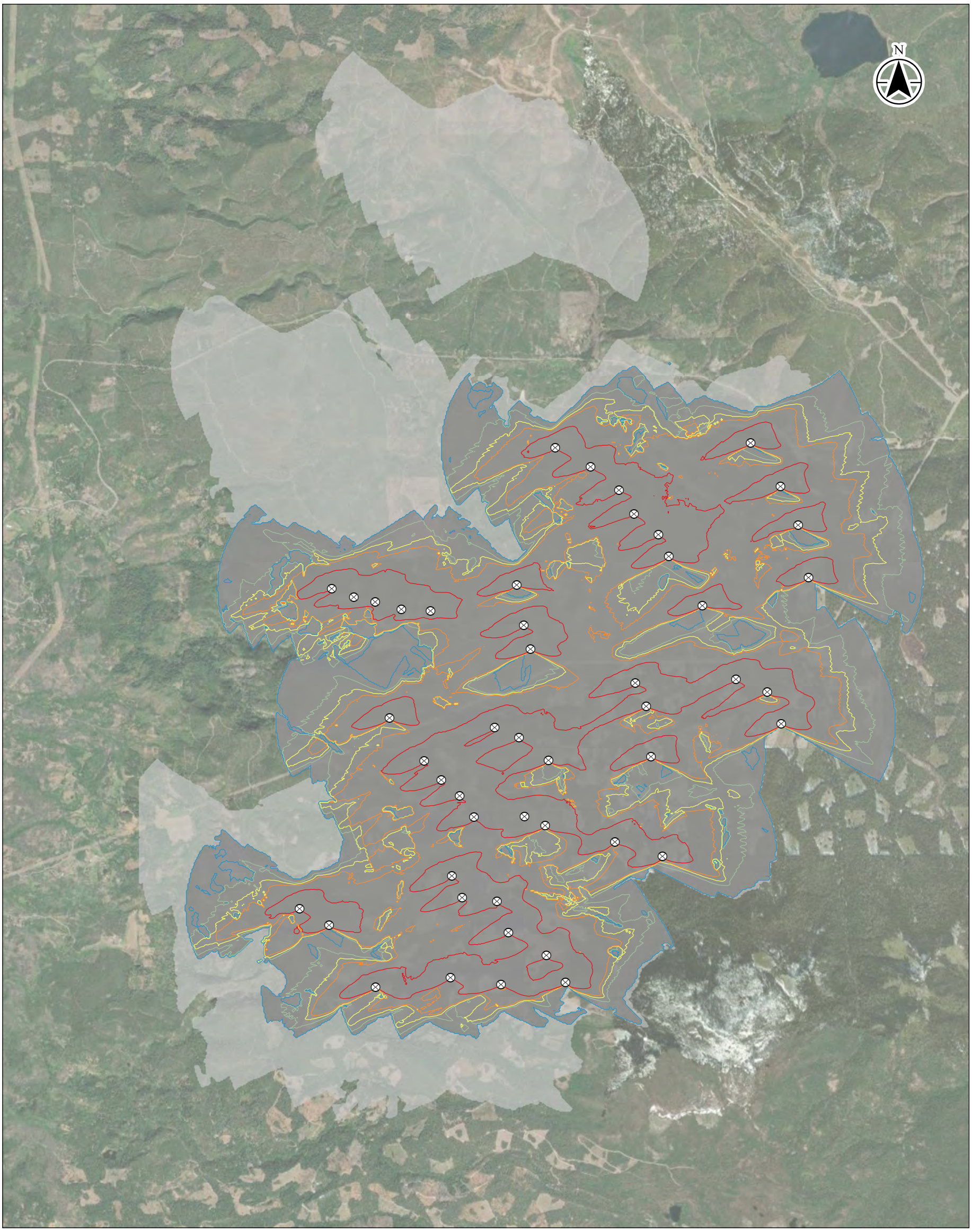
Figure No.
2

DRAFT

Title
Updated Impacts to Aquatic Resources - Refined Project Layout

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N FT
2. Background: ESRI World Topographic Base Map

V:\18571\Active\185703743_FountainWind\03_data\gis_cad\gis\mxd\2021\flicker_compare.mxd Revised: 2021-09-10 By: lansmith



Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

⊗ Potential Turbine Location

Shadow Isolines - 2021

- 0 hours/year
- 10 hours/year
- 20 hours/year
- 30 hours/year
- 100 hours/year
- Reduced Shadow Flicker Area
- Original Shadow Flicker Area

0 1 2 Miles

1:60,000 (At Original document size of 11x17)

Stantec

Project Location
185804576

Shasta County
California

Prepared by LS on 2021-09-09
Technical Review by CB 2021-09-09
Independent Review by JC 2021-09-09

Client/Project

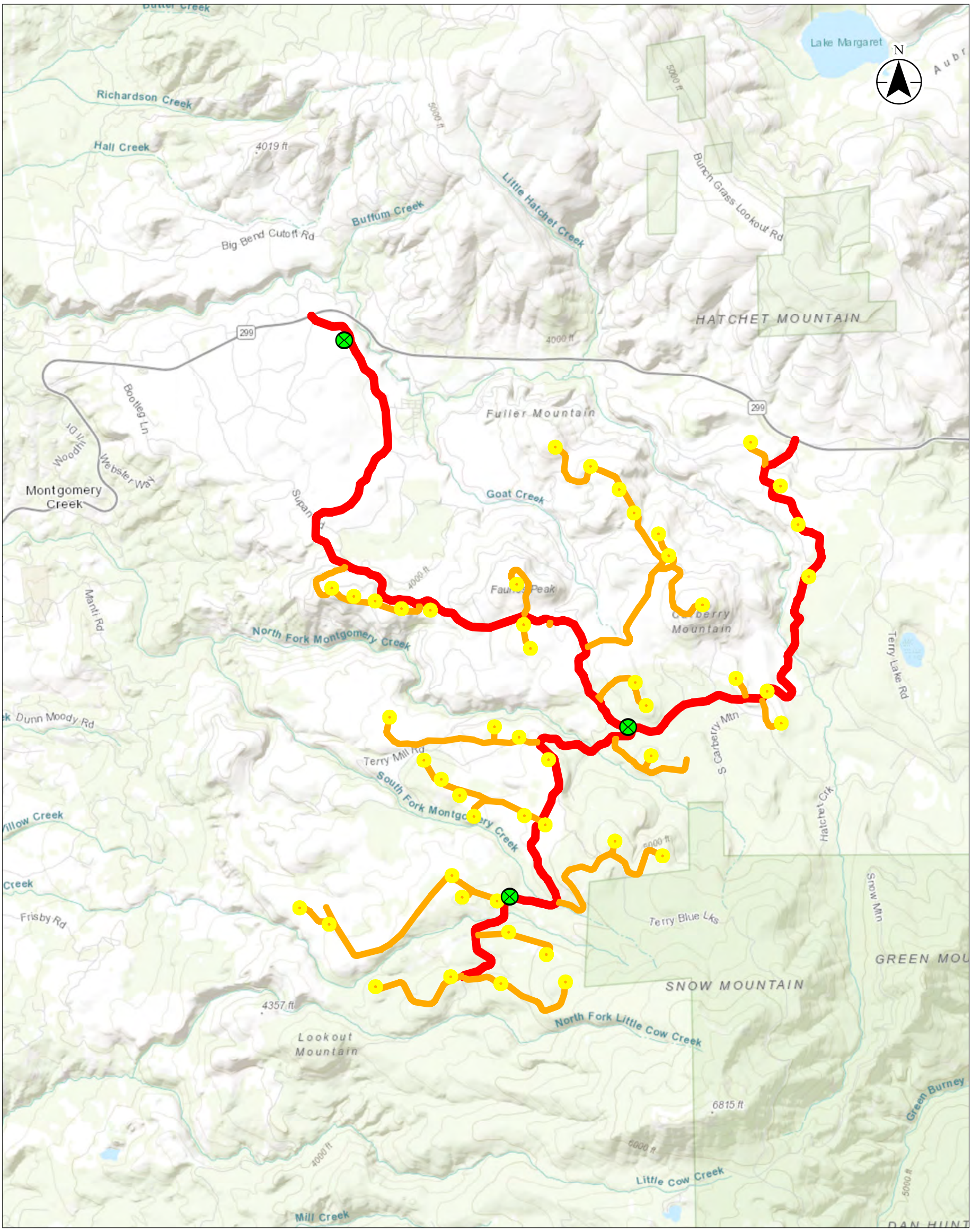
Fountain Wind Project
ConnectGen Operating LLC

Figure No.
3

Title

Comparison of Shadow Flicker Results (2020 vs 2021)

V:\1857\Active\185703743_FountainWind\03_data\gis_cad\gis\mxd\2021\fire_breaks.mxd Revised: 2021-09-10 By: jbarber



Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Service Layer Credits: ESRI online services, 2019

Fire Suppresion Storage

Turbine Fuel Break

Secondary Road Fuel Break

Main Road Fuel Break

0 0.95 1.9 Miles

1:60,000 (At Original document size of 11x17)

Stantec

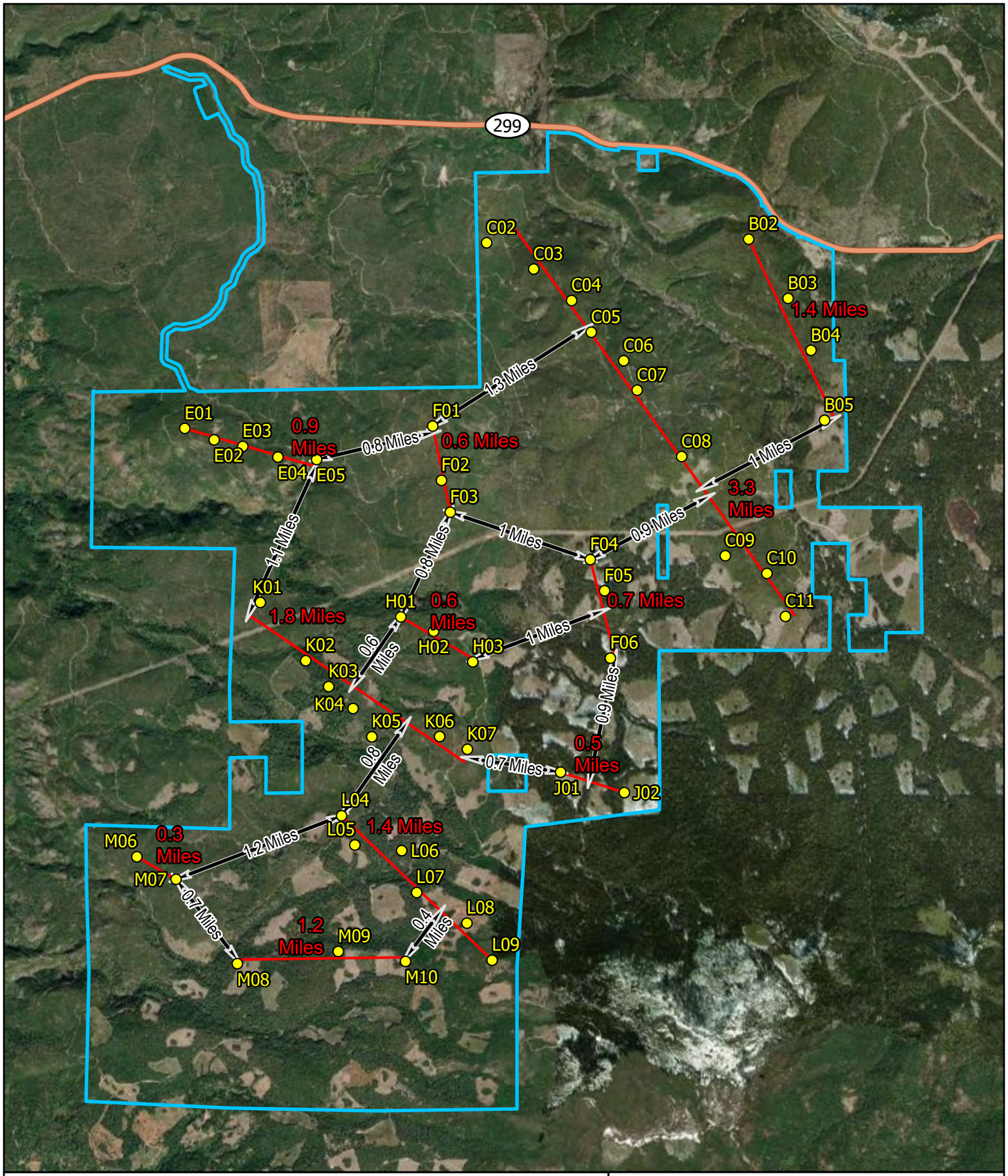
Project Location
Shasta County, California

185703743
Prepared by LS on 2021-09-09
Technical Review by CB 2021-09-09
Independent Review by JC 2021-09-09

Client/Project
Fountain Wind Energy

Figure No.
4a

Title
Fire Breaks



Turbine Locations

Approximate Turbine Strings

Refined Project Area

1 inch = 0.87 mile

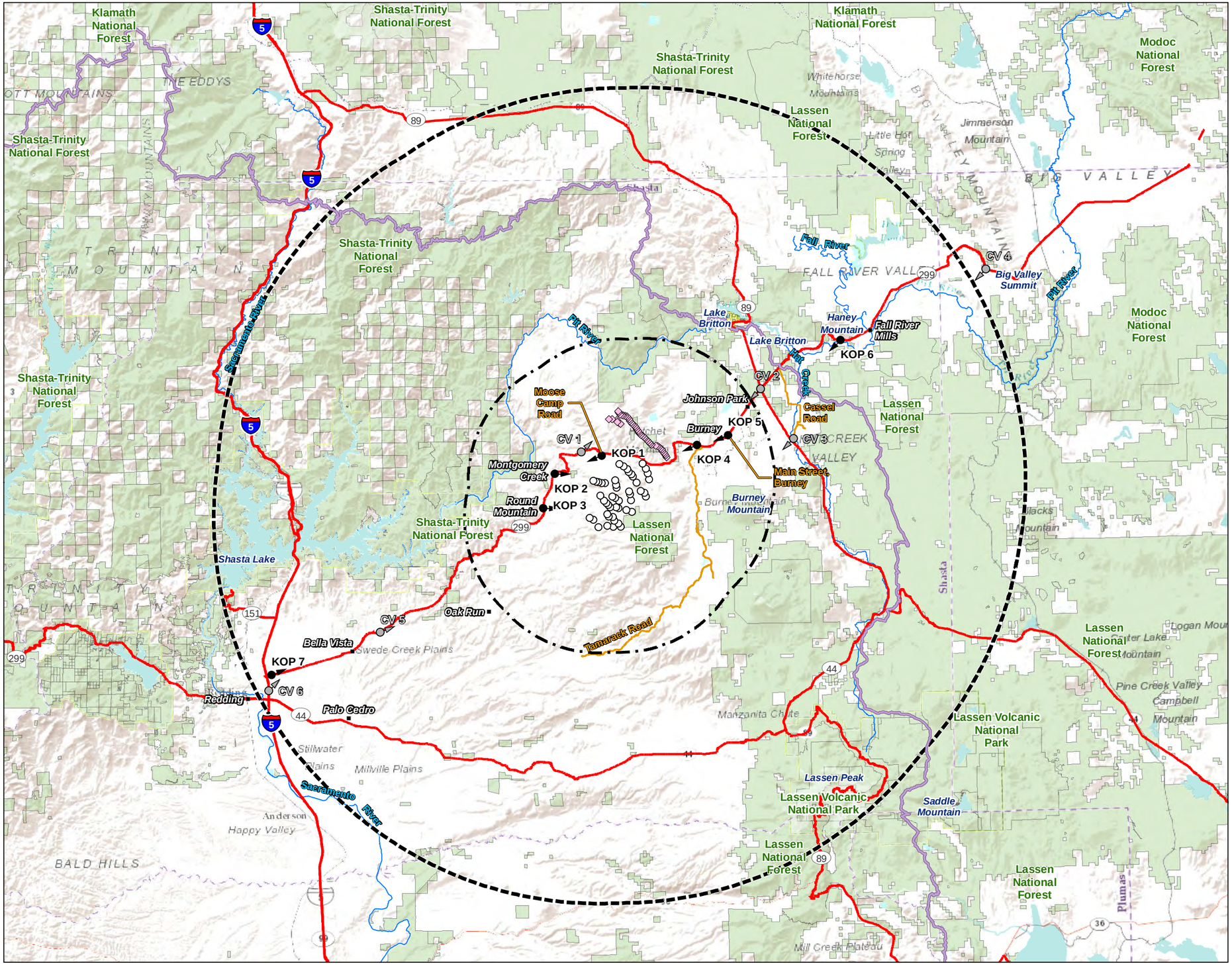
9/10/2021

Miles

0 0.5 1 2

N

Figure 4b. Distance between turbines/strings



Legend

- Potential Turbine Location
- Key Observation Point (KOP)
- Character View (CV) Location
- 10 Mile Radius from Project Boundary
- 30 Mile Radius from Project Boundary
- Hatchett Ridge Wind Project
- Major River
- Pacific Crest Trail
- Major Road
- Local Road
- McArthur-Burney Falls Memorial State Park
- Federal Owned Land

N

0 4 8 Miles

(At original document size of 11x17)
1:506,880

Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: USGS
3. Background: ESRI Terrain Base Map

Project Location
Shasta County
California

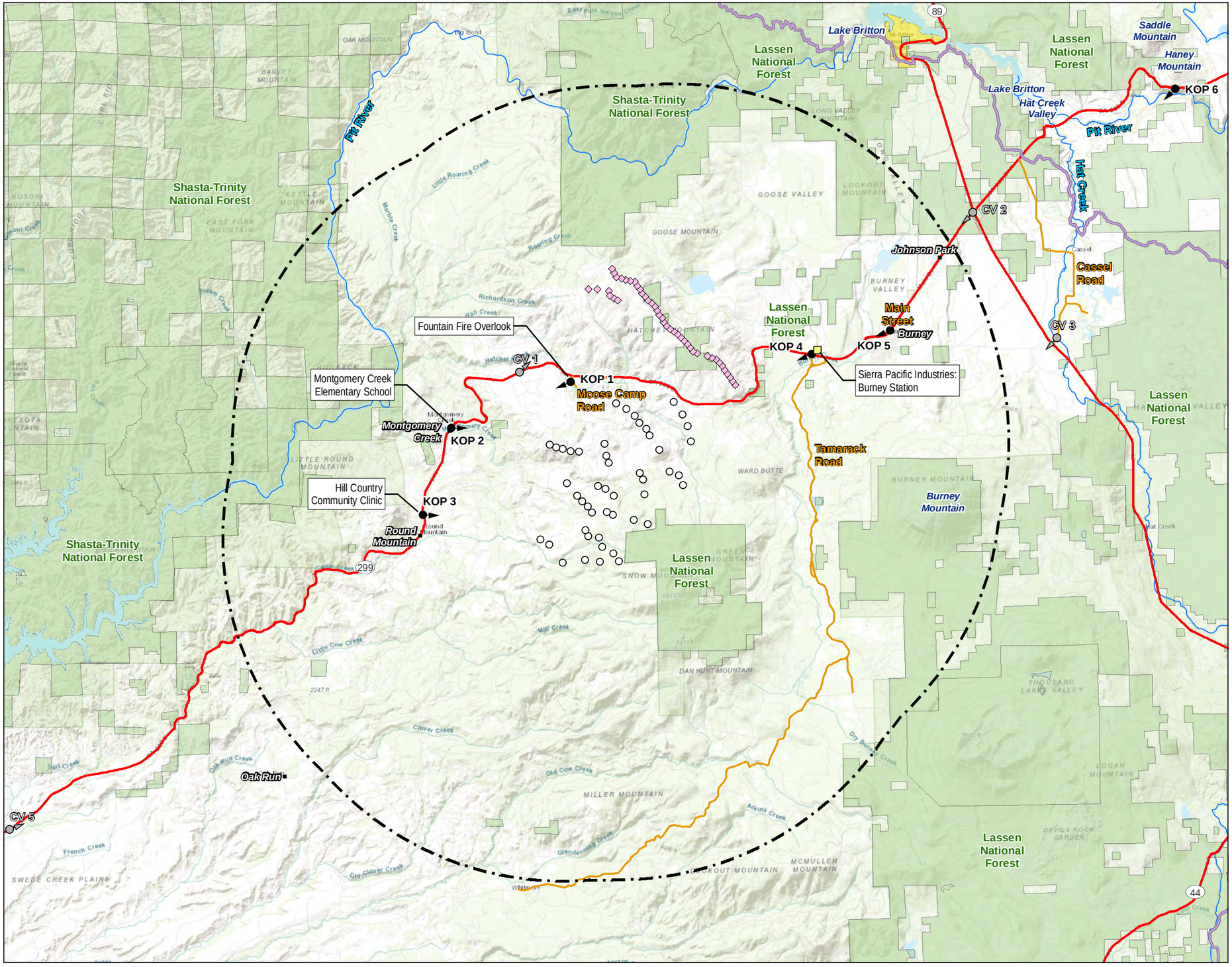
Prepared by GC on 2021-09-08
Reviewed by JH on 2021-09-08

Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
5a

Title
Project Location, Visual Resources, and Key Observation Points



Legend

- Potential Turbine Location
- Key Observation Point (KOP)
- Character View (CV) Location
- 10 Mile Radius from Project Boundary
- Hatchett Ridge Wind Project
- Major River
- Pacific Crest Trail
- Major Road
- Local Road
- McArthur-Burney Falls Memorial State Park
- Federal Owned Land

N

0 3 Miles

(At original document size of 11x17)
1:200,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: USGS
3. Background: ESRI Terrain Base Map

Project Location
Shasta County
California

Prepared by GC on 2021-09-08
Reviewed by JH on 2021-09-08

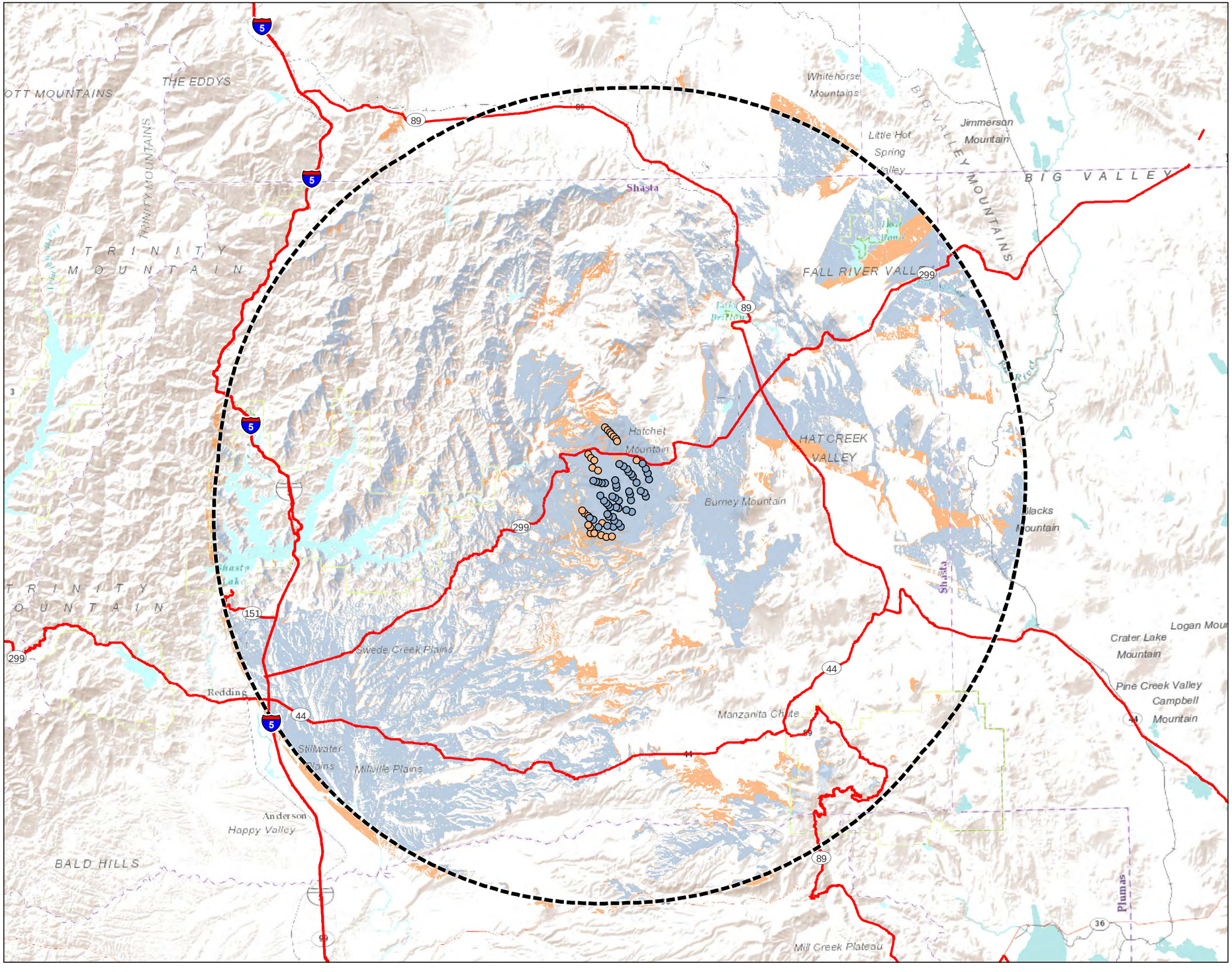
Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
5b

Title
Project Location, Visual Resources, and Key Observation Points - 10 Mile Radius

V:\1956\active_Task Owner and other Non-BC\1956_Jobs\185703743\03_data\gis_cad\gis\mxd\Viewshed\Sept2021_update\185804576_05B_LocationVS_2021.mxd Revised: 2021-09-13 By: gcarpentier



Stantec

Legend

- Refined Project Layout (48 Turbines)
- Proposed Project Layout Turbines Removed
- Proposed Project Visible and Refined Project Not Visible
- Both Proposed and Refined Projects Visible
- Proposed Project Not Visible and Refined Project Visible
- 30 Mile Radius from Refined Project Layout

N

0 4 8 Miles

(At original document size of 11x17)
1:506,880

Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: USGS
3. Background: ESRI Terrain Base Map

Project Location
Shasta County
California

Prepared by GC on 2021-09-13
Reviewed by JH on 2021-09-13

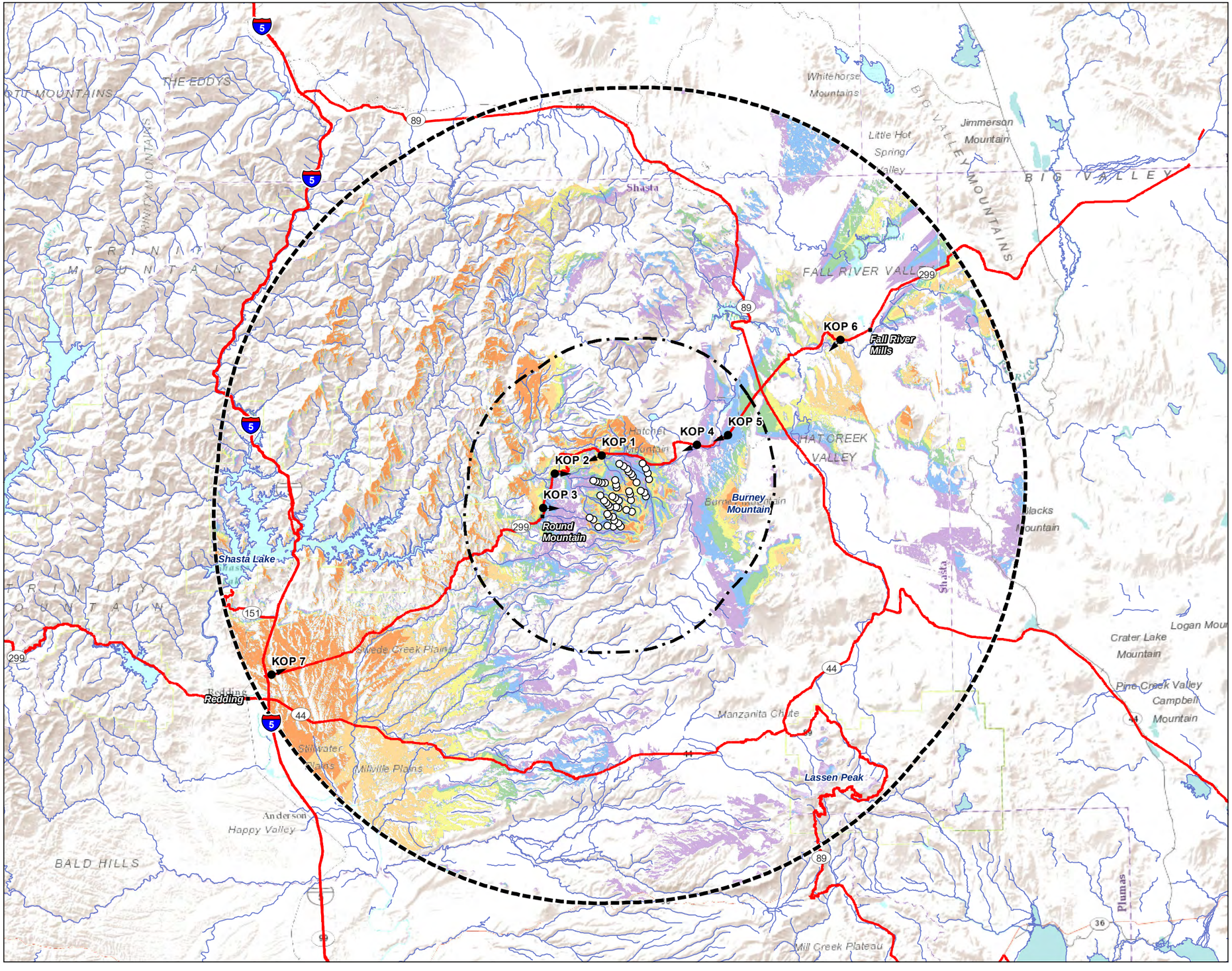
Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
5c

Title
30-Mile Radius Viewshed Turbine Blade Tip – Proposed / Refined Comparative

V:\1956\active_Task Owner and other Non-BC\1956 Jobs\185703743603_data\gis_cad\gis\mxd\Viewshed\Sept2021_update\185804576_05C_30mileBladeTipsComp.mxd Revised: 2021-09-13 By: gcarpentier



Stantec

Legend

- Potential Turbine Location
- Key Observation Point (KOP)
- 10 Mile Radius from Project Footprint
- 30 Mile Radius from Project Footprint
- 30-Mile Radius Viewshed – Turbine Blade Tip

Number of Potential Turbines Visible

- 1 - 8
- 9 - 16
- 17 - 24
- 25 - 32
- 33 - 40
- 41 - 48

N

0 4 8 Miles

(At original document size of 11x17)
1:506,880

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: USGS
3. Background: ESRI Terrain Base Map

Project Location
Shasta County
California

Prepared by GC on 2021-09-08
Reviewed by JH on 2021-09-08

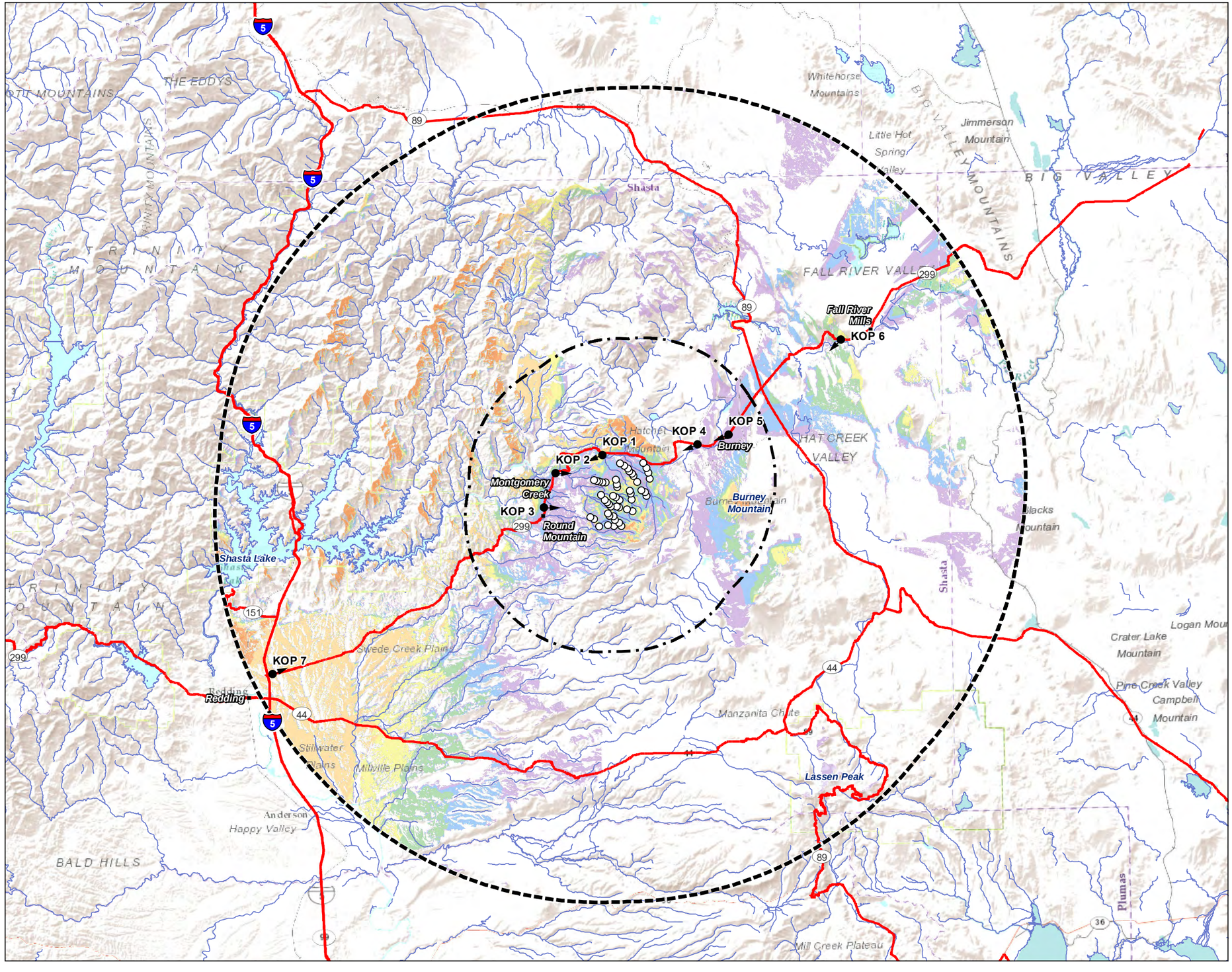
Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
5D

Title
30-Mile Radius Viewshed Turbine Blade Tip – Refined Layout

V:\185\active_Task Owner and other Non-BC\1968 Jobs\185703749\03_data\gis_ca\gis\mxd\Viewshed\Sept2021_update\185804576_05D_30mileBladeTipVS_2021.mxd Revised: 2021-09-13 By: gcarpenter



Stantec

Legend

- Potential Turbine Location
- Key Observation Point (KOP)
- 10 Mile Radius from Project Footprint
- 30 Mile Radius from Project Footprint

30-Mile Radius Viewshed – Hub Height

Number of Potential Turbines Visible

- 1 - 8
- 9 - 16
- 17 - 24
- 25 - 32
- 33 - 40
- 41 - 48

N

0 4 8 Miles

(At original document size of 11x17)
1:506,880

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: USGS
3. Background: ESRI Terrain Base Map

Project Location
Shasta County
California

Prepared by GC on 2021-09-08
Reviewed by JH on 2021-09-08

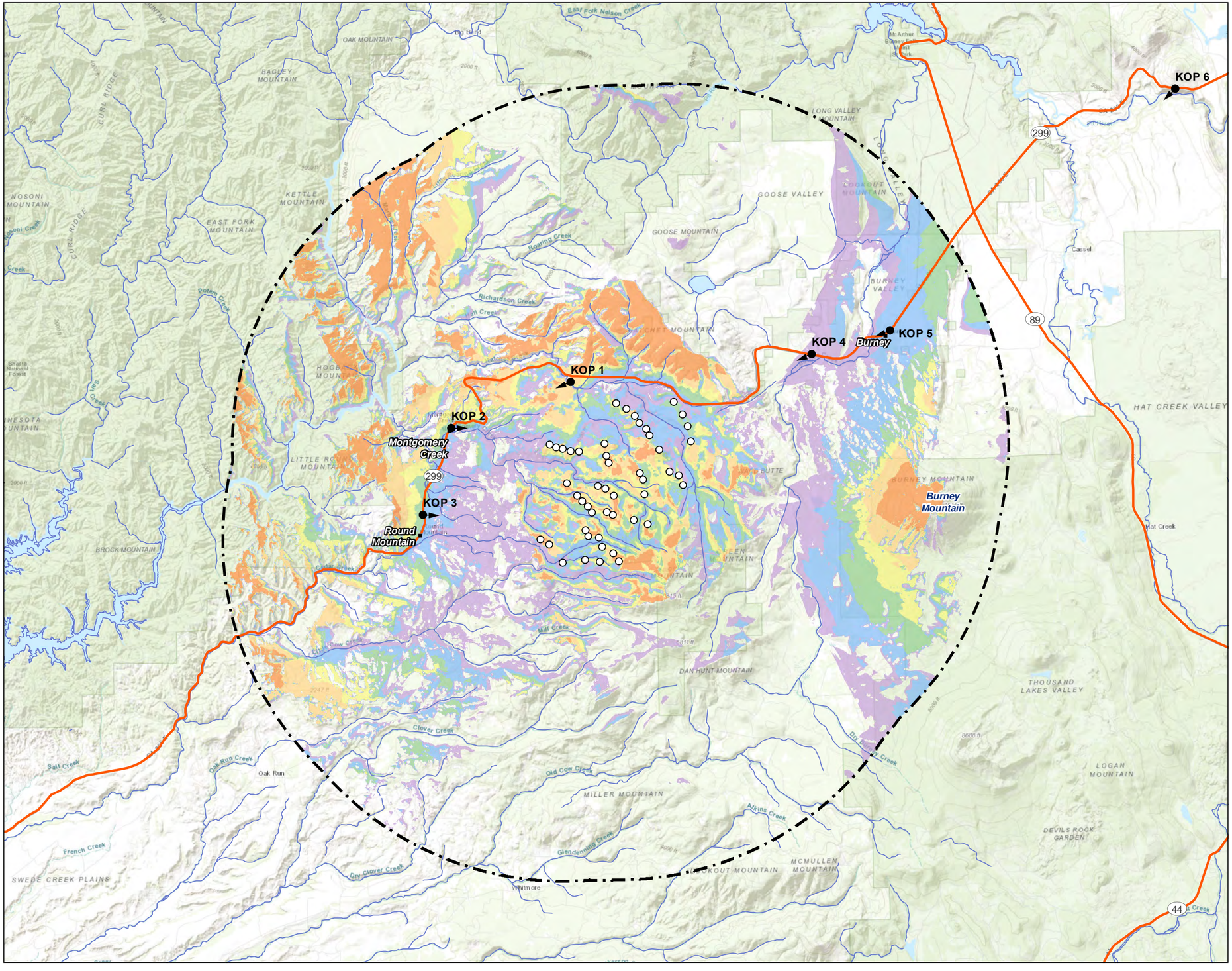
Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
5e

Title
30-Mile Radius Viewshed Hub Height – Refined Layout

V:\185\active_Task Owner and other Non-BC\185 Jobs\185703749\03_data\gis_cad\gis\mxd\Viewshed\Sept2021_update\185804576_05E_30mileHubVS_2021.mxd Revised: 2021-09-13 By: gcarpentier



Stantec

Legend

- Potential Turbine Location
- Key Observation Point (KOP)
- 10 Mile Radius from Project Footprint

10-Mile Radius Viewshed – Turbine Blade Tip

Number of Potential Turbines Visible

- 1 - 8
- 9 - 16
- 17 - 24
- 25 - 32
- 33 - 40
- 41 - 48

N

0 3 Miles

(At original document size of 11x17)
1:200,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: USGS
3. Background: ESRI World Topographic Map

Project Location
Shasta County
California

Prepared by GC on 2021-09-08
Reviewed by JH on 2021-09-08

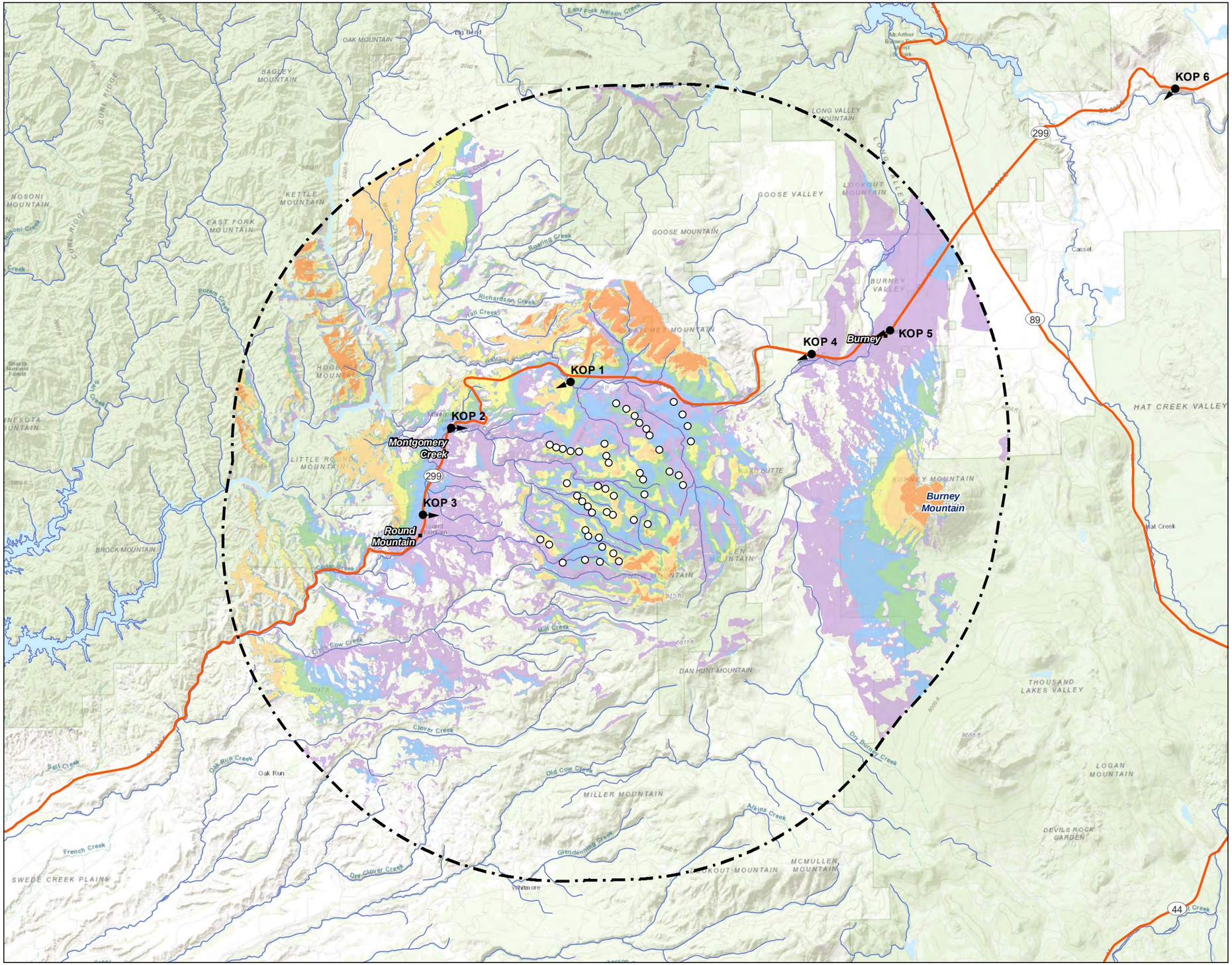
Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
5f

Title
10-Mile Radius Viewshed Turbine Blade Tip – Refined Layout

V:\185\active_Task Owner and other Non-BC\968 Jobs\185703743\03_data\gis_cad\gis\mxd\Viewshed\Sept2021_update\185804576_05F_10mileBladeTip\VS_2021.mxd Revised: 2021-09-13 By: gcarpenter



Stantec

Legend

- Potential Turbine Location
- Key Observation Point (KOP)
- 10 Mile Radius from Project Footprint

10-Mile Radius Viewshed – Hub Height

Number of Potential Turbines Visible

- 1 - 8
- 9 - 16
- 17 - 24
- 25 - 32
- 33 - 40
- 41 - 48

N

0 3 Miles

(At original document size of 11x17)
1:200,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: USGS
3. Background: ESRI World Topographic Map

Project Location
Shasta County
California

Prepared by GC on 2021-09-08
Reviewed by JH on 2021-09-08

Client/Project
Fountain Wind Project
ConnectGen Operating LLC

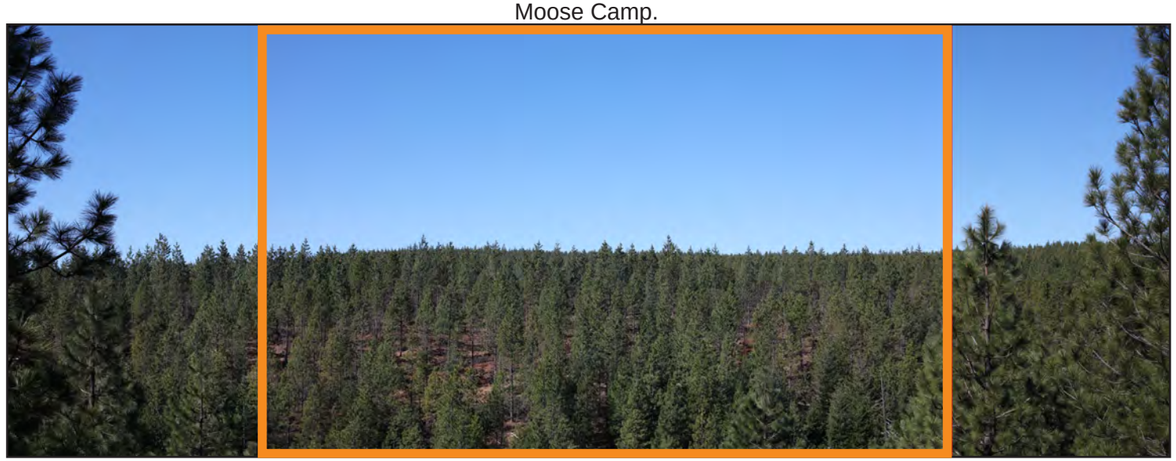
185804576

Figure No.
5g

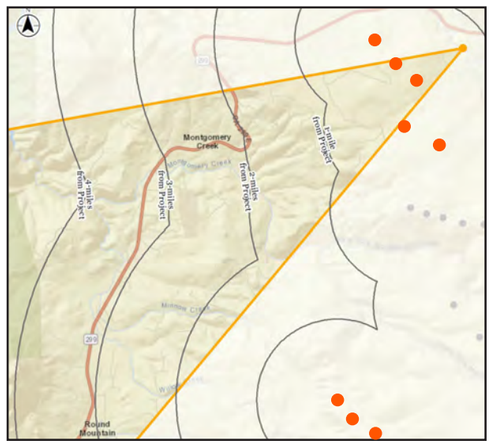
Title
10-Mile Radius Viewshed Hub Height – Refined Layout

A: View from KOP 1 with 72-turbine layout simulated as evaluated in the FEIR. Proposed turbines would be visible just under one mile away. This view was evaluated as an approximation of Project visibility from nearby Moose Camp.

B: There would be no turbines visible from KOP 1 with the 48-turbine layout.



C: Existing view from KOP 1 (outlined) within broader context.



D: Approximate location of turbines within the 40-degree horizontal field of vision represented in the above view. Orange dots indicate turbines removed in refined project layout.

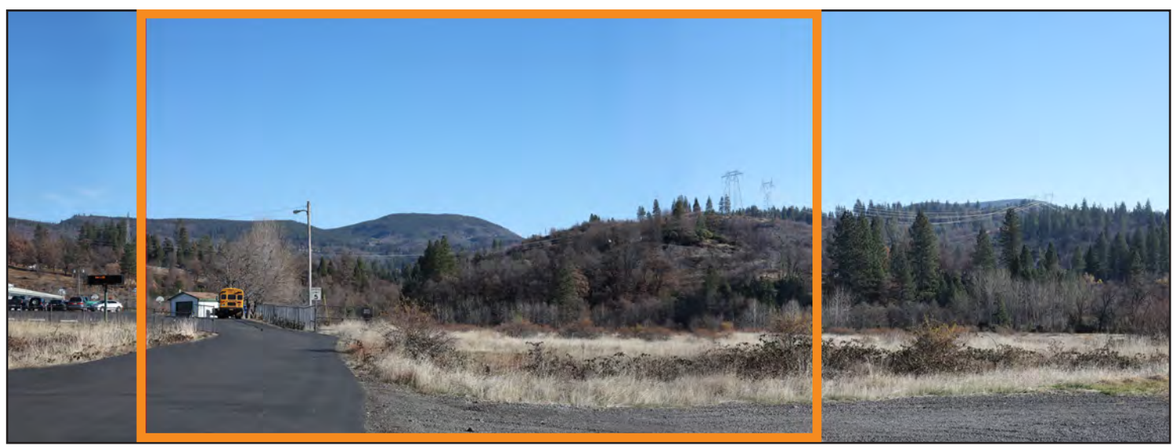
Specifications
Location: 40°51’47.50”N, 121°51’1.23”W
View Direction: West-Southwest
Date & Time: 18 April 2019, 10:38 a.m.
Camera Focal Length: 50 mm
Camera Make / Model: 5DsR
Photo Source: Stantec
Number of Refined Layout Turbines Visible: 0

Stantec

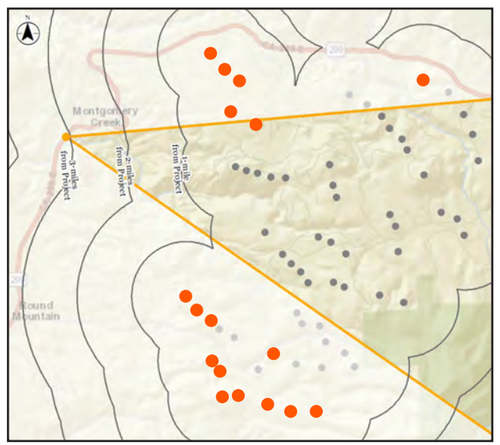
Figure 6-1
KOP 1: Fountain Fire Overlook
Fountain Wind Project

A: View from KOP 2 with 72-turbine layout simulated as evaluated in the FEIR. Proposed turbines would be most visible in the left half of the view, between 3 and 5 miles away.

B: With the 48-turbine layout, one turbine would be removed from the left edge of this view. Other turbines would remain but would appear lower in profile along the ridgeline in the center of the view.



C: Existing view from KOP 2 (outlined) within broader context.



D: Approximate location of turbines within the 40-degree horizontal field of vision represented in the above view. Orange dots indicate turbines removed in refined project layout.

Specifications
Location: 40°50’34.57”N, 121°55’20.54”W
View Direction: East
Date & Time: 13 December 2018, 2:18 p.m.
Camera Focal Length: 50 mm
Camera Make / Model: 5DsR
Photo Source: Stantec
Number of Refined Layout Turbines Visible: 9

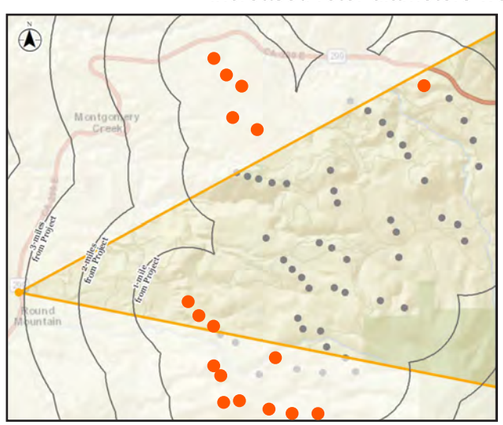
Stantec

Figure 6-2
KOP 2: Montgomery Creek
Fountain Wind Project

A: View from KOP 3 with 72-turbine layout simulated as evaluated in the FEIR. Proposed turbines would be visible between 3 and 6 miles away.

B: With the 48-turbine layout, the three nearest turbines visible in the right of the view evaluated in the FEIR would be removed. The height of other remaining turbines would appear lower along the ridgelines, though their increased rotor diameters would make them slightly more prominent.

C: Existing view from KOP 3 (outlined) within broader context.



D: Approximate location of turbines within the 40-degree horizontal field of vision represented in the above view. Orange dots indicate turbines removed in refined project layout.

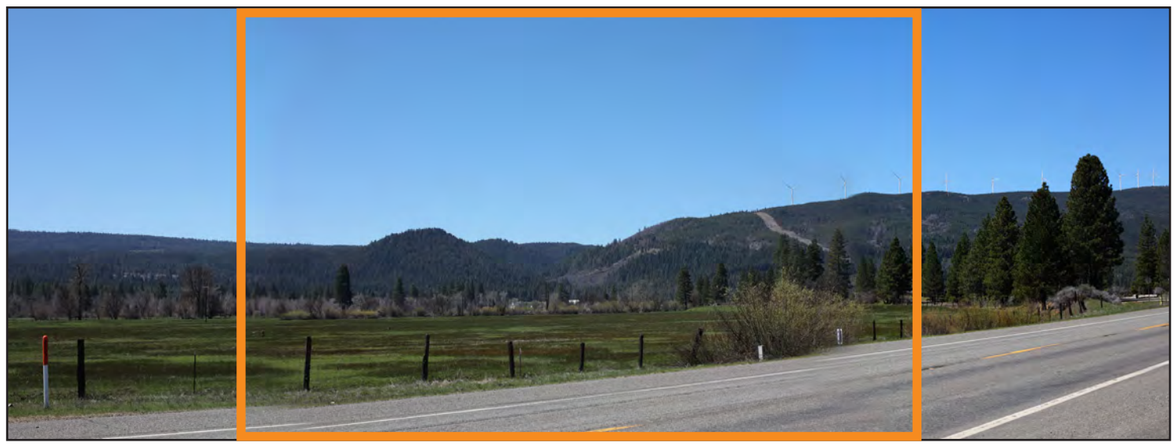
Specifications
Location: 40°48’11.94”N, 121°56’24.44”W
View Direction: East
Date & Time: 13 December 2018; 3:18 p.m.
Camera Focal Length: 50 mm
Camera Make / Model: 5DsR
Photo Source: Stantec
Number of Refined Layout Turbines Visible: 9

Stantec

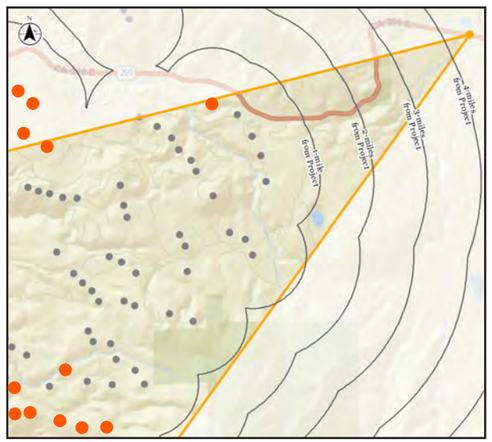
Figure 6-3
KOP 3: Round Mountain
Fountain Wind Project

A: View from KOP 4 with 72-turbine layout simulated as evaluated in the FEIR. Two Project turbines would be visible between 4 and 6 miles away, in the center of the view.

B: With the 48-turbine layout, the nearer of the two Project turbines would be removed and the other would appear slightly shorter.



C: Existing view from KOP 4 (outlined) within broader context.



D: Approximate location of turbines within the 40-degree horizontal field of vision represented in the above view. Orange dots indicate turbines removed in refined project layout.

Specifications
Location: 40°52’27.26”N, 121°42’19.29”W
View Direction: West-Southwest
Date & Time: 18 April 2019, 12:07 p.m.
Camera Focal Length: 50 mm
Camera Make / Model: 5DsR
Photo Source: Stantec
Number of Refined Layout Turbines Visible: 1

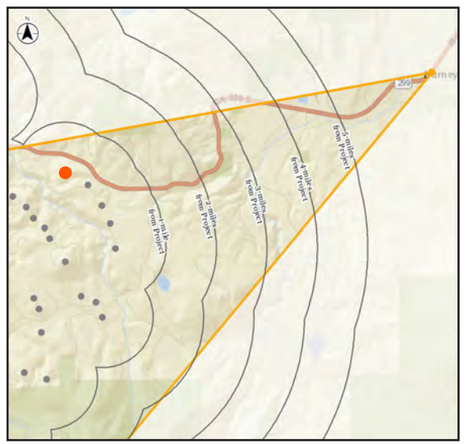
Stantec

Figure 6-4
KOP 4: SR 299 at Tamarack Road
Fountain Wind Project

A: View from KOP 5 with 72-turbine layout simulated as evaluated in the FEIR. The Project turbines in the center of the view would be visible between 7 and 10 miles away and appear to the left of the existing Hatchet Ridge turbines.

B: With the 48-turbine layout, Project turbines would remain in view but appear lower in profile along the ridgeline.

C: Existing view from KOP 5 (outlined) within broader context.



D: Approximate location of turbines within the 40-degree horizontal field of vision represented in the above view. Orange dots indicate turbines removed in refined project layout.

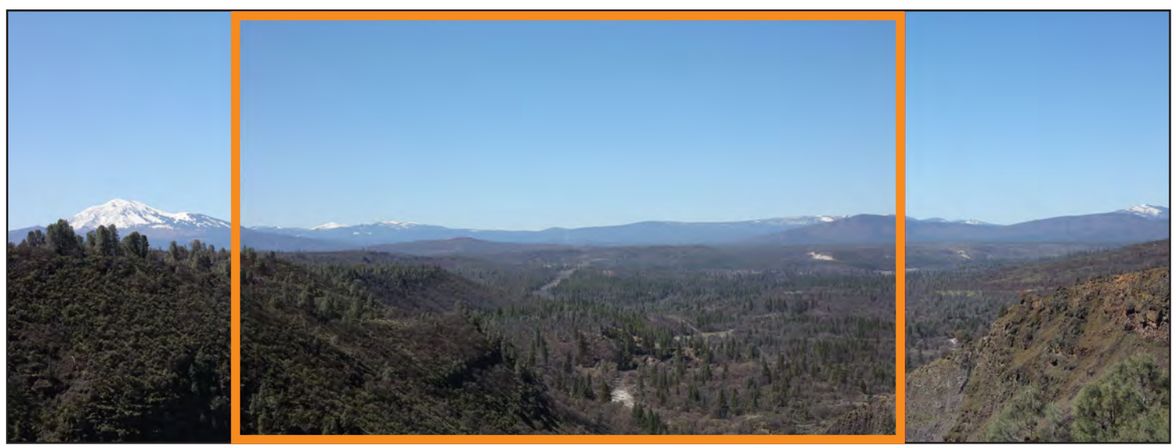
Specifications
Location: 40°53’4.21”N, 121°39’27.93”W
View Direction: West-Southwest
Date & Time: 18 April 2019, 11:08 a.m.
Camera Focal Length: 50 mm
Camera Make / Model: 5DsR
Photo Source: Stantec
Number of Refined Layout Turbines Visible: 7

Stantec

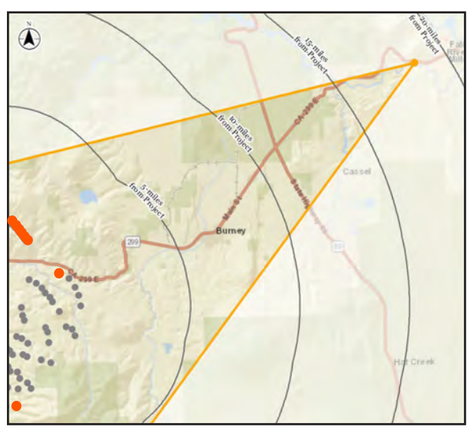
Figure 6-5
KOP 5: Burney
Fountain Wind Project

A: View from KOP 6 with 72-turbine layout simulated as evaluated in the FEIR. The 72-turbine layout would be visible just under 19 miles away, alongside the Hatchet Ridge Wind Project.

B: With the 48-turbine layout, fewer turbines would be discernable along, beneath, and beyond the distant ridgeline. The Project would remain broadly visible in the distance.



C: Existing view from KOP 6 (outlined) within broader context.



D: Approximate location of turbines within the 40-degree horizontal field of vision represented in the above view. Orange dots indicate turbines removed in refined project layout.

Specifications
Location: 40°59’33.61”N, 121°29’2.01”W
View Direction: Southwest
Date & Time: 18 April 2019, 11:42 a.m.
Camera Focal Length: 50 mm
Camera Make / Model: 5DsR
Photo Source: Stantec
Number of Refined Layout Turbines Visible: 23

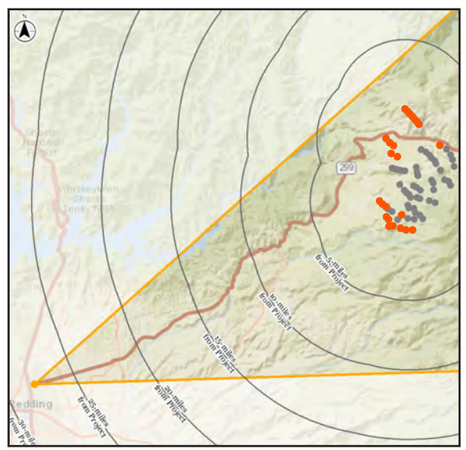
Stantec

Figure 6-6
KOP 6: SR 299-Pit River Overlook
Fountain Wind Project

A: View from KOP 7 with 72-turbine layout simulated as evaluated in the FEIR. Project turbines would be visible just under 28 miles away.

B: With the 48-turbine layout, a reduced number of turbines would be visible within the same general area from this distance.

C: Existing view from KOP 7 (outlined) within broader context.



D: Approximate location of turbines within the 40-degree horizontal field of vision represented in the above view. Orange dots indicate turbines removed in refined project layout.

Specifications
Location: 40°36’48.54”N, 122°21’20.27”W
View Direction: East-Northeast
Date & Time: 18 April 2019, 1:26 p.m.
Camera Focal Length: 50 mm
Camera Make / Model: 5DsR
Photo Source: Stantec
Number of Refined Layout Turbines Visible: 48

Stantec

Figure 6-7
KOP 7: Redding
Fountain Wind Project

APPENDIX B – Updated Shadow Flicker Study

EDR

Memorandum

To:	Henry Woltag ConnectGen, LLC
From:	Lindsay Donahoe Jacob Runner
Date:	September 13, 2021
Reference:	Fountain Wind Farm Updated Shadow Flicker Analysis
EDR Project No:	19255

Introduction

This memorandum report presents the findings of a shadow flicker analysis for the proposed Fountain Wind Farm (the Project) proposed by ConnectGen LLC (Client) in Shasta County, California (Figure 1). The layout evaluated in this analysis includes 48 Siemens Gamesa wind turbines on a 100-meter tower. The shadow flicker impact was evaluated at five receptors within 10 rotor diameters (1,700 meters) of the proposed wind turbines.

Shadow flicker refers to the shadows that a wind turbine casts over structures and observers at times of the day when the sun is directly behind the turbine rotor from an observer's position. During intervals of sunshine, operating wind turbine generators will cast a shadow on surrounding areas as the rotor blades pass in front of the sun, causing a flickering effect while the rotor is in motion. Shadow flicker is most pronounced in northern latitudes during winter months because of the lower angle of the sun in the winter sky. However, it is possible to encounter shadow flicker anywhere for brief periods after sunrise and before sunset (U.S. Department of the Interior, 2005). Shadow flicker does not occur when fog or clouds obscure the sun, or when turbines are not operating.

The distance between a wind turbine and a potential shadow-flicker receptor affects the intensity of the shadows cast by the blades, and therefore the intensity of flickering. Shadows cast close to a turbine will be more intense, distinct, and focused. This is because a greater proportion of the sun's disc is intermittently blocked by the turbine (BERR, 2009). Obstacles such as terrain, vegetation, and/or buildings occurring between residences and wind turbines can significantly reduce or eliminate shadow flicker effects. At distances beyond roughly 10 rotor diameters (approximately 1,700 meters based on the largest turbine model proposed for the Project [SG170]) shadow flicker effects are generally considered negligible (BERR, 2009; DECC, 2011; DOER, 2011).

For this reason, the shadow flicker analysis was run with a study area of 10 rotor diameters (1,700 meters).

The location and duration of shadow flicker can be predicted quite accurately using computer modeling programs and input data regarding turbine locations, turbine dimensions, receptor locations, local topography, and sunshine frequency. A conservative assumption that the turbines are in continuous operation is also applied. Shadow flicker effects predicted by the modeling exercise are expressed in terms of frequency (hours per year) at each receptor location.

Methods

This shadow flicker analysis evaluated the potential impact of 48 Siemens Gamesa SG170 turbines, each with a rotor diameter of 170 meters and a hub height of 100 meters (Figure 2).

WindPRO 3.4 software and the associated Shadow module was used to conduct the shadow flicker analysis. This software is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. Input variables and assumptions used for shadow flicker modeling calculations for the proposed Project include:

- The latitude and longitude coordinates of 48 proposed wind turbine sites (provided by the Applicant).
- The latitude and longitude coordinates for five potential receptors located within the 10-rotor diameter Study Area.
- USGS 1:24,000 topographic mapping and USGS digital elevation model (DEM) data.
- The rotor diameter (170 meters) and hub height (100 meters) for the SG 170 turbine.
- Annual wind rose data (provided by the Applicant) to determine the approximate directional frequency of rotor orientation throughout the year (Table A1 of Attachment A).
- To account for the occurrence of cloudy conditions, the average monthly percent of available sunshine for the nearest National Oceanic and Atmospheric Administration (NOAA) weather station in Sacramento, California was used (Table A2 of Attachment A). Data were obtained from NOAA's "Comparative Climatic Data for the United States through 2015" (http://www.ncdc.noaa.gov).
- No allowance was made for wind being below or above generation speeds. Blades are assumed to be moving during all daylight hours when the sun's elevation is more than 3 degrees above the horizon. Shadow flicker is generally considered imperceptible when the sun is less than 3 degrees above the horizon due to the scattering effect of the atmosphere on low angle sunlight (DECC, 2011).

- In the preliminary analysis, the possible screening effect of trees and buildings adjacent to the receptors was not taken into consideration. In addition, the number and/or orientation of windows in residential receptors were not considered in the analysis.

Based on these variables and assumptions, *WindPRO* was used to calculate the theoretical number of hours per year that shadow flicker would occur at any given location in the vicinity of the Project. These predicted values represent a worst-case scenario. To more accurately calculate the amount of shadow flicker modeled to occur at non-participating receptors predicted to receive over 30-hours in the preliminary analysis, a desktop analysis was conducted to identify obstacles that could fully or partially block shadows at receptor sites. These data were then incorporated into the WindPro model and the analysis of predicted shadow flicker impacts at this receptor was evaluated. The following steps were undertaken as part of this desktop analysis:

1. Orthographic images were imported into the WindPro model (all images are geo-referenced).
2. Using digitizing tools in WindPro, geometric objects were drawn to represent different types of obstacles. Each object was assigned a width, length, and height to reflect the dimensions of the obstacle, as documented through client correspondence and orthographic images.
3. Porosity is then assigned to each obstacle. Low porosity factors (0, 0.2, etc.) were assigned to dense obstacles (such as buildings or stands of conifers) while higher porosity factors (0.5, 0.6, etc.) were assigned to obstacles with less density (such as widely spaced deciduous trees), see Table 1.

Table 1. Summary of Identified Obstacles at Non-Participating Receptors Predicted to Exceed 30 Hours[1]

Receptor ID	Obstacle Types	Obstacle Location Relative to Receptor	Approximate Obstacle Dimensions (meters)	Assigned Porosity Factor
1	Large Stand of Mixed Trees	NW	12 x 60 x 146	0.3
	Large Stand of Mixed Trees	NNE	12 x 128 x 247	0.3
2	Deciduous Tree	W	12 x 8 x 7	0.4
	Open Hedge	N	8 x 30 x 5	0.7
57	Large Stand of Mixed Trees	NW	12 x 24 x 11	0.3

[1] The non-participating receptors identified in this table were identified based on the results of the conservative worst-case analysis modeling. See the Results section of this document for an identification of receptors predicted to receive over 30 hours of shadow flicker per year after the effects of screening were taken into consideration.

No consistent national, state, county, or local standards exist for allowable frequency or duration of shadow flicker from wind turbines at the proposed Project site. The National Association of Regulatory Utility Commissioners (NARUC) recommends a threshold of 30 hours of shadow flicker per year at occupied buildings (NARUC, 2012). Accordingly, a threshold of 30 hours of shadow flicker per year was applied to this Project.

Although shadow flicker has been alleged to cause or contribute to health effects, including seizures, modern wind turbines typically operate at a frequency lower than the typical threshold for photosensitive epilepsy sensitivity, and there is no evidence that wind turbines can trigger seizures (British Epilepsy Association, 2007; Ellenbogen et al., 2012; NHMRC, 2010; DECC, 2011).

Other health effects alleged to be caused by wind turbines are the symptoms associated with Wind Turbine Syndrome including insomnia, headaches, tinnitus, dizziness, nausea, panic attacks, and palpitations. Based on a detailed review of scientific literature and other reports, an expert panel found that, "there is limited scientific evidence of an association from prolonged shadow flicker (exceeding 30 minutes per day) and potential transitory cognitive and physical health effects" (Ellenbogen et al., 2012). Ellenbogen et al. (2012) also concluded, "there is no evidence for a set of health effects, from exposure to wind turbines that could be characterized as a 'Wind Turbine Syndrome.'" The primary concern with shadow flicker is the annoyance it can cause for adjacent homeowners.

The model calculations include the cumulative sum of shadow hours for all turbines. This omni-directional approach reports total shadow flicker results at a receptor regardless of the presence or orientation of windows at the receptor (i.e., it assumes shadows from all directions can be perceived at a receptor, which may or may not be true). A receptor in the model is defined as a one square meter area, one meter above ground level; the actual dimensions of the receptor or window locations are not taken into consideration.

Results

Output from the model includes the following information:

- Calculated shadow flicker time (specific days, maximum hours per day, and total hours per year when shadow flicker is expected) at each of the receptors located in the Study Area.
- Tabulated and plotted time of day that receptors are predicted to receive shadow flicker (Attachment B).

- Shadow isolines, which are used to create maps showing turbine locations, receptors, and projected shadow flicker duration (hours per year; Figure 3).

A summary of the projected shadow flicker at each of the five receptors in the Study Area is presented below:

- 1 (20%) of the receptors may be affected 0-1 hour/year,
- 3 (60%) of the receptors may be affected 1-10 hours/year,
- 0 (0%) of the receptors may be affected 10-20 hours/year,
- 0 (0%) of the receptors may be affected 20-30 hours/year,
- 1 (20%) of the receptors may be affected for more than 30 hours/year.

As these results indicate, 80% of the receptors are predicted to receive less than 30 hours of shadow flicker per year, with 80% of the receptors also predicted to receive less than 10 hours of shadow flicker per year. At most receptor locations, shadow flicker will occur primarily in the early morning or late afternoon and will generally last less than 1 hour per day. The maximum daily duration of shadow flicker is 50 minutes (at participating receptor 58, see Attachment B).

The one receptor predicted to receive over 30 hours of shadow flicker per year is a participating receptor. Table 2 provides the results of the predicted shadow flicker for all receptors included in this analysis and Figure 4 provides a detailed map of these receptors. The times of day and duration of shadow flicker experienced by each receptor will vary throughout the calendar year based on the position of the sun in the sky and the direction of prevailing winds. See Attachment B for detailed calendars that illustrate the specific times of year and day that shadow flicker may occur at all receptors.

Table 2. Summary of Shadow Flicker Results

Receptor ID	Project Status	Predicted Annual Shadow Flicker (hh:mm)	Predicted Max Daily Shadow Flicker (hh:mm)	Predicted Shadow Flicker (days/year)
43	Non-Participating – Inholding	0:00	0:00	0
1	Non-Participating – Inholding	3:04	0:29	45
57	Non-Participating – Lammers Trust	5:08	0:23	40
2	Non-Participating – Lammers Trust	6:55	0:25	48
58	Participating – Leased Land	39:40	0:50	132

Conclusion

In summary, as a result of modeling the proposed Siemens Games SG 170 turbine model, *WindPRO* predicted that one receptor will receive more than 30 hours of shadow flicker per year; however, that one receptor is a Project participant. The primary concern with shadow flicker is the annoyance that it can cause for adjacent homeowners. A common finding is that annoyance is lower among residents who benefited economically from the wind turbines (i.e., project participants; Michaud et al., 2016). Based on this turbine layout and model selected, there are no non-participating receptors that are predicted to receive more than 30 hours/year of shadow flicker, the proposed threshold as described above.

References

British Epilepsy Association. 2007. Photosensitive Epilepsy. Epilepsy Action, Yeadon Leeds, UK.

Business Enterprise & Regulatory Reform (BERR). 2009. *Onshore Wind: Shadow Flicker* [website]. Available at: https://webarchive.nationalarchives.gov.uk/20081013125014/http://www.berr.gov.uk/whatwedo/energy/sources/renewables/planning/onshore-wind/shadow-flicker/page18736.html.

Department of Energy and Climate Change (DECC). 2011. *Update of UK Shadow Flicker Evidence Base: Final Report*. Parsons Brinckerhoff, London, UK, p. 5.

Ellenbogen, J. M., S. Grace, W. J. Heigher-Bernays, J. F. Manwell, D. A. Mills, K. A. Sullivan, M. G. Weisskopf. 2012. Wind Turbine Health Impact Study: Report of Independent Expert Panel. January 2012. Prepared for Massachusetts Department of Environmental Protection and Massachusetts Department of Public Health. Available at: http://www.mass.gov/eea/docs/dep/energy/wind/turbine-impact-study.pdf

Massachusetts Department of Energy Resources (DOER). 2011. *Model Amendment to a Zoning Ordinance or By-law: Allowing Conditional Use of Wind Energy Facilities.* Available at Available at: http://www.mass.gov/eea/docs/doer/gca/wind-not-by-right-bylaw-june13-2011.pdf.

Michaud et. al. 2016. Estimating Annoyance to Calculated Wind Turbine Shadow Flicker is Improved when Variables Associated with Wind Turbine Noise Exposure are considered. Journal of the Acoustical Society of America 139, 1480.

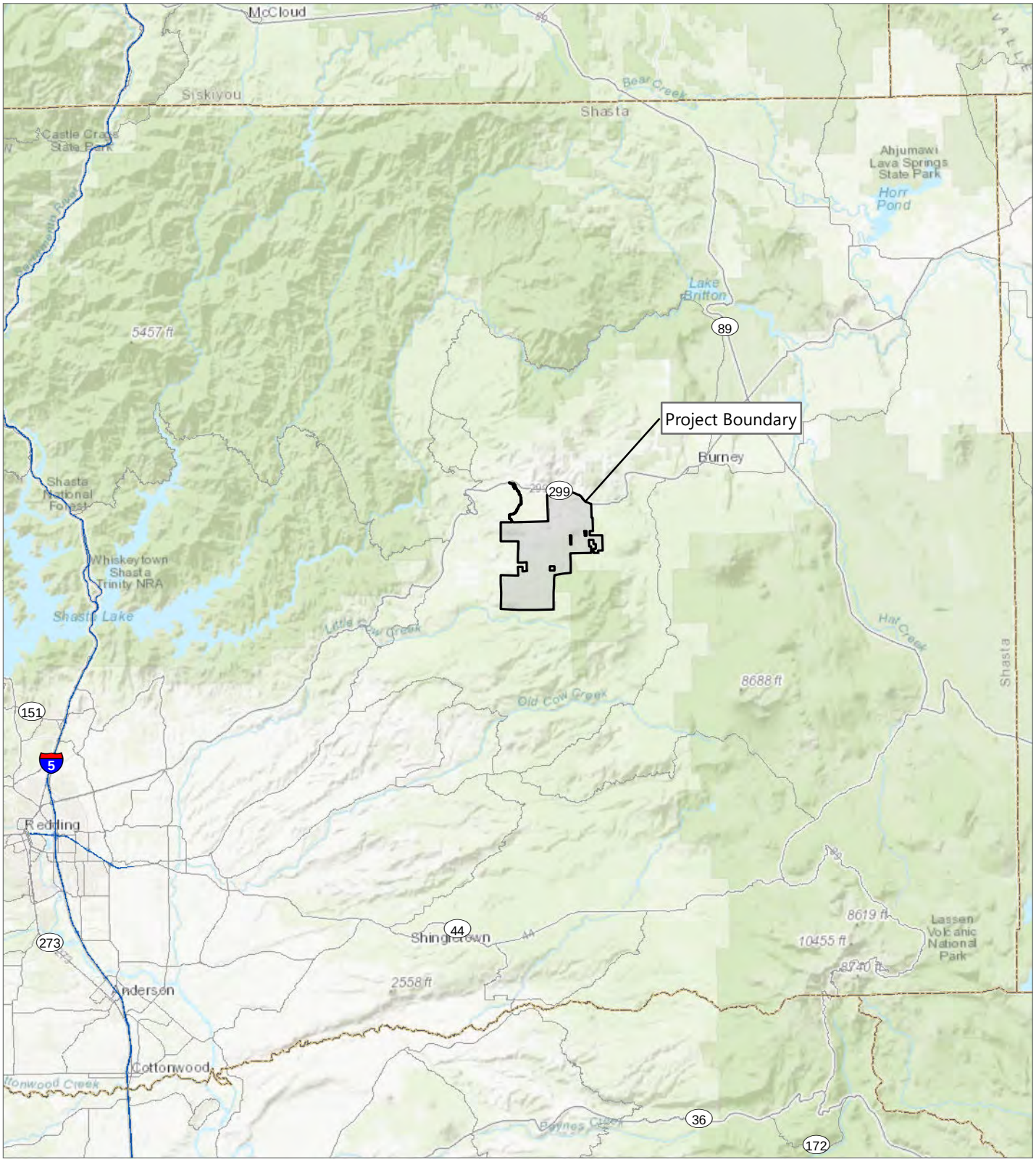
National Association of Regulatory Utility Commissioners (NARUC). 2012. *Wind Energy & Wind Park Siting and Zoning Best Practices and Guidance for States.* A report for the Minnesota Public Utilities Commission Funded by the U.S. Department of Energy. January 2012.

National Health and Medical Research Council (NHMRC). 2010. *Wind Turbines and Health: A Rapid Review of the Evidence.* Australian Government, July 2010.

U.S. Department of the Interior. 2005. *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States.* Bureau of Land Management.

Figures

Figure 1. Regional Project Location



Fountain Wind
Shasta County, California

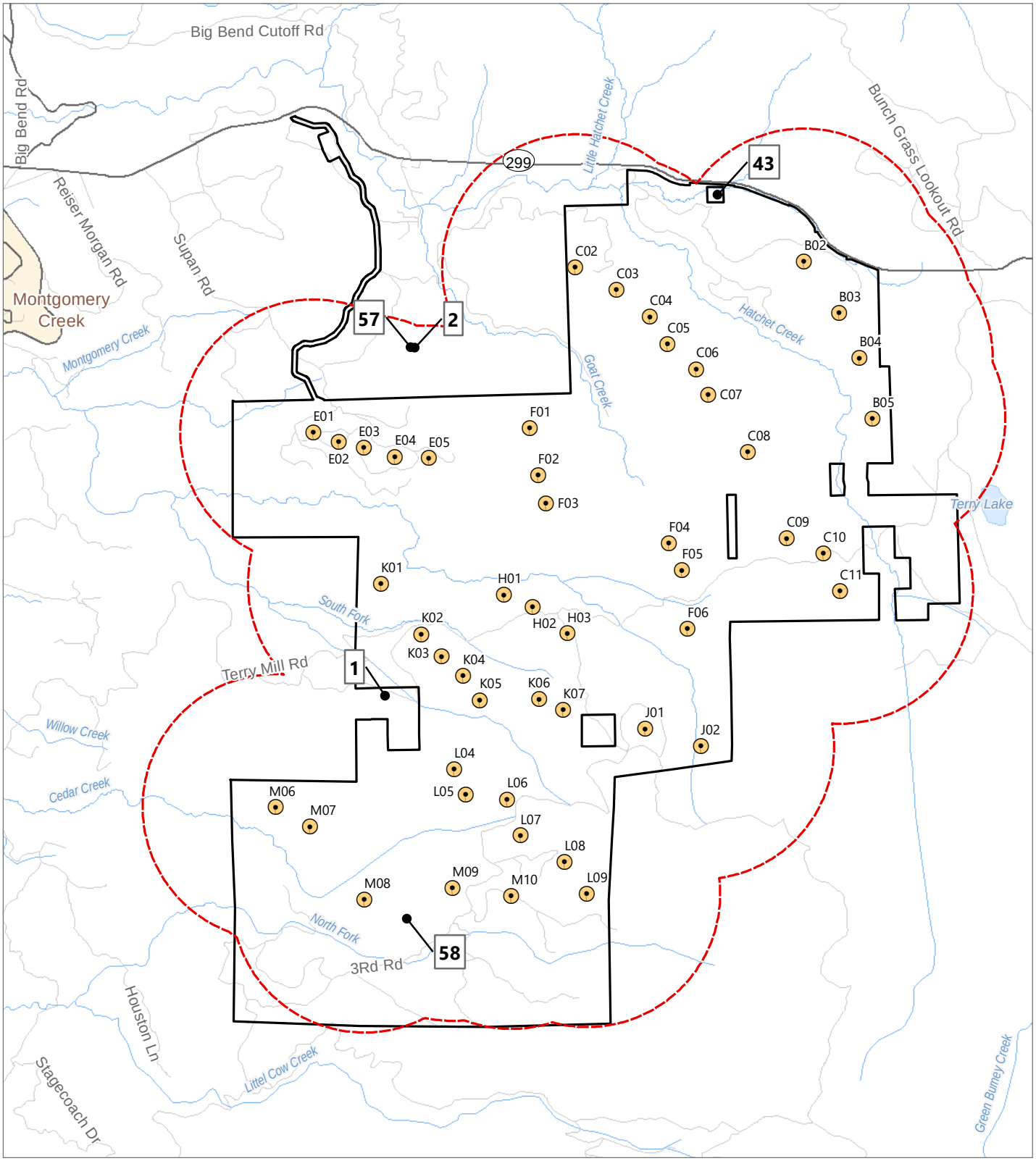
Shadow Flicker Analysis

0 2.5 5 10
Miles

Prepared September 13, 2021
Basemap: ESRI ArcGIS Online "World Topographic Map" map service.

EDR

Figure 2. Proposed Turbine Layout



Fountain Wind
Shasta County, California

Shadow Flicker Analysis

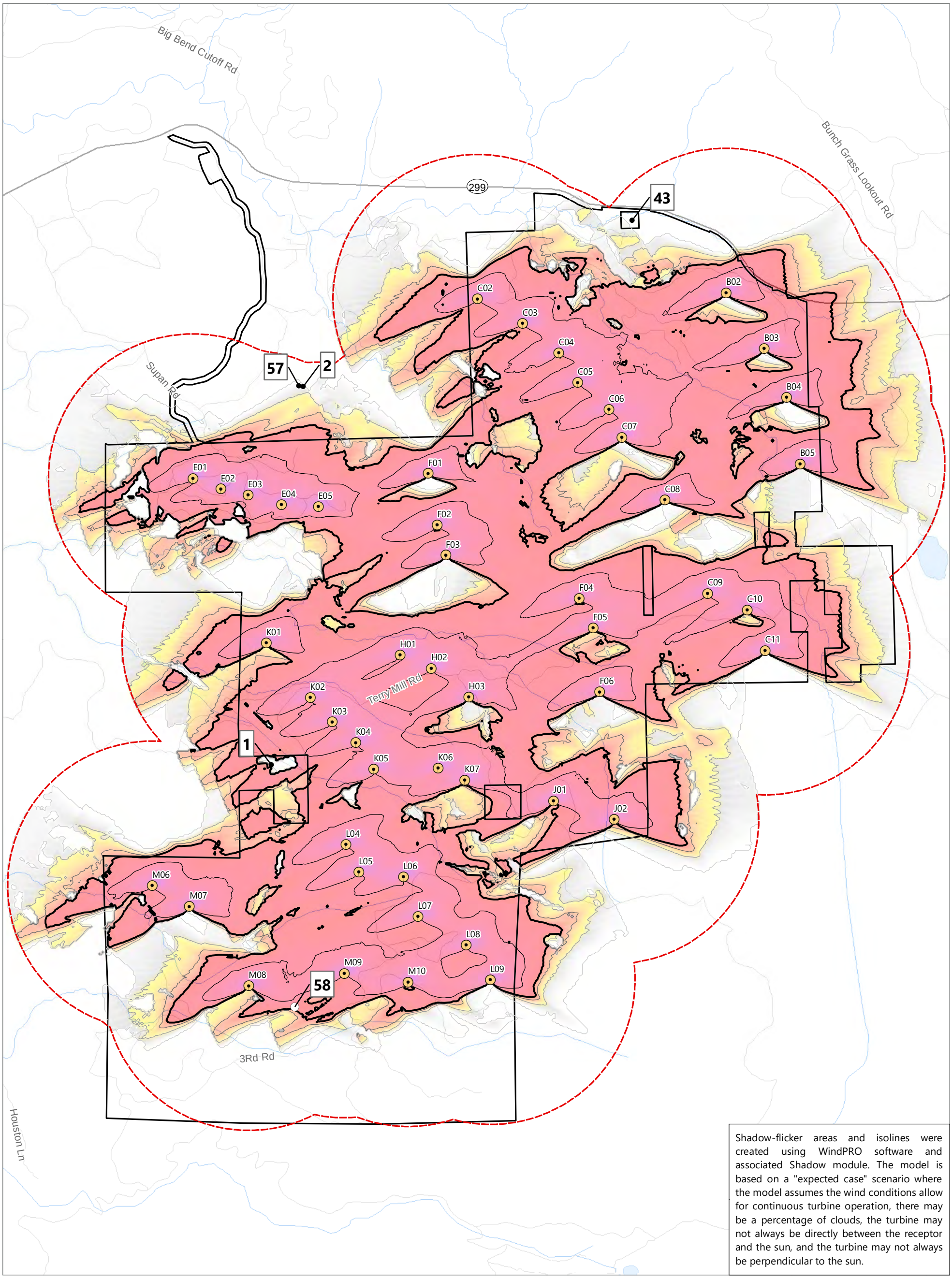
Receptor
Wind Turbine
Project Boundary
1,700-meter Study Area

0 0.5 1 2
Miles

Prepared September 13, 2021
Basemap: Esri StreetMap North America, 2008.

EDR

Figure 3. Projected Shadow Flicker



Fountain Wind

Shasta County, California

Shadow Flicker Analysis

Receptor < 30 Hours/Year
Participant > 30 Hours/Year
Wind Turbine
Project Boundary
1,700-meter Study Area

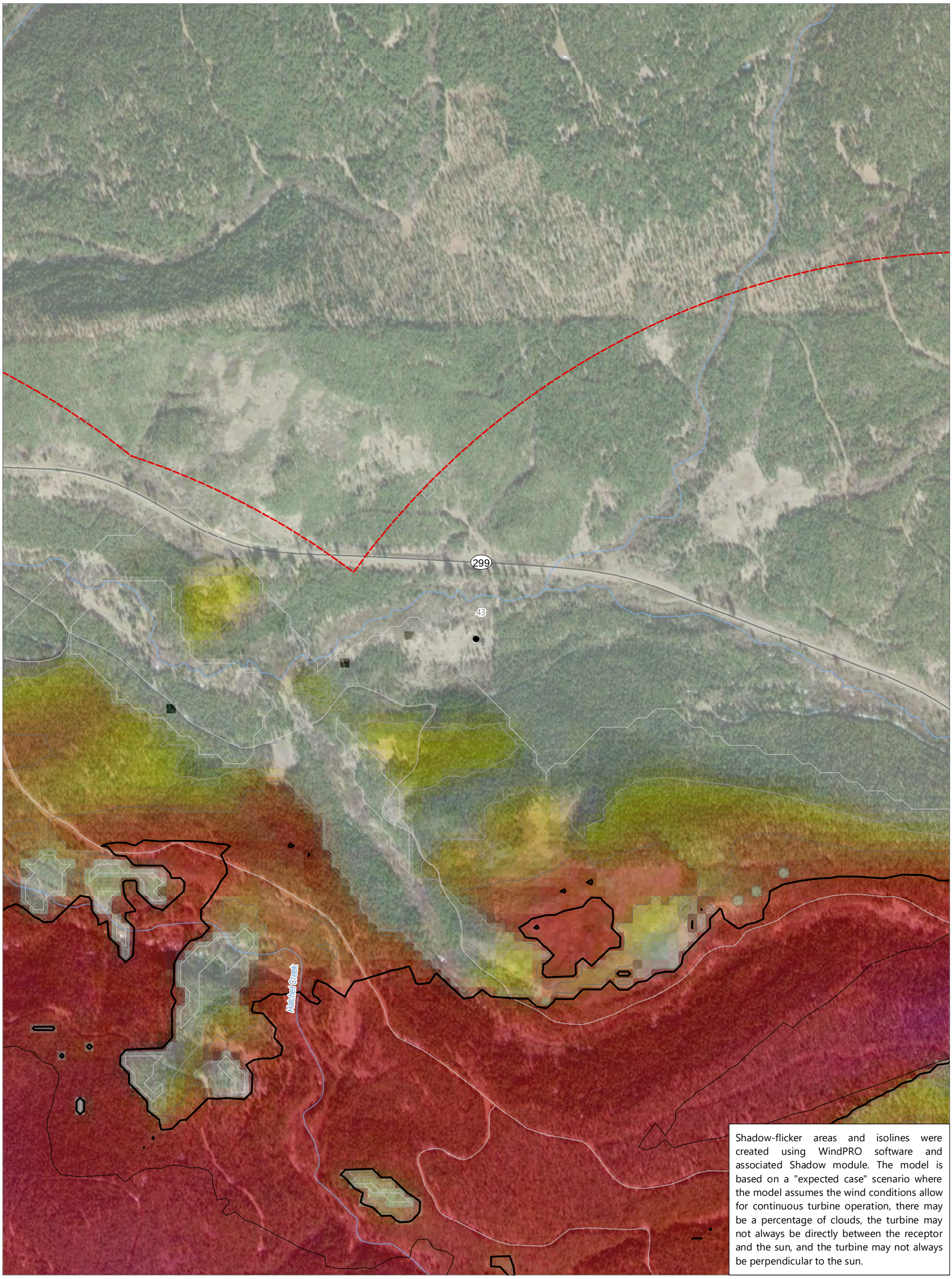
Shadow Isolines
0 hours/year
10 hours/year
20 hours/year
30 hours/year
100 hours/year

Shadow Flicker (hours/year)
< 1
1 - 10
10 - 20
20 - 30
30 - 100
> 100

0 0.5 1 2
Miles

Prepared September 13, 2021
Basemap: ESRI StreetMap North America, 2008.

Figure 4. Projected Shadow Flicker Details



Shadow-flicker areas and isolines were created using WindPRO software and associated Shadow module. The model is based on a "expected case" scenario where the model assumes the wind conditions allow for continuous turbine operation, there may be a percentage of clouds, the turbine may not always be directly between the receptor and the sun, and the turbine may not always be perpendicular to the sun.

Fountain Wind

Shasta County, California

Shadow Flicker Analysis

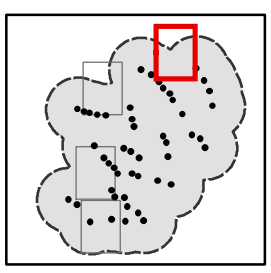
- Receptor < 30 Hours/Year
- Participant > 30 Hours/Year
- Wind Turbine
- 1,700-meter Study Area

Shadow Isolines

- 0 hours/year
- 10 hours/year
- 20 hours/year
- 30 hours/year
- 100 hours/year

Shadow Flicker (hours/year)

- < 1
- 1 - 10
- 10 - 20
- 20 - 30
- 30 - 100
- > 100



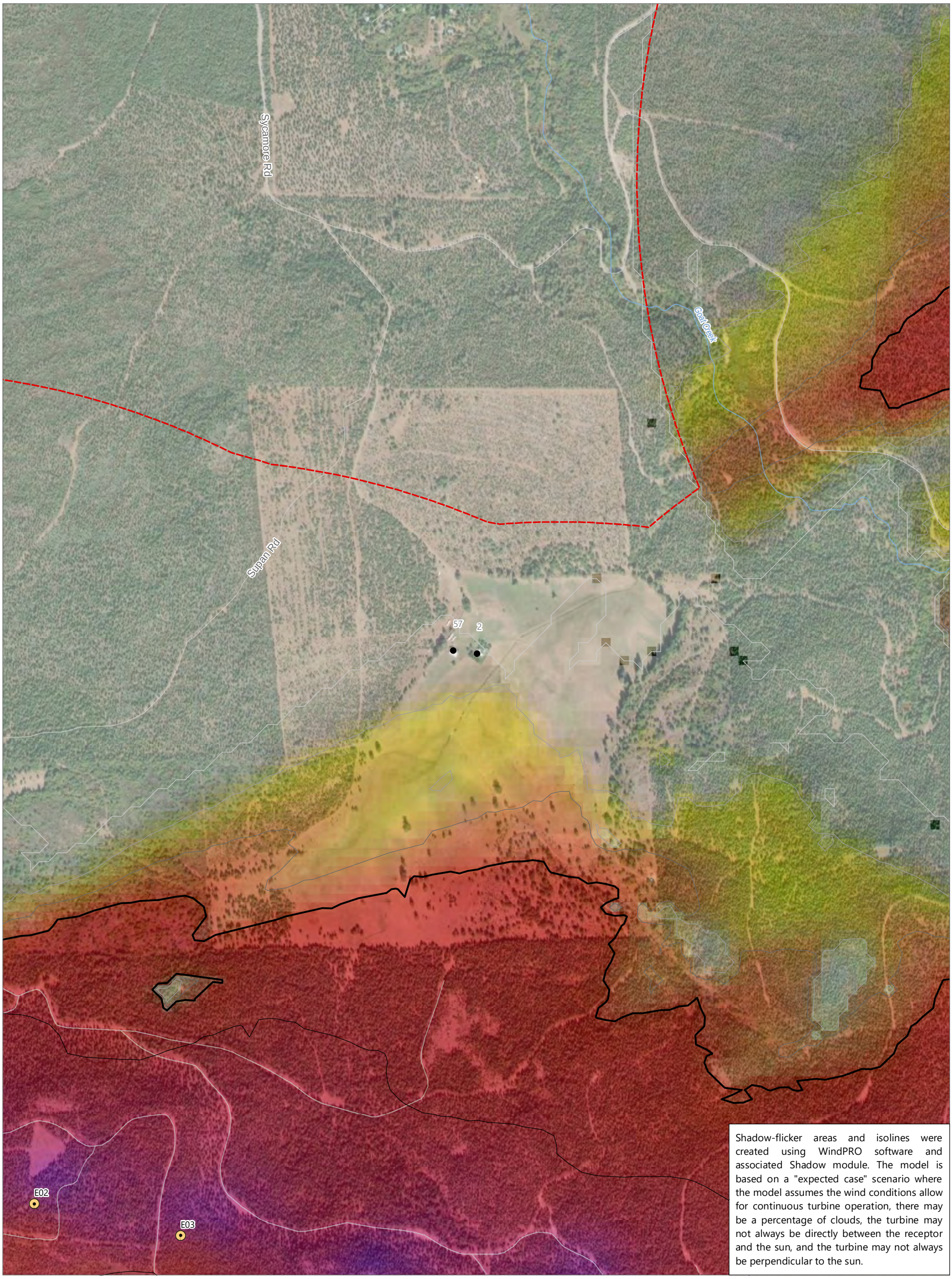
0 250 500 1,000

Feet

Prepared September 10, 2021

Basemap: Esri ArcGIS Online "World Imagery" map service.

Figure 4. Projected Shadow Flicker Details



Shadow-flicker areas and isolines were created using WindPRO software and associated Shadow module. The model is based on a "expected case" scenario where the model assumes the wind conditions allow for continuous turbine operation, there may be a percentage of clouds, the turbine may not always be directly between the receptor and the sun, and the turbine may not always be perpendicular to the sun.

Fountain Wind

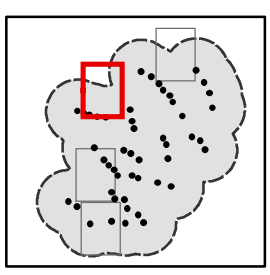
Shasta County, California

Shadow Flicker Analysis

Receptor < 30 Hours/Year
Participant > 30 Hours/Year
Wind Turbine
1,700-meter Study Area

Shadow Isolines
0 hours/year
10 hours/year
20 hours/year
30 hours/year
100 hours/year

Shadow Flicker (hours/year)
< 1
1 - 10
10 - 20
20 - 30
30 - 100
> 100

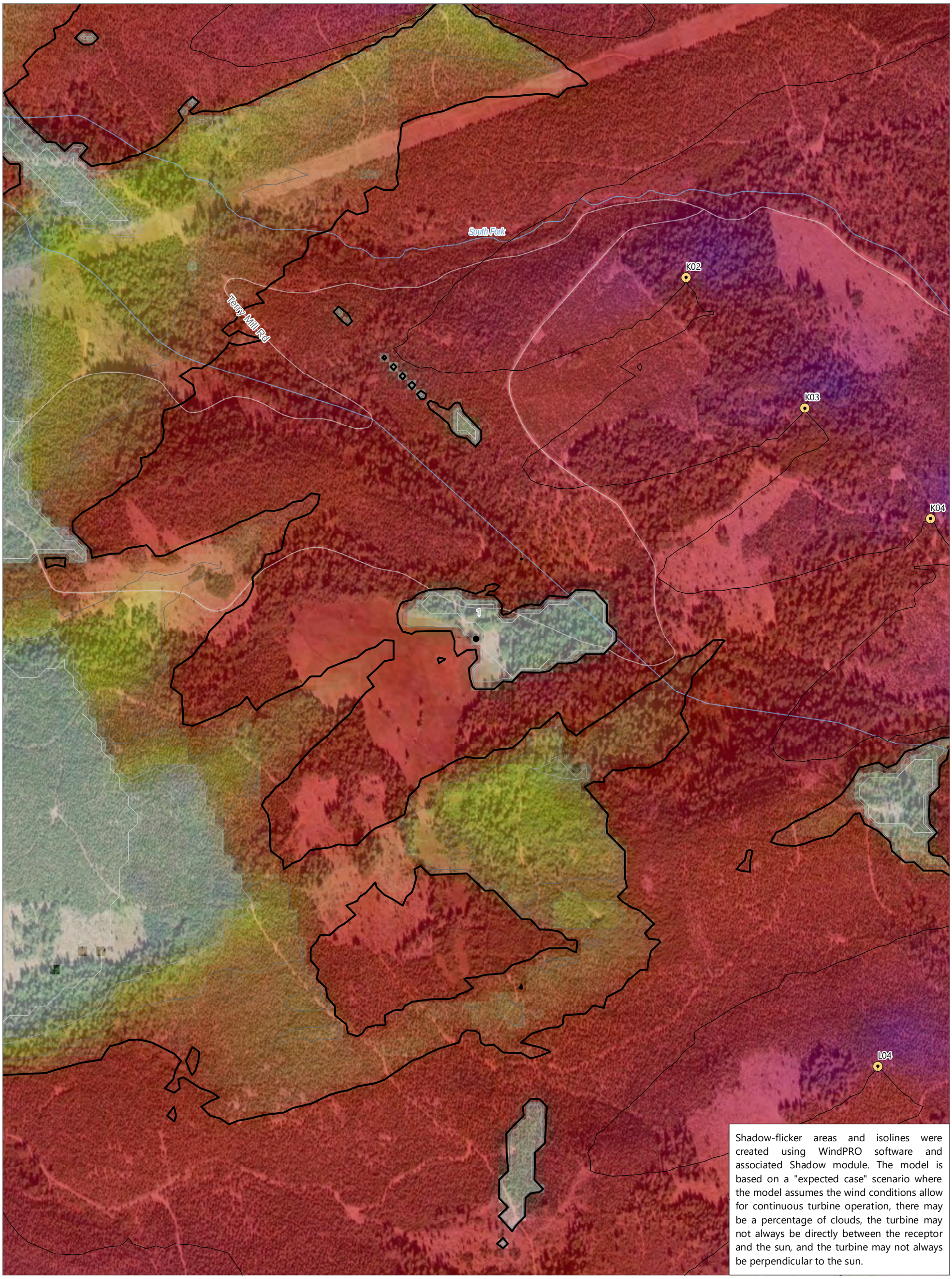


0 250 500 1,000
Feet

Prepared September 10, 2021
Basemap: Esri ArcGIS Online "World Imagery" map service.

EDR

Figure 4. Projected Shadow Flicker Details



Shadow-flicker areas and isolines were created using WindPRO software and associated Shadow module. The model is based on a "expected case" scenario where the model assumes the wind conditions allow for continuous turbine operation, there may be a percentage of clouds, the turbine may not always be directly between the receptor and the sun, and the turbine may not always be perpendicular to the sun.

Fountain Wind

Shasta County, California

Shadow Flicker Analysis

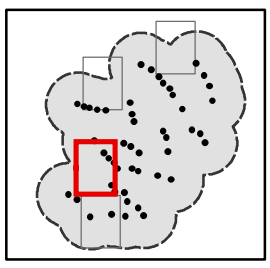
- Receptor < 30 Hours/Year
- Participant > 30 Hours/Year
- Wind Turbine
- 1,700-meter Study Area

Shadow Isolines

- 0 hours/year
- 10 hours/year
- 20 hours/year
- 30 hours/year
- 100 hours/year

Shadow Flicker (hours/year)

- < 1
- 1 - 10
- 10 - 20
- 20 - 30
- 30 - 100
- > 100



0 250 500 1,000

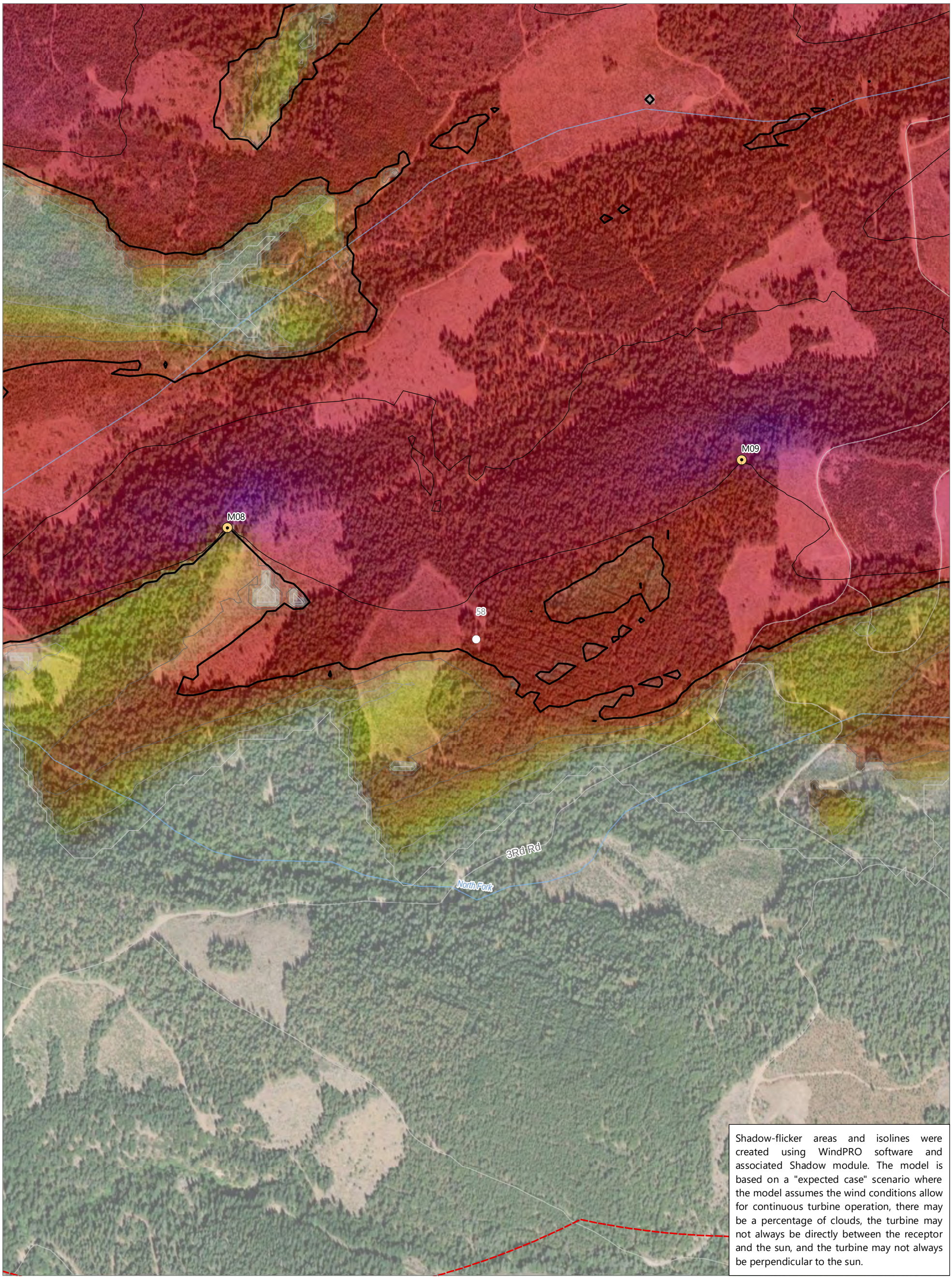
Feet

Prepared September 10, 2021

Basemap: Esri ArcGIS Online "World Imagery" map service.

EDR

Figure 4. Projected Shadow Flicker Details



Shadow-flicker areas and isolines were created using WindPRO software and associated Shadow module. The model is based on a "expected case" scenario where the model assumes the wind conditions allow for continuous turbine operation, there may be a percentage of clouds, the turbine may not always be directly between the receptor and the sun, and the turbine may not always be perpendicular to the sun.

Fountain Wind

Shasta County, California

Shadow Flicker Analysis

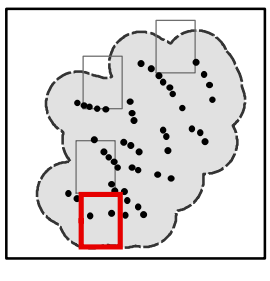
- Receptor < 30 Hours/Year
- Participant > 30 Hours/Year
- Wind Turbine
- 1,700-meter Study Area

Shadow Isolines

- 0 hours/year
- 10 hours/year
- 20 hours/year
- 30 hours/year
- 100 hours/year

Shadow Flicker (hours/year)

- < 1
- 1 - 10
- 10 - 20
- 20 - 30
- 30 - 100
- > 100



0 250 500 1,000
Feet

Prepared September 10, 2021
Basemap: Esri ArcGIS Online "World Imagery" map service.

EDR

Attachment A

Wind Rose and Sunshine Data

Table A1. Wind Rose Data

SECTOR	N	NNE	NE	ENE	E	ESE	SE	SSE
Frequency	0.26	0.74	3.65	22.10	20.89	1.36	0.06	0.27
Hours of Operation	23	65	319	1,935	1,830	119	5	24

SECTOR	S	SSW	SW	WSW	W	WNW	NW	NNW
Frequency	3.88	16.34	20.16	8.68	1.13	0.22	0.12	0.15
Hours of Operation	340	1,432	1,766	761	99	19	10	13

Source: Wind rose data provided by ConnectGen LLC.

Table A2. Sunshine Probability Data[1]

Month	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Sunshine Probability[2]	0.45	0.62	0.73	0.82	0.92	0.94	0.97	0.96	0.93	0.84	0.61	0.47

[1]Source: NOAA Comparative Climatic Data for the United States through 2015 – Sacramento, California Weather Station.

[2]Defined by NOAA as the total time that sunshine reaches the surface of the earth, expressed as the percentage of the maximum amount possible from sunrise to sunset with clear sky conditions.

Attachment B

WindPRO Results and Calendar

Licensed user:
EDR
217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688

Calculated:
9/3/2021 5:20 PM/3.4.415

SHADOW - Main Result

Assumptions for shadow calculations

Maximum distance for influence	1,700	m
Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.45	0.62	0.73	0.82	0.92	0.94	0.97	0.96	0.93	0.84	0.61	0.47

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
23	65	319	1,935	1,830	119	5	24	340	1,432	1,766	761

W	WNW	NW	NNW	Sum
99	19	10	13	8,760

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: 5m_contour.wpo (2)
Obstacles used in calculation
Eye height for map: 1.5 m
Grid resolution: 1.0 m

All coordinates are in
UTM (north)-NAD83 (US+CA) Zone: 10

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	RPM
			[m]					[kW]	[m]	[m]	[RPM]
B02	602,115	4,523,201	1,331.9	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
B03	602,563	4,522,545	1,353.9	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
B04	602,825	4,521,968	1,380.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
B05	602,986	4,521,188	1,420.5	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
C02	599,188	4,523,128	1,328.7	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
C03	599,717	4,522,840	1,375.4	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
C04	600,145	4,522,493	1,399.2	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
C05	600,368	4,522,142	1,388.9	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
C06	600,734	4,521,827	1,440.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
C07	600,889	4,521,501	1,448.6	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
C08	601,394	4,520,764	1,527.3	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
C09	601,894	4,519,662	1,405.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
C10	602,361	4,519,469	1,403.6	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
C11	602,574	4,518,992	1,389.6	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
E01	595,840	4,521,016	1,265.6	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
E02	596,169	4,520,891	1,248.3	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
E03	596,489	4,520,822	1,285.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
E04	596,884	4,520,707	1,259.3	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
E05	597,316	4,520,684	1,243.8	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
F01	598,609	4,521,073	1,434.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
F02	598,714	4,520,467	1,415.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
F03	598,816	4,520,113	1,404.3	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
F04	600,386	4,519,601	1,438.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
F05	600,550	4,519,255	1,413.9	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
F06	600,623	4,518,503	1,415.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
H01	598,277	4,518,937	1,379.8	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
H02	598,646	4,518,781	1,411.7	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
H03	599,087	4,518,444	1,441.3	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
J01	600,082	4,517,223	1,548.1	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
J02	600,796	4,517,003	1,573.4	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
K01	596,706	4,519,081	1,307.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
K02	597,220	4,518,436	1,358.6	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
K03	597,480	4,518,150	1,380.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
K04	597,755	4,517,908	1,383.4	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
K05	597,969	4,517,594	1,374.2	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
K06	598,726	4,517,606	1,467.9	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8

To be continued on next page...

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Calculated:
9/3/2021 5:20 PM/3.4.415

SHADOW - Main Result

...continued from previous page

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	RPM
			[m]					[kW]	[m]	[m]	[RPM]
K07	599,038	4,517,467	1,507.8	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
L04	597,640	4,516,708	1,461.3	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
L05	597,793	4,516,383	1,448.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
L06	598,317	4,516,327	1,446.5	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
L07	598,490	4,515,860	1,498.6	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
L08	599,054	4,515,524	1,579.5	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
L09	599,341	4,515,113	1,621.1	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
M06	595,359	4,516,224	1,316.0	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
M07	595,799	4,515,977	1,343.6	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
M08	596,495	4,515,043	1,365.7	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
M09	597,621	4,515,192	1,422.1	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8
M10	598,373	4,515,089	1,510.2	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 10...	Yes	Siemens Gamesa	SG 6.0-170-6,200	6,200	170.0	100.0	8.8

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
1	596,761	4,517,643	1,313.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
2	597,139	4,522,095	1,193.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
43	601,007	4,524,052	1,253.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
57	597,086	4,522,102	1,193.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
58	597,040	4,514,798	1,418.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

Calculation Results

Shadow receptor

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
1	17:39	45	0:29	3:04
2	16:34	48	0:25	6:55
43	0:00	0	0:00	0:00
57	12:21	40	0:23	5:08
58	79:44	132	0:50	39:40

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
B02	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (158)	0:00	0:00
B03	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (157)	0:00	0:00
B04	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (153)	0:00	0:00
B05	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (151)	0:00	0:00
C02	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (187)	0:00	0:00
C03	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (186)	0:00	0:00
C04	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (159)	0:00	0:00
C05	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (156)	0:00	0:00
C06	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (155)	0:00	0:00
C07	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (154)	0:00	0:00
C08	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (152)	0:00	0:00
C09	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (148)	0:00	0:00
C10	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (147)	0:00	0:00
C11	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (146)	0:00	0:00
E01	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (185)	18:34	7:45
E02	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (184)	0:00	0:00
E03	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (183)	0:00	0:00
E04	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (182)	0:00	0:00
E05	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (181)	0:00	0:00
F01	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (180)	0:00	0:00
F02	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (179)	0:00	0:00
F03	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (178)	0:00	0:00
F04	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (150)	0:00	0:00

To be continued on next page...

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SHADOW - Main Result

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
F05	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (149)	0:00	0:00
F06	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (145)	0:00	0:00
H01	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (176)	0:00	0:00
H02	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (171)	0:00	0:00
H03	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (170)	0:00	0:00
J01	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (144)	0:00	0:00
J02	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (143)	0:00	0:00
K01	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (177)	0:00	0:00
K02	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (175)	0:00	0:00
K03	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (174)	0:00	0:00
K04	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (173)	0:00	0:00
K05	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (172)	0:00	0:00
K06	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (169)	0:00	0:00
K07	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (164)	0:00	0:00
L04	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (166)	17:39	3:04
L05	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (165)	0:00	0:00
L06	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (162)	0:00	0:00
L07	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (161)	0:00	0:00
L08	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (160)	0:00	0:00
L09	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (140)	0:00	0:00
M06	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (168)	0:00	0:00
M07	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (167)	0:00	0:00
M08	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (142)	62:17	27:25
M09	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (163)	0:00	0:00
M10	Siemens Gamesa SG 6.0-170 6200 170.0 !O! hub: 100.0 m (TOT: 185.0 m) (141)	17:27	12:06

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

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Calculated:
9/3/2021 5:20 PM/3.4.415

SHADOW - Calendar

Shadow receptor: 1 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (148)

Assumptions for shadow calculations

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.45	0.62	0.73	0.82	0.92	0.94	0.97	0.96	0.93	0.84	0.61	0.47

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
23	65	319	1,935	1,830	119	5	24	340	1,432	1,766	761	99	19	10	13	8,760

	January			February	March	April	May	June	July	August	September	October	November			December		
1	07:32		08:48 (L04)	07:19	06:43	06:53	06:07	05:39	05:40	06:04	06:34	07:04	06:38			07:12		08:40 (L04)
	16:50	27	09:15 (L04)	17:24	17:57	19:31	20:03	20:32	20:43	20:25	19:43	18:53	18:06			16:41	13	08:53 (L04)
2	07:32		08:49 (L04)	07:18	06:41	06:51	06:06	05:39	05:40	06:05	06:35	07:05	06:39			07:13		08:39 (L04)
	16:51	26	09:15 (L04)	17:25	17:59	19:32	20:04	20:33	20:43	20:24	19:41	18:51	17:05			16:41	16	08:55 (L04)
3	07:33		08:50 (L04)	07:17	06:40	06:49	06:05	05:38	05:41	06:06	06:36	07:06	06:40			07:14		08:38 (L04)
	16:51	25	09:15 (L04)	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04			16:41	18	08:56 (L04)
4	07:33		08:50 (L04)	07:16	06:38	06:48	06:03	05:38	05:41	06:07	06:37	07:07	06:41			07:15		08:38 (L04)
	16:52	25	09:15 (L04)	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02			16:41	20	08:58 (L04)
5	07:33		08:51 (L04)	07:15	06:37	06:46	06:02	05:37	05:42	06:08	06:38	07:08	06:42			07:16		08:38 (L04)
	16:53	24	09:15 (L04)	17:28	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01			16:40	21	08:59 (L04)
6	07:33		08:51 (L04)	07:14	06:35	06:44	06:01	05:37	05:43	06:09	06:39	07:09	06:44			07:17		08:37 (L04)
	16:54	23	09:14 (L04)	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00			16:40	23	09:00 (L04)
7	07:32		08:53 (L04)	07:13	06:34	06:43	06:00	05:37	05:43	06:10	06:40	07:10	06:45			07:18		08:37 (L04)
	16:55	21	09:14 (L04)	17:31	18:04	19:37	20:09	20:36	20:42	20:19	19:33	18:43	16:59			16:40	24	09:01 (L04)
8	07:32		08:54 (L04)	07:11	07:32	06:41	05:59	05:37	05:44	06:10	06:41	07:11	06:46			07:19		08:38 (L04)
	16:56	20	09:14 (L04)	17:32	19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58			16:40	24	09:02 (L04)
9	07:32		08:55 (L04)	07:10	07:30	06:40	05:58	05:36	05:44	06:11	06:42	07:12	06:47			07:20		08:38 (L04)
	16:57	18	09:13 (L04)	17:33	19:06	19:40	20:11	20:37	20:42	20:16	19:30	18:40	16:57			16:40	25	09:03 (L04)
10	07:32		08:57 (L04)	07:09	07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13	06:48			07:21		08:38 (L04)
	16:58	16	09:13 (L04)	17:35	19:08	19:41	20:12	20:38	20:41	20:15	19:28	18:38	16:56			16:40	26	09:04 (L04)
11	07:32		08:58 (L04)	07:08	07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14	06:50			07:22		08:38 (L04)
	16:59	13	09:11 (L04)	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55			16:40	27	09:05 (L04)
12	07:31		09:00 (L04)	07:07	07:26	06:35	05:54	05:36	05:47	06:14	06:45	07:15	06:51			07:22		08:39 (L04)
	17:00	10	09:10 (L04)	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54			16:40	26	09:05 (L04)
13	07:31		09:05 (L04)	07:05	07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52			07:23		08:38 (L04)
	17:01	2	09:07 (L04)	17:38	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53			16:40	27	09:05 (L04)
14	07:31			07:04	07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53			07:24		08:39 (L04)
	17:02			17:40	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52			16:41	27	09:06 (L04)
15	07:30			07:03	07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19	06:54			07:25		08:39 (L04)
	17:03			17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51			16:41	28	09:07 (L04)
16	07:30			07:02	07:19	06:29	05:50	05:36	05:50	06:18	06:49	07:20	06:55			07:25		08:40 (L04)
	17:04			17:42	19:14	19:47	20:18	20:41	20:38	20:07	19:18	18:29	16:50			16:41	28	09:08 (L04)
17	07:30			07:00	07:17	06:27	05:49	05:36	05:50	06:19	06:50	07:21	06:57			07:26		08:40 (L04)
	17:06			17:43	19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	16:49			16:41	28	09:08 (L04)
18	07:29			06:59	07:16	06:26	05:48	05:36	05:51	06:20	06:51	07:22	06:58			07:27		08:40 (L04)
	17:07			17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:49			16:42	29	09:09 (L04)
19	07:29			06:58	07:14	06:24	05:48	05:36	05:52	06:21	06:52	07:23	06:59			07:27		08:40 (L04)
	17:08			17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48			16:42	29	09:09 (L04)
20	07:28			06:56	07:12	06:23	05:47	05:36	05:53	06:22	06:53	07:24	07:00			07:28		08:41 (L04)
	17:09			17:47	19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:23	16:47			16:42	29	09:10 (L04)
21	07:27			06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01			07:28		08:42 (L04)
	17:10			17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46			16:43	29	09:11 (L04)
22	07:27			06:53	07:09	06:20	05:45	05:37	05:55	06:24	06:55	07:26	07:02			07:29		08:42 (L04)
	17:11			17:49	19:21	19:53	20:24	20:43	20:34	19:58	19:08	18:20	16:46			16:43	29	09:11 (L04)
23	07:26			06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04			07:29		08:42 (L04)
	17:13			17:50	19:22	19:54	20:24	20:43	20:34	19:57	19:06	18:18	16:45			16:44	29	09:11 (L04)
24	07:25			06:50	07:06	06:17	05:44	05:37	05:56	06:26	06:57	07:29	07:05			07:30		08:43 (L04)
	17:14			17:52	19:23	19:55	20:25	20:43	20:33	19:55	19:04	18:17	16:45			16:44	29	09:12 (L04)
25	07:25			06:49	07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06			07:30		08:43 (L04)
	17:15			17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44			16:45	29	09:12 (L04)
26	07:24			06:47	07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07			07:31		08:44 (L04)
	17:16			17:54	19:25	19:57	20:27	20:43	20:31	19:52	19:01	18:14	16:43			16:45	29	09:13 (L04)
27	07:23			06:46	07:01	06:13	05:42	05:38	05:59	06:29	07:00	07:32	07:08			07:31		08:45 (L04)
	17:17			17:55	19:26	19:58	20:28	20:43	20:30	19:51	18:59	18:13	16:43			16:46	28	09:13 (L04)
28	07:22			06:44	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09			07:31		08:45 (L04)
	17:19			17:56	19:27	19:59	20:29	20:44	20:29	19:49	18:58	18:11	16:43			16:47	28	09:13 (L04)
29	07:22				06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10			07:32		08:45 (L04)
	17:20				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42			16:47	28	09:13 (L04)
30	07:21				06:56	06:09	05:40	05:39	06:02	06:32	07:03	07:35	07:11		08:42 (L04)	07:32		08:46 (L04)
	17:21				19:29	20:02	20:30	20:43	20:27	19:46	18:54	18:09	16:42	9	08:51 (L04)	16:48	27	09:13 (L04)
31	07:20				06:54		05:39		06:03	06:33		07:37				07:32		08:47 (L04)
	17:22				19:30		20:31		20:26	19:44		18:07				16:49	27	09:14 (L04)
Potential sun hours	298			297	369	398	448	451	458	428	375	346	299			288		
Total, worst case		250															800	
Sun reduction		0.45												0.61			0.47	
Oper. time red.		1.00												1.00			1.00	
Wind dir. red.		0.37												0.37			0.37	
Total reduction		0.17												0.23			0.18	
Total, real		42												2			141	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
EDR
217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688

Calculated:
9/3/2021 5:20 PM/3.4.415

SHADOW - Calendar

Shadow receptor: 2 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (149)

Assumptions for shadow calculations

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.45	0.62	0.73	0.82	0.92	0.94	0.97	0.96	0.93	0.84	0.61	0.47

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
23	65	319	1,935	1,830	119	5	24	340	1,432	1,766	761	99	19	10	13	8,760

	January			February	March	April	May	June	July	August	September	October	November			December		
1	07:32		15:50 (E01)	07:19	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38			07:12		15:40 (E01)
	16:50	23	16:13 (E01)	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06			16:41	15	15:55 (E01)
2	07:33		15:51 (E01)	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39			07:13		15:40 (E01)
	16:50	23	16:14 (E01)	17:25	17:58	19:32	20:04	20:33	20:43	20:24	19:41	18:51	17:05			16:41	17	15:57 (E01)
3	07:33		15:51 (E01)	07:17	06:40	06:49	06:05	05:38	05:41	06:06	06:36	07:06	06:40			07:14		15:40 (E01)
	16:51	23	16:14 (E01)	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04			16:41	18	15:58 (E01)
4	07:33		15:52 (E01)	07:16	06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07	06:41			07:15		15:40 (E01)
	16:52	22	16:14 (E01)	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02			16:41	19	15:59 (E01)
5	07:33		15:53 (E01)	07:15	06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:43			07:16		15:40 (E01)
	16:53	21	16:14 (E01)	17:28	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01			16:40	20	16:00 (E01)
6	07:33		15:54 (E01)	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44			07:17		15:40 (E01)
	16:54	21	16:15 (E01)	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00			16:40	21	16:01 (E01)
7	07:33		15:54 (E01)	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45			07:18		15:40 (E01)
	16:55	20	16:14 (E01)	17:31	18:04	19:37	20:09	20:36	20:42	20:19	19:33	18:43	16:59			16:40	21	16:01 (E01)
8	07:32		15:55 (E01)	07:11	07:32	06:41	05:59	05:36	05:44	06:10	06:41	07:11	06:46			07:19		15:39 (E01)
	16:56	19	16:14 (E01)	17:32	19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58			16:40	22	16:01 (E01)
9	07:32		15:56 (E01)	07:10	07:30	06:39	05:57	05:36	05:44	06:11	06:42	07:12	06:47			07:20		15:39 (E01)
	16:57	18	16:14 (E01)	17:33	19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:39	16:57			16:40	23	16:02 (E01)
10	07:32		15:57 (E01)	07:09	07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13	06:48			07:21		15:40 (E01)
	16:58	17	16:14 (E01)	17:35	19:07	19:41	20:12	20:38	20:41	20:15	19:28	18:38	16:56			16:40	23	16:03 (E01)
11	07:32		15:58 (E01)	07:08	07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14	06:50			07:22		15:40 (E01)
	16:59	15	16:13 (E01)	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55			16:40	23	16:03 (E01)
12	07:32		15:59 (E01)	07:07	07:26	06:35	05:54	05:36	05:46	06:14	06:45	07:15	06:51			07:23		15:41 (E01)
	17:00	14	16:13 (E01)	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54			16:40	23	16:04 (E01)
13	07:31		16:01 (E01)	07:05	07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52			07:23		15:41 (E01)
	17:01	11	16:12 (E01)	17:38	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53			16:40	24	16:05 (E01)
14	07:31		16:03 (E01)	07:04	07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53			07:24		15:41 (E01)
	17:02	7	16:10 (E01)	17:40	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52			16:40	24	16:05 (E01)
15	07:31			07:03	07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19	06:54			07:25		15:41 (E01)
	17:03			17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51			16:41	25	16:06 (E01)
16	07:30			07:02	07:19	06:28	05:50	05:36	05:49	06:18	06:49	07:20	06:56			07:26		15:42 (E01)
	17:04			17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50			16:41	24	16:06 (E01)
17	07:30			07:00	07:17	06:27	05:49	05:36	05:50	06:19	06:50	07:21	06:57			07:26		15:42 (E01)
	17:05			17:43	19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	16:49			16:41	24	16:06 (E01)
18	07:29			06:59	07:16	06:25	05:48	05:36	05:51	06:20	06:51	07:22	06:58			07:27		15:43 (E01)
	17:07			17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:49			16:41	24	16:07 (E01)
19	07:29			06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59			07:27		15:43 (E01)
	17:08			17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48			16:42	25	16:08 (E01)
20	07:28			06:56	07:12	06:22	05:47	05:36	05:53	06:22	06:53	07:24	07:00			07:28		15:43 (E01)
	17:09			17:47	19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47			16:42	25	16:08 (E01)
21	07:28			06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01			07:29		15:44 (E01)
	17:10			17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46			16:43	25	16:09 (E01)
22	07:27			06:53	07:09	06:20	05:45	05:36	05:54	06:24	06:55	07:26	07:03			07:29		15:44 (E01)
	17:11			17:49	19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:20	16:46			16:43	25	16:09 (E01)
23	07:26			06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04			07:30		15:45 (E01)
	17:12			17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45			16:43	25	16:10 (E01)
24	07:26			06:50	07:06	06:17	05:43	05:37	05:56	06:26	06:57	07:29	07:05			07:30		15:45 (E01)
	17:14			17:51	19:23	19:55	20:25	20:43	20:33	19:55	19:04	18:17	16:44			16:44	25	16:10 (E01)
25	07:25			06:49	07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06			07:30		15:46 (E01)
	17:15			17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44			16:45	24	16:10 (E01)
26	07:24			06:48	07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07			07:31		15:47 (E01)
	17:16			17:54	19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43			16:45	24	16:11 (E01)
27	07:23			06:46	07:01	06:12	05:41	05:38	05:59	06:29	07:00	07:32	07:08			07:31		15:47 (E01)
	17:17			17:55	19:26	19:58	20:28	20:44	20:30	19:51	18:59	18:13	16:43			16:46	24	16:11 (E01)
28	07:22			06:44	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09		15:43 (E01)	07:31		15:47 (E01)
	17:18			17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	7	15:50 (E01)	16:46	24	16:11 (E01)
29	07:22				06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10		15:41 (E01)	07:32		15:48 (E01)
	17:20				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	11	15:52 (E01)	16:47	24	16:12 (E01)
30	07:21				06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11		15:40 (E01)	07:32		15:49 (E01)
	17:21				19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	14	15:54 (E01)	16:48	24	16:13 (E01)
31	07:20				06:54		05:39		06:03	06:33		07:37				07:32		15:49 (E01)
	17:22				19:30		20:31		20:26	19:44		18:07				16:49	24	16:13 (E01)
Potential sun hours	298			297	369	398	448	451	458	428	375	346	298			288		
Total, worst case		254												32			708	
Sun reduction		0.45												0.61			0.47	
Oper. time red.		1.00												1.00			1.00	
Wind dir. red.		0.89												0.89			0.89	
Total reduction		0.40												0.54			0.42	
Total, real		102												17			297	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
EDR
217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688

Calculated:
9/3/2021 5:20 PM/3.4.415

SHADOW - Calendar

Shadow receptor: 43 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (150)

Assumptions for shadow calculations

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.45	0.62	0.73	0.82	0.92	0.94	0.97	0.96	0.93	0.84	0.61	0.47

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
23	65	319	1,935	1,830	119	5	24	340	1,432	1,766	761	99	19	10	13	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:32	07:19	06:43	06:52	06:07	05:39	05:39	06:03	06:34	07:04	06:38	07:12
	16:49	17:23	17:57	19:31	20:03	20:32	20:43	20:25	19:43	18:52	18:06	16:41
2	07:32	07:18	06:41	06:51	06:06	05:38	05:40	06:04	06:35	07:05	06:39	07:13
	16:50	17:24	17:58	19:32	20:04	20:33	20:43	20:24	19:41	18:51	17:05	16:41
3	07:32	07:17	06:40	06:49	06:04	05:38	05:40	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	17:59	19:33	20:05	20:33	20:43	20:23	19:39	18:49	17:03	16:41
4	07:33	07:16	06:38	06:47	06:03	05:37	05:41	06:06	06:37	07:07	06:41	07:15
	16:52	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:47	17:02	16:40
5	07:33	07:15	06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:42	07:16
	16:53	17:28	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01	16:40
6	07:32	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:29	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:32	07:12	06:33	06:42	05:59	05:36	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:42	20:18	19:33	18:43	16:59	16:40
8	07:32	07:11	07:32	06:41	05:58	05:36	05:43	06:10	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58	16:40
9	07:32	07:10	07:30	06:39	05:57	05:36	05:44	06:11	06:42	07:12	06:47	07:20
	16:57	17:33	19:06	19:39	20:11	20:37	20:42	20:16	19:30	18:39	16:57	16:40
10	07:32	07:09	07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13	06:48	07:21
	16:58	17:34	19:07	19:40	20:12	20:38	20:41	20:15	19:28	18:38	16:56	16:40
11	07:32	07:08	07:27	06:36	05:55	05:36	05:45	06:13	06:44	07:14	06:49	07:22
	16:59	17:36	19:08	19:41	20:13	20:39	20:41	20:13	19:26	18:36	16:55	16:40
12	07:31	07:07	07:25	06:34	05:54	05:36	05:46	06:14	06:45	07:15	06:51	07:22
	17:00	17:37	19:09	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:05	07:24	06:33	05:53	05:35	05:47	06:15	06:46	07:16	06:52	07:23
	17:01	17:38	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53	16:40
14	07:31	07:04	07:22	06:31	05:52	05:35	05:48	06:16	06:47	07:17	06:53	07:24
	17:02	17:39	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:31	16:52	16:40
15	07:30	07:03	07:20	06:30	05:51	05:35	05:48	06:17	06:48	07:18	06:54	07:25
	17:03	17:41	19:13	19:46	20:17	20:40	20:39	20:08	19:20	18:30	16:51	16:40
16	07:30	07:01	07:19	06:28	05:50	05:35	05:49	06:18	06:49	07:19	06:55	07:25
	17:04	17:42	19:14	19:47	20:18	20:41	20:38	20:07	19:18	18:28	16:50	16:41
17	07:30	07:00	07:17	06:27	05:49	05:35	05:50	06:19	06:50	07:21	06:57	07:26
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:05	19:16	18:27	16:49	16:41
18	07:29	06:59	07:16	06:25	05:48	05:36	05:51	06:20	06:51	07:22	06:58	07:27
	17:06	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:14	18:25	16:48	16:41
19	07:29	06:57	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:27
	17:08	17:45	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:41
20	07:28	06:56	07:12	06:22	05:46	05:36	05:52	06:22	06:53	07:24	07:00	07:28
	17:09	17:47	19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	16:42
21	07:27	06:55	07:11	06:21	05:46	05:36	05:53	06:23	06:54	07:25	07:01	07:28
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:09	18:21	16:46	16:42
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:02	07:29
	17:11	17:49	19:20	19:53	20:24	20:43	20:34	19:58	19:08	18:19	16:45	16:43
23	07:26	06:52	07:07	06:18	05:44	05:36	05:55	06:25	06:56	07:27	07:04	07:29
	17:12	17:50	19:21	19:54	20:24	20:43	20:34	19:57	19:06	18:18	16:45	16:43
24	07:25	06:50	07:06	06:16	05:43	05:37	05:56	06:26	06:57	07:28	07:05	07:30
	17:13	17:51	19:22	19:55	20:25	20:43	20:33	19:55	19:04	18:16	16:44	16:44
25	07:25	06:49	07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06	07:30
	17:15	17:52	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:44
26	07:24	06:47	07:02	06:14	05:42	05:37	05:58	06:28	06:59	07:31	07:07	07:31
	17:16	17:54	19:25	19:57	20:27	20:43	20:31	19:52	19:01	18:14	16:43	16:45
27	07:23	06:46	07:01	06:12	05:41	05:38	05:59	06:29	07:00	07:32	07:08	07:31
	17:17	17:55	19:26	19:58	20:28	20:43	20:30	19:51	18:59	18:12	16:43	16:46
28	07:22	06:44	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:31
	17:18	17:56	19:27	19:59	20:29	20:44	20:29	19:49	18:57	18:11	16:42	16:46
29	07:21		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:19		19:28	20:00	20:30	20:44	20:28	19:47	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:01	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:01	20:30	20:43	20:27	19:46	18:54	18:08	16:41	16:48
31	07:20		06:54		05:39		06:02	06:33		07:36		07:32
	17:22		19:30		20:31		20:26	19:44		18:07		16:48
Potential sun hours	298	297	369	398	448	452	458	428	375	346	298	288
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
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217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688

Calculated:
9/3/2021 5:20 PM/3.4.415

SHADOW - Calendar

Shadow receptor: 57 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (151)

Assumptions for shadow calculations

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.45	0.62	0.73	0.82	0.92	0.94	0.97	0.96	0.93	0.84	0.61	0.47

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
23	65	319	1,935	1,830	119	5	24	340	1,432	1,766	761	99	19	10	13	8,760

	January			February	March	April	May	June	July	August	September	October	November	December		
1	07:32		15:47 (E01)	07:19	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38	07:12		
	16:50	20	16:07 (E01)	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06	16:41		
2	07:33		15:47 (E01)	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13		15:41 (E01)
	16:50	20	16:07 (E01)	17:25	17:58	19:32	20:04	20:33	20:43	20:24	19:41	18:51	17:05	16:41	5	15:46 (E01)
3	07:33		15:48 (E01)	07:17	06:40	06:49	06:05	05:38	05:41	06:06	06:36	07:06	06:40	07:14		15:39 (E01)
	16:51	19	16:07 (E01)	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41	10	15:49 (E01)
4	07:33		15:49 (E01)	07:16	06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07	06:41	07:15		15:38 (E01)
	16:52	18	16:07 (E01)	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02	16:41	12	15:50 (E01)
5	07:33		15:50 (E01)	07:15	06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:43	07:16		15:38 (E01)
	16:53	17	16:07 (E01)	17:28	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01	16:40	14	15:52 (E01)
6	07:33		15:51 (E01)	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17		15:38 (E01)
	16:54	16	16:07 (E01)	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40	15	15:53 (E01)
7	07:33		15:52 (E01)	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18		15:37 (E01)
	16:55	14	16:06 (E01)	17:31	18:04	19:37	20:09	20:36	20:42	20:19	19:33	18:43	16:59	16:40	17	15:54 (E01)
8	07:32		15:53 (E01)	07:11	07:32	06:41	05:59	05:36	05:44	06:10	06:41	07:11	06:46	07:19		15:36 (E01)
	16:56	13	16:06 (E01)	17:32	19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58	16:40	18	15:54 (E01)
9	07:32		15:55 (E01)	07:10	07:30	06:39	05:57	05:36	05:44	06:11	06:42	07:12	06:47	07:20		15:36 (E01)
	16:57	10	16:05 (E01)	17:33	19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:39	16:57	16:40	19	15:55 (E01)
10	07:32		15:58 (E01)	07:09	07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13	06:48	07:21		15:37 (E01)
	16:58	6	16:04 (E01)	17:35	19:07	19:41	20:12	20:38	20:41	20:15	19:28	18:38	16:56	16:40	19	15:56 (E01)
11	07:32			07:08	07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14	06:50	07:22		15:37 (E01)
	16:59			17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40	20	15:57 (E01)
12	07:32			07:07	07:26	06:35	05:54	05:36	05:46	06:14	06:45	07:15	06:51	07:23		15:37 (E01)
	17:00			17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40	21	15:58 (E01)
13	07:31			07:05	07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52	07:23		15:38 (E01)
	17:01			17:38	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53	16:40	21	15:59 (E01)
14	07:31			07:04	07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53	07:24		15:37 (E01)
	17:02			17:40	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52	16:40	22	15:59 (E01)
15	07:31			07:03	07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19	06:54	07:25		15:38 (E01)
	17:03			17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41	21	15:59 (E01)
16	07:30			07:02	07:19	06:28	05:50	05:36	05:49	06:18	06:49	07:20	06:56	07:26		15:38 (E01)
	17:04			17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41	22	16:00 (E01)
17	07:30			07:00	07:17	06:27	05:49	05:36	05:50	06:19	06:50	07:21	06:57	07:26		15:38 (E01)
	17:05			17:43	19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	16:49	16:41	22	16:00 (E01)
18	07:29			06:59	07:16	06:25	05:48	05:36	05:51	06:20	06:51	07:22	06:58	07:27		15:39 (E01)
	17:07			17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:49	16:41	22	16:01 (E01)
19	07:29			06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:27		15:40 (E01)
	17:08			17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42	22	16:02 (E01)
20	07:28			06:56	07:12	06:22	05:47	05:36	05:53	06:22	06:53	07:24	07:00	07:28		15:39 (E01)
	17:09			17:47	19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	16:42	23	16:02 (E01)
21	07:28			06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29		15:40 (E01)
	17:10			17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43	23	16:03 (E01)
22	07:27			06:53	07:09	06:20	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29		15:40 (E01)
	17:11			17:49	19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:20	16:46	16:43	23	16:03 (E01)
23	07:26			06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30		15:41 (E01)
	17:12			17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43	23	16:04 (E01)
24	07:26			06:50	07:06	06:17	05:43	05:37	05:56	06:26	06:57	07:29	07:05	07:30		15:42 (E01)
	17:14			17:51	19:23	19:55	20:25	20:43	20:33	19:55	19:04	18:17	16:44	16:44	22	16:04 (E01)
25	07:25			06:49	07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06	07:30		15:42 (E01)
	17:15			17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45	22	16:04 (E01)
26	07:24			06:48	07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07	07:31		15:43 (E01)
	17:16			17:54	19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43	16:45	22	16:05 (E01)
27	07:23			06:46	07:01	06:12	05:41	05:38	05:59	06:29	07:00	07:32	07:08	07:31		15:43 (E01)
	17:17			17:55	19:26	19:58	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46	22	16:05 (E01)
28	07:22			06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:31		15:44 (E01)
	17:18			17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46	21	16:05 (E01)
29	07:22				06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32		15:44 (E01)
	17:20				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47	22	16:06 (E01)
30	07:21				06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32		15:45 (E01)
	17:21				19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48	22	16:07 (E01)
31	07:20				06:54		05:39		06:03	06:33		07:37		07:32		15:46 (E01)
	17:22				19:30		20:31		20:26	19:44		18:07		16:49	21	16:07 (E01)
Potential sun hours	298			297	369	398	448	451	458	428	375	346	298	288		
Total, worst case		153													588	
Sun reduction		0.45													0.47	
Oper. time red.		1.00													1.00	
Wind dir. red.		0.89													0.89	
Total reduction		0.40													0.42	
Total, real		61													247	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
EDR
217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688

Calculated:
9/3/2021 5:20 PM/3.4.415

SHADOW - Calendar

Shadow receptor: 58 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (152)

Assumptions for shadow calculations

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.45	0.62	0.73	0.82	0.92	0.94	0.97	0.96	0.93	0.84	0.61	0.47

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
23	65	319	1,935	1,830	119	5	24	340	1,432	1,766	761	99	19	10	13	8,760

	January	February	March	April		May		June		July		August		September	October	November	December
1	07:32	07:19	06:43	06:53		06:07		06:44 (M10)		05:39		19:24 (M08)		05:40		19:30 (M08)		06:04		19:36 (M08)		06:34		07:04		06:38		07:12
	16:50	17:24	17:57	19:31		20:03	31	19:40 (M08)		20:32	44	20:08 (M08)		20:43	48	20:18 (M08)		20:25	25	20:01 (M08)		19:43		18:53		18:06		16:41
2	07:32	07:18	06:41	06:51		06:06		06:45 (M10)		05:39		19:23 (M08)		05:40		19:30 (M08)		06:05		19:36 (M08)		06:35		07:05		06:39		07:13
	16:51	17:25	17:59	19:32		20:04	33	19:42 (M08)		20:33	45	20:08 (M08)		20:43	48	20:18 (M08)		20:24	24	20:00 (M08)		19:41		18:51		17:05		16:41
3	07:32	07:17	06:40	06:49		06:05		06:44 (M10)		05:38		19:24 (M08)		05:41		19:30 (M08)		06:06		19:37 (M08)		06:36		07:06		06:40		07:14
	16:52	17:26	18:00	19:33		20:05	35	19:42 (M08)		20:33	45	20:09 (M08)		20:43	48	20:18 (M08)		20:23	22	19:59 (M08)		19:40		18:49		17:04		16:41
4	07:32	07:16	06:38	06:48		06:03		06:45 (M10)		05:38		19:24 (M08)		05:41		19:31 (M08)		06:07		07:02 (M10)		06:37		07:07		06:41		07:15
	16:52	17:27	18:01	19:34		20:06	35	19:43 (M08)		20:34	45	20:09 (M08)		20:43	47	20:18 (M08)		20:22	30	19:58 (M08)		19:38		18:48		17:03		16:41
5	07:32	07:15	06:37	06:46		06:02		06:46 (M10)		05:37		19:24 (M08)		05:42		19:30 (M08)		06:08		07:00 (M10)		06:38		07:08		06:42		07:16
	16:53	17:29	18:02	19:35		20:07	35	19:44 (M08)		20:35	46	20:10 (M08)		20:43	47	20:17 (M08)		20:21	33	19:57 (M08)		19:36		18:46		17:01		16:41
6	07:32	07:14	06:35	06:44		06:01		06:47 (M10)		05:37		19:25 (M08)		05:43		19:31 (M08)		06:09		06:58 (M10)		06:39		07:09		06:44		07:17
	16:54	17:30	18:03	19:36		20:08	35	19:45 (M08)		20:35	46	20:11 (M08)		20:43	46	20:17 (M08)		20:20	35	19:56 (M08)		19:35		18:44		17:00		16:40
7	07:32	07:12	06:34	06:43		06:00		06:49 (M10)		05:37		19:25 (M08)		05:43		19:30 (M08)		06:10		06:57 (M10)		06:40		07:10		06:45		07:18
	16:55	17:31	18:04	19:37		20:09	34	19:46 (M08)		20:36	47	20:12 (M08)		20:42	47	20:17 (M08)		20:18	35	19:55 (M08)		19:33		18:43		16:59		16:40
8	07:32	07:11	07:32	06:41		05:59		06:51 (M10)		05:37		19:24 (M08)		05:44		19:31 (M08)		06:11		06:56 (M10)		06:41		07:11		06:46		07:19
	16:56	17:32	19:05	19:38		20:10	32	19:47 (M08)		20:37	48	20:12 (M08)		20:42	46	20:17 (M08)		20:17	34	19:53 (M08)		19:31		18:41		16:58		16:40
9	07:32	07:10	07:30	06:40		05:58		06:54 (M10)		05:36		19:25 (M08)		05:45		19:31 (M08)		06:12		06:55 (M10)		06:42		07:12		06:47		07:20
	16:57	17:33	19:06	19:39		20:11	27	19:48 (M08)		20:37	47	20:12 (M08)		20:42	46	20:17 (M08)		20:16	34	19:52 (M08)		19:30		18:40		16:57		16:40
10	07:32	07:09	07:29	06:38		05:56		19:27 (M08)		05:36		19:25 (M08)		05:45		19:31 (M08)		06:12		06:54 (M10)		06:43		07:13		06:48		07:21
	16:58	17:35	19:08	19:41		20:12	22	19:49 (M08)		20:38	48	20:13 (M08)		20:41	45	20:16 (M08)		20:15	34	19:51 (M08)		19:28		18:38		16:56		16:40
11	07:32	07:08	07:27	06:36		05:55		19:26 (M08)		05:36		19:26 (M08)		05:46		19:31 (M08)		06:13		06:53 (M10)		06:44		07:14		06:49		07:22
	16:59	17:36	19:09	19:42		20:13	24	19:50 (M08)		20:38	48	20:14 (M08)		20:41	45	20:16 (M08)		20:14	32	19:50 (M08)		19:26		18:36		16:55		16:40
12	07:31	07:07	07:26	06:35		05:54		19:26 (M08)		05:36		19:26 (M08)		05:47		19:32 (M08)		06:14		06:53 (M10)		06:45		07:15		06:51		07:22
	17:00	17:37	19:10	19:43		20:14	25	19:51 (M08)		20:39	48	20:14 (M08)		20:40	44	20:16 (M08)		20:12	30	19:49 (M08)		19:25		18:35		16:54		16:40
13	07:31	07:05	07:24	06:33		05:53		19:25 (M08)		05:36		19:26 (M08)		05:47		19:31 (M08)		06:15		06:52 (M10)		06:46		07:16		06:52		07:23
	17:01	17:38	19:11	19:44		20:15	27	19:52 (M08)		20:40	49	20:15 (M08)		20:40	43	20:14 (M08)		20:11	29	07:21 (M10)		19:23		18:33		16:53		16:40
14	07:31	07:04	07:22	06:32		05:52		19:25 (M08)		05:36		19:27 (M08)		05:48		19:31 (M08)		06:16		06:52 (M10)		06:47		07:17		06:53		07:24
	17:02	17:40	19:12	19:45		20:16	28	19:53 (M08)		20:40	48	20:15 (M08)		20:39	43	20:14 (M08)		20:10	29	07:21 (M10)		19:21		18:32		16:52		16:41
15	07:30	07:03	07:21	06:30		05:51		19:24 (M08)		05:36		19:27 (M08)		05:49		19:32 (M08)		06:17		06:51 (M10)		06:48		07:18		06:54		07:25
	17:03	17:41	19:13	19:46		20:17	30	19:54 (M08)		20:40	48	20:15 (M08)		20:39	42	20:14 (M08)		20:08	29	07:20 (M10)		19:20		18:30		16:51		16:41
16	07:30	07:02	07:19	06:29		05:50		19:24 (M08)		05:36		19:27 (M08)		05:50		19:32 (M08)		06:18		06:51 (M10)		06:49		07:20		06:55		07:25
	17:05	17:42	19:14	19:47		20:18	31	19:55 (M08)		20:41	49	20:16 (M08)		20:38	42	20:14 (M08)		20:07	29	07:20 (M10)		19:18		18:29		16:50		16:41
17	07:30	07:00	07:17	06:27	06:57 (M10)	05:49		19:23 (M08)		05:36		19:27 (M08)		05:50		19:31 (M08)		06:19		06:51 (M10)		06:50		07:21		06:57		07:26
	17:06	17:43	19:15	19:48	7 07:04 (M10)	20:19	32	19:55 (M08)		20:41	49	20:16 (M08)		20:38	41	20:12 (M08)		20:05	29	07:20 (M10)		19:16		18:27		16:49		16:41
18	07:29	06:59	07:16	06:26	06:53 (M10)	05:49		19:23 (M08)		05:36		19:27 (M08)		05:51		19:32 (M08)		06:20		06:51 (M10)		06:51		07:22		06:58		07:27
	17:07	17:44	19:16	19:49	15 07:08 (M10)	20:20	33	19:56 (M08)		20:42	49	20:16 (M08)		20:37	40	20:12 (M08)		20:04	28	07:19 (M10)		19:15		18:26		16:49		16:42
19	07:29	06:57	07:14	06:24	06:51 (M10)	05:48		19:23 (M08)		05:36		19:27 (M08)		05:52		19:32 (M08)		06:21		06:51 (M10)		06:52		07:23		06:59		07:27
	17:08	17:46	19:17	19:50	18 07:09 (M10)	20:21	34	19:57 (M08)		20:42	49	20:16 (M08)		20:37	40	20:12 (M08)		20:03	28	07:19 (M10)		19:13		18:24		16:48		16:42
20	07:28	06:56	07:12	06:23	06:49 (M10)	05:47		19:23 (M08)		05:36		19:27 (M08)		05:53		19:33 (M08)		06:22		06:51 (M10)		06:53		07:24		07:00		07:28
	17:09	17:47	19:18	19:51	22 07:11 (M10)	20:22	36	19:59 (M08)		20:42	49	20:16 (M08)		20:36	38	20:11 (M08)		20:01	27	07:18 (M10)		19:11		18:23		16:47		16:42
21	07:27	06:55	07:11	06:21	06:47 (M10)	05:46		19:23 (M08)		05:36		19:28 (M08)		05:54		19:33 (M08)		06:23		06:52 (M10)		06:54		07:25		07:01		07:28
	17:10	17:48	19:19	19:52	24 07:11 (M10)	20:23	36	19:59 (M08)		20:42	50	20:18 (M08)		20:35	38	20:11 (M08)		20:00	25	07:17 (M10)		19:10		18:21		16:47		16:43
22	07:27	06:53	07:09	06:20	06:47 (M10)	05:45		19:23 (M08)		05:37		19:28 (M08)		05:55		19:33 (M08)		06:24		06:52 (M10)		06:55		07:26		07:02		07:29
	17:11	17:49	19:21	19:53	25 07:12 (M10)	20:23	37	20:00 (M08)		20:43	49	20:17 (M08)		20:34	37	20:10 (M08)		19:58	24	07:16 (M10)		19:08		18:20		16:46		16:43
23	07:26	06:52	07:07	06:18	06:46 (M10)	05:44		19:22 (M08)		05:37		19:28 (M08)		05:55		19:33 (M08)		06:25		06:53 (M10)		06:56		07:27		07:03		07:29
	17:13	17:50	19:22	19:54	27 07:13 (M10)	20:24	38	20:00 (M08)		20:43	49	20:17 (M08)		20:34	35	20:08 (M08)		19:57	22	07:15 (M10)		19:06		18:18		16:45		16:44
24	07:25	06:50	07:06	06:17	06:45 (M10)	05:44		19:23 (M08)		05:37		19:28 (M08)		05:56		19:33 (M08)		06:26		06:55 (M10)		06:57		07:28		07:05		07:30
	17:14	17:52	19:23	19:55	28 07:13 (M10)	20:25	39	20:02 (M08)		20:43	49	20:17 (M08)		20:33	35	20:08 (M08)		19:55	18	07:13 (M10)		19:04		18:17		16:45		16:44
25	07:25	06:49	07:04	06:15	06:45 (M10)	05:43		19:22 (M08)		05:37		19:29 (M08)		05:57		19:33 (M08)		06:27		06:57 (M10)		06:58		07:30		07:06		07:30
	17:15	17:53	19:24	19:56	28 07:13 (M10)	20:26	40	20:02 (M08)		20:43	49	20:18 (M08)		20:32	34	20:07 (M08)		19:54	14	07:11 (M10)		19:03		18:15		16:44		16:45
26	07:24	06:47	07:02	06:14	06:44 (M10)	05:42		19:22 (M08)		05:38		19:29 (M08)		05:58		19:34 (M08)		06:28		07:00 (M10)		06:59		07:31		07:07		07:31
	17:16	17:54	19:25	19:57	29 07:13 (M10)	20:27	41	20:03 (M08)		20:43	49	20:18 (M08)		20:31	32	20:06 (M08)		19:52	7	07:07 (M10)		19:01		18:14		16:44		16:45
27	07:23	06:46	07:01	06:13	06:44 (M10)	05:42		19:23 (M08)		05:38		19:29 (M08)		05:59		19:34 (M08)		06:29				07:00		07:32		07:08		07:31
	17:17	17:55	19:26	19:58	29 07:13 (M10)	20:28	41	20:04 (M08)		20:43	49	20:18 (M08)		20:30	32	20:06 (M08)		19:51				18:59		18:13		16:43		16:46
28	07:22	06:44	06:59	06:11	06:44 (M10)	05:41		19:22 (M08)		05:39		19:30 (M08)		06:00		19:35 (M08)		06:30				07:01		07:33		07:09		07:31
	17:19	17:56	19:27	19:59	29 07:13 (M10)	20:29	42	20:04 (M08)		20:43	48	20:18 (M08)		20:29	30	20:05 (M08)		19:49				18:58		18:11		16:43		16:47
29	07:21		06:57	06:10	06:43 (M10)	05:41		19:23 (M08)		05:39		19:29 (M08)		06:01		19:35 (M08)		06:31				07:02		07:34		07:10		07:32
	17:20		19:28	20:00	29 07:12 (M10)	20:30	43	20:06 (M08)		20:43	49	20:18 (M08)		20:28	29	20:04 (M08)		19:48				18:56		18:10		16:42		16:47
30	07:21		06:56	06:09	06:44 (M10)	05:40		19:23 (M08)		05:39		19:30 (M08)		06:02		19:36 (M08)		06:32				07:03		07:35		07:11		07:32
	17:21		19:29	20:02	28 07:12 (M10)	20:30	43	20:06 (M08)		20:43	48	20:18 (M08)		20:27	27	20:03 (M08)		19:46				18:54		18:09		16:42		16:48
31	07:20		06:54			05:39		19:23 (M08)						06:03		19:35 (M08)		06:33						07:37				07:32
	17:22		19:30			20:31	44	20:07 (M08)						20:26	26	20:01 (M08)		19:44						18:07				16:49
Potential sun hours	298	297	369	398		447		451		458		428		375	346	299	288
Total, worst case				338		1063		1436		1241		706					
Sun reduction				0.82		0.92		0.94		0.97		0.96					
Oper. time red.				1.00		1.00		1.00		1.00		1.00					
Wind dir. red.				0.76		0.52		0.47		0.47		0.69					
Total reduction				0.63		0.48		0.44		0.45		0.66					
Total, real				213		507		631		562		468					

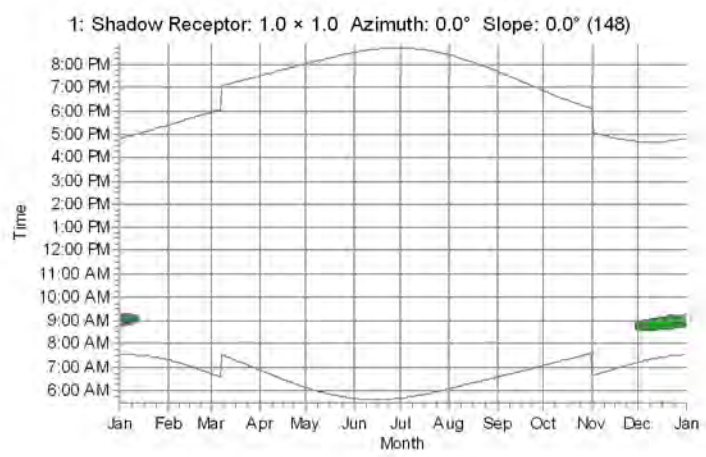
Table layout: For each day in each month the following matrix apply

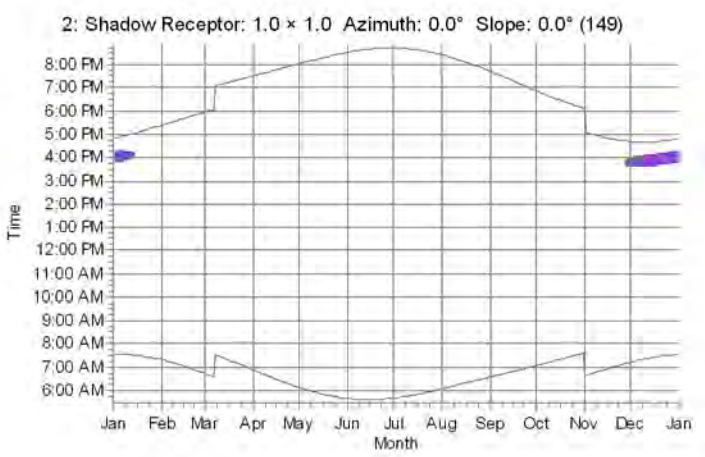
Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

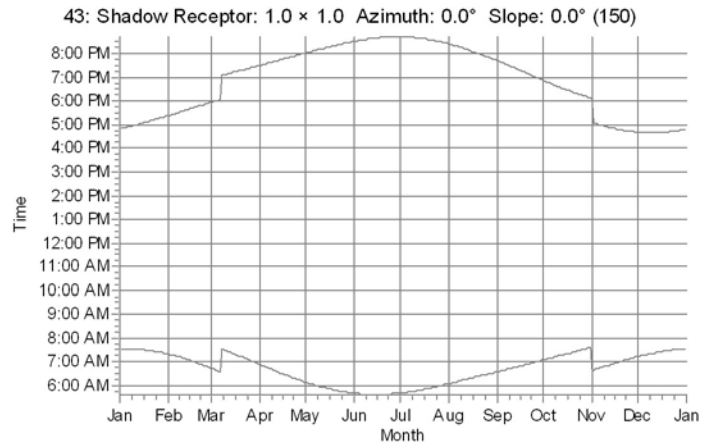
Licensed user:
EDR
217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688

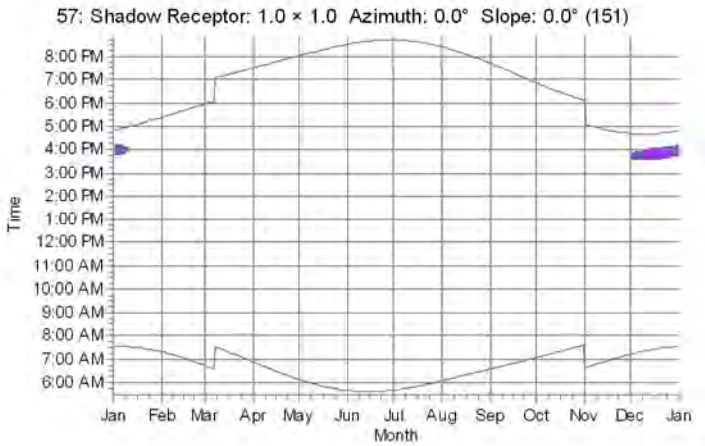
Calculated:
9/3/2021 5:20 PM/3.4.415

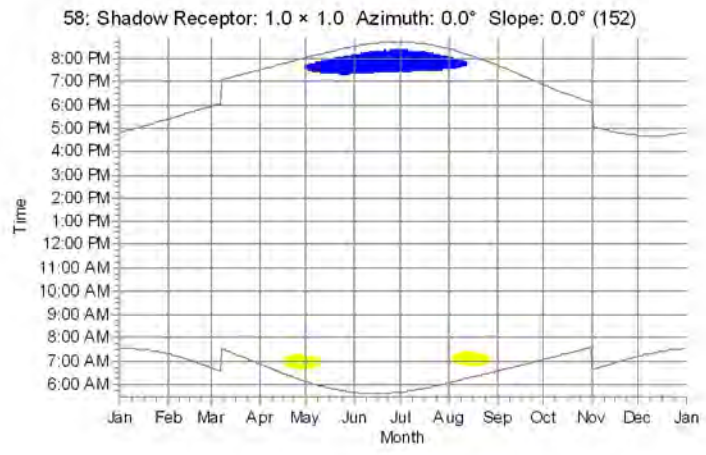
SHADOW - Calendar, graphical











WTGs

M10: Siemens Gamesa SG 6.0-170 6200 170.0 IO! hub: 100.0 m (TOT: 185.0 m) (141)
M08: Siemens Gamesa SG 6.0-170 6200 170.0 IO! hub: 100.0 m (TOT: 185.0 m) (142)
L04: Siemens Gamesa SG 6.0-170 6200 170.0 IO! hub: 100.0 m (TOT: 185.0 m) (166)
E01: Siemens Gamesa SG 6.0-170 6200 170.0 IO! hub: 100.0 m (TOT: 185.0 m) (185)